Technical Bulletin
Avery Dennison® Hot Metal Labelling

Labels in the metal industry

In the metal working industry, labels are used for in-process-tracking to enable reliable ongoing identification. Marking is achieved via tags or labels, which have to endure extreme temperatures and harsh environments. With temperatures exceeding 250°C, normal label materials considered to be durable are not an option – and special materials are needed.

Application environment

Tracking hot metal parts as they leave the oven is increasingly critical for today's hot metal processers. The data collected from track and trace labels assure customers that they are receiving genuine, high-quality alloys that meet their requirements, and they help manufacturers ensure product quality, inventory accuracy and operational efficiency.

Unfortunately, the ultra-high temperatures typically found in hot metal processing plants create a tough environment for labels. Sheets, blocks, slabs, rolls or coils of metal can be extremely hot when they come out of ovens and rolling mills. Traditional printed label materials will melt under these conditions, because coatings and adhesives burn at high temperatures. Labels may also fail when they are exposed to oils and chemicals during hot metal processing, or to scraping and scuffing during transport.

Ultimately, track and trace labels work best when hot metal manufacturers apply them as soon as possible. In-process labels can uniquely identify each metal type, and link manufacturers to helpful data about the source of the raw material and its performance properties. The unique identifiers also trace metals throughout the manufacturing process.

However, hot metal labels are only as effective as their adhesion and readability performance in harsh manufacturing environments, especially as customer specifications and regulations tighten. Current solutions for track and trace labelling in the hot metal industry include:

> Riveting or welding metal plates onto the material - which adds an expensive, time-consuming step.
> Chalking identification numbers onto rolls of hot metal - in this case, writing with chalk and then trying to read it is prone to human error.
> Waiting for hot metal materials to cool down before applying polyester labels, (not engineered for high temperatures). This option creates waiting time during production, increasing the period of time when unidentified materials can be lost or misidentified.

The solution - Avery Dennison Alu Tag 175 White TOP

> Aluminium foil 150µ, coated on both sides with an opaque white top coat (12.5grs)
> Top coat is thermal transfer printable with commonly available ribbons
> Construction is heat resistant to 550°C

Printing and conversion

Conventional Printing

Avery Dennison Alu Tag 175 White TOP is coated on both sides with a high caliper white topcoat that can be printed with UV flexo and waterbased flexo inks. For improved anchorage, especially of UV flexo inks, a corona treatment can be applied. Please note that regular flexo inks, especially coloured (non-black), are not heat-proof. Colours may fade when exposed to temperatures exceeding 225°C.

For die cutting, please contact your tool manufacturer. Special hardened dies are recommended for cutting the 150 micron hard tempered aluminium. Unsuitable dies will cause sharp edges on the material, resulting in thermal transfer ribbon breaks and accelerated wearing of press and printer rollers.

Printed and die-cut tags should be re-wound on cores with a diameter as large as possible (e.g. a 6" diameter core). This is to minimise the memory or curl of the finished tags when in roll format. For thermal transfer printing, care must be taken when winding down to smaller rolls, ensuring a minimal roll tesion is achieved throughout the roll.

Printer

Thermal Transfer printing gives the best results using a near-edge printer. Due to the high stiffness of the material, flat head printers do not give the best print quality. Good results have been obtained on an Avery or Novexx 6404 or 6406 Near Edge printer.

Ribbons

Ribbons succesfully tested on the Avery Dennison Alu Tag 175 White TOP material include:

Limak Netmark	IQ	(w/r)
DNP	TR4500	(w/r)
Armor	APX650	(w/r)
Ricoh	B120E	(w/r)
Ricoh	B130ED	(w/r)
Ricoh	B130EV	(w/r)

Product characteristics

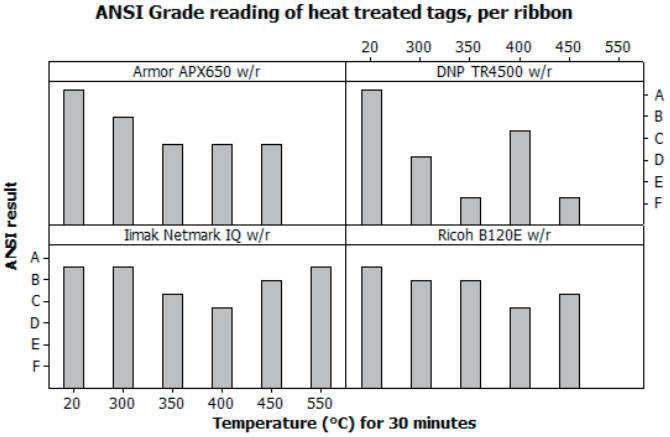
Outdoor durability

Printed tags are able to withstand outdoor conditions for one year in a mid-European climate. They feature good resistance against UV light and weathering.

Resistance of thermal transfer print

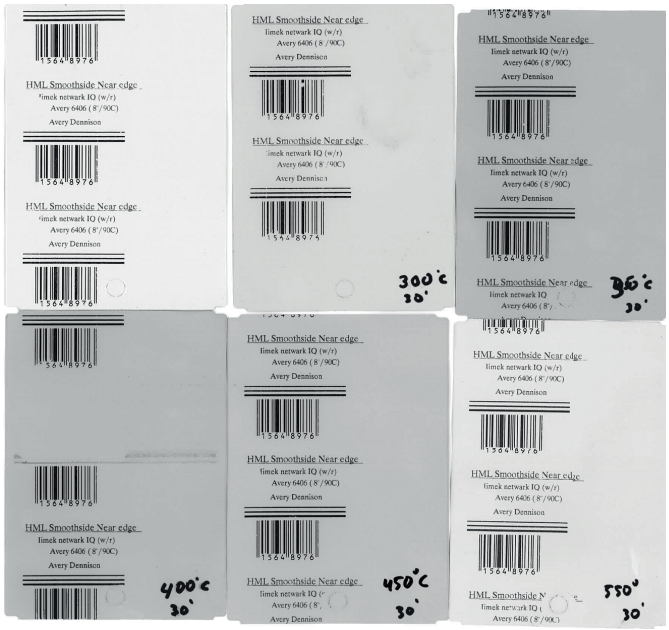
After exposure of printed tags to temperatures above 300°C the white coating cross-links and fixes the thermal transfer print, resulting in excellent scratch and solvent resistance. Wiping 10 times with solvents such as acetone, ethyl acetate, isopropanol or heptane should does not significantly affect print appearance.

Before the exposure to elevated temperatures, the TT printed tags should not be exposed to harsh chemicals or severe abrasion.



Discolouring and barcode readability

At temperatures of 350°C and above, the white print receptive coating develops a greyish colour. This colour change does not affect legibility of the TT print significantly. At temperatures above 450°C, the darker colour becomes lighter again. At temperatures over 550°C, the black thermal transfer print becomes lighter. Up to and including this temperature (550°C), the barcode can still be read successfully. Above these temperatures, the barcode readability starts to become poor.



The white print receptive coating decomposes at temperatures over 600°C. Aluminum melts at 660°C.

Physical properties

As the tag material is aluminum, the tags will become less stiff and more pliable once exposed to temperatures of 280°C and higher. This process is irreversible: the softness will persist after cooling.

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