

WHITE PAPER

Laying a Cost-Effective Foundation for Data and Power

Decentralized Installation Technology
on Machines and Systems



INTRODUCTION

Analyzing installation technology with respect to decentralization and modularization for existing machines and systems often can only be assessed from an objective point of view. Are the installation concepts optimized for the machine? Do they perform well and for long periods of time? Murrelektronik can provide answers to these questions – combined with guaranteed optimization in project planning, implementation, and operation of systems, resulting in an up to 30% reduction in electrical installation costs.

Efficient power supply and data communications are the cornerstones of an installation concept that connects all of the sensors and actuators in machines or systems to a controller, or sometimes even to a cloud, in a cost-effective manner. This white paper details the range of installation options from once common practices to current solutions, with a clear focus on achieving a low total cost of ownership and a long life cycle. Our focus is on innovative products with ingenious features.



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From the Past to the Present Day – An Illustrative Example

Back in the old days, installing a simple valve connector required a great deal of effort. The housing had to be disassembled, the cable threaded through the fitting, the wires screwed tightly onto the terminal block, and then the whole thing put back together without pinching or damaging the wires. Finally, the cable fitting had to be reinserted. If you wanted to control a solenoid valve with it, you had to connect a diode – to suppress the voltage spikes – next to the stranded wire connections. You had a fifty-fifty chance of installing it with the polarity reversed, causing the diode to say goodbye with a dull bang the first time the system was turned on.

These steps are unthinkable today. Nowadays you use market-standard, fully molded valve connectors with interference suppression, status LEDs, and connected cables built in. In addition to these innovative products, the market has increasingly recognized the opportunities and potential savings offered by plug-in, decentralized installation concepts. For companies like Murrelektronik, this is what drives them to be an innovator in the field and gives them an idea of where the decentralized installation technology road is headed.

It is all the more astonishing – especially for a tech-savvy installation specialist – that, in the case of an M8/M12 cordset, factors come into play that have a direct impact on installation time and work quality. Today, it's hard to imagine working with M12 and M8 connectors without the hexagonal wrench face on their knurled nuts. This standard, developed by Murrelektronik years ago, when combined with the right torque wrench means that connections are properly sealed. This eliminates problems of the past where connectors were never truly screwed tight. Often installers had to come back and further tighten them by as much as half a turn or more.

Hand tightening connections meant they could leak or have a loose contact which posed a significant potential hazard. Therefore, cost-effective installation technology begins with each individual sensor and actuator connection. Any ongoing, repetitive manual process has the potential to generate savings.



What the World Needs Is New Installation Technology!

Electrical installation technology's job is clearly defined: it connects the control system, or cloud, with sensors and actuators. Up to now, the majority of all control technology – the coupler level, fieldbus systems, power supply, and the controller (or the IPC) – has been placed in a control cabinet. In the field, the machine periphery, the sensor system, ensures that all positions are detected by a “watchful eye and a sharp mind.” The actuator is the “mover” – controlling valves, cylinders, and locking mechanisms in the process.

So, we need to look at the primary challenges in mechanical and systems engineering, including...

- Considerable cost pressure from the market
- Shortage of skilled labor
- Reducing lead times
- Eliminating error sources
- Improving quality
- Technological change

You will notice, hardly any attention is paid to electrical installation technology. Every mechanical engineer grapples with new solutions to remedy the situation. Unfortunately, all too often – and especially in cost-cutting projects – the efforts end after looking through the individual BOMs, so you often only end up seeing component prices.

This is where you can arguably find the most efficient and powerful leverage to cut costs and improve machines and systems – by overhauling the electrical installation technology



Decentralized Installation Technology Cuts Costs

A study conducted at the Institute for Machine Tools and Industrial Management (iwb) at the Technical University of Munich investigated decentralized and standardized installation concepts and the resulting savings potential. The study came about as a result of the institute's collaboration with the DESINA (**DECENTRALIZED STANDARDIZED INSTALLATION TECHNOLOGY**) user group. It describes complete concepts for decentralized, electrical, and hydraulic installations on machines and systems all with a high IP rating.

Their aim was to perform simple, fast, and safe installations on equipment and machine tools. These facts were developed by the German Machine Tool Builders' Association (VDW) in accordance with suppliers and customers in the automotive industry.

