



Identification Systems





	Page
5.1 Technical Indices	
Label Selection Guide	302
Bonding properties of labels	304
Effect of surface energy on bonding properties	305
Instructions for using cable markers with protective laminate	306
Interesting facts about thermal transfer films (colour ribbons)	307
Interesting facts about thermal transfer printing	308
Material Overview	309
5.2 Wire and Cable Markers	
ShrinkTrak Ladder style 3:1 UL grade heatshrink wire markers, thermal transfer	312
TULT – Continuous 3:1 UL grade heatshrink printable tubing, thermal transfer	316
TCGT – Continuous 3:1 commercial grade heatshrink printable tubing, thermal transfer	318
TLFX – Continuous 2:1 Halogen Free heatshrink printable tubing, thermal transfer	320
TLFPT – Continuous Halogen Free non-shrink printable tubing, thermal transfer	322
TIPTAG – Halogen free cable bundle identification tags, thermal transfer	323
TIPTAG VA – Halogen free ladder style cable bundle identification tags, thermal transfer	324
TIPTAG PU – High temperature cable route marker tags, thermal transfer	325
Self-laminating labels (WH/CL), thermal transfer – Material 1209	326
High temperature self-laminating labels, thermal transfer – Materials 320 and 322	327

	Page
Self-laminating labels (WH/CL), laser – Material 1104	328
Self-laminating labels (WH/CL), laser – Material 750	329
Self laminating labels (WH/CL) Dot Matrix – Material 1301	330
RiteOn – Self Laminating Labels (WH/CL) – Material 1401	331
RiteOn Starter Pack	331
RiteOn Refill Packs / Marker Pens	332
HELASIGN – Self Laminating Label Booklet (WH/CL) – Material 1402	333
HELASIGN – Self Laminating Label Booklet (WH/CL) – Material 1402	334
Ovalgrip Straight Cut	337
WIC	339
Embossed Polychloroprene Markers	342
Arrowtags and Marker Plates	345
IT and IMP Plates	346
IT Cable Tie with identification plate	347
Adhesive labels for identification ties and tag labels, thermal transfer – Materials 1210 (WH)	349
Adhesive labels for identification ties and tag labels, thermal transfer – Materials 1211 (YE)	350
HFX Helafix labels	351
Helafix Carriers HC and HCR	352
Helafix HCT tool and Accessories	353
5.3 Control Panel Labelling	
Helatag 860, 880 labels for control panel identification	354
Helatag 1210 labels for terminal block identification	355
Control Panel Labelling, Laser – Material 1102 (YE)	356
Control Panel Labelling, Laser – Material 1101 (WH)	357
HELASIGN – Cotton Cloth Booklet	358

Identification Systems

	Page
Control Panel Labelling, A4 sheet, handwriting – Material 270 (YE)	359
Control Panel Labelling, A4 sheet, handwriting – Material 265 (WH)	360
5.4 Industrial Identification	
Asset labelling (SR), thermal transfer – Material 1204	361
Asset labelling (WH), thermal transfer – Material 1206	362
Rough surface component labels (WH), thermal transfer – Material 1210	363
Removable asset tracking label (WH), thermal transfer – Material 1205	364
Inventory Control Labelling, Laser – Material 1103 (SR)	365
Small Component Labelling, Laser – Material 1102 (YE)	366
Small Component Labelling, Laser – Material 1101 (WH)	367
Warehouse labelling, thermal transfer – Material 1213	368
Pipemarking, thermal transfer – Material 1213	369
Secure identification of component parts and circuit boards with Helatag	370
5.5 Security Labeling	
Tamper evident security labelling (SR), thermal transfer – Material 1203	371
Fragmenting tamper evident security labelling (WH), thermal transfer – Material 1208	372
Tamper evident 2 piece security labelling (SR / CL), thermal transfer – Material 951	373

