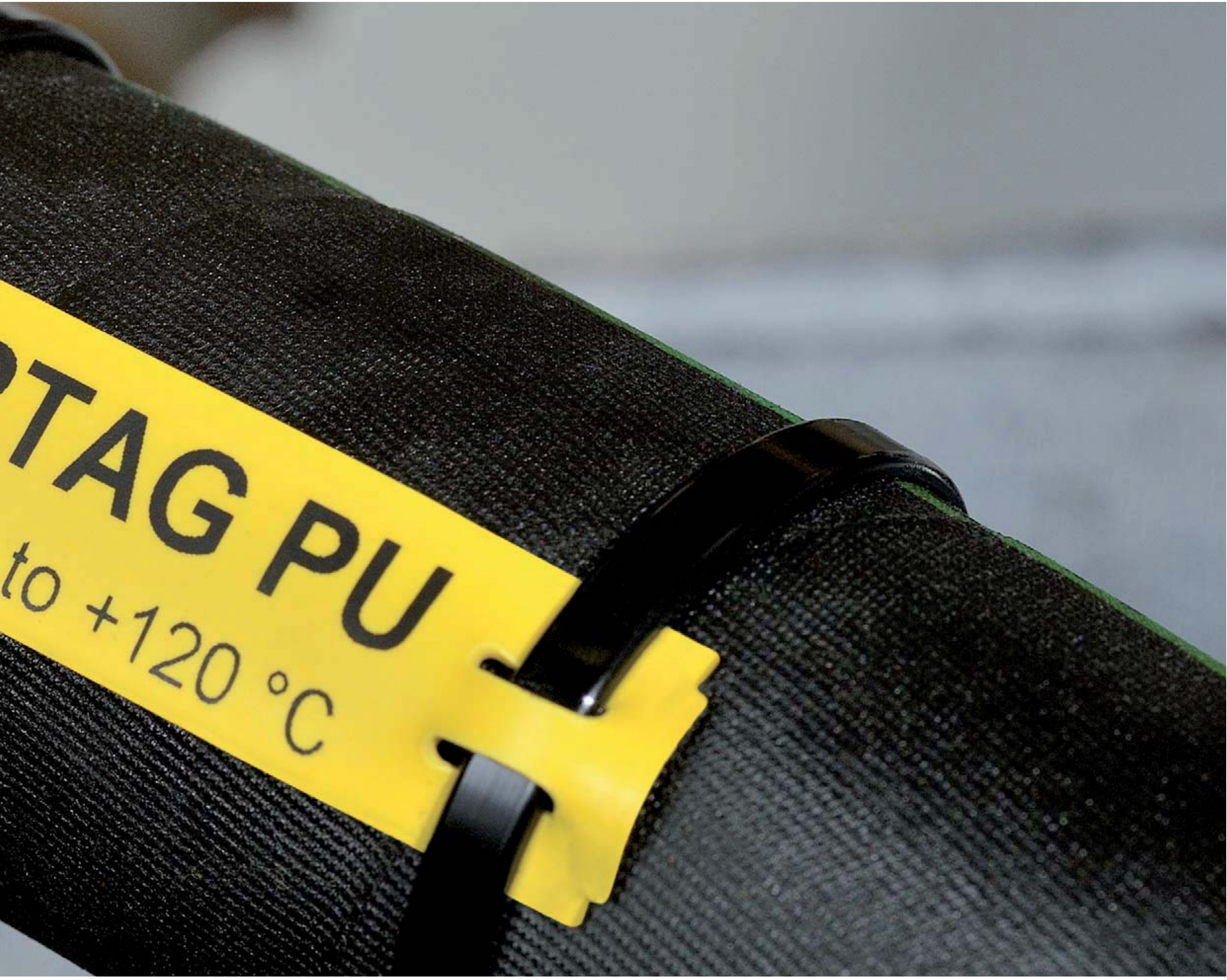
HellermannTyton

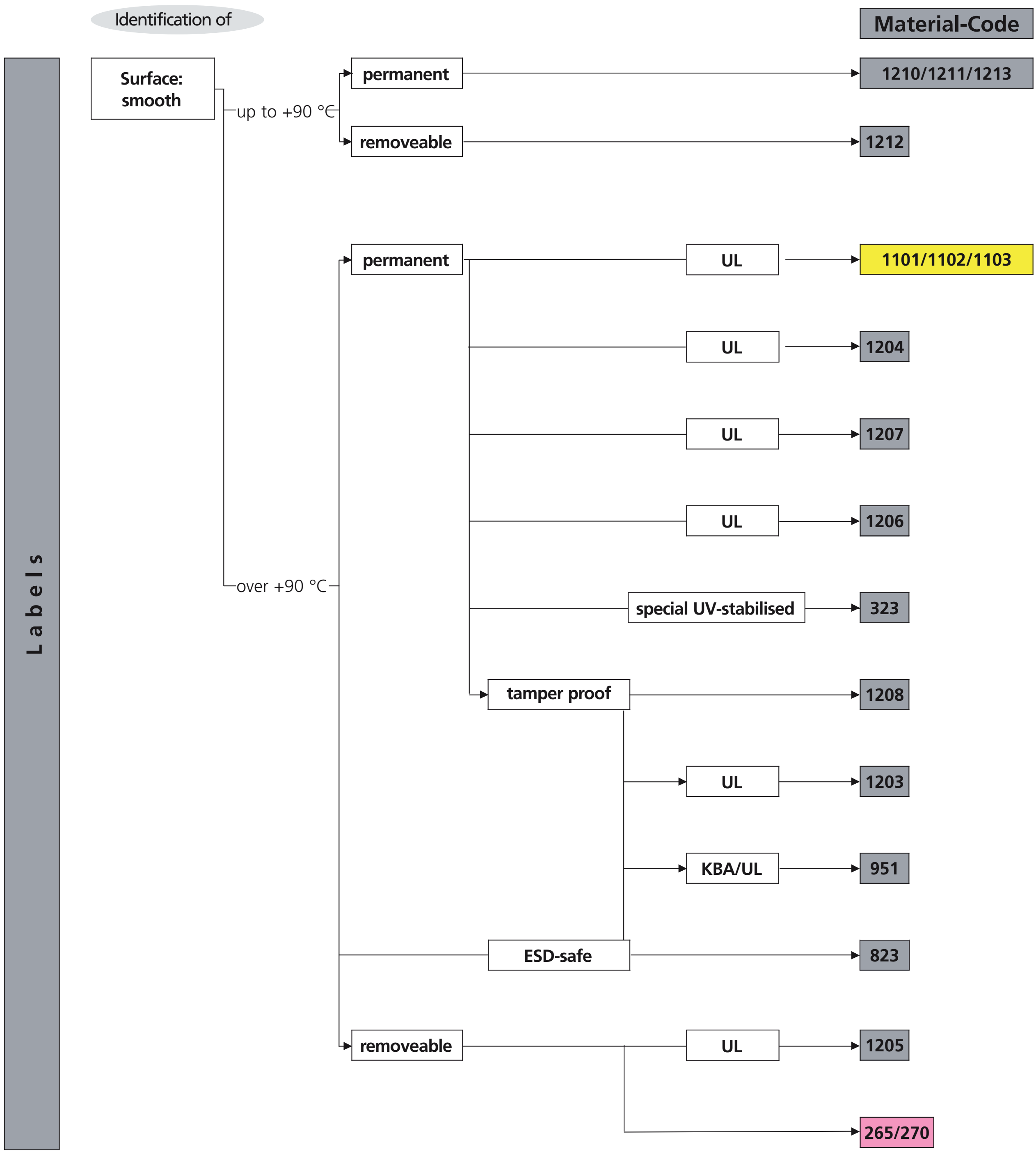
Date of issue: Juni 2012



Identification 4

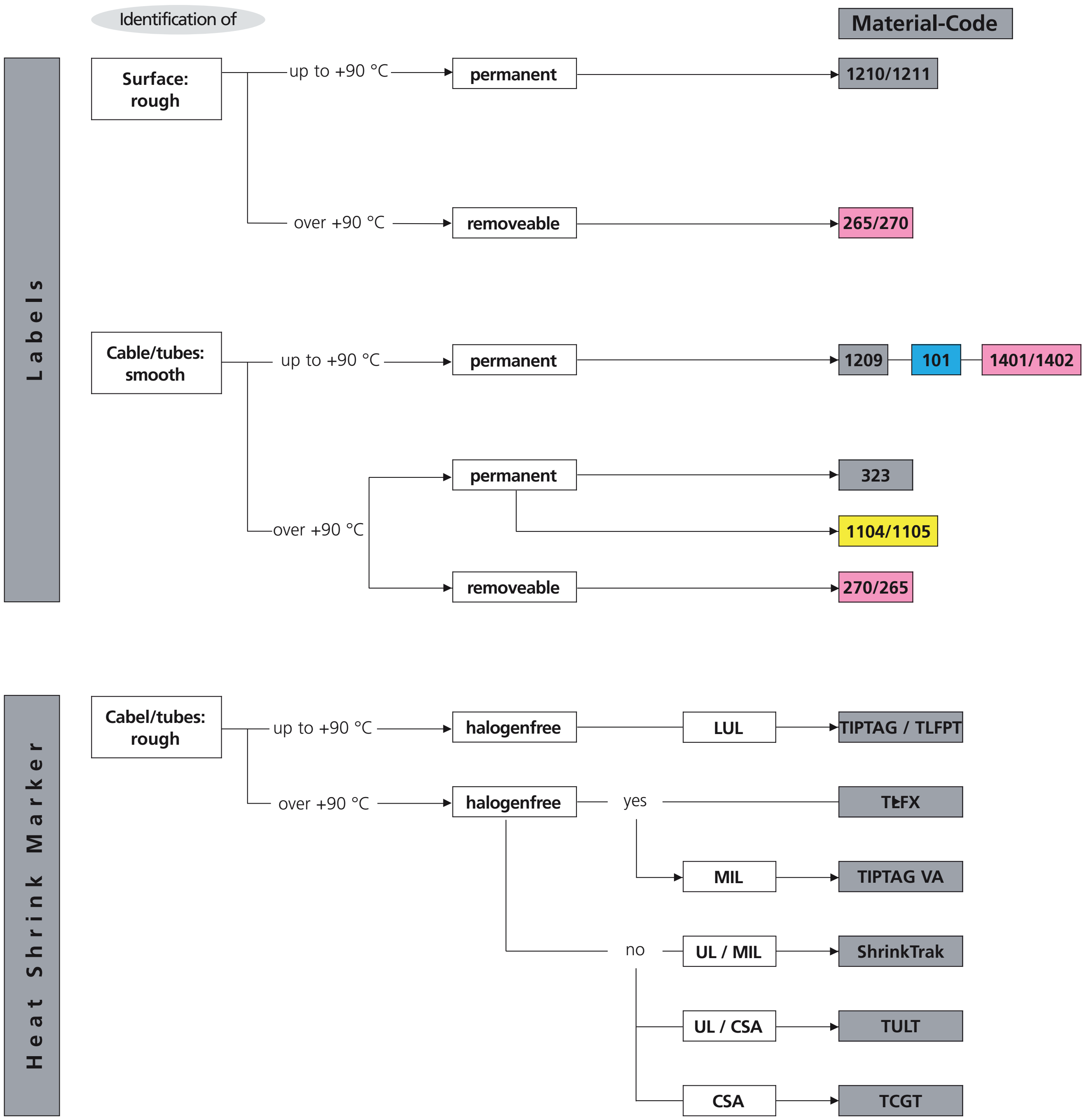
Use our flowchart to find the right label or identification material.
Select the object to be identified (flat or curved surface) and its surface quality (smooth or rough). Depending on what you require from our identification systems, you will be guided through the flowchart to the end. Please note 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: London Underground RSE STD 013 (Großbritannien)
5) CSA: Canadian Standards Authority

Bonding properties of labels

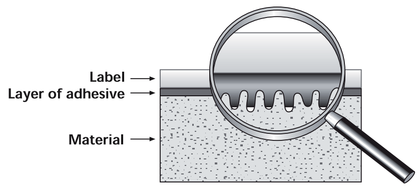
The great variety of ways and places where labels can be used requires a broad range of combinations of different materials and adhesives. In the following text, a glimpse into the basic properties and differences between label adhesives will be provided.

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.

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.

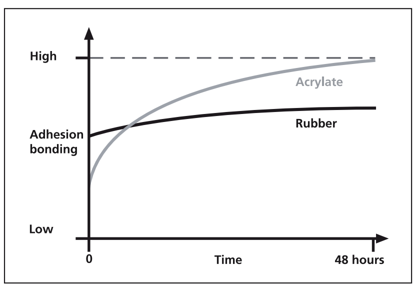
Adhesion: powers of attraction between two materials
Adhesion can be described, in principle, as the ability of the adhesive to form a bond with the surface of the surface of the material (substrate). The influencing factors for optimum bonding of the label are the quality of the surface of the material 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 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).



