GEFRAN

GPC

Advanced Power Controller

CONFIGURATION AND PROGRAMMING MANUAL

Software version 2.1x

code: 81901A “MSW_GPC-40/600A”

81901A “MSW_GPC-40/600A” _03-2021_ENG

TABLE OF CONTENTS

PREFACE

Warnings and safety

Gefran always has the latest version of the Instruction Manual available for free downloads and in multiple languages at www.gefran.com. The current manual must be made available to all people that interact with the devices this manual describes.

Only qualified technicians, following current laws and regulations should be installing this device and care be taken to follow instructions given in this manual 2nd could be better stated

Gefran is not liable for injury to personnel, damage to property, other equipment, or to this device for improperly following the instruction manuals and safety regulations.

Installation and maintenance technicians must read the manual, following instructions written within the manual and its annexes.

Before proceeding with this device, GPC Controller, the technicians and operators must be sufficiently trained in the operation, emergency, diagnostics, and maintenance procedures for this type of device. This device can be used in applications with risk for injury or death, damage to machines and materials, in those cases the users and installers must combine auxiliary devices and system safegaurds to protect against hazards.

Caution! Do not touch the terminals on the device when it is powered.

Contact Gefran Technical Support if you suspect instrument malfunction. Prior to contact Gefran, review the manual and sections of the manual that pertains to the problem encountered. When contacting Gefran have the manual available for reference.

Caution! Repairs to the Advanced Power Controller must only be made by technical personnel suitably trained and authorised by Gefran. Any attempt to repair or modify the hardware features of the device by unauthorised personnel will void the warranty.

Disposal

The instrument must be segregated from other waste at the end of its useful life.

The user must take the equipment at the end of its useful life to an appropriate sorting centre for electrotechnical and electronic waste, or a similar facility, in accordance with the regulations in force in the country of installation, in order to dispose of the components which are potentially harmful to the environment.

This helps prevent negative effects on the environment and health and facilitates recycling of the materials from which the instrument is made.

Typographical Conventions used in the manual

Pay attention when the following symbols are found in the manual.

They indicate particularly important information relevant to correct product operation or safety, or provide instructions that must be strictly followed.

This highlights a risk condition for the installation technician or user due to hazardous voltage levels.

This calls the reader's attention to a specific point.

This indicates a suggestion that could be helpful for better use of the device.

This indicates a reference to other technical documents that may be downloaded from www.gefran.com.

Liability disclaimer

Although all the information in this document has been carefully checked, Gefran S.p.A. cannot be held liable for the possible presence of errors, or for damage to persons or property due to improper use of this manual.

Gefran S.p.A. also reserves the right to make changes to the content and form of this document and to the features of the devices it describes at any time without prior notice.

The technical and performance data given in this manual are to be considered as a guide for the user to determine the suitability for a certain use and are not a guarantee. They may be the result of Gefran S.p.A. test conditions and the user must compare them to his/her real application requirements.

Gefran S.p.A. cannot be held in any way liable for damage to persons or property resulting from tampering or use that is incorrect, improper or otherwise incompliant with the features of the controller and the instructions contained in this manual.

Gefran S.p.A. shall not be liable for installations upstream or downstream from the instrument.

Copyright

1. GENERAL DESCRIPTION

1.1. Summary

The GPC Advanced Power Controller is a self-contained unit for independent control of up to 3 phases. It features a high level of operational flexibility achieved through the extensive configurability and programmability of its parameters.

The Advanced Power Controller is the ideal solution for applications in heat treatment ovens, autoclaves, glass furnaces and dryers.

Due to its high level of programmability, the controller can also be used in other applications, provided that they are compatible with the technical specifications of the instrument.

The instrument can be configured and programmed using a keypad (GFW/GPC-OP) or a PC installed with the special GF_eXpress application
software and connected to the instrument via a Gefran RS485 to USB cable (F055002).

1.2. Field of application

As the Advanced Power Controller can be used in a multitude of installations and environments, adequate technical training is required to make full use of the instrument's potential.
In any case, the instrument must always be used within the limits specified in the technical specifications in the accompanying documentation.

Regardless of any other consideration, **it is always strictly prohibited to**:

- use the instrument or parts of it (including the software) for purposes other than those specified in the accompanying technical documentation;
- change the working parameters not accessible to the operator, or decrypt or transfer the software or parts of it;
- use the instrument in particularly flammable environments;
- repair or modify the instrument using non-original spare parts;
- use the instrument or parts of it without having read and correctly interpreted the contents of the accompanying technical documentation;
- dispose of or discard the instrument in common landfills.

1.3. Technicians and operators

The Advanced Power Controller must only be used by personnel qualified for the assigned task, in compliance with the instructions for that task, especially the safety warnings and precautions they contain.
Qualified personnel, due to their training and experience, are able to recognise the risks involved in using the instrument and avoid potential hazards.

In addition, it is assumed that the technicians who commission the instrument and connect it to other units, and those who carry out maintenance, have sufficient technical knowledge, particularly in the field of electronics and automation, to fully understand the information provided in this manual.

2. COMMISSIONING

2.1. Commissioning operations

The simplest and safest way to commission GPC Advanced Power Controllers, after connecting the 24 Vdc power supply and a PC to the CPU, is to use the GF_eXpress software and its “SMART CONFIGURATION” function.

Through the “SMART CONFIGURATION” wizard menu, a safe working recipe can be created to test the controller and its load in just a few minutes, by answering some simple questions about the application.

Connection from PC to GPC, use cable Gefran F055002 which is a USB to RS485 type cable.

2.2. Programming tool

2.2.1. GF_eXpress

GF_eXpress is the configuration tool for components, automation, drives and sensors in the Gefran catalog.
GF_eXpress tool is easy and intuitive thanks to a graphical interface, with devices divided according to product type and function. The choice of the product to be configured is made through a contextual menu with visual selection using real product images.
This management makes it possible to have a single device library for all Gefran products.
The software is available free of charge and can be downloaded from www.gefran.com, where it is always updated to the latest version available.

Applications

- Create a resource library of all Gefran devices on the plant floor (instrumentation, drives, sensors, power controllers). of Gefran devices (instrumentation, drives, sensors).
- Tuning of adjustment parameters with on-line test and Trend.
- Parameter archive management for multiple configurations.

Features

- Guided product selection.
- Simplified setting.
- Multilingual.
- Print parameters.
- Creation and saving of recipes.
- Network autoscan.

2.2.1.1. System requirements

	Minimum	Recommended
Operating system	Windows XP SP2, Windows Vista or Windows 7 (32-bit)	Windows 10 (64 bit)
Processor	Intel Pentium 1 GHz	Intel Core i7 2.9 Ghz or higher
RAM	2 GB	4 GB or more
Free hard disk space	2 GB	4 GB or more
Graphic resolution	XGA (1024 x 768 pixels)	SXGA (1280 x 1024 pixels) or higher
Browser	Microsoft Internet Explorer 8.0	Microsoft Edge or higher
Ethernet Port	1 RJ45	1 RJ45
DVD player	Yes	Yes
USB port	1 USB 2.0	1 USB 2.0

2.3. First power-on

For commissioning of the Advanced Power Controller, the following steps and checks must be carried out:

1. Connect the line and load cables in accordance with the wiring diagram and leave the power line fuses open.
2. Connect the analog and/or serial/fieldbus communication signals.
3. Power the GPC-M module via a 24 Vdc power supply.
4. Once the GPC-M is switched on, the LEDs start turning on and off to indicate CPU initialisation. The following sequence is seen:
   a) All 8 LEDs on steadily at the same time for approx. 2 seconds.
   b) All 8 LEDs flashing simultaneously 3 times for approx. 2 seconds.
   c) The LEDs light up in sequence from number 1 to number 8.
5. Finally, the “RUN” (green) and “ER” (red) LEDs remain flashing. The “ER” LED will turn off when Digital Input 4 is subsequently connected.
6. Proceed with programming:
   a) Connect the PC to the GPC-M.
   b) Open the GF_eXpress software and select “INSTRUMENTS” and then, in the “Solid State Relay” drop-down menu, select GPC 40-600A.
   c) After setting the configuration parameters, select the “SMART CONFIGURATOR” menu.
   d) Complete the indicated steps providing the required information.
   e) Save the final parameter recipe and send it to the controller.
   f) Select “WIZARD”.
   g) Select “M” and check the following parameters and their values in the data sheet: ***OFF/ON*** = OFF; ***MAN/AUTO*** = MAN, ***Man.P*** = 0.0. Change the parameter if necessary.
7. Close the power line fuses.
8. Connect the ENABLE/INTERLOCK signal to Digital Input 4. The “ER” LED (red) goes off. If this 24 Vdc signal is not present, the controller is not enabled to supply output power to the load and the “ER” LED remains lit.
9. Change the value of the following parameters with GF_eXpress: ***OFF/ON*** = ON; ***Man.P*** = 10.0. With this action the output is activated at 10% power.
10. If the “ER” (red) LED flashes, the power will not be delivered. Check for the following possible causes:
    - Fuses not closed.
    - No line voltage.
11. Check:
    - for the GPC 400...600A models, the connection of the Ref.V_LINE and Ref.V_Load signals (terminals 3/L1 and 4/L2 on connector J6 and, depending on the options, also check terminals 6/T2 and 5/T1 on connector J7);
    - for the GPC 40...300A models, the connection of the Ref.V_LINE and Ref.V_Load signals (terminals 3/L2 and 4/T2 and, depending on the options, also terminals 5/T3 of connector J10).
12. Test the system by increasing the percentage of power to the load in small steps (*Man.P*parameter) and checking the correct behaviour of the controller using the monitor functions in GF_eXpress.

3. CONFIGURATION

Configuration and programming of the Advanced Power Controller can be performed with a keypad (GFW/GPC-OP) or preferably with a PC installed with the special GF_eXpress application software and connected to the instrument via a USB cable (F055002), which can be ordered from Gefran.

For more information on programming with the keypad, see chapter “5. Using the GFW/GPC-OP keypad”.

For more information on programming with a PC, see the GF_eXpress documentation available at www.gefran.com.

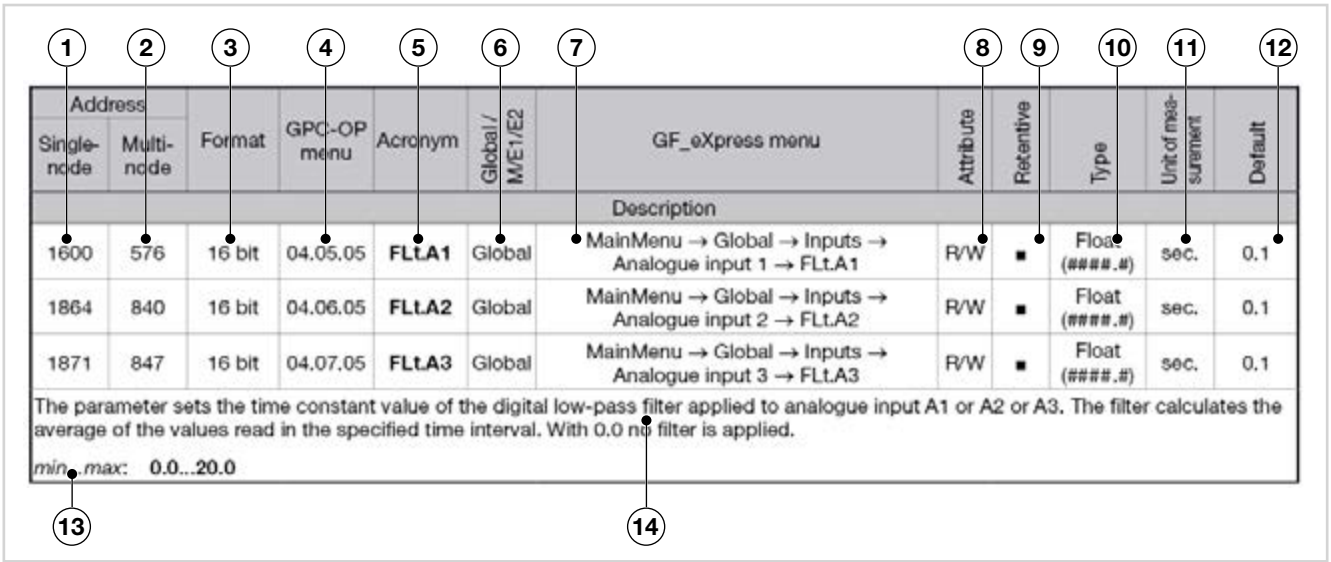
Caution! Advanced knowledge of the problems and techniques associated with control is required to correctly set the parameters needed to configure the Advanced Power Controller so that it meets the application requirements.

Caution! Before commissioning the controller, the user must ensure that the parameters are set correctly to avoid damages to persons or property.

If you are unsure of your skills or not fully aware of the potential consequences of incorrect parameter settings, we advise you not to proceed with the configuration.

If in doubt, or if you would like some clarification, please visit www.gefran.com or contact the Gefran Customer Care service.

3.1. Parameter legend

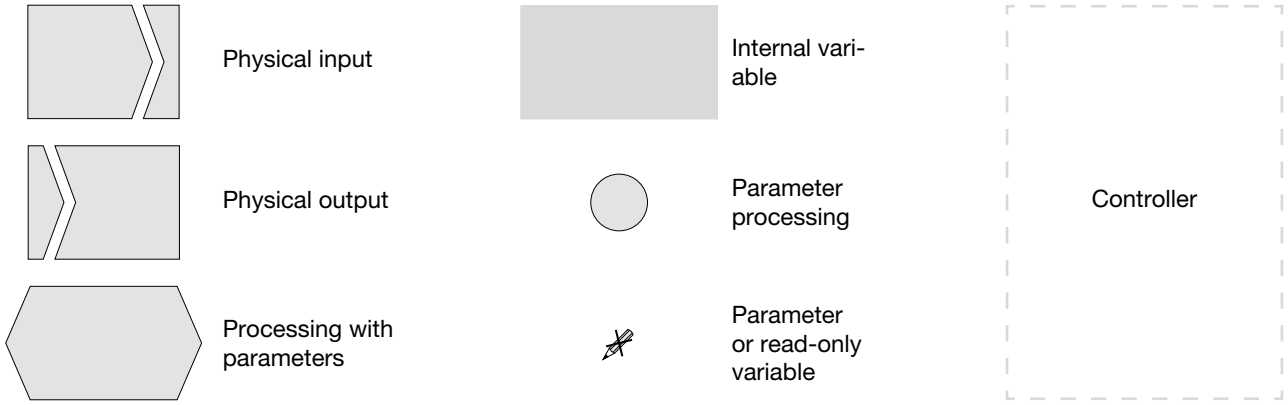


NOTE: 16 bit data is integer type. Decimal representation is virtual only and must be managed by the display device. A maximum of 16 continuous 16 bit register may be read at one time. See Modbus Address Manual for full details.

1. Parameter address in Single-node mode.
2. Parameter address in Multi-node mode.
3. Parameter format, which can be:
   - bit,
   - 16 bit,
   - 32 bit.
4. Menu address with the GFW/GPC-OP keypad.
5. Acronym by which the parameter is identified.
6. Indicates whether the parameter is global or only affects a particular module.
7. Complete path of the GF_eXpress menu.
8. Parameter attribute:
   - R = the parameter is read-only,
   - R/W = the parameter can be read and written.
9. Indicates whether the parameter value remains stored even after the controller is switched off.
10. Indicates the type of parameter.
    With 16-bit parameter it can be:
    - Unsigned Short,
    - Short,
    - Float (the position of the decimal point is indicated in brackets).

    With 32-bit parameter (16-bit LSW at parameter address + 16-bit MSW at parameter address + 1) it can be:
    - Unsigned Int,
    - Float32 (the position of the decimal point is shown in brackets).
11. Unit of measurement of the value managed by the parameter. The unit of measurement can be unique or depend on other configuration choices, such as the temperature unit, which can be set either to Centigrade or Fahrenheit.
    Not all parameters have units of measurement.
12. Factory parameter value.
13. Value that the parameter can take. The value can be of two types: discrete or belonging to a range of values, typically numerical. With a discrete value, all possible values are listed. With value ranges, the minimum and maximum values that the parameter can take are shown.
14. Full description of the parameter.

3.2. Legend for functional parameter diagrams



3.3. Modes of use

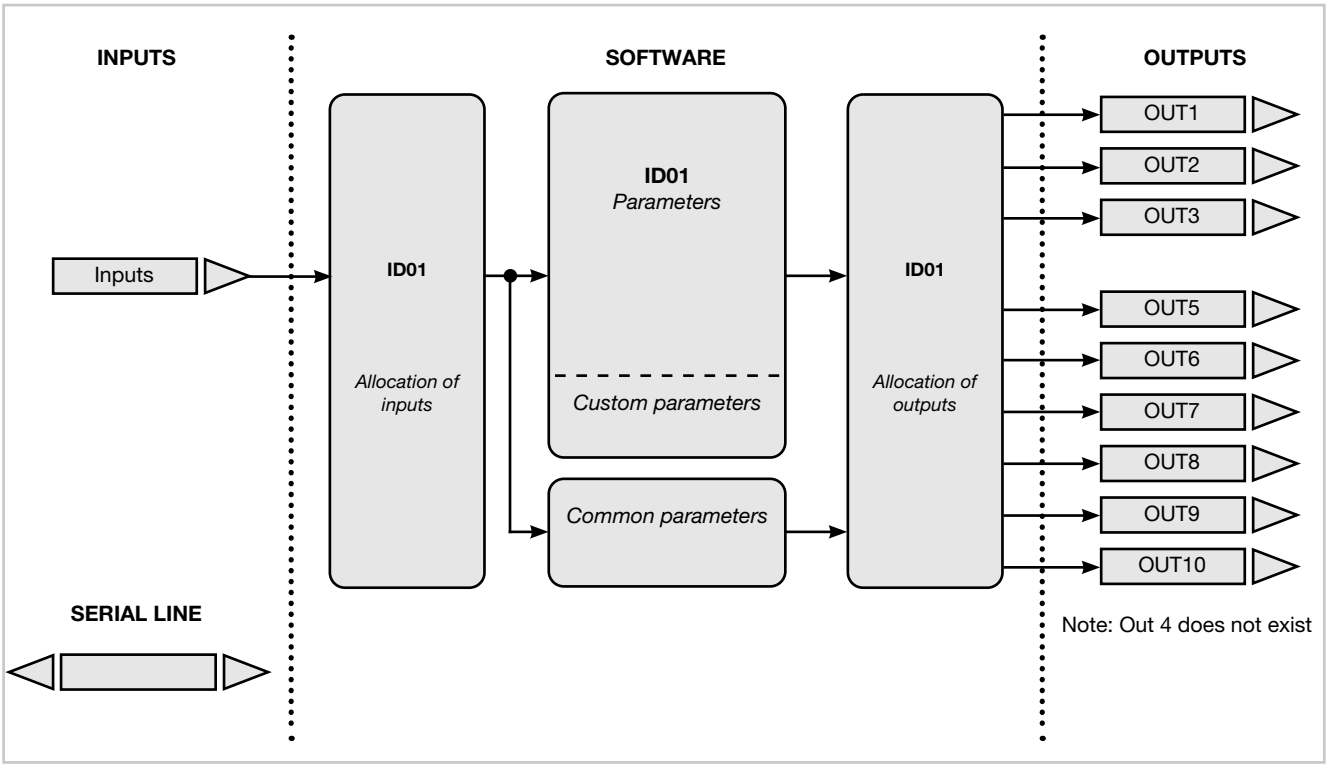
The GPC Advanced Power Controller can be used and addressed in two different modes:

- **Single-node**, in which GPC behaves as an individual single-phase, two-phase or three-phase controller.
- **Multi-node**, in which GPC behaves as if it were several separate single-phase controllers (max 3).

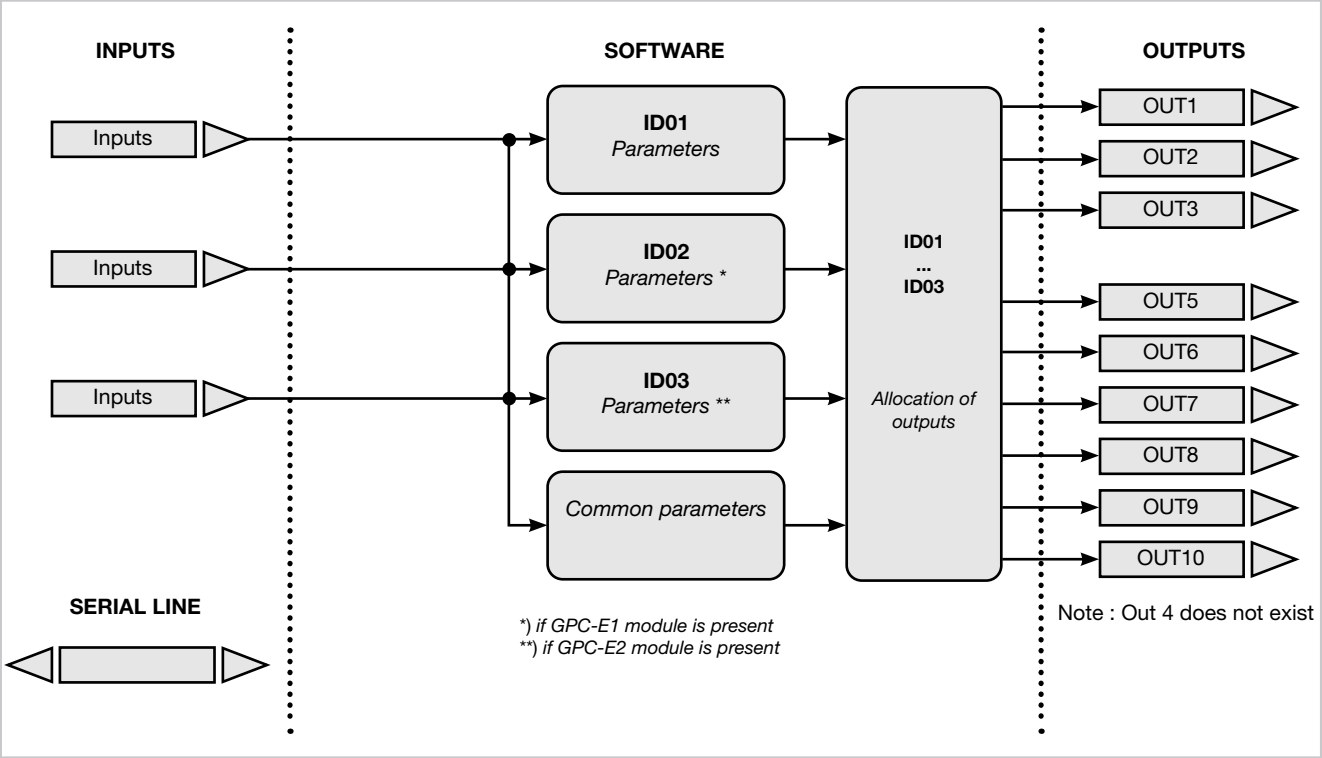
The difference consists in in the way it is used on the application and the way the parameters are addressed.
New common parameters are available in both modes, allowing more advanced functions.

Single-node mode, in addition to having a set of customisable custom parameters for dynamic addressing, allows only one node to be used in the communication network, instead of the 3 nodes required by Multi-node mode.

3.3.1. Functional diagram of Single-node mode



3.3.2. Functional diagram of multi-node mode



3.4. Serial communication (Modbus)

3.4.1. Addressing (Cod)

GPC devices are identified uniquely identified through the node address (Cod, i.e., device identification code) set with the two hexadecimal rotary switches (tens + units). The address is read-only.
Up to 99 GPC devices can be installed in a serial network, with a selection of standard node addresses from '01' to '99' (hexadecimal settings A, B, C, D, E are reserved).

The selection of Single-node or Multi-node operating mode is made via DIP switch 7.

3.4.2. Single-node mode

The default mode selected is Single-node. This mode is activated by setting DIP switch 7 = OFF and it allows the serial communication efficiency to be optimised by integrating several modules (a maximum of 3) with the Advanced Power Controller.

The memory is organised in groups: the modules (max 3) are the same as in Multi-node mode, plus the Custom group. Thus, you have:
- GPC-M for the controller's M module variables.
- GPC-E1 for the controller's E1 module variables.
- GPC-E2 for the controller's E2 module variables.
- Custom, which collects up to 120 variables and parameters, each one word long, the meaning of which can be changed.

The set value (Cod) on the rotary switches is unique.
The address of the individual modules is the same as the Multi-node address with a fixed offset (+1024 for GPC-M, +2048 for GPC-E1 and +4096 for GPC-E2).
For example, to access the variable *Ou.P*, which contains the value of the control output, you use:
- the address *Cod*, 1026 (= *Cod*, 2+1024) for GPC-M,
- the address *Cod*, 2050 (= *Cod*, 2+2048) for GPC-E1,
- the address *Cod*, 4098 (= *Cod*, 2+4096) for GPC-E2.

"2" is the address of the variable *Ou.P* in Multi-node mode.

3.4.2.1. Custom Modbus memory map

The addresses 0 to 119 correspond to the words of the Custom group; variables and parameters are defined by default.

The Custom Modbus map, accessible via the Main Menu → Custom Map, allows a word memory area of 32 contiguous elements to be defined in order to make use of the Modbus multi-word read and write commands and thus speed up data exchange with a Modbus Master device.
The parameters defining the 120 internal variables, to be read or written contiguously, are available in GF_eXpress Custom Map in addresses 200 to 319. Addresses 0 to 119 contain the value of these parameters.

Addresses 200...319, the values of the Custom variables and parameters, are protected against overwriting.
To enable writing, the value 99 must be written to addresses 600 and 601. The value 99 is reset at each startup.

Example of memory map use
You want to access the *Ou.P* (power output) variables from GPC-M, GPC-E1 and GPC-E2.
The 3 required Modbus addresses are 1026 for GPC-M, 2050 for GPC-E1 and 4098 for GPC-E2. Given the Modbus addresses of the three parameters, three separate requests would be necessary if the Custom map was not used.

IPA	Name	Value	Unit	Default value	Min	Max	Description	Address	Type
10200	CustomVar1	1024 = None of M		1024 = None of M	0	0	Address of custom variable 1	200	UnsignedShort
10201	CustomVar2	1024 = None of M		1024 = None of M	0	0	Address of custom variable 2	201	UnsignedShort
10202	CustomVar3	1024 = None of M		1024 = None of M	0	0	Address of custom variable 3	202	UnsignedShort
10203	CustomVar4	1024 = None of M		1024 = None of M	0	0	Address of custom variable 4	203	UnsignedShort
10204	CustomVar5	1024 = None of M		1024 = None of M	0	0	Address of custom variable 5	204	UnsignedShort
10205	CustomVar6	1024 = None of M		1024 = None of M	0	0	Address of custom variable 6	205	UnsignedShort
10206	CustomVar7	1024 = None of M		1024 = None of M	0	0	Address of custom variable 7	206	UnsignedShort
10207	CustomVar8	1024 = None of M		1024 = None of M	0	0	Address of custom variable 8	207	UnsignedShort
10208	CustomVar9	1024 = None of M		1024 = None of M	0	0	Address of custom variable 9	208	UnsignedShort
10209	CustomVar10	1024 = None of M		1024 = None of M	0	0	Address of custom variable 10	209	UnsignedShort

IPA	Name	Value	Unit	Default value	Min	Max	Description	Address	Type
10200	CustomVar1	1026 = Ou.P of M		1024 = None of M	0	0	Address of custom variable 1	200	UnsignedShort
10201	CustomVar2	2050 = Ou.P of E1		1024 = None of M	0	0	Address of custom variable 2	201	UnsignedShort
10202	CustomVar3	4098 = Ou.P of E2		1024 = None of M	0	0	Address of custom variable 3	202	UnsignedShort
10203	CustomVar4	1024 = None of M		1024 = None of M	0	0	Address of custom variable 4	203	UnsignedShort
10204	CustomVar5	1024 = None of M		1024 = None of M	0	0	Address of custom variable 5	204	UnsignedShort
10205	CustomVar6	1024 = None of M		1024 = None of M	0	0	Address of custom variable 6	205	UnsignedShort
10206	CustomVar7	1024 = None of M		1024 = None of M	0	0	Address of custom variable 7	206	UnsignedShort
10207	CustomVar8	1024 = None of M		1024 = None of M	0	0	Address of custom variable 8	207	UnsignedShort
10208	CustomVar9	1024 = None of M		1024 = None of M	0	0	Address of custom variable 9	208	UnsignedShort
10209	CustomVar10	1024 = None of M		1024 = None of M	0	0	Address of custom variable 10	209	UnsignedShort

Note: The Custom map function is not available in Multi-node mode

To read these quantities in a single request, thereby reducing the update times, simply do the following in GF_eXpress:

- in the *CustomVar1* object (address 200) enter the value 1026, i.e., the Modbus address of the first parameter to be accessed;
- in the *CustomVar2* object (address 201), the value 2050, i.e., the Modbus address of the second parameter to be accessed;
- in the *CustomVar3* object (address 202), the value 4098, i.e., the Modbus address of the third parameter to be accessed.

At this point, through the Modbus read command of three consecutive addresses starting from 0, the three powers supplied can be accessed by means of a single operation.

3.4.3. Multi-node mode

This mode is activated by setting DIP switch 7 = ON.
The memory is organised in groups:

- GPC-M for the controller's M module variables.
- GPC-E1 for the controller's E1 module variables.
- GPC-E2 for the controller's E2 module variables.

The value set (Cod) on the rotary switches corresponds to that of GPC-M; that of the other modules, if present, is in sequence (Cod+1 for GPC-E1, Cod+2 for GPC-E2).

Examples

The rotary switches show the value 14. Therefore, node (Cod) 14 addresses GPC-M, node 15 addresses GPC-E1 and node 16 addresses GPC-E2.

Using this setting, for example, the variable *Ou.P* in GPC-M will have the address *14, 2* (=Cod, 2), the variable *Ou.P* in GPC-E1 will have the address *15, 2* (=Cod+1, 2) and the variable Ou.P in *GPC-E2* will have the address 16, 2 (= Cod+2, 2).

3.5. Time constraints of serial communication

In order to permit correct serial data exchange with the device, the following time constraints must be respected:

- **Reading register/word parameters**
  Reading *n* consecutive parameters, with *n* varying from 1 to 16, requires a time of:
  – 40 ms with retentive memory enabled (default),
  – 35 ms with retentive memory disabled.
  The retentive memory setting is obtained through the parameter EEP.E (see paragraph "3.26.2. Enabling retentive memory storage").
  Thus, the next Modbus command to the same node, whether read or write, must be sent after this delay time has expired.

- **Writing parameters to register/word**
  The writing of *n* consecutive parameters, with *n* varying from 1 to 16 and a complete set of updated values (16 in total) with regard to those currently present on the device, requires a time of:
  – 40 ms + (*n* x 10 ms *) with retentive memory enabled (default),
  – 35 ms with retentive memory disabled

  The retentive memory setting is obtained through the parameter EEP.E (see paragraph "3.26.2. Enabling retentive memory storage").
  Thus, the next Modbus command to the same node, whether read or write, must be sent after this delay time has expired.

The times given refer to cases with a serial baudrate of 19200. Lower baudrates increase transmission times and thus waiting times.

Notes

*) If the STATUS_W parameters (Modbus address 305) are included in the write request, and their value is different from the one currently present in the slave, the time needed to write each one will be 30ms instead of 10ms

3.6. Connections

In a network, a “Master” device can be identified, which communicates through commands, and “Slave” devices, which interpret and implement the commands. The GPC devices are the Slaves and the Master is the supervisor terminal or a PLC.

Each GPC device is equipped with an opto-isolated RS485 serial port (PORT 1 or serial 1) which uses the standard Modbus protocol. The connectors used are J8 and J9 (RJ10 type). An additional optional serial interface (PORT 2 or serial 2) can also be inserted into the device to connect to the required fieldbus. Interfaces are available for connection to Modbus, Profibus DP, CANopen and Ethernet (Modbus TCP, EtherCAT and EthernetIP).

A parameter can be read or written from both PORT 1 and PORT 2 and both communication ports respond to the same Cod address.

3.6.1. Modbus network installation

The procedure described below is for the Modbus protocol. For the remaining protocols, please refer to the specific fieldbus manuals available at www.gefran.com.
GPC devices leave the factory with the following settings:

- Cod = 0 (rotary switches set 0 + 0)

	PORT 1 (Serial 1)	**PORT 2** (Serial 2)
Speed (bit/s)	19200	19200
Parity	No parity	No parity

In summary, the valid settings on the rotary switches (tens + units) are:

- (0 + 0) = Autobaud Serial 1
- (B + 0) = Autobaud Serial 2

The communication parameters for PORT 1 are *bAu*, which allows the speed to be set in bits/s, and *Par*, which allows the parity to be set. The corresponding parameters for PORT 2 are *bAu.2* and *PAr2*.

Changing the parameters *bAu* and *PAr* may invalidate the communication.

3.6.2. Communication error

If a communication error occurs between the GPC device and the Master device, it is possible to force an output power value (*C.E.P* parameter of each module) and transmit the alarm status to a relay output (*rL.x* parameters).
If the communication error is caused by the timeout, the timeout time can be changed in the *C.E.t* parameter.

3.6.3. Device identification code

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1070	46	16 bit	02.09	**Cod**	Global	MainMenu → Global → Info → Cod	R		Unsigned Short		10
The parameter shows the identification code of the GPC device, which is set with the hexadecimal rotary switches. *min...max*: **1...99**											

3.6.4. Serial port transmission speed

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1069	45	16 bit	03.01.01	**bAu**	Global	MainMenu → Global → Info → bAu	R/W	■	Unsigned Short		4
1650	626	16 bit	03.01.03	**bAu.2**	Global	MainMenu → Global → Info → bAu.2	R/W	■	Unsigned Short		4
The parameter sets the transmission speed of the serial port. *Options*: **0** = Speed 1200 bit/s **1** = Speed 2400 bit/s **2** = Speed 4800 bit/s **3** = Speed 9600 bit/s **4** = Speed 19200 bit/s **5** = Speed 38400 bit/s **6** = Speed 57600 bit/s **7** = Speed 115200 bit/s											

3.6.5. Communication error timeout

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1914	890	16 bit	02.09	**C.E.t**	Global	MainMenu → Global → Info → C.E.t	R/W	■	Unsigned Short	sec.	0
The parameter sets the timeout time before a communication error is generated. Setting the parameter to “0” disables the communication error. *min...max*: **0**...**121**											

3.6.6. Power delivery mode with communication error

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1915	891	16 bit	03.02.01	**C.E.m**	M	MainMenu → M → Controls → C.E.m_1	R/W	■	Unsigned Short		0
2939			03.03.01		E1	MainMenu → E1 → Controls → C.E.m_2					
4987			03.04.01		E2	MainMenu → E2 → Controls → C.E.m_3					
The parameter defines what happens to the power delivered from the output of the GPC device when a communication error occurs. *Options*: **0** = The power delivered is not changed **1** = The power delivered is forced to the value determined by the parameter C.E.P											

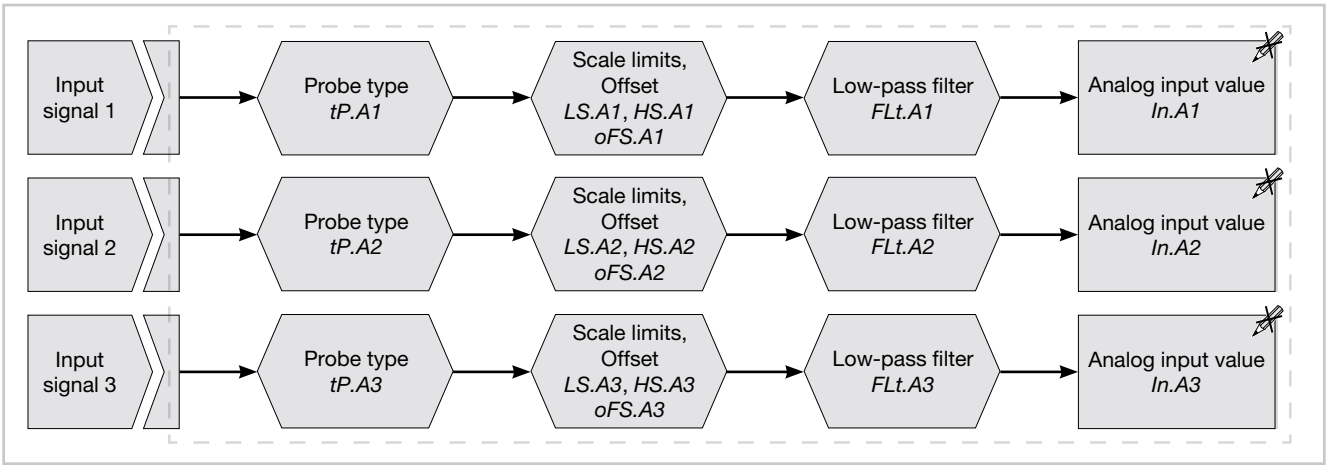
3.6.7. Output power with communication error

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1916	892	16 bit	03.02.02	**C.E.P**	M	MainMenu → M → Controls → C.E.P_1	R/W	■	Float (####.#)	%	0.0
2940			03.03.02		E1	MainMenu → E1 → Controls → C.E.P_2					
4988			03.04.02		E2	MainMenu → E2 → Controls → C.E.P_3					
When a communication error occurs, if the parameter C.E.m has been set to “1”, the parameter sets the power delivered by the output of the GPC device as a percentage value of the maximum power that can be delivered by the output. *min...max*: **0.0**...**100.0**											

3.7. Analog inputs

3.7.1. Functional diagram of analog inputs

The Advanced Power Controller has 3 analog inputs whose main purpose is to control the power output. The input electrical signal is processed to obtain a valid analog value for the control function.
The diagram shows the signal processing sequences.



3.7.2. Types of analog input

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1597	573	16 bit	04.05.01	**tP.A1**	Global	MainMenu → Global → Inputs → Analog input 1 → tP.A1	R/W	■	Unsigned Short		0
1861	837	16 bit	04.06.01	**tP.A2**	Global	MainMenu → Global → Inputs → Analog input 2 → tP.A2	R/W	■	Unsigned Short		0
1868	844	16 bit	04.07.01	**tP.A3**	Global	MainMenu → Global → Inputs → Analog input 3 → tP.A3	R/W	■	Unsigned Short		0

The parameter sets the type of electrical signal expected on analog input A1 or A2 or A3. This signal is typically generated by a probe.

Options:
0 = Input disabled
1 = Voltage 0...10 V
2 = Voltage 0...5 V or potentiometer
3 = Current 0...20 mA
4 = Current 4...20 mA

3.7.3. Analog input lower scale limit

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1598	574	16 bit	04.05.02	**LS.A1**	Global	MainMenu → Global → Inputs → Analog input 1 → LS.A1	R/W	■	Float (####.#)	s.p.	0.0
1862	838	16 bit	04.06.02	**LS.A2**	Global	MainMenu → Global → Inputs → Analog input 2 → LS.A2	R/W	■	Float (####.#)	s.p.	0.0
1869	845	16 bit	04.07.02	**LS.A3**	Global	MainMenu → Global → Inputs → Analog input 3 → LS.A3	R/W	■	Float (####.#)	s.p.	0.0

The parameter sets the lower limit of the measurement scale used for analog input A1 or A2 or A3.
For examples of the use of the parameter, see paragraph “4.1. Setting parameters LS.A1/LS.A2/LS.A3 and HS.A1/HS.A2/HS.A3”.

min...max: **-100.0**...**200.0**

3.7.4. Analog input upper scale limit

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1599	575	16 bit	04.05.03	**HS.A1**	Global	MainMenu → Global → Inputs → Analog input 1 → HS.A1	R/W	■	Float (####.#)	s.p.	100.0
1863	839	16 bit	04.06.03	**HS.A2**	Global	MainMenu → Global → Inputs → Analog input 2 → HS.A2	R/W	■	Float (####.#)	s.p.	100.0
1870	846	16 bit	04.07.03	**HS.A3**	Global	MainMenu → Global → Inputs → Analog input 3 → HS.A3	R/W	■	Float (####.#)	s.p.	100.0
The parameter sets the upper limit of the measuring scale used for analog input A1 or A2 or A3. For examples of the use of the parameter, see paragraph “4.1. Setting parameters LS.A1/LS.A2/LS.A3 and HS.A1/HS.A2/HS.A3”. *min...max*: **LS.Ax**...**200.0**											

3.7.5. Analog input offset

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1601	577	16 bit	04.05.04	**oFS.A1**	Global	MainMenu → Global → Inputs → Analog input 1 → oFS.A1	R/W	■	Float (####.#)	s.p.	0.0
1865	841	16 bit	04.06.04	**oFS.A2**	Global	MainMenu → Global → Inputs → Analog input 2 → oFS.A2	R/W	■	Float (####.#)	s.p.	0.0
1872	848	16 bit	04.07.04	**oFS.A3**	Global	MainMenu → Global → Inputs → Analog input 3 → oFS.A3	R/W	■	Float (####.#)	s.p.	0.0
The parameter sets the offset applied to the value read from analog input A1 or A2 or A3 to match the expected value. It is used to correct a possible constant probe reading error. This offset applies linearly to all readings, so it cannot be used to correct for probe linearity errors. *min...max*: **-99.9**...**99.9**											

3.7.6. Analog input low-pass filter

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1600	576	16 bit	04.05.05	**FLt.A1**	Global	MainMenu → Global → Inputs → Analog input 1 → FLt.A1	R/W	■	Float (####.#)	sec.	0.1
1864	840	16 bit	04.06.05	**FLt.A2**	Global	MainMenu → Global → Inputs → Analog input 2 → FLt.A2	R/W	■	Float (####.#)	sec.	0.1
1871	847	16 bit	04.07.05	**FLt.A3**	Global	MainMenu → Global → Inputs → Analog input 3 → FLt.A3	R/W	■	Float (####.#)	sec.	0.1
The parameter sets the time constant value of the digital low-pass filter applied to analog input A1 or A2 or A3. The filter calculates the average of the values read in the specified time interval. With 0.0 no filter is applied. *min...max*: **0.0**...**20.0**											

3.7.7. Analog input process value

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1596	572	16 bit	04.01.01	**In.A1**	Global	MainMenu → Global → Status → In.A1	R		Float (####.#)	s.p.	
1860	836	16 bit	04.01.02	**In.A2**	Global	MainMenu → Global → Status → In.A1	R		Float (####.#)	s.p.	
1867	843	16 bit	04.01.03	**In.A3**	Global	MainMenu → Global → Status → In.A1	R		Float (####.#)	s.p.	
The parameter shows the process value of analog input A1 or A2 or A3. *min...max*: **0.0**...**100.0**											

3.8. Measuring load current

The Advanced Power Controller is able to measure the current input from the controlled load, whether single-phase or three-phase. The current input of a two-phase load can also be measured.
The absolute current input value read is processed to obtain an RMS current value useful for controlling the application.

The RMS current value can be read in the variable *Ld.A* of the individual module (each module corresponds to a single-phase load).
For three-phase loads, which use 3 modules (M = line L1, E1 = line L2, E2 = line L3), the average of the *Ld.A* variables of the individual modules is taken and stored in the variable *Ld.A.t*.

Input measurement accuracy is better than 1% in start modes ZC, BF and HSC.
In PA mode the accuracy is better than 3% with a conduction angle >90° and better than 10% for smaller conduction angles.
The circulating current in the load is acquired with a 0.2 ms sampling time.

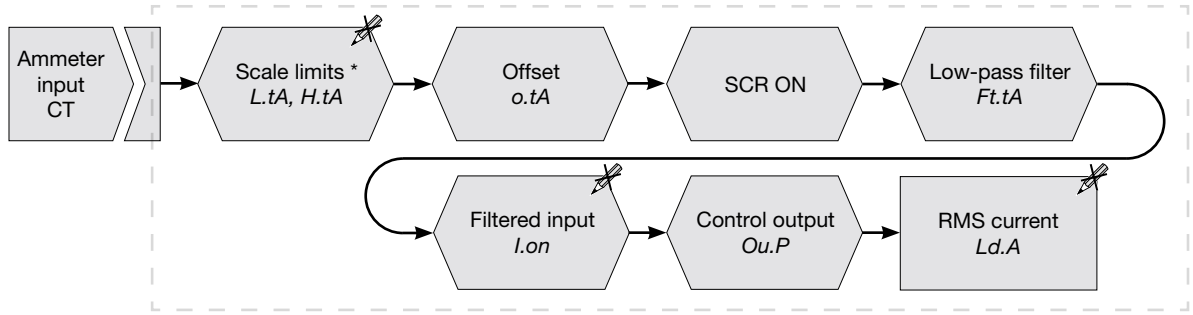
If diagnostics detects a fault condition on the load, the red ER LED will flash in synch with the yellow O1, O2 or O3 LED for the module in question.

