

DIRECT THERMAL AND THERMAL TRANSFER BOOK



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Variable Information Printing

Thermal transfer (TTR) and Direct thermal (DT) are methods of Variable Information Printing (VIP). Using VIP, information can be changed from one printed piece to the next without slowing down the printing process. VIP printing on self-adhesive labels is usually done at the point where the label is applied. Prior to this, labels can be pre-printed with a logo or with a Prime labelling style multicolour layout.

UPM Raflatac is a global leader in VIP business. We are part of UPM, the frontrunner in the new Biofore segment, uniting the expertise and technologies of the bio and forest industries. Our technological leadership sets new standards for the entire industry – in efficiency, ecology and economy. We are constantly innovating new and improved labelling products that meet market demand for higher performance materials with unrivalled visual appeal. UPM Raflatac is renowned for high-quality products with sustainable lifecycles, and excellence in customer service.

THE APPLICATIONS

Direct Thermal printing is used mainly in Retail end-uses, and also in Logistics and Food labelling. The shelf-life of the print is usually relatively short in these cases, though special thermal grades are available to extend the durability of the print. In Retail, direct thermal VIP is most common at fresh service counters, especially self-service weigh-price labelling, and it is also used in backroom meat labelling. The main benefits of DT are its ease of use and the relatively cost-competitive printing and scanning equipment, as paper is the only consumable. It is also possible to achieve good quality bar codes at high speed.

Thermal Transfer is mainly used in logistics applications where a longer print life or higher durability are required. Though both DT and TTR printing methods are relatively mature, market volumes are increasing thanks to growth in retail and manufacturing, a trend towards smaller packages because labels don't shrink in proportion, internet and home shopping, and limited threat from other labelling technologies.

UPM Raflatac offers a wide range of DT and TTR face materials covering needs from short shelf-life labelling to extended durability and fast print speed. This Direct Thermal and Thermal Transfer Book serves as an informative thermal printing resource while presenting UPM Raflatac products for every VIP requirement.



AN INTRODUCTION TO THERMAL TRANSFER

The sheer volume of variable information printed by thermal transfer reflects a vast and rapidly expanding market. With so many TTR labelstocks available for numerous end-uses, it becomes all the more difficult to select the right product for the right application. But making the correct choice needn't be that complicated. UPM Raflatac has applied its universally acknowledged expertise in self-adhesive pressure sensitive labelstock to design and produce a range of dedicated thermal transfer products to meet virtually every need.

From tracking and tracing and product identification to logistics and industrial end-uses, the common point of any

TTR application is the long life required from the label in difficult conditions – environmental, physical and chemical. The TTR-printed image must be equally enduring, and it is here that the choice of ribbon is decisive. Our Ribbon Recommendations Directory is an invaluable companion to this publication, matching the right UPM Raflatac labelstocks with the most suitable transfer ribbons. An online product and ribbon consultant can also be found at www.upmraflatac.com.

TTR Technology

HOW IT WORKS

Thermal transfer printing creates an image by melting solid ink coated on a filmic ribbon and transferring it onto a receiving material. The receiving material can be an uncoated paper, a coated paper or a film. Though almost all pressure sensitive labelstocks can be printed by thermal transfer, the best results are achieved with the use of carefully selected materials. Depending on the type of print and level of quality that converters and their customers require, a suitable ribbon must be used in combination with an appropriate and correctly set printing device.

PRINTERS AND THERMAL PRINT HEADS

Industrial thermal transfer printers, which typically have a resolution of 8 dots/mm and work at speeds below 305 mm/s, use flat thermal print heads. With flat-type print heads, it takes longer to transfer the ink than with near- and corner-edge technology. With near- and corner-edge technology the ink is transferred very quickly, as the ribbon is removed while the ink is still molten. Industrial near- and corner-edge printers typically work below 12 dots/mm and 254 mm/s.

