User Manual

KONECT
ENERGY METER

Index

*The **Konect** was developed and is manufactured by KRON Instrumentos Elétricos, a company founded in 1954 with experience in manufacturing instruments for measurement and process control. Their main policy is continuous improvement and technological, industrial, and human development to increase the reliability of their products and meet the expectations of their users.*

The information provided in this manual aims to assist you in the correct use and specification of the Konect. Due to continuous improvement, the information contained herein is subject to change without prior notice.

Introduction

Konect represents a new approach in the energy metering segment, combining electrical parameter measurement with the integration of other components present in industrial automation systems, incorporating multiple functions into a single and versatile product.

Produced in a panel-mount enclosure, it uses alternating current or direct current signals as input for auxiliary power supply (Universal Power Supply 85 to 265 VAC / 100 to 350 VDC). It performs direct current measurements up to 63A AC or with the aid of external transformers. For voltage, direct measurement extends from 20 to 500V AC (Phase-to-Phase). It has a mass memory of 2MB for periodic recording of measured quantities.

Integration with automation systems can be done through various communication interfaces, such as Ethernet and RS-485 outputs, and connection via Bluetooth and Wi-Fi or LoRa.

Just like other embedded electronic devices - cell phones, tablets, cars, security systems, etc. - Konect incorporates the concept of the Internet of Things (IoT).

In this approach, the meters send data to cloud servers without the need for an external request, only requiring an internet connection. The data is transmitted using the MQTT protocol.

It has an internal web server that allows reading of electrical quantities and instrument configuration through an internet browser (Internet Explorer, Firefox, Netscape, etc.).

The presence of digital outputs and inputs, analog inputs, and PT-100 sensor inputs makes it capable of collecting data related to, for example, water and gas consumption measurements, temperature, air humidity level indication, as well as performing lighting control, monitoring of quantities, and assisting in load control systems.

It is essential to read the User Manual before installing and using Konect, and any questions can be clarified through our telephone support (phone: +55 11 5525-2000) or our email support@kron.com.br

Warranty Terms

Kron Instrumentos Elétricos Ltda guarantees that its products are rigorously calibrated and tested, committing to repair them in case of any manufacturing defects.

1 one year warranty
From the date of purchase as evidenced by the purchase invoice.

The warranty does not cover

- Devices that have been tampered with;
- Disassembled or opened by unauthorized personnel;
- Damaged by overload or installation error;
- Used negligently or improperly;
- Damaged by any kind of accident.

Maintenance:

Preventive maintenance of the devices is unnecessary. Corrective maintenance, if necessary, must be performed by specialized personnel from Kron Instrumentos Elétricos, upon sending the defective part to our factory. Instrument cleaning, when necessary, should only be done on external areas using neutral materials and with all electrical connections disconnected.


In very special cases, it is recommended to have the device calibrated every two wears to ensure its accuracy.

Getting to Know the Product....
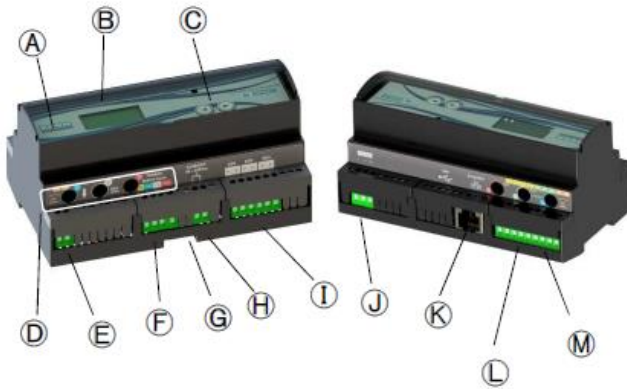
Ⓐ	Konect	Ⓗ	Power Supply
Ⓑ	LCD Display	Ⓘ	Digital Inputs
Ⓒ	Navigation keys	Ⓙ	RS-485 Output
Ⓓ	Orifice for cable passage, max. cable diameter of 9mm (63A and 5A models)	Ⓚ	Ethernet Output
Ⓔ	Digital Outputs	Ⓛ	Analog Inputs
Ⓕ	Voltage Input	Ⓜ	PT-100 Input
Ⓖ	DIN rail lock		

Dimensions
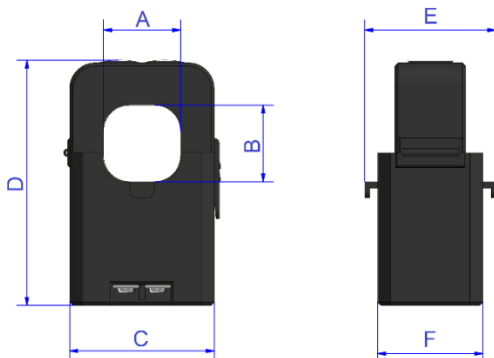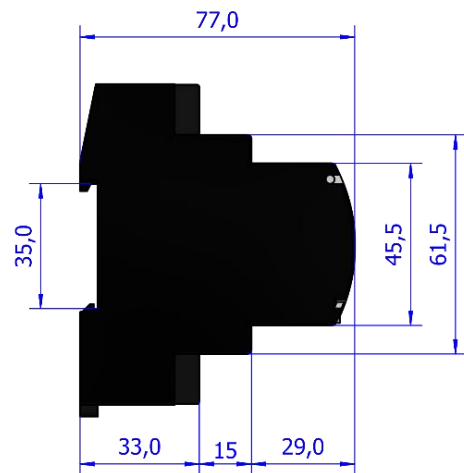
Model	A	B	C	D	E	F
100A	16	16	29,5	55	31	31
300A	24	24,0	45	74,5	34	34
600A	36,0	36,0	56,7	92,6	48,4	39,8

Measurement Parameters

With **Konect**, it is possible to measure up to 50 electrical quantities in single-phase, two-phase, three-phase star, or delta systems. All measurements are TRUE RMS (true root mean square) values.

	Greatness	Unit	Measurement Type
Snapshots	Voltage	Va.c	Three-phase/Bi-phase, Phase-Neutral (star/single-phase system) or Phase-to-phase (star or delta system)
	Electric current	Ac.a.	Three-phase or Two-phase/Per phase
	Active Power	W	Three-phase or Two-phase/Per phase
	Reactive Power	VAr	Three-phase or Two-phase/Per phase
	Apparent Power	VA	Three-phase or Two-phase/Per phase
	Power Factor	-	Three-phase or Two-phase/Per phase
	Frequency	Hz	Phase R
	THD - (by voltage and current phase, up to the 40th order)	%	Per phase
	Individual Harmonics (by voltage and current phase up to 40th order)	%	Per phase
	K factor	-	Per phase
Cumulative	Positive active Energy	KWh	Three-phase, two-phase or single-phase, depending on the circuit to be measured
	Negative active Energy	KWh	
	Positive Reactive	KVArh	
	Negative reactive Energy	KVArh	
	Active average demand	KW	
	Apparent average demand	KVA	
	Maximum active demand	KW	
	Apparent maximum demand	KVA	
	Maximum three-phase voltage	Va.c	
	Maximum three-phase current	Ac.a.	
	Hour meter	-	

Demand Measurement (for more information, please refer to Appendix C)

Konect utilizes the demand block algorithm (or sliding window) for demand measurement, with a programmable time interval ranging from 1 to 60 minutes.

Non-volatile memory

Konect is equipped with technology that ensures energy data, maximum demands, maximum three-phase voltage, and three-phase current will not be lost (for a period of up to 10 years) in the event of equipment shutdown or power outage.

Technical Characteristics

External power source:

- Power Supply : 85 a 265Va.c. or 100 a 350 Vd.c.

Maximum consumption: < 10,0 VA

For direct current (DC) power supply, it is recommended to use a 500mA fuse in series with the instrument.

For alternating current (AC) power supply, it is recommended to install a 1A fuse or circuit breaker for protection.

Voltage input:

- Working range: 20 to 500 VAC (RMS) (phase-to-phase)
- Operating frequency: 50 Hz (42.5 to 57.5 Hz) | 60 Hz (51 to 69 Hz)
- Maximum power consumption: < 0.5 VA
- Overload: 1.5 times the maximum voltage (for 1 second)

It is recommended to install a 1A fuse or circuit breaker for protection.

Current Input: Split Core Transformers

- Nominal (In): 63Aac (standard), 5 Aac, or Split Core Transformers of 100Aac, 200Aac, 300Aac or 600 Aac.

- Minimum indication: 200 mA (for 63 Aac or 5 Aac), 2% of the nominal value (for Split Core Transformers).

- Internal power consumption: < 0.5 VA

Precision*:

- Voltage, current, active power, reactive power, apparent power, power factors: 0.5% accuracy.
- Frequency: 0,1Hz
- Energies: 1,0%
- THD and Harmonics: ± 5% *Tests based on references described in Table 4 - item 4.6.2 of ANEEL Prodist Resolution - Module 8, Revision 7, and Table 1 - item 5.3 of IEC 61000-4-7 - 2002-08.
- Sampling: 128 Samples per cycle
- Reading range: every 200ms

*All measurements are True RMS

** The accuracy refers to the full scale

Galvanic Isolation:

- Between inputs and outputs: 1.5 kV

Communication Interfaces:

- RS-485:
  - Connection: Quick plug terminal
  - Speed: 9600, 19200, 38400, or 57600 bps
  - Data format: 8N1/8N2/8E1/8O1
  - Protocol: MODBUS-RTU (refer to RS-485 Interface chapter for details)

- Ethernet:
  - Connection: RJ-45
  - Speed: 10/100 Mbps
  - Protocol: Modbus TCP/IP, MQTT or Bacnet IP

- Bluetooth
  - Protocol: Modbus RTU

- Wi-Fi
  - Protocol: Modbus TCP/IP and MQTT

- LoRa: Protocol LoRaWan (LA 915 - 928A)

Mechanical Aspects:

- Case: Thermoplastic (ABS V0)
- Fixation: Panel´s background, using 35mm DIN rail
- Protection Degree: IP20
- Mounting Position: Any

Environmental Conditions of Use

- Operation Temperature: 0 to 60°C (32 to 140°F)
- Relative Air Humidity: Maximum 90% (non-condensation)
- Storage and Transportation Temperature: -25 to 60°C (-13 to 140°F)
- Temperature Coefficient: 50ppm/ºC

Digital Interfaces

- Digital Input:
  - 3 inputs of optical coupler type
  - Voltage: 12-24VDC
  - Maximum frequency: 2 Hz

- Digital Output:
  - 2 relay outputs
  - Electrical characteristics: 250V-2A (AC or DC)
  - Operation: Control via communication interfaces

Analog Interfaces

- Analog Input: 2 analog inputs, 0-10 VDC or 4-20 mA DC (this option is defined in the order)
- Temperature: 1 input for PT-100, 0 to 150°C (32 to 302°F)

Product Installation

The installation process is based on five steps, as outlined below. Cables with a minimum cross-sectional area of 1.5mm2, should be used, for external power connections, voltage signal, and current signal (when used with external CTs).

For direct measurement, the cables that will power the load(s) being measured must be in accordance with their nominal current and should not exceed a diameter of 9mm.

For all connections to the transducers, the use of pin-type terminals is mandatory to achieve better connectivity and to prevent damage to the terminals.

WARNING

Installation, parameterization, and operation of the Konect, should only be carried out by specialized personnel, who are fully aware of and understand the contents of the User Manual.
All connections must be made with the system non-energized.
If you have any questions, please contact our Technical Support via phone (+55 11 5525-2000) or email (suporte@kron.com.br).

1.Mounting the Konect on the panel

The first step is to secure the Konect to the back of the panel. The instrument can be mounted in any position; however, for optimal use, it is recommended to install it in a way that allows for easy reading and understanding of the information on the front panel and display.
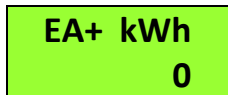
2. External Power

Konect is designed for a specific external power supply voltage, which is indicated by a label affixed to its top surface.

External Power
85...265Va.c / 100...350Vd.c (No polarity)
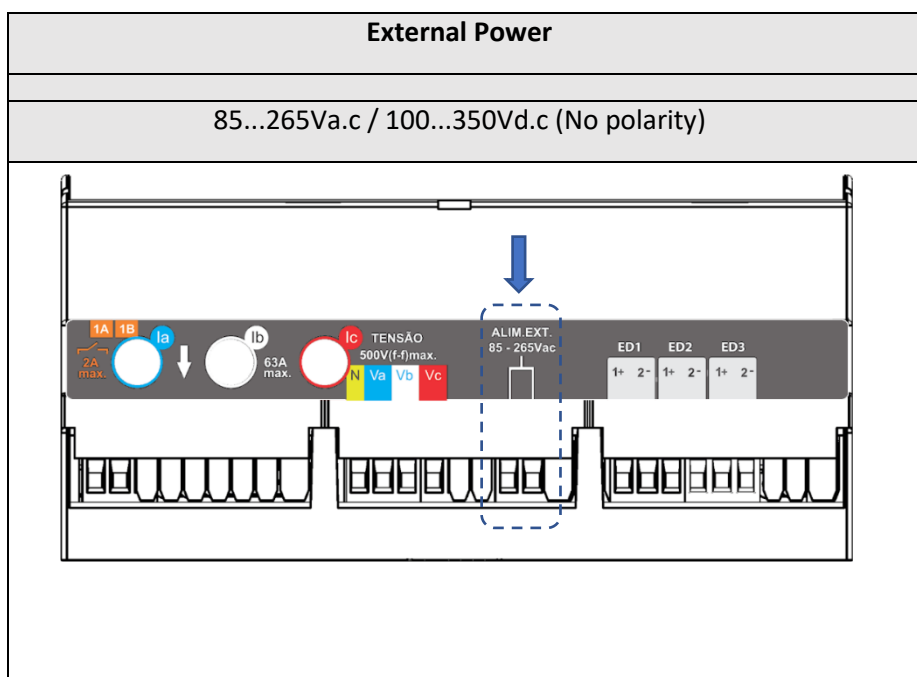
It is necessary to ensure that the voltage used for the external power supply is within the allowed range for the meter, as there is a risk of damage in case of an incorrect connection or voltage exceeding the allowed limit.

After making the electrical connections to the indicated terminals and powering up the instrument, the entire display should light up, and it will start measuring the energy mode, displaying the positive active energy (EA+) on the screen, as shown in the example below:

EA+ kWh
0

An "on/off" switch should be provided for the external power supply of the instrument, and it should be properly labeled and easily accessible to the operator. After the meter is installed, it is recommended to remove the protective film from the front panel to improve the visibility of information on the **Konect** display.

Before proceeding with the connection of current and voltage, it is necessary to choose the appropriate electrical scheme (Connection Diagrams) for the application in which the **Konect** is being used. Therefore, please refer to the Connection Diagrams chapter before proceeding.

3. Voltage signal

Using the appropriate connection diagram, please ensure that the voltage connections are made correctly. It is recommended to use protective circuit breakers or fuses between the system and the **Konect** to protect the instrument and facilitate future handling during installation. It is essential that the voltage signal is connected in a clockwise direction (R-S-T).

The connection of voltage transformers is only necessary in cases **where you want to isolate the measurement circuit from the electrical installation or when the voltage between phases of the system exceeds 500V AC (L-L) or 288.67V AC (L-N, in the case of using the TL-02 scheme: Single Phase).**

4. Current signal

For indirect measurements using external CTs

Check (using the appropriate diagram) how the current connection should be made. The connection of current transformers (CTs) is necessary in cases where the line current exceeds the instrument's nominal current or when the cable size used for the load being measured exceeds the diameter of the internal CTs (9mm). With conventional current transformers, with a 5Aac secundary, it is important to pay attention to the polarities (P1/P2, S1/S2) and also to the "matching" between the current and voltage connections. It is recommended to use Measuring blocks or another device with the same function to short-circuit the current transformers for future maintenance or replacement of the equipment, allowing it to be isolated from the main circuit without the need to disconnect the measured load.

