



# MARKING system

Systems, technologies, and quality



# MARKING system

## Simply easy!

We simplify your daily work – that's the promise backing every industrial marking and identification solution from Phoenix Contact. The MARKING system portfolio provides a comprehensive system solution for simple and efficient marking processes – consisting of intuitive marking software, powerful marking systems, versatile identification solutions, and comprehensive services.

### Your advantages

- ✓ Everything from a single source, from planning right through to the finished marking
- ✓ High-quality results in no time with perfectly coordinated components
- ✓ Time savings with rapid integration of our software and devices into existing structures

### Marking systems

MARKING system offers three identification technologies for different durability requirements as well as devices for stationary and mobile use. Whether manual or automated identification, all systems provide intuitive support when creating markings.

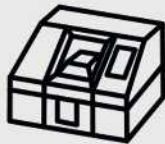
### Services

Expert support for any pre-sales, sales, or after-sales issues. Whether by email, phone, or directly on site – we are here to assist you at any time with our individual services.



### Marking software

User-friendly marking software for all target groups with application-specific functions – from fully comprehensive desktop software to identification directly on site with the MARKING system app.



### Marking materials

The MARKING system covers every application with a wide variety of marking materials. When it comes to marking terminals, wires and cables, equipment, and plants, versions are available to meet every requirement.



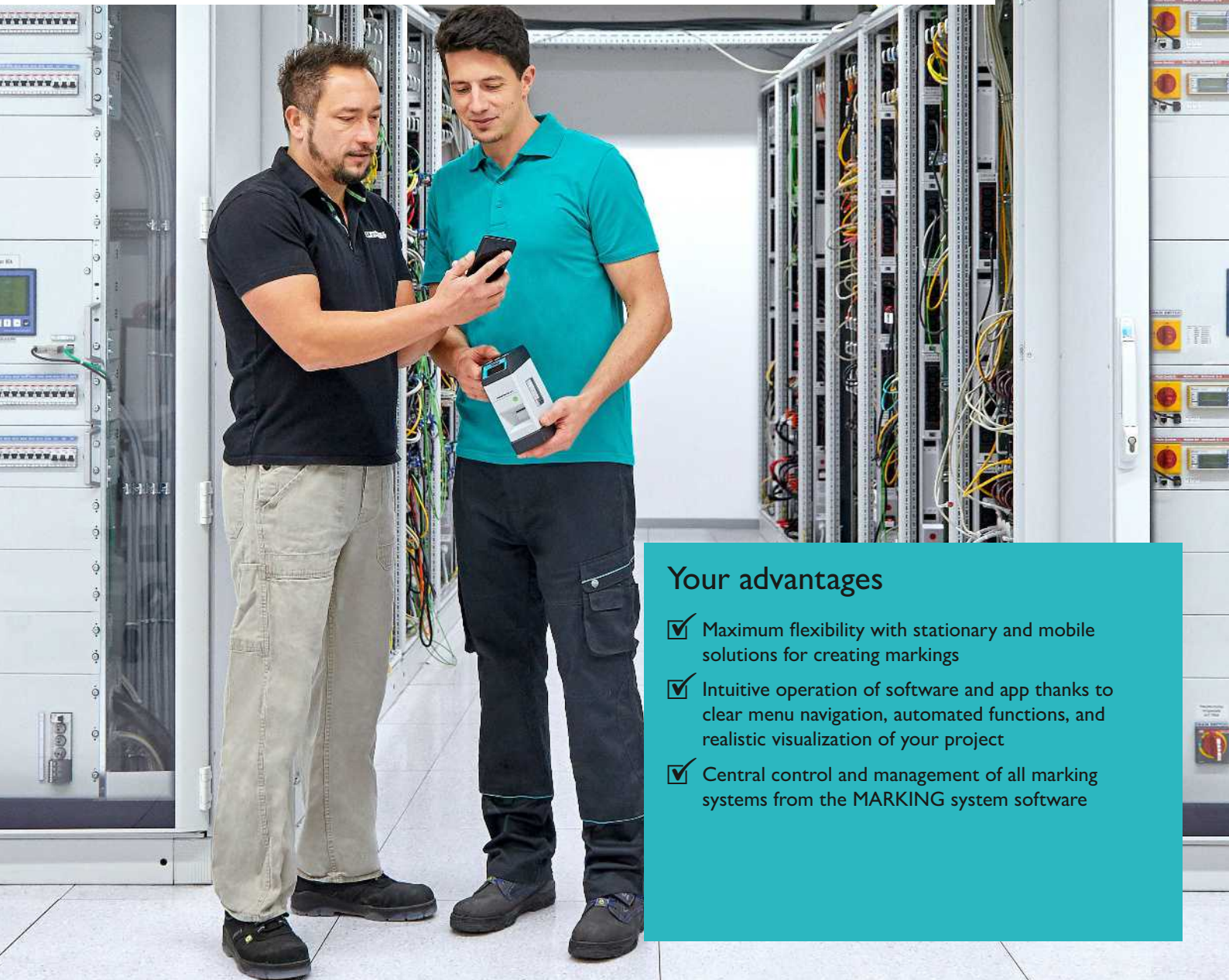
THERMOMARK PRIME



# MARKING system software – digital solutions for intuitive identification



Comprehensive data for the creation of all marking files is the basis for an efficient and straightforward marking process. The user-friendly marking software is able to ensure this marking process thanks to powerful data import functions, interfaces to common E-CAD programs, and the full range of functions for all applications. The MARKING system app is available for quick and easy marking processes directly on site.



## Your advantages

- ✓ Maximum flexibility with stationary and mobile solutions for creating markings
- ✓ Intuitive operation of software and app thanks to clear menu navigation, automated functions, and realistic visualization of your project
- ✓ Central control and management of all marking systems from the MARKING system software



## MARKING system software

The MARKING system software enables you to implement your custom-designed marking solutions easily and conveniently. You can control and manage all Phoenix Contact marking systems centrally from this software. In addition to comprehensive functions for the visual design of markings, the software ensures efficient marking processes thanks to its powerful data import functions and interfaces to common E-CAD programs and spreadsheet formats. The Wire Marking Application Center even guides you through the entire printing and applying process all the way to the finished marked cable.



