Maximum precision at minimum space
Low-channel measurement data acquisition. What's really important?

Everyone is talking about digitalisation and connectivity in measurement tasks. Measurement data from distributed sources need to be linked, analysed centrally and made available for worldwide access. So far so clear. But there remains the crucial question of how the measurement data is actually supplied? This article gives answers.

There are many applications/scenarios in which data acquisition can bring added value or competitive advantage. A system of machines that has grown over the years can be made Industry 4.0 ready as part of a retrofitting project. This requires different types of measurement to be recorded at many different measuring points, often by using a low number of channels. Equipping complex systems with condition monitoring also requires a multitude of different measurement types at different locations. Road and field test systems require globally distributed measurement data to be recorded. What these and many other such applications have in common is the need for a decentralised acquisition of different types of measured data, generally from a low number of channels at each location. There is a confusing and innumerable choice of measurement data acquisition devices available to users. But what is really important in low-channel measurement data acquisition?

Universal and precision analog and digital I/Os

The quality of the signal inputs and outputs is vital in data acquisition because these represent the interfaces between the measurement device and the process.

Analog inputs should always have high resolution and high accuracy. If the resolution is too low, small changes in the measured data can result in an unattractive "step effect" when displaying the data. This, for example, then prevents detection of impending trends. If measurement accuracy is too low, the measurement's absolute values are then negatively influenced. A further important point is to have clear potential separation by using differential analog inputs. To keep costs down, many providers use a common earth connection for multiple analog inputs. This can lead to the formation of parasitic earth loops and therefore to measurement errors so must be avoided in any event.

In general, analog inputs should be universal. Some locations require different types of measurement to be measured simultaneously, e.g. temperatures, pressures and voltages. It then helps greatly if the inputs in the measurement device can be configured for the different measurement types required. In any event, connecting thermocouples, resistance thermometers as well as voltage and current signals should be possible. When using resistance thermometers, the fine detail needs to be observed. Common resistance thermometers such as Pt100 or Pt1000 are used when high-precision temperature measurements are required. However, their capabilities can be exploited only as 4-wire connections. In this configuration, the measuring current is input via one wire pair, and the voltage drop is measured directly at the resistance thermometer via the second wire pair. This eliminates interference from lead wires.

The lowest possible measuring current is also required to keep ohmic heating of the resistance thermometer to a minimum. A 3-wire or 2-wire connection are alternatives when cabling costs are to be minimized and measurement precision does not need to be quite as high. Linearization functions for all common sensor types should be available within the measurement device. If, for example, a Pt100 is used, the operator wants the temperature values to be displayed directly without having to derive these from the measured resistance data.

To monitor and control processes, digital inputs and switching outputs are often required in addition to the analog inputs. These should ideally be switchable via software and thus configurable as either inputs or outputs. Other useful features are a frequency measurement/counting function for the inputs and a PWM function for the outputs.

The new Loggito Logger from Delphin Technology AG is a low-channel data logger that meets all these requirements. The Loggito Logger has either 4 or 8 universal differential analog inputs which can be configured to connect voltage, current or thermocouple signals. The "RTD" versions also enable the connecting of all common resistance thermometers such as Pt100 or Pt1000 as 2-, 3- and 4-wire. Linearization functions are available in the device and are automatically applied when a resistance thermometer is selected.

The Loggito Logger's analog inputs have 24-bit resolution and a measuring precision of 0.01% of the measuring-range end-value for voltage, current and resistance measurements. When connecting 4-wire resistance thermometers, the measuring deviation is less than 0.1 °C. The high accuracy of resistance thermometers is achieved by the use of very low measuring currents from 50 µA.

The Loggito Logger also has two software-switchable digital inputs/outputs with frequency measurement, counting and PWM functions.

Good usability

Even the best sensor interfaces are worthless when excessive effort is required to connect sensors and configure measurement channels. When selecting a measurement device, care should be taken to ensure that both connecting and changing signal cables and the setup or adaptation of the measurement task can be carried out intuitively, requiring no great effort to learn how to use the system. The device should also be easy to handle.

In the Loggito Logger, signal cables are simple to connect and disconnect using the detachable 4-pin terminal blocks with spring-cage technology. Connected 4-wire resistance thermometers can be re-connected to another analog input without reconnecting the signal lines. The Loggito Logger's compact dimensions of 95 mm x 67 mm x 65 mm and light weight of approx. 220 grams makes handling very easy. It can be mounted in a control cabinet, operated directly at the system or used as a desktop unit in a laboratory. The measuring channels are set up using clear and intuitive configuration dialogs.

Internal device intelligence and autonomous operation

Many applications are not able to be permanently connected to a measuring computer or a PLC. In such cases, it is vital that the recorded measurement data can be reliably stored within the device. The device also needs to be capable of independently performing control tasks, e.g. when a limit value is exceeded requiring rapid emergency system shutdown. The device should ideally have sufficient internal intelligence to undertake the (partial) automation of processes. Many users also want an option of displaying current system parameters and measurement data directly at the site using a smartphone or tablet, without having to spend time first installing software. A data logger with such a function is not easy to find.

Loggito Logger has an optional internal data memory of 4 or 8 GB enabling the storage of up to 240 million measured values. To reliably eliminate data loss, high-quality, industrial-grade data storage is used. Thanks to internal device intelligence in the form of software channels, the Loggito Logger not only solves simple control tasks, but can also implement complex logic circuits. This enables the devices to monitor and automate processes and trigger alarms even without a connected PC.

Loggito Logger with the ProfiSignal Web option is the ultimate solution for visualising and controlling processes at the system site via a smartphone or tablet. Individualised dashboards can be created using various display and control elements. These dashboards can then be operated in the browsers of any end device and require no software installation. The Loggito Logger acts as a web server transmitting measurement data via WLAN to the smartphone or tablet. An internal data memory in the Loggito Logger enables easy access to historical measurement data.

Functional interfaces

In the era of increasing digitalisation, both horizontal M2M communications and vertical communications to other company levels and the cloud are becoming increasingly important. When selecting a data acquisition device, it should therefore be capable of supporting modern communication standards to enable the device to easily share data with all levels involved. OPC UA is vital here, now established as a kind of standard for Industry 4.0 applications and enabling reliable data sharing whatever the manufacturer or platform.

Integrated LAN and USB interfaces allow the Loggito Logger to communicate via OPC UA, Modbus TCP and user-defined protocols. An OPC UA HA server interface is available as a special feature in the Loggito Logger. The OPC UA standard can then also be used for accessing archived measurement data. This function is now being demanded by more and more users.

Maximum precision requiring minimum space

Choosing a low-channel measurement data acquisition device means avoiding the many pitfalls as far as possible. Careful study of the technical specifications and available features is necessary to avoid unpleasant surprises.

The Loggito Logger from Delphin Technology AG provides universal, separated analog inputs with precision measurement accuracy, software-switchable digital inputs and outputs with frequency measurement, counting and PWM functions, future-proof interfaces and optimum usability. Its internal data memory and internal device intelligence makes the Loggito Logger ideal for autonomous use and the independent monitoring and control of systems.

The optional ProfiSignal Web enables the Loggito Logger to visualise and control ongoing processes, simply via the browser of any device and without requiring any software installation.

And all this in a handy pocket format.

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