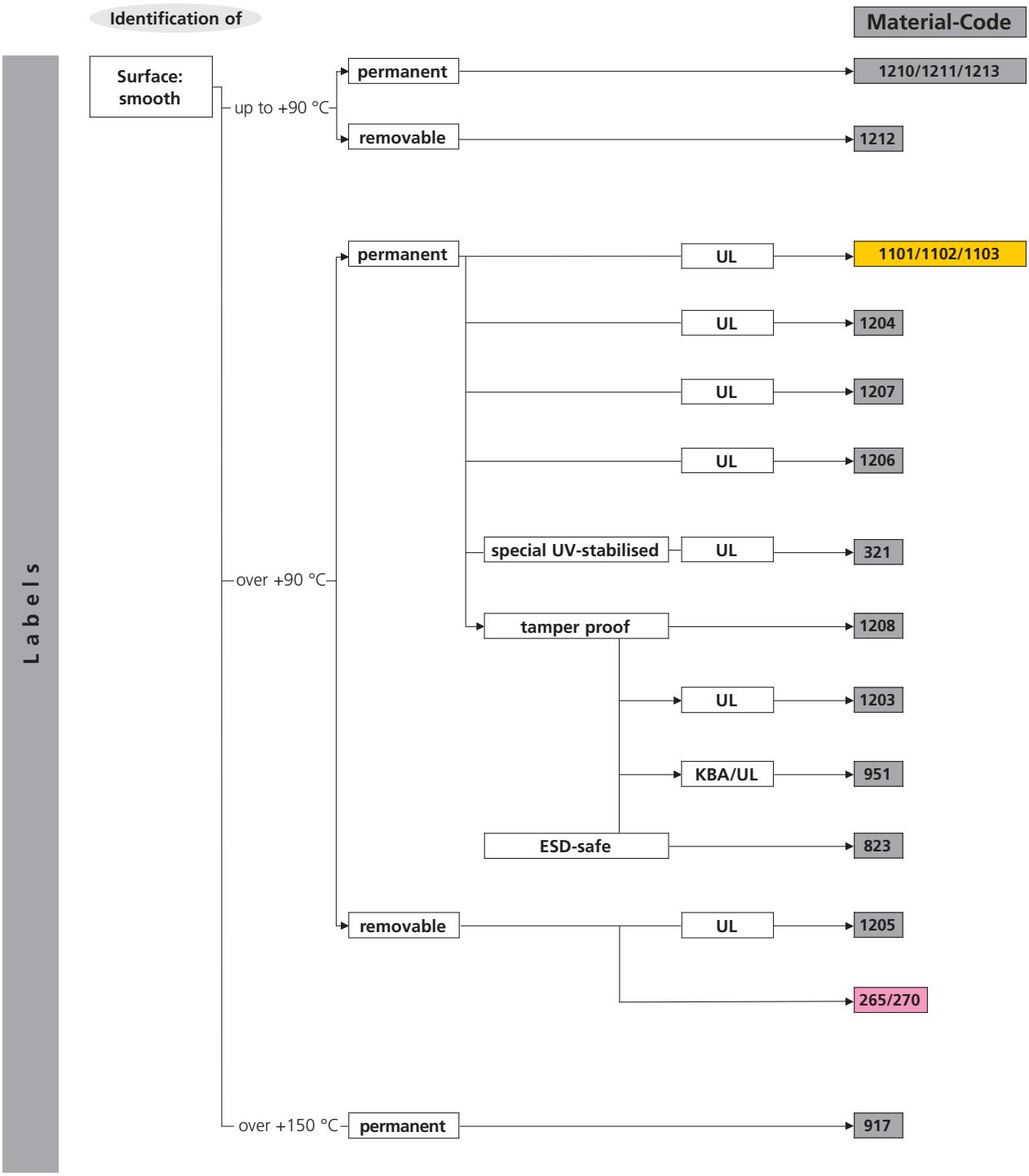
Label Selection

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

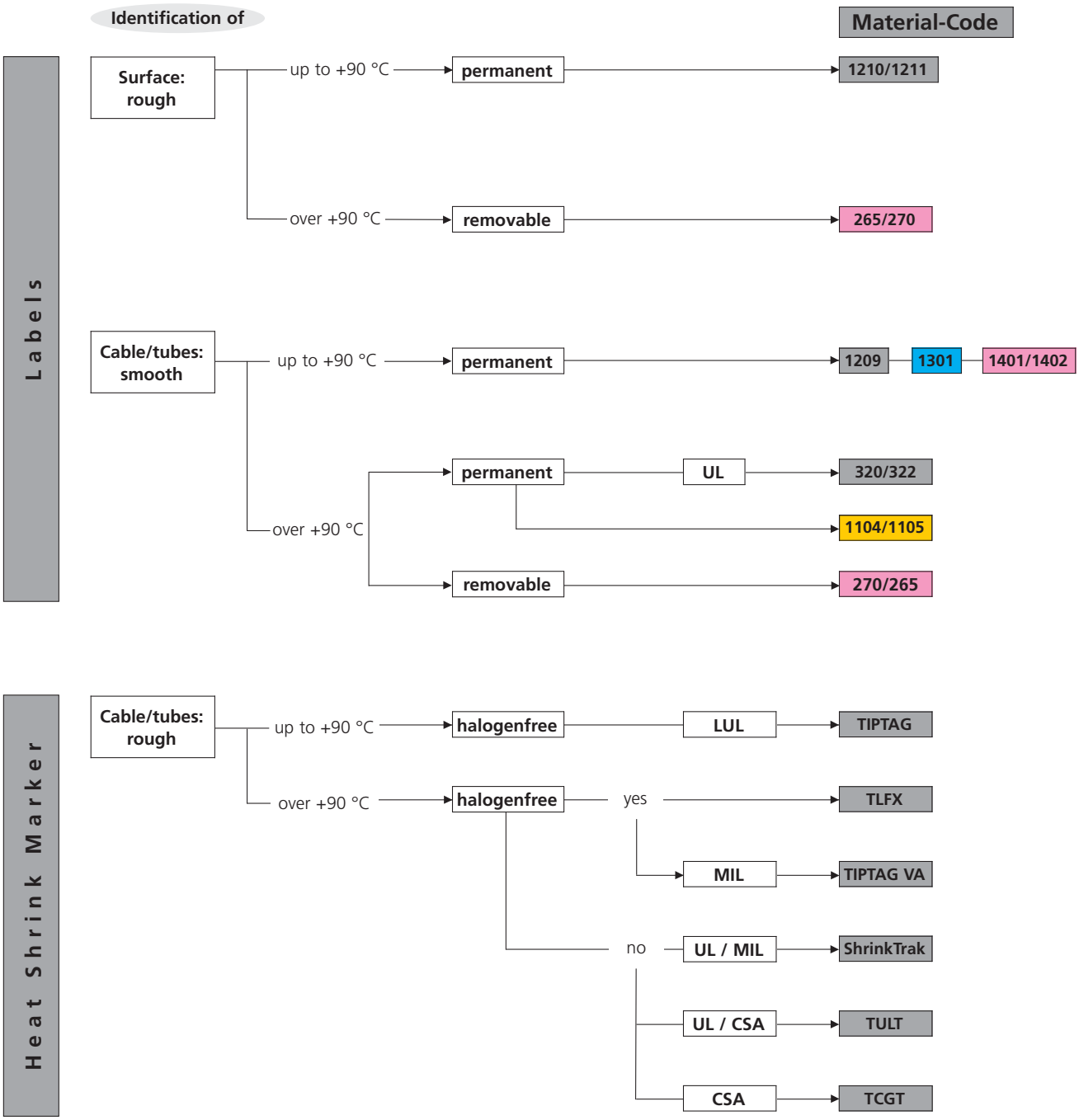
Select the object to be identified (flat or curved surface) and its surface quality (smooth or rough). Depending on what you require from our identification systems, you will be guided through the flowchart to the end. Please note that we have highlighted the respective printer technology (thermal transfer,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

