RPB 5051-Mb User Manual

Revision	Date	Comments
2	4/21/2021	
1	3/16/2021	Initial versión.

OBJECT

This manual is intended to help users set up and operate the overcurrent protection relay RPB 5051-Mb.

1 OPERATING PRINCIPLES

The RPB 5051-Mb is a compact three-phase plus neutral overcurrent protection relay with instantaneous (ANSI code 50/50N) and time (ANSI code 51/51N) trip characteristics. Its microprocessor-based design makes it suitable to provide versatile overload and fault protection on 50 Hz or 60 Hz systems and adaptable for a wide range of applications. RPB 5051-Mb provides RMS measure of each phase and neutral, and records information of the last fault.

The relay also provides reclosing function (ANSI code 79), which is configurable by the user.

Due to its small design, it is ideal for applications and facilities requiring highly compact equipment. Housed in a 6-Module DIN rail standard enclosure makes it a direct replacement for existing Arteche RV-IT and RV-ITN relays.

2 RECEPTION & STORAGE

The PB 5051-Mb protection relay is supplied with packaging capable of protecting it during normal handling for equipment of this type.

If it is not to be installed immediately, it should be kept in the packaging, properly closed and in indoor conditions, protected from rain, dust, vibration, etc.

If the packaging is damaged or it is believed that the unit may have been incorrectly handled in transit, the carrier, the relevant insurance company and the manufacturing plant should be informed forthwith.

Check also that the data on the ID plate matches the order data.

3 OPERATIONAL CHARACTERISTICS

4.1 Protective Functions

The RPB 5051-Mb protection relay features the following protective functions for phase and neutral:

- Instantaneous unit (ANSI code 50):
  - Instantaneous operation.
  - Additional time.
- Time unit (ANSI code 51):
  - Definite time.
  - Operation by IEC standard curves:
    - Inverse,
    - Very inverse
    - Extremely inverse.
- AC Reclosing Relay / Auto Reclose (ANSI code 79)

4.2 Relay setting

The relay can be adjusted:

- Via the display and keyboard on its front (user interface).
- Via Modbus/TCP protocol.

4.1 Digital output contacts

The RPB 5051-Mb protection relay has two output contacts, each one provided with a NO (normally open), NC (normally close) and COM (common) terminal. Each output contacts' function can be configured by the user from the following range of options:

Function	Description
Disabled	Relay disabled
General trip	General trip
Phase instant	Phase instantaneous
Neutral instant	Neutral instantaneous
Phase timed	Phase timed
Neutral timed	Neutral timed
Phase startup	Phase start up
Neutral startup	Neutral start up
Disable instant	Instantaneous disabled
Phase trip	Phase tripping (instantaneous or timed)
Neutral trip	Neutral tripping (instantaneous or timed)
Instant trip	Instantaneous tripping (phase or neutral)
Timed trip	Timed tripping (phase or neutral)
Reclosing	Reclosing function
Device fail	Internal hardware system fail (only output contact 2)

Table 1. Programable digital output functions

4.1 Digital Input

The relay has 1 digital input whose function can be configured by the user from the following range of options:

Function	Description
Disabled	Input disabled
Trip disable	It disables all trips and overrides ongoing trips
Trip reset	Reset of the trip signal and last fault data
Trigger reclosing	Triggering of the reclosing function
Lock reclosing	Locking the reclosing function.

Table 2. Programable digital input functions.

4.2 Current Inputs

These are powered by an external current transformer which adjusts the primary current to the secondary measuring current of the relay (see connection diagrams in Section 5). This instrument transformer should be powerful enough to power the measuring circuit (see Section 6.1: Technical Specifications). The RBP 5051-Mb overcurrent relay can be connected directly, with no need for external current transformers, in circuits with rated current levels

coincidental with the relay itself. Maximum current levels are shown in section 6.1 (Technical Specifications).

4.3 LED Indicator

Apart from the display itself, the RBP 5051-Mb includes a LED indicator fitted in the front panel, which provides clear annunciation of status:

LED State	Description
Blue	System OK
Orange	System failure
Flashing (Blue/Orange)	Tripping has occurred

Table 3. LED indicator states.

When tripping has occurred, the LED remains on flashing state until it is acknowledged manually or via the digital input or communications.

4.4 Self-Diagnosis

The relay continually checks the status of its own internal components, program cycle monitoring, power supply, etc. The results of these checks are reflected in the following two components:

- OK output contact function for relay health monitoring.
- LED indicator.

4.5 Communications

The user can communicate with the protection relay to configure its operational parameters and check its status. The information communicated is as follows:

- Configuration: adjust & display of settings.
- Measurements: RMS current input levels.
- Internal status: indication of relay functions enabled, and whether they are tripped or not. The status and configuration of the relay outputs and the digital input are also shown.
- Last trip: When a trip occurs, the display reads ‘FALT’. The UP/ DOWN keys can be used to display the currents measured in each phase at when the fault occurred. This information can also be consulted via the keyboard or through the user interface until a reset command is given through one of these channels or through the digital input.

Remote Communication Characteristics

- Remote communications are based on the Modbus-TCP protocol.
- The PC is always the client in communications and the relay acts as the server.
- Communication runs on Ethernet. The physical layer is stablished via the RJ45 port which is in the front panel.
- The relay must be provided with an IP address, Gateway and Mask parameters that identify the server. These parameters can be set either manually, by choosing the Static Mode in configuration, or automatically, by selecting the DHCP Mode. If DHCP mode is set, modification of the previous parameters is not enabled.
- The relay is also allocated an ID number which can be selected between 1 and 240. This number identify each relay of a Modbus installation.

Remote communication may be stablished with any Modbus client software. We recommend using our *CESINEL ModbusMaster* software.

For a table of the Modbus registers map see Appendix 2.

5 CONNECTION DIAGRAMS

Figure 1 shows a schematic of the RPB 5051-Mb:

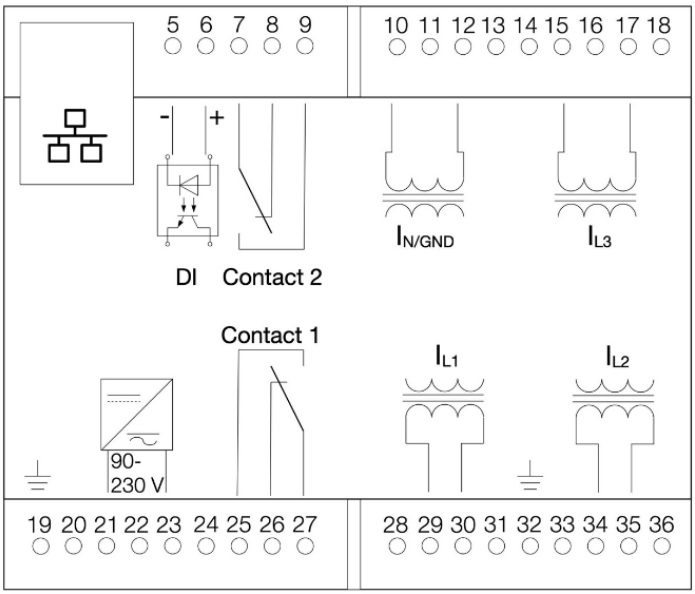


Figure 1. Connection diagram.

5.1 Connection Terminals Designation

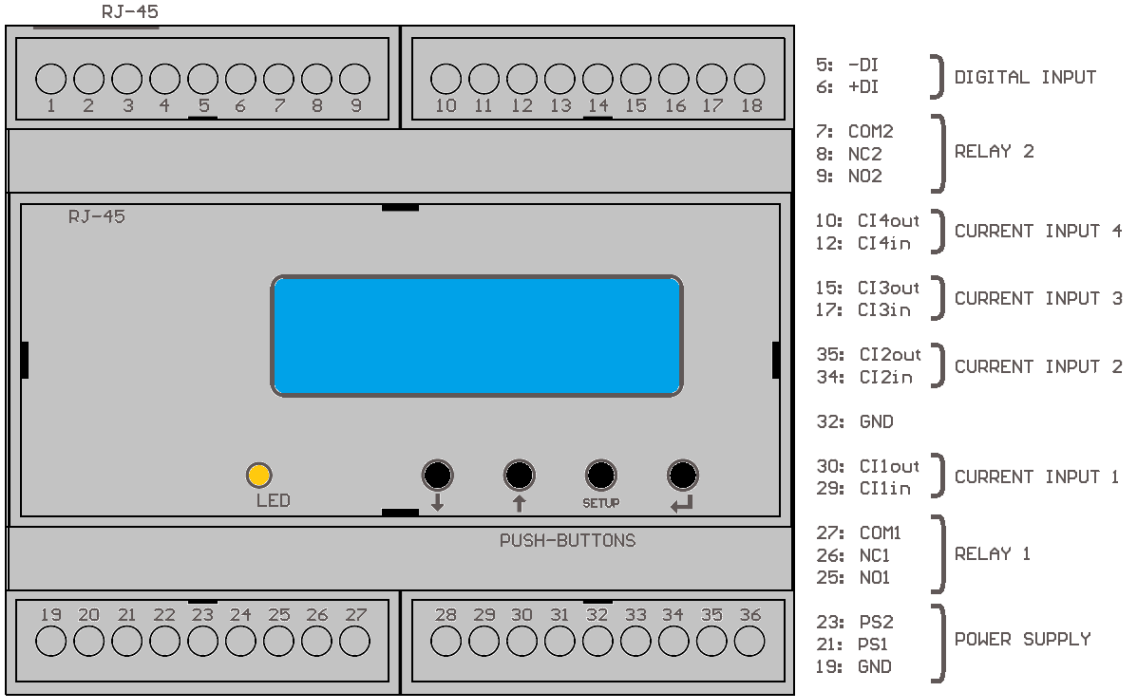


Figure 2. Connection location.

