GEFRAN

GTF and GTF-Xtra
POWER CONTROLLER

CONFIGURATION AND PROGRAMMING MANUAL

Software version: **2.5x**

code: **80961F - 07-2018 - ENG**

This document supplements the following manuals:
- Instructions and warnings for GTF/GTF-Xtra

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.

The Customer is obligated to respect trade secrets. Therefore, this manual and its attachments may not be tampered with, changed, reproduced, or transferred to third parties without **GEFRAN's** authorization.

TABLE OF CONTENTS AND SUMMARIES

INTRODUCTION

The advanced Solid State Relays described in this manual and shown on the cover is a separate unit for the independent control, it offers high applicative flexibility thanks to the extended configurability and programmability of its parameters.

Configuration and programming must be performed with a PC connected in USB/232/485, with specific software **(GF_express)**.

Since it is impossible to foresee all of the installations and environments with 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 advanced Solid State Relays is the ideal solution for applications in heat treatment furnaces, in thermoformers, in packaging and packing machines. 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

This manual is intended for technical personnel, who commission the instrument by connecting it to other units, and for service and maintenance personnel.
It is assumed that such persons have adequate technical knowledge, especially in the fields of electronics and automation.

The instrument described in this manual may be operated only by personnel who are trained for their assigned task, in conformity to the instructions for such task and, specifically, to the safety warnings and precautions contained in such instructions. Thanks to their training and experience, qualified personnel can recognize the risks inherent to the use of these products/systems and are able to avoid possible dangers.

STRUCTURE OF THIS MANUAL

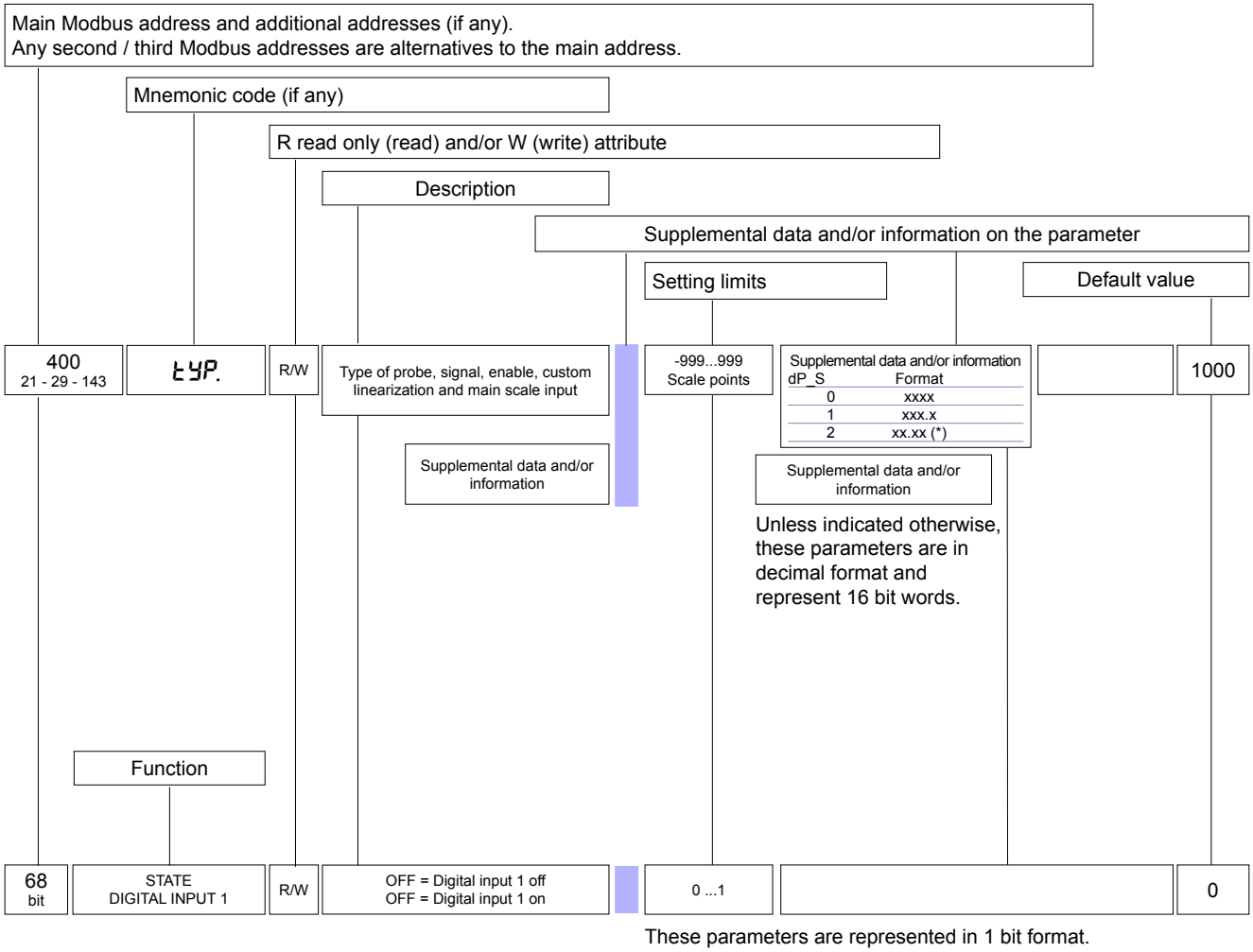
This manual was originally written in ITALIAN. Therefore, in case of inconsistencies or doubts, request the original manual or explanations from GEFRAN.
The instructions in this manual do not replace the safety instructions and the technical data for installation, configuration and programming applied 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:



Communications

Each GTF has an optically isolated serial port TTL with standard Modbus for GTF 25-120A protocol via connector J2 type RJ10 (J5 for GTF 150-250A).
As an option, you may have an optically isolated RS485 serial port with standard Modbus protocol for GTF 25-120° via connectors j3 and j4 type RJ10 (J6, J7 for GTF 150-250A).
The Cod parameter (read only) shows the value of the node address, settable from 00 to 99 with the 2 rotary switches acquired power; the hexadecimal settings are reserved.

Changing the bAU (select baud-rate) and/or PAr (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. For TTL serial port, code Cod. is fixed at 1.

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.
GTF 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).

23	Cod	R	*Identification code*	1 ... 99		1

NOTES:
- ID code 0 is reserved to the` Autobaud function
- The ID code is the image of the rotary switches acquired at power-on

24	bAu	R/W	Select Baudrate	*Baudrate table*		4

0	1200 bit/s
1	2400 bit/s
2	4800 bit/s
3	9600 bit/s
4	19200 bit/s

25	PAr	R/W	Select parity	*Parity table*		0

0	No parity
1	Odd
2	Even

NOTE:
- Configuration via the TTL serial port is done with the following parameters:
  Cod = 1
  bAu = 4
  PAr = 0

Communication failure

If Modbus communication between the GTF and the Master node goes into Timeout, you can set an output power value and transmit the alarm state to the relay output (RL parameter).

163	C.E.t	R/W	*Timeout due to communication failure*	0 ... 99 sec	Value 0 disables the function	0
164	C.E.P	R/W	*Output power when communication failure is active*	0.0 ... 100.0 %		0.0

MAIN INPUT

The advanced Solid State Relays have 1 main input to control, to which you can connect, linear sensors in voltage or current to acquire process variable (PV) values

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,.

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.

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.