The default value of the *H.tA* maximum limit or ammeter full-scale depends on the controller model*:*

GPC model	Rated current	H.tA
GPC 40	40 A	80.0
GPC 60	60 A	120.0
GPC 100	100 A	200.0
GPC 150	150 A	300.0
GPC 200	200 A	400.0
GPC 250	250 A	500.0
GPC 300	300 A	600.0
GPC 400	400 A	800.0
GPC 500	500 A	1000.0
GPC 600	600 A	1200.0
External CT	*r.tA* = 200	1000.0

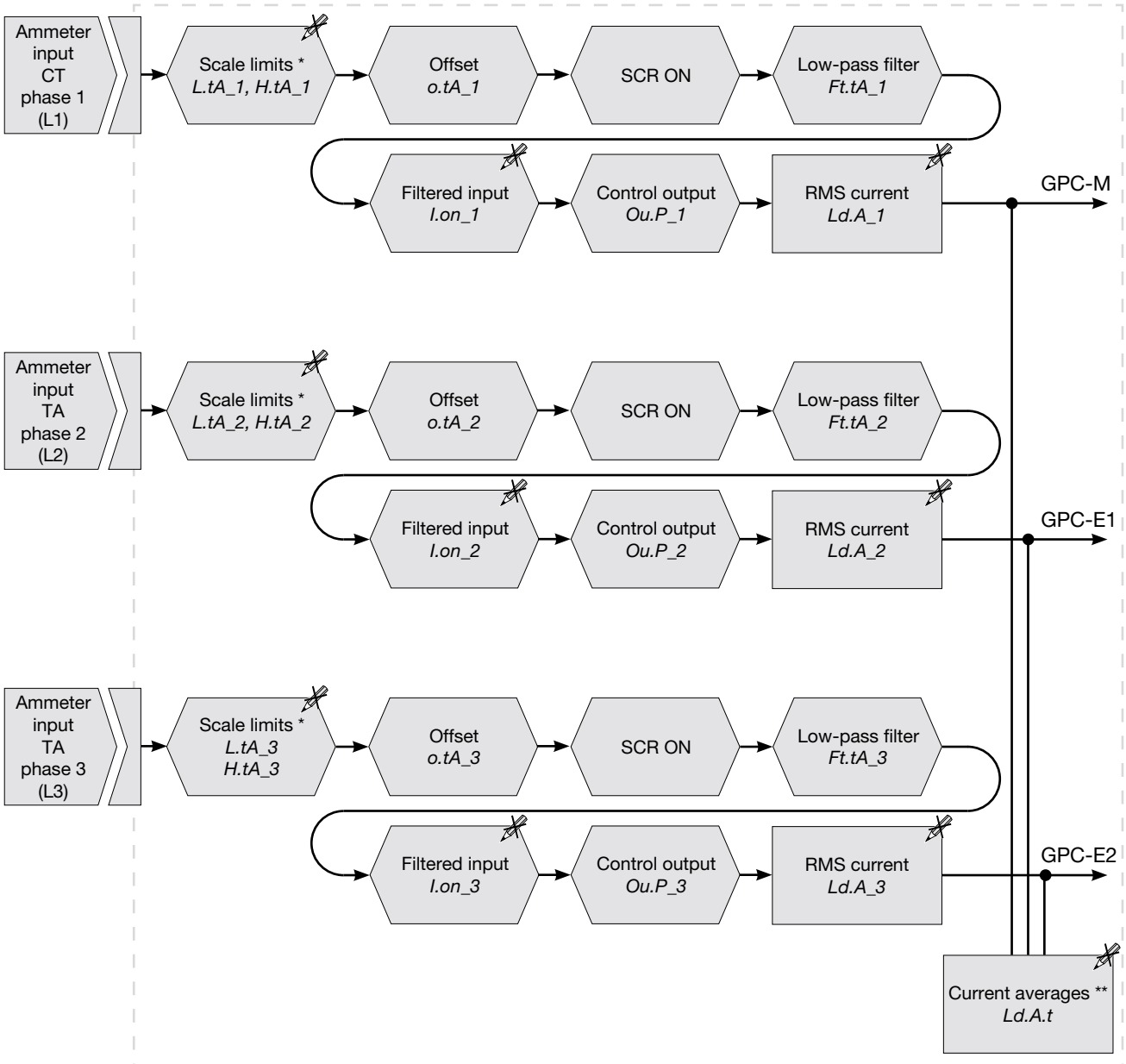
The following diagrams show the processing sequences for the initial current value.

Single-phase load



*) limits depend on the current rating of the device

Three-phase load



*) limits depend on the current rating of the device
**) with BIPHASE command the value *Ld.A_3* is calculated as the average of the values *Ld.A_1* and *Ld.A_2*

3.8.1. Ammeter input lower scale limit

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1770	746	16 bit	04.08.01	**L.tA**	M	MainMenu → M → Inputs → CT input → Lt.A_1	R		Float (####.#)	A	0.0
2794			04.11.01		E1	MainMenu → E1 → Inputs → CT input → Lt.A_2					
4842			04:14:01		E2	MainMenu → E2 → Inputs → CT input → Lt.A_3					
The parameter shows the lower limit of the measuring scale used for the CT ammeter input of device M or E1 or E2.											

3.8.2. Ammeter input upper scale limit

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1429	405	16 bit	04.08.02	**H.tA**	M	MainMenu → M → Inputs → CT input → Ht.A_1	R		Float (####.#)	A	see table
2453			04.11.02		E1	MainMenu → E1 → Inputs → CT input → Ht.A_2					
4501			04:14:02		E2	MainMenu → E2 → Inputs → CT input → Ht.A_3					
The parameter shows the upper limit of the measuring scale used for the CT ammeter input of device M or E1 or E2. The value depends on the current rating of the device or, in the case of an external CT, on the value of the parameter *r.tA.*											

3.8.3. Ammeter input offset

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1244	220	16 bit	04.08.03	**o.tA**	M	MainMenu → M → Inputs → CT input → o.tA_1	R/W	■	Float (####.#)	A	0.0
2268			04.11.03		E1	MainMenu → E1 → Inputs → CT input → o.tA_2					
4316			04:14:03		E2	MainMenu → E2 → Inputs → CT input → o.tA_3					
The parameter shows the offset applied to the value read from the CT ammeter input of device M or E1 or E2 to match the expected value. It serves to correct a possible constant reading error. This offset applies linearly to all readings. *min...max*: **-99.9**...**99.9**											

3.8.4. Transformation ratio for external CT input

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1417	393	16 bit	04.08.05	**r.tA**	M	MainMenu → M → Inputs → CT input → r.tA_1	R/W	■	Unsigned Short		200
2441			04.11.05		E1	MainMenu → E1 → Inputs → CT input → r.tA_2					
4489			04:14:05		E2	MainMenu → E2 → Inputs → CT input → r.tA_3					
The parameter sets the transformation ratio for the external CT input of device M or E1 or E2. External current transformers of up to 3275.0 A can be used on the secondary circuit, equivalent to 5.0 A (full scale) x 655 (max. transformation ratio). *min...max*: **1**...**655** ***Example***: You have a 1000 A : 5 A external transformer. The transformation ratio to be set in parameter *r.tA* is therefore 1000/5 = 200.											

3.8.5. Instantaneous ammeter input value

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1163	139	16 bit		**I.tA**	M	MainMenu → M → Status → I.tA_1	R		Float (####.#)	A	
2187					E1	MainMenu → E1 → Status → I.tA_2					
4235					E2	MainMenu → E2 → Status → I.tA_3					
The parameter shows the instantaneous input read from the ammeter input of device M or E1 or E2.											

3.8.6. Filtered ammeter input value

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1492	468	16 bit	04.02.01	**I.on**	M	MainMenu → M → Status → I.on_1	R		Float (####.#)	A	
2516			04.03.01		E1	MainMenu → E1 → Status → I.on_2					
4564			04.04.01		E2	MainMenu → E2 → Status → I.on_3					
The parameter shows the input read by the ammeter input of device M or E1 or E2 when the output is activated.											

3.8.7. Peak ammeter input value

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1733	709	16 bit		**I.tAP**	M	MainMenu → M → Status → I.tAP_1	R		Float (####.#)	A	
2757					E1	MainMenu → E1 → Status → I.tAP_2					
4805					E2	MainMenu → E2 → Status → I.tAP_3					
The parameter shows the peak input value read by the ammeter input of device M or E1 or E2 during the phase softstart ramp.											

3.8.8. Power factor

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1740	716	16 bit		**CoS.F**	M	MainMenu → M → Status → CoS.F_1	R		Float (####.#)		
2764					E1	MainMenu → E1 → Status → CoS.F_2					
4812					E2	MainMenu → E2 → Status → CoS.F_3					
The parameter shows the power factor of the device M or E1 or E2.											

3.8.9. RMS load current

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1777	753	16 bit	01.02.06	**Ld.A**	M	MainMenu → M → Status → Ld.A_1	R		Float (####.#)	A	
2801			01.03.06		E1	MainMenu → E1 → Status → Ld.A_2					
4849			01.04.06		E2	MainMenu → E2 → Status → Ld.A_3					
The parameter shows the RMS load current input of device M or E1 or E2.											

3.8.10. RMS current in three-phase load

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1778	754	16 bit	01.01.02	**Ld.A.t**	Global	MainMenu → Global → Status → Ld.A.t	R		Float (####.#)	A	
The parameter shows the RMS current input of the three-phase load.											

3.8.11. Ammeter input digital filter

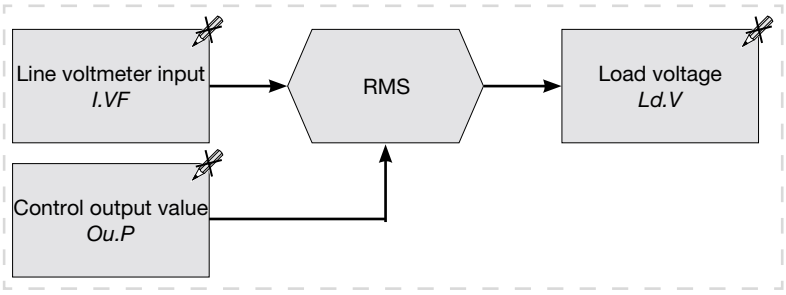
Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1243	219	16 bit	04.08.04	**Ft.tA**	M	MainMenu → M → Inputs → CT input → Ft.tA_1	R/W	■	Float (####.#)	sec.	0.1
2267			04.11.04		E1	MainMenu → E1 → Inputs → CT input → Ft.tA_2					
4315			04:14:04		E2	MainMenu → E2 → Inputs → CT input → Ft.tA_3					
The parameter sets the time constant value of the digital filter applied to the CT ammeter input of device M or E1 or E2. The filter calculates the average of the values read in the specified time interval. With 0.0 no filter is applied. *min...max*: **0.0**...**20.0**											

3.9. Measuring load voltage

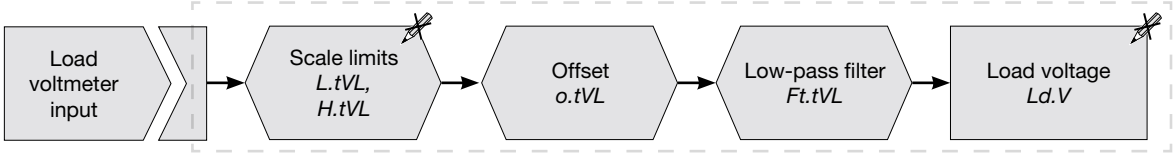
The Advanced Power Controller is able to measure the RMS voltage value of the controlled load, whether single-phase or three-phase. It can also measure the voltage of a two-phase load.
In the absence of the VLOAD measurement option, the RMS voltage value of the load is calculated from the line voltage and power output values.

The following diagrams show the processing sequences for the initial voltage value.

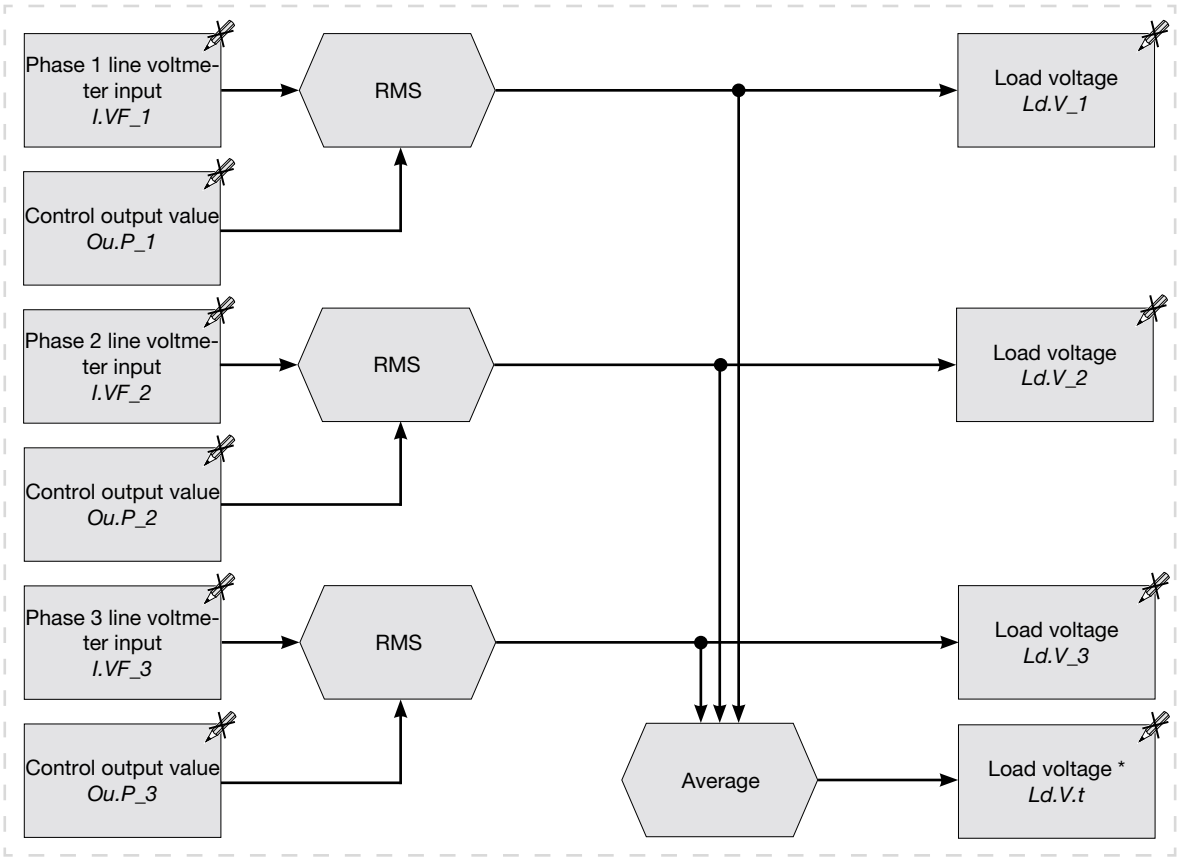
Single-phase load without VLOAD option



Single-phase load with VLOAD option

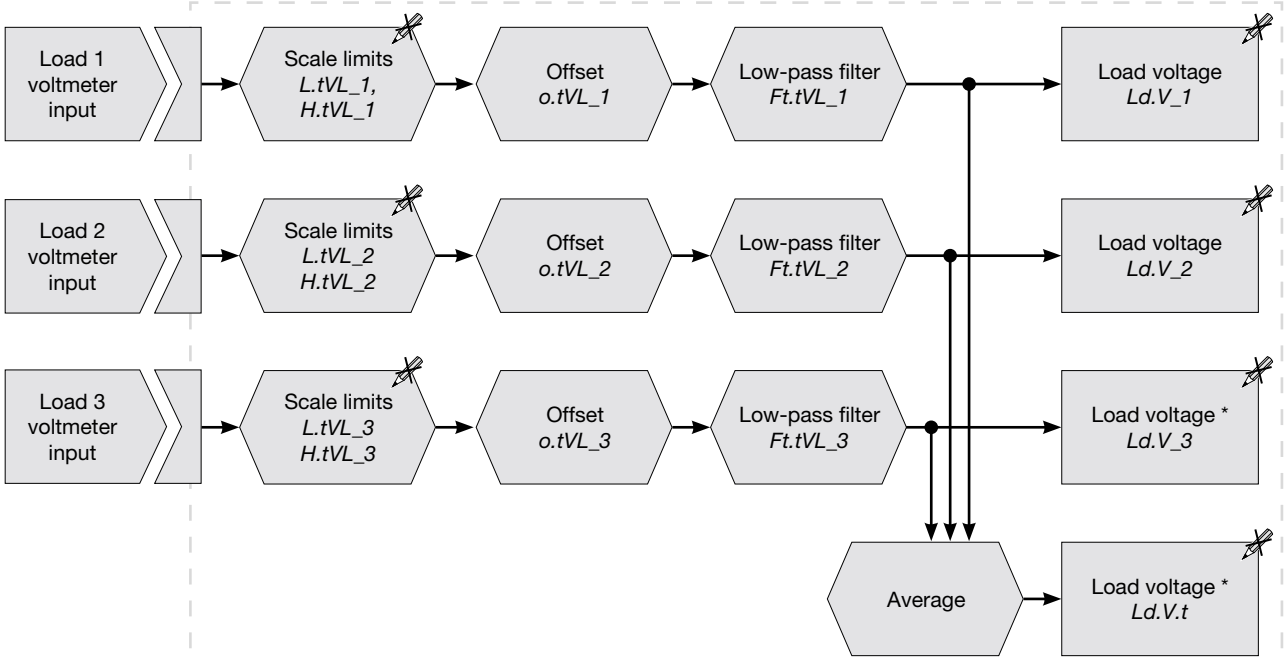


Three-phase load without VLOAD option



*) with BIPHASE command the value *Ld.V_3* is obtained as the average of the values *Ld.V_1* and *Ld.V_2*

Three-phase load with VLOAD option



*) with BIPHASE command the value *Ld.V_3* is obtained as the average of the values *Ld.V_1* and *Ld.V_2*

3.9.1. RMS load voltage

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1775	751	16 bit	01.02.05	**Ld.V**	M	MainMenu → M → Status → Ld.V_1	R		Float (####.#)	V	
2799			01.03.05		E1	MainMenu → E1 → Status → Ld.V_2					
4847			01.04.05		E2	MainMenu → E2 → Status → Ld.V_3					
The parameter shows the RMS voltage on the load.											

3.9.2. Instantaneous load voltage

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1734	710	16 bit		**Ld.VIS**	M	MainMenu → M → Status → Ld.VIS_1	R		Float (####.#)	V	
2758					E1	MainMenu → E1 → Status → Ld.VIS_2					
4806					E2	MainMenu → E2 → Status → Ld.VIS_3					
The parameter shows the instantaneous voltage on the load.											

3.9.3. Load voltage with output activated

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1735	711	16 bit		**Ld.Von**	M	MainMenu → M → Status → Ld.Von_1	R		Float (####.#)	V	
2759					E1	MainMenu → E1 → Status → Ld.Von_2					
4807					E2	MainMenu → E2 → Status → Ld.Von_3					
The parameter shows the voltage on the load when the output is activated.											

3.9.4. Voltage on three-phase load

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1776	752	16 bit	01.01.01	**Ld.V.t**	Global	MainMenu → Global → Status → Ld.V.t	R		Float (####.#)	V	
The parameter shows the voltage on the three-phase load.											

3.9.5. Lower voltmeter input scale limit

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1463	439	16 bit	04.10.01	**L.tVL**	M	MainMenu → M → Inputs → VT load input → L.tVL_1	R		Float (####.#)	V	0.0
2487			04.13.01		E1	MainMenu → E1 → Inputs → VT load input → L.tVL_2					
4535			04:16:01		E2	MainMenu → E2 → Inputs → VT load input → L.tVL_3					
The parameter shows the lower limit of the measurement scale used for the TV_LOAD voltage transformer input. The parameter is present if the VLOAD option exists.											

3.9.6. Upper voltmeter input scale limit

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1467	443	16 bit	04.10.02	**H.tVL**	M	MainMenu → M → Inputs → VT load input → H.tVL_1	R		Float (####.#)	V	see table
2491			04:13:02		E1	MainMenu → E1 → Inputs → VT load input → H.tVL_2					
4539			04:16:02		E2	MainMenu → E2 → Inputs → VT load input → H.tVL_3					

The parameter shows the upper limit of the measurement scale used for the TV_LOAD voltage transformer input.
The parameter is present if the VLOAD option exists.
The upper limit default value depends on the controller model:

GPC model	Rated voltage	H.tVL
GPC 480	480 Vac	530.0
GPC 600	600 Vac	660.0
GPC 690	690 Vac	760.0

3.9.7. Voltmeter input offset

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1468	444	16 bit	04.10.03	**o.tVL**	M	MainMenu → M → Inputs → VT load input → o.tVL_1	R/W	■	Float (####.#)	V	0.0
2492			04:13:03		E1	MainMenu → E1 → Inputs → VT load input → o.tVL_2					
4540			04:16:03		E2	MainMenu → E2 → Inputs → VT load input → o.tVL_3					

The parameter sets the offset applied to the value read from the TV_LOAD voltage transformer input to match the expected value. Its function is to correct any constant reading errors.
This offset applies linearly to all readings.
The parameter is present if the VLOAD option exists.

min...max: **-99.9**...**99.9**

3.9.8. Voltmeter input digital filter

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1466	442	16 bit	04.10.04	**Ft.tVL**	M	MainMenu → M → Inputs → VT load input → Ft.tVL_1	R/W	■	Float (####.#)	V	0.1
2490			04:13:04		E1	MainMenu → E1 → Inputs → VT load input → Ft.tVL_2					
4538			04:16:04		E2	MainMenu → E2 → Inputs → VT load input → Ft.tVL_3					

The parameter sets the time constant value of the digital filter applied to the value read from the input of the TV_LOAD voltage transformer. The filter calculates the average of the values read in the specified time interval.
With 0.00 no filter is applied.
The parameter is present if the VLOAD option exists.

min...max: **0.0**...**20.0**

3.10. Measuring line voltage

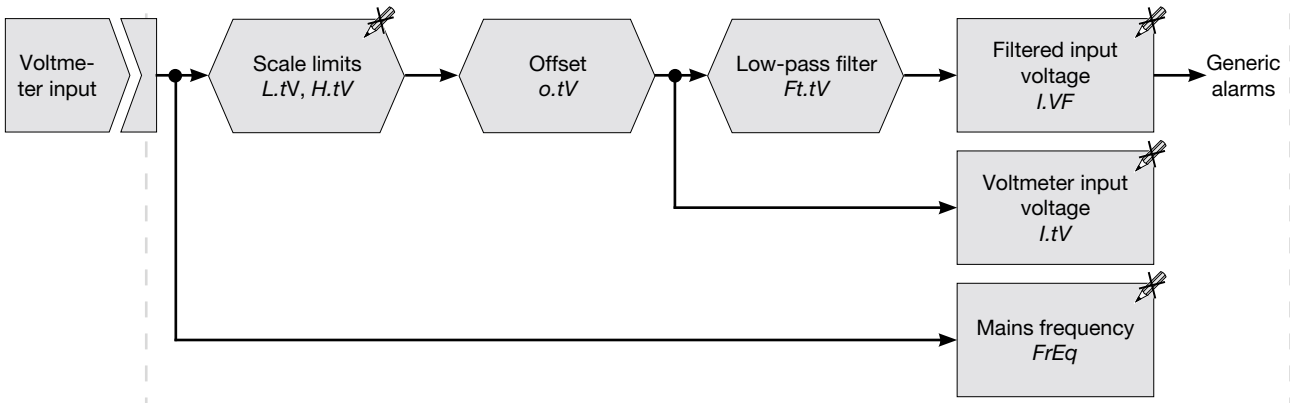
The Advanced Power Controller is able to measure the line voltage value. The parameters present depend on the type of load (single-phase or three-phase).

A voltage presence check is active for each phase, which switches off the GPC module if it detects incorrect values. For three-phase loads, unbalance diagnostics is provided to switch off the load and indicate the fault with LEDs.

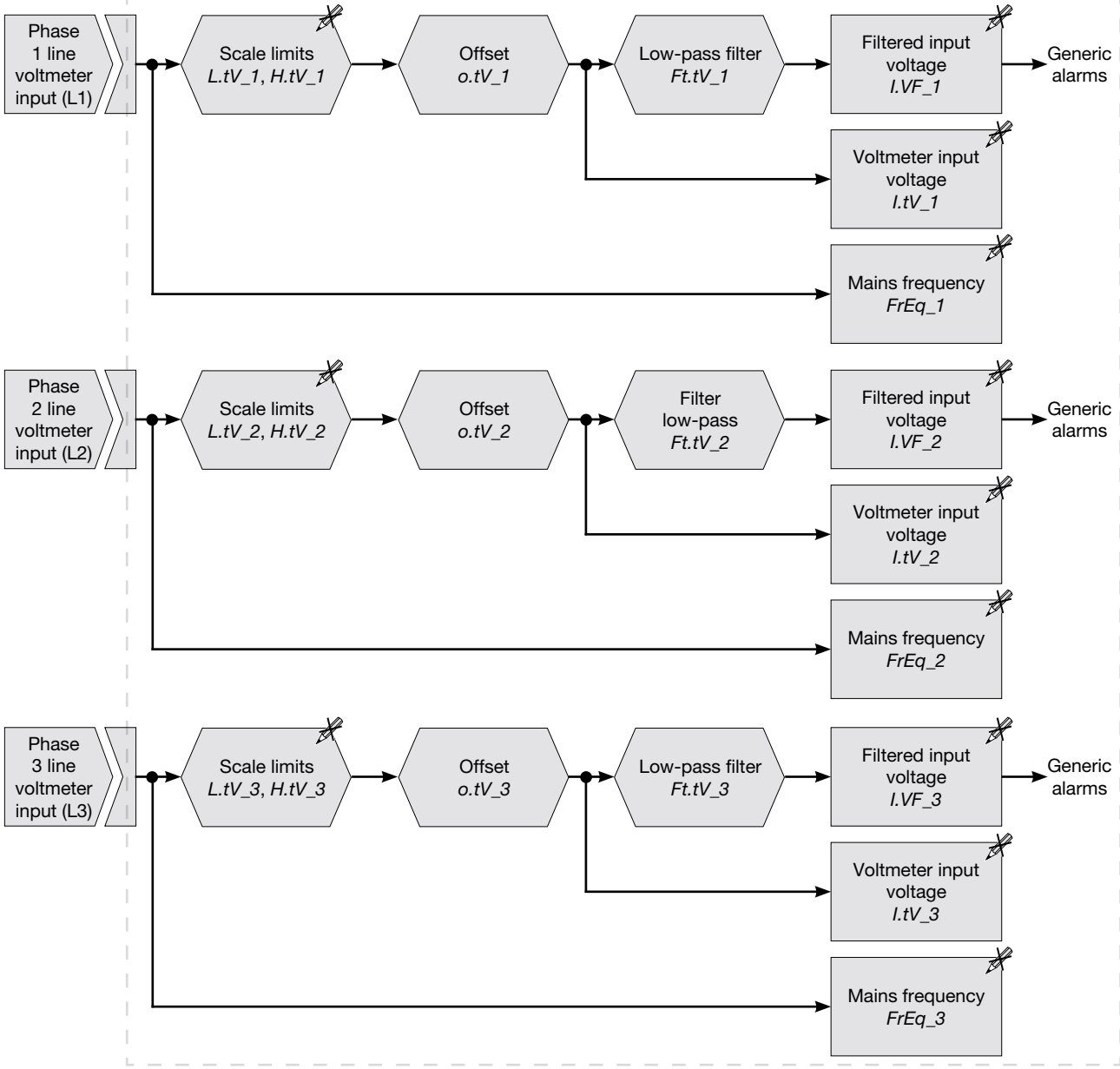
The *VOLTAGE_STATUS* parameter contains information on the status of the line voltage, including the mains frequency. With three-phase loads, diagnostics are available for correct phase connection, lack of one voltage and unbalance of the three line voltages.

The following diagrams show the processing sequences of the line voltage value.

Single-phase load



Three-phase load



3.10.1. Lower VT voltmeter input scale limit

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1477	453	16 bit	04.09.01	**L.tV**	M	MainMenu → M → Inputs → VT line input → L.tV_1	R		Float (####.#)	V	60.0
2501			04.13.01		E1	MainMenu → E1 → Inputs → VT line input → L.tV_2					
4549			04:15:01		E2	MainMenu → E2 → Inputs → VT line input → L.tV_3					
The parameter shows the lower limit of the line voltage measurement scale used for the voltmeter input.											

3.10.2. Upper VT voltmeter input scale limit

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1434	410	16 bit	04.09.02	**H.tV**	M	MainMenu → M → Inputs → VT line input → H.tV_1	R		Float (####.#)	V	see table paragraph 3.9.6
2458			04:13:02		E1	MainMenu → E1 → Inputs → VT line input → H.tV_2					
4506			04:15:02		E2	MainMenu → E2 → Inputs → VT line input → H.tV_3					
The parameter shows the upper limit of the line voltage measurement scale used for the voltmeter input. The default value of the upper limit depends on the controller model (see the table in paragraph “3.9.6. Upper voltmeter input scale limit”).											

3.10.3. VT voltage transformer input offset

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1435	411	16 bit	04.09.03	**o.tV**	M	MainMenu → M → Inputs → VT line input → o.tV_1	R/W	■	Float (####.#)	V	0.0
2459			04.12.03		E1	MainMenu → E1 → Inputs → VT line input → o.tV_2					
4507			04:15:03		E2	MainMenu → E2 → Inputs → VT line input → o.tV_3					
The parameter sets the offset applied to the line voltage value read at the input of the VT voltage transformer to match the expected value. Its function is to correct a possible constant reading error. This offset applies linearly to all readings. *min...max*: **-99.9**...**99.9**											

3.10.4. Three-phase line unbalance threshold

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1280	256	16 bit	07.01.04	**Unb.1**	Global	MainMenu → Global → Controls → Unb.1	R/W	■	Unsigned Short	%	10
1281	257	16 bit	07.01.05	**Unb.2**	Global	MainMenu → Global → Controls → Unb.2	R/W	■	Unsigned Short	%	20
1282	258	16 bit	07.01.06	**Unb.3**	Global	MainMenu → Global → Controls → Unb.3	R/W	■	Unsigned Short	%	30
The parameters set the thresholds 1, 2 and 3 for signalling a percentage unbalance on the three-phase line. Exceeding the the threshold is shown with the VOLTAGE_STATUS parameter (see paragraph “3.10.7. VOLTAGE_STATUS”). *min...max*: **0**...**50**											

3.10.5. Voltmeter input value

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1256	232	16 bit		**I.tV**	M	MainMenu → M → Status → I.tV_1	R		Float (####.#)	V	
2280					E1	MainMenu → E1 → Status → I.tV_2					
4328					E2	MainMenu → E2 → Status → I.tV_3					
The parameter shows the instantaneous value of the mains voltage for the voltmeter input.											

3.10.6. Filtered voltmeter input value

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1346	322	16 bit	01.02.02	**I.VF**	M	MainMenu → M → Status → I.VF_1	R		Float (####.#)	V	
2370			01.03.02		E1	MainMenu → E1 → Status → I.VF_2					
4418			01.04.02		E2	MainMenu → E2 → Status → I.VF_3					
The parameter shows the filtered mains voltage value for the voltmeter input.											

3.10.7. VOLTAGE_STATUS

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1726	702	16 bit	01.01.07		Global	VOLTAGE_STATUS	R		Unsigned		

The stored bytes contain information about the line voltage status and other operating states of the device. Each bit contains a specific piece of information, as shown in the table.

bit	Description
0	Line frequency out of limits *
1	Line voltage unbalance > Unb.1 *
2	Line voltage imbalance > Unb.2 *
3	Line voltage unbalance > Unb.3 * (30%_UNBALANCED_ERROR)
4	Rotation of phases 1-3-2 *
5	Three-phase line failure * (TRIPHASE_MISSING_LINE_ERROR)
6	Line frequency 60 Hz
7	Device not ready (DEVICE_NOT_READY)
8	DIP switch and EEPROM configuration error (MODE_ERROR)
9	
10	Enabling from Interlock (1 = device enabled)

*) only for three-phase configuration

3.10.8. Grid frequency

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1339	315	16 bit	01.02.03	**FrEq**	M	MainMenu → M → Status → FrEq_1	R		Float (####.#)	Hz	
2363			01.03.03		E1	MainMenu → E1 → Status → FrEq_2					
4411			01.04.03		E2	MainMenu → E2 → Status → FrEq_3					

The parameter shows the filtered value of the mains frequency.

3.10.9. VT voltmeter input digital filter

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1436	412	16 bit	04.09.04	**Ft.tV**	M	MainMenu → M → VT line input → Ft.tV_1	R/W	■	Float (####.#)	sec.	2.0
2460			04.10.04		E1	MainMenu → M → VT line input → Ft.tV_1					
4508			04.12.04		E2	MainMenu → M → VT line input → Ft.tV_1					

The parameter sets the time constant value of the digital filter applied to the value read from the VT voltage transformer input. The filter calculates the average of the values read in the specified time interval.
With 0.00 no filter is applied.

min...max: **0.0**...**20.0**

3.11. Measuring the power on the load and energy consumed

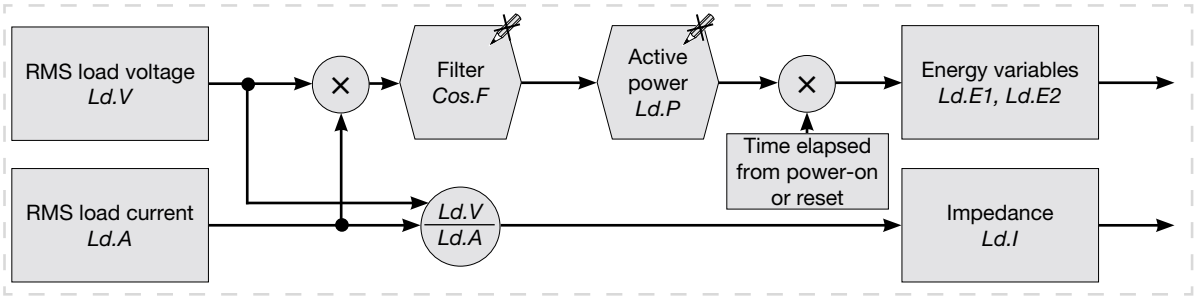
The Advanced Power Controller is able to measure the instantaneous active power value on the load and the energy consumed since the first power-on or the last reset. The parameters present depend on the type of load (single-phase or three-phase).

The update in the non-volatile memory takes place every two hours and when the line voltage is disconnected.

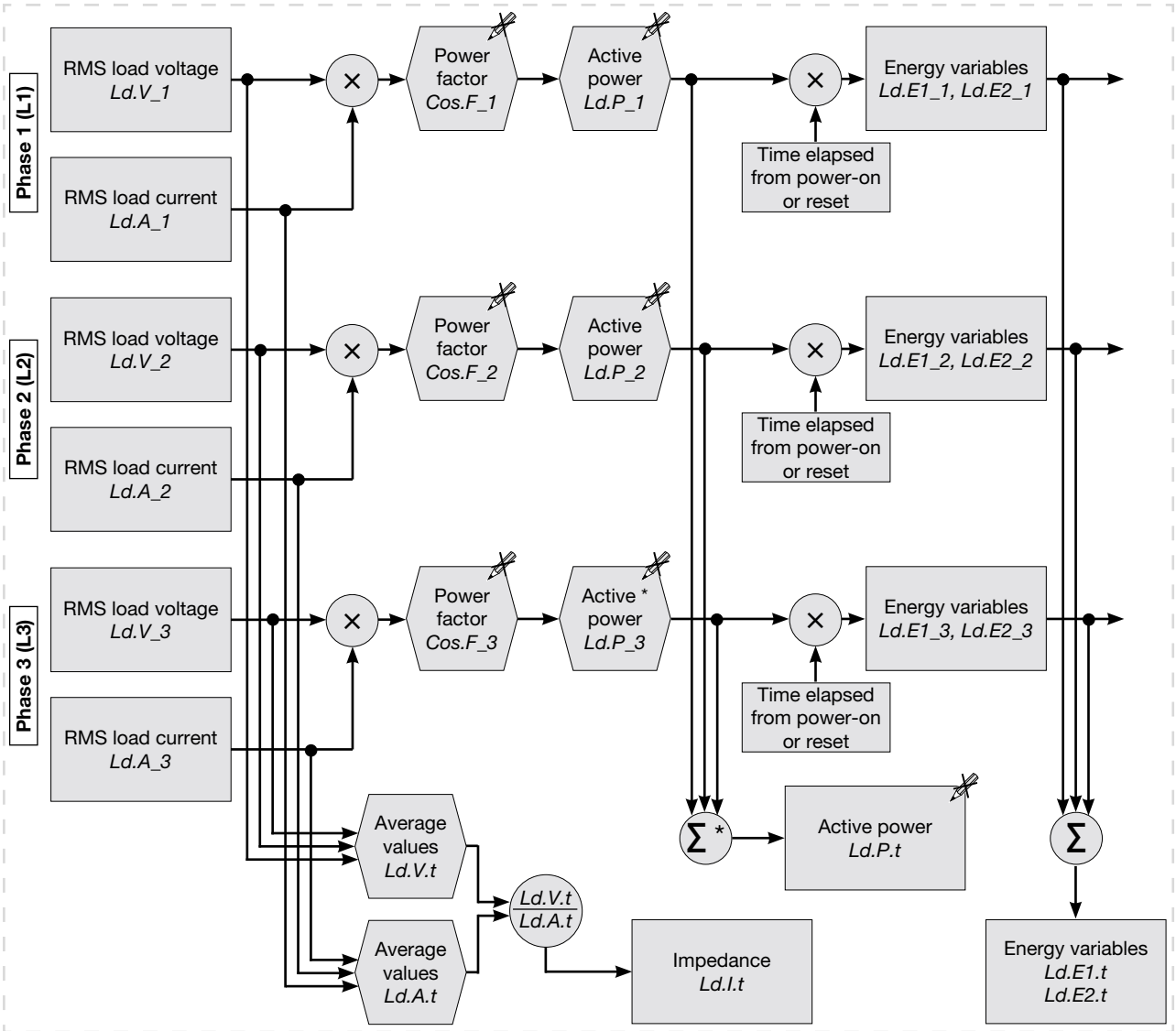
The load impedance value of the individual module is also available; if the load is three-phase, the impedance value is the total value. For loads such as IR lamps, the impedance value can vary greatly depending on the power transferred to the load.

The following diagrams show the processing sequences to arrive at the active power, energy consumed and impedance values.

Single-phase load



Three-phase load



(*) with BIPHASE command the value *Ld.P_3* is obtained as the average of the values *Ld.P_1* and *Ld.P_2*

3.11.1. Power on load

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1904	880	32 bit	01.02.07	**Ld.P**	M	MainMenu → M → Status → Ld.P_1	R		Float32 (####.#)	kW	
2928			01.03.07		E1	MainMenu → E1 → Status → Ld.P_2					
4976			01.04.07		E2	MainMenu → E2 → Status → Ld.P_2					
The parameter shows the value of the power on the load.											

3.11.2. Power on three-phase load

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1906	882	32 bit	01.01.03	**Ld.P.t**	Global	MainMenu → Global → Status → Ld.P.t	R		Float32 (####.#)	kW	
The parameter shows the value of the power on the 3-phase load, which is the sum of the loads on the 3 individual phases.											

3.11.3. Load impedance

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1773	749	16 bit	01.02.08	**Ld.I**	M	MainMenu → M → Status → Ld.I_1	R		Float (####.#)	ohm	
2797			01.03.08		E1	MainMenu → E1 → Status → Ld.I_2					
4845			01.04.08		E2	MainMenu → E2 → Status → Ld.I_3					
The parameter shows the load impedance value. The value is calculated by dividing the value of Ld.V *by* the value of Ld.A .											

3.11.4. Three-phase load impedance

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1774	750	16 bit	01.01.04	**Ld.I.t**	Global	MainMenu → Global → Status → Ld.I.t	R		Float (####.#)	ohm	
The parameter shows the impedance value of the three-phase load. The value is calculated by dividing the average value of the three *Ld.V* values by the average value of the three *Ld.A* values.											

3.11.5. E1 Energy consumed

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1555	531	32 bit	01.02.09	**Ld.E1**	M	MainMenu → M → Status → Ld.E1_1	R	■	Unsigned Int	kWh	
2579			01.03.09		E1	MainMenu → E1 → Status → Ld.E1_2					
4627			01.04.09		E2	MainMenu → E2 → Status → Ld.E1_3					
This parameter shows the value of the E1 energy consumed since the meter was switched on or last reset.											

3.11.6. E2 energy consumed

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1534	510	32 bit	01.02.10	**Ld.E2**	M	MainMenu → M → Status → Ld.E2_1	R	■	Unsigned Int	kWh	
2558			01.03.10		E1	MainMenu → E1 → Status → Ld.E2_2					
4606			01.04.10		E2	MainMenu → E2 → Status → Ld.E2_3					
This parameter shows the value of the E2 energy consumed since the meter was switched on or last reset.											

3.11.7. E1 three-phase energy consumed

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1565	541	32 bit	01.01.05	**Ld.E1.t**	Global	MainMenu → Global → Status → Ld.E1.t	R	■	Unsigned Int	kWh	
The parameter shows the value of the E1 three-phase energy consumed since the meter was switched on or last reset, which is the sum of the E1 energies consumed on the 3 individual phases.											

3.11.8. E2 three-phase energy consumed

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1524	500	32 bit	01.01.06	**Ld.E2.t**	Global	MainMenu → Global → Status → Ld.E2.t	R	■	Unsigned Int	kWh	
The parameter shows the value of the E2 three-phase energy consumed since the meter was switched on or last reset, which is the sum of the E2 energies consumed on the 3 individual phases.											

3.11.9. E1 energy consumption meter reset

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1138	114	bit		**BIT_ RESET_ LDE1**	M	MainMenu → M → Expert → Bit → BIT_RESET_LDE1_1	R/W				OFF
2162					E1	MainMenu → E1 → Expert → Bit → BIT_RESET_LDE1_2					
4210					E2	MainMenu → E2 → Expert → Bit → BIT_RESET_LDE1_3					
The parameter sets the reset function of the E1 energy meter. *Options*: **OFF** = Function is disabled **ON** = The function is enabled. The meter *Ld.E1* is reset to zero.											

3.11.10. E2 energy consumption meter reset

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1139	115	bit		**BIT_ RESET_ LDE2**	M	MainMenu → M → Expert → Bit → BIT_RESET_LDE2_1	R/W				OFF
2163					E1	MainMenu → E1 → Expert → Bit → BIT_RESET_LDE2_2					
4211					E2	MainMenu → E2 → Expert → Bit → BIT_RESET_LDE2_3					
The parameter sets the reset function of the E2 energy meter. *Options*: **OFF** = Function is disabled **ON** = The function is enabled. The meter *Ld.E2* is reset to zero.											

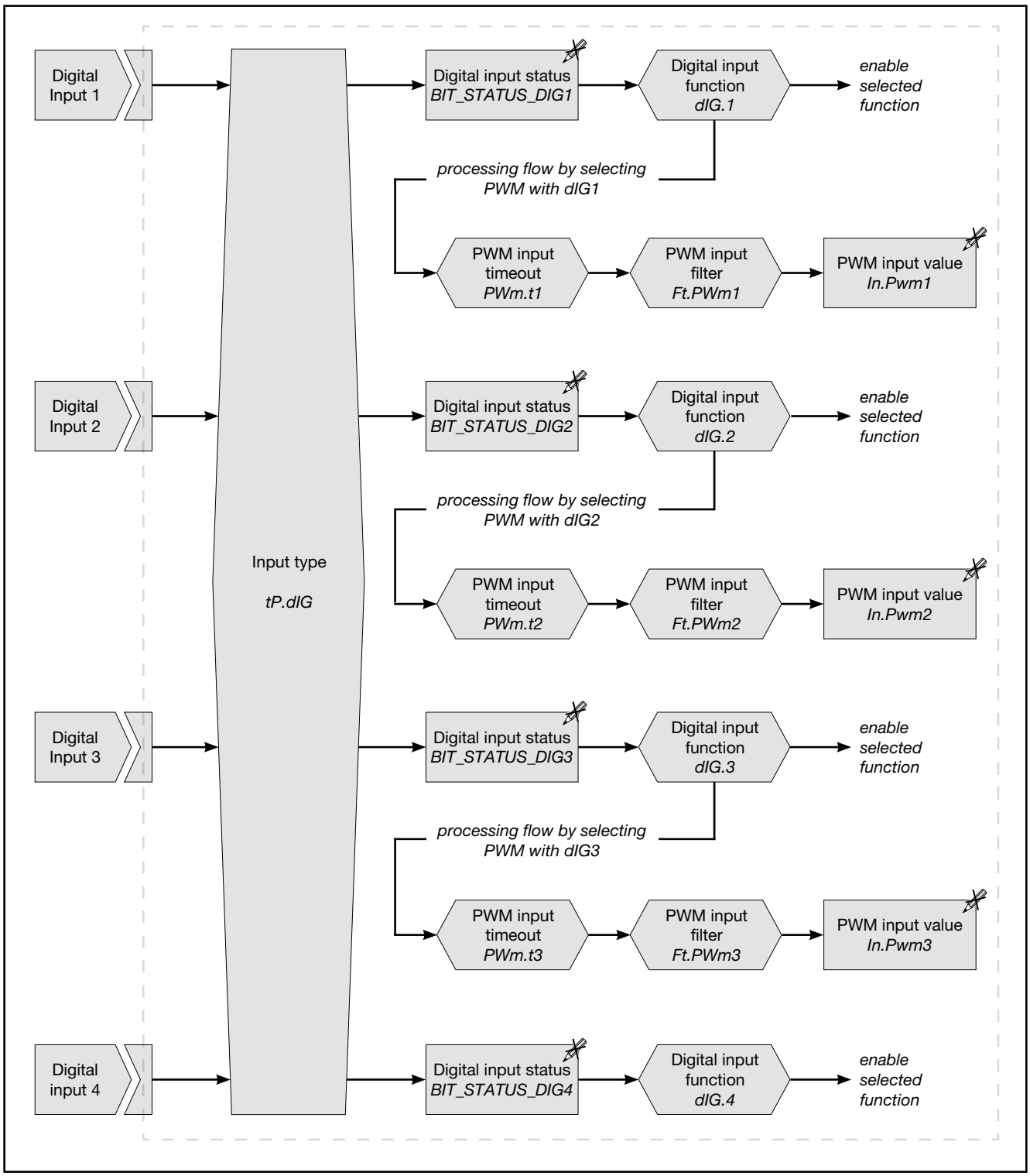
3.12. Digital inputs

The following functions are related to the digital inputs:
- Automatic / manual control (see paragraph “3.22. Automatic - manual control”).
- Alarm memory reset (see paragraph “3.13.13. Alarm memory reset”).
- Software shutdown / startup (see paragraph “3.25. Software shutdown”).
- Reference Feedback calibration (see paragraph “3.31.9. Feedback reference calibration”).
- HB alarm calibration (see diagrams “Functional diagram of HB calibration in ZC - BF - HSC mode” on page 61, “Functional diagram of HB calibration in PA mode” on page 61, “Functional diagram of HB calibration for infrared lamps” on page 62).

For further explanations on the use and configuration of the digital inputs, see paragraphs:
- “4.2. Using a function associated with the digital input and via serial”,
- “4.3. Using digital input 1 to enable software startup”,

particularly the examples chapter.

The following functional diagram shows the signal processing sequences of the digital inputs.


