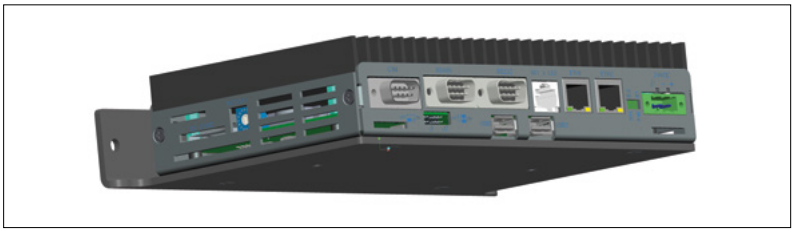
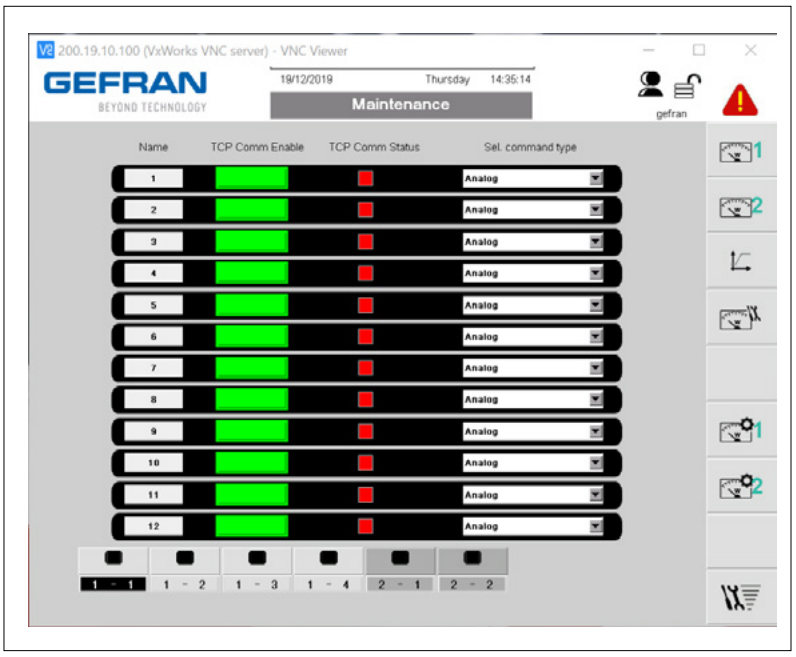
GEFRAN

GSLM
Smart Load Manager





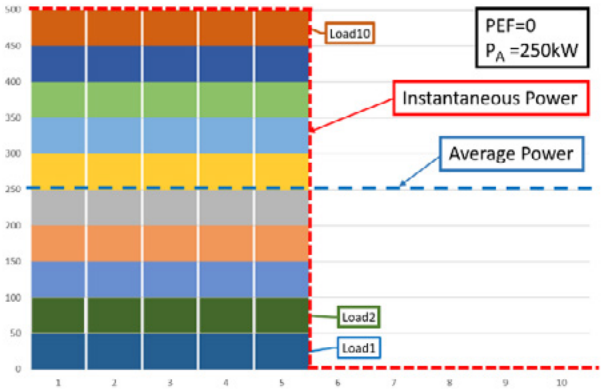
User Manual

code: **80582_11-2020_ENG**

SUMMARIES AND TABLES OF CONTENTS

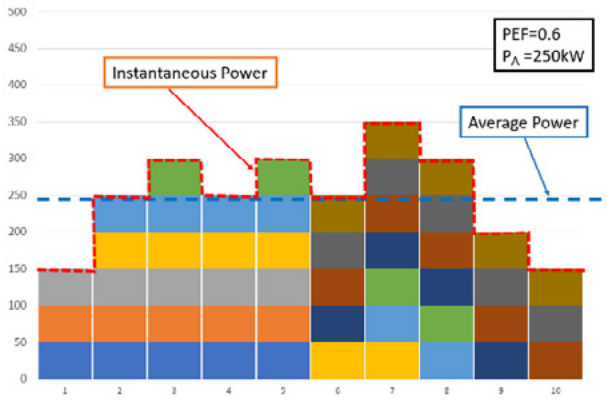
GSLM SCOPE

The goal of the GSLM is to optimize the management of resistive electric loads. A typical issue, in plants, that use electric heating systems, is to absorb instantaneous electrical powers that are considerably higher than the average required ones. A not managed distribution of demand leads to an increase in the cost of electricity supply. The increase is not due to actual greater consumption of energy, but by the absorption peaks reached. Generally, the tariffs for electricity supplies, vary according to the maximum absorption achieved during a given period. The reached peak determines the energy price *.
To measure the imbalance of absorption over time, we use the Power Efficiency Factor.
PEF=(Pmax -(Pimax - Pimin))/Pmax
Where Pmax is the total of the installed powers. Pimax and Pimin are respectively the maximum and minimum powers reached by adding the instantaneous powers of each load.
*NOTE: How and much how the price is increased will depend on the contract. Automatic contract-size changes can be implemented by the distributor, with a relative increase in maintenance costs required. In addition, could be applied fixed costs for each kW exceeded above the contractual threshold.
The peaks can occur mainly for two reasons: first is the high absorption in the initial stages of heating, the second is the lack of temporal organization of the firing. With the GSLM connected to Gefran's GFW/GPC and GPC power controllers, these situations can be avoided. The supervision of the powers required of each controller is processed by the GSLM to plan the best firing strategy. The GSLM consists of two main features:
-Load Shedding: makes sure that the required power does not exceed a certain threshold. If this happens, the delivery will be postponed ensuring a cut in peak absorption.
-Load Sharing: distributes the ON and OFF cycles of the individual controllers over time as evenly as possible, trying to achieve maximum absorption efficiency (PEF=1).
Let's take the example of a 500kW installed power heat treatment plant. The system will typically absorb 100% of power (500kW) only in the start-up phase, while the maintenance phase will have a very low average consumption, let's assume 50% (250kW). This is the typical situation, where the initial peak is used to achieve plant stability in the shortest possible time. The other situation in which power peaks can occur is the maintenance phase. However, it is necessary to analyze the load control strategy in more detail, to understand how peaks can be generated in a phase in which only 50% of power is required. Let's assume that the plant in question is managed by 10 power controllers of 50 kW each, which work in full waves, alternating the ON and OFF cycles. The 10 controllers will go to 50% of their nominal load. Therefore, 50% of the periods to 50 kW and the remaining 50% to 0 kW. This means that, if the correct firing synchronization is not provided, the system could absorb peaks of 500 kW even if the average consumption is 250 kW.
The Power Efficiency Factor in this case, without the intervention of the GSLM, is 0. Because Pmax=10x50kW= 500kW, Pimax and Pimin worth respectively 500kW and 0kW. The situation described above is represented in the following graph.



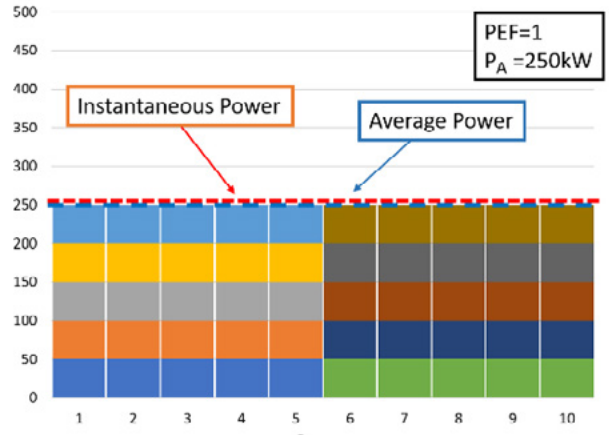
Trend of the instantaneous power during the control at 50% of the total power (PEF=0)

By letting the power controllers work independently, even better conditions could be achieved, but these are not always guaranteed. See the following graph for an example.



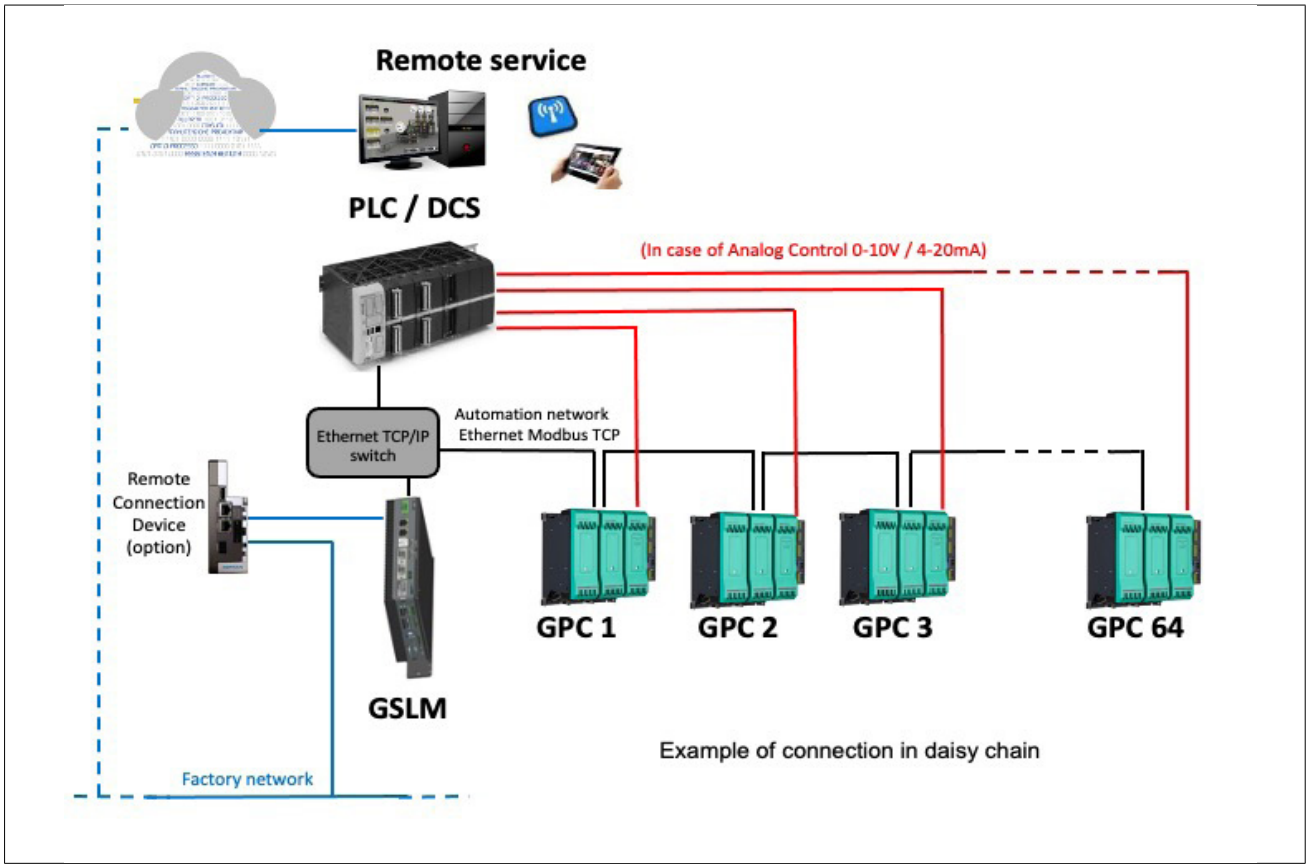
Trend of the instantaneous power during the control at 50% of the total power without GSLM action (PEF=0.6)

In this simple example it is clear that to improve the results it would be enough to combine the ON cycles of the first 5 controllers with the OFF cycles of the second 5 and vice versa. At this point, the Pimax would be 250kW, like the Pimin, and therefore the PEF = 1. The result of this management is the one shown in the following graph.

