

Monitoring Relay Interface protection Relay Type PI-DIN CEI 0-21: 2022-03

CARLO GAVAZZI



- Single and Three phase monitoring relay
- Auxiliary power supply 115...230Vac (H) or 24Vdc (L)
- Settings, menu and logger navigation by means of front joystick
- Password protected settings
- 4 digital inputs, 2 relay outputs
- Dual Function Alarm LED
- Data logger with 10 last events logging
- RS485 Serial communication
- Approved according to CEI 0-21:2022-03 (relevant to installations with Power \geq 800W)

Product Description

The PI-DIN interface protection device is a monitoring relay especially designed for the connection of renewable energy production plants to the public utility. Voltage and frequency are constantly monitored and measured. In case the measured values are out of the Norm

specified ranges the grid feeding is interrupted by opening the main breaker. Feeding is restored as soon as the grid values return to specified ranges. This specific device is equipped with 2 relay outputs: one for the control of the main breaker ("DDI") and the second one for the backup

breaker ("Rincalzo") which is mandatory on plants above 20kWp according to CEI 0-21:2022-03 Norm. The PI-DIN logs all the events with registration of date, time and type of the last 10 events. The data can be remotely read in real time by means of the RS 485 communication line. The

line can also be used for remote configuration, simplifying the operation.

Ord. key PI DIN 0021 H I4R2 S1 XX

Model	PI
Mounting	DIN
Norm	0021
Auxiliary supply	H
I/O	I4R2
Serial Communication	S1
Option	XX

Type Selection

Mode	Interface protection	PI
Mounting		DIN (4 modules)
Norm	CEI 0-21: ed. 2022-03	0021
Auxiliary supply	High voltage 115...230Vac Low Voltage 24Vdc	H L
I / O	4 digital inputs, 2 relay outputs	I4R2
Communication	RS485 port	S1
Option	None	XX

Integrated protection functions

Code/Protection Function	Description
27.S1	Min. voltage set 1
27.S2	Min. voltage set 2
59.S1	Max. voltage set 1 (EN 61000-4-30)
59.S2	Max. voltage set 2
81<.S1	Min. frequency set 1
81<.S2	Min. frequency set 2
81>.S1	Max. frequency set 1
81>.S2	Max. frequency set 2
BF (Breaker Failure)	DDI open failure
AI Seq	incorrect phase sequence



Interface protection

Voltage Setpoint		Timings	
Maximum voltage (59.S1)* *the average value is calculated by measuring the voltage for 10 minutes, every 3s a new average value is calculated on the previous 10 minutes, according to CEI EN 61000-4-30.	1.1Un	Turn on delay Overvoltage protection (59.S1)	1s Variable according to the start / end voltage value. Max. 603 s.
Max. voltage (59.S2)	1.15Un	Overvoltage protection (59.S2)	200ms
Min. voltage (27.S1)	0.85Un	Undervoltage protection (27.S1)	1.5s
Min. voltage (27.S2)	0.15Un	Undervoltage protection (27.S2)	200ms
Rated grid frequency	50Hz	Overfrequency protection (81>.S1)	100ms
Frequency Setpoint		Underfrequency protection (81<.S1)	100ms
Max. frequency (81>.S1)	50.2Hz	Overfrequency protection (81>.S2)	100ms o 1s (remote mode)
Min. frequency (81<.S1)	49.8Hz	Underfrequency protection (81<.S2)	100ms o 4s (remote mode)
Max. frequency (81>.S2)	51.5Hz		
Min. frequency (81<.S2)	47.5Hz		

Connection / Reconnection conditions

Verified conditions	Relapse rate
Max. frequency (81>.S1 ; S2)	between 0.997 and 0.999
Min. frequency (81<.S1 ; S2)	between 1.001 and 1.003
Max. voltage (59.S1 ; S2)	between 0.95 and 0.97
Min. voltage (27.S1 ; S2)	between 1.03 and 1.05
Turn on delay connection	1s
Reconnection after Interface Protection	0.05s

