INSTRUCTION MANUAL

SIL 2 Load Cell/Strain Gauge Bridge Isolating Converter DIN-Rail Power Bus and Termination Board Model D5264S

technology for safety

Characteristics

General Description:
The single channel DIN Rail Load Cell/Strain Gauge Bridge Isolating Converter D5264S module is a unit suitable for applications requiring SIL 2 level (according to IEC 61511) in safety related systems for high risk industries.
The unit acts as a galvanically isolated interface installed between a PLC/DCS in Safe Area and a load cell (or a group of load cells) in Hazardous Area. Up to four 350 Ω load cells, or five 450 Ω load cells, or ten 1000 Ω load cells can be connected in parallel. It provides a fully floating power supply voltage with remote sensing capabilities to load cells located in Hazardous Area and converts the mV signal from the load cell into a 0/4-20 mA, providing both current source and sink capabilities. The module is also provided with PhotoMOS alarm output. A modbus output is also provided to interface the PLC/DCS using digital communication.
Automatic Calibration: Automatic calibration can be accomplished in the field without disconnecting the unit.
Function: 1 channel I.S. input from strain gauge signals, provides 3 port isolation (input/output/supply) and current (source or sink mode) output signal. A modbus output is also provided to interface digital device.
Signalling LED: Power supply indication (green).
Alarm indication (red).
Configurability: Totally software configurable, no jumpers or switches, input calibration, mA source/sink output signal by GM PPC5092 Adapter and SWC5090 Configurator software.
A 16 characters tag can be inserted using the configuration software.
EMC: Fully compliant with CE marking applicable requirements.