Probe type

27	tYP.	R/W	Type main input		*Table of probes and sensors*	1

	Probe type
0	Disable input
1	0...10V
2	0 ... 5V/Potentiometer
3	0...20mA
4	4...20mA

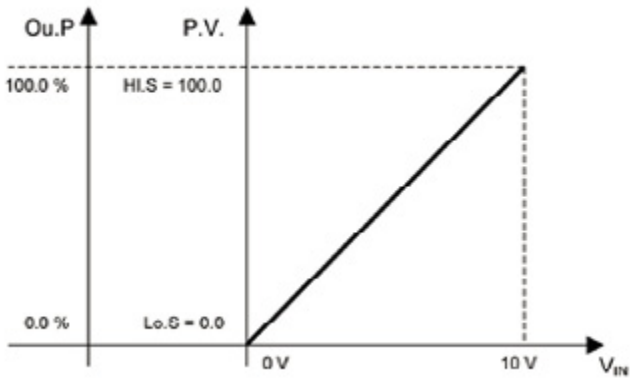
+16 Function ON/OFF Software (only when dIG=7 PWM input)
+32 Function ON/OFF Software (only when dIG=7 PWM input) inversed logic

Scale limits

29	Lo.S	R/W	Minimum scale limit of main input	-100.0...200.0 scale points		0,0
30	H I.S	R/W	Maximum scale limit of main input	-100.0...200.0 scale points		100,0

Examples of Lo.S and HI.S parameter settings

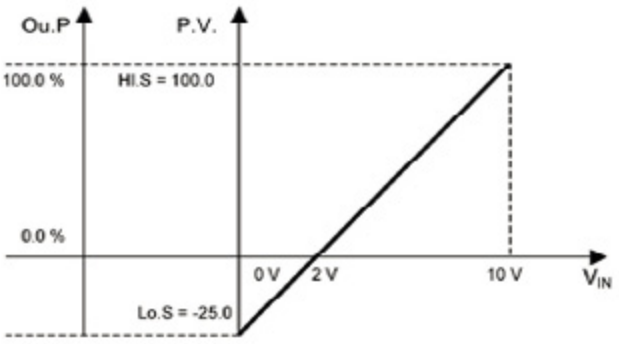
Example 1:
VIN = 0…10V
tyP. = 1
Lo.S = 0.0
HI.S = 100.0



The default values (Lo.S = 0.0 and HI.S = 100.0) can be changed to obtain the required scale of the PV in engineering value corresponding to the minimum and maximum of the physical input (V/mA).

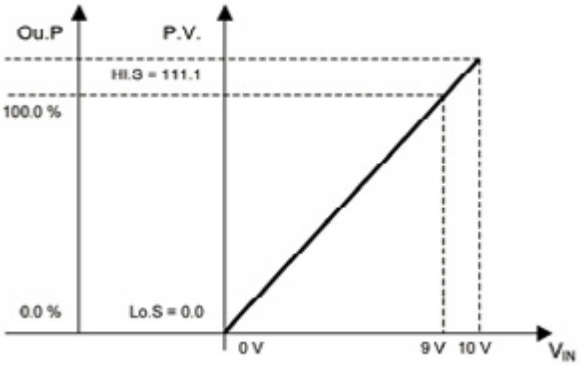
In automatic mode, the engineering value (PV) is attributed to power Ou.P for values between 0.0 and 100.0.

Example 2:
VIN = 2…10V
tyP. = 1
Lo.S = -25.0
HI.S = 100.0



Since the 0…10V input range is reduced 80% above, the scale interval (HI.S – Lo.S) must be extended downward so that the useful interval (100.0 – 0.0) is 80% (100.0/125.0 = 0.8).

Example 3:
VIN = 0…9V
tyP. = 1
Lo.S = 0.0
HI.S = 111.1



Since the 0…10V input range is reduced 90% below, the scale interval (HI.S – Lo.S) must be extended upward so that the useful interval (100.0 – 0.0) is 90% (100.0/111.1 = 0.9).

Offset adjustment

31	oFS.	R/W	*Offset correction for main input*	-99,9...99,9 scale points		0,0

Read state

0	P.V.	R	Read of engineering value of *process variable* (PV)	scale points

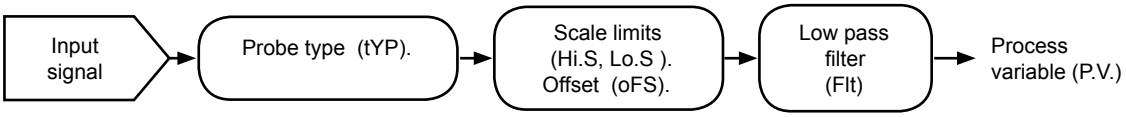
ADVANCED SETTINGS

Input filter

28	FLt	R/W	*Low pass digital filter* on input signal	0,0 .... 20,0 sec		0,1

Sets a low pass *digital filter* on the main input, running the average value read in the specified time interval. If = 0 exclude the average filter on the sampled values.

FUNCTIONAL DIAGRAM



CURRENT VALUE IN LOAD

The RMS current value is read in variable Ld.A of each zone.
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 0.2ms sampling time.

The following parameters are also available:

- I.tA instantaneous ammeter value
- I.onF current with active control
- o.tA ammeter input offset correction
- Ft.A ammeter input digital filter

If diagnostics detects a fault condition on the load, the yellow STATUS LED will enable..
The condition POWER FAULT in OR with HB alarm can be assigned to an alarm or identified in the state of a bit in variable STATUS2

POWER_FAULT diagnostics is configurable with parameter hd.2, which can be partially 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
  (NOTE: the No_Current alarm trips when the current value on the load is less than 4% of I_nominal of the product. For example, for GTF-25A the alarm trips with load current below 1A).

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
25A	50,0
40A	80,0
50A	100,0
60A	120,0
75A	150,0
90A	180,0
120A	240,0
150A	300,0
200A	400,0
250A	500,0

Scale limits

33	L.tA	R	Minimum scale limit of CT input	
34	H.tA	R	Maximum scale limit of CT input	

Setting the offset

35	o.tA	R/W	*Offset correction CT input*	-99,9 ...99,9 A		0,0

Read state

87	I.tA	R	Instantaneous current variable
88	I.onF	R	CT filtered ammeter input value with output activate
94	I.tAP	R	Peak ammeter input value during phase softstart ramp
104	Ld.A	R	Current RMS of load

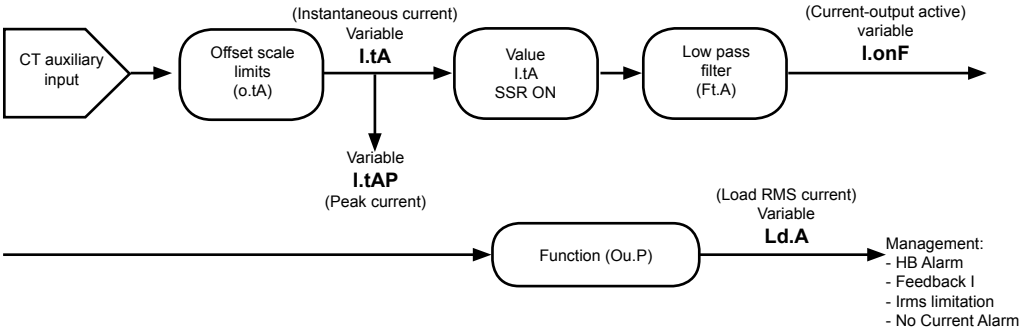
ADVANCED SETTINGS

Input filter

32	Ft.A	R/W	*CT input digital filter*	0,0 ... 20,0 sec		2.0

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



The line voltage interval for correct operation is 90…600VAC.
There are the following parameters:

I.tV instantaneous voltmeter value of line
I.tVF filtered voltmeter value
o.tV voltmeter input offset correction
Ft.V voltmeter input digital filter

RMS voltage values refer to the voltage between the terminal: 1/L1 and 3/L2.
It has a voltage presence check that shuts off the module in case of incorrect values.
A “STATUS 3” parameter contains information on the status of line voltage, including mains frequency identified 50/60Hz.

