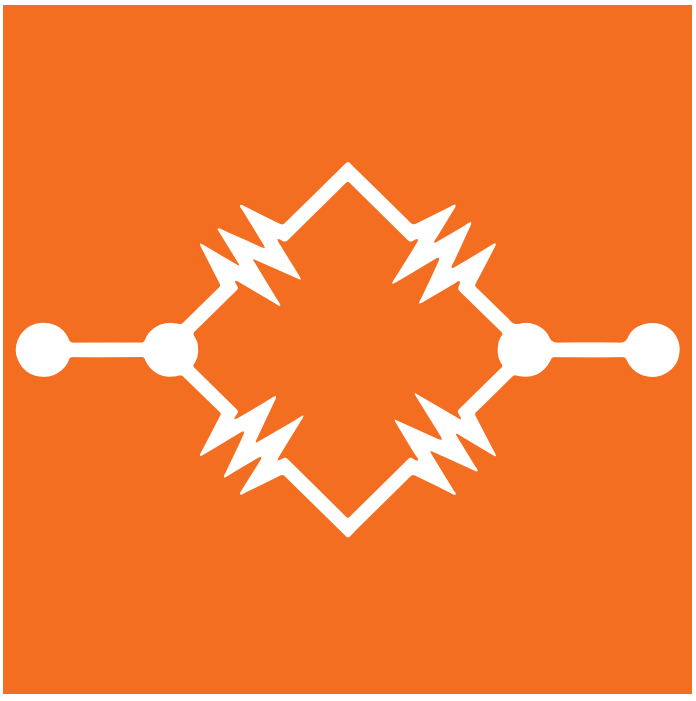
100% Made & Designed in Italy

# STRAIN GAUGE WEIGHING I/O MODULES



SENECA

www.seneca.it

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

# STRAIN GAUGE WEIGHING I/O MODULES

## OVERVIEW

### Load Cells I/O Modules

Z-SG | ZC-SG | R-SG3 | Z-SG3



ZE-SG3 | ZE-SG3-P | R-SG3-P



SENECA I/O modules for strain gauge load cells (strain gauges) can be integrated into all weighing systems in a flexible form In addition to weight, force or tension gauges, “SG” modules allow data acquisition in stand-alone mode or interfaced with third-party systems The devices provide multiple methods of calibration of the load cell connected directly from web server (TCP-IP Profinet models with or without dedicated software, with or without weight sample, with or without acquisition of factory parameters The modules are available with the form factors Z (17,5 x 102,5 x 111 mm) and R (53,3 x 90 x 32 mm) depending on installation requirements Measurement, made in 4- or 6-wire technique, is available via ModBUS RTU, ModBUS TCP IP, CANopen Profinet IO communication protocols and mA V analog output (where available).
SG modules directly power the strain gauge and provide primary features of robustness, safety and accuracy with galvanic isolation up to 1.500 Vac The accuracy class is 0,01 with load cell sensitivity from 1 to 64 mV/V. Hot swapping allows its replacement without interrupting the continuity of the weighing system. Among the most advanced features are versatile management of the application (counting pieces, automatic tare reset, alarm threshold, automatically upgradable firmware) and fo measurement (integer value or floating point, stabilization by predictive algorithm and noise filter, configurable resolution and sampling rate). ModBUS models also support the Pass Through function that enables to divert requests from Modbus TCP-IP nodes to the RS485 serial line and behave as gateways The SENECA solution for weighing systems includes an equalization system and connection of up to 4 load cells in parallel (SG-EQ 4) in addition to the availability of OLED (S401) LED (VISUAL Series) and IIoT (SSD) HMIs, radio modules and gateways for remote signal transmission.

**Z (width 17 mm) or R (depth 32 mm) form factor**

**Predictive filter for measurement stabilization**

**Accuracy class 0,01%**

**Load cell high sensitivity from 1 to 64 mV/V**

**ModBUS RTU / TCP-IP, CANopen, Profinet IO integrated communication**

**Settable sampling frequency**

**Flexible configuration (DIP-switches, software, web server)**

**Advanced functions (tare acquisition,piece counter, threshold settable alarm)**

**Advanced connectivity (Peerto- Peer, ModBUS Pass Through)**

**Flexible calibration methods of the load cell**

**4 / 6-wire technique load celle connection**

**Equalizer for parallel connections**

## CALIBRATION METHODS FOR LOAD CELL

Load cells are transducers that convert compressive, tensile, torsional, pressure or rotational forces into anelectrical signal. They are used for measuring force and weight (from micrograms to tons). They usually generate an output signal analog that is amplified through special acquisition boards. SG modules allow flexible management of thecalibration of the connected load cell, a precondition for proper operation of the weighing system.

