Protection and monitoring relay

RDA-10A, RDA-100A



INSTRUCTION MANUAL

(M359BVM-03-24A)

CE


22
PAP

SAFETY PRECAUTIONS

Follow the warnings described in this manual with the symbols shown below.

	**DANGER** Warns of a risk, which could result in personal injury or material damage.

	**ATTENTION** Indicates that special attention should be paid to a specific point.

If you must handle the unit for its installation, start-up or maintenance, the following should be taken into consideration:

	Incorrect handling or installation of the unit may result in injury to personnel as well as damage to the unit. In particular, handling with voltages applied may result in electric shock, which may cause death or serious injury to personnel. Defective installation or maintenance may also lead to the risk of fire. Read the manual carefully prior to connecting the unit. Follow all installation and maintenance instructions throughout the unit's working life. Pay special attention to the installation standards of the National Electrical Code.

	**Refer to the instruction manual before using the unit** In this manual, if the instructions marked with this symbol are not respected or carried out correctly, it can result in injury or damage to the unit and / or installations.

Vector, reserves the right to modify features or the product manual without prior notification.

DISCLAIMER

Vector, reserves the right to make modifications to the device or the unit specifications set out in this instruction manual without prior notice.

Vector, on its web site, supplies its customers with the latest versions of the device specifications and the most updated manuals.

www.vectorenergy.com

	**Vector,** recommends using the original cables and accessories that are supplied with the device.

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REVISION LOG

Table 1: Revision log.

Date	Revision	Description
04/24	M359BVM-03-24A	First Version

SYMBOLS

Table 2: Symbols.

Symbol	Description
CE	In accordance with the relevant European directive.
	Device covered by European Directive 2012/19/EC. At the end of its useful life, do not discard of the device in a household refuse bin. Follow local regulations on electronic equipment recycling.
⎓	Direct current.
~	Alternating current.

Note: *The images of the devices are for illustrative purposes only and may differ from the original device.*

1.- VERIFICATION UPON RECEPTION

Upon receipt of the device, check the following points:

a) The device meets the specifications described in your order.
b) The device has not sustained any damage during transport.
c) Perform an external visual inspection of the device prior to switching it on.
d) Check that it has been delivered with the following:

- An installation guide,

> If any problem is noticed upon reception, immediately contact the transport company and/or **Vector**'s after-sales service.

2 - PRODUCT DESCRIPTION

The **RDA-10A / RDA-100A** is a type-A ultraimmunised earth leakage protection and monitoring relay that is compatible with the earth leakage transformers in the **TDC** range.



The device features:

- Display for showing the parameters.
- **3 keys** to browse through the different screens and program the device.
- **2 relays:** a tripping relay and a pre-alarm relay.
- **Digital** test or remote control **inputs** (**TRIP / RESET**).
- **3 DIN rail modules**, panel installation with front accessory.
- **RS-485 communications,** available on the **RDA-100A** model.

The **TDC** is a range of electronic, type A earth leakage protection and measuring transformers.

Vector offers 12 models with transformers of different sizes.

3.- INSTALLATION OF THE DEVICE

3.1 - PRELIMINARY RECOMMENDATIONS



In order to use the device safely, personnel operating it must follow the safety measures that comply with the standards of the country where it is to be installed; operators must wear the required personal protective equipment (rubber gloves, approved facial protection and flame-resistant clothing) to prevent injuries from electric shock or arcs caused by exposure to current-carrying conductors, and they must heed the various warnings indicated in this instruction manual.

The **RDA-10A / RDA-100A** device must be installed by authorised and qualified staff.

The power supply plug must be disconnected and measurement systems switched off before handling, altering the connections or replacing the device. It is dangerous to handle the device while it is powered.

Cables must always be kept in perfect condition to avoid accidents or injury to personnel or installations.

Restrict the operation of the device to the specified measurement category, voltage or current values.

The manufacturer of the device is not responsible for any damage resulting from failure by the user or installer to heed the warnings and/or recommendations set out in this manual, nor for damage resulting from the use of non-original products or accessories or those made by other manufacturers.

Do not use the device to take any measurements if an anomaly or malfunction is detected.

Check the surrounding environment before starting to take measurements. Do not take any measurements in hazardous or explosive environments.



Before carrying out maintenance or repairs, or handling any of the device's connections, the device must be disconnected from all power sources, both from the device's own power supply and the measurement's.
Contact the after-sales service if you notice that the device is not working properly.

3.2.- INSTALLATION



When the device is on, its terminals, opening covers or removing elements may expose the user to parts that are hazardous to touch. Do not use the device until it is fully installed.

The device must be installed inside an electric panel or enclosure with DIN rail mounting (IEC 60715).

Note: *Follow the instructions in **Figure 1** to correctly install the device on the DIN rail.*

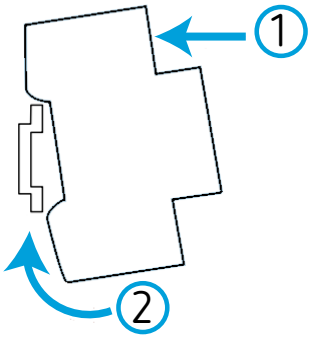


Figure 1:Installing the RDA-10A on the DIN rail.

The device has a LED (**CPU**) that indicates voltage presence. Even if the aforementioned LED is off, the user still needs to verify that the device is disconnected from any power supply.

The **RDA-10A / RDA-100A** has to be connected to a power circuit that is protected with a circuit-breaker or equivalent device to disconnect the device from the mains supply.

3.3 - PANEL MOUNTING ACCESSORY (72 x 72 mm)

Note: *The 72 x 72 mm panel mounting accessory is sold separately.*

Vector has a panel mounting accessory for the **RDA-10A / RDA-100A** device so that it can be installed on 72 x 72 mm panels.

Figure 2 shows the installation of the panel mounting accessory to the **RDA-10A / RDA-100A**.

Disconnect all power supplies and measuring equipment from the device before installing the panel mounting accessory.

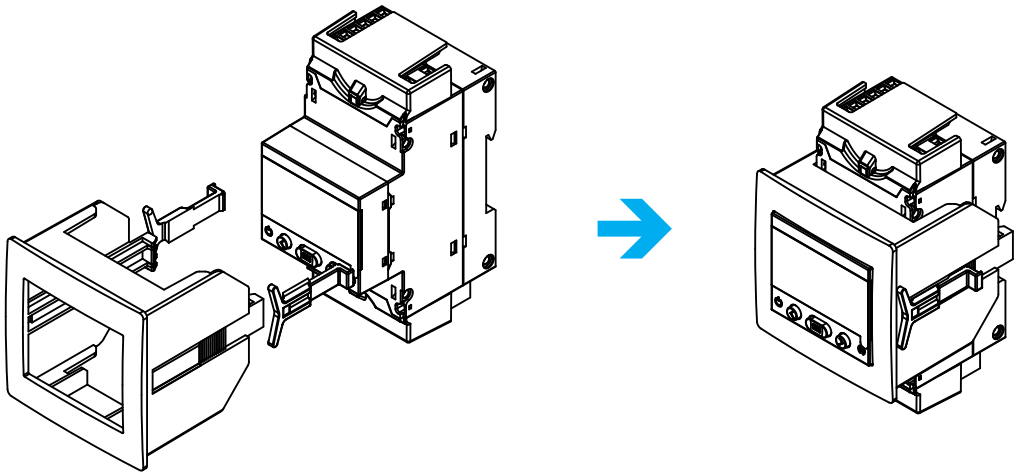


Figure 2: Installation of the panel mounting accessory.

Table 3: Technical features.

Technical features	
Protection degree	IP40
Enclosure	Self-extinguishing V0 plastic

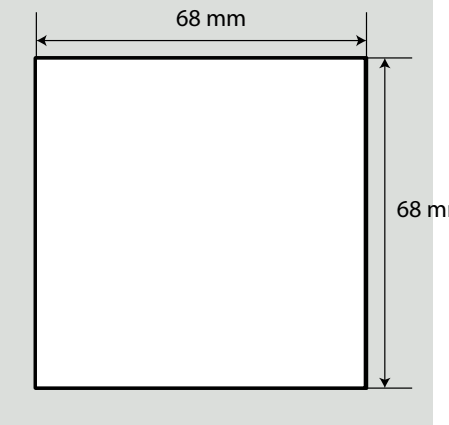


Figure 3: Panel cut-out.

3.4 - DEVICE TERMINALS

3.4.1. RDA-10A

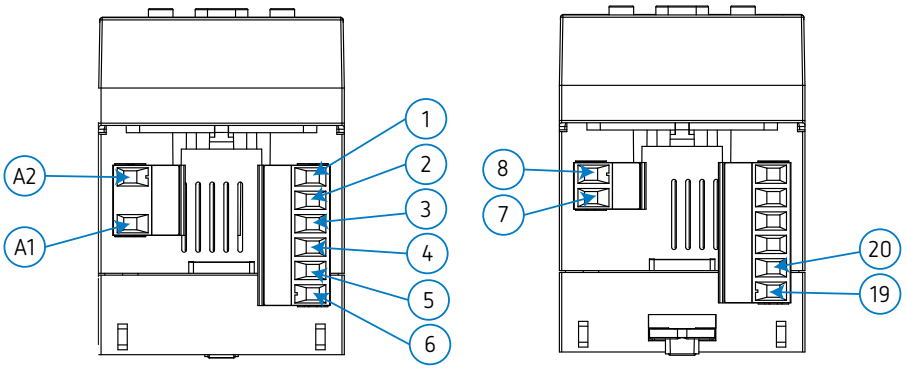


Figure 4: Terminals of the RDA-10A: Upper - Lower.

Table 4: List of RDA-10A terminals.

Device terminals	
A1: A1, Power supply	**5: R2,** Pre-alarm relay (NC)
A2: A2, Power supply	**6: C2,** Pre-alarm relay (Common)
1: R1, Trip relay (NO)	**7: 1S1,** Transformer connection **TDC**
2: R1, Trip relay (NC)	**8: 1S2,** Transformer connection **TDC**
3: C1, Trip relay (Common)	**19: TRIP/RESET**, Input for trigger or external reset
4: R2, Pre-alarm relay (NO)	**20: TRIP/RESET**, Input for trigger or external eset

3.4.2. RDA-100A

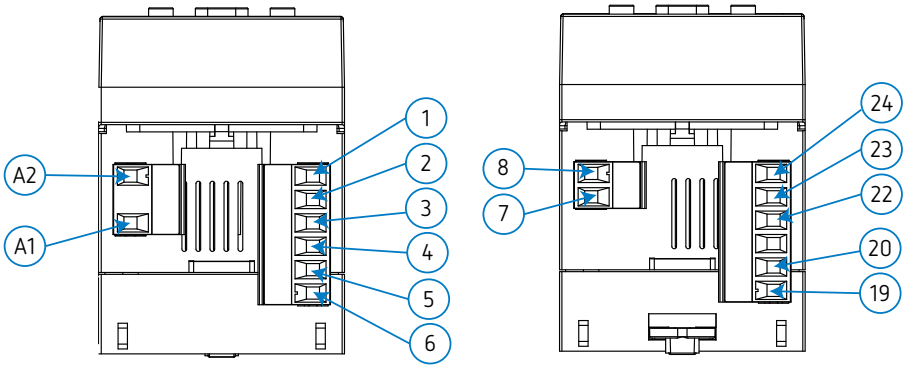


Figure 5: Terminals of the RDA-100A: Upper - Lower.

Table 5: List of RDA-100A terminals.

