SENECA

USER MANUAL

S203TA-D

S203RC-D

Advanced Energy Counter and Analyzer

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MI004070_105

Date	Revision	Notes
22/01/2014	15	-Add impulse time value on Digital Output chapter
02/04/2014	16	-Add Rogowski Coil full scale configuration in the modbus registers and S203RC-D electrical connection. -Modified the firmware update chapter
18/04/2014	17	-Add demand time calculation info
04/07/2014	18	-Add insertion info -Modified Terminal position chapters
23/03/2015	19	-Added RS485 Pinout
30/04/2015	_100	-Fixed Qabc formula in3 or 4 wires insertion
28/08/2015	_101	-Added new commands from firmware SW004300
10/09/2015	_102	-Added info on cutoff Modbus register
22/09/2015	_103	-Added Chapter "Setup a rogowski coil probe for S203RC-D model"
02/10/2015	_104	-Fixed Table values on chapter "Setup a rogowski coil probe for S203RC-D model" -Minor Fix
06/10/2015	_105	-Changed Active Power calculation from firmware SW004302

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Seneca **S203TA-D / S203RC-D**

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1. Introduction

Models S203TA-D and S203RC-D are a complete three-phase energy analyzers with display, suited for use with up to 600Vac voltage range (without a TV transformer), and max current equal to 5A (without a TA transformer) connected to the inputs. A double serial interface (USB or RS485) it's also available (Modbus RTU protocol).
Analog and digital outputs can be connected to the electrical measure.

1.1. Features

- Energy values backup (FeRAM backup values without battery need)
- Last screen page displayed backup (FeRAM backup without battery need)
- Easy configurable by free configuration software or by display menu
- RS485 serial communication with MODBUS-RTU protocol, maximum 32 nodes.
- USB serial communication with Modbus RTU protocol for registers access and configuration
- High precision: 0,2%class (S203TA-D).
- 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 pulse signal for Energy or Energy sign.
- Possibility for connection and management by external CTs with 5A output.
- Possibility for connection and management by external VTs.
- All kind of insertion possible: single phase, Aron, 4-wires, 3-wires .
- Possibility to compensate errors caused by frequency change in places where network frequency is not stable (frequency changes > 30 mHz).
- USB Firmware update
- Easy-wiring of power supply and serial bus by means of the bus housed in the DIN rail.
- S203RC-D can be used with rogowski coil of various full scale

1.2. Electrical Measure on Display

The instruments provide all the following electrical measurable quantities by the display:

- V RMS (phase A to neutral)
- V RMS (phase B to neutral)
- V RMS (phase C to neutral)
- V RMS 3-phase
- I RMS phase A
- I RMS phase B
- I RMS phase C
- I RMS 3-phase
- P ACTIVE phase A
- P ACTIVE phase B
- P ACTIVE phase C
- P ACTIVE 3-phase
- Q reactive phase A
- Q reactive phase B
- Q reactive phase C
- Q reactive 3-phase
- S apparent phase A
- S apparent phase B

- S apparent phase C
- S apparent 3-phase
- Cosfi phase A
- Cosfi phase B
- Cosfi phase C
- Cosfi 3-phase
- Active Energy phase A
- Active Energy phase B
- Active Energy phase C
- Active Energy 3-phase
- Only positive Active Energy 3-phase
- Only negative Active Energy 3-phase
- Phase A frequency
- Reactive Energy phase A
- Reactive Energy phase B
- Reactive Energy phase C
- Reactive Energy 3-phase
- Only positive Reactive Energy 3-phase
- Only negative Reactive Energy 3-phase
- Maximum P Active value phase A
- Maximum P Active value 3-phase
- Maximum Q Reactive value phase A
- Maximum Q Reactive value 3-phase
- Average Active power 3-phase/A-phase value for demand time (configurable).

1.3. Electrical Measure on Modbus RTU Interface

By the serial RS485 or USB (Modbus RTU Protocol) the following electrical measurable quantities are available:

- V RMS (phase A to neutral)
- V RMS (phase B to neutral)
- V RMS (phase C to neutral)
- V RMS 3-phase
- I RMS phase A
- I RMS phase B
- I RMS phase C
- I RMS 3-phase
- P ACTIVE phase A
- P ACTIVE phase B
- P ACTIVE phase C
- P ACTIVE 3-phase
- Q reactive phase A
- Q reactive phase B
- Q reactive phase C
- Q reactive 3-phase
- S apparent phase A
- S apparent phase B
- S apparent phase C
- S apparent 3-phase
- Cosfi phase A
- Cosfi phase B
- Cosfi phase C

- Cosfi 3-phase
- Active Energy phase A
- Active Energy phase B
- Active Energy phase C
- Active Energy 3-phase
- Only positive Active Energy phase A
- Only positive Active Energy phase B
- Only positive Active Energy phase C
- Only positive Active Energy 3-phase
- Only negative Active Energy phase A
- Only negative Active Energy phase B
- Only negative Active Energy phase C
- Only negative Active Energy 3-phase
- Phase A frequency
- Reactive Energy phase A
- Reactive Energy phase B
- Reactive Energy phase C
- Reactive Energy 3-phase
- Only positive Reactive Energy phase A
- Only positive Reactive Energy phase B
- Only positive Reactive Energy phase C
- Only positive Reactive Energy 3-phase
- Only negative Reactive Energy phase A
- Only negative Reactive Energy phase B
- Only negative Reactive Energy phase C
- Only negative Reactive Energy 3-phase
- Maximum P Active value phase A
- Maximum P Active value 3-phase
- Maximum Q Reactive value phase A
- Maximum Q Reactive value 3-phase
- Average Active power 3-phase/A-phase value for demand time (configurable).

1.4. Electrical Measure on Analog Output

The modules can put to the analog output (configurable in current 0-20 mA, 4-20 mA or voltage 0-10 V) one of the following electrical measurable quantities :

- V RMS (phase A to neutral)
- V RMS (phase B to neutral)
- V RMS (phase C to neutral)
- V RMS 3-phase
- I RMS phase A
- I RMS phase B
- I RMS phase C
- I RMS 3-phase
- P ACTIVE phase A
- P ACTIVE phase B
- P ACTIVE phase C
- P ACTIVE 3-phase
- Cosfi phase A
- Cosfi phase B
- Cosfi phase C
- Cosfi 3-phase

1.5. Electrical Measure on Digital Output

The modules can put to the digital output (pulse weight configurable) one of the following electrical measurable quantities :

- Positive Active Energy phase A
- Positive Active Energy phase B
- Positive Active Energy phase C
- Negative Active Energy phase A
- Negative Active Energy phase B
- Negative Active Energy phase C
- 3-phase only positive Active Energy
- 3-phase only negative Active Energy
- Positive Reactive Energy phase A
- Positive Reactive Energy phase B
- Positive Reactive Energy phase C
- Negative Reactive Energy phase A
- Negative Reactive Energy phase B
- Negative Reactive Energy phase C
- 3-phase only positive Reactive Energy
- 3-phase only negative Reactive Energy

1.6. S203TA-D Insertion types

The following insertion types are possible (CT = current transformer, VT = voltage transformer):

- Single phase insertion
- Single phase insertion with CT
- Single phase insertion with VT
- Single phase insertion with CT and VT
- Aron insertion with CTs
- Aron insertion with CTs and VTs
- 3-phase insertion with neutral with CTs
- 3-phase insertion without neutral with CTs
- 3-phase insertion without neutral with CTs and VTs

WARNING!

ARON insertion without CTs it’s not allowed (two phases are short circuited!)
3-PHASE insertion without CTs it’s not allowed (the phases are short circuited!)

1.7. S203RC-D Insertion types

- Single phase insertion
- Single phase insertion with VT
- Aron insertion
- Aron insertion with VTs
- 3-phase insertion with neutral
- 3-phase insertion with neutral with VTs
- 3-phase insertion without neutral
- 3-phase insertion without neutral with VTs

1.8. Measures response time

- S203TA-D (Typical):
  63% IRMS 80 ms
  100% IRMS 1000 ms
  63% VRMS 100 ms
  100% VRMS 960 ms

- S203RC-D (Typical):
  63% IRMS 40 ms
  100% IRMS 1680 ms
  63% VRMS 100 ms
  100% VRMS 960 ms

  Analog Output Response Time: Typical 10 ms (10-90%)
  Modbus Response Time: Typical 5 ms

2. S203TA-D Electrical Connections

DANGER!

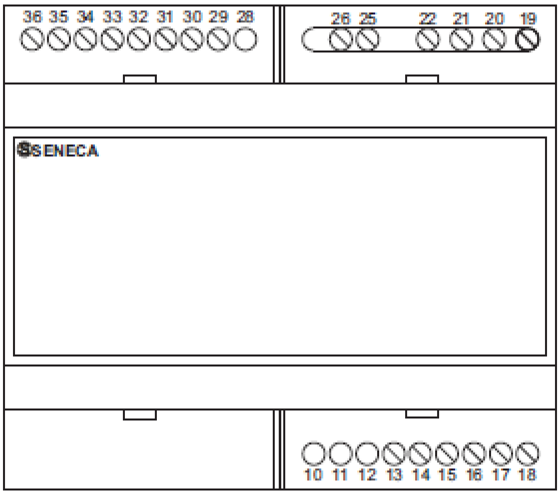
Never open the secondary circuit of CT under applying current to load.
Never remove the terminal block under applying current to load, will cause electric shock or breakdown CT

WARNING!

- ***ARON insertion without CTs it's not allowed (two phases are short circuited!)***
- ***3-PHASE insertion without CTs it's not allowed (the phases are short circuited!)***
- ***You can't connect the secondary of any CTs to the Earth.***
- ***Terminals 14, 16 18 and 22 are internally connected!***
- ***Use CT with the secondary side current is 5A***
- ***All CTs connected should be the same.***
- ***When connecting CT, connect the secondary side to the terminal of the main unit first, and after that wire the primary side to a load electric wire. Incorrect order might cause an electric shock or break CT.***

- ***The CT has polarity. Wrong direction can't measure correctly (for example negative current value instead of positive)***
- ***If there is some distortion by harmonic or waveform, it may not measure correctly.***
- ***Separate the wiring (strong electric part) of the measured voltage input terminal (operating power supply terminal) from the CT cable. It may not satisfy the accuracy due to noise.***
- ***Current Terminals Max 5A, Voltage Terminals Max 600V***

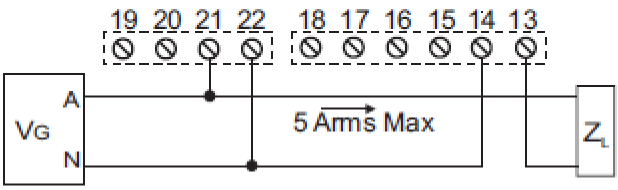
2.1. S203 TA-D Terminal Positions



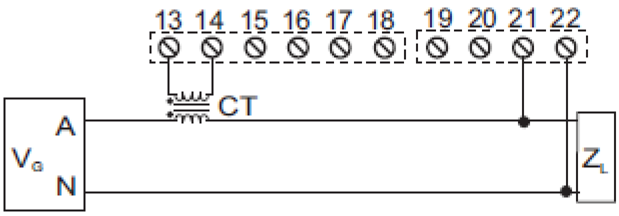
2.2. Single phase insertion (1-phase insertion)

WARNING!

