

TR-Electronic – your partner in automation





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Editorial

We understand the wishes
our customers and implement them
flexibly into innovative products.

For over 40 years, you, our customers, have been at the heart of everything we do. We use all our innovative strength for you to constantly develop new products that offer the optimum solution for the challenges on the market. Our products speak for themselves, but on the following pages we would like to briefly present our technological highlights and give you an overview of our expertise. We also take a look at the diverse markets in which our products have been contributing to the success of your machines and systems for many years.

If you have any questions about position sensors, decentralized actuators or PC-based automation, just get in touch with us!

We look forward to hearing from you

Translated with DeepL.com (free version)

If you have any other detailed requests please don't hesitate to contact us!

We look forward to hearing from you.



left to right:

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Head of R&D functional safety

Dr. Markus Ron Dietrich:

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Claudia Tessari:

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CEO

Bastian Seufert:

VP Sales

Marc Hepting:

CFO





TR-Electronic – Innovative and Successful



We provide: Measurement and control systems for automation technology

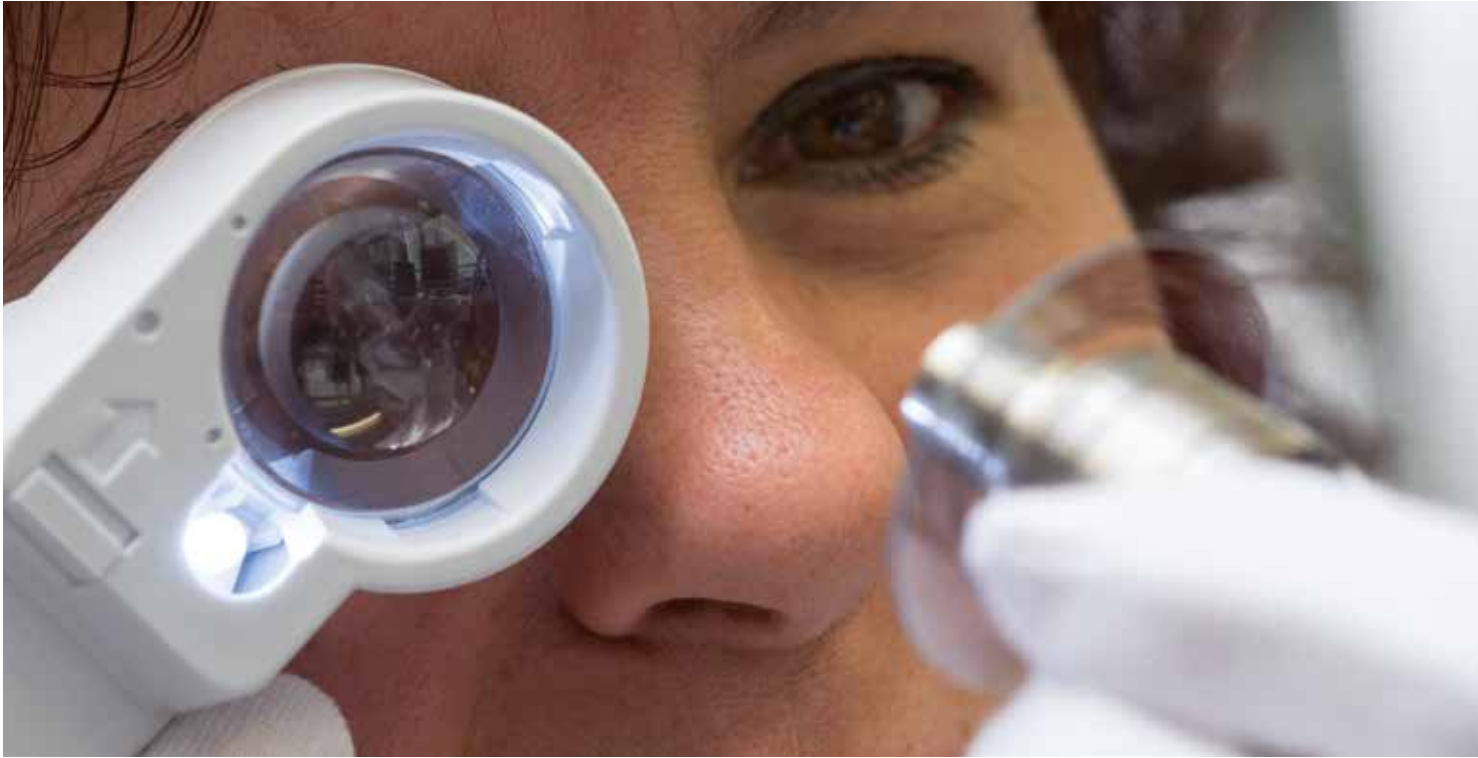
When industrial processes need to run smoothly and reliably, measurement and control solutions from TR-Electronic play their part. When a theater curtain goes up, for example, systems made by TR monitor the complex stage technology. People and machines work safely together and the audience enjoys a perfect production. Wind energy plants generate electricity with maximum efficiency thanks to optimally aligned rotor blades - controlled by TR solutions.

In press lines for the automotive industry TR sensors guarantee safe forming of the body components. In logistics TR measuring systems enable smooth transport of goods, e.g. in conveying systems and high racks. TR control and measuring modules control and monitor pumps for the drinking water supply, regulate correct feeding of pellets in woodfueled installations or help to detect faults in a punching machine at an early stage.



Our team spirit helps us leave our competitors behind.