Digital Input 1
Digital Input 2
Digital Input 3
Digital input 4
Input type
tP.dIG
Digital input status
BIT_STATUS_DIG1
Digital input function
dIG.1
enable selected function
processing flow by selecting PWM with dIG1
PWM input timeout
PWm.t1
PWM input filter
Ft.PWm1
PWM input value
In.Pwm1
Digital input status
BIT_STATUS_DIG2
Digital input function
dIG.2
enable selected function
processing flow by selecting PWM with dIG2
PWM input timeout
PWm.t2
PWM input filter
Ft.PWm2
PWM input value
In.Pwm2
Digital input status
BIT_STATUS_DIG3
Digital input function
dIG.3
enable selected function
processing flow by selecting PWM with dIG3
PWM input timeout
PWm.t3
PWM input filter
Ft.PWm3
PWM input value
In.Pwm3
Digital input status
BIT_STATUS_DIG4
Digital input function
dIG.4
enable selected function

3.12.1. Definition of digital input types

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1409	385	16 bit	04:17:05	**tP.dIG**	Global	MainMenu → Global → Inputs → Digital inputs → tP.dIG	R/W	■	Unsigned Short		0
The parameter sets the types of all digital inputs. *Options*: **0** = PNP digital inputs **1** = NPN digital inputs											

3.12.2. Digital input status

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1092	68	bit		**BIT_STATUS_DIG1**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_DIG1	R				
1116	92	bit		**BIT_STATUS_DIG2**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_DIG2	R				
1091	67	bit		**BIT_STATUS_DIG3**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_DIG3	R				
1090	66	bit		**BIT_STATUS_DIG4**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_DIG4	R				
The parameter shows the status of digital input 1, 2, 3 or 4, depending on the address used. *Options*: **OFF** = Digital input off **ON** = Digital input active											

3.12.3. Digital input status

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1341	317	16 bit	04.01.07	**INPUT_DIG**	Global	MainMenu → Global → Status → INPUT_DIG	R				
The parameter shows the status of the 4 digital inputs with 4-bit status. *Options*: **bit 0** = INDIG1 status **bit 1** = INDIG2 status **bit 2** = INDIG3 status **bit 3** = INDIG4 status											

3.12.4. Digital input function

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1164	140	16 bit	04:17:01	**dIG.1**	Global	MainMenu → Global → Inputs → Digital inputs → dIG.1	R/W	■	Unsigned Short		0
1642	618	16 bit	04:17:02	**dIG.2**	Global	MainMenu → Global → Inputs → Digital inputs → dIG.2	R/W	■	Unsigned Short		0
1718	694	16 bit	04:17:03	**dIG.3**	Global	MainMenu → Global → Inputs → Digital inputs → dIG.3	R/W	■	Unsigned Short		0
1736	712	16 bit	04:17:04	**dIG.4**	Global	MainMenu → Global → Inputs → Digital inputs → dIG.4	R/W	■	Unsigned Short		128

This parameter sets the function associated with digital input 1, 2, 3 or 4, depending on the address used. The input can be activated by a change in value ("On leading edge") or by its state ("On state").
Each main function is identified by an index. By adding a fixed value to the index, the functions are thus modified:
+16 = input in denied logic
+32 = logic state 0 (OFF) is forced
+64 = logic state 1 (ON) is forced

Options:

Index	Description	Activation
0	No function (input disabled)	On leading edge
1	MAN / AUTO controller	On leading edge
4	Generic alarm memory reset AL1...AL8	On state
6	Software ON/OFF	On leading edge
7	PWM * input	On leading edge
10	Reset POWER_FAULT alarm memory	On leading edge
12	AL1...AL8 and POWER_FAULT generic alarm memory reset	On state
13	Enable software startup **	On state
14	Reference calibration of feedback selected by *hd.6*	On leading edge
15	HB alarm threshold calibration	On leading edge
64	FUSE_OPEN / SHORT_CIRCUIT_CURRENT alarm reset	On state
65	Reference calibration of feedback selected by *hd.6* for GPC-M	On leading edge
66	Reference calibration of feedback selected by *hd.6* for GPC-E1	On leading edge
67	Reference calibration of feedback selected by *hd.6* for GPC-E2	On leading edge
68	Calibration of HB alarm threshold for GPC-M	On leading edge
69	Calibration of HB alarm threshold for GPC-E1	On leading edge
70	Calbiration of HB alarm setpoint for GPC-E2	On leading edge
71	MAN / AUTO for GPC-M	On leading edge
72	MAN / AUTO for GPC-E1	On leading edge
73	MAN / AUTO for GPC-E2	On leading edge
74	ON / OFF Software for GPC-M	On leading edge
75	ON / OFF Software for GPC-E1	On leading edge
76	ON / OFF Software for GPC-E2	On leading edge
77	Trigger change for GPC-M	On state
78	Trigger change for GPC-E1	On state
79	Trigger change for GPC-E2	On state
128	Interlock	On state

*) only for *dIG.1* (PWM1, max 100 Hz), *dIG.2* (PWM2, max 1 Hz), *dIG.3* (PWM3, max 1 Hz)
**) only for *dIG.1*

Examples
Setting value "4" activates the cancellation function of alarms AL.1...AL.8 (e.g., by closing the digital input); by setting 20 (=4+16) the AL.1...AL.8 alarm cancellation occurs with denied logic (e.g., by opening the digital input).

3.12.5. PWM input timeout

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1380	356	16 bit	04:17:09	**PWm.t1**	Global	MainMenu → Global → Inputs → Digital inputs → PWm.t1	R/W	■	Float (####.#)	sec.	0.01
1381	357	16 bit	04:17:10	**PWm.t2**	Global	MainMenu → Global → Inputs → Digital inputs → PWm.t2	R/W	■	Float (####.#)	sec.	1.00
1386	362	16 bit	04:17:11	**PWm.t3**	Global	MainMenu → Global → Inputs → Digital inputs → PWm.t3	R/W	■	Float (####.#)	sec.	1.00

The parameter sets the timeout for the digital input PWM 1, PWM 2 or PWM 3, depending on the address used.

IMPORTANT! If the digital input is used to control the power percentage (parameter *Ou.P*) to be delivered on the load (PWM input function, *dIG* = 7), the parameter *PWm.t* must be set to a value equal to or greater than the period of the PWM control signal used, in order to guarantee the reaction time even in static conditions of low (*Ou.P* = 0%) or high (*Ou.P* = 100%) input.

min...max: **0.01**...**10.00**

3.12.6. Digital filter for PWM input

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1462	438	16 bit	04:17:06	**Ft.PWm1**	Global	MainMenu → Global → Inputs → Digital inputs → Ft.PWm1	R/W	■	Float (####.#)	sec.	0.1
1396	372	16 bit	04:17:07	**Ft.PWm2**	Global	MainMenu → Global → Inputs → Digital inputs → Ft.PWm2	R/W	■	Float (####.#)	sec.	0.1
1397	373	16 bit	04:17:08	**Ft.PWm3**	Global	MainMenu → Global → Inputs → Digital inputs → Ft.PWm3	R/W	■	Float (####.#)	sec.	0.1

This parameter sets the value of the digital filter time constant applied to the value read from digital input PWM 1, PWM 2 or PWM 3, depending on the address used. The filter calculates the average of the values read in the specified time interval.
With 0.0 no filter is applied.

min...max: **0.0**...**20.0**

3.12.7. PWM input value

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1542	518	16 bit	04.01.04	**In.Pwm1**	Global	MainMenu → Global → Status → In.Pwm1	R		Float (####.#)	%	
1459	435	16 bit	04.01.05	**In.Pwm2**	Global	MainMenu → Global → Status → In.Pwm2	R		Float (####.#)	%	
1481	457	16 bit	04.01.06	**In.Pwm3**	Global	MainMenu → Global → Status → In.Pwm3	R		Float (####.#)	%	

The parameter shows the value of the input PWM 1, PWM 2 or PWM 3, depending on the address used, as a percentage of the ON state compared to the ON + OFF period.

min...max: **0.0**...**100.0**

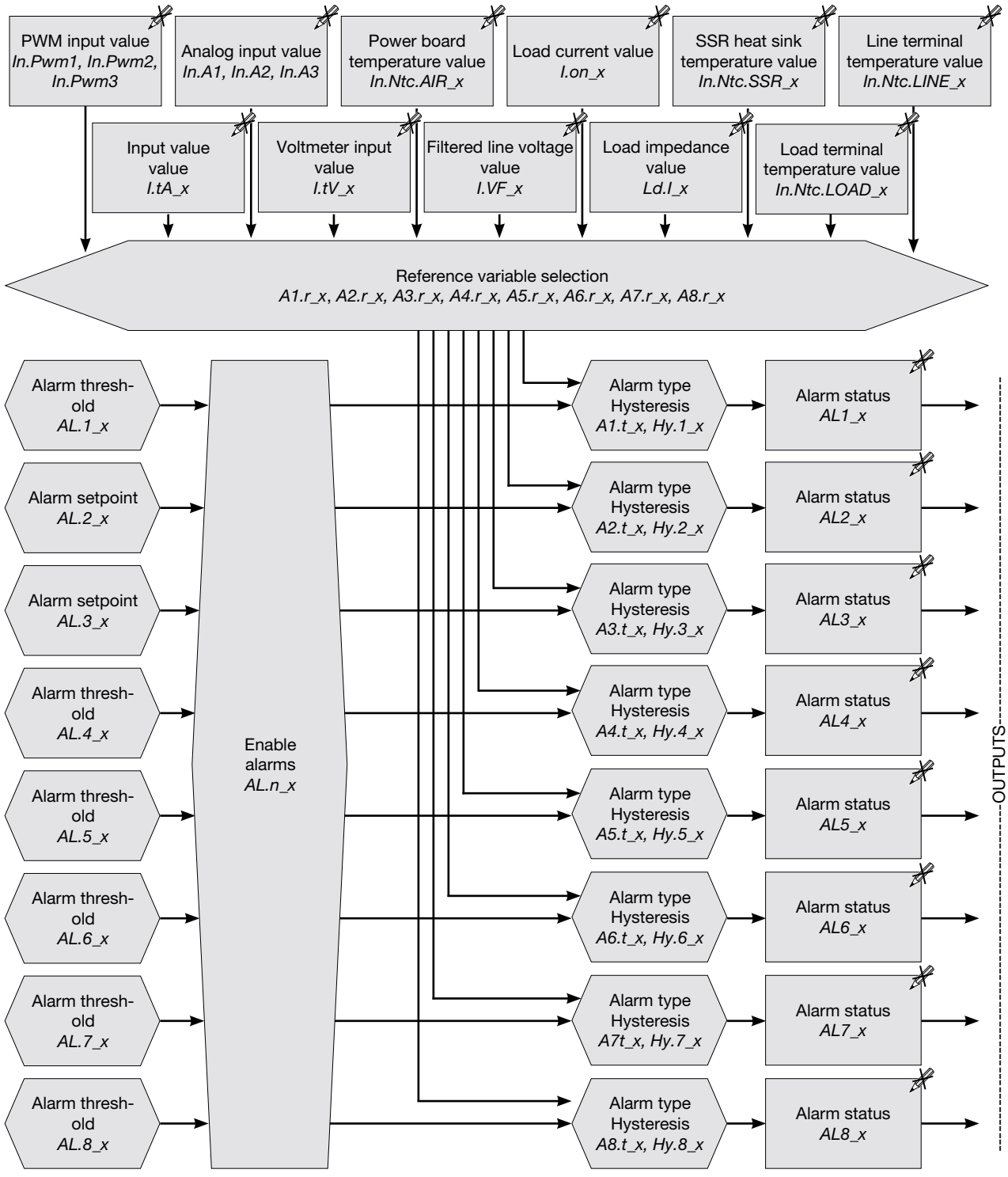
3.13. Generic alarms AL1 ... AL8

The Advanced Power Controller has 8 alarms (*AL1…AL8)* per module, described as generic, which can take on various functions.

The hysteresis value is used to define a band for the safe re-entry of the alarm condition and to avoid the continuous generation of alarms if the reference signal fluctuates around the threshold value.

Alarms can be configured to be triggered if the reference threshold is exceeded (value read greater than maximum threshold or less than minimum threshold), or if the threshold value is not reached (value read less than maximum threshold or greater than minimum threshold) or for other reasons.
The following diagram shows the parameter processing sequences for the generation of generic alarms.

Functional diagram of generic alarms



with x = 1...3

The default settings of the alarm definition parameters allow the following to be configured for each module:

- AL1: Maximum line voltage alarm with time delay.
- AL2: Minimum line voltage alarm with time delay.
- AL3: Minimum current alarm with active output with time delay disabled during softstart ramp.
- AL4: Alarm disabled.
- AL5: like AL1.
- AL6: like AL2.
- AL7: Maximum current alarm with active output with time delay.
- AL8: Alarm disabled.

The minimum and maximum values depend on the current and voltage ratings of the device.

3.13.1. Enable alarms

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1219	195	bit	05.01.01	**AL.n**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL.n_1	R/W	■	Unsigned Short		231
2243			05.02.01		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL.n_2					
4291			05.03.01		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL.n_3					

The parameter sets the generic alarms to be enabled. The combination of enabling and disabling is determined by the index set. The following table shows the enabled alarms according to the index.

The default index 231 (= 7 + 32 + 64 + 128) enables alarms AL.1 + AL.2 + AL.3 (index 7), AL.5 (+32), AL.6 (+64) and AL.7 (+128).

Options:

Index	Alarm 1	Alarm 2	Alarm 3	Alarm 4
0				
1	■			
2				
3	■	■		
4				
5	■			
6				
7	■	■	■	
8				
9	■			
10				
11	■	■		
12				
13	■			
14				
15	■	■	■	■

Increasing the index results in the following behaviours:
+16 to enable the HB alarm.
+32 to enable Alarm 5.
+64 to enable Alarm 6.
+128 to enable Alarm 7.
+256 to enable Alarm 8.

Example: Setting 19 (= 3 + 16) enables generic alarms 1 and 3, including their HB alarms, while all other alarms are disabled.

3.13.2. Generic alarm reference variable selection

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1239	215	16 bit	05.01.02	**A1.r**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL1 → A1.r_1	R/W	■	Unsigned Short		18
2263			05.02.02		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL1 → A1.r_2					
4311			05.03.02		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL1 → A1.r_3					
1240	216	16 bit	05.01.03	**A2.r**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL2 → A2.r_1	R/W	■	Unsigned Short		18
2264			05.02.03		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL2 → A2.r_2					
4312			05.03.03		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL2 → A2.r_3					
1241	217	16 bit	05.01.04	**A3.r**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL3 → A3.r_1	R/W	■	Unsigned Short		17
2265			05.02.04		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL3 → A3.r_2					
4313			05.03.04		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL3 → A3.r_3					
1242	218	16 bit	05.01.05	**A4.r**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL4 → A4.r_1	R/W	■	Unsigned Short		18
2266			05.02.05		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL4 → A4.r_2					
4314			05.03.05		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL4 → A4.r_3					
1226	202	16 bit	05.01.06	**A5.r**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL5 → A5.r_1	R/W	■	Unsigned Short		18
2250			05.02.06		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL5 → A5.r_2					
4298			05.03.06		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL5 → A5.r_3					
1227	203	16 bit	05.01.07	**A6.r**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL6 → A6.r_1	R/W	■	Unsigned Short		18
2251			05.02.07		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL6 → A6.r_2					
4299			05.03.07		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL6 → A6.r_3					
1228	204	16 bit	05.01.08	**A7.r**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL7 → A7.r_1	R/W	■	Unsigned Short		17
2252			05.02.08		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL7 → A7.r_2					
4300			05.03.08		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL7 → A7.r_3					
1229	205	16 bit	05.01.09	**A8.r**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL8 → A8.r_1	R/W	■	Unsigned Short		18
2253			05.02.09		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL8 → A8.r_2					
4301			05.03.09		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL8 → A8.r_3					

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										

Description

The parameter sets the reference variable for the generic alarms AL1...AL8 of modules GPC-M, GPC-E1 and GPC-E2. The alarm and module concerned depend on the address used. The range of valid values and the position of the decimal point for alarm threshold and hysteresis can vary depending on the reference variable chosen for the alarm.

Options:

Index	Variable for comparison	Reference threshold	Alarm threshold range	Decimal point position
9	*In.A1*: Analog input 1	*AL.y* (with y = 1...8)	LS.A1…HS.A1	###.#
10	*In.Pwm1*: input PWM 1		0.0…100.0	###.#
11	*In.A2*: Analog input 2		LS.A2…HS.A2	###.#
12	*In.A3*: Analog input 3		LS.A3…HS.A3	###.#
13	*In.Pwm2*: input PWM 2		0.0…100.0	###.#
14	*In.Pwm3*: input PWM 3		0.0…100.0	###.#
15	*I.tA_x*: instantaneous load current of module x *		L.tA_x…H.tA_x *	###.#
16	*I.tV_x*: instantaneous line voltage of module x *		L.tV_x…H.tV_x *	###.#
17	*I.on_x*: Load current of module x at activated output *		L.tA_x…H.tA_x *	###.#
18	*I.VF_x*: Filtered line voltage of module x *		L.tV_x…H.tV_x *	###.#
19	*Ld.I_x*: load impedance of module x *		0.00…655.35	####.##
20	*In.Ntc.SSR_x*: SSR heat sink temperature of module x *		10.0…120.0	###.#
21	*In.Ntc.LINE_x*: LINE terminal temperature of module x *		10.0…120.0	###.#
22	*In.Ntc.LOAD_x*: LOAD terminal temperature of module x *		10.0…120.0	###.#

*) x = 1 identifies GPC-M, x = 2 identifies GPC-E1; x = 3 identifies GPC-E2

3.13.3. Alarm threshold

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1036	12	16 bit	05.01.18	**AL.1**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL1 → AL.1_1	R/W	■	Float *	s.p. *	see Table A
2060			05.02.18		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL1 → AL.1_2					
4108			05.03.18		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL1 → AL.1_3					
1037	13	16 bit	05.01.19	**AL.2**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL2 → AL.2_1	R/W	■	Float *	s.p. *	75.0
2061			05.02.19		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL2 → AL.2_2					
4109			05.03.19		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL2 → AL.2_3					
1038	14	16 bit	05.01.20	**AL.3**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL3 → AL.3_1	R/W	■	Float *	s.p. *	see Table B
2062			05.02.20		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL3 → AL.3_2					
4110			05.03.20		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL3 → AL.3_3					
1082	58	16 bit	05.01.21	**AL.4**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL4 → AL.4_1	R/W	■	Float *	s.p. *	see Table A
2106			05.02.21		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL4 → AL.4_2					
4154			05.03.21		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL4 → AL.4_3					
1222	198	16 bit	05.01.22	**AL.5**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL5 → AL.5_1	R/W	■	Float *	s.p. *	see Table A
2246			05.02.22		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL5 → AL.5_2					
4294			05.03.22		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL5 → AL.5_3					
1223	199	16 bit	05.01.23	**AL.6**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL6 → AL.6_1	R/W	■	Float *	s.p. *	75.0
2247			05.02.23		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL6 → AL.6_2					
4295			05.03.23		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL6 → AL.6_3					
1224	200	16 bit	05.01.24	**AL.7**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL7 → AL.7_1	R/W	■	Float *	s.p. *	see table
2248			05.02.24		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL7 → AL.7_2					
4296			05.03.24		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL7 → AL.7_3					
1225	201	16 bit	05.01.25	**AL.8**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL8 → AL.8_1	R/W	■	Float *	s.p. *	75.0
2249			05.02.25		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL8 → AL.8_2					
4297			05.03.25		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL8 → AL.8_3					

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											

The parameter sets the alarm threshold for generic alarms AL1...AL8 of modules GPC-M, GPC-E1 and GPC-E2. The threshold and module concerned depend on the address used. The default values may depend on the controller model.

*) The range of valid values for the threshold and the position of the decimal point may vary according to the reference variable chosen for the alarm *Ax.r* (with x = 1...8).

Table A	
Model	**Default**
480 V	528.0
600 V	658.0
690 V	758.0

Table B	
Model	**Default**
40 A	0.4
60 A	0.6
100 A	1.0
150 A	1.5
200 A	2.0
250 A	2.5
300 A	3.0
400 A	4.0
500 A	5.0
600 A	6.0

Table C	
Model	**Default**
40 A	44.0
60 A	66.0
100 A	110.0
150 A	165.0
200 A	220.0
250 A	275.0
300 A	330.0
400 A	440.0
500 A	550.0
600 A	660.0

min...max: **-999**...**999** If symmetrical alarm
0...**999** If symmetrical and relative alarm

For further information on symmetrical alarms, see paragraph “4.4.1. Generic alarms AL1...AL8”.

3.13.4. Alarm hysteresis

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1211	187	16 bit	05.01.26	**Hy.1**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL1 → Hy.1_1	R/W	■	Float *	s.p. * sec. min.	1
2235			05.02.26		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL1 → Hy.1_2					
4283			05.03.26		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL1 → Hy.1_3					
1212	188	16 bit	05.01.27	**Hy.2**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL2 → Hy.2_1	R/W	■	Float *	s.p. * sec. min.	1
2236			05.02.27		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL2 → Hy.2_2					
4284			05.03.27		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL2 → Hy.2_3					
1213	189	16 bit	05.01.28	**Hy.3**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL3 → Hy.3_1	R/W	■	Float *	s.p. * sec. min.	2
2237			05.02.28		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL3 → Hy.3_2					
4285			05.03.28		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL3 → Hy.3_3					
1083	59	16 bit	05.01.29	**Hy.4**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL4 → Hy.4_1	R/W	■	Float *	s.p. * sec. min.	1
2107			05.02.29		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL4 → Hy.4_2					
4155			05.03.29		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL4 → Hy.4_3					
1234	210	16 bit	05.01.30	**Hy.5**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL5 → Hy.5_1	R/W	■	Float *	s.p. * sec. min.	1
2258			05.02.30		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL5 → Hy.1_2					
4306			05.03.30		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL5 → Hy.5_3					
1235	211	16 bit	05.01.31	**Hy.6**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL6 → Hy.6_1	R/W	■	Float *	s.p. * sec. min.	1
2259			05.02.31		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL6 → Hy.6_2					
4307			05.03.31		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL6 → Hy.6_3					
1236	212	16 bit	05.01.32	**Hy.7**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL7 → Hy.7_1	R/W	■	Float *	s.p. * sec. min.	1
2260			05.02.32		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL7 → Hy.7_2					
4308			05.03.32		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL7 → Hy.7_3					
1237	213	16 bit	05.01.33	**Hy.8**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL8 → Hy.8_1	R/W	■	Float *	s.p. * sec. min.	1
2261			05.02.33		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL8 → Hy.8_2					
4309			05.03.33		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL8 → Hy.8_3					

The parameter sets the hysteresis for generic alarms AL1...AL8 of modules GPC-M, GPC-E1 and GPC-E2. The alarm and module concerned depend on the address used.

*) The range of valid values for the threshold and the position of the decimal point may vary according to the reference variable chosen for the alarm *Ax.r* (with x = 1...8).

min...max: -**99.9**...**99.9** If symmetrical alarm
0...**999***With* unit of measurement in seconds, if +32 in parameter *Ax.t*, with x = alarm number
0...**999** With unit of measurement in minutes, if +64 in parameter *Ax.t*, with x = alarm number

For further information on symmetrical alarms, see paragraph “4.4.1. Generic alarms AL1...AL8”.

3.13.5. Alarm type

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1430	406	16 bit	05.01.10	**A1.t**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL1 → A1.t_1	R/W	■	Unsigned Short		32
2454			05.02.10		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL1 → A1.t_2					
4502			05.03.10		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL1 → A1.t_3					
1431	407	16 bit	05.01.11	**A2.t**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL2 → A2.t_1	R/W	■	Unsigned Short		33
2455			05.02.11		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL2 → A2.t_2					
4503			05.03.11		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL2 → A2.t_3					
1432	408	16 bit	05.01.12	**A3.t**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL3 → A3.t_1	R/W	■	Unsigned Short		161
2456			05.02.12		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL3 → A3.t_2					
4504			05.03.12		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL3 → A3.t_3					
1433	409	16 bit	05.01.13	**A4.t**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL4 → A4.t_1	R/W	■	Unsigned Short		32
2457			05.02.13		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL4 → A4.t_2					
4505			05.03.13		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL4 → A4.t_3					
1230	206	16 bit	05.01.14	**A5.t**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL5 → A5.t_1	R/W	■	Unsigned Short		32
2254			05.02.14		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL5 → A5.t_2					
4302			05.03.14		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL5 → A5.t_3					
1231	207	16 bit	05.01.15	**A6.t**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL6 → A6.t_1	R/W	■	Unsigned Short		33
2255			05.02.15		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL6 → A6.t_2					
4303			05.03.15		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL6 → A6.t_3					
1232	208	16 bit	05.01.16	**A7.t**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL7 → A7.t_1	R/W	■	Unsigned Short		32
2256			05.02.16		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL7 → A7.t_2					
4304			05.03.16		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL7 → A7.t_3					
1233	209	16 bit	05.01.17	**A8.t**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL8 → A8.t_1	R/W	■	Unsigned Short		33
2257			05.02.17		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL8 → A8.t_2					
4305			05.03.17		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL8 → A8.t_3					

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											

The parameter sets the alarm type for generic alarms AL1...AL8 of modules GPC-M, GPC-E1 and GPC-E2. The alarm and module concerned depend on the address used.

Options:

Index	Direct (maximum) or Reverse (minimum)	Absolute or Relative	Normal or Symmetrical (window)
0	Direct	Absolute	Normal
1	Reverse	Absolute	Normal
2	Direct	Relative *	Normal
3	Reverse	Relative *	Normal
4	Direct	Absolute	Symmetrical
5	Reverse	Absolute	Symmetrical
6	Direct	Relative *	Symmetrical
7	Reverse	Relative *	Symmetrical

Increasing the index by a fixed amount results in the following behaviours:
Index +8 = The alarm is disabled from startup until the alarm threshold is first intercepted.
Index +16 = Alarm memory is enabled.
Index +32 = *A1.t* becomes the alarm activation delay time (0...999 minutes)
This does not apply to the symmetrical absolute.
Index +64 = *A1.t* becomes the alarm activation delay time (0...999 seconds).
This does not apply to the symmetrical absolute.
Index +128 = Alarm is disabled during softstart.

Notes:
*) Setting not available for generic alarm 1.
The relative alarm type refers to the immediately preceding absolute alarm with index 1...8.

Examples:
Setting 20 (= 4 + 16) provides a direct, absolute and symmetrical alarm that is only enabled when the alarm threshold is exceeded for the first time since startup.
If AL1 and AL2 are absolute, by setting AL3 as relative, alarm 3 will be relative to alarm 2.

3.13.6. Direct setting of a direct or reverse alarm

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1070	46	bit		**BIT_ AL1_ DIR_INV**	M	MainMenu → M → Expert → Bit → BIT_AL1_DIR_INV_1	R/W	■			OFF
2094					E1	MainMenu → E1 → Expert → Bit → BIT_AL1_DIR_INV_2					
4142					E2	MainMenu → E2 → Expert → Bit → BIT_AL1_DIR_INV_3					
1078	54	bit		**BIT_ AL2_ DIR_INV**	M	MainMenu → M → Expert → Bit → BIT_AL2_DIR_INV_1	R/W	■			OFF
2102					E1	MainMenu → E1 → Expert → Bit → BIT_AL2_DIR_INV_2					
4150					E2	MainMenu → E2 → Expert → Bit → BIT_AL2_DIR_INV_3					
1060	36	bit		**BIT_ AL3_ DIR_INV**	M	MainMenu → M → Expert → Bit → BIT_AL3_DIR_INV_1	R/W	■			OFF
2084					E1	MainMenu → E1 → Expert → Bit → BIT_AL3_DIR_INV_2					
4132					E2	MainMenu → E2 → Expert → Bit → BIT_AL3_DIR_INV_3					
1094	70	bit		**BIT_ AL4_ DIR_INV**	M	MainMenu → M → Expert → Bit → BIT_AL4_DIR_INV_1	R/W	■			OFF
2118					E1	MainMenu → E1 → Expert → Bit → BIT_AL4_DIR_INV_2					
4166					E2	MainMenu → E2 → Expert → Bit → BIT_AL4_DIR_INV_3					
The parameter sets the direct or reverse mode for alarms 1, 2, 3 and 4, depending on the address used.											
Options: **OFF** = Direct alarm (maximum) **ON** = Reverse alarm (minimum)											

3.13.7. Direct setting of an absolute or relative alarm

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1071	47	bit		**BIT_ AL1_ ABS_ REL**	M	MainMenu → M → Expert → Bit → BIT_AL1_ABS_REL_1	R/W	■			OFF
2095					E1	MainMenu → E1 → Expert → Bit → BIT_AL1_ABS_REL_2					
4143					E2	MainMenu → E2 → Expert → Bit → BIT_AL1_ABS_REL_3					
1079	55	bit		**BIT_ AL2_ ABS_ REL**	M	MainMenu → M → Expert → Bit → BIT_AL2_ABS_REL_1	R/W	■			OFF
2103					E1	MainMenu → E1 → Expert → Bit → BIT_AL2_ABS_REL_2					
4151					E2	MainMenu → E2 → Expert → Bit → BIT_AL2_ABS_REL_3					
1061	37	bit		**BIT_ AL3_ ABS_ REL**	M	MainMenu → M → Expert → Bit → BIT_AL3_ABS_REL_1	R/W	■			OFF
2085					E1	MainMenu → E1 → Expert → Bit → BIT_AL3_ABS_REL_2					
4133					E2	MainMenu → E2 → Expert → Bit → BIT_AL3_ABS_REL_3					
1095	71	bit		**BIT_ AL4_ ABS_ REL**	M	MainMenu → M → Expert → Bit → BIT_AL4_ABS_REL_1	R/W	■			OFF
2119					E1	MainMenu → E1 → Expert → Bit → BIT_AL4_ABS_REL_2					
4167					E2	MainMenu → E2 → Expert → Bit → BIT_AL4_ABS_REL_3					

The parameter sets the absolute or relative mode for alarms 1, 2, 3 and 4, depending on the address used.

Options: **OFF** = Absolute alarm
ON = Relative alarm

3.13.8. Direct setting of a normal or symmetrical alarm

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1072	48	bit		**BIT_ AL1_ NOR_ SYM**	M	MainMenu → M → Expert → Bit → BIT_AL1_NOR_SYM_1	R/W	■			OFF
2096					E1	MainMenu → E1 → Expert → Bit → BIT_AL1_NOR_SYM_2					
4144					E2	MainMenu → E2 → Expert → Bit → BIT_AL1_NOR_SYM_3					
1080	56	bit		**BIT_ AL2_ NOR_ SYM**	M	MainMenu → M → Expert → Bit → BIT_AL2_NOR_SYM_1	R/W	■			OFF
2104					E1	MainMenu → E1 → Expert → Bit → BIT_AL2_NOR_SYM_2					
4152					E2	MainMenu → E2 → Expert → Bit → BIT_AL2_NOR_SYM_3					
1062	38	bit		**BIT_ AL3_ NOR_ SYM**	M	MainMenu → M → Expert → Bit → BIT_AL3_NOR_SYM_1	R/W	■			OFF
2086					E1	MainMenu → E1 → Expert → Bit → BIT_AL3_NOR_SYM_2					
4134					E2	MainMenu → E2 → Expert → Bit → BIT_AL3_NOR_SYM_3					
1096	72	bit		**BIT_ AL4_ NOR_ SYM**	M	MainMenu → M → Expert → Bit → BIT_AL4_NOR_SYM_1	R/W	■			OFF
2120					E1	MainMenu → E1 → Expert → Bit → BIT_AL4_NOR_SYM_2					
4168					E2	MainMenu → E2 → Expert → Bit → BIT_AL4_NOR_SYM_3					

The parameter sets the normal or symmetrical mode for alarms 1, 2, 3 and 4, depending on the address used. For further information, see paragraph “4.4.1. Generic alarms AL1...AL8”.

Options: **OFF** = Normal alarm
ON = Symmetrical alarm

3.13.9. Direct setting of alarm enabling at startup

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1073	49	bit		**BIT_ AL1_ DISA-BLE_ PWON**	M	MainMenu → M → Expert → Bit → BIT_AL1_DISABLE_PWON_1	R/W	■			OFF
2097					E1	MainMenu → E1 → Expert → Bit → BIT_AL1_DISABLE_PWON_2					
4145					E2	MainMenu → E2 → Expert → Bit → BIT_AL1_DISABLE_PWON_3					
1081	57	bit		**BIT_ AL2_ DISA-BLE_ PWON**	M	MainMenu → M → Expert → Bit → BIT_AL2_DISABLE_PWON_1	R/W	■			OFF
2105					E1	MainMenu → E1 → Expert → Bit → BIT_AL2_DISABLE_PWON_2					
4153					E2	MainMenu → E2 → Expert → Bit → BIT_AL2_DISABLE_PWON_3					
1063	39	bit		**BIT_ AL3_ DISA-BLE_ PWON**	M	MainMenu → M → Expert → Bit → BIT_AL3_DISABLE_PWON_1	R/W	■			OFF
2057					E1	MainMenu → E1 → Expert → Bit → BIT_AL3_DISABLE_PWON_2					
4135					E2	MainMenu → E2 → Expert → Bit → BIT_AL3_DISABLE_PWON_3					
1097	73	bit		**BIT_ AL4_ DISA-BLE_ PWON**	M	MainMenu → M → Expert → Bit → BIT_AL4_DISABLE_PWON_1	R/W	■			OFF
2121					E1	MainMenu → E1 → Expert → Bit → BIT_AL4_DISABLE_PWON_2					
4169					E2	MainMenu → E2 → Expert → Bit → BIT_AL4_DISABLE_PWON_3					

This parameter sets the enabling or disabling of alarms 1, 2, 3 and 4 at startup, depending on the address used.

Options: **OFF** = Alarm enabled on startup
ON = Alarm disabled on startup

3.13.10. Direct setting of alarm memory activation

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1074	50	bit		**BIT_ AL1_ MEM**	M	MainMenu → M → Expert → Bit → BIT_AL1_MEM_1	R/W	■			OFF
2098					E1	MainMenu → E1 → Expert → Bit → BIT_AL1_MEM_2					
4146					E2	MainMenu → E2 → Expert → Bit → BIT_AL1_MEM_3					
1082	58	bit		**BIT_ AL2_ MEM**	M	MainMenu → M → Expert → Bit → BIT_AL2_MEM_1	R/W	■			OFF
2106					E1	MainMenu → E1 → Expert → Bit → BIT_AL2_MEM_2					
4154					E2	MainMenu → E2 → Expert → Bit → BIT_AL2_MEM_3					
1064	40	bit		**BIT_ AL3_ MEM**	M	MainMenu → M → Expert → Bit → BIT_AL3_MEM_1	R/W	■			OFF
2088					E1	MainMenu → E1 → Expert → Bit → BIT_AL3_MEM_2					
4136					E2	MainMenu → E2 → Expert → Bit → BIT_AL3_MEM_3					
1098	74	bit		**BIT_ AL4_ MEM**	M	MainMenu → M → Expert → Bit → BIT_AL4_MEM_1	R/W	■			OFF
2122					E1	MainMenu → E1 → Expert → Bit → BIT_AL4_MEM_2					
4170					E2	MainMenu → E2 → Expert → Bit → BIT_AL4_MEM_3					

The parameter sets the activation and deactivation of alarm memory 1, 2, 3 and 4, depending on the address used.

Options: **OFF** = Alarm memory deactivated
ON = Alarm memory activated

3.13.11. Alarm validation power

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1084	60	16 bit	05.01.34	**A1.P**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL1 → A1.P_1	R/W	■	Float (####.#)	%	0.0
2108			05.02.34		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL1 → A1.P_2					
4156			05.03.34		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL1 → A1.P_3					
1085	61	16 bit	05.01.35	**A2.P**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL2 → A2.P_1	R/W	■	Float (####.#)	%	0.0
2109			05.02.35		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL2 → A2.P_2					
4157			05.03.35		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL2 → A2.P_3					
1086	62	16 bit	05.01.36	**A3.P**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL3 → A3.P_1	R/W	■	Float (####.#)	%	2.0
2110			05.02.36		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL3 → A3.P_2					
4158			05.03.36		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL3 → A3.P_3					
1087	63	16 bit	05.01.37	**A4.P**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL4 → A4.P_1	R/W	■	Float (####.#)	%	0.0
2111			05.02.37		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL4 → A4.P_2					
4159			05.03.37		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL4 → A4.P_3					
1088	64	16 bit	05.01.38	**A5.P**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL5 → A5.P_1	R/W	■	Float (####.#)	%	0.0
2112			05.02.38		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL5 → A5.P_2					
4160			05.03.38		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL5 → A5.P_3					
1089	65	16 bit	05.01.39	**A6.P**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL6 → A6.P_1	R/W	■	Float (####.#)	%	0.0
2113			05.02.39		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL6 → A6.P_2					
4161			05.03.39		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL6 → A6.P_3					
1090	66	16 bit	05.01.40	**A7.P**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL7 → A7.P_1	R/W	■	Float (####.#)	%	0.0
2114			05.02.40		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL7 → A7.P_2					
4162			05.03.40		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL7 → A7.P_3					
1091	67	16 bit	05.01.41	**A8.P**	M	MainMenu → M → Alarms → AL1...AL8 alarms → AL8 → A8.P_1	R/W	■	Float (####.#)	%	0.0
2115			05.02.41		E1	MainMenu → E1 → Alarms → AL1...AL8 alarms → AL8 → A8.P_2					
4163			05.03.41		E2	MainMenu → E2 → Alarms → AL1...AL8 alarms → AL8 → A8.P_3					

The parameter sets the validation power for generic alarms AL1...AL8 of modules GPC-M, GPC-E1 and GPC-E2. The alarm and module concerned depend on the address used.

min...max: **0.0**...**100.0**

3.13.12. Alarm status reading

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1028	4	bit		**BIT_STATUS_AL1**	M	MainMenu → M → Expert → Bit → BIT_STATUS_AL1_1	R				
2052					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_AL1_2					
4100					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_AL1_3					
1029	5	bit		**BIT_STATUS_AL2**	M	MainMenu → M → Expert → Bit → BIT_STATUS_AL2_1	R				
2053					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_AL2_2					
4101					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_AL2_3					
1086	62	bit		**BIT_STATUS_AL3**	M	MainMenu → M → Expert → Bit → BIT_STATUS_AL3_1	R				
2110					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_AL3_2					
4158					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_AL3_3					
1093	69	bit		**BIT_STATUS_AL4**	M	MainMenu → M → Expert → Bit → BIT_STATUS_AL4_1	R				
2117					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_AL4_2					
4165					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_AL4_3					
1042	18	bit		**BIT_STATUS_AL5**	M	MainMenu → M → Expert → Bit → BIT_STATUS_AL5_1	R				
2066					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_AL5_2					
4114					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_AL5_3					
1043	19	bit		**BIT_STATUS_AL6**	M	MainMenu → M → Expert → Bit → BIT_STATUS_AL6_1	R				
2067					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_AL6_2					
4115					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_AL6_3					
1044	20	bit		**BIT_STATUS_AL7**	M	MainMenu → M → Expert → Bit → BIT_STATUS_AL7_1	R				
2068					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_AL7_2					
4116					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_AL7_3					
1045	21	bit		**BIT_STATUS_AL8**	M	MainMenu → M → Expert → Bit → BIT_STATUS_AL8_1	R				
2069					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_AL8_2					
4117					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_AL8_3					

The parameter shows the status of generic alarms AL1...AL8 of modules GPC-M, GPC-E1 and GPC-E2. The alarm and module concerned depend on the address used.

Options: **OFF** = Alarm not active
ON = Alarm on

3.13.13. Alarm memory reset

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1103	79	bit	12.01.03	**BIT_ RESET_ AL1_AL8**	M	MainMenu → M → Expert → Bit → BIT_RESET_AL1_AL8_1	R/W	■			
2127			12.02.03		E1	MainMenu → E1 → Expert → Bit → BIT_RESET_AL1_AL8_2					
4175			12.03.03		E2	MainMenu → E2 → Expert → Bit → BIT_RESET_AL1_AL8_3					

The parameter allows the memory of all generic alarms to be cleared by changing the state of the bit.
To clear the memory of a specific generic alarm, see parameters *dIG.1*, *dIG.2*, *dIG.3* and *dIG.4* for alarms 1, 2, 3 and 4 respectively.

Options: **OFF** = No function
ON = Generic alarms AL1...AL8 are reset

3.13.14. Alarm status (ALSTATE_IRQ)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1342	318	16 bit		**AL-STATE_ IRQ**	M	MainMenu → M → Status → ALSTATE_IRQ_1	R				
2366					E1	MainMenu → E1 → Status → ALSTATE_IRQ_2					
4414					E2	MainMenu → E2 → Status → ALSTATE_IRQ_3					

The parameter shows the status of generic alarms AL1...AL8 and HB / POWER_FAULT alarms. Bit = 0 indicates the alarm is not active, bit = 1 indicates the alarm is active.
The following table shows the correspondence between bit and individual alarms.

Options:

bit	Description	Alarm type
0	Alarm status AL1	Generic alarm
1	Alarm status AL2	Generic alarm
2	Alarm status AL3	Generic alarm
3	Alarm status AL4	Generic alarm
4	Alarm status AL.HB (or phases 1/2/3 if three-phase) or POWER_FAULT	Heater Break Alarm / POWER_FAULT
5	Alarm status AL.HB phase 1 (with three-phase load)	Heater Break Alarm
6	Alarm status AL.HB phase 2 (with three-phase load)	Heater Break Alarm
7	Alarm status AL.HB phase 3 (with three-phase load)	Heater Break Alarm
8	Alarm status AL5	Generic alarm
9	Alarm status AL6	Generic alarm
10	Alarm status AL7	Generic alarm
11	Alarm status AL8	Generic alarm

3.14. HB (Heater Break) Alarms

The HB alarms of the Power Controller are used to identify load breakage or interruption through the value of the current delivered, which is measured using a current transformer.

Three types of fault can occur during system operation:
1. The current delivered is lower than the rated current: this is the most common situation and indicates that an element of the load has failed.
2. The current delivered is higher than the rated current: this situation occurs, for example, when there are partial short circuits of the load elements.
3. The current delivered remains significant even during periods when it should be zero: this is the situation when the load drive circuits are short-circuited or when the relay contacts weld together. Early intervention in these situations is very important to avoid major damage to the load and/or the driver circuits.

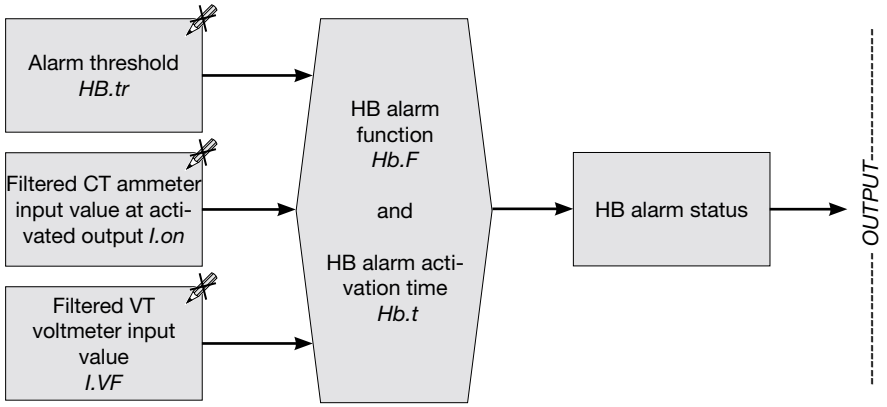
In standard configuration, the SSR output is associated with the heating control of GPC-M, achieved by modulating the electrical power with the ON/OFF control according to the set cycle time.

The current reading taken during the ON phase allows identification of an abnormal deviation from its rate value due to a fault on the load (type 1 fault).
The current reading taken during the OFF phase, on the other hand, allows the detection of a control relay fault (output continuing to deliver current, fault type 3).

An alarm threshold teach-in function is also available. The function can be activated by a command from a serial line, a digital input (see paragraph “3.12.4. Digital input function”) or a key (see paragraph “3.36. Key functions”).

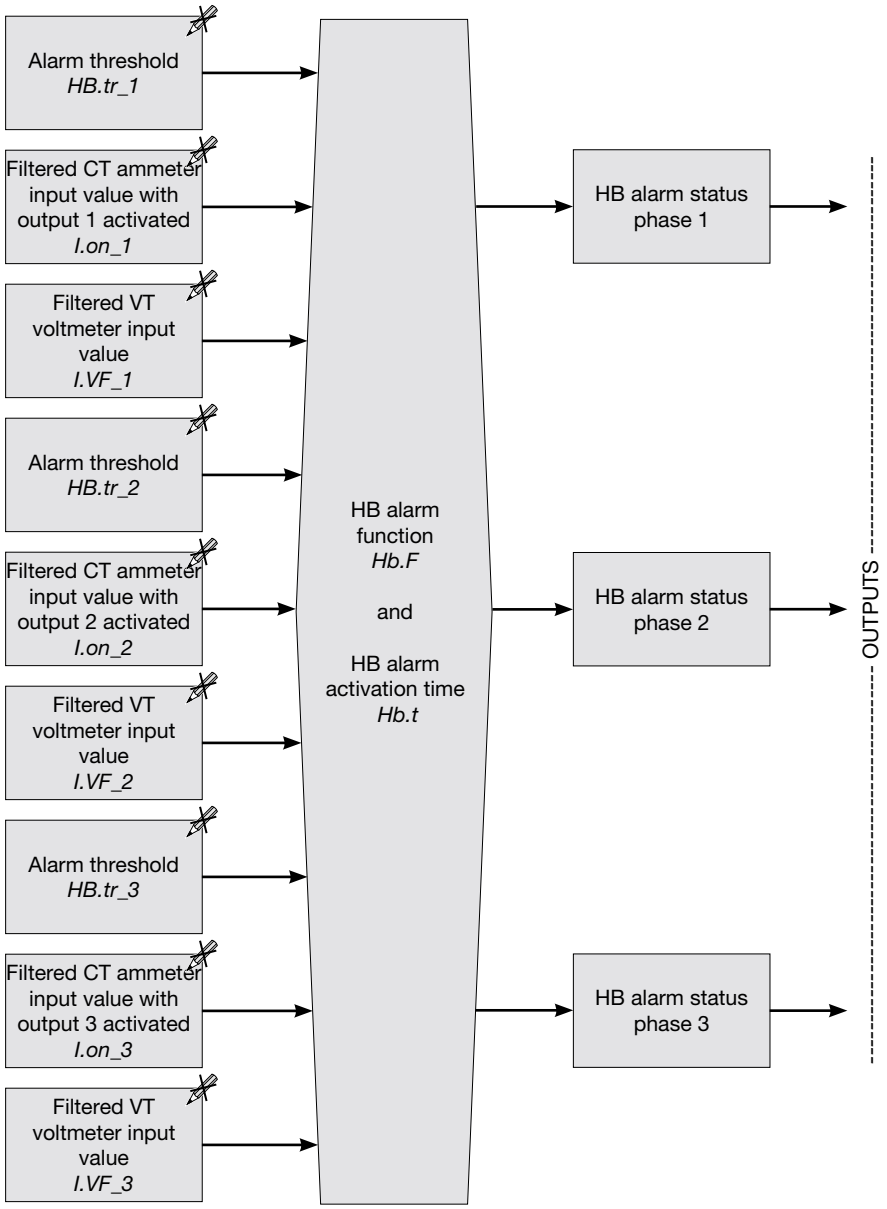
The following diagrams show the parameter processing sequence for generating an HB alarm and for calibrating the HB alarm.