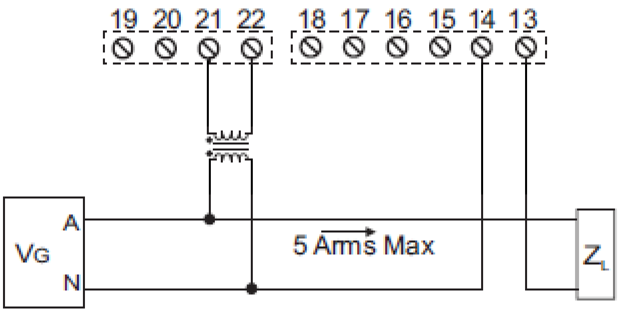
Pay attention to the different terminals positions in this schematics:



2.3. Single phase insertion with CT (1-phase insertion)

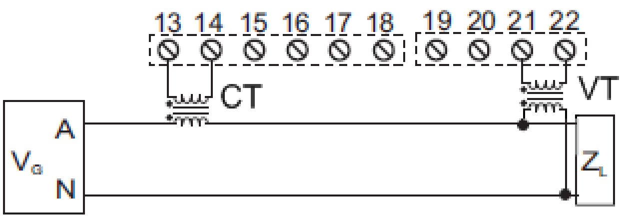


2.4. Single phase insertion with VT (1-phase insertion)

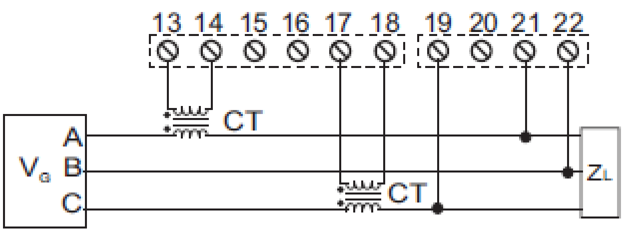


I MAX = 5 A

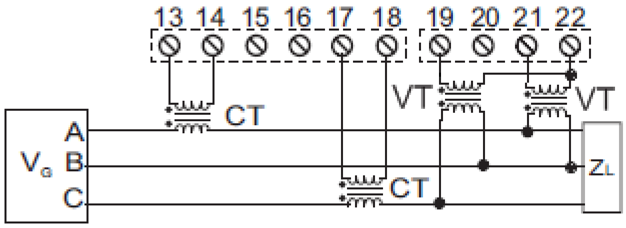
2.5. Single phase insertion with CT and VT (1-phase insertion)



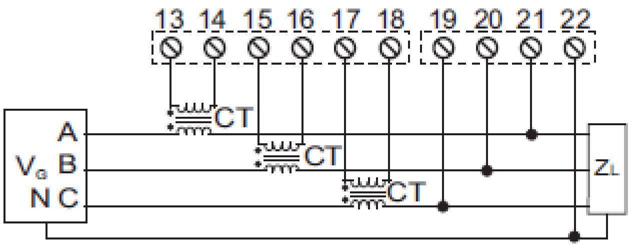
2.6. Aron insertion with CTs (Aron insertion)



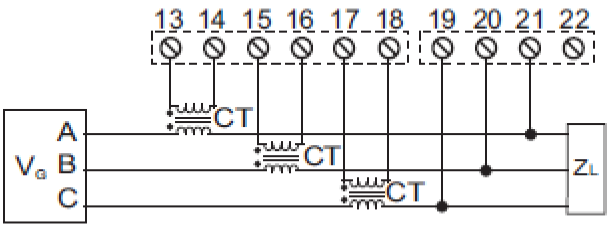
2.7. Aron insertion with CTs and VTs (Aron insertion)



2.8. 4 wire with neutral insertion with CTs (4 wires insertion)



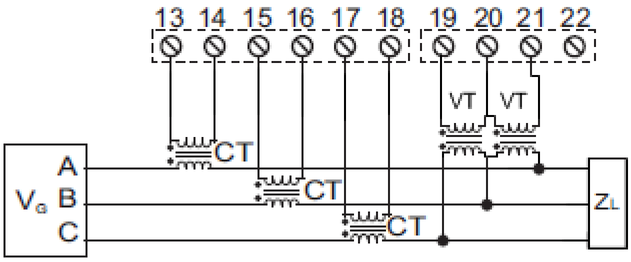
2.9. 3-phase without neutral insertion with CTs (4 wires insertion)



NOTE!

For use this insertion configure 4-wires insertion (for 3-wires with neutral insertion or 3-wires without neutral insertion S203TA/RC-D must be configured in "4-wires insertion").

2.10. 3-phase without neutral insertion with CTs and VTs (4 wires insertion)

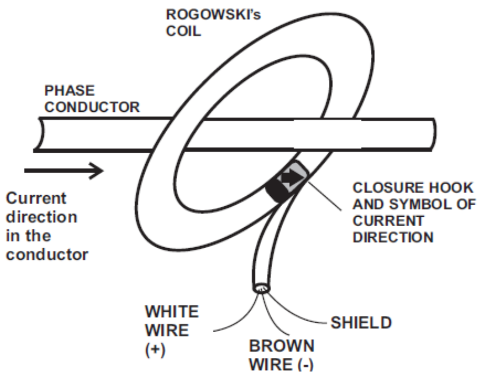


NOTE!

For use this insertion configure 4-wires insertion (for 3-wires with neutral insertion or 3-wires without neutral insertion S203TA/RC-D must be configured in "4-wires insertion").

3. S203RC-D Electrical Connections

ROGOWSKI'S COIL WARNING!

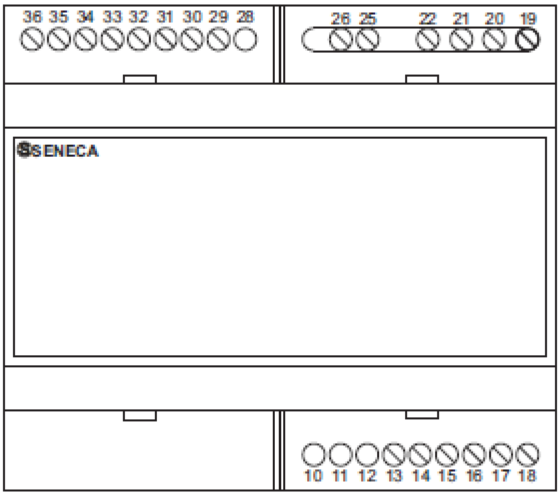


Rogowski's coil (accessory RC-V400-100) have been designed for accurate nonintrusive measurement of AC, pulsed DC or complex waveforms.
To use in an appropriate way,
- wrap the ring on the conductor so that the arrow symbol (stamped in the ring) is oriented in the same direction of the current in the conductor
- make sure that the connections are performed properly: the white output wire is positive (+), the brown wire is the negative (-).

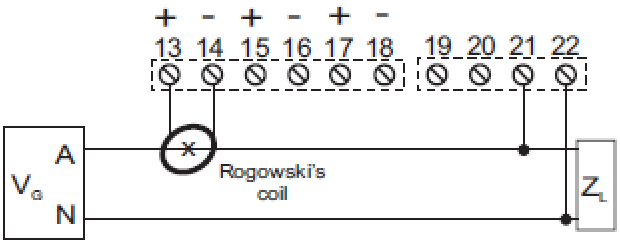
WARNING!

- ***Connect the shield of the Rogowski's coil at negative (-) (one of the terminals 14 or 16 or 18 or 22).***
- ***Terminals 14, 16 18 and 22 are internally connected***
- ***Voltage Terminals Max 600V***
- ***The Rogowski has polarity. Wrong direction can't measure correctly (for example negative current value instead of positive)***
- ***If there is some distortion by harmonic or waveform, it may not measure correctly.***
- ***Separate the wiring (strong electric part) of the measured voltage input terminal (operating power supply terminal) from the CT cable. It may not satisfy the accuracy due to noise.***
- ***The S203RC-D input full scale factory calibrated is only the +-100mV for 1000A. Others full scale configurable are +-50 mV or +- 200mV for better measure precision, but in this cases you must manually set the currents user calibration values.***

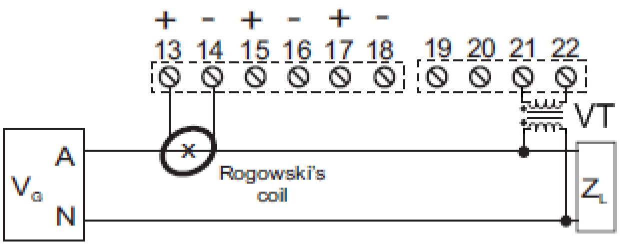
3.1. S203 RC-D Terminal Positions



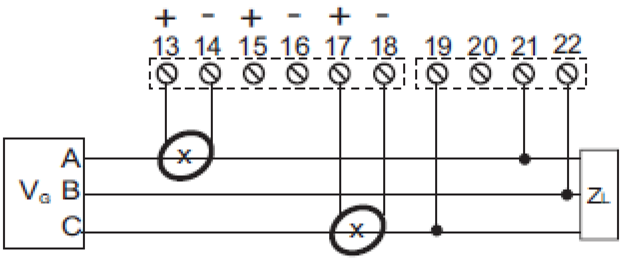
3.2. *Single phase insertion (1-phase insertion)*



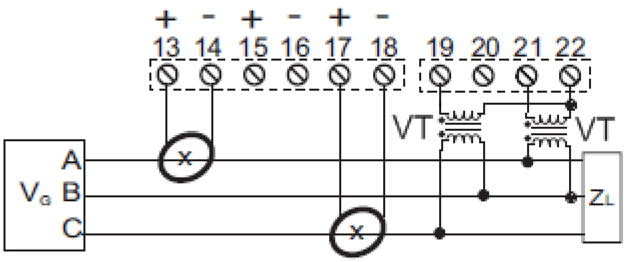
3.3. *Single phase insertion with VT (1-phase insertion)*



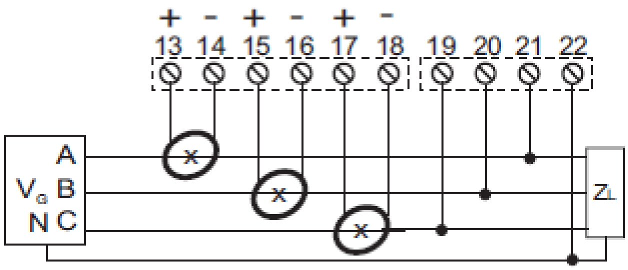
3.4. *Aron insertion (Aron insertion)*



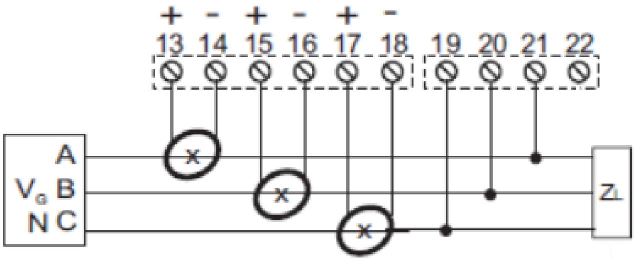
3.5. *Aron insertion with VTs (Aron insertion)*



3.6. *4 wires with neutral insertion (4-wires insertion)*



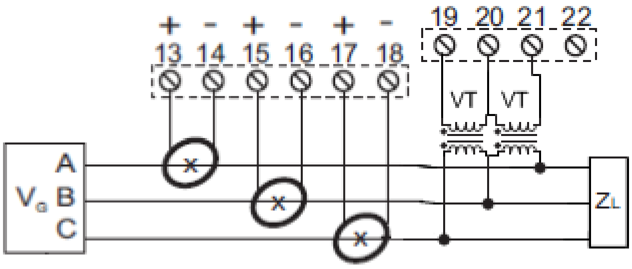
3.1. *3-phase without neutral insertion (4-wires insertion)*



NOTE!

For use this insertion configure 4-wires insertion (for 3-wires with neutral insertion or 3-wires without neutral insertion S203TA/RC-D must be configured in "4-wires insertion").

3.2. 3-phase without neutral insertion with VTs (4-wires insertion)



NOTE!

For use this insertion configure 4-wires insertion (for 3-wires with neutral insertion or 3-wires without neutral insertion S203TA/RC-D must be configured in "4-wires insertion").

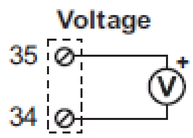
4. Analog Output

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

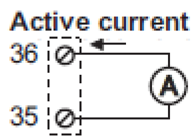
WARNING

There is no insulation between RS485, USB and the analog output

4.1. Analog Output in voltage mode connections



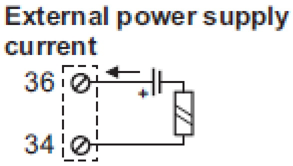
4.2. Analog Output in current active mode connections



4.3. Analog Output in current passive mode connections

WARNING

Vext MAX = 24V DC



5. Digital Output

The module has a digital output: configurable in two different modes:
-Each pulse corresponds to a given number of increments of to the Active or Reactive energy counter
-The output is linked to the sign of the Active power

The impulse duration is fixed in 200ms.

For more informations, see the display menù chapter.

5.1. Digital Output electrical connections

An external DC Voltage source is needed for using the digital output, a relay can be connected (see figure below).

