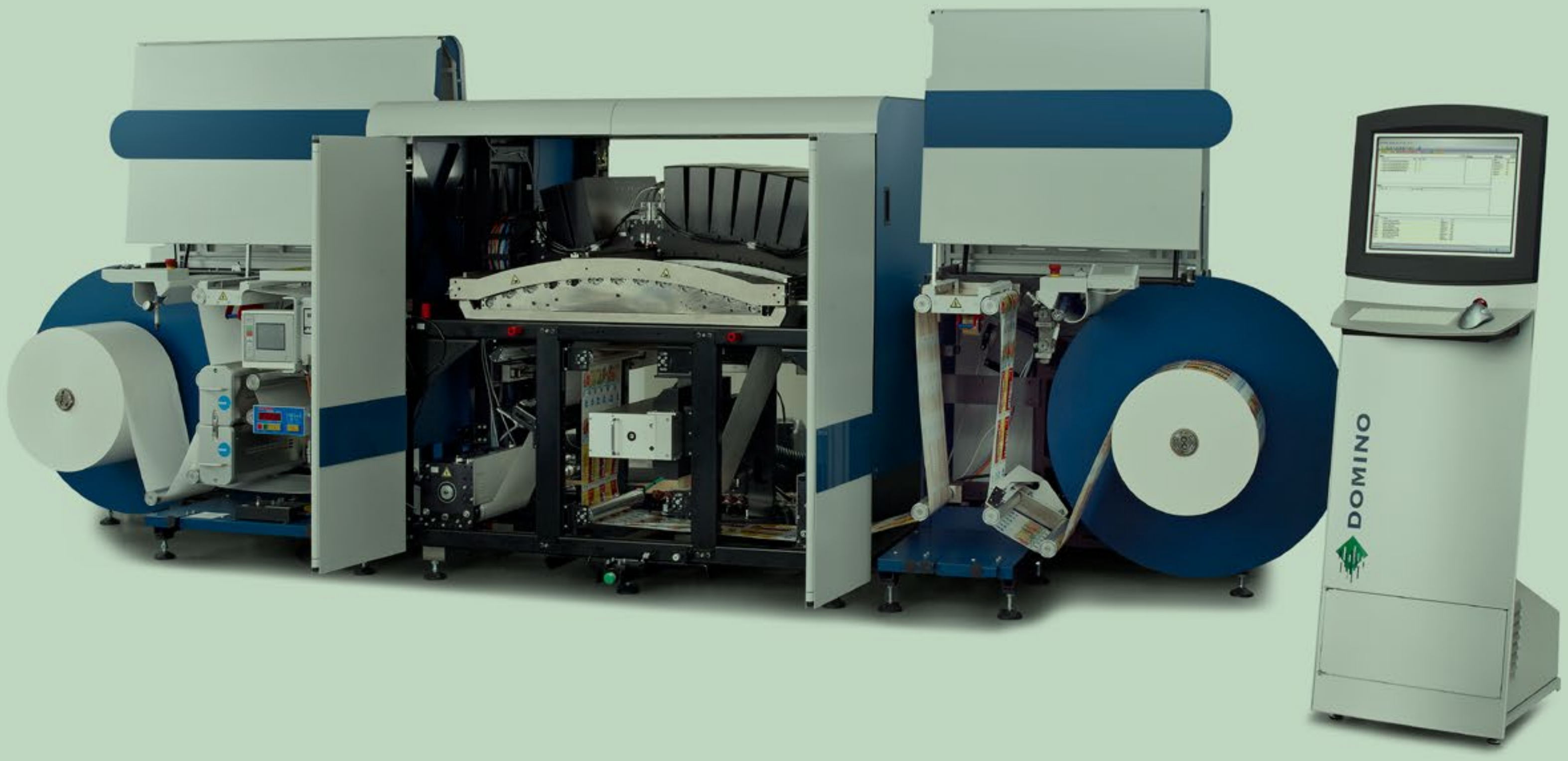
Durable digital labelling solutions

Digital UV Inkjet materials for industrial and technical applications

DOMINO

AVERY DENNISON®



Domino **N6**10i digital ink jet label press

DOMINO

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Digital UV Inkjet for durables applications

Avery Dennison, a leading manufacturer of label materials, has seen a growing trend towards using digital UV inkjet printing for label production. In chemical and technical industrial applications, durable print performance is even more important than pure shelf appeal. Avery Dennison has therefore completed extensive testing, in close cooperation with Domino Digital Printing Solutions.