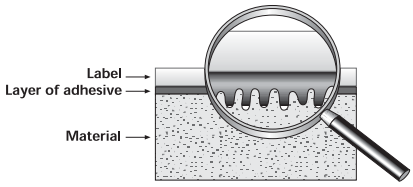
Initial and final bonding

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

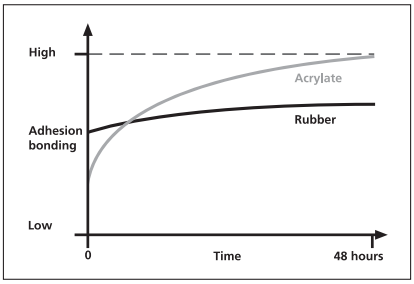
Adhesion can be described, in principle, as the ability of the adhesive to form a bond with the surface of the surface of the material (substrate). The influencing factors for optimum bonding of the label are the quality of the surface of the material and the creep ability of the adhesive. The crucial 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 thermo-plastic 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).

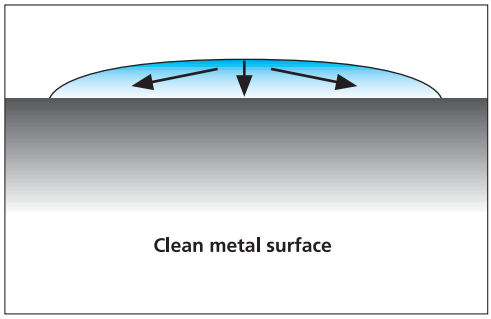
Synthetic rubber-based adhesives, unlike acrylate-based adhesives, are distinguished by their high initial bonding. But this adhesive technology does not achieve a final bonding comparable to acrylate adhesives (see graph). Special mixtures of synthetic rubber are used in labelling technology, for example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



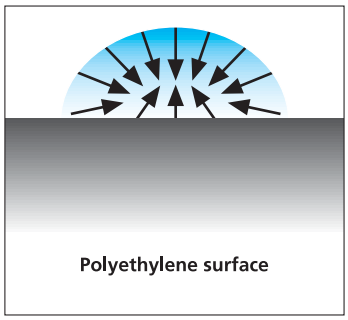
Effect of surface energy on bonding properties

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 rubber	25
Polypropylene (PP)	29
Acryl (PMMA)	31
Epoxy (EP)	36
Polyacetal (POM)	36
Polystyrol (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.

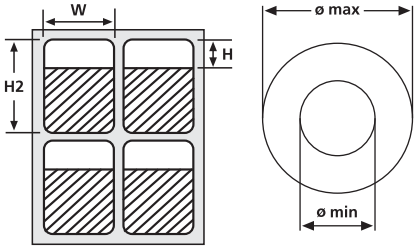
For optimum marking using acrylate-based adhesive labels, HellermannTyton uses an improved adhesive formulation, which is coordinated to the most common materials in industry. In most cases it is possible to guarantee very good application of these labels. In borderline cases, a modified adhesive formulation 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 468.

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:

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

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

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

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:

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

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

$$\text{Diameter}_{max} = \frac{67.7 - 19.05}{3.14} = 2*\text{Diameter min.}$$

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

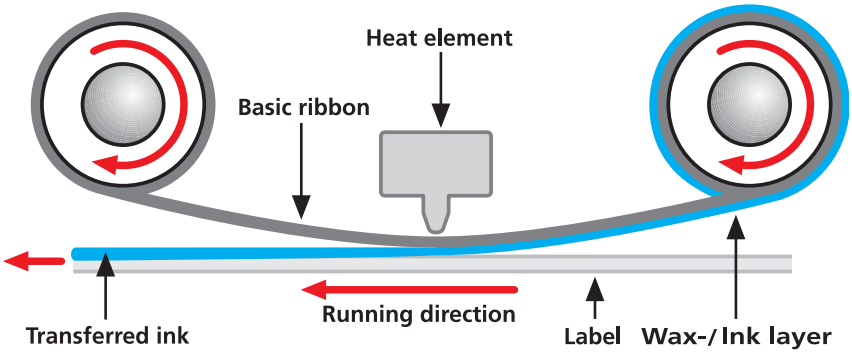
The colour layer at this quality level is based entirely on synthetic resins, developed for industrial applications and extreme conditions. Resin-based colour ribbons guarantee maximum readability, even on the most difficult materials (e.g. barcodes). Depending on the backing material, medium to high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

