nexen®

WEB CONTROL PRODUCTS

User Manual

Signal Conditioner

SC100

FORM NO. L-21163-B-0304

In accordance with Nexen's established policy of constant product improvement, the specifications contained in this manual are subject to change without notice. Technical data listed in this manual are based on the latest information available at the time of printing and are also subject to change without notice.

Technical Support: 800-843-7445
(651) 484-5900
www.nexengroup.com

DANGER

Read this manual carefully before installation and operation.

Follow Nexen's instructions and integrate this unit into your system with care.

This unit should be installed, operated and maintained by qualified personnel ONLY.

Improper installation can damage your system or cause injury or death.

Comply with all applicable codes.

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Vadnais Heights, Minnesota 55127

ISO 9001 Certified

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INTRODUCTION

The SC100 Signal Conditioner provides excitation and signal processing to amplify two low voltage sensor signals to industry standard voltage and current levels for further use in process control and monitoring applications. The SC100 supports two different sensor families: first, differential signal sensors such as strain gauge load cells used to measure force or tension; second, single-ended signal sensors such as LVDT load cells used to measure force or tension and web guide sensors used to measure web edge position.

The DIN Rail mountable SC100 features an adjustable, bipolar excitation voltage that ranges from ±5 to ±15 VDC. Both SC100 inputs accept output voltages from sensors in a maximum range of 0-1 V. A gain range selector switch is available for each input channel, choosing either high or low gain. Further, both 0-10 V and 4-20 mA ranges are provided for each output and can be scaled to any desired engineering unit using onboard zero and span calibration potentiometers. These outputs are suitable for use as a feedback signal to indicators, PLCs, PCs or other controls.

INSTALLATION

CAUTION

Mount in a shock and vibration free area with an ambient temperature greater than 0°C [32°F] but less than 60°C [140°F]. The SC100 is for indoor use only.

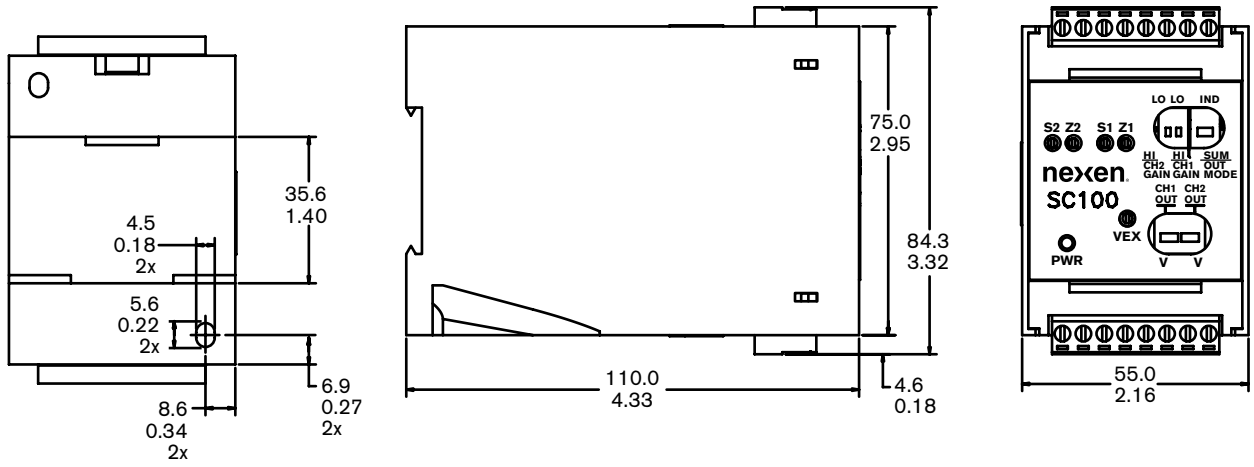

Figure 1

WIRING INSTALLATION GUIDELINES

This product is designed to minimize the effects of ElectroMagnetic Interference (EMI) on its operation, but as with any electronic device, proper installation and wiring methods are necessary to ensure proper operation. By doing so, the interference from external effects such as electrical line spikes, electrical noise, static electricity, etc. will be minimized. The following methods outline wiring installation guidelines to protect your system:

- All input and output signal and sensor cables must be shielded with the shields tied to earth ground at one end. In case of very high frequency (MHz range) electrical noise, both ends of the shield need to be tied to earth ground.
- Keep cable length as short as possible. Think of them as antennae for noise.
- Use power line filters to suppress interference on the AC voltage lines that power the unit.
- Place a resistor-capacitor network (snubber) across inductive coils such as relays and solenoids in order to stop electrical interference at the source (See Figure 2).
- Isolate signal and sensor cables from cables carrying AC voltages, power for high current loads or relays and solenoids. Either relocate the signal and sensor cables away from other cables or use grounded metal conduits to shield them. This will reduce the potential for noise interference between the signal and sensor cables and the other noisy cables.