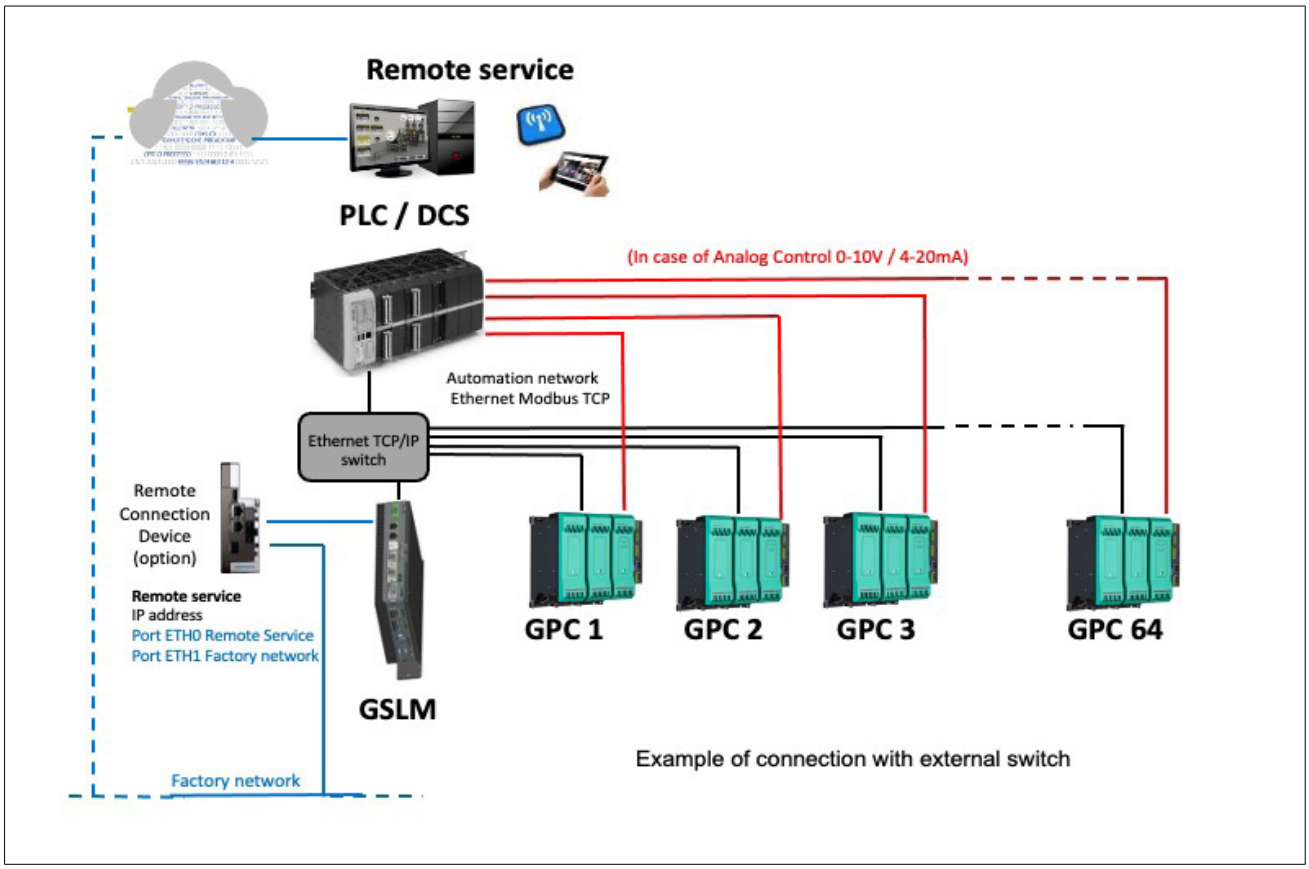


Trend of the instantaneous power during the control at 50% of the total power with the action of the GSLM (PEF = 1)

Architecture diagram 1



Architecture diagram 2

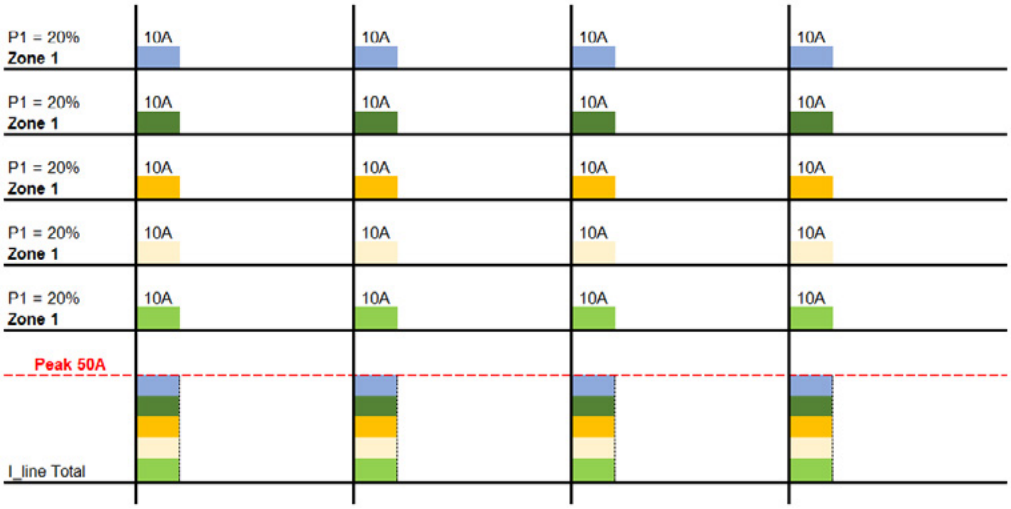


FUNCTIONS OVERVIEW

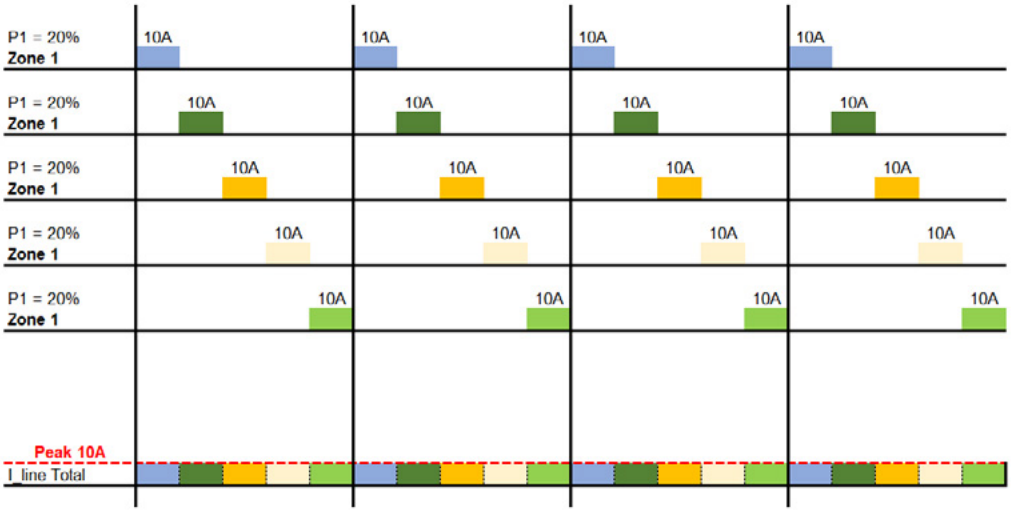
General information

As seen above the functionalities of the GSLM can be divided in two concepts that can work together. The first concept, named Power distribution (Load Sharing), takes care of the firing distribution to all the Power Controllers, in a way that minimizes the instantaneous current peaks and is able to distribute the energy consumption along all the control period time.
The effect is a considerable reduction of current variations and peaks and a better Power Efficiency Factor.

Nr. 5 Zones (I = 10A) – (P% = 20%)
Power distribution: **DISABLE** / Power limit: **NONE**



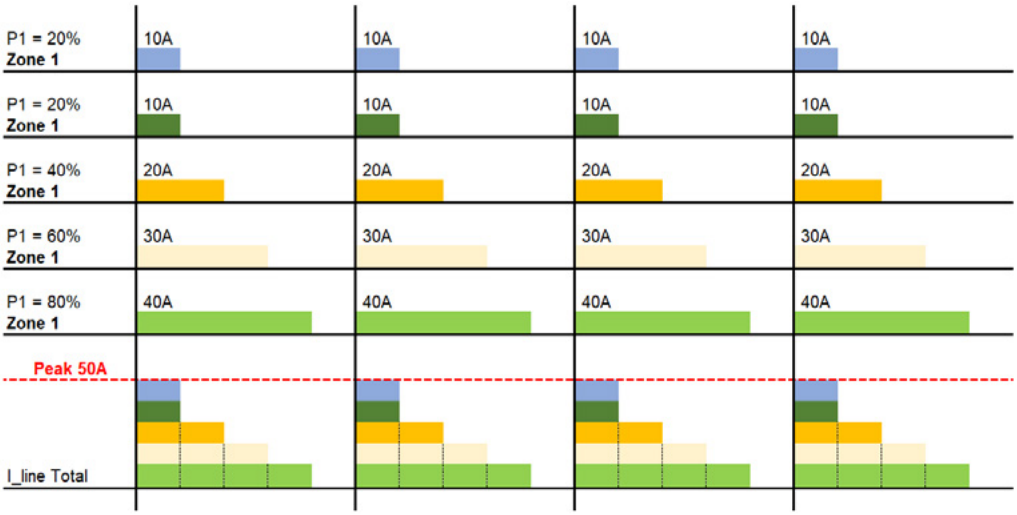
Nr. 5 Zones (I = 10A) – (P% = 20%)
Power distribution: **ENABLE** / Power limit: **NONE**



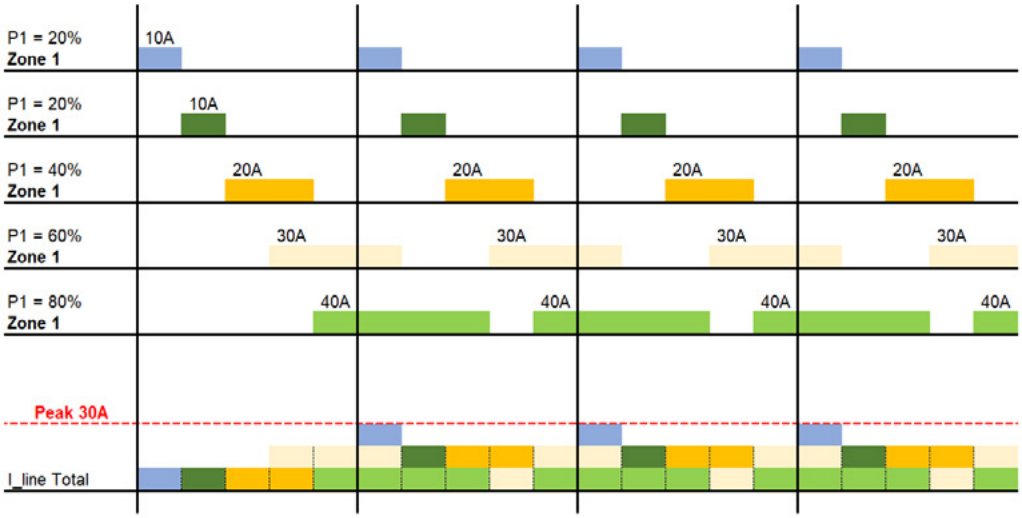
The second part, Power Limit (Load Shedding), takes care of the eventual total power limit that can be set for the plant. This limit will never be exceeded, the GSLM Unit will insure a reduction of the power on all the zones, meanwhile it continues to provide the load sharing control as well.

The result of these two algorithms working together will be a stable power consumption not exceeding the configured power limit.

Nr. 5 Zones (I = 10A) – (P% = 20% - 20% - 40% - 60% - 80%)
Power distribution: **DISABLE** / Power limit: **NONE**



Nr. 5 Zones (I = 10A) – (P% = 20% - 20% - 40% - 60% - 80%)
Power distribution: **ENABLE** / Power limit: **ENABLE**



The following features are available:

- Limiting the maximum instantaneous consumption peaks (Load sharing)
- Limiting the maximum power consumption of all the zones (Load shedding)
- Control type: Burst Firing algorithm.

For each zone, the nominal power and the maximum output power required by the heating system must be configured.

If the total power required by the control loop PIDs is greater than the maximum output power:

- The power sent to the individual Power Controllers is reduced, compared to the value calculated by the PID, in proportion to the reduction calculated;
- The total instantaneous power output is limited to the maximum set value.

If instead the overall power required by the control loop PIDs is less than the maximum deliverable power:

- The individual Power Controller will receive the power calculated by the PID;

The control of the heating outputs is performed with periods that are multiples of the power line period. Therefore, with a 50 Hz power line the control will use multiple periods of 20 ms, while multiple periods of 16 ms will be used with 60 Hz.

Burst Firing mode

The GSLM works in Burst firing mode: the output, the output is controlled to ON or OFF cycles according to the power calculated by the PID.

Burst Firing mode improves the power output control in the following ways:

- An accurate burst switch between ON and OFF ensures a uniform distribution of energy over time. Example: if the PID calculates a power of 50.0% one wave will be applied to the load (ON), one wave will be stopped (OFF).
- The output is exactly that required by the PID (one thousand of accuracy). Example, if the PID calculates a power of 51.2%, the control cycle will be 512 burst ON and 488 burst OFF cycles, following with continuous alternation of burst ON and OFF cycles.
- The power output control is adjusted immediately to the values calculated from the PID

Further, with the Burst Firing control, the total energy delivered to the outputs of heating is distributed effectively over time between different areas.

Function overview

The general operation requires that the single GFW/GPC connected in the network receive the power command (P%) from an analog signal wired in the terminal board or from remote device (DCS/PLC) via Modbus TCP network or manually directly from the GSLM graphic interface.
This value is read by the GSLM via Modbus TCP and on the basis of the set configuration (max total power) it sends via Modbus TCP, to the individual GFW/GPC, the digital On/Off power on command. **It is required that each Power Controller have the Ethernet Modbus TCP fieldbus Option.**
The firing mode of the GFW/GPC, to work properly with GSLM, is “Burst Firing”

- For single phase loads controlled by phase-phase or by phase-neutral connection
- For Dual phase with closed delta or star without neutral connection
- For three phases with star (with or without neutral) or delta (closed or open) connection

Main features overview:

- GSLM can manage 16, 32, or 64 GFW/GPC units in a Modbus TCP network with three models:
  - GSLM-16
  - GSLM-32
  - GSLM-64
- Total limitation of power peak consumption
- Optimized distribution of individual loads (load sharing)
- Three different power control modes:
  - Wired analog signal
  - Power reference from DCS/PLC via Modbus TCP network
  - Manual from GSLM interface
- ON/OFF control (enable/disable power) of each GSLM Power controller
- Modbus TCP slave
- Remote service (option)
- Remote interface (VNC)
- DIN rail mounting
- Graphical configuration interface
- Diagnostic pages
- Alarm management (real/historical)
- Three levels of configuration access

There are 3 levels of access to the GSLM configuration:
- Operator Level
- Maintenance Level
- Admin Level

Access to the configuration is via Ethernet network both locally and remotely. The page and VNC remote service is protected by a customer-modifiable password.