Connection no.	Description
(5) DI +	Digital Input positive input. (90 to 250 VDC)
(6) DI -	Digital Input negative input.
(7) Contact 1 COM	Common terminal for output contact 1
(8) Contact 1 NC	Normally Closed terminal for output contact 1
(9) Contact 1 NO	Normally Open terminal for output contact 1
(10) I N/GND In	Neutral / Ground current input
(12) I N/GND Out	Neutral / Ground current output
(15) I L3 In	L3 current input
(17) I L3 Out	L3 current output
(19) PE	Power Supply GND
(21) Power supply L or +	Power supply input 90 –230 V
(23) Power supply N or -	Power supply input 90 –230 V
(25) Contact 2 NO	Normally Open terminal for output contact 2
(26) Contact 2 NC	Normally Closed terminal for output contact 2
(27) Contact 2 COM	Common terminal for output contact 2
(29) I L1 In	L1 current input
(30) I L1 Out	L2current output
(32) GND	Current sensing GND
(34) I L2 In	L1 current input
(35) I L2 Out	L2 current output

Table 4. Connection description.

6 TECHNICAL CHARACTERISTICS

6.1 Technical Specifications

Measured magnitudes	Range	Measurement quantization	Max. measurement error	Sampling rate
AC Current	In = 5Arms Imax (1 s.) = 75 Arms Imax (continuous) = 20 Arms	5mA	±1% + 20 mA	12.8 kHz
AC Current Averaging window				16,66 / 20 ms
Current burden per phase				< 750 mΩ
Communication				
Logical protocol	Modbus TCP			
Physical medium	Ethernet			
Digital Outputs				
Number of outputs	2			
Type of contact	Dry contact: NO+NC			
Contact Un	250 V			
Contact making / breaking current	5 A			
Operation time	5 ms			
Miscellanea				
External dimensions	106x90x58mm			
Weigh	280gr			
Mounting	DIN Rail			
IP rating	IP54			
Power consumption	1.5W(max)			
Aux. Power Supply	90 to 230Vac	Other available upon request		
Operating temperature	-40 ºC to 70ºC			
Conformance	CE-compliant			
Electro-magnetic compatibility	EMC directive 2004/108/EC			
Noise emission	EN61000-6-4			
Noise immunity	EN61000-6-2			

Table 5. Technical specifications.

6.2 Time Settings

Operation time: 5ms.

6.2.1 Instantaneous protection settings (ANSI 50)

Additional trip time: 0 – 99,99s.

Adjustment step: 0,01s.

6.2.2 Time-Delayed protection settings (ANSI 51)

- Definite time: 00,00 – 99,99s
  Adjustment step: 0.01s
- IEC Curves: Inverse, Very inverse, Extremely inverse
- Selection of K: 0.05 – 1.04; Adjustment step 0.01.
  The formula applicable to each curve model are detailed below. This enables the exact response point of the relay to be calculated.

IEC 60255 Curve

$$t = \frac{k}{\left(I/I_a\right)^a - 1} \cdot K$$

Where:
t: trip time in seconds
I: Measured current.
I_a: Setting or 'start-up' current.
K: Multiplication factor or 'time index'. Valid values between 0.05 and 1.04.
Parameters k and a are set according to Table 6. Parameters for IEC 60225 curves.

	Curve A Inverse	**Curve B Very inverse**	**Curve C Extremely inverse**
k	0.14	13.50	80.00
a	0.02	1.00	2.00

Table 6. Parameters for IEC 60225 curves

See Appendix 1 to find the different curves.

6.2.3 Auto-Reclosing settings (ANSI 79)

- Dead time: 0,10 – 200,00s
  Adjustment step: 0,01s
- Reclaim time: 0,01 – 200,00s
  Adjustment step: 0,01s
- Lockout time: 0,00s – 200,00s
  Adjustment step: 0,01s

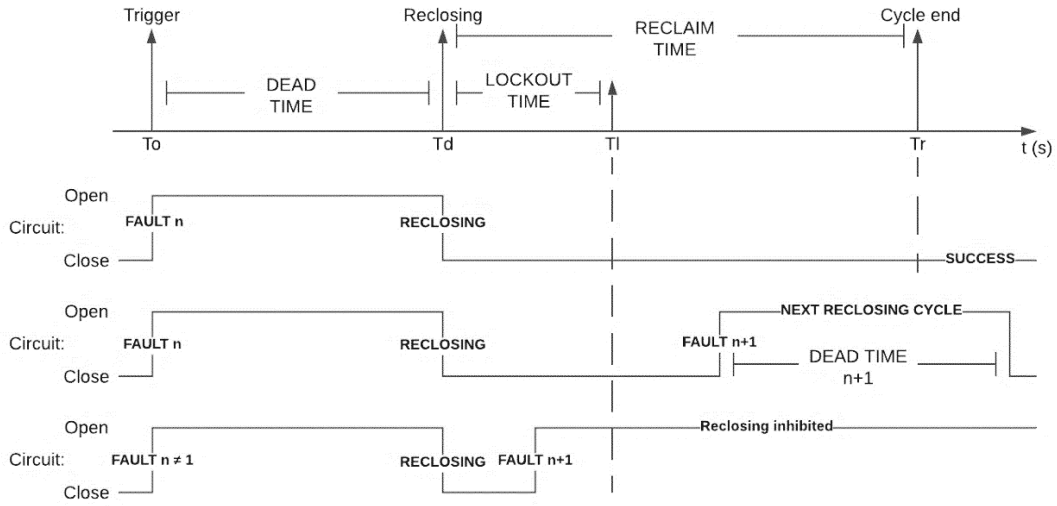


Figure 3. Simplified scheme of the auto-reclosing function (ANSI 79).

Auto-reclosing function permits to configure the maximum number of reclosing cycles:

- Cycles: 1 – 5

Also, different Dead and Reclaim timings between cycles are configurable using the following time factors, which multiplicate the previous cycles' timings to use them at the current cycle:

- Dead time factor: 1,00 – 2,00
  Adjustment step: 0,01s
- Reclaim time factor: 1,00 – 2,00
  Adjustment step: 0,01s

7 OPERATING INSTRUCTIONS

7.1 User Interface

The user interface of the relay comprises a message and data display unit, one LED indicator and a keyboard (4 buttons) through which commands and data are input. The characteristics of this user interface are as follows:

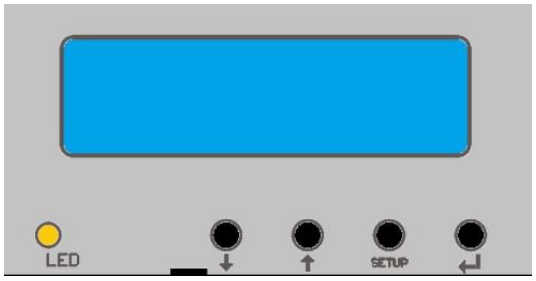


Figure 4. RPB 5051 Mb's User interface.

The display unit is composed of 4 lines of 20 characters. Using the keyboard, the user can navigate through the hole configuration settings.

The LED indicates that the protection relay is operating correctly (Blue) o not (Orange). It also alerts when a tripping occurs (Flashing Orange->Blue).

7.2 Keyboard Functions

- 

Use "SETUP" key to exit any menu. This always returns to the initial menu. When in initial menu, it brings user to the second layer menu.
- 
"UP" and "DOWN" keys. Used to scroll through menu options. In parameter configuration menus these keys increase or decrease the relevant figures.
- 
"ENTER". Used to select a menu and accept a figure.

7.3 Relay Adjustment and Menu Sequence

The graphics below show the various relay menus, the information appearing on screen and how to set the parameters (adjust) the relay.

