



impulse

Murrelektronik Customer Magazine

MAI68

What is the easiest way to get the apple into the bottle?

➤ more on page 02



KANBAN SYSTEMS

Advanced Logistics

➤ more on page 03



BEST PRACTICE

Special Task for MVK Metal



➤ more on page 06



EDITORIAL

Dear Customer,

When it comes to choosing an installation concept, engineers and customers make their decisions based on very different criteria.



For some of them, price is important. They go with the most economical solution. Others focus on expandability. They know they will be expanding their machine over the next few years so it is important to have some unused ports. While another group focuses their attention on diagnostic functions. If there is a failure, it is important to them that it to be recognized immediately so troubleshooting can begin and downtime can be minimized.

Because our customers' requirements for their installation concepts are so different, it is important for us to pay attention to these differences.

Working with our customers, we are able to design concepts that fit their needs. When possible, we strive to offer two or three alternatives for their applications. This gives our customers the flexibility to find the solution that best meets their needs whether it's: Two alternatives that are equally attractive with regard to price, different modular design concepts that allow for module expansion, or, two concepts that focus on troubleshooting and minimizing downtime.

Then the decision is not, will we implement this concept or not, but instead, which of the concepts do we prefer?

In this edition of Impulse, we will show you an overview of some of the solutions we have implemented with our customers starting with a very simple MAI68 system and going all the way up to a high performance Cube67 solution. **Take a look and decide which concept works for you!**

Stay connected!

Jürgen Zeltwanger
Jürgen Zeltwanger
Chief Marketing & Sales Officer

ESCAPE THE INSTALLATION MAZE

➤ Smart Solutions from Murrelektronik

ESCAPE THE INSTALLATION MAZE



Efficient installation concepts connect all I/O points of a system or machine in a way that maximizes cost-effectiveness.

Cost-effectiveness, however, can mean different things to different people. **Material costs, installation time and service level** all play different roles in making this determination.

Murrelektronik has 30 years of experience with decentralized installation technology. We have implemented many projects using this installation concept. We have introduced new technologies into the market while continuously improving proven solutions.

Our customers benefit from our expertise because we don't just offer one solution for the challenges presented by decentralized installation. From a technical point of view, often several concepts are possible including ring structures, line structures and star topologies.

Then it is up to you! You choose a concept that not only meets your technical requirements, but also focuses on the pricing aspects that are important to you.

MASI68

WHAT IS THE EASIEST WAY TO GET THE APPLE INTO THE BOTTLE?



MASI68 – an easy solution for

- Machine Building and Plant Engineering
- Packaging Industry
- Logistics and Material Handling Industry
- Assembly and Handling Technology
- Automotive Industry

Murrelektronik's MASI68 simplifies decentralized installation solutions – like those in bottling plants.

Decentralized installations with MASI68 are, above all, very easy. They have a short installation time, are very flexible, offer efficient technology and are also very rugged. This makes them a viable solution for a wide range of applications.

MASI68 installations are easily integrated into higher-level fieldbus systems with gateways. Meaning, once a concept is designed, it can be used in like systems and machines without adaptation. Only the interface component has to be changed. This illustrates the principle "Change the control without having to change the system" because the system installation becomes independent of the fieldbus.

MASI68 is easy in many respects:

MASI68 stands for Flexible Applications

MASI68 modules are available in a wide range of configurations: with four or eight ports, as input, output or mixed models. The installation concepts can be structured in small units as required by the application.

Even with complicated topologies the level of flexibility is high. Many of the MASI68 modules are expansion ones. They make it possible to easily integrate new components into the installation concept.

