



MAKROLON[®]

Product range • Typical values



MAKROLON®

Makrolon® is the brand name of our polycarbonate, which we produce in all the major economic regions of the world. For Makrolon®, the most important economic regions are Asia-Pacific (APAC), Europe, Middle East, Africa and Latin America (EMEA/LA), and North America and Mexico (NAFTA).

Characterization

Compared with other thermoplastics, the amorphous material Makrolon® has a very unique property profile. It is noted above all for its high transparency, heat resistance, toughness and dimensional stability coupled with a high creep

modulus and good electrical insulation properties. Glass fiber reinforced Makrolon® has particularly high stiffness and outstanding dimensional stability.

Makrolon® is available in:

- General purpose grades
- Food contact grades
- Impact modified grades
- Flame retardant grades
- Glass fiber reinforced (milled fiber) grades
- Glass fiber reinforced (normal fiber) grades

■ Grades for special applications

- Optical storage media
- Optical lenses
- Light guides
- Lighting
- Automotive lighting
- Automotive glazing
- Blow molding
- Furniture
- Extrusion
- Structural foam
- Medical devices*

Nomenclature

The non-reinforced, general purpose and food contact grades of Makrolon® are available in different viscosity classes. The first two digits in the type designation usually characterize the viscosity, while the third and fourth digits specify the additives:

- ..03 UV-stabilized
- ..05 Easy release
- ..07 UV-stabilized, easy release

- ..06 So-called “food contact” grades that comply with the regulations of the EU and its member states with regard to plastics in contact with foodstuffs, conform to the relevant FDA regulations and also meet the recommendations of Germany’s Bundesinstitut für Risikobewertung (BfR = Federal Institute for Risk Assessment)
- ..56 Easy release “food contact” grades that comply with the regulations of the EU and its member states with regard to plastics in contact with foodstuffs, conform to the relevant FDA regulations and also meet the recommendations of Germany’s Bundesinstitut für Risikobewertung (BfR = Federal Institute for Risk Assessment)

* See warranty on page 32



Properties

- **Inherent color**

Clear and transparent, like glass

- **Toughness**

Without notching, no failure

High notched impact strength

- **Dimensional accuracy and stability**

Exceptionally high, since no change in dimensions due to water absorption and post shrinkage, high creep modulus, high heat deflection temperature, isotropic behavior

- **Heat resistance**

Glass transition temperature up to 148 °C

- **Resistance to ignition sources**

Fire classification (grade-dependent) to UL 94V-0/1.2mm, and UL 94-5VA/3.0 mm; maximum temperature in glow wire test: up to 960 °C

- **Electrical insulation**

Volume resistivity $10^{14} \Omega \cdot m$;

Dielectric strength up to 36 kV/mm (1 mm thickness)

Main application areas

- Appliances
- Automotive & Transportation
- Construction
- Consumer products
- Electrical

- Electronics, IT & Communication
- Medical*
- Food contact
- Security & Protection

All Makrolon® batches are homogenized after production.

The production plants for Makrolon® have been certified to DIN EN ISO 9001 and 14001 by the appropriate certification organizations.



Colors

The Makrolon® general purpose grades are available in transparent, translucent and opaque colors. Special colors can be arranged on request.

The food contact grades having ..06 and ..56 as the final digits are only available in colors which are in compliance with the relevant provisions on colorants for plastic materials.

In Germany, the BfR Recommendation IX applies (BfR = Federal Institute for Risk Assessment).

In France, Circulaire No. 176 applies. In the USA, FDA's regulations in 21 CFR apply (CFR = Code of Federal Regulations).

In the EU, the Commission Regulation (EU) No. 10/2011 on "plastic materials and articles intended to come into contact with food" does not regulate the use of colorants.

Certain grades contain additives which affect transparency. Therefore they are not available in transparent shades. In particular, this refers to all impact modified and glass fiber reinforced grades as well as certain flame retardant grades. A higher degree of pigmentation can lead to reduced toughness, especially in case of the easy flow grades of the 22.. and 24.. series. Hence, for applications where toughness is particularly important, higher-viscosity grades or impact modified grades should be selected.



Color designations

The range of colors for Makrolon® is based largely on the RAL color system. The colors are designated by a numerical code in which the first two digits specify the basic color, while the other four digits indicate the various shades.

	Opaque	Transparent	Translucent	Metallic	Transparent
	Non-reinforced, glass fiber reinforced		Non-reinforced		IR-protected
Natural color	000000	000000	–	–	–
Clear transparent	–	55....	–	–	–
White	01....	–	02....	03....	–
Yellow	10....	15....	12....	13....	17....
Orange	20....	25....	22....	23....	27....
Red	30....	35....	32....	33....	37....
Violet	40....	45....	42....	43....	47....
Blue	50....	55....	52....	53....	57....
Green	60....	65....	62....	63....	67....
Gray	70....	75....	72....	73....	77....
Brown	80....	85....	82....	83....	87....
Black	90....	–	92....	93....	–

Processing

Pre-treatment/drying

Makrolon® must be dried prior to processing. For injection molding, no more than 0.02 % residual moisture may be present in the granules and, for extrusion, no more than 0.01 %. Moisture in the melt leads to surface defects and an increased reduction in molecular weight. Makrolon® should be dried in suitable driers at 120 °C. Please refer to our ISO data sheets for any exceptions.

The drying time for moist granules is largely a function of the nature and type of the drying unit and can total 2 to 12 hours depending on the drying capacity. Drying times of 2 to 4 hours are sufficient in modern high-speed driers. One means

of dispensing with pre-drying is for the moisture to be removed during melting with the aid of a degassing unit, as has been standard practice in extrusion for a long time.

Please consider that some of our special grades, particularly grades containing flame retardants, show significantly lower dimensional stability under heat.

Therefore, these grades require lower drying and processing temperatures as indicated in the corresponding ISO datasheets.

Injection molding

Makrolon® can be processed on all modern injection molding machines. Shut-off nozzles are suitable given sufficient, uniform heating. At high melt temperatures, melt can flow out of open nozzles.

The melt temperatures generally employed during processing are between 280 and 320 °C.

It should be possible for the molds to be heated intensively and uniformly, and the mold temperature should be at least 80 °C to ensure parts with a low inherent stress and a good surface. No demolding difficulties are encountered at up to 120 °C. It will not generally be necessary to employ mold release agents when Makrolon® grades with easy mold release are used.

Please consider that some of our special grades, particularly grades containing flame retardants, show significantly lower dimensional stability under heat. Therefore, these grades require lower drying and processing temperatures as indicated in the corresponding ISO datasheets.

Under the recommended processing conditions small quantities of decomposition product may be given off during processing. To preclude any risk to the health and well-being of the machine operatives, tolerance limits for the work environment must be ensured by the provision of efficient exhaust ventilation and fresh air at the workplace in accordance with the Safety Data Sheet.

In order to prevent the partial decomposition of the polymer and the generation of volatile decomposition products, the prescribed processing temperatures should not be substantially exceeded.

Extrusion

The high-viscosity and high-viscosity/branched Makrolon® grades (Grades for Extrusion) are particularly suitable for processing by extrusion. Use is made solely of single-screw extruders.

With regard to temperature control, a barrel temperature profile that decrease from 280 °C at the hopper to 250 °C at the die, for instance, has proved successful. The downstream equipment, right through to the die, is best aligned to the temperature of the final barrel section. The melt temperature on output from the die should be 240 °C to 300 °C as a function of the processing method. The extruder should be run until it is empty in the event of interruptions to production. It is recommended that all components in contact with the molten polycarbonate (extruder barrel, screen changer, melt pump, adapter, die) be kept at a temperature of 160 °C to 170 °C.

Details about the properties and the processing of our Makrolon® grades can be found in our Technical Information Sheets.

The Technical Information Sheets can be found in the Internet at <http://plastics.bayer.com>



■ General Purpose Grades

■ Low viscosity

2205	MVR (300 °C/1.2 kg) 34 cm ³ /10 min; general purpose; low viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors	2405	MVR (300 °C/1.2 kg) 19 cm ³ /10 min; general purpose; low viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors
2207	MVR (300 °C/1.2 kg) 35 cm ³ /10 min; general purpose; low viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors	2407	MVR (300 °C/1.2 kg) 19 cm ³ /10 min; general purpose; low viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors

■ Medium viscosity

2605	MVR (300 °C/1.2 kg) 12 cm ³ /10 min; general purpose; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors	2805	MVR (300 °C/1.2 kg) 9.0 cm ³ /10 min; general purpose; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors
2607	MVR (300 °C/1.2 kg) 12 cm ³ /10 min; general purpose; medium viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors	2807	MVR (300 °C/1.2 kg) 9.0 cm ³ /10 min; general purpose; medium viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors

■ High viscosity

3105	MVR (300 °C/1.2 kg) 6.0 cm ³ /10 min; general purpose; high viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors	3107	MVR (300 °C/1.2 kg) 6.0 cm ³ /10 min; general purpose; high viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors
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■ Food Contact Grades

■ Low viscosity

2256	MVR (300 °C/1.2 kg) 34 cm ³ /10 min; food contact quality; low viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors	2456	MVR (300 °C/1.2 kg) 19 cm ³ /10 min; food contact quality; low viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors
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■ Medium viscosity

2656	MVR (300 °C/1.2 kg) 12 cm ³ /10 min; food contact quality; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors	1248	MVR (300 °C/1.2 kg) 7.0 cm ³ /10 min; food contact quality; medium viscosity; impact modified; injection molding – melt temperature 280–320 °C; available in light colors only
2856	MVR (300 °C/1.2 kg) 9.0 cm ³ /10 min; food contact quality; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors		

■ High viscosity

3156	MVR (300 °C/1.2 kg) 6.0 cm ³ /10 min; food contact quality; high viscosity; easy release; injection molding – melt temperature 280–320 °C; extrusion; available in transparent, translucent and opaque colors
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■ Impact Modified Grades

■ Low viscosity

1260	MVR (300 °C/1.2 kg) 34 cm ³ /10 min; impact modified; low viscosity; easy release; injection molding – melt temperature 280–320 °C; available in light colors only
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■ Medium viscosity

