



## INSTALLATION AND OPERATION MANUAL

code 80380A - 11/2015 - ENG



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### GRAPHIC SYMBOLS

To differentiate the type and importance of the information in this User Manual, graphic reference symbols are used to make such information easier to interpret.



*Indicates contents of sections, general instructions, notes, and other points to which the reader's attention needs to be called.*



Indicates a suggestion based on the experience of GEFIRAN's Technical Personnel that could be especially useful under certain circumstances.



**Indicates a particularly delicate situation that could affect the safety or correct operation of the controller, or an instruction that MUST be followed to prevent hazards.**



Indicates a reference to Detailed Technical Documents available on the GEFIRAN website [www.gefran.com](http://www.gefran.com).



Indicates a risk to the user's safety due to high voltage at the points indicated.

## 1.1 PROFILE

The compact, powerful, smart Power Controller IR-12/IR-24 is the ideal solution for multichannel Infrared lamps heating systems.

In a unique, robust, "all in one" wall mounting cabinet are available all the necessary components for the complete IR lamps management for up to 60Kw electrical power.

The product is available in different models: IR-24 (with 24 outputs) , or IR-12 (with 12 outputs) and they are available with communication RS485 MODBUS RTU or with Fieldbus PROFINET. Each one of the 24 channels available can be controlled independently by commands received on the FieldBus or on the RS485 communication line, with Modbus RTU protocol and baud rate selectable up to 57.600 bps.

The channels are able to provide 9Amps as maximum current per channel on all the 24 channels contemporary.

The soft start phase, useful to grant a gradual heating of the lamps and so a longer lifetime, is provided by phase angle control.

When the lamp filament is warm, after the soft start phase, the burst firing control takes place, with a typical cycle time of 2 seconds.

It can be configured also the Phase-angle (PA\_mode) firing steady-state control mode.

Using the zero crossing firing method is possible to avoid the EMC emission and consequently avoiding to use expensive and space consuming EMC filters.

IR-12/IR-24 is equipped with a local brain able to provide a continuous monitoring of the power percentage provided by the single channel in order to act a time-sharing distribution.

The result is a continuous balancing of the instantaneous absorption on each phase of the power line, with big advantages in term of current peaks reduction, increasing of the system power factor, finally money saving for the machine/line users.

Another local control is performed locally by the IR-12/IR-24 in order to compensate the line voltage variations, resulting in the capability to grant a constant power to the lamps even when the voltage power supply is not constant in the factory.

Complete exhaustive diagnostic functions are available for each single channel as for the central unit.

The fault conditions of lamp out, fuse blown, scr in short circuit, loss of phases, loss of 24Vdc power supply are all displayed by common Leds and with a single diagnostic bit for each channel, readable by Fieldbus or Serial Line.

The several trigger modes are software configurable and provide:

- **BF**: Burst-Firing, Zero crossing with optimized minimum cycle time, for systems with low thermal inertia, medium-wave IR lamps
- **HSC**: Half Single Cycle Zero Crossing corresponds to Burst Firing that manages single semi-cycles of conduction or stop cycles, useful for short-wave IR lamps, reduces flickering and limits generation of EMC noise on the power line
- **PA**: Phase-Angle, load control using phase angle SCR firing modulation control
- **Soft Start Ramp**: With phase angle control to reduce current peaks at firing .

IR-12/IR-24 runs complete diagnostics of current, voltage, power, and temperature levels:

### Current Diagnostics:

- Total load interrupt alarm
- Alarm for SCR in short circuit

### Voltage Diagnostics:

- Alarm for absence of phase

### Fuse diagnostics:

- Automatic detection of blown fuse (for every channel)

### Temperature Diagnostics:

- Alarm for over temperature of power module

Power control with Soft start ramp limits load, optimizes the consumptions and increases the load operating duration.

**NOTE:** In PA\_mode the diagnostic Alarms Load-Open and Fuse\_open are detected for SCR power firing higher than 40%

**NOTE:** In PA\_mode the diagnostic Alarm SSR-SHORT is detected when SCR power firing is P=0% or when his channel is disabled

The IR-12/IR-24 can be connected serially by means of an RS485 with Modbus RTU protocol or by Fieldbus PROFINET in order to control the power outputs, the load state, and the device from an HMI or PLC.



*The section contains general information and warnings to be read before installing, configuring and using the controller.*

## 1.2 GENERAL DESCRIPTION

IR-12/IR-24 is multizone advanced solid state power unit, extremely compact, equipped with different functions; it offers an exclusive combination of performance, reliability, and flexibility. In particular, this new line of Gefran controllers is the ideal solution for sectors demanding high performance and continuity

of service, such as:

- IR welding
- Thermoforming
- Blowing
- Hot runners for injection presses
- Texturizing of fibers
- Heat treatment furnaces
- Woodworking machines
- Glass tempering furnaces.

IR-12/IR-24 is used for the power control of single-phase (phase neutral) loads, including resistive loads with high and low temperature coefficient, short wave IR lamps.



*Attention: the description of programming and configuration parameters are contained in the "Programming and configuration" manual, downloadable from the website [www.gefran.com](http://www.gefran.com)*

### 1.3 PRELIMINARY INSTRUCTION



*Read the following preliminary instructions before installing and using the IR-12/IR-24 modular power controller.*

*This will make start-up faster and avoid some problems that could be mistakenly interpreted as malfunctions or limitations of the controller.*



Users and/or system integrators who want detailed information on serial communication between Gefran standard and/or industrial PCs and Gefran Programmable Instruments can access Technical Reference Documents on serial communication and MODBus protocol, etc., in Adobe Acrobat format on the Gefran website **www.gefran.com**:

- Serial Communication
- MODBus Protocol

Immediately after unpacking the unit, check the order code and the other data on the label attached to the outside of the container.

Write them on the following table.

SN.....	(Serial number)
CODE .....	(Product code)
TYPE.....	(Order code)
SUPPLY.....	(Power Supply)
VERS. ....	(Firmware version)

This data must always be available and given to Gefran

Customer Care representatives are available if technical service is needed. Check that the controller is in perfect condition, was not damaged during shipment, and that the package also contains the “Configuration and Programming” manual.

Immediately report any errors, shortages, or signs of damage to your Gefran dealer.

Check that the order code matches the configuration requested for the intended application by consulting the section: “Technical-Commercial Information.”

See paragraph 2.1 “Dimensions and mounting” before installing the IR-12/IR-24 on the machine/host system control panel.

To configure the PC use the SW Gefran GF-Express kit and the relative connection cable. For the order code, see Section: “Technical-Commercial Information”.

Before calling Gefran Customer Care in case of assumed malfunctions, please see the Troubleshooting Guide in the “Maintenance” section and, if necessary, the F.A.Q. (Frequently Asked Questions) section on the Gefran website **www.gefran.com**



This section contains the instructions needed for correct installation of IR-12/IR-24 controllers on the machine/host system control panel and for correct connection of the power supply, inputs, outputs and interfaces.



**CAREFULLY READ THE FOLLOWING WARNINGS BEFORE INSTALLING THE INSTRUMENT!**  
Disregard of such warnings could create electrical safety and electromagnetic compatibility problems, as well as void the warranty.

## 2.1 ELECTRICAL POWER SUPPLY

- the controller DOES NOT have an On/Off switch: the user must install switch/isolator conforming to safety requisites (CE mark) to cut off the power supply up-line of the controller. The switch must be installed in the immediate vicinity of the controller in easy reach of the operator. A single switch can be used for multiple devices.
- the earth connection must be made with a specific lead.
- if the product is used in applications with risk of harm to persons or damage to machines or materials, it MUST be equipped with auxiliary alarm devices. It is advisable to provide the ability to check for tripped alarms during regular operation. DO NOT install the product in rooms with hazardous (inflammable or explosive) atmosphere; it may be connected to elements that operated in such atmosphere only by means of appropriate interfaces that conform to current safety standards.

## 2.2 NOTES ON ELECTRICAL SAFETY AND ELECTROMAGNETIC COMPATIBILITY:

### 2.2.1 CE MARKING: EMC (electromagnetic compatibility) conformity

in compliance with Directive 2004/108/CE and following modifications.

Series IR-12/IR-24 controllers are mainly intended for industrial

use, installed on panels or control panels of production process machines or systems.

For purposes of electromagnetic compatibility, the most restrictive generic standards have been adopted, as shown on the table.

### 2.2.2 LV (low voltage) conformity

in compliance with Directive 2006/95/CE.



EMC conformity has been verified with the connections indicated on table 1.

## 2.3 RECOMMENDATIONS FOR CORRECT INSTALLATION FOR PURPOSES OF EMC

### 2.3.1 Instrument power supply

- The power supply for the electronic instrumentation on the panels must always come directly from a cut-off device with fuse for the instrument part.
- Electronic instrumentation and electromechanical power devices such as relays, contactors, solenoids, etc., MUST ALWAYS be powered by separate lines.
- When the power supply line of electronic instruments is heavily disturbed by switching of thyristor power groups or by motors, you should use an isolation transformer only for the controllers, grounding its sheathing.
- It is important for the system to be well-grounded:
  - voltage between neutral and ground must not be  $> 1V$
  - Ohmic resistance must be  $< 6\Omega$ ;
- If the grid voltage is highly unstable, use a voltage stabilizer.
- In proximity of high-frequency generators or arc welders, use adequate grid filters.
- The power supply lines must be separate from instrument input and output lines.



- Supply from Class II or from limited energy source

### 2.3.2 Input and output connections

Before connecting or disconnecting any connection, always check that the power and control cables are isolated from voltage. Appropriate devices must be provided: fuses or automatic switches to protect power lines.

The fuses present in the module function solely as a protection for the IR-12/IR-24 semiconductors.

- Connected outside circuits must be doubly isolated.
- To connect analog inputs, strain gauges, linears, (TC, RTD), you have to:
  - physically separate the input cables from those of the power supply, outputs, and power connections.
  - use braided and shielded cables, with sheathing grounded at a single point.

### 2.3.3 Installation notes

Use the extra-rapid fuse indicated in the catalogue according to the connection example equipped.

- Moreover, the applications with solid-state units require a safety automatic switch to section the load power line.

To ensure maximum reliability, the device must be correctly installed in the panel in such a way as to obtain adequate heat exchange between the heat sink and the surrounding air under conditions of natural convection..

Fit the device vertically (maximum angle  $10^\circ$  to the vertical axis) see figure 3

- Vertical distance between a device and the panel wall  $> 100\text{mm}$
- Horizontal distance between a device and the panel wall at last  $20\text{mm}$
- Vertical distance between a device and the next one at last  $300\text{mm}$ .
- Horizontal distance between a device and the next one at last  $20\text{mm}$ .