Technical Data

Supply:
24 Vdc nom (18 to 30 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp.
Current consumption @ 24 V: 100 mA with four 350 Ω load cells connected and with 20 mA output typical.
Power dissipation: 2.1 W with 24 V supply voltage, four 350 Ω load cells connected and 20 mA output typical.
Max. power consumption: at 30 V supply voltage, short circuited input, overload condition, 2.2 W.
Isolation (Test Voltage):
I.S. In/Out 1.5 KV; I.S. In/Modbus Out 1.5 KV; I.S. In/Supply 1.5 KV;
Out/Supply 500 V; Modbus Out/Supply 500 V; Out/Modbus Out 500 V;
Out/Alarm Output 500 V; Alarm Out/Modbus Out 500 V; Supply/Alarm Output 500 V
Input:
up to four 350 Ω load cells (parallel connection).
up to five 450 Ω load cells (parallel connection).
up to ten 1000 Ω load cells (parallel connection).
A/D Conversion time: 100 ms (slow acquisition mode) or 12.5 ms (fast acquisition mode).
Bridge supply voltage: 4.0 Vdc nominal.
Bridge output signal: 1 to 4 mV/V.
Line resistance compensation: ≤ 10 Ω.
Output: Fully customizable 0/4 to 20 mA, on max. 300 Ω load source mode, current limited at 24 mA. In sink mode, the external voltage generator range is V min. 3.5V at 0Ω load and V max. 30V. If generator voltage Vg > 10 V, a series resistance ≥ (Vg - 10)/0.024 Ω is needed. The maximum value of series resistance is (Vg - 3.5)/0.024 Ω.
Response time: ≤ 20 ms (10 to 90 % step).
Output ripple: ≤ 20 mVrms on 250 Ω load.
Modbus Output: Modbus RTU protocol up to 115.200 baud on Bus connector and terminals 11-12.
Alarm:
Trip point range: within rated limits of the input sensor.
Output: voltage free SPST photoMOS: 100 mA, 60 Vdc (≤ 1 V voltage drop).
Performance:
Ref. Conditions 24 V supply, 250 Ω load, 23 ± 1 °C ambient temperature.
Input:
Accuracy after autocalibration: ≤ ± 0.05 % of full scale.
Linearity accuracy: ≤ ± 0.02 % of full scale of input range.
Temperature influence: ≤ ± 0.002 % of full scale of input range for a 1 °C change.
Supply voltage influence: ≤ ± 0.002 % of full scale of input range for a min to max supply voltage change.
Analog Output:
Calibration accuracy: ≤ ± 0.05 % of full scale.
Linearity error: ≤ ± 0.05 % of full scale.
Supply voltage influence: ≤ ± 0.02 % of full scale for a min to max supply change.
Load influence: ≤ ± 0.02 % of full scale for a 0 to 100 % load resistance change.
Temperature influence: ≤ ± 0.01 % on zero and span for a 1 °C change.
Compatibility:
CE mark compliant, conforms to Directives:
2014/34/EU ATEX, 2014/30/EU EMC, 2014/35/EU LVD, 2011/65/EU RoHS.
Environmental conditions:
Operating: temperature limits –40 to + 70 °C,
relative humidity max 95 % non condensing, up to 55 °C.
Storage: temperature limits – 45 to + 80 °C.
Safety Description:
ATEX: II 3(1) G Ex nA [ia Ga] IIC T4 Gc, II (1) D [Ex ia Da] IIIC, I (M1) [Ex ia Ma] I
IECEx: Ex nA [ia Ga] IIC T4 Gc, [Ex ia Da] IIIC, [Ex ia Ma] I
UL: NI / I / 2 / ABCD / T4, AIS / I, II, III / 1 / ABCDEFG, AEx nA [ia Ga] IIC T4 Gc
C-UL: NI / I / 2 / ABCD / T4, AIS / I, II, III / 1 / ABCDEFG, Ex nA [ia Ga] IIC T4 Gc
associated apparatus and non-sparking electrical equipment.
Uo/Voc = 7.2 V, Io/Isc = 177 mA, Po/Po = 471 mW at terminals 13-14-15-16-17-18.
Um = 250 Vrms, -40 °C ≤ Ta ≤ 70°C.
Approvals:
TUV 15 ATEX 170897 X conforms to EN60079-0, EN60079-11, EN60079-15,
IECEx TUN 16.0005X conforms to IEC60079-0, IEC60079-11, IEC60079-15.
UL & C-UL E222308 conforms to UL 61010-1, UL 913, UL 60079-0, UL 60079-11, UL 60079-15, ISA 12.12.01 for UL and
CAN/CSA C22.2 No.61010-1-12, CSA C22.2 60079-0, CSA C22.2 60079-11, CSA C22.2 60079-15, CSA C22.2 No. 213, CSA C22.2 No. 157-92 for C-UL.
SIL 2 conforms to IEC 61511. *(pending)*
DNV No.TAA00001U0 and KR No.MIL20769-EL002 for maritime applications.
Mounting:
EN/IEC60715 TH 35 DIN-Rail, with or without Power Bus or on customized Termination Boards.
Weight: about 160 g.
Connection: by polarized plug-in disconnect screw terminal blocks to accomodate terminations up to 2.5 mm^2 (13 AWG).
Location: installation in Safe Area/Non Hazardous Locations or Zone 2, Group IIC T4 or Class I, Division 2, Group A,B,C,D, T4 or Class I, Zone 2, Group IIC, T4.
Protection class: IP 20.
Dimensions: Width 22.5 mm, Depth 123 mm, Height 120 mm.

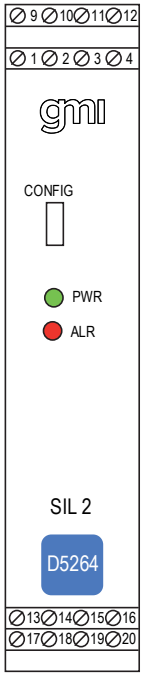
Ordering information

Model:	D5264S

Power Bus and DIN-Rail accessories:
Connector JDFT050
Cover and fix MCHP196
Terminal block male MOR017
Terminal block female MOR022

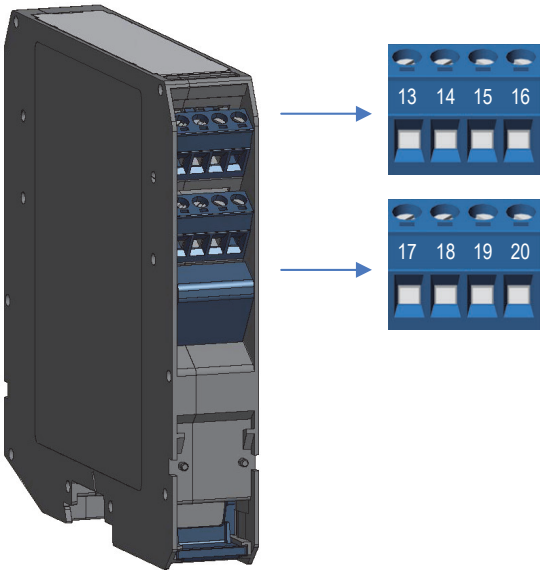
Operating parameters are programmable from PC by the GM Pocket Portable Adapter PPC5092 via USB serial line and SWC5090 Configurator software.

