

RNX 2000

Remote terminal Unit



USER'S MANUAL

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1. INTRODUCTION

Scope:

This manual describes the functions and technical features of Fanox RTU. The information included in this document is reviewed regularly, so any correction or improvement will be included in the following revisions.

The right to make technical improvements without notice is reserved.

1.1. Symbols

Conformity:

This product is designed according to **IEC 61850-3** Standard.

Technical support: Contact Fanox technical Service: www.fanox.com

Copyright: All right reserved.

Warranty: Fanox warrants the correct working of the devices under normal use for FIVE (5) YEARS from the date of dispatch.

Safety recommendations: The warning contained in this manual are important to ensure the safety.



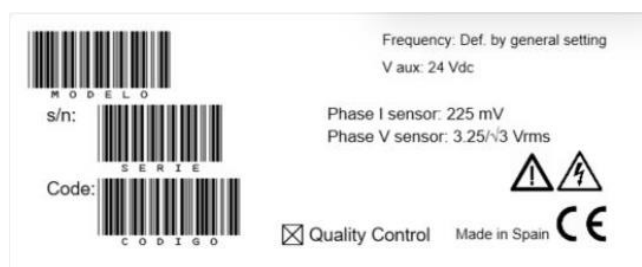
CAUTION Personal injury or property damage can result if precautions are not taken.

Installation and commissioning must be carried out by qualified personnel. In paragraph 2 the reception, handling, and commissioning processes are explained deeply. Please, follow the instructions.



CAUTION Settings must be established based on coordination study. The default values and the examples included in the manual are for educational purpose and they do not be used for real application in any case.

The RNX 2000 is identified with the following quality label:



2. RECEIVING, HANDLING AND INSTALLATION

2.1. Unpackaging

RTU must only be handled by qualified personnel and special care must be taken to protect all their parts from any damage while they are being unpacked and installed.

The use of good illumination is recommended to facilitate the device visual inspection.

The facility must be clean and dry, and devices should not be stored in places that are exposed to dust or humidity. Special care must be taken if construction work is taking place.

2.2. Receiving of devices

It is necessary to inspect the device at the time it is delivered to ensure that the devices have not been damaged during transport.

If any defect is found, the transport company and FANOX should be informed immediately.

If the devices are not for immediate use, they should be returned to their original packaging.

2.3. Handling of electronic devices

RTU contain an electronic component that is sensitive to electrostatic discharges.

Just by moving, a person can build up an electrostatic potential of several thousand volts.

Discharging this energy into electronic components can cause serious damage to electronic circuits. It is possible that this damage may not be detected straight away, but the electronic circuit reliability and life will be reduced. This electronic component in the device is well protected by the metal housing, which should not be removed as the device cannot be adjusted internally.

If it is necessary to disassemble the electronic component, this must be carried out with care and contact with electronic components, printed circuits and connections must be avoided to prevent an electrostatic discharge that could damage one of the components. If the electronic components are stored outside the metal housing, they must be placed in an antistatic conductive bag.

If it is necessary to open a module, care must be taken to preserve the device reliability and the duration of the life cycle as designed by the manufacturer, taking the following actions:

- Touch the housing to ensure that you have the same potential.
- Avoid touching the electronic components and handle the module by its edges.
- Remember that everyone who handles the module must have the same potential.
- Use a conductive bag to transport the module.

For more information about how to handle electronic circuits, consult official documents such as the IEC 147-OF.

2.4. Installation, commissioning, and service

The personnel in charge of installing, commissioning, and maintaining this device must be qualified and must be aware of the procedures for handling it. The product documentation should be read before installing, commissioning, or carrying out maintenance work on the device.

Personnel should take specific protection measures to avoid the risk of electronic discharge when access is unlocked on the front part of the device.

To guarantee safety, the crimp terminal and a suitable tool must be used to meet isolation requirements on the terminal strip. Crimped terminations must be used for the voltage and current connections.

It is necessary to connect the device to earth through the corresponding terminal, using the shortest possible cable. As well as guaranteeing safety for the personnel, this connection allows high-frequency noise to be evacuated directly to earth.

The following checks must be performed before the device is supplied:

- The rated voltage and polarity.
- The power rating of the CT circuit and the integrity of the connections.
- The integrity of the earth connection.

The device must be used within the stipulated electrical and environmental limits.

NOTE: current transformer circuits: Do not open a live CT secondary circuit. The resulting high voltage could damage the isolation and threaten lives.

The user shall be responsible for ensuring the integrity of any protective conductor connections before carrying out any other actions.

The user shall also be responsible for checking equipment ratings, operating instructions and installation instructions before commissioning or maintenance.

It is the responsibility of the user to ensure that the equipment is installed, operated, and used for its intended function in the manner specified by Fanox.

According to the standard NEN-EN-IEC 61850-3 during the commissioning process any external fuse or protective device required for safe operation of the equipment shall be installed if necessary.

In case of any failure, contact Fanox.

2.5. Storage

If the devices are not going to be installed immediately, they must be stored in a dust—and humidity-free environment after the visual inspection has been carried out.

2.6. Recycling

Before recycling the device, the capacitors should be discharged through the external terminals. To avoid the risk of electrical discharge, all electrical power sources should be removed before performing this operation.

This product must be disposed of in a safe way. It should not be incinerated or brought into contact with water sources like rivers, lakes, etc.

Fanox Electronic, S.L. adheres itself to the 1st additional disposal of the Spanish 11/97 Standard in which it is said that the final user of the containers should give them, properly segregated by materials, to an authorized recovery, recycler, or valorization company.

3. GENERAL DESCRIPTION

The energy sector is currently immersed in a deep change worldwide. As a result of high levels of energy demand, more distribution lines and advanced supervision systems are required. Given the need for creating smart infrastructures, Fanox has developed the RNX family to carry out this goal.

RNX 2000 is designed for advanced monitoring and control in complex energy systems. It supports RMU multiple feeder monitoring, providing real-time supervision of various feeder lines. The device facilitates seamless monitoring of multiple slaves and ensures reliable communication thanks to its ability to connect to multiple master devices.

Configuration and diagnostics can be carried out through an integrated web server, or remotely via “RNXStudio”, a proprietary and free software with gateway configuration and logic editor, allowing precise customization and integration in the system. In addition, GPS clock synchronization is available, ensuring accurate event timing across the system.

As a key advantage, the RNX 2000 features enhanced cyber security and supports multiple protocols, making it highly adaptable. It is also equipped with four Ethernet ports and two serial ports, ensuring flexible and secure network integration. Additionally, Sequential Events Recording (SER) in non-volatile RAM memory guarantees that critical event data is securely stored, even in the event of a power failure.