1837	MVR (300 °C/1.2 kg) 11 cm ³ /10 min; impact modified; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in opaque colors only	1248	MVR (300 °C/1.2 kg) 7.0 cm ³ /10 min; food contact quality; medium viscosity; impact modified; injection molding – melt temperature 280–320 °C
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■ Flame Retardant Grades

■ Low viscosity

2467	MVR (300 °C/1.2 kg) 19 cm ³ /10 min; flame retardant; UL 94V-2/1.5 mm and 3.0 mm; low viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors	6165X	MVR (300 °C/1.2 kg) 28 cm ³ /10 min; flame retardant; UL 94V-0/1.2 mm; low viscosity; easy release; injection molding – melt temperature 280–320 °C; available in opaque colors only; LCD TV frame
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6265X MVR (300 °C/1.2 kg) 19 cm³/10 min; flame retardant; UL 94V-0/1.5 mm; low viscosity; easy release; injection molding – melt temperature 280–320 °C; available in opaque colors only

6267X MVR (300 °C/1.2 kg) 19 cm³/10 min; flame retardant; UL 94V-0/1.5 mm; low viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in opaque colors only

■ Medium viscosity

2665 MVR (300 °C/1.2 kg) 12 cm³/10 min; flame retardant; UL 94V-2/1.5 mm and 3.0 mm; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors

6485 MVR (300 °C/1.2 kg) 9.0 cm³/10 min; flame retardant; UL 94V-0/1.5 mm and 5VA/3.0 mm; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in opaque colors only

2667 MVR (300 °C/1.2 kg) 12 cm³/10 min; flame retardant; UL 94V-2/1.5 mm and 3.0 mm; medium viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors

6487 MVR (300 °C/1.2 kg) 9.0 cm³/10 min; flame retardant; UL 94V-0/1.5 mm and 5VA/3.0 mm; medium viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in opaque colors only

2865 MVR (300 °C/1.2 kg) 10 cm³/10 min; flame retardant; UL 94V-2/1.5 mm and 3.0 mm; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors

6555 MVR (300 °C/1.2 kg) 10 cm³/10 min; flame retardant; UL 94V-0/3.0 mm; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors

6455 MVR (300 °C/1.2 kg) 12 cm³/10 min; flame retardant; UL 94V-0/3.0 mm; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors

6557 MVR (300 °C/1.2 kg) 10 cm³/10 min; flame retardant; UL 94V-0/3.0 mm; medium viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors

6457 MVR (300 °C/1.2 kg) 12 cm³/10 min; flame retardant; UL 94V-0/3.0 mm; medium viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent and opaque colors

■ High viscosity, branched

6717 MVR (300 °C/1.2 kg) 3.0 cm³/10 min; flame retardant; UL 94V-0/2.0 mm; high viscosity; branched; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; extrusion; available in transparent, translucent and opaque colors

■ Glass Fiber Reinforced (Milled-Fiber-)Grades

■ 20 % glass fiber reinforced

8025	MVR (300 °C/1.2 kg) 6.0 cm³/10 min; 20 % glass fiber reinforced; milled fiber; high viscosity; easy release; injection molding – melt temperature 310–330 °C; extrusion; available in opaque colors only; precision parts
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■ 30 % glass fiber reinforced

8035	MVR (300 °C/1.2 kg) 4.0 cm³/10 min; 30 % glass fiber reinforced; milled fiber; high viscosity; easy release; injection molding – melt temperature 310–330 °C; extrusion; available in opaque colors only; precision parts
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■ Glass Fiber Reinforced (Normal-Fiber-)Grades

■ 10 % glass fiber reinforced

9417	MVR (300 °C/1.2 kg) 6.0 cm³/10 min; 10 % glass fiber reinforced; flame retardant; UL 94V-0/1.5 mm and 5VA/3.0 mm; high viscosity; UV-stabilized; easy release; injection molding – melt temperature 310–330 °C; available in opaque colors only	9415	MVR (300 °C/1.2 kg) 6.0 cm³/10 min; 10 % glass fiber reinforced; flame retardant; UL 94V-0/1.5 mm and 5VA/3.0 mm; high viscosity; easy release; injection molding – melt temperature 310–330 °C; available in opaque colors only
GF9002	MVR (300 °C/1.2 kg) 15 cm³/10 min; 10 % glass fiber reinforced; flame retardant UL 94V-0/1.2 mm; low viscosity; easy release; injection molding – melt temperature 310–330 °C; available in opaque colors only; electrical/electronic; housing parts with low wall thickness		

■ 20 % glass fiber reinforced

GF8001	MVR (300 °C/1.2 kg) 16 cm³/10 min; 20 % glass fiber reinforced; low viscosity; easy release; injection molding – melt temperature 310–330 °C; available in opaque colors only; housing parts	9125	MVR (300 °C/1.2 kg) 8.0 cm³/10 min; 20 % glass fiber reinforced; flame retardant; UL 94V-0/1.5 mm; medium viscosity; easy release; injection molding – melt temperature 310–330 °C; available in opaque colors only
8325	MVR (300 °C/1.2 kg) 4.0 cm³/10 min; 20 % glass fiber reinforced; high viscosity; easy release; injection molding – melt temperature 310–330 °C; extrusion; available in opaque colors only	9425	MVR (300 °C/1.2 kg) 5.0 cm³/10 min; 20 % glass fiber reinforced; flame retardant; UL 94V-0/1.5 mm and 5VA/3.0 mm; high viscosity; easy release; injection molding – melt temperature 310–330 °C; extrusion; available in opaque colors only

■ 35 % glass fiber reinforced

8345 MVR (300 °C/1.2 kg) 3.0 cm³/10 min; 35 % glass fiber reinforced; high viscosity; easy release; injection molding – melt temperature 310–330 °C; extrusion; available in opaque colors only

■ 40 % glass fiber reinforced

GF9008 MVR (260 °C/5 kg) 25 cm³/10 min; 40 % glass fiber reinforced; flame retardant; low viscosity; injection molding – melt temperature 260 °C; modified drying conditions: 4–6 h at 65 °C; housing parts

■ Grades for Special Applications

■ Optical storage media

OD2015 MVR (250 °C/2.16 kg) 17 cm³/10 min; optical storage media; suitable for all formats; high purity; injection molding – melt temperature 300–350 °C; available in color code 000000 only

■ Light guides

LED2045 MVR (250 °C/2.16 kg) 17 cm³/10 min; light guides; PC with highest transmission; low viscosity; easy release; injection molding – melt temperature 260–300 °C; available in transparent colors only

LED2643 MVR (300 °C/1.2 kg) 13 cm³/10 min; light guides; PC with highest transmission; medium viscosity; UV-stabilized; injection molding – melt temperature 280–320 °C; available in transparent colors only

LED2245 MVR (300 °C/1.2 kg) 34 cm³/10 min; light guides; PC with highest transmission; low viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent colors only

■ Optical lenses

LQ2647 MVR (300 °C/1.2 kg) 12 cm³/10 min; optical lens; medium viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent tints only; safety glasses

LQ3187 MVR (300 °C/1.2 kg) 6.0 cm³/10 min; optical lens; high viscosity; UV stabilized; UV 400 cut off; easy release; injection molding – melt temperature 280–320 °C; available in transparent tints only; safety glasses; sun glasses

■ Lighting

LTG2623 MVR (300 °C/1.2 kg) 13 cm³/10 min; lighting; High Intensity Discharge (HID) lenses; medium viscosity; UV-stabilized; injection molding – melt temperature 280–320 °C; available in transparent colors only

■ Automotive lighting

AL2447 MVR (300 °C/1.2 kg) 19 cm³/10 min; automotive lighting; low viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in clear transparent colors and in various signal colors; headlamp lenses for automotive forward lighting

AL2647 MVR (300 °C/1.2 kg) 12 cm³/10 min; automotive lighting; medium viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in clear transparent colors and in various signal colors; headlamp lenses for automotive forward lighting

■ Automotive glazing

AG2677 MVR (300 °C/1.2 kg) 12 cm³/10 min; medium viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent colors only; automotive glazing; roof modules

■ Blow molding

WB1239 MVR (300 °C/1.2 kg) 2.0 cm³/10 min; blow molding; high viscosity; branched; food contact quality; extrusion blow molding; injection stretch blow molding; available in transparent colors only; water bottles

■ Furniture grades

FU1007 MVR (300 °C/1.2 kg) 9.0 cm³/10 min; special grade for furniture applications with demands regarding fire standards UNI 8456, 8457, 9174 and 9175; medium viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors

FU4007 MVR (300 °C/1.2 kg) 6.0 cm³/10 min; special grade for furniture applications with demands regarding fire standards UNI 8456, 8457, 9174 and 9175; high viscosity; UV-stabilized; easy release; injection molding – melt temperature 280–320 °C; available in transparent, translucent and opaque colors



■ Extrusion

ET2613 MVR (300 °C/1.2 kg) 12 cm³/10 min; extrusion; medium viscosity; UV-stabilized; available in transparent colors only; solid sheet

ET UV120 PC/UV absorber concentrate; high viscosity; easy release; special grade for the coextrusion of Makrolon® ET base resins; available in transparent colors only; solid sheet; multi wall sheet/profiles

ET3113 MVR (300 °C/1.2 kg) 6.0 cm³/10 min; extrusion; high viscosity; UV-stabilized; available in transparent colors only; solid sheet; corrugated sheet

ET UV130 PC/UV absorber concentrate; high viscosity; easy release; special grade for the coextrusion of Makrolon® ET base resins; available in transparent colors only; solid sheet; multi wall sheet/profiles

ET3117 MVR (300 °C/1.2 kg) 6.0 cm³/10 min; extrusion; high viscosity; UV-stabilized; easy release; available in transparent colors only; multi wall sheet/profiles; corrugated sheet

ET UV510 PC/UV absorber concentrate; high viscosity; easy release; very low plate-out; special grade for the coextrusion of Makrolon® ET base resins; available in transparent colors only; solid sheet; multi wall sheet/profiles

ET3127 MVR (300 °C/1.2 kg) 6.0 cm³/10 min; extrusion; high viscosity; branched; UV-stabilized; easy release; available in transparent colors only; multi wall sheet/profiles

ET UV530 PC/UV absorber concentrate; high viscosity; easy release; very low plate-out; special grade for the coextrusion of Makrolon® ET base resins; available in transparent colors only; solid sheet; multi wall sheet/profiles