All data managed by GSLM are published as Slave Modbus TCP and available for connection to a Master Modbus TCP device.

GSLM GRAPHIC INTERFACE

A series of graphic interfaces are provided for the configuration and diagnostics of the GSLM system.
The graphic pages are available with a VNC interface.
Access to VNC pages is password-protected.
The ETH2 IP address, available for the VNC and Automation network, is 200.19.10.100 . Default password for VNC: adminadmin .
The ETH1 IP address, available for the Factory network and also for the VNC, is 192.168.1.100 .
The resolution of the graphic pages is based on a 15" screen size.
All pages have a common layout:

- Current Date/Time Display
- Active user and direct access to Log In page
- Alarm status and direct active alarms page access
- Active control mode (Analog / DCS-PLC / Manual)
- Page name
- A series of buttons that allow access to the various configuration or display interfaces. Access to the pages is limited according to the active user level.

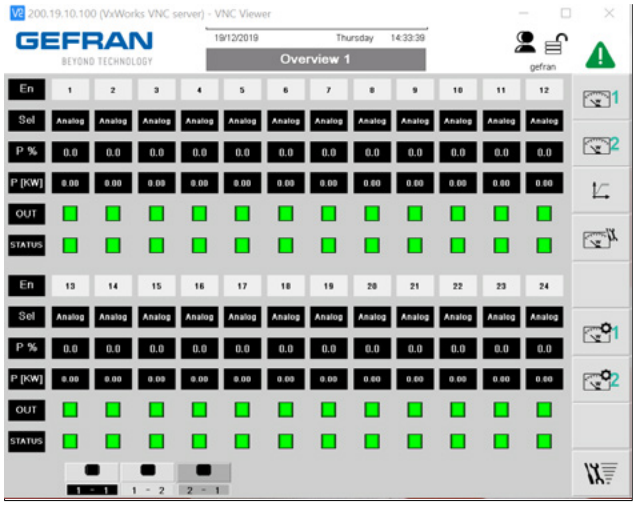
The following main pages are available:

- Start pages
- Overview page 1
- Overview page 2
- Maintenance Page
- Configuration page 1
- Configuration Page 2
- System pages

Initial page

The page contains the product logo.

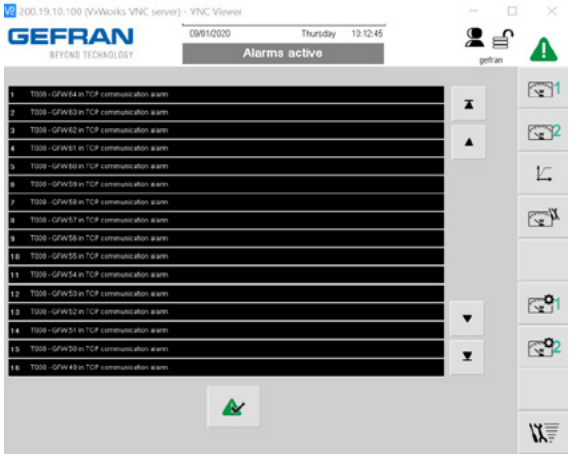
Page overview 1



For the number of GFW/GPC enabled it is possible:

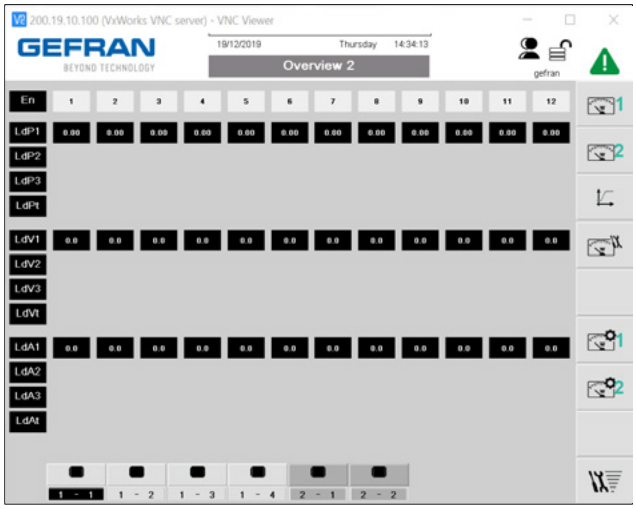
- Enable / Disable individual GFW/GPC (access by Maintenance/Admin level)
- Display the percentage power (P%) required by analog or DCS/PLC signal. In the case of a manual mode change the %P value.
- Display the instantaneous power (kW)
- Status of GFW/GPC power controller. Selecting the status icon (if red) a pop up window will appare with detailed information on all the alarms of the selected GFW/GPC.

Page Alarms active



- Display of the digital ON/OFF command sent to the individual GFW/GPC

Page Overview 2

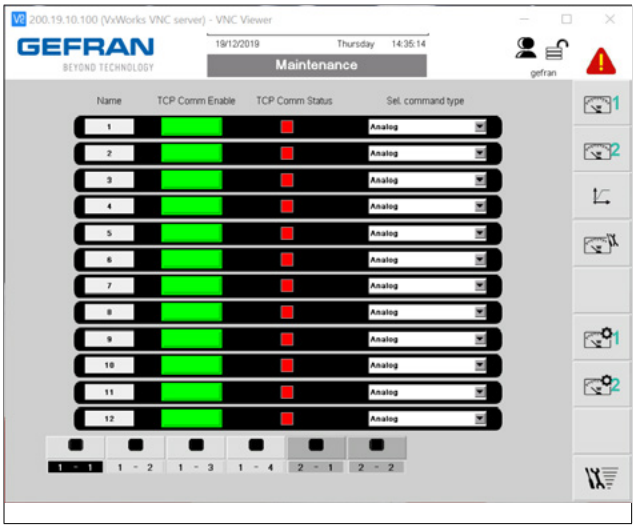


For the number of GFW/GPC enabled it is possible:

- Displaying the GFW/GPC enable status
- Display of phase 1, phase 2 and phase 3 GFW/GPC load currents (only the current values available for each individual GFW/GPC are displayed)
- Display of the powers phase 1, phase 2 and phase 3 of the GFW/GPC (only the power values available for each individual GFW/GPC are displayed)

- Display of phase 1, phase 2 and phase 3 load voltages of the GFW/GPC (only the voltage values available for each individual GFW/GPC are displayed)

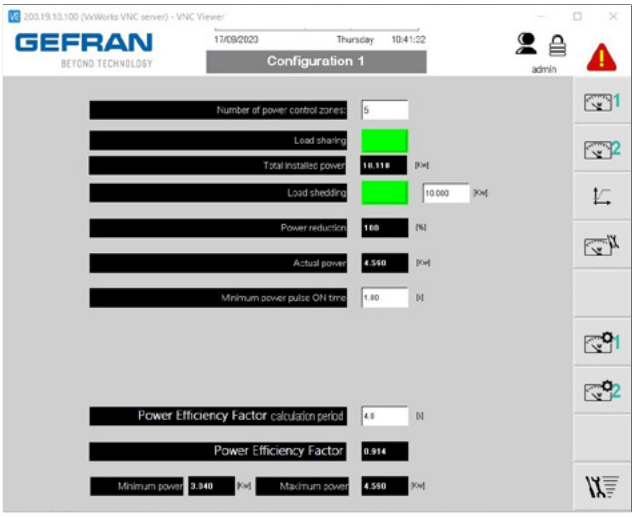
Page maintenance



Page with access to Maintenance/Admin levels only.
From the page it is possible to disable a single GFW/GPC from the load management algorithm. This could be the case if you need to carry out maintenance operations.
It is possible to select between three GFW/GPC command modes:

- Analog signal wired in GFW/GPC terminal board (the enable signal for each power controller is a digital input on its own terminal board)
- Modbus TCP network in case of DCS/PLC master control device (the enable for each power controller must be write from DCS/PLC in the dedicated parameter)
- Manual from GSLM graphic pages (the enable of each power controllers can be set from the Page maintenance)

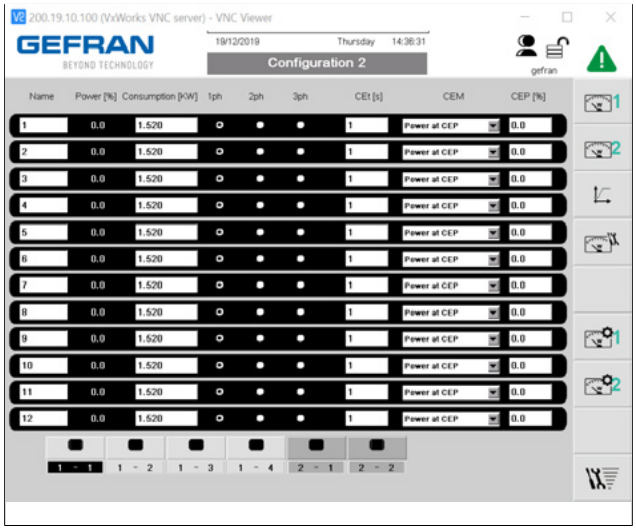
Page configuration 1



Page with access to Admin levels only. In the page it is possible to set the total number of GFW/GPC managed from GSLM (max 64, based on the model selected).
The following GSLM parameters can be configured:

- Set the number of power control Zones
- Enable Load Sharing Function
- Enable Load Shedding Fucntion
- Set the maximum total power limit value used by the Load Shedding Function [kW].
- Set Minium power pulse ON Time [s]
- Set Power Efficency Factor calculation period [s]

Page configuration 2



Page with access to Admin levels only
On the page for all configured GFW/GPC is possible:

- Set the theoretical power of the load (kW)
- Select the type of connection (single-phase / two-phase / three-phase)
- Modify the identification name (default from 1 to 64)
- Configure the CEP parameter: safety value forced by GFW/GPC in case of lack of communication with GSLM

SYSTEM PAGES

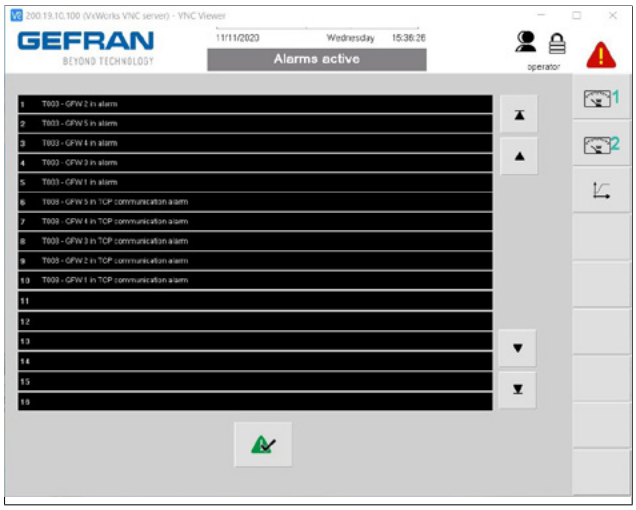
Pages with access to Admin levels only.
From the System page the following main info are available:

- Configure GSLM node IP address
- Check the status of Modbus TCP communication
- Select language (Default English)
- Password and user management
- View alarm history
- View settings history

Alarms active page

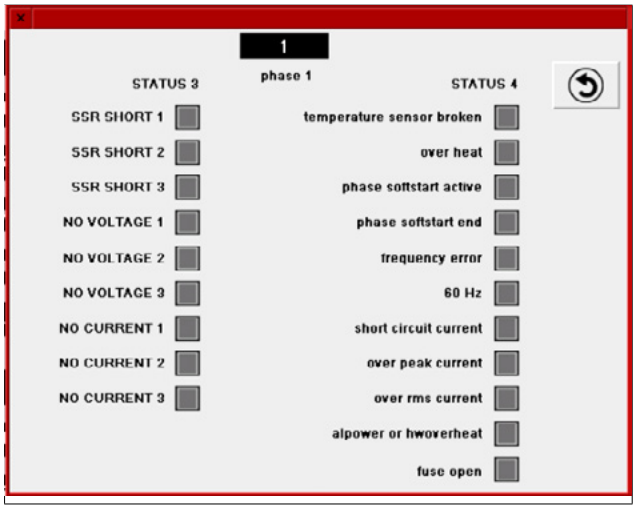
Opened by the icon 

The active alarms list page displays descriptions and the date/time of activation for all active alarms on the machine. The alarms can be “communications alarms” or alarms coming from the Power Controllers. There are four buttons on the right (scroll up/down) to display the alarm message lines that exceed monitor dimensions.



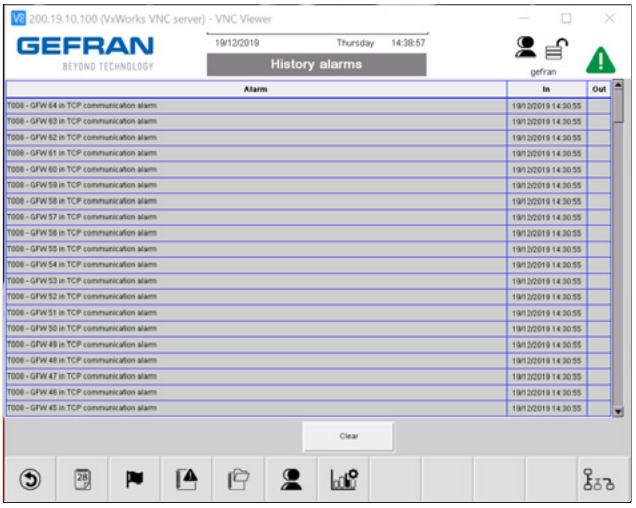
Alarms active page

The alarms coming from the GPC/GFW are listed in the following dedicated page.