### Calibration tools and methods for Z-SG, ZC-SG, Z-SG3 models:

- **DIP-switch+pulsante tara**
- **EASY SETUP**
- **EASY SETUP APP**
- **EASY SETUP2**
- **Nodo fieldbus**
- **Peso campione**
- **Parametri di fabbrica**

### Calibration method for R SG3, ZE SG3, ZE SG3 P, R SG3 P models:

- **Web Server**

For more details on calibration methods, lease see the User Manual of the instruments.

# SENECA I/O RANGE FOR WEIGHING SYSTEMS

| | Z-SG | ZC-SG | R-SG3 |
|---|---|---|---|
| | ModBUS RTU  | CANopen  | ModBUS RTU<br>ModBUS TCP-IP  |
| | **ModBUS RTU strain gauge converter module with micro USB port** | **CANopen strain gauge converter module** | **ModBUS RTU/TCP-IP compact strain gauge module** |
| **GENERAL DATA** | | | |
| **Power supply** | 10..40 Vdc / 19..28 Vac | 10..40 Vdc / 19..28 Vac | 10..40 Vdc; 19..28 Vac |
| **Power consumption** | Tipico: 1,5 W @ 24Vdc, Max: 2 W | Max 2 W | Max 1,5 W |
| **Isolation** | 1,5 kVac | 1.5 kVac (3-way) | 1.5 kVac (3-way) |
| **Connections** | Power supply<br>Error<br>Data Transmission<br>Data Reception | Power supply<br>Communication<br>Error Input | RX/TX RS485<br>Digital I/O Activation<br>Power supply<br>Load Cell Overload<br>Calibration Transit Ethernet Connection |
| **Protection degree** | IP20 | IP20 | IP20 |
| **Operating temperature** | -10..+65°C | -10..+65°C | -25..+65°C |
| **Dimension** | 17,5 x 102,5 x 111 mm | 17.5 x 102.5 x 111 mm | 53.3 x 90 x 32.2 mm |
| **Weight** | Approx 110 g | Approx 170 g | Approx 80 g |
| **Case** | PA6, black color | Nylon 6 filled with 30% glass fiber, self-extinguishing class V0 | Material PC / ABS self-extinguishing UL94-V0, color black |
| **Connections** | Removable screw terminals up to 2.5 mm2 conductors<br>IDC10 rear connector for DIN rail 46277<br>Front micro USB | Removable 4-way screw terminals, 3.5 mm pitch<br>IDC10 rear connector for DIN rail<br>3.5 mm stereo front jack for RS232 (COM) | Removable screw terminals 5 mm pitch |
| **Mounting** | IEC EN60715 35mm DIN rail in vertical position | IEC EN60715 35mm DIN rail in vertical position | On DIN EN 60715 rail, wall-mounted / panel-mounted |
| **Approvals** | CE | CE, CAN 2.0A, 2.0B CiA 401 v.2.01 IEC EN 61131-2 | CE, UKCA |
| **CONFIGURATION** | | | |
| **DIP Switch** | x | x | x |
| **Z-NET4** | x | x | |
| **EASY SETUP / EASY SETUP 2** | x | x | |
| **WEB SERVER** | | | x |
| **SoftPLC IEC 61131-2** | | x | |
| **Advanced functions** | Tare functions (Reset, Acquisition ); Stable weighing signal | Tare functions (Reset, Acquisition ); Stable weighing signal | Tare functions (Silos, Reset, Acquisition); Counting function; Stable weighing signal; Peer-To-Peer; Pass-Through |
| **Advanced settings** | Sampling frequency; Alarm threshold with hysteresis ; Resolution | Sampling frequency; Alarm threshold with hysteresis ; Resolution | Firmware upgradeable; Independent digital I/O; Sampling rate; Alarm threshold with hysteresis; Resolution |