4. IDENTIFICATION OF THE RTU

4.1. Ratings / Technical features of the device

Secondary nominal current	225 mV
Secondary nominal voltage	$3.25/\sqrt{3}$
Rated frequency	50/60 Hz
Rated auxiliary voltage	24-48 Vdc ($\pm 20\%$)
Binary input operating voltage	24-48 Vdc ($\pm 20\%$)
Binary input threshold	15 Vdc
Output contact continuous current	1 A
Mechanical class	1
EMC emission class	A
EMC immunity zone	A
Overvoltage category	III
Pollution degree	2
IP-Class:	IP 20 (Terminals)
Insulation type	Functional
Maximum operating temperature	+70 °C
Minimum operating temperature	-40 °C
Maximum storage temperature	+80 °C
Minimum storage temperature	-40 °C

5. SUMMARY OF THE MAIN FEATURES

- RNX2000 is a flexible, compact and modular (depending on model) remote-terminal unit (RTU) for primary and secondary distribution suitable for low and medium voltage switchgears, being an optimal solution for Ring Main Units monitoring and control thanks to its compact size.
- RNX2000 is provided with 24-48 Vdc power supply.
- If measurements are selected, the following options are available depending on model:
 - » Current:
 - 9 current channels for current sensors (LPCT or Rogowski).
 - » Voltage:
 - 3 voltage channels for resistive or capacitive low voltage sensors (LEAs)
- RNX2000 includes the following communication ports:
 - » Serial Ports:
 - 1x RS485 Port.
 - 1x RS232/RS485 Port selectable by switch.
 - » Ethernet ports:
 - 2x WAN (10/100/1000 Base Tx) Ports (RJ45 connectors).
 - 1x LAN (10/100/1000 Base Tx) Port (RJ45 connector).
 - 1x Service LAN (10/100/1000 Base Tx) Port (RJ45 connector).
- RNX2000 will support all the standard protocols enhancing cyber security requirements to fulfil IEC62351:
 - » Slave/Server: IEC60870-5-104
 - » Master/Client: Modbus RTU, NTP/SNTP.

Master/Client: IEC60870-5-101/104, IEC60870-5-103, Modbus (TCP/IP), DNP3 (TCP/IP and Serial), IEC61850 (Upcoming).

Slave/Server: IEC60870-5-101, IEC60870-5-103, Modbus (TCP/IP and RTU), DNP3 (TCP/IP and Serial), IEC61850 (Upcoming).

- RNX2000 includes different modules of I/O available to support:
 - » 32, 48 or 64 inputs.
 - » 8, 16, 24, 32 or 40 outputs with associated LED indicators.
- Metallic box with high electromagnetic compatibility level (EMC) and wide range of operating temperature.
- Protection functions available depending on model.
- Advanced logic configuration and automation capability thanks to the programmable logic.
- Sequential Events Recording (SER) in non-volatile RAM memory maintaining the date & time thanks to its internal RTC (Real Time Clock).
- Integrated Web server for configuration and diagnostics.

6. TECHNICAL FEATURES OF THE DEVICE

Current Circuit	
Current inputs	9
Nominal measuring range	225 mV
Burden	<50 μ VA
Current sensors	LPCT/Rogowski

Voltage Circuit	
Voltage inputs	3
Nominal measuring range	$3.25/\sqrt{3}$
Burden	<10 μ VA
Voltage sensors	LEAs

Frequency	
System frequency	50/60 Hz

Auxiliary Power Supply	
Range	24Vdc
Tolerance	$\pm 20\%$
Burden	< 10 W

Binary Inputs	
Inputs	Up to 64 (Depending on model)
Range	24 Vdc
Tolerance	$\pm 20\%$
Threshold	15 Vdc
Burden	< 100 mW

Outputs Contact	
Outputs	Up to 16
Permanent switching capacity	1A
Withstand voltage across open contacts	300 V

Operating & Storage	
Operating Temperature	-40 °C to +70 °C
Storage Temperature	-40 °C to +80 °C
Relative humidity	95%

Led Indicators	
Run	Running status
Error	Malfunction or error
Local	Local State
ON	Power Supply

Communication Interfaces	
Ethernet RJ45 (x4)	
RJ45 Connector	Female RJ45
Type	UTP Cat 6
Length	100 m
Baud rate	10/1000 Mbps
Serial Port RS232	
RS232 Connector	3 threads
Serial Port RS232/RS485 Configurable by HW	
RS232 Connector	3 threads
RS485 Connector	2 threads

Supported Protocols	
Master/Client	
IEC 60870-5-101*	Controlling station
IEC 60870-5-104*	Controlling station
DNP3 (TCP-IP/Serial)*	Master
Modbus (TCP-IP/Serial)	Client
IEC 61850*	Client
NTP/SNTP	Client
Slave/Server	
IEC 60870-5-101*	Controlled station
IEC 60870-5-104	Controlled station
DNP3 (TCP-IP/Serial)*	Outstation
Modbus (TCP-IP/Serial)*	Server
IEC 61850*	Server
Redundance protocols	
PRP*	Parallel Redundancy Protocol
HSR*	High-Availability Seamless Redundancy

*Upcoming

Cybersecurity	
Protocol encryption	IEC 62351-3
Secure authentication	IEC 62351-4
Role Based Access	IEC 62351-8

Technical characteristics

Communication interfaces	Serial ports: 1x RS485 Port. 1x RS232/RS485 Port (selectable by switch). Ethernet ports: 2x WAN Ports (10/100/1000 Base Tx) (RJ45 connectors). 1x LAN Port (10/100/1000 Base Tx) (RJ45 connector). 1x Service LAN Port (10/100/1000 Base Tx) (RJ45 connector).
Protocol Support	Slave/Server: IEC60870-5-104 Master/Client: Modbus RTU, NTP/SNTP. <i>Master/Client: IEC60870-5-101/104, IEC60870-5-103, Modbus (TCP/IP), DNP3 (TCP/IP and Serial), IEC61850 (Upcoming).</i> <i>Slave/Server: IEC60870-5-101, IEC60870-5-103, Modbus (TCP/IP and RTU), DNP3 (TCP/IP and Serial), IEC61850 (Upcoming).</i>
Function 50-1 (*)	Function enable: No/Yes
Function 50-2 (*)	Current tap: 40 to 8000 A (step 0.001 A)
	Time delay: 0.000 to 300.000 s (step 0.001 s)
	Reset Time: 0.000 to 300.000 s (step 0.001 s)
	Block Signal: 0 to 512 (step 1)
Function 50N-1 (*)	Function enable: No/Yes
Function 50N-2 (*)	Current tap: 40 to 800 A (step 0.001 A)
	Time delay: 0.000 to 300.000 s (step 0.001 s)
	Reset Time: 0.000 to 300.000 s (step 0.001 s)
	Block Signal: 0 to 512 (step 1)
Function 50INC (*)	Function enable: No/Yes
	Current Set: 1 to 4 (Step 1)
	Phase Current Tap: 40 to 8000 A (step 0.001 A)
	Pickup Peaks number: 1 to 20 (step 1)
	Trip Peak number: 1 to 20 (step 1)
	Block Signal: 0 to 512 (step 1)
	Reset Signal: 0 to 512 (step 1)
Function 21FL (*)	Function enable: No/Yes
	Current Set: 1 to 4 (Step 1)
	Line length 0.1 to 100.0 km (step 0.1 km)
	Z1 line magnitude: 0.001 to 5.000 (step 0.001 Ω /km)
	Z1 line angle: 0 to 90° (step 0.1°)
	Z0 line magnitude: 0.001 to 5.000 (step 0.001 Ω /km)
	Z0 line angle: 0 to 90° (step 0.1°)
Other Functionality	Advanced logic configuration and automation capability thanks to the programmable logic. Cyber Security, according to IEC62351-3, IEC62351-4 and IEC62351-8. Integrated Web Server for configuration and diagnostics.
Current measurements (*)	OUTGOING-1: I-A, I-B, I-C, I-N (Calculated) INCOMING-2: I-A, I-B, I-C, I-N (Calculated) OUTGOING-2: I-A, I-B, I-C, I-N (Calculated) Current measurement: /225 mV Current range: 0.004 - 8x nominal Secondary range: 0.004x225-8x225 → 0.9 mV - 1.8V Accuracy: $\pm 1\%$ in a band of $\pm 20\%$ the nominal current and $\pm 2\%$ or ± 5 mA (greater of both) in the rest of the range
Voltage measurements (*)	OUTGOING-2: V-A, V-B, V-C, V-N (Calculated), UAB, UBC, UCA Voltage measurement: /3.25· $\sqrt{3}$ Voltage range: $V_n : /3.25 \cdot \sqrt{3} = 1.88$ V Range: 0.04-2xVn Secondary range: 0.04x1.88-2x1.88 → 75 mV - 3.8V