Scale limits

37	LtV	R	Minimum scale limit of TV input
38	HtV	R	Maximum scale limit of TV input

Setting the offset

39	o.tV	R/W	*Offset correction for TV input*	-99,9 ...99,9 **V**		0,0

Read state

96	I.tV	R	Value of voltmeter input
97	I.tVF	R	Value of voltmeter input
103	FrEq	R	Voltage frequency in tenths of Hz

ADVANCED SETTINGS

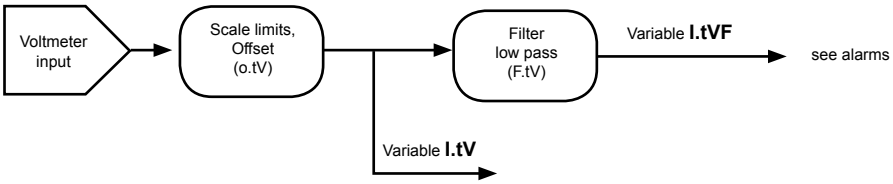
Input filter

36	F.tV	R/W	*Digital filter for voltmeter transformer TV auxiliary input*	0,0 ... 20,0 sec		2.0

Sets a low pass filter on the 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



VOLTAGE VALUE ON LOAD

RMS voltage is read in variable.
Voltage on the load is acquired with sampling on each cycle, 20ms at 50Hz (16.6ms at 60Hz).
Accuracy is better than 1%.

ATTENTION: For load voltages below 90VAC, the voltage read on the load and possible related alarms have no value.

105	Ld.V	R	Voltage on load

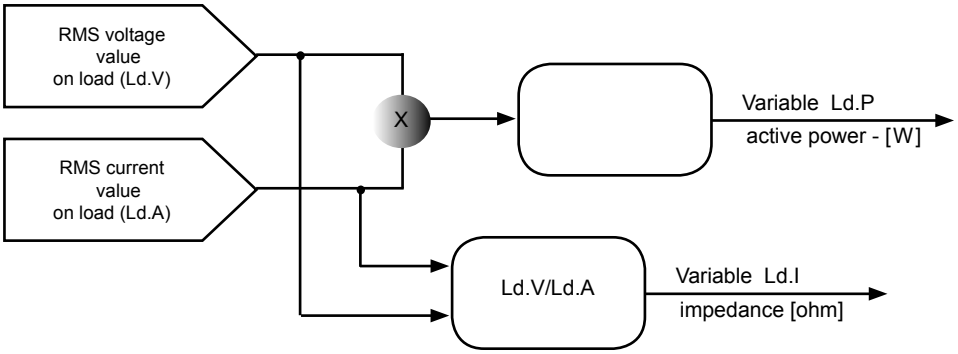
POWER ON LOAD

Power on the load in each zone is read in variable Ld.P
The load impedance in each zone is read in variable Ld.I.

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

106	Ld.P	R	Power on load	
107	Ld.I	R	Impedance on load	

Functional Diagram



DIGITAL INPUTS

input can perform various functions based on the setting of the following parameters.

54	dIG.	R/W	Digital input function	*Digital input functions table*		0

0	No functions (input off)
1	MAN / AUTO controller
6	ON/OFF Software
7	PWM input (Ou.P)
10	Power_Fault alarms memory reset
15	HB Calibration

+ 16 for inverse logic input

NOTE:
In SLAVE and BI-PHASE SLAVE mode (parameter hd.1), the digital input assumes the fixed function of SSR control from the master.

NOTE:
When digital input is used in PWM mode (DIG=7), it is important to set the PWM timeout parameter PWm.t with a value equal or greater than PWM cycle-time, in order to have this timeout reaction time on power output, when the digital input is maintained steady at low level (power output Ou.P =0%) or when is maintained steady at high level (power output Ou.P=100%).

83	PWm.t	R/W	Timeout for PWM input	0.01 - 10.00		1.00

Read state

5 bit	STATE of DIGITAL INPUT	R	OFF = Digital input off R ON = Digital input on		
118		R	State of INPUT DIG digital inputs	bit.0 = state dIG	0

HB ALARM (Heater Break Alarm)

This type of alarm identifies load break or interruption by measuring 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 Hd.2; 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 at 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.
For loads such as IR lamps, with high temperature coefficient, the HB alarm is disabled when delivered power is below 20%.

Function: HB alarm setpoint self-learning

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 or digital input (see parameter dIG or dIG.2) or key (see HW/SW Information-Key Features).
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 NO infrared lamps, the existing RMS current value is shown at 100% of power, which, multiplied by parameter Hb.P, determines the HB alarm setpoint. Before activating the function, it is necessary that the GTF is switched on with power, it is recommended, above 50%.

In the case of HSC mode or PA for infrared 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.

In this phase, the maximum conduction value can be limited by means of parameter Hb. Pm
In case of HSC firng mode, the Heater Break alarm teach-in function doesn't calibrate at 5%, 3%, 2% and 1% in order to avoid high peak currents due to the low impedence at very low temperature of the IR lamp filament.

Enable alarm

43	hd.2	R/W	*Enable POWER_FAULT alarms*	*Table of Power Fault alarms*	0

	SSR_SHORT	NO_ VOLTAGE	NO_CURRENT
0			
1	x		
2		x	
3	x	x	
8			x
9	x		x
10		x	x
11	x	x	x

+ 32 with memory alarm
+64 for enabling HB alarm

3	Hb.F	R/W	HB alarm functions	*Table of HB alarm functions*	0

0	alarm active at a load current value below set point for control output ON time.
1	alarm active at a load current value above set point for control output OFF time.
2	Alarm active if one of functions 0 and 1 is active (OR logic between functions 0 and 1) (*)
3	Continuous alarm

(*) minimum setpoint is set at 12% of ammeter full scale
+ 8 HB reverse alarm
+32 HB alarm with memory

5	Hb.t	R/W	Delay time for activation of HB alarm	0 ... 999 sec	The value must exceed the cycle time of the output to which the HB alarm is associated.	10

Alarm setpoints

4	A.Hb	R/W	*HB alarm setpoint (scale points ammeter input)*	L.tA ... H.tA A		10,0
6	Hb.P	R/W	Percentage HB alarm setpoint of current read in HB calibration	0,0 ... 100,0%		90,0
14 bit	Calibration HB alarm setpoint for zone	R/W	OFF = Calibration not enabled ON = Calibration enabled	0...1		0
82	Hb.Pm	R/W	Maximum limit with conduction HB calibration (only for IR lamps)	0,0 ... 100,0%		100,0

Read state

7	Hb.tA	R/W	CT read in HB calibration		0,0
8	Hb.t.V	R/W	TV read in HB calibration		0,0
9	Hb.PW	R/W	Ou.P power in HB calibration/		0,0

10	IrtA.0	R/W	CT read in HB calibration to 100% with conduction (only for IR lamps)			0,0
11	IrtA.1	R/W	CT read in HB calibration to 50% with conduction (only for IR lamps)			0,0
12	IrtA.2	R/W	CT read in HB calibration to 30% with conduction (only for IR lamps)			0,0
13	IrtA.3	R/W	CT read in HB calibration to 20% with conduction (only for IR lamps)			0,0
79	IrtA.4	R/W	CT read in HB calibration to 15% with conduction (only for IR lamps)			0,0
80	IrtA.5	R/W	CT read in HB calibration to 10% with conduction (only for IR lamps)			0,0
81	IrtA.6	R/W	CT read in HB calibration to 5% with conduction (only for IR lamps in mode PA)			0,0
153	IrtA.7	R/W	CT read in HB calibration to 3% with conduction (only for IR lamps in mode PA)			0,0
154	IrtA.8	R/W	CT read in HB calibration to 2% with conduction (only for IR lamps in mode PA)			0,0
155	IrtA.9	R/W	CT read in HB calibration to 1% with conduction (only for IR lamps in mode PA)			0,0