ET3227 MVR (300 °C/1.2 kg) 3.0 cm³/10 min; extrusion; high viscosity; branched; UV-stabilized; easy release; multi wall sheet/profiles

ET UV540 PC/UV absorber concentrate; high viscosity; easy release; very low plate-out; special grade for the coextrusion of Makrolon ET base resins; available in transparent colors only; solid sheet; multi wall sheet/profiles

ET UV110 PC/UV absorber concentrate; high viscosity; easy release; special grade for the coextrusion of Makrolon® ET base resins; available in transparent colors only; solid sheet; multi wall sheet/profiles

■ Structural foam

SF800 MVR (300 °C/1.2 kg) 5.0 cm³/10 min; structural foam; 5 % glass fiber reinforced; flame retardant; high viscosity; easy release; in combination with an appropriate blowing agent for the production of structural foam moldings

SF810 MVR (300 °C/1.2 kg) 6.0 cm³/10 min; structural foam; glass fiber reinforced; flame retardant; easy release; injection molding; in combination with an appropriate blowing agent for the production of structural foam moldings

SF805 MVR (300 °C/1.2 kg) 7.0 cm³/10 min; structural foam; 5 % glass fiber reinforced; flame retardant; high viscosity; easy release; injection molding; available in natural (opaque) and opaque colors; in combination with an appropriate blowing agent for the production of structural foam moldings



■ Medical devices*

2258	MVR (300 °C/1.2 kg) 34 cm³/10 min; medical devices; suitable for ETO and steam sterilization at 121 °C; biocompatible according to many ISO 10993-1 test requirements; low viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent and opaque colors	Rx2430	MVR (300 °C/1.2 kg) 19 cm³/10 min; medical devices; suitable for sterilization with high-energy radiation; biocompatible according to many ISO 10993-1 test requirements; low viscosity; injection molding – melt temperature 280–320 °C; transparent parts for medical devices
2458	MVR (300 °C/1.2 kg) 19 cm³/10 min; medical devices; suitable for ETO and steam sterilization at 121 °C; biocompatible according to many ISO 10993-1 test requirements; low viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent and opaque colors	Rx2435	MVR (300 °C/1.2 kg) 23 cm³/10 min; medical devices; suitable for sterilization with high-energy radiation; biocompatible according to many ISO 10993-1 test requirements; low viscosity; easy release; injection molding – melt temperature 280–320 °C; available in color code 451118 only; transparent parts for medical devices
2558	MVR (300 °C/1.2 kg) 14 cm³/10 min; medical devices; suitable for ETO and steam sterilization at 121 °C; biocompatible according to many ISO 10993-1 test requirements; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent and opaque colors	Rx2530	MVR (300 °C/1.2 kg) 15 cm³/10 min; medical devices; suitable for sterilization with high-energy radiation; biocompatible according to many ISO 10993-1 test requirements; medium viscosity; injection molding – melt temperature 280–320 °C; transparent parts for medical devices
2658	MVR (300 °C/1.2 kg) 12 cm³/10 min; medical devices; suitable for ETO and steam sterilization at 121 °C; biocompatible according to many ISO 10993-1 test requirements; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent and opaque colors	Rx2635	MVR (300 °C/1.2 kg) 12 cm³/10 min; medical devices; suitable for sterilization with high-energy radiation; biocompatible according to many ISO 10993-1 test requirements; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in color code 451118 only; transparent parts for medical devices
2858	MVR (300 °C/1.2 kg) 9.0 cm³/10 min; medical devices; suitable for ETO and steam sterilization at 121 °C; biocompatible according to many ISO 10993-1 test requirements; medium viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent and opaque colors	Rx1805	MVR (300 °C/1.2 kg) 6.0 cm³/10 min; medical devices; high lipid resistance; suitable for sterilization with high-energy radiation; biocompatible according to many ISO 10993-1 test requirements; high viscosity; injection molding – melt temperature 280–320 °C; transparent parts for medical devices
3258	MVR (300 °C/1.2 kg) 5.0 cm³/10 min; medical devices; suitable for ETO and steam sterilization at 121 °C; biocompatible according to many ISO 10993-1 test requirements; high viscosity; easy release; injection molding – melt temperature 280–320 °C; available in transparent and opaque colors		

* See warranty on page 32

Makrolon® (PC) – typical values

General purpose grades

				Low viscosity			
Typical Properties	Test Conditions	Units	Standards	2205	2207	2405	2407
Rheological properties							
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	34	34	19	19
Mechanical properties (23 °C / 50 % r. h.)							
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	2400	2400	2400	2400
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	65	65	65	66
C Yield strain	50 mm/min	%	ISO 527-1, -2	6.0	6.0	6.0	6.0
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	> 50	> 50	> 50	> 50
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	60	60	65	65
C Strain at break	5 mm/min	%	ISO 527-1, -2	120	120	125	130
C Tensile creep modulus	1 h	MPa	ISO 899-1	2100	2100	2200	2200
C Tensile creep modulus	1000 h	MPa	ISO 899-1	1700	1700	1900	1900
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	55P(C)	55P(C)	65P	65P(C)
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	12C	12C	14C	14C
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	65P(C)	65P(C)	75P(C)	75P(C)
C Puncture maximum force	23 °C	N	ISO 6603-2	4900	4900	5100	5100
C Puncture energy	23 °C	J	ISO 6603-2	55	55	55	55
Thermal properties							
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	145	144	144	143
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	124	123	124	124
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	137	136	137	136
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	145	143	145	143
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-2 ¹⁾ (0.75)	V-2 ¹⁾ (0.75)	V-2 (0.75)	V-2 (0.75)
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	HB ¹⁾ (2.9)	HB ¹⁾ (2.9)	HB ¹⁾ (2.7)	HB (2.7)
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	28	28	27	27
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	850	850	850	850
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	875	875	875	875
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	930	930	930	930
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	875	875	875	875
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	875	875	875	875
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	875	875	875	875
Electrical properties (23 °C / 50 % r. h.)							
C Relative permittivity	100 Hz	–	IEC 60250	3.1	3.1	3.1	3.1
C Relative permittivity	1 MHz	–	IEC 60250	3.0	3.0	3.0	3.0
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	5	5	5	5
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	90	90	90	90
C Volume resistivity	–	Ohm · m	IEC 60250	1E14	1E14	1E14	1E14
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16	1E16
C Electrical strength	1 mm	kV/mm	IEC 60093	34	34	34	34
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	250	250	250	250
Other properties (23 °C)							
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.30	0.30	0.30
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12	0.12	0.12	0.12
C Density	–	kg/m³	ISO 1183	1190	1190	1200	1200
Material specific properties							
Refractive index	Procedure A	–	ISO 489	1.586	1.586	1.585	1.584
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	89	89	89	89
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	89	89	89	89
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	88	88	88	88
Processing conditions for test specimens							
C Injection molding–Melt temperature	–	°C	ISO 294	280	280	280	280
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80	80
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

¹⁾ clear

Makrolon® (PC) – typical values

				General purpose grades					
				Medium viscosity				High viscosity	
Typical Properties	Test Conditions	Units	Standards	2605	2607	2805	2807	3105	3107
Rheological properties									
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	12	12	9	9	6	6
Mechanical properties (23 °C / 50 % r. h.)									
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	2400	2400	2400	2400	2400	2400
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	66	66	66	66	66	66
C Yield strain	50 mm/min	%	ISO 527-1, -2	6.1	6.1	6.2	6.1	6.2	6.1
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	> 50	> 50	> 50	> 50	> 50	> 50
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	70	70	70	70	70	70
C Strain at break	5 mm/min	%	ISO 527-1, -2	130	130	130	130	125	120
C Tensile creep modulus	1 h	MPa	ISO 899-1	2200	2200	2200	2200	2200	2200
C Tensile creep modulus	1000 h	MPa	ISO 899-1	1900	1900	1900	1900	1900	1900
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	70P	70P	75P	75P	80P	80P
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	16C	14C	16C	14C	16C	14C
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	80P(C)	80P(C)	85P	85P(C)	90P	90P
C Puncture maximum force	23 °C	N	ISO 6603-2	5400	5400	5400	5400	5600	5600
C Puncture energy	23 °C	J	ISO 6603-2	60	60	60	60	60	60
Thermal properties									
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	144	143	145	144	146	145
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	125	123	125	124	126	125
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	136	135	137	136	138	137
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	144	143	144	143	145	144
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.65	0.65
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.65	0.65
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-2 (0.75)	V-2 (0.75)	V-2 (0.75)	V-2 (0.75)	HB (1.5)	HB (1.5)
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	HB (2.5)	HB (2.5)	HB (2.5)	HB (2.5)	V-2 (0.75)	V-2 (0.75)
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	28	28	28	28	27	27
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	850	850	850	850	875	875
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	850	850	875	875	875	875
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	930	930	960	960	960	960
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	875	875	875	875	875	875
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	875	875	875	875	875	875
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	875	875	900	875	900	900
Electrical properties (23 °C / 50 % r. h.)									
C Relative permittivity	100 Hz	–	IEC 60250	3.1	3.1	3.1	3.1	3.1	3.1
C Relative permittivity	1 MHz	–	IEC 60250	3.0	3.0	3.0	3.0	3.0	3.0
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	5	5	5	5	5	5
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	90	90	90	90	95	95
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	1E14	1E14	1E14	1E14
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16	1E16	1E16	1E16
C Electrical strength	1 mm	kV/mm	IEC 60093	34	34	34	34	34	34
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	250	250	250	250	250	250
Other properties (23 °C)									
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.30	0.30	0.30	0.30	0.30
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12	0.12	0.12	0.12	0.12	0.12
C Density	–	kg/m³	ISO 1183	1200	1200	1200	1200	1200	1200
Material specific properties									
Refractive index	Procedure A	–	ISO 489	1.586	1.586	1.586	1.586	1.586	1.586
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	89	89	89	89	89	89
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	89	89	89	89	89	89
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	88	88	88	88	88	88
Processing conditions for test specimens									
C Injection molding–Melt temperature	–	°C	ISO 294	290	290	300	300	300	300
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80	80	80	80
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