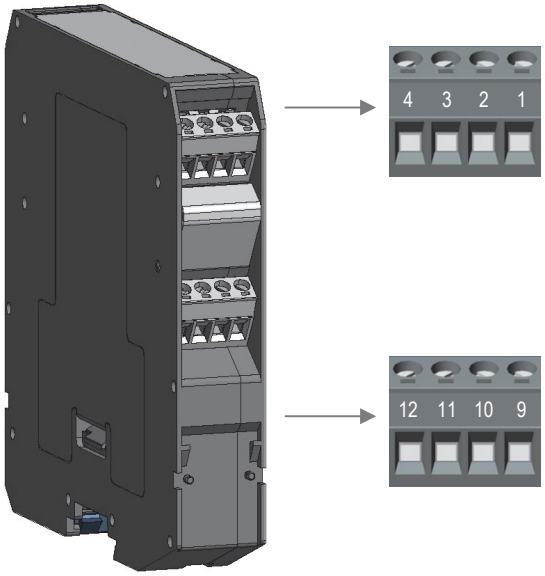
Front Panel and Features



- SIL 2 according to IEC 61511 for Tproof = 2 / 4 yrs (10 / 20 % of total SIF), SFF 70.62%, PFDavg (1 year) 4.65 E-04.
- Input from Zone 0 (Zone 20), installation in Zone 2.
- Strain Gauge Bridge Isolated Converter.
- Up to four 350 Ω load cells in parallel or up to five 450 Ω load cells in parallel or up to ten 1000 Ω load cells in parallel.
- 0/4-20 mA Sink or Source.
- Modbus Output.
- Field Automatic Calibration.
- Three port isolation, Input/Output/Supply.
- EMC Compatibility to EN61000-6-2, EN61000-6-4, EN61326-1, EN61326-3-1 for safety system.
- Fully programmable operating parameters.
- ATEX, IECEx, UL & C-UL Certifications.
- TÜV Certifications (Pending).
- Type Approval Certificate DNV and KR for maritime applications
- High Reliability, SMD components.
- Simplified installation using standard DIN Rail and plug-in terminal blocks, with or without Power Bus, or on customized Termination Board.
- 250 Vrms (Um) max. voltage allowed to the instruments associated with the barrier.

Terminal block connections





HAZARDOUS AREA

13	+ Input Ch 1 EXC (Load cell)
14	+ Input Ch 1 Sense (Load cell)
15	- Input Ch 1 Sense (Load cell)
16	- Input Ch 1 EXC (Load cell)
17	+ Input Ch 1 IN (Load cell)
18	- Input Ch 1 IN (Load cell)
19	Not used
20	Not used

SAFE AREA

1	+ Output Ch 1
2	- Output Ch 1
3	+ Alarm Output
4	- Alarm Output
9	+ Power Supply 24 Vdc
10	- Power Supply 24 Vdc
11	A- Modbus IN/OUT RS485
12	B+ Modbus IN/OUT RS485

Parameters Table

In the system safety analysis, always check the Hazardous Area/Hazardous Locations devices to conform with the related system documentation, if the device is Intrinsically Safe check its suitability for the Hazardous Area/Hazardous Locations and group encountered and that its maximum allowable voltage, current, power (Ui/Vmax, Ii/Imax, Pi/Pi) are not exceeded by the safety parameters (Uo/Voc, Io/Isc, Po/Po) of the D5264 series Associated Apparatus connected to it. Also consider the maximum operating temperature of the field device, Check that added connecting cable and field device capacitance and inductance do not exceed the limits (Co/Ca, Lo/La, Lo/Ro) given in the Associated Apparatus parameters for the effective group. See parameters indicated in the table below:

D5264 Terminals	D5264 Associated Apparatus Parameters	Must be	Hazardous Area/Hazardous Locations Device Parameters
13 - 14 - 15 - 16 - 17 - 18	Uo / Voc = 7.2 V	≤	Ui / Vmax
13 - 14 - 15 - 16 - 17 - 18	Io / Isc = 177 mA	≤	Ii / Imax
13 - 14 - 15 - 16 - 17 - 18	Po / Po = 471 mW	≤	Pi / Pi