Events & Alarms messages

Events	Notes		
Number registered events	10 - FIFO - with hour and date		
Alarms	Log	V Up (59.S2)	Max. voltage set 2
		V Lo (27.S1)	Min. voltage set 1
		Fr. Up (81>.S1 or 81>S2)	Max. frequency set 1 OR Max. frequency set 2
		Fr. Lo (81<.S1 or 81<S2)	Min. frequency set 1 OR Min. frequency set 2
		VAvG (59.S1)	Max. voltage set 1 (EN 61000-4-30)
		V2Lo (27.S2)	Min. voltage set 2
		Seq	Incorrect phase sequence
		Prdn	Power down
	Main contactor fault detection (DDI) or internal fault		
Registered events	Remote Off, local control, external signal		

Timings and thresholds settings

Parameter	Default	Setting Range	Setting Steps
27.S1 : Min. voltage set 1	0.85Un 1.5s	0.2Un ÷ 1Un 0.05s ÷ 5s	0.05Un 0.05s
27.S2 : Min. voltage set 2	0.15Un 0.2s	0Un ÷ 1Un 0.05s ÷ 5s	0.05Un 0.05s
59.S1 : Max. voltage set 1 EN 61000-4-30	1.10Un ≤ 603s*	1.0Un ÷ 1.20Un -	0.01Un -
59.S2 : Max. voltage set 2	1.15Un 0.2s	1.0Un ÷ 1.3Un 0.05s ÷ 1s	0.01Un 0.05s
81<.S1 : Min. frequency set 1	49.8Hz 0.1s	47.0Hz ÷ 50.0Hz 0.05s ÷ 5s	0.1Hz 0.05s
81<.S2 : Min. frequency set 2	47.5Hz 0.1s(1) o 4s(2)	47.0Hz ÷ 50.0Hz 0.05s ÷ 5s	0.1Hz 0.05s
81>.S1 : Max. frequency set 1	50,2 Hz 0.1s	50.0Hz ÷ 52.0Hz 0.05s ÷ 5s	0.1Hz 0.05s
81>.S2 : Max. frequency set 2	51.5Hz 0.1s(1) o 1s(2)	50.0Hz ÷ 52.0Hz 0.05s ÷ 5s	0.1Hz 0.05s

(1) Local mode (2) Remote Mode

According to the Norm the timing setting can only be modified when the device is set on "remote mode".

*Note: Variable according to the start / end voltage value.



Reading input specifications

Rated inputs		Display accuracy (@25°C ±5°C, RH 60%, 45÷60Hz)	
System type	1P, 3P, 3Pn	Voltage	±0.5% RDG +1DGT
Rated voltage	230V _{LN} /400V _{LL}	Frequency	±0.1Hz
Distortion (THD)	+/-1% @ full scale	Voltage repeatability	≤5%
Temperature drift	≤ 200ppm/°C	Frequency tolerance	±20mHz
Rated frequency	50Hz	Timing repeatability	≤3% ±20ms
Input impedance			
400VL-L			
230VL-N			

I/O signals specifications

Digital inputs functions		Output relay function	
Input 1	Local Control Terminals 1-33 or 1-3	Output Relay 1	DDI Breaker Terminals NO 12, NC 11, COM 13
Input 2	External Signal Terminals 2-3 or 2-33	Output Relay 2	Backup Breaker Terminals NO 9, NC 8, COM 10
Input 3	Remote Off Terminals 41-3 or 41-33	Output relay type	
Input 4	DDI Auxiliary Contact Terminals 42-33 or 42-3	Contact configuration	SPDT
Common terminals	Terminals 3 and 33	Contact AC1	8A @ 250Vac
Digital inputs type		Contact AC15	2.5A @ 250Vac
“LOW” level input voltage	< 0,5V	Contact DC12	5A @ 24Vdc
“HIGH” level input voltage	2.4V a 25VCC	Contact DC13	2.5A @ 24Vdc
Max. input current	< 1mA	Mechanical life	> 30*10 ⁶ ops
		Electrical life	> 10*10 ⁵ ops @ 8A 250Vac cosφ 1

Main Functions

Password	4-digit numeric code	Clock	
Default	Password “0”.	Functions	Clock and calendar
System selection		Time format	Hour: minutes: seconds with formats selection 24 hours or AM/PM.
3Ph system	3-phases (4-wires).	Date format	Day-month-year with DD-MM-YY or MM-DD-YY format selection
3Ph system	3-phases (3-wires).	Battery life	10 years
1Ph system	1-phase (2-wires).		

