USER MANUAL

Z203-1

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MI002651

Seneca Z-PC Line module: **Z203-1**

The Z203-1 module is a single-phase electric-line analyzer for line voltage up to 500 Vac and line current up to 5A (35 Hz to 75 Hz). The module has an analogue output, electrical value directly proportional to selected input: voltage-type out or current-type out. The electrical value (output) is available on screw terminals and the normalized value is available on RS485 registers. A digital output is available, too, to generate a number of pulses depending on the energy increment.

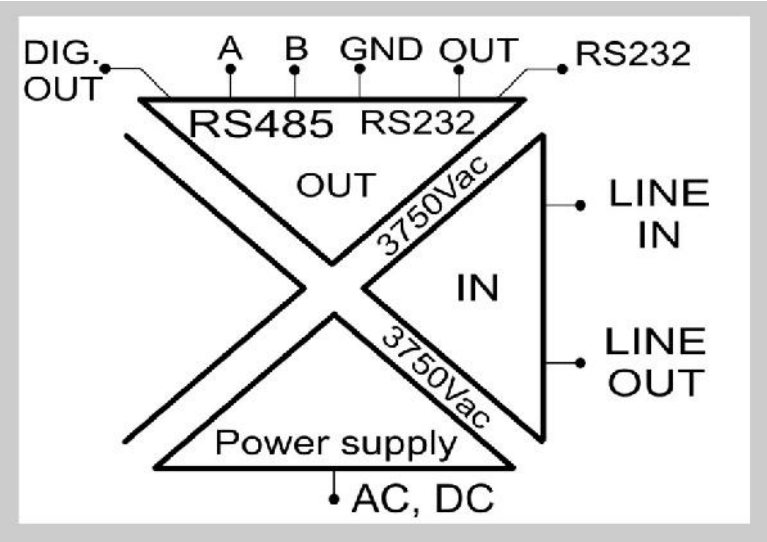
General characteristics

- It is possible to detect, with reference to the electric line and load connected to its: RMS voltage, RMS current, active power, reactive power, cosΦ, frequency, energy
- A FeRAM allows to recovery the energy if a black-out occurs
- Energy counter: pulse digital output, reading on Modbus register
- It is possible to change electrical start/end scale by Dip-switch (see table 1, for each type of retransmitted output) or by Modbus registers (every value)
- Normalized start/end scale between 0..+10000 (for RMS voltage, RMS current, active power), 350..750 (for frequency) or between 0..+10000 (for **absolute values** of reactive power, cosΦ). It isn't possible to associate a normalized value to the energy quantity
- Possibility for connection and management by an external Current Transformer (only if Z203-1 is configurated by a configuration software).
- Easy configuration with the software Easy, downloadable from www.seneca.it
- Configuration of the module (node) address and baud-rate by Dip-Switches
- Configuration of the electrical-network nominal frequency, output type, retransmission scaling and retransmitted output by Dip-Switches
- It is possible to add/remove the module to/from RS485-bus without disconnecting the communication or power supply
- It is possible to switch automatically RS485 to RS232 or vice versa

Features

INPUT/RETRANSMITTED OUTPUT (ELECTRIC-NETWORK SIDE)	
Number	1
Accuracy	0.5% of E.E.S. (Voltmeter, ampere-meter, watt-meter for active power, frequency-meter)
	Thermal stability: < 100 ppm/°K
	EMI: < 1%
Protection	This module provides inputs protection against the ESD (up to 4kV)
Voltage-type IN	E.S.S./E.E.S.(Electrical Start/End Scale) configurable between: 0..125 Vac; 0..250 Vac; 0..500 Vac. Input impedance: 600 kΩ
Current-type IN	E.S.S./E.E.S.(Electrical Start/End Scale) configurable between: 0..1.25A; 0..2.5A; 0..5A. Peak factor: 3; rated current: 5 Arms; max current: 15 A. Input impedance: 3.3 mΩ
ANALOGUE OUTPUT	
Number	1
Resolution	12 bits
Accuracy	0.1% of output scale range
Voltage-type OUT	Output scale range configurable between: 0-10 V or 0-5 V by dip-switch, as desired by modbus register (minimum resistance that

	can be connected: 2 kΩ). Saturation if voltage > 11 V
Current-type OUT	Output scale range configurable between: 0-20 mA or 4-20 mA by dip-switch, as desired by modbus register (max resistance that can be connected: 500 Ω). Saturation if current > 21 mA
DIGITAL OUTPUT: PULSE COUNTER FOR ENERGY INCREMENT	
Number	1
Type	Passive (it must be powered)
Range	50 mA
Isolation	1500 Vpeak
Screw terminals	1, 6 (reference, common with GND of analogue output)
CONNECTIONS	
RS485 interface	IDC10 connector
RS232 interface	Jack stereo 3.5mm connector: plugs into COM port
ISOLATIONS	
	1500Vac isolation between: power supply, ModBUS RS485/RS232 + output 3750Vac isolation between: input (electric line) and other parts

