光学ガラスカタログ 09 【Japanese】

OPTICAL GLASS 09 【English】

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光学ガラス恒数図

ｎｄ－νｄ図，ｎｅ－νｅ図，ｎｄ－1000/νｄ図

d-C/F-C －νｄ 図，g-F/F-C －νｄ 図，g-d/F-C －νｄ 図

データ改訂履歴

硝種別データ

１．光学ガラスの種類と名称

光ガラスでは，地球の環境保護の観点から鉛，砒素を全く含有しない光学ガラスを開発し，環境対策ガラス（ECO　OPTICAL GLASS）として提供しております。
従来の硝種名（原則としてショット社名称を使用）の先頭に“J-”をつける事により，改訂データの硝種を従来データの硝種と区別できるようにしました。

２．コード

コードは 6 桁の数字で表記されます。初めの 3 桁は屈折率の小数点以下 3 桁を表し，後ろの 3 桁はアッベ数の上 3 桁を表しています。例えば J-BK7 は，n_d = 1.516800, ν_d = 64.10 ですから，コード(d)は 517641 となります。本カタログでは，“n_d”と“ν_d”から成る“コード(d)”と，“n_e”と“ν_e”から成る“コード(e)”を併記しています。

３．光学的性質

（１）屈折率 n

屈折率は，表 1 の 21 のスペクトルに対して，可視域（ｉ～A’）は小数点以下 6 桁，赤外域（s～2 μm）は 5 桁の数値で表示してあります。掲載されている屈折率は 3.(4)項の分散曲線方程式（ベキ級数式）により計算したものです。

表 1　スペクトル

スペクトル線	光　　源	波　長　[μm]
2.058	He	2.05809
1.970	Hg	1.97063
1.530	Hg	1.529582
1.129	Hg	1.12864
1.064	Nd(YAG)レーザー	1.06414
t	Hg	1.01398
s	Cs	0.85211
A’	K	0.768195
r	He	0.706519
C	H	0.656273
C’	Cd	0.643847
He-Ne	He-Ne レーザー	0.632816
D	Na	0.589294
d	He	0.587562
e	Hg	0.546074
F	H	0.486133
F’	Cd	0.479992
g	Hg	0.435835
h	Hg	0.404656
0.389	He	0.388865
i	Hg	0.365015

（２）分散

二つのスペクトル X，Y の屈折率差ｎX－ｎY を部分分散とよびます。簡略化して X－Y と表示しています。二つの部分分散の比を部分分散比とよびます。表１のいくつかのスペクトルに関する部分分散，部分分散比を掲載しています。

アッベ数 ν_d ，ν_e は，それぞれ次式により定義されます。

$$\nu_d = \frac{n_d - 1}{n_F - n_C} \qquad \nu_e = \frac{n_e - 1}{n_{F'} - n_{C'}}$$

数値を小数点以下２桁まで表示しています。

（３）異常分散性

一般的に光学ガラスの多くは，部分分散比とアッベ数の間にほぼ直線関係が成り立ち，このような硝種を正常部分分散ガラス（ノーマルガラス）と呼んでいます。他方，この直線関係から離れた位置にある硝種は異常部分分散ガラス（アブノーマルガラス）と呼んでいます。異常分散性の大きさは，ノーマルガラスの基準となる K7 と F2 を結んで得られる標準線からの部分分散比の偏差（$\Delta P_{x,y}$）で表します。データシートには P_{dc} と P_{gF} の２種類を表示しています。

（４）分散曲線方程式

データシートに記載されていない任意波長λに対する屈折率は，分散曲線方程式を利用して算出することが出来ます。一般に分散曲線方程式はいくつかありますが，このカタログでは次式で表される分散曲線方程式を採用しています。

$$n_{(\lambda)}^{\ 2} = A_0 + A_1\lambda^2 + A_2\lambda^4 + A_3\lambda^{-2} + A_4\lambda^{-4} + A_5\lambda^{-6} + A_6\lambda^{-8} + A_7\lambda^{-10} + A_8\lambda^{-12}$$

ここで、A_0～A_8 は硝種により定まる定数で，硝種ごとに精密に測定された屈折率から最小二乗法により算出しました。

参考までに分数式の分散曲線方程式も表示します。分数式は，セルマイヤーの式と左辺が異なります。

$$\frac{n^2 - 1}{n^2 + 2} = \frac{P_1\lambda^2}{\lambda^2 - Q_1} + \frac{P_2\lambda^2}{\lambda^2 - Q_2} + \frac{P_3\lambda^2}{\lambda^2 - Q_3}$$

これら２つの分散曲線方程式のフィッティング誤差を表記しているので参考にしてください。

分散曲線方程式の適用範囲は，屈折率がデータシートに記載されている波長範囲内のみに限られます。なお，波長λの単位は[μm]を使用します。

（５）屈折率の温度係数Δｎ/ΔＴ

相対屈折率および絶対屈折率の温度係数を，－70 ℃～90 ℃，0.389 μm～1.083 μm の範囲で 20 ℃間隔で表記しています。ただし温度の両端は 10 ℃間隔です。単位を[10^{-6}/℃]で表示します。

（６）内部透過率τ

内部透過率は，表面反射による損失を含まない透過率です。このカタログでは，280 nm～2400 nm までの波長範囲について，厚さ 10 mm 当たりの内部透過率を表記してあります。i 線（365 nm）の透過率も表示しています。また，このカタログでは，内部透過率が 80%と 5%を示すときの波長を“内部透過”として表示しました。例えば，内部透過率が 80%を示すときの波長が 321 nm，5%を示すときの波長が 286 nm のときは，321/286 のように表記されます。

（７）着色度 CC （JOGIS 02-2003）

着色度は，厚さ 10 mm の表面反射を含む分光透過率曲線において，全透過率 80%を示す波長と 5%を示す波長をそれぞれ 10 nm の単位で表記してあります。例えば，全透過率 80%及び 5%を示す波長がそれぞれ 332 nm，286 nm のガラスは，33/29 のように表記されます。なお，ne が 1.85 以上の高屈折率硝種に関しては，反射損失が大きいため 80%の代わりに 70%の透過率を示す波長を表記しました。

４．化学的性質

（１）表面法耐酸性 AR(S)

新鮮な研磨面を持つ試料を 30℃，pH4.6，pH5.9，pH6.8 の緩衝溶液中で浸漬処理し，研磨表面がうすいアンバー色の干渉色を呈するまでの時間を測定して次表に従い分類表記してあります。

表 2　表面法耐酸性

級	1	2	3	4	5	6	7
pH4.6	60 分以上	12 分以上 60 分未満	12 分未満				
pH5.9			60 分以上	12 分以上 60 分未満	12 分未満		
pH6.8					60 分以上	12 分以上 60 分未満	12 分未満

（２）耐洗剤性 PR(S) （ISO 9689:1990）

新鮮な研磨面を持つ試料を 50 ℃の 0.01 mol/l トリポリリン酸ナトリウム水溶液で浸漬して，ガラスが 0.1 μm 浸食されるのに要する時間を測定し，次表に従い分類表記してあります。

表 3　耐洗剤性

級	1	2	3	4
0.1 μm 浸食するのに要する時間 [h]	4 以上	1 以上 4 未満	0.25 以上 1 未満	0.25 未満

（３）耐候性 CR(S) （JOGIS 07-2006）

新鮮な研磨面を持つ試料を，57.5 ℃で 50 分，64 ℃で 50 分保持し，これを連続して 24

サイクル 48 時間繰り返し，発生した曇りをヘーズメータでヘーズを測定し，次表により分類表記してあります。

表 4　耐候性

級	1	2	3	4	5
ヘーズ	2%未満	2%以上 10%未満	10%以上 20%未満	20%以上 30%未満	30%以上

（４）粉末法耐水性 WR(P)　(JOGIS 06-1999)

粉砕されたガラスの比重グラムを白金製カゴに入れ，フラスコ内の純水（pH 6.5～7.5）80 ml 中に浸して沸騰水中で 60 分間加熱し，120 ℃にて乾燥後秤量し，その減量パーセントで次表に従い分類表記してあります。

表 5　粉末法耐水性

級	1	2	3	4	5	6
減量率 [mass%]	0.05 未満	0.05 以上 0.10 未満	0.10 以上 0.25 未満	0.25 以上 0.60 未満	0.60 以上 1.10 未満	1.10 以上

（５）粉末法耐酸性 AR(P)　(JOGIS 06-1999)

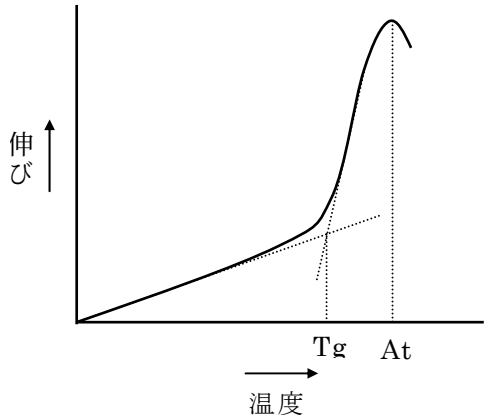
粉末法耐水性試験と同一の装置方法で 0.01 N 硝酸水溶液 80 ml を用い，その減量パーセントで次表に従い分類表記してあります。

表 6　粉末法耐酸性

級	1	2	3	4	5	6
減量率 [mass%]	0.20 未満	0.20 以上 0.35 未満	0.35 以上 0.65 未満	0.65 以上 1.20 未満	1.20 以上 2.20 未満	2.20 以上

５．熱的性質

ガラスの熱間加工や熱処理する際に必要な熱的性質として，転移点 Tg，屈伏点 At および高温と常温での平均線膨張係数 α を記載しました。Tg，At，高温 α は，十分に徐冷された長さ 50 mm, 直径 4 mm の試料を，毎分 4 ℃で昇温加熱したときに得られた，温度と試料の伸びの関係を示した膨張曲線（図 1 参照）から求めます。常温 α は，加熱・冷却可能な装置で 2 温度間の膨張を測定します。



<図 1> 膨張曲線

（１）転移点 Tg　(JOGIS 08-2003)

転移点は図 1 に示すように，熱膨張曲線における 2 つの直線部分を延長した交点に対応する温度[℃]で表示してあります。

（２）屈伏点 At　(JOGIS 08-2003)

屈伏点は図 1 に示すように，熱膨張曲線におけるピーク点で，その温度[℃]で表示してあります。

（３）平均線膨張係数 α　(JOGIS 08-2003, JOGIS 16-2003)

常温（－30 ℃～70 ℃）および高温（100 ℃～300 ℃）における平均線膨張係数を[10^{-7}/℃]の単位で表示してあります。

（４）熱伝導率 λ，比熱 c，熱拡散率 κ

室温における熱伝導率[W/(m･K)]，比熱[10^{3} J/(kg･K)]，熱拡散率[10^{-6} m^2/sec]を表示してあります。熱伝導率は，比熱と熱拡散率より関係式で求めました。

６．機械的性質

（１）摩耗度 A　(JOGIS 10-1994)

30×30×10 ｍｍの大きさの試料を水平に毎分 60 回転する鋳鉄製平面皿（φ250 ｍｍ）の中心から 80 ｍｍの定位置にのせ，9.8 Ｎの荷重をかけながら＃800（平均粒度 20 μｍ）のラップ剤 10 ｇを水 20 ｍｌに添加した研磨液を 5 分間一様に供給して摩耗させ，ラップ前後の試料重量を測定し摩耗質量 W を求めます。また，同様にして標準試料の摩耗質量 W_0 を求め，次式によって算出した値を表示してあります。

$$A=\frac{W/S}{W_0/S_0}\times 100$$

ここで，S，S_0 は試料および標準試料の比重を表します。

（２）ヌープ硬さ Hk　(JOGIS 09-1975)

平面研磨されたガラス面に対稜角が 172°30′と 130°のダイヤモンド四角錐圧子（ヌープ圧子）に 0.98 Ｎの荷重を 15 秒間かけてくぼみをつけ，次式により算出してあります。

$$(\text{ヌープ硬さ})=\frac{1.451F}{l^2}$$

ここで、F は荷重[N]，l はくぼみの長い方の対角線の長さ[ｍｍ]です。
このカタログには，測定値と測定値から次表により分類した級とを表示してあります。

表 7　ヌープ硬さ

級	1	2	3	4	5	6	7
ヌープ硬さ	150 未満	150 以上 250 未満	250 以上 350 未満	350 以上 450 未満	450 以上 550 未満	550 以上 649 未満	650 以上

（３）弾性率

ヤング率 E，剛性率 G は，超音波を用い，5 MHz の縦波速度（Vl）と 2 MHz の横波速

度（Vs）を測定し，それぞれ次式により算出します。数値は，[10^9 Pa]単位で表記します

$$G = V_s^{\,2} \cdot \rho$$

$$E = \frac{4G^2 - 3G \cdot V_l \cdot \rho}{G - V_l \cdot \rho}$$

ここで，ρはガラスの密度です。
ポアソン比μは，ヤング率と剛性率から，次式により求めます。

$$\mu = \frac{E}{2G} - 1$$

（４）光弾性定数β

光学ガラスは，通常光学的に等方性ですが，応力が存在すると複屈折性を示すようになります。光弾性定数βとは，応力Fと複屈折による光路差δとの関係を表す定数で，ガラスの厚さをdとすると，

$$\delta = \beta \cdot d \cdot F$$

の関係があります。このカタログでは，[10^{-5} nm/cm／Pa]の単位で表示してあります。

７．その他の性質

（１）比重 SG （JOGIS 05-1975）

比重は，4 ℃における同定積の純水に対する質量比で，小数点以下 2 桁まで表示してあります。よくアニールされた試料を，いわゆるアルキメデス法によって測定します。空気の浮力による補正は行なっていません。

（２）泡・異物

光学ガラスでは全く泡のないものをつくる事は極めて困難です。泡は，ガラス 100 ml 中における断面積の総和として表示されます。また，結晶や節のような異物などがある場合も，泡と同様とみなし，泡の断面積の総和に加算してあります。なお，この分類は泡及び異物の直径または最大径が 0.03 mm 以上のものを対象としております。

表 8　泡・異物等級

級	1	2	3	4	5
100 ml 中の泡の 断面積の総和[mm²]	0.03 未満	0.03 以上 0.10 未満	0.10 以上 0.25 未満	0.25 以上 0.50 未満	0.50 以上

８．品質保証

（１）屈折率およびアッベ数

ファインアニールされた製品の屈折率及びアッベ数はこのカタログの値に対し通常次の公差に入っています。

nd ： ±500×10^{-6}

νd ： ±0.8%

特別なご要望に対しましては

n_d ：±200×10^{-6}

ν_d ：±0.3%

の公差にも応じます。納品に際しましては，C，d，F，g の各スペクトル線に対する小数点以下 6 桁までの屈折率，及びこれより求めた小数点以下 2 桁までの ν_d 値を添付いたします。その他の光学恒数規格が必要な場合には，別途ご相談ください。

（２）歪（JOGIS 14-1975）

歪はガラス内部の残留応力によって生じた複屈折によるガラス厚さ 1 cm 当たりに生ずる光路差を次表により分類表記します。

表 9　歪等級

級	1	2	3	4
歪量 [nm/cm]	5 未満	5 以上 10 未満	10 以上 20 未満	20 以上

（３）脈理

JOGIS 11-1975 に定められ標準試料との比較検査にて次表の等級に格付けしています。

表 10　脈理等級

級	脈理の程度
1	認められないもの
2	標準試料Ｂ（薄くて分散した脈理で目に見える限界のもの）と同程度のもの
3	標準試料Ｃ（研磨面に対して垂直な方向と平行な脈理がわずかにあるもの）と同程度のもの

（４）泡・異物

各メルトごとに試料をとり，７．(2) 項に従ってその中に含まれる泡・異物の断面積の総和を算出して，等級を決めています。

（５）着色度

カタログに示された着色度を基準に，±1 の変動幅で管理しています。特にご要望があれば，納入メルトの着色度もしくは必要な波長範囲の分光透過率を測定してお知らせいたします。

９．製品区分

（１）ブロック品

幅・長さ・厚さ・形状等は，別途ご相談下さい。

（２）プレス品

ガラス材料を再加熱成型したプレス品です。プレス品の加工公差は表 11 の通りですが，特別の寸法公差を必要とする場合にはご相談に応じます。なお，ご注文の際には研磨取代を含んだ直径，中心肉厚，及び曲率の寸法をご指示下さい。

表 11　プレス製品寸法と加工公差

外径寸法[mm]	外径公差[mm]	肉厚公差[mm]
φ 12 未満	±0.10	±0.4
φ12 以上 ～ 40 未満	±0.15	±0.3
φ40 以上 ～ 60 未満	±0.20	±0.3
φ60 以上 ～ 90 未満	±0.25	±0.3
φ90 以上 ～ 150 未満	±0.40	±0.4
φ150 以上 ～ 300 未満	±0.50	±0.5

（３）丸棒切断品

丸目加工により外径を仕上げた後切断したものです。プレス品より寸法精度が良い為，外径はそのまま使用することが可能です。

表 12　丸棒切断製品寸法と加工公差

製品寸法[mm]	外径公差[mm]	肉厚公差[mm]
φ3～25	±0.05	±0.15

（４）その他の特殊形状品

指定寸法の丸目品、及び特殊形状品、指定重量の切断品、ＣＧ加工品なども取り扱っております。

１０．生産頻度

生産頻度は生産量，生産方法，硝種により異なりますが，以下のように大別されます。

A：生産頻度が非常に高い

B：生産頻度が高い

C：生産頻度が低い

D：生産頻度が特に低い

E：今後廃止の可能性が高い

F：新規見積もり不可

Contents

1. Optical glass designation

To help safeguard Earth's ecology, HIKARI GLASS has developed a line of glass called ECO OPTICAl GLASS which is entirely free from lead(Pb) and arsenic(As).
A "J-" is prefixed to the SCHOTT glass type to indicate an updated version of glass.

2. Optical glass code

Each glass type has a code of 6 digits. The initial 3 digits are the first three decimal places of the refractive index rounded up to the third decimal place. The latter 3 digits are the first three digits of the Abbe number rounded up to the first decimal place. For example, the glass code for J-BK7 (n_d 1.516800 and v_d 64.10) is expressed as 517641. The optical glass codes for both d- and e-lines are included in each data sheet.

3. Optical properties

3.1 Refractive index (n)

Refractive indices in the visible and infrared range are listed to the sixth and fifith decimal places, respectively, in each data sheet at the spectral lines given in Table 1. The refractive indices are calculated using the power series dispersion formula expressed in 3.4.

Table 1. Spectrum

Spectral line symbol	Light source	Wavelength [μm]
2.058	He	2.05809
1.970	Hg	1.97063
1.530	Hg	1.529582
1.129	Hg	1.12864
1.064	Nd(YAG) LASER	1.06414
t	Hg	1.01398
s	Cs	0.85211
A'	K	0.768195
r	He	0.706519
C	H	0.656273
C'	Cd	0.643847
He-Ne	He-Ne LASER	0.632816
D	Na	0.589294
d	He	0.587562
e	Hg	0.546074
F	H	0.486133
F'	Cd	0.479992
g	Hg	0.435835

Table 1. Spectrum (Continued)

Spectral line symbol	Light source	Wavelength [μm]
h	Hg	0.404656
0.389	He	0.388865
i	Hg	0.365015

3.2 Dispersion

"Partial dispersion" is defined as the difference between two associated refractive indices, nX-nY, with two different spectra. For simplicity X-Y is used in place of nX-nY. "Relative partial dispersion" is defined as the ratio of two partial dispersions. Several partial dispersions and relative partial dispersions concerning spectra in Table 1 are listed in each data sheet.

Abbe numbers ν_d and ν_e are defined as:

$$\nu_d = \frac{n_d - 1}{n_F - n_C} \qquad \nu_e = \frac{n_e - 1}{n_{F'} - n_{C'}}$$

Both Abbe numbers are listed to the second decimal place. Reciprocal of the Abbe number is included in the excel file only.

3.3 Abnormal dispersion (ΔP)

In a diagram of relative partial dispersion versus Abbe number, the glass types that are clustered linearly are called "normal partial dispersion glass (normal glass)." Glass types that fall away from the linear cluster are called "abnormal partial dispersion glass (abnormal glass)." The deviation of the relative partial dispersion from the straight line between glass types K7 and F2 are listed in the data sheet as the degree of abnormalness (ΔP_{dC}, ΔP_{gF}).

3.4 Dispersion formula

The refractive indices for the wavelengths not listed in the data sheet can be calculated by using a dispersion formula. Generally several formulae are used to express the dispersion curve. For all data sheets, the dispersion formula with the smallest fitting error is utilized and shown below:

$$n_{(\lambda)}{}^2 = A_0 + A_1\lambda^2 + A_2\lambda^4 + A_3\lambda^{-2} + A_4\lambda^{-4} + A_5\lambda^{-6} + A_6\lambda^{-8} + A_7\lambda^{-10} + A_8\lambda^{-12}$$

Constants, A_0 to A_8, are determined by using the method of least squares from precisely measured refractive indices.

Another dispersion formula is shown below, which is nearly the same formula as that of Sellmeier. Since the Sellmeier formula is widely used in the theoretical field, a formula nearly eqiuvalent to the Sellmeier formula, is included in each data sheet and is shown below:

$$\frac{n^2-1}{n^2+2}=\frac{P_1\lambda^2}{\lambda^2-Q_1}+\frac{P_2\lambda^2}{\lambda^2-Q_2}+\frac{P_3\lambda^2}{\lambda^2-Q_3}$$

Fitting errors of the two formulae above are listed for reference.
The applicable spectral range of the dispersion formula is limited to the range where refractive index data are given. Please note that wavelength λ is expressed in μm.

3.5 Temperature coefficient of the refractive index (Δn/ΔT)

Temperature coefficients of the relative refractive index and of the absolute refractive index are listed at a temperature range from -70 °C to 90 °C and spectral range from 389 nm to 1083 nm. It should be noted that a 10 °C interval is used at the beginning and end of the temperature range, while a 20 °C interval is used in between -60 °C to 80 °C. The coefficients are expressed as 10^{-6}/°C.

3.6 Internal transmittance (τ)

Internal transmittance is the value of transmittance that excludes losses from surface reflections. Data for glass with a 10 mm thickness are listed in the spectral range from 280 nm to 2400 nm. Please note that i-line data for 365 nm is included in the data sheet. The HIKARI GLASS Internal Color Code (Internal CC) is derived by linking together the wavelengths observed at 80% and 5% internal transmittance, respectively, for a given type of glass with a thickness of 10 mm. For instance, a glass whose internal transmittance is 80% at a wavelength of 321 nm and 5% at a wavelength of 286 nm is expressed as 321/286.

3.7 Coloring (JOGIS 02-2003)

The Color Code (CC) is derived by linking together the first two digits, rounded to the second digit, of the wavelengths observed at 80% and 5% total transmittance, respectively, for a given type of glass with a thickness of 10 mm. For instance, the CC of a glass whose total transmittance is 80% at a wavelength of 332 nm and 5% at a wavelength of 286 nm is 33/29. For a glass with a high refractive index, whose n_e value is higher than 1.85, 70% transmittance is used in place of 80% transmittance.

4. Chemical properties

4.1 Acid resistance by surface method (AR(S))

To test the acid resistance of a glass sample using the surface method, a freshly polished surface of the sample is immersed in a set of buffer solutions with pHs of 4.6, 5.9, and 6.8 at 30 °C until a slight amber interference color appears on the surface. Acid resistance is classified by the time it takes for the appearance of the interference color as denoted in Table 2.

Table 2. Acid resistance by surface method

Class	1	2	3	4	5	6	7
pH 4.6	60 min <	12 min < ≦ 60 min	≦ 12 min				
pH 5.9			60 min <	12 min < ≦ 60 min	≦ 12 min		
pH 6.8					60 min <	12 min < ≦60 min	≦12 min

4.2 Alkaline detergent resistance by surface method (PR(S)) (ISO 9689:1990)

To test the alkaline detergent resistance of a glass sample using the surface method, a freshly polished surface of the sample is immersed in a solution of 0.01 mol/l sodium tripolyphosphate at 50 °C for the specified amount of time and measured for weight loss. Alkaline detergent resistance is classified according to the time taken to dissolve 0.1 µm as denoted in Table 3.

Table 3. Alkaline detergent resistance by surface method

Class	1	2	3	4
Time to dissolve 0.1 µm [h]	4 <	1 < ≦ 4	0.25 < ≦ 1	≦ 0.25

4.3 Climate resistance by surface method (CR(S)) (JOGIS 07-2006)

To measure the climate resistance of a glass sample using the surface method, a freshly polished surface of the sample is incubated in consecutive humid water baths for 50 min each at 57.5 °C and 64 °C respectively. The process is repeated for 24 cycles over a span of 48 h. Any haze that appears on the glass surface is then measured and converted into a percentage using a hazemeter. Climate resistance is classified according to the haze% as denoted in Table 4.

Table 4. Climate resistance by surface method

Class	1	2	3	4	5
Haze%	< 2	2 ≦ < 10	10 ≦ < 20	20 ≦ < 30	30 ≦

4.4 Water resistance by powder method (WR(P)) (JOGIS 06-1999)

To determine the water resistance of a glass sample using the powder method, the sample to be tested is ground into powder, weighed to an amount equivalent to the number of the sample's specific gravity [g], and placed into a platinum basket, immersed into 80 ml of distilled water (pH 6.5-7.5) and boiled for 60 min. The boiled powder is then dried at 120 °C and measured for weight loss. Water resistance is classified by the percentage of glass weight loss as denoted in Table 5.

Table 5. Water resistance by powder method

Class	1	2	3	4	5	6
Weight loss [mass %]	< 0.05	0.05 ≦ < 0.10	0.10 ≦ < 0.25	0.25 ≦ < 0.60	0.60 ≦ < 1.10	1.10 ≦

4.5 Acid resistance by powder method (AR(P)) (JOGIS 06-1999)

The same protocol is employed as in 4.4 to measure the acid resistance of a glass sample using the powder method, except that 80 ml of 0.01 N solution of nitric acid is substituted in place of distilled water. Acid resistance is classified by the percentage of glass weight loss as denoted in Table 6.

Table 6. Acid resistance by powder method

Class	1	2	3	4	5	6
Weight loss [mass %]	< 0.20	0.20 ≦ < 0.35	0.35 ≦ < 0.65	0.65 ≦ < 1.20	1.20 ≦ < 2.20	2.20 ≦

5. Thermal properties

Thermal properties are essential to processing optical glass for annealing and heat treatment. The temperature of the transformation point (Tg), yield point (At), and the mean linear coefficient of thermal expansion (α) are derived from the thermal expansion curve shown in Fig.1.

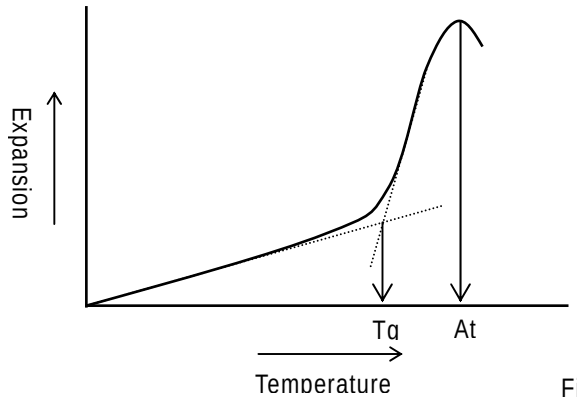


Fig. 1. Thermal expansion curve.

5.1 Transformation point (Tg) (JOGIS 08-2003)

The transformation point is denoted as the intersecting point of the two straight dotted lines shown in Fig. 1. Tg is expressed in °C.

5.2 Yield point (At) (JOGIS 08-2003)

The point at the peak of the thermal expansion curve is known as the yield point and is expressed in °C.

5.3 Coefficient of linear thermal expansion (CTE, α) (JOGIS 08-2003, JOGIS 16-2003)

Two coefficients of linear thermal expansion are included in each data sheet. One coefficient is utilized for the temperature range between -30°C.and 70°C, while the other is used for the temperature range between 100 °C and 300 °C. The former originates from a HIKARI GLASS designed instrument that measures thermal expansion, while the latter is derived from Fig. 1. Both coefficients are expressed as 10^{-7} /°C.

5.4 Heat conductivity (λ), specific heat capacity (c), and thermal diffusivity (κ)

The heat conductivity, specific heat capacity, and thermal diffusivity of each glass sample at room temperature are listed and expressed in the data sheets as W/(m·K), 10^3 J/(kg·K), 10^{-6} m²/s respectively. Heat conductivity is derived from the relationship below, where ρ is the density of the glass.

$$\lambda = \rho \cdot \kappa \cdot c$$

6. Mechanical properties

6.1 Abrasion hardness (A) (JOGIS 10-1994)

To determine the abrasion hardness of a glass sample, a 30 mm x 30 mm x 10 mm piece of the sample is placed on a cast iron abrasing plate with a diameter of Φ 250 mm that revolves at 60 rpm and is lapped for 5 min at a load of 9.8 N in lapping liquid with abrasives #800. The abraded weight is then measured and used to obtain the abrasion hardness. The abrasion hardness is defined as the ratio of the volume of the abraded sample vs. a standard sample abraded in the same manner.

$$A = \frac{W/S}{W_0/S_0} \times 100$$

6.2 Knoop hardness (Hk) (JOGIS 09-1975)

To measure the Knoop hardness of a glass sample, a polised surface of the sample is indented with a diamond rhombic pyramid knoop indenter (vertex angles: 172°30' and 130°) under a load of 0.98 N for 15 s. The Knoop hardness is calculated by the following formula:

$$(Knoop \quad hardness) = \frac{1.451F}{l^2}$$

where F [N] denotes the applied load and l [mm] is the length of the longer indented diagonal line. In each data sheet, the measured value and the corresponding classified grade are denoted in Table 7.

Table 7. Knoop hardness

Class	1	2	3	4	5	6	7
Knoop hardness	< 150	150 ≦ < 249	250 ≦ < 349	350 ≦ < 449	450 ≦ < 549	550 ≦ < 649	650 ≦

6.3 Modulus of elasticity (E, G, and μ)

Young's modulus (E) and shear modulus (G) are derived from the following formulae by measuring the velocities of the 5 MHz longitudinal wave (V_l), and the 2 Hz transverse wave (V_s). Both moduli are expressed as 10^9 Pa.

$$G = V_s^{\,2} \cdot \rho$$

$$E = \frac{4G^2 - 3G \cdot V_l \cdot \rho}{G - V_l \cdot \rho}$$

Poison's ratio (μ) is derived from the following formula:.

$$\mu = \frac{E}{2G} - 1$$

6.4 Stress optical coefficient (ß)

Optical glass is ordinarily optically isotropic. However, birefringence appears if stress is applied to the glass. The stress optical coefficient (ß) relates the birefringence (δ) to the stress (F) and is expressed below, where d is the thickness of the glass.

$$\delta = \beta \cdot d \cdot F$$

ß is expressed as (nm/cm)/10^5 Pa.

7. Other properties

7.1 Specific gravity (SG) (JOGIS 05-1975)

Specific gravity of glass is defined as the ratio of glass weight to pure water at 4 °C. Well-annealed glass is used as a test piece and is measured using the Archimedes method. A correction for the buoyancy of air is ignored.

7.2 Bubbles and inclusions

It is extremely difficult to make optical glass completely free of bubbles. Bubbles are measured by their sum total in a cross sectional area per 100 ml of glass. It should be noted that some inclusions in the glass are opticaly identified with the bubbles and are accordingly counted and added to the cross sectional total. Only bubbles and inclusions with a diameter greater than 0.03 mm are subject to classification and are denoted in Table 8.

Table 8. Bubbles and inclusions

Class	1	2	3	4	5
Total cross sectional area per 100 ml of glass [mm²]	< 0.03	0.03 ≦ < 0.10	0.10 ≦ < 0.25	0.25 ≦ < 0.50	0.50 ≦

8. Quality control

8.1 Refractive index and Abbe number

The refractive index and Abbe number of finely annealed glass are typically within the following tolerances:

n_d : ± 500 x 10^{-6}

v_d : ± 0.8 %

Upon request, we can supply glass to the following tolerances:

n_d : ± 200 x 10^{-6}

v_d : ± 0.3 %

Our melt certification contains the refractive indices for the C, d, F, and g spectral lines. Please consult us if you have any special requests for additional spectral lines.

8.2 Birefringence (JOGIS 14-1975)

Birefringence is graded according to the following table specified by JOGIS.

Table 9. Birefringence grade

Class	1	2	3	4
Birefringence [nm/cm]	< 5	5 ≦ < 10	10 ≦ < 20	20 ≦

8.3 Striae

The striae grade is determined by comparing the glass sample with the standard sample specified by JOGIS 11-1975 and is denoted in Table 10:

Table 10. Striae grade

Class	Degree of Striae
1	No visible striae
2	Standard degree B (Striae is light and scattered)
3	Standard degree C (Slight striae exist in vertical direction of polished face)

8.4 Bubbles and inclusions

Quality control grading for bubbles and inclusions is determined by measuring several samples from each melt as stated in 7.2.

8.5 Coloring

Since it is hard to avoid color variation among each glass melt, we have listed the

average color code value, generally within a ± 1 range of variation, in each data sheet. On special request, we shall report the coloring of the glass to be supplied by measuring the spectral transmission in the necessary range of wavelength.

9. Forms of supply

9.1 Glass block (slab glass)

Please contact us about the required width, length, thickness, and shape of glass.

9.2 Pressings

Pressings are blanks formed by manually/automatically pressing softened glass in a mold. The tolerances of our pressings are shown in Table 11. Specified pressed blanks can be manufactured to the customer's own tolerances. We request the customer to specify the pressed blank size including an allowance for grinding of the diameter, center thickness, and curvature when placing orders.

Table 11. Pressings blank dimension and tolerances

Outer Diameter [mm]	Tolerance of OuterDiameter [mm]	Tolerance of Thickness[mm]
< Φ 12	± 0.10	± 0.4
Φ 12 to Φ 40	± 0.15	± 0.3
Φ 40 to Φ 60	± 0.20	± 0.3
Φ 60 to Φ 90	± 0.25	± 0.3
Φ 90 to Φ150	± 0.40	± 0.4
Φ150 to Φ300	± 0.50	± 0.5

9.3 Round cut rod

Round cut rod are formed from cutting a precise ground rod into individual cut blanks. Since its dimensional accuracy is better than that of pressings, the outer diameter can most likely be used left intact. These blanks are excellent for small diameter/tight tolerance requirements.

Table 12. Rod cut size and tolerance

Rod Dimension [mm]	Tolerance of OuterDiameter [mm]	Tolerance of Thickness [mm]
3 to Φ 25	± 0.05	± 0.15

9.4 Other specified products

Cut glass according to the customer's specified dimensions, specified form pressings (moldings), and CG processing are all available.

10. Product frequency

Pdoduct frequency depends upon the glass type, volume, and production method of the optical glass.

A: Very high frequency of production.

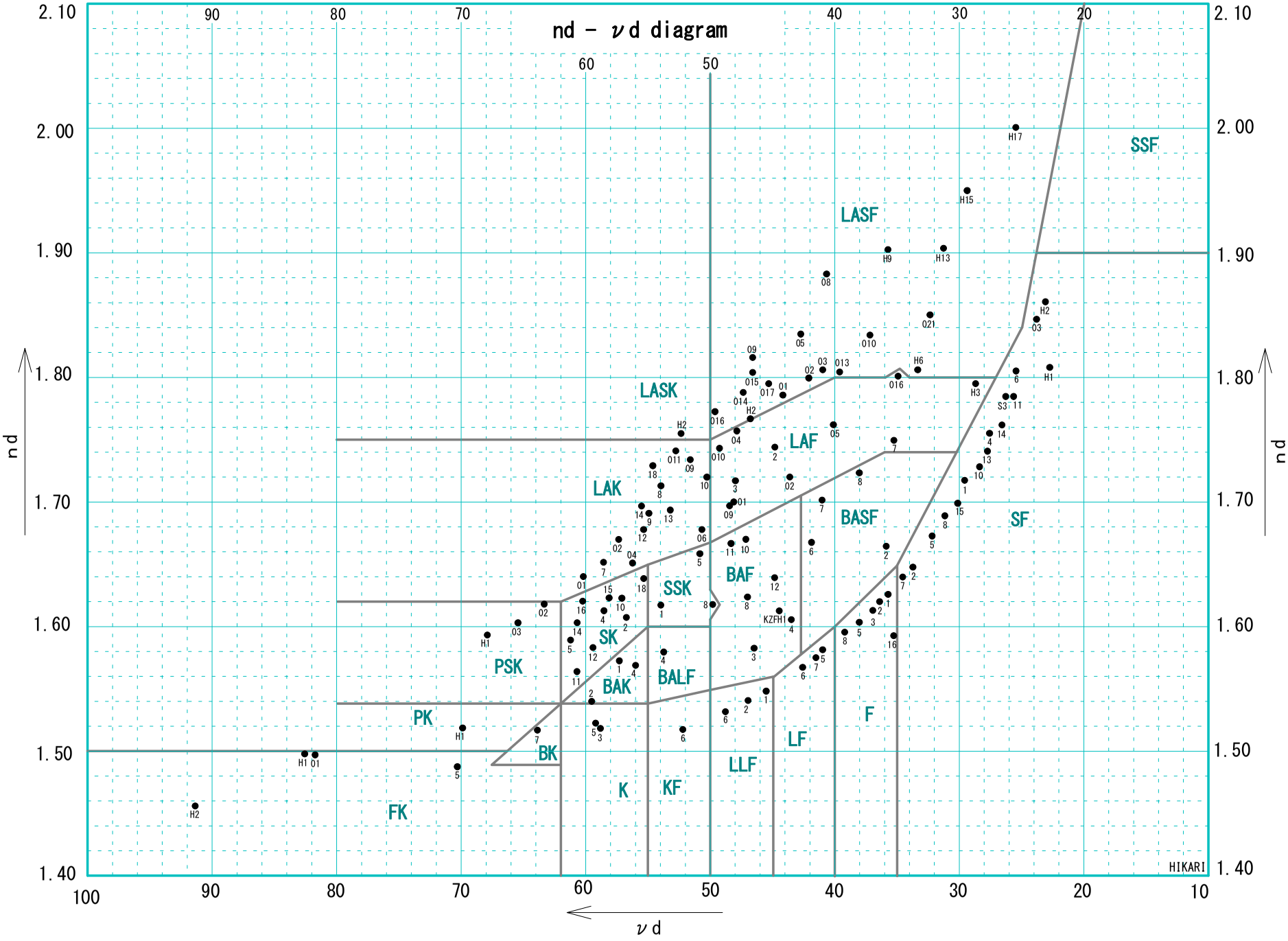
B: High frequency of production.