For all of these and other applications TR-Electronic supplies the right rotary encoders, linear encoders and drives – as high-quality standard products or customized solutions.



Technology leader and quality from the very start

TR-Electronic develops, manufactures and sells sensors and actuators for industrial applications in automation technology. In order to better integrate the individual areas of expertise and make them more transparent for our customers, we have organized the company into business units: Products in the Rotary Encoders Business Unit with optical or magnetic scanning are required to detect the angular movement of a rotating shaft.

Magnetostrictive linear encoders measure the position of a linear movement without contact, for example in a hydraulic cylinder. Intelligent compact drives from the Drives Business Unit are used as actuators or, in the high-end version, as process drives.

Customized control and measuring modules in combination with special know-how in pressing and punching processes complete the extensive product portfolio. Automation com-



Modern production technology in the Encoder production

ponents from the Components Business Unit round out the product range.

The development services provided by the Automation Business Unit bring press lines to new levels of performance, provide smart metering solutions for efficient energy utilization and fair billing, enable remote monitoring of water supply networks or ensure a cosy environment through intelligent heating automation.



Based in the region, present throughout the world

Characterized by the typical Swabian inclination to hard work, TR-Electronic has strong regional roots while at the same time being active throughout the world. Its most important customer is the mechanical and plant engineering industry, which has a strong tradition in Germany. In addition to the primary location of Trossingen, our subsidiaries and technical sales partners in Europe, the USA, Canada, Brazil and Asia offer professional advice and project planning and ensure worldwide access to the TR product range. TR's sales subsidiary established in China in 2010, with head office in Beijing, is now the direct contact for production locations in Asia for many European companies and supports ambitious industrial projects in the Far East.

The basis of our innovative products and growing global success are the experts, their ideas and development expertise in Trossingen. The optimal combination of longstanding

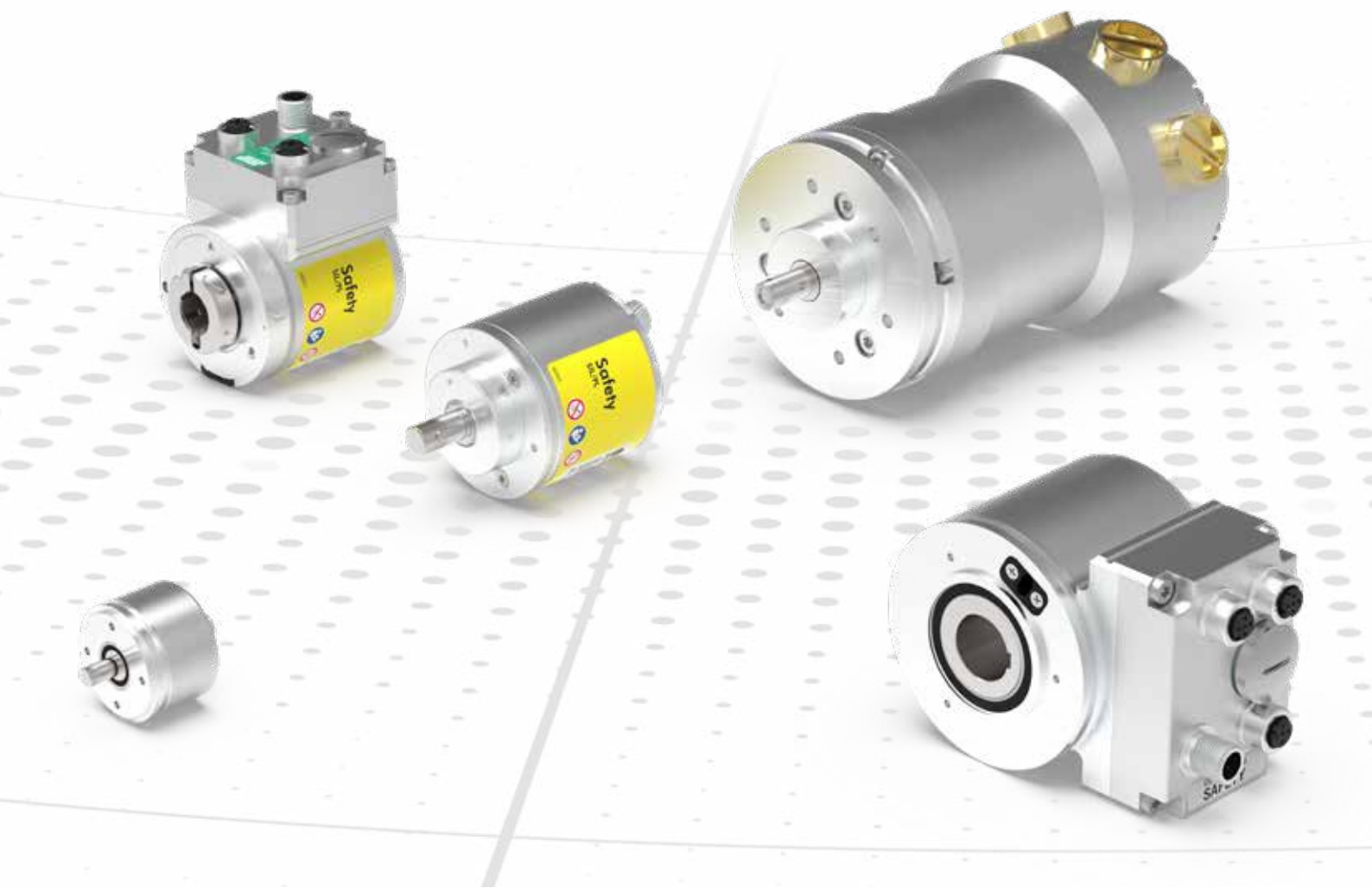


experience and the fresh inspiration provided by qualified new employees ensures a competitive advantage in terms of the functionality, quality and cost efficiency of our product range, both today and in the future.

