SDI-12 / RS485 Intelligent Network Isolator & Protocol Converter

Manufactured by Keynes Controls Ltd

Part No. NP_Isolator-Pro

- **Isolated Network Communication**
- **Simple Network Data Diagnostics**
- **Isolated SDI-12 / RS485 media conversion**
- **Improved network reliability**
- **In-built network power supply monitor**
- **Protection from hazardous ground loops and voltage spikes.**

- **Isolated SDI-12 / SDI-12 Operations**
- **Isolated RS-485 / RS-485 Operations**
- **Automatic Port Identifications**
- **Network Data Indicators**
- **Extended SDI-12 network operations**
- **Available as OEM Part**

Introduction

The **NP_Isolator-Pro** module is an intelligent multi-purpose device capable of being used for a range of tasks. The main use is to isolate intelligent devices and sensors on one part of a network, from devices on another part of a network, in order to maintain measurement operations in the case of possible network damage or failure.

Any sensor or network failure up to the NP_ Isolator unit that under normal circumstances will cause a complete system to fail, and therefor stop measurements from being acquired are prevented from causing any problems.

The **NP_Isolator-Pro** device also offers isolated SDI12-SDI-12 operations, isolated SDI-12 to RS485 network conversion, SDI-12 network extension and stand-alone isolated RS-485 to RS-485 operations. The device also prevents current loops occurring between devices which can cause interference, and irregular measurements.

The **NP_Isolator-Pro** module is ideally suited to protect sensors deployed under water, or hard to get at locations where long term stand-alone operations is required. The local display shows network traffic and measurement operations and is an ideal tool to assist in diagnostics for remote sensor operations.

This device supports all of Keynes Controls sensors and systems and many third party devices.

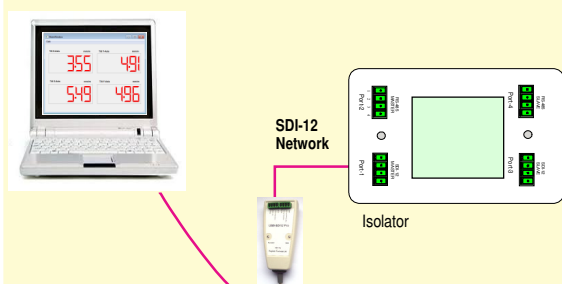**Isolator module used to monitor an SDI-12 network being used by a PC based monitoring system.**

Fig-1

Isolator module used to monitor an RS485 network being used by a PC based monitoring system.

Fig-2

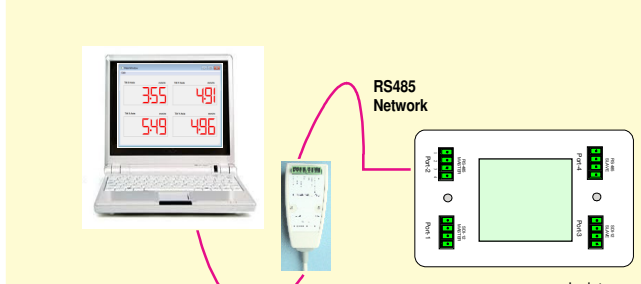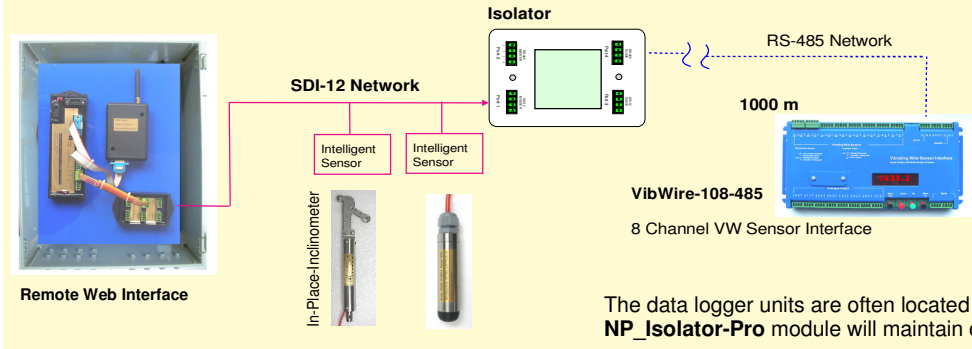| Part No. | **USB-SDI12-Pro** **Q-LOG** | USB-SDI12 Media Converter Data Acquisition & Display Software |

| Part No. | **USB-485-Pro** **Q-LOG** | USB-485 Media Converter Data Acquisition & Display Software |