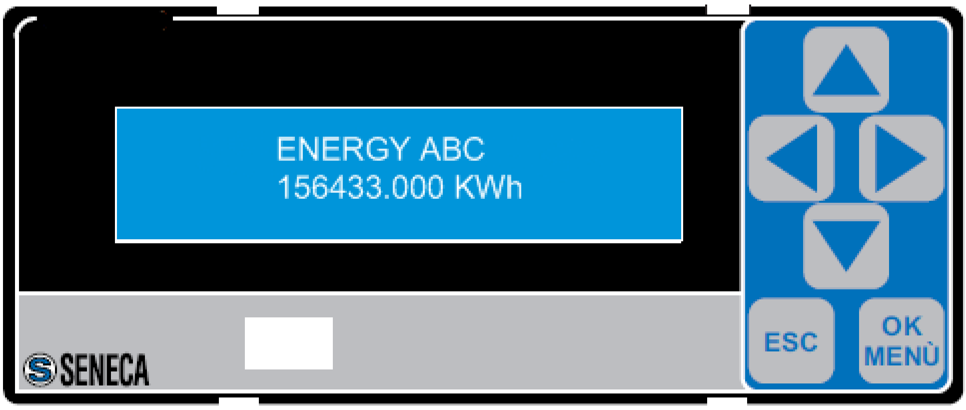
WARNING!

I max= 50 mA

V max= 28V dc

7. The display

By the display the electrical measures are viewable in real time, also a display configuration menù it's available.



7.1. Electrical symbols on Display

By pressing the button OK/MENU' it's possible to switch to the next measure visualization.

You can return to the previous measures by pressing the ESC button.

When a new page is selected, the page is first saved into the FeRAM and then displayed, so if the module it's switched off and then on the last page displayed it's visualized.

The Measure displayed depends from the insertion type (the following measures are in visualization order):

7.1.1. 3/4 wires insertion (with or without neutral)

DISPLAY ELECTRICAL QUANTITY SYMBOL	COMMENT	MEASURED VALUE	CALCULATED VALUE	EQUATION USED
VRMS A	V PHASE A RMS Voltage from phase A to NEUTRAL*	X		*For connection without neutral a "virtual neutral" it's used
VRMS B	V PHASE B RMS Voltage from phase B To NEUTRAL*	X		*For connection without neutral a "virtual neutral" it's used
VRMS C	V PHASE C	X		*For connection without neutral a "virtual

	RMS Voltage from phase C To NEUTRAL*			neutral" it's used
VRMS ABC	V RMS Three phase Voltage		X	$\frac{VrmsA + VrmsB + VrmsC}{3}$
IRMS A	RMS phase A current	X		-
IRMS B	RMS phase B current	X		-
IRMS C	RMS phase C current	X		-
IRMS ABC	RMS Three phase Current		X	$\frac{IrmsA + IrmsB + IrmsC}{3}$
P A	Phase A Active Power		X	$IrmsA \times VrmsA \times cos\varphi_A$
P B	Phase B Active Power		X	$IrmsB \times VrmsB \times cos\varphi_B$
P C	Phase C Active Power		X	$IrmsC \times VrmsC \times cos\varphi_C$
P ABC	Three phase active power		X	$P\ A + P\ B + P\ C$
Q A	Phase A Reactive Power		X	$\pm\sqrt{(S\ A)^2 - (P\ A^{measured^2})}$
Q B	Phase B Reactive Power		X	$\pm\sqrt{(S\ B)^2 - (P\ B^{measured^2})}$
Q C	Phase C Reactive Power		X	$\pm\sqrt{(S\ C)^2 - (P\ C^{measured^2})}$
Q ABC	Three phase reactive power		X	$Q\ A + Q\ B + Q\ C$
S A	Phase A		X	

	Apparent power			$VRMS\ A \times IRMS\ A$
S B	Phase B Apparent power		X	$VRMS\ B \times IRMS\ B$
S C	Phase C Apparent power		X	$VRMS\ C \times IRMS\ C$
S ABC	Three phase apparent power		X	$S\ A + S\ B + SC$
COSFI A	Phase A cosΦ		X	$\frac{PA^{Measured}}{S\ A}$
COSFI B	Phase B cosΦ		X	$\frac{PB^{Measured}}{S\ B}$
COSFI C	Phase C cosΦ		X	$\frac{PC^{Measured}}{S\ C}$
COSFI ABC	Three phase cosΦ		X	$\frac{P\ A^{Measured} + PB^{Measured} + PC^{Measured}}{S\ ABC}$
ENERGY A	Phase A Active Energy		X	$\int P\ A^{Measured}{}_i\ dt$
ENERGY B	Phase B Active Energy		X	$\int P\ B^{Measured}{}_i\ dt$
ENERGY C	Phase C Active Energy		X	$\int P\ C^{Measured}{}_i\ dt$
ENERGY ABC	Three phase active energy		X	$ENERGY\ A + ENERGY\ B + ENERGY\ C$
POS ENERGY ABC	Three phase only positive		X	$POS\ ENERGY\ A + POS\ ENERGY\ B + POS\ ENERGY\ C$

	active energy			
NEG ENERGY ABC	Three phase only negative active energy		X	$NEG\ ENERGY\ A + NEG\ ENERGY\ B + NEG\ ENERGY\ C$
REACT ENERGY A	Phase A Reactive Energy		X	$\int Q\ A_i\ dt$
REACT ENERGY B	Phase B Reactive Energy		X	$\int Q\ B_i\ dt$
REACT ENERGY C	Phase C Reactive Energy		X	$\int Q\ C_i\ dt$
REACT ENERGY ABC	Three phase Reactive energy		X	$REACT\ ENERGY\ A + REACT\ ENERGY\ B + REACT\ ENERGY\ C$
POS REACT EN ABC	Three phase only positive Reactive energy		X	$POS\ REACT\ ENERGY\ A + POS\ REACT\ ENERGY\ B + POS\ REACT\ ENERGY\ C$
NEG REACT EN ABC	Three phase only negative Reactive energy		X	$NEG\ REACT\ ENERGY\ A + NEG\ REACT\ ENERGY\ B + NEG\ REACT\ ENERGY\ C$
P MAX ABC	Three phase maximum active power		X	$MAX(\|P^{measured}\ ABC\|)$
Q MAX ABC	Three phase maximum reactive power		X	$MAX(\|Q\ ABC\|)$
P AVG ABC	Three phase average active power for the last n minutes		X	$\frac{\sum_1^n P^{measured}{}_i}{n}$
FREQUENCY	Frequency	X		Measured from phase A

7.1.2. 1 wire insertion

DISPLAY ***ELECTRICAL QUANTITY*** ***SYMBOL***	***COMMENT***	***MEASURED VALUE***	***CALCULATED VALUE***	***EQUATION USED***
VRMS A	V PHASE A RMS Voltage from phase A to NEUTRAL	X		-
IRMS A	RMS phase A current	X		-
P A	Phase A Active Power		X	$VRMS\ A \times IRMS\ A \times Cos\varphi_A$
Q A	Phase A Reactive Power		X	$\pm\sqrt{(S\ A)^2 - (P\ A^{measured^2})}$
S A	Phase A Apparent power		X	$VRMS\ A \times IRMS\ A$
COSFI A	Phase A cosΦ		X	$\frac{P\ A^{measured}}{S\ A}$
ENERGY A	Phase A Active Energy		X	$\int P\ A^{measured}{}_i\ dt$
POS ENERGY A	One phase only positive active energy		X	$\int P\ A^{measured}\ (+)_i\ dt$
NEG ENERGY A	One phase only negative active energy		X	$\int P\ A^{measured}\ (-)_i\ dt$
REACT ENERGY A	Phase A Reactive Energy		X	$\int Q\ A_i\ dt$
POS REACT EN A	Phase A only positive Reactive		X	$\int Q\ A\ (+)_i\ dt$

	energy			
NEG REACT EN A	Phase A only negative Reactive energy		X	$\int Q\ A\ (-)_i\ dt$
P MAX A	Phase A maximum active power		X	$MAX(\lvert P\ A^{measured}\rvert)$
Q MAX A	Phase A maximum reactive power		X	$MAX(\lvert Q\ A\rvert)$
P AVG A	Phase A average active power for the last n minutes		X	$\frac{\sum_1^n P^{measured}{}_i}{n}$
FREQUENCY	Frequency	X		Measured from phase A

7.1.3. Aron insertion

DISPLAY *ELECTRICAL QUANTITY* *SYMBOL*	*COMMENT*	*MEASURED VALUE*	*CALCULATED VALUE*	*EQUATION USED*
VRMS AC	V AC RMS Voltage from phase A to C	X		-
VRMS BC	V BC RMS Voltage From phase B to C	X		-
IRMS A	RMS phase A current	X		-

IRMS C	RMS phase C current	X		-
P AC	Phase A C Active Power		X	$V\ AC \times IA\ \times Cos\varphi_A$
P BC	Phase B C Active Power		X	$V\ BC \times IC\ \times Cos\varphi_C$
P ABC	Three phase active power		X	$P\ AC + P\ BC$
Q ABC	Three phase reactive power		X	$\sqrt{3}\ \times (P\ AC^{measured} - P\ BC^{measured})$
S ABC	Three phase apparent power		X	$\sqrt{3}\ \times \frac{(S\ A + S\ C)}{2}$
COSFI ABC	Three phase cosΦ		X	$\frac{P\ AC + P\ BC}{\sqrt{(P\ AC + P\ BC)^2 + 3 * (P\ AC - P\ BC)^2}}$
ENERGY ABC	Three phase active energy		X	$\int P\ ABC^{measured}{}_i\ dt$
POS ENERGY ABC	Three phase only positive active energy		X	$\int P\ ABC^{measured}\ (+)_i\ dt$
NEG ENERGY ABC	Three phase only negative active energy		X	$\int P\ ABC^{measured}\ (-)_i\ dt$
REACT ENERGY ABC	Three phase Reactive energy		X	$\int Q\ ABC_i\ dt$
POS REACT EN ABC	Three phase only positive Reactive energy		X	$\int Q\ ABC\ (+)_i\ dt$
NEG REACT EN ABC	Three phase only negative Reactive energy		X	$\int Q\ ABC\ (-)_i\ dt$
P MAX ABC	Three phase		X	

	maximum active power			$MAX(\|P\ ABC^{measured}\|)$
Q MAX ABC	Three phase maximum reactive power		X	$MAX(\|Q\ ABC\|)$
P AVG ABC	Three phase average active power for the last n minutes		X	$\frac{\sum_1^n P^{measured}{}_i}{n}$
FREQUENCY	Frequency	X		Measured from phase A

7.2. *Diagnostics Page*

If S203TA-D / S203RC-D is configured for a 3 or 4-wires insertion, a diagnostics page will be displayed after the standard measures.

The upper line of diagnostics page shows the connection status of the three phases. If the phases are connected properly the line displayed will be "A->B->C   OK", otherwise "A->B->C   ERROR".

The lower line of diagnostics page informs the user about errors on the 3-phase active power:

If the Phase A,B and C active power have not the same sign the display write "ENERGY ERROR"

If the Phase A,B and C active power have the sign + the display write "ENERGY CONSUMPTION"

If the Phase A,B and C active power have the sign - the display write "ENERGY PRODUCTION"

7.3. *Display Menù*

By the display menù it's possible to setup the S203TA-D / S203RC-D, for a faster configuration you can also use a PC with the free software Easy Setup downloadable from www.seneca.it.

For enter to the Menù press the button OK/Menù for 5 seconds.

By pressing the UP or DOWN menù it's possible to change the parameter to edit, confirm by pressing the OK/MENU' button or ESC button to exit from the menu:

7.3.1. A) Measure config

PARAMETER	***VALUES***
A1) USING TA	To be used only for S203TA-D model, for S203RC-D model use only NO YES= A Current Transformer it's connected to A, B and C phases NO = No Current transformer used DEFAULT: NO
A2) TA RATIO	Current Transformer ratio value. The transformer secondary it's 5A. Example: for a 100/5 (100:5) Current transformer type 100,000. All current values will be multiplied for a factor of 20. Default: 5,000 (TA 5/5)
A3) FREQUENCY COMPENSATION	YES = The S203TA/RC-D will compensate the frequency fluctuation (use only if the source frequency it's not stable) NO = no frequency fluctuation compensation used Default: NO
A4) POWER FREQUENCY	50 Hz = 50 Hz calibration values will be used (for European 50 Hz power frequency) 60 Hz = 60 Hz calibration values will be used Default: 50Hz
A5) INSERTION TYPE	1-PHASE = For 1 phase insertions 4 WIRE = For 3-phase with or without neutral insertion ARON = For 3-phase Aron insertion Default: 4 WIRE
A6) TV RATIO	Voltage Transformer ratio value. If no Voltage Transformer it's used type 1,000. Example: for a 1:100 voltage transformer type 100,000.

