Industrial Manufacturing

In the new industrial revolution companies will need to focus on innovative technologies to create better and more sustainable working environments.

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In This Issue

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Foreword

Distrelec is proud to announce the third edition of its eBook series focusing on industrial manufacturing.

Manufacturing is the foundation of the economy. It plays an important role for both the consumers and employees. The impact of manufacturing can be seen in many human activities, from handcraft to high-tech. However, it is most usually associated with industrial design, which involves the large-scale transformation of raw materials from the primary sector into completed goods.

Since the first industrial revolution in the 1800s, manufacturing progress has continued. It has undergone a constant process of reinvention. Before the first industrial revolution, work was fully dependent on people. Now, a lot of things can be done by machines. Engineers and specialists in artificial intelligence and IT make such progress possible.

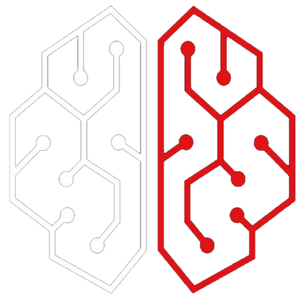
Distrelec collaborates with engineers and industry specialists by investing in innovative solutions. This trusted distribution partner provides its clients with a best-in-class product portfolio from major suppliers.

To stay current with the changes in the manufacturing industry, it is important to know how it all started. The industrial revolutions changed the farm and handicrafts-based economies into factory-based industries. The second revolution brought access to electricity, mass production, and accessibility to assembly lines. Later, the third industrial revolution brought computers, automation, and electronics. Now business owners and customers talk about smart factories that are changing the way of working.

With the beginning of the fourth industrial revolution (Industry 4.0), businesses are implementing new technologies on the factory floor, including advanced automation, wireless technologies, Big Data, networking, Artificial Intelligence (AI) and IoT-integrated smart facilities. And these processes are all shaping today's production environments.

For some companies, adapting to changes in the industry is still a difficulty. Businesses must focus on new technologies to create more sustainable and better-working environments. Thanks to the digital transformation, and with that advanced production, enterprises can ensure safety, more sustainable environments, and customer and workforce satisfaction.

Distrelec is pleased to provide a variety of industrial manufacturing, automated, and technologically advanced solutions to meet our customers' demands. In the eBook we look at some of the solutions to help our readers and customers prepare for the technological developments of their factories.



Smart factories changing the manufacturing industry

By Chris Rush

Smart manufacturing (SM) is a technology approach that requires Internet-connected machines to monitor the production process in real-time. The main objective of SM is to identify opportunities for automating operations throughout and use data analytics to improve performance.

The addition of the industrial internet of things (IIoT), artificial intelligence (AI) and Edge computing have been a significant factor in accelerating the growth and expansion in many manufacturing industries in the last ten years.

Factories are becoming, without a doubt, more intelligent, more efficient, cost-effective. This results in increased manufacturing capacity and delivery of excellence in service to its customers.

How does SM compare from traditional manufacturing approaches?

Traditional manufacturing processes developed when mass production focused on the economy of scale

Smart factories changing the manufacturing industry

and machine utilisation. The idea behind this was that if a machine was idle at any point, it was potentially losing money, so companies kept them running continuously.

To achieve customer satisfaction which was the core focus for many companies, traditional manufacturing companies made extensive inventories available to fulfil any potential orders with ease, resulting in increased profits. The consequence of operating using this method is that these companies have to keep their machines running with specific setup and configurations for as long as possible to reduce the costs of making the parts.

This operation style is known as batch-and-queue processing. Mass production manufacturing approach is where the goods are processed at one stage of the manufacturing process and moved to the next stage, whether needed or not, and wait in a queue. This method, if not managed correctly, could cause substantial bottlenecks at any stage of manufacturing.

This traditional approach to manufacturing isn't very efficient for several reasons, such as:

Machine setup times are typically much longer. Setting up a machine will ultimately lead to machine downtime, resulting in lost production time, which can have enormous consequences in mass production.

Quality will be a significant factor in any manufacturing process. With the traditional mass-producing method, batches with quality issues will not be noticed until it reaches the following process. The work then has to be done again, which ties up further resources and incur costs and delays.

> ***The IIoT vision of the world is one where smart connected assets (the things) operate as part of a larger system or systems of systems that make up the smart manufacturing enterprise.***
>
> ***John Conway is Schneider Electric's VP for Strategy & Partnerships***

Smart factories changing the manufacturing industry

Smart manufacturing is primarily designed to automate a lot of the processes and address these issues in traditional methods. It is seen as a collaborative way to fully integrate a manufacturing system that can respond and adapt its resources in real-time. With conditions that can be ever-changing and the demands on a factory in the supply network, smart manufacturing is the ideal solution whilst keeping the customer at the focal point.

Intelligent manufacturing aims to improve the manufacturing process using a technology-driven approach that combines IoT machines to monitor the production process in real-time. Smart manufacturing allows companies to identify opportunities for automating manufacturing processes and use data analytics to improve performance.

Advantages and disadvantages of smart manufacturing

Smart manufacturing offers several benefits, such as improved efficiency, increased productivity and overall cost savings. In a smart factory, productivity is continuously improved, increasing the output capacity. Suppose a particular machine is slowing down production or a quality issue arises. In that case, intelligent factories will highlight the issue using AI software systems and work out a resolution to fix the issue. These types of systems offer way more flexibility than you can imagine.

When we talk about improved efficiency, the initial savings come directly from the reduced downtime of machines. Modern machinery in a factory generally has many sensors and diagnostics that can alert operators if an issue or potential issue may occur. Combine these machines with advanced AI technology, and you can highlight problems before they happen and take the appropriate actions. This is known as predictive AI.

The biggest downside with smart manufacturing is by far the initial investment of implementing an intelligent system. Some small/medium size companies cannot simply take the risk of introducing technology unless there is long term growth.

If companies can overcome the initial cost, then the biggest hurdle in implementing technology within manufacturing is installation. These types of systems can be very complex and must be fine-tuned to suit the needs of manufacturing. If the system is poorly run or requires constant tweaking, then this could potentially eat into profits.

Smart factories changing the manufacturing industry

Smart manufacturing enterprise

While the long term impact of IIoT is at times difficult to predict, three distinct operational environments will set the stage for the smart manufacturing enterprise to emerge.

Smart Enterprise Control – IIoT technologies will enable tight integration of intelligent connected machines and smart connected manufacturing assets with the broader enterprise. This will facilitate more flexible and efficient, and hence profitable, manufacturing. Smart enterprise control can be viewed as a mid-to-long-term trend. It is complex to implement and will require new standards to enable the convergence of IT and OT systems.

Asset Performance Management – Deployment of cost-effective wireless sensors, easy cloud connectivity (including WAN) and data analytics will improve asset performance. These tools allow data to be easily gathered from the field and converted into actionable information in real-time. This will result in better business decisions and forward-looking decision-making processes.

Augmented Operators – Future employees will use mobile devices, data analytics, augmented reality and transparent connectivity to increase productivity. As fewer skilled workers are left behind to man core operations due to a rapid increase in baby boomer retirement, younger replacement plant workers will need information at their fingertips. That information will be delivered in a real-time format that is familiar to them. Thus the plant evolves to be more user-centric and less machine-centric.

Cyber Security

The arrival of IIoT is accelerating the need for cyber security in industrial systems, more so where there is sensitive data. Due to the complexity of IIoT, it means that security must be a feature that is not only at the software level but built into the hardware and components that make up smart control systems.

The approval of security standards with certification will also be vital to the growth of IIoT. It will ensure that the security is not only for individual parts but integrated into a much extensive system.

The adoption of certification means that certain elements

Smart factories changing the manufacturing industry

within a system will ultimately be critical components. The components will be combined securely by security experts and be operated in a secure system.

Technological components leading the IIoT transformation

IIoT is softening the edges between physical and virtual components. This is allowing more flexible models of accessing processes and machine data – circumventing traditional automation architectures and gaining access to more user-friendly, mobile systems based on IoT standards.

Whilst collecting data is a vital aspect of IIoT, this single aspect alone will not allow manufacturers to reach the full potential of IIoT. Other components within IIoT also need to be considered:

- Edge computing to collect data, display relevant information and forward the data to the cloud for more advanced analytics

- Application and services to analyse data.

- Open standards to allow a more uniform approach to connected devices of different manufacturers

- Smart devices that are IIoT ready will feature an advanced sensing system that can create data at the first point of data analysis reducing the over computation load further down the line.

Designing smart connected devices for IIoT requires natively featuring internet technologies such as Wi-Fi, Ethernet, and web services. Without these technologies built-in into the core specification of smart devices, the industry wouldn't grow.

An edge gateway will collect data from various sources and deliver real-time information to the right people at the right time. Edge computing is vital in an IIoT system. It can deliver and process data in real-time to the user on the factory floor before it gets sent to the cloud system for further analysis.

It also facilitates value-added services independent of the control system. The edge gateway ensures a high level of performance and connectivity to address the critical needs of the IIoT platform.

Digital applications and services are critical to end users achieving the business performance as

Smart factories changing the manufacturing industry

promised by IIoT. Simple data collection must be extended to include analytics that delivers valuable business information. Examples of such applications and services include:

- Installation optimisation.

- Asset management and protection.

- Condition-based monitoring.

- Augmented reality applcations and OEE calculation.

Programmable Logic Controllers, TM22, Schneider Electric

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I/O Modules, TM22, Schneider Electric

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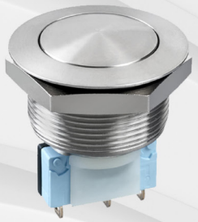
DISCOVER APEM AND IDEC SWITCHES

Dedicated solutions for health-related and transportation applications.



SECURITY PUSHBUTTON SWITCH WITH LARGE ACTUATOR

DISTINCTIVE FEATURES:

- Large actuator
- Low profile option
- Momentary (combined NC+NO)
- Anodized actuators
- Sealed to IP65

SECURITY PUSHBUTTON SWITCH WITH LATCHING

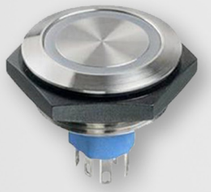
DISTINCTIVE FEATURES:

- Latching action
- 3 terminal types
- Panel sealing option

SECURITY PUSHBUTTON SWITCH WITH MOMENTARY NO

DISTINCTIVE FEATURES:

- Momentary (NO)
- Momentary (NC) and alternate action also available
- Long life
- UL-CSA approved (long case only)
- Marking available



SECURITY PUSHBUTTON SWITCH WITH ILLUMINATED MOMENTARY

DISTINCTIVE FEATURES:

- Large actuator
- With illuminated ring
- Momentary NC/NO
- Solder lug, flying lead or cable terminals
- Marking available on request Momentary (NO)

PUSHBUTTON SWITCH FOR HARSH ENVIRONMENT

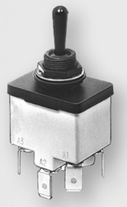
DISTINCTIVE FEATURES:

- Backlighted marking in a compact case
- Strong tactile feedback
- NO or NC/NO
- High sealing level, no space between actuator and bushing (IP67/IP69K)

PIEZO SWITCH

DISTINCTIVE FEATURES:

- Momentary (NO)
- Momentary (NC) and alternate action also available
- Long life
- UL-CSA approved (long case only)
- Marking available



HIGH PERFORMANCE TOGGLE SWITCHES

DISTINCTIVE FEATURES:

- Completely sealed switches withstanding 0.1 bar pressure
- Approved to European standards CECC 96000
- Three types of terminals
- Many lever styles available

SEALED TOGGLE SWITCHES FOR OUTDOOR APPLICATIONS

DISTINCTIVE FEATURES:

- Sealed to IP67
- Solid silver contacts
- UL approved

PBA SERIES PIEZO SWITCHES

DISTINCTIVE FEATURES:

- Bushing diameter 16 (.630), 19 (.748), 22 (.866) or 30 mm (1.181)
- Sealed to IP68 and IP69K (switches mounted on panel)
- Easy to clean metal surface
- Very long life expectancy
- Ring or dot illumination

APEM
an IDEC company

What makes Sensata Wireless Solutions ideal for manufacturing lines?

Sensata

With the growth of new technologies, sensing solutions are also growing, especially for those that allow for communication in a secure wireless manner.

What makes Sensata Wireless Solutions ideal for manufacturing lines?

The development of new technologies contributed to many industrial revolutions. One that opened up vast opportunities for controlling machines and improving the factory plants is Industry 4.0. Among others, the wireless solutions had the impact that contributed to the revolution.

Wireless technology is one of the most widely used in manufacturing today, with benefits felt throughout the value chain. In smart manufacturing, sensing technology allows for continuous asset monitoring where wireless networks eliminate the installation and maintenance costs associated with wired solutions.

The Role of Wireless Solutions in Industry 4.0

In the fourth revolution, wireless systems facilitate data transfer from one location to another. They allow for greater data transmission. Wireless networks have always fueled smart production, starting with 4G and subsequently shifting to 5G. The 5G is the next generation of mobile communication technology that offers higher speed, advanced analytics and big data.

Wireless devices connect equipment that needs to move around freely and allow for machine-to-machine connectivity. The wireless solutions are in almost all sectors of the factory floor. It covers development to production, as well as storage and distribution. It also helps solve the issues that come in any of these processes. Thanks to that, the response for instructions in robotics and automation is under control. It is especially important because soon, many factories will move from Industry 4.0 to Industry 5.0, where the cooperation between robots and humans will play the biggest role.