WARNING: NEVER LEAVE THE SECONDARY OF CURRENT TRANSFORMERS OPEN, AS THIS WILL CAUSE HIGH VOLTAGES IN THE SECONDARY SIDE OF THE TRANSFORMER, POTENTIALLY CAUSING DAMAGE TO IT AND SAFETY RISKS.

For the standard version

The **Konect** has internal current transformers (CTs) for direct measurement up to 63A, eliminating the need for external CTs.

The default direction of current is from top to bottom, as indicated by the arrow on the meter. However, it is possible to change the direction of current through software settings.

5. Parameterization

The Konect allows the configuration of TP (Potential Transformer), TC (Current Transformer), TL (Connection type), TI (Integration time for demand calculation), current direction, address, and serial directly through the HMI (Human Machine Interface) and via communication interfaces. Other configurations can only be made through its communication interfaces using the **Redemb software, Kron-Fi application (for meters with Wi-Fi), or via the Web page (for meters with Ethernet output).** By default, the **Konect** is provided with the following values:

TP	1	TC	1	TL	0	TI	15
BAUD RATE (RS-485)	9600 bps	BITS (RS-485)	8N2	MODBUS –RTU ADDRESS (RS-485)	254	DHCP (Ethernet)	OFF (IP Estático)
IP (Ethernet)	10.0.0.1	SUBNET MASK (Ethernet)	255.0.0.0	GATEWAY (Ethernet)	0.0.0.0	DNS (Ethernet)	0.0.0.0
Slave ID (MODBUS-TCP)	255	DHCP (Wi-Fi)	ON	Bluetooth	OFF		

6. Installation verification and measurement coherence

After being properly installed, parameterized, and energized, it is recommended to verify the coherence of the measurements being performed by the **Konect**.

To do so, it is recommended to follow the following checklist. It is necessary to read the chapter "Human-Machine Interface" for guidance on how to read the parameters measured by the **Konect**.

1) Is the voltage reading as expected?
2) Is the current reading as expected?
3) Is the active power reading as expected?
4) Is the power factor reading as expected? Be wary of power factors that are too low or inconsistent with the installation.
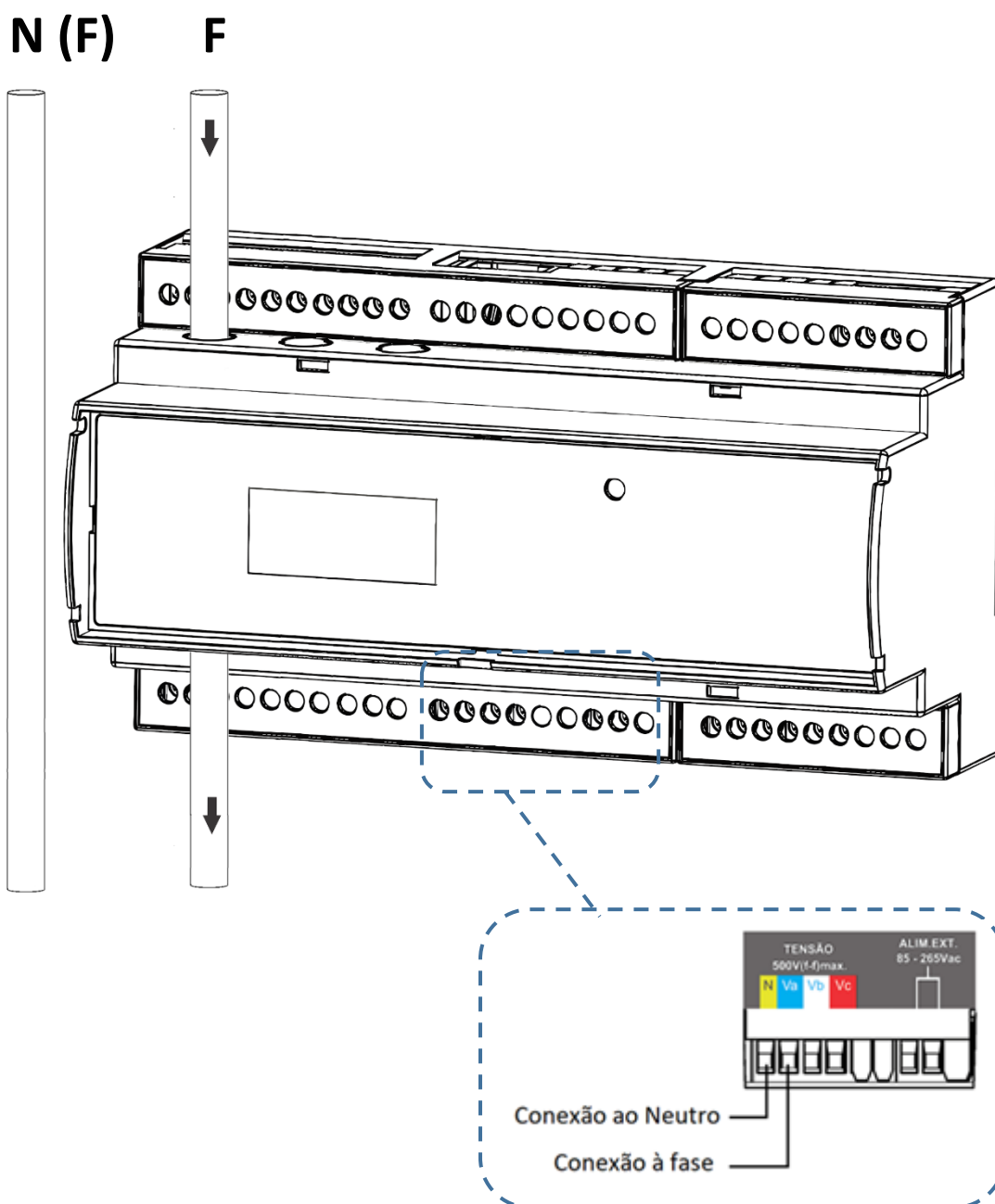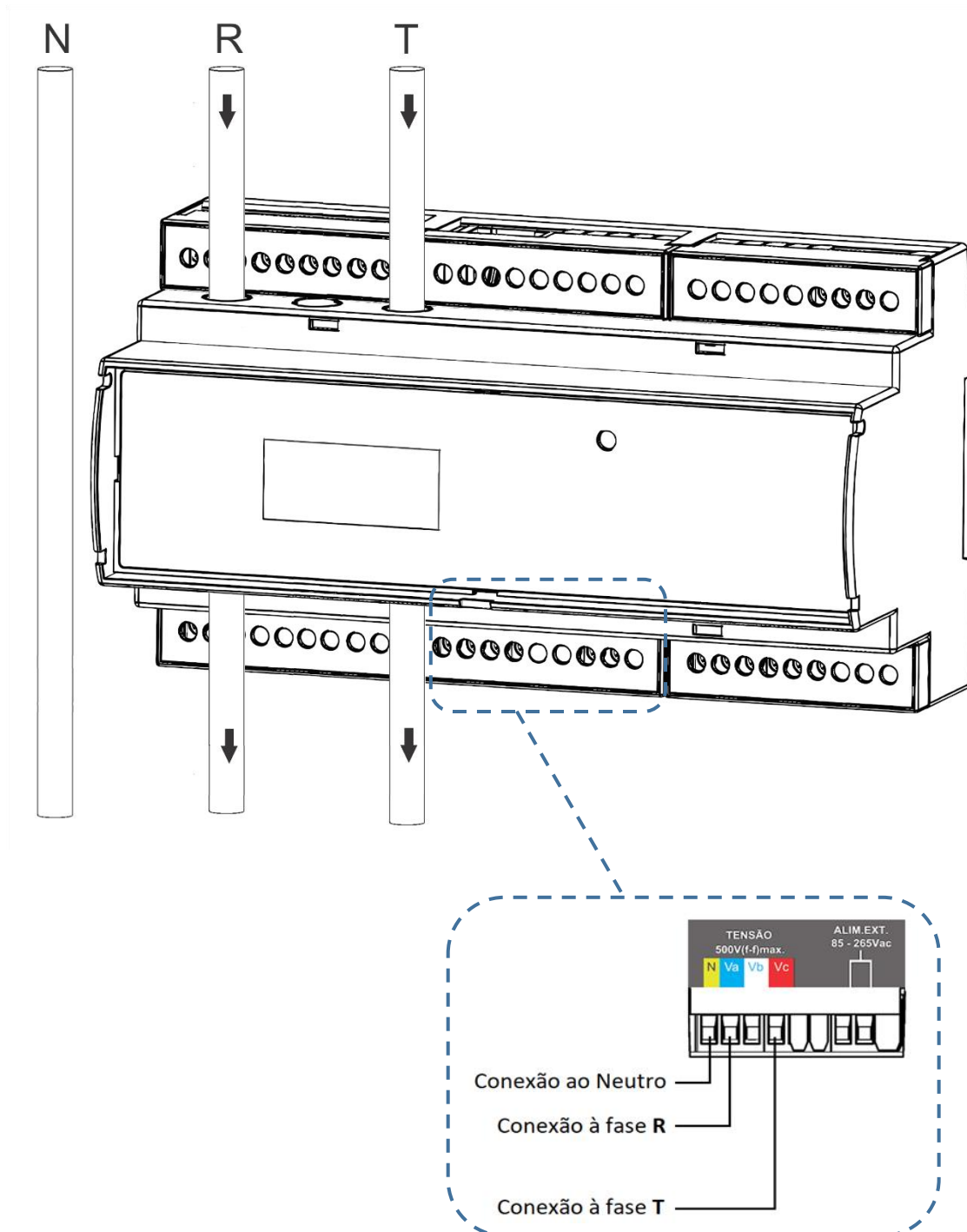
Connection diagrams

TL 02

Single phase
1 element 2 wires

Application:

Measurement of single-phase circuits.

The use of current and voltage transformers is only necessary if the current or voltage of the system exceeds the limits specified in *the Technical Specifications* chapter.

It is possible to use **any of the three phases for measurement**, as long as the reference is connected to the "Va" and "Ia" channels. The Neutral reference can receive phase voltage, as long as the resulting voltage between phase and neutral is below 288.67 Vrms (L-N).

TL 01

Bi-phasic
2 elements 3 wires

Application:

Measurement of two-phase circuits.

The use of current and potential transformers is only necessary if the current or voltage of the system exceeds the limits specified in the *Technical Specifications chapter.*

It is essential that the phase sequence is in a clockwise direction (R-S-T), meaning R-T, S-R, or T-S.

Conexão ao Neutro
Conexão à fase **R**
Conexão à fase **T**

TL 00

Three-Phase Balanced or Unbalanced Star (3F + N)
3 elements 4 wires

Application:

Measurement of three-phase star circuits (3F + N)

The use of current and voltage transformers is only necessary if the current or voltage of the system exceeds the limits specified in the *Technical Specifications chapter.*

It is essential that the phase sequence is in a clockwise direction (R-S-T).
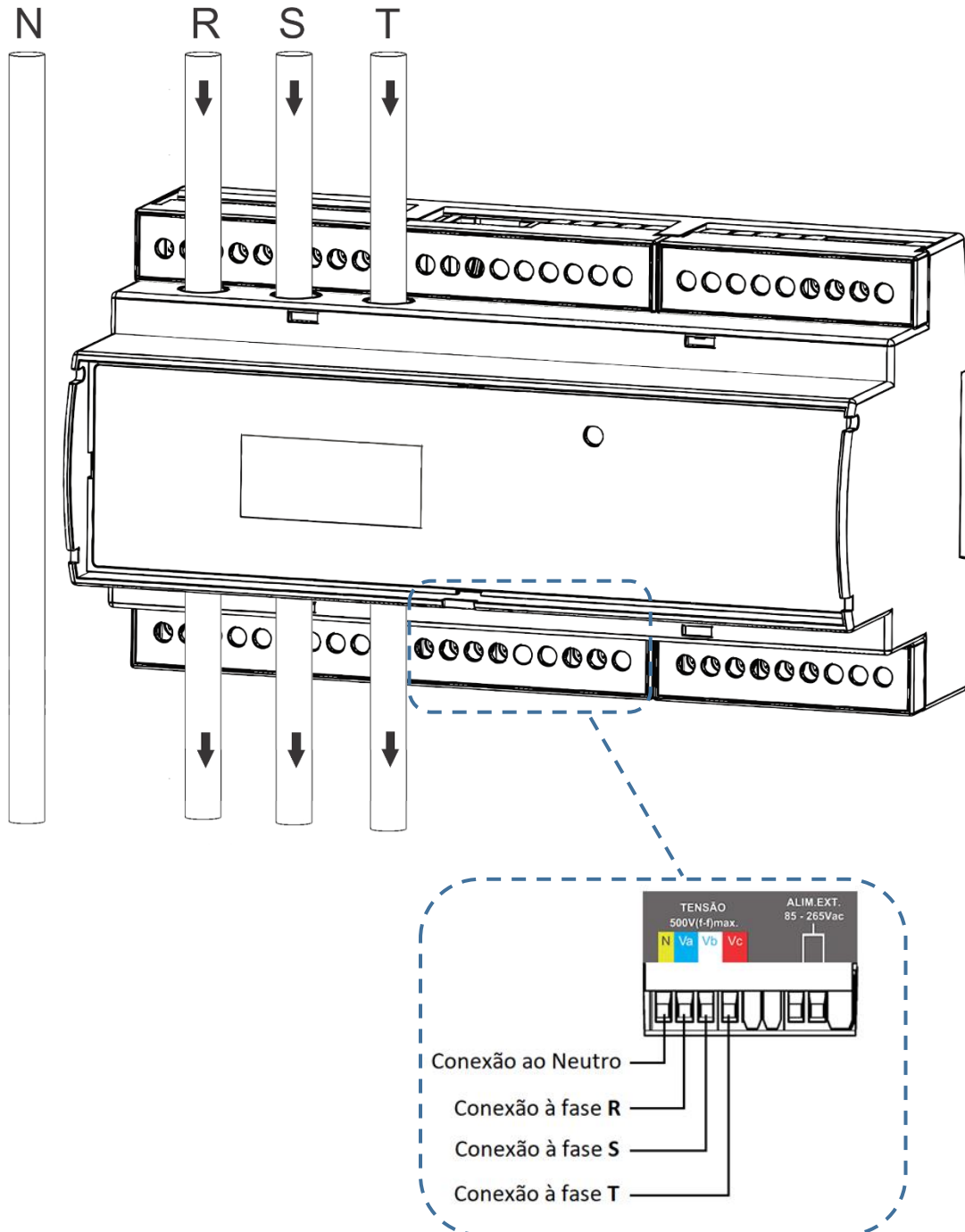
TL 48

Unbalanced Delta Three-Phase (3F) - 3 elements.
3 elements 3 wires – 2PTs

Application:

Measurement of delta three-phase (3F) circuits, using 3 (three) current transformers (elements) and 2 (two) potential transformers.

The use of current and potential transformers is only necessary if the current or voltage of the system exceeds the limits specified in the *Technical Specifications chapter*.