**This is what we stand for. This is what we work for.
And this is what we want to be measured by!**



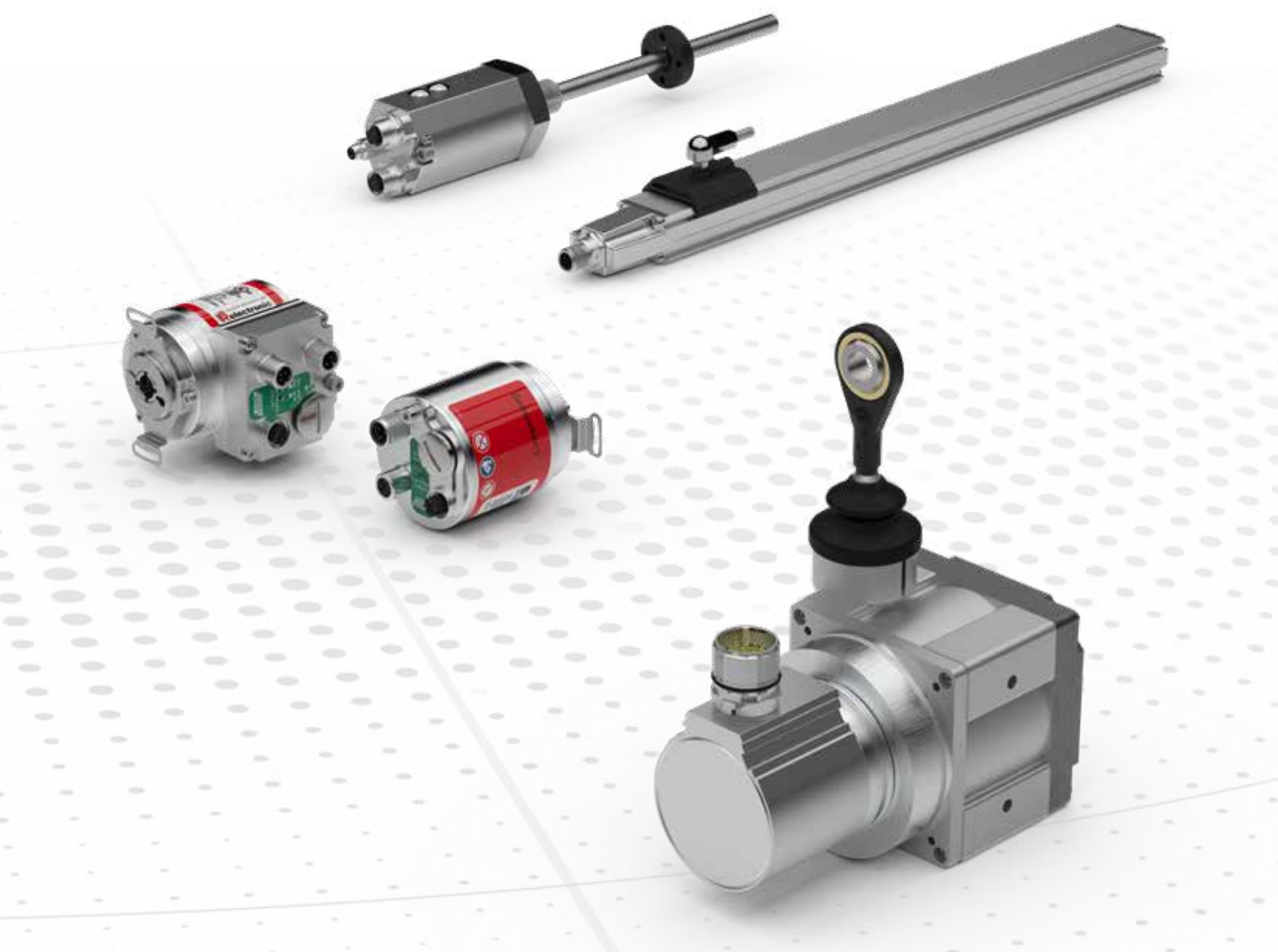
TR expertise



30 years of experience

TR-Electronic has been developing and producing angular and position measuring technology for over three decades. Its experience and expertise goes far beyond the pure conversion of mechanical positions into electronic signals. On the following pages we have set out some of our technologies and specialties.

We use these to produce your rotary encoder, linear encoder, positioning drive or automation solution to optimally measure, control and regulate your processes – with the experience of more than 30 years as a pioneer in industrial position measuring technology.



Content

Functional safety, SIL/PL.....	12	Compact drives	14
Linear encoder for up to 20 m	13	Interfaces.....	15
Laser distance sensors	13	Press retrofit/control of hydraulic axis.....	16
Rugged sensors.....	14	Control and automation solutions	16
Compact sensors 36mm	14		

Switch-on – absolute position – safety

**Safety
Integrated**

Functional Safety

Many applications in automation technology demand the highest safety requirements.