The key factors to global mobile traffic growth are wireless devices' ever-changing mix and growth. According to Cisco research, by 2023, 8.7 billion portable or personal mobile-ready gadgets will be in use. Between 2018 and 2023, North America and Western Europe will have the highest growth in mobile devices and connections, with CAGRs of 16% and 11%.

Sensata Wireless Systems

With the growth of new technologies, sensing solutions are also growing, especially for those that allow for communication in a secure wireless manner. Sensata helps your business achieve its digital transformation goals by providing wireless solutions that securely transmit and receive mission-critical data from various sources and integrate seamlessly into your existing automation system.

Sensata's wireless system devices simplify the addition of IoT connectivity to industrial equipment, for increased productivity and safety. They help eliminate installation and maintenance costs associated with wired systems for continuous asset monitoring.

What makes Sensata Wireless Solutions ideal for manufacturing lines?

From basic cable replacement systems to full IIoT solutions, Sensata wireless solutions offer many applications. Sensata's wireless system devices, including wireless pressure and temperature sensors, receivers, transmitters, and gateways, are versatile and configurable, making the installation of IoT connectivity for industrial equipment simple and cost-effective. The wireless sensors eliminate the need for costly or time-consuming cable runs while providing precision, reliability, and durability.

Benefits of Wireless Connectivity

With a rising number of manufacturing companies seeing the benefits of wireless technology, its adoption is only anticipated to grow. As per Sensata, there are five main wireless connectivity benefits that smart factories gain:

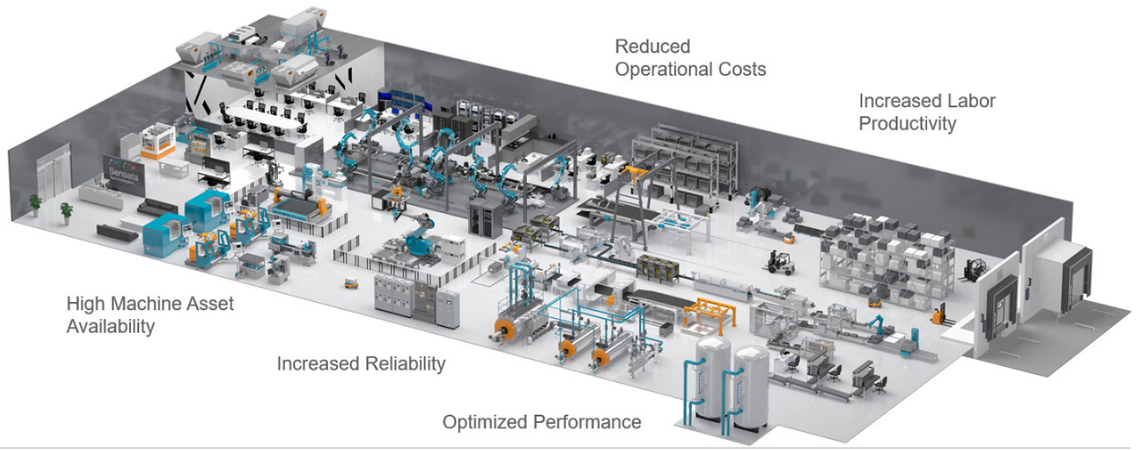
1. Optimise performance.
2. Increase productivity
3. Reduce costs
4. Increase plant's reliability
5. Increase machine assets

Optimised performance

Now with the industrial revolutions growing, the capabilities of factories are changing. Optimising the manufacturing floor can help produce faster and better products. Wireless sensors and systems integrated into automation equipment enable precise control. The system delivers data wherever the process changes. The speedy response aids in the operation and performance of the company.

Increased productivity

Factories with only a few automation systems are working way slower than smart factories. The manufacturing equipment that is based on wireless technology can improve the factory plant by working longer and more efficiently. Thanks to automation, this can also remove route-based maintenance and manual



The concept of smart manufacturing is based on increased labour productivity and reliability, reduced cost, high machine assets and optimised performance. Source: Sensata

What makes Sensata Wireless Solutions ideal for manufacturing lines?

tasks.

Reduced costs

Wireless solutions help automation systems run as efficiently as possible, generating little waste heat, utilising the least amount of power, and maximising all plant resources. Because wireless solutions function on low voltage, they can also eliminate the requirement for electricians. Manufacturing becomes more cost-effective and productive as a result of all of this.

Increase plant's reliability

Wireless communication can replace material and labour costs and remove long and intricate wiring runs. Plants become more reliable as a result of the combination of these factors. The reliability works on an increase in production and finally benefits the company.

Increased machine assets

The profitability grows when machines are in use. Factories with little availability and low production times cannot achieve high performance. To avoid downtimes, it is important to invest in wireless connectivity.

The new industrial revolution is driven by wireless connectivity

In the era of innovations transforming outdated plants into digital factories should start as soon as possible. With the growth of industry 4.0 and the advent of the IoT, industries are going through some changes, mostly digitalisation. Businesses that stay behind with production and do not keep up with the changes will not succeed. The wireless connection is driving the industrial revolution with components, such as sensors, machines and other devices waiting to be connected.

Examples can be new Human Machine Interfaces (HMIs) that use augmented and virtual reality. They need to meet the same requirements for delivering high-resolution visuals and quickly responding to the user's gestures. Besides that, mobile robots require ultra-reliable, low-latency connectivity and a high-fidelity data line. Also, sensors need to connect with other sensors or machines and be able to work consistently in crowded environments. All of these devices need wireless capabilities.

Sensata

Wireless Pressure Sensor, Sensata Cynergy3

The IWPTLU Wireless Pressure Transducer is a low-cost alternative to a normally wired pressure transducer. An IWR-1 or IWR-5 receiver can be used with the IWPT sensor.

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Wireless Transmitter Sensata Cynergy3

The IWCTT Wireless Transmitter is a low-cost alternative to traditional wiring. It can be readily connected to any of the IWR receivers, making it a "plug and play" solution for your present measurement application.

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Wireless to USB Gateway, Sensata Cynergy3

The IWR-USB Gateway connects wireless sensors to any computer that has a USB port. All of the sensors in the wireless network can be monitored and logged using a regular PC using a free software programme.

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IoT Gateway, Sensata Cynergy3

Virtually any sensor may be monitored from anywhere with a cellular connection thanks to the IoT Gateway. Features: available real-time monitoring of remote assets via the internet, includes 2G/3G/4G modem and digital communications ports for data acquisition, input types include Analog/digital I/O, IWT wireless sensors.

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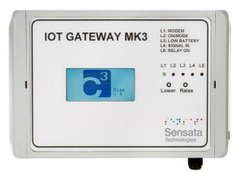

Channel Wireless Receiver, Sensata Cynergy3

The IWR-1 is a single-channel receiver that works in conjunction with the IWPT and IWTT wireless pressure and temperature transmitters to create a cost-effective alternative to standard wired transducers.

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2. SIGNALLING
3. HMI PANEL INTERFACE
4. MOTOR CONTROL & DRIVES
5. PLC & LOGIC CONTROLLERS
6. POWER SUPPLIES
7. RELAYS
8. DIN RAIL TERMINAL BLOCKS
9. HMI - PANEL INDICATORS & SWITCHES
10. EMERGANCY STOPS & SWITCHES
11. CIRCUIT BREAKERS

Phoenix Contact - Complete Cabinet Confidence

Phoenix Contact

The requirement to place more technology within a single cabinet brings its own challenges accommodating power, signal conditioning, connectivity, and safety systems.

Phoenix Contact - Complete Cabinet Confidence

The industrial manufacturing market has experienced unprecedented change over the past two decades. Industrial performance improvements led by transformational initiatives such as Industry 4.0 are responsible for the internet of things (IoT) implementations across the factoryfloor.Thedeployment of leading-edge industrial control, monitoring, and analysis systems is now commonplace. This increase in technology is set against the backdrop of increasing pressure on space utilisation, with the available floor space for essential control cabinets at a premium. The requirement to place more technology within a single cabinet brings its own challenges accommodating power, signal conditioning, connectivity, and safety systems. This article highlights the structured and streamlined approach Phoenix Contact brings to control cabinets, ensuring customers can confidently implement systems.

Industrial transformation

As technologies advance, so does the opportunity to enable applications and use cases previously impossible. Timing plays an essential factor, and the timing was perfect when industrial performance improvement and transformation initiatives aligned with the nascent industrial internet of things (IIoT). Deploying technology to monitor, analyse, and adjust manufacturing processes in real-time leads to productivity and efficiency improvements. The performance of manufacturing assets, from complete chemical processes, individual production lines, and single electric motors, can be optimised to achieve higher throughput levels while reducing unplanned and costly downtime to a minimum. However, the industrial environment can present a challenge for many electronics, with static electricity, humidity, vibration, and wide variations of temperature, to mention just a few considerations.

Factory floor space at a premium

Typically, factory floor space is at a premium due to cost, and the norm is to limit each major production asset to just one control cabinet. In turn, this restricts the amount of equipment placed in each cabinet. Industrial automation machinery and system builders are acutely aware of these challenges and strive to achieve space-efficient cabinets while controlling the implementation costs. This requirement is paramount so that their customers can reap the commercial benefits of enhanced productivity.

However, placing a large amount of components within a confined space is not without several considerations. Packing DIN-rail mounted switchgear, power supplies, process controllers, and IIoT edge nodes may be possible, but it can create heat dissipation issues and restrict airflow. Electronics-based systems are prone to poor reliability as the ambient temperature rises. Also, access and clarity of wiring are crucial for ease of maintenance and unit replacement. Faulting and attempting to follow cables within a densely packed and operational control cabinet also creates safety issues for maintenance staff. Most control cabinets built today

need to integrate every aspect of the controlled process, from power supplies, inputs from edge sensors, process controllers, and network connectivity to cloud services. A more structured approach to laying out components and cable terminations within a confined control cabinet can make it significantly easier for servicing and fault finding.

Control cabinet selection

To satisfy the requirements of industrial system builders, Phoenix Contact has developed the COMPLETE line of control cabinet solutions, including all the documentation and diagrams necessary for the reliable implementation, and running of an application.

Power reliability

Perhaps one of the most crucial aspects of a control cabinet is power. All the integrated systems and external equipment rely on a reliable power source. Protection from line surges, high voltage transients, overvoltage, and overcurrent conditions is paramount, as is the need to provide redundancy and alternative power sources such as battery backup. Figure 1 highlights the complexity of provisioning power for an industrial application.

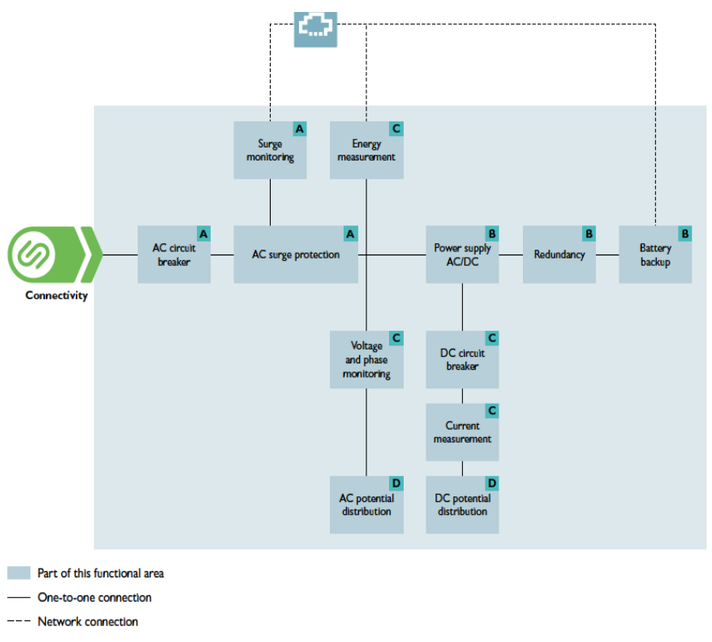


Figure 1 - Power delivery and protection considerations for provisioning reliable power in a control cabinet (source Phoenix Contact)

There are four aspects of power to consider: protection, conversion, monitoring, and distribution. The COMPLETE range accommodates each with a range of modules, measurement equipment (such as energy meter or programmable logic controller), and electrical connection methods. Protection includes preventing harmful transients from interrupting equipment operation and potentially causing permanent damage to electrically sensitive components.

Power conversion covers AC/DC and DC/DC converters to supply the enclosed systems and provide redundancy of supply either through line power or battery uninterruptable power systems. Constantly monitoring the power supplies helps achieve the organisation's energy efficiency goals and indicates signs of impending machine failure or erratic behaviour.

Power distribution is often overlooked but is an equally important aspect of power reliability. Every wire in a cabinet has a purpose, so a purposeful, safe, and reliable connection is vital.

Connectivity

Figure 2 highlights the diversity of connectivity considerations inside a cabinet. Wired connections to production assets, host computer servers, sensors, and actuators must be connected in the panel building process. Power terminations and connections also need to be routed through to those items too. There will be a wide variety of different voltages and currents carried by a range of cable sizes. Some wires may be screened to preserve signal integrity and need terminating accordingly. Sensor cables may involve analogue or digital signals. To acquire digital signals, check Phoenix Contact I/O terminal module, designed to use within an inline station.

