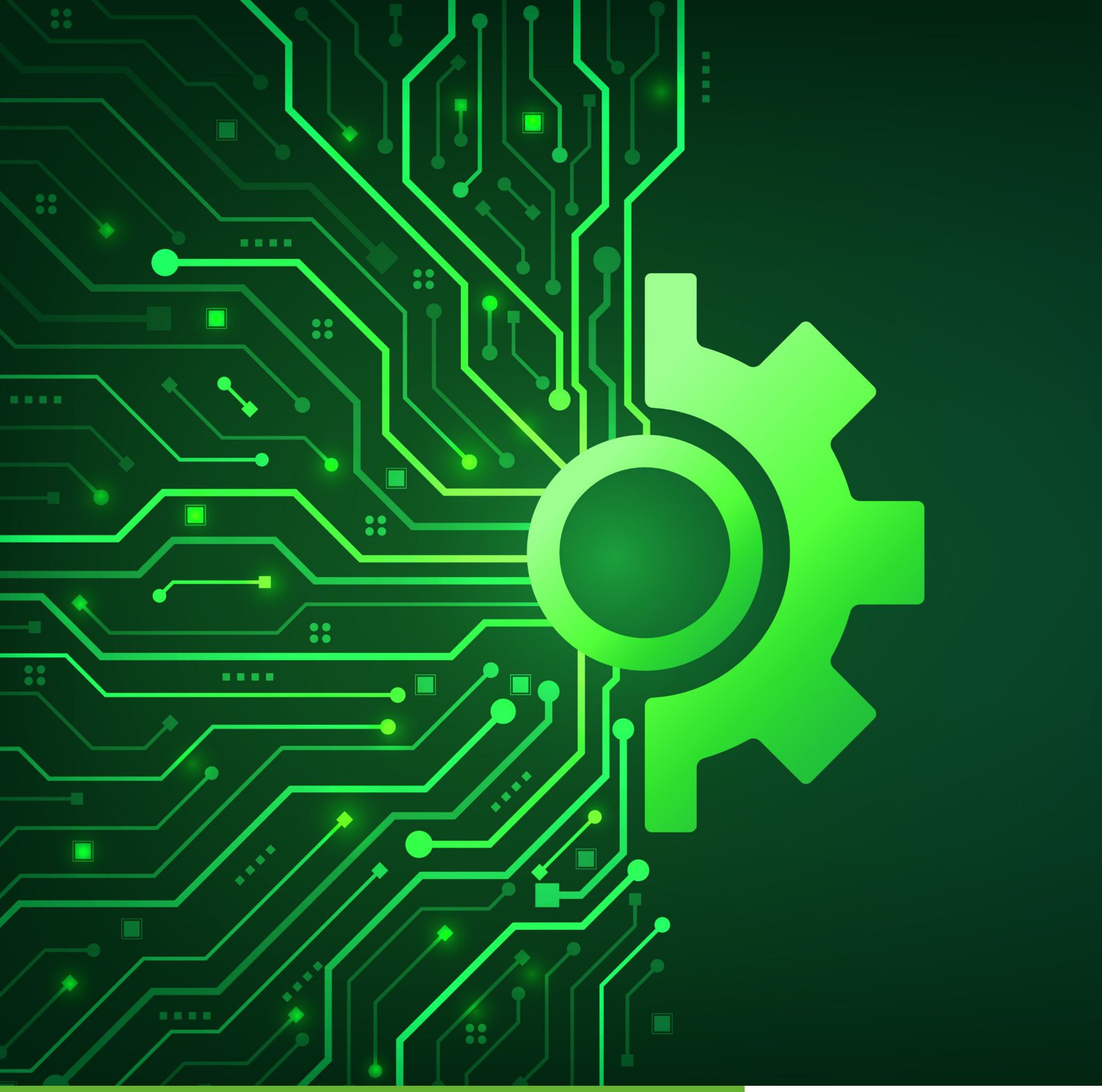

WHITE PAPER

Simple, decentralized installation concepts in machine tools

with NC control “ONE”