It is essential that the sequence of phases is in a clockwise direction (R-S-T).
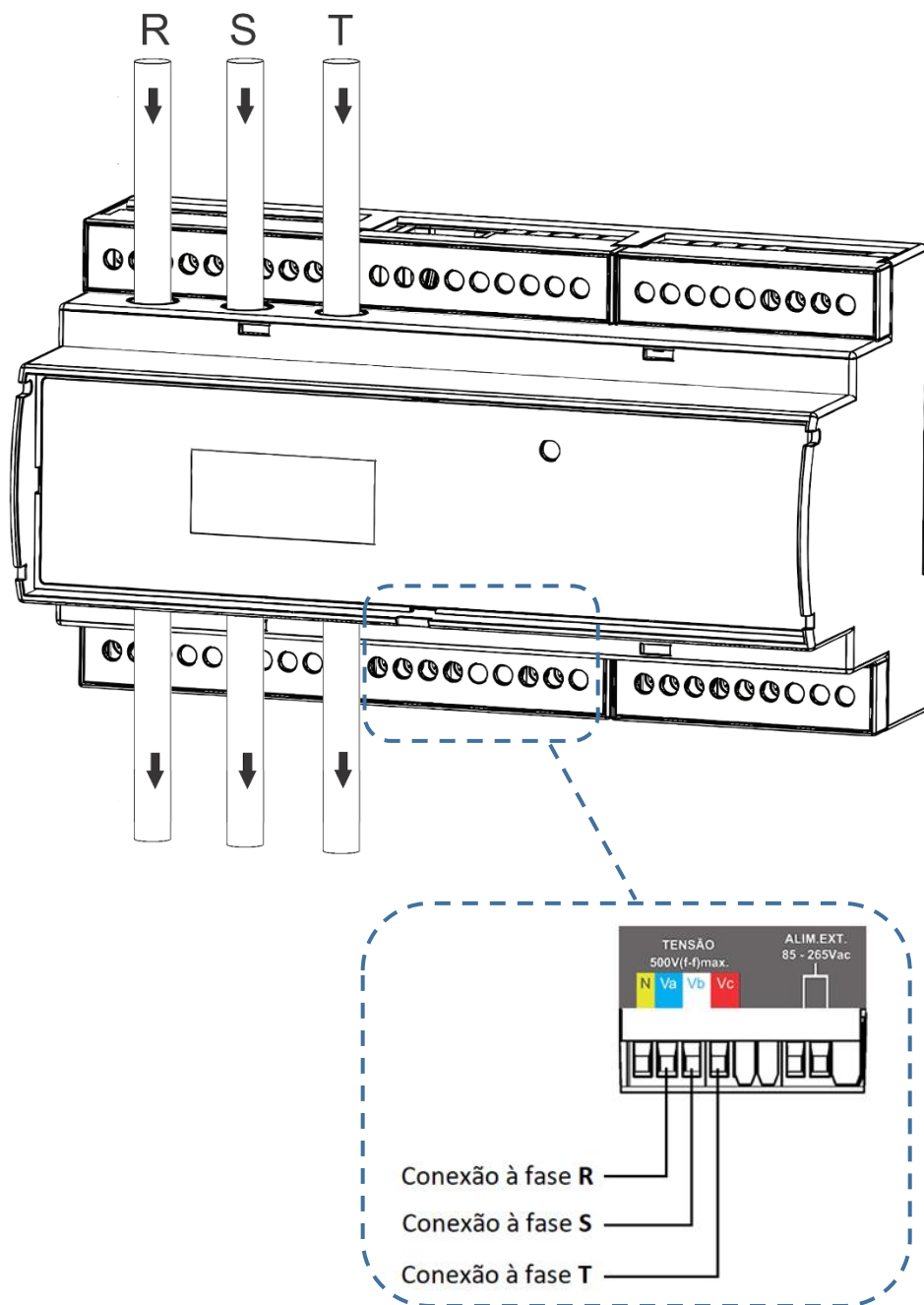
TL 00

Balanced or Unbalanced Three-Phase Star (3F + N) - connection to external CTs for 5A AC / Direct voltage measurement.
3 elements 4 wires

Application: Measurement of three-phase star circuits (3F + N).

The use of current and voltage transformers is only necessary if the current or voltage of the system exceeds the limits specified in the *Technical Characteristics chapter.*

It is essential that the phase sequence is in a clockwise direction (R-S-T).
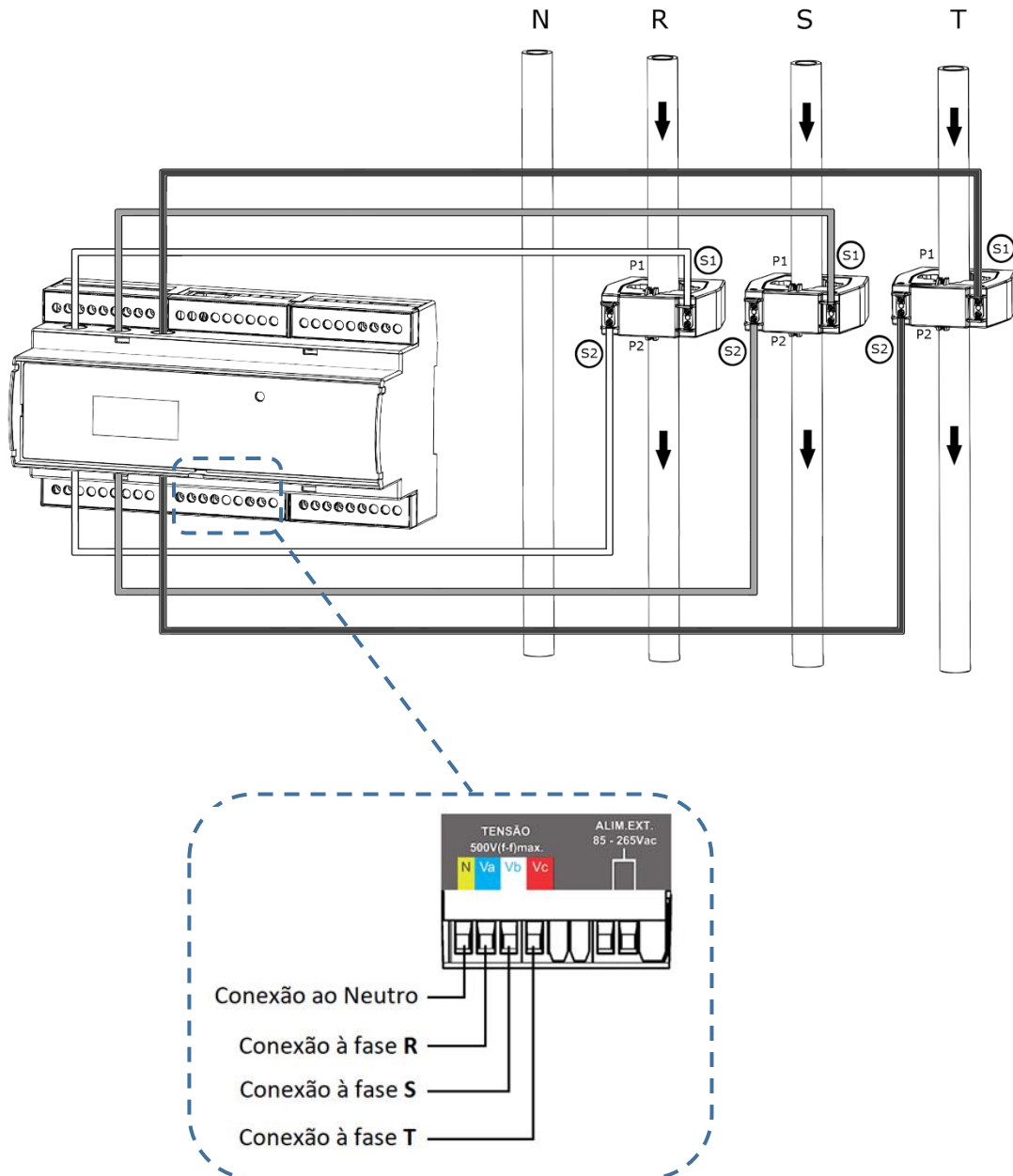
OBS: Replicate the concept above for the other types of connections.

TL 00

Balanced or Unbalanced Three-Phase Star (3F + N) - connection to Split Core type CTs for direct voltage measurement.
3 elements 4 wires

Application: Measurement of three-phase star circuits (3F + N).

The use of current and potential transformers is only necessary if the current or voltage of the system exceeds the limits specified in the *Technical Characteristics chapter*.

It is essential that the phase sequence is in a clockwise direction (R-S-T).
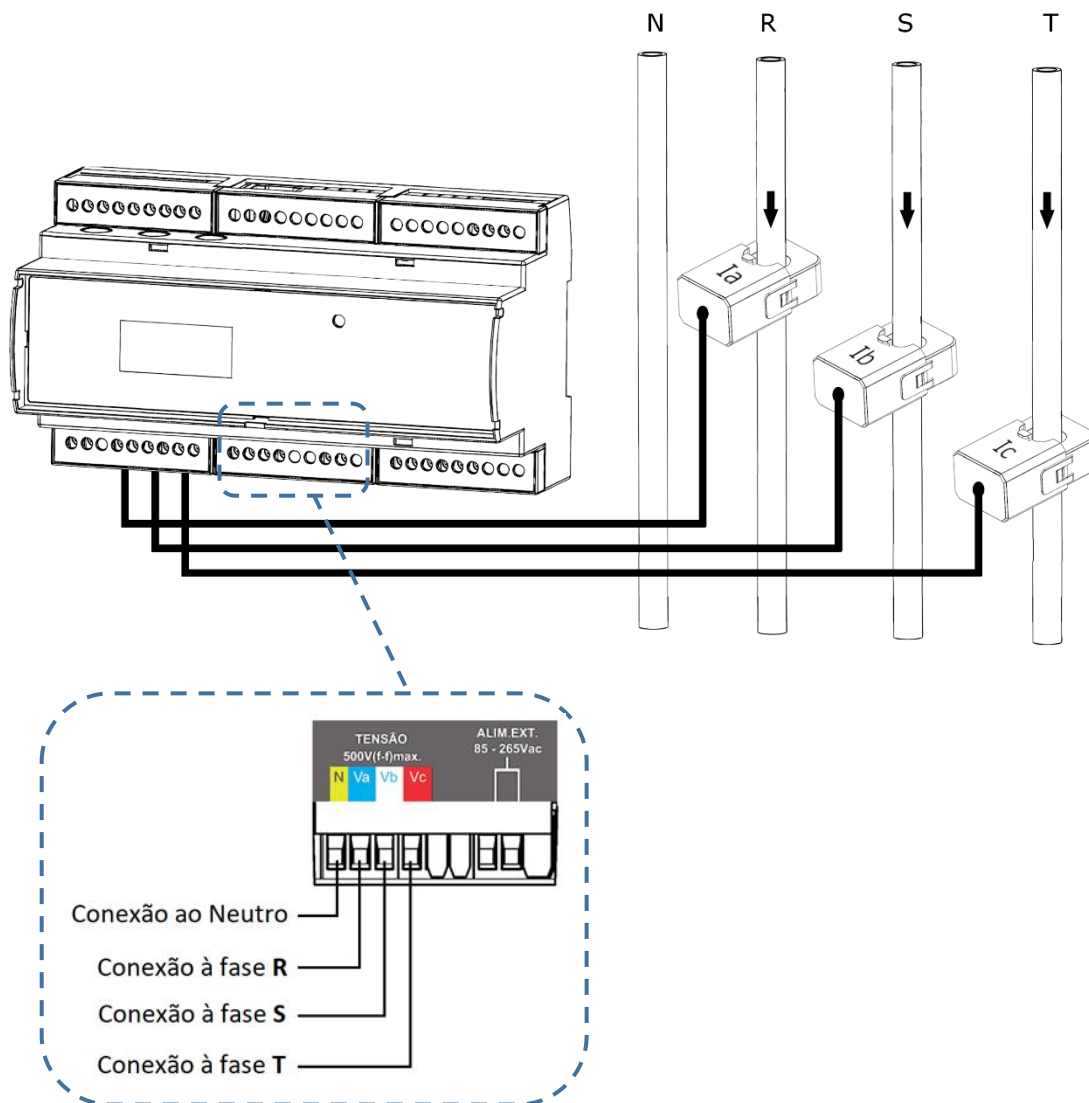
OBS: Replicate the concept above for the other types of connections.

ATTENTION
Never apply a voltage signal to the current inputs. This will damage the meter.

Digital Inputs

The purpose of digital inputs is to obtain information from external sensors (such as water meter, gas meter and etc.). Each input functions as a counter for the number of pulses coming from the meters of other variables. These quantities are then available for reading through communication with Konect (RS-485, Ethernet, Wi-Fi, or Bluetooth).

When establishing communication, it is possible to obtain, in addition to the pulse counters, the width of the last pulse and the status of the inputs (ON/OFF).

It is important to note that the association of pulse quantities with their equivalence parameters is done outside of the instrument.

In Konect, there are three inputs available, labeled as "EDP1", "EDP2", and "EDP3".
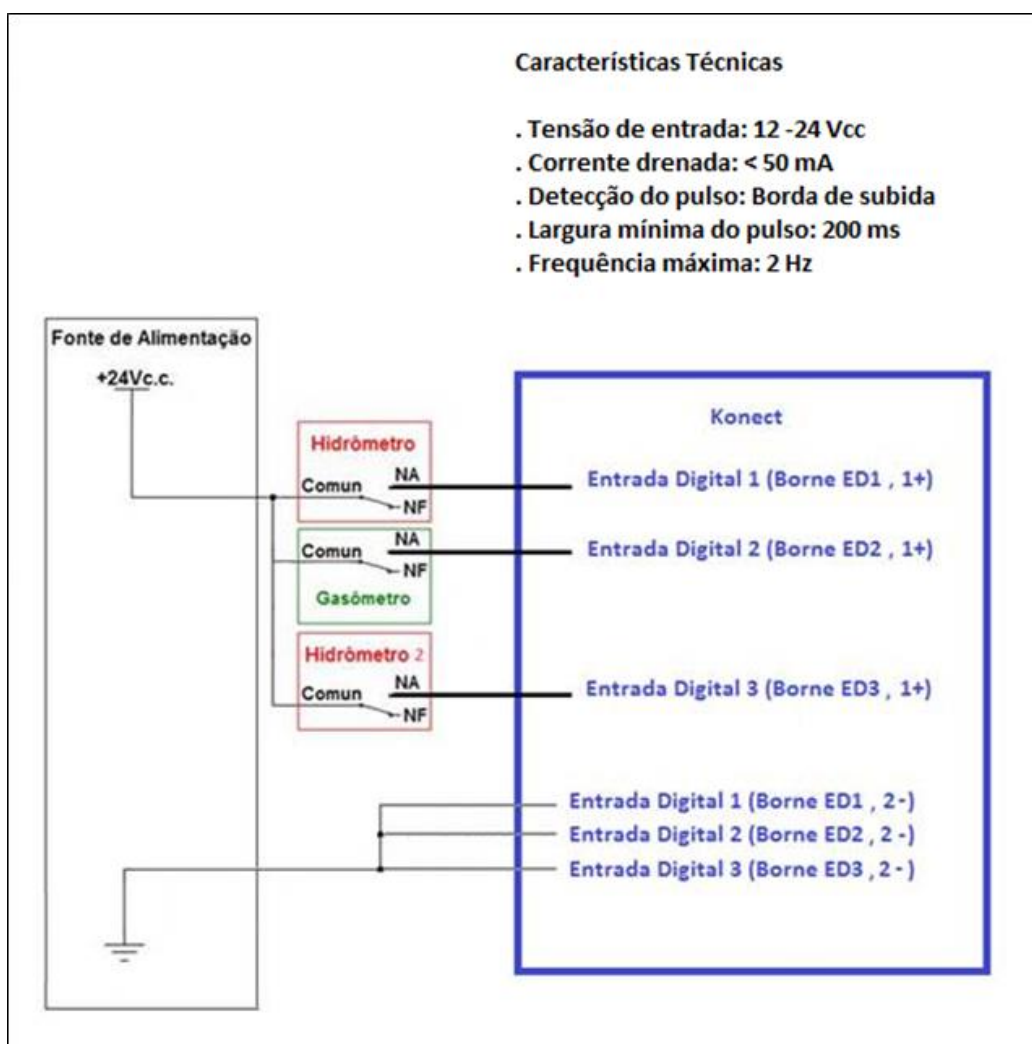
Digital Outputs

Konect has two digital outputs, using relay, for remote activation via RS-485, Ethernet, Wi-Fi or LoRa.

Application

The digital outputs can be used to activate relays, alarms, sirens, etc.

Activation and deactivation of the relays are dependent on external command, that is, the master device has to send the information through some means of communication, to change the state (ON/OFF). The meter, by itself, does not activate or deactivate the outputs.

These outputs must not be used on loads that require a current greater than that specified.