	All voltage values will be multiplied for a factor of 100. Default: 1,000

7.3.1. B) Config RS485

PARAMETER	***VALUES***
B1) ADDRESS	Modbus RTU station address from 1 to 253 Default: 1
B2) BAUDRATE	Serial RS485 baudrate, can be: 2400 baud 4800 baud 9600 baud 19200 baud 38400 baud 57600 baud 115200 baud Default: 38400 baud
B3) PARITY	Parity bit, can be: NONE ODD EVEN Default: NONE
B4) STOP BIT	Stop bit, can be: 1 stop bit 2 stop bits Default: 1 stop bit

7.3.1. C) Out Measure

PARAMETER	***VALUES***
C1) OUTPUT PHASE	Phase to link to the analog output: 3-phase = ABC measure value Phase A = phase A measure Phase B = phase B measure Phase C = phase C measure Default: 3-phase
C2) OUT MEASURE	Measure to link to the analog output: VRMS = Vrms linked to the analog output IRMS = Irms linked to the analog output PACT= Active Power linked to the analog output COSFI= Power factor linked to the analog output Default: PACT
C3) IN STARTSCALE	Start Scale Measure linked to the output With this measure value the output will be at 0% Default: 0.0 W
C4) IN ENDSCALE	End Scale Measure linked to the output With this measure value the output will be at 100% Default: 9000.0 W
C5) OUTPUT TYPE	Analog output type: mA = Output in current mode V = Output in voltage mode Default: mA
C6) OUT STARTSCALE	Start Value for analog output (0%) when the input measure = IN STARTSCALE Default: 4.0 mA

C7) OUT ENDSCALE	End Value for analog output (100%) when the input measure = IN ENDSCALE Default: 20.0 mA

7.3.1. D) Counters

PARAMETER	***VALUES***
D1) Measure Unit	Active Energy measure unit: KWh MWh Wh mWh Default: KWh
D2) Digital Output function	Digital output mode: Pulse counter = Output mode in pulse mode, 1 pulse will be generated for every integer Measure unit Energy increment Energy sign = Output mode in sign mode (digital out high if active power is positive, digital output low if active power is negative) Default: Pulse counter
D3) Dig out ratio	If the Digital output mode is in “Pulse Counter mode” the digital output generate a pulse for every Dig out ratio integer value. For example: If Dig out ratio = 1 KWh the digital output will generate a pulse for every Kwh Energy increment If Dig out ratio = 100 KWh the digital output will generate a pulse for every 100Kwh Energy increment The value of 0.000 it’s used when the digital output function it’s in “Energy sign mode”. Default: 1 KWh

7.3.1. E) Display

PARAMETER	***VALUES***
E1) LANGUAGE	Set the menu language: English Italiano Default: English
E2) DISPLAY MODE	Can set for the automatic cycle of all screen measures: Manual loop = Change the display screen by pressing OK/Menù for NEXT, ESC for PREVIOUS measure Automatic loop = Automatically change the screen measure (in this mode the screen page backup feature it's not available) Default: Manual Loop
E3) PASSWORD	Can be used for restrict the access to the menu by typing a password. NO = No password is required for access to the menù YES = The password 5477 is required for access to the menu Default: NO
D4) COUNT DIGOUT	When the digital output is in "pulse mode" the measure linked to the digital output can be: 3ph pos energy 3ph neg energy Pos energy A Pos energy B Pos energy C Neg energy A Neg energy B Neg energy C

	3ph pos react energy 3ph neg react energy Pos react energy A Pos react energy B Pos react energy C Neg react energy A Neg react energy B Neg react energy C Default 3ph pos energy
D5) DIGOUT PHASE	When the digital output is in “sign mode” the sign linked to the digital output can be from: Phase A Active Power Phase B Active Power Phase C Active Power 3-phase Active Power Phase A Reactive Power Phase B Reactive Power Phase C Reactive Power 3-phase Reactive Power Default: 3-phase
D6) DIGOUT LOGIC	Digital output logic can be: Normally open Normally close Default: normally open

7.3.1. F) User Taratures

PARAMETER	***VALUES***
F1) VOLT PHASE A	Set a multiplication factor for VRMS A Default: 1,000
F2) VOLT PHASE B	Set a multiplication factor for VRMS B Default: 1,000
F3) VOLT PHASE C	Set a multiplication factor for VRMS C Default: 1,000
F4) CURRENT PHASE A	Set a multiplication factor for IRMS A Default: 1,000 **ONLY FOR S203RC-D model:** For Rogowski coil of 100mV/1000A use multiplication factor of 1,000 (factory default) Else use this formula: Multiplication factor = (S203RC-D Full scale Input [mv]/ Full scale rogowski [mV])*(Full scale rogowski[A]/1000) for example: Input full scale of +-100mV and Rogowski coil of 100mV/500A use 0,500 Input full scale of +-100mV and Rogowski coil of 100mV/2000A use 2,000 Input full scale of +-200mV and Rogowski coil of 200mV/2000A use 2,000 Etc…
F5) CURRENT PHASE B	Set a multiplication factor for IRMS B Default: 1,000 **ONLY FOR S203RC-D model:** For Rogowski coil of 100mV/1000A use multiplication factor of 1,000 (factory default) Else use this formula: Multiplication factor = (S203RC-D Full scale Input [mv]/ Full scale rogowski [mV])*(Full scale rogowski[A]/1000) for example: Input full scale of +-100mV and Rogowski coil of 100mV/500A use 0,500 Input full scale of +-100mV and Rogowski coil of 100mV/2000A use 2,000 Input full scale of +-200mV and Rogowski coil of 200mV/2000A use 2,000

	Etc…
F6) CURRENT PHASE C	Set a multiplication factor for IRMS C Default: 1,000 **ONLY FOR S203RC-D model:** For Rogowski coil of 100mV/1000A use multiplication factor of 1,000 (factory default) Else use this formula: Multiplication factor = (S203RC-D Full scale Input [mv]/ Full scale rogowski [mV])*(Full scale rogowski[A]/1000) for example: Input full scale of +-100mV and Rogowski coil of 100mV/500A use 0,500 Input full scale of +-100mV and Rogowski coil of 100mV/2000A use 2,000 Input full scale of +-200mV and Rogowski coil of 200mV/2000A use 2,000 Etc…

8. Energy Counters

The Energy Values are incremented independently:

Positive Active Energy Phase A

Positive Active Energy Phase B

Positive Active Energy Phase C

Negative Active Energy Phase A

Negative Active Energy Phase B

Negative Active Energy Phase C

Positive Reactive Energy Phase A

Positive Reactive Energy Phase B

Positive Reactive Energy Phase C

Negative Reactive Energy Phase A

Negative Reactive Energy Phase B

Negative Reactive Energy Phase C

The Others Energy ABC variables are obtained by the relations:

$POS\ ENERGY\ ABC = POS\ ENERGY\ A + POS\ ENERGY\ B + POS\ ENERGY\ C$

$NEG\ ENERGY\ ABC = NEG\ ENERGY\ A + NEG\ ENERGY\ B + NEG\ ENERGY\ C$

$ENERGY\ ABC = POS\ ENERGY\ A - NEG\ ENERGY\ B$

$POS\ REACT\ ENERGY\ ABC = POS\ REACT\ ENERGY\ A + POS\ REACT\ ENERGY\ B + POS\ REACT\ ENERGY\ C$

$NEG\ REACT\ ENERGY\ ABC = NEG\ REACT\ ENERGY\ A + NEG\ REACT\ ENERGY\ B + NEG\ REACT\ ENERGY\ C$

$REACT\ ENERGY\ ABC = POS\ REACT\ ENERGY\ ABC - NEG\ REACT\ ENERGY\ B$

8.1. Energy counter overflow

The max value reached by each Energy variable counters is 9 999 999, 999 after that a new increment of 0,001 will reset the counter to 0,000.

8.2. Non volatile memory Energy backup

The following Energy variables are write on a non-volatile memory (using a Fe RAM technology):

- Integer and fractionary part of phase A positive Energy
- Integer and fractionary part of phase B positive Energy
- Integer and fractionary part of phase C positive Energy
- Integer and fractionary part of phase A negative Energy
- Integer and fractionary part of phase B negative Energy
- Integer and fractionary part of phase C negative Energy
- Integer and fractionary part of phase A positive Reactive Energy
- Integer and fractionary part of phase B positive Reactive Energy
- Integer and fractionary part of phase C positive Reactive Energy
- Integer and fractionary part of phase A negative Reactive Energy
- Integer and fractionary part of phase B negative Reactive Energy
- Integer and fractionary part of phase C negative Reactive Energy

The energy values are written with a round robin policy. Each energy value is written at most every 2 seconds.

9. Setup a rogowski coil probe for S203RC-D model

S203RC-D can be used with Rogowski coil of various input full scale.

The most common Rogowski coil probes are the models:

Model +-100mV/1000A

Model +-50mV/1000A

NOTE:

A +-100mV/1000A Rogowski can be used also like a:

+-200mV/2000A or +-50mV/500A

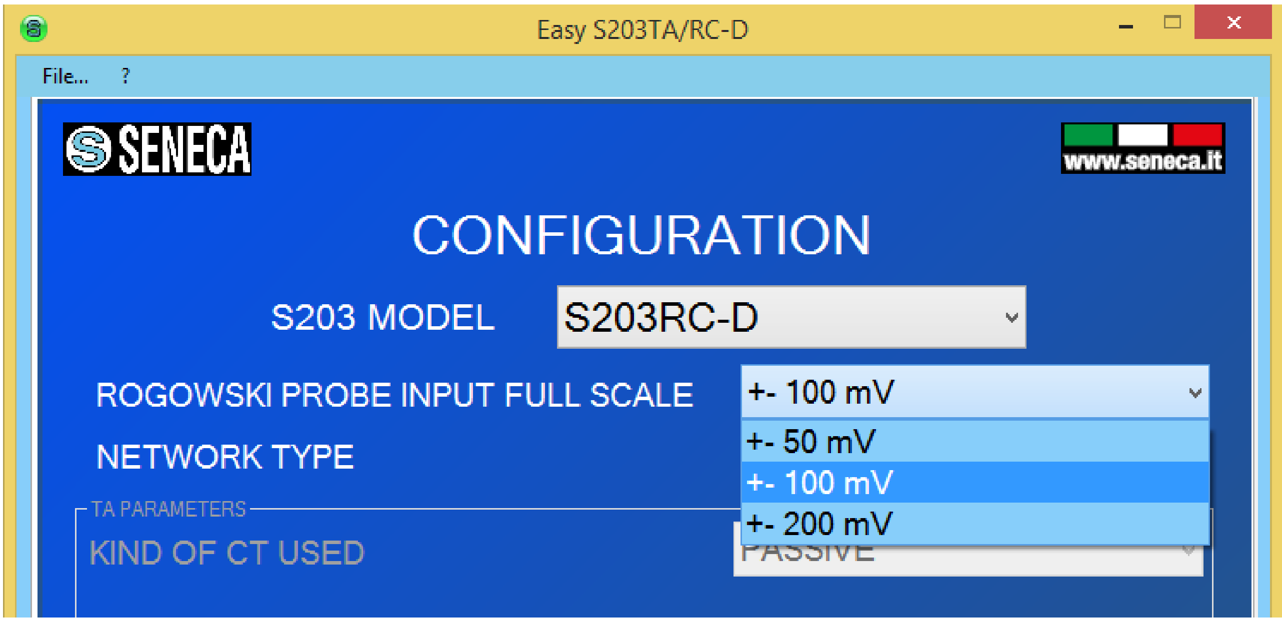
A+-50mV/1000A Rogowski can be used also like a