Functional diagram of HB alarm single-phase load



Note
The *Hb.tr* threshold value of the HB alarm is calculated in two different ways, depending on the chosen operating mode:
- with ZC, BF, HSC operating modes: $Hb.tr = A.Hb$
- with PA operating mode: $Hb.tr = A.Hb * \sqrt{(Ou.P)}$

Functional diagram of HB alarm three-phase load

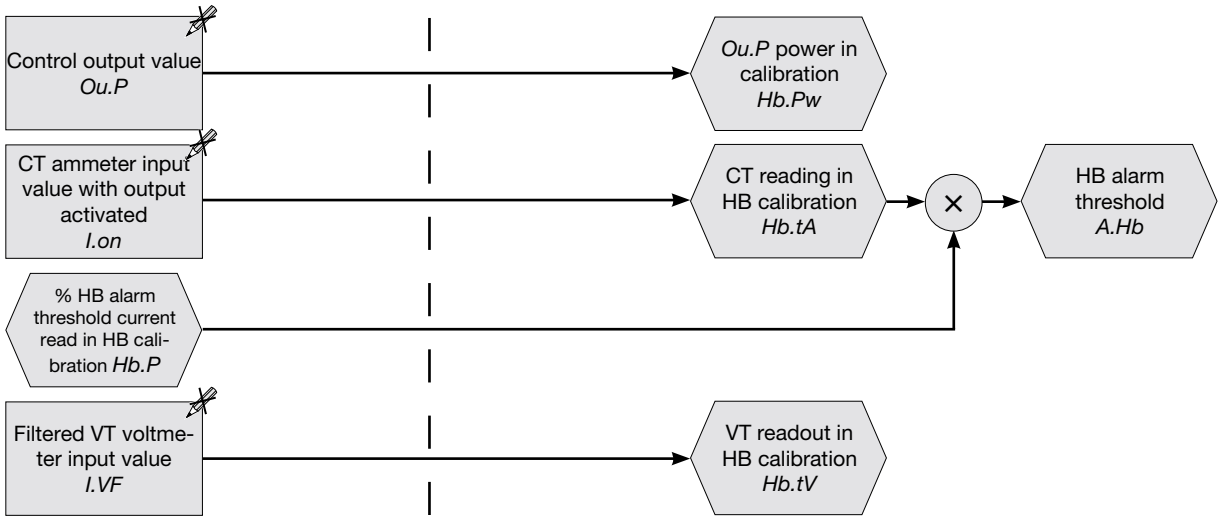


Note

The *Hb.tr* threshold value of the HB alarm is calculated in two different ways, depending on the chosen operating mode:

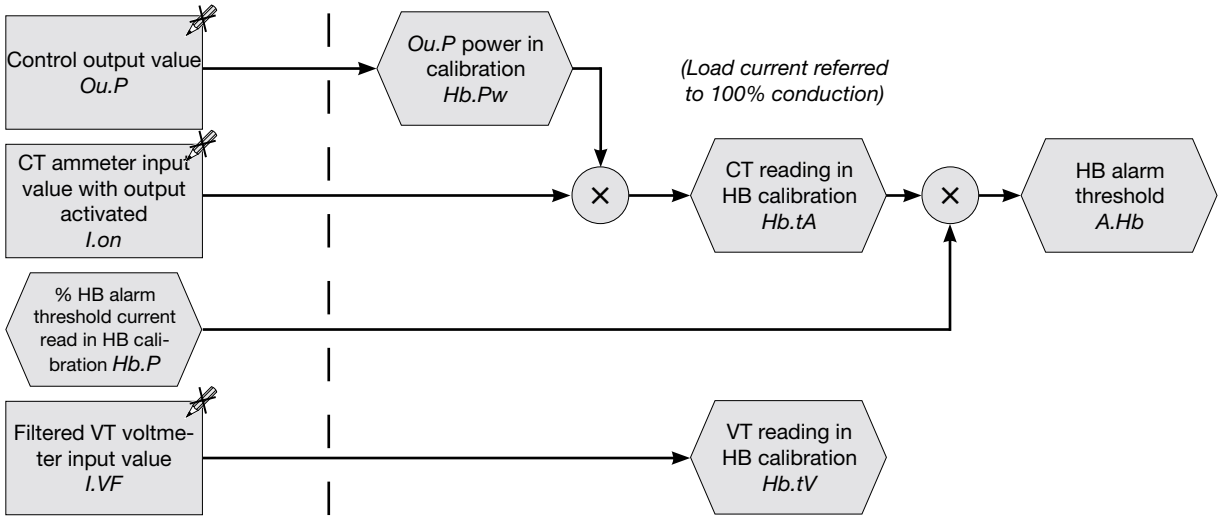
- with ZC, BF, HSC operating modes: $Hb.tr = A.Hb$
- with PA operating mode: $Hb.tr = A.Hb * \sqrt{(Ou.P)}$

Functional diagram of HB calibration in ZC - BF - HSC mode



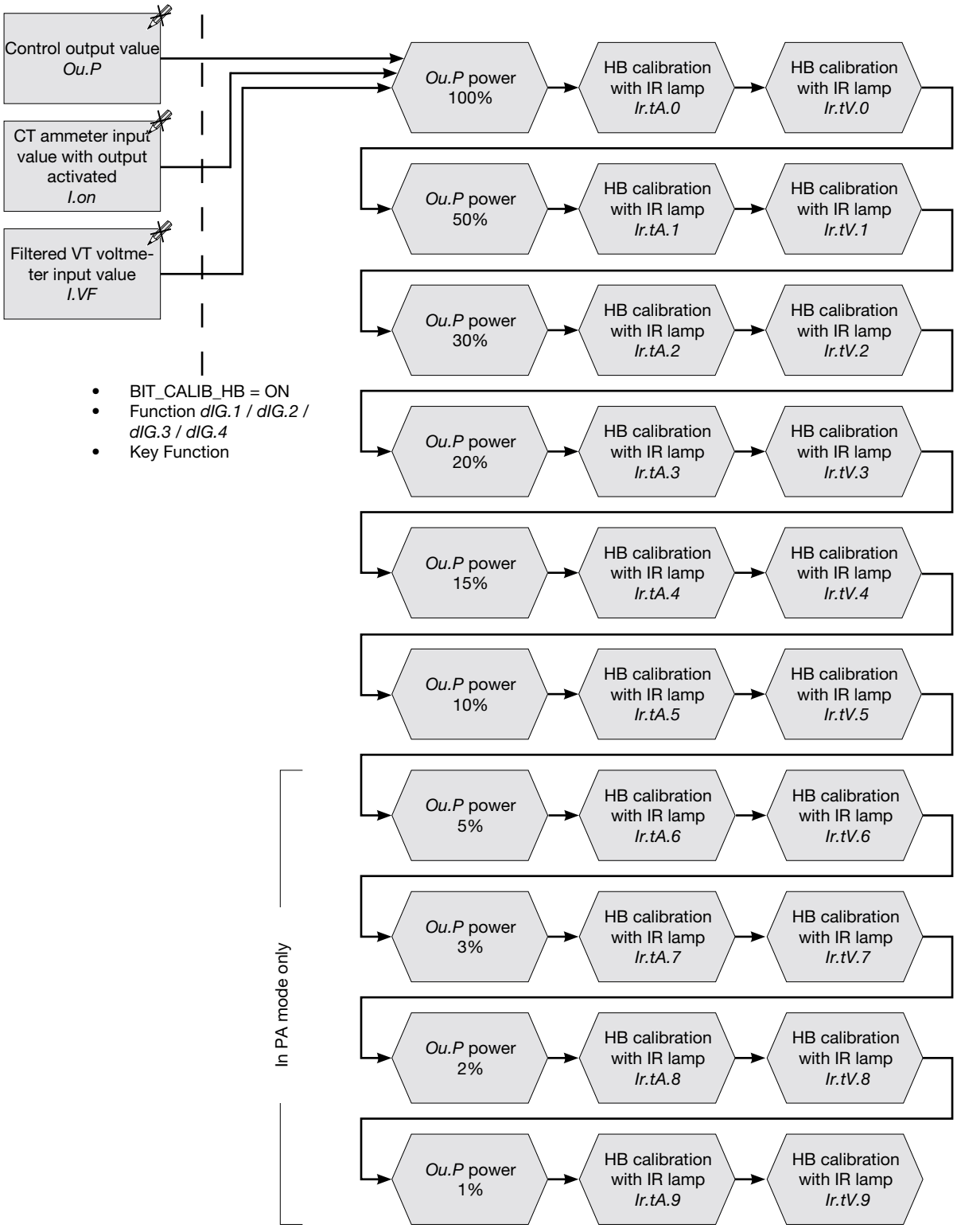
- BIT_CALIB_HB = ON
- Function *dIG.1* / *dIG.2* / *dIG.3* / *dIG.4*
- Key Function

Functional diagram of HB calibration in PA mode



- BIT_CALIB_HB = ON
- Function *dIG.1* / *dIG.2* / *dIG.3* / *dIG.4*
- Key Function

Functional diagram of HB calibration for infrared lamps



3.14.1. Enabling alarms

See paragraph “3.13.1. Enable alarms”.

3.14.2. HB alarm function

Address		Format	GPC-OP menu	Acronym		GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1081	57	16 bit	05.04.01	**Hb.F**	M	MainMenu → M → Alarms → HB alarm → Hb.F_1	R/W	■	Unsigned Short		see table
2105			05.05.01		E1	MainMenu → E1 → Alarms → HB alarm → Hb.F_2					
4153			05.06.01		E2	MainMenu → E2 → Alarms → HB alarm → Hb.F_3					

The parameter sets the function of the HB alarm via an index.
With a **single-phase load**, the alarm thresholds *A.Hb_1*, *A.Hb_2* and *A.Hb_3* refer to the respective module.
With a **three-phase load**, the reference thresholds are *A.Hb_1*, *A.Hb_2* and *A.Hb_3* with OR of the states between phases 1, 2 and 3.
With a **two-phase load**, the reference thresholds are *A.Hb_1* e *A.Hb_2* with OR of the states between phases 1 and 2.

Default			
	GPC-M	GPC-E1	GPC-E2
Single-phase load	0	0	0
Three-phase or two-phase load	16	16	16

Options:

Index	**Function description**
0	Can be used with relay or logic output. The alarm is active when the load current value is lower than the threshold set for the ON time of the SSR control output.
1	Can be used with relay or logic output. The alarm is active when the load current value is higher than the threshold set for the OFF time of the SSR control output.
2	The alarm is active if one of the functions 0 and 1 is active (logical OR between functions 0 and 1). For function 1, the threshold is considered to be 12% of the ammeter full scale *H.tA_x*.
3	Continuous heating alarm. The alarm is active when the load current value is lower than the threshold value in *A.Hb_x*. The alarm does not refer to the cycle time and is disabled if the heating output value is less than 3%. The setting *A.Hb_x* = 0 disables the HB alarm by forcing its state to off.

Notes:
The alarm is automatically reset when the condition that caused it is removed.

Increasing the index by a fixed amount results in the following behaviours:
Index +8 = HB alarm is reversed.
Index +16 = Alarm is related to single thresholds and single phases with three-phase load.
Index +32 = HB alarm storage is enabled.

Examples:
Setting index 11 (= 3+8) results in a continuous alarm reversed in state.

By setting index 17 (= 1+16) an alarm is triggered when the current is higher than the threshold for the OFF time, having a three-phase configuration in which differentiated *A.Hb_1*, *A.Hb_2*, *A.Hb_3* thresholds are desired in the individual phases.

3.14.3. Delay time for HB alarm activation

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1080	56	16 bit	05.04.02	**Hb.t**	M	MainMenu → M → Alarms → HB alarm → Hb.t_1	R/W	■	Unsigned Short	sec.	5
2104			05.05.02		E1	MainMenu → E1 → Alarms → HB alarm → Hb.t_2					
4152			05.06.02		E2	MainMenu → M → Alarms → HB alarm → Hb.t_3					
The parameter sets the delay time before the HB alarm is activated. The *Hb.t* value must be greater than the cycle time of the output with which the HB alarm is associated. *min...max*: **0**...**999**											

3.14.4. Enabling calibration

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1136	112	bit	12.01.05	**BIT_ CALIB_ HB**	M	MainMenu → M → Expert → Bit → BIT_CALIB_HB_1	R/W				0
2160			12.02.05		E1	MainMenu → E1 → Expert → Bit → BIT_CALIB_HB_2					
4208			12.03.05		E2	MainMenu → E2 → Expert → Bit → BIT_CALIB_HB_3					
This bit enables the alarm threshold calibration function for modules GPC-M, GPC-E1 and GPC-E2, depending on the address used. It should be noted that with a three-phase load, a different value can be set for the *A.Hb* alarm thresholds. In this mode an unbalanced three-phase load can be controlled without problems. *Options:* **OFF** = Calibration not enabled **ON** = Calibration enabled											

3.14.5. HB alarm threshold

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1079	55	16 bit	05.04.03	**A.Hb**	M	MainMenu → M → Alarms → HB alarm → A.Hb_1	R/W	■	Float (####.#)	A	10.0
2103			05.05.03		E1	MainMenu → E1 → Alarms → HB alarm → A.Hb_2					
4151			05.06.03		E2	MainMenu → E2 → Alarms → HB alarm → A.Hb_3					
The parameter sets the HB alarm threshold. *min...max*: **0.0**...**3275.0**											

3.14.6. HB alarm threshold percentage

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1761	737	16 bit	05.04.04	**Hb.P**	M	MainMenu → M → Alarms → HB alarm → Hb.P_1	R/W	■	Float (####.#)	%	80.0
2785			05.05.04		E1	MainMenu → E1 → Alarms → HB alarm → Hb.P_2					
4833			05.06.04		E2	MainMenu → E2 → Alarms → HB alarm → Hb.P_3					
The parameter sets the HB alarm threshold percentage of the current read in HB calibration. *min...max*: **0.0**...**100.0**											

3.14.7. CT reading in HB calibration

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1766	742	16 bit	05.04.05	**Hb.tA**	M	MainMenu → M → Alarms → HB alarm → Hb.tA_1	R/W	■	Float (####.#)	A	0.0
2790			05.05.05		E1	MainMenu → E1 → Alarms → HB alarm → Hb.tA_2					
4838			05.06.05		E2	MainMenu → E2 → Alarms → HB alarm → Hb.tA_3					
The parameter sets the CT reading in HB calibration. *min...max*: **0.0**...**3275.0**											

3.14.8. VT reading in HB calibration

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1476	452	16 bit	05.04.06	**Hb.tV**	M	MainMenu → M → Alarms → HB alarm → Hb.tV_1	R/W	■	Float (####.#)	V	0.0
2500			05.05.06		E1	MainMenu → E1 → Alarms → HB alarm → Hb.tV_2					
4548			05.06.06		E2	MainMenu → E2 → Alarms → HB alarm → Hb.tV_3					
The parameter sets the VT reading in HB calibration. *min...max*: **0.0**...**999.9**											

3.14.9. Ou.P power in calibration

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1767	743	16 bit	05.04.07	**Hb.Pw**	M	MainMenu → M → Alarms → HB alarm → Hb.Pw_1	R/W	■	Float (####.#)	%	0.0
2791			05.05.07		E1	MainMenu → E1 → Alarms → HB alarm → Hb.Pw_2					
4839			05.06.07		E2	MainMenu → E2 → Alarms → HB alarm → Hb.Pw_3					
The parameter sets the *Ou.P* power in HB calibration. *min...max*: **0.0**...**100.0**											

3.14.10. HB calibration with IR lamp (current)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1782	758	16 bit	05.04.08	**Ir.tA.0**	M	MainMenu → M → Alarms → HB alarm → Ir.tA.0_1	R/W	■	Float (####.#)	A	0.0
2806			05.05.08		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tA.0_2					
4854			05.06.08		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tA.0_3					
1783	759	16 bit	05.04.09	**Ir.tA.1**	M	MainMenu → M → Alarms → HB alarm → Ir.tA.1_1	R/W	■	Float (####.#)	A	0.0
2807			05.05.09		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tA.1_2					
4855			05.06.09		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tA.1_3					
1784	760	16 bit	05.04.10	**Ir.tA.2**	M	MainMenu → M → Alarms → HB alarm → Ir.tA.2_1	R/W	■	Float (####.#)	A	0.0
2808			05.05.10		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tA.2_2					
4856			05.06.10		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tA.2_3					
1785	761	16 bit	05.04.11	**Ir.tA.3**	M	MainMenu → M → Alarms → HB alarm → Ir.tA.3_1	R/W	■	Float (####.#)	A	0.0
2809			05.05.11		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tA.3_2					
4857			05.06.11		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tA.3_3					
1791	767	16 bit	05.04.12	**Ir.tA.4**	M	MainMenu → M → Alarms → HB alarm → Ir.tA.4_1	R/W	■	Float (####.#)	A	0.0
2815			05.05.12		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tA.4_2					
4863			05.06.12		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tA.4_3					
1792	768	16 bit	05.04.13	**Ir.tA.5**	M	MainMenu → M → Alarms → HB alarm → Ir.tA.5_1	R/W	■	Float (####.#)	A	0.0
2816			05.05.13		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tA.5_2					
4864			05.06.13		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tA.5_3					
1793	769	16 bit	05.04.14	**Ir.tA.6**	M	MainMenu → M → Alarms → HB alarm → Ir.tA.6_1	R/W	■	Float (####.#)	A	0.0
2817			05.05.14		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tA.6_2					
4865			05.06.14		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tA.6_3					
1406	382	16 bit	05.04.15	**Ir.tA.7**	M	MainMenu → M → Alarms → HB alarm → Ir.tA.7_1	R/W	■	Float (####.#)	A	0.0
2430			05.05.15		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tA.7_2					
4478			05.06.15		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tA.7_3					
1407	383	16 bit	05.04.16	**Ir.tA.8**	M	MainMenu → M → Alarms → HB alarm → Ir.tA.8_1	R/W	■	Float (####.#)	A	0.0
2431			05.05.16		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tA.8_2					
4479			05.06.16		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tA.8_3					
1408	384	16 bit	05.04.17	**Ir.tA.9**	M	MainMenu → M → Alarms → HB alarm → Ir.tA.9_1	R/W	■	Float (####.#)	A	0.0
2432			05.05.17		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tA.9_2					
4480			05.06.17		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tA.9_3					

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										

Description

The parameter sets the HB calibration when using IR lamps. The following table shows the correspondence between acronym and percentage of conduction current.

Acronym	Current
Ir.tA.0	100 % conduction
Ir.tA.1	50 % conduction
Ir.tA.2	30 % conduction
Ir.tA.3	20 % conduction
Ir.tA.4	15 % conduction
Ir.tA.5	10 % conduction
Ir.tA.6	5 % conduction
Ir.tA.7	3 % conduction
Ir.tA.8	2 % conduction
Ir.tA.9	1 % conduction

min...max: **0.0**...**3275.0**

For details of HB calibration with IR lamps see paragraph “4.4.3. HB alarm threshold teach-in function”.

3.14.11. HB calibration with IR lamp (voltage)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1469	445	16 bit	05.04.18	**Ir.tV.0**	M	MainMenu → M → Alarms → HB alarm → Ir.tV.0_1	R/W	■	Float (####.#)	V	0.0
2493			05.05.18		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tV.0_2					
4541			05.06.18		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tV.0_3					
1470	446	16 bit	05.04.19	**Ir.tV.1**	M	MainMenu → M → Alarms → HB alarm → Ir.tV.1_1	R/W	■	Float (####.#)	V	0.0
2494			05.05.19		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tV.1_2					
4542			05.06.19		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tV.1_3					
1471	447	16 bit	05.04.20	**Ir.tV.2**	M	MainMenu → M → Alarms → HB alarm → Ir.tV.2_1	R/W	■	Float (####.#)	V	0.0
2495			05.05.20		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tV.2_2					
4543			05.06.20		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tV.2_3					
1472	448	16 bit	05.04.21	**Ir.tV.3**	M	MainMenu → M → Alarms → HB alarm → Ir.tV.3_1	R/W	■	Float (####.#)	V	0.0
2496			05.05.21		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tV.3_2					
4544			05.06.21		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tV.3_3					
1473	449	16 bit	05.04.22	**Ir.tV.4**	M	MainMenu → M → Alarms → HB alarm → Ir.tV.4_1	R/W	■	Float (####.#)	V	0.0
2497			05.05.22		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tV.4_2					
4545			05.06.22		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tV.4_3					
1474	450	16 bit	05.04.23	**Ir.tV.5**	M	MainMenu → M → Alarms → HB alarm → Ir.tV.5_1	R/W	■	Float (####.#)	V	0.0
2498			05.05.23		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tV.5_2					
4546			05.06.23		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tV.5_3					
1475	451	16 bit	05.04.24	**Ir.tV.6**	M	MainMenu → M → Alarms → HB alarm → Ir.tV.6_1	R/W	■	Float (####.#)	V	0.0
2499			05.05.24		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tV.6_2					
4547			05.06.24		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tV.6_3					
1414	390	16 bit	05.04.25	**Ir.tV.7**	M	MainMenu → M → Alarms → HB alarm → Ir.tV.7_1	R/W	■	Float (####.#)	V	0.0
2438			05.05.25		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tV.7_2					
4486			05.06.25		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tV.7_3					
1415	391	16 bit	05.04.26	**Ir.tV.8**	M	MainMenu → M → Alarms → HB alarm → Ir.tV.8_1	R/W	■	Float (####.#)	V	0.0
2439			05.05.26		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tV.8_2					
4487			05.06.26		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tV.8_3					
1416	392	16 bit	05.04.27	**Ir.tV.9**	M	MainMenu → M → Alarms → HB alarm → Ir.tV.9_1	R/W	■	Float (####.#)	V	0.0
2440			05.05.27		E1	MainMenu → E1 → Alarms → HB alarm → Ir.tV.9_2					
4488			05.06.27		E2	MainMenu → E2 → Alarms → HB alarm → Ir.tV.9_3					

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											

The parameter sets the HB calibration when using IR lamps. The following table shows the correspondence between acronym and percentage of conduction voltage.

Acronym	Voltage
Ir.tV.0	100 % conduction
Ir.tV.1	50 % conduction
Ir.tV.2	30 % conduction
Ir.tV.3	20 % conduction
Ir.tV.4	15 % conduction
Ir.tV.5	10 % conduction
Ir.tV.6	5 % conduction
Ir.tV.7	3 % conduction
Ir.tV.8	2 % conduction
Ir.tV.9	1 % conduction

min...max: **0.0**...**999.9**

For details of HB calibration with IR lamps see paragraph “4.4.3. HB alarm threshold teach-in function”.

3.14.12. HB alarm threshold as function of power on load

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1768	744	16 bit		**Hb.tr**	M	MainMenu → M → Alarms → HB alarm → Hb.tr_1	R		Float (####.#)	A	
2792					E1	MainMenu → E1 → Alarms → HB alarm → Hb.tr_2					
4840					E2	MainMenu → E2 → Alarms → HB alarm → Hb.tr_3					

The parameter shows the HB alarm threshold as a function of the power on the load.

min...max: **0.0**...**3275.0**

3.14.13. HB (OR TA1-TA2-TA3) OR POWER FAULT alarm status

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1050	26	bit		**BIT_ STATUS_ HB_OR_ PF**	M	MainMenu → M → Expert → Bit → BIT_STATUS_HB_OR_PF_1	R				
2074					E1	MainMenu → M → Expert → Bit → BIT_STATUS_HB_OR_PF_2					
4122					E2	MainMenu → M → Expert → Bit → BIT_STATUS_HB_OR_PF_3					

The parameter shows the HB (OR TA1-TA2-TA3) OR POWER_FAULT alarm status.

Options: **OFF** = Alarm off
ON = Alarm on

3.14.14. HB alarm status (single-phase configuration or CT phase 1 two-phase or three-phase configuration)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1100	76	bit		**BIT_STATUS_HB**	M	MainMenu → M → Expert → Bit → BIT_STATUS_HB_1	R				
2124					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_HB_2					
4172					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_HB_3					
The parameter shows the HB alarm status in the single-phase configuration or that of CT phase 1 in the two-phase or three-phase configuration. *Options:* **OFF** = Alarm off **ON** = Alarm on											

3.14.15. HB alarm status (single-phase configuration or CT phase 2 two-phase or three-phase configuration)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1101	77	bit		**BIT_STATUS_HB_PHASE2**	Global	MainMenu → M → Expert → Bit → BIT_STATUS_HB_PHASE2_1	R				
The parameter shows the HB alarm status in the single-phase configuration or that of CT phase 2 in the two-phase or three-phase configuration. *Options:* **OFF** = Alarm off **ON** = Alarm on											

3.14.16. HB alarm status (single-phase configuration or CT phase 3 three-phase configuration)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1102	78	bit		**BIT_STATUS_HB_PHASE3**	Global	MainMenu → M → Expert → Bit → BIT_STATUS_HB_PHASE3_1	R				
The parameter shows the HB alarm status in the single-phase configuration or that of CT phase 3 in the three-phase configuration. *Options:* **OFF** = Alarm off **ON** = Alarm on											

3.14.17. ALSTATE alarm status for single-phase loads and phase 1 of three-phase loads

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1536	512			**AL-STATE**	M	MainMenu → M → Status → ALSTATE_1	R				
2560					E1	MainMenu → E1 → Status → ALSTATE_2					
4608					E2	MainMenu → E2 → Status → ALSTATE_3					

The parameter shows the HB ALSTATE Alarm statuss for single-phase loads and phase 1 of three-phase loads. Each bit signals a state (bit = 0 corresponds to OFF, bit = 1 corresponds to ON).

Options:

bit	HB alarm status
4	HB alarm status for ON time
5	HB alarm status for OFF time
6	AL.HB alarm status (with single-phase load) or AL.HB phase 1 Alarm status (with two-phase or three-phase load)

3.14.18. ALSTATE_HB alarm status (phase 2 of two-phase/three-phase loads and phase 3 of three-phase loads)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1528	504	16 bit		**AL-STATE_HB**	Global	MainMenu → Global → Status → ALSTATE_HB	R				

The parameter shows the HB ALSTATE_HB alarm status for phase 2 of two-phase or three-phase loads and phase 3 of three-phase loads. Each bit signals a state (bit = 0 corresponds to OFF, bit = 1 corresponds to ON).

Options:

bit	HB alarm status
0	HB phase 2 alarm status for ON time
1	HB phase 2 alarm status for OFF time
2	AL.HB phase 2 alarm status (with two-phase or three-phase load)
3	HB phase 3 alarm status for ON time
4	HB phase 2 alarm status for OFF time
5	AL.HB phase 3 alarm status (with three-phase load)

3.14.19. Alarm status (ALSTATE_IRQ)

See paragraph “3.13.14. Alarm status (ALSTATE_IRQ)”.

3.14.20. HB, SSR_SHORT, NO_VOLTAGE and NO_CURRENT alarm reset

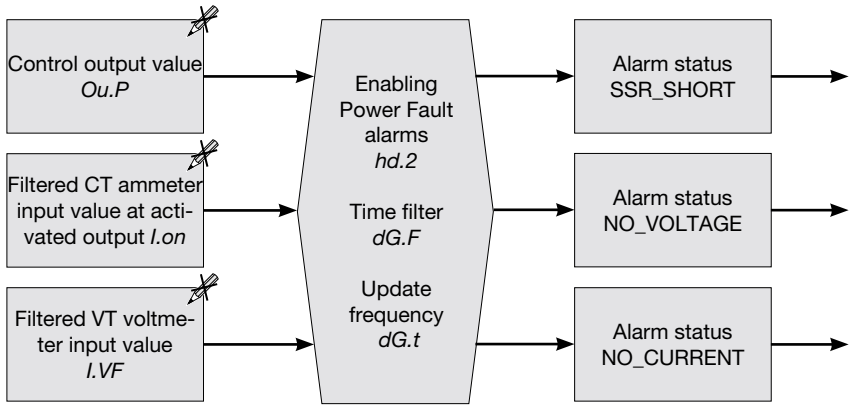
Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1129	105	bit	12.01.04	**BIT_RESET_HB_PF**	M	MainMenu → M → Expert → Bit → BIT_RESET_HB_PF_1	R/W				
2153			12.02.04		E1	MainMenu → E1 → Expert → Bit → BIT_RESET_HB_PF_2					
4201			12.03.04		E2	MainMenu → E2 → Expert → Bit → BIT_RESET_HB_PF_3					

The bit sets the reset for HB, SSR_SHORT, NO_VOLTAGE and NO_CURRENT alarms.

Options: **OFF** = No action
ON = Reset HB, SSR_SHORT, NO_VOLTAGE and NO_CURRENT alarms

3.15. POWER_FAULT alarms (SSR_SHORT, NO_VOLTAGE and NO_CURRENT)

Functional diagram of Power Fault alarms



3.15.1. Enable POWER_FAULT alarms

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1684	660	16 bit	05.07.01	**hd.2**	M	MainMenu → M → Alarms → PF alarms → hd.2_1	R/W	■	Unsigned Short		11
2708			05.08.01		E1	MainMenu → E1 → Alarms → PF alarms → hd.2_2					
4756			05.09.01		E2	MainMenu → E2 → Alarms → PF alarms → hd.2_3					

The parameter sets the POWER_FAULT alarms: SSR_SHORT (SSR short circuit), NO_VOLTAGE (voltage failure) and NO_CURRENT (current failure). Active alarms are identified and set with an index.
The index 0 deactivates all 3 alarms.

Options:

Index	SSR_SHORT alarm on	NO_VOLTAGE alarm on	NO_CURRENT alarm on
0			
1	■		
2		■	
3	■	■	
8			■
9	■		■
10		■	■
11	■	■	■

Notes:
Increasing the index by a fixed amount results in the following behaviours:
Index + 32 = POWER_FAULT alarm storage is enabled.
Index + 64 = Current polarity control is disabled (only for inductive loads).

Examples:
Setting index 35 (= 3 + 32) enables SSR_SHORT and NO_VOLTAGE alarms with alarm storage.
Setting index 73 (= 9 + 64), with an inductive load, enables SSR_SHORT and NO_CURRENT alarms without polarity check for current.

3.15.2. SSR_SHORT update frequency

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1685	661	16 bit	05.07.03	**dG.t**	Global	MainMenu → Global → Alarms → PF alarms → dG.t	R/W	■	Unsigned Short	sec.	10
The parameter sets the update frequency for the SSR_SHORT alarm, which corresponds to the delay time for activation of the alarm. *min...max*: **1**...**999**											

3.15.3. Time filter for NO_VOLTAGE and NO_CURRENT alarms

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1686	662	16 bit	05.07.02	**dG.F**	M	MainMenu → M → Alarms → PF alarms → dG.F_1	R/W	■	Unsigned Short	sec.	10
2710			05.08.02		E1	MainMenu → E1 → Alarms → PF alarms → dG.F_2					
4758			05.09.02		E2	MainMenu → E2 → Alarms → PF alarms → dG.F_3					
The parameter sets the time filter for the NO_VOLTAGE and NO_CURRENT alarms. It is recommended to set a value not lower than the cycle time. *min...max*: **0**...**99**											

3.15.4. HB, SSR_SHORT, NO_VOLTAGE and NO_CURRENT alarm reset

See paragraph “3.14.20. HB, SSR_SHORT, NO_VOLTAGE and NO_CURRENT alarm reset”.

3.15.5. Status 3 (STATUS3)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1657	633	16 bit	01.02.18	**STATUS3**	M	MainMenu → M → Status → STATUS3_1	R		Unsigned Short		
2681			01.03.18		E1	MainMenu → E1 → Status → STATUS3_2					
4729			01.04.18		E2	MainMenu → E2 → Status → STATUS3_3					

The parameter shows the status of the device. The individual statuses are highlighted by the corresponding bit.

Options:

bit	Status of
3	SSR_SHORT (PHASE 1 with three-phase load)
4	SSR_SHORT PHASE 2 (with three-phase load)
5	SSR_SHORT PHASE 3 (with three-phase load)
6	NO_VOLTAGE (PHASE 1 with three-phase load)
7	NO_VOLTAGE PHASE 2 (with three-phase load)
8	NO_VOLTAGE PHASE 3 (with three-phase load)
9	NO_CURRENT (PHASE 1 with three-phase load)
10	NO_CURRENT PHASE 2 (with three-phase load)
11	NO_CURRENT PHASE 3 (with three-phase load)

3.15.6. SSR_SHORT alarm status (single-phase configuration or CT phase 1 two-phase or three-phase configuration)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1120	96	bit		**BIT_STATUS_SSR_SHORT**	M	MainMenu → M → Expert → Bit → BIT_STATUS_SSR_SHORT_1	R				
2144					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_SSR_SHORT_2					
4192					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_SSR_SHORT_3					
The bit shows the SSR_SHORT alarm status in the single-phase configuration or that of CT phase 1 in two-phase or three-phase configuration. *Options:* **OFF** = Alarm off **ON** = Alarm on											

3.15.7. SSR_SHORT alarm status (single-phase configuration or CT phase 2 two-phase or three-phase configuration)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1121	97	bit		**BIT_STATUS_SSR_SHORT_PHASE2**	M	MainMenu → M → Expert → Bits → BIT_STATUS_SSR_SHORT_PHASE2_1	R				
The bit shows the SSR_SHORT alarm status in the single-phase configuration or that of CT phase 2 in two-phase or three-phase configuration. *Options:* **OFF** = Alarm off **ON** = Alarm on											

3.15.8. SSR_SHORT alarm status (single-phase configuration or CT phase 3 three-phase configuration)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1122	98	bit		**BIT_STATUS_SSR_SHORT_PHASE3**	M	MainMenu → M → Expert → Bits → BIT_STATUS_SSR_SHORT_PHASE3_1	R				
The bit shows the SSR_SHORT alarm status in single-phase configuration or that of CT phase 3 in three-phase configuration. *Options:* **OFF** = Alarm off **ON** = Alarm on											

3.15.9. NO_VOLTAGE alarm status (single-phase configuration or CT phase 1 two-phase or three-phase configuration)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1123	99	bit		**BIT_STATUS_NO_VOLTAGE**	M	MainMenu → M → Expert → Bit → BIT_STATUS_NO_VOLTAGE_1	R				
2147					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_NO_VOLTAGE_2					
4195					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_NO_VOLTAGE_3					
The bit shows the NO_VOLTAGE alarm status in single-phase configuration or the phase 1 CT status in two-phase or three-phase configuration. *Options:* **OFF** = Alarm off **ON** = Alarm on											

3.15.10. NO_VOLTAGE alarm status (single-phase configuration or CT phase 2 two-phase or three-phase configuration)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1124	100	bit		**BIT_STATUS_NO_VOLTAGE_PHASE2**	M	MainMenu → M → Expert → Bits → BIT_STATUS_NO_VOLTAGE_PHASE2_1	R				
The bit shows the NO_VOLTAGE alarm status in single-phase configuration or the phase 2 CT status in two-phase or three-phase configuration. *Options:* **OFF** = Alarm off **ON** = Alarm on											

3.15.11. NO_VOLTAGE alarm status (single-phase configuration or CT phase 3 three-phase configuration)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1125	101	bit		**BIT_STATUS_NO_VOLTAGE_PHASE3**	M	MainMenu → M → Expert → Bit → BIT_STATUS_NO_VOLTAGE_PHASE3_1	R				
The bit shows the NO_VOLTAGE alarm status in single-phase configuration or the phase 3 CT status in three-phase configuration. *Options:* **OFF** = Alarm off **ON** = Alarm on											

3.15.12. NO_CURRENT alarm status (single-phase configuration or CT phase 1 two-phase or three-phase configuration)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1126	102	bit		**BIT_ STATUS_ NO_CUR-RENT**	M	MainMenu → M → Expert → Bit → BIT_STATUS_NO_CURRENT_1	R				
2150					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_NO_CURRENT_2					
4198					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_NO_CURRENT_3					
The bit shows the NO_CURRENT alarm status in single-phase configuration or the CT phase 1 status in two-phase or three-phase configuration. *Options:* **OFF** = Alarm off **ON** = Alarm on											

3.15.13. NO_CURRENT alarm status (single-phase configuration or CT phase 2 two-phase or three-phase configuration)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1127	103	bit		**BIT_ STATUS_ NO_CUR-RENT_ PHASE2**	M	MainMenu → M → Expert → Bit → BIT_STATUS_NO_CURRENT_PHASE2_1	R				
The bit shows the NO_CURRENT alarm status in single-phase configuration or the CT phase 2 status in two-phase or three-phase configuration. *Options:* **OFF** = Alarm off **ON** = Alarm on											

3.15.14. NO_CURRENT alarm status (single-phase configuration or CT phase 3 three-phase configuration)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1128	104	bit		**BIT_ STATUS_ NO_CUR-RENT_ PHASE3**	M	MainMenu → M → Expert → Bit → BIT_STATUS_NO_CURRENT_PHASE3_1	R				
The bit shows the NO_CURRENT alarm status in single-phase configuration or the CT phase 3 status in three-phase configuration. *Options:* **OFF** = Alarm off **ON** = Alarm on											

3.16. Thermal protection alarms

Each SSR power module of the Advanced Power Controller has:

- a temperature sensor for the internal heat sink;
- two additional temperature sensors connected to the LINE and LOAD terminals;
- an “in-air” sensor to measure the board temperature.

The temperature values are stored in the variables *In.Ntc.SSR*, *In.Ntc.LINE*, *In.Ntc.LOAD* and *In.Ntc.AIR* with a range of 10.0...120.0 °C.
The following are also saved:

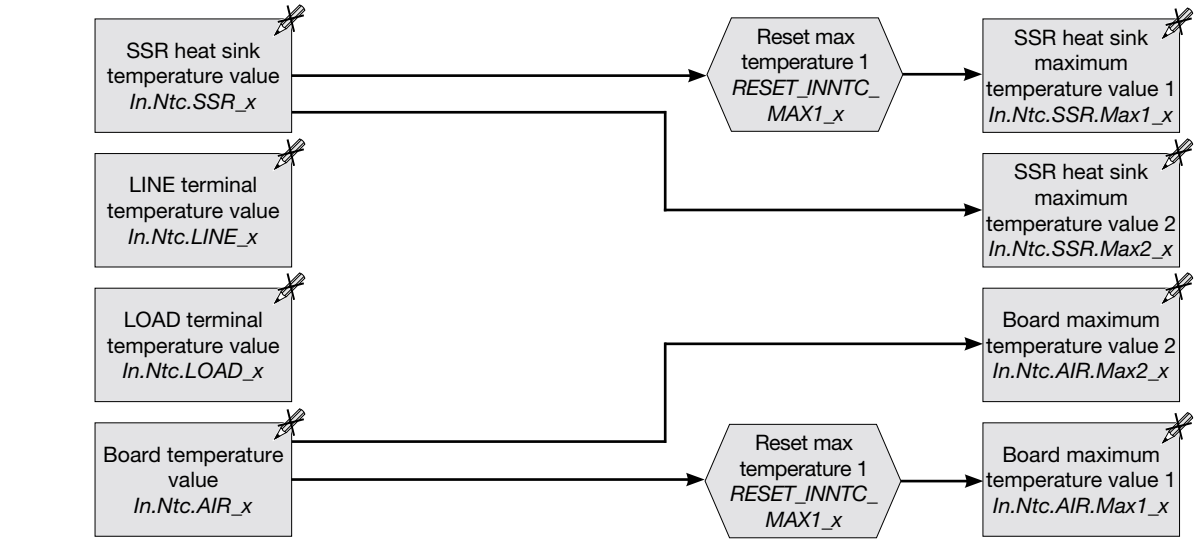
- in *In.Ntc.SSR.Max1* and *In.Ntc.SSR.Max2*, the maximum temperature reached by *In.Ntc.SSR*;
- in *In.Ntc.AIR.Max1* and *In.Ntc.AIR.Max2*, the maximum temperature reached by *In.Ntc.AIR*.

The *In.Ntc.SSR.Max1* and *In.Ntc.AIR.Max1* temperatures can be reset with a command.

The OVER_HEAT alarm is activated when at least one of the temperatures exceeds a set threshold; there is also a hysteresis to deactivate the alarm.
This condition could be caused by obstruction of the ventilation grill or blockage of the cooling fan.
With the OVER_HEAT alarm on, the control disables control outputs OUT1, OUT2 and OUT3.

As an additional safety feature, the power modules are equipped with maximum hardware temperature protection, which disables the SSR commands.

Functional diagram of thermal protection alarms



with x = 1...3

3.16.1. SSR heat sink temperature value

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1679	655	16 bit		**In.Ntc. SSR**	M	MainMenu → M → Expert → Status → In.Ntc.SSR_1	R		Float (####.#)	°C	
2703					E1	MainMenu → E1 → Expert → Status → In.Ntc.SSR_2					
4751					E2	MainMenu → E2 → Expert → Status → In.Ntc.SSR_3					
The parameter shows the temperature recorded by the power module's internal temperature sensor.											

3.16.2. Temperature value of LINE terminals

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1558	534	16 bit		**In.Ntc. LINE**	M	MainMenu → M → Expert → Status → In.Ntc.LINE_1	R		Float (####.#)	°C	
2582					E1	MainMenu → E1 → Expert → Status → In.Ntc.LINE_2					
4630					E2	MainMenu → E2 → Expert → Status → In.Ntc.LINE_3					
The parameter shows the temperature recorded by the temperature sensor connected to the LINE terminals.											

3.16.3. Temperature value of LOAD terminals

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1559	535	16 bit		**In.Ntc. LOAD**	M	MainMenu → M → Expert → Status → In.Ntc.LOAD_1	R		Float (####.#)	°C	
2583					E1	MainMenu → E1 → Expert → Status → In.Ntc.LOAD_2					
4631					E2	MainMenu → E2 → Expert → Status → In.Ntc.LOAD_3					
The parameter shows the temperature recorded by the temperature sensor connected to the LOAD terminals.											

3.16.4. Temperature value of the power board

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1560	536	16 bit		**In.Ntc. AIR**	M	MainMenu → M → Expert → Status → In.Ntc.AIR_1	R		Float (####.#)	°C	
2584					E1	MainMenu → E1 → Expert → Status → In.Ntc.AIR_2					
4632					E2	MainMenu → E2 → Expert → Status → In.Ntc.AIR_3					
The parameter shows the temperature of the power board measured by the sensor in the air.											

3.16.5. Maximum temperature value of SSR heat sink

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1352	328	16 bit		**In.Ntc. SSR. Max1**	M	MainMenu → M → Expert → Status → In.Ntc.SSR.Max1_1	R	■	Float (####.#)	°C	
2376					E1	MainMenu → E1 → Expert → Status → In.Ntc.SSR.Max1_2					
4424					E2	MainMenu → E2 → Expert → Status → In.Ntc.SSR.Max1_3					
1703	679	16 bit		**In.Ntc. SSR. Max2**	M	MainMenu → M → Expert → Status → In.Ntc.SSR.Max2_1	R	■	Float (####.#)	°C	
2727					E1	MainMenu → E1 → Expert → Status → In.Ntc.SSR.Max2_2					
4775					E2	MainMenu → E2 → Expert → Status → In.Ntc.SSR.Max2_3					

The parameter shows the maximum temperature shown by the SSR heatsink temperature sensor of GPC-M, GPC-E1 and GPC-E2.
The differences are:

- In.Ntc.SSR.Max1 shows the maximum temperature value since the last reset. To reset the parameter, see paragraph “3.16.8. Max1 temperature reset”.
- In.Ntc.SSR.Max2 shows the maximum temperature value over the entire lifetime of the device, i.e., since the first power-on. The parameter cannot be reset.

3.16.6. Maximum temperature value of the power board

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1387	363	16 bit		**In.Ntc. AIR. Max1**	M	MainMenu → M → Expert → Status → In.Ntc.AIR.Max1_1	R	■	Float (####.#)	°C	
2411					E1	MainMenu → E1 → Expert → Status → In.Ntc.AIR.Max1_2					
4459					E2	MainMenu → E2 → Expert → Status → In.Ntc.AIR.Max1_3					
1353	329	16 bit		**In.Ntc. AIR. Max2**	M	MainMenu → M → Expert → Status → In.Ntc.AIR.Max2_1	R	■	Float (####.#)	°C	
2377					E1	MainMenu → E1 → Expert → Status → In.Ntc.AIR.Max2_2					
4425					E2	MainMenu → E2 → Expert → Status → In.Ntc.AIR.Max2_3					

The parameter shows the maximum temperature of the power board shown by the air temperature sensor of GPC-M, GPC-E1 and GPC-E2.
The differences are:

- *In.Ntc.AIR.Max1* shows the maximum temperature value since the last reset. To reset the parameter see paragraph “3.16.8. Max1 temperature reset”.
- *In.Ntc.AIR.Max2* shows the maximum temperature value over the entire lifetime of the device, i.e., since its first power-on. The parameter cannot be reset.

3.16.7. Status reading (STATUS4)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1658	634	16 bit	01.02.19	**STATUS4**	M	MainMenu → M → Status → STATUS4_1	R		Unsigned Short		
2682			01.03.19		E1	MainMenu → E1 → Status → STATUS4_2					
4730			01.04.19		E2	MainMenu → E2 → Status → STATUS4_3					

The parameter shows the status of the device. The OFF bit indicates off, the ON bit indicates on.

Options:

bit	Status
0	Faulty temperature sensor (TEMPERATURE_SENSOR_BROKEN)
1	Overtemperature (OVER_HEAT)
2	Active phase softstart
3	End of phase softstart
4	Frequency alarm or single-phase line failure alarm
5	60 Hz
6	Short-circuit current in phase softstart (SHORT_CIRCUIT_CURRENT)
7	Peak current limiter in phase softstart
8	RMS steady state current limiter
9	24 V fan power failure (SSR_SAFETY)
10	Fuse open (FUSE_OPEN)
11	Current polarity control
12	HSC current overload limiter in phase softstart
13	Faulty current transformer sensor
14	SSR hardware overtemperature (HW_OVER_HEAT)

3.16.8. Max1 temperature reset

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1146	122	bit		**RESET_INNTC_MAX1**	M	MainMenu → M → Expert → Bit → BIT_RESET_INNTC_MAX1_1	R/W				
2170					E1	MainMenu → E1 → Expert → Bit → BIT_RESET_INNTC_MAX1_2					
4218					E2	MainMenu → E2 → Expert → Bit → BIT_RESET_INNTC_MAX1_3					

The parameter resets the *In.Ntc.SSR.Max1* and *In.Ntc.AIR.Max1* temperatures.

