

MO-067-EN
version 01

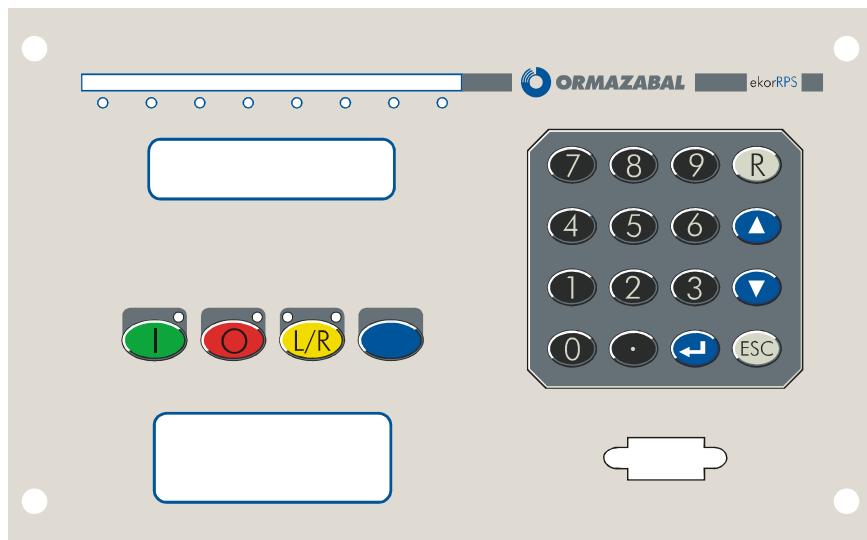
Operation Manual

ekorRPS
MULTIFUNCTIONAL PROTECTION UNIT

CONFIGURATION AND GENERAL CHARACTERISTICS

LIB

30.05.2014



CAUTION!

When MV equipment is operating, certain components are live, other parts may be in movement and some may reach high temperatures. Therefore, the use of this equipment poses electrical, mechanical and thermal risks.

In order to ensure an acceptable level of protection for people and property, and in compliance with applicable environmental recommendations, Ormazabal designs and manufactures its products according to the principle of integrated safety, based on the following criteria:

- **Elimination of hazards wherever possible.**
- **Where elimination of hazards is neither technically nor economically feasible, appropriate protection functions are incorporated in the equipment.**
- **Communication about remaining risks to facilitate the design of operating procedures which prevent such risks, training for the personnel in charge of the equipment, and the use of suitable personal protective equipment.**
- **Use of recyclable materials and establishment of procedures for the disposal of equipment and components so that once the end of their service lives is reached, they are duly processed in accordance, as far as possible, with the environmental restrictions established by the competent authorities.**

Consequently, the equipment to which the present manual refers complies with the requirements of section 11.2 of the forthcoming IEC standard 62271-1. It must therefore only be operated by appropriately qualified and supervised personnel, in accordance with the requirements of standard EN 50110-1 on the safety of electrical installations and standard EN 50110-2 on activities in or near electrical installations. Personnel must be fully familiar with the instructions and warnings contained in this manual and in other recommendations of a more general nature which are applicable to the situation according to current legislation. .

The above must be carefully observed, as the correct and safe operation of this equipment depends not only on its design but also on general circumstances which are in general beyond the control and responsibility of the manufacturer. More specifically:

- **The equipment must be handled and transported appropriately from the factory to the place of installation.**
- **All intermediate storage should occur in conditions which do not alter or damage the characteristics of the equipment or its essential components.**
- **Service conditions must be compatible with the equipment rating.**
- **The equipment must be operated strictly in accordance with the instructions given in the manual, and the applicable operating and safety principles must be clearly understood.**
- **Maintenance should be performed properly, taking into account the actual service and environmental conditions in the place of installation.**

The manufacturer declines all liability for any significant indirect damages resulting from violation of the guarantee, under any jurisdiction, including loss of income, stoppages and costs resulting from repair or replacement of parts.