+-100mV/2000A or +-200mV/4000A

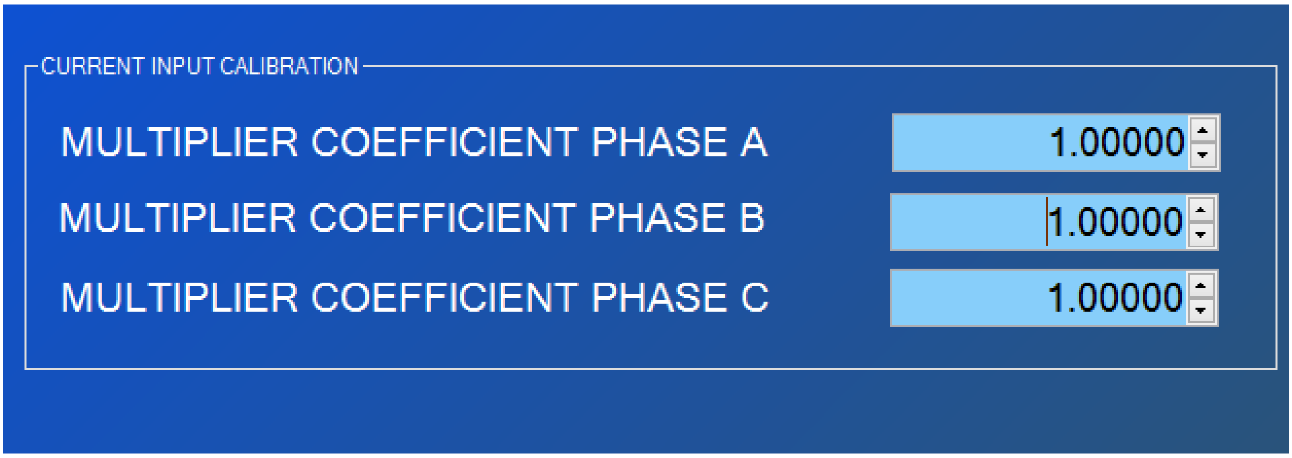
The following table shows the configurations for the most common types of rogoski coil:

ROGOWSKI COIL MODEL	***EASY SETUP ROGOWSKI COIL PROBE INPUT FULL SCALE***	***EASY SETUP CURRENT USER TARATURE MULTIPLIER PHASE A,B,C***	***S203RC-D CURRENT FULL SCALE***
+-100mV/1000A	+-100mV	1,000 (Default)	1000 A
	+-200mV	2,000	2000 A
	+-50mV	0,500	500 A
+-50mV/1000A	+-50mV	1,000 (Default)	1000 A
	+-100mV	2,000	2000 A
	+-200mV	4,000	4000 A
+-333mV/1000A	+-200mV	0,6006	600,6 A

The Rogoski probe input full scale can be configured in Easy Setup here:



Set the right full scale on S203RC-D for various Rogowski coil type and/or the user tarature multiplication factor for current phase A,B and C (From Easy Setup software or by menu -> user tarature->current phase A,B,C).



For use with a different Rogoski Coil Model you must calculate the right coefficient using this formula (Note that the "*Rogowski Probe Input Full Scale* [mV]" can only be 50,100 or 200 mV):

$$Current\ Multiplier\ User\ Tarature_{A,B,C} = \frac{(S203RC\ Rogowski\ Probe\ Input\ Full\ Scale\ [mV])}{Rogowski\ Full\ Scale\ Input\ [mV]} \times \frac{Rogowski\ Full\ Scale\ Output\ [A]}{1000}$$

$$Maximum\ S203RC - D\ Current\ Measure = Current\ Multiplier\ User\ Tarature_{A,B,C} \times 1000\ [A]$$

For example:

For a Rogowski Coil model of +-250mV/1000A use the Maximum full Scale Input (200mV):

$$Current\ Multiplier\ User\ Tarature_{A,B,C} = \frac{200}{250} \times \frac{1000}{1000} = 0.800$$

The same value must be inserted on all the A,B,C current coefficient.

The Maximum current Measured by the S203RC-D will be:

$$Maximum\ S203RC - D\ Current\ Measure = 0.8\ \times 1000\ [A] = 800\ A$$

10. Serial Communication

The models S203TA-D and S203RC-D feature it's the serial communication ability.

Two serial ports are available: a RS485 port and an USB port.

The RS485 port and USB port can't work both at the same time, the first byte received from the USB port will switch the communication from RS485 to USB.

After 5 seconds without a USB byte received the communication return to RS485.

The protocol supported for both ports is Modbus RTU slave, for more information about this protocol please refer to Modbus specification website:

http://www.modbus.org/specs.php

The default configuration for RS485 port is:

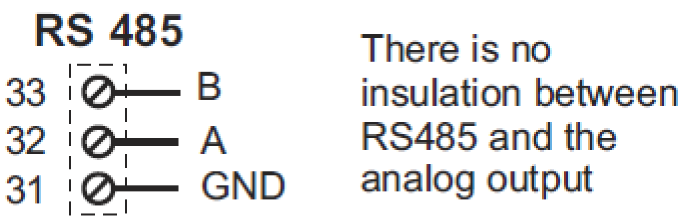
- Modbus station address: 1
- baud rate: 38400 baud
- parity: none
- data bit: 8
- stop bit: 1

Please note that the device must reboot after any modification to the RS485 communication parameters to work properly.

The configuration for USB port is fixed and not configurable:

- Modbus station address: 1
- baud rate: 38400 baud
- parity: none
- data bit: 8
- stop bit: 1

10.1. RS485 Serial Communication Electrical connection



10.2. Modbus RTU protocol

All registers are "Holding register" (Read Modbus function 3) with the convention that the first register is the 40001 address.

The following Modbus functions are supported:

Read Single Modbus Register (function 3)

Write Single Modbus Register (function 6)

Write Multiple Modbus Registers (function 16)

All values in 32bits are stored into 2 consecutive registers, for example:

VRMS A in floating point 32 bits is stored into registers 40135 and 40136, the Most significant word is the register 40135, the less significant word is the 40136.

So the 32bits value is obtained by the following relation:

$$VRMS\ A = Reg40136 + (Reg40135 \times 2^{16}) = Reg40136 + (Reg40135\ \times 65536)$$

10.2.1. Abbreviation used

In the following table this abbreviations are used:

"MS" = Most significant
"LS" = Less significant
"MSB" = Most significant Byte
"LSB" = Less significant Byte
"MSW" = Most significant Word (16 bits)
"LSW" = Less significant Word (16 bits)
"R" = Read only register
"RW" = Read and write register

“Unsigned 16 bits” = Unsigned 16 bits register
“Signed 16 bits” = 16 bits register with sign
“Float 32 bits” = Floating point single precision 32 bits (IEEE 754) register
“0x” = Hexadecimal Value

Default communication parameters, RS485: 38400 baud, 8N1.

Default communication parameters, USB: 38400 baud, 8N1.

10.2.2. Modbus Register Addresses

Register Name	Comment	Register Type	R/W	Default value or Start Value	Modbus Address
MachineID	Module ID code	Unsigned 16 bits	R	0x4F00	40001
Phase linked to analog output	Phase retransmitted in analog output: 0=phase A, 1=phase B, 2=phase C, 3=three phase	Unsigned 16 bits	RW	3	40017
CT Ratio	Current transformer numerator for CT ratio value (example: if this 32 bits register is 10.0, CT ratio is 10/5).	Float 32 bits	RW	5.0	40018(MS) 40019(LS)
StartScale IN	Start scale value for input in use. Default value depends on the selected type of input	Float 32 bits	RW	-1.0 for cosfi 0 others	40020(MS) 40021(LS)
EndScale IN	End scale value for input in use. Default value depends on the selected type of input	Float 32 bits	RW	Vrms = 600 V Irms = 5 A Active Energy = 9000 W Cosfi = 1	40022(MS) 40023(LS)
Line frequency compensation	Line Frequency fluctuation compensation: 0 = NO 1 = YES	Unsigned 16 bits	RW	0	40024
MB_Address	RS485 Modbus address value	Unsigned 8 bits	RW	1	40025 MSB (Bit [15:8])
Parity	RS485 Communication parity Parity: no parity=0 even = 1 odd=2	Unsigned 8 bits	RW	0	40025 LSB (Bit [2:0])
MB_Baudrate	RS485 Port baudrate value: 0x0000 = 4800; 0x0100= 9600; 0x0200 = 19200; 0x0300 = 38400; 0x0400 = 57600; 0x0500 = 115200; 0x0700 = 2400	Unsigned 16 bits	RW	0x0300 (38400 baud)	40026
Insertion type	0=ARON 1=3 or 4 wires 2=single phase	Unsigned 16 bits	RW	1	40027
Line frequency	Select the line frequency: 0=50 Hz, 1=60 Hz	Unsigned 16 bits	RW	0	40028
Modbus Stop Bits	Number of stop bits for modbus protocol (only for RS485 port) 0= 1 stop bit 1= 2 stop bits	Unsigned 16 bits	RW	0	40029

Measure linked To analog output	0=VRMS, 1=IRMS, 2=Active power, 3=Cosfi	Unsigned 16 bits	RW	2	40030
Start Scale OUTPUT	Start scale value for output in use.	Float 32 bits	RW	4.0 mA	40031(MS) 40032(LS)
End Scale OUTPUT	End scale value for output in use.	Float 32 bits	RW	20.0 mA	40033(MS) 40034(LS)
Digital output energy ratio	**0.0 = the digital output it's in "Energy sign configuration"** Other values: Digital output make a pulse when energy has an increment of a given value of energy E. Default value is 1.0. Measure unit of the energy value is Wh (or Varh), KWh (or KVarh), MWh (or MVarh), depending on the selected measure unit of "Energy ratio" register.	Float 32 bits	RW	1.0	40035(MS) 40036(LS)
Active Energy ratio	Configure measure unit of energy. to set Wh write 1 to set KWh write 1000 to set MWh write 1000000 etc…	Float 32 bits	RW	1000.0 (KWh)	40037(MS) 40038(LS)
Command aux 1	See Command register	-	W	0	40039
Command aux 2	See Command register	-	W	0	40040
TV ratio	Voltage transformer ratio value	Float 32 bits	RW	1.0	40041(MS) 40042(LS)
Phase linked to digital output	Selected phase to switch the digital output (if digout function is "energy sign configuration") 0=phase A, 1=phase B, 2=phase C, 3=three phase	Unsigned 16 bits	RW	3	40043
Model Type	0 = S203TA-D 1 = S203RC-D (Input suitable for a +-50mV rogowski coil full scale) 2 = S203RC-D (Input suitable for a +-100mV rogowski coil full scale) 3 = S203RC-D (Input suitable for a +-200mV rogowski coil full scale)	Unsigned 16 bits	RW	0 for S203TA-D 2 for S203RC-D	40044
Digital Output Logic	Select the logic for digital output switching. 0 = Normally open 1 = Normally close	Unsigned 16 bits	RW	0	40047
Reactive Energy ratio	Configure measure unit of reactive energy.	Float 32 bits	RW	1000.0 (KVarh)	40048(MS) 40049(LS)

	to set Varh write 1 to set KVarh write 1000 to set MVarh write 1000000 etc…				
Cfg flags	Control flags bitwise. (0 = LSB) Bit 0 = energy values protection from reset through RS485 if set to 1 enable the protection. Bit 1 = if set to 1, the digital output energy sign values reactive energy instead of active energy.	Unsigned 16 bits	RW	0	40050
Demand Time	Time (minutes) on which the average active power is evaluated (0 = function disabled)	Unsigned 16 bits	RW	15	40051
Cut off current	Minimum current (mA) necessary to activate the energy counter. Under this value the phase IRMS is also set to 0. For S203TA-D model the value to enter is after the CT. For example if a 50/5 CT is used, and the cut-off current is set to 50mA under (50/5)*50mA = 500mA the current value is set to 0mA and the energy counter is stopped. For S203RC-D model the value to enter is the real current value see chapter in the manual for more info.	Unsigned 16 bits	RW	50 mA	40052
Command	Command register. To reset the device, write ***0xDEAD*** in Command register To reset the Peak Values of: Phase A MAX POWER 3-Phase MAX POWER Phase A MAX REACT. POWER 3-Phase MAX REACT. POWER Write ***0xB01B*** in Command register To reset energy values of: Energy A Energy B Energy C Energy ABC Reactive Energy A Reactive Energy B Reactive Energy C	Unsigned 16 bits	RW	0	40131