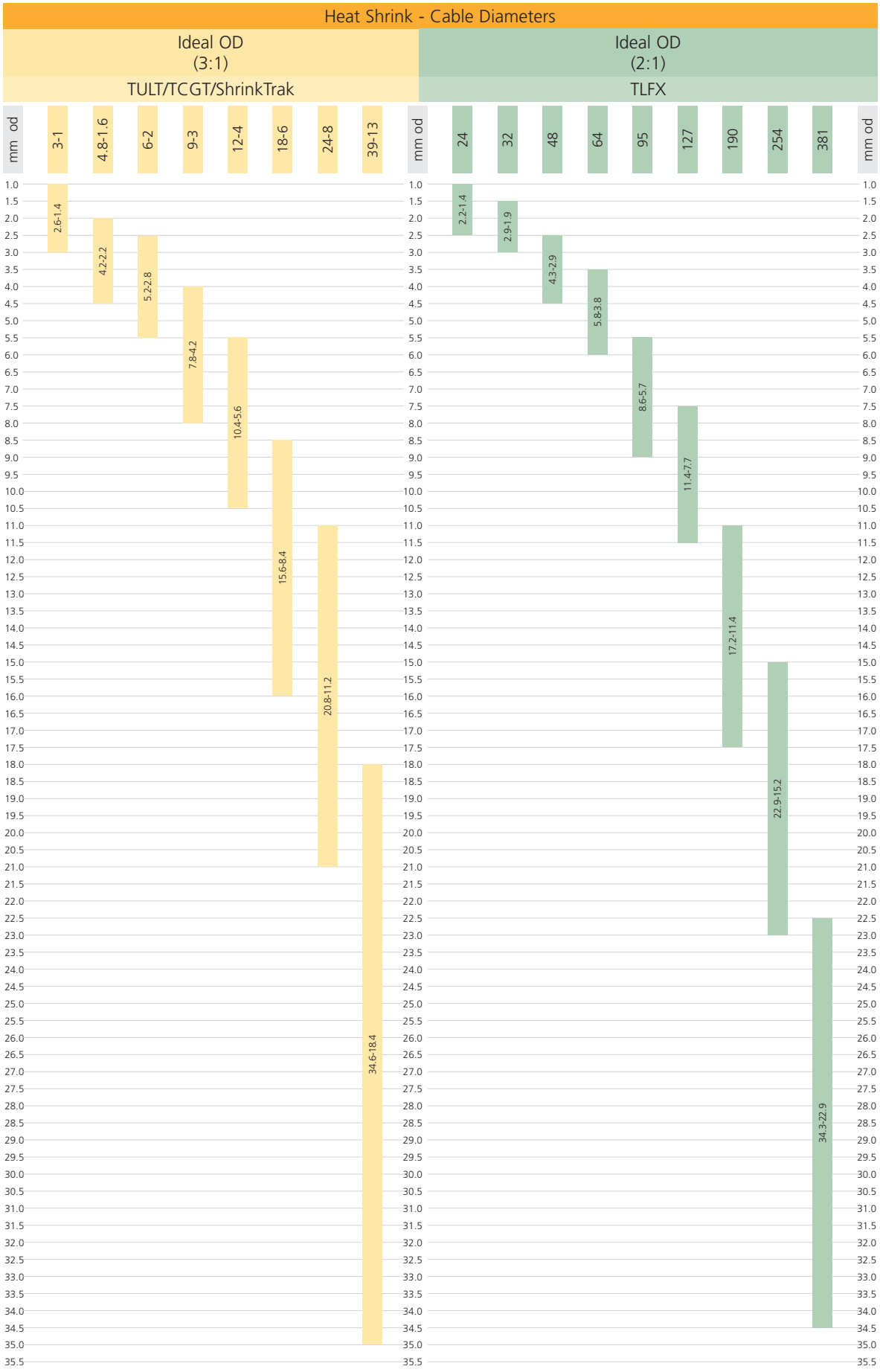
Moreover, the linear orientation of the labels or of the heat shrink tubing makes it possible to print on demand. The printing is then carried out as required. This is especially useful in the production of rating plates in series production.