As it is shown in the image, menus are divided into 5 layers. These five menu layers are as follows:

- **First layer:**
  With the relay operational, the first menu displays the measurements of each phase. If a trip occurs, display will change to show trip information.
- **Second layer:**
  This menu shows and able to navigate throw the different parameters of the relay that can be configured. On the left side it is showed the parameter itself. In the right side, user can quickly read its actual value (phase/neutral).
- **Third layer:**
  This menu layer appears when the user tries to change some parameters and no valid session has been logged. Once the user has logged in, this menu will not appear any more until the current session finishes.
- **Fourth layer:**
  This menu permits the user configuring the selected parameter either for phase or neutral protection.
- **Fifth layer:**
  In the fifth layer menu the user sets the parameter value.

After an inactivity period the display turns off. When any button is pressed, display turns on showing the previous screen.

Navigation through different layers is achieved using the ENTER and SETUP keys. Ones in a menu layer, user can choose between different option using the UP/DOWN keys.

To set a configuration parameter in the fifth layer, choose the option desired and press ENTER.

The default password is '0001'.

7.3.1 Menu Sequence

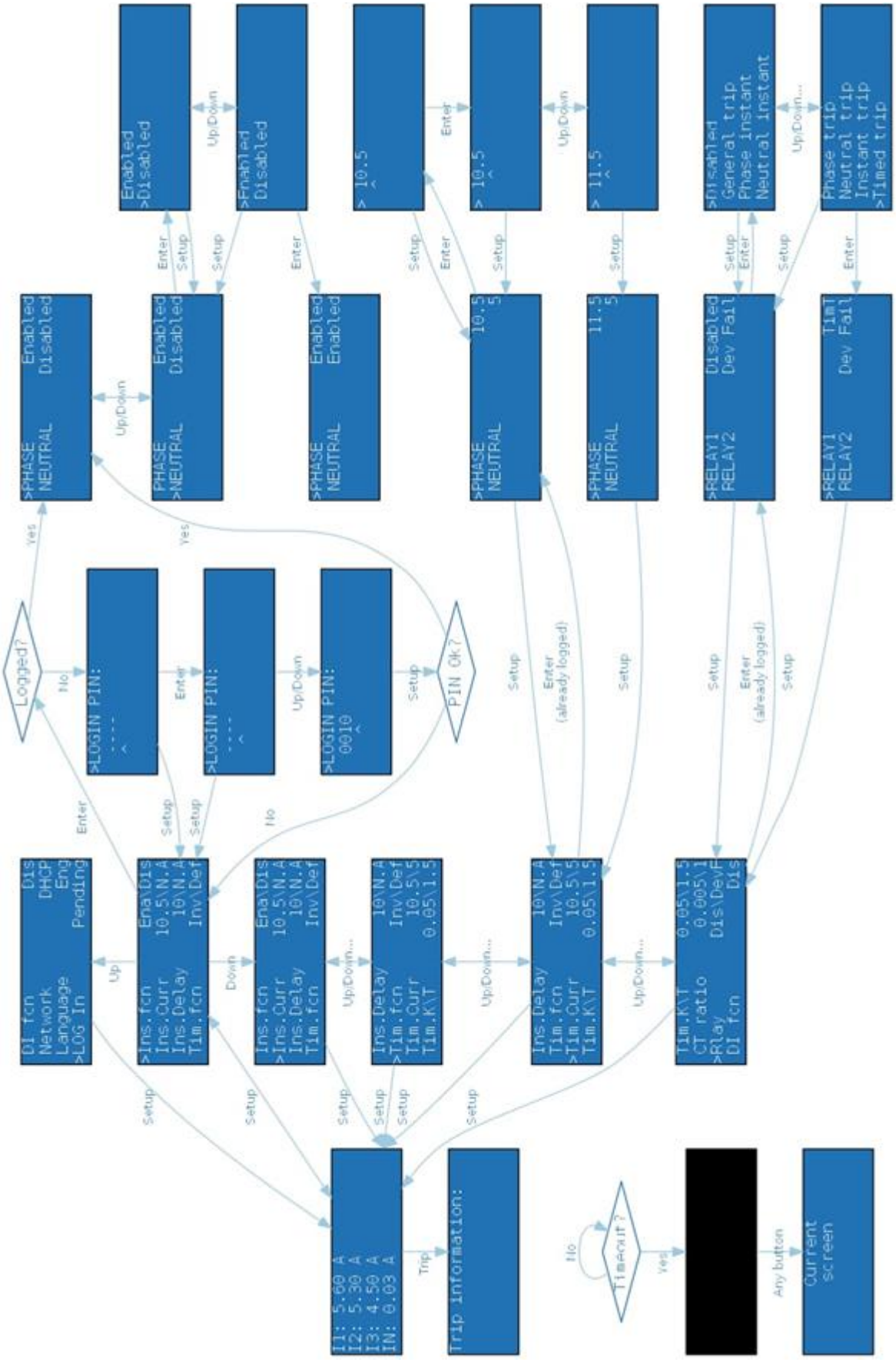


Figure 5. RPB 5051 Mb's Full menu sequence.

7.4 Configuration Parameters.

Configuration parameter				Range (Units)	Description
Level 1	**Level 2**	**Level 4**	**Level 5**		
Instant measurements					
L1				00,00 - 999,99 (A, kA)	IL1 current measurement (primary)
L2				00,00 - 999,99 (A, kA)	IL2 current measurement (primary)
L3				00,00 - 999,99 (A, kA)	IL3 current measurement (primary)
LN				00,00 - 999,99 (A, kA)	IN/GND current measurement (primary)
Instantaneous overcurrent protection parameters (ANSI 50/50N)					
	Ins.fcn			phase\neutral	Instantaneous overcurrent protection
		PHASE		{enabled, disabled}	Phase instantaneous overcurrent protection (50)
			Enabled	set-not set (exclusive)	Enabled instantaneous overcurrent protection in phases
			Disabled	set-not set (exclusive)	Disabled instantaneous overcurrent protection in phases
		NEUTRAL		{enable, disabled}	Neutral instantaneous overcurrent protection (50N)
			Enabled	set-not set (exclusive)	Enabled instantaneous overcurrent protection in neutral
			Disabled	set-not set (exclusive)	Disabled instantaneous overcurrent protection in neutral
	Ins.Curr			phase\neutral	Instantaneous overcurrent setting
		PHASE		00,00 -99999,9 (A)	Instantaneous current phase setting (primary)

		NEUTRAL		00,00 -99999,9 (A)	Instantaneous current neutral setting (primary)
	Ins.Dlay			phase\neutral	Instantaneous overcurrent trip delay
		PHASE		00,00 - 99,99 (s)	Phase instantaneous overcurrent trip delay
		NEUTRAL		00,00 - 99,99 (s)	Neutral instantaneous overcurrent trip delay
Time overcurrent protection parameters (ANSI 51/51N)					
	Tim.fcn			phase\neutral	Time overcurrent protection
		PHASE		{Definite, Inverse, Very inverse, Extremely inverse}	Phase time overcurrent protection (51)
			Time definite	set-not set (exclusive)	Time definite protection curve set in phases
			Inverse	set-not set (exclusive)	Inverse protection curve set in phases
			Very inverse	set-not set (exclusive)	Very inverse protection curve set in phases
			Extremely inverse	set-not set (exclusive)	Extremely inverse protection curve set in phases
		NEUTRAL		{Definite, Inverse, Very inverse, Extremely inverse}	Neutral time overcurrent protection (51N)
			Time definite	set-not set (exclusive)	Time definite protection curve set in neutral
			Inverse	set-not set (exclusive)	Inverse protection curve set in neutral
			Very inverse	set-not set (exclusive)	Very inverse protection curve set in neutral
			Extremely inverse	set-not set (exclusive)	Extremely inverse protection curve set in neutral
	Tim.Curr			phase\neutral	Time overcurrent setting
		PHASE		00,00 -99999,9 (A)	Time or start-up current phase setting (primary)