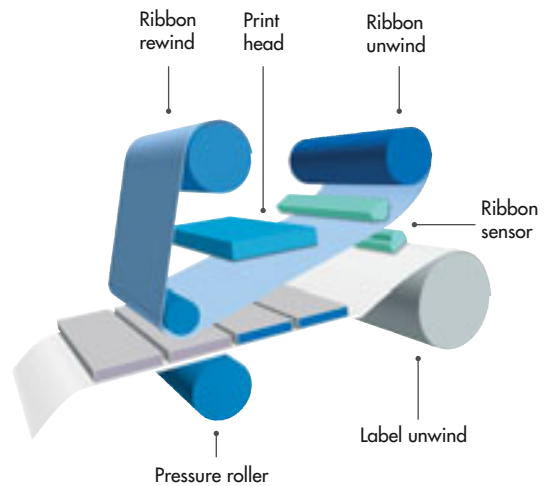
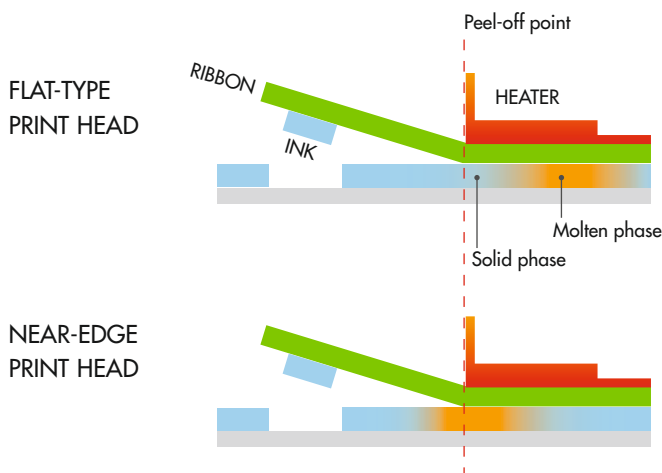
LABEL FACES AND RIBBON COMPATIBILITY

The chemical and physical properties on the surface of a labelstock's face material determine the type of thermal transfer ribbon that will be compatible. There are three main types of ribbon.

WAX ribbons are the most commonly used ribbon type and provide an economical solution for thermal transfer. Designed for use with flat-type print heads, wax ribbons can be used with comparatively absorbent uncoated face papers as well as with coated papers.

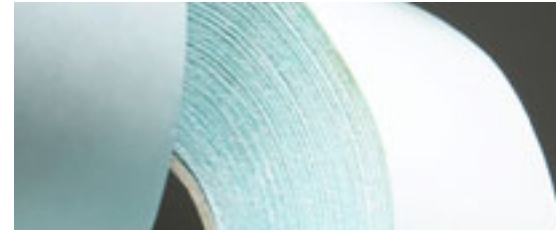
WAX/RESIN ribbons supply high performance for a variety of end-uses. The mechanical resistance of the printed image is very good. Wax/resin ribbons are intended for use with non-absorbent materials such as coated paper and films, but they can also be used with Vellum when exceptional mechanical resistance is required. Wax/resin ribbons can be printed with near-edge and corner-edge print heads.

RESIN ribbons are designed for use in very demanding applications. Images printed with a resin ribbon have very high resistance to mechanical wear, solvents and heat. This type of ribbon is usually used with filmic face materials like PE, PP and PET, and comparatively less transfer ink is required to produce an opaque image.



Source: Sony Chemicals Corporation

THE THERMAL TRANSFER PRODUCT RANGE



All the following TTR products perform reliably and offer a consistently high-quality thermal transfer with selected ribbons.

VELLUM TTR

Surface-sized, wood-free, supercalendered paper.

A universal label paper for commercial and general labelling requiring variable information printing by thermal transfer.

Vellum TTR can be used with wax and wax/resin ribbons, depending on the required scratch/smudge resistance and heat tolerance.

TRANSFER MATT

Matt-white, off-machine coated, wood-free supercalendered label paper.

For multipurpose labels with a matt finish.

Designed for thermal transfer printing with good bar code resolution.

Transfer Matt can be used with wax and wax/resin ribbons depending on the required scratch/smudge resistance and heat tolerance. High opacity and brightness levels.

TRANSFER XTRA

Wood-free label paper, matt-coated on one side for optimal thermal transfer printability.

Specially designed for thermal transfer applications to give the highest character definition and bar code resolution. Also accepts the main types of press print including water-based flexography.

RAFLABRITE

White, wood-free, machine-coated, supercalendered midgloss paper.

A multipurpose label paper for high-quality multicolour labels requiring good print definition and fine detail.

