

Welcome to Monitor - the data acquisition and control newsletter. Any comments or questions email [monitor@windmillsoft.com](mailto:monitor@windmillsoft.com). You can download this issue as a pdf file from <https://www.windmill.co.uk/monitor/monitor247.pdf>.



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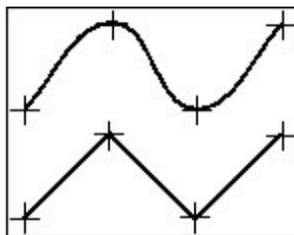
## How often to sample an Analogue Signal?

Web link: <https://www.windmill.co.uk/sampling-rate.html>

When monitoring analogue signals, the data acquisition equipment digitises the signal before transferring the reading to the computer. It does this by "sampling" the signal at regular intervals. How do you choose the sampling rate to get an accurate picture of an analogue waveform?

The first thing to decide is how fast the signal is changing. For faster signals this is determined from the maximum frequency component in the signal. For slowly changing signals, such as those from industrial plants, you can use the maximum expected rate of change.

For frequency components the Nyquist theorem demands that the signal be sampled at least twice in each cycle, otherwise the amplitude of this frequency component will distort the signal at lower frequencies. So, sample at least twice as fast as the highest significant component. This rate would not mimic the waveform very closely though.



*Angular waveform produced when the signal is sampled at twice its highest frequency. For a more accurate representation sample five to ten times this rate.*

To get an accurate picture of the waveform you will need a sampling rate of 10 to 20 times the highest frequency.

For slowly changing, essentially DC, signals, then all that is necessary is to consider the minimum time for a significant change in the signal.

## Windmill Software

It's easy to set the sampling rate with Windmill Logger, or, for high speed applications, Windmill Streamer. These are supplied with all [Microlink hardware](#). Alternatively Monitor subscribers can ask us for a copy of Windmill for RS232 instruments for free.

## Your Data Acquisition Questions Answered: Measuring

# Temperature and Pressure

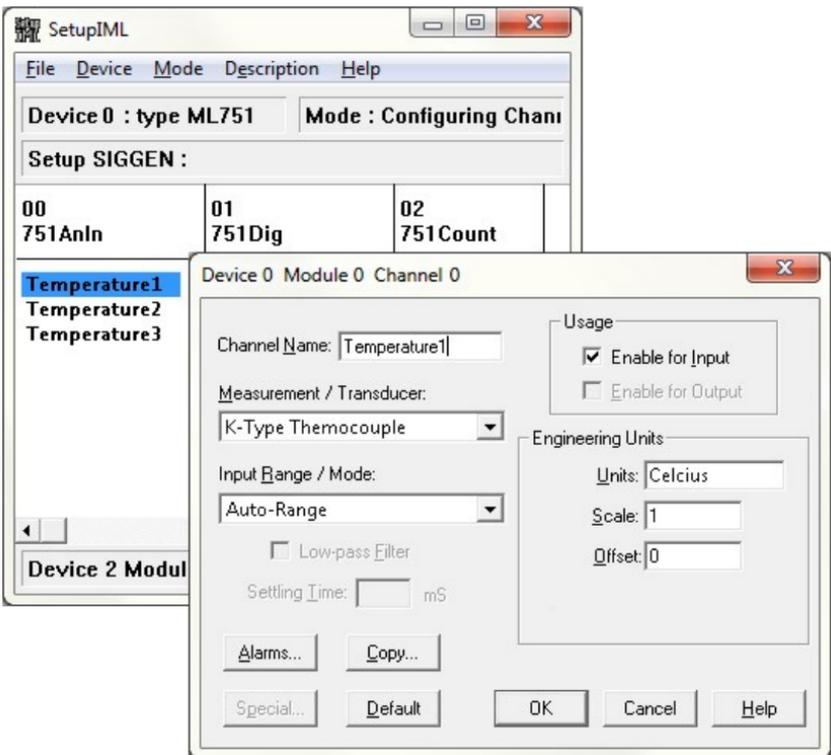
## Question

I have a test set-up with 3 thermocouples and 1 differential pressure transmitter. The differential pressure transmitter sends a 3-wire 0-10 V signal. I would like to be able to read and log data from these devices to a computer and am hoping that a Windmill 750 USB Data Acquisition can achieve this. Can it?

