GEFRAN

IR-12 / IR-24

MULTICHANNEL POWER CONTROLLER

Main Applications

- *Welding of composites and plastics*
- *Preheating on Blow Molding lines*
- *Thermoforming*
- *Multichannel applications with infrared lamps*

Main Characteristics

- *12 and 24 independent 9A channels*
- *Fast Zero-Crossing, Half-Single-Cycle and Phase-Angle control*
- *Built-in extra-rapid fuses*
- *Current balancing with time-sharing*
- *Voltage swing compensation*
- *Voltage and current diagnostics (interrupted load, line voltage)*
- *Diagnostics of SCR temperature, SCR short circuit, open fuse*
- *Modbus and Profinet communication*

PROFILE

Powerful and compact IR12 and IR24 Multichannel Power Controllers are the ideal solution for heating systems that use any type of infrared lamps.

With an "all-in-one" philosophy, all of the elements needed for complete control of IR lamp groups (for total power up to 60 kW) are contained in a robust, compact metal container that mounts on the wall.

There are various models: IR-24 with 24 independent control output and IR-12 with 12 outputs, both with Modbus RTU or Profinet Fieldbus communication options.

COMMAND

The 12 or 24 channels are commanded via Modbus RTU serial communication (max 57,600bps) or via Profinet.
Each channel is commanded independently.

POWER

Each control output can deliver a maximum current of 9A, including simultaneously on all channels, up to 216 Amps for IR24 models.

CONTROL

The Soft-start function, provided in Phase Angle mode, guarantees gradual initial heating of lamps, reduces current spikes, and lengthens life cycle.
After the Soft-start phase, when the filament is hot, the lamp can be controlled in "Burst Firing" or "Half Single Cycle" mode.
Complete Phase Angle control can always be chosen. In detail, the control modes, configurable via SW, are:
BF: Burst Firing
Zero crossing with optimized cycle time: ideal for fast heating systems with medium-wave IR lamps.
HSC: Half Single Cycle
Zero crossing similar to BF, but able to control half-waves, making it perfect for short wave lamps as well because it greatly limits flickering without generating EMC noise; therefore, expensive and bulky EMC filters are not needed.
PA: Phase angle
Modulating the conduction angle of each wave allows more precise and stable control of IR lamps.

TIME SHARING

Continuous monitoring of power percentages on outputs allows intelligent "time-sharing" distribution of outputs and provides continuous balancing of total instantaneous current levels on each of the three phases. This reduces spikes, increases the system's power factor, and saves energy.

LINE VOLTAGE COMPENSATION

Automatic compensation ensures correct power to loads even in the presence of voltage swings.

DIAGNOSTICS

Great attention is given to general and specific diagnostic functions for every output, with signal LEDs and specific diagnostic bits readable from serial and Fieldbus.

- *Current Diagnostics:*
  Total load interrupt alarm
  SCR short circuit alarm
- *Voltage Diagnostics:*
  Alarm for absence of phase
- *Fuse Diagnostics*
  Fuse break signal (for each output)
- *Temperature Diagnostics*
  Alarm for over–temperature of power module