Typical end-uses are food and product information labelling where gloss is required. Raflabrite can be printed with wax/resin ribbons.

FILMS

SYNTRANSFER

Syntransfer is a matt-coated, white highly opaque polyethylene film designed for thermal transfer applications. It offers excellent print and overprint properties coupled with stiffness suitable for automatic dispensing.

The strength of Syntransfer's coating makes it ideal for outdoor applications where high-strength properties and resistance to smudging are a must.

Syntransfer is printable with wax, wax/resin and resin ribbons.

POLYPRINT 100

Polyprint 100 is synonymous with chemical drum labelling. It is a high-density polyethylene film with a matt-white coating.

This label material is durable, almost completely tear-proof, and resistant to water and most oils and chemicals. Its chemical composition also provides good stability under exposure to sunlight outdoors.

Polyprint 100 gives a smudgeproof print using wax, wax/resin and resin ribbons, and also prints well with the main printing processes.

SYNLITE TTR

Synlite TTR is a white, opaque, matt coated PP-based film.

Its thinner nature makes it ideal for hand applied labels and automatic dispensing of large labels in logistics and industrial chemical end-uses. It offers good chemical and environmental resistance and smudgeproof performance with selected TTR ribbons. Synlite TTR is printable with wax, wax/resin and resin ribbons.

SynLite TTR, Syntransfer and Polyprint 100 are BS5609 approved with selected adhesives.

OTHER TTR FILM PRODUCTS

Top-coated BOPP, PE and PET products are also suitable for use in a range of applications involving information labels overprinted by thermal transfer. Please refer to our technical information sheets for details of our filmic face materials and their suitability. UPM Raflatrac also provides a ribbon recommendations tool online to match appropriate combinations of face material and ribbon.



AN INTRODUCTION TO DIRECT THERMAL

Because labels printed by direct thermal have a comparatively short lifespan due to the way the image tends to fade over time, the main end-use areas are service counter and self-service price labelling, backroom weight-price labelling in retail, industrial shipping & logistics and automatic labelling in the food industry.

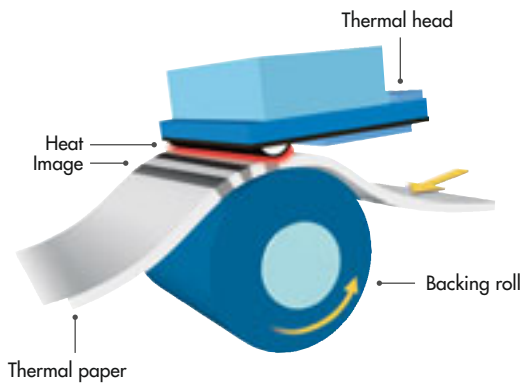
Direct thermal papers are classified into three main categories, Eco, barrier-coated on one side and barrier-coated on both sides. The thermal layer on Eco papers is unprotected, and the stability of the printed image against chemicals, water and abrasion is limited. The thermal layer on papers with a single coat is protected on the printed side of the label to provide higher image stability and good scratch resistance. Thermal papers with a barrier coat on both sides provide even greater image stability and resistance to water, plasticizers and oil, for example. The second coat also prevents substances migrating up through the reverse side of the label. Even so, it should be remembered that printed thermal papers with a barrier coat on both sides still have a limited lifespan.

DT Technology

HOW IT WORKS

Direct thermal products derive their functionality from thermochromism, which describes the ability of a substance to alter in colour due to a change in temperature.

The thermal layer in all direct thermal products contains three main components: a colourless dye (colour former), an acidic material (colour developer) and a sensitizer. Various quantities of pigments, binders and additives are also included.



A microencapsulated solid blend of colour former and sensitizer melts under the thermal print head (e.g. at 250 C) and reacts with the colour developer. As a consequence of this chemical reaction, the pH decreases inside the microcapsule, the colour former is protonated, and it transforms into a coloured form. This reaction is reversible, so the printed image can fade or totally disappear due to exposure to water, light, oil, plasticizers and solvents.

ECO OR BARRIER-COATED?