MURR ELEKTRONIK

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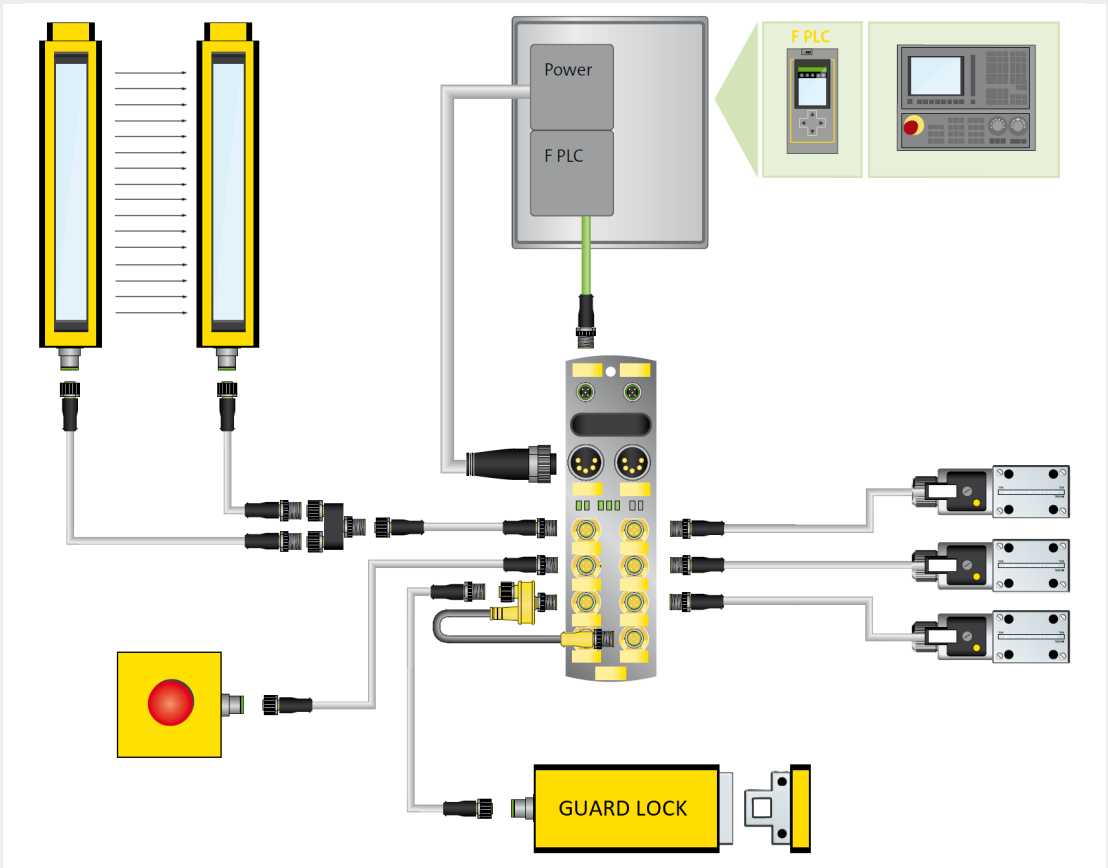

Illustration 1: Active safety technology via Profisafe under Profinet on the f-PLC simplifies decentralized installation – how to use the advantage under the NC?

NC controller “SINUMERIC ONE” from Siemens in the TIA Portal:

Decentralized installation and safety in the machine tool

Decentralized, fieldbus-based machine concepts with plugged-in sensors and actuators simplify design, project planning, installation and maintenance enormously and are therefore the first choice for future-proof machine tools. Only for safety applications, an elementary component of every machine tool, do many experts still consider a special approach to be necessary and choose point-to-point wiring in the control cabinet despite all the known disadvantages. With the “ONE” NC generation from Siemens, however, there is no longer any reason for this special approach.

Modern fieldbus-based, decentralized installations, especially those based on Profinet, offer a number of significant advantages in the life cycle of a machine tool:

- Simple and clear to design and configure
- Installation of components using plug connectors instead of complex wiring
- Clever, software-supported (also partial) commissioning and parameterization
- Extensive diagnostic options during operation
- Can be expanded quickly and flexibly
- Modular designs can be implemented clearly

Today, fieldbus-based installation concepts are a technological standard in the machine tool industry. With one decisive exception: for safety applications, many machine manufacturers choose a complex and expensive special route and wire conventionally into the control cabinet in order to switch off in a safety-oriented manner. Emergency stop and safety gate switching are therefore often left out of the advantageous decentralized installation.