		NEUTRAL		00,00 -99999,9 (A)	Time or start-up current neutral setting (primary)
	Tim.K/T			phase\neutral	Time delay (definite curve) or curve setting (rest of the curves)
		PHASE		00,00 – 99,99 (s) 0,05-1,04 (scalar)	Time delay phase setting when definite curve selected K factor for IEC/BS curve phase setting when rest of the curves selected
		NEUTRAL		00,00 - 99,99 (s) 0,05 – 1,04 (scalar)	Time delay neutral setting when definite curve selected K factor for IEC/BS curve neutral setting when rest of the curves selected
Reclosing (ANSI 79) function					
	Recls.fcn			Instant trip / Timed trip / Digital input	Multi-shot auto-reclosing function (ANSI code 79) triggers
		Instant trip		{Enable, Disable}	Reclosing function triggered after instantaneous overcurrent tripping (50/50N)
			Enabled	set-not set (exclusive)	Auto-reclosing function triggered after instantaneous overcurrent tripping
			Disabled	set-not set (exclusive)	Auto-reclosing function NOT triggered after instantaneous overcurrent tripping
		Timed trip		{Enable, Disable}	Reclosing function triggered after time-delayed overcurrent tripping (51/51N)
			Enabled	set-not set (exclusive)	Auto-reclosing function triggered after time-delayed overcurrent tripping
			Disabled	set-not set (exclusive)	Auto-reclosing function NOT triggered after time-

					delayed overcurrent tripping
	Recls.set			Cycles \ Dead time \ Dead time factor \ Reclaim time \ Reclaim time factor \ Lockout time	Multi-shot auto-reclosing function (ANSI code 79) settings.
		Cycles		1 – 5 (scalar)	Number of reclosing cycles
		Dead time		0,10 –200,00 (s)	Time delay required to restore insulation. Sets the first cycle dead time.
		Dead time factor		1,00 – 2,00 (scalar)	Multiplication factor which sets the successive cycle's dead time to "reclaim-time-factor" times the previous cycle's dead time.
		Reclaim time		0,10 –200,00 (s)	Time delay without protection trippings after reclosing to ensure reclosing success. Sets the first cycle reclaim time.
		Reclaim time factor		1,00 – 2,00 (scalar)	Multiplication factor which sets the successive cycle's reclaim time to "reclaim-time-factor" times the previous cycle's reclaim time.
		Lockout time		0,00 –200,00 (s)	Time period activated from second auto-reclosing cycle within which a protection tripping inhibits following reclosures.
Measurement parameters					
	CT ratio			phase\neutral	Current transformer ratio
		PHASE		primary/secondary (scalar)	Current transformer ratio for phases
			PRIMARY	00000 - 99999 (A)	Primary rated current of phases transformer

			SECONDARY	00000 - 99999 (A)	Secondary rated current of phases transformer
		NEUTRAL		primary/secondary (scalar)	Current transformer ratio for neutral
			PRIMARY	00000 - 99999 (A)	Primary rated current of neutral transformer
			SECONDARY	00000 - 99999 (A)	Secondary rated current of neutral transformer
	Freq			{50 Hz, 60 Hz}	Net frequency
			60 Hz	set-not set (exclusive)	Net frequency 60 Hz
			50 Hz	set-not set (exclusive)	Net frequency 50 Hz
Input / Output configuration parameters					
	Rlay			RELAY 1 \ RELAY 2	Output relay's function setting
		RELAY 1		{Disabled, General trip, Phase instant, Neutral instant, Phase timed, Neutral timed, Phase startup, Neutral startup, Disable instant, Phase trip, Neutral trip, Instant trip, Timed trip, Reclosing}	Output contact 1 function
			Disabled	set-not set (exclusive)	Relay disabled
			General trip	set-not set (exclusive)	General trip
			Phase instant	set-not set (exclusive)	Phase instantaneous
			Neutral instant	set-not set (exclusive)	Neutral instantaneous
			Phase timed	set-not set (exclusive)	Phase timed
			Neutral timed	set-not set (exclusive)	Neutral timed
			Phase startup	set-not set (exclusive)	Phase start up
			Neutral startup	set-not set (exclusive)	Neutral start up
			Disable instant	set-not set (exclusive)	Instantaneous disabled

			Phase trip	set-not set (exclusive)	Phase tripping (instantaneous or timed)
			Neutral trip	set-not set (exclusive)	Neutral tripping (instantaneous or timed)
			Instant trip	set-not set (exclusive)	Instantaneous tripping (phase or neutral)
			Timed trip	set-not set (exclusive)	Timed tripping (phase or neutral)
			Reclosing	set-not set (exclusive)	AC reclosing signal (ANSI 79)
		RELAY 2		{Disabled, General trip, Phase instant, Neutral instant, Phase timed, Neutral timed, Phase startup, Neutral startup, Disable instant, Phase trip, Neutral trip, Instant trip, Timed trip, Reclosing, Device fail}	Output contact 2 function
			Disabled	set-not set (exclusive)	Relay disabled
			General trip	set-not set (exclusive)	General trip
			Phase instant	set-not set (exclusive)	Phase instantaneous
			Neutral instant	set-not set (exclusive)	Neutral instantaneous
			Phase timed	set-not set (exclusive)	Phase timed
			Neutral timed	set-not set (exclusive)	Neutral timed
			Phase startup	set-not set (exclusive)	Phase start up
			Neutral startup	set-not set (exclusive)	Neutral start up
			Disable instant	set-not set (exclusive)	Instantaneous disabled
			Phase trip	set-not set (exclusive)	Phase tripping (instantaneous or timed)
			Neutral trip	set-not set (exclusive)	Neutral tripping (instantaneous or timed)

			Instant trip	set-not set (exclusive)	Instantaneous tripping (phase or neutral)
			Timed trip	set-not set (exclusive)	Timed tripping (phase or neutral)
			Reclosing	set-not set (exclusive)	AC reclosing signal (ANSI 79)
			Device fail	set-not set (exclusive)	Internal failure
	DI fcn			{Disabled, Trip disable, Trip reset}	Digital input function
			Disabled	set-not set (exclusive)	Input disabled
			Trip disable	set-not set (exclusive)	It disables all trips and overrides ongoing trips
			Trip reset	set-not set (exclusive)	Reset of the trip signal and last fault data
			Trigger reclosing	set-not set (exclusive)	Triggers the reclosing function ANSI 79
			Lock reclosing	set-not set (exclusive)	Locks the reclosing function ANSI 79
Communication parameters					
	Network			Mode	Communication settings
		Mode		{Static, DHCP}	Connection protocol
			Static	set-not set (exclusive)	Connection with static IP (configurable by user)
			DHCP	set-not set (exclusive)	Connection with dynamic IP (DHCP protocol)
		IP		0.0.0.0 - 255.255.255.255 (4 bytes)	Server (relay) static IP Address
		GTW		0.0.0.0 - 255.255.255.255 (4 bytes)	Network Gateway
		Msk		0.0.0.0 - 255.255.255.255 (4 bytes)	Network mask
		MDB Add		0 - 240	Server ID for Modbus TCP protocol
Accessibility					
	Language			{Esp, Eng, Deu}	Language selection
			Spa	set-not set (exclusive)	Spanish

			Eng	set-not set (exclusive)	English
			Deu	set-not set (exclusive)	German
	Log In			{Pending, Logged, Disabled}	Log in configuration
		Request		{enabled, disabled}	Sets if authentication is needed to change the configuration device
			Enabled	set-not set (exclusive)	Authentication enabled
			Disabled	set-not set (exclusive)	Authentication disabled
		Change pin		0000 - 9999	Sets a new pin to log in
		Log out			Exits the current logged session

Table 7. Configuration parameters.

7.5 Alarm Screen

When a fault occurs, the relay display jumps from the menu displayed to the alarm screen.

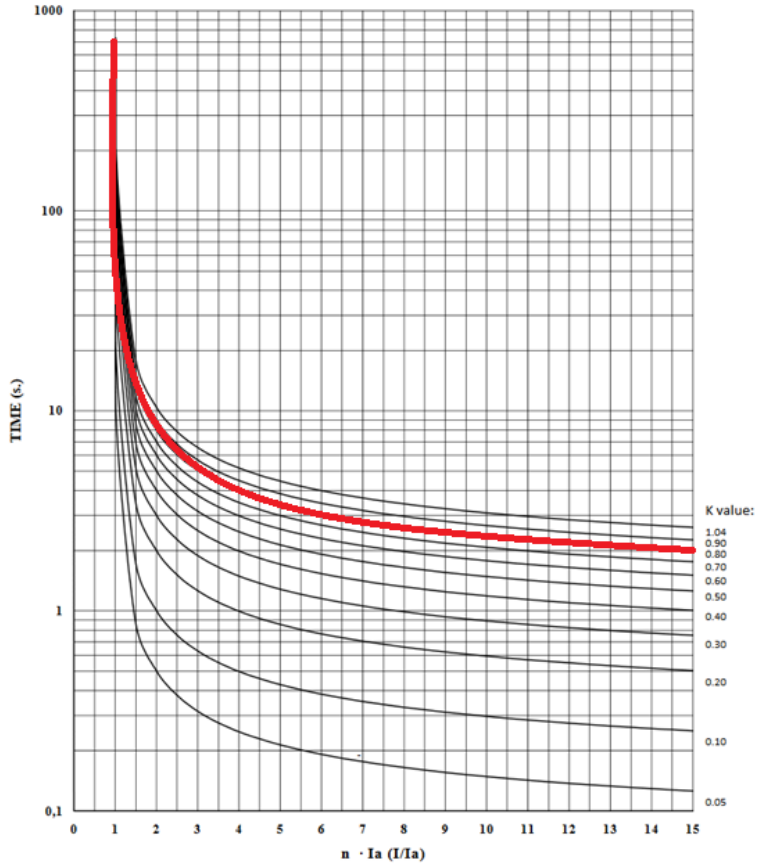
- The LED flashes.
- The screen message FALT. appears. Up and Down keys can be used to check the current levels at the time of the fault. The menu is identical to the Instantaneous Measurement menu, except that the LED for the fault flashes.
- To revert to initial status keep ENTER pressed until the relay rearms.