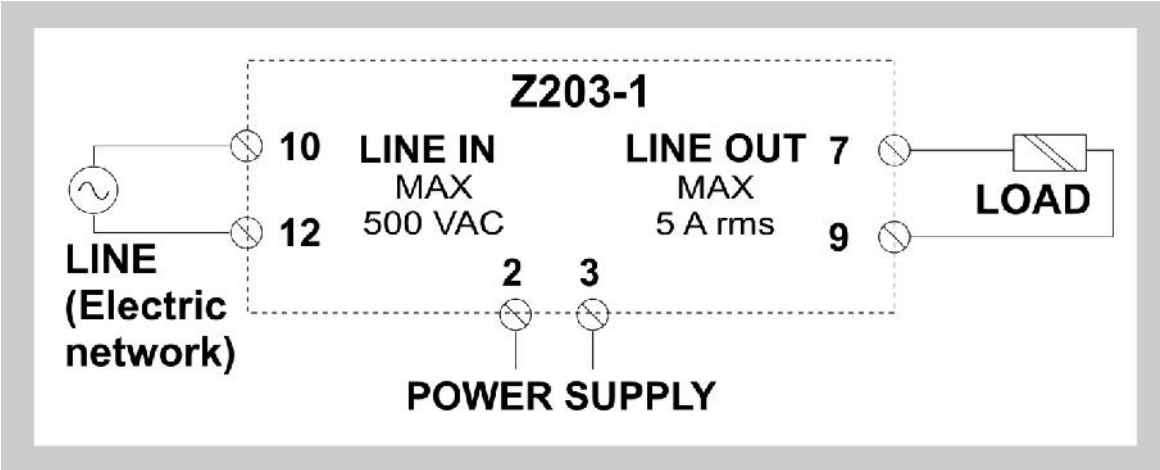


POWER SUPPLY	
Supply voltage	10 – 40 Vdc or 19 – 28 Vac (50Hz - 60Hz)
Power consumption	Max: 2.5 W

The power supply transformer necessary to supply the module must comply with EN60742 (Isolated transformers and safety transformers requirements). To protect the power supply, it is recommended to install a fuse.

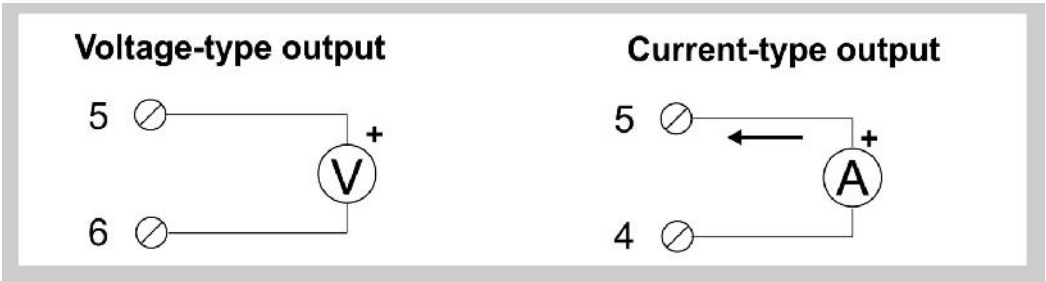
Connections

Input connection



Connect to the screw terminals 10 and 12 the electric network.
Connect to the screw terminals 7 and 9 the load to analyze.