MASI68 stands for Quick Installation

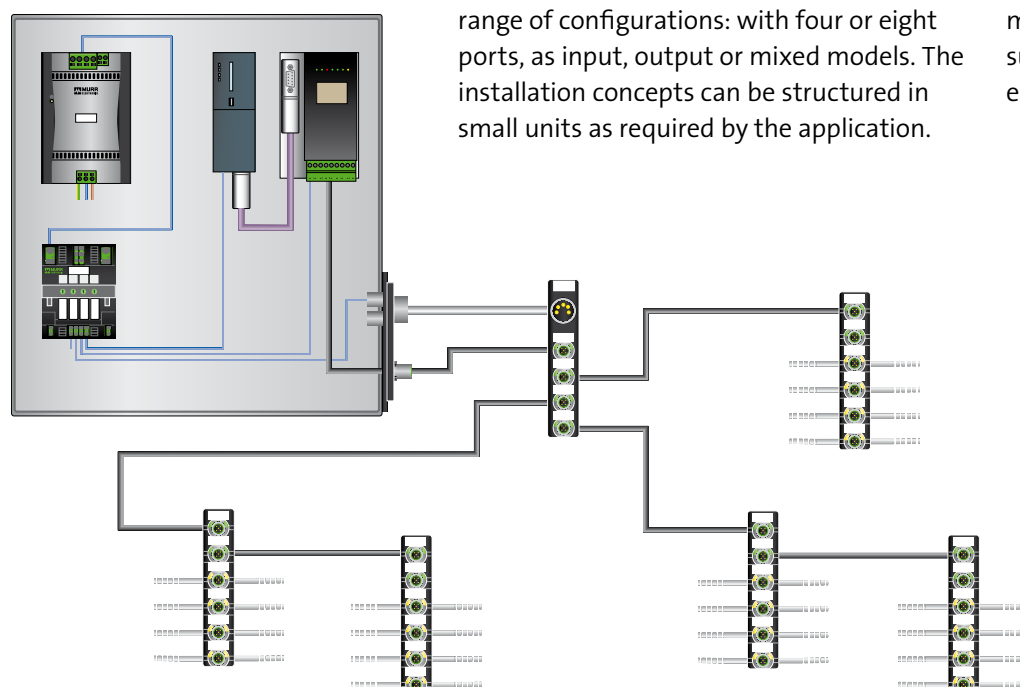
MASI68 modules are installed close to the sensors and actuators allowing you to use short M12 connection cables. Murrelektronik's principle is: "Plugged, what else." Murrelektronik offers a variety of high quality M12 round plug connectors with molded homerun cables.

MASI68 stands for Efficient Technology

Data and power are transferred via unshielded, four-wire cables. Distribution is done without switches which considerably reduces costs, especially in comprehensive installations that have a high number of stations and a wide extension.

MASI68 stands for Rugged Design

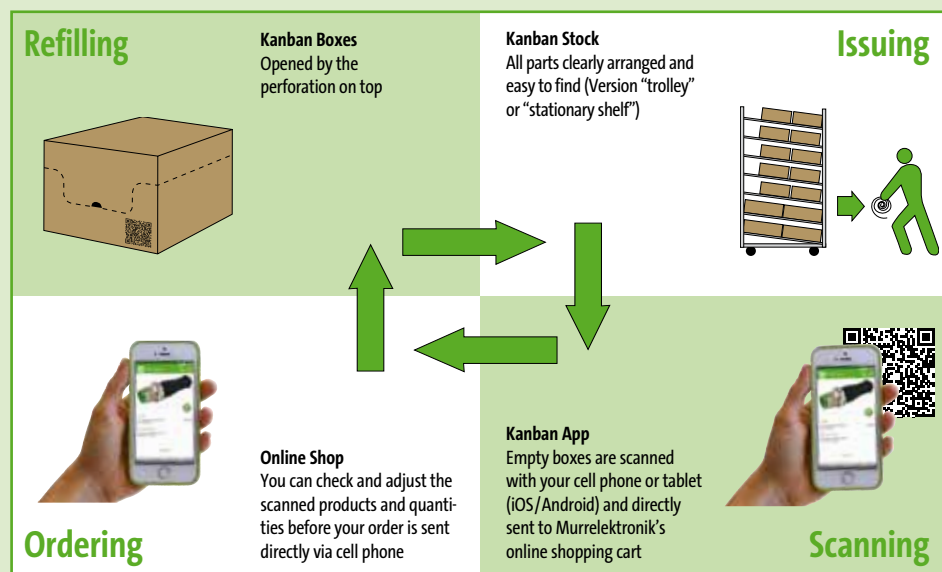
The IP68 modules are fully potted. Because they are reliably sealed, they can be used in the most demanding industrial environments. The high-quality workmanship makes sure the components operate reliably and error-free for a long time.