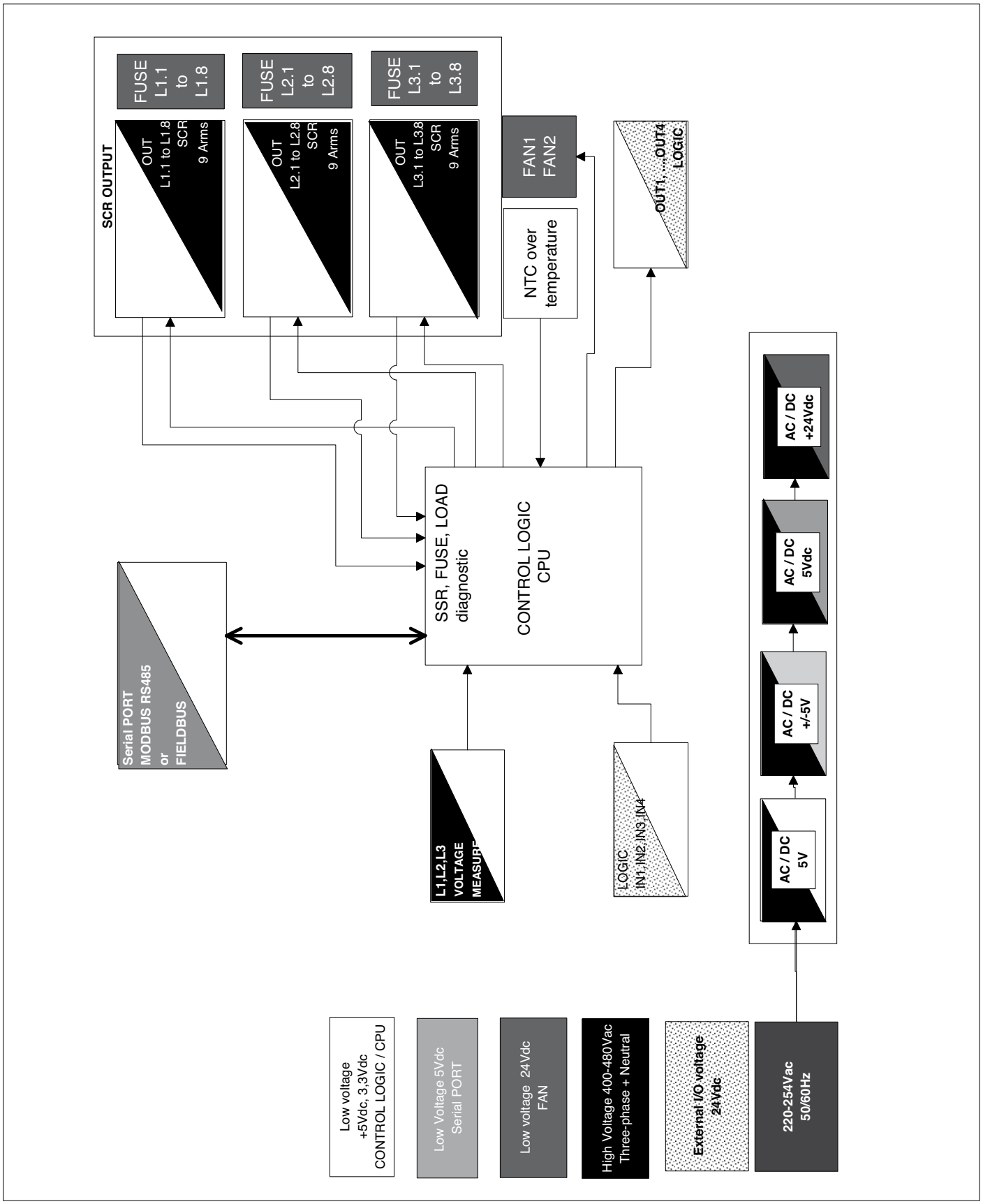
The IR-24 and IR-12 Controllers are completely configurable via GF_ eXpress, Gefran's powerful SW configuration tool for all of its devices.

