

# Makrolon® LED2245

Polycarbonate

Covestro - Polycarbonates

## Message:

MVR (300 °C/1.2 kg) 34 cm<sup>3</sup>/10 min; light guides; optics and lenses; PC with highest transmission; low viscosity; easy release; injection molding - melt temperature 280 - 320 °C

| General Information                        |                       |                        |              |
|--------------------------------------------|-----------------------|------------------------|--------------|
| UL YellowCard                              | E41613-233174         |                        |              |
| Features                                   | Good Mold Release     |                        |              |
|                                            | High Clarity          |                        |              |
|                                            | Low Viscosity         |                        |              |
| Uses                                       | Lenses                |                        |              |
|                                            | Lighting Applications |                        |              |
|                                            | Optical Applications  |                        |              |
| RoHS Compliance                            | RoHS Compliant        |                        |              |
| Processing Method                          | Injection Molding     |                        |              |
| Physical                                   | Nominal Value         | Unit                   | Test Method  |
| Density (23°C)                             | 1.19                  | g/cm <sup>3</sup>      | ISO 1183     |
| Apparent Density <sup>1</sup>              | 0.66                  | g/cm <sup>3</sup>      | ISO 60       |
| Melt Volume-Flow Rate (MVR) (300°C/1.2 kg) | 34.0                  | cm <sup>3</sup> /10min | ISO 1133     |
| Molding Shrinkage <sup>2</sup>             |                       |                        | ISO 294-4    |
| Across Flow : 2.00 mm                      | 0.70                  | %                      |              |
| Flow : 2.00 mm                             | 0.65                  | %                      |              |
| Water Absorption                           |                       |                        | ISO 62       |
| Saturation, 23°C                           | 0.30                  | %                      |              |
| Equilibrium, 23°C, 50% RH                  | 0.12                  | %                      |              |
| Hardness                                   | Nominal Value         | Unit                   | Test Method  |
| Ball Indentation Hardness                  | 115                   | MPa                    | ISO 2039-1   |
| Mechanical                                 | Nominal Value         | Unit                   | Test Method  |
| Tensile Modulus (23°C)                     | 2350                  | MPa                    | ISO 527-2/1  |
| Tensile Stress                             |                       |                        | ISO 527-2/50 |
| Yield, 23°C                                | 63.0                  | MPa                    |              |
| Break, 23°C                                | 60.0                  | MPa                    |              |
| Tensile Strain                             |                       |                        | ISO 527-2/50 |
| Yield, 23°C                                | 6.0                   | %                      |              |
| Break, 23°C                                | 130                   | %                      |              |
| Nominal Tensile Strain at Break (23°C)     | > 50                  | %                      | ISO 527-2/50 |

| Flexural Modulus <sup>3</sup> (23°C)                     | 2350                      | MPa               | ISO 178        |
|----------------------------------------------------------|---------------------------|-------------------|----------------|
| Flexural Stress <sup>4</sup>                             |                           |                   | ISO 178        |
| 3.5% Strain, 23°C                                        | 73.0                      | MPa               |                |
| 23°C                                                     | 97.0                      | MPa               |                |
| Flexural Strain at Flexural Strength <sup>5</sup> (23°C) | 7.1                       | %                 | ISO 178        |
| Burning Rate - US-FMVSS (> 1.00 mm)                      | passed                    |                   | ISO 3795       |
| Flash Ignition Temperature                               | 480                       | °C                | ASTM D1929     |
| Self Ignition Temperature                                | 550                       | °C                | ASTM D1929     |
| ISO Shortname                                            | ISO 7391-PC,MRT,(,,)-24-9 |                   |                |
| Impact                                                   | Nominal Value             | Unit              | Test Method    |
| Charpy Notched Impact Strength <sup>6</sup>              |                           |                   | ISO 7391       |
| -30°C, Complete Break                                    | 12                        | kJ/m <sup>2</sup> |                |
| 23°C, Partial Break                                      | 60                        | kJ/m <sup>2</sup> |                |
| Charpy Unnotched Impact Strength                         |                           |                   | ISO 179/1eU    |
| -60°C                                                    | No Break                  |                   |                |
| -30°C                                                    | No Break                  |                   |                |
| 23°C                                                     | No Break                  |                   |                |
| Notched Izod Impact Strength <sup>7</sup>                |                           |                   | ISO 7391       |
| -30°C, Complete Break                                    | 12                        | kJ/m <sup>2</sup> |                |
| 23°C, Partial Break                                      | 55                        | kJ/m <sup>2</sup> |                |
| Multi-Axial Instrumented Impact Energy                   |                           |                   | ISO 6603-2     |
| -30°C                                                    | 60.0                      | J                 |                |
| 23°C                                                     | 55.0                      | J                 |                |
| Multi-Axial Instrumented Impact Peak Force               |                           |                   | ISO 6603-2     |
| -30°C                                                    | 5900                      | N                 |                |
| 23°C                                                     | 4900                      | N                 |                |
| Thermal                                                  | Nominal Value             | Unit              | Test Method    |
| Heat Deflection Temperature                              |                           |                   |                |
| 0.45 MPa, Unannealed                                     | 138                       | °C                | ISO 75-2/B     |
| 1.8 MPa, Unannealed                                      | 125                       | °C                | ISO 75-2/A     |
| Glass Transition Temperature <sup>8</sup>                | 145                       | °C                | ISO 11357-2    |
| Vicat Softening Temperature                              |                           |                   |                |
| --                                                       | 145                       | °C                | ISO 306/B50    |
| --                                                       | 146                       | °C                | ISO 306/B120   |
| Ball Pressure Test (136°C)                               | Pass                      |                   | IEC 60695-10-2 |
| CLTE                                                     |                           |                   | ISO 11359-2    |
| Flow : 23 to 55°C                                        | 6.5E-5                    | cm/cm/°C          |                |
| Transverse : 23 to 55°C                                  | 6.5E-5                    | cm/cm/°C          |                |
| Thermal Conductivity <sup>9</sup> (23°C)                 | 0.20                      | W/m/K             | ISO 8302       |
| RTI Elec (1.50 mm)                                       | 125                       | °C                | UL 746         |
| RTI Imp (1.50 mm)                                        | 115                       | °C                | UL 746         |