Why has the decentralization of security technology been so slow to date?

Two hearts beat in the classic machine tool: the NC for axis control and the PLC for the logic control of the machine. Although technologically networked, their interaction is complex in terms of design and installation. Safety technology in particular presents a challenge, as safety-related inputs and outputs are important in both control levels, NC and PLC. Multi-level and multi-circuit shutdown concepts for operation, set-up mode, maintenance, emergency stop, etc. are required in the NC drive system. To implement these concepts, designers often rely on separate safety control technology, which significantly increases the complexity of the installation and the hardware costs.

In principle, commercially available safety components such as guard locking devices and light curtains are already designed to be pluggable for industrial use and are therefore theoretically easy to integrate into a decentralized topology. It is therefore all the more annoying that this advantage has been difficult to exploit to date.

The increasing spread and use of IO-Link sensors and actuators also increases the project planning effort on the PLC side, if conventional parameterization tools have to be used.

A consistent fieldbus-based installation of all necessary components of the topology from NC, PLC, IO-Link and safety world is therefore complex, challenging, expensive and error-prone in terms of project planning, parameterization and commissioning due to the many, sometimes disruptive systems.

As a result, machine tool manufacturers in particular, who typically use NC controllers, forego the aforementioned advantages of the consistency of a decentralized, fieldbus-based installation.

There has long been a desire for a central authority to unite the three worlds technologically and thus make them easier to manage.

SINUMERIC ONE opens up new possibilities

With the introduction of the “SINUMERIC ONE” NC generation, Siemens is providing machine designers with precisely the consistency that was previously lacking in a modern installation concept.

With the “ONE”, it is possible to configure and parameterize all topologies of the fieldbus-based system installation consistently in the TIA Portal, as the NC and PLC are located on one and the same logical level.
In this simple way, even the active safety components can be used in the Profinet Profisafe network – this makes it much easier to integrate them into the machine tool processes. This opens up simplifications in configuration and parameterization that many users have complex, especially with regard to safety integration.

In NC drives, the safety technology is closely linked to the control of the axes and the necessary “failsafe” functionality is an elementary component of the NC control. In these cases, it is therefore only logical to manage this transparently and consistently in a topology level with the safety technology.

According to this logic, “Safety” is therefore nothing more than an integrative component of the classic control program. Separate and complex jumps between the “NC” and “PLC” levels are no longer necessary. This makes configuration and programming much easier for the user.
This is particularly useful for project-related reintegration, e.g. for machine replacement components with their own safety technology.

New fields of application for integrative safety are opening up for the design of machine tools in safety-related fieldbus products, e.g. from Murrelektronik, which can now be used in the process on the program side without time-consuming cross-referencing between NC and PLC.

Illustration 2 & 3: Safety-oriented PROFISAFE fieldbus modules from ME

The project planning and configuration of all hardware components to be used (standard components and active safety components) is carried out without further jumps or subroutines thanks to direct integration into the TIA Step7 project planning tool using GSDML.

IO-Link is also very quick and easy to use with process data-supported integration: the use of process data enables the IO-Link user to realize the benefits of end-to-end digital communication with the sensor level without further IODD jumps. Important to know: Murrelektronik has optimized many of its IO-Link devices for process data-supported use, saving the user from having to parameterize the devices.

If parameterization of the IO-Link devices is required, this is also possible from the TIA environment without a cumbersome device tool thanks to Murrelektronik's "IODD on board" function, as all the IODDs required by the user are already integrated in the master's GSDML. IODDs required by the user are already integrated in the GSDML of the master.

This means that the project managers only use one central topology in the TIA Portal. This results in the consistent and simple use of all components parameterized in the system in Profinet/ Profisafe in all control areas of the topology. NC, PLC, digital I/O, IO-Link and safety technology merge into one user-friendly solution.

