Makrolon® M6011 FR

/	medium viscosity; impact modified; UV stabilized; flame retardant; improved chemical resistance compared to standard Makrolon grades; tested only according to ISO 10993-5 and ISO 10993-10 for contact with uncompromised skin only; available in opaque colors only; electrical/electronic; housing parts
ISO Shortname	PC-I FR(40)

	Property	Test Condition	Unit	Standard	typical Value
Rheological properties					
C	Melt volume-flow rate	300 °C/ 5 kg	cm³/10 min	ISO 1133	25
	Melt volume-flow rate	300 °C/ 1.2 kg	cm³/10 min	ISO 1133	4
	Melt viscosity	1000 s^{-1}/ 300 °C	Pa·s	b.o. ISO 11443-A	320
	Molding shrinkage, parallel/normal	Value range based on general practical experience	%	b.o. ISO 2577	0.6 - 0.8
Mechanical properties (23 °C/50 % r. h.)					
C	Tensile modulus	1 mm/min	MPa	ISO 527-1,-2	2250
C	Yield stress	50 mm/min	MPa	ISO 527-1,-2	60
C	Yield strain	50 mm/min	%	ISO 527-1,-2	5.9
C	Nominal strain at break	50 mm/min	%	ISO 527-1,-2	>50
	Flexural modulus	2 mm/min	MPa	ISO 178	2250
	Flexural strength	2 mm/min	MPa	ISO 178	89
C	Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N
	Izod notched impact strength	23 °C/ 3 mm	kJ/m²	ISO 21305/based on ISO 180/A	70 P
	Izod notched impact strength	-10 °C/ 3 mm	kJ/m²	ISO 21305/based on ISO 180/A	60 P
	Izod notched impact strength	-30 °C/ 3 mm	kJ/m²	ISO 21305/based on ISO 180/A	20 C
C	Puncture impact properties - maximum force	23 °C	N	ISO 6603-2	5000
C	Puncture impact properties - maximum force	-30 °C	N	ISO 6603-2	6200
C	Puncture energy	23 °C	J	ISO 6603-2	51
C	Puncture energy	-30 °C	J	ISO 6603-2	57
Thermal properties					
C	Temperature of deflection under load	1.80 MPa	°C	ISO 75-1,-2	115
C	Temperature of deflection under load	0.45 MPa	°C	ISO 75-1,-2	129
C	Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	136
	Vicat softening temperature	50 N; 120 °C/h	°C	ISO 306	138
C	Burning behavior UL 94	1.0 mm	Class	UL 94	V-1
C	Burning behavior UL 94	1.5 mm	Class	UL 94	V-0
	Resistance to heat (ball pressure test)		°C	IEC 60695-10-2	125
	Glow wire test (GWFI)	1.0 mm	°C	IEC 60695-2-12	960
	Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	960
	Glow wire test (GWIT)	1.0 mm	°C	IEC 60695-2-13	875
	Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	850
Other properties (23 °C)					
C	Water absorption (saturation value)	Water at 23 °C	%	ISO 62	0.36
C	Water absorption (equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12
C	Density		kg/m³	ISO 1183-1	1190
Processing conditions for test specimens					
C	Injection molding - Melt temperature		°C	ISO 294	300
C	Injection molding - Mold temperature		°C	ISO 294	90

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	Property	Test Condition	Unit	Standard	typical Value
Recommended processing and drying conditions					
	Dry Air Drying Temperature		°C	-	120
	Dry Air Drying Time		h	-	4

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

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

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Information Impact properties

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

Typical value

These values are typical values only. Unless explicitly agreed in written form, the 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

The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations are beyond our control. Therefore, it is imperative that you test our products, technical assistance, information and recommendations to determine to your own satisfaction whether our products, technical assistance and information are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety, and environmental standpoint. Such testing has not necessarily been done by Covestro. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale which are available upon request. All information and technical assistance is given without warranty or guarantee and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance, and information. Any statement or recommendation not contained herein is unauthorized and shall not bind us. Nothing herein shall be construed as a recommendation to use any product in conflict with any claim of any patent relative to any material or its use. No license is implied or in fact granted under the claims of any patent. With respect to health, safety and environment precautions, the relevant Material Safety Data Sheets (MSDS) and product labels must be observed prior to working with our products.

Covestro Medical Grades

For more information on Covestro products in Medical Applications, please request from your sales support contact our Guidance document: GUIDANCE ON USE OF COVESTRO PRODUCTS IN A MEDICAL APPLICATION.

Medical Grade with limited bio-compatibility

The biocompatibility testing referenced above cannot assure the biocompatibility of final or intermediate products made from Covestro products 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 Covestro products meet the necessary requirements of ISO Standard 10993-1. It is the sole responsibility of the manufacturer of the 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. For more information on Covestro products in medical applications, please request from your sales support contact our Guidance document: Guidance on Use of Covestro Products in a Medical Application

Recommended Processing and Drying Conditions

Barrel temperatures are valid for a standard 3-zone barrel. Temperature set-up for different barrel types may change according to configuration. Values for hold pressure as percentage of injection pressure may vary depending on, amongst others, part geometry, injection molding machine and injection mold. Drying conditions are for dry air dryers only. Drying times and drying temperatures may differ depending on valid dryer type. Further information is provided by your local Covestro support as well as in the following brochures: Injection Molding of High Quality Molded Parts - Drying; Determining the Dryness of Makrolon by TVI Test; The fundamentals of shrinkage in thermoplastics; Shrinkage and deformation of glass fiber reinforced thermoplastics [...]. https://www.plastics.covestro.com/Library/Overview.aspx

Disclaimer shrinkage data

Shrinkage data is provided as a reference only, and is based on sample plaques molded under specific, controlled processing conditions. Shrinkage rates in production parts can vary and are influenced by several variables such as, but not limited to: part design (e.g. part size, thickness and geometry), mold design (e.g. gate type and location, runner design, mold materials, cooling system), molding conditions (e.g. processing temperature, mold temperature, packing time and pressure, injection speed). We suggest materials be evaluated in existing applicable molds to achieve the most accurate shrinkage estimation for your specific application and processing practices. The final choice of shrinkage is the responsibility of the user of the material, and should be made based on your experience and testing results. We shall not be liable for any damage caused by the use of the shrinkage data as provided by us. If you have any questions, pls consult technical representatives from Covestro.

Covestro AG

Kaiser-Wilhelm-Allee 60

51373 Leverkusen

Germany

www.solutions.covestro.com

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