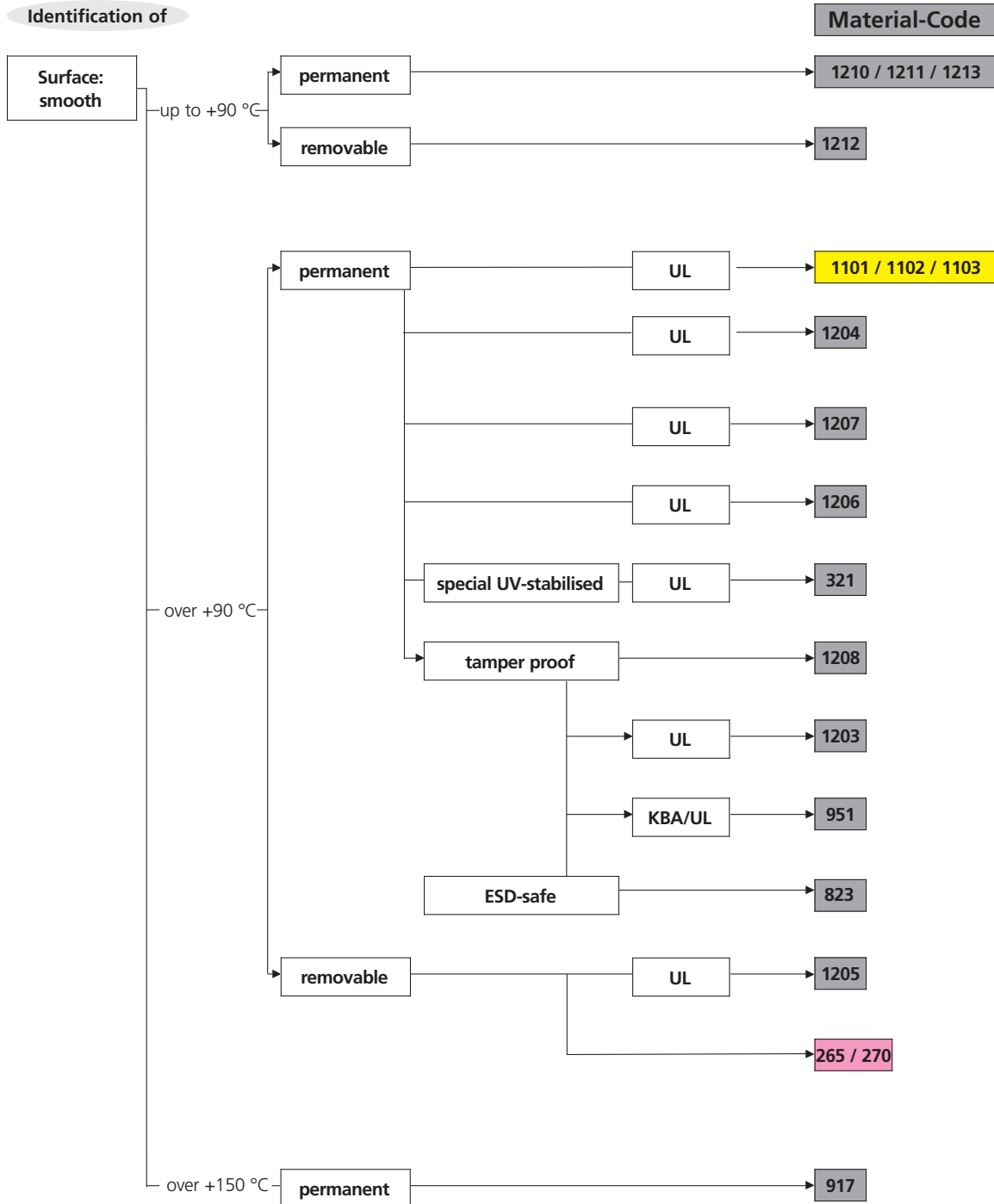
	Page
5.6 Hazardous Area Identification	
M-Boss System, printer and cassette	374
M-Boss System, CombiPack	375
M-Boss Printshop	376
Hellermark stainless steel marking, manual	377
Helatag 321, 840 protective laminate labels for very special requirements	378
5.7 Printers and Software	
Thermal Transfer Printers TT4000-2, TT4000-3, and TT420	379
Selection matrix	380
T.I.P.S. Ribbons	381
Recommended ribbons for printing on shrinking sleeve	381
Ribbons for printing on labels	382
S3000 Cutter	383
Software HellermannTyton TagPrint PRO	384
5.8 Overview of sizes for self-laminating labels Helatag®	
Overview of sizes for self-laminating labels Helatag® for dot matrix printer	385
Overview of sizes for self-laminating labels Helatag® for laser printers	387
Overview of sizes for self-laminating labels for thermal transfer printers	392



Use our flowchart to find the right label or identification material.

Select the object to be identified (flat or curved surface) and its surface quality (smooth or rough). Depending on what you require from our identification systems, you will be guided through the flowchart to the end. Please note that we have highlighted the respective printer technology (thermal transfer, matrix or laser printer, etc.) in colour.

