



Makrolon® 2405

Covestro - Polycarbonates - Polycarbonate

Wednesday, January 29, 2020

General Information

Product Description

MVR (300°C/1.2 kg) 19 cm³/10 min; general purpose; low viscosity; easy release; injection molding - melt temperature 280 - 320°C; available in transparent, translucent and opaque colors

General

Material Status	• Commercial: Active		
Regional Availability	• Africa & Middle East • Asia Pacific	• Europe • Latin America	• North America
Features	• General Purpose	• Good Mold Release	• Low Viscosity
Uses	• General Purpose		
RoHS Compliance	• RoHS Compliant		
Automotive Specifications	• GM GMP.PC.001 • GM GMP.PC.015	• GM GMW16727P-PC-T4 • GM QK 005941 R Color: 551105 Colorless	
Appearance	• Clear/Transparent • Colors Available	• Opaque • Translucent	
Processing Method	• Injection Molding		

ASTM & ISO Properties ¹

Physical	Typical Value (English)	Typical Value (SI)	Test Method
Density (73°F (23°C))	1.20 g/cm³	1.20 g/cm³	ISO 1183
Apparent (Bulk) Density ²	0.66 g/cm³	0.66 g/cm³	ISO 60
Melt Mass-Flow Rate (MFR) (300°C/1.2 kg)	20 g/10 min	20 g/10 min	ISO 1133
Melt Volume-Flow Rate (MVR) (300°C/1.2 kg)	19 cm³/10min	19 cm³/10min	ISO 1133
Molding Shrinkage			
Across Flow	0.50 to 0.70 %	0.50 to 0.70 %	ISO 2577
Flow	0.50 to 0.70 %	0.50 to 0.70 %	ISO 2577
Across Flow : 536°F (280°C), 0.0787 in (2.00 mm) ³	0.70 %	0.70 %	ISO 294-4
Flow : 0.0787 in (2.00 mm) ³	0.65 %	0.65 %	ISO 294-4
Water Absorption			
Saturation, 73°F (23°C)	0.30 %	0.30 %	ISO 62
Equilibrium, 73°F (23°C), 50% RH	0.12 %	0.12 %	
Mechanical	Typical Value (English)	Typical Value (SI)	Test Method
Tensile Modulus (73°F (23°C))	348000 psi	2400 MPa	ISO 527-2/1
Tensile Stress			ISO 527-2/50
Yield, 73°F (23°C)	9430 psi	65.0 MPa	
Break, 73°F (23°C)	9430 psi	65.0 MPa	
Tensile Strain			ISO 527-2/50
Yield, 73°F (23°C)	6.0 %	6.0 %	
Break, 73°F (23°C)	130 %	130 %	
Nominal Tensile Strain at Break			ISO 527-2/50
73°F (23°C)	> 50 %	> 50 %	

