USER MANUAL

Z-SG2 / Z-SG2-L

DIGITAL LOAD CELL CONVERTER WITH 24 BIT ADC

CE

SENECA S.r.l.
Via Austria 26 – 35127 – Z.I. - PADOVA (PD) - ITALY
Tel. +39.049.8705355 – 8705355 Fax +39 049.8706287
www.seneca.it

ORIGINAL INSTRUCTIONS

Introduction

The content of this documentation refers to products and technologies described in it.
All technical data contained in the document may be changed without notice.
The content of this documentation is subject to periodic review.
To use the product safely and effectively, read the following instructions carefully before use.
The product must be used only for the use for which it was designed and manufactured: any other use is under the full responsibility of the user.
Installation, programming and set-up are allowed only to authorized, physically and intellectually suitable operators.
Set-up must be performed only after correct installation and the user must follow all the operations described in the installation manual carefully.
Seneca is not responsible for failures, breakages and accidents caused by ignorance or failure to apply the stated requirements.
Seneca is not responsible for any unauthorized modifications.
Seneca reserves the right to modify the device, for any commercial or construction requirement, without the obligation to promptly update the reference manuals.
No liability for the contents of this document can be accepted.
Use the concepts, examples and other content at your own risk.
There may be errors and inaccuracies in this document that could damage your system, so proceed with caution, the author(s) will not take responsibility for it.
Technical specifications are subject to change without notice.

CONTACT US	
Technical support	support@seneca.it
Product information	commerciale@seneca.it

Document revisions

DATE	REVISION	NOTES	AUTHOR
18/07/2019	1.0.0.0	First revision	MM
16/09/2019	1.0.0.1	Added info for bootloader mode Updated info for the USB port Added a note for the Auto Resolution Added A Resolution Warning	MM
26/11/2019	1.0.0.2	Fix Status register	MM

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1. INTRODUCTION

ATTENTION!

This user manual extends the information from the installation manual to the configuration of the device. Use the installation manual for more information.

ATTENTION!

In any case, SENECA s.r.l. or its suppliers will not be responsible for the loss of data/revenue or consequential or incidental damages due to negligence or bad/improper management of the device, even if SENECA is well aware of these possible damages.
SENECA, its subsidiaries, affiliates, group companies, suppliers and distributors do not guarantee that the functions fully meet the customer's expectations or that the device, firmware and software should have no errors or operate continuously.

1.1. DESCRIPTION

Z-SG2 is a load cell converter (strain gauge). The measurement, carried out with the 4 or 6-wire technique, is available via the MODBUS-RTU serial protocol or via the fully configurable analogue output.
The device is equipped with a new noise filter specifically developed to obtain a rapid response time. The device is fully configurable via the USB or RS485 ports using the Easy Setup configuration software.
Compared to its predecessor, it offers a new anti-noise filter and numerous new features, dramatically increasing product performance.

Model	Description	Communication protocol
Z-SG2	Strain Gauge converter with digital input/output and analogue output	Modbus RTU Slave
Z-SG2-L	Strain Gauge converter with digital input/output	Modbus RTU Slave

1.2. TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS	
Analogue/digital converter	24 Bit > of 16777000 points
Type of measurement	Unipolar ratiometric (compression only) or bipolar ratiometric (compression and traction)
Noise digital filter	New advanced digital filter with configurable response time from 16ms to about 2s. Filter advanced configuration possibility.
Analogue output response time	About 5ms.
Modbus port (RS485) response time	About 6ms.
Net weight resolution	Configurable, factory-set on 10000 points (automatic).
Isolated analogue output resolution	10000 points
Operating mode	Calibration with sample weight (in the field) or without calibration (factory calibration).
Isolated digital input/output	Yes, configurable between input/output.
USB port	Yes, on the front for the configuration, calibration, register reading. Drivers Virtual com port for Windows ™, Linux, MAC OS, Windows CE
Configuration and calibration software	Easy Setup, free. For Windows operating systems.
Isolated digital input functions	Configurable between tare reset or external digital input.
Isolated digital output functions	Configurable in alarm mode: - Cell bottom scale exceeded - Threshold and stable weighing exceeded - Stable weighing - Generic output controlled by Modbus - Threshold exceeded with hysteresis
Isolated analogue output (only Z-SG2)	Voltage/Current configurable. Fully configurable on the 0-10V / 0-20mA range.
Firmware update	Yes for the addition of new functions.
Sensitivity	From +-1 mV/V to +-64 mV/V
“Stable weighing” function	Yes, configurable
Automatic tare tracker function	Yes, configurable
Piece counting function	Yes, configurable
“Manual tare” function	Yes, configurable. It does not need to acquire the tare value from the field but it can be entered manually.

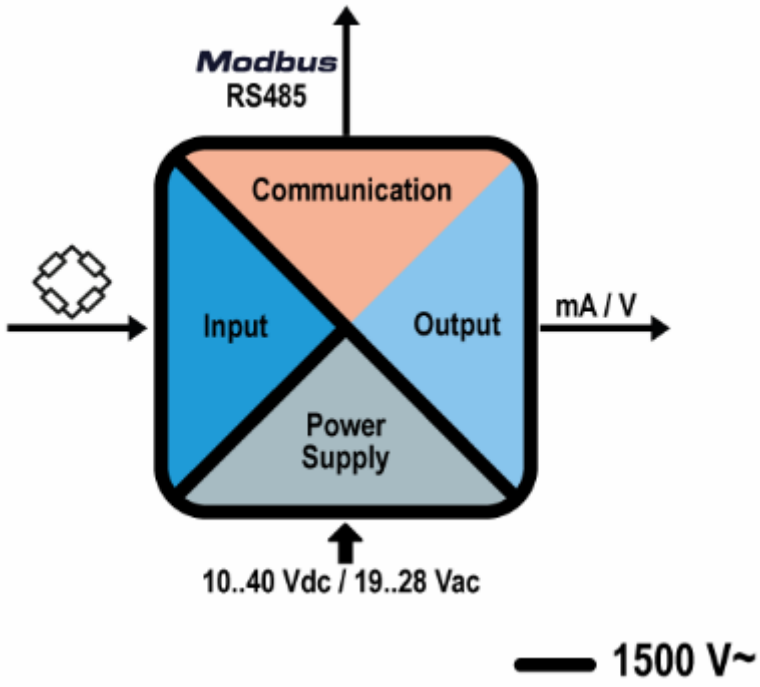
RS485 port baud rate	From 2400 to 115200 bit/s configurable
Parity, Delay in replying	Configurable
USB / RS485 port protocol	Modbus RTU Slave

2. LED SIGNALS

2.1. Z-SG2 / Z-SG2-L LED

LED SIGNALS ON THE Z-SG2 / Z-SG2-L FRONT		
LED	***STATUS***	***LED MEANING***
PWR	*ON*	Device powered
PWR	*OFF*	Device OFF
ERR	*ON*	Corrupted Flash memory
RX	*FLASHING*	Data receipt on RS485 port
TX	*FLASHING*	Data sending on RS485 port
TX	*ON*	Check RS485 port connection

3. INSULATION



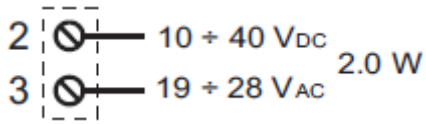
4. POWER SUPPLY

ATTENTION!

The upper power supply limits must not be exceeded, as this might cause serious damage to the module

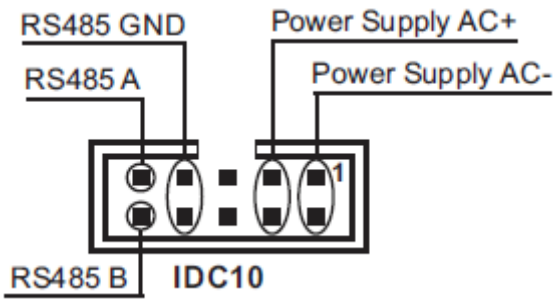
Switch the module off before connecting inputs and outputs.
To meet the electromagnetic immunity requirements:
- use shielded signal cables;
- connect the shield to a preferential instrumentation earth system;
- separate shielded cables from other cables used for power installations (transformers, inverters, motors, induction ovens, etc...)

The power supply must be connected to terminals 20 and 21.
The supply voltage must be between:
10 and 40Vdc (indifferent polarity), or between 19 and 28 Vac.



19 – 28 Vac 50 – 60 Hz
10 – 40 Vdc
Maximum absorption 2 W

If the ZPCDIN accessory is used, it is not necessary to wire the power supply (nor the RS485 port) as it is present in the IDC10 connector:



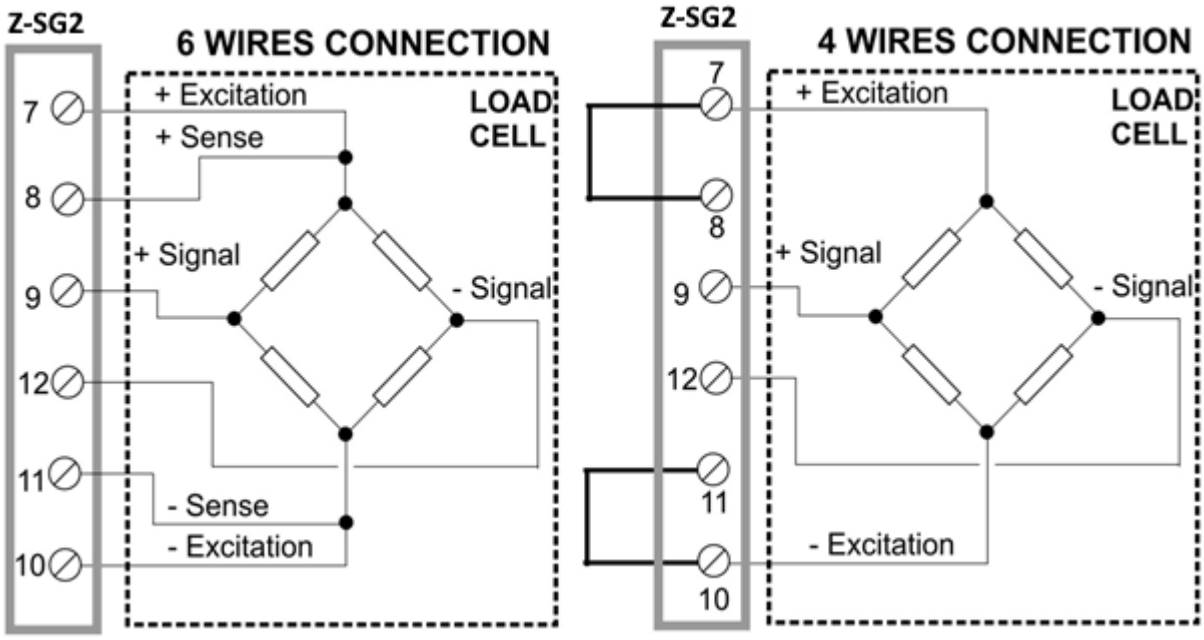
5. LOAD CELL CONNECTION

It is possible to connect the converter to the load cell in 4- or 6-wire mode. 6-wire measurement is preferable for measurement accuracy.
The load cell power supply is provided directly by Z-SG2.

