Quick User Guide

OEM Customised Product - Contact Keynes Control Ltd for more details
Tel: 0118 327 6067 or sales@keynes-controls.com

The following document is a quick user guide for the operation of the range single channel SDI-12 strain gauge cards manufactured by Keynes Controls.

Part No **NP-Strain-1-SDI12**

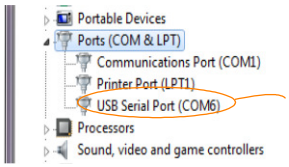
The example show the use of a PC data acquisition unit running Q-LOG data display and recording software. This is the fastest and simplest way to undertake measurements.

Part No. USB-SDI12-Pro
Isolated SDI-12 to USB media converter

Part No. **NP-Strain-1-SDI12**
Single channel strain gauge interface with SDI-12 digital network.

Q-Log Application

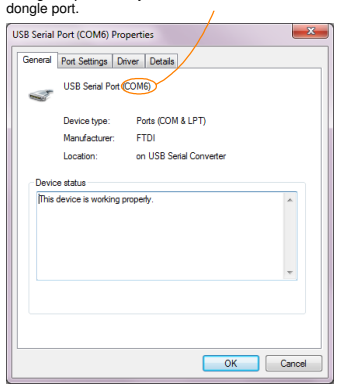
Windows Operating System



Windows device manager

COM 6 is shown identified by the operating system as being in use

COM 6: This is the port number used in the Q-Log setup to identify the media converter dongle port.



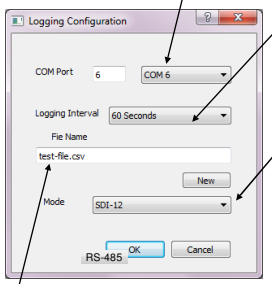
Download Q-LOG

Download a copy of Q-LOG at

http://www.aquabat.net/QLOGFree/qlogv2.html

Sample Q-LOG Configuration Window

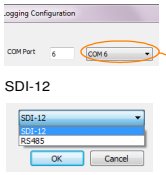
Logging Configuration Window



COM Port Selection List

Sample Rate

Data Log File
Name & Storage Location



Enter the COM Port number identified in the 'Device Manager' list here.

Select the Network Type

The network type is printed on the label of the media converter

Select: SDI12

1. Set the USB-SDI12-Pro COM port

Plug the USB-SDI12-Pro media converter into the PC.

Identify the active COM port in the operating system using the 'Device Manager'.

The driver software will load automatically if an Internet connection is available.

The drivers are often supplied as standard in the Windows Operating Systems.

AquaLOG / 3rd Part Logger

or

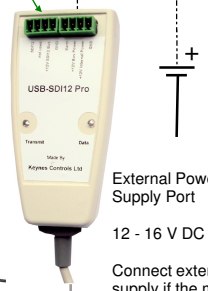
USB-SDI12-Pro

SDI-12 Port

Part No. USB-SDI12-Pro

Isolated USB - SDI12 media converter.

This device can power up to 10 single channel devices from the USB-SDI12-Pro media converter directly from the PC USB port.



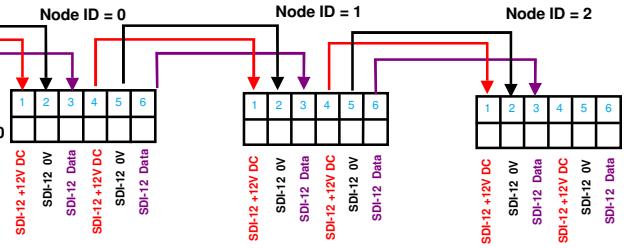
External Power Supply Port

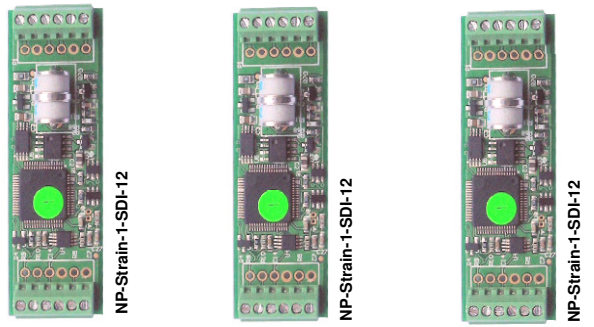
12 - 16 V DC

Connect external power supply if the maximum current for the number of devices on the SDI12 network exceeds 85 mA

Image is for marketing purposes only
The supplied card may differ slightly from the image below.