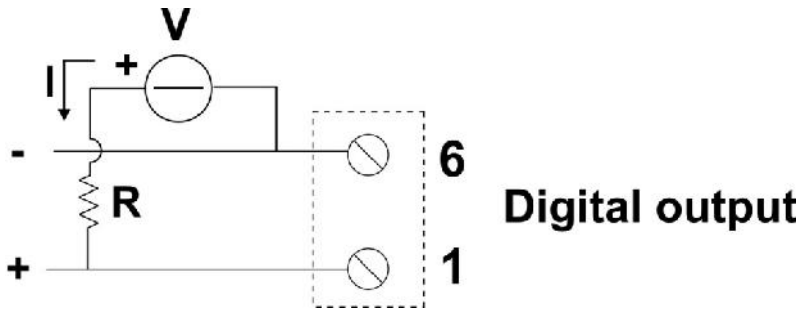
Output connection



Shielded cables are recommended to connect the outputs (through screw terminals: 5, 6 if voltage-type output; 4, 5 if current-type output).

Digital output for counter

The energy value (W/h; see the register 40120/40121) is saved on FeRAM; if the digital output is activated, it sends a pulse for each unit increment of energy (pulse duration: 200 ms). **Maximum current: I_{MAX}=V/R=50 mA**

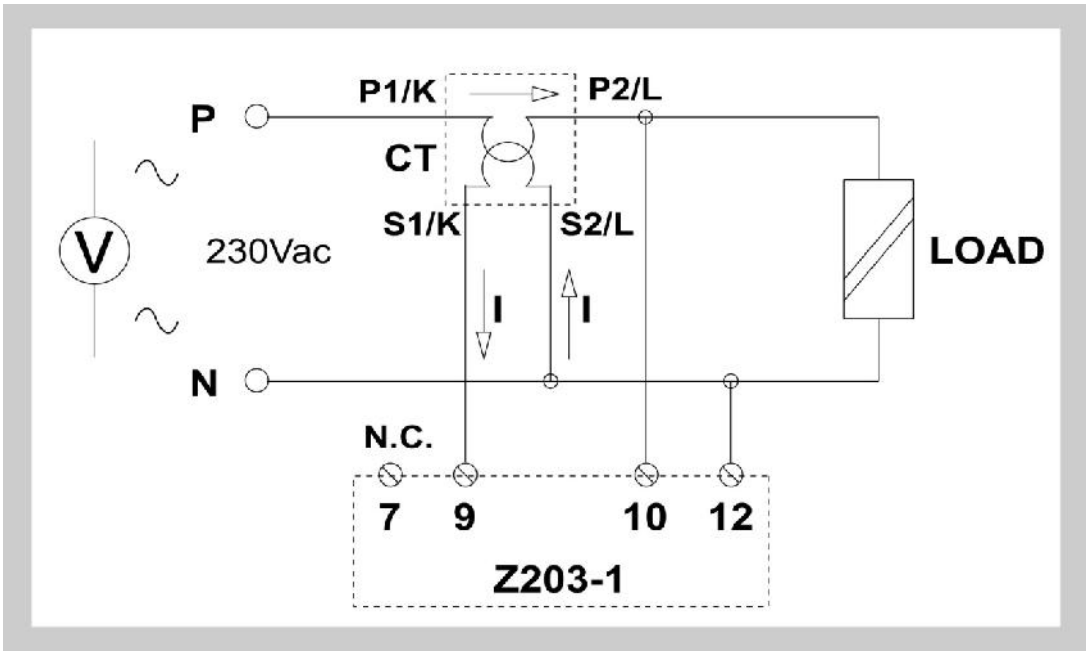


Connection with current transformer (in this case, configure the Z203-1 using software, NOT dip-switch)

The Z203-1 module allows to control a single-phase load connected to the electric network. To use the Z203-1 for high power devices, it is possible to connect a current transformer.

WARNING

Only the connection shown in the following figure is allowed, if a current transformer need to be connected.



Screw terminal 7 is open.

Parameters of current transformer CT are shown in the following table.

P1/K	Primary wound input
P2/L	Primary wound output
S2/K	Secondary wound input
S2/L	Secondary wound output

Dip-switches table

In the following tables: box without circle means Dip-Switch=0 (OFF state); box with circle means Dip-Switch=1 (ON state).

