



**Makrolon® ET –**  
Resins for Extrusion and Thermoforming





**Makrolon®**



## **Makrolon® for Extrusion and Thermoforming**

Makrolon® is Covestro's polycarbonate, which is available out of local productions in all major regions of the world. Due to its unique property profile – the combination of transparency, heat resistance, toughness, dimensional stability, high creep modulus, good electrical insulation and self-extinguishing behaviour – Makrolon® is an essential material in a huge variety of applications.

The Makrolon® "ET" = "Extrusion and Thermoforming" product series covers a range of resins dedicated for the use in extruded parts like solid or multiwall sheets, films, profiles, panels etc. The ET resins have been specially optimized to meet the necessities of processing on extrusion lines.

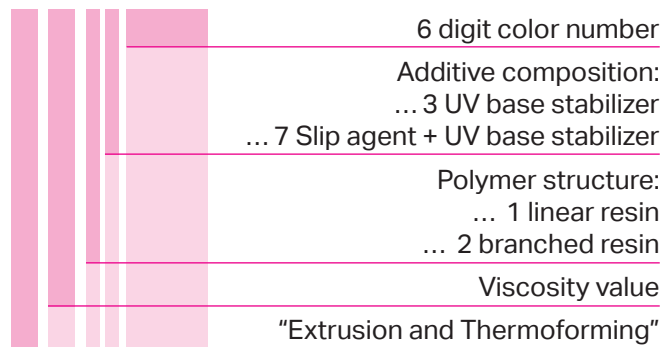


## Base resins

The Makrolon® ET resin portfolio is divided into two subgroups: the base resins and the functional materials. The base resins follow the well-known Makrolon® nomenclature<sup>1</sup> as shown in the following scheme:

### Makrolon®


**ET3113 550060**



1) For additional information pls. refer to the general Makrolon® Product Brochure:  
[http://plastics.covestro.com/plastics/emea/en/product/makrolon/Product\\_description.html](http://plastics.covestro.com/plastics/emea/en/product/makrolon/Product_description.html)

Makrolon® Grade	Old Name	Linear/ Branched	MVR	
<b>ET2613</b>	2603 MAS157	Linear	12.5	
<b>ET3113</b>	3103 MAS157	Linear	6.0	
<b>ET3117</b>	DP1-1883	Linear	6.0	
<b>ET3137</b>		Branched	6.0	
<b>ET3227</b>	1143 MAS157	Branched	3.0	

 excellent fit

 can be advantageous under certain conditions/  
machine setups

The Makrolon® ET base resins are equipped with a low-volatile additive package to provide low plate-out and less deposits. All resins are available in clear transparent colors<sup>2</sup>; custom colors are available upon request.

The following table gives an overview of the resins available, their basic properties and designated fields of application:

	UV base stabilizer <sup>3</sup>	Slip agent	Suitable for					Remarks
			Solid	Multi	Corr.	Panel	Profile	
	Yes	No						Advantageous for very thin sheets (< 1.5 mm)
	Yes	No						Standard resin for solid sheets
	Yes	Yes						For standard multiwall sheets; excellent mixing partner for branched Makrolon® ET grades for more complex sheet geometries
	Yes	Yes						For more complex multiwall sheet geometries
	Yes	Yes						Similar to Makrolon® ET3137; higher viscosity supports processing of multiwall sheets with very complex geometries

<sup>2</sup> The color of all Covestro materials is described by a 6 digit color number. This system is based largely on the RAL color system: the first two digits specify the basic color, while the other four digits indicate the various shades

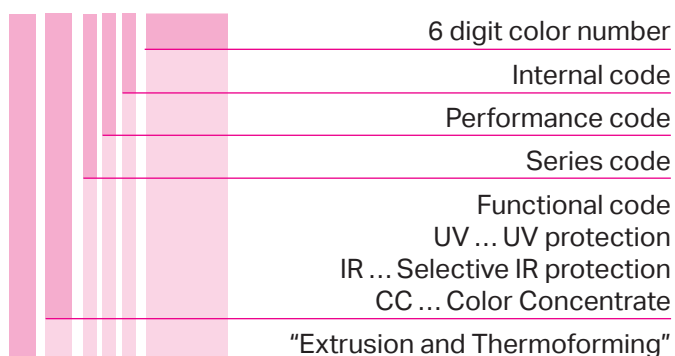
<sup>3</sup> The UV base stabilization provides sufficient protection for most indoor applications. For outdoor use, additional protective measures are necessary, see "UV Protection"

## Functional materials

Resins providing special functions are grouped according to their basic functionality. They are marked by a 5-digit letter-figure combination as a detailed code.