5.1. 4 OR 6-WIRE LOAD CELL CONNECTION

A load cell can have a four-wire or six-wire cable. In addition to having the +/- excitation and +/- signal lines a six-wire cable also has the +/- sense lines. It is a common misconception to think that the only difference between 4- or 6-wire load cells is the possibility of the latter to measure the actual voltage at the load cell. A load cell is compensated to work within specifications in a certain temperature range (usually -10 - +40°C). Since the cable resistance depends on the temperature, the response of the cable to temperature changes must be eliminated. The 4-wire cable is part of the load cell temperature compensation system. The 4-wire load cell is calibrated and compensated with a certain amount of cable connected. For this reason, never cut the cable of a 4-wire load cell. The cable of a 6-wire cell, on the other hand, is not part of the load cell temperature compensation system. The sense lines are connected to the sense terminals of the indicator/meter, to measure and adjust the actual voltage of the load cell. The indicator/meter corrects the output voltage or its amplifier to compensate for the change in resistance in the cable. The advantage of using this "active" system is the possibility of cutting (or extending) the 6-wire load cell cable to any length. It must be considered that a 6-wire load cell will not reach the performance declared in the specifications if the sense lines are not used.

The figures show the two possible connections:



LOAD CELL CONNECTION		
SIGNAL	***TERMINAL No.***	***MEANING***
+Excitation	7	Cell supply (+)
+Sense	8	Reading of the supply to the cell (+)
+Signal	9	Load cell signal (+)
- Signal	12	Load cell signal (-)
- Sense	11	Reading of the supply to the cell (-)
- Excitation	10	Cell supply (-)

6. *CHECKING THE LOAD CELL OPERATION*

Before starting the configuration of the device it is necessary to verify the correctness of the wiring and the integrity of the load cell.

6.1. CHECKING CABLES WITH A DIGITAL MULTIMETER

First you need to check with the load cell manual that there are about 5V DC between the +Excitation and –Excitation cables. If the cell has 6 wires check that the same voltage is also measured between +Sense and –Sense.
Now leave the cell at rest (without the tare) and check that the voltage between the +Signal and –Signal cables is around 0 V.
Now unbalance the cell by applying a compression force, checking that the signal increases until it reaches the full scale (if possible) where the measurement will be approximately:

5* (cell sensitivity) mV.

For example, if the declared cell sensitivity is 2 mV/V, 5 * 2 = 10 mV must be obtained.

In the case of bipolar measurement only (compression/traction) it is necessary to completely unbalance the cell even in traction, in this case the same value must be measured between the +Signal and –Signal cables but with the negative sign:

-5* (cell sensitivity) mV.

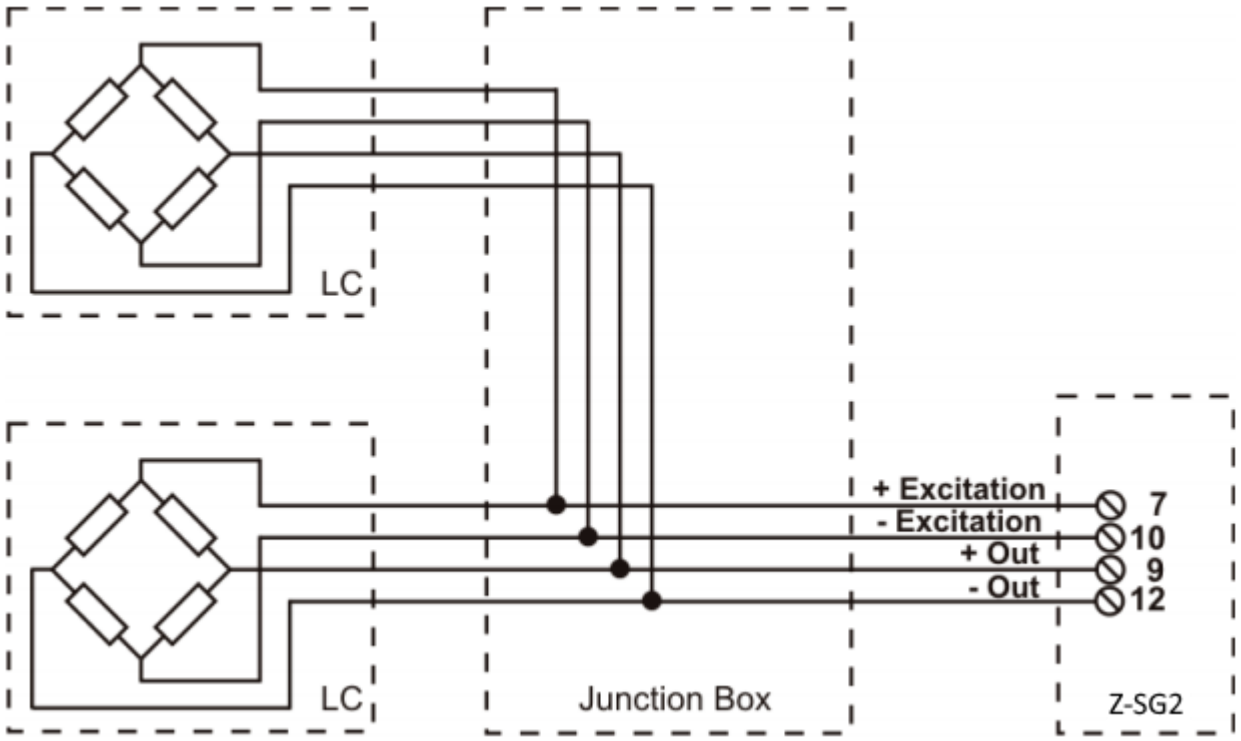
7. CONNECTION OF MORE LOAD CELLS IN PARALLEL

It is possible to connect up to a maximum of 8 load cells (and in any case without ever falling below the minimum 87 Ohms). It is therefore possible to connect:

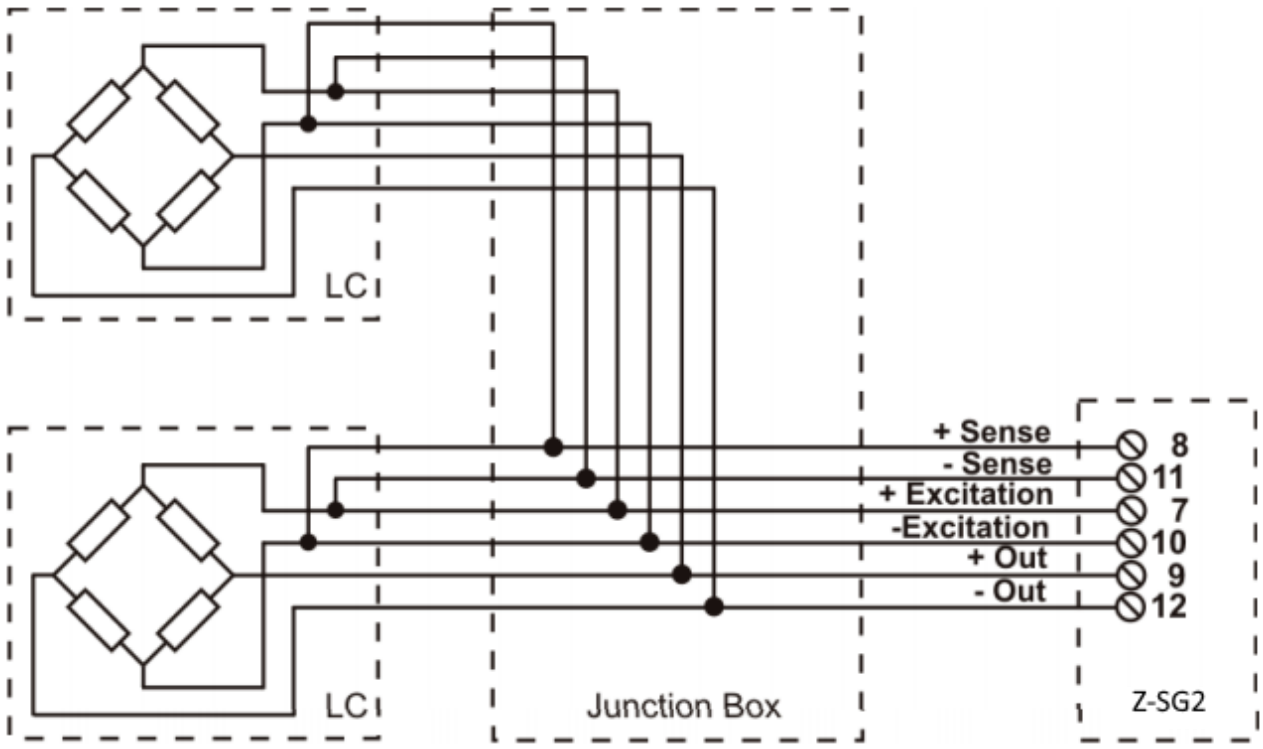
NUMBER OF LOAD CELLS IN PARALLEL	
IMPEDANCE OF THE STATED LOAD CELL [Ohm]	***MAXIMUM NUMBER OF CONNECTABLE CELLS IN PARALLEL***
350	4
1000	8

For the connection of 4 load cells Seneca recommends using the SG-EQ4 product.

To connect 2 or more 4-wire cells in parallel with the SG-EQ4 junction box, use the following diagram:



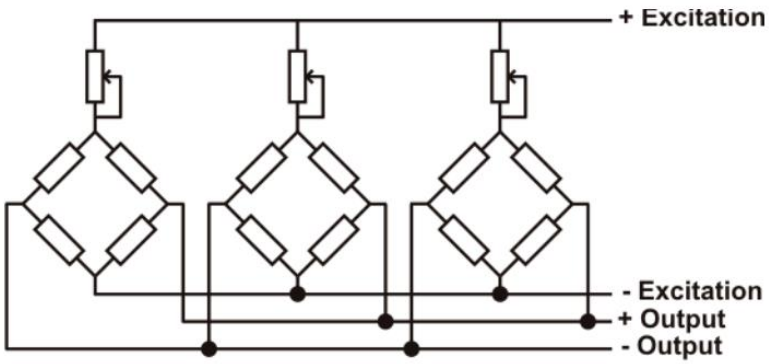
To connect 2 or more 6-wire cells in parallel with the SG-EQ4 junction box use the following diagram:



For more details, refer to the SG-EQ4 Junction Box accessory manual.

7.1. TRIMMING 4-WIRE LOAD CELLS

The figure below shows a diagram of three trimmed load cells.