History alarms page

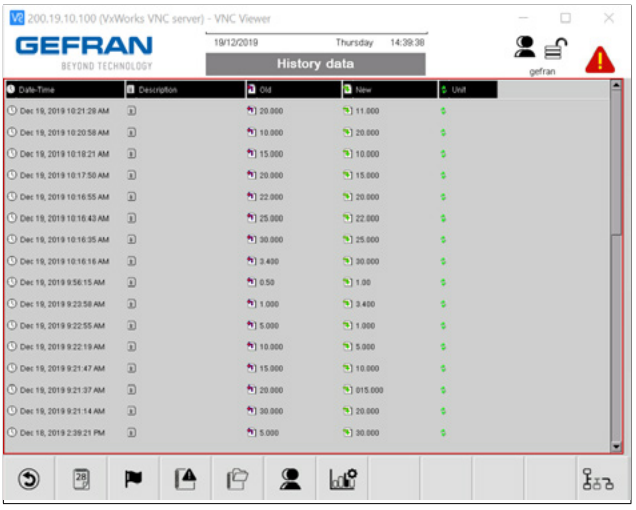
The historical alarms list page displays the descriptions, state (ON / ACK), and date/time of activation of all historical alarms recorded on the machine. There is a scroll bar on the right (scroll up/down) to display the alarm message lines that exceed monitor dimensions.
There is also a Clear button to reset the recorded historical alarms.



History alarms page

History data page

This page lists, in chronological order, all of the changes made on the machine.
Each change is shown with a reference to the active user at the time of the change, the date and time of the change, a description, the old data, and the new data.



History Data page

User login page

Through the icon 

it's possible to change the active user.

There are 3 access levels:

Level 0 Name: "operator" (Default password "operator")

Level 1 Name: "maintenance" (Default password "maintenance")

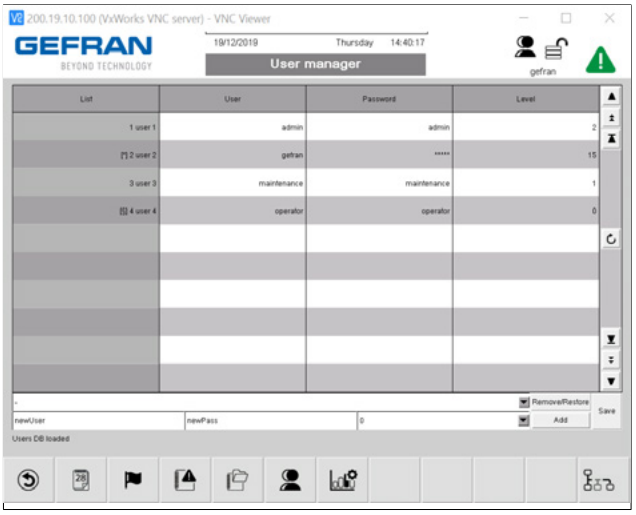
Level 2 Name: "admin" (Default password "admin")

The password must be digit from virtual keyboard from VNC. It is invalid if digit from physical keyboard of VNC Client.
The number of the active level is shown at the top of every graphic page.

Pop-up User login

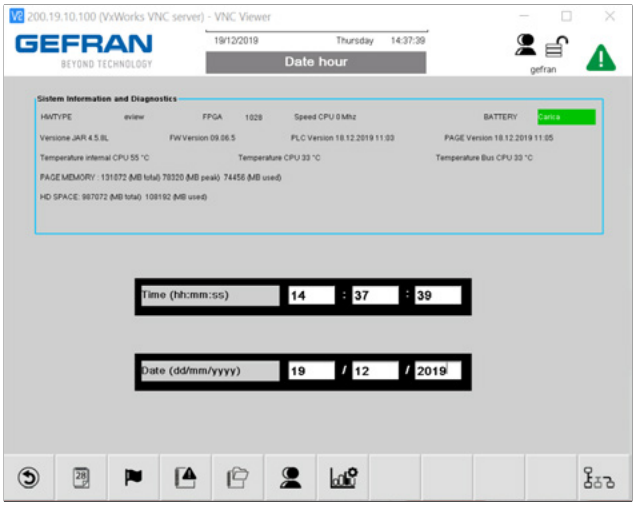
User manager page

This page allows to add, remove or change the password to the archived users.
The page shows the list of archived users with password, name and permitted access level.



Date hour page

On the date hour page, you can configure the date/time shown on the graphics pages.
A field is present in this page with information about the status of the CPU that is useful in case of diagnostic.

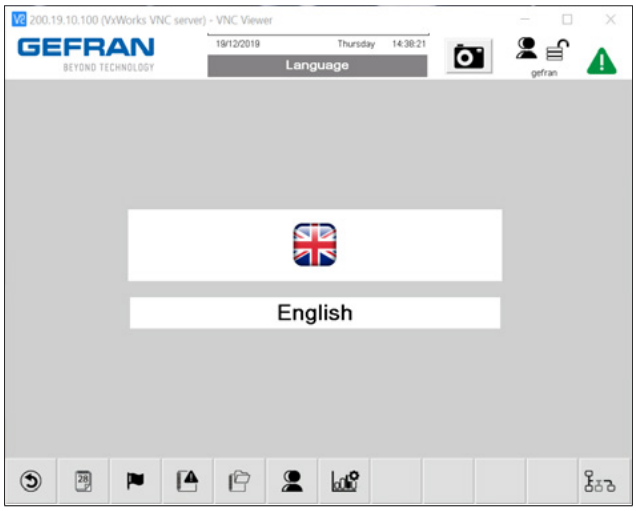


Date hour page

Language page

The language page is designed to allow the future selection of other languages.

At the moment the available language is English.



Language page

Net configuration page

This page is useful for the configuration of ethernet ports.

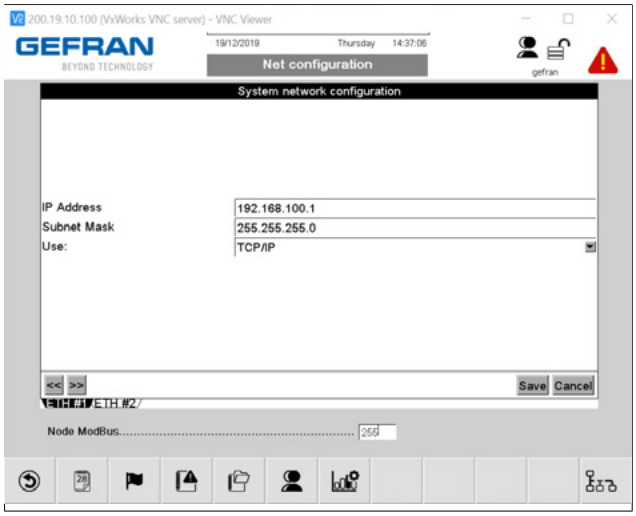
ETH1 is dedicated to be connected, if necessary, to the factory network (default IP 192.168.1.100).

ETH2 is dedicated to connect the GFW/GPC units on the automation network (default IP 200.19.10.100)

In this page it is possible to change the Modbus TCP slave node address of the device (the default numebr node of GSLM is 255)

In this page it is possible to change the Modbus TCP slave node address of the device.

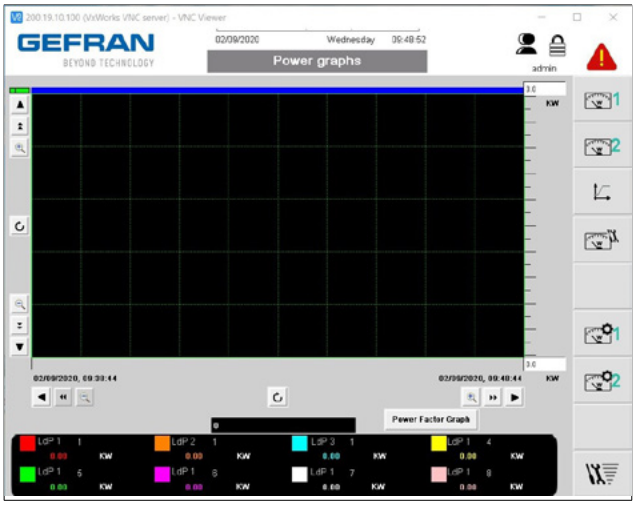
For the changes on the ethernet port is necessary a reboot of the panel to apply the new configuration.



Net configuration page

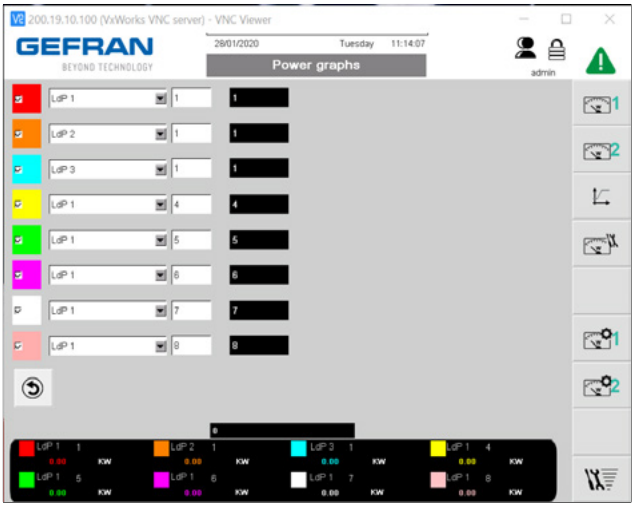
Power graphs page

Up to 8 pens can be displayed simultaneously on trend pages. Sampling time of all variables can be configured in seconds. The Trend page shows the trend of 8 variables of the Power outputs over time. The pages have a series of buttons that let you zoom+, zoom-, scroll+ and scroll- the curves on the page.



Power graphs page

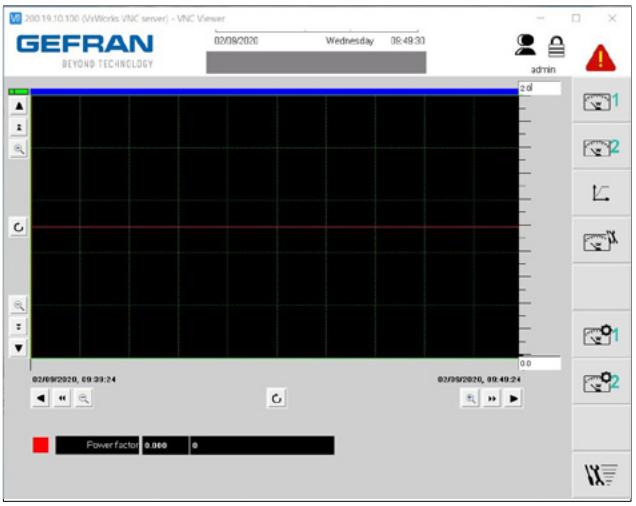
The curve displayed on the trend page is matched with the variable to be represented on a dedicated page that is accessed by pressing the bottom of such page at the legend of the displayed curves.



Power graphs page

Power Efficiency Factor graph page

The “Power Efficiency Factor” calculation, depending on the real Power distribution trought the Power Controllers in the network, is shown in the Power Effcicinecy Factor graph. The more the value is close to one, the better is the efficiency of the system.

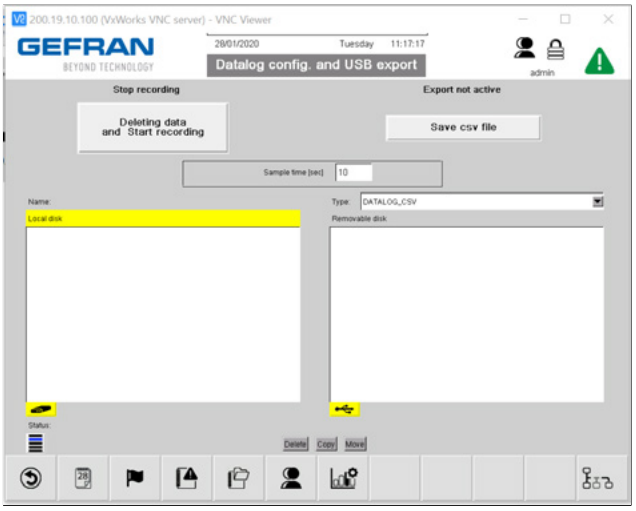


Data Log configuration and USB exporting page

In this page are present a series of commands that allow the exporting of storage data like DataLog.

The data logger are temporary recordings of all the Power values (in kW) of all the zones. The sample time of recording can be setting from minimum 1 to maximum 999 seconds.