The COMPLETE range accommodates all popular types of connectivity, interface and touch panels, and unit mounting options.

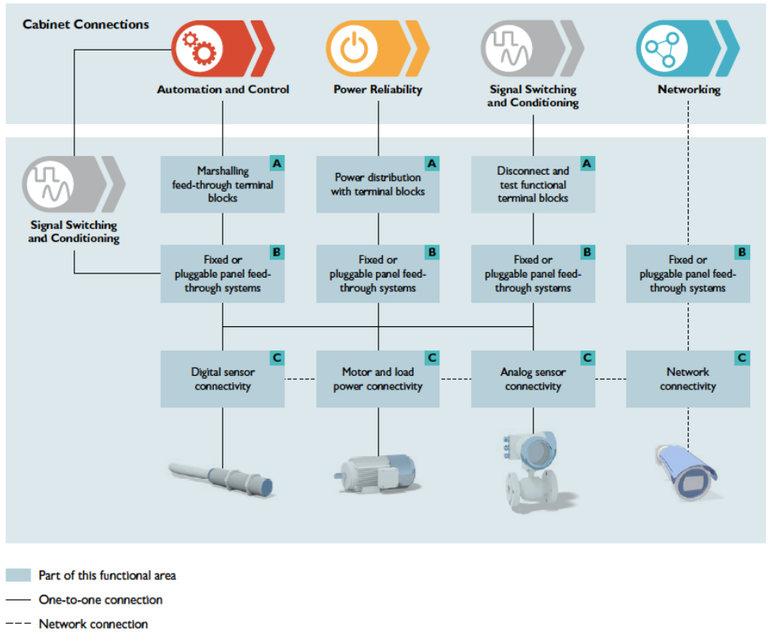


Figure 2 - The diversity of connectivity arrangements required in a typical control cabinet (source Phoenix Contact)

Signal switching and conditioning

The industrial domain is an electrically noisy environment, with many electrical transients created during motor start-up and switch-off and the operation of other production assets. Analogue sensor output signals are particularly vulnerable to these transients, so some form of signal conditioning occurs in addition to screening cables and implementing electromagnetic interference (EMI) preventative measures.

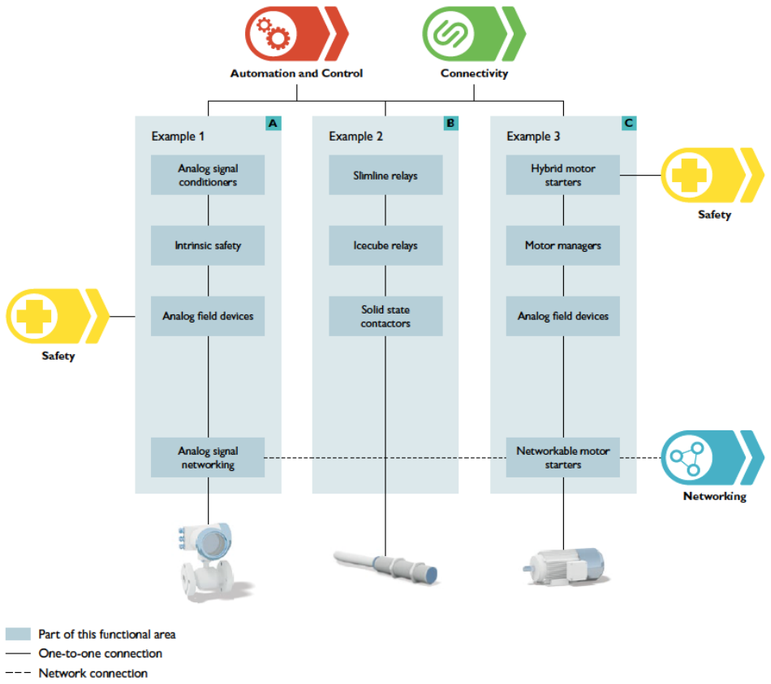


Figure 3 - Signal switching and conditioning involves many different signals, with currents ranging from milliamps up to hundreds of Amps (source Phoenix Contact)

Phoenix Contact offers a range of analogue and digital signal conditioning modules to improve the integrity and isolation of sensor outputs - see Figure 3.

Safety

All control systems and production assets fall within the scope of internationally recognised functional safety regulations such as IEC 61508, ISO 13849, and ISO 62061. These standards stipulate the required safety behaviour of equipment to reduce the risk of injury and harm to any operator or maintenance staff. A safety integrity level (SIL) indicates the probability of equipment failure and the potential consequence and severity of an injury resulting. The COMPLETE series includes compliant relays, switchgear, motor drives, and other protection devices.

Cabinet builder productivity

To aid the design and layout of the COMPLETE range of control cabinets, Phoenix Contact offers a comprehensive range of tools, resources, and accessories - see Figure 5.

Figure 4 showcases some of the Phoenix Contact COMPLETE range of DIN-rail mounted protection and safety devices.

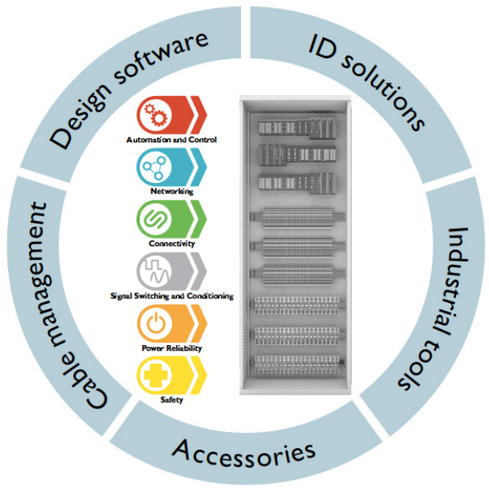


Figure 5 - Achieving high levels of cabinet design and implementation productivity with the Phoenix Contact COMPLETE range of solutions (source Phoenix Contact)

The Phoenix Contact rail assembly and marking design software suite is free and eases the selection and placement of the DIN-rail mounted units and validates it for the correct layout. It also provides the ability to print out labelling information. ID solutions complete the build process, with a variety of desktop and portable printers capable of printing on a range of materials.

Automation and control

To automate and control systems, Phoenix Contact has developed a range of programmable controllers, remote I/Os and gateways, and industrial PC and human-machine interfaces (HMIs). Examples of three are illustrated in Figure 6.

In Figure 6, example 1 showcases a PLC connected to a gateway and human-machine interface (HMI). The HMI is incorporated to visualise the operation of a valve, and the gateway offers network connectivity to legacy devices.

Phoenix Contact offers a scalable range of programmable logic controllers (PLCs), from simple, single-function control to those that support real-time SCADA applications. PLCnext logic controllers provide infinite automation by providing solutions for

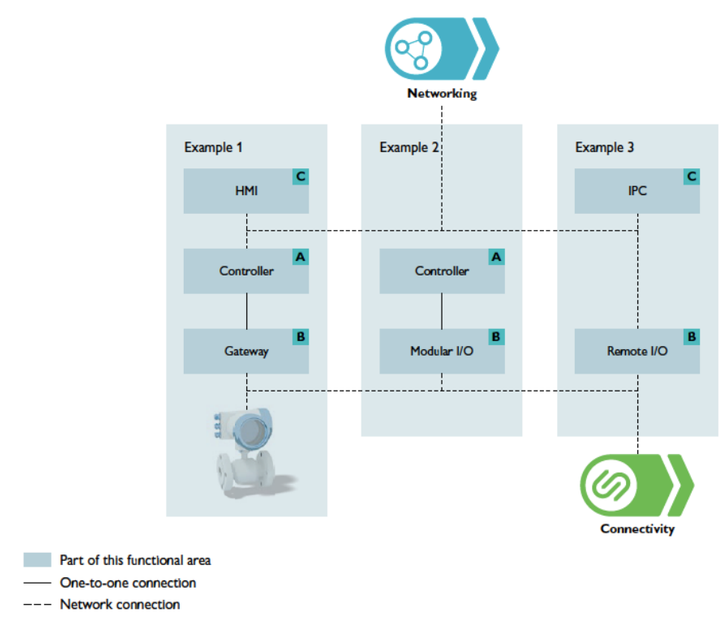


Figure 6 - Examples of three automation and control solutions available from Phoenix Contact (source Phoenix Contact)

Phoenix Contact - Complete Cabinet Confidence

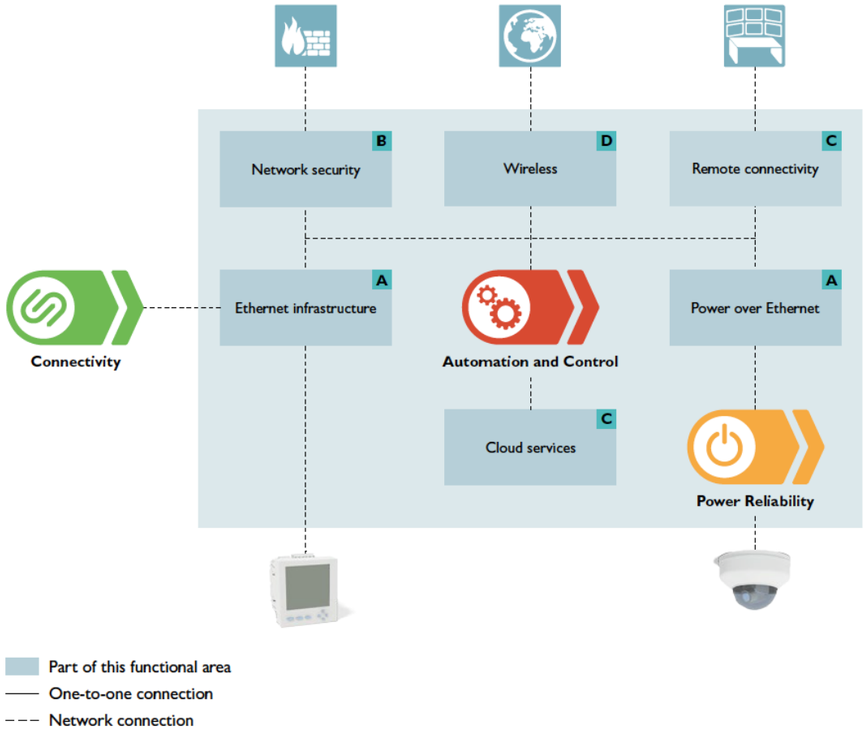


Figure 7 - The Phoenix Contact COMPLETE range of network solutions (source Phoenix Contact)

any IoT application. Take use of the PLCnext modular engineering software, PLCnext store, cloud integration, and PLCnext community sharing platform. PLCnext enables intelligent automation in the control cabinet, in the field, and in smart industrial or building infrastructure.

Networking and security

Any IIoT deployment relies on network connectivity, whether wired or wireless. Building any infrastructure based on an internet-connected network exposes it to a host of cybersecurity risks, vulnerabilities, and the potential for exploitation. Implementing and managing a resilient network mitigates the risk of compromise by adversaries. Phoenix Contact networking and security solutions - see Figure 7 - provide scalable, reliable, and robust connectivity and protection whatever communication mediums you use.

Build your cabinet with confidence

Distrelec is a trusted distribution partner for Phoenix Contact products. You can find more information on the COMPLETE range of cabinets, solutions, and devices on Distrelec page.

Increasing workforce productivity through mobile technology deployment

Discover showcases mobile barcode scanners (readers) and industrial-grade tablets specifically designed for industrial applications.
Zebra, Honeywell, Datalogic

The industrial domain has experienced a significant transformation over the last couple of decades. Industrial transformational initiatives, such as Industry 4.0, are not the only reasons technology is increasingly deployed. As products come off manufacturing and assembly lines, they enter the world of logistics, packaging, and supply chain. Barcodes are now commonly employed to identify parts during the manufacturing and assembly process: technology assists product identification, data capture, and workflow processes. Also, keeping industrial production assets running depends on maintenance techniques such as condition-based monitoring and predictive maintenance. For field-based engineers, ease of access to plant schematics, parts lists, and service procedures helps keep downtime to a minimum and productivity high.

Mobile technology is essential for achieving high levels of productivity

The fast pace of many businesses today, whether in manufacturing or supply chain and logistics, rely heavily on automation. Production lines and industrial processes are optimised to operate with high levels of overall operational effectiveness, a key measure of manufacturing efficiency. However, the efficiency of identifying and moving assembled products and components from production into the supply chain is equally crucial. Some supply chains, such as food supermarkets, involve multiple locations, from the supplier to warehouses and regional distribution centres to end up in a local store.

Barcodes have become the defacto product identification method, either as a self-adhesive label or printed directly onto the item. Automatic identification and data capture (ADC) has become an established method of selecting, identifying, and tracking an object, large or small, through any form of the industrial or retail process.

Many automated manufacturing processes use machinery mounted ADC barcode scanners to ingest information into a computer system. However, not all tasks are automated; the need for human interaction, selecting and moving parts through the supply chain is equally important.

Examples include:

- Forklift operators selecting products for a shipping consignment.
- Workers on an automotive production line.
- Internet retail order pickers.

These individuals require handheld barcode scanners since they are constantly on the move. Corded barcode scanners are available, but they pose a safety risk and are somewhat restricting if shared, so wirelessly connected scanners offer the most mobility.