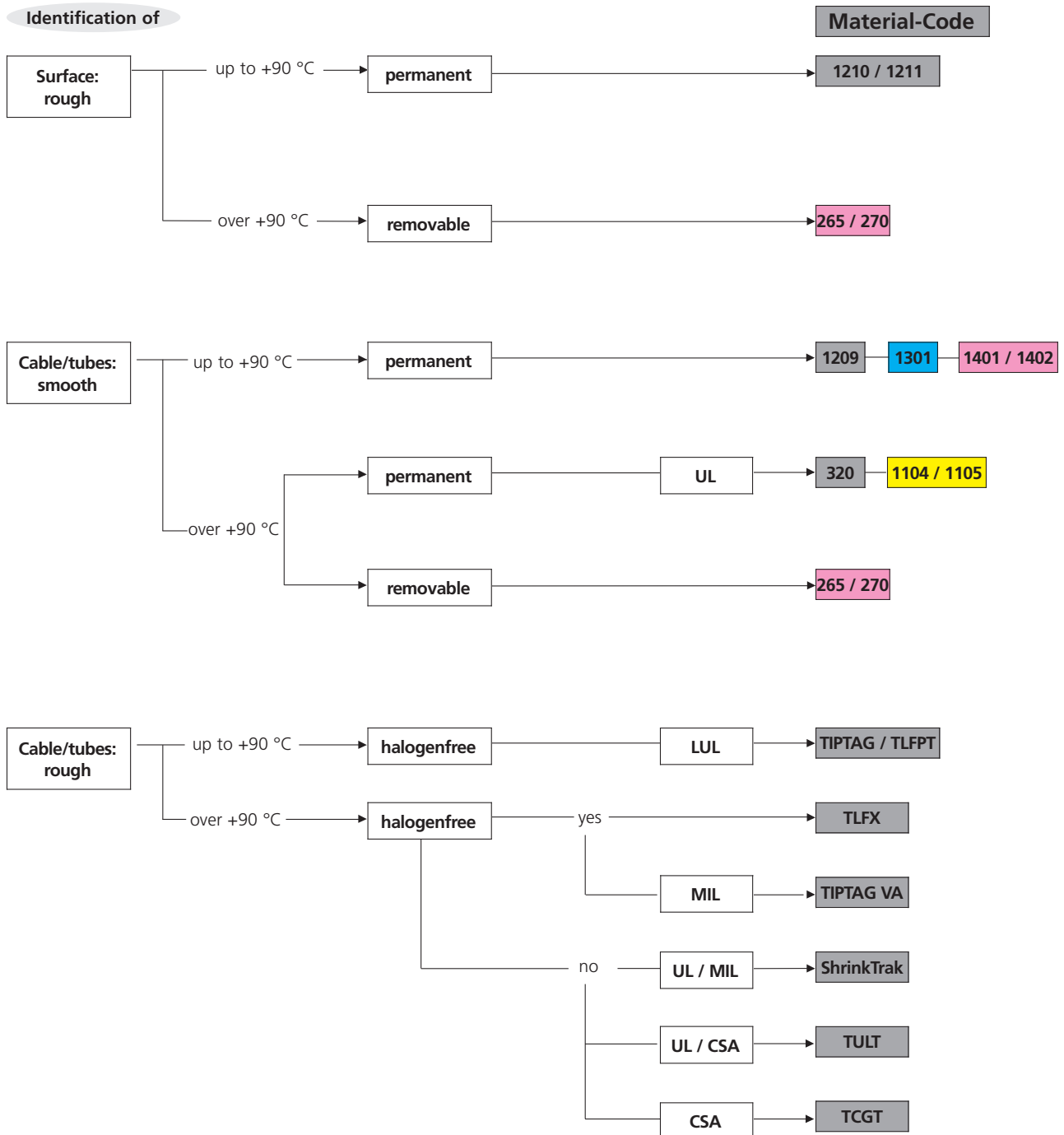
figure 1





When selecting the material, the general rule is that a higher quality material can of course be used for lower requirements (e.g. a material for operating temperatures of over +90 °C can also be used for temperatures below +90 °C). And you can, of course, always ring us on our usual telephone numbers.

figure 2



Labelling material for:

- TT printer
- Matrix printer
- Laser printer
- Handwritten identification

Approvals:

1. UL: Underwriter Laboratories
2. KBA: German Motor Transport Authority
3. MIL: Military Specification (USA)
4. LUL: RSE STD 013
5. CSA: Canadian Standards Authority



Bonding properties of labels

The great variety of ways and places where labels can be used requires a broad range of combinations of different materials and adhesives. In the following text, a glimpse into the basic properties and differences between label adhesives will be provided.

To enable you to make the right choice for your particular application quickly and efficiently, we have set out the most important selection criteria diagrammatically in our flowchart.

