



# Makrolon® 2405

MVR (300°C/1.2 kg) 19 cm<sup>3</sup>/10 min; general purpose; low viscosity; easy release; injection molding - melt temperature 280 - 320°C; available in transparent, translucent and opaque colors

## Physical Properties

MEASUREMENT	CONDITION	Value
Density (73°F)	ISO 1183	1.20g/cm <sup>3</sup>
Apparent (Bulk) Density <sup>3</sup>	ISO 60	0.66g/cm <sup>3</sup>
Melt Mass-Flow Rate (MFR) (300°C/1.2 kg)	ISO 1133	20g/10 min
Melt Volume-Flow Rate (MVR) (300°C/1.2 kg)	ISO 1133	19cm <sup>3</sup> /10min
Molding Shrinkage		
Across Flow	ISO 2577	0.50 to 0.70%
Flow	ISO 2577	0.50 to 0.70%
Across Flow : 536°F, 0.0787 in <sup>4</sup>	ISO 294-4	0.70%
Flow : 0.0787 in <sup>4</sup>	ISO 294-4	0.65%
Water Absorption		
Saturation, 73°F	ISO 62	0.30%
Equilibrium, 73°F, 50% RH		0.12%

## Hardness Properties

MEASUREMENT	CONDITION	Value
Ball Indentation Hardness	ISO 2039-1	16700 psi

## Mechanical Properties

MEASUREMENT	CONDITION	Value
Tensile Modulus (73°F)	ISO 527-1/1	348000 psi
Tensile Stress		
Yield, 73°F	ISO 527-2/50	9430 psi
Break, 73°F		9430 psi

### Features

- General Purpose
- Good Mold Release
- Low Viscosity

### Processing Method

- Injection Molding

### Applications

- General Purpose

### Colors

- Clear/Transparent
- Colors Available
- Opaque
- Translucent

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## Mechanical Properties (continued)

MEASUREMENT	CONDITION	Value
Tensile Strain Yield, 73°F <sup>1</sup> Break, 73°F	ISO 527-2/50	6.0% 130%
Nominal Tensile Strain at Break (73°F)	ISO 527-2/50	> 50%
Tensile Creep Modulus 1 hr 1000 hr	ISO 899-1	319000 psi 276000 psi
Flexural Modulus <sup>5</sup> (73°F)	ISO 178	341000 psi
Flexural Stress <sup>5</sup> 73°F 3.5% Strain, 73°F	ISO 178	14100 psi 10600 psi
Flexural Strain at Flexural Strength <sup>6</sup> (73°F)	ISO 178	7.1%

## Films

MEASUREMENT	CONDITION	Value
Water Vapor Transmission Rate (73°F, 85% RH, 3.9 mil)	ISO 15106-1	0.97g/100 in <sup>2</sup> /24 hr
Carbon Dioxide Permeability (73°F, 1.0 mil)	ISO 2556	18900cm <sup>3</sup> /m <sup>2</sup> /bar/24 hr
Gas Permeation Carbon Dioxide : 3.9 mil Nitrogen : 1.0 mil Nitrogen : 3.9 mil Oxygen : 1.0 mil Oxygen : 3.9 mil	ISO 2556	4000cm <sup>3</sup> /m <sup>2</sup> /bar/24 hr 630cm <sup>3</sup> /m <sup>2</sup> /bar/24 hr 130cm <sup>3</sup> /m <sup>2</sup> /bar/24 hr 3150cm <sup>3</sup> /m <sup>2</sup> /bar/24 hr 700cm <sup>3</sup> /m <sup>2</sup> /bar/24 hr

## Impact Properties

MEASUREMENT	CONDITION	Value
Charpy Notched Impact Strength <sup>7</sup> -22°F, Complete Break 73°F, Partial Break	ISO 179/1eA	6.7ft-lb/in <sup>2</sup> 31ft-lb/in <sup>2</sup>
Charpy Unnotched Impact Strength -76°F -22°F 73°F	ISO 179/1eU	No Break No Break No Break

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## Impact Properties (continued)

MEASUREMENT	CONDITION	Value
Notched Izod Impact Strength <sup>7</sup> -22°F, Complete Break 73°F, Partial Break	ISO 180/A	7.1ft·lb/in <sup>2</sup> 31ft·lb/in <sup>2</sup>
Multi-Axial Instrumented Impact Energy -22°F 73°F	ISO 6603-2	47.9ft·lb 40.6ft·lb
Multi-Axial Instrumented Impact Peak Force -22°F 73°F	ISO 6603-2	1350lbf 1150lbf

