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Universal signal conditioners/converters Configuration options keep it quick and easy

By Derek Sackett — Senior Product Marketing Specialist ICE-Interface
Phoenix Contact USA

Introduction

Just like with personal electronics, most people working with analog signal converters want universal modules in the smallest width, with the most flexibility in analog ranges. The goal is to have the least number of modules on their shelves to cover any signal combination they could possibly run into. At the same time, they need to meet all their analog signal matching needs, wherever the project might be going around the world.

Components, layout, and housing are critical to achieve the physical design. But just as critical is the module's ability to be programmed to fill the function of a multifaceted/universal signal conditioner.

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Software configuration of multifunctional modules

Software-based configuration for signal conditioners/transducers has become standard. Users of multifunctional modules can match up virtually any signal combination – even beyond typical standard signals – within certain limits. This creates many advantages. The device can be adapted for different applications, resulting in substantially less variance in terms of vendors, purchase orders, and modules to stock.

Making this configuration software as intuitive as possible is key, especially with so many functional options via the software. Dropdown boxes limiting selection keeps things from becoming a guessing game. Where the options are open choice, pop-ups with limits help minimize frustration. A manual with in-depth instruction on the configuration software can be a sanity saver. If one module can have multiple sensors or wiring schemes, showing the proper one upon that selection within the user interface helps keep everything organized.

Serial communication is usually the medium between PC-based configuration software and analog modules. This also lends to visualization of current process values through a monitoring function and allows the possibility of recording/logging these same signal characteristics over a defined time period.

Open standard software platform

Because there are so many manufacturers of analog signal isolators/conditioners and instruments, along with their proprietary software, keeping up with it all can become a daunting task. This is one of the reasons open software/fieldbus communication protocols such as the FDT/DTM protocol have become so popular. End users configuring a module to be implemented into the FDT framework will find the same look and feel from manufacturer to

manufacturer. Once an individual becomes familiar with the FDT/DTM program, the configuration and implementation will have the same look and feel, even though the parameter options might differ.

DIP switches for minimalists

On the conservative side are those who want analog range flexibility, yet want to keep things simple, reliable, and maybe not too universal – just enough to cover the most common analog ranges (i.e., 0-5 V, 0-10 V, 0-20 mA, 4-20 mA...).

The DIP switch-based configuration has long been established, particularly when it comes to highly compact isolation amplifiers (**Figure 1**). This is because it is easy to produce and use. Settings can be made directly on the device without any further equipment, and the user does not require special expertise. DIP switches don't care what operating system your PC uses or what version of programming software is loaded, and they do not need a programming cable you might not have. Keep in mind that some companies and certain industries do their best to stay away from software-programmable devices (for example, the nuclear industry). Though many modules come with both configuration options, DIP switch-only modules are available for these customers.



Figure 1: Today's signal conditioners come in extremely narrow packages, sometimes as slim as 6 mm.

Bluetooth and NFC-based configuration options

In addition to DIP switch-based configuration or PC software, users now have the option of using readily available commercial-based devices that can transmit data to the signal conditioner/converters and transducers via a smartphone or tablet. Incorporating smart devices into the mix offers a readily portable way of getting the power and flexibility of PC software out of the office and into the field. This could be used for initial set-up of an additional module, to fix a signal issue, or to troubleshoot an existing module in place.

Two different approaches have come to be used in this context. First, there are concepts that allow for a bidirectional data exchange via the wireless Bluetooth protocol. This offers users the same functional scope as a PC configuration. In addition to the configuration of a module, current process values can also be visualized in this way (**Figure 2**). This wireless connection on the analog module side can be realized two ways. One is to integrate the Bluetooth chip into the analog module itself. The other is to add the wireless connection via a separate Bluetooth dongle that physically plugs into the analog module.



Figure 2: The Mini Analog Pro app is used to configure data also via Bluetooth from a smartphone.

Another variant of the app-based device configuration via a smartphone uses Near Field Communication (NFC) wireless technology for data transmission (**Figure 3**). The process, based on RFID technology, enables communication between an active sender (the smartphone) and a passive receiver (the transducer). This beneficial technology is similar to PC-based software by allowing the user to set parameters, but without any further accessories. You can also utilize the NFC to view the DIP switch configuration options. The main limitation with this technology is the low power of NFC. The technology can transmit signals only a few centimeters, so the signal conditioner must be removed from the DIN rail for configuration. The positive aspect, however, is that the limited range protects against unauthorized access to the module's parameters, which could cause major issues in the process.



Figure 3: Optionally, the user can configure the devices wirelessly via NFC using the Mini Analog Pro app.

Documentation makes it easy

Many users quickly get frustrated when faced with numerous configuration options or lack of said documentation. It used to be commonly said in tech service that the first thing people do after opening up the packaging is to throw away the documentation. Well, for both of those scenarios, Phoenix Contact offers a couple of fixes, so feel free to throw away that package sheet. On the product's web page, under the download section, we have a DIP switch configuration aid that you can view online or download to your computer. Dropdown parameters quickly guide you through all the pertinent configuration options associated with that module.

Conclusion

Narrow signal conditioners and converters do not have to mean difficult configuration. Phoenix Contact's MINI Analog Pro offers many options to configure a wide variety of needs, anywhere in the world.

Module configuration by the factory

Though this paper has focused on the user experience of configuring Phoenix Contact's Mini Analog Pro signal conditioners, Phoenix Contact also offers factory configuration of those modules. Users can preselect their configuration, the factory programs to those specifications, and when the product is unpackaged, it will be ready to snap on the DIN rail for use. Besides configuration, Phoenix Contact also offers calibration with options of three or five points of calibration, with certificates.

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For more information about Phoenix Contact or its products, visit www.phoenixcontact.com or e-mail cdinfo@phoenixcontact.ca.