## MARKING system app

Which marking is the right one? The MARKING system app provides the answer and guides you through the entire printing process. Find the right marking solutions for every requirement quickly and easily with the systematic querying of application parameters or using the integrated product scanner. With the help of the Marking Editor, you can design your individual, application-specific identification solution intuitively – without requiring any specialist knowledge. The app is available in 19 languages, is compatible with iOS and Android devices, and is available both online and offline.



## Identification on site

Using the battery-powered THERMOMARK GO mobile label printer and the MARKING system app, you can easily create markings on site on your smart device. Send your print jobs directly to the printer from your tablet PC or smartphone via Bluetooth. The ability to create the necessary marking directly in the application environment is a particular advantage when carrying out service call-outs where components need to be marked retrospectively.



# Three technologies, one goal: The right marking system for every task

There are numerous and varied requirements for markings that are used in industrial applications. Nevertheless, they must enable clear identification, regardless of the conditions. The selection of the marking method, material, and mounting type therefore requires particular flexibility and expertise. As the expert in these tasks, Phoenix Contact works with not just one, but three different marking technologies: flexible thermal transfer printing, versatile UV LED printing, and resilient direct laser marking.



## Flexible thermal transfer printing

The printers in the THERMOMARK series are characterized by the proven, low-maintenance thermal transfer printing technology and easy handling. While the THERMOMARK CARD 2.0 prints a wide range of materials in card and sheet format, the THERMOMARK ROLL 2.0 prints materials in roll format and continuous format. The THERMOMARK E.300 (D) / E.600 (D) is suitable for long-term industrial use as well as for large print volumes. In combination with one of the four applicators from the THERMOMARK E SERIES, this printer also enables automated identification. In addition to the printers for centrally organized industrial assembly, we also offer solutions for technical supply units in the application environment with our mobile thermal transfer printers. The battery-powered THERMOMARK PRIME, THERMOMARK GO, and THERMOMARK GO.K printers are ready for use exactly where you need them thanks to integrated marking software and wireless control via app.



More information starting on page 8

## Versatile UV LED printing

Choose innovative UV LED technology in a space-saving device. The BLUEMARK ID printing systems are the all-in-one solution for processing high print volumes in industrial identification. Materials in card and sheet format as well as aluminum markers are printed quickly and easily by the versatile printers. The materials are instantly wipe- and scratch-proof, so are ready for immediate use. In addition to the BLUEMARK ID for monochrome printing, the BLUEMARK ID COLOR system also prints CMYK multicolor markings. Both printing systems have a stacking and de-stacking function. This enables the processing of more than 21,000 markers per hour for monochrome printing and 14,000 markers per hour for color printing.



More information starting on page 10

## Resilient direct laser marking

The TOPMARK NEO marking system enables you to flexibly implement the requirements of challenging identification applications. With modern laser technology, you can create durable and resilient marking materials for use in industrial applications. The laser marker processes materials in card and sheet format, creating markings that impress with their excellent resilience against a wide range of environmental and mechanical influences. The marking is just as robust as the marking material itself. Preset parameters ensure easy operation, without requiring any specialist knowledge of lasers.



More information starting on page 12



# Thermal transfer printing

## Reliable, easy, flexible

During the thermal transfer printing process, the desired print image is generated through a spot heat generation of the ink ribbon without greater mechanical influence of the marking material (Greek thermós = warm). Thermal transfer printers are extremely easy to service due to their low-maintenance operation. In thermal transfer printing, the three components comprising the printer, marking material, and thermal transfer ribbon determine the print quality. If their interaction is optimally coordinated, this ensures high-quality, resistant printing results.



# Thermal transfer printing in detail

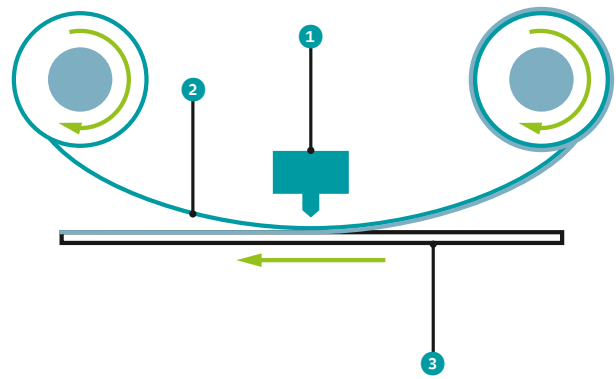
## Did you know...?

There are essentially three different ink ribbon types. Wax ribbons are optimally designed for printing on paper. Resin ribbons, in contrast, are particularly well-suited for foil and plastic printing. They are resistant to a variety of environmental influences. Mixed ribbons made of wax and resin lie between the two types of ribbon in terms of their properties.

## The printing method

In thermal transfer printing, the ink ribbon is fed along the print head in synchronization with the marking material. The heating elements of the print head are heated according to the desired print image. The heat and contact pressure initiate precise ink transfer to the marking material.

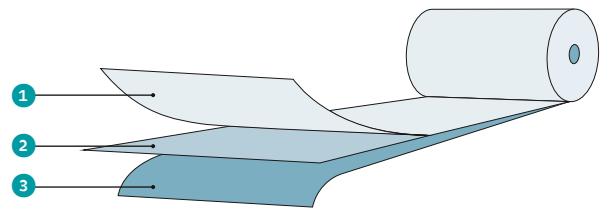
(1) Print head (2) Ink ribbon (3) Marking material



## The structure of the ink ribbon

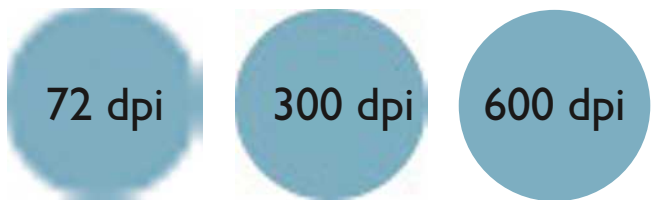
The ink ribbon consists of three layers. To protect the print head, the top layer is designed for the lowest possible friction and reduced static charge. There is a polyester foil in the middle that has a heat-sensitive ink ribbon layer on one side.