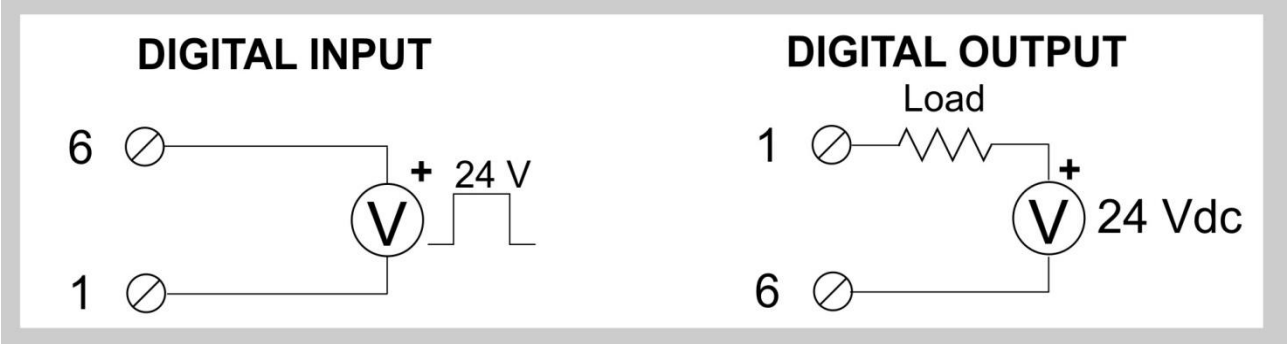


A variable resistor, independent of the temperature, or a typically 20 Ω potentiometer is inserted in the +Excitation cable of each load cell. There are two ways to trim the load cells: The first method is to adjust the potentiometers by trial, shifting the calibration weights from one corner to another. All the potentiometers must be adjusted so as to set the maximum sensitivity for each cell, turning them all completely clockwise. Then, once the angle with the lowest output is located, act on the trimmers of the other cells until obtaining the same minimum output value. This method can be very long, especially for large scales where the use of test weights

on the corners is not very practical. In these cases the second, more suitable method is to "pre-trim" the potentiometers using a precision voltmeter (at least 4 1/2 digits). You can use the following procedure:
1) Determine the exact mV/V ratio of each load cell, shown in the calibration certificate of the cell itself.
2) Determine the exact excitation voltage provided by the indicator/meter (for example Z-SG), measuring this voltage with the voltmeter (for example 10.05 V).
3) Multiply the lowest mV/V value found (point 1) by the excitation voltage (point 2).
4) Divide the trimming factor calculated in point 3 by the mV/V value of the other load cells.
5) Measure and adjust the excitation voltage of the other three load cells using the respective potentiometer. Check the results and make a final adjustment by moving a test load from corner to corner.

8. DIGITAL OUTPUT / INPUT CONNECTIONS

The device can be configured with a digital input or output.
The digital input can be configured to reset the tare if it is active for more than 3 seconds.
The digital output can be linked to a series of events (for example alarm on threshold, stable weighing etc ...).
In the case of configuration as a digital input or as a digital output, the connection diagram is as follows:

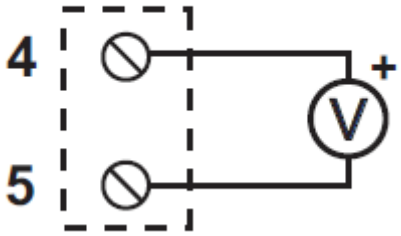


8.1.1. ANALOGUE OUTPUT CONNECTIONS (Z-SG ONLY)

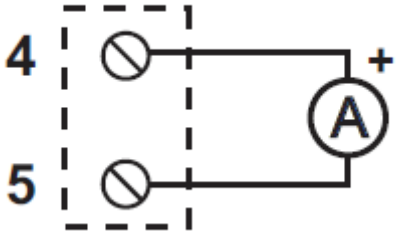
The Z-SG device has an analogue output that can be configured for either voltage or current.
The operating ranges are 0-10V for the voltage output, 0-20 mA for the current output.
It is possible to freely configure the output in the entire range.

The wiring diagrams are:

Analogue voltage output:



Analogue current output:



8.2. RS485 PORT CONNECTIONS

The device has an RS485 serial port to be connected to the Z-PC-DINAL accessory and therefore directly connected to the Seneca Z-PC range of devices:

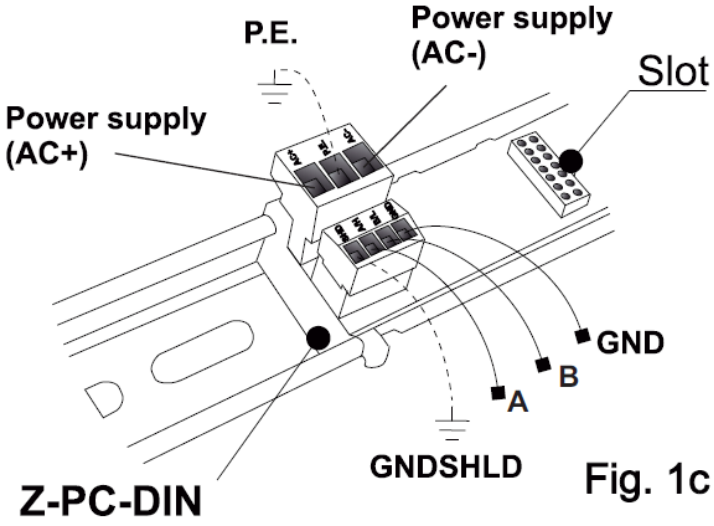


Fig. 1c

Find below the pins for connector IDC10:

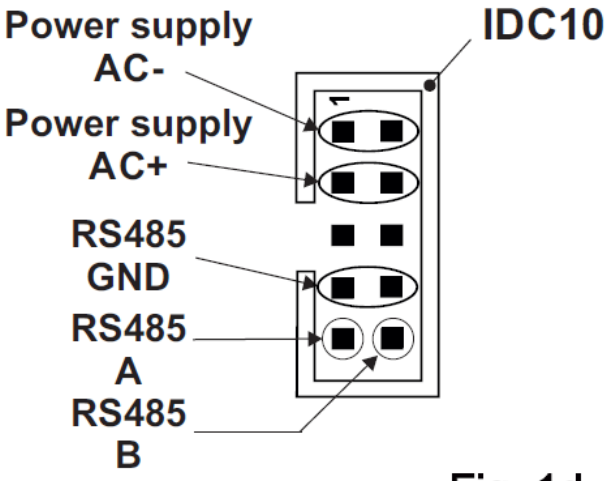


Fig. 1d

The protocol available through the RS485 port is Modbus RTU Slave.

9. CONFIGURATION OF THE RS485 PORT BY DIP SWITCH

The SW1 dip switch is used to configure the parameters related to the RS485 communication port.

DIP switches 1 and 2 are used for the baud rate of the RS485 port
DIP switches 3 to 8 are used for the Modbus station address of the RS485 port

ATTENTION!

The configuration via dip switch is active only after a restart!

ATTENTION!

The configuration via dip switch has priority over the one saved in flash, if you need to use the configuration of the RS485 port sent by Easy Setup you must bring all the dip switches 1..8 to "OFF" and restart the device.

9.1. CONFIGURATION OF THE FLASH MEMORY RS485 PORT

If ALL the dip switches 1 ... 8 are OFF, the device uses the configuration saved in Flash (configured with the Easy Setup software) for the RS485 port.

RS485 configuration	*DIP1*	*DIP2*	*DIP3*	*DIP4*	*DIP5*	*DIP6*	*DIP7*	*DIP8*
FROM FLASH	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

9.2. SETTING THE BAUD RATE OF THE RS485 PORT BY DIP SWITCH

Dip switches 1 and 2 configure the baud rate.

Baud Rate	*DIP1*	*DIP2*
9600	OFF	OFF
19200	OFF	ON
38400	ON	OFF
57600	ON	ON

ATTENTION !

The parity bit and other baud rates can only be configured via the Easy Setup software.
Setting the dip switches, parity will always be "No" and stop bits always at 1.

9.3. SETTING THE MODBUS STATION ADDRESS OF THE RS485 PORT BY DIP SWITCH

Dip switches 3 to 8 are used to configure the modbus station address of the RS485 port using the binary convention:

Modbus Station Address	*DIP3*	*DIP4*	*DIP5*	*DIP6*	*DIP7*	*DIP8*
1	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	OFF	ON	ON
4	OFF	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	OFF	ON	OFF	ON
6	OFF	OFF	OFF	ON	ON	OFF
7	OFF	OFF	OFF	ON	ON	ON
8	OFF	OFF	ON	OFF	OFF	OFF
9	OFF	OFF	ON	OFF	OFF	ON
10	OFF	OFF	ON	OFF	ON	OFF
11	OFF	OFF	ON	OFF	ON	ON
12	OFF	OFF	ON	ON	OFF	OFF
13	OFF	OFF	ON	ON	OFF	ON
14	OFF	OFF	ON	ON	ON	OFF
15	OFF	OFF	ON	ON	ON	ON
…	…	…	…	…	…	…
63	ON	ON	ON	ON	ON	ON

ATTENTION !

To set station addresses > 63 it is necessary to use the Easy Setup software.

9.4. SETTING THE R-C TERMINATOR BY SW3 DIP SWITCH

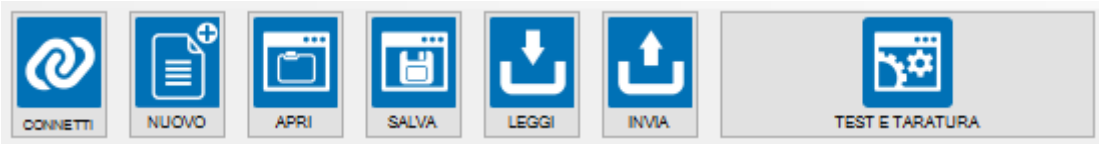
Usually it is not necessary to use a terminator on the RS485 line unless this is inserted into the bus by some other device (for example some modbus masters have a terminator that cannot be removed).