Device terminals	
A1: A1, Power supply	**7: 1S1,** Transformer connection **TDC**
A2: A2, Power supply	**8: 1S2,** Transformer connection **TDC**
1: R1, Trip relay (NO)	**19: TRIP/RESET**, Input for trigger or external reset
2: R1, Trip relay (NC)	**20: TRIP/RESET**, Input for trigger or external eset
3: C1, Trip relay (Common)	**22: S,** GND for RS-485
4: R2, Pre-alarm relay (NO)	**23: B-,** RS-485
5: R2, Pre-alarm relay (NC)	**24: A+,** RS-485
6: C2, Pre-alarm relay (Common)	

3.5 - TDC TRANSFORMERS

The transformer is designed for wall-mounting or DIN-rail assembly with an accessory for installation.

The **TDC** is a feed-thru busbar type transformer, where the conductor cables to be measured must pass through the inner hole or window of the transformer.

3.5.1 PANEL INSTALLATION

For panel installation, 4 clamping clips are provided with the transformer, see **Figure 6**.

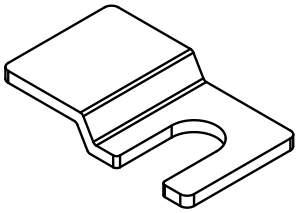


Figure 6: Clamping clip.

The clamping clips must be installed on the **TDC**, as shown in **Figure 7**.

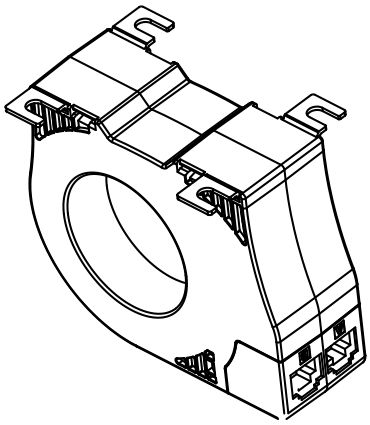


Figure 7: Position of the clamping clips.

3.5.2 INSTALLATION ON A DIN RAIL

For installation on a DIN rail, two support brackets are provided with the device, see **Figure 8**.

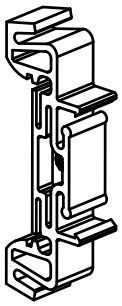


Figure 8: TDC support brackets.

The steps to ensure proper installation are:

1 - Install the brackets in the **TDC**, **Step 1** in **Figure 9**.

2 - Install the **TDC** on the DIN rail, **Step 2** in **Figure 9**.

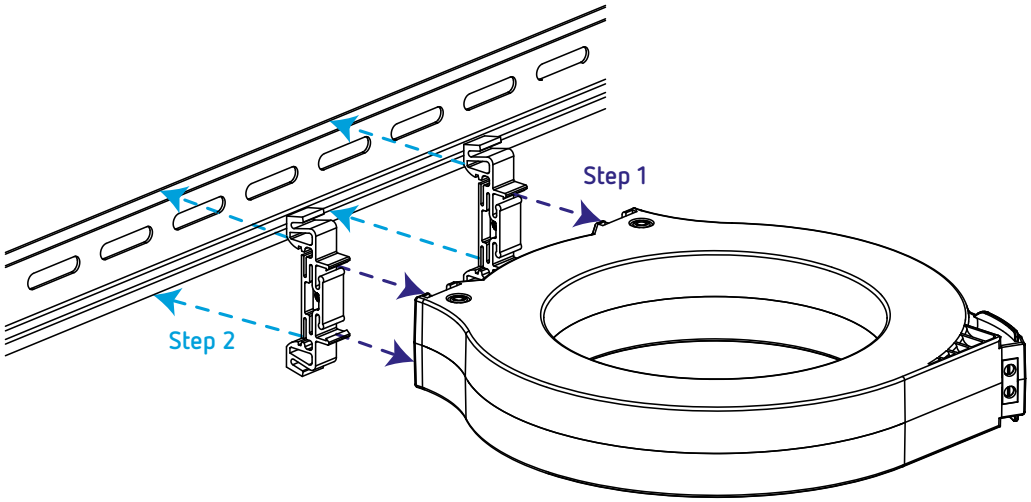


Figure 9: Installing a TDC on the DIN rail.

3.5.3 DISTRIBUTION OF THE CONDUCTORS IN THE TDC

All the active conductors that feed the loads or part of the installation where earth leakage protection or monitoring is required must pass through the **TDC** transformer associated with the **RDA-10A / RDA-100A**.
Active conductors are defined as the phases (**L1**, **L2** and **L3**) and neutral. Never the protection cable (**PE** or **Earth**) (**Figure 10**).

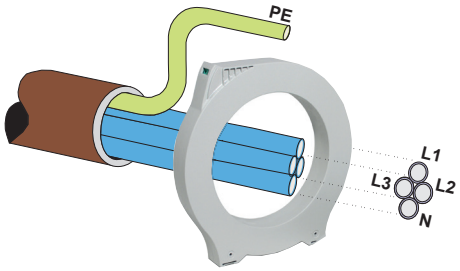


Figure 10:Distribution of the conductors.

> Routing the Earth cable (PE) and the rest of the active conductors through the transformer disables earth leakage current measurement, and earth leakage protection and motorisation consequently cease to function.

In the event of having to route a cable hose containing all the conductors, including the earth conductor (PE), the PE conductor must be routed in the opposite direction to counteract the effects of its original path, see **Figure 11**.

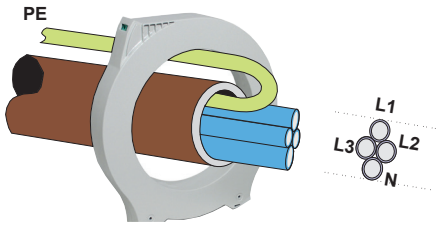


Figure 11:Conductor distribution (cable hose).

Conductor routing must be neat, centred and separated from the transformer's inner opening, **Figure 12**.

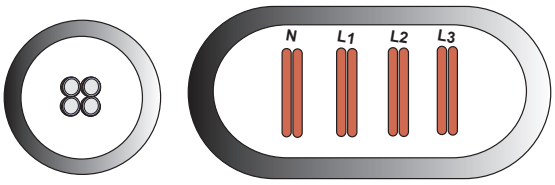


Figure 12:Correct distribution of conductors.

> The inadequate arrangement of the conductors, as shown in **Figure 13**, as well as not following the recommendations indicated in **Figure 14,** can cause the transformer to lose its measurement efficiency and residual current protection. Unexpected disconnections may occur in the installation if the **TDC** is associated to a differential relay that actuates the circuit breaker.

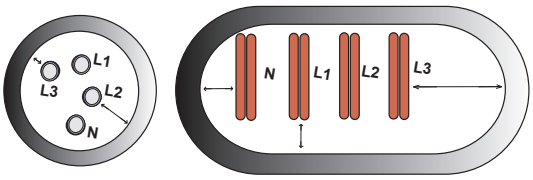


Figure 13:Incorrect distribution of conductors.

The elbows of the conductors passing through the **TDC** must be avoided, both at inlet (before feed-through) and outlet (after feed-through),**Figure 14**.

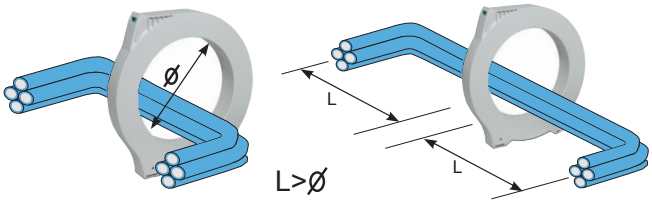


Figure 14:Avoid elbows in conductors.

3.6 - CONNECTION DIAGRAMS

3.6.1 CONNECTION WITH EMISSION COIL

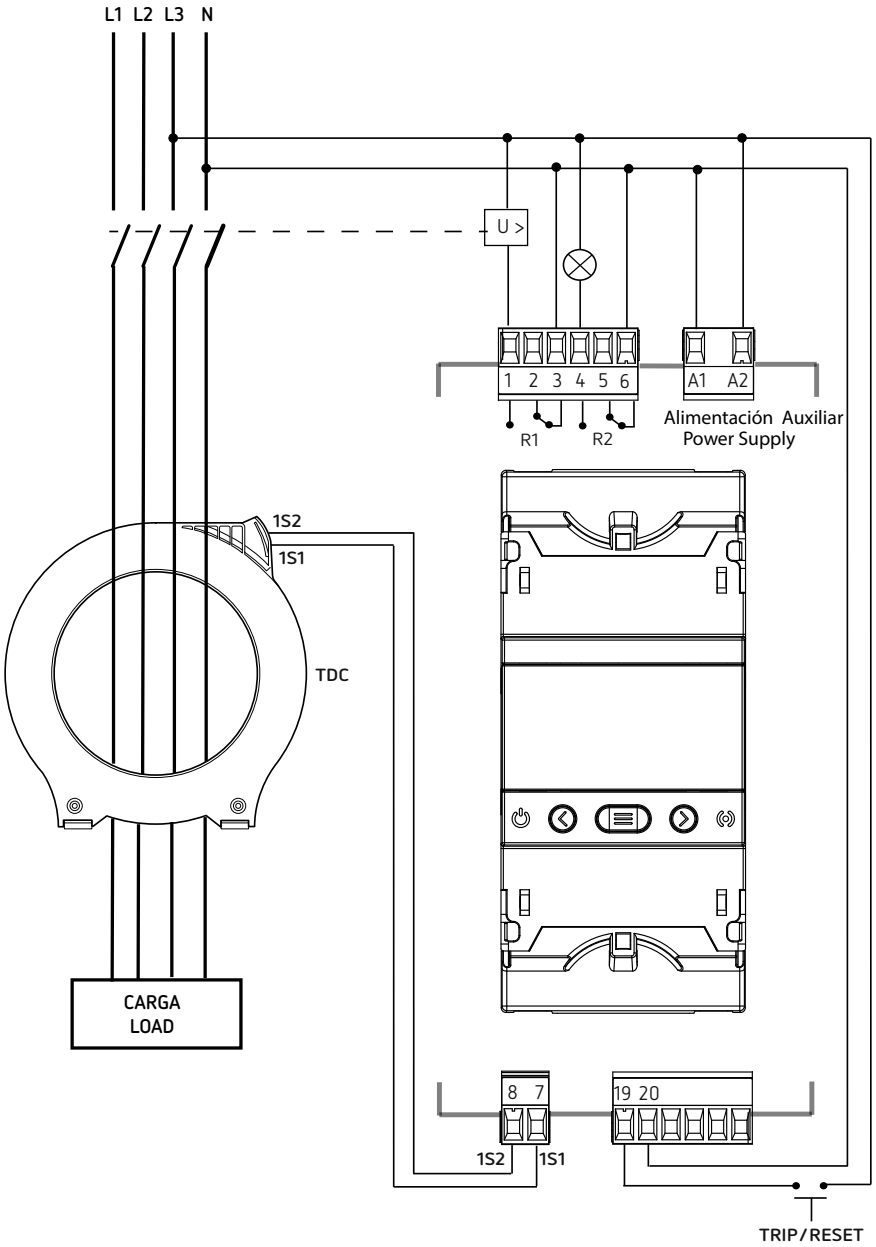


Figure 15: Connection diagram with emission coil.