Table for settings as inputs

“OP MODE”	Inputs		Frequency thresholds	Tripping timings
	Input 2 “External Signal” Terminals 2-3 or 2-33	Input 3 “Local Control” Terminals 1-33 or 1-3		
“Loc”: local operation	Irrelevant	Open	Restrictive 49.80Hz ÷ 50.20Hz	49.80Hz - 0.1s 50.20Hz - 0.1s
	Irrelevant	Close	Permissive 47.50Hz ÷ 51.50Hz	47.50Hz - 0.1s 51.50Hz - 0.1s
“Rem”: remote operation	Open	Irrelevant	Restrictive 49.80Hz ÷ 50.20Hz	49.80Hz - 0.1s 50.20Hz - 0.1s
	Close	Irrelevant	Permissive 47.50Hz ÷ 51.50Hz	47.50Hz - 4s 51.50Hz - 1s



Serial communication RS485

RS485 Port			
Type	Multidrop, bidirectional (static and dynamic variables).	Data format	1 bit for start, 8 bit for data, no parity/odd parity, equal parity, 1 bit for stop.
Connection	2 wires, Half Duplex. Maximum distance 1000m, termination on instrument.	Communication speed	Selectionable: 4.8k, 9,6k, 19.2k bit/s.
Address	247, selezionabile by frontal keyboard.	Network devices	1/5 unit load. Maximum 160 devices in the same network.
Protocol	MODBUS/JBUS (RTU)		
Data (bidirectional)			
Dynamic (only reading)	Variables of system and phase: please see "List of variables measured" table.		
Static (reading and writing)	All configuration parameters.		

General specification

Operating temperature	From -20 a +55°C (-4°F to 131°F) (U.R. from 0 to 90% without condensation @ 40°C)	Conformity Standards	
		Safety	EN61010-1
Storage temperature	From -30 to +70°C (-22°F to 158°F) (U.R. < 90% without condensation @ 40°C)	Approvals	CE, CEI 0-21:2022-03
		Terminals	Screw
Installation category	Cat. IV (IEC60664, EN60664)	Cable references	Max. 2.5 mm ² .
Dielectric strength	3310Vac for 1 minute	Tightening torque	Min./Max.: 0.4Nm/1Nm.
Rejection rate		Housing	
CMRR	100dB, from 48Hz to 62Hz	Dimensions (WxHxD)	90x71.6x66.3mm
EMC	according to EN61000-6-3 and EN61000-6-2.	Material	Front: ABS, Self extinguishing: UL 94 V-0 DIN rail
Protection degree		Mounting	
Front	IP50	Weight	300g ca (including packaging)
Screw terminals	IP20		
Pollution degree	3		