	Accuracy: $\pm 1\%$ in a band of $\pm 20\%$ the nominal current and $\pm 2\%$ or ± 5 mA (greater of both) in the rest of the range
Angle measurements (*)	OUTGOING-1: Ang I-A, Ang I-B, Ang I-C, Ang I-N INCOMING-2: Ang I-A, Ang I-B, Ang I-C, Ang I-N OUTGOING-2: Ang I-A, Ang I-B, Ang I-C, Ang I-N Ang V-A, Ang V-B, Ang V-C, Ang V-N Ang UAB, Ang UBC, Ang UCA
	Accuracy: $\pm 2^\circ$
Power measurements (*)	OUTGOING-1: Total active power, reactive power, apparent power, power factor INCOMING-2: Total active power, reactive power, apparent power, power factor OUTGOING-2: Total active power, reactive power, apparent power, power factor
Power supply	24-48 Vdc $\pm 20\%$
Digital Outputs Module (*)	Depending on the model: 8, 16, 24, 32 or 40 outputs (1 module of 16 outputs or 1, 2, 3, 4 or 5 modules of 8 outputs): Each 8-outputs module (separated common per output): • 2 NO-NC output + 6 NO outputs. • Switching capacity: 24-48 Vdc/1A • Withstand voltage across open contacts: 300 V Each 16-outputs module (separated common by every 8 outputs): • 1 NC output + 15 NO outputs. • Switching capacity: 24-48 Vdc/1A • Withstand voltage across open contacts: 300 V
Digital Inputs Module (*)	Depending on model: 16 inputs, 32 inputs, 48 inputs or 64 inputs (16 Inputs per module): The voltage of the inputs is the same as the auxiliary power supply (Minimum threshold: 15 V).
Analog Measurements Modules (*)	» Current: ▪ 9 current channels for current sensors (LPCT/Rogowski) » Voltage: ▪ 3 voltage channels for resistive or capacitive low voltage sensors (LEAs) Upcoming different combinations of current and voltage channels.
Energizing Quantities	Burden of current inputs: <50 μVA Burden of voltage inputs: <10 μVA Burden of power supply unit: 24-48 Vdc ($\pm 20\%$): < 10 W Burden for binary inputs: 24-48 Vdc ($\pm 20\%$): < 100 mW
Environmental conditions	Operating temperature: -40 to 70°C
	Storage temperature: -40 to 80°C
Mechanical characteristics	Relative humidity: 95%
	Metallic box
	7-modules (fixed structure): Horizontal assembly HxWxD: 147.5 x 223.2 x 146.48 mm Vertical assembly HxWxD: 223.2 x 147.5 x 146.48 mm
	7-modules (modular structure): Horizontal assembly HxWxD: 148.5 x 236.2 x 146.22 mm Vertical assembly HxWxD: 236.2 x 148.5 x 146.22 mm
	10-module (modular structure): Horizontal assembly HxWxD: 148.5 x 300.98 x 146.22 mm Vertical assembly HxWxD: 300.98 x 148.5 x 146.22 mm

(*) Optional depending on model

7. SELECTION OF ORDERING CODE

7.1. RNX 2000 Selection and ordering codes

RNX 2000

Ring Terminal Unit							
00 9P							PHASE CURRENT MEASUREMENT Without measurement 9xLPCT (xxA/225 mV)
	00 3L						VOLTAGE MEASUREMENT Without measurement 3xLEA: 3.25/ $\sqrt{3}$ Vrms
		A					POWER SUPPLY 24-48 Vdc
			A				COMMUNICATION PORTS RS485 + RS232/RS485 + 4 x Ethernet (10/100/1000 Base Tx)
				1 2 3 4			INPUTS 1 x 16 Inputs 2 x 16 Inputs 3 x 16 Inputs 4 x 16 inputs
					0 1 2 3 4 5		OUTPUTS 1 x 8 Outputs 1 x 16 Outputs 2 x 8 Outputs 3 x 8 Outputs 4 x 8 Outputs 5 x 8 Outputs
						5 7 8	MECHANICS 7 Slots modular assembly (2 fixed + 5 modular) 7 Slots (compact structure only) 10 Slots modular assembly (2 fixed + 8 modular)
							ADAPTATION A - B + (2) 50 + (2) 50N + (2) 21FL + (2) 50INC C + (2) 50 + (2) 50N D + (2) 50 + (2) 50N+ SZM + 52

NOTE: When the part number is selected, the admissible maximum number of inputs and outputs are:

Maximum 64 inputs.

Maximum 40 outputs.

Example of ordering code:

9P	3L	A	A	3	0	7	A	RNX 2000 9P3LAA307A
RNX 2000								

7.2. RNX 2000 Modules Selection and ordering codes

RNX Modules

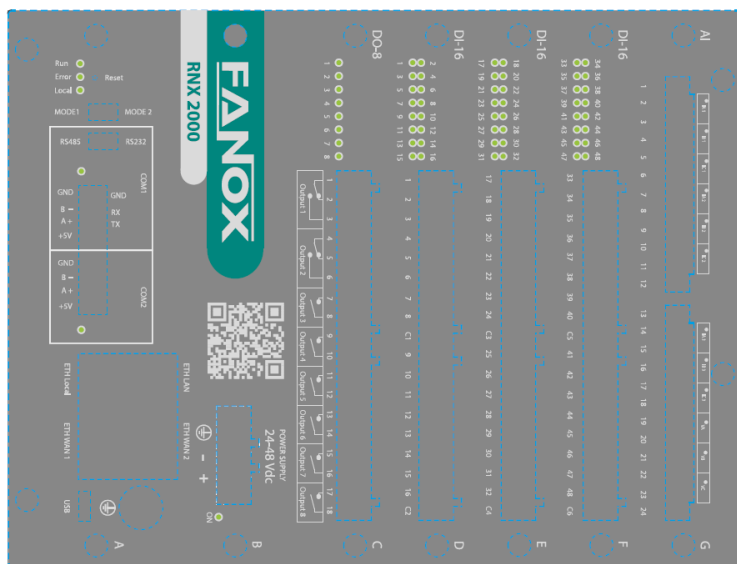
MODULES	DESCRIPTION	CODE
MEASUREMENT MODULES		
RNX-AIM-0309	Analogue Input Module: 3xLEA + 9xLPCT	
COMMUNICATION MODULES		
RNX-COM-1140	Communication Module: 1xRS485 + 1xRS232/RS485 + 4RJ45	
POWER SUPPLY MODULES		
RNX-PSM-24	Power Supply Module: 24-48 Vdc	
INPUTS MODULES		
RNX-DIM-16	Digital Inputs Module: 16 Inputs	
OUTPUTS MODULES		
RNX-DOM-08	Digital Outputs Module: 8 Outputs	
RNX-DOM-16	Digital Outputs Module: 16 Outputs	
BLANK COVER		
RNX-BCM-00	Blank Cover	