Check that the cable holder runners do not reduce these distances, in this case fit the cantilever units opposite the panel so that the air can flow vertically on the dissipator without any obstacles.

- dissipation of device thermic power with effects on installation room temperature.
- thermal power dissipation with limits on installation room temperature.
- requires exchange with external air or an air conditioner to transfer dissipated power outside the panel.
- maximum limits of voltage and derived power of transients on the line, for which the solid state power unit contains protective devices (based on the model).
- presence of dispersion current in non-conducting state (current of a few mA due to RC Snubber circuit to protect the thyristor).



**GEFRAN S.p.A. assumes no liability for any damage to persons or property deriving from tampering, from incorrect or improper use, or from any use not conforming to the characteristics of the controller and to the instructions in this User Manual.**

**Table 1 EMC Emission**

AC semiconductor controllers and contactors for non-motor loads	EN 60947-4-3	
Emission enclosure compliant in firing mode single cycle and phase angle if external filter fitted	EN 60947-4-3 CISPR-11 EN 55011	Class A Group 2

**Table 2 EMC Immunity**

AC semiconductor controllers and contactors for non-motor loads	EN 60947-4-3	
ESD immunity	EN 61000-4-2	4 kV contact discharge 8 kV air discharge
RF interference immunity	EN 61000-4-3 /A1	10 V/m amplitude modulated 80 MHz-1 GHz 10 V/m amplitude modulated 1.4 GHz-2 GHz
Conducted disturbance immunity	EN 61000-4-6	10 V/m amplitude modulated 0.15 MHz-80 MHz
Burst immunity	EN 61000-4-4	2 kV power line 2 kV I/O signal line
Surge immunity	EN 61000-4-4/5	Power line-line 1 kV Power line-earth 2 kV Signal line-earth 2 kV Signal line-line 1 kV
Magnetic fields immunity	Test are not required. Immunity is demonstrated by the successful completion of the operating capability test	
Voltage dips, short interruptions and voltage immunity tests	EN 61000-4-11	100%U, 70%U, 40%U,

**Table 3 LVD Safety**

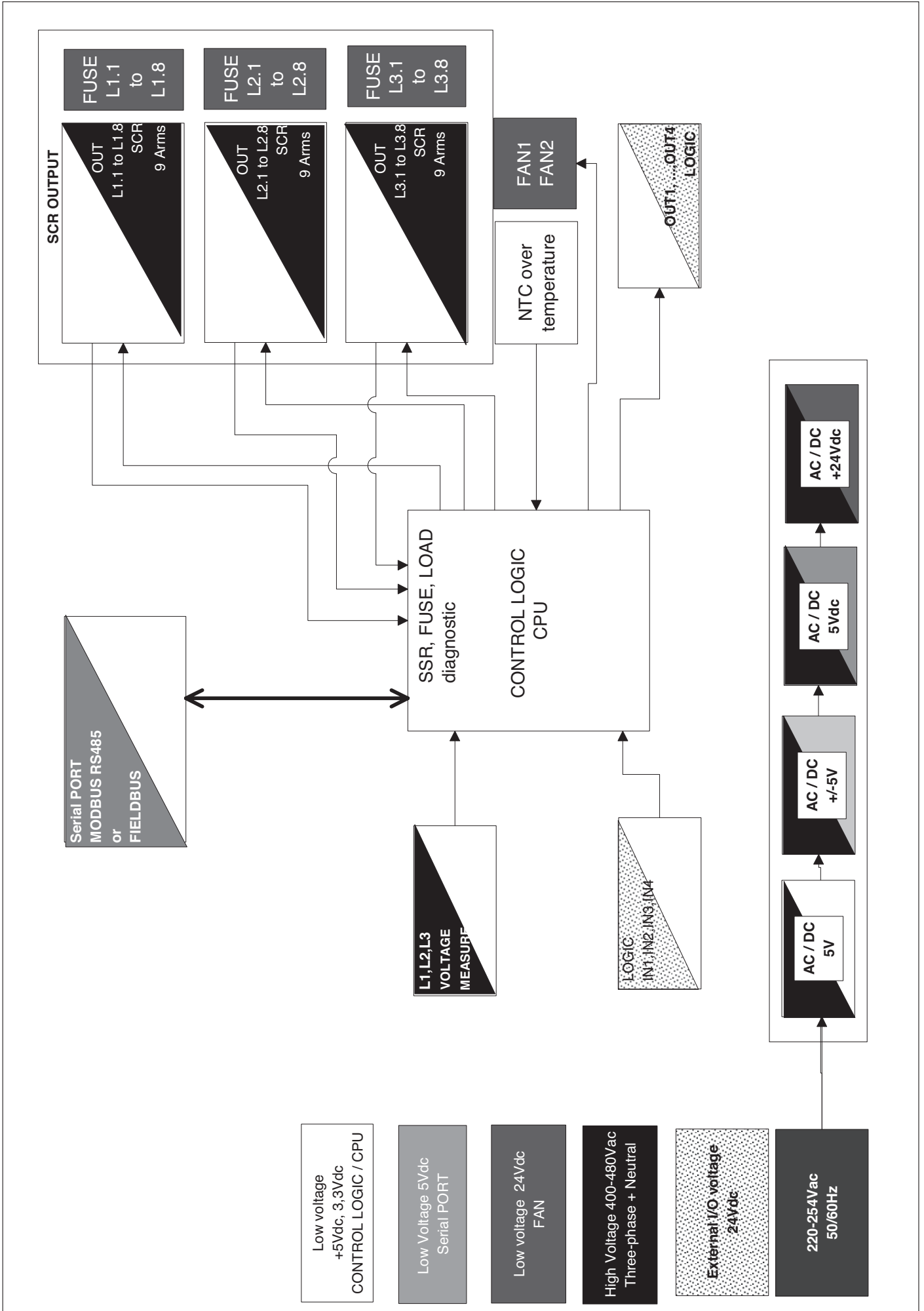
Safety requirements for electrical equipment for measurement, control and laboratory use	EN 61010-1 UL 508	
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**ATTENTION**

This product has been designed for class A equipment. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.

The CE declaration of conformity is available on request

INSULATION DIAGRAM



## 2.4 DIMENSIONS

Fastening can be done with five screw M6. See figures 1 and 2.  
All dimensions are expressed in mm.