Different Safety Integrity Levels (SIL) or Performance Levels (PL) are required, depending on the field of application. TR offers suitable sensor solutions for the common SIL3 / PL_e or SIL2 / PL_d. These devices are developed and produced in accordance with the valid regulations and standards. Development and production are certified by independent bodies.

Absolute rotary encoder with SIL3 / PL_e

By using SIL3/PL_e-certified products, you will achieve maximum safety in common workplaces or in environments shared by people and machines.

Since several years, TR-Electronic gained experience with the well established 75mm-Series. The new series CD_582+FS now take benefit from these experiences. The compact sized housing with diameter 58 mm, CD_582+FS holds a fully redundant double multiturn rotary absolute encoder with integrated safety check. Output information is transmitted via secured bus protocols.

Depending on the desired features, the encoder is equipped for highest safety level SIL3 / PL_e or optimized for SIL2 / PL_e applications. The modular mechanic concept fits into most constructions. Different flange and shaft geometries make integration quite simple. If changing climate could result in dewfall (e.g. wind turbines), a double magnetic detection can be used. More precision is provided by diverse optical/magnetic detection.

As the encoder system contains two fully independent multiturn detections, CD_582+FS may be used with all safety functions that require a real absolute multiturn position value without any referencing or homing. Suitable safety controls can use the secured position values to realize functions as

(e.g.) safety operation stop (SOS), safe limited position (SLP), safe position (SP), safe direction (SDI). The speed value is likely transmitted via secured protocol and can be used for all safety functions requiring secured speed values.

If the safety functions are fully integrated in the main central control, machine layout can take full benefit from the „integrated safety“ design provided by TR-Electronic: For a secured position information, there is no need for additional safety controllers. A safe and certified bus system transports all data, no configuration of a separate safety controller, The easiest and most cost effective way to safety position detection!

Incremental rotary encoder with SIL3 / PL_e

For simplified safety functions which only require the speed as a signal and in the case of lower safety requirements, certified incremental rotary encoders from TR-Electronic are an effective solution. The know-how and experience from our absolute rotary encoder development is also at your disposal for these simpler applications.

In combination with suitable safety modules, safety functions such as Safely Limited Speed (SLS), Safe Speed Monitor (SSM), Safe Speed Range (SSR) are available. TR-Electronic offers a suitable safety module, but safe incremental rotary encoders can also be combined with other, commercially available modules. Safe incremental rotary encoders are available with a sine/cosine output and with square-wave signals.

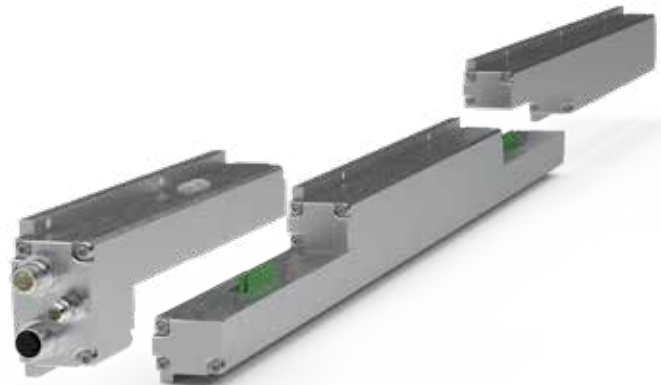
The transmission of incremental signals with a sine/cosine signal is particularly advantageous. Thanks to the mathematical relationship, according to which $\sin^2 + \cos^2$ must be = 1 at any given time, the safety module can easily determine the integrity of the signals.

The resolution of safe incremental rotary encoders is always reliably defined by the optical division of the disk.



Cascadable linear encoders up to 20 m

Wire-actuated encoders are subject to wear, while laser measuring systems cannot acquire several positions simultaneously in the same clear width. Magnetic tapes are susceptible to ferromagnetic chips, position marks read optically with readers can become soiled, and magnetostrictive measuring systems are limited in their measuring length glass scales are priceless from certain measurement lengths. With patented LMC 55 we close this gap: Up to 30 positions are acquired simultaneously. The moving part is a passive magnet, which does not require a power supply.



LMC55

CANopen EtherCAT PROFIBUS EtherNet/IP ETHERNET POWERLINK PROFINET

Laser distance measurement up to 240 m

Measurement over long distances without contact and fast enough for closed-loop control

PROPERTIES of LE200

- _ Robust design
- _ Detection of linear movement patterns
- _ Contact-free and wear-free distance measurement
- _ Distance measurements up to 125 m, 170 m, 195 m, 240 m. Other distances on request
- _ Parameterizable
- _ Additional interfaces available
- _ Optionally with heating or cooling
- _ Customer-specific adjustments can be requested



LE200

Advantages of LLB65/LLB500

Analog and PROFIBUS-DP interface

- _ RS232, RS422 interface
- _ Detection of positions
- _ Contact-free distance measurement
- _ Distance measurements on natural surfaces: 0.05 to approx. 65 m, with reflector up to 500 m
- _ Programmable
- _ Optional heating



LLB500

Heavy duty – rotary encoder in gas-tight, welded stainless steel housing up to IP69K

The 36 series - developed for growing requirements. The new, compact single-turn rotary encoder CMV 36 S has a completely encapsulated electronics unit. There is no rotating feedthrough. The position information is transferred contactlessly through a fixed housing wall. The rotary encoder is protected from dust and water, and is also used in applications with changing temperatures (risk of condensation) or for speed monitoring. The maximum achievable tightness corresponds to a rating of IP69K. This rotary encoder can therefore be used without problem in vehicle manufacture, for mobile machines and other outdoor applications.