C: Low frequency of production.

D: Very low frequency of production.

E: High possibility of production stoppage.

F: No making an estimate.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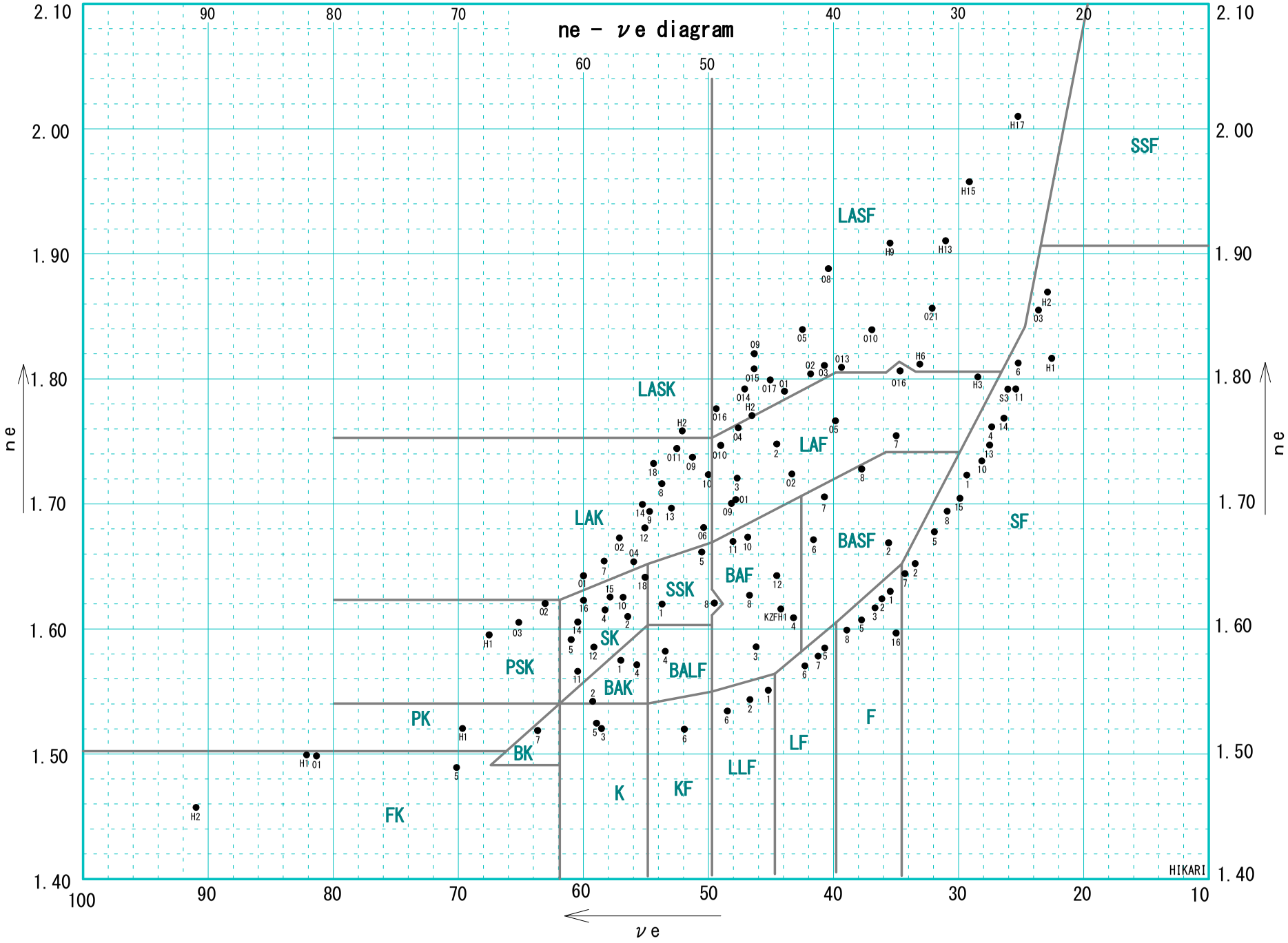
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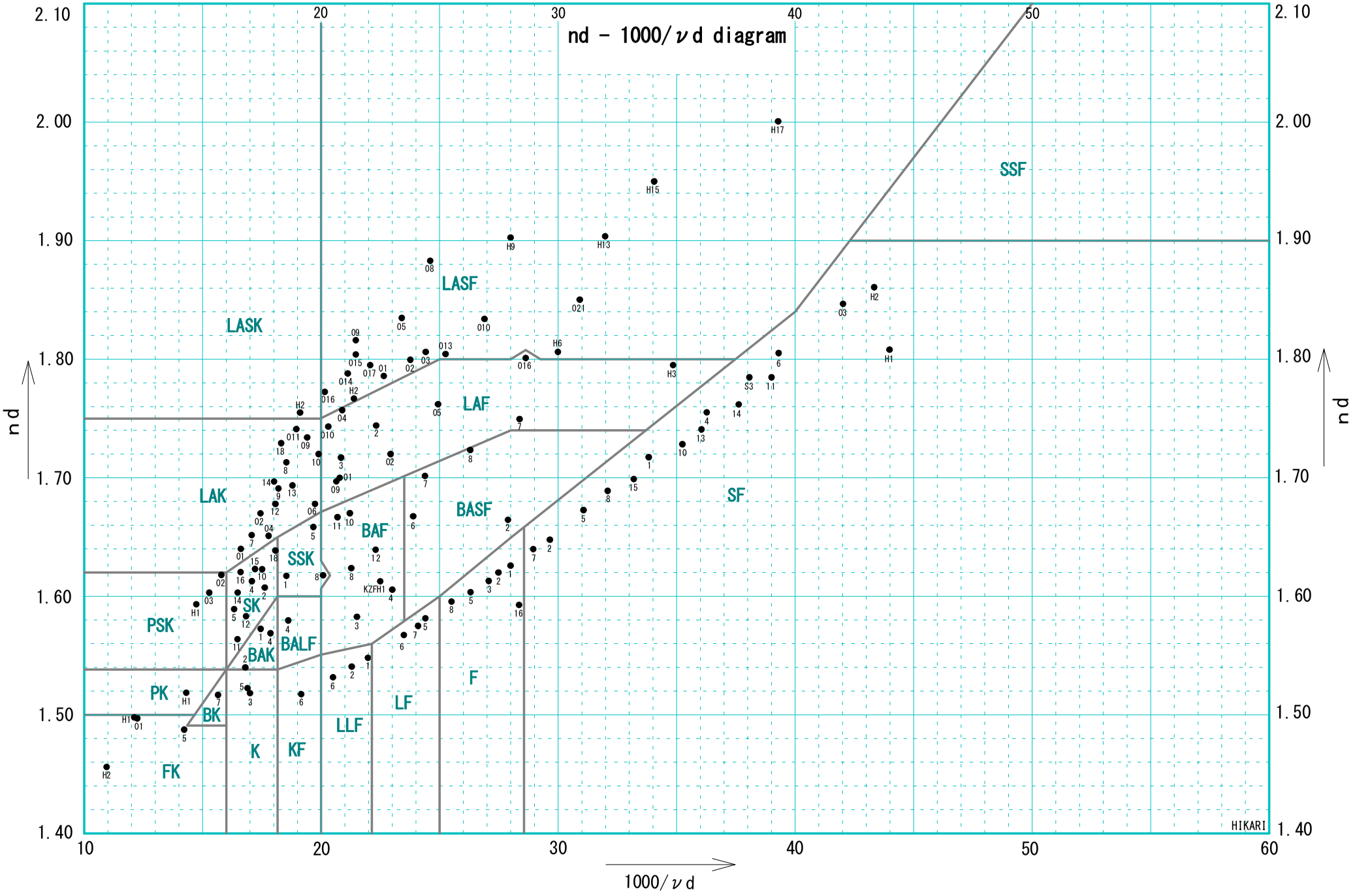
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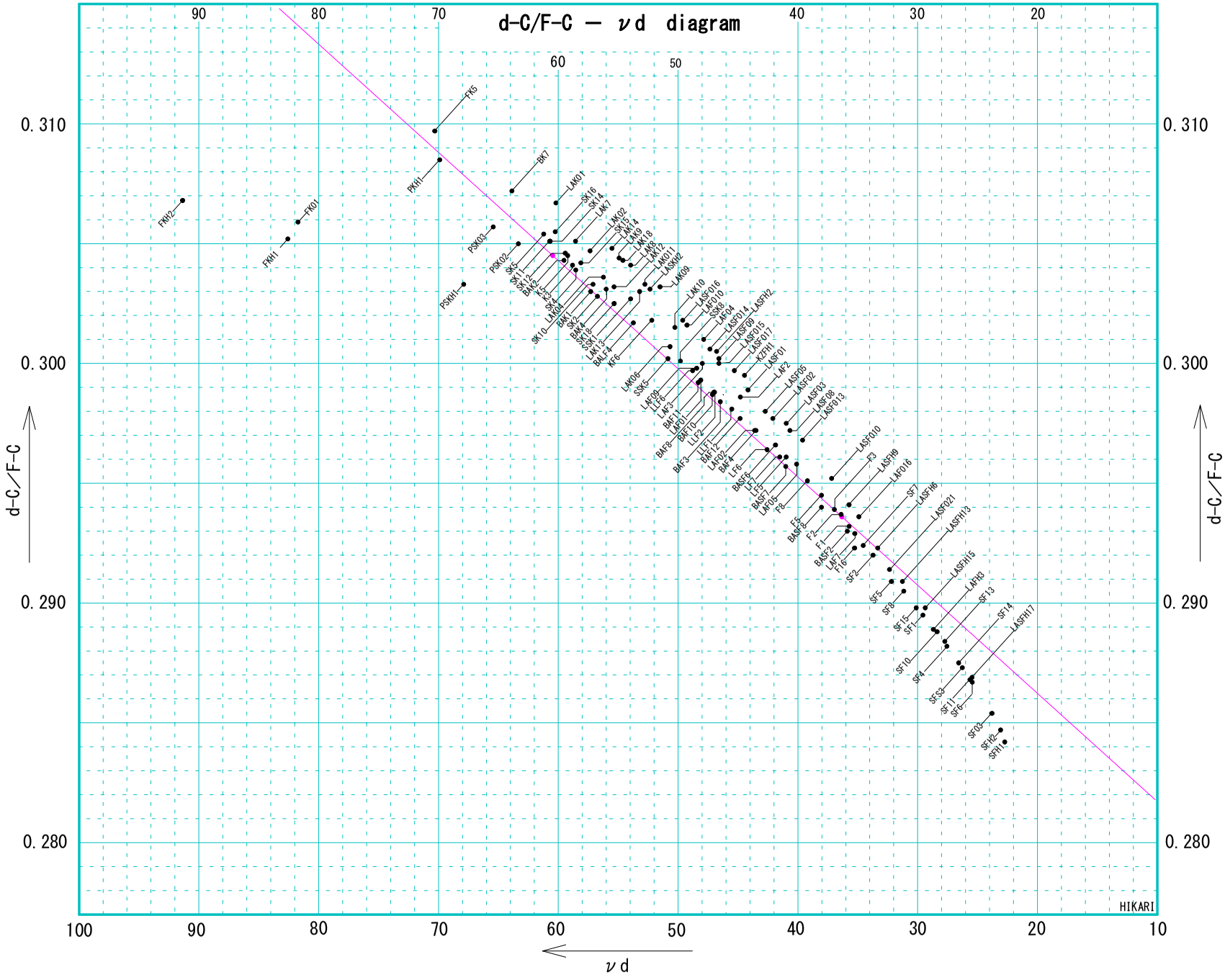
d-C/F-C — νd diagram
d-C／F-C
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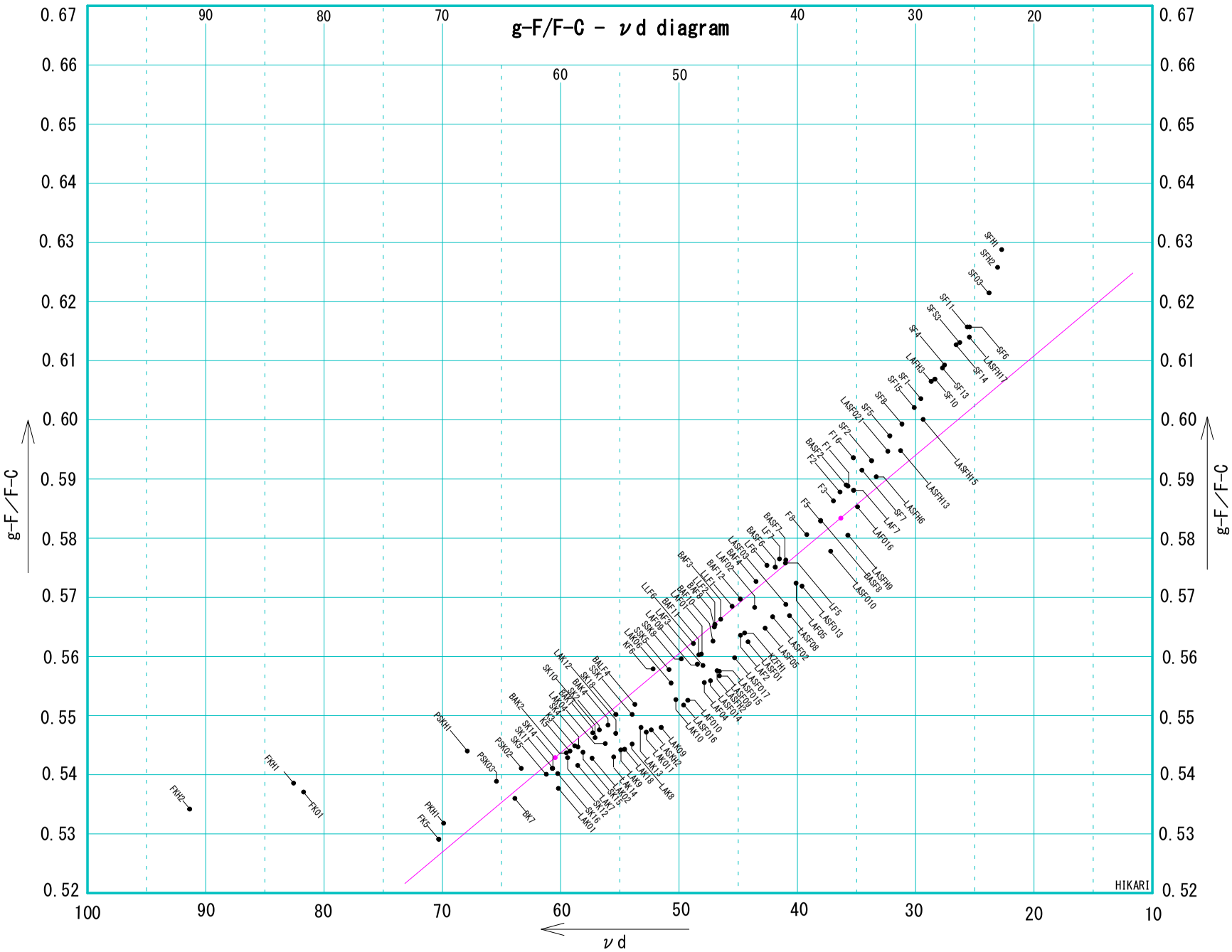
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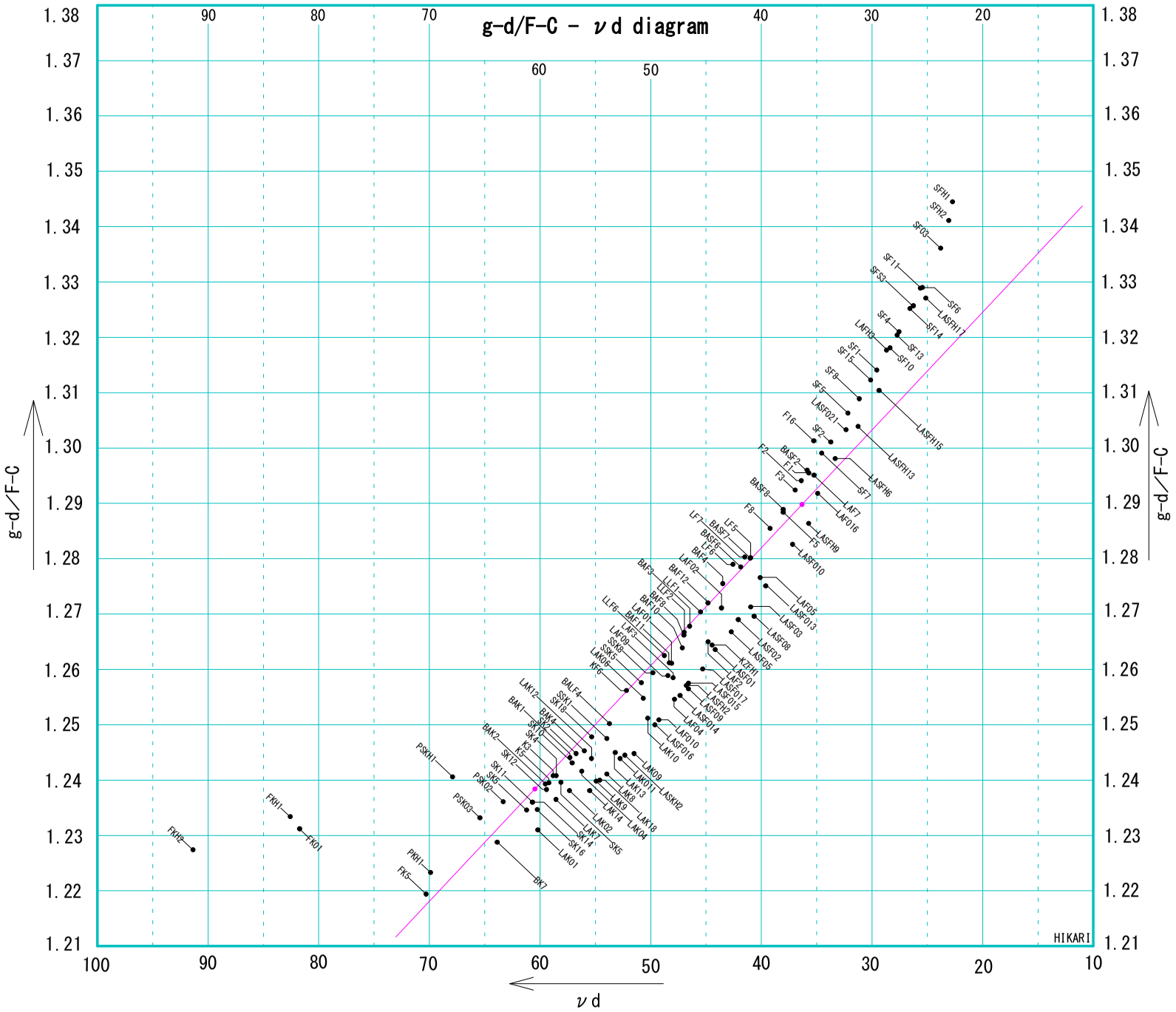
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LAF03
LLF6
BAF10
LASF08
LAF01
BAF1
LASF02
LAF09
LASF05
SSK6
LAK03
KZFH1
SSK5
LASF01
KF6
LAF017
LASF015
LAK12
BALF4
LASFH12
SSK1
LASF09
SK18
LASF014
BAK1
LAF04
BAK4
LAF010
SK10
LASF016
SK4
BAK2
LAK10
K3
SK12
PSKH1
LAK09
SK11
LAKH1
LASKH2
SK5
PSK02
LAK13
PSK03
LAK9
LAK18
LAK14
LAK04
LAK02
LAK7
SK14
SK5
SK16
LAK01
FKH2
FKH1
FK01
PKH1
FK5
BK7

データ改訂履歴

年／月／日	硝種	内　　容
2009/9/1	09版カタログ発行	(1)物性値追加・修正, (2)硝種名変更(″J-″), (3)6硝種廃止(E-SSFH1, E-LAKH1, E-LAF11, E-LAFH2, E-LASF04, E-LASFH10)

注）データは予告なく変更されることがあります

Revision history of data

M/D/Y	Glass type	Note
9/1/09	Release 09 version catalog	(1)Addition and correction of data, (2)changing the name of all glass types ("J-"), (3)obsoleting six glass types (E-SSFH1, E-LAKH1, E-LAF11, E-LAFH2, E-LASF04, E-LASFH10)

Note : Data are subject to change without prior notice.

J-FK5

nd = 1.487490　　ne = 1.489145

νd = 70.31　　νe = 70.14

Glass code (d)
487703
Glass code (e)
489701

Spectral l.	Refractive idx
2.058	1.46613
1.970	1.46742
1.530	1.47314
1.129	1.47773
1.064	1.47850
t	1.47912
s	1.48137
A'	1.482813
r	1.484095
C	1.485343
C'	1.485688
He-Ne	1.486009
D	1.487428
d	1.487490
e	1.489145
F	1.492276
F'	1.492662
g	1.495944
h	1.498956
0.389	1.500781
i	1.504034

Coef. disp. form. (pwr ser.)	
A0	2.18826855E+00
A1	-9.19044724E-03
A2	-1.11621071E-04
A3	9.26372815E-03
A4	7.34900733E-05
A5	4.19724242E-06
A6	-1.15412203E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.006933
F'-C'	0.006974
C-t	0.006227
C-A'	0.002530
d-C	0.002147
e-C	0.003802
g-d	0.008454
g-F	0.003668
h-g	0.003012
i-g	0.008090
C'-t	0.006572
e-C'	0.003457
F'-e	0.003517
i-F'	0.011372

Relative partial dispersion	
C-t／F-C	0.8982
C-A'／F-C	0.3649
d-C／F-C	0.3097
e-C／F-C	0.5484
g-d／F-C	1.2194
g-F／F-C	0.5291
h-g／F-C	0.4344
i-g／F-C	1.1669
C'-t／F'-C'	0.9424
e-C'／F'-C'	0.4957
F'-e／F'-C'	0.5043
i-F'／F'-C'	1.6306

Deviation of relative partial disp.	
ΔPdC	0.0007
ΔPgF	0.0027

Specific gravity	2.45

Thermal properties	
CTE(-30,70) [1E-7/℃]	89
CTE(100,300) [1E-7/℃]	97
Tg [℃]	468
At [℃]	559
Ht cndct. [W/m･K]	1.030
Sp. heat [kJ/kg･K]	0.795
Ht diffus. [1E-6 m2/sec]	0.532

Chemical properties [class]	
Acid res. (surface)	2
Alkaline detergent res.	3
Climate resistance	2
Water res. (powder)	4
Acid res. (powder)	5

Mechanical properties	
Knoop hardness	432 (4)
Abrasion hardness	126
Young's mod. [GPa]	60.1
Shear mod. [GPa]	24.3
Poisson's ratio	0.235
Stress optical coef. [1E-5 nm/cm／Pa]	2.97

Color Code (80%/5%)	31/28
Internal CC	302/280

Internal trans. (10mm)	
λ [nm]	τ
280	0.19
290	0.51
300	0.77
310	0.900
320	0.953
330	0.976
340	0.987
350	0.993
360	0.996
365	0.995
370	0.995
380	0.995
390	0.997
400	0.999
420	0.997
440	0.996
460	0.997
480	0.997
500	0.997
550	0.997
600	0.997
650	0.996
700	0.997
800	0.994
900	0.999
1000	0.999
1200	0.999
1400	0.969
1600	0.987
1800	0.980
2000	0.968
2200	0.82
2400	0.80

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	-1.3	-1.3	-1.2	-1.1	-1.1	-1.0	-1.0	-1.0	-0.9	-0.8	-0.6	-0.6	-0.4	-0.2	-0.1
60 to 80(ref.)	-1.4	-1.4	-1.3	-1.3	-1.2	-1.2	-1.1	-1.1	-1.1	-1.0	-0.8	-0.8	-0.6	-0.4	-0.2
40 to 60	-1.6	-1.6	-1.5	-1.4	-1.4	-1.3	-1.3	-1.3	-1.2	-1.2	-1.0	-1.0	-0.8	-0.6	-0.4
20 to 40	-1.7	-1.7	-1.6	-1.6	-1.5	-1.5	-1.5	-1.5	-1.4	-1.3	-1.2	-1.1	-0.9	-0.8	-0.6
0 to 20	-1.8	-1.8	-1.8	-1.7	-1.7	-1.6	-1.6	-1.6	-1.5	-1.4	-1.3	-1.3	-1.1	-0.9	-0.8
-20 to 0	-1.9	-1.9	-1.8	-1.8	-1.7	-1.7	-1.7	-1.7	-1.6	-1.5	-1.4	-1.3	-1.2	-1.0	-0.9
-40 to -20	-1.9	-1.9	-1.8	-1.8	-1.7	-1.7	-1.7	-1.7	-1.6	-1.5	-1.4	-1.4	-1.2	-1.0	-0.9
-60 to -40(ref.)	-1.8	-1.8	-1.8	-1.7	-1.7	-1.6	-1.6	-1.6	-1.5	-1.5	-1.3	-1.3	-1.1	-1.0	-0.9
-70 to -60(ref.)	-1.7	-1.7	-1.6	-1.6	-1.5	-1.5	-1.5	-1.5	-1.4	-1.4	-1.2	-1.2	-1.0	-0.9	-0.8

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-2.2	-2.2	-2.1	-2.0	-2.0	-1.9	-1.9	-1.9	-1.8	-1.7	-1.6	-1.6	-1.4	-1.2	-1.0
60 to 80	-2.4	-2.4	-2.3	-2.3	-2.2	-2.2	-2.2	-2.1	-2.1	-2.0	-1.8	-1.8	-1.6	-1.4	-1.3
40 to 60	-2.7	-2.7	-2.6	-2.6	-2.5	-2.5	-2.5	-2.4	-2.4	-2.3	-2.1	-2.1	-1.9	-1.7	-1.6
20～40	-3.0	-3.0	-2.9	-2.9	-2.8	-2.8	-2.8	-2.8	-2.7	-2.6	-2.5	-2.4	-2.3	-2.1	-2.0
0 to 20	-3.3	-3.3	-3.2	-3.2	-3.1	-3.1	-3.1	-3.1	-3.0	-2.9	-2.8	-2.8	-2.6	-2.4	-2.3
-20 to 0	-3.6	-3.6	-3.5	-3.5	-3.4	-3.4	-3.4	-3.4	-3.3	-3.3	-3.1	-3.1	-2.9	-2.8	-2.7
-40 to -20	-3.9	-3.9	-3.8	-3.8	-3.8	-3.7	-3.7	-3.7	-3.6	-3.6	-3.4	-3.4	-3.3	-3.1	-3.0
-60 to -40	-4.2	-4.2	-4.1	-4.1	-4.1	-4.0	-4.0	-4.0	-3.9	-3.9	-3.8	-3.7	-3.6	-3.4	-3.3
-70 to -60	-4.4	-4.4	-4.4	-4.3	-4.3	-4.3	-4.2	-4.2	-4.2	-4.1	-4.0	-4.0	-3.9	-3.7	-3.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.29676653E-01
Q1	8.17573782E+01
P2	2.84127590E-02
Q2	1.70456177E-02
P3	2.55329066E-01
Q3	4.25672246E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.3	6.1
Frac. eq. (ref.)	0.3	6.7

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-FSL5	HOYA	FC5
C.D.G.M	H-QK3L	SCHOTT	N-FK5

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-FK01

nd = 1.497000　　ne = 1.498452

νd = 81.73　　νe = 81.34

Glass code (d)
497817
Glass code (e)
498813

Spectral l.	Refractive idx
2.058	1.48180
1.970	1.48256
1.530	1.48603
1.129	1.48909
1.064	1.48964
t	1.49009
s	1.49183
A'	1.493007
r	1.494078
C	1.495140
C'	1.495437
He-Ne	1.495713
D	1.496946
d	1.497000
e	1.498452
F	1.501221
F'	1.501565
g	1.504487
h	1.507176
0.389	1.508806
i	1.511711

Coef. disp. form. (pwr ser.)	
A0	2.21789187E+00
A1	-5.56369762E-03
A2	-3.28049024E-05
A3	8.39632921E-03
A4	8.32133541E-05
A5	8.94361600E-07
A6	1.16808762E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.006081
F'-C'	0.006128
C-t	0.005045
C-A'	0.002133
d-C	0.001860
e-C	0.003312
g-d	0.007487
g-F	0.003266
h-g	0.002689
i-g	0.007224
C'-t	0.005342
e-C'	0.003015
F'-e	0.003113
i-F'	0.010146

Relative partial dispersion	
C-t／F-C	0.8296
C-A'／F-C	0.3508
d-C／F-C	0.3059
e-C／F-C	0.5446
g-d／F-C	1.2312
g-F／F-C	0.5371
h-g／F-C	0.4422
i-g／F-C	1.1880
C'-t／F'-C'	0.8717
e-C'／F'-C'	0.4920
F'-e／F'-C'	0.5080
i-F'／F'-C'	1.6557

Deviation of relative partial disp.	
ΔPdC	-0.0082
ΔPgF	0.0299

Specific gravity	3.61

Thermal properties	
CTE(-30,70) [1E-7/℃]	124
CTE(100,300) [1E-7/℃]	144
Tg [℃]	479
At [℃]	510
Ht cndct. [W/m･K]	0.837
Sp. heat [kJ/kg･K]	0.654
Ht diffus. [1E-6 m2/sec]	0.354

Chemical properties [class]	
Acid res. (surface)	4
Alkaline detergent res.	4
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	377 (4)
Abrasion hardness	496
Young's mod. [GPa]	76.8
Shear mod. [GPa]	29.6
Poisson's ratio	0.297
Stress optical coef. [1E-5 nm/cm／Pa]	0.89

Color Code (80%/5%)	34/29
Internal CC	335/290

Internal trans. (10mm)	
λ [nm]	τ
280	0.01
290	0.05
300	0.15
310	0.33
320	0.54
330	0.73
340	0.85
350	0.925
360	0.962
365	0.973
370	0.979
380	0.987
390	0.990
400	0.991
420	0.991
440	0.990
460	0.991
480	0.992
500	0.993
550	0.993
600	0.993
650	0.991
700	0.992
800	0.987
900	0.990
1000	0.988
1200	0.995
1400	0.995
1600	0.992
1800	0.986
2000	0.988
2200	0.985
2400	0.988

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	-5.8	-5.8	-5.8	-5.7	-5.7	-5.6	-5.6	-5.6	-5.5	-5.4	-5.3	-5.2	-5.1	-4.9	-4.8
60 to 80(ref.)	-5.7	-5.7	-5.6	-5.6	-5.6	-5.5	-5.5	-5.5	-5.4	-5.3	-5.2	-5.2	-5.0	-4.8	-4.7
40 to 60	-5.6	-5.6	-5.5	-5.5	-5.4	-5.4	-5.3	-5.3	-5.3	-5.2	-5.0	-5.0	-4.9	-4.7	-4.6
20 to 40	-5.4	-5.4	-5.3	-5.3	-5.2	-5.2	-5.2	-5.2	-5.1	-5.0	-4.9	-4.8	-4.7	-4.5	-4.4
0 to 20	-5.2	-5.2	-5.1	-5.1	-5.0	-5.0	-5.0	-4.9	-4.9	-4.8	-4.6	-4.6	-4.5	-4.3	-4.2
-20 to 0	-4.9	-4.9	-4.9	-4.8	-4.8	-4.7	-4.7	-4.7	-4.6	-4.5	-4.4	-4.4	-4.2	-4.1	-4.0
-40 to -20	-4.6	-4.6	-4.5	-4.5	-4.4	-4.4	-4.4	-4.4	-4.3	-4.2	-4.1	-4.1	-3.9	-3.8	-3.6
-60 to -40(ref.)	-4.2	-4.2	-4.1	-4.1	-4.0	-4.0	-4.0	-4.0	-3.9	-3.8	-3.7	-3.7	-3.5	-3.4	-3.2
-70 to -60(ref.)	-3.8	-3.8	-3.8	-3.7	-3.7	-3.6	-3.6	-3.6	-3.5	-3.5	-3.3	-3.3	-3.1	-3.0	-2.9

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-6.8	-6.8	-6.7	-6.6	-6.6	-6.5	-6.5	-6.5	-6.4	-6.4	-6.2	-6.2	-6.0	-5.9	-5.8
60 to 80	-6.7	-6.7	-6.7	-6.6	-6.6	-6.5	-6.5	-6.5	-6.4	-6.3	-6.2	-6.2	-6.0	-5.9	-5.8
40 to 60	-6.7	-6.7	-6.6	-6.6	-6.6	-6.5	-6.5	-6.5	-6.4	-6.3	-6.2	-6.2	6.0	-5.9	-5.8
20～40	-6.7	-6.7	-6.6	-6.6	-6.5	-6.5	-6.5	-6.5	-6.4	-6.3	-6.2	-6.2	-6.0	-5.9	-5.8
0 to 20	-6.7	-6.6	-6.6	-6.6	-6.5	-6.5	-6.5	-6.4	-6.4	-6.3	-6.2	-6.1	-6.0	-5.9	-5.8
-20 to 0	-6.6	-6.6	-6.6	-6.5	-6.5	-6.4	-6.4	-6.4	-6.4	-6.3	-6.2	-6.1	-6.0	-5.9	-5.8
-40 to -20	-6.6	-6.6	-6.5	-6.5	-6.5	-6.4	-6.4	-6.4	-6.3	-6.3	-6.1	-6.1	-6.0	-5.8	-5.7
-60 to -40	-6.6	-6.5	-6.5	-6.5	-6.5	-6.4	-6.4	-6.4	-6.3	-6.3	-6.1	-6.1	-6.0	-5.8	-5.7
-70 to -60	-6.5	-6.5	-6.5	-6.5	-6.4	-6.4	-6.4	-6.4	-6.3	-6.2	-6.1	-6.1	-6.0	-5.8	-5.7

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.34894460E-01
Q1	1.43697781E+02
P2	1.29441213E-01
Q2	9.18281234E-03
P3	1.59307219E-01
Q3	1.42539205E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.3	2.5
Frac. eq. (ref.)	0.3	2.6

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-FPL51	HOYA	FCD1
C.D.G.M	H-FK61	SCHOTT	N-PK52A

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-FKH1

nd = 1.497820　　ne = 1.499259

νd = 82.57　　νe = 82.14

Glass code (d)
498826
Glass code (e)
499821

Spectral l.	Refractive idx
2.058	1.48334
1.970	1.48404
1.530	1.48723
1.129	1.49009
1.064	1.49062
t	1.49105
s	1.49273
A'	1.493880
r	1.494932
C	1.495980
C'	1.496273
He-Ne	1.496547
D	1.497766
d	1.497820
e	1.499259
F	1.502009
F'	1.502351
g	1.505256
h	1.507932
0.389	1.509554
i	1.512445

Coef. disp. form. (pwr ser.)	
A0	2.22016073E+00
A1	-5.00725473E-03
A2	-3.55507111E-05
A3	8.42088796E-03
A4	7.02327459E-05
A5	2.47007900E-06
A6	-6.50002003E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.006029
F'-C'	0.006078
C-t	0.004929
C-A'	0.002100
d-C	0.001840
e-C	0.003279
g-d	0.007436
g-F	0.003247
h-g	0.002676
i-g	0.007189
C'-t	0.005222
e-C'	0.002986
F'-e	0.003092
i-F'	0.010094

Relative partial dispersion	
C-t／F-C	0.8175
C-A'／F-C	0.3483
d-C／F-C	0.3052
e-C／F-C	0.5439
g-d／F-C	1.2334
g-F／F-C	0.5386
h-g／F-C	0.4439
i-g／F-C	1.1924
C'-t／F'-C'	0.8592
e-C'／F'-C'	0.4913
F'-e／F'-C'	0.5087
i-F'／F'-C'	1.6607

Deviation of relative partial disp.	
ΔPdC	-0.0093
ΔPgF	0.0327

Specific gravity	3.86

Thermal properties	
CTE(-30,70) [1E-7/℃]	129
CTE(100,300) [1E-7/℃]	152
Tg [℃]	479
At [℃]	510
Ht cndct. [W/m･K]	0.832
Sp. heat [kJ/kg･K]	0.596
Ht diffus. [1E-6 m2/sec]	0.361

Chemical properties [class]	
Acid res. (surface)	6
Alkaline detergent res.	4
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	391 (4)
Abrasion hardness	524
Young's mod. [GPa]	77.4
Shear mod. [GPa]	29.7
Poisson's ratio	0.302
Stress optical coef. [1E-5 nm/cm／Pa]	0.69

Color Code (80%/5%)	35/29
Internal CC	341/286

Internal trans. (10mm)	
λ [nm]	τ
280	0.03
290	0.07
300	0.15
310	0.30
320	0.48
330	0.66
340	0.79
350	0.88
360	0.930
365	0.945
370	0.958
380	0.975
390	0.982
400	0.988
420	0.990
440	0.991
460	0.993
480	0.994
500	0.995
550	0.995
600	0.994
650	0.994
700	0.993
800	0.991
900	0.993
1000	0.993
1200	0.998
1400	0.999
1600	0.995
1800	0.991
2000	0.994
2200	0.988
2400	0.984

