



Marking solutions for electronics production MARKING system

The complete marking range for electronics production

Phoenix Contact can provide marking solutions for numerous applications, from unique identification of components, through traceability in the production process, to protection against tampering and counterfeiting.



Printed circuit board

Protect the traceability of your products with resistant marking. Phoenix Contact labels will help you to cut costs but not quality. High-definition barcodes ensure that information remains permanently available.



Housing marking

Professional device labeling is a walking advertisement for your products. Labeling materials from Phoenix Contact can be relied upon for clear and durable marking from front panel to rating plate.

Marking systems benefiting from the expertise of electronics specialists

Phoenix Contact is one of the world's leading manufacturers of electronic components and systems for industrial automation technology. Our production activities have helped us build up a wealth of expertise in all aspects of marking, which we are now happy to share with our customers. Here at Phoenix Contact, you can expect products that have already proven their worth in thousands of practical applications.

We can provide you with materials and devices that have been customized to meet the specific challenges encountered when marking

- PCBs
- Housings
- PCB terminal blocks and plug-in connectors
- Cables and lines

The complete marking portfolio for electronics production.

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THERMOMARK ROLL

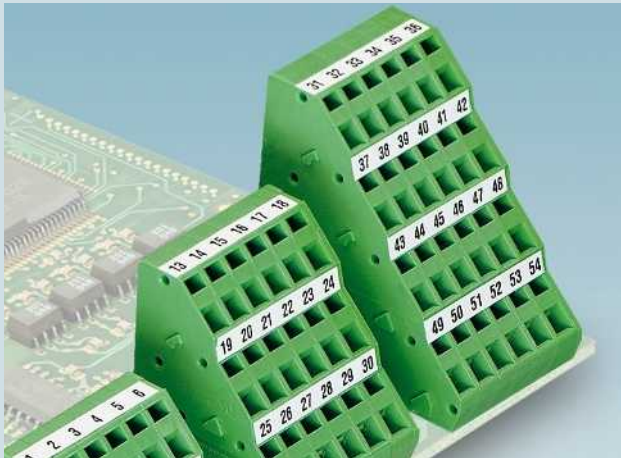
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PCB terminal block and plug-in connector marking

With clear and rugged terminal marking, your products can be wired reliably and conveniently. Choose materials from the market leader in PCB connection technology when marking your device connections.



Cable and conductor marking

Thanks to our optimized printing technologies and resistant materials, even markings exposed to significant stress remain permanently legible.

Marking expertise

Phoenix Contact marking materials provide an assurance of long-lasting durable marking for components and parts. Their high quality is demonstrated by recognized tests which are documented in national and international standards.



Test passed

- ▶ Grid test
- ▶ Adhesive strength test
- ▶ Resistance to abrasion
- ▶ Scratch resistance
- ▶ Abrasion and wipe resistance

Mechanical tests

- ▶ UV light resistance
- ▶ Solvent resistance
- ▶ Resistance to oil and chemicals

Environment tests

- ▶ Halogen-free protection against flames
- ▶ Inflammability classification
- ▶ Material properties

Material tests

Material properties

Polyvinyl chloride (PVC)

PVC has a long service life. It is characterized by its high mechanical strength and chemical resistance. Neither oxygen nor ozone affects PVC. The material is resistant to corrosive salt solutions and most acids. The polyvinyl chloride used by Phoenix Contact is silicone-free and is suitable for use in temperatures between -30°C and +80°C.

Polyester

Polyester is a chemical-resistant material. It is ideally suited to printing, shaping, and punching. Polyester is resistant to UV radiation and absorbs little moisture. The polyester used by Phoenix Contact is silicone and halogen-free. Depending on its composition, it is suitable for use in temperatures between -40°C and +150°C.

Polyolefin

Polyolefines are semi-crystalline thermoplastics, which can be easily processed as extrusion profiles (shrink sleeves). They are characterized by good chemical resistance. Silicone-free, temperature range: -55°C to +125°C.

Polycarbonate (PC)

Polycarbonate has high mechanical strength and chemical resistance. Rigidity, dimensional stability, and good heat distortion resistance are further distinguishing features of this material. Polycarbonate is used to manufacture particularly smooth and stable marking materials. The polycarbonate used by Phoenix Contact is silicone and halogen-free. It absorbs little moisture and is suitable for use at temperatures between -40 °C and +125 °C.

Polyurethane (PU)

Thermoplastic polyurethane is a highly-flexible and also extremely tear-proof material. PU is chemically very resistant. The material used by Phoenix Contact is free from halogen and attains the inflammability class UL 94 V0. Temperature range: -25 °C to +80 °C.

Polyimide (PI)

Polyimide is a high-performance plastic and is distinguished by its high resistance to weather conditions and chemicals. The material is free from silicon and halogen.

In addition, it also has a very high resistance to temperature. Temperature range of polyimide foil: permanent exposure from -40 °C to +170°C, brief exposure up to +398 °C.

Polyamide (PA)

Even at high operating temperatures, polyamide has excellent electrical, mechanical, chemical and thermal properties. Brief peak temperatures of up to 200°C are permitted as a result of heat aging stabilization. PA belongs to inflammability class V2 to V0 as per UL 94. The polyamide used by Phoenix Contact is silicone and halogen-free and is suitable for use in temperatures between -60°C and +125°C.

Inflammability classification

► UL 94

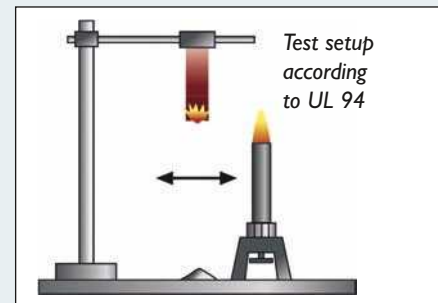
UL 94 describes inflammability tests that have gained particular importance in the field of electrotechnology. Behavior in fire is the main focus. Items are classified according to either UL 94 HB (Horizontal Burn) or UL 94 V (Vertical Burn). The test setup is such that the 94 V0/1/2 classifications are stricter than the 94 HB classification.

UL 94 V0/1/2

After conditioning, the test bar is vertically clamped and flame-treated several times for 10 seconds each. Between the

flame treatments, the time until the test bar is extinguished is measured. Afterwards, the afterburning times and the drip behavior are evaluated. The test procedure laid down by this standard is not suitable for foils and/or very thin test objects that shrink under the heat of the flame.

The plastic used for Phoenix Contact products fulfills the higher-grade criteria.



Classification

	UL 94 V0	UL 94 V1	UL 94 V2	UL 94 HB
Burning time after each flame treatment	≤ 10 s	≤ 30 s	≤ 30 s	–
Total burning time after 10 flame treatments	≤ 50 s	≤ 250 s	≤ 250 s	–
Glowing time after the 2nd flame treatment	≤ 30 s	≤ 60 s	≤ 60 s	–
Complete burn-off	No	No	No	Yes
Inflammation of the absorbent cotton under the sample	No	No	Yes	–

Halogen-free protection against flames

► DIN EN ISO 1043-4

Halogens are the chemical elements astatine, fluorine, chlorine, bromine, and iodine. One characteristic of the halogen compounds of bromine and chlorine relates to the reduction in the degree of inflammability when used in plastics. In the event of fire, poisonous corrosive gases are formed, which can also lead to secondary damage as a result of the extinguishing water. For this reason, wherever possible, Phoenix Contact does not use any flame protection agents which

contain halogen or other additives. Polyamide, polycarbonate, polyester, polyurethane and polyolefines feature halogen-free flame protection systems.



Resistance to oil and chemicals

► DIN EN ISO 175

Physical and/or chemical processes/reactions can occur as a result of external media, such as liquids or gases. This can result in a change to the plastic's properties, the plastic becoming damaged or even destroyed. Imprints and labels can also be affected by these changes.

In order to prevent this from happening, Phoenix Contact uses only plastics and printing/labeling materials which have been tested in accordance with DIN EN ISO 175.