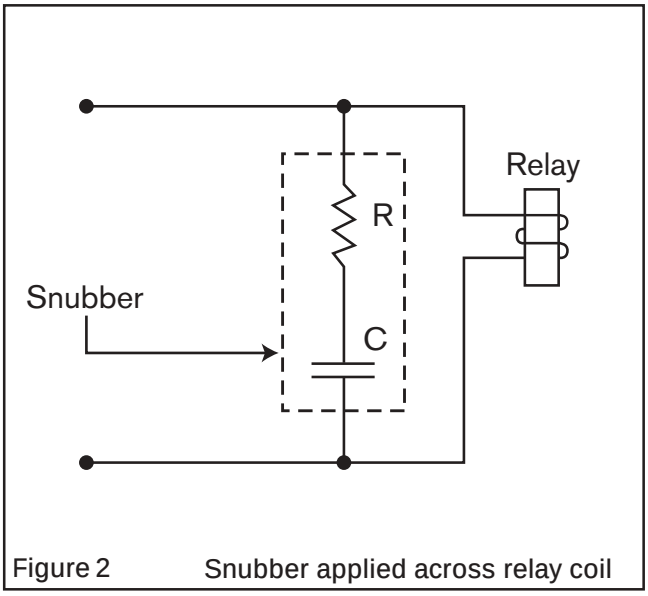

Figure 2 Snubber applied across relay coil

For environments that experience high levels of static electricity follow these additional guidelines:

- Remove the static charge from material carrying it. In the case of webs that carry static charges, there are static charge removal products available such as static bars and ionized blowers.
- Ensure that sensors and machine frames are grounded to earth through a low impedance path.
- Wrap grounding tinsel around sensors and cables that are close to the source of the static electricity and ground the tinsel to earth.
- Tie all signal and sensor cable shields directly to earth ground without passing through the electronic device. This will help prevent high voltage interference from coupling into other circuits within the device.

FORM NO. L-21163-B-0304

ELECTRICAL CONNECTIONS

1	+ 24 VDC
2	DC Com
3	Isolated +VDC
4	Isolated Com
5	Out 1
6	Com 1
7	Out 2
8	Com 2

9	+ Sensor 1
10	- Sensor 1
11	+ Vex
12	- Vex
13	Com
14	Shield
15	+ Sensor 2
16	- Sensor 2

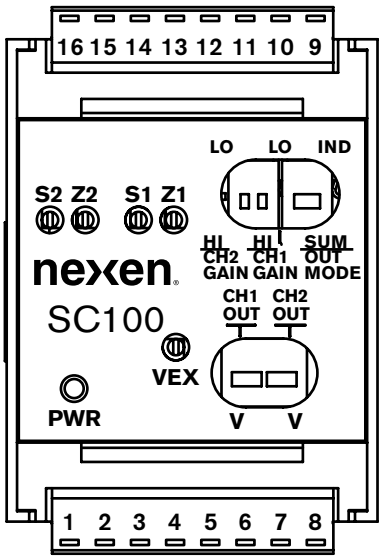

Figure 3

+24 VDC & Common: The SC100 requires 24 VDC to operate (Refer to SPECIFICATIONS for current rating).

Isolated +VDC Input: In cases where isolated Control Outputs are desired, this input is the supply line for the isolated 15-24 VDC power supply (supplied by user). If isolation is not needed, this input must be connected to the +24 VDC input.

Isolated Common: In cases where isolated Control Outputs are desired, this input is the return line for the isolated power supply (supplied by user). If isolation is not needed, this input must be connected to the DC Common input.

Out 1 and Out 1 Common: This is the control output and return line for Channel 1. This output signal can be used as an input to a PLC, PC, indicator or other controls. The output can be configured to be the output for Sensor 1 or the summation of Sensor 1 and Sensor 2. This function is chosen by the Out Mode switch (Refer to Switch Settings). The output can also be set to 0-10 VDC or 4-20 mA, chosen with the CH1 Out switch (Refer to Switch Settings). Both ranges are factory calibrated and ready for use.

Out 2 and Out 2 Common: This is the control output and return line for Channel 2. This output signal can be used as an input to a PLC, PC, indicator or other controls. This output refers to Sensor 2. This output can be set to 0-10 VDC or 4-20 mA, chosen with the CH2 Out switch (Refer to Switch Settings). Both ranges are factory calibrated and ready for use.

Excitation Voltage: The excitation voltage is made up of three lines: +Vex, -Vex and Common. These three can be used in any combination to fit the specific sensor specification. For bipolar excitation voltage, use +Vex and -Vex. For unipolar excitation voltage, use +Vex and Common. The excitation voltage is adjustable from 5 to 15 VDC by adjusting Vex located on the cover of the unit (Refer to SETUP).

+Sensor 1 and -Sensor 1: This is the input for sensor 1, which accepts both differential and single-ended inputs. The input voltage range is 0-500 mV for summed outputs and 0-1 V for individual outputs (Refer to SPECIFICATIONS).

+Sensor 2 and -Sensor 2: This is the input for sensor 2, which accepts both differential and single-ended inputs. The input voltage range is 0-500 mV for summed outputs and 0-1 V for individual outputs (Refer to SPECIFICATIONS).

Shield: This is a ground connection for the shielding on sensor cables. Shield all sensor wiring and keep away from wires carrying heavy loads or AC supply power.