Figure 1a - Dimensions of Models IR-24 and IR-12 with MODBUS RTU communication

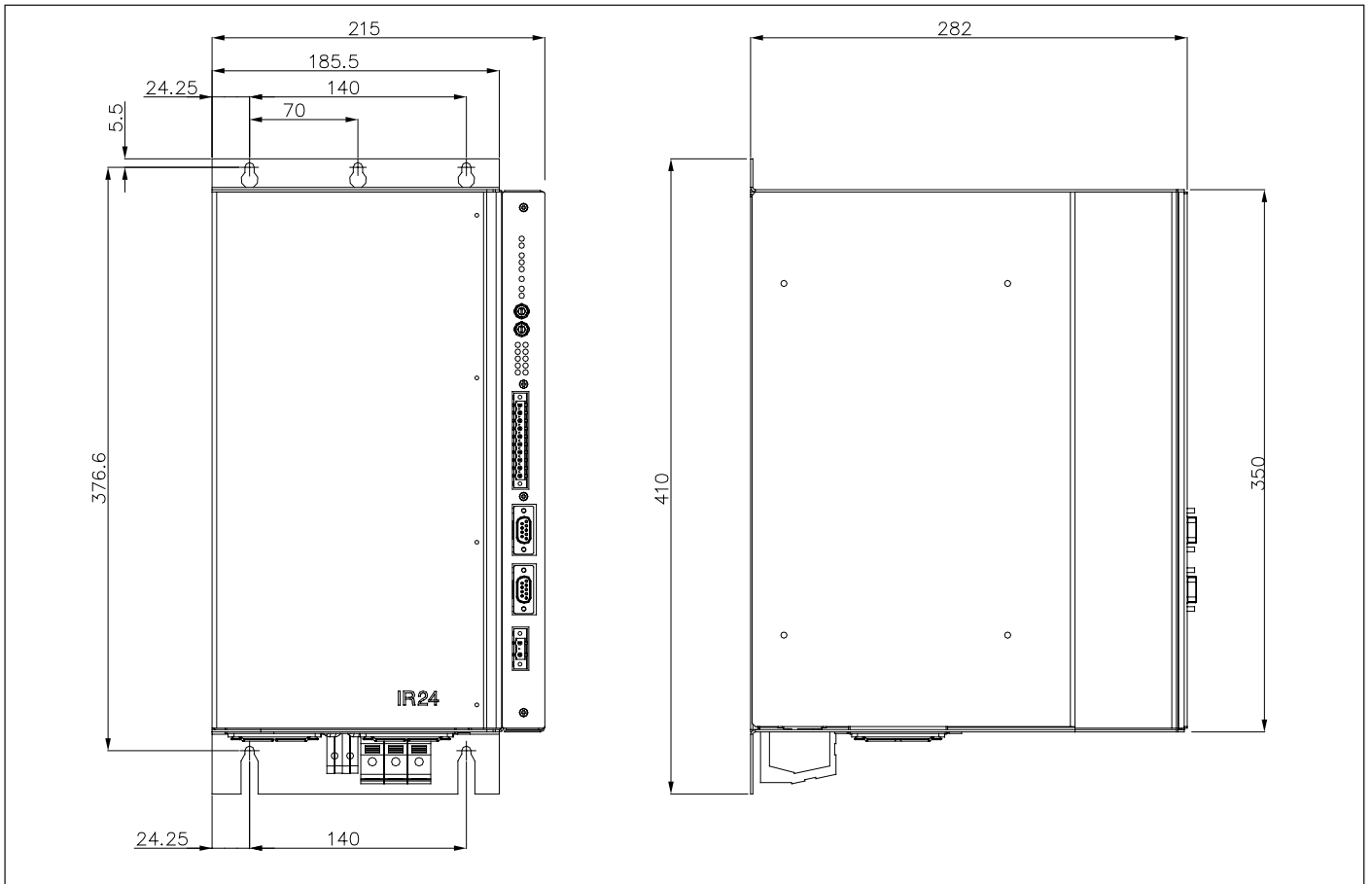
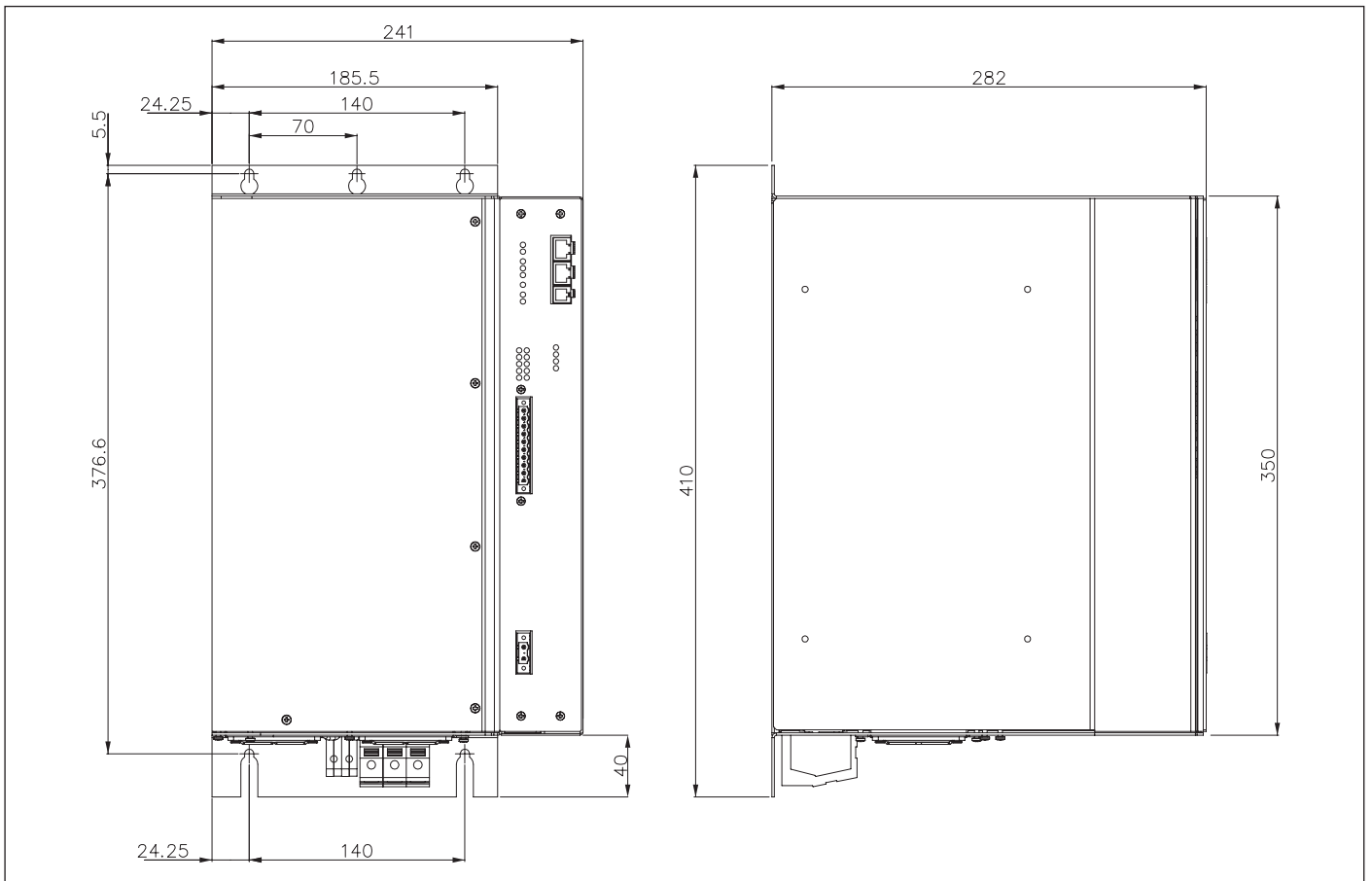
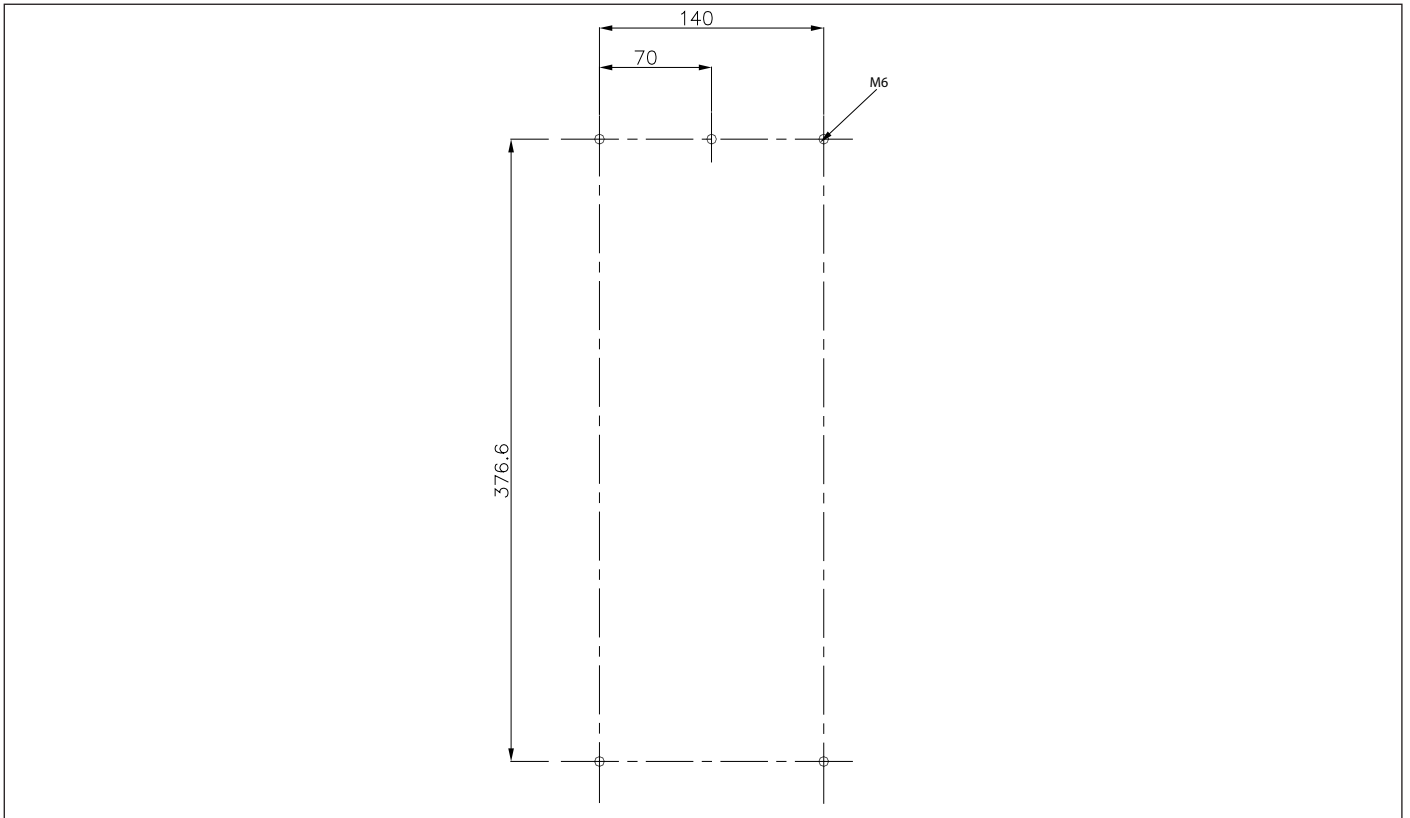


Figure 1b - Dimensions of Models IR-24 and IR-12 with Fieldbus communication



## 2.4.1 TEMPLATE DIMENSIONS

Figure 2



## 2.5 INSTALLATION



Attention: respect the minimum distances shown in figure 3 to provide adequate air circulation.