TECHNICAL DATA

Power supply	CPU Supply	230 Vac ± 10 % 50/60 Hz 20 VA	
	Power circuits	480Vac (VF/N= 270Vac) ±10% 50-60Hz	
Overvoltage category	2 (industrial devices with permanent connection to power grid)		
Rated current	Model IR-24	9A x 8 zone = 72A per ogni linea trifase (72A x 3)	
	Model IR-12	9A x 4 zone= 36A per ogni linea trifase (36A x 3)	
Rated power	Model IR-24	49.6 kW @ 230Vac (72A x 230Vac x 3)	
	Model IR-12	24.8 kW @ 230Vac (36A x 230Vac x 3)	
Control mode	PA	Modulation with phase-angle control	
	BF	Zero-Crossing modulation at full-wave with optimized cycle time (ex.: medium-wave IR lamps)	
	HSC	Zero-Crossing modulation at half-wave with optimized cycle time (ex.: short-wave IR lamps)	
Circuit breakers	24 AC-switch monophase with pair of 1200V SCRs in antiparallel		
Functions	Power control	Control, linearization, ON percentage compensation for each of 24 channels based on control received, internal tables, and actual line voltage (according to selected mode)	
	Measurement	Effective value of three effective line voltages RN , SN and TN	
	Diagnostic	State of any alarms on each channel and overall state of module	
Serial communication	MODBUS (option M)	- Protocol: MODBUS RTU - Address: 1 ... 99 selectable by 2 RotarySwitch - N. 2 Connectors DB9 (X5, X6) - Baud rate: configurable 1200 ... 57600 bit/s (default = 57600) - Serial RS485 optoisolated	
	PROFINET (option E4)	- Protocol: PROFINET-IO - N. 2 Ethernet port RJ45: ETH0, ETH1 - Internal Switch - Baudrate: 100 Mbit/s - Auto-Crossover - Address Switch integrated DCP - Message supported: Cyclic / Acyclic - N. 4 status Leds (Link / Signal, for each Ethernet port)	
Protections and Alarms	Circuit break in presence of control	Interrupted load signal (for each output) Signal for broken fuse /SCR that does not close (for each output)	
	Current crossing in absence of control	Signal for SCR in short (for each output)	
	Over temperature power card 1	Insufficient cooling of power card 1 by heat-sinks, collective trip with block of phases involved	
	Over temperature power card 2	Insufficient cooling of power card 2 by heat-sinks, collective trip with block of phases involved	
Signal LEDs	PW	Presence of voltage to CPU	green
	WD	Watch Dog tripped, CPU function blocked	yellow
	L1	Presence of phase L1 (presence of crossing for zero)	green
	L2	Presence of phase L2 (presence of crossing for zero)	green
	L3	Presence of phase L3 (presence of crossing for zero)	green
	FAULT	Presence of one or more alarm conditions, differentiated with flashing	red
	RX	State of Rx serial line	green
	TX	State of Tx serial line	green
	IN1...4	Inputs state	green
	OUT1...4	Outputs state LED	green
	24V	Presence of voltage for 24V digitals	green
	OK	Output OK: Correct operation of digital outputs	green
I/O logic signals	4 Logic inputs	24V Optoisolated, current draw 20mA	
	4 Logic outputs	24V Optoisolated, maximum deliverable power 250mA	
Electrical connections	Auxiliaries power supply	2-pole extractable terminal block, pitch 7.62mm, 400V/20A for flex cable from 0.2 to 4 mm² (AWG 4-10), with screw flange (Male)	1
	Power supply	Single power connectors, 500V/101A for flex cable from 10 to 25 mm² (AWG 20-4)	4
	Earthing	Power connector for flex cable from 0.5 to 16 mm² (AWG 10-2)	1
	Power outputs	8-pole extractable terminal block, pitch 7.62mm, 400V/20A for flex cable from 0.2 to 4 mm² (AWG 4-10) , with screw flange (Male)	3
	RS 485	D-Sub 9 pin female connector in parallel (Female)	2
	Logic I/Os	10-pole extractable terminal block, pitch 5.08 mm, 250V/12A, with screw flange (Male)	1
Cooling	Power board	forced air with 2 24VDC 3.6W fans (only 1 fan for IR-12)	
	Control board	natural convection	
Working temperature	0....40°C		
Relative humidity	10....95% without condensation		