Makrolon® (PC) – typical values

				Food contact grades					
				Low viscosity		Medium viscosity			High viscosity
Typical Properties	Test Conditions	Units	Standards	2256	2456	2656	2856	1248	3156
Rheological properties									
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	34	19	12	9	7	6
Mechanical properties (23 °C / 50 % r. h.)									
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	2400	2400	2400	2350	2250	2400
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	65	65	66	65	61	66
C Yield strain	50 mm/min	%	ISO 527-1, -2	6.0	6.2	6.1	6.2	6.0	6.2
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	> 50	> 50	> 50	> 50	> 50	> 50
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	60	70	70	70	70	70
C Strain at break	5 mm/min	%	ISO 527-1, -2	125	130	130	130	130	130
C Tensile creep modulus	1 h	MPa	ISO 899-1	2200	2200	2200	2200	–	2200
C Tensile creep modulus	1000 h	MPa	ISO 899-1	1900	1900	1900	1900	–	1900
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	55P(C)	65P	70P	75P	70P	80P
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	12C	14C	16C	16C	60P(C)	16C
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	65P(C)	75P(C)	80P(C)	85P	80P	90P
C Puncture maximum force	23 °C	N	ISO 6603-2	4900	5100	5400	5400	5200	5600
C Puncture energy	23 °C	J	ISO 6603-2	55	55	60	60	55	60
Thermal properties									
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	145	146	145	145	147	146
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	124	125	124	125	125	126
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	137	138	137	137	139	138
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	145	145	143	145	146	147
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.7	0.65
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.7	0.65
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	–	V-2 (0.75)	V-2 (0.75)	V-2 (0.75)	HB (1.5)	–
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	–	HB (2.7)	HB (2.5)	HB (2.5)	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	28	28	28	28	30	27
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	850	850	850	850	850	850
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	875	875	850	875	850	850
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	930	930	960	930	900	930
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	875	875	875	875	800	875
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	875	875	875	875	875	875
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	875	875	875	875	875	900
Electrical properties (23 °C / 50 % r. h.)									
C Relative permittivity	100 Hz	–	IEC 60250	3.1	3.1	3.1	3.1	3.1	3.1
C Relative permittivity	1 MHz	–	IEC 60250	3.0	3.0	3.0	3.0	3.0	3.0
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	5	5	5	5	12	5
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	90	90	95	90	120	95
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	1E14	1E14	1E14	1E14
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16	1E16	1E16	1E16
C Electrical strength	1 mm	kV/mm	IEC 60093	34	34	34	34	34	34
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	250	250	250	250	225	250
Other properties (23 °C)									
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.30	0.30	0.30	0.40	0.30
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12	0.12	0.12	0.12	0.12	0.12
C Density	–	kg/m³	ISO 1183	1190	1200	1200	1200	1200	1200
Material specific properties									
Refractive index	Procedure A	–	ISO 489	1.586	1.586	1.586	1.586	1.586	1.586
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	89	89	89	89	89	89
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	89	89	89	89	89	89
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	88	88	88	88	88	88
Processing conditions for test specimens									
C Injection molding–Melt temperature	–	°C	ISO 294	280	280	290	300	300	300
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80	80	80	80
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

Makrolon® (PC) – typical values

				Impact modified grades		
				Low viscosity	Medium viscosity	
Typical Properties	Test Conditions	Units	Standards	1260	1837	1248
Rheological properties						
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	33	11	7
Mechanical properties (23 °C / 50 % r. h.)						
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	2350	2200	2250
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	63	58	61
C Yield strain	50 mm/min	%	ISO 527-1, -2	5.8	5.7	6.0
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	> 50	> 50	> 50
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	55	60	70
C Strain at break	5 mm/min	%	ISO 527-1, -2	100	120	130
C Tensile creep modulus	1 h	MPa	ISO 899-1	–	–	–
C Tensile creep modulus	1000 h	MPa	ISO 899-1	–	–	–
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	55P	60P	70P
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	14C	50P	60P(C)
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	65P	70P	80P
C Puncture maximum force	23 °C	N	ISO 6603-2	4800	4900	5200
C Puncture energy	23 °C	J	ISO 6603-2	50	50	55
Thermal properties						
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	142	143	147
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	122	121	125
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	135	134	139
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	142	141	146
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.7	0.7	0.7
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.7	0.7	0.7
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	–	–	–
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-2 (0.75)	HB (0.75)	HB (1.5)
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	30	30	30
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	875	850	850
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	900	875	850
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	960	900	900
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	875	–	–
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	875	–	850
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	900	–	850
Electrical properties (23 °C / 50 % r. h.)						
C Relative permittivity	100 Hz	–	IEC 60250	3.1	3.2	3.2
C Relative permittivity	1 MHz	–	IEC 60250	3.0	3.1	3.1
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	10	14	12
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	100	125	120
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	1E14
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16
C Electrical strength	1 mm	kV/mm	IEC 60093	34	34	34
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	250	225	225
Other properties (23 °C)						
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.40	0.40
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12	0.12	0.12
C Density	–	kg/m³	ISO 1183	1200	1190	1200
Material specific properties						
Refractive index	Procedure A	–	ISO 489	–	–	–
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	–	–	–
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	–	–	–
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	–	–	–
Processing conditions for test specimens						
C Injection molding–Melt temperature	–	°C	ISO 294	280	290	300
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

Makrolon® (PC) – typical values

Flame retardant grades

Low viscosity

Typical Properties	Test Conditions	Units	Standards	6165 X	2467	6265 X	6267 X
Rheological properties							
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	28	19	19	19
Mechanical properties (23 °C / 50 % r. h.)							
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	2350	2400	2400	2450
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	65	66	65	67
C Yield strain	50 mm/min	%	ISO 527-1, -2	6.0	6.0	6.0	6.0
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	> 50	> 50	> 50	> 50
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	55	70	65	65
C Strain at break	5 mm/min	%	ISO 527-1, -2	120	130	120	120
C Tensile creep modulus	1 h	MPa	ISO 899-1	–	–	2200	–
C Tensile creep modulus	1000 h	MPa	ISO 899-1	–	–	1900	–
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	15C	65P(C)	65P(C)	12C(P)
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	12C	14C	12C	12C
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	12C	75P(C)	12C(P)	12C(P)
C Puncture maximum force	23 °C	N	ISO 6603-2	4800	5100	5000	5000
C Puncture energy	23 °C	J	ISO 6603-2	45	55	50	50
Thermal properties							
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	–	144	144	–
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	124	124	124	122
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	136	138	137	134
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	143	144	145	144
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	–	V-2 (0.75)	–	–
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-0 (1.2)	V-0 (6.4)	V-0 (1.5)	V-0 (1.5)
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	35	30	36	36
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	–	–	960	–
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	960	–	960	960
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	960	–	960	960
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	–	–	875	–
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	–	–	900	–
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	–	–	900	–
Electrical properties (23 °C / 50 % r. h.)							
C Relative permittivity	100 Hz	–	IEC 60250	3.1	3.1	3.1	3.1
C Relative permittivity	1 MHz	–	IEC 60250	3.0	3.0	3.0	3.0
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	–	5	8	8
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	–	90	90	90
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	1E14	1E14
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16	1E16
C Electrical strength	1 mm	kV/mm	IEC 60093	34	34	34	34
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	225	225	225	225
Other properties (23 °C)							
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.30	0.30	0.30
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12	0.12	0.12	0.12
C Density	–	kg/m³	ISO 1183	1200	1200	1200	1200
Material specific properties							
Refractive index	Procedure A	–	ISO 489	–	1.586	–	–
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	–	89	–	–
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	–	89	–	–
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	–	88	–	–
Processing conditions for test specimens							
C Injection molding–Melt temperature	–	°C	ISO 294	280	280	280	280
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80	80
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

Makrolon® (PC) – typical values

				Flame retardant grades				
				Medium viscosity				
Typical Properties	Test Conditions	Units	Standards	2665	2667	2865	6455	6457
Rheological properties								
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	12	12	10	12	12
Mechanical properties (23 °C / 50 % r. h.)								
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	2400	2400	2400	2400	2450
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	66	67	66	66	67
C Yield strain	50 mm/min	%	ISO 527-1, -2	6.1	6.1	6.2	6.1	6.1
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	> 50	> 50	> 50	> 50	> 50
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	70	70	–	65	65
C Strain at break	5 mm/min	%	ISO 527-1, -2	130	130	–	115	115
C Tensile creep modulus	1 h	MPa	ISO 899-1	2200	2200	2200	–	–
C Tensile creep modulus	1000 h	MPa	ISO 899-1	1900	1900	1900	–	–
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	70P	70P	75P	70P	70P(C)
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	16C	14C	16C	14C	14C
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	80P(C)	80P(C)	85P	–	–
C Puncture maximum force	23 °C	N	ISO 6603-2	5400	5400	5400	5400	5400
C Puncture energy	23 °C	J	ISO 6603-2	60	60	60	60	60
Thermal properties								
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	144	144	146	145	144
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	124	123	125	125	123
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	136	135	137	136	135
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	143	143	145	143	142
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.65
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.65
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-2 (0.75)	V-2 (0.75)	V-2 (0.75)	V-2 (1.5)	V-2 (1.5)
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-0 (6.0)	V-0 (6.0)	V-0 (6.0)	V-0 (3.0)	V-0 (3.0)
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	30	34	32	35	35
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	850	850	850	–	–
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	900	900	850	960	960
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	960	960	960	960	960
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	875	875	875	–	–
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	875	875	900	960	960
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	875	875	900	960	960
Electrical properties (23 °C / 50 % r. h.)								
C Relative permittivity	100 Hz	–	IEC 60250	3.1	3.1	3.1	3.1	3.1
C Relative permittivity	1 MHz	–	IEC 60250	3.0	3.0	3.0	3.0	3.0
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	5	5	5	8	8
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	90	90	90	90	90
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	1E14	1E14	1E14
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16	1E16	1E16
C Electrical strength	1 mm	kV/mm	IEC 60093	34	34	34	34	34
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	225	225	225	225	225
Other properties (23 °C)								
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.30	0.30	0.30	0.30
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12	0.12	0.12	0.12	0.12
C Density	–	kg/m³	ISO 1183	1200	1200	1200	1200	1200
Material specific properties								
Refractive index	Procedure A	–	ISO 489	1.586	1.586	1.586	1.586	1.586
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	89	89	89	89	89
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	89	89	89	89	89
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	88	88	88	88	88
Processing conditions for test specimens								
C Injection molding–Melt temperature	–	°C	ISO 294	290	290	300	290	290
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80	80	80
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