Figure 3

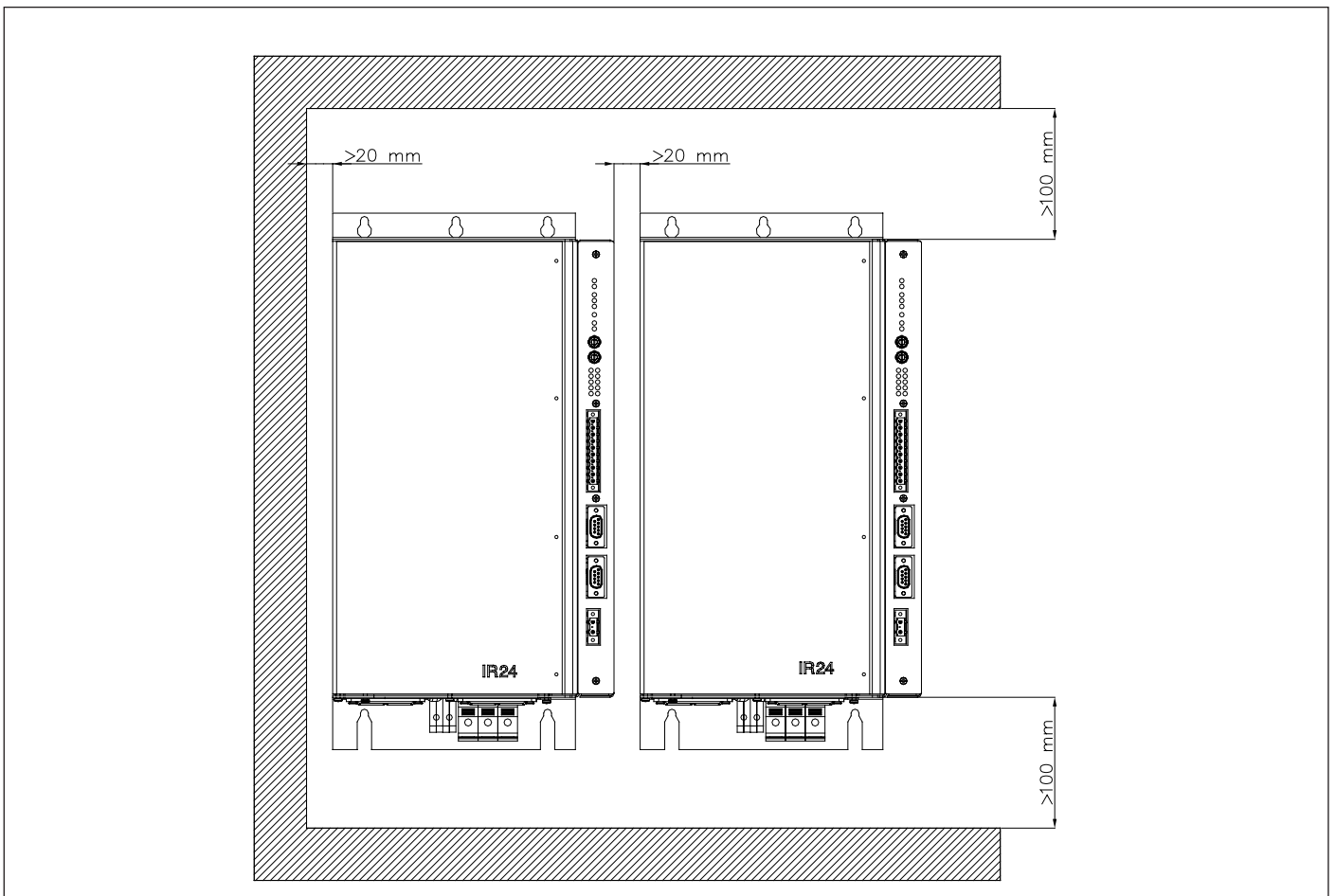




Figure 4a - Frontal view of IR-24 and IR-12 with MODBUS communication

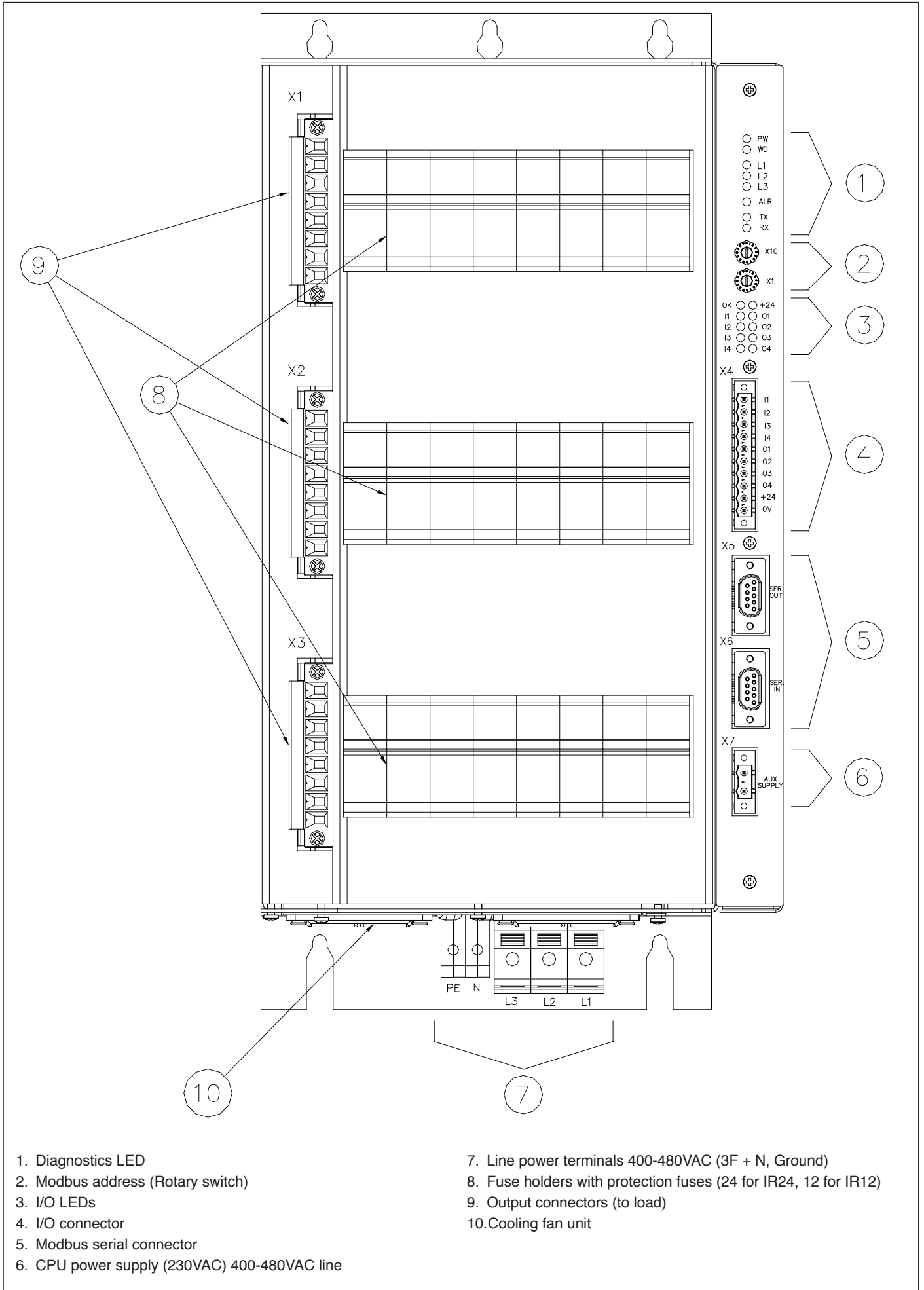
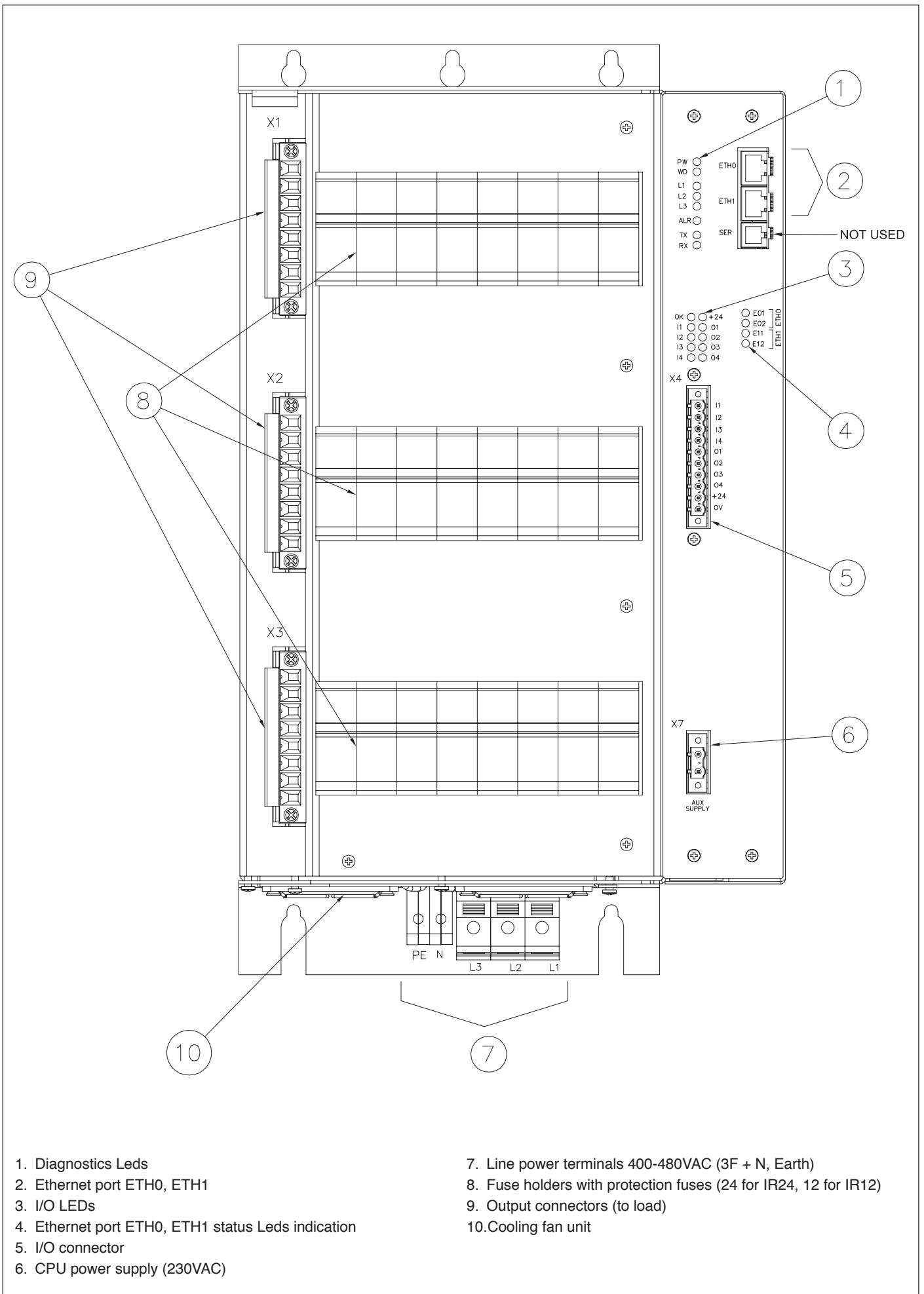


