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UNIT PRICE	PRICE
1,80/kg	1,79€

# DIRECT THERMAL AND THERMAL TRANSFER BOOK

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## Variable Information Printing

Thermal Transfer (TTR) and Direct Thermal (DT) are part of Variable Information Printing (VIP). In VIP, information can be changed from one printed piece to the next without slowing down the printing process. With pressure sensitive labels, VIP printing is usually done at the point of applying the label on the substrate. Prior to VIP printing, the labels can be pre-printed with a logo or with a Prime labeling type of multi-color layout.

UPM Raflatac is one of the global leaders in VIP business. We are part of UPM, the frontrunner in the new Biofore segment that combines the expertise and technologies of the bio and forest industries. Our technological leadership sets new standards for the entire industry: efficiency, ecology and economy. We are constantly innovating for new and improved labeling products to cater for our customers' needs for higher performance materials with unrivalled visual appeal. UPM Raflatac is known for its high quality products with sustainable lifecycles and excellence in customer service.

### THE APPLICATIONS

Direct Thermal printing is mainly used in the Retail end-use area, but also in Logistics and Food. In these end-uses, the shelf-life of print is usually relatively short, even though there are also special thermal grades for longer print durability. In Retail, the most common applications are in fresh service counters, especially self-service weigh price labeling, but also in backroom meat labeling. The main benefits of DT are easy and relatively cost competitive printing and scanning equipment, since label is the only consumable used. It is also possible to reach good quality bar codes with high speed.

TTR is mainly used in different logistics and food segment applications where longer print life or higher durability is required. UPM Raflatac offers a wide range of face materials for both DT and TTR, ranging from short shelf-life labels to applications requiring high durability and print speed.

Both printing methods are relatively mature but market volumes are growing thanks to growth in retail and manufacturing, the trend towards smaller packages as labels do not shrink in proportion, internet and home shopping, and limited threat from other labeling technologies.



## 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 for labels printed by direct thermal are service counter and self-service price labeling, backroom weight-price labeling in retail, industrial shipping & logistics applications as well as automatic labeling in 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

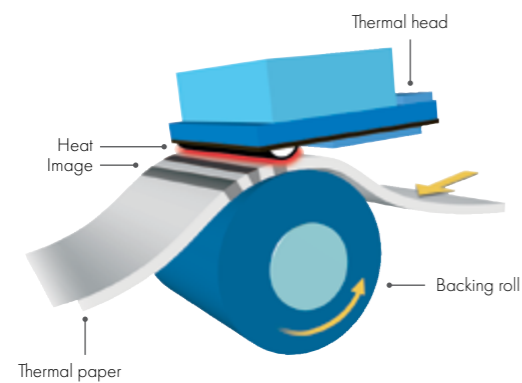
the printed image against chemicals, water and abrasion is limited. The thermal layer on papers with a single coat is protected on the printed side of the label to provide higher image stability and good scratch resistance. Thermal papers with a barrier coat on both sides provide even greater image stability 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 most of 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.



Thermal print head generates heat energy which cause melting of colour former and developer, consequently colourless dye is protonated by the developer and cause pH-change of the dye. This pH-decrease forms colour change of the dye (e.g. black). 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?

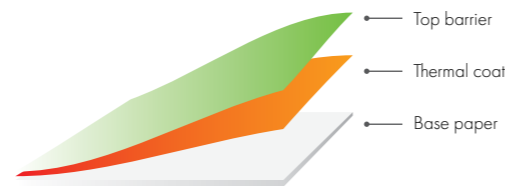
### ECO

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



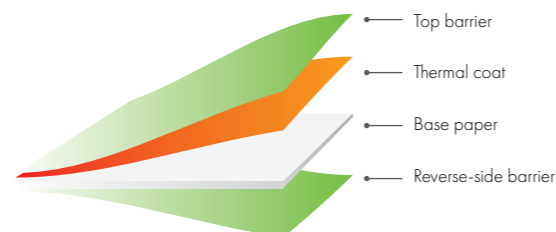
### ONE-SIDE COATED

- Barrier-coated on topside
- High bar-code scratch resistance
- Good image stability
- Recommended for logistic 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



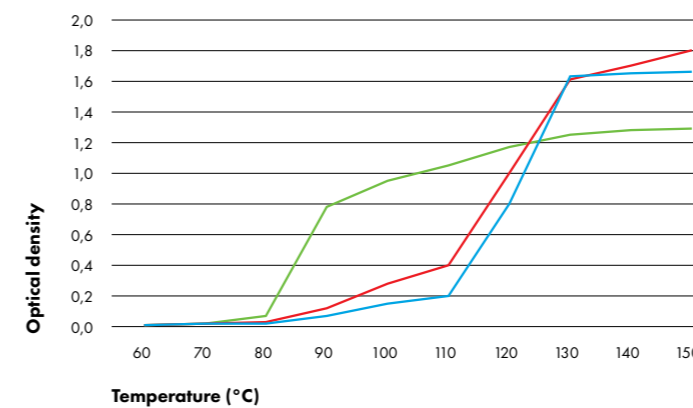
# THERMAL PAPERS AND SENSITIVITY

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.