3.6.2 CONNECTION WITH UNDERVOLTAGE COIL

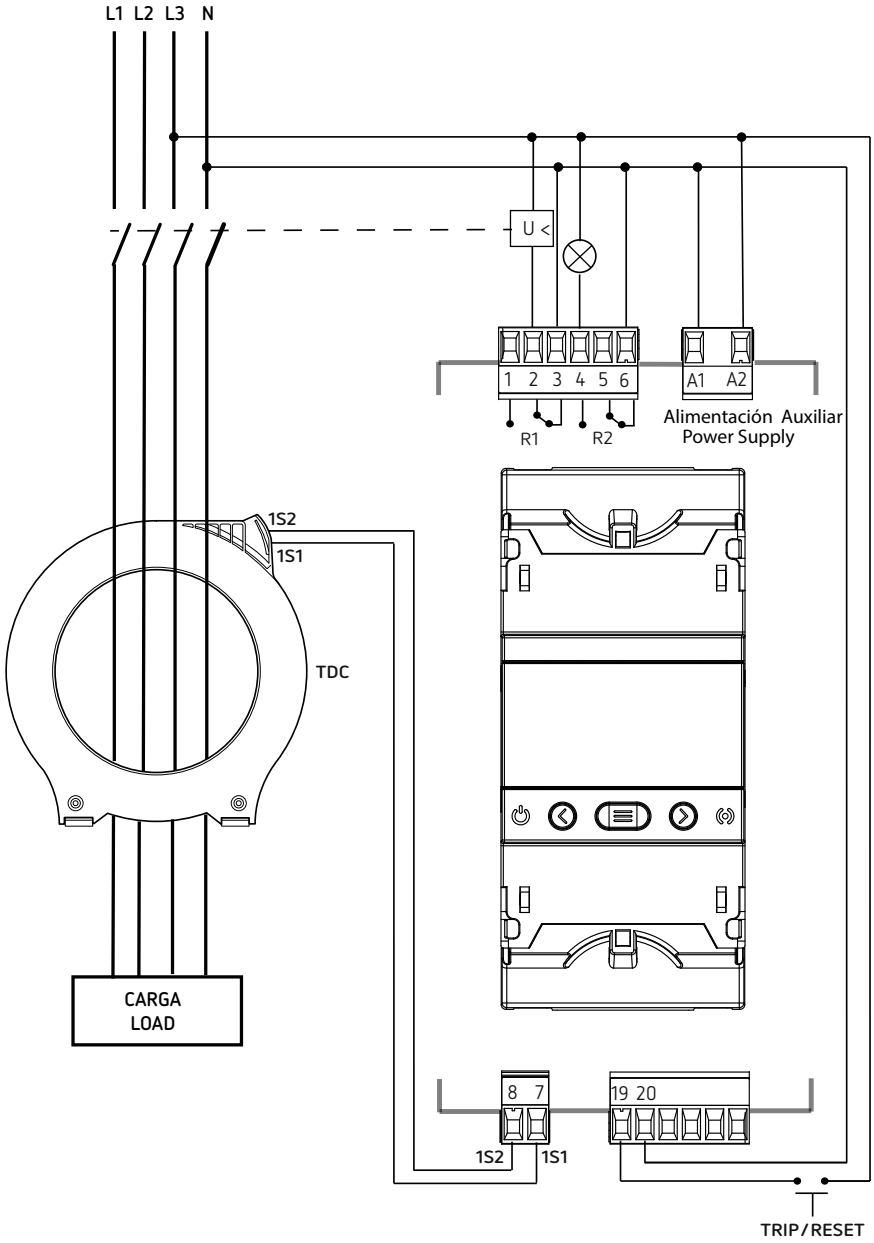


Figure 16: Connection diagram with undervoltage coil.

4.- OPERATION

4.1 - PRINCIPLE OF OPERATION

The **RDA-10A /RDA-100A** is a type-A ultraimmunised earth leakage protection and monitoring relay that is compatible with the earth leakage transformers in the **TDC** range.
The device measures, calculates and displays the residual current of balanced or unbalanced three-phase industrial networks. The measurement is a true RMS value, taken by using a residual current input from an external measurement toroidal transformer of the **TDC** series.

The **RDA-10A /RDA-100A** can be used to program and adjust all the parameters required to obtain complete protection and control of the installation.

In normal operating conditions, the main values that determine the residual current protection of the installation, such as sensitivity, delay and instantaneous leakage current, are shown on the display.

In normal operating conditions, the display is shown in **White**, **Blue** if in configuration mode, **Yellow** if the pre-alarm has tripped, or **Red** for any event that causes a trip of the main relay, showing the reason.

Main characteristics:

- ✓ True root mean square value.
- ✓ Ultra-immunised type A differential.
- ✓ Immunity to transients.
- ✓ Filtering of the highest order high frequencies.
- ✓ Trip adjustment between 80 and 100% **IΔn**.
- ✓ Inverse curve.

4.2 - LED INDICATORS

The **RDA-10A /RDA-100A** device has 2 LEDs:

- **CPU**, indicates that the device is on.

- **STATE**, indicates the device status, see **Table 6**.

Table 6: State LED.

LED	Backlight	Description
Fast blinking	**OFF**	Device processing the signal.
Slow blinking	**Yellow**	Pre-alarm relay trip.
ON	**Network**	Deive triped due to leakage, transformer error, external trip or TEST of the trip relay.

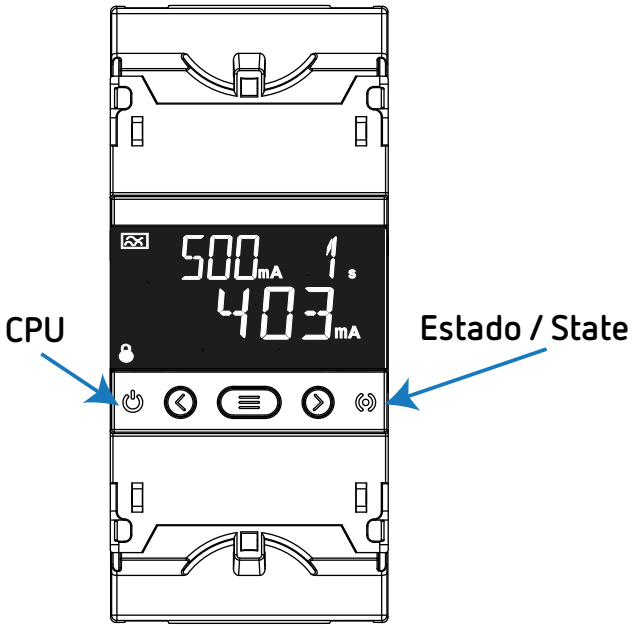


Figure 17: RDA-10A/RDA-100A LED indicators.

4.3 - DISPLAY

The device has a backlit LCD display that is split into two areas (**Figure 18**):

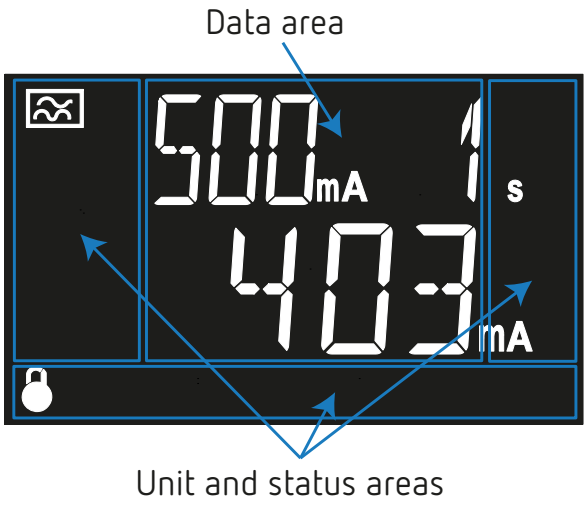


Figure 18: RDA-10A/RDA-100A display areas.

✓ The **data area**, which displays all the values measured by the device, as well as the sensitivity or delay settings.

✓ The **unit and device status area,** which displays the different statuses, units and device information (**Table 7**).

Table 7: Display icons.

Icon	Description	Icon	Description
	Type-A residual current protection		Pre-alarm activated.
prog	Programming screen.	trip	A trip has been generated.

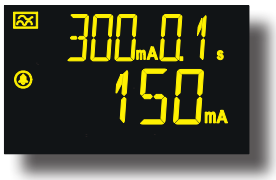
Table 7 (Continued): Display icons.

Icon	Description
	The relay works with positive polarity.
	The direct adjustments "*6 - DIRECT ADJUSTMENTS*" are locked. The setup menu *"7 - CONFIGURATION"* is locked and cannot be accessed. Go to the lock menu, *"5.4 - LOCK"* to change the option.

The device's display can change colour, indicating:



Blue:
Adjustment or configuration screen.



Yellow:
The pre-alarm has been activated.



Red:
A relay has tripped due to leakage current, see *"5.2.- TRIP DISPLAY SCREENS"*,
An Individual test has been carried out, see *"5.3 - TEST SCREEN"*.
An error has been detected, see "*5.5 - ERROR SCREEN*"

4.4 - KEYBOARD FUNCTIONS

The **RDA-10A / RDA-100A** has 3 keys to browse through the different screens and program the device.

Function of the keys (**Table 8**):

Table 8: Function of the keys on display screens.

Key	Short keystroke	Long keystroke (3s)
< T	Previous screen	Tests the trip relay.
> R	Next screen	If there has been a trip, it resets the relay.
≡	Access to the Lock/Unlock menu and device setup.	-

4.5 - RELAY

The **RDA-10A / RDA-100A** has 2 output relays, an **R1** trip relay and an **R2** pre-alarm relay (**Figure 19**). See ***"6 - DIRECT ADJUSTMENTS"*** to configure the parameters of the trip relay and ***"7.1 - PRE-ALARM RELAY"*** to configure the parameters of the pre-alarm relay.

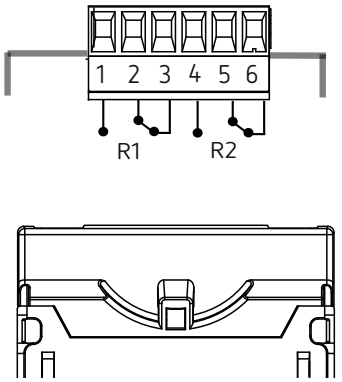


Figure 19:RDA-10A/RDA-100A relay.

4.6 - DIGITAL INPUT

The device has a digital input, **TRIP/RESET** (**Figure 20**), to do an external trip or reset.
If this input is activated, the relay is tripped. See ***"5.2 - TRIP DISPLAY SCREENS".***

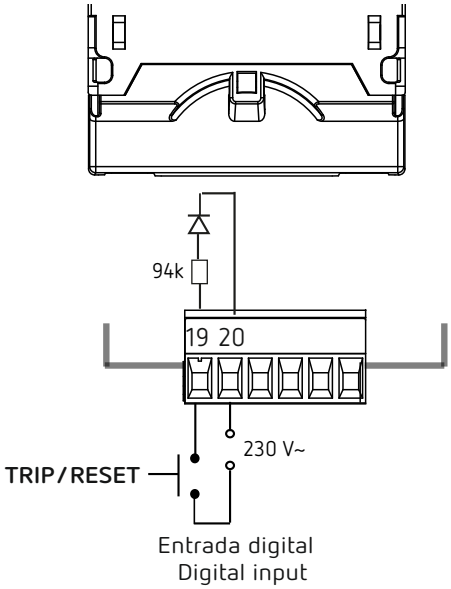


Figure 20: RDA-10A/RDA-100A Digital inputs.

The **TRIP/RESET** digital input works like a status input, meaning if the device is in idle and a voltage is applied to the digital input, the **R1** trip relay trips. The device remains tripped while the digital input remains activated, **Figure 21**.

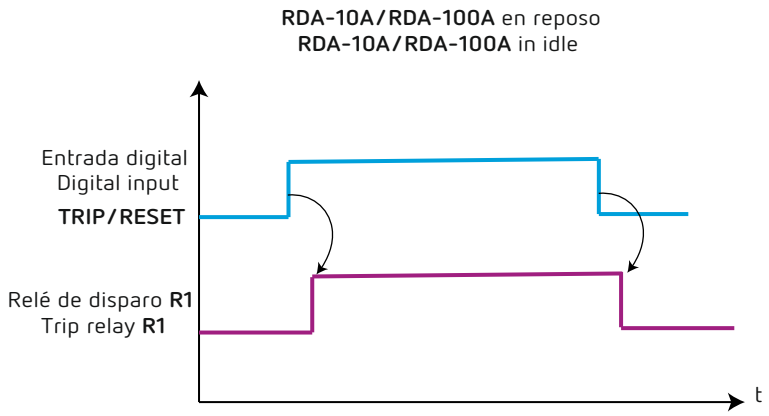


Figure 21: RDA-10A/RDA-100A in idle.

