WHITE PAPER

PROFINET **on the button**

Convenient integration of commanding and signaling devices into digital automation environments

Commanding and signaling devices with PROFINET

Commanding and signaling devices have always been the “direct link” to the machine or system – whether pressed, turned or signaling a specific status. The wiring is exclusively electrical, as is the exchange of signals. So far so good – but now there is a cutting-edge PROFINET solution that allows e.g. push buttons, selector switches and key-operated switches to take full advantage of digital technology – not only in standard automation, but also in safety systems.

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PROFINET on the button

With its SIRIUS ACT product range, Siemens has significantly modernized the world of push buttons and signaling devices. Four different design lines for push buttons, selector switches, indicators, emergency stop devices etc. offer a flexible selection range. As shown in many examples, SIRIUS ACT can also be flexibly used for various industrial applications. Christian Bufler, Head of Electrical Engineering at WIMO Hebetechnik in Woringen, Germany, emphasizes: "The design just appeals to me." Hugues Le Forestier, process engineer at Siemens, who is also involved in the use of state of the art push buttons and signaling devices on e-car assembly lines, goes one step further: "I really like the one turn, simple installation, as well as the connection to PROFINET." Cutting edge, rugged design, ease of operation, high protection class IP69 (IP69K), and the free choice of signal connection, form the basis for the optimal design of machines and systems. The devices are reliable for use even under tough industrial conditions.

In addition to conventional wiring, the push buttons and signaling devices can be connected to the control environment via AS Interface, IO Link and now also via PROFINET or PROFIsafe. Christian Bufler confirms: "I like the PROFINET connection because it reduces wiring work and simplifies the connection to the controller." And Hugues Le Forestier is also impressed by the fact that "SIRIUS ACT not only enables PROFINET, but also safety technology."

Generally speaking, the development of SIRIUS ACT follows the guiding principle that communication must operate easily and flexibly. When selecting the push buttons and indicator lights, for example, it is irrelevant how the subsequent signal connection is made. Not only the front mounted actuators and indicators such as push buttons, switches and lamps, but also the holders on the rear panel are the same, both for conventional wiring and bus based connections. This means that users can save in terms of engineering overhead and equipment stocks from the very start.

SIRIUS ACT is Siemens' answer to the increasing digitization of industrial processes. It allows push buttons and indicator lights to be easily integrated into the control topology via PROFINET or PROFIsafe.

Up to 21 push buttons, selector switches and indicator lights can be connected to a PROFINET interface module using ribbon cable off the roll.

Standardized solution for simple PROFINET connection

The only differences are between the convenient snap-on interface and terminal modules on the rear panel. In the case of the PROFINET connection with certified PROFINET devices, the communication module is the same for all devices and is equipped with two interfaces, each designed for a seven wire flat ribbon cable. Connection is easy: The ribbon cable, which is marked in red on one side, is cut from the roll and inserted into the cable port, which is then pressed flush against the enclosure of the communication module. In this way, a fast and secure piercing connection is created without the need for any special tools. The two cable ports are clearly marked with “IN” and “OUT” to prevent any wiring errors.

Up to 21 command and signaling points can be connected in series with a maximum spacing of one meter between two push buttons and indicator lights, and a total system length of ten meters. These points can then be connected using the interface module, which is not only available for standard automation tasks, but also for fail safe applications with the associated emergency stop button. Essentially, the underlying systematics follow the modular structure principle already familiar to automation engineers from the SIMATIC ET 200SP distributed I/O: The interface module is at the front, to which the required number of push buttons and indicator lights can be connected in a row using the PROFINET interface.

Easy installation without the need for special knowledge or tools

Experience has shown how practical such a configuration can be.
The push buttons and indicator lights (up to 21) are fixed securely in the mounting holes to prevent twisting, and then an interface module and up to 20 terminal modules are snapped into place. Afterwards, the installation engineer connects the modules by means of the ribbon cable. This is done by inserting the end of the ribbon cable into the module and engaging the lever – all without any special tools.

If the 24 V DC supply voltage is then connected, the system can be tested immediately without a connection to the controller, and each individual station can be checked for correct wiring and functionality. The diagnostic LEDs on the individual modules provide feedback. A green light shows that everything is OK. This means that neither special technical knowledge nor special tools are required for the complete installation of the push buttons and indicator lights, nor is it necessary to assign addresses. The advantages gained from the PROFINET connection are numerous and varied: The operator panel fronts on machines and systems are often located at a considerable distance from the control cabinet where the controller is situated. Conventional wiring involves great effort, using long cables and cumbersome wiring harnesses, but now it is only necessary to route the typical green cable from the communication module to the controller. The advantage of simple cable routing also becomes noticeable when a large number of push buttons and indicator lights are mounted in the cabinet door.

Furthermore, the SIRIUS ACT Configurator simplifies the overall engineering process. With this intuitive online tool, enclosures and labels can be assembled individually to suit specific customer needs, made particularly easy thanks to the image-based component selection using the drag and drop function, as well as a graphical preview. A fact confirmed by Hugues Le Forestier: “I use the Configurator on a regular basis.”