Guarantee

The manufacturer guarantees this product against any defect in materials and operation during the contractual period. In the event that defects are detected, the manufacturer may opt either to repair or replace the equipment. Improper handling of this equipment and its repair by the user shall constitute a violation of the guarantee.

Registered Trademarks and Copyrights

All registered trademarks cited in this document are the property of their respective owners. The intellectual property of this manual belongs to the manufacturer.

In view of the constant evolution in standards and design, the characteristics of the elements contained in this manual are subject to change without prior notification.

The validity of these characteristics, as well as the availability of components, are subject to confirmation by Ormazabal's Technical - Commercial Department.

CONTENTS

1. GENERAL DESCRIPTION	4
1.1.USER INTERFACE	4
1.1.1. Local.....	4
1.1.2. Remote.....	5
1.2.HARDWARE CONFIGURATION	5
1.3.ENVIRONMENTAL CONDITIONS	7
1.4.TESTS	7
1.4.1. Electrical Tests.....	7
1.4.2. Climatic Tests.....	7
1.4.3. Mechanical Tests.....	7
2. HARDWARE	8
2.1.CONSTRUCTIONAL CHARACTERISTICS	8
2.2.REAR TERMINALS	9
2.3.REAR COMMUNICATION OUTPUT OPTIONS	10
2.3.1. Single output.....	10
2.3.2. Double output.....	10
3. TECHNICAL CHARACTERISTICS	12
3.1.AUXILIARY POWER SUPPLY VOLTAGE	12
3.2.OUTPUT CONTACTS	12
3.3.ANALOGUE OUTPUTS	13
3.4.PHASE AND NEUTRAL CURRENT CIRCUITS (STANDARD RATING 1 A)	13
3.5.SENSITIVE NEUTRAL OR ISOLATED NEUTRAL CURRENT CIRCUITS (STANDARD RATING 0.025 A)	13
3.6.PHASE AND NEUTRAL CURRENT CIRCUITS (SPECIFIED RATING 1/5 A)	13
3.7.SENSITIVE NEUTRAL OR ISOLATED NEUTRAL CURRENT CIRCUITS (SPECIFIED RATING 0.25 / 0.025 A)	13
3.8.VOLTAGE CIRCUITS	14
3.9.ACCURACY OF MEASUREMENTS	14
3.10.OPERATING FREQUENCY	14
3.11.PHASE ORDER	14

1. GENERAL DESCRIPTION

ekorRPS units are multifunctional protection relays of numeric technology, and constitute the basic element of protection measurement and control for cogeneration installations or MV electric bays. They can be used as autonomous protection, control and measurement elements of electric bays, or incorporated into an integrated protection and control system.

Different models are available, each having a distinct aspect of hardware or functionality. A common aspect to all the models is the firmware; the functions available to the user of each model are defined in the circuit of a programmable logic device (PLD), which cannot be configured by the user.

1.1. USER INTERFACE

1.1.1. Local

The front board has:

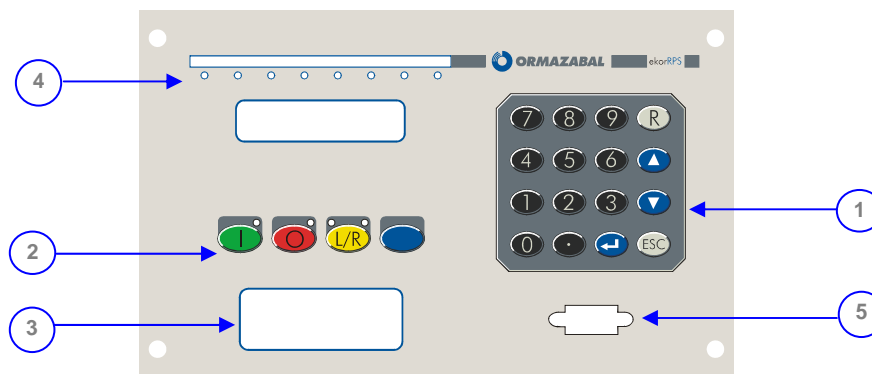


Figure 1.1: Front mimic diagram

1 16-key keyboard

2 4 signalled push-buttons

: Circuit-breaker closing

: Circuit-breaker opening

: Local / Remote

: Validates three other push-buttons in order to prevent unintended operations. It must be pressed at the same time as the other buttons to take effect.