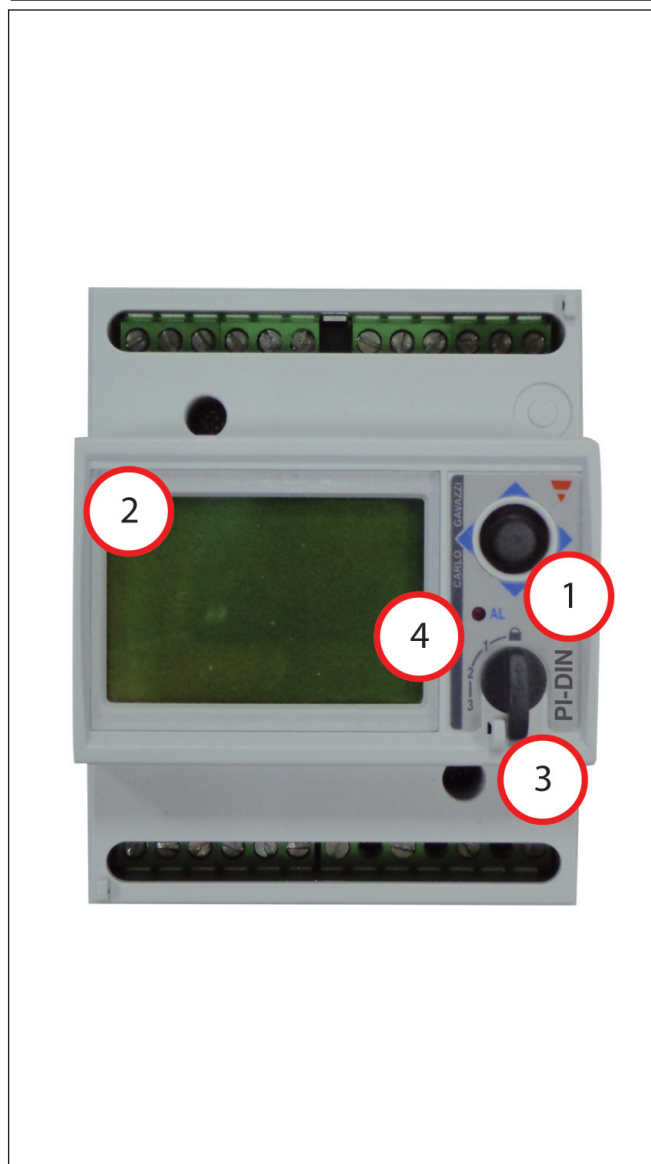
Auxiliary power supply specifications

Auxiliary power supply		Self-consumption	
" H " version	115..230Vac, 48-62Hz -20% +15%	" H " version	7VA
" L " version	24Vdc -20% +20%	" L " version	2W

Display, LEDs and commands

Display refresh time	≤ 100 ms	Rotary switch	programming menus access: password, date & time, interface protection parameters, system, etc... Selector is provided with a slit for lead seal locking.
Display	2 lines, 4-DGT 1 line, 8-DGT	LED on front panel	Dual function RED LED Lit: alarm triggered Blinking: Alarm triggered, elapsing delay before opening.
Model	LCD		
Digit dimension	h 7mm		
Joystick	Variables reading selection, operating parameters settings, triggered events list.		

Front panel description



1. Joystick

Programming menus parameters configuration and navigation. Events and variables scrolling.

2. Display

LCD with alphanumerical indications:

- Display configuration parameters;
- Display all the measured variables;
- Display logged events.

3. Programming menu selector

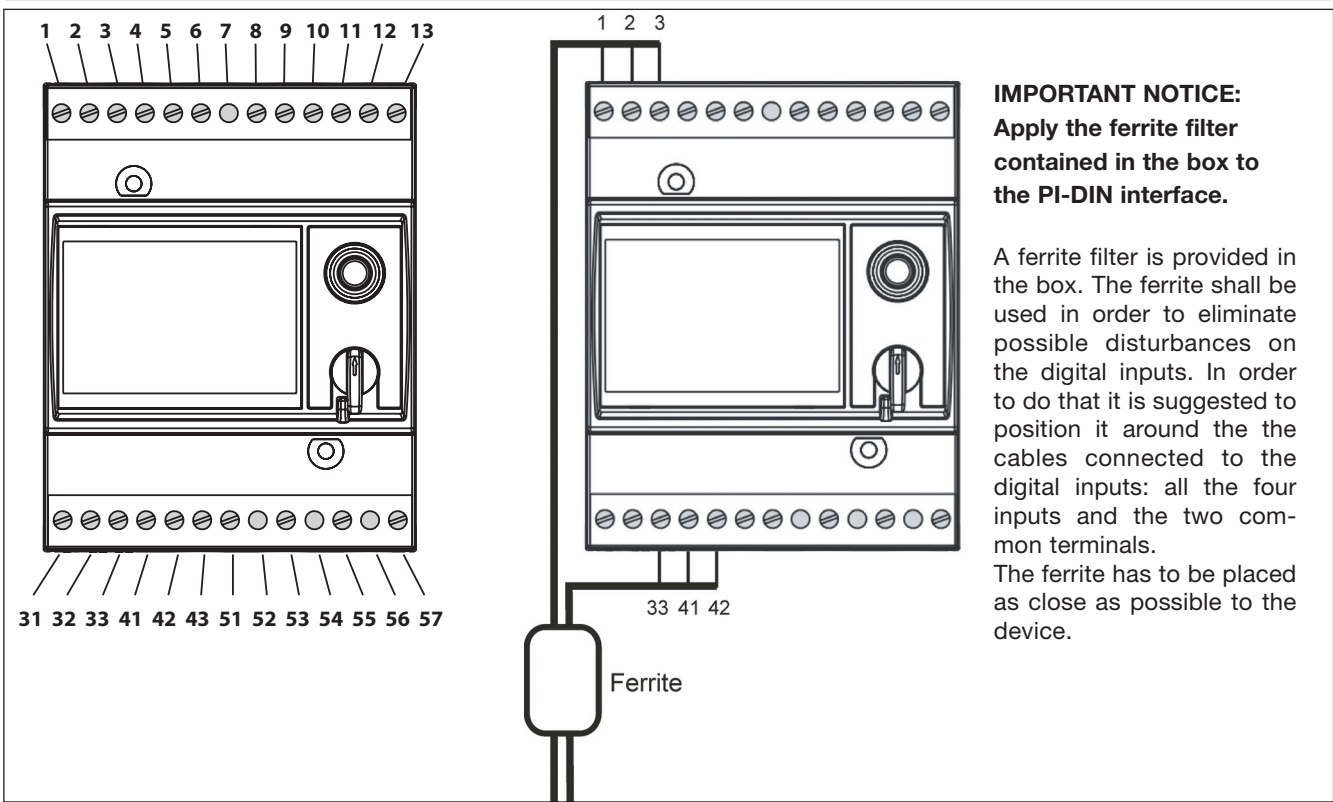
With the Rotary selector (lead seal lockable) it is possible to select the main menu, the setting menu or the configuration menu.

