



PROGRAMMING MANUAL

CONFIGURATION AND

Software version: 1.0x

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This document supplements the following manuals: - Instructions and warnings for GFW

ATTENTION!

This manual is an integral part of the product, and must always be available to operators.

This manual must always accompany the product, including if it is transferred to another user.

Installation and/or maintenance workers MUST read this manual and scrupulously follow all of the instructions in it and in its attachments. **GEFRAN** will not be liable for damage to persons and/or property, or to the product itself, if the following terms and conditions are disregarded.



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INTRODUCTION

The modular power controller described in this manual and shown on the cover is a separate unit for the independent control of a maximum of 3 zones. It offers high applicative flexibility thanks to the extended configurability and programmability of its parameters.

Instrument configuration and programming must be performed with a Keypad or a PC connected in USB/RS232/ RS485, with specific GF_eXpress application software.

Since it is impossible to foresee all of the installations and environments in which the instrument may be applied, adequate technical preparation and complete knowledge of the instrument's potentials are necessary.



GEFRAN declines all liability if rules for correct installation, configuration, and/or programming are disregarded, as well as all liability for systems upline and/or downline of the instrument.

FIELD OF USE

The modular power controller is the ideal solution for applications in heat treatment furnaces, in thermoformers, in packaging and packing machines and, in general, in standard temperature control applications. Nevertheless, because it is highly programmable, the controller can also be used for other applications provided they are compatible with the instrument's technical data.

Although the instrument's flexibility allows it to be used in a variety of applications, the *field of use* must always conform to the limits specified in the technical data supplied.



GEFRAN declines all liability for damage of any type deriving from installations, configurations, or programmings that are inappropriate, imprudent, or not conforming to the technical data supplied.

Prohibited use

It is absolutely prohibited:

- to utilize the instrument or parts of it (including software) for any use not conforming to that specified in the technical documentation supplied;

- to modify working parameters inaccessible to the operator, decrypt or transfer all or part of the software;

- to utilize the instrument in explosive atmospheres;

- to repair or convert the instrument using non-original replacement parts;

- to utilize the instrument or parts of it without having read and correctly understood the technical documentation supplied;

- to scrap or dispose of the instrument in normal dumps; components that are potentially harmful to the environment must be disposed of in conformity to the regulations of the country of installation.

CHARACTERISTICS OF PERSONNEL

All *personnel operating*, installing, or doing maintenance on the instrument must be expert, trained, aware and mature, able to reliably and correctly interpret this manual.

This manual CANNOT make up for cultural or intellectual insufficiencies. Therefore, all personnel interacting with the instrument must:

- have adequate education, training, and skills;

- be completely aware of what he/she is doing;

- NOT act in an intentionally self-destructive manner.

All personnel must always use proper methods, instruments, and protective devices to work under safe conditions.



It is forbidden to employ untrained personnel, persons with disabilities, legally disqualified persons, persons who are not sober, or persons who take drugs.

STRUCTURE OF THIS MANUAL

This manual was originally written in ITALIAN. Therefore, in case of inconsistencies or doubts, request the original manual or explanations from GEFRAN.

The instructions in this manual do not replace the safety instructions and the technical data for installation, configuration and programming applied directly to the product or the rules of common sense and safety regulations in effect in the country of installation.

For easier understanding of the controller's basic functions and its full potentials, the configuration and programming parameters are grouped according to function and are described in separate **chapters**.

Each chapter has from 1 to 3 sections:

- the first section presents a general description of the parameters described in detail in the following zones;

- the second section presents the parameters needed for the controller's **basic applications**, which users and/or installers can access clearly and easily, immediately finding the parameters necessary for quick use of the controller;

- the third section (ADVANCED SETTINGS) presents parameters for advanced use of the controller: this section is addressed to users and/or installers who want to use the controller in special applications or in applications requiring the high performance offered by the instrument.

Some sections may contain a functional diagram showing interaction among the parameters described;

- terms used on other pages of the manual (related or supplemental topics) are shown in underlined italics and listed in the index (linked to IT support).

In each section, the programming parameters are shown as follows:

Main Modbus address and additional addresses (if any). Any second / third Modbus addresses are alternatives to the main address. The presence of the asterisk pear the main address indicates that the parameter is available for every zone: th

The presence of the asterisk near the main address indicates that the parameter is available for every zone; the lack indicates that the parameter is total to the device.

		Mnem	ionic code	e (if a	רy)									
				R rea	ad only (re	ead) and/or W	(write) at	tribute						
						Description								
								Supple	emental	data and/o	or informat	ion on the	e parameter	
								Settir	g limits				Default va	lue
40 21 - 29)0* 9 - 143	Ł	уP.	R/W	Type of pr	obe, signal, enable	e, custom	-999 Scale	999 points	Supplement	al data and/or Format	information		1000
										0 1 2	XXXX XXX.X XX.XX (*)			
						Supplemental da	ata and/or		Supplem	ental data and	d/or informatio	on		
						mornau								
								Unless and re	s indicate present	ed otherwi 16 bit wor	se, these ds.	paramete	ers are in decin	al format
		Functi	on											
68 bit	D	STATE	E PUT 1	R/W	OF	F = Digital input 1 F = Digital input 1	off on	These	parame	eters are re	presented	l in 1 bit f	ormat.	

INSTRUMENT ARCHITECTURE

The modular power controller's flexibility permits replacement of previous-version such as GEFLEX (GFX), GFX4 and GFX4-IR instruments without changing the control software in use.

Based on the chosen work mode (see MODBUS SERIAL COMMUNICATION), you can use the instrument in 2 different modes:

- GFX compatible mode: as if there were at most 3 separate instruments (recommended for retrofitting projects and/ or replacement of damaged instruments);

- GFX4/GFW mode: as a single instrument with the same functions as at most 3 separate instruments, but with possibility of interaction among the various parameters, inputs and outputs (recommended for new projects).

New shared parameters, are accessible for both modes and permit more advanced functions such as:

604 FLEZ R/W Digital filter for auxiliary input		0.0 20.0 sec		0.	.1
---	--	--------------	--	----	----

In addition to having a CUSTOM group of parameters for dynamic addressing, GFX4/GFW mode lets you use a single communication network node instead of 3 nodes as in GFX compatible mode.



When programming, keep in mind that some of the addresses (parameters) described in this manual exist at most 3 times, specified by address node (ID).





SERIAL COMMUNICATION (MODBUS)

There are two Modbus addressing modes for variables and configuration parameters:

- GFX compatible
- GFX4/GFW
- The modes are selected with dip-switch-7.

GFX-compatible mode (dip-switch-7 =ON)

This lets you uses supervision programs created for Geflex modules.

- Memory is organized in at most 3 groups:
- Zone 1 for the variables of the module GFW-M
- Zone 2 for the variables of the module GFW-E1
- Zone 3 for the variables of the module GFW-E2

In each zone, the variables and parameters have the same address as a Geflex instrument; the value (Cod) set on the rotary switches corresponds to that of Zone 1; the values in the other zones, if expansions are present, are sequential.

Examples:

if the rotary switches have value 14, node 14 addresses Zone 1 (GFW-M), node 15 Zone 2 (GFW-E1), node 16 Zone 3 (GFW-E2). The power Ou.P for Zone 1 has address Cod 2, the Ou.P for Zone 2 has address Cod+1, 2, etc... Parameter out.5, which defines the function of output OUT 5 on the GFW, has address Cod 611.

GFX4/GFW mode (dip-switch-7=OFF)

This lets you optimize the efficiency of serial communication by integrating at most 3 zones in the GFW. Memory is organized in 4 groups: 3 already in GFX-compatible mode, plus one group defined as custom:

- Custom (additional memory map for dynamic addresses)
- Zone 1 for the variables of the module GFW-M
- Zone 2 for the variables of the module GFW-E1
- Zone 3 for the variables of the module GFW-E2

The custom group contains variables and parameters for a maximum of 120 words. The meaning of these words can be changed.

There is a single value (Cod) set on the rotary switches; i.e., one for each GFX4/GFW instrument. To access the data in each zone, simply add an offset to the address (+1024 for Zone 1, +2048 for Zone 2, +4096 for Zone 3).

Words in the custom group have addresses 0,...,119. The variables and parameters are defined by default. At addresses 200,...,319 we have words containing the value of the address of the corresponding variables or parameters. These addresses can be changed by the user, offering the ability to read/write data with multi-word messages structured according to various supervision requirements.

Protection of Maps 1-2 You have to write the value 99 on addresses 600 and 601 to enable change of the custom group (addresses 200... 31). This value is reset at each switch-on.



you can access the Ou.P variable in Zone 1 with address Cod, 1+1024 or address Cod, 11 custom variable 12 (address Cod, 211 has value 2+1024):

you can access the Ou.P variable in Zone 2 with address Cod, 2+ 2048 or address Cod, 40 custom variable 41 (address Cod, 240 has value 2+2048);

if you want to read the 3 powers in sequence at the first 3 addresses, set Cod, 200 = 1026, Cod.201 = 2050, Cod,202 = 4098.

CONNECTION

Each GFW has an optically isolated serial port RS485 (PORT 1) with standard Modbus protocol via connectors J8 and J9 (type RJ10).

You can insert a serial interface (PORT 2). There are various models based on the field bus required: Modbus, Profibus DP, CANopen, DeviceNet and Ethernet.

This communication port (PORT 2) has the same Cod address as PORT 1.

The parameters for PORT 2 are bAu.2 (select baud-rate) and Par.2 (select parity).

The Cod parameter (read only) shows the value of the node address, settable from 00 to 99 with the 2 rotary switches; the hexadecimal settings are reserved.

A parameter can be read or written from both communication ports (PORT 1 and PORT 2).



Changing the bR⊔ (select baud-rate) and/or PRr (select parity) parameters may cause communication failure.

To set the bAu and PAr parameters, you have to run the Autobaud procedure described in the "Instruction and warnings" manual.

Installation of the "MODBUS" serial network

A network typically has a Master that "manages" communication by means of "commands" and Slaves that interpret these commands.

GFW are considered Slaves to the network master, which is usually a supervision terminal or a PLC.

They are positively identified by means of a node address (ID) set on the rotary switches (tens + ones).

GFW have a ModBus serial (Serial 1) and optional Fieldbus (Serial 2) serial (see order code) with one of the following protocols: ModBus, Profibus, CANopen, DeviceNet, Ethernet, EtherCAT and EthernetIP.

The following procedures are indispensable for the Modbus protocol.

For the remaining protocols, see the specific Geflex Profibus, Geflex CANopen, Geflex DeviceNet, Geflex Ethernet, GFX4-EtherCAT and GFX4-ETH1 manuals.

GFW modules have the following default settings:

- node address = 0(0+0)
- speed Serial 1 = 19200 bit/s
- parity Serial 1 = none
- speed Serial 2 = 19200 bit/s

- parity Serial 2 = none

You can install a maximum of 99 GFW modules in a serial network, with node address selectable from "01" to "99" in standard mode, or create a mixed GFW / GFX4 network in GFX compatible mode in which each GFW identifies 3 zones with sequential node address starting from the code set on the rotary switches.

In short, the valid rotary switch settings (tens + ones) are:

- (0 +0) = Autobaud Serial 1

- (B +0) = Autobaud Serial 2

46	Cod	R	Device identification code	1 99	
45	6Ru	R/W	Select Baudrate - Serial 1	Baudrate table	4
626	68u.2	R/W	Select Baudrate - Serial 2	0 1200 bit/s 1 2400 bit/s 2 4800 bit/s	4
				3 9600 bit/s 4 19200 bit/s 5 38400 bit/s 6 57600 bit/s 7 115200 bit/s	
47	PRr	R/W	Select parity - Serial 1	Parity table	0
627	PRr.2	R/W	Select parity - Serial 2	0 No parity 1 Odd 2 Even	0

INPUTS

ANALOG INPUT

The modular power controller has a analog input with the functionality power retransmission.

Probe type

573	EP.R	R/W	analog input		Table of analog input	1
				0 1 2 3 4	Disable 0 10V 0 5V/Potentiometer 0 20mA	

Scale limits

574	L <u>5</u> .8	R/W	Minimum scale limit analog input	-100,0200,0	0,0
575	H <u>S</u> R	R/W	Maximum scale limit analog input	LS.A200,0	100,0

Offset adjustment

577	oF <u>5</u> .R	R/W	Offset correction for analog input	-99,999,9	0,0	

Read state

572 Infl R Value of the ingegrand	neristico reading input
-----------------------------------	----------------------------

ADVANCED SETTINGS



MAIN INPUT PID

The modular power controller has one main input (IN1) to control, to which you can connect temperature sensors (thermocouples and RTD), linear sensors or custom sensors to acquire process variable (PV) values. These type of input is optional.

To configure, you always have to define the type of probe or sensor (tYP), the maximum and minimum scale limit (Hi.S – Lo.S) for the process variable value, and the position of the <u>decimal point</u> (dP.S).

If the sensor is a thermocouple or resistance thermometer, the minimum and maximum limits can be defined on the specific scale of the sensor. These limits define the width of the proportional control band and the range of values settable for the setpoint and alarm setpoints.

There is a parameter to correct the offset of the input signal (oF.S): the set value is algebraically added to the read of the process variable.

You can read the state of the main input (Err) in which an input error is reported: when the *process variable* goes beyond the upper or lower scale limit, it assumes the value of the limit and the corresponding state reports the error condition: Lo = process variable < minimum scale limit

Hi = process variable > maximum scale limit

Err = Pt100 in short circuit and input value below minimum limit,

4...20mA transmitter interrupted or not powered

Sbr = Tc probe interrupted or input value above maximum limit

If noise on the main input causes instability of the acquired value, you can reduce its effect by setting a low pass digital filter (Flt). The default setting of 0.1sec is usually sufficient.

You can also use a *digital filter* (Fld) to increase the apparent stability of the process variable PV; the filter introduces a hysteresis on its value: if the input variation remains within the set value, the DPV value is considered unchanged.

Probes and sensors

	TC S Type 0 1 2 3 4 5 6 7 8 9 9 28 29 28 29 28 29	ENSOR TC J TC J TC J TC K TC K TC K TC R TC R TC R TC R TC S TC S TC T TC T TC T TC T TC T	Scale °C °F °C °F °C °F °C °F °C °F custom custom	Without dec. point 0/1000 32/1832 0/1300 32/2372 0/1750 32/3182 0/1750 32/3182 -200/400 -328/752 custom	With de 0.0/99 32.0/99 0.0/99 32.0/99 32.0/99 0.0/99 32.0/99 -199.9/4	ec. point 9.9 9.9 9.9 9.9 9.9 9.9 9.9 9.9 9.9 9.
	Type 0 1 2 3 4 4 5 6 7 8 9 28 29 28 29 28 29	Type of probe TC J TC J TC K TC R TC R TC S TC T TC T TC T TC T TC T TC T TC T	Scale °C °F °C °F °C °F °C °F °C °F °C °F °C °F °C °F °C °C °F °C °F °C °C °F °C °C °F °C °C °C °C °C °C °C °C °C °C	Without dec. point 0/1000 32/1832 0/1300 32/2372 0/1750 32/3182 0/1750 32/3182 -200/400 -328/752 custom	With de 0.0/99 32.0/99 0.0/99 32.0/99 32.0/99 0.0/99 32.0/99 0.0/99 32.0/99	ec. point 9.9 99.9 99.9 99.9 99.9 99.9 99.9 99.
	1 2 3 4 4 5 6 6 7 7 8 8 9 28 29 28 29 28 29	TCJ TCK TCK TCR TCR TCS TCS TCT TCT TC TC	°F °C °F °C °F °C °F °C °F custom custom	32/1832 0/1300 32/2372 0/1750 32/3182 0/1750 32/3182 -200/400 -328/752 custom	32.0/99 0.0/99 32.0/99 0.0/99 32.0/99 0.0/99 32.0/99 -199.9/4	99.9 99.9 99.9 99.9 99.9 99.9 99.9 99.
	2 3 4 5 6 7 7 8 9 9 28 29 28 29 5 EN: Ture	TCK TCR TCR TCS TCS TCT TCT TC TC TC	°C °F °C °F °C °F °C °F custom custom	0/1300 32/2372 0/1750 32/3182 0/1750 32/3182 -200/400 -328/752 custom	0.0/99 32.0/99 0.0/99 32.0/99 32.0/99 32.0/99 -199.9/4	99.9 99.9 9.9 99.9 9.9 9.9 9.9 9.9
	4 5 6 7 7 8 9 9 28 29 28 29 5 EN: Ture	TCR TCR TCS TCS TCT TCT TCT TC TC	°C °F °C °F °C °F custom custom	0/1750 32/3182 0/1750 32/3182 -200/400 -328/752 custom	0.0/99 32.0/99 0.0/99 32.0/99 32.0/99 -199.9/4	9.9 99.9 9.9 9.9 99.9
	5 6 7 8 9 9 28 29 SEN	TC R TC S TC S TC T TC T TC T TC TC	°F °C °F °C °F custom custom	32/3182 0/1750 32/3182 -200/400 -328/752 custom	32.0/99 0.0/99 32.0/99 -199.9/4	99.9 9.9 99.9
	0 7 8 9 28 29 SEN: Type	TC S TC T TC T TC T TC TC	°F °C °F custom custom	32/3182 -200/400 -328/752	32.0/99	9.9 99.9
	8 9 28 29 SEN: Type	TC T TC T TC TC TC	°C °F custom custom	-200/400 -328/752	-199.9/4	100.0
	9 28 29 SEN	TC T TC TC	°F custom custom	-328/752		
	28 29 SEN: Type	TC TC	custom custom	custom	-199.9/7	′52.0
	29 SEN Type		Custom	oustom	custo	m
	SEN			custom	Cusio	m
	Type	SOR: RTD 3-wires				
	30	e Type of probe PT100	Scale °C	Without dec. point -200/850	With de	c. point
	31	PT100	°F	-328/1562	-199.9/9	99.9
	32	JPT100	°C	-200/600	-199.9/6	00.0
	33	JPT100	°F	-328/1112	-199.9/9	199.9
	SEN	SOR: 60mV voltage	1			
	Туре	e Type of probe	Scale	Without dec. point	With de	c. point
	34	060 mV	Linear	Custom linearization	Custom line	arization
	36	1260 mV	Linear	-1999/9999	-199.9/9	999.9
Г	37	1260 mV	Linear	Custom linearization	Custom line	arization
Maximum error of non linearity for thermocouples (Tc), resistance thermor	meter (PT100)	SOR: 20mA current	:			
	Туре	e Type of probe	Scale	Without dec. point	With de	c. point
Tc type:	38	020 mA	Linear	-1999/9999	-199.9/9	99.9
J, K error < 0.2% f.s.	39	020 mA	Linear	Custom linearization	Custom line	arization
S, R range 01750°C: error < 0.2% f.s. (t > 300°C) For other ranges: error < 0.5% f.s.	40	420 mA	Linear	Custom linearization	Custom line	arization
T error < 0.2% f.s. (t > -150°C)						
And incerting a system linearization	SEN	SOR: 1V voltage				
F N I error <0.2% f s	Туре	Type of probe	Scale	Without dec. point	With de	c. point
B range 441800°C; error < 0.5% f.s. (t > 300°C)	42	01 V	linear	-1999/9999	-199.9/9	99.9
range 44.0999.9; error f.s.(t>300°C)		200 my. 1 V	linear	-1999/9999	-199 9/9	anzation 199.9
U range -200400; error < 0.2% f.s. (for t > -100°C) For other ranges: error <0.5% f.s.	45	200 mv1 V	linear	Custom linearization	Custom line	arization
G error < 0.2% f.s. (t > 300°C)						
D error < 0.2% f.s. (t > 200°C)	SEN	SOR: Custom				
C range 02300; error < 0.2% f.s.	Туре	Type of probe	Scale	Without dec. point	With de	c. point
1 01 00161 ranges, en01 < 0.3 % 1.5.		Cust 20mA	-	-1999/9999 Custom linearization	-199.9/9 Custom line	199.9 arization
JPT100 and PT100 error < 0.2% f.s.	47	Cust. 20mA	-	-1999/9999	-199.9/9	anzauon 999.9
	49	Cust. 60mV	-	Custom linearization	Custom line	arization
The error is calculated as deviation from theoretical value with % ref	ference 50	PT100-JPT	-	custom	custo	m
to the full-scale value expressed in degrees Celsius (°C).	00	Input off				

403	dP.S	R/W	Decimal point position for input scale	Decimal point table	
Specifies the nu example, 875.4	umber of decimal figu (°C) with dP.S = 1.	ires use	d to represent the input signal value: for	Format 0 xxxx 1 xxx.x 2 xx.xx (*) 3 x.xxx (*) (*) Not available for TC, RTD probes	

Scale limits

401	Lo.S	R/W	Minimum scale limit of main input	minmax scale	0
Engineering valu connected to the	e associated to mini input: for example 0	mum lev (°C) with	vel of the signal generated by the sensor type K thermocouple.	in tyP	
402	H (5	R/W	Maximum scale limit of main input	minmax scale	1000
Engineering valu connected to the	e associated to max input: for example 13	imum le 300 (°C)	vel of the signal generated by the sensor with type K thermocouple.	in tyP	

Setting the offset

519 23	oF 5.	R/W	Offset correction for main input		-999999 scale points	0
Lets you set a va the input sensor.	23 OF 5. R/W Offset correction for main input Lets you set a value in scale points that is algebraically added to the value measured by the input sensor. Image: Correction for main input					

0

Read state

0 470	P.V.	R	Read of engineering value of process variable (PV)		
85	Err	R	Self-diagnostic error code of main input		Error code table
	For custom lineari - LO is signaled w calibration value. - HI is signaled wi calibration value.	zation (1 ith input th input	YP = 28 or 29): values below Lo.S or at minimum values above Lo.S or at maximum		0 No Error 1 Lo (process variable value is < Lo.S)
349	DPV R Read of engineering value of process variable (PV) filtered by FLd				

ADVANCED SETTINGS

Input filters

24	FLE RW Low pass digital filter on input signal		Low pass digital filter on input signal		0.0 20.0 sec	0,1
Sets a low pass specified time in	iets a low pass <u>digital filter</u> on the main input, running the average value read in pecified time interval. If = 0 exclude the average filter on the sampled values. 179 FLd R/W Digital filter on oscillations of input signal					
179 FLd R/W Digital filter on oscillations of input signal					0 9.9 scale points	0,5
Introduces a hysi unchanged, ther	179 FLd R/W Digital filter on oscillations of input signal ntroduces a hysteresis zone on the input signal value within which the signal is considered unchanged, thereby increasing its apparent stability.					

