

TR8-RS485-25A

Multi-channel DC voltage and current analyzer



1. DESCRIPTION OF THE UNIT

TR8-RS485 is a measurement unit with up to eight DC channels and a voltage channel, handling up to 1,000 Vdc. Current is measured through eight hall effect transformers (transformers used to measure DC current), with a 25 A primary.

The unit has two RS-485 communications ports. The first port is used to connect and transmit the information to the master with the Modbus/RTU protocol. The second communications port can be used for multi-master communication topologies (see section 4.6.- Connection diagram of the RS-485 communications slave and sub-slave), since many applications can be composed of a large number of TR8-RS485 analyzers. The communications parameters can be configured with the switches on the unit's front panel.

In addition, the unit has 8 digital inputs (logical) for the detection of the status of digital signals coming from the unit's environment. This information will also be available via RS-485 communications.

2. PRELIMINARY CONSIDERATIONS

2.1 Checks on reception

On receiving the instrument, check the following points:

- The unit's specifications are the same as those on your order.
- Check that the device has not suffered any damage during transport.

You can download further and updated information from the **CIRCUTOR** website: www.circutor.com

2.2 Safety precautions

The staff using or handling the unit must follow the common safety measures and warnings included in the instruction manual.

The **TR8-RS485** unit has been specifically designed for its installation in a control panel or enclosure fixed to a DIN rail. The equipment must never be installed or integrated in a place where people may have direct contact. **TR8-RS485** has a flashing red LED (CPU) when it is in operation and, therefore, it shows that there is voltage and current in the electronic circuit. The user must make sure that the unit is not connected to the power supply at all times, even when the LED is not flashing.

3. INSTALLATION AND START-UP

The user must take into account and observe the information and warnings included in this manual to guarantee the correct operation of the unit and comply with the safety specifications. The unit must not be turned on until it is fully installed in the electrical panel.

IMPORTANT!

The unit's protection systems might not be effective if the unit is used for purposes other than those specified by the manufacturer.

Disconnect the unit from the power supply when the unit's safety protection systems are not working or there are signs of a problem (for example, in the case of visible damage). In this case, contact a qualified technical service or contact our Technical Assistance Service TAS (see section 7.- TECHNICAL ASSISTANCE SERVICE).

3.1 Installing the equipment

The unit will be installed on DIN rails. It has a surface for 9 DIN modules (157.5 mm) and a height of 58 mm. All connections remain inside the electric panel.

Remember that with the unit connected, the terminals may be hazardous to the touch, and opening the covers or removing elements may provide access to parts that are dangerous to the touch. The unit must not be used or powered until it is fully installed.

The unit must be connected to a power supply circuit protected with fuses. The fuses' specifications will comply with the power supply range and its consumption. Likewise, the power supply circuit must have a built-in circuit breaker or equivalent device to disconnect the unit from the power supply network. The power supply circuit must be connected with a cable that has a minimum section of 1 mm².

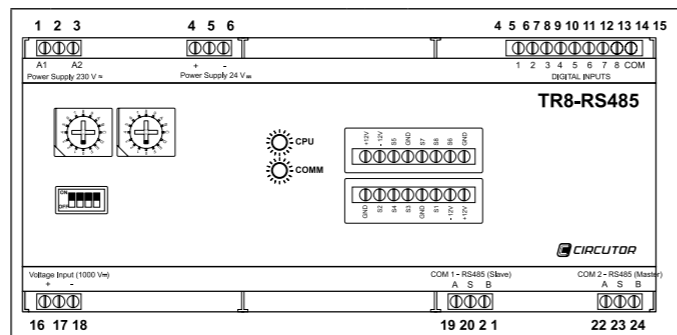
3.2 Power supply of the unit

The unit has two auxiliary power supply inputs; an AC and a DC current input. The user must not connect both power supply inputs at the same time.