72	IrtV.0	R/W	TV read in HB calibration to100% with conduction (only for IR lamps)			0,0
73	IrtV.1	R/W	TV read in HB calibration to 50% with conduction (only for IR lamps)			0,0
74	IrtV.2	R/W	TV read in HB calibration to 30% with conduction (only for IR lamps)			0,0
75	IrtV.3	R/W	TV read in HB calibration to 20% with conduction (only for IR lamps)			0,0
76	IrtV.4	R/W	TV read in HB calibration to 15% with conduction (only for IR lamps)			0,0
77	IrtV.5	R/W	TV read in HB calibration to 10% with conduction (only for IR lamps)			0,0
78	IrtV.6	R/W	TV read in HB calibration to 5% with conduction (only for IR lamps in mode PA)			0,0
150	IrtV.7	R/W	TV read in HB calibration to 3% with conduction (only for IR lamps in mode PA)			0,0
151	IrtV.8	R/W	TV read in HB calibration to 2% with conduction (only for IR lamps in mode PA)			0,0
152	IrtV.9	R/W	TV read in HB calibration to 1% with conduction (only for IR lamps in mode PA)			0,0
4 bit	ALARM STATE HB or POWER_FAULT	R	OFF = Alarm off ON = Alarm on			
6 bit	HB alarm state	R	OFF = Alarm off ON = Alarm on			
12 bit	Reset SSR_SHORT / NO_VOLTAGE / NO_CURRENT alarms/HB	R/W	OFF= - ON= reset alarms		0 ... 1	0

113		R	States of alarm ALSTATE	*Table of HB alarm states*

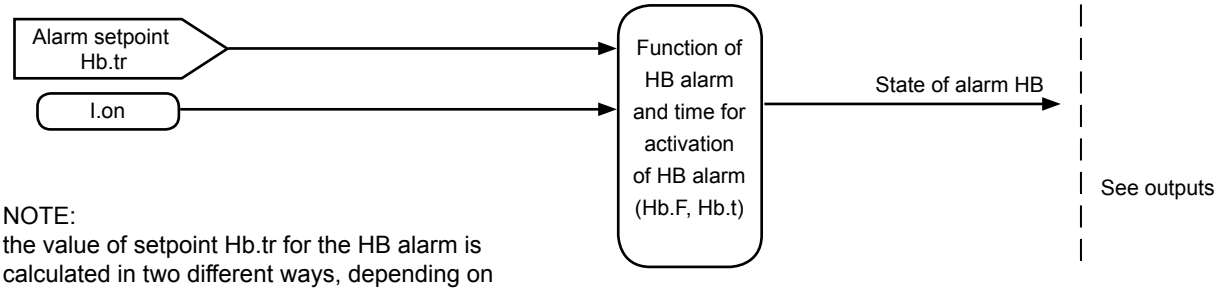
bit	
4	alarm HB temp ON
5	alarm HB temp OFF
6	alarm HB

114		R	States of alarm ALSTATE_IRQ	*Table of alarm states ALSTATE*

bit	
4	HB alarm or POWER_FAULT

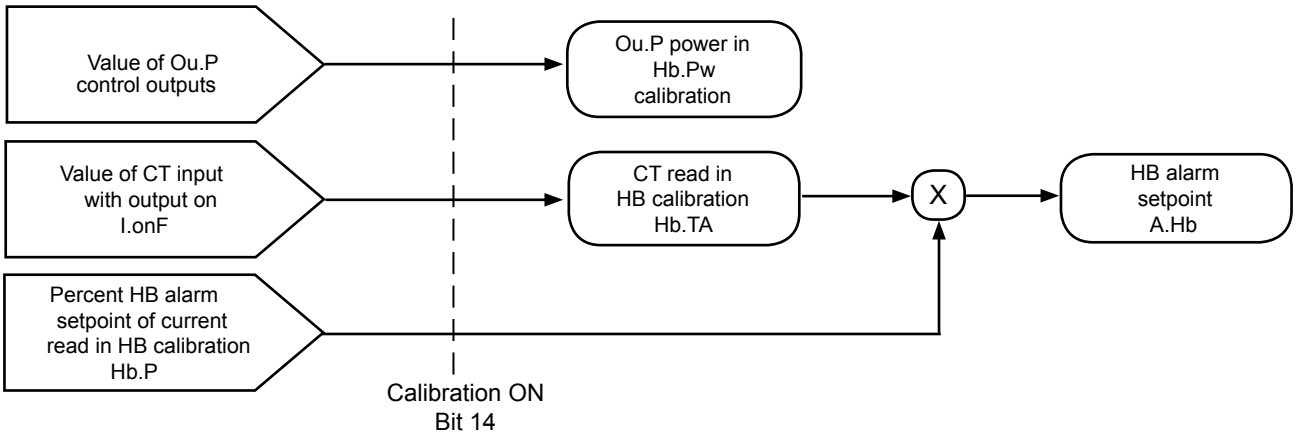
111	HbEr	R	HB alarm setpoint as function of power on load

FUNCTIONAL DIAGRAM

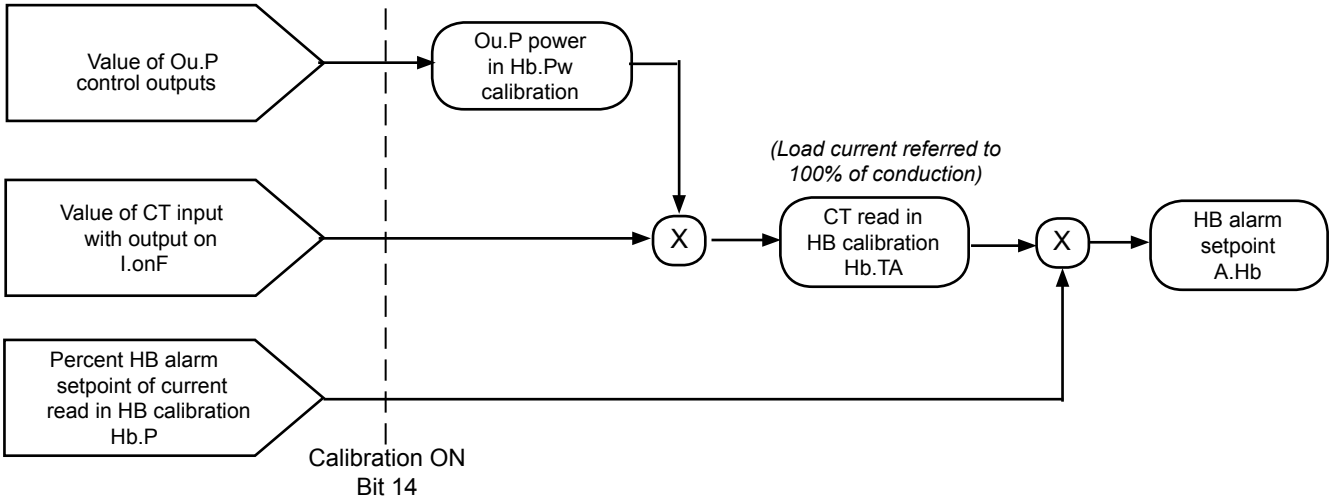


NOTE:
the value of setpoint Hb.tr for the HB alarm is calculated in two different ways, depending on the selected function mode:
if ZC, BF, HSC mode: Hb.tr = A.Hb
if PA mode: Hb.tr = A.Hb * $\sqrt{(Ou.P)}$

HB Calibration in modes ZC - BF - HSC



HB Calibration in mode PA



Power Fault ALARMS (SSR_SHORT, NO_VOLTAGE e NO_CURRENT)

43	hd.2	R/W	*Enable POWER_FAULT alarms*	*Table of Power Fault alarms*	0
44	dU.t	R/W	Refresh SSR SHORT The alarm activates after 3 seconds.	1...999 sec	10
45	dU.F	R/W	Time filter for NO_VOLTAGE, SSR_OPEN and NO_CURRENT alarms Note: set a value not less than cycle time.	0...99 sec	10

Reading state

12 bit	Reset SSR_SHORT / NO_VOLTAGE / NO_ CURRENT/HB alarms	R/W	OFF= - ON= reset alarms		0 ... 1		0
7 bit	State of alarmSSR_ SHORT	R					
8 bit	State of alarm NO_VOLTAGE	R					
9 bit	State of alarm NO_CURRENT	R					
114		R	State of alarms ALSTATE IRQ		*Table State of alarms*		0
115		R	Status 2		*Table Status 2*		0

Overheat alarm

The controller has a temperature sensor for the internal heatsink.
The temperature value of the heatsink is in variable IN_NTC; the over_heat alarm trips when the temperature exceeds 105°C.
This condition may be caused by obstructed air vents or by a blocked cooling fan.
With the over_heat alarm on, the control disables control output SSR.
There is another maximum temperature protection that disables the hardware for the SSR control.