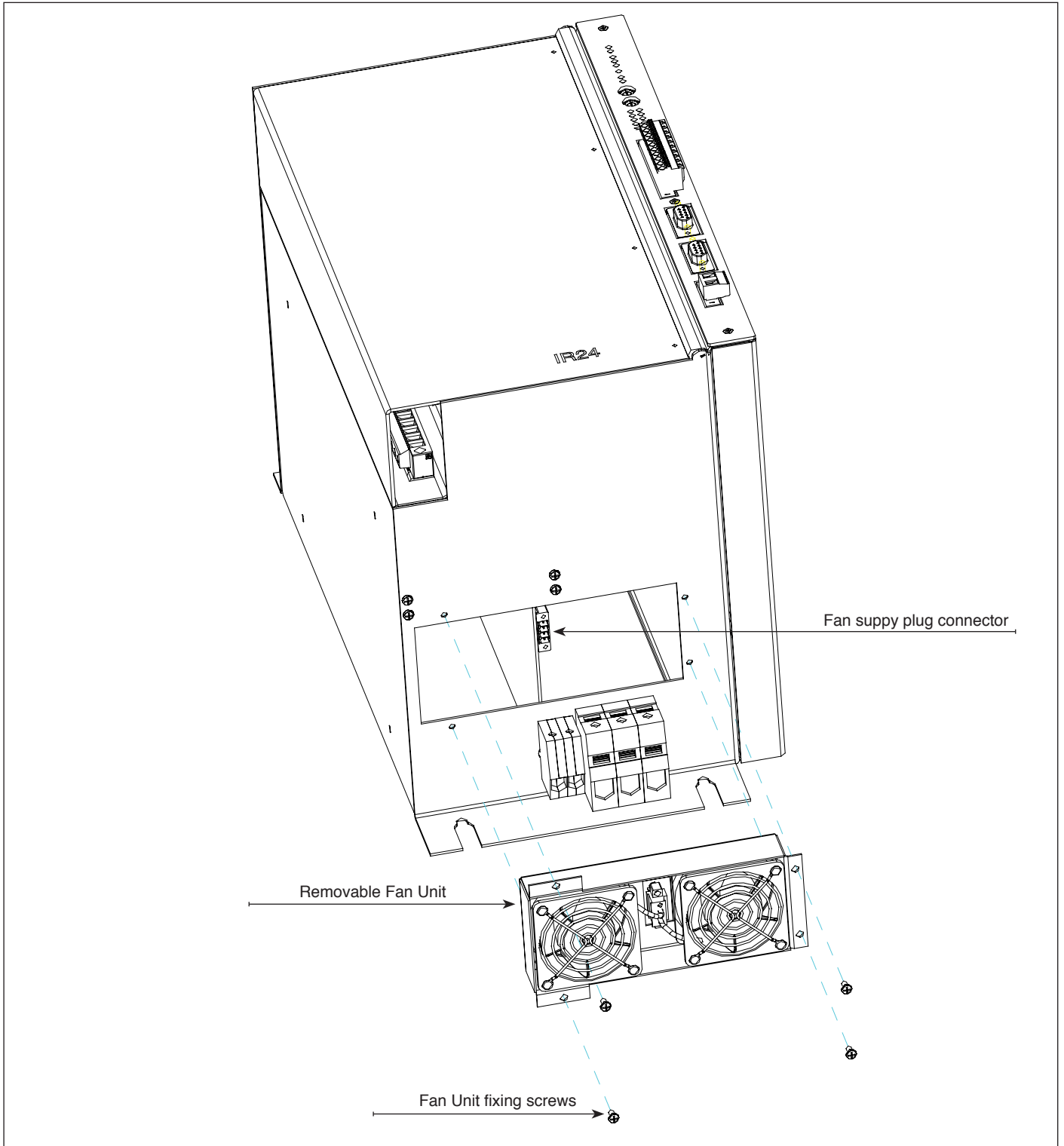
Figure 4b - Frontal View of IR-24 and IR-12 with Fieldbus PROFINET



- 1. Diagnostics Leds
- 2. Ethernet port ETH0, ETH1
- 3. I/O LEDs
- 4. Ethernet port ETH0, ETH1 status Leds indication
- 5. I/O connector
- 6. CPU power supply (230VAC)

- 7. Line power terminals 400-480VAC (3F + N, Earth)
- 8. Fuse holders with protection fuses (24 for IR24, 12 for IR12)
- 9. Output connectors (to load)
- 10. Cooling fan unit

Figure 5



**NOTE:** For IR-12 models, the fan Unit is provided with only one fan.

### **PERIODIC CLEANING**

Every 6-12 months (depending on the dust level of the installation) blow a compressed air jet downward through the upper rectangular cooling grilles (on the side opposite the fan).

This will clean the internal heat dissipater and the cooling fan.

### **IN CASE OF OVERHEAT ALARM**

#### **ATTENTION:**

Before and during the inspection/maintenance cut power to the fan controller and verify that the system is isolated for operator safety.

If periodic cleaning does not eliminate the problem, do as follows

- a Remove the cooling fan unit by unscrewing the 4 screws and sliding off the connector.
- b Disconnect the fan connector from the panel
- c Check the condition of the two fans
- d Clean or replace the fans  
Attention: check that the arrow (on the fan indicating the direction of air flow is pointing to the heat sink
- e Insert the connector into the panel
- f Insert the fan unit and fasten it with the 4 screws
- g Power up the device and check fan rotation when at least one load is on.

## **2.8 REPLACING THE INTERNAL FUSES**

### **ATTENTION:**

Before and during the inspection/maintenance cut power to the fuses controller and verify that the system is isolated for operator safety.

- Open the front cover (magnetic release)
- This exposes the fuses
- Pull the fuse holder outwards (remove the fuse)
- Insert the new fuse.

### 3 · ELECTRICAL CONNECTIONS

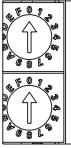

#### 3.1 POWER CONNECTIONS

##### RECOMMENDED WIRE GAUGES

Table 4

MODEL	TERMINAL / CONNECTOR	CABLE SECTION	TERMINAL TYPE	TIGHTENING TORQUE /TOOL
IR24, IR12	L1, L2, L3	25-35 mm <sup>2</sup> 4-2 AWG	Tip / Stripped wire	4 ...4,2 Nm / Flat-head screwdriver
IR24, IR12	PE	16-25 mm <sup>2</sup> 6-4 AWG	Tip / Stripped wire	2 ...2,2 Nm / Flat-head screwdriver
IR24, IR12	N	1-16 mm <sup>2</sup> 17-6 AWG	Tip / Stripped wire	0,5 ...2,2 Nm / Flat-head screwdriver
IR24, IR12	X1, X2, X3	2,5-4 mm <sup>2</sup> 14-10 AWG	Tip / Stripped wire	0,5 ...0,6 Nm / Flat-head screwdriver
IR24, IR12	X7	1,5-2,5 mm <sup>2</sup> 16-14 AWG	Tip / Stripped wire	0,5 ...0,6 Nm / Flat-head screwdriver

Table 6 Description of Rotary Switches

Switch	Description
 x10  x1	Defines address of module 00...99  (Only for models with MODBUS RS485 communication, please refer to figure N. 4a)

#### 3.2 FUNCTIONS OF INDICATOR LEDS

##### Description of LEDs

Table 6

LED	DESCRIPTION	COLOR
PW W/D	CPU supply voltage ON	green
	Watch Dog tripped, CPU blocked	yellow
L1 L2 L3	L1 phase voltage ON	green
	L2 phase voltage ON	green
	L3 phase voltage ON	green
ALR	One or more alarm conditions present	red
TX RX	Status of serial line transmission	green
	Status of serial line reception	green
OK +24	Digital outputs functioning correctly	green
	24V voltage ON for digital I/Os	green
I1	Status of digital input I1	green
I2	Status of digital input I2	green
I3	Status of digital input I3	green
I4	Status of digital input I4	green
O1	Status of digital output O1	green
O2	Status of digital output O2	green
O3	Status of digital output O3	green
O4	Status of digital output O4	green

### 3.3 CONTROL CONNECTOR

#### 3.3.1 CONNECTOR X4 - DIGITAL I/O

Figure 6

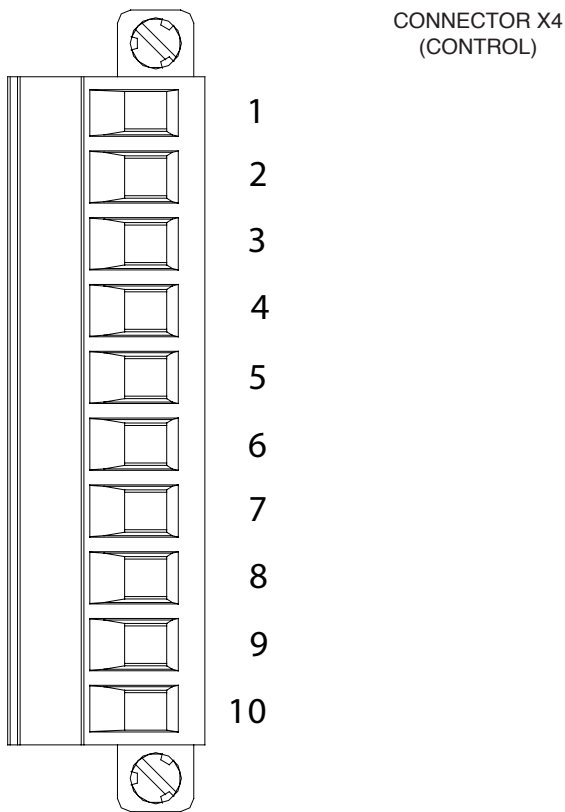


Table 7

	0,2 - 2,5mm <sup>2</sup>	24-14AWG
	0,25 - 2,5mm <sup>2</sup>	23-14AWG

Figure 7 Connection schema X4 - Connector Digital I/O

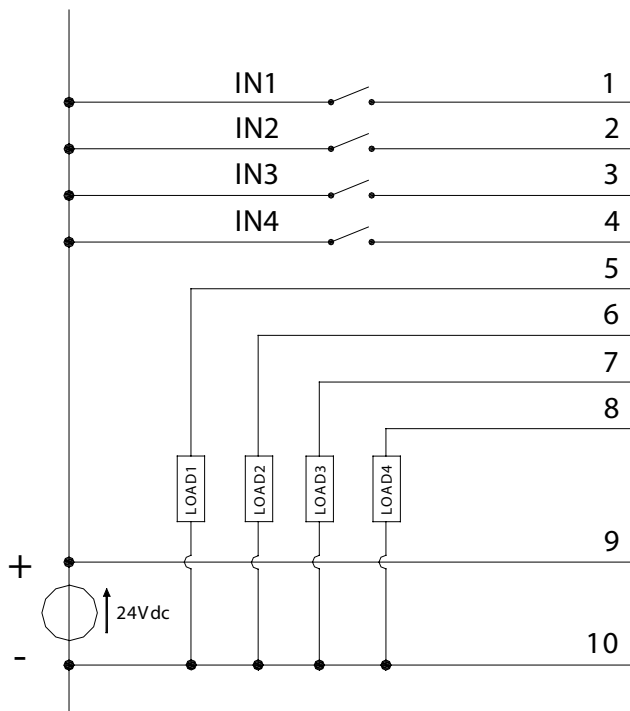
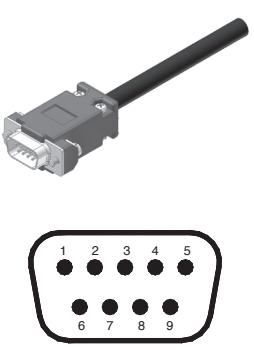
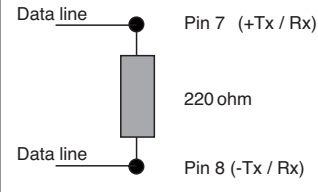


Table 8

PIN	NAME	DESCRIPTION
1	I1	Digital input I1
2	I2	Digital input I2
3	I3	Digital input I3
4	I4	Digital input I4
5	O1	Digital output O1
6	O2	Digital output O2
7	O3	Digital output O3
8	O4	Digital output O4
9	+24V	+24VDC power supply digital outputs
10	0V	GROUND power supply digital inputs and outputs