Enhance your printing flexibility with proven materials

Adding digital UV inkjet technology to your printing capabilities does not mean increasing your inventory, when you choose label materials that are compatible with digital UV inkjet and UV flexo. The portfolio presented in this document is a selection of widely used materials, suitable for both platforms.

The performance challenge

Avery Dennison materials have been tested for chemical and technical applications with a Domino **N6**10i digital UV inkjet press. You can be confident that you know which combination of material and print will deliver reliable performance in the harshest application conditions.

Printed labels have undergone extensive testing in Avery Dennison's laboratories, proving their resistance to abrasion, chemical exposure, UV exposure and weathering. In addition some UV inkjet printed labels have been UL, CSA and BS 5609 (Section 2 and 3) recognised to speed up adoption and simplify qualification.

Outstanding top-coating and adhesive technologies

Avery Dennison offers an advanced R&D capability for developing and applying engineered topcoats, resulting in unique, high-performance products for your printing needs. Many of the products listed are available with different adhesive technologies, to meet very specific application needs. Please contact us for advice and support during selection.

Avery Dennison's promise

Our company

- Global innovation and expertise, underpinned by strong local teams of experts
- Nearly 80 years' experience developing high performance label materials
- Broadest range of adhesive technologies in the market
- Approval to international standards, e.g. UL and CSA and BS 5609
- Market-leading service levels, with most products in stock
- Mix & Match™ services that combine different adhesives, facestocks and liners
- Ready Width™ and EXACT™ services, for optimum order quantities, less waste and smaller inventories - with MOQs as low as 100 sqm

Your support

- Application labs in Europe, Asia and USA for help with materials and applications
- Technical support when choosing the right construction for your customers' needs
- Support for converters when obtaining UL recognitions and with other compliance issues
- Short response times for technical enquiries
- Free of charge BS 5609 Section 3 qualification service

Label materials for tyres and petrochemical applications

Test Methods

- Barcode readability: ANSI standard
- Resistance to n-hexane: IEC EN 60601-1 part 7.1.3: 15 seconds wiping with hexane, 1kg
- Resistance to methylated spirit: IEC EN 60335-1 part 7.14: 15 seconds wiping with methylated spirit and isopropyl alcohol
- Resistance to gasoline: TL 52038 4.2: 10 rubs with a gasoline-saturated cotton cloth, 1kg
- Temperature: UL 969 part 7.1., 10 days at 150° and 180°C
- Abrasion: ASTM D4060, two Taber CS10 abrasive wheels, load 500g, 100 cycles
- Outdoor weathering: Xenon Arc, D4956
- UV exposure testing: SuperUV
- UL: UL 969 (“Marking and Labeling Systems”)
- CSA: CSA C22.2 No. 0.15 (“Adhesive Labels”)

* Barcodes printed on silver or chrome materials without a white underprint cannot be read

** Services and minimum ordering quantities are subject to change. The information available in this document is valid as of June 2019

All materials presented in this document have been printed on a Domino **N6**10i ink jet press using the standard six colour UV90 inks plus white. The printing was done at a speed of 50m per minute using the **N6**10i standard print settings