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	-7.1	-7.1	-7.1	-7.0	-6.9	-6.8	-6.8	-6.8	-6.7	-6.6	-6.4	-6.4	-6.2	-6.1	-6.0
60 to 80(ref.)	-7.0	-6.9	-6.8	-6.8	-6.8	-6.7	-6.7	-6.7	-6.6	-6.5	-6.3	-6.3	-6.1	-6.0	-5.8
40 to 60	-6.7	-6.7	-6.6	-6.6	-6.5	-6.5	-6.5	-6.5	-6.4	-6.3	-6.1	-6.1	-5.9	-5.8	-5.7
20 to 40	-6.5	-6.5	-6.4	-6.4	-6.3	-6.3	-6.2	-6.2	-6.2	-6.1	-5.9	-5.9	-5.7	-5.6	-5.5
0 to 20	-6.2	-6.2	-6.1	-6.1	-6.0	-6.0	-6.0	-6.0	-5.9	-5.8	-5.7	-5.6	-5.5	-5.3	-5.2
-20 to 0	-5.8	-5.8	-5.8	-5.8	-5.7	-5.7	-5.7	-5.7	-5.6	-5.5	-5.4	-5.3	-5.2	-5.1	-5.0
-40 to -20	-5.4	-5.4	-5.4	-5.4	-5.3	-5.3	-5.3	-5.3	-5.2	-5.1	-5.0	-5.0	-4.8	-4.7	-4.6
-60 to -40(ref.)	-4.9	-4.9	-4.9	-4.9	-4.9	-4.8	-4.8	-4.8	-4.8	-4.7	-4.6	-4.5	-4.4	-4.3	-4.2
-70 to -60(ref.)	-4.5	-4.5	-4.5	-4.5	-4.5	-4.4	-4.4	-4.4	-4.4	-4.3	-4.2	-4.1	-4.0	-3.9	-3.8

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-8.1	-8.0	-7.9	-7.9	-7.8	-7.8	-7.7	-7.7	-7.6	-7.5	-7.4	-7.3	-7.2	-7.0	-6.9
60 to 80	-8.0	-8.0	-7.9	-7.8	-7.8	-7.7	-7.7	-7.7	-7.6	-7.5	-7.3	-7.3	-7.2	-7.0	-6.9
40 to 60	-7.9	-7.8	-7.8	-7.7	-7.7	-7.6	-7.6	-7.6	-7.5	-7.4	-7.3	-7.3	-7.1	-7.0	-6.9
20～40	-7.8	-7.7	-7.7	-7.6	-7.6	-7.6	-7.5	-7.5	-7.5	-7.4	-7.2	-7.2	-7.1	-6.9	-6.8
0 to 20	-7.7	-7.6	-7.6	-7.6	-7.5	-7.5	-7.5	-7.5	-7.4	-7.3	-7.2	-7.2	-7.0	-6.9	-6.8
-20 to 0	-7.5	-7.5	-7.5	-7.5	-7.4	-7.4	-7.4	-7.4	-7.3	-7.3	-7.1	-7.1	-7.0	-6.8	-6.7
-40 to -20	-7.4	-7.4	-7.4	-7.4	-7.4	-7.3	-7.3	-7.3	-7.3	-7.2	-7.1	-7.0	-6.9	-6.8	-6.7
-60 to -40	-7.3	-7.3	-7.3	-7.3	-7.3	-7.3	-7.2	-7.2	-7.2	-7.1	-7.0	-7.0	-6.9	-6.8	-6.7
-70 to -60	-7.2	-7.2	-7.2	-7.2	-7.2	-7.2	-7.2	-7.2	-7.1	-7.1	-7.0	-7.0	-6.8	-6.7	-6.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.22682060E-01
Q1	1.44413557E+02
P2	9.76901834E-02
Q2	1.01538863E-02
P3	1.91449766E-01
Q3	2.19355503E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	9.1
Frac. eq. (ref.)	0.9	8.7

Prod. Freq. (A to F)	A

Similar glass type			
OHARA		HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-FKH2

nd = 1.456000　　ne = 1.457192

νd = 91.36　　νe = 90.97

Glass code (d)
456914
Glass code (e)
457910

Spectral l.	Refractive idx
2.058	1.44327
1.970	1.44391
1.530	1.44685
1.129	1.44943
1.064	1.44990
t	1.45028
s	1.45173
A'	1.452705
r	1.453592
C	1.454469
C'	1.454714
He-Ne	1.454942
D	1.455955
d	1.456000
e	1.457192
F	1.459460
F'	1.459740
g	1.462126
h	1.464317
0.389	1.465643
i	1.468003

Coef. disp. form. (pwr ser.)	
A0	2.10149795E+00
A1	-4.68337833E-03
A2	-1.34642385E-05
A3	6.77542246E-03
A4	4.53499889E-05
A5	2.24209054E-06
A6	-6.21790903E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.004991
F'-C'	0.005026
C-t	0.004192
C-A'	0.001764
d-C	0.001531
e-C	0.002723
g-d	0.006126
g-F	0.002666
h-g	0.002191
i-g	0.005877
C'-t	0.004437
e-C'	0.002478
F'-e	0.002548
i-F'	0.008263

Relative partial dispersion	
C-t／F-C	0.8399
C-A'／F-C	0.3534
d-C／F-C	0.3068
e-C／F-C	0.5456
g-d／F-C	1.2274
g-F／F-C	0.5342
h-g／F-C	0.4390
i-g／F-C	1.1775
C'-t／F'-C'	0.8828
e-C'／F'-C'	0.4930
F'-e／F'-C'	0.5070
i-F'／F'-C'	1.6441

Deviation of relative partial disp.	
ΔPdC	-0.0117
ΔPgF	0.0431

Specific gravity	3.67

Thermal properties	
CTE(-30,70) [1E-7/℃]	134
CTE(100,300) [1E-7/℃]	160
Tg [℃]	454
At [℃]	482
Ht cndct. [W/m･K]	0.868
Sp. heat [kJ/kg･K]	0.684
Ht diffus. [1E-6 m2/sec]	0.345

Chemical properties [class]	
Acid res. (surface)	7
Alkaline detergent res.	4
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	335 (3)
Abrasion hardness	404
Young's mod. [GPa]	71.4
Shear mod. [GPa]	27.3
Poisson's ratio	0.305
Stress optical coef. [1E-5 nm/cm／Pa]	0.82

Color Code (80%/5%)	35/30
Internal CC	341/301

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	0.04
310	0.15
320	0.37
330	0.60
340	0.78
350	0.89
360	0.945
365	0.963
370	0.974
380	0.986
390	0.991
400	0.994
420	0.994
440	0.994
460	0.995
480	0.996
500	0.996
550	0.997
600	0.996
650	0.996
700	0.996
800	0.992
900	0.994
1000	0.993
1200	0.995
1400	0.994
1600	0.994
1800	0.991
2000	0.995
2200	0.994
2400	0.998

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	-6.9	-6.9	-6.9	-6.8	-6.8	-6.7	-6.7	-6.7	-6.6	-6.5	-6.4	-6.4	-6.3	-6.1	-6.0
60 to 80(ref.)	-6.8	-6.7	-6.7	-6.6	-6.6	-6.5	-6.5	-6.5	-6.5	-6.4	-6.3	-6.3	-6.1	-6.0	-5.9
40 to 60	-6.5	-6.5	-6.5	-6.4	-6.4	-6.3	-6.3	-6.3	-6.2	-6.2	-6.1	-6.0	-5.9	-5.8	-5.7
20 to 40	-6.3	-6.3	-6.2	-6.2	-6.1	-6.1	-6.1	-6.0	-6.0	-5.9	-5.8	-5.8	-5.7	-5.5	-5.4
0 to 20	-6.0	-6.0	-5.9	-5.9	-5.8	-5.8	-5.8	-5.8	-5.7	-5.7	-5.5	-5.5	-5.4	-5.3	-5.2
-20 to 0	-5.6	-5.6	-5.6	-5.5	-5.5	-5.5	-5.4	-5.4	-5.4	-5.3	-5.2	-5.2	-5.1	-4.9	-4.9
-40 to -20	-5.2	-5.2	-5.2	-5.1	-5.1	-5.1	-5.1	-5.0	-5.0	-4.9	-4.8	-4.8	-4.7	-4.6	-4.5
-60 to -40(ref.)	-4.8	-4.7	-4.7	-4.7	-4.6	-4.6	-4.6	-4.6	-4.5	-4.5	-4.4	-4.4	-4.2	-4.1	-4.0
-70 to -60(ref.)	-4.3	-4.3	-4.3	-4.2	-4.2	-4.2	-4.2	-4.2	-4.1	-4.1	-3.9	-3.9	-3.8	-3.7	-3.6

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-7.8	-7.8	-7.7	-7.7	-7.7	-7.6	-7.6	-7.6	-7.5	-7.5	-7.3	-7.3	-7.2	-7.0	-7.0
60 to 80	-7.7	-7.7	-7.7	-7.6	-7.6	-7.5	-7.5	-7.5	-7.5	-7.4	-7.3	-7.3	-7.1	-7.0	-6.9
40 to 60	-7.6	-7.6	-7.6	-7.5	-7.5	-7.4	-7.4	-7.4	-7.4	-7.3	-7.2	-7.2	-7.0	-6.9	-6.8
20～40	-7.5	-7.5	-7.5	-7.4	-7.4	-7.3	-7.3	-7.3	-7.3	-7.2	-7.1	-7.1	-7.0	-6.8	-6.7
0 to 20	-7.4	-7.4	-7.3	-7.3	-7.3	-7.2	-7.2	-7.2	-7.2	-7.1	-7.0	-7.0	-6.9	-6.8	-6.7
-20 to 0	-7.3	-7.3	-7.2	-7.2	-7.2	-7.1	-7.1	-7.1	-7.1	-7.0	-6.9	-6.9	-6.8	-6.7	-6.6
-40 to -20	-7.2	-7.2	-7.1	-7.1	-7.1	-7.0	-7.0	-7.0	-7.0	-6.9	-6.8	-6.8	-6.7	-6.6	-6.5
-60 to -40	-7.1	-7.1	-7.0	-7.0	-7.0	-6.9	-6.9	-6.9	-6.9	-6.8	-6.7	-6.7	-6.6	-6.5	-6.4
-70 to -60	-7.0	-7.0	-7.0	-6.9	-6.9	-6.9	-6.9	-6.9	-6.8	-6.8	-6.7	-6.7	-6.6	-6.5	-6.4

Coef. disp. form. (frac. eq.)(ref.)	
P1	–
Q1	–
P2	–
Q2	–
P3	–
Q3	–

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.3	3.8
Frac. eq. (ref.)	–	–

Prod. Freq. (A to F)	B

Similar glass type			
OHARA		HOYA	FCD10
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-PKH1

nd = 1.518600　　ne = 1.520372

νd = 69.89　　νe = 69.67

Glass code (d)
519699
Glass code (e)
520697

Spectral l.	Refractive idx
2.058	1.49701
1.970	1.49826
1.530	1.50384
1.129	1.50840
1.064	1.50918
t	1.50980
s	1.51212
A'	1.513636
r	1.514988
C	1.516311
C'	1.516678
He-Ne	1.517020
D	1.518533
d	1.518600
e	1.520372
F	1.523731
F'	1.524147
g	1.527677
h	1.530922
0.389	1.532889
i	1.536397

Coef. disp. form. (pwr ser.)	
A0	2.27892705E+00
A1	-9.04327622E-03
A2	-1.10679206E-04
A3	1.01870033E-02
A4	9.31149884E-05
A5	2.72256540E-06
A6	-1.82952398E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.007420
F'-C'	0.007469
C-t	0.006510
C-A'	0.002675
d-C	0.002289
e-C	0.004061
g-d	0.009077
g-F	0.003946
h-g	0.003245
i-g	0.008720
C'-t	0.006877
e-C'	0.003694
F'-e	0.003775
i-F'	0.012250

Relative partial dispersion	
C-t／F-C	0.8774
C-A'／F-C	0.3605
d-C／F-C	0.3085
e-C／F-C	0.5473
g-d／F-C	1.2233
g-F／F-C	0.5318
h-g／F-C	0.4373
i-g／F-C	1.1752
C'-t／F'-C'	0.9207
e-C'／F'-C'	0.4946
F'-e／F'-C'	0.5054
i-F'／F'-C'	1.6401

Deviation of relative partial disp.	
ΔPdC	-0.0003
ΔPgF	0.0047

Specific gravity	2.60

Thermal properties	
CTE(-30,70) [1E-7/℃]	63
CTE(100,300) [1E-7/℃]	75
Tg [℃]	572
At [℃]	612
Ht cndct. [W/m･K]	0.860
Sp. heat [kJ/kg･K]	0.777
Ht diffus. [1E-6 m2/sec]	0.425

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	3
Climate resistance	2
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	536 (5)
Abrasion hardness	188
Young's mod. [GPa]	73.1
Shear mod. [GPa]	29.8
Poisson's ratio	0.224
Stress optical coef. [1E-5 nm/cm／Pa]	2.78

Color Code (80%/5%)	34/29
Internal CC	329/291

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.04
300	0.19
310	0.43
320	0.66
330	0.81
340	0.904
350	0.948
360	0.970
365	0.976
370	0.981
380	0.986
390	0.991
400	0.991
420	0.988
440	0.983
460	0.984
480	0.987
500	0.990
550	0.995
600	0.995
650	0.991
700	0.990
800	0.992
900	0.996
1000	0.995
1200	0.996
1400	0.992
1600	0.963
1800	0.904
2000	0.84
2200	0.70
2400	0.64

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.6	3.6	3.7	3.8	3.9	4.0	4.0	4.0	4.1	4.2	4.4	4.5	4.7	5.0	5.1
60 to 80(ref.)	3.5	3.5	3.6	3.7	3.8	3.8	3.8	3.9	3.9	4.1	4.3	4.3	4.6	4.8	4.9
40 to 60	3.3	3.4	3.5	3.5	3.6	3.7	3.7	3.7	3.8	3.9	4.1	4.1	4.4	4.6	4.8
20 to 40	3.2	3.2	3.3	3.4	3.5	3.5	3.5	3.6	3.6	3.7	4.0	4.0	4.2	4.5	4.6
0 to 20	3.1	3.2	3.2	3.3	3.4	3.4	3.4	3.5	3.5	3.6	3.9	3.9	4.1	4.4	4.5
-20 to 0	3.1	3.1	3.2	3.3	3.3	3.4	3.4	3.4	3.5	3.6	3.8	3.8	4.1	4.3	4.4
-40 to -20	3.1	3.1	3.2	3.3	3.3	3.4	3.4	3.4	3.5	3.6	3.8	3.8	4.1	4.3	4.4
-60 to -40(ref.)	3.2	3.2	3.3	3.4	3.4	3.5	3.5	3.5	3.6	3.7	3.9	3.9	4.1	4.4	4.5
-70 to -60(ref.)	3.4	3.4	3.5	3.5	3.6	3.6	3.6	3.7	3.7	3.8	4.0	4.0	4.3	4.5	4.6

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.7	2.7	2.8	2.9	2.9	3.0	3.0	3.0	3.1	3.2	3.5	3.5	3.8	4.0	4.1
60 to 80	2.5	2.5	2.6	2.7	2.7	2.8	2.8	2.8	2.9	3.0	3.2	3.3	3.5	3.8	3.9
40 to 60	2.2	2.2	2.3	2.4	2.4	2.5	2.5	2.5	2.6	2.7	2.9	3.0	3.2	3.4	3.6
20～40	1.9	1.9	2.0	2.1	2.1	2.2	2.2	2.2	2.3	2.4	2.6	2.7	2.9	3.1	3.2
0 to 20	1.6	1.7	1.7	1.8	1.9	1.9	1.9	1.9	2.0	2.1	2.3	2.3	2.6	2.8	2.9
-20 to 0	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.7	1.7	1.8	2.0	2.0	2.3	2.5	2.6
-40 to -20	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.5	1.7	1.7	2.0	2.2	2.3
-60 to -40	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.1	1.1	1.2	1.4	1.4	1.6	1.8	1.9
-70 to -60	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.9	1.0	1.2	1.2	1.4	1.6	1.7

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.14576746E-01
Q1	7.69727154E+01
P2	1.10968918E-02
Q2	2.34302770E-02
P3	2.87809559E-01
Q3	4.87585612E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	5.2
Frac. eq. (ref.)	0.5	5.2

Prod. Freq. (A to F)	D

Similar glass type			
OHARA		HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-PSK02

nd = 1.618000　　ne = 1.620328

ν d = 63.34　　ν e = 63.06

Glass code (d)
618633
Glass code (e)
620631

Spectral l.	Refractive idx
2.058	1.59332
1.970	1.59459
1.530	1.60036
1.129	1.60533
1.064	1.60622
t	1.60695
s	1.60973
A'	1.611614
r	1.613326
C	1.615024
C'	1.615498
He-Ne	1.615941
D	1.617913
d	1.618000
e	1.620328
F	1.624781
F'	1.625335
g	1.630061
h	1.634432
0.389	1.637092
i	1.641858

Coef. disp. form. (pwr ser.)	
A0	2.57826227E+00
A1	-9.69723449E-03
A2	-1.07085207E-04
A3	1.43480110E-02
A4	1.59222199E-04
A5	5.33085601E-06
A6	-5.80638431E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.009757
F'-C'	0.009837
C-t	0.008074
C-A'	0.003410
d-C	0.002976
e-C	0.005304
g-d	0.012061
g-F	0.005280
h-g	0.004371
i-g	0.011797
C'-t	0.008548
e-C'	0.004830
F'-e	0.005007
i-F'	0.016523

Relative partial dispersion	
C-t／F-C	0.8275
C-A'／F-C	0.3495
d-C／F-C	0.3050
e-C／F-C	0.5436
g-d／F-C	1.2361
g-F／F-C	0.5411
h-g／F-C	0.4480
i-g／F-C	1.2091
C'-t／F'-C'	0.8690
e-C'／F'-C'	0.4910
F'-e／F'-C'	0.5090
i-F'／F'-C'	1.6797

Deviation of relative partial disp.	
ΔPdC	-0.0008
ΔPgF	0.0031

Specific gravity	3.56

Thermal properties	
CTE(-30,70) [1E-7/℃]	90
CTE(100,300) [1E-7/℃]	107
Tg [℃]	620
At [℃]	661
Ht cndct. [W/m･K]	0.692
Sp. heat [kJ/kg･K]	0.561
Ht diffus. [1E-6 m2/sec]	0.346

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	4
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	5

Mechanical properties	
Knoop hardness	355 (4)
Abrasion hardness	341
Young's mod. [GPa]	73.3
Shear mod. [GPa]	28.4
Poisson's ratio	0.291
Stress optical coef. [1E-5 nm/cm／Pa]	1.42

Color Code (80%/5%)	38/33
Internal CC	369/326

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	0.01
330	0.09
340	0.26
350	0.48
360	0.67
365	0.75
370	0.81
380	0.89
390	0.936
400	0.958
420	0.969
440	0.971
460	0.978
480	0.985
500	0.990
550	0.995
600	0.993
650	0.992
700	0.992
800	0.990
900	0.993
1000	0.991
1200	0.994
1400	0.992
1600	0.986
1800	0.973
2000	0.956
2200	0.88
2400	0.77

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	-2.8	-2.8	-2.7	-2.6	-2.6	-2.5	-2.5	-2.4	-2.3	-2.2	-1.9	-1.9	-1.6	-1.3	-1.1
60 to 80(ref.)	-2.9	-2.8	-2.7	-2.7	-2.6	-2.5	-2.5	-2.5	-2.4	-2.2	-2.0	-1.9	-1.7	-1.4	-1.2
40 to 60	-2.9	-2.8	-2.8	-2.7	-2.6	-2.5	-2.5	-2.5	-2.4	-2.3	-2.0	-2.0	-1.7	-1.5	-1.3
20 to 40	-2.9	-2.8	-2.7	-2.7	-2.6	-2.6	-2.5	-2.5	-2.4	-2.3	-2.0	-2.0	-1.8	-1.5	-1.3
0 to 20	-2.8	-2.8	-2.7	-2.7	-2.6	-2.5	-2.5	-2.5	-2.4	-2.3	-2.0	-2.0	-1.7	-1.5	-1.3
-20 to 0	-2.7	-2.7	-2.6	-2.6	-2.5	-2.4	-2.4	-2.4	-2.3	-2.2	-2.0	-1.9	-1.7	-1.5	-1.3
-40 to -20	-2.6	-2.5	-2.5	-2.4	-2.4	-2.3	-2.3	-2.3	-2.2	-2.0	-1.8	-1.8	-1.6	-1.3	-1.2
-60 to -40(ref.)	-2.3	-2.3	-2.2	-2.2	-2.1	-2.1	-2.0	-2.0	-1.9	-1.8	-1.6	-1.6	-1.4	-1.1	-1.0
-70 to -60(ref.)	-2.1	-2.0	-2.0	-1.9	-1.9	-1.8	-1.8	-1.8	-1.7	-1.6	-1.4	-1.3	-1.1	-0.9	-0.7

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-3.8	-3.8	-3.7	-3.6	-3.6	-3.5	-3.5	-3.4	-3.3	-3.2	-2.9	-2.9	-2.6	-2.3	-2.1
60 to 80	-3.9	-3.9	-3.8	-3.8	-3.7	-3.6	-3.6	-3.6	-3.5	-3.3	-3.1	-3.0	-2.8	-2.5	-2.3
40 to 60	-4.1	-4.1	-4.0	-3.9	-3.9	-3.8	-3.8	-3.7	-3.6	-3.5	-3.3	-3.2	-3.0	-2.7	-2.5
20～40	-4.3	-4.2	-4.1	-4.1	-4.0	-4.0	-3.9	-3.9	-3.8	-3.7	-3.5	-3.4	-3.2	-3.0	-2.8
0 to 20	-4.4	-4.4	-4.3	-4.3	-4.2	-4.1	-4.1	-4.1	-4.0	-3.9	-3.7	-3.6	-3.4	-3.2	-3.0
-20 to 0	-4.6	-4.6	-4.5	-4.4	-4.4	-4.3	-4.3	-4.3	-4.2	-4.1	-3.9	-3.8	-3.6	-3.4	-3.2
-40 to -20	-4.7	-4.7	-4.6	-4.6	-4.5	-4.5	-4.5	-4.4	-4.4	-4.3	-4.1	-4.0	-3.8	-3.6	-3.5
-60 to -40	-4.9	-4.9	-4.8	-4.8	-4.7	-4.7	-4.6	-4.6	-4.5	-4.4	-4.2	-4.2	-4.0	-3.8	-3.7
-70 to -60	-5.0	-5.0	-4.9	-4.9	-4.8	-4.8	-4.8	-4.8	-4.7	-4.6	-4.4	-4.4	-4.2	-4.0	-3.8

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.20459741E-01
Q1	8.62206490E+01
P2	4.43027945E-02
Q2	1.76922785E-02
P3	3.00450152E-01
Q3	4.19488634E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	3.1
Frac. eq. (ref.)	0.5	3.2

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-PHM52	HOYA	PCD4
C.D.G.M	H-ZPK1	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-PSK03

nd = 1.603000　　ne = 1.605199

νd = 65.44　　νe = 65.17

Glass code (d)
603654
Glass code (e)
605652

Spectral l.	Refractive idx
2.058	1.57914
1.970	1.58040
1.530	1.58607
1.129	1.59092
1.064	1.59178
t	1.59248
s	1.59515
A'	1.596945
r	1.598572
C	1.600183
C'	1.600633
He-Ne	1.601052
D	1.602918
d	1.603000
e	1.605199
F	1.609398
F'	1.609919
g	1.614364
h	1.618467
0.389	1.620961
i	1.625420

Coef. disp. form. (pwr ser.)	
A0	2.53267453E+00
A1	-9.50416844E-03
A2	-1.06883723E-04
A3	1.34397360E-02
A4	1.41770605E-04
A5	4.73043880E-06
A6	-8.62000830E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.009215
F'-C'	0.009286
C-t	0.007701
C-A'	0.003238
d-C	0.002817
e-C	0.005016
g-d	0.011364
g-F	0.004966
h-g	0.004103
i-g	0.011056
C'-t	0.008151
e-C'	0.004566
F'-e	0.004720
i-F'	0.015501

Relative partial dispersion	
C-t／F-C	0.8357
C-A'／F-C	0.3514
d-C／F-C	0.3057
e-C／F-C	0.5443
g-d／F-C	1.2332
g-F／F-C	0.5389
h-g／F-C	0.4453
i-g／F-C	1.1998
C'-t／F'-C'	0.8778
e-C'／F'-C'	0.4917
F'-e／F'-C'	0.5083
i-F'／F'-C'	1.6693

Deviation of relative partial disp.	
ΔPdC	-0.0010
ΔPgF	0.0043

Specific gravity	3.52

Thermal properties	
CTE(-30,70) [1E-7/℃]	89
CTE(100,300) [1E-7/℃]	103
Tg [℃]	603
At [℃]	639
Ht cndct. [W/m･K]	0.671
Sp. heat [kJ/kg･K]	0.570
Ht diffus. [1E-6 m2/sec]	0.335

Chemical properties [class]	
Acid res. (surface)	4
Alkaline detergent res.	4
Climate resistance	2
Water res. (powder)	1
Acid res. (powder)	5

Mechanical properties	
Knoop hardness	316 (3)
Abrasion hardness	398
Young's mod. [GPa]	70.0
Shear mod. [GPa]	27.2
Poisson's ratio	0.284
Stress optical coef. [1E-5 nm/cm／Pa]	1.40

Color Code (80%/5%)	37/32
Internal CC	361/314
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	0.03
320	0.10
330	0.25
340	0.45
350	0.65
360	0.79
365	0.84
370	0.88
380	0.933
390	0.958
400	0.971
420	0.973
440	0.972
460	0.977
480	0.983
500	0.988
550	0.991
600	0.990
650	0.989
700	0.989
800	0.987
900	0.992
1000	0.990
1200	0.994
1400	0.990
1600	0.981
1800	0.958
2000	0.932
2200	0.84
2400	0.78

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	-2.8	-2.8	-2.7	-2.6	-2.5	-2.5	-2.4	-2.4	-2.3	-2.2	-2.0	-2.0	-1.7	-1.4	-1.3
60 to 80(ref.)	-2.9	-2.9	-2.7	-2.7	-2.6	-2.5	-2.5	-2.5	-2.4	-2.3	-2.1	-2.0	-1.8	-1.5	-1.4
40 to 60	-2.9	-2.9	-2.8	-2.8	-2.7	-2.6	-2.6	-2.6	-2.5	-2.4	-2.2	-2.1	-1.9	-1.7	-1.5
20 to 40	-3.0	-3.0	-2.9	-2.8	-2.7	-2.7	-2.6	-2.6	-2.5	-2.4	-2.2	-2.2	-2.0	-1.8	-1.6
0 to 20	-3.0	-3.0	-2.9	-2.8	-2.7	-2.7	-2.7	-2.6	-2.6	-2.5	-2.3	-2.3	-2.0	-1.8	-1.7
-20 to 0	-2.9	-2.9	-2.8	-2.8	-2.7	-2.6	-2.6	-2.6	-2.5	-2.4	-2.3	-2.2	-2.0	-1.8	-1.7
-40 to -20	-2.8	-2.8	-2.7	-2.7	-2.6	-2.6	-2.5	-2.5	-2.4	-2.4	-2.2	-2.2	-2.0	-1.8	-1.7
-60 to -40(ref.)	-2.6	-2.6	-2.5	-2.5	-2.4	-2.4	-2.3	-2.3	-2.3	-2.2	-2.0	-2.0	-1.8	-1.6	-1.5
-70 to -60(ref.)	-2.4	-2.4	-2.3	-2.3	-2.2	-2.1	-2.1	-2.1	-2.0	-2.0	-1.8	-1.8	-1.6	-1.4	-1.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-3.8	-3.8	-3.7	-3.6	-3.5	-3.5	-3.4	-3.4	-3.3	-3.2	-3.0	-3.0	-2.7	-2.5	-2.3
60 to 80	-3.9	-3.9	-3.8	-3.8	-3.7	-3.6	-3.6	-3.6	-3.5	-3.4	-3.2	-3.2	-2.9	-2.7	-2.5
40 to 60	-4.2	-4.1	-4.0	-4.0	-3.9	-3.8	-3.8	-3.8	-3.7	-3.6	-3.4	-3.4	-3.2	-2.9	-2.8
20～40	-4.4	-4.3	-4.2	-4.2	-4.1	-4.1	-4.0	-4.0	-3.9	-3.9	-3.7	-3.6	-3.4	-3.2	-3.1
0 to 20	-4.6	-4.5	-4.5	-4.4	-4.3	-4.3	-4.3	-4.2	-4.2	-4.1	-3.9	-3.9	-3.7	-3.5	-3.4
-20 to 0	-4.8	-4.7	-4.7	-4.6	-4.6	-4.5	-4.5	-4.5	-4.4	-4.3	-4.1	-4.1	-3.9	-3.8	-3.6
-40 to -20	-5.0	-4.9	-4.9	-4.8	-4.8	-4.7	-4.7	-4.7	-4.6	-4.5	-4.4	-4.4	-4.2	-4.0	-3.9
-60 to -40	-5.2	-5.1	-5.1	-5.0	-5.0	-4.9	-4.9	-4.9	-4.8	-4.8	-4.6	-4.6	-4.5	-4.3	-4.2
-70 to -60	-5.3	-5.3	-5.2	-5.2	-5.1	-5.1	-5.1	-5.1	-5.0	-5.0	-4.8	-4.8	-4.6	-4.5	-4.4

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.14862526E-01
Q1	8.23972872E+01
P2	6.20276986E-02
Q2	1.47458503E-02
P3	2.76130278E-01
Q3	3.76713473E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	2.8
Frac. eq. (ref.)	0.5	2.6

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-PHM53	HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-PSKH1

nd = 1.593190　　ne = 1.595274

νd = 67.90　　νe = 67.54

Glass code (d)
593679
Glass code (e)
595675

Spectral l.	Refractive idx
2.058	1.57343
1.970	1.57433
1.530	1.57847
1.129	1.58228
1.064	1.58299
t	1.58358
s	1.58592
A'	1.587541
r	1.589039
C	1.590540
C'	1.590961
He-Ne	1.591354
D	1.593112
d	1.593190
e	1.595274
F	1.599276
F'	1.599774
g	1.604028
h	1.607963
0.389	1.610358
i	–

Coef. disp. form. (pwr ser.)	
A0	2.50208083E+00
A1	-6.72143907E-03
A2	-5.34313751E-05
A3	1.28264400E-02
A4	1.56205388E-04
A5	1.21593549E-06
A6	9.59550869E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.008736
F'-C'	0.008813
C-t	0.006956
C-A'	0.002999
d-C	0.002650
e-C	0.004734
g-d	0.010838
g-F	0.004752
h-g	0.003935
i-g	–
C'-t	0.007377
e-C'	0.004313
F'-e	0.004500
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7962
C-A'／F-C	0.3433
d-C／F-C	0.3033
e-C／F-C	0.5419
g-d／F-C	1.2406
g-F／F-C	0.5440
h-g／F-C	0.4504
i-g／F-C	–
C'-t／F'-C'	0.8371
e-C'／F'-C'	0.4894
F'-e／F'-C'	0.5106
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0045
ΔPgF	0.0135

Specific gravity	4.10

Thermal properties	
CTE(-30,70) [1E-7/℃]	114
CTE(100,300) [1E-7/℃]	132
Tg [℃]	564
At [℃]	591
Ht cndct. [W/m･K]	0.663
Sp. heat [kJ/kg･K]	0.522
Ht diffus. [1E-6 m2/sec]	0.309

Chemical properties [class]	
Acid res. (surface)	3
Alkaline detergent res.	3
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	290 (3)
Abrasion hardness	540
Young's mod. [GPa]	76.0
Shear mod. [GPa]	29.3
Poisson's ratio	0.298
Stress optical coef. [1E-5 nm/cm／Pa]	0.60

Color Code (80%/5%)	36/31
Internal CC	352/304

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	0.03
310	0.10
320	0.24
330	0.43
340	0.63
350	0.78
360	0.88
365	0.911
370	0.937
380	0.966
390	0.978
400	0.985
420	0.989
440	0.989
460	0.991
480	0.992
500	0.993
550	0.996
600	0.994
650	0.993
700	0.992
800	0.989
900	0.993
1000	0.992
1200	0.999
1400	0.997
1600	0.995
1800	0.988
2000	0.990
2200	0.989
2400	0.987

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	-6.1	-6.1	-6.0	-5.9	-5.9	-5.8	-5.8	-5.8	-5.7	-5.6	-5.3	-5.3	-5.0	-4.8	-4.6
60 to 80(ref.)	-6.1	-6.0	-5.9	-5.9	-5.8	-5.8	-5.7	-5.7	-5.6	-5.5	-5.3	-5.3	-5.0	-4.7	-4.5
40 to 60	-6.0	-6.0	-5.9	-5.8	-5.8	-5.7	-5.7	-5.7	-5.6	-5.5	-5.3	-5.2	-5.0	-4.7	-4.5
20 to 40	-5.9	-5.8	-5.8	-5.7	-5.7	-5.6	-5.6	-5.6	-5.5	-5.4	-5.2	-5.1	-4.9	-4.6	-4.4
0 to 20	-5.7	-5.7	-5.6	-5.6	-5.5	-5.5	-5.4	-5.4	-5.3	-5.2	-5.0	-5.0	-4.8	-4.5	-4.3
-20 to 0	-5.5	-5.5	-5.4	-5.4	-5.3	-5.3	-5.3	-5.2	-5.2	-5.1	-4.9	-4.8	-4.6	-4.4	-4.2
-40 to -20	-5.3	-5.3	-5.2	-5.1	-5.1	-5.0	-5.0	-5.0	-4.9	-4.8	-4.6	-4.6	-4.4	-4.1	-4.0
-60 to -40(ref.)	-4.9	-4.9	-4.9	-4.8	-4.7	-4.7	-4.7	-4.7	-4.6	-4.5	-4.3	-4.3	-4.0	-3.8	-3.7
-70 to -60(ref.)	-4.6	-4.6	-4.5	-4.5	-4.4	-4.4	-4.3	-4.3	-4.2	-4.2	-4.0	-3.9	-3.7	-3.5	-3.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-7.1	-7.1	-7.0	-6.9	-6.9	-6.8	-6.8	-6.8	-6.7	-6.6	-6.4	-6.3	-6.1	-5.8	-5.6
60 to 80	-7.1	-7.1	-7.0	-7.0	-6.9	-6.8	-6.8	-6.8	-6.7	-6.6	-6.4	-6.4	-6.1	-5.9	-5.7
40 to 60	-7.2	-7.2	-7.1	-7.0	-7.0	-6.9	-6.9	-6.9	-6.8	-6.7	-6.5	-6.5	-6.2	-6.0	-5.8
20～40	-7.2	-7.2	-7.1	-7.1	-7.0	-7.0	-7.0	-6.9	-6.9	-6.8	-6.6	-6.6	-6.3	-6.1	-5.9
0 to 20	-7.3	-7.3	-7.2	-7.2	-7.1	-7.0	-7.0	-7.0	-6.9	-6.8	-6.7	-6.6	-6.4	-6.2	-6.0
-20 to 0	-7.4	-7.3	-7.3	-7.2	-7.2	-7.1	-7.1	-7.1	-7.0	-6.9	-6.7	-6.7	-6.5	-6.3	-6.1
-40 to -20	-7.4	-7.4	-7.3	-7.3	-7.2	-7.2	-7.2	-7.2	-7.1	-7.0	-6.8	-6.8	-6.6	-6.4	-6.2
-60 to -40	-7.5	-7.5	-7.4	-7.3	-7.3	-7.3	-7.2	-7.2	-7.2	-7.1	-6.9	-6.9	-6.7	-6.5	-6.3
-70 to -60	-7.5	-7.5	-7.4	-7.4	-7.4	-7.3	-7.3	-7.3	-7.2	-7.1	-7.0	-6.9	-6.8	-6.5	-6.4

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.07864082E-01
Q1	1.08487364E+02
P2	5.74402039E-02
Q2	1.50165453E-02
P3	2.76204496E-01
Q3	3.75883453E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	5.3
Frac. eq. (ref.)	0.4	5.6

Prod. Freq. (A to F)	A

Similar glass type			
OHARA		HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BK7

nd = 1.516800 ne = 1.518730

ν d = 63.88 ν e = 63.66

Glass code (d)
517639
Glass code (e)
519637

Spectral l.	Refractive idx
2.058	1.49397
1.970	1.49526
1.530	1.50105
1.129	1.50584
1.064	1.50666
t	1.50733
s	1.50980
A'	1.511426
r	1.512883
C	1.514315
C'	1.514713
He-Ne	1.515083
D	1.516728
d	1.516800
e	1.518730
F	1.522405
F'	1.522861
g	1.526741
h	1.530321
0.389	1.532497
i	1.536391

Coef. disp. form. (pwr ser.)	
A0	2.27109726E+00
A1	-9.47304881E-03
A2	-8.91871520E-05
A3	1.09352525E-02
A4	1.36527555E-04
A5	1.68617824E-06
A6	5.85391298E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.008090
F'-C'	0.008148
C-t	0.006990
C-A'	0.002889
d-C	0.002485
e-C	0.004415
g-d	0.009941
g-F	0.004336
h-g	0.003580
i-g	0.009650
C'-t	0.007388
e-C'	0.004017
F'-e	0.004131
i-F'	0.013530

Relative partial dispersion	
C-t／F-C	0.8640
C-A'／F-C	0.3571
d-C／F-C	0.3072
e-C／F-C	0.5457
g-d／F-C	1.2288
g-F／F-C	0.5360
h-g／F-C	0.4425
i-g／F-C	1.1928
C'-t／F'-C'	0.9067
e-C'／F'-C'	0.4930
F'-e／F'-C'	0.5070
i-F'／F'-C'	1.6605

Deviation of relative partial disp.	
ΔPdC	0.0011
ΔPgF	-0.0012

Specific gravity	2.52

Thermal properties	
CTE(-30,70) [1E-7/℃]	71
CTE(100,300) [1E-7/℃]	94
Tg [℃]	552
At [℃]	616
Ht cndct. [W/m･K]	1.180
Sp. heat [kJ/kg･K]	0.788
Ht diffus. [1E-6 m2/sec]	0.596

