As a service for our customers, we have classified usual type / color combinations from the Covestro portfolio in white, grey and black according to the legibility of the laser inscription.

The typeface impression was evaluated, a contrast measurement was carried out based on ISO IEC 15415: 2011 and the automatic recognition of a QR code by a mobile device was checked and evaluated.

The following table gives an overview of the results with an Nd-YAG laser:

Product	Color	Readability	Contrast based on ISO IEC 15415:2011	Automatic recognition of a QR code
Makrolon®	010131 (white)	👍	3	👍
Makrolon®	010180 (white)	👍	4	👍
Makrolon®	012823 (white)	👊	3	👍
Makrolon®	013192 (white)	👍	4	👍
Makrolon®	700209 (grey)	👍	1	👍
Makrolon®	700394 (grey)	👍	2	👍
Makrolon®	900007 (black)	👍	1	👍
Makrolon®	901510 (black)	👍	0	👍
Bayblend®	011039 (white)	👍	3	👍
Bayblend®	012975 (white)	👍	4	👍
Bayblend®	700394 (grey)	👊	2	👍
Bayblend®	703571 (grey)	👍	2	👍
Bayblend®	901510 (black)	👊	0	👍
Apec®	700209 (grey)	👍	2	👍
Apec®	700394 (grey)	👍	2	👍
Apec®	901510 (black)	👍	0	👍

The results listed above represent a selection of common colors of our materials.

For any color requests, please contact us.

Typical value

These values are typical values only. Unless explicitly agreed in written form, they do not constitute a binding material specification or warranted values. Values may be affected by the design of the mold/die, the processing conditions and coloring/pigmentation of the product. Unless specified to the contrary, the property values given have been established on standardized test specimens at room temperature.

The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations, are beyond our control. Therefore, it is imperative that you test our products, technical assistance, information and recommendations to determine to your own satisfaction whether our products, technical assistance and information are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety, and environmental standpoint. Such testing has not necessarily been done by Covestro.

Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale which are available upon request. All information and technical assistance is given without warranty or guaran-

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With respect to health, safety and environment precautions, the relevant Material Safety Data Sheets (MSDS) and product labels must be observed prior to working with our products.

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Makrolon® Bayblend® Apec®

Laser Marking Guide:
Thermoplastics material selection and testing results

covestro

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Setting

A Nd-YAG laser serves as the energy source for laser engraving. The electromagnetic wave with a defined wavelength of 1064 nm (red laser), or 532 nm in the case of a frequency-doubled wave (green laser), is guided over two computer-controlled deflecting mirrors and can engrave any two-dimensional geometrical shape on the molded part.

A focused laser beam offers the following advantages:

- high laser-engraving speed
- short preparation times for new designs
- integration in flexible production systems
- rapid change-over to a different layout (no setting-up costs)
- non-contact marking of fully assembled parts (including large areas)
- precise positioning
- no liquid or paste-like coloring agents needed
- good chemical and abrasion resistance
- indirect laser marking by coating removal



Results

The engineering thermoplastics, namely Apec®, Bayblend® and Makrolon® are essentially suitable for laser marking, resulting in a good to very good quality. Both dark graphics on a light background and light graphics on a dark background are possible.

Conditions

In line with the requirements laid down by the Association of the Administrative Professions (Verwaltungsberufsgenossenschaft), the background light density (BLD) and marking light density (MLD) are measured in order to determine **the contrast ratio.** The light density is expressed in cd/m^2. Diffuse lighting with an illuminance of 500 Lux ± 10 % should prevail. The contrast ratio is expressed in the form of BLD : MLD and, to satisfy the requirements, must be greater than 3 : 1 in order to obtain the GS quality mark for keyboards. Other parameters, such as the reflection factor and the degree of gloss of the molded parts, should be maintained within the specified tolerances.

Laser marking quality

The laser marking quality is crucially influenced by the process parameters and must be determined separately for each individual case. The change brought about in the surface of a molded part by laser marking is a function of the material, the texture of the surface being engraved and the laser parameters. With Covestro thermoplastics, a special computerized control system makes it possible to achieve good surfaces with an excellent contrast of up to 5 : 1, depending on the product in question. The requirements placed on the plastic being marked will vary according to the particular application.

The most stringent quality requirements currently apply to the engraving of keyboards and barcodes. In the development of specially modified Bayblend® grades, particular attention was paid to the problems of achieving sufficient contrast and abrasion resistance in the keyboard lettering. The material grades which have been optimized for laser marking give very good inscription (thanks to carbonization effects in the polymer) coupled with cost-efficient production.

Colored marking is possible in special cases. Gases are released during laser marking on account of the local pyrolysis that takes place. A suction unit acting directly at the marking point, which conducts the air and gas to the outside, is required as an occupational safety measure. On the basis of the knowledge currently available, there is no need for the waste air to be treated, since the values are well below the limits set out in the Federal German Clean Air Guidelines** (TA Luft).

The following list of Covestro thermoplastics and fields of application is designed to show which finished parts can be laser marked in order to give abrasion-proof, legible markings with a lettering size of approximately 0.5 to 100 mm. This is not intended as an exhaustive list and may change in line with market requirements.