Technical characteristics

• Maximum voltage: 250V
• Maximum output current: 2A
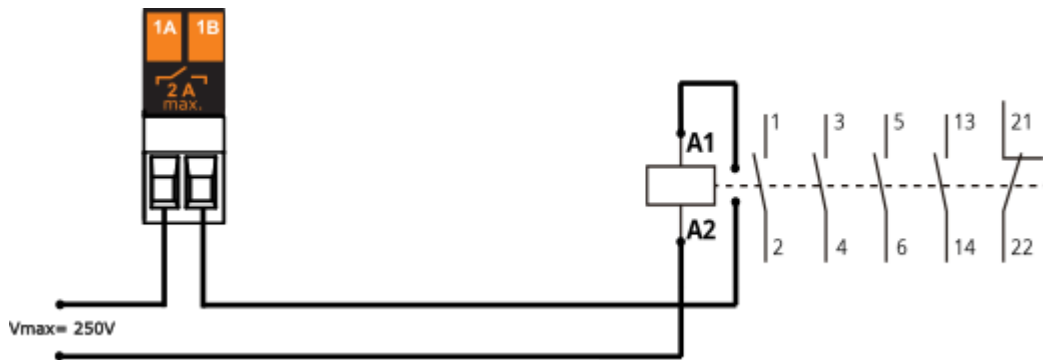
HMI: Human-Machine Interface

Konect is equipped with a 16-character LCD display (8 x 2) with backlight for viewing the measured quantities.

Konect's interface has the following modes:

1) **Modo Energia** (**ENERGY MODE**)

Reading of cumulative measurements (energy consumption, demand, etc...)

2) **Modo Instantâneo** (**INSTANT MEASUREMENT**)

Reading of instantaneous measurements (voltage, current, etc...)

3) **Modo Parâmetros** (**PARAMETERS MODE**)

Allows configuration of VT (Voltage Transformer and CT (Current Transformer) ratios, connection diagram type, integration time for demand calculation, serial settings, Modbus address, threshold, current direction, and enabling access password.

4) **Modo Sistema** (**SYSTEM MODE**)

Access to information such as serial number, error code, number of starts, and firmware version.

5) **Modo Configuração Ethernet (ETHERNET CONFIGURATION)**

Verification of IP settings, Subnet Mask, Gateway, DNS, DHCP (ON/OFF), and Mac Address of the Ethernet output.

6) **Configuração LoRa** (**LORA CONFIGURATION)***

Verification of deviceEUI settings, ADR (Adaptive Data Rate), activation, class, RSSI (Received Signal Strength Indicator), and error code.

By holding both buttons for 3 seconds on the RSSI screen, the meter will send a Check Link command. The RSSI value takes at least 15 seconds to update. If the RSSI is equal to 0, it means that the Link Check command determined that there is no link with the Network Server or the signal strength between the gateway and the device is very weak. (only avaible for LoRa Version)

7) **Modo sem fio (WIRELESS MODE)***

Allows the user to enable the wireless communication options to be used (Wi-Fi and Bluetooth) (only avaible for Wi-Fi Version).

8) **Configuração Bluetooth (BLUETOOTH SETTINGS)**

Verification of the meter description, Bluetooth Mac address, and whether Bluetooth is enabled.

9) **Configuração Wi-Fi (WiFi CONFIGURATION)***

Verification of the network SSID, IP settings, Subnet Mask, Gateway, DNS, DHCP (ON/OFF), Mac Address, and communication status. (only avaible for Wi-Fi Version)

10) **Modo AP (AP MODE)**

Access Point mode, used to include the meter in the desired Wi-Fi network. (only avaible for Wi-Fi Version)

11) **Restauração dos parâmetros de fábrica (FACTORY RESTORE)**

Restores the communication parameters to the factory default settings.

The mode selection is done by pressing the buttons ◀ and ▶ for approximately three seconds. Within each mode, the selection of each measurement or parameter is done by pressing the buttons ◀ or ▶ . The menus are circular, meaning that after selecting the last measurement or parameter, the first one will be displayed.

* The meter can only have LoRa or Wi-Fi communication. It's not possible to have both types of communication in the same product.


HMI: Energy Measurement Mode

In Energy Mode, it is possible to measure quantities related to energy (active and reactive, in the four quadrants) and demand (last integration and maximums). The selection of the quantity is done through the ◀ or ▶ keys.

The available quantities for reading are:

Display	Descrição
EA+	Positive Active Energy
EA-	Negative Active Energy
ER+	Positive Reactive Energy
ER-	Negative Reactive Energy
DA	Active Demand
MDA	Maximum Active Demand
DS	Apparent Demand
MDS	Maximum Apparent Demand

Reading example:

Measured greatness   Unit

```
EA+  kWh
        0
```

                                                measured value
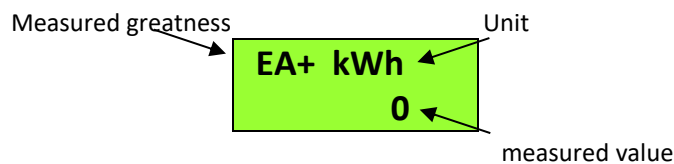
Konect features an intelligent value presentation system, which means that when the value of a specific quantity exceeds the indication limit, the unit scale will automatically increase, allowing the visualization of that quantity.

To switch to the next mode, simply press and hold both the ◀ ▶ Keys simultaneously for three seconds.

HMI: Instantaneous Measurement Mode

In Instant mode, it is possible to visualize instant measurement quantities (voltage, current, power, etc.). **Konect** features an intelligent indication system that will only display quantities relevant to the selected connection scheme (diagram). The selection of the quantity is done through the ◀ or ▶ keys.

The quantities available for reading are:

Display	Description	Display	Description
U0	Three-phase voltage	S0	Three-phase apparent power
U1N	Voltage on line 1	S1	Three-phase apparent power
U2N	Voltage on line 2	S2	Three-phase apparent power
U3N	Voltage on line 3	S3	Three-phase apparent power
U12	Voltage on phase 1-2	PF0	Three-phase power factor
U23	Voltage on phase 2-3	PF1	Line 1 power factor
U31	Voltage on phase 3-1	PF2	Line 2 power factor
I0	Three-phase current	PF3	Line 3 power factor
I1	Line 1 current	Freq	Frequency (R phase)
I2	Line 2 current	THDU1	THD line 1 – voltage
I3	Line 3 current	THDU2	THD line 2 – voltage
P0	Three-phase active power	THDU3	THD line 3 – voltage
P1	Line 1 active power	THDI1	THD line 1 - current
P2	Line 2 active power	THDI2	THD line 2 - current
P3	Line 3 active power	THDI3	THD line 3 - current
Q0	Three-phase reactive power	FK 1	K Factor - Line 1
Q1	Line 1 reactive power	FK 2	K Factor - Line 2
Q2	Line 2 reactive power	FK 3	K Factor - Line 3
Q3	Line 3 reactive power		

Reading example:

Measured greatness   Unit

U0   kV
       13.81

Measured value
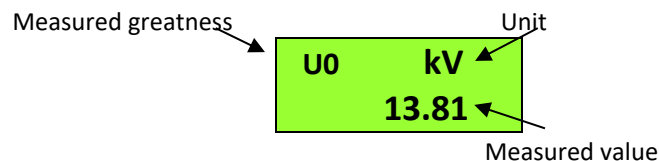
Konect features an intelligent indication system, which means that when the value of a specific quantity exceeds the digit limit, the unit scale will automatically increase, allowing for better visualization.

To switch to the next mode, simply press and hold both the ◀ ▶ keys simultaneously for three seconds.

HMI: Parameters Mode

In Parameters Mode, it is possible to configure the parameters related to measurement and RS-485 communication. If the access password is enabled, use *00021* to access. Use the ⏺ to increment the value of the digit that is flashing, and ⏺ to navigate between digits.

The selection of the information to be displayed is done through the ⏺ or ⏺ keys. To configure the parameter being shown on the display, hold down both the ⏺ and ⏺ keys for 3 seconds. Use ⏺ to increment the value of the digit that is flashing, and ⏺ to navigate between digits. The configuration will be completed by clicking ⏺ when you are on the last digit.

To exit the configuration menu, navigate to "PARAMET SAIR" and hold down both the ⏺ and ⏺ keys for 3 seconds.

The information available in this mode is:

Display	Description
TP	The TP/VT (Voltage Transformer) ratio should be programmed according to the actual ratio used. If a TP with a ratio of, for example, 480/120V is being used, the ratio should be programmed as 4.
TC	The TC/CT (Current Transformer) ratio should be programmed according to the actual ratio used. If a TC with a ratio of, for example, 1000/5A is being used, the ratio should be programmed as 200.
TL	It indicates which type of connection diagram is selected.
TI	Integration time for demand calculation, in minutes.
Serial	Baud rate and data format (parity and stop bits) selected for RS-485 serial output.
Endereco	Selected MODBUS address.
Thresh	Current value for hour meter counting.
DIR I.	Displays the reading direction of the current

HMI: System Mode

This mode allows access to information such as serial number, error code, number of starts, firmware version, and internal meter configuration.

Display	Description
Num Ser	The product serial number
Cod Erro	Error code. To know the meaning of each error code, please refer to Appendix A - *Error Code.*
Partidas	Number of times Konect was restarted.
Versao	Konect firmware version
CONF INT	Konect internal configuration

HMI: Ethernet Configuration Mode (only avaible for Ethernet Versions)

In Ethernet Configuration mode, it is possible to check IP, Subnet Mask, Gateway, DNS, DHCP and MAC Address data.

The selection of the information to be displayed is done through the ◀ or ▶ keys. The programming of parameters is done via communication interfaces.

HMI: Wireless Mode (only avaible for Wi-Fi Versions)

Allows the user to enable the wireless communication options that will be used (Wi-Fi and Bluetooth)

Within the Wireless menu, you will be able to access the options Bluetooth, Wi-Fi, and Exit. Use the ◀ or ▶ keys to select the wireless communication method you want to enable on the meter. Holding down both the ◀ and ▶ keys simultaneously until the meter restarts will turn on or off the displayed communication type. If the communication type is set to "OFF," it will change to "ON" after the command. It is possible to use both types of communication simultaneously.

If you are in this menu and do not want to change the means of communication, keep the Keys ◀ and ▶ pressed simultaneously when the "SAIR" option is being shown on the display.

HMI: Bluetooth Configuration Mode (only avaible for Wi-Fi Versions)

With the Bluetooth communication option enabled, this mode will display the information that Bluetooth is enabled (ON), the meter's description, and the Bluetooth MAC Address.

If the Bluetooth communication option is disabled, it will only display the information that it is deactivated (OFF).

The selection of the information to be displayed is done using the ◀ or ▶ keys.

HMI: Wi-Fi Configuration Mode (only avaible for Wi-Fi Versions)

With the Wi-Fi communication option enabled, this mode will display that Wi-Fi is enabled (ON), the SSID of the network, IP settings, Subnet Mask, Gateway, DNS, DHCP status (ON/OFF), MAC Address, and communication status.

If the Wi-Fi communication option is disabled, it will only display the information that it is deactivated (OFF).

The selection of the information to be displayed is done using the ◀ or ▶ keys.

HMI: Access Point Mode (only avaible for Wi-Fi Versions)

With the Wi-Fi communication option enabled, this mode allows the meter to enter Access Point mode to be connected to a Wi-Fi network using the Kron-Fi application. To put the instrument in Access Point mode, simply press and hold both the ◀ and ▶ keys until the message "*MODO AP*" appears on the display. Then, press any of the navigation keys and select the option "*SIM*". The next step is to continue holding down the ◀ and ▶ keys until the message "*MODO AP ATIVO*" appears and the LED starts blinking. The meter will remain in this mode for approximately 3 minutes.

HMI: Factory Restore Mode

To reset the communication parameters, simply press and hold both the ◄ and ► keys until the message "*RESTAURA FABRICA*" appears on the display. Then, press any of the navigation keys and select the option "*SIM*" (Yes). The next step is to continue holding down the ◄ and ► keys until the instrument restarts (the message "**KONECT**" will be displayed), and then it will return to the "*MEDIÇÃO ENERGIA*" mode.

The parameters will be restored to the factory default according to the table:

Parameters	Restored Value
Baudrate	9600bps
Character format	8N2
Modbus RTU address	254
Modbus TCP address	255
IP address (Eth)	10.0.0.1
Address Mask (Eth)	255.0.0.0
Gateway address (Eth)	0.0.0.0
IP configuration (Eth)	Estático/Static
Bluetooth Description	Konect_xxxxxxx (where "xxxxxxx" is the Serial Number)
Bluetooth password	1234
IP Configuration (Wi-Fi)	Dinâmico/Dynamic (DHCP ON)

Hourmeter and Load Status

The Hour Meter aims to record the time that a specific load remains turned on, acting as a digital timer that monitors the activity of machines, motors, and so on.

On the other hand, the Load Status simply indicates whether the load is turned On or Off.

For the Hour Meter to start counting, it is necessary for the current of at least one phase to be above a pre-configured value (threshold). When this occurs, the instrument changes the load status to "on," and the hour meter starts counting. The threshold value is configured through the RedeMB software or Kron-Fi application. The default pre-set threshold is 2A.

The accuracy of the Hour Meter is in hundredths of an hour (1/100). Thus, the reading is displayed with two decimal places and has a resolution of 36 seconds. For example, when 1 hour is totaled, the hour meter reading will show 1.00, which actually corresponds to 100 x 36 seconds = 3600 seconds.

Another example is when the hour meter reading shows 2.50, which means that the load has been turned on for 2 hours and 30 minutes.

RS-485 Serial Interface

Introduction

The **Konect** is equipped with a standard RS-485 two-wire, half-duplex serial output for remote reading and parameterization of the meter.

The communication protocol used by RS-485 on the **Konect** is **MODBUS**-**RTU**, which allows up to 247 transducers to operate on the same communication network.

The **Konect** can work with other MODBUS-RTU devices on the same network, as long as the specifications regarding speed, parity, start bits, data bits, and stop bits are respected.

Remote monitoring of the **Konect** can be done using any equipment that acts as a master (MASTER), communicates via the MODBUS-RTU protocol, and has an available serial interface, such as supervisory systems running on PCs, PLCs, or other control units.

Technical Characteristics	
Standard:	RS-485 Half-Duplex 2 wires
Protocol:	MODBUS-RTU
Baud rate in bps:	9600 19200 38400 57600
Parity:	None, odd or even
Stop bits:	1 ou 2
Start bits:	1
Data Bits:	8 bits
Address range:	1 to 247
Maximum distance without the need to use signal amplifiers:	1000m
Maximum number of transducers without the need to use signal amplifiers:	32

Connection diagram

The **Konect** RS-485 serial interface has 3 (three) connection points: "+", "-" and "GND" (ground).

The correct way to connect the instruments in a network is in a "point-to-point" manner, meaning that the master device (PLC, PC, converter) is connected to the first meter, and then from this first meter, the connection is made to the second meter, and so on.