D5264 Terminals	D5264 Associated Apparatus Parameters Cenelec (US)		Must be	Hazardous Area/Hazardous Locations Device Parameters
13 - 14 - 15 - 16 - 17 - 18	Co / Ca = 0.3 µF Co / Ca = 1.5 µF Co / Ca = 2.2 µF Co / Ca = 2.8 µF Co / Ca = 1.5 µF	IIC (A,B) IIB (C) IIA (D) I IIIC (E, F, G)	≥	Ci / Ci device + C cable
13 - 14 - 15 - 16 - 17 - 18	Lo / La = 0.5 mH Lo / La = 6.5 mH Lo / La = 9.5 mH Lo / La = 13 mH Lo / La = 6.5 mH	IIC (A,B) IIB (C) IIA (D) I IIIC (E, F, G)	≥	Li / Li device + L cable

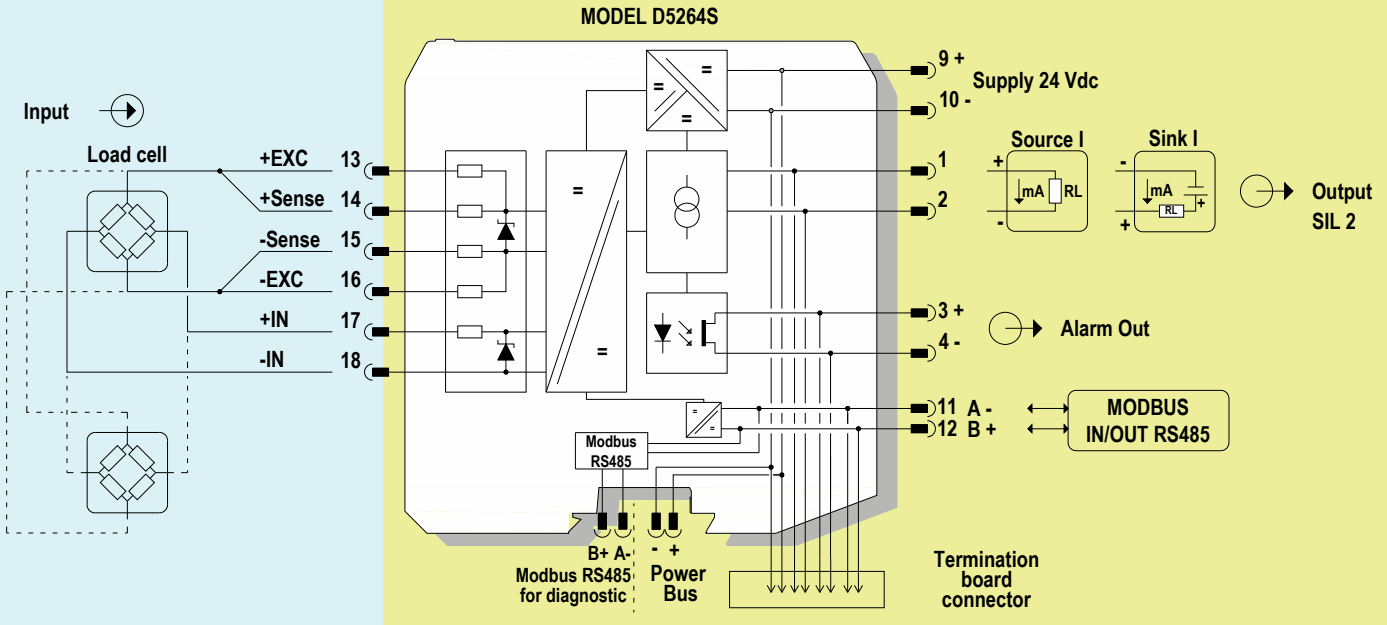
Characteristic: trapezoidal.

If the cable parameters are unknown, the following values may be used: Capacitance 180pF per meter (60pF per foot), Inductance 0.60µH per meter (0.20µH per foot).