Focus on mobile automatic identification and data capture devices

We are probably all familiar with encountering barcodes in our everyday lives. They appear on our groceries, our internet-shopping deliveries, and consumer appliances. You may have noticed two distinct barcode types: 1D and 2D.

Single dimension (1D) barcodes comprise a linear set of vertical lines with varying widths spaced with gaps between them.

Two-dimensional (2D) barcodes are more sophisticated and are typically either square or rectangular. They provide a means of representing more data in a given area than a 1D barcode. Because the information density is greater than a 1D barcode, and the encoding used is much more refined, the resolution and quality of the scanner are significantly more critical.

Multiple 1D and 2D barcode standards are available, each of which defines the usable character set. There are four-character sets in widespread use across the standards: numeric (numbers 0 - 9 only), alpha-numeric (0-9 and A-Z), GS1 AI 82 (adds special characters to alpha-numeric), and full ASCII (any ASCII character with a value 0 - 127).

Numeric 1D barcode examples include EAN12, UPC-A, and Code-11. Full ASCII 2D codes include Aztec, QR and MaxiCode.

When selecting a barcode scanner for your application, these are the key considerations to check when reviewing the datasheet.

Barcode standards supported:
What are the barcode standards you need to support? Some readers only scan 1D barcodes, and over its lifetime, you may consider migrating to using a 2D format.

Durability:
Like any handheld device, there is always a risk of accidentally dropping or falling during use. The datasheet should indicate the scanner's survival ability of drops and tumbles onto a concrete surface multiple times. Also, what are the environmental conditions where the scanner will be

Increasing workforce productivity through mobile technology deployment

used? Is ingress protection from dust or moisture required?

Scanning performance:
The ability of the scanner to successfully decode 1D and 2D barcodes from different distances and angles will vary. An operator sitting in a forklift truck may not be able to touch the scanned item, for example. Typical maximum scanning distances for a 2D code are 200 mm.

Radio standards:
Commercially available wireless barcode scanners employ either an open wireless standard such as Wi-Fi or a vendor-proprietary method. Check if it supports the wireless protocol you intend to use.

Battery life:
Most handheld devices are expected to work throughout the working day. Will the scanner's battery last for a shift without recharging? Will it be necessary to install charging points at operator workstations?

Accessing information on the go

Another aspect of workforce mobility involves access to critical information. For example, plant maintenance staff require access to work orders, asset diagrams, parts lists, and service manuals to perform their job. Continually returning to a workshop to access printed documentation reduces productivity, so tablet computers offer a convenient method of accessing relevant enterprise systems and applications.

When considering the use of an industrial tablet computer, here are some of the key selection criteria:

Operating system:
Check which operating systems the applications use. Microsoft Windows, Linux, and Android are popular operating systems.

Touchscreen type and size:
The screen size dictates the tablet's physical size. Smaller tablets are far more convenient to carry, but some applications stipulate a minimum screen size. Also, maintenance diagrams may become difficult to read on a small screen. Low-cost tablets may use a resistive touch screen approach; however, they are less reliable and more prone to moisture ingress than capacitive touch screens.

Mechanical durability:
As already highlighted for the barcode scanners, the need for mechanical resilience is essential for any handheld device. Since they tend to be physically larger than a scanner, tablet computers and their screens may be more prone to damage from tumbles. Check it is rugged enough for the environment the workforce will use it within.

Figure 1 - The Datalogic POWERSCAN PM9501 barcode scanner series (source Datalogic)DC/DC converters (source Traco Power)

Increasing workforce productivity through mobile technology deployment

Figure 2 - The Zebra LI3600-ER series of 1D ultra-rugged barcode scanners (source Zebra)

Battery life:
How long the computer will operate from a single charge is heavily influenced by how often the screen is used. The vendor's datasheet should estimate battery life and indicate the capacity, in mAh, of the unit's battery. Removable and 'hot-swappable' batteries are worthwhile options if available.

Additional features:
Some industrial tablet computers may feature other capabilities, such as an integrated barcode scanner and various docking stations or holsters.

Barcode scanners and industrial tablet computer showcase

Barcode scanners
The Datalogic Powerscan PM9501 series - see Figure 1 - can read a wide variety of 1D and 2D barcodes, regardless of orientation, up to 1 m depending on the code's type and resolution. Weighing approximately 450g and ergonomically designed to be comfortable in use, it features an intuitive aiming system and a soft pulsed white scanning illumination light.

The PM9501 is available in various configurations with two display options and either four or sixteen configurable keys, permitting two-way interaction with the host application.

Figure 3 - The Honeywell Xenon 1950g 1D and 2D corded barcode scanner (source Honeywell) DC/DC converters (source Traco Power)

Increasing workforce productivity through mobile technology deployment

Wireless communication uses Datalogic's STAR Cordless system that permits point-to-point or multi-point configuration in the ISM 433 or 910 MHz frequency spectrum. In a multi-point star deployment, up to 16 scanners can access a single wired network-connected radio receiver. The open-air operating range is 50 m for high-speed communication at 433 MHz and 170 m for 910 MHz.

A docking cradle provides charging and wired network communication using Industrial Ethernet or Modbus.

The environmental specifications of the PM9501 include an IP65 ingress protection rating and the ability to survive 50 drops from 2.0 m height onto a concrete surface.

The Zebra LI3600-ER is an example of an ultra-rugged 1D barcode reader - see Figure 2.

The Zebra LI3600 is available in both corded and cordless versions. The cordless version uses Bluetooth communication to communicate with the host docking cradle. Supported network interfaces include Ethernet IP, Industrial Ethernet, and TCP/IP.

It can survive multiple 3 m drops onto concrete and up to 7,500 tumbles from 1 m. Reader decode capabilities include ten 1D barcode formats, and the decode range is up to 17 m for the Code 39 100 mil standard. Operation permits up to 100,000 scans from on a full charge of the 3100 mAh Li-ion rechargeable battery.

Another fully corded and extremely durable scanner is the Xenon Extreme Performance (XP) 1950g from Honeywell - see Figure 3. The scanner is purpose-designed for retail applications, capable of reading and decoding 1D and 2D barcodes.

Rugged industrial tablet computers

Figure 4 illustrates the Honeywell RT10W rugged tablet. It features an integrated 1D/2D barcode scanner, a 10.1-inch high resolution 1920 x 1200 dpi

With its bright, high-resolution screen, perfect balance of ruggedness and lightweight design, and integrated barcode scanning, the RT10W improves worker productivity while maintaining a low total cost of ownership.

Figure 4 - The Honeywell RT10W rugged industrial tablet with integrated 1D/2D barcode reader (source Honeywell)

Increasing workforce productivity through mobile technology deployment

Figure 5 - Zebra ET51/ET56 Microsoft Windows-based tablets (source Zebra)

screen, and 128 GB storage. The tablet runs the Microsoft Windows 10 IoT 64-bit Enterprise operating system. Wireless connectivity options include Wi-Fi, 4G LTE cellular, and Bluetooth 5.0.

Another rugged tablet is the Zebra ET51/ET56 Microsoft Windows-based tablets - see Figure 5. Available in both 8.4-inch (570 g) and 10.1-inch (765 g) capacitive touch screen versions, it incorporates Wi-Fi cellular and Bluetooth wireless communications. A GNSS receiver supports GPS and Galileo constellations with the option of using an assisted GPS capability. Removable and hot-swappable battery options are also available.

Increasing workforce productivity through mobile technology deployment

With their ability to offer mobile access to critical information and data collection, handheld portable and rugged industrial tablet computers and barcode scanners help improve workforce productivity. This short article has highlighted just some of the benefits mobile technology brings to a workforce constantly on the move.

Analyze networks with Discovery Applications

NetAlly

The EtherScope nXG and LinKrunner 10G Discovery application creates an inventory of the devices on your networks along with their attributes: device types, names, addresses, interfaces, VLANs, resources, and other connected or associated devices.

The app allows you to identify and analyze network devices and acts as a jumping off point for further analysis using other apps, such as Wi-Fi, Path Analysis and connection tests. Devices are discovered in the local broadcast domains where the EtherScope / LR10G is physically connected, as well as other configured subnets.

This Discovery test will bring you a Topology map that will be saved and accessible via or free Cloud Service LinkLive. you can use the new feature Discovery-Diff that will show you the topology map of your network comparing two Discovery over time and will indicate what is missing and what as been added to it so that you can keep track and be aware of any alarm.

For the machinery park that uses both wireless and wired connection in your network the Etherscope nXG200 Discovery App and Wireless troubleshooting APP's will be the perfect tool to use since it also as a Wi-Fi

Analyze networks with Discovery Applications

since it also as a Wi-Fi radio 802.11ac that will provide you all the wifi technology App's to troubleshoot any issues, while the LR10G is limited to wired Discovery.

Maintaining your machinery park will become an easy task for any technician or engineer responsible for the site. Both the Etherscope nXG 200 and the LinKrunner 10G have a Packet capture App that recorded network traffic in the form of packets as data streams back and forth over Wi-Fi or wired connections.

Packet captures can help you analyse network problems, debug client/server communications, track applications and content, ensure that users are adhering to administration policies, and verify network security:

· Data Start: Time to receive the first frame of HTML from the web server
· Data Transfer: Time to receive the data from the target server
· Data Bytes: Total number of data bytes transferred. This does not include header bytes
· Rate (bps): The measured data transfer rate
Note: that these devices are not able to transfer data's (Network packets) over TCP from each other it is a traffic network traffic analysis on packets and Hops giving the health of your network by separating a chunks.
Note: that these devices are not able to transfer data's (Network packets) over TCP from each other it is a traffic network traffic analysis on packets and Hops giving the health of your network by separating a chunks.

EtherScope® nXG Portable Network Expert

Shop now

LinkRunner 10G Advanced Ethernet Tester

Shop now

Rohde & Schwarz Interference Hunting in Smart Factories

Rohde & Schwarz

In today's networks, unwanted RF interferer signal transmitters are common. A few decibels of signal to noise ratio reduction at the receiver significantly influence network capacity. Do you know how to determine the location of interferers and keep the business agility?

Rohde & Schwarz Interference Hunting in Smart Factories

In the era of advanced technology, smart factories rely on wireless solutions. The Industrial Internet of Things (IIoT) enables highly reliable, secure and low-latency communications between the manufacturing devices with automated and increased productivity. However, any source of RF interference can cause the production process disruption or the output delay.

In today's networks, unwanted RF interferer signal transmitters are common. A few decibels of signal to noise ratio reduction at the receiver significantly influence network capacity. How to determine the location of interferers and keep the business agility? Read on to find out.

RF Interferer signals

The RF interferer signals can appear at any time and be located anywhere on the manufacturing floor. Unwanted signals can come unintentionally or on purpose, modulated or unmodulated, causing RF interference that impedes wireless communications. Critical LMR or LTE communications between first responders can begin that, and navigational devices that employ GPS or other satellite-based location services.

Figure 1 - Rohde & Schwarz Spectrum Rider FPH handheld spectrum analyzer.

To eliminate interferences, it is important to use the right equipment, such as spectrum analyzers, scanners, and receivers. Scanners can detect undesirable transmitters automatically, and spectrum analyzers or receivers, combined with a direction-finding antenna and sophisticated software, can automate locating interference.

Rohde & Schwarz Interference Analysis Solutions

Because The RF signals cannot be seen to the naked eye, Rohde & Schwarz has the solution for it - Rugged portable spectrum analyzers. These devices can be used anywhere in the factory and display all RF signals. Users can use recording features to do postprocessing and examine occurrence patterns to figure out where the emitter is coming from.

The Rohde & Schwarz Spectrum Rider FPH is a handheld spectrum analyzer that can measure frequencies from 5 kHz to 31 GHz. This rider can run for up to eight hours on a single charge, depending on the model. Its compact

size and ergonomic design make it simple to transport and utilise. This handheld spectrum analyser weighs only 2.5 kg, independent of the frequency range, and meets the IP class 54 standard.

The analyzer can record the spectrogram for up to 999 hours with the FPH-K15 interference analysis option from Rohde & Schwarz; the duration is dependent on the recording interval setting. Postprocessing can be done on the analyzer with the free to download InstrumentView software from Rohde & Schwarz or without it.