101		R	IN_NTC: SSR temperature		°C
102		R	DER_NTC: temperature derivative of the SSR		°C / 12sec

Reading state

117		R	Status 3		*Table Status 3*

FUSE_OPEN AND SHORT_CIRCUIT_CURRENT ALARMS

The FUSE_OPEN alarm trips when the internal high-speed fuse (optional) blows or, on GTF-Xtra models, when the overcurrent protection device switches off.

The SHORT_CIRCUIT_CURRENT alarm trips when peak current on the load exceeds the maximum limit (corresponding to twice the rating) during the softstart ramp or at first power-on (with softstart ramp disabled).

If configured (parameter Fr.n other than zero), the device restarts automatically in softstart for a maximum of Fr.n attempts, beyond which it remains deactivated while awaiting manual reset with front panel key BUT or with the control via serial (bit 16).

For GTF-Xtra models, the number of times the overcurrent protection device switches off is shown in FO.c1 and FO.c2.

The FO count. c1 can be reset via the command via serial (bit17).

158	Fr.n	R/W	*Number of restarts in case of FUSE_OPEN / SHORT_CIRCUIT_CURRENT*		0
16 bit	RESET FUSE_OPEN /SHORT_ CIRCUIT_CURRENT ALARMS	R/W	OFF = - ON = Reset FUSE_OPEN / SHORT_CIRCUIT_CURRENT alarms		
17 bit	RESETTING FO.c 1	R/W	OFF = - ON = Reset count FO.c1		

Read state

115		R	Status 2 (STATUS2)	Status 2 table
159	FO.c 1	R	Counter 1: FUSE_OPEN events	
160	FO.c2	R	Counter 2: FUSE_OPEN events	

OVERCURRENT FAULT PROTECTION

This function eliminates the need for an external extra-rapid fuse to protect the device. In case of load short-circuit, the internal IGBT device is instantaneously switched off and the alarm status is signaled.

- The overcurrent fault protection function DOES NOT replace any of the safeties on the system (such as magnetothermic switches, delay fuses, etc.).

- These caracteristic protects the controller (and therefore also the load) by replacing the high-speed fuse needed to protect the control SCRs against faults (without creating any additional cost to replace the fuse and reducing machine downtime).

- The overcurrent fault protection has 2 function states:

- *Normal (On-Off control of load power)*

- *Fuse-Open: GTF is open (a short occurred during normal operation).*

Allocation of reference signals

40	rL.	R/W	Allocation of reference signal for alarm relay output	*Table of reference signals*	0

0	Output disabled
1	AL.HB or Power Fault
2	AL.HB
3	Power Fault
4	AL.HB or Power Fault or Fuse Open
5	AL.HB or Fuse Open
6	Power Fault or Fuse Open
7	Fuse Open
8	Communication failure
9	AL.HB or Power Fault or Communication failure
10	AL.HB or Communication failure
11	Power Fault or Communication failure
12	AL.HB or Power Fault or Fuse open or Communication failure
13	AL.HB or Fuse open or Communication failure
14	Power Fault or Fuse open or Communication failure
15	Fuse open or Communication failure

+32 For denied logical level in output

50	Ld.1	R/W	*Function RUN led*	*Table of function Leds*	16
51	Ld.2	R/W	*Function STATUS led*		1

	Function
0	RUN
1	AUTO/MAN
2	ON/OFF software
7	Serial dialog active
9	Softstart Ramp running

+16 LED Blinking when active

The state of the LEDs matches the corresponding parameter, except in the following special cases:
- LED 1 (green) + LED 2 (yellow) both flashing rapidly: autobaud in progress
- LED 2 (yellow) flashing rapidly: SSR temperature sensor broken or SSR Over Heat or Rotation Error or Fuse_open (GTF 150...250A for models with SCR) or Load_short_protection (GTF-Xtra) or Short_Circuit_Current or Line-Load Terminals Over Heat (GTF 150...250A)

Read state

119		R	State of outputs MASKOUT	*Table of output states*

bit	
0	State SSR output
1	State rL output

2 bit	STATE SSR output	R	OFF = Output off ON = Output on
3 bit	STATE rL output	R	OFF = Output off ON = Output on

42	Hd. 1	R/W	*Type of operation*	*Table type of operation*	0

0	Master
1	Slave
2	Slave biphase

+ 8 to enable virtual instrument
+ 16 to disable saving of manual power MAN_POWER
+ 32 to load with transformer

AUTOMATIC / MANUAL CONTROL

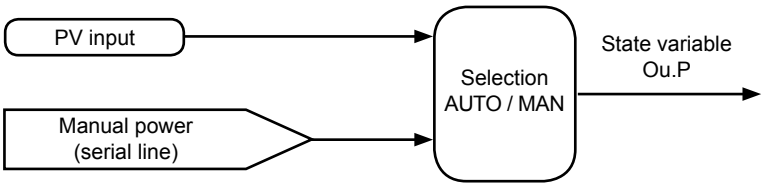
The process variable value and the setpoints remain “frozen” for the time the digital input is active.

1 bit	AUTO/MAN	R/W	OFF = Automatic ON =Manual	0... 1	0
54	d IG.	R/W	Digital input function	*See: Table of digital input functions*	0
2	Ou.P	R	SSR output value	(W – only in manual mode at address 56)	0,0

Read state

5 bit	DIGITAL INPUT STATE	R	ON = Digital input on OFF = Digital input off		
55		R/W	STATUS_W	*See: Table of STATUS_W settings*	0

FUNCTIONAL DIAGRAM



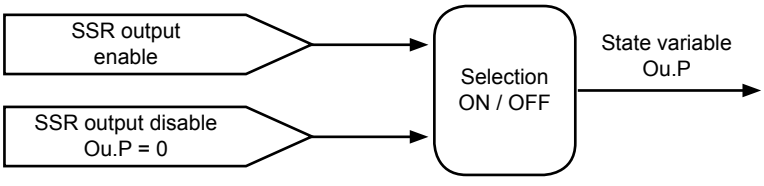
ON/OFF SOFTWARE (ENABLE/DISABLE)

0 bit	ON/ OFF SOFTWARE	R/W	OFF = On ON =Off	0... 1	0
54	d IG.	R/W	Function digital input	*See: Table function digital inputs*	0

Read state

5 bit	STATE DIGITAL INPUT	R	ON = Active digital input OFF = NO Active digital input		
55		R/W	STATUS_W	*See: Table formulations STATUS_W*	0

FUNCTIONAL DIAGRAM



START MODE

52	P.onE	R/W	Start modes at Power-On	0*	Function at previous state	0
				1	OFF software	
				2	ON software	

(*) digital input state always has priority

OPERATING HOUR METER

The device shows in OH. c (Operating Hours Counter) the number of operating hours (line voltage present and non-zero power); updating in non-volatile memory occurs every two hours and the disarming of the line voltage.