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	3
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	495 (5)
Abrasion hardness	118
Young's mod. [GPa]	78.6
Shear mod. [GPa]	32.4
Poisson's ratio	0.215
Stress optical coef. [1E-5 nm/cm／Pa]	2.95

Color Code (80%/5%)	33/29
Internal CC	321/288

Internal trans. (10mm)	
λ [nm]	τ
280	0.01
290	0.08
300	0.30
310	0.59
320	0.79
330	0.89
340	0.947
350	0.973
360	0.986
365	0.988
370	0.990
380	0.990
390	0.995
400	0.996
420	0.996
440	0.995
460	0.995
480	0.996
500	0.996
550	0.996
600	0.996
650	0.994
700	0.993
800	0.989
900	0.997
1000	0.996
1200	0.997
1400	0.977
1600	0.987
1800	0.960
2000	0.921
2200	0.81
2400	0.75

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.8	2.8	3.1	3.4	3.6
60 to 80(ref.)	1.8	1.8	1.9	2.0	2.1	2.1	2.2	2.2	2.3	2.4	2.7	2.7	3.0	3.3	3.5
40 to 60	1.6	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.3	2.5	2.6	2.8	3.1	3.3
20 to 40	1.6	1.6	1.7	1.8	1.8	1.9	1.9	1.9	2.0	2.2	2.4	2.4	2.7	3.0	3.1
0 to 20	1.5	1.5	1.6	1.7	1.8	1.8	1.9	1.9	2.0	2.1	2.3	2.4	2.6	2.9	3.0
-20 to 0	1.5	1.5	1.6	1.7	1.7	1.8	1.8	1.8	1.9	2.1	2.3	2.3	2.6	2.8	3.0
-40 to -20	1.5	1.6	1.6	1.7	1.8	1.8	1.9	1.9	2.0	2.1	2.3	2.3	2.6	2.8	3.0
-60 to -40(ref.)	1.7	1.7	1.8	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.4	2.4	2.7	2.9	3.1
-70 to -60(ref.)	1.8	1.9	1.9	2.0	2.1	2.1	2.2	2.2	2.3	2.4	2.6	2.6	2.8	3.1	3.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	0.9	1.0	1.1	1.2	1.2	1.3	1.3	1.4	1.5	1.6	1.9	1.9	2.2	2.5	2.6
60 to 80	0.8	0.8	0.9	1.0	1.0	1.1	1.1	1.2	1.3	1.4	1.6	1.7	2.0	2.2	2.4
40 to 60	0.5	0.5	0.6	0.7	0.8	0.9	0.9	0.9	1.0	1.1	1.4	1.4	1.7	1.9	2.1
20～40	0.3	0.3	0.4	0.4	0.5	0.6	0.6	0.6	0.7	0.8	1.1	1.1	1.4	1.6	1.8
0 to 20	0.0	0.0	0.1	0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8	1.1	1.3	1.5
-20 to 0	-0.2	-0.2	-0.1	-0.1	0.0	0.1	0.1	0.1	0.2	0.3	0.5	0.5	0.8	1.0	1.2
-40 to -20	-0.5	-0.5	-0.4	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1	0.0	0.2	0.3	0.5	0.7	0.9
-60 to -40	-0.7	-0.7	-0.6	-0.6	-0.5	-0.5	-0.5	-0.4	-0.4	-0.3	-0.1	0.0	0.2	0.4	0.5
-70 to -60	-0.9	-0.9	-0.8	-0.8	-0.7	-0.7	-0.6	-0.6	-0.6	-0.5	-0.3	-0.2	0.0	0.2	0.3

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.39550757E-01
Q1	8.95386491E+01
P2	6.35878002E-02
Q2	1.51266237E-02
P3	2.34024244E-01
Q3	3.57748829E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.3	5.6
Frac. eq. (ref.)	0.3	5.7

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-BSL7	HOYA	BSC7
C.D.G.M	H-K9	SCHOTT	N-BK7

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BAK1

nd = 1.572500 ne = 1.574882

ν d = 57.30 ν e = 57.01

Glass code (d)
573573
Glass code (e)
575570

Spectral l.	Refractive idx
2.058	1.54903
1.970	1.55016
1.530	1.55531
1.129	1.55991
1.064	1.56075
t	1.56145
s	1.56417
A'	1.566036
r	1.567755
C	1.569472
C'	1.569953
He-Ne	1.570402
D	1.572411
d	1.572500
e	1.574882
F	1.579464
F'	1.580036
g	1.584931
h	1.589484
0.389	1.592266
i	1.597270

Coef. disp. form. (pwr ser.)	
A0	2.43258691E+00
A1	-8.22086723E-03
A2	-9.21764324E-05
A3	1.43187501E-02
A4	1.59799832E-04
A5	8.58344462E-06
A6	-1.00538104E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.009992
F'-C'	0.010083
C-t	0.008023
C-A'	0.003436
d-C	0.003028
e-C	0.005410
g-d	0.012431
g-F	0.005467
h-g	0.004553
i-g	0.012339
C'-t	0.008504
e-C'	0.004929
F'-e	0.005154
i-F'	0.017234

Relative partial dispersion	
C-t／F-C	0.8029
C-A'／F-C	0.3439
d-C／F-C	0.3030
e-C／F-C	0.5414
g-d／F-C	1.2441
g-F／F-C	0.5471
h-g／F-C	0.4557
i-g／F-C	1.2349
C'-t／F'-C'	0.8434
e-C'／F'-C'	0.4888
F'-e／F'-C'	0.5112
i-F'／F'-C'	1.7092

Deviation of relative partial disp.	
ΔPdC	0.0000
ΔPgF	-0.0011

Specific gravity	3.17

Thermal properties	
CTE(-30,70) [1E-7/℃]	73
CTE(100,300) [1E-7/℃]	83
Tg [℃]	599
At [℃]	656
Ht cndct. [W/m･K]	0.936
Sp. heat [kJ/kg･K]	0.618
Ht diffus. [1E-6 m2/sec]	0.476

Chemical properties [class]	
Acid res. (surface)	2
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	2

Mechanical properties	
Knoop hardness	467 (5)
Abrasion hardness	138
Young's mod. [GPa]	73.3
Shear mod. [GPa]	29.3
Poisson's ratio	0.251
Stress optical coef. [1E-5 nm/cm／Pa]	3.02

Color Code (80%/5%)	34/30
Internal CC	332/294

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.02
300	0.13
310	0.36
320	0.60
330	0.78
340	0.88
350	0.939
360	0.966
365	0.976
370	0.982
380	0.985
390	0.990
400	0.993
420	0.993
440	0.991
460	0.992
480	0.993
500	0.994
550	0.996
600	0.994
650	0.993
700	0.993
800	0.991
900	0.997
1000	0.995
1200	0.996
1400	0.989
1600	0.990
1800	0.976
2000	0.965
2200	0.916
2400	0.88

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.1	3.2	3.3	3.4	3.5	3.7	3.7	3.7	3.9	4.0	4.4	4.4	4.8	5.2	5.4
60 to 80(ref.)	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.5	3.6	3.8	4.1	4.2	4.5	4.9	5.2
40 to 60	2.7	2.7	2.8	2.9	3.0	3.1	3.2	3.2	3.3	3.5	3.8	3.8	4.2	4.6	4.8
20 to 40	2.4	2.5	2.6	2.7	2.8	2.9	2.9	2.9	3.1	3.2	3.5	3.6	3.9	4.3	4.5
0 to 20	2.2	2.2	2.4	2.5	2.6	2.7	2.7	2.7	2.8	3.0	3.3	3.3	3.7	4.0	4.3
-20 to 0	2.0	2.1	2.2	2.3	2.4	2.5	2.5	2.5	2.7	2.8	3.1	3.1	3.5	3.8	4.1
-40 to -20	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.6	2.7	3.0	3.0	3.4	3.7	3.9
-60 to -40(ref.)	1.9	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.7	3.0	3.0	3.3	3.7	3.9
-70 to -60(ref.)	2.0	2.0	2.2	2.3	2.3	2.4	2.5	2.5	2.6	2.7	3.0	3.0	3.4	3.7	3.9

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.2	2.2	2.4	2.5	2.6	2.7	2.7	2.7	2.9	3.0	3.4	3.4	3.8	4.2	4.4
60 to 80	1.9	1.9	2.1	2.2	2.3	2.4	2.4	2.4	2.6	2.7	3.0	3.1	3.4	3.8	4.1
40 to 60	1.5	1.5	1.6	1.7	1.8	1.9	2.0	2.0	2.1	2.3	2.6	2.6	3.0	3.3	3.6
20～40	1.1	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.7	1.8	2.1	2.2	2.5	2.9	3.1
0 to 20	0.7	0.7	0.8	0.9	1.0	1.1	1.1	1.2	1.3	1.4	1.7	1.7	2.1	2.4	2.7
-20 to 0	0.3	0.3	0.4	0.5	0.6	0.7	0.7	0.7	0.8	1.0	1.3	1.3	1.6	2.0	2.2
-40 to -20	-0.1	-0.1	0.0	0.1	0.2	0.3	0.3	0.3	0.4	0.6	0.8	0.9	1.2	1.5	1.7
-60 to -40	-0.5	-0.5	-0.4	-0.3	-0.2	-0.2	-0.1	-0.1	0.0	0.1	0.4	0.4	0.7	1.0	1.2
-70 to -60	-0.9	-0.8	-0.7	-0.6	-0.6	-0.5	-0.5	-0.4	-0.3	-0.2	0.1	0.1	0.4	0.7	0.9

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.25334798E-01
Q1	9.83783343E+01
P2	2.36950126E-02
Q2	2.51187977E-02
P3	2.99538486E-01
Q3	5.24516443E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	5.7
Frac. eq. (ref.)	0.6	6.7

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-BAL11	HOYA	
C.D.G.M	H-BaK8	SCHOTT	N-BAK1

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BAK2

nd = 1.539960 ne = 1.542123

νd = 59.52 νe = 59.26

Glass code (d)
540595
Glass code (e)
542593

Spectral l.	Refractive idx
2.058	1.51748
1.970	1.51862
1.530	1.52379
1.129	1.52829
1.064	1.52909
t	1.52976
s	1.53231
A'	1.534045
r	1.535627
C	1.537199
C'	1.537639
He-Ne	1.538049
D	1.539879
d	1.539960
e	1.542123
F	1.546271
F'	1.546787
g	1.551203
h	1.555299
0.389	1.557798
i	1.562285

Coef. disp. form. (pwr ser.)	
A0	2.33616060E+00
A1	-8.18245071E-03
A2	-9.82753897E-05
A3	1.27499096E-02
A4	1.22269251E-04
A5	8.48994057E-06
A6	-1.59525058E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.009072
F'-C'	0.009148
C-t	0.007438
C-A'	0.003154
d-C	0.002761
e-C	0.004924
g-d	0.011243
g-F	0.004932
h-g	0.004096
i-g	0.011082
C'-t	0.007878
e-C'	0.004484
F'-e	0.004664
i-F'	0.015498

Relative partial dispersion	
C-t／F-C	0.8199
C-A'／F-C	0.3477
d-C／F-C	0.3043
e-C／F-C	0.5428
g-d／F-C	1.2393
g-F／F-C	0.5437
h-g／F-C	0.4515
i-g／F-C	1.2216
C'-t／F'-C'	0.8612
e-C'／F'-C'	0.4902
F'-e／F'-C'	0.5098
i-F'／F'-C'	1.6941

Deviation of relative partial disp.	
ΔPdC	0.0003
ΔPgF	-0.0008

Specific gravity	2.84

Thermal properties	
CTE(-30,70) [1E-7/℃]	76
CTE(100,300) [1E-7/℃]	87
Tg [℃]	559
At [℃]	624
Ht cndct. [W/m･K]	0.915
Sp. heat [kJ/kg･K]	0.632
Ht diffus. [1E-6 m2/sec]	0.508

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	2

Mechanical properties	
Knoop hardness	465 (5)
Abrasion hardness	119
Young's mod. [GPa]	70.7
Shear mod. [GPa]	28.7
Poisson's ratio	0.232
Stress optical coef. [1E-5 nm/cm／Pa]	2.80

Color Code (80%/5%)	33/29
Internal CC	324/292
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.03
300	0.19
310	0.48
320	0.73
330	0.87
340	0.940
350	0.971
360	0.984
365	0.988
370	0.990
380	0.990
390	0.993
400	0.996
420	0.995
440	0.994
460	0.994
480	0.995
500	0.996
550	0.996
600	0.996
650	0.995
700	0.995
800	0.992
900	0.996
1000	0.996
1200	0.996
1400	0.990
1600	0.990
1800	0.972
2000	0.947
2200	0.89
2400	0.85

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	1.6	1.6	1.7	1.9	2.0	2.1	2.1	2.1	2.2	2.4	2.7	2.8	3.1	3.5	3.7
60 to 80(ref.)	1.5	1.5	1.7	1.7	1.8	1.9	2.0	2.0	2.1	2.3	2.6	2.6	3.0	3.3	3.5
40 to 60	1.4	1.4	1.5	1.6	1.7	1.8	1.8	1.9	2.0	2.1	2.4	2.5	2.8	3.1	3.3
20 to 40	1.3	1.3	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.3	2.3	2.7	3.0	3.2
0 to 20	1.2	1.3	1.4	1.5	1.5	1.6	1.7	1.7	1.8	1.9	2.2	2.2	2.6	2.9	3.0
-20 to 0	1.2	1.3	1.4	1.4	1.5	1.6	1.6	1.7	1.8	1.9	2.2	2.2	2.5	2.8	3.0
-40 to -20	1.3	1.3	1.4	1.5	1.6	1.7	1.7	1.7	1.8	1.9	2.2	2.2	2.5	2.8	2.9
-60 to -40(ref.)	1.4	1.5	1.6	1.6	1.7	1.8	1.8	1.8	1.9	2.0	2.3	2.3	2.6	2.9	3.0
-70 to -60(ref.)	1.6	1.6	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.4	2.5	2.7	3.0	3.1

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	0.6	0.7	0.8	0.9	1.0	1.1	1.1	1.2	1.3	1.4	1.7	1.8	2.2	2.5	2.7
60 to 80	0.5	0.5	0.6	0.7	0.8	0.9	0.9	1.0	1.1	1.2	1.5	1.6	1.9	2.3	2.5
40 to 60	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.9	1.2	1.3	1.6	1.9	2.1
20～40	0.0	0.0	0.1	0.2	0.3	0.4	0.4	0.4	0.5	0.7	0.9	1.0	1.3	1.6	1.8
0 to 20	-0.3	-0.2	-0.1	-0.1	0.0	0.1	0.1	0.1	0.3	0.4	0.6	0.7	1.0	1.3	1.5
-20 to 0	-0.5	-0.5	-0.4	-0.3	-0.2	-0.2	-0.1	-0.1	0.0	0.1	0.4	0.4	0.7	0.9	1.1
-40 to -20	-0.8	-0.7	-0.6	-0.6	-0.5	-0.4	-0.4	-0.4	-0.3	-0.2	0.1	0.1	0.4	0.6	0.8
-60 to -40	-1.0	-1.0	-0.9	-0.8	-0.8	-0.7	-0.7	-0.7	-0.6	-0.5	-0.2	-0.2	0.1	0.3	0.4
-70 to -60	-1.2	-1.2	-1.1	-1.0	-1.0	-0.9	-0.9	-0.9	-0.8	-0.7	-0.5	-0.4	-0.2	0.1	0.2

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.22545246E-01
Q1	9.24022804E+01
P2	1.79911705E-02
Q2	2.59658508E-02
P3	2.90195251E-01
Q3	5.32121925E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	7.5
Frac. eq. (ref.)	0.7	7.5

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-BAL12	HOYA	
C.D.G.M	H-BaK2	SCHOTT	N-BAK2

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BAK4

nd = 1.568830　　ne = 1.571250

νd = 56.00　　νe = 55.73

Glass code (d)
569560
Glass code (e)
571557

Spectral l.	Refractive idx
2.058	1.54426
1.970	1.54548
1.530	1.55104
1.129	1.55592
1.064	1.55680
t	1.55753
s	1.56033
A'	1.562249
r	1.564003
C	1.565751
C'	1.566241
He-Ne	1.566698
D	1.568740
d	1.568830
e	1.571250
F	1.575909
F'	1.576491
g	1.581480
h	1.586137
0.389	1.588993
i	1.594153

Coef. disp. form. (pwr ser.)	
A0	2.42114503E+00
A1	-8.99959341E-03
A2	-9.30006854E-05
A3	1.43071120E-02
A4	1.89993274E-04
A5	6.09602388E-06
A6	2.25737069E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.010158
F'-C'	0.010250
C-t	0.008223
C-A'	0.003502
d-C	0.003079
e-C	0.005499
g-d	0.012650
g-F	0.005571
h-g	0.004657
i-g	0.012673
C'-t	0.008713
e-C'	0.005009
F'-e	0.005241
i-F'	0.017662

Relative partial dispersion	
C-t／F-C	0.8095
C-A'／F-C	0.3448
d-C／F-C	0.3031
e-C／F-C	0.5413
g-d／F-C	1.2453
g-F／F-C	0.5484
h-g／F-C	0.4585
i-g／F-C	1.2476
C'-t／F'-C'	0.8500
e-C'／F'-C'	0.4887
F'-e／F'-C'	0.5113
i-F'／F'-C'	1.7231

Deviation of relative partial disp.	
ΔPdC	0.0006
ΔPgF	-0.0020

Specific gravity	2.84

Thermal properties	
CTE(-30,70) [1E-7/℃]	70
CTE(100,300) [1E-7/℃]	84
Tg [℃]	580
At [℃]	635
Ht cndct. [W/m･K]	0.993
Sp. heat [kJ/kg･K]	0.697
Ht diffus. [1E-6 m2/sec]	0.500

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	509 (5)
Abrasion hardness	115
Young's mod. [GPa]	82.1
Shear mod. [GPa]	32.9
Poisson's ratio	0.246
Stress optical coef. [1E-5 nm/cm／Pa]	2.62

Color Code (80%/5%)	36/33
Internal CC	353/328
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	0.10
340	0.45
350	0.74
360	0.88
365	0.922
370	0.947
380	0.971
390	0.983
400	0.990
420	0.993
440	0.993
460	0.994
480	0.995
500	0.996
550	0.995
600	0.995
650	0.994
700	0.993
800	0.989
900	0.998
1000	0.996
1200	0.999
1400	0.984
1600	0.990
1800	0.972
2000	0.955
2200	0.88
2400	0.83

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.8	2.9	2.9	3.1	3.2	3.3	3.4	3.4	3.6	3.7	4.1	4.1	4.6	5.0	5.2
60 to 80(ref.)	2.7	2.7	2.9	3.0	3.1	3.2	3.2	3.3	3.4	3.6	3.9	4.0	4.4	4.8	5.1
40 to 60	2.6	2.6	2.7	2.8	2.9	3.1	3.1	3.1	3.3	3.4	3.8	3.8	4.2	4.6	4.9
20 to 40	2.5	2.5	2.6	2.7	2.8	2.9	3.0	3.0	3.1	3.3	3.6	3.7	4.1	4.4	4.7
0 to 20	2.4	2.4	2.5	2.6	2.7	2.8	2.9	2.9	3.0	3.2	3.5	3.5	3.9	4.3	4.5
-20 to 0	2.4	2.4	2.5	2.6	2.7	2.8	2.8	2.9	3.0	3.1	3.4	3.5	3.9	4.2	4.4
-40 to -20	2.4	2.4	2.5	2.6	2.7	2.8	2.9	2.9	3.0	3.1	3.4	3.5	3.8	4.2	4.4
-60 to -40(ref.)	2.5	2.5	2.6	2.7	2.8	2.9	3.0	3.0	3.1	3.2	3.5	3.6	3.9	4.3	4.5
-70 to -60(ref.)	2.7	2.7	2.8	2.9	3.0	3.1	3.1	3.1	3.3	3.4	3.7	3.7	4.1	4.4	4.6

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.9	1.9	2.0	2.1	2.2	2.4	2.4	2.4	2.6	2.7	3.1	3.1	3.6	4.0	4.2
60 to 80	1.7	1.7	1.8	1.9	2.0	2.1	2.2	2.2	2.4	2.5	2.9	2.9	3.3	3.7	4.0
40 to 60	1.4	1.4	1.5	1.6	1.7	1.9	1.9	1.9	2.1	2.2	2.5	2.6	3.0	3.4	3.6
20～40	1.1	1.1	1.3	1.4	1.5	1.6	1.6	1.6	1.8	1.9	2.2	2.3	2.7	3.0	3.3
0 to 20	0.9	0.9	1.0	1.1	1.2	1.3	1.3	1.3	1.5	1.6	1.9	2.0	2.3	2.7	2.9
-20 to 0	0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.0	1.2	1.3	1.6	1.6	2.0	2.3	2.5
-40 to -20	0.3	0.3	0.4	0.5	0.6	0.7	0.7	0.8	0.9	1.0	1.3	1.3	1.7	2.0	2.2
-60 to -40	0.1	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.6	0.7	1.0	1.0	1.3	1.7	1.8
-70 to -60	-0.2	-0.1	-0.1	0.0	0.1	0.2	0.2	0.2	0.3	0.5	0.7	0.8	1.1	1.4	1.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.32025131E-01
Q1	9.47904687E+01
P2	1.03988255E-02
Q2	3.68050059E-02
P3	3.11070528E-01
Q3	5.79597844E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	4.1
Frac. eq. (ref.)	0.5	5.1

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-BAL14	HOYA	BaC4
C.D.G.M	H-BaK7	SCHOTT	N-BAK4

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-K3

nd = 1.518230 ne = 1.520330

ν d = 58.82 ν e = 58.55

Glass code (d)
518588
Glass code (e)
520586

Spectral l.	Refractive idx
2.058	1.49627
1.970	1.49739
1.530	1.50247
1.129	1.50688
1.064	1.50767
t	1.50832
s	1.51081
A'	1.512490
r	1.514026
C	1.515551
C'	1.515978
He-Ne	1.516375
D	1.518152
d	1.518230
e	1.520330
F	1.524362
F'	1.524865
g	1.529163
h	1.533159
0.389	1.535601
i	1.539996

Coef. disp. form. (pwr ser.)	
A0	2.27169182E+00
A1	-8.15289465E-03
A2	-6.46337623E-05
A3	1.19516164E-02
A4	1.76673730E-04
A5	1.45062194E-06
A6	2.24852090E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.008811
F'-C'	0.008887
C-t	0.007229
C-A'	0.003061
d-C	0.002679
e-C	0.004779
g-d	0.010933
g-F	0.004801
h-g	0.003996
i-g	0.010833
C'-t	0.007656
e-C'	0.004352
F'-e	0.004535
i-F'	0.015131

Relative partial dispersion	
C-t／F-C	0.8205
C-A'／F-C	0.3474
d-C／F-C	0.3041
e-C／F-C	0.5424
g-d／F-C	1.2408
g-F／F-C	0.5449
h-g／F-C	0.4535
i-g／F-C	1.2295
C'-t／F'-C'	0.8615
e-C'／F'-C'	0.4897
F'-e／F'-C'	0.5103
i-F'／F'-C'	1.7026

Deviation of relative partial disp.	
ΔPdC	0.0003
ΔPgF	-0.0008

Specific gravity	2.50

Thermal properties	
CTE(-30,70) [1E-7/℃]	89
CTE(100,300) [1E-7/℃]	111
Tg [℃]	508
At [℃]	559
Ht cndct. [W/m･K]	1.020
Sp. heat [kJ/kg･K]	0.771
Ht diffus. [1E-6 m2/sec]	0.527

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	2
Water res. (powder)	3
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	451 (5)
Abrasion hardness	114
Young's mod. [GPa]	70.6
Shear mod. [GPa]	28.8
Poisson's ratio	0.226
Stress optical coef. [1E-5 nm/cm／Pa]	3.13

Color Code (80%/5%)	35/32
Internal CC	345/316
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	0.01
320	0.13
330	0.44
340	0.71
350	0.86
360	0.929
365	0.950
370	0.964
380	0.977
390	0.987
400	0.991
420	0.993
440	0.993
460	0.994
480	0.994
500	0.995
550	0.994
600	0.995
650	0.994
700	0.994
800	0.991
900	0.998
1000	0.995
1200	0.997
1400	0.988
1600	0.987
1800	0.956
2000	0.909
2200	0.82
2400	0.76

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.4	0.5	0.5	0.7	0.8	0.9	0.9	0.9	1.0	1.2	1.5	1.6	2.0	2.4	2.5
60 to 80(ref.)	0.3	0.4	0.5	0.6	0.7	0.8	0.8	0.8	0.9	1.1	1.4	1.5	1.9	2.3	2.4
40 to 60	0.3	0.3	0.4	0.5	0.6	0.7	0.7	0.7	0.8	1.0	1.3	1.3	1.8	2.1	2.3
20 to 40	0.2	0.2	0.4	0.4	0.5	0.6	0.6	0.6	0.7	0.9	1.2	1.2	1.6	2.0	2.1
0 to 20	0.2	0.2	0.3	0.4	0.5	0.6	0.6	0.6	0.7	0.8	1.1	1.2	1.6	1.9	2.0
-20 to 0	0.2	0.2	0.4	0.4	0.5	0.6	0.6	0.6	0.7	0.8	1.1	1.2	1.6	1.9	2.0
-40 to -20	0.3	0.3	0.4	0.5	0.6	0.6	0.7	0.7	0.8	0.9	1.2	1.2	1.6	1.9	2.0
-60 to -40(ref.)	0.5	0.5	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0	1.3	1.4	1.7	2.0	2.1
-70 to -60(ref.)	0.7	0.7	0.8	0.9	0.9	1.0	1.0	1.0	1.1	1.2	1.5	1.5	1.9	2.2	2.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-0.5	-0.5	-0.3	-0.3	-0.2	-0.1	-0.1	0.0	0.1	0.2	0.6	0.6	1.0	1.4	1.6
60 to 80	-0.7	-0.6	-0.5	-0.4	-0.3	-0.3	-0.2	-0.2	-0.1	0.0	0.4	0.4	0.8	1.2	1.3
40 to 60	-0.9	-0.8	-0.7	-0.6	-0.6	-0.5	-0.5	-0.4	-0.3	-0.2	0.1	0.2	0.6	0.9	1.1
20～40	-1.1	-1.1	-0.9	-0.9	-0.8	-0.7	-0.7	-0.7	-0.6	-0.4	-0.1	-0.1	0.3	0.6	0.8
0 to 20	-1.3	-1.3	-1.2	-1.1	-1.0	-0.9	-0.9	-0.9	-0.8	-0.7	-0.4	-0.4	0.0	0.3	0.5
-20 to 0	-1.5	-1.5	-1.4	-1.3	-1.2	-1.2	-1.2	-1.1	-1.0	-0.9	-0.6	-0.6	-0.2	0.1	0.2
-40 to -20	-1.7	-1.7	-1.6	-1.5	-1.5	-1.4	-1.4	-1.4	-1.3	-1.2	-0.9	-0.9	-0.5	-0.2	-0.1
-60 to -40	-1.9	-1.9	-1.8	-1.8	-1.7	-1.6	-1.6	-1.6	-1.5	-1.4	-1.2	-1.1	-0.8	-0.5	-0.4
-70 to -60	-2.1	-2.1	-2.0	-1.9	-1.9	-1.8	-1.8	-1.8	-1.7	-1.6	-1.3	-1.3	-1.0	-0.7	-0.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.31786626E-01
Q1	9.86678624E+01
P2	1.83036821E-02
Q2	2.74845709E-02
P3	2.79397396E-01
Q3	5.25409101E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.3	5.9
Frac. eq. (ref.)	0.3	6.3

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-NSL3	HOYA	E-C3
C.D.G.M	H-K10	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-K5

nd = 1.522490 ne = 1.524594

ν d = 59.21 ν e = 58.95

Glass code (d)
522592
Glass code (e)
525590

Spectral l.	Refractive idx
2.058	1.50022
1.970	1.50138
1.530	1.50659
1.129	1.51107
1.064	1.51187
t	1.51252
s	1.51503
A'	1.516727
r	1.518271
C	1.519803
C'	1.520231
He-Ne	1.520631
D	1.522411
d	1.522490
e	1.524594
F	1.528627
F'	1.529130
g	1.533427
h	1.537420
0.389	1.539861
i	1.544251

Coef. disp. form. (pwr ser.)	
A0	2.28421062E+00
A1	-8.15537489E-03
A2	-1.05573054E-04
A3	1.22386101E-02
A4	1.10833374E-04
A5	9.05979458E-06
A6	-1.07673777E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.008824
F'-C'	0.008899
C-t	0.007278
C-A'	0.003076
d-C	0.002687
e-C	0.004791
g-d	0.010937
g-F	0.004800
h-g	0.003993
i-g	0.010824
C'-t	0.007706
e-C'	0.004363
F'-e	0.004536
i-F'	0.015121

Relative partial dispersion	
C-t／F-C	0.8248
C-A'／F-C	0.3486
d-C／F-C	0.3045
e-C／F-C	0.5430
g-d／F-C	1.2395
g-F／F-C	0.5440
h-g／F-C	0.4525
i-g／F-C	1.2267
C'-t／F'-C'	0.8659
e-C'／F'-C'	0.4903
F'-e／F'-C'	0.5097
i-F'／F'-C'	1.6992

Deviation of relative partial disp.	
ΔPdC	0.0006
ΔPgF	-0.0010

Specific gravity	2.52

Thermal properties	
CTE(-30,70) [1E-7/℃]	77
CTE(100,300) [1E-7/℃]	91
Tg [℃]	563
At [℃]	612
Ht cndct. [W/m･K]	1.133
Sp. heat [kJ/kg･K]	0.728
Ht diffus. [1E-6 m2/sec]	0.617

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	3
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	475 (5)
Abrasion hardness	94
Young's mod. [GPa]	73.1
Shear mod. [GPa]	29.9
Poisson's ratio	0.222
Stress optical coef. [1E-5 nm/cm／Pa]	3.20

Color Code (80%/5%)	35/32
Internal CC	345/318
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	0.09
330	0.40
340	0.70
350	0.86
360	0.933
365	0.953
370	0.967
380	0.980
390	0.989
400	0.994
420	0.995
440	0.995
460	0.996
480	0.996
500	0.996
550	0.996
600	0.997
650	0.997
700	0.996
800	0.991
900	0.999
1000	0.996
1200	0.997
1400	0.989
1600	0.990
1800	0.971
2000	0.945
2200	0.88
2400	0.85

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	1.8	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.6	2.9	2.9	3.3	3.6	3.9
60 to 80(ref.)	1.7	1.7	1.8	1.9	2.0	2.1	2.1	2.2	2.3	2.4	2.7	2.8	3.1	3.5	3.7
40 to 60	1.6	1.6	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.3	2.6	2.6	3.0	3.3	3.5
20 to 40	1.5	1.5	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.2	2.5	2.5	2.8	3.2	3.3
0 to 20	1.4	1.5	1.5	1.6	1.7	1.8	1.8	1.9	2.0	2.1	2.4	2.4	2.7	3.0	3.2
-20 to 0	1.4	1.5	1.5	1.6	1.7	1.8	1.8	1.8	1.9	2.1	2.3	2.4	2.7	3.0	3.1
-40 to -20	1.5	1.5	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.1	2.4	2.4	2.7	3.0	3.1
-60 to -40(ref.)	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.5	2.5	2.8	3.0	3.2
-70 to -60(ref.)	1.8	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.4	2.6	2.6	2.9	3.2	3.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	0.9	0.9	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.6	1.9	2.0	2.3	2.7	2.9
60 to 80	0.7	0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.4	1.7	1.7	2.1	2.4	2.6
40 to 60	0.4	0.4	0.5	0.6	0.7	0.8	0.8	0.9	1.0	1.1	1.4	1.4	1.8	2.1	2.3
20～40	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.6	0.7	0.8	1.1	1.2	1.5	1.8	2.0
0 to 20	0.0	0.0	0.0	0.1	0.2	0.3	0.3	0.3	0.4	0.6	0.8	0.9	1.2	1.5	1.6
-20 to 0	-0.3	-0.3	-0.2	-0.1	-0.1	0.0	0.1	0.1	0.2	0.3	0.5	0.6	0.9	1.1	1.3
-40 to -20	-0.5	-0.5	-0.5	-0.4	-0.3	-0.2	-0.2	-0.2	-0.1	0.0	0.3	0.3	0.6	0.8	1.0
-60 to -40	-0.8	-0.8	-0.7	-0.6	-0.6	-0.5	-0.5	-0.5	-0.4	-0.3	0.0	0.0	0.3	0.5	0.6
-70 to -60	-1.0	-0.9	-0.9	-0.8	-0.8	-0.7	-0.7	-0.6	-0.6	-0.5	-0.2	-0.2	0.0	0.3	0.4

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.36005021E-01
Q1	9.95639722E+01
P2	1.00006529E-02
Q2	3.33640621E-02
P3	2.89810235E-01
Q3	5.65060229E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	9.2
Frac. eq. (ref.)	0.6	14.9

Prod. Freq. (A to F)	E

Similar glass type			
OHARA	S-NSL5	HOYA	
C.D.G.M	H-K50	SCHOTT	N-K5

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-KZFH1

nd = 1.612660 ne = 1.615934

ν d = 44.46 ν e = 44.21

Glass code (d)
613445
Glass code (e)
616442

Spectral l.	Refractive idx
2.058	1.58013
1.970	1.58175
1.530	1.58914
1.129	1.59556
1.064	1.59672
t	1.59767
s	1.60136
A'	1.603883
r	1.606206
C	1.608532
C'	1.609186
He-Ne	1.609797
D	1.612538
d	1.612660
e	1.615934
F	1.622313
F'	1.623117
g	1.630085
h	1.636718
0.389	1.640855
i	1.648477

Coef. disp. form. (pwr ser.)	
A0	2.54674023E+00
A1	-1.22652610E-02
A2	-1.34279040E-04
A3	1.85970683E-02
A4	5.22959966E-04
A5	-9.93145010E-06
A6	2.37371768E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.013781
F'-C'	0.013931
C-t	0.010858
C-A'	0.004649
d-C	0.004128
e-C	0.007402
g-d	0.017425
g-F	0.007772
h-g	0.006633
i-g	0.018392
C'-t	0.011512
e-C'	0.006748
F'-e	0.007183
i-F'	0.025360

Relative partial dispersion	
C-t／F-C	0.7879
C-A'／F-C	0.3373
d-C／F-C	0.2995
e-C／F-C	0.5371
g-d／F-C	1.2644
g-F／F-C	0.5640
h-g／F-C	0.4813
i-g／F-C	1.3346
C'-t／F'-C'	0.8264
e-C'／F'-C'	0.4844
F'-e／F'-C'	0.5156
i-F'／F'-C'	1.8204

Deviation of relative partial disp.	
ΔPdC	0.0023
ΔPgF	-0.0058

Specific gravity	2.80

Thermal properties	
CTE(-30,70) [1E-7/℃]	57
CTE(100,300) [1E-7/℃]	70
Tg [℃]	548
At [℃]	600
Ht cndct. [W/m･K]	0.991
Sp. heat [kJ/kg･K]	0.738
Ht diffus. [1E-6 m2/sec]	0.479

Chemical properties [class]	
Acid res. (surface)	2
Alkaline detergent res.	2
Climate resistance	2
Water res. (powder)	3
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	580 (6)
Abrasion hardness	133
Young's mod. [GPa]	81.3
Shear mod. [GPa]	32.6
Poisson's ratio	0.249
Stress optical coef. [1E-5 nm/cm／Pa]	4.03

Color Code (80%/5%)	36/33
Internal CC	348/324

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	0.23
340	0.62
350	0.82
360	0.905
365	0.931
370	0.948
380	0.967
390	0.977
400	0.983
420	0.987
440	0.989
460	0.991
480	0.993
500	0.994
550	0.995
600	0.996
650	0.995
700	0.995
800	0.991
900	0.999
1000	0.996
1200	0.999
1400	0.970
1600	0.985
1800	0.974
2000	0.945
2200	0.80
2400	0.63

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.5	3.6	3.7	3.8	4.0	4.1	4.1	4.2	4.4	4.6	5.1	5.1	5.7	6.3	6.7
60 to 80(ref.)	3.4	3.4	3.6	3.7	3.8	4.0	4.0	4.0	4.2	4.4	4.9	5.0	5.5	6.1	6.5
40 to 60	3.2	3.3	3.4	3.5	3.7	3.8	3.8	3.9	4.0	4.2	4.7	4.7	5.3	5.8	6.2
20 to 40	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.7	3.9	4.1	4.5	4.6	5.1	5.6	6.0
0 to 20	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.6	3.8	4.0	4.4	4.4	4.9	5.4	5.8
-20 to 0	3.0	3.0	3.2	3.3	3.4	3.5	3.5	3.5	3.7	3.9	4.3	4.3	4.8	5.3	5.6
-40 to -20	3.0	3.0	3.2	3.3	3.4	3.5	3.5	3.5	3.7	3.9	4.3	4.3	4.8	5.3	5.6
-60 to -40(ref.)	3.2	3.2	3.3	3.4	3.5	3.6	3.6	3.6	3.8	4.0	4.3	4.4	4.8	5.3	5.6
-70 to -60(ref.)	3.3	3.4	3.5	3.6	3.6	3.7	3.8	3.8	3.9	4.1	4.5	4.5	4.9	5.4	5.7