General information								Print quality evaluation		Chemical resistance			Temperature testing		Abrasion	Aging (Months)		BS 5609					Services		
Code	Face	Adhesive	Adhesive technology	Adhesive coat weight (grams per sqm)	Total caliper of laminate	Total caliper of construction (excluding liner)	Recommended application	Print quality	Barcode readability	Chemical resistance n-hexane	Chemical resistance methylated spirit	Chemical resistance gasoline (super)	Minimum service temperature	Max. recommended service temperature	Taber abrasion testing	UV exposure testing No visible change	UV exposure testing severe degradation	Section 2 certification	Section 3 Abrasion test	Section 3 Weathering test	Section 3 certification	Section 3 certification (UV Flexo)	Service**	MOQ (sqm)**	Lead time
PE films																									
AF170	PE100 White	S277	Solvent Rubber	21	176µm +-10%	115µm +-10%	Chemical drum & Lubricants	•••	••••	•••	•••	•••	-20°C	80°C	••	108	◆	✓	Pass	Pass	✓	✓	EXT	970	1 day
AF172	PE100 Top White	S277	Solvent Rubber	21	177µm +-10%	116µm +-10%	Chemical drum & Lubricants	•••	••••	••••	•••	•••	-20°C	80°C	•••	97	◆	✓	Pass	Pass	✓	✓	EXT	970	1 day
BB697	PE100 Top White	S477	Solvent Rubber	21	177µm +-10%	116µm +-10%	Chemical drum & Lubricants	•••	••••	••••	•••	•••	-20°C	80°C	•••	97	◆	✓	Pass	Pass	✓	✓	EXT	970	1 day
AM664	Transfer PEHD105	S445N	Rubber Hotmelt	30	185µm +-10%	136µm +-10%	Chemical drum & Lubricants	••	••••	••••	••	•	-40°C	70°C	••	84	106	✓		Pass		✓	EXT	970	1 day
AF207	TUFF	S445N	Rubber Hotmelt	30	192µm +-10%	143µm +-10%	Chemical drum & Lubricants	•••	••••	••••	•••	•	-40°C	70°C	•	57	80	✓		Pass		✓	FTO	1000	1 day
PP films																									
AB303	PP NG Top White Plus	S445N SGP	Rubber Hotmelt	30	152µm +-10%	91µm +-10%	Chemical drum & Lubricants	•••	••••	•••	•••	•••	-40°C	70°C	•••	46	75	✓	Pass	Pass	✓	✓	FTO	1000	1 day
AF548	PP NG Top White	TS8000 SGP	Rubber Hotmelt	50	181µm +-10%	113µm +-10%	Tyres	•••	••••	•••	•••	•••	-20°C	70°C	•••	46	75						FTO	1000	1 day
AL900	PP NG Top White	S3100 INC	Acrylic UV Hotmelt	30	159µm +-10%	91µm +-10%	Motorcycle tyres	•••	••••	•••	•••	•••	-20°C	80°C	•••	46	75						CTO	1000	7 days
AV723	PP Light Top Silver	S477	Solvent Rubber	21	127µm +-10%	74µm +-10%	Lubricants	•••	n/a*	•••	•••	•••	-20°C	80°C	•••								CTO	1000	7 days
AQ409	PP Light Top Silver	TS8000	Rubber Hotmelt	56	176µm +-10%	108µm +-10%	Tyres	•••	n/a*	•••	•••	•••	-20°C	70°C	•••								CTO	1000	7 days
Polyolefin film																									
AB655	CO-EX100	S445N	Rubber Hotmelt	30	192µm +-10%	131µm +-10%	Chemical drum & Lubricants	•••	••••	••••	•••	•••	-40°C	70°C	•••	75	109	✓	Pass	Pass	✓	✓	CTO	1000	7 days
PVC films																									
AF174	PVC White	S277	Solvent Rubber	21	169µm +-10%	108µm +-10%	Chemical drum & Lubricants	••	••••	••••	•••	•••	-20°C	80°C	•••	97	◆	✓				✓	FTO	1000	1 day