Makrolon® (PC) – typical values

				Flame retardant grades				
				Medium viscosity				High viscosity
Typical Properties	Test Conditions	Units	Standards	6485	6487	6555	6557	6717
Rheological properties								
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	10	10	10	10	3
Mechanical properties (23 °C / 50 % r. h.)								
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	2400	2450	2400	2400	2400
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	66	66	66	66	67
C Yield strain	50 mm/min	%	ISO 527-1, -2	6.1	6.0	6.2	6.1	6.4
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	> 50	> 50	> 50	> 50	> 50
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	65	65	70	70	65
C Strain at break	5 mm/min	%	ISO 527-1, -2	120	115	130	130	105
C Tensile creep modulus	1 h	MPa	ISO 899-1	2200	–	2200	2200	–
C Tensile creep modulus	1000 h	MPa	ISO 899-1	1900	–	1900	1900	–
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	70P(C)	70P(C)	70P	70P(C)	70P
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	14C	12C	14C	14C	14C
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	80P(C)	70P(C)	80P	80P(C)	80P
C Puncture maximum force	23 °C	N	ISO 6603-2	5200	5200	5400	5400	5500
C Puncture energy	23 °C	J	ISO 6603-2	50	50	60	60	60
Thermal properties								
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	142	141	145	144	146
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	124	122	125	124	127
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	136	134	137	136	139
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	144	143	144	143	146
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.70
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.70
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-1 (0.75)	–	V-2 (1.0)	V-2 ¹⁾ (0.75)	–
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-0 (1.5)	V-0 (1.5)	V-0 (3.0)	V-0 (3.0)	V-0 (2.0)
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	5VA (3.0)	5VA (3.0)	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	36	36	35	36	43
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	960	960	875	900	960
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	960	960	960	960	960
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	960	960	960	960	960
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	875	875	875	875	875
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	875	900	875	875	900
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	875	930	875	900	900
Electrical properties (23 °C / 50 % r. h.)								
C Relative permittivity	100 Hz	–	IEC 60250	3.1	3.1	3.1	3.1	3.1
C Relative permittivity	1 MHz	–	IEC 60250	3.0	3.0	3.0	3.0	3.0
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	8	8	8	8	10
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	90	90	90	90	90
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	1E14	1E14	1E14
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16	1E16	1E16
C Electrical strength	1 mm	kV/mm	IEC 60093	34	34	34	34	34
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	225	225	225	225	225
Other properties (23 °C)								
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.30	0.30	0.30	0.30
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12	0.12	0.12	0.12	0.12
C Density	–	kg/m³	ISO 1183	1200	1200	1200	1200	1200
Material specific properties								
Refractive index	Procedure A	–	ISO 489	–	–	1.586	1.586	1.586
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	–	–	89	89	87
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	–	–	89	89	86
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	–	–	88	88	85
Processing conditions for test specimens								
C Injection molding–Melt temperature	–	°C	ISO 294	300	300	300	300	310
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80	80	90
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

¹⁾ clear

Makrolon® (PC) – typical values

Typical Properties	Test Conditions	Units	Standards	Glass fiber reinforced (milled fiber)		Glass fiber reinforced (normal fiber)		
				20 % GF	30 % GF	10 % GF		
				8025	8035	GF9002	9415	9417
Rheological properties								
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	6	4	15	6	6
Mechanical properties (23 °C / 50 % r. h.)								
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	4000	5100	3900	3800	3800
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	58	59	60	64	62
C Yield strain	50 mm/min	%	ISO 527-1, -2	3.5	2.5	4.5	4.4	4.6
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	–	–	–	–	–
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	50	55	45	45	45
C Strain at break	5 mm/min	%	ISO 527-1, -2	6.5	3.5	10	15	15
C Tensile creep modulus	1 h	MPa	ISO 899-1	3700	4700	–	3600	3600
C Tensile creep modulus	1000 h	MPa	ISO 899-1	3500	3900	–	2900	2900
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	55C	40C	>100C	150C(N)	150C(N)
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	12C	8C	8C	10C	10C
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	8C	7C	–	8C	–
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	12C	8C	8C	10C	10C
C Puncture maximum force	23 °C	N	ISO 6603-2	3300	1300	3200	4000	4000
C Puncture energy	23 °C	J	ISO 6603-2	20	5	16	25	25
Thermal properties								
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	–	–	–	–	–
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	134	135	132	135	133
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	141	141	–	140	141
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	146	147	141	145	143
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.45	0.35	0.4	0.4	0.4
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.55	0.55	0.6	0.65	0.65
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-2 (1.5)	–	V-2 (0.75)	V-2 (0.75)	–
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-1 (6.0)	V-1 (1.5)	V-0 (1.2)	V-0 (1.5)	V-0 (1.5)
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	5VA (6.0)
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	5VA ²⁾
C Oxygen index	Method A	%	ISO 4589-2	32	37	35	35	36
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	800	960	960	960	960
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	960	960	960	960	960
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	960	960	960	960	960
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	850	875	–	900	825
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	875	875	800	900	900
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	875	875	875	900	900
Electrical properties (23 °C / 50 % r. h.)								
C Relative permittivity	100 Hz	–	IEC 60250	3.3	3.5	3.2	3.2	3.2
C Relative permittivity	1 MHz	–	IEC 60250	3.3	3.5	3.2	3.2	3.2
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	10	15	10	10	10
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	90	90	90	90	90
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	1E14	1E14	1E14
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16	1E16	1E16
C Electrical strength	1 mm	kV/mm	IEC 60093	36	36	36	36	36
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	175	175	175	175	175
Other properties (23 °C)								
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.24	0.22	0.3	0.26	0.26
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.10	0.10	0.10	0.12	0.12
C Density	–	kg/m³	ISO 1183	1340	1420	1270	1270	1270
Material specific properties								
Refractive index	Procedure A	–	ISO 489	–	–	–	–	–
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	–	–	–	–	–
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	–	–	–	–	–
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	–	–	–	–	–
Processing conditions for test specimens								
C Injection molding–Melt temperature	–	°C	ISO 294	300	300	300	300	300
C Injection molding–Mold temperature	–	°C	ISO 294	110	110	110	110	110
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

²⁾ black

Makrolon® (PC) – typical values

				Glas fiber (normal fiber)					
				20 % GF				35 % GF	40 % GF
Typical Properties	Test Conditions	Units	Standards	GF8001	9125	9425	8325	8345	GF9008**
Rheological properties									
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–	–	25
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	16	8	5	4	3	–
Mechanical properties (23 °C / 50 % r. h.)									
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	6000	5800	5800	5800	9400	12000
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	–	82	86	99	113	–
C Yield strain	50 mm/min	%	ISO 527-1, -2	–	2.2	2.7	3.3	1.9	–
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	–	–	–	–	–	–
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	105	85	85	85	110	115
C Strain at break	5 mm/min	%	ISO 527-1, -2	3.0	2.2	2.6	4.4	1.8	1.5
C Tensile creep modulus	1 h	MPa	ISO 899-1	–	5700	5700	–	9000	–
C Tensile creep modulus	1000 h	MPa	ISO 899-1	–	5200	5200	–	8500	–
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	50C	35C	40C	60C	40C	35C
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	8C	8C	8C	10C	8C	10C
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	–	–	–	–	–	–
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	–	8C	8C	10C	8C	–
C Puncture maximum force	23 °C	N	ISO 6603-2	700	800	900	1000	900	–
C Puncture energy	23 °C	J	ISO 6603-2	2.7	5	5	5	5	–
Thermal properties									
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	–	–	–	–	–	–
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	137	138	138	142	140	82
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	141	142	142	145	144	–
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	144	145	146	149	148	87
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.3	0.3	0.3	0.3	0.2	–
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.6	–
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-2 (1.0) ²⁾	–	V-2 (0.5) ²⁾	V-2 (1.5) ²⁾	V-1 (1.5) ²⁾	V-0 (1.0) ²⁾
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	HB (1.5)	V-0 (1.5)	V-0 (1.5)	V-0 (3.0)	V-0 (3.0)	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	5VA	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	–	36	35	32	35	–
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	–	–	960	–	–	–
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	–	960	960	–	960	–
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	–	960	960	–	960	–
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	–	–	875	–	–	–
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	–	850	875	–	–	–
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	–	850	900	–	–	–
Electrical properties (23 °C / 50 % r. h.)									
C Relative permittivity	100 Hz	–	IEC 60250	3.3	3.3	3.3	3.3	3.6	–
C Relative permittivity	1 MHz	–	IEC 60250	3.3	3.3	3.3	3.3	3.6	–
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	10	10	10	10	10	–
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	90	90	90	90	90	–
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	1E14	1E14	1E14	–
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16	1E16	1E16	–
C Electrical strength	1 mm	kV/mm	IEC 60093	36	36	36	36	36	–
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	175	175	175	175	175	200
Other properties (23 °C)									
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.24	0.24	0.24	0.24	0.20	–
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.10	0.10	0.10	0.10	0.80	–
C Density	–	kg/m³	ISO 1183	1340	1340	1340	1340	1480	1520
Material specific properties									
Refractive index	Procedure A	–	ISO 489	–	–	–	–	–	–
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	–	–	–	–	–	–
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	–	–	–	–	–	–
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	–	–	–	–	–	–
Processing conditions for test specimens									
C Injection molding–Melt temperature	–	°C	ISO 294	300	300	300	300	300	300
C Injection molding–Mold temperature	–	°C	ISO 294	110	110	110	110	110	110
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.
* See warranty on page 32

Impact properties:
N = non break
P = partial break
C = complete break

²⁾ black
** modified drying conditions (ISO Datasheet)