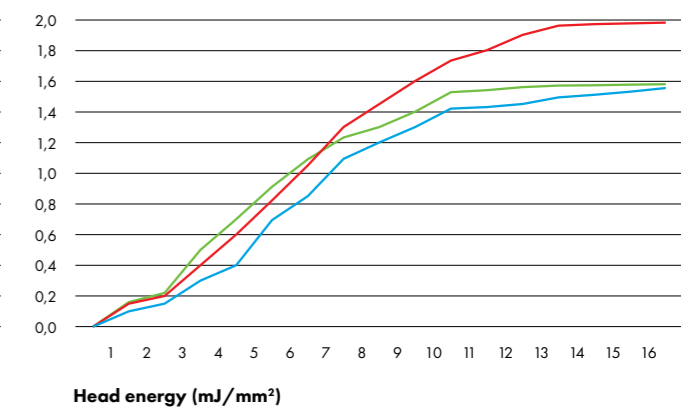
## STATIC SENSITIVITY

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. Dynamic sensitivity of the thermal material is the most important technical characteristic in direct thermal printing.



— Thermal Top Logistics NXT+PEFC — Thermal Top Food NXT+PEFC — Thermal Eco BPA-Free NXT+FSC

# THE DIRECT THERMAL PRODUCT RANGE

## ECO PRODUCTS

Products for short-life information labeling in dry environments, with limited resistance to scratching and smudging.

### RETAIL ECO BPA FREE NXT+FSC\*

A non top-coated thermal paper with standard sensitivity. For retail labeling in short life applications requiring standard dynamic sensitivity. Optimal performance in weigh-price scale and retail backroom labeling. Verified as positive climate action.

### RETAIL ECO TP FREE NXT+FSC

Next generation total phenol-free non top-coated thermal paper with standard sensitivity. For retail labeling in short life applications requiring standard dynamic sensitivity. Optimal performance in weigh-price scale and retail backroom labeling. Verified as positive climate action.

### THERMAL ECO BPA FREE NXT+FSC\*

A non top-coated thermal paper with standard sensitivity. For retail and logistics labeling in short life applications requiring standard dynamic sensitivity. Verified as positive climate action.

### THERMAL ECO TP FREE NXT+FSC

Next generation total phenol-free non top-coated paper with a high sensitivity thermal coating. Produced without phenol-based chemistry. For information labeling in dry environments such as price marking and other short-life retail and logistics end-uses. Verified as positive climate action.

### THERMAL ECO BPA FREE-FSC

A non top-coated paper with a high sensitivity thermal coating. Produced without BPA-based chemistry. For information labeling in dry environments such as price marking and other short-life retail and logistics end-uses.

### THERMAL ECO TP FREE-FSC

A non top-coated paper with a high sensitivity thermal coating. Produced without phenol-based chemistry. For information labeling in dry environments such as price marking and other short-life retail and logistics end-uses.

### RECYCLED ECO TPF PCR-FSC

A non top-coated paper with a standard sensitivity thermal coating produced totally without phenol chemistry. This face material is made from FSC™ Recycled-certified pulp.

## TOP-COATED PRODUCTS

Products for dry environment applications requiring good bar code scratch resistance to guarantee excellent scanning properties, in end-use areas including retail and logistics. Pre-printable with all conventional printing methods.

### THERMAL TOP LOGISTICS NXT+FSC

Top side barrier coated paper with a standard sensitivity thermal coating. Verified as positive climate action.

### THERMAL TOP 200-FSC

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

### RECYCLED TOP TPF PCR-FSC

A top side barrier coated paper with a standard sensitivity thermal coating produced totally without phenols. This face material is made from FSC™ Recycled-certified pulp.

### THERMALITE TOP 200-FSC

A thin, top side barrier coated paper with standard sensitivity thermal coating designed for retail, logistics and transport applications.