Linearization of input signal

The modular power controller lets you set a custom linearization of the signal acquired by the main input for signals coming from sensors and for signals coming from custom thermocouples.

Linearization is performed with 33 values (S00 ... S32: 32 segments).

S33, S34, S35 are an additional 3 values to be inserted in case of linearization with custom CT.

- Signals from sensors

For signals coming from sensors, linearization is done by dividing the input scale into 32 zones of equal dV amplitude, where:

dV = (full-scale value - start of scale value) / 32

Point 0 (origin) corresponds to the engineering value attributed to the minimum value of the input signal. Subsequent points correspond to the engineering values attributed to input values equal to:

Input value (k) = Minimum input value + k * dV

where k is the order number of the linearization point



The engineering values calculated in this way by the user can be set by means of the following parameters.

86	5.00	R/W	Engineering value attributed to Point 0 (minimum value of input scale)	(- 1999 9999)
87	5.0 1	R/W	Engineering value attributed to Point 1	(- 1999 9999)
		RW Point 1 intermediate values		
118	5.32	R/W	Engineering value attributed to Point 32 (maximum value of input scale)	(- 1999 9999)



For correct signaling of error state (Lo, Hi), the value set in S.00 must coincide with limit Lo.S and the value set in S.32 with limit Hi.S.

- Signals coming from custom thermocouples

An alternate linearization is available only for sensors consisting of custom thermocouples, created by defining engineering values at three measurement scale points settable with the following parameters:

293	5.33	R/W	Engineering value attributed to minimum value of the input scale.		mV start of scale (- 19,99 99,99)
294	5.34	R/W	Engineering value attributed to maximum value of the input scale.		mV full scale ((S.33+1) 99,99)
295	5.35	R/W	Engineering value attributed to input signal corresponding to 50°C.		mV at 50° C (- 1,999 9,999)

FUNCTIONAL DIAGRAM





N.B. The decimal point does not change the contents of the PV, but only permits its correct interpretation.

Ex.: if dP.S = 1 and PV = 300, the engineering value in °C is 30.0.

CURRENT VALUE IN LOAD

The RMS current value is read in variable Ld.A of each zone. If zone 1 has a 3-phase load, variable Ld.At contains the average value of the three RMS currents. The Ld.A of the first three zones contain the RMS current value on lines L1, L2 and L3, respectively.. Accuracy is better than 1% in start modes ZC, BF and HSC. Accuracy is better than 3% in PA mode with conduction angle >90°, and better than 10% for lower conduction angles.

The circulating current in the load is acquired with a 0.25ms sampling time.

In addition, there are the following parameters for a zone with single-phase load:

I.tA1 instantaneous ammeter value

I.AF1 filtered ammeter value (see Ft.tA)

I1on current with active control

o.tA1 ammeter input offset correction

Ft.tA ammeter input digital filter

There are also the following parameters if zone 1 has a three-phase load:

I.tA1, I.tA2 and I.tA3 instantaneous ammeter value on line L1, L2 and L3

I.AF1, I.AF2 and I.AF3 filtered ammeter value (see Ft.tA) on line L1, L2 and L3

11on, 12on and 13on current with active control

o.tA1, o.tA2 and o.tA3 ammeter input offset correction on line L1, L2 and L3

Ft.tA ammeter input digital filter

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

The condition POWER FAULT in OR with HB alarm can be assigned to an alarm or identified in the state of a bit in variables STATUS, STATUS1, STATUS2 and STATUS3.

In STATUS3 you can identify the condition that activated the POWER_FAULT alarm.

POWER_FAULT diagnostics is configurable with parameter hd.2, with which even just a part may be enabled

SSR SHORT SSR module in short circuit NO VOLTAGE power failure or interrupted fuse NO CURRENT due to SSR module open or fuse or load interrupted

For alarm HB (load partially interrupted), refer to the specific section of this manual.

The default value of the maximum limit or ammeter full-scale depends on the model:

MODEL	H.tA
40A	80,0
60A	120,0
100A	200,0
150A	300,0
200A	400,0
250A	500,0

Scale limits

746*	LERI	R	Minimum limit of CT ammeter input scale (phase1)	
747	L.E.R.2	R	Minimum limit of CT ammeter input scale (phase 2)	With 3-phase load
748	L.ER3	R	Minimum limit of CT ammeter input scale (phase 3)	With 3-phase load
405*	HERI	R	Maximum limit of CT ammeter input scale (phase 1)	
]	
413	HF85	R	Maximum limit of CT ammeter input scale (phase 2)	With 3-phase load
	L			
414	HER3	R	Maximum limit of CT ammeter input scale (phase 3)	With 3-phase load

Setting the offset

220	o <u></u> £81	R/W	Offset correction CT input (phase 1)		-99.999.9 scale points		0,0 zone 1	0,0 zone 2	0,0 zone 3
415	o.£82	R/W	Offset correction CT input (phase 2)		-99.999.9 scale points	With 3-phase load			
				5]		
416	o.£83	R/W	(phase 3)		scale points	With 3-phase load			

Read state

227* 473 - 139 - 756	IER I	R	Instantaneous CT ammeter input value (phase 1)		
490 494	IF85	R	Instantaneous CT ammeter input value (phase 2)		With 3-phase load
491 495	1£83	R	Instantaneous CT ammeter input value (phase 3)		With 3-phase load
468*	l Ion	R	CT filtered ammeter input value with output activated (phase 1)		
498	l2on		CT filtered ammeter input value with output activated (phase 2)		With 3-phase load
				_	
499	(3on	R	CT filtered ammeter input value with output activated (phase 3)		With 3-phase load
				=	
709*	12on 1.3on 1.8P		Peak ammeter input during phase softstart ramp		
716*	co5,F	R	Power factor in hundredths		
753*	LdR	R	Current RMS on load		
754	LdRE	R	Current RMS on 3-phase load		

ADVANCED SETTINGS

Input filter

219*	FLLA	R/W	<u>CT input digital filter</u>		0.0 20.0 sec	0,1 zone 1	0,1 zone 2	0,1 zone 3
Sets a low pass t specified time int	Sets a low pass filter on the CT auxiliary input, running the average of values read in the specified time interval. If = 0, excludes the average filter on sampled values.							

FUNCTIONAL DIAGRAM

Monophase load



FUNCTIONAL DIAGRAM

Threephase load



(*) with BI-PHASE command the Ld.A value of zone 3 is gained like average of the Ld.A values of zones 1 and 2

VOLTAGE VALUE ON LOAD

RMS voltage is read in variable Ld.V of each zone. If zone 1 has a 3-phase load, variable Ld.V.t in the first zone contains the average RMS value of voltages on three load L1, L2 and L3.

Voltage on the load is acquired with sampling on each cycle, 20ms at 50Hz (16.6ms at 60Hz). Accuracy is better than 1%. If the option VLOAD is not present, the Load RMS voltage value is calculated from the line voltage and from the output power values.

Read state

751*	Ld.U	R	Voltage on load	
752	LdUE	R	Voltage on 3-phase load (*)	

if the option VLOAD is present there are available the following parameters:

Scale limit

439*	L.E.VL	R	Minimum limit of TV_LOAD voltmeter input scale	
443*	HEVL	R	Maximum limit of TV_LOAD voltmeter input scale	

Setting the offset

444*	o.EVL	R/W	Offset correction for TV_LOAD input		-99.999.9 scale points		0,0 zona 1	0,0 zona 2	0,0 zone 3
------	-------	-----	--	--	---------------------------	--	---------------	---------------	---------------

ADVANCED SETTINGS

Input filter

442*	FE.EVL	R/W	Digital filter for voltmeter transformer TV_LOAD input	0,020,0 sec	0,1 zona 1	0,1 _{zona 2}	0,1 zone 3

FUNCTIONAL DIAGRAM

Single-Phase Load without VLOAD option



Single-Phase Load with VLOAD option



FUNCTIONAL DIAGRAM

Three-Phase Load without VLOAD option



Three-Phase Load with VLOAD option



LINE VOLTAGE VALUE

There are the following parameters if zone 1 has a single-phase load:

- I.tV1 instantaneous voltmeter value of line
- I.VF1 filtered voltmeter value
- o.tV1 voltmeter input offset correction
- Ft.tV voltmeter input digital filter

There are the following parameters if zone 1 has a 3-phase load:

I.tV1, I.tV2 and I.tV3, the instantaneous voltmeter value on line L1, L2 and L3, respectively.

RMS voltage values refer to voltage between 1/L1 and 3/L2 terminals.

I.VF1, I.VF2 and I.VF3 filtered voltmeter value on line L1, L2 and L3

o.tV1, o.tV2 and o.tV3 voltmeter input offset correction on line L1, L2 and L3.

Each phase has a voltage presence check that shuts off the module in case of incorrect values.

3-phase loads have an imbalance diagnostic, with consequent shut-down of the load and signal via LEDs.

A "voltage status" parameter contains information on the status of line voltage, including mains frequency identified 50/60Hz.

3-phase loads have diagnostics for correct phase connection, lack of a voltage, or imbalance of the three line voltages.

Scale limits

453*	LEV I	R	Minimum limit of TV voltmeter input scale (phase1)		
454	L:EV2	R	Minimum limit of TV voltmeter input scale (phase 2)		With 3-phase load
455	55 LEVB		Minimum limit of TV voltmeter input scale (phase 3)		With 3-phase load
410*	HEV I	R	Maximum limit of TV voltmeter input scale (phase 1)		
417	17 HEV2		Maximum limit of TV voltmeter input scale (phase 2)		With 3-phase load
418	HEV3 F		Maximum limit of TV voltmeter input scale (phase 3)		With 3-phase load

Setting the offset

411*	o.EU I	R/W	Offset correction for TV input (phase 1)	-99.999.9 Scale points		0,0 zone 1	0,0 zone 2	0,0 zone 3
419	o.EU2	R/W	Offset correction for TV input (phase 2)	-99.999.9 Scale points	With 3-phase load	0,0		
420	o.EU3	R/W	Offset correction for TV input (phase 3)	-99.999.9 Scale points	With 3-phase load	0,0		

Read state

232* 485	1.EU 1	R	Value of voltmeter input (phase 1)	
492	1505	R	Value of voltmeter input (phase 2)	With 3-phase load
493	IEU3	R	Value of voltmeter input (phase 3)	With 3-phase load
322*	WF I	R	Value of voltmeter input (phase 1)	
496	96 (UF2 R		Value of voltmeter input (phase 2)	With 3-phase load
497	WF 3	R	Value of voltmeter input (phase 3)	With 3-phase load
702		R	Voltage Stutus	Table Voltage Status
				bit 0 frequency_warning 1 10% umbalanced_line_warning 2 20% umbalanced_line_warning 3 30% umbalanced_line_error 4 rotation 123_error 5 triphase_missing_line_error 6 60Hz
315*	FrE9	R	Voltage frequency in tenths of Hz	

ADVANCED SETTINGS

Input filter

412*	FŁŁU	R/W	Digital filter for voltmeter transformer TV input		0.0 20.0 sec.	2,0 zone 1	2,0 zone 2	2,0 zone 3
Sets a low pass filter on the auxiliary TV input, running the average of values read in the specified time interval. If = 0 , excludes the average filter on sampled values.								

FUNCTIONAL DIAGRAM

Single-phase load



FUNCTIONAL DIAGRAM

3-phase load



POWER ON LOAD

Power on the load in each zone is read in variable Ld.P and the corresponding energy value in variables Ld.E1 and Ld.E2. These energy values show the value accumulated since the first power on or since the last reset (commands at bits 114 and 115); non-volatile memory is updated at power off.

Load impedance in each zone is read in variable Ld.I.

If zone 1 has a 3-phase load, variable Ld.P.t shows power and Ld.I.t total impedance, the corresponding energy value in variables Ld.E1.t and Ld.E2.t.

Note that for loads such as IR lamps, impedance can vary greatly based on the power transferred to the load.

719*	LdP	R	Power on load	
720	Ld.P.E	R	Power on load 3-phase	
749*	Ld. I	R	Impedance on load	
750	Ld. lE	R	Impedance onload 3-phase	
531*	Ld.El	R	Energy on load	Data in DWORD (32 bit) format
541	L d.E. I.E	R	Energy on 3-phase load	Data in DWORD (32 bit) format
510*	L d.E 2	R	Energy on load	Data in DWORD (32 bit) format
541	Ld.E2.E	R	Energy on 3-phase load	Data in DWORD (32 bit) format
114* bit	Azzeramento	R/W	OFF = - ON = Reset Ld.E1	
115* bit	Azzeramento	R/W	OFF = - ON = Reset Ld.E2	

FUNCTIONAL DIAGRAM

Single-phase load



FUNCTIONAL DIAGRAM

3-phase load



(*) with BI-PHASE command the Ld.A value of zone 3 is gained like average of the Ld.A values of zones 1 and 2



AUXILIARY ANALOG INPUTS (LIN/TC)

The GFW has 4 inputs defined as auxiliary (IN2 for zone 1, IN3 for zone 2, IN4 for zone 3, IN5 for zone 4) to which TC or linear temperature sensors can be connected. The presence of these inputs is optional

Input values are available in variables In.2/In.3/In.4/In.5 and can be read or used to activate assigned alarm signals.

When an auxiliary input is present, you have to define the following parameters:

- sensor type (AI.2, AI.3, AI.4, AI.5);
- _ its function (tP.2); (only for IN2 input)
- decimal point position (dP.2, HS.3 LS.3, HS.4 LS.4, HS.5 LS.5);
- scale limits (HS.2 LS.2);
- offset correction value (oFS.2, oFS.3, oFS.4, oFS.5).

If the sensor is a thermocouple, the minimum and maximum limits can be defined in the specific scale of the sensor used. The range of values settable for alarm setpoints depends on these limits.

There is also a digital filter (Fit.2, Fit.3, Fit.4, Fit.5,) that can be used to reduce noise on the input signal.

194	R (2	R/W	Select type of auxiliary sensor input 2		Auxiliary inputs sensors table					
553	R (3	R/W	Select type of auxiliary sensor input 3	Туре	Type of probe or sensor	Without dec. point	With dec. point	0		
				0	TC J °C	0/1000	0.0/999.9	-		
554 Я ! Ч	DAA		1	TC J °F	32/1832	32.0/999.9				
	R/W	Select type of auxiliary sensor input 4	2	TC K °C	0/1300	0.0/999.9	0			
				3	TC K °F	32/2372	32.0/999.9	L		
				4	TC R °C	0/1750	0.0/999.9			
555	815	R/W	Select type of auxiliary sensor input 5	5	TC R °F	32/3182	32.0/999.9	0		
				6	TC S °C	0/1750	0.0/999.9			
				7	TC S ° F	32/3182	32.0/999.9			
				8	TC T °C	-200/400	-199.9/400.0			
				9	TC T °F	-328/752	-199.9/752.0			
				34	060 mV	-1999/9999	-199.9/999.9			
				35	060 mV	Custom linearization	Custom linearization			
				36	1260 mV	-1999/9999	-199.9/999.9			
				37	1260 mV	Custom linearization	Custom linearization			
				99	Input off					

Input off

181	£ <i>P.</i> 2	R/W	Definition of auxiliary analog input function		Table of auxiliary input functions							
				tP.2	Auxiliary input function	LIMITS FOR SETTIN	G the LS.2 and HS.2 max					
				0	None	-1999	9999					
				1	Remote setpoint	Absolute Lo.S, deviation -999	Absolute Hi.S, deviation +999	(*)				
				2	Manual analog remote	-100.0%	+100.0%	(*)				
				3	Reset analog power	-100.0%	+100.0%	(**)				
				8	analogic remote manual from main input			(*)				
				16	remote manual from analogic input			(*)				
				32	remote manual from			(*)				
					(*) see	e: Settings – Control Se	etpoint]				
					(**) se	e: Controls –PID Parar	neters					

	Decimal point table	0
0	Format xxxx	0
1 2 3	XXX.X XX.XX (*) X.XXX (*)	0
(*) not ava	ilable for TC probes	0

677	dP.2	R/W	Decimal point position for the auxiliary input scale 2				
568	dP.3	R/W	Decimal point position for the auxiliary input scale 3				
569	dP.4	R/W	Decimal point position for the auxiliary input scale 4				
570	dP.5	R/W	Decimal point position for the auxiliary input scale 5				
Specifies the number of decimal figures used to represent the input signal value: for example, 875.4 (°C) with dP.S: = 1							

Scale limits

404	L 5.2	R/W	Minimum limit of auxiliary input scale 2	Minmax input scale selected in AI.2 and tP.2	0
556	L 5.3	R/W	Minimum limit of auxiliary input scale 3	Minmax input scale selected in AI.3	0
557	L <u>5.</u> 4	R/W	Minimum limit of auxiliary input scale 4	Minmax input scale selected in AI.4	0
558	L 5.5	R/W	Minimum limit of auxiliary input scale 5	Minmax input scale selected in AI.5	0
603	H5.2	R/W	Maximum limit of auxiliary input scale 2	Minmax input scale selected in AI.2 and tP.2	1000
559	H5.3	R/W	Maximum limit of auxiliary input scale 3	Minmax input scale selected in AI.3	1000
560	<u>Н5.</u> Ч	R/W	Maximum limit of auxiliary input scale 4	Minmax input scale selected in Al.4	1000
561	H5.5	R/W	Maximum limit of auxiliary input scale 5	Minmax input scale selected in AI.5	1000

Setting the offset

605	oF5.2	R/W	Offset for auxiliary input correction 2	-999999 Scale points	0
565	oF 5.3	R/W	Offset for auxiliary input correction 3	-999999 punti scala	0
566	oF 5.4	R/W	Offset for auxiliary input correction 4	-999999 punti scala	0
567	oF 5.5	R/W	Offset for auxiliary input correction 5	-999999 punti scala	0

Read state

602	In.2	R	Value of auxiliary input 2	
547	ln.3	R	Value of auxiliary input 3	
548	In.4	R	Value of auxiliary input 4	
549	In.5	R	Value of auxiliary input 5	
606	Er.2	R	Error code for self-diagnosis of auxiliary input 2	Error code table
550	Er.3	R	Error code for self-diagnosis of auxiliary input 3	0 No error 1 Lo (value of process variable is < LS.x) 2 Hi (value of process variable is > HS.x)
551	Er.4	R	Error code for self-diagnosis of auxiliary input 4	2 Fin (value or process variable is > FIS.X) 3 ERR [third wire interrupted for PT100 or input values below minimum limits (ex.: for TC with connection error)] 4 SBR (recease interrupted or input values beyond maximum limits)
552	Er.S	R	Error code for self-diagnosis of auxiliary input 5	

ADVANCED SETTINGS

Input filter

604	FLE.2	R/W	Digital filter for auxiliary input 2
562	FLE.3	R/W	Digital filter for auxiliary input 3
563	FLE.4	R/W	Digital filter for auxiliary input 4
564	FLE.S	R/W	Digital filter for auxiliary input 5

0.0 20.0 sec	0.1
0.0 20.0 sec	0.1
0.0 20.0 sec	0.1
0.0 20.0 sec	0.1

Sets a low pass filter on the auxiliary input, running the average of values read in the specified time interval. If = 0 , excludes the average filter on sampled values.

FUNCTIONAL DIAGRAM



DIGITAL INPUTS

There are always three inputs. Each input can perform various functions based on the setting of the following parameters:

140	d 1G.	R/W	Digital input function	Digital input functions table) <u>Activation</u>
618	d 16.2	R/W	Digital input 2 function	0 No functions (input off) 1 MAN/AUTO controller 2 LOC / REM 3 HOLD 4 Al.1,, AL4 alarms memory reset 5 SP1 / SP2 selection 6 Software on/off 7 None 8 START / STOP Selftuning 9 START / STOP Autotuning 10 Power_Fault alarms memory reset 11 LBA alarm reset 12 AL1AL4 and Power_Fault alarms reset memory Image: State of the set 12 AL1AL4 and Power_Fault alarms reset 14 Reference calibration of retroaction selected by Hd.6 15 Calibration threshold alarm HB + 16 for inverse logic input + 32 to force logic state 0 (OFF) + 48 to force logic state 1 (ON) (*) For d ½ only (*) IN d ½ alternative to serial	On leading edge On leading edge On state On state On leading edge On leading edge On leading edge (**) On leading edge (**) On state On state On state
694	d 16.3	R/W	Digital input 3 function	Digital input 3 functions table	ט
	Read state			0 No functions (input off) 1 PWM input + 16 for inverse logic input	
68 S	TATE of DIGITAL INPUT 1	R	OFF = Digital input 1 off ON = Digital input 1 on		

67 bit STATE of DIGITAL INPUT 3 R OFF = Digital input 3 off ON = Digital input 3 on 317 R State of (INPUT_DIG) digital inputs bit.0 = stat bit.1 = stat bit.2 = stat				
317 R State of (INPUT_DIG) digital inputs bit.0 = state IND bit.1 = state IND bit.2 = state IND bit.2 = state IND	67 bit	STATE of DIGITAL INPUT 3	R	OFF = Digital input 3 off ON = Digital input 3 on
317 R State of (INPUT_DIG) digital inputs bit.1 = state INDIG bit.2 = state INDIG				1
	31	7	R	State of (INPUT_DIG) digital inputs
		_		

OFF = Digital input 2 off ON = Digital input 2 on

Functions related to digital inputs

R

- MAN / AUTO controller

STATE of DIGITAL INPUT 2

- LOC / REM
- HOLD

92

bit

- Reset memory latch
- Select SP1 / SP2
- Software OFF / ON
- START / STOP Selftuning
- START / STOP Autotuning
- Calibration of feedback reference
- Calibration of HB alarm setpoint

see SETTING THE SETPOINT see HOLD FUNCTION see GENERIC ALARMS AL1 .. AL4 see SETTINGS - Multiset see SOFTWARE SHUTDOWN see SELFTUNING see AUTOTUNING see FEEDBACK see HB ALARM

see AUTO/MAN CONTROL

USING A FUNCTION ASSOCIATED WITH DIGITAL INPUT AND VIA SERIAL

At power-on or on the leading edge of digital input 1 or 2, all zones assume the state set by the digital input. For each zone, this state can be changed by writing via serial.

The setting via serial is saved in eeprom (STATUS_W_EEP, address 698).