○ = Fail
• = Not recommended
•• = Good
••• = Better
•••• = Best

Aging

Outdoor Weathering
Maximum numbers of months of outdoor exposure

Colour fastness
Maximum numbers of months of UV exposure (Netherlands) before clear visual changes occur. Maximum numbers of months of UV exposure (Netherlands) before the printed label is no longer usable
◆ Indication that the point of failure was not reached during the testing

Service

EXT = Exact service
FTO = Finish to order
CTO = Coat to order

Label materials for technical and industrial applications

Test Methods

- Barcode readability: ANSI standard
- Resistance to n-hexane: IEC EN 60601-1 part 7.1.3: 15 seconds wiping with hexane, 1kg
- Resistance to methylated spirit: IEC EN 60335-1 part 7.14: 15 seconds wiping with methylated spirit and isopropyl alcohol
- Resistance to gasoline: TL 52038 4.2: 10 rubs with a gasoline-saturated cotton cloth, 1kg.
- Temperature: UL 969 part 7.1., 10 days at 150° and 180°C
- Abrasion: ASTM D4060, two Taber CS10 abrasive wheels, load 500g, 100 cycles
- Outdoor weathering: Xenon Arc, D4956
- UV exposure testing: SuperUV
- UL: UL 969 ("Marking and Labeling Systems")
- CSA: CSA C22.2 No. 0.15 ("Adhesive Labels")

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General information								Print quality evaluation		Chemical resistance			Temperature testing				Abrasion	Aging (Months)				Recognitions		Services		
Code	Face	Adhesive	Adhesive technology	Adhesive coat weight (grams per sqm)	Total caliper of laminate	Total caliper of construction (excluding liner)	Recommended application	Print quality	Barcode readability	Chemical resistance n-hexane	Chemical resistance methylated spirit	Chemical resistance gasoline (super)	Minimum service temperature	Service temperature of 150°C	Peak temperature of 180°C only text	Peak temperature of 180°C text + backprint	Taber abrasion testing	Outdoor weathering Black ink	Outdoor weathering colour inks	UV exposure testing No visible change	UV exposure testing severe degradation	UL recognition	CSA recognition	Service**	MOQ (sqm)**	Lead time
Gloss White																										
BL805	Transfer PET White PT	S8002	Emulsion acrylic	27	134µm +-10%	77µm +-10%	Appliances, electronics	•••	••••	••	•••	••	-40°C	••••	••••	•••	•	Please contact your Avery Dennison sales representative for details						FTO	300	1 day
BJ330	Transfer PET White Top	S8002	Emulsion acrylic	27	134µm +-10%	77µm +-10%	Appliances, electronics	•••	••••	••••	•••	•••	-40°C	••••	••••	••	••			45	71	✓	✓	EXT	100	1 day
AA641	Transfer PET White Top	S8020	Emulsion acrylic	20	128µm +-10%	71µm +-10%	Appliances, electronics	•••	••••	••••	•••	•••	-40°C	••••	••••	••	••			45	71	✓	✓	FTO	300	1 day
AA642	Transfer PET White Top	AL170	Solvent acrylic	24	132µm +-10%	75µm +-10%	Automotive labels on metals	•••	••••	••••	•••	•••	-80°C	••••	••••	••	••			45	71	✓	✓	EXT	100	1 day
BN947	Transfer PET White Top	S8029	Rubber hybridised acrylic	27	141µm +-10%	78µm +-10%	Automotive labels on plastics	•••	••••	••••	•••	•••	-40°C	••••	••••	••	••			45	71	✓	✓	FTO	300	1 day
Matt White																										
BL802	Transfer PET Matt White TC6	S8002	Emulsion acrylic	27	134µm +-10%	77µm +-10%	Appliances, electronics	•••	••••	••••	••	•••	-40°C	••••	••••	•••	••••	Please contact your Avery Dennison sales representative for details						EXT	100	1 day
AN754	Transfer PET Matt White TC6	S8030	Solvent acrylic	24	132µm +-10%	75µm +-10%	Appliances, electronics	•••	•••	••••	••	•••	-40°C	••••	••••	•••	••••							FTO	300	1 day
BN104	Transfer PP TR 75 Matt White	S8002	Emulsion acrylic	27	159µm +-10%	102µm +-10%	Appliances, electronics	•••	••••	••••	••	•••	-40°C	○	○	○	•••							FTO	300	1 day
Chrome																										
AA644	Transfer PET Matt Chrome Top	S8020	Emulsion acrylic	20	127µm +-10%	71µm +-10%	Appliances, electronics	•••	n/a*	••••	••••	••••	-40°C	••••	••••	••	••	Please contact your Avery Dennison sales representative for details				✓	✓	EXT	100	1 day
BL799	Transfer PET Matt Chrome Top	S8002	Emulsion acrylic	27	134µm +-10%	77µm +-10%	Appliances, electronics	•••	n/a*	••••	••••	••••	-40°C	••••	••••	••	••					✓	✓	EXT	100	1 day
AD221	Transfer PET Matt Chrome Top	S8030	Solvent acrylic	24	132µm +-10%	75µm +-10%	Appliances, electronics	•••	n/a*	••••	••••	••••	-40°C	••••	••••	••	••					✓	✓	FTO	300	1 day
AA645	Transfer PET Matt Chrome Top	AL170	Solvent acrylic	24	132µm +-10%	75µm +-10%	Automotive labels on metals	•••	n/a*	••••	••••	••••	-80°C	••••	••••	••	••					✓	✓	FTO	500	1 day
BH781	Transfer PET Matt Chrome Top	S8029	Rubber hybridised acrylic	27	141µm +-10%	78µm +-10%	Automotive labels on plastics	•••	n/a*	••••	••••	••••	-40°C	••••	••••	••	••					✓	✓	FTO	300	1 day