MURRELEKTRONIK'S KANBAN SYSTEM

ADVANCED LOGISTICS

THE RIGHT PRODUCTS IN THE RIGHT QUANTITY IN THE RIGHT TIME AND PLACE,
IN THE RIGHT QUALITY AND AT THE RIGHT PRICE...



Time pressure and postponed delivery dates – these are the problems machine builders often have to worry about. And sometimes they are caused by technicalities:

- The setup date has to be postponed because a cable has not been delivered in time.
- A sensor that was installed cannot be connected because the necessary cable is not in stock.
- The selected cable is too short because it had to be installed in a different way than originally planned.

Even comprehensive project management can't prevent problems like these. Planning the demand for cables and connectors in advance is very difficult. Partially because exact cable lengths and connector designs are not determined until installation begins.

Unfortunately, this is the time when pressure is high. If, at this moment, a part that is rated as a C-part forms a bottleneck, every additional day you have to wait for delivery is a day too many.

Murrelektronik's Kanban system helps to avoid this stress!

This logistics concept is tailored to meet company requirements and it ensures setup can be done in due time. It guarantees that the cables and connectors needed for sys-

tem installation are always available without increasing the inventory. The Kanban system transfers storing and, if required, part procurement directly into production. This saves time, money and nerves!

Implementing a Kanban system is easy:

1. Murrelektronik and the customer work to determine a customized assortment of cables and connectors (M8, M12, 7/8", valve connectors...).
2. The average consumption during the replenishment period is split into two boxes. This makes sure that follow-up orders are placed in time.
3. The optimum shelf system – static or mobile – is selected. The products are arranged in a logical order to avoid searching for products.
4. The parts are delivered in Kanban boxes allowing existing inventory to be integrated into the material flow.
5. If the requirements change, the assortment can be immediately adapted.

INTRODUCING: THE 24/7 MAINTENANCE STATION FOR SERVICE

A machine stops in the middle of the night because of a defective, electronic component. Replacing the part would be easy but the supply warehouse is closed. A long downtime is inevitable. The 24/7 maintenance station provides an assortment of spare parts tailored to the special needs of a customer's machines no matter when that downtime happens. The parts taken out are logged to avoid the problem of missing inventory. The station is refilled at predetermined intervals based on customer schedules.



AT A GLANCE

FOAM PACKAGING

PRODUCT PROTECTION AT ITS FINEST

Murrelektronik has introduced a new packaging system for its transformers and rectified power supplies. We are now using dense foam that forms to the shape of the product and is better able to absorb shock and vibration during transport. This helps make sure that the outer parts, like brackets and terminals, are not damaged. This solution was carefully tested and selected because it was the only packaging material that passed the parcel services' drop tests. Another plus: the packaging material can be completely recycled!

MA5168

ONE MODULE FOR VOLTAGE AND CURRENT SIGNALS

Murrelektronik's new MA5168 module makes installations much easier. This analog module can also be used as expansion module to process analog voltage and current signals. The module has four measuring channels that can be configured individually. This allows you to go from having two analog modules integrated in your installations with different signals (voltage and current) to using only one module!

MIRO BT

WIRELESS SIGNAL TRANSFER

The compact MIRO BT and MIRO BT IO modules have been designed for reliable wireless signal transfer. They are used in applications where cable based systems reach their limits. MIRO BT and it's built in Bluetooth technology makes it possible to cover distances of up to 100 meters. The Murrelektronik components are provided with a unique Bluetooth ID so that they communicate with the correct stations. MIRO BT is designed for wireless connection of Profibus DP stations to Profibus networks while MIRO BT IO is made for point-to-point transfer between machines and systems.

SMALL PART, BIG SAVINGS

VALVE PLUGS WITH POWER REDUCTION

Energy efficiency in machine tools is an important issue. It's well known that relatively simple measures in big installations quickly add up to considerable savings. Murrelektronik's MSUD valve connectors with power reduction are one of those small things. Our pre-wired, form-A valve connectors supply 100% power when starting up but, when a system is on hold, reduce their power consumption by 40 to 60 percent (pulse width modulation – PWM). If there are a lot valves in a machine, the savings will really add up.

ROBUST AND RELIABLE



xtreme

INSTALLATION SOLUTIONS FOR MOBILE APPLICATIONS



EXTREME CONDITIONS. EASY INSTALLATIONS.

