SENECA

Serie Z-PC

EN

# S203TA-D

## Advanced Three-phase Network Analyzer with display

# Installation Manual

***Contents:***





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CSQ IQNet ISO 9001:2008

## GENERAL SPECIFICATIONS

Model S203TA-D is a complete three-phase network analyzer, with display, suited for use with up to 600Vac voltage range, and max current equal to 5A connected to the inputs.The instrument provides all the following electrical measurable quantities: **Vrms, Irms, Watt, VAR, VA, Frequency, Cosϕ** and **Active Energy**. All measurements given above (except frequency) are available both single-phase and three-phase.Measurements are read through serial communication both in floating point and normalized format (except Frequency and Active Energy).It is possible the analog retransmission of any Vrms, Irms, Watt and Cosϕ quantity either single phase or three-phase, or any phase chosen (by specific display or MODBUS registry). The module is also distinguished by:

- Communication configurability through software.
- RS485 serial communication with MODBUS-RTU protocol, maximum 32 nodes.
- Easy-wiring of power supply and serial bus by means of the bus housed in the DIN rail.
- High precision: 0,2 % class.
- Protection against ESD discharge up to 4 kV.
- Measure input insulation: 4000 Vac towards all the other circuits.
- Insulation between communication and power supply: 1500Vac.
- Insulation between retransmitted output and power supply: 1500Vac.
- Analog output signal settable in voltage or current.
- Digital output for energy counter
- Possibility for connection and management by external CTs with 5A output.
- All kind of insertion possible: single phase, Aron, four wires
- Possibility to compensate errors caused by frequency change in places where network frequency is not stable (frequency changes > 30 mHz).

## TECHNICAL FEATURES

### Communication port

| | |
|---|---|
| RS485 | Baud rate: 1200..115200 baud. Protocol: Modbus RTU |
| USB | Mini-USB, for programming (software Easy) |

### Input

| | |
|---|---|
| Voltage input | Up to 600 Vac, frequency 50 or 60 Hz |
| Current input | Rated range :5 A<br>Max Crest Factor: 3. Continuous Max Current: 15 A |
| Class/Base Precision (1) | Network Frequency: 50 or 60 Hz.Voltmeter : 0,2 %.<br>Amperometer : 0,2 %. Wattmeter : 0,2 %. |
| Max Resistance of each CT's secondary wire : | To ensure the accuracy on nominal measure, cable lenght must be compatible with the current transformer. If Rtotal=sum of the resistance of the wire going (from CT to S203TA-D) and back (from S203TA-D to CT), then Rtotal*$I^2$< (CT nominal power) |

(1) Precisions are given in the following range: ***Vrms***: 40..600 Vac; Cosϕ>0.9
(without error due to external CT) ***Irms***: 0,4-100% Iprimary of TA

### Digital output for energy counter

| | |
|---|---|
| Type | Passive (it has to be powered on), no protection for short circuit |
| Range | 50 mA / 28 V |

## Analog Output

| | |
|---|---|
| Voltage Output | 0..10 Vdc, 0..5 Vdc, Min. load resistance: 2 kΩ. |
| Current Output | 0..20 mA, 4..20 mA, Max load resistance: 500 Ω. |
| Transmission error | 0,1 % (max range). |
| Response time | 0,4 s (10%..90%) |
| Thermal stability | 100 ppm / K |

## Other Specifications

| | |
|---|---|
| Voltage | 11 ..40 $V_{DC}$ or 19 ..28 $V_{AC}$ @ 50 ..60 Hz |
| Consumption | Max 2,5 W |

## Installation

| | |
|---|---|
| Installation category | III (up to 300 V), II (up to 600 V) |

## Environmental conditions

| | |
|---|---|
| Temperature | -10 ..+65°C |
| Humidity | 30 ..90% |
| Storage temperature | -20 ..+85°C |
| International protection | IP20 |

## Connections

| | |
|---|---|
| Connections | Screw terminals, 5,08 / 7,5 pitch |

## Dimensions / case / display

| | |
|---|---|
| Dimensions | 105 x 89 x 60 mm |
| Case | Plastic UL 94 VO, grey color. |
| Display | Front LCD 2 lines x 16 characters alphanumeric (backlighted) |

## Isolations

| | |
|---|---|
| Insulation voltage | 4000 Vac between the input and all the other circuits.<br>1500 Vac between power supply and communication.<br>1500 Vac between power supply and analog output. |