Adhesion: powers of attraction between two materials

Adhesion can be described, in principle, as the ability of the adhesive to form a bond with the surface of the surface of the material (substrate). The influencing factors for optimum bonding of the label are the quality of the surface of the material and the creep ability of the adhesive. The crucial factor is the proportion of the surface which is actually to be wetted by the adhesive. Most surfaces

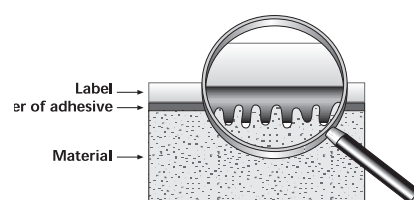
Initial and final bonding

In principle there are two different bonding conditions for labels: The initial bonding which occurs immediately after the label and surface are brought together and the final bonding which represents the permanent bonding status between label and surface following the application, pressing on and curing of the adhesive. The bonding of labels is measured in a defined test process (FINATFTM) and stated in N/mm.

The initial bonding (or tack) describes the bonding ability of the label after it has been applied to the surface, without being pressed down. The final bonding of labels is ultimately affected by the combined factors of material quality, adhesive basis, curing time, pressure applied and surface tension.

appear – from a microscopic point of view – like a mountain range with peaks and valleys; i.e. the effective surface is much bigger than that seen by the naked eye. No matter how smooth and flat a substrate may appear to be, there is always some roughness. The more thinly the adhesive flows into the valleys, the more bonding points it can form and the better the adhesive will bond to the surface. A thicker layer of adhesive does

allow these uneven areas to be filled in better, but a thicker coat of adhesive has negative effects when labels are processed by machine (e.g. leakage of the adhesive or limited storage life).

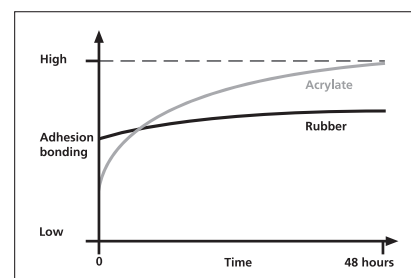


Adhesive basis

HellermannTyton currently uses acrylate and synthetic rubber as adhesive bases. Acrylate adhesives belong to the family of thermoplastic resins and at normal temperatures they provide high and lasting adhesion. When considering the final bonding of acrylate adhesives, however, it must be noted that the relatively high final bonding is only attained after a certain curing period. This is especially true of labelling materials which may be used for rating plates. So, for example, the adhesive for material types 796 or 950 must harden for at least 48 hours on the surface without loading. Only after this period does the safety measure become

apparent, for example, when an attempt is made to pull off the rating plate (triangles remain on the 796 material, "VOID" imprint on the 950).

Synthetic rubber-based adhesives, unlike acrylate-based adhesives, are distinguished by their high initial bonding. But this adhesive technology does not achieve a final bonding comparable to acrylate adhesives (see graph). Special mixtures of synthetic rubber are used in labelling technology, for example for removable labels, e.g. HellermannTyton material type 265 and 270.

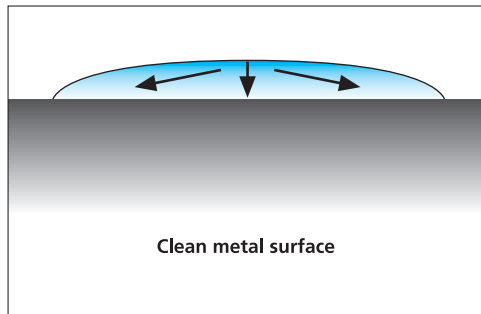




Effect of surface energy on bonding properties

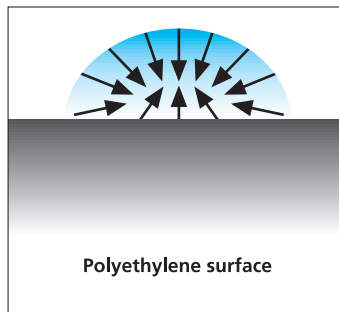
The surface energy (also known as surface tension) is an important factor in the selection of the right adhesive. Because of their chemical formulation, all surfaces have their own polarity and surface tension. The cause of surface tensions is the tendency of liquids to reduce their surface as far as possible, thus to form drops. When a surface which is to be marked (substrate) is wetted with an adhesive, in addition to the adhesive formulation and the surface quality (material, roughness, dampness etc.) the surface energy is also a decisive factor in the maximum attainable bonding force of the adhesive.

As a basic rule, it can be noted that the surface energy of the adhesive must be less than the surface energy of the material to be bonded (substrate). The adhesive should completely wet the substrate and not form any drops.



Flat drops

- High surface energy
- Good wetting
- Good bonding properties



Rounded drops

- Low surface energy
- Poor wetting
- Weak bonding properties

The material combination is the decisive factor

An acrylate-based adhesive is polar and therefore has a relatively high surface energy. Acrylate-based adhesives achieve optimum final bonding on polar substrates (e.g. glass or metals) with a high surface energy.