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.5	2.6	2.7	2.8	3.0	3.1	3.1	3.2	3.4	3.6	4.0	4.1	4.7	5.2	5.6
60 to 80	2.3	2.4	2.5	2.6	2.7	2.9	2.9	2.9	3.1	3.3	3.8	3.8	4.4	5.0	5.3
40 to 60	2.0	2.1	2.2	2.3	2.4	2.6	2.6	2.6	2.8	3.0	3.4	3.5	4.0	4.6	4.9
20～40	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.3	2.5	2.7	3.1	3.1	3.6	4.2	4.5
0 to 20	1.5	1.5	1.6	1.7	1.8	1.9	2.0	2.0	2.1	2.3	2.7	2.8	3.3	3.8	4.1
-20 to 0	1.2	1.2	1.3	1.4	1.5	1.6	1.6	1.7	1.8	2.0	2.4	2.4	2.9	3.4	3.7
-40 to -20	0.9	0.9	1.0	1.1	1.2	1.3	1.3	1.4	1.5	1.7	2.0	2.1	2.5	3.0	3.3
-60 to -40	0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.1	1.2	1.3	1.7	1.7	2.2	2.6	2.9
-70 to -60	0.4	0.4	0.5	0.6	0.7	0.8	0.8	0.8	0.9	1.1	1.4	1.5	1.9	2.3	2.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.12852557E-01
Q1	6.44828839E+01
P2	1.63091315E-02
Q2	4.47179637E-02
P3	3.23827161E-01
Q3	6.24486335E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	1.3	10.3
Frac. eq. (ref.)	1.4	11.8

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-NBM51	HOYA	E-ADF10
C.D.G.M		SCHOTT	N-KZFS4

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-KF6

nd = 1.517420 ne = 1.519777

νd = 52.20 νe = 51.93

Glass code (d)
517522
Glass code (e)
520519

Spectral l.	Refractive idx
2.058	1.49223
1.970	1.49357
1.530	1.49959
1.129	1.50471
1.064	1.50561
t	1.50635
s	1.50914
A'	1.511021
r	1.512730
C	1.514429
C'	1.514905
He-Ne	1.515348
D	1.517332
d	1.517420
e	1.519777
F	1.524341
F'	1.524914
g	1.529871
h	1.534576
0.389	1.537508
i	1.542910

Coef. disp. form. (pwr ser.)	
A0	2.26653222E+00
A1	-9.74283829E-03
A2	-8.49115572E-05
A3	1.27195343E-02
A4	3.15395806E-04
A5	-8.83703038E-06
A6	1.84064027E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.009912
F'-C'	0.010009
C-t	0.008080
C-A'	0.003408
d-C	0.002991
e-C	0.005348
g-d	0.012451
g-F	0.005530
h-g	0.004705
i-g	0.013039
C'-t	0.008556
e-C'	0.004872
F'-e	0.005137
i-F'	0.017996

Relative partial dispersion	
C-t／F-C	0.8152
C-A'／F-C	0.3438
d-C／F-C	0.3018
e-C／F-C	0.5395
g-d／F-C	1.2562
g-F／F-C	0.5579
h-g／F-C	0.4747
i-g／F-C	1.3155
C'-t／F'-C'	0.8548
e-C'／F'-C'	0.4868
F'-e／F'-C'	0.5132
i-F'／F'-C'	1.7980

Deviation of relative partial disp.	
ΔPdC	0.0010
ΔPgF	0.0011

Specific gravity	2.47

Thermal properties	
CTE(-30,70) [1E-7/℃]	68
CTE(100,300) [1E-7/℃]	79
Tg [℃]	443
At [℃]	524
Ht cndct. [W/m･K]	1.023
Sp. heat [kJ/kg･K]	0.748
Ht diffus. [1E-6 m2/sec]	0.555

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	3
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	458 (5)
Abrasion hardness	84
Young's mod. [GPa]	66.9
Shear mod. [GPa]	27.5
Poisson's ratio	0.214
Stress optical coef. [1E-5 nm/cm／Pa]	3.96

Color Code (80%/5%)	36/34
Internal CC	359/338

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.09
350	0.54
360	0.82
365	0.88
370	0.921
380	0.949
390	0.968
400	0.975
420	0.983
440	0.987
460	0.991
480	0.994
500	0.995
550	0.998
600	0.997
650	0.997
700	0.997
800	0.994
900	0.999
1000	0.999
1200	0.999
1400	0.989
1600	0.994
1800	0.990
2000	0.985
2200	0.921
2400	0.88

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.5	2.5	2.6	2.7	2.8	2.9	3.0	3.0	3.1	3.3	3.7	3.7	4.1	4.6	4.9
60 to 80(ref.)	2.3	2.4	2.5	2.6	2.7	2.8	2.8	2.8	3.0	3.1	3.5	3.5	3.9	4.4	4.7
40 to 60	2.2	2.2	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.3	3.3	3.7	4.2	4.5
20 to 40	2.0	2.1	2.2	2.2	2.3	2.4	2.5	2.5	2.6	2.8	3.1	3.1	3.5	3.9	4.2
0 to 20	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.5	2.6	2.9	3.0	3.4	3.8	4.1
-20 to 0	1.9	1.9	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.5	2.8	2.9	3.2	3.6	3.9
-40 to -20	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.3	2.4	2.5	2.8	2.8	3.2	3.6	3.9
-60 to -40(ref.)	1.9	2.0	2.1	2.1	2.2	2.3	2.3	2.3	2.4	2.6	2.9	2.9	3.2	3.6	3.9
-70 to -60(ref.)	2.1	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.7	3.0	3.0	3.3	3.7	4.0

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.5	1.6	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.4	2.7	2.7	3.2	3.6	3.9
60 to 80	1.3	1.4	1.5	1.6	1.7	1.8	1.8	1.8	1.9	2.1	2.4	2.5	2.9	3.3	3.6
40 to 60	1.0	1.1	1.2	1.3	1.3	1.4	1.5	1.5	1.6	1.8	2.1	2.1	2.5	3.0	3.3
20～40	0.7	0.8	0.9	0.9	1.0	1.1	1.1	1.2	1.3	1.4	1.8	1.8	2.2	2.6	2.9
0 to 20	0.4	0.5	0.6	0.6	0.7	0.8	0.8	0.9	1.0	1.1	1.4	1.4	1.8	2.2	2.5
-20 to 0	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.5	0.6	0.8	1.1	1.1	1.4	1.8	2.1
-40 to -20	-0.2	-0.1	-0.1	0.0	0.1	0.2	0.2	0.2	0.3	0.4	0.7	0.8	1.1	1.5	1.7
-60 to -40	-0.5	-0.4	-0.4	-0.3	-0.2	-0.2	-0.1	-0.1	0.0	0.1	0.4	0.4	0.7	1.1	1.3
-70 to -60	-0.7	-0.7	-0.6	-0.5	-0.5	-0.4	-0.4	-0.4	-0.3	-0.1	0.1	0.1	0.5	0.8	1.1

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.31586600E-01
Q1	8.28160644E+01
P2	7.42229602E-03
Q2	5.27857629E-02
P3	2.89400464E-01
Q3	6.01259424E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	5.0
Frac. eq. (ref.)	0.5	6.5

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-NSL36	HOYA	E-CF6
C.D.G.M	H-KF6	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BALF4

nd = 1.579570　　ne = 1.582139

νd = 53.74　　νe = 53.46

Glass code (d)
580537
Glass code (e)
582535

Spectral l.	Refractive idx
2.058	1.55505
1.970	1.55620
1.530	1.56144
1.129	1.56618
1.064	1.56706
t	1.56780
s	1.57066
A'	1.572644
r	1.574478
C	1.576316
C'	1.576832
He-Ne	1.577314
D	1.579474
d	1.579570
e	1.582139
F	1.587100
F'	1.587721
g	1.593052
h	1.598037
0.389	1.601097
i	1.606631

Coef. disp. form. (pwr ser.)	
A0	2.45156936E+00
A1	-8.35914203E-03
A2	-8.88499407E-05
A3	1.53016408E-02
A4	2.24512880E-04
A5	5.89498036E-06
A6	2.59209632E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.010784
F'-C'	0.010889
C-t	0.008521
C-A'	0.003672
d-C	0.003254
e-C	0.005823
g-d	0.013482
g-F	0.005952
h-g	0.004985
i-g	0.013579
C'-t	0.009037
e-C'	0.005307
F'-e	0.005582
i-F'	0.018910

Relative partial dispersion	
C-t／F-C	0.7902
C-A'／F-C	0.3405
d-C／F-C	0.3017
e-C／F-C	0.5400
g-d／F-C	1.2502
g-F／F-C	0.5519
h-g／F-C	0.4623
i-g／F-C	1.2592
C'-t／F'-C'	0.8299
e-C'／F'-C'	0.4874
F'-e／F'-C'	0.5126
i-F'／F'-C'	1.7366

Deviation of relative partial disp.	
ΔPdC	0.0003
ΔPgF	-0.0023

Specific gravity	3.13

Thermal properties	
CTE(-30,70) [1E-7/℃]	80
CTE(100,300) [1E-7/℃]	99
Tg [℃]	529
At [℃]	577
Ht cndct. [W/m･K]	0.793
Sp. heat [kJ/kg･K]	0.623
Ht diffus. [1E-6 m2/sec]	0.409

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	3
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	511 (5)
Abrasion hardness	131
Young's mod. [GPa]	74.3
Shear mod. [GPa]	29.4
Poisson's ratio	0.262
Stress optical coef. [1E-5 nm/cm／Pa]	3.09

Color Code (80%/5%)	36/32
Internal CC	354/324
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	0.01
330	0.19
340	0.50
350	0.74
360	0.87
365	0.905
370	0.933
380	0.964
390	0.978
400	0.987
420	0.992
440	0.993
460	0.993
480	0.995
500	0.996
550	0.996
600	0.997
650	0.995
700	0.995
800	0.993
900	0.998
1000	0.996
1200	0.998
1400	0.993
1600	0.990
1800	0.977
2000	0.962
2200	0.907
2400	0.84

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.2	2.2	2.3	2.5	2.7	2.8	2.8	2.9	3.1	3.3	3.7	3.8	4.3	4.8	5.1
60 to 80(ref.)	2.1	2.1	2.3	2.4	2.5	2.7	2.7	2.8	2.9	3.1	3.6	3.6	4.1	4.6	4.9
40 to 60	2.0	2.0	2.1	2.3	2.4	2.5	2.6	2.6	2.8	3.0	3.4	3.4	3.9	4.4	4.7
20 to 40	1.9	1.9	2.1	2.2	2.3	2.4	2.5	2.5	2.7	2.8	3.2	3.3	3.8	4.2	4.5
0 to 20	1.8	1.9	2.0	2.1	2.2	2.4	2.4	2.4	2.6	2.8	3.1	3.2	3.6	4.1	4.3
-20 to 0	1.8	1.8	2.0	2.1	2.2	2.3	2.4	2.4	2.5	2.7	3.1	3.1	3.5	4.0	4.2
-40 to -20	1.9	1.9	2.0	2.1	2.2	2.4	2.4	2.4	2.6	2.7	3.1	3.1	3.5	3.9	4.2
-60 to -40(ref.)	2.0	2.0	2.2	2.3	2.4	2.5	2.5	2.6	2.7	2.8	3.2	3.2	3.6	4.0	4.2
-70 to -60(ref.)	2.2	2.2	2.3	2.4	2.6	2.7	2.7	2.7	2.9	3.0	3.3	3.4	3.8	4.1	4.4

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.2	1.3	1.4	1.5	1.7	1.8	1.9	1.9	2.1	2.3	2.7	2.8	3.3	3.8	4.1
60 to 80	1.0	1.1	1.2	1.3	1.5	1.6	1.6	1.7	1.9	2.1	2.5	2.5	3.0	3.5	3.8
40 to 60	0.8	0.8	1.0	1.1	1.2	1.3	1.4	1.4	1.6	1.8	2.2	2.2	2.7	3.1	3.4
20～40	0.5	0.6	0.7	0.8	0.9	1.1	1.1	1.1	1.3	1.5	1.8	1.9	2.3	2.8	3.1
0 to 20	0.3	0.3	0.4	0.5	0.7	0.8	0.8	0.8	1.0	1.2	1.5	1.6	2.0	2.4	2.7
-20 to 0	0.0	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.9	1.2	1.3	1.7	2.1	2.3
-40 to -20	-0.2	-0.2	-0.1	0.0	0.1	0.2	0.3	0.3	0.4	0.6	0.9	1.0	1.3	1.7	2.0
-60 to -40	-0.5	-0.5	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.1	0.3	0.6	0.6	1.0	1.4	1.6
-70 to -60	-0.7	-0.6	-0.5	-0.4	-0.4	-0.3	-0.2	-0.2	-0.1	0.1	0.4	0.4	0.8	1.1	1.3

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.18078949E-01
Q1	9.26271780E+01
P2	1.61813352E-02
Q2	3.26808720E-02
P3	3.09920889E-01
Q3	5.74581058E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	5.2
Frac. eq. (ref.)	0.4	5.7

Prod. Freq. (A to F)	D

Similar glass type			
OHARA		HOYA	
C.D.G.M	H-BaF3	SCHOTT	N-BALF4

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BAF3

nd = 1.582670　　ne = 1.585648

ν d = 46.48　　ν e = 46.19

Glass code (d)
583465
Glass code (e)
586462

Spectral l.	Refractive idx
2.058	1.55565
1.970	1.55686
1.530	1.56243
1.129	1.56755
1.064	1.56851
t	1.56932
s	1.57252
A'	1.574752
r	1.576832
C	1.578929
C'	1.579520
He-Ne	1.580073
D	1.582559
d	1.582670
e	1.585648
F	1.591464
F'	1.592198
g	1.598562
h	1.604624
0.389	1.608407
i	1.615393

Coef. disp. form. (pwr ser.)	
A0	2.45448839E+00
A1	-8.67148963E-03
A2	-1.04715240E-04
A3	1.76039752E-02
A4	1.54610243E-04
A5	5.59918259E-05
A6	-5.01297284E-06
A7	3.17557990E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.012535
F'-C'	0.012678
C-t	0.009605
C-A'	0.004177
d-C	0.003741
e-C	0.006719
g-d	0.015892
g-F	0.007098
h-g	0.006062
i-g	0.016831
C'-t	0.010196
e-C'	0.006128
F'-e	0.006550
i-F'	0.023195

Relative partial dispersion	
C-t／F-C	0.7663
C-A'／F-C	0.3332
d-C／F-C	0.2984
e-C／F-C	0.5360
g-d／F-C	1.2678
g-F／F-C	0.5663
h-g／F-C	0.4836
i-g／F-C	1.3427
C'-t／F'-C'	0.8042
e-C'／F'-C'	0.4834
F'-e／F'-C'	0.5166
i-F'／F'-C'	1.8295

Deviation of relative partial disp.	
ΔPdC	0.0003
ΔPgF	-0.0001

Specific gravity	2.74

Thermal properties	
CTE(-30,70) [1E-7/℃]	85
CTE(100,300) [1E-7/℃]	98
Tg [℃]	558
At [℃]	612
Ht cndct. [W/m･K]	1.097
Sp. heat [kJ/kg･K]	0.723
Ht diffus. [1E-6 m2/sec]	0.554

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	483 (5)
Abrasion hardness	134
Young's mod. [GPa]	76.0
Shear mod. [GPa]	30.6
Poisson's ratio	0.244
Stress optical coef. [1E-5 nm/cm／Pa]	2.54

Color Code (80%/5%)	38/35
Internal CC	369/345

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.19
360	0.58
365	0.72
370	0.82
380	0.917
390	0.960
400	0.977
420	0.989
440	0.991
460	0.992
480	0.994
500	0.994
550	0.996
600	0.994
650	0.993
700	0.993
800	0.990
900	0.998
1000	0.998
1200	0.999
1400	0.992
1600	0.989
1800	0.968
2000	0.946
2200	0.88
2400	0.83

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.6	0.6	0.8	1.0	1.1	1.2	1.3	1.3	1.5	1.7	2.2	2.3	2.9	3.5	4.0
60 to 80(ref.)	0.5	0.6	0.8	0.9	1.0	1.1	1.2	1.2	1.4	1.6	2.1	2.2	2.7	3.4	3.8
40 to 60	0.4	0.5	0.6	0.8	0.9	1.0	1.1	1.1	1.3	1.5	1.9	2.0	2.6	3.2	3.6
20 to 40	0.3	0.4	0.5	0.7	0.8	0.9	1.0	1.0	1.2	1.4	1.8	1.9	2.4	3.0	3.4
0 to 20	0.3	0.3	0.5	0.6	0.7	0.9	0.9	0.9	1.1	1.3	1.7	1.8	2.3	2.8	3.2
-20 to 0	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0.9	1.1	1.3	1.7	1.7	2.2	2.8	3.1
-40 to -20	0.4	0.4	0.6	0.7	0.8	0.9	0.9	1.0	1.1	1.3	1.7	1.7	2.2	2.7	3.1
-60 to -40(ref.)	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.1	1.2	1.4	1.8	1.8	2.3	2.8	3.1
-70 to -60(ref.)	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.3	1.4	1.6	1.9	2.0	2.4	2.9	3.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-0.4	-0.3	-0.1	0.0	0.1	0.3	0.3	0.3	0.5	0.8	1.2	1.3	1.9	2.5	3.0
60 to 80	-0.5	-0.5	-0.3	-0.2	-0.1	0.1	0.1	0.1	0.3	0.5	1.0	1.1	1.6	2.3	2.7
40 to 60	-0.8	-0.7	-0.6	-0.4	-0.3	-0.2	-0.2	-0.1	0.1	0.3	0.7	0.8	1.3	1.9	2.3
20～40	-1.0	-1.0	-0.8	-0.7	-0.6	-0.5	-0.4	-0.4	-0.2	0.0	0.4	0.5	1.0	1.6	2.0
0 to 20	-1.3	-1.2	-1.1	-0.9	-0.8	-0.7	-0.7	-0.7	-0.5	-0.3	0.1	0.2	0.7	1.2	1.6
-20 to 0	-1.5	-1.4	-1.3	-1.2	-1.1	-1.0	-0.9	-0.9	-0.8	-0.6	-0.2	-0.2	0.3	0.9	1.2
-40 to -20	-1.7	-1.7	-1.6	-1.4	-1.3	-1.2	-1.2	-1.2	-1.0	-0.9	-0.5	-0.5	0.0	0.5	0.9
-60 to -40	-2.0	-1.9	-1.8	-1.7	-1.6	-1.5	-1.5	-1.4	-1.3	-1.1	-0.8	-0.8	-0.3	0.2	0.5
-70 to -60	-2.1	-2.1	-2.0	-1.9	-1.8	-1.7	-1.7	-1.6	-1.5	-1.4	-1.0	-1.0	-0.6	-0.1	0.2

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.15657985E-01
Q1	8.68803305E+01
P2	9.88427417E-03
Q2	5.11274577E-02
P3	3.16699166E-01
Q3	6.63914300E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	7.9
Frac. eq. (ref.)	0.8	6.7

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-BAM3	HOYA	
C.D.G.M	H-BaF4	SCHOTT	N-BAF3

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BAF4

nd = 1.605620 ne = 1.608924

νd = 43.49 νe = 43.20

Glass code (d)
606435
Glass code (e)
609432

Spectral l.	Refractive idx
2.058	1.57560
1.970	1.57696
1.530	1.58321
1.129	1.58891
1.064	1.58998
t	1.59088
s	1.59440
A'	1.596870
r	1.599166
C	1.601481
C'	1.602134
He-Ne	1.602745
D	1.605498
d	1.605620
e	1.608924
F	1.615408
F'	1.616230
g	1.623384
h	1.630262
0.389	1.634595
i	1.642691

Coef. disp. form. (pwr ser.)	
A0	2.52175840E+00
A1	-9.79498428E-03
A2	-1.34973275E-04
A3	1.97297837E-02
A4	7.13034071E-05
A5	1.03716753E-04
A6	-1.06452623E-05
A7	6.63899530E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.013927
F'-C'	0.014096
C-t	0.010604
C-A'	0.004611
d-C	0.004139
e-C	0.007443
g-d	0.017764
g-F	0.007976
h-g	0.006878
i-g	0.019307
C'-t	0.011257
e-C'	0.006790
F'-e	0.007306
i-F'	0.026461

Relative partial dispersion	
C-t／F-C	0.7614
C-A'／F-C	0.3311
d-C／F-C	0.2972
e-C／F-C	0.5344
g-d／F-C	1.2755
g-F／F-C	0.5727
h-g／F-C	0.4939
i-g／F-C	1.3863
C'-t／F'-C'	0.7986
e-C'／F'-C'	0.4817
F'-e／F'-C'	0.5183
i-F'／F'-C'	1.8772

Deviation of relative partial disp.	
ΔPdC	0.0004
ΔPgF	0.0013

Specific gravity	2.89

Thermal properties	
CTE(-30,70) [1E-7/℃]	62
CTE(100,300) [1E-7/℃]	76
Tg [℃]	598
At [℃]	651
Ht cndct. [W/m･K]	1.058
Sp. heat [kJ/kg･K]	0.697
Ht diffus. [1E-6 m2/sec]	0.525

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	482 (5)
Abrasion hardness	108
Young's mod. [GPa]	84.6
Shear mod. [GPa]	34.2
Poisson's ratio	0.236
Stress optical coef. [1E-5 nm/cm／Pa]	3.11

Color Code (80%/5%)	39/35
Internal CC	377/352
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.02
360	0.29
365	0.49
370	0.66
380	0.84
390	0.916
400	0.950
420	0.973
440	0.978
460	0.983
480	0.986
500	0.989
550	0.992
600	0.993
650	0.992
700	0.992
800	0.989
900	0.996
1000	0.995
1200	0.997
1400	0.982
1600	0.990
1800	0.982
2000	0.971
2200	0.901
2400	0.87

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.2	4.3	4.5	4.7	4.8	5.0	5.0	5.1	5.3	5.6	6.2	6.3	7.0	7.8	8.4
60 to 80(ref.)	4.1	4.2	4.4	4.5	4.7	4.8	4.9	4.9	5.1	5.4	6.0	6.1	6.8	7.6	8.1
40 to 60	3.9	4.0	4.2	4.3	4.5	4.7	4.7	4.7	4.9	5.2	5.7	5.8	6.5	7.3	7.8
20 to 40	3.8	3.9	4.1	4.2	4.3	4.5	4.5	4.6	4.8	5.0	5.5	5.6	6.3	7.0	7.5
0 to 20	3.7	3.8	4.0	4.1	4.2	4.4	4.4	4.4	4.6	4.9	5.4	5.4	6.0	6.7	7.2
-20 to 0	3.7	3.7	3.9	4.0	4.2	4.3	4.3	4.4	4.5	4.8	5.2	5.3	5.9	6.5	7.0
-40 to -20	3.7	3.7	3.9	4.0	4.2	4.3	4.3	4.4	4.5	4.7	5.2	5.2	5.8	6.4	6.9
-60 to -40(ref.)	3.8	3.9	4.0	4.1	4.2	4.4	4.4	4.4	4.6	4.8	5.2	5.3	5.8	6.4	6.8
-70 to -60(ref.)	4.0	4.0	4.2	4.3	4.4	4.5	4.5	4.6	4.7	4.9	5.3	5.4	5.9	6.5	6.9

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.3	3.3	3.5	3.7	3.8	4.0	4.0	4.1	4.3	4.6	5.2	5.2	6.0	6.8	7.3
60 to 80	3.0	3.1	3.3	3.4	3.6	3.8	3.8	3.8	4.1	4.3	4.9	4.9	5.7	6.4	7.0
40 to 60	2.7	2.8	3.0	3.1	3.3	3.4	3.5	3.5	3.7	4.0	4.5	4.6	5.2	6.0	6.5
20～40	2.4	2.5	2.7	2.8	3.0	3.1	3.1	3.2	3.4	3.6	4.1	4.2	4.8	5.5	6.0
0 to 20	2.2	2.2	2.4	2.5	2.6	2.8	2.8	2.9	3.0	3.3	3.7	3.8	4.4	5.1	5.6
-20 to 0	1.9	1.9	2.1	2.2	2.3	2.4	2.5	2.5	2.7	2.9	3.3	3.4	4.0	4.6	5.1
-40 to -20	1.6	1.6	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.5	3.0	3.0	3.6	4.2	4.6
-60 to -40	1.3	1.3	1.5	1.6	1.7	1.8	1.8	1.9	2.0	2.2	2.6	2.6	3.1	3.7	4.1
-70 to -60	1.1	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.8	1.9	2.3	2.4	2.8	3.4	3.8

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.10004273E-01
Q1	7.52194401E+01
P2	9.42216527E-03
Q2	5.73632071E-02
P3	3.27207024E-01
Q3	6.92180568E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	8.9
Frac. eq. (ref.)	1.5	8.6

Prod. Freq. (A to F)	F

Similar glass type			
OHARA	S-BAM4	HOYA	
C.D.G.M	H-BaF5	SCHOTT	N-BAF4

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BAF8

nd = 1.623740　　ne = 1.626893

ν d = 47.01　　ν e = 46.72

Glass code (d)
624470
Glass code (e)
627467

Spectral l.	Refractive idx
2.058	1.59462
1.970	1.59595
1.530	1.60207
1.129	1.60764
1.064	1.60867
t	1.60954
s	1.61296
A'	1.615339
r	1.617550
C	1.619775
C'	1.620402
He-Ne	1.620988
D	1.623623
d	1.623740
e	1.626893
F	1.633044
F'	1.633820
g	1.640541
h	1.646936
0.389	1.650926
i	1.658287

Coef. disp. form. (pwr ser.)	
A0	2.58219095E+00
A1	-9.86301021E-03
A2	-1.16286506E-04
A3	1.89733467E-02
A4	2.19248923E-04
A5	4.98624477E-05
A6	-4.45223153E-06
A7	3.07817299E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.013269
F'-C'	0.013418
C-t	0.010231
C-A'	0.004436
d-C	0.003965
e-C	0.007118
g-d	0.016801
g-F	0.007497
h-g	0.006395
i-g	0.017746
C'-t	0.010858
e-C'	0.006491
F'-e	0.006927
i-F'	0.024467

Relative partial dispersion	
C-t／F-C	0.7710
C-A'／F-C	0.3343
d-C／F-C	0.2988
e-C／F-C	0.5364
g-d／F-C	1.2662
g-F／F-C	0.5650
h-g／F-C	0.4820
i-g／F-C	1.3374
C'-t／F'-C'	0.8092
e-C'／F'-C'	0.4838
F'-e／F'-C'	0.5162
i-F'／F'-C'	1.8234

Deviation of relative partial disp.	
ΔPdC	0.0004
ΔPgF	-0.0005

Specific gravity	3.14

Thermal properties	
CTE(-30,70) [1E-7/℃]	67
CTE(100,300) [1E-7/℃]	80
Tg [℃]	589
At [℃]	641
Ht cndct. [W/m･K]	0.960
Sp. heat [kJ/kg･K]	0.663
Ht diffus. [1E-6 m2/sec]	0.461

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	2

Mechanical properties	
Knoop hardness	511 (5)
Abrasion hardness	124
Young's mod. [GPa]	85.7
Shear mod. [GPa]	34.0
Poisson's ratio	0.261
Stress optical coef. [1E-5 nm/cm／Pa]	2.72

Color Code (80%/5%)	38/35
Internal CC	373/346

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.14
360	0.49
365	0.65
370	0.76
380	0.88
390	0.933
400	0.960
420	0.980
440	0.986
460	0.989
480	0.992
500	0.994
550	0.995
600	0.994
650	0.994
700	0.994
800	0.989
900	0.999
1000	0.997
1200	0.999
1400	0.990
1600	0.990
1800	0.979
2000	0.966
2200	0.901
2400	0.82

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.5	3.6	3.8	4.0	4.1	4.3	4.3	4.4	4.6	4.8	5.4	5.4	6.1	6.8	7.3
60 to 80(ref.)	3.4	3.5	3.7	3.8	4.0	4.1	4.2	4.2	4.4	4.7	5.2	5.3	5.9	6.6	7.1
40 to 60	3.3	3.3	3.5	3.7	3.8	4.0	4.0	4.1	4.2	4.5	5.0	5.1	5.7	6.3	6.6
20 to 40	3.2	3.2	3.4	3.5	3.7	3.8	3.9	3.9	4.1	4.3	4.8	4.9	5.5	6.1	6.5
0 to 20	3.1	3.2	3.3	3.5	3.6	3.7	3.8	3.8	4.0	4.2	4.7	4.7	5.3	5.9	6.3
-20 to 0	3.1	3.1	3.3	3.4	3.5	3.7	3.7	3.8	3.9	4.1	4.6	4.6	5.2	5.7	6.2
-40 to -20	3.1	3.2	3.3	3.5	3.6	3.7	3.7	3.8	3.9	4.1	4.5	4.6	5.1	5.7	6.1
-60 to -40(ref.)	3.3	3.3	3.5	3.6	3.7	3.8	3.8	3.9	4.0	4.2	4.6	4.7	5.2	5.7	6.1
-70 to -60(ref.)	3.4	3.5	3.6	3.7	3.8	4.0	4.0	4.0	4.2	4.4	4.7	4.8	5.3	5.8	6.1

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.5	2.6	2.8	3.0	3.1	3.3	3.3	3.4	3.6	3.8	4.3	4.4	5.1	5.8	6.3
60 to 80	2.3	2.4	2.6	2.7	2.9	3.0	3.1	3.1	3.3	3.6	4.1	4.1	4.8	5.5	5.9
40 to 60	2.1	2.1	2.3	2.4	2.6	2.7	2.8	2.8	3.0	3.2	3.7	3.8	4.4	5.0	5.5
20～40	1.8	1.8	2.0	2.1	2.3	2.4	2.5	2.5	2.7	2.9	3.4	3.4	4.0	4.6	5.1
0 to 20	1.5	1.6	1.7	1.9	2.0	2.1	2.2	2.2	2.4	2.6	3.0	3.1	3.6	4.2	4.6
-20 to 0	1.2	1.3	1.4	1.6	1.7	1.8	1.8	1.9	2.0	2.2	2.7	2.7	3.2	3.8	4.2
-40 to -20	1.0	1.0	1.2	1.3	1.4	1.5	1.5	1.6	1.7	1.9	2.3	2.4	2.9	3.4	3.8
-60 to -40	0.7	0.7	0.9	1.0	1.1	1.2	1.2	1.3	1.4	1.6	2.0	2.0	2.5	3.0	3.3
-70 to -60	0.5	0.5	0.7	0.8	0.9	1.0	1.0	1.0	1.2	1.3	1.7	1.7	2.2	2.7	3.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.10512594E-01
Q1	7.79743638E+01
P2	9.62875752E-03
Q2	5.14298507E-02
P3	3.35700552E-01
Q3	6.49937209E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	7.4
Frac. eq. (ref.)	0.8	7.6

Prod. Freq. (A to F)	F

Similar glass type			
OHARA		HOYA	E-BAF8
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BAF10

nd = 1.670030　　ne = 1.673410

νd = 47.14　　νe = 46.86

Glass code (d)
670471
Glass code (e)
673469

Spectral l.	Refractive idx
2.058	1.64083
1.970	1.64204
1.530	1.64770
1.129	1.65310
1.064	1.65414
t	1.65502
s	1.65856
A'	1.661063
r	1.663410
C	1.665785
C'	1.666455
He-Ne	1.667082
D	1.669905
d	1.670030
e	1.673410
F	1.679998
F'	1.680827
g	1.687994
h	1.694772
0.389	1.698973
i	1.706653

Coef. disp. form. (pwr ser.)	
A0	2.72808119E+00
A1	-9.30210914E-03
A2	-7.12221204E-05
A3	2.08031569E-02
A4	4.57311835E-04
A5	-2.96273778E-06
A6	1.63114030E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.014213
F'-C'	0.014372
C-t	0.010760
C-A'	0.004722
d-C	0.004245
e-C	0.007625
g-d	0.017964
g-F	0.007996
h-g	0.006778
i-g	0.018659
C'-t	0.011430
e-C'	0.006955
F'-e	0.007417
i-F'	0.025826

Relative partial dispersion	
C-t／F-C	0.7571
C-A'／F-C	0.3322
d-C／F-C	0.2987
e-C／F-C	0.5365
g-d／F-C	1.2639
g-F／F-C	0.5626
h-g／F-C	0.4769
i-g／F-C	1.3128
C'-t／F'-C'	0.7953
e-C'／F'-C'	0.4839
F'-e／F'-C'	0.5161
i-F'／F'-C'	1.7970

Deviation of relative partial disp.	
ΔPdC	0.0002
ΔPgF	-0.0027

Specific gravity	3.57

Thermal properties	
CTE(-30,70) [1E-7/℃]	67
CTE(100,300) [1E-7/℃]	83
Tg [℃]	581
At [℃]	640
Ht cndct. [W/m･K]	0.985
Sp. heat [kJ/kg･K]	0.564
Ht diffus. [1E-6 m2/sec]	0.489

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	2

Mechanical properties	
Knoop hardness	534 (5)
Abrasion hardness	133
Young's mod. [GPa]	94.8
Shear mod. [GPa]	37.2
Poisson's ratio	0.274
Stress optical coef. [1E-5 nm/cm／Pa]	2.22

Color Code (80%/5%)	38/34
Internal CC	367/339

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.07
350	0.39
360	0.68
365	0.77
370	0.84
380	0.916
390	0.950
400	0.969
420	0.983
440	0.988
460	0.991
480	0.992
500	0.994
550	0.995
600	0.995
650	0.994
700	0.994
800	0.989
900	0.998
1000	0.995
1200	0.998
1400	0.999
1600	0.992
1800	0.983
2000	0.973
2200	0.940
2400	0.89

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.5	4.5	4.7	4.9	5.1	5.3	5.3	5.4	5.6	5.9	6.5	6.6	7.3	8.0	8.5
60 to 80(ref.)	4.4	4.4	4.7	4.8	5.0	5.2	5.2	5.3	5.5	5.8	6.3	6.4	7.1	7.8	8.3
40 to 60	4.2	4.3	4.5	4.7	4.8	5.0	5.1	5.1	5.3	5.6	6.1	6.2	6.9	7.6	8.0
20 to 40	4.1	4.2	4.4	4.6	4.7	4.9	4.9	5.0	5.2	5.4	6.0	6.0	6.7	7.3	7.8
0 to 20	4.1	4.1	4.3	4.5	4.6	4.8	4.8	4.9	5.1	5.3	5.8	5.9	6.5	7.2	7.6
-20 to 0	4.1	4.1	4.3	4.5	4.6	4.8	4.8	4.8	5.0	5.3	5.8	5.8	6.4	7.0	7.5
-40 to -20	4.1	4.2	4.4	4.5	4.7	4.8	4.8	4.9	5.1	5.3	5.8	5.8	6.4	7.0	7.4
-60 to -40(ref.)	4.3	4.3	4.5	4.7	4.8	4.9	5.0	5.0	5.2	5.4	5.8	5.9	6.4	7.0	7.4
-70 to -60(ref.)	4.5	4.5	4.7	4.8	5.0	5.1	5.1	5.2	5.4	5.6	6.0	6.1	6.6	7.1	7.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.4	3.5	3.7	3.9	4.1	4.3	4.3	4.4	4.6	4.9	5.4	5.5	6.2	7.0	7.5
60 to 80	3.2	3.3	3.5	3.7	3.9	4.0	4.1	4.1	4.4	4.6	5.2	5.2	5.9	6.6	7.1
40 to 60	3.0	3.0	3.3	3.4	3.6	3.7	3.8	3.8	4.0	4.3	4.8	4.9	5.6	6.2	6.7
20～40	2.7	2.8	3.0	3.1	3.3	3.4	3.5	3.5	3.7	4.0	4.5	4.6	5.2	5.8	6.3
0 to 20	2.4	2.5	2.7	2.8	3.0	3.1	3.2	3.2	3.4	3.7	4.1	4.2	4.8	5.4	5.9
-20 to 0	2.2	2.2	2.4	2.6	2.7	2.8	2.9	2.9	3.1	3.3	3.8	3.9	4.4	5.0	5.4
-40 to -20	1.9	2.0	2.1	2.3	2.4	2.5	2.6	2.6	2.8	3.0	3.5	3.5	4.1	4.6	5.0
-60 to -40	1.6	1.7	1.9	2.0	2.1	2.2	2.3	2.3	2.5	2.7	3.1	3.2	3.7	4.2	4.6
-70 to -60	1.4	1.5	1.7	1.8	1.9	2.0	2.1	2.1	2.3	2.5	2.9	2.9	3.4	3.9	4.3

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.12167309E-01
Q1	9.09103715E+01
P2	1.25830025E-02
Q2	4.36118239E-02
P3	3.52889109E-01
Q3	6.43290245E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	4.2
Frac. eq. (ref.)	0.6	5.5

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-BAH10	HOYA	BaF10
C.D.G.M	H-ZBaF52	SCHOTT	N-BAF10

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BAF11

nd = 1.666720 ne = 1.670002

ν d = 48.33 ν e = 48.04

Glass code (d)
667483
Glass code (e)
670480

Spectral l.	Refractive idx
2.058	1.63817
1.970	1.63935
1.530	1.64491
1.129	1.65021
1.064	1.65123
t	1.65210
s	1.65555
A'	1.657996
r	1.660282
C	1.662593
C'	1.663245
He-Ne	1.663855
D	1.666598
d	1.666720
e	1.670002
F	1.676388
F'	1.677191
g	1.684118
h	1.690647
0.389	1.694683
i	1.702036

Coef. disp. form. (pwr ser.)	
A0	2.71886836E+00
A1	-9.21086428E-03
A2	-5.97080099E-05
A3	2.02512558E-02
A4	4.23467645E-04
A5	-1.03717059E-06
A6	1.22100678E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.013795
F'-C'	0.013946
C-t	0.010494
C-A'	0.004597
d-C	0.004127
e-C	0.007409
g-d	0.017398
g-F	0.007730
h-g	0.006529
i-g	0.017918
C'-t	0.011146
e-C'	0.006757
F'-e	0.007189
i-F'	0.024845

Relative partial dispersion	
C-t／F-C	0.7607
C-A'／F-C	0.3332
d-C／F-C	0.2992
e-C／F-C	0.5371
g-d／F-C	1.2612
g-F／F-C	0.5603
h-g／F-C	0.4733
i-g／F-C	1.2989
C'-t／F'-C'	0.7992
e-C'／F'-C'	0.4845
F'-e／F'-C'	0.5155
i-F'／F'-C'	1.7815