BAUD-RATE (Dip-Switches: SW1)		
1	2	Meaning
		Baud-rate=9600 Baud
	●	Baud-rate=19200 Baud
●		Baud-rate=38400 Baud
●	●	Baud-rate=57600 Baud

ADDRESS (Dip-Switches: SW1)						
3	4	5	6	7	8	Meaning
						Address and Baud-Rate are acquired from memory(EEPROM)
					●	Address=1
				●		Address=2
				●	●	Address=3
			●			Address=4
X	X	X	X	X	X	……
●	●	●	●	●	●	Address=63

NOMINAL FREQUENCY (Dip-Switches: SW2)	
1	Meaning
	50Hz
●	60Hz

OUTPUT TYPE (Dip-Switches: SW2)		
2	3	Meaning
		Output=0..10V
	●	Output=0..5V
●		Output=0..20mA
●	●	Output=4..20mA

RETRANSMISSIONS SCALING/OUT. RANGE (Dip-Switches: SW2)		
4	5	Meaning
		Rescaled=100% (see table 1)
	●	Rescaled=50% (see table 1)
●		Rescaled=25% (see table 1)
●	●	Not allowed

SELECTION OF QUANTITY RETRANSMITTED/RETR. OUTPUT (Dip-Switches: SW2)			
6	7	8	Meaning
			Not allowed (**configuration by EEPROM if SW2-1..8 are all «0»**)
		●	Retransmission of RMS voltage
	●		Retransmission of RMS current
	●	●	Retransmission of Active power
●			Retransmission of CosΦ
●		●	Retransmission of Frequency
●	●		Retransmission of Reactive power
●	●	●	Not allowed

RS485 TERMINATOR (Dip-Switches: SW3)		
1	2	Meaning
		RS485 terminator disabled
●		RS485 terminator enabled

The measure ranges for RMS voltage, RMS current, active power, reactive power, cosΦ, frequency are shown in the following table, if configuration by Dip-Switch.

RMS voltage, RMS current, active power, frequency are measured by Z203-1 directly; energy, reactive power, cosΦ are obtained through processing by Z203-1.

Possible measures	Retransmitted output range (100%)		Retransmitted output range (50%)		Retransmitted output range (25%)	
	Min	Max	Min	Max	Min	Max
RMS voltage	0Vac	500Vac	0 Vac	250Vac	0 Vac	125Vac
RMS current	0A	5A	0A	2.5A	0A	1.25A
Active power	0W	2500W	0W	1250 W	0 W	625W
Reactive power	0VAR	2500 VAR	0 VAR	1250 VAR	0 VAR	625 VAR
CosΦ	0	1	0	0.5	0	0.25
Frequency	35Hz	65Hz	45Hz	75Hz	40 Hz	60Hz

Table 1 – Measure range configurable from Dip-Switch (see the dip-switch table)

Physical value	Range of normalized value
VRMS from 0 to 500 V	0..10000
IRMS from 0 to 5 A	0..10000
WATT from 0 to 2500 W	0..10000
Reactive power from -2500 to 2500 VAR	0..10000 (*)
Power factor from -1 to 1	0..10000 (**)
Frequency from 35 Hz to 75 Hz	350..750

Table 2 – Range of normalized measures

(*) For example: if reactive power is -2500 VAR (physical value, electric line), corresponding numeric value is +10000 and retransmitted output (available at the screw terminals) is +10 V (if SW2-2,3=”00”).

If reactive power is 0 VAR (physical value, electric line), corresponding numeric value is 0 and retransmitted output (available at the screw terminals) is 0 V (if SW2-2,3=”00”).

If reactive power is +2500 VAR (physical value, electric line), corresponding numeric value is +10000 and retransmitted output (available at the screw terminals) is +10 V (if SW2-2,3=”00”).

(**) The same behavior of reactive power.

IMPORTANT!

If all the dip-switch of SW2 are equal to zero, so “00000000”: the module acquires the configuration from EEPROM for: nominal frequency, output-type, output-electric value, retransmitted output, electric start scale, electric end scale (see the modbus registers).

If at least one dip-switch of SW2 is different from zero: the module acquires only the configurations appliable from dip-switch SW2. For example: if SW2 is equal to “1 | 00 | 00 | 001”, then the nominal frequency is configurated as “60 Hz” from dip-switch, the output type is configurated as “0..10 V” from dip-switch, the retransmission scaling is configurated as “100%” and the retransmitted output is VRMS. In this case, the content of the registers 40110/40111, 40112/40113 (retransmitted output range), 40114/40115, 40116/40117 (analogue output range) are not acquired for the scaling.