Seal Pack – salt water-resistant housing

This optional package has an additionally sealed housing cover. It combines coordinated measures for absolute rotary encoders in order to guarantee the following characteristics: An upgraded rating of IP67, hermetically sealed against the ingress of moisture and special imperviousness to the ingress of penetrating oils such as honing oil. It also passes the salt spray test, which lasts 672 h (EN-DIN 60068-2-52 (severity 1), without any problem.

Further options

With us you are safely equipped for all eventualities. TR measuring systems can be adapted to a wide range of ambient conditions with special housings. A stainless steel housing can be used for aggressive environments or food applications, for example. The extruded aluminium housing (size 115 mm) offers exceptional protection against vibrations and high temperature fluctuations.

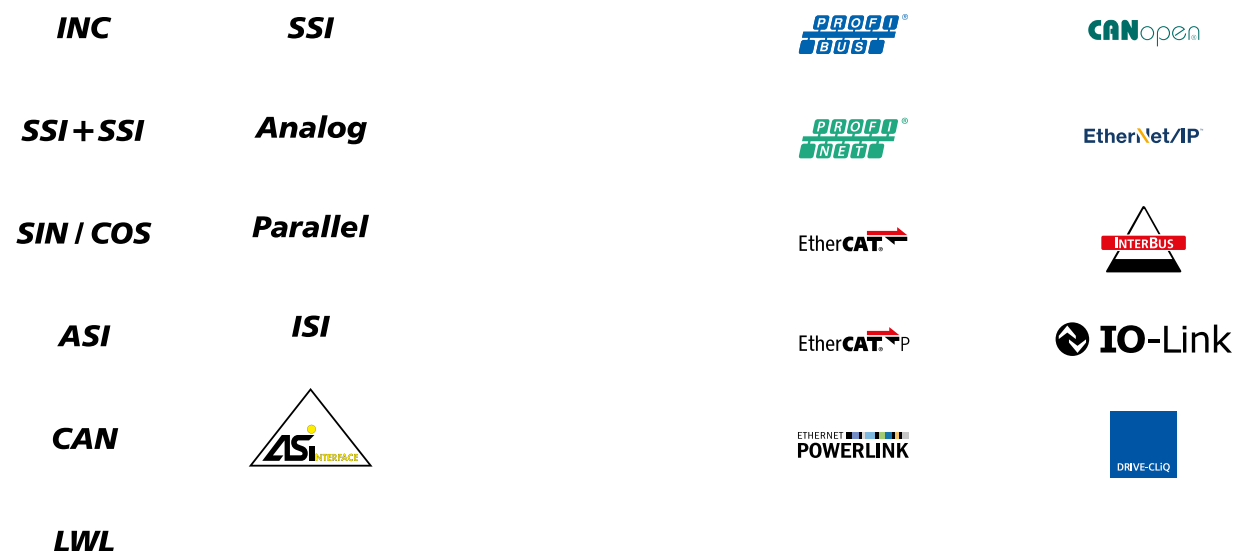
Appropriately equipped rotary encoders can also operate safely in explosive atmospheres up to Zone 1/21 or 2/22, guaranteeing maximum safety. Another special feature consists in equipping the encoders with bearing modules. These serve as collar bearings for our 58, 65 and 100 mm encoders, to absorb increased bearing load. A typical application is the mounting of a chain disk or belt pulley.

Intelligent compact drive technology

Different batch sizes, huge product diversity, the individualization of production and maximum cost efficiency are central requirements of modern production processes. In order to cope with these requirements, secondary functions are increasingly being electromechanically automated in machines and systems, in addition to primary processes.

TR-Electronic's fieldbus-capable encoTRive compact drives make this possible – in machine construction and machine tools as well as in the packaging, press, woodworking, glass, printing, plastic and textile industries. These compact drives have no external electronics. They integrate actuator, sensor and control technology in one housing: control logic, position, speed and torque controller, power electronics and absolute rotary encoder. These compact drives can communicate with the PLC via fieldbus. Further components such as transmission, holding brakes or I/Os are added, depending on the application. On the basis of the encoTRive communication and controller platform both simple control applications and complex machine processes can be automated efficiently and consistently with different drive types - simply, flexibly and cost-effectively.

Interfaces



Interfaces

Since the very beginning TR-Electronic has developed industrial sensors to meet the needs of users. This also includes equipping our sensors with a wide variety of interfaces. TR can even be rightly regarded as one of the companies which (in relation to the entire product spectrum) offers the greatest diversity of industrial interfaces. TR is also right at the forefront when it comes to equipping position sensors with new interfaces, which enable integration into innovative control and system concepts.

Wide variety of interfaces

Starting from the simple analog output (which can also perform very specific tasks, thanks to a number of special options) to established fieldbuses and cutting-edge Industrial Ethernet, TR-Electronic offers a wide range of interfaces for rotary encoders, linear encoders, drives and control technology. TR cooperates with the relevant standardization organizations and thus ensures 100% compatibility and perfect integration into your application. Networked development means that all areas benefit from the integration of a new interface. This gives you considerably more freedom to combine mechanical design, sensor performance and the desired interface, even in the standard product range. And if you don't find what you're looking for right away – please ask us. We can provide far more in addition to what is printed here in the catalog.

Over the years we have developed a number of specializations, particularly for customized devices. New product generations naturally also benefit from this experience. We are confident that we can find (or invent) the right solution for your application too.