Deviation of relative partial disp.	
ΔPdC	0.0001
ΔPgF	-0.0029

Specific gravity	3.59

Thermal properties	
CTE(-30,70) [1E-7/℃]	67
CTE(100,300) [1E-7/℃]	84
Tg [℃]	573
At [℃]	631
Ht cndct. [W/m･K]	0.895
Sp. heat [kJ/kg･K]	0.563
Ht diffus. [1E-6 m2/sec]	0.442

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	544 (5)
Abrasion hardness	124
Young's mod. [GPa]	94.0
Shear mod. [GPa]	36.8
Poisson's ratio	0.277
Stress optical coef. [1E-5 nm/cm／Pa]	2.59

Color Code (80%/5%)	38/34
Internal CC	364/335

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.15
350	0.49
360	0.73
365	0.81
370	0.86
380	0.927
390	0.957
400	0.973
420	0.985
440	0.988
460	0.991
480	0.993
500	0.994
550	0.996
600	0.995
650	0.994
700	0.993
800	0.987
900	0.997
1000	0.996
1200	0.998
1400	0.997
1600	0.992
1800	0.979
2000	0.970
2200	0.935
2400	0.88

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.3	4.3	4.5	4.7	4.9	5.0	5.1	5.1	5.4	5.6	6.2	6.3	7.0	7.7	8.1
60 to 80(ref.)	4.2	4.2	4.4	4.6	4.7	4.9	5.0	5.0	5.2	5.5	6.1	6.1	6.8	7.5	7.9
40 to 60	4.1	4.1	4.3	4.4	4.6	4.8	4.8	4.9	5.1	5.3	5.9	5.9	6.6	7.2	7.6
20 to 40	4.0	4.0	4.2	4.3	4.5	4.6	4.7	4.7	4.9	5.2	5.7	5.8	6.4	7.0	7.4
0 to 20	3.9	3.9	4.1	4.3	4.4	4.6	4.6	4.7	4.8	5.1	5.6	5.6	6.2	6.8	7.2
-20 to 0	3.9	3.9	4.1	4.2	4.4	4.5	4.6	4.6	4.8	5.0	5.5	5.6	6.1	6.7	7.0
-40 to -20	4.0	4.0	4.1	4.3	4.4	4.6	4.6	4.6	4.8	5.0	5.5	5.6	6.1	6.6	6.9
-60 to -40(ref.)	4.1	4.1	4.3	4.4	4.6	4.7	4.7	4.8	4.9	5.2	5.6	5.6	6.2	6.7	7.0
-70 to -60(ref.)	4.3	4.3	4.5	4.6	4.7	4.9	4.9	4.9	5.1	5.3	5.7	5.8	6.3	6.8	7.1

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.3	3.3	3.5	3.7	3.8	4.0	4.1	4.1	4.3	4.6	5.2	5.2	5.9	6.6	7.0
60 to 80	3.1	3.1	3.3	3.5	3.6	3.8	3.8	3.9	4.1	4.4	4.9	5.0	5.7	6.3	6.7
40 to 60	2.8	2.8	3.0	3.2	3.3	3.5	3.5	3.6	3.8	4.0	4.6	4.6	5.3	5.9	6.3
20～40	2.5	2.6	2.7	2.9	3.0	3.2	3.2	3.3	3.5	3.7	4.2	4.3	4.9	5.5	5.9
0 to 20	2.3	2.3	2.5	2.6	2.8	2.9	3.0	3.0	3.2	3.4	3.9	3.9	4.5	5.1	5.4
-20 to 0	2.0	2.0	2.2	2.3	2.5	2.6	2.7	2.7	2.9	3.1	3.5	3.6	4.2	4.7	5.0
-40 to -20	1.7	1.8	1.9	2.0	2.2	2.3	2.4	2.4	2.6	2.8	3.2	3.3	3.8	4.3	4.6
-60 to -40	1.5	1.5	1.6	1.8	1.9	2.0	2.1	2.1	2.3	2.5	2.9	2.9	3.4	3.9	4.2
-70 to -60	1.3	1.3	1.4	1.6	1.7	1.8	1.8	1.9	2.0	2.2	2.6	2.7	3.1	3.6	3.9

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.22633232E-01
Q1	1.00010916E+02
P2	1.54366657E-02
Q2	3.89083675E-02
P3	3.48798360E-01
Q3	6.16825972E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	1.9
Frac. eq. (ref.)	0.5	2.8

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-BAH11	HOYA	BAF11
C.D.G.M	H-ZBaF16	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BAF12

nd = 1.639300 ne = 1.642685

ν d = 44.83 ν e = 44.54

Glass code (d)
639448
Glass code (e)
643445

Spectral l.	Refractive idx
2.058	1.60880
1.970	1.61017
1.530	1.61644
1.129	1.62220
1.064	1.62329
t	1.62420
s	1.62780
A'	1.630326
r	1.632680
C	1.635055
C'	1.635725
He-Ne	1.636352
D	1.639174
d	1.639300
e	1.642685
F	1.649314
F'	1.650153
g	1.657437
h	1.664407
0.389	1.668777
i	1.676892

Coef. disp. form. (pwr ser.)	
A0	2.62810335E+00
A1	-9.95087731E-03
A2	-1.44740792E-04
A3	2.06473464E-02
A4	1.62531777E-04
A5	7.85240289E-05
A6	-7.45350927E-06
A7	4.83617341E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.014259
F'-C'	0.014428
C-t	0.010856
C-A'	0.004729
d-C	0.004245
e-C	0.007630
g-d	0.018137
g-F	0.008123
h-g	0.006970
i-g	0.019455
C'-t	0.011526
e-C'	0.006960
F'-e	0.007468
i-F'	0.026739

Relative partial dispersion	
C-t／F-C	0.7613
C-A'／F-C	0.3317
d-C／F-C	0.2977
e-C／F-C	0.5351
g-d／F-C	1.2720
g-F／F-C	0.5697
h-g／F-C	0.4888
i-g／F-C	1.3644
C'-t／F'-C'	0.7989
e-C'／F'-C'	0.4824
F'-e／F'-C'	0.5176
i-F'／F'-C'	1.8533

Deviation of relative partial disp.	
ΔPdC	0.0003
ΔPgF	0.0005

Specific gravity	3.23

Thermal properties	
CTE(-30,70) [1E-7/℃]	67
CTE(100,300) [1E-7/℃]	75
Tg [℃]	583
At [℃]	632
Ht cndct. [W/m･K]	0.856
Sp. heat [kJ/kg･K]	0.586
Ht diffus. [1E-6 m2/sec]	0.453

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	2

Mechanical properties	
Knoop hardness	535 (5)
Abrasion hardness	144
Young's mod. [GPa]	98.2
Shear mod. [GPa]	38.8
Poisson's ratio	0.265
Stress optical coef. [1E-5 nm/cm／Pa]	2.73

Color Code (80%/5%)	39/35
Internal CC	377/349
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.06
360	0.38
365	0.56
370	0.69
380	0.84
390	0.913
400	0.948
420	0.975
440	0.982
460	0.987
480	0.990
500	0.993
550	0.996
600	0.996
650	0.995
700	0.996
800	0.994
900	0.999
1000	0.997
1200	0.998
1400	0.990
1600	0.990
1800	0.981
2000	0.968
2200	0.906
2400	0.81

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.2	3.3	3.4	3.6	3.8	4.0	4.0	4.1	4.3	4.6	5.2	5.3	6.0	6.6	6.9
60 to 80(ref.)	3.1	3.1	3.3	3.5	3.6	3.8	3.9	3.9	4.1	4.4	5.0	5.1	5.8	6.4	6.6
40 to 60	3.0	3.0	3.2	3.3	3.5	3.6	3.7	3.7	3.9	4.2	4.8	4.8	5.5	6.1	6.3
20 to 40	2.8	2.9	3.0	3.2	3.3	3.5	3.5	3.6	3.8	4.0	4.6	4.6	5.3	5.8	6.0
0 to 20	2.8	2.8	2.9	3.1	3.2	3.4	3.4	3.5	3.7	3.9	4.4	4.5	5.1	5.6	5.8
-20 to 0	2.7	2.7	2.9	3.0	3.2	3.3	3.4	3.4	3.6	3.8	4.3	4.4	4.9	5.4	5.6
-40 to -20	2.8	2.8	2.9	3.0	3.2	3.3	3.4	3.4	3.6	3.8	4.2	4.3	4.9	5.3	5.5
-60 to -40(ref.)	2.9	2.9	3.0	3.2	3.3	3.4	3.5	3.5	3.7	3.9	4.3	4.4	4.9	5.3	5.5
-70 to -60(ref.)	3.0	3.1	3.2	3.3	3.4	3.6	3.6	3.6	3.8	4.0	4.4	4.5	5.0	5.4	5.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.2	2.3	2.4	2.6	2.8	3.0	3.0	3.0	3.3	3.5	4.1	4.2	4.9	5.5	5.8
60 to 80	2.0	2.0	2.2	2.4	2.5	2.7	2.8	2.8	3.0	3.3	3.9	3.9	4.6	5.2	5.5
40 to 60	1.7	1.8	1.9	2.1	2.2	2.4	2.4	2.5	2.7	2.9	3.5	3.6	4.2	4.8	5.0
20～40	1.4	1.5	1.6	1.8	1.9	2.1	2.1	2.2	2.3	2.6	3.1	3.2	3.8	4.3	4.5
0 to 20	1.2	1.2	1.3	1.5	1.6	1.7	1.8	1.8	2.0	2.2	2.7	2.8	3.4	3.9	4.1
-20 to 0	0.9	0.9	1.0	1.2	1.3	1.4	1.5	1.5	1.7	1.9	2.4	2.4	3.0	3.5	3.6
-40 to -20	0.6	0.6	0.7	0.8	1.0	1.1	1.1	1.2	1.3	1.5	2.0	2.1	2.6	3.0	3.3
-60 to -40	0.3	0.3	0.4	0.5	0.7	0.8	0.8	0.9	1.0	1.2	1.6	1.7	2.2	2.6	2.7
-70 to -60	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.6	0.8	0.9	1.3	1.4	1.9	2.3	2.4

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.01418564E-01
Q1	7.16266791E+01
P2	9.76853251E-03
Q2	5.44636973E-02
P3	3.42089890E-01
Q3	6.70566733E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	11.4
Frac. eq. (ref.)	0.9	10.4

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-BAM12	HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BASF2

nd = 1.664460　　ne = 1.668844

νd = 35.87　　νe = 35.60

Glass code (d)
664359
Glass code (e)
669356

Spectral l.	Refractive idx
2.058	1.62927
1.970	1.63062
1.530	1.63707
1.129	1.64339
1.064	1.64464
t	1.64570
s	1.65000
A'	1.653099
r	1.656034
C	1.659032
C'	1.659883
He-Ne	1.660682
D	1.664298
d	1.664460
e	1.668844
F	1.677556
F'	1.678670
g	1.688467
h	1.698048
0.389	1.704168
i	1.715809

Coef. disp. form. (pwr ser.)	
A0	2.69527127E+00
A1	-1.09541476E-02
A2	0.00000000E+00
A3	2.34490053E-02
A4	1.90163560E-03
A5	-3.68276327E-04
A6	7.49770823E-05
A7	-7.09432490E-06
A8	3.01058679E-07

Partial dispersion	
F-C	0.018524
F'-C'	0.018787
C-t	0.013329
C-A'	0.005933
d-C	0.005428
e-C	0.009812
g-d	0.024007
g-F	0.010911
h-g	0.009581
i-g	0.027342
C'-t	0.014180
e-C'	0.008961
F'-e	0.009826
i-F'	0.037139

Relative partial dispersion	
C-t／F-C	0.7196
C-A'／F-C	0.3203
d-C／F-C	0.2930
e-C／F-C	0.5297
g-d／F-C	1.2960
g-F／F-C	0.5890
h-g／F-C	0.5172
i-g／F-C	1.4760
C'-t／F'-C'	0.7548
e-C'／F'-C'	0.4770
F'-e／F'-C'	0.5230
i-F'／F'-C'	1.9768

Deviation of relative partial disp.	
ΔPdC	-0.0004
ΔPgF	0.0048

Specific gravity	3.08

Thermal properties	
CTE(-30,70) [1E-7/℃]	84
CTE(100,300) [1E-7/℃]	98
Tg [℃]	572
At [℃]	614
Ht cndct. [W/m･K]	1.060
Sp. heat [kJ/kg･K]	0.657
Ht diffus. [1E-6 m2/sec]	0.523

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	503 (5)
Abrasion hardness	175
Young's mod. [GPa]	84.8
Shear mod. [GPa]	33.9
Poisson's ratio	0.252
Stress optical coef. [1E-5 nm/cm／Pa]	2.88

Color Code (80%/5%)	40/36
Internal CC	386/359

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.08
365	0.23
370	0.43
380	0.71
390	0.85
400	0.915
420	0.964
440	0.976
460	0.981
480	0.986
500	0.988
550	0.993
600	0.992
650	0.991
700	0.992
800	0.991
900	0.998
1000	0.995
1200	0.997
1400	0.993
1600	0.988
1800	0.972
2000	0.952
2200	0.89
2400	0.84

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.8	0.9	1.1	1.3	1.5	1.7	1.8	1.9	2.2	2.6	3.4	3.5	4.6	5.9	6.8
60 to 80(ref.)	0.7	0.8	1.0	1.2	1.4	1.6	1.7	1.7	2.0	2.4	3.2	3.3	4.4	5.6	6.5
40 to 60	0.6	0.7	0.9	1.1	1.2	1.4	1.5	1.6	1.8	2.2	3.0	3.1	4.1	5.2	6.1
20 to 40	0.5	0.6	0.8	0.9	1.1	1.3	1.4	1.4	1.7	2.0	2.8	2.9	3.8	4.9	5.7
0 to 20	0.5	0.5	0.7	0.9	1.0	1.2	1.3	1.3	1.6	1.9	2.6	2.7	3.6	4.6	5.3
-20 to 0	0.5	0.5	0.7	0.9	1.0	1.2	1.2	1.3	1.5	1.8	2.5	2.6	3.4	4.4	5.0
-40 to -20	0.5	0.6	0.8	0.9	1.0	1.2	1.3	1.3	1.5	1.8	2.4	2.5	3.3	4.2	4.8
-60 to -40(ref.)	0.7	0.8	0.9	1.0	1.2	1.3	1.4	1.4	1.6	1.9	2.5	2.6	3.3	4.1	4.7
-70 to -60(ref.)	0.9	0.9	1.1	1.2	1.4	1.5	1.5	1.6	1.8	2.0	2.6	2.7	3.4	4.2	4.7

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-0.2	-0.1	0.1	0.3	0.5	0.7	0.8	0.8	1.1	1.5	2.3	2.5	3.5	4.8	5.7
60 to 80	-0.4	-0.3	-0.1	0.1	0.3	0.5	0.5	0.6	0.9	1.3	2.1	2.2	3.2	4.4	5.3
40 to 60	-0.6	-0.6	-0.4	-0.2	0.0	0.2	0.2	0.3	0.6	0.9	1.7	1.8	2.8	3.9	4.7
20～40	-0.9	-0.8	-0.6	-0.5	-0.3	-0.1	-0.1	0.0	0.2	0.6	1.3	1.4	2.3	3.4	4.2
0 to 20	-1.1	-1.1	-0.9	-0.8	-0.6	-0.4	-0.4	-0.3	-0.1	0.2	0.9	1.0	1.9	2.9	3.6
-20 to 0	-1.4	-1.4	-1.2	-1.0	-0.9	-0.7	-0.7	-0.6	-0.4	-0.1	0.5	0.6	1.4	2.4	3.0
-40 to -20	-1.7	-1.6	-1.5	-1.3	-1.2	-1.0	-1.0	-0.9	-0.7	-0.5	0.1	0.2	1.0	1.8	2.5
-60 to -40	-1.9	-1.9	-1.7	-1.6	-1.5	-1.3	-1.3	-1.3	-1.1	-0.8	-0.3	-0.2	0.5	1.3	1.9
-70 to -60	-2.1	-2.1	-1.9	-1.8	-1.7	-1.6	-1.5	-1.5	-1.3	-1.1	-0.5	-0.5	0.2	0.9	1.5

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.00362810E-01
Q1	7.32458985E+01
P2	1.42101815E-02
Q2	5.95561472E-02
P3	3.46573289E-01
Q3	7.65094042E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	6.2
Frac. eq. (ref.)	2.3	10.7

Prod. Freq. (A to F)	E

Similar glass type			
OHARA		HOYA	
C.D.G.M		SCHOTT	N-BASF2

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BASF6

nd = 1.667550　　ne = 1.671331

νd = 41.87　　νe = 41.60

Glass code (d)
668419
Glass code (e)
671416

Spectral l.	Refractive idx
2.058	1.63334
1.970	1.63489
1.530	1.64203
1.129	1.64851
1.064	1.64972
t	1.65074
s	1.65475
A'	1.657562
r	1.660179
C	1.662821
C'	1.663567
He-Ne	1.664265
D	1.667410
d	1.667550
e	1.671331
F	1.678763
F'	1.679706
g	1.687932
h	1.695862
0.389	1.700870
i	1.710252

Coef. disp. form. (pwr ser.)	
A0	2.71408053E+00
A1	-1.14438690E-02
A2	-1.85062065E-04
A3	2.32439131E-02
A4	1.30291556E-04
A5	1.18143460E-04
A6	-1.18586652E-05
A7	7.68022789E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.015942
F'-C'	0.016139
C-t	0.012079
C-A'	0.005259
d-C	0.004729
e-C	0.008510
g-d	0.020382
g-F	0.009169
h-g	0.007930
i-g	0.022320
C'-t	0.012825
e-C'	0.007764
F'-e	0.008375
i-F'	0.030546

Relative partial dispersion	
C-t／F-C	0.7577
C-A'／F-C	0.3299
d-C／F-C	0.2966
e-C／F-C	0.5338
g-d／F-C	1.2785
g-F／F-C	0.5751
h-g／F-C	0.4974
i-g／F-C	1.4001
C'-t／F'-C'	0.7947
e-C'／F'-C'	0.4811
F'-e／F'-C'	0.5189
i-F'／F'-C'	1.8927

Deviation of relative partial disp.	
ΔPdC	0.0005
ΔPgF	0.0010

Specific gravity	3.21

Thermal properties	
CTE(-30,70) [1E-7/℃]	66
CTE(100,300) [1E-7/℃]	81
Tg [℃]	600
At [℃]	644
Ht cndct. [W/m･K]	0.899
Sp. heat [kJ/kg･K]	0.653
Ht diffus. [1E-6 m2/sec]	0.429

Chemical properties [class]	
Acid res. (surface)	7
Alkaline detergent res.	2
Climate resistance	2
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	510 (5)
Abrasion hardness	128
Young's mod. [GPa]	88.7
Shear mod. [GPa]	35.0
Poisson's ratio	0.268
Stress optical coef. [1E-5 nm/cm／Pa]	2.73

Color Code (80%/5%)	41/36
Internal CC	389/355

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.01
360	0.16
365	0.31
370	0.46
380	0.68
390	0.81
400	0.88
420	0.938
440	0.961
460	0.973
480	0.981
500	0.986
550	0.991
600	0.992
650	0.992
700	0.993
800	0.988
900	0.999
1000	0.996
1200	0.998
1400	0.992
1600	0.990
1800	0.979
2000	0.962
2200	0.89
2400	0.73

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.4	2.5	2.6	2.8	3.0	3.2	3.2	3.3	3.5	3.8	4.4	4.5	5.4	6.2	6.8
60 to 80(ref.)	2.3	2.3	2.5	2.7	2.9	3.0	3.1	3.1	3.4	3.6	4.2	4.3	5.1	6.0	6.5
40 to 60	2.2	2.2	2.4	2.5	2.7	2.9	2.9	2.9	3.2	3.4	4.0	4.1	4.9	5.7	6.2
20 to 40	2.1	2.1	2.2	2.4	2.5	2.7	2.8	2.8	3.0	3.3	3.8	3.9	4.6	5.4	5.9
0 to 20	2.0	2.0	2.2	2.3	2.4	2.6	2.6	2.7	2.9	3.1	3.7	3.7	4.4	5.2	5.6
-20 to 0	2.0	2.0	2.1	2.3	2.4	2.5	2.6	2.6	2.8	3.0	3.5	3.6	4.3	5.0	5.4
-40 to -20	2.0	2.0	2.2	2.3	2.4	2.6	2.6	2.6	2.8	3.0	3.5	3.6	4.2	4.9	5.3
-60 to -40(ref.)	2.2	2.2	2.3	2.4	2.5	2.7	2.7	2.7	2.9	3.1	3.6	3.6	4.2	4.9	5.3
-70 to -60(ref.)	2.3	2.3	2.5	2.6	2.7	2.8	2.9	2.9	3.1	3.3	3.7	3.8	4.3	5.0	5.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.4	1.4	1.6	1.8	2.0	2.1	2.2	2.2	2.5	2.8	3.4	3.5	4.3	5.2	5.7
60 to 80	1.2	1.2	1.4	1.6	1.7	1.9	2.0	2.0	2.2	2.5	3.1	3.2	4.0	4.8	5.4
40 to 60	0.9	0.9	1.1	1.3	1.4	1.6	1.6	1.7	1.9	2.1	2.7	2.8	3.6	4.4	4.9
20～40	0.6	0.7	0.8	1.0	1.1	1.3	1.3	1.4	1.6	1.8	2.3	2.4	3.1	3.9	4.4
0 to 20	0.4	0.4	0.5	0.7	0.8	0.9	1.0	1.0	1.2	1.5	2.0	2.0	2.7	3.5	3.9
-20 to 0	0.1	0.1	0.2	0.4	0.5	0.6	0.7	0.7	0.9	1.1	1.6	1.7	2.3	3.0	3.4
-40 to -20	-0.2	-0.2	-0.1	0.1	0.2	0.3	0.3	0.4	0.6	0.8	1.2	1.3	1.9	2.5	2.9
-60 to -40	-0.5	-0.5	-0.4	-0.3	-0.1	0.0	0.0	0.1	0.2	0.4	0.8	0.9	1.5	2.1	2.5
-70 to -60	-0.7	-0.7	-0.6	-0.5	-0.4	-0.2	-0.2	-0.2	0.0	0.1	0.6	0.6	1.2	1.7	2.1

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.01508388E-01
Q1	6.45319879E+01
P2	1.08815270E-02
Q2	5.72169663E-02
P3	3.52821748E-01
Q3	6.86732413E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	10.4
Frac. eq. (ref.)	1.4	9.7

Prod. Freq. (A to F)	F

Similar glass type			
OHARA		HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BASF7

nd = 1.701540 ne = 1.705598

ν d = 41.02 ν e = 40.73

Glass code (d)
702410
Glass code (e)
706407

Spectral l.	Refractive idx
2.058	1.66819
1.970	1.66950
1.530	1.67568
1.129	1.68171
1.064	1.68290
t	1.68391
s	1.68799
A'	1.690915
r	1.693675
C	1.696483
C'	1.697278
He-Ne	1.698024
D	1.701390
d	1.701540
e	1.705598
F	1.713586
F'	1.714600
g	1.723434
h	1.731926
0.389	1.737268
i	–

Coef. disp. form. (pwr ser.)	
A0	2.82115391E+00
A1	-1.00514408E-02
A2	-9.24350756E-05
A3	2.49821665E-02
A4	5.23468025E-04
A5	3.70259835E-05
A6	-2.14786963E-06
A7	2.97698375E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.017103
F'-C'	0.017322
C-t	0.012575
C-A'	0.005568
d-C	0.005057
e-C	0.009115
g-d	0.021894
g-F	0.009848
h-g	0.008492
i-g	–
C'-t	0.013370
e-C'	0.008320
F'-e	0.009002
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7353
C-A'／F-C	0.3256
d-C／F-C	0.2957
e-C／F-C	0.5329
g-d／F-C	1.2801
g-F／F-C	0.5758
h-g／F-C	0.4965
i-g／F-C	–
C'-t／F'-C'	0.7719
e-C'／F'-C'	0.4803
F'-e／F'-C'	0.5197
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	0.0000
ΔPgF	0.0003

Specific gravity	3.63

Thermal properties	
CTE(-30,70) [1E-7/℃]	67
CTE(100,300) [1E-7/℃]	82
Tg [℃]	579
At [℃]	639
Ht cndct. [W/m･K]	0.985
Sp. heat [kJ/kg･K]	0.583
Ht diffus. [1E-6 m2/sec]	0.464

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	531 (5)
Abrasion hardness	115
Young's mod. [GPa]	97.2
Shear mod. [GPa]	38.2
Poisson's ratio	0.272
Stress optical coef. [1E-5 nm/cm／Pa]	2.37

Color Code (80%/5%)	40/35
Internal CC	382/351
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.04
360	0.29
365	0.45
370	0.59
380	0.77
390	0.86
400	0.912
420	0.954
440	0.967
460	0.975
480	0.980
500	0.984
550	0.990
600	0.991
650	0.991
700	0.991
800	0.988
900	0.996
1000	0.994
1200	0.997
1400	0.996
1600	0.991
1800	0.982
2000	0.973
2200	0.938
2400	0.88

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.5	4.5	4.7	5.0	5.2	5.4	5.4	5.5	5.8	6.1	6.9	7.0	7.9	8.9	9.6
60 to 80(ref.)	4.4	4.4	4.7	4.8	5.0	5.2	5.3	5.4	5.6	6.0	6.7	6.8	7.7	8.7	9.3
40 to 60	4.2	4.3	4.5	4.7	4.9	5.1	5.1	5.2	5.4	5.8	6.5	6.6	7.4	8.3	8.9
20 to 40	4.1	4.2	4.4	4.5	4.7	4.9	5.0	5.0	5.3	5.6	6.3	6.3	7.2	8.1	8.6
0 to 20	4.1	4.1	4.3	4.5	4.6	4.8	4.9	4.9	5.2	5.5	6.1	6.2	7.0	7.8	8.3
-20 to 0	4.0	4.1	4.3	4.4	4.6	4.8	4.8	4.9	5.1	5.4	6.0	6.1	6.8	7.6	8.1
-40 to -20	4.1	4.1	4.3	4.4	4.6	4.8	4.8	4.9	5.1	5.4	5.9	6.0	6.7	7.5	8.0
-60 to -40(ref.)	4.2	4.3	4.4	4.6	4.7	4.9	4.9	5.0	5.2	5.5	6.0	6.1	6.8	7.5	7.9
-70 to -60(ref.)	4.4	4.4	4.6	4.8	4.9	5.1	5.1	5.1	5.3	5.6	6.1	6.2	6.9	7.5	8.0

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.4	3.5	3.7	3.9	4.1	4.3	4.4	4.4	4.7	5.1	5.8	5.9	6.8	7.8	8.5
60 to 80	3.2	3.3	3.5	3.7	3.9	4.1	4.1	4.2	4.5	4.8	5.5	5.6	6.5	7.5	8.1
40 to 60	3.0	3.0	3.2	3.4	3.6	3.8	3.8	3.9	4.1	4.5	5.1	5.2	6.1	7.0	7.6
20～40	2.7	2.7	2.9	3.1	3.3	3.4	3.5	3.5	3.8	4.1	4.8	4.8	5.7	6.5	7.1
0 to 20	2.4	2.4	2.6	2.8	2.9	3.1	3.2	3.2	3.5	3.7	4.4	4.5	5.2	6.0	6.6
-20 to 0	2.1	2.1	2.3	2.5	2.6	2.8	2.9	2.9	3.1	3.4	4.0	4.1	4.8	5.6	6.1
-40 to -20	1.8	1.9	2.0	2.2	2.3	2.5	2.5	2.6	2.8	3.0	3.6	3.7	4.4	5.1	5.6
-60 to -40	1.5	1.6	1.7	1.9	2.0	2.2	2.2	2.2	2.4	2.7	3.2	3.3	3.9	4.6	5.1
-70 to -60	1.3	1.4	1.5	1.6	1.8	1.9	2.0	2.0	2.2	2.4	2.9	3.0	3.6	4.3	4.7

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.10478239E-01
Q1	8.55560494E+01
P2	1.40861354E-02
Q2	5.16621818E-02
P3	3.63660694E-01
Q3	6.86792659E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	7.5
Frac. eq. (ref.)	0.6	8.8

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-BAH27	HOYA	BAFD7
C.D.G.M	H-ZBaF20	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-BASF8

nd = 1.723420 ne = 1.727927

ν d = 38.03 ν e = 37.75

Glass code (d)
723380
Glass code (e)
728378

Spectral l.	Refractive idx
2.058	1.68732
1.970	1.68870
1.530	1.69523
1.129	1.70167
1.064	1.70296
t	1.70405
s	1.70849
A'	1.711700
r	1.714733
C	1.717827
C'	1.718705
He-Ne	1.719528
D	1.723254
d	1.723420
e	1.727927
F	1.736849
F'	1.737986
g	1.747938
h	1.757590
0.389	1.763711
i	1.775229

Coef. disp. form. (pwr ser.)	
A0	2.88696022E+00
A1	-1.05560202E-02
A2	-1.02521932E-04
A3	2.80905311E-02
A4	3.99098561E-04
A5	1.15091109E-04
A6	-1.16375905E-05
A7	8.75066077E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.019022
F'-C'	0.019281
C-t	0.013775
C-A'	0.006127
d-C	0.005593
e-C	0.010100
g-d	0.024518
g-F	0.011089
h-g	0.009652
i-g	0.027291
C'-t	0.014653
e-C'	0.009222
F'-e	0.010059
i-F'	0.037243

Relative partial dispersion	
C-t／F-C	0.7242
C-A'／F-C	0.3221
d-C／F-C	0.2940
e-C／F-C	0.5310
g-d／F-C	1.2889
g-F／F-C	0.5830
h-g／F-C	0.5074
i-g／F-C	1.4347
C'-t／F'-C'	0.7600
e-C'／F'-C'	0.4783
F'-e／F'-C'	0.5217
i-F'／F'-C'	1.9316

Deviation of relative partial disp.	
ΔPdC	-0.0003
ΔPgF	0.0024

Specific gravity	3.61

Thermal properties	
CTE(-30,70) [1E-7/℃]	69
CTE(100,300) [1E-7/℃]	84
Tg [℃]	600
At [℃]	653
Ht cndct. [W/m･K]	0.921
Sp. heat [kJ/kg･K]	0.580
Ht diffus. [1E-6 m2/sec]	0.440

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	519 (5)
Abrasion hardness	121
Young's mod. [GPa]	99.7
Shear mod. [GPa]	39.2
Poisson's ratio	0.271
Stress optical coef. [1E-5 nm/cm／Pa]	2.21

Color Code (80%/5%)	41/36
Internal CC	385/355

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.10
360	0.17
365	0.34
370	0.50
380	0.73
390	0.84
400	0.904
420	0.955
440	0.970
460	0.978
480	0.983
500	0.987
550	0.992
600	0.992
650	0.992
700	0.992
800	0.990
900	0.996
1000	0.995
1200	0.998
1400	0.996
1600	0.991
1800	0.982
2000	0.971
2200	0.934
2400	0.87

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.8	3.9	4.1	4.3	4.6	4.8	4.9	4.9	5.3	5.6	6.5	6.6	7.7	8.9	9.7
60 to 80(ref.)	3.7	3.8	4.0	4.2	4.4	4.6	4.7	4.8	5.1	5.5	6.3	6.4	7.4	8.6	9.4
40 to 60	3.5	3.6	3.9	4.0	4.2	4.5	4.5	4.6	4.9	5.2	6.0	6.1	7.1	8.2	9.0
20 to 40	3.4	3.5	3.7	3.9	4.1	4.3	4.4	4.4	4.7	5.1	5.8	5.9	6.8	7.9	8.6
0 to 20	3.4	3.4	3.6	3.8	4.0	4.2	4.2	4.3	4.6	4.9	5.6	5.7	6.6	7.6	8.2
-20 to 0	3.3	3.4	3.6	3.8	3.9	4.1	4.2	4.2	4.5	4.8	5.5	5.6	6.4	7.3	7.9
-40 to -20	3.4	3.4	3.6	3.8	4.0	4.1	4.2	4.2	4.5	4.8	5.4	5.5	6.3	7.1	7.7
-60 to -40(ref.)	3.5	3.6	3.8	3.9	4.1	4.2	4.3	4.3	4.6	4.8	5.4	5.5	6.3	7.1	7.6
-70 to -60(ref.)	3.7	3.8	4.0	4.1	4.2	4.4	4.5	4.5	4.7	5.0	5.6	5.6	6.3	7.1	7.6

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.7	2.8	3.1	3.3	3.5	3.7	3.8	3.9	4.2	4.6	5.4	5.5	6.6	7.8	8.6
60 to 80	2.5	2.6	2.9	3.1	3.3	3.5	3.5	3.6	3.9	4.3	5.1	5.2	6.2	7.4	8.2
40 to 60	2.2	2.3	2.6	2.7	2.9	3.1	3.2	3.3	3.6	3.9	4.7	4.8	5.8	6.8	7.6
20～40	2.0	2.0	2.2	2.4	2.6	2.8	2.9	2.9	3.2	3.5	4.3	4.4	5.3	6.3	7.0
0 to 20	1.7	1.7	1.9	2.1	2.3	2.5	2.5	2.6	2.8	3.2	3.9	4.0	4.8	5.8	6.4
-20 to 0	1.4	1.4	1.6	1.8	2.0	2.1	2.2	2.2	2.5	2.8	3.4	3.5	4.4	5.2	5.9
-40 to -20	1.1	1.2	1.3	1.5	1.6	1.8	1.9	1.9	2.1	2.4	3.0	3.1	3.9	4.7	5.3
-60 to -40	0.8	0.9	1.0	1.2	1.3	1.5	1.5	1.6	1.8	2.1	2.6	2.7	3.4	4.2	4.7
-70 to -60	0.6	0.6	0.8	0.9	1.1	1.2	1.3	1.3	1.5	1.8	2.3	2.4	3.1	3.8	4.3

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.04773433E-01
Q1	7.92701952E+01
P2	1.39007302E-02
Q2	5.65058214E-02
P3	3.72250971E-01
Q3	7.25055966E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	5.4
Frac. eq. (ref.)	2.0	10.1

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-BAH28	HOYA	BaFD8
C.D.G.M	H-ZBaF21	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SK2

nd = 1.607380　　ne = 1.609932

νd = 56.74　　νe = 56.46

Glass code (d)
607567
Glass code (e)
610565

Spectral l.	Refractive idx
2.058	1.58249
1.970	1.58367
1.530	1.58909
1.129	1.59394
1.064	1.59484
t	1.59558
s	1.59847
A'	1.600467
r	1.602303
C	1.604139
C'	1.604653
He-Ne	1.605134
D	1.607285
d	1.607380
e	1.609932
F	1.614843
F'	1.615456
g	1.620704
h	1.625584
0.389	1.628565
i	1.633926

Coef. disp. form. (pwr ser.)	
A0	2.53980653E+00
A1	-8.90433248E-03
A2	-8.40740070E-05
A3	1.55288703E-02
A4	2.21892881E-04
A5	3.98552039E-06
A6	1.13655993E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.010704
F'-C'	0.010803
C-t	0.008558
C-A'	0.003672
d-C	0.003241
e-C	0.005793
g-d	0.013324
g-F	0.005861
h-g	0.004880
i-g	0.013222
C'-t	0.009072
e-C'	0.005279
F'-e	0.005524
i-F'	0.018470

Relative partial dispersion	
C-t／F-C	0.7995
C-A'／F-C	0.3430
d-C／F-C	0.3028
e-C／F-C	0.5412
g-d／F-C	1.2448
g-F／F-C	0.5476
h-g／F-C	0.4559
i-g／F-C	1.2352
C'-t／F'-C'	0.8398
e-C'／F'-C'	0.4887
F'-e／F'-C'	0.5113
i-F'／F'-C'	1.7097

Deviation of relative partial disp.	
ΔPdC	0.0000
ΔPgF	-0.0016

Specific gravity	3.53

Thermal properties	
CTE(-30,70) [1E-7/℃]	57
CTE(100,300) [1E-7/℃]	69
Tg [℃]	654
At [℃]	702
Ht cndct. [W/m･K]	0.961
Sp. heat [kJ/kg･K]	0.548
Ht diffus. [1E-6 m2/sec]	0.496

Chemical properties [class]	
Acid res. (surface)	2
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	512 (5)
Abrasion hardness	164
Young's mod. [GPa]	77.6
Shear mod. [GPa]	30.6
Poisson's ratio	0.266
Stress optical coef. [1E-5 nm/cm／Pa]	2.82

Color Code (80%/5%)	35/29
Internal CC	336/292
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.04
300	0.14
310	0.33
320	0.54
330	0.72
340	0.84
350	0.910
360	0.951
365	0.963
370	0.972
380	0.983
390	0.988
400	0.992
420	0.994
440	0.994
460	0.995
480	0.995
500	0.996
550	0.996
600	0.995
650	0.995
700	0.994
800	0.990
900	0.995
1000	0.995
1200	0.998
1400	0.989
1600	0.991
1800	0.982
2000	0.972
2200	0.917
2400	0.87

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.3	4.3	4.4	4.6	4.7	4.9	4.9	4.9	5.1	5.3	5.7	5.7	6.2	6.7	7.0
60 to 80(ref.)	4.1	4.2	4.3	4.4	4.6	4.7	4.7	4.8	4.9	5.1	5.5	5.6	6.0	6.5	6.7
40 to 60	4.0	4.0	4.1	4.3	4.4	4.5	4.5	4.6	4.7	4.9	5.3	5.3	5.8	6.2	6.4
20 to 40	3.8	3.8	4.0	4.1	4.2	4.3	4.3	4.4	4.5	4.7	5.1	5.1	5.5	5.9	6.2
0 to 20	3.7	3.7	3.9	4.0	4.1	4.2	4.2	4.2	4.4	4.5	4.9	4.9	5.3	5.7	5.9
-20 to 0	3.6	3.7	3.8	3.9	4.0	4.1	4.1	4.1	4.3	4.4	4.8	4.8	5.2	5.6	5.8
-40 to -20	3.6	3.7	3.8	3.9	4.0	4.1	4.1	4.1	4.2	4.4	4.7	4.8	5.1	5.5	5.7
-60 to -40(ref.)	3.7	3.7	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.4	4.8	4.8	5.1	5.5	5.7
-70 to -60(ref.)	3.9	3.9	4.0	4.1	4.2	4.3	4.3	4.3	4.4	4.6	4.9	4.9	5.2	5.6	5.7