NOTE:

. In order to consider these push-buttons active, they must be pressed for at least half a second.

In order for them to take effect, the "Enable push-buttons" configuration must be set to "Yes".

3 2-row, 16-character display

4 7 red LED lights and one green/red

5 RS-232 connector for direct connection to a PC via Procome Protocol.

1.1.2. Remote

Depending on the model, there is a rear board consisting of 1 or 2-way glass optical fibre (ST type connector), plastic optical fibre, RS-232 or RS-485 for a PC, modem or substation control unit connection (in integrated systems). Protocol available is: Procome, DNP 3.0, MODBUS, IEC 870-5-101 or IEC 870-5-103.

Models with an Ethernet port (optical fibre or RJ-45) are available with TCP/IP Procome protocol.

1.2. HARDWARE CONFIGURATION

The different hardware possibilities that define a model are:

Hardware Configuration		
Box type	Horizontal	
Terminal type	Pin-type termination	
	Eyelet termination	
Unit power supply voltage	125 / 220 V _{DC}	
	24 / 48 V _{DC}	
Voltage range of digital inputs	Extended (low)	18 to 160 V _{DC} ^(*)
	Extended (high)	86 to 280 V _{DC} ^(*)
	Restricted 24 V _{DC}	18 to 34 V _{DC} ^(**)
	Restricted 48 V _{DC}	36 to 60 V _{DC} ^(**)
	Restricted 125 V _{DC}	85 to 150 V _{DC} ^(**)
	Restricted 220 V _{DC}	165 to 264 V _{DC} ^(**)

^(*) Single-directional inputs (with polarity)

^(**) Two-way inputs (without polarity)

Hardware Configuration		
Number of digital inputs/outputs	Standard	8 inputs (5 independent, 3 with a common point)
		7 outputs (4 independent, 3 with a common point)
	Extended: adds to the standard	9 inputs (6 independent, 3 with a common point)
		7 outputs (4 independent, 3 with a common point)
	Extended (option 2): adds to the standard	5 independent inputs
		6 outputs (4 independent, 2 with a common point)
		2 analogue outputs (0 to 5 mA) ^[1]
Rear communication ^[2]		Glass optical fibre (GOF)
		Plastic optical fibre (POF)
		RS-232
		RS-485
		GOF + GOF
		POF + POF
		RS-232 + RS-232
		RS-485 + RS-232
		GOF + RS-232
		GOF + Ethernet (RJ-45)
		GOF + Ethernet (OF)
		RS-232 + Ethernet (RJ-45)
RS-485 + Ethernet (RJ-45)		
Analogue inputs ^[3]	Input number	Application
	1	I _A phase current metering
	2	I _B phase current metering
	3	I _C phase current metering
	4	I _N sensitive neutral current metering
	5 ^[4]	Not available
		I _N sensitive neutral current metering
	6	V ₀ zero-sequence voltage metering
		V _A phase voltage metering
	7	V _B phase voltage metering
	8	V _C phase voltage metering
	9 ^[4]	Not available
V ₀ zero-sequence voltage metering		
V ₀ zero-sequence voltage metering for the syncrocheck function		

[1] For other ranges, please consult the **Ormazabal** Technical - Commercial Department.

[2] In the event of rear two-way ports, the one indicated in second place is in parallel with the front RS-232 (they occupy the same port).

[3] The unit can have up to 9 analogue inputs (via a transformer).

[4] Depending on the model, the input possibilities vary.