Terminator	*DIP SW3*
OFF	OFF
ON	ON

10. COMPLETE CONFIGURATION WITH EASY SETUP

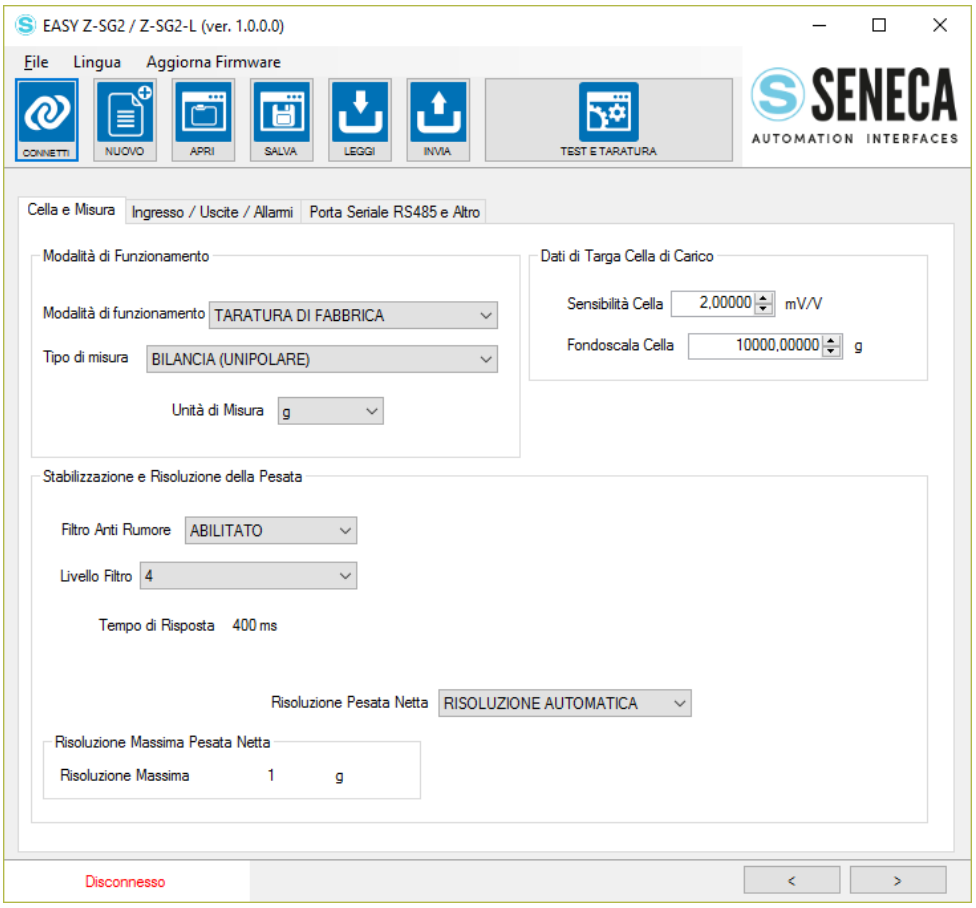
To configure the device it is necessary to install the free "Easy Setup" software suite which can be downloaded in section Z-SG2/Z-SG2-L of the www.seneca.it website.

10.1. EASY SETUP MENU



Connect: Allows connecting the device to the PC.
New: Loads the default (factory) parameters onto the current project.
Open: Opens a previously saved project.
Save: Saves the current project
Read: Reads the current configuration from the device
Send: Sends the configuration (if the dip switches ARE NOT ALL OFF the device uses the configuration of the RS485 by dip switch and NOT the one sent by the configuration)
Test and Calibration: Opens a new screen to read the main registers and allows you to send the commands for the calibration of the load cell to the device.

10.2. CREATING A PROJECT



ATTENTION!

It is necessary to set all the dip switches to OFF before sending the configuration to the device or the configuration of the RS485 port will be consistent with the dip switch settings!

10.2.1. OPERATING MODE

It allows to configure the basic operation of the device, can be set to factory calibration or to Calibration with Sample weight:

10.2.1.1. FACTORY CALIBRATION

It is used when a load cell with declared sensitivity (cell calibration) combined with the calibration of the device's factory full scale is available.
In this mode the calibration consists only in acquiring the tare directly on the field with a direct measurement or manually entering the tare value. For more information refer to chapters 11 and 14 of the manual.

10.2.1.2. CALIBRATION WITH SAMPLE WEIGHT

It is used when a sample weight is available (as far as possible towards the load cell full scale).
In this mode the calibration consists in acquiring both the tare and the sample weight directly on the field. For more information refer to chapters 11 and 14 of the manual.

10.2.2. TYPE OF MEASUREMENT

It allows to configure the operation of the device between:

10.2.2.1. COMPRESSION ONLY (SCALES)

It is used when a scale is being created in which the load cell is only compressed, in this case the maximum resolution of the compression measurement is obtained.

10.2.2.2. COMPRESSION AND TRACTION

It is used when a measurement system (typically of force) is being created that can both compress and extend the load cell. In this case the direction of the force can also be decided, if compression the measurement will have the + sign, if traction it will have the - sign. A typical case of use is to link the direction of the force to the analogue output so that, for example, 4mA correspond to the maximum traction force and 20mA correspond to the maximum compression force (in this case the cell at rest will provide 12Ma).

10.2.3. UNIT OF MEASUREMENT

It allows to set the weighing unit of measurement (selectable between Kg, g, t, etc. ...)

10.2.4. CELL SENSITIVITY

It is the value expressed in mV/V declared by the cell (in most cells it is 2mV/V).

10.2.5. CELL FULL SCALE

It is the value expressed in the selected unit of measurement declared by the cell.

10.2.6. SAMPLE WEIGHT

If the mode of operation with sample weight has been chosen, it is necessary to enter the value of the sample weight that will be used in the calibration.

10.2.7. NOISE FILTER

It enables or disables the noise filter for the weight measurement. The filter consists of two sections:
In the first there is an anti-noise filter based on a statistic obtained from the input, in the second there is a filter in moving average.
If the noise filter is disabled, it will still be possible to act on the moving average and on the ADC speed (see chapter 10.2.9).

10.2.8. FILTER LEVEL

It is possible to configure a pre-set filter level (this is a combination of the two sections described above). Depending on the level, the response time will also appear, in particular:

FILTER LEVEL	*RESPONSE TIME [ms]*
0	16
1	32
2	50
3	250
4	400 (default)
5	900
6	1800
ADVANCED	Dependent on the configuration

The higher the filter level the more stable (but slow) the weight measurement will be.
In the "Advanced" mode it will be possible to act on the individual filter parameters (to be used only by experts or on the advice of Seneca personnel).

10.2.9. ADVANCED FILTERING

These parameters can only be configured by expert personnel or at the suggestion of Seneca:

10.2.9.1. NUMBER OF SAMPLES OF THE MOVING AVERAGE

It is the number of samples on which the moving average is calculated, the more it increases and the slower and more stable the response of the filter is (minimum 1, maximum 100).

10.2.9.2. ADC CHOPPING

It allows you to enable the ADC chopping feature (it decreases acquisition speed and noise and improves ADC performance).
This mode can only be activated with the calibration with sample weight mode.

10.2.9.3. ADC SPEED

It is a parameter that configures the sampling rate of the ADC.

With *ADC CHOPPING DISABLED* it can be configured from 3 (maximum speed) to 255 (minimum speed).
The speed is calculated with the formula:

$$f_{ADC}[Hz] = \frac{4096}{ADC\_speed\_register}$$

So for example with the value 3 we get an ADC speed of:

$$f_{ADC}[Hz] = \frac{4096}{3} = 1365\ Hz$$

With *ADC CHOPPING ENABLED* it can be configured from 13 (maximum speed) to 255 (minimum speed). The speed is calculated with the formula:

$$f_{ADC\ CHOP}[Hz] = \frac{4096}{3 * ADC\_speed\_register}$$

So for example with the value 13 we get an ADC speed of:

$$f_{ADC}[Hz] = \frac{4096}{13 * 3} = 105\ Hz$$

10.2.9.4. NOISE VARIATION IN ADC POINTS

It represents the variation in ADC points due to noise alone.

10.2.9.5. FILTER RESPONSE SPEED

It represents a parameter related to the filter response speed, it can vary from 0.001 (slowest response) to 1 (fastest response).

10.2.10. NET WEIGHING RESOLUTION

It is the resolution with which the net weight value is represented.

10.2.10.1. MAXIMUM RESOLUTION

It will represent the net weight with the highest possible resolution

10.2.10.1. MANUAL

It will represent the net weight with the manual resolution set (in engineering units).
For example, by setting 0.1 Kg you will get that the net weight can only vary by multiples of 100g.

10.2.10.2. AUTOMATIC RESOLUTION

It will represent the net weight with a calculated resolution of about 11000 points. Unlike Maximum or Manual resolution, this setting limits also the ADC value and therefore affects all measurements.

CAUTION

Keep in mind that in the "Calibration with sample weight" mode, using the "Manual Resolution", the correct sample weight value may not be perfectly represented:

For example, you have:

Cell full scale 15000 g
Sample weight 14000 g
Manual Resolution 1.5 g

The value of the sample weight (14000 g) cannot be represented with the resolution in 1.5g steps (14000/1.5g = 9333.333 is not an integer value) so it will be represented as: 9333*1.5g = 13999.5g
To avoid this effect, use a resolution that allows the value to be represented (for example 1g or 2g).

10.2.11. DIGITAL INPUT/OUTPUT SELECTION

It selects whether the Z-SG2 digital channel is configured as an input or an output.

10.2.12. DIGITAL INPUT CONFIGURATION

If the digital channel is set as an input, it is possible to select its behaviour:

10.2.12.1. ACQUIRES THE TARE

In this mode, if the digital input is activated for a time longer than 3 seconds, a new tare value is acquired (in RAM, then it is lost upon restart). It is equivalent to sending the command 49594 (decimal) in the command register (see chapter 16.6).

10.2.12.2. EXTERNAL DIGITAL INPUT

In this mode the status of the digital input has no effect other than the display of the status in the Modbus STATUS register.

10.2.13. DIGITAL OUTPUT OPERATION MODE

If the digital channel is set as an output, you can select its behaviour:

10.2.13.1. CELL FULL SCALE

In this mode the output is activated when the gross weight reaches the full scale.

10.2.13.2. EXCEEDING THE THRESHOLD AND STABLE WEIGHING

In this mode the output is activated when the net weight exceeds the set threshold and the stable weighing condition is verified.

10.2.13.3. STABLE WEIGHING

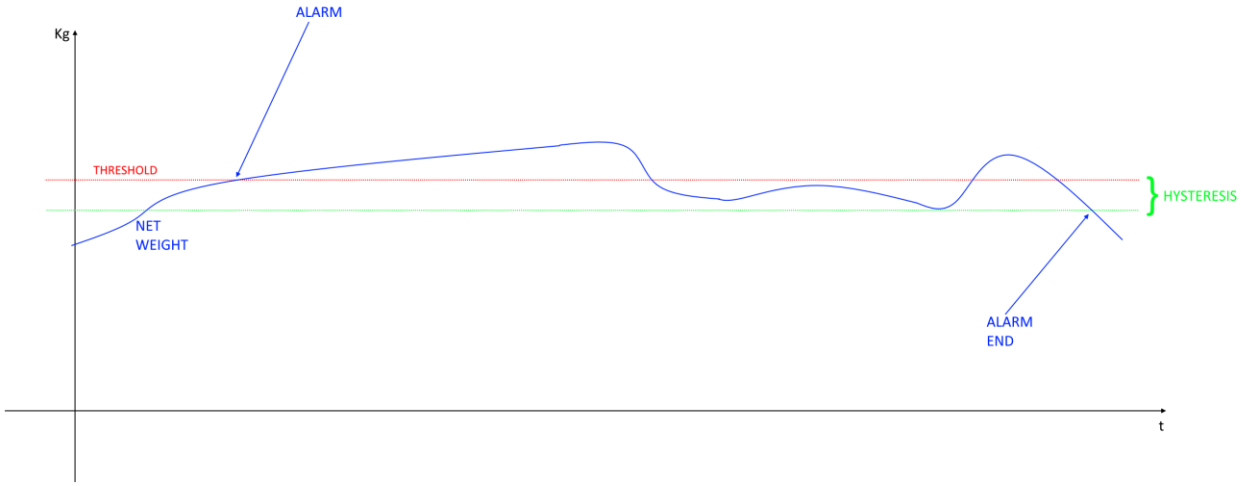
In this mode the output is activated when the stable weighing condition is verified.