8. HARDWARE AND CONNECTION DIAGRAMS

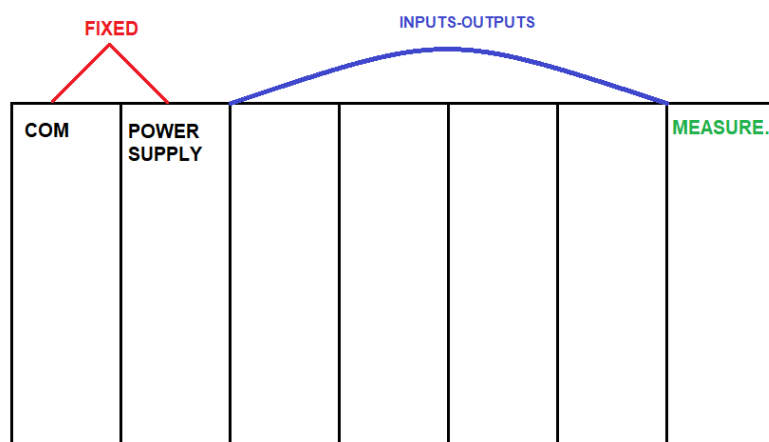
8.1. Hardware description

3 different options are available:

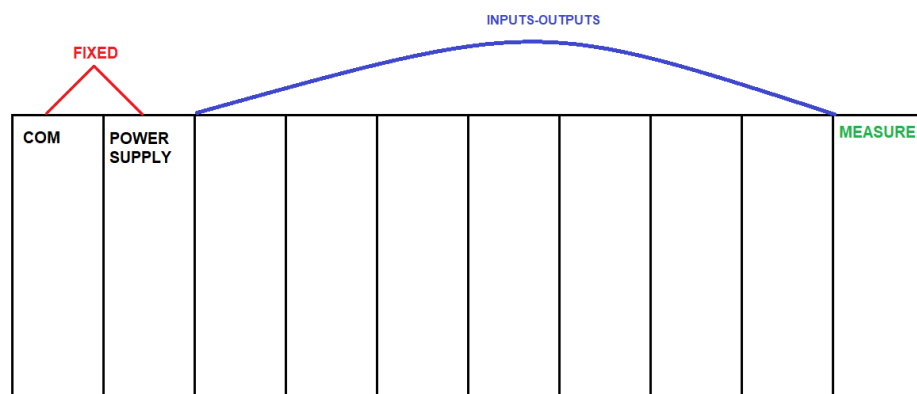
7-Slots (compact structure only): All fixed modules:



7-Slots modular assembly (2 fixed modules + 5 modular modules)



10-Slots modular assembly (2 fixed modules + 8 modular modules)



Considerations:

The RTU made of 7-Slots ((compact structure only), is composed of different modules:

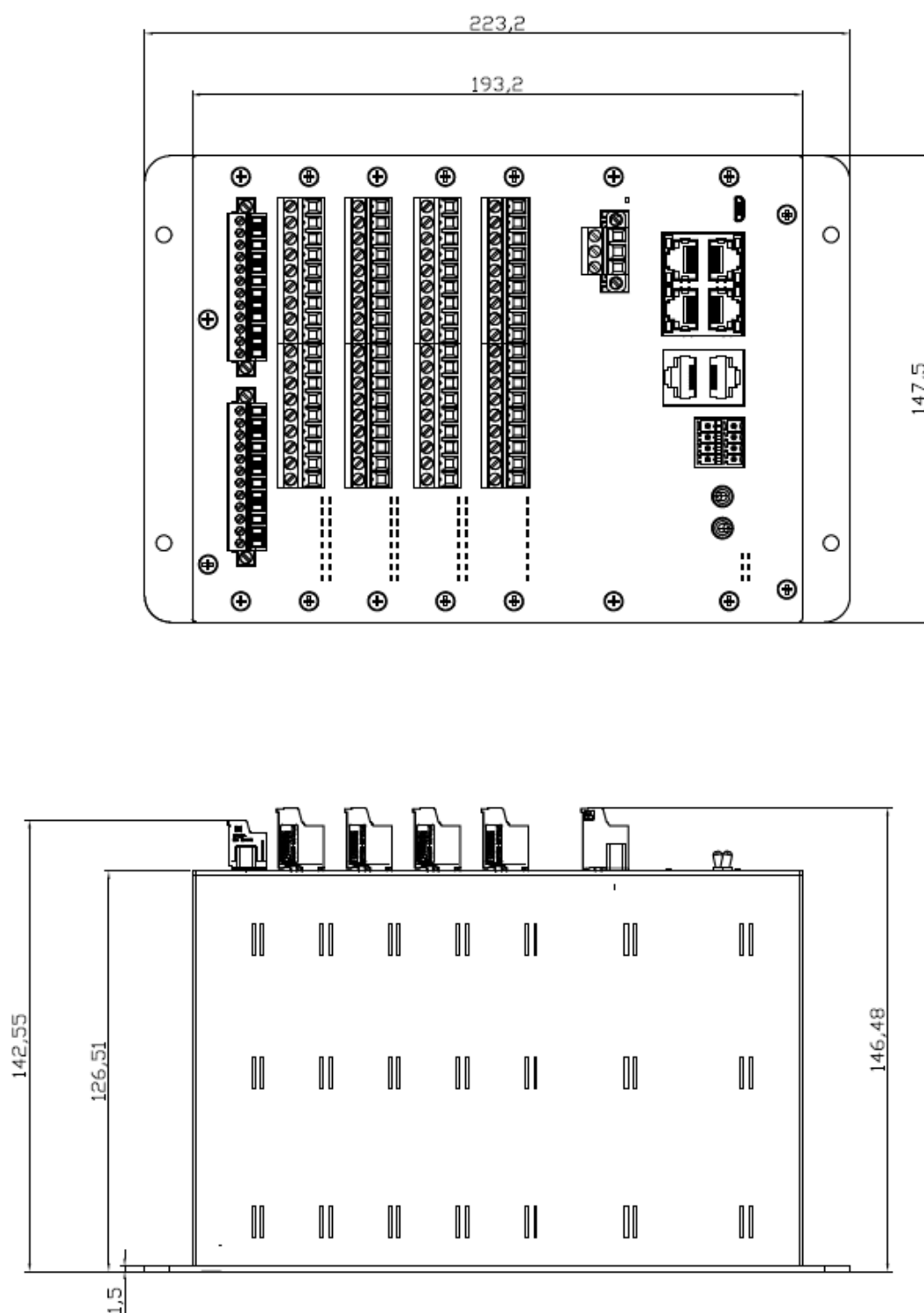
- CPU and Communication module.
- Power Supply module.
- Digital outputs module.
- Digital inputs module.
- Analog inputs module.