We present interfaces and possible extensions in the appendix "TR Information" at the end of this catalog.

Interface combinations

Machines developed in accordance with the latest state-of-the-art technology often work with highly integrated PC-based, programmable logic or special NC controls. All machine parts are linked via high-speed Industrial Ethernet. There are many applications in which a quick signal pick-up directly at the site of the rotary encoder makes an automation task much easier.

Incremental signals, which are acquired directly from the rotary encoder, are used for commutation and provide the necessary signals for secondary speed control loops without any time lag - entirely without an additional measuring system. A decentralized control loop can directly receive SSI signals and consequently move to or maintain a position in the secondary position control loop, even in the event of failure of the communication network.

Press retrofit / hydraulic controls

A retrofit serves as a replacement for components that are no longer available. A process optimization can also be carried out, i.e. productivity is increased. In comparison to purchasing a new system, costs are minimized, as the existing system is only upgraded and retrofitted. In many cases the machine can be used more flexibly after a retrofit. Retrofitting a machine has a higher level of internal acceptance, as the machines and systems are for the most part already familiar.

Customized controls

Our HMI controllers are perhaps the most compact route into the world of precise, reliable and cost-effective control technology. With compact HMI controllers from TRsystems, you have the choice between controllers with a display or without a display.

The compact controller comes with Ethernet, USB and an onboard CAN fieldbus interface. If you need more, additional fieldbus interfaces (CAN or PROFIBUS) can be optionally added. For ease of operation all HMI controllers can be extended with a touch screen and/or a keyboard front panel.

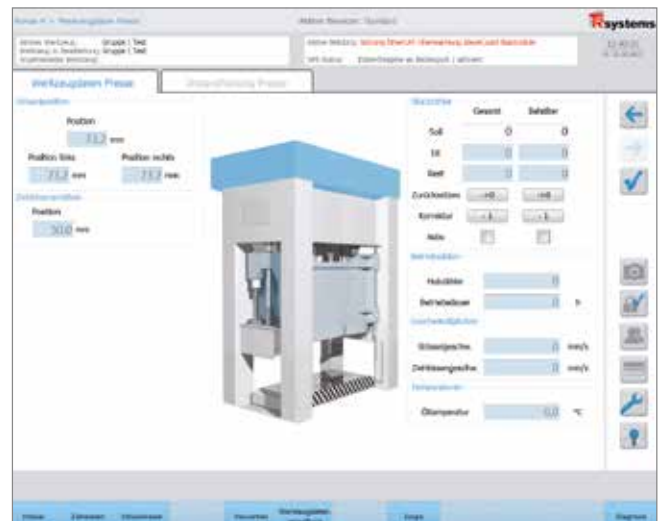
Individual visualization systems

We also provide visualization to go with new hardware.

ProVi enables both data display and data input.

It visualizes the operating system. It is based on Microsoft Net Framework and is integrated into a client/server architecture. The visualization is clearly structured and easy to operate. It has an implemented language changeover and user administration. The user interface varies depending on the preselected functions.

It has system-specific input masks. In addition to the convenient dynamic signal display, extensive diagnostics functions in relation to messages, PLC processes, static process signals and much more are available. All Windows-based programs can be integrated into the visualization, e.g. Media Player, Adobe Reader etc.



Monitoring of presses and punches

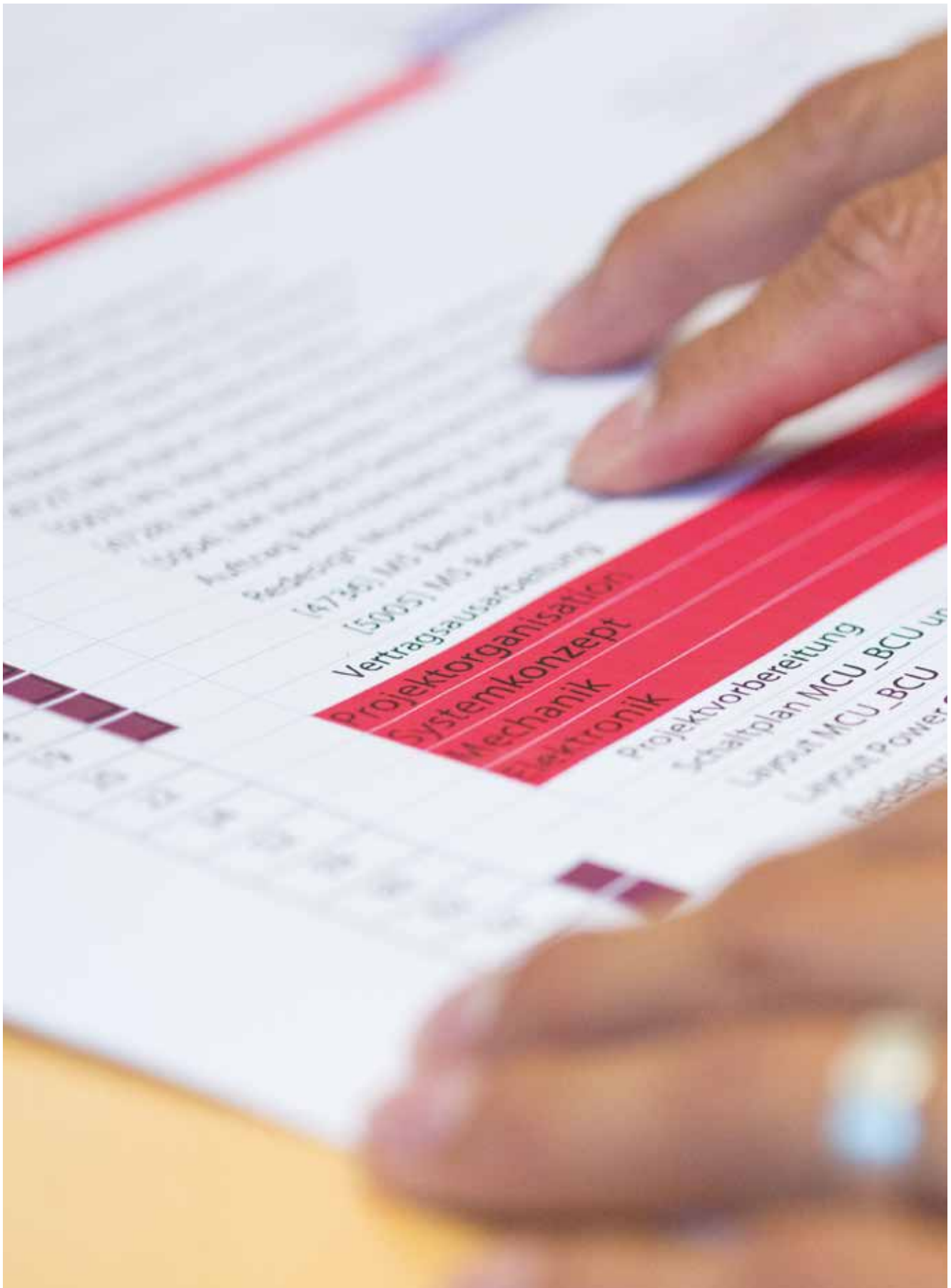
Deformations and material damage can mean the end for the system. It must therefore operate safely within defined load limiting ranges.