### 3.3.2 CONNECTOR X5,X6 - modbus RS485

Figure 8

X4, X5 connector D-SUB 9 pin male	Nr. Pin	Name	Description	Note
	1	n.c.	Not used	For last module connected to serial line. Connect the termination resistor as shown in the figure (inside the connector). 
	2	+ Tx/Rx	RS485 serial (A+)	
	3	Terra	Ground (cable shield)	
	4	- Tx/Rx	RS485 serial (B-)	
	5	GND	Serial GROUND	
	6	n.c.	Not used	
	7	+ Tx/Rx	(For termination)	
	8	- Tx/Rx	(For termination)	
	9	n.c.	Not used	

**Cable type:** Shielded

### 3.3.3 X7 CONNECTOR - 230VAC power supply

Figure 9

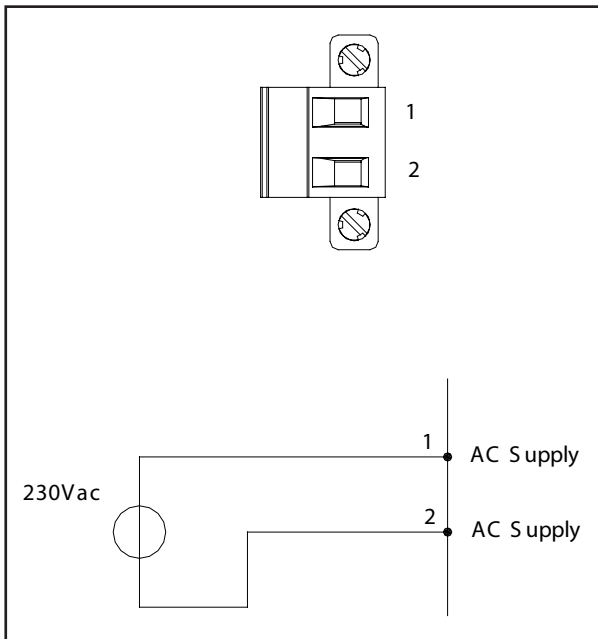



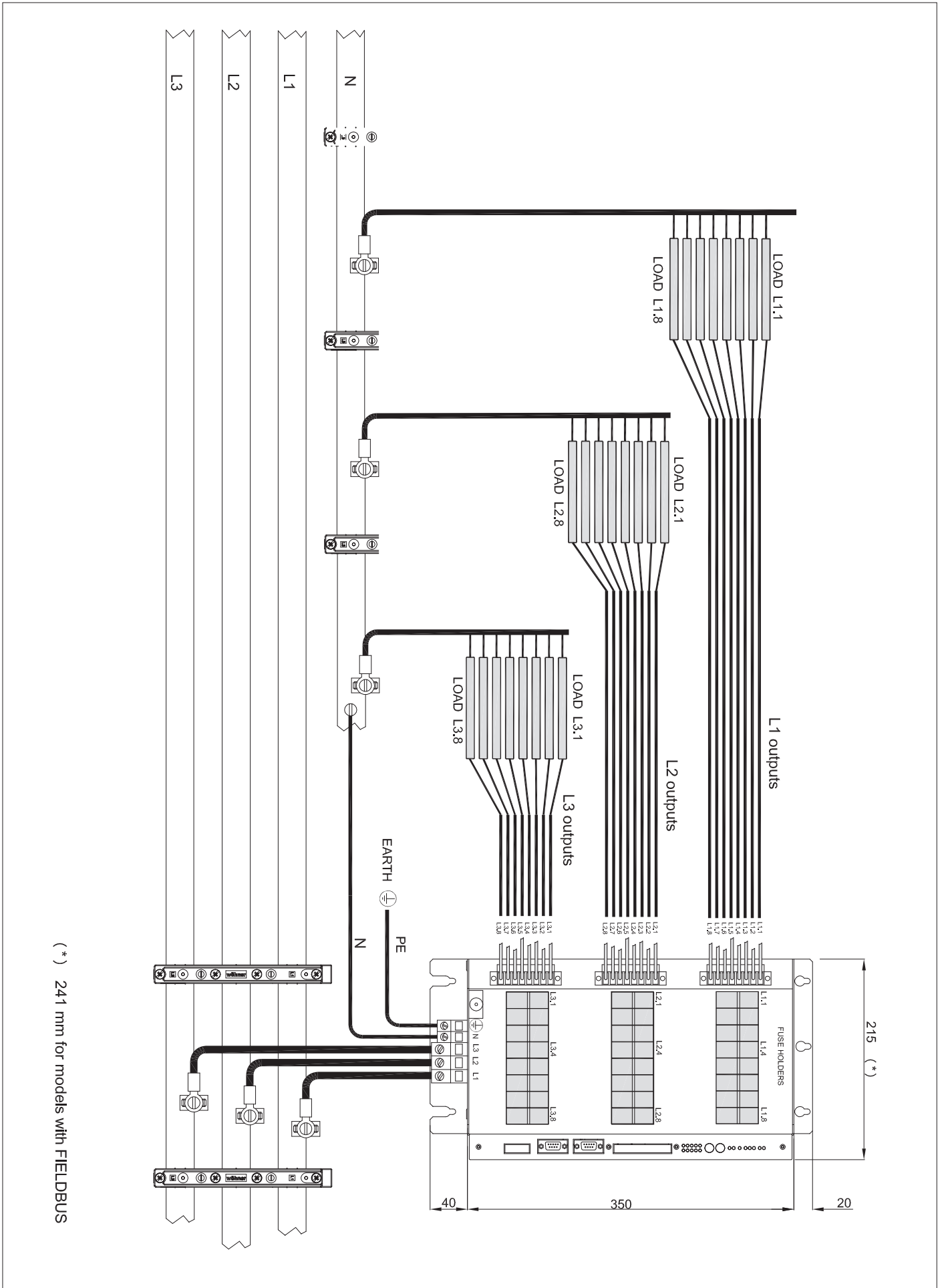
Table 9

	0,2 - 2,5mm <sup>2</sup>	24-14AWG
	0,25 - 2,5mm <sup>2</sup>	23-14AWG

### 3.4 CONNECTION EXAMPLE: POWER SECTION

Connection example: IR-24 connected to 24 loads

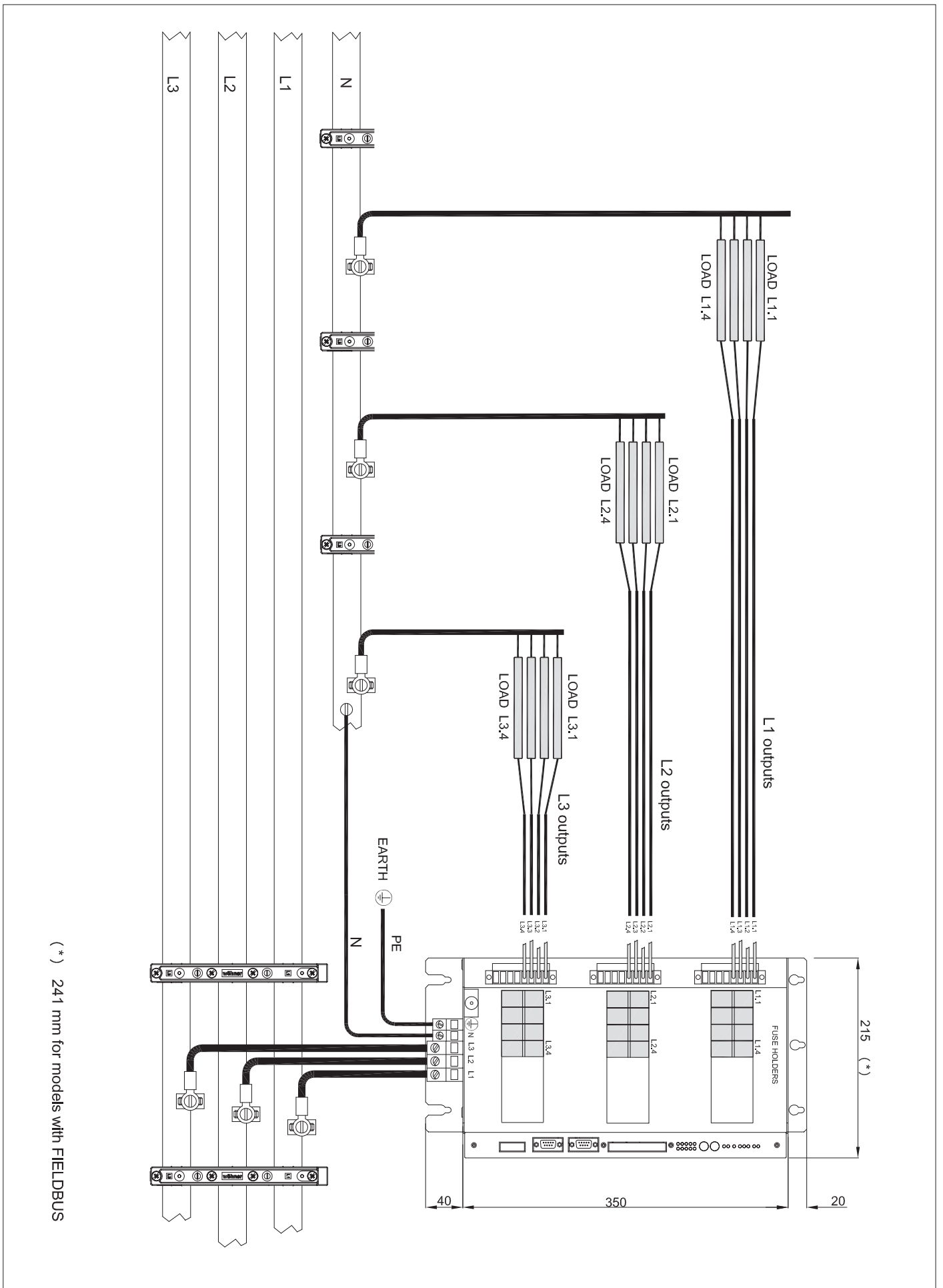
Figure 10a





Connection example: IR-12 connected to 12 loads

Figure 10b





### Firing modes

The IR24- IR12 power controllers have the following control modes:

- modulation by variation of phase angle
- modulation by variation of number of conduction cycles with “zero crossing”, Burst Firing or Half Single Cycle firing