| **MEASUREMENTS** | | | |
| **24-bit ADC** | Yes | Yes | Yes |
| **Accuracy class** | 0,01% | 0,01% | 0,01% |
| **Stability** | 0,025%/°C | 0,025%/°C | 0,025%/°C |
| **Thermal drift** | <25 ppm/°C | <25 ppm/°C | <25 ppm/°C |
| **Integer value / floating point** | (only weight) | (only weight) | Yes |
| **Min/max net weight value** | No | No | Yes |
| **Stabilized measurement** | Yes with moving average filter | Yes with moving average filter | Yes with noise filter and predictive filter |
| **Ratiometric measurement** | Yes | Yes | Yes |
| **COMMUNICATION** | | | |
| **Interfaces** | Nr.1 RS485 2-wire port<br>Nr.1 RS232 (3.5 mm stereo jack) port | Nr. 1 CAN port<br>Nr. 1 RS232 port | Nr.1 100 baseT Ethernet port on RJ45<br>Nr.1 RS485 port on terminals<br>Nr.1 Micro USB (programming) |
| **Speed** | Up to 115,200 bps | Up to 1 1Mbps (CANopen) | Up to 115,200 bps (RS485) / 100 Mbps (TCP-IP) |
| **Protocols** | ModBUS RTU | CANopen | ModBUS RTU, ModBUS TCP-IP |
| **Communication time** | < 10 ms (@38,400 bps) | 20 ms | < 10 ms |
| **INPUT/OUTPUT DATA** | | | |
| **Analog input up to 4 load cells in parallel** | Nr.1 ANALOG INPUT 4- or 6-wire differential measurement. Input impedance: > 1 MΩ Full scale: ± 10 mV / ± 320 mV Error: 0.01% f.s. Thermal stability: 0.0025%/°C f.s. LOAD CELL Supply voltage: 5 Vdc Minimum impedance: 87 Ω equivalent Sensitivity: ±1 mV/V to ±64 mV/V | Nr.1 ANALOG INPUT 4- or 6-wire differential measurement. Input impedance: > 1 MΩ Full scale: ± 10 mV / ± 320 mV Error: 0.01% f.s. Thermal stability: 0.0025%/°C f.s. LOAD CELL Supply voltage: 5 Vdc Minimum impedance: 87 Ω equivalent Sensitivity: ±1 mV/V to ±64 mV/V | Nr.1 ANALOG INPUT 4- or 6-wire differential measurement. Input impedance: > 1 MΩ Full scale: ± 10 mV / ± 320 mV Error: 0.01% f.s. Thermal stability: 0.0025%/°C f.s. LOAD CELL Supply voltage: 5 Vdc Minimum impedance: 87 Ω equivalent Sensitivity: ±1 mV/V to ±64 mV/V |
| **Trimming load cells** | Yes | Yes | Yes |
| **Analog output retransmitted (net weight)** | Nr.1 ANALOG OUTPUT Voltage: Configurable between 0 - 10 Vdc, minimum load resistance 2 kΩ Current: Configurable between 0 - 20 mA, maximum load resistance 500 Ω Retransmission error: 0.1 % of maximum range Response time ( 10%..90%): 5 ms | | |
| **Digital Input/Output (tare calibration or weight threshold)** | Nr.1 DIGITAL INPUT/OUTPUT. Opto-isolated Digital Input: Min voltage 12 V / Max voltage 30 V Opto-isolated Digital Output: Min. current 50 mA / Max voltage 30 V | Nr.1 DIGITAL INPUT/OUTPUT Opto-isolated Digital Input: Min voltage 12 V / Max voltage 30 V Opto-isolated Digital Output: Min. current 50 mA / Max voltage 30 V | Nr.2 DIGITAL INPUT/OUTPUT Opto-isolated Digital Input: Min voltage 12 V / Max voltage 30 V Opto-isolated Digital Output: Min. current 50 mA / Max voltage 30 V |