More critical is the application of labels using acrylate-based adhesives on materials with low surface energy (apolar substrates) such as, for example, silicone, polyethylene and polypropylene. The surface tensions of an acrylate-based adhesive can be reduced for particular applications by the addition of specific additives. However, this step brings with it some drawbacks, for example, a free-flowing adhesive and thus a limited life and storage ability of the labels.

The lower bonding force of low-energy surfaces must therefore be taken into account of when considering the end use.

Surface energies of different materials

Material Surface energy [mN/m]*

Polytetrafluor ethylene (PTFE)	18
Silicone (Si)	24
Polyvinyl fluoride (PVF)	25
Natural rubberPolypropylene (PP)	29
Acryl (PMMA)	31
Epoxy (EP)	36
Polyacetal (POM)	36
Polystyrol (PS)	36
Polyvinyl chloride (PVC)	36
Vinylidene chloride (VC)	40
Polyester (PET)	41
Polyimide (PI)	41
Polyarylsulfone (PAS)	41
Phenolic resinPolyurethane (PUR)	43
Polyamide 6 (PA 6)	43
Polycarbonate (PC)	46
Lead (Pb)	450
Aluminium (Al)	840
Copper (Cu)	1100
Chromium (Cr)	2400
Iron (Fe)	2550

*The values stated are non-binding reference values and for guidance purposes only.

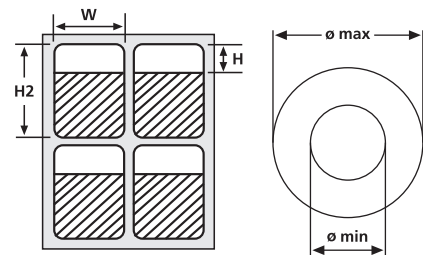
For optimum marking using acrylate-based adhesive labels, HellermannTyton uses an improved adhesive formulation, which is co-ordinated to the most common materials in industry. In most cases it is possible to guarantee very good application of these labels. In borderline cases, a modified adhesive formulation may be necessary.

Talk to us, we'll be delighted to advise you.

Instructions for using cable markers with protective laminate

Cable markers with protective laminate (also known as cable laminators) have a white or coloured label field which can be written on either manually using a marker pen (see RiteOn and Helasign) or using a matrix, laser or thermal transfer printer (see Helatag). Depending on the design for the respective type of printing, the title block has a special surface finish to achieve the optimum fixation of the printing ink.

This results in long-lasting, clear, sharp writing with text, graphics or barcode. A special feature is that the **HellermannTyton** protective laminate comes with rounded corners. This achieves greater final adhesion of the protective laminate and counteracts any undesirable removal of the label, especially with cables of small diameter and in heavy-duty applications.



Helatag self-laminating labels.

For further information on labels and label adhesives, see page 304.

When calculating the minimum and maximum diameters, the following formula has been used:

$$\text{Diameter} = \frac{\text{Length of laminate}}{\pi}$$

Pi (p) is the constant 3.14.

Minimum diameter:

To save time, when wrapping the cable with the cable laminator, a limit of max. 2 windings has been set. The protective laminate length is calculated from: Height H2 – height H

By applying the “diameter” formula this produces the approx. minimum diameter:

$$\text{Diameter}_{\min} = \frac{H2-H}{2 \cdot \pi}$$

Example: TAG136LA4 (H = 19.05 mm; H2 = 67.70 mm):

$$\text{Diameter}_{\min} = \frac{67.7 - 19.05}{2 \cdot 3,14}$$

Maximum diameter:

In this case the minimum requirement is complete coverage of the label field with the protective laminate with a single winding. The length of the protective laminate is again obtained from the formula: H2 – H.

By applying the “diameter” formula this produces the approx. maximum diameter, which also corresponds to double the minimum diameter:

$$\text{Diameter}_{\max} = \frac{H2 - H}{\pi} = 2 \cdot \text{Diameter}_{\min}$$

Example: TAG136LA4 (H = 19.05 mm; H2 = 67.70 mm)

$$\text{Diameter}_{\max} = \frac{67,7 - 19,05}{3,14} = 2 \cdot \text{Diameter}_{\min}$$



Interesting facts about thermal transfer films (colour ribbons)

The thermal transfer ribbon is perhaps the most important consumable that is used in this printing system – using the right ribbon for a particular application is extremely important.

Not every transfer ribbon is equally suited to any purpose. Depending on the printing requirements (e.g. smudge or scratchproof) to be met, what type of labels will be used, an appropriate thermal transfer ribbon must be used.