The signal intensity of the emitter can be displayed on an uploaded production floorplan with the help of FPH-K16 signal strength mapping. The signal strength mapping option provides a visual depiction of the

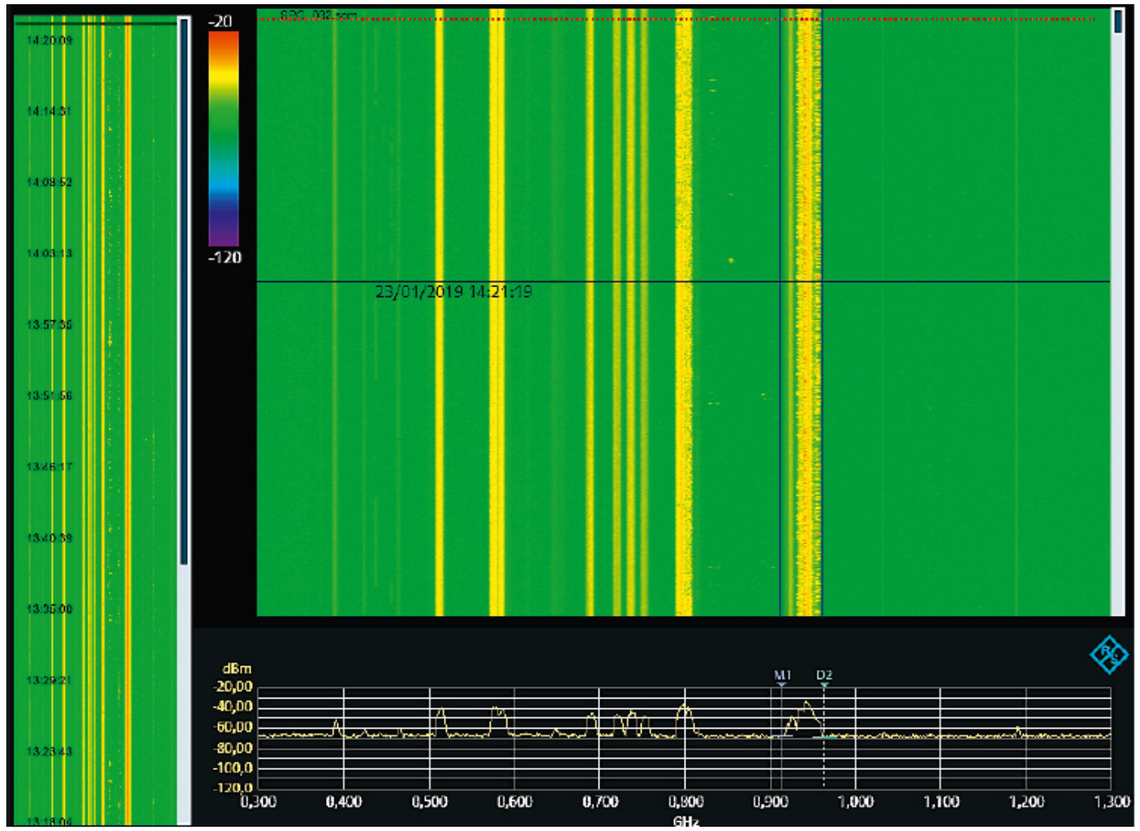


Figure 2 - InstrumentView software from Rohde & Schwarz can help postprocess interference activity.

Rohde & Schwarz Interference Hunting in Smart Factories

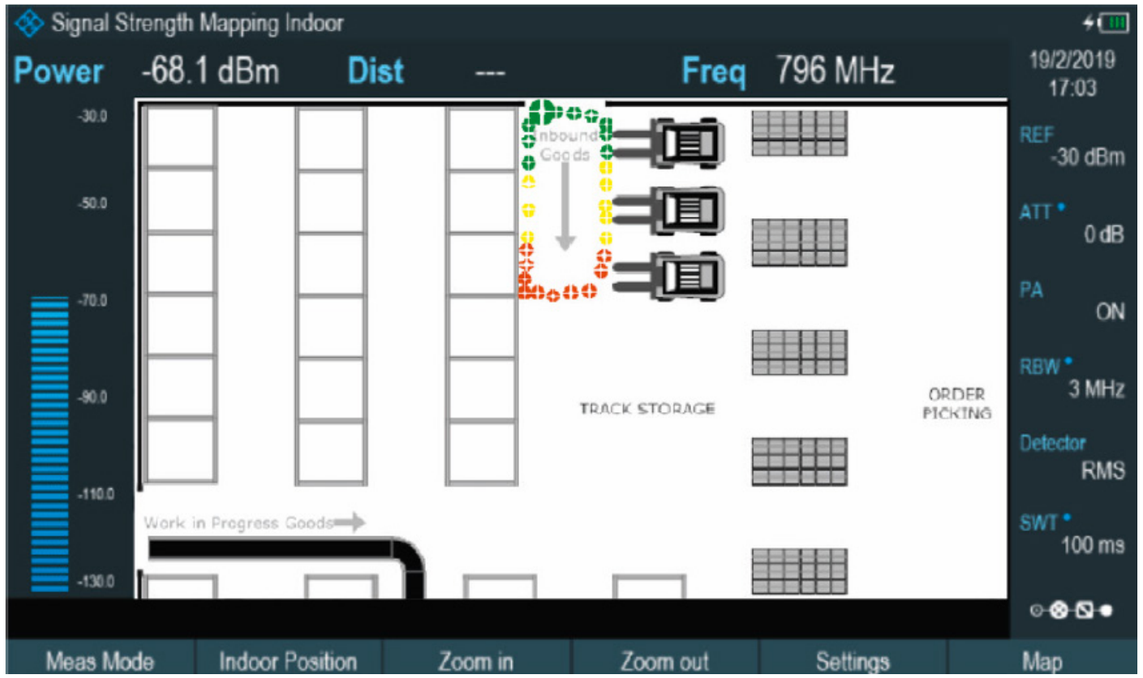


Figure 3 - Signal strength measurement on an indoor map with the FPH-K16 from Rohde & Schwarz indicates that the interferer may be close to the entry. The interfering factor in this scenario is a malfunctioning digital advertising board near the entryway.

emitter's signal strength in a certain area as well as indicates where the emitter is (see Figure 3).

Eliminating all kinds of interference

Eliminating the possible risk of unwanted interferences requires the right devices. Network operators, regulators, and service providers can quickly and accurately identify and locate any source of RF interference in mobile networks, thanks to the Spectrum Rider FPH from Rohde & Schwarz. Interference hunting in factories can be very simple and efficient. Analysis devices give you a guarantee that your smart factory will run smoothly.

Rohde & Schwarz

Handheld Spectrum Analyser, 4GHz, 50Ohm, Rohde & Schwarz

This handheld spectrum analyzer can measure frequencies from 5 kHz to 31 GHz. It is made to work in both the field and the lab, indoor and outdoor settings. Thanks to its compact size and an ergonomic design, it is simple to carry. Features: 2.5 kg, independent of frequency range, meets the IP class 54 standard.

Shop now

Signal Strength Mapping, Rohde & Schwarz

The FPH-K16 signal strength mapping option from Rohde & Schwarz is excellent for evaluating and locating confusing signals or interferers. The signal strength mapping shows a graphical representation of the signal power level on an interior or outdoor map.

Shop now

Spectrum Analyser, 3GHz, 50Ohm, Rohde & Schwarz

This spectrum analysers series is as important in an RF lab as an oscilloscope or multimeter. It is a single measuring device that may be used for a range of purposes. It allows for spectrum analysis and very accurate power measurement using power sensors and for the analysis of both analogue and digitally modulated signals.

Shop now

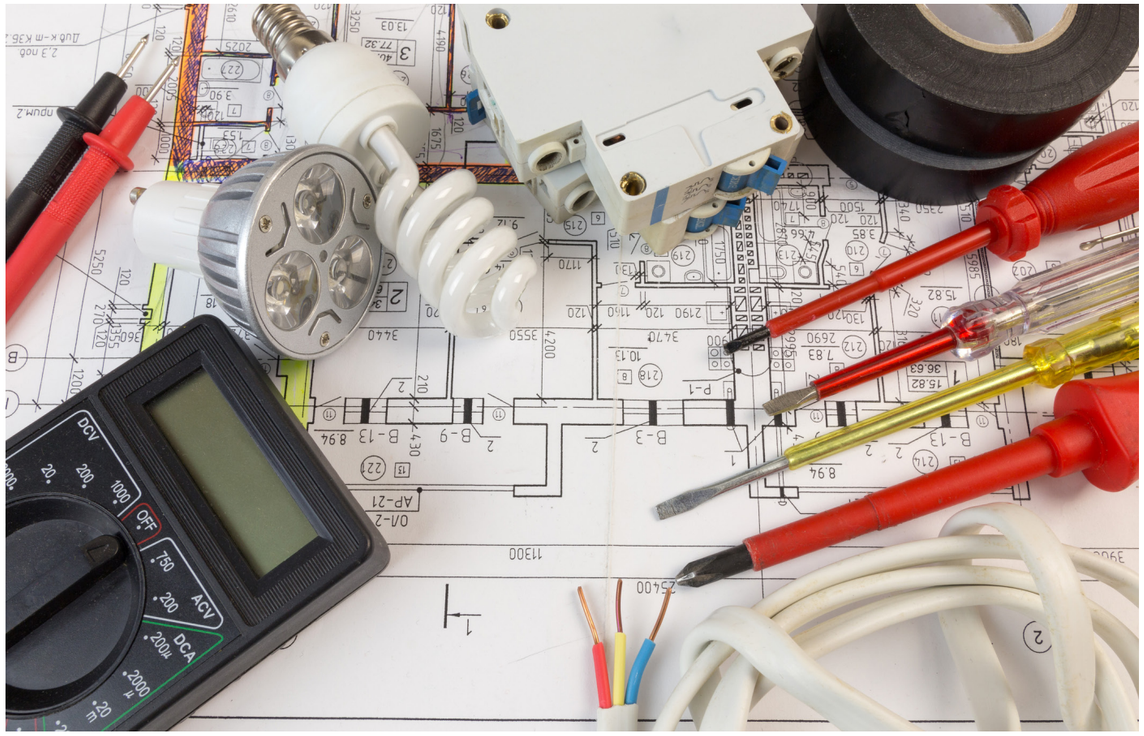
HIGH VALUE 3-in-1 Vector Network Analyser Bundle, 6GHz, 50Ohm, Rohde & Schwarz

This vector signal generator is suited for a wide range of applications thanks to its ultra-high output power, fully calibrated wideband signal production, and simple touchscreen operation. Features: frequency range from 8 kHz to 3 GHz or 6 GHz, signal generation for all major digital communications standards: 5G NR, LTE and WLAN.

Shop now

RND electrical and electronic components used in industrial applications

RND



Sourcing electronic components consumes a lot of an engineer's time. There are typically several vital factors that influence the final choice. Subtle differences in a product's specification, performance and price can make selecting components a challenging task. This is why focusing on what components can offer overall across its entire lifespan is critical. For example, components offering higher than required performance but also at a higher price may not be the best overall offering. Components that are fit for purpose at a much more economical price makes much more sense.

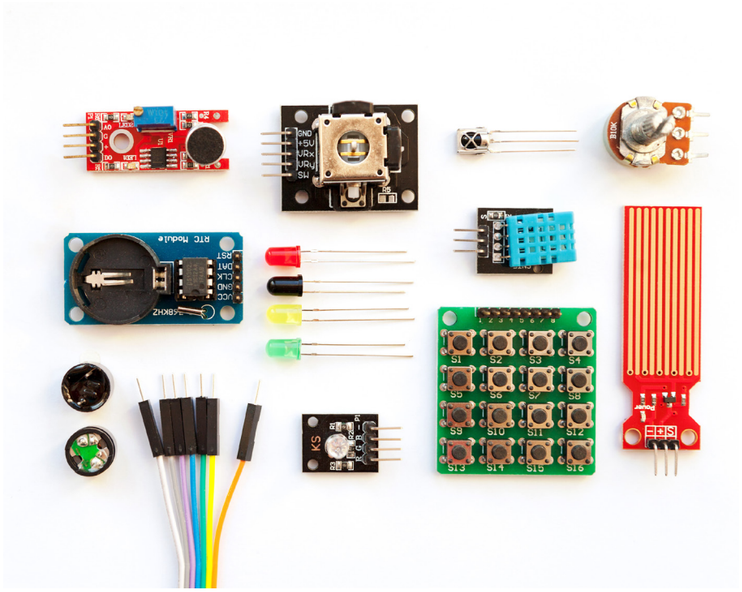
This is where a brand like RND comes into its own, providing an extensive product portfolio for maintenance technicians and engineers. RND offers a wide range of high-quality electronic products and components at reasonable prices.

RND electrical and electronic components used in industrial applications

Electronic component sourcing

Look inside any piece of modern electrical equipment, and you'll find a variety of electronic components. If you peer at the printed circuit boards, you may see a number of complex and sophisticated processing integrated circuits, known as 'ICs' or 'chips'. These 'chips', such as microcontrollers (MCUs), field-programmable gate arrays (FPGAs), and graphics processing units (GPUs), provide the machine's digital processing capabilities. However, the vast number of components you'll see are passive components, such as resistors, capacitors, and inductors. But let's not also forget the crucial hardware items, including connectors, ferrules, enclosures, and LED panel indicators.

Whether specialised or commodity,everycomponent must be accounted for on a bill of materials (BOM) and needs sourcing. Together, everything on the BOM makes the product function, but equally as important is the product's reliability and longevity of operation.



To comply with regional and international safety standards, the internal workings of the equipment must also conform to stringent standards and requirements. In short, a high degree of trust is needed in components to deliver a high degree of reliability and that they meet all relevant technical and safety standards.

Industrial components selecting guidelines

The easiest way to choose the right electronic or electrical equipment is to use already proven devices. Being familiar with the designs will save you time and effort. However, you can miss out on the advantage of new parts with that in mind. Some newer devices offer much better efficiency, ease of integration and often a more affordable price.

Choosing new parts that haven't previously been sourced might be problematic. This is why validating products, to ensure that are fit for purpose, is really important before making any selection.

Manufacturers

Devices keep changing, and it is good to keep up to date with the latest technologies and

RND electrical and electronic components used in industrial applications

specifications. Manufacturers might enhance and even change some component speciation's over time without prior notice. This makes selecting manufacturers and brands that provide datasheets, reference designs and application notes very important.