10.2.13.4. MODBUS CONTROLLABLE

In this mode the output can be controlled directly by modbus (see STATUS register in the chapter 16.6).

10.2.13.5. EXCEEDED THRESHOLD WITH HYSTERESIS (ALARM)

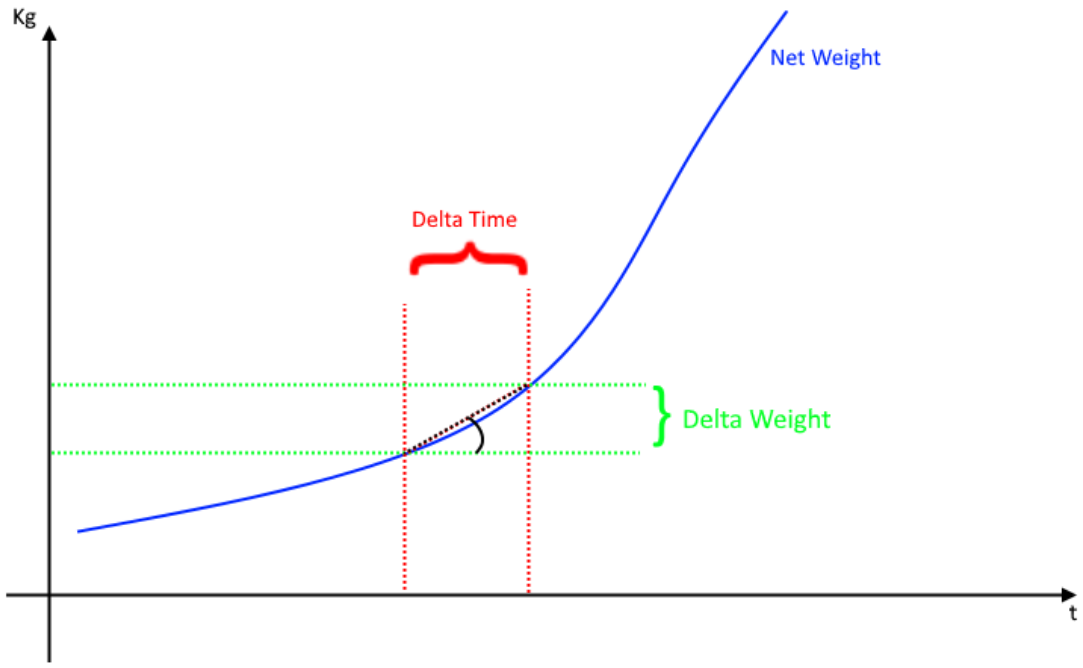
In this mode the output is activated when the net weight reaches the threshold, the alarm is cancelled when the net weight falls below the Threshold-Hysteresis value:



10.2.14. STABLE WEIGHING CONDITION

The stable weighing condition is used to indicate that the net weight measurement is stable if:

The net weight remains within the weight $\Delta peso\_netto$ over time $\Delta tempo$ or if the slope of the curve drawn by the net weight is less than $\frac{\Delta peso\_netto}{\Delta tempo}$:



10.2.14.1. DELTA WEIGHT

It is the maximum variation of the net weight accepted in the time defined by Delta Time.

10.2.14.2. DELTA TIME

It is the time (in quanta of 100 ms) in which the net weight must vary less than the Delta Weight set value.

10.2.15.NET WEIGHING ALARM

It is the threshold value in technical units (see 10.2.13

10.2.16.HYSTERESIS

It is the hysteresis value used in the digital output mode "EXCEEDED THRESHOLD WITH HYSTERESIS" see 10.2.13.5

10.2.17.ANALOGUE OUTPUT TYPE

The analogue output follows the value of the net weight measurement, it is possible to choose between:

10.2.17.1. VOLTAGE

If you select the voltage analogue output, the output can vary (depending on the configuration) between 0V and 10V.

10.2.17.2. CURRENT

If the analogue current output is selected, the output can vary (depending on the configuration) between 0mA and 20mA.

10.2.18.ANALOGUE OUTPUT CONFIGURATION

The analogue output is completely configurable passing 4 points: two of net weight and two of analogue output:
Example:

We would like the analogue output to be 4 mA with a net weight of 0 Kg and 20 mA with a net weight of 10 Kg:

With net weighing 0 Kg the output must be 4 mA
With net weighing 10 Kg the output must be 20 mA

Between these two points the value is linear (for example at 5 Kg the output will be 12 mA).

10.2.19.STATION ADDRESS

It represents the station address used in the Modbus RTU slave protocol available in the RS485 port.

10.2.20.BAUD RATE

It selects the baud rate to be used in the communication from the RS485 port.

10.2.21.PARITY

It sets whether the communication of the RS485 port must take place with or without even or odd parity.

10.2.22.DELAY IN REPLYING

It introduces the delay to the Modbus response in number of characters.

10.2.23.SAMPLE WEIGHT

It sets the weight of a single piece in technical units for the "piece weighing" mode. By setting the net weight of a single element in this register, Z-SG2 will be able to indicate the number of pieces present in the scales according to the relation:

$$Nr\ pieces = \frac{Net\ Weight}{One\ Piece\ Weight}$$

10.2.24.AUTOMATIC TARE TRACKER

It allows Z-SG2 to set the automatic tare reset.

10.2.24.1. TARE TRACKER

It allows you to enable or disable the automatic tare reset.

10.2.24.2. ADC VALUE

It allows to set the number of ADC points within which to reset the tare automatically.
If after 5 seconds of stable weighing condition the ADC value of the net weight deviates by less than this value then a new tare is acquired.

For example, if the tare ADC value is 5670 points and if the tare tracking ADC value is 10 points, a new tare will be acquired if the ADC value of 5675 points is stable for 5 seconds.

10.2.25.FLOATING POINT REPRESENTATION OF THE MEASUREMENTS

It allows to configure the type of representation of the floating point values of the measurements (while the configuration parameters do not change operation).

10.2.25.1. FIRST PART H THEN L

The floating point value is represented so that the most significant part is on the lowest modbus address (standard).

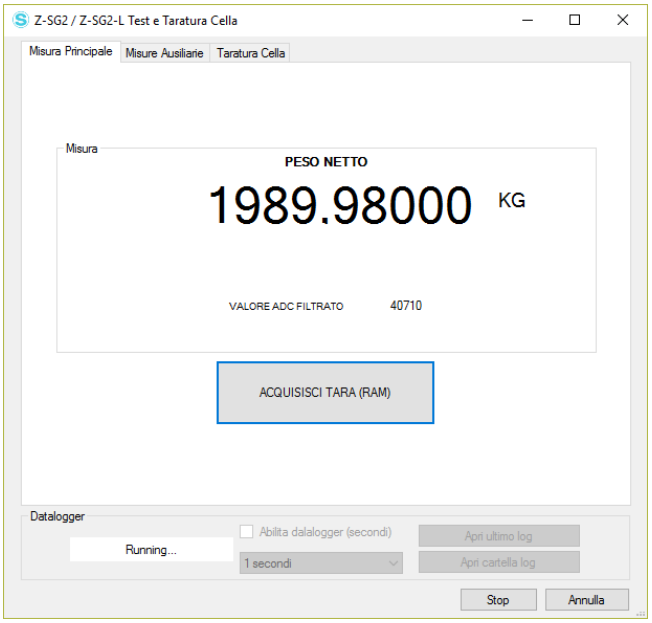
10.2.25.2. FIRST PART I THEN h

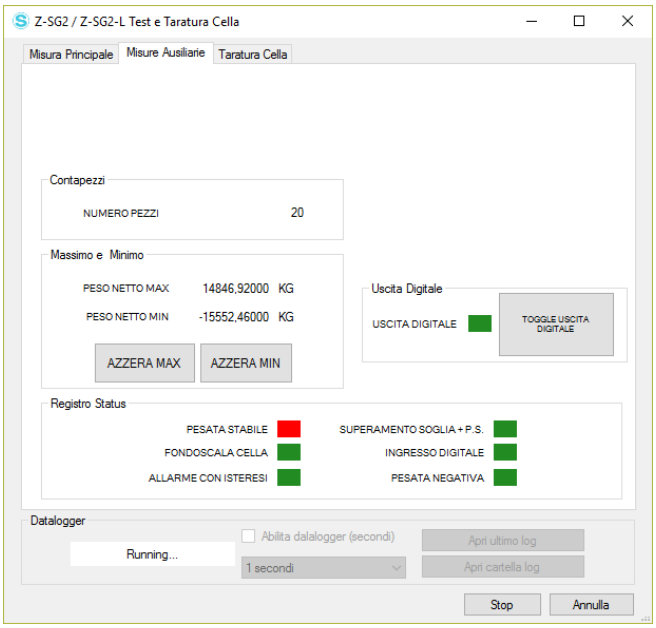
The floating point value is represented so that the most significant part is on the highest modbus address.

10.3. DEVICE TEST

When the configuration is sent, by pressing the 

button it is possible to check the configuration sent:





The test will continue to request registers via Modbus and it will be possible to send commands using the appropriate commands.
It is also possible to calibrate the cell or start the data logger.

10.3.1. THE DATA LOGGER

The data logger can be used to acquire data that can be used with external software (e.g. Microsoft Excel™).
The sample acquisition time can be set (minimum 1 second).
The data logger will create a text file in a standard .csv format.

11. CALIBRATION OF THE LOAD CELL WITH THE EASY SETUP SOFTWARE

In the Calibration section of the configuration test it is possible to easily calibrate a load cell.

From the main menu press the 

button to enter the configuration test, now select the Cell calibration tab:

11.1. FACTORY CELL CALIBRATION

When factory calibrating the cell it is not necessary to use a sample weight for calibration. The data that are always required for calibration are:

-Cell sensitivity
-Cell full scale

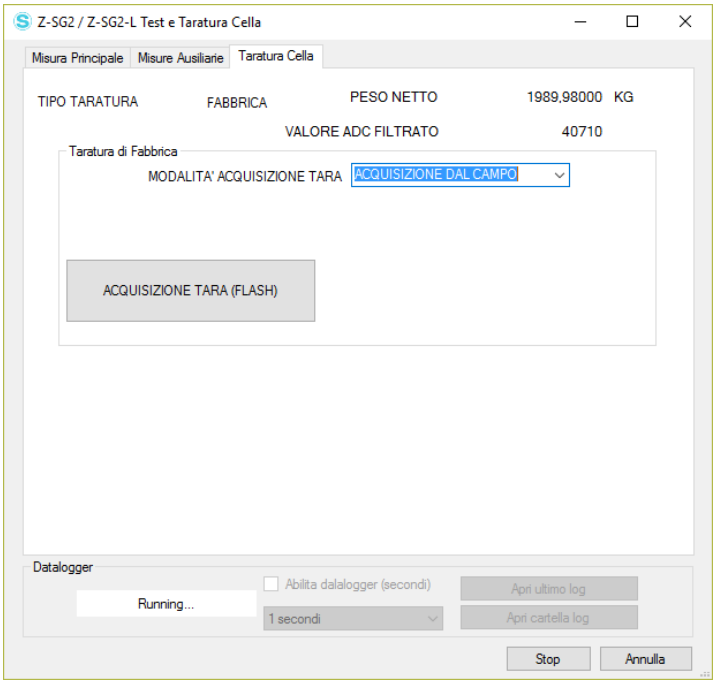
Now you can choose how to acquire the tare choosing between:

Field or Manual.