161	OH.c	R	hours of operation

SSR CONTROL MODES

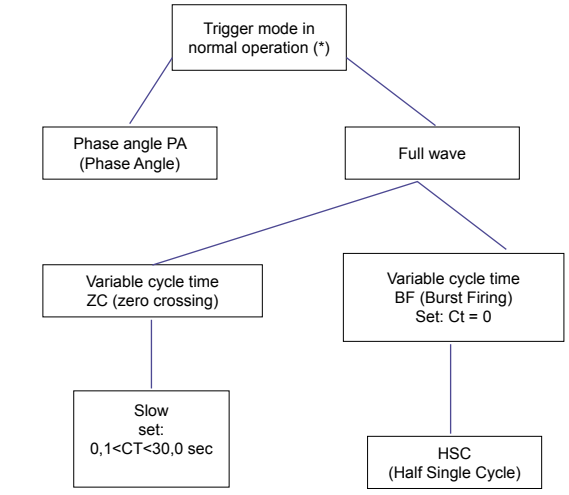
settings

The GTF 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 0,1 to 30,0 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 neutral 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.
In ZC or BF mode as well, limiting the rms current value corresponds to limiting the maximum conduction angle.

14	Hd.5	R/W	Enable trigger modes	*Table of trigger modes*	0



+ 32 only for ZC/BF modes: enable delay triggering
+ 64 linear phase Softstart in power
+128 phase Softstart for IR lamps
+ 256 phase Softstart for shutdown in software ON/OFF switching

	phased Softstart	Trigger mode in normal operation (*)	BF mode	RMS peak current control	
				in softstart	in normal operation
0	NO	ZC/BF	-	NO	NO
1	YES	ZC/BF	-	NO	NO
2	NO	PA	-	NO	NO
3	YES	PA	-	NO	NO
4	NO	ZC/BF	HSC	NO	NO
5	YES	ZC/BF	HSC	NO	NO
6	NO	PA	-	NO	NO
7	YES	PA	-	NO	NO
8	NO	ZC/BF	-	YES	NO
9	YES	ZC/BF	-	YES	NO
10	NO	PA	-	YES	NO
11	YES	PA	-	YES	NO
12	NO	ZC/BF	HSC	YES	NO
13	YES	ZC/BF	HSC	YES	NO
14	NO	PA	-	YES	NO
15	YES	PA	-	YES	NO
16	NO	ZC/BF	-	NO	YES
17	YES	ZC/BF	-	NO	YES
18	NO	PA	-	NO	YES
19	YES	PA	-	NO	YES
20	NO	ZC/BF	HSC	NO	YES
21	YES	ZC/BF	HSC	NO	YES
22	NO	PA	-	NO	YES
23	YES	PA	-	NO	YES
24	NO	ZC/BF	-	YES	YES
25	YES	ZC/BF	-	YES	YES
26	NO	PA	-	YES	YES
27	YES	PA	-	YES	YES
28	NO	ZC/BF	HSC	YES	YES
29	YES	ZC/BF	HSC	YES	YES
30	NO	PA	-	YES	YES
31	YES	PA	-	YES	YES

19	FuLA	R/W	Max. limit of RMS current in normal op	0.0 ...999,9 A	Modello	25A	40A	50A	60A	75A	90A	120A	150A	200A	250A
						25,0	40,0	50,0	60,0	75,0	90,0	120,0	150,0	200,0	250,0
15	bF.Cy	R/W	Min. number of cycles in BF mode	1 ...10											1
41	Ct	R/W	Cycle time SCR output (only for ZC mode)	0.1 ...30,0 sec	Setting to 0 to BF function										0

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 100.0% conduction angle. The time can be 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 analog input.

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.

16	PS.tn	R/W	Duration of phase softstart ramp	0.1 ...60,0 s		10,0
17	PS.oF	R/W	Minimum non-conduction time to reactivate phase softstart ramp	0 ...999 s		2
18	PS.tA	R/W	Maximum peak current limit during phase softstart ramp	0.0 ...999,9 A		
13 bit	Restart of phase softstart ramp	R/W	OFF = Restart not enabled ON = Restart enabled			OFF

Modello	25A	40A	50A	60A	75A	90A	120A	150A	200A	250A
GTF	70,0	110,0	140,0	170,0	210,0	250,0	340,0	420,0	560,0	700,0
GTF Xtra	70,0	110,0	140,0	140,0						

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: 80°

20	dL.t	R/W	Delay triggering (first trigger only)	0 ... 90 °		60
21	dL.oF	R/W	Minimum non-conduction time to reactivate delay triggering	0 ... 10000ms		10

ADVANCED SETTINGS

53	G.oUt	R/W	Gradient for control output	0.0 ...200,0 %/sec	Set to 0 to disable	0,0
22	Lo.P	R/W	Minimum trigger output	0.0 ...50,0 %		0,0

Read state

10 bit	State of phase softstart ramp	R	OFF = Ramp off ON = Ramp on
11 bit	State of phase softstart ramp	R	OFF = Ramp not ended ON = Ramp ended

FEEDBACK MODES

The GTF has the following power control modes:
V-voltage
V^2-squared voltage
I-current
I^2-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 108 register.

Voltage feedback (V^2)
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* $\sqrt{(P\%\_pid\_man/100)}$), and is indicated in the Modbus 108 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 108 register.

Current feedback (I^2)
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* $\sqrt{(P\%\_pid\_man/100)}$), and is indicated in the Modbus 108 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 108 register.


IMPORTANT!

Feedback calibration can be activated from the digital input (parameters DIG and DIG.2) or by serial control (ref. bit15) and, IF DEMANDED, IT 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 0 100%).
If you change function mode (PA, ZC, BF, HSC), you have to re-run the Feedback calibration procedure.

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.

46	HdB	R/W	Enable feedback modes		Table of feedback modes		0

0	None
1	V^2 (Voltage)
2	I^2 (Current)
3	P (Power)
4	None
5	V (Linear voltage)
6	I (Linear current)

47	riF.V	R/W	Voltage feedback reference		0.0 ...999,9 V		0,0
48	riF.A	R/W	Current feedback reference		0.0 ...999,9 A		0,0
49	r iF.P	R/W	Power feedback reference		0.0 ...150,00 kW		0,0
157	Fb. it	R/W	Feedback Response Speed		0.1 ...1,0 % / 60msec		0,3

15 bit	Calibration of voltage feedback reference	R/W	OFF = Calibration not enabled ON = Calibration enabled		0 ...1		0

Read state

108	Feedback reference	R	Setpoint V, I, P to be maintained on load Note: Values of V (I) are expressed in tenths of Volt (Amperes) Values of P are expressed in tenths of Watt)		0.0 ...999,9 A 0.0 ...999,9 A 0.0 ...150,00 kW

VIRTUAL INSTRUMENT CONTROL

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

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

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 SERIAL_PV.

42	hd. 1	R/W	*Type of operation*		*Table type of operation*	0

26	S. Io	R/W	*Control input/outputs from serial*		0 ... 1023		0

	InNTC	-	Led 2	Led 1	Out rL	Out SCR	In Dig	inTV	inCT	PV
Bit	9	8	7	6	5	4	3	2	1	0

Table of virtual register addresses

Parameter	bit	Resource enabled	Address of image register	Format	Name of register
S. Io	0	Input PV	132	Word	SERIAL_PV
	1	Input In.TA	133	Word	SERIAL_INTA
	2	Input In.TV	134	Word	SERIAL_INTV
	3	Input Digital	131	Word bit 2	SERIAL_IO
	4	Output Out SSR	131	Word bit 0	SERIAL_IO
	5	Output Out rL	131	Word bit 1	SERIAL_IO
	6	Led 1	131	Word bit 3	SERIAL_IO
	7	Led2	131	Word bit 4	SERIAL_IO
	9	Output In.NTC	135	Word	SERIAL_INNTC