ECO

- No topcoat
- No resistance to plasticizers, oil or water
- No scratch resistance
- Recommended for a short life in a safe environment



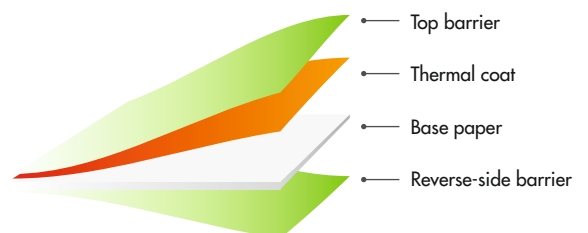
ONE-SIDE COATED

- Barrier-coated on the topside
- High bar-code scratch resistance
- Good image stability
- Recommended for logistical labels

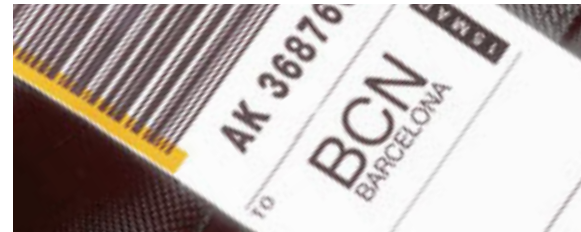


TWO-SIDES COATED

- Barrier-coated on top and reverse side
- Smudgeproof
- Resists plasticizers, oil and water
- Good scratch resistance
- Well protected against chemical and mechanical stress and high humidity



THERMAL PAPERS AND SENSITIVITY



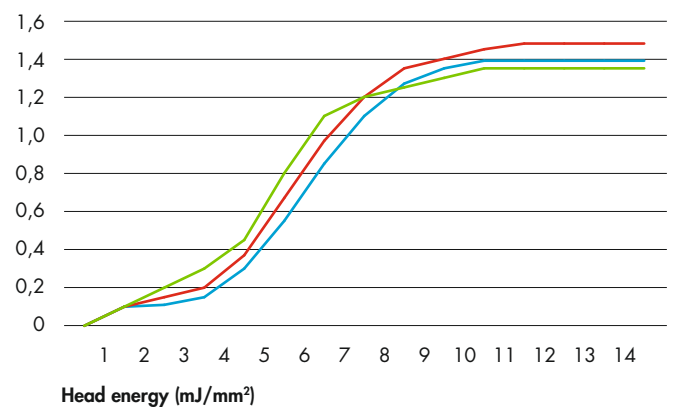
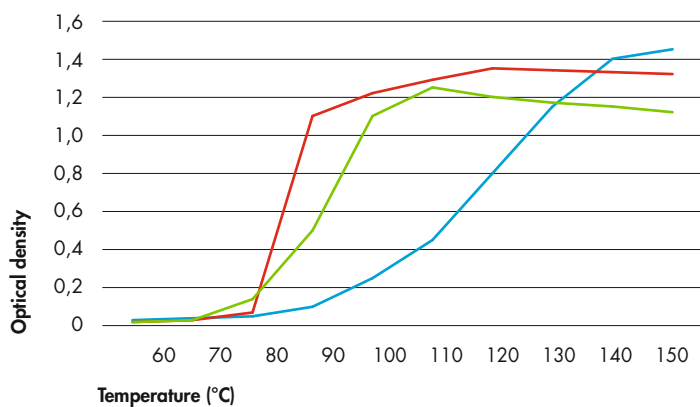
The sensitivity of a direct thermal paper is a key influence on the speed at which it can be printed and the quality of the image. There are two types of sensitivity: static and dynamic. In general it can be said that an optimum thermal paper has low static sensitivity coupled with high dynamic sensitivity.

STATIC SENSITIVITY

Static sensitivity indicates the temperature at which the thermal coating starts to react, and this influences both the heat resistance and the resolution of the printed image. Low static sensitivity prevents a premature reaction of the thermal layer during label converting and makes it possible to use the printed labels in a warm environment. Low static sensitivity also prevents an undesirable reaction in the thermal coating during the cooling stage of each printing pulse, ensuring a crisp image for trouble-free scanning and reading.

DYNAMIC SENSITIVITY

Dynamic sensitivity defines the reaction speed of the thermal material when printed. A high printing speed means that less heat energy is supplied by the print head, in which case the thermal paper must have high dynamic sensitivity to generate a good optical image density. UPM Raflatac defines high-speed printing as above 200 mm/s. Because dynamic sensitivity is the most important variable in direct thermal printing, dynamic sensitivity levels are included in our product names (200 = standard dynamic sensitivity, 300 = high dynamic sensitivity).