Isolated Power Supply connections are available so that the Control Outputs are isolated from the input circuitry. When using Isolated Control Outputs, a second 15-24 VDC power supply is needed (See Figure 4). This setup is most commonly used to prevent the mixing of power supply commons together when connecting analog control outputs to a motor drive (Refer to SPECIFICATIONS).

Power Supply Connections for Isolated Outputs

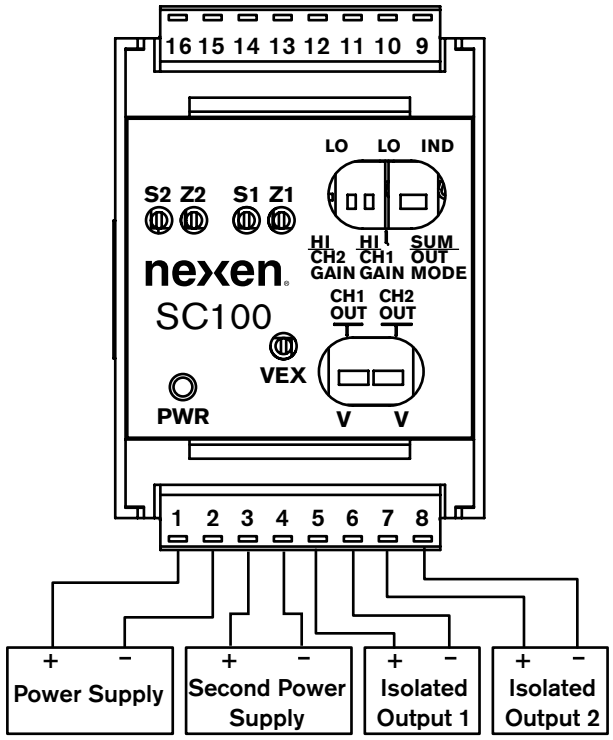

Figure 4

If Isolated Control Outputs are not needed, the Isolated +VDC and ISO Common must be connected to +24 VDC and DC common inputs, respectively (See Figure 5).