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Technical data and diagrams on this document are indicative and not binding

| Z-SG3 | ZE-SG3 | ZE-SG3-P | R-SG3-P |
|---|---|---|---|
| ModBUS RTU  | ModBUS RTU<br>ModBUS TCP-IP  | PROFINET® COMING SOON  | PROFINET® COMING SOON  |
| **ModBUS RTU advanced strain gauge converter module** | **ModBUS RTU/TCP-IP advanced strain gauge converter module** | **Profinet IO advanced strain gauge converter module** | **Profinet IO compact strain gauge converter module** |
| | | | |
| 10..40 Vdc / 19..28 Vac | 10..40 Vdc / 19..28 Vac | 10..40 Vdc / 19..28 Vac | 10..40 Vdc; 19..28 Vac |
| Max 2 W | Max 2 W | Max 2 W | Max 1,5 W |
| 1,5 kVac (5-way) | 1,5 kVac (6-way) | 1.5 kVac (6-way) | 1.5 kVac (3-way) |
| RX/TX RS485<br>Digital I/O Activation<br>Power supply<br>Load Cell Overload | RX/TX RS485<br>Digital I/O Activation<br>Power supply<br>Load Cell Overload | Digital I/O activation<br>Power supply<br>Load cell overload | Digital I/O activation<br>Power supply<br>Load cell overload |
| IP20 | IP20 | IP20 | IP20 |
| -25..+70°C | -25..+70°C | -25..+70°C | -25..+65°C |
| 17.5 x 102.5 x 111 mm | 17.5 x 102.5 x 111 mm | 17.5 x 102.5 x 111 mm | 53.3 x 90 x 32.2 mm |
| Approx 110 g | Approx 110 g | Approx 110 g | Approx 80 g |
| PA6, color black | PA6, black color | PA6, black color | Material PC / ABS self-extinguishing UL94-V0, color black |
| Removable 3-way screw terminals, 5 mm pitch<br>IDC10 rear connector for DIN rail 46277<br>Micro USB front | Removable 3-way screw terminals, 5 mm pitch<br>IDC10 rear connector for DIN rail 46277<br>- | Removable 3-way screw terminals, 5 mm pitch<br>IDC10 rear connector for DIN rail 46277 | Removable screw terminals 5 mm pitch |
| IEC EN60715 35mm DIN rail in vertical position | IEC EN60715 35mm DIN rail in vertical position | IEC EN60715 35mm DIN rail in vertical position | On DIN EN 60715 rail, wall-mounted / panel-mounted |
| CE, UKCA | CE, UKCA | CE, UKCA | CE, UKCA |
| | | | |
| x | x | x | x |
| | | | |
| | | | |
| x | x | x | x |
| | | x | x |
| Tare functions (Silos, Reset, Acquisition); Counting function; Stable weighing report; Peer-To-Peer; Pass-Through | Tare functions (Silos, Reset, Acquisition); Counting function; Stable weighing report; Peer-To-Peer; Pass-Through | Tare functions (Silos, Reset, Acquisition); Counting function; Peer-To-Peer; Pass-Through | Tare functions (Silos, Reset, Acquisition); Counting function; Peer-To-Peer; Pass-Through |
| Firmware upgradeable; Independent digital I/O; Sampling rate; Alarm threshold with hysteresis; Resolution | Firmware upgradeable; Independent digital I/O; Sampling rate; Alarm threshold with hysteresis; Resolution | Firmware upgradeable; Independent digital I/O; Sampling rate; Alarm threshold with hysteresis; Resolution | Firmware upgradeable; Independent digital I/O; Sampling rate; Alarm threshold with hysteresis; Resolution |
| | | | |
| Yes | Yes | Yes | Yes |
| 0,01% | 0,01% | 0,01% | 0,01% |
| 0,025%/°C | 0,025%/°C | 0,025%/°C | 0,025%/°C |