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*

120		R	Manufacturer - Trade Mark (Gefran)	Name of manufacturer	5000
121		R	Device ID (GTFP)	Product ID	213

Read state

55		R/W	Current state (STATUS_W)	*Table settings STATUS_W*	0
129		R	State saved in eeprom (STATUS_W_EEP)		

bit	
3	Select ON/OFF
4	Select AUTO/MAN

115		R	Status2

Table status2

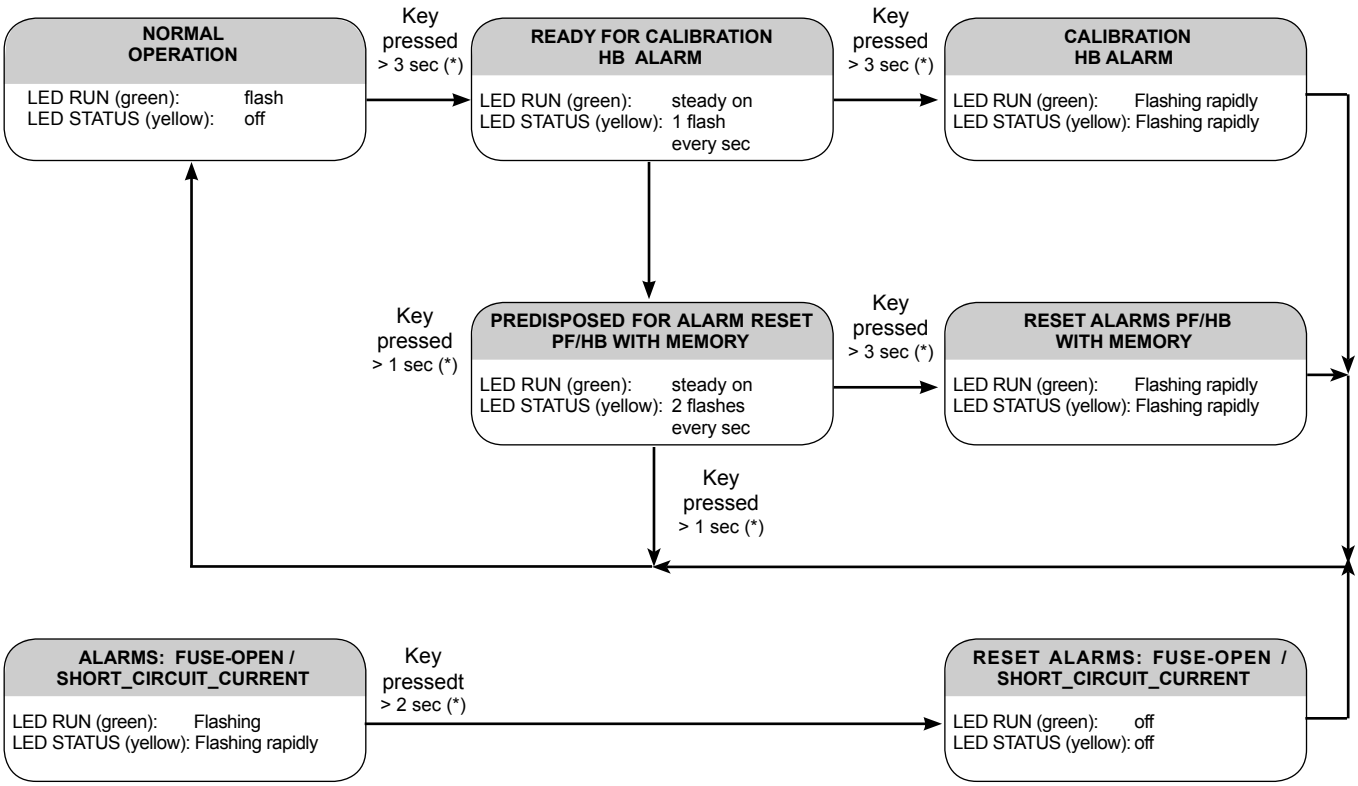
bit	
0	AL.HB or Power Fault
1	AL.HB
2	Power Fault
3	AL.SSR short
4	No Voltage
5	No Current
6	Fuse_open or Load_short_protection
13	ON/OFF
14	AUTO/MAN

117		R	Status3

Table status3

bit	
0	SSR temperature sensor broken
1	SSR over heat
2	phase_softstart_active
3	phase_softstart_end
4	frequency_warning_or monophase_missing_line_warning
5	60Hz
6	short_circuit_current phase softstart
7	Peak current limiter phase softstart
8	RMS current limiter system
9	rotation_error (only for slave biphase configuration)
10	LINE-LOAD Terminals over heat (GTF 150...250A)
11	-
12	Over Peak HSC current limiter phase softstart
13	Current Transformer sensor broken

Functionality key



(*) with key pressed, the state of the RUN and STATUS LEDs is steadily on; the LEDs switch off after 2/3 seconds to indicate switching to ready state

Ex:
to activate the alarm HB calibration press and hold the button for 3 seconds, release the button and then press for 3 sec.

INSTRUMENT CONFIGURATION SHEET

PARAMETERS

			Definition of parameter		Note	Assigned value
INSTALLATION OF MODBUS SERIAL NETWORK						
23	Cod	R	*Identification code*			
24	bAu	R/W	Select Baudrate			
25	PAr	R/W	Select parity			
163	C.E.t	R/W	Timeout due to communication failure			
164	C.E.P	R/W	Output power when communication failure is active			
MAIN INPUT						
27	tYP.	R/W	analog input			
29	Lo.S	R/W	Minimum scale limit of main input			
30	H I.S	R/W	Maximum scale limit of main input			
31	oFS.	R/W	*Offset correction for main input*			
0	P.V.	R	Read of engineering value of *process variable* (PV)			
28	FLt	R/W	*Low pass digital filter* on input signal			
LOAD CURRENT VALUE						
33	L.tA	R	Minimum scale limit of CT input			
34	H.tA	R	Maximum scale limit of CT input			
35	o.tA	R/W	*Offset correction CT input*			
87	I.tA	R	Offset correction CT input			
88	I.onF	R	CT filtered ammeter input value with output activate			
94	I.tAP	R	Peak ammeter input during phase softstart ramp			
104	Ld.A	R	Current on load			
32	Ft.A	R/W	*CT input digital filter*			

LINE VOLTAGE VALUE

37	L.tV	R	Minimum scale limit of TV input		
38	H.tV	R	Maximum scale limit of TV input		
39	o.tV	R/W	*Offset correction voltmeter* transformer input TV		
96	I.tV	R	Voltmeter input value		
97	I.tVF	R	Voltmeter input value		
103	FrEq	R	Voltage frequency in tenths of Hz		
36	F.tV	R/W	*Digital filter TV auxiliary input*		

VALUE OF LOAD VOLTAGE

105	Ld.V	R	Voltage on load

POWER ON LOAD

106	Ld.P	R	Power on load
107	Ld. I	R	Impedance on load

DIGITAL INPUTS

54	d IG.	R/W	Function of digital input		
83	PWm.t	R/W	Timeout per ingresso PWM		
5 bit	STATE OF DIGITAL INPUT	R	OFF = Digital input off ON = Digital input on		
118		R	State of digital inputs INPUT DIG		

ALARM HB (Heater Break Alarm)