If the **R1** trip relay is tripped, when a voltage is applied to the **TRIP/RESET** digital input, the **RDA-10A/RDA-100A** indicates that there has been a trip, and when the voltage is no longer applied to the digital input, the **R1** relay resets, **Figure 22**.

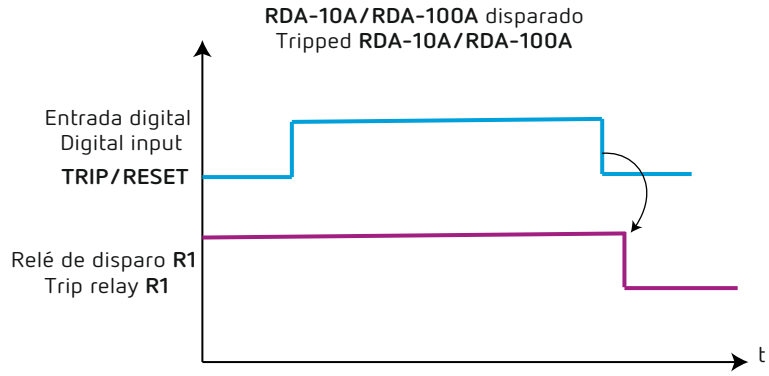


Figure 22: Tripped RDA-10A/RDA-100A.

5 - DISPLAY

When starting the device, the home screen is displayed, showing the version of the device, **Figure 23**, and after 13 seconds the display screen is shown.

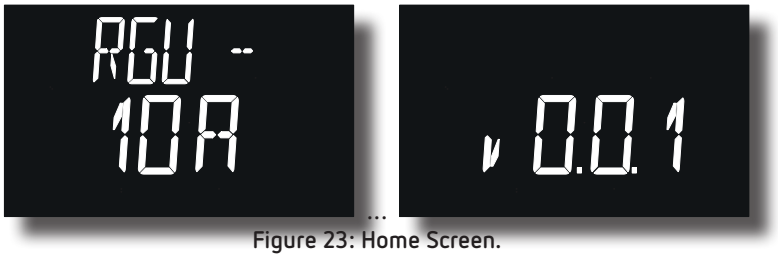


Figure 23: Home Screen.

Note: *If the* ☰ *key is pressed, the device goes directly to the display screen.*

5.1 - DISPLAY SCREENS

The main display screen shows the leakage current and the trip current and delay values, **Figure 24**.

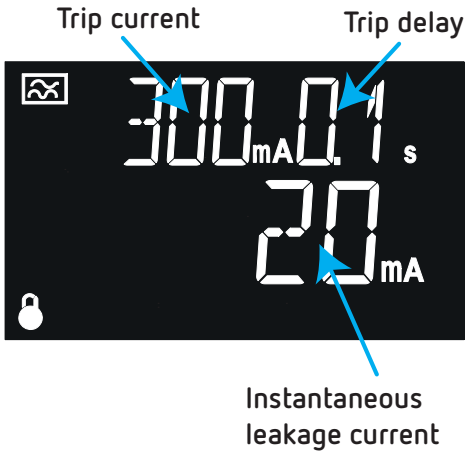


Figure 24: Main display screen.

Use the keys > and < to browse through the different screens:

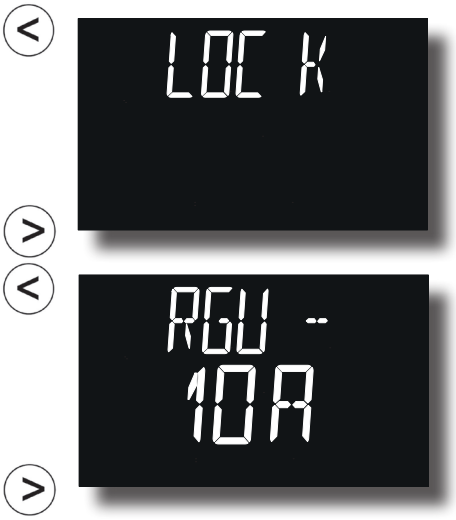


Trip current (mA)
Trip delay
Instantaneous leakage current (mA)



Access the general setup menu by pressing the key ☰. (See *"7 - CONFIGURATION"*)

Note: *If the device is locked,* 🔒*, the menu cannot be accessed.*
Note: *If no key is pressed for 1 minute, the device goes to the main display screen.*

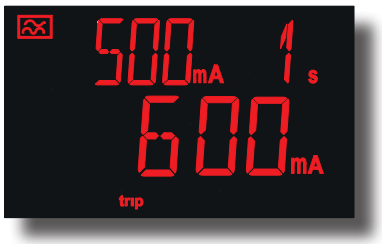


Access the lock menu by pressing the key ☰. (See *"5.4 - LOCK"*)
Note: *If no key is pressed for 1 minute, the device goes to Channel 1's display screen.*

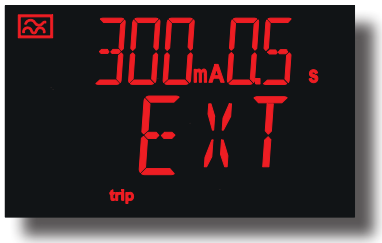
Screen with information on the device version. Press the key ☰ to see the version of the **RDA-10A/RDA-100A**.

5.2 - TRIP DISPLAY SCREENS

If a trip has been generated, the main display screen will be shown in red, the **Alarm** LED will be lit in red and the last cycle current that tripped the relay will be displayed.



Trip current (mA)
Trip delay
Leakage current that tripped the relay (mA)



If a trip was been generated using the **TRIP/RESET** input, it shows:
Trip current (mA)
Trip delay
The text EXT, indicating that the trip was through the TRIP/RESET input.

Pressing the key > **R** for > 3s or doing an external reset via the **TRIP/RESET** input returns the relay to its initial status and the main screen display is shown in white.

5.3 - TEST SCREEN

A test can be done to verify the proper functioning of the relay.

To do this, press the key < **T** for > 3s while the main display screen is shown.

If the relay has been tripped correctly, the screen in **Figure 25** is displayed. And the **Alarm** LED is lit in red.

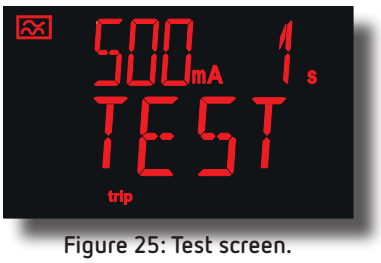


Figure 25: Test screen.

The relay is returned to its idle status by pressing the key > **R** for > 3s.

If the trip could not be carried out, the error screen (**Figure 26**) is displayed for 3s before returning to the channel display screen.

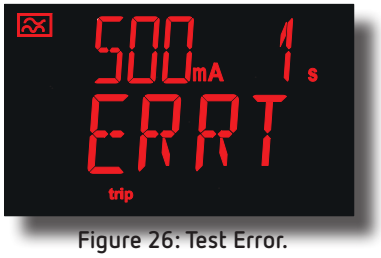


Figure 26: Test Error.

5.4 - LOCK

To enter the lock menu, we must display the Lock screen and press the key ☰.



Figure 27: Lock menu.

The lock configuration screen is shown. If the device locks:

- The direct settings screens are locked ("***6 - DIRECT ADJUSTMENTS***") and the values cannot be modified.
- The setup menu ("***7 - CONFIGURATION***") is locked and cannot be accessed.



Use keys (>) and (<) to skip through the different options.

✓ **Configuration values**

Table 9:Configuration values: Lock.

Lock	
Possible values	YES, the device is locked.
	NO, the lock on the device is deactivated.

Hold down the key (≡) for > 3s, to validate the data and exit the programming.

Note: *If no key is pressed for 1 minute, the device will lock automatically.*

5.5 - ERROR SCREEN

If the device detects a problem with the transformer, the following screen is shown:



The device has detected an error in the transformer.

6.- DIRECT ADJUSTMENTS

The trip current and trip delay can be configured from the main display screen. To do this, press key .

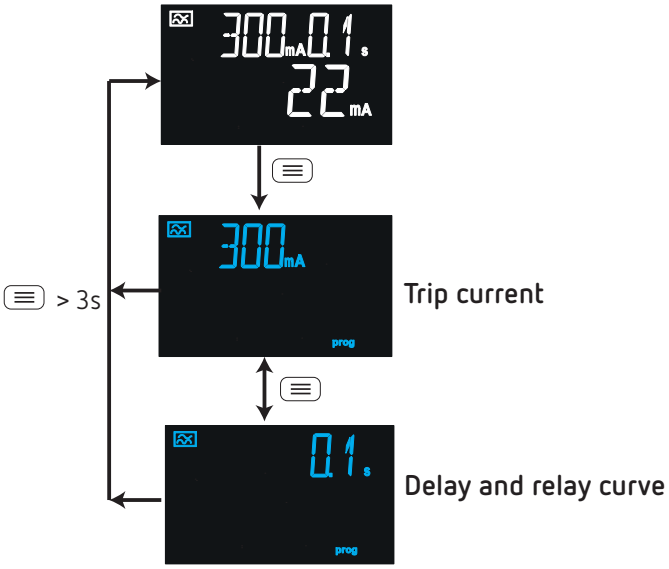


Figure 28: Direct settings.

Note: *If the device is locked, the direct settings cannot be modified and the screen shows the symbol . See (**"5.4 - LOCK"**), to modify the lock option.*

Note: *In **"ANNEX A.- DIRECT SETTINGS"** we can see the configuration tree.*

6.1 - TRIP CURRENT

The relay's trip current is configured in this screen.



Use keys > and < to skip through the different options.

✓ **Configuration values**

Table 10:Configuration values: Trip current.

Trip currrent							
Possible values	30 mA	100 mA	200 mA	300 mA	500 mA	750 mA	1.0 A
	1.5 A	2.0 A	3.0 A	5.0 A(1)	10 A(1)	30 A(1)	

(1) Possible values if the trip current limit has been set (***"7.2.2 - TRIP CURRENT LIMIT"***) to 30A.

To skip to the next programming point, press once the key ☰.

Hold down the key ☰ for > 3s, to validate the data and exit the programming.

6.2 - DELAY AND RELAY CURVE

This screen is used to configure the delay of the relay trip or the type of trip curve.



Use keys > and < to skip through the different options.

✓ **Configuration values**

Table 11:Configuration values: Delay and relay curve.

Delay and relay curve						
Possible values	0.1 s	0.2 s	0.3 s	0.4 s	0.5 s	0.8 s
	1 s	3 s	5 s	**INS**, curve INS	**[S]**, curve SEL	

To return to the last programming point, press once the key ☰.

Hold down the key ☰ for > 3s, to validate the data and exit the programming.

7.- CONFIGURATION

To enter the configuration menu, we must display the Events screen and press the key .

Note: *If the device is locked, , the menu cannot be accessed.*

The device configuration on the **RDA-10A / RDA-100A** is organised into 2 or 3 menus, **Figure 29**.