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

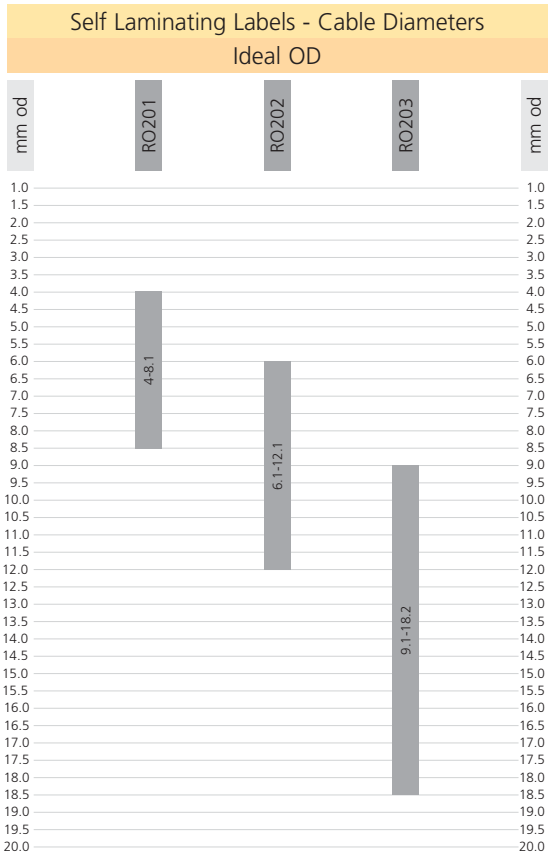
The advantages at a glance:

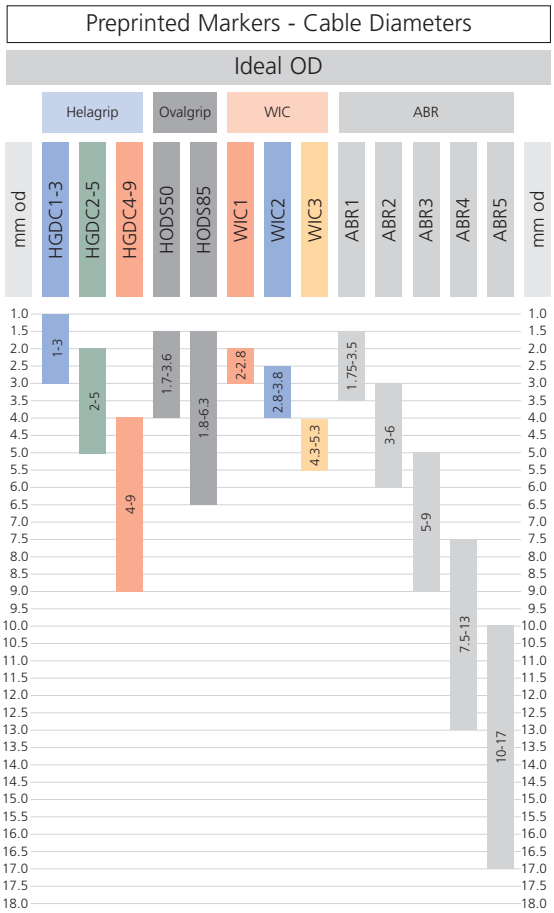
- High print quality with a resolution of 8-12 dots/mm (12 dots/mm corresponds to approx. 300 dpi)
- Barcode printing in excellent quality, hence good optical readability
- High print speeds of between 50mm/sec and 200mm/sec
- Individual graphics capability
- Problem free and rapid realisation of self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