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Test procedures

Print quality

Avery Dennison has an internal qualification procedure to ensure good print quality. A dedicated test chart is printed on the relevant printer platform and substrate, and print quality and compatibility with the substrate are then judged against specific parameters. Print sharpness is evaluated based on text quality and barcode readability (ANSI standard). Colour and uniformity are also evaluated, based on the measurements of micro grain, macro mottle and voids.

Chemical resistance

Chemical resistance tests should simulate the end-user application cleaning conditions: where a label is cleaned by chance during general cleaning of the product, rather than a deliberate attempt to clean the label directly.

These tests are required for different standards. We test as follows:

- Based on IEC EN 60601-1 part 7.1.3: 15 seconds of wiping with a cotton cloth saturated with hexane. Our chosen load for wiping (not defined by standard) is 1kg
- Based on IEC EN 60335-1 part 7.14: 15 seconds of wiping with a saturated cotton cloth, first saturated with methylated spirit and then with isopropyl alcohol
- TL 52038 4.2: 10 rubs with a gasoline-saturated cotton cloth. Our chosen load for wiping (not defined by standard) is 1kg.

Temperature resistance

Specifically for label materials based on PET, we define a ‘normal’ service temperature range up to 150°C. To simulate the effect of temperature on printed labels we perform tests based on UL 969 part 7.1. Labels are exposed for 10 days to a defined temperature, and we test at both 150° and 180°C. This ensures that the printed label will be able to resist high temperature environments after application.

Taber test

To simulate mechanical friction and rubbing on a printed durable label material, the Taber Rotary Abraser test is used. Tests are based on the ASTM D4060 standard. This apparatus is used as an accelerated wear tester and involves the mounting of a test specimen to a flat turntable platform. Two Taber CS10 abrasive wheels are lowered onto the test specimen at a load of 500g. After setting up the machine, the test is started by rotation of the turntable platform. One test cycle is a 360° rotation of the platform during which the abrasive wheels rub/wear the sample material. The full test comprises of 100 cycles in total.