State A/B	Setting	Address for writing via serial			
	dIG. or dIG.2	Access at 16 bits	Access at 1 bit		
AUTO/MAN controller	1	word 305 bit 4	bit 1		
LOC/REM setpoint	2	word 305 bit 6	bit 10		
SP1/SP2 setpoint	5	word 305 bit 1	bit 75		
ON/OFF software	6	word 305 bit 3	bit 11		
STOP/START selftuning	8	word 305 bit 2	bit 3		
STOP/START autotuning(*) (**)	9	word 305 bit 5	bit 29		

(*) continuous or one-shot (**) only for zone 1 (GFW-M)



USING A FUNCTION OF DIGITAL INPUT 1 TO ENABLE AT SOFTWARE ON

Software ON can be configured either by enabling a digital input or by writing via serial. Enabling by digital input 1 (*d* 1^C) is common to all zones, whereas enabling via serial is specific for each individual zone.

The ON/OFF setting via serial is saved in eeprom (STATUS_W_EEP, address 698 bit 3) for resetting of the condition at the next hardware power-on; use parameter P.On.t. to force software always ON or software always OFF at next power-on.

	Setting	Address for writing via serial		
	dIG	Access at 16 bits	Access at 1 bit	
ON/OFF software	13	word 305 bit 3	bit 11	



ALARMS

GENERIC ALARMS AL1, AL2, AL3 and AL4

Four generic alarms are always available and can perform various functions. Typically, alarm AL.1 is defined as minimum and AL.2 as maximum.

These alarms are set as follows:

- select the reference variable to be used to monitor the value (parameters A1.r, A2.r, A3.r and A4.r): the origin of the variable can be chosen from the process variable PV (generally linked to the main input), the ammeter input, the voltmeter input, the auxiliary analog input, or the active setpoint.

- set the value of the alarm setpoint (parameters AL.1, AL.2, AL.3 and AL.4).

This value is used for comparison with the reference variable value: it can be absolute or indicate a shift from the variable in case of deviation alarm.

- set the hysteresis value for the alarm (parameters Hy.1, Hy.2, Hy.3 and Hy.4):

the hysteresis value defines a band for safe re-entry of the alarm condition: without this band, the alarm would be deactivated as soon as the reference variable re-entered the setpoint limits, with the possibility of generating another alarm signal in the presence of oscillations of the reference signal around the setpoint value.

- select alarm type:

- absolute/deviation: if the alarm refers to an absolute value or to another variable (for example, to the setpoint).

- direct/reverse: if the reference variable exceeds the alarm setpoint in the "same direction" as the control action or not. For example, the alarm is direct if the reference variable exceeds the upper setpoint value during heating or assumes values below the lower setpoint during cooling. In the same manner, the alarm is reverse if the reference variable assumes values below the lower setpoint during heating or exceeds the setpoint during cooling.

- normal/symmetrical: if band value is subtracted or added, respectively, to/from the upper and lower limit of the alarm setpoints or indicates a higher and lower band compared to the alarm setpoint.

- with/without disabling at switch-on: if you want to check the reference variable value at system switch-on or wait until the variable enters the control window.

- with/without memory: if the alarm signal persists even when the cause has been eliminated or stops when the variable returns to normal values.

The above concepts are better explained in the following figures:



For AL1 reverse absolute alarm (low) with positive Hyst1, AL1 t = 1 (*) = OFF if disabled at switch on

For AL2 direct absolute alarm (high) with negative Hyst2, AL2 t = 0



For AL1 = normal inverse deviation alarm with negative Hyst 1, AL1 t = 3 For AL1 = normal direct deviation alarm with negative Hyst 1, AL1 t = 2



For AL1 = symmetrical inverse absolute alarm with Hyst1, AL1 t = 5 For AL1 = symmetrical direct absolute alarm with Hyst1, AL1 t = 4 Minimum hysteresis = 2 scale points





Deviation alarm

Reference variables

215	R (r	R/W	Select reference variable alarm 1
216	82.r	R/W	Select reference variable alarm 2
217	8 <u>3</u> r	R/W	Select reference variable alarm 3
218	<i>ጸ</i> ዛ _፫	R/W	Select reference variable alarm 4

Table of alarm reference setpoints						
	Variable to be compared	Reference setpoint	l			
0	PV (process variable)	AL	(
1	in.tA1	AL	`			
	(In.tA1 OR In.tA2 OR In.tA3					
	WITH 3-PHASE LOAD)					
2	In.tV1	AL	(
	(In.tV1 OR In.tV2 OR In.tV3					
	WITH 3-PHASE LOAD)					
3	SPA (active setpoint)	AL (absolute only)	(
4	PV (process variable)	AL [deviation only and				
		referred to SP1				
		(with multiset function)				
5	In.2 auxiliary input	AL				
6	In.3 auxiliary input	AL				
7	In.4 auxiliary input	AL				
8	In.5 auxiliary input	AL				
9	In.A analg input	AL				
10	In.Pwm PWM input	AL				

N.B. for codes 1, 2, 5, 6, 7, 8, 9 and 10 the reference to the alarm is in scale points and not to the decimal point (dP.x)

Alarm setpoints

12 475 - 177	AL. I	R/W	Alarm setpoint 1 (scale points)	-19999999 Scale points	-999999 if alarm symetrical 0999 if alarm relative and symetrical	500
13 476 - 178	RL.2	R/W	Alarm setpoint 2 (scale points)	-19999999 Scale points	-999999 if alarm symetrical 0999 if alarm relative and symetrical	100
14 52 - 479	RL.3	R/W	Alarm setpoint 3 (scale points)	-19999999 Scale points	-999999 if alarm symetrical 0999 if alarm relative and symetrical	700
58 480	RL.4	R/W	Alarm setpoint 4 (scale points)	-19999999 Scale points	-999999 if alarm symetrical 0999 if alarm relative and symetrical	800

Alarms hysteresis

27 187	H <u>H</u> I	R/W	Hysteresis for alarm 1	± 999 Scale points	0999 sec. If +32 in A1.t 0999 min. If +64 in A1.t	- 1
30 188	H <u>7</u> 5	R/W	Hysteresis for alarm 2	± 999 Scale points	0999 sec. If +32 in A1.t 0999 min. If +64 in A1.t	- 1
53 189	HY.3	R/W	Hysteresis for alarm 3	± 999 Scale points	0999 sec. If +32 in A1.t 0999 min. If +64 in A1.t	- 1
59	<u>нч</u> ч	R/W	Hysteresis for alarm 4	± 999 Scale points	0999 sec. If +32 in A1.t 0999 min. If +64 in A1.t	- 1

Alarm type

406	R IE	R/W	Alarm type 1
407	82.E	R/W	Alarm type 2
408 54	83 <u>1</u>	R/W	Alarm type 3
409	RYE	R/W	Alarm type 4

Table of alarm behaviour								
	Direct (high limit) Inverse (low limit)	Absolute Relative to activfe setpoint	Normal Symmetrical (window)	0				
0	direct	absolute	normal					
1	inverse	absolute	normal					
2	direct	relative	normal	0				
3	inverse	relative	normal	L				
4	direct	absolute	symmetrical					
5	inverse	absolute	symmetrical	0				
6	direct	relative	symmetrical					
7	inverse	relative	symmetrical					
				1				

+ 8 to disable at switch-on until first setpoint
+ 16 to enable memory latch
+ 32 Hys becomes delay time for activation of alarm (0....999 sec.) (excluding absolute symmetrical)
+ 64 Hys becomes delay time for activation of alarm (0....999 min.) (excluding absolute symmetrical)
+ 136 to disable at switch-on or at change of setpoint until first setpoint
+ 256 only for alarms with memory and delay time: the delay time becomes a timed hysteresis (with time stopped in case of SBR condition: when SBR condition disappears the delay time starts counting from zero)

46	AL 1 direct/inverse	DAA	
bit	AL1 direct/inverse	R/W	
47 bit	AL1 absolute/relative	R/W	
48 bit	AL1 normal/symmetrical	R/W	
49 bit	AL1 disabled at switch-on	R/W	
50 bit	AL1 with memory	R/W	
54 bit	AL2 direct/inverse	R/W	
55 bit	AL2 absolute/relative	R/W	
56 bit	AL2 normal/symmetrical	R/W	
57 bit	AL2 disabled at switch-on	R/W	
58 bit	AL2 with memory	R/W	
36 bit	AL3 direct/inverse	R/W	
37 bit	AL3 absolute/relative	R/W	
38 bit	AL3 normal/symmetrical	R/W	
39 bit	AL3 disabled at switch-on	R/W	
40 bit	AL3 with memory	R/W	
70 bit	AL4 direct/inverse	R/W	
71 bit	AL4 absolute/relative	R/W	
72 bit	AL4 normal/symmetrical	R/W	
73 bit	AL4 disabled at switch-on	R/W	
74 bit	AL4 with memory	R/W	

Enable alarms

195*	RLn	R/W	Select number of enabled alarms		Table of enabled alarms						0 zone2	0 zone3
					1.1	Alarm 1	Alarm 2	Alarm 3	Alarm 4			
				0		disabled	disabled	disabled	disabled			
				1		enabled	disabled	disabled	disabled			
				2		disabled	enabled	disabled	disabled			
				3		enabled	enabled	disabled	disabled			
				4		disabled	disabled	enabled	disabled			
				5		enabled	disabled	enabled	disabled			
				6		disabled	enabled	enabled	disabled			
				7		enabled	enabled	enabled	disabled			
				8		disabled	disabled	disabled	enabled			
				9		enabled	disabled	disabled	enabled			
				10) (disabled	enabled	disabled	enabled			
				11	1	enabled	enabled	disabled	enabled			
				12	2 (disabled	disabled	enabled	enabled			
				13	3	enabled	disabled	enabled	enabled			
				14	1 (disabled	enabled	enabled	enabled			
				15	5	enabled	enabled	enabled	enabled			
				+ 16 to enable HB alarm + 32 to enable LBA alarm								

(*) For zone 2 (GFW-E1) and zona 3 (GFW-E2), AL.n defines enabling of only the HB alarm in mono-phase configuration.

140	d 1G.	R/W	Digital input function		Digital input functions table	0
618	d 16.2	R/W	Digital input function 2	0 No function (input off) 1 MAN /AUTO controller 2 LOC / REM 3 HOL D		0
				4 5 6 7 8 9 100 111 12 13 14 15	AL1,, AL4 latch alarm reset SP1 / SP2 selection Software on/off None START / STOP Selftuning START / STOP Autotuning Power_Fault latch alarm reset LBA alarm reset AL1AL4 and Power_Fault latch alarm reset Enable at software ON (*) Reference calibration of retroaction selected by Hd.6 Calibration threshold alarm HB + 16 for inverse logic input + 32 to force logic state 0 (OFF) + 48 to force logic state 1 (ON)	
				(*) For	d IG. only	

Reset memory latch

79 bit	Reset memory latch	R/W	

Read state

4	STATE of	R	OFF = Alarm off
bit	ALARM 1		ON = Alarm on
5	STATE of	R	OFF = Alarm off
bit	ALARM 2		ON = Alarm on

62	STATE of	R	OFF = Alarm off
bit	ALARM 3		ON = Alarm on
69	STATE of	R	OFF = Alarm off
bit	ALARM 4		ON = Alarm on
318	3*	R	State of alarms ALSTATE IRQ

States of alarm table bit 0 State AL.1 1 State AL.2 2 2 State AL.3 3 3 State AL.4 4 4 State AL.HB (if 3-phase or phase 1/2/3) or Power Fault 5 5 State AL.HB PHASE 1 (if 3-phase) 6 State AL.HB PHASE 2 (if 3-phase) 7 State AL.HB PHASE 3 (if 3-phase)

FUNCTIONAL DIAGRAM



LBA ALARM (Loop Break Alarm)

This alarm identifies incorrect functioning of the control loop due to a possible load break or to a short circuited or reversed probe.

With the alarm enabled (parameter AL.n), the instrument checks that in condition of maximum power delivered for a settable time (Lb.t) greater than zero, the value of the process variable increases in heating or decreases in cooling: if this does not happen, the LBA alarm trips. In these conditions, power is limited to value (Lb.P).

The alarm condition resets if the temperature increases in heating or decreases in cooling.

Enable alarm

195	5*	RLn	R/W	Select number of enabled alarms	see: Table of enabled alarms 3 Zone1			0 zone:	0 zone3
44		L b.E	R/W	Delay time for tripping of LBA alarm	0,0 500,0 min	If Lb.t = 0, the LBA alarm	is disabled		30,0
119)	LЪР	R/W	Limitation of power delivered in presence of LBA alarm	-100,0100,0 %				25,0
81 bit	Re	set LBA alarm	R/W						

Read state

8	STATE of LBA	R	OFF = LBA alarm off
bit	ALARM		ON = LBA alarm on

FUNCTIONAL DIAGRAM



HB ALARM (Heater Break Alarm)

This type of alarm identifies load break or interruption by measure the current delivered by means of a current transformer. The following three fault situations may occur:

- delivered current is lower than nominal current: this is the most common situation, and indicates that a load element is breaking.

- delivered current is higher than nominal current: this situation occurs, for example, due to partial short circuits of load elements.

- delivered current remains significant even during periods in which it should be zero: this situation occurs in the presence of pilot circuits for the short-circuited load or due to relay contacts soldered together. In these cases, prompt action is very important to prevent greater damage to the load and/or to the pilot circuits.

In standard configuration, output SSR is associated to heating control in zone 1, obtained by modulating electrical power with the ON/OFF control based on the set cycle time.

The current read performed during the ON phase identifies an anomalous shift from the rated value due to a load break (first two fault situations described above), while the current read performed during the OFF phase identifies a break in the control relay, with consequent output always active (third fault situation).

The alarm is enabled by means of parameter AL.n; select the type of function you want by means of parameter Hb.F:

Hb.F=0: alarm activates if the current load value is below the setpoint value set in A.Hbx while the SSR control output is ON. **Hb.F=1**: alarm activates if the current load value is above the setpoint value set in A.Hbx while the SSR control output is OFF. **Hb.F=2**: alarm activates by combining functions 0 and 1, considering the setpoint of function 1 as 12% of the ammeter full scale defined in H.tAx.

Hb.F=3 or **Hb.F=7** (continuous alarm): alarm activates due to a load current value below the setpoint value set in A.Hbx; this alarm does not refer to the cycle time and is disabled if the heating (cooling) output value is below 3%.

Setting A.Hbx = 0 disables both types of HB alarm by forcing deactivation of the alarm state.

The alarm resets automatically if its cause is eliminated.

An additional configuration parameter for each zone, related to the HB alarm is:

Hb.t = delay time for activation of HB alarm, understood as the sum of times for which the alarm is considered active.

For example, with:

- Hb.F = 0 (alarm active with current below setpoint value),

- Hb.t = 60 sec and cycle time of control output = 10 sec,

- power delivered al 60%,

the alarm will activate after 100 sec (output ON for 6 sec each cycle);

if power is delivered at 100%, the alarm will activate after 60 sec.

If the alarm deactivates during this interval, the time sum is reset.

The delay time set in Hb.t must exceed the cycle time of the SSR output.

If zone 1 has a 3-phase load, you can set three different setpoints for the HB alarm:

A.Hb1= alarm setpoint for line L1

A.Hb2= alarm setpoint for line L2

A.Hb3= alarm setpoint for line L3

FUNCTION: HB ALARM SETPOINT SELF-LEARNING

This function permits self-learning of the alarm setpoint.

To use this function, you first have to set parameter Hb.P, which defines the percentage of current compared to rated load below which the alarm trips.

The function can be activated via control from serial line, digital input (see parameter dIG or dIG.2) or by key.

When the Teach-in function is activated in modes ZC, BF and HSC, the RMS current value in conduction ON multiplied by parameter Hb.P determines the HB alarm setpoint.

When the Teach-in function is activated in mode PA, the existing RMS current value is shown at 100% of power, which, multiplied by parameter Hb.P, determines the HB alarm setpoint.

For IR lamps (see parameter Hd.5 option +128), the function activates automatic reading of the power/current curve useful for determining the HB alarm setpoint.

Automatic reading of the power/current curve takes place with the following sequence:

- softstart at maximum power (default 100%), 5 sec. delay

- reduction of power to 50%, 30%, 20%, 15%, 10%, 5%, 3%, 2%, 1%, between every value 5 sec. delay

- return to normal operation.

Maximum conduction value in this phase can be limited by means of the PS.Hi parameter.

Enable alarm

195*	8! 0	R/W	Select number of enabled alarms]	See:	3	0	0	
195	11611						zone1	zone2	zone3
57*	нь,F	R/W	HB alarm functions		Table of HB alarm functions		0 zone1	0 zone2	0 zone3
Default: SINGLE-PHASE LOAD: each A.HbX refers to its respective phase. 2-PHASE LOAD: single reference setpoint A.Hb1 and OR between phases 1, 2 and phases 3, 4. 3-PHASE LOAD: single reference setpoint A.Hb1 and OR among phases 1, 2 and 3. + 8 HB reverse alarm + 16 relates to single setpoints and singled phases WITH 3-PHASE LOAD 56* Hb.Ł R/W Delay time for activation of HB alarm			Val. Description 0 Relay, logic set point for 1 Relay, logic set point for 2 Alarm activu (OR logic bu 3 Continuous 7 Continuous (*) minimum setpo	of functions output: alarm active at a load current control output ON time. output: alarm active at a load current control output OFF time. e if one of functions 0 and 1 is active etween functions 0 and 1) (*) heating alarm cooling alarm cooling alarm bint is set at 12% of ammeter full scale The value must exceed the cycle time of the output to which the HB alarm is associated.	value belov value abov	v e zone2	5 zone3		
112* bit	alarm setpoint for zone	R/W	OFF = Calibration not enabled ON = Calibration enabled		NB: In case o A.Hb2, A.H	f 3-phase load, you can set a differen lb3 for each zone (ex.: to control an u	t value for p nbalanced 3	arameter A 3-phase loa	.Hb1, ad).
-	Alarm setpoin	ts							
55*	<i>R</i> ,нь I	R/W	HB alarm setpoint (scale points amme- ter input - Phase 1)				10,0 zone1	10,0 zone2	10,0 zone3
502	Я.ньг	R/W	HB alarm setpoint (scale points amme- ter input - Phase 2)			With 3-phase load	10,0		
503	<i></i> Я, <i>н</i> ь 3	R/W	HB alarm setpoint (scale points amme- ter input - Phase 3)			With 3-phase load	10,0		
737*	Н <u>ь</u> Р	R/W	Percentage HB alarm setpoint of current read in HB calibration		0,0 100,0%		80,0 zone1	80,0 zone2	80,0 zone3
742*	Hb <u>F</u> R	R/W	CT read in HB calibration				0,0 zone1	0,0 zone2	0,0 zone3
452*	H₽FΛ	R/W	TV read in HB calibration				0,0 zone1	0,0 zone2	0,0 zone3
743*	Hb.Pw	R/W	Ou.P power in calibration				0,0 zone1	0,0 zone2	0,0 zone3
758*	Ir ERO	R/W	HB Calibration with IR lamp: current at 100% conduction				0,0 zone1	0,0 zone2	0,0 zone3
759*	Ir.ER.I	R/W	HB Calibration with IR lamp: current at 50% conduction				0,0 zone1	0,0 zone2	0,0 zone3
760*	Ir.ER2	R/W	HB Calibration with IR lamp: current at 30% conduction				0,0 zone1	0,0 zone2	0,0 zone3
761*	Ir.E.R.3	R/W	HB Calibration with IR lamp: current at 20% conduction				0,0 zone1	0,0 zone2	0,0 zone3
767*	Ir.£8,4	R/W	HB Calibration with IR lamp current at 15% conduction				0,0 zone1	0,0 zone2	0,0 zone3
768*	Ir.ER.S	R/W	HB Calibration with IR lamp current at 10% conduction				0,0 zone1	0,0 zone2	0,0 zone3
769*	Ir.ER.6	R/W	HB Calibration with IR lamp (only in mode PA): current at 5% conduction				0,0 zone1	0,0 zone2	0,0 zone3
382*	Ir £ ጺ ገ	R/W	HB Calibration with IR lamp (only in mode PA): current at 3% conduction				0,0 zone1	0,0 zone2	0,0 zone3
383*	Ir.£R.8	R/W	HB Calibration with IR lamp (only in mode PA): current at 2% conduction				0,0 zone1	0,0 zone2	0,0 zone3
384*	Ir.ER.9	R/W	HB Calibration with IR lamp (only in mode PA): current at 1% conduction				0,0 zone1	0,0 zone2	0,0 zone3
445*	Ir.EV.O	R/W	HB Calibration with IR lamp: voltage at 100% conduction		0,0 zone1	0,0 zone2	0,0 zone3		
------	---------	-----	---	--	--------------	--------------	--------------		
446*	Ir.EV.I	R/W	HB Calibration with IR lamp: voltage at 50% conduction		0,0 zone1	0,0 zone2	0,0 zone3		
447*	Ir.EV.2	R/W	HB Calibration with IR lamp: voltage at 30% conduction		0,0 zone1	0,0 zone2	0,0 zone3		
448*	Ir.EV.3	R/W	HB Calibration with IR lamp: voltage at 20% conduction		0,0 zone1	0,0 zone2	0,0 zone3		
449*	Ir.EV.4	R/W	HB Calibration with IR lamp: voltage at 15% conduction		0,0 zone1	0,0 zone2	0,0 zone3		
450*	Ir.EV.5	R/W	HB Calibration with IR lamp: voltage at 10% conduction		0,0 zone1	0,0 zone2	0,0 zone3		
451*	Ir.EV.6	R/W	HB Calibration with IR lamp (only in mode PA): voltage at 5% conduction		0,0 zone1	0,0 zone2	0,0 zone3		
390*	Ir.EV.7	R/W	HB Calibration with IR lamp (only in mode PA): voltage at 3% conduction		0,0 zone1	0,0 zone2	0,0 zone3		
391*	Ir.EV.B	R/W	HB Calibration with IR lamp (only in mode PA): voltage at 2% conduction		0,0 zone1	0,0 zone2	0,0 zone3		
392*	Ir.EV.9	R/W	HB Calibration with IR lamp (only in mode PA): voltage at 1% conduction		0,0 zone1	0,0 zone2	0,0 zone3		

Read state

744	1 *	Hbtr	R	HB alarm setpoint as function of power on load	
26* bit	HB A P	LARM STATE OR OWER_FAULT	R	OFF = Alarm off ON = Alarm on	
76* bit	76* State of HB alarm bit phase 1TA		R	OFF = Alarm off ON = Alarm on	
77 bit	St	ate of HB alarm phase 2TA	R	OFF = Alarm off ON = Alarm on	
78 bit	St	ate of HB alarm phase 3TA	R	OFF = Alarm off ON = Alarm on	
50	4		R	HB alarm states ALSTATE_HB (for 3-phase loads)	Table of HB alarm states
					bit 0 HB TA2 time ON 1 HB TA2 time OFF 2 HB alarm TA2 3 HB TA3 time OFF 4 HB TA3 time OFF 5 HB alarm TA3
512	<u>2</u> *		R	States of alarm ALSTATE (for single-phase loads)	Table of alarm states ALSTATE
					bit 4 HB alarm time ON 5 HB alarm time OFF 6 HB alarm
318	8*		R	State of alarms ALSTATE IRQ	States of alarm table
					bit 0 State AL.1 1 State AL.2 2 State AL.3 3 State AL.4 4 State AL.HB (if 3-phase or phase 1/2/3) or Power Fault 5 State AL.HB PHASE 1 (if 3-phase) 6 State AL.HB PHASE 2 (if 3-phase) 7 State AL.HB PHASE 3 (if 3-phase)

FUNCTIONAL DIAGRAM



NOTE:

the value of setpoint Hb.tr for the HB alarm is calculated in two different ways, depending on the selected function mode:



HB Calibration in modes ZC - BF - HSC



SBR - ERR ALARM (probe in short or connection error)

This alarm is always ON and cannot be deactivated. It controls correct functioning of the probe connected to the main

input.