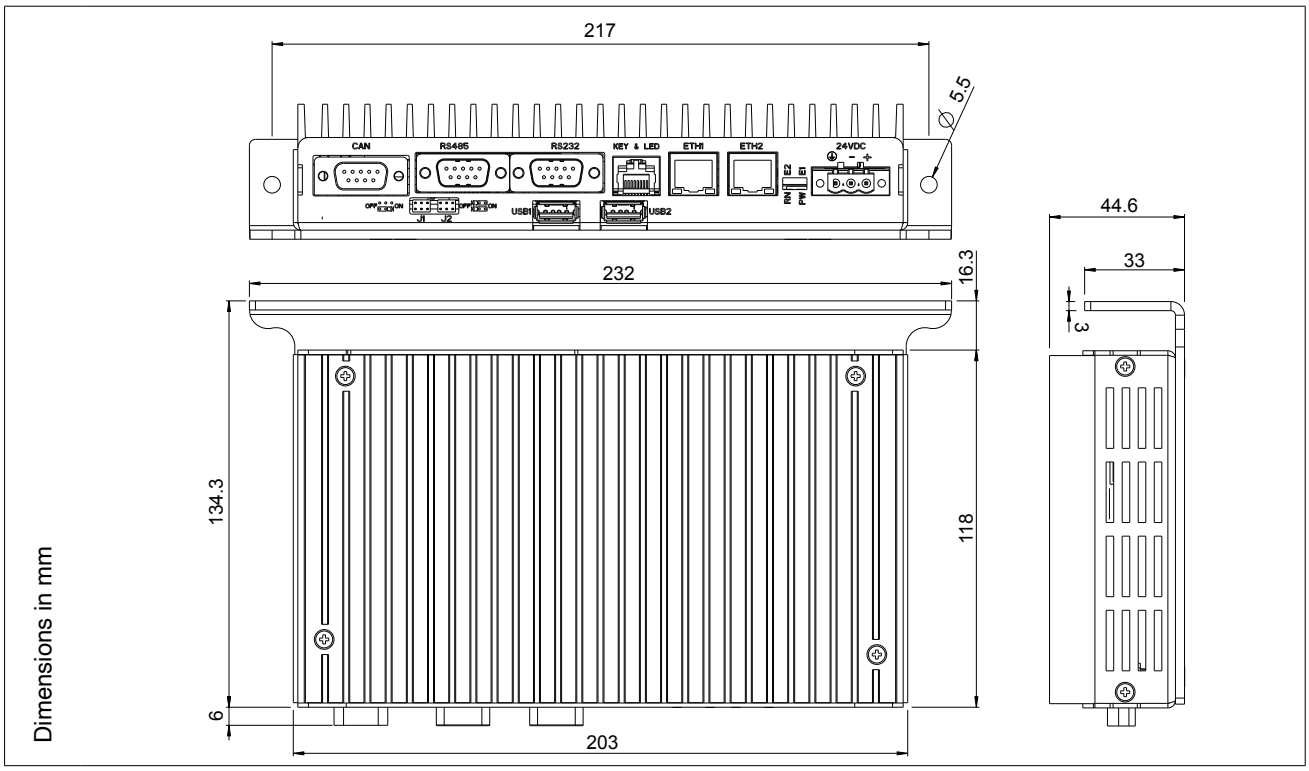
The csv files exporting it's allowed by USB.



Data log configuration page

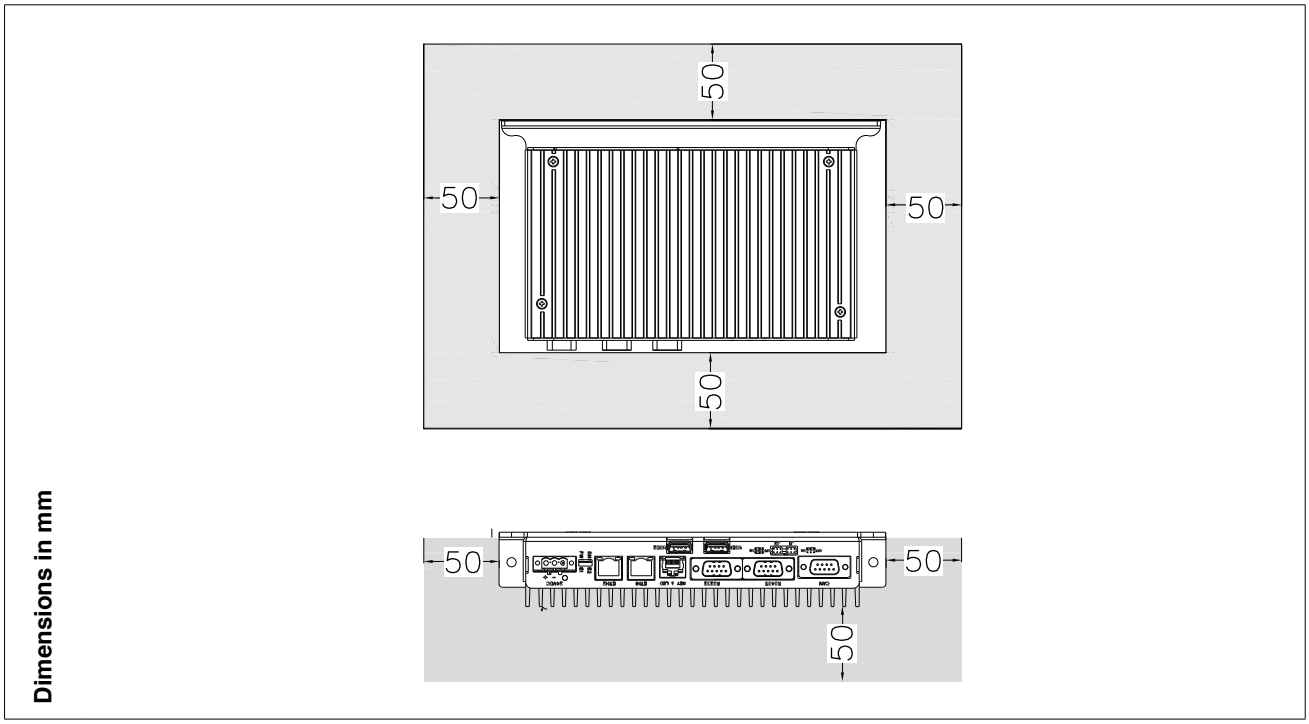
Dimension

GSLM assembly dimension



Space for ventilation

The open spaces shown in gray are recommended with static ventilation. These spaces may be reduced with forced ventilation.

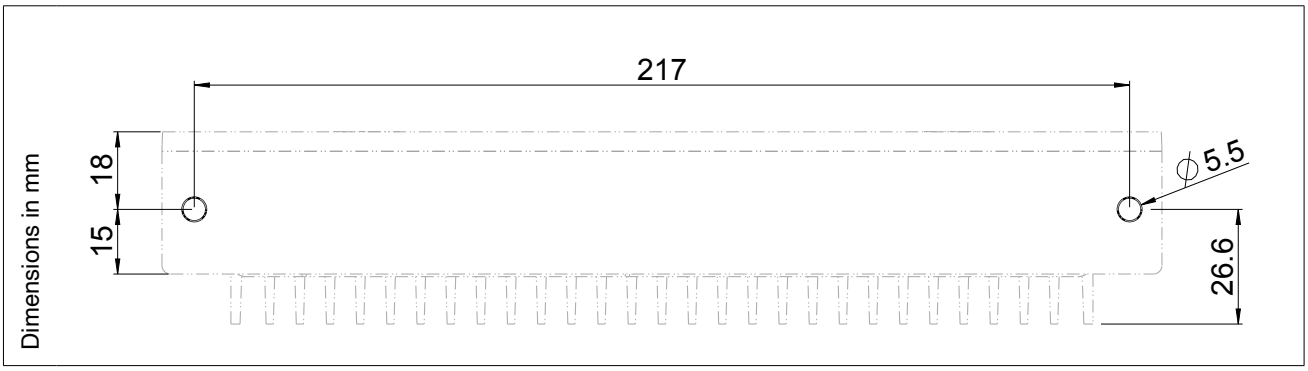


Attention: the temperature in the compartment containing the internal cabinet control panel must never exceed 55°C.

Assembly and Installation

Hole dimensions. For correct installation, observe the dimensions of the templates shown in the illustration
Attention: the panel on which the internal cabinet control panel is mounted has to have the following characteristics:

- Be sufficiently stiff and strong so that it does not bend during use;
- Be between 1 and 6 mm thick, to allow the fastening of the device with the terminals supplied.



Protection against infiltrations of water
The internal cabinet control panel offers an IP20 protection level.
If the product has to be used in an environment in which a protection level higher than IP20 is required, this must be guaranteed by the cabinet that hosts the product itself.

Vibration
The internal cabinet control panel can support vibrations:

- From 5 to 9 Hz: sinusoidal 3.5 mm constant;
- From 9 to 150 Hz: sinusoidal with acceleration equal to 1 G

Should the device be mounted on a support that exceeds these limits it is necessary to envisage a system for the suspension and mitigation of the vibrations.

Minimum spaces for ventilation
The temperature of the compartment that houses the internal cabinet control panel must not exceed 55°C.
The free spaces for ventilation show the minimum free distances recommended in the installation of the device in a closed compartment

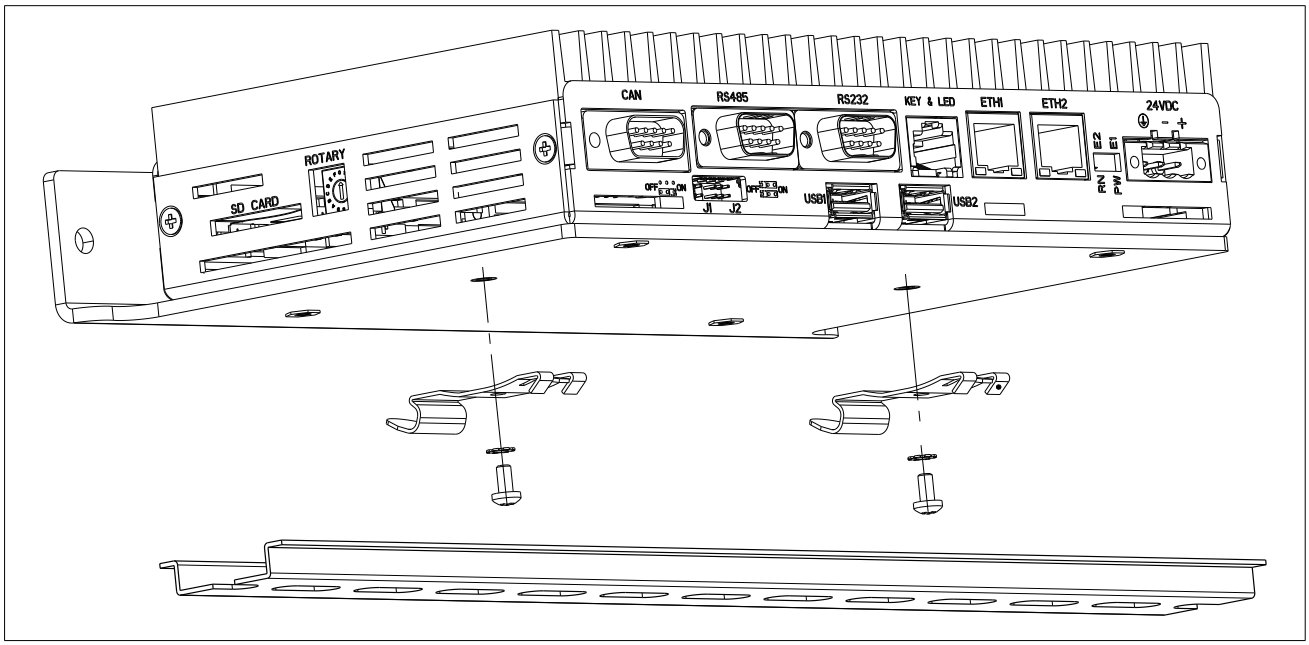
Positioning
The internal cabinet control panel has to be positioned in order to guarantee the following conditions:

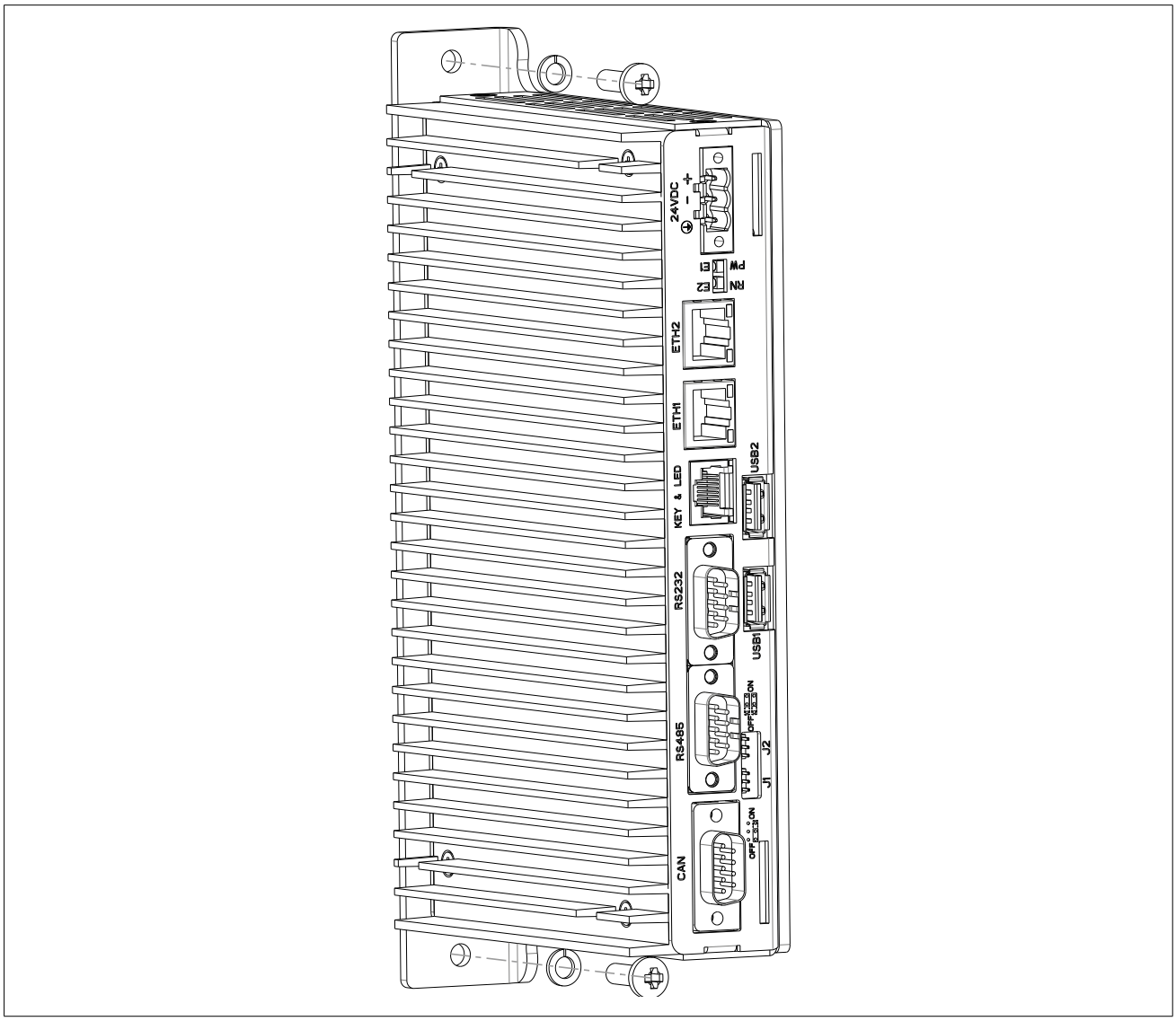
- If necessary, screen direct rays, using an antiglare shutter for example;
- There must be no sudden temperature changes;
- There must be a low explosion risk: it can be connected to elements that operate in environments with a hazardous atmosphere (flammable or explosive) only through appropriate and suitable types of interface, compliant to the safety standards in force;
- Low presence of magnetic fields.