### Makrolon®

**ET UV 1 1 0 550054**



## UV-Protection

The use of Makrolon® in applications subject to outdoor weathering requires additional protection against UV radiation on the exposed surface. The standard method used today is the application of a thin layer of a UV resin by coextrusion. With the Makrolon® ET UV resins Covestro offers a choice of materials, providing different levels of UV protection and processing performance.

The Makrolon® ET UV100 materials provide UV protection and processing properties on the high level which has been known in the market for many years.

Makrolon® ET UV100 resins can be applied on both linear and branched base materials.

Makrolon® Grade	MVR	UV protection level	Remarks
ET UV110	9.0	+	Typically used for multi-wall sheets, profiles, corrugated sheets
ET UV120	9.0	++	Typically used on solid sheets
ET UV130	10.0	+++	Typically used on solid sheets

The Makrolon® ET UV500 product range exhibits a further improvement in processing performance. The deposit formation during extrusion is extremely low, which allows up to four times longer extrusion runs between cleaning cycles. Also, improved surface qualities were observed.



Again the Makrolon® ET UV500 product range can be used together with all ET base materials:

Makrolon® Grade	MVR	UV protection level	Remarks
ET UV510	9.0	+	Typically used for multi-wall sheet, profiles, corrugated sheet
ET UV530	10.0	+++	Typically used on multi wall sheets and panels
ET UV540	10.0	++++	High performance UV-Batch for applications in critical climate conditions; typically used on multi wall sheets and panels

### Flame Retardancy

Makrolon® is well known for its excellent flame retardancy. All Makrolon® ET resins have a UL yellow card describing the UL-94 performance (most recent versions are available at <http://www.ul.com/>).



Many products made from Makrolon® ET resins are used in applications which are subject to specific building codes or standards. This usually requires specific fire tests, which in most cases are performed as a component test and not as a material test. In these cases Covestro does not hold fire certificates for the Makrolon® ET resins. Nevertheless indications can be given whether sheets of Makrolon® ET meet certain specifications and standards. Furthermore Covestro offers assistance in evaluating the performance of your specific part by the Covestro fire testing laboratory (see "Technical Support").

### Further Information – Datasheets – Technical Support

This brochure is meant to give an overview of the Makrolon® extrusion resin portfolio. More detailed technical information on the Makrolon® ET products– like datasheets, processing recommendations and information on specific properties – can be obtained either from the Covestro tech center ([www.plastics.covestro.com](http://www.plastics.covestro.com)) or your local technical contact partner.

The Covestro technical team is ready to give assistance on any technical questions or queries concerning Makrolon® ET grades, e. g. special product data or support in processing of Makrolon® ET.

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 guarantee and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance, and information. Any statement or recommendation not contained herein is unauthorized and shall not bind us. Nothing herein shall be construed as a recommendation to use any product in conflict with any claim of any patent relative to any material or its use. No license is implied or in fact granted under the claims of any patent.

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.

The products are not designated for the manufacture of a medical device or of intermediate products for medical devices<sup>1</sup>. The products are also not designated for food contact<sup>2</sup>, including drinking water, or cosmetic applications. If the intended use of the product is for the manufacture of a medical device or of intermediate products for medical devices, for food contact products or cosmetic applications, Covestro must be contacted in advance to provide its agreement to sell such product for such purpose. Nonetheless, any determination as to whether a product is appropriate for use in a medical device or intermediate products for medical devices, for food contact products or cosmetic applications must be made solely by the purchaser of the product without relying upon any representations by Covestro.

<sup>1</sup> Please see the "Guidance on Use of Covestro Products in a Medical Application" document.

<sup>2</sup> As defined in Commission Regulation (EU) 1935/2004.

#### Typical value

The values listed in this brochure 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.



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