Power Supply Connections for Non-Isolated Outputs

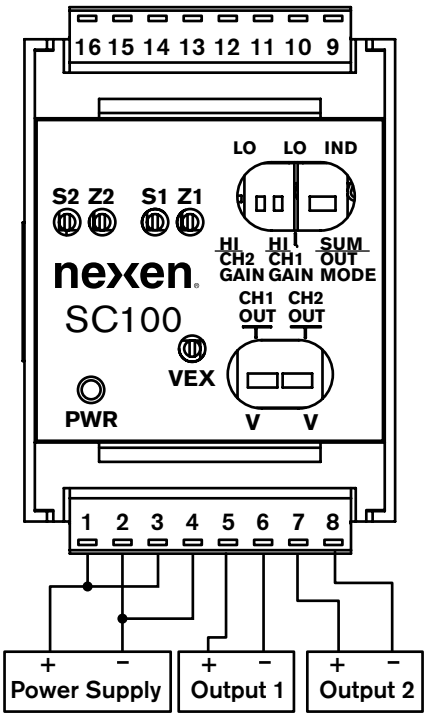

Figure 5

NEXEN SENSOR CONNECTIONS DIAGRAMS

Web Tension Sensors

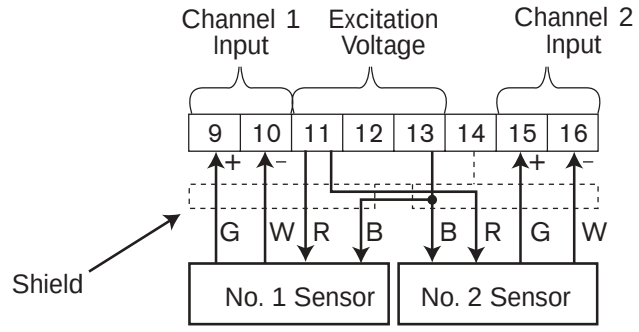

Figure 6 Dual MB Sensor Wiring

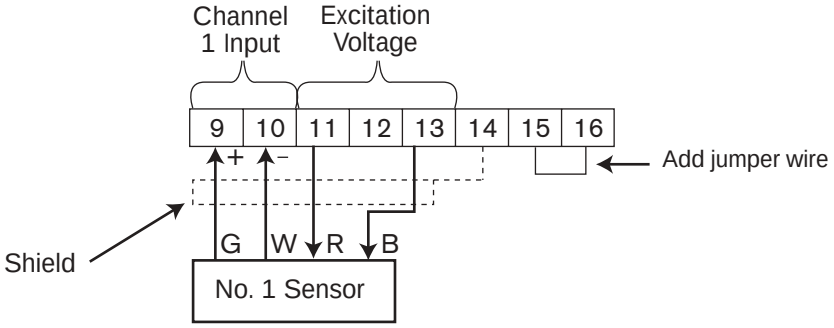

Figure 7 Single MB Sensor Wiring

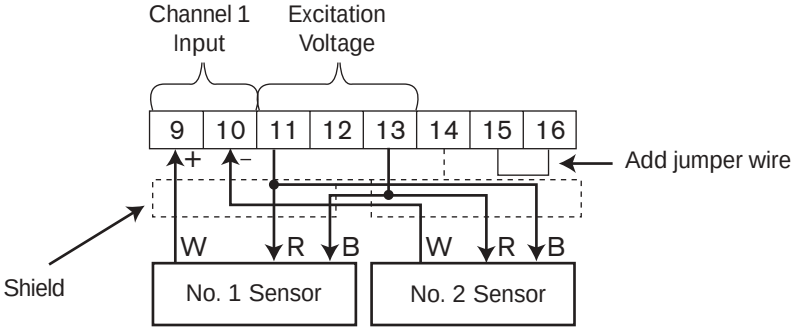

Figure 8 SW Sensor Wiring

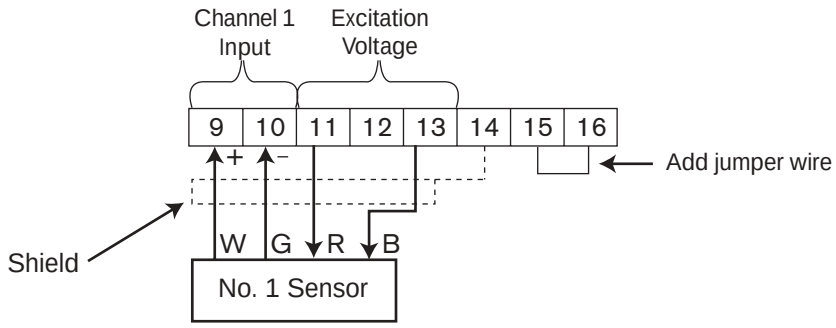

Figure 9 CFL Load Sensor Wiring

Web Guide Sensors

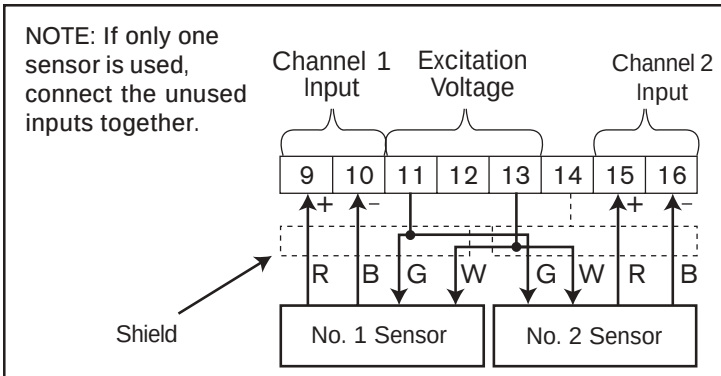

Figure 10 PH16 or PH21 Edge Guide Sensor Wiring

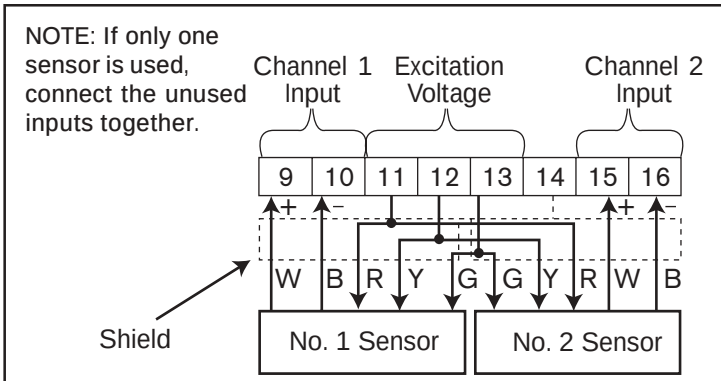

Figure 11 UH21 Ultrasonic Sensor

GENERIC SENSOR CONNECTION DIAGRAMS

SINGLE-ENDED OUTPUT SENSORS

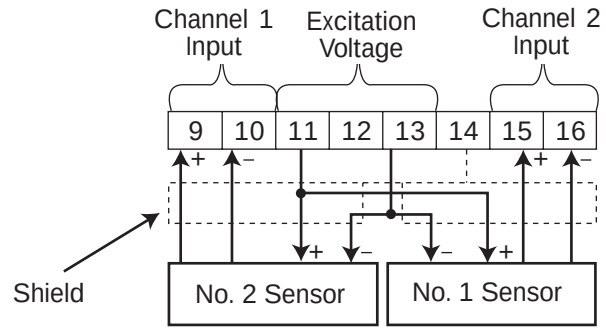

Figure 12 Dual Sensor Wiring

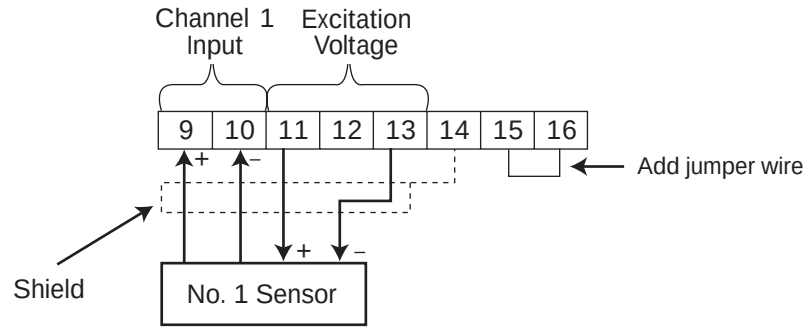

Figure 13 Single Sensor Wiring

DIFFERENTIAL OUTPUT SENSORS

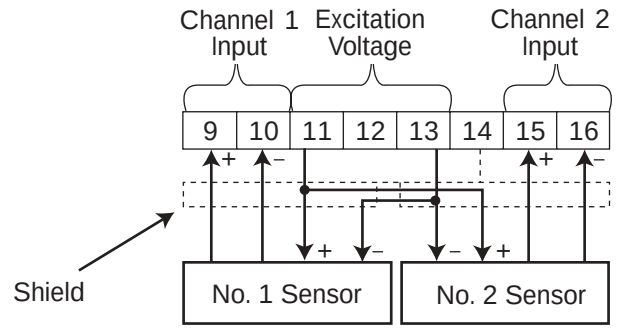

Figure 14 Full Bridge Sensor Wiring

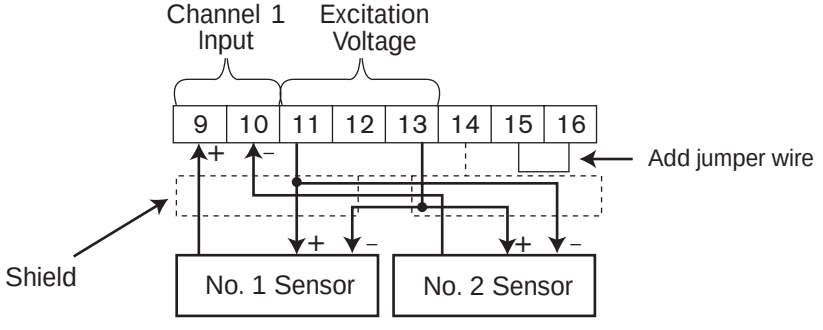

Figure 15 Half Bridge Sensor Wiring

SWITCH SETTINGS

Voltage or Current Output Selector

Both output channels are equipped with voltage or current outputs. This is user selectable via CH1 OUT and CH2 OUT switches accessed through the cover of the SC100.

