

TRH16-RS485-25A

Voltage and direct current multi-channel analyser



1. DESCRIPTION OF THE DEVICE

The **TRH16-RS485** is a measurement device for up to sixteen direct current channels and a voltage channel of up to 1500 V of direct voltage. The measurement of the current is done by means of sixteen Hall effect transformers (transformer for measuring direct current), with 25 A primary.

The device has 2 RS-485 communications ports. The first of these is used to connect and transmit the information to the master by means of the Modbus/RTU protocol. The second communications port, allows for setting up a multi-master type of communications typology (see section 4.5. Connection diagram of the RS-485 slave and sub-slave connection bus), given the multitude of applications that can be comprised by a large number of **TRH16-RS485** analysers. The communications parameters can be configured by using the selectors located on the front panel of the device.

Moreover, this device is equipped with 3 (logical) digital inputs, for detecting the status of digital signals, coming from the device's surroundings and the information of which is also available via RS-485 communication. Apart from the digital inputs, the device is equipped with an analogue input with a 0...20 mA range and an input for a configurable Pt100 or Pt1000 probe.

2. PRELIMINARY CONSIDERATIONS

2.1 Verifications on receiving

Upon receiving the instrument verify the compliance of the following points:

- The device corresponds to the specifications of your order.
- Verify that the device has not been damaged in transit

2.2 Safety precautions

For the safe use of the device, it is essential that the people who install or handle it follow the usual safety measures, as well as the warnings documented in the said instructions manual.

The **TRH16-RS485** device has specifically been designed to be installed inside an electric or enclosed cabinet, fastened to a DIN rail. Under no circumstances may the device be installed or integrated into a place where it is in direct contact with people. The **TRH16-RS485** is fitted with a blinking red LED light (CPU), which warns that it is running, and therefore warns of the presence of voltage and current in the electronic circuit. Even though the LED light is not on, this does not free the user of verifying that the device is disconnected from all power sources.

3. INSTALLATION AND START-UP

This manual contains information and warnings that the user must adhere to in order to guarantee the safe operation of the device, and maintain it in a good state with regards to safety. In its usual operation it should not be used until it has been mounted in its final location in the electric cabinet.

IMPORTANT!

If the equipment is used in a manner not specified by the manufacturer, the device's protection may be compromised.

When it is probable that the device may have lost its safety protection (for example, if visible damage can be seen), the device must be disconnected from the power supply. In this case, contact the qualified technical service or otherwise contact our Technical assistance Service (see section 7. TECHNICAL ASSISTANCE SERVICE).

3.1 Equipment installation

The installation of the device is of the DIN rail type; it has a surface of 9 DIN modules (160 mm), and a height of 58 mm. All the connections remain accommodated inside the electric cabinet.

Take into account that with the equipment connected, the terminals and the opening of the covers or the elimination of elements, may give access to parts that it is hazardous to touch. The equipment must not be used or powered up until its installation has been fully completed.

IMPORTANT!

DC power supply of TRH16 must be protected by fuses, circuit-breaker or any other devices providing overcurrent protection. This devices must be set according to the DC installation power.

The equipment must be connected to a fuse-protected power circuit, in accordance with its power supply range and consumption. In turn, the power supply circuit must be fitted with a circuit breaker switch or an equivalent device, in order to be able to disconnect the equipment from the power supply grid. The power supply circuit must be connected using a cable with a minimum section of 1 mm².

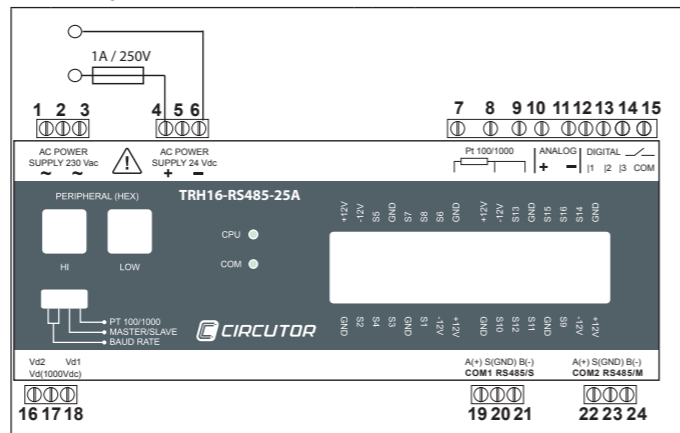
3.2 Power supply of the equipment

The device has two auxiliary power supply inputs; one for alternating current and the other for direct current. Under no circumstances may the user connect both power supply inputs simultaneously.