	Reactive Energy ABC Phase A pos energy Phase B pos energy Phase C pos energy 3-phase pos energy Phase A neg energy Phase B neg energy Phase C neg energy 3-phase neg energy Phase A pos react. energy Phase B pos react. energy Phase C pos react. energy 3-phase pos react. energy Phase A neg react. energy Phase B neg react. energy Phase C neg react. energy 3-phase neg react. energy Write ***0xB01A*** in Command register To set a positive energy value for phase A, write the value ***(in integer unsigned 32 bits format)*** in Command aux 1 (high part) and command aux 2 (low part), then write ***0xBACA*** in Command register To set a positive energy value for phase B, write the value ***(in integer unsigned 32 bits format)*** in Command aux 1 (high part) and command aux 2 (low part), then write ***0xBACB*** in Command register To set a positive energy value for phase C, write the value ***(in integer unsigned 32 bits format)*** in Command aux 1 (high part) and command aux 2 (low part), then write ***0xBACC*** in Command register To set a negative energy value for phase A, write the value ***(in integer unsigned 32 bits format, the firmware add itself the sign)*** in Command aux 1 (high part) and command aux 2 (low part), then write ***0xBACD*** in Command register To set a negative energy value for phase B, write the value ***(in integer unsigned 32 bits format, the firmware add itself the sign)*** in				

	Command aux 1 (high part) and command aux 2 (low part), then write ***0xBACE*** in Command register To set a negative energy value for phase C, write the value ***(in integer unsigned 32 bits format, the firmware add itself the sign)*** in Command aux 1 (high part) and command aux 2 (low part), then write ***0xBACF*** in Command register				
Status	Bit 0 = communication error Bit 3 = Vrms > 45 V for phase A Bit 4 = Vrms > 45 V for phase B Bit 5 = Vrms > 45 V for phase C Bit 6 = Sequence order phase status (Correct Sequence R-> S -> T will put the bit to 1 else 0) - only for 4-wire or 3-phase without neutral Bit 7 = Irms > cut off current for phase A Bit 8 = Irms > cut off current for phase B Bit 9 = Irms > cut off current for phase C Bit 15 = Feram error	Unsigned 16 bits	R	0	40133
VRMS A	Voltage RMS measure for phase A, [Vrms]	Float 32 bits	R	0.0	40135(MS) 40136(LS)
VRMS B	Voltage RMS measure for phase B, [Vrms]	Float 32 bits	R	0.0	40137(MS) 40138(LS)
VRMS C	Voltage RMS measure for phase C, [Vrms]	Float 32 bits	R	0.0	40139(MS) 40140(LS)
VRMS ABC	Voltage RMS measure for 3-phase, [Vrms]	Float 32 bits	R	0.0	40141(MS) 40142(LS)
IRMS A	Current RMS measure for phase A, [mA rms]	Float 32 bits	R	0.0	40143(MS) 40144(LS)
IRMS B	Current RMS measure for phase B, [mA rms]	Float 32 bits	R	0.0	40145(MS) 40146(LS)
IRMS C	Current RMS measure for phase C, [mA rms]	Float 32 bits	R	0.0	40147(MS) 40148(LS)
IRMS ABC	Current RMS measure for phase 3-phase, [mA rms]	Float 32 bits	R	0.0	40149(MS) 40150(LS)
P ACTIVE A	Active power measure for phase A, [Watt]	Float 32 bits	R	0.0	40151(MS) 40152(LS)
P ACTIVE B	Active power measure for phase B, [Watt]	Float 32 bits	R	0.0	40153(MS) 40154(LS)
P ACTIVE C	Active power measure for phase C, [Watt]	Float 32 bits	R	0.0	40155(MS) 40156(LS)
P ACTIVE ABC	Active power measure for 3-phase, [Watt]	Float 32 bits	R	0.0	40157(MS) 40158(LS)
Q A	Reactive power measure for phase A, [VAR]	Float 32 bits	R	0.0	40159(MS) 40160(LS)
Q B	Reactive power measure for phase B, [VAR]	Float 32 bits	R	0.0	40161(MS) 40162(LS)

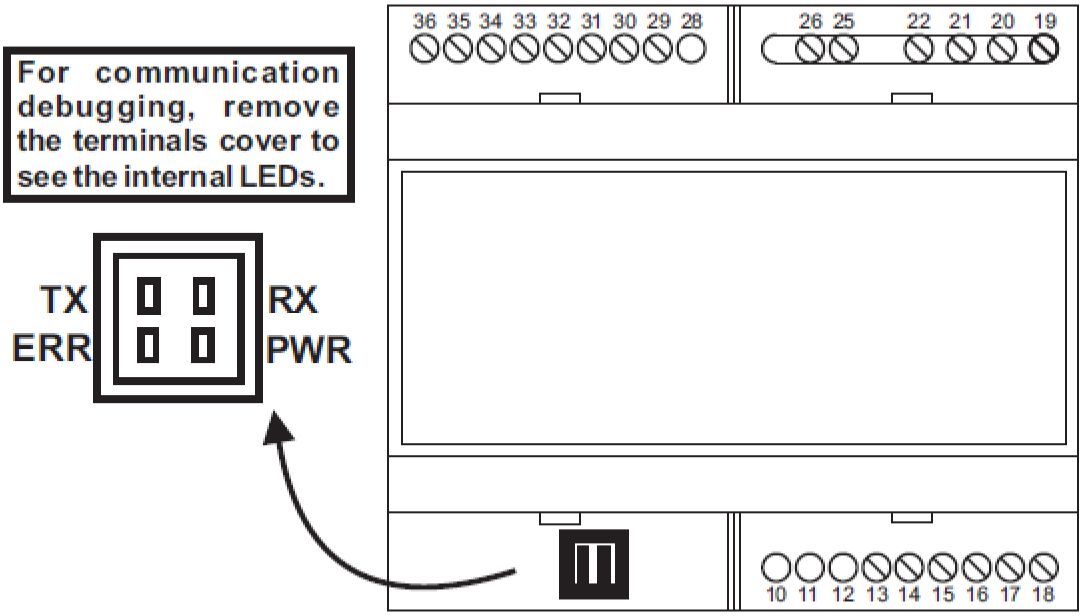
Q C	Reactive power measure for phase C, [VAR]	Float 32 bits	R	0.0	40163(MS) 40164(LS)
Q ABC	Reactive power measure for phase ABC, [VAR]	Float 32 bits	R	0.0	40165(MS) 40166(LS)
S A	Apparent power measure for phase A [VA]	Float 32 bits	R	0.0	40167(MS) 40168(LS)
S B	Apparent power measure for phase B [VA]	Float 32 bits	R	0.0	40169(MS) 40170(LS)
S C	Apparent power measure for phase C [VA]	Float 32 bits	R	0.0	40171(MS) 40172(LS)
S ABC	Apparent power measure for 3-phase, [VA]	Float 32 bits	R	0.0	40173(MS) 40174(LS)
CosFi A	Cosfi measure for phase A	Float 32 bits	R	0.0	40175(MS) 40176(LS)
CosFi B	Cosfi measure for phase B	Float 32 bits	R	0.0	40177(MS) 40178(LS)
CosFi C	Cosfi measure for phase C	Float 32 bits	R	0.0	40179(MS) 40180(LS)
CosFi ABC	Cosfi measure for phase ABC	Float 32 bits	R	0.0	40181(MS) 40182(LS)
Frequency	Frequency measure, in Hz (from phase A)	Float 32 bits	R	0.0	40183(MS) 40184(LS)
Energy A	Energy measure for phase A, measure unit depending on the selected measure unit (mWh, Wh, kWh, MWh)	Float 32 bits	R	0.0	40185(MS) 40186(LS)
Energy B	Energy measure for phase B, measure unit depending on the selected measure unit (mWh, Wh, kWh, MWh)	Float 32 bits	R	0.0	40187(MS) 40188(LS)
Energy C	Energy measure for phase C, measure unit depending on the selected measure unit (mWh, Wh, kWh, MWh)	Float 32 bits	R	0.0	40189(MS) 40190(LS)
Energy ABC	Energy measure for 3-phase, measure unit depending on the selected measure unit (mWh, Wh, kWh, MWh)	Float 32 bits	R	0.0	40191(MS) 40192(LS)
Screen Display mode	1=auto change screen page 0=manual change screen page	Unsigned 16 bits	RW	0	40222
Display menù Language	Language of items displayed: 1=italiano 0=english	Unsigned 16 bits	RW	0	40223
Reactive Energy A	Reactive Energy measure for phase A, measure unit depending on the selected measure unit (mVARh, VARh, kVARh, MVARh)	Float 32 bits	R	0.0	40225(MS) 40226(LS)
Reactive Energy B	Reactive Energy measure for phase B, measure unit depending on the selected measure unit (mVARh, VARh, kVARh, MVARh)	Float 32 bits	R	0.0	40227(MS) 40228(LS)
Reactive Energy C	Reactive Energy measure for phase C, measure unit depending on the selected	Float 32 bits	R	0.0	40229(MS) 40230(LS)

	measure unit (mVARh, VARh, kVARh, MVARh)				
Reactive Energy ABC	Reactive Energy measure for 3-phase, measure unit depending on the selected measure unit (mVARh, VARh, kVARh, MVARh)	Float 32 bits	R	0.0	40231(MS) 40232(LS))
Start scale INPUT for VRMS (analog output)	Start scale for input, with reference to the analog output [V]	Float 32 bits	RW	0.0	40505(MS) 40506(LS)
Start scale INPUT for IRMS (analog output)	Start scale for input, with reference to the analog output [A]	Float 32 bits	RW	0.0	40507(MS) 40508(LS)
Start scale INPUT for P ACTIVE (analog output)	Start scale for input, with reference to the analog output [W]	Float 32 bits	RW	0.0	40509(MS) 40510(LS)
Start scale INPUT for COSFI (analog output)	Start scale for input, with reference to the analog output [W]	Float 32 bits	RW	-1.0	40511(MS) 40512(LS)
End scale INPUT for VRMS (analog output)	End scale for input, with reference to the analog output retransmission [V]	Float 32 bits	RW	600.0	40513(MS) 40514(LS)
End scale INPUT for IRMS (analog output)	End scale for input, with reference to the analog output retransmission [A]	Float 32 bits	RW	5.0	40515(MS) 40516(LS)
End scale IN for PACT (analog output)	End scale for input, with reference to the analog output retransmission [W]	Float 32 bits	RW	9000.0	40517(MS) 40518(LS)
End scale IN for COSFI (analog output)	End scale for input, with reference to the analog output retransmission	Float 32 bits	RW	1.0	40519(MS) 40520(LS)
Digital out counter configuration	Select the digital output retransmission between: Digital output positive energy, phase A (write “0”) Digital output positive energy, phase B (write “1”) Digital output positive energy, phase C (write “2”) Digital output negative energy, phase A (write “3”) Digital output negative energy, phase B (write “4”) Digital output negative energy, phase C (write “5”) Digital output positive energy,	Unsigned 16 bits	RW	6	40521

	threephase (write “6”) Digital output negative energy, threephase (write “7”)				
User tarature – current for phase A	User Tarature coefficient for phase A current	Float 32 bits	RW	1.0	40524(MS) 40525(LS)
User tarature – current for phase B	User Tarature coefficient for phase B current	Float 32 bits	RW	1.0	40526(MS) 40527(LS)
User tarature – current for phase C	User Tarature coefficient for phase C current	Float 32 bits	RW	1.0	40528(MS) 40529(LS)
User tarature – voltage for phase A	User Tarature coefficient for phase A voltage	Float 32 bits	RW	1.0	40530(MS) 40531(LS)
User tarature – voltage for phase B	User Tarature coefficient for phase B voltage	Float 32 bits	RW	1.0	40532(MS) 40533(LS)
User tarature – voltage for phase C	User Tarature coefficient for phase C voltage	Float 32 bits	RW	1.0	40534(MS) 40535(LS)
Firmware code	Device Firmware code	Unsigned 16 bits	R	-	40901
Output type	Type for analog output: 0 = Voltage Output 1 = Current Output	Unsigned 16 bits	RW	1	40921
Phase A pos energy	Sum of energy for phase A (only positive)	Float 32 bits	R	0.0	40942 (MS) 40943 (LS)
Phase A neg energy	Sum of energy for phase A (only negative)	Float 32 bits	R	0.0	40944 (MS) 40945 (LS)
Phase B pos energy	Sum of energy for phase B (only positive)	Float 32 bits	R	0.0	40946 (MS) 40947 (LS)
Phase B neg energy	Sum of energy for phase B (only negative)	Float 32 bits	R	0.0	40948 (MS) 40949 (LS)
Phase C pos energy	Sum of energy for phase C (only positive)	Float 32 bits	R	0.0	40950 (MS) 40951 (LS)
Phase C neg energy	Sum of energy for phase C (only negative)	Float 32 bits	R	0.0	40952 (MS) 40953 (LS)
3-phase pos energy	Sum of energy for three phases (only positive)	Float 32 bits	R	0.0	40954 (MS) 40955 (LS)
3-phase neg energy	Sum of energy for three phases (only negative)	Float 32 bits	R	0.0	40956 (MS) 40957 (LS)
IRMS Ampere A	Current RMS measure for phase A, [A rms]	Float 32 bits	R	0.0	40958(MS) 40959(LS)
IRMS Ampere B	Current RMS measure for phase B, [A rms]	Float 32 bits	R	0.0	40960(MS) 40961(LS)
IRMS Ampere C	Current RMS measure for phase C, [A rms]	Float 32 bits	R	0.0	40962(MS) 40963(LS)
IRMS Ampere ABC	Current RMS measure for phase 3-phase, [A rms]	Float 32 bits	R	0.0	40964(MS) 40965(LS)