Function Diagram

HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC,
HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D,
CLASS II, DIVISION 1, GROUPS E, F, G, CLASS III, DIVISION 1,
CLASS I, ZONE 0, GROUP IIC

SAFE AREA, ZONE 2 GROUP IIC T4,
NON HAZARDOUS LOCATIONS, CLASS I, DIVISION 2,
GROUPS A, B, C, D T-Code T4, CLASS I, ZONE 2, GROUP IIC T4



Warning

D5264 series is an isolated Intrinsically Safe Associated Apparatus installed into standard EN/IEC60715 TH 35 DIN-Rail located in Safe Area or Zone 2, Group IIC, Temperature T4 or Class I, Division 2, Group A, B, C, D, T4 Hazardous Area within the specified operating temperature limits Tamb –40 to +70 °C, and connected to equipment with a maximum limit for power supply Um of 250 Vrms or Vdc.
Not to be connected to control equipment that uses or generates more than 250 Vrms or Vdc with respect to earth ground.
D5264 series must be installed, operated and maintained only by qualified personnel, in accordance with the relevant national/international installation standards (e.g. IEC/EN60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines)), following the established installation rules; particular care must be given to segregation and clear identification of I.S. conductors from non I.S. ones.
De-energize power source (turn off power supply voltage) before plug or unplug the terminal blocks when installed in Hazardous Area or unless area is known to be nonhazardous.
Warning: substitution of components may impair Intrinsic Safety and suitability for Zone 2.
Explosion Hazard: to prevent ignition of flammable or combustible atmospheres, disconnect power before servicing or unless the area is known to be non-hazardous.
Failure to properly installation or use of the equipment may risk to damage the unit or severe personal injury.
The unit cannot be repaired by the end user and must be returned to the manufacturer or his authorized representative. Any unauthorized modification must be avoided.

Operation

The Load Cell/Strain Gauge Bridge Isolating Converter D5264 series acts as a galvanic isolated interface installed between a PLC/DCS in Safe Area/Non Hazardous Locations and a load cell (or a group of load cells) in Hazardous Area/Hazardous Locations. Up to four 350 Ω load cells, or five 450 Ω load cells, or ten 1000 Ω load cells can be connected in parallel.
It provides a fully floating power supply voltage with remote sensing capabilities to load cell located in Hazardous Area/Hazardous Locations and converts the mV signal from load cell into a 0/4-20 mA signal according to user desired range.
Remote sensing wires (terminals “14” +Sense and “15” –Sense) must be always connected to force lines (terminals “13” +Exc and “14” –Exc) for proper operation of the unit, in case of 4 wires cell connect the sensing lines near to the cell connections to minimize the power supply voltage compensation error.
The Output circuit provides both current source and sink capabilities. Modbus output is also provided to interface PLC/DCS using digital communication.
The Presence of supply power is displayed by a green signaling LED.
The module is also provided with a PhotoMOS alarm output and an alarm indication red led. The module is totally software configurable by means of the GM PPC5092 adapter and SWC5090 configuration software.