7.6 Configuration examples

7.6.1 Time-Delayed Overcurrent protection

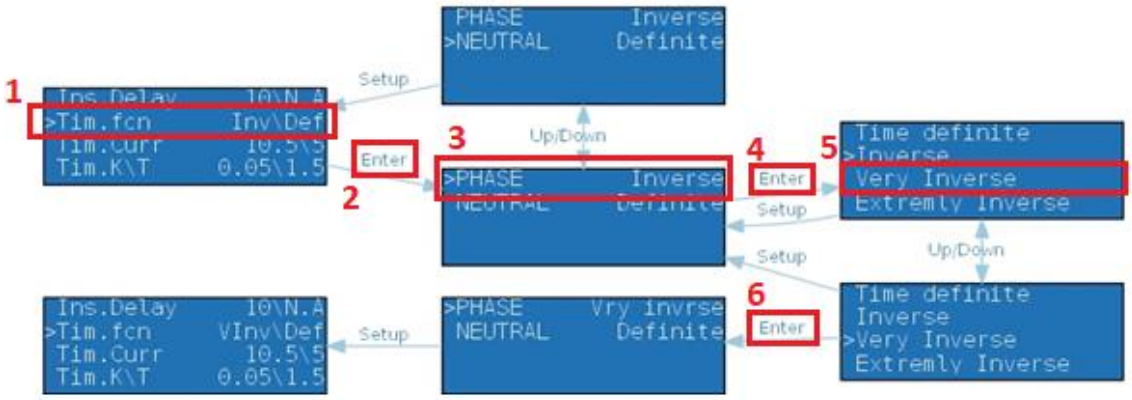
Next procedure shows how to configure the relay to implement Time Overcurrent protection. Either phase or neutral configuration follow the same steps.

In the example, the relay is going to be set to implement time overcurrent protection function (50) of a 63A current line so its response to be as follows:



Firstly, we select the protection type or curve in the “Tim.fcn” parameter:

- Tim.fcn -> ENTER.
- PHASE -> ENTER.
- Very Inverse -> ENTER.



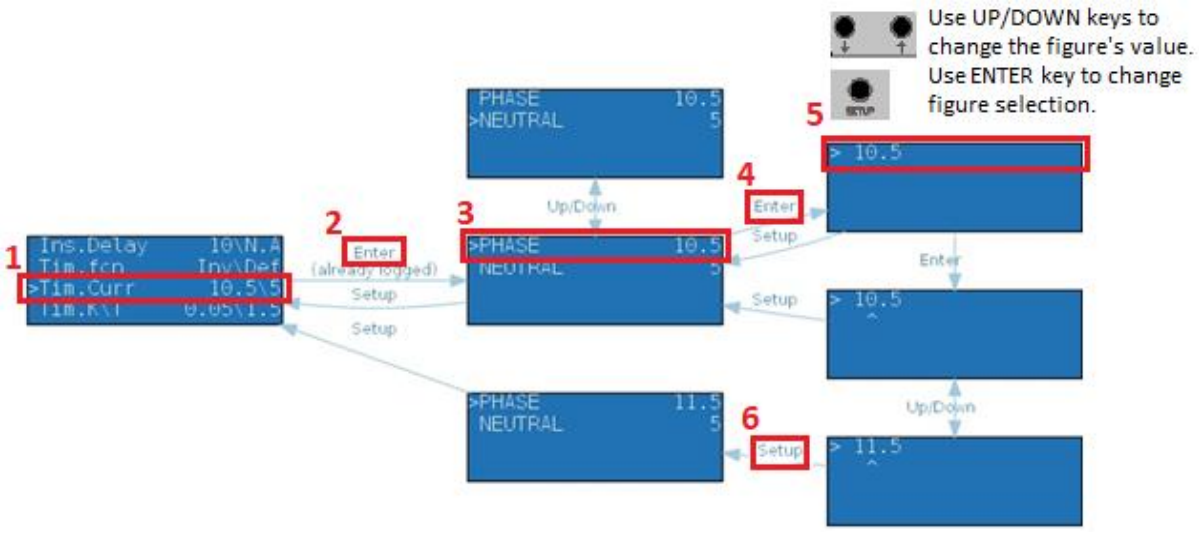
This sets the Time-Delayed Overcurrent protection in phases (50) to follow an IEC very inverse curve.

Double pressing to SETUP to get to the main menu again.

Then, it is necessary to set the start-up current in the “Tim.curr” parameter:

- Tim.curr -> ENTER.
- PHASE -> ENTER.

- UP/DOWN keys to set the figure value. ENTER key to switch to next figure. Set value 63.0 A -> SETUP.



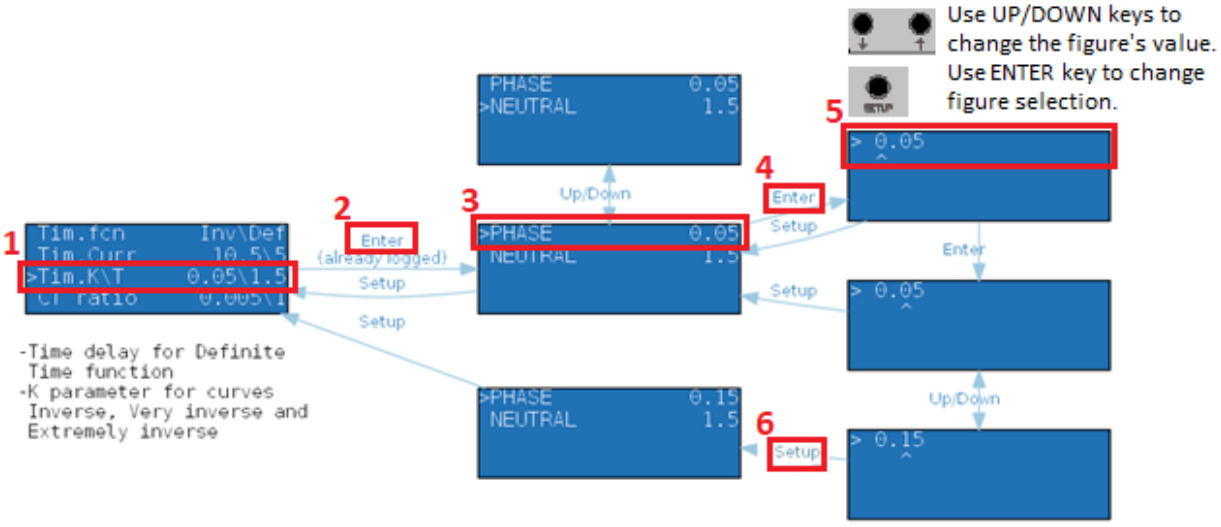
As “Tim.fcn” is set to Very Inverse, “Tim.current” sets the I_a current of the IEC curve (see Section 6.2.2).

Double pressing to SETUP to get to the main menu again.

Finally, we need to configure the time setting:

- Tim.K\T -> ENTER.
- PHASE -> ENTER.
- UP/DOWN and ENTER keys to set 0.80 -> SETUP.

As “Tim.fcn” is set to Very Inverse, “Tim.K\T” sets the K factor of the IEC curve (see Section 6.2.2).



In case that “Tim.fcn” is set to Definite, the “Tim.K\T” parameter sets the tripping time for the definite protection.

In this example, “Tim.fcn” is set to any of the IEC curves, so the “Tim.K\T” parameter sets the K factor of the IEC curve (see Section 6.2.2 and Appendix 1).

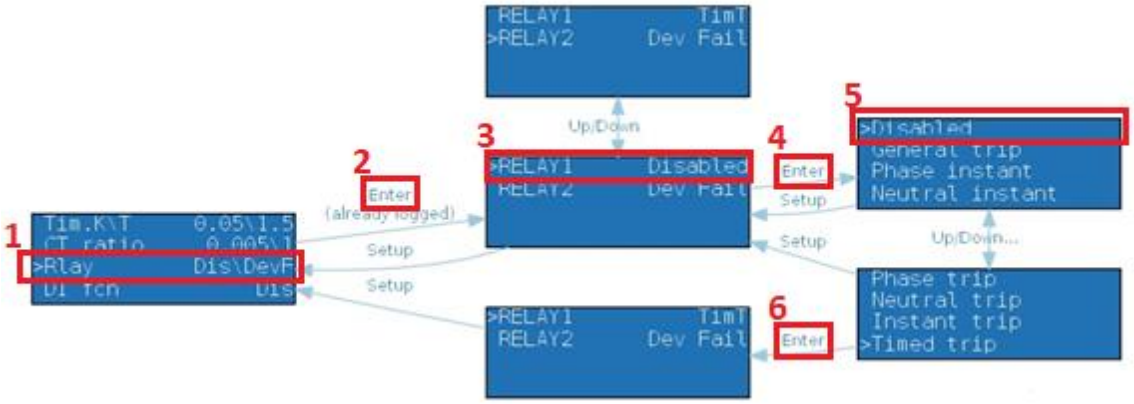
7.6.2 Output contacts:

Next procedure shows how to configure the different output contacts of the relay from its range of functions.