In case of broken probe:

- the state of alarms AL1, AL2, AL3 and AL4 is set based on the value of parameter rEL;

- control power control is set to the value of parameter FAP.

Identification of the type of break detected on the main input is contained in Err.

Enable alarm

229	rEL	R/W	Fault action (definition of state in case	Table of probe alarm settings						
			of broken probe) Sbr, Err Only for main input	0 1 2 3	Alarm 1 OFF ON OFF ON	Alarm 2 OFF OFF ON ON	Alarm 3 OFF OFF OFF OFF	Alarm 4 OFF OFF OFF OFF		
				4 5 7 8 9 10 11 12 13 14	OFF ON OFF ON OFF ON OFF ON OFF	OFF OFF ON OFF OFF ON OFF OFF ON	ON ON ON OFF OFF OFF OFF ON ON ON	OFF OFF OFF ON ON ON ON ON ON ON		
		1		15	ON	ON	ON	ON		
228	FRP	R/W	Fault action power (supplied in conditions of broken probe)	-100,0100,	0 % se	ee: OTHER FU	NCTION		0,0	

Read state

85	85 Err		Error code in self-diagnostics of main input		See: Table of error codes
9 bit	STATE OF INPUT IN SBR	R	OFF = - ON = Input in SBR		

Power Fault ALARMS (SSR_SHORT, NO_VOLTAGE, SSR_OPEN and NO_CURRENT)

660*	hd.2	R/W	Enable POWER_FAULT alarms			Table of	Power Fault ala	ms_	0 zone1	0 zone2	0 zone3
						SSR_SHORT	NO_VOLTAGE	NO_CURRENT			
					0						
					1	Х					
				- 1	2		X				
				- 1-	3	X	Х				
				- 1	4	V					
				- 1	5 6	~	v				
				-	7	X	×				
				-	8	~	~	X			
				-	9	Х		X			
				-	10		Х	Х			
					11	Х	Х	Х			
				- 1	12			X			
				- 1	13	X	~	<u> </u>			
				- 1	14	Y	X	X X			
					10	^	^	^			
				+	32 a	larms with mer	mory				

667	1	dū.t	R/W	Refresh rate SSR_SHORT The alarm activates after 3 seconds.	1999 sec		10		
662	2*	dGF	R/W	Time filter for NO_VOLTAGE, SSR_ OPEN and NO_CURRENT alarms	099 sec	Set a value not less than cycle time	10 zone1	10 zone2	10 zone3
105* _{bit}	Reset SSI / NO_VO NO_CURRI	R_SHORT DLTAGE / ENT alarms	R/W						

Read state

96* bit	State of alarm SSR_SHORT phase 1	R	OFF = LBA alarm off ON = LBA alarm on	
97 bit	State of alarm SSR_SHORT phase 2	R	OFF = LBA alarm off ON = LBA alarm on	with 3-phase load
98 bit	State of alarm SSR_SHORT phase 3	R	OFF = LBA alarm off ON = LBA alarm on	with 3-phase load
99* bit	State of alarm NO_VOLTAGE phase 1	R	OFF = LBA alarm off ON = LBA alarm on	
100 bit	State of alarm NO_VOLTAGE phase 2	R	OFF = LBA alarm off ON = LBA alarm on	with 3-phase load
101 bit	State of alarm NO_VOLTAGE phase 3	R	OFF = LBA alarm off ON = LBA alarm on	with 3-phase load
102* bit	State of alarm NO_CURRENT phase 1	R	OFF = LBA alarm off ON = LBA alarm on	
103 bit	State of alarm NO_CURRENT phase 2	R	OFF = LBA alarm off ON = LBA alarm on	with 3-phase load
104 bit	State of alarm NO_CURRENT phase 3	R	OFF = LBA alarm off ON = LBA alarm on	with 3-phase load

Overheat alarm

Each power module has one temperature sensor for the internal heat sink and two additional temperature sensors connected to the LINE and LOAD terminals.

Temperature levels are shown in variables INNTC_SSR, INNTC_LINE and INNTC_LOAD.

The over_heat alarm trips when at least one of the temperatures exceeds a set threshold.

This condition may be caused by obstructed ventilation slits or by a stopped cooling fan.

With the over_heat alarm active, the control disables control outputs OUT1, OUT2 and OUT3.

There is an additional maximum temperature protection that hardware disables the SSR controls.

655*	R	INNTC_SSR	10,0120,0 °C	<u>Overheat alarm</u>
534*	R	INNTC_LINE	10,0120,0 °C	<u>Overheat alarm</u>
535*	R	INNTC_LOAD	10,0120,0 °C	<u>Overheat alarm</u>

OUTPUTS

The modular power controller has high flexibility in the assignment of functions to the physical outputs. As a result, the instrument can be used in sophisticated applications.

A function is assigned to each physical output in two steps: first assign the function to one of internal reference signals rL.1 .. rL.6, and then attribute the reference signal to parameters out.1 .. out.10 (corresponding to physical outputs OUT1 .. OUT10).

In standard configuration, physical outputs Out1, Out2, Out3 perform the heating control function (Heat) for zone 1, zone 2, and zone 3, respectively; value 0 (function HEAT) is assigned to reference signals rL.1 in each zone, and the following values to the output parameters: out.1=1 (output rL.1 zone 1), out.2=2 (output rL.1 zone 2), out.3=3 (output rL.1 zone 3).

Physical outputs Out5, Out6, Out7, Out8 are optional, and the type (relay, logic, continuous or triac) is defined by the order code. In standard configuration, these outputs perform the cooling control function (Cool) for zone 1, zone 2, and zone 3, respectively. In this configuration, value 1 (function COOL) is assigned to reference signals rL.2 in each zone, and the following values to the output parameters: out.5=5 (output rL.2 zone 1), out.6=6 (output rL.2 zone 2), out.7=7 (output rL.2 zone 3).

Relay outputs Out9 and Out10 are always present, programmable by means of parameters out.9 and out.10, to which available alarm signal functions are assigned by means of the four reference signals rL.3, rL.4, rL.5, rL.6 in each zone.

Standard configuration has the following assignments:

- reference signals: rL.3=2 (function AL1), rL.4=3 (function AL2), rL.5=4 (function AL3) and rL.6=5 (function AL.HB or PO-WER_FAULT with HB alarm).

- output parameters: out.9 =17 and out.10 =18.

In this way, the state of output physical Out9 is given by the logic OR of AL1, AL3 in each zone, and the state of output Out10 is given by the logic AND of AL2, AL.HB in each zone.

Each output can always be disabled by setting parameter out x = 0.

The state of outputs Out1,...,Out10 can be acquired by serial communication by means of bit variables.

The following additional configuration parameters are related to the outputs:

Ct.1 = cycle time for output rL.1 for heating control (Heat)

Ct.2 = cycle time for output rL.2 for cooling control (Cool)

rEL = alarm states AL1, AL2, AL3, AL4 in case of broken probe, Err, Sbr

ALLOCATION OF REFERENCE SIGNALS

						0	0	0
160*	r L. I	R/W	Allocation of reference signal		Table of reference signals	zona1	zona2	zona3
[)[]				Function		1	
163*	rL2	R/W R/W	Allocation of reference signal	0 1 2 3 3 4 5 6 6 7 8 9 9 10(0 111 12	Function HEAT (heating control output) / in case of continuous output 020mA / 010V COOL (cooling control output) / in case of continuous output 020mA / 010V AL1 - alarm 1 (*) AL2 - alarm 2 (*) AL3 - alarm 3 (*) AL4 OR TA2 OR TA3) (*) IN1 - repetition of logic input DIG1 (*) AL4 - alarm 4 (*) AL4 - alarm 4 (*) AL1 or AL2 (*) AL1 or AL2 or AL3 (*) AL1 and AL2 (*)	1 zona1	1 zona2	1 zona3
	εx.: Το assign DUT5, assign n han assign par	alarr L.1-Zo amet	n AL1 to physical output one1=2 (AL1-alarm 1) and er out.5=1 (rL.1-Zone1)	14 14 15 16 17 18 20 21 22 22 24 64 65 65 14 14 15 16 17 17 18 16 20 22 24 64 16 17 17 18 18 19 20 22 24 64 18 18 18 18 18 18 18 18 18 18 18 18 18	AL1 and AL2 and AL3 and AL4 (*) AL1 and AL2 and AL3 and AL4 (*) AL1 or AL. HB or POWER_FAULT with HB alarm (TA1 OR TA2 OR TA3) (*) AL1 or AL2 or (AL1 HB or POWER_FAULT) with HB alarm (TA1 OR TA2 OR TA3) (*) AL1 and (AL2 or (AL1 HB or POWER_FAULT) with HB alarm (TA1 OR TA2 OR TA3) (*) AL1 and (AL2 and (AL. HB or POWER_FAULT) with HB alarm (TA1 OR TA2 OR TA3) (*) AL1 HB - HB alarm (TA1 OR TA2 OR TA3) (*) AL. HB - HB alarm (TA3) Setpoint power alarm (*) AL. HB - HB alarm (TA1) POWER_FAULT POWER_FAULT POWER_FAULT (*) AL. HB - HB alarm (TA1) POWER_FAULT POWER_FAULT N2 - repetition of logic input DIG2 HEAT (heating control output) with fast cycle time 0.1 20.9esc. / in case of continuous output 420mA / 210V COCL (cooling control output) with fast cycle time 0.1 20.9esc. / in case of continuous output 420mA / 210V 2 for logic level denied in output 28 to force output to zero 17E: continuous COOL OUTPUTS can be assigned co 18 time fixed at 100 ms	odes 0, 1, 64	4 and 65 on	ly, with

(*) only for zone 1 (GFW-M)

(see: SETTINGS) (see: SETTINGS) (see: GENERIC ALARMS)

166*	rL.3	R/W	Allocation of reference signal
170*	rL.4	R/W	Allocation of reference signal
171*	r L.5	R/W	Allocation of reference signal
172*	r L.6	R/W	Allocation of reference signal

2	Function AL1 - alarm 1 (*)	2 zone1	2 zone2	2 zone3
3	AL2 - alarm 2 (*)			
4	AL3 - alarm 3 (*)	25	25	25
5	AL.HB or POWER_FAULT	35	35	35
	with HB alarm (TA1 OR TA2 OR TA3)	zonen	zone2	zone3
6	LBA - LBA alarm (*)	·		
7	IN1 - repetition of logic input INDIG1	4	4	4
8	AL4 - alarm 4 (*)	zone1	zone2	zone3
9	AL1 or AL2 (*)		201102	201100
10	AL1 or AL2 or AL3 (*)	100	100	100
11	AL1or AL2 or AL3 or AL4 (*)	160	160	160
12	AL1 and AL2 (*)	zone1	zone2	zone3
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 and (AL.HB or POWERFAULT)			
	with HB alarm (TA1 OR TA2 OR TA3) (*)			

19	AL.HB - HB alarm (TA2)	
20	AL.HB - HB alarm (TA3)	
21	Setpoint power alarm	(*)
22	AL.HB - HB alarm (TA1)	

23	POWER_FAULT
24	IN2 - repetition of logic input INDIG2

- + 32 for denied logic level at output + 128 to force output to zero

(*) state definite in zone 1 (GFW-M)

152* 9	E E. 1	R/W	OUT 1 (Heat) cycle time	1200 sec (0,120,0 sec)	Set 0 for BF/HSC function See POWER CONTROL	0 zone1	0 zone2	0 zone3
159*	C Ł.2	R/W	OUT 2 (Cool) cycle time	1200 sec (0,120,0 sec)		0 zone1	0 zone2	0 zone3

Read state

	308* 319		R	State of rL.x (MASKOUT_RL)		
--	-------------	--	---	----------------------------	--	--

	Table of signal reference states
bit	
0	State rL.1
1	State rL.2
2	State rL.3
3	State rL.4
4	State rL.5
5	State rL.6

12* bit	STATE rL.1	R	OFF = Signal off ON = Signal on
13* _{bit}	STATE rL.2	R	OFF = Signal off ON = Signal on
14* bit	STATE rL.3	R	OFF = Signal off ON = Signal on
15* _{bit}	STATE rL.4	R	OFF = Signal off ON = Signal on
16* _{bit}	STATE rL.5	R	OFF = Signal off ON = Signal on
17* bit	STATE rL.6	R	OFF = Signal off ON = Signal on

80963_M	ISW_C	GFW_	12-2011	_ENG
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80963_MSW_GFW_12-2011_ENG

ALLOCATION OF PHYSICAL OUTPUTS

607	out. I	R/W	Allocation of physical output OUT 1
608	out.2	R/W	Allocation of physical output OUT 2 (*)
609	out.3	R/W	Allocation of physical output OUT 3(**)
611	out.5	R/W	Allocation of physical output OUT 5
612	out.6	R/W	Allocation of physical output OUT 6
613	out.7	R/W	Allocation of physical output OUT 7
614	out.8	R/W	Allocation of physical output OUT 8
615	out.9	R/W	Allocation of physical output OUT 9
616	out. 10	R/W	Allocation of physical output OUT 10

	Table of output allocations	1
0	Output disabled	2
1	Output rL.1 zone 1	2
2	Output rL.1 zone 2	
3	Output rL.1 zone 3	3
5	Output rL.2 zone 1	Ŭ
6	Output rL.2 zone 2	
7	Output rL.2 zone 3	5
9	Output rL.3 OR rL.5 zone 1	Ŭ
10	Output rL.3 OR rL.5 zone 2	
11	Output rL.3 OR rL.5 zone 3	6
13	Output rL.4 AND rL.6 zone 1	
14	Output rL.4 AND rL.6 zone 2	_
15	Output rL.4 AND rL.6 zone 3	7
17	Output (rL.3 OR rL.5) zone 1zone 3	
18	Output (rL.4 AND rL.6) zone 1zone 3	q
+32	to reverse output status (only for Logic/Relay)	

 NOTE: In 3-phase configuration, the state of physical output OUT1 is copied to OUT2 and OUT3.
 17

 In case of auxiliary continuous outputs, the same output functions can not be used on other outputs.
 18

 Ex: If alls. i = 1 (out rL. i zone 1) it is not possible to set alls.5 with the same code, if alls.5 is continuous
 18

(*) available only with GFW-E1 present

(**) available only with GFW-E2 present

Read state

82 bit	State of output OUT1	R	OFF = Output off ON = Output on
83 bit	State of output OUT2	R	OFF = Output off ON = Output on
84 bit	State of output OUT3	R	OFF = Output off ON = Output on
86 bit	State of output OUT5	R	OFF = Output off ON = Output on
87 bit	State of output OUT6	R	OFF = Output off ON = Output on
88 bit	State of output OUT7	R	OFF = Output off ON = Output on
89 bit	State of output OUT8	R	OFF = Output off ON = Output on
90 bit	State of output OUT9	R	OFF = Output off ON = Output on
91 bit	State of output OUT10	R	OFF = Output off ON = Output on

664 R State of outputs (MASKOUT_OUT	664	R State of outputs (MASKOUT_OUT)
-------------------------------------	-----	----------------------------------

	Table of output state
bit	
0	OUT 1
1	OUT 2
2	OUT 3
4	OUT 5
5	OUT 6
6	OUT 7
7	OUT 8
8	OUT 9
9	OUT 10

FUNCTIONAL DIAGRAM



SETTINGS

The controller has the following setpoint controls.

SETTING THE SETPOINT

The active (control) setpoint (SPA) can be set by means of the local setpoint (SP) or the remote setpoint (SP.rS). A remote setpoint can assume the value of an auxiliary input or one set via serial line (SP.r).

The remote setpoint can be defined in absolute value or relative to the local setpoint; in the latter case, the control setpoint will be given by the algebraic sum of the set local and the remote setpoint.

Local setpoint

	138 16 - 472	SP	R/W	Local setpoint		Lo.H HI.L		0	
--	------------------------	----	-----	----------------	--	-----------	--	---	--

Remote setpoint

181	£ <i>P.</i> 2	R/W	Auxiliary analog input function	See: AUXILIARY ANALOG INPUT (LIN/TC)	0
	The remote setpoin input by enabling th	t can be e functic	set by means of the auxiliary analog in with parameter tP.2		
18 136 - 249	SPr	R/W	<u>Remote setpoint</u> (SET gradient for manual power correction)	Setpoint table Type of remote set Absolute/Relative 0 Digital (from serial line) Absolute 1 Digital (from serial line) Relative to local set (SP or SP1 or SI 2 Auxiliary input Absolute 3 Auxiliary input Relative to set (SP or SP1 or SP2) +4 set gradient in digit/sec. +8 manual power correction based on line voltage +16 disables saving of local setpoint SP +32 disables saving of local manual power (at switch-off, returns to last va saved)	0 2) ue
250	SERIAL_SP	R/W	Remote setpoint from serial line	Lo.H HI.L	0

Shared settings

25 20 - 28	5 - 142	LoL	R/W	Lower settable limit SP, SP remote	Lo.S Hi.S				0
	_								
21 - 29	o - 143	HUL	R/W	Upper settable limit SP, SP remote	Lo.S Hi.S				1000
10 bit	LC	DCAL/REMOTE	R/W	OFF = Enable local setpoint ON = Enable remote setpoint					
30	5*		R/W	State (STATUS_W)	1	able of state settings	0 zone1	0 zone2	0 zone3
					bit				
					0 -				
					1 Select SI	P1/SP2 (*)			
					2 Start/Sto 3 Select O				
					4 Select Al	JTO/MAN			

(*) only for zone1 (GFW-M)

Start/Stop Autotuning (*) Select LOC/REM (*)

Read active setpoint

1 137 - 481	SPR	R	Active setpoint
4		R	Deviation (SPA - PV)

SETPOINT CONTROL

Set gradient

The "Set gradient" function sets a gradual variation of the setpoint, with programmed speed, between two defined values. If this function is active (1.5P other than 0), at switchon and at auto/man switching the initial setpoint is assumed equal to the PV, and the local or selected set is reached with set gradient. Every variation of set, including variations of the local setpoint, is subject to the gradient.

The value of remote setpoint SP.rS is not saved in eeprom. The set gradient is inhibited at switch-on when selftuning is enabled.



234 22	6.SP	R/W	Set gradient		0.099 (digit /	99.9 digit / min sec see SP.r)		0,0
259	6.52	R/W	Set gradient relative to SP2		0.099 (digit /	99.9 digit / min sec see SP.r)		0,0
								1
265	Hot	R/W	Select special functions			Table of special functio	ns	0
					Enable	Fault action power if PV is not stabilized	Enable preheating softstart	
				0		FA.P		
				1	Х	Average power		
				2		FA.P		
				3	X	FA.P		
				4		FA.P	X	
				5	X	Average power	X	
				6		FA.P	X	
				-			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	

. ⊦8 enable GS.2

FA.P – see alarm for probe in short or connection error (SBR-ERR)

Multiset

The MULTISET function determines the local setpoint by selecting the value from Setpoint 1 (SP.1) or from Setpoint 2 (SP.2) based on the state of a digital input or by setting from a serial line.

The variation between Setpoint 1 and Setpoint 2 can take place with gradient: parameter G.SP determines the speed for reaching Setpoint 1 and parameter G.S2 defines the speed for reaching Setpoint 2.

The MULTISET function is enabled with parameter hd.1 and automatically enables the gradient function. Selection between Setpoint 1 and Setpoint 2 can be seen by means of LED.



191	hd. I	R/W	<u>Enable multiset:</u> control instruments via serial		Multis	et table	0
				hd.1 0 1 2 3	Enable Multiset X X	Enable virtual instrument X X	
230 482	5P. 1	R/W	Setpoint 1	Lo.H	1 HI.L		100
231 483	5P.2	R/W	Setpoint 2	Lo.H	1 HI.L		200

14	0	d 16.	R/W	Digital input function		See: Table of digital input functions			0
61	8	d 16.2	R/W	Digital input function 2		See: Table of digital input functions			0
75 bit		SELECT SP1 / SP2	R/W	OFF = Select SP1 ON = Select SP2]				
30	5*		R/W	State (STATUS_W)		Table of state settings	0 zone1	0 zone2	0 zone3
						bit			

(*) only for zone1 (GFW-M)

FUNCTIONAL DIAGRAM



CONTROLS

PID HEAT/COOL CONTROL

The controller can manage a heating output and a cooling output in a completely independent manner. Heating and cooling parameters are described below. Parameters for <u>PID</u> (proportional band, integral and derivative time) control are typically calculated by means of Autotuning and Selftuning functions.

Control actions

Proportional action:

action in which contribution to output is proportional to deviation at input (deviation = difference between controlled variable and setpoint

Derivative action:

action in which contribution to output is proportional to rate of variation input deviation.

Integral action:

action in which contribution to output is proportional to integral of time of input deviation.

Proportional, derivative, and integral action

Increasing the proportional band reduces oscillation but increases deviation.

Reducing the proportional band reduces deviation but causes oscillation of the controlled variable (excessively low proportional band values make the system unstable).

An increase in Derivative Action corresponds to an increase in Derivative Time, reduces deviation, and prevents oscillation up to a critical Derivative Time value, beyond which deviation increases and there are prolonged oscillations.

An increase in Integral Action corresponds to a decrease in Integral Time, tends to annul deviation between the controlled variable and the setpoint at rated operating speed.