Does the Windmill software output the thermocouple signal as temperature? Or does it only return the micro volt signal? I see there's a known relationship between millivolts and temperature depending on the thermocouple type and it would be great if I could just input the thermocouple type and have it output the temperature.

## Answer

To monitor the thermocouples you would need to use a Microlink 751 TC. This is because thermocouples produce very low voltage signals and require a measurement of the cold junction temperature. The Microlink 751 TC will also measure the 0-10 V signal from the differential pressure transmitter. The Windmill software can log all values to one file, with all readings time-stamped. As you require, you just choose the thermocouple type in Windmill and it will output the temperature.



Read more about the [Microlink 751 TC](#) system or about [making measurements from thermocouples](#).

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## Measurement and Control Exhibitions and Conferences

The quarterly update of data acquisition and control exhibitions around the world.

### DMEMS 2019

1-2 May 2019

San Diego California

Quality and test, assembly and manufacturing, ideas and design.

<http://www.mfgshow.com/>

### Control

7-10 May 2019

Stuttgart Germany

Technologies, processes, products and system solutions in the field of industrial quality assurance.

<https://www.control-messe.de/>

### **International Industrial Automation**

8-10 May 2019

Beijing China

Control technology, sensor technology, industrial automation software and interface technology.

<http://en.auto-wo.com/>

### **National Manufacturing Week**

14-17 May 2019

Melbourne Australia

Includes automation and robotics, engineering, Industrial Internet of Things and Manufacturing Solutions.

<https://www.nationalmanufacturingweek.com.au/>

### **Automotive Testing Expo**

21-23 May 2019

Stuttgart Germany

Vehicle and component testing and validation technology and services exhibition. Data acquisition and signal analysis, test rigs, materials testing, environmental testing, laboratory instrumentation, sensors and transducers, crash testing know-how and emission measurement systems.

<https://www.testing-expo.com/europe/en/>

### **Africa Automation Fair**

4-7 June 2019

Johannesburg South Africa

Automation and smart control in Africa.

<https://www.africaautomationfair.com/>

### **Assembly and Automation**

19-22 June 2019

Bangkok Thailand

Industrial automation systems and solutions

<https://www.assemblytechexpo.com/>

### **Sensor + Test**

25-27 June 2019

Nurnberg Germany

Forum for sensors, measuring and testing technologies worldwide.

<https://www.sensor-test.de/welcome-to-the-measurement-fair-sensor-test-2019/>

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## **DAQ News Round-up**

Welcome to our round-up of the data acquisition and control news. If you would like to receive more timely DAQ news updates then follow us on [Twitter](#) - [@DataAcquisition](#) - or grab our [rss feed](#).

### **Redefining SI Units**

On 20 May 2019 SI units will be redefined. The changes will ensure that the SI definitions remain robust for the future, ready for advancements in science and technology.

Source: NPL

<https://www.npl.co.uk/>

### **New polymer mixture creates ultra-sensitive heat sensor**

Flexible, transparent and printable sensor has potential for a wide range of applications including smart buildings.

Source: Linköping University

<https://liu.se/>

## Bridge Over Coupled Waters: Scientists 3D-Print All-Liquid 'Lab on a Chip'

A new class of 3D-printed, all-liquid devices could automate chemical synthesis for batteries and drug formulations.

Source: Newswise

<https://www.newswise.com/>

## Marine Skin tagging system dives deeper

A pioneering tagging system that monitors the movement and local environment of sea animals can now reach deeper depths and higher sensitivities.

Source: SCUBA News

<https://news.scubatravel.co.uk/>



*The Marine Skin sensors attached to a Ray*

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\* For more articles see <https://www.windmill.co.uk/>

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<https://www.windmill.co.uk/monitorindex.html>

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