Adding a RS-485 Network Sensors & Interfaces to an SDI-12 Logger

Remote Web Interface

SDI-12 Network

Intelligent Sensor | Intelligent Sensor

In-Place-Inclinometer

Isolator

RS-485 Network

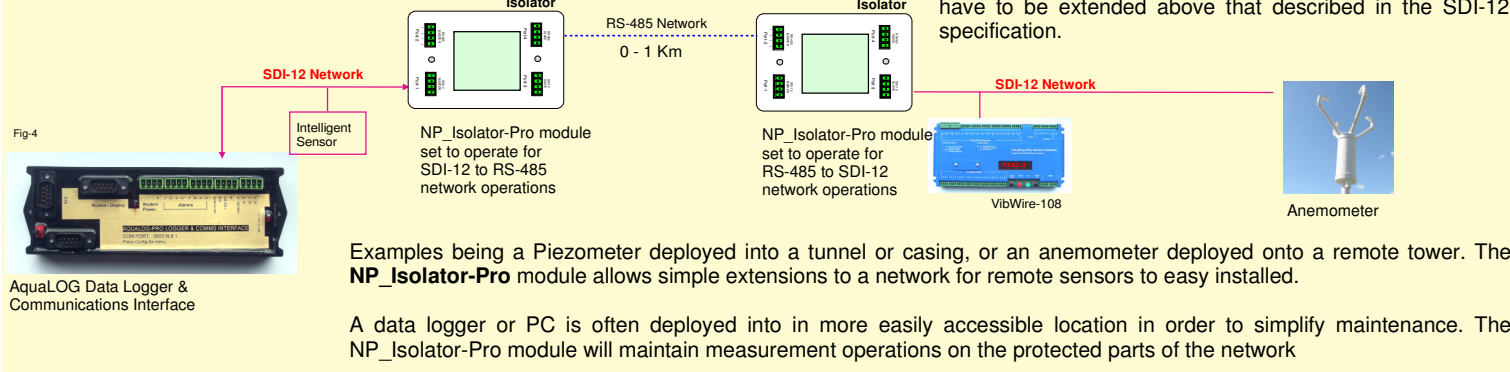1000 m

VibWire-108-485

8 Channel VW Sensor Interface

The image opposite demonstrates how the NP_Isolator-Pro is used to add RS-485 network and intelligent sensors to a data logger only supporting a SDI-12 digital interface.

Example Application

There are many applications where sensors are deployed some way from the data logger unit. A common application is in the deployment of Geotechnical sensors into mines and tunnels. These often flood and sensors once deployed are hard to access. The NP_Isolator-Pro module protects network sections and maintains measurement operations.

The data logger units are often located into easy access locations for ease of maintenance. The **NP_Isolator-Pro** module will maintain operations long after similar systems have failed.

Extending an SDI-12 network

Fig-4

SDI-12 Network

Intelligent Sensor

Isolator

NP_Isolator-Pro module set to operate for SDI-12 to RS-485 network operations

RS-485 Network
0 - 1 Km

Isolator

NP_Isolator-Pro module set to operate for RS-485 to SDI-12 network operations

VibWire-108

SDI-12 Network

Anemometer
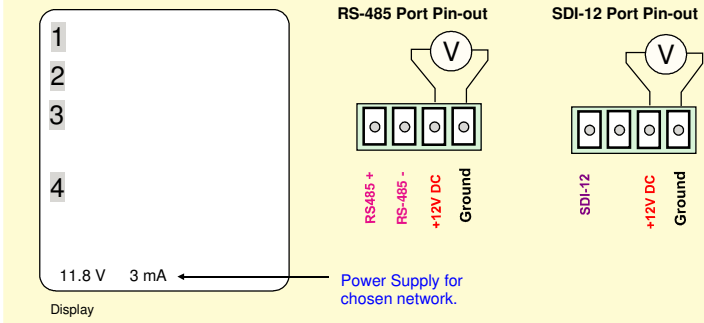
AquaLOG Data Logger & Communications Interface

There are many occasions when the SDI-12 network may have to be extended above that described in the SDI-12 specification.