Chemical	Weight %
Alkalis	
Sodium hydroxide solution	3
Potassium hydroxide solution	3
Ammonium hydroxide (ammonia water)	25
Alcohols	
Ethanol	100
1-propanol	100
2-propanol	100
Diethylene glycol	100
Aldehyde/ketones	
Ethyl acetate	100
Oils, greases, aliphatic and aromatic hydrocarbons	
IRM 902	100
IRM 903	100
ASTM No. 1	100
Xylol	100
Test benzene (180/220)	100
Hycut SU 68	100
Hycut SET 46	100
Shell Tellus 92	100
Aqueous salt solutions	
Sodium chloride	5
Potassium chloride	5
Ammonium chloride (ammonia solution)	100



Resistance to solvents

► EN 60464-2:2001

Imprints and labels must be resistant to solvent vapors. Therefore, in accordance with the aforementioned standard, exposure to solvents is continued over 10 days in the following atmospheres:

- Acetone
- n-hexane
- Ethanol

The labels and imprints must still be legible after the 10-day exposure.

Phoenix Contact marking materials are solvent-resistant and fulfill the stringent requirements.



UV light resistance

► DIN EN ISO 4892-2 and DIN EN ISO 60068-2-5

In addition to infrared radiation, the solar radiation affecting the surface of the earth has radiation ranges from the UV-A and UV-B spectrum. Depending on the plastic used, the UV-B part of the wavelength of 320 nm induces a more or less strong molecular decomposition that is responsible for a considerable restriction of the plastic's mechanical property profile. Even the properties of imprints and labels can sustain damage to a greater or lesser extent due to this UV radiation. This results in fading and can even lead to complete illegibility.

If plastics and their imprints and labels are often subjected to day/night cycles outdoors, condensation may appear on the surface in the form of water droplets, which can act in a similar way to magnifying glasses when the sunshine returns, thus intensifying the radiation effect. The UV-B part of the solar spectrum in particular leads to an impairment of the plastic's mechanical property profile.

Marking materials from Phoenix Contact can be stored in dry as well as humid atmospheres under UV radiation and are tested in accordance with the aforementioned standards. The properties of the plastic and the legibility of the imprints and labels are checked after the test.



Abrasion and wipe resistance

► DIN EN 61010-1

Labels and imprints must be resistant to the standard cleaning agents used in the industry. Therefore, at Phoenix Contact, labels and imprints are rubbed using a soft cloth with water, isopropanol, petroleum ether, and n-hexane. The labels and imprints must still be legible after the test.

Phoenix Contact marking materials meet stringent requirements with regard to abrasion and wipe resistance and can thus be used in all applications.



Scratch resistance

► DIN EN ISO 1518

Labels and imprints must also be resistant to external, point and/or linear mechanical loads. For this reason, Phoenix Contact tests all labels and imprints for scratch resistance in accordance with the aforementioned standard. The test is carried out by applying a scratching tool with a hemispherical tip ($\varnothing$ 1 mm) to the test objects. Depending on the printing

procedure, a force of between 2 N and 6 N is applied. This is followed by a visual and microscopic inspection of the test objects.

Phoenix Contact marking materials meet these stringent mechanical requirements.



Resistance to abrasion

► KIMW 003, Part 1 In-house standard of the Lüdenschied Plastics Institute

Labels and imprints must be resistant to externally applied surface loads. Therefore, at Phoenix Contact, labels and imprints are subjected to various numbers of strokes (1000, 10,000, 30,000) using a felt disk (hardness H1 according to DIN 61200) with a specific

pressure force (1 N, 2 N and/or 4 N). Classification into the various load classes presented in the standard depends on the pressure force that leads to damage to the printing with reference to the number of strokes.

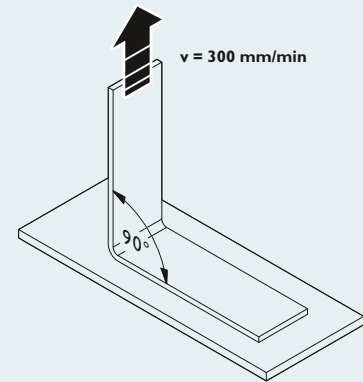
The imprints and labels at Phoenix Contact comply with the highest load class K9 (30,000 strokes with 4 N pressure force).

Adhesive strength test

► based on FINAT test method No. 2

The purpose of this test is to compare the adhesive strength of labels on various basic materials. To this end, a strip of labels (25 mm x 175 mm) is applied to the respective basic material with a specified force. After a defined storage period, the strip is removed from the basic material at an angle of 90° and with a speed of 300 mm/min. The adhesive strength is

specified in N/25 mm. The test thus enables the selection of the most suitable label for the application.



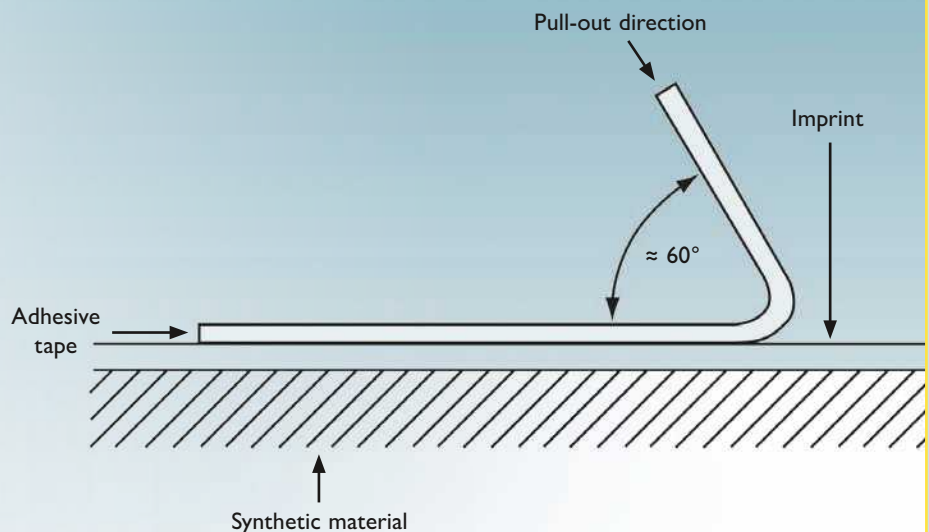
Grid test

► DIN EN ISO 2409

A "Sellotape test" is conducted in accordance with this standard. A transparent self-adhesive tape (e.g., Sellotape) with an adhesive force of 10 ± 1 N is applied to the labeling or printing to be tested and is then removed from the surface with an angle of 60° to the pull-out direction with a speed of approx. 1 cm/s.

There should be no marks from the printing on the adhesive tape after the test.

Phoenix Contact marking materials are tough and resistant to peeling.



Printed circuit board

Use Phoenix Contact labels for secure and reliable marking of your PCBs.

We can provide ESD-safe materials for labeling and marking components that are particularly sensitive.

Our range features residue-free removable labels for temporary marking during production.

Our high-temperature-resistant material is easily able to withstand the prevailing temperatures in reflow and wave soldering procedures.



Protection against static discharge

ESD-safe labels can be used to mark components and PCBs that are at risk from electrostatic discharge.



Removable labeling

A special adhesive ensures both the durability of the marking throughout the production process and residue-free removal (should this be necessary).



Reliable marking

Labels that are resistant to high temperatures ensure reliable marking of components and PCBs during the production process and beyond.

PHOENIX CONTACT 11

PHOENIX CONTACT 13

Housing marking

Clear housing labels can make your products more successful. Impress your customers with perfectly designed front panels, protect yourself against piracy with anti-forgery rating plates, and ensure traceability with serial numbers that are affixed permanently.

Resistant labels from Phoenix Contact are ideal for use on plastic housings and lend your device a professional design.



High resistance

High-quality materials provide an assurance of high resistance to oils and solvents.



Permanently legible

Housing labels that are wipe-proof and scratch-proof ensure that your product will remain clearly identifiable for its entire service life.



Protection against tampering

As these rating plates clearly show attempts at tampering, they cannot be reused.

Product overview for housing marking

EML rugged polyester labels

EML labels can be used for universal marking. They are particularly resistant to solvents and oils.