UV resistance

SuperUV equipment is used to investigate printed label material performance when exposed to UV radiation. The machine uniformly irradiates the printed sample material using a high intensity UV source. UV wavelengths that are not part of normal sunlight are excluded in order to limit the introduction of artificial failures in the material. This test, does not correlate to any weathering simulations, so it does not consider light cycles, temperature changes or humidity. It can, however, be used to indicate the resistance of inks to UV exposure.

27h of testing simulates 1 year of vertical exposure to exclusively UV radiation in northern Europe.

Outdoor weathering

In order to evaluate the outdoor durability of materials, artificial weathering machines are used. These devices make use of Xenon Arc lamps, combined with an optical filter to closely reproduce the natural sunlight spectrum. Since water also plays an important role in the degradation of materials, the machine applies a spray of water onto the test panels.

In our outdoor weathering tests, the weathering machine is programmed as follows, based on the D4956 standard:

- 102 minutes of light exposure only
- 18 minutes of light exposure and water spray

The chamber temperature of the machine is set at 47°C, at a relative humidity of 50%. The so-called black panel temperature is set at 70°C.

200h of testing simulates 3 months of a vertical outdoor application, facing south, for a mid-to-northern European climate.

BS 5609 Section 2 - Adhesion test

Passing BS 5609 section 2 certification guarantees that a self adhesive material will withstand 3 months in the ocean, in case it is lost at sea, and will remain in place where it was applied on its chemical container. The unprinted label is applied onto a metal panel, which is then immersed/exposed to the seawater of the English Channel at our test site in Cramlington, UK, for a period of 3 months.

The panel with the label applied onto it is then placed into a climate chamber and the temperature and humidity are cycled as follows: 48 hours at 22°C / 50%RH; 168 hours at 60°C / 40%RH; 2 hours at 0°C / 0%RH; and 2 hours at 22°C / 50%RH.

To finish the testing process, the material goes into a Xenon Arc weathering machine for Artificial Weathering (5 cycles of 17 hr UV light; 6 Hr salt spray).

The material passes this BS 5609 section 2 testing only if it successfully passes a 180° peel test, with a colour-fastness rating not less than 2 on the standard gray scale, and with no more than 1% expansion or 3% shrinkage in the material.

BS 5609 Section 3 - Weathering

Part of the BS 5609 standard is dedicated to artificial weathering of the printed label. One full test cycle comprises 17 hours of weathering followed by 6 hours of salt spray exposure. The salt spray exposure test is performed to simulate marine conditions. This is performed in an apparatus that uses a spray of a 5% solution of NaCl in water. The nozzle temperature is set at 48°C, and chamber temperature at 35°C. Printed samples are subjected to 5 full test cycles.

The printed material passes the test if the colours remains recognizable, 2 BS grey scale. The legend and symbol must also remain identifiable.

BS 5609 Section 3 - Abrasion Resistance

In order to simulate the severe abrasive conditions found when a drum is washed off onto a beach shore or into the ocean, the printed label material is applied onto a stainless steel rod. The rod is immersed for 24 hours in a solution of NaCl in water. Then, the rod is exposed to 500 revolutions in an abrader vessel containing a mixture of sea water and sand.

The printed material passes the test if the colours remains recognizable, 2 BS grey scale. The legend and symbol must also remain identifiable.

UL and CSA recognitions

On electronic goods and appliances sold in the USA, warning and identification labels have to be UL recognised. UL 969 specifies clear requirements regarding permanence of adhesion and printing. Avery Dennison’s UL recognitions for the category PGJI2 (“Marking and Labeling Systems”) are listed in the UL file MH27538. The same file number is used to capture products that are recognised according to the Canadian standard CSA C22.2 No. 0.15 (“Adhesive Labels”) for use in Canada.

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For more information on technical performance and printing recommendations, please refer to the respective datasheets. Please note that the Avery Dennison product range and service offering can be subject to changes. For an accurate overview, please check our website label.averydennison.eu or contact your local Avery Dennison sales representative.