If the Integral Time value is too long (weak Integral Action), there may be persistent deviation between the controlled variable and the setpoint.

For more information on control actions, contact GEFRAN.

Heat/cool control with separate or superimposed band

Output with separate band

Control output with only proportional action in case of proportional heating band separate from cooling band.



Output with superimposed band

Control output with only proportional action in case of proportional heating band superimposed on cooling band.



SP = heating setpoint h_Pb = heating proportional band

Heat/cool control with relative gain

This control mode (enabled with parameter Ctr = 14) asks you to specify cooling type. The <u>PID</u> cooling parameters are then calculated based on heating parameters in the ratio specified (ex: C.ME = 1 (oil), H_Pb = 10, H_dt = 1, H_It = 4 implies: C_Pb = 12.5, C_dt = 1, C_It = 4)

Apply the following values when setting cycle times:

Air T Cool cycle = 10 sec.

Oil T Cool cycle = 4 sec.

Water T Cool cycle = 2 sec.

NB.: Cool parameters cannot be changed in this mode.

PID Parameters

617*	SPU	R/W	Reference power		Table of selections	0 zone1	0 zone2	0 zone3
(**) function "sla - The reference zone in autor - The reference - Software shu	ve" zone e power of a slave zon matic or manual mode e power of a slave zon tdown remains indepe	ne in aut e. ne in ma endent fo	omatic mode is the power of a master nual mode is the zone manual power. r each zone.	SPU 0 1 2 3 4 5 6 7 9 10 11	Power from analog input (In.A) Power from main input (PV) Power from aux input (In.2) Power from aux input (In.3) Power from aux input (In.4) Power from PID (PID_POWER) (**) Power from GPU-M (FW_POWER) (**) Power from GFW-M (FW_POWER) (**) Power from GFW-E1 (FW_POWER) (**) Power from GFW-E1 (FW_POWER) (**)			

180	[Fr	R/W	Control type		Table of heat/cool controls	134
				Val 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14	Control type P heat P cool P heat / cool Pl heat Pl cool Pl heat / cool PlD heat / cool PID heat / cool ON-OFF heat ON-OFF heat / cool ON-OFF heat / cool ON-OFF heat + ON-OFF cool ON-OFF heat + PID cool PID heat + cool with relative gain (see parameter C.MEd)	
				Select +0 sar +16 sa +32 sa +64 sa +128 Note:	sample time for derivative action. mple 1 sec. ample 4 sec. ample 8 sec. ample 240 msec. No Reset of integral component at setpoint change the LBA alarm is not enabled in the ON/OFF control.	

5 148 - 149	አዖይ	R/W	Proportional band for heating or hyste- resis ON/OFF	0999,9% f.s.	1,0
7 150	h. lE	R/W	Integral heating time	0.0099,99 min	4,00
8 151	h.dt	R/W	Derivative heating time	0.0099,99 min	1,00
6	с.РЬ	R/W	Proportional band for cooling or hyste- resis ON/OFF	0999,9% f.s.	1,0
76	c. 1L	R/W	Integral cooling time	0.0099,99 min	4,00
77	c.dŁ	R/W	Derivative cooling time	0.0099,99 min	1,00

Note: Parameters c.PB, c.It and c.dt are read-only if heat/cool control is enabled with relative gain (Ctr = 14).

513	ЕЛЕ	R/W	Select cooling fluid	02			Relative gain (rG)	0	
					0	Air	1		
					1	Oil	0,8		
					2	Water	0,4		
F	lead state							1	
2* 132 - 471	Ou.P	R	<u>Value of control outputs</u> (+Heat / -Cool)	(W – only in manual mode at address 252)					

ADVANCED SETTINGS

39	c.SP	R/W	Cooling setpoint	±25.0% f.s.	7	0,0
484			Telative to heating selpoint			
78	r 5t	R/W	Manual reset (value added to PID input)	-999999 scale points		0
			I		7	
516	Pr5	R/W	<u>Reset power</u> (value added directly to PID output)	-100,00 100,0 %		0,0
	1	1			7	
79	Rr S	R/W	Antireset (limits integral action of PID))	09999 scale points		0
		ı			-	
80	FFd	R/W	Feedforward (value added to PID output after processing)	-100,00 100,0 %		0,0
	1	ı			-	
42 146	አዖአ	R/W	Maximum limit <u>heating power</u>	0.0100,0 %		100,0
					_	
254	<u> </u>	R/W	Minimum limit heating power (not available for double heat/cool	0.0100,0 %		0,0
			action)		-	
			Maximum limit		7	
43	с.Р.Н	R/W	cooling power	0.0100,0 %		100,0
		1			-	
255	c.P.L	R/W	Minimum limit cooling power (not availa- ble for double heat/cool action)	0.0100,0 %		0,0
			, ,,		-	
765*	P_PEr	R/W	Percentage of output power	0.0100,0 %	100,0 100,0 zone1 zone2	100,0 zone3
L	IL					
]]	<u> </u>			
766*	P.oFS	R/W	Offset of output power	-100,0100,0 %	0,0 0,0 zone1 zone2	0,0 zone3
763*	<u> Gout</u>	R/W	Gradient for control output	0,0 100,0 % set to ø to disable	0,0 0,0 zone1 zone2	0,0
L	IL					201100
[]	1	1				
764*	Lo.P	R/W	Minimum trigger output	0,050,0 %	0,0 0,0 zone1 zone2	0,0 zone3

FUNCTIONAL DIAGRAM



AUTOMATIC / MANUAL CONTROL

By means of the digital input function you can set the controller in MAN (manual) and set the control output to a constant value changeable by means of communication.

When returning to AUTO (automatic), if the variable is within the proportional band, switching is bumpless.

252*		R/W	MANUAL_POWER	-1	00,0100,0%		0,0 zone1	0,0 zone2	0,0 zone3
2 * 132 - 471	0u.P	R	<u>Value of control outputs</u> (+Heat / -Cool)		(W – only in manual n	node at address	252)		
140	d 1G.	R/W	Digital input function	See	: Table of digital input fund	ctions			0
618	5.JI b	R/W	Digital input function 2						0
1* bit	AUTO/MAN	R/W	OFF = Automatic ON =Manual						
305*		R/W	State (STATUS_W)		See: Table of state settin	gs	0 zone1	0 zone2	0 zone3

HOLD FUNCTION

The process variable value and the setpoints remain "frozen" for the time the digital input is active.

By activating the digital input with the Hold function when the variable is at values below the setpoint, a setpoint memory reset de-energizes all energized relays and resets all memory latches.

14	0	d 1G.	R/W	Digital input function	See: Table of digital input functions	0
61	8	d 16.2	R/W	Digital input function 2		0
64 bit		HOLD	R/W	OFF = Disable hold ON = Enable hold		

MANUAL POWER CORRECTION

With this function (available on models with CV diagnostics option), you can run a correction of power delivered in manual based on the reference line voltage (riF). The % value of the (Cor) is freely settable and acts in inverse proportion. The function is activated/deactivated by means of parameter SP.r.

Example: with the following settings: Cor = 10%; riF = 380; SP.r = value + 8; instrument in manual; line voltage 380 VAC, manual power set at 50%, following a 10% increase in line voltage, 380V + 10% (380V) = 418V, there is a decrease in set manual power equal to the same % of change: 50% - 10% (50%) = 45%.

To use this function, the controller must have a CT (current transformer) and a VT (voltage transformer).

N.B.: the % change in manual power is limited to the value set in parameter "Cor".

The maximum manual power correction is limited to \pm 65%.

505*	r IF	R/W	Line voltage		0.0999,9			0,0 zone1	0,0 zone2	0,0 zone3
	Compensation of th power at a constant	owpensation of the voltage transformer read to maintain output ower at a constant level.								
506*	Eor	R/W	Correction of manual power based on line voltage		0,0100,0 %			0,0 zone1	0,0 zone2	0,0 zone3
18 136 - 249	SP,r	R/W	<u>Remote setpoint</u> (SET gradient for manual power correction)		Type of r Digital (fr Digital (fr Auxiliary Auxiliary 44 set gradient in +8 correction of r +16 disable savir +32 disable savir saved)	Se emote set om serial line) om serial line) input digit/sec. nanual power bas g of local setpoin ng of local manua	Absolute/Deviation Absolute Deviation local set Absolute Deviation set (_SF Deviation set (_SF sed on line voltage t_SP al power (at switch-off	C (_SP o SP O SP1 o SI F returns to I	1 o SP2) P2) ast value	0

MANUAL TUNING

A) Enter the setpoint at its working value.

B) Set the proportional band at 0.1% (with on-off type setting). C) Switch to automatic and observe the behavior of the varia-

ble. It will be similar to that in the figure:

D) The PID parameters are calculated as follows: Proportional band

Peak P.B.= ----- x 100 V max - V min

(V max - V min) is the scale range.

Integral time It = $1,5 \times T$

Derivative time dt = It/4

E) Switch the controller to manual, set the calculated parameters (activate the PID control by setting a cycle time for relay outputs, if any), switch to automatic.

F) To assess parameter optimization, change the setpoint value if possible and check temporary behavior. If oscillation persists, increase the value of the proportional band; if response is too slow, decrease the value.



See: CONTROL - PID Parameters

AUTOTUNING

Enabling the autotuning function blocks the settings of the PID parameters.

Autotuning continues to measure the system oscillations, seeking as quickly as possible the PID parameter values that reduce the oscillation; it does not intervene if the oscillations drop to values below 1.0% of the proportional band. It is interrupted if the setpoint is changed, and resumes automatically with a constant setpoint. The calculated parameters are not saved; if the instrument is switched off the controller resumes with the parameters programmed before autotuning was enabled.

Autotuning terminates the procedures with switching to manual.

Enabling the autotuning function blocks the settings of the PID parameters. It can be two types: continuous or one shot.

Continuous autotuning is enabled with parameter Stu (values 1, 3, 5); it continues to measure the system oscillations, seeking as quickly as possible the PID parameter values that reduce the oscillation; it does not intervene if the oscillations drop to values below 1.0% of the proportional band.

It is interrupted if the setpoint is changed, and resumes automatically with a constant setpoint.

The calculated parameters are not saved if the instrument is switched off, in case of switching to manual or disabling the code in configuration, and controller resumes with the parameters programmed before autotuning was enabled.

The calculated parameters are saved when the function is enabled via digital input or via A/M key (start /stop) at stop.

One-shot autotuning can be activated manually or automatically with parameter Stu (as can be seen on the table, the values to be set depend on enabling of Selftuning or Softstart).

It is useful for calculating PID parameters when the system is in the vicinity of the setpoint; it produces a variation on the control output of a maximum of ± 100% of the current control power limited by h.PH - h.PL (heat), c.PH - c.PL (cool) and assesses the effects in overshoot over time. The calculated parameters are saved.

Manual activation (code Stu = 8, 10, 12) by setting the parameter directly or via digital input or key. Automatic activation (code Stu = 24, 26, 28 with error range of 0.5%) when the PV-SP error exceeds the defined range (programmable at 0.5%, 1%, 2%, 4% of full scale).

Activation is inhibited if PV <5% or PV >95% of input scale.

NB: at switch-on after selftuning, after switching to MANUAL, after software shutdown or after a setpoint change, automatic activation is inhibited for an interval equal to five times the integral time, with a minimum of 5 minutes. An identical interval has to lapse after a one-shot run.

See: CONTROL - PID Parameters

31	5.50	R/W	<u>Enable selftuning.</u> <u>autotuning, softstart</u>		<u>Selftuning, aut</u>	otuning, softstart ta	able	0
					Autotuning continuous	Selftuning	Softstart	
				0	NO	NO	NO	_
				1	YES	NO	NO	_
				2	NO	YES	NO	_
				3	YES	YES	NO	_
				4	NO	NO	YES	_
				5	YES	NO	YES	_
				6	Autotuning One-shot			_
				8*	WAIT	NO	NO	_
				9	GO	NO	NO	_
				10*	WAIT	YES	NO	_
				11	GO	YES	NO	_
				12*	WAIT	NO	YES	_
				13	GO	NO	YES	_
				(*) +16 with +32 with a +64 with a +128 with	h automatic switching in utomatic switching in GC utomatic switching in GC automatic switching in G	GO if PV-SP > 0.5) if PV-SP > 1% f.s) if PV-SP > 2% f.s ;O if PV-SP > 4% f.	% f.s. s.	

14	0	d 16.	R/W	Digital input function	See: Table of digital input functions	0
618		5.01 b	R/W	Digital input 2 function		0
29 bit		AUTOTUNING	R/W	OFF = Stop Autotuning ON = Start Autotuning		

Read state

28 bit	AUT	OTUNING STATE	R	OFF = Autotuning in Stop ON = Autotuning in Start	
68 bit	DI	GITAL INPUT 1	R	OFF = Digital input 1 off ON = Digital input 1 on	See: Table of digital input functions
92 bit	2 DIGITAL INPUT 2		R	OFF = Digital input 2 off ON = Digital input 2 on	
29	6		R	Autotuning and selftuning enable state (FLG_PID)	bit 3 Selftuning on
		<u></u>			4 Softstart on 6 Autotuning on

305*	R/W	State (STATUS_W)		Table of state settings	0 zone1	0 zone2	0 zone3
			bit 0 1 2 3 4 5 6	- Select SP1/SP2 (*) Start/Stop Selftuning (*) Select ON/OFF Select AUTO/MAN Start/Stop Autotuning (*) Select LOC/REM (*)			

(*) only for zone1 (GFW-M)

SELFTUNING

This function is valid for single-action (either heat or cool) systems and for double-action (heat/cool) systems.

Selftuning is activated to calculate the best control parameters when starting the process. The variable (example: temperature) must be the one assumed at zero power (room temperature).

The controller supplies the maximum power set until reaching an intermediate point between starting value and the setpoint, then resets power. The <u>PID</u> parameters are calculated by evaluating superelongation and the time needed to reach the peak (N.B.: This action is not considered in ON/OFF control).

When the function is completed, it disengages automatically, and the control proceeds to reach the setpoint.

Selftuning



The procedure runs automatically until termination. At termination, the new PID parameters are saved: proportional band, integral and derivative times calculated for the current action (heat or cool). In case of double action (heat + cool), the parameters for the opposite action are calculated by maintaining the initial ratio between the parameters (example: Cpb = Hpb * K; where K = Cpb / Hpb when selftuning is started). At termination, the Stu code is automatically cancelled.

Note: The procedure does not start if temperature exceeds the setpoint for heat control, or is below the setpoint for cool control. In this case, the Stu code is not cancelled. It is advisable to enable the LEDs to signal selftuning state. By setting parameter Ld.St = 4 on the Hrd menu, the appropriate LED will light up or flash when selftuning is active.

 see: CONTROLS - PID parameters

31	5.Eu	R/W	Enable selftuning. autotuning, softstart		<u>Selftuning, auto</u>	tuning, softstart tab	le_	0
					Autotuning continuous	Selftuning	Softstart	
				0	NO	NO	NO	
				1	YES	NO	NO	
				2	NO	YES	NO	
				3	YES	YES	NO	
				4	NO	NO	YES	
				5	YES	NO	YES	
				6	Autotuning One-shot			
				8*	WAIT	NO	NO	
				9	GO	NO	NO	
				10*	WAIT	YES	NO	
				11	GO	YES	NO	
				12*	WAIT	NO	YES	
				13	GO	NO	YES	
				(*) +16 wit +32 with a +64 with a +128 with	h automatic switching in utomatic switching in GC utomatic switching in GC automatic switching in G	GO if PV-SP > 0.5% 0 if PV-SP > 1% f.s. 0 if PV-SP > 2% f.s. O if PV-SP > 4% f.s	ó f.s.	
140	d 1G.	R/W	Function digital input	s	ee: Table of digital input	functions		0
618	d 16.2	R/W	Digital input 2 function					0
3 bit	SELFTUNING	R/W	OFF = Selftuning in Stop ON = Selftuning in Start					
305*		R/W	Instrument state (STATUS_W)		See: Table of	instrument settings		

Read state

0 bit	SELFTUNING STATE	R	OFF = Selftuning in Stop ON = Selftuning in Start	
68 bit	STATE OF DIGITAL INPUT 1	R	OFF = Digital input 1 off ON = Digital input 1 on	See: Table of digital input functions
92 bit	92 bit INPUT 2		OFF = Digital input 2 off ON = Digital input 2 on	
29	6	R	Autotuning and selftuning enable state (FLG_PID)	bit 3 Selftuning on 6 Autotuning on

SOFTSTART

If enabled, this function partializes power based on a percentage of time elapsed since instrument switch-on compared to the set time of 0.0 ... 500.0 min ("SoFt" parameter CFG phase). Softstart is an alternative to selftuning and is activated after each instrument switch-on. Softstart is reset when switching to manual.

tart
1
2
,
,
)
3
3
)
)
)
)
3
3

26	3	SP.5	R/W	<u>Softstart setpoint</u> (preheating hot runners)		100
30 bit	RES SOFT	START ISTART	R/W	OFF = ON = Restart of Softstart		

Read state

63 bit	STATE SOFTSTART	R	OFF = NO Active Softstart ON = Active Softstar
0.0			

START MODE

699*	P.ont	R/W	Start modes at Power-On	$\frac{0^*}{1}$	Function at previous state Software shutdown	0 zone1	0 zone2	0 zone3
				2	Software startup	-		

(*) digital input states always have priority

SOFTWARE SHUTDOWN

Running the software shutdown procedure causes the following:

- 1) Reset of Autotuning, Selftuning and Softstart.
- 2) Digital input enabled only if assigned to SW shutdown function.
- 3) In case of switch-on after SW shutdown, any ramp for the set (set gradient) starts from the PV.

4) Outputs OFF: except for signals them of reference rL.4 and rL.6 that they come forced ON

- 5) Reset of HB alarm.
- 6) Reset of LBA alarm.
- 7) The Heat and Cool bit on the state word STATUS and POWER are reset.
- 8) At shutdown, the current power is saved. At switch-on, integral power is recalculated as the difference between saved power and proportional power; this calculation is defined as "desaturation at switch-on."
- 9) In case of Geflex, the state of alarms (AL1...AL4, ALHBTA1...ALHBTA3) is reset.
- 9) Alarms AL 1... AL 4 can be enable or disable through the parameter oFF.t.



+16 restart softstart (if enabled) at software relaunch

Read state

68 bit	STATE of DIGITAL INPUT 1	R	OFF = Digital input 1 off ON = Digital input 1 on	See: Table of digital input functions	
92 bit	STATE of DIGITAL INPUT 2	R	OFF = Digital input 2 off ON = Digital input 2 on		
30	5*	R/W	Instrument (STATUS_W)	See: Table of state settings	0

OTHER FUNCTIONS

FAULT ACTION POWER

You can decide what power to supply in case of broken probe.

FAP is the reference power for parameter FAP.

Average power is the average power calculated in the last 300 sec.

The alarm reset and reference power update take place only at switch-on or after a setpoint change.

The alarm is not activated if the control (Ctr) is ON/OFF type, during Selftuning and in Manual.

265	Hot	R/W	Select special functions	See: Hot runners table - Setpoint Settings	0
228	FRP	R/W	Fault action power (supplied in conditions of broken probe)	-100,0 100,0 %	0,0

Read state

26*	STATE OF HB ALARM	R	OFF = Alarm off
_{bit}	OR POWER_FAULT		ON = Alarm on
80 bit	State of power alarm	R	OFF = Alarm off ON = Alarm on

POWER ALARM

The alarm signals any power changes (OuP) after the process variable (PV) has stabilized on the setpoint (SP). The time beyond which the process variable is considered stable is 300 sec.

The reference power update take place only at switch-on or after a setpoint change.

If the process variable leaves the stabilization band after the first stabilization, this does not influence the alarm. In case of SBR:

- if the PV has not yet stabilized, either the average power over the last 5 minutes or FAP power is supplied (depending on the setting of the HOT parameter).

- if the PV has stabilized the average power over the last 5 minutes is supplied.

Function:

If necessary, assign an output (rL.2...6) for the power alarm.

Set the band (b.ST) within which the process variable is considered stable after 300 sec. have elapsed.

Set the band (b.PF) outside which the alarm is activated after time PF.t has elapsed.

The reference power is the active power after 300 sec. have elapsed.

The alarm reset and reference power update take place only at switch-on or after a setpoint change.

The alarm is not activated if the control (Ctr) is ON/OFF type, during Selftuning and in Manual.



The parameters for alarm power are:

261	6.SE	R/W	<u>Stability band</u> (alarm power function)	0,0 100,0 % f.s.	0,0
262	Ь.PF	R/W	<u>Alarm power band</u> (alarm power function)	0,0100,0 %	0,0
260	PF <u>.</u> E	R/W	Delay time for alarm power activation	0999 sec	0
160*	rL.1	R/W	Allocation of reference signal	See: Generic alarms – Table of reference signals 0 zone1 zone	0 2 zone3
		1	1		
163*	rL.2	R/W	Allocation of reference signal	1 1 zone1 zone	2 zone3
166*	rL.3	R/W	Allocation of reference signal - OR Output	2 2 zone1 zone	2 2 zone3
170*	<u> ዮሬ.</u> ዓ	R/W	Allocation of reference signal - AND Output	35 35 zone1 zone	35 2 zone3
171*	rL.5	R/W	Allocation of reference signal - OR Output	4 4 zone1 zone	4 2 zone3
	1				
172*	r L.6	R/W	Allocation of reference signal - AND Output	160 160 zone1 zone) 160 2 zone3

SOFTSTART FOR PREHEATING

This function lets you deliver a settable power (So.P) for time (SoF), after which normal control is resumed by means of PID control.

Activation is only at switch-on, with manual-automatic switching during Softstart (the time restarts from 0), and if the process variable is below setpoint SP.S.



31	5.Eu	R/W	<u>Enable selftuning.</u> autotuning, softstart		<u>Selftuning, auto</u>	otuning, softstart ta	ble	0
					Autotuning continuous	Selftuning	Softstart	
				0	NO	NO	NO	
				1	YES	NO	NO	
				2	NO	YES	NO	
				3	YES	YES	NO	
				4	NO	NO	YES	
				5	YES	NO	YES	
				6	Autotuning One-shot			
				8*	WAIT	NO	NO	
				9	GO	NO	NO	
				10*	WAIT	YES	NO	
				11	GO	YES	NO	
				12*	WAIT	NO	YES	
				13	GO	NO	YES	
				(*) +16 with +32 with a +64 with a +128 with	h automatic switching in utomatic switching in GC utomatic switching in GC automatic switching in G	GO if PV-SP > 0.5) if PV-SP > 1% f.s) if PV-SP > 2% f.s O if PV-SP > 4% f	% f.s. s.	_

263	SP.S	R/W	Softstart setpoint		100
264	So.P	R/W	Softstart power	-100,00 100,0 %	0,0
147	SoF	R/W	Softstart time	0.0500,0 min	0,0

Read state

63 bit	STATE OF SOFTSTART	R	OFF = Softstart in Stop ON = Softstart in Start
-----------	--------------------	---	--

HEATING OUTPUT (Fast cycle)

For outputs rL.1 (Out 1) and rL.2 (Out 2) you can set a fast cycle time (0.1 ... 20,0 sec) by setting the parameter to 64 (Heat) or 65 (Cool).