Phase A pos Reactive energy	Sum of Reactive energy for phase A (only positive)	Float 32 bits	R	0.0	41002 (MS) 41003 (LS)
Phase A neg Reactive energy	Sum of Reactive energy for phase A (only negative)	Float 32 bits	R	0.0	41004 (MS) 41005 (LS)
Phase B pos Reactive energy	Sum of Reactive energy for phase B (only positive)	Float 32 bits	R	0.0	41006 (MS) 41007 (LS)
Phase B neg Reactive energy	Sum of Reactive energy for phase B (only negative)	Float 32 bits	R	0.0	41008 (MS) 41009 (LS)
Phase C pos Reactive energy	Sum of Reactive energy for phase C (only positive)	Float 32 bits	R	0.0	41010 (MS) 41011 (LS)
Phase C neg Reactive energy	Sum of Reactive energy for phase C (only negative)	Float 32 bits	R	0.0	41012 (MS) 41013 (LS)
3-phase pos Reactive energy	Sum of Reactive energy for three phases (only positive)	Float 32 bits	R	0.0	41014 (MS) 41015 (LS)
3-phase neg Reactive energy	Sum of Reactive energy for three phases (only negative)	Float 32 bits	R	0.0	41016 (MS) 41017 (LS)
Phase A MAX POWER	Maximum absolute value of Phase A active power (calculated since the last device reset.)	Float 32 bits	R	0.0	41018 (MS) 41019 (LS)
3-Phase MAX POWER	Maximum absolute value of Phases ABC active power (calculated since the last device reset.)	Float 32 bits	R	0.0	41020 (MS) 41021 (LS)
Phase A MAX REACTIVE POWER	Maximum absolute value of Phase A reactive power (calculated since the last device reset.)	Float 32 bits	R	0.0	41022 (MS) 41023 (LS)
3-Phase MAX REACTIVE POWER	Maximum absolute value of Phase ABC reactive power (calculated since the last device reset.)	Float 32 bits	R	0.0	41024 (MS) 41025 (LS)
Average active power	Average value of 3-phases (Phase A if 1-wire insertion is selected) active power. Value is estimated for the last N minutes, where N is the "demand time value" selected by the user. The Calculation is obtained by a moving average and is updated every 1 minute.	Float 32 bits	R	0.0	41026 (MS) 41027 (LS)

11. DEBUG LEDs



LED	LED status	Meaning
PWR	Constant light	The module power is on
ERR	Constant light	Measure of voltage: <45Vac (at least one of the phases used)
RX	Blinking light	The module received a data packet from RS485
TX	Blinking light	The module sent a data packet to the RS485

12. THE KIT-USB

The KIT-USB can be obtained from Seneca (Can be bought also from the E-commorce Website www.seneca.it)

The kit contain:

- A CD with the USB drivers for Windows and the Easy Setup software
- A standard mini-B and micro-USB USB Cables

  The USB drivers can also be downloaded from the website:
  http://www.ftdichip.com/Drivers/VCP.htm

  The Easy Setup software can also be freely downloaded from the website:
  www.seneca.it

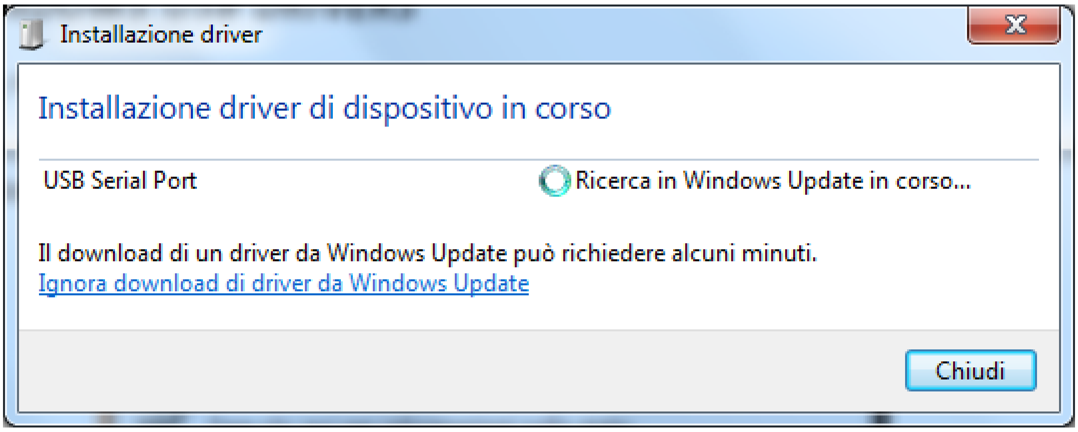
13. *WINDOWS USB DRIVERS INSTALLATION*

For installing the USB drivers follow this procedure:

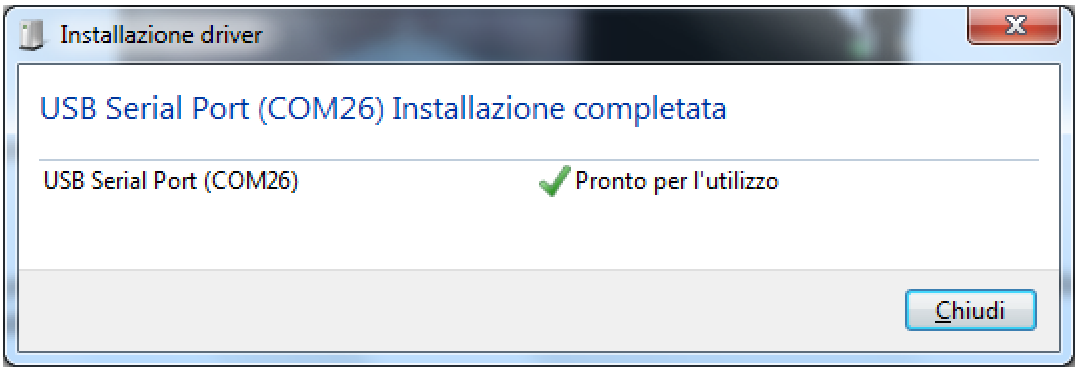
- Power up the S203TA-D / S203RC-D and connect the USB to the PC, the new hardware it's detected:

- If you don't have an internet connection insert the CD and install the FTDI driver or download the drivers from the website http://www.ftdichip.com/Drivers/VCP.htm

- If you have an internet connection the driver is automatically searched into the Windows Update database:



- After 3-4 minutes the driver is installed and the USB (USB Serial Port) is ready to use :



14. OTHERS OPERATING SYSTEM DRIVERS:

From the website:

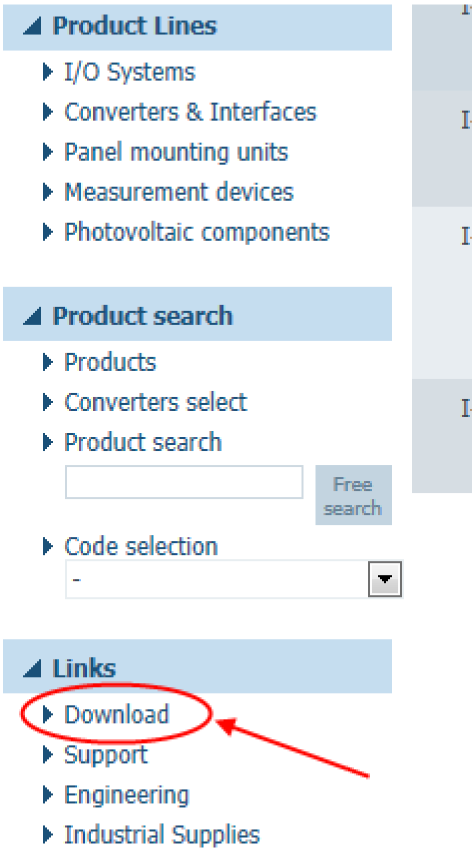
http://www.ftdichip.com/Drivers/VCP.htm

you can download the USB drivers for various operating systems like:

Windows xp, Vista, Windows 8
Linux
MAC OS
Windows CE

15. *EASY SETUP SOFTWARE for Windows*

From the Website www.seneca.it can be downloaded free of charge the Easy Setup suite software, select Download from the Links section:



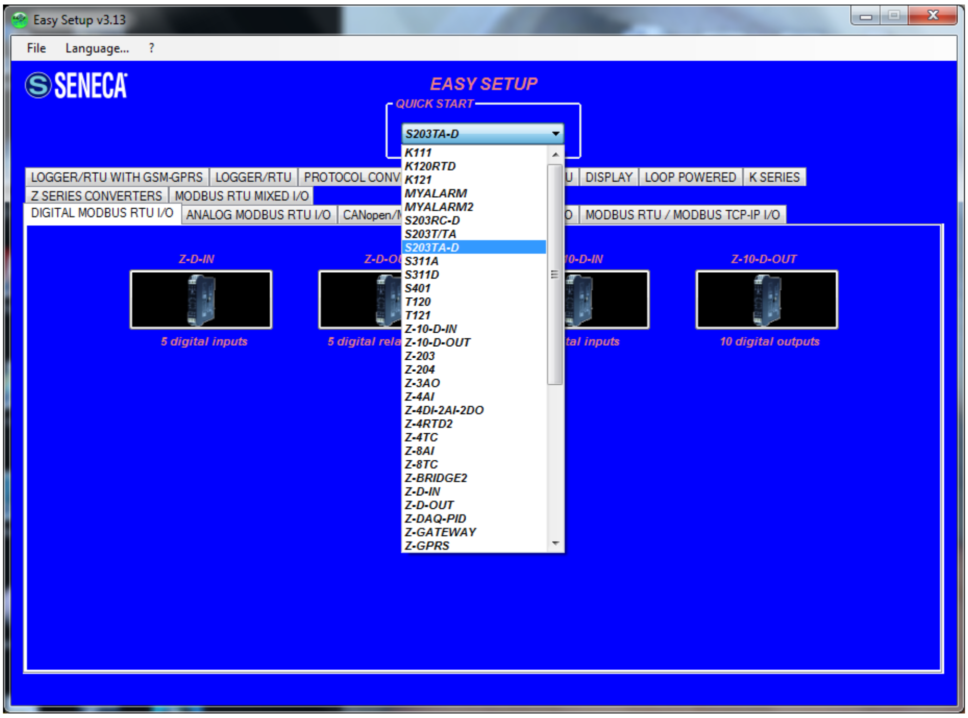
Then download the last Easy Setup version:

Easy Setup works on Windows XP 32/64 bits, Windows Vista 32/64 bits, Windows 7 32/64 bits, Windows 8 32/64 bits.