MURRELEKTRONIK'S XTREME DISTRIBUTION BOXES AND CONNECTORS ARE THE INSTALLATION SOLUTION FOR HARSH ENVIRONMENTS.

Parched fields with swirling dust. Icy streets treated with salt. Wet soil where harvesters fight the mud and dirt. All are demanding environments where heavy equipment has to deal with a variety of conditions.

Products used in mobile applications are exposed to wide temperature fluctuations and UV light. They are pelted by dust, treated with high pressure water (IP66K) and cleaners (IP69K) and sometimes they are even immersed (IP68). They have to withstand vibration and oils. In short, they have to meet the most extreme requirements. To this point, single wire connections have been used in the construction of heavy equipment. This means many individual parts (cables, cable ties, ferrule ends) have to be connected by hand, big cable ducts are required and keeping it all tightly sealed is a permanent problem.

To solve these problems, we offer modular, pluggable solutions (the XTREME series) for mobile applications that are similar to those used in machine building. We know that by using pre-wired connection cables and distribution boxes, you can save a lot of installation time.

The XTREME Family is made up of:

M12 XTREME – rugged connection cables

All metal parts on these connectors are made of corrosion resistant stainless steel. The hex nut works with our torque wrench so you can ensure correct connections. An axial and radial locking mechanism, along with an innovatively shaped gasket, ensures stable connections even



with vibration. The rugged PUR cable jacket is flexible and wear-resistant. The black material is resistant to UV light.

MSUD XTREME – the valve connector for extremely demanding conditions

The valve plugs are completely molded and absolutely sealed. The silicon gasket doesn't get brittle and it is fixed in a way that it cannot get lost. The screw is made of stainless steel. The jacket material is PUR. The valve plugs are equipped with an LED status display. The valve connectors include integrated suppression components.

MVP XTREME – the impact-resistant and fully potted distribution box

The plastic housing is resistant to UV light. The threaded connections are made of stainless steel. Ultra bright LEDs make it easy to recognize the operating state. MVP XTREME has eight M12 ports that can transfer either one or two signals. The molded PUR homerun cables are suitable for C-track applications and available in lengths from 3 to 30 meters.

TYPICAL EXAMPLES OF MOBILE APPLICATIONS:

- Agricultural Machinery (tractors, combine harvesters)
- Forestry Machines
- Construction Machinery (road and tunnel construction)
- Street Cleaners, Garbage Trucks
- Industrial Trucks (forklift and pallet trucks)
- Cranes (stationary and mobile installations)

“THE GREEN FACTORY”

INNOVATIVE TECHNOLOGY WITH STANDARD COMPONENTS

MURRELEKTRONIK COMPONENTS CONTROL ELECTRICAL CLAMPING TECHNOLOGY AND HELP TO SAVE ENERGY

Many companies, especially those in the Automotive industry, dream of a “green factory”. They want to save resources and reduce energy costs with lower energy consumption.

Univer offers a field-tested solution for body shops. The company not only relies on pneumatic clamping systems but also on electrical components. Murrelektronik is an important partner for Univer because, with MVK Metal, we offer standard components with a proven track record in car factories.

A look into the future with Markus Oerder, managing director of Univer GmbH and Peter Ohr, Key Account Manager Automotive at Murrelektronik.