RS485 Register table

Name	Range	Interpretation of register	R/W	Default	Address
MachineID	/	MSB, LSB	R		40001
	Id_Code (Module ID)				Bit [15:8]
	Ext_Rev (Module version)				Bit [7:0]
FWREV	/	Word	R		40005
	Firmware Code				
Status	/	Bit	R/W		40093
	Reset of module: 0x65 (101 decimal)=activated; any other number=deactivated			/	Bit [15:8]
	Input voltage: 0=voltage > 40 Vrms; 1=voltage < 40 Vrms			/	Bit 7
	These bits aren’t used			/	Bit [6:5]
	Hardware error: 0=there isn’t; 1=there is			/	Bit 4
	These bits aren’t used			/	Bit [3:1]
	Communication error with FeRAM: 0=there isn’t; 1=there is			/	Bit 0
Baudrate Delay	/	MSB, LSB	R/W		40003
	Baud-rate for RS485 (baud-rate of module/node if parameters are configurated by memory modality): 0=4800; 1=9600; 2=19200; 3=38400; 4=57600; 5=115200; 6=1200; 7=2400			38400	Bit [15:8]
	Delay for RS485 (delay of communication response: it represents the number of the pauses(*) between the end of Rx message and the start of Tx message): from 0x00=0 to 0xFF=255 (*)1 pause=6 characters			0	Bit [7:0]
Address Parity	Address: from 0x01=1 to 0xFF=255	MSB, LSB	R/W		40002
	Address for RS485 (address of module/node if parameters are configurated by memory modality)			1	Bit [15:8]
	Parity for RS485: 0=there isn’t; 1=even; 2=odd			0	Bit [7:0]
Nominal Frequency		Word	R/W		40007
	If Dip-Switches SW2 are equal to “00000000”: 0=50 Hz; 1=60 Hz				
CONFIGURATION OF RETRANSMITTED QUANTITY (ALTERNATIVE TO DIP-SWITCH)					
Measured quantity on electric-line		Word	R/W		40009
	If Dip-Switches SW2 are equal to “00000000”: quantity retransmitted is: 0=VRMS; 1=IRMS; 2=potentiometer;				