4. Alarm LED

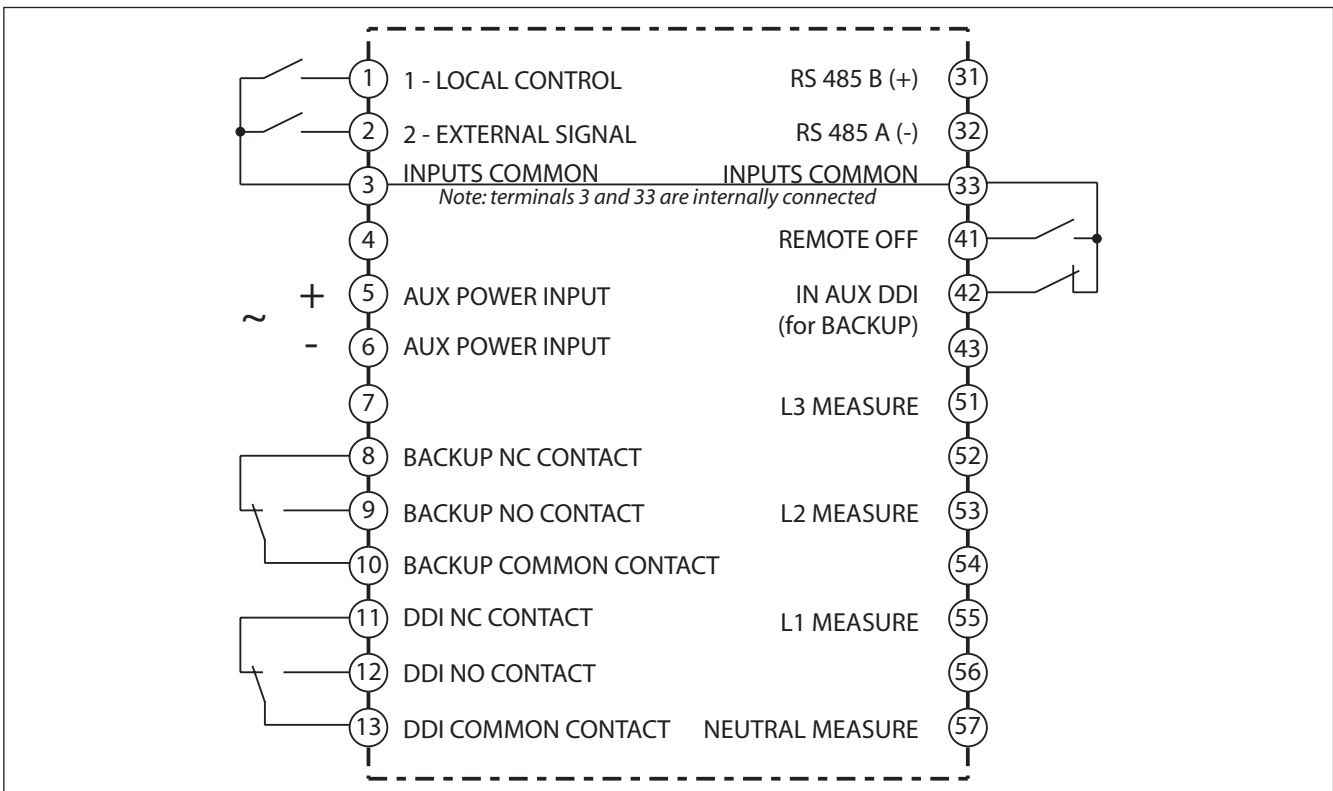
Status LED

- OFF, no alarms
- ON, triggered alarm protection tripped
