



# Makrolon LED2245

## Grades / Light guides

Formerly Makrolon DP1-1857; MVR (300 °C/1.2 kg) 35 cm<sup>3</sup>/10 min; light guides; PC with highest transmission; low viscosity; easy release; injection molding - melt temperature 280 - 320 °C; available in color code 000000 only

## ISO Shortname

ISO 7391-PC,MRT,(,.)-24-9

| Property                                        | Test Condition      | Unit                    | Standard                  | Value  |
|-------------------------------------------------|---------------------|-------------------------|---------------------------|--------|
| <b>Rheological properties</b>                   |                     |                         |                           |        |
| C Melt volume-flow rate                         | 300 °C; 1.2 kg      | cm <sup>3</sup> /10 min | ISO 1133                  | 34     |
| C Molding shrinkage, parallel                   | 60x60x2 mm; 500 bar | %                       | ISO 294-4                 | 0.65   |
| C Molding shrinkage, normal                     | 60x60x2 mm; 500 bar | %                       | ISO 294-4                 | 0.7    |
| <b>Mechanical properties (23 °C/50 % r. h.)</b> |                     |                         |                           |        |
| C Tensile modulus                               | 1 mm/min            | MPa                     | ISO 527-1,-2              | 2350   |
| C Yield stress                                  | 50 mm/min           | MPa                     | ISO 527-1,-2              | 63     |
| C Yield strain                                  | 50 mm/min           | %                       | ISO 527-1,-2              | 6.0    |
| C Nominal strain at break                       | 50 mm/min           | %                       | ISO 527-1,-2              | > 50   |
| Stress at break                                 | 50 mm/min           | MPa                     | ISO 527-1,-2              | 60     |
| Strain at break                                 | 50 mm/min           | %                       | b.o. ISO 527-1,-2         | 125    |
| Flexural modulus                                | 2 mm/min            | MPa                     | ISO 178                   | 2350   |
| Flexural strength                               | 2 mm/min            | MPa                     | ISO 178                   | 97     |
| Flexural strain at flexural strength            | 2 mm/min            | %                       | ISO 178                   | 7.1    |
| Flexural stress at 3.5 % strain                 | 2 mm/min            | MPa                     | ISO 178                   | 73     |
| C Charpy impact strength                        | 23 °C               | kJ/m <sup>2</sup>       | ISO 179-1eU               | N      |
| C Charpy impact strength                        | -30 °C              | kJ/m <sup>2</sup>       | ISO 179-1eU               | N      |
| Charpy impact strength                          | -60 °C              | kJ/m <sup>2</sup>       | ISO 179-1eU               | N      |
| Charpy notched impact strength                  | 23 °C; 3 mm         | kJ/m <sup>2</sup>       | ISO 7391/b.o. ISO 179-1eA | 60P(C) |
| Charpy notched impact strength                  | -30 °C; 3 mm        | kJ/m <sup>2</sup>       | ISO 7391/b.o. ISO 179-1eA | 12C    |
| Izod notched impact strength                    | 23 °C; 3 mm         | kJ/m <sup>2</sup>       | ISO 7391/b.o. ISO 180-A   | 60P(C) |
| Izod notched impact strength                    | -30 °C; 3 mm        | kJ/m <sup>2</sup>       | ISO 7391/b.o. ISO 180-A   | 12C    |
| Izod notched impact strength                    | 23 °C; 3.2 mm       | kJ/m <sup>2</sup>       | b.o. ISO 180-A            | 65P(C) |
| Izod notched impact strength                    | -30 °C; 3.2 mm      | kJ/m <sup>2</sup>       | b.o. ISO 180-A            | 12C    |
| C Puncture maximum force                        | 23 °C               | N                       | ISO 6603-2                | 4900   |
| C Puncture maximum force                        | -30 °C              | N                       | ISO 6603-2                | 5900   |
| C Puncture energy                               | 23 °C               | J                       | ISO 6603-2                | 55     |
| C Puncture energy                               | -30 °C              | J                       | ISO 6603-2                | 60     |
| Ball indentation hardness                       |                     | N/mm <sup>2</sup>       | ISO 2039-1                | 115    |