| <25 ppm/°C | <25 ppm/°C | <25 ppm/°C | <25 ppm/°C |
| Yes | Yes | Yes | Yes |
| Yes | Yes | Yes | Yes |
| Sì con filtro antirumore predittivo | Yes with noise filter and predictive filter | Yes with noise filter and predictive filter | Yes with noise filter and predictive filter |
| Yes | Yes | Yes | Yes |
| | | | |
| Nr.1 RS485 port on terminals / IDC10<br>Nr.1 Micro USB (programming) | Nr.1 Ethernet port 100 baseT on RJ45 (with fault-bypass LAN function)<br>Nr.1 RS485 port on terminals / IDC 10 | Nr.1 Ethernet port (with fault-bypass LAN function) 100 baseT on RJ45 | Nr.1 Ethernet port (with fault-bypass LAN function) 100 baseT on RJ45 |
| Up to 115,200 bps (RS485) | Up to 115,200 bps (RS485) / 100 Mbps (TCP-IP) | | |
| ModBUS RTU | ModBUS RTU, ModBUS TCP-IP | Profinet IO | Profinet IO |
| < 10 ms | < 10 ms | n.a. | n.a. |
| | | | |
| Nr.1 ANALOG INPUT 4- or 6-wire differential measurement. Input impedance: > 1 MΩ Full scale: ± 10 mV / ± 320 mV Error: 0.01% f.s. Thermal stability: 0.0025%/°C f.s. LOAD CELL Supply voltage: 5 Vdc Minimum impedance: 87 Ω equivalent Sensitivity: ±1 mV/V to ±64 mV/V | Nr.1 ANALOG INPUT 4- or 6-wire differential measurement. Input impedance: > 1 MΩ Full scale: ± 10 mV / ± 320 mV Error: 0.01% f.s. Thermal stability: 0.0025%/°C f.s. LOAD CELL Supply voltage: 5 Vdc Minimum impedance: 87 Ω equivalent Sensitivity: ±1 mV/V to ±64 mV/V | Nr.1 ANALOG INPUT 4- or 6-wire differential measurement. Input impedance: > 1 MΩ Full scale: ± 10 mV / ± 320 mV Error: 0.01% f.s. Thermal stability: 0.0025%/°C f.s. LOAD CELL Supply voltage: 5 Vdc Minimum impedance: 87 Ω equivalent Sensitivity: ±1 mV/V to ±64 mV/V | Nr.1 ANALOG INPUT 4- or 6-wire differential measurement. Input impedance: > 1 MΩ Full scale: ± 10 mV / ± 320 mV Error: 0.01% f.s. Thermal stability: 0.0025%/°C f.s. LOAD CELL Supply voltage: 5 Vdc Minimum impedance: 87 Ω equivalent Sensitivity: ±1 mV/V to ±64 mV/V |
| Yes | Yes | Yes | Yes |
| Nr.1 ANALOG OUTPUT Voltage: Configurable between 0 - 10 Vdc, minimum load resistance 2 kΩ Current: Configurable between 0 - 20 mA, maximum load resistance 500 Ω Retransmission error: 0.1 % of maximum range Response time ( 10%..90%): 5 ms | Nr.1 ANALOG OUTPUT Voltage: Configurable between 0 - 10 Vdc, minimum load resistance 2 kΩ Current: Configurable between 0 - 20 mA, maximum load resistance 500 Ω Retransmission error: 0.1 % of maximum range Response time ( 10%..90%): 5 ms | | |
| Nr.2 DIGITAL INPUT/OUTPUT Opto-isolated Digital Input: Min voltage 12 V / Max voltage 30 V Opto-isolated Digital Output: Min. current 50 mA / Max voltage 30 V | Nr.2 DIGITAL INPUT/OUTPUT Opto-isolated Digital Input: Min voltage 12 V / Max voltage 30 V Opto-isolated Digital Output: Min. current 50 mA / Max voltage 30 V | Nr.2 DIGITAL INPUT/OUTPUT Opto-isolated Digital Input: Min voltage 12 V / Max voltage 30 V Opto-isolated Digital Output: Min. current 50 mA / Max voltage 30 V | Nr.2 DIGITAL INPUT/OUTPUT. Opto-isolated Digital Input: Min voltage 12 V / Max voltage 30 V Opto-isolated Digital Output: Min. current 50 mA / Max voltage 30 V |