Options: **OFF** = No action
ON = Reset of *In.Ntc.SSR.Max1* and *In.Ntc.AIR.Max1 temperatures*

3.17. FUSE_OPEN and SHORT_CIRCUIT_CURRENT alarms

The FUSE_OPEN alarm is activated when the optional internal electronic fuse (extra-rapid type) is opened.

The SHORT_CIRCUIT_CURRENT alarm is activated when the peak current on the load exceeds the maximum permitted value (corresponding to twice the device's rated current) during the softstart ramp or during the first power-on (with softstart ramp disabled).

3.17.1. Number of automatic restarts

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1480	456	16 bit	08.01.01	**Fr.n**	Global	MainMenu → Global → Special functions → Fr.n	R/W	■	Unsigned Short		0
The parameter sets the number of automatic device restarts after a FUSE_OPEN or SHORT_CIRCUIT_CURRENT alarm. The device automatically restarts in softstart mode. If the number of attempts exceeds the *Fr.n* value, the device remains disabled while awaiting manual reset with the BUT front button or the serial communication command (bit 109). Setting *Fr.n* = 0 disables automatic restart. *min...max*: **0**...**20**											

3.17.2. FUSE_OPEN and SHORT_CIRCUIT_CURRENT alarm reset

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1133	109	bit		**BIT_RESET_SHORT_FUSE**	M	MainMenu → M → Expert → Bit → BIT_RESET_SHORT_FUSE_1	R/W				
2157					E1	MainMenu → E1 → Expert → Bit → BIT_RESET_SHORT_FUSE_2					
4205					E2	MainMenu → E2 → Expert → Bit → BIT_RESET_SHORT_FUSE_3					
The parameter resets the FUSE_OPEN or SHORT_CIRCUIT_CURRENT alarms. *Options:* **OFF** = No action **ON** = Reset of FUSE_OPEN or SHORT_CIRCUIT_CURRENT *alarms*											

3.17.3. STATUS4 state reading

See paragraph "3.16.7. Status reading (STATUS4)".

3.18. General description of the outputs

The Advanced Power Controller is extremely flexible with regard to the control of its physical outputs, allowing it to be used in sophisticated applications.

To assign a particular function to a physical output, you must:
1. Allocate the desired function to one of the internal reference signals *rL.1 .. . rL.6*.
2. Allocate the appropriate reference signal to parameters *out.1 . .. out.10* (corresponding to the physical outputs OUT1 ... OUT10).

In standard configuration, the physical outputs OUT1, OUT2 and OUT3 perform the control function for the GPC-M, GPC-E1 and GPC-E2 respectively.
The reference signals *rL.1* of each module are assigned the value 0 (*Ou.P* function) and the output parameters are assigned the following values:
- *out.1* = 1 (output *rL.1* GPC-M),
- *out.2* = 2 (output *rL.1* GPC-E1),
- *out.3* = 3 (output *rL.1* GPC-E2).

The physical outputs OUT5, OUT6, OUT7 and OUT8 are optional relay, logic and analog outputs.
In standard configuration these outputs perform the HB alarm function for GPC-M, GPC-E1 and GPC-E2 respectively.
In this configuration the *rL.2* reference signals of each module are assigned the values 2, 3 and 4 and the output parameters the following values*:*
- *out.5* = 5 (GPC-M *rL.2* output),
- *out.6* = 6 (GPC-E1 *rL.2* output),
- *out.7* = 7 (GPC-E2 *rL.2* output).

The two relay outputs OUT9 and OUT10, which are programmed via the corresponding parameters out.9 and out.10, are always present and are assigned to user-definable custom status programmed only with GF_eXpress.

The **standard configuration** of the outputs has the following parameter assignments*:*
- **Reference signals**:
  - *rL.3* = 2 (AL1 function),
  - *rL.4* = 35 (inverted AL2 function),
  - *rL.5* = 4 (AL3 function),
  - *rL.6* = 160 (active forced output function).
- **Output parameters**:
  - *out.9* = 31,
  - *out.10* = 31.

In this way, the default status of physical output OUT9 and OUT10 are given by the OR logical operator of each enabled modules alarm.

The “Overtemperature alarm” setting includes the following alarms, which are distinct for each module:
- Overtemperature for SCR or LINE terminal or LOAD terminal, STATUS4 bit 1 (OVER_HEAT).
- Temperature sensor failure for SCR or LINE terminal or LOAD terminal, STATUS4 bit 0 (TEMPERATURE_SENSOR_BROKEN).
- Hardware overtemperature for SCR, STATUS4 bit 14 (HW_OVER_HEAT).

The “Device not ready” setting (DEVICE_NOT_READY) includes the following alarms:
- Temperature alarm (OVER_HEAT or TEMPERATURE_SENSOR_BROKEN or HW_OVER_HEAT).
- Short-circuit current alarm during softstart (SHORT_CIRCUIT_CURRENT).
- Faulty CT sensor alarm (CURRENT_SENSOR_BROKEN).
- Invalid operating mode set on DIP switches (MODE_ERROR).
- Interlock.

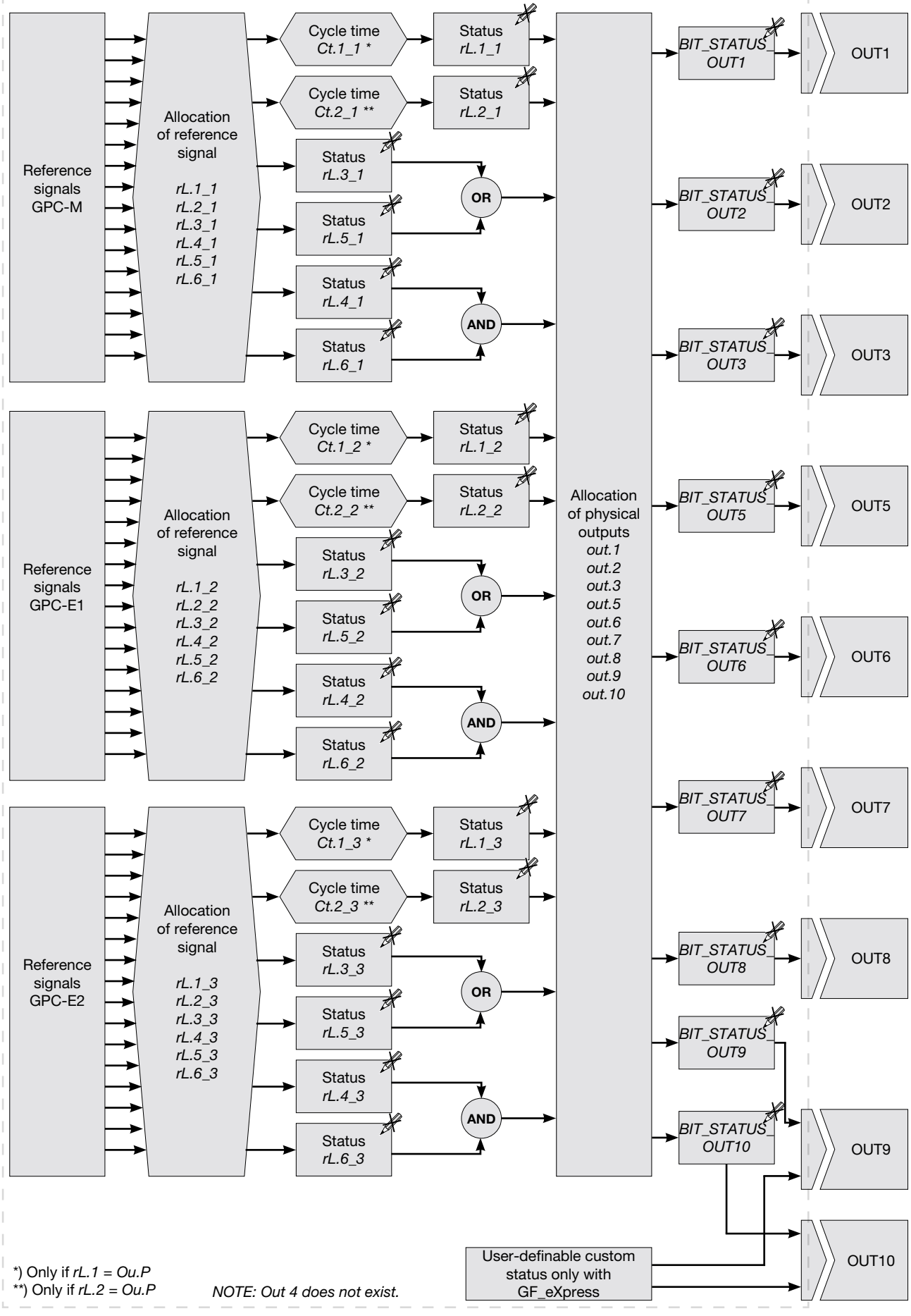
The function of each individual output can be disabled by setting the relevant parameter *out.x* = 0.
The status of outputs OUT1...OUT10 can be acquired by serial communication using bit variables.

The following configuration parameters are also linked to the outputs:
- *Ct.1*, i.e., the cycle time for control output *rL.1*. For further information, see paragraph “3.19.2. OUT cycle time”.

The following functional diagram shows the parameter processing sequence for control of the outputs.

NOTE: Out 4 does not exist.

Functional diagram of outputs



3.19. Allocation of reference signals to outputs

3.19.1. Allocation of reference signal

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1184	160	16 bit	06.01.01	**rL.1**	M	MainMenu → M → Outputs → rL.1_1	R/W	■	Unsigned Short		0
2208			06.02.01		E1	MainMenu → E1 → Outputs → rL.1_2					
4256			06.03.01		E2	MainMenu → E2 → Outputs → rL.1_3					
1187	163	16 bit	06.01.02	**rL.2**	M	MainMenu → M → Outputs → rL.2_1	R/W	■	Unsigned Short		5
2211			06.02.02		E1	MainMenu → E1 → Outputs → rL.2_2					
4259			06.03.02		E2	MainMenu → E2 → Outputs → rL.2_3					
1190	166	16 bit	06.01.03	**rL.3**	M	MainMenu → M → Outputs → rL.3_1	R/W	■	Unsigned Short		2
2214			06.02.03		E1	MainMenu → E1 → Outputs → rL.3_2					
4262			06.03.03		E2	MainMenu → E2 → Outputs → rL.3_3					
1194	170	16 bit	06.01.04	**rL.4**	M	MainMenu → M → Outputs → rL.4_1	R/W	■	Unsigned Short		35
2218			06.02.04		E1	MainMenu → E1 → Outputs → rL.4_2					
4266			06.03.04		E2	MainMenu → E2 → Outputs → rL.4_3					
1195	171	16 bit	06.01.05	**rL.5**	M	MainMenu → M → Outputs → rL.5_1	R/W	■	Unsigned Short		4
2219			06.02.05		E1	MainMenu → E1 → Outputs → rL.5_2					
4267			06.03.05		E2	MainMenu → E2 → Outputs → rL.5_3					
1196	172	16 bit	06.01.06	**rL.6**	M	MainMenu → M → Outputs → rL.6_1	R/W	■	Unsigned Short		160
2220			06.02.06		E1	MainMenu → E1 → Outputs → rL.6_2					
4268			06.03.06		E2	MainMenu → E2 → Outputs → rL.6_3					

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											

The parameter sets the allocation of the value of another parameter, or a function of parameters, to the reference signal *rL.x*, with x ranging from 1 to 6. The reference signal must be understood as an internal status.
To associate an alarm with an output, first associate the alarm with a *rL.x* reference signal, then associate the same *rL.x* reference signal with an output.
The signal allocation is identified by an index.

Options:

Index	Parameter or function
0	*Ou.P* (control output) *
2	*AL1* (alarm 1)
3	*AL2* (alarm 2)
4	*AL3* (alarm 3)
5	*AL.HB* OR *POWER_FAULT* with *HB* alarm (*TA1* OR *TA2* OR *TA3*)
7	*IN1* (INDIG1 logic input repetition)
8	*AL4* (alarm 4)
9	*AL1* OR *AL2*
10	*AL1* OR *AL2* OR *AL3*
11	*AL1* OR *AL2* OR *AL3* OR *AL4*
12	*AL1* AND *AL2*
13	*AL1* AND *AL2* AND *AL3*
14	*AL1* AND *AL2* AND *AL3* AND *AL4*
15	*AL1* OR *AL.HB* OR *POWER_FAULT* with *HB* alarm (*TA1* OR *TA2* OR *TA3*)
16	*AL1* OR *AL2* OR (*AL.HB* OR *POWER_FAULT*) with *HB* alarm (*TA1* OR *TA2* OR *TA3*)
17	*AL1* AND (*AL.HB* OR *POWER_FAULT*) with *HB* alarm (*TA1* OR *TA2* OR *TA3*)
18	*AL1* AND *AL2* OR (*AL.HB* OR *POWER_ FAULT*) with *HB* alarm (*TA1* OR *TA2* OR *TA3*)
19	*AL.HB* (HB alarm *TA2*)
20	*AL.HB* (HB alarm *TA3*)
22	*AL.HB* (alarm *HB TA1*)
23	*POWER_FAULT* (*SSR_SHORT* OR *NO_VOLTAGE* OR *NO_CURRENT*)
24	*IN2* (INDIG2 logic input repetition)
25	*IN3* (INDIG3 logic input repetition)
26	*IN4* (INDIG4 logic input repetition)
27	*FUSE_OPEN* / *SHORT_CIRCUIT_CURRENT*
28	Overtemperature alarm
29	Communication error
30	Device not ready (*DEVICE_NOT_READY*)
64	*Ou.P* (control output) with fast cycle time 0.1...20.0 seconds *

Notes:
*) only for *rL.1* and *rL.2*.

OR and AND are to be understood as Boolean operators and determine the result of the function. *AL1* OR *AL2* OR *AL3*, for example, provides TRUE if at least one of the three alarms is active; *AL1* AND *AL2* AND *AL3*, for example, only provides TRUE if all alarms are active.

Increasing the index by a fixed amount results in the following behaviours:
Index +32 = The output logic level is negated (if TRUE becomes FALSE and vice versa).
Index +128 = Output is forced to 0.

3.19.2. OUT cycle time

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1033	9	16 bit	06.01.07	**Ct.1**	M	MainMenu → M → Outputs → Ct.1_1	R/W	■	Float	sec.	see table
2057			06.02.07		E1	MainMenu → E1 → Outputs → Ct.1_2					
4105			06.03.07		E2	MainMenu → E2 → Outputs → Ct.1_3					
1183	159	16 bit	06.01.08	**Ct.2**	M	MainMenu → M → Outputs → Ct.2_1	R/W	■	Float	sec.	20
2207			06.02.08		E1	MainMenu → E1 → Outputs → Ct.2_2					
4255			06.03.08		E2	MainMenu → E2 → Outputs → Ct.2_3					

The parameter sets the OUT1 and OUT2 cycle time, depending on the address used. The cycle time is the duration of a series of conduction and non-conduction cycles in the same ratio as the power to be transferred to the load.
The value of the parameter depends on the type of trigger.

DIP switch position 5	Default Ct.1
OFF (resistive load)	0
ON (inductive load)	4

Type of trigger	Parameter	
	min	max
BF	0	0
ZC with slow cycle time (see setting *rL.1*)	0	200
ZC with fast cycle time (see setting *rL.1*)	0.1	20.0

3.19.3. Status rL.x (MASKOUT_RL)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1332	308	16 bit	01.02.23	**MASK-OUT_RL**	M	MainMenu → M → Status → MASKOUT_RL_1	R		Unsigned Short		
2356			01.03.23		E1	MainMenu → E1 → Status → MASKOUT_RL_2					
4404			01.04.23		E2	MainMenu → E2 → Status → MASKOUT_RL_3					

The parameter bits show the status of the output reference signals.

Options:

bit	Signal
0	Status *rL.1*
1	Status *rL.2*
2	Status *rL.3*
3	Status *rL.4*
4	Status *rL.5*
5	Status *rL.6*

3.19.4. Status rL

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1036	12	bit		**BIT_STATUS_RL1**	M	MainMenu → M → Expert → Bit → BIT_STATUS_RL1_1	R				
2060					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_RL1_2					
4108					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_RL1_3					
1037	13	bit		**BIT_STATUS_RL2**	M	MainMenu → M → Expert → Bit → BIT_STATUS_RL2_1	R				
2061					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_RL2_2					
4109					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_RL2_3					
1038	14	bit		**BIT_STATUS_RL3**	M	MainMenu → M → Expert → Bit → BIT_STATUS_RL3_1	R				
2062					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_RL3_2					
4110					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_RL3_3					
1039	15	bit		**BIT_STATUS_RL4**	M	MainMenu → M → Expert → Bit → BIT_STATUS_RL4_1	R				
2063					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_RL4_2					
4111					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_RL4_3					
1040	16	bit		**BIT_STATUS_RL5**	M	MainMenu → M → Expert → Bit → BIT_STATUS_RL5_1	R				
2064					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_RL5_2					
4112					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_RL5_3					
1041	17	bit		**BIT_STATUS_RL6**	M	MainMenu → M → Expert → Bit → BIT_STATUS_RL6_1	R				
2065					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_RL6_2					
4113					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_RL6_3					
The bit shows the status of the reference signals *rL.1...rL.6* of modules GPC-M, GPC-E1, and GPC-E2, depending on the address used.											
Options: **OFF** = Signal off **ON** = Signal on											

3.19.5. Allocation of physical outputs

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1631	607	16 bit	06.04.01	**out.1**	Global	MainMenu → Global → Outputs → Out1...Out10 → out.1	R/W	■	Unsigned Short		1
1632	608	16 bit	06.04.02	**out.2**	Global	MainMenu → Global → Outputs → Out1...Out10 → out.2	R/W	■	Unsigned Short		2
1633	609	16 bit	06.04.03	**out.3**	Global	MainMenu → Global → Outputs → Out1...Out10 → out.3	R/W	■	Unsigned Short		3
1635	611	16 bit	06.04.04	**out.5**	Global	MainMenu → Global → Outputs → Out1...Out10 → out.5	R/W	■	Unsigned Short		5
1636	612	16 bit	06.04.05	**out.6**	Global	MainMenu → Global → Outputs → Out1...Out10 → out.6	R/W	■	Unsigned Short		6
1637	613	16 bit	06.04.06	**out.7**	Global	MainMenu → Global → Outputs → Out1...Out10 → out.7	R/W	■	Unsigned Short		7
1638	614	16 bit	06.04.07	**out.8**	Global	MainMenu → Global → Outputs → Out1...Out10 → out.8	R/W	■	Unsigned Short		9
1639	615	16 bit	06.04.08	**out.9**	Global	MainMenu → Global → Outputs → Out1...Out10 → out.9	R/W	■	Unsigned Short		31
1640	616	16 bit	06.04.09	**out.10**	Global	MainMenu → Global → Outputs → Out1...Out10 → out.10	R/W	■	Unsigned Short		31

The parameter sets the allocation of the *rL* signal to the physical output OUT1...OUT10, corresponding to the parameters *out.1...out.10*. Several *rL* signals can be allocated to the same physical output using the OR and AND logical operators. The allocation is identified by an index.
out.2 is only available with GPC-E1 present. In the three-phase configuration the status of the physical output OUT1 is copied.
out.3 is only available with GPC-E2 present. In the three-phase configuration the status of the physical output OUT1 is copied.

Options:

Index	Allocation
0	Output disabled
1	Output *rL.1* GPC-M
2	Output *rL.1* GPC-E1
3	Output *rL.1* GPC-E2
5	Output *rL.2* GPC-M
6	Output *rL.2* GPC-E1
7	Output *rL.2* GPC-E2
9	Output *rL.3* OR *rL.5* GPC-M
10	Output *rL.3* OR *rL.5* GPC-E1
11	Output *rL.3* OR *rL.5* GPC-E2
13	Output *rL.4* AND *rL.6* GPC-M
14	Output *rL.4* AND *rL.6* GPC-E1
15	Output *rL.4* AND *rL.6* GPC-E2
17	Output (*rL.3* OR *rL.5*) GPC-M...GPC-E2
18	Output (*rL.4* AND *rL.6*) GPC-M...GPC-E2
31	Custom output (for out.9 and out.10 only)

Increasing the +32 index inverts the output status for relay or static/Triac type outputs.

3.19.6. Alarm status masks for custom output 9

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1934	910	16 bit		**OCM.9_1**	Global	MainMenu → Global → Expert → Output Custom → OCM.9_1	R/W	■	Unsigned Short		4095
1935	911	16 bit		**OCM.9_2**	Global	MainMenu → Global → Expert → Output Custom → OCM.9_2	R/W	■	Unsigned Short		4095
1936	912	16 bit		**OCM.9_3**	Global	MainMenu → Global → Expert → Output Custom → OCM.9_3	R/W	■	Unsigned Short		4095
1937	913	16 bit		**OCM.9_4**	Global	MainMenu → Global → Expert → Output Custom → OCM.9_4	R/W	■	Unsigned Short		4088
1938	914	16 bit		**OCM.9_5**	Global	MainMenu → Global → Expert → Output Custom → OCM.9_5	R/W	■	Unsigned Short		4088
1939	915	16 bit		**OCM.9_6**	Global	MainMenu → Global → Expert → Output Custom → OCM.9_6	R/W	■	Unsigned Short		4088
1940	916	16 bit		**OCM.9_7**	Global	MainMenu → Global → Expert → Output Custom → OCM.9_7	R/W	■	Unsigned Short		26195
1941	917	16 bit		**OCM.9_8**	Global	MainMenu → Global → Expert → Output Custom → OCM.9_8	R/W	■	Unsigned Short		26195
1942	918	16 bit		**OCM.9_9**	Global	MainMenu → Global → Expert → Output Custom → OCM.9_9	R/W	■	Unsigned Short		26195
1943	919	16 bit		**OCM.9_10**	Global	MainMenu → Global → Expert → Output Custom → OCM.9_10	R/W	■	Unsigned Short		943
The parameters set the alarm status masks ALSTATE_IRQ, STATUS3, STATUS4, and VOLTAGE_STATUS for custom output OUT9. *min...max:* **0**...**65535**											

3.19.7. Alarm status masks for custom output 10

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1944	920	16 bit		**OCM.10_1**	Global	MainMenu → Global → Expert → Output Custom → OCM.10_1	R/W	■	Unsigned Short		4095
1945	921	16 bit		**OCM.10_2**	Global	MainMenu → Global → Expert → Output Custom → OCM.10_2	R/W	■	Unsigned Short		4095
1946	922	16 bit		**OCM.10_3**	Global	MainMenu → Global → Expert → Output Custom → OCM.10_3	R/W	■	Unsigned Short		4095
1947	923	16 bit		**OCM.10_4**	Global	MainMenu → Global → Expert → Output Custom → OCM.10_4	R/W	■	Unsigned Short		4088
1948	924	16 bit		**OCM.10_5**	Global	MainMenu → Global → Expert → Output Custom → OCM.10_5	R/W	■	Unsigned Short		4088
1949	925	16 bit		**OCM.10_6**	Global	MainMenu → Global → Expert → Output Custom → OCM.10_6	R/W	■	Unsigned Short		4088
1950	926	16 bit		**OCM.10_7**	Global	MainMenu → Global → Expert → Output Custom → OCM.10_7	R/W	■	Unsigned Short		26195
1951	927	16 bit		**OCM.10_8**	Global	MainMenu → Global → Expert → Output Custom → OCM.10_8	R/W	■	Unsigned Short		26195
1952	928	16 bit		**OCM.10_9**	Global	MainMenu → Global → Expert → Output Custom → OCM.10_9	R/W	■	Unsigned Short		26195
1953	929	16 bit		**OCM.10_10**	Global	MainMenu → Global → Expert → Output Custom → OCM.10_10	R/W	■	Unsigned Short		943
The parameters set the alarm status masks STATUS3, STATUS4, ALSTATE_IRQ and VOLTAGE_STATUS for custom output OUT10. *min...max:* **0**...**65535**											

3.19.8. Status reset to last activation of custom OUT9

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1134	110	bit		**BIT_ RESET_ OUT9_ CUSTOM**	Global	MainMenu → Global → Expert → Bit → BIT_RESET_OUT9_CUSTOM	R/W				
The bit resets the status to the last activation of custom output 9. *Options:* **OFF** = No action **ON** = Resets the status to the last activation of custom OUT9											

3.19.9. Status reset to last activation of custom OUT10

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1135	111	bit		**BIT_ RESET_ OUT10_ CUSTOM**	Global	MainMenu → Global → Expert → Bit → BIT_RESET_OUT10_CUSTOM	R/W				
The bit resets the status to the last activation of custom output 10. *Options:* **OFF** = No action **ON** = Resets the status to the last activation of custom OUT10											

3.19.10. Physical output status

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1106	82	bit		**BIT_ STATUS_ OUT1**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_OUT1	R				
1107	83	bit		**BIT_ STATUS_ OUT2**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_OUT2	R				
1108	84	bit		**BIT_ STATUS_ OUT3**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_OUT3	R				
1110	86	bit		**BIT_ STATUS_ OUT5**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_OUT5	R				
1111	87	bit		**BIT_ STATUS_ OUT6**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_OUT6	R				
1112	88	bit		**BIT_ STATUS_ OUT7**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_OUT7	R				
1113	89	bit		**BIT_ STATUS_ OUT8**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_OUT8	R				
1114	90	bit		**BIT_ STATUS_ OUT9**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_OUT9	R				
1115	91	bit		**BIT_ STATUS_ OUT10**	Global	MainMenu → Global → Expert → Bit → BIT_STATUS_OUT10	R				
The bits show the status of the physical outputs. *Options:* **OFF** = Output off **ON** = Output on											

3.19.11. rL.x (MASKOUT_OUT) status

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1688	664	16 bit	01.01.10	**MASK_OUT**	Global	MainMenu → Global → Status → MASK_OUT	R		Unsigned Short		

The parameter bits show the status of the physical outputs.

Options:

bit	Physical output
0	Status OUT1
1	Status OUT2
2	Status OUT3
4	Status OUT5
5	Status OUT6
6	Status OUT7
7	Status OUT8
8	Status OUT9
9	Status OUT10

NOTE: Out 4 does not exist.

3.19.12. Alarm status stored at last activation for custom output

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1321	297	16 bit		**STATUS3_FOR_OUT09**	M	MainMenu → Global → Expert → Output Custom → STATUS3_FOR_OUT09_1	R		Unsigned Short		
2345					E1	MainMenu → Global → Expert → Output Custom → STATUS3_FOR_OUT09_2					
4393					E2	MainMenu → Global → Expert → Output Custom → STATUS3_FOR_OUT09_3					
1322	298	16 bit		**STATUS3_FOR_OUT10**	M	MainMenu → Global → Expert → Output Custom → STATUS3_FOR_OUT10_1	R		Unsigned Short		
2346					E1	MainMenu → Global → Expert → Output Custom → STATUS3_FOR_OUT10_2					
4394					E2	MainMenu → Global → Expert → Output Custom → STATUS3_FOR_OUT10_3					

The parameter shows the STATUS3 status stored at the last activation of custom outputs OUT9 and OUT10.

3.19.13. STATUS4 stored with custom output activation

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1323	299	16 bit		**STATUS4_FOR_OUT09**	M	MainMenu → Global → Expert → Output Custom → STATUS4_FOR_OUT09_1	R		Unsigned Short		
2347					E1	MainMenu → Global → Expert → Output Custom → STATUS4_FOR_OUT09_2					
4395					E2	MainMenu → Global → Expert → Output Custom → STATUS4_FOR_OUT09_3					
1324	300	16 bit		**STATUS4_FOR_OUT10**	M	MainMenu → Global → Expert → Output Custom → STATUS4_FOR_OUT10_1	R		Unsigned Short		
2348					E1	MainMenu → Global → Expert → Output Custom → STATUS4_FOR_OUT10_2					
4396					E2	MainMenu → Global → Expert → Output Custom → STATUS4_FOR_OUT10_3					
The parameter shows the STATUS4 status stored at the last activation of custom outputs OUT9 and OUT10.											

3.19.14. ALSTATE_IRQ stored with custom output activation

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1356	332	16 bit		**ALSTATE_IRQ_FOR_OUT09**	M	MainMenu → Global → Expert → Output Custom → ALSTATE_IRQ_FOR_OUT09_1	R		Unsigned Short		
2380					E1	MainMenu → Global → Expert → Output Custom → ALSTATE_IRQ_FOR_OUT09_2					
4428					E2	MainMenu → Global → Expert → Output Custom → ALSTATE_IRQ_FOR_OUT09_3					
1357	333	16 bit		**ALSTATE_IRQ_FOR_OUT10**	M	MainMenu → Global → Expert → Output Custom → ALSTATE_IRQ_FOR_OUT10_1	R		Unsigned Short		
2381					E1	MainMenu → Global → Expert → Output Custom → ALSTATE_IRQ_FOR_OUT10_2					
4429					E2	MainMenu → Global → Expert → Output Custom → ALSTATE_IRQ_FOR_OUT10_3					
The parameter shows the ALSTATE_IRQ status stored at the last activation of custom outputs OUT9 and OUT10.											

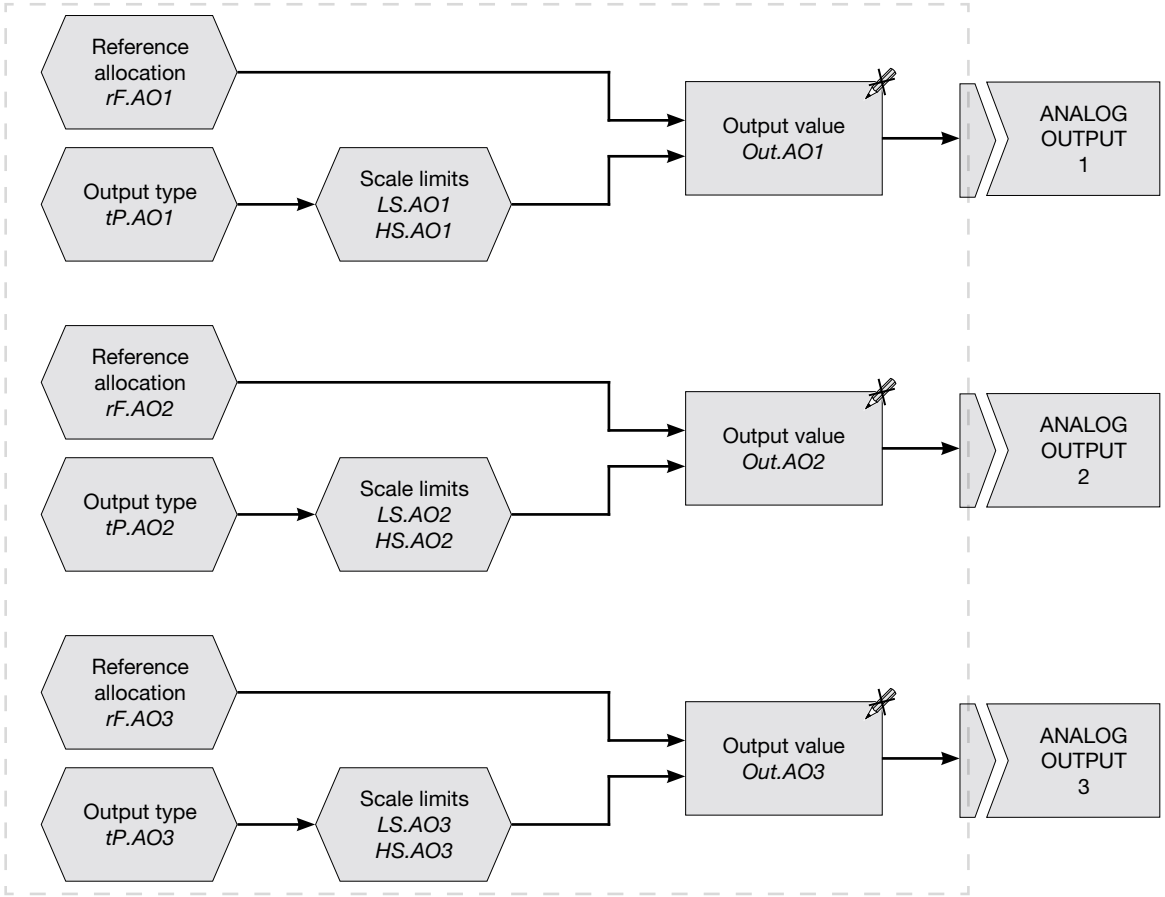
3.19.15. VOLTAGE_STATUS stored with custom output activation

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1325	301	16 bit		**VOLTAGE_STATUS_FOR_OUT09**	Global	MainMenu → Global → Expert → Output Custom → VOLTAGE_STATUS_FOR_OUT09	R		Unsigned Short		
1326	302	16 bit		**VOLTAGE_STATUS_FOR_OUT10**	Global	MainMenu → Global → Expert → Output Custom → VOLTAGE_STATUS_FOR_OUT10	R		Unsigned Short		
The parameter shows the VOLTAGE_STATUS stored at the last activation of custom outputs OUT9 and OUT10.											

3.20. Analog outputs

The Advanced Power Controller has 3 optional analog outputs that allow the value of analog quantities to be retransmitted.
The engineering value of the quantity is limited to the set scale values and reparameterisation is applied according to the selected output type.

Functional diagram of analog outputs



3.20.1. Types of analog output

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1889	865	16 bit	06.05.01	**tP.AO1**	Global	MainMenu → Global → Outputs → Analog output1 → tP.A01	R/W	■	Unsigned Short		1
1890	866	16 bit	06.06.01	**tP.AO2**	Global	MainMenu → Global → Outputs → Analog output2 → tP.A02	R/W	■	Unsigned Short		1
1891	867	16 bit	06.07.01	**tP.AO3**	Global	MainMenu → Global → Outputs → Analog output3 → tP.A03	R/W	■	Unsigned Short		1

The parameter sets the type of analog outputs 1, 2 and 3, depending on the address used. Allocation is identified by an index.

Options:

Index	Types of analog output
0	Current output 0...20 mA
1	Current output 4...20 mA
2	Voltage output 0...10 V
3	Voltage output 2...10 V

Increasing the index by +16 inverts the output status.

Examples:
Setting value 17 (= 1 + 16) ensures that the minimum output (4 mA) is at the maximum value of the set reference and the maximum output (20 mA) is at the minimum value of the set reference.

3.20.2. Analog output reference allocation

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1892	868	16 bit	06.05.02	**rF.A01**	Global	MainMenu → Global → Outputs → Analog output1 → rF.A01	R/W	■	Unsigned Short		0
1893	869	16 bit	06.06.02	**rF.A02**	Global	MainMenu → Global → Outputs → Analog output2 → rF.A02	R/W	■	Unsigned Short		0
1894	870	16 bit	06.07.02	**rF.A03**	Global	MainMenu → Global → Outputs → Analog output3 → rF.A03	R/W	■	Unsigned Short		0

The parameter sets the type of reference signal for analog outputs 1, 2 and 3, depending on the address used.
Each type of signal has a unit of measurement and a scale with minimum and maximum permissible limits. The limits used are specified with the parameters *LS.AO*x and *HS.AO*x.
Allocation is identified by an index.

Options:

Index	Type of reference signal	Scale limits		Unit of measurement
		Min	*Max*	
0	None	-	-	-
1	*Ou.P* (control output) of GPC-M	0.0	100.0	%
2	*Ou.P* (control output) of GPC-E1	0.0	100.0	%
3	*Ou.P* (control output) of GPC-E2	0.0	100.0	%
4	*In.A1* (analog input 1)	0.0	100.0	%
5	*In.A2* (analog input 2)	0.0	100.0	%
6	*In.A3* (analog input 3)	0.0	100.0	%
7	In.PWM1 (PWM input 1)	0.0	100.0	%
8	In.PWM2 (PWM input 2)	0.0	100.0	%
9	In.PWM3 (PWM input 3)	0.0	100.0	%
10	*I.VF* (line voltage) of GPC-M	0.0	6553.5	V
11	*I.VF* (line voltage) of GPC-E1	0.0	6553.5	V
12	*I.VF* (line voltage) of GPC-E2	0.0	6553.5	V
13	*Ld.V* (load voltage) of GPC-M	0.0	6553.5	V
14	*Ld.V* (load voltage) of GPC-E1	0.0	6553.5	V
15	*Ld.V* (load voltage) of GPC-E2	0.0	6553.5	V
16	*Ld.V.t* (voltage on three-phase load)	0.0	6553.5	V
17	*Ld.A* (current in load) of GPC-M	0.0	6553.5	A
18	*Ld.A* (current in load) of GPC-E1	0.0	6553.5	A
19	*Ld.A* (current in load) of GPC-E2	0.0	6553.5	A
20	*Ld.A.t* (current on three-phase load)	0.0	6553.5	A
21	*Ld.P* (power on load) of GPC-M	0.0	6553.5	kW
22	*Ld.P* (power on load) of GPC-E1	0.0	6553.5	kW
23	*Ld.P* (power on load) of GPC-E2	0.0	6553.5	kW
24	*Ld.P.t* (power on three-phase load)	0.0	6553.5	kW
25	Serial line value	0.0	6553.5	-

3.20.3. Lower analog output scale limit

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1895	871	16 bit	06.05.03	**LS.A01**	Global	MainMenu → Global → Outputs → Analog output1 → LS.AO1	R/W	■	Float (####.#)	s.p.	0.0
1896	872	16 bit	06.06.03	**LS.A02**	Global	MainMenu → Global → Outputs → Analog output2 → LS.AO2	R/W	■	Float (####.#	s.p.	0.0
1897	873	16 bit	06.07.03	**LS.A03**	Global	MainMenu → Global → Outputs → Analog output3 → LS.AO3	R/W	■	Float (####.#	s.p.	0.0

The parameter sets the lower scale limit of analog outputs 1, 2 and 3, depending on the address used. The type of limit and the unit of measurement are determined by the reference selected with parameter *rF.AO1*, *rF.AO2* or *rF.AO3*.

min...max: **0.0**...**6553.5**

3.20.4. Upper analog output scale limit

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1898	874	16 bit	06.05.04	**HS.A01**	Global	MainMenu → Global → Outputs → Analog output1 → HS.AO1	R/W	■	Float (####.#	s.p.	100.0
1899	875	16 bit	06.06.04	**HS.A02**	Global	MainMenu → Global → Outputs → Analog output2 → HS.AO2	R/W	■	Float (####.#	s.p.	100.0
1900	876	16 bit	06.06.07	**HS.A03**	Global	MainMenu → Global → Outputs → Analog output3 → HS.AO3	R/W	■	Float (####.#	s.p.	100.0

The parameter sets the upper scale limit of analog outputs 1, 2 and 3, depending on the address used. The type of limit and the unit of measurement are determined by the reference selected with parameter *rF.AO1*, *rF.AO2* or *rF.AO3*.
The range of permissible values is limited at the lower end by the setting of parameter *LS.AO1*, *LS.AO2* or *LS.AO3*, depending on the address chosen.

min...max: ***LS.AO1***...**6553.5** (analog output 1)
LS.AO2...**6553.5** (analog output 2)
LS.AO3...**6553.5** (analog output 3)

3.20.5. Serial line value for analog output

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1751	727	16 bit	10.01.23	**SERIAL_ OUTA1**	Global	MainMenu → Global → Expert → Virtual → SERIAL_OUTA1	R/W		Float (####.#	s.p.	0.0
1752	728	16 bit	10.01.24	**SERIAL_ OUTA2**	Global	MainMenu → Global → Expert → Virtual → SERIAL_OUTA2	R/W		Float (####.#	s.p.	0.0
1753	729	16 bit	10.01.25	**SERIAL_ OUTA3**	Global	MainMenu → Global → Expert → Virtual → SERIAL_OUTA3	R/W		Float (####.#	s.p.	0.0

The parameter sets the serial line value for analog outputs 1, 2 and 3, depending on the address used. The limits for analog outputs 1, 2 and 3 are defined by parameters *LS.AO1* and *HS.AO1*, *LS.AO1* and *HS.AO1* and *LS.AO1* and *HS.AO1* respectively.

min...max: ***LS.AO1...HS.AO1*** (analog output 1)
LS.AO2...HS.AO2 (analog output 2)
LS.AO3...HS.AO3 (analog output 3)

3.20.6. Analog output value

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1901	877	16 bit	01.01.11	**Out.A01**	Global	MainMenu → Global → Status → OUT.A01	R		Float (####.#	%	
1902	878	16 bit	01.01.12	**Out.A02**	Global	MainMenu → Global → Status → OUT.A02	R		Float (####.#	%	
1903	879	16 bit	01.01.13	**Out.A03**	Global	MainMenu → Global → Status → OUT.A03	R		Float (####.#	%	
The parameter shows the percentage value of analog outputs 1, 2 and 3, depending on the address used.											

3.21. Controls - general description

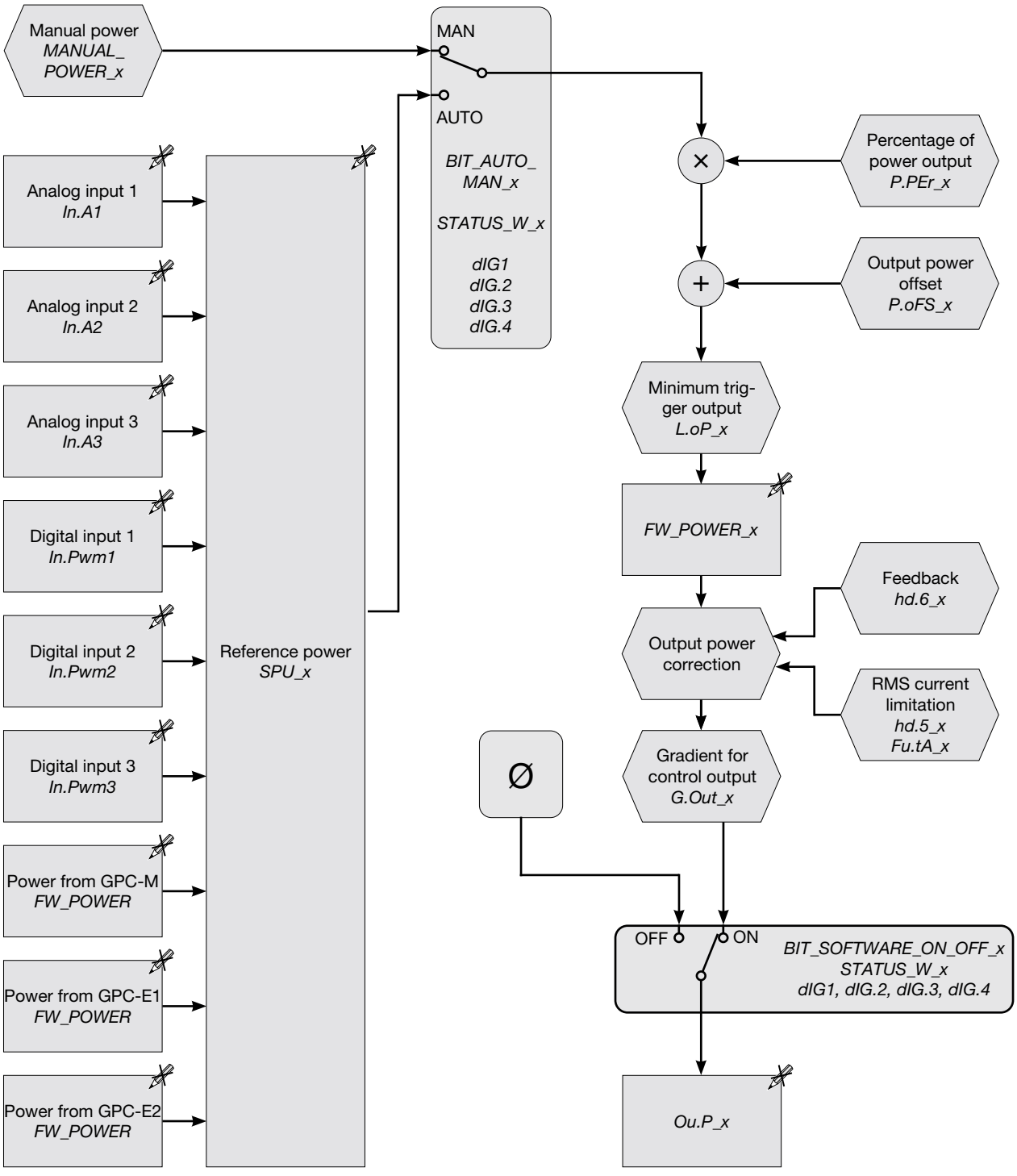
The Advanced Power Controller allows control of power output in automatic (AUTO) or manual (MAN) mode. In manual mode, the control output is set to a constant value that can be modified via serial communication.
When switching from MAN to AUTO, the setting of the output gradient(G.Out_x) will move the Power Controller from the current MAN setting to the new Reference Power (SPU_x) setting.

When switching from AUTO to MAN it is possible to see a sudden output change in power.

In manual mode, the power output can be automatically corrected in relation to the reference mains voltage (*riF*). *The%* value of the correction (*Cor*) is freely adjustable and acts in an inversely proportional manner, i.e., if the reference voltage increases, the power output decreases, and vice versa.

The following functional diagram shows the parameter processing sequence in power output management.

Functional diagram of controls



with x = 1...3

3.21.1. Reference power

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1641	617	16 bit	07.02.02	**SPU**	M	MainMenu → M → Controls → SPU_1	R/W	■	Unsigned Short		0
2665			07.03.02		E1	MainMenu → E1 → Controls → SPU_2					12
4713			07.04.02		E2	MainMenu → E2 → Controls → SPU_3					13

The parameter sets the reference power for output power control. Allocation is identified by an index.

Options:

Index	Selection
0	Power from analog input 1 (*In.A1*)
7	Power from digital input 1 (*In.Pwm1*)
9	Power from GPC-M (*FW_POWER*). With “slave” module operation: • The reference power of a “slave” module in automatic operation is the power of a “master” module in automatic or manual operation. • The reference power of a “slave” module in manual operation is the manual power of the module. • Software shutdown remains independent for each module.
10	Power from GPC-E1 (*FW_POWER*). For “slave” operation, the same indications as in index 9 apply.
11	Power from GPC-E2 (*FW_POWER*) For “slave” operation, the same indications as in index 9 apply.
12	Power from analog input 2 (*In.A2*)
13	Power from analog input 3 (*In.A3*)
14	Power from digital input 2 (*In.Pwm2*)
15	Power from digital input 3 (*In.Pwm3*)

3.21.2. Output power value

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1026	2	16 bit	01.02.01	**Ou.P**	M	MainMenu → M → Status → Ou.P_1	R		Float (####.#)	%	
2050			01.03.01		E1	MainMenu → E1 → Status → Ou.P_2					
4096			01.04.01		E2	MainMenu → E2 → Status → Ou.P_3					

The parameter shows the value of the control output.
The parameter can also be written in manual mode (address 252).