Within the scope of the project, the following machine installation factors were found to open up new, cost-effective possibilities that come with cost savings of up to 30 %. In the case of special machines, the benefits can be even higher.

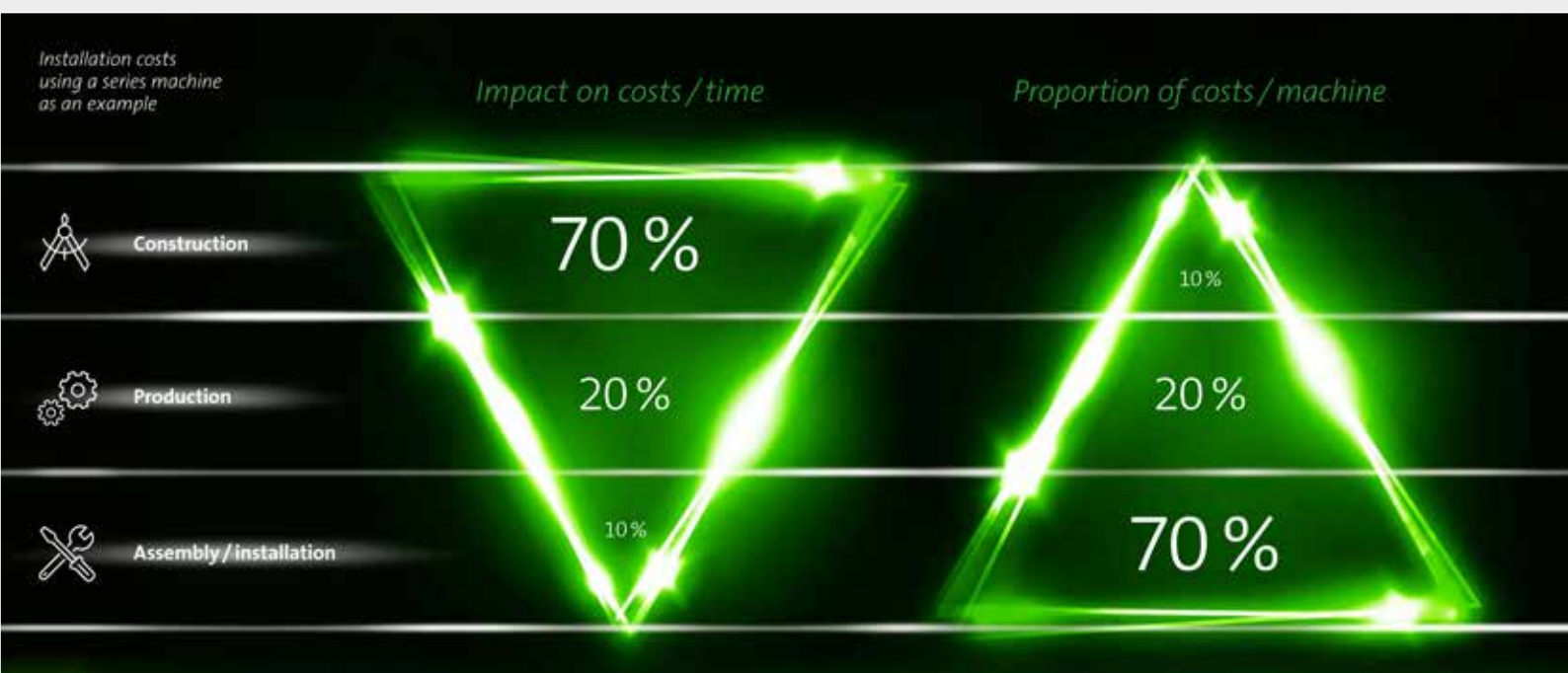
- Decentralized automation technology – components are relocated from the control cabinet to the direct vicinity of the process
- Systemic installation technology – coordinated system modules instead of different individual components

Our hands-on global experience, along with our references from a range of companies in a variety of industries confirms the results of this study.



Recommended Approach

The study shows that 70 % of the installation costs are already defined as fixed at the beginning of the engineering stage. This means that the design determines the machine configuration. This makes it all the more important to analyze the repetitive processes of each machine and to optimize them with the help of decentralized installation technology. This potential becomes clear when you take a closer look at a run-of-the-mill IO terminal box versus an IP67 fieldbus module.

