(1) Top layer (2) Polyester foil (3) Ink ribbon layer



## The structure of the print head

A print head has hundreds of computer-controlled heating elements that transfer the print image. The indicator “dpi” (dots per inch) specifies the number of these elements per inch. The larger it is, the higher the resolution. When a heating element is controlled and heated, the ink layer melts and is transferred to the marking material.



## UV LED printing

### Versatile, resistant, intuitive

UV LED printing technology is based on the curing process of a printing fluid with UV light. LEDs generate this light on an area of 1 cm<sup>2</sup> with very high intensity. No heat is generated during this process, so the resulting markings can be used immediately. The printed plastic or metal markings have high wipe and scratch resistance and are resistant to chemicals.





# UV LED technology in detail

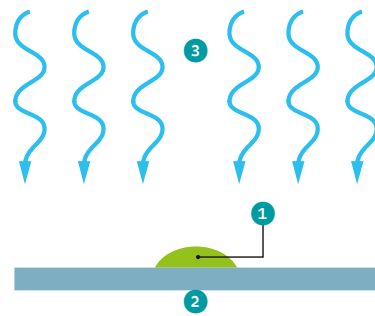
## Did you know...?

Inkjet printers work with two different printing technologies: While a **continuous inkjet** dispenses permanent ink drops, the printer applies color only when needed with the **drop-on-demand technology**. BLUEMARK ID printing systems communicate with numerous small ink nozzles via tiny electrical pulses. This method conserves resources, can be implemented with solvent-free fluid, and results in a high-quality print image.

## The printing method

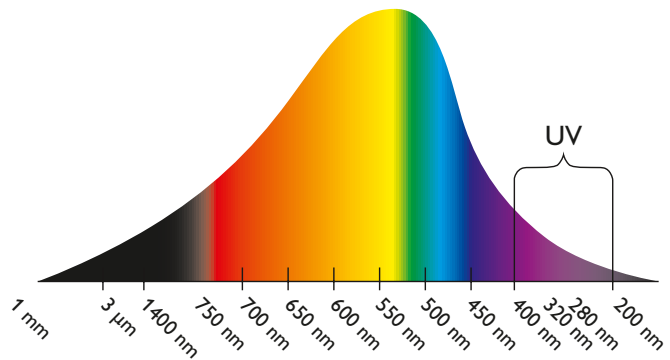
The print head creates individual drops of ink and propels them in the direction of the marking material. The drops of printing fluid are applied in lines below the print head through the movement of the marking material. In the same step, UV radiation cures the fluid without a heating effect.

(1) Printing fluid (2) Marking material (3) UV LED radiation



## The light source

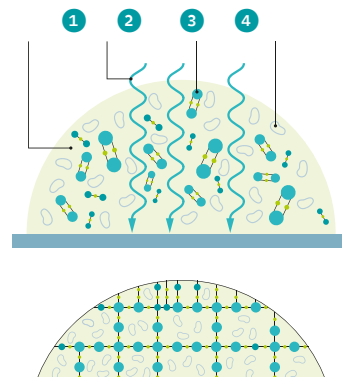
A UV LED generates UVA radiation in precisely the relevant wavelength for the printing process. The LED technology enables the emitted light to be generated in a significantly narrower range than with traditional, energy-intensive UV lamps. This creates significantly less scattered light. In addition, the process releases hardly any heat.



## The printing fluid

The BLUEMARK ID printing systems use a printing fluid. It contains an initiator that reacts with the binder of the fluid when exposed to UV radiation. This creates polymers (molecular chains) that surround the color pigments and thereby cure the fluid.

(1) Printing fluid (2) UV radiation (3) Polymers (4) Color pigments



# Direct laser marking

## Resilient, long-lasting, high-quality

During laser marking, a focused laser beam is guided over the component to be marked. Depending on the material, there are various options for creating the contrast required with the base material. The selection of the appropriate marking method for the respective application is crucial. If all the parameters are well matched, this results in markings that impress with their excellent resilience against a wide range of environmental and mechanical influences.



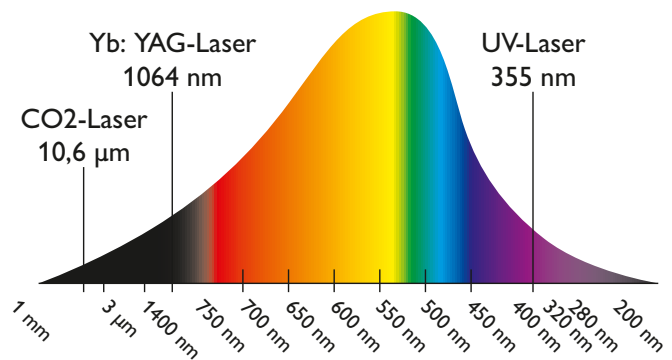
# Laser marking in detail

## Did you know...?

Lasers are often categorized and named based on the properties of the laser medium used. The roughest classification is determined by the state of aggregation. An important gas laser, for example, is the CO<sub>2</sub> laser emitting at 10.6 μm. The group of solid-state lasers includes lasers whose laser media consist of crystals. One of the commonly used solid-state lasers is the Nd:YAG laser. Many options exist for the shape of the solid state, such as the rod laser, disk laser, and fiber laser.