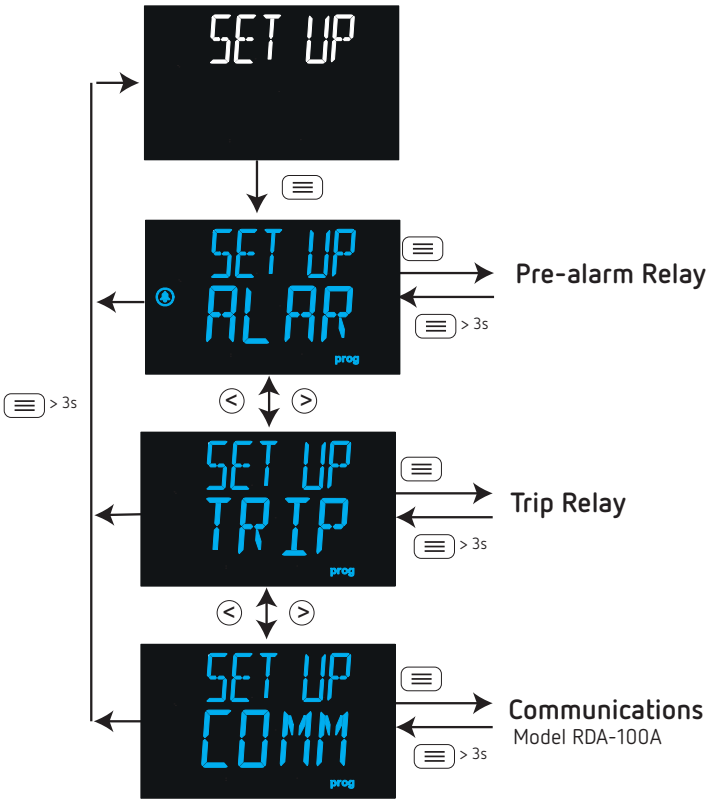


Figure 29: Configuration menu.

Note: *In "ANNEX B.- CONFIGURATION MENU" we can see the configuration tree.*

7.1 - PRE-ALARM RELAY

Figure 30 shows the home screen of the pre-alarm relay configuration menu. Press the key to access the menu.



Figure 30: Pre-alarm menu.

Figure 31 shows the configuration menu of the pre-alarm relay.

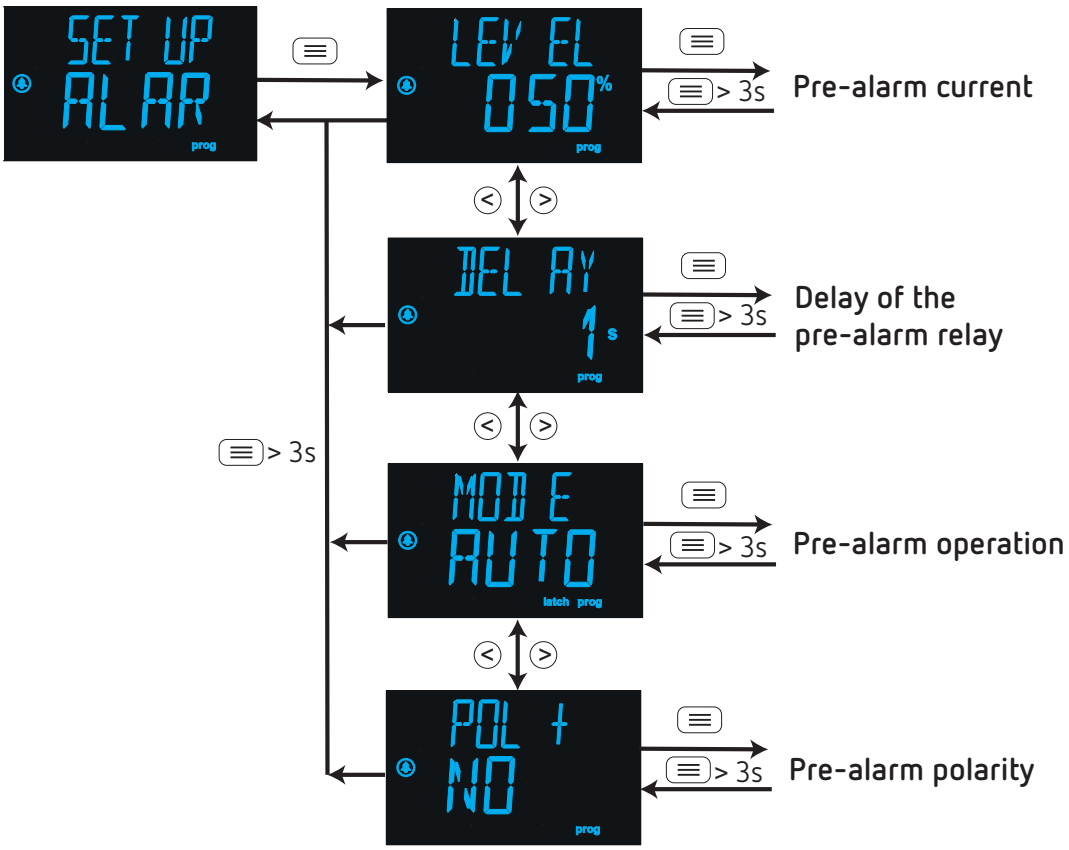


Figure 31: Pre-alarm relay configuration menu.

7.1.1 - PRE-ALARM CURRENT

This screen is used to configure the current at which the pre-alarm will be activated according to the % of the relay's trip current.



Press the key ☰ to enter edit mode, the programming value flashes.

Use the keys > and < to modify the value.

✓ **Configuration values**

Table 12:Configuration values: Pre-alarm current.

Pre-alarm current	
Minimum value	25%
Maximum value	100%

Hold down the key ☰ for > 3s to validate the data and exit edit mode.

To skip to the next programming point, press once the key >.

7.1.2 - DELAY OF THE PRE-ALARM RELAY

This screen is used to configure the delay of the pre-alarm relay trip, in seconds.



Press the key ☰ to enter edit mode, the programming value flashes.

Use the keys > and < to skip through the different options.

✓ **Configuration values**

Table 13:Configuration values: Delay of pre-alarm relay.

Delay of pre-alarm relay			
Possible values	1 s.	3 s.	5 s.

Hold down the key ☰ for > 3s to validate the data and exit edit mode.

To skip to the next programming point, press once the key >.

7.1.3 - PRE-ALARM OPERATION

This screen is used to configure the operation of the pre-alarm.



Press the key ☰ to enter edit mode, the programming value flashes.

Use the keys > and < to skip through the different options.

✓ **Configuration values**

Table 14:Configuration values: Pre-alarm operation.

Pre-alarm operation	
Possible values	*DISA*, pre-alarm deactivated.
	AUTO, pre-alarm activated with latch deactivated; if the condition for the pre-alarm clears, the pre-alarm is disconnected.
	MANU, pre-alarm activated with latch activated, the pre-alarm clears when re-setting via the keyboard.

Hold down the key ☰ for > 3s to validate the data and exit edit mode.

To skip to the next programming point, press once the key >.

7.1.4.- POLARITY

The polarity of the pre-alarm relay is configured in this section.



Press the key ☰ to enter edit mode, the programming value flashes.

Use the keys > and < to skip through the different options.

✓ **Configuration values**

Table 15:Configuration values: Polarity.

Polarity	
Possible values	YES, The pre-alarm relay works with positive polarity (the polarity of the contacts is reversed with respect to the standard polarity).
	NO, the pre-alarm relay works with standard polarity.

Hold down the key ☰ for > 3s to validate the data and exit edit mode.

To jump to the home screen of the pre-alarm menu, press the key ☰ for > 3s

7.2.- TRIP RELAY

Figure 32 shows the home screen of the trip relay configuration menu. Press the key ☰ to access the menu.

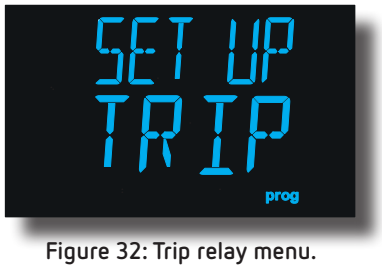


Figure 32: Trip relay menu.

Figure 33 shows the configuration menu of the trip relay.

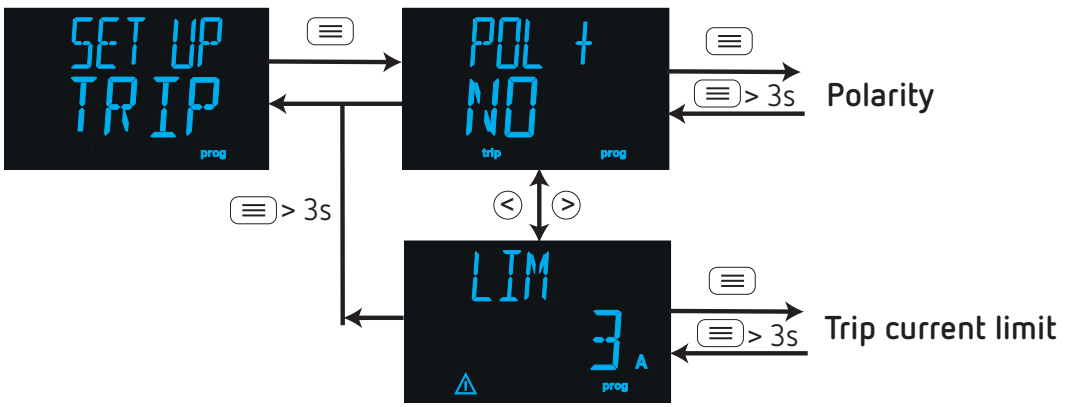


Figure 33: Configuration menu of the trip relay.

7.2.1 - POLARITY

The polarity of the trip relay is configured in this section.



Press the key ☰ to enter edit mode, the programming value flashes.

Use the keys > and < to skip through the different options.

✓ **Configuration values**

Table 16:Configuration values: Polarity.

Polarity	
Possible values	YES, The trip relay works with positive polarity. The **+** icon is shown on the display.
	NO, the trip relay works with standard polarity.

Hold down the key ☰ for > 3s to validate the data and exit edit mode.

To skip to the next programming point, press once the key >.

7.2.2 - TRIP CURRENT LIMIT

In this section, the trip current limit is set, which can be programmed as a direct setting on the device (see ***"6.1 - TRIP CURRENT"***).



Press the key ☰ to enter edit mode, the programming value flashes.

Use the keys > and < to skip through the different options.

✓ **Configuration values**

Table 17:Configuration values: Trip current limit.

Trip current limit		
Possible values	3 A	30 A

Hold down the key ☰ for > 3s to validate the data and exit edit mode.

To jump to the home screen of the trip relay menu, press the key ☰ for > 3s.

7.3.- COMMUNICATIONS

Note: *Menu only available on the* ***RDA-100A*** *model.*

Figure 34 shows the initial screen of the RS-485 communications menu. Press the key ☰ to access the menu.



Figure 34: Communications menu.

Figure 35 shows the RS-485 communications configuration menu.