Makrolon® (PC) – typical values

				Speciality grades					
				Optical storage media	Light guides			Optical lenses	
Typical Properties	Test Conditions	Units	Standards	OD2015	LED2045	LED2245	LED2643	LQ2647	LQ3187
Rheological properties									
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	17	17	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	–	–	34	13	12	6
Mechanical properties (23 °C / 50 % r. h.)									
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	2350	2350	2350	2350	2400	2400
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	63	63	63	65	67	66
C Yield strain	50 mm/min	%	ISO 527-1, -2	5.9	6.0	6.0	6.3	6.1	6.2
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	> 50	> 50	> 50	> 50	> 50	> 50
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	55	55	60	70	70	70
C Strain at break	5 mm/min	%	ISO 527-1, -2	100	100	125	130	130	125
C Tensile creep modulus	1 h	MPa	ISO 899-1	–	–	–	–	2200	2200
C Tensile creep modulus	1000 h	MPa	ISO 899-1	–	–	–	–	1900	1900
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	50P(C)	50P(C)	60P(C)	70P	70P	80P
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	12C	12C	12C	14C	14C	14C
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	50P(C)	55P(C)	65P(C)	80P	80P(C)	90P
C Puncture maximum force	23 °C	N	ISO 6603-2	4700	4700	4900	5400	5400	5600
C Puncture energy	23 °C	J	ISO 6603-2	50	50	55	60	60	60
Thermal properties									
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	145	144	145	146	144	145
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	124	124	125	126	123	125
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	138	137	138	138	135	137
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	145	145	145	145	143	145
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.65	0.65
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.65	0.65
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	–	–	V-2 ¹⁾ (0.75)	V-2 (0.75)	V-2 (0.8)	V-2 (0.8)
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-2 (0.71)	V-2 ¹⁾ (0.71)	HB ¹⁾ (2.9)	HB (2.5)	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	28	27	28	28	28	28
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	–	–	850	850	–	–
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	–	–	875	855	–	–
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	–	–	930	960	–	–
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	–	–	875	875	–	–
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	–	–	875	875	–	–
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	–	–	900	875	–	–
Electrical properties (23 °C / 50 % r. h.)									
C Relative permittivity	100 Hz	–	IEC 60250	3.1	3.1	3.1	3.1	3.1	3.1
C Relative permittivity	1 MHz	–	IEC 60250	3.0	3.0	3.0	3.0	3.0	3.0
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	5	5	5	5	5	5
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	95	90	95	95	90	95
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	–	–	1E14	1E14
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	–	–	1E16	1E16
C Electrical strength	1 mm	kV/mm	IEC 60093	34	34	34	34	34	34
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	225	225	250	250	250	250
Other properties (23 °C)									
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.30	0.30	0.30	0.30	0.30
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12	0.12	0.12	0.12	0.12	0.12
C Density	–	kg/m³	ISO 1183	1190	1190	1190	1200	1200	1200
Material specific properties									
Refractive index	Procedure A	–	ISO 489	1.584	1.584	1.584	1.586	1.586	1.586
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	> 89	90	90	90	89	89
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	–	90	90	90	89	89
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	–	89	89	89	88	88
Processing conditions for test specimens									
C Injection molding–Melt temperature	–	°C	ISO 294	280	280	280	290	290	300
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80	80	80	80
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

¹⁾ clear

Makrolon® (PC) – typical values

				Speciality grades						
				Lighting	Automotive lighting	Automotive glazing	Blow molding	Furniture application		
Typical Properties	Test Conditions	Units	Standards	LTG2623	AL2447	AL2647	AG2677	WB1239	FU1007	FU4007
Rheological properties										
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	12	19	12	12	2	9	6
Mechanical properties (23 °C / 50 % r. h.)										
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	2350	2400	2400	2400	2300	2400	2400
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	65	66	67	67	64	67	66
C Yield strain	50 mm/min	%	ISO 527-1, -2	6.3	6.0	6.1	6.1	6.6	6.1	6.1
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	> 50	> 50	> 50	> 50	> 50	> 50	> 50
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	70	70	70	70	65	70	70
C Strain at break	5 mm/min	%	ISO 527-1, -2	120	130	130	130	100	120	120
C Tensile creep modulus	1 h	MPa	ISO 899-1	–	2200	2200	2200	–	2200	2200
C Tensile creep modulus	1000 h	MPa	ISO 899-1	–	1900	1900	1900	–	1900	1900
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N	N	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	70P	65P	70P	70P	75P	75P	80P
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	16C	14C	14C	14C	20C(P)	14C	14C
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	80P	75P(C)	80P(C)	80P(C)	85P	85P(C)	80P
C Puncture maximum force	23 °C	N	ISO 6603-2	5400	5100	5400	5400	5500	5400	5600
C Puncture energy	23 °C	J	ISO 6603-2	60	55	60	60	55	60	60
Thermal properties										
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	147	145	144	144	152	143	145
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	126	125	124	124	132	124	125
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	138	138	136	136	145	136	137
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	145	144	143	143	150	144	144
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.7	0.65	0.65
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.7	0.65	0.65
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-2 (1.5)	V-2 (0.75)	V-2 (0.75)	V-2 (0.75)	–	1** (4 mm)	1** (4 mm)
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	–	HB (2.7)	HB (2.5)	HB (2.7)	–	1** (6 mm)	1** (6 mm)
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	27	28	28	28	26	28	27
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	–	–	–	–	900	–	–
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	–	–	–	850	900	–	–
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	–	–	–	930	930	–	–
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	–	–	–	–	–	–	–
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	–	–	–	–	–	–	–
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	–	–	–	–	–	–	–
Electrical properties (23 °C / 50 % r. h.)										
C Relative permittivity	100 Hz	–	IEC 60250	3.1	3.1	3.1	3.1	3.1	3.1	3.1
C Relative permittivity	1 MHz	–	IEC 60250	3.0	3.0	3.0	3.0	3.0	3.0	3.0
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	5	5	5	5	10	5	5
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	90	90	90	90	100	90	95
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	1E14	1E14	1E14	1E14	1E14
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16	1E16	1E16	1E16	1E16
C Electrical strength	1 mm	kV/mm	IEC 60093	34	34	34	34	34	34	34
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	250	250	250	250	250	250	250
Other properties (23 °C)										
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.30	0.30	0.30	0.30	0.30	0.30
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12	0.12	0.12	0.12	0.12	0.12	0.12
C Density	–	kg/m³	ISO 1183	1200	1200	1200	1200	1200	1200	1200
Material specific properties										
Refractive index	Procedure A	–	ISO 489	1.587	1.586	1.587	1.586	1.587	1.586	1.586
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	89	89	89	89	86 ¹⁾	89	89
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	89	89	89	89	83 ¹⁾	89	89
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	88	88	88	88	80 ¹⁾	88	88
Processing conditions for test specimens										
C Injection molding–Melt temperature	–	°C	ISO 294	290	280	290	290	310	300	300
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80	80	90	80	80
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

¹⁾ blue

** Burning behavior Uni 8456, 8457, 9174 and 9175

Makrolon® (PC) – typical values

				Speciality grades				
				Extrusion				
Typical Properties	Test Conditions	Units	Standards	ET2613	ET3113	ET3117	ET3127	ET3227
Rheological properties								
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	12	6	6	6	3
Mechanical properties (23 °C / 50 % r. h.)								
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	2350	2350	2400	2400	2400
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	65	65	65	67	66
C Yield strain	50 mm/min	%	ISO 527-1, -2	6.3	6.3	6.3	6.2	6.2
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	> 50	> 50	> 50	> 50	> 50
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	70	70	70	65	65
C Strain at break	5 mm/min	%	ISO 527-1, -2	130	130	130	110	100
C Tensile creep modulus	1 h	MPa	ISO 899-1	–	–	–	–	–
C Tensile creep modulus	1000 h	MPa	ISO 899-1	–	–	–	–	–
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	70P	80P	80P	70P	70P
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	16C	18C(P)	14C	14C	16C
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	80P	90P	90P	80P	80P
C Puncture maximum force	23 °C	N	ISO 6603-2	5400	5600	5600	5500	5500
C Puncture energy	23 °C	J	ISO 6603-2	60	60	60	60	60
Thermal properties								
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	147	148	146	146	146
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	–	128	127	126	128
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	–	141	140	138	140
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	145	148	146	144	146
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.65
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.65
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-2 (0.75)	V-2 (0.75)	HB (1.5)	–	HB ³⁾ (1.5)
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	HB (2.5)	V-0 ¹⁾ (10.0)	V-2 (1.5)	HB (0.75)	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	29	28	28	28	28
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	850	875	875	875	875
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	850	875	875	875	875
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	960	960	960	960	960
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	875	875	875	875	–
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	875	875	875	875	–
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	875	900	900	900	–
Electrical properties (23 °C / 50 % r. h.)								
C Relative permittivity	100 Hz	–	IEC 60250	3.1	3.1	3.1	–	–
C Relative permittivity	1 MHz	–	IEC 60250	3.0	3.0	3.0	–	–
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	5	8	10	8	8
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	90	100	95	95	95
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	1E14	1E14	1E14
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16	1E16	1E16
C Electrical strength	1 mm	kV/mm	IEC 60093	34	34	34	34	36
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	250	250	250	250	250
Other properties (23 °C)								
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.30	0.30	0.30	0.30
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12	0.12	0.12	0.12	0.12
C Density	–	kg/m³	ISO 1183	1200	1200	1200	1200	1200
Material specific properties								
Refractive index	Procedure A	–	ISO 489	1.586	1.586	1.586	1.586	1.586
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	89	89	89	89	89
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	89	89	89	88	88
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	88	88	88	88	88
Processing conditions for test specimens								
C Injection molding–Melt temperature	–	°C	ISO 294	300	300	300	300	310
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80	80	80
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