#### 1 Burst Firing mode

**BF** -with variable cycle time

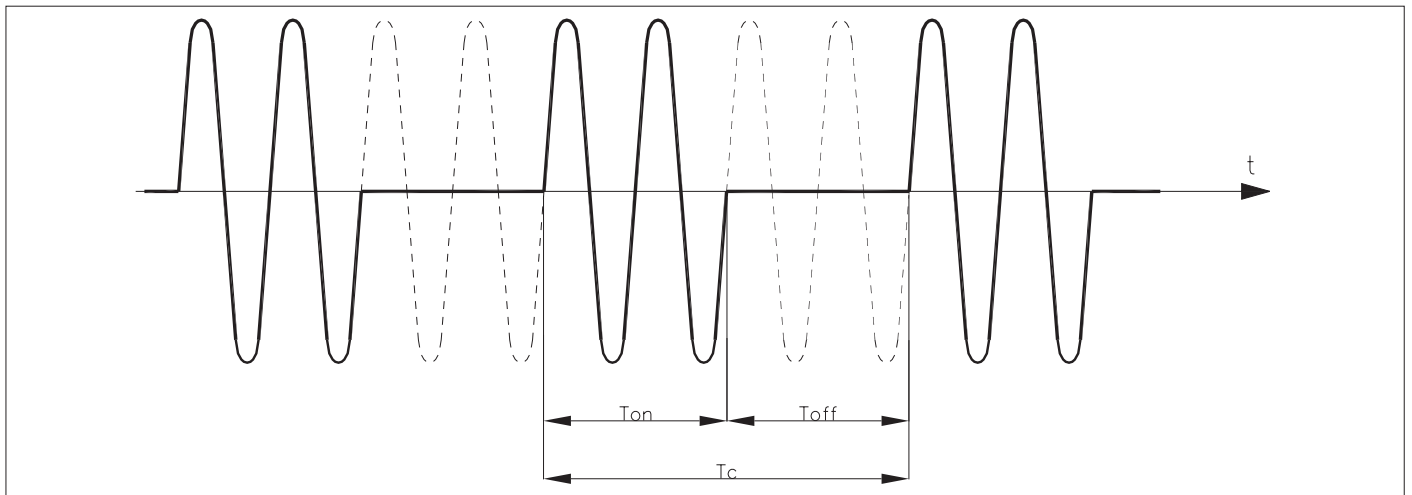
This mode manages power on the load by means of a series of conduction (ON) and non-conduction (OFF) cycles. The ratio of the number of ON cycles to the number of OFF cycles is proportional to the power level to be supplied to the load.

Repetition period CT is kept to the minimum for all power levels.

#### 2 Optimized Burst Firing Mode

This mode manages power like BF, but optimizes conduction cycles among the various channels by shifting them in time in order to limit simultaneous conduction in all channels. A parameter defines the minimum number of conduction cycles settable from 1 to 10, in the following example, the parameter = 2.

Figure 11



Example of operation in BF mode with 50% power

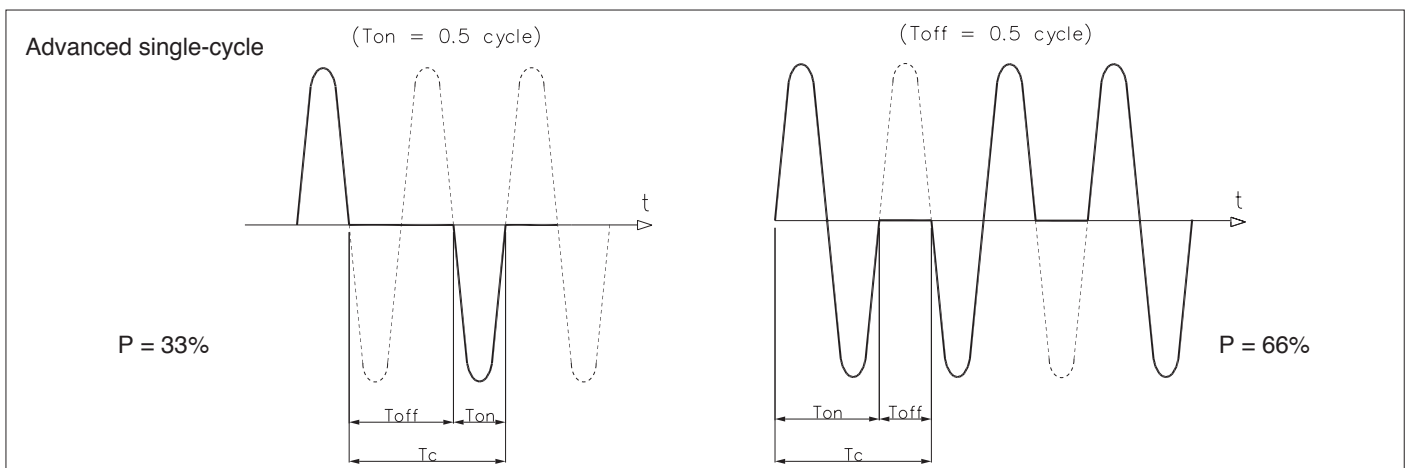
#### 3 Half Single Cycle Mode



**HSC** - Half single cycle

This mode corresponds to Burst Firing that manages ON and OFF half-cycles. It is useful for reducing the flickering of filaments with short/medium-wave IR lamp loads. With these loads, to limit operating current with low power, it is useful to set a minimum power limit (for example,  $Lo.p = 10\%$ ).

Figure 12



Example of operation in HSC mode with power at 33 and 66%.

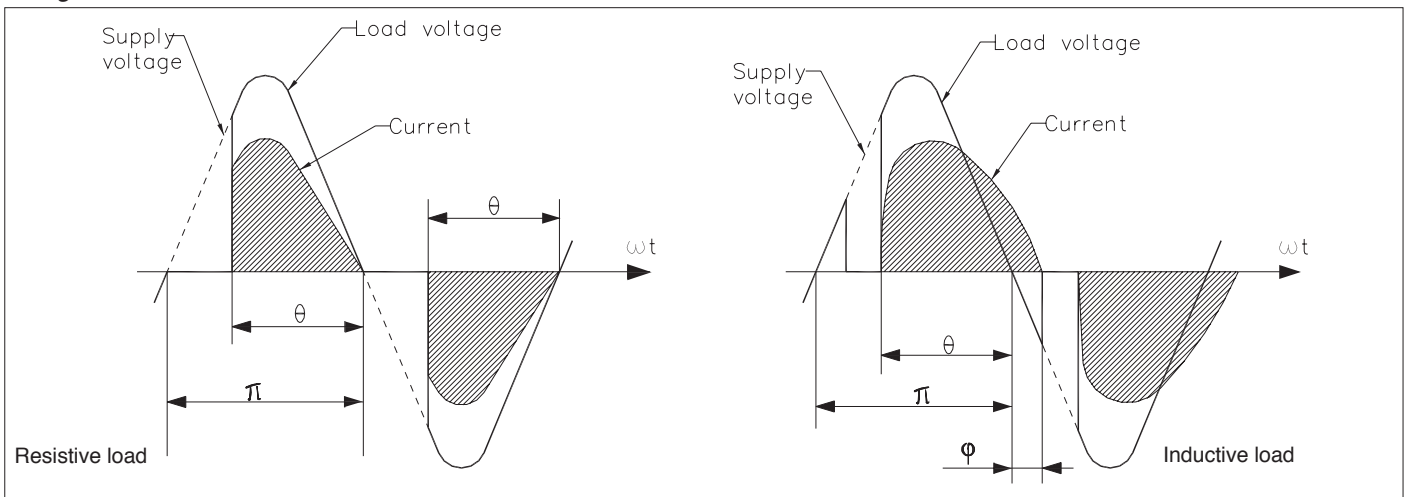
#### 4 Phase angle (PA)

This mode controls power on the load via modulation of trigger angle  $\theta$

Example: if power to be transferred to the load is 100%,  $\theta = 180^\circ$

or if power to be transferred to the load is 50%,  $\theta = 90^\circ$

Figure 13

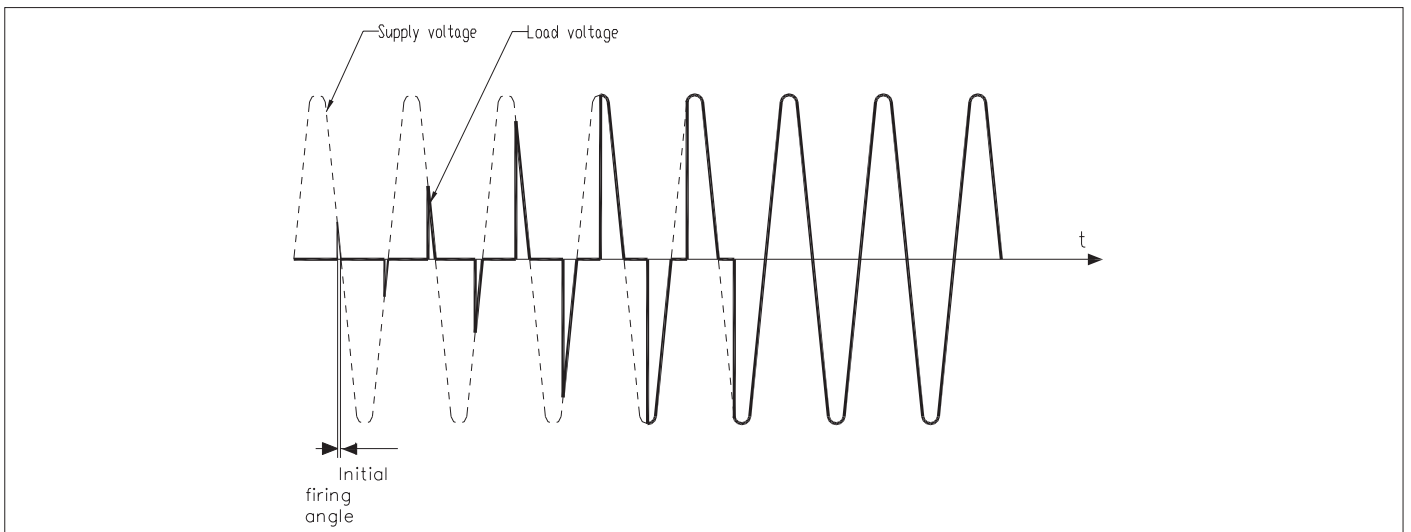


#### ADDITIONAL FUNCTIONS

##### Softstart

This type of start can be enabled to limit peak currents in IR lamps with initially cold filament.

Figure 14



Example of firing ramp with phase Soft-Start

## 4 · INSTALLATION OF THE SERIAL PORT

**NOTE:** - Chapter 4.0 and 4.1 are referred only to products with MODBUS communication.  
 - For products with Fieldbus communication please refer to specific Fieldbus SW Manual

A network typically has a Master that “manages” communication by means of “commands,” and Slaves that carry out these commands.

IR Control controller modules are considered Slaves to the network master, which is usually a supervision terminal or a PLC. It is positively identified by means of a node address (ID) set on rotary switches (tens + units).