160*	rL.1	R/W	Allocation of reference signal	See: Generic alarms -Table of reference signals	0 zone1	0 zone2	0 zone3
163*	rL2	R/W	Allocation of reference signal		1 zone1	1 zone2	1 zone3

POWER CONTROL

SSR CONTROL MODES

ON Modality

The GFW has the following power control modes:

PA modulation via variation of phase angle

ZC, BF, HSC modulation via variation of number of conduction cycles with zero crossing trigger.

PA phase angle: this mode controls power on the load via modulation of the phase angle.

ZC zero crossing: this type of operation reduces EMC emissions. This mode controls power on the load via a series of conduction ON and non conduction OFF cycles.

The cycle time is constant and can be set from 1 to 200 sec (or from 0.1 to 20.0 sec).

BF burst firing: this mode controls power on the load via a series of conduction ON and non conduction OFF cycles. The ratio of the number of ON cycles to OFF cycles is proportional to the power value to be supplied to the load. The repeat period or cycle time is kept to a minimum for each power value.

Parameter bF.Cy defines the minimum number of conduction cycles, settable from 1 to 10.

In case of 3-phase load without neutral or closed delta, BF.Cy >= 5 has to be set to ensure correct operation (balancing of current in the 3 loads). HSC Half Single Cycle: this mode corresponds to a BF that includes ON and OFF half-cycles. It is useful for reducing flicker with short-wave IR loads (and is applied only to single-phase or 3-phase with neutre or open delta loads).

Start mode is set with parameter Hd.5

Control of maximum rms current (whose value is set in parameter Fu.tA) can always be enabled with parameter Hd.5 in every power-on mode. The cycle time can be set with two different resolutions in seconds or tenths of a second based on the type of heat or cool function assigned to outputs rL1 and rL2. The use of short cycle times (< 2-3 sec) is always recommended in case of control with SSRs.

Settings



PA + 32 only for ZC/BF modes: enable delay triggering

ZC/BF

PA

PA

ZC/BF

ZC/BF

PA

+ 64 linear phase Softstart in power +128 phase Softstart for IR lamps

YES

NO

YES

NO

YES

NO

YES

+ 256 phase Softstart for shutdown in software ON/OFF switching

HSC

HSC

YES

707	FUER	R/W	Max. limit of RMS current in normal op	0.0999,9 A		
704	bF.c Y	R/W	Min. number of cycles in BF mode	110		1

25

26

27

28

29

30

31

NB: In case of a 3-phase load, you can set a different value from parameter FU.tA for each zone (ex. to control an unbalanced 3-phase load).

707*	FUER	R/W	Max. limit of RMS current in normal op	0,0999,9 A	Model	40A	60A	100A	150A	200A	250A
					Default zone 13	40,0	60,0	100,0	150,0	200,0	250,0
704*	bF.c У	R/W	Min. number of cycles in BF mode	110				, zor	1 ne1	1 zone2	1 zone3

NB: In case of a 3-phase load, you can set a different value from parameter FU.tA for each zone (ex. to control an unbalanced 3-phase load).

SOFTSTART or START RAMP

This type of start can be enabled either in phase control or pulse train mode and acts via control of the conduction angle. It is enabled with parameter Hd.5.

The softstart ramp starts from a zero conduction angle and reaches the angle set in parameter PS.HI in the time set in parameter PS.tm, from 0.1 to 60.0 sec.

With parameter Hd.5 (+64), you can configure a linear softstart in power, i.e., starting from zero you reach the power value corresponding to the maximum conduction angle set in PS.HI. Softstart ends before the set time if power reaches the corresponding value set in manual control or calculated by PID.

Control of maximum peak current can be enabled with parameter Hd.5 during the ramp phase; peak value is settable in parameter PS.tA. This function is useful in case of short circuit on the load of loads with high temperature coefficients to automatically adjust start time to the load.

The softstart ramp activates at the first start after power-ON and after a software reboot. It can be reactivated via software control by writing bit 108 or automatically if there are OFF conditions for a time exceeding the one settable in PS.oF (if =0 the function is as if disabled).

The ramp can also be enabled with parameter Hd.5 (+256) after a software shutdown, i.e., zero is reached in the set time from delivered power.

630*	P <u>5</u> ,H I	R/W	maximum phase of phase softstart ramp	0.0100,0 %				100,0 zone1) 10 zo	0,0 ne2	100,0 zone3
705*	P <u>5.</u> Em	R/W	Duration of phase softstart ramp	0.160,0 s				10,0 zone1	1 zo),0 ne2	10,0 zone3
629*	P5.oF	R/W	Minimum non-conduction time to reacti- vate phase softstart ramp	0999 s				2 zone1	zo	2 ne2	2 zone3
706*	P5 <u></u> £8	R/W	Maximum peak current limit during phase softstart ramp	0.0999,9 A	Model	40A	60A	100A	150A	200A	250A
108* bit	Restart of phase softstart ramp	R/W	OFF = Restart not enabled ON = Restart enabled		Default zone 13	110,0	170,0	280,0	420,0	560,0	700,0
106* bit	State of phase softstart ramp	R	OFF = Ramp not active ON = Ramp active								
107* bit	State of phase softstart ramp	R	OFF = Ramp not ended ON = Ramp ended								

NB: In case of a 3-phase load, you can set a different value from parameter PS.tA for each zone (ex. to control an unbalanced 3-phase load).

DELAY TRIGGERING

In firing modes ZC and BF, with inductive loads, this function inserts delay triggering in the first cycle.

The delay is expressed in degrees settable in parameter dL.t, from 0 to 90 degrees. The function is enabled with parameter Hd.5 (+32).

The function activates automatically if there are OFF conditions for a time exceeding the one settable in dL.oF (if =0 the function is as if disabled).

- Optimised Delay-Triggering value for transformer: 60°
- Optimised Delay-Triggering value for 3-phase transformer: 90°, 90°, 60°

708*	dL.E	R/W	Delay triggering (first trigger only)	0 90 °	60 zone1	60 zone2	60 zone3
738*	dL.oF	R/W	Minimum non-conduction time to reactivate delay triggering	0 10000ms	10 zone1	10 zone2	10 zone3

FEEDBACK MODES

The GFW has the following power control modes: V-voltage V²-squared voltage I-current I²-squared current P-power A control mode is enabled with parameter Hd.6.

Voltage feedback (V)

To keep voltage on the load constant, this compensates possible variations in line voltage with reference to the rated voltage saved in riF.V. (expressed in Vrms).

The voltage value maintained on the load is (ref.V*P%_pid_man/100) and is indicated in the Modbus 757 register.

Voltage feedback (V²)

To keep voltage on the load constant, this compensates possible variations in line voltage with reference to the rated voltage saved in riF.V. (expressed in Vrms).

The voltage value maintained on the load is (rif.V* V (P%_pid_man/100)), and is indicated in the Modbus 757 register.

Current feedback (I)

To keep current on the load constant, this compensates possible variations in line voltage and/or variations in load impedance with reference to the rated current saved in riF.I. (expressed in Arms).

The current value maintained on the load is (rif.I*P%_pid_man/100), and is indicated in the Modbus 757 register.

Current feedback (I²)

To keep current on the load constant, this compensates possible variations in line voltage and/or variations in load impedance with reference to the rated current saved in riF.I. (expressed in Arms).

The current value maintained on the load is (rif.I* V (P%_pid_man/100)), and is indicated in the Modbus 757 register.

Power feedback P

To keep power on the load constant, this compensates both variations in line voltage and variations in load impedance with reference to the rated power saved in riF.P. (expressed in kWatt).

The current value maintained on the load is (rif.P*P%_pid_man/100), and is indicated in the Modbus 757 register.

Feedback calibration can be activated from the digital input (parameters DIG and DIG.2) or by serial control (ref. bit113), and if requested MUST be activated only with Hd.6=0 (the required Hd.6 value can be set only after calibration) and preferably with maximum power on the load (ex. P_man or P_pid at 100%).

If you change function mode (PA, ZC, BF, HSC), you have to re-run the Feedback calibration procedure.

Voltage V (or current I or power P) feedback corrects the % of conduction with a maximum settable value in parameter Cor. V (or Cor.I or Cor.P).

For non-linear loads (ex.: Super Kanthal or Silicon Carbide) the automatic calibration procedure is NOT NECESSARY. Set the value of parameters ref.V, ref. I, ref. P based on the specific nominal of the load shown on the data-sheet (ref. GFW Installation Guide).

730	*	Hd.5	R/W	Enable feedback modes	Table of feedback modes	0 zone1	0 zone2	0 zone3
					Feedback ON 0 None 1 V ² (Voltage) 2 l ² (Current) 3 P (Power) 4 None 5 V (Linear voltage) 6 I (Linear current)			
731	*	Cor.V	R/W	Maximum correction of voltage feedback	0.0100,0 %	100,0 zone1	100,0 zone2	100,0 zone3
732	*	Cor. I	R/W	Maximum correction of current feedback	0.0100,0 %	100,0 zone1	100,0 zone2	100,0 zone3
733	*	Cor.P	R/W	Maximum correction of power feedback	0.0100,0 %	100,0 zone1	100,0 zone2	100,0 zone3
734	.*	r iF.V	R/W	Voltage feedback reference	0.0999,9 V	0,0 zone1	0,0 zone2	0,0 zone3
735	5*	riF. l	R/W	Current feedback reference	0.0999,9 A	0,0 zone1	0,0 zone2	0,0 zone3
736	*	r iF,P	R/W	Power feedback reference	0.099,99 kW	0,0 zone1	0,0 zone2	0,0 zone3
11.3*	Cali	ibration of voltage		OFF = Calibration not enabled				

READ	STATE

Calibration of voltage feedback reference

R/W

ON = Calibration enabled

113*

bit

757*	Rr iF	R	Reference of Feedback	0.0999,9 V 0.0999,9 A	Setpoint of V, I, P to maintain on load
				0.099,99 kW	



HEURISTIC CONTROL POWER

It is useful to be able to limit the delivery of total power to the loads in order to avoid input peaks from the single-phase power line.

This condition occurs during switch-on phases when the machine is cold; the demand for heating power is 100% until temperatures near the setpoint are reached. It is also useful to avoid simultaneity of conduction when there is ON-OFF modulation for temperature maintenance.

The cycle time must be identical for all zones; the power percentage for each zone 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 1:

4 loads 380V - 32A (zone 1), 16A (zone 2), 25A (zone 3), 40Alimit value(maximum current is 73A in case of simultaneity of conduction).11 + 12 = 12 + 13 + 12 + 13 = 12 + 13

|1+|3 = 57A |2+|3 = 41A |1+|2+|3 = 73A The combinations corresponding to current values below the limit value are: 11+12 = 48A

I2+I3 = 41A

The one with lower current is given by zone 2 and zone 3.

In the single cycle time for the enabled zones, the delivery of power may be reduced to respect the maximum current limit.

The time distribution for activation of the zones is calculated at the start of each cycle:

Ptot = P1+ P2 (if P2>P3) + P3 (if P3>P2) Simultaneity is allowed for zones 2 and 3.

If P1= 100%, P2= 100%, P3= 100% Ptot=200%; since Ptot>100%, the conduction time of the zone x is obtained by Px * (100/Ptot) P1,2,3 delivered = 100%*0.5 = 50%



If P1= 100%, P2= 50%, P3= 0% Ptot=150%; since Ptot>100%, the conduction time of the zone x is obtained by Px * (100/Ptot) P1 delivered = 100%*0.66 = 67% P2 delivered = 50%*0.66 = 33% P3 delivered = 0%*0.66 = 0% ON Zone 1 ON Zone 1



680	hd.3	R/W	Enable heuristic power control		<u>Tab</u>	le for enabling	g heuris	stic power	0
				0 3 5 6 7	ZONE 1 X X X	ZONE 2 X X X X		ZONE 3 X X X	
NOTE: Only for (1200sec)	GFW with CTs prese	nt and c	utputs OUT1OUT3 with slow cycle time						
681	IHEU	R/W	Maximum current for heuristic power control		0.0999,9 A				0,0

HETEROGENEOUS POWER CONTROL

This function matches that of a thermal cutout that disconnects the load based on instantaneous input. The load is disconnected based on a preset priority.

Zone 1 has priority: in case of overload, zone 3 is disconnected, followed by zone 2, etc.

682	<u> </u>	R/W	Enable heterogeneous power control		<u>Table i</u>	or enabling hetero	geneous power	
					ZONE 1	ZONE 2	ZONE 3	
				0				
				1	Х			
				2		Х		
				3	Х	Х		
				4			Х	
				5	Х		Х	
				6		Х	Х	
				7	Х	Х	Х	

683	(HEF	R/W	Maximum current for heterogeneous power control	0.0999,9 A	0,0

VIRTUAL INSTRUMENT CONTROL

Virtual instrument control is activated by means of parameter hd.1.

By setting parameters S.In and S.Ou you can enable the writing of some parameters via serial line, set the value of inputs and the state of outputs.

You have to enable alarm setpoints AL1, ..., AL4 when write operations are continuous, and you don't have to keep the last value in eeprom.

Enabling the PV input means being able to exclude the local Tc or RTD acquisition and replace it with the value written in the register VALUE_F.

Enabling digital input IN lets you set the state of this input, for example to run MAN/AUTO switching with the writing of bit 7 in the register V_IN_OUT.

Likewise, you can set the on/off state of outputs OUT1, ..., OUT10 and of the LEDs by writing bits in the register V_IN_OUT.

191	ha	. 1	R/W	<u>Enable mu</u> instrument contro	l <u>tiset</u> I via serial	Table for multiset/ virtual instrument								0			
							0 1 2 3	Enable Multiset X X	vir	Ena tual ins X	ble strumer	nt					_
224	5.	In	R/W	Control inputs fr	om serial		0 2	255						0 zone	21 :	0 zone2	0 zone3
							Inputs Bit	In.A 10	In.5 9	In.4 8	In.3 7	In.2 6	- 5	In.1 4	AL4 3	AL3 2	AL2 AL1
225	5.0	5.0 R/W Control outputs from serial					0 1	023									0
							Outputs	Out10	Out9	Out8	Out7	Out6	Out5	Out4	Out3	Out2	Out1
	1			0. / // 50. / //			Bit	' 9	8	7	6	5	4	3	2	1	0
628	5,6	. 1	R/W	Control LEDs and dig serial	ital inputs from		0 1	023					LED				0
								D2	D1	out4	out3	out2	out1	DI2	DI1	ER	RN
					Table of virtual	l regis	Bit ster addres	ises	8	1	6	5	4	3		1	
Parameter	bit	Reso	urce en	abled	Addr	ress	of		For	mat				Name	of reg	ister	
S.In	0 (**)	Alarm	1 setpoi	nt AL1	3 3	841 842	SIEI		wor	d				AL1_	RAM ((**)	
	2 (**)	Alarm	1 setpoir	nt AL3	3	343			word					AL3_	RAM (() (**)	
	3 (**)	Alarm Input	n setpoii In.1	nt AL4	3	321 347			wor	d d				AL4_ SERIA	RAM (L IN1	(**) (**)	
	6 (**)	Input	In.2		3	348			wor	d				SERIA	L_IN2	2 (**)	
	8 (**)	Input	In.4		5	579			word				SERIAL_INS ()				
	9 (**)	Input	In.5		5	80			wor	d				SERIA	L_IN5	5 (**)	
	10()	input	III.A		J	101			WOI	u						()	
S.Ou	0	Outpu		2	3	344 844			wor	d, bit ()					T T	
	2	Outpu	ut OUT	3	3	344			wor	d, bit 2	2			ii		т Т	
	4	Outpu		5 (relays)	3	344			wor	d, bit 4	4					T TFC*	
	5	Outpu	ut OUT	6 (relays)	3	339			wor	u d, bit {	5					T	
	5	Outpu	ut OUT	6 (continuous)	6	640			wor	d d	`		5	SERIAL		T6C*	
	6	Outpu	ut OUT	7 (relays) 7 (continuous)	6	644 641			wor	d, bit t d	5		5			T7C*	
	7	Outpu	ut OUT	8 (relays)	3	344			wor	d, bit i	7			V_II	V_OU	T	
	/ 8	Outpu	ut OUT	8 (continuous)		642 844			wor	d d bit8	3			SERIAL VII		18C* T	
	9	Outpu	ut OUT	10	3	344			wor	d, bit 9	9			ii	N_OU	T	
SIL	0	l ed 5	2N		3	351			wor	d hit (າ			\/ ¥		s	
	1	Led E	R		3	351			wor	d, bit	1			X	LED	S	
	2	Led D)1		3	351			wor	d, bit 2	2			XX		S	
	4	Led C) <u>/</u>)1		3	351			wor	d, bit 4	1			X	LED	S	
	5	Led C)2		3	351			wor	d, bit t	5			<u>v_</u> x		S	
	б 7	Led C)3)4		3	351 351			wor	u, bit t d. bit 7	5 7			X X		s S	
	8	Input	D1		3	344			wor	d, bit	10			V_II	<u>v_ou</u>	Ť	
	9	Input	D2		3	344			wor	d, bit '	11			V_11	1_OU	ľ	

HW/SW INFORMATION

The following data registers can be used to identify the controller HW/SW and check its operation.

122	UPd	R	Software version code
85	Err	R	<u>Self-diagnosis</u> error code for main input
606	Er.2	R	<u>Self-diagnosis</u> error code for auxiliary input 2
550	Er.3	R	<u>Self-diagnosis</u> error code for auxiliary input 3
551	Er.4	R	<u>Self-diagnosis</u> error code for auxiliary input 4
552	Er.5	R	<u>Self-diagnosis</u> error code for auxiliary input 5

	Table of main input errors										
0	No Error										
1	Lo (process variable value < Lo.S)										
2	Hi (process variable value > Hi.S)										
3	ERR [third wire interrupted for PT100 or input values below minimum										
	limits (ex. for TC with connection error)]										
4	SBR (probe interrupted or input values beyond maximum limits)										

190	E.Hd	R	Hardware configuration codes	Table of hardware configuration codes
				bit
508	Г на I	R	Hardware configuration codes 1	Table of hardware configuration codes 1

508	E.H.J 1	R	Hardware configuration codes 1	Table of hardware configuration codes 1	
				bit	

543	с.наг	R	Hardware configuration codes 2		Table of hardware configuration codes 2
	L.) IUL	ĸ		bit 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14	= 1 GFW-E1 no power = 1 GFW-E1 40A = 1 GFW-E1 40A = 1 GFW-E1 60A = 1 GFW-E1 100A = 1 GFW-E1 200A = 1 GFW-E1 200A = 1 GFW-E1 250A = 1 GFW-E2 100A = 1 GFW-E2 40A = 1 GFW-E2 100A = 1 GFW-E2 100A = 1 GFW-E2 200A = 1 GFW-E2 250A
				15	= 1 GFW-E2 El. Fuse

693 697	UPdF	R	Fieldbus software version
695	CodF	R	Fieldbus node
696	ьRU,F	R	Fieldbus baudrate

Γ

	Profibus	Canopen				
bAu.F	baudrate	bAu.F	baudrate			
0	12.00 Mbit/s	0	1000 Kbit/s			
1	6.00 Mbit/s	1	800 Kbit/s			
2	3.00 Mbit/s	2	500 Kbit/s			
3	1.50 Mbit/s	3	250 Kbit/s			
4	500.00 Kbit/s	4	125 Kbit/s			
5	187.50 Kbit/s	5	100 Kbit/s			
6	93.75 Kbit/s	6	50 Kbit/s			
7	45.45 Kbit/s	7	20 Kbit/s			
8	19.20 Kbit/s	8	10 Kbit/s			
9	9.60 Kbit/s	L	1			

Devicenet							
bAu.F	baudrate						
0	125 Kbit/s						
1	250 Kbit/s						
2	500 Kbit/s						
E	thernet						
bAu.F	baudrate						
0	100 Mbit/s						
	40 10.14/-						

346		R		<u>Jumper</u>		Table of jumper states				
						bit 0 1 2 3 4	State jumper S1 State jumper S2 State jumper S7-1: (*) State jumper S7-2: (*) State jumper S7-3: (*)	OFF	ON	
						5 6 7 8	State jumper S7-4: (*) State jumper S7-5: State jumper S7-6: State jumper S7-7:	resistive load - GFX4/GFW	inductive load Configuration parameters of default Simulation 4 GFX	
	S7-1 OFF OFF ON ON ON	S7-2 OFF ON ON ON ON	S7-3 OFF OFF OFF ON OFF	S7-4 OFF OFF OFF OFF ON	(*) FL 3 sing 3 ind 3-pha 3-pha 3-pha	(*) FUNCTION MODES 3 single-phase loads 3 independent single-phase loads in open delta 3-phase load open delta / star with neutral 3-phase star load vithout neutral				

120		R	Manufact - Trade Mark (Gefran)			Name of manufacturer	5000
121		R	Device ID (GFW)			Product ID	214
197	Ld.SE	R/W	RN LED status function			Table of LED functions	16
	1		-]		Val	Eurotion	l
610	כגי	R/M	ER I ED status function		0	PLIN	12
013				1	1	MAN/ALITO controller	12
					2	LOC / REM	-
					3	HOLD	
620	F 1 1	R/W	Function of LED DI1		4	Selftuning on	6
					5	Autotuning on	
				_	6	Repeat digital input INDIG1	
					7	Serial 1 dialog	
621	L G.Y	R/W	Function of LED DI2		8	State of OUI 2 zone 1	11
					9 10	Indication of SP1 SP2 (SP1 with pilot input inactive and LED off)	
					11	Repeat digital input INDIG2	
					12	Input in error (I.O. Hi Err. Sbr)	
					13	Serial 2 dialog	
					14	Repeat digital input INDIG3	
					+ 16	LED flashing if active (code 8 excluded)	

622	Ld.5	R/W	Function of LED O1
623	Ld.6	R/W	Function of LED O2
624	Ld.7	R/W	Function of LED O3
625	Ld.8	R/W	Function of LED Button