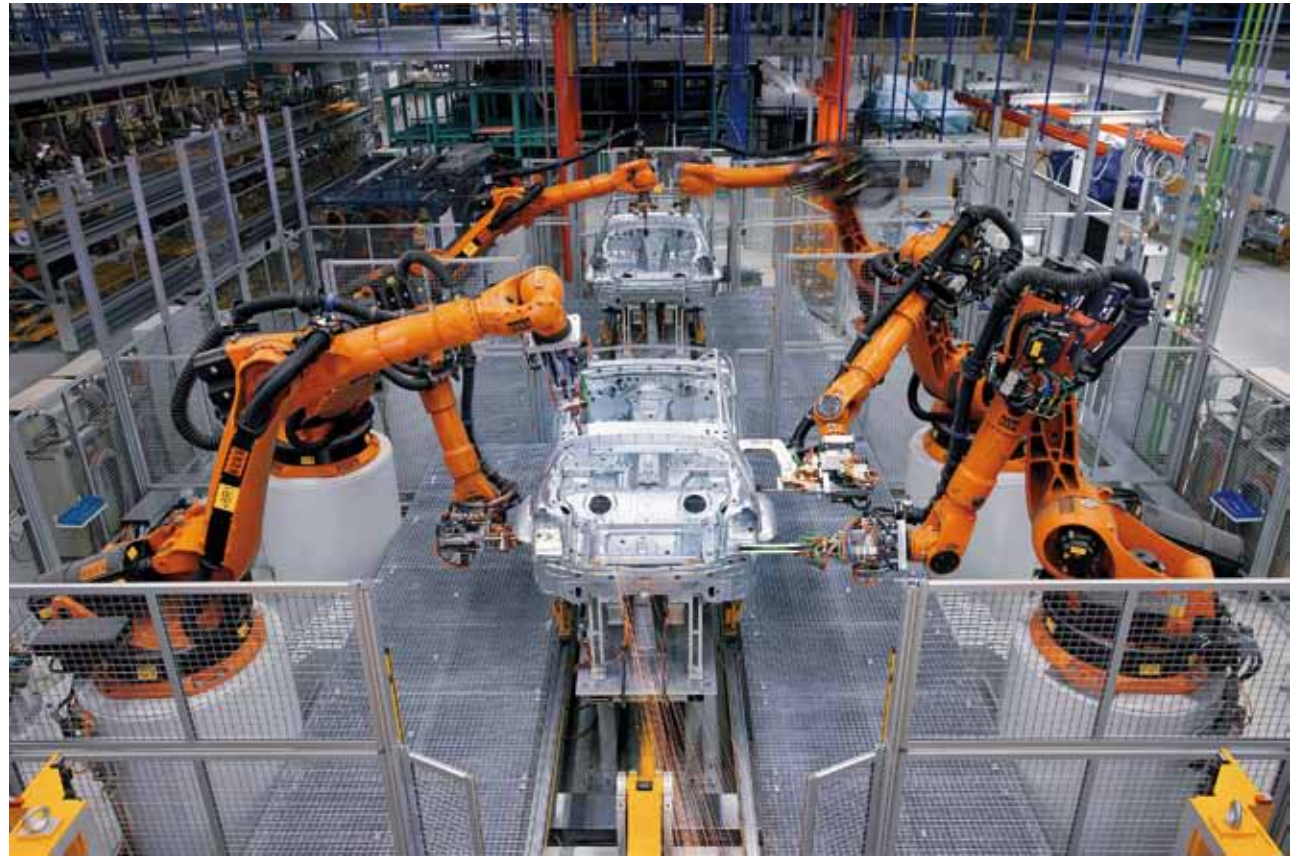
In the body shop, many metal sheets and parts are attached to the frame. Before the parts can be welded, they must first be fixed in their exact position which requires many individual clamps. Conventionally, these clamps are pneumatically driven.

Recently there has been a growing demand for electrical clamps. Why?

MARKUS OERDER: An electrical drive with an efficiency rating of over 80 percent is considered to be considerably more efficient than pneumatic drivers. However, when cost factors into the equation, electrical components only make sense when pneumatics are no longer needed for assembly. This is why electrical clamps are an interesting choice when welding tongs, cutters and lifting units are already electrically driven.

But not only the costs are only one part of the equation. Electrically driven units also have technical benefits. Processes and functions can be carried out individually, different from pneumatics. This is required for body shop applications, where different models are produced in individual lines. Furthermore, they enable more complex analysis regarding quality and process. Univer is a specialist for electrical clamps, the company implemented complete body construction systems for Lancia and Alfa Romeo.

MARKUS OERDER: This way, we have gained intensive, practical experience. We have also achieved positive results with other companies from the automotive industry including General Motors. Currently, the majority of our sales of electrical clamps are for smaller projects and/or industrial applications that don't have any pneumatic installation.



However, the electrical clamp has not been widely accepted. Why not?

MARKUS OERDER: The price is higher at the moment because of the quantities being used and also from the investment costs caused by switching over to electrical components. If you compared the prices based on the same quantities and calculated this against necessary, new installations, the prices would be similar. Moreover, engineers often assume electrical solutions can only be designed with expensive, special constructions and many accommodations for the power supply.