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.3	3.3	3.5	3.6	3.7	3.9	3.9	3.9	4.1	4.3	4.7	4.7	5.2	5.7	5.9
60 to 80	3.1	3.1	3.2	3.4	3.5	3.6	3.6	3.7	3.8	4.0	4.4	4.5	4.9	5.3	5.6
40 to 60	2.8	2.8	2.9	3.0	3.1	3.3	3.3	3.3	3.5	3.7	4.0	4.1	4.5	4.9	5.2
20～40	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.0	3.1	3.3	3.6	3.7	4.1	4.5	4.7
0 to 20	2.1	2.1	2.3	2.4	2.5	2.6	2.6	2.6	2.8	2.9	3.3	3.3	3.7	4.1	4.3
-20 to 0	1.8	1.8	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.6	2.9	2.9	3.3	3.7	3.8
-40 to -20	1.5	1.5	1.6	1.7	1.8	1.9	1.9	1.9	2.1	2.2	2.5	2.5	2.9	3.2	3.4
-60 to -40	1.2	1.2	1.3	1.4	1.5	1.5	1.6	1.6	1.7	1.8	2.1	2.2	2.5	2.8	3.0
-70 to -60	0.9	0.9	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.6	1.8	1.9	2.2	2.5	2.7

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.21503006E-01
Q1	9.35640895E+01
P2	5.14196139E-02
Q2	1.93145621E-02
P3	2.87770878E-01
Q3	4.39985459E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.3	4.2
Frac. eq. (ref.)	0.3	4.2

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-BSM2	HOYA	BACD2
C.D.G.M	H-ZK50	SCHOTT	N-SK2

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SK4

nd = 1.612720　　ne = 1.615216

ν d = 58.54　　ν e = 58.27

Glass code (d)
613585
Glass code (e)
615583

Spectral l.	Refractive idx
2.058	1.58718
1.970	1.58846
1.530	1.59426
1.129	1.59934
1.064	1.60026
t	1.60101
s	1.60393
A'	1.605913
r	1.607730
C	1.609539
C'	1.610045
He-Ne	1.610518
D	1.612627
d	1.612720
e	1.615216
F	1.620006
F'	1.620603
g	1.625707
h	1.630445
0.389	1.633337
i	1.638532

Coef. disp. form. (pwr ser.)	
A0	2.55820861E+00
A1	-9.63062190E-03
A2	-1.05056878E-04
A3	1.52842971E-02
A4	1.88241434E-04
A5	5.74199467E-06
A6	3.67306869E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.010467
F'-C'	0.010558
C-t	0.008525
C-A'	0.003626
d-C	0.003181
e-C	0.005677
g-d	0.012987
g-F	0.005701
h-g	0.004738
i-g	0.012825
C'-t	0.009031
e-C'	0.005171
F'-e	0.005387
i-F'	0.017929

Relative partial dispersion	
C-t／F-C	0.8145
C-A'／F-C	0.3464
d-C／F-C	0.3039
e-C／F-C	0.5424
g-d／F-C	1.2408
g-F／F-C	0.5447
h-g／F-C	0.4527
i-g／F-C	1.2253
C'-t／F'-C'	0.8554
e-C'／F'-C'	0.4898
F'-e／F'-C'	0.5102
i-F'／F'-C'	1.6981

Deviation of relative partial disp.	
ΔPdC	0.0003
ΔPgF	-0.0015

Specific gravity	3.53

Thermal properties	
CTE(-30,70) [1E-7/℃]	62
CTE(100,300) [1E-7/℃]	75
Tg [℃]	652
At [℃]	694
Ht cndct. [W/m･K]	0.884
Sp. heat [kJ/kg･K]	0.538
Ht diffus. [1E-6 m2/sec]	0.460

Chemical properties [class]	
Acid res. (surface)	4
Alkaline detergent res.	2
Climate resistance	2
Water res. (powder)	2
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	485 (5)
Abrasion hardness	106
Young's mod. [GPa]	82.4
Shear mod. [GPa]	32.5
Poisson's ratio	0.266
Stress optical coef. [1E-5 nm/cm／Pa]	2.14

Color Code (80%/5%)	36/32
Internal CC	352/318

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	0.09
330	0.33
340	0.60
350	0.78
360	0.88
365	0.908
370	0.933
380	0.961
390	0.974
400	0.983
420	0.989
440	0.990
460	0.992
480	0.993
500	0.994
550	0.994
600	0.994
650	0.993
700	0.993
800	0.990
900	0.998
1000	0.995
1200	0.997
1400	0.986
1600	0.990
1800	0.978
2000	0.961
2200	0.88
2400	0.79

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.7	2.7	2.7	2.9	3.0	3.1	3.2	3.2	3.3	3.5	3.8	3.9	4.3	4.7	4.9
60 to 80(ref.)	2.5	2.5	2.7	2.8	2.9	3.0	3.0	3.0	3.2	3.3	3.7	3.7	4.1	4.5	4.7
40 to 60	2.4	2.4	2.5	2.6	2.7	2.8	2.8	2.9	3.0	3.1	3.5	3.5	3.9	4.3	4.4
20 to 40	2.3	2.3	2.4	2.5	2.6	2.7	2.7	2.7	2.8	3.0	3.3	3.3	3.7	4.1	4.2
0 to 20	2.2	2.2	2.3	2.4	2.5	2.6	2.6	2.6	2.7	2.9	3.2	3.2	3.6	3.9	4.1
-20 to 0	2.1	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.7	2.8	3.1	3.1	3.5	3.8	4.0
-40 to -20	2.2	2.2	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.8	3.1	3.1	3.5	3.8	3.9
-60 to -40(ref.)	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9	3.2	3.2	3.5	3.8	4.0
-70 to -60(ref.)	2.4	2.5	2.5	2.6	2.7	2.8	2.8	2.8	2.9	3.0	3.3	3.3	3.7	3.9	4.1

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.7	1.7	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.5	2.8	2.8	3.3	3.6	3.8
60 to 80	1.4	1.5	1.6	1.7	1.8	1.9	1.9	1.9	2.1	2.2	2.5	2.6	3.0	3.4	3.5
40 to 60	1.2	1.2	1.3	1.4	1.5	1.6	1.6	1.6	1.8	1.9	2.2	2.2	2.6	3.0	3.2
20～40	0.9	0.9	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.6	1.9	1.9	2.3	2.6	2.8
0 to 20	0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.5	1.6	1.9	2.3	2.4
-20 to 0	0.3	0.3	0.4	0.5	0.6	0.7	0.7	0.7	0.8	0.9	1.2	1.2	1.6	1.9	2.0
-40 to -20	0.0	0.0	0.1	0.2	0.3	0.4	0.4	0.4	0.5	0.6	0.9	0.9	1.2	1.5	1.6
-60 to -40	-0.3	-0.3	-0.2	-0.1	0.0	0.0	0.1	0.1	0.2	0.3	0.5	0.6	0.9	1.1	1.3
-70 to -60	-0.5	-0.5	-0.4	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1	0.0	0.3	0.3	0.6	0.9	1.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.20597544E-01
Q1	8.62245013E+01
P2	2.08228775E-02
Q2	2.54136407E-02
P3	3.21046137E-01
Q3	5.20024979E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	3.7
Frac. eq. (ref.)	0.5	3.5

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-BSM4	HOYA	BACD4
C.D.G.M	H-ZK6	SCHOTT	N-SK4

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SK5

nd = 1.589130　　ne = 1.591426

νd = 61.22　　νe = 60.98

Glass code (d)
589612
Glass code (e)
591610

Spectral l.	Refractive idx
2.058	1.56405
1.970	1.56537
1.530	1.57138
1.129	1.57650
1.064	1.57740
t	1.57814
s	1.58094
A'	1.582810
r	1.584509
C	1.586191
C'	1.586660
He-Ne	1.587097
D	1.589044
d	1.589130
e	1.591426
F	1.595814
F'	1.596359
g	1.601011
h	1.605313
0.389	1.607932
i	1.612622

Coef. disp. form. (pwr ser.)	
A0	2.48748280E+00
A1	-1.01006793E-02
A2	-9.51075480E-05
A3	1.37290228E-02
A4	1.82268499E-04
A5	1.87989450E-06
A6	9.76616911E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.009623
F'-C'	0.009699
C-t	0.008051
C-A'	0.003381
d-C	0.002939
e-C	0.005235
g-d	0.011881
g-F	0.005197
h-g	0.004302
i-g	0.011611
C'-t	0.008520
e-C'	0.004766
F'-e	0.004933
i-F'	0.016263

Relative partial dispersion	
C-t／F-C	0.8366
C-A'／F-C	0.3513
d-C／F-C	0.3054
e-C／F-C	0.5440
g-d／F-C	1.2346
g-F／F-C	0.5401
h-g／F-C	0.4471
i-g／F-C	1.2066
C'-t／F'-C'	0.8784
e-C'／F'-C'	0.4914
F'-e／F'-C'	0.5086
i-F'／F'-C'	1.6768

Deviation of relative partial disp.	
ΔPdC	0.0006
ΔPgF	-0.0016

Specific gravity	3.26

Thermal properties	
CTE(-30,70) [1E-7/℃]	55
CTE(100,300) [1E-7/℃]	67
Tg [℃]	613
At [℃]	658
Ht cndct. [W/m･K]	1.092
Sp. heat [kJ/kg･K]	0.614
Ht diffus. [1E-6 m2/sec]	0.542

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	2
Water res. (powder)	2
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	523 (5)
Abrasion hardness	85
Young's mod. [GPa]	86.1
Shear mod. [GPa]	34.4
Poisson's ratio	0.252
Stress optical coef. [1E-5 nm/cm／Pa]	2.56

Color Code (80%/5%)	35/30
Internal CC	339/294

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.03
300	0.11
310	0.28
320	0.49
330	0.68
340	0.81
350	0.89
360	0.942
365	0.958
370	0.969
380	0.980
390	0.987
400	0.991
420	0.994
440	0.994
460	0.995
480	0.996
500	0.996
550	0.997
600	0.996
650	0.995
700	0.994
800	0.991
900	0.997
1000	0.995
1200	0.997
1400	0.979
1600	0.989
1800	0.979
2000	0.962
2200	0.87
2400	0.79

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.8	3.8	3.9	4.0	4.1	4.2	4.2	4.2	4.3	4.5	4.8	4.8	5.1	5.4	5.6
60 to 80(ref.)	3.6	3.7	3.8	3.9	3.9	4.0	4.1	4.1	4.2	4.3	4.6	4.6	5.0	5.2	5.5
40 to 60	3.5	3.5	3.6	3.7	3.8	3.8	3.9	3.9	4.0	4.2	4.4	4.4	4.8	5.0	5.2
20 to 40	3.3	3.4	3.5	3.6	3.6	3.7	3.7	3.7	3.9	4.0	4.3	4.3	4.6	4.8	5.0
0 to 20	3.2	3.3	3.4	3.4	3.5	3.6	3.6	3.6	3.7	3.9	4.1	4.1	4.4	4.7	4.9
-20 to 0	3.2	3.2	3.3	3.4	3.4	3.5	3.5	3.6	3.7	3.8	4.1	4.1	4.4	4.6	4.8
-40 to -20	3.2	3.2	3.3	3.4	3.5	3.5	3.5	3.6	3.7	3.8	4.0	4.1	4.3	4.6	4.8
-60 to -40(ref.)	3.3	3.3	3.4	3.5	3.6	3.6	3.6	3.7	3.8	3.9	4.1	4.1	4.4	4.6	4.8
-70 to -60(ref.)	3.4	3.5	3.6	3.6	3.7	3.8	3.8	3.8	3.9	4.0	4.3	4.3	4.5	4.8	4.9

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.8	2.8	3.0	3.0	3.1	3.2	3.2	3.2	3.4	3.5	3.8	3.8	4.1	4.4	4.6
60 to 80	2.6	2.6	2.7	2.8	2.9	2.9	3.0	3.0	3.1	3.3	3.5	3.5	3.9	4.1	4.3
40 to 60	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9	3.2	3.2	3.5	3.8	4.0
20～40	2.0	2.0	2.1	2.2	2.2	2.3	2.3	2.4	2.5	2.6	2.9	2.9	3.2	3.4	3.6
0 to 20	1.7	1.7	1.8	1.9	1.9	2.0	2.0	2.0	2.2	2.3	2.5	2.5	2.8	3.1	3.2
-20 to 0	1.4	1.4	1.5	1.6	1.6	1.7	1.7	1.7	1.8	2.0	2.2	2.2	2.5	2.7	2.9
-40 to -20	1.1	1.1	1.2	1.3	1.3	1.4	1.4	1.4	1.5	1.6	1.9	1.9	2.1	2.4	2.5
-60 to -40	0.8	0.8	0.9	0.9	1.0	1.1	1.1	1.1	1.2	1.3	1.5	1.5	1.8	2.0	2.2
-70 to -60	0.5	0.6	0.7	0.7	0.8	0.8	0.8	0.9	0.9	1.1	1.3	1.3	1.5	1.7	1.9

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.32946901E-01
Q1	8.83791979E+01
P2	7.83138637E-02
Q2	1.47105353E-02
P3	2.53166689E-01
Q3	3.53720032E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.3	3.7
Frac. eq. (ref.)	0.3	4.1

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-BAL35	HOYA	BACD5
C.D.G.M	H-ZK3	SCHOTT	N-SK5

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SK10

nd = 1.622800 ne = 1.625400

νd = 57.10 νe = 56.83

Glass code (d)
623571
Glass code (e)
625568

Spectral l.	Refractive idx
2.058	1.59692
1.970	1.59817
1.530	1.60391
1.129	1.60900
1.064	1.60993
t	1.61070
s	1.61369
A'	1.615735
r	1.617616
C	1.619492
C'	1.620018
He-Ne	1.620509
D	1.622703
d	1.622800
e	1.625400
F	1.630399
F'	1.631023
g	1.636358
h	1.641315
0.389	1.644342
i	1.649783

Coef. disp. form. (pwr ser.)	
A0	2.58848328E+00
A1	-9.52709742E-03
A2	-9.90298068E-05
A3	1.60216897E-02
A4	2.07026667E-04
A5	6.19900432E-06
A6	1.17812844E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.010907
F'-C'	0.011005
C-t	0.008788
C-A'	0.003757
d-C	0.003308
e-C	0.005908
g-d	0.013558
g-F	0.005959
h-g	0.004957
i-g	0.013425
C'-t	0.009314
e-C'	0.005382
F'-e	0.005623
i-F'	0.018760

Relative partial dispersion	
C-t／F-C	0.8057
C-A'／F-C	0.3445
d-C／F-C	0.3033
e-C／F-C	0.5417
g-d／F-C	1.2431
g-F／F-C	0.5463
h-g／F-C	0.4545
i-g／F-C	1.2309
C'-t／F'-C'	0.8463
e-C'／F'-C'	0.4891
F'-e／F'-C'	0.5109
i-F'／F'-C'	1.7047

Deviation of relative partial disp.	
ΔPdC	0.0003
ΔPgF	-0.0022

Specific gravity	3.58

Thermal properties	
CTE(-30,70) [1E-7/℃]	68
CTE(100,300) [1E-7/℃]	80
Tg [℃]	623
At [℃]	671
Ht cndct. [W/m･K]	0.822
Sp. heat [kJ/kg･K]	0.521
Ht diffus. [1E-6 m2/sec]	0.440

Chemical properties [class]	
Acid res. (surface)	7
Alkaline detergent res.	3
Climate resistance	3
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	547 (5)
Abrasion hardness	167
Young's mod. [GPa]	82.7
Shear mod. [GPa]	32.5
Poisson's ratio	0.273
Stress optical coef. [1E-5 nm/cm／Pa]	2.43

Color Code (80%/5%)	35/30
Internal CC	342/296

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.02
300	0.09
310	0.25
320	0.45
330	0.64
340	0.78
350	0.88
360	0.930
365	0.948
370	0.961
380	0.977
390	0.986
400	0.990
420	0.993
440	0.993
460	0.994
480	0.995
500	0.996
550	0.996
600	0.996
650	0.994
700	0.995
800	0.990
900	0.996
1000	0.996
1200	0.997
1400	0.989
1600	0.989
1800	0.976
2000	0.959
2200	0.89
2400	0.78

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.0	2.0	2.1	2.3	2.4	2.5	2.5	2.6	2.7	2.9	3.3	3.3	3.7	4.1	4.3
60 to 80(ref.)	1.9	1.9	2.1	2.2	2.3	2.4	2.4	2.4	2.6	2.7	3.1	3.1	3.6	3.9	4.1
40 to 60	1.7	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.6	2.9	2.9	3.3	3.7	3.9
20 to 40	1.6	1.7	1.8	1.9	2.0	2.1	2.1	2.1	2.3	2.4	2.7	2.8	3.2	3.5	3.7
0 to 20	1.6	1.6	1.7	1.8	1.9	2.0	2.0	2.0	2.2	2.3	2.6	2.7	3.0	3.4	3.5
-20 to 0	1.5	1.5	1.6	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.5	2.6	2.9	3.3	3.4
-40 to -20	1.6	1.6	1.7	1.8	1.8	1.9	2.0	2.0	2.1	2.2	2.5	2.6	2.9	3.2	3.4
-60 to -40(ref.)	1.7	1.7	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.6	2.6	3.0	3.3	3.4
-70 to -60(ref.)	1.8	1.9	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.5	2.8	2.8	3.1	3.4	3.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.0	1.0	1.2	1.3	1.4	1.5	1.5	1.6	1.7	1.9	2.2	2.3	2.7	3.1	3.3
60 to 80	0.8	0.8	1.0	1.1	1.2	1.3	1.3	1.3	1.5	1.6	2.0	2.0	2.4	2.8	3.0
40 to 60	0.5	0.5	0.7	0.8	0.9	1.0	1.0	1.0	1.2	1.3	1.6	1.7	2.1	2.4	2.6
20～40	0.2	0.3	0.4	0.5	0.6	0.7	0.7	0.7	0.8	1.0	1.3	1.3	1.7	2.1	2.2
0 to 20	0.0	0.0	0.1	0.2	0.3	0.4	0.4	0.4	0.5	0.7	1.0	1.0	1.4	1.7	1.9
-20 to 0	-0.3	-0.3	-0.2	-0.1	0.0	0.1	0.1	0.1	0.2	0.3	0.6	0.7	1.0	1.3	1.5
-40 to -20	-0.6	-0.6	-0.5	-0.4	-0.3	-0.3	-0.2	-0.2	-0.1	0.0	0.3	0.3	0.7	0.9	1.1
-60 to -40	-0.9	-0.9	-0.8	-0.7	-0.6	-0.6	-0.5	-0.5	-0.4	-0.3	0.0	0.0	0.3	0.6	0.7
-70 to -60	-1.1	-1.1	-1.0	-0.9	-0.9	-0.8	-0.8	-0.7	-0.7	-0.5	-0.3	-0.3	0.0	0.3	0.4

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.22567490E-01
Q1	8.97846825E+01
P2	3.82261328E-02
Q2	2.10742317E-02
P3	3.07985247E-01
Q3	4.76996135E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.3	1.9
Frac. eq. (ref.)	0.4	1.7

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-BSM10	HOYA	E-BACD10
C.D.G.M	H-ZK10L	SCHOTT	N-SK10

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SK11

nd = 1.563840　　ne = 1.566055

ν d = 60.71　　ν e = 60.46

Glass code (d)
564607
Glass code (e)
566605

Spectral l.	Refractive idx
2.058	1.53995
1.970	1.54120
1.530	1.54686
1.129	1.55171
1.064	1.55257
t	1.55328
s	1.55595
A'	1.557752
r	1.559387
C	1.561006
C'	1.561458
He-Ne	1.561879
D	1.563757
d	1.563840
e	1.566055
F	1.570294
F'	1.570821
g	1.575320
h	1.579485
0.389	1.582022
i	1.586569

Coef. disp. form. (pwr ser.)	
A0	2.40941529E+00
A1	-9.29122990E-03
A2	-9.65092890E-05
A3	1.31170272E-02
A4	1.53988355E-04
A5	4.69136387E-06
A6	-2.59660236E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.009288
F'-C'	0.009363
C-t	0.007729
C-A'	0.003254
d-C	0.002834
e-C	0.005049
g-d	0.011480
g-F	0.005026
h-g	0.004165
i-g	0.011249
C'-t	0.008181
e-C'	0.004597
F'-e	0.004766
i-F'	0.015748

Relative partial dispersion	
C-t／F-C	0.8321
C-A'／F-C	0.3503
d-C／F-C	0.3051
e-C／F-C	0.5436
g-d／F-C	1.2360
g-F／F-C	0.5411
h-g／F-C	0.4484
i-g／F-C	1.2111
C'-t／F'-C'	0.8738
e-C'／F'-C'	0.4910
F'-e／F'-C'	0.5090
i-F'／F'-C'	1.6819

Deviation of relative partial disp.	
ΔPdC	0.0005
ΔPgF	-0.0014

Specific gravity	3.06

Thermal properties	
CTE(-30,70) [1E-7/℃]	64
CTE(100,300) [1E-7/℃]	77
Tg [℃]	603
At [℃]	653
Ht cndct. [W/m･K]	0.873
Sp. heat [kJ/kg･K]	0.550
Ht diffus. [1E-6 m2/sec]	0.444

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	2

Mechanical properties	
Knoop hardness	508 (5)
Abrasion hardness	112
Young's mod. [GPa]	79.9
Shear mod. [GPa]	32.2
Poisson's ratio	0.241
Stress optical coef. [1E-5 nm/cm／Pa]	2.94

Color Code (80%/5%)	34/29
Internal CC	330/289

Internal trans. (10mm)	
λ [nm]	τ
280	0.01
290	0.06
300	0.22
310	0.45
320	0.65
330	0.80
340	0.89
350	0.944
360	0.972
365	0.981
370	0.986
380	0.990
390	0.996
400	0.999
420	0.999
440	0.999
460	0.999
480	0.999
500	0.999
550	0.999
600	0.999
650	0.999
700	0.999
800	0.996
900	0.999
1000	0.999
1200	0.999
1400	0.982
1600	0.992
1800	0.980
2000	0.962
2200	0.87
2400	0.82

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.6	3.7	3.7	3.9	3.9	4.0	4.1	4.1	4.2	4.3	4.6	4.6	4.9	5.2	5.4
60 to 80(ref.)	3.4	3.4	3.6	3.6	3.7	3.8	3.8	3.9	4.0	4.1	4.4	4.4	4.7	5.0	5.2
40 to 60	3.1	3.2	3.3	3.4	3.5	3.5	3.6	3.6	3.7	3.8	4.1	4.1	4.4	4.7	4.9
20 to 40	2.9	2.9	3.0	3.1	3.2	3.3	3.3	3.3	3.4	3.6	3.8	3.9	4.1	4.4	4.6
0 to 20	2.7	2.7	2.8	2.9	3.0	3.1	3.1	3.1	3.2	3.4	3.6	3.6	3.9	4.2	4.4
-20 to 0	2.5	2.6	2.7	2.8	2.8	2.9	3.0	3.0	3.1	3.2	3.4	3.5	3.8	4.0	4.2
-40 to -20	2.4	2.5	2.6	2.7	2.7	2.8	2.9	2.9	3.0	3.1	3.3	3.4	3.7	3.9	4.1
-60 to -40(ref.)	2.4	2.5	2.6	2.7	2.7	2.8	2.8	2.9	3.0	3.1	3.3	3.4	3.6	3.9	4.1
-70 to -60(ref.)	2.5	2.5	2.6	2.7	2.8	2.9	2.9	2.9	3.0	3.2	3.4	3.4	3.7	4.0	4.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.7	2.7	2.8	2.9	3.0	3.1	3.1	3.1	3.2	3.3	3.6	3.6	3.9	4.2	4.4
60 to 80	2.4	2.4	2.5	2.6	2.7	2.8	2.8	2.8	2.9	3.0	3.3	3.3	3.6	3.9	4.1
40 to 60	2.0	2.0	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.9	2.9	3.2	3.5	3.6
20～40	1.6	1.6	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.4	2.5	2.7	3.0	3.2
0 to 20	1.2	1.2	1.3	1.4	1.5	1.5	1.6	1.6	1.7	1.8	2.0	2.1	2.3	2.6	2.8
-20 to 0	0.8	0.8	0.9	1.0	1.0	1.1	1.1	1.2	1.3	1.4	1.6	1.6	1.9	2.2	2.4
-40 to -20	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.8	0.9	1.0	1.2	1.2	1.5	1.7	1.9
-60 to -40	0.0	0.0	0.1	0.2	0.2	0.3	0.3	0.3	0.4	0.6	0.8	0.8	1.1	1.3	1.5
-70 to -60	-0.3	-0.3	-0.2	-0.1	-0.1	0.0	0.0	0.0	0.1	0.2	0.5	0.5	0.7	1.0	1.2

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.30541326E-01
Q1	9.05077329E+01
P2	4.41635252E-02
Q2	1.83187813E-02
P3	2.75495920E-01
Q3	4.38027483E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.3	3.4
Frac. eq. (ref.)	0.3	3.6

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-BAL41	HOYA	BACD11
C.D.G.M	H-BaK6	SCHOTT	N-SK11

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SK12

nd = 1.583130　　ne = 1.585470

νd = 59.42　　νe = 59.16

Glass code (d)
583594
Glass code (e)
585592

Spectral l.	Refractive idx
2.058	1.55838
1.970	1.55965
1.530	1.56543
1.129	1.57042
1.064	1.57131
t	1.57204
s	1.57483
A'	1.576718
r	1.578436
C	1.580141
C'	1.580617
He-Ne	1.581061
D	1.583043
d	1.583130
e	1.585470
F	1.589954
F'	1.590513
g	1.595281
h	1.599700
0.389	1.602395
i	1.607229

Coef. disp. form. (pwr ser.)	
A0	2.46741191E+00
A1	-9.52788845E-03
A2	-1.02594923E-04
A3	1.40303006E-02
A4	1.69265777E-04
A5	5.39399652E-06
A6	-2.33385875E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.009813
F'-C'	0.009896
C-t	0.008098
C-A'	0.003423
d-C	0.002989
e-C	0.005329
g-d	0.012151
g-F	0.005327
h-g	0.004419
i-g	0.011948
C'-t	0.008574
e-C'	0.004853
F'-e	0.005043
i-F'	0.016716

Relative partial dispersion	
C-t／F-C	0.8252
C-A'／F-C	0.3488
d-C／F-C	0.3046
e-C／F-C	0.5431
g-d／F-C	1.2383
g-F／F-C	0.5429
h-g／F-C	0.4503
i-g／F-C	1.2176
C'-t／F'-C'	0.8664
e-C'／F'-C'	0.4904
F'-e／F'-C'	0.5096
i-F'／F'-C'	1.6892

Deviation of relative partial disp.	
ΔPdC	0.0006
ΔPgF	-0.0018

Specific gravity	3.23

Thermal properties	
CTE(-30,70) [1E-7/℃]	60
CTE(100,300) [1E-7/℃]	73
Tg [℃]	604
At [℃]	650
Ht cndct. [W/m･K]	0.869
Sp. heat [kJ/kg･K]	0.558
Ht diffus. [1E-6 m2/sec]	0.479

Chemical properties [class]	
Acid res. (surface)	2
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	483 (5)
Abrasion hardness	112
Young's mod. [GPa]	81.6
Shear mod. [GPa]	32.6
Poisson's ratio	0.252
Stress optical coef. [1E-5 nm/cm／Pa]	2.93

Color Code (80%/5%)	35/30
Internal CC	335/294

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.02
300	0.12
310	0.33
320	0.55
330	0.73
340	0.85
350	0.917
360	0.954
365	0.964
370	0.974
380	0.984
390	0.988
400	0.993
420	0.994
440	0.995
460	0.995
480	0.996
500	0.996
550	0.997
600	0.997
650	0.996
700	0.995
800	0.993
900	0.997
1000	0.997
1200	0.999
1400	0.985
1600	0.990
1800	0.976
2000	0.962
2200	0.88
2400	0.80

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.5	3.6	3.7	3.8	3.9	4.0	4.0	4.1	4.2	4.4	4.7	4.8	5.1	5.5	5.8
60 to 80(ref.)	3.4	3.5	3.6	3.7	3.8	3.9	3.9	3.9	4.1	4.2	4.6	4.6	5.0	5.3	5.6
40 to 60	3.3	3.3	3.4	3.5	3.6	3.7	3.7	3.7	3.9	4.0	4.4	4.4	4.7	5.1	5.3
20 to 40	3.1	3.2	3.3	3.4	3.5	3.5	3.6	3.6	3.7	3.9	4.2	4.2	4.5	4.9	5.1
0 to 20	3.0	3.1	3.2	3.3	3.3	3.4	3.5	3.5	3.6	3.8	4.0	4.1	4.4	4.7	4.9
-20 to 0	3.0	3.0	3.1	3.2	3.3	3.4	3.4	3.4	3.5	3.7	4.0	4.0	4.3	4.6	4.8
-40 to -20	3.0	3.0	3.1	3.2	3.3	3.4	3.4	3.4	3.5	3.7	3.9	4.0	4.3	4.5	4.7
-60 to -40(ref.)	3.1	3.2	3.2	3.3	3.4	3.5	3.5	3.5	3.6	3.7	4.0	4.0	4.3	4.6	4.8
-70 to -60(ref.)	3.3	3.3	3.4	3.5	3.5	3.6	3.6	3.7	3.8	3.9	4.1	4.2	4.4	4.7	4.9

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.6	2.6	2.7	2.8	2.9	3.0	3.1	3.1	3.2	3.4	3.7	3.8	4.1	4.5	4.7
60 to 80	2.4	2.4	2.5	2.6	2.7	2.8	2.8	2.9	3.0	3.1	3.5	3.5	3.9	4.2	4.5
40 to 60	2.1	2.1	2.2	2.3	2.4	2.5	2.5	2.5	2.7	2.8	3.1	3.2	3.5	3.8	4.1
20～40	1.8	1.8	1.9	2.0	2.1	2.2	2.2	2.2	2.3	2.5	2.8	2.8	3.1	3.5	3.7
0 to 20	1.5	1.5	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.2	2.4	2.5	2.8	3.1	3.3
-20 to 0	1.2	1.2	1.3	1.4	1.5	1.5	1.6	1.6	1.7	1.8	2.1	2.1	2.4	2.7	2.9
-40 to -20	0.9	0.9	1.0	1.1	1.2	1.2	1.3	1.3	1.4	1.5	1.8	1.8	2.1	2.3	2.5
-60 to -40	0.6	0.6	0.7	0.8	0.9	0.9	0.9	1.0	1.1	1.2	1.4	1.4	1.7	1.9	2.1
-70 to -60	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.9	1.2	1.2	1.4	1.7	1.8

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.27040365E-01
Q1	8.81223287E+01
P2	4.08483065E-02
Q2	1.95227691E-02
P3	2.87645522E-01
Q3	4.52794933E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.3	2.5
Frac. eq. (ref.)	0.4	3.3

Prod. Freq. (A to F)	E

Similar glass type			
OHARA	S-BAL42	HOYA	
C.D.G.M	H-ZK2	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SK14

nd = 1.603110 ne = 1.605480

ν d = 60.69 ν e = 60.45

Glass code (d)
603607
Glass code (e)
605605

Spectral l.	Refractive idx
2.058	1.57754
1.970	1.57887
1.530	1.58494
1.129	1.59014
1.064	1.59106
t	1.59181
s	1.59467
A'	1.596598
r	1.598346
C	1.600078
C'	1.600562
He-Ne	1.601012
D	1.603021
d	1.603110
e	1.605480
F	1.610015
F'	1.610579
g	1.615392
h	1.619847
0.389	1.622559
i	1.627420

Partial dispersion	
F-C	0.009937
F'-C'	0.010017
C-t	0.008266
C-A'	0.003480
d-C	0.003032
e-C	0.005402
g-d	0.012282
g-F	0.005377
h-g	0.004455
i-g	0.012028
C'-t	0.008750
e-C'	0.004918
F'-e	0.005099
i-F'	0.016841

Relative partial dispersion	
C-t／F-C	0.8318
C-A'／F-C	0.3502
d-C／F-C	0.3051
e-C／F-C	0.5436
g-d／F-C	1.2360
g-F／F-C	0.5411
h-g／F-C	0.4483
i-g／F-C	1.2104
C'-t／F'-C'	0.8735
e-C'／F'-C'	0.4910
F'-e／F'-C'	0.5090
i-F'／F'-C'	1.6812

Deviation of relative partial disp.	
ΔPdC	0.0005
ΔPgF	-0.0014

Specific gravity	3.43

Thermal properties	
CTE(-30,70) [1E-7/℃]	58
CTE(100,300) [1E-7/℃]	72
Tg [℃]	646
At [℃]	691
Ht cndct. [W/m･K]	0.979
Sp. heat [kJ/kg･K]	0.567
Ht diffus. [1E-6 m2/sec]	0.501

Chemical properties [class]	
Acid res. (surface)	4
Alkaline detergent res.	2
Climate resistance	3
Water res. (powder)	3
Acid res. (powder)	5

Mechanical properties	
Knoop hardness	503 (5)
Abrasion hardness	142
Young's mod. [GPa]	85.7
Shear mod. [GPa]	34.0
Poisson's ratio	0.260
Stress optical coef. [1E-5 nm/cm／Pa]	2.19

Color Code (80%/5%)	35/30
Internal CC	342/295

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.02
300	0.10
310	0.25
320	0.45
330	0.64
340	0.78
350	0.87
360	0.929
365	0.946
370	0.961
380	0.977
390	0.984
400	0.990
420	0.994
440	0.994
460	0.995
480	0.996
500	0.996
550	0.997
600	0.996
650	0.995
700	0.995
800	0.992
900	0.996
1000	0.996
1200	0.998
1400	0.979
1600	0.988
1800	0.974
2000	0.952
2200	0.84
2400	0.74

Coef. disp. form. (pwr ser.)	
A0	2.53043945E+00
A1	-1.02567827E-02
A2	-9.79440830E-05
A3	1.42752530E-02
A4	2.00898558E-04
A5	1.18522803E-06
A6	1.46555128E-07
A7	0.00000000E+00
A8	0.00000000E+00

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.7	2.7	2.8	2.9	3.0	3.1	3.1	3.2	3.3	3.4	3.7	3.8	4.1	4.5	4.6
60 to 80(ref.)	2.6	2.6	2.7	2.8	2.9	3.0	3.0	3.0	3.1	3.3	3.6	3.6	4.0	4.3	4.4
40 to 60	2.4	2.4	2.5	2.6	2.7	2.8	2.8	2.8	2.9	3.1	3.4	3.4	3.8	4.1	4.2
20 to 40	2.2	2.3	2.4	2.5	2.5	2.6	2.6	2.7	2.8	2.9	3.2	3.2	3.6	3.9	4.0
0 to 20	2.1	2.1	2.2	2.3	2.4	2.5	2.5	2.5	2.6	2.8	3.1	3.1	3.4	3.7	3.9
-20 to 0	2.1	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.7	3.0	3.0	3.3	3.6	3.8
-40 to -20	2.1	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.7	3.0	3.0	3.3	3.6	3.8
-60 to -40(ref.)	2.2	2.2	2.3	2.3	2.4	2.5	2.5	2.5	2.6	2.8	3.0	3.1	3.4	3.7	3.8
-70 to -60(ref.)	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9	3.2	3.2	3.5	3.8	3.9

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.7	1.7	1.9	1.9	2.0	2.1	2.1	2.2	2.3	2.4	2.7	2.7	3.1	3.4	3.6
60 to 80	1.5	1.5	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.2	2.4	2.5	2.8	3.2	3.3
40 to 60	1.2	1.2	1.3	1.4	1.5	1.6	1.6	1.6	1.7	1.8	2.1	2.1	2.5	2.8	2.9
20～40	0.9	0.9	1.0	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.8	1.8	2.1	2.4	2.6
0 to 20	0.6	0.6	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2	1.4	1.5	1.8	2.1	2.2
-20 to 0	0.2	0.3	0.3	0.4	0.5	0.6	0.6	0.6	0.7	0.8	1.1	1.1	1.5	1.7	1.9
-40 to -20	-0.1	-0.1	0.0	0.1	0.2	0.3	0.3	0.3	0.4	0.5	0.7	0.8	1.1	1.4	1.5
-60 to -40	-0.4	-0.4	-0.3	-0.2	-0.1	-0.1	-0.1	0.0	0.1	0.2	0.4	0.4	0.8	1.0	1.1
-70 to -60	-0.6	-0.6	-0.5	-0.5	-0.4	-0.3	-0.3	-0.3	-0.2	-0.1	0.2	0.2	0.5	0.8	0.9

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.29162449E-01
Q1	8.62734299E+01
P2	9.62415853E-02
Q2	1.39736344E-02
P3	2.41574459E-01
Q3	3.09089297E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	5.3
Frac. eq. (ref.)	0.6	5.6

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-BSM14	HOYA	BACD14
C.D.G.M	H-ZK14	SCHOTT	N-SK14

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SK15

nd = 1.622990　　ne = 1.625546

νd = 58.12　　νe = 57.87

Glass code (d)
623581
Glass code (e)
626579

Spectral l.	Refractive idx
2.058	1.59635
1.970	1.59771
1.530	1.60386
1.129	1.60920
1.064	1.61015
t	1.61094
s	1.61396
A'	1.616004
r	1.617872
C	1.619729
C'	1.620248
He-Ne	1.620733
D	1.622895
d	1.622990
e	1.625546
F	1.630448
F'	1.631058
g	1.636277
h	1.641119
0.389	1.644073
i	1.649378