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| Property                                                              | Test Condition    | Unit                | Standard       | Value    |
|-----------------------------------------------------------------------|-------------------|---------------------|----------------|----------|
| <b>Thermal properties</b>                                             |                   |                     |                |          |
| 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    | 125      |
| C Temperature of deflection under load                                | 0.45 MPa          | °C                  | ISO 75-1,-2    | 138      |
| C Vicat softening temperature                                         | 50 N; 50 °C/h     | °C                  | ISO 306        | 145      |
| Vicat softening temperature                                           | 50 N; 120 °C/h    | °C                  | ISO 306        | 146      |
| C Coefficient of linear thermal expansion, parallel                   | 23 to 55 °C       | 10 <sup>-4</sup> /K | ISO 11359-1,-2 | 0.65     |
| C Coefficient of linear thermal expansion, transverse                 | 23 to 55 °C       | 10 <sup>-4</sup> /K | ISO 11359-1,-2 | 0.65     |
| C Burning behavior UL 94 [UL recognition]                             | 0.75 mm           | Class               | UL 94          | V-2 (CL) |
| Burning behavior UL 94 [UL recognition]                               | 2.9 mm            | Class               | UL 94          | HB (CL)  |
| C Oxygen index                                                        | Method A          | %                   | ISO 4589-2     | 28       |
| Thermal conductivity                                                  | 23 °C             | W/(m·K)             | ISO 8302       | 0.20     |
| Resistance to heat (ball pressure test)                               |                   | °C                  | IEC 60695-10-2 | 136      |
| Relative temperature index (Tensile strength) [UL recognition]        | 1.5 mm            | °C                  | UL 746B        | 80       |
| Relative temperature index (Tensile impact strength) [UL recognition] | 1.5 mm            | °C                  | UL 746B        | 80       |
| Relative temperature index (Electric strength) [UL recognition]       | 1.5 mm            | °C                  | UL 746B        | 80       |
| Glow wire test (GWFI)                                                 | 1.0 mm            | °C                  | IEC 60695-2-12 | 850      |
| Glow wire test (GWFI)                                                 | 1.5 mm            | °C                  | IEC 60695-2-12 | 875      |
| Glow wire test (GWFI)                                                 | 3.0 mm            | °C                  | IEC 60695-2-12 | 930      |
| Glow wire test (GWIT)                                                 | 0.75 mm           | °C                  | IEC 60695-2-13 | 875      |
| Glow wire test (GWIT)                                                 | 1.5 mm            | °C                  | IEC 60695-2-13 | 875      |
| Glow wire test (GWIT)                                                 | 3.0 mm            | °C                  | IEC 60695-2-13 | 900      |
| Burning rate (US-FMVSS)                                               | ≥1.0 mm           | mm/min              | ISO 3795       | passed   |
| Flash ignition temperature                                            |                   | °C                  | ASTM D1929     | 480      |
| Self ignition temperature                                             |                   | °C                  | ASTM D1929     | 550      |
| <b>Electrical properties (23 °C/50 % r. h.)</b>                       |                   |                     |                |          |
| C Relative permittivity                                               | 100 Hz            | -                   | IEC 60250      | 3.1      |
| C Relative permittivity                                               | 1 MHz             | -                   | IEC 60250      | 3.0      |
| C Dissipation factor                                                  | 100 Hz            | 10 <sup>-4</sup>    | IEC 60250      | 5        |
| C Dissipation factor                                                  | 1 MHz             | 10 <sup>-4</sup>    | IEC 60250      | 95       |
| C Volume resistivity                                                  |                   | Ohm·m               | IEC 60093      | 1E14     |
| C Surface resistivity                                                 |                   | Ohm                 | IEC 60093      | 1E16     |
| C Electrical strength                                                 | 1 mm              | kV/mm               | IEC 60243-1    | 34       |
| C Comparative tracking index CTI                                      | Solution A        | Rating              | IEC 60112      | 250      |
| Comparative tracking index CTI M                                      | Solution B        | Rating              | IEC 60112      | 125M     |
| <b>Other properties (23 °C)</b>                                       |                   |                     |                |          |
| 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     | 1190     |
| Bulk density                                                          | Pellets           | kg/m³               | ISO 60         | 660      |
| <b>Material specific properties</b>                                   |                   |                     |                |          |
| Refractive index                                                      | Procedure A       | -                   | ISO 489        | 1.584    |
| Haze for transparent materials                                        | 3 mm              | %                   | ISO 14782      | < 0.5    |
| Luminous transmittance (clear transparent materials)                  | 1 mm              | %                   | ISO 13468-2    | 90       |
| C Luminous transmittance (clear transparent materials)                | 2 mm              | %                   | ISO 13468-2    | 90       |
| Luminous transmittance (clear transparent materials)                  | 3 mm              | %                   | ISO 13468-2    | > 89     |
| Luminous transmittance (clear transparent materials)                  | 4 mm              | %                   | ISO 13468-2    | > 89     |





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| Property                                 | Test Condition | Unit | Standard | Value |
|------------------------------------------|----------------|------|----------|-------|
| Processing conditions for test specimens |                |      |          |       |
| C Injection molding-Melt temperature     |                | °C   | ISO 294  | 280   |
| C Injection molding-Mold temperature     |                | °C   | ISO 294  | 80    |
| C Injection molding-Injection velocity   |                | mm/s | ISO 294  | 200   |

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