Examples being a Piezometer deployed into a tunnel or casing, or an anemometer deployed onto a remote tower. The **NP_Isolator-Pro** module allows simple extensions to a network for remote sensors to easy installed.

A data logger or PC is often deployed into in more easily accessible location in order to simplify maintenance. The NP_Isolator-Pro module will maintain measurement operations on the protected parts of the network
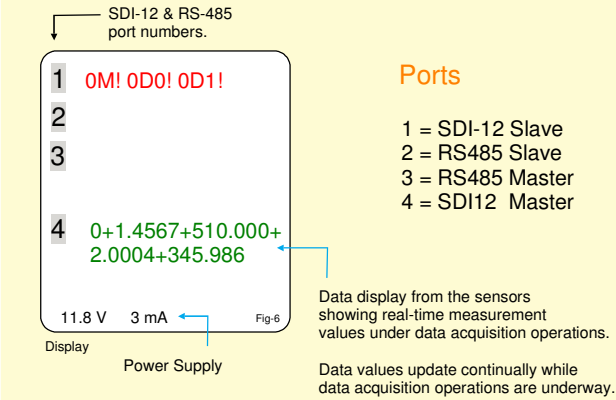
Network Supply Monitor

1
2
3
4

11.8 V   3 mA

Display

RS-485 Port Pin-out

RS485 +   RS-485 -   +12V DC   Ground

SDI-12 Port Pin-out

SDI-12   +12V DC   Ground

Power Supply for chosen network.

The **NP_Isolator-Pro** has a built in power supply monitor system that is used to indicate the voltage and current levels being used on the main network power connection.

The power levels are shown on the display

The power supply can vary as the different sensor and interfaces take measurements and report data across the network. A failing sensor can often be detected by the increase in power above the normal operating limits.

Network Port Identification

SDI-12 & RS-485 port numbers.

1 0M! 0D0! 0D1!
2
3
4 0+1.4567+510.000+
   2.0004+345.986

11.8 V   3 mA   Fig-6

Display

Power Supply

Data display from the sensors showing real-time measurement values under data acquisition operations.

Data values update continually while data acquisition operations are underway.

Ports

1 = SDI-12 Slave
2 = RS485 Slave
3 = RS485 Master
4 = SDI12 Master

The NP_Isolator-Pro module automatically detects sensors on the different ports.

The measurement instructions sent to the different sensors is shown on the 'Slave' ports part of the display.

The data values, measured by the sensors, and being sent across the networks to the data logger or PC, is shown in the 'Master' ports part on the display.