Fastening
The internal cabinet control panel can be installed in two ways:

- Horizontal on DIN 35 mm track:
  - Install the 2 brackets for the DIN 35 track. Fasten the product and press hard to complete the operation, rotating downwards.
- Vertical mounting:
- Prepare the M5 threaded holes, done with the template, position the product and screw in place.

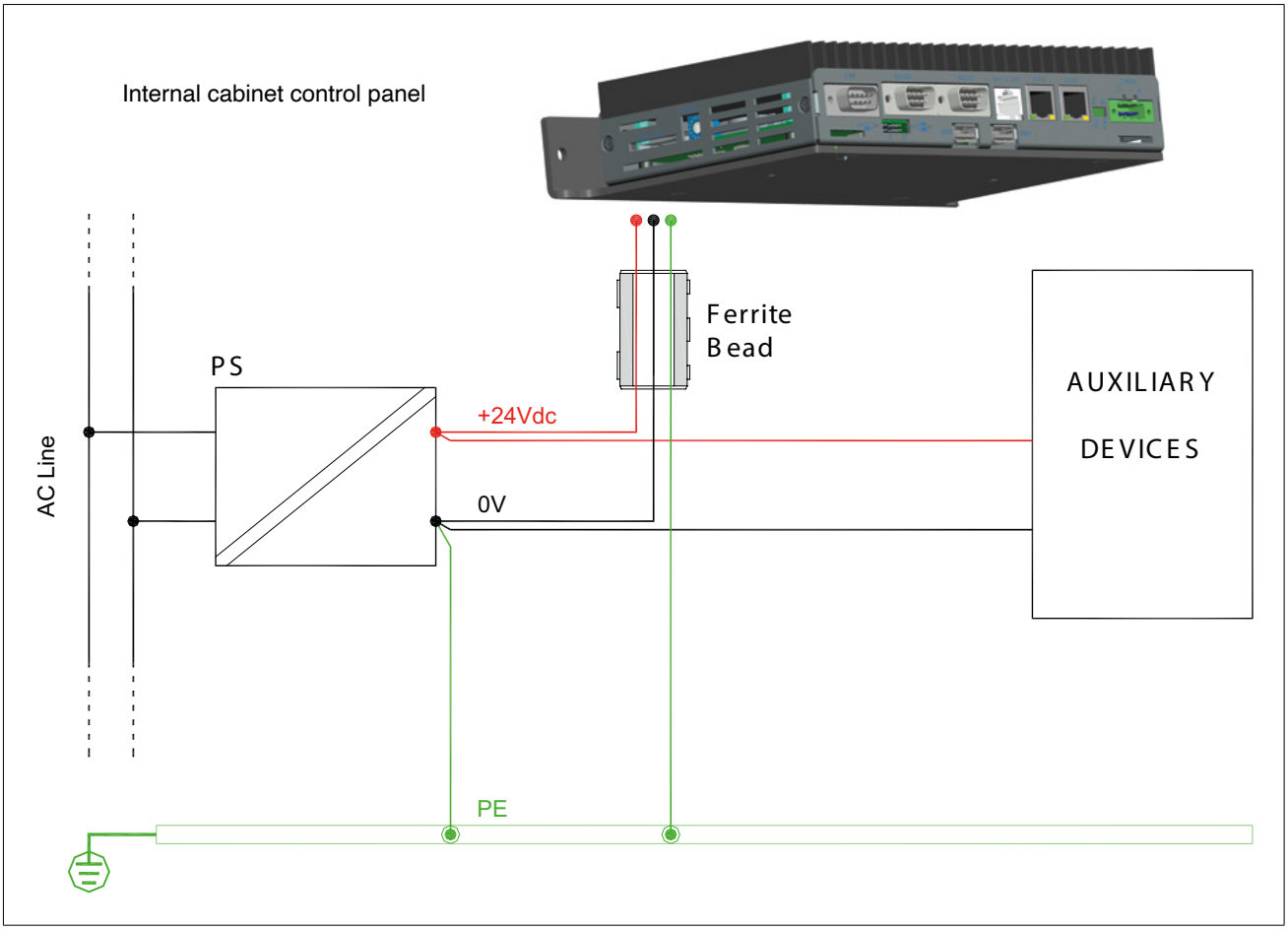
Warning: install locking washers to prevent the screws from loosening!





MAIN POWER SUPPLY

The system is powered with ONE (1) power supply.



To power the system correctly, make sure that:

- The power supply has the power needed to run the system and any additional resources connected to it.
- Ground the power supply (GND) with a wire that is straight and as short as possible (PE).
- Insert the ferrites into the power supply cables as close as possible to the GSLM Control Panel.
- The system power supply line must have a different path from the plant and machine power cables.

Ground the GSLM ground terminal and with a wire that is straight and as short as possible to the (PE) point.

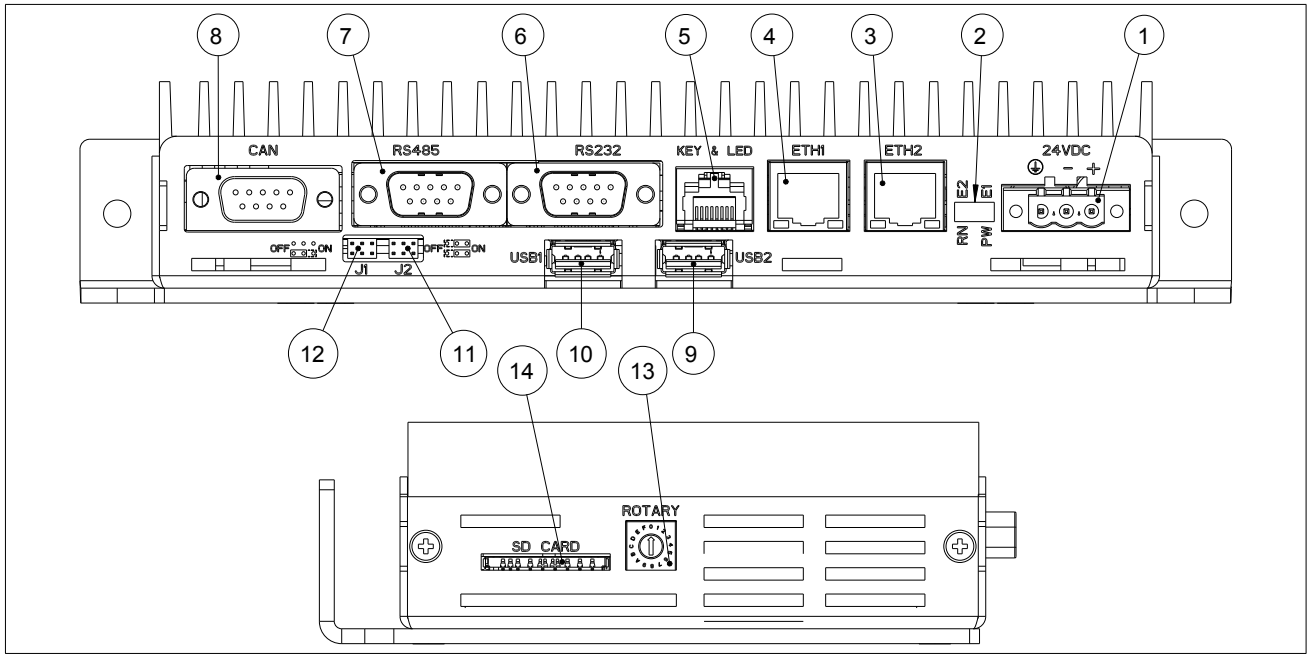
Technical data

GSLM technical data table

POWER SUPPLY	Operating voltage	24 VDC ±25%
	Current draw (at 24 VDC)	500 mA max
	Power dissipation	12 W max
	Protections	Polarity inversion Short circuit
	Connection	3-pin polarized removable connector Screw terminals, max cable section 2.5 mm^2
CONNECTIONS	Ethernet port (ETH)	Number of channels: 2 Connector: RJ45 Speed: 10 / 100 / 1000 Mbit/s Signals: green connection LED, yellow data LED
	USB port	Number of ports: 2 max Connector: type A Standard: USB 2.0 Protection: overload
COMMUNICATION PROTOCOLS	Ethernet	Modbus TCP/IP Master/Slave
VIEWING ELEMENTS	Diagnostics	PW LED (yellow): power supply on RN LED (green): SW program state LED E1 (red): HW Watchdog state LED E2 (red): SW program error
MICROPROCESSOR	Type and frequency	ATOM E640 1 GHz ATOM E660, 1.3 GHz
MEMORY	System	512 MB, DRAM type DDR II
	Mass	2 GB Flash memory
AMBIENT CONDITIONS	Operating temperature	0 ... +55 °C (as per IEC 68-2-14)
	Storage temperature	-20 ... +70 °C (as per IEC 68-2-14)
	Relative humidity	max 95% RH non condensing (as per IEC 68-2-3)
	Vibrations	5 to 9 Hz: sine constant 3.5 mm 10 to 150 Hz: sine acceleration 1G
ASSEMBLY		Mounting inside the control panel, horizontally with the DIN bar or vertically with fixing screws.
PROTECTION LEVEL		IP 20 (as per IEC 68-2-3)
WEIGHT		1,250 kg
CE STANDARDS	EMC (electromagnetic compatibility)	Conforms to Directive 2014/30/EU EN61131-2: Programmable controllers Part 2: Equipment requirements and tests.

Connections

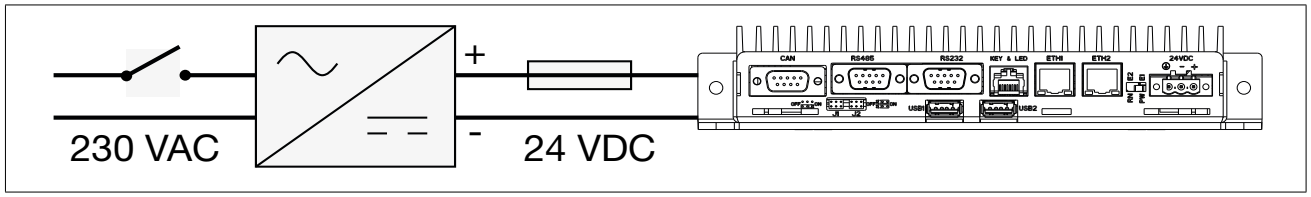
Inputs, Outputs and signals



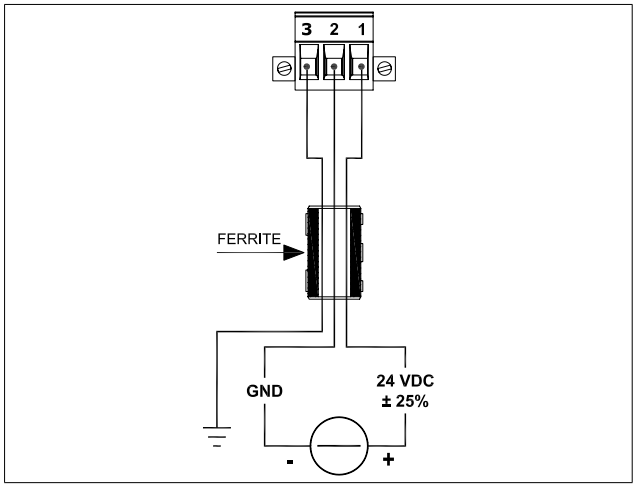
No	Description	Connector / indicator	Notes
1	24 VDC ± 25% power supply input	Removable polarized terminal block	
2	LED	PW (yellow): power ON RN (green): SW program status E1 (red): HW Watchdog status	
3	Ethernet to be connected to GFW/ GPC	RJ45	
4	Ethernet for LAN connection	RJ45	
5			NOT USED
6			NOT USED
7			NOT USED
8			NOT USED
9	Porta USB	Type A	
10	Porta USB	Type A	
11			NOT USED
12			NOT USED
13			NOT USED
14			NOT USED

Power

The GSLM internal cabinet control panel must be connected to a 24 Vdc power supply unit.
The same 24 VDC power supply can feed other devices as well. Make sure that the current issued by the power supply is higher than the total maximum current absorbed by all the devices connected.