1.3. ENVIRONMENTAL CONDITIONS

- Operation temperature - 10 to + 55 °C
- Storage temperature - 40 to + 85 °C
- Relative humidity up to 95% with no condensation

1.4. TESTS

1.4.1. Electrical Tests

- Dielectric rigidity acc. to IEC 255-5, C series (2 kV, 1 min)
- Insulation resistance acc. to IEC 255-5, > 10 GΩ at 500 V_{dc}
- Pulse (lightning impulse) acc. to IEC 255-5, appendix E., class III
- HF disturbances acc. to IEC 255-22-1, class III
- Fast transients (bursts) acc. to IEC 61000-4-4, class IV
- Electrostatic discharges acc. to IEC 61000-4-2, class IV
- Overvoltage pulses (surge) acc. to IEC 61000-4-5, class IV
- Voltage dips acc. to IEC 60870-2-1, 100 ms at 110 V_{dc}
- Radiated electromagnetic interference acc. to EN 61000-6-4
- Immunity to radiated fields acc. to IEC 61000-4-3, class III
- Immunity to induced signals acc. to IEC 61000-4-6, class III radiofrequency
- Immunity to magnetic fields acc. to low frequency IEC 61000-4-8

1.4.2. Climatic Tests

- Cold acc. to IEC 68-2-1 (-40°C)
- Dry heat acc. to IEC 68-2-2 (+85°C)
- Humid heat acc. to IEC 68-2-3 (+70°C, 93% Relative humidity)
- Thermal shock acc. to IEC 68-2-14 (-20°/70°C. 2 4-hour cycles)
- Operating range - 10°C to + 55°C

1.4.3. Mechanical Tests

- Vibration tests acc. to IEC 255-21-1 class I
- Shock and bump tests acc. to IEC 255-21-1 class I

2. HARDWARE

2.1. CONSTRUCTIONAL CHARACTERISTICS

Horizontal box (ekorRPS-H).

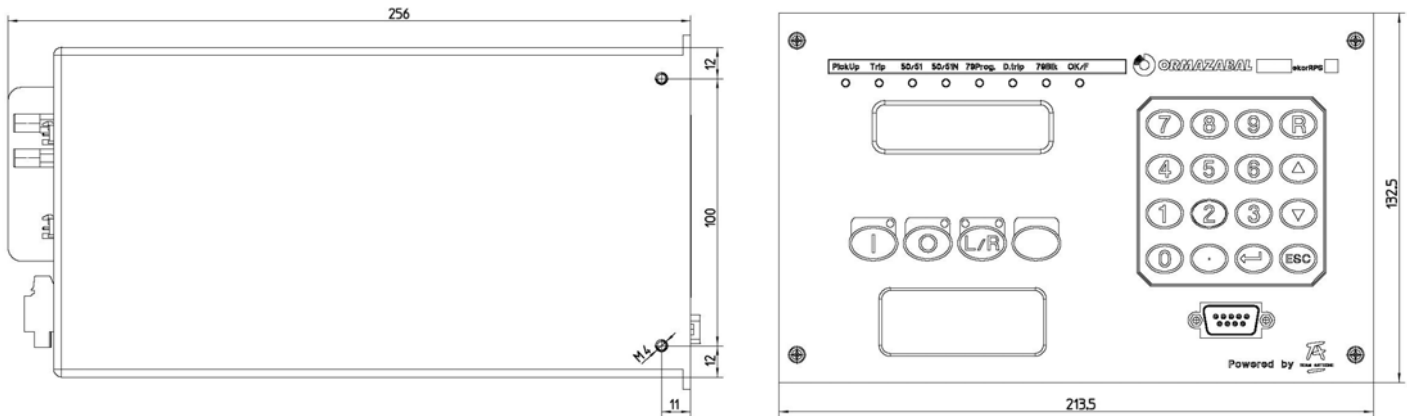


Figure 2.1: External dimensions of the unit [mm]