11.2. FACTORY CALIBRATION WITH TARE ACQUISITION FROM THE FIELD

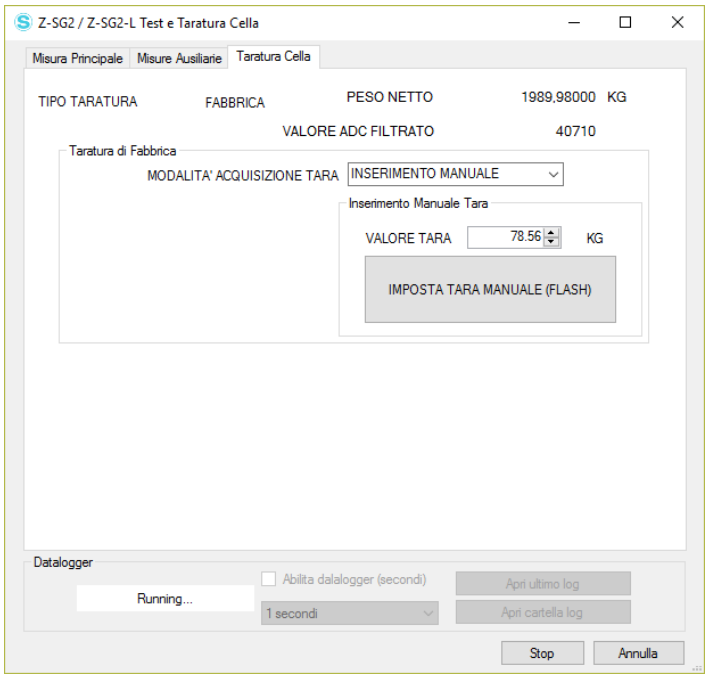
In the tare acquisition mode from the field, proceed as follows for calibration:

1) Replace the tare on the cell
2) Wait for the measurement to stabilize
3) Press the "TARE ACQUISITION (FLASH)" button



11.3. FACTORY CALIBRATION WITH MANUAL TARE ACQUISITION

It is not always possible to acquire the tare value from the field (for example in the case of already filled silos), in these cases it is possible to introduce the tare weight in technical units:



In Manual calibration mode, proceed as follows for calibration:

1) Set the Tare value in technical units
2) Press the "SET MANUAL TARE (FLASH)" button

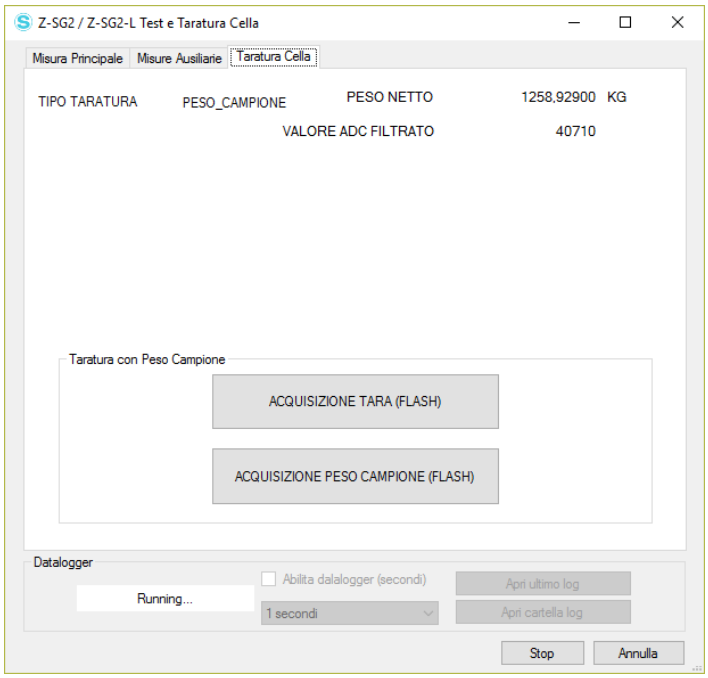
ATTENTION!

To obtain better measurement accuracy, use the tare acquisition mode from the field.

11.4. CELL CALIBRATION WITH A SAMPLE WEIGHT

In cell calibration with a sample weight it is necessary to have or know:

-The cell sensitivity
-The cell full scale
- A sample weight (such that its gross weight is as close as possible to the full scale)



In Sample Weight mode, proceed as follows for calibration:

1) Replace the tare on the cell
2) Wait for the measurement to stabilize
3) Press the "TARE ACQUISITION (FLASH)" button
4) Replace the Tare + Sample Weight
5) Wait for the measurement to stabilize
6) Press the "SAMPLE WEIGHT ACQUISITION (FLASH)" button

12. USB PORT

The front USB port allows a simple connection using the Modbus RTU slave protocol, the communication parameters for the USB port cannot be modified and are:

Baud rate: 38400
Address of the Modbus RTU station: 1
Data Bit: 8
Stop bit: 1

⚠ ATTENTION!

IT IS NOT POSSIBLE TO COMMUNICATE SIMULTANEOUSLY FROM BOTH THE RS485 PORT AND THE USB PORT, THE USB PORT HAS PRIORITY (WHEN THE USB CABLE IS INSERTED, THE COMMUNICATION IS ONLY FROM THE USB).
TO GET THE COMMUNICATION ON THE RS485 IT IS NECESSARY TO DISCONNECT THE USB CABLE.

12.1. DRIVERS FOR WINDOWS SYSTEMS

Drivers for Windows systems can be downloaded from the device's web page.
The drivers are however installed automatically with the installation of the "Easy Setup" software.

12.2. DRIVERS FOR LINUX SYSTEMS

In many Linux distributions the drivers of this port are already included (for example Raspbian for Raspberry Pi devices). It is possible to consult the web page of the device on the Seneca website for more information.

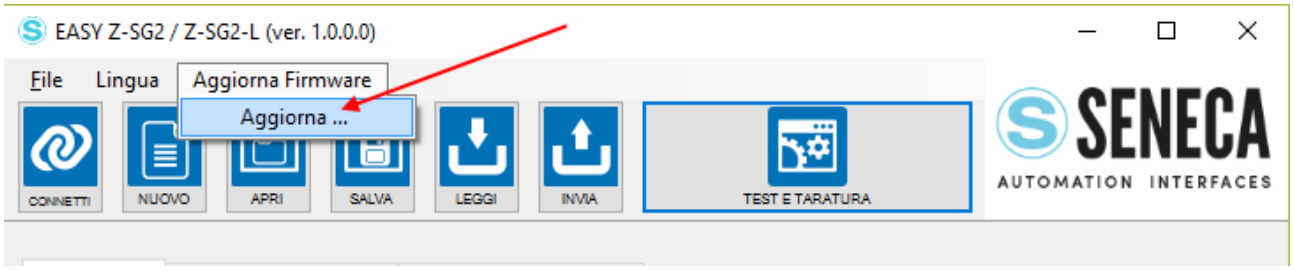
13. FIRMWARE UPDATE

In order to improve, add, optimize the functions of the product, Seneca releases firmware updates on the device section on the www.seneca.it website

⚠ ATTENTION!

NOT TO DAMAGE THE DEVICE DO NOT REMOVE THE POWER SUPPLY DURING THE FIRMWARE UPDATE OPERATION.

To update the firmware in the menu, select Update Firmware-> Update:



To bring the device in bootloader mode, follow the procedure below:

1) Remove power from the device
2) Keep the side button pressed
3) Power the device keeping the side device pressed
4) Wait a few seconds
5) Release the side button

To exit bootloader mode and return to the normal device operation, just:

1) Turn off the device
2) Power the device without pressing the side button

14. LOAD CELL CALIBRATION WITH MODBUS REGISTERS

Sometimes it is not possible to use the Easy Setup software to calibrate the load cell, for example if a PLC or an HMI is to be used.
It is possible to easily implement the calibration of a load cell by sending Modbus commands depending on the type of operation chosen.

14.1. CALIBRATION PROCEDURE WITH AN EXTERNAL DEVICE (FACTORY CALIBRATION WITH TARE ACQUIRED FROM THE FIELD)

1) Place the tare on the load cell
2) Wait for the measurement to stabilize
3) Write the decimal value 49914 in the COMMAND REGISTER
4) The device saves the new tare value in flash and resets the COMMAND REGISTER value
5) The load cell is calibrated

14.2. CALIBRATION PROCEDURE WITH AN EXTERNAL DEVICE (FACTORY CALIBRATION WITH MANUALLY INSERTED TARE)

1) Write the tare value in technical units in the FACTORY MANUAL TARE registers
2) Write the decimal value 50773 in the COMMAND REGISTER
3) The device acquires the new flash tare value and resets the COMMAND REGISTER value
4) The load cell is calibrated

14.3. CALIBRATION PROCEDURE WITH AN EXTERNAL DEVICE (CALIBRATION WITH SAMPLE WEIGHT)

1) Place the tare on the load cell
2) Wait for the measurement to stabilize

3) Write the decimal value 49914 in the COMMAND REGISTER
4) The device saves the new tare value in flash and resets the COMMAND REGISTER value
5) Enter the weight value of the sample weight in technical units in the STANDARD WEIGHT VALUE registers
6) Place the sample weight on the load cell
7) Wait for the measurement to stabilize
8) Write the decimal value 50700 in the COMMAND REGISTER
9) The device saves the new sample weight value in flash and resets the COMMAND REGISTER value
10) The load cell is calibrated

15. MODBUS RTU SLAVE COMMUNICATION PROTOCOL

The communication protocol is:

- Modbus RTU Slave (from both the RS485 and USB ports)

For more information on these protocols, see the website:
http://www.modbus.org/specs.php.

15.1. SUPPORTED MODBUS FUNCTION CODES

The following Modbus functions are supported:

- Read Holding Register (function 3)
- Write Single Register (function 6)
- Write Multiple registers (function 16)

ATTENTION!

All 32-bit values are contained in 2 consecutive registers

ATTENTION!

