Makrolon® Rx3440

/	high viscosity; MVR (300 °C/1.2 kg) 4.5 cm/10 min; medical devices; high lipid resistance; suitable for sterilization with high-energy radiation; biocompatible according to many ISO 10993-1 test requirements; improved oncology drug resistance; injection molding - melt temperature 280 - 320 °C; transparent parts for medical devices
ISO Shortname	PC

	Property	Test Condition	Unit	Standard	typical Value
Rheological properties					
C	Melt volume-flow rate	300 °C/ 1.2 kg	cm³/10 min	ISO 1133	4.5
	Melt mass-flow rate	300 °C/ 1.2 kg	g/10 min	ISO 1133	4.7
C	Molding shrinkage, parallel	60x60x2 mm³/ 500 bar	%	ISO 294-4	0.7
C	Molding shrinkage, normal	60x60x2 mm³/ 500 bar	%	ISO 294-4	0.7
	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	2300
C	Yield stress	50 mm/min	MPa	ISO 527-1,-2	65
C	Yield strain	50 mm/min	%	ISO 527-1,-2	6.4
C	Nominal strain at break	50 mm/min	%	ISO 527-1,-2	> 50
	Stress at break	50 mm/min	MPa	ISO 527-1,-2	75
	Strain at break	50 mm/min	%	b.o. ISO 527-1,-2	135
	Flexural modulus	2 mm/min	MPa	ISO 178	2300
	Flexural strength	2 mm/min	MPa	ISO 178	98
	Flexural strain at flexural strength	2 mm/min	%	ISO 178	7.4
	Flexural stress at 3.5 % strain	2 mm/min	MPa	ISO 178	73
C	Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	N
C	Charpy impact strength	-30 °C	kJ/m²	ISO 179/1eU	N
	Charpy impact strength	-60 °C	kJ/m²	ISO 179/1eU	N
	Charpy notched impact strength	23 °C/ 3 mm	kJ/m²	ISO 21305/based on ISO 179/1eA	90 P
	Charpy notched impact strength	-30 °C/ 3 mm	kJ/m²	ISO 21305/based on ISO 179/1eA	19 C
	Izod notched impact strength	23 °C/ 3 mm	kJ/m²	ISO 21305/based on ISO 180/A	80 P
	Izod notched impact strength	-30 °C/ 3 mm	kJ/m²	ISO 21305/based on ISO 180/A	14 C
C	Puncture impact properties - maximum force	23 °C	N	ISO 6603-2	5700
C	Puncture impact properties - maximum force	-30 °C	N	ISO 6603-2	6600
C	Puncture energy	23 °C	J	ISO 6603-2	65
C	Puncture energy	-30 °C	J	ISO 6603-2	70
	Ball indentation hardness		N/mm²	ISO 2039-1	114
Thermal properties					
C	Glass transition temperature	10 °C/min	°C	ISO 11357-1,-2	145
C	Temperature of deflection under load	1.80 MPa	°C	ISO 75-1,-2	126
C	Temperature of deflection under load	0.45 MPa	°C	ISO 75-1,-2	139
C	Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	144
	Vicat softening temperature	50 N; 120 °C/h	°C	ISO 306	146
C	Coefficient of linear thermal expansion, parallel	23 to 55 °C	10^{-4}/K	ISO 11359-1,-2	0.65
C	Coefficient of linear thermal expansion, normal	23 to 55 °C	10^{-4}/K	ISO 11359-1,-2	0.65
C	Oxygen index	Method A	%	ISO 4589-2	27
	Thermal conductivity, through-plane	23 °C; 50 % r. h.	W/(m·K)	ISO 8302	0.20
	Resistance to heat (ball pressure test)		°C	IEC 60695-10-2	135
	Flash ignition temperature		°C	ASTM D1929	480
	Self ignition temperature		°C	ASTM D1929	550

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	Property	Test Condition	Unit	Standard	typical Value
Other properties (23 °C)					
C	Water absorption (saturation value)	Water at 23 °C	%	ISO 62	0.30
C	Water absorption (equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12
C	Density		kg/m³	ISO 1183-1	1200
	Bulk density	Pellets	kg/m³	ISO 60	660
Processing conditions for test specimens					
C	Injection molding - Melt temperature		°C	ISO 294	300
C	Injection molding - Mold temperature		°C	ISO 294	80
C	Injection molding - Injection velocity		mm/s	ISO 294	200
Recommended processing and drying conditions					
	Melt temperatures		°C	-	290-330
	Standard Melt temperature		°C	-	310
	Barrel Temperatures - Rear		°C	-	260-270
	Barrel Temperatures - Middle		°C	-	280-290
	Barrel Temperatures - Front		°C	-	290-300
	Barrel Temperatures - Nozzle		°C	-	300-310
	Mold Temperatures		°C	-	80-120
	Hold Pressure (% of injection pressure)		%	-	50 - 75
	Plastic Back Pressure (specific)		bar	-	50-150
	Peripheral Screw Speed		m/s	-	0.05 - 0.2
	Shot-to-Cylinder Size		%	-	30 - 70
	Dry Air Drying Temperature		°C	-	120
	Dry Air Drying Time		h	-	2.0-3.0
	Moisture Content max. (%)		%	-	<= 0,02
	Vent Depth		mm	-	0.025 - 0.075

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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Disclaimer

Information Impact properties

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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.

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.

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