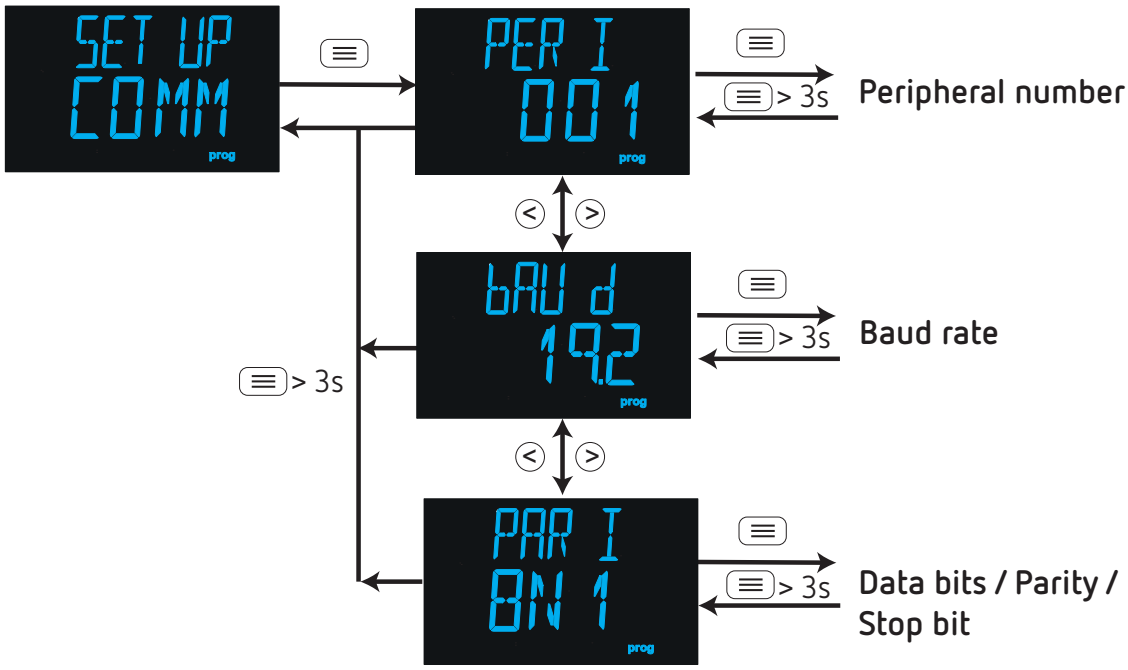


Figure 35: RS-485 communications configuration menu.

7.3.1.- PERIPHERAL NUMBER

In this section, the device's peripheral number for RS-485 communications is selected.



Press the key ☰ to enter edit mode, the programming value flashes.

Use the keys > and < to skip through the different options.

✓ **Configuration values**

Table 18:Configuration values: Peripheral number.

Peripheral number	
Minimum value	1
Maximum value	247

Hold down the key ☰ for > 3s to validate the data and exit edit mode.

To skip to the next programming point, press once the key >.

7.3.2.- BAUD RATE

In this screen, the baud rate of the RS-485 communications is set up.



Press the key ☰ to enter edit mode, the programming value flashes.

Use the keys > and < to skip through the different options.

✓ **Configuration values**

Table 19:Configuration values: Baud rate.

Baud rate			
Possible values	4.8, 4800 bps	9.6, 9600 bps	19.2, 19200 bps
	38.4, 38400 bps	57.6, 57600 bps	115.2, 115200 bps

Hold down the key ☰ for > 3s to validate the data and exit edit mode.

To skip to the next programming point, press once the key >.

7.3.3.- DATA BITS / PARITY / STOP BIT

In this section, the data and stop bits and the parity of the RS-485 communications are selected.



Press the key ☰ to enter edit mode, the programming value flashes.

Use the keys > and < to skip through the different options.

✓ Configuration values

Table 20:Configuration values: Data bits / Parity / Stop bits.

Data bits / Parity / Stop bits	
Possible values	8N1, 8 data bits, no parity, 1 stop bit.
	8E1, 8 data bits, even parity, 1 stop bit.
	8O1, 8 data bits, odd parity, 1 stop bit.
	8N2, 8 data bits, no parity, 2 stop bits.
	8E2, 8 data bits, even parity, 2 stop bits.
	8O2, 8 data bits, odd parity, 2 stop bits.

Hold down the key  for > 3s to validate the data and exit edit mode.

To jump to the initial screen of the communications menu, press the key  for > 3s.

8.- RDA-100A: RS-485 COMMUNICATIONS

The **RDA-100A** has an RS-485 communications port. The device is equipped with the **MODBUS RTU** communication protocol as standard.

8.1.- CONNECTIONS

The RS-485 cable must be wired using twisted pair cable with mesh shield (minimum 3 wires), with a maximum distance of 1200 meters between the **RDA-100A** and the master unit.
In this bus we can connect a maximum of 32 **RDA-100A**.

For communication with the master unit, we must use a smart RS-232 to RS-485 network protocol converter.

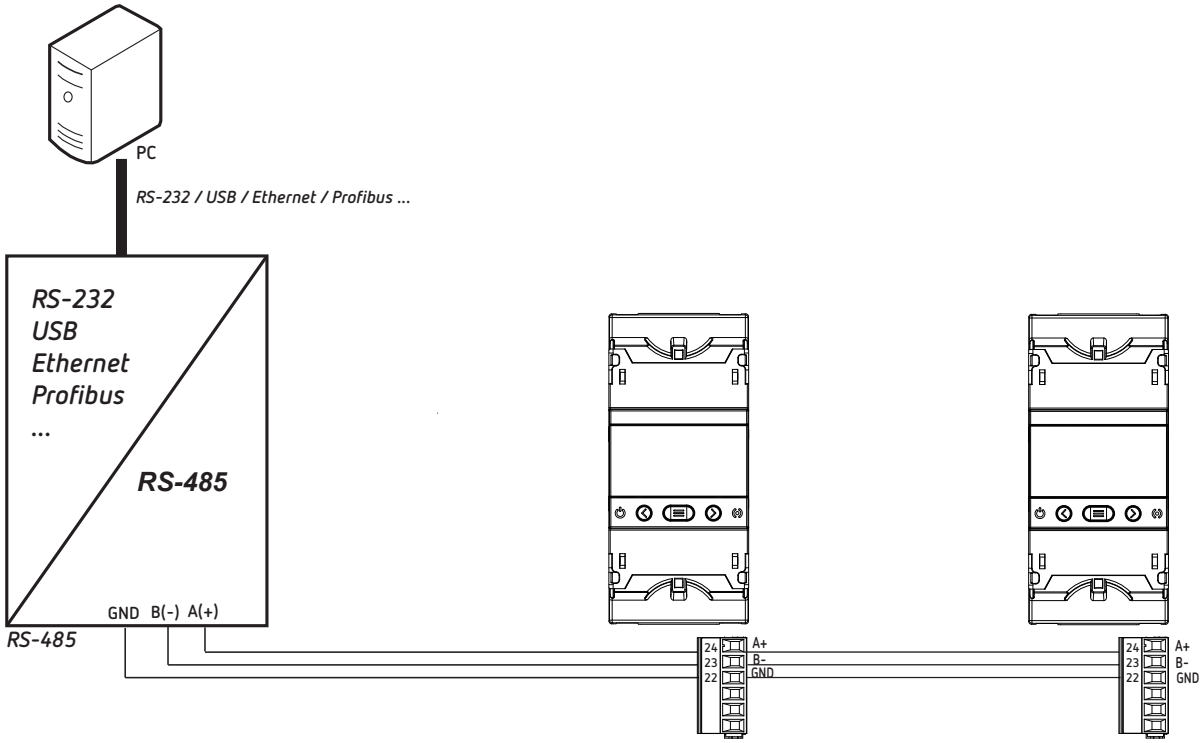


Figure 36: RS-485 connection diagram.

Note: *Default values of the RS-485 communication:* ***115200 bps, no parity, 8 data bits*** *and* **1 stop bit**.

8.2.- MODBUS PROTOCOL

Within the Modbus protocol, the **RDA-100A** uses the RTU (Remote Terminal Unit) mode.
The Modbus functions implemented in the device are as follows:

Function 0x01: Reading a relay.
Function 0x02: Reading input status.
Functions 0x03 and 0x04: Reading integer registers.
Function 0x05: Writing a relay.
Function 0x10: Writing multiple registers.

8.3.- MODBUS COMMANDS

All **MODBUS** map addresses are in Hexadecimal format.

8.3.1.- VARIABLES OF THE DEVICE

Function 0x04 is used for these variables.

Table 21: Modbus Memory Map: Device parameters (Table 1).

Parameter	Format	Address	Units
Instant leakage current	Unit [16]	0FA0	mA
Trip current	Unit [16]	0FC8	mA

Table 22: Modbus Memory Map: Device parameters (Table 2).

Parameter	Format	Address	Value
Model ID: Residual Current Equipment Type	ARRAY	1388 - 1389	"MRCD"
Model ID: Measurement Type	ARRAY	138A	"A"
Model ID: No. of measurement channels	Unit [16]	138B	1
ID no. of device	Unit [32]	361A - 361B	-
Serial no. of device	Unit [16]	364C ... 3652	-
Firmware version (part 1)	Unit [16]	361A	-
Firmware version (part 2)	Unit [16]	361B	-
Firmware version revision	Unit [16]	361C	-

Function 0x02 is used for these variables.

Table 23: Modbus Memory Map: RDA-100A status.

Parameter	Format	Address	Value
Pre-alarm activated by leakage current	bool	0001	**0:** Deactivated **1:** Activated
Device tripped	bool	0002	**0:** Not tripped **1:** Tripped
Device tripped by leakage current	bool	0003	
Device tripped by error in the **TDC**	bool	0004	
Channel tripped by test	bool	0005	
Channel tripped by **TRIP** input	bool	0006	
Channel tripped by communications	bool	0007	

8.3.2.- TRIPPING DUE TO TEST OR COMMUNICATIONS

Función 0x05 is used for these variables.

Table 24: Modbus Memory Map: tripping due to test or communications.

Tripping due to test or communications				
Parameter	Format	Address	Valid data range	Default value
Tripping due to **TEST**	bool	07D0	**FF00:** Activate TEST **0000**: Finish TEST	0000
Tripping due to Communications	bool	07F8	**FF00:** Tripping of channel **0000**: Channel reset	0000

8.3.3.- DEVICE CONFIGURATION VARIABLES

The following functions are used for these variables:
Function 0x03: Reading of registers
Function 0x10:Writing multiple registers.

8.3.3.1.- Configuration of the trip

Table 25: Modbus Memory Map: Configuration of the trip.

Configuration of the trip				
Configuration parameter	Format	Address	Valid data range	Default value
Delay or Relay curve	Unit [16]	3778	**1:** Curve INS, **2:** Curve SEL, 100 ms, 200 ms, 300 ms, 400 ms, 500 ms, 800 ms, 1000 ms, 2000 ms, 3000 ms, 5000 ms	1
Trip current	Unit [16]	3779	30 mA, 100 mA, 200 mA, 300 mA, 500 mA, 750 mA, 1000 mA, 1500 mA, 2000 mA, 3000 mA, 5000 mA, 10000 mA, 30000 mA	30 mA

8.3.3.2.- Pre-alarm relay configuration

Table 26: Modbus Memory Map: Pre-alarm relay configuration.

Pre-alarm relay configuration				
Configuration parameter	Format	Address	Valid data range	Default value
Pre-alarm current	Unit [16]	377A	25 ... 100 %	50 %
Pre-alarm Operation	Unit [16]	377B	**0:** Deactivated **1:** Activated with deactivated latch **2:** Activated with activated latch	1
Pre-alarm relay delay	Unit [16]	377C	1000, 3000, 5000 ms	1000 ms
Pre-alarm polarity	Unit [16]	380E	**0:** standard polarity **1:** positive polarity	0

8.3.3.3.- Trip Relay Configuration

Table 27: Modbus Memory Map: Trip Relay Configuration.

Trip Relay Configuration				
Configuration parameter	Format	Address	Valid data range	Default value
Trip Relay Polarity	Unit [16]	37DC	**0:** standard polarity **1:** positive polarity	0
Trip current limit	Unit [16]	377D	**0:** 30 A **1:** 3 A	0
Enable remote trip	Unit [16]	377E	**0:** Disabled **1:** Enabled	0

8.3.3.4.- RS-485 communications

Table 28: Modbus Memory Map: RS-485 Communications.

