

|               |               |                 |               |                              |
|---------------|---------------|-----------------|---------------|------------------------------|
| <b>H-ZF7L</b> | <b>805255</b> | $n_d = 1.80518$ | $v_d = 25.46$ | $n_F - n_C = 0.031630$       |
|               |               | $n_e = 1.81263$ | $v_e = 25.25$ | $n_{F'} - n_{C'} = 0.032180$ |

| Refractive Indices |                |             |
|--------------------|----------------|-------------|
|                    | $\lambda$ (nm) | $n_\lambda$ |
| $n_{2325}$         | 2325.42        | 1.74928     |
| $n_{1970}$         | 1970.09        | 1.75560     |
| $n_{1530}$         | 1529.58        | 1.76321     |
| $n_{1129}$         | 1128.64        | 1.77158     |
| $n_{1064}$         | 1064.00        | 1.77339     |
| $n_t$              | 1013.98        | 1.77494     |
| $n_s$              | 852.11         | 1.78150     |
| $n_{A'}$           | 768.19         | 1.78642     |
| $n_f$              | 706.52         | 1.79118     |
| $n_C$              | 656.27         | 1.79611     |
| $n_{C'}$           | 643.85         | 1.79752     |
| $n_{He-Ne}$        | 632.80         | 1.79883     |
| $n_D$              | 589.29         | 1.80491     |
| $n_d$              | 587.56         | 1.80518     |
| $n_e$              | 546.07         | 1.81263     |
| $n_F$              | 486.13         | 1.82774     |
| $n_{F'}$           | 479.99         | 1.82970     |
| $n_g$              | 435.84         | 1.84721     |
| $n_h$              | 404.66         | 1.86480     |
| $n_i$              | 365.01         | 1.89846     |
|                    |                |             |
|                    |                |             |

| Relative Partial Dispersion |        |
|-----------------------------|--------|
| $P_{d,C}$                   | 0.2868 |
| $P_{e,d}$                   | 0.2355 |
| $P_{g,F}$                   | 0.6156 |
| $P'_{d,c'}$                 | 0.2380 |
| $P'_{e,d}$                  | 0.2315 |
| $P'_{g,f'}$                 | 0.5441 |
|                             |        |

| Chemical Properties (grade) |   |
|-----------------------------|---|
| RC (S)                      | 1 |
| RA (S)                      | 1 |
| D <sub>W</sub>              | 1 |
| D <sub>A</sub>              | 1 |
| R <sub>OH</sub> (S)         | 1 |
| RP (S)                      | 1 |
| CR                          | 1 |

| Internal Transmittance |              |               |
|------------------------|--------------|---------------|
| $\lambda$ (nm)         | $\tau_{5mm}$ | $\tau_{10mm}$ |
| 2400                   | 0.927        | 0.863         |
| 2200                   | 0.960        | 0.920         |
| 2000                   | 0.979        | 0.956         |
| 1800                   | 0.987        | 0.976         |
| 1600                   | 0.998        | 0.996         |
| 1400                   | 0.998        | 0.996         |
| 1200                   | 0.998        | 0.996         |
| 1060                   | 0.998        | 0.996         |
| 1000                   | 0.998        | 0.996         |
| 950                    | 0.998        | 0.996         |
| 900                    | 0.998        | 0.996         |
| 850                    | 0.998        | 0.996         |
| 800                    | 0.998        | 0.997         |
| 750                    | 0.998        | 0.997         |
| 700                    | 0.998        | 0.997         |
| 650                    | 0.998        | 0.996         |
| 600                    | 0.998        | 0.997         |
| 550                    | 0.997        | 0.995         |
| 500                    | 0.994        | 0.988         |
| 480                    | 0.992        | 0.984         |
| 460                    | 0.989        | 0.979         |
| 440                    | 0.984        | 0.969         |
| 420                    | 0.974        | 0.948         |
| 400                    | 0.946        | 0.894         |
| 390                    | 0.906        | 0.821         |
| 380                    | 0.799        | 0.638         |
| 370                    | 0.527        | 0.278         |
| 360                    | 0.148        | 0.022         |
| 350                    |              |               |
| 340                    |              |               |
| 330                    |              |               |
| 320                    |              |               |
| 310                    |              |               |
| 300                    |              |               |
| 290                    |              |               |
| 280                    |              |               |

| Deviation of Relative Partial Dispersions |        |
|---|--------|
| $\Delta P_{F,e}$                          | 0.0016 |
| $\Delta P_{g,F}$                          | 0.0142 |
| $\Delta P_{C,t}$                          | 0.0058 |
| $\Delta P_{C,s}$                          | 0.0004 |

| Expansion Coefficient $\alpha$ ( $\times 10^{-7}/K$ ) |          |
|---|----------|
| $^{\circ}C$   | $\alpha$ |
| -50/-40   | 80       |
| -40/-30   | 82       |
| -30/-20   | 85       |
| -20/-10   | 87       |
| -10/0   | 89       |
| 0/10  | 90       |
| 10/20   | 91       |
| 20/30   | 92       |
| 30/40   | 92       |
| 40/50   | 93       |
| 50/60   | 93       |
| 60/70   | 94       |
| 70/80   | 95       |
| 80/90   | 95       |
| 90/100  | 97       |
| 100/110   | 98       |
| 110/120   | 99       |
| 120/130   | 100      |
| 130/140   | 102      |
| 140/150   | 102      |
| 150/160   | 103      |