Material data EML

Material: Polyester
Free from silicone and halogen
Temperature: -40 °C to +150 °C



	Lettering field size [mm]	Markers per roll	Type	Order No.		
				WH	YE	SR
 Multi-web version	Standard roll, multi-web version – printing with THERMOMARK ROLL and THERMOMARK ROLL X1					
	10x4	10000	EML (10x4) R	0815583		
	10x7	10000	EML (10x7) R ...	0816663	0816676	
	15x6	2500	EML (15x6) R YE		0819288	
	15x9	2500	EML (15x9) R ...	0815677	0816045	0816032
	16.5x5	2500	EML (16,5x5) R ...	0816702	0816728	
	16x7	2500	EML (16x7) R ...	0818001	0816731	
	17.5x8	2500	EML (17,5x8) R ...	0816744	0816757	
	19x6	2500	EML (19x6) R	0816760	0800107	
	20x7	2500	EML (20x7) R YE		0816773	
	20x8	2500	EML (20x8) R ...	0816786	0816799	
	21.5x21.5	2500	EML (21,5x21,5) R SR			0816812
	24x4	2500	EML (24x4) R	0800061		
	25.4x12.7	2500	EML (25,4x12,7) R ...	0816825	0816838	
	26.5x7.5	1000	EML (26,5x7,5) R			0816841
	26.5x12	2500	EML (26,5x12) R			0816854
	26.5x17.5	2500	EML (26,5x17,5) R ...		0816896	0816883
	26.5x18.5	2500	EML (26,5x18,5) R			0816906
	26.5x26.5	2500	EML (26,5x26,5) R ...			0816919
	30x20	2500	EML (30x20) R ...	0816922	0816935	
	32x25	1500	EML (32x25) R YE		0800020	
	38x17	2500	EML (38x17) R	0816951		
	40x8	1000	EML (40x8) R	0816980		
	40x15	2500	EML (40x15) R SR			0815729
	40x25	1000	EML (40x25) R ...	0818027	0816977	
	51x25	1000	EML (51x25) R ...	0817028	0817031	0817002
	70x32	1000	EML (70x32) R ...	0817060	0817073	0817057
	70x50	400	EML (70x50) R ...	0817099		0817086
	90x5	2500	EML (90x5) R	0817109		
	100x40	300	EML (100x40) R	0800286		
	100x73	300	EML (100x73) R ...	0817125	0817138	0817112
100x90	250	EML (100x90) R ...	0817154		0817141	
Large roll – printing with THERMOMARK ROLL X1 or with THERMOMARK ROLL with external media hub						
16.5x5	10000	EML (16,5x5) RL	0816113	0816126		
17.5x8	10000	EML (17,5x8) RL		0816139		
18x6	10000	EML (18x6) RL YE		0828460		
25.4x12.7	10000	EML (25,4x12,7) RL	0816087			
38.1x19	10000	EML (38,1x19) RL	0816171			
50.8x25.4	3000	EML (50,8x25,4) RL	0816184			
69.8x31.8	10000	EML (69,8x31,8) RL	0816197			
76.2x6.5	10000	EML (76,2x6,5) RL YE		0816207		
101.6x25.4	10000	EML (101,6x25,4) RL SR			0815790	

Product overview for housing marking

US-EML rugged polyester labels

EML material is also available in card format for printing with the THERMOMARK CARD.

Material data US-EML

Material: Polyester
Free from silicone and halogen
Temperature: -40 °C to +150 °C



	Lettering field size [mm]	Markers per card	Type	Order No.		
				WH	YE	SR
	UniSheet card format – printing with THERMOMARK CARD					
	17.5x8	80	US-EML (17,5x8)	0800461	0800463	
	20x8	64	US-EML (20x8)	0800458	0800460	
	104x3.8	34	US-EML (104x3,8)	0800464		
	104x140	1	US-EML (104x140)	0800465	0800467	0800466

EML-HA high adhesive strength labels

The particularly high adhesive strength of EML-HA labels makes for optimum adhesion to low-energy materials or materials with complex structures.

Material data EML-HA

Material: Polyester
Free from silicone and halogen
Temperature: -40 °C to +150 °C



	Lettering field size [mm]	Markers per roll	Type	Order No.	
				WH	SR
 Multi-web version	Standard roll, multi-web version – printing with THERMOMARK ROLL and THERMOMARK ROLL X1				
	15x9	2500	EML-HA (15x9)R	0830600	
	19x6	2500	EML-HA (19x6)R	0830601	
	20x20	2500	EML-HA (20x20)R	0830602	
	26.5x12	2500	EML-HA (26,5x12)R	0830603	
	40x8	2500	EML-HA (40x8)R	0830604	
	40x15	1000	EML-HA (40x15)R	0830605	
	51x25	1000	EML-HA (51x25)R	0830729	
	60x30	1000	EML-HA (60x30)R	0830606	
	70x32	1000	EML-HA (70x32)R	0830607	
	70x50	1000	EML-HA (70x50)R	0830730	
	70x150	250	EML-HA (70x150)R	0830608	
	76x51	1000	EML-HA (76x51)R	0830609	
	85x32	1000	EML-HA (85x32)R	0830610	
	100x73	300	EML-HA (100x73)R	0830731	
	100x90	250	EML-HA (100x90)R	0830732	
	15x9	2500	EML-HA (15x9)R SR		0830611
	19x6	2500	EML-HA (19x6)R SR		0830612
	20x20	2500	EML-HA (20x20)R SR		0830613
	26.5x12	2500	EML-HA (26,5x12)R SR		0830614
	40x8	2500	EML-HA (40x8)R SR		0830615
	40x15	1000	EML-HA (40x15)R SR		0830616
	51x25	1000	EML-HA (51x25)R SR		0830733
	60x30	1000	EML-HA (60x30)R SR		0830617
	70x32	1000	EML-HA (70x32)R SR		0830618
	70x50	1000	EML-HA (70x50)R SR		0830734
	70x150	250	EML-HA (70x150)R SR		0830619
76x51	1000	EML-HA (76x51)R SR		0830620	
85x32	1000	EML-HA (85x32)R SR		0830621	
100x73	300	EML-HA (100x73)R SR		0830735	
100x90	250	EML-HA (100x90)R SR		0830736	

Product overview for housing marking

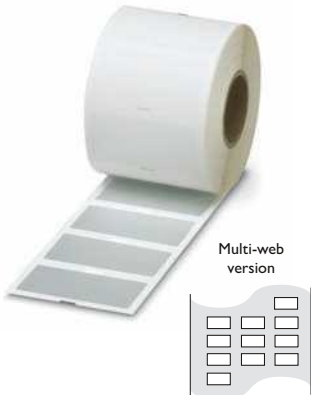
Tamper-proof labels EMLS

EMLS labels show evidence of tampering by leaving behind a pattern both in the label and on the surface of the device.

Material data EMLS

Material: Polyester
Free from silicone and halogen
Temperature: -40 °C to +150 °C



	Lettering field size [mm]	Markers per roll	Type	Order No. SR
	Standard roll, multi-web version – printing with THERMOMARK ROLL and THERMOMARK ROLL X1			
	15x9	2500	EMLS (15x9) R SR	0800347
	19x6	2500	EMLS (19x6) R SR	0800343
	20x20	1000	EMLS (20x20) R SR	0800344
	26.5x12	1000	EMLS (26.5x12) R SR	0800353
	38.1x19	1000	EMLS (38.1x19) R SR	0800354
	40x8	1000	EMLS (40x8) R SR	0800348
	45x15	1000	EMLS (45x15) R SR	0800345
	60x30	500	EMLS (60x30) R SR	0800355
	70x32	500	EMLS (70x32) R SR	0800346
	70x150	100	EMLS (70x150) R SR	0800351
	76x51	250	EMLS (76x51) R SR	0800350
	85x32	250	EMLS (85x32) R SR	0800356

EMLC and EMLF labels offering particular flexibility

The material from which the EMLC labels are made makes them very flexible; they can even be attached around edges. EMLF is particularly suited for uneven and rough surfaces.