Label Selection Guide

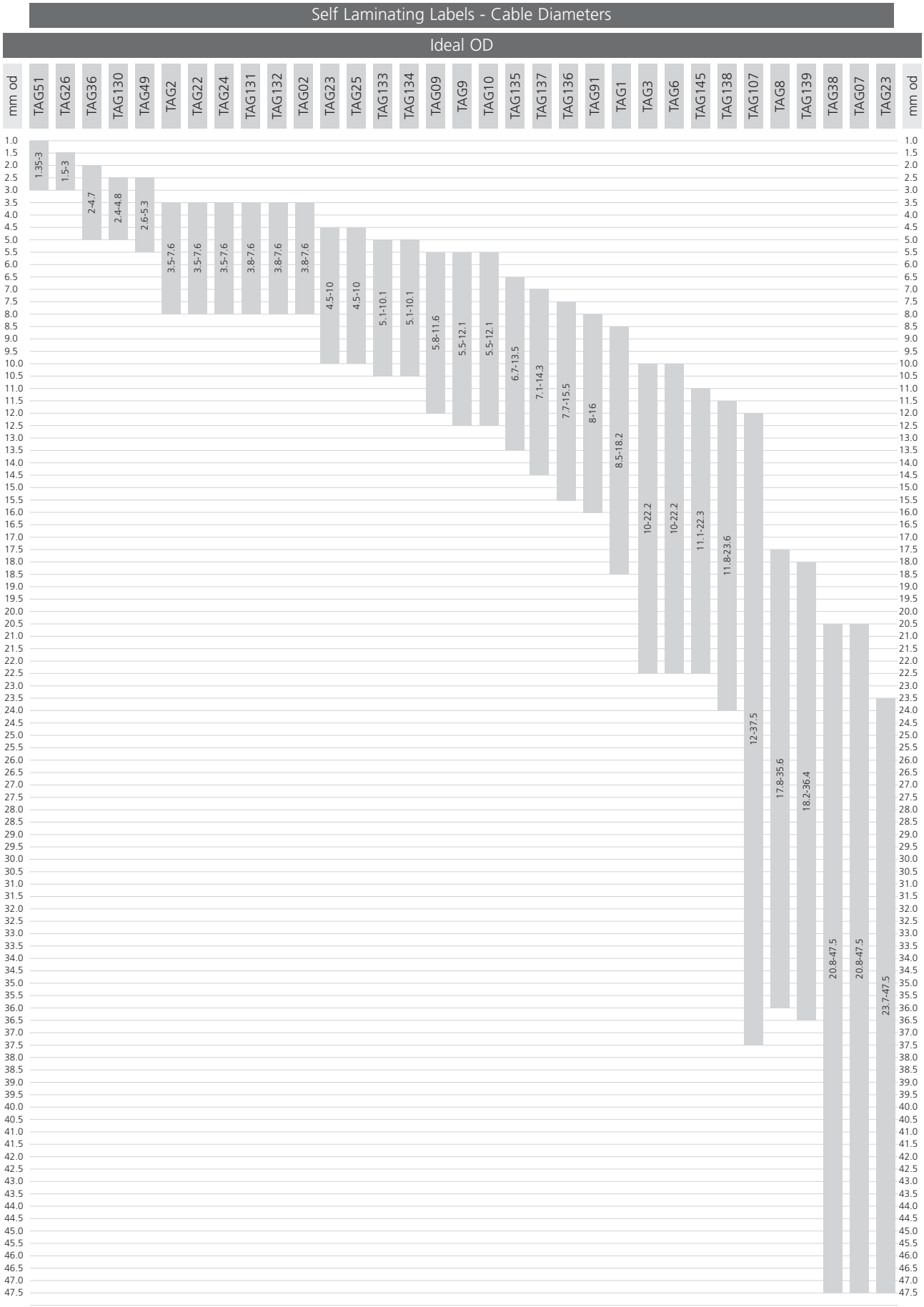


Label Selection Guide





Label Selection Guide



Laser Printer					
Material	**1101**	**1102**	**1103**	**1104**	**1105**
Material Description	Polyester, white	Polyester, yellow	Polyester, silver (SR)	Polyester self-laminating, super transparent with white write on area.	Polyester self-laminating, super transparent with white write on area.
Material Application	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	Self-laminating wire and cable marking, also suitable for flat cables	Self-laminating wire and cable marking, also suitable for flat cables
Thickness (T)	60 µm	60 µm	60 µm	23 µm	50 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 0 °C	From 0 °C	From 0 °C	From +5 °C	From +5 °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)
Label Type					
Page	518, 528	517, 527	526	492	493

Dot Matrix Printer	
Material	**1301**
Material Description	Self-laminating super transparent vinyl with white writeon area
Material Application	Self-laminating wire and cable marking (also suitbale for flat ribbon cables)
Thickness (T)	100 µm
Operating Temperature	-20 °C to +70 °C
Curing Temperature	From +10 °C
Adhesive	Acrylic
Material Durability	2 years external weathering (central European climate)
Label Type	
Page	494