Installation

D5264 series is a Load Cell/Strain Gauge Bridge Isolating Repeater housed in a plastic enclosure suitable for installation on EN/IEC60715 TH 35 DIN-Rail, with or without Power Bus, or on customized Termination Boards. D5264 series can be mounted with any orientation over the entire ambient temperature range.
Electrical connections are accommodated by polarized plug-in removable screw terminal blocks which can be plugged in/out into a powered unit without suffering or causing any damage **(for Zone 2 installations check the area to be nonhazardous before servicing)**. Connect only one individual conductor per each clamping point, use conductors up to 2.5 mm² (13 AWG) and a torque value of 0.5-0.6 Nm. Use only cables that are suitable for a temperature of at least 85°C.The wiring cables have to be proportionate in base to the current and the length of the cable.
On the section “Function Diagram” and enclosure side a block diagram identifies all connections.
Identify the function and location of each connection terminal using the wiring diagram in the corresponding section, for example:
Connect a 24 Vdc power supply voltage between terminals “9” (positive pole) and “10” (negative pole).
Connect current source mode positive output at terminal “1” and negative output at “2” or current sink mode positive output at terminal “2” and negative output at terminal “1”
Connect serial line Modbus output at terminal “11” and at terminal “12”.
Connect strain gauge bridge voltage supply at terminal “13” positive and terminal “16” negative.
Connect strain gauge bridge voltage sensing supply at terminal “14” positive and terminal “15” negative.
If strain gauge bridge has no internal voltage sensing capability always connect terminal "14" to terminal "13" and terminal "15" to terminal "16";
for better performance connect the wire at the end of the line near the load cells.
Connect strain gauge bridge output signal at terminal “17” positive and terminal “18” negative.
Intrinsically Safe conductors must be identified and segregated from non I.S. and wired in accordance to the relevant national/international installation standards (e.g. EN/IEC60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines)), make sure that conductors are well isolated from each other and do not produce any unintentional connection. Isolation in accordance with EN/IEC 60079-11 clause 6.3.13 is provided between non-intrinsically safe circuits and intrinsically safe circuits.
The enclosure provides, according to EN60529, an IP20 minimum degree of protection (or similar to NEMA Standard 250 type 1). The equipment shall only be used in an area of at least pollution degree 2, as defined in IEC 60664-1. When installed in EU Zone 2, the unit shall be installed in an enclosure that provides a minimum ingress protection of IP54 in accordance with IEC 60079-0. When installed in a Class I, Zone 2 Hazardous Location, the unit shall be mounted in a supplemental AEx or Ex enclosure that provides a degree of protection not less than IP54 in accordance with UL/CSA 60079-0. When installed in a Class I, Division 2 Hazardous Location, the unit shall be mounted in a supplemental enclosure that provides a degree of protection not less than IP54. The enclosure must have a door or cover accessible only by the use of a tool. The end user is responsible to ensure that the operating temperature of the module is not exceeded in the end use application.
Units must be protected against dirt, dust, extreme mechanical (e.g. vibration, impact and shock) and thermal stress, and casual contacts. If enclosure needs to be cleaned use only a cloth lightly moistened by a mixture of detergent in water.
Electrostatic Hazard: to avoid electrostatic hazard, the enclosure of D5264 series must be cleaned only with a damp or antistatic cloth.
Any penetration of cleaning liquid must be avoided to prevent damage to the unit.
Any unauthorized modification must be avoided.
D5264 series must be connected to SELV or PELV supplies.
All circuits connected to D5264 series must comply with the overvoltage category II (or better) according to EN/IEC60664-1.

Start-up

Before powering the unit check that all wires are properly connected, particularly supply conductors and their polarity, input and output wires, also check that Intrinsically Safe conductors and cable trays are segregated (no direct contacts with other non I.S. conductors) and identified either by color coding, preferably blue, or by marking.
Check conductors for exposed wires that could touch each other causing dangerous unwanted shorts.
Before turning power on, field load cell must be connected to the module. Then, turn power on, the “power on” green led must be lit, output must be in accordance with the corresponding input signal value. If possible change the load cell condition and check the corresponding Safe Area output.

Screenshot:

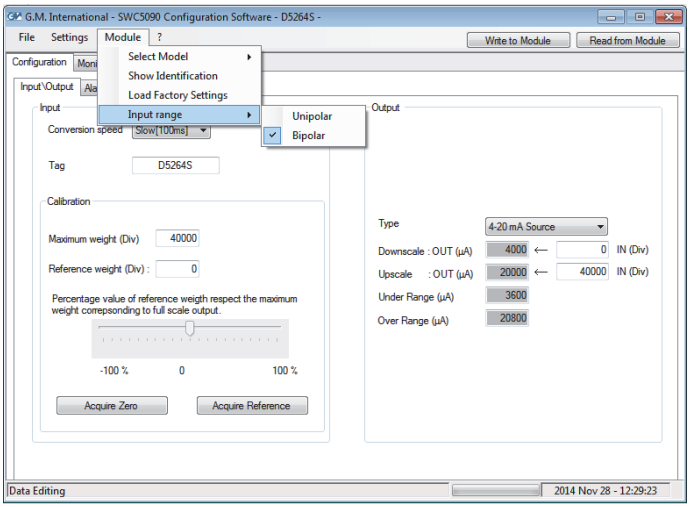
Input range :
Unipolar: the input scale ranges from 0 to the maximum value. This scale is particularly indicated to measure a weight.
Bipolar: the input scale ranges form – to + maximum value. This scale is particularly indicated for other sensors, i.e. strain gauges.