Below is depicted a typical application of meters using an RS-485 to USB or Ethernet converter for connection to a PC and the use of the **RedeMB** software.
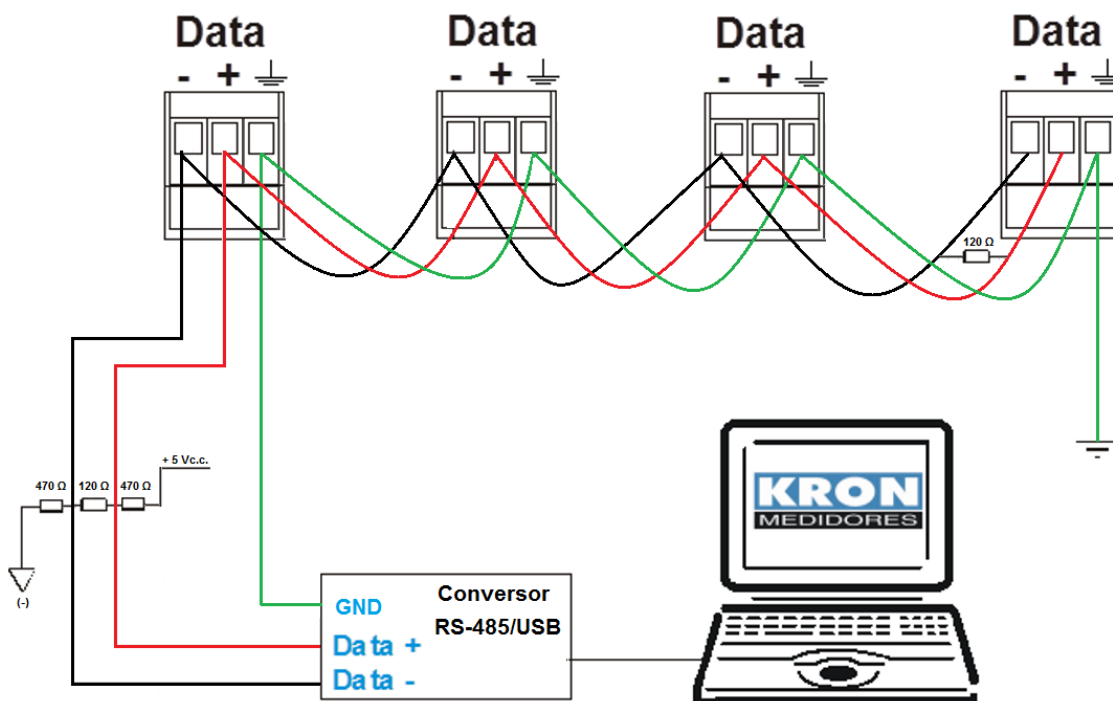
RS-485

Terminal	Description
" +"	DATA-
" - "	DATA+
"⏚"	GND

Recommendations

- Use twisted pair cable 2x24 AWG or 3x24 AWG. This cable should have shielding and a characteristic impedance of 120Ω.

- Connect two termination resistors of 120Ω at each end, that is, one at the output of the converter and another at the last instrument installed in the network. Connect two biasing resistors of 470Ω using an external 5 VDC power supply as shown in the diagram of the previous illustration.

- If the option is not to use biasing resistors, also eliminate the termination resistors. It is important to note that this will result in a loss of communication signal quality and may even cause communication failures.

- Connect **one of the available wires of the cable to the "ground" terminal of the RS-485** of the meters, and simultaneously connect only one end of this wire to the grounding point of the installation. The cable shielding should **not** be used for connection to the "ground" terminal of the instruments.

- Connect one of the ends of the shield to the installation ground.

- For more than 32 instruments or distances exceeding 1000 meters, a signal amplifier should be used. For each installed signal amplifier, it will be necessary to add termination and biasing resistors according to the RS-485 wiring diagram.

Converters

Its function is to convert one physical medium to another. The most common models available on the market are RS-485 to USB or Ethernet converters.

To enable communication between the PC and the transducers, a converter is required, in this case, from RS-485 to another standard (USB, Ethernet, etc....).

KRON Instrumentos Elétricos sells an RS-485 to USB converter, the KRS-485/USB. For information on quotes and delivery times, please contact our sales department by email at vendas@kron.com.br or by phone at (11) 5525-2000.
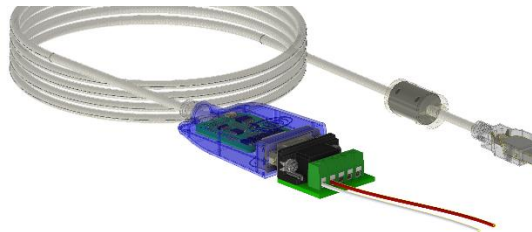
Communication problems

This manual includes a chapter on *Troubleshooting*, a topic dedicated specifically to common questions and problems related to using the serial interface of **Konect** meters.

When facing difficulties in implementing an automation system using the serial interface of Konect, do not hesitate to refer to this section of the documentation, as most of the commonly encountered questions or issues are addressed in this chapter.

IP configuration on a LAN

Konect meters with an Ethernet communication interface use the **factory default IP address 10.0.0.1.**

The IP address can be changed according to the user's interest or needs. Parameters such as IP address, Gateway, and Subnet Mask can be configured.

With a network cable connected to the Konect, perform the procedures below to establish communication between the computer and the meter.

To carry out a communication, it will be necessary that the meter and the computer are in the same IP group. For this, go to:

➢ Control Panel > Network and Internet > Network and Sharing Center
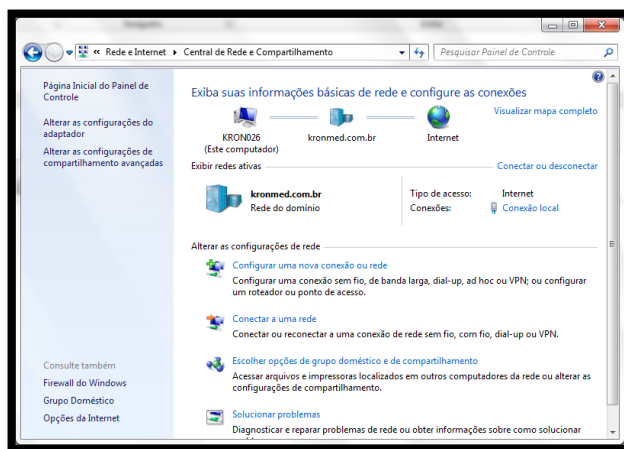
➢ Click Local Area Connection > Properties
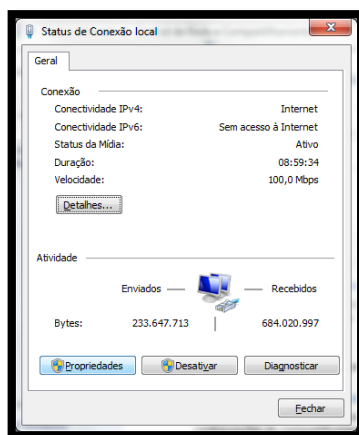
➢ In the window that appears, on the General tab, select **TCP/IP Version 4 protocol** and click on the Properties button.
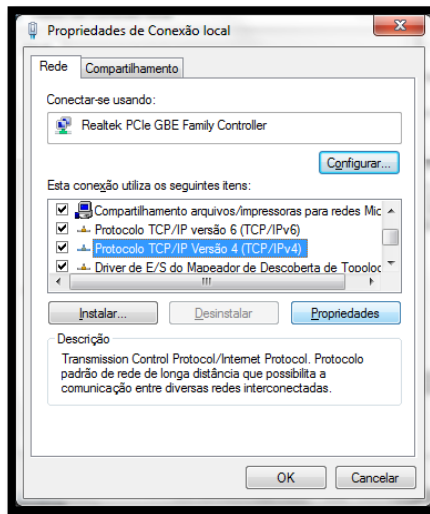
➢ Next, make the necessary changes so that the PC is in the same IP group as the meter.

The Konect comes from the factory with the following network settings.

IP	10.0.0.1
Subnet Mask	255.0.0.0
Gateway	0.0.0.0
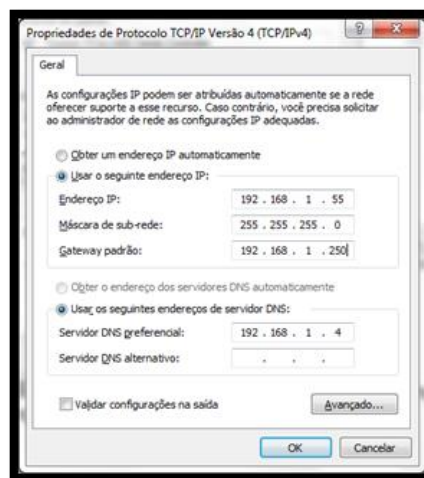
Web Page Access

> ➤ To change the IP address of the meter via the web page, access the internet browser on your PC and type in the IP address of the meter. On the screen below, click the "Configure Server" button.

> ➤ Enter a password:
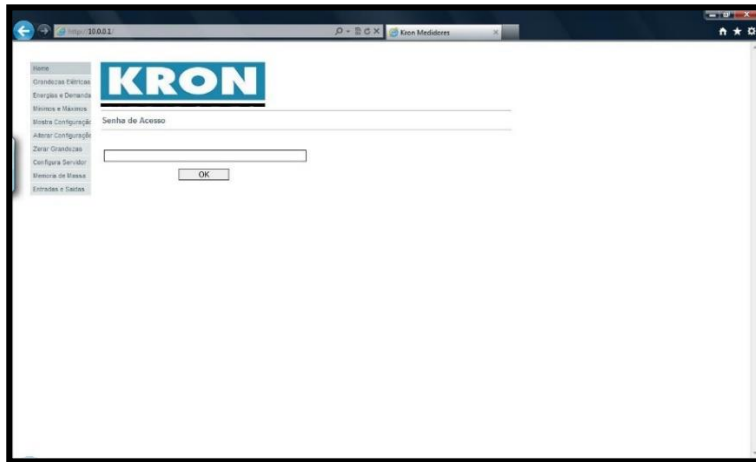
For instruments with firmware versions prior to 2.4, the password is 2.
For instruments with firmware versions from 2.4 onwards, the password is 1234.

After this action, the editing menu will appear:
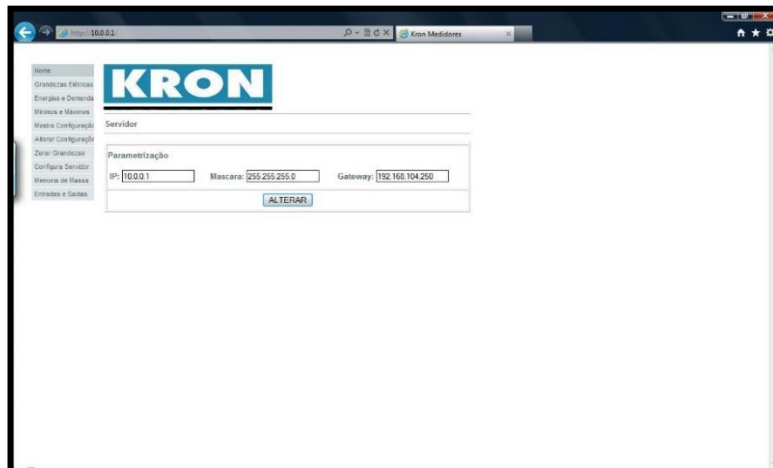
> ➤ Configure the IP address, subnet mask, and gateway according to the characteristics of the target network.

> ➤ Confirm the change and perform a browser reading test with the meter connected to the target network.

Password 1234 must be used to access the three menus.

Softwares

Kron provides the free license software RedeMB and RedeMB TCP, which can be used on Windows operating systems. To obtain their latest versions, visit the website www.kron.com.br or request them via email at suporte@kron.com.br.

RedeMB is a software that allows communication with Kron's multi-meters, enabling reading and configuration of RS-485 instruments manufactured by Kron Medidores. On the other hand, RedeMB TCP facilitates communication with Kron meters that have Ethernet and/or Wi-Fi communication output.

RedeMB TCP (Ethernet and Wi-Fi)

Step by step – Installation:

To use the RedeMB TCP/IP and BDE Admin software, you will need **to have administrator privileges on the computer.**

In case of use in the field, a notebook with Windows version 7 or higher is recommended.

1. **Installing the RedeMB TCP/IP software**

    ➢ Inside the "Disk 1" folder, locate the "SETUP.EXE" file and run it
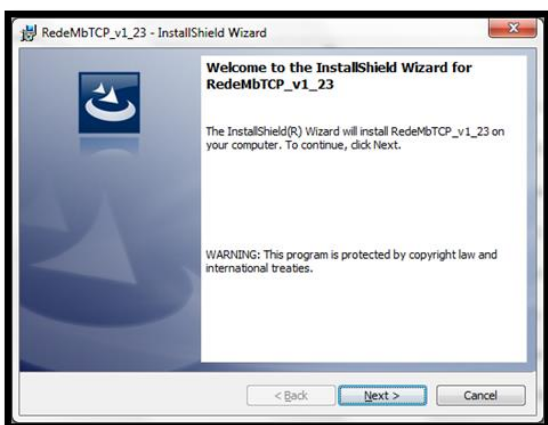
The installer presentation screen will be displayed, being necessary to click **Next** to continue the installation.
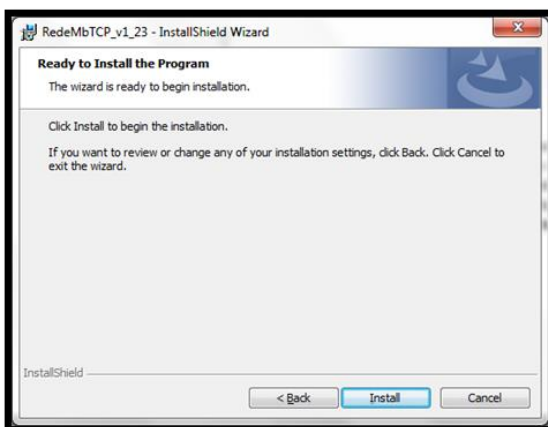
The installation confirmation screen will be displayed, click **Install** to continue.

KRON Instrumentos Elétricos Ltda.
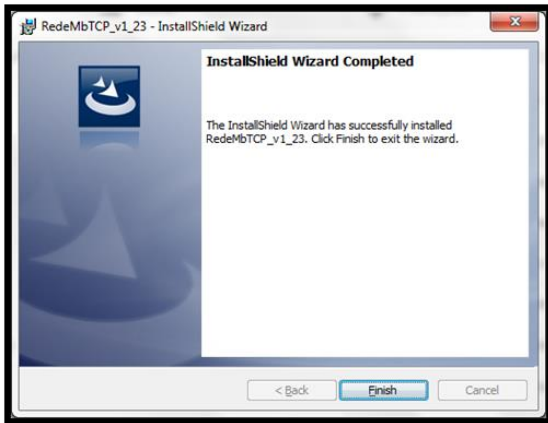
Installation of the files will begin, and after completion, the installation completion screen will be displayed. Confirm the option by clicking **Finish**.

Step by step – Usage:

➢ Access RedeMBTCP, using **nork0** as password.
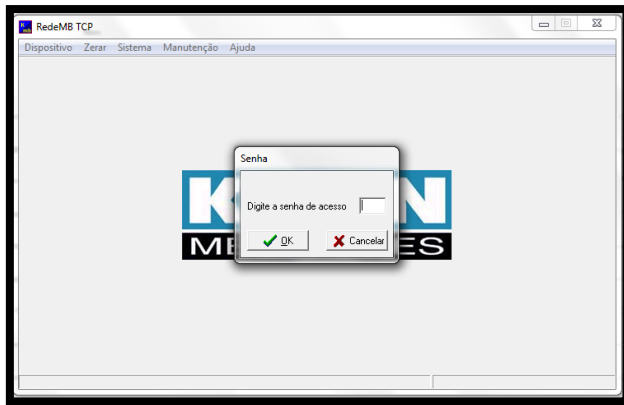
c) To add the first multimeter, select the ***Dispositivo/Adicionar***. The following options will be displayed: Manually (Manualmente) and Find on Network (Localizar na Rede). If you choose the "Manually" option, the instrument addition screen will be displayed. Fill in the fields with the IP address, serial number of the meter, and a description to identify the instrument in the software.

