

# Optical Materials for Precision Molding

## Product Information

SCHOTT offers various optical glasses specifically developed for precision molding – the so called low Tg glasses. Low Tg glasses have a glass transformation temperature suitable for precision molding and a special glass composition to decrease the tendency for devitrification and to reduce the reaction with mold materials within the molding temperature range. During a precision molding process, a polished or fire polished preform is shaped into a final geometry, while conserving its surface quality. The typical temperature range for the molding process is between 500°C and 700°C, enabling the extension of the operating lifetime of the mold material and a significant time reduction of the press process.

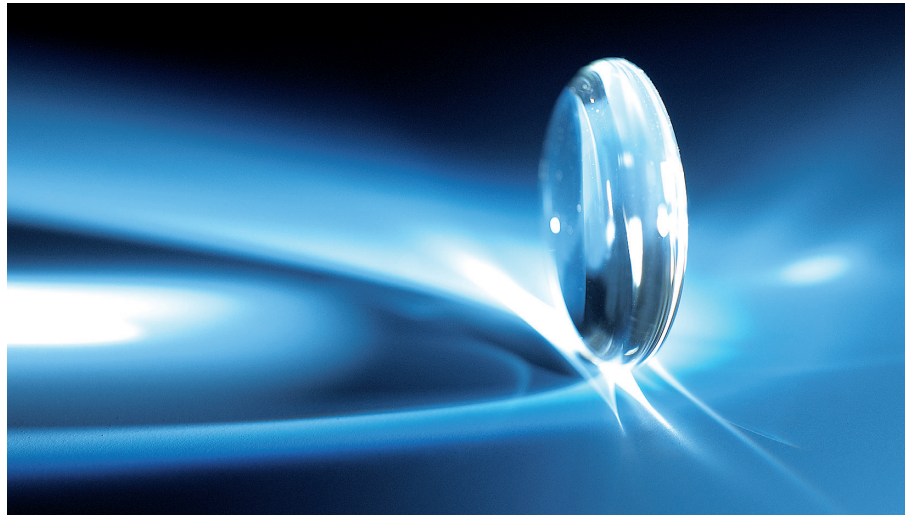
## Advantages

- Low transformation temperatures, most below 550°C, to increase lifetime of molds and to reduce process time
- Low tendency to chemical interaction between glass constituents and mold materials within the molding temperature range
- Tight optical tolerance
- Wide range of dimensions
- Various forms of supply
- Application support from SCHOTT
- Continuous extension of the portfolio ⇒ new glass types in development

## Forms of Supply

- Optical glass rods\* in various shapes and surface qualities, diameter <1–12.5 mm, length up to 1000 mm
- Ball lenses\* in different formats
- Other supply forms on request

\*individual product flyers available



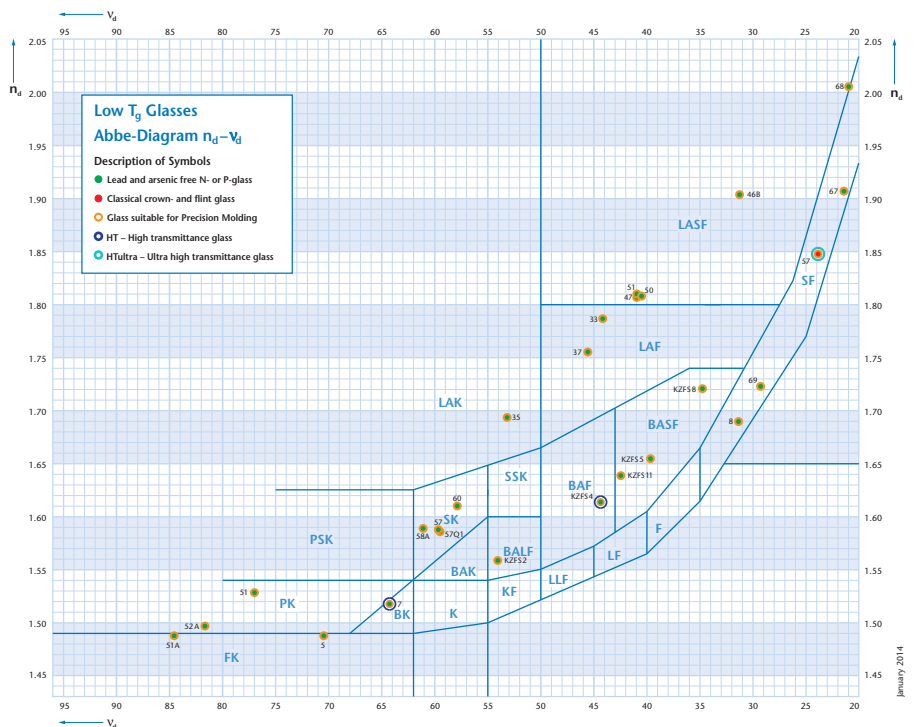
## Applications

Precision molding is the state-of-the-art technology for the volume production of complex lenses, e.g. aspheres, for various applications such as:

- Digital Projection
- Digital Cameras
- Camcorders
- Microscopy
- Industrial Applications

## Materials

### SCHOTT Low Tg Glass



| Glass Type**        | Optical Properties          |                             |            | n <sub>d</sub> ref. <sup>2</sup> | After molding <sup>3</sup> |                | Thermal Properties |         | Chemical Res.                  |                                 | Physical Properties                                  |               |                          |                              |
|---------------------|-----------------------------|-----------------------------|------------|----------------------------------|----------------------------|----------------|--------------------|---------|--------------------------------|---------------------------------|--|---------------|--------------------------|------------------------------|
|                     | n <sub>d</sub> <sup>1</sup> | v <sub>d</sub> <sup>1</sup> | Color code |                                  | n <sub>d</sub>             | v <sub>d</sub> | Tg [°C]            | AT [°C] | SR-J <sup>4</sup><br>Acid Res. | WR-J <sup>4</sup><br>Water Res. | CTE [10 <sup>-6</sup> K <sup>-1</sup> ] <sup>5</sup> | Hardness (HK) | Abrasion Aa <sup>4</sup> | Density [g/cm <sup>3</sup> ] |
| N-FK51A             | 1.48656                     | 84.47                       | 34/28      | 1.48597                          | 1.4847                     | 84.2           | 464                | 503     | 3                              | 1                               | 14.8   | 345           | 528                      | 3.68                         |
| N-FK5               | 1.48749                     | 70.41                       | 30/27      | 1.48666                          | 1.4850                     | 70.2           | 466                | 557     | 5                              | 4                               | 10.0   | 520           | 109                      | 2.45                         |
| N-PK52A             | 1.49700                     | 81.61                       | 34/28      | 1.49640                          | 1.4952                     | 81.3           | 467                | 520     | 4                              | 1                               | 15.0   | 355           | 526                      | 3.70                         |
| P-BK7               | 1.51640                     | 64.06                       | 33/30      | 1.51576                          | 1.5144                     | 63.9           | 498                | 546     | 1                              | 4                               | 7.3  | 627           | 66                       | 2.43                         |
| P-PK53 <sup>i</sup> | 1.52690                     | 66.22                       | 36/31      | 1.52567                          | 1.5232                     | 66.0           | 383                | 418     | 3                              | 1                               | 16.0   | 335           | 977                      | 2.83                         |
| N-PK51              | 1.52855                     | 76.98                       | 34/29      | 1.52784                          | 1.5267                     | 76.7           | 487                | 528     | 3                              | 1                               | 14.1   | 415           | 592                      | 3.86                         |
| N-KZFS2             | 1.55836                     | 54.01                       | 34/30      | 1.55666                          | 1.5534                     | 53.7           | 472                | 533     | 6                              | 6                               | 5.4  | 490           | 70                       | 2.54                         |
| P-SK57Q1            | 1.58600                     | 59.60                       | 34/31      | 1.58496                          | 1.5833                     | 59.4           | 439                | 522     | 4                              | 1                               | 8.9  | 535           | 124                      | 3.01                         |
| P-SK57              | 1.58700                     | 59.60                       | 34/31      | 1.58596                          | 1.5843                     | 59.4           | 493                | 522     | 4                              | 1                               | 8.9  | 535           | 124                      | 3.01                         |
| P-SK58A             | 1.58913                     | 61.15                       | 35/31      | 1.58795                          | 1.5860                     | 60.8           | 510                | 551     | 4                              | 2                               | 8.4  | 662           | 102                      | 2.97                         |
| P-SK60              | 1.61035                     | 57.90                       | 33/29      | 1.60918                          | 1.6068                     | 57.7           | 507                | 547     | 4                              | 3                               | 8.9  | 601           | 86                       | 3.08                         |
| N-KZFS4             | 1.61336                     | 44.49                       | 36/32      | 1.61227                          | 1.6100                     | 44.5           | 536                | 597     | 6                              | 4                               | 8.2  | 520           | 130                      | 3.00                         |
| N-KZFS11            | 1.63775                     | 42.41                       | 36/30      | 1.63658                          | 1.6341                     | 42.3           | 551                | –       | –                              | –                               | 7.6  | 530           | 74                       | 3.20                         |