3.21.3. Output power value without correction

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1746	722	16 bit	01.02.22	**FW_ POWER**	M	MainMenu → M → Status → FW_POWER_1	R		Float (####.#)	%	
2770			01.03.22		E1	MainMenu → E1 → Status → FW_POWER_2					
4818			01.04.22		E2	MainMenu → E2 → Status → FW_POWER_3					

The parameter shows the power value before correction for feedback and RMS current limitation.

3.21.4. Power output percentage

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1789	765	16 bit	07.02.03	**P.PEr**	M	MainMenu → M → Controls → P.PEr_1	R/W	■	Float (####.#)	%	100.0
2813			07.03.03		E1	MainMenu → E1 → Controls → P.PEr_2					
4861			01.04.03		E2	MainMenu → E2 → Controls → P.PEr_3					
The parameter sets the percentage of the output power. *min...max:* **0.0**...**100.0**											

3.21.5. Output power offset

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1790	766	16 bit	07.02.04	**P.oFS**	M	MainMenu → M → Controls → P.oFS_1	R/W	■	Float (####.#)	%	0.0
2814			07.03.04		E1	MainMenu → E1 → Controls → P.oFS_2					
4862			01.04.04		E2	MainMenu → E2 → Controls → P.oFS_3					
The parameter sets the offset percentage of the output power. *min...max:* **-100.0**...**100.0**											

3.21.6. Control output gradient

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1787	763	16 bit	07.02.05	**G.Out**	M	MainMenu → M → Controls → G.Out_1	R/W	■	Float (####.#)	%/s	0.0
2811			07.03.05		E1	MainMenu → E1 → Controls → G.Out_2					
4859			01.04.05		E2	MainMenu → E2 → Controls → G.Out_3					
The parameter sets the gradient for the control output, i.e., how quickly the final value is reached. The gradient is defined as a percentage increment per second in relation to the final value to be achieved. Set the parameter to 0 to disable the gradient. *min...max:* **0.0**...**200.0** **Example:** By setting the gradient to 50%/s the *Ou.P* output is not implemented instantaneously but gradually. If the power goes from 0% to 100%, actuation occurs in a linear ramp of 2 seconds duration.											

3.21.7. Minimum trigger output

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1788	764	16 bit	07.02.06	**Lo.P**	M	MainMenu → M → Controls → Lo.P_1	R/W	■	Float (####.#)	%	0.0
2812			07.03.06		E1	MainMenu → E1 → Controls → Lo.P_2					
4860			01.04.06		E2	MainMenu → E2 → Controls → Lo.P_3					
The parameter sets the minimum output for triggering as a percentage of the maximum achievable value. *min...max:* **0.0**...**50.0**											

3.22. Automatic - manual control

The digital input function can be used to put the Advanced Power Controller in MAN (manual) status and set the control output to a constant value, which can be changed via serial communication.

When returning to AUTO (automatic) status, the transition from manual mode will be based upon the reference power (SPU_x) and the control output gradient (G.out).

In addition to the parameters shown below, the following parameters should also be considered for automatic - manual control:

- digital input function *dIG.1* / *dIG.2* / *dIG.3* / *dIG.4* (see paragraph “3.12.4. Digital input function”);
- value of the control output *Ou.P* (see paragraph “3.21.2. Output power value”).

3.22.1. Manual power

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1276	252	16 bit	07.02.01	**MANUAL_POWER**	M	MainMenu → M → Controls → MANUAL_POWER_1	R/W	■	Float (####.#)	%	0.0
2300			07.03.01		E1	MainMenu → E1 → Controls → MANUAL_POWER_2					
4348			01.04.01		E2	MainMenu → E2 → Controls → MANUAL_POWER_3					
The parameter sets the percentage of manual power. *min...max:* **-100.0**...**100.0**											

3.22.2. Automatic - manual selection

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1025	1	bit	12.01.01	**BIT_AUTO_MAN**	M	MainMenu → M → Expert → Bit → BIT_AUTO_MAN_1	R/W	■	Unsigned Short		OFF
2049			12.02.01		E1	MainMenu → E1 → Expert → Bit → BIT_AUTO_MAN_2					
4097			12.03.01		E2	MainMenu → E2 → Expert → Bit → BIT_AUTO_MAN_3					
The bit sets the automatic/manual operation of the Advanced Power Controller. *Options:* **OFF** = Automatic **ON** = Manual											

3.22.3. Status (STATUS_W)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1329	305	16 bit	07.02.14	**STA-TUS_W**	M	MainMenu → M → Controls → STATUS_W_1	R/W	■	Unsigned Short		0
2353			07.03.14		E1	MainMenu → E1 → Controls → STATUS_W_2					
4401			01.04.14		E2	MainMenu → E2 → Controls → STATUS_W_3					

The parameter sets the Automatic/Manual and Software startup/shutdown operating status of the controller with bits.

Options:

bit	Status setting
3	ON/OFF selection
4	AUTO/MAN selection

3.23. Manual power correction

In manual operation, the power output can be corrected automatically in relation to the reference mains voltage (*riF*). *The*% correction value (*Cor*) is freely adjustable and acts in an inversely proportional manner, i.e., if the reference voltage increases, the power output decreases, and vice versa. The function is switched on and off via the *SP.r* parameter.

In addition to the parameters explained below, the STATUS_W parameter should also be considered in manual power correction (see paragraph “3.22.3. Status (STATUS_W)”.
When moving from AUTO to MAN mode, sudden output changes are possible.

3.23.1. Mains voltage

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1529	505	16 bit	07.02.07	**riF**	M	MainMenu → M → Controls → riF_1	R/W	■	Float (####.#)	V	0.0
2553			07.03.07		E1	MainMenu → M → Controls → riF_2					
4601			01.04.07		E2	MainMenu → M → Controls → riF_3					

The parameter sets the reference mains voltage, i.e., the voltage value against which the actual voltage is compared in order to keep the output power constant.

min...max: **0.0**...**999.9**

3.23.2. Manual power correction

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1530	506	16 bit	07.02.08	**Cor**	M	MainMenu → M → Controls → Cor_1	R/W	■	Float (####.#)	%	0.0
2554			07.03.08		E1	MainMenu → E1 → Controls → Cor_2					
4602			01.04.08		E2	MainMenu → E2 → Controls → Cor_3					

The parameter sets the manual power correction depending on the mains voltage.
The maximum manual power correction is limited to ± 65%.

min...max: **0.0**...**100.0**

3.23.3. Enabling manual power correction and storage

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1042	18	16 bit	07.01.01	**SP.r**	Global	MainMenu → Global → Controls → SP.r	R/W	■	Unsigned Short		0

The parameter enables manual power correction and storage.

Options: **0** = No function
8 = Manual power correction based on mains voltage
32 = Disabling of local manual power storage (the last stored value is retrieved when switching off)

3.24. Start modes

3.24.1. Start mode at Power-On

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1723	699	16 bit	07.02.09	**P.Ont**	M	MainMenu → M → Controls → P.Ont_1	R/W	■	Unsigned Short		0
2747			07.03.09		E1	MainMenu → E1 → Controls → P.Ont_2					
4795			01.04.09		E2	MainMenu → E2 → Controls → P.Ont_3					

This parameter sets the mode in which the Advanced Power Controller starts up when power is supplied.
The mode is identified by an index.

Options:

Index	Start modes
0	Operation of the controller resumes with the same modalities as the last state prior to shutdown. Digital input states always take priority over other states.
1	Software shutdown.
2	Software startup.

3.25. Software shutdown

The Advanced Power Controller can also be switched off by a software command.
When the software shutdown function is activated:

- The digital input is only enabled if it is associated with the software shutdown function.
- Outputs are forced to OFF at shutdown. The exception is the reference signals *rL.4* and *rL.6*, which are forced to ON.
- HB alarms are reset.
- The generic alarms AL1...AL8 can be enabled or disabled via the parameter *oFF.t*.

In addition to the parameters shown below, the following parameters should also be considered for software shutdown:

- digital input function *dIG.1* / *dIG.2* / *dIG.3* / *dIG.4* (see paragraph “3.12.4. Digital input function”);
- status (STATUS_W) (see paragraph “3.22.3. Status (STATUS_W)”);
- digital input status *dIG.1* / *dIG.2* / *dIG.3* / *dIG.4* (see paragraph “3.12.2. Digital input status”).

3.25.1. Software startup/shutdown

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1035	11	bit	12.01.02	**BIT_ SOFTWARE_ ON_OFF**	M	MainMenu → M → Expert → Bit → IT_SOFTWARE_ON_OFF_1	R/W	■			OFF
2059			12.02.02		E1	MainMenu → E1 → Expert → Bit → IT_SOFTWARE_ON_OFF_2					
4107			12.03.02		E2	MainMenu → E2 → Expert → Bit → IT_SOFTWARE_ON_OFF_3					
The bit sets the software startup and shutdown. *Options:* **OFF** = Software on **ON** = Software off											

3.25.2. Software shutdown modes

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1724	700	16 bit		**OFF.t**	Global	MainMenu → Global → Controls → OFF.t	R/W	■	Unsigned Short		0

The parameter sets the software shutdown mode.

Options:

Index	Description
0	Outputs *rL.1 - rL.2 - rL.3 - rL.5* = OFF Outputs *rL.4 - rL.6* = ON Generic alarms *AL1...AL8* disabled
1	Outputs *rL.1 - rL.2 - rL.3 - rL.5* = OFF Outputs *rL.4 - rL.6* = ON Generic alarms *AL1...AL8* enabled

3.26. Other functions

3.26.1. Operating hour meter

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1420	396	32 bit	01.02.13	**OH.c**	M	MainMenu → M → Status → OH.c_1	R	■	Unsigned Int	h	
2444			01.03.13		E1	MainMenu → E1 → Status → OH.c_2					
4492			01.04.13		E2	MainMenu → E2 → Status → OH.c_3					
The parameter shows the number of operating hours of the Advanced Power Controller. The controller is in operation when line voltage is present and the power is non-zero. The update in the non-volatile memory takes place every two hours and when the line voltage is switched off.											

3.26.2. Enabling retentive memory storage

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1925	901	16 bit	07.01.02	**EEP.E**	Global	MainMenu → Global → Comms → EEP.E	R/W	■	Unsigned Short		0
The parameter sets how the parameters are saved in the retentive memory. With 0 (retentive memory enabled), when the device is first powered “on”, the device will utilize the last saved parameters for startup (saved in retentive memory). Any parameters changed while retentive memory is disabled will not be saved when device is shutdown (power off). In any case, the parameters relating to the energy count, operating hour meter and maximum temperatures are always stored in retentive memory. Options: **0** = Retentive memory enabled **1** = Retentive memory disabled											

3.27. Power control modes

The Advanced Power Controller modulates the power delivery with two modes:

- by changing the phase angle (PA mode);
- by changing the number of operating cycles with zero crossing triggering (ZC, BF, and HSC modes). This is commonly referred to a Pulse Train Mode.

PA
An acronym for *Phase Angle*, this type of operation manages the power on the load by modulating the phase angle (power-on).

ZC
An acronym for *Zero Crossing*, this type of operation reduces EMC emissions. The load power is managed via a series of conduction (ON) cycles and non-conduction (OFF) cycles. The cycle time (one ON and one OFF phase) is constant and can be set from 1 to 200 seconds, or from 0.1 to 20.0 seconds for a fast cycle.
The cycle time can be set with two resolutions (seconds or tenths of a second) depending on the type of function allocated to outputs *rL1* and *rL2*.

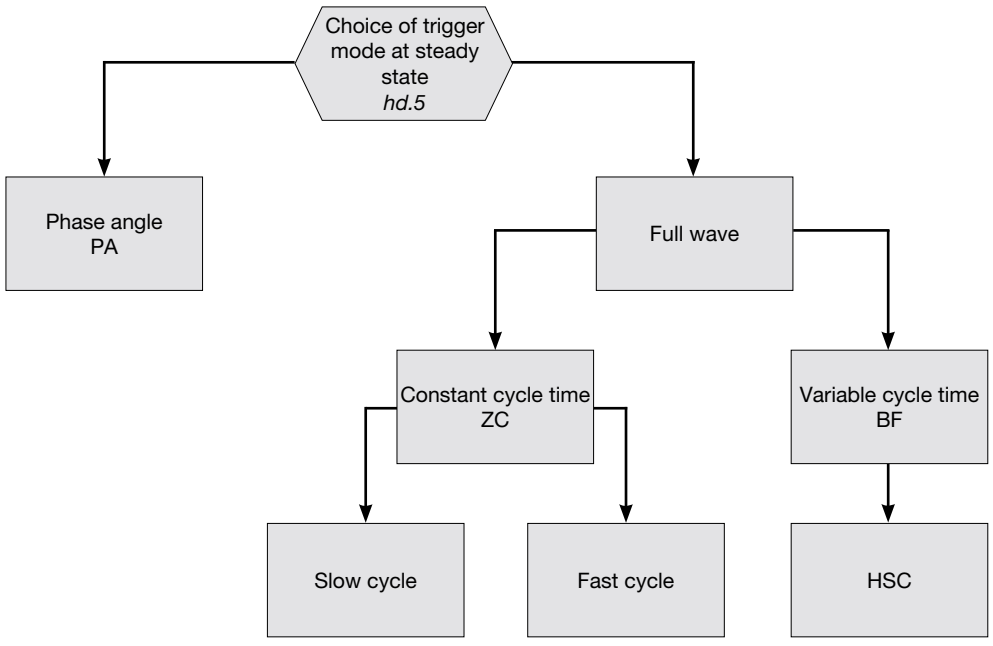
BF
An acronym for *Burst Firing*, this operating mode manages load power through a series of conduction (ON) cycles and non-conduction (OFF) cycles. The ratio of the number of ON cycles to the number of OFF cycles is proportional to the value of the power to be supplied to the load. The repetition period or cycle time is kept as short as possible for each power value.
The parameter *bF.Cy* defines the minimum number of conduction cycles, which can be set from 1 to 10.
In the case of a three-phase load (star without neutral or closed delta), a value of *bF.Cy* >= 5 must be set to ensure correct operation (current balance in the 3 loads).

HSC
An acronym for *Half Single Cycle*, this type of operation corresponds to BF operation comprising half on/off cycles. It is useful for reducing *flicker* with short-wave infrared loads. It is applied only to single-phase or three-phase loads with neutral or open delta.

The power delivery mode is set with parameter *hd.5*.
In each power delivery mode, the maximum RMS current control can be enabled with the *hd.5* parameter. The maximum RMS current value is set with the parameter *Fu.tA*.

The following functional diagram shows the different power control modes.

Functional diagram of power control modes



3.27.1. Enabling trigger modes

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1727	703	16 bit	09.01.01	**hd.5**	M	MainMenu → M → Power controls → hd.5_1	R/W	■	Unsigned Short		see table
2751			09.02.01		E1	MainMenu → E1 → Power controls → hd.5_2					
4799			09.03.01		E2	MainMenu → E2 → Power controls → hd.5_3					

This parameter shows and sets the power delivery mode. The mode is identified by an index.
The default values of the trigger mode depend on the setting of DIP switch 5:

DIP switch 5 position	Default	Description
OFF(resistive load)	141 (= 13 + 128)	HSC trigger mode at steady state, softstart ramp for infrared lamps, peak current control in softstart load
ON (inductive load)	32 (= 0 + 32)	ZC/BF trigger mode at steady state, delay triggering enabled

Options:

Trigger mode					
Index	**Softstart ramp**	**Trigger mode in steady state**	**BF mode**	**Peak current control in softstart load**	**RMS current control in steady state load**
0	NO	ZC/BF	-	NO	NO
1	YES	ZC/BF	-	NO	NO
2	NO	PA	-	NO	NO
3	YES	PA	-	NO	NO
4	NO	ZC/BF	HSC	NO	NO
5	YES	ZC/BF	HSC	NO	NO
6	NO	PA	-	NO	NO
7	YES	PA	-	NO	NO
8	NO	ZC/BF	-	YES	NO
9	YES	ZC/BF	-	YES	NO
10	NO	PA	-	YES	NO
11	YES	PA	-	YES	NO
12	NO	ZC/BF	HSC	YES	NO
13	YES	ZC/BF	HSC	YES	NO
14	NO	PA	-	YES	NO
15	YES	PA	-	YES	NO

Trigger mode					
Index	**Softstart ramp**	**Trigger mode in steady state**	**BF mode**	**Peak current control in softstart load**	**RMS current control in steady state load**
16	NO	ZC/BF	-	NO	YES
17	YES	ZC/BF	-	NO	YES
18	NO	PA	-	NO	YES
19	YES	PA	-	NO	YES
20	NO	ZC/BF	HSC	NO	YES
21	YES	ZC/BF	HSC	NO	YES
22	NO	PA	-	NO	YES
23	YES	PA	-	NO	YES
24	NO	ZC/BF	-	YES	YES
25	YES	ZC/BF	-	YES	YES
26	NO	PA	-	YES	YES
27	YES	PA	-	YES	YES
28	NO	ZC/BF	HSC	YES	YES
29	YES	ZC/BF	HSC	YES	YES
30	NO	PA	-	YES	YES
31	YES	PA	-	YES	YES

Increasing the index by a fixed amount results in the following behaviours:
Index +32 = Enable delay triggering (only for ZC/BF modes).
Index +64 = Linear phase softstart in power.
Index +128 = Phase softstart for infrared lamps.
Index +256 = Softstart of shutdown phase in software ON/OFF switching.

3.27.2. Maximum RMS current limit in steady state

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1731	707	16 bit	09.01.02	**Fu.tA**	M	MainMenu → M → Power controls → Fu.tA_1	R/W	■	Float (####.#)	A	see table
2755			09.02.02		E1	MainMenu → E1 → Power controls → Fu.tA_2					
4803			09.03.02		E2	MainMenu → E2 → Power controls → Fu.tA_3					

The parameter sets the maximum limit of the RMS current at steady state.
The default value depends on the size of the controller:

Size GPC-M, GPC-E1, GPC-E2	**Default**
40 A	40.0
60 A	60.0
100 A	100.0
150 A	150.0
200 A	200.0
250 A	250.0
300 A	300.0
400 A	400.0
500 A	500.0
600 A	600.0

With a three-phase load, a different Fu.tA parameter value can be set *for* each module. This allows, for example, control of an unbalanced three-phase load.

min...max: **0.0**...**3275.0**

3.27.3. Minimum number of cycles of BF mode

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1728	704	16 bit	09.01.03	**Bf.Cy**	M	MainMenu → M → Power controls → Bf.Cy_1	R/W	■	Unsigned Short		see table
2752			09.02.03		E1	MainMenu → E1 → Power controls → Bf.Cy_2					
4800			09.03.03		E2	MainMenu → E2 → Power controls → Bf.Cy_3					

The parameter sets the minimum number of BF mode cycles.
The default value of the parameter depends on the setting of DIP switch 5:

DIP switch 5 position	**Default**
OFF (resistive load)	1
ON (inductive load)	5

min...max: **1**...**10**

3.28. Softstart

Softstart allows a gradual increase in power output. It can be enabled in either phase control or zero crossing modes (or pulse train modes) and acts by controlling the conduction angle.
Softstart is enabled via parameter *hd.5*.

The softstart ramp starts from a zero conduction angle and reaches the angle set in parameter *PS.HI* within the time period set in parameter *PS.tm* (0.1 to 60.0 seconds).
A linear softstart in power can be configured with parameter *hd.5* (+64), i.e., starting from zero, the power value corresponding to the maximum conduction angle set in *PS.HI* is reached starting from zero.

The softstart ends before the defined time if the power reaches the corresponding required value set in manual control.

During the ramp phase, control of the maximum peak current can be enabled via the *hd.5* parameter; the peak value can be set in parameter *PS.tA*.
This function is useful in the event of a short circuit on the load or of loads with high temperature coefficients in order to automatically adapt the start-up time to the load.
The softstart ramp is activated at the first startup after the Power-On and after a software restart. It can be reactivated by a software command by writing bit 108, or automatically if there are OFF conditions for a time longer than that set in *PS.oF* (if =0 the function is as if it were disabled).

The switch-off ramp can also be enabled via parameter *hd.5* (+256). In this case, zero power is achieved within the set time.

3.28.1. Maximum phase of the phase softstart ramp

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1654	630	16 bit	09.01.04	**PS.Hi**	M	MainMenu → M → Power controls → PS.Hi_1	R/W	■	Float	%	100.0
2755			09.02.04		E1	MainMenu → E1 → Power controls → PS.Hi_2					
4803			09.03.04		E2	MainMenu → E2 → Power controls → PS.Hi_3					
The parameter sets the maximum phase of the phase softstart ramp. *min...max:* **0.0**...**100.0**											

3.28.2. Phase softstart ramp duration

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1729	705	16 bit	09.01.05	**PS.tm**	M	MainMenu → M → Power controls → PS.tm_1	R/W	■	Float	sec.	10.0
2753			09.02.05		E1	MainMenu → E1 → Power controls → PS.tm_2					
4801			09.03.05		E2	MainMenu → E2 → Power controls → PS.tm_3					
The parameter sets the duration of the phase softstart ramp. *min...max:* **0.1**...**60.0**											

3.28.3. Minimum non-conduction time for ramp reactivation

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1653	629	16 bit	09.01.06	**PS.oF**	M	MainMenu → M → Power controls → PS.oF_1	R/W	■	Unsigned Short	sec.	2
2677			09.02.06		E1	MainMenu → E1 → Power controls → PS.oF_2					
4725			09.03.06		E2	MainMenu → E2 → Power controls → PS.oF_3					

The parameter sets the minimum non-conduction time to reactivate the phase softstart ramp.

min...max: **0**...**999**

3.28.4. Maximum peak current limit during ramp

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1730	706	16 bit	09.01.06	**PS.tA**	M	MainMenu → M → Power controls → PS.tA_1	R/W	■	Float (####.#)	Apk	see table
2754			09.02.06		E1	MainMenu → E1 → Power controls → PS.tA_2					
4802			09.03.06		E2	MainMenu → E2 → Power controls → PS.tA_3					

The parameter sets the maximum peak current limit during the phase softstart ramp.
The default value depends on the size of the controller:

Size GPC-M, GPC-E1, GPC-E2	**Default**
40 A	110.0
60 A	170.0
100 A	280.0
150 A	420.0
200 A	560.0
250 A	700.0
300 A	840.0
400 A	1130.0
500 A	1410.0
600 A	1690.0

With a three-phase load, a different PS.tA parameter value can be set *for* each module. This allows, for example, control of an unbalanced three-phase load.

min...max: **0.0**...**3275.0**

3.28.5. Phase softstart ramp restart

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1132	108	bit		**BIT_ SOFTS-TART_RE-START**	M	MainMenu → M → Expert → Bit → BIT_SOFTSTART_RESTART_1	R/W				OFF
2156					E1	MainMenu → E1 → Expert → Bit → BIT_SOFTSTART_RESTART_2					
4204					E2	MainMenu → E2 → Expert → Bit → BIT_SOFTSTART_RESTART_3					
The bit sets enablement of phase softstart ramp restart. *Options:* **OFF** = No function **ON** = Restart enabled											

3.28.6. Phase softstart ramp status

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1130	106	bit	M	**BIT_ STATUS_ SOFTS-TART**	M	MainMenu → M → Expert → Bit → BIT_STATUS_SOFTSTART_1	R				
2154			E1		E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_SOFTSTART_2					
4202			E2		E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_SOFTSTART_3					
The bit shows the status of the phase softstart ramp. *Options:* **OFF** = Ramp not active **ON** = Ramp active											

3.28.7. Phase softstart ramp completion status

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1131	107	bit		**BIT_ STATUS_ SOFT-START_ END**	M	MainMenu → M → Expert → Bit → BIT_STATUS_SOFTSTART_END_1	R				
2155					E1	MainMenu → E1 → Expert → Bit → BIT_STATUS_SOFTSTART_END_2					
4203					E2	MainMenu → E2 → Expert → Bit → BIT_STATUS_SOFTSTART_END_3					
The bit shows the completion status of the phase softstart ramp. *Options:* **OFF** = Ramp not ended **ON** = Ramp ended											

3.29. Delay Triggering

Delay Triggering is a function that inserts a trigger delay on the first cycle with inductive loads in start modes ZC and BF. The startup delay is expressed in degrees and can be set in the *dL.t* parameter.

3.29.1. Delay triggering

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1732	708	16 bit	09.01.08	**dL.t**	M	MainMenu → M → Power controls → dL.t_1	R/W	■	Unsigned Short	degrees	see table
2756			09.02.08		E1	MainMenu → E1 → Power controls → dL.t_2					
4804			09.03.08		E2	MainMenu → E2 → Power controls → dL.t_3					

The parameter sets the trigger delay, expressed in sexagesimal degrees (base 60), on the first cycle. The default value of the parameter depends on the configuration:

Type of load	Default		
	GPC-M	GPC-E1	GPC-E2
Three-phase star load without neutral or closed delta, with DIP switch 5 = ON (inductive load)	40	40	90
All other types of load	60	60	60

min...max: **0**...**90**

3.29.2. Delay triggering with rotation of phases 1-3-2

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1796	772	16 bit	09.01.09	**dL.tr**	M	MainMenu → M → Power controls → dL.tr_1	R/W	■	Unsigned Short	degrees	see table
2820			09.02.09		E1	MainMenu → E1 → Power controls → dL.tr_2					
4868			09.03.09		E2	MainMenu → E2 → Power controls → dL.tr_3					

The parameter sets the trigger delay, expressed in sexagesimal degrees, with rotation of phases 1-3-2. The default value of the parameter depends on the configuration:

Type of load	Default		
	GPC-M	GPC-E1	GPC-E2
Three-phase star load without neutral or closed delta, with DIP switch 5 = ON (inductive load)	90	90	40
All other types of load	60	60	60

min...max: **0**...**90**

3.30. Automatic Firing Change function

The dynamic Firing Change feature allows you to switch between phase angle (PA) and full wave (ZC/BF/HSC) firing modes in four different configurations:

1. Automatically, by comparing the RMS current on the load and the threshold (*Fu.tA - FC.tA*).
2. Automatically, by comparing the RMS current on the load and the absolute threshold *FC.thr*.
3. On request from digital input.
4. On request from serial communication.

The switchover is always made by bringing the power to zero and restarting with the set ramp.

The RMS current condition is only evaluated in steady state.

The ZC/BF/HSC trigger mode is selected by forcing bit 1 of parameter *hd.5* to 0:

- with RMS current < (*Fu.tA - FC.tA*) and actuation power > FC.P;
- with RMS current < (*FC.thr - FC.tA*) and actuation power > *FC.P*;
- with open digital input setting (logic state 0);
- with writing from serial with bit at 0.

The PA trigger mode is selected by forcing bit 1 of parameter *hd.5* to 1:

- with RMS current >= (*Fu.tA - FC.tA/2*);
- with RMS current >= (*FC.thr*);
- with closed digital input setting (logical state 1);
- with writing from serial with bit at 1.

Other features:

- The parameter FC.tA is the hysteresis for automatic switching and is expressed as a percentage [0.0...100.0%] of:
  – *Fu.tA*;
  – *FC.thr*.
- In any case, the function of the RMS current control in steady state (*Fu.tA* parameter) remains unaffected (erosion of power output to limit current).
- In PA the RMS current is obtained as a full-wave projection based on the percentage of phase angle implemented.
- In ZC/BF/HSC the RMS current is *I.on*.
- In two-phase or three-phase configuration, the conditions on the RMS currents of the modules are in logical AND when switching from PA to ZC/BF/HSC and in logical OR when switching from ZC/BF/HSC to PA.

The following settings are recommended:

- *FC.P* = 5.0%
- *PS.tm* > 4.0 sec
- *G.Out* = 20.0%

3.30.1. Enabling Firing Change function

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1919	895	16 bit	09.04.01	**hd.7**	Global	MainMenu → Global → Special functions → hd.7	R/W	■	Unsigned Short		0

The parameter enables the Firing Change function. The mode is identified by an index.

Options:

Index	GPC-M enabled	GPC-E1 enabled	GPC-E2 enabled
0			
1	■		
2		■	
3	■	■	
4			■
5	■		■
6		■	■
7	■	■	■

Increasing the index by a fixed amount results in the following behaviours:
Index +8 = Enabling of Firing Change function from digital inputs.
Index +16 = Enabling of Firing Change function from serial communication.
Index +32 = GPC-E1 follows GPC-M (only applies if GPC-E1 is enabled).
Index +64 = GPC-E2 follows GPC-M (only applies if GPC-E2 is enabled).
Index +128 = GPC-E2 follows GPC-E1 (only applies if GPC-E2 is enabled).
Index +256 = Enabling of *FC.thr* as current threshold.

3.30.2. Current threshold for activating Firing Change

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1926	902	16 bit	09.04.02	**FC.thr**	M	MainMenu → M → Power controls → FC.thr_1	R/W	■	Float (####.#)	A	0.0
2950			09.05.01		E1	MainMenu → E1 → Power controls → FC.thr_2					
4998			09.06.01		E2	MainMenu → E2 → Power controls → FC.thr_3					
The parameter sets the current value required to activate the Firing Change (only with *hd.7* = +256). *min...max:* **0.0**...**3275.0**											

3.30.3. Current hysteresis for activating Firing Change

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1920	896	16 bit	09.04.03	**FC.tA**	M	MainMenu → M → Power controls → FC.tA_1	R/W	■	Float (####.#)	%	10.0
2944			09.05.02		E1	MainMenu → E1 → Power controls → FC.tA_2					
4992			09.06.02		E2	MainMenu → E2 → Power controls → FC.tA_3					
The parameter sets the current hysteresis value required to activate the Firing Change. It is expressed in % of the current threshold *Fu.tA* or *FC.thr* (only if enabled by setting *hd.7* = +256). *min...max:* **0.0**...**100.0**											

3.30.4. Minimum power for activating Firing Change

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1924	900	16 bit	09.04.04	**FC.P**	M	MainMenu → M → Power controls → FC.P_1	R/W	■	Float (####.#)	%	0.0
2948			09.05.03		E1	MainMenu → E1 → Power controls → FC.P_2					
4996			09.06.03		E2	MainMenu → E2 → Power controls → FC.P_3					
This parameter sets the minimum power value required to activate the Firing Change. *min...max:* **0.0**...**100.0**											

3.30.5. Firing Change status set via serial

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1921	897	16 bit		**SERIAL_FC**	M	MainMenu → M → Expert → Virtual → SERIAL_FC_1	R/W		Unsigned Short		0
2945					E1	MainMenu → M → Expert → Virtual → SERIAL_FC_2					
4993					E2	MainMenu → M → Expert → Virtual → SERIAL_FC_3					
The parameter sets the Firing Change mode set via serial. *Options:* **0** = ZC/BF/HSC mode **1** = PA mode											

3.30.6. Firing Change status set via serial

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1145	121	bit		**BIT_SERIAL_FC_PA_MODE**	M	MainMenu → M → Expert → Bit → BIT_SERIAL_FC_PA_MODE_1	R/W				OFF
2169					E1	MainMenu → E1 → Expert → Bit → BIT_SERIAL_FC_PA_MODE_2					
4217					E2	MainMenu → E2 → Expert → Bit → BIT_SERIAL_FC_PA_MODE_3					
The bit sets the Firing Change mode set via serial. *Options:* **OFF** = ZC/BF/HSC mode **ON** = PA mode											

3.31. Feedback mode

The Advanced Power Controller offers the following possibilities to control power through *feedback*:

- V Voltage;
- V^2 Quadratic voltage;
- I Current;
- I^2 Quadratic current;
- P Power.

Enabling of the control mode is set via parameter *hd.6*.

Voltage feedback (V)
This is used to maintain a constant load voltage. Compensates for possible variations in line voltage from the nominal voltage (value stored in the parameter *riF.V*, expressed in Vrms).
The voltage value maintained on the load is equal to the result of the formula

$$rif.V \times (Ou.P\ [\%] / 100)$$

and is contained in the Modbus 757 register.

Quadratic voltage feedback (V^2)
This is used to maintain a constant load voltage. It compensates possible variations in line voltage from the rated voltage (value stored in the parameter *riF.V*, expressed in Vrms).
The voltage value maintained on the load is equal to the result of the formula

$$rif.V \times \sqrt{Ou.P\ [\%] / 100)}$$

and is contained in the Modbus 757 register.

Current feedback (I)
This is used to maintain a constant load current. It compensates possible variations in line voltage and/or load impedance with respect to the rated current (value stored in the *riF.I* parameter, expressed in Arms).
The current value maintained on the load is equal to the result of the formula

$$rif.I \times (Ou.P\ [\%] / 100)$$

and is contained in the Modbus 757 register.

Quadratic current feedback (I^2)
This is used to maintain a constant load current. It compensates possible variations in line voltage and/or load impedance with respect to the rated current (value stored in the *riF.I* parameter, expressed in Arms).
The current value maintained on the load is equal to the result of the formula

$$rif.I \times \sqrt{Ou.P\ [\%] / 100)}$$

and is contained in the Modbus 757 register.

Power feedback (P)
This is used to keep the load power constant. It compensates possible variations in line voltage and/or load impedance with respect to the rated power (value stored in *riF.P*, expressed in kWatts).
The power value maintained on the load is equal to the result of the formula

$$rif.P \times (Ou.P\ [\%] / 100)$$

and is contained in the Modbus 757 register.

IMPORTANT!
The feedback calibration can be activated by digital input (parameters *dIG.1, dIG.2, dIG.3, diG.4*) or by serial command (ref. *bit 113*).

If required, calibration MUST only be activated after first setting parameter *hd.6* = 0 and preferably under conditions of maximum power on the load (e.g., *Ou.P* [%] at 100%).
Only after calibration has been carried out can the parameter *hd.6* be set to the desired value.

If the operating mode is changed (PA, ZC, BF, HSC), the feedback calibration procedure outlined above must be repeated.

The voltage V feedback (or current I feedback or power P feedback) corrects the % conduction with a maximum value that can be set in the parameter *Cor.V* (or *Cor.I* or *Cor.P*).

For non-linear loads (e.g., Super Kanthal or Silicon Carbide) the automatic calibration procedure is NOT NECESSARY, but the value of parameters *ref.V*, *ref.I* and *ref.P* must be set directly based on the nominal load specification given in the data-sheet (see GPC Installation Guide Document).

Note: Feedback mode can not be changed while the unit is in operation. Software must be off to make the change.

3.31.1. Enabling feedback mode

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1732	708	16 bit	09.01.10	**hd.6**	M	MainMenu → M → Power controls → hd.6_1	R/W	■	Unsigned Short		0
2756			09.02.10		E1	MainMenu → E1 → Power controls → hd.6_2					
4804			09.03.10		E2	MainMenu → E2 → Power controls → hd.6_3					

The parameter sets enabling of the feedback mode. The enabled mode is identified by an index.

Options:

Index	Feedback mode
0	No feedback enabled
1	V^2 (quadratic voltage feedback)
2	I^2 (quadratic current feedback)
3	P (power feedback)
4	No feedback enabled
5	V (linear voltage feedback)
6	I (linear current feedback)

3.31.2. Maximum voltage feedback correction

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1755	731	16 bit	09.01.11	**Cor.V**	M	MainMenu → M → Power controls → Cor.V_1	R/W	■	Float (####.#)	%	100.0
2779			09.02.11		E1	MainMenu → E1 → Power controls → Cor.V_2					
4827			09.03.11		E2	MainMenu → E2 → Power controls → Cor.V_3					

The parameter sets the maximum correction of the voltage feedback. It serves to limit the correction.

min...max: **0.0**...**100.0**

3.31.3. Maximum current feedback correction

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1756	732	16 bit	09.01.12	**Cor.I**	M	MainMenu → M → Power controls → Cor.I_1	R/W	■	Float (####.#)	%	100.0
2780			09.02.12		E1	MainMenu → M → Power controls → Cor.I_2					
4828			09.03.12		E2	MainMenu → M → Power controls → Cor.I_3					

The parameter sets the maximum correction of the current feedback. It serves to limit the correction.

min...max: **0.0**...**100.0**

3.31.4. Maximum power feedback correction

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1757	733	16 bit	09.01.12	**Cor.P**	M	MainMenu → M → Power controls → Cor.P_1	R/W	■	Float (####.#)	%	100.0
2781			09.02.12		E1	MainMenu → E1 → Power controls → Cor.P_2					
4829			09.03.12		E2	MainMenu → E2 → Power controls → Cor.P_3					
The parameter sets the maximum correction of power feedback. It serves to limit the correction. *min...max:* **0.0**...**100.0**											

3.31.5. Voltage feedback reference

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1758	734	16 bit	09.01.14	**riF.V**	M	MainMenu → M → Power controls → riF.V_1	R/W	■	Float (####.#)	V	0.0
2782			09.02.14		E1	MainMenu → E1 → Power controls → riF.V_2					
4830			09.03.14		E2	MainMenu → E2 → Power controls → riF.V_3					
The parameter sets the voltage feedback reference, i.e., the rated voltage. *min...max:* **0.0**...**999.9**											

3.31.6. Current feedback reference

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1758	734	16 bit	09.01.15	**riF.I**	M	MainMenu → M → Power controls → riF.I_1	R/W	■	Float (####.#)	A	0.0
2782			09.02.15		E1	MainMenu → E1 → Power controls → riF.I_2					
4830			09.03.15		E2	MainMenu → E2 → Power controls → riF.I_3					
The parameter sets the current feedback reference, i.e., the rated current. *min...max:* **0.0**...**3275.0**											

3.31.7. Power feedback reference

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1908	884	32 bit	09.01.16	**riF.P**	M	MainMenu → M → Power controls → riF.P_1	R/W	■	Float32 (####.#)	kW	00:00
2932			09.02.16		E1	MainMenu → E1 → Power controls → riF.P_2					
4980			09.03.16		E2	MainMenu → E2 → Power controls → riF.P_3					
The parameter sets the power feedback reference, i.e., the rated power. The LSW data in Word format (16 bits) is available at address 736 (1760 - 2784 - 4832). *min...max:* **0.00**...**1500.00**											

3.31.8. Feedback response speed

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1765	741	16 bit	09.01.17	**Fb.It**	M	MainMenu → M → Power controls → Fb.It_1	R/W	■	Float (####.#)	% / 60 ms	0.3
2813			09.02.17		E1	MainMenu → E1 → Power controls → Fb.It_2					
4837			09.03.17		E2	MainMenu → E2 → Power controls → Fb.It_3					
The parameter sets the feedback response speed. The speed is expressed as a percentage change in output power calculated every 60 ms. *min...max:* **0.1**...**5.0**											

3.31.9. Feedback reference calibration

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1137	113	bit	12.01.06	**BIT_ CALIB_ FEED-BACK**	M	MainMenu → M → Expert → Bit → BIT_CALIB_FEEDBACK_1	R/W				OFF
2161			12.02.06		E1	MainMenu → E1 → Expert → Bit → BIT_CALIB_FEEDBACK_2					
4227			12.03.06		E2	MainMenu → E2 → Expert → Bit → BIT_CALIB_FEEDBACK_3					
The bit enables and disables calibration of the feedback reference. *Options:* **OFF** = No function **ON** = Calibration enabled											

3.31.10. Feedback reference

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1910	886	32 bit		**AriF**	M	MainMenu → M → Expert → Status → AriF_1	R		Float32 (see table)	see table	see table
2934					E1	MainMenu → E1 → Expert → Status → AriF_1					
4982					E2	MainMenu → E2 → Expert → Status → AriF_1					

The parameter shows the feedback reference. The data is in DWord format (32 bit).
The LSW data in Word format (16 bit) is available at address 757 (1781 - 2805 - 4853).
The default value is the threshold of V, I, P to be maintained on the load.

	Type of feedback		
	Voltage	**Current**	**Power**
Unit of measurement	V	A	kW
Range	0.0...999.9	0.0...3275.0	0.00...1500.00
Format	(####.#)	(####.#)	(###.##)

3.32. Heuristic power control

Heuristic mode allows for the device to synchronize outputs within the device to maintain a more steady usage of power. Heuristic mode that is not enabled could result in all outputs being turned on(full conduction) at the same time, or conversely all off at the same time. With Heuristic mode the user will set a maximum current limit and the device will manage outputs based upon this maximum current.

Heuristic mode helps limit peak power demands within the device. While in heuristic mode the power control will determine the most appropriate output combinations to stay under maximum power applied to load.

This function only works with the GPC-3PH models that are controlling 3 single phase lines in on-off modulation (zero cross modes).

Gefran has products that has the ability to manage peak power demands across the entire plant floor. See Gefran model GSLM, Smart Load Management.

Refer to section “4.4.4. Heuristic power control” Examples and Application Notes for more information.

3.31.11. Enabling heuristic power control

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1704	680	16 bit	09.07.01	**hd.3**	Global	MainMenu → Global → Powers → hd.3	R/W	■	Unsigned Short		0

The parameter enables the heuristic power control of GPC-M, GPC-E1 and GPC-E2. Setting *hd.3* = 0 disables heuristic power control for all modules.
Enabling only applies to GPCs with OUT1...OUT3 outputs with slow cycle time (1...200 seconds).

Options:

Index	GPC-M enabled	GPC-E1 enabled	GPC-E2 enabled
0			
3	■	■	
5	■		■
6		■	■
7	■	■	■

3.31.12. Maximum current for heuristic power control

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1705	681	16 bit	09.07.02	**I.HEU**	Global	MainMenu → Global → Powers → I.HEU	R/W	■	Float (####.#)	A	0.0

The parameter sets the maximum current for heuristic power control.

min...max: **0.0**...**3275.0**

3.33. Heterogeneous power control

The Heterogenous power control function is like a programmable circuit breaker. It allows the user to set a maximum power to be used by the device in its entirety. If the maximum is reached then specific parts of the load are switched off (disconnected) according to a predefined priority.

GPC-M always has priority and is switched off last. If power control is enabled for several modules, the disconnection sequence starts with the module with the highest number (GPC-E2 before GPC-E1 and GPC-M, GPC-E1 before GPC-M).

3.33.1. Enabling heterogeneous power control

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1706	682	16 bit	09.08.01	**hd.4**	Global	MainMenu → Global → Powers → hd.4	R/W	■	Unsigned Short		0

The parameter enables heterogeneous power control of GPC-M, GPC-E1 and GPC-E2. Setting *hd.4* = 0 disables heterogeneous power control for all modules.

Options:

Index	GPC-M enabled	GPC-E1 enabled	GPC-E2 enabled
0			
1	■		
2		■	
3	■	■	
4			■
5	■		■
6		■	■
7	■	■	■

3.33.2. Maximum current for heterogeneous power control

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1707	683	16 bit	09.08.02	**I.HEt**	Global	MainMenu → Global → Powers → I.HEt	R/W	■	Float (####.#)	A	0.0

The parameter sets the maximum current for heterogeneous power control.

min...max: **0.0**...**3275.0**

3.34. Virtual instrument control

The virtual instrument allows the hardware resources of the device to be set up from the serial line, writing dedicated configuration parameters instead of using the normal controller processing flow.

Control of the virtual instrument is activated via the parameter *hd.1*.

By setting the *S.In* e *S.Ou* parameters, it is possible to enable the writing of certain variables from the serial line and impose the value of the inputs and the status of the outputs.

Alarm thresholds AL1... must be enabled. AL4 when write operations are continuous and there is no need to keep the last value in the EEPROM.

Enabling digital input D1 allows the status of this input to be set, for example to perform MAN/AUTO switching by writing bit 10 of the SERIAL_LED register.
Similarly, the ON/OFF state of outputs OUT1...OUT10 and LEDs can be set by writing bits in the SERIAL_IN_OUT register.

3.34.1. Enabling instrument control via serial

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1215	191	16 bit	10.01.01	**hd.1**	Global	MainMenu → Global → Controls → hd.1	R/W	■	Unsigned Short		0
The parameter enables control of the virtual instrument via serial. *Options:* **0** = Virtual instrument not enabled **2** = Virtual instrument enabled											

3.34.2. Input control from serial

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1248	224	16 bit	10.01.02	**S.In**	M	MainMenu → Global → Expert → Virtual → S.In_1	R/W	■	Unsigned Short		0
2272			10.01.03		E1	MainMenu → Global → Expert → Virtual → S.In_2					
4320			10.01.04		E2	MainMenu → Global → Expert → Virtual → S.In_3					

The parameter sets the control of inputs from serial. The table shows the correspondence between bits and inputs.

Inputs	In.A1	In.A2	In.A3	-	-	-	-	AL4	AL3	AL2	AL1
bit	10	9	8	7	6	5	4	3	2	1	0

NOTE: Inputs *In.A1*, *In.A2* and *In.A3* are only valid for GPC-M.

min...max: **0**...**2047**

3.34.3. Output control from serial

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1249	225	16 bit	10.01.05	**S.Ou**	Global	MainMenu → Global → Expert → Virtual → S.Ou	R/W	■	Unsigned Short		0

The parameter sets the control of outputs from serial. The table shows the correspondence between bits and outputs.

Outputs	OUT10	OUT9	OUT8	OUT7	OUT6	OUT5	OUT4	OUT3	OUT2	OUT1
bit	9	8	7	6	5	4	3	2	1	0

min...max: **0**...**1023**

3.34.4. LED and digital input control from serial

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1652	628	16 bit	10.01.06	**S.LI**	Global	MainMenu → Global → Expert → Virtual → S.LI	R/W	■	Unsigned Short		0

The parameter sets the control of the instrument's LEDs and digital inputs from serial. The table shows the correspondence between bits, digital inputs and LEDs.