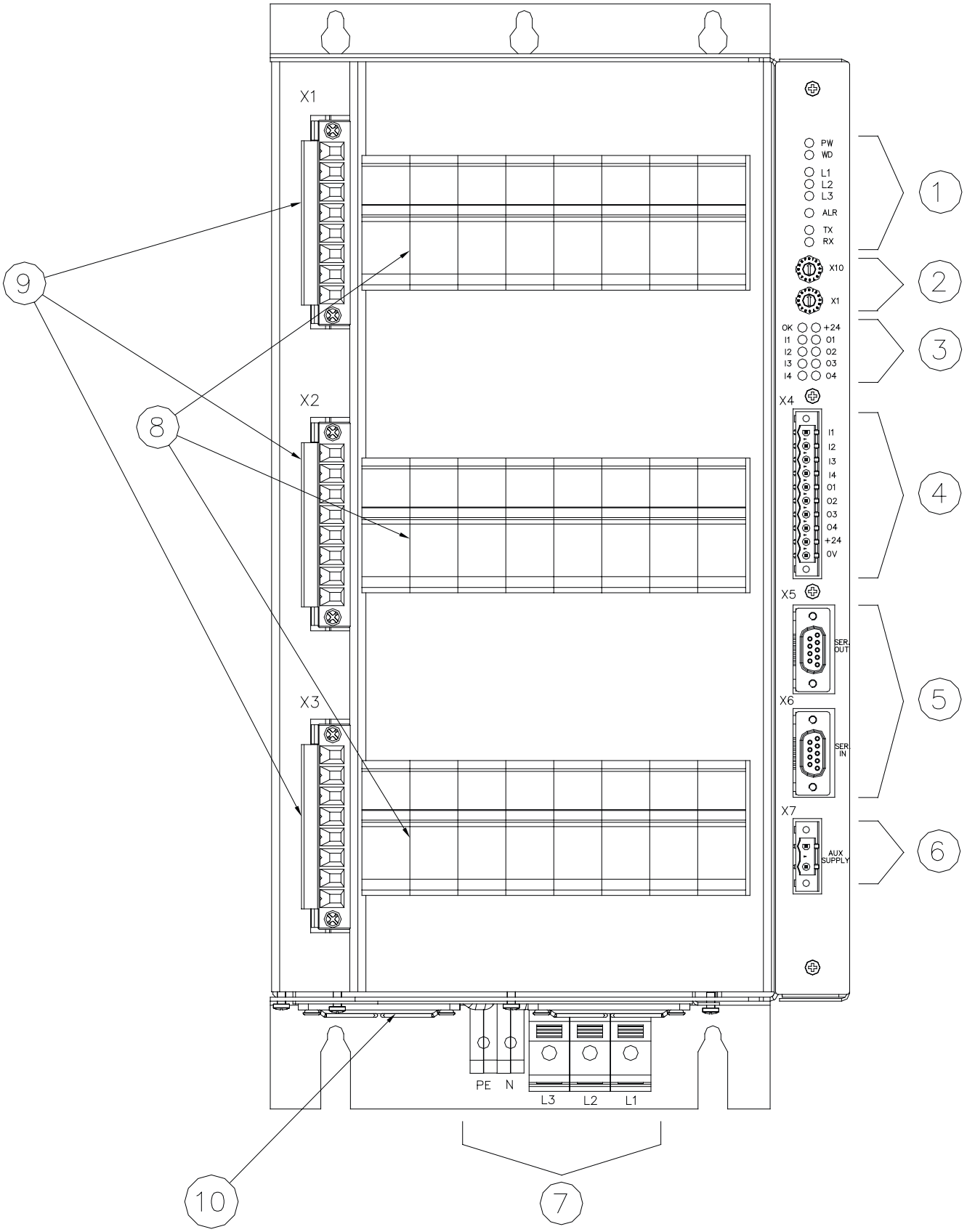
Container	Type	“Book” format: closed painted plate box, ready to install in panel, with ventilation slits	
	Dimensions (mm)	Height without fastening flange	350
	Dimensions External (mm)	Depth	280
		Width	215
		Support in panel	410 x 215
	Weight	IR-24	14 Kg
		IR-12	12 Kg