— THERMAL TOP P 200 — THERMAL TOP 200 — THERMAL ECO 300

THE DIRECT THERMAL PRODUCT RANGE

ECO PRODUCTS

THERMAL ECO 300

Non top-coated paper with a high sensitivity thermal coating. Limited resistance to thermal image scratching or smudging.

For information labelling in dry environments such as price marking and other short-life retail and logistics end-uses. Avoid contact with moisture, oil, fats and plasticizers (PVC).

Printing speed: up to 300 mm/s (plain label).

THERMAL ECO 300 F CERT MC

Non top-coated paper with a high sensitivity thermal coating. FSC certified (mixed credit). Limited resistance to thermal image scratching or smudging.

For information labelling in dry environments such as price marking and other

short-life retail and logistics end-uses. Avoid contact with moisture, oil, fats and plasticizers (PVC).

Printing speed: up to 300 mm/s (plain label).

THERMAL ECO 200

Non top-coated paper with a standard sensitivity thermal coating. Very limited resistance to scratching or smudging of the thermal image.

For short-life information labelling in dry environments such as weigh-pricing in food retail. Avoid contact with moisture, oil, fats and plasticizers (PVC).

Printing speed: up to 200 mm/s (plain label).

THERMALITE ECO 300

Non top-coated thin paper with a high sensitivity thermal coating. Limited resistance to thermal image scratching or smudging.

For information labelling in dry environments such as price marking and other short-life retail and logistics end-uses. Avoid contact with moisture, oil, fats and plasticizers (PVC).

Printing speed: up to 300 mm/s (plain label).

THERMAL ECO TPF F CERT MC

Non top-coated paper with a high sensitivity thermal coating. Produced without phenol-based chemistry. FSC certified (mixed credit). Limited resistance to thermal image scratching or smudging.

For self-service scales, weigh-price, shipping and logistics labelling. Avoid contact with moisture, oil, fats and plasticizers (PVC).

Printing speed: up to 300 mm/s (plain label).

THERMAL ECO BPAF F CERT MC

Non top-coated paper with a high sensitivity thermal coating. Produced without BPA-based chemistry. FSC certified (mixed credit). Limited resistance to thermal image scratching or smudging.

For self-service scales, weigh-price, shipping and logistics labelling. Avoid contact with moisture, oil, fats and plasticizers (PVC).

Printing speed: up to 300 mm/s (plain label).



BARRIER-COATED PRODUCTS

THERMAL TOP 200

Top side barrier-coated paper with a standard sensitivity thermal coating.

Information labelling requiring good bar code scratch resistance to guarantee excellent scanning properties in dry end-use environments including retail, transport and logistics.

Pre-printable with all press methods including flexo (water, solvent and UV), letterpress and UV offset.

Printing speed:
up to 200 mm/s (plain label).

THERMAL TOP P 180

Top and reverse side barrier-coated paper with a standard sensitivity thermal coating.

For a wide range of industrial applications including pre-packed foodstuffs labelling where premium resistance to oil and water is required.

Pre-printable with all press methods including flexo (water, solvent and UV), letterpress and UV offset.

Printing speed:
up to 180 mm/s (plain label).

THERMAL TOP P 200

Top and reverse side barrier-coated paper with a standard sensitivity thermal coating.

For a wide range of information and product labelling requiring good environmental resistance of the printed image in end-use areas such as food, retail, transport and logistics.

Pre-printable with all press methods including flexo (water, solvent and UV), letterpress and UV offset.

Printing speed:
up to 200 mm/s (plain label).

THERMAL TOP P 300

Top and reverse side barrier-coated paper with a standard sensitivity thermal coating.

For universal information and product labelling requiring good environmental resistance from the printed image in end-use areas such as food, retail, transport and logistics.

Pre-printable with all press methods including flexo (water, solvent and UV), letterpress and UV offset.

Printing speed:
up to 300 mm/s (plain label).

THERMALITE TOP 200

Top side barrier-coated thin paper with a standard sensitivity thermal coating.