Another important consideration for the thermal transfer ribbon is the electrostatic charging which can arise during the printing process. Some transfer ribbons become statically charged during the printing process, which can damage an ESD-sensitive printer head in the long run.

To clarify: The thermal transfer printer head is in physical contact with the back of the thermal transfer ribbon and consists solely of electronic, voltage-sensitive elements, which are known as dots.

These can become damaged when the thermal transfer ribbon causes discharges, which usually results in dot drop-outs. At points where the print head is damaged, no more colour is transferred. This leaves gaps on the label.

Thermal transfer films usually consist of three layers:

- A polyester strip as supporting material
- A protective, gliding backing layer on one side
- A colour layer on the other side.

The colour remains solid at room temperature, but liquefies under the effect of heat. To manufacture the colour ribbons, the polyester ribbon is coated with a special backing and then the respective coloured ink is applied. Print characteristics and bonding ability on various materials depend mainly on the chemical composition of this colour ink.

The main distinguishing feature of thermal transfer ribbons is the so-called quality of the coating. There are three basic types of thermal transfer ribbons:

Wax-based films – economical and versatile

Economical wax-based thermal transfer films are most frequently used in logistics applications. Due to the softness of the coloured ink, they produce good printing results at standard print temperatures even at high print speeds. Wax based films are almost exclusively suited to simple or coated papers. Resistance to solvents, heat and general abrasion and scratch-resistance is only average.

Wax-resin based films – good synthesis

With this quality of a wax-resin mixture, the good print characteristics of the wax are essentially retained, but the resin content increases mechanical strength. The print image produced has high resistance to heat, solvents, abrasion and scratching and high print quality, e.g. for barcodes. These colour ribbons are suitable for use on synthetic materials. They can be used for most applications at standard print temperatures.

Resin-based films – for very heavy-duty purposes

The colour layer at this quality level is based entirely on synthetic resins, developed for industrial applications and extreme conditions. Resin-based colour ribbons guarantee maximum readability, even on the most difficult materials (e.g. barcodes). Depending on the backing material, medium to high print temperatures and slow print speeds are necessary when using these thermal transfer films. In return, a print image is obtained which stands out for its high resistance to abrasion and scratching and great solvent and heat resistance.

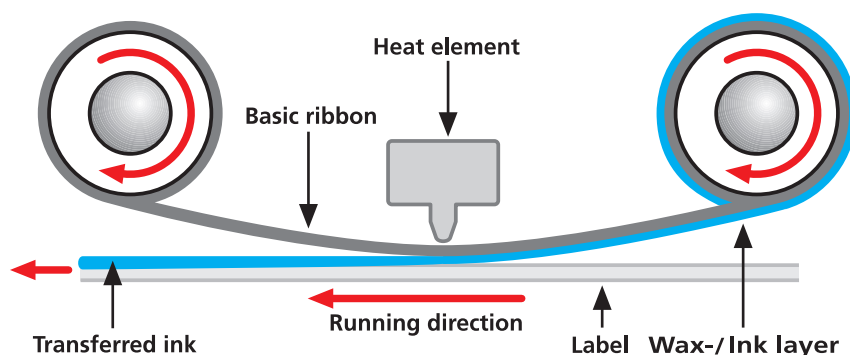


Interesting facts about thermal transfer printing

Although thermal transfer printing is still a relatively new technology, because it is so versatile, it promises a high rate of growth. Thermal transfer printing plays a central role, especially in the field of printing variable data, single-proofs and even for small series. This is largely due to the fact that thermal transfer printing is a non-impact printing (NIP) process. Unlike traditional printing processes, such as offset-printing, a NIP printing process does not require a fixed printing block and can therefore print out different data with consistent quality from print to print.

Due to the increasing spread and importance of one and two-dimensional barcodes in goods inventory systems, logistics and in the field of component identification, the market potential of thermal transfer printing is growing all the time. The same is also true of in-cremental serial numbers, inventory designations, entrance tickets, rating plates, wine labels and many more.

Good print quality, high print speeds and the option of printing almost all backing materials permanently – these are the critical advantages of thermal transfer printing. It's good readability, resistance and abrasion resistance allow thermal transfer printing to be put to use in applications where the print results from laser, inkjet or dot matrix printers are not satisfactory.



Heated dots strike a special colour ribbon, the thermal transfer film, which transfers liquefied colour ink at exactly that point onto the backing material (labels, tubes, rating plates). Our modern printers use what is known as "thin film technology", in which the very brief liquid phase of the ink produces faster print speeds and better and more precise images than with the "thick film technology" formerly used.