Considering that the device has no switch, it is necessary to install one before it, with a protective fuse.
The switch has to be positioned in the immediate vicinity of the device and be easy for the operator to reach.
For the 24 Vdc power supply, use a separate line from that used for electromechanical power devices such as relays, contactors, solenoids, etc.
If there are considerable changes in the mains voltage, use a voltage stabiliser. Near to high frequency generators or arc welders, use adequate grid filters. Connect the power cables to the power connector. Assemble the ferrite (supplied) as close as possible to the device to limit its susceptibility to electromagnetic noise.
The 24 Vdc power cables must follow a separate route from the power cables of the system or the machine.

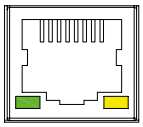


Attention: make sure that the earth connection is efficient. A non-existent or inefficient earth connection can make the operation of the device unstable, due to excessive environmental disturbance.
In particular, check that:

- the voltage between ground and earth is < 1 V;
- the ohm resistance is < 6 Ω.
- the wire is as short as possible and and is strait as possible without twists or curls.

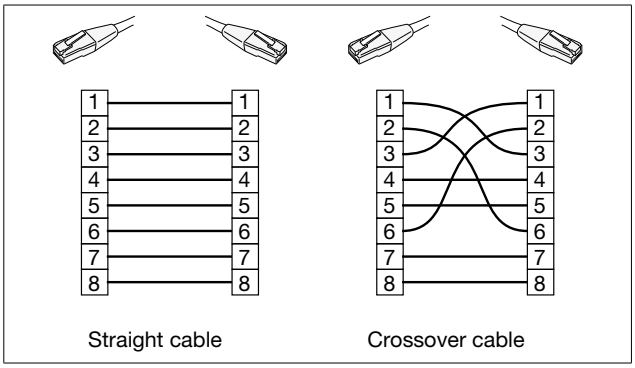
USB
The USB ports let you connect external devices conforming to the USB standard. The connectors are Type A and the ports support the USB 2.0 standards, with speed up to 480 Mbit/s. The ports can deliver 500 mA current at 5 VDC to power external USB devices. The USB cable can have a maximum length of 5 meters. Use approved USB 2.0 cables.
Logging from panel into the controller's USB port is possible through the carry-over cable (separately sortable). In order to set the grip of this cable, the thickness of the panel in the chosen position mustn't be higher than 2 mm.

Ethernet
The Ethernet port lets you connect the controller to a computer or a corporate LAN.



Pin	Name	Description
1	TX+	Data transmission +
2	TX-	Data transmission -
3	RX+	Data receiving +
4		
5		
6	RX-	Data receiving -
7		
8		

The connection cable used, straight or crossover, depends on the type of device that should be connected.
For example, to connect directly to a legacy PC without a modern Auto MDI-X port, a crossover cable must be used.

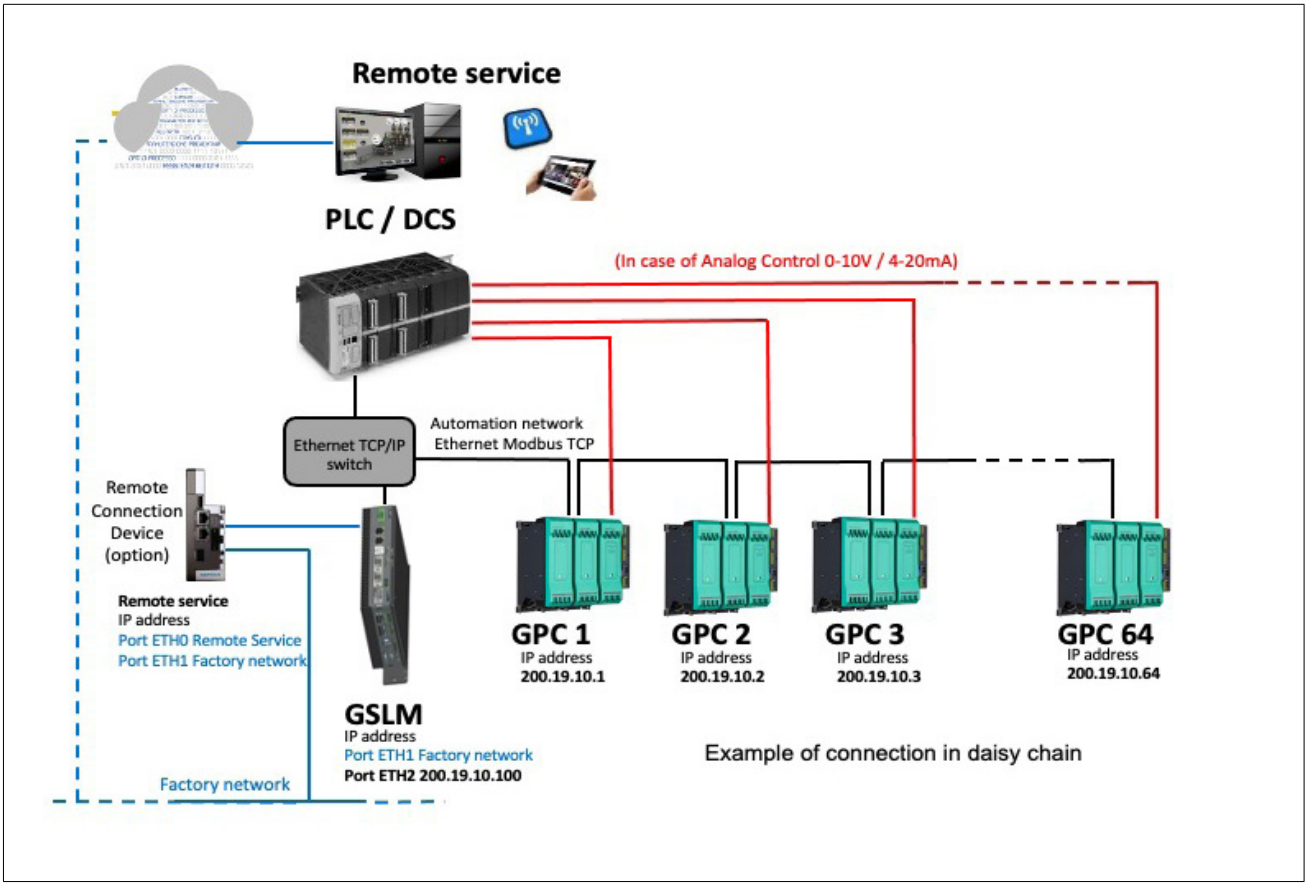


For the connection, use a CAT6 UTP cable or superior, the maximum length of the Ethernet cable is 100 metres. Do not run the Ethernet cable alongside the machine power cables, to avoid interference with data transmission. The RJ45 socket has two status LEDs. When the Ethernet connection is active, the green LED stays permanently lit; when data is being transmitted, the yellow LED flashes

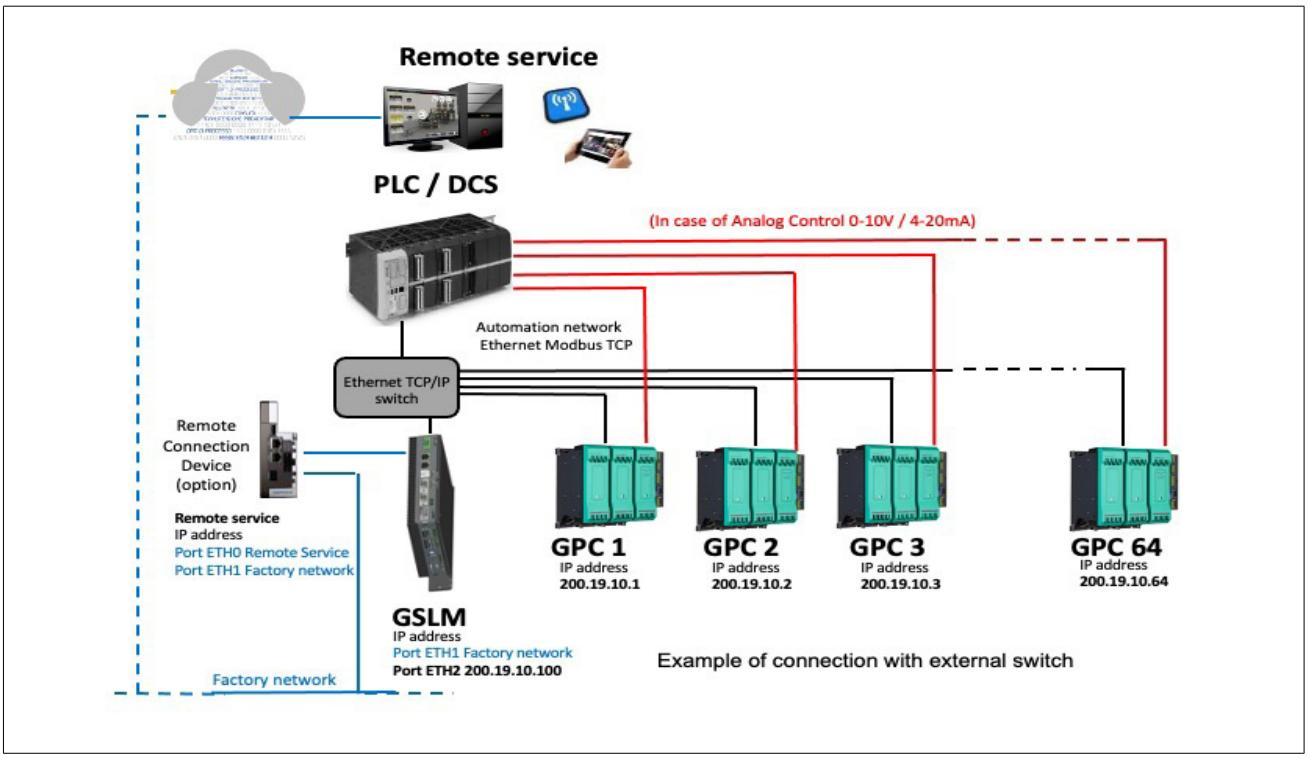
Architectures

All the GFW/GPC Power Controllers and the Smart Load Manager GSLM are connected via Ethernet TCP/IP network and the communication between all the devices is Modbus TCP. Two types of Power Controller GFW/GPC and Power manager GSLM connection architectures can be used:

- Daisy chain connection: the connection between each GFW/GPC is made using the pass-through Ethernet port available on this Power
- Controller



- Mesh connection: the connection between each GFW/GPC is made using a switch device



GFW/GPC/GSLM Ethernet IP addresses.
The communication between the various GFW/GPC / GSLM / Remote service devices (option) is Ethernet TCP/IP. The IP addresses of the individual devices connected to GSLM are pre-configured and immutable.

GFW/GPC 1 - IP 200.19.10.1
GFW/GPC 2 - IP 200.19.10.2
GFW/GPC 3 - IP 200.19.10.3
.....
GFW/GPC64- IP 200.19.10.64
.....
GSLM (ETH1) – IP 192.168.1.100 (IP address for Factory network connections)
GSLM (ETH2) – IP 200.19.10.100

Note:
Modbus TCP slave variables from GSLM are available on Factory network network (ETH1).
Modbus TCP communication between GSLM (ETH2) and each Power controller is over automation network.
DCS/PLC access to single Power controller parameters through GSLM device.

Modbus TCP address map

The communication between GFW/GPC and GSLM is Modbus TCP ethernet. The GFW/GPCs will be slaves of the GSLM.