Material data EMLC

Material: PA
Free from silicone and halogen
Temperature: -40 °C to +150 °C

Material data EMLF

Material: PVC
Free from silicone
Temperature: -40 °C to +110 °C



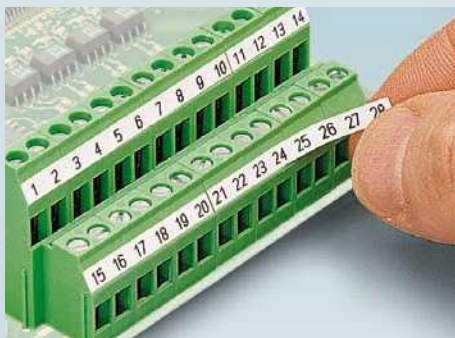
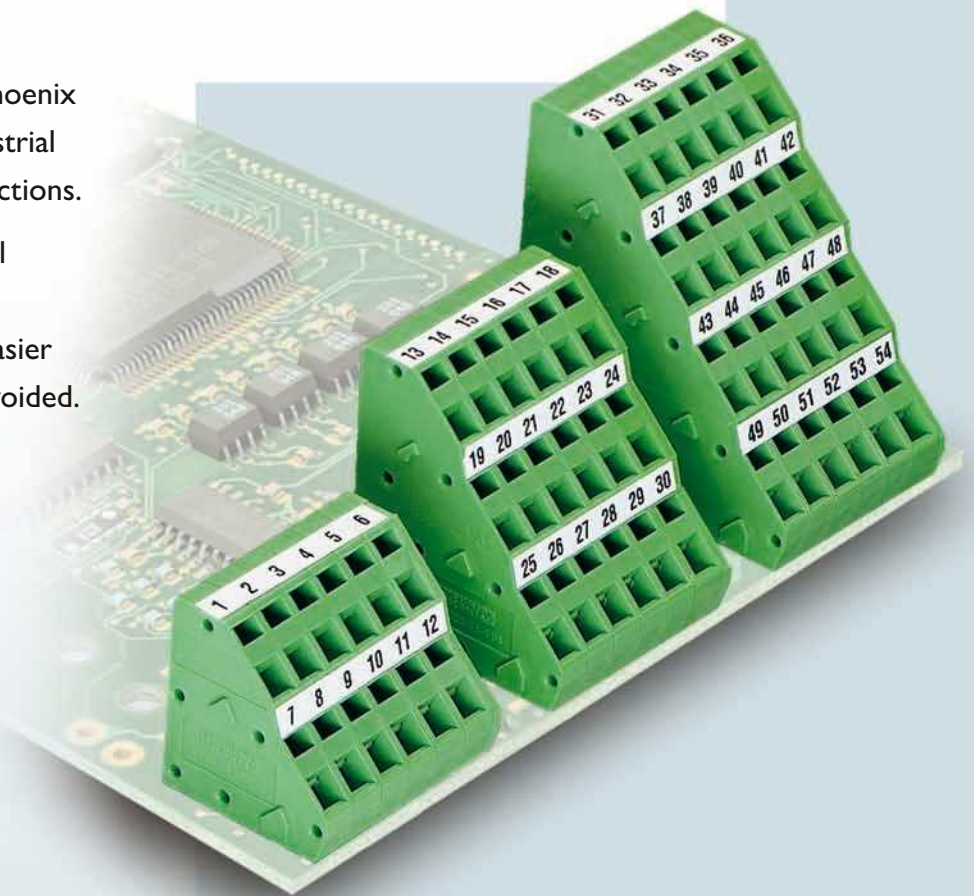
	Lettering field size [mm]	Markers per roll	Type	Order No.			
				WH	YE	SR	TR
	Standard roll, multi-web version – printing with THERMOMARK ROLL and THERMOMARK ROLL X1						
	15x9	2500	EMLC (15x9) R YE		0800236		
	17.5x8	2500	EMLC (17,5x8) R YE		0800237		
	20x8	2500	EMLC (20x8) R YE	0815680	0800235		
	25x8	2500	EMLC (25x8) R YE		0800240		
	25.4x12.7	2500	EMLC (25,4x12,7) R YE		0800238		
	38x17	1000	EMLC (38x17) R YE		0800557		
	40x8	1000	EMLC (40x8) R ...	0800554	0800555		
	51x25	750	EMLC (51x25) R YE		0800558		

	Lettering field size [mm]	Meter per roll	Type	Order No.			
				WH	YE	SR	TR
	Standard roll, continuous version – printing with THERMOMARK ROLL and THERMOMARK ROLL X1						
	108xE	40 m	EMLF (108xE) R	0800549	0800550	0800551	0800552

PCB terminal block and plug-in connector marking

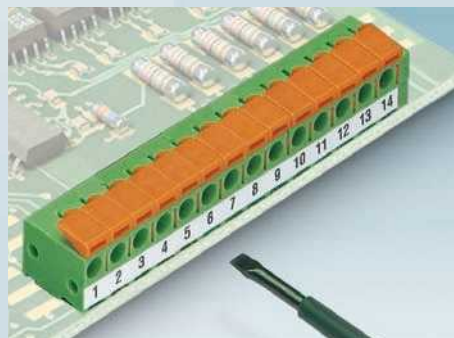
TML and SK marker strips from Phoenix Contact are the international industrial standard for marking device connections.

By labeling the connection terminal blocks individually, you simplify the wiring process. Connections are easier to identify and wiring errors are avoided. This increases acceptance of your products by users.



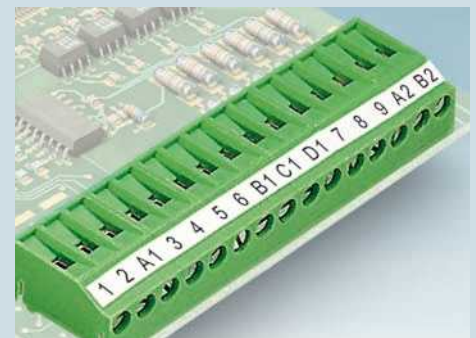
Marking after installation

Unprinted PCB terminal blocks can be labeled quickly and clearly even after they have been installed.



Permanent marking

With TML and SK labeling strips, you get an absolute assurance of optimum adhesion to the high-quality plastics from which your connection terminal blocks are made.



Individual labeling

Even very specific marking requirements such as special symbols can be met with ease.

Product overview for labeling PCB terminal blocks and plug-in connectors

Self-adhesive marker strips for TML and SK terminal blocks

TML and SK strips were developed specifically for marking connection terminal blocks and plugs. They are a reliable option for long-lasting marking.

Material data TML and SK

Material: Polyester
Free from silicone and halogen
Temperature: -40 °C to +150 °C



	Height of strip [mm]	Length of strips [mm]	Labels per roll	Type	Order No. WH
	Standard roll, strips horizontally on the role – printing with THERMOMARK ROLL and THERMOMARK ROLL X1				
	2.8	104	2500	TML (104x2,8) R	0801832
	3.8	104	2500	TML (104x3,8) R	0801833
	5	104	2500	TML (104x5) R	0801834
	10	104	1500	TML (104x10) R	0801835
	Height of strip [mm]	Length per roll [m]	Strips per roll	Type	Order No. WH
	Standard roll, strips vertically on the role – printing with THERMOMARK ROLL and THERMOMARK ROLL X1				
	2.8	30	14	TML (Ex2,8) R	0801836
	3.8	30	12	TML (Ex3,8) R	0801837
	5	30	10	TML (Ex5) R	0801838
	10	30	6	TML (Ex10) R	0801839
	Height of strip [mm]	Length of strips [mm]	Strips per card	Type	Order No. WH
	UniSheet card format – printing with THERMOMARK CARD				
	2.8	104	14	US-TML (104x2,8)	0830767
	3.8	104	12	US-TML (104x3,8)	0830768
	5	104	10	US-TML (104x5)	0830769
	10	104	6	US-TML (104x10)	0830770
	Height of strip [mm]	Pitch [mm]	Strips per card	Type	Order No. WH
	Cards, preprinted with numbers (1 – 10, 11 – 20, ..., 91 – 100)				
	2.8	2.54	14	SK 2,54/2,8:FORTL.ZAHLEN	0804853
	2.8	3.5	14	SK 3,5/2,8:FORTL.ZAHLEN	0804073
	2.8	3.81	14	SK 3,81/2,8:FORTL.ZAHLEN	0804109
	2.8	5.08	14	SK 5,08/2,8:FORTL.ZAHLEN	0804280
	3.8	5	12	SK 5/3,8:FORTL.ZAHLEN	0804183
	3.8	5.08	12	SK 5,08/3,8:FORTL.ZAHLEN	0804293
	3.8	6.2	12	SK 6,2/3,8:FORTL.ZAHLEN	0804374
	3.8	7.5	12	SK 7,5/3,8:FORTL.ZAHLEN	0804455
	3.8	7.62	12	SK 7,62/3,8:FORTL.ZAHLEN	0804549
	5	7.5	10	SK 7,5/5:FORTL.ZAHLEN	0804468
	5	7.62	10	SK 7,62/5:FORTL.ZAHLEN	0804552