### THERMALITE TOP OPAQUE BLACK 200-FSC

A thin, top side barrier coated paper with standard sensitivity thermal coating designed for information labeling and retail applications where high opacity is needed to cover unwanted information.

Products for a wide range of applications requiring good bar code scratch resistance to guarantee excellent scanning properties as well as high level of moisture resistance, in end-use areas such as food, retail and logistics. Pre-printable with all conventional printing methods.

### THERMAL TOP FOOD NXT+FSC\*

Top side barrier coated with a standard sensitivity thermal coating. Reverse side barrier properties are integrated into the base paper for good moisture resistance. Verified as positive climate action.

### THERMAL TOP P 180-FSC

Top and reverse side barrier coated paper with a standard sensitivity thermal coating and excellent moisture resistance.

### THERMAL TOP P 200 TP FREE-FSC

Total phenol-free top and reverse side barrier coated paper with a high sensitivity thermal coating and excellent moisture resistance.

### THERMAL TOP OPAQUE BLUEGREY-FSC

Top and reverse side barrier coated paper with a high sensitivity thermal coating. Designed for demanding information labeling applications where good opacity and excellent moisture resistance is needed.

### THERMAL TOP P 300 TP FREE-FSC

Top and reverse side barrier coated paper with a premium sensitivity thermal coating and excellent moisture resistance.

### THERMAL DURABLE P 300-FSC

Top and reverse side barrier coated paper with premium sensitivity thermal coating and improved environmental resistance (compared to other thermal top papers).

## FILM PRODUCTS

### SYNTHERMAL P 200

A top and reverse side barrier top coated PP film with a standard sensitivity thermal coating designed for retail and logistics labeling applications when stiff and durable film label material is needed.

### SYNTHERMAL LITE

A top and reverse side barrier top coated PP film with a standard sensitivity thermal coating designed for versatile labeling applications when strong and flexible film material is needed.

### SYNTHERMAL CLEAR PLUS

A top and reverse side barrier top coated film with a standard sensitivity thermal coating designed for food labeling applications when clear face material is needed for no-label look on the transparent package.

## BOARD PRODUCTS

### THERMAL ECO BOARDS

Non top coated lightweight boards with standard sensitivity thermal coating for information labeling in indoor applications such as retail, boarding card and travel tags. Available in 100, 140 and 180 g/m<sup>2</sup>.

### THERMAL TOP BOARDS

Top and reverse side barrier coated lightweight boards with standard sensitivity thermal coating for information labeling in dry environments such as hang and shelf tags, lottery use, ticketing, boarding passes and inventory control tags. Available in 105, 150 and 170 g/m<sup>2</sup>.

## LUGGAGE TAG ECO BPAF-FSC & FRUIT TAG PRODUCTS

### Products with high tear resistance

#### LUGGAGETAG ECO BPAF-FSC

Laminated with a 30-micron PP film, this product is designed especially for Luggage Tag type applications where strong and tear resistant labels are required.

#### FRUIT TAG THERMAL TOP 230

Designed for tag applications where very good thermal print results and high tear resistance in dry conditions are needed, such as fruit net tags, hang tags and routing tags.

\*Also available as Carbon Neutral

\*Also available as Carbon Neutral



# 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.

## PRE-PRINTING AND VARNISHING

Pre-printing and varnish layers decrease print head heat energy conductivity into thermal layer, consequently it is recommended not to pre-print/varnish label area which is meant for direct thermal printing.



# 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 labeling properties during storage.

# 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 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. Please refer to the "Ribbon recommendations - film & paper label materials" guide for more information on transfer ribbons.

# 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.

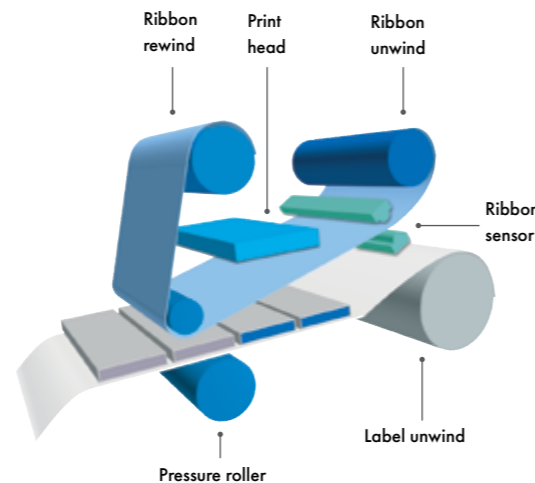
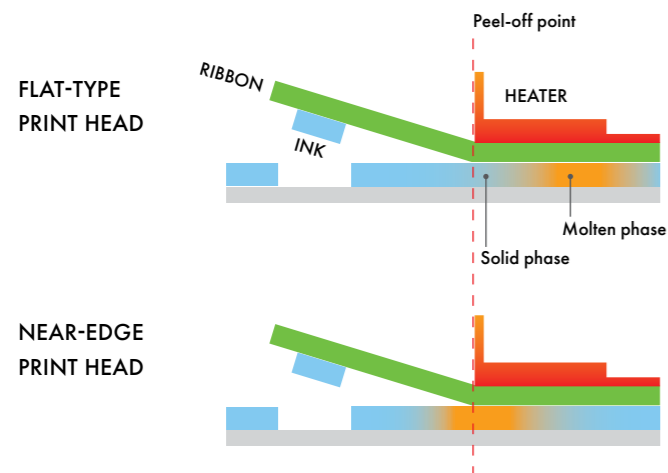
## LABEL FACES AND RIBBON COMPATIBILITY