Network connection for multiple devices

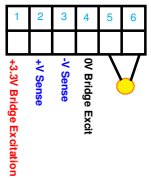




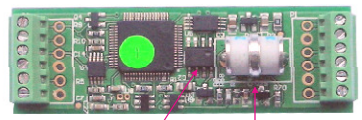
Sensor Connection

Strain Gauge Port Pin-out

View looking into port



Part No. **NP-Strain-1-SDI-12**



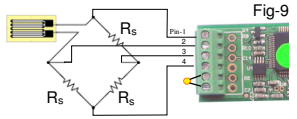


Fig-9

Example circuit shows a quarter (N=1) bridge strain gauge and thermistor.

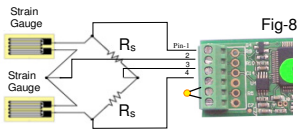
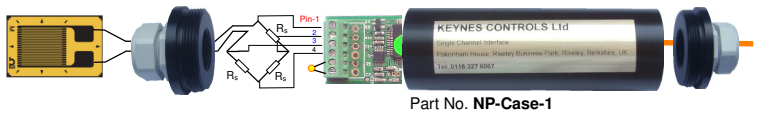


Fig-8

Example circuit shows a half (N=2) bridge strain gauge and thermistor.

Enclosure

The NP-Strain-1-SDI-12 card is deployed onto a field application using the custom designed enclosure **NP-Case-1**, see image below. The NP-Case-1 enclosure is sealed against the environment using the cable glands.



Part No. **NP-Case-1**

Example of a completely sealed NP-Case-1 and sensor

Network

Fig-10

Use Formula operations in Q-LOG to convert raw data into Engineering units

Measurements

$$\varepsilon = \frac{Reading}{GF}$$ **Full bridge strain gage**

$$\varepsilon = \frac{4 \,.\, Reading}{GF}$$ **¼ bridge strain gage**

$$\varepsilon = \frac{2.\ Reading}{GF}$$ **½ bridge strain gage**

where

ε = strain

GF = Gage Factor

Reading = 'aM!' 'aD0'

Measurement data from NP-Strain-1 card

Point–slope form

$y - y_1 = m(x - x_1)$

Lasted updated: 17/07/2015

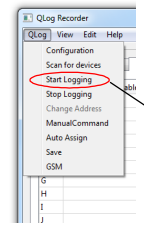
Q-Log Quick User Guide

Scan for Devices

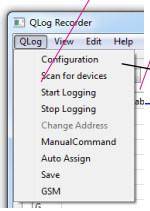
The Q-Log software scans the network and lists the identified instruments automatically.

The network to be scanned is that specified in the '**Device Setup**' Window.

Start Data Acquisition

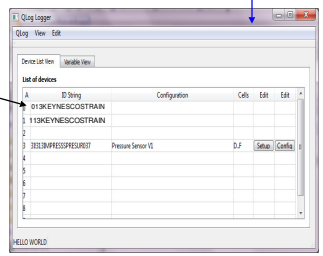


Only start data logging upon identifying instruments on a network.



After '**Scan for devices**' option selected the the following Window will be shown.

The sample sensors have ID=0 and ID=1



Sensor ID=0

Once the Window above is displayed it means that the USB-SDI12-Pro media converter and the single channel interface cards are installed and operating correctly.

Temperature Compensated Readings

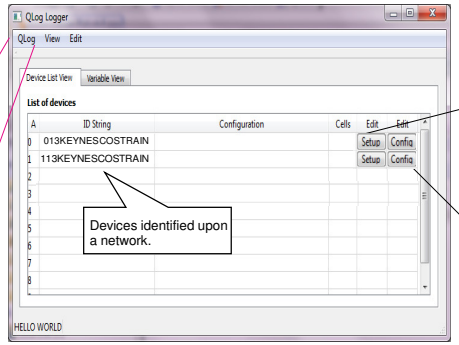
For some applications temperature compensated readings will improve the accuracy of the measurements.

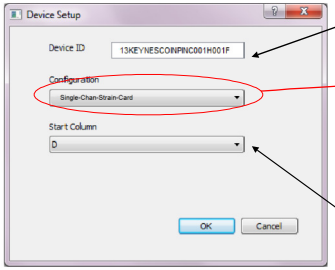
The NP-Strain-1 card supports the standard strain gauge temperature compensation equation by default.

The optional temperature sensor can be directly installed in the case, or by use of an external thermistor mounted onto the structure under investigation.