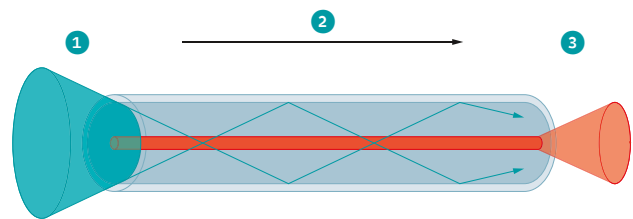
## The wavelength

Depending on the application, the selection of the wavelength and, with it, the laser type is crucial. Lasers with a wavelength of 10.6 μm are mainly used to process non-metallic materials such as wood, leather, glass, or stone. Lasers with a wavelength of 1,064 nm are particularly suitable for contrast-rich markings on plastics, steel, and aluminum. The basis for this is the great depth effect of the 1,064 nm wavelength, among other things. In contrast, UV lasers emit a wavelength of just 355 nm and are suitable for marking particularly sensitive materials.



## The fiber laser

A fiber laser is a special type of solid-state laser in which the doped core of a glass fiber forms the active medium. In other words, it involves a glass laser with fiber-optic properties. The laser beam, which is guided through the laser-active fiber, undergoes a very high amplification due to the large length. Fiber lasers also offer high electrical-to-optical efficiency, outstanding beam quality, and a long service life. The robust, compact, and low-maintenance design is also impressive.

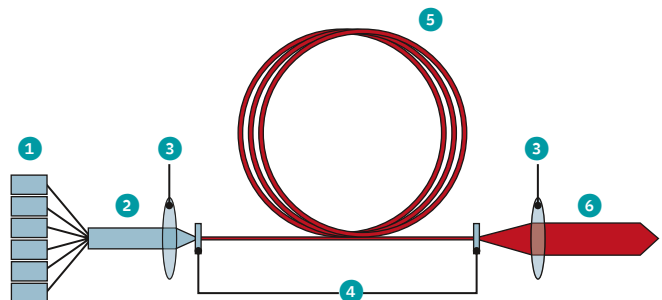


(1) Pump radiation (2) Laser-active fiber (3) Laser beam

## The laser source

A pulsed ytterbium fiber laser feeds radiation from multiple pump laser diodes into a single-coupling optic. After exiting the central part of a glass fiber doped with ytterbium ions, the laser beam enters an optical fiber. A special optic then focuses the beam.

(1) Laser diodes (2) Single-coupling optic (3) Lens (4) Resonator (5) Active fiber (6) Laser beam





# Direct laser marking

## Different methods for optimal results

The process of laser marking changes the marking material itself. Therefore, the method applied and the energy needed for it depends on the material used. This results in resilient, long-lasting identification solutions since the resistance of the marking corresponds to the resistance of the material. The TOPMARK NEO uses a fiber laser to generate the laser beam. The advantage of this technology is the high beam quality, and therefore a high resolution, since the laser beam is generated directly in the glass fiber.

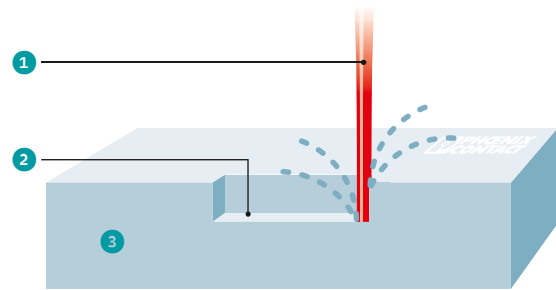


# An overview of direct laser marking

## Engraving solid material through abrasion

During the engraving process, the laser beam meets the surface of the solid material. The heat generated vaporizes the material and thus removes it. The resulting indentation is equivalent to what is known as the engraving.

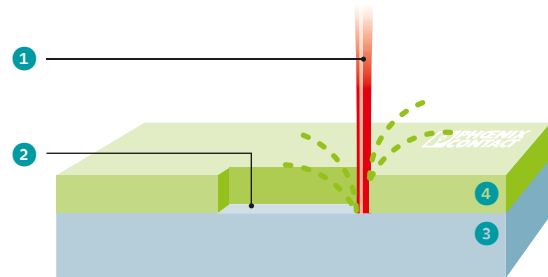
(1) Laser beam (2) Engraving (3) Base material



## Engraving through abrasion of the top layer

The abrasion of the top layer makes the base material visible. This process is typically used for anodized aluminum, coating layers, or special laser marking films. The different visible material layers create the color contrast for the marking.

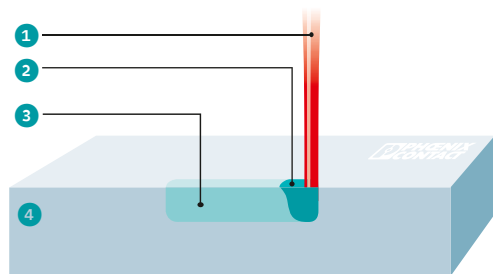
(1) Laser beam (2) Engraving (3) Base material (4) Top layer



## Marking by means of annealing marking

In annealing marking, the laser applies an oxide layer in the workpiece. The color of the layer depends on the temperature. No material is removed in this case, so the surface of the workpiece remains smooth and even.

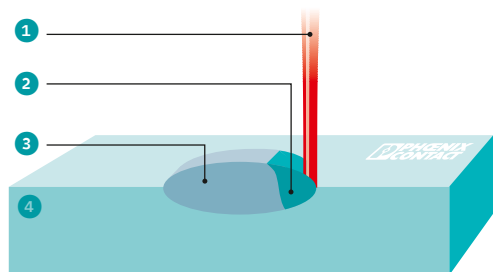
(1) Laser beam (2) Heated area (3) Cooled area (4) Base material: steel



## Marking by means of carbonization and/or foaming

This method creates a marking by melting the material. Carbonization is suitable for light-colored plastics because it causes a darkening of the material. By contrast, foaming forms small gas bubbles in plastic that reflect the light and thus create light-colored markings on dark plastic.