## Standards

**Reference standards :**

CE

**EN61000-6-4** (electromagnetic emission, industrial environment).

**EN61000-6-2** (electromagnetic immunity, industrial environment).

**EN61010-1** (safety)

## OPERATING LOGIC

The module measures the following electrical quantities: Vrms, Irms, Watt, VAR, VA, Frequency, Cosϕ and Active Energy, and provides the values in the corresponding MODBUS registers.
In three-phase environments, measurements given above corresponding to any phase are available, other than the three-phase value (except the frequency).
These measurements are rendered in both floating point and normalized format (except Frequency and Active energy) between 0..+10000 (-10000 ..+10000 for VAR e Cosϕ). Active energy value is stored in memory and when the instrument is switched off, the last value before switching is kept in memory.
The module output can transmit one of the following quantities: Vrms, Irms, Watt, cosΦ as either a current or voltage value. If the instrument is set for three-phase measurements, it transmits automatically the three-phase value of the selected measurement. However, via MODBUS register, the user can choose to transmit the measurement corresponding to any phase: A, B, C.
The user can set through MODBUS the values **MIN** and **MAX** of the measurement to transmit corresponding to 0% and 100% of the analog output. For example, if the signal is transmitted as current 4..20 mA and the quantity to transmit is voltage Vrms in the 10..300 V range, (therefore **MIN=10, MAX=300**), then if Vrms measured is 10V, analog output will be 4mA, while if Vrms=300V output will be 20mA. In the intermediate points the behaviour is linear. The analog output values saturate at approximately 11 V for voltage output and at 22mA for current output (analog output clamped at 110 %).
If network frequency oscillates more than 30 mHz from rated values (50 o 60 Hz), it's possibile to compensate errors on measurements of Power and Energy caused by these variations. This option is selectable via MODBUS register. Vrms and Irms measurements are not influenced by these variations.
When the module is switched on, the appropriate setting coefficients are measured (depending on the choice of 50 or 60 Hz frequency). All the settings made will be automatically loaded when the module is reset.

NOTE: without load connected to the S203TA-D, only the (displayed) voltage and frequency assume a corrected value.

## Measured quantity of S203TA-D

| ELECTRICAL QUANTITY | SYMBOLS USED | MEASURED VALUES | CALCULATED VALUES | EQUATION |
|---|---|---|---|---|
| Root-mean squared voltage (Vrms) | $V_A$, $V_B$, $V_C$ | ● | | |
| Mean three phase voltage | V | | ● | $(V_A+V_B+V_C)/3$ |
| Root-mean squared current (Irms) | $I_A$, $I_B$, $I_C$ | ● | | |
| Mean three phase current | I | | ● | $(I_A+I_B+I_C)/3$ |
| Active power (phase) | $P_A$, $P_B$, $P_C$ | ● | | |
| Total three phase active power | P | | ● | $P_A+P_B+P_C$ |
| Reactive power (phase) | $Q_A$, $Q_B$, $Q_C$ | | ● | $\sqrt{(S_{A,B,C})^2-(P_{A,B,C})^2}$ |
| Total three phase reactive power | Q | | ● | $Q_A+Q_B+Q_C$ |
| Apparent power (phase) | $S_A$, $S_B$, $S_C$ | | ● | $V_{A,B,C}*I_{A,B,C}$ |
| Total three phase apparent power | S | | ● | $S_A+S_B+S_C$ |
| cosϕ (phase) | $cosfi_A$, $cosfi_B$, $cosfi_C$ | | ● | $P_{A,B,C}/ S_{A,B,C}$ |
| Total three-phase cosϕ | cosfi | | ● | P / S |
| Frequency | Hz | ● | | |
| Active Energy (phase) | $E_A$, $E_B$, $E_C$ | ● | | |
| Total three-phase active energy | E | | ● | $E_A+E_B+E_C$ |

## Retransmission range

| Electrical Quantity | Measurement Range |
|---|---|
| V rms | 0..600 Vac |
| I rms | 0..I primary of CT |
| Active Power | (0..I primary of CT*600)W |
| Reactive Power | (0..I primary of CT*600)VAR |
| Apparent Power | (0..I primary of CT*600)VA |
| Cosϕ | 0..1 |
| Frequency | 40..70 Hz |

# ELECTRIC CONNECTIONS

**POWER SUPPLY**

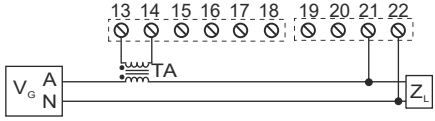
26 / 25 — 11 ÷ 40 VDC / 19 ÷ 28 VAC, 2.5 W