¹⁾ clear
³⁾ clear, no color

Makrolon® (PC) – typical values

				Speciality grades					
				Extrusion					
Typical Properties	Test Conditions	Units	Standards	ET UV110	ET UV120	ET UV130	ET UV510	ET UV530	ET UV540
Rheological properties									
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	10	11	11	8	10	11
Mechanical properties (23 °C / 50 % r. h.)									
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	–	–	–	–	–	–
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	–	–	–	–	–	–
C Yield strain	50 mm/min	%	ISO 527-1, -2	–	–	–	–	–	–
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	–	–	–	–	–	–
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	–	–	–	–	–	–
C Strain at break	5 mm/min	%	ISO 527-1, -2	–	–	–	–	–	–
C Tensile creep modulus	1 h	MPa	ISO 899-1	–	–	–	–	–	–
C Tensile creep modulus	1000 h	MPa	ISO 899-1	–	–	–	–	–	–
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	–	–	–	–	–	–
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	–	–	–	–	–	–
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	–	–	–	–	–	–
C Puncture maximum force	23 °C	N	ISO 6603-2	–	–	–	–	–	–
C Puncture energy	23 °C	J	ISO 6603-2	–	–	–	–	–	–
Thermal properties									
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	–	–	–	–	–	–
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	118	116	115	125	124	120
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	130	128	127	138	137	133
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	136	134	134	144	143	140
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	–	–	–	–	–	–
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	–	–	–	–	–	–
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	–	–	–	–	–	–
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	–	–	–	–	–	–
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	–	–	–	–	–	–
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	–	–	–	–	–	–
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	–	–	–	–	–	–
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	–	–	–	–	–	–
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	–	–	–	–	–	–
Electrical properties (23 °C / 50 % r. h.)									
C Relative permittivity	100 Hz	–	IEC 60250	–	–	–	–	–	–
C Relative permittivity	1 MHz	–	IEC 60250	–	–	–	–	–	–
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	1E14	1E14	1E14	1E14	1E14	1E14
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	1E16	1E16	1E16	1E16	1E16	1E16
C Volume resistivity	–	Ohm·m	IEC 60250	–	–	–	–	–	–
C Surface resistivity	–	Ohm	IEC 60093	–	–	–	–	–	–
C Electrical strength	1 mm	kV/mm	IEC 60093	–	–	–	–	–	–
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	–	–	–	–	–	–
Other properties (23 °C)									
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	–	–	–	–	–	–
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	–	–	–	–	–	–
C Density	–	kg/m³	ISO 1183	–	–	–	–	–	–
Material specific properties									
Refractive index	Procedure A	–	ISO 489	–	–	–	–	–	–
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	–	–	–	–	–	–
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	–	–	–	–	–	–
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	–	–	–	–	–	–
Processing conditions for test specimens									
C Injection molding–Melt temperature	–	°C	ISO 294	300	300	300	300	300	300
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80	90	80	80
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

Makrolon® (PC) – typical values

				Speciality grades		
				Structural Foam		
Typical Properties	Test Conditions	Units	Standards	SF800	SF805	SF810
Rheological properties						
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	5	7	6
Mechanical properties (23 °C / 50 % r. h.)						
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	3000	2900	3800
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	64	62	64
C Yield strain	50 mm/min	%	ISO 527-1, -2	5.4	4.7	4
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	–	–	–
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	50	60	45
C Strain at break	5 mm/min	%	ISO 527-1, -2	40	20	15
C Tensile creep modulus	1 h	MPa	ISO 899-1	–	–	–
C Tensile creep modulus	1000 h	MPa	ISO 899-1	–	–	–
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	230C	190C	–
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	–	15C	–
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	–	–	–
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	–	15C	8C
C Puncture maximum force	23 °C	N	ISO 6603-2	4500	4300	–
C Puncture energy	23 °C	J	ISO 6603-2	35	25	–
Thermal properties						
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	–	–	–
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	135	130	135
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	143	140	140
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	146	143	145
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.55	0.55	0.4
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.7	0.65
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	–	–	–
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-0 (6.0)	V-0 (3.0) [®]	V-0 (3.6)
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	5VA (6.0)	5VA (5.0) [®]	5VA (4.4)
C Oxygen index	Method A	%	ISO 4589-2	36	32	35
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	–	–	–
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	–	960	960
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	–	960	960
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	930	–	–
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	930	825	825
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	930	825	825
Electrical properties (23 °C / 50 % r. h.)						
C Relative permittivity	100 Hz	–	IEC 60250	–	3.1	3.2
C Relative permittivity	1 MHz	–	IEC 60250	–	3.0	3.2
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	8	8	8
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	90	90	–
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	–
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	–
C Electrical strength	1 mm	kV/mm	IEC 60093	32	34	36
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	175	175	175
Other properties (23 °C)						
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.30	0.26
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.10	0.10	0.10
C Density	–	kg/m³	ISO 1183	1230	1230	1270
Material specific properties						
Refractive index	Procedure A	–	ISO 489	–	–	–
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	–	–	–
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	–	–	–
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	–	–	–
Processing conditions for test specimens						
C Injection molding–Melt temperature	–	°C	ISO 294	300	300	300
C Injection molding–Mold temperature	–	°C	ISO 294	110	110	110
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

Impact properties:
N = non break
P = partial break
C = complete break

® grey

Makrolon® (PC) – typical values

				Speciality grades					
				Medical*					
Typical Properties	Test Conditions	Units	Standards	2258	2458	2558	2658	2858	3258
Rheological properties									
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	34	19	14	12	9	5
Mechanical properties (23 °C / 50 % r. h.)									
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	2400	2400	2400	2400	2350	2400
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	65	65	66	66	66	66
C Yield strain	50 mm/min	%	ISO 527-1, -2	6.0	6.1	6.1	6.1	6.1	6.2
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	> 50	> 50	> 50	> 50	> 50	> 50
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	60	70	70	70	70	70
C Strain at break	5 mm/min	%	ISO 527-1, -2	125	130	130	130	130	120
C Tensile creep modulus	1 h	MPa	ISO 899-1	–	2200	2200	2200	2200	2200
C Tensile creep modulus	1000 h	MPa	ISO 899-1	–	1900	1900	1900	1900	1900
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	55P(C)	65P	70P	70P	75P	80P
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	12C	14C	16C	16C	16C	16C
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	65P(C)	75P(C)	80P(C)	80P(C)	85P	90P
C Puncture maximum force	23 °C	N	ISO 6603-2	4900	5100	5400	5400	5400	5800
C Puncture energy	23 °C	J	ISO 6603-2	55	55	60	60	60	65
Thermal properties									
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	145	146	144	145	145	147
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	124	125	124	124	125	127
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	137	139	136	137	137	139
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	145	145	144	144	145	148
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.65	0.65
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.65	0.65
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	V-2 (0.75) ¹⁾	V-2 (0.75)	–	V-2 (0.75)	V-2 (0.75)	–
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	HB (2.9) ¹⁾	HB (2.7)	–	HB (2.5)	HB (2.5)	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	–	28	28	27	28	–
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	–	–	–	–	–	–
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	–	–	–	850	850	–
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	–	–	–	930	930	–
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	875	–	–	875	875	–
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	875	–	–	875	875	–
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	900	–	–	875	900	–
Electrical properties (23 °C / 50 % r. h.)									
C Relative permittivity	100 Hz	–	IEC 60250	3.1	3.1	3.1	3.1	3.1	–
C Relative permittivity	1 MHz	–	IEC 60250	3.0	3.0	3.0	3.0	3.0	–
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	5	5	5	5	5	–
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	90	90	95	95	90	–
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	1E14	1E14	1E14	–
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16	1E16	1E16	–
C Electrical strength	1 mm	kV/mm	IEC 60093	34	34	34	34	34	–
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	250	250	250	250	250	–
Other properties (23 °C)									
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.30	0.30	0.30	0.30	0.30
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12	0.12	0.12	0.12	0.12	0.12
C Density	–	kg/m³	ISO 1183	1200	1200	1200	1200	1200	1200
Material specific properties									
Refractive index	Procedure A	–	ISO 489	1.586	1.586	1.586	1.586	1.586	1.587
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	89	89	89	89	89	89
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	89	89	89	89	89	89
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	88	88	88	88	88	88
Processing conditions for test specimens									
C Injection molding–Melt temperature	–	°C	ISO 294	280	280	290	290	300	310
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80	80	80	90
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

* See warranty on page 32

Impact properties:

N = non break

P = partial break

C = complete break

¹⁾ clear

Makrolon® (PC) – typical values

				Speciality grades				
				Medical*				
Typical Properties	Test Conditions	Units	Standards	Rx2430	Rx2435	Rx2530	Rx2635	Rx1805
Rheological properties								
C Melt volume-flow rate (MVR)	250 °C; 2.16 kg	cm³/(10 min)	ISO 1133	–	–	–	–	–
C Melt volume-flow rate (MVR)	300 °C; 1.2 kg	cm³/(10 min)	ISO 1133	19	23	15	12	6
Mechanical properties (23 °C / 50 % r. h.)								
C Tensile modulus	1 mm/min	MPa	ISO 527-1, -2	2400	2400	2400	2400	2400
C Yield stress	50 mm/min	MPa	ISO 527-1, -2	67	67	67	67	67
C Yield strain	50 mm/min	%	ISO 527-1, -2	6.1	6.1	6.1	6.1	6.3
C Nominal strain at break	50 mm/min	%	ISO 527-1, -2	> 50	> 50	> 50	> 50	> 50
C Stress at break	5 mm/min	MPa	ISO 527-1, -2	70	70	75	75	75
C Strain at break	5 mm/min	%	ISO 527-1, -2	130	120	130	130	130
C Tensile creep modulus	1 h	MPa	ISO 899-1	–	–	–	–	–
C Tensile creep modulus	1000 h	MPa	ISO 899-1	–	–	–	–	–
C Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N	N	N	N	N
Charpy notched impact strength	23 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	70P	75P	70P	–	80P
Charpy notched impact strength	–30 °C; 3 mm	kJ/m²	i. A. ISO 179/1eA	14C	12C	14C	–	16C
Izod notched impact strength	23 °C; 3.2 mm	kJ/m²	i. A. ISO 180/A	80P(C)	75P(C)	80P(C)	85P	90P
C Puncture maximum force	23 °C	N	ISO 6603-2	5300	5100	5300	5300	5700
C Puncture energy	23 °C	J	ISO 6603-2	60	55	60	60	65
Thermal properties								
C Glass transition temperature	10 °C/min	°C	ISO 11357-1, -2	–	–	142	–	145
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1, -2	122	120	122	121	126
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1, -2	134	132	134	133	138
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	141	139	141	–	144
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.65
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1, -2	0.65	0.65	0.65	0.65	0.65
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–
C Burning behavior UL 94 (mm) (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–
C Burning behavior UL 94-5V (UL registration)	(...) mm	Class	UL 94	–	–	–	–	–
C Oxygen index	Method A	%	ISO 4589-2	–	–	27	–	27
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	–	–	–	–	–
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	–	–	–	–	–
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	–	–	–	–	–
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	–	–	–	–	–
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	–	–	–	–	–
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	–	–	–	–	–
Electrical properties (23 °C / 50 % r. h.)								
C Relative permittivity	100 Hz	–	IEC 60250	–	–	–	–	–
C Relative permittivity	1 MHz	–	IEC 60250	–	–	–	–	–
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	–	–	–	–	–
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	–	–	–	–	–
C Volume resistivity	–	Ohm·m	IEC 60250	1E14	1E14	1E14	1E14	1E14
C Surface resistivity	–	Ohm	IEC 60093	1E16	1E16	1E16	1E16	1E16
C Electrical strength	1 mm	kV/mm	IEC 60093	–	–	–	–	–
C Comparative tracking index CTI	Solution A	Rating	IEC 60243-1	–	–	–	–	–
Other properties (23 °C)								
C Water absorption (Saturation value)	Water at 23 °C	%	ISO 62	0.30	0.30	0.30	0.30	0.30
C Water absorption (Equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12	0.12	0.12	0.12	0.12
C Density	–	kg/m³	ISO 1183	1200	1200	1200	1200	1200
Material specific properties								
Refractive index	Procedure A	–	ISO 489	–	–	–	–	–
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	–	–	–	–	–
C Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	–	–	–	–	–
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	–	–	–	–	–
Processing conditions for test specimens								
C Injection molding–Melt temperature	–	°C	ISO 294	280	280	280	290	300
C Injection molding–Mold temperature	–	°C	ISO 294	80	80	80	80	80
C Injection molding–Injection velocity	–	mm/s	ISO 294	200	200	200	200	200

C This property characteristics are taken from the CAMPUS® plastics data bank and are based on the international catalogue of basic data for plastic according to ISO 10350.