| N-KZFS5             | 1.65412                     | 39.70                       | 37/32      | 1.65272                          | 1.6498                     | 39.8           | 584                | 648     | 1                              | 1                               | 7.4  | 555           | 122                      | 3.04                         |
| P-SF8               | 1.68893                     | 31.25                       | 40/36      | 1.68623                          | 1.6814                     | 31.7           | 524                | 580     | 1                              | 1                               | 11.1   | 533           | 200                      | 2.90                         |
| P-LAK35             | 1.69350                     | 53.20                       | 36/29      | 1.69234                          | 1.6904                     | 53.0           | 508                | 544     | 4                              | 3                               | 9.7  | 616           | 119                      | 3.85                         |
| N-KZFS8             | 1.72047                     | 34.70                       | 38/33      | 1.71896                          | 1.7158                     | 34.8           | 509                | 561     | 1                              | 1                               | 9.4  | 570           | 152                      | 3.20                         |
| P-SF69              | 1.72250                     | 29.23                       | 40/36      | 1.72006                          | 1.7155                     | 29.7           | 508                | 547     | 1                              | 1                               | 11.1   | 612           | –                        | 2.93                         |
| P-LAF37             | 1.75550                     | 45.66                       | 37/31      | 1.75396                          | 1.7508                     | 45.5           | 506                | 546     | 4                              | 1                               | 7.8  | 697           | 67                       | 3.99                         |
| N-LAF33             | 1.78582                     | 44.05                       | 39/32      | 1.78425                          | 1.7813                     | 43.9           | 600                | 628     | 6                              | 1                               | 6.7  | 730           | 67                       | 4.36                         |
| P-LASF47            | 1.80610                     | 40.90                       | 39/33      | 1.80449                          | 1.8016                     | 40.8           | 530                | 580     | 3                              | 1                               | 7.3  | 620           | 70                       | 4.54                         |
| P-LASF50            | 1.80860                     | 40.46                       | 39/32      | 1.80699                          | 1.8036                     | 40.3           | 527                | 571     | 3                              | 1                               | 7.3  | 655           | 62                       | 4.54                         |
| P-LASF51            | 1.81000                     | 40.93                       | 39/33      | 1.80842                          | 1.8055                     | 40.8           | 526                | 570     | 3                              | 1                               | 7.4  | 722           | 66                       | 4.58                         |
| SF57 <sup>h</sup>   | 1.84666                     | 23.83                       | 40/37*     | 1.84608                          | 1.8447                     | 23.7           | 414                | 449     | 6                              | 1                               | 9.2  | 350           | 344                      | 5.51                         |
| N-LASF46B           | 1.90366                     | 31.32                       | 40/36*     | 1.90165                          | 1.8977                     | 31.4           | 611                | 649     | 1                              | 2                               | 7.1  | 712           | 55                       | 4.51                         |
| P-SF67 <sup>i</sup> | 1.90680                     | 21.40                       | 48/39*     | 1.90439                          | 1.8998                     | 21.6           | 539                | 601     | 1                              | 1                               | 7.4  | 440           | 309                      | 4.24                         |
| P-SF68              | 2.00520                     | 21.00                       | 49/41*     | 2.00365                          | 2.0004                     | 20.9           | 428                | 468     | 4–5                            | 1                               | 9.7  | 410           | 298                      | 6.19                         |

\* Wavelength for transmittance 0.7 and 0.05

\*\* Technical datasheets available at: [http://www.schott.com/advanced\\_optics/downloads/optical\\_glass](http://www.schott.com/advanced_optics/downloads/optical_glass)

<sup>1</sup> Catalog value (reference annealing rate 2 K/h)

<sup>2</sup> nd reference value (annealing rate 25 K/h)

<sup>3</sup> As pressed @ SCHOTT, for details please contact SCHOTT.

<sup>4</sup> SR-J, WR-J and Abrasion Aa according to Jogis

<sup>5</sup> Value between 20–300 °C

<sup>h</sup> Also in High Transmission version available, color code 39/36

<sup>i</sup> P-PK53 will become inquiry glass as of 2014/01/01, not recommended for new designs

P-SF67 will become inquiry glass as of 2016/01/01, not recommended for new designs

N-glasses: lead & arsenic free

P-glasses: lead & arsenic free Low Tg glasses exclusively developed for precision molding

In case the optical values do not fit exactly to your applications, please get in touch with your local sales office.



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