However, it doesn't have to be this way as proven by the projects Murrelektronik and Univer have done together. Peter Ohr, from Murrelektronik, has been working together with Markus Oerder for over a year. This partnership began with a shared contact at Ford in Cologne. Ohr occupied himself intensively with the challenges resulting from the electrical aspects. It became obvious that electrical clamps (operating voltage of 24V) require a relatively high current when starting up and during the actual clamping process. Therefore, it is important to produce and distribute energy that can operate up to 5,000 clamps per system.

And this is where Murrelektronik components are an option?

PETER OHR: Yes, indeed. The discussions with Univer showed that Murrelektronik could drive the electrical clamp using standard components. We immediately started endurance testing that proved successful.

What does this mean for car manufacturers?

PETER OHR: To control the clamps, they can use a standard MVK Metal module that is already installed in high quantities in many automotive plants. This also means they can use a proven technology. They don't have to get familiar with new technology and no new spare parts are required for maintenance. With Emparro67, Murrelektronik provides the appropriate solution for an intelligent power supply.

Together with Univer, Murrelektronik built a prototype to demonstrate how easy this procedure is. It is used to present the concept to engineers in the automotive plants.

What is the future for such a solution?

MARKUS OERDER: Our aim is playing a leading role in clamping technology. Therefore, we are studying the latest technologies and we make the corresponding investments. This is why integrating electrical clamping technology plays an important role for us. To implement them in the markets, we are looking for a partnership. Together with Murrelektronik we can present an innovation in car body construction.



HALDER GMBH

SPECIAL TASK FOR MVK METAL

Text & Images:
Alexander Hornauer

AN APPLICATION THAT IS ANYTHING BUT ORDINARY: MANUFACTURER OF FORESTRY MACHINES RELIES ON MVK METAL IN A MOBILE DEBARKING SYSTEM



Mobile Debarking
System Working



Fieldbus installation concepts using MVK Metal are well-established solutions for highly automated production lines. Sometimes, Murrelektronik's rugged fieldbus module is used in applications where you wouldn't quite expect it. A prime example is the Halder GmbH mobile debarking system. The machine builder, located in southern Germany, retrofitted their systems with MVK Metal, a modern Profibus fieldbus solution.

Machinery used in the forestry industry has to be extremely rugged. This includes the mobile debarking system that operates in different locations in the wooded area in southern Germany. Each system is operated by two workers sitting in the operator cabin of the MAN truck. They skillfully maneuver long and heavy trunks onto the vehicle where the bark is rapidly removed and the trunks are stacked along the road.

"Our mobile debarking system has been operating since 1996", says Berthold Halder, President, who has a passion for machine building. The system operates for approximately 1,200 hours a year, sometimes more, sometimes less. "The machine has been operating for almost 38,000 hours." It is a reliable and robust machine: forest paths full of mud, heavy rainstorms and constant vibrations will not damage the machine.

Debarking systems are commonly ordered by saw mills that don't have a permanently installed debarking system on their premises. The mobile system is also

very useful if the trunks have to dry rapidly as the wood dries much faster when the bark is removed. "In 45 minutes, we can handle about 100 solid cubic meters", says Berthold Halder. This is an impressive pile of wood. A single 500HP motor is used to drive the vehicle and the eleven hydraulic pumps of the debarking system during operation.

The cutting blades that strip the bark of the trunks have hydraulic suspension and are installed on a rotating drum. The rotor disk is driven by a powerful hydraulic motor. Feed rollers transport the trunks through the machines. A bark centrifuge, that can be variably positioned, transports the stripped bark to the side. The speed of all three movable parts can be adjusted. It is also used to regulate the throwing distance. A large number of sensors are installed in the machine to monitor the operating state of the actuators including the inductive proximity switches installed at the outriggers. They make sure the outriggers are retracted when the machine is driving on the street.

The machine has many I/O points. "About two thirds of them are actuators and one third are sensors", explains Halder. When he wired the debarking system for the first time, over two decades ago, he used conventional single wire connections. Alois Öhler, a control technology specialist from R&Ö, remembers: "This was a very tricky job because there were winding cables of up to 20 meters in length." Throughout the years, the installation has been continuously simplified, part of it with the first fieldbus components. When it was time for a big retrofit, Halder knew that this time they wanted a Profibus fieldbus solution for the machines. Öhler adds: "Our many years of experience helped us as we looked for suitable components for our special application."