RS-485 Communications				
Configuration parameter	Format	Address	Valid data range	Default value
Peripheral number	Unit [16]	36B0	1 ... 247	1
Baud rate	Unit [32]	36B1 - 36B2	4800, 9600, 19200, 38400, 57600, 115200	115200
Data format	Unit [16]	36B3	**0:** 8N1, **1:** 8E1, **2:** 801 **3:** 8N2, **4:** 8E2, **5:** 802	**0**

9- TECHNICAL FEATURES

9.1 - RDA-10A / RDA-100A

AC Power supply	
Rated voltage	110 ... 230 V
Frequency	50... 60 Hz
Consumption	6.5 VA
Installation category	CAT III 300V

Monitoring features	
Protection Type	Type A ultaimmunised
Sensitivity (IΔn)	0.03 - 0.1 - 0.2. - 0.3 - 0.5 - 0.75 - 1 - 1.5 - 2 - 3 - 5 - 10 - 30 A
Adjustable trigger delay	INS - [S] - 0.1 - 0.2 - 0.3 - 0.4 - 0.5 - 0.8 - 1 - 3 - 5 s
Rated frequency of the monitored circuit	50 / 60 Hz
Rated residual non-operating current	0.8 IΔn
Rated short-time withstand current (Icw)	32 kA / 1s
Conditional short-circuit differential current (IΔc)	1500 A
Uimp of the voltage source	4 kV (CAT III)

Relay outputs	
Quantity	2
Maximum voltage open contacts	230 V ~ ± 15%
Maximum current	6 A
Maximum switching power	1500 VA
Electrical life (250V ~ / 5A)	$60x10^3$ Cycles
Mechanical life	$10x10^6$ Cycles

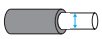
TRIP / RESET input	
Type	Voltage 110 ... 230 V~
Insulation	3 kV
Input impedance	94 KΩ

RS-485 communications	
Communication protocol	Modbus RTU
Baud rate	4800 - 9600 - 19200 - 38400 - 57600 - 115200 bps
Data bits	8
Stop bits	1 - 2
Parity	without, even, odd

User interface	
Display	LCD custom (negative)
Keyboard	3 keys
LED	2 LED

Environmental features	
Operating temperature	-10 °C ... +60 °C
Storage temperature	-20 °C ... +70 °C
Relative humidity (without condensation)	5 ... 95%
Maximum altitude	2000 m
IP protection rating	IP30, Front: IP40
IK protection rating	IK08

(Continued) Environmental features	
Pollution degree	2
Use	Indoor

Mechanical features			
			
Terminals: A1, A2, 1 ... 8, 19, 20	2.5 mm^2	≤ 0.4 Nm, M2.5	Flat
Cable from TDC to RDA-10A / RDA-100A			
Maximum length	5 m		
Dimensions	**Figure 37 (mm)**		
Weight	186 g		
Enclosure	Self-extinguishing V0 plastic		

Standards	
Low-voltage switchgear and control gear. Part 2: Circuit-breakers. Annex M: Modular Residual Current Devices	IEC 60947-2-M
RDA-100A	
Electrical accessories - Residual current monitors (RCMs) - Part 1: RCMs for household and similar uses	IEC 62020-1
Environmental testing -- Part 2-1: Tests - Test A: Cold (IEC 60068-2-1:2007)	UNE-EN 60068-2-1
Environmental testing -- Part 2-2: Tests - Tests B: Dry heat. (IEC 60068-2-2:2007)	UNE-EN 60068-2-2
Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state	UNE-EN 60068-2-78

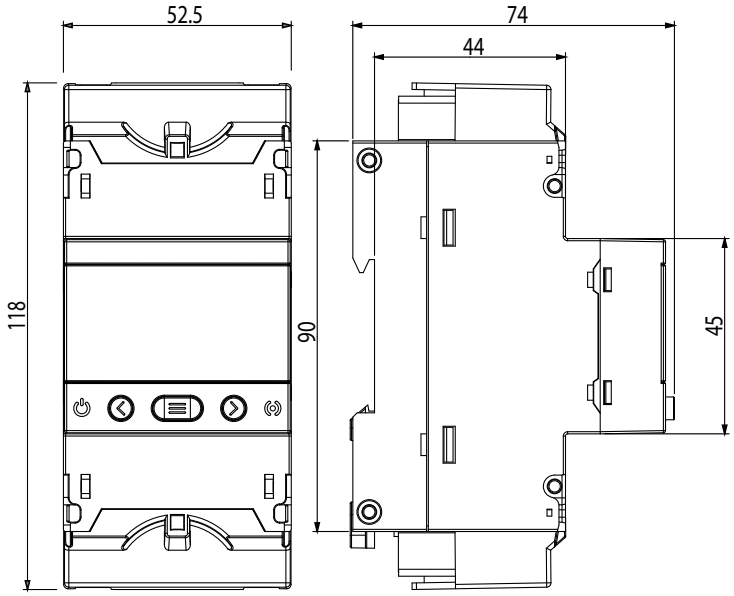


Figure 37: Dimensions of RDA-10A/RDA-100A.

9.2 - TDC

Measurement circuit	
Type	Passant
Network frequency	45... 60 Hz
Assigned transformation ratio (Kn)	30 / 0.06 A

Differential Current measurement circuit		
Scale range	Scale found	Display resolution
30 mA	75 mA	± 1 mA
300 mA	750 mA	± 1 mA
3 A	7.5 A	± 0.1 A
30 A	75 A	± 0.1 A

Model	Nominal current (In)	Imax / IΔn[2]
TDC 20	< 63 A	240 A / 30 mA
TDC 25	< 63 A	240 A / 30 mA
TDC 30	63... 80 A	480 A / 30 mA
TDC 35	63... 80 A	480 A / 30 mA
TDC 55	80... 160 A	500 A / 30 mA
TDC 80	160... 250 A	900 A / 300 mA
TDC 110	250... 400 A	1500 A / 500 mA
TDC 140	400... 600 A	2000 A / 1000 mA
TDC 180	600... 800 A	3600 A / 1000 mA
TDC 220x105	1000... 1250 A	7500 A / 3000 mA
TDC 350x150	1500... 2000 A	10000 A / 3000 mA
TDC 500x200	2500... 4000 A	10000 A / 3000 mA

[2] **Imax:** Maximum transient current (peaks)

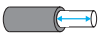
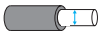
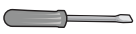
IΔn: Adjusted tripping current at the earth leakage relay.

Electrical insulation	
Maximum operating voltage	0.72 kV
Isolation voltage	3 kV
Installation category	CAT III

Environmental features	
Operating temperature	-10 °C ... +60 °C
Storage temperature	-20 °C ... +70 °C
Relative humidity (non-condensing)	5 ... 95%
Maximum altitude	2000 m
Protection rating	Case: IP40 - Terminals: IP20

Mechanical features		
Primary connection		
Model	Windows	Conductors section (3F+N)
TDC 20	20	4 x 6 mm^2
TDC 25	25	4 x 6 mm^2
TDC 30	30	4 x 10 mm^2
TDC 35	35	4 x 25 mm^2
TDC 55	55	4 x 70 mm^2

(Continued) Mechanical features		
TDC 80	80	4 x 120 mm²
TDC 110	110	4 x 240 mm²
TDC 140	140	8 x 185 mm²
TDC 180	180	8 x 240 mm²
TDC 220x105	220 x 115	4 x 100 x 10 mm²
TDC 350x150	350 x 150	8 x 100 x 10 mm²
TDC 500x200	500 x 200	16 x 100 x 10 mm²

Secondary connection			
S1, S2	5 mm	1.5 mm²	M5
DIN rail attachment	With accessory **PA-TC/WG**		
Enclosure	Polycarbonate V0 self-extinguishing		

Standards	
Instrument transformers -- Part 1: General requirements	IEC 61869-1
Instrument transformers - Part 2: Additional requirements for current transformers	IEC 61869-2
Insulation coordination for equipment within low-voltage systems - Part 3: Use of coating, potting or moulding for protection against pollution	IEC 60664-3

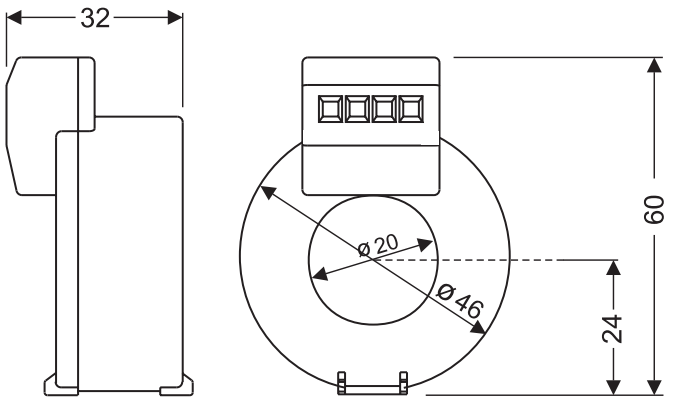


Figure 38: TDC 20 dimensions (in mm).

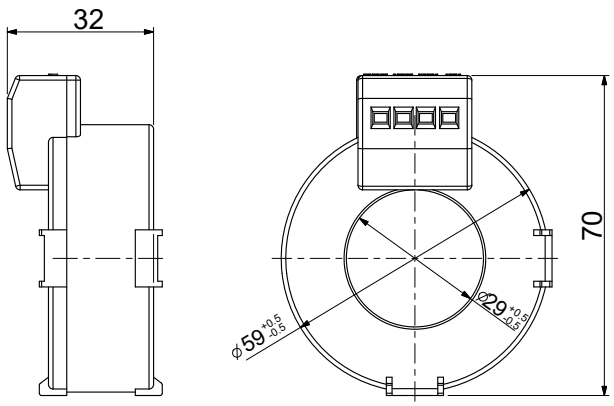


Figure 39: TDC 30 dimensions (in mm).

Table 29: TDC 20 and TDC 30 Weight.

Weight	
Model	Weight
TDC 20	61 g
TDC 30	71 g

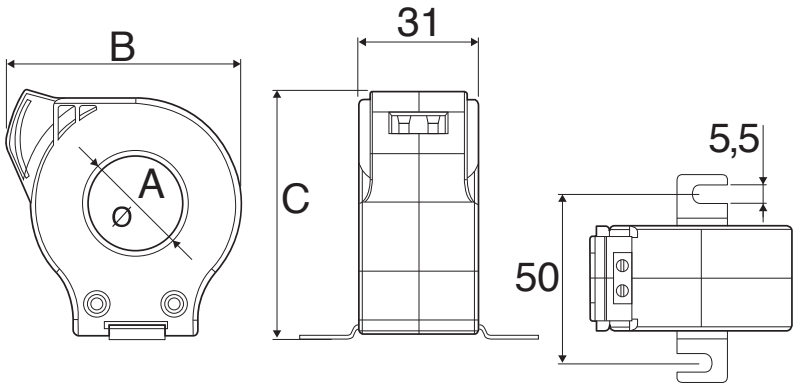


Figure 40: TDC 25 and TDC 35 dimensions (in mm).

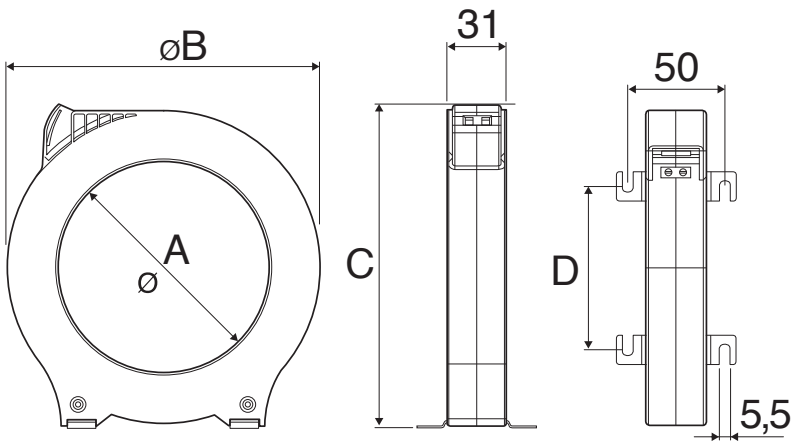


Figure 41: TDC 55, TDC 80, TDC 110, TDC 140 and TDC 180 dimensions (in mm).