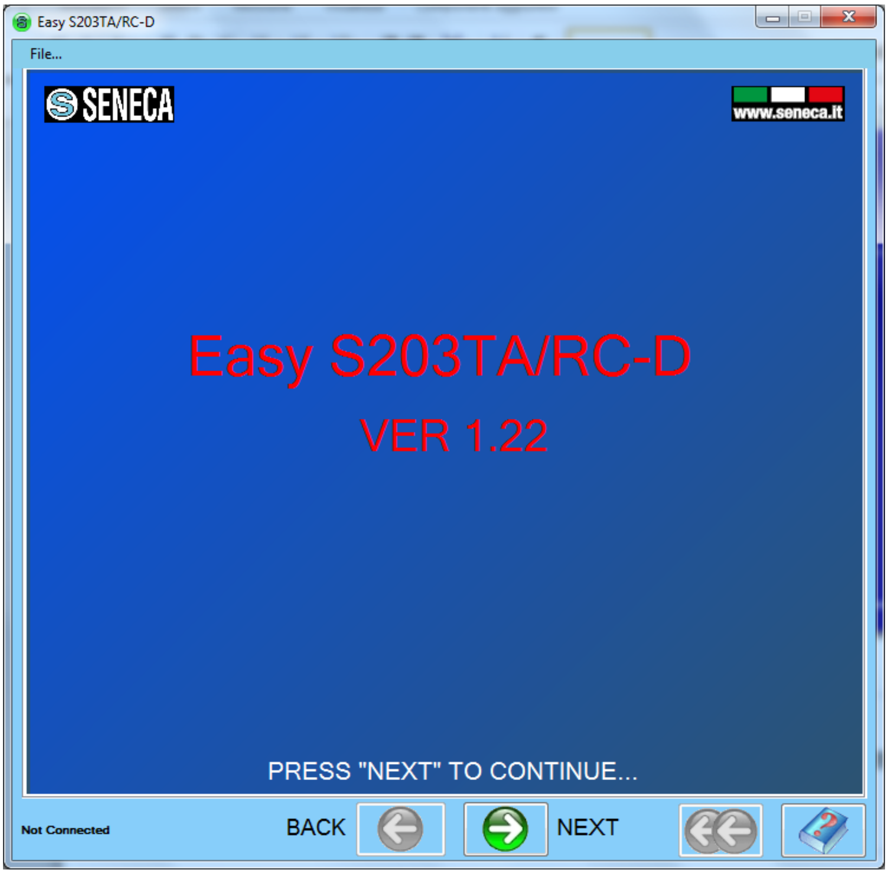
If you want to configure the S203TA/RC-D by the USB you must FIRST install the USB drivers (see chapter 13).

Extract the zip file and double click on the Setup file for install the software.

From the Quick Start menu select the S203TA-D or S203RC-D model (you can also click on the tab "Analog Modbsu RTU I/O" and select the S203TA-D or S203RC-D button).



Now the configuration software "Easy S203TA/RC-D" starts:



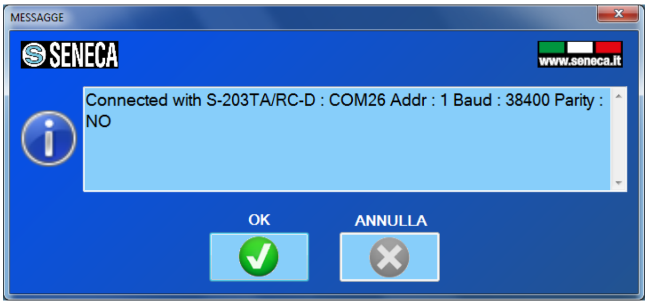
Press “Next”:

If you have previously installed the USB drivers connect the USB cable to the PC , also use a RS485 to USB converter like Seneca S117P1 (see www.seneca.it website for more info).

Although RS485 to USB converters can be used only Seneca RS485 to USB converters are tested to work with S203TA/RC-D.

Click on “AUTOMATIC SEARCH” for automatic connection to the S203TA/RC-D.

The software try to connect with all the serial ports until the S203TA/RC-D will answer:



Now the configuration menu will be displayed:

15.1. *Firmware Update*

With a new revision of Easy Setup, Seneca can include a new S203TA/RC-D firmware.

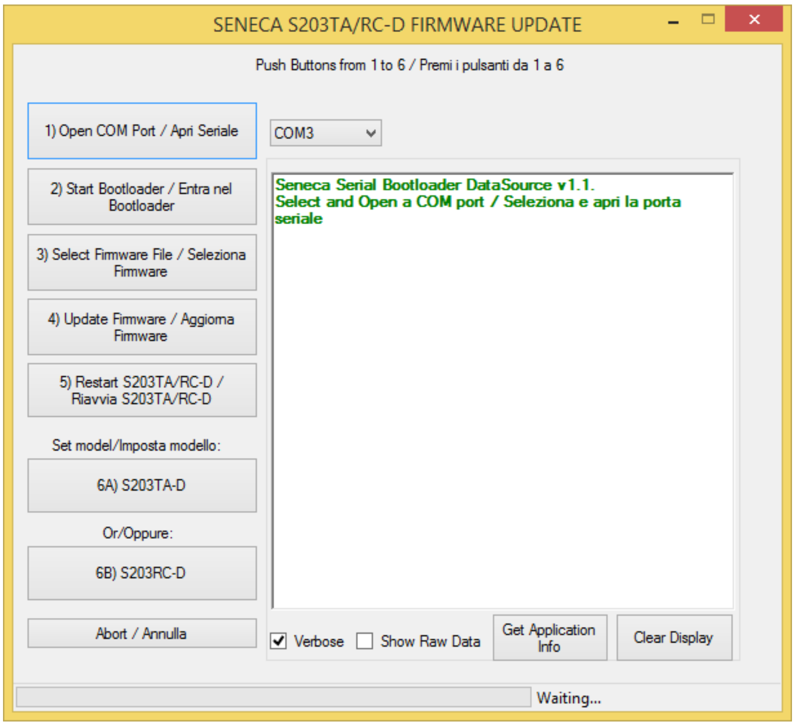
A new firmware update can include new features or bugfix.

WARNING!

When the firmware update it's started don't power down or disconnect the S203TA/RC-D until all the procedure it's finished.

Power ON the S203TA/RC-D and connect it to the ***PC BY THE USB CABLE (DO NOT USE THE RS485 CONNECTION)*** (see chapter 15)

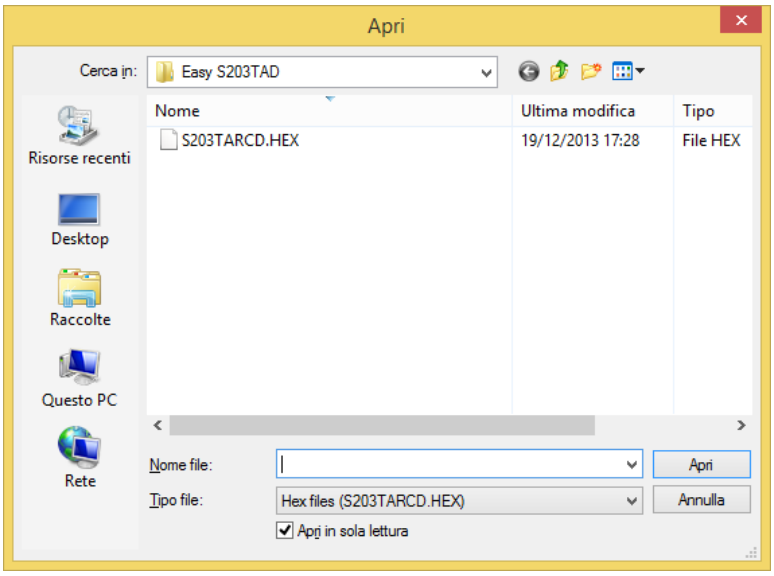
On the configuration menu click on "Software update"



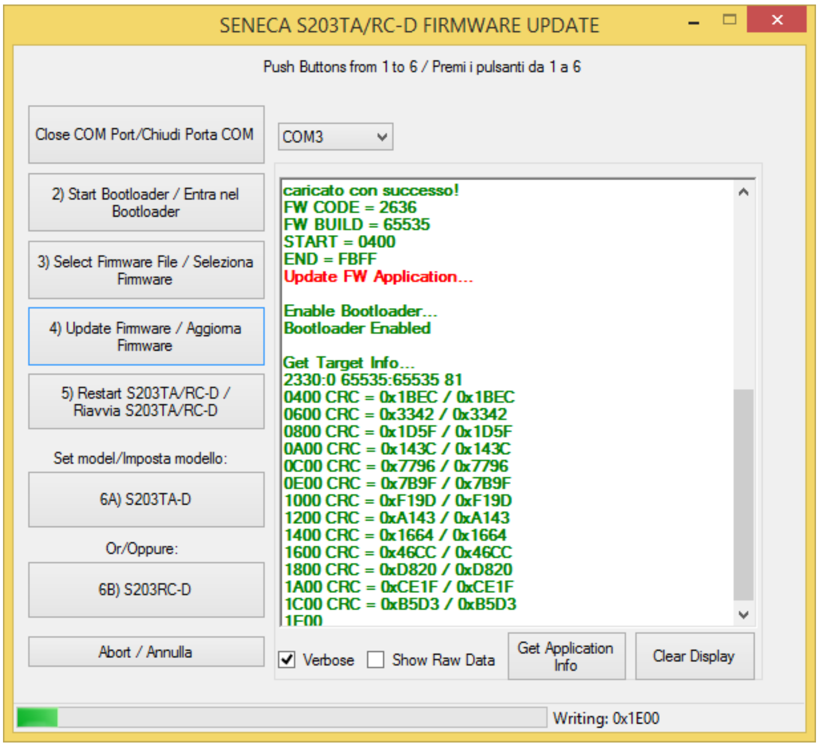
Press the 1) button for connect to the right S203TA/RC-D serial port

Press the 2) button to put the S203TA/RC-D in bootloader mode, on the S203TA/RC-D display will be displayed: "UPDATING... PLEASE WAIT..."

Press the 3) button for select the firmware to send to the S203TA/RC-D, the software will open directly the firmware directory.

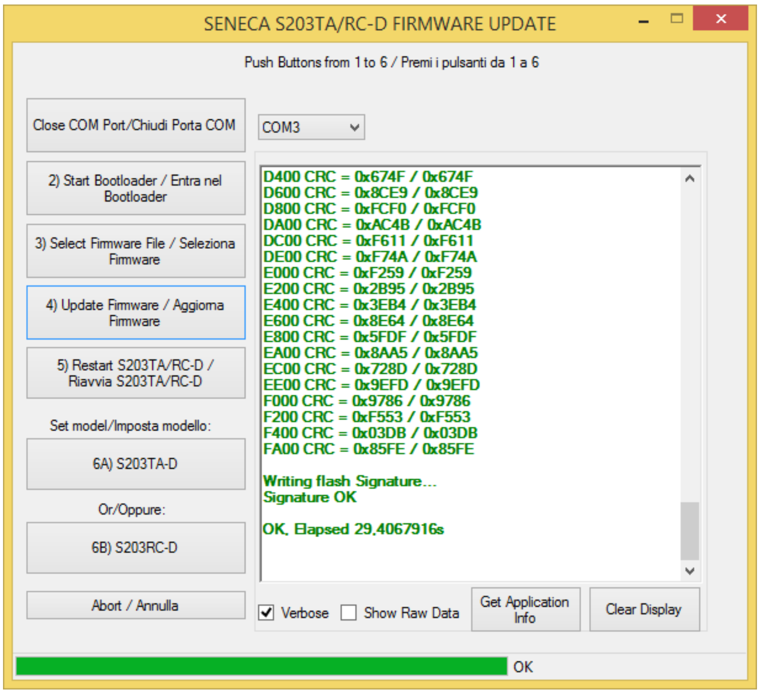


Press the 4) button to start the firmware update:



The firmware update take less than 1 minute.

When the update is finished:



Press the 5) button to restart the S203TA/RC-D, now the board is out of the bootloader mode.

Now Set the right S203 model by the 6A) button (for S203TA-D model) or 6B) button (for S203RC-D model).

WARNING!

When the firmware update it's finished the last configuration it's overwritten by the default configuration.

For S203RC-D model you must also configure with the software Easy Setup the right Rogowski coil input full scale because this configuration can not be configured by the display menu.