printed horizontally

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

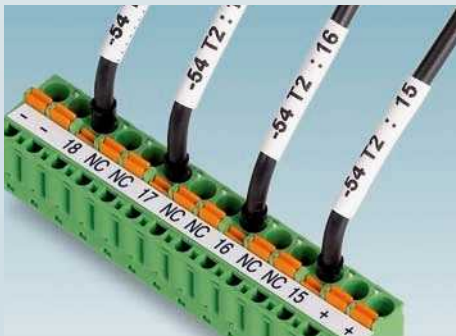
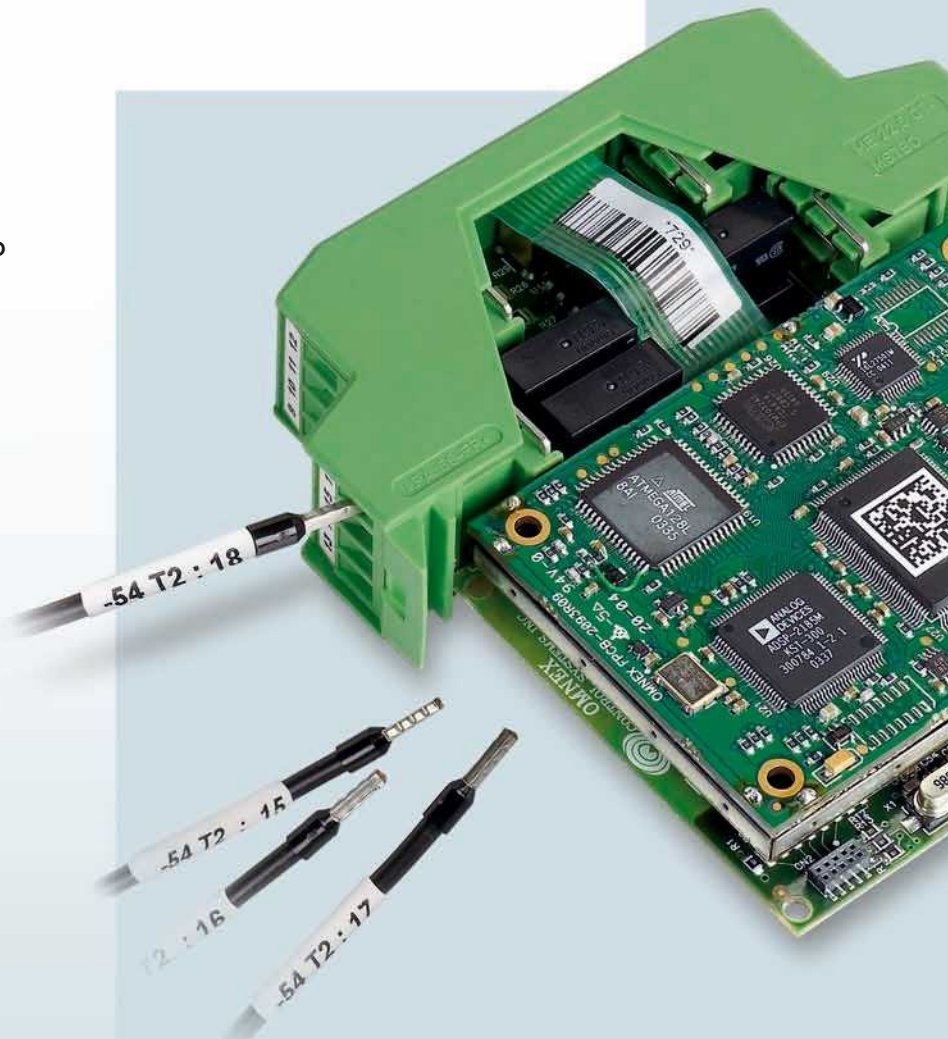
Example configuration: standard labeling

Horizontal consecutive numbering from 1 to 10 is required for 120 identical PCB terminal block strips with 5 mm pitch. Since each marker card has 12 strips, order as follows:

Quantity	Product no.	Numbers from	Numbers to
10	0804183	1	10

Cable and conductor marking

Phoenix Contact can provide the ideal marking option for any application. Just select an assembly method. The markers can be threaded on, clipped or glued into place, or attached with cable binders.



Marking that stays put

Printed shrink sleeve is a particularly durable method of marking.



Fast mounting

Thread-on markers enable multiple wires to be marked in next to no time.



Versatility in application

With self-laminating labels, even flat-ribbon cables can be marked clearly and without abrasion.

PHOENIX CONTACT 21

Product overview for cable and conductor marking

WML and US-WML labels for cable lamination

The conductor marker labels consist of a labeling field and a transparent protective foil. This is wound over the labeling and protects it permanently against contamination and abrasion.

Material data WML

Material: PVC
Free from silicone
Temperature: -50 °C to +70 °C

Material data US-WML

Material: PVC
Free from silicone
Temperature: -50 °C to +70 °C



	Conductor diameter [mm]	Lettering field size [mm]	Markers per roll	Type	Order No.	
					WH	YE
 Multi-web version	Standard roll, multi-web version – printing with THERMOMARK ROLL and THERMOMARK ROLL X1					
	< 3	13x10	5000	WML 3 (13x10) R	0800073	
	< 5	25x10	3000	WML 5 (25x10) R	0817523	0830673
	< 6	13x13	7000	WML 6 (13x13) R	0816252	0830674
	< 7.5	13x13	4000	WML 7,5 (13x13) R	0800074	
	< 7.5	17x9	1500	WML 7,5 (17x9) R	0828444	
	< 7.5	25x13	2100	WML 7,5 (25x13) R	0800075	
	< 12	25x19	1000	WML 12 (25x19) R	0800076	
	< 14	25x19	1500	WML 14 (25x19) R	0817536	0817549
	< 14	38x19	1000	WML 14 (38x19) R	0817552	0830675
	< 18	12x12	2500	WML 18 (12x12) R	0817507	
	< 20	31x25	500	WML 20 (31x25) R	0828457	
	< 22	25x25	900	WML 22 (25x25) R	0800078	
	< 36	25x38	500	WML 36 (25x38) R	0817510	
	< 36	25x38	500	WML 36 (25x38) R	0817510	
< 46	25x38	250	WML 46 (25x38) R	0800067		
 Single-web version	Large roll, single-web version – printing with THERMOMARK ROLL X1 or with THERMOMARK ROLL with external media hub					
	< 5	25x10	10000	WML 5 (25x10) RL	0830676	
	< 6	13x13	15000	WML 6 (13x13) RL	0830677	
	< 14	25x19	5000	WML 14 (25x19) RL	0830678	
	< 14	38x19	3000	WML 14 (38x19) RL	0830679	

	Conductor diameter [mm]	Lettering field size [mm]	Markers per card	Type	Order No.	
					WH	YE
	UniSheet card format – printing with THERMOMARK CARD					
	< 6	13x13	32	US-WML 6 (13x13)	0800472	
	< 14	25x19	8	US-WML 14 (25x19)	0800473	
	< 36	25x25	4	US-WML 36 (25x25)	0800474	

Product overview for cable and conductor marking

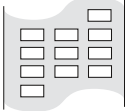
WMT thread-on markers

WMT markers are made of polyester foil. They are used to label conductors. The printed individual markers thread onto the conductor easily and are captively mounted.

Material data WMT

Material: Polyester
Free from silicone and halogen
Temperature: -40 °C to +120 °C



	Conductor diameter [mm]	Lettering field size [mm]	Markers per roll	Type	Order No.	
					WH	YE
 Multi-web version 	Standard roll, multi-web version – printing with THERMOMARK ROLL and THERMOMARK ROLL X1					
	1.0 – 2.4	15x4	4000	WMT 2,4 (15x4) R	0816281	
	2.0 – 3.5	15x5	4000	WMT 3,5 (15x5) R	0817222	
	3.0 – 4.2	15x6	4000	WMT 4,2 (15x6) R	0817235	
	4.0 – 5.5	15x8	4000	WMT 5,5 (15x8) R	0817248	
	5.0 – 8.4	17x10	4000	WMT 8,4 (17x10) R	0817251	

UCT-WMS thread-on markers

UCT-WMS markers thread onto the conductor easily. They are held securely in place by three internal studs. UCT-WMS sheets are printed using the THERMOMARK CARD printer with UCT magazine 3.