| Thermal Properties                              |      |
|---|------|
| T <sub>g</sub> ( $^{\circ}C$ )                  | 606  |
| T <sub>s</sub> ( $^{\circ}C$ )                  | 636  |
| T <sub>10</sub> <sup>14.5</sup> ( $^{\circ}C$ ) | 565  |
| T <sub>10</sub> <sup>13</sup> ( $^{\circ}C$ )   | 581  |
| $\alpha_{-50/80^{\circ}C}$ ( $10^{-7}/K$ )      | 88   |
| $\alpha_{100/300^{\circ}C}$ ( $10^{-7}/K$ )     | 109  |
| $\lambda$ (W/(m K))                             | 0.99 |

| Constants of Dispersion Formula |                 |
|---------------------------------|-----------------|
| A <sub>0</sub>                  | 3.11898504E+00  |
| A <sub>1</sub>                  | -1.24052596E-02 |
| A <sub>2</sub>                  | 4.32862244E-02  |
| A <sub>3</sub>                  | 2.26049835E-03  |
| A <sub>4</sub>                  | -7.69462999E-05 |
| A <sub>5</sub>                  | 2.11453139E-05  |

| Mechanical Properties |       |
|-----------------------|-------|
| HK ( $10^7$ Pa)       | 523   |
| F <sub>A</sub>        | 186   |
| E (GPa)               | 93.6  |
| G (GPa)               | 36.1  |
| $\mu$                 | 0.296 |
| $\sigma_b$ (MPa)      | 77    |
| B ( $10^{-12}$ /Pa)   | 2.67  |

| Density                     | Solarization        |
|-----------------------------|---------------------|
| $\rho$ (g/cm <sup>3</sup> ) | $\Delta\lambda$ (%) |
| 3.38                        | -0.6                |

| Range of Temperature ( $^{\circ}C$ ) | Temperature Coefficients of Refractive Index    |      |     |     |       |     |     |     |     |     |
|--------------------------------------|---|------|-----|-----|-------|-----|-----|-----|-----|-----|
|                                      | dn/dt relative ( $\times 10^{-6} / ^{\circ}C$ ) |      |     |     |       |     |     |     |     |     |
|                                      | t   | s    | C   | C'  | He-Ne | d   | e   | F   | F'  | g   |
| -60 ~ -40                            | -0.8  | -0.2 | 0.2 | 0.3 | 0.4   | 0.6 | 1.2 | 2.4 | 2.5 | 3.7 |
| -40 ~ -20                            | -0.8  | -0.1 | 0.3 | 0.4 | 0.4   | 0.7 | 1.3 | 2.5 | 2.6 | 4.0 |
| -20 ~ 0                              | -0.8  | -0.1 | 0.3 | 0.4 | 0.5   | 0.8 | 1.4 | 2.6 | 2.7 | 4.3 |
| 0 ~ 20                               | -0.8  | -0.1 | 0.3 | 0.4 | 0.5   | 0.9 | 1.5 | 2.9 | 3.0 | 4.7 |
| 20 ~ 40                              | -0.8  | -0.1 | 0.4 | 0.5 | 0.6   | 1.0 | 1.6 | 3.0 | 3.1 | 5.0 |
| 40 ~ 60                              | -0.7  | 0.1  | 0.5 | 0.6 | 0.7   | 1.1 | 1.8 | 3.3 | 3.4 | 5.3 |
| 60 ~ 80                              | -0.7  | 0.1  | 0.7 | 0.8 | 0.9   | 1.3 | 2.0 | 3.6 | 3.7 | 5.7 |
| 80 ~ 100                             | -0.6  | 0.2  | 0.9 | 1.0 | 1.1   | 1.5 | 2.1 | 3.8 | 3.9 | 5.9 |
| 100 ~ 120                            | -0.4  | 0.3  | 1.0 | 1.1 | 1.2   | 1.7 | 2.3 | 4.0 | 4.1 | 6.1 |
| 120 ~ 140                            | -0.3  | 0.4  | 1.1 | 1.2 | 1.3   | 1.8 | 2.4 | 4.2 | 4.3 | 6.4 |
| 140 ~ 160                            | -0.2  | 0.5  | 1.2 | 1.3 | 1.4   | 2.0 | 2.6 | 4.5 | 4.6 | 6.7 |

| Coloration Code                        |         |
|--|---------|
| $\lambda_{80}(\lambda_{70})/\lambda_5$ | 425/365 |
| Coloration of Internal Transmittance   |         |
| $\lambda\tau_{80}/\lambda\tau_5$       | 388/361 |

| Constants of dn/dt |                |                |
|--------------------|----------------|----------------|
| D <sub>0</sub>     | D <sub>1</sub> | D <sub>2</sub> |
| -4.83E-06          | 1.06E-08       | -1.80E-11      |
| E <sub>0</sub>     | E <sub>1</sub> | $\lambda_{TK}$ |
| 9.79E-07           | 1.08E-09       | 2.95E-01       |