In the example, Relay 1 is going to be set disabled and Relay 2 to trip with any phase fault (this includes the previous 50 protection configured in the previous example):

Firstly, showed in red, we disable the Relay 1 trip:

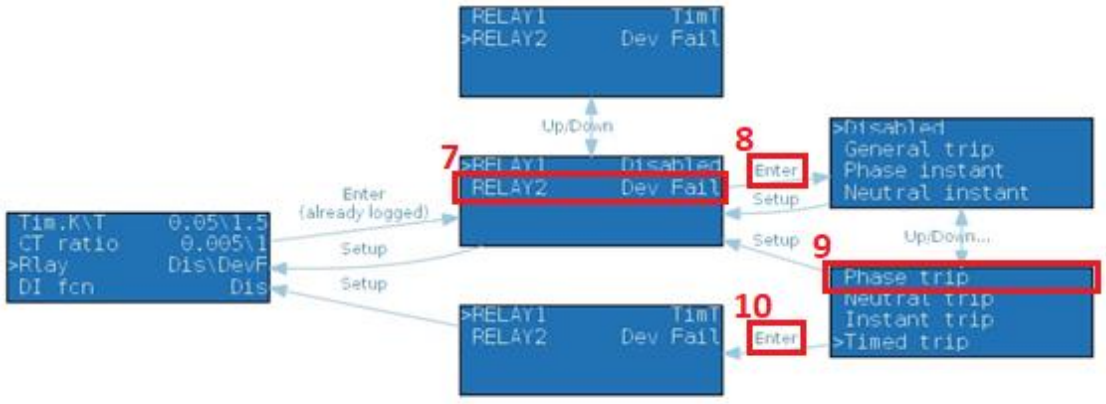
- Rlay -> ENTER.
- RELAY1 -> ENTER.
- Disabled ->ENTER.



This procedure sets the output contact 1 disabled.

Then, we configure Relay 2 to trip with any phase fault:

- RELAY2 -> ENTER.
- Phase trip -> ENTER.

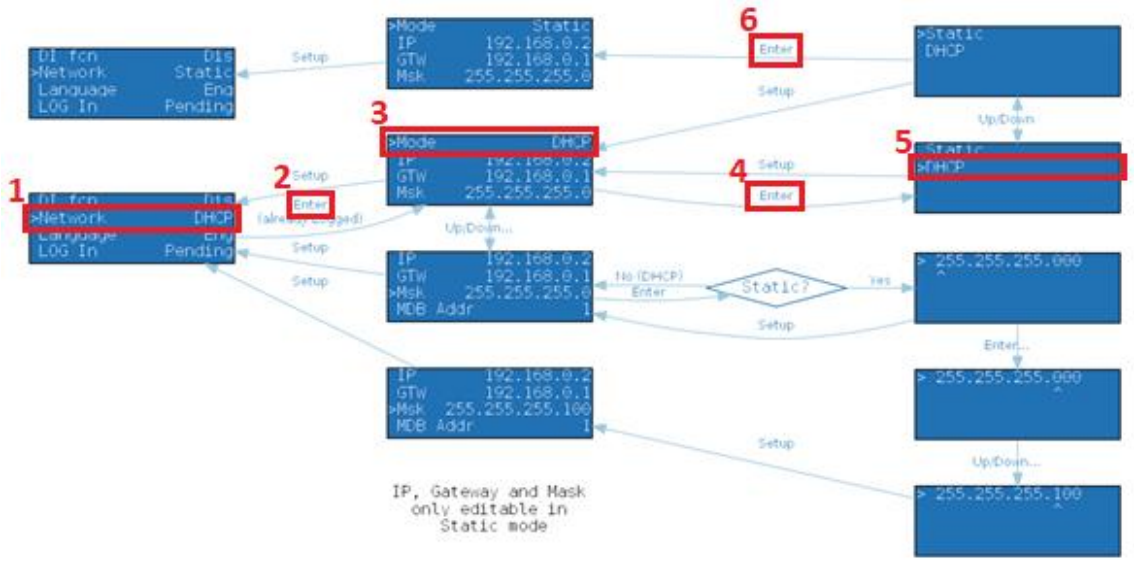


This sets Relay 2 to trip with any phase fault detected.

7.6.3 Network parameters:

This example shows how to set the network addressing mode to dynamic (DHCP):

- Network -> ENTER.
- Mode -> ENTER.
- DHCP -> ENTER.



Sets the network addressing mode to dynamic (DHCP).

7.7 Common issues

Completing this index.

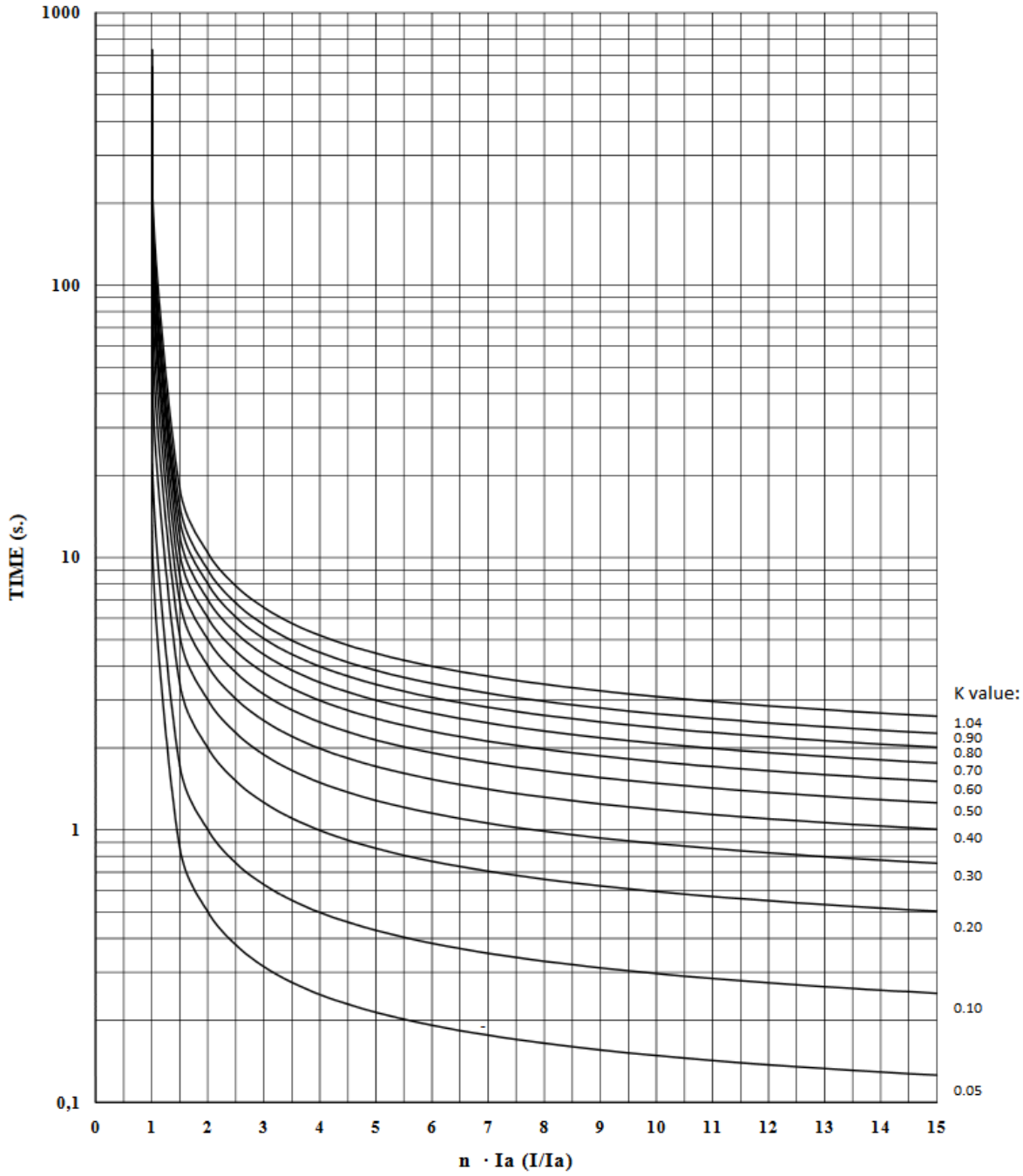
8 CONSTRUCTION FEATURES

The RPB 5051-Mb protection relay is supplied in a NORYL self-extinguishing plastic case compliant with standard UL-94, class V0.