**RS 485**

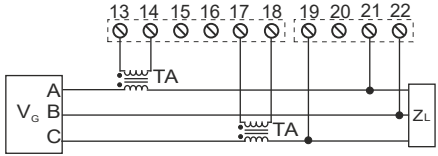
33 — B
32 — A
31 — GND

There is no insulation between RS485 and the analog output

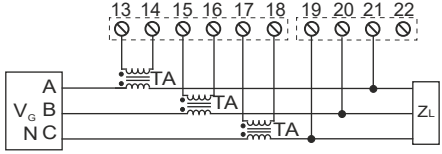
**SINGLE PHASE INPUT**



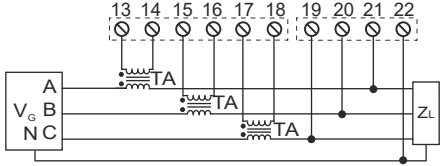

**ARON** Three-Phase without Neutral




**3 WIRES** Three-Phase without Neutral

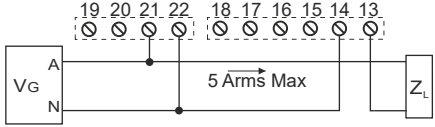



**4 WIRES** Three-Phase with Neutral




**Note: You can't connect the secondary of any CTs to the Earth. Terminals 14, 16 18 and 22 are internally connected.**

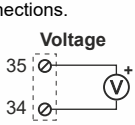
**SINGLE PHASE WITHOUT CT**

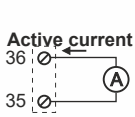


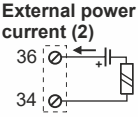

**Note: *PAY ATTENTION* to the different terminals position from the other schematics**

**ANALOG OUTPUT**

The module provides a programmable, analog output in voltage (0..10 Vdc) or active and passive current (0..20 mA). We recommend using shielded cables for the electric connections.



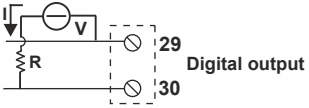




There is no insulation between RS485 and the analog output.

**DIGITAL OUTPUT**

The module has a digital output: each pulse corresponds to a given number of increments about to the energy counter. Imax=V/R=50 mA, Vmax=28V. For more informations, see the S203TA-D display settings manual.




## LEDs signallings

| LED | STATUS | LEDs signallings |
|---|---|---|
| PWR | ON (GREEN) | The module is power on |
| ERR | ON (YELLOW) | At least one of the active phases' voltage is less than 40 Vac |
| TX | Blinking (RED) | Data are being transmitted through the RS485 comm. port |
| RX | Blinking (RED) | Data are being received through the RS485 comm. port |

## *SERIAL INTERFACE*

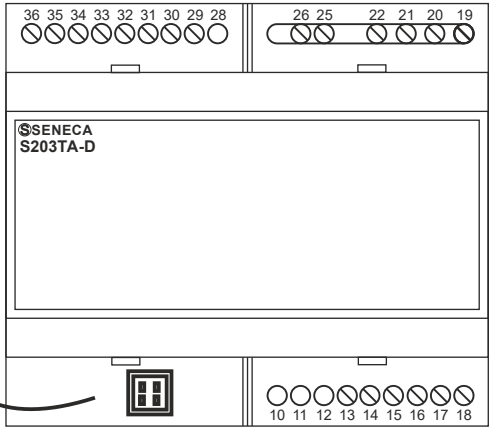
For detailed information on RS485 serial interface, consult the documentation provided by the website www.seneca.it, in the section **Prodotti/Serie Z-PC/MODBUS TUTORIAL**.

## Programming

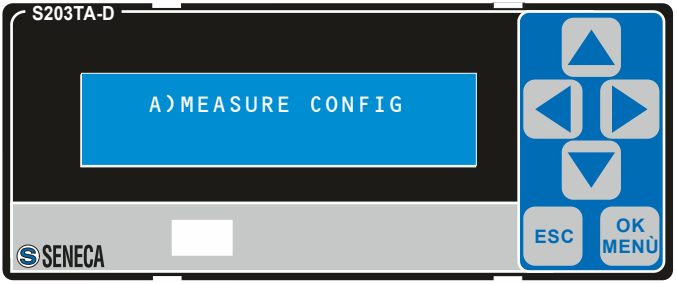
The communication parameters have the following default values:: baudrate=38400, no parity, bit number=8, bit stop=1. These values can be modified by display or Modbus protocol. To program the device, download the free software Easy Setup from the website www.seneca.it.

## CASE AND SCREW TERMINAL NUMBERS

**For communication debugging, remove the terminals cover to see the internal LEDs.**


## FRONT PANEL




## DISPLAY PROGRAMMING

For detailed information on display programming, consult the documentation provided by the website www.seneca.it.

Disposal of Electrical & Electronic Equipment (Applicable throughout the European Union and other European countries with separate collections programs). This symbol, found on your producr or on its packaging, indicates that this product should not be treated as household waste when you wish to dispose of it. Instead, it should be handed over to an applicable collection point for the recycling of electrical & electronic equipment. By ensuring this product is didposed of correctly, you will help prevent potential negative consequences to the environment and human health, which could otherwise be caused by inappropriate disposal of this product. The recycling of materials will help to conserve natural resources. For more detailed information about the recycling of the product, please contact your local city office, waste disposal service of the retail store where you purchased this product.