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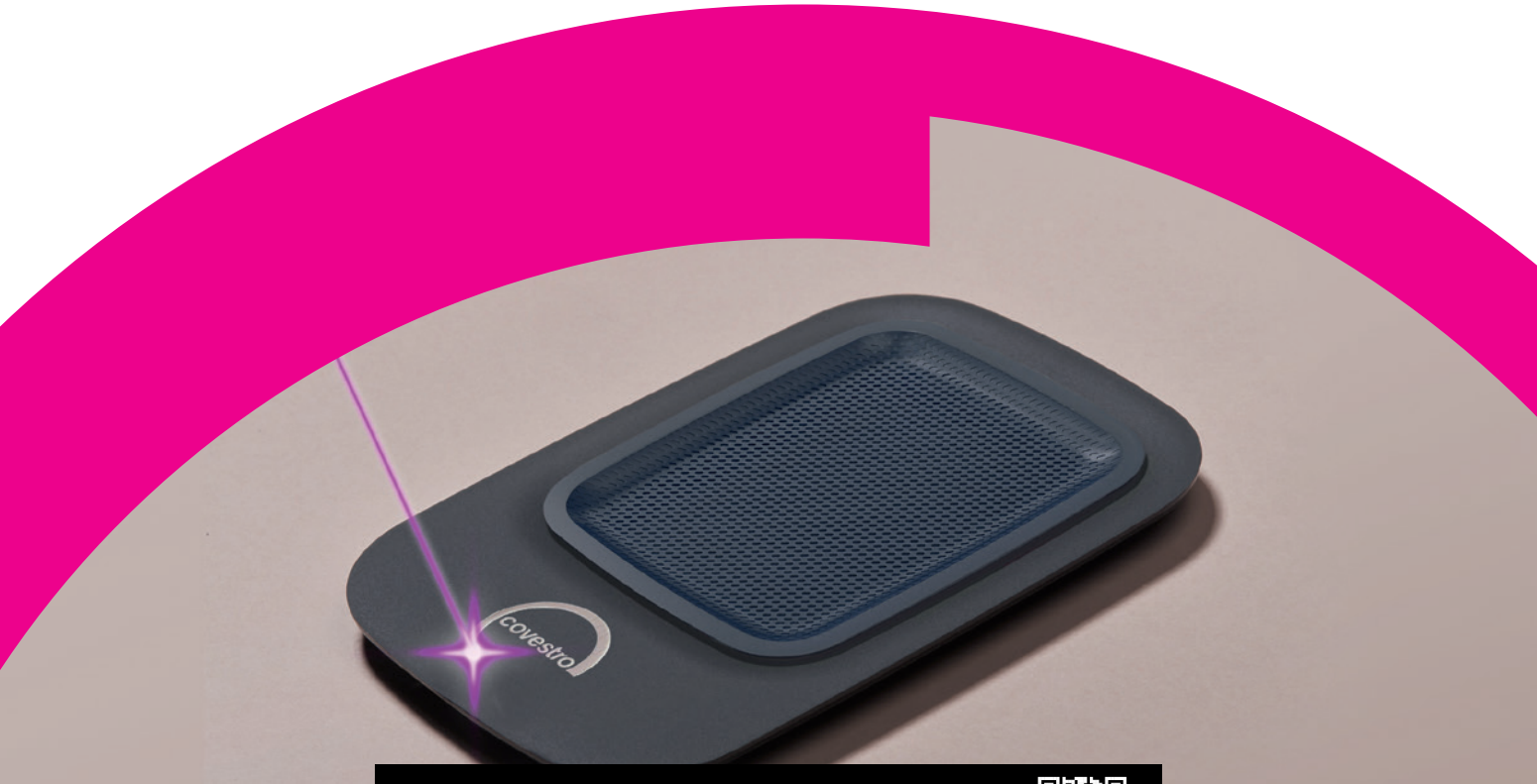
Potential applications for laser-engraving of Covestro thermoplastics

Covestro thermoplastics	Sample applications	Laser markings	Comments
Apec® PC-HT	• automotive safety fuses • lamp housings	• technical data	• very good dark colors achieved • light-colored markings can be achieved on a black base color
Bayblend® (PC+ABS)-Blend	• housing for electrical devices • computer housings • interior vehicle components • switches, plugs • functional elements e.g. keys	• finished part numbers • approval or test numbers • barcode markings • serial numbers • identification of functional elements	• light-colored material permits very good dark-colored markings • dark-colored materials convert into light shades
Makrolon® PC	• transparent covers • lamp housings • computer housings • electric components e.g. terminal blocks, distribution boxes	• serial numbers • approval or test numbers • technical data • graduations • barcode markings	• very good dark colors achieved • light-colored markings can be achieved on a black base color

Elementary tests were also conducted with other types of laser (CO_2, Excimer). At present, an Nd-YAG laser with a wavelength of 1064 nm or 532 nm gives the best results when marking or engraving Covestro thermoplastics.

As a service for our customers, we have classified the usual type / color combinations from the Covestro portfolio in white, grey and black according to the legibility of the laser inscription.

The readability was evaluated, a contrast measurement was carried out based on ISO IEC 15415: 2011 and the automatic recognition of a QR code by a mobile device was checked and evaluated.



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