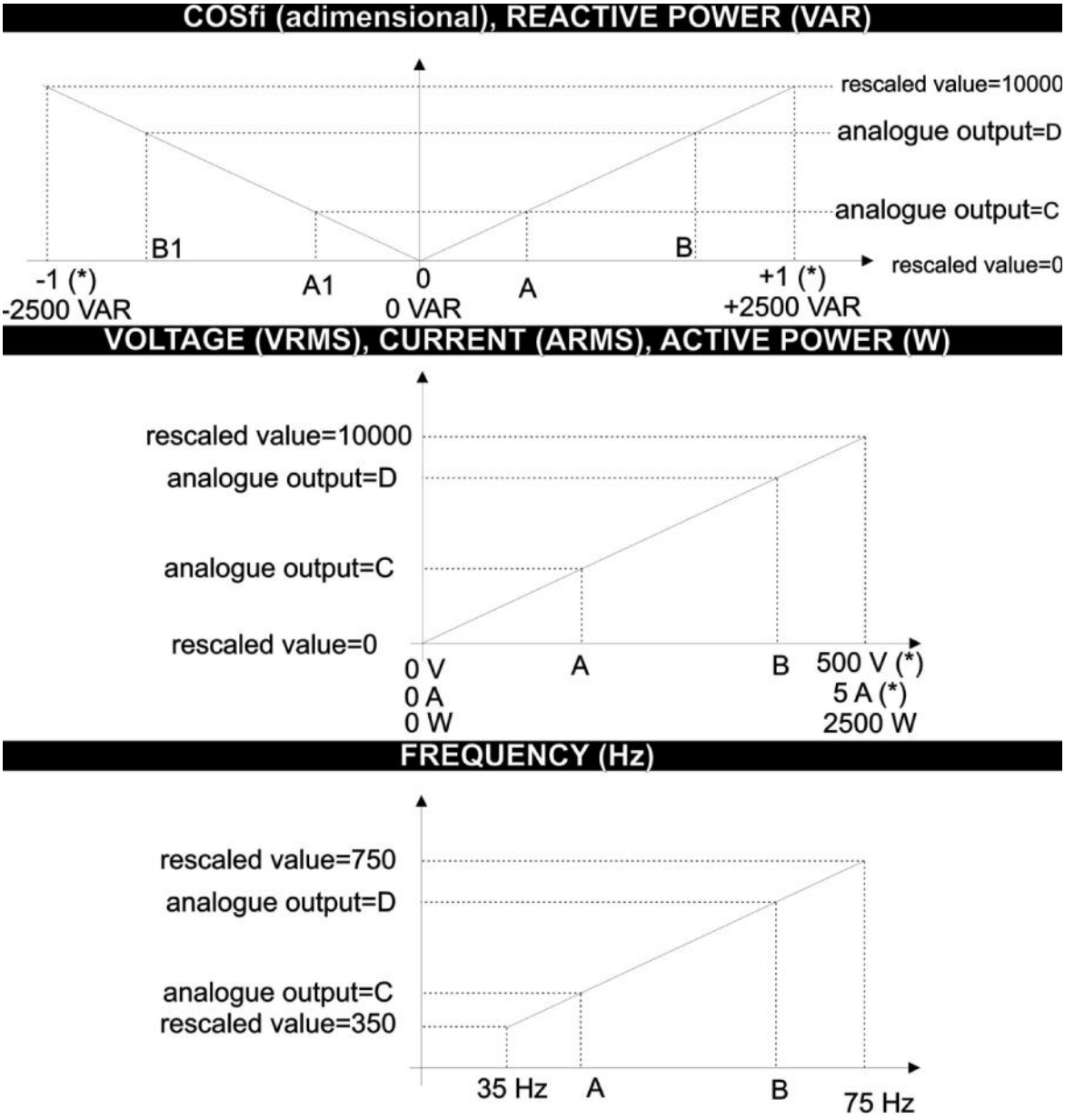
	3=cosfi; 4=frequency; 5=VAR; otherwise: see the Dip-switch table				
Start scale electric MSW		FP32bit_MSW	R/W		40110
Start scale electric LSW		FP32bit_LSW	R/W		40111
	Electrical start scale value (if SW2 is “00000000”). To know which input is acquired, see reg.40009				
Stop scale electric MSW		FP32bit_MSW	R/W		40112
Stop scale electric LSW		FP32bit_LSW	R/W		40113
	Electrical stop scale value (if SW2 is “00000000”). To know which input is acquired, see reg.40009				
CT Ratio		Word	R/W		40004
	Transformation ratio for possible current transformer connected to input (CT). If there isn’t, reg.40004=10 (CT=1); if there is, reg.40004=10*CT (retransmission is not influenced by CT value, if configuration from Dip-switch)			10 (CT=1)	
CONFIGURATION OF OUTPUT TYPE (ALTERNATIVE TO DIP-SWITCH)					
Output type		Word	R/W		40008
	If SW2 are equal to “00000000”, analogue output is: 0=voltage; 2=current. In this case, start scale output is reg.40114/40115, end scale output is reg.40116/40117				
Start scale output MSW		FP32bit_MSW	R/W		40114
Start scale output LSW		FP32bit_LSW	R/W		40115
	Output start scale value. To know the analogue output, see reg.40008 (if SW2 are equal to “00000000”)				
Stop scale output MSW		FP32bit_MSW	R/W		40116
Stop scale output LSW		FP32bit_LSW	R/W		40117
	Output stop scale value. To know the analogue output, see reg.40008 (if SW2 are equal to “00000000”)				
VOLTAGE					
Voltage MSW		FP32bit_MSW	R		40081
Voltage LSW		FP32bit_LSW	R		40082
	Retransmitted output is RMS voltage [Vrms]. This value is regardless of reg.40004			/	
Voltage	0..10000	Word	R		40095
	RMS voltage: normalized measure of retransmitted output. This value is regardless of reg.40004			/	
CURRENT					
Current MSW		FP32bit_MSW	R		40083
Current LSW		FP32bit_LSW	R		40084
	Retransmitted output is RMS current [Arms]. This value depends on reg.40004			/	
Current	0..10000	Word	R		40096
	RMS current: normalized measure of retransmitted output. This value is regardless of reg.40004			/	
ACTIVE POWER					
Active Power MSW		FP32bit_MSW	R		40085
Active Power LSW		FP32bit_LSW	R		40086
	Retransmitted output is Active power [W]. This value depends on reg.40004			/	

