**Serie Z-PC****EN****S203TA-D****Advanced Three-phase  
Network Analyzer with display**

# **Installation Manual**

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For manual and configuration softwares, please see: [www.seneca.it](http://www.seneca.it)

CERTIFICAZIONE DITTA SENEC - REG. STATISTICO D. M. 10/19/2007

azienda con sistema di gestione per la qualità certificato  
**ISO 9001:2008**

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## 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, Cos $\phi$**  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 Cos $\phi$  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 :given by $I_{NOMINAL}$ of CT. Max Crest Factor :3.Max Current : $3*I_{NOMINAL}$ of CT.
Class/Base Precision (1)	Network Frequency: 50 or 60 Hz.Voltmeter : 0,2 %. 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 $R_{total}$ =sum of the resistance of the wire going (from CT to S203TA-D) and back (from S203TA-D to CT), then $R_{total}*I^2 <$ (CT nominal power)

(1) Precisions are given in the following range: **Vrms**: 40..600 Vac; Cos $\phi$ >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 k $\Omega$ .
Current Output	0..20 mA, 4..20 mA, Max load resistance: 500 $\Omega$ .
Transmission error	0,1 % (max range).
Response time	0,4 s (10%..90%)
Thermal stability	100 ppm / K

## Other Specifications

Voltage	11 ..40 V <sub>DC</sub> or 19 ..28 V <sub>AC</sub> @ 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.  
1500 Vac between power supply and communication.  
1500 Vac between power supply and analog output.

## Standards

### Reference standards :

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

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

EN61010-1 (safety)



The module measures the following electrical quantities:  $V_{rms}$ ,  $I_{rms}$ , Watt, VAR, VA, Frequency,  $\cos\phi$  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  $\cos\phi$ ). 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:  $V_{rms}$ ,  $I_{rms}$ , Watt,  $\cos\phi$  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  $V_{rms}$  in the 10..300 V range, (therefore **MIN=10**, **MAX=300**), then if  $V_{rms}$  measured is 10V, analog output will be 4mA, while if  $V_{rms}=300V$  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 possible to compensate errors on measurements of Power and Energy caused by these variations. This option is selectable via MODBUS register.  $V_{rms}$  and  $I_{rms}$  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.

# ELECTRICAL QUANTITIES

## 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)	$\cos\phi_A, \cos\phi_B, \cos\phi_C$		●	$P_{A,B,C} / S_{A,B,C}$
Total three-phase cosφ	cosφ		●	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

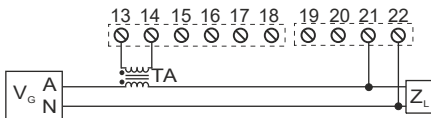
26	⊗	11 + 40 VDC
25	⊗	19 + 28 VAC 2.5 W

## RS 485

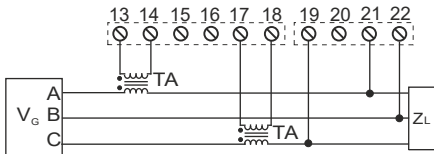
33	⊗	B
32	⊗	A
31	⊗	GND

There is no insulation  
between RS485 and  
the analog output

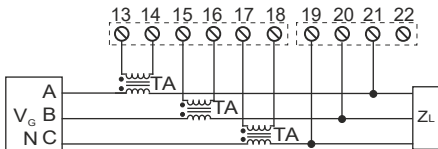
**SINGLE  
PHASE  
INPUT**



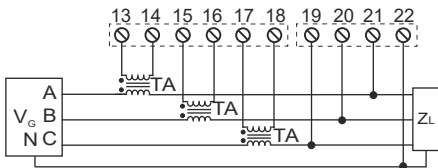
**ARON**  
Three-Phase  
without Neutral



**4 WIRES**  
Three-Phase  
without Neutral

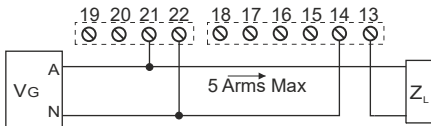


**4 WIRES**  
Three-Phase  
with Neutral



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

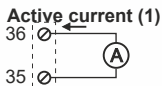
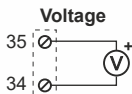
**SINGLE  
PHASE  
WITHOUT CT**



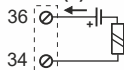
**Note:** PAY ATTENTION to the different terminals position from the other schematics

## 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.



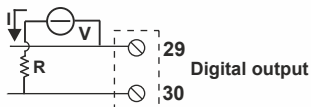
## External power supply current (2)



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.  $I_{max}=V/R=50$  mA,  $V_{max}=28$ V. For more informations, see the S203TA-D display settings manual.



## LEDs signalling

LED	STATUS	LEDs signalling
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

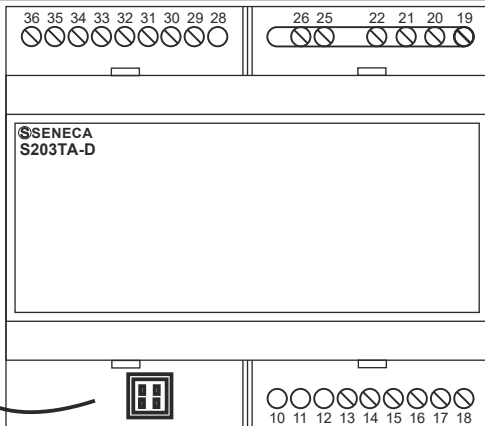
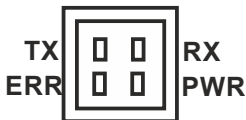
For detailed information on RS485 serial interface, consult the documentation provided by the website [www.seneca.it](http://www.seneca.it), in the section **Prodotti/Serie Z-PC/MODBUS TUTORIAL**.

## Programming

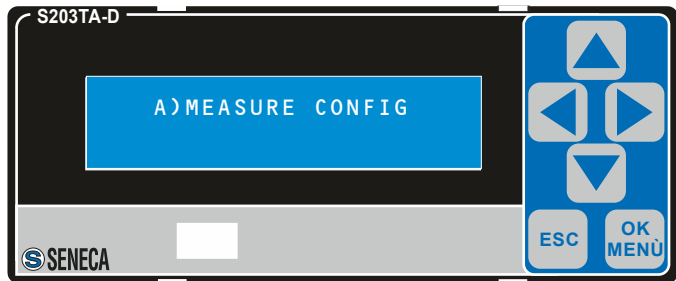
The communication parameters have the following default values:: baudrate=38400, no parity, bit number=8, bit stop=1. These values can be modified by display or Modbus protocol. To program the device, download the free software Easy Setup from the website [www.seneca.it](http://www.seneca.it).

## 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](http://www.seneca.it).



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