Any registers with RW* (in flash memory) can be written up to 10000 times
The PLC/Master Modbus programmer must not exceed this limit

16. MODBUS REGISTER TABLE

The following abbreviations are used in the register tables:

MS = More significant
LS = Less significant
MSW = 16 most significant bits
LSW = 16 least significant bits
MSW* = 16 most significant or least significant bits depending on the configuration (most significant default)
LSW* = 16 less significant or more significant bits depending on the configuration (less significant default)
MSW = 8 most significant bits
LSW = 8 least significant bits
MSBIT = Most significant bit
MSBIT = Least significant bit
RO = Register in read-only
RW = Read/write register
RW** = Reading and writing register contained in flash memory, writable a maximum of 10000 times.
Unsigned 16 bit = unsigned integer register, can take values from 0 to 65535
Signed 16 bit = signed integer register can take values from -32768 to +32767
Float 32 bits = 32-bit single-precision floating point register (IEEE 754) https://en.wikipedia.org/wiki/IEEE_754
BIT = Boolean registry, can be 0 (false) or 1 (true)

16.1. NUMBERING OF "0-BASED" OR "1-BASED" MODBUS ADDRESSES

According to the Modbus standard the Holding Register registers are addressable from 0 to 65535, there are 2 different conventions for numbering the addresses: "0-BASED" and "1-BASED".
For greater clarity, Seneca shows its register tables in both conventions.

ATTENTION!

CAREFULLY READ THE DOCUMENTATION OF THE MODBUS MASTER DEVICE IN ORDER TO UNDERSTAND WHICH OF THE TWO CONVENTIONS THE MANUFACTURER HAS DECIDED TO USE

16.1.1. NUMBERING OF MODBUS ADDRESSES WITH "0-BASED" CONVENTION

The numbering is:

HOLDING REGISTER MODBUS ADDRESS (OFFSET)	*MEANING*
0	FIRST REGISTER
1	SECOND REGISTER
2	THIRD REGISTER
3	FOURTH REGISTER
4	FIFTH REGISTER

Therefore the first register is at address 0.
In the following tables, this convention is indicated with ***"ADDRESS OFFSET".***

16.1.2. NUMBERING OF MODBUS ADDRESSES WITH "1 BASED" CONVENTION (STANDARD)

The numbering is that established by the Modbus consortium and is of the type:

HOLDING REGISTER MODBUS ADDRESS 4x	*MEANING*
40001	FIRST REGISTER
40002	SECOND REGISTER
40003	THIRD REGISTER
40004	FOURTH REGISTER
40005	FIFTH REGISTER

In the following tables this convention is indicated with ***"ADDRESS 4x"*** since a 4 is added to the address so that the first Modbus register is 40001.

A further convention is also possible where the number 4 is omitted in front of the register address:

HOLDING MODBUS ADDRESS WITHOUT 4x	*MEANING*
1	FIRST REGISTER
2	SECOND REGISTER
3	THIRD REGISTER
4	FOURTH REGISTER
5	FIFTH REGISTER

16.2. BIT CONVENTION WITHIN A MODBUS HOLDING REGISTER

A Modbus Holding Register consists of 16 bits with the following convention:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0

For instance, if the value of the register in decimal is
12300
the value 12300 in hexadecimal is:
0x300C

the hexadecimal 0x300C in binary value is:
11 0000 0000 1100

So, using the above convention, we get:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0

16.3. MSB and LSB BYTE CONVENTION WITHIN A MODBUS HOLDING REGISTER

A Modbus Holding Register consists of 16 bits with the following convention:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0

LSB Byte (Least Significant Byte) defines the 8 bits ranging from Bit 0 to Bit 7 included, we define MSB Byte (Most Significant Byte) the 8 bits ranging from Bit 8 to Bit 15 inclusive:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
BYTE MSB								BYTE LSB							

16.4. REPRESENTATION OF A 32-BIT VALUE IN TWO CONSECUTIVE MODBUS HOLDING REGISTERS

The representation of a 32-bit value in the Modbus Holding Registers is made using 2 consecutive Holding Registers (a Holding Register is a 16-bit register). To obtain the 32-bit value it is therefore necessary to read two consecutive registers:

For example, if register 40064 contains the 16 most significant bits (MSW) while register 40065 contains the least significant 16 bits (LSW), the 32-bit value is obtained by composing the 2 registers:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
40064 MOST SIGNIFICANT WORD															

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
40065 LEAST SIGNIFICANT WORD															

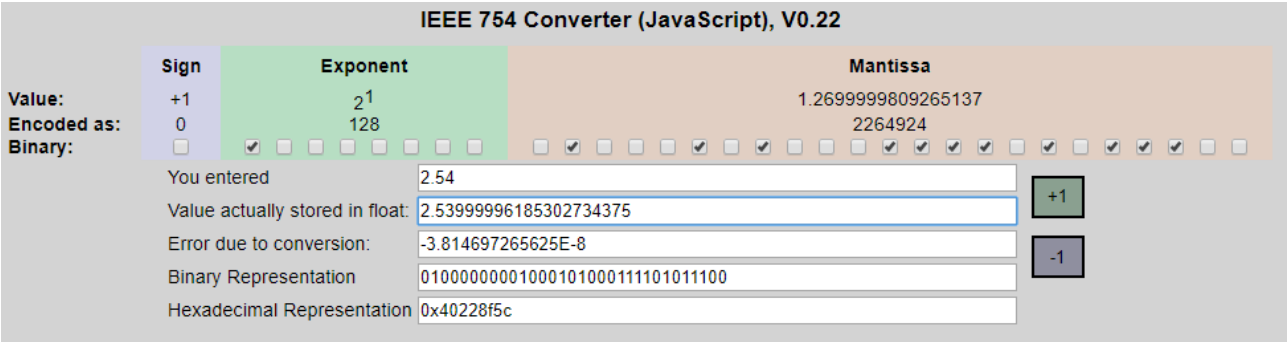
$$Value_{32bit} = Register_{LSW} + (Register_{MSW} * 65536)$$

In the reading registers it is possible to swap the most significant word with the least significant word, therefore it is possible to obtain 40064 as LSW and 40065 as MSW.

16.5. TYPE OF 32-BIT FLOATING POINT DATA (IEEE 754)

The IEEE 754 standard (https://en.wikipedia.org/wiki/IEEE_754) defines the format for representing floating point numbers.
As already mentioned, since it is a 32-bit data type, its representation occupies two 16-bit holding registers.
To obtain a binary / hexadecimal conversion of a floating point value it is possible to refer to an online converter at this address:

http://www.h-schmidt.net/FloatConverter/IEEE754.html



Using the last representation the value 2.54 is represented at 32 bits as:

0x40228F5C

Since we have 16-bit registers available, the value must be divided into MSW and LSW:

0x4022 (16418 decimal) are the 16 most significant bits (MSW) while 0x8F5C (36700 decimal) are the 16 least significant bits (LSW).

16.6. Z-SG2/Z-SG2-L: MODBUS 4X HOLDING REGISTERS TABLE (FUNCTION CODE 3)

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	DESCRIPTION	W/R	TYPE
40001	0	MACHINE-ID	DEVICE IDENTIFICATION	RO	UNSIGNED 16 BIT
40002	1	FIRMWARE REVISION	FIRMWARE REVISION	RO	UNSIGNED 16 BIT
40003	2	UNIT / UNIPOLAR	(MSB) UNIT Selects the unit of measurement among 0=Kg 1=g 2=t 3=lb 4=l 5=N 6=bar 7=atm 8=Other (LSB) UNIPOLAR 0 = ADC Configured for Traction and Compression (bipolar) 1 = ADC Configured for Compression (unipolar)	RW**	UNSIGNED 16 BIT
40004	3	RS485 MODBUS STATION / RS485 PARITY	(MSB) Modbus Station: It is the Modbus station address of the RS485 port (LSB) Parity: Sets the parity of the Modbus communication of the RS485 port 0=No parity 1 = Even 2 = Odd	RW**	UNSIGNED 16 BIT

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	DESCRIPTION	W/R	TYPE
40005	4	RS485 BAUD RATE / RS485 DELAY	(MSB) Baud Rate: Selects the baud rate of the RS485 port 0= 4800 1 = 9600 2=19200 3=38400 4=57600 5=115200 6 = RESERVED 7= 2400 (LSB) DELAY RS485: Delay to the Modbus response in number of characters	RW**	UNSIGNED 16 BIT
40006	5	OUTPUT STOP SCALE [V / mA]	Full scale value of the analogue output in [V/mA] (MSW)	RW**	FLOATING POINT 32 BIT
40007	6		Full scale value of the analogue output in [V/mA] (LSW)	RW**	
40008	7	OUTPUT START SCALE [V / mA]	Start scale value of the analogue output in [V/mA] (MSW)	RW**	FLOATING POINT 32 BIT
40009	8		Start scale value of the analogue output in [V/mA] (LSW)	RW**	
40010	9	DIGITAL IN-OUT / ANALOG OUT TYPE	(MSB) DIGITAL IN-OUT: 0 = Digital channel configured as Input 1 = Digital channel configured as Output (LSB) ANALOG OUT TYPE: 0 = Voltage analogue output 1 = Current analogue output	RW**	UNSIGNED 16 BIT

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	DESCRIPTION	W/R	TYPE
40011	10	DIGITAL INPUT TYPE / CALIBRATION MODE	(MSB) DIGITAL INPUT TYPE: Selects the operation of the digital input 0 = The digital input acquires the tare 1 = The status of the digital input is shown on Modbus without effects (LSB) CALIBRATION MODE: Sets the type of operation and calibration 0 = It uses factory calibration 1 = It uses the calibration with sample weight	RW**	UNSIGNED 16 BIT
40029	28	CELL SENSIBILITY [mV/V]	Ratio value of the load cell sensitivity in [mV/V] (MSW)	RW**	FLOATING POINT 32 BIT
40030	29		Ratio value of the load cell sensitivity in [mV/V] (MSW)	RW**	
40031	30	CELL FULL SCALE [kg/g/t…]	Full scale value of the load cell in technical units (MSW)	RW**	FLOATING POINT 32 BIT
40032	31		Full scale value of the load cell in technical units (LSW)	RW**	
40033	32	STANDARD WEIGHT VALUE [kg/g/t…]	Value of the standard weight in technical units to be used in the calibration mode with sample weight (MSW)	RW**	FLOATING POINT 32 BIT
40034	33		Value of the standard weight in technical units to be used in the calibration mode with sample weight (LSW)	RW**	
40035	34	OUTPUT WEIGHT STOP SCALE [kg/g/t…]	Full scale value of the net weight for the analogue output in technical units (MSW)	RW**	FLOATING POINT 32 BIT
40036	35		Full scale value of the net weight for the analogue output in technical units (LSW)	RW**	
40037	36	OUTPUT WEIGHT STOP SCALE [kg/g/t…]	Start scale value of the net weight for the analogue output (MSW)	RW**	FLOATING POINT 32