Information labelling requiring good bar code scratch resistance to guarantee excellent scanning properties in dry end-use environments including retail, transport and logistics.

Pre-printable with all press methods including flexo (water, solvent and UV), letterpress and UV offset.

Printing speed:
up to 200 mm/s (plain label).

THERMAL DURABLE P 300

Top and reverse side barrier-coated paper with a high sensitivity thermal coating.

For universal information and product labelling requiring extremely good environmental and heat resistance from the printed image. Typical applications include logistics, transport, retail and food labelling, where the label must remain readable for several months.

Pre-printable with all press methods including flexo (water, solvent and UV), letterpress and offset.

Printing speed:
up to 300 mm/s (plain label).



LUGGAGE TAG PRODUCTS

Laminated with a 30-micron PP film, these products are designed especially for Luggage Tag type applications requiring strong and tear-resistant labels.

LUGGAGE TAG ECO 300

Where image stability is not critical.

LUGGAGE TAG TOP 200

Where high image stability is required.

LUGGAGE TAG TOPLITE 200

Where high image stability and a thinner laminate construction are preferred.

These products are ideally suited for indoor use.

For short-term outdoor use and other applications requiring high image stability and a more durable label, a filmic solution is recommended.

SYNTHERMAL P 200

A top and reverse side barrier-coated PP film with a standard sensitivity thermal coating. Reinforced with a two-layer cross-laminated HDPE film, which provides a uniformly strong, tear and puncture resistant tag material.

Printing speed: up to 200 mm/s (plain label).

BOARD PRODUCTS

THERMAL ECO BOARDS

Non top-coated lightweight board with a standard sensitivity thermal coating. Limited resistance to thermal image scratching or smudging.

For information labelling, preferably in indoor applications such as retail, boarding cards and travel tags. Avoid contact with plasticizers and fatty substances.

Available in 100, 130, 160, 190 and 220 g/m².

Printing speed: up to 200 mm/s (plain label).

THERMAL TOP BOARDS

Top and reverse side barrier-coated lightweight board with a standard sensitivity thermal coating.

For information labelling in dry environments, e.g. hang and shelf tags, lottery use, ticketing, boarding passes and inventory control tags.

Available in 105, 150 and 170 g/m².

Printing speed: up to 200 mm/s (plain label).

DIRECT THERMAL AND PRE-PRINTED PRESS INKS

Printing a thermal paper with ink is no more complicated than printing on standard paper. However, some consideration must be given to the ink in order to avoid damaging the thermal printer or reducing the print quality. The use of a special range of inks is recommended for direct thermal papers in order to avoid trouble. Please contact your ink supplier or UPM Raflatac representative for more information.

HEAT RESISTANCE

The ink should be able to tolerate the 250 °C generated by the thermal print head. In addition to lowering the image quality, molten ink residue on the print head prevents proper cooling and leads to burnout.

ABRASIVE PARTICLES

Titanium dioxide is a very abrasive pigment. It is chiefly used as a white colorant in water-based flexo inks. Creating lighter colour shades by adding a white colorant is not recommended as it has an adverse effect on the service life of the thermal head.

INK ADHESION

ON TOP-COATED PAPER

Thermal Top papers are coated with a non-absorbent topcoat. In order to achieve optimal ink anchorage, special inks must be used.

METALLIC COLOURS

Metallic pigments are quite abrasive. The use of metallic inks on direct thermal paper is not recommended as it reduces the service life of the print head.

AMINE RATIO AND THERMAL ECO

If the amine ratio in the ink is too high, the thermal layer in Thermal Eco will react and turn grey, affecting the shade of the pre-printed image. Check that the ink is recommended for use with direct thermal Eco papers.

STORAGE AND HANDLING RECOMMENDATIONS

ROOM TEMPERATURE

+20°C

MAX RELATIVE HUMIDITY

50%

PROTECT FROM LIGHT



NO HOT OR DAMP CONDITIONS



UPM Raflatac recommends that labelstock is stored in room temperature (+20 °C) at a maximum relative humidity of 50%. Labelstock should be kept in its original packaging and protected from light. Damp or hot conditions should be avoided. The shelf life is calculated from the date of the labelstock's manufacture and is based on the adhesive's ability to maintain optimal labelling properties during storage.



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