## Thermal Properties

MEASUREMENT	CONDITION	Value
Deflection Temperature Under Load 66 psi, Unannealed 264 psi, Unannealed	ISO 75-2/B ISO 75-2/A ISO 11357-2	279°F 255°F 271°F
Glass Transition Temperature <sup>8</sup>	ISO 11357-2	291°F
Vicat Softening Temperature -- --	ISO 306/B120 ISO 306/B50	295°F 293°F
Ball Pressure Test (277°F)	IEC 60695-10-2	Pass
CLTE Flow : 73 to 131°F Transverse : 73 to 131°F	ISO 11359-2	3.6E-5in/in/°F 3.6E-5in/in/°F
Thermal Conductivity <sup>9</sup> (73°F)	ISO 8302	1.4Btu·in/hr/ft <sup>2</sup> /°F
RTI Elec (0.06 in)	UL 746B	257°F
RTI Imp (0.06 in)	UL 746B	239°F
RTI Str (0.06 in)	UL 746B	257°F

## Electrical Properties

MEASUREMENT	CONDITION	Value
Surface Resistivity	IEC 60093	1.0E+16 ohms
Volume Resistivity (73°F)	IEC 60093	1.0E+16 ohms·cm

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## Electrical Properties (continued)

MEASUREMENT	CONDITION	Value
Electric Strength (73°F, 0.0394 in)	IEC 60243-1	860V/mil
Relative Permittivity 73°F, 100 Hz 73°F, 1 MHz	IEC 60250	3.10 3.00
Dissipation Factor 73°F, 100 Hz 73°F, 1 MHz	IEC 60250	5.0E-4 9.0E-3
Comparative Tracking Index Solution A Solution B	IEC 60112	250 V 125 V

## Flammability Properties

MEASUREMENT	CONDITION	Value
Flame Rating 0.11 in 0.014 in 0.030 in	IEC 60695-2-12	HB V-2 V-2
Glow Wire Flammability Index 0.030 in 0.060 in 0.12 in	IEC 60695-2-12	1560°F 1610°F 1710°F
Glow Wire Ignition Temperature 0.030 in 0.04 in 0.06 in 0.12 in	IEC 60695-2-13	1610°F 1610°F 1610°F 1610°F
Oxygen Index <sup>10</sup>	ISO 4589-2	27%
Application of Flame from Small Burner <sup>11</sup> (78.7 mil)	DIN 53438-1, -3	K1, F1
Burning Rate <sup>12</sup> (> 39.4 mil)	ISO 3795	passed
Flash Ignition Temperature	ASTM D1929	896°F
Needle Flame Test 59.1 mil <sup>13</sup> 59.1 mil <sup>14</sup> 78.7 mil <sup>13</sup> 78.7 mil <sup>14</sup> 0.12 in <sup>13</sup> 0.12 in <sup>14</sup>	IEC 60695-11-5	5.0 sec 60.0 sec 5.0 sec 120.0 sec 10.0 sec 120.0 sec

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## Flammability Properties (continued)

MEASUREMENT	CONDITION	Value
Self Ignition Temperature	ASTM D1929	1022°F

## Optical Properties

MEASUREMENT	CONDITION	Value
Refractive Index <sup>15</sup>	ISO 489	1.585
Light Transmittance		
39.37 mil		89.0%
78.74 mil	ISO 13468-2	89.0%
118.1 mil		88.0%
157.5 mil		87.0%
Haze (118.1 mil)	ISO 14782	< 0.800%

## Additional Information

MEASUREMENT	CONDITION	Value
Electrolytical Corrosion (73°F)	IEC 60426	A1

## Injection Properties

MEASUREMENT	Value
Drying Temperature - Dry Air Dryer	248°F
Drying Time - Dry Air Dryer	2.0 to 3.0hr
Suggested Max Moisture	< 0.020%
Suggested Shot Size	30 to 70%
Rear Temperature	482 to 500°F
Middle Temperature	518 to 536°F
Front Temperature	536 to 554°F
Nozzle Temperature	554 to 572°F
Processing (Melt) Temp	536 to 608°F

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## Injection Properties (continued)

MEASUREMENT	Value
Mold Temperature	176 to 248°F
Back Pressure	725 to 2180 psi
Vent Depth	9.8E-4 to 3.0E-3 in
Hold Pressure (% of Injection Pressure)	50 - 75%
Peripheral Screw Speed	0.05 - 0.2 m/s
Standard Melt Temperature	300°C

### Notes

<sup>3</sup>Pellets

<sup>4</sup>60x60x2mm, 500 bar

<sup>5</sup>0.079 in/min

<sup>6</sup>2.0 mm/min

<sup>7</sup>3 mm

<sup>8</sup>10°C/min

<sup>9</sup>Across Flow

<sup>10</sup>Procedure A

<sup>11</sup>Method K and F

<sup>12</sup>US-FMVSS

<sup>13</sup>Method K

<sup>14</sup>Method F

<sup>15</sup>Method A

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