Material data UCT-WMS

Material: PC V0
Free from silicone and halogen
Temperature: -40 °C to +120 °C



	Conductor diameter [mm]	Lettering field size [mm]	Markers per card	Type	Order No.	
					WH	YE
	UniCard card format – printing with THERMOMARK CARD					
	1.5 – 3.2	12x4	55	UCT-WMS 3,2 (12x4)...	0828570	0828572
	2.5 – 4.7	12x5.5	45	UCT-WMS 4,7 (12x5,5)	0828571	0828573
	Magazine		THERMOMARK CARD UCT-MAG3		5146613	

Product overview for cable and conductor marking

Marking for attachment using cable binders WMTB, US-WMTB, and WMTB-HF

WMTB marking labels are attached with cable binders. As such, they can be used to label conductors after they have been connected. US-WMTB is an alternative in UniSheet card format. WMTB-HF are manufactured from polyurethane so are particularly flexible.

Material data

WMTB free from silicone and halogen

Material: Polyester -40 to +120 °C

US-WMTB free from silicone

Material: Polyester -30 to +80 °C

WMTB-HF free from halogen

Material: PUR -25 to +80 °C



	Conductor diameter [mm]	Lettering field size [mm]	Markers per roll	Type	Order No.	
					WH	YE
	Standard roll, multi-web version – printing with THERMOMARK ROLL and THERMOMARK ROLL X1					
	> 6	24x8	4000	WMTB (24x8) R	0816278	
	> 6	35x15	1700	WMTB (35x15) R	0817316	
	Standard roll, single-web version – printing with THERMOMARK ROLL and THERMOMARK ROLL X1					
	> 6	40x12	1000	WMTB-HF (40x12) R	0830407	0830408
	> 6	55x15	1000	WMTB-HF (55x15) R	0830409	0830410
	> 6	55x25	500	WMTB-HF (55x25) R	0830411	0830412

	Conductor diameter [mm]	Lettering field size [mm]	Markers per card	Type	Order No.	
					WH	YE
	UniSheet card format – printing with THERMOMARK CARD					
	> 4	24x5	35	US-WMTB (24x5)	0828771	0828958
	> 6	29x8	24	US-WMTB (29x8)	0828772	0828959
	> 6	44x15	12	US-WMTB (44x15)	0828773	0828960

WT cable binders

Cable binders have been used for decades for binding control lines and cables. They are ideal for fixing cables and as an accessory for various cable markers.

Material data WT

Material: Polyamide

Free from silicone and halogen

Temperature: -40 °C to +85 °C



	Length/width [mm]	Pcs. / Pkt.	Color	Type	Order No.
	98x2,5	1000	transparent	WT-HF 2,5X98-L	3240735
	160x2,6	1000	transparent	WT-HF 2,6X160-L	3240739
	200x2,6	1000	transparent	WT-HF 2,6X200-L	3240743
	140x3,6	1000	transparent	WT-HF 3,6X140-L	3240747
	200x3,6	1000	transparent	WT-HF 3,6X200-L	3240751
	290x3,6	1000	transparent	WT-HF 3,6X290-L	3240755
	160x4,5	1000	transparent	WT-HF 4,5X160-L	3240759
	200x4,5	1000	transparent	WT-HF 4,5X200-L	3240763
	98x2,5	1000	black	WT-HF 2,5X98 BK-L	3240734
	160x2,6	1000	black	WT-HF 2,6X160 BK-L	3240738
	200x2,6	1000	black	WT-HF 2,6X200 BK-L	3240742
	140x3,6	1000	black	WT-HF 3,6X140 BK-L	3240746
	200x3,6	1000	black	WT-HF 3,6X200 BK-L	3240750
	290x3,6	1000	black	WT-HF 3,6X290 BK-L	3240754
	160x4,5	1000	black	WT-HF 4,5X160 BK-L	3240758
	200x4,5	1000	black	WT-HF 4,5X200 BK-L	3240762

Product overview for cable and conductor marking

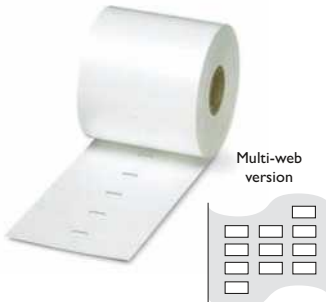
Conductor marking for insertion into EMT marking collars

EMT markers are inserted into PATG, PATO or PAB-KTL marking collars which provide protection against environmental influences and abrasion.

Material data EMT

Material: Polyester
Free from silicone and halogen
Temperature: -40°C to +100°C



	Lettering field size [mm]	Markers per roll	Type	Order No.	
				WH	YE
 Multi-web version	Standard roll, multi-web version – printing with THERMOMARK ROLL and THERMOMARK ROLL X1				
	10x4	7500	EMT (10x4) R	0816235	
	15x4	7500	EMT (15x4) R	0817329	0817358
	23x4	5000	EMT (23x4) R	0817361	0817374

Conductor marking for insertion into US-WMT / UCT-WMT marking collars

US-WMT / UCT-WMT markers are also used in conjunction with PATG, PATO and PAB-KTL marking collars. As the marker strips can be replaced, both versions can also be used to mark conductors after they have been connected or if changes need to be made to imprints or labels.

Material data

US-WMT free from silicone
Material: PVC
Temperature: -30°C to +80°C

UCT-WMT

Free from silicone and halogen
Material: PC V0
Temperature: -40°C to +120°C



	Lettering field size [mm]	Markers per card	Type	Order No.	
				WH	YE
	UniSheet card format – printing with THERMOMARK CARD				
	10x4	112	US-WMT (10x4)	0828765	0828952
	12x4	98	US-WMT (12x4)	0828766	0828953
	15x4	84	US-WMT (15x4)	0828767	0828954
	18x4	70	US-WMT (18x4)	0828768	0828955
	23x4	56	US-WMT (23x4)	0828769	0828956
	30x4	42	US-WMT (30x4)	0828770	0828957
	UniCard card format – printing with THERMOMARK CARD				
	10x4	60	UCT-WMT (10X4)	0801430	
	12x4	50	UCT-WMT (12X4)	0801438	
	15x4	50	UCT-WMT (15X4)	0801446	
	18x4	40	UCT-WMT (18X4)	0801462	
	23x4	30	UCT-WMT (23X4)	0801453	
	30x4	30	UCT-WMT (30X4)	0801422	

Product overview for cable and conductor marking

Marking collars PATG/PATO Marker carriers PAB-KTL

The PATG marking collars are pushed onto the conductor before it is connected. PATO can also be used to mark conductors after they have been connected. The PAB-KTL marker carriers can be used for simultaneous bundling and marking of cables and wires.

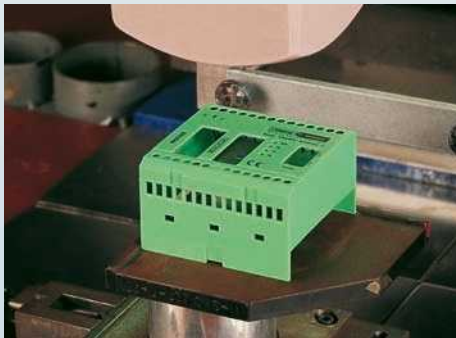


	Conductor diameter [mm]	Type	Length of lettering field					
			10	12	15	18	23	30
	PATG							
	0.6 – 1.2	PATG 0/...	1013795	0827076	1013740	0820507	0828046	–
	1.5 – 2.5	PATG 1/...	1013805	0827077	1013025	0820510	1013847	0822440
	2.0 – 4.0	PATG 2/...	1013818	0827078	1013038	0820523	1013850	0822453
	4.0 – 7.0	PATG 3/...	1013821	0827079	1013041	0820536	1013863	0822466
	6.0 – 10.0	PATG 4/...	–	0827080	1013054	0820549	0808011	0822479
	10.0 – 14.0	PATG 5/...	–	–	1013067	0828059	0808024	0822482
	14.0 – 22.0	PATG 6/...	–	–	1013070	0828062	0808037	–

Marking expertise for the electronics industry

Phoenix Contact can offer you a wide range of marking options for components and parts in electronics production. If you are buying in large quantities, we can supply your components labeled ex-works if you like. Whether you need PCB terminal blocks pre-printing or individual housings labeled, we have both the know-how and the necessary production technologies.

If you are buying in smaller quantities or require custom imprinting or labeling, we can offer you a variety of printers and marking materials for your components.



1. Pad printing

Pad printing is widely recognized for labeling electronics housings. A legible and high-contrast print can be made based on your electronic print copy. A wide range of printing colors is available.



2. Laser printing

Generally all technical thermoplastics can be labeled by laser beam. Readability and contrast ratios largely depend on the particular plastic/color combination, the wavelength of the laser, and the process parameters, and, therefore, need to be determined accordingly.