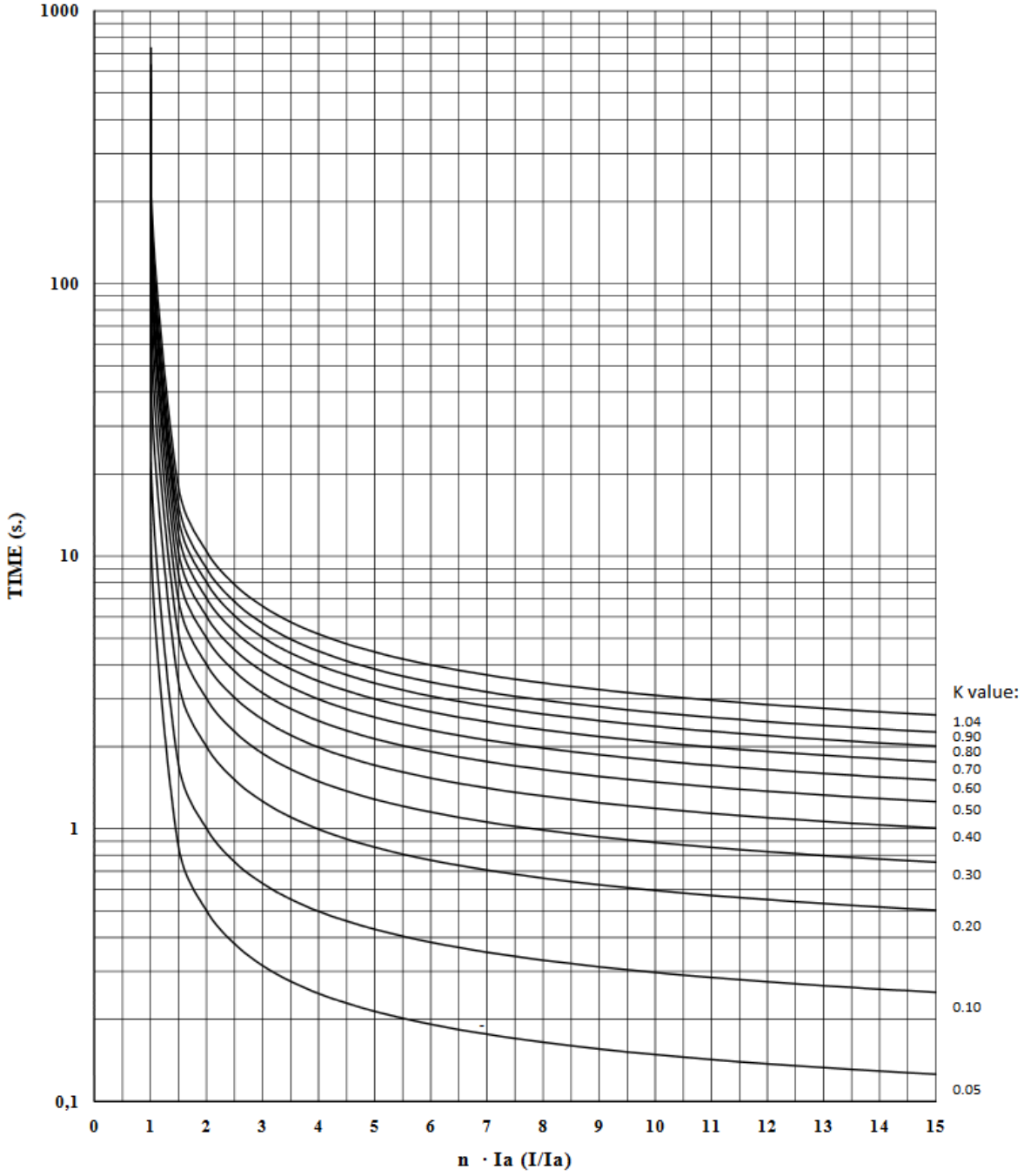
The box is RAL 7035 grey and is designed to be installed on a DIN EN 50022 rail as per DIN 43880.

APPENDIX 1: IEC-BS Curves

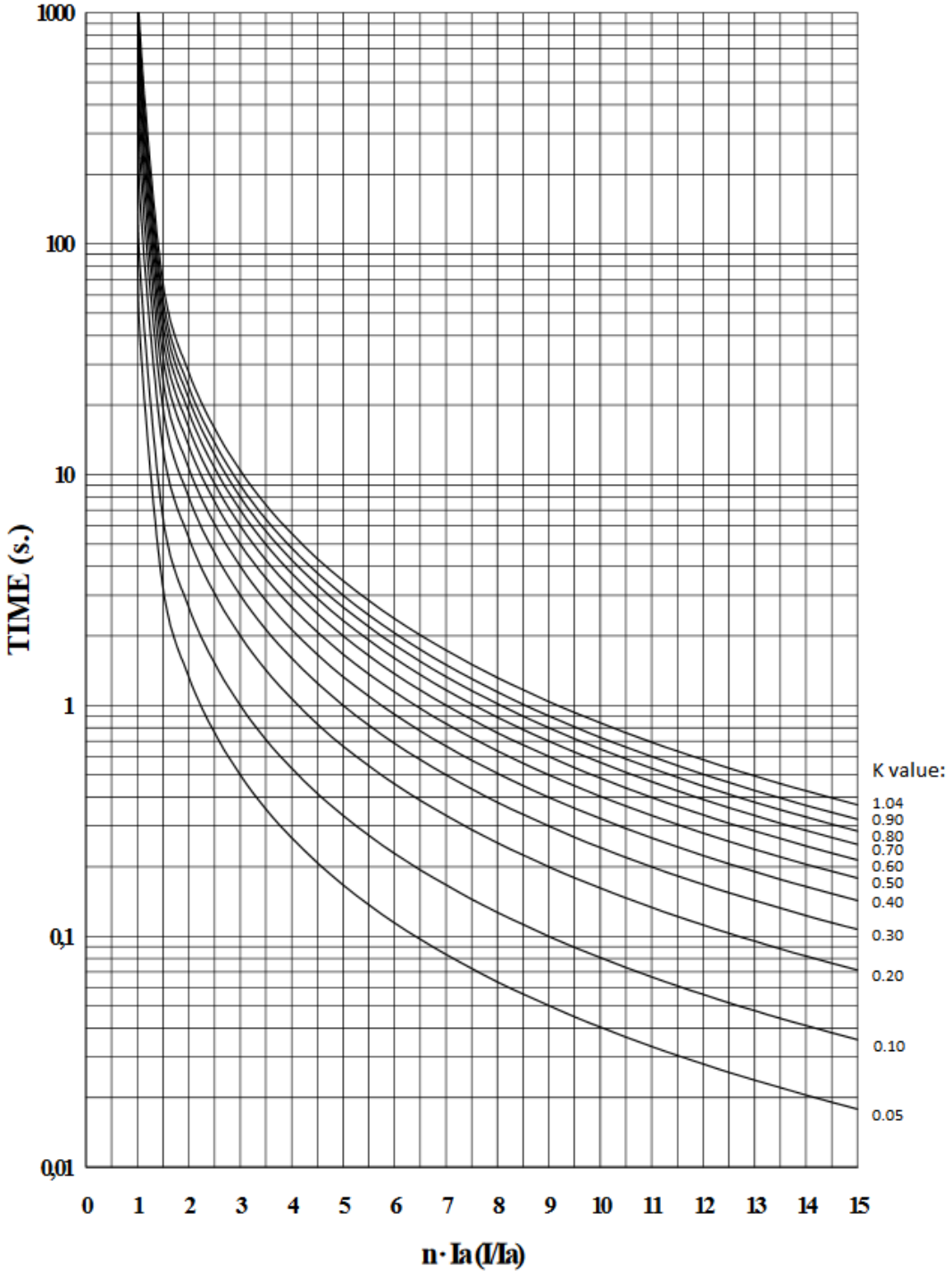
Inverse Curve:



Very Inverse Curve



Extremely Inverse Curve:



Appendix 2: Modbus Registers Map

The following registers are defined as "Holding Registers" according to Modbus protocol.