Moreover, the linear orientation of the labels or of the heatshrink tubing makes it possible to print on demand. The printing is then carried out as required. This is especially useful in the production of rating plates in series production.






In thermal transfer printing, the print image is defined by the three components: printer, label material and thermal transfer film (colour ribbon).

The advantages at a glance:

- High print quality with a resolution of 8-12 dots/mm (12 dots/mm corresponds to approx. 300 dpi)
- Barcode printing in excellent quality, hence good optical readability
- High print speeds of between 50mm/sec and 200 mm/sec

- Individual graphics capability
- Problem free and rapid realisation of self designed drafts
- Quiet and service friendly printers
- Prints are UV fast and permanent with high definition and contrast and good resistance to mechanical and chemical influences.



Laser Printer					
Material	1104	1105	1101	1102	1103
Material Description	Polyester self laminating, super transparent with white write on area.	Polyester self laminating, super transparent with white write on area.	Polyester, white	Polyester, yellow	Polyester, silver
Material Application	selflaminating wire and cable marking, also suitable for flat cables	selflaminating wire and cable marking, also suitable for flat cables	Permanent identification of assets and components, particularly suitable for identification of switch panels	Permanent identification of assets and components, particularly suitable for identification of switch panels	Permanent identification of assets and components, particularly suitable for identification of switch panels
Thickness (T)	25.0 µm	37.0 µm	60.0 µm	60.0 µm	60.0 µm
Operating Temperature	-40 °C to +150 °C	-40 °C to +150 °C	-40 °C to +150 °C	-40 °C to +150 °C	-40 °C to +150 °C
Curing Temperature	From +10 °C	From +10 °C	from 0 °C	from 0 °C	from 0 °C
Adhesive	Acrylic	Acrylic	Acrylic	Acrylic	Acrylic
Material Durability	2 years external weathering (central European climate)	2 years external weathering (central European climate)	2 years external weathering (central European climate)	2 years external weathering (central European climate)	2 years external weathering (central European climate)
Page	328 	329 	357, 367 	356, 366 	365 

Dot Matrix Printer Material	
Material	1301
Material Description	selflaminating supertransparent vinyl with white write on area
Material Application	selflaminating wire and cable marking (also suitable for flat ribbon cables)
Thickness (T)	80.0 µm
Operating Temperature	-40 °C to +80 °C
Curing Temperature	From +10 °C
Adhesive	Acrylic
Material Durability	2 years external weathering (central European climate)
Page	330






Thermal Transfer - Plain Labels			
Material	1211	1212	823
Material Description	A smooth, gloss yellow painted Vinyl foil. Adhesive suitable for critical surfaces.	A smooth, matt yellow painted Vinyl foil.	A gloss white, heat resistant polyester.
Material Application	General identification. Identification of control panels and warning labels. Use also with IT identification ties and AT/IMP plates.	Temporary general identification. Identification of control panels and terminal blocks.	Electrostatic sensitive applications.
Mech. Material Properties	permanent adhesive, suitable for critical surfaces	removable adhesive on most surfaces	ESD requirements of EIA 625 and 541
Thickness (T)	83 µm	86 µm	51 µm
Operating Temperature	-20 °C to +80 °C	-20 °C to +80 °C	-40 °C to +150 °C
Curing Temperature	from +5 °C	from +5 °C	from +5 °C
Adhesive	Acrylic	Acrylic	Acrylic
Material Durability	At vertical exposure to weathers (central European climate) 2 years. Excellent indoor use.	At vertical exposure to weathers (central European climate) 1 year.	2 years external (central European climate). Some yellowing in direct sunlight.
Page	354	354	370

Thermal Transfer - Plain Labels				
Material	917	1204	1206	1210
Material Description	A flexible, yellow Polyimide (Kapton) material.	A silver-matt, highly heat resistant, reverse side aluminised Polyester. Adhesive suitable for critical surfaces.	Type 1206 is a white glossy material suitable for printing with thermal transfer printers. Adhesive suitable for critical surfaces.	A smooth, gloss white Vinyl foil. Adhesive suitable for critical surfaces.
Material Application	electronic: wave-soldering and reflow soldering identification of top and bottom side of PCB's.	Electro and electronic identification. Permanent identification of components and housings. Type- and nameplates.	Permanent identification of components and housings. Type- and nameplates.	General identification. Identification of control panels and warning labels. Use also with IT identification ties and AT/IMP plates.
Mech. Material Properties	Excellent resistance to high temperature loading, especially at soldering processing of PCB boards.	permanent adhesive, suitable for critical surfaces	permanent adhesive, suitable for critical surfaces	permanent adhesive, suitable for critical surfaces
Thickness (T)	50 µm	55 µm	50 µm	83 µm
Operating Temperature	-40 °C to +150 °C, Intermittent +372 °C	-40 °C to +150 °C, intermittent +200 °C	-40 °C to +150 °C, intermittent +200 °C	-20 °C to +80 °C
Curing Temperature	From +10 °C	from 0 °C	from 0 °C	from +5 °C
Adhesive	Acrylic	Acrylic	Acrylic	Acrylic
Material Durability	At vertical exposure to weathers (central European climate) 2 years.	At vertical exposure to weathers (central European climate) 1 year.	At vertical exposure to weathers (central European climate) 2 years.	At vertical exposure to weathers (central European climate) 2 years. Excellent indoor use.
Page	370	361	362	355, 363