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	DESCRIPTION	W/R	TYPE
40038	37		Start scale value of the net weight for the analogue output (LSW)	RW**	BIT
40039	38	THRESHOLD [kg/g/t…]	Value of the threshold in alarm in technical units (MSW)	RW**	FLOATING POINT 32 BIT
40040	39		Value of the threshold in alarm in technical units (LSW)	RW**	
40041	40	ΔWEIGHT [kg/g/t…]	Value of the delta weight in technical units for the stable weighing condition (MSW)	RW**	FLOATING POINT 32 BIT
40042	41		Value of the delta weight in technical units for the stable weighing condition (LSW)	RW**	
40043	42	ΔTIME	Value of the delta time in quanta of 100ms for the stable weighing condition	RW**	UNSIGNED 16 BIT
40044	43	DIGITAL OUT NCNO / DIGITAL OUT MODE	(MSB) DIGITAL OUT NCNO: 0 = Normally open digital output 1 = Normally closed digital output (LSB) DIGITAL OUT MODE: 0 = Active when exceeding cell full scale 1 = Active on exceeding threshold + stable weighing 2 = Active on Stable Weighing 3 = Can be controlled by Modbus 4 = Active on exceeding threshold with hysteresis	RW**	UNSIGNED 16 BIT

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	DESCRIPTION	W/R	TYPE
40045	44	ADVANCED ADC SPEED	Configures the ADC sampling speed. For further information, please refer to 10.2.9.3 It is active only if level 7 filtering (advanced) is set.	RW**	UNSIGNED 16 BIT
40046	45	ADVANCED MOVING AVERAGE	Represents the number of samples in the moving average from 1 to 100 It is active only if level 7 filtering (advanced) is set.	RW**	UNSIGNED 16 BIT
40047	46	ADVANCED ADC CHOPPING	Enables or disables the ADC Chopping mode. For further information, please refer to 10.2.9.2 It is active only if level 7 filtering (advanced) is set and in calibration mode with sample weight.. 0 = It disables ADC Chopping 1 = It enables ADC Chopping	RW**	UNSIGNED 16 BIT
40048	47	AUTOMATIC TARE RESET	0 = It disables the tare tracker If >= 1 is the value of ADC points within which to reset the tare automatically. If after 5 seconds of stable weighing condition the ADC value of the net weight deviates by less than this value then a new tare is acquired.	RW**	UNSIGNED 16 BIT
40049	48	THRESHOLD HYSTERESIS [kg/g/t…]	It is the hysteresis value for the threshold exceeded alarm (MSW)	RW**	FLOATING POINT 32 BIT

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	DESCRIPTION	W/R	TYPE
40050	49		It is the hysteresis value for the threshold exceeded alarm (LSW)	RW**	
40051	50	ADVANCED DENOISE FILTER VARIATION	Represents the variation in ADC points due to noise alone. It is active only if level 7 filtering (advanced) is set. (MSW)	RW**	FLOATING POINT 32 BIT
40052	51		Represents the variation in ADC points due to noise alone. It is active only if level 7 filtering (advanced) is set. (LSW)	RW**	
40053	52	ADVANCED DENOISE FILTER RESPONSE	Represents a parameter related to the filter response speed, it can vary from 0.001 (slowest response) to 1 (fastest response). It is active only if level 7 filtering (advanced) is set. (MSW)	RW**	FLOATING POINT 32 BIT
40054	53		Represents a parameter related to the filter response speed, it can vary from 0.001 (slowest response) to 1 (fastest response). It is active only if level 7 filtering (advanced) is set. (LSW)	RW**	

<table>
<tr><th>ADDRESS (4x)</th><th>ADDRESS OFFSET</th><th>REGISTER</th><th>DESCRIPTION</th><th>W/R</th><th>TYPE</th></tr>
<tr><td>40055</td><td>54</td><td>DENOISE FILTER VALUE</td><td>It is possible to configure a pre-determined filter level:

<table>
<tr><th>FILTER LEVEL</th><th>RESPONSE TIME [ms]</th></tr>
<tr><td>0</td><td>16</td></tr>
<tr><td>1</td><td>32</td></tr>
<tr><td>2</td><td>50</td></tr>
<tr><td>3</td><td>250</td></tr>
<tr><td>4</td><td>400 (default)</td></tr>
<tr><td>5</td><td>900</td></tr>
<tr><td>6</td><td>1800</td></tr>
<tr><td>7 “ADVANCED”</td><td>Dependent on the configuration</td></tr>
</table>

The higher the filter level the more stable (but slow) the weight measurement will be.
A value other than 7 will overwrite the advanced parameters.
In the "Advanced" mode it will be possible to act on the individual parameters of the ADVANCED MOVING AVERAGE, ADVANCED NOISE FILTER VARIATION, ADVANCED NOISE FILTER RESPONSE filter ADVANCED ADC CHOPPER</td><td>RW**</td><td>UNSIGNED 16 BIT</td></tr>
</table>

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	DESCRIPTION	W/R	TYPE
40056	55	RESOLUTION MODE / DENOISE FILTER ENABLE	RESOLUTION MODE (MSB) Selects the type of resolution to be used only with the net weight measurement between: 0 = Maximum resolution 1 = Manual resolution (MANUAL RESOLUTION register) 2 = Automatic Resolution (calculated based on full scale to get 10000 points) DENOISE FILTER ENABLE (LSB) 0 = Noise filter disabled (advanced mode) 1 = Noise filter enabled	RW**	UNSIGNED 16 BIT
40057	56	MANUAL RESOLUTION [kg/g/t…]	Sets the manual resolution with which the net weight measurement is displayed in technical units (MSW)	RW**	FLOATING POINT 32 BIT
40058	57		Sets the manual resolution with which the net weight measurement is displayed in technical units (LSW)	RW**	
40059	58	ONE PIECE WEIGHT [kg/g/t…]	Sets the weight of a single piece to be used when using the piece counter (MSW)	RW**	FLOATING POINT 32 BIT
40060	59		Sets the weight of a single piece to be used when using the piece counter (LSW)	RW**	

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	DESCRIPTION	W/R	TYPE
40061	60	FLOATING POINT ORDER	Selects whether the RO registers in floating point format are displayed in the modbus registers in H/L or L/H: 0 = Displays the registers in H/L 1 = Displays the registers in L/H	RW**	UNSIGNED 16 BIT
40062	61	16 BIT ADC FILTERED	16-bit filtered and scaled ADC value In the case of unipolar measurement it can vary from 0 to 65535 In the case of bipolar measurement It can vary from 0 (max traction) to 32767 (min traction) From 32768 (condition of 0 or rest) to 65535 (max compression)	RO	UNSIGNED 16
40063	62	RESERVED	-	RO	UNSIGNED 16
40064	63	NET WEIGHT [kg/g/t…]	Value of the net weight in technical units (MSW*)	RO	FLOATING POINT 32 BIT
40065	64		Value of the net weight in technical units (LSW)	RO	
40066	65	GROSS WEIGHT [kg/g/t…]	Value of the gross weight in technical units (MSW*)	RO	FLOATING POINT 32 BIT
40067	66		Value of the gross weight in technical units (LSW*)	RO	
40068	67	TARE WEIGHT [kg/g/t…]	Value of the tare in technical units (MSW*)	RO	FLOATING POINT 32 BIT
40069	68		Value of the tare in technical units (LSW*)	RO	
40070	69	INTEGER NET WEIGHT	Value of the net weight in technical units (MSW)	RO	SIGNED 32 BIT

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	DESCRIPTION	W/R	TYPE
40071	70	[kg/g/t…]	Value of the net weight in technical units (LSW)	RO	
40072	71	INTEGER GROSS WEIGHT [kg/g/t…]	Value of the gross weight in technical units (MSW)	RO	SIGNED 32 BIT
40073	72		Value of the gross weight in technical units (LSW)	RO	
40074	73	INTEGER TARE WEIGHT [kg/g/t…]	Value of the tare in technical units (MSW)	RO	SIGNED 32 BIT
40075	74		Value of the tare in technical units (LSW)	RO	
40076	75	FACTORY MANUAL TARE [kg/g/t…]	Value to be used for manual tare in factory calibration mode (MSW*)	RO	FLOATING POINT 32 BIT
40077	76		Value to be used for manual tare in factory calibration mode (LSW*)	RO	

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	DESCRIPTION	W/R	TYPE
40078	77		Status register: BIT 0 LSBIT (RO) Bit 0 = 1 Exceeded threshold + Stable weighing BIT 1 (RO) Bit 1 = 1 The cell has reached full scale BIT 2 (RO) Bit 2 = 1 Net weight is < 0 BIT 3 (RO) Reserved BIT 4 (RO) Bit 4 = 1 Weighing is stable BIT 5 (R/W) Only if the modbus-controlled output mode has been selected: Bit 5 = 1 The digital output is activated Bit 5 = 0 The digital output is deactivated BIT 6 (RO) Bit 6 = 1 if the digital output is high BIT 7 (RO) Bit 7 = 1 Exceeded threshold with hysteresis BIT 8 (RO) Bit 8 = 1 The tare tracker intervened BIT 9..15 Not Used intervened (if enabled)	R/W	UNSIGNED 16 BIT

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	DESCRIPTION	W/R	TYPE
40079	78	RESERVED	-	RO	UNSIGNED 16 BIT
40080	79	COMMAND REGISTER	Command register, after executing the command the register returns to the value 0 43948 (decimal) Reboots the device 49594 (decimal) Acquires the tare in RAM (on restart it is lost) 49914 (decimal) Acquires the tare in Flash for the calibration procedure in both operating modes (factory calibration and with sample weight) 50700 (decimal) Acquires the value of the sample weight in Flash for the calibration with sample weight 50773 (decimal) Acquires the tare value from the MANUAL TARE register (only for the factory calibration mode) 49151 (decimal) Resets the register with the maximum net weight 45056 (decimal) Clears the register with the minimum net weight	R/W	UNSIGNED 16 BIT
40081	80	PIECES NR	It is the register where the number of pieces is counted	RO	UNSIGNED 16 BIT

ADDRESS (4x)	ADDRESS OFFSET	REGISTER	DESCRIPTION	W/R	TYPE
40082	81	MAX NET WEIGHT [kg/g/t…]	Maximum value of the net weight in technical units from restart (MSW*)	RO	FLOATING POINT 32 BIT
40083	82		Maximum value of the net weight in technical units from restart (LSW*)	RO	
40084	83	MIN NET WEIGHT [kg/g/t…]	Minimum value of the net weight in technical units from restart (MSW*)	RO	FLOATING POINT 32 BIT
40085	84		Minimum value of the net weight in technical units from restart (LSW*)	RO	
40086	85	RESERVED	-	RO	UNSIGNED 16 BIT
40087	86	RESERVED	-	RO	UNSIGNED 16 BIT
40088	87	RESERVED	-	RO	UNSIGNED 16 BIT
40089	88	RESERVED	-	RO	UNSIGNED 16 BIT
40090	89	RESERVED	-	RO	UNSIGNED 16 BIT
40091	90	RESERVED	-	RO	UNSIGNED 16 BIT
40092	91	ADC RAW 24 BIT	Unfiltered 24-bit ADC value (MSW)	RO	UNSIGNED 32 (UNIPOLAR MODE)
40093	92		Unfiltered 24-bit ADC value (LSW)	RO	SIGNED 32 (BIPOLAR MODE)