'**Q-Log Data Recording**' Window:

Display Identified Instrument/sensor list.





Device Identification String
Preset into the sensor or interface

Sensor Option Selection
Enables different sensor options to be used. **Import you use this option**

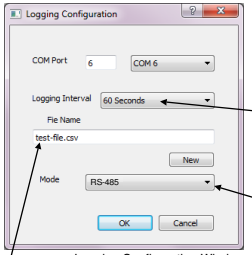
Select 'Dual Axis Option' from pull down list

Assigns the start cell of the sensor data into the data table making up the log file.

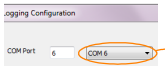
First cell where measurements can be stored is '**Cell D**'

A .. IU - Excel spreadsheet format.

COM Port Selection List

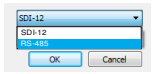


Logging Configuration Window



Enter the COM Port number identified in Device Manager List here.

Sample Rate



Select the Network Type

The network type is printed on the label of the media converter

Select: SDI-12

Data Log File
Name & Storage Location

Engineer Units

The NP-Strain-1 range of cards can return data values directly in engineering units

SDI-12 Command: aXCn,value!

$Y = [0] + [1]*S + [2]*S^2 + [4]*t*S + [5]*t*S^2$

where Y = Output Engineering Units
S = Sample reading from device
t = temperature (compensation)

[0] = Offset [1] = Gradient (m)

(Calibration factors for linear interpolation only)

Example - enter linear interpolation values for a device with ID = 5. Offset = 520.06, m = 6.1453

[0] = 520.06 [1] = 6.1453 (m)

Start measurement: **5M!** - get data **5D0!**

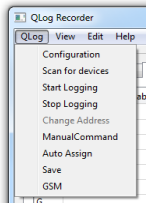
ID=5

Set offset [0] with command 5XC0,520.06!

Set Gradient (m) [1] with command 5XC1,6.1453!

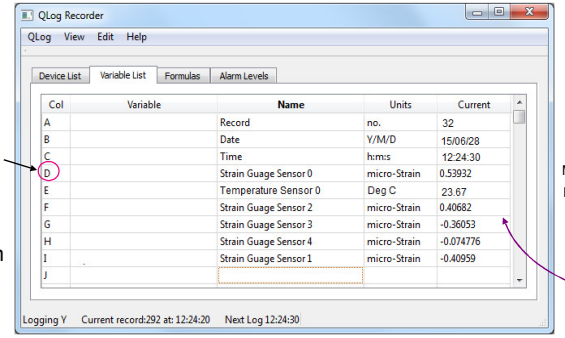
Results are now in engineering units Y(Engineer units) = [520.06] + [6.1453]*S

Auto-Assign Results Table



Press the 'Auto Assign' button so that the data from the sensors fits in consecutive cells in the data table.

Cell D



Micro-strain
ID=0 Temp Deg C

Real-time results updates after each acquisition.

IMPORTANT NOTE. This is not the default screen.

Refer to the Q-LOG manual for changing the '**Name**' and '**Units**'

SDI-12 Logger Commands

Use the following commands to start a measurement and receive data from the devices.

Start measurement:	0M!	returns 012 - 1 sec response 2 values
	0D0!	returns 0+'Meaurement' +temp

Engineering Units

All of the strain gauge cards can be set to give measurements in engineering units, or can use Q-LOG to apply calibration curves using the in-built formulae processing.

Excel Spreadsheet Data Results

First data cell

A	B	C	D	E	F
Record No	Date	Time	0.53932	23.67	

When a results file is loaded into Excel the file format will be as shown.

Sensor Data Temp Deg C

Important Note. To get data from sensor with ID=0 automatically into Cell 'D' press the auto assign option.

Wiring Guide - NP-Strain-1-SDI12 Interface Card

The images below demonstrate the complete set single channel strain gauge kit available from Keynes Controls Ltd.

The NP-Case-1 forms an environmentally sealed enclosure for all of the Keynes Controls range single channel intelligent of interface cards.

The NP-Case-1 is made from an PVC plastic tube and is sealed using removable cable glands fitted to gland plates. The tubes seal out the effects of the environment such as moisture and the ingress of dust.

For additional protection waterproof gaskets and IP-65 rated cable glands can be used.

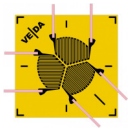


Image below shows the NP-Case-1 sealed for environmental protection.