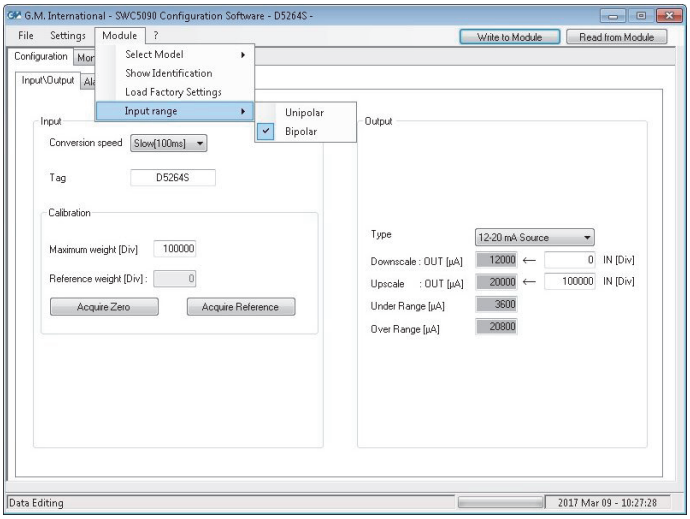
INPUT :
Conversion speed (Input data acquisition time):
Slow: 100 ms
Fast: 12.5 ms
Tag : 16 alphanumerical characters
Maximum weight: configurable from 0 to 100000 divisions. Higher values lead to greater resolutions.
Reference weight: weight used for calibration.
Configurable form 0 to selected maximum weight.
Acquire Zero : press button to start the zero acquiring procedure.
Acquire Reference : press button to start reference acquiring procedure

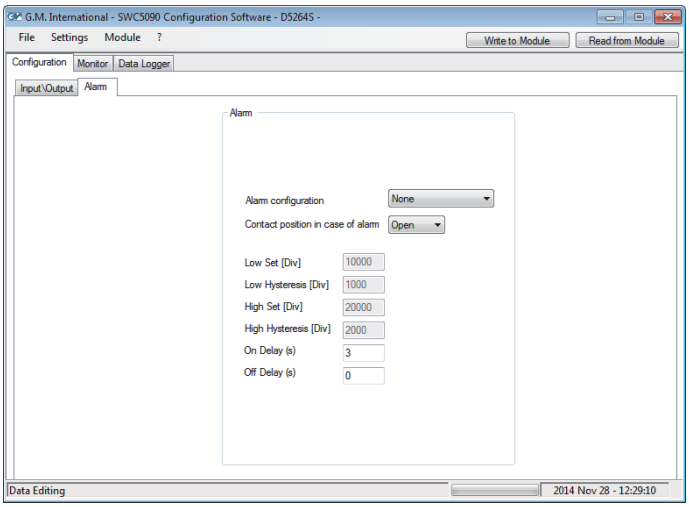
OUTPUT:
0-20 mA Sink
4-20 mA Sink
Custom Sink All Output parameters are fully customizable.
0-20 mA Source
4-20 mA Source
Custom Source All Output parameters are fully customizable.
Downscale: analog output downscale in normal working condition (range 0 to 24 mA)
Upscale: analog output upscale in normal working condition (range 0 to 24 mA)
Under range: analog output value in under range condition (range 0 to 24 mA)
Over range: analog output value in over range condition (range 0 to 24 mA)

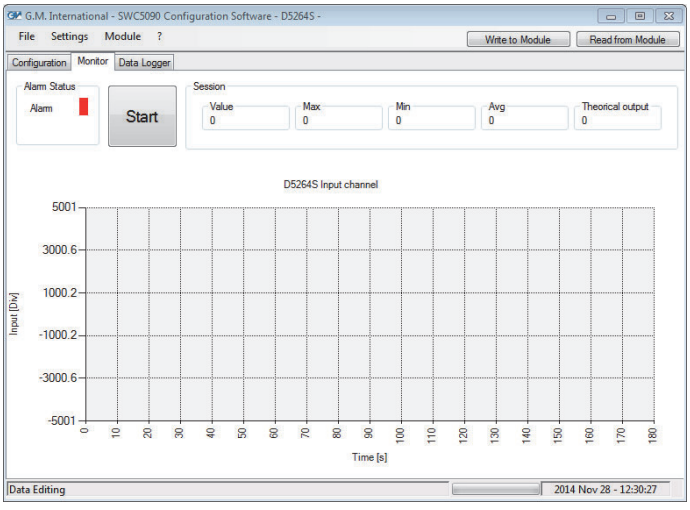
ALARM
Configuration:
None: alarm is disabled,
Low: alarm is triggered when source descends below "Low Set",
High: alarm is triggered when source ascends over "High Set",
Window: alarm is triggered below "Low Set" and above "High Set",
Contact position in case of alarm:
Open: alarm output is closed under regular working conditions, and it opens in case of alarm;
Closed: alarm output is open under regular working conditions and it closes in case of alarm;