Register Position	Name	R/W	Value	Description
Measurements				
0	L1 (LSBs)	R	0 – 65535	Phase 1 primary current Least Significant Bytes (A/100)
1	L1 (MSBs)	R	0 - 65535	Phase 1 primary current Most Significant Bytes (A/100)
2	L2 (LSBs)	R	0 – 65535	Phase 2 primary current Least Significant Bytes (A/100)
3	L2 (MSBs)	R	0 - 65535	Phase 2 primary current Most Significant Bytes (A/100)
4	L3 (LSBs)	R	0 – 65535	Phase 3 primary current Least Significant Bytes (A/100)
5	L3 (MSBs)	R	0 - 65535	Phase 3 primary current Most Significant Bytes (A/100)
6	LN (LSBs)	R	0 – 65535	Neutral primary current Least Significant Bytes (A/100)
7	LN (MSBs)	R	0 - 65535	Neutral primary current Most Significant Bytes (A/100)
8	L1_2	R	0 – 65535	Phase 1 secondary current (A/100)
9	L2_2	R	0 – 65535	Phase 2 secondary current (A/100)
10	L3_2	R	0 – 65535	Phase 3 secondary current (A/100)
11	LN_2	R	0 – 65535	Neutral secondary current (A/100)
12	System Status	R	0: System Fault 1: System OK 2: Trip	Shows system status
13	Last fault	R	0: No fault 1: Phase instantaneous 2: Neutral instantaneous 3: Phase time 4: Neutral time	Indicates type of the last fault

14	L1 Fault (LSBs)	R	0 - 65535	Phase 1 fault primary current Least Significant Bytes (A/100)
15	L1 Fault (MSBs)	R	0 - 65535	Phase 1 fault primary current Most Significant Bytes (A/100)
16	L2 Fault (LSBs)	R	0 - 65535	Phase 1 fault primary current Least Significant Bytes (A/100)
17	L2 Fault (MSBs)	R	0 - 65535	Phase 1 fault primary current Most Significant Bytes (A/100)
18	L3 Fault (LSBs)	R	0 - 65535	Phase 1 fault primary current Least Significant Bytes (A/100)
19	L3 Fault (MSBs)	R	0 - 65535	Phase 1 fault primary current Most Significant Bytes (A/100)
20	LN Fault (LSBs)	R	0 - 65535	Phase 1 fault primary current Least Significant Bytes (A/100)
21	LN Fault (MSBs)	R	0 - 65535	Phase 1 fault primary current Most Significant Bytes (A/100)
22	Last fault time	R	0 - 65535	Last fault timer value (ms)
Configuration				
50	Frequency	R/W	0: 50 Hz 1: 60 Hz	Net operation frequency
51	Phase CT Primary Rated Current	R/W	0 - 9999	Phase CT primary rated current (A)
52	Phase CT Secondary Rated Current	R/W		Phase CT secondary rated current (A)
53	Neutral CT Primary Rated Current	R/W		Neutral CT primary rated current (A)
54	Neutral CT Secondary Rated Current	R/W		Neutral CT secondary rated current (A)
Instantaneous overcurrent protection (50/50N)				
100	Phase Instantaneous Current Protection	R/W	0: Disabled 1: Enabled	Indicates if phase instantaneous protection (50) is enabled
101	Phase Instantaneous Current Setting LSBs	R/W	0 - 65535	Instantaneous primary phase current setting LSBs (A/100)
102	Phase Instantaneous Current Setting MSBs	R/W	0 - 65535	Instantaneous primary phase current setting MSBs (A/100)
103	Phase Instantaneous Trip Delay	R/W	0 - 9999	Instantaneous phase tripping delay (s/100)

104	Neutral Instantaneous Current Protection	R/W	1: Disabled 0: Enabled	Indicates if neutral instantaneous protection (50N) is enabled
105	Neutral Instantaneous Current Setting LSBs	R/W	0 - 65535	Instantaneous primary neutral current setting LSBs (A/100)
106	Neutral Instantaneous Current Setting MSBs	R/W	0 - 65535	Instantaneous primary neutral current setting MSBs (A/100)
107	Neutral Instantaneous Trip Delay	R/W	0 - 9999	Instantaneous neutral tripping delay (s/100)
Timed overcurrent protection (51/51N)				
110	Phase Time Overcurrent Protection	R/W	0: Definite 1: Inverse 2: Very inverse 3: Extremely inverse	Sets phase time protection (51) curve
111	Phase Time Current Setting LSBs	R/W	0 - 65535	Time phase primary current setting LSBs (A/100)
112	Phase Time Current Setting MSBs	R/W	0 - 65535	Time phase primary current setting MSBs (A/100)
113	Phase Time K/Time Setting	R/W	5 - 104 0 - 9999	K factor of IEC curve (K/100) Time setting (s/100)
114	Neutral Time Overcurrent Protection	R/W	0: Definite 1: Inverse 2: Very inverse 3: Extremely inverse	Sets neutral time protection (51N) curve
115	Neutral Time Current Setting LSBs	R/W	0 - 65535	Time neutral primary current setting LSBs (A/100)
116	Phase Time Current Setting MSBs	R/W	0 - 65535	Time neutral primary current setting MSBs (A/100)
117	Neutral Time Protection K/Time Setting	R/W	5 - 104 0 - 9999	K factor of IEC curve (K/100) Time setting (s/100)
Reclosing (ANSI 79)				
150	Reclosing function (ANSI 79) for instantaneous trip	R/W	0: Disabled 1: Enabled	Reclosing function triggered after instantaneous trip (ANSI 50/50N)
151	Reclosing function (ANSI 79) for timed trip	R/W	0: Disabled 1: Enabled	Reclosing function triggered after timed trip (ANSI 51/51N)

152	Cycles	R/W	0 - 5	Number of cycles for reclosing function (ANSI 79)
153	Dead Time	R/W	0 - 65535	Dead time for reclosing function (s/10)
154	Dead Time Factor	R/W	1 - 2	Dead time multiplication factor for reclosing function
155	Reclaim Time	R/W	0 - 65535	Reclaim time for reclosing function (s/10)
156	Reclaim Time Factor	R/W	1 - 2	Reclaim time multiplication factor for reclosing function
157	Lockout Time	R/W	0-65535	Lockout time for reclosing function (s/10)
Digital Input/Outputs				
200	Output Contact 1	R/W	0: Relay disabled 1: General trip 2: Phase instantaneous 3: Neutral instantaneous 4: Phase timed 5: Neutral timed 6: Phase start up 7: Neutral start up 8: Instantaneous disabled 9: Phase tripping 10: Neutral tripping 11: Instantaneous tripping 12: Timed tripping (phase or neutral) 13: Reclosing	Sets the output contacts' function
201	Output Contact 2	R/W	0: Relay disabled 1: General trip 2: Phase instantaneous 3: Neutral instantaneous 4: Phase timed 5: Neutral timed 6: Phase start up 7: Neutral start	

			up 8: Instantaneous disabled 9: Phase tripping 10: Neutral tripping 11: Instantaneous tripping 12: Timed tripping (phase or neutral) 13: Reclosing 14: Device Fail	
202	Digital Input	R/W	0: Disabled 1: Trip disable 2: Trip reset 3: Trigger reclosing 4: Lock reclosing	Sets the digital input's function
Network				
300	Mac Address (MSBs 1)	R/W	0 - 65535	Device's MAC Address (first 16 bits of 48)
301	Mac Address (MSBs 2)	R/W	0 - 65535	Device's MAC Address (middle 16 bits of 48)
302	Mac Address (LSBs)	R/W	0 - 65535	Device's MAC Address (last 16 bits of 48)
303	Mode	R/W	1: Static 2: DHCP	Sets the addressing protocol for TCP/IP network
304	IP Address (MSBs)	R/W	0 - 65535	MSBs: sets the most significant bits of the 32 bits word LSBs: sets the least significant bits of the 32 bits word (xxx.xxx.xxx.xxx <-> MSBs.LSBs)
305	IP Address (LSBs)	R/W	0 - 65535	
306	Gateway (MSBs)	R/W	0 - 65535	
307	Gateway (LSBs)	R/W	0 - 65535	
308	Mask (MSBs)	R/W	0 - 65535	
309	Mask (LSBs)	R/W	0 - 65535	
310	DNS Address (MSBs)	R/W	0 - 65535	
311	DNS Address (LSBs)	R/W	0 - 65535	
312	NTP Address (MSBs)	R/W	0 - 65535	
313	NTP Address (LSBs)	R/W	0 - 65535	
314	Modbus ID	R/W	0 - 240	Modbus server ID
Accessibility				
400	Session Logged	R	0: No current session logged 1: Session logged in	Shows remote user if there is a current session logged
401	User pin	R/W	0 - 9999	Permits remote user to log in

402	Change pin	W	1 - 9999	Permits remote user to change user pin
403	Logging Request	W	0: Enable 1: Disabled	Permits remote user to change log in configuration
404	Log out	W	1: Log out	Log out session
405	Language	R/W	0: English 1: Spanish 2: German	Sets the user interface language