- Blinking, alarm triggered, protection tripping after delay.

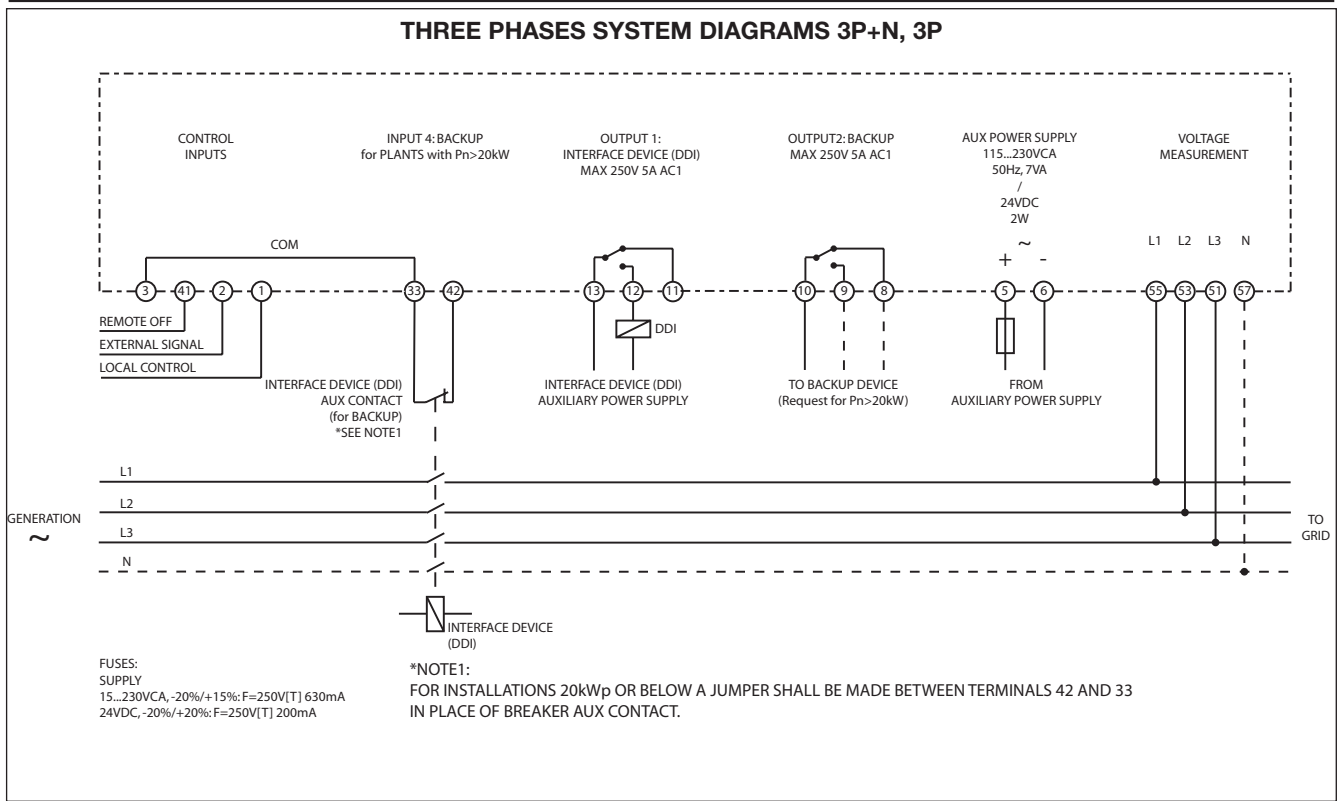
Terminal board layout (back view)