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 products perform reliably and offer a consistently high-quality thermal transfer properties with different ribbon types.

## PAPERS

### VELLUM LOGISTICS NXT+FSC

Uncoated surface-sized paper designed for a wide range industrial applications including logistics and warehouse inventory labeling. Verified as positive climate action.

### VELLUM TTR-FSC

Uncoated surface-sized paper designed for a wide range of industrial applications including logistics and warehouse inventory labeling.

### VELLUM PREMIUM-FSC

Uncoated surface-sized paper designed for a wide range industrial applications including logistics and warehouse inventory labeling. Vellum Premium-FSC has enhanced compatibility with a wide range of wax/resin ribbons.

### VELLUM PREMIUM OPAQUE BLACK-FSC

Uncoated surface-sized paper designed for retail labeling applications where high opacity is needed to cover up un-wanted printed information.

### TRANSFER MATT-FSC

Matt-coated paper with high stiffness designed for labeling in retail, logistics and food end-use segments requiring high bar code resolution and scanning properties.

### TRANSFER MATT OPAQUE BLUEGREY-FSC

Matt-coated paper designed for versatile labeling applications where good bar code resolution and good opacity are needed to cover up un-wanted printed information.

### TRANSFER XTRA-FSC

Matt-coated paper designed for labeling in retail, logistics and food end-use segments requiring high bar code resolution and scanning properties.

### OTHER PAPER PRODUCTS

Midgloss papers (e.g. Raflacoat NXT+FSC, Raflacoat Plus-FSC, Raflabrite-FSC) and Raflagloss-FSC are also suitable for thermal transfer printed product and information labels.

## FILMS

### SYNTRANSFER

Matt coated white highly opaque polyethylene film designed for information labeling applications, printable with wax, wax/resin and resin ribbons. Ideal for industrial chemical applications when conformability and stiffness are needed as well as resistance to smudging.

### POLYPRINT 100

Matt coated white opaque high-density polyethylene film designed for information labeling applications, printable with wax, wax/resin and resin ribbons but especially recommend when wax ribbons are used. Ideal for industrial chemical applications like drum labeling when dimensional stability, stiffness and tear resistant are needed. It offers also good stability under outdoor conditions.

### SYNLITE TTR

Matt coated white polypropylene film designed for information labeling applications, printable with wax, wax/resin and resin ribbons. Ideal for industrial chemical applications when high flexibility is needed as well as resistance to smudging.

### PP MATT WHITE XTRA TC 65

Matt coated white polypropylene film designed for information labeling application, like industrial chemical labeling, when good outdoor resistance is needed. Withstands 2-year outdoor exposure in Scandinavian climate conditions. PP MATT WHITE XTRA TC 65 is printable with wax, wax/resin and resin ribbons.

### OTHER FILMIC PRODUCTS

PE white TC 85, PP white FTC 60 and PET white TC 50 are also suitable for thermal transfer printed product and information labels.



### UPM Raflatac RAFNXT+

RAFNXT+ is the world's first labeling material verified by the Carbon Trust to reduce carbon footprint and help mitigate climate change.

We use a science-based approach to quantify the positive impact you can make by choosing RAFNXT+ instead of our standard label materials, through carbon emission reduction and the forests' increased capacity to remove carbon.

The calculation model is verified by the Carbon Trust and is in accordance to international greenhouse gas accounting standard PAS2050.

We also offer CarbonNeutral® certified RAFNXT+ labeling material. The cradle-to-customer GHG emissions of CarbonNeutral® certified RAFNXT+ labeling material are compensated in full in accordance with the CarbonNeutral® Protocol.



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