If you select the "Find on Network" (*Localizar na rede*) option, the instrument addition screen will be displayed. Meters connected to the network will be shown. Choose the desired equipment, describe it and click "Add" (Adicionar).
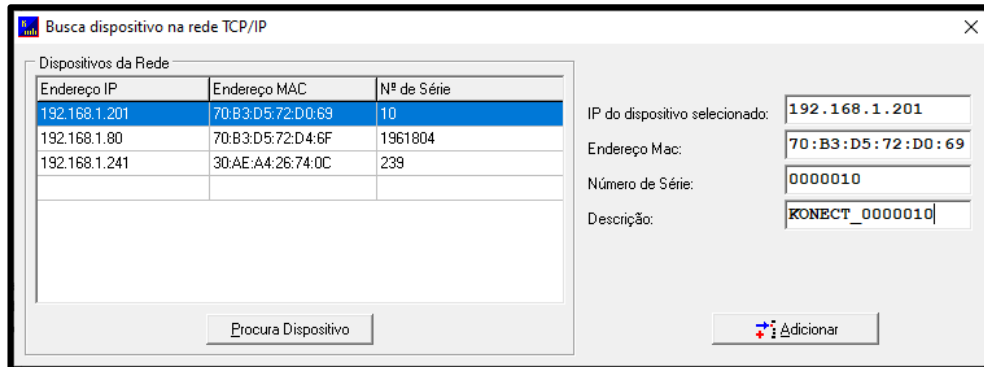
➢ After the registration, the meter will be displayed on the software's home screen with the previously provided description. Click on the description of the meter and then click on "Read" (*Ler*).
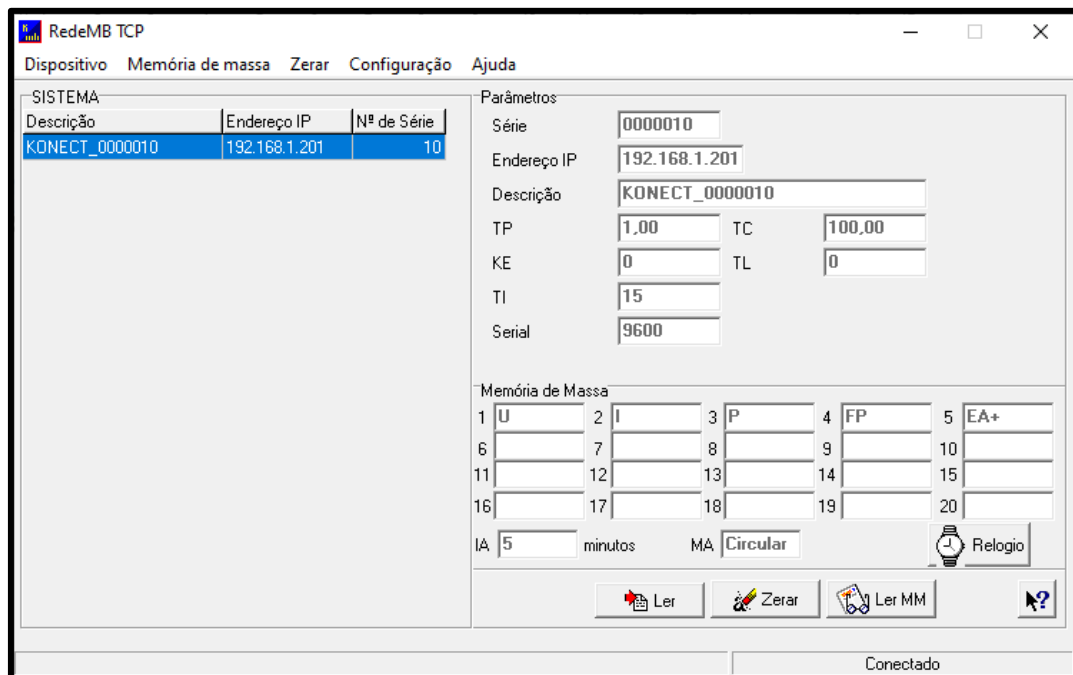
> ➤ In the next window, activate the communication on the yellow key.

Button to activate communication
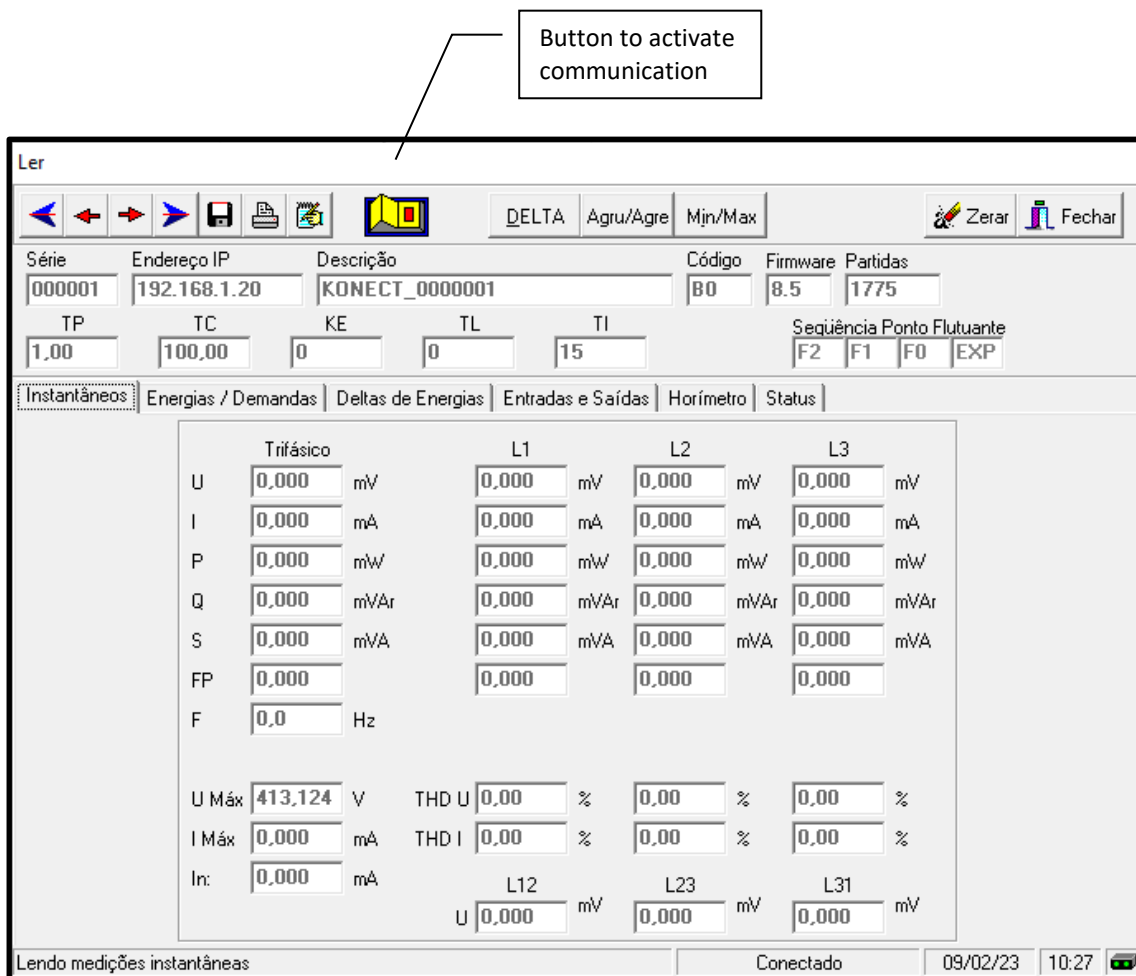
The reading screen is separated by tabs, where the information is made available in the following categories:

1. *"Instantâneos"* (Instantaneous): Displays the instantaneous measurements that are being taken;
2. *"Energias/Demandas"* (Energies/Demands): Displays the accumulated energy values in the four quadrants and the calculated demands;
3. *"Deltas de Energia"* (Energy Deltas): Calculation of energy deltas based on the data transmission interval via MQTT, LoRa, or mass memory storage interval;
4. *"Entradas e Saídas"* (Inputs and Outputs): Displays the status of digital inputs and outputs, counter and pulse width of digital inputs, as well as on/off buttons for digital outputs and a button to reset the counters;
5. *"Horímetro"* (Hour Meter): Displays the operating hour counter, load status, and a button to reset the hour meter;
6. *"Status"* (Meter Status): Indication and Error Codes.

Accessing the settings menu

➢ On the software's home screen, right-click on the meter and select the *"Alterar"* (Modify) option.
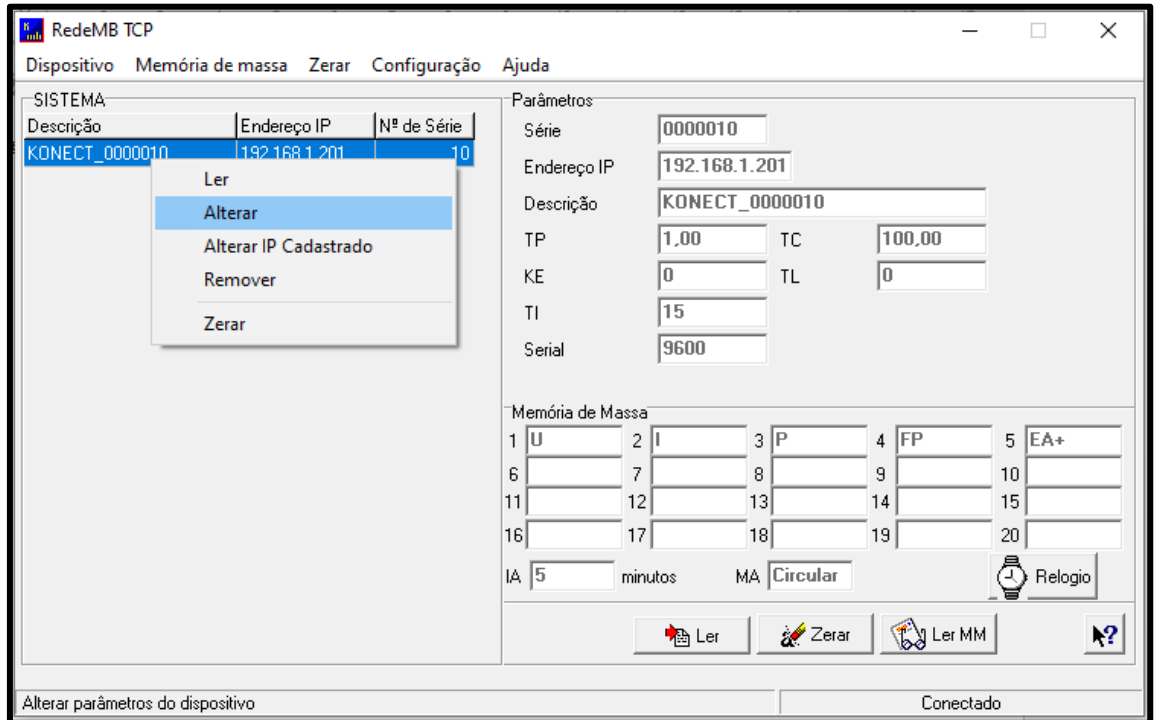
➢ In the window that appears, select the meter and click on *"Selecionar"* (Select).
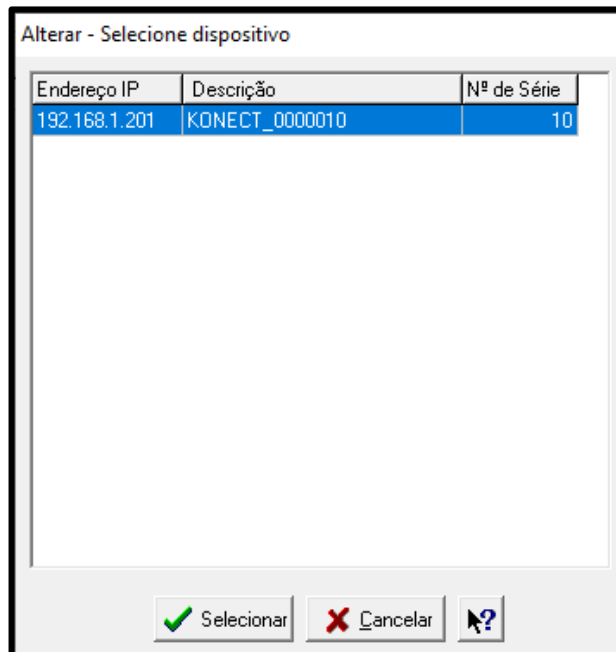
Just like in the reading screen, the settings screen also has tabs that separate the configurations into categories.

"Configurações Gerais" (General Settings)

• "*Endereço IP*" (IP Address) Changes the IP address for Ethernet communication of the meter.

• *"Endereço"* (Address) Changes the slave ID address for Ethernet communication in RedeMB TCP and the Modbus when using RedeMB (RS-485).

• The "*TP*" (VT) and "*TC*" (CT) menus correspond to multiplicative factors applied when measurements use additional transformers to adapt voltage (TP) or current (TC). In Konect, the default configuration for these two parameters is "1".

• The **TL** parameter corresponds to the numerical code representing the defined connection type. In the example, the value "0" corresponds to Star - 3-Phase + Neutral connection.

• The **TI** parameter defines the integration time for demand calculation; KE is not used for this model and should be kept as "0".

• The "*Relógio*" (Clock) field allows direct modification of date and time when the "Manual" option is activated. To work with the reference provided by the computer's clock, the "PC" option needs to be selected.

• The **Current** field has a flag where it is possible to invert the current signal reading.

• The **Seq. PF** parameter corresponds to changing the floating point sequence, allowing the configuration of the sequence according to the reading system used.

• The **Grouping Type** parameter allows selecting whether the harmonic grouping will be performed by Group or Subgroup.

NOTE: Whenever the TP, TC, or TL parameters are changed, the instrument will automatically reset all energy and demand registers.

"Comunicação sem fios" (Wireless communication)

• The "*Ativo*" (Activate) field allows configuring which wireless communication method will be used (Wi-Fi or Bluetooth) or disabling (*"Desativar"*) wireless communication.

• In the **Wi-Fi** field, network parameters related to the meter's Wi-Fi communication are configured, such as SSID and Password (*"Senha"*).

• Both fields display the current network settings of the instrument. The DHCP menu allows changing the operating mode between IP assignment by DHCP - **ON** option - or operation with a fixed IP - **OFF** option.

• The **DNS** field, if enabled, allows configuring the user's preferred DNS.

• In the Bluetooth configuration, it is possible to set the description (*"Descrição"*) and pairing password (*"Senha"*) for Bluetooth.

SNTP

• The **SNTP Configuration** field, if enabled, allows using a remote server reference for clock synchronization. This includes configuring the time server, synchronization interval, and local time zone.

IOT

• The **IoT** field enables the IoT function and allows configuration of the MQTT broker, communication port, publication topic, device information, application token, and information transmission interval.

• The **Intervalo** "field allows configuring the interval for sending measurements to the IoT platform.

• **The Keep Connection Active** flag, when selected, maintains the meter's connection to the network regardless of the configured sending interval. When not selected, the meter remains disconnected when the interval is longer than 10 minutes, connecting only at the time of sending measurements to the IoT platform.

• The **TLS** flag, when selected, enables encryption of the data sent to the IoT platform.

• The **KronCloud** flag, when selected, fills in the URL, Port, and Topic data with the standard used in the Kron platform.

• The **Available Measurements** field allows selection of the measurements that will be sent to the MQTT broker.

Relógio

• It allows configuring the date and time set on the meter, allowing manual configuration or setting the computer's time as the reference.

Serial

Velocidade	Formato
⦿ 9600	◯ 8N1
◯ 19200	⦿ 8N2
◯ 38400	◯ 8O1
◯ 57600	◯ 8E1

• It allows configuring the baud rate and data format used in RS-485 communication on the meter.

Grandezas IOT

Grandezas IOT
Disponíveis:

0018 - Corrente de Neutro (A)
0026 - Freqüência Linha 1(Hz)
0028 - Freqüência Linha 2(Hz)
0030 - Freqüência Linha 3(Hz)
0032 - Freqüência Linha 1(IEC - 10s)
0042 - Potência Reativa Trifásica (VAr)
0044 - Potência Reativa Linha 1 (VAr)
0046 - Potência Reativa Linha 2 (VAr)
0048 - Potência Reativa Linha 3 (VAr)
0050 - Potência Aparente Trifásica (VA)

Selecionadas:

0002 - Tensão Trifásica (V)
0004 - Tensão Fase/Fase (A-B)
0006 - Tensão Fase/Fase (B-C)
0008 - Tensão Fase/Fase (C-A)
0010 - Tensão Linha 1 (V)
0012 - Tensão Linha 2 (V)
0014 - Tensão Linha 3 (V)
0016 - Corrente Trifásica (A)
0020 - Corrente Linha 1 (A)
0022 - Corrente Linha 2 (A)
0024 - Corrente Linha 3 (A)

[Adicionar] [Remover]

• **The "grandezas IOT" field** allows configuring up to 20 measurements for transmission via MQTT to an external server. The **"Disponíveis"** section indicates the measurements that can be programmed, and the "**Selecionadas**" section lists the measurements that are already defined for transmission.