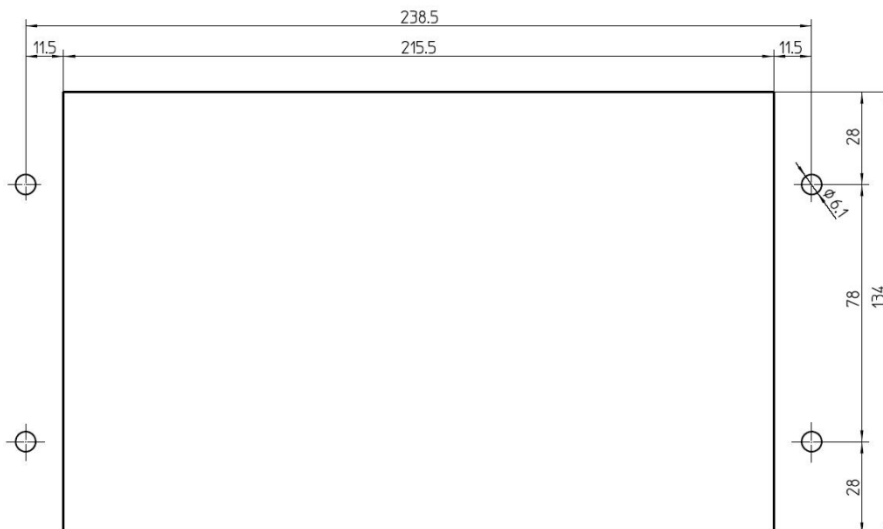


Figure 2.2: Panel cut-off [mm]

2.2. REAR TERMINALS

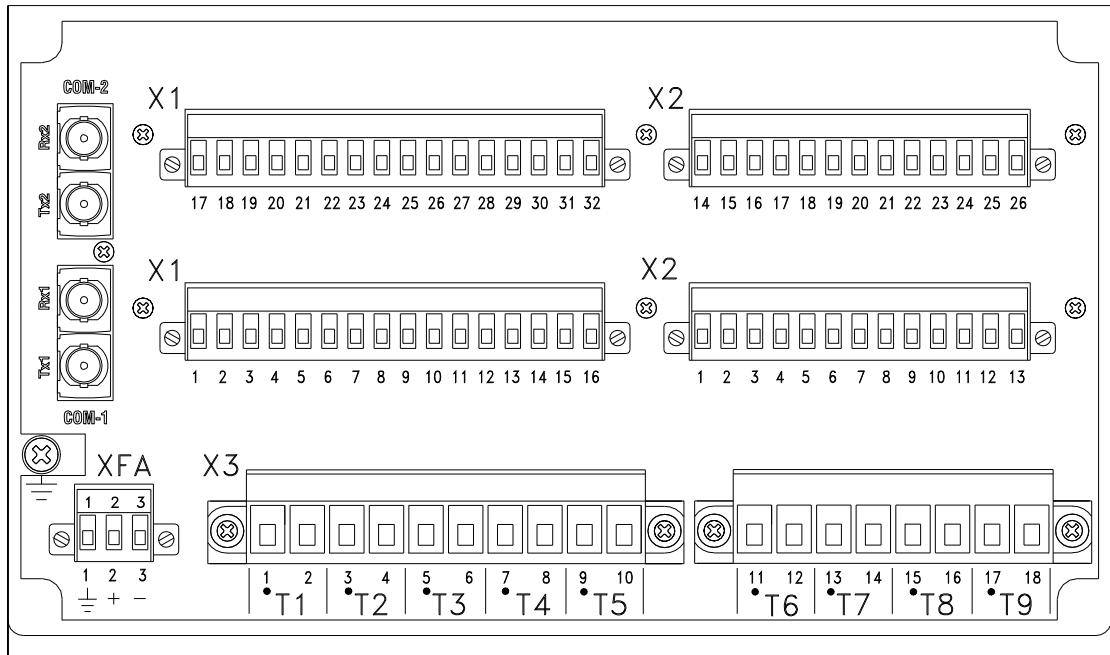


Figure 2.3: Standard (all for pin-type termination)