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Mechanical	Typical Value (English)	Typical Value (SI)	Test Method
Tensile Creep Modulus			ISO 899-1
1 hr	319000 psi	2200 MPa	
1000 hr	276000 psi	1900 MPa	
Flexural Modulus ⁴ (73°F (23°C))	341000 psi	2350 MPa	ISO 178
Flexural Stress ⁴			ISO 178
73°F (23°C)	14100 psi	97.0 MPa	
3.5% Strain, 73°F (23°C)	10600 psi	73.0 MPa	
Flexural Strain at Flexural Strength ⁵			ISO 178
73°F (23°C)	7.1 %	7.1 %	
Films	Typical Value (English)	Typical Value (SI)	Test Method
Water Vapor Transmission Rate			ISO 15106-1
73°F (23°C), 85% RH, 3.9 mil (100 µm)	0.97 g/100 in ² /24 hr	15 g/m ² /24 hr	
Carbon Dioxide Permeability			ISO 2556
73°F (23°C), 1.0 mil (25.4 µm)	18900 cm ³ /m ² /bar/24 hr	18900 cm ³ /m ² /bar/24 hr	
Gas Permeation			ISO 2556
Carbon Dioxide : 3.9 mil (100.0 µm)	4000 cm ³ /m ² /bar/24 hr	4000 cm ³ /m ² /bar/24 hr	
Nitrogen : 1.0 mil (25.4 µm)	630 cm ³ /m ² /bar/24 hr	630 cm ³ /m ² /bar/24 hr	
Nitrogen : 3.9 mil (100.0 µm)	130 cm ³ /m ² /bar/24 hr	130 cm ³ /m ² /bar/24 hr	
Oxygen : 1.0 mil (25.4 µm)	3150 cm ³ /m ² /bar/24 hr	3150 cm ³ /m ² /bar/24 hr	
Oxygen : 3.9 mil (100.0 µm)	700 cm ³ /m ² /bar/24 hr	700 cm ³ /m ² /bar/24 hr	
Impact	Typical Value (English)	Typical Value (SI)	Test Method
Charpy Notched Impact Strength ⁶			ISO 179/1eA
-22°F (-30°C), Complete Break	6.7 ft·lb/in ²	14 kJ/m ²	
73°F (23°C), Partial Break	31 ft·lb/in ²	65 kJ/m ²	
Charpy Unnotched Impact Strength			ISO 179/1eU
-76°F (-60°C)	No Break	No Break	
-22°F (-30°C)	No Break	No Break	
73°F (23°C)	No Break	No Break	
Notched Izod Impact Strength ⁶			ISO 180/A
-22°F (-30°C), Complete Break	7.1 ft·lb/in ²	15 kJ/m ²	
73°F (23°C), Partial Break	31 ft·lb/in ²	65 kJ/m ²	
Multi-Axial Instrumented Impact Energy			ISO 6603-2
-22°F (-30°C)	47.9 ft·lb	65.0 J	
73°F (23°C)	40.6 ft·lb	55.0 J	
Multi-Axial Instrumented Impact Peak Force			ISO 6603-2
-22°F (-30°C)	1350 lbf	6000 N	
73°F (23°C)	1150 lbf	5100 N	
Hardness	Typical Value (English)	Typical Value (SI)	Test Method
Ball Indentation Hardness	16700 psi	115 MPa	ISO 2039-1
Thermal	Typical Value (English)	Typical Value (SI)	Test Method
Heat Deflection Temperature			
66 psi (0.45 MPa), Unannealed	279 °F	137 °C	ISO 75-2/B
264 psi (1.8 MPa), Unannealed	255 °F	124 °C	ISO 75-2/A
Glass Transition Temperature ⁷	291 °F	144 °C	ISO 11357-2

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Thermal	Typical Value (English)	Typical Value (SI)	Test Method
Vicat Softening Temperature			
--	295 °F	146 °C	ISO 306/B120
--	293 °F	145 °C	ISO 306/B50
Ball Pressure Test (277°F (136°C))	Pass	Pass	IEC 60695-10-2
CLTE			ISO 11359-2
Flow : 73 to 131°F (23 to 55°C)	3.6E-5 in/in/°F	6.5E-5 cm/cm/°C	
Transverse : 73 to 131°F (23 to 55°C)	3.6E-5 in/in/°F	6.5E-5 cm/cm/°C	
Thermal Conductivity ⁸ (73°F (23°C))	1.4 Btu·in/hr/ft ² /°F	0.20 W/m/K	ISO 8302
RTI Elec (0.06 in (1.5 mm))	257 °F	125 °C	UL 746
RTI Imp (0.06 in (1.5 mm))	239 °F	115 °C	UL 746
RTI Str (0.06 in (1.5 mm))	257 °F	125 °C	UL 746
Electrical	Typical Value (English)	Typical Value (SI)	Test Method
Surface Resistivity	1.0E+16 ohms	1.0E+16 ohms	IEC 60093
Volume Resistivity (73°F (23°C))	1.0E+16 ohms·cm	1.0E+16 ohms·cm	IEC 60093
Electric Strength			IEC 60243-1
73°F (23°C), 0.0394 in (1.00 mm)	860 V/mil	34 kV/mm	
Relative Permittivity			IEC 60250
73°F (23°C), 100 Hz	3.10	3.10	
73°F (23°C), 1 MHz	3.00	3.00	
Dissipation Factor			IEC 60250
73°F (23°C), 100 Hz	5.0E-4	5.0E-4	
73°F (23°C), 1 MHz	9.0E-3	9.0E-3	
Comparative Tracking Index			IEC 60112
Solution A	250 V	250 V	
Solution B	125 V	125 V	
Flammability	Typical Value (English)	Typical Value (SI)	Test Method
Flame Rating			UL 94
0.11 in (2.7 mm)	HB	HB	
0.014 in (0.36 mm)	V-2	V-2	
0.030 in (0.75 mm)	V-2	V-2	
Glow Wire Flammability Index			IEC 60695-2-12
0.030 in (0.75 mm)	1560 °F	850 °C	
0.06 in (1.5 mm)	1610 °F	875 °C	
0.12 in (3.0 mm)	1710 °F	930 °C	
Glow Wire Ignition Temperature			IEC 60695-2-13
0.030 in (0.75 mm)	1610 °F	875 °C	
0.04 in (1.0 mm)	1610 °F	875 °C	
0.06 in (1.5 mm)	1610 °F	875 °C	
0.12 in (3.0 mm)	1610 °F	875 °C	
Oxygen Index ⁹	27 %	27 %	ISO 4589-2
Application of Flame from Small Burner ¹⁰	K1, F1	K1, F1	DIN 53438-1, -3
Burning Rate ¹¹ (> 39.4 mil (> 1.00 mm))	passed	passed	ISO 3795
Flash Ignition Temperature	896 °F	480 °C	ASTM D1929