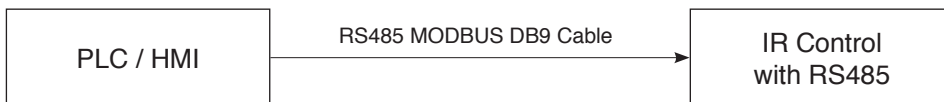
A maximum of 99 IR-12/IR-24 controller, modules can be installed in a serial network, with node address selectable from “01” to “99” IR-12/IR-24 controller modules have a ModBus serial

The MODBUS RTU port 1 has the following factory settings (default):

Parameter	Default	Range
ID	1	1...99
BaudRate	57.6Kbit/s	1200...57600bit/s
Parity	None	Odd/Even/None
StopBits	1	-
DataBits	8	-

The following procedures are indispensable for the Modbus protocol.  
 Set the rotary switch at “0+0” for AutoBaud function

Parameter	Position rotary switches		
	tens	unit	
AutoBaud	0	0	Allows setting of the correct BaudRate value automatically detecting the master transmission frequency



**Function**

Adapt the serial communication speed and parity of the IR-12/IR-24 modules to the connected supervision terminal or PLC.

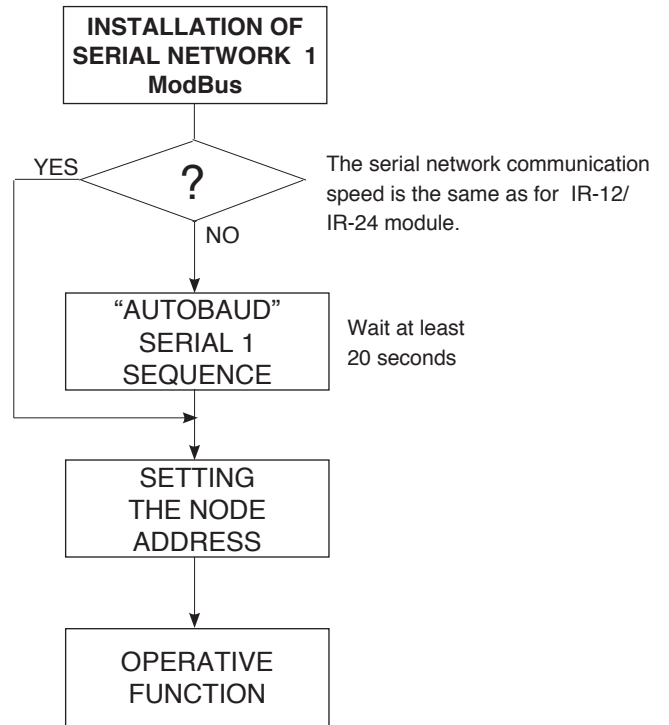
**Procedure**

- 1) Connect the serial cables for all modules on the network t and to the supervision terminal.
- 2) Set the rotary switch on the IR-12/IR-24 modules to be installed, or on all modules present in case of first installation, to position "0+0".
- 3) The supervision terminal must transmit a series of generic "MODBUS" read messages to the network.
- 4) Wait at least 20 seconds.

The new speed parameter is saved permanently in each IR-12/IR-24; therefore, the "AUTOBAUD SERIAL" sequence does not have to be run at subsequent power-ups.



When the Autobaud procedure is done, set the Rotary Switches to the required address value.



## 5 • TECHNICAL CHARACTERISTICS

### INPUTS

#### INDIG Digital Inputs

Function	N. 4 configurable digital inputs
Voltage range	18-30V (max 15 mA)
Safe voltage read status "0"	< 15 V
Safe voltage read status "1"	> 18 V

#### Line voltage measurement

Line voltage measurement function (F - N)	Measure RMS voltage for each phase, phase/neutral Working voltage range: 90...300VAC)
Accuracy of RMS voltage measurement	1% f.s. at ambient temperature of 25°C Thermal drift: < 100 ppm/°C
Line frequency	50 / 60 Hz

### OUTPUTS

#### DIGITAL OUTPUTS

Function	4 configurable digital outputs
Type	PNP I <sub>max</sub> : 500mA protected against short circuit 24VDC external power supply

### COMMUNICATION PORTS

#### RS485 Modbus (Only for models with MODBUS communication)

Function	Local serial communication
Protocol	ModBus RTU
Baudrate	Settable 1200 ... 57600 bit/s (default 57.600Kbit/s)
Node address	Settable with 2 rotary-switches
Type	RS485 - DB9 dual connector
Isolation	500V

#### PROFINET FIELDBUS (Only for models with Profinet communication)

Function	Profinet-IO Slave
Type	N. 2 port RJ45 (ETH0, ETH1) Internal Switch
Baudrate	10/100Mbps base-tx, Autosensing, Autocrossover Data transport Layer Ethernet II, IEEE 802.3
Protocol	PROFINET    RTC - Real time Cyclic Protocol Class 1 & Class 2 (unsynchronized) RTA - Real time Acyclic Protocol DCP - Discovery and Configuration Protocol

### POWER (SOLID STATE POWER UNIT)

CATEGORY OF USE (Tab. 2 EN60947-4-3)	AC 51 resistive loads or low induction AC 55b infrared lamps
Firing modes	<b>PA</b> - load control via modulation of firing phase angle <b>BF</b> - Burst Firing with variable cycle time. <b>Optimized BF</b> - like BF, but optimizes conduction cycles by shifting them in time in order to limit simultaneous firing of all channels (optimized distribution of currents) <b>HSC</b> - Half Single Cycle corresponds to Burst Firing that manages half-cycles of firing and stop cycles Useful for reducing flicker with short-wave IR loads
Three-phase line voltage compensation	The line voltage compensation option can be selected to guarantee stable output power
Max. nominal voltage	480Vac (V <sub>F/N</sub> = 270Vac) ± 10%
Working voltage Max Range	50...530Vac
Non-repetitive voltage	1200Vp
Nominal frequency	50/60Hz self-determination
Nominal current AC51 -AC55b non-inductive or slightly inductive loads, IR lamps (@ Amb.T = 40°C)	9A for each output
Maximum output current	9A x 8 zones = 72A for each Threephase line (72A x 3)
Dissipation	For each zone = 1.2 V * I <sub>LOAD</sub> (Watts)
Non-repetitive over-current (t=10msec)	500
I <sup>2</sup> t for fusing (t=1...10msec) A <sup>2</sup> s	1250
Critical Dv/dt with output deactivated	1000V/μsec
Rated impulse withstand voltage	4KV
Nominal current in short circuit	5KA

FUNCTIONS	
Diagnostics (for each zone)	SSR short detection. absence of line voltage, HB alarm (total load interrupt), blown fuse
OPTIONS	
Options	<ul style="list-style-type: none"> <li>- Timed Soft-Start firing ramp with phase angle control</li> <li>- Soft-Start firing ramp specific for IR lamps</li> </ul>
Diagnostics	<ul style="list-style-type: none"> <li>- SCR in short circuit (presence of current with control OFF)</li> <li>- Absence of current due to SCR open/load interrupted</li> <li>- Overtemperature alarm</li> <li>- HB interrupted load alarm</li> </ul> <p><u>Voltage read</u></p> <ul style="list-style-type: none"> <li>• No line voltage</li> </ul> <p><b>NOTE1</b> : In PA_mode, the diagnostic Alarms Load-Open and Fuse_open are detected for SCR power firing higher than 40%.</p> <p><b>NOTE2</b>: In PA_mode, the diagnostic Alarm SSR-SHORT is detected when SCR power firing is P=0% or when its channel is disabled.</p> <p><b>NOTE3</b>: All diagnostics work with voltage line (F/N) between 200V and 305V.</p>
GENERAL INFORMATION	
Power supply CPU Board	230Vac ± 10%, 50-60 Hz 20VA
Power supply for internal fan	24Vdc (internally provided)
LEDs	18 Leds: for CPU status, Alarm diagnostic, I/O status, Threephase line detection. (For details please refer to Table 6)
Connection and load type	Single-phase load (Phase/Neutral) 8 loads for each phase maximum
Protection level	IP20
Working / Storage temperature	0...40°C
Cooling	N.2 fans 24Vdc - 3,6W (only one fan for IR-12 models)
Relative humidity	10...95% Ur non-condensing
Ambient operating conditions	internal use, max. altitude 2000 meters
Installation	Fastens to panel with screws
Installation regulations	Installation category II, pollution degree 2 - Max. air temperature surrounding device 40°C
Weight IR 24	14 Kg
IR 12	12 Kg
Packing dimensions IR-12/IR-24	350 x 280 x 215mm

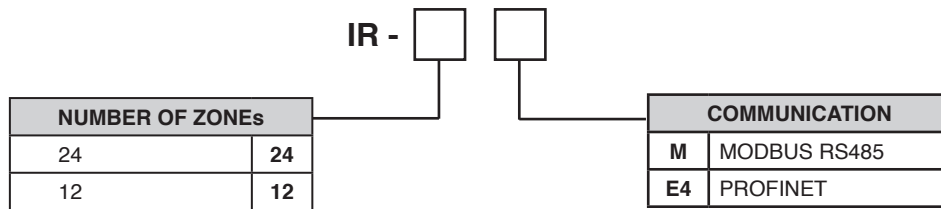
## 6 • TECHNICAL / COMMERCIAL INFORMATION



This section contains information on order codes for the Controller and its main accessories.

immediately identifies the unit's hardware configuration. Therefore, you must always give the order code when contacting Gefran Customer Care for the solution to any problems.

As mentioned in the Preliminary Instructions in this User Manual, a correct reading of the Controller order code



MODEL	DESCRIPTION	CODE
IR-12-M	12 Zones, Modbus RTU serial communication	F062606
IR-12-E4	12 Zones, Fieldbus Profinet serial communication	F062611
IR-24-M	24 Zones, Modbus RTU serial communication	F062605
IR-24-E4	24 Zones, Fieldbus Profinet serial communication	F062612

### 6.1 ACCESSORIES



It is available the SW Configuration tool "GF-eXpress" cod. F043958, useful for quick IR-24 / IR-12 configuration using a PC with a USB / RS485 serial port.

It is also available the accessory cable USB/RS485 cod. F062615 useful for models with Modbus communication, to be connected to PC computer with USB port.

### 6.2 FUSES

Model	FUSES			
	Size I <sup>2</sup> t	Sign Form	Model Code	Power dissipation @ In
IR 24 IR 12	32A 600A <sup>2</sup> s	FUS-032 10x38	FWC32A10F 338483	1W