	Input				**LED**							
	D4	**D3**	**D2**	**D1**	**BUT**	**O3**	**O2**	**O1**	**DI2**	**DI1**	**ER**	**RN**
bit	11	10	9	8	7	6	5	4	3	2	1	0

min...max: **0**...**4095**

3.34.5. Virtual register address table

Parameter	bit	Enabled resource	Single-node address	Multi node address	Format	Register name
S.In_1	0	Alarm threshold AL1 for GPC-M	1365	341	word	SERIAL_AL1_1
	1	Alarm threshold AL2 for GPC-M	1366	342	word	SERIAL_AL2_1
	2	Alarm threshold AL3 for GPC-M	1367	343	word	SERIAL_AL3_1
	3	Alarm threshold AL4 for GPC-M	1345	321	word	SERIAL_AL4_1
	8	Input In.A3	1709	685	word	SERIAL_ANALOG3
	9	Input In.A2	1737	713	word	SERIAL_ANALOG2
	10	Input In.A1	4605	581	word	SERIAL_ANALOG1
S.In_2	0	Alarm threshold AL1 for GPC-E1	2389	341	word	SERIAL_AL1_2
	1	Alarm threshold AL2 for GPC-E1	2390	342	word	SERIAL_AL2_2
	2	Alarm threshold AL3 for GPC-E1	2391	343	word	SERIAL_AL3_2
	3	Alarm threshold AL4 for GPC-E1	2369	321	word	SERIAL_AL4_2
S.In_3	0	Alarm threshold AL1 for GPC-E2	4437	341	word	SERIAL_AL1_3
	1	Alarm threshold AL2 for GPC-E2	4438	342	word	SERIAL_AL2_3
	2	Alarm threshold AL3 for GPC-E2	4439	343	word	SERIAL_AL3_3
	3	Alarm threshold AL4 for GPC-E2	4417	321	word	SERIAL_AL4_3
S.Ou	0	OUT 1 output	1368	344	word, bit 0	SERIAL_IN_OUT
	1	OUT 2 output	1368	344	word, bit 1	SERIAL_IN_OUT
	2	OUT 3 output	1368	344	word, bit 2	SERIAL_IN_OUT
	4	OUT 5 output (relay)	1368	344	word, bit 4	SERIAL_IN_OUT
	4	OUT 5 output (Analog A1)	1751	727	word	SERIAL_OUTA1
	5	OUT 6 output (relay)	1368	344	word, bit 5	SERIAL_IN_OUT
	5	OUT 6 output (Analog A2)	1752	728	word	SERIAL_OUTA2
	6	OUT 7 output (relay)	1368	344	word, bit 6	SERIAL_IN_OUT
	6	OUT 7 output (Analog A3)	1753	729	word	SERIAL_OUTA3
	7	OUT 8 output (relay)	1368	344	word, bit 7	SERIAL_IN_OUT
	8	OUT 9 output	1368	344	word, bit 8	SERIAL_IN_OUT
	9	OUT 10 output	1368	344	word, bit 9	SERIAL_IN_OUT
S.LI	0	LED RN	1375	351	word, bit 0	SERIAL_LED
	1	LED ER	1375	351	word, bit 1	SERIAL_LED
	2	LED D1	1375	351	word, bit 2	SERIAL_LED
	3	LED D2	1375	351	word, bit 3	SERIAL_LED
	4	LED O1	1375	351	word, bit 4	SERIAL_LED
	5	LED O2	1375	351	word, bit 5	SERIAL_LED
	6	LED O3	1375	351	word, bit 6	SERIAL_LED
	7	LED BUT	1375	351	word, bit 7	SERIAL_LED
	8	D1 input	1368	344	word, bit 10	SERIAL_LED
	9	D2 input	1368	344	word, bit 11	SERIAL_LED
	10	D3 input	1368	344	word, bit 12	SERIAL_LED
	11	D4 input	1368	344	word, bit 13	SERIAL_LED

3.35. HW and SW information

The hardware and software of the Advanced Power Controller can be identified and its functioning checked by accessing the information registers.

3.35.1. Software version code

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1146	122	16 bit	02.01	**UPd**	Global	MainMenu → Global → Info → UPd	R		Float (###.##)		
The register shows the software version (versione_major.versione_minor).											

3.35.2. Hardware configuration codes

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1214	190	16 bit	02.02	**C.Hd**	Global	MainMenu → Global → Info → C.Hd	R		Unsigned Short		

The register shows the output hardware configuration.

Options:

bit	Configuration
0	OUTPUT AUX absent
1	OUTPUT AUX relay
2	OUTPUT AUX logic
3	OUTPUT AUX triac 250 Vac 1 A
5	AUX OUTPUT analog 12bit 20mA/10V
14	EXTERNAL CT (for all models: 1PH / 2PH / 3PH)

3.35.3. Hardware configuration codes 1

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1532	508	16 bit	02.03	**C.Hd1**	Global	MainMenu → Global → Info → C.Hd1	R		Unsigned Short		

The register shows the hardware configuration of the controller's Fieldbuses.

Options:

bit	Configuration
2	-
3	FIELDBUS ETH4 (ProfiNet)
4	FIELDBUS ETH8
5	FIELDBUS ETH6
6	FIELDBUS absent
7	FIELDBUS Modbus
8	FIELDBUS Profibus
9	FIELDBUS CanOpen
10	FIELDBUS DeviceNet
11	FIELDBUS Ethernet
12	FIELDBUS Euromap66
13	FIELDBUS ETH3
14	FIELDBUS ETH7 (Ethercat)
15	FIELDBUS ETH1 (Ethernet IP)

3.35.4. Hardware configuration codes 2/3/4

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1567	543	16 bit	02.04	**C.Hd2**	Global	MainMenu → Global → Info → C.Hd2	R		Unsigned Short		
1216	162	16 bit	02.05	**C.Hd3**	Global	MainMenu → Global → Info → C.Hd3	R		Unsigned Short		
1217	193	16 bit	02.06	**C.Hd4**	Global	MainMenu → Global → Info → C.Hd4	R		Unsigned Short		

The register shows the hardware configuration (rating) of GPC-M, GPC-E1 and GPC-E2, according to the chosen address.

Options:

bit	Configuration
0	no power
1	40 A
2	60 A
3	100 A
4	150 A
5	200 A
6	250 A
7	300 A
8	400 A
9	500 A
10	600 A

3.35.5. Fieldbus board firmware version

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1717	693	16 bit	02.10	**UPd.F**	Global	MainMenu → Global → Info → UPd.F	R		Float (###.##)		
The log shows the firmware version of the Fieldbus board.											

3.35.6. Fieldbus board node

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1719	695	16 bit	02.11	**Cod.F**	Global	MainMenu → Global → Info → Cod.F	R		Unsigned Short		
The register shows the node number of the Fieldbus board.											

3.35.7. Fieldbus board baudrate

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1720	696	16 bit	02.12	**bAu.F**	Global	MainMenu → Global → Comms → bAu.F	R		Unsigned Short		

The register shows the transmission speed of the Fieldbus board, based on the Fieldbus type.

Options:

Profibus	
bAu.f	**baudrate**
0	12.00 Mbit/s
1	6.00 Mbit/s
2	3.00 Mbit/s
3	1.50 Mbit/s
4	500.00 kbit/s
5	187.50 kbit/s
6	93.75 kbit/s
7	45.45 kbit/s
8	19.20 kbit/s
9	9.60 kbit/s

CANopen	
bAu.f	**baudrate**
0	1000 kbit/s
1	800 kbit/s
2	500 kbit/s
3	250 kbit/s
4	125 kbit/s
5	100 kbit/s
6	50 kbit/s
7	20 kbit/s
8	10 kbit/s

Ethernet	
bAu.f	**baudrate**
0	100 Mbit/s
1	10 Mbit/s

3.35.8. I/O data size for Fieldbus

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1918	894	16 bit	03.01.05	**F.SIZE**	Global	MainMenu → Global → Comms → F.SIZE	R/W	■	Unsigned Short		0

This parameter sets the I/O data size for the Fieldbus.

Options: **0** = 12 WORD per input + 12 WORD per output
1 = 24 WORD per input + 24 WORD per output

3.35.9. Jumper / DIP switch status

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1370	346	16 bit	02.07	**JUMPER_STATUS**	Global	MainMenu → Global → Info → JUMPER_STATUS	R		Unsigned Short		0

The register shows the status of the jumpers / DIP switches. The status of the individual jumper / DIP switch can determine a specific configuration.
The combination of the status of jumpers / DIP switches S7-1, S7-2, S7-3 and S7-4 determines the operating mode.

Options:

Configuration			
bit	**Jumper / DIP switch**	**Status OFF**	**Status ON**
0	S1		
1	S2		
2	S7-1	*see table* **DIP switch status S7-1...S7-4**	
3	S7-2		
4	S7-3		
5	S7-4		
6	S7-5	Resistive load	Inductive load
7	S7-6		Default parameter configuration
8	S7-7	Single-node mode	Multi-node mode

DIP switch status S7-1...S7-4				
S7-1	**S7-2**	**S7-3**	**S7-4**	**Operating modes**
OFF	OFF	OFF	OFF	3 single-phase loads
OFF	ON	OFF	OFF	3 independent single-phase open delta loads
ON	ON	OFF	OFF	three-phase open delta/star load with neutral
ON	ON	ON	OFF	three-phase closed delta load
ON	OFF	OFF	ON	three-phase star load without neutral
ON	OFF	OFF	OFF	three-phase star load without neutral with TWO-PHASE control
ON	OFF	ON	OFF	three-phase closed delta load with TWO-PHASE control

3.35.10. Enabling virtual DIP switch control

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1797	773	16 bit	03.01.06	**J.Set**	Global	MainMenu → Global → Parameters → J.Set	R/W	■	Unsigned Short		0

The factory configuration has the hardware DIP switch control active (*J.Set* = 0). Setting parameter *J.Set* = 1 enables the control of virtual DIP switches via serial.

When virtual control is active, the configuration considered is not that described by the hardware DIP switches but that shown in the *J.SEr* parameter (for the writing of *J.SEr* refer to the table in paragraph “3.35.9. Jumper / DIP switch status”).
The S7 hardware DIP switches in positions 1-2-3-4-5-7 are no longer considered while the S7 hardware DIP switch in position 6 (forced CGF) if active (ON) has priority over the virtual DIP switches, returning the parameters *J.Set* and *J.Ser* to zero after a restart.

NOTE: Any change in the hardware DIP-Switches and *J.Set* and *J.Ser* parameters will only be active after a restart.

NOTE: As with control of hardware DIP-Switches, also for virtual control, following a change in the configuration, the parameter initialisation procedure must be performed after a configuration change by setting the virtual DIP-Switch position 6 (forced CGF) to ON and restarting the product.

Options: **0** = Hardware DIP switch priority
1 = Virtual DIP switch priority (from serial line)

3.35.11. Virtual DIP switch status

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1798	774	16 bit	03.01.07	**J.Ser**	Global	MainMenu → Global → Parameters → J.Ser	R/W	■	Unsigned Short		0
The parameter sets the configuration of the virtual DIP switches. For the values, see the jumper / DIP switch status tables in paragraph "3.35.9. Jumper / DIP switch status".											

3.35.12. Manufacturer identification

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1370	120	16 bit			Global		R		Unsigned Short		5000
The log shows the name of the manufacturer (Gefran).											

3.35.13. Product identification

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1371	121	16 bit		**deviceID**	Global	MainMenu → Global → Info → deviceID	R		Unsigned Short		218
The register shows the device identifier (GPC) within the Modbus communication network.											

3.35.14. LED operation

The status of the LEDs RN, ER, DI1, DI2, O1, O2, O3 and BUT refers to the status of the corresponding parameter, with the following exceptions:

LED behaviour	Description of signal
LED RN (green) on	Key function active
LED RN (green) and LED ER (red) flash quickly together	Autobaud in progress
LED ER (red) flashing	Temperature alarm (OVER_HEAT OR TEMPERATURE_SENSOR_BROKEN) *or* SHORT_CIRCUIT_CURRENT OR SSR_SAFETY OR HW_OVER_HEAT OR FUSE_OPEN alarm (only for single-phase configuration) *or* Interlock
LED ER (red) and LED Ox (yellow) both flashing	HB alarm or POWER_FAULT of module x
All LEDs flashing rapidly except LED DI1	Jumper configuration not provided (MODE_ERROR)
All LEDs flashing rapidly except LED DI2	30%_UNBALANCED_ERROR alarm (only for three-phase configuration)
All LEDs flashing rapidly except LED O1	SHORT_CIRCUIT_CURRENT alarm (only for three-phase configuration)
All LEDs flashing rapidly except LED O2	TRIPHASE_MISSING_LINE_ERROR alarm (only for three-phase configuration)
All LEDs flashing rapidly except LED O3	SSR_SAFETY OR HW_OVER_HEAT alarm (only for three-phase configuration)
All LEDs flashing rapidly, except for the BUT LED.	FUSE_OPEN alarm (only for three-phase configuration)

3.35.15. RN - ER - DI1 - DI2 LED function

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1221	197	16 bit	06.08.01	**Ld.St**	Global	MainMenu → Global → Leds → Ld.St	R/W	■	Unsigned Short		16
1643	619	16 bit	06.08.02	**Ld.2**	Global	MainMenu → Global → Leds → Ld.2	R/W	■	Unsigned Short		12
1644	620	16 bit	06.08.03	**Ld.3**	Global	MainMenu → Global → Leds → Ld.3	R/W	■	Unsigned Short		15
1645	621	16 bit	06.08.04	**Ld.4**	Global	MainMenu → Global → Leds → Ld.4	R/W	■	Unsigned Short		11

This parameter sets the function associated with the RN (*Ld.St*), ER (*Ld.2*), DI1 (*Ld.3*) and DI2 (*Ld.4*) LEDs, according to the address used. The function is identified by an index.

Options:

Index	Function associated with the LED
0	RUN
1	MAN/AUTO controller
6	INDIG1 digital input configuration
7	Serial dialogue 1
8	OUT 2 GPC-M status
11	INDIG2 digital input configuration
12	Error status
13	Serial dialogue 2
14	INDIG3 digital input configuration
15	INDIG4 digital input configuration

By increasing the index by +16 the LED flashes if active (except index 8).

3.35.16. O1 - O2 - O3 LED function

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1646	622	16 bit	06.08.05	**Ld.5**	Global	MainMenu → Global → Leds → Ld.5	R/W	■	Unsigned Short		1
1647	623	16 bit	06.08.06	**Ld.6**	Global	MainMenu → Global → Leds → Ld.6	R/W	■	Unsigned Short		2
1648	624	16 bit	06.08.07	**Ld.7**	Global	MainMenu → Global → Leds → Ld.7	R/W	■	Unsigned Short		3
1649	625	16 bit	06.08.08	**Ld.8**	Global	MainMenu → Global → Leds → Ld.8	R/W	■	Unsigned Short		4

This parameter sets the function associated with the O1 (*Ld.5*), O2 (*Ld.6*), O3 (*Ld.7*) and BUTTON (*Ld.8*) LEDs, according to the address used. The function is identified by an index.

Options:

Index	Function associated with the LED
0	Disabled
1	Repetition of status OUT 1
2	Repetition of status OUT 2
3	Repetition of status OUT 3
4	Key status
5	Repetition of status OUT 5
6	Repetition of status OUT 6
7	Repetition of status OUT 7
8	Repetition of status OUT 8
9	Repetition of status OUT 9
10	Repetition of status OUT 10
12	Serial dialogue 1
13	Serial dialogue 2
14	INDIG3 digital input configuration
15	INDIG4 digital input configuration

By increasing the index by +16, the LED flashes if active.

3.35.17. Status (STATUS_W)

For STATUS_W, see paragraph “3.22.3. Status (STATUS_W)”.

3.35.18. Alarm status reading

To read the status of ALSTATE_IRQ alarms, see paragraph “3.13.14. Alarm status (ALSTATE_IRQ)”.

3.35.19. Status (STATUS)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1491	467	16 bit	01.02.15	**STATUS**	M	MainMenu → M → Status → STATUS_1	R		Unsigned Short		
2515			01.03.15		E1	MainMenu → E1 → Status → STATUS_2					
4563			01.04.15		E2	MainMenu → E2 → Status → STATUS_3					

The parameter shows the status of the device. The individual statuses are highlighted by the corresponding bit.

Options:

bit	State of
0	*AL1* OR *AL2* OR *AL3* OR *AL4* or *AL.HB* (OR PHASES 1/2/3 with three-phase load) OR POWER_FAULT
5	*Ou.P* > 0
8	*AL1*
9	*AL2*
10	*AL3*
11	*AL4*
12	*AL.HB* OR POWER_FAULT
13	ON/OFF
14	AUTO/MAN

3.35.20. Status 1 (STATUS1)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1493	469	16 bit	01.02.16	**STATUS1**	M	MainMenu → M → Status → STATUS1_1	R		Unsigned Short		
2517			01.03.16		E1	MainMenu → E1 → Status → STATUS1_2					
4565			01.04.16		E2	MainMenu → E2 → Status → STATUS1_3					

The parameter shows the status of the device. The individual statuses are highlighted by the corresponding bit.

Options:

bit	State of
0	*AL1* OR *AL2* OR *AL3* OR *AL4* or *AL.HB* (OR PHASES 1/2/3 with three-phase load) OR POWER_FAULT
8	*AL1*
9	*AL2*
10	*AL3*
11	*AL4*
12	*AL.HB* PHASE 1 (with three-phase load)
13	*AL.HB* PHASE 2 (with three-phase load)
14	*AL.HB* PHASE 3 (with three-phase load)

3.35.21. Status 2 (STATUS2)

Address		Format	GPC-OP menu	Acronym	Global / M/E1/E2	GF_eXpress menu	Attribute	Retentive	Type	Unit of measurement	Default
Single-node	Multi-node										
Description											
1656	632	16 bit	01.02.17	**STATUS2**	M	MainMenu → M → Status → STATUS2_1	R		Unsigned Short		
2680			01.03.17		E1	MainMenu → E1 → Status → STATUS2_2					
4728			01.04.17		E2	MainMenu → E2 → Status → STATUS2_3					

The parameter shows the status of the device. The individual statuses are highlighted by the corresponding bit.

Options:

bit	State of
0	AL1
1	AL2
2	AL3
3	AL4
4	AL.HB PHASE 1 (with three-phase load)
5	AL.HB PHASE 2 (with three-phase load)
6	AL.HB PHASE 3 (with three-phase load)

3.35.22. Status 3 (STATUS3)

See paragraph “3.15.5. Status 3 (STATUS3)”.

3.35.23. Status 4 (STATUS4)

See paragraph “3.16.7. Status reading (STATUS4)”.

3.35.24. Voltage status (VOLTAGE_STATUS)

See paragraph “3.10.7. VOLTAGE_STATUS”.

3.36. Key functions

The Advanced Power Controller key allows the status of the device to be changed.
A pressing and holding the key changes the status; the length of time key is pressed determines the new status.

Release the key before switching to another status.

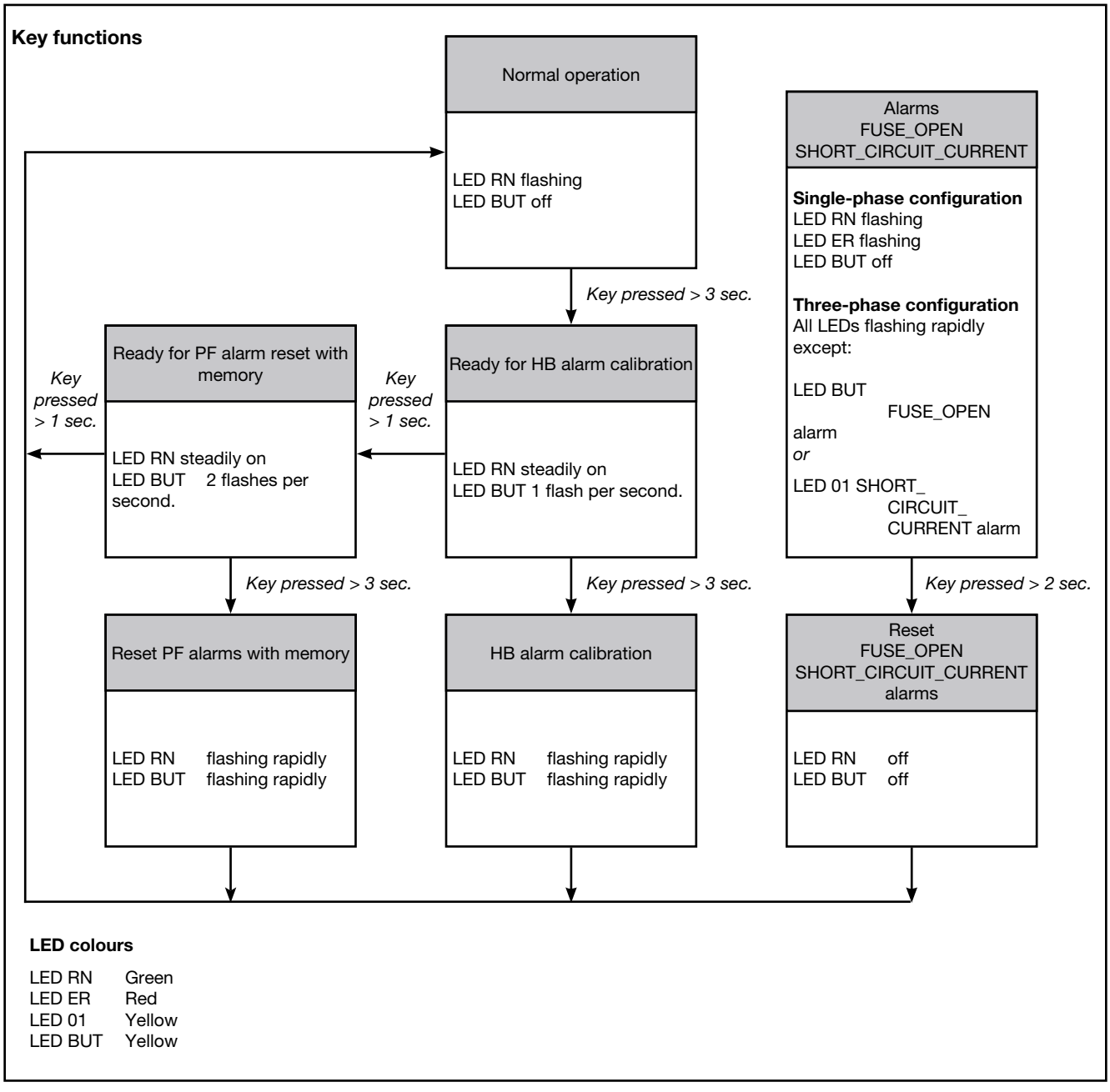
The arrival status is determined by the departure status.

When the key is pressed, the RN and BUT LEDs light up steadily and then go out after 2 or 3 seconds to indicate the change of status.

Example of key use
To activate the HB alarm calibration, start from normal operation (RN LED flashing, BUT LED off):

1. press and hold the key for at least 3 seconds, the LEDs will light up steadily;
2. release the key;
3. wait for the LEDs to go out;
4. press the key again for at least 3 seconds;
5. wait for the LEDs to go out;
6. the HB alarm calibration procedure starts (LEDs flash rapidly);
7. When the LEDs resume normal operation, the calibration procedure is complete.

The following diagram shows how to use the key.
Each box represents a status, which is identified in the grey area.

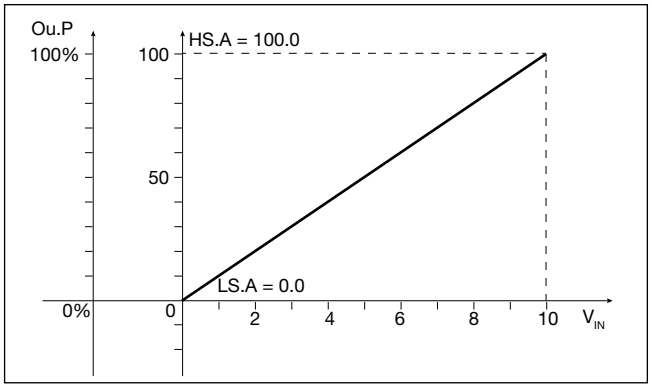


4. EXAMPLES AND APPLICATION NOTES

4.1. Setting parameters LS.A1/LS.A2/LS.A3 and HS.A1/HS.A2/HS.A3

The default values*(LS.A1*/*LS.A2*/*LS.A3* = 0.0 and *HS.A1*/*HS.A2*/*HS.A3* = 100.0) can be changed to obtain different assignments between the physical input value (V or mA) and the engineering value (*In.A1*/*In.A2*/*In.A3*).
In automatic operation the engineering value (*In.A1*/*In.A2*/*In.A3*) is allocated, for values between 0.0 and 100.0, to power *Ou.P*.

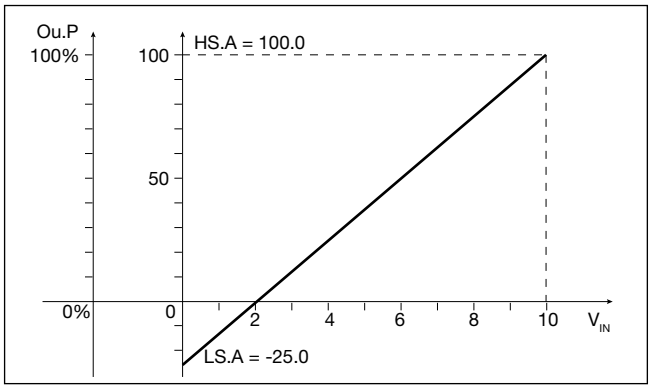
4.1.1. Full input voltage range



Initial data
V_{IN} = 0...10 V
tyP = 1

In this case the input voltage V_{IN} covers the entire range that the device can control. There is therefore no need to modify *LS.A* and *HS.A*, which can be left at their default values.

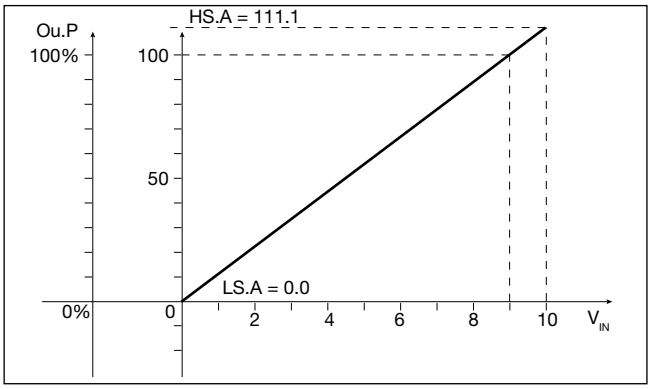
4.1.2. Input voltage range limited downwards



Initial data
V_{IN} = 2...10 V
tyP = 1

In this case, the V_{IN} input voltage only covers the upper 80% of the range that the device can control. This range should therefore be extended downwards so that 80% of the modified range corresponds to the useful range (0...100). 80% of 125 corresponds to 100.
Setting *LS.A* = -25.0 and *HS.A* = 100.0 gives the desired result.

4.1.3. Input voltage range limited upwards



Initial data
V_{IN} = 0...9 V
tyP = 1

In this case the V_{IN} input voltage only covers the lower 90% of the range that the device can control. This range should therefore be extended upwards so that 90% of the modified range corresponds to the useful range (0...100). 90% of 111.1 corresponds to 100.
Setting *LS.A* = 0.0 and *HS.A* = 111.1 gives the desired result.

4.1.4. Formulas for calculating LS.Ax and HS.Ax

Given the following definitions:

- min_d = lower limit of the range controllable by the input device
- max_d = upper limit of the range controllable by the input device
- min_{in} = real lower limit of the input signal
- max_{in} = real upper limit of the input signal

we have

$$LS.Ax = 100 \frac{min_d - min_{in}}{max_{in} - min_{in}}$$

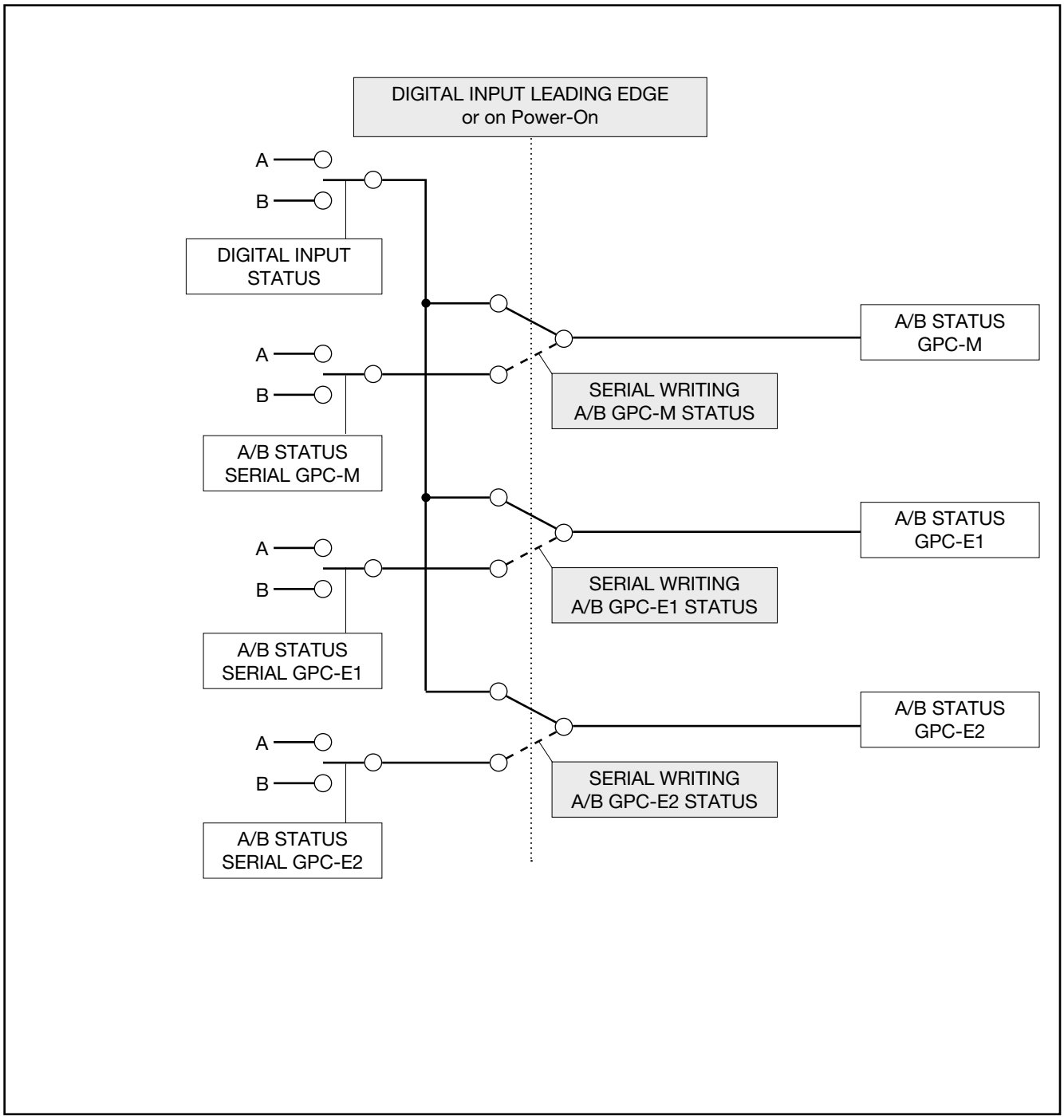
$$HS.Ax = 100 \frac{max_d - min_{in}}{max_{in} - min_{in}}$$

4.2. Using a function associated with the digital input and via serial

At power-on or on the leading edge of digital input 1 or 2 all modules assume the status set by the digital input. This status can be changed, for each individual module, by writing via serial.

For maintenance work on the oven, it may be necessary to check that the heating elements are working properly. In this case the power controller is brought into Manual (MAN) condition, providing (*Man.P*) power test values.

A/B status	Setting	Address for serial writing	
	dIG1 / dIG2 / dIG3 / dIG4	16-bit access	1-bit access
AUTO/MAN controller	1	STATUS_W 305, bit 4	BIT_AUTO_MAN 1
Software ON/OFF	6	STATUS_W 305, bit 4	BIT_SOFT-WARE_ON_OFF 11

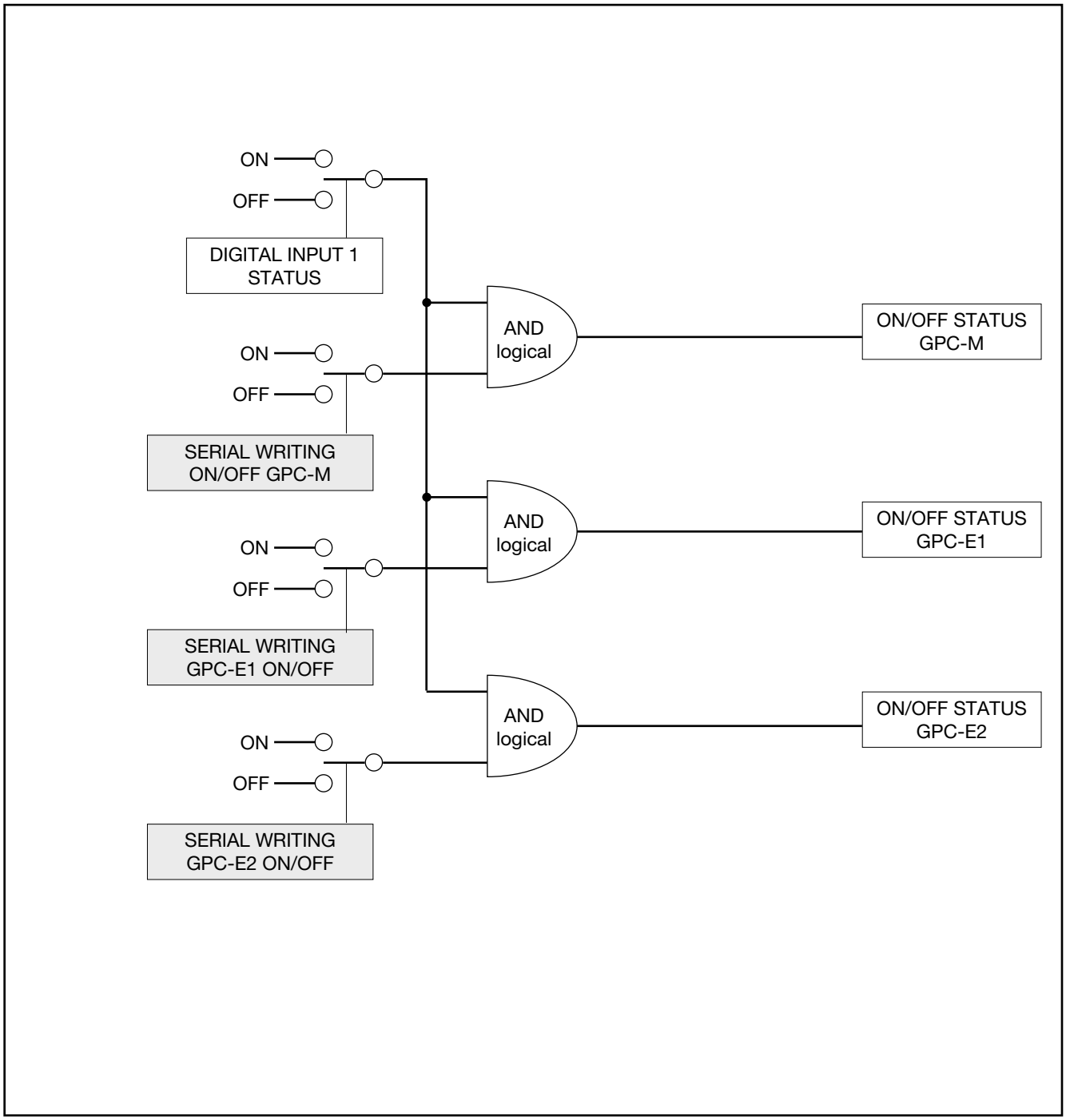


4.3. Using digital input 1 to enable software startup

Software startup (ON) can be configured with the dual enabling condition by digital input and by writing via serial. Enabling by digital input 1 (*dIG.1*) is common to all modules, while enabling by writing via serial is specific to each individual module.

The software startup function (OFF) can be used in fault or emergency conditions by resetting the control of the heating resistors.

	Setting	Address for serial writing	
	dIG.1	16-bit access	1-bit access
Software ON/ OFF	6	STATUS_W 305, bit 3	BIT_SOFT-WARE_ON_ OFF 11

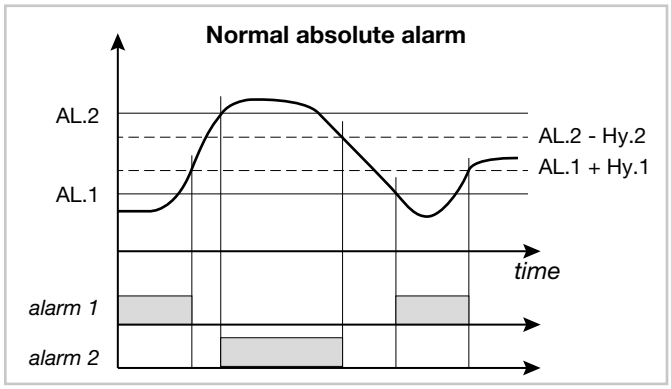


4.4. Alarms

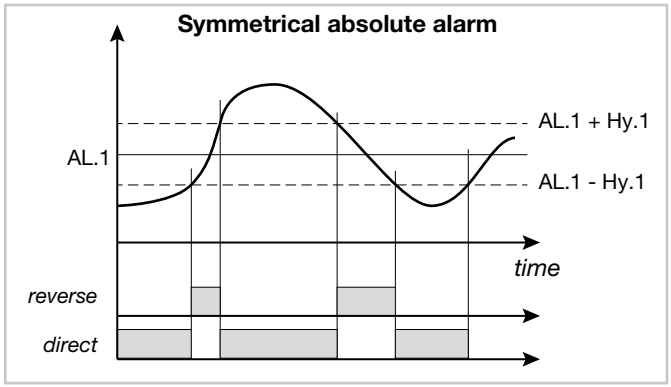
4.4.1. Generic alarms AL1...AL8

Generic alarms *AL1…AL8* can be of 4 main types, shown below:

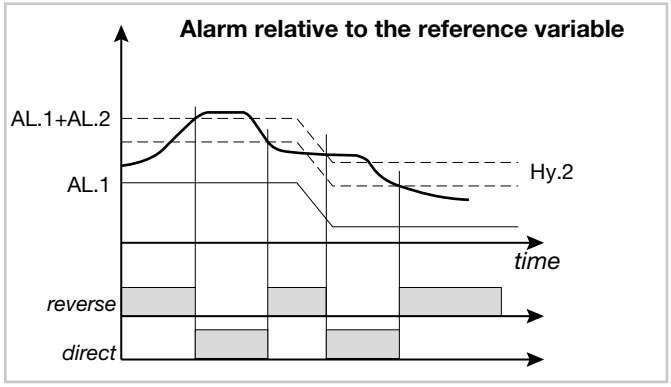
Normal absolute alarm
(*AL*.1 inverse and absolute, *AL.2* direct and absolute).
Two alarm thresholds are set, *AL.1* (lower threshold) and *AL.2* (upper threshold), which correspond to two hysteresis values, *Hy.1* (positive) and *Hy.2* (negative). The alarm is triggered when the measured value remains below *AL.1* or greater than *AL.2* for the set activation delay times.
The alarm condition stops when the measured value is greater than *AL.1* + *Hy.1*, or is less than *AL.2* - *Hy.2*. This avoids repeated alarms caused by slight variations in the measured value.
Any alarm signal at startup, when the equipment is not in normal operation, can be avoided by disabling it when power is turned on.



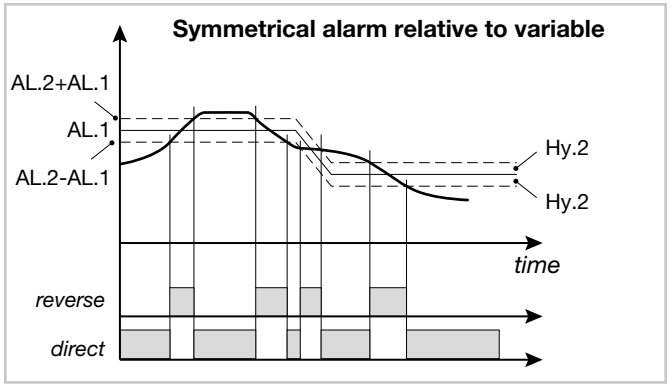
Symmetrical absolute alarm
A single *AL.1* alarm threshold and a single *Hy.1* hysteresis value are set.
With the direct alarm setting, the alarm is triggered when the measured value is less than *AL.1* - *Hy.1* or greater than *AL.1* + *Hy.1* for the set delay activation time.
With the inverse alarm setting, the alarm is triggered when the measured value is greater than *AL.1* - *Hy.1* or less than *AL.1* + *Hy.1* for the set delay activation time.



Normal alarm for the reference variable
A single hysteresis value *Hy.2* (negative), an alarm threshold *AL.2* and the value to which it relates are set. The previous alarm threshold (in this case *AL.1*) is used as the relative value. With the direct alarm setting, the alarm is triggered when the reference value (*A2.r*) is greater than *AL.1* + *AL.2* for the set delay activation time. The alarm condition stops when the measured value is less than *AL.1* + *AL.2* - *Hy.1*.
With the reverse alarm setting, the alarm is triggered when the measured value (*A2.r*) is less than *AL.1* + *AL.2* - *Hy.1*for the set delay activation time. The alarm condition stops when the measured value exceeds *AL.2* + *AL.1*.



Symmetrical alarm relative to the reference variable
A single hysteresis value *Hy.2* (negative), an alarm threshold *AL.2* and the value to which it relates are set. The previous alarm threshold (in this case *AL.1*) is used as the relative value.
With the direct alarm setting, the alarm is triggered when the reference value (*A2.r)* is less than the value *AL.2 -AL.1*, or is greater than the value *AL.2* + *AL.1*.
With the reverse alarm setting, the alarm is triggered when the measured value is between *AL2* - *AL.2* and *AL.2* + *AL.1*.



4.4.2. HB alarm

The HB (Heater Break) alarm identifies load break or interruption through measurement of the current delivered obtained by means of a current transformer.
See the diagram in the installation manual.

The following three fault situations may occur:
1. The current delivered is lower than the rated current. This is the most common situation and indicates failure of a load element.
2. The current delivered is higher than the rated current. This situation occurs, for example, due to partial short circuits of load elements.
3. The current delivered remains significant even during periods when it should be zero. This situation occurs when the load control circuits are short-circuited or relay contacts are welded together. Prompt intervention in these situations is very important to prevent greater damage to the load and/or the pilot circuits.

In standard configuration, the power output is associated with the heating control of a phase, obtained by modulating electrical power with an ON/OFF control based on the set cycle time.
The current reading taken during the ON phase makes it possible to identify an abnormal deviation from its rated value due to a fault on the load, i.e., the first two fault situations listed above.
The current reading taken during the OFF phase makes it possible to detect a possible fault on the control relay, resulting in an output that is always active (third fault situation).

The alarm is enabled by means of parameter *AL.n*.
The type of function desired is selected by means of the *Hb.F* parameter:
- **Hb.F = 0**: the alarm is activated if the current load value is below the threshold value set in *A.Hbx* while the SSR control output is ON.
- **Hb.F = 1**: the alarm is triggered if the current load value is above the threshold value set in *A.Hbx* while the SSR control output is OFF
- **Hb.F = 2**: alarm activation is obtained by combining functions 0 and 1, considering the threshold of function 1 as 12% of the ammeter full scale defined in *H.tAx*.
- **Hb.F = 3** (continuous alarm): the alarm is activated due to a load current value below the threshold value set in *A.Hbx*; this alarm does not refer to the cycle time and is disabled if the heating output value is below 3%. The setting *A.Hbx* = 0 disables both types of HB alarm by forcing deactivation of the Alarm status.

The alarm is reset automatically if its cause is eliminated.

An additional configuration parameter for each phase, related to the HB alarm, is **Hb.t**, i.e., the delay time for activation of the HB alarm, understood as the sum of times for which the alarm is considered active.
For example, with:
- *Hb.F* = 0 (active alarm with current below the threshold value),
- *Hb.t* = 60 sec. and control output cycle time = 10 sec,
- power delivered at 60%,

the alarm will activated after 100 seconds (output ON for 6 seconds each cycle).

Under the same conditions, if the power is delivered at 100%, the alarm will activate after 60 seconds. If the alarm goes off during this interval, the time sum is reset.
The delay time set in *Hb.t* must exceed the cycle time of the SSR output.

With a three-phase load, three different activation thresholds can be set for the HB alarm:
- *A.Hb1* = alarm threshold for line L1,
- *A.Hb2* = alarm threshold for line L2,
- *A.Hb3* = alarm threshold for line L3.

4.4.3. HB alarm threshold teach-in function

This function allows teach-in of the alarm threshold. To use this function, it is first necessary to set the *Hb.P* parameter, which defines the percentage of current in relation to the rated load below which the alarm is activated.

The function can be activated by a command from a serial line, a digital input (see paragraph “3.12.4. Digital input function”) or a key (see paragraph “3.36. Key functions”).
When the Teach-in function is activated in ZC, BF and HSC modes, the RMS current value in conduction ON multiplied by the *Hb.P* parameter determines the HB alarm threshold.
When the Teach-in function is activated in PA mode (not in combination with infrared lamps), the RMS current value is shown at 100% power, which, when multiplied by the *Hb.P* parameter, determines the HB alarm threshold. Before activating the function, the module must be switched on with power, which is recommended to be above 50%.

In the case of HSC or PA mode for infrared lamps (see parameter *hd.5* option +128, paragraph “3.27.1. Enabling trigger modes”) the function activates automatic reading of the power/current curve useful for determining the HB alarm threshold.
Automatic reading of the power/current curve takes place in the following sequence:
- softstart at maximum power (default 100%), 5 second delay;
- reduction of power to 50%, 30%, 20%, 15%, 10%, 5%, 3%, 2%, 1%, with a 5-second delay between each value;
- return to normal operation.

Maximum conduction value in this phase can be limited by means of the parameter *PS.Hi*.
If required, it MUST only be activated with *hd.6* = 0 (the desired *hd.6* value can only be set after calibration).
In HSC mode, the HB alarm threshold teach-in function does NOT calibrate at 5%, 3%, 2%, 1% to avoid high peak currents due to low impedance for the low temperature of the IR lamp filament.

4.4.4. Heuristic power control

Note: The function is only available when using GPC model 3PH, with separate control of three individual single-phase loads.

This type of control is used to limit the delivery of total power to the loads in order to avoid input peaks from the single-phase power line.
An example of this type of input occurs during the start phases when the machine is cold; the demand for heating power is almost 100% until temperature values near the threshold are reached.

It is useful to avoid simultaneous conduction even when there is ON-OFF modulation for temperature maintenance.

The cycle time must be unique or identical for all modules; the power percentage of each module is limited to that necessary to maintain current within set limits.