Setting output channels:

Using a screw driver or your finger, slide the switch to 'I' for 4-20 mA output or to "V" for 0-10 V output. (See Figure 16).

Output Mode

The SC100 outputs can be set with both sensor channels summed together or each sensor channel separately.

Individual Outputs:

Channel 1 output is an amplification of Channel 1 sensor input. Similarly, channel 2 output is an amplification of the channel 2 sensor input.

Individual Outputs are generally used for web guide sensors, different sensor types using the same SC100, or load cells measuring tension in different tension zones.

Summed Output:

Channel 1 output is the summation of the amplification of Channel 1 and Channel 2 sensor inputs. Channel 2 output is the amplification of channel 2 sensor input.

Summed Output is generally used for a pair of load cells or strain gauges measuring tension in a single tension zone (See Figure 17).

NOTE: When using the summed output, each channel must be calibrated separately. This means when a total maximum output of 10 V is needed, each channel must be spanned to 5 V.

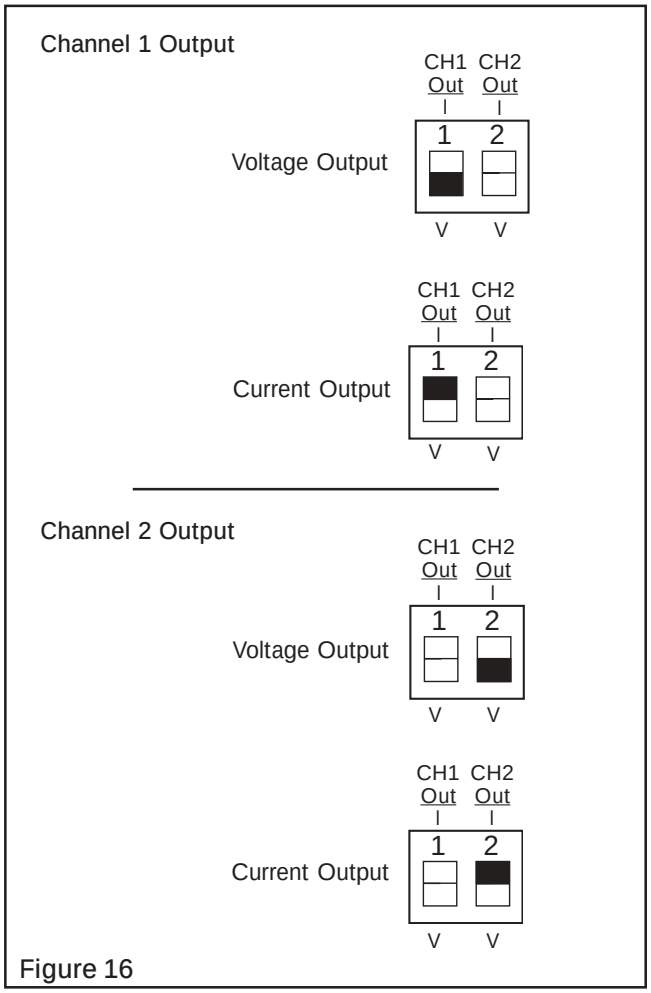

Figure 16

Set for Individual or Summed outputs.