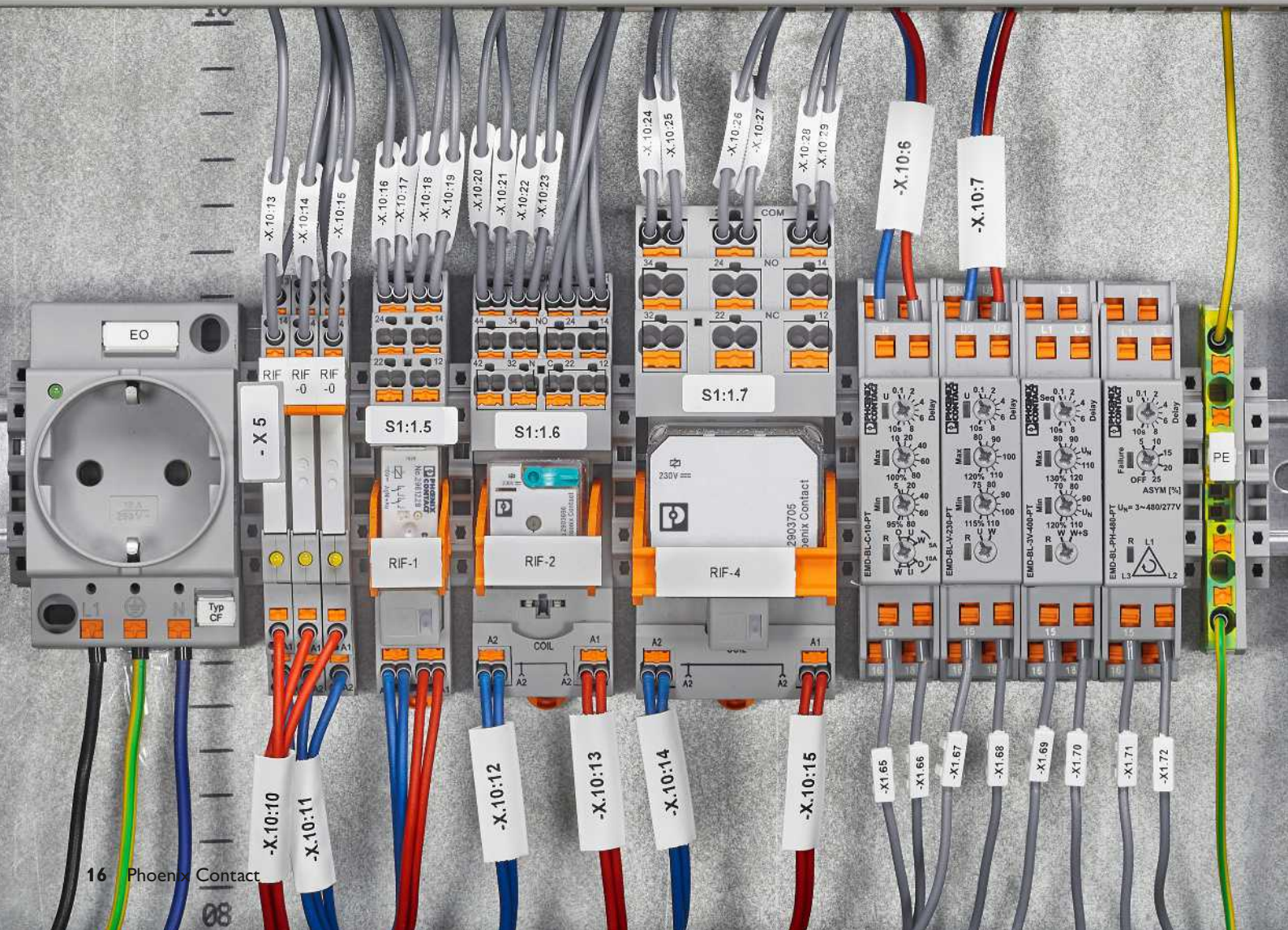
(1) Laser beam (2) Heated area (3) Cooled area (4) Base material: plastic





# Marking materials Solutions for every application

The MARKING system product range offers marking materials for the identification of terminals, wires and cables, equipment, and plants. Choose any solution you want from a large selection of various base materials, formats, and mounting options. The durability of the markings, even under extreme conditions, has been proven in numerous laboratory tests and satisfies all international norms and standards.