Table of OUT LED functions								
0	Disabled							
1	Repetition of state OUT 1							
2	Repetition of state OUT 2							
3	Repetition of state OUT 3							
4	State key							
5	Repetition of state OUT 5							
6	Repetition of state OUT 6							
7	Repetition of state OUT 7							
8	Repetition of state OUT 8							
9	Repetition of state OUT 9							
10	Repetition of state OUT 10							
+ 16 L	+ 16 LED flashing if active							





B

- LED status refers to the corresponding parameter, with the following special cases: LED RN (green) on: hotkey functionality LED RN (green) + LED ER (red) both flashing rapidly: autobaud in progress LED ER (red) on: error in one of main inputs (Lo, Hi, Err, Sbr) LED ER (red) flashing: temperature alarm ((OVER_HEAT or TEMPERATURE_SENSOR_BROKEN) or alarm of SHORT_CIRCUIT_CURRENT or SSR_SAFETY or FUSE_OPEN (only for singlephase configuration). LED ER (red) + LED Ox (yellow) both flashing: HB alarm or POWER_FAIL in zone x All LEDs flashing rapidly: ROTATION123 alarm (only for threephase configuration) All LEDs flashing rapidly except LED D11: jumper configuration not provided All LEDs flashing rapidly except LED D12: SMORT_CIRCUIT_CURRENT alarm (only for threephase configuration) All LEDs flashing rapidly except LED 01: SHORT_CIRCUIT_CURRENT alarm (only for threephase configuration) All LEDs flashing rapidly except LED 02: TRIPHASE_MISSING_LINE_ERROR alarm (only for threephase configuration) All LEDs flashing rapidly except LED 02: SSR_SAFETY alarm (only for threephase configuration) All LEDs flashing rapidly except LED 02: SSR_SAFETY alarm (only for threephase configuration) All LEDs flashing rapidly except LED 02: RIPHASE_MISSING_LINE_ERROR alarm (only for threephase configuration) All LEDs flashing rapidly except LED 04: SSR_SAFETY alarm (only for threephase configuration) All LEDs flashing rapidly except LED 04: FUSE_OPEN alarm (only for threephase configuration) All LEDs flashing rapidly except LED 04: FUSE_OPEN alarm (only for threephase configuration)

305*	R	R/W	Current state (STATUS_W)		Table of state settings	0 zone1	0 zone2	0 zone3
698*		R	State saved in eeprom (STATUS W EEP)	bit 0	- 	0 zone1	0 zone2	0 zone3
		1		2 3 4 5 6	Start/Stop Selftuning (*) Select ON/OFF Select AUTO/MAN Start/Stop Autotuning (*) Select LOC/REM (*)			

(*) only for zone 1 (GFW-M)

467	R	State (STATUS)		Table of state
			 bit 0 / / 1 2 3 4 5 6 6 7 8 / / 9 / / 10 / / 11 / / 12 4 5 7 14 14 14 14 14 15 14 14 14 14 15 16 16	AL.1 or AL.2 or AL.3 or AL.4 or ALHB.TA1 or ALHB.TA2 or ALHB.TA3 or Power Fault Input Lo Input Hi Input Err Input Sbr neat sool LBA AL.1 AL.2 AL.3 AL.4 AL.4 AL.4 ALHB or Power Fault DN/OFF AUTO/MAN LOC/REM

469*	R	State 1 (STATUS1)		Table of state 1
			bit 0 1 2 3 4 7 8 9 10 11 12 13 14 15	AL.1 or AL.2 or AL.3 or AL.4 or ALHB.TA1 or ALHB.TA2 or ALHB.TA3 or Power Fault Input Lo Input Hi Input Err Input Sbr LBA AL.1 AL.2 AL.3 AL.4 ALHB.TA1 ALHB.TA2 ALHB.TA2 ALHB.TA3 Selftuning on

632*	R	State 2 (STATUS2)	Table of state 2
			bit

633	R	State 3 (STATUS3)	Table of state 3
			bit 0 AL.SCR open 1 1 AL.SCR open 2 2 2 AL.SCR short 1 3 3 AL.SCR short 1 4 4 AL.SCR short 2 5 5 AL.SCR short 3 6 6 No voltage 1 7 7 No voltage 2 8 8 No Voltage 3 9 9 No current 1 10 10 No current 3 11

634	R	State 4 (STATUS4)		Table of state 4
			bit 0 1 2 3 4 5 6 7 7 8 9 9 10 11	Temperature sensor broken over heat phase_softstart_active phase_softstart_end frequency_warning or monophase_missing_line_warning 60Hz short_circuit_current in softstart di fase over_peak_current in softstart di fase over_ms_current a regime SSR_Safety (24V fan presence or SSR hardware over temperature) Fuse open or over current protection Current polarity check

702	R	Voltage status	Table of voltage status	
			bit 0 frequency_warning 1 10% unbalanced_line_warning 2 20% unbalanced_line_warning 3 30% unbalanced_line_error 4 rotation123_error 5 three-phase_missing_line_error 6 60Hz	

Functionality key



(*) with key pressed, the state of the RN and Button LEDs is steadily on; the LEDs switch off after 3 seconds to indicate switching to ready state or execution of the function.
INSTRUMENT CONFIGURATION SHEET

PARAMETERS

Definition of parameter	Note	Assigned value

INSTALLATION OF MODBUS SERIAL NETWORK

46	Cod	R	Device identification code	
45	6Ru	R/W	Select Baudrate - Serial 1	
626	6Ru.2	R/W	Select Baudrate - Serial 2	
47	PRr	R/W	Select parity - Serial 1	
627	PRr.2	R/W	Select parity - Serial 2	

ANALOG INPUT

573	EP.R	R/W	analog input		
574	L 5.A	R/W	Minimum scale limit analog input		
575	H5.R	R/W	Maximum scale limit analog input		
577	oF 5.8	R/W	Offset correction for analog input		
572	In.R	R	Value of the ingegneristico reading analog input		
576	FLER	R/W	Low pass digital filter analog input		

MAIN INPUT PID

400	ESP.	R/W	Probe, signal, enable, custom linearization and main input scale
403	dP.S	R/W	Decimal point position for input scale
401	Lo.S	R/W	Minimum scale limit for main input
402	H I,5	R/W	Maximum scale limit for main input
519 23	oF 5.	R/W	Main input offset correction
0 470	P.V.	R	Read of process variable (PV) engineering value
349	DPV	R	Read of engineering value of process variable (PV) filtered by FLd
85	Err	R	Self-diagnosis error code for main input
24	FLE	R/W	low pass digital filter for input signal
179	FLd	R/W	Digital filter on oscillations of input signal
86	5.00	R/W	Engineering value attributed to Point 0 (minimum value of input scale)
87	5.0 1	R/W	Engineering value attributed to Point 1
88	5.02	R/W	Engineering value attributed to Point 2
	503	R/W	Engineering value attributed to Point 3

90	5.04	R/W	Engineering value attributed to Point 4		
91	5.05	R/W	Engineering value attributed to Point 5		
92	5.06	R/W	Engineering value attributed to Point 6		
93	ר 0.5	R/W	Engineering value attributed to Point 7		
94	5.08	R/W	Engineering value attributed to Point 8		
95	5.09	R/W	Engineering value attributed to Point 9		
96	5. 10	R/W	Engineering value attributed to Point 10		
97	5.11	R/W	Engineering value attributed to Point 11		
98	5. 12	R/W	Engineering value attributed to Point 12		
99	5. 13	R/W	Engineering value attributed to Point 13		
100	5. 14	R/W	Engineering value attributed to Point 14		
101	5. 15	R/W	Engineering value attributed to Point 15		
102	5. 16	R/W	Engineering value attributed to Point 16		
103	5. 17	R/W	Engineering value attributed to Point 17		
104	5. 18	R/W	Engineering value attributed to Point 18		
105	5. 19	R/W	Engineering value attributed to Point 19		
106	5.20	R/W	Engineering value attributed to Point 20		
107	5.2 (R/W	Engineering value attributed to Point 21		
108	5.22	R/W	Engineering value attributed to Point 22		
109	5.23	R/W	Engineering value attributed to Point 23		
110	5.24	R/W	Engineering value attributed to Point 24		
111	5.25	R/W	Engineering value attributed to Point 25		
112	5.26	R/W	Engineering value attributed to Point 26		
113	5.27	R/W	Engineering value attributed to Point 27		
114	5.28	R/W	Engineering value attributed to Point 28		
115	5.29	R/W	Engineering value attributed to Point 29		
116	5.30	R/W	Engineering value attributed to Point 30		
117	5.3 1	R/W	Engineering value attributed to Point 31		

118	5.32	R/W	Engineering value attributed to Point 32 (maximum value of input scale))		
293	5.33	R/W	Engineering value attributed to minimum value of the input scale		
294	5.34	R/W	Engineering value attributed to maximum value of the input scale.		
295	5.35	R/W	Engineering value of input signal corresponding to temperature of 50°C.		

LOAD CURRENT VALUE

746*	L.ER I	R	Minimum limit of CT ammeter input scale (phase1)	
747	L£82	R	Minimum limit of CT ammeter input scale (phase 2)	With 3-phase load
748	L.ER3	R	Minimum limit of CT ammeter input scale (phase 3)	With 3-phase load
405*	HER I	R	Maximum limit of CT ammeter input scale (phase 1)	
413	HF85	R	Maximum limit of CT ammeter input scale (phase 2)	With 3-phase load
414	HER3	R	Maximum limit of CT ammeter input scale (phase 3)	With 3-phase load
220*	o.ER 1	R/W	Offset correction CT input (phase 1)	
415	o.£82	R/W	Offset correction CT input (phase 2)	
416	o.£83	R/W	Offset correction CT input (phase 3)	
227* 473 - 139	IER I	R	Instantaneous CT input value	
			(priase T)	
490	IE82	R	Instantaneous CT input value (phase 2)	With 3-phase load
490 491	(E82 (E83	R	Instantaneous CT input value (phase 2) Instantaneous CT input value (phase 3)	With 3-phase load With 3-phase load
490 491 468*	1,582 1,583 1, Ion	R R R	Instantaneous CT input value (phase 2) Instantaneous CT input value (phase 3) CT input value with output on (phase 1)	With 3-phase load With 3-phase load
490 491 468* 498	IER2 IER3 I. Ion I.2on	R R R R	Instantaneous CT input value (phase 2) Instantaneous CT input value (phase 3) CT input value with output on (phase 1) CT input value with output on (phase 2)	With 3-phase load With 3-phase load With 3-phase load
490 491 468* 498 499	IER2 IER3 I. Ion I.2on I.3on	R R R R	Instantaneous CT input value (phase 2) Instantaneous CT input value (phase 3) CT input value with output on (phase 1) CT input value with output on (phase 2) CT input value with output on (phase 3)	With 3-phase load With 3-phase load With 3-phase load With 3-phase load
490 491 468* 498 499 219*	1,200 1,200 1,300 1,200 1,300	R R R R R R	(phase 1) Instantaneous CT input value (phase 2) Instantaneous CT input value (phase 3) CT input value with output on (phase 1) CT input value with output on (phase 2) CT input value with output on (phase 3) CT input value with output on (phase 3) CT input value with output on (phase 3) CT input digital filter (phases 1, 2 and 3)	With 3-phase load With 3-phase load With 3-phase load With 3-phase load
490 491 468* 498 499 219* 709*	I.E.R2 I.E.R3 I. Ion I.Zon I.Zon F.E.E.R I.E.RP	R R R R R W	(phase 1) Instantaneous CT input value (phase 2) Instantaneous CT input value (phase 3) CT input value with output on (phase 1) CT input value with output on (phase 2) CT input value with output on (phase 3) CT input value with output on (phase 3) CT input value with output on (phase 3) CT input digital filter (phases 1, 2 and 3) Peak ammeter input during phase softstart ramp	With 3-phase load With 3-phase load With 3-phase load With 3-phase load
490 491 468* 498 499 219* 709* 716*	IER2 IER3 I. Ion I.2on I.3on FEER IERP CoSF	R R R R R W R	Instantaneous CT input value (phase 2) Instantaneous CT input value (phase 3) CT input value with output on (phase 1) CT input value with output on (phase 2) CT input value with output on (phase 3) CT input value with output on (phase 3) CT input digital filter (phases 1, 2 and 3) Peak ammeter input during phase softstart ramp Power factor in hundredths	With 3-phase load With 3-phase load With 3-phase load With 3-phase load

VALUE OF LOAD VOLTAGE

754

LdRE

751*	LdU	R	Voltage on load
752	LdUE	R	Voltage on 3-phase load

R

Current on 3-phase load

LINE VOLTAGE VALUE

453*	L.EV I	R	Minimum limit of TV voltmeter input scale (phase1)	
454	L.EV2	R	Minimum limit of TV voltmeter input scale (phase 2)	With 3-phase load
455	LEV3	R	Minimum limit of TV voltmeter input scale (phase 3)	With 3-phase load
410*	HEV I	R	Maximum limit of TV voltmeter input scale (phase 1)	
417	HEV2	R	Maximum limit of TV voltmeter input scale (phase 2)	With 3-phase load
418	HEV3	R	Maximum limit of CT voltmeter input scale (phase 3)	With 3-phase load
411*	o.눈U I	R/W	Offset correction voltmeter transformer input TV (phase 1)	
419	o.£U2	R/W	Offset correction voltmeter transformer input TV (phase 2)	With 3-phase load
420	o.EU3	R/W	Offset correction voltmeter transformer input TV (phase 3)	With 3-phase load
232* 485	IEU I	R	Voltmeter input value (phase 1)	
492	1505	R	Voltmeter input value (phase 2)	With 3-phase load
493	(EU3	R	Voltmeter input value (phase 3)	With 3-phase load
322*	IUF I	R	Voltmeter input value (phase 1)	
496	WF2	R	Voltmeter input value (phase 2)	With 3-phase load
497	IUF 3	R	Voltmeter input value (phase 3)	With 3-phase load
412*	FEEU	R/W	Digital filter TV auxiliary input (phase 1, 2, 3)	
315*	FrEq	R	Voltage frequency in tenths of Hz	

POWER ON LOAD

719*	LdP	R	Power on load	
720	LdPE	R	Power on 3-phase load	
749*	Ld. I	R	Impedance on load	
750	Ld. (E	R	Impedance on 3-phase load	
531*	Ld.E I	R	Energia sul carico	
541	L d.E l.E	R	Energia sul carico trifase	
510*	Ld.E2	R	Energia sul carico	
541	Ld.E2.E	R	Energia sul carico trifase	
114* bit	Azzeramento	R/W	OFF = - ON = Azzeramento Ld.E1	
115* bit	Azzeramento	R/W	OFF = - ON = Azzeramento Ld.E2	

AUXILIARY ANALOG INPUTS (LIN/TC)

				_	
194	R (2	R/W	Select type of auxiliary input sensor 2		
553	R (3	R/W	Select type of auxiliary sensor input 3		
554	R (4	R/W	Select type of auxiliary sensor input 4		
555	R I.S	R/W	Select type of auxiliary sensor input 5		
181	£P.2	R/W	Definition of auxiliary analog input function 2		
677	dP.2	R/W	Decimal point position for auxiliary input scale 2		
568	dP.3	R/W	Decimal point position for the auxiliary input scale 3		
569	dP.4	R/W	Decimal point position for the auxiliary input scale 4		
570	dP.S	R/W	Decimal point position for the auxiliary input scale 5		
404	L 5.2	R/W	Minimum limit auxiliary input scale		
556	L 5.3	R/W	Minimum limit of auxiliary input scale 3		
557	L <u>5.</u> 4	R/W	Minimum limit of auxiliary input scale 4		
558	L 5.5	R/W	Minimum limit of auxiliary input scale 5		
603	H5.2	R/W	Maximum limit auxiliary input scale 2		
559	H5.3	R/W	Maximum limit of auxiliary input scale 3		
560	H <u>5.</u> 4	R/W	Maximum limit of auxiliary input scale 4		
561	H5.5	R/W	Maximum limit of auxiliary input scale 5		
605	oF 5.2	R/W	Offset correction for auxiliary input 2		
565	oF 5.3	R/W	Offset for auxiliary input correction 3		
566	oF 5.4	R/W	Offset for auxiliary input correction 4		
567	oF 5.5	R/W	Offset for auxiliary input correction 5		
602	In.2	R	Value of auxiliary input 2		
547	In.3	R	Value of auxiliary input 3		
548	10.4	R	Value of auxiliary input 4		
549	In.5	R	Value of auxiliary input 5		
606	Er.2	R	Error code for self-diagnosis of auxiliary input 2]	
550	Er.3	R	Error code for self-diagnosis of auxiliary input 3		
551	Er.4	R	Error code for self-diagnosis of auxiliary input 4]	
552	Er.5	R	Error code for self-diagnosis of auxiliary input 5		
604	FLE.2	R/W	Digital filter for auxiliary input 2		
562	FLE.3	R/W	Digital filter for auxiliary input 3		

56	3	FLE.4	R/W	Digital filter for auxiliary input 4
56	4	FLE.S	R/W	Digital filter for auxiliary input 5
DIGITA	AL INF	PUTS		
14	0	d 16.	R/W	Function of digital input
61	8	d 16.2	R/W	Function of digital input 2
69	4	d 16.3	R/W	Digital input 3 function
31	7		R	State of digital inputs INPUT DIG
68 bit	STA	ATE OF DIGITAL INPUT 1	R	OFF = Digital input 1 off ON = Digital input 1 on
92 bit	STA	ATE OF DIGITAL INPUT 2	R	OFF = Digital input 2 off ON = Digital input 2 on
67 bit	ST	ATE of DIGITAL INPUT 3	R	OFF = Digital input 3 off ON = Digital input 3 on
51	8	In.PWM	R	PWM input value
GENEF		ARMS AL1. AL	2. AL3	and AL4
21	5	Ric	R/W	Select reference variable alarm 1
21	6	82,r	R/W	Select reference variable alarm 2
21	7	R3r	R/W	Select reference variable alarm 3
21	8	ጸዒራ	R/W	Select reference variable alarm 4
12 475 -	2	AL. I	R/W	Setpoint alarm 1 (scale points)
13 476 -	} 178	RL.2	R/W	Setpoint alarm 2 (scale points)
14 52 - 4	1 179	AL.3	R/W	Setpoint alarm 3 (scale points)
58 480	<u>}</u>	RL.4	R/W	Setpoint alarm 4 (scale points)
27 18	7	HY. 1	R/W	Hysteresis for alarm 1
30 188) 3	HY.2	R/W	Hysteresis for alarm 2
53	 }	НУ.З	R/W	Hysteresis for alarm 3
59)	<u> </u>	R/W	Hysteresis for alarm 4
40	6	R (E	R/W	Alarm type 1
40	7	82.E	R/W	Alarm type 2
40 54	8	R3.E	R/W	Alarm type 3

Alarm type 4

409

46 bit

47 bit

48 bit

49 bit

50 bit

RYE

AL1 direct/inverse

AL1 absolute/relative

AL1 normal/symmetrical

AL1 disabled at switch on

AL1 with memory

R/W

R/W

R/W

R/W

R/W

R/W

54 bit	AL	2 direct/inverse	R/W			
55 bit	AL2	absolute/relative	R/W			
56 bit	AL2 n	ormal/symmetrical	R/W			
57 bit	AL2 di	sabled at switch on	R/W			
58 bit	AL	2 with memory	R/W			
36 bit	AL	3 direct/inverse	R/W			
37 bit	AL3	absolute/relative	R/W			
38 bit	AL3 n	ormal/symmetrical	R/W			
39 bit	AL3 di	sabled at switch on	R/W			
40 bit	AL	.3 with memory	R/W			
70 bit	AL	4 direct/inverse	R/W			
71 bit	AL4	absolute/relative	R/W			
72 bit	AL4 n	ormal/symmetrical	R/W			
73 bit	AL4 di	sabled at switch on	R/W			
74 bit	AL	4 with memory	R/W			
25 20 - 28	- 142	LoL	R/W	Lowest settable limit SP, SP remote and absolute alarms		
26 21 - 29	6 - 143	H IL	R/W	Highest settable limit SP, SP remote and absolute alarms		
195	5*	RLn	R/W	Select number of enabled alarms		
14	0	d 1G.	R/W	Digital input function		
61	8	d 16.2	R/W	Digital input function 2		
79 bit	Re	eset alarm latch	R/W			
4 bit		STATE OF ALARM 1	R	OFF = Alarm off ON = Alarm on		
5 bit		STATE OF ALARM 2	R	OFF = Alarm off ON = Alarm on		
62 bit		STATE OF ALARM 3	R	OFF = Alarm off ON = Alarm on]	
69 bit		STATE OF ALARM 4	R	OFF = Alarm off ON = Alarm on		
31	8		R	States of alarm ALSTATE IRQ		

LBA ALARM (Loop Break Alarm)

195	5*	RLn	R/W	Select number of enabled alarms					
44	1	L b.E	R/W	Delay time for LBA alarm activation					
119	9	L.b.P	R/W	Limit of supplied power in presence of LBA alarm					
81 bit	R	eset LBA alarm	R/W						
8 bit	STATE OF LBA ALARM		R	OFF = LBA off ON = LBA alarm on					

HB ALARM (Heater Break Alarm)