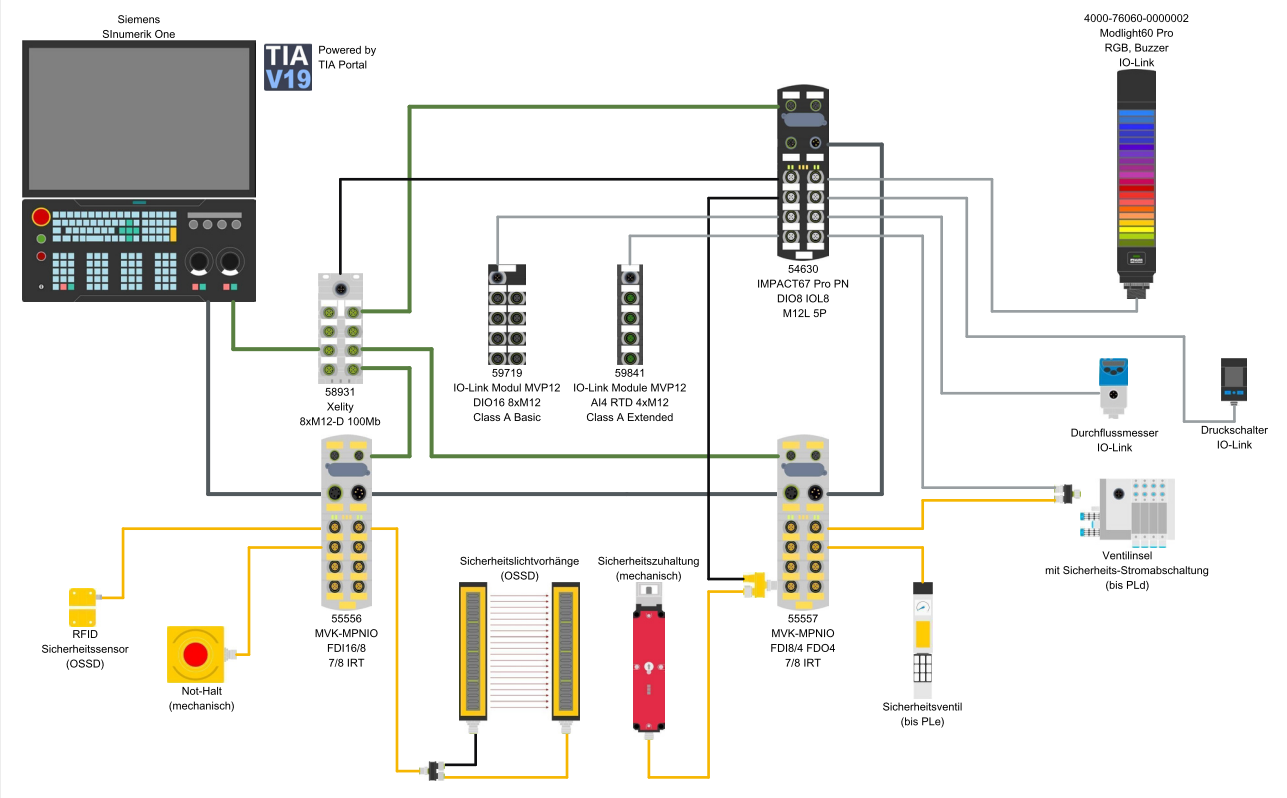

Illustration 4: Example of an integrative topology with Profinet/ Profisafe on a "One". Active safety components and the E-A level with IO-Link as the last meter can be integrated.

Conclusion

The integration of SINUMERIC ONE into the familiar TIA Step 7 configuration interface makes it much easier and more efficient for the user to use fieldbus-based components through to active safety technology.

Murrelektronik offers a broad portfolio of suitable system solutions.
Decentralized safety modules and IO-Link are core competencies.

- PROFISAFE- I-O Module von Murrelektronik
- Fieldbus module MVK Fusion
- Fieldbus modules MVK Safety
- IO-Link

Our application experts will also support your project in its successful implementation.

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About the author

Heiko Bischof has been working for Murrelektronik for over 15 years and, as Head of Key Account Management, supports the machine tool industry with his team. With his technical background and many practical projects in the industry, he has acquired in-depth knowledge.

About Murrelektronik

Murrelektronik is an international, family-run company in the automation technology sector with more than 3000 employees. The vision and mission of Murrelektronik is to optimize machinery and plant installations and thus generate a competitive edge for its customers. Decentralization is the company's speciality: the control layer of machinery and plant is optimally connected to the sensor-actuator layer with proven concepts and innovative technologies. Close customer cooperation is vital to develop customized solutions for optimum machine installation. High product availability rounds off the Murrelektronik portfolio and the customer experience.