Figure 6 opposite shows SDI-12 sensors operating on an SDI-12 network. This could be to a USB-SDI12-Pro connected PC or to a stand-alone data logger.
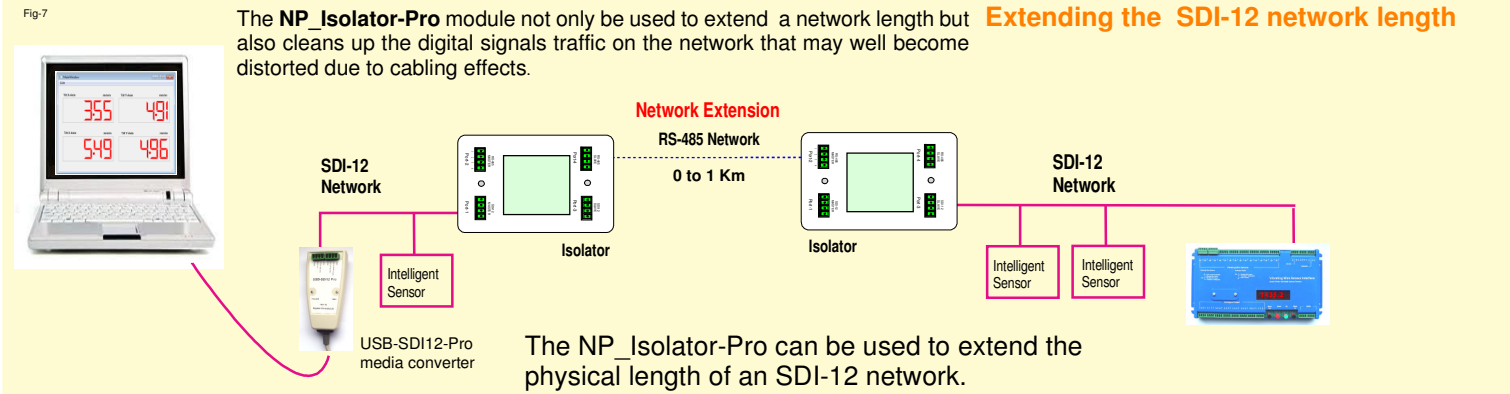
Extending the SDI-12 network length

Fig-7

The **NP_Isolator-Pro** module not only be used to extend a network length but also cleans up the digital signals traffic on the network that may well become distorted due to cabling effects.

Network Extension

SDI-12 Network

Isolator

RS-485 Network
0 to 1 Km

Isolator

SDI-12 Network

USB-SDI12-Pro media converter

Intelligent Sensor

Intelligent Sensor | Intelligent Sensor

The NP_Isolator-Pro can be used to extend the physical length of an SDI-12 network.

Fig 8 opposite shows how a typical RS-485 network failure can occur.

Intelligent sensors such as the VibWire-108 connect in parallel onto the network.

Any short circuit between the main network power supply or between the +485 / -485 network signals can cause the complete network to fail. This can, in some cases prevent data from all the of the sensors from being accessed.

Protecting Critical Sensors

Figure 10 shows a series of I-P-I (In-place-inclinometer) chains deployed to measure tilt in a vertical plane and in casings that can be flooded. The I-P-I sensors have to operate continually underwater.

The water that gets into the casing is often impure and contains dissolved materials enabling enhanced conductivity. Should water get into a submerged connector , or inside a sensor, then there can be conduction between the different signals making up the network or short circuit of the network power lines.

Under normal network operations without the NP_Isolator-Pro fitted, any I-P-I sensor that fails due to water ingress can prevent all other sensors from working, and so no data from any device can be recorded.
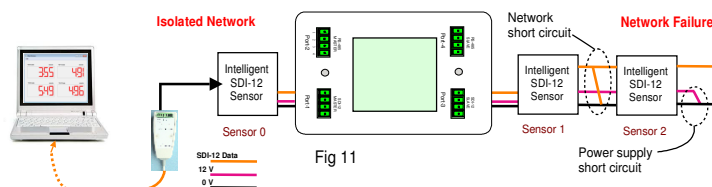
NP_Isolator-Pro Protection

Fig 9 above shows how the NP_Isolator-Pro module is used to isolate sensors on a RS-485 network. Sensors 0 and 1 are shown isolated from those of Sensor 2 and Sensor 3.
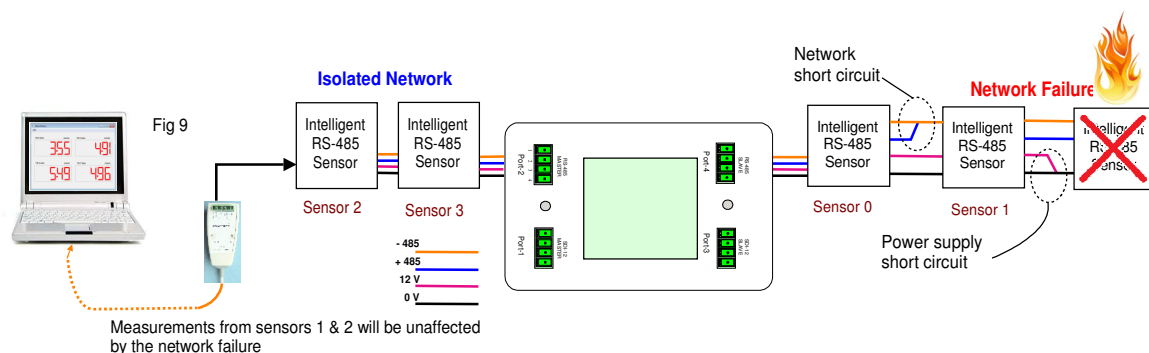