For the modular options:

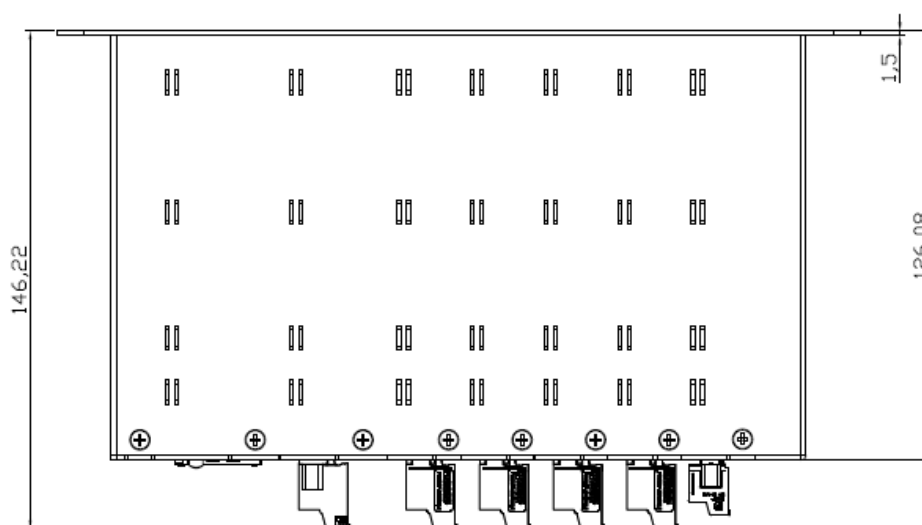
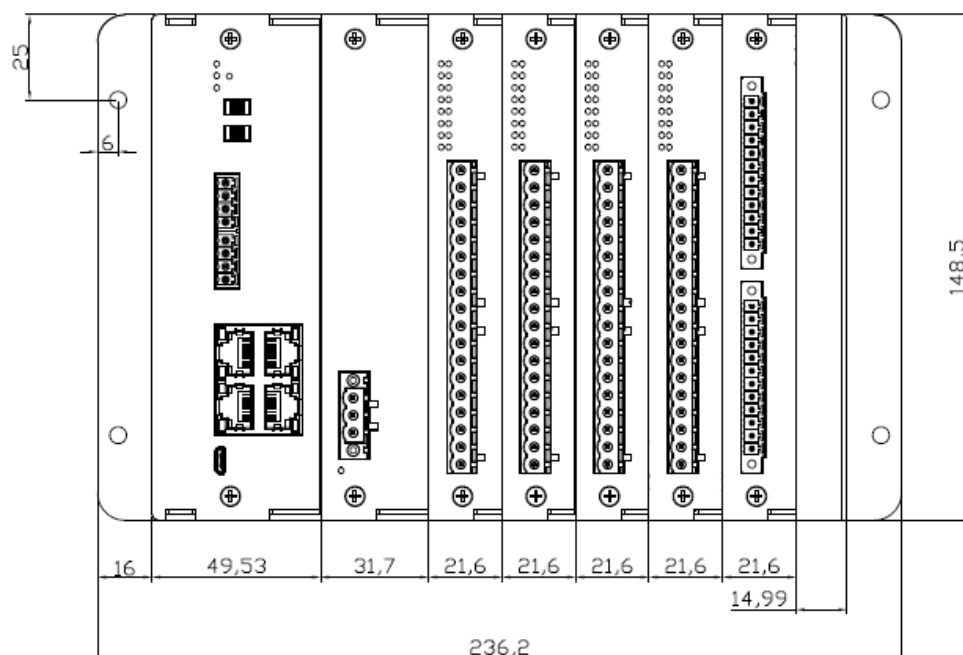
- CPU and Communication module (fixed).
- Power Supply module (fixed).
- OUTPUTS:
 - ✓ Number of outputs with 16-outputs boards: Only one Slot is acceptable (RNX 2000 xxxx1xx)
 - ✓ Number of outputs with 8-outputs boards: Maximum 40 outputs (this will imply to select maximum 5 slots (8x5=40))
- Number of inputs: Maximum 64 inputs (this will imply selecting maximum 4 slots (16x4=64)).
- The INPUTS and OUTPUTS modules must be consecutive, and they cannot alternate. If INPUTS are necessary, after the power supply, the outputs boards will be installed. Once the outputs are covered, the remaining slots can be used for inputs (respecting the maximum number described above).

8.2. RTU Dimensions

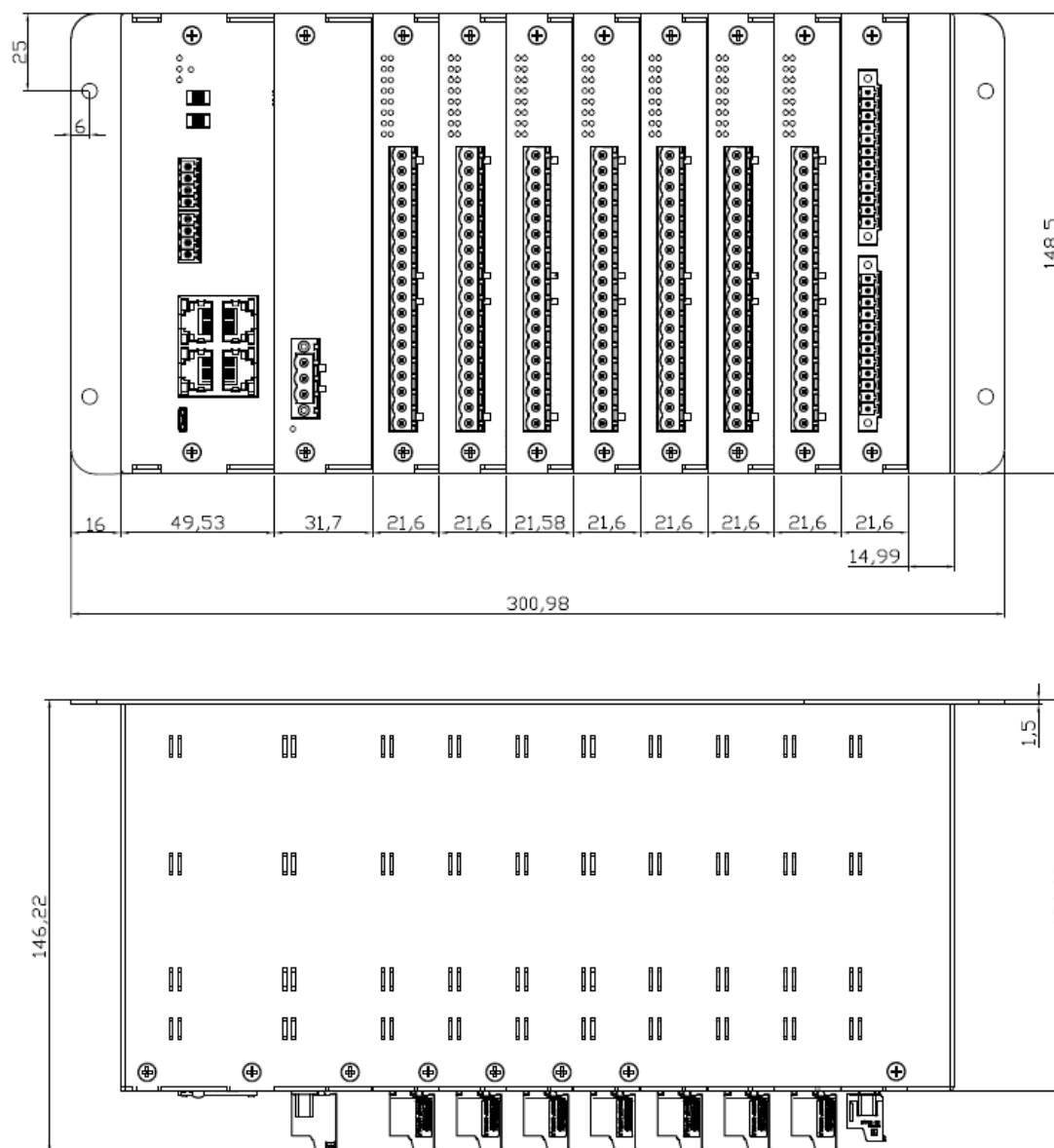
7-Slot (Fixed structure)



7-Slot (Modular Structure)



10-Slot (Modular Structure)