• The "**Adicionar**" button includes, in the " **Selecionadas** " section, a pre-chosen quantity in the "**Disponíveis**" section.

• The "**Remover**" button removes a previously defined measurement from the "**Selecionadas**" section.

Note: The functions in this area are only available after enabling the "SNTP Configuration" and "IoT Platform" fields.

*To confirm the changes, you need to click the "**Alterar**" button. If you don't want to modify the settings, simply click "**Cancelar".***

[📝 Alterar]   [✖ Cancelar]

RedeMB (RS-485 and Bluetooth)

Step by step – Installation

a) Download the desired software from the Kron website via the link: https://kron.com.br/softwares/

b) Unzip the downloaded folder, locate the "SETUP.EXE" file, and run it. The installer's welcome screen will be displayed, and you will need to click "**Next**" to proceed with the installation.
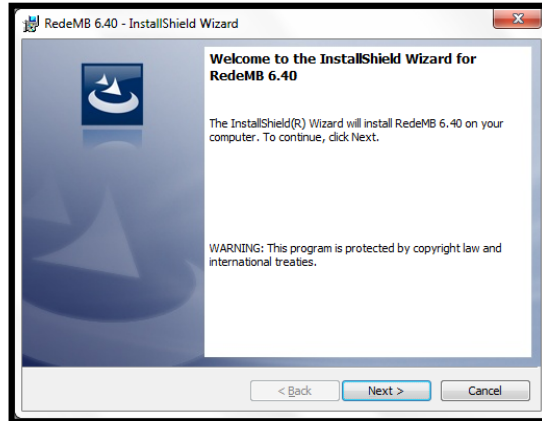
Figure a – RedeMB installer

c) Click **install** to start installing the software.
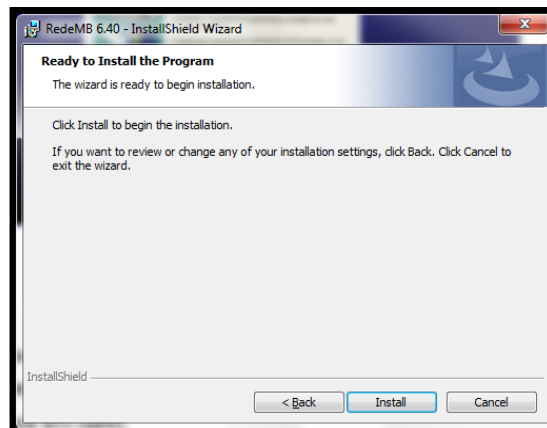
Figure b – Installation screen

d) The installation confirmation screen will be displayed. Confirm by clicking on "**Finish**".
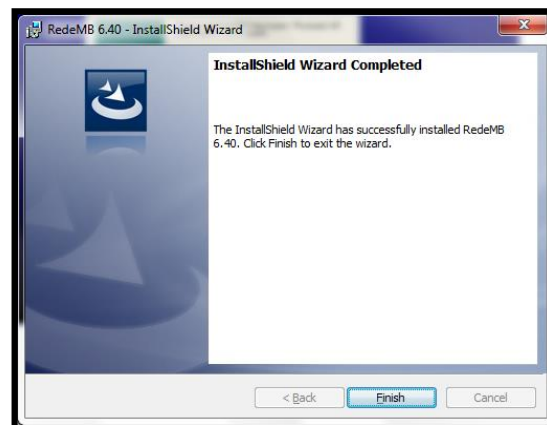
Figure c - Installation completion screen

Step by step – Usage:

a) After the computer restarts, access RedeMB through the shortcut created in the "Start Menu".

b) You will be prompted for a password to access the software, as shown in figure d. The default factory password is **nork0**. Enter the password and click **OK** to start RedeMB.
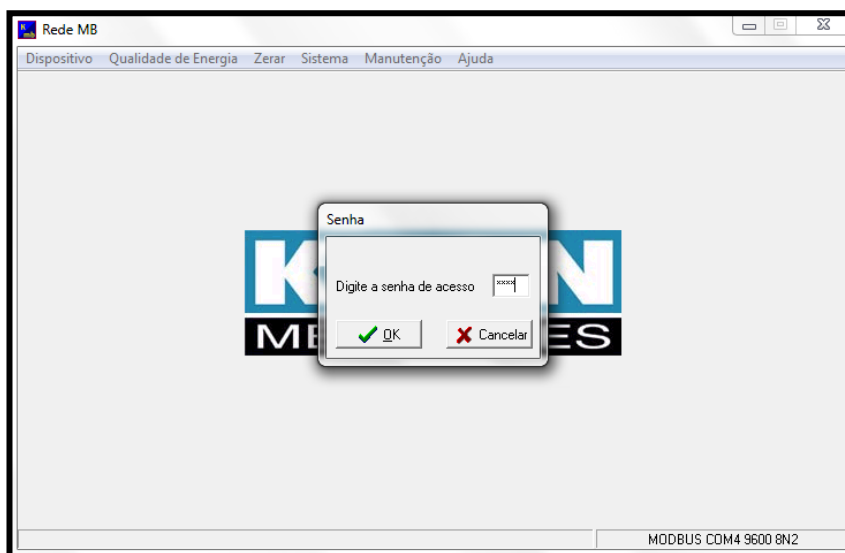
Figure d – RedeMB opening screen

c)   During the first initialization of RedeMB, it will be necessary to program the PC's serial interface, ensuring compatibility with the speed and data format programmed in the meter. Click **OK** to proceed.

Communication speed (Default: 9600bps)

PC serial port

Select this option if you are not using a self-powered converter.

Data format (Default: 8N2)
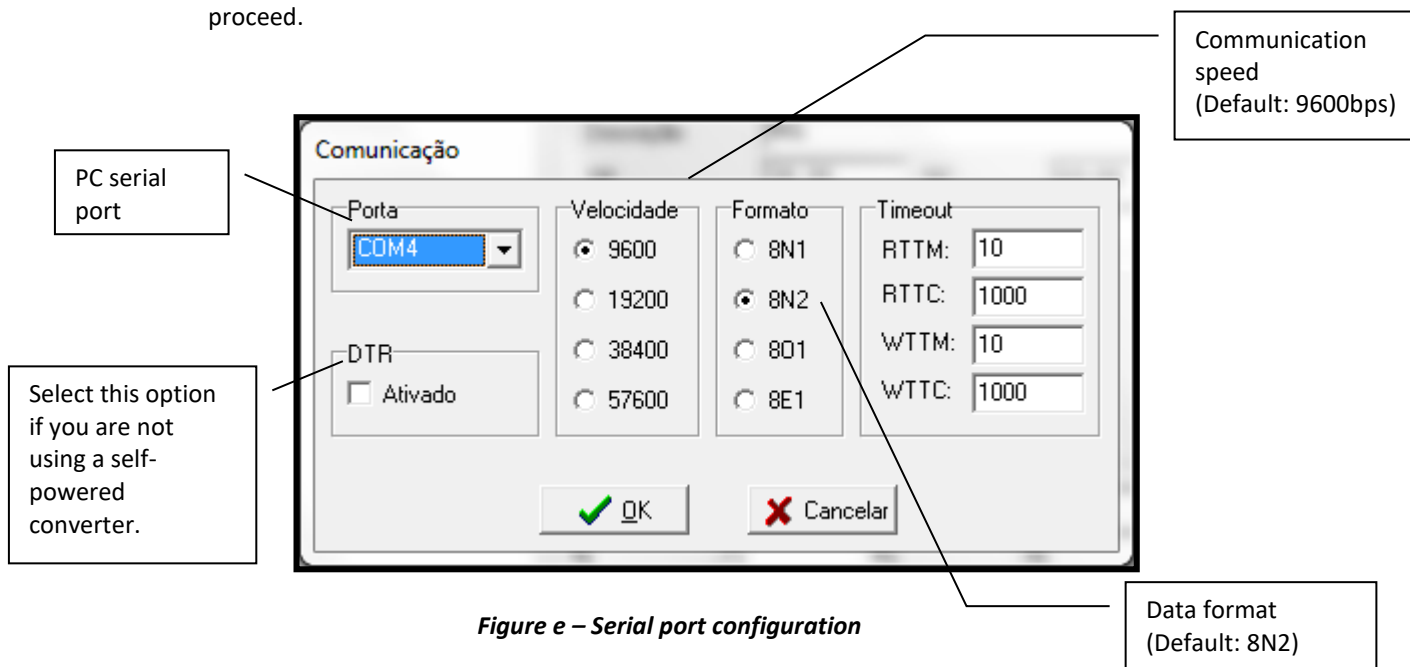
Figure e – Serial port configuration

d) It will also be necessary to configure the directory for saving power quality files and decide whether the files will be saved in encrypted format or as text/Excel files (only applicable for Mult-K NG line).

Define the format in which the file

Click this button to set the directory.
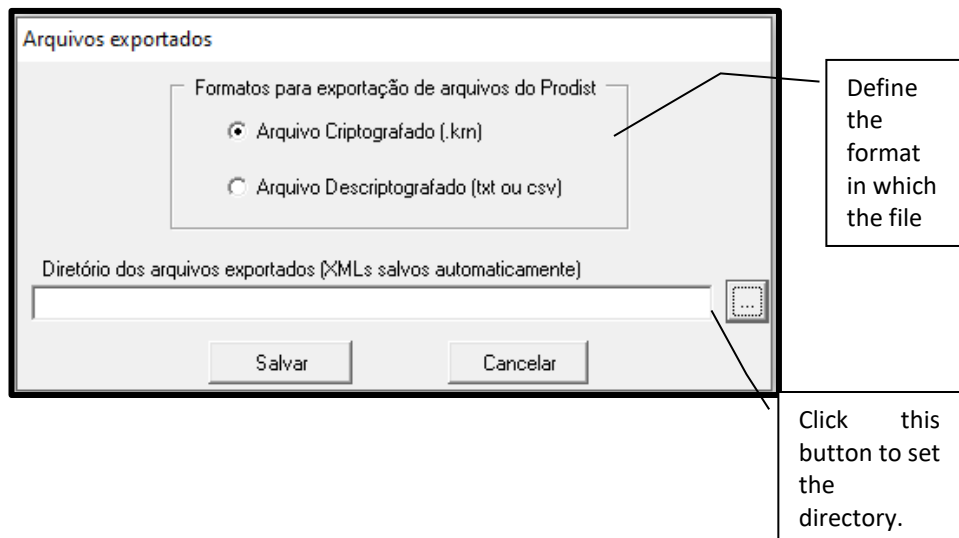
NOTE: **Konect** comes from the factory with the parameters set to a speed of 9600 bps and data format of 8N2.

If the serial port is initialized successfully, the following screen will be displayed:
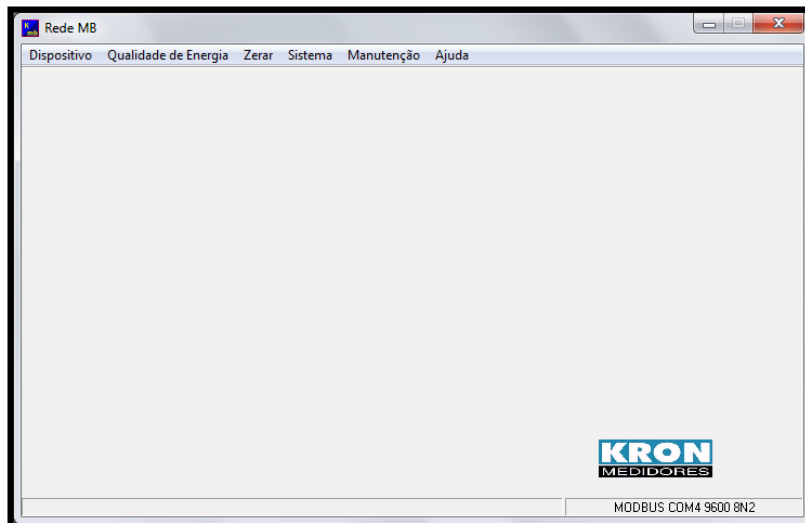
Figure f – Main screen

e) To add the first power meter, select the option **Dispositivo / Adicionar**. The following options will be displayed: **Manualmente, Dispositivo Único e Localizar na Rede**. If you choose the "**Manualmente**" option, the instrument addition screen will appear. Fill in the necessary information and click on "**Adicionar**" to proceed:

The instrument's serial number is located on the label affixed to its upper part (consider only the last 7 digits).

The address must be chosen between 1 and

Choose the type of instrument being added. For Konect, choose "Linha Mult-K"

The description is an identification of the meter, stored only in the RedeMB database.

Figure g – Instrument addition screen

- **The "Dispositivo Único" option will include the meter found on the network and automatically configure its address as 1.**

- **The "Localizar na Rede" option will search all possible addresses, and if an instrument is found, it will show the option to add the meter. If you confirm this option, the software will display the screen shown in "Figure g".**

After the mentioned steps above, all subsequent processes follow the same pattern used in RedeMB TCP software.

Kron-Fi App (Wi-Fi and Bluetooth)

Kron-Fi is a free application available for Android devices that allows integration of meters with Wi-Fi communication into an existing network. It can also be used as a tool for reading and configuring connected meters via Bluetooth, Ethernet, or Wi-Fi networks.

Step by step – Usage:

After Kron-Fi initializes, it will check for the necessary permissions for execution, requesting user confirmation when needed. To include a meter in the network, the mobile device needs to have location (GPS) and Wi-Fi enabled, and mobile data disabled. In addition to having Wi-Fi enabled, the mobile device must be connected to the Wi-Fi network to which you intend to connect the meter.

The application will start on the following screen:

From any application screen, you can access the menu bar. This bar has the following options:

Leitura (Reading):

On this screen, you can select the type of communication used (Wi-Fi, Bluetooth, or Access Point), choose the meter you want to read from, and view the measured values.

Ajustes (Settings):

On this screen, you can configure the electrical parameters of the meter such as TC, TP, and TL, set the date and time, and select the type of wireless communication that will be used by the meter.
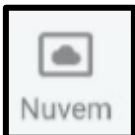
Nuvem (Cloud):

On this screen, it is possible to configure the IoT parameters of the meter such as Broker MQTT, Topic and Token.

Wi-Fi:

On this screen it is possible to insert a meter that is in AP mode in the Wi-Fi network that the mobile device is connected to.

Sobre (About):

On this screen, you can view the application version, the Wi-Fi network the mobile device is connected to, and the IP assigned to it.

Reading screen:

• To start the reading, you will need to choose the type of communication used (Wi-Fi, Bluetooth, or Access Point).

• Click on the "LOCALIZAR MEDIDOR" button and select the meter you want to read from.

• After choosing the communication type and the meter, click on the "INICIAR LEITURA" button. The values will be displayed, and you will be able to obtain information about the meter status, Wi-Fi communication status, firmware version, and reading tabs, which will be presented according to the meter model.

• After starting the reading, the "INICIAR LEITURA" button will change to display the message "FINALIZAR LEITURA" and will be used to end the communication with the meter.

Settings Screen:

• On this screen, you can modify parameters such as TP, TC, TL, Connection Type, date and time, hour meter threshold, password, and Bluetooth connection description. Additionally, you can change the type of wireless communication to be used by the meter.

• After making the desired changes, simply click on "SALVAR" to confirm.

• If you change the type of wireless communication, you will need to click on "SALVAR CONEXÃO" to confirm.

Cloud Screen:

This screen allows for the configuration of the IoT parameters of the meter, where:

• **Configuração IoT:** Enables the data sending function to the cloud. When enabled, the fields for filling in the data will be available for editing, and the button to select the quantities to be sent will be active.

• **KronCloud:** When enabled, configures the fields with the Kron default MQTT broker.