Individual Outputs:

Output 1 = Channel 1

Output 2 = Channel 2

Summed output:

Output 1 = Channel 1 + Channel 2

Output 2 = Channel 2

Figure 17

Input Range Selector

Each input sensor channel can be set up with varying gains. Gains are user selectable with CH1 GAIN and CH2 GAIN switches accessible through the SC100 cover (See Figure 18).

For both Channel 1 and 2, LO GAIN has an overall gain range of 5-120; HI GAIN has a gain range of 50-1200. To calculate, take the maximum output voltage per channel divided by the maximum input voltage per channel. If the result is less than 50, choose LO gain, otherwise choose HI.

Example 1: Maximum output = 10V

Maximum input = 300mV

Gain = 33 => LO GAIN

Example 2: Maximum output = 10V

Maximum input = 50mV

Gain = 200 => HI GAIN

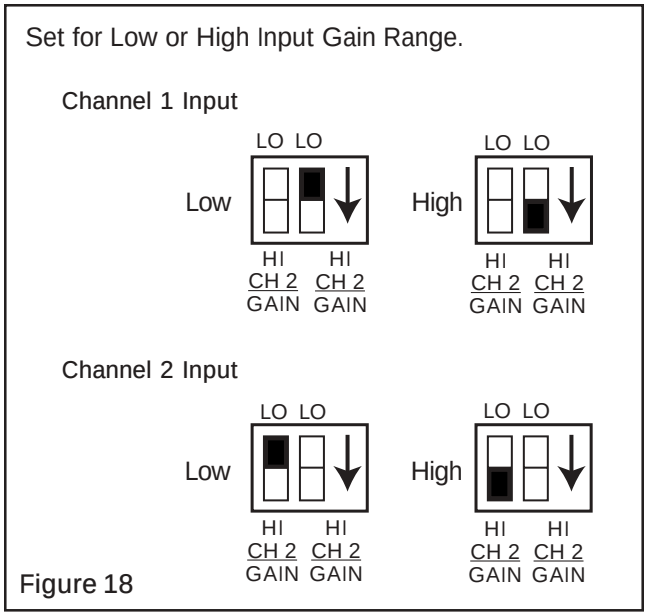

Figure 18

ADJUSTABLE EXCITATION VOLTAGE

The SC100 supplies an excitation voltage to sensors. This excitation is bipolar and adjustable from ±5 to ±15 VDC. It's three lines can be used in any combination per the sensor specifications.

1. Remove sensor excitation voltage connection.
2. Apply power to the SC100
3. Connect a voltmeter to terminals 11 (+) and 13 (-).
4. Adjust Vex until required excitation voltage is reached.
5. Reconnect sensor excitation voltage connection.
6. Recheck excitation voltage and adjust as necessary.

Table 1 Nexen Sensor Compatibility

Sensor	Excitation Volts	Output Volts	Maximum Quantity
MB Series (LVDT)	6 VDC	0–400 mV	2
SW Series (Strain Gauge)	6 VDC	0–250 mV (1/2 bridge) 0–600 mV (full bridge)	2
PH16	12 VDC	0–350 mA	2
PH21	12 VDC	0–350 mA	2
UH21	±15 VDC	0–200 mA	2

CALIBRATION

NOTE: Prior to calibration, make sure the Span and Zero Potentiometers are fully counterclockwise and the Output Selector switches are set to Individual and voltage output for both Channel 1 and Channel 2.

This procedure refers to the 0–10 VDC output, however the 4-20 mA will also change automatically in proportion to the voltage output.

When calibration procedure is complete, place the Output selector switches to the setting required for the application, Refer to SWITCH SETTINGS.

TENSION SENSORS

Zero Adjustment

1. Apply Power to the SC100.
2. Unload the sensor or sensors making sure their outputs represent the minimum value or at rest condition.
3. Connect a voltmeter to terminals 5 (+) and 6 (-).
4. Rotate Z1 until the voltmeter reads 0.025 VDC.
5. Connect a voltmeter to terminals 7 (+) and 8 (-).
6. Rotate Z2 until the voltmeter reads 0.025 VDC.

Span Adjustment

1. Apply a known load to the sensor 1 (See Figure 19).
2. Connect a voltmeter to terminals 5 (+) and 6 (-).
3. Rotate S1 clockwise to increase the reading to the desired voltage level. Example: Maximum Load = 100 lbs with a 50 lb weight, adjust the output for 5.0 VDC.

NOTE: If using one sensor, skip steps 4 through 6.

4. Connect a voltmeter to terminals 7 (+) and 8 (-).
5. Rotate S2 clockwise to increase the reading to the desired voltage level.
6. Set the Output Mode switch to the desired setting, either Individual or Summed (See Switch Settings in SETUP section).
7. Repeat the *Zero Adjustment* and *Span Adjustment* procedures detailed above.

NOTE: Span Adjustments procedures may offset the Zero Adjustment settings. Repeating both procedures will ensure that settings are accurate.