"The fully potted modules are reliably sealed."

Together they decided to use Murrelektronik's MVK Metal fieldbus modules. One deciding factor was the rugged housing of the components. Öhler says: "The fully potted MVK Metal modules are reliably sealed." Additional rubber buffers absorb heavy vibrations and even with very bad weather and cold, the official temperature range for an MVK module is -25 up to +55°C, the modules work reliably without failures. "Even when its 20 degrees below zero there

P&S MASCHINENBAU GMBH

SPACE SAVINGS MADE SIMPLE

P&S MASCHINENBAU GMBH IMPLEMENTED THE CUBE67 FIELDBUS SYSTEM AND ACHIEVED MANY ADVANTAGES THIS WAY

P&S Maschinenbau GmbH's cutting machines are well known in today's market. They are preparing for the future with a new installation concept based on Murrelektronik's Cube67 fieldbus system. Cube67 creates more space in the cabinet, simplifies installation and offers comprehensive diagnostics.

Prior to using Cube67, the cutting machine sensors and actuators were connected by single wire connections to the coupling units in the cabinet. This took a lot of time and the coupling units and output terminals required a lot of space in the cabinet. In order to provide space for possible future expansions of the best selling machine, the P&S Maschinenbau electrical engineers looked for a new way to create space in the control cabinet.



Berthold Halder, Director of the Company

aren't any problems", explains Berthold Halder as he smiles a bit. "However, we don't benefit from this advantage. Even though we work with all kinds of weather, we have to quit at 10 degrees below zero because you can't strip back from the trees at this temperature."

MVK Metal's multi-function ports were a great advantage during the retrofit phase. "This provided flexibility. We could use and configure the individual ports as input or output, according to the specific requirements", explains Alois Öhler. In the end, a complete fieldbus solution was implemented with a relatively small number of modules. If a port is not used, it is sealed with a blind plug. However, this doesn't happen often as most of the ports are used twice, most commonly for double valve connectors that control the hydraulic pumps. The integrated hex thread on the M12 cordsets is another advantage for Halder. They are able to accurately tighten them with the torque wrench and quickly loosen them for repair work.

Another advantage of the MVK Metal fieldbus solution is that the machine operators are able to troubleshoot problems themselves. "If it should happen that a fieldbus module doesn't work, they can take a spare module, set the correct addresses and replace the defective module", explains Berthold Halder. The automatic topology discovery does the rest. This avoids abandoning an operation or having to do troubleshooting on site – not that either happens very often. Berthold Halder says: "To be honest, so far there was only one failure with a Profibus connection that interrupted the fieldbus system, and this was caused by inappropriate use." Another project, installing a display in the driver's cab to easily use MVK Metal's diagnostic options, has already been initiated.

In the vehicle's operator cabin and in some smaller, decentralized cabins of the mobile debarking system, Murrelektronik's Cube20s system has been installed. "There isn't much room in these cabins. Therefore it is very important to install high density compact components", says Berthold Halder. Like the MVK Modules, these modules are also exposed to vehicle shock and vibrations", says Berthold Halder. However, this doesn't cause a problem. According to Alois Öhler: "The wires are connected to vibration-resistant spring clamp terminals to make a safe connection." He also appreciates that the terminals are easy to reach. Another important point for Halder is that the fieldbus solution is continuously supplied



MVK Metal Close to the Process, with Double Valve Connectors



Cube20S in a Switch Box in the Operator Cabin



MB Cap for Buffering Voltage Drops

with power. Because, when the motor is started, the generator needs a lot of power. This is always a critical moment as "It can happen that voltage is interrupted for a brief time, in the worst case scenario even for a few seconds", comments Berthold Halder. Here, Murrelektronik's buffer module MB Cap helps to protect the 24 V supply of the control and the fieldbus system.

In the end, Halder is very satisfied with Murrelektronik's products and solutions. "It is important for us that the machines work and we aren't standing in the rain, in the woods, having to look for failures". Components from Murrelektronik help to ensure this.