| RTI Str (1.50 mm)                 | 125                        | °C      | UL 746         |
|-----------------------------------|----------------------------|---------|----------------|
| Electrical                        | Nominal Value              | Unit    | Test Method    |
| Surface Resistivity               | 1.0E+16                    | ohms    | IEC 60093      |
| Volume Resistivity (23°C)         | 1.0E+16                    | ohms·cm | IEC 60093      |
| Electric Strength (23°C, 1.00 mm) | 34                         | kV/mm   | IEC 60243-1    |
| Relative Permittivity             |                            |         | IEC 60250      |
| 23°C, 100 Hz                      | 3.10                       |         |                |
| 23°C, 1 MHz                       | 3.00                       |         |                |
| Dissipation Factor                |                            |         | IEC 60250      |
| 23°C, 100 Hz                      | 5.0E-4                     |         |                |
| 23°C, 1 MHz                       | 9.5E-3                     |         |                |
| Comparative Tracking Index        |                            |         | IEC 60112      |
| Solution A                        | 250                        | V       |                |
| Solution B                        | 125                        | V       |                |
| Flammability                      | Nominal Value              | Unit    | Test Method    |
| Flame Rating                      |                            |         | UL 94          |
| 2.90 mm, CL                       | HB                         |         |                |
| 0.750 mm, CL                      | V-2                        |         |                |
| Glow Wire Flammability Index      |                            |         | IEC 60695-2-12 |
| 1.00 mm                           | 850                        | °C      |                |
| 1.50 mm                           | 875                        | °C      |                |
| 3.00 mm                           | 930                        | °C      |                |
| Glow Wire Ignition Temperature    |                            |         | IEC 60695-2-13 |
| 0.750 mm                          | 875                        | °C      |                |
| 1.50 mm                           | 875                        | °C      |                |
| 3.00 mm                           | 900                        | °C      |                |
| Oxygen Index <sup>10</sup>        | 28                         | %       | ISO 4589-2     |
| Optical                           | Nominal Value              | Unit    | Test Method    |
| Refractive Index <sup>11</sup>    | 1.584                      |         | ISO 489        |
| Transmittance                     |                            |         | ISO 13468-2    |
| 1000 µm                           | 90.0                       | %       |                |
| 2000 µm                           | 90.0                       | %       |                |
| 3000 µm                           | > 89.0                     | %       |                |
| 4000 µm                           | > 89.0                     | %       |                |
| Haze (3000 µm)                    | < 0.50                     | %       | ISO 14782      |
| NOTE                              |                            |         |                |
| 1.                                | Pellets                    |         |                |
| 2.                                | 60x60x2 mm, 500 bar        |         |                |
| 3.                                | 2.0 mm/min                 |         |                |
| 4.                                | 2.0 mm/min                 |         |                |
| 5.                                | 2 mm/min                   |         |                |
| 6.                                | Based on ISO 179-1eA, 3 mm |         |                |

|     |                          |
|-----|--------------------------|
| 7.  | Based on ISO 180-A, 3 mm |
| 8.  | 10°C/min                 |
| 9.  | Cross-flow               |
| 10. | Procedure A              |
| 11. | Method A                 |

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