Low Set: source value below which the alarm is triggered (in Low, Window)
Low Hysteresis: hysteresis on the low set value
High Set: source value above which the alarm is triggered (in High,Window)
High Hysteresis: hysteresis on the high set value
On Delay: time for which the source variable has to be in alarm condition before the alarm output is triggered; configurable from 0 to 1000 seconds in steps of 100 ms
Off Delay: time for which the source variable has to be in normal condition before the alarm output is deactivated; configurable from 0 to 1000 seconds in steps of 100 ms









Supported ModBus Parameters:

Param. Address	Description	Notes	Type (7)
0	G.M. Factory Code	Identification Data	R
1	Instrument Code		
2	Option Code		
3	Hardware Release		
4	Software Release		
5 to 15	Reserved		
16	Modbus Address	Communication Data	R/W
17	Modbus Baudrate		
18	Modbus Format		
73	Measured Weight (Low 16 bits)	Input (Field) Data	R
74	Measured Weight (High 16 bits)		
116	Input Conversion Speed (1)	Input (Field) Configuration	R/W
117	Input Minimum (Low 16 bits)		
118	Input Minimum (High 16 bits)		
119	Input Maximum (Low 16 bits)		
120	Input Maximum (High 16 bits)		
121	Input Downscale (Low 16 bits)		
122	Input Downscale (High 16 bits)		
123	Input Upscale (Low 16 bits)		
124	Input Upscale (High 16 bits)		
160	Output Downscale (Low 16 bits) (2)	Output Configuration	R/W
161	Output Downscale (High 16 bits) (2)		
162	Output Upscale (Low 16 bits) (2)		
163	Output Upscale (High 16 bits) (2)		
164	Output Under Range (Low 16 bits) (2)		
165	Output Under Range (High 16 bits) (2)		
166	Output Over Range (Low 16 bits) (2)		
167	Output Over Range (High 16 bits) (2)		
168	Output Fault Current (Low 16 bits) (2)		
169	Output Fault Current (High 16 bits) (2)		
171	Output Source (3)		
240	Alarm Configuration (4)	Alarm Control	R/W
244	Contact Position in Case of Alarm (5)		
245	Delay to Alarm Issue (6)		
246	Delay to Alarm Removal (6)		
247	Alarm Low Threshold (Low 16 bits)		
248	Alarm Low Threshold (High 16 bits)		
249	Alarm Low Threshold Hysteresis (Low 16 bits)		
250	Alarm Low Threshold Hysteresis (High 16 bits)		
251	Alarm High Threshold (Low 16 bits)		
252	Alarm High Threshold (High 16 bits)		
253	Alarm High Threshold Hysteresis (Low 16 bits)		
254	Alarm High Threshold Hysteresis (High 16 bits)		
464	EEPROM Write	Command	W
556	Ch. 1 chars 0, 1	Tags	R/W
557	Ch. 1 chars 2, 3		
558	Ch. 1 chars 4, 5		
559	Ch. 1 chars 6, 7		
560	Ch. 1 chars 8, 9		
561	Ch. 1 chars 10, 11		
562	Ch. 1 chars 12, 13		
563	Ch. 1 chars 14, 15		

ModBus parameters details:

Supported ModBus Baudrates	
Index	Baudrate
0	4800
1	9600
2	19200
3	38400
4	57600
5	115200

Address 18: Supported Modbus Formats

High Byte								Low Byte							
Bit position															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Endianness 32 bit Data (0 = Little; 1 = Big)

Termination resistance (1 = enabled)

Supported Modbus Parity:
0 8 data bit, no parity, 1 stop bit
1 8 data bit, even parity, 1 stop bit
2 8 data bit, odd parity, 1 stop bit

Address 464: EEPROM Write

High Byte								Low Byte							
Bit position															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

1 Save Input/Output Configuration
2 Save Modbus configuration
8 Save Tags

(1) 0 = SLOW (100 ms); 1 = FAST (12.5 ms)
(2) Expressed in 100 µA
(3) 0 = Output Sink; 1 = Output Source
(4) 0 = None; 1 = Low Threshold; 2 = High Threshold; 3 = Window Thresholds
(5) 0 = Open; 1 = Closed
(6) Expressed in 100 ms
(7) Parameter Type:
R = read only,
W = write only,
R/W = read and write.