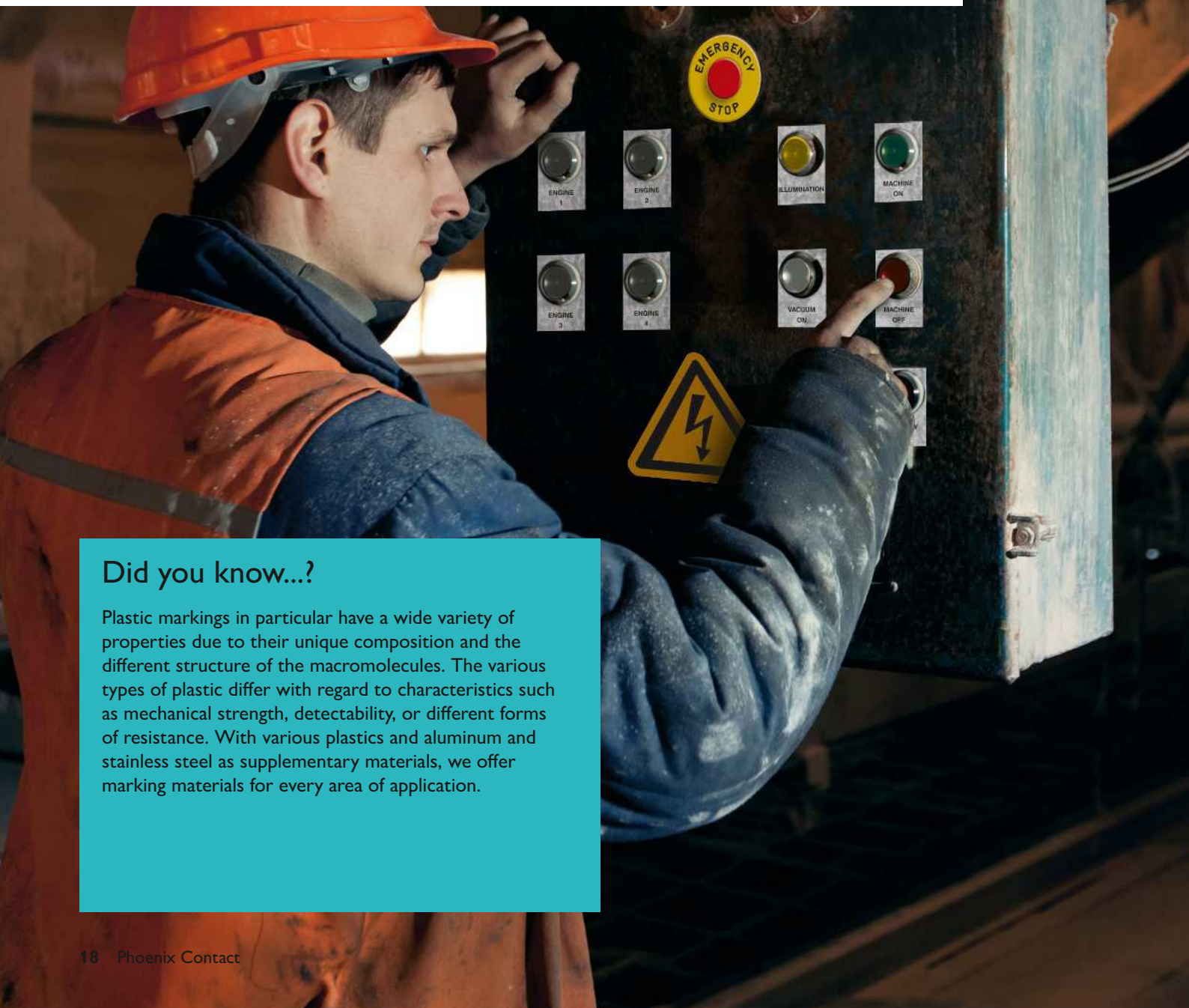




# Marking materials

## Solutions for special applications

Increasing complexity and networking in the industrial world calls for the clear and durable identification of all components. Different applications require different marking methods. Markings in outdoor installations require different materials and processes compared to what is needed for the identification of a terminal block in the control cabinet. Phoenix Contact offers a comprehensive portfolio of high-quality, special marking solutions for a wide range of applications.



### Did you know...?

Plastic markings in particular have a wide variety of properties due to their unique composition and the different structure of the macromolecules. The various types of plastic differ with regard to characteristics such as mechanical strength, detectability, or different forms of resistance. With various plastics and aluminum and stainless steel as supplementary materials, we offer marking materials for every area of application.

# Resistant even under extreme conditions

## Adhesives with special properties

Labels consist of an upper material, an adhesive material, and a carrier material. For a marking that can be removed without leaving any residue, the pressure-sensitive adhesive has a physical bonding effect and does not require any additional curing time. It hardens when the label is applied with pressure. The adhesive strength is produced without diffusion effects, so no residue remains when it is removed. A special metallized adhesive on tamper-proof labels ensures that a silver triangular pattern is left on the label and the surface when the label is removed.

**i** Web code: #3282



## Durable cable markers

Cable markers made of polypropylene (PP) are highly durable. The material is characterized by its strength, thermal resistance, moisture resistance, and resistance to chemicals. Marking using the TOPMARK NEO laser marker protects both the marking material and the marking itself from environmental and mechanical influences. The markers are therefore suitable for the most demanding industrial requirements.

**i** Web code: #3283



## Robust metal labels

The biggest advantage of metal labels is their resistance and durability. Unlike most plastics, the use of metallic base materials is possible even under extreme ambient conditions. Therefore, these materials are increasingly used in particularly harsh industrial environments and are also particularly suitable for use in outdoor installations. Metal labels engraved with the TOPMARK NEO laser marker are virtually indestructible.

**i** Web code: #3284



## Detectable marking materials

The food industry is subject to stringent hygiene and safety requirements. Marking materials must withstand the daily cleaning of production equipment with aggressive cleaning agents and must not be impaired or even destroyed as a result of this. The high adhesive strength of the labels allows them to adhere to rough, textured, and low-energy surfaces. However, if marking materials are damaged, even the smallest fragments must be identifiable. An integrated aluminum layer makes the labels detectable and thus traceable.