Manual			
Material	**265**	**270**	**1401**
Material Description	Type 265, white cotton cloth material	Type 270, yellow cotton cloth material	Self-laminating super transparent vinyl with white write on area (WHCL)
Material Application	Temporary/permanent identification of assets and components, particularly suitable for switch panels	Temporary/permanent identification of assets and components, particularly suitable for switch panels	Self-laminating cable and wire marking (also suitable for flat ribbon cables)
Thickness (T)	150 µm	150 µm	80 µm
Operating Temperature	-40 °C to +121 °C	-40 °C to +121 °C	-40 °C to +80 °C
Curing Temperature	From +4 °C	From +4 °C	From +10 °C
Adhesive	Synthetic rubber	Synthetic rubber	Acrylic
Material Durability	2 years external weathering (central European climate)	2 years external weathering (central European climate)	2 years external weathering (central European climate)
Label Type			
Page	521	519, 520	495

Thermal Transfer - Plain Labels					
Material	**320**	**321**	**322**	**823**	**917**
Material Description	A white/clear, smooth, flame retardant, chemical resistant Polyvinylflourid (Tedlar®).	A transparent, flame retardant, smooth Polyvinylflouride (Tedlar®).	A yellow/clear smooth, chemical resistant, flame retardant Polyvinylflouride (Tedlar®).	A gloss white, heat resistant polyester.	Polyimide, yellow (YE), very heat resistant
Material Application	Self laminating wire and cable identification in aggressive environments.	Protective laminate with excellent resistance against a wide range of chemicals and solvents.	Self laminating wire and cable identification for aggressive environments.	Use in electrostatic sensitive applications.	Identification of PCBs and electonical components
Mech. Material Properties	Permanent adhesive	Protective over-laminate or clear printable label	Extremely scratch resistant	ESD requirements of EIA 625 and 541	Excellent resistance to high temperature loading, especially solder processing of PCB boards.
Thickness (T)	25 µm	25 µm	25 µm	51 µm	50 µm
Operating Temperature	-40 °C bis +107°C	-40 °C bis +107°C	-40 °C bis +107°C	-40 °C to +150 °C	-40 °C to +150 °C, Intermittent +372 °C
Curing Temperature	From +10 °C	From +10 °C	From +10 °C	From +5 °C	From +10 °C
Adhesive	Acrylic	Acrylic	Acrylic	Acrylic	Acrylic
Material Durability	10 years external (central European climate). Excellent indoor use.	10 years external (central European climate). Excellent indoor use.	10 years external (central European climate). Excellent indoor use.	2 years external (central European climate). Some yellowing in direct sunlight.	2 years external weathering (central European climate)
Recommended Ribbon Type	TT932DOUT	TT822OUT, TT940DOUT, TTDTHOUT	TT932DOUT	TT822OUT, TT940DOUT	TTDTHOUT
Label Type					
Page	491	539	491	531	531

Thermal Transfer - Plain Labels					
Material	**951**	**1203**	**1204**	**1205**	**1206**
Material Description	Polyester, silver (SR), tamper proof (951A) and Polyester transparent (CL) as overlaminate (951B). Set out of 2 materials.	Polyester, silver (SR), tamper proof, adhesive suitable for critical surfaces	A silver-matt, highly heat resistant, reverse side aluminised Polyester. Adhesive suitable for critical surfaces.	Polyester, white (WH), with adhesive that is removable without residuals	Type 1206 is a white glossy material suitable for printing with thermal transfer printers. Adhesive suitable for critical surfaces.
Material Application	For automotive and electric industries for tamper proof applications. Particularly suitable as type label according to norms of German Kraftfahrtbundesamt (KBA).	Electrical and electronic identification. Security and warranty identification of components, housings and nameplates.	Electro and electronic identification. Permanent identification of components and housings. Type- and nameplates.	Electro and electronical identification. Temporary identification of components and housings.	Permanent identification of components and housings. Type- and nameplates.
Mech. Material Properties	Tamper proof identification, leaves small checkboard traces	Tamper proof identification, leaves small checkboard traces	Permanent adhesive, suitable for critical surfaces	Removable without residuals	Permanent adhesive, suitable for critical surfaces
Thickness (T)	36/25 µm	53 µm	55 µm	58 µm	50 µm
Operating Temperature	-40 °C to +150 °C	-40 °C to +120 °C	-40 °C to +150 °C, intermittent +200 °C	-40 °C to +120 °C	-40 °C to +150 °C, intermittent +200 °C
Curing Temperature	From 0 °C	From +7°C	From 0 °C	From 0 °C	From 0 °C
Adhesive	Acrylic	Acrylic	Acrylic	Acrylic	Acrylic
Material Durability	951B, approximately 2 years. Outdoor aging is dependent on climate, direction the label is facing, surface angle and amount of airborne pollutants to which the label is exposed.	At vertical exposure to weathering (central European climate) 2 years.	At vertical exposure to weathering (central European climate) 1 year.	At vertical exposure to weathering (central European climate) 2-3 years.	At vertical exposure to weathers (central European climate) 2 years.
Recommended Ribbon Type	TT822OUT	TT822OUT	TT822OUT	TT822OUT	TT822OUT
Label Type					
Page	534	532	522	525	523