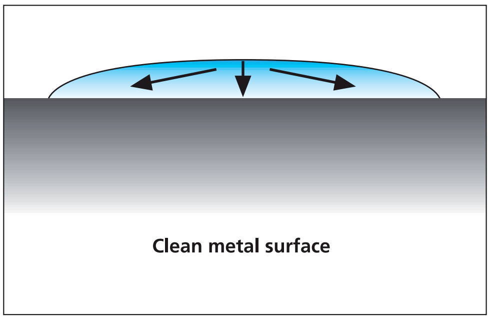
Adhesive basis
HellermannTyton currently uses acrylate and synthetic rubber as adhesive bases. Acrylate adhesives belong to the family of thermoplastic resins and at normal temperatures they provide high and lasting adhesion.
When considering the final bonding of acrylate adhesives, however, it must 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 1203 or 951 must harden for at least 48 hours on the surface without loading.
Only after this period does the safety measure become apparent; when an attempt is made to pull off the rating plate (checkboard traces remain on the type 1203 and 951 materials).

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.

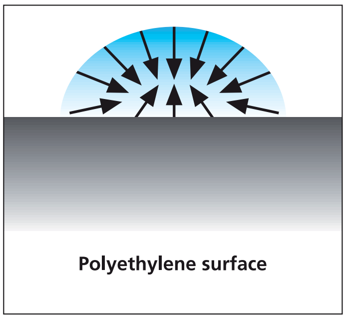


Effect of surface energy on bonding properties

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, silicon, 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]*
Polytetrafluorethylene (PTFE)	18
Silicon (Si)	24
Polyvinyl fluoride (PVF)	25
Natural rubber(CR)	25
Polypropylene (PP)	29
Polyethylene (PE)	35
Polymethyl methacrylate, Acryl (PMMA)	36
Epoxy (EP)	36
Polyoxymethylene, Acetal (POM)	36
Polystyrene (PS)	38
Polyvinyl chloride (PVC)	39
Vinylidene chloride (VC)	40
Polyester (PET)	41
Polyimide (PI)	41
Polyarylsulfone (PAS)	41
Phenolic resin	42
Polyurethane (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.

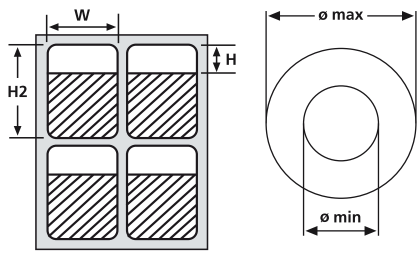
For optimum marking using acrylate-based adhesive labels, HellermannTyton uses an improved adhesive formulation, which is co-ordinated to the most common materials in industry. In most cases it is possible to guarantee very good application of these labels. In borderline cases, a modified adhesive formulation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

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

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

Pi (π) is the constant 3.14.

For further information on labels and label adhesives, see page 180.

Minimum diameter:
o 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:

$$\text{Diameter min.} = \frac{H2 - H}{2*\pi}$$

Example: TAG136LA4
(H = 19,05 mm; H2 = 67,70 mm):

$$\text{Diameter min.} = \frac{67{,}7 - 19{,}05}{2*3{,}14}$$

Minimum 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:

$$\text{Diameter max.} = \frac{H2 - H}{\pi} = 2*\ \text{Durchmesser min.}$$

Example: TAG136LA4
(H = 19,05 mm; H2 = 67,70 mm):

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

Diameter max. = (67,7 - 19,05) / 3,14 = 2* 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 (paper or plastic) 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

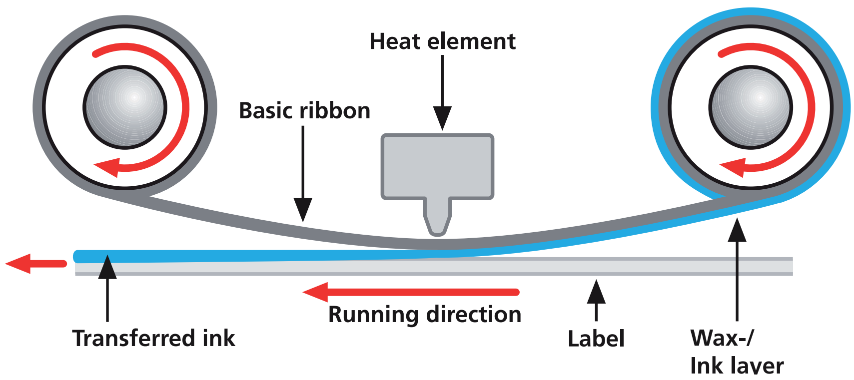
The colour layer at this quality level is based entirely on synthetic resins, developed for industrial applications and extreme conditions. Resin-based colour ribbons guarantee maximum readability, even on the most difficult materials (e.g. barcodes). Depending on the backing material, medium to high 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 incremental 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 50 mm/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.