BLOCK DIAGRAM



GENERAL DESCRIPTION

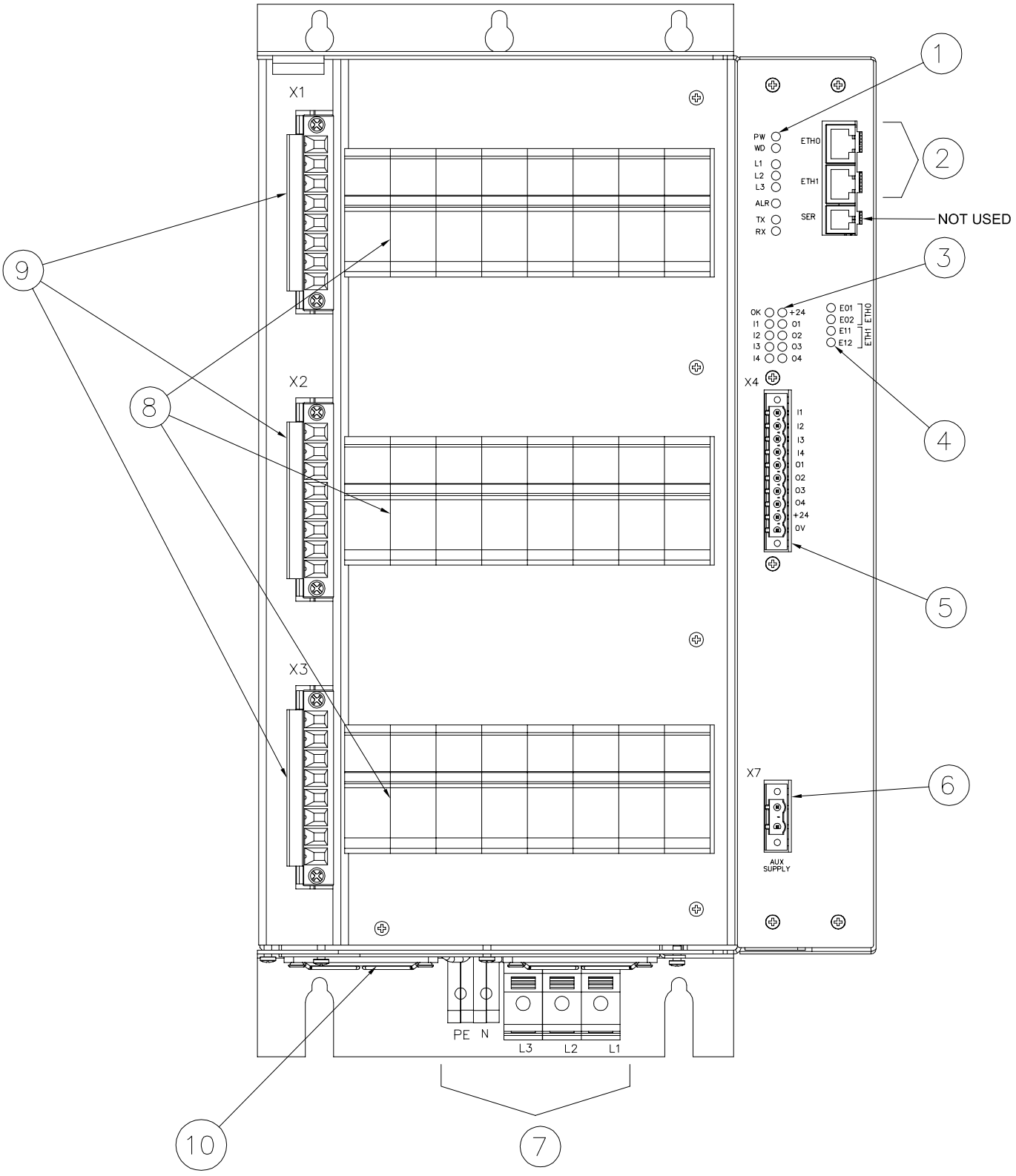
Front view with MODBUS communication



1. Diagnostics LED
2. Modbus address (Rotary switch)
3. I/O LEDs
4. I/O connector
5. Modbus serial connector
6. CPU power supply (230VAC) 400-480VAC line
7. Line power terminals 400-480VAC (3F + N, Ground)
8. Fuse holders with protection fuses (24 for IR24, 12 for IR12)
9. Output connectors (to load)
10. Cooling fan unit