Direct Connection to a Data Logger or Hub-6 Port Expansion Block

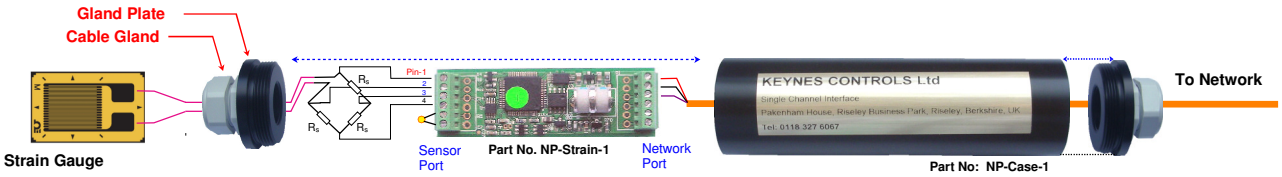


Fig-11

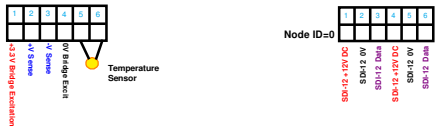
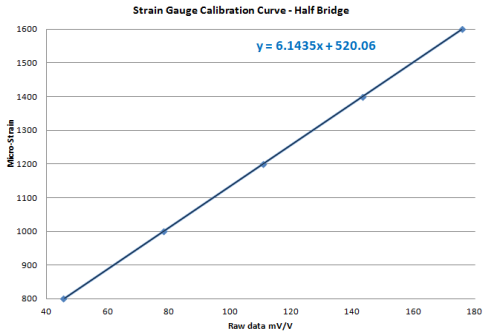


Fig-13

Card Installation into the NP-Case-1

1. Connect the signal cables and network connections onto the NP-Strain-1 card. See Figures 11 & 12.
2. Slide the sensor gland plate and with attached gland over sensor cabling making sure that the gland opening is wide enough no to interfere with wiring.
3. Attach the network cabling to the network port on the NP-Strain-1 card.
4. Screw the gland plate into the tube and secure. Lock down the cable glands to grip securely the wiring. This action secures the NP-Strain-1 card into place and provides the environmental protection and will look like Fig 13 when finally assembled.

Determine & Assign Calibration Factors



Raw Data mV/V	Calibration Points micro-Strain
45.567	800
78.12175	1000
110.6765	1200
143.2313	1400
175.786	1600

$Y = [0] + [1]*S + [2]*S^2 + [4]*t*S + [5]*t*S^2$

Becomes

Y(Engineer units) = [520.06] + [6.1453]*S

Example

The following data points were measured under test conditions using a strain gauge calibrator.

Use a simple linear regression to determine calibration curve used to convert measured values directly into engineering units.

The simplest way to determine the calibration factors is to use a spreadsheet package such as the Microsoft Excel.

Plot the test data into a Scatter Plot and have Excel determine and show the curve parameters.

A worked example of using a Scatter plot the test data shown above is shown in Fig 12.

Calibration Factor Calculations

Paste the test data into a spreadsheet.
Select and display the sample test data in a Microsoft Excel Scatter Chart.
Use the Trend Line format operations and select '**Linear**' and '**Display Equation on Chart**'.

The factors shown in the linear equation is used to convert raw data into engineering units.

A quadratic calibration equation can be used should this be proved suitableRef

Refer to Microsoft Excel User Guide for further details.

Example Calibration Commands

aXC0,offset! aXC1,scale!

Example - Using the sample test data above and Set calibration factors for device with ID = 3 to Scale = **6.1435** and offset = **520.06**

SDI-12 Commands are 3XC1,6.1435! 3XC0,520.06!

Results are now in engineering units.

Output (Eng Units) = **6.1435**. mV/ V_{in} + **520.06**

Direct Connection to a Windows PC

Figure 14 below shows how a simple PC based data acquisition system is created using the NP-Strain-1 card and USB-SDI12-Pro media converter.

Each of the single channel cards, regardless of type can be combined into a single system and powered directly from the laptop/PC USB port.

When fitted inside a NP-Case-1 enclosure they remain safe from local environmental effects making them perfect for remote stand-alone applications.

The free Q-LOG data acquisition and display software enables the data to be observed and recorded in a Windows environment.

Parts List

NP-Strain-1-SDI12	Intelligent single channel strain gauge interface with SDI-12 Comms
NP-Case-1	Environmentally sealed Plastic Case for all single channel interface cards
USB-SDI12-Pro	Isolated USB to SDI-12 media converter
Q-LOG	Free Data Recording & Display Software

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