Quality

Out of the thousands of products available from plenty of manufacturers, suppliers, and distributors, it is difficult to find the right equipment that will be affordable and high-quality. RND products offer genuinely great value to engineers wishing to buy competitively priced, high-quality components that offer efficiency and longevity of performance across the entire lifecycle.

Electrical parameters

Electrical parameters, specifications and section criteria will usually differ according to the product being sourced. For example, for a DC-DC converter IC, you have to consider: voltage range, output voltage accuracy, over and under voltage, thermal shutdown, power rating, inbuilt protections, light load efficiency, thermal management, etc.

PCB package

A PCB package aims to describe numerous parameters of actual electronic components graphically. It shows the component size, length and width, in-line, patch, pad size, pin length and breadth, pin spacing, etc. These parameters may be referred to when constructing a PCB diagram. It is important to know the PCB footprint, especially if you order something to fit in on the board and is too big or too small.

Costs

Sourcing components that are attractively priced, particularly those that are required in large numbers, ensure the manufacturer maintains profit margins and their end-products are commercially viable. Choosing RND products from Distrelec guarantees access to low-cost components without compromising on quality.

RND product portfolio

The RND brand, available exclusively from Distrelec, offers electrical, electronic, and maintenance engineers an affordable and high-quality range of components they can trust. The portfolio of over 5,000 RND products provides a reasonably priced alternative to big brand products, manufactured to high-quality standards and compliant with relevant industry technical, quality and safety specifications such as CE, RoHS, and REACH.

The RND portfolio includes:

- **Power products:** Batteries, power conversion devices such as DC/AC inverters, and external power supplies.
- **Lab equipment:** Oscilloscopes, multimeters, bench tools such as soldering stations, and benchtop power supplies.
- **Cabling:** Single core, multicore, mains/line cables, AV, data networking, cable ties, cable glands, and heat shrink tubing.
- **Connectors:** Power connectors, terminal blocks, PCB connectors, network/telecom connectors, and Audio Visual connectors.

RND electrical and electronic components used in industrial applications

- **Components:** Electronic and electro-mechanical components including semiconductors, passives, switches, relays, optoelectronics, modules, circuit protection, development boards and evaluation kits. Also supporting components and accessories, including enclosures, thermal management, and automation components.

RND Electrical and Electronic Components

In electrical and electronic projects, the most commonly used are resistors, capacitors, fuses, transistors, integrated circuits, relays, switches, motors, circuit breakers, and others. These components, categorised into two categories: active and passive components, are used to design many circuits.

This product showcase highlights just a few examples. But these are equally important items that are essential in any electrical or electronic applications. To find a complete listing of the entire range, go to the RND page.

Batteries

A battery is an electrical device that uses electrochemical discharge processes to transform chemical energy into electrical energy. The RND range of alkaline AA / LR6 batteries is suitable for a wide range of industrial and commercial applications. These popular 1.5 VDC batteries are available in packs of 4 or 48, and they conform to the EU's battery directive (2013/56/EU). Also,

Figure 1 - Pack of 48 pieces of Primary Batteries, Alkaline, AA, 1.5V, Ultra Power, RND Power

the packaging materials meet the EU 94/62/EC directive for packaging materials and waste. The quoted storage life is one year, and the expiry date is five years from manufacture.

Connectors

Connectors are necessary for most industrial systems to send signals from cables to other devices or portions of the machinery. The RND D-Sub connectors comprise a series of all the popular industry-standard pin configurations of 9, 15, 25, 37, or 50 pins, plugs and sockets. Mounting options include PCB through-hole solder (90 degrees bent pins or straight through), solder pins or cups, or crimped. Brass or copper alloy contacts with gold flashing options are available for some connector arrangements. Current ratings for each connector pin are configuration dependent and vary from 1 A to 5 A. Waterproof plug and socket D-sub connectors, rated to IP67, are available from stock.

Figure 2 - D-Sub Plug, Poles 9, Solder Cup / Solder Lug/ Straight, RND Connect

Heat shrink tubing

A popular method of safely isolating soldered wire connections, terminal lugs, and other exposed connections is using heat shrink tubing. The RND heat-

RND electrical and electronic components used in industrial applications

Figure 3 - Heat-Shrink Tubing 2:1, White, Polyolefin, 15m, RND Components

shrink tubing range includes adhesive lined medium wall tubing manufactured from polyolefin or ethylene-ethyl acetate. Providing excellent electrical dielectric strength, up to 20 kV, and mechanical performance, the tubing also gives environmental protection to enclosed cables. RoHS and REACH certificates are downloadable from the Distrelec website together with detailed product datasheets.

Bootlace ferrules

Using bootlace ferrules offers a simple yet highly reliable method of connecting cables into screw-type or spring-loaded connectors. The RND bootlace ferrule range of colour-coded ferrules is available to suit all the popular wire gauges from 4 AWG to 26 AWG with 12 colours. Contacts are tin-plated copper and designed for crimping. The series conforms to UL E502427 certification.

Cable ties

Along with electric and electronic applications, security plays a big role. A popular method of securing cables internally or externally is flexible, adjustable length cable ties. The RND cable tie range is polyamide-based, has UL 510248 certification, and conforms to UL 94V-2 flammability rating. The cable ties are available in various lengths, widths, colours, and tensile strengths. The range datasheet highlights all the cable tie options available. An RND cable tie tensioning tool is also available.

Figure 4 - Bootlace Ferrule 0.5mm² White 14mm Pack of 100 pieces, RND Connect

LED panel mount indicators

Engineers typically opt to use low-power, panel-mounted LEDs to indicate equipment operation visually. A LED generates light at a specific frequency when a current is applied. LEDs are utilised in various applications, including keyboards, hard disc drives, and TV remote controls. They're also handy as status indicators in computers and battery-operated electronics Transistors. The RND panel mount LED series comprises a range of available colours, wavelength, operating voltages, and luminosity values. Mounting hole sizes of 6.2 mm and 8 mm, and the LEDs are fitted with a current limiting resistor.

Figure 5 - Cable tie in size of 100 x 2.5mm, material: poly-amide 6.6, 78.45N, in black colour, RND Cable

Fuse

A fuse is a material or a piece of wire that protects components from being destroyed by too much current flowing through them. When an excessive amount of current is passed through a circuit, the wires become hot and damaged. As a result, the current comes to a halt. When a fuse melts owing to an overload of current, the fuse element absorbs some of the energy. The RND 5 x 20 Fuses have quick blow (F) IEC60127-2/2, nickel-plated end caps, and are UL approved, E492698.

Figure 6 - LED Indicator, Green, 8mm, 24V, Solder, RND Components

Choosing the right components for industrial settings

Electrical and electronic components play a crucial role in almost every area of the modern world. The most important aspect is to ensure safety first and foremost, with a key focus also on the components' efficiency and quality. Especially before bringing new components to the field or factory, it is vital to ensure that the product is suitable for the specific application and also offers great overall value.

Whether you are a maintenance engineer maintaining industrial machinery or you are designing new electrical products, you can put your trust in RND. RND maintains high levels of quality from the initial product research and development, during prototyping, right through to production. The brand offer engineers great value for money, fully compliant with relevant industry and technical standards, and outstanding stock availability.

FIgure 7 - Fuse 5 x 20mm, 2A, 250V, Quick Acting F, RND Components

RND

Primary Batteries, AA, Ultra Power, RND Power

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Standard D-Sub Connectors, RND Connect

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Heat-Shrink Tubing, RND

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Bootlace Ferrules, RND

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Nylon Cable Ties, UL Approved, RND

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Panel Mount LED Indictors, RND

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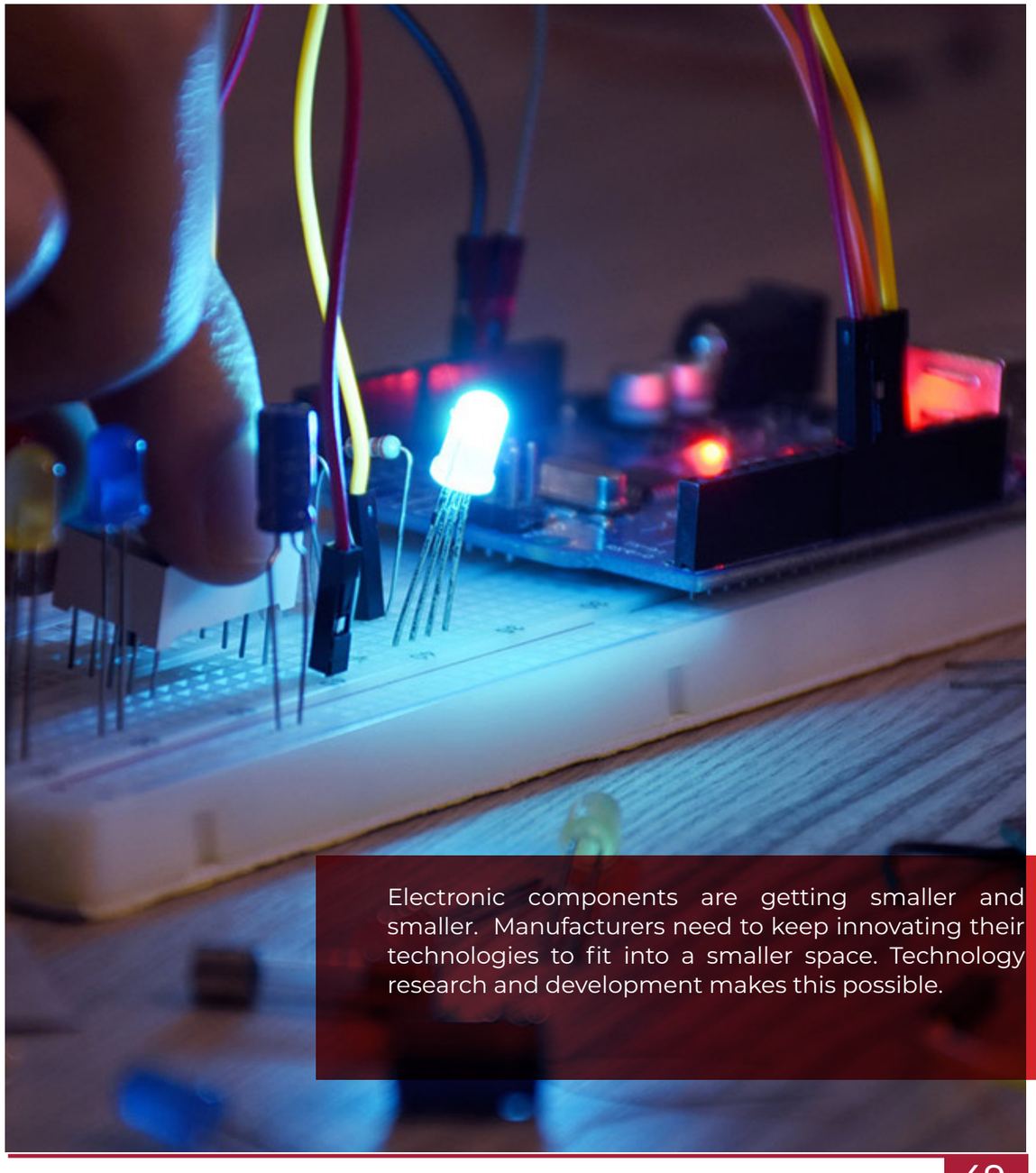
Component miniaturisation of electronic components and industrial sensors

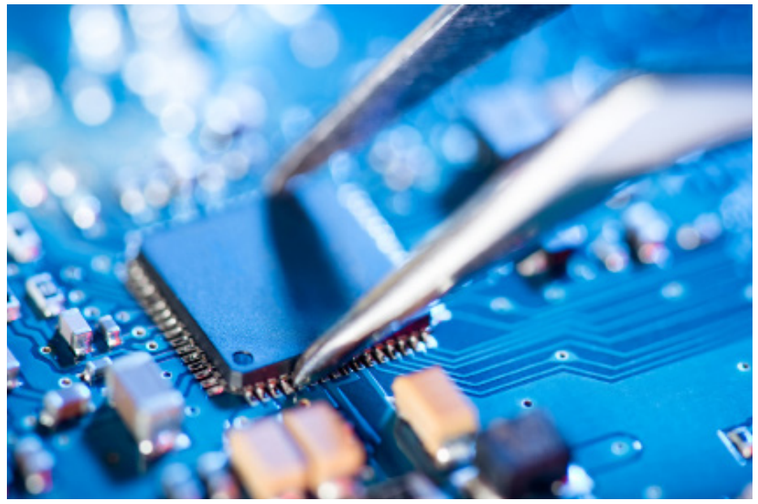
Baumer, Würth Elektronik, Kemet, Wachendorff, Yageo



Electronic components are getting smaller and smaller. Manufacturers need to keep innovating their technologies to fit into a smaller space. Technology research and development makes this possible.

Component miniaturisation of electronic components and industrial sensors

Electronic components are getting smaller and smaller. Several inter-related factors explain this trend. The pressure is on end-product manufacturers to make their products smaller yet increase their capabilities and functionality. To achieve that, component manufacturers need to keep innovating their technologies to fit into a smaller space. Technology research and development makes this possible; an excellent example is how semiconductors continue to pack in billions of transistors into an ever-decreasing footprint. But semiconductors are not the only electronic component that needs to get smaller. Today, most electronics-based end-products may only contain less than five semiconductors, even though their capabilities have hugely increased. However, supporting and equally essential components, such as passives (inductors, capacitors, and resistors), are required in the hundreds.