GENERAL DESCRIPTION

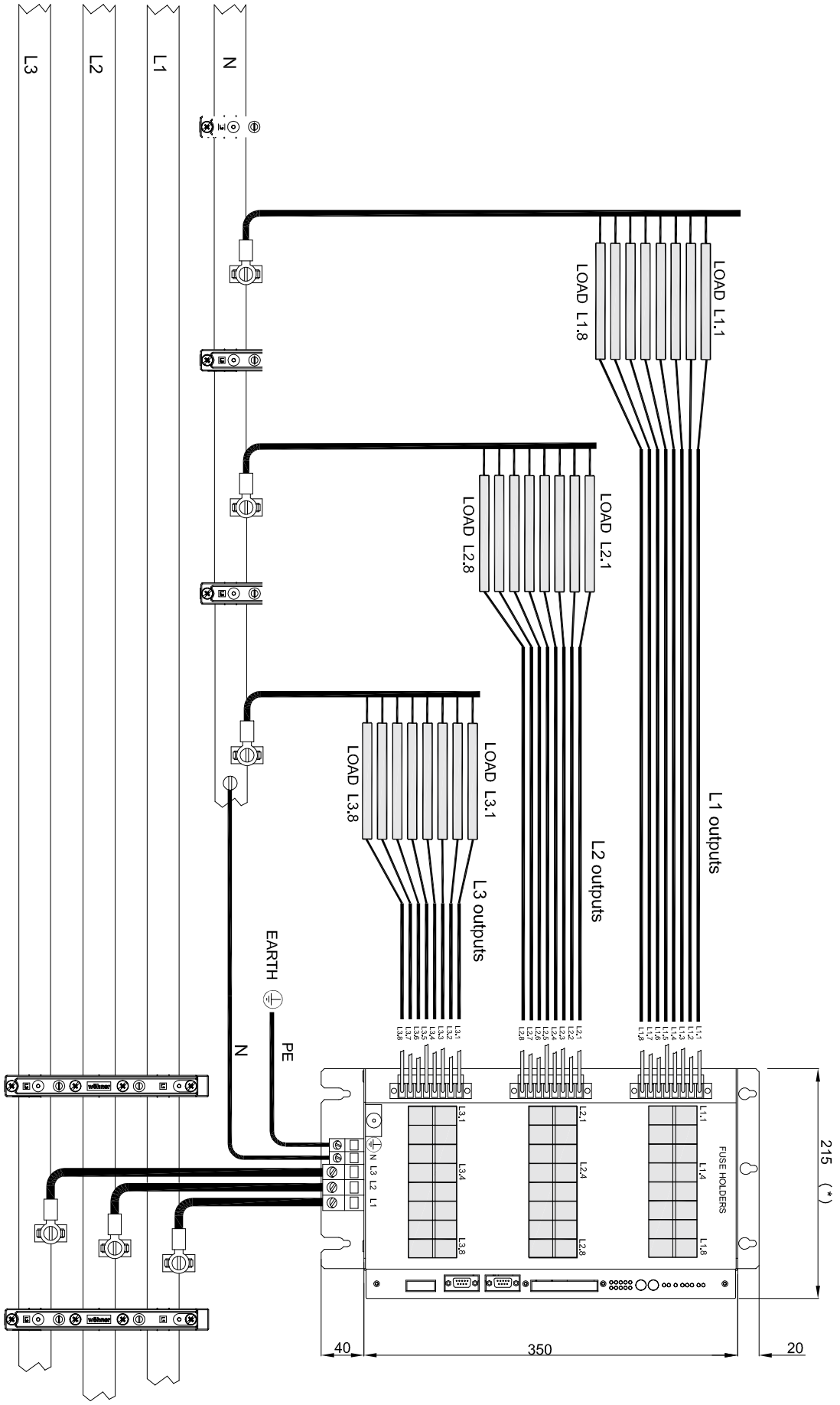
Front view with PROFINET Fieldbus



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

WIRING DIAGRAM

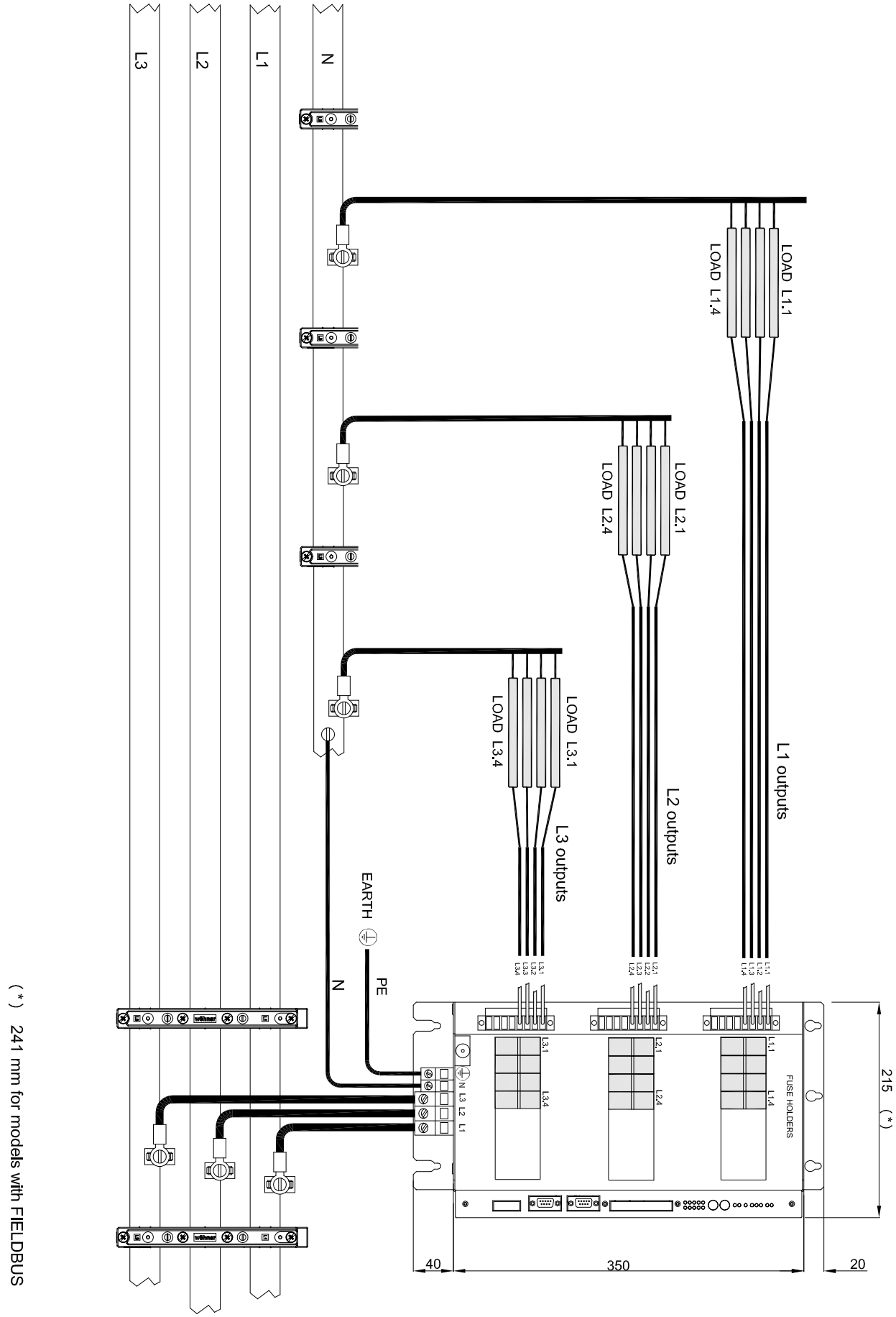
Connection example: IR-24 connected to 24 loads



(*) 241 mm for models with FIELDBUS

WIRING DIAGRAM

Connection example: IR-12 connected to 12 loads



(*) 241 mm for models with FIELDBUS

ORDERING CODE

IR - [ ] [ ]

NUMBER OF ZONES	
24	**24**
12	**12**

COMMUNICATION	
M	MODBUS RS485
E4	PROFINET

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

UL	Conformity C/UL/US File E243386 Vol1 sec.6
CE	The instrument conforms to the European Directives 2004/108/CE and 2006/95/CE with reference to the generic standards: - **EN 60947-4-3** (Product) - **EN 61010-1** (safety)

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