Power supply	Alternating C.	Direct C.
Nominal voltage	230 Vac	24 Vdc =
Power supply tolerance	± 30 %	± 10 %
Frequency	50 Hz	-
Consumption of the equipment without transformers	8 mA / 1.84 V•A	70 mA
Consumption of the equipment with 8 sensors (no load)	32 mA / 7.36 V•A	270 mA
Consumption of the equipment with 8 sensors (with current)	32 mA / 7.36 V•A	270 mA
Operating conditions		
Operating temperature	-35...+65°C	
Relative humidity	5... 95% RH (non-condensing)	
Maximum operating altitude	2,000 metres	
Protection	IP 20	
TR8-RS485 precision		
Linearity Error	± 0.1 %	Offset Error 0.075 % I _n
Total Error	± 0.5 % I _n	Range 2,5 100% I _n
Resolution Error	± 0.075 % I _n	Voltage Error 1 %
Transformer precision		
Linearity Error (not including offset)	± 0.5%	Offset Drift / Temp. ±1 mV / °C
Offset Error 25°C	±10 mV at I _n =0	Thermal Gain Drift ±0.05 % / °C
Safety		
Category III – 300 Vac (EN 61010)		
Double-insulated electric shock protection class II		

4. CONNECTIONS

4.1 Description of connection terminals



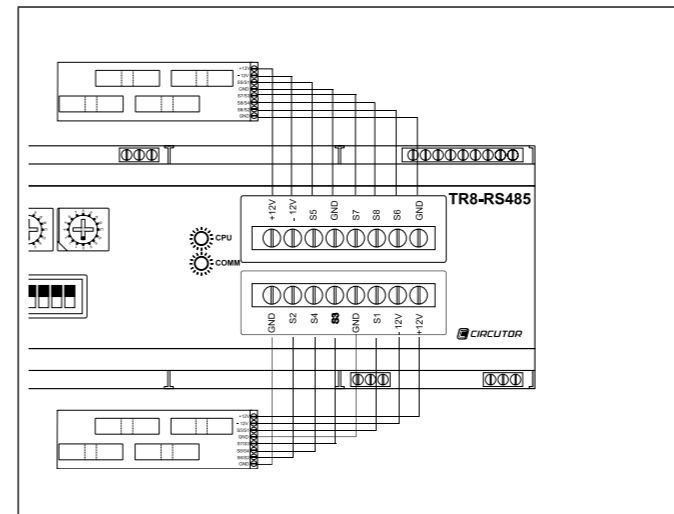
Description	Description
1 Supply 230 Vac≈ (phase or neutral)	13 Digital Input 7
2 Not used	14 Digital Input 8
3 Supply 230 Vac≈ (phase or neutral)	15 Digital inputs common
4 Power supply 24 Vdc (+)	16 Continuous voltage (positive)
5 Not used	17 Not used
6 Power supply 24 Vdc (-)	18 Continuous voltage (negative)
7 Digital Input 1	19 Slave port (A - Positive)
8 Digital Input 2	20 Slave Port (S - GND)
9 Digital Input 3	21 Slave port (B - Negative)
10 Digital Input 4	22 Master port (A - Positive)
11 Digital Input 5	23 Master Port (S - GND)
12 Digital Input 6	24 Master port (B - Negative)

IMPORTANT!

When connecting a transformer that has not been specified by the manufacturer or with a primary current different to that specified in this manual, the voltage measurement will be incorrect and the unit's protection systems might not work properly.

4.2 Connection diagram of current transformers

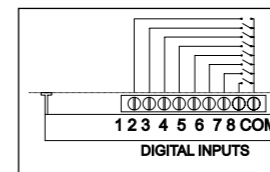
The **TR8-RS485** has been designed to measure up to 8 DC current lines simultaneously. The unit has eight built-in inputs for hall effect transformers, which can measure DC currents of up to 25 A per channel.



Connection details of M/TR8 transformers

4.3 Connection details of digital inputs

The **TR8-RS485** unit has eight voltage-free inputs and a voltage of 24 Vdc in the common for the detection of the logical status of external sensors. It reads the status of inputs in real time (open or closed contact) and transmits this information through the RS-485 communications bus.



The use and cabling of these inputs is optional and its execution does not affect the operation of the rest of the set.

4.4 Connection diagram of the conventional RS-485 communications bus

The **TR8-RS485** unit has a RS-485 communications port for real-time communications, with a master communications system of the PLC or SCADA type for industrial control purposes. Communications are through a braided pair communications cable with shielded mesh and a minimum of three wires. The system accepts a maximum distance of 1,200 metres between the master system and the last peripheral unit. A maximum of 32 peripherals can be connected in parallel to the communications bus for every port used.