This function acts by enabling the control to search for the most appropriate input combinations.

EXAMPLE
We have three single-phase loads supplied with 380 V:
- GPC-M = 32 A,
- GPC-E1 = 16 A,
- GPC-E2 = 25 A.

The maximum current, in the case of simultaneous conduction, is 73 A.
The current limit value set with *I.HEU* is 50 A.

Bearing in mind that combinations without repetitions are equal to

$$\frac{n!}{k!\,(n-k)!}$$

it is seen that the possible combinations of conduction can be:
- I1 + I2 = 48 A
- I1 + I3 = 57 A
- I2 + I3 = 41 A
- I1 + I2 + I3 = 73 A

The combinations corresponding to current values below the current limit value *I.HEU* are therefore:
- I1 + I2 = 48 A
- I2 + I3 = 41 A

Of these, the one with the lowest current is the sum of GPC-E1 and GPC-E2.

In the single cycle for the enabled modules, the delivery of power may be reduced to comply with the maximum current limit.
The time distribution of module activation is calculated at the start of each cycle:

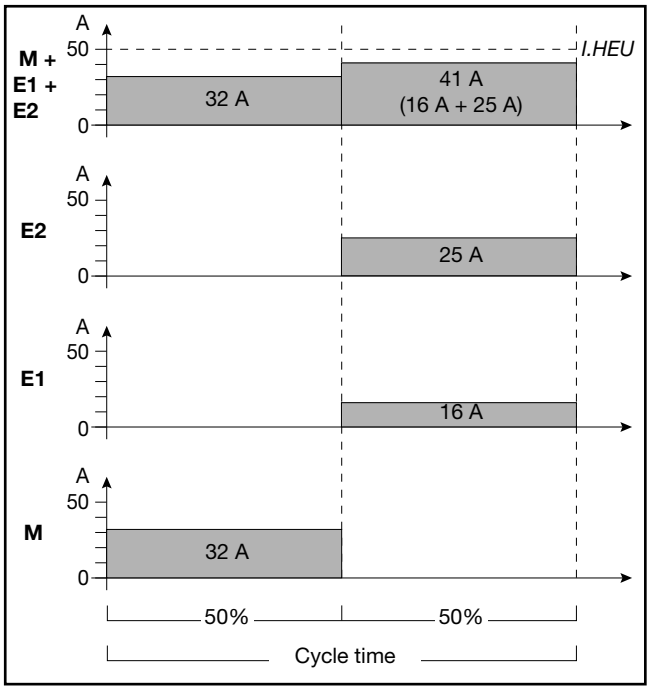
$$Ou.P_{tot} = Ou.P\_1 + (Ou.P\_2^{*} \text{ or } Ou.P\_3^{**})$$

(*) if *Ou.P_2* > *Ou.P_3* (**) if *Ou.P_3* > *Ou.P_2*

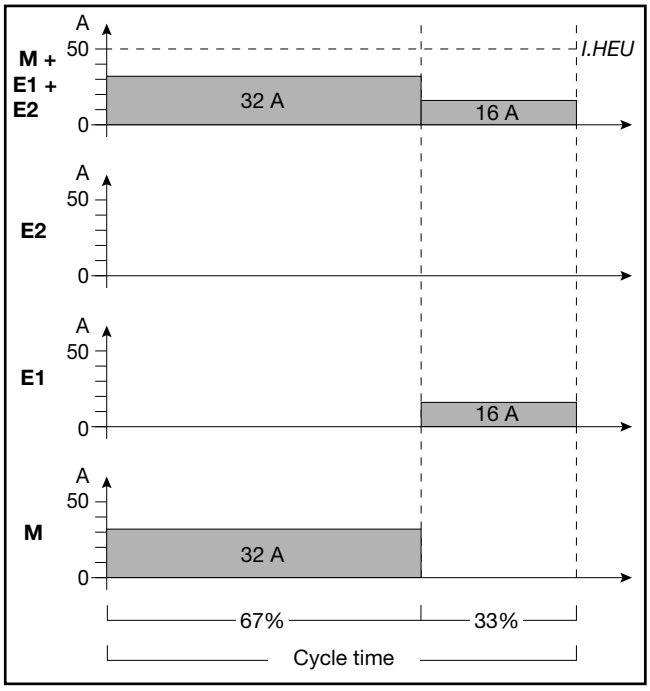
For GPC-E1 and GPC-E2, simultaneous operation is permissible because their sum is less than the set current limit.
The percentage of conduction time of the x-module during the cycle is calculated as

$$\%\ \text{conduction time module-x} = \frac{Px}{P_{tot}}\ 100\%$$

Case 1
If *Ou.P_1* = 100%, *Ou.P_2* = 100% and *Ou.P_3* = 100% we have $Ou.P_{tot}$ = 200%.
As $Ou.P_{tot}$ > 100% we therefore have:
- % time *Ou.P_1* = 0.50 ×100% = 50%.
- % time *Ou.P_2* = 0.50 ×100% = 50%.
- % time *Ou.P_3* = 0.50 ×100% = 50%.



Case 2
If *Ou.P_1* = 100%, *Ou.P_2* = 50% and *Ou.P_3* = 0% we get $Ou.P_{tot}$ = 150%.
As *Ou.Ptot* > 100% rounding up, we there have:
- % time *Ou.P_1* = 0.66 ×100% = 67%.
- % time *Ou.P_2* = 0.66 × 50% = 33%.
- % time *Ou.P_3* = 0.66 × 0% = 0%.



5. USING THE GFW/GPC-OP KEYPAD

5.1. Description

The programming keypad is used to display status parameters and for diagnostics during operation. It can also be used to modify a large number of GPC parameters.

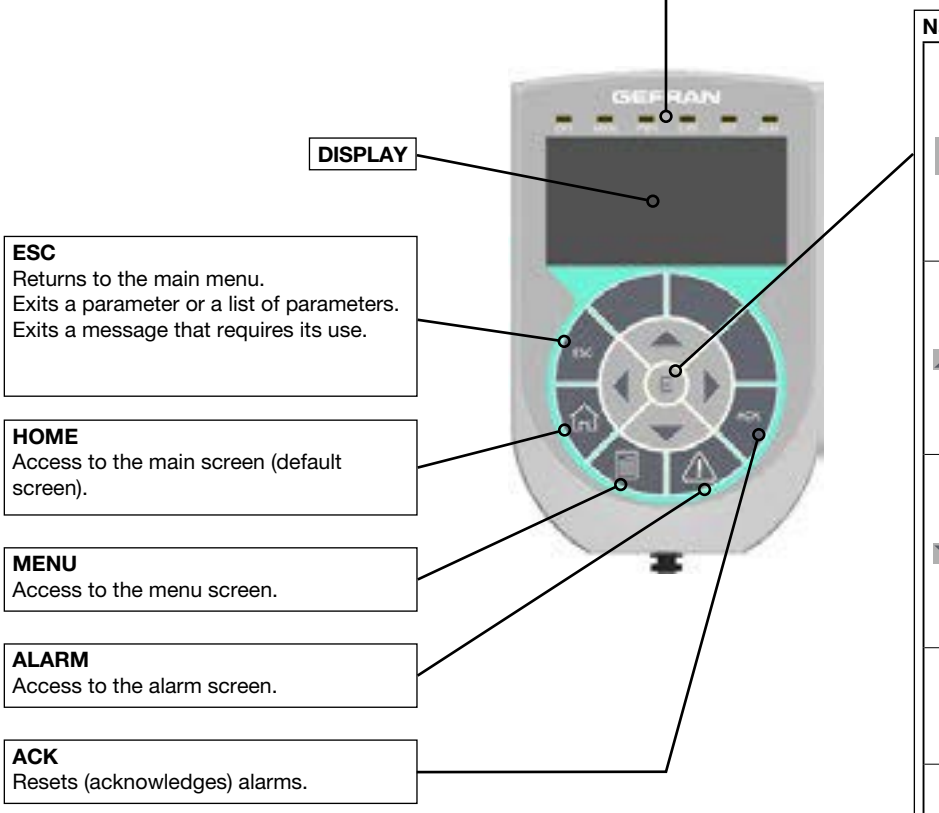
The keypad has a 5 x 21 character liquid crystal display. A membrane keypad is used for navigation and controls. There are also 6 LEDs for signalling.

A strip of magnetic material is located on the back of the keypad so that it can be fixed to the front of the GPC-M or to a metal surface (e.g., the switchboard door).

The keypad (GFW/GPC-OP cod. F068952) comes with a 70 cm cable with a DB9 male connector for connection to the GPC-M.

5.2. Legend

LED	COLOUR	MEANING
OFF	Yellow	The LED is on when GPC is in software OFF.
MAN	Yellow	The LED is on when GPC is in manual operation.
PWR	Green	The LED is on during power supply.
ILIM	Red	The LED lights up when GPC reaches a current limit condition (if enabled). During normal operation this LED is off.
SST	Yellow	The LED is on during the softstart ramp.
ALM	Red	The LED is on when GPC signals the activation of an alarm.



Navigation keys

E	ENTER	Enters the selected submenu or parameter, or selects an operation. It is used when changing parameters to confirm the new set value.
▲	UP	Moves the selection up in a menu or parameter list. When editing a parameter, it increases the value of the figure under the cursor.
▼	DOWN	Moves the selection down in a menu or parameter list. When editing a parameter, decreases the value of the figure under the cursor.
◀	LEFT	Returns to the main menu. When editing a parameter, it moves the cursor to the left.
▶	RIGHT	Enters the selected submenu or parameter. When editing a parameter, it moves the cursor to the right

5.3. Operations

5.3.1. HOME screen

	E2	E1	M
V	230	230	230
A	200	200	200
KW	46	46	46

The screen gives a summary of the basic GPC parameters:
- voltage on the load (V),
- current in the load (A)
- power on load (KW)

of the three modules.

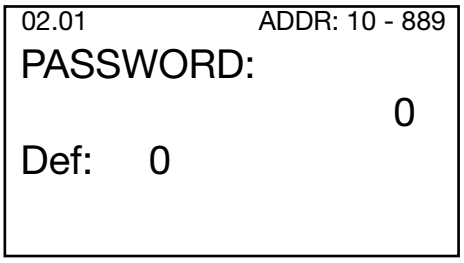
The screen is displayed:
- with the GPC is switched on (keypad already connected),
- when connecting the keypad to the GPC (in the absence of alarms),
- by pressing the HOME button.

5.3.2. Accessing the menu

To access the menu, press the MENU button.
The keypad checks whether a password has been set (configurable via GF_eXpress).

If the password has not been enabled (PASS.C = 0), the menus are accessed directly.

If the password is enabled (PASS.C > 0), it displays the screen on which to enter the numeric password (PASSWORD = PASS.C) which allows access to the menus, if the value entered is correct.



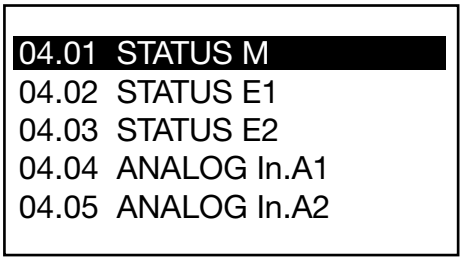
If the password entered is incorrect, you return to HOME.

The entered password will remain valid until the GPC-OP is disconnected from the GPC or the HOME or ALARM button is pressed.
For instructions on changing your password, see paragraph “5.3.5. Changing a numerical parameter”.

5.3.3. Browsing the menus

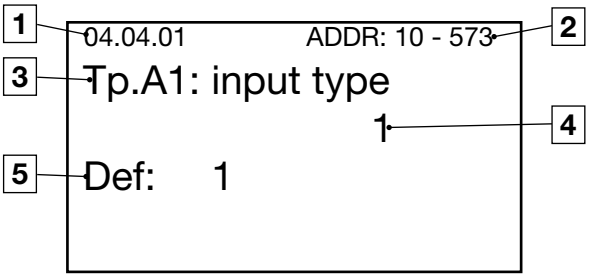
Press the ► key to enter the submenu or parameter. The same result is obtained by pressing the ENTER key.
Press the ► key twice to return to the main menu.
Press the ▼ and ▲ keys to scroll through the various menu items.

Each menu item is preceded by a numerical address with 2-digits (1st level menu), 4-digits (2nd level menu) or 6-digits (3rd level menu). The address digits are grouped in twos and separated by a dot.



In the above screenshot, the parameter ANALOG In.A2 has address 04.05, i.e., the fourth item in the first-level menu and the fifth item in the corresponding second-level menu.

5.3.4. Parameter display



1. Indication of menu index and parameter position.
2. Modbus address of the parameter in *node - address* format (in the image node = 10, address = 573).
3. Parameter description.
4. Parameter value:
   - Numerical parameter: the numerical value of the parameter is displayed in the required format, together with the unit of measurement.
   - Binary parameter: the 16 data bits are displayed in succession by pressing the ►key.
   - Status parameter (COMMANDS menu): the status description is displayed.
5. Additional information depending on the type of parameter:
   - Numerical parameter: the default, minimum and maximum values of the parameter are displayed. These values are shown in sequence by pressing the ► button (only if the parameter is R/W).
     When setting the R/W parameter, any *Out of range* error condition of the entered value is shown.
   - Binary parameter: displays the status (ON-OFF, AUTO-MAN, ...) of the bits selected in sequence by pressing the ►key.

5.3.5. Changing a numerical parameter

A numerical parameter can be changed (only if R/W type), as follows:

1. Press the **E** key when the parameter you want to change is displayed.
2. The cursor is activated, with inverted colours, on the digit of the parameter value corresponding to the unit.
3. Use the ▼ and ▲ keys to increase or decrease the digit under the cursor. When a value affecting the left digit is reached, it is changed even if the cursor position does not change. For example, increasing the digit 9 by 1 automatically increases the digit to its left by 1 and 9 becomes 0 without moving the cursor.
   By using the ◄ and ► keys, the cursor can be moved across all digits to set a value more quickly, including non-significant zeros, which are not normally displayed when confirming the data.
4. To save the parameter value after editing, press the **E**key again. To exit the edit mode without saving the value, press the **ESC** key.

5.3.6. Changing a status parameter

To change a status parameter (COMMANDS menu):

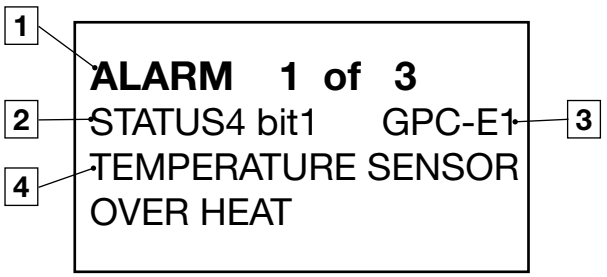
1. Press the **E** key when the parameter you want to change is displayed.
2. The current status description is displayed with inverted colours.
3. Press the ▼ and ▲ keys to select a status from those available.
4. To save the parameter value after editing, press the **E**key again. To exit edit mode without saving the value, press the **ESC** key.

5.3.7. ALARM screen

In the presence of an alarm, the red ALM LED is activated and the ALARM screen is automatically displayed, showing the details of the first alarm detected by the parameter scan; the parameters show the status starting from the least significant bit.
The ▼ and ▲ keys can be used to scroll through the details of any other alarms that may be present.

When there are no more active alarms, because they have been reset via the ACK key or reset automatically, the ALM LED goes off and the HOME screen is automatically displayed.

If you exit the ALARM screen, for example, by pressing the HOME or MENU button, and there are still active alarms (ALM LED lit), you must press the ALARM button to return to the alarm screen.
If there are no alarms, the ALARM button does not cause any change to the current display.



1. Alarm sequence number and total number of alarms present.
2. Indication of the variable and alarm bit.
3. Indication of the module in Alarm status (if missing, the alarm is global).
4. Alarm description.

5.3.8. Alarm reset

There are two types of alarms:

- Alarms with memory.
- Alarms without memory.

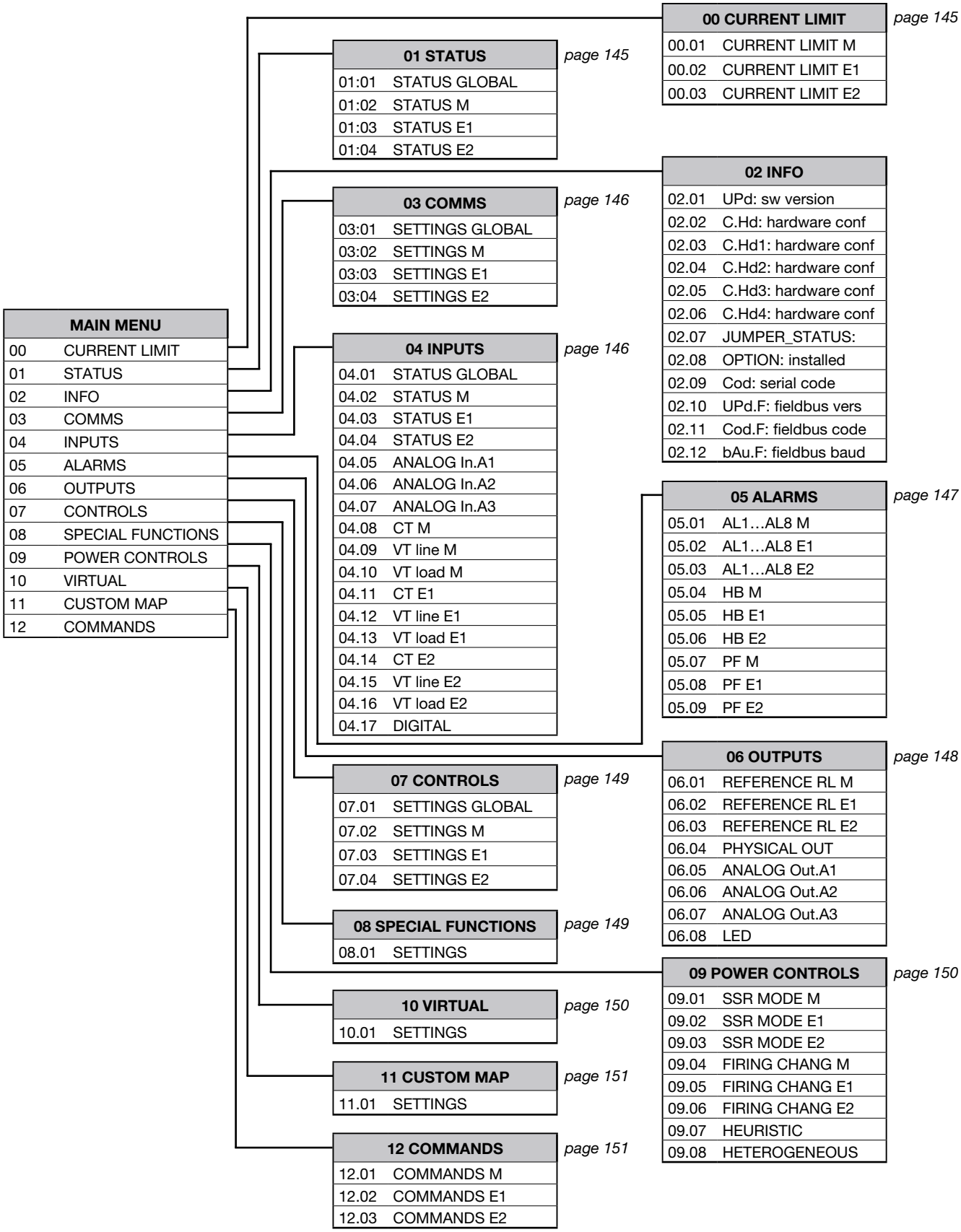
To reset an alarm with memory, go to the ALARM screen, which shows the details of the alarm in question and press the **ACK** button. What happens next depends on the cause of the alarm:

- if the cause is no longer valid, the corresponding item is deleted from the alarm list;
- if the cause is still valid, the corresponding entry remains in the alarm list.

Alarms with no memory are automatically reset when the cause of the alarm ceases to exist. The ALM LED and ALARM screen are updated accordingly.

5.4. Menu structure

5.4.1. Main menu and 2nd level menu



5.4.2. 00 CURRENT LIMIT - 3rd level menu

00.01 CURRENT LIMIT M	
08.01	SETTINGS

00.02 CURRENT LIMIT E1	
08.01	SETTINGS

00.03 CURRENT LIMIT E2	
08.01	SETTINGS

5.4.3. 01 STATUS - 3rd level menu

01.01 STATUS GLOBAL	
01.01.01	Ld.V.t: load voltage
01.01.02	Ld.A.t: load current
01.01.03	Ld.P.t: load power
01.01.04	Ld.I.t: load imped.
01.01.05	Ld.E1.t: load ener.1
01.01.06	Ld.E2.t: load ener.2
01.01.07	VOLTAGE_STATUS:
01.01.08	MODE_STATUS:
01.01.09	ALSTATE_HB status
01.01.10	MASKOUT_OUT status
01.01.11	Out.AO1: analog out
01.01.12	Out.AO2: analog out
01.01.13	Out.AO1: analog out

01.02 STATUS M	
01.02.01	Ou.P: control output
01.02.02	I.VF: line voltage
01.02.03	FrEq: line frequency
01.02.04	I.on: on current
01.02.05	Ld.V: load voltage
01.02.06	Ld.A: load current
01.02.07	Ld.P: load power
01.02.08	Ld.I: load impedance
01.02.09	Ld.E1: load energy 1
01.02.10	Ld.E2: load energy 2
01.02.11	FO.c1: fuse open cnt
01.02.12	FO.c2: fuse open cnt
01.02.13	OH.c: operating cnt
01.02.14	STATUS_W: mode
01.02.15	STATUS
01.02.16	STATUS1:
01.02.17	STATUS2:
01.02.18	STATUS3:
01.02.19	STATUS4:
01.02.20	ALSTATE_IRQ status
01.02.21	ALSTATE status
01.02.22	FW_POWER: master out
01.02.23	MASKOUT_RL status

01.03 STATUS E1	
01.03.01	Ou.P: control output
01.03.02	I.VF: line voltage
01.03.03	FrEq: line frequency
01.03.04	I.on: on current
01.03.05	Ld.V: load voltage
01.03.06	Ld.A: load current
01.03.07	Ld.P: load power
01.03.08	Ld.I: load impedance
01.03.09	Ld.E1: load energy 1
01.03.10	Ld.E2: load energy 2
01.03.11	FO.c1: fuse open cnt
01.03.12	FO.c2: fuse open cnt
01.03.13	OH.c: operating cnt
01.03.14	STATUS_W: mode
01.03.15	STATUS
01.03.16	STATUS1:
01.03.17	STATUS2:
01.03.18	STATUS3:
01.03.19	STATUS4:
01.03.20	ALSTATE_IRQ status
01.03.21	ALSTATE status
01.03.22	FW_POWER: master out
01.03.23	MASKOUT_RL status

01.04 STATUS E2	
01.04.01	Ou.P: control output
01.04.02	I.VF: line voltage
01.04.03	FrEq: line frequency
01.04.04	I.on: on current
01.04.05	Ld.V: load voltage
01.04.06	Ld.A: load current
01.04.07	Ld.P: load power
01.04.08	Ld.I: load impedance
01.04.09	Ld.E1: load energy 1
01.04.10	Ld.E2: load energy 2
01.04.11	FO.c1: fuse open cnt
01.04.12	FO.c2: fuse open cnt
01.04.13	OH.c: operating cnt
01.04.14	STATUS_W: mode
01.04.15	STATUS
01.04.16	STATUS1:
01.04.17	STATUS2:
01.04.18	STATUS3:
01.04.19	STATUS4:
01.04.20	ALSTATE_IRQ status
01.04.21	ALSTATE status
01.04.22	FW_POWER: master out
01.04.23	MASKOUT_RL status

5.4.4. 03 COMMS - 3rd level menu

03.01 SETTINGS GLOBAL
03.01.01 bAu: baudrate 1
03.01.02 PAr: parity 1
03.01.03 bAu.2: baudrate 2
03.01.04 PAr.2: parity 2
03.01.05 F.SIZE: fieldbus size
03.01.06 J.Set: jumpers set
03.01.07 J.Ser: jumpers value
03.01.08 C.E.t: comm err time

03.02 SETTINGS M
03.02.01 C.E.m: comm err mode
03.02.02 C.E.P: comm err powr

03.03 SETTINGS E1
03.03.01 C.E.m: comm err mode
03.03.02 C.E.P: comm err powr

03.04 SETTINGS E2
03.04.01 C.E.m: comm err mode
03.04.02 C.E.P: comm err powr

5.4.5. 04 INPUTS - 3rd level menu

04.01 STATUS GLOBAL
04.01.01 In.A1: analog inp
04.01.02 In.A2: analog inp
04.01.03 In.A3: analog inp
04.01.04 In.Pwm1: pwm inp
04.01.05 In.Pwm2: pwm inp
04.01.06 In.Pwm3: pwm inp
04.01.07 INPUT_DIG: dig state

04.02 STATUS M
04.02.01 I.1on: on current
04.02.02 I.VF1: line voltage

04.03 STATUS E1
04.03.01 I.1on: on current
04.03.02 I.VF1: line voltage

04.04 STATUS E2
04.04.01 I.1on: on current
04.04.02 I.VF1: line voltage

04.05 ANALOG In.A1
04.05.01 tP.A1: input type
04.05.02 LS.A1: min scale
04.05.03 HS.A1: max scale
04.05.04 oFS.A1: offset scale
04.05.05 FLt.A1: time filter

04.06 ANALOG In.A2
04.06.01 tP.A2: input type
04.06.02 LS.A2: min scale
04.06.03 HS.A2: max scale
04.06.04 oFS.A2: offset scale
04.06.05 FLt.A2: time filter

04.07 ANALOG In.A3
04.07.01 tP.A3: input type
04.07.02 LS.A3: min scale
04.07.03 HS.A3: max scale
04.07.04 oFS.A3: offset scale
04.07.05 FLt.A3: time filter

04.08 CT M
04.08.01 L.tA: min scales
04.08.02 H.tA: max scale
04.08.03 o.tA: offset scale
04.08.04 Ft.tA: time filter
04.08.05 r.tA: transfor ratio

04.09 VT line M
04.09.01 L.tV: min scale
04.09.02 H.tV: max scale
04.09.03 o.tV: offset scale
04.09.04 Ft.tV: time filter

04.10 VT load M
04.10.01 L.tVL: min scale
04.10.02 H.tVL: max scale
04.10.03 o.tVL: offset scale
04.10.04 Ft.tVL: time filter

04.11 CT E1
04.11.01 L.tA: min scales
04.11.02 H.tA: max scale
04.11.03 o.tA: offset scale
04.11.04 Ft.tA: time filter
04.11.05 r.tA: transfor ratio

04.12 VT line E1
04.12.01 L.tV: min scale
04.12.02 H.tV: max scale
04.12.03 o.tV: offset scale
04.12.04 Ft.tV: time filter

04.13 VT load E1
04.13.01 L.tVL: min scale
04:13:02 H.tVL: max scale
04:13:03 o.tVL: offset scale
04:13:04 Ft.tVL: time filter

04.14 CT E2
04:14:01 L.tA: min scales
04:14:02 H.tA: max scale
04:14:03 o.tA: offset scale
04:14:04 Ft.tA: time filter
04:14:05 r.tA: transfor ratio

04.15 VT line E2
04:15:01 L.tV: min scale
04:15:02 H.tV: max scale
04:15:03 o.tV: offset scale
04:15:04 Ft.tV: time filter

04.16 VT load E2
04:16:01 L.tVL: min scale
04:16:02 H.tVL: max scale
04:16:03 o.tVL: offset scale
04:16:04 Ft.tVL: time filter

04.17 DIGITAL GLOBAL
04:17:01 dIG.1: dig1 function
04:17:02 dIG.2: dig1 function
04:17:03 dIG.3: dig3 function
04:17:04 dIG.4: dig4 function
04:17:05 tP.dIG: input type
04:17:06 Ft.PWm1: time filter
04:17:07 Ft.PWm2: time filter
04:17:08 Ft.PWm3: time filter
04:17:09 PWm.t1: timeout
04:17:10 PWm.t2: timeout
04:17:11 PWm.t3: timeout

5.4.6. 05 ALARMS - 3rd level menu

05.01 AL1…AL8 M
05.01.01 AL.n: enable alarms
05.01.02 A1.r: reference
05.01.03 A2.r: reference
05.01.04 A3.r: reference
05.01.05 A4.r: reference
05.01.06 A5.r: reference
05.01.07 A6.r: reference
05.01.08 A7.r: reference
05.01.09 A8.r: reference
05.01.10 A1.t: type
05.01.11 A2.t: type
05.01.12 A3.t: type
05.01.13 A4.t: type
05.01.14 A5.t: type
05.01.15 A6.t: type
05.01.16 A7.t: type
05.01.17 A8.t: type
05.01.18 AL.1: threshold
05.01.19 AL.2: threshold
05.01.20 AL.3: threshold
05.01.21 AL.4: threshold
05.01.22 AL.5: threshold
05.01.23 AL.6: threshold
05.01.24 AL.7: threshold
05.01.25 AL.8: threshold
05.01.26 HY.1: hysteresis
05.01.27 HY.2: hysteresis
05.01.28 HY.3: hysteresis
05.01.29 HY.4: hysteresis
05.01.30 HY.5: hysteresis
05.01.31 HY.6: hysteresis
05.01.32 HY.7: hysteresis
05.01.33 HY.8: hysteresis
05.01.34 A1.P: validat pow
05.01.35 A2.P: validat pow
05.01.36 A3.P: validat pow
05.01.37 A4.P: validat pow
05.01.38 A5.P: validat pow
05.01.39 A6.P: validat pow
05.01.40 A7.P: validat pow
05.01.41 A8.P: validat pow

05.02 AL1…AL8 E1
05.02.01 AL.n: enable alarms
05.02.02 A1.r: reference
05.02.03 A2.r: reference
05.02.04 A3.r: reference
05.02.05 A4.r: reference
05.02.06 A5.r: reference
05.02.07 A6.r: reference
05.02.08 A7.r: reference
05.02.09 A8.r: reference
05.02.10 A1.t: type
05.01.11 A2.t: type
05.02.12 A3.t: type
05.02.13 A4.t: type
05.02.14 A5.t: type
05.02.15 A6.t: type
05.02.16 A7.t: type
05.02.17 A8.t: type
05.02.18 AL.1: threshold
05.02.19 AL.2: threshold
05.02.20 AL.3: threshold
05.02.21 AL.4: threshold
05.02.22 AL.5: threshold
05.02.23 AL.6: threshold
05.02.24 AL.7: threshold
05.02.25 AL.8: threshold
05.02.26 HY.1: hysteresis
05.02.27 HY.2: hysteresis
05.02.28 HY.3: hysteresis
05.02.29 HY.4: hysteresis
05.02.30 HY.5: hysteresis
05.02.31 HY.6: hysteresis
05.02.32 HY.7: hysteresis
05.02.33 HY.8: hysteresis
05.02.34 A1.P: validat pow
05.02.35 A2.P: validat pow
05.02.36 A3.P: validat pow
05.02.37 A4.P: validat pow
05.02.38 A5.P: validat pow
05.02.39 A6.P: validat pow
05.02.40 A7.P: validat pow
05.01.41 A8.P: validat pow

05.03 AL1…AL8 E2
05.03.01 AL.n: enable alarms
05.03.02 A1.r: reference
05.03.03 A2.r: reference
05.03.04 A3.r: reference
05.03.05 A4.r: reference
05.03.06 A5.r: reference
05.03.07 A6.r: reference
05.03.08 A7.r: reference
05.03.09 A8.r: reference
05.03.10 A1.t: type
05.03.11 A2.t: type
05.03.12 A3.t: type
05.03.13 A4.t: type
05.03.14 A5.t: type
05.03.15 A6.t: type
05.03.16 A7.t: type
05.03.17 A8.t: type
05.03.18 AL.1: threshold
05.03.19 AL.2: threshold
05.03.20 AL.3: threshold
05.03.21 AL.4: threshold
05.03.22 AL.5: threshold
05.03.23 AL.6: threshold
05.03.24 AL.7: threshold
05.03.25 AL.8: threshold
05.03.26 HY.1: hysteresis
05.03.27 HY.2: hysteresis
05.03.28 HY.3: hysteresis
05.03.29 HY.4: hysteresis
05.03.30 HY.5: hysteresis
05.03.31 HY.6: hysteresis
05.03.32 HY.7: hysteresis
05.03.33 HY.8: hysteresis
05.03.34 A1.P: validat pow
05.03.35 A2.P: validat pow
05.03.36 A3.P: validat pow
05.03.37 A4.P: validat pow
05.03.38 A5.P: validat pow
05.03.39 A6.P: validat pow
05.03.40 A7.P: validat pow
05.03.41 A8.P: validat pow

05.04 HB M
05.04.01 Hb.F: functions
05.04.02 Hb.t: time delay
05.04.03 A.Hb.1: threshold
05.04.04 Hb.P: percentage
05.04.05 Hb.tA: calibration
05.04.06 Hb.tV: calibration
05.04.07 Hb.Pw: calibration
05.04.08 Ir.tA.0: calibration. 0
05.04.09 Ir.tA.1: calibration. 1
05.04.10 Ir.tA.2: calibration. 2
05.04.11 Ir.tA.3: calibration. 3
05.04.12 Ir.tA.4: calibration. 4
05.04.13 Ir.tA.5: calibration. 5
05.04.14 Ir.tA.6: calibration. 6
05.04.15 Ir.tA.7: calibration. 7
05.04.16 Ir.tA.8: calibration. 8
05.04.17 Ir.tA.9: calibration. 9
05.04.18 Ir.tV.0: calibration. 0
05.04.19 Ir.tV.1: calibration. 1
05.04.20 Ir.tV.2: calibration. 2
05.04.21 Ir.tV.3: calibration. 3
05.04.22 Ir.tV.4: calibration. 4
05.04.23 Ir.tV.5: calibration. 5
05.04.24 Ir.tV.6: calibration. 6
05.04.25 Ir.tV.7: calibration. 7
05.04.26 Ir.tV.8: calibration. 8
05.04.27 Ir.tV.9: calibration. 9

05.05 HB E1
05.05.01 Hb.F: functions
05.05.02 Hb.t: time delay
05.05.03 A.Hb.1: threshold
05.05.04 Hb.P: percentage
05.05.05 Hb.tA: calibration
05.05.06 Hb.tV: calibration
05.05.07 Hb.Pw: calibration
05.05.08 Ir.tA.0: calibration. 0
05.05.09 Ir.tA.1: calibration. 1
05.05.10 Ir.tA.2: calibration. 2
05.05.11 Ir.tA.3: calibration. 3
05.05.12 Ir.tA.4: calibration. 4
05.05.13 Ir.tA.5: calibration. 5
05.05.14 Ir.tA.6: calibration. 6
05.05.15 Ir.tA.7: calibration. 7
05.05.16 Ir.tA.8: calibration. 8
05.05.17 Ir.tA.9: calibration. 9
05.05.18 Ir.tV.0: calibration. 0
05.05.19 Ir.tV.1: calibration. 1
05.05.20 Ir.tV.2: calibration. 2
05.05.21 Ir.tV.3: calibration. 3
05.05.22 Ir.tV.4: calibration. 4
05.05.23 Ir.tV.5: calibration. 5
05.05.24 Ir.tV.6: calibration. 6
05.05.25 Ir.tV.7: calibration. 7
05.05.26 Ir.tV.8: calibration. 8
05.05.27 Ir.tV.9: calibration. 9

05.06 HB E2
05.06.01 Hb.F: functions
05.06.02 Hb.t: time delay
05.06.03 A.Hb.1: threshold
05.06.04 Hb.P: percentage
05.06.05 Hb.tA: calibration
05.06.06 Hb.tV: calibration
05.06.07 Hb.Pw: calibration
05.06.08 Ir.tA.0: calibration. 0
05.06.09 Ir.tA.1: calib. 1
05.06.10 Ir.tA.2: calib. 2
05.06.11 Ir.tA.3: calib. 3
05.06.12 Ir.tA.4: calib. 4
05.06.13 Ir.tA.5: calib. 5
05.06.14 Ir.tA.6: calib. 6
05.06.15 Ir.tA.7: calib. 7
05.06.16 Ir.tA.8: calib. 8
05.06.17 Ir.tA.9: calib. 9
05.06.18 Ir.tV.0: calib. 0
05.06.19 Ir.tV.1: calib. 1
05.06.20 Ir.tV.2: calib. 2
05.06.21 Ir.tV.3: calib. 3
05.06.22 Ir.tV.4: calib. 4
05.06.23 Ir.tV.5: calib. 5
05.06.24 Ir.tV.6: calib. 6
05.06.25 Ir.tV.7: calib. 7
05.06.26 Ir.tV.8: calib. 8
05.06.27 Ir.tV.9: calib. 9

05.07 PF M
05.07.01 hd.2: enable
05.07.02 dG.F: time filter
05.07.03 dG.t: rate

05.08 PF E1
05.08.01 hd.2: enable
05.08.02 dG.F: time filter

05.09 PF E2
05.09.01 hd.2: enable
05.09.02 dG.F: time filter

5.4.7. 06 OUTPUTS - 3rd level menu

06.01 REFERENCE RL M
06.01.01 rL.1: reference
06.01.02 rL.2: reference
06.01.03 rL.3: reference
06.01.04 rL.4: reference
06.01.05 rL.5: reference
06.01.06 rL.6: reference
06.01.07 Ct.1: cycle time
06.01.08 Ct.2: cycle time

06.02 REFERENCE RL E1
06.02.01 rL.1: reference
06.02.02 rL.2: reference
06.02.03 rL.3: reference
06.02.04 rL.4: reference
06.02.05 rL.5: reference
06.02.06 rL.6: reference
06.02.07 Ct.1: cycle time
06.02.08 Ct.2: cycle time

06.03 REFERENCE RL E2
06.03.01 rL.1: reference
06.03.02 rL.2: reference
06.03.03 rL.3: reference
06.03.04 rL.4: reference
06.03.05 rL.5: reference
06.03.06 rL.6: reference
06.03.07 Ct.1: cycle time
06.03.08 Ct.2: cycle time

06.04 PHYSICAL OUT
06.04.01 out.1: reference
06.04.02 out.2: reference
06.04.03 out.3: reference
06.04.04 out.5: reference
06.04.05 out.6: reference
06.04.06 out.7: reference
06.04.07 out.8: reference
06.04.08 out.9: reference
06.04.09 out.10: reference

06.05 ANALOG Out.A1
06.05.01 tP.AO1: out type
06.05.02 rF.AO1: reference
06.05.03 LS.AO1: min scale
06.05.04 HS.AO1: max scale

06.06 ANALOG Out.A2
06.06.01 tP.AO2: out type
06.06.02 rF.AO2: reference
06.06.03 LS.AO2: min scale
06.06.04 HS.AO2: max scale

06.08 LED	
06.08.01	Ld.St: RN function
06.08.02	Ld.2 ER function
06.08.03	Ld.3 DI1 function
06.08.04	Ld.4 DI2 function
06.08.05	Ld.5 O1 function
06.08.06	Ld.6 O2 function
06.08.07	Ld.7 O3 function
06.08.08	Ld.8 BUT function

5.4.8. 07 CONTROLS - 3rd level menu

07.01 SETTINGS GLOBAL	
07.01.01	SP.r: manual p. set
07.01.02	EEP.E: eeprom enable
07.01.03	OFF.t: poweroff type
07.01.04	Unb.1: unbalanced 1
07.01.05	Unb.2: unbalanced 2
07.01.06	Unb.3: unbalanced 3

07.02 SETTINGS M	
07.02.01	MAN_POWER: manual pw
07.02.02	SPU: enable
07.02.03	P.PEr: out rescale
07.02.04	P.oFS: out offset
07.02.05	G.oUt: out gradient
07.02.06	Lo.P: min firing
07.02.07	rIF: reference
07.02.08	Cor: correction
07.02.09	P.ont: poweron type

07.03 SETTINGS E1	
07.03.01	MAN_POWER: manual pw
07.03.02	SPU: enable
07.03.03	P.PEr: out rescale
07.03.04	P.oFS: out offset
07.03.05	G.oUt: out gradient
07.03.06	Lo.P: min firing
07.03.07	rIF: reference
07.03.08	Cor: correction
07.03.09	P.ont: poweron type

07.04 SETTINGS E2	
07.04.01	MAN_POWER: manual pw
07.04.02	SPU: enable
07.04.03	P.PEr: out rescale
07.04.04	P.oFS: out offset
07.04.05	G.oUt: out gradient
07.04.06	Lo.P: min firing
07.04.07	rIF: reference
07.04.08	Cor: correction
07.04.09	P.ont: poweron type

5.4.9. 08 SPECIAL FUNCTIONS - 3rd level menu

08.01 SETTINGS	
08.01.01	Fr.n: fuse restart n

5.4.10. 09 POWER CONTROLS - 3rd level menu

09.01 SSR MODE M
09.01.01 Hd.5: firing enabl
09.01.02 FU.tA: max current
09.01.03 bF.Cy: BF cycles
09.01.04 PS.HI: max phase
09.01.05 PS.tM: ramp time
09.01.06 PS.oF: min time
09.01.07 PS.tA: ramp max curr
09.01.08 dL.t: delay trigger
09.01.09 dL.tr: delay t. rot
09.01.10 Hd.6: feedback enabl
09.01.11 Cor.V: max voltage
09.01.12 Cor.I: max current
09.01.13 Cor.P: max power
09.01.14 riF.V: ref. voltage
09.01.15 reF.I: ref. current
09.01.16 reF.P: ref. power
09.01.17 Fb.it: speed respons

09.02 SSR MODE E1
09.02.01 Hd.5: firing enabl
09.02.02 FU.tA: max current
09.02.03 bF.Cy: BF cycles
09.02.04 PS.HI: max phase
09.02.05 PS.tM: ramp time
09.02.06 PS.oF: min time
09.02.07 PS.tA: ramp max curr
09.02.08 dL.t: delay trigger
09.02.09 dL.tr: delay t. rot
09.02.10 Hd.6: feedback enabl
09.02.11 Cor.V: max voltage
09.02.12 Cor.I: max current
09.02.13 Cor.P: max power
09.02.14 riF.V: ref. voltage
09.02.15 reF.I: ref. current
09.02.16 reF.P: ref. power
09.02.17 Fb.it: speed respons

09.03 SSR MODE E2
09.03.01 Hd.5: firing enabl
09.03.02 FU.tA: max current
09.03.03 bF.Cy: BF cycles
09.03.04 PS.HI: max phase
09.03.05 PS.tM: ramp time
09.03.06 PS.oF: min time
09.03.07 PS.tA: ramp max curr
09.03.08 dL.t: delay trigger
09.03.09 dL.tr: delay t. rot
09.03.10 Hd.6: feedback enabl
09.03.11 Cor.V: max voltage
09.03.12 Cor.I: max current
09.03.13 Cor.P: max power
09.03.14 riF.V: ref. voltage
09.03.15 reF.I: ref. current
09.03.16 reF.P: ref. power
09.03.17 Fb.it: speed respons

09.04 FIRING CHANG M
09.04.01 Hd.7: enable
09.04.02 FC.tA: perc of Fu.tA
09.04.03 FC.P: min power

09.05 FIRING CHANG E1
09.05.01 FC.tA: perc of Fu.tA
09.05.02 FC.P: min power

09.06 FIRING CHANG E2
09.06.01 FC.tA: perc of Fu.tA
09.06.02 FC.P: min power

09.07 HEURISTIC
09.07.01 hd.3: heuristic
09.07.02 I.HEU: max current

09.08 HETEROGENEOUS
09.08.01 hd.4: heterogeneous
09.08.02 I.HEt: max current

5.4.11. 10 VIRTUAL - 3rd level menu

10.01 SETTINGS
10.01.01 hd.1: enable
10.01.02 S.In M: input
10.01.03 S.In E1: input
10.01.04 S.In E2: input
10.01.05 S.Ou: output
10.01.06 S.LI: led/indig
10.01.07 SERIAL_AL1_RAM M
10.01.08 SERIAL_AL2_RAM M
10.01.09 SERIAL_AL3_RAM M
10.01.10 SERIAL_AL4_RAM M
10.01.11 SERIAL_AL1_RAM E1
10.01.12 SERIAL_AL2_RAM E1
10.01.13 SERIAL_AL3_RAM E1
10.01.14 SERIAL_AL4_RAM E1
10.01.15 SERIAL_AL1_RAM E2
10.01.16 SERIAL_AL2_RAM E2
10.01.17 SERIAL_AL3_RAM E2
10.01.18 SERIAL_AL4_RAM E2
10.01.19 SERIAL_INA1:
10.01.20 SERIAL_INA2:
10.01.21 SERIAL_INA3:
10.01.22 SERIAL_OUT:
10.01.23 SERIAL_OUTA1:
10.01.24 SERIAL_OUTA2:
10.01.25 SERIAL_OUTA3:
10.01.26 SERIAL_LEDS:

5.4.12. 11 CUSTOM MAP - 3rd level menu

11.01 SETTINGS	
11.01.01	CustomVar1
11.01.02	CustomVar2
11.01.03	CustomVar3
	…
11.01.119	CustomVar119
11.01.120	CustomVar120

5.4.13. 12 COMMANDS - 3rd level menu

12.01 COMMANDS M	
12.01.01	Power mode
12.01.02	Software On/Off
12.01.03	Reset AL1…AL8
12.01.04	Reset PF alarms
12.01.05	HB calib
12.01.06	Calibrated feedback

6. ACCESSORIES

Code		Description
F049095	**GF_eXK-2-0-0**	GF_eXpress software on CD-ROM, USB/485/TTL converter complete with cables for connection to PC, Geflex, GTF, GFW and instrument.
F068952	**GFW/GPC**	Programming panel for GFW/GPC Power Controllers. LCD display 5 lines by 21 characters, keypad for recalling and setting parameters. Attachment to GFW/GPC-M via magnetic plate.
F032861	**CV4-03**	Cable L = 0.3 m for Modbus serial connection (RJ10) (local bus).
F032862	**CV4-1**	Cable L = 1 m for Modbus serial connection (RJ10) (local bus).
F032863	**CV4-2**	Cable L = 2 m for Modbus serial connection (RJ10) (local bus).
F032864	**CV4-5**	Cable L = 5 m for Modbus serial connection (RJ10) (local bus).

GEFRAN

GEFRAN spa
via Sebina, 74
25050 Provaglio d'Iseo (BS) Italy
Tel. +39 0309888.1
Fax +39 0309839063
info@gefran.com
http://www.gefran.com