Power Supply	AC	DC	
Nominal voltage	230 V~	24 V ---	
Power supply tolerance	± 20%	± 10%	
Frequency	50 Hz	-	
Equipment consumption without transformers	2 VA	2 W	
Equipment consumption with 16 sensors (without load)	14 VA	8 W	
Equipment consumption with 16 sensors (with current load)	24 VA	14 W	
In-rush current	3.5 A (3 ms)	15 A (1 ms)	
Operating conditions			
Operating temperature	-10 ... 65 °C		
Relative humidity	5...95 RH without condensation		
Maximum operating height	2,000 metres		
Protection	IP20		
Accuracy			
Voltage measurement margin	30 ... 1500V ---	Current measurement margin (FS: 3.9V)	10 ... 100 %
Voltage measurement Error	1% FS	Current measurement Error	± 0.5 % FS
Resolution Error	± 0.075 % I _n	Offset Error	0.075 % I _n
Temperature input accuracy			
Pt100 / Pt1000 temperature probe	± 3 °C		
Analogue input accuracy			
Input accuracy 0...20 mA	± 0.5 %		
Input impedance	165 Ω		
Resolution in dots	1024 dots		
Converter resolution	10 bits		
Digital inputs			
Quantity	3	Impedance	12 MΩ
Safety			
Category III – 300 V-			
Overcurrent internally protected by high impedance			
Double-insulated electric shock protection class II			

4. CONNECTIONS

4.1 Description of the connection terminals



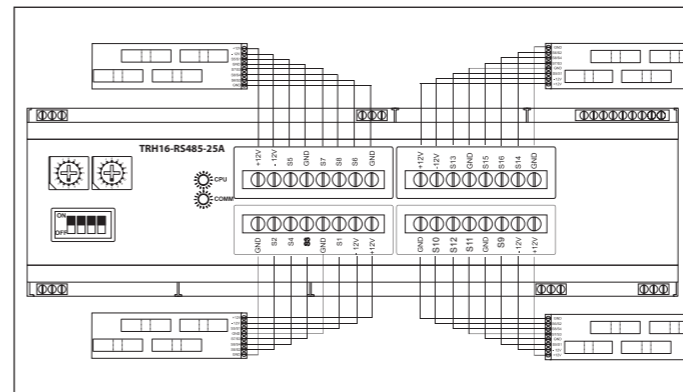
Description	Description
1 Power supply 230 V ~	13 Digital input 2
2 Not used	14 Digital input 3
3 Power supply 230 V ~	15 Common digital inputs
4 Power supply 24 V --- (positive)	16 Direct voltage (positive)
5 Not used	17 Not used
6 Power supply 24 V --- (negative)	18 Direct voltage (negative)
7 Pt100 / Pt1000 probe input	19 Slave RS485 port (A – positive)
8 Pt100 / Pt1000 probe input	20 Slave RS485 port (S – GND)
9 Pt100 / Pt1000 probe input	21 Slave RS485 port (B – negative)
10 Analogue input 0...20 mA (positive)	22 Master RS485 port (A – positive)
11 Analogue input 0...20 mA (negative)	23 Master RS485 port (S – GND)
12 Digital input 1	24 Master RS485 port (B – negative)

IMPORTANT!

If a transformer not specified by the manufacturer is connected, or it is connected to a different primary current than that specified in this manual, the current measurement will be incorrect and the device's protection may be compromised. If no probe is connected to the device, you must make a bridge between the three terminals meant for the probe. (7, 8, 9).

4.2 Connection diagram of the current transformers

The **TRH16-RS485** is a device designed to measure up to 16 direct current lines simultaneously. The device is equipped with 16 inputs for Hall effect transformers, with which one can measure up to 25 A per direct current channel.



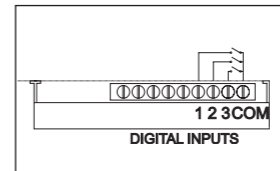
Detailed connection diagram of the M/TR transformers

For connecting the M/TR-25A to the **TRH16-RS485**, device, the use of a screened cable is recommended, the mesh of which must solely be connected to the GND connector on the device.