In any case, star-shaped topologies must be avoided, thus linking the output of the communications bus of a peripheral to the next input and so forth. The installation of a resistor at the end of the line is not required for the installation of these devices. SEE LAYOUT A

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

The **TR8-RS485** unit has a second communications bus that is used to establish communications with other **TR8-RS485** units in parallel (sub-slave units).

The RS-485 communications bus has a limitation of 32 units per bus, so that each node connected to the main bus can communicate with 31 new units simultaneously. Therefore, a maximum of 32 units plus an additional 31 sub-slave units per node installed can be installed on the main bus.

This communication topology will be followed by the installation of many different nodes within a single communications network, with no penalty on the pooling of the main communications bus.

The header unit connected to the main network records all memory addresses of the sub-slave units connected to it, so that the communications master reduces the number of nodes queried throughout the communications bus and, therefore, reduces the pooling time.

The topology and connections are shown on LAYOUT B

5. CONFIGURATION

As regards the measurement of DC voltage or current, the unit does not require any sort of special configuration, since the internal adjustment and configuration ranges are already set up at the factory.

5.1 Communication

The communications protocol implemented is of the MODBUS/RTU® type. The **TR8-RS485** peripheral unit is connected to a control system with the RS-485 bus, as shown on the connection diagrams. A node number will be assigned to each unit so that it can be identified within the communications bus.

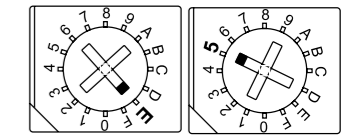
The front panel includes a series of built-in rotary switches and MINI-DIPS that can be used to establish the parameters of the different communications setpoints. Only the parameters of the node or peripheral number and the RS-485 communication speed must be established to integrate the unit in the bus. These will obviously be the same as those of the communications master. The default configuration of communications is: 1 stop bit, Parity No and 8 bit length (8/N/1).

5.2 Configuration of the peripheral number

The two rotary switches on the unit's front panel can be used to establish the peripheral number (node). The unit communicates the peripheral or station number with the Modbus/RTU protocol, which will range from 1 to 255 (FF in hexadecimal). The configuration of the node is achieved with the said number in hexadecimal format. Decimal format must not be used. Examples of decimal to hexadecimal conversion:

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

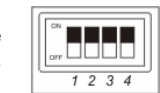
The first number corresponds to the left switch and the second one to the right switch in the case of hexadecimal node numbers. The unit does not have to be reset once the device number has been configured.



n. periférico: E5 = 229

5.3 Configuration of the communication speed

TR8-RS485 has a four-switch module (MINI-DIPS), that can be used to configure the transmission speed with 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

The unit does not have to be reset when the transmission speed is modified. Likewise, it does not have to be changed when the node number is changed (peripheral).

5.4 Configuration of slave and sub-slave units

The user can use switch 3 to select the type of communications topology. The unit can be configured as a conventional slave in a communications network or it can be configured as a sub-slave within a multi-slave network.

5.4.1 Slave units

On LAYOUT A, the communications bus has a conventional communications topology. In this type of topology, the peripherals are numbered 1 to 255 (01 to FF in hexadecimal).

Switch 3 Position Layout A	OFF	The nodes are numbered 1 to 255 (01 to FF in hexadecimal).

5.4.2 Sub-slave units

In the case of communication systems with slaves and sub-slaves (LAYOUT B. Connection diagram of the RS-485 slave and sub-slave communications bus), the communications of the units marked as sub-slaves (A₁, A₂, ..., A₃₂ ... A₁₃₂, A₂₃₂, ..., A₃₂₂) must have a different configuration and a well ordered node numbering system.

The slave nodes (A₁, A₂ ... A₃₂), can be numbered from peripheral 1 to 255, as specified in the previous section (from 01 to FF in hexadecimal). On the contrary, the sub-slaves of each communication bus must be numbered 2 to 32 (02 to 20 in hexadecimal) and correlative to each corresponding bus. Slave units can not detect the presence of sub-slave units with node numbers above 32 (20 in hexadecimal).