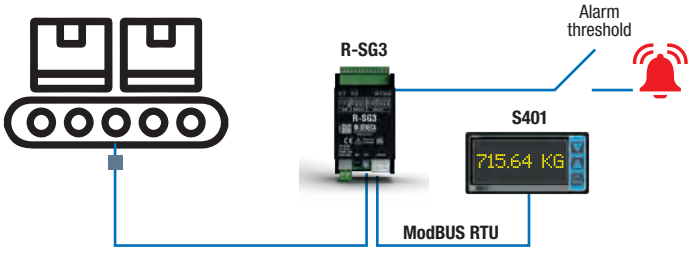


Technical data and diagrams on this document are indicative and not binding

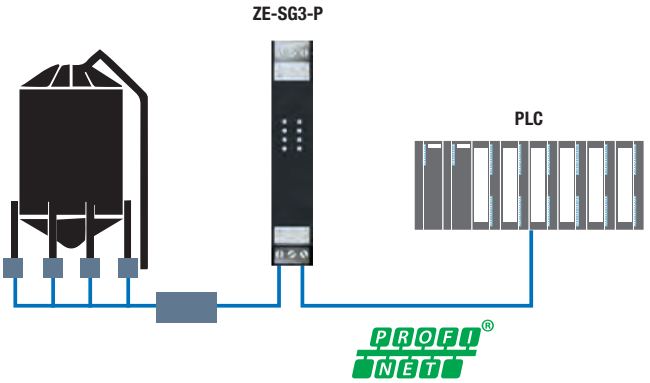
# STRAIN GAUGE WEIGHING I/O MODULES

## APPLICATION SCHEMES

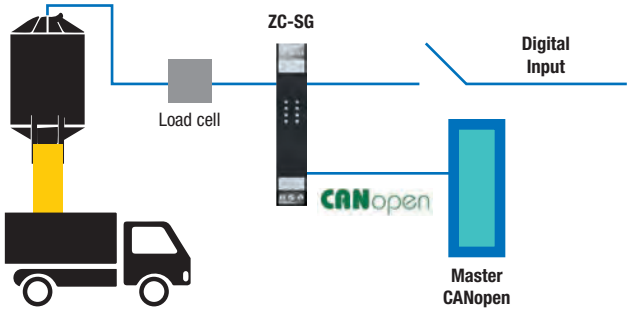
### WEIGHING SYSTEM WITH CONVEYOR BELT



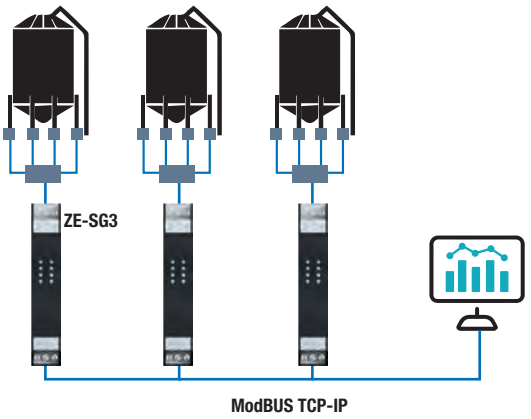

### MEASUREMENT AND RETRANSMISSION WEIGHT WITH LOAD CELLS IN PARALLEL



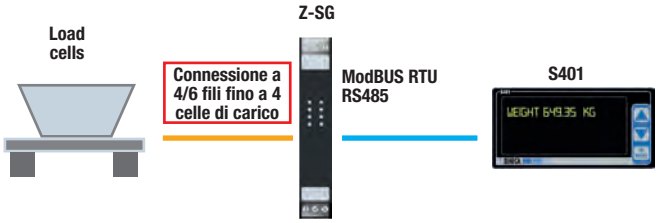

### WEIGHING SYSTEM CALIBRATION



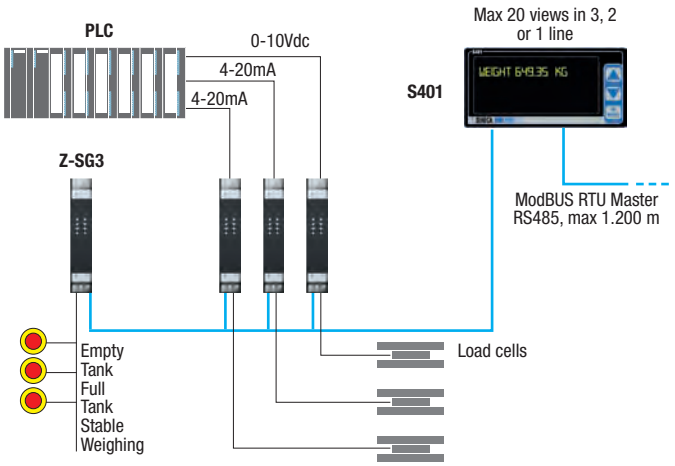

### LOAD CELL MEASUREMENT IN PARALLEL AND RETRANSMISSION IN SERIES




### VISUALIZATION OF VALUES OF WEIGHT AND FORCE




### VISUALIZATION AND ALARM MANAGEMENT OF WEIGHT AND FORCE VALUES






Technical data and diagrams on this document are indicative and not binding

# STRAIN GAUGE WEIGHING I/O MODULES

## ACCESSORIES AND SUPPLY COMPLEMENTS

### SG-EQ4
**Equalizer**



SG-EQ4 is a junction-box / equalizer for connecting multiple load cells to weighing systems. The load cells must be electrically connected in such a way that the signal lines (output), excitation (power supply) and sense (when present) are in parallel.