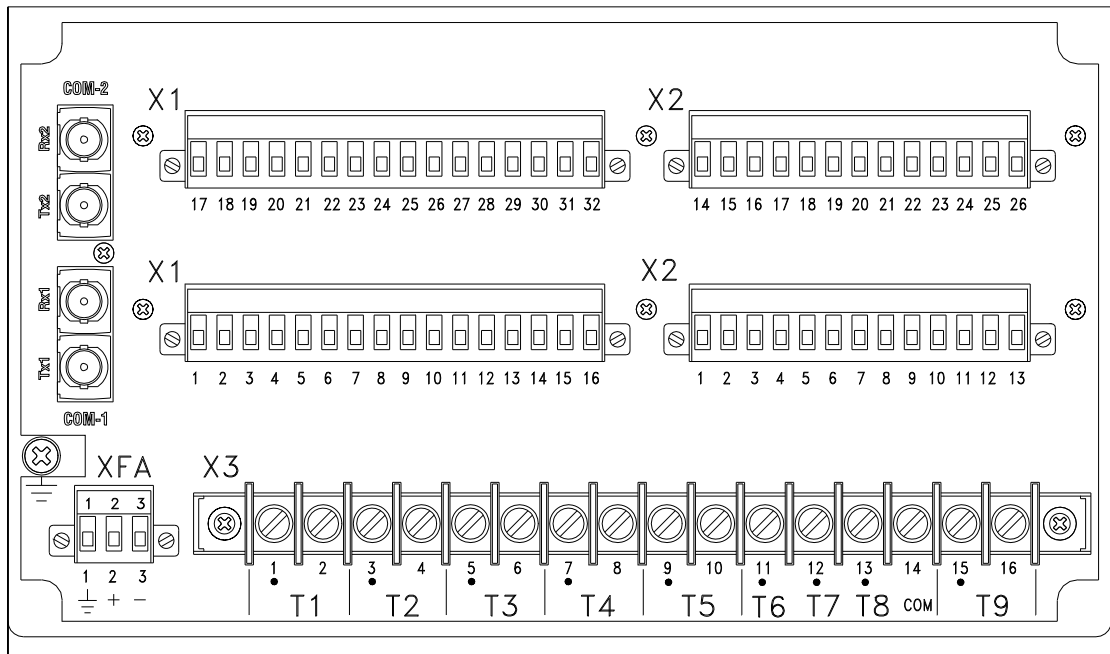


Figure 2.4: Eyelet-type termination terminal option for analogue inputs

2.3. REAR COMMUNICATION OUTPUT OPTIONS

2.3.1. Single output

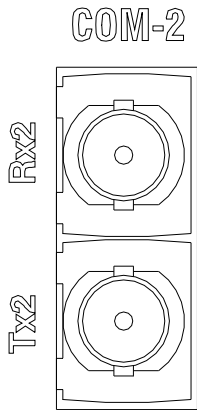


Figure 2.5: OF (glass or plastic)