* See warranty on page 32

Impact properties:

N = non break

P = partial break

C = complete break

Commercialization and continued supply of this material are not assured. Its supply may be discontinued at any time.

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 and information 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 us. 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.

Typical value disclaimer

The values provided 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.

General safety advice

Under the recommended processing conditions small quantities of decomposition product may be given off during processing. To preclude any risk to the health and well-being of the machine operatives, tolerance limits for the work environment must be ensured by the provision of efficient exhaust ventilation and fresh-air at the workplace in accordance with the Safety Data Sheet. In order to prevent the partial decomposition of the polymer and the generation of volatile decomposition products, the prescribed processing temperatures should not be substantially exceeded. Since excessively high temperatures are generally the result of operator error or defects in the heating system, special care and controls are essential in these areas.

*** Medical Grades and Applications**

1. Medical Application

The term "Medical Application" means all applications of medical devices wherein the medical device is manufactured with a BMS Product(s) and is intended under normal use to be brought into direct contact with the patient's body (e.g., skin, body fluids or tissues, including indirect contact to blood). If the medical device has more than one part or component, the term "Medical Application" shall apply only to the part or component which is intended under normal use to be brought into direct contact with the patient's body

(e.g., skin, body fluids or tissues, including indirect contact to blood) and is also manufactured with a BMS Product(s). Medical devices implanted in the human body as well as components of drug delivery devices which are intended to be in direct contact with the drug are also included.

2. Makrolon® Medical Grades

BMS designates certain fully reacted BMS polymeric materials as "Medical Grade": please refer to the list of Makrolon® "Medical Grades" on page 15 of this brochure. The designation as "Medical Grade" does not mean that BMS or anyone else has determined that the product is suitable for use in any particular Medical Application. Moreover, Makrolon® grades not designated as a medical grade shall not be used in a medical application. Makrolon® grades that are designated as "Medical Grade" meet certain biocompatibility test requirements of ISO Standard 10993-1: "Biological Evaluation of Medical Devices" for the categories including: (1) skin contact, (2) up to 24 hours contact with circulating blood, tissue, bone, and dentin, (3) up to 30 days contact with mucosal membranes, compromised surfaces, and blood path, indirect. Makrolon® grades designated as "Medical Grade" shall not be considered candidates for the following types of Medical Applications unless BMS explicitly agrees, in writing, to sell such products for such applications: (a) cosmetic, reconstructive, or reproductive implant applications; (b) any other bodily implant applications; (c) applications involving contact with or storage of human tissue, blood, or other bodily fluids, for greater than 30 days; or (d) applications having greater than 24 hours contact with circulating blood, tissue, bone and dentin.

The biocompatibility testing referenced above cannot assure the biocompatibility of final or intermediate products made from Makrolon® Medical Grades or the suitability of such products for their use in a Medical Application, i.e., the test data cannot be used to conclude that any medical devices manufactured from the Makrolon® Medical Grades meet the necessary requirements of ISO Standard 10993-1. It is the sole responsibility of the manufacturer of final end-use product to conduct all necessary tests (including biocompatibility tests) and inspections and to evaluate the final product under actual end-use requirements.

3. Appropriate use of Makrolon® Medical Grades in a medical application

BMS has not performed clinical medical studies concerning the use of Makrolon® Medical Grades. Moreover, BMS has neither sought nor received approval from the United States Food and Drug Administration (FDA) or other competent authorities from other regions for the use of BMS Products in a Medical Application.

BMS makes no representations or warranty regarding (and accepts no responsibility for determining) either: (a) the suitability of a Makrolon® Medical Grade for a particular Medical Application or final end-use product or (b) the adequacy of any warning relating to a Makrolon® Medical Grade or particular Medical Application or final end-use product. The suitability of Makrolon® Medical Grades in a given end-use environment is dependent upon various conditions including, without limitation, chemical compatibility, method of manufacture, temperature, part design, sterilization method, residual stresses, and external loads. It is the sole responsibility of the manufacturer of the final end-use product to determine the suitability (including biocompatibility) of all raw materials and components, including any Makrolon® Medical Grades, in order to ensure that the final product:

- meets relevant biocompatibility requirements and is otherwise safe for its end-use,
- performs or functions as intended,
- is suitable for its intended use, and
- complies with all applicable FDA and other regulatory requirements.

It also is the sole responsibility of the manufacturer of the final end-use product to conduct all necessary tests and inspections and to evaluate the final product under actual end-use requirements and to adequately advise and warn purchasers, users, and/or learned intermediaries (such as physicians) of pertinent risks and fulfill any postmarket surveillance obligations.

Any decision regarding the appropriateness of a particular medical product in a particular clinical or Medical Application should be based on the judgment of the manufacturer, seller, the competent authority, and the treating physician. BMS cannot weigh the benefits against the risks of a medical device and cannot offer a medical or legal judgment on the safety or efficacy of the use of a Makrolon® Medical Grade in a specific Medical Application.

4. Sterilization

The sterilization method and the number of sterilization cycles a medical device can withstand will vary depending upon type/grade of product, part design, processing parameters, sterilization temperature, and chemical environment. Therefore, the manufacturer of the end-use final product must evaluate each device to determine the sterilization method and the number of permissible sterilization cycles appropriate for actual end-use requirements and must adequately advise and warn purchasers, users, and/or learned intermediaries (such as physicians) of pertinent risks and limitations and must fulfill postmarket surveillance obligations.

5. Test Data

BMS may agree to provide existing test data and other information about its Makrolon® Medical Grades or to perform additional testing of Makrolon® Medical Grades. In so doing, BMS does not assume any responsibility to determine the suitability of a Makrolon® Medical Grade for a particular Medical Application or final end-use product or to provide adequate warnings; moreover, any agreement by BMS to provide such data and/or information does not relieve the manufacturer of its sole responsibility to properly evaluate its final end-use product under actual end-use requirements, nor does it relieve the manufacturer of any of its other responsibilities described in this brochure.

6. Re-use of Medical Devices

BMS does not warrant or represent that medical devices made from a Makrolon® Medical Grade are suitable for multiple uses. If the medical device is reprocessed and/or labeled for multiple uses, it is the responsibility of the manufacturer and/or reprocessor to determine the appropriate number of permissible uses by evaluating the device under actual sterilization, cleaning, and end-use conditions and to adequately advise and warn purchasers, users, and/or learned intermediaries (such as physicians) of pertinent risks and fulfill postmarket surveillance obligations.

7. FDA Master Files

If the FDA requires proprietary information about any Makrolon® Medical Grade as part of the 510(k) clearance or premarket application (PMA) approval process for the manufacturer's end-use final product, BMS may establish a Drug or Device Master File and grant a right of reference

to it, in order to allow the FDA to review such information without disclosing BMS' proprietary information to the manufacturer.

8. Special Considerations

Only virgin Makrolon® Medical Grades have been tested according to certain tests under ISO 10993-1. Any use of regrind (for example, runners from mold flow channels or trim pieces) must be evaluated by the medical device manufacturer for suitability.

9. Risk of Failure

There is a risk of failure and adverse consequences with all Medical Applications and medical devices, including devices implanted in the human body and devices that are in contact with body fluids or tissues. There is also a risk of failure and adverse consequences for the use of Makrolon® Medical Grades in connection with any Medical Application and medical device, including devices implanted in the human body.

10. Packaging and Labeling

The purchaser of Makrolon® Medical Grades shall be solely responsible for, or shall procure that the manufacturer and/or reprocessor of the medical device shall be responsible for (a) the design, production, assembly, packaging and labeling of the medical device which incorporates a Makrolon® Medical Grade and (b) assigning the purpose for which that Makrolon® Medical Grade is to be used. For the avoidance of doubt, BMS is not the manufacturer of any of the medical devices for which the Makrolon® Medical Grades shall be sold and shall, to the extent permitted by law, not be liable as such.

11. Disclaimer of Warranty and Prohibition on Conflicting Oral Representations

- 1) To the extent permitted by law, BMS makes no representation, promise, express warranty, implied warranty of merchantability, implied warranty for a particular purpose, or other implied warranty concerning the suitability of any BMS product for use in any specific medical device or other product or for any medical application; and
- 2) to the extent permitted by law, BMS makes no representation, promise, express warranty, implied warranty of merchantability, implied warranty for a particular purpose, or other implied warranty concerning the suitability of any medical device or other product made, wholly or in part, from any BMS product.

No BMS representative has the authority to make any oral representation that conflict with any portion of this guidance.

12. Responsibility to Forward This Guidance Document

If the purchaser of any Makrolon® Medical Grade is not the manufacturer of the final end-use product, it is the responsibility of the purchaser to forward the BMS' Guidance Document available as PDF-download from the BMS Website to such manufacturer.





A series of horizontal lines for writing, spanning the width of the page. The lines are evenly spaced and cover most of the page area, leaving margins at the top and bottom. The background features a faint, light blue geometric pattern of hexagons and lines.



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