Active power	0..10000		R		40097
	Active power: normalized measure of retransmitted output. This value is regardless of reg.40004			/	
REACTIVE POWER					
Reactive Power MSW		FP32bit_MSW	R		40089
Reactive Power LSW		FP32bit_LSW	R		40090
	Retransmitted output is RMS reactive power [VARrms]. This value depends on reg.40004			/	
Reactive power	0..10000 (**absolute value**)		R		40098
	RMS reactive power: normalized measure of retransmitted output. This value is regardless of reg.40004			/	
COSC					
CosΦ MSW		FP32bit_MSW	R		40091
CosΦ LSW		FP32bit_LSW	R		40092
	CosΦ electrical measure of input			/	
CosΦ	0..10000 (**absolute value**)		R		40099
	CosΦ normalized measure of input. This value is regardless of reg.40004			/	
FREQUENCY					
Freq MSW		FP32bit_MSW	R		40087
Freq LSW		FP32bit_LSW	R		40088
	Retransmitted output is Frequency [Hz]				
Frequency	350..750		R		40101
	Frequency: normalized measure of retransmitted output. 350 corresponds to 35 Hz, 750 corresponds to 75 Hz				
ENERGY					
Energy MSW		Signed long	R		40079
Energy LSW		Signed long	R		40080
	Energy measure [W/h]				
OTHER PARAMETERS					
Command		Word	R/W		40102
	0xBACA: it loads the value of command aux in the energy register				
CommandAux MSW		Word	R/W		40103
CommandAux LSW		Word	R/W		40104
	Energy value that can be overwritten to the reg.40079, 40080 (see reg.40102)				
Digital output energy ratio MSW		Unsigned long, MSW	R/W		40118
Digital output energy ratio LSW		Unsigned long, LSW	R/W		40119
	Digital output energy ratio. It allows to set the partition coefficient through which a pulse is generated. If it is equal to 1, the pulse is generated when energy is incremented of a unit; if it is equal to 10, the pulse is generated when energy is incremented of 10 units; etc…				
Energy ratio MSW		Floating, 32 bit, MSW	R		40120
Energy ratio LSW		Floating, 32 bit, LSW	R		40121
	Energy ratio. It allows to set the partition coefficient through which the energy counter is incremented. If it is				

	equal to 1, the energy is counted as W/h; if it is equal to 1000, the energy is counted as kW/h, etc…If it is 3600: the energy is counted as W/s		

How to interpret the quantities

NOTE: In the following figures, “A”, “B”, “A1”, “B1”, “C”, “D” are references for the table 3.



(*) Limit values of voltage, current, cosfi depend on the dip-switch SW2-4,5. In the previous figures are shown the limits related to 100% retransmission scaling.

As you can see in the following table, there are two alternative modalities to configure the Z203-1: by RS485 registers or by Dip-Switch SW2.

Ref.	FEATURE	Rs485 Registers (**)	Dip-switch
/	Retransmitted quantity: VRMS, ARMS, W, VAR, cosfi, Hz	40009	SW2-6,7,8
A,A1	Start scale of retr. quantity	40110/40111	SW2-4,5
B,B1	Stop scale of retr. quantity	40112/40113	SW2-4,5
/	Rescaled value (0..10000 or 350..750)	Read: 40095..40101	/
/	Type of analog output: voltage or current	40008	SW2-2,3
C	Start scale of analog output: V or mA	40114/40115	SW2-2,3
D	Stop scale of analog output: V or mA	40116/40117	SW2-2,3

Table 3 – Two alternative modalities to configure the Z203-1: by registers or Dip-switch

(**)If SW2=»00000000», all the configurations are acquired from registers. If start/stop scale value of analogue output (C,D) are configurated from Dip-Switch, start scale (for example: 4 mA) corresponds to the rescaled value=0 and stop scale (for example: 20 mA) corresponds to the rescaled value=10000.

LEDs for signalling

In the front-side panel there are 4 LEDs and their state refers to important operating conditions of the module.

LED	LED status	Meaning
PWR	Constant light	The power is on
ERR	Blinking light	Measure of voltage: < 40 Vac and < 20 mA
	Constant light	The module has at least one of the errors described in RS485 Registers table
RX	Constant light	Verify if the bus connection is corrected
	Blinking light	The module received a data packet
TX	Blinking light	The module sent a data packet

Easy-SETUP

To configure the Seneca Z-PC Line modules, it is possible to use Easy-SETUP software,

Free-downloadable from the www.seneca.it; the configuration can be performed by RS232 or RS485 bus communication.