Thermal Transfer - Plain Labels				
Material	**1207**	**1208**	**1209**	**1210**
Material Description	Type 1207 is a clear smooth PET foil with highest adhesion. The material is best resistant against many chemicals and solvents.	Acetate foil, white (WH), tamper proof	A white/clear, smooth, flame retardant vinyl.	A smooth, gloss white Vinyl foil. Adhesive suitable for critical surfaces.
Material Application	Protective laminate for labels	General identification with need of manipulation detection	Self-laminating cable and wire identification, also suitable for flat ribbon cables.	General identification. Identification of control panels and warning labels. Use also with IT identification ties and AT/IMP plates.
Mech. Material Properties	Protection towards abrasion	Tamper proof, material will easily fragment if removed	Due to its flexibility particularly suitable for identification of cables	Permanent adhesive, suitable for critical surfaces
Thickness (T)	60 µm	50 µm	90 µm	83 µm
Operating Temperature	-40 °C to +150 °C, intermittent +200 °C	-40 °C to +100 °C	-20 °C to +80 °C	-20 °C to +80 °C
Curing Temperature	From 0 °C	From +10 °C	From 0 °C	From +5 °C
Adhesive	Acrylic	Acrylic	Acrylic	Acrylic
Material Durability	At vertical exposure to weathering (central European climate) 3 years. Virtually unlimited when used indoors.	At vertical exposure to weathering (central European climate) 2 years.	At vertical exposure to weathering (central European climate) 1 year. Excellent for indoor use.	At vertical exposure to weathering (central European climate) 2 years. Excellent indoor use.
Recommended Ribbon Type	TT822OUT, TT940DOUT, TTDTHOUT	TT822OUT	TT896OUT, TT932DOUT	TT822OUT
Label Type				
Page	539	533	490	511, 524

Thermal Transfer - Plain Labels			
Material	**1211**	**1212**	**1213**
Material Description	A smooth, gloss yellow vinyl label. Adhesive suitable for critical surfaces.	Vinyl, matt yellow (YE)	Type 1213 is a coloured and very smooth Vinyl material with excellent outdoor properties. It has nearly endless shelf life when used indoors. The material is flame retardent.
Material Application	General identification. Identification of IT ties and AT/IMP plates as well as switch panels.	General Identification. Suitable for temporary and permanent identification.	Warehouse labeling, warning notices. Also General marking purposes.
Mech. Material Properties	Adhesive suitable for critical surfaces	Adhesive removable without traces.	Permanent adhesive, suitable for rough surfaces
Thickness (T)	83 µm	86 µm	66 µm
Operating Temperature	-20 °C to +80 °C	-20 °C to +80 °C	-40 °C to +90 °C
Curing Temperature	From +5 °C	From +5 °C	From +8 °C
Adhesive	Acrylic	Acrylic	Acrylic
Material Durability	At vertical exposure to weathering (central European climate) 2 years. Excellent for indoor use.	2 years external weathering (central European climate)	At vertical exposure to weathers (central European climate) 7-8 years. Nearly endless when used indoors.
Recommended Ribbon Type	TT822OUT	TT822OUT	TT822OUT, TTRW
Label Type			
Page	512, 515	515	529, 530