

## PD, polyester decorative foil

### Description:

PrintoLUX®-PD material is already used as a labelling standard by several plant and mechanical engineering companies. The sign material consists of a specially coated polyester. Screen printing ink is applied on one side. In addition, the PrintoLUX®-PD material we offer can be finished with two PrintoLUX® standard adhesives (refer to separate data sheets of our adhesives).

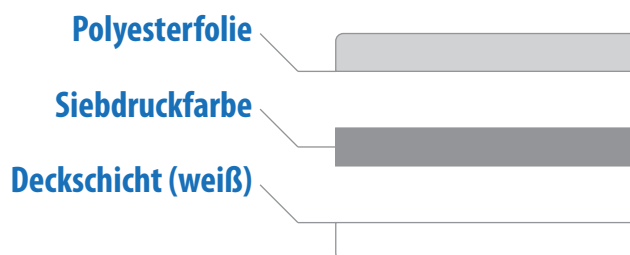
Certified PrintoLUX®-PD material is available in matt white, yellow, silver and transparent. Additional colours on request. PrintoLUX®-PD material is supplied in the following material thicknesses, as self-adhesive and non-adhesive components:

- 0.2 mm
- 0.4 mm

### Temperature resistance:

- Permanent resistance: Up to 95 °C
- Short-term resistance (30 minutes): Up to 180 °C
- Low temperatures: Down to - 30 °C

### PA, polyamide consists of the following components:



All production batches of PrintoLUX®-PD materials are subject to comprehensive testing before approval for further processing or sales:

- Wipe and abrasion test according to DIN 30643 with acetone, cellulose thinner, isopropanol, vinegar essence (35 percent) and soda solution
- Cross-cut test according to DIN EN ISO 2409:2007
- Pencil abrasion test with hardness grade 6 on four different print patterns

## Applied tests

**We consider high quality standards and transparent operating processes to be paramount elements. For this reason, all tests carried out by PrintoLUX are always completed, documented and archived as specified in correspondingly relevant standards.**

PrintoLUX® ink used to print on PrintoLUX®-PD material has been put through the following comprehensive tests:

- Wipe and abrasion test according to DIN 30643
- Cross-cut test according to DIN EN ISO 2409:2007
- UV resistance test
- Weathering test according to DIN EN ISO 4892-2:2013, DIN EN ISO 16474-2 (2014-03) or DIN EN ISO 4892-3 (Cycle 2):2013 (E)
- Salt spray test according to EN 60068-2-52, sharpness degree 3

We have compiled the results and assessments of the corresponding tests on the following pages.

# WIPE AND ABRASION TEST ACCORDING TO DIN 30643

This test simulates continuous rubbing at a defined pressure using filter paper or stamp material lined with a previously defined cotton cloth. The filter paper or cotton cloth is clamped onto the stamp material and coated with a previously defined chemical.

We have commissioned an accredited test institute to assess the wiping and abrasion resistance of printed PrintoLUX®-PD materials in matt silver. The following parameters have been specified:

- Linear tester 249 by Erichsen
- Cylinder-shaped aluminium test stamp with a diameter of 25 mm
- 20 Newton contact pressure
- Abrasion fabric made of cotton
- 110 mm abrasion space
- Test involves 100 abrasion cycles (one cycle corresponds to twice 110 mm)
- Abrasion speed 1 second +/- 0.5 seconds for one cycle
- Visual assessment according to DIN EN ISO 4628-1 (Table 1)

## Assessment table:

Rating (KW)	Intensity of the change
0	Unchanged, i.e. no perceivable changes
1	Very minor, i.e. changes just about noticeable
2	Minor, i.e. clearly visible changes
3	Moderate, i.e. very clearly visible changes
4	Severe, i.e. significant changes
5	Very significant changes

Table 1: Assessment criteria for wipe and abrasion tests.

## The following chemicals are used for wipe and abrasion tests:

	Result CMYK colour area:	Result Black font:
→ Acetone	0	0
→ Cellulose thinner	0	0
→ Brake fluid	0	0
→ Premium petrol	0	0
→ Isopropanol	0	0
→ Spirit	0	0
→ Plexinova paint stripper	0	0
→ AdBlue	0	0
→ Hakapur 700 BF	0	0
→ Oregon-MX-14	0	0
→ Synthetic hand perspiration solution, alkaline pH 8	0	0
→ Synthetic hand perspiration solution, acidic pH 5.5	0	0

# CROSS-CUT TEST ACCORDING TO DIN EN ISO 2409:2007

## Explanation:

A cross-cut test involves six parallel cuts with a cross-cutter down to the substrate. Then six more cuts are produced at a right angle to the previous cuts. This results in a uniform pattern of squares. Masking tape with an adhesive force of 8 to 10 N/25 mm is applied to the resulting square before it is removed at an angle of around 60 degrees. The resulting grid is then assessed. Cross-cut ratings of 0 (outstanding adhesion) to 5 (very poor adhesion), abbreviated to GT 0 to GT 5, can then be assigned depending on the condition.

## Assessment table:







Cross-cut rating	Description	Surface appearance
0	Edges of the cuts are completely smooth, none of the squares has chipped off.	
1	Small chips of the coating have chipped off at the cut grid lines. Chipped area does not significantly exceed 5 percent of the cross-cut test area.	
2	Coating has chipped off along the cut edges and/or on the cut grid lines. Chipped off area significantly larger than 5 percent, but not much larger than 15 percent of the cross-cut test area.	
3	Coating has fully (in wide strips) or partly chipped off along the cut edges and/or some squares have fully or partly chipped off. Affects a cross-cut test area significantly larger than 15 percent, but not much larger than 35 percent.	
4	Coating has chipped off along the cut edges in wide strips and/or some squares have fully or partly chipped off. Affects a cross-cut test area significantly larger than 35 percent, but not much larger than 65 percent.	
5	Any chipping that can no longer be assigned to any of the cross-cut test ratings.	