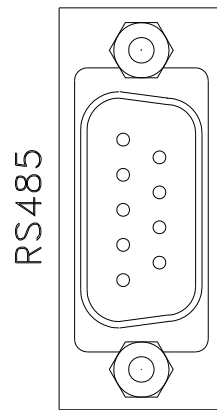


Figure 2.6: RS-485

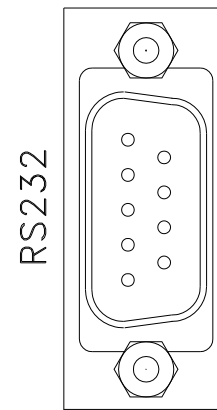


Figure 2.7: RS-232

2.3.2. Double output

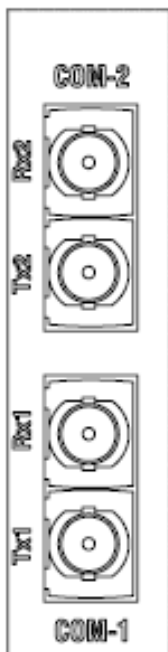


Figure 2.8: OF + OF

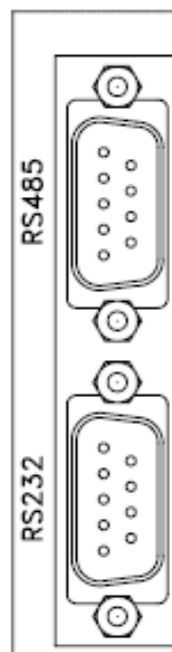


Figure 2.9: RS-485 + RS-232

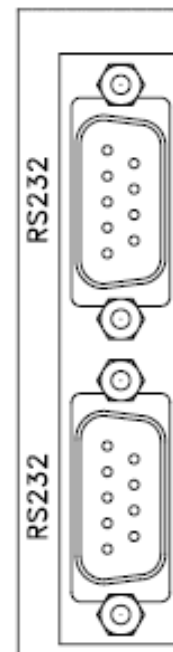


Figure 2.10: RS-232 + RS232



Figure 2.11: OF + RS-232

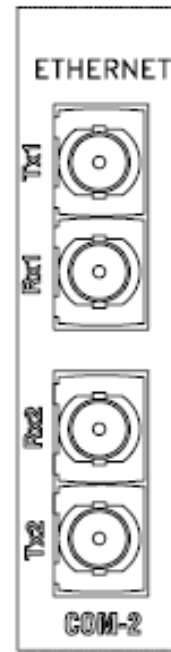


Figure 2.12: Ethernet OF + OF

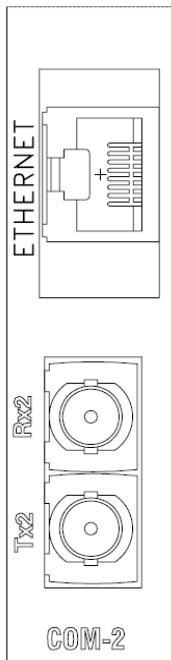


Figure 2.13: Ethernet RJ45 + OF

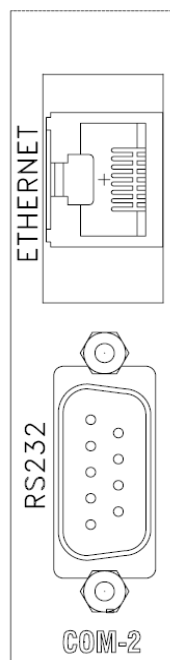


Figure 2.14: Ethernet RJ45 + RS-232

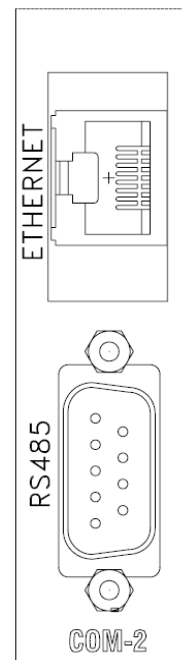


Figure 2.15: Ethernet RJ45 + RS-485

3. TECHNICAL CHARACTERISTICS

3.1. AUXILIARY POWER SUPPLY VOLTAGE

- 24 and 48 V_{dc} models
 - ❖ Operating range: 18 to 60 V_{dc}
- 125 and 220 V_{dc} models
 - ❖ Operating range: 86 to 280 V_{dc}
- Consumption: 8 W minimum
 18 W maximum

3.2. OUTPUT CONTACTS

- | | | | |
|-----------------------------|--------------------------------|---------------------|--------|
| • Relays 1 to 6 and 8 to 13 | Passage of current (permanent) | + 5 A to + 25 °C | |
| | Max. inrush current (0.5 s) | 30 A | |
| | Breaking capacity | 220 V _{dc} | 0.4 A |
| | | 125 V _{dc} | 1 A |
| | | 48 V _{dc} | 3 A |
| | Breaking capacity (L/R=40 ms) | 220 V _{dc} | 0.2 A |
| 125 V _{dc} | | 0.3 A | |
| 48 V _{dc} | | 0.5 A | |
| • Relays 7 and 14 | Passage of current (permanent) | + 5 A to + 25 °C | |
| | Max. inrush current (0.5 s) | 30 A | |
| | Breaking capacity | 220 V _{dc} | 0.15 A |
| | | 125 V _{dc} | 0.4 A |
| | | 48 V _{dc} | 2 A |
| | Breaking capacity (L/R=40 ms) | 125 V _{dc} | 0.25 A |
| 48 V _{dc} | | 0.5 A | |