Any failure of the network string containing sensors with Sensor 0 and 1 will not prevent any other sensor from operating and reporting data across the network.

Fig 10 below shows the NP_Isolator-Pro deployed to protect the individual I-P-I sensor strings. Each I-P-I string is now isolated from the main network and from each other. Any network failure will be limited to affecting only those sensors up until the NP_Isolator-Pro module.

Any electrical leakage between conductors of a network under water will be minimised and so prevent deterioration of the physical cabling to a minimum.
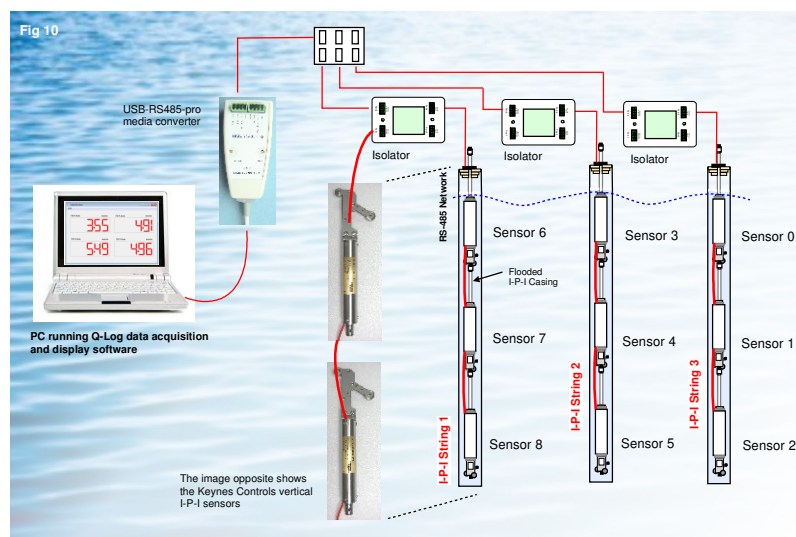

Practical Example

Fig 10 shows the NP_Isolator-Pro modules deployed to protect 3 x submerged I-P-I tilt sensor strings.

Should the network between Sensor 8 and Sensor 7 at the bottom of the I-P-I string 1 fail, then only the sensors numbered 8,7 and 6 will be effected. All of the other devices on the network will return data as usual.

An underwater failure underwater can easily short out the complete network and prevent all sensors from reporting measurements.

All other sensors, 3 to 5 on I-P-I string 2, and 0 to 5 on I-P-I string 3 will function correctly and report data values.

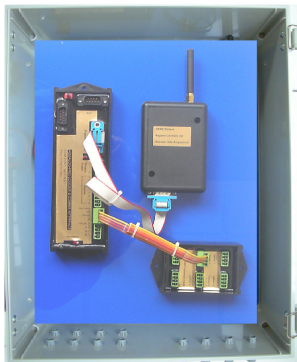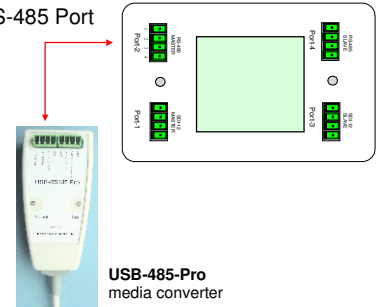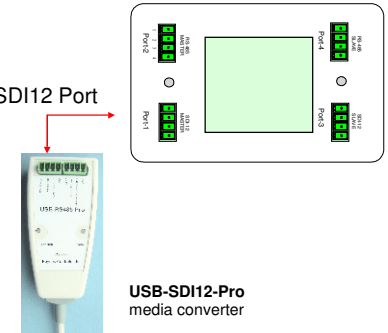## Intelligent Sensors