3. Individual marking

Professional marking systems like thermal transfer systems are able to provide quick and flexible solutions for individual marking requirements on site.

THERMOMARK ROLL



The THERMOMARK ROLL can print markers supplied in roll format for terminal, conductor, cable, and device marking applications

THERMOMARK ROLL X1



The THERMOMARK ROLL X1 is able to process large rolls and thus produce large quantities in industrial production applications.

THERMOMARK CARD



THERMOMARK CARD prints materials in card and sheet format, providing quick and easy solutions for a wide variety of marking requirements.

CLIP PROJECT



CLIP PROJECT is a high-performance marking software solution for customized labeling materials. CLIP PROJECT supports all output devices from Phoenix Contact.

THERMOMARK ROLL

This thermal transfer printer has been designed for printing rolls and continuous media. You can easily create accurately printed labels, markers and shrink sleeves for terminal block, conductor and device marking. The compact printer is also suitable for mobile use.



Technical data	Description	Type	Order No.
Print resolution Interfaces Power supply Operation Printable material Dimensions (W x H x D) Weight	300 dpi USB and Ethernet 100 – 240 V ~ 50/60 Hz, Touch screen Labels and shrink sleeve in roll format 253 x 189 x 320 mm approx. 3.5 kg	THERMOMARK ROLL , thermal transfer printer for roll material, CLIP PROJECT advanced software, one roll of EML (20x8) labels containing 1000 labels, one ink ribbon (50 m sample roll)	THERMOMARK ROLL 5146477
	THERMOMARK ROLL SET, consisting of THERMOMARK ROLL and MARKING NOTEBOOK with German keyboard and the CLIP PROJECT professional software	THERMOMARK ROLL SET	5147300
	THERMOMARK ROLL SET EN, consisting of THERMOMARK ROLL and MARKING NOTEBOOK with English keyboard and the CLIP PROJECT professional software	THERMOMARK ROLL SET EN	5147301

THERMOMARK ROLL X1

The dimensions of the THERMOMARK ROLL X1 thermal transfer printer mean that it is also able to process large rolls.



Technical data	Description	Type	Order No.
Print resolution Interfaces Power supply Operation Printable material Dimensions (W x H x D) Weight	300 dpi USB and Ethernet 100 – 240 V ~ 50/60 Hz, Touch screen Labels and shrink sleeve in roll format 264 x 245 x 412 mm approx. 5 kg	THERMOMARK ROLL X1 , thermal transfer printer for roll material, Software CLIP PROJECT advanced, one roll of EML (20x8) labels containing 1000 labels, one ink ribbon (50 m sample roll)	THERMOMARK ROLL X1 5146723

THERMOMARK ROLL

THERMOMARK ROLL and THERMOMARK ROLL X1 accessories	Description	Type	Order No.
	External media hub, for rolls of 150 to 305 mm outside diameter (RL rolls) for THERMOMARK ROLL	THERMOMARK ROLL-ERH	5146448
	External media hub, for rolls of up to 500 mm outside diameter (RXL rolls) for THERMOMARK ROLL	THERMOMARK-ERH 500	5146309
	Ink ribbon, ink color: black, length 300 m, width 110 mm	THERMOMARK-RIBBON 110	5145384
	Ink ribbon, ink color: blue, length 300 m, width 110 mm	THERMOMARK-RIBBON 110 BU	0829544
	Ink ribbon, ink color: green, length 300 m, width 110 mm	THERMOMARK-RIBBON 110 GN	0829542
	Ink ribbon, ink color: red, length 300 m, width 110 mm	THERMOMARK-RIBBON 110 RD	0829543
	Ink ribbon, ink color: black, length 300 m, width 110 mm, for high-temperature labels	THERMOMARK-RIBBON 110-EMLHT	0800342
	Ink ribbon for labeling shrink sleeves, ink color: black, length 300 m, width 110 mm	THERMOMARK-RIBBON 110-WMSU	0801358
	Ink ribbon for labeling shrink sleeves, ink color: white, length 300 m, width 110 mm	THERMOMARK-RIBBON 110-WMSU WH	0801359
	Ink ribbon, ink color: black, for labeling WMTB-HF, length 300 m, width 110 mm	THERMOMARK-RIBBON 110-WMTB	5148007
	Stable transport case with aluminum edges for printers and accessories, for THERMOMARK ROLL or CARD	TL CASE	0800613

Cutters and perforation devices

Continuous media can be cut and perforated with a high degree of positioning accuracy with cutters and perforation devices.



Cutters and perforation devices	Description	Type	Order No.
	Cutter, can be assembled later, for cutting continuous media precisely to length for THERMOMARK ROLL	THERMOMARK ROLL-CUTTER	5146422
	Perforation device, can be assembled later, for perforating continuous media	THERMOMARK ROLL-CUTTER/P	5146435
	Cutter, can be assembled later, for cutting continuous media precisely to length for THERMOMARK ROLL X1	THERMOMARK ROLL X1 CUTTER	5146765
	Perforation device, can be assembled later, for perforating continuous media for THERMOMARK ROLL X1	THERMOMARK ROLL X1 CUTTER/P	5146766

THERMOMARK CARD

This thermal transfer printer prints marking materials in card and sheet format. You can mark your terminal blocks, conductors and devices easily and to a high quality. The low weight and compact design of the printer also allow for mobile use on-site. The automatic material detection reduces the risk of print errors.



Technical data	Description	Type	Order No.
Print resolution 300 dpi Speed 8 sec/sheet Interfaces USB and Ethernet Power supply 100 - 240 V ~ 50/60 Hz, Touch screen Operation Plastic sheets, UCT and US format Dimensions (W x H x D) 253 x 189 x 320 mm Weight approx. 6 kg	THERMOMARK CARD , thermal transfer printer for card and sheet material, CLIP PROJECT advanced software, magazines for US and UCT materials, one UCT-TM 6, one US-EMP (85.6 x 54), one ink ribbon (50 m sample roll)	THERMOMARK CARD	5146464
	THERMOMARK CARD SET, consisting of THERMOMARK CARD and MARKING NOTEBOOK with German keyboard and the CLIP PROJECT professional software	THERMOMARK CARD SET	5147200
	THERMOMARK CARD SET EN , consisting of THERMOMARK CARD and MARKING NOTEBOOK with English keyboard and the CLIP PROJECT professional software	THERMOMARK CARD SET EN	5147201

THERMOMARK CARD accessories	Description	Type	Order No.
	Magazine for US cards (included in the scope of supply of the THERMOMARK CARD)	THERMOMARK CARD – US-MAG1	5146451
	Magazine for UCT sheets [UCT-WMS...]	THERMOMARK CARD – UCT-MAG3	5146613
	Ink ribbon, ink color: black, length 300 m, width 110 mm	THERMOMARK-RIBBON 110-TC	0801371

CLIP PROJECT software and MARKING NOTEBOOK

CLIP PROJECT

The high-performance marking software provides a solution for the quick and individual labeling of all Phoenix Contact marking materials. CLIP PROJECT supports all output devices from Phoenix Contact and, thanks to automatic Internet updates, is always up-to-date. CLIP PROJECT advanced is supplied as standard with our THERMOMARK printers.



Technical data		Description	Type	Order No.
CPU	Pentium II > 400 MHz	CLIP PROJECT advanced , planning and marking software in German, English, French, Italian, Spanish, Russian, Polish, Hungarian, Czech, Portuguese, Chinese, Turkish, Dutch, Japanese Software is included in the scope of supply of the THERMOMARK CARD and THERMOMARK ROLL.	CLIP PROJECT ADVANCED	5146040
Main memory/	128 MB/2 GB			
hard disk space	CD-ROM			
Drive	1024x768			
Monitor resolution	Mouse recommended			
Operating equipment	Windows Vista	CLIP PROJECT professional , extended version of CLIP PROJECT advanced with additional template designer, for designing your own marking material.	CLIP PROJECT PROFESSIONAL	5146053
Operating systems	Windows XP			
	Windows 7			

MARKING BOX / MARKING NOTEBOOK

The MARKING BOX contains the THERMOMARK CARD and THERMOMARK ROLL thermal transfer printers, plus the MARKING NOTEBOOK with the CLIP PROJECT professional marking software pre-installed.

The notebook from the Dell Latitude TM E range transforms the new THERMOMARK printers into a complete marking system. It is characterized by reliability, a long service life and a professional design.