IO Terminal Box versus IP67 Fieldbus Module

Even a small application shows the advantages and synergies that can lead to enormous potential savings in machines and systems.

The task:

Eight inductive sensors and eight solenoid valves need to be controlled in the field and communicate with a ProfiNet controller on-site.

	IO Terminal Box	IP67 Fieldbus Module
		
Description	Cube20S PN 8DI/8 DO-2A terminal box with IO station	IMPACT67 16 DIO field bus module
Weight	> 2.5 kg	< 0.5 kg
Dimensions	400 x 300 x 200 mm	225 x 63 x 36 mm
Planning/ engineering	3 hours 	0.5 hours 
Installation time	3 hours 	0.5 hours 
Peripheral cabling incl. initial operation	2.25 hours 	1 hour 
Cost of IO Hardware	490 euros 	370 euros 
Cost of housing	125 euros 	—
Cost of peripheral cable	258 euros 	331 euros 
Diagnostics	Module diagnostics, short circuit	Single-channel diagnostics, short circuit

This symbol represents 30 minutes of labor:  | This symbol represents a gross cost of 50 euros: 

You can see from the symbols that the terminal box option requires significantly more run-up and installation time – an entire workday. Initially not a new insight, but worth highlighting are the engineering details such as creating the schematic diagram and bill of materials. In the case of IP67 fieldbus modules, a free macro module can be used making the effort required to create the BOM minimal.

The comparison also dispels old myths that IP20 control cabinet solutions are cheaper than IP67 fieldbus modules. In this case, the IO hardware alone is more expensive exclusive of the terminal box and installation time.

Likewise, the advantages of the IP67 option are wide ranging and may be weighted differently depending on the application. This is due to the low weight, which is an advantage in handling/robot applications, as well as the compact size and small footprint, which is worth its weight in gold in terms of the production space saved.

During operation, in the event of peripheral faults, such as short circuits and overloads, the clearly visible status LEDs and diagnostic messages provide valuable assistance during control, initial setup, and troubleshooting.

It is easy to modify and expand the system, since any of the free ports can be assigned as inputs/outputs, or you can continue to daisy chain power and communication and add in an additional module.

Summary

The comparison of the two installation options – terminal box and IP67 fieldbus module – clearly shows the advantages and synergies of a decentralized solution. If you want to leverage savings potential, boost sustainability and efficiency, and modernize your engineering, we recommend comprehensively rethinking your installation concepts.

If we consider the aforementioned list of challenges in mechanical and systems engineering, it becomes clear that increased machine throughput, shortened installation times, and less time spent on wiring the machine go hand in hand with the objective of optimizing engineering on the basis of installation technology. Working with Murrelektronik has proven to customers time and time again that cost-cutting leverage can be found in a holistic machine installation. Decentralization is the key success factor when it comes to laying a cost-effective foundation for data and power.



Outlook

It is interesting to take a closer look at other profiles for electromechanical interfaces. This white paper has only examined the comparison of a terminal box with an IP67 fieldbus module, without referencing other cost drivers such as cable grommets, terminal blocks, single-wire cabling, single-wire labeling, and internal cabling to control cabinet IOs.

Whether a point-to-point installation, IP20 fieldbus EA in a terminal box, or IP67 fieldbus EA, with Murrelektronik, you can reduce your project planning effort and the number of components to suit your needs. An engineering process orientation also provides additional potentials like simplifying administrative work with multiple suppliers and service providers.

References:

Desina study – iwB TU Munich





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About the author

Martin Lanz has held various positions at Murrelektronik Switzerland for 20 years. For the past 10 years, he has led the sales team as Head of Sales and Systems Engineering. As an additional qualification, he continued his education as an electrical engineer and sales manager. His

experience in electrical manufacturing has sensitized him to identify cost drivers, lengthy processes and sources of error, from which potential savings can be developed for Murrelektronik customers. Decentralized installation technology and its synergies are an inner conviction for him.

About Murrelektronik

Murrelektronik is an international, family-run company in the automation technology sector with approx. 3.000 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.