All recorded values are monitored and logged. SmartControl, with its specially developed piezo sensors, is used for this purpose. The system visualizes, measures and checks all sensor signals and combines them.

Any violation of preset target or limit values is indicated and recorded. It is quick to install and ready for operation in a few easy steps.

Convenient data output/evaluation is enabled by special software on the powerful industrial PC.

SmartControl protects the system safely and reliably.



Industries and Applications



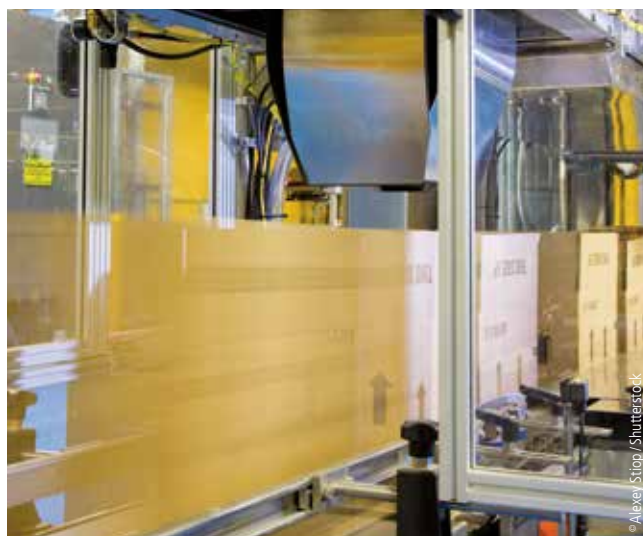
At home in every industry – draw on years of experience!

Goods find their way to the right place in deserted high-rack warehouses as if by magic. Fully automated processes ensure that sheets are bent, rolled or welded. Hoists, curtains and scenery move across the stages of the world's most famous theaters and festival halls, invisibly controlled. Wind power plants and solar reflectors invariably rotate into the optimal position.

The list of examples in which absolute rotary encoders and incremental rotary encoders, linear encoders, intelligent compact drives and components from TR-Electronic are used could be continued ad infinitum.

Our measurement and control systems offer the right solution for your individual application: From laser distance measuring sensors in mechanized container picking systems in logistics to sensors in punching and forming processes to SIL3-/PLe-certified safety rotary encoders in event technology to high-performance cam groups and compact drives in sheet offset machines in the printing industry.

But however different the sensors may be from one another, they have one thing in common: their reliability. TR attaches the greatest importance to this during the product development stage.



Sensors for everyday use

TR sensors do their jobs effectively for renowned companies in countless industries around the world. TR can offer the right sensor for almost any process task from its extensive standard portfolio. If you can't find "your" sensor in the portfolio, please contact us; we will find the right solution for your requirements.

That's where we are your specialists

Storage and logistics	21
Printing technology and paper processing	22
Metal processing	23
Event technology	24
Woodworking	25
Renewable energies	26
Packaging industry	27
Plastics processing	28



Storage and logistics

Particularly in the area of modern warehouse setups, such as shelf-stacking devices, transfer belts and crane systems, a powerful, decentralized measuring and control system for simple project processing and quick configuration makes all the difference.

Successful products in the field of storage and logistics

All information and data can be found at:
www.tr-electronic.com/applications/storage-and-logistics

Access information even faster:
by scanning the QR code.





Printing technology and paper processing

Fast signal processing for printing machines enables high register accuracy and decentralized compact drives automate setting processes. Rotary encoders with stainless steel housings can resist even aggressive media such as groundwood pulp in paper machines. Small absolute encoders measure movements in restricted installation spaces.