However, component miniaturisation requirements are not limited to just electronic components. Factory floor space is at a premium in the industrial domain, and the space available for each production asset, sensor and actuator are limited. Consequently, the next generation of each production asset needs to be smaller and provide more functionality.

This article focuses on how continued component miniaturisation is paramount in the industrial domain, whether an electronic component or an industrial sensor.

Component miniaturisation strives forward

Change is constant in the electronics industry. Since the birth of the transistor in the late 1940s, researchers embarked on an evolutionary journey that would focus on miniaturisation. A decade later, the first integrated circuit (IC) containing four transistors was developed by Robert Noyce at Fairchild Semiconductor. Fast forward to today, and you'll find tens of billions of transistors in leading-edge processors. The process of fabricating semiconductors in an increasingly smaller area has advanced significantly. However, the advancements in component design and manufacture have also benefitted the broader electronics industry.

The impact of technology advancements for electronic components

The first transistor prototype was a large item compared to today's devices. However, it was significantly smaller than the legacy technology of that era: thermionic valves. Not only was the transistor more diminutive, but its supply voltage arrangement was less complex than used on valves. Also, without the need for a heater element, the circuit ran cool. At an early stage, engineers could see the potential of what

Component miniaturisation of electronic components and industrial sensors

the integration of transistors into an IC could achieve. The journey to increase the capabilities of an IC while reducing the physical footprint had started. Gordon Moore, the co-founder of Intel, famously forecast his 'Moore's Law', that the 'number of transistors incorporated into an IC would double every two years'.

The research and development into semiconductor IC design and development continues to lead the electronics industry today. Making electronic components smaller challenges the automated production equipment manufacturers to accommodate smaller sizes. The physical dimensions now involved are staggering. For example, an advanced semiconductor process node size is currently 5 nanometre (nm). This dimension doesn't relate to the actual transistor size but is used by semiconductor manufacturers to indicate the transistor density. Many smartphones use ICs based on the 5 nm process, and the computation power of its 30 billion transistors enables the phone's operation and all our popular apps.

Transistors and semiconductor ICs are packaged according to standard surface mount (SMT) packaging specifications managed by the JEDEC Solid State Technology Association. The same is true for surface-mounted passive components such as capacitors, resistors, and inductors. As semiconductors shrink and their capabilities increase, the need for their supporting passive components to reduce in size is paramount. Take a look at any embedded system design today, and you'll spot just a couple of complex ICs. However, there will be many hundreds of passive components placed around the ICs that are fundamental to their operation.

An example transistor package format is SOT23-3 (Small Outline Transistor). Typically used for small signal general-purpose transistors, it has three terminals and measures 3 mm x 1.75 mm x 1.3 mm. Some ICs also use the SOT-23 package, the '-x' indicating the number of pins used. For example, a SOT23-6 denotes an IC with six pins.

Integrated circuits have a wide variety of different package configurations, some leaded, others not. Either way, they all are surface mounted. Some sensors, such as micro-electromechanical systems (MEMS), are constructed in popular semiconductor packages. Examples include:

- SSOP (Shrink Small Outline Package) - leaded - with a pin pitch of 0.635 mm
- TSSOP (Thin Shrink Small Outline Package) - leaded - this has a pin pitch of 0.65 mm
- QFN (Quad Flat Non-leaded) package - this is available in a variety of different electrode (pin) connections - from 14 to 100 and various pitch widths - 0.5

Figure 1: Example of Yageo SMD Resistor (source Yageo)

Figure 2: Example of WE-MAPI SMT Power Inductor (source Würth Elektronik)

mm - 1.65 mm

The majority of surface-mounted “chip” passive components use the EIA codes to denote component size. Popular examples sizes include:

- 0805, measuring 2.0 mm x 1.30 mm (0.08 inches x 0.05 inches)
- 0603 measuring 1.5 mm x 0.80 mm (0.06 inches x 0.03 inches)
- 0402 measuring 1.0 mm x 0.50 mm (0.04 inches x 0.02 inches)

Electronic component miniaturisation showcase

Yageo is a leading supplier of passive components. Examples include the RC_L series of thick film ‘chip’ resistors and SMT multilayer ceramic capacitors (MLCC). These series has a highly reliable electrode construction in a small form making it suitable for all general purpose applications where size is constantly reducing ie smart phones, laptops, televisions as well as more industrial settings PLCM controllers and automation equipment. A guide to the Yageo RC_L series, complete with all electrical and mechanical specifications, is available here.

Würth Elektronik supply SMT inductors such as the MAPI and MAIA series. MAPI power inductors offer high current capability and handles high transient current spikes. They are magnetically shielded, offering low acoustic noise, low leakage flux noise, and high rated current thanks to their magnetic iron alloy.

The WE-MAIA is one of the smallest metal alloy power inductors on the market. Its efficiency is remarkable, and the 4020HT series now comes

Figure 3: Example of Würth Elektronik’s Metal Alloy Power Inductors (source Würth Elektronik)

Component miniaturisation of electronic components and industrial sensors

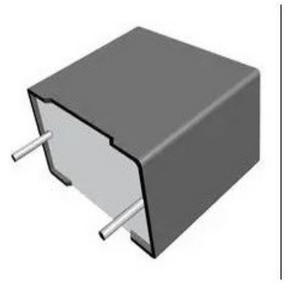


Figure 4: Example of Radial Capacitor from KEMET (source KEMET)

in new sizes and extended temperature versions with AEC-Q200 Grade 0 approval for operation temperatures ranging from -55 to +150 degrees Celsius. Discover more in the catalog of the series here.

For circuit prototyping purposes, the Würth Elektronik MAIA metal alloy power inductor design kit offers a convenient evaluation resource. It covers the full range of inductors in the series; a data sheet for the kit is available here.

KEMET offers a comprehensive range of capacitors, including surface-mount MLCCs, and larger, higher voltage axial and radial leaded devices. The EIA classifies these MLCCs as “temperature stable” and Class II materials. Class II capacitors are fixed ceramic dielectric capacitors that are suitable for bypass and decoupling applications as well as frequency discriminating circuits where capacitance Q and stability are not crucial.

Other series is the C4AU offering a high voltage, automotive-qualified capacitor suitable for use in harsh electrical environments, particularly for DC link applications. The C4AU Series is a metallized film capacitor made of polypropylene that has a high capacitance density and high contact reliability. The series is an excellent example of product innovation, where the techniques of metalised film capacitors have enabled product miniaturisation. An informative white paper about the C4AU development is available here.

The Distrelec website showcases the broad KEMET range of capacitors suitable for various applications.

Component miniaturisation

Figure 5: Example of Length Measuring System from Wachendorf (source Wachendorff)

Component miniaturisation of electronic components and industrial sensors

in the industrial domain

End-product manufacturers are keen to take advantage of the continual size reduction of electronic components. The industrial sector, in particular, has seen the degree of automation used increase significantly over the last decade. Industrial efficiency improvement initiatives, such as Industry 4.0 and the industrial internet of things (IIoT), are responsible for the increasing deployment of electronics-based sensors, control equipment, and AI machine learning systems. This increase in automation equipment is set against the backdrop of available factory space at a premium, driving demand for compact, energy-efficient, and leading-edge component technologies.

The drive to component miniaturisation is not limited to electronic components. Manufacturers of automation equipment and sub-assemblies have also been innovating. Advances in 3D printing, material technology research and a deeper understanding of finite element analysis in mechanical design contribute to weight, size, and cost reductions.

Industrial component miniaturisation showcase

Ultrasonic sensors are employed in various object detection tasks such as safety cages and products on a conveyor belt. An example of a compact ultrasonic sensor is the Baumer U300 series. It uses an ultrasonic emitter operating at 310 kHz to provide a detection range up to 1 m. The U300 series measures 12.9 mm x 32.2 mm x 23 mm and takes up considerably less space than the previous generation of detection sensors. Connection to the host controller is achieved using an 8-pin M12 round industrial connector and is IP67 rated. Baumer offers a comprehensive line-up of sensors designed specifically for industrial applications.

Another industrial sensor manufacturer is Wachendorff. A product example is the LMSCA32 ultra compact length measurement system. This system measures the length of materials, wood, metal, fabrics etc., during a manufacturing process using a 200 mm measurement wheel rotation.

An ultra-compact system with new spring-loaded arm maintains wheel contact with the measured material, and the rotary encoder sends out pulses as the wheel rotates. The resolution frequency of the pulses is configurable from 200 pulses per revolution (ppr) to 16,000 ppr.

The benefits of component miniaturisation

The ongoing trend of component miniaturisation enables designers and manufacturers to incorporate more advanced features into their end-products while also reducing their footprint. Whether designing an IIoT sensor or an industrial programmable logic controller, you can realise space savings within the product enclosure. Miniaturisation allows for the design of more stylish and space-efficient products. It also opens up the opportunity to increase the features and functionality of new products without increasing their dimensions.

Discover the key to Success in IIoT

Sebastian Werler
Product Manager Digital Business at FESTO

An interview with Sebastian Werler from FESTO

1. How is FESTO involved in the IIoT industry?

As a leading company in automation technology, Festo has its spot in many industries across the globe. Industry 4.0 and IIoT are not only buzzwords for Festo, but are filled with products and solutions. As an equipment manufacturer, a huge amount of Festo's range of hardware products acts as a data source for IIoT projects. With its ever increasing portfolio of IoT solutions, Festo is heavily involved in the IIoT industry: it starts with a broad portfolio of sensors and smart products that aggregate data on the lowest level. The offering is continued with IoT gateways (provided as hardware or software modules) that build a bridge between OT and IT world. This is especially useful in brown field scenarios where equipment usually lacks modern interfaces to acquire data.

The portfolio is completed with our AI based software solution Festo AX that e.g. predicts equipment failure or quality deviations and increases productivity.

2. What do you think are the key factors in driving this industry forward?

Openness is the key to success for Industry 4.0 in an increasingly heterogeneous vendor and solution landscape. Many different IoT platforms, the offerings of so-called "hyperscalers" in cloud computing and a multitude of ecosystems and alliances in edge computing: Those who want to have success in this space rely on open technologies and standards, such as OPC-UA at the field level, containerisation and microservices in the area of software architecture and, for example, ONNX for the distribution of AI models.

Openness and standards reduce investment risk for OEMs by avoiding dependencies on individual providers and prevents lock-in effects for machine operators.

3. What do you think are the most challenging aspects to working in this industry?

For companies offering solutions in this space, it is challenge to find the uniqueness in one's offering. Many companies, from start-up to well-known industrial companies and the so-called "Hyperscalers" like Amazon and Microsoft are active in this industry.

Discover the key to Success in IIoT

Festo claims a unique spot by combining huge automation technology and domain know-how with comprehensive data science and AI know-how, thanks to the acquisition of a leading German AI company, Resolto Informatik, in 2018.

4. What do you think is holding some companies back from investing in IIoT?

Often, IIoT Services advertised lack a clear and easy-to-understand value proposition: what's better after the investment in such solutions. Behind the buzzwords, a business case must be visible. This can be an increase in productivity, lower maintenance costs, more good parts or less energy consumption.

A lack of a business case and a clear value proposition is holding companies back from investing in IIoT.

A start must not be hard and expensive. A start into the world of IIoT and Industry 4.0 can be easy and low on investment. It can start with digital maintenance management, such as "Smartenance" or a pilot project with Festo AX to prove the value for a certain industrial application or process.

5. What do your customers say about your solutions?

Customers appreciate that Festo also contributes its domain know-how in the area of digital services. Customers also demand this expertise. In particular, customers also appreciate the fact that Festo also uses its digital solutions in its own factories and thus that a customer's production also benefits indirectly from the experience gained there.

As Festo is a supplier to many manufacturing companies, Festo is also seen as having a connecting role – i.e. a function that can help to drive-

forward and establish overarching standards and best practices.

6. How do you think security concerns have been addressed?

Edge computing has lowered the barrier for IoT projects, especially with regard to cybersecurity and data privacy: data is processed locally, close to the process and does not (necessarily) leave the company network.

In order to counter reservations and risks at an early stage, it is advisable for the roll-out of IOT and AI in production to also involve the IT department at an early stage. For quick successes and pilots, however, the topic of edge computing and testing in isolated networks is also advantageous.

In IoT product development it is recommended to make security a first-class-requirement from the beginning – no matter if talking about a hardware product or software: security considerations should be part of every step in development, from the beginning to the release and the product's life cycle.

Furthermore it is recommended to validate security considerations and measurements by external players, for example with penetration tests.

Festo's digital products are regularly pen tested and we also have set up a Product Security Incidence Response Team (PSIRT) inside Festo to cover and manage the topic of our products, hardware and software products.

7. IIoT is very much a data driven industry, do you offer data services? How does this solution fair over other competitor services?

With Festo AX, we offer a data-driven solution. It is an end-to-end solution, starting from connecting machines and getting the right data in the right granularity. This is the Festo AX connectivity layer. Next we analyze and prepare the data. This is performed by data scientists. Afterwards then machine learning models are trained with the prepared data in Festo AX. These models do anomaly scoring and classification of data and predict equipment failures, quality deviations or leackages in industrial machines and processes.

8. companies investing in IIoT solutions can be costly if not done right, what level of support do you offer your customers in adopting your solutions?