Thermal Transfer - Plain Labels					
Material	321	1207	320	322	1209
Material Description	A transparent, flame retardant, smooth Polyvinylfluoride (Tedlar).	Type 1207 is a clear smooth PET foil with highest adhesion. The material is best resistant against manz chemicals and solvents.	A white/clear, smooth, flame retardant, chemical resistant Polyvinylfluorid (Tedlar).	A yellow/clear smooth, chemical resistant, flame retardant Polyvinylfluorid (Tedlar).	A white/clear, smooth, flame retardant Vinyl.
Material Application	Protective laminate with excellent resistance against a wide range of chemicals and solvents.	Protective laminate for labels, exposed to extreme dirt, chemical- or mechanical forces.	Self laminating wire and cable identification in aggressive environments.	Self laminating wire and cable identification for aggressive environments.	Self laminating cable and wire identification, flat cable marking in normal environments.
Mech. Material Properties	protective over-laminate or clear printable label	use as protective over-laminate or clear printable label	permanent adhesive	permanent adhesive	permanent adhesive
Thickness (T)	25 µm	60 µm	25 µm	25 µm	80 µm
Operating Temperature	-40 °C to +130 °C	-40 °C to +150 °C, intermittent +200 °C	-40 °C to +130 °C	-40 °C to +130 °C	-40 °C to +80 °C
Curing Temperature	From +10 °C	from 0 °C	From +10 °C	From +10 °C	From +10 °C
Adhesive	Acrylic	Acrylic	Acrylic	Acrylic	Acrylic
Material Durability	10 years external (central European climate). Excellent indoor use.	At vertical exposure to weathers (central European climate) 3 years. Nearly endless when used indoors.	10 years external (central European climate). Excellent indoor use.	10 years external (central European climate). Excellent indoor use.	At vertical exposure to weathers (central European climate) 1 year. Excellent indoor use.
Page	378 	378 	327 	327	326

Thermal Transfer - Plain Labels					
Material	951	1203	1205	1208	1213
Material Description	Type 951 defines a set of labels consisting of 951A a tamper evident, bright PET material and 951B a matt clear PET overlaminate.	A silver, heat resistant, reverse side aluminised Polyester. Adhesive suitable for critical surfaces.	A white, heat resistant, reusable label.	A single use, matt white Acrylic foil.	Type 1213 is a coloured and very smooth Vinyle material with excellent outdoor properties. It has nearly endless shelf life when used indoors. The material is flame retardent.
Material Application	Non-transferrable labels for automotive, appliance and electric industries. Tamper indicating labels and seals for over-the-counter drugs and other packaging applications.	Electro and electronic identification. Security and warranty identification of components, housings and nameplates.	General temporary electrical/electronic component identification. Second layer for over-paint protection.	Security applications, warranty sealing.	Warehouse labeling, warning notices. Also General marking purposes.
Mech. Material Properties	tamper proof feature that leaves small check-board traces	tamper proof feature that leaves small check-board traces	removable without residue	tamper proof, material will easily fragment if removed	permanent adhesive, suitable for rough surfaces
Thickness (T)	36 µm	53 µm	58 µm	50 µm	66 µm
Operating Temperature	-40 °C to +150 °C	-40 °C to +120 °C	-40 °C to +120 °C	-40 °C to +100 °C	-40 °C to +90 °C
Curing Temperature	from 0 °C	from +7°C	from +15 °C	From +10 °C	From +8 °C
Adhesive	Acrylic	Acrylic	Acrylic	Acrylic	Acrylic
Material Durability	951B, approximately 2 years. Outdoor aging is depending on climate, direction of the label facing, surface angle and amount of airborne pollutants to which the label is exposed.	At vertical exposure to weathers (central European climate) 2 years.	At vertical exposure to weathers (central European climate) 2-3 years.	At vertical exposure to weathers (central European climate) 2 years.	At vertical exposure to weathers (central European climate) 7-8 years. Nearly endless when used indoors.
Page	373	371	364	372	368, 369