• **Criptografia TLS:** When enabled, data is sent to the cloud with encryption.

• **Manter Conexão Ativa com o Broker:** By default, when the interval for sending the quantities to the cloud is greater than 10 minutes, the instrument only connects to the network at the time of sending. Enabling the active connection keeps the instrument always connected, regardless of the configured sending interval.

• **Configurações SNTP:** When enabled, allows for the configuration of a time server, synchronization interval, and local time zone.

Screen displayed when clicking the button "CONFIGURAR GRANDEZAS IOT"

Wi-Fi Screen:

• This screen is intended for registering meters on the Wi-Fi network of interest.

• To do this, the meter must be in Access Point mode, and the mobile device must have GPS enabled, be connected to the desired Wi-Fi network, and have mobile data disabled.

• After meeting the requirements mentioned above, click on "PROCURAR" to find devices that are in Access Point mode.

• Once the application finds the meter, select the Wi-Fi network and enter its password.

• To confirm the addition of the meter to the selected network, click on "CONFIGURAR" to proceed with the process.

NOTE: Access to this screen will be blocked if the application is connected to a meter.

• After clicking on "CONFIGURAR", the application will start the registration and this window will appear, being necessary to confirm the process, clicking on "CONECTAR"
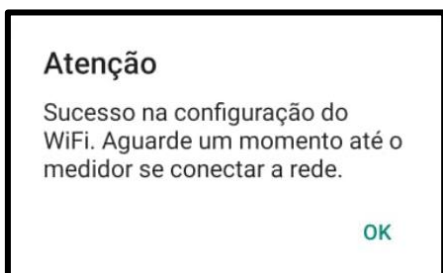
• When completing the process of adding the meter on the Wi-Fi network, the application will present the confirmation message.

Troubleshooting

The purpose of this chapter is to provide quick answers to problems or questions that frequently arise when using **Konect**. If you still have doubts, feel free to contact our *Technical Support* for assistance.

1) Problem: The meter has the display off.

Solution:
Check:

- Was the external power connection made correctly? The power supply should be connected according to the panel's identification or labeling;

- Is the voltage reaching the transducer suitable for its operation?

If, after all the checks, it is determined that the connection is correct, please contact technical support. If the meter has been powered incorrectly (e.g., 380V AC instead of 110V AC or 220V AC), it may have been damaged.

2) Problem: The meter is not measuring demand, even though the power factor and power values are consistent.

Solution:
In the case of models for indirect measurement (1A or 5A), check if the CTs (current transformers) are not inverted, meaning that the current flow is not opposite to what it should be. Note that CTs have markings such as P1/P2 for the primary side and S1/S2 for the secondary side. When there is current flowing from P1 to P2, there should be current flowing from S1 to S2 on the secondary side.

Therefore, incorrect positioning of the primary side will result in a negative active power measurement, making it impossible to calculate the demand. Another point to check is if the TI constant is programmed with a value greater than zero.

For the Konect direct measurement version (63A), check if the cables are oriented correctly.

3) **Problem: One of the phases is at zero.**

Solution:

Check the parameter TL (type of connection) that has been configured. By default, the instrument is set to TL 00 (Star - 3 elements 4 wires), but this parameter can be changed. Also, verify using another instrument if there is indeed a signal reaching the meter.

4) **Problem: The voltage and/or current are being measured incorrectly.**

Solution:

Check:

- Were the TC (current transformer) and TP (potential transformer) constants configured correctly?
- Was the wiring scheme chosen appropriately?
- Is the voltage and/or current reaching the meter according to expectations?

5) **Problem: Power factor and/or powers are being measured incorrectly.**

Solution:

This is a typical sign of incorrect wiring, specifically not following the "matching" between voltage and current, meaning that you should maintain the same sequence used for voltage connection when connecting the current as well.

- Were the TC (current transformer) and TP (potential transformer) constants configured correctly?
- Was the wiring scheme chosen appropriately?
- Is the voltage and/or current reaching the meter according to expectations?
- Is the matching between voltage and current being respected?

6) **Part returned to original factory IP address.**

Please check in the "CONFIG REDE" mode if the instrument has the "DHCP" option set to "ON". In this case, Konect will assume a new IP address as soon as an available IP is detected on the LAN. If the instrument is disconnected from the network or if there is no available address, it will revert back to the factory default address.

To make a fresh attempt, you can restart the meter.

Another reason for the return to the original IP is the use of the "RESTAURA FÁBRICA" command, as discussed in the "Resetting communication parameters" section.

7) **Issues: The Wi-Fi communication is slow, intermittent, or it's not possible to integrate the meter into the Wi-Fi network, as well as read it locally or through the cloud.**

Solution:

Check:

- Review the steps described in the "Kron-Fi App" section, page 42.
- For the Konect, it is recommended to have a minimum download speed of 10MB/s.
- Local Reading: Check with your IT team/network administrator if port 502 is blocked. If it is, request it to be unblocked.
- Internet Reading – MQTT: Check with your IT team/network administrator if port 1883 is blocked. If it is, request it to be unblocked.

Troubleshooting - RS-485 Interface

In this topic, troubleshooting for RS-485 interface issues will not be addressed in a question/answer format, as the procedures described below are applicable to most cases where there are communication problems with the meters.

A communication problem is usually caused by:

Unstable network

First and foremost, it is important to strictly follow the *recommendations* provided in the RS-485 Interface chapter. Improper grounding of the communication line, for example, can frequently cause intermittent communication issues with the meters. Additionally, a network configured as a "multi-drop" instead of a "point-to-point" connection can result in signal quality loss and often lead to communication failures with the devices.

Check if there are any high voltage cables or cables carrying high current near the communication cables, especially if you are not using shielded cables. The electromagnetic field generated by such cables can interfere with the communication of the meters.

One point that is always worth mentioning is the possibility of poor contacts, such as splices or other types of connections. Whenever making splices or connecting "terminals" to the communication wires, it is always preferable to use soldering instead of relying solely on physical contact.

Incorrect wiring

Remember that the communication signal has polarity (DATA+ and DATA-). Reversing them in the connection of the meters to the PLC or the meters to the converter will result in communication failure.

Incorrect configuration of the master/slave

Check, according to the steps below, the compatibility between master/slave:

1. Do the master (PLC or PC) and the slave (meter) communicate under the same protocol?
2. Do they have the same communication speed?
3. Do they have the same bit format?
4. Is the interface between the master and the slave, typically an RS-485/USB or RS-485/Ethernet converter, compatible in terms of speed/bit format?
5. Is the slave parameterized with the address that the master is seeking?

After studying and analyzing these items, if there is no success in the RS-485 network communication, it is recommended to attempt an isolated connection to the meter. This is done with the intention of detecting incorrect parameters/address or to determine if the issue lies with the meter or the network infrastructure.

Appendix A - Error Code

Through the Error Code, it is possible to check several points of the **Konect** system.
The reading of this Error Code is done according to the procedure described in the *IHM* (Human Machine Interface) chapter – *Modo FUNÇÕES*.

The code is divided into three distinct tabs. In the HMI, it is possible to view two of these tabs, being separated according to the example image:

| Error from Table 1 | | Cod   Erro
1 : 8 | | Error from Table 2 |
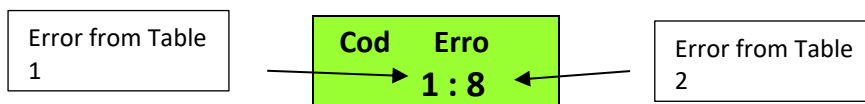
The read code must be interpreted according to the tables below:

Table 1		Table 2	
Code	**Description**	**Code**	**Description**
00	Correct operation of the transducer. Note that this code does not imply correct wiring or system parameterization.	**00**	Correct Operation.
01	Voltage phases in counterclockwise sequence or absence of one of the phases.	**01**	System synchronizing the Phases.
02	Mathematical error	**02**	Out of frequency range.
08	The voltage and/or current limit has been exceeded. This can damage the meter, requiring it to be sent for technical assistance.	**08**	Active firmware protection.
16	System rebooted incorrectly	**64**	Error in the Ethernet module.
64	RTC – low battery		
128	Mass memory error.		

The *Error Code* is binary information, meaning that if error 001 occurs in conjunction with error 016, the error code 017 (001 + 016) will be displayed.

Wi-Fi Module error code

Code	Description
00	Correct operation.
01	Maximum connection time with AP reached.
02	Incorrect AP connection password.
04	Failed to find the AP.
08	AP connection failed.
16	Broker rejected piece login.
32	Error in publishing measurements.
64	No internet connection.
128	Unknown error.

LoRa error code

Code	Description
00	Correct operation.
01	Error when attempting to perform Join (only in OTAA mode).
02	Error receiving downlink from confirmation message (only if confirmation message is configured).

Appendix B - Demand Measurement

Definition: Demanda is the electrical power measured during a specific time interval. This time interval, known as *Integration Time (TI),* has a range of 1 to 60 minutes and can be configured either via the Human Machine Interface (HMI) or through the serial interface.

The active demand is given in watts (W), while the apparent demand is given in volt-amperes (VA).

Maximum Demand Active (MDA) and Maximum Demand Apparent (MDS)

Maximum Demand Active (**MDA**) refers to the maximum calculated value for active demand, while Maximum Demand Apparent (**MDS**) refers to the maximum calculated value for apparent demand. Both MDA and MDS can be reset using the *Zerar Energias e Demandas* function.

Operation

The **Konect** demand measurement uses a sliding window algorithm, which means that the average demand (**DA** or **DS**) information is updated at intervals shorter than the integration time. For this reason, when using the *Zerar Energias e Demandas* function or making changes to the *TC* (current transformer) and *TP* (potential transformer) parameters, there may be remnants of previous values stored in the buffer, resulting in incorrect readings.

In this case, it is recommended to wait for a minimum interval of one integration time (the parameter TI defines this interval, typically set to 15 for measurements every 15 minutes) or perform a demand synchronization, which resets the internal buffer. This ensures accurate readings and eliminates any remnants of previous values in the buffer.

Demand Synchronization

A command is provided via the communication interface to synchronize the demand calculation of **Konect**.

Every integration has a start and end, and when we perform synchronization, we define the beginning of this integration. This allows, for example, the synchronization of **Konect's** demand measurement with other energy meters used in the automation system (for comparison with the utility meter or for internal allocation purposes).

Appendix C - Formulas Used

Internally, for the calculation of electrical quantities, **Konect** uses the following formulas:

- **RMS voltage per phase**

$$Vrms = \sqrt{\sum_{1}^{n} (Vi)^2 / n}$$

- **RMS current per phase**

$$Irms = \sqrt{\sum_{1}^{n} (Ii)^2 / n}$$

- **Active power per phase**

$$P = \sum_{1}^{n} (Vi \times Ii) / n$$

- **Apparent power per phase**

$$S = Vrms \times Irms$$

- **Reactive power per phase**

$$Q = \sqrt{S^2 - P^2}$$

- **Power Factor per phase**

$$FP = P/S$$

- **Three-Phase Voltage (DELTA)**

$$V\phi = \frac{V12 + V23 + V31}{3}$$

- **Three Phase Voltage (STAR)**

$$V\phi = \frac{V1N + V2N + V3N}{3} \times \sqrt{}$$

- **Three-Phase Active Power**

$$P\phi = P1 + P2 + P3$$

- **Three-Phase Reactive Power**

$$Q\phi = Q1 + Q2 + Q3$$

- **Three-phase Apparent Power**

$$S\phi = \sqrt{P\phi^2 + Q\phi^2}$$

- **Three-Phase Current**

$$I\phi = \frac{S\phi}{V\phi \times \sqrt{3}}$$

- **Three Phase Power Factor**

$$FP\phi = \frac{P\phi}{S\phi}$$

Appendix D - Mass Memory / MQTT Buffer (IoT)

Application: It is a non-volatile memory (data is not lost in case of power failure) that allows recording the historical behavior of electrical quantities.

The information is stored in floating-point format, including its date and time, obtained from an internal clock in the multimeter.

Type: Non-volatile (retentive) memory
Capacity: 2 megabytes
Storage mode: Circular (when the memory capacity is exhausted, older data is erased to make space for newer data, sector by sector) or linear (when the memory capacity is exhausted, data storage stops).

The stored data can be collected through RS-485, Ethernet, Wi-Fi, or Bluetooth interfaces using PLCs, data concentrators, supervisory applications, or the RedeMB and RedeMBTCP software.

These software allow exporting the information as unformatted text files (text - "txt"), facilitating the creation of graphs in Excel, for example.

With the IoT function enabled, the Konect Memory serves as a backup for the data sent to the cloud. In this case, up to 20 electrical quantities can be stored in the memory (and sent to the cloud). With the IoT function enabled, the memory will be automatically configured as Circular.

It is essential to note that even if the data is sent to the cloud, it remains stored internally until the memory is fully filled.

Therefore, the earliest stored data is deleted to make room for new data (circular mode).

Below is an example of mass memory autonomy based on the number of selected quantities, considering storage intervals of 1, 10, and 15 minutes.

Number of Quantities	Autonomy (in days) for AI=1 minute	Autonomy (in days) for AI=10 minutes	Autonomy (in days) for AI=15 minutes
1	156	1567	2351
2	117	1175	1763
3	94	940	1410
4	78	783	1175
5	67	671	1007
6	58	587	881
7	52	522	783
8	47	470	705
9	42	427	640
10	39	391	587
11	36	361	542
12	33	335	503
13	31	313	470
14	29	293	440
15	27	276	414
16	26	261	391
17	24	247	371
18	23	235	352
19	22	223	335
20	21	213	320

Appendix E - Glossary

This chapter provides brief explanations of the technical terms used in this manual, including nomenclature and abbreviations used in **KRON** products.

Auxiliary Power Supply or External Power Supply	It is a voltage used to internally power the equipment, that is, to operate its internal circuits.
Measuring range	Range of values within which the instrument performs its measurements with the accuracies specified in the *Technical Specifications* chapter.
TC	Current Transformer (CT) is a transformer used to adapt and/or isolate the current from the main circuit (phases) to the measurement circuit (meter inputs).
TI	Integration Time is an internal constant that determines the interval at which the demand value should be calculated, typically expressed in minutes.
TL	Connection Type is an internal constant that defines the type of circuit being measured, whether it is single-phase, two-phase, or three-phase.
TP	Potential Transformer (PT) is a transformer used to adapt and/or isolate the voltage from the main circuit to the measurement circuit.
TRUE RMS	Measurement Type that takes into account the distortion present in a specific waveform. Considering that most industrial systems have nonlinear loads, it is essential for the instrument to have this characteristic in order to provide accurate readings.
Communication Protocol	It is the "language" spoken by the serial interface of the meter. When automating a system, it is necessary for the master and slave to speak the same language, that is, use the same protocol. For the **KS** line, the standard protocol used is MODBUS-RTU. The models with Wi-Fi operate on the MODBUS-TCP and MQTT (IoT) protocols.
MODBUS-RTU	The standard communication protocol for instruments in the KS line is MODBUS. It is a protocol developed by MODICON® and allows data from the meter's serial interface to be read by automation systems. It serves as the "language" spoken by the serial interface.
MQTT	Lightweight messaging protocol, optimized for high-latency TCP/IP networks. The message exchange is based on the Publisher-Subscriber model, which is extremely simple and facilitates its application in devices supporting the Internet of Things (IoT).
RedeMB and RedeMBTCP	Free software provided for reading and configuring Kron meters. RedeMB allows communication via RS-485 and Bluetooth, while RedeMBTCP supports devices with Ethernet or Wi-Fi communication.
RS-485	It is a type of serial communication interface. It is one of the options for requesting information from master devices.
BaudRate	It is the speed at which a particular instrument communicates with another. The higher this value, the faster the communication.
Parity	It is a function used for marking a specific message sent by an instrument. It can be nonexistent, even (O - ODD), or odd (E - EVEN).
Stop Bits	It is the number of stop bits that a particular instrument transmits when completing the sending of a message. An equipment typically operates with either 1 stop bit or 2 stop bits.