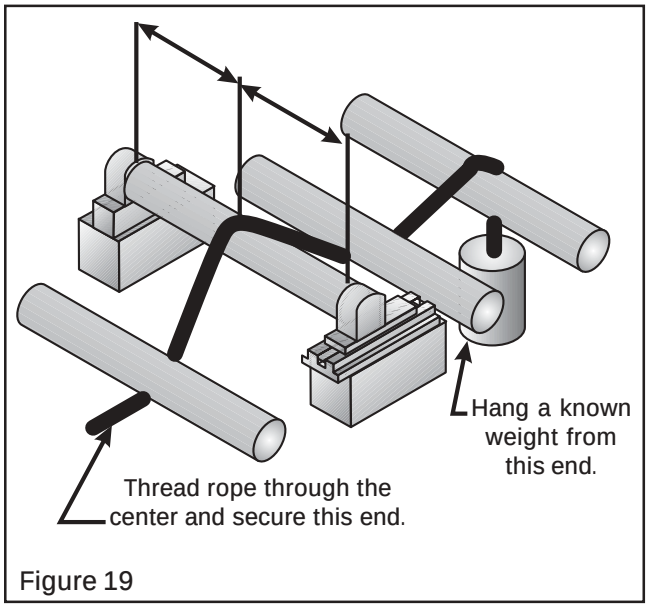

Figure 19

WEB GUIDE SENSORS

Zero Adjustment

1. Apply Power to the SC100.
2. Cover the sensor window completely with an opaque material (See Figure 20).
3. Connect a voltmeter to terminals 5 (+) and 6 (-).
4. Adjust Z1 until the voltmeter reads 0.025 VDC.
5. Connect a voltmeter to terminals 7 (+) and 8 (-).
6. Adjust Z2 until the voltmeter reads 0.025 VDC.

Span Adjustment

1. Uncover the sensor window.
2. Connect a voltmeter to terminals 5 (+) and 6 (-).
3. Adjust S1 until the voltmeter displays 10.0 VDC.

NOTE: If using one sensor, skip steps 4 through 6.

4. Connect a voltmeter to terminals 7 (+) and 8 (-).
5. Adjust R4 until the voltmeter displays 10.0 VDC.

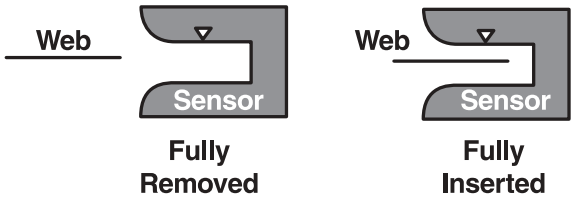

Figure 20

6. Set the Output Mode switch to the desired setting, either Individual or Summed (See Switch Settings in SETUP section).
7. Repeat the *Zero Adjustment* and *Span Adjustment* procedures detailed above.

NOTE: Span Adjustments procedures may offset the Zero Adjustment settings. Repeating both procedures will ensure that settings are accurate.

GENERIC SENSORS

Zero Adjustment

1. Apply Power to the SC100.
2. Unload the sensor or sensors making sure their outputs represent the minimum value or at rest condition.
3. Connect a voltmeter to terminals 5 (+) and 6 (-).
4. Rotate Z1 until the voltmeter reads 0.025 VDC.
5. Connect a voltmeter to terminals 7 (+) and 8 (-).
6. Rotate Z2 until the voltmeter reads 0.025 VDC.

Span Adjustment

1. Apply a known load to the sensor 1.
2. Connect a voltmeter to terminals 5 (+) and 6 (-).
3. Rotate S1 clockwise to increase the reading to the desired voltage level for the load applied.

NOTE: If using one sensor, skip steps 4 through 6.

4. Connect a voltmeter to terminals 7 (+) and 8 (-).
5. Rotate S2 clockwise to increase the reading to the desired voltage level for the load applied.
6. Set the Output Mode switch to the desired setting, either Individual or Summed (See Switch Settings in SETUP section).
7. Repeat the *Zero Adjustment* and *Span Adjustment* procedures detailed above.

NOTE: Span Adjustments procedures may offset the Zero Adjustment settings. Repeating both procedures will ensure that settings are accurate.

TROUBLESHOOTING

Problem	Possible Cause	Quick Test	Corrective Action
Power LED is not lit.	No power or incorrect power to SC100	Test terminal 1 (+) and terminal 2 (-) with a voltmeter.	Check wire connections and/or replace power supply.
SC100 Output does not change with load.	Incorrect power supply connections	Test terminals 1 (+) and 2 (-) and terminals 3 (+) and 4 (-) with a voltmeter.	Check wire connections and/or replace power supply.
	Sensor inputs wired backwards	Test terminals 9 (+) and 10 (-) and terminals 15 (+) and 16 (-) with a voltmeter.	If test shows a negative voltage, swap sensor leads.
	Incorrect excitation voltage	Compare adjustable excitation voltage with sensor specifications.	Adjust excitation voltage potentiometer for correct voltage.
	Incorrect polarity on SW sensors.	Refer to Sensor Connections Diagrams.	Check wire connections; make sure red and black wires are swapped on the No. 2 sensor.
Span does not reach required voltage level.	Wrong GAIN setting	Refer to Switch Settings.	Switch the input GAIN switch and adjust span potentiometer.