Bus based complete solution simplifies machine integration

Thanks to the flexible communication connection, control cabinet and machine builders are well prepared for current and future requirements in accordance with Industry 4.0 and the increasing trend towards digitalization. Siemens provides three different basic modules: for simple signal recording (push button), for illuminated signal recording (push button + LED), and signaling devices (LED lamps). The controller immediately notices if the wrong terminal modules have been installed. For the development of SIRIUS ACT with PROFINET a key requirement was the lowest possible risk of errors, not only during installation, but also during signal connection.

A great advantage of this modern interfacing of push buttons and indicator lights via PROFINET also becomes apparent with regard to “option handling”. This functionality, which Siemens already provides in the ET 200SP distributed I/O, is also provided here. This means that the “maximum extension level” can be programmed for different machine and system configurations. This generally occurs with the aid of the TIA Portal, the engineering framework for programming, parameterization, visualization and safety engineering, into which SIRIUS ACT is also integrated. If users do not wish to include certain functionalities in their project order, these can be deactivated in the program by the machine or plant manufacturer. The corresponding lack of hardware has no effect on the program cycle, and slots for the corresponding push buttons and signaling devices can be occupied with purpose made sealing plugs. This saves money and makes it possible for the scope to be expanded at a later date.

If additional functions are subsequently required, the machine manufacturer or plant operator simply replaces the sealing plug with the desired push button or indicator light. They then connect it using the ribbon cable, as described above, and integrate it into the automation system in no time at all. By activating the corresponding option in the program, the function is made ready for routine operation. Here too, the Siemens controller “checks” the presence of the correct device.

Simplified handling leads to savings

Even the service-related replacement of push buttons and indicator lights is easily possible in this way without any errors. You simply open the cable port, pull out the ribbon cable, plug the new terminal module onto the push button or indicator light, cut off any protruding ribbon cable wires using scissors and make the contact as usual by closing the cable port.

Whatever the situation, whether during initial installation and commissioning, or as part of servicing: using the PROFINET version of SIRIUS ACT with bus capability saves more than half the time normally required for conventional wiring.

In addition, an analysis of the modernization costs reveals that they are relatively low. Due to the modular, flexible PROFINET connection, the otherwise necessary I/O add-on modules on the controller, distributed I/O, or even I/O devices specially required for the I/O connection, can in some cases be dispensed with altogether. For users who deploy a dozen or more push buttons and indicator lights, SIRIUS ACT with a PROFINET interface is certainly an alternative worth thinking about.

PROFINET all the way to the top

The same applies to safety-related automation solutions, because the PROFINET interface module for SIRIUS ACT is also available in fail-safe form, allowing communication with a fail-safe CPU via the PROFINET standard, using the PROFIsafe bus profile. In this way, it is possible to incorporate an emergency stop button as part of the safety chain. The fail-safe interface module includes a replaceable memory module, containing all the necessary program information, as standard. This also shows how simple the system is to set up and operate. If servicing is required, it is only necessary to swap the memory card from the old device to the new one and everything works perfectly again. The interesting thing, as Hugues Le Forestier stresses, is that: “The Emergency Off diagnosis is included in the HMI and is easy to program with the TIA Portal, saving a great deal of time.”

This state-of-the-art solution for the simple connection of commanding and signaling devices shows that the digitalization of industrial automation processes is quickly progressing. Users are completely free to choose whether they connect their devices conventionally using parallel wiring, or quickly and easily using PROFINET or PROFIsafe. Christian Bufler is convinced: “I really like the installation and the option of PROFINET connection.”

For the PROFINET connection, the interface module already mentioned is sufficient in standard or fail-safe form. In addition, further functions can be added directly, using four digital inputs, one digital output and one analog input. In short: SIRIUS ACT has expanded to become a cutting edge PROFINET solution for push buttons and devices extending digital communication into machines and systems as far as to the operating level.

SIRIUS ACT can also be used in safety engineering via PROFIsafe with all the advantages of digital communication.

Your benefits at a glance

- Digital communication solution for commanding and signaling devices – efficient integration into the controller (PLC) via PROFINET
- Reduced wiring – less sources of error during installation and commissioning
- Fast installation using a ribbon cable, no special tools required
- High flexibility
  – 4 additional digital inputs (DI), 1 digital output (DQ) and 1 analog input(A 1)
  – Modular and pluggable components
- Safety Integrated: Connection of fail-safe devices up to SIL 3 (e.g. EMERGENCY STOP) to the interface module (IM F) via PROFIsafe communication
- Addressing of individual command and signaling points not required – only one IP address for up to 21 devices
- Simple memory module replacement, no programming expertise required
- Advanced diagnosis and parameterization options and consistent engineering with integration into the TIA Portal

More information: **siemens.com/sirius-act-profinet**

System Manual SIRIUS ACT with PROFINET IO: **siemens.com/sirius-act-profinet-manual**

Technical specifications: **siemens.com/sios**

Product selection: **siemens.com/sirius-act/configurator**

Ordering: **siemens.com/industrymall**

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