**i** Web code: #3285

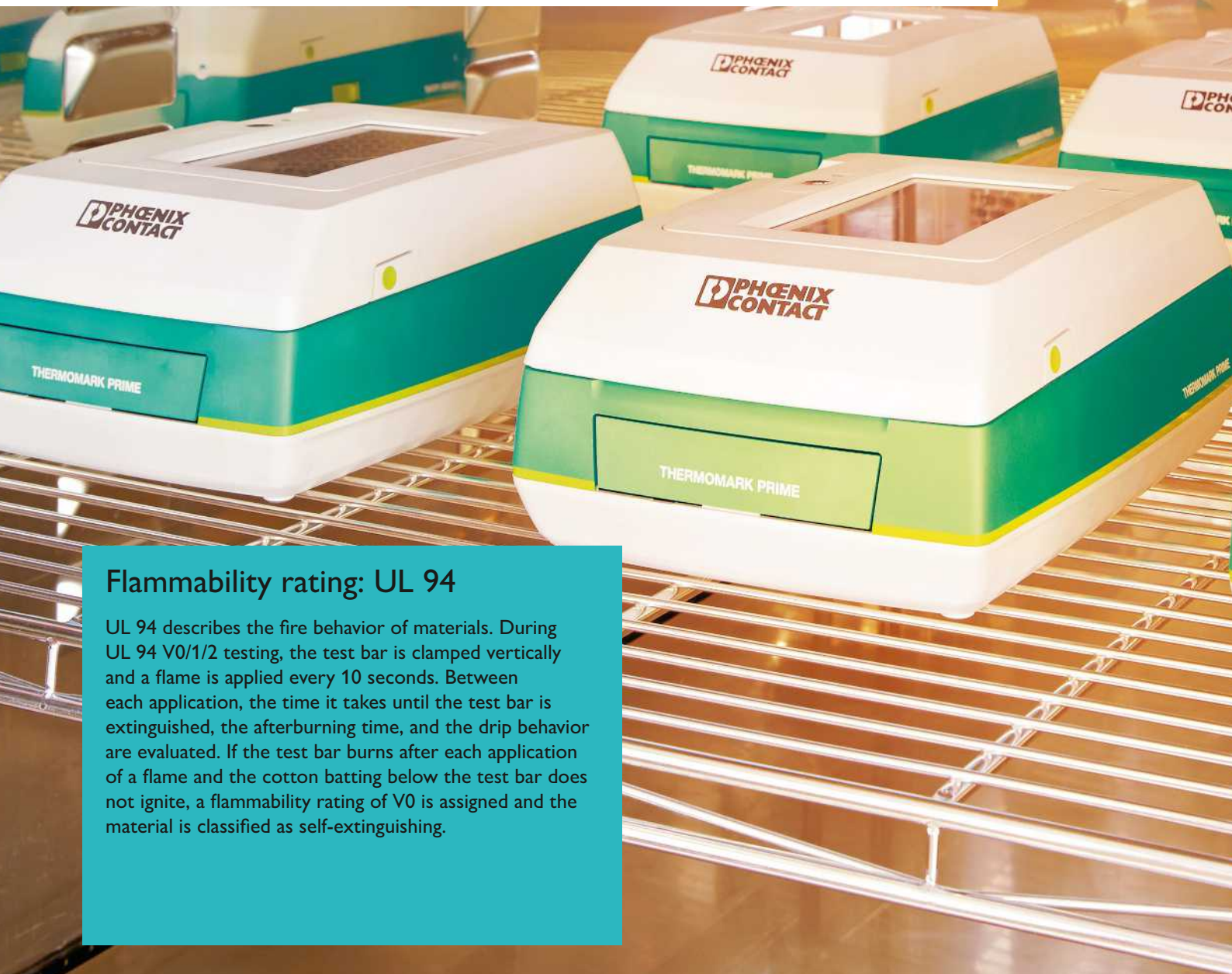




# Industrial identification

## Environmental tests

Marking materials and their markings must be particularly resilient depending on their area of application. To ensure clear and durable identification, the properties of the base material must not be able to change too drastically. The quality of the printing must remain constant. Phoenix Contact strictly uses tested materials that fulfill the requirements set by various standards in every respect.



### Flammability rating: UL 94

UL 94 describes the fire behavior of materials. During UL 94 V0/1/2 testing, the test bar is clamped vertically and a flame is applied every 10 seconds. Between each application, the time it takes until the test bar is extinguished, the afterburning time, and the drip behavior are evaluated. If the test bar burns after each application of a flame and the cotton batting below the test bar does not ignite, a flammability rating of V0 is assigned and the material is classified as self-extinguishing.

# Certified quality for your applications

## Weathering and radiation: DIN EN ISO 4892-2

To simulate several years of use outdoors, the marking materials are exposed to cyclical stresses through UV radiation and humidity. In this way, artificial weathering can be created, which provides an insight into the mechanical properties and the appearance of a material.



## Chemical resistance: DIN EN ISO 175

Liquid oils and chemicals can trigger physical or chemical reactions that have a negative impact on the base material. Both the mechanical properties of a plastic and the durability of the marking can be affected. Tested materials withstand these influences.



## Wipe resistance: DIN EN ISO 61010-1 and DIN EN 62208

To ensure the wipe resistance of markings in an industrial environment, the markings undergo a test with isopropanol, n-hexane, and petroleum ether. A cloth is soaked in the respective chemical and wiped over the marking material with a defined force for 30 s. After the test, the marking must still be clearly legible.



## Condensation changing climate: DIN 50018

To test the resistance of the materials to corrosion damage, they are exposed to a condensation changing climate with a sulfur dioxide atmosphere at +40°C. An acidic atmosphere forms during the test. Finally, a microscopic visual inspection of the materials is performed.



## Salt spray: IEC 60068-2-11/-52

Particularly in shipbuilding and in offshore applications, the markings must withstand corrosive atmospheres containing salt. To ensure this can be achieved, the resistance of the materials is tested through salt spray in a corrosive atmosphere. A visual inspection is performed after the test.





# Industrial identification

## Environmental tests

In addition to environmental influences, marking materials and their markings are often subjected to mechanical influences. It must not be possible to scratch the marking off and abrasive industrial cleaning agents must not render the marking illegible. Furthermore, the marking materials must also remain securely fixed in place even when subjected to vibration. The materials used by Phoenix Contact also fully satisfy all standards and requirements in this area.

### FINAT test methods

There are a total of 24 FINAT test methods for adhesive label material. Phoenix Contact tests label materials in accordance with test methods 1, 2, and 9.

Test methods 1 and 2 test the permanent adhesion to various base materials at peeling angles of  $180^\circ$  and  $90^\circ$ , respectively. In contrast to these, test method 9 tests the initial adhesive strength (loop tack). This is the force necessary to separate a loop of the test material that is affixed to a test surface at a specified speed.



# Certified quality for your applications

## Scratch resistance: DIN EN ISO 1518

Using an Erichsen hardness test pencil, the scratch resistance of markings is tested by exposing them to point or linear stress. A defined force is applied to an engraving needle via spring tension. The spring tension under which the Erichsen hardness test pencil leaves a barely visible trace is the deciding factor.