Here below the two Custom maps that must be used in the GFW/GPCs for the communication with GSLM (available on the .gfe files on the Gefran web site)

GFW 40…300A CUSTOM MAP

IPA	Name	Value	Unit	Default value
10200	CustomVar1	1657 = STATUS3 of M		1024 = STATUS3 of M
10201	CustomVar2	1658 = STATUS4 of M		1024 = STATUS4 of M
10202	CustomVar3	1904 = Ld.P of M		1024 = Ld.P of M
10203	CustomVar4	1775 = Ld.V of M		1024 = Ld.V of M
10204	CustomVar5	1777 = Ld.A of M		1024 = Ld.A of M
10205	CustomVar6	1341 = INPUT_DIG of Global		1024 = INPUT_DIG of Global
10206	CustomVar7	1596 = In.A1 of Global		1024 = In.A1 of Global
10207	CustomVar8	2928 = Ld.P of E1		1024 = Ld.P of E1
10208	CustomVar9	1906 = Ld.P.t of Global		1024 = Ld.P.t of Global
10209	CustomVar10	2799 = Ld.V of E1		1024 = Ld.V of E1
10210	CustomVar11	1776 = Ld.Vt of Global		1024 = Ld.Vt of Global
10211	CustomVar12	2801 = Ld.A of E1		1024 = Ld.A of E1
10212	CustomVar13	1778 = Ld.A.t of Global		1024 = Ld.A.t of Global
10213	CustomVar14	2681 = STATUS3 of E1		1024 = STATUS3 of E1
10214	CustomVar15	2682 = STATUS4 of E1		1024 = STATUS4 of E1
10215	CustomVar16	4976 = Ld.P of E2		1024 = Ld.P of E2
10216	CustomVar17	4847 = Ld.V of E2		1024 = Ld.V of E2
10217	CustomVar18	4849 = Ld.A of E2		1024 = Ld.A of E2
10218	CustomVar19	4729 = STATUS3 of E2		1024 = STATUS3 of E2
10219	CustomVar20	4730 = STATUS4 of E2		1024 = STATUS4 of E2
10220	CustomVar21	1329 = STATUS_W of M		1024 = STATUS_W of M
10221	CustomVar22	1276 = MANUAL_POWER of M		1024 = MANUAL_POWER of M
10222	CustomVar23	1914 = C.E.t of Global		1024 = C.E.t of Global
10223	CustomVar24	1915 = C.E.m of M		1024 = C.E.m of M
10224	CustomVar25	1916 = C.E.P. of M		1024 = C.E.P. of M

GPC 40...600 A / GFW 400...600 A CUSTOM MAP

IPA	Name	Value	Unit	Default value
10200	CustomVar1	1657 = STATUS3 of M		1024 = STATUS3 of M
10201	CustomVar2	1658 = STATUS4 of M		1024 = STATUS4 of M
10202	CustomVar3	1743 = Ld.P of M		1024 = Ld.P of M
10203	CustomVar4	1775 = Ld.V of M		1024 = Ld.V of M
10204	CustomVar5	1777 = Ld.A of M		1024 = Ld.A of M
10205	CustomVar6	1341 = INPUT_DIG of Global		1024 = INPUT_DIG of Global
10206	CustomVar7	1596 = In.A1 of Global		1024 = In.A1 of Global
10207	CustomVar8	2767 = Ld.P of E1		1024 = Ld.P of E1
10208	CustomVar9	1744 = Ld.P.t of Global		1024 = Ld.P.t of Global
10209	CustomVar10	2799 = Ld.V of E1		1024 = Ld.V of E1
10210	CustomVar11	1776 = Ld.Vt of Global		1024 = Ld.Vt of Global
10211	CustomVar12	2801 = Ld.A of E1		1024 = Ld.A of E1
10212	CustomVar13	1778 = Ld.A.t of Global		1024 = Ld.A.t of Global
10213	CustomVar14	2681 = STATUS3 of E1		1024 = STATUS3 of E1
10214	CustomVar15	2682 = STATUS4 of E1		1024 = STATUS4 of E1
10215	CustomVar16	4815 = Ld.P of E2		1024 = Ld.P of E2
10216	CustomVar17	4847 = Ld.V of E2		1024 = Ld.V of E2
10217	CustomVar18	4849 = Ld.A of E2		1024 = Ld.A of E2
10218	CustomVar19	4729 = STATUS3 of E2		1024 = STATUS3 of E2
10219	CustomVar20	4730 = STATUS4 of E2		1024 = STATUS4 of E2
10220	CustomVar21	1329 = STATUS_W of M		1024 = STATUS_W of M
10221	CustomVar22	1276 = MANUAL_POWER of M		1024 = MANUAL_POWER of M
10222	CustomVar23	1914 = C.E.t of Global		1024 = C.E.t of Global
10223	CustomVar24	1915 = C.E.m of M		1024 = C.E.m of M
10224	CustomVar25	1916 = C.E.P. of M		1024 = C.E.P. of M

Modbus TCP Slave address map

The GSLM as slave Modbus TCP publishes a set variables for a communication with a Master Modbus TCP system.

Node addresses table	Address Modbus	Data Type	Read / Write
Power output % actual	0	WORD	R/W
Manual power output configured	128	WORD	R/W
GFW/GPC status word 3	256	WORD	R/W
GFW/GPC status word 4	384	WORD	R/W
GFW/GPC CEP parameter	512	WORD	R/W
GFW/GPC phase 1 voltage	640	WORD	R/W
GFW/GPC phase 2 voltage	768	WORD	R/W
GFW/GPC phase 3 voltage	896	WORD	R/W
GFW/GPC three phase voltage	1024	WORD	R/W
GFW/GPC phase 1current	1152	WORD	R/W
GFW/GPC phase 2 current	1280	WORD	R/W
GFW/GPC phase 3 current	1408	WORD	R/W
GFW/GPC three phase current	1536	WORD	R/W
GFW/GPC phase 1 power	1664	WORD	R/W
GFW/GPC phase 2 power	1792	WORD	R/W
GFW/GPC phase 3 power	1920	WORD	R/W
GFW/GPC three phase power	2048	WORD	R/W
Power reference from DCS	2176	WORD	R/W
Parameter CEP from DCS	2304	WORD	R/W
Enable command from DCS	0	BOOL	R/W
Output On/Off	128	BOOL	R/W

Maintenance and Diagnostics

WEEE Information

Implementation of Directive 2012/19/EU on waste electrical and electronic equipment (WEEE)".

The symbol showing a crossed-out wheeled bin on equipment or its packaging indicates that the product must be collected separately from other waste at the end of its useful life.
The manufacturer is responsible for organising and managing the separate collection of this piece of equipment at the end of its useful life. Users wishing to dispose of the equipment must therefore contact the manufacturer to obtain instructions from the same on how to have the equipment collected separately at the end of its useful life. By collecting the disused equipment separately, it can be recycled, treated or disposed of in an environmentally friendly manner, thus helping to prevent the environment and public health from being affected negatively and enabling reuse and/or recycling of the materials forming the same equipment.

Local diagnostic - Control Panel
In the event of any malfunctions, check the LED to determine the cause of the problem and find possible remedies.

LED	Meaning	Boot	Runtime
PW (yellow)	POWER	On steady	On steady
RN (green)	PLC program diagnostics	On steady	On steady: application program exists, has been loaded, and is running. Off: Error, application program not running.
E1 (red)	Hardware watchdog	On steady	On: HW watchdog tripped.

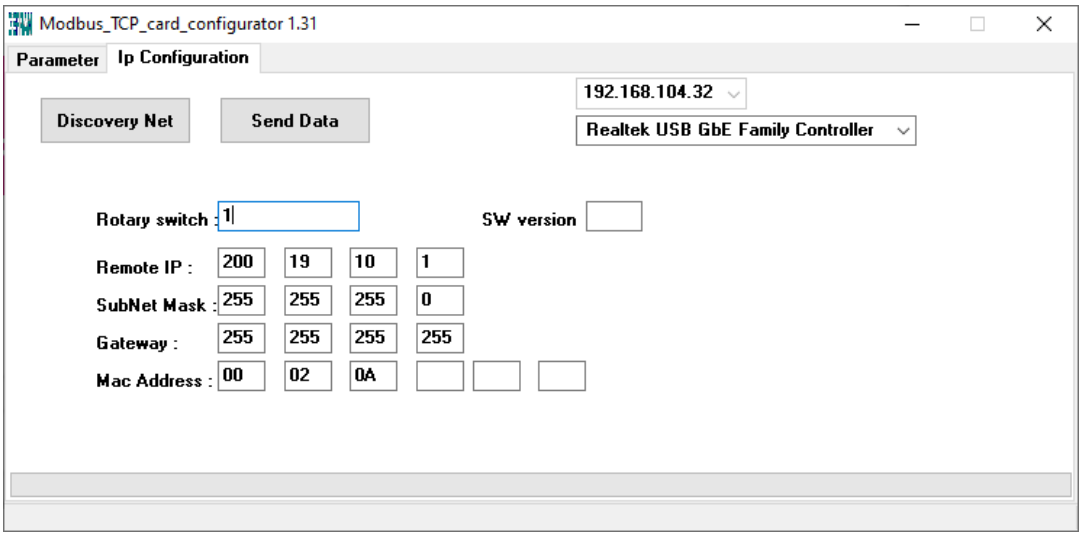
SYSTEM CONFIGURATION QUICK START

Step1:

download Modbus TCP Configurator SW from Gefran web site at the link:

https://www.gefran.com/en/products/292-modbus-tcp#downloads

Configure the nodes and IP addresses of all the GFW/GPC Modbus TCP cards



Node addresses table

64 Zones			
32 Zones			
16 Zones			
Node xx_ 200.19.10.xx	**Node xx_ 200.19.10.xx**	**Node xx_ 200.19.10.xx**	**Node xx_ 200.19.10.xx**
1 _ 1	17 _ 17	33 _ 33	49 _ 49
2 _ 2	18 _ 18	34 _ 34	50 _ 50
3 _ 3	19 _ 19	35 _ 35	51 _ 51
4 _ 4	20 _ 20	36 _ 36	52 _ 52
5 _ 5	21 _ 21	37 _ 37	53 _ 53
6 _ 6	22 _ 22	38 _ 38	54 _ 54
7 _ 7	23 _ 23	39 _ 39	55 _ 55
8 _ 8	24 _ 24	40 _ 40	56 _ 56
9 _ 9	25 _ 25	41 _ 41	57 _ 57
10 _ 10	26 _ 26	42 _ 42	58 _ 58
11 _ 11	27 _ 27	43 _ 43	59 _ 59
12 _ 12	28 _ 28	44 _ 44	60 _ 60
13 _ 13	29 _ 29	45 _ 45	61 _ 61
14 _ 14	30 _ 30	46 _ 46	62 _ 62
15 _ 15	31 _ 31	47 _ 47	63 _ 63
16 _ 16	32 _ 32	48 _ 48	64 _ 64

Set to 0 the time “delay between serial communication

Step 2

Program all the GFW/GPC nodes with the configuration files for GF_eXpress available on the Gefran web site

File names:

- GSLM_GFW/GPC_300
- GSLM_GFW/GPC_600

Step 3

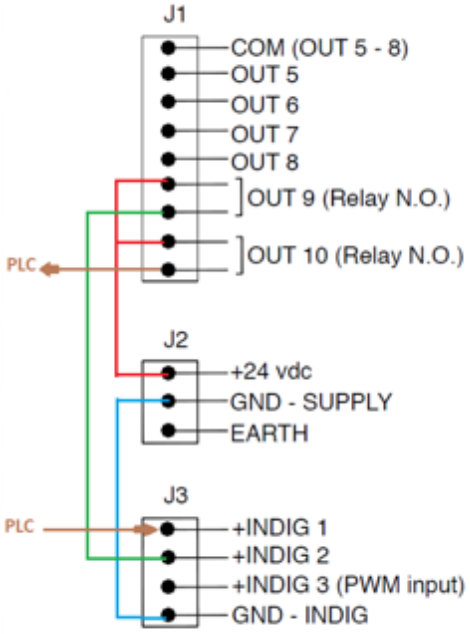
GFW 40…300 A Inputs and Outputs wiring

INDIG 1 = ON/OFF from PLC

INDIG 2 = MAN/AUT from OUT 9

OUT 9 = Modbus TCP GFW/GPC<> GSLM communication lost Alarm

OUT 10 = Modbus TCP GFW/GPC/GSLM <> PLC communication lost Alarm



Step 3a

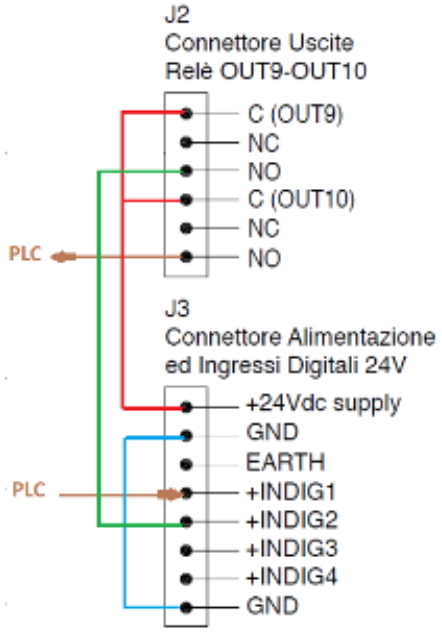
GFW 400…600 A Inputs and Outputs wiring

INDIG 1 = ON/OFF from PLC

INDIG 2 = MAN/AUT from OUT 9

OUT 9 = Modbus TCP GFW/GPC<> GSLM communication lost Alarm

OUT 10 = Modbus TCP GFW/GPC/GSLM <> PLC communication lost Alarm



Step 3b

GPC Inputs and Outputs wiring

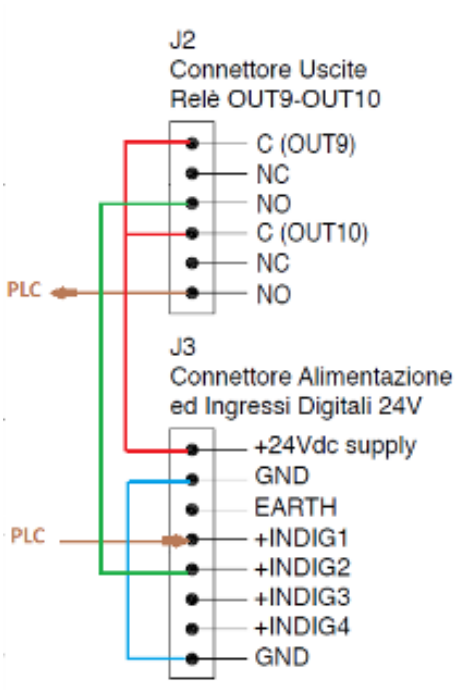
INDIG 1 = ON/OFF from PLC

INDIG 2 = MAN/OUT from OUT 9

INDIG 4 = Interlock (enable)

OUT 9 = Modbus TCP GPC <> GSLM communication lost Alarm

OUT 10 = Modbus TCP GPC/GSLM <> PLC communication Alarm



Order code

Code	Model	Description
F081440	GSLM-16	Load control module up to 16 Power Controllers series GFW/GPC
F081441	GSLM-32	Load control module up to 32 Power Controllers series GFW/GPC
F081442	GSLM-64	Load control module up to 64 Power Controllers series GFW/GPC

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