### S401
**Oled Indicator**




S401-L is an industrial indicator with display. OLED (Organic Light Emitting Diode) with dual RS485 ModBUS serial port. It enables the display of up to 30 measurements (20 direct, 10 calculated) and the alarm management on threshold or event.

### CONTROL UNITS



SENECA multifunction controllers are modular/allin-one high connectivity devices. They combine PLC tasks based on the Straton IEC 61131-3 softLPLC platform with web server, datalogger, remote control, remote service and energy management features.

### GATEWAYS



SENECA gateways connect new and legacy systems, facilitating a secure and uninterrupted flow between peripheral devices and serverscentralized servers. The devices establish a two-way communication between the field and the supervision, ensure networking functions and data processing.

### SSD
**IIoT HMI**



SURPRISE Smart Display is an operator terminal 7" touch of the latest generation with dual port fast ethernet, 802.11 b/g/n wi-fi module and function sniffer for serial lines. It is a multipurpose with IIoT gateway functionality, datalogger, Wi-Fi router, microcontroller, unit for remote assistance and remote control.

### RADIO MODULES



For the radio transmission of SENECA's signals adopts UHF, VHF and LoRA technologies with coverage varying from a few hundred meters to several kilometers. Radio modules perform, among others, remote control and diagnostic functions through point-to-point, multipoint, broadcasting connections, signal repetitions.

## APPLICATION FIELDS

- LOAD CELL MANUFACTURERS
- LABORATORIES
- BUILDING CONSTRUCTION
- FOOD INDUSTRY
- SCALES MANUFACTURERS
- TRANSPORTATION
- LOGISTICS AND WAREHOUSES
- ROBOTICS AND BENCHES ASSEMBLY

**ORDER CODES**

| Code | Description |
|---|---|
| STRAIN GAUGE MODULES | |
| R-SG3 | Modbus TCP-IP / Modbus RTU compact strain gauge module |
| R-SG3-P | Profinet IO compact strain gauge module |
| ZC-SG | CANopen strain gauge converter module |
| ZE-SG3 | ModBUS RTU / TCP-IP advanced strain gauge converter module |
| ZE-SG3-P | Profinet IO advanced strain gauge module |
| Z-SG | ModBUS RTU strain gauge converter module |
| Z-SG3 | ModBUS RTU advanced strain gauge converter module |
| ACCESSORIES | |
| SG-EQ4 | Equalization board up to 4 load cells |
| SG-EQ4-BOXPG7 | Board + equalization box up to 4 load cells |

**ORDER CODES**

| Code | Description |
|---|---|
| SOFTWARE | |
| EASY SETUP / EASY SETUP 2 | Plug&play programmable instruments configurator |
| Z-NET4 | Automation systems configuration and engineering environment |
| HMI | |
| S401 | 2.7" OLED indicator with ModBUS interface |
| SSD | |
| https://www.seneca.it/en/linee-di-prodotto/acquisizione-dati-e-automazione/hmi-display/iiot/surprise-smart-display | |
| CONTROL UNITS | |
| https://www.seneca.it/linee-di-prodotto/acquisizione-dati-e-automazione/cpu-multifunzione-iec-61131/ | |
| RADIO MODULES | |
| https://www.seneca.it/en/linee-di-prodotto/comunicazione-industriale-e-telecontrollo/moduli-radio/ | |

23C0536_SG_MODULES_2307_ENG – July 2023

SENECA

**Headquarters:**
Via Austria, 26 - 35127 Padova (I)
T. +39 049 8705.359 - F. +39 049 8706.287
info@seneca.it - www.seneca.it

The material in this document is for information only and is subject to change without notice. While reasonable efforts have been made in the preparation of this document to assure its accuracy, SENECA assumes no liability resulting from errors or omissions, or from the use of the information contained herein. Reproduction is forbidden unless authorized.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000