Table 2: Assessment criteria for cross-cut tests.

## Result:

Evaluated cross-cut tests of PrintoLUX®-PD materials resulted in a rating of GT 0 (no visual chipping).

# UV RESISTANCE TEST

## Explanation:

PrintoLUX®-PD material is exposed to UV radiation amounting  $0.65 \text{ W/m}^2$  emitted by a xenon radiation source for a duration of 2,000 hours. PrintoLUX®-PD material samples are printed with the PrintoLUX® process using the following colours:

- Yellow
- Pink
- Light blue
- Red
- Green
- Blue
- Black
- Orange
- Light green
- Grey

## Result:

One of our laboratory service providers exposed the samples to radiation and visually assessed them by determining the individual remission value (optical density value factor) of the printed colour strips. Determinations of the visual density of individual colours prior to exposure and after 1,000 and 2,000 hours of exposure using measuring equipment produced excellent results. Changes in colour are hardly noticeable with the naked eye. We estimate the resistance of colour wedges under the influence of solar radiation in Central Europe to between five and eight years.

# WEATHERING TEST ACCORDING TO DIN EN ISO 4892-2:2013, DIN EN ISO 16474-2 (2014-03) OR DIN EN ISO 4892-3 (CYCLE 2):2013 (E)

## Explanation:

In addition to tests carried out by accredited test laboratories PrintoLUX also operates an in-house test laboratory as well as a QUV accelerated weathering tester. This system is most of all used for long-term tests as per DIN EN ISO 4892-3(2):2013.

The material is exposed to UV light (UVA 340, type 1A) at 0.76 W/m<sup>2</sup> for a duration of eight hours in dry conditions. The black field temperature is approximately 50 °C. The unit is then exposed to a water jet from pressure nozzles for 15 minutes. The subsequent condensation test is carried out for a duration of 3.45 hours at approximately 50 °C. This sequence is permanently repeated.

- ➔ **1,000 hours** laboratory weathering cycle corresponds to up to **two years** atmospheric influence in Central Europe.
- ➔ **2,500 hours** laboratory weathering cycle corresponds to up to **five years** atmospheric influence in Central Europe.
- ➔ **3,000 hours** laboratory weathering cycle corresponds to up to **six years** atmospheric influence in Central Europe.
- ➔ **4,000 hours** laboratory weathering cycle corresponds to up to **ten years** atmospheric influence in Central Europe.
- ➔ **6,000 hours** laboratory weathering cycle corresponds to up to **fourteen years** atmospheric influence in Central Europe.

## Result:

Print	1,000 hours	2,500 hours	3,000 hours	4,000 hours	6,000 hours
Black print	No visible change	Severe fading visible, font easily legible	Very severe fading visible, font legible	Very severe fading visible, font poorly legible	Very severe fading visible, font illegible
Printed black and in colour; laminated with PrintoLUX®-UVplus foil	No visible change of any colour	No visible change of any colour	No visible change of any colour	No visible change of any colour	No visible change of any colour

# SALT SPRAY TEST ACCORDING TO EN 60068-2-52, SHARPNESS DEGREE 3

## Explanation:

### Definition of the cycle for sharpness degrees 1 to 3:

Two hours of spray mist with 5 percent sodium chloride (common salt) solution at 35 °C, then stored for 22 hours at 40 °C air temperature and 93 percent relative humidity.

- Sharpness degree 1 corresponds to one cycle
- Sharpness degree 2 corresponds to two cycles
- Sharpness degree 3 corresponds to three cycles

### Definition of the cycle for sharpness degrees 4 to 6:

Two hours of spray mist with 5 percent sodium chloride (common salt) solution at 35 °C, then stored for seven days at 40 °C air temperature and 93 percent relative humidity.

- Sharpness degree 4 corresponds to two cycles
- Sharpness degree 5 corresponds to four cycles
- Sharpness degree 6 corresponds to eight cycles

Sharpness degree 1 is used for products in a coastal environment or near a coast. Sharpness degree 3 to 6 are intended for products operated in locations subject to environments with alternating salty and dry atmospheres, such as in locations where salt is used to melt ice.

## Result:

The salt spray test as per DIN EN 60068-2-52 (sharpness degree 3) did not cause any visual changes of the print that were noticeable with the naked eye. Labels and signs exposed to corrosion test cycles were put through additional tests after having been stored for 72 hours in normal climatic conditions.

After having removed the adhesive tape the cross-cut test resulted in a rating of GT 0.

The abrasion test as per DIN 30643 resulted in visible changes of the colour areas after 75 abrasion cycles using acetone at a contact pressure of 20 Newton. The black font remains easily legible after 100 abrasion cycles.

# NOTE

Described test methods are applied depending on the label or sign and their application areas.

Given the extremely large number of possible applications and environmental conditions that can impact the labels, such as radiation, gases, temperature or aggressive substances (e.g. concentrated acids), PrintoLUX is unable to offer any warranty as to the suitability of the labels in all customer applications. Clients are therefore responsible for carrying out individual suitability tests for specific purposes. PrintoLUX is happy to offer the advice and support you need.

**Please note that we can exclusively guarantee the specific, high print quality and its durability when using all components\* making up our patented PrintoLUX® process.**

\*PrintoLUX® process components: PrintoLUX®-certified materials; water-based PrintoLUX® special ink; PrintoLUX® pre-treatment fluids; PrintoLUX® printing systems; PrintoLUX® heat units; PLX cleaning and pre-treatment cloths



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