P&S Maschinenbau GmbH

- Founded 1996
- Headquarters in Cham/Bavaria, Germany
- 70 employees

A fieldbus system is a good solution. However, in that type of system, the components are "relocated" from the cabinet into the harsh industrial field where they are exposed to demanding conditions. They could come into contact with oils or with a carbide grinding dust. Therefore, the engineers decided on an installation concept using Murrelektronik's Cube67 modular fieldbus system. The fully potted compact modules are robust and sealed allowing them to be moved to the field thus achieving the primary objective of creating more space in the cabinet.

The Cube67 installation concept provides even more benefits to P&S Maschinenbau GmbH. Installation time is reduced considerably because, with Cube67, one connection cable is all that is needed to connect the bus node to the individual distribution boxes. This green

hybrid cable supplies power and transfers data simultaneously. The pin level diagnostics of a Cube67 system are another attractive feature. In the event of a failure, the diagnostic tools allow a technician to find (and fix) the problem immediately without having to search the machine increasing machine-operating time. In some cases, remote maintenance is also possible, because with Cube67 you can switch each individual channel from a distance. This is an important tool, especially for smaller companies, where one machine operator may be responsible for many different machines or systems.

ONLINE SHOP

COMPLEX INFORMATION CLEARLY PICTURED



To see the award
winning site, visit:

shop.murrelektronik.com



MURRELEKTRONIK'S ONLINE SHOP WINS THE GOLDEN-CART-AWARD

Murrelektronik's new online shop has won the 2014 Golden Cart Award for "B2B-Commerce". This prize, awarded by OXID eSales AG, is a remarkable achievement. Over 12,000 online shops worldwide have been created based on this open source eCommerce platform.

Finding the winner was challenging. There were many great sites in the running for the prize. The judges appreciated the great shopping experience Murrelektronik's online shop offers. The shop, created in conjunction with Netformic (an internet agency in Stuttgart) provides complex product information in a comprehensive and informative way. At the same time, the product detail pages are clearly structured. This structure, according to the judges, is more important in the B2B sector than showing colorful pictures, cute videos and animations.

Murrelektronik's online shop does not only use the options of the standard software. By targeted applications and features for the B2B sector, the software was also enhanced.

Janko Strauß, marketing manager for the project, was very happy to receive the award.

"Our aim was to offer Murrelektronik's customers the best B2B shop in the electronics industry. We wanted to make searching and finding products as easy as possible. With OXID we were able to achieve this goal." Strauß continues: "The award shows that people realize how much time and effort was into the project to create a customer oriented solution."

FIRST CLASS QUALITY

Murrelektronik is known for their first class quality products! To show you how we do this we produced a video about the production of our transformers.

A virtual tour of our production that consistently follows the one piece flow principle will give you an excellent impression of why our transformers are the best on the market. And you will also see how we can be so quick, reliable and flexible when producing.

Enjoy the video!



YouTube Video



FALL 2014 APPRENTICESHIPS & TRAINEES

WELCOME NEW STUDENTS!

Training has always been a high priority for Murrelektronik because today's trainees become tomorrow's workers. In September and October 2014, ten people started their apprenticeships at our headquarters in Oppenweiler. Currently we have students training to become industrial clerks,

logistics experts, electrical engineers, and graphic designers. Additionally, students are employed at Murrelektronik through the German "Dual Studies Training" program. This program combines classroom education with both vocational school classes and internships at either an industrial engineering, electrical engineering or information technology company. This allows the students to receive a combination of a hands-on practice and technical-scientific training.



3						7		
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1	4					3	7	
6		2			5			

EPISODE 25

MURRPHY



SUDOKU FUN WITH MURRPHY

It's a bit tricky at the beginning. Get the first numbers right and the rest will fall into place...

Enjoy the puzzle!

Murrphy

Solution:

8	1	6	5	7	4	2	3	9
9	4	8	8	2	7	6	5	1
5	7	2	9	1	6	7	4	8
4	9	7	4	7	2	8	6	5
7	6	1	7	5	8	9	2	3
2	8	5	6	9	4	1	7	3
1	5	4	3	9	7	2	6	8
3	9	8	2	7	1	5	4	6
6	2	7	1	4	5	9	8	3