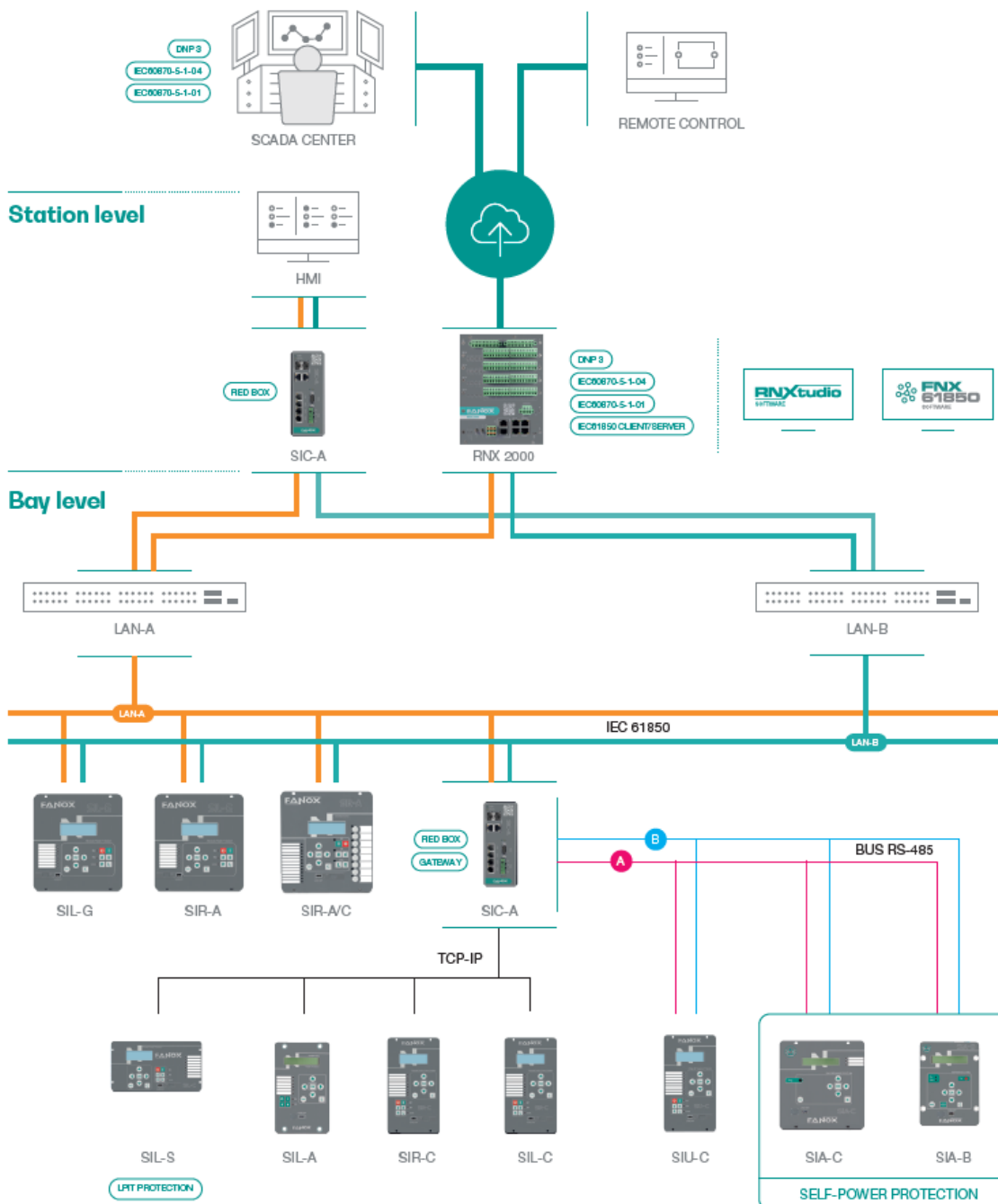


Note:

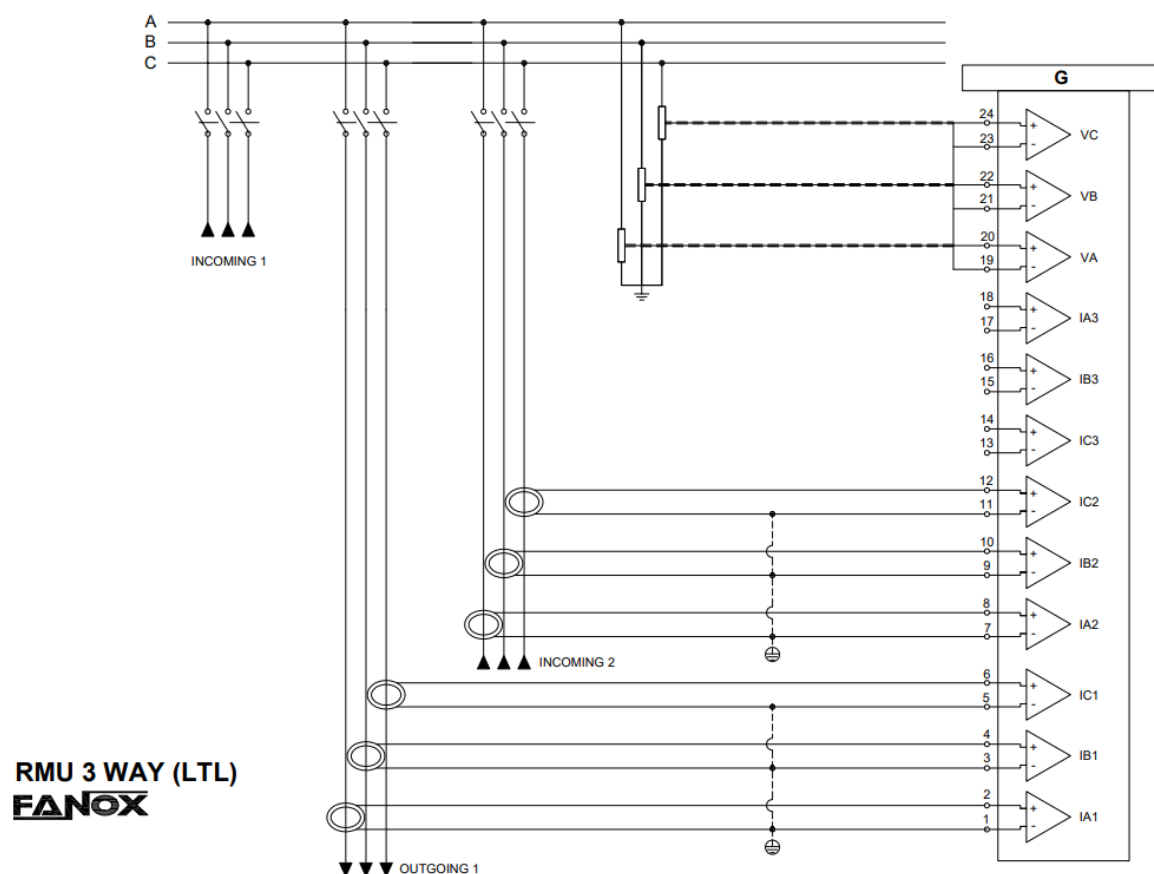
- 1) The dimensions are in "mm".
- 2) The required screws to fix the device should be M4.