3.3. ANALOGUE OUTPUTS

- Range: 0 to 5 mA
- Accuracy: $\pm 1\%$ of full scale
- Maximum load: 1200Ω
- Insulation: 1 kV

3.4. PHASE AND NEUTRAL CURRENT CIRCUITS (standard rating 1 A)

- Phases full scale 40 A
- Neutral full scale 20 A
- Thermal Capacity
 - ❖ Continuous 20 A
 - ❖ Short duration 500 A (1 s)
- Consumption $I_r = 1 \text{ A}$ $< 0.02 \text{ VA}$

3.5. SENSITIVE NEUTRAL OR ISOLATED NEUTRAL CURRENT CIRCUITS (standard rating 0.025 A)

- Full scale 1 A
- Thermal Capacity
 - ❖ Continuous 3 A
 - ❖ Short duration 60 A (1 s)
- Consumption $I_r = 0.025 \text{ A}$ $< 0.015 \text{ VA}$

3.6. PHASE AND NEUTRAL CURRENT CIRCUITS (specified rating 1/5 A)

- Thermal Capacity
 - ❖ Continuous 20 A
 - ❖ Short duration 500 A (1 s)
 - ❖ Very short duration 1250 A (half cycle)
- Consumption $I_r = 5 \text{ A}$ $< 0.2 \text{ VA}$
- Consumption $I_r = 1 \text{ A}$ 0.02 VA

3.7. SENSITIVE NEUTRAL OR ISOLATED NEUTRAL CURRENT CIRCUITS (specified rating 0.25 / 0.025 A)

- Thermal Capacity
 - ❖ Continuous 20 A
 - ❖ Short duration 500 A (1 s)
- Consumption $I_r = 0.025 \text{ A}$ 0.015 VA

3.8. VOLTAGE CIRCUITS

- Thermal Capacity
 - ❖ Continuous $2 U_r$
 - ❖ Short duration $5 U_r$ (1 s)
 $3.5 U_r$ (1 min)
 - ❖ Consumption 63.5 V 0.015 VA
 - ❖ Consumption 100 V $< 0.03 \text{ VA}$

NOTE:

ekorRPS units preferably have standard rating current circuits. Specified rating current circuits can be provided optionally after confirmation from the **Ormazabal** Technical - Commercial Department.

3.9. ACCURACY OF MEASUREMENTS

- Current
 - ❖ Range $(0 \text{ to } 1.2 \cdot I_r)$
 - For $I_r=1$: class 1 (1% of I_r)
 - For $I_r=5$: class 0.5 (0.5% of I_r)
 - ❖ Protection range $(0.1 \text{ to } 200 \text{ A})$
 - 1% of the real value, for $I > 1 \text{ A}$
 - 3% of the real value, for $I > 1 \text{ A}$

(in areas where the measurement range and the protection range overlap, the accuracy is the best one of both of them)
- Voltage
 - ❖ Accuracy 0.5% of rated voltage U_r to $1.2 \cdot V_r$
- Phase difference angles
 - ❖ Accuracy $\pm 1^\circ$
- Active power
 - ❖ Range $(0 \text{ to } 1.2 \cdot I_r \cdot 1.2 \cdot V_r)$
 - For $I_r= 1$: class 1 (1% of P_r)
 - For $I_r= 5$: class 0.5 (0.5% of P_r)

3.10. OPERATING FREQUENCY

- Rated: $50 \text{ or } 60 \text{ Hz}$ (programmable)
- Operating range: $f_r \pm 5 \text{ Hz}$

3.11. PHASE ORDER

- ABC or CBA (programmable)



TECHNICAL - COMMERCIAL DEPARTMENT:

www.ormazabal.com