At Festo, we offer to support our customers from conception to roll-out. In order to be able to see rapid successes, it makes sense to concentrate on sub-areas of a production and to test concepts and strategies there first before carrying out large roll-out projects. Intervention and countermeasures are naturally much easier on a smaller scale. As a manufacturing company ourselves, we at Festo also offer customers access to experience from our own factories. This knowledge and the experience gained also flow continuously into the further development of IIoT products.

9. What do you think will be the main focus in IIoT over the next couple of years?

A main focus will be the establishment of further lighthouse projects. These successfully implemented projects have an impact on one customer but can also influence an entire industry. Increasingly, protocols and interaction models will also be further standardised, which will facilitate cross-company or cross-supplier collaboration.

Typically, the manufacturing industry is always a bit behind other industries. In the next few years, we will therefore probably see a further establishment of data-driven approaches, as they have been common in other industries, such as finance, for a long time. It will become more and more commodity to rely on data-driven decision making and virtualisation in the entire manufacturing area, i.e. from machine planning to commissioning and operation.

Discover the key to Success in IIoT

10. What are you the most passionate about working in this industry?

There is a lot of potential for improving processes, often even with simple tools and methodologies. For example, our "Smartenance" software helps to move maintenance away from pen and paper and towards a digital solution, thus significantly simplifying everyday routine tasks.

In addition, you experience new challenges every day and come into contact with the latest technology such as robotics and AI.

11. Is FESTO already looking towards Industry 5.0?

The term Industry 5.0 is associated with topics such as resilience, sustainability, human-centeredness and autonomy.

Naturally, Festo is concerned with all of these topics. First and foremost, of course, with measures and efforts to successively reduce the CO2 footprint and to make its own contribution to climate-neutral production. In addition, with its Festo Didiactic division, Festo is actively involved in the further training and qualification of the workforce for the working world of tomorrow. And in the field of autonomy, Festo is constantly researching and developing further technologies for autonomous machines and production processes.

12. What are your company's current and future digital ambitions?

Festo wants to further provide customers with digital services as another building block on the road to higher productivity. On the one hand, digital services are intended to add functions and added value to core products, but on the other hand they are also intended to provide added value for customers as digital services in their own right.

In addition, Festo's digital ambitions are also evident in the area of sales channels with the continuous expansion of the online shop and product configurators. In addition, the topic of digital Zwlling is also central to Festo. Individual, specific assemblies can already be obtained from Festo as a digital twin. This enables the virtual planning and commissioning of machines and processes and will be significantly expanded in the future.

13. The IoT industry has many manufacturers all working toward various standards or proprietary specifications,

Discover the key to Success in IIoT

this prevents challenges when communicating between one-another. How open would you say your solutions are in the Industry?

Festo is an active member of various organisations and committees for the development of standards, such as the OPC Foundation and the Industrial Digital Twin Association (IDTA). Adopted standards then find their way into product development.

In the area of digital services, Festo resorts to the use of standards wherever possible. However, the end customer who ultimately uses a digital service also has a decisive influence on its use: Festo is guided in particular by their requests and aligns to their specifications. End Users, such as automotive companies, food corporations etc. have a big influence on bringing standards to life.

14. What is unique about your FESTO technology in connecting all systems into one data driven solution?

Festo's unique approach is the combination of comprehensive domain know-how in pneumatic and electrical automation, extensive industry and sector know-how and know-how in the field of AI, machine learning and data science. This combination is truly rare, even unique in individual markets, and is what sets the Festo approach apart. Many companies over some of the parts of the journey from machines up to business insights. Festo offers a complete approach, from OT into IT.

15. How do you support real-time data driven productivity?

The maintenance messages, anomaly detections and other events generated by Festo solutions can be immediately forwarded to other systems. Decision-makers can thus react immediately to malfunctions or possible maintenance events.

16. What is your latest innovation in driving AI automation? (real-time data collection, tracking, planning, control and solution proposals)

Our latest innovation in this field is "GripperAI". It's a software containing a trained neuronal network that is attached to a robot with a vision system attached, that perfoms pick-and-place tasks. GripperAI allows the autonomous grip into a box: that means a gripper can pick and place parts that are lying in a box, without the need to be trained on those parts in advance. This drastically reduces commissioning time and increases flexibility. GripperAI is used by customers in logistics applications with great results so far.

Is your business ready for Industry 5.0?

by Justyna Matuszak

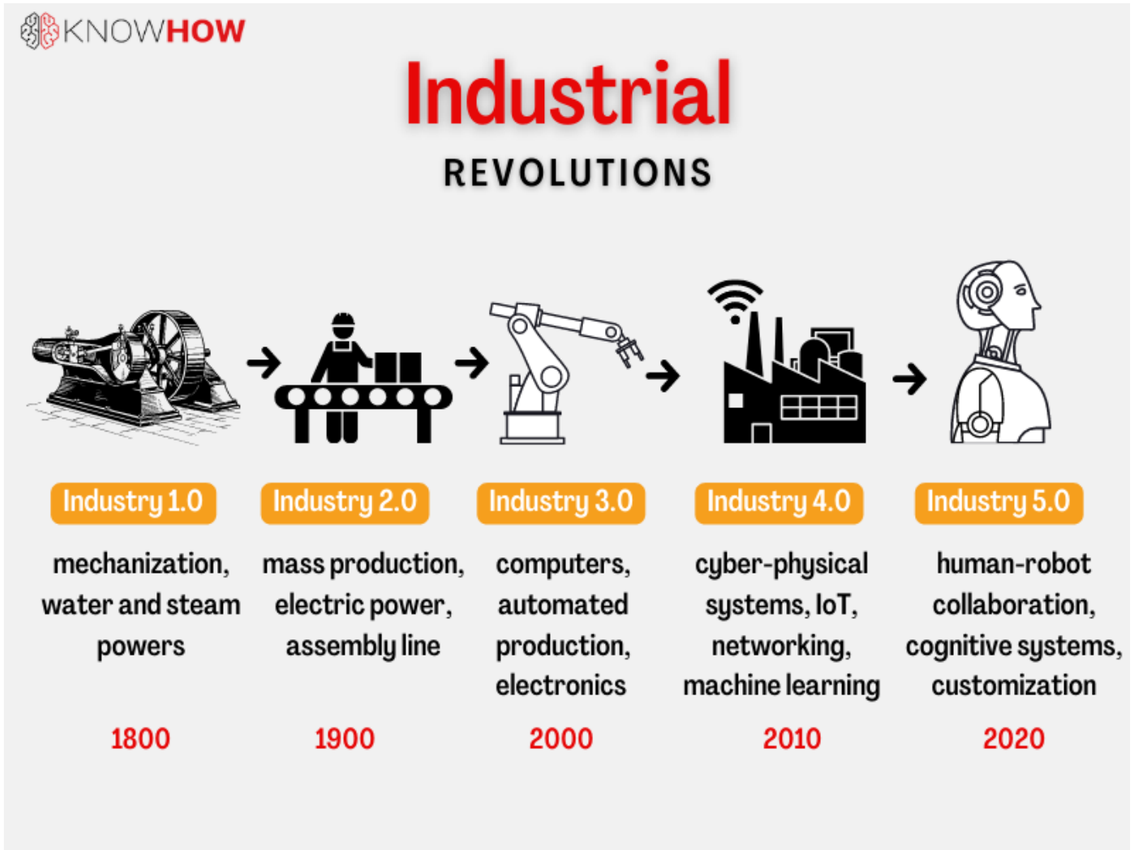
Adapting to industrial changes can still be a challenge for some companies. However, the progress has not stopped since the beginning of the first industrial revolution around the 1800s. Through centuries of investing in new devices and more technological equipment, finally, companies can welcome industry 5.0. What does it mean for industry 4.0? And what will be the fifth industrial revolution? In this article, you will find answers to these and more questions.

Industrial revolution progression

Human civilization was going through some drastic changes due to industrial revolutions. One was converting agriculture and handicrafts-based economies into sectors based on automated manufacturing and the factory system.

Revolution 1.0 began with mechanisation and steam and water power. Later, the second revolution implemented electricity, mass production and assembly lines, third industrial computers, automation, and electronics. The first three revolutions transformed the way society is working and living. Now

Is your business ready for Industry 5.0?



companies are more productive and efficient due to new machinery, new power sources, and new ways of arranging work.

We are now in the midst of the cyber revolution, often known as Industry 4.0 or cyber-physical human intelligence. The fourth revolution is about machines replacing humans and transforming manufacturing into IoT-integrated smart facilities. It means that the industry 4.0 focus is on Artificial Intelligence (AI), computer-based systems (cyber-physical), networking and cloud servers, machine learning, 3D printing, autonomation, VR, and computing's advantages. Check how Eaton is pushing the boundaries in Industry 4.0.

What is Industry 5.0?

Industry 4.0 is not fully incorporated yet, so why do people already talk about industry 5.0? Whereas Industry 4.0 was about connecting automation and digitalisation, industry 5.0 collaborates between humans and machines.

The fifth revolution is about connecting people with robots and making them work together. The fourth revolution started around 2010 and changed the way companies functioned. Thanks to advanced technologies and automation, many companies were able to replace humans with robots. Many businesses have been influenced by Industry 4.0 so far. Some still adapt to the technologies that industry 4.0 has brought. Does it mean that Industry 4.0 will be over? The fourth revolution doesn't end yet and will continue to impact many companies.

Nevertheless, now the focus is on Industry 5.0 as one of the top trends in industrial manufacturing in 2022. Simply put, Industry 5.0 is the reintroduction of humans and minds into the industrial structure. Here humans and machines reconcile and collaborate to benefit from new production efficiencies. Companies that are only starting to adapt to Industry 4.0 may find themselves in the middle of this new industrial revolution.

What does Industry 5.0 mean for manufacturing?

The robotic manufacturing co-worker in industry 5.0 is supposed to successfully act as a human companion, resulting in improved production processes and waste and cost reduction. The interaction between humans and computerised machinery will drastically improve the optimisation and automation of many enterprises. Collaboration between the two industrial processes entities will offer new techniques and ideas for managing a workforce that includes both people and software robots.

Besides robots, the next industrial revolution level will bring cobots or differently called collaborative robots. Cobots can observe, learn, and execute jobs the same way as humans. Thanks to their partnership with humans there is potential of increased production efficiency and improved operations. By merging workflows with intelligent systems, this mix of people and machines will also assist organisations in focusing on enhancing brain potential and creativity.

Is your business ready for Industry 5.0?

Manufacturers will benefit from taking away repetitive tasks. Businesses will seek artificial intelligence machines to increase productivity and empower workers, once robots become more accessible. Hence industry 5.0 will create more jobs than eliminate as new skills will be required in programming, controlling intelligent systems, and emerging technologies.

Important factors about Industry 5.0

Because Industry 5.0 just entered the market, there are some speculations in regards to the impact of the new industrial revolution on life and work. Take a look at some sentences below to dispel your doubts:

- Robots aren't supposed to supersede humans but co-op with them.
Some people worry about the impact of robotics development on human life. While robots are more reliable than people and are better at precision work, they lack adaptability and critical thinking skills. The main purpose of robots is to fulfil their assigned mission of offering aid and improving our lives when they collaborate with people.

- Industry 5.0 will bring broader benefits to the marketplace than industry 4.0.
Industry 5.0 could not exist without industry 4.0 that brought automation. However, it will change automation to manufacturing tasks while allowing consumers to acquire goods and services that are tailored to their requirements.

This new data reveals that 96 jobs across seven professional clusters are fast emerging in tandem reflecting "digital" and "human" factors driving growth in the professions of tomorrow.

World Economic Forum

- Industry 5.0 will create more jobs than eliminate.
We were already thinking about robots taking human jobs in previous articles. But the conclusion is that automation opens more job opportunities than it displaces.

- Personalisation will lead, not mass production.
Thanks to Industry 5.0, people will be able to personalise their products better as the original designs need human interventions.

- Psychology will control technology.
Ensuring product quality requires human interventions. In industry 4.0, many products created for a big scale didn't need human touch. But the new revolution will allow workers to interfere with the product with robotics help and psychological analytics.

- The progress into industry 5.0 is inevitable.
With the growth of technology, there is no way to go back. Everything is computerised nowadays. So instead of thinking about the sense of robotics, it is better to focus on implementing changes and preparing workplaces and the workforce for industry 5.0.

Are you ready for the new industrial revolution?

Without constant development, humans could not exist. Therefore, the world and

Is your business ready for Industry 5.0?

industrial sectors are going through some revolutions. But how will the development of robots and cobots result in human life? Can we expect some danger from these machines like it shows in some science fiction movies?

The question about the need for robot development is controversial because, on the one hand, it picturises a list of improvements, if only in manufacturing but also in transport, healthcare, agriculture, earth and space exploration. On the other hand, it creates a fear of the unknown. People simply do not know what the future will bring; we can only predict. But there is a danger with every invention. That doesn't mean we should stop discovering and improving.

The truth is that people already have contact with robots by chatting with them (chatbots), getting some information from virtual assistants (Alexa/ Siri), while driving (parking sensors) and much more. With an increasing number of jobs, individualised products, automated machinery, and delighted customers, Industry 5.0 is the way to go for many companies. However, before that, governments all across the world, as well as the world's major high-tech corporations, must establish a framework for defining machine intelligence rules.

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