Ezi-Log Web Access

Master RS-485 Port

USB-485-Pro
media converter

To Laptop / PC
USB Port
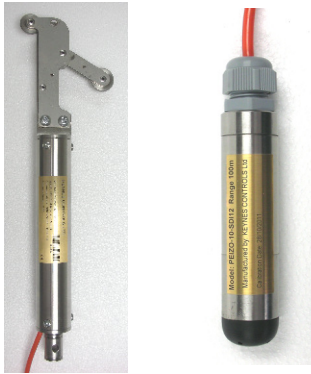
RS-485 Network Connection

Photo shows the display in operation
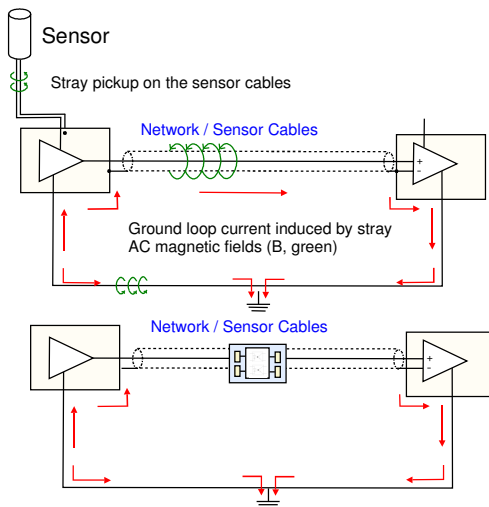on the NP_Isolator-Pro.

Master SDI12 Port

USB-SDI12-Pro
media converter

To Laptop / PC
USB Port

SDI-12 Network Connection

Earth Loops & Electronic Isolation

When two or more devices are connected to a common ground through different paths, a ground loop occurs. Currents flow through these multiple paths and develop voltages which can cause damage, noise or unreliable readings for the different sensors and interfaces.

To prevent ground loops in the instrumentation systems, Keynes Controls developed the NP_Isolator-Pro module. all signal grounds need to go to one common point and when two grounding points cannot be avoided, one side must isolate the signal and grounds from the other.

The NP_Isolator-Pro module breaks the DC connection between the network components while passing the communications signal on the line. Even if one or both systems are ungrounded (floating), no noise will be introduced. The NP_Isolator-Pro uses opto-isolation to physically remove one network section from another.

Description

Dimensions	110 x 74 x 28 mm
Operating Temp	- 10 to 60 Deg C
Power Supply SDI-12 RS-485	9 - 24 DV DC @ 3 mA
Communications Ports	1 x SDI-12 Master - 1 x SDI-12 Slave 2 x RS-485
Media Conversion	Isolated SDI-12 / SDI-12 Isolated RS-485 / RS-485 Isolated SDI-12 / RS485
Display Parameters	Network Voltage & Current Data Packet Counter Network Sensor ID Numbers Data Tx / Rx
Isolation	Opto coupled - 500 V DC
Communications Speed	Auto-assigned SDI-12 RS-485

Low Cost Monitoring Solutions

USB-SDI12-Pro or USB-495-Pro
media converters

Keynes Controls offer the free Q-LOG data acquisition and display software. This software supports all of our sensors and interfaces. The USB-SDI12/485-Pro media converts are used to connect the networks to a PC.

Download Q-LOG Software

Further information at:

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

Part Number

NP_Isolator-Prov1	Intelligent network interface with display
USB-SDI12-Pro	Isolated USB-SDI12 Interface
USB-485-Pro	Isolated USB-485 Interface
Q-LOG	Free data acquisition & display package