Successful products in the field of printing technology and paper processing

All information and data can be found at:
[www.tr-electronic.com/applications/
printing-and-paper](http://www.tr-electronic.com/applications/printing-and-paper)

Access information even faster:
by scanning the QR code.





Metal processing

The world of presses and punches has long been TR-Electronic's special field. We develop the products from the outset so that they can withstand the high stresses of shocks and vibrations.

Successful products in the field of metal processing

All information and data can be found at:
www.tr-electronic.com/applications/metal-processing

Access information even faster:
by scanning the QR code.





Event technology

TR-Electronic absolute encoders offer safety for all requirement classes in event technology. From rotary encoders with an additional incremental track through to SIL3-/PLe-certified safety rotary encoders, we offer the right solution for your customized safety concept.

Successful products in the field of event technology

All information and data can be found at:
[www.tr-electronic.com/applications/
event-technology](http://www.tr-electronic.com/applications/event-technology)

Access information even faster:
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Woodworking

Intelligent, decentralized control concepts, efficient sensors with local signal processing and components which operate reliably despite strong temperature fluctuations are the basis for automation solutions in the woodworking industry. The intelligent equipping and networking of transfer machines, machining centers and assembly cells is our speciality, especially when you require a platform for your own special machine philosophy or special function!

Successful products in the field of woodworking

All information and data can be found at:
www.tr-electronic.com/applications/woodworking

Access information even faster:
by scanning the QR code.





Renewable energies

Intelligent tracking of photovoltaic systems increases efficiency and accelerates automation. High-resolution rotary encoders enable exact positioning. Compact drives reduce the number of components to be networked and align your system with the sun, even after a number of years.

Safe rotary encoders in pitch and azimuth drives in wind power plants assist optimal alignment for the most efficient energy conversion, whilst at the same time offering sufficient reliability to put the system into a safe condition in the event of a malfunction.

Successful products in the field of photovoltaic systems

All information and data can be found at:
www.tr-electronic.com/applications/renewable-energies

Access information even faster:
by scanning the QR code.





Packaging industry

Flexible automation solutions according to our customers' wishes are the intelligent basis for successful machine concepts within the packaging industry. High processing speeds enable fast turnaround times and large quantities. Absolute measuring systems save time-consuming reference travel, while highly integrated, intelligent sensor technology reduces space requirements and relieves higher-level controls. We can provide solutions which were previously not possible, particularly for high-precision applications.

Successful products in the field of the packaging industry

All information and data can be found at:
www.tr-electronic.com/applications/packaging-industry

Access information even faster:
by scanning the QR code.





Plastics processing

Diverse measurement tasks in plastics processing machinery and systems require fast signal processing and high precision. Linear measuring systems for installation in hydraulic cylinders can be integrated seamlessly into injection molding machines, while industrial PCs are a universal platform for user-specific control systems in both series machines and special systems.

Successful products in the field of plastics processing

All information and data can be found at:
[www.tr-electronic.com/applications/
plastics-processing](http://www.tr-electronic.com/applications/plastics-processing)

Access information even faster:
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TR-Electronic – your partner in automation

Rotary encoders

Absolute encoder, incremental rotary encoder, wire-actuated encoder

Rotary encoders with optical and magnetic scanning function register the precise position in a wide variety of applications and industries. In medical engineering, miniature versions ensure correct positioning while SIL3-approved absolute rotary encoders provide the necessary safety. We offer not only high-quality rotary encoders (from Ø 22 to 160 mm) for almost any application but also comprehensive accessories.

Linear encoders

Linear absolute measuring systems, laser displacement measurement

Linear encoders register linear motions in machines, tools and systems according to specific requirements using different technologies. Linear encoders allow measuring distances of max. 20 m almost without any wear. This value is max. 240 m for laser measuring systems. Machines and systems can be precisely controlled to reach their desired positions.

Motion

Compact actuating and positioning drives

Intelligent encoTRive drives are available with the current field bus systems, such as PROFIBUS, PROFINET and CANopen, within a power range of up to 400 watts. The drives are configured to meet customer requirements and can be freely combined with gear and holding brake. Values of up to 4,350 rpm and powerful 200 Nm are available to cope with demanding applications.



Components

**Industrial PC, field bus I/O,
PLC, HMI controller**

Industrial PCs are available in numerous variants and offer customized calculation power for PC-assisted automation. Programmable logic controllers (PLC) are the traditional means for automation. HMI controllers establish the interface to the user. Field bus nodes, I/O modules and cam controllers complete the range of automation components.

Automation

**Consulting and implementation
for new machines and retrofit**

You want to set up a largely automated new machine or retrofit and modernize your existing machine with automation systems? Then you just need our extensive expert knowledge and the more than 20 years of our experience.

Unidor

**Blanking and forming,
systems, controls and sensors**

Trendsetting blanking and forming technology for more than 30 years. We are your reliable partner in the world of blanking and pressing and can prove this with thousands of machines which we have successfully installed all over the world. Sensors, controls and systems ensure optimal results in machines, tools and retrofit projects.



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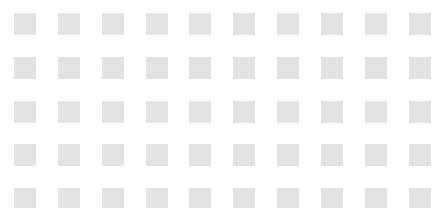
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