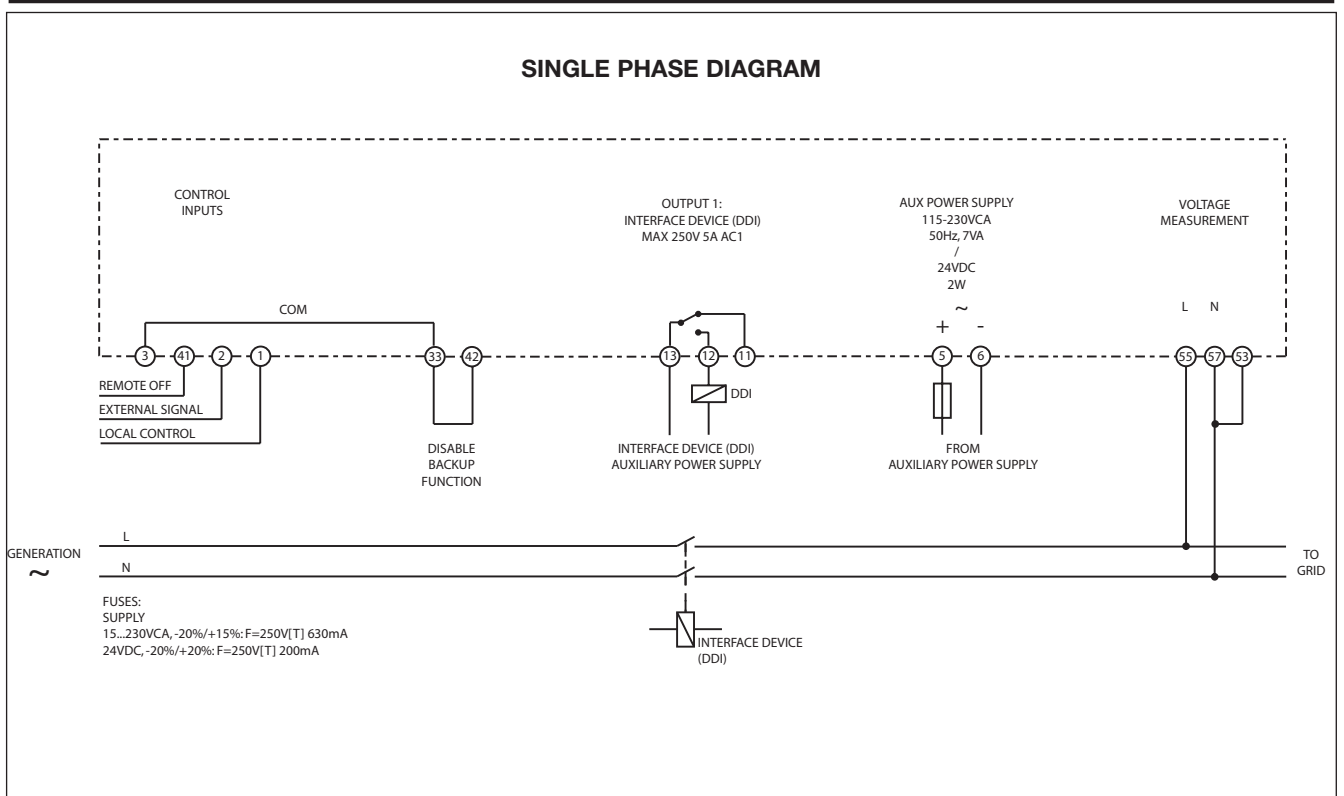
Input/Output pinout



Three Phases System wirings



Single Phases System wirings



Dimensions (mm)