SPECIFICATIONS

Power Supply		+24 VDC ±10% at 500 mA max
Isolated Power Supply (optional)		+15-24 VDC at 150 mA
Analog Inputs		Individual: 0-1 V maximum Summed: 0-500 mV maximum
Operating Ambient Temperature		0°C [32°F} to 60°C [140°F]
Outputs	Control (Analog)	0-10 VDC at 30 mA
	Control (Analog)	4-20 mA
	Sensor Excitation Voltage	+5 to +15 VDC at 300 mA -5 to -15 VDC at 50 mA Adjustable
Relative Humidity		80% maximum
Pollution Degree		2
Altitude		0 to 2000 m (6561 ft)
Installation (or over voltage) Category		II
Din Rail		35 mm
Certification		CE, ETL

PART NUMBERS

SC100 964420
Power Supply 964509

PARTS LIST

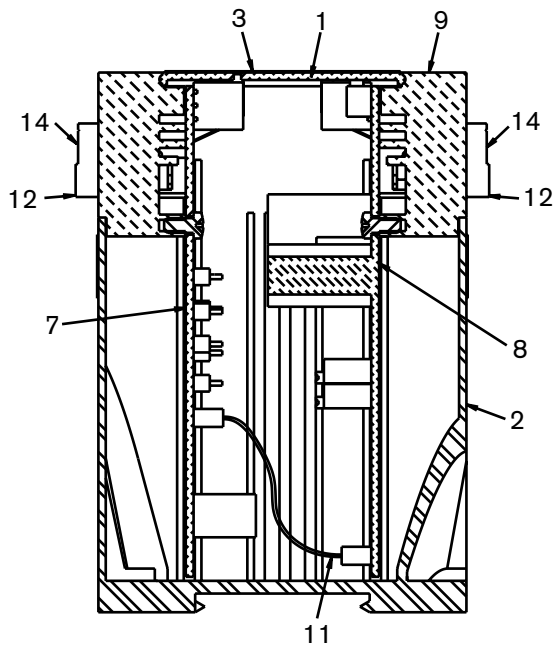

Figure 21

ITEM	DESCRIPTION	QTY
1	Enclosure Cover	1
2	Enclosure Base	1
3	Cover Decal	1
7	Analog Printed Circuit Board Assembly	1
8	Power Printed Circuit Board Assembly	1
9	Enclosure Inserts	2
11	Ribbon Cable	1
12	Terminal Connector	2
14	Numbered Terminal Markings	2

Warranties

Nexen warrants that the Products will be free from any defects in material or workmanship for a period of 12 months from the date of shipment. NEXEN MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty applies only if (a) the Product has been installed, used and maintained in accordance with any applicable Nexen installation or maintenance manual for the Product; (b) the alleged defect is not attributable to normal wear and tear; (c) the Product has not been altered, misused or used for purposes other than those for which it was intended; and (d) Buyer has given written notice of the alleged defect to Nexen, and delivered the allegedly defective Product to Nexen, within one year of the date of shipment.

Exclusive Remedy

The exclusive remedy of the Buyer for any breach of the warranties set out above will be, at the sole discretion of Nexen, a repair or replacement with new, serviceably used or reconditioned Product, or issuance of credit in the amount of the purchase price paid to Nexen by the Buyer for the Products.

Limitation of Nexen's Liability

TO THE EXTENT PERMITTED BY LAW NEXEN SHALL HAVE NO LIABILITY TO BUYER OR ANY OTHER PERSON FOR INCIDENTAL DAMAGES, SPECIAL DAMAGES, CONSEQUENTIAL DAMAGES OR OTHER DAMAGES OF ANY KIND OR NATURE WHATSOEVER, WHETHER ARISING OUT OF BREACH OF WARRANTY OR OTHER BREACH OF CONTRACT, NEGLIGENCE OR OTHER TORT, OR OTHERWISE, EVEN IF NEXEN SHALL HAVE BEEN ADVISED OF THE POSSIBILITY OR LIKELIHOOD OF SUCH POTENTIAL LOSS OR DAMAGE. For all of the purposes hereof, the term "consequential damages" shall include lost profits, penalties, delay images, liquidated damages or other damages and liabilities which Buyer shall be obligated to pay or which Buyer may incur based upon, related to or arising out of its contracts with its customers or other third parties. In no event shall Nexen be liable for any amount of damages in excess of amounts paid by Buyer for Products or services as to which a breach of contract has been determined to exist. The parties expressly agree that the price for the Products and the services was determined in consideration of the limitation on damages set forth herein and such limitation has been specifically bargained for and constitutes an agreed allocation of risk which shall survive the determination of any court of competent jurisdiction that any remedy herein fails of its essential purpose.

Limitation of Damages

In no event shall Nexen be liable for any consequential, indirect, incidental, or special damages of any nature whatsoever, including without limitation, lost profits arising from the sale or use of the Products.

Warranty Claim Procedures

To make a claim under this warranty, the claimant must give written notice of the alleged defect to whom the Product was purchased from and deliver the Product to same within one year of the date on which the alleged defect first became apparent.

nexen

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