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Flammability	Typical Value (English)	Typical Value (SI)	Test Method
Needle Flame Test			IEC 60695-11-5
59.1 mil (1.50 mm) ¹²	5.0 sec	5.0 sec	
59.1 mil (1.50 mm) ¹³	60.0 sec	60.0 sec	
78.7 mil (2.00 mm) ¹²	5.0 sec	5.0 sec	
78.7 mil (2.00 mm) ¹³	120.0 sec	120.0 sec	
0.12 in (3.00 mm) ¹²	10.0 sec	10.0 sec	
0.12 in (3.00 mm) ¹³	120.0 sec	120.0 sec	
Self Ignition Temperature	1022 °F	550 °C	ASTM D1929
Optical	Typical Value (English)	Typical Value (SI)	Test Method
Refractive Index ¹⁴	1.585	1.585	ISO 489
Transmittance			ISO 13468-2
39.4 mil (1000 µm)	89.0 %	89.0 %	
78.7 mil (2000 µm)	89.0 %	89.0 %	
118 mil (3000 µm)	88.0 %	88.0 %	
157 mil (4000 µm)	87.0 %	87.0 %	
Haze (118 mil (3000 µm))	< 0.800 %	< 0.800 %	ISO 14782
Additional Information	Typical Value (English)	Typical Value (SI)	Test Method
Electrolytical Corrosion (73°F (23°C))	A1	A1	IEC 60426
ISO Shortname	7391-PC,MR,(,,-) 18-9	7391-PC,MR,(,,-) 18-9	

Processing Information

Injection	Typical Value (English)	Typical Value (SI)
Drying Temperature - Dry Air Dryer	248 °F	120 °C
Drying Time - Dry Air Dryer	4.0 hr	4.0 hr
Suggested Max Moisture	< 0.020 %	< 0.020 %
Suggested Shot Size	30 to 70 %	30 to 70 %
Rear Temperature	482 to 518 °F	250 to 270 °C
Middle Temperature	518 to 554 °F	270 to 290 °C
Front Temperature	545 to 581 °F	285 to 305 °C
Nozzle Temperature	518 to 581 °F	270 to 305 °C
Processing (Melt) Temp	536 to 608 °F	280 to 320 °C
Mold Temperature	158 to 230 °F	70 to 110 °C
Back Pressure	1450 to 2900 psi	10.0 to 20.0 MPa
Vent Depth	9.8E-4 to 3.0E-3 in	0.025 to 0.075 mm

Injection Notes

Hold Pressure (% of Injection Pressure): 50 - 75%
 Peripheral Screw Speed: 0.05 - 0.2 m/s
 Standard Melt Temperature: 300°C

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Notes

¹ Typical properties: these are not to be construed as specifications.

² Pellets

³ 60x60x2mm, 500 bar

⁴ 0.079 in/min (2.0 mm/min)

⁵ 2 mm/min

⁶ 3 mm

⁷ 10°C/min

⁸ Across Flow

⁹ Procedure A

¹⁰ Method K and F

¹¹ US-FMVSS

¹² Method K

¹³ Method F

¹⁴ Method A