Table 30: TDC 55, TDC 80, TDC 110, TDC 140 and TDC 180 dimensions.

Dimensions and Weight					
Model	A	B	D	D	Weight
TDC 25	25 mm	60.5 mm	64 mm	-	80 g
TDC 35	35 mm	70.5 mm	75.5 mm	-	120 g
TDC 55	55 mm	92 mm	98 mm	38 mm	160 g
TDC 80	80 mm	124.5 mm	130 mm	60 mm	300 g
TDC 110	110 mm	163 mm	168 mm.	84.5 mm	420 g
TDC 140	140 mm	201 mm	206 mm	110 mm	760 g
TDC 180	180 mm	252 mm	256 mm	144 mm	1.480 kg

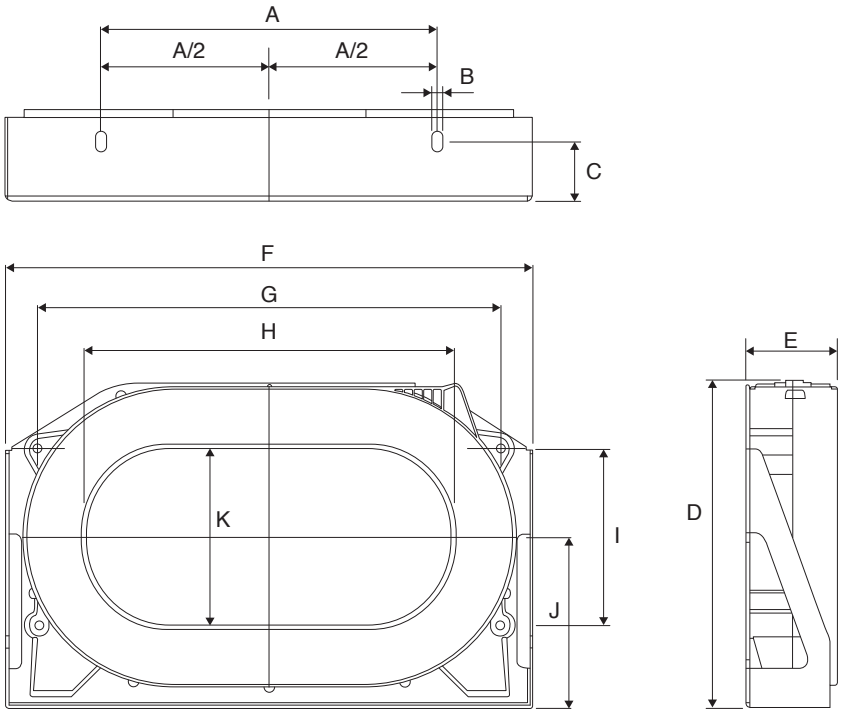


Figure 42: TDC 220x105, TDC 350x150 and TDC 500x200 dimensions (in mm.).

Table 31: TDC 220x105, TDC 350x150 and TDC 500x200 dimensions.

Dimensions (in mm) and Weight												
Model	A	B	D	D	E	F	G	H	I	J	K	Weight
TDC 220x105	200	7	35	195	54,2	314	275	220	105	102	105	3.740 kg
TDC 350x150	340	7	30	279	50,2	479	430	350	165	143	150	7.800 kg
TDC 500x200	460	7	40	306	64	614	550	500	180	155	200	11.300 kg

10 - MAINTENANCE AND TECHNICAL SERVICE

In the case of any query in relation to device operation or malfunction, please contact the **Vector,** Technical Support Service.

Technical Assistance Service
C/ Montcada 7, Pol. Ind. Les Pereres
08130 - Santa Perpètua de Mogoda (Barcelona)
Tel: (+34) 935 748 206
email: info@vectorenergy.com

11.- GUARANTEE

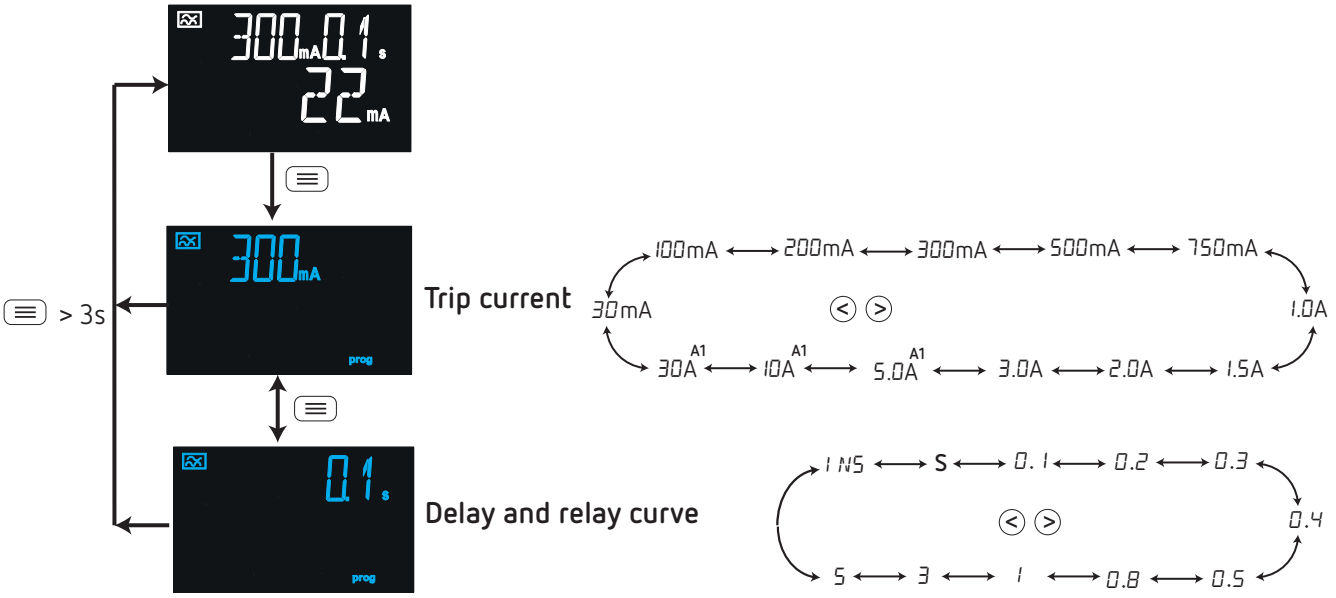
Vector guarantees its products against any manufacturing defect for two years after the delivery of the units.

Vector will repair or replace any defective factory product returned during the guarantee period.



• No returns will be accepted and no unit will be repaired or replaced if it is not accompanied by a report indicating the defect detected or the reason for the return.
• The guarantee will be void if the units has been improperly used or the storage, installation and maintenance instructions listed in this manual have not been followed. "Improper usage" is defined as any operating or storage condition contrary to the national electrical code or that surpasses the limits indicated in the technical and environmental features of this manual.
• **Vector** accepts no liability due to the possible damage to the unit or other parts of the installation, nor will it cover any possible sanctions derived from a possible failure, improper installation or "improper usage" of the unit. Consequently, this guarantee does not apply to failures occurring in the following cases:
- Overvoltages and/or electrical disturbances in the supply;
- Water, if the product does not have the appropriate IP classification;
- Poor ventilation and/or excessive temperatures;
- Improper installation and/or lack of maintenance;
- Buyer repairs or modifications without the manufacturer's authorisation.

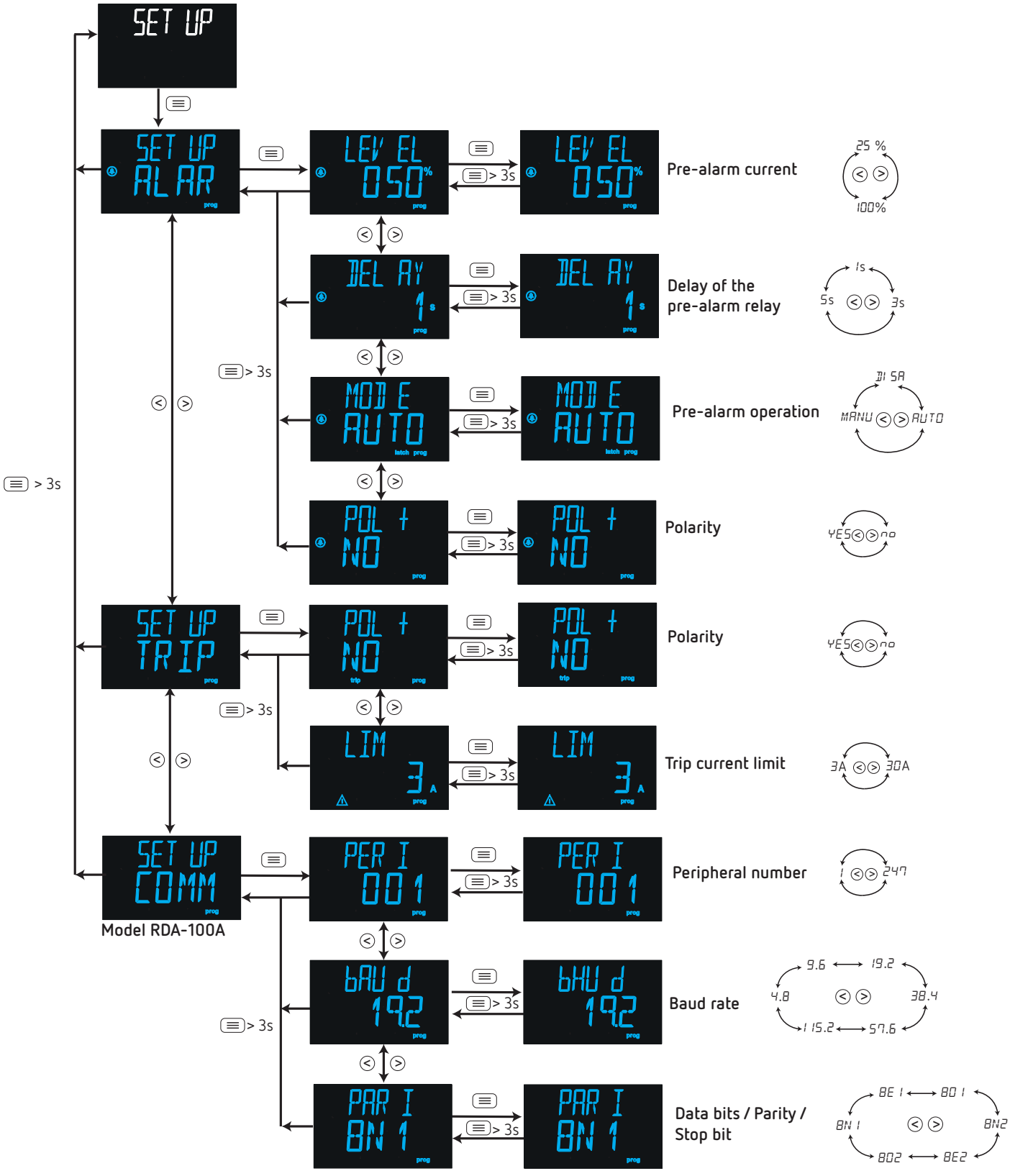
ANNEX A - DIRECT SETTINGS



(A1) Possible values if the trip current limit has been set ("**7.2.2 - TRIP CURRENT LIMIT**") to 30A.

Note: *If the device is locked, the direct settings cannot be modified and the screen shows the symbol* 🔒 *. See (**"5.4 - LOCK"**), to modify the lock option.*

ANNEX B - SETUP MENU



Note: *If the device is locked, the setup menu cannot be modified and the screen shows the symbol* . *See (**"5.4 - LOCK"**), to modify the lock option.*

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