43	hd.2	R/W	*Enable POWER_FAULT alarm*			
3	Hb.F	R/W	HB alarm function			
5	Hb.t	R/W	Delay time for HB alarm activation			
4	A.Hb	R/W	*HB alarm setpoint* (ammeter input scale points)			
6	Hb.P	R/W	Percentage HB alarm setpoint of current read in HB calibration			
14 bit	Calibration theresold for zone HB alarm	R/W	OFF = Calibration not enabled ON = Calibration enabled			
82	Hb.Pm	R/W	Maximum limit with conduction HB calibration (only for IR lamps)			
7	Hb.tA	R/W	CT read in HB calibration			
8	Hb.t.V	R/W	TV read in HB calibration			
9	Hb.PW	R/W	Ou.P power in HB calibration/			
10	Ir.tA.0	R/W	CT read in HB calibration to 100% with conduction (only for IR lamps)			
11	Ir.tA.1	R/W	CT read in HB calibration to 50% with conduction (only for IR lamps)			
12	Ir.tA.2	R/W	CT read in HB calibration to 30% with conduction (only for IR lamps)			
13	Ir.tA.3	R/W	CT read in HB calibration to 20% with conduction (only for IR lamps)			
79	Ir.tA.4	R/W	CT read in HB calibration to 15% with conduction (only for IR lamps)			
80	Ir.tA.5	R/W	CT read in HB calibration to 10% with conduction (only for IR lamps)			
81	Ir.tA.6	R/W	CT read in HB calibration to 5% with conduction (only for IR lamps in mode PA)			
153	Ir.tA.7	R/W	CT read in HB calibration to 3% with conduction (only for IR lamps in mode PA)			
154	Ir.tA.8	R/W	CT read in HB calibration to 2% with conduction (only for IR lamps in mode PA)			
155	Ir.tA.9	R/W	CT read in HB calibration to 1% with conduction (only for IR lamps in mode PA)			

72	Ir.tV.0	R/W	TV read in HB calibration to100% with conduction (only for IR lamps)			
73	Ir.tV. 1	R/W	TV read in HB calibration to 50% with conduction (only for IR lamps)			
74	Ir.tV.2	R/W	TV read in HB calibration to 30% with conduction (only for IR lamps)			
75	Ir.tV.3	R/W	TV read in HB calibration to 20% with conduction (only for IR lamps)			
76	Ir.tV.4	R/W	TV read in HB calibration to 15% with conduction (only for IR lamps)			
77	Ir.tV.5	R/W	TV read in HB calibration to 10% with conduction (only for IR lamps)			
78	Ir.tV.6	R/W	TV read in HB calibration to 5% with conduction (only for IR lamps in mode PA)			
150	Ir.tV.7	R/W	TV read in HB calibration to 3% with conduction (only for IR lamps in mode PA)			
151	Ir.tV.8	R/W	TV read in HB calibration to 2% with conduction (only for IR lamps in mode PA)			
152	Ir.tV.9	R/W	TV read in HB calibration to 1% with conduction (only for IR lamps in mode PA)			

4 bit	ALARM STATE HB or POWER_FAULT	R	OFF = Alarm off ON = Alarm on		
6 bit	State HB alarm	R	OFF = Alarm off ON = Alarm on		
12 bit	Reset SSR_SHORT / NO_VOLTAGE / NO_ CURRENT/HB alarm	R/W			
113		R	States of alarm ALSTATE		
114		R	States of alarm ALSTATE_IRQ		
111	Hb.tr	R	HB alarm setpoint as function of power on load		

Power Fault ALARMS (SSR_SHORT, NO_VOLTAGE and NO_CURRENT)

43	hd.2	R/W	*Enable POWER_FAULT alarms*		
44	dG.t	R/W	Refresh SSR SHORT The alarm activates after 3 seconds.		
45	dG.F	R/W	Time filter for NO_VOLTAGE, SSR_OPEN and NO_CURRENT alarms Note: set a value not less than cycle time.		
12 bit	Reset SSR_SHORT / NO_VOLTAGE / NO_ CURRENT/HB alarm	R/W			
7 bit	State SSR_SHORT alarm	R			
8 bit	State NO_VOLTAGE alarm	R			
9 bit	State NO_CURRENT alarm	R			
114		R	States of alarm ALSTATE IRQ		
115		R	Status 2		

ALARM due to overload

101		R	SSR temperature			
102		R	Status 2			
117		R	Status 3			

FUSE_OPEN AND SHORT_CIRCUIT_CURRENT ALARMS

158	Fr.n	R/W	*Number of restarts in case of FUSE_OPEN / SHORT_CIRCUIT_CURRENT*			
16 bit	RESET FUSE_OPEN / SHORT_CIRCUIT_ CURRENT ALARMS	R/W	OFF = - ON = Reset FUSE_OPEN / SHORT_CIRCUIT_CURRENT alarms			
17 bit	RESETTING FO.c 1	R/W	OFF = - ON = RESET COUNT FO.C1			
115		R	Status 2 (STATUS2)			
159	FO.c 1	R	COUNTER 1: FUSE_OPEN EVENT			
160	FO.c2	R	COUNTER 2: FUSE_OPEN EVENT			

OUTPUTS

40	rL.	R/W	Allocation of reference signal for alarm relay output			
50	Ld.1	R/W	*Function RUN led*			
51	Ld.2	R/W	*Function STATUS led*			
119		R	State of outputs MASKOUT			
2 bit	STATE SSR output	R	OFF = Output off ON = Output on			
3 bit	STATE rL output	R	OFF = Output off ON = Output on			

CONTROLS

42	Hd.1	R/W	*Type of operation*			

AUTOMATIC/MANUAL CONTROL

1 bit	AUTO/MAN	R/W	OFF = Automatic ON =Manual			
54	d IG.	R/W	Digital input function			
2	OuP	R	SSR output value			
5 bit	STATE DIGITAL INPUT	R	ON = Digital input on OFF = Digital input off			
55		R/W	STATUS_W			

ON/OFF SOFTWARE (ENABLE/DISABLE)

0 bit	ON/ OFF SOFTWARE	R/W	OFF = On ON =Off			
54	d IG.	R/W	Function digital input			
5 bit	DIGITAL INPUT STATE	R	ON = Active digital input OFF = NO Active digital input			
55		R/W	STATUS_W			

START MODE

52	P.onE	R/W	Start modes at Power-On			

OPERATING HOURS COUNTER

161	OH.c	R	Number of operating hours

SSR CONTROL MODES

14	Hd.S	R/W	Enable trigger modes			
19	FU.tA	R/W	Max. limit of RMS current in normal op			
15	bF.CY	R/W	Min. number of cycles in BF mode			
41	Ct	R/W	Cycle time SCR output (only for ZC mode)			

SOFTSTART or START RAMP

16	PS.tn	R/W	Duration of phase softstart ramp			
17	PS.oF	R/W	Minimum non-conduction time to reactivate phase softstart ramp			
18	PS.tA	R/W	Maximum peak current limit during phase softstart ramp			
13 bit	Restart of phase softstart ramp	R/W	OFF = Restart not enabled ON = Restart enabled			

DELAY TRIGGERING

20	dL.t	R/W	Delay triggering (first trigger only)			
21	dL.oF	R/W	Minimum non-conduction time to reactivate delay triggering			
53	G.oUt	R/W	Gradient for control output			
22	Lo.P	R/W	Minimum trigger output			
10 bit	State of the ramp of softstart of phase	R	OFF = Ramp off ON = Ramp on			
11 bit	State of the ramp of softstart of phase	R	OFF = Ramp not ended ON = Ramp ended			

FEEDBACK MODES

46	Hd.b	R/W	Enable feedback modes			
47	riF.V	R/W	Voltage feedback reference			
48	riF.A	R/W	Current feedback reference			
49	riF.P	R/W	Power feedback reference			
15 bit	Calibration of voltage feedback reference	R/W	OFF = Calibration not enabled ON = Calibration enabled			
108	Feedback reference	R	Setpoint V, I, P to be maintained on load Note: Values of V (I) are expressed in tenths of Volt (Amperes) Values of P are expressed in tenths of Watt)			

VIRTUAL INSTRUMENT CONTROL

42	hd. 1	R/W	*Type of operation*			
26	S. Io	R/W	*Control input/outputs from serial*			

HW/SW INFORMATION

122	UPd	R	*Software version code*			
120		R	Manufacturer - Trade Mark (Gefran)			
121		R	Device ID (GTFP)			
55		R/W	Current state (STATUS_W)			
129		R	State saved in eeprom (STATUS_W_EEP)			
115		R	Status2			
117		R	Status3			

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