Optionally, up to a maximum of four M/TR-25Ax4 modules (16 channels) can be connected to the **TRH16-RS485** device. After initialising, the equipment performs a scan of all the inputs of the transformer modules, disabling the unused, and consequently not physically connected inputs, by software. In the event that a new four transformer M/TR module is subsequently connected, the user must reset the device's power supply, for the four new current measurement transformers to be recognised.

4.3 Connection diagram of the digital inputs

The **TRH16-RS485** device has three voltage-free inputs and a voltage of 24 V DC on the common one for detecting the logical status of the external pickups. On a real-time basis it detects the status of the inputs (open contact or closed contact), and transmits this information through the RS-485 communications bus.



The use and cabling of the said inputs is entirely optional and its implementation does not affect the operation of the rest of the assembly.

4.4 Connection diagram of the conventional RS-485 communications bus

The **TRH16-RS485** has an RS-485 communications port for real-time connection with a master PLC or SCADA industrial control type communications system. The communication must be made using a twisted-pair mesh-screened communications cable, with a three-core minimum. Between the master system and the last peripheral, the systems allows for a maximum distance of 1,200 metres. A maximum of 32 parallel-connected peripherals may be connected to the communication bus, for each port used.

In any event, star-type installations must be avoided, as the communications bus output of a peripheral must be chained to the input of the next and successive ones.

For installing these devices, it should be noted that there is no prior need of any type of end-of-line resistor. SEE DIAGRAM A

4.5 Connection diagram of the RS-485 slave and sub-slave communications bus

The **TRH16-RS485** has a second communications bus, which has the purpose of being able to communicate with other **TRH16-RS485s** in a parallel manner (sub-slave devices).

The nodes connected to the main bus, can simultaneously be connected to 15 new devices. Therefore, at the main bus level, a maximum of 32 devices can be installed, plus 15 sub-slave devices per installed node.

This communications typology results in the installation of 512 nodes on a single communications network, without this fact penalising the *pooling* time of the main communications bus.

The leading device connected to the main network, registers all the memory addresses of the sub-slave devices connected to it, thus reducing the number of nodes to be queried along the communications bus by the communications master, therefore reducing the *pooling* time.

The typology and the connections setup is described in DIAGRAM B

5. CONFIGURATION

In that relating to the measurement of voltage or direct current, the device does not require any special type of configuration, as the internal adjustment configuration ranges come set from the factory.

5.1 Communications

The implemented communications protocol is of the MODBUS/RTU® type.

As shown in the connection diagrams, the **TRH16-RS485** peripheral is connected to a control system by means of the RS-485 bus. For this purpose, each of the devices must be assigned a node number to identify them within the communications bus.

The front panel of the device is fitted with rotary switches and MINI-DIP switches that allow the user to adjust the parameters of the different communications settings. To integrate the device in the bus, only the node or peripheral number and the transmission speed of the RS-485 bus need to be set, which must naturally be the same as that of the communications master.

By default, the communication is set to 1 stop bit, Parity No and 8 bits in length (8/N/1).

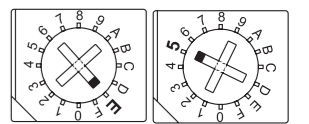
5.2 Setting the peripheral number.

The two rotary switches on the front panel of the device, are used to set the peripheral number (node). As the device communicates in Modbus/RTU protocol, the peripheral or station number may vary in the range 1 to 255 (FF in hexadecimal).

The node number is set in hexadecimal format; under no circumstances may this be set in decimal format. See several examples of the conversion of decimal to hexadecimal:

Decimal Node	Hexadecimal Node	Decimal Node	Hexadecimal Node
10	0A	80	50
15	0F	150	96
25	19	180	B4
50	32	200	C8
65	41	255	FF

For the hexadecimal node number, the first digit is set with the left-hand switch and the second with the right-hand switch. After the device number has been set, it is not necessary to reset the device.



E5 = 229

5.3 Setting the transmission speed

The **TRH16-RS485** has a module with four (MINI-DIP) switches, which allow the transmission speed to be set using switches 1 and 2. See the following table:



Transmission speed	Switch 1	Switch 2
9,600 / 8 / N / 1	OFF	OFF
19,200 / 8 / N / 1	OFF	ON
38,400 / 8 / N / 1	ON	OFF

When a change is made to the transmission speed, it is not necessary to reset the device. Nor when the node (peripheral) number is changed.