8.3. RTU Connection

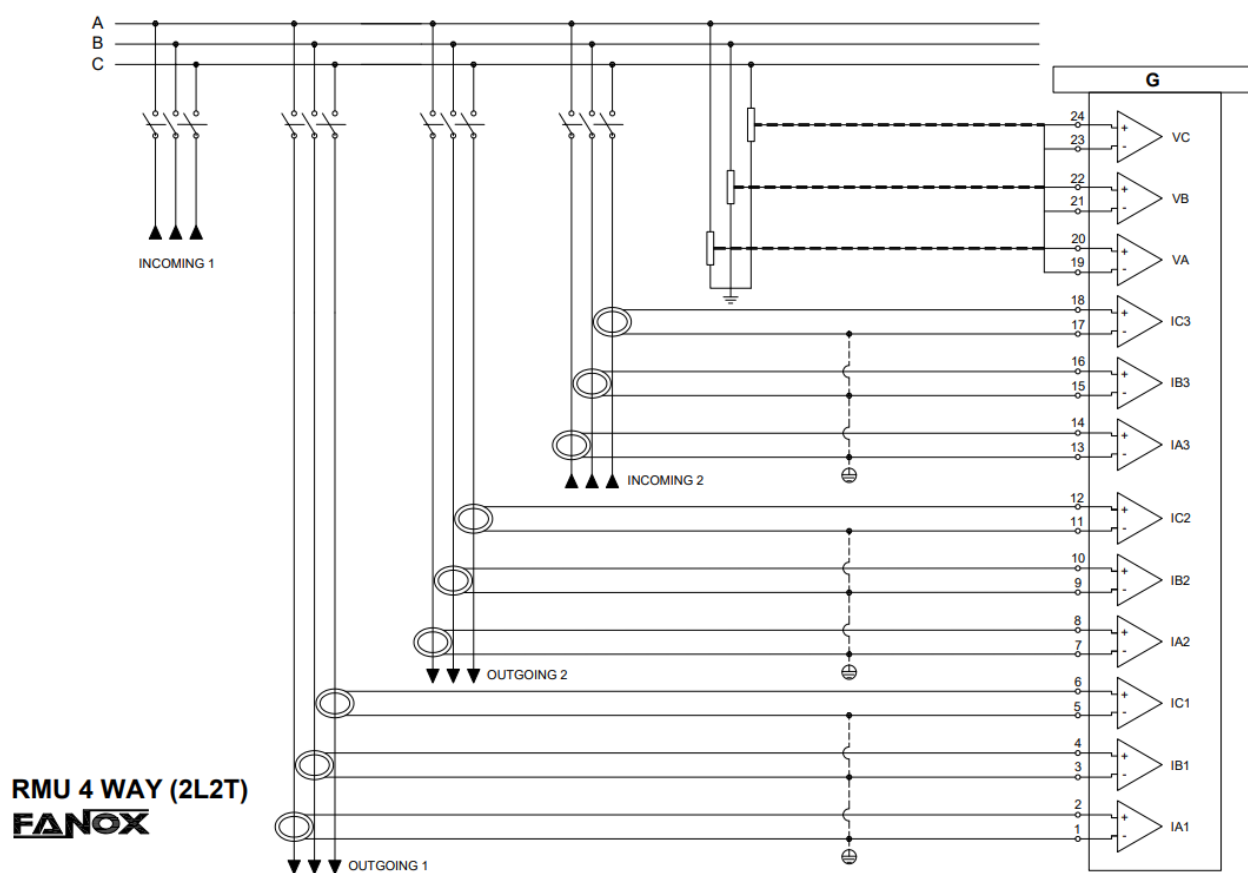
Network level



8.3.1. RMU 3 way (LTL)

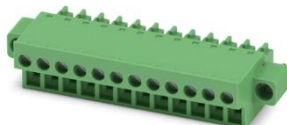


8.3.2. RMU 4 way (2L2T)



8.4. Terminals

The following types of terminals are used in the device:

	Reference	Features	Connectors
Analog channels terminals	1850958 (Phoenix Contact)	28 AWG – 16 AWG: 0.14 – 1.5 mm ² cable. Torque: 0.22 Nm ... 0.25 Nm	
RS485-RS232/RS485 terminals	1850686 (Phoenix Contact)	28 AWG – 16 AWG: 0.14 – 1.5 mm ² cable. Torque: 0.22 Nm ... 0.25 Nm	
Inputs/Outputs terminals	1777358 (Phoenix Contact)	24 AWG – 12 AWG: 0.2 – 2.5 mm ² cable. Torque : 0.5 Nm ... 0.6 Nm	
Power supply terminals	1777811 (Phoenix Contact)	24 AWG – 12 AWG: 0.2 – 2.5 mm ² cable. Torque : 0.5 Nm ... 0.6 Nm	

8.5. Modules description

8.5.1. CPU Module



- LED indications:
 - RUN
 - ERROR
 - LOCAL indication
- RESET button
- Serial ports:
 - RS485/232 Select by hw
 - RS232
- LAN ports:
 - RJ45 x 4.
- Selector switches
 - Mode 1/ Mode 2, configurable by the user.
 - RS485/RS232 selector.
- USB port
- Earthing screw*

**Earthing screw (protective earth) connection should not be removed when the equipment is energized.*

8.5.2. Power supply module



- LED indications
 - ON
- Range
 - 24 Vdc (+/- 20%)

TERMINALS	DESCRIPTIONS
1	Protective Ground*
2	(-) Negative of the Power supply
3	(+) Positive of the Power supply

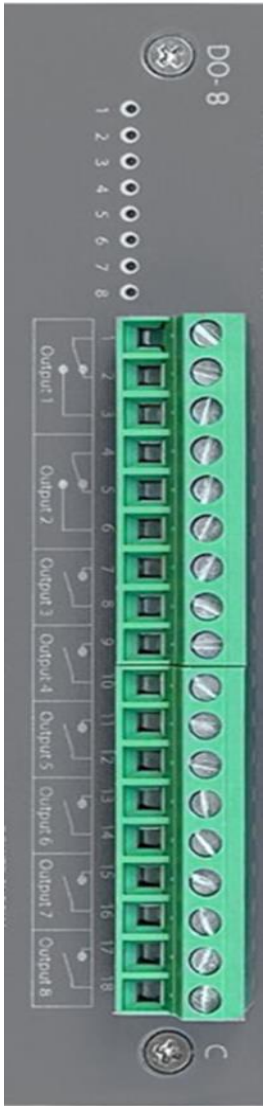
**Terminal 1 from the power supply must be earthed (as well as the earthing screw). Protective earth connections should not be removed when the equipment is energized*

8.5.3. Digital Output Module (DO Module)

There are two types of Output Card:

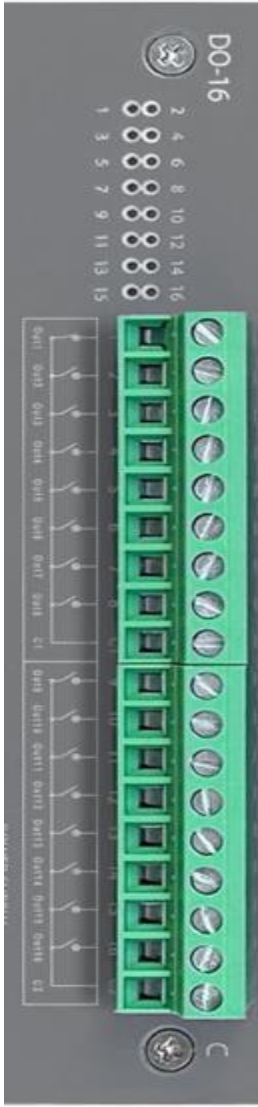
8.5.3.1. DO-8 Card

- 8 digital outputs:
 - 2 switched (3 contacts).
 - 6 independent
- LED indication per point
- Terminals:

DO-8 Card	Digital output	Terminal No.	Contact
	DO 1	1	COM
		2	NC
		3	NO
	DO 2	4	COM
		5	NC
		6	NO
	DO 3	7	COM
		8	NO
	DO 4	9	COM
		10	NO
	DO 5	11	COM
		12	NO
	DO 6	13	COM
		14	NO
	DO 7	15	COM
		16	NO
	DO 8	17	COM
		18	NO

8.5.3.2. DO-16 Card

- 16 digital outputs in 2 groups of 8
- LED indication per point
- Terminals:

DO-16 Card	Digital output	Terminal No.	Contact
	DO 1	1	NO
	DO 2	2	NO
	DO 3	3	NO
	DO 4	4	NO
	DO 5	5	NO
	DO 6	6	NO
	DO 7	7	NO
	DO 8	8	NO
	C1	C1	COM-1
	DO 9	9	NO
	DO 10	10	NO
	DO 11	11	NO
	DO 12	12	NO
	DO 13	13	NO
	DO 14	14	NO
	DO 15	15	NO
	DO 16	16	NO
	C2	C2	COM-2

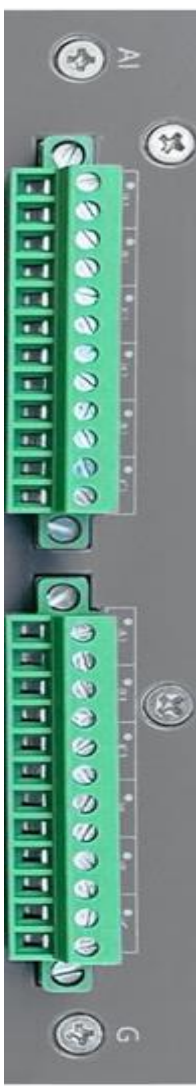
8.5.4. Digital Inputs Module (DI-16 Module)

- 16 digital inputs in 2 groups of 8
- Up to 48 digital inputs (DI-16 x 3 card)
- LED indication per point
- Terminals:

DI-16 Card	Digital input	Terminal No.
	DI 1	1
	DI 2	2
	DI 3	3
	DI 4	4
	DI 5	5
	DI 6	6
	DI 7	7
	DI 8	8
	C1	C1
	DI 9	9
	DI 10	10
	DI 11	11
	DI 12	12
	DI 13	13
	DI 14	14
	DI 15	15
	DI 16	16
	C2	C2

8.5.5. Analog Inputs Module (AI Module)

- 9 Current Inputs
- Current Sensors:
 - LPCT
 - Rogowski
- 3 Current Inputs
- Voltage Sensors:
 - LEAs
- Terminals:

AI Card	Current input	Terminal No.	Voltage input	Terminal No.
	Phase A1	1	Voltage V1	19
		2		20
	Phase B1	3	Voltage V2	21
		4		22
	Phase C1	5	Voltage V3	23
		6		24
	Phase A2	7		
		8		
	Phase B2	9		
		10		
	Phase C2	11		
		12		
	Phase A3	13		
		14		
	Phase B3	15		
		16		
	Phase C3	17		
		18		

9. Type Test

EMC emission test		
Radiated emission	IEC 61850-3 CISPR22 Clause 6.7.4 Table 5/7	Class: A
Conducted emission	IEC 61850-3 CISPR22 Clause 6.7.4 Table 1/2	Class: A
EMC immunity test		
Damped oscillatory wave (1MHz)	IEC61850-3(IEC 61000-4-18) Clause 6.7.3	HV/Telec. 2,5 kV CM 1,0 kV DM
Electrostatic discharge	IEC 61850-3 (IEC 61000-4-2) Clause 6.7.3	6 kV cont. 8 kV air
Radiated, radio-frequency magnetic field	IEC 61850-3 (IEC 61000-4-3) Clause 6.7.3	80 - 3000 MHz AM 10 V/m 80, 160, 380, 450, 900, 1850, 2150 MHz AM 10 V/m
Fast transient/burst	IEC 61850-3 (IEC 61000-4-4) Clause 6.7.3	HV/Telec. 4 kV CM
Surge	IEC 61850-3 (IEC 61000-4-5) Clause 6.7.3	HV/Telec. to 4 kV LE to 2 kV LL to 2 kV LE to 1 kV LL
Conduced disturbance, induced by RF field	IEC 61850-3 (IEC 61000-4-6) Clause 6.7.3	0,15 - 80 MHz 10 V 27, 68 MHz 10 V
Main frequency voltage	IEC 61850-3 (IEC 61000-4-16) Clause 6.7.3	DC, 50 Hz, 60 Hz 30 V; cont.

		300 V; 1 s
Power frequency magnetic field	IEC 61850-3 (IEC 61000-4-8) Clause 6.7.3	100 A/m cont. 1000 A/m 1 s
D.C. voltage dips	IEC 61850-3 (IEC 61000-4-29) Clause 6.7.3	60%; 0,1 s 30%; 0,1 s
D.C. voltage interruptions	IEC 61850-3 (IEC 61000-4-29) Clause 6.7.3	100%; 0,05 s
DC ripple	IEC 61850-3 (IEC 61000-4-17) Clause 6.7.3	10% Ur_dc
Energizing quantities		
DC Burden & inrush current PSU	IEC 61850-3 Clause 6.8.1	
AC Burden & inrush current PSU	IEC 61850-3 Clause 6.8.2	
Burden binary input	IEC 61850-3 Clause 6.8.3	at rated voltage
Climatic tests		
Cold operation	IEC 61850-3 (IEC 60068-2-1, test Ad) Clause 6.9.3.1	-25°C 96 hours
Dry heat operation	IEC 61850-3 (IEC 60068-2-2, test Bd) Clause 6.9.3.2	+70°C 96 hours
Cold storage	IEC 61850-3 (IEC 60068-2-1, test Ab) Clause 6.9.3.3	-25°C 96 hours
Dry heat storage	IEC 61850-3 (IEC 60068-2-2, test Bb) Clause 6.9.3.4	+70°C 96 hours
Change of temperature	IEC 61850-3 (IEC 60068-2-14, test Nb) Clause 6.9.3.5	-25°C; +70°C
Damp heat steady	IEC 61850-3 (IEC 60068-2-78, test Cab) Clause 6.9.3.6	+40°C; 93% 10 days

Damp heat cyclic	IEC 61850-3 (IEC 60068-2-30, test Db) Clause 6.9.3.	+25°C;+55°C (outdoor) 97%; 93% 6 cycles
Mechanical tests		
Vibration response	IEC 61850-3 (IEC 60255-21-1) Clause 6.10.1	Class 1
Vibration endurance	IEC 61850-3 (IEC 60255-21-1) Clause 6.10.1	Class 1
Shock reponse	IEC 61850-3 (IEC 60255-21-2) Clause 6.10.2	Class 1
Shock withstand	IEC 61850-3 (IEC 60255-21-2) Clause 6.10.2	Class 1
Bump	IEC 61850-3 (IEC 60255-21-2) Clause 6.10.2	Class 1
Seismic	IEC 61850-3 (IEC 60255-21-3) Clause 6.10.3	Class 1



FANOX ELECTRONIC

Bizkaia Technology Park

Building, 604

Derio, 48160 Bizkaia SPAIN

T. +34 94 471 14 09

fanox@fanox.com

www.fanox.com