Windows 7, CLIP PROJECT professional planning and marking software and all of the required drivers are pre-installed and ensure quick startup of the entire system. Simply connect the notebook and printer via USB and you're done (Plug'n'Print).



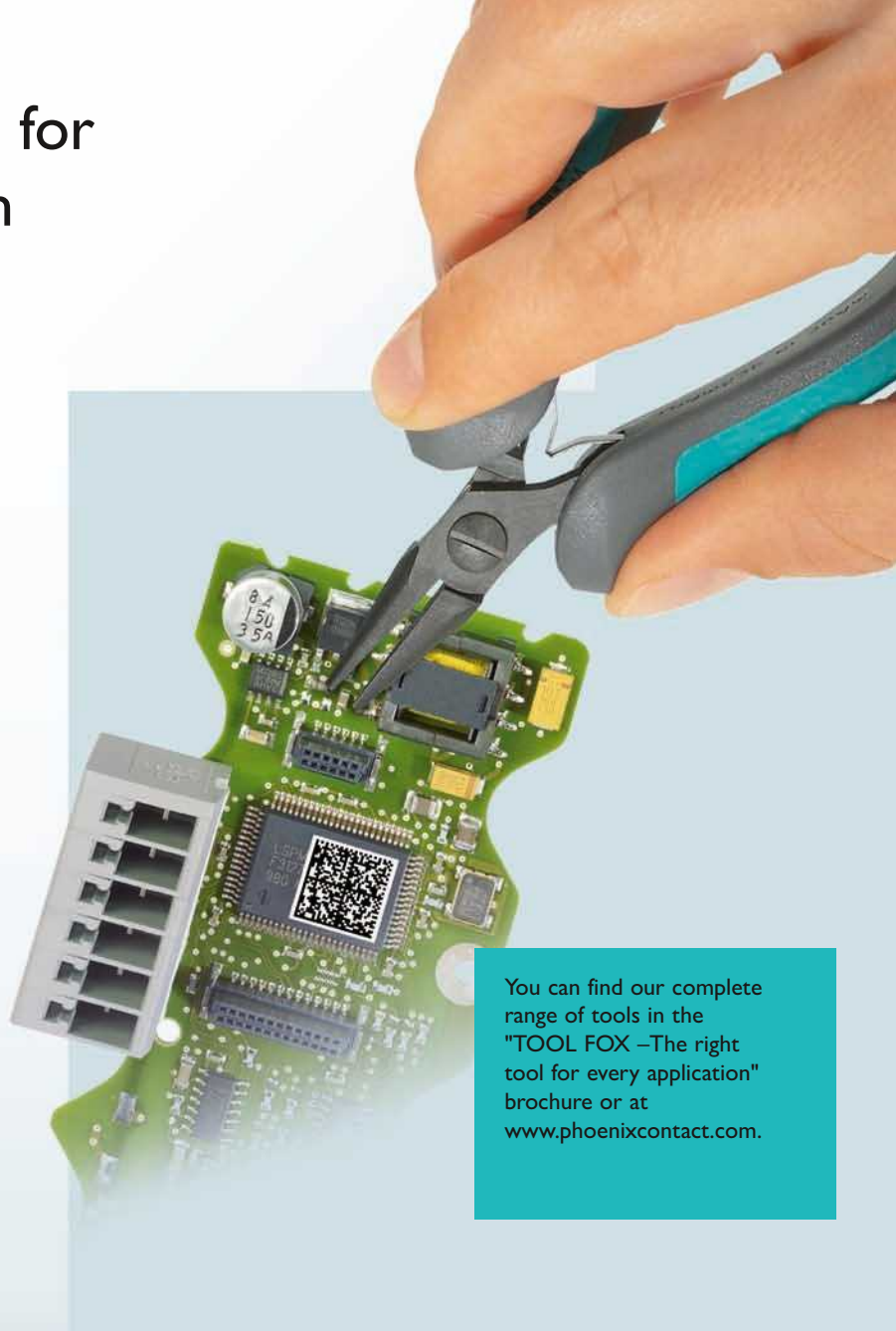
Description	Type	Order No.
MARKING BOX , consisting of the THERMOMARK CARD and THERMOMARK ROLL printers, plus the MARKING NOTEBOOK with German keyboard	MARKING BOX	5147100
MARKING BOX EN , consisting of the THERMOMARK CARD and THERMOMARK ROLL printers, plus the MARKING NOTEBOOK with German keyboard	MARKING BOX EN	5147101

Technical data		
Processor	Intel Celeron B840	The information describes the configuration at the time of going to print. Subject to modifications in the interest of technical progress or product improvements.
Display	14" 1366 x 768	
Hard disk	320 GB serial ATA (7200 RPM)	
Main memory	2 GB and 1600 MHz	
Battery	Li-ION battery with 40 Wh	

MICROFOX – Tools for electronics production

MICROFOX – the range of pliers for all tasks in electronics and electromechanical engineering.

Like all Phoenix Contact tools, the micro pliers are equipped with two-component handles which have been designed specifically to ensure a safe grip and eliminate fatigue. For the protection of sensitive electronics components, we recommend the ESD versions with special handles, as they are able to discharge electrostatic charges in a controlled manner conforming to applicable standards and regulations.



You can find our complete range of tools in the "TOOL FOX –The right tool for every application" brochure or at www.phoenixcontact.com.



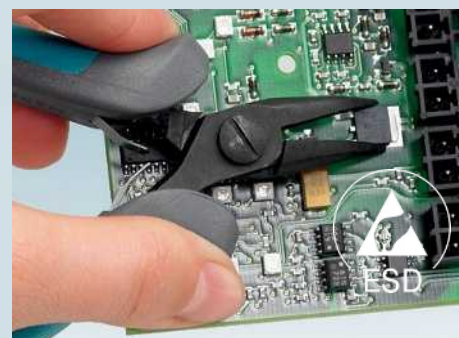
Durable

The tools are made from special C 60 tool steel. They are hardened and precision-ground for excellent cutting performance and are particularly durable.



Precision

The integrated double leaf spring and the ergonomic non-slip handle ensure accuracy and precision when working with electronic components.



Protective

The handles of the MICROFOX... ESD electronics pliers are made from conductive plastic. This means that electrostatic energy is discharged in a gradual and controlled manner.

Tools for electronics production

Electronics pliers

MICROFOX electronics pliers feature a through-connected joint for permanent stability and optimum distribution of force. The surfaces are finely polished and oiled.



Type	Order No.	MICROFOX-SB	1212489	MICROFOX E	1212494	MICROFOX-P	1212491
Description		Diagonal cutter		Front cutter		Needle-nose pliers	
		Rounded head with chamfer		No chamfer		Smooth gripping surface	
Type	Order No.	MICROFOX-SP	1212488	MICROFOX-EO	1212495		
Description		Needle-nose pliers		Angled front cutter			
		Tapered head, no chamfer		Angled, 20°, no chamfer			



Type	Order No.	MICROFOX-PC	1212492	MICROFOX-F	1212493	MICROFOX-R	1212490
Description		Needle-nose pliers		Flat-nose pliers		Round-nose pliers	
		45° angle, smooth gripping surface		Smooth gripping surface		Smooth gripping surface	

ESD electronics pliers

The ESD MICROFOX electronics pliers conform to applicable standards and regulations including DIN EN 61340-5. The screwed precision joint makes for optimum results. Mirror-polished and phosphate-treated metal surfaces ensure that there is no glare when working.



Type	Order No.	MICROFOX-S ESD	1212480	MICROFOX-E ESD	1212485	MICROFOX-P ESD	1212482
Description		Diagonal cutter		Front cutter		Needle-nose pliers	
		Rounded head, no chamfer		No chamfer			



Type	Order No.	MICROFOX-PC ESD	1212483	MICROFOX-F ESD	1212484	MICROFOX-R ESD	1212481
Description		Needle-nose pliers		Flat-nose pliers		Round-nose pliers	
		Smooth gripping surface. 45° angle		Smooth gripping surface		Smooth gripping surface	

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PHOENIX CONTACT GmbH & Co. KG
32823 Blomberg, Germany
Phone: +49 (0) 52 35 3-00
Fax: +49 (0) 52 35 3-4 12 00
www.phoenixcontact.com

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

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- Поставка сложных, дефицитных, либо снятых с производства позиций;
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- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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JONHON

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А