## Grid test: DIN EN ISO 2409

The Tesa test is used to test the adhesion of printing. A transparent self-adhesive tape with an adhesive strength of  $10 \pm 1$  N is applied to the printing to be tested and is then removed from the surface at an angle of  $60^\circ$  to the pull-off direction. There should be no marks from the printing on the adhesive tape after the test.



## Adhesion: FINAT 1, 2, and 9

To determine the adhesive strength of a label on a base material, a strip of labels (25 mm x 175 mm) is applied with a specified force. The test sample is then removed after a defined wait time, at a predefined angle, at 300 mm/min. The adhesive strength is specified in N/25 mm.



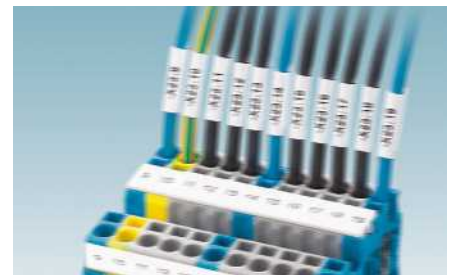
## Degrees of protection: DIN EN 60529/ISO 20653

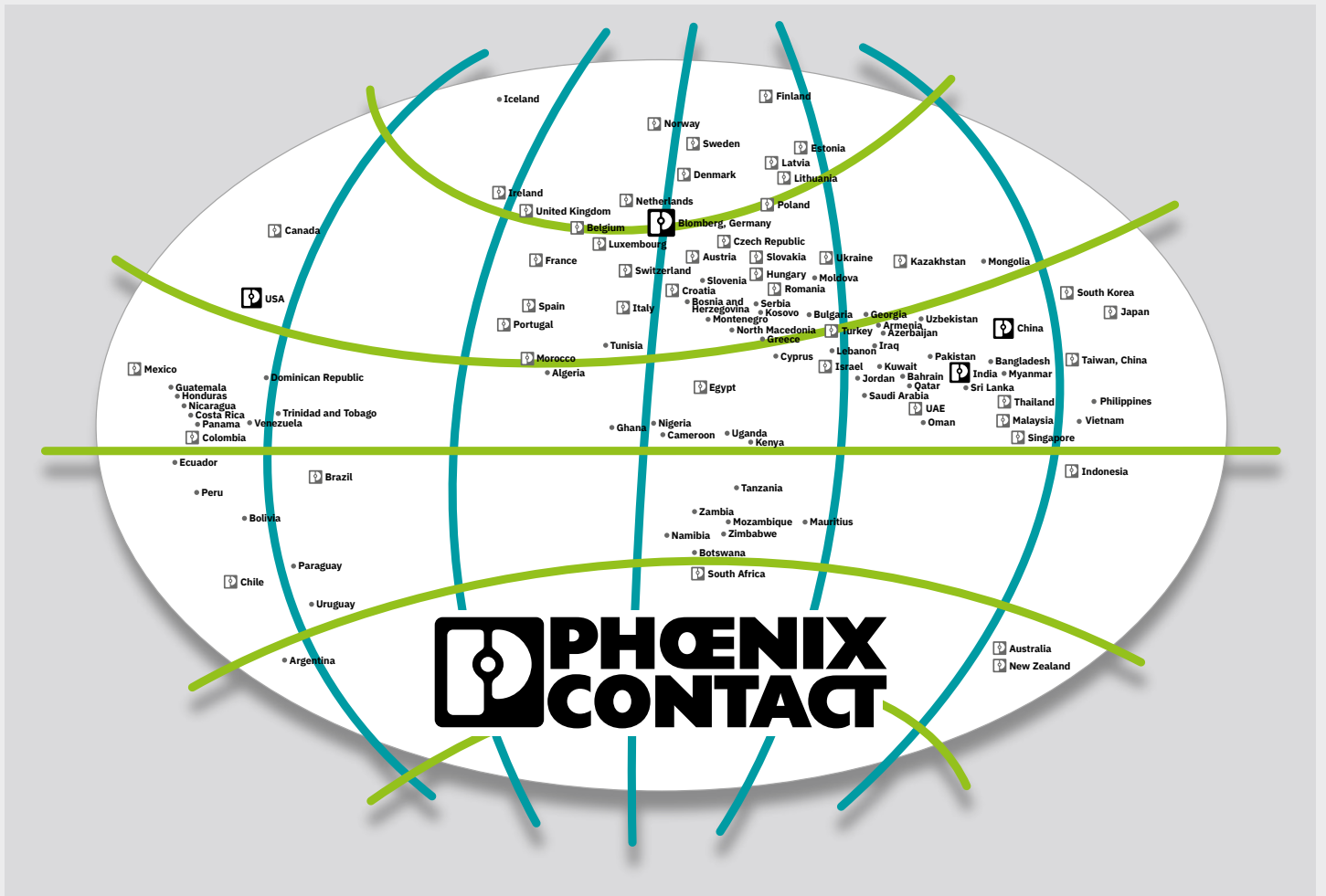
Differing ambient conditions and requirements necessitate a clear classification of markings in IP degrees of protection. These are indicated by a code consisting of two numbers following the IP abbreviation. The first number describes the scope of protection against the ingress of foreign bodies, and the second the tightness of seal against moisture.



## Vibrations: DIN EN 50155

To simulate vibration stress that occurs in practice (e.g., in the railway industry), the marking materials are exposed to increasing and decreasing frequencies and amplitudes. They are tested in the three axes (x, y, z) for five hours each, and must not be damaged and their secure positioning must not have been impacted.





## Open communication with customers and partners worldwide

Phoenix Contact is a global market leader based in Germany. We are known for producing future-oriented products and solutions for the electrification, networking, and automation of all sectors of the economy and infrastructure. With a global network reaching across more than 100 countries with over 21,000 employees, we maintain close relationships with our customers, something we believe is essential for our common success.

Our wide range of innovative products makes it easy for our customers to implement the latest technology in a variety of applications and industries. This especially applies to the target markets of energy, infrastructure, industry, and mobility.

You can find your local partner at  
[phoenixcontact.com](http://phoenixcontact.com)