195*	RL.n	R/W	Select number of enabled alarms			
57*	Hb,F	R/W	HB alarm function			
56*	Hb.E	R/W	Delay time for HB alarm activation			
55*	Я,НЬ I	R/W	HB alarm setpoint (ammeter input scale points - Phase 1)			
502	R,H62	R/W	HB alarm setpoint (ammeter input scale points - Phase 2)	With three-phase load		
503	<i>Я</i> .НЬ З	R/W	HB alarm setpoint (ammeter input scale points - Phase 3)	With three-phase load		
737*	нь.Р	R/W	Percentage HB alarm setpoint of current read in HB calibration			
112* Cali bit	bration HB alarm setpoint	R/W	OFF = Calibration not enabled ON = Calibration enabled			
742*	H <u>b</u> ER	R/W	CT read in HB calibration			
452*	HPFA	R/W	TV read in HB calibration			
743*	Hb.Pw	R/W	Ou.P power in calibration			
758*	Ir_ER_D	R/W	HB Calibration with IR lamp: current at 100% conduction			
759*	Ir_ER.I	R/W	HB Calibration with IR lamp: current at 50% conduction			
760*	Ir.ER.2	R/W	HB Calibration with IR lamp: current at 30% conduction			
761*	ir.ER.3	R/W	HB Calibration with IR lamp: current at 20% conduction			
767*	Ir. <u>ER</u> H	R/W	HB Calibration with IR lamp: current at 15% conduction			
768*	Ir.ER.S	R/W	HB Calibration with IR lamp: current at 10% conduction			
769*	Ir.ER6	R/W	HB Calibration with IR lamp (only in mode PA): current at 5% conduction			
382*	IF.E.R.7	R/W	HB Calibration with IR lamp (only in mode PA): current at 3% conduction			
383*	Ir.ER.8	R/W	HB Calibration with IR lamp (only in mode PA): current at 2% conduction			
384*	Ir.ER.9	R/W	HB Calibration with IR lamp (only in mode PA): current at 1% conduction			
445*	Ir.EV.O	R/W	HB Calibration with IR lamp: voltage at 100% conduction			
446*	Ir.EV.I	R/W	HB Calibration with IR lamp: voltage at 50% conduction			
447*	Ir.EV.2	R/W	HB Calibration with IR lamp: voltage at 30% conduction			
448*	Ir.EV.3	R/W	HB Calibration with IR lamp: voltage at 20% conduction			
449*	Ir.EV.4	R/W	HB Calibration with IR lamp: voltage at 15% conduction			
450*	Ir.£V.5	R/W	HB Calibration with IR lamp: voltage at 10% conduction			

45	1*	Ir.EV.6	R/W	HB Calibration with IR lamp (only in mode PA): voltage at 5% conduction
390* Ir.EV.7		R/W	HB Calibration with IR lamp (only in mode PA): voltage at 3% conduction	
391*		Ir.EV.8	R/W	HB Calibration with IR lamp (only in mode PA): voltage at 2% conduction
392* Ir.EV.9		Ir.EV.9	R/W	HB Calibration with IR lamp (only in mode PA): voltage at 1% conduction
744* Hb.Er		R	HB alarm setpoint as function of power on load	
26* bit	STATE	E OF HB ALARM or OWER_FAULT	R	OFF = Alarm off ON = Alarm on
76* bit	St	ate of HB alarm phase 1TA	R	OFF = Alarm off ON = Alarm on
77 bit	St	ate of HB alarm phase 2TA	R	OFF = Alarm off ON = Alarm on
78 bit	St	ate of HB alarm phase 3TA	R	OFF = Alarm off ON = Alarm on
50)4		R	States of alarm HB ALSTATE_HB (for 3-phase loads)
51	2*		R	States of alarm ALSTATE (for single-phase loads)
31	8*		R	State of alarms ALSTATE IRQ

ALARM SBR - ERR (Probe in short or connection error)

22	9	rEL	R/W	Fault action (in case of broken probe) Sbr, Err Only for main input
228		FRP	R/W	Fault action power (supplied in condition of broken probe)
85	5	Err	R	Self-diagnosis error code for main input
9 bit STATE		OF INPUT IN SBR	R	OFF = - ON = Input in SBR

66)*	hd.2	R/W	Enable POWER_FAULT alarms		
66	661 dū. Ł		R/W	Refresh rate SSR-SHORT		
66	2*	dG,F	R/W	Time filter for alarms NO_VOLTAGE and NO_CURRENT		
105 _{bit}	5 Reset SSR_SHORT / NO_ VOLTAGE / NO_CUR- RENT alarms		R/W			
96* bit	SSR.	State of alarm _SHORT phase 1	R	OFF = Alarm off ON = Alarm on		
97 bit	97 State of alarm bit SSR_SHORT phase 2		R	OFF = Alarm off ON = Alarm on	With 3-phase load	
98 bit	3 State of alarm SSR_SHORT phase 3		R	OFF = Alarm off ON = Alarm on	With 3-phase load	
99* bit	NO_V	State of alarm /OLTAGE phase 1	R	OFF = Alarm off ON = Alarm on		
100 bit) State of alarm NO_VOLTAGE phase 2		R	OFF = Alarm off ON = Alarm on	With 3-phase load	
101 bit	NO_V	State of alarm /OLTAGE phase 3	R	OFF = Alarm off ON = Alarm on	With 3-phase load	
102* bit	S NO_C	State of alarm CURRENT phase 1	R	OFF = Alarm off ON = Alarm on		
103 bit	NO_C	State of alarm CURRENT phase 2	R	OFF = Alarm off ON = Alarm on	With 3-phase load	
104 bit	NO_C	State of alarm CURRENT phase 3	R	OFF = Alarm off ON = Alarm on	With 3-phase load	

ALARM due to overload

655*	R	INNTC_SSR
534*	R	INNTC_LINE
535*	R	INNTC_LOAD

OUTPUTS

	•			
160)*	rL.1	R/W	Allocation of reference signal
163	3*	r L.2	R/W	Allocation of reference signal
166	6*	rL.3	R/W	Allocation of reference signal
170)*	rL.4	R/W	Allocation of reference signal
171	1*	r L.5	R/W	Allocation of reference signal
172	2*	r L.6	R/W	Allocation of reference signal
152	<u>2</u> *	EE.I	R/W	OUT 1 (Heat) cycle time
9]			
159	9*	CE.2	R/W	OUT 2 (Cool) cycle time
308 319	3* 9		R	State rL.x (MASKOUT_RL)
] 			
12^ bit		STATE rL.1	R	OFF = Signal off ON = Signal on
13* bit		STATE rL.2	R	OFF = Signal off ON = Signal on
14* bit		STATE rL.3	R	OFF = Signal off ON = Signal on
15* _{bit}		STATE rL.4	R	OFF = Signal off ON = Signal on
16* _{bit}		STATE rL.5	R	OFF = Signal off ON = Signal on
17* bit		STATE rL.6	R	OFF = Signal off ON = Signal on
60	7	out. 1	R/W	Allocation of physical output OUT 1
608	8	out.2	R/W	Allocation of physical output OUT 2
609	9	out.3	R/W	Allocation of physical output OUT 3
61	1	out.5	R/W	Allocation of physical output OUT 5
612	2	out.6	R/W	Allocation of physical output OUT 6
61:	3	out.7	R/W	Allocation of physical output OUT 7
614	4	out.8	R/W	Allocation of physical output OUT 8
61	5	out.9	R/W	Allocation of physical output OUT 9
616	6	out. 10	R/W	Allocation of physical output OUT 10
82 bit	Stat	e of output OUT1	R	OFF = Output off ON = Output on
83 bit	Stat	e of output OUT2	R	OFF = Output off ON = Output on
84 bit	Stat	e of output OUT3	R	OFF = Output off ON = Output on
85 bit	Stat	e of output OUT4	R	OFF = Output off ON = Output on
86 bit	Stat	e of output OUT5	R	OFF = Output off ON = Output on
87 bit	Stat	e of output OUT6	R	OFF = Output off ON = Output on
88 bit	Stat	e of output OUT7	R	OFF = Output off ON = Output on
89 bit	Stat	e of output OUT8	R	OFF = Output off ON = Output on

90 bit	State of output OUT9	R	OFF = Output off ON = Output on
91 bit	State of output OUT10	R	OFF = Output off ON = Output on
664	4	R	State outputs (MASKOUT_OUT)

SETPOINT SETTING

138 16 - 472	SP	R/W	Local setpoint					
181	£ <i>P.</i> 2	R/W	Auxiliary analog input function					
18 136 - 249	SP,r	R/W	Remote setpoint (SET Gradient for manual power correction)					
25 20 - 28 - 142	LoL	R/W	Lowest settable limit SP, SP remote and absolute alarms					
26 21 - 29 - 143	нш	R/W	Highest settable limit SP, SP remote and absolute alarms					
10 bit LO	CAL / REMOTE	R/W	OFF = Enable local setpoint ON = Enable remote setpoint					
305*		R/W	State (STATUS_W)					
1 137 - 481	SPR	R	Active setpoint					
4		R	Deviation (SPA - PV)					

SETPOINT CONTROL

234 22	6.5P	R/W	Set Gradient					
259	6.52	R/W	Set Gradient for SP2					
265	Hot	R/W	Select special functions					
191	hd. 1	R/W	Enable multiset instrument control via serial					
230 482	5P. I	R/W	Setpoint 1					
231 483	5 <i>P.</i> 2	R/W	Setpoint 2					
140	d 16.	R/W	Digital input function					
618	d 16.2	R/W	Digital input function 2					
75 bit	SELECT SP1 / SP2	R/W	OFF = Select SP1 ON = Select SP2					
305*		R/W	State (STATUS_W)					

PID HEAT/ COOL CONTROL

617*	SPU	R/W	Power reference			
180	[Lr	R/W	Control type]	
5 148 - 149	<i></i>	R/W	Proportional band for heating or hysteresis ON/OFF			
7 150	h. IE	R/W	Integral heating time			
8 151	h.dt	R/W	Derivative heating time			
6	с.РЪ	R/W	Proportional band for cooling or hysteresis ON/OFF]	
76	c. 12	R/W	Integral cooling time			
77	c.db	R/W	Derivative cooling time			
513	СЛЕ	R/W	Select cooling fluid			
152 9	CE. 1	R/W	Cycle time OUT 1 (Heat)			
159	C£.2	R/W	Cycle time OUT 2 (Cool)			
2* 132 - 471	0u.P	R	Value control outputs (+Heat / -Cool)			
39 484	c.SP	R/W	Cooling setpoint relative to heating setpoint			
78	r SE	R/W	Manual reset (value added to PID input)			
516	P.r.S	R/W	Reset power (value added directly to PID output)			
79	Rr S	R/W	Antireset (limits integral PID action)			
80	FFd	R/W	Feedforward (value added to PID output after processing)			
42 146	_ካ ይዝ	R/W	Maximum limit heating power			
254	<i></i> አዎደ	R/W	Min. limit heating power (not available for double action heat/cool)			
43	с.Р.Н	R/W	Maximum limit cooling power			
255	c.P.L	R/W	Min. limit cooling power (not available for double action heat/cool)			
765*	P.PEr	R/W	Percentage of output power			
766*	P.oF5	R/W	Offset of output power			
763*	G.oUE	R/W	Gradient for output control			
				ישר	ן [
/64*	Lo.Y	R/W	Uscita minima di innesco			

AUTOMATIC/MANUAL CONTROL

25	2*		R/W	MANUAL_POWER					
2 ⁻ 132 -	* 471	0uP	R	Value control outputs (+Heat / -Cool)					
14	10	d 1G.	R/W	Digital input function					
618		d 16.2	R/W	Digital input function 2					
1* bit		AUTO/MAN	R/W	OFF = Automatic ON =Manual					
30	5*		R/W	State (STATUS_W)					

HOLD FUNCTION

14	0	d 1G.	R/W	Digital input function		
61	8	a 16.2	R/W	Digital input function 2		
64 bit		HOLD	R/W	OFF = hold off ON = hold on		

MANUAL POWER CORRECTION

505*	r IF	R/W	Line voltage			
506*	Cor	R/W	Manual power correction based on line voltage			
18 136 - 249	SP.r	R/W	Remote setpoint (SET Gradient for power correction			

AUTOTUNING

31	1	5.Eu	R/W	Enable selftuning, autotuning, softstart
14	0	d 1G.	R/W	Digital input function
61	8	6 IG.2	R/W	Digital input function 2
29 bit	ļ	AUTOTUNING	R/W	OFF = Stop Autotuning ON = Start Autotuning
28 bit	AUT	OTUNING STATE	R	OFF = Autotuning in Stop ON = Autotuning in Start
68 bit	58 DIGITAL INPUT bit STATE 1		R	OFF = Digital input 1 off ON = Digital input 1 on
92 bit	2 DIGITAL INPUT 5 STATE 2		R	OFF = Digital input 2 off ON = Digital input 2 on
29	6		R	Enable autotuning and selftuning state (FLG_PID)
30	5*		R/W	State (STATUS_W)

SELFTUNING

31		5.Eu	R/W	Enable selftuning, autotuning, softstart
14	0	d 16.	R/W	Digital input function
61	8	6 IG.2	R/W	Digital input function 2
3 bit	S	SELFTUNING	R/W	OFF = Stop Selftuning ON = Start selftuning
0 bit	0 SELFTUNING STATE		R	OFF = Selftuning in Stop ON = Selftuning in Start
68 bit	68 DIGITAL INPUT bit STATE 1		R	OFF = Digital input 1 off ON = Digital input 1 on
92 bit	D	IGITAL INPUT STATE 2	R	OFF = Digital input 2 off ON = Digital input 2 on
29	6		R	Enable autotuning and selftuning state (FLG_PID)
305	5*		R/W	State (STATUS_W)

SOFTSTART

31		5.Eu	R/W	Enable selftuning, autotuning, softstart	
14	7	SoF	R/W	Softstart time	
63 bit SOFTSTART STATE		R	OFF = Softstart off ON = Softstart on		

START MODE

699* P.o.t R/W Start mode at Power-On		
---------------------------------------	--	--

SOFTWARE SHUTDOWN

14	0	d 1G.	R/W	Digital input function
61	8	d 16.2	R/W	Digital input function 2
70	0	oFF.Ł	R/W	Software OFF
11 bit	SOF	TWARE ON/OFF	R/W	OFF = On software ON =Off software
68 bit	C	DIGITAL INPUT STATE 1	R	OFF = Digital input 1 off ON = Digital input 1 on
92 bit	C	DIGITAL INPUT STATE 2	R	OFF = Digital input 2 off ON = Digital input 2 on
305	5*		R/W	State (STATUS_W)

FAULT ACTION POWER

26	5	Hot	R/W	Select special functions
228		FRP	R/W	Fault action power (supplied in conditions of broken probe)
26*	6* STATE OF HB ALARM		R	OFF = Alarm off
_{bit}	OR POWER_FAULT			ON = Alarm on
80	80 State of power alarm		R	OFF = Alarm off
bit	bit (special function)			ON = Alarm on

POWER ALARM

261	b.5£	R/W	Stability band (special power alarm function)		
262	Ь.PF	R/W	Power alarm band (special power alarm function)		
260	PF.Ł	R/W	Power alarm delay time (special function)		
160*	rL.1	R/W	Allocation of reference signal		
163*	rL.2	R/W	Allocation of reference signal		
166*	rL.3	R/W	Allocation of reference signal - Output OR		
170*	rL.4	R/W	Allocation of reference signal - Output AND		
171*	rL.5	R/W	Allocation of reference signal - Output OR		
172*	r L.5	R/W	Allocation of reference signal - Output AND		

PREHEATING SOFTSTART

31	1	5.Eu	R/W	Enable selftuning, autotuning, softstart				
26	3	SP.5	R/W	Softstart setpoint (special function)				
26	4	So.P	R/W	Softstart power (special function)				
147		SoF	R/W	Softstart time				
63 bit STATE OF SOFTSTART		R	OFF = Softstart in Stop ON = Softstart in Start					

HEATING OUTPUT (fast cycle)

160*	rL.1	R/W	Allocation of reference signal			
163*	r L.2	R/W	Allocation of reference signal			

TRIGGER MODES

703*	Hd.5	R/W	Enable trigger modes			
707*	FutR	R/W	Maximum limit of RMS current at normal operation			
704*	ЬF.СУ	R/W	Minimum number of cycles of BF modes			

SOFTSTART

630)*	P <u>5</u> .H I	R/W	Maximum phase of phase softstart ramp	
70	5*	PS <u>E</u> r	R/W	Duration of phase softstart ramp	
629	9*	P5.oF	R/W	Minimum non-conduction time to reactivate phase softstart ramp	
706	6*	PS.ER	R/W	Maximum peak current limit during phase softstart ramp	
108* _{bit}	Resta	rt of phase softstart ramp	R/W	OFF = Restart not enabled ON=Restart enabled	
106* _{bit}	State	e of softstart ramp from phase	R	OFF = Ramp not ended ON = ramp ended	
107* _{bit}	State	e of softstart ramp from phase	R	OFF = Ramp not ended ON = ramp ended	

DELAY TRIGGERING

708*	dL.E	R/W	Delay triggering (first trigger only)			
738*	dL.oF	R/W	Minimum non-conduction time to reactivate delay triggering			

FEEDBACK MODES

730)*	Hd <u>.</u> 5	R/W	Enable feedback modes			
731	*	Cor.U	R/W	Maximum correction of voltage feedback			
732)* -	Cor. I	R/W	Maximum correction of current feedback			
733	5*	[orP	R/W	Maximum correction of power feedback			
734	*	┍ ╢ 두 ,∐	R/W	Voltage feedback reference			
735	5*	r 1F. 1	R/W	Current feedback reference			
736	6*	r IF,P	R/W	Power feedback reference			
113* _{bit}	Calif fee	pration of selected adback reference	R/W	OFF=Calibration non enabled ON= Calibration enabled			
757*		Rr IF	R	Feedback	Setpoint of V, I, P to maintain	on load	

HEURISTIC POWER CONTROL

680	hd.3	R/W	Enable heuristic power control		
681	IHEU	R/W	Maximum current for heuristic power control		

HETEROGENEOUS POWER CONTROL

682	hd.4	R/W	Enable heterogeneous power control		
683	UHEE	R/W	Maximum current for heterogeneous power control		

VIRTUALINSTRUMENTCONTROL

191	hd. I	R/W	Enable multiset instrument control via serial	
224*	5. In	R/W	Control inputs from serial	
225	5.0u	R/W	Control outputs from serial	
628	5.L I	R/W	Control LEDs and digital inputs from serial	

HW/SW DATA

122	UPd	R	Software version code
85	Err	R	Self-diagnosis error code for main input
606	Er.2	R	Self-diagnosis error code for auxiliary input 2
550	Er.3	R	Self-diagnosis error code for auxiliary input 3
551	Er.4	R	Self-diagnosis error code for auxiliary input 4
552	Er.5	R	Self-diagnosis error code for auxiliary input 5
190	Е.Н.в	R	Hardware configuration codes
508	E.Hd I	R	Hardware configuration codes 1
543	5.Hd2	R	Hardware configuration codes 2
693 697	UPdF	R	Fieldbus software version
695	CodF	R	Fieldbus node
696	68U,F	R	Fieldbus baudrate
346		R	State of jumper
120		R	Manufact - Trade Mark (Gefran)
121		R	Device ID (GFW)
197	Ld.5E	R/W	RN status LED function
619	Ld.2	R/W	ER status LED function
620	L.d.3	R/W	DI1 LED function
621	L d.Y	R/W	DI2 LED function
622	Ld.5	R/W	O1 LED function
623	Ld.5	R/W	O2 LED function
624	LdJ	R/W	O3 LED function
625	Ld.8	R/W	O4 LED function
305*		R/W	State (STATUS_W)

46	7		R	State (STATUS)
469			R	State 1 (STATUS1)
632			R	State 2 (STATUS2)
633			R	State 3 (STATUS3)
63	4		R	State 4 (STATUS4)
106 bit	Stat	e of softstart ramp from phase	R	OFF = Ramp not ended ON = ramp ended
107 bit	State of softstart ramp from phase		R	OFF = Ramp not ended ON = ramp ended
702			R	Voltage status

KEYPAD USE

This charter describes the optional KB-ADL keypad and use mode to display and program parameters.



← Signal led
← Liquid crystal display 5 alphameric lines of 21 characters each
← Pad keypad

Description

The program keypad is used to display the state and diagnostic parameters during operating period; on the back is present a magnetic material strip to fix it on GFW-master frontal or on a metal surface (ex. Electrical panel door). The keypad is equipped with a connection cable of 70 centimeters.

Membrane keyboard

The following table describes the keypad and its functions:

Symble	Reference	Description
ESC	Escape	Comes back to the higher menu or submenu. Exits from a parameter, or a parameter list. Allows to exit from a message requiring its use.
SAVE		No function
FIND		No function
RST		No function
CUST		No function
DISP		No function
E	Enter	Enters the submenu or the selected parameter, or selects an operation. It is used during the parameter change to confirm the new set value.
٨	Up	Moves the selection in a menu or a parameter list highwards. During a parameter change, increases the figure value under the cursor.
v	Down	Moves the selection in a menu or a parameter list downwards. During a parameter change, decreases the figure value under the cursor.
<	Left	Comes back to top menu. During a parameter change, moves the cursor verso rightwards.
>	Right	Enters the submenu or the selected parameter. During a parameter change, moves the cursor verso rightwards.

Leds meaning:

LEDs	Colour	Led meaning	
BRK	Yellow	Led is on when GFW is OFF software	
CNT	Yellow	Led is on when GFW is in manual operating	
EN	Green	Led is on when during power supply	
ILIM	Red	This led flashes when GFW reaches a current limit condition (if enabled). During normal operation this led is off.	
N=0	Yellow	Led is on when during softstart ramp	
AL	Red	Led is on when GFW signals an alarm trigger	

Netsurfing

Scan of first and second level menus:

First Level

01 STATUS 02 INFO 03 COMMS 04 INPUTS 05 ALARMS	▲ UP	11 VIRTUAL 01 STATUS 02 INFO 03 COMMS 04 INPUTS
	down	01 STATUS 02 INFO 03 COMMS 04 INPUTS 05 ALARMS
First Level		Second Level
01 STATUS 02 INFO 03 COMMS 04 INPUTS 05 ALARMS	► Right	04.01 STATUS 04.02 ANALOG 04.03 MAIN 04.04 AUX 1 04.05 AUX 2

Parameter display

1	04.02.01	ADDR:10-400	2
3	tyP: input	type O	4
5	Def: 0	_	

- (1) Indication of menu and of parameter position
- (2) Modubus address of parameter (node address 16 bits or address 1 bit)
- (3) Parameter description
- (4) Depends on the parameter type:
 - Numerical parameter: displays the parameter numerical value, in the requested format and measurement unit.
- (5) This position displays:
 - Numerical parameter: displays the minimum and maximum default values of parameter. These values are displayed in order by pressing key ►
 - Binary parameter: displays the parameter state (ON-OFF, AUTO-MAN, ...)
 - Error signals and conditions:

Out of range: you are trying to enter a value outside the min and max limits.

Scan parameters



Change parameters

- To access to change mode press key E when the parameter to changed is displayed.
- To save the parameter value, after changing it, press again key E.
- To exit from change mode without saving the value, press key ESC.
- The operations to execute to change the value depend on the type of parameter, as described below.

Numerical parameters



- When E is pressed, to access to change mode, the cursor on number corresponding to unit is activated.
- Use keys ◀ and ► to move cursor on all the numbers, included the non-signifiant zeroes, which are not normally displayed.
- With keys ▲ and ▼ the number under cursor is increased or decreased.
- Press E to confirm the change or ESC to cancel it.



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