Coef. disp. form. (pwr ser.)	
A0	2.59035665E+00
A1	-1.02907579E-02
A2	-1.19847148E-04
A3	1.57254882E-02
A4	1.90519844E-04
A5	6.52864472E-06
A6	-1.78313721E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.010719
F'-C'	0.010810
C-t	0.008788
C-A'	0.003725
d-C	0.003261
e-C	0.005817
g-d	0.013287
g-F	0.005829
h-g	0.004842
i-g	0.013101
C'-t	0.009307
e-C'	0.005298
F'-e	0.005512
i-F'	0.018320

Relative partial dispersion	
C-t／F-C	0.8199
C-A'／F-C	0.3475
d-C／F-C	0.3042
e-C／F-C	0.5427
g-d／F-C	1.2396
g-F／F-C	0.5438
h-g／F-C	0.4517
i-g／F-C	1.2222
C'-t／F'-C'	0.8610
e-C'／F'-C'	0.4901
F'-e／F'-C'	0.5099
i-F'／F'-C'	1.6947

Deviation of relative partial disp.	
ΔPdC	0.0008
ΔPgF	-0.0030

Specific gravity	3.58

Thermal properties	
CTE(-30,70) [1E-7/℃]	60
CTE(100,300) [1E-7/℃]	70
Tg [℃]	651
At [℃]	696
Ht cndct. [W/m･K]	0.975
Sp. heat [kJ/kg･K]	0.614
Ht diffus. [1E-6 m2/sec]	0.517

Chemical properties [class]	
Acid res. (surface)	7
Alkaline detergent res.	2
Climate resistance	2
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	507 (5)
Abrasion hardness	124
Young's mod. [GPa]	85.6
Shear mod. [GPa]	33.9
Poisson's ratio	0.264
Stress optical coef. [1E-5 nm/cm／Pa]	2.22

Color Code (80%/5%)	36/30
Internal CC	347/299

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.01
300	0.05
310	0.17
320	0.35
330	0.55
340	0.72
350	0.83
360	0.905
365	0.931
370	0.948
380	0.969
390	0.981
400	0.988
420	0.994
440	0.994
460	0.995
480	0.996
500	0.997
550	0.996
600	0.996
650	0.995
700	0.994
800	0.992
900	0.996
1000	0.996
1200	0.998
1400	0.985
1600	0.988
1800	0.974
2000	0.952
2200	0.85
2400	0.73

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.8	2.8	2.9	3.1	3.2	3.3	3.3	3.3	3.4	3.6	3.9	3.9	4.3	4.7	4.9
60 to 80(ref.)	2.6	2.7	2.8	2.9	3.0	3.1	3.1	3.2	3.3	3.4	3.7	3.8	4.1	4.5	4.7
40 to 60	2.5	2.5	2.7	2.7	2.8	2.9	3.0	3.0	3.1	3.3	3.6	3.6	3.9	4.3	4.5
20 to 40	2.4	2.4	2.5	2.6	2.7	2.8	2.8	2.8	3.0	3.1	3.4	3.4	3.8	4.1	4.3
0 to 20	2.3	2.3	2.4	2.5	2.6	2.7	2.7	2.7	2.9	3.0	3.3	3.3	3.6	3.9	4.2
-20 to 0	2.2	2.3	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.9	3.2	3.2	3.5	3.9	4.1
-40 to -20	2.2	2.3	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9	3.2	3.2	3.5	3.8	4.0
-60 to -40(ref.)	2.4	2.4	2.5	2.6	2.7	2.7	2.8	2.8	2.9	3.0	3.3	3.3	3.6	3.9	4.1
-70 to -60(ref.)	2.5	2.5	2.7	2.7	2.8	2.9	2.9	2.9	3.0	3.2	3.4	3.4	3.7	4.0	4.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.8	1.8	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.6	2.9	2.9	3.3	3.6	3.9
60 to 80	1.6	1.6	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.3	2.6	2.7	3.0	3.4	3.6
40 to 60	1.3	1.3	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.3	2.3	2.7	3.0	3.2
20～40	1.0	1.0	1.1	1.2	1.3	1.4	1.4	1.4	1.6	1.7	2.0	2.0	2.3	2.6	2.8
0 to 20	0.7	0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.4	1.6	1.7	2.0	2.3	2.5
-20 to 0	0.4	0.4	0.5	0.6	0.7	0.8	0.8	0.8	0.9	1.0	1.3	1.3	1.6	1.9	2.1
-40 to -20	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.7	1.0	1.0	1.3	1.6	1.7
-60 to -40	-0.2	-0.2	-0.1	0.0	0.1	0.1	0.2	0.2	0.3	0.4	0.6	0.6	0.9	1.2	1.4
-70 to -60	-0.4	-0.4	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	0.0	0.1	0.4	0.4	0.7	0.9	1.1

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.23469308E-01
Q1	8.35768084E+01
P2	3.22374048E-02
Q2	2.17575456E-02
P3	3.14247196E-01
Q3	4.85654114E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	4.9
Frac. eq. (ref.)	0.4	5.4

Prod. Freq. (A to F)	E

Similar glass type			
OHARA	S-BSM15	HOYA	BACD15
C.D.G.M	H-ZK21	SCHOTT	N-SK15

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SK16

nd = 1.620410 ne = 1.622866

ν d = 60.25 ν e = 60.01

Glass code (d)
620603
Glass code (e)
623600

Spectral l.	Refractive idx
2.058	1.59326
1.970	1.59473
1.530	1.60130
1.129	1.60686
1.064	1.60783
t	1.60862
s	1.61163
A'	1.613642
r	1.615463
C	1.617264
C'	1.617766
He-Ne	1.618234
D	1.620318
d	1.620410
e	1.622866
F	1.627562
F'	1.628145
g	1.633125
h	1.637732
0.389	1.640539
i	1.645569

Partial dispersion	
F-C	0.010298
F'-C'	0.010379
C-t	0.008640
C-A'	0.003622
d-C	0.003146
e-C	0.005602
g-d	0.012715
g-F	0.005563
h-g	0.004607
i-g	0.012444
C'-t	0.009142
e-C'	0.005100
F'-e	0.005279
i-F'	0.017424

Relative partial dispersion	
C-t／F-C	0.8390
C-A'／F-C	0.3517
d-C／F-C	0.3055
e-C／F-C	0.5440
g-d／F-C	1.2347
g-F／F-C	0.5402
h-g／F-C	0.4474
i-g／F-C	1.2084
C'-t／F'-C'	0.8808
e-C'／F'-C'	0.4914
F'-e／F'-C'	0.5086
i-F'／F'-C'	1.6788

Deviation of relative partial disp.	
ΔPdC	0.0011
ΔPgF	-0.0031

Specific gravity	3.52

Thermal properties	
CTE(-30,70) [1E-7/℃]	58
CTE(100,300) [1E-7/℃]	71
Tg [℃]	647
At [℃]	679
Ht cndct. [W/m･K]	0.837
Sp. heat [kJ/kg･K]	0.545
Ht diffus. [1E-6 m2/sec]	0.436

Chemical properties [class]	
Acid res. (surface)	6
Alkaline detergent res.	3
Climate resistance	3
Water res. (powder)	3
Acid res. (powder)	5

Mechanical properties	
Knoop hardness	449 (4)
Abrasion hardness	136
Young's mod. [GPa]	88.7
Shear mod. [GPa]	35.0
Poisson's ratio	0.266
Stress optical coef. [1E-5 nm/cm／Pa]	2.16

Color Code (80%/5%)	36/30
Internal CC	347/298

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.01
300	0.06
310	0.18
320	0.36
330	0.55
340	0.71
350	0.83
360	0.900
365	0.925
370	0.945
380	0.966
390	0.979
400	0.985
420	0.991
440	0.992
460	0.994
480	0.995
500	0.995
550	0.995
600	0.996
650	0.995
700	0.995
800	0.992
900	0.998
1000	0.996
1200	0.998
1400	0.979
1600	0.986
1800	0.971
2000	0.947
2200	0.83
2400	0.67

Coef. disp. form. (pwr ser.)	
A0	2.58448044E+00
A1	-1.11132665E-02
A2	-1.37540448E-04
A3	1.49921982E-02
A4	1.88581834E-04
A5	3.56240422E-06
A6	7.76507396E-08
A7	0.00000000E+00
A8	0.00000000E+00

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.4	2.4	2.5	2.6	2.7	2.8	2.9	2.9	3.0	3.2	3.5	3.5	3.9	4.2	4.4
60 to 80(ref.)	2.3	2.3	2.4	2.5	2.6	2.7	2.7	2.8	2.9	3.0	3.3	3.4	3.7	4.0	4.2
40 to 60	2.2	2.2	2.3	2.4	2.5	2.6	2.6	2.6	2.7	2.9	3.1	3.2	3.5	3.8	4.0
20 to 40	2.0	2.1	2.2	2.3	2.4	2.4	2.5	2.5	2.6	2.7	3.0	3.0	3.4	3.7	3.8
0 to 20	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.9	2.9	3.2	3.5	3.7
-20 to 0	2.0	2.0	2.1	2.2	2.2	2.3	2.3	2.4	2.5	2.6	2.8	2.9	3.2	3.4	3.6
-40 to -20	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.8	2.9	3.1	3.4	3.5
-60 to -40(ref.)	2.1	2.2	2.2	2.3	2.4	2.5	2.5	2.5	2.6	2.7	2.9	3.0	3.2	3.5	3.6
-70 to -60(ref.)	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9	3.1	3.1	3.4	3.6	3.7

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.4	1.4	1.5	1.6	1.7	1.8	1.9	1.9	2.0	2.2	2.4	2.5	2.8	3.2	3.3
60 to 80	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.2	2.2	2.6	2.9	3.1
40 to 60	0.9	1.0	1.1	1.2	1.2	1.3	1.4	1.4	1.5	1.6	1.9	1.9	2.2	2.6	2.7
20～40	0.7	0.7	0.8	0.9	1.0	1.0	1.1	1.1	1.2	1.3	1.6	1.6	1.9	2.2	2.3
0 to 20	0.4	0.4	0.5	0.6	0.7	0.7	0.8	0.8	0.9	1.0	1.2	1.3	1.6	1.8	2.0
-20 to 0	0.1	0.1	0.2	0.3	0.4	0.5	0.5	0.5	0.6	0.7	0.9	0.9	1.2	1.5	1.6
-40 to -20	-0.2	-0.1	-0.1	0.0	0.1	0.2	0.2	0.2	0.3	0.4	0.6	0.6	0.9	1.1	1.3
-60 to -40	-0.4	-0.4	-0.3	-0.3	-0.2	-0.1	-0.1	-0.1	0.0	0.1	0.3	0.3	0.6	0.8	0.9
-70 to -60	-0.6	-0.6	-0.5	-0.5	-0.4	-0.3	-0.3	-0.3	-0.2	-0.2	0.0	0.1	0.3	0.5	0.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.17133032E-01
Q1	7.35971696E+01
P2	3.13502706E-02
Q2	2.07201986E-02
P3	3.14284226E-01
Q3	4.73371033E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.3	7.6
Frac. eq. (ref.)	0.3	7.8

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-BSM16	HOYA	BACD16
C.D.G.M	H-ZK9A	SCHOTT	N-SK16

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SK18

nd = 1.638540　　ne = 1.641289

νd = 55.34　　νe = 55.07

Glass code (d)
639553
Glass code (e)
641551

Spectral l.	Refractive idx
2.058	1.61110
1.970	1.61245
1.530	1.61859
1.129	1.62400
1.064	1.62498
t	1.62579
s	1.62894
A'	1.631094
r	1.633073
C	1.635050
C'	1.635605
He-Ne	1.636122
D	1.638438
d	1.638540
e	1.641289
F	1.646589
F'	1.647251
g	1.652938
h	1.658254
0.389	1.661518
i	1.667427

Coef. disp. form. (pwr ser.)	
A0	2.63738575E+00
A1	-1.03287558E-02
A2	-1.09091934E-04
A3	1.67282181E-02
A4	3.03233685E-04
A5	-2.03256494E-06
A6	7.96743025E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.011539
F'-C'	0.011646
C-t	0.009256
C-A'	0.003956
d-C	0.003490
e-C	0.006239
g-d	0.014398
g-F	0.006349
h-g	0.005316
i-g	0.014489
C'-t	0.009811
e-C'	0.005684
F'-e	0.005962
i-F'	0.020176

Relative partial dispersion	
C-t／F-C	0.8021
C-A'／F-C	0.3428
d-C／F-C	0.3025
e-C／F-C	0.5407
g-d／F-C	1.2478
g-F／F-C	0.5502
h-g／F-C	0.4607
i-g／F-C	1.2557
C'-t／F'-C'	0.8424
e-C'／F'-C'	0.4881
F'-e／F'-C'	0.5119
i-F'／F'-C'	1.7324

Deviation of relative partial disp.	
ΔPdC	0.0003
ΔPgF	-0.0013

Specific gravity	3.67

Thermal properties	
CTE(-30,70) [1E-7/℃]	67
CTE(100,300) [1E-7/℃]	81
Tg [℃]	645
At [℃]	684
Ht cndct. [W/m･K]	0.831
Sp. heat [kJ/kg･K]	0.526
Ht diffus. [1E-6 m2/sec]	0.429

Chemical properties [class]	
Acid res. (surface)	6
Alkaline detergent res.	3
Climate resistance	3
Water res. (powder)	3
Acid res. (powder)	5

Mechanical properties	
Knoop hardness	499 (5)
Abrasion hardness	157
Young's mod. [GPa]	87.0
Shear mod. [GPa]	34.2
Poisson's ratio	0.271
Stress optical coef. [1E-5 nm/cm／Pa]	1.92

Color Code (80%/5%)	38/34
Internal CC	364/335

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	0.01
340	0.17
350	0.49
360	0.73
365	0.80
370	0.86
380	0.924
390	0.955
400	0.972
420	0.985
440	0.988
460	0.990
480	0.992
500	0.993
550	0.995
600	0.994
650	0.994
700	0.993
800	0.993
900	0.993
1000	0.993
1200	0.997
1400	0.989
1600	0.987
1800	0.969
2000	0.946
2200	0.85
2400	0.73

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	1.7	1.7	1.8	1.9	2.0	2.2	2.2	2.2	2.4	2.6	2.9	3.0	3.5	3.9	4.2
60 to 80(ref.)	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.1	2.3	2.4	2.8	2.8	3.3	3.7	4.0
40 to 60	1.4	1.4	1.6	1.7	1.8	1.9	1.9	2.0	2.1	2.3	2.6	2.7	3.1	3.5	3.7
20 to 40	1.3	1.3	1.5	1.6	1.7	1.8	1.8	1.8	2.0	2.1	2.5	2.5	2.9	3.3	3.6
0 to 20	1.3	1.3	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.4	2.4	2.8	3.2	3.4
-20 to 0	1.3	1.3	1.4	1.5	1.6	1.7	1.7	1.7	1.9	2.0	2.3	2.4	2.7	3.1	3.3
-40 to -20	1.3	1.3	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.3	2.4	2.7	3.1	3.3
-60 to -40(ref.)	1.5	1.5	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.4	2.5	2.8	3.1	3.3
-70 to -60(ref.)	1.7	1.7	1.8	1.9	1.9	2.0	2.1	2.1	2.2	2.3	2.6	2.6	3.0	3.3	3.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	0.7	0.7	0.8	0.9	1.0	1.2	1.2	1.2	1.4	1.5	1.9	2.0	2.4	2.8	3.1
60 to 80	0.5	0.5	0.6	0.7	0.8	0.9	1.0	1.0	1.1	1.3	1.7	1.7	2.2	2.6	2.8
40 to 60	0.2	0.2	0.3	0.4	0.5	0.7	0.7	0.7	0.8	1.0	1.4	1.4	1.8	2.2	2.4
20～40	-0.1	-0.1	0.1	0.2	0.3	0.4	0.4	0.4	0.6	0.7	1.0	1.1	1.5	1.9	2.1
0 to 20	-0.3	-0.3	-0.2	-0.1	0.0	0.1	0.1	0.1	0.3	0.4	0.7	0.8	1.1	1.5	1.7
-20 to 0	-0.6	-0.6	-0.5	-0.4	-0.3	-0.2	-0.2	-0.2	0.0	0.1	0.4	0.4	0.8	1.1	1.3
-40 to -20	-0.9	-0.8	-0.8	-0.7	-0.6	-0.5	-0.5	-0.4	-0.3	-0.2	0.1	0.1	0.5	0.8	1.0
-60 to -40	-1.1	-1.1	-1.0	-0.9	-0.8	-0.8	-0.8	-0.7	-0.6	-0.5	-0.2	-0.2	0.1	0.4	0.6
-70 to -60	-1.3	-1.3	-1.2	-1.2	-1.1	-1.0	-1.0	-0.9	-0.8	-0.7	-0.5	-0.5	-0.1	0.1	0.3

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.05284203E-01
Q1	7.37088855E+01
P2	1.09317433E-02
Q2	3.78284051E-02
P3	3.42135739E-01
Q3	5.67258954E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	3.7
Frac. eq. (ref.)	0.5	5.4

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-BSM18	HOYA	BACD18
C.D.G.M	H-ZK11	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SSK1

nd = 1.617200　　ne = 1.619924

νd = 53.97　　νe = 53.71

Glass code (d)
617540
Glass code (e)
620537

Spectral l.	Refractive idx
2.058	1.58946
1.970	1.59085
1.530	1.59717
1.129	1.60268
1.064	1.60368
t	1.60450
s	1.60765
A'	1.609804
r	1.611774
C	1.613738
C'	1.614288
He-Ne	1.614802
D	1.617098
d	1.617200
e	1.619924
F	1.625175
F'	1.625831
g	1.631468
h	1.636742
0.389	1.639984
i	1.645856

Coef. disp. form. (pwr ser.)	
A0	2.56917001E+00
A1	-1.05347050E-02
A2	-1.14820760E-04
A3	1.63890732E-02
A4	2.66043325E-04
A5	2.86703318E-06
A6	5.89038637E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.011437
F'-C'	0.011543
C-t	0.009240
C-A'	0.003934
d-C	0.003462
e-C	0.006186
g-d	0.014268
g-F	0.006293
h-g	0.005274
i-g	0.014388
C'-t	0.009790
e-C'	0.005636
F'-e	0.005907
i-F'	0.020025

Relative partial dispersion	
C-t／F-C	0.8079
C-A'／F-C	0.3440
d-C／F-C	0.3027
e-C／F-C	0.5409
g-d／F-C	1.2475
g-F／F-C	0.5502
h-g／F-C	0.4611
i-g／F-C	1.2580
C'-t／F'-C'	0.8481
e-C'／F'-C'	0.4883
F'-e／F'-C'	0.5117
i-F'／F'-C'	1.7348

Deviation of relative partial disp.	
ΔPdC	0.0011
ΔPgF	-0.0036

Specific gravity	3.30

Thermal properties	
CTE(-30,70) [1E-7/℃]	59
CTE(100,300) [1E-7/℃]	74
Tg [℃]	600
At [℃]	649
Ht cndct. [W/m･K]	0.865
Sp. heat [kJ/kg･K]	0.592
Ht diffus. [1E-6 m2/sec]	0.442

Chemical properties [class]	
Acid res. (surface)	6
Alkaline detergent res.	3
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	539 (5)
Abrasion hardness	136
Young's mod. [GPa]	86.2
Shear mod. [GPa]	34.1
Poisson's ratio	0.265
Stress optical coef. [1E-5 nm/cm／Pa]	2.75

Color Code (80%/5%)	37/33
Internal CC	359/332

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	0.02
340	0.26
350	0.61
360	0.82
365	0.88
370	0.916
380	0.958
390	0.976
400	0.986
420	0.991
440	0.992
460	0.994
480	0.995
500	0.996
550	0.997
600	0.996
650	0.994
700	0.994
800	0.991
900	0.997
1000	0.996
1200	0.998
1400	0.987
1600	0.989
1800	0.978
2000	0.960
2200	0.87
2400	0.75

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.9	3.9	4.0	4.2	4.3	4.4	4.5	4.5	4.6	4.8	5.3	5.3	5.8	6.3	6.6
60 to 80(ref.)	3.8	3.8	4.0	4.1	4.2	4.3	4.3	4.3	4.5	4.7	5.1	5.1	5.6	6.1	6.3
40 to 60	3.6	3.6	3.8	3.9	4.0	4.1	4.1	4.1	4.3	4.5	4.9	4.9	5.4	5.8	6.1
20 to 40	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.0	4.1	4.3	4.7	4.7	5.2	5.6	5.9
0 to 20	3.3	3.4	3.5	3.6	3.7	3.8	3.8	3.9	4.0	4.2	4.5	4.6	5.0	5.4	5.7
-20 to 0	3.3	3.3	3.4	3.5	3.6	3.7	3.8	3.8	3.9	4.1	4.4	4.5	4.9	5.3	5.5
-40 to -20	3.3	3.3	3.5	3.5	3.6	3.7	3.7	3.8	3.9	4.1	4.4	4.4	4.9	5.3	5.5
-60 to -40(ref.)	3.4	3.4	3.5	3.6	3.7	3.8	3.8	3.9	4.0	4.1	4.5	4.5	4.9	5.3	5.5
-70 to -60(ref.)	3.5	3.6	3.7	3.8	3.9	3.9	4.0	4.0	4.1	4.3	4.6	4.6	5.0	5.4	5.6

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.5	3.6	3.8	4.2	4.3	4.8	5.2	5.5
60 to 80	2.7	2.7	2.9	3.0	3.1	3.2	3.2	3.2	3.4	3.6	4.0	4.0	4.5	4.9	5.2
40 to 60	2.4	2.4	2.5	2.6	2.7	2.8	2.9	2.9	3.0	3.2	3.6	3.7	4.1	4.6	4.8
20～40	2.1	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.7	2.9	3.3	3.3	3.7	4.2	4.4
0 to 20	1.8	1.8	1.9	2.0	2.1	2.2	2.2	2.2	2.4	2.5	2.9	2.9	3.4	3.8	4.0
-20 to 0	1.4	1.5	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.2	2.5	2.6	3.0	3.4	3.6
-40 to -20	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.6	1.7	1.9	2.2	2.2	2.6	3.0	3.2
-60 to -40	0.8	0.9	1.0	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.8	1.9	2.2	2.6	2.8
-70 to -60	0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.6	1.6	2.0	2.3	2.5

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.21623796E-01
Q1	8.02644402E+01
P2	1.09215263E-02
Q2	3.87083928E-02
P3	3.32513362E-01
Q3	5.82267405E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	4.9
Frac. eq. (ref.)	0.4	5.3

Prod. Freq. (A to F)	D

Similar glass type			
OHARA		HOYA	
C.D.G.M	H-ZK20	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SSK5

nd = 1.658440　　ne = 1.661522

ν d = 50.84　　ν e = 50.54

Glass code (d)
658508
Glass code (e)
662505

Spectral l.	Refractive idx
2.058	1.63030
1.970	1.63156
1.530	1.63735
1.129	1.64268
1.064	1.64369
t	1.64453
s	1.64786
A'	1.650196
r	1.652367
C	1.654552
C'	1.655167
He-Ne	1.655742
D	1.658325
d	1.658440
e	1.661522
F	1.667504
F'	1.668256
g	1.674728
h	1.680821
0.389	1.684584
i	1.691437

Coef. disp. form. (pwr ser.)	
A0	2.69546608E+00
A1	-9.46960473E-03
A2	-1.10686762E-04
A3	1.90535266E-02
A4	3.49767067E-04
A5	1.61235917E-06
A6	1.06076791E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.012952
F'-C'	0.013089
C-t	0.010022
C-A'	0.004356
d-C	0.003888
e-C	0.006970
g-d	0.016288
g-F	0.007224
h-g	0.006093
i-g	0.016709
C'-t	0.010637
e-C'	0.006355
F'-e	0.006734
i-F'	0.023181

Relative partial dispersion	
C-t／F-C	0.7738
C-A'／F-C	0.3363
d-C／F-C	0.3002
e-C／F-C	0.5381
g-d／F-C	1.2576
g-F／F-C	0.5578
h-g／F-C	0.4704
i-g／F-C	1.2901
C'-t／F'-C'	0.8127
e-C'／F'-C'	0.4855
F'-e／F'-C'	0.5145
i-F'／F'-C'	1.7710

Deviation of relative partial disp.	
ΔPdC	0.0000
ΔPgF	-0.0013

Specific gravity	3.75

Thermal properties	
CTE(-30,70) [1E-7/℃]	70
CTE(100,300) [1E-7/℃]	84
Tg [℃]	641
At [℃]	681
Ht cndct. [W/m･K]	0.759
Sp. heat [kJ/kg･K]	0.531
Ht diffus. [1E-6 m2/sec]	0.382

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	3
Climate resistance	2
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	483 (5)
Abrasion hardness	163
Young's mod. [GPa]	83.4
Shear mod. [GPa]	32.6
Poisson's ratio	0.280
Stress optical coef. [1E-5 nm/cm／Pa]	2.03

Color Code (80%/5%)	38/34
Internal CC	370/340

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.05
350	0.33
360	0.62
365	0.73
370	0.80
380	0.900
390	0.941
400	0.964
420	0.983
440	0.988
460	0.991
480	0.993
500	0.995
550	0.996
600	0.997
650	0.996
700	0.994
800	0.991
900	0.997
1000	0.995
1200	0.997
1400	0.992
1600	0.989
1800	0.976
2000	0.959
2200	0.900
2400	0.80

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	1.9	2.0	2.1	2.2	2.4	2.5	2.5	2.6	2.8	3.0	3.4	3.5	4.0	4.6	5.0
60 to 80(ref.)	1.8	1.9	2.0	2.1	2.2	2.4	2.4	2.4	2.6	2.8	3.3	3.4	3.9	4.4	4.8
40 to 60	1.7	1.7	1.9	2.0	2.1	2.2	2.3	2.3	2.5	2.7	3.1	3.2	3.7	4.2	4.5
20 to 40	1.6	1.6	1.8	1.9	2.0	2.1	2.1	2.2	2.3	2.5	3.0	3.0	3.5	4.0	4.3
0 to 20	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.1	2.2	2.4	2.9	2.9	3.4	3.9	4.2
-20 to 0	1.5	1.5	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.4	2.8	2.8	3.3	3.8	4.1
-40 to -20	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.1	2.2	2.4	2.8	2.8	3.3	3.7	4.0
-60 to -40(ref.)	1.7	1.7	1.9	2.0	2.0	2.2	2.2	2.2	2.4	2.5	2.9	3.0	3.4	3.8	4.1
-70 to -60(ref.)	1.9	1.9	2.0	2.1	2.2	2.3	2.4	2.4	2.5	2.7	3.1	3.1	3.5	3.9	4.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	0.9	0.9	1.1	1.2	1.3	1.5	1.5	1.5	1.7	1.9	2.4	2.5	3.0	3.5	3.9
60 to 80	0.7	0.7	0.9	1.0	1.1	1.3	1.3	1.3	1.5	1.7	2.2	2.2	2.7	3.2	3.6
40 to 60	0.4	0.5	0.6	0.7	0.8	1.0	1.0	1.0	1.2	1.4	1.8	1.9	2.4	2.9	3.2
20～40	0.1	0.2	0.3	0.4	0.5	0.7	0.7	0.7	0.9	1.1	1.5	1.5	2.0	2.5	2.8
0 to 20	-0.1	-0.1	0.1	0.2	0.3	0.4	0.4	0.4	0.6	0.8	1.2	1.2	1.7	2.1	2.5
-20 to 0	-0.4	-0.3	-0.2	-0.1	0.0	0.1	0.1	0.1	0.3	0.5	0.8	0.9	1.3	1.8	2.1
-40 to -20	-0.7	-0.6	-0.5	-0.4	-0.3	-0.2	-0.2	-0.2	0.0	0.2	0.5	0.6	1.0	1.4	1.7
-60 to -40	-0.9	-0.9	-0.8	-0.7	-0.6	-0.5	-0.5	-0.5	-0.3	-0.2	0.2	0.2	0.6	1.0	1.3
-70 to -60	-1.1	-1.1	-1.0	-0.9	-0.8	-0.7	-0.7	-0.7	-0.6	-0.4	-0.1	0.0	0.4	0.8	1.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	9.83663348E-02
Q1	7.63945327E+01
P2	1.03186784E-02
Q2	4.32605569E-02
P3	3.50770304E-01
Q3	6.14483385E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	8.3
Frac. eq. (ref.)	0.6	9.0

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-BSM25	HOYA	BACED5
C.D.G.M	H-ZBaF58	SCHOTT	N-SSK5

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SSK8

nd = 1.617720 ne = 1.620669

ν d = 49.81 ν e = 49.53

Glass code (d)
618498
Glass code (e)
621495

Spectral l.	Refractive idx
2.058	1.58991
1.970	1.59120
1.530	1.59714
1.129	1.60250
1.064	1.60349
t	1.60432
s	1.60756
A'	1.609817
r	1.611903
C	1.613998
C'	1.614587
He-Ne	1.615138
D	1.617610
d	1.617720
e	1.620669
F	1.626399
F'	1.627119
g	1.633338
h	1.639220
0.389	1.642869
i	1.649551

Coef. disp. form. (pwr ser.)	
A0	2.56658096E+00
A1	-9.72847347E-03
A2	-9.45439785E-05
A3	1.74935076E-02
A4	3.71433240E-04
A5	-4.00752907E-06
A6	1.64198401E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.012401
F'-C'	0.012532
C-t	0.009678
C-A'	0.004181
d-C	0.003722
e-C	0.006671
g-d	0.015618
g-F	0.006939
h-g	0.005882
i-g	0.016213
C'-t	0.010267
e-C'	0.006082
F'-e	0.006450
i-F'	0.022432

Relative partial dispersion	
C-t／F-C	0.7804
C-A'／F-C	0.3372
d-C／F-C	0.3001
e-C／F-C	0.5379
g-d／F-C	1.2594
g-F／F-C	0.5596
h-g／F-C	0.4743
i-g／F-C	1.3074
C'-t／F'-C'	0.8193
e-C'／F'-C'	0.4853
F'-e／F'-C'	0.5147
i-F'／F'-C'	1.7900

Deviation of relative partial disp.	
ΔPdC	0.0004
ΔPgF	-0.0012

Specific gravity	3.18

Thermal properties	
CTE(-30,70) [1E-7/℃]	74
CTE(100,300) [1E-7/℃]	89
Tg [℃]	593
At [℃]	639
Ht cndct. [W/m･K]	0.979
Sp. heat [kJ/kg･K]	0.626
Ht diffus. [1E-6 m2/sec]	0.492

Chemical properties [class]	
Acid res. (surface)	6
Alkaline detergent res.	3
Climate resistance	2
Water res. (powder)	2
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	493 (5)
Abrasion hardness	129
Young's mod. [GPa]	85.6
Shear mod. [GPa]	34.0
Poisson's ratio	0.260
Stress optical coef. [1E-5 nm/cm／Pa]	2.37

Color Code (80%/5%)	38/34
Internal CC	372/343

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.01
350	0.22
360	0.55
365	0.67
370	0.77
380	0.88
390	0.932
400	0.960
420	0.979
440	0.984
460	0.987
480	0.990
500	0.992
550	0.995
600	0.993
650	0.991
700	0.992
800	0.988
900	0.997
1000	0.994
1200	0.997
1400	0.989
1600	0.989
1800	0.977
2000	0.961
2200	0.902
2400	0.83

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.1	2.1	2.2	2.4	2.5	2.7	2.7	2.7	2.9	3.1	3.6	3.6	4.1	4.7	5.0
60 to 80(ref.)	1.9	2.0	2.2	2.3	2.4	2.5	2.6	2.6	2.8	3.0	3.4	3.5	4.0	4.5	4.8
40 to 60	1.8	1.8	2.0	2.1	2.2	2.3	2.4	2.4	2.6	2.8	3.2	3.2	3.7	4.2	4.6
20 to 40	1.6	1.7	1.8	1.9	2.1	2.2	2.2	2.2	2.4	2.6	3.0	3.1	3.5	4.0	4.4
0 to 20	1.5	1.6	1.7	1.8	1.9	2.1	2.1	2.1	2.3	2.5	2.9	2.9	3.4	3.9	4.2
-20 to 0	1.5	1.5	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.4	2.8	2.8	3.3	3.7	4.1
-40 to -20	1.5	1.6	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.4	2.8	2.8	3.2	3.7	4.0
-60 to -40(ref.)	1.6	1.7	1.8	1.9	2.0	2.1	2.1	2.1	2.3	2.5	2.8	2.9	3.3	3.7	4.0
-70 to -60(ref.)	1.8	1.8	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.6	3.0	3.0	3.4	3.9	4.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.1	1.1	1.3	1.4	1.5	1.7	1.7	1.7	1.9	2.1	2.5	2.6	3.1	3.6	4.0
60 to 80	0.9	0.9	1.1	1.2	1.3	1.4	1.5	1.5	1.7	1.9	2.3	2.3	2.8	3.3	3.7
40 to 60	0.6	0.6	0.8	0.9	1.0	1.1	1.1	1.2	1.3	1.5	1.9	2.0	2.5	3.0	3.3
20～40	0.3	0.3	0.4	0.6	0.7	0.8	0.8	0.8	1.0	1.2	1.6	1.6	2.1	2.6	2.9
0 to 20	0.0	0.0	0.1	0.2	0.3	0.5	0.5	0.5	0.7	0.9	1.2	1.3	1.7	2.2	2.5
-20 to 0	-0.3	-0.3	-0.2	-0.1	0.0	0.1	0.2	0.2	0.3	0.5	0.9	0.9	1.4	1.8	2.1
-40 to -20	-0.6	-0.6	-0.5	-0.4	-0.3	-0.2	-0.2	-0.1	0.0	0.2	0.5	0.6	1.0	1.4	1.7
-60 to -40	-0.9	-0.9	-0.8	-0.7	-0.6	-0.5	-0.5	-0.5	-0.3	-0.2	0.2	0.2	0.6	1.0	1.3
-70 to -60	-1.2	-1.1	-1.0	-0.9	-0.8	-0.8	-0.7	-0.7	-0.6	-0.4	-0.1	0.0	0.4	0.8	1.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.14440812E-01
Q1	8.22577070E+01
P2	8.67672536E-03
Q2	4.88531477E-02
P3	3.34364724E-01
Q3	6.32531622E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.9	6.8
Frac. eq. (ref.)	0.7	7.6

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-BSM28	HOYA	
C.D.G.M		SCHOTT	N-SSK8

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LLF1

nd = 1.548140　　ne = 1.551000

νd = 45.51　　νe = 45.22

Glass code (d)
548455
Glass code (e)
551452

Spectral l.	Refractive idx
2.058	1.52182
1.970	1.52302
1.530	1.52855
1.129	1.53359
1.064	1.53453
t	1.53532
s	1.53840
A'	1.540544
r	1.542539
C	1.544550
C'	1.545117
He-Ne	1.545647
D	1.548034
d	1.548140
e	1.551000
F	1.556594
F'	1.557301
g	1.563441
h	1.569310
0.389	1.572986
i	1.579793

Coef. disp. form. (pwr ser.)	
A0	2.35082049E+00
A1	-8.90815763E-03
A2	-4.67960548E-05
A3	1.55575823E-02
A4	4.97642954E-04
A5	-1.81687973E-05
A6	2.83408723E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.012044
F'-C'	0.012184
C-t	0.009232
C-A'	0.004006
d-C	0.003590
e-C	0.006450
g-d	0.015301
g-F	0.006847
h-g	0.005869
i-g	0.016352
C'-t	0.009799
e-C'	0.005883
F'-e	0.006301
i-F'	0.022492

Relative partial dispersion	
C-t／F-C	0.7665
C-A'／F-C	0.3326
d-C／F-C	0.2981
e-C／F-C	0.5355
g-d／F-C	1.2704
g-F／F-C	0.5685
h-g／F-C	0.4873
i-g／F-C	1.3577
C'-t／F'-C'	0.8043
e-C'／F'-C'	0.4828
F'-e／F'-C'	0.5172
i-F'／F'-C'	1.8460

Deviation of relative partial disp.	
ΔPdC	0.0003
ΔPgF	0.0005

Specific gravity	2.55

Thermal properties	
CTE(-30,70) [1E-7/℃]	87
CTE(100,300) [1E-7/℃]	105
Tg [℃]	471
At [℃]	529
Ht cndct. [W/m･K]	1.050
Sp. heat [kJ/kg･K]	0.770
Ht diffus. [1E-6 m2/sec]	0.534

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	3
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	455 (5)
Abrasion hardness	109
Young's mod. [GPa]	71.0
Shear mod. [GPa]	29.2
Poisson's ratio	0.216
Stress optical coef. [1E-5 nm/cm／Pa]	3.16

Color Code (80%/5%)	38/35
Internal CC	373/345

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.17
360	0.51
365	0.65
370	0.76
380	0.88
390	0.939
400	0.968
420	0.987
440	0.991
460	0.993
480	0.994
500	0.995
550	0.996
600	0.996
650	0.995
700	0.994
800	0.991
900	0.997
1000	0.996
1200	0.998
1400	0.993
1600	0.990
1800	0.962
2000	0.920
2200	0.84
2400	0.79

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.9	1.0	1.1	1.3	1.4	1.6	1.6	1.6	1.8	2.1	2.6	2.7	3.3	4.0	4.4
60 to 80(ref.)	0.9	0.9	1.1	1.2	1.4	1.5	1.5	1.6	1.8	2.0	2.5	2.6	3.2	3.8	4.3
40 to 60	0.8	0.9	1.0	1.2	1.3	1.4	1.5	1.5	1.7	1.9	2.4	2.4	3.0	3.7	4.1
20 to 40	0.8	0.9	1.0	1.1	1.2	1.4	1.4	1.5	1.6	1.8	2.3	2.4	2.9	3.5	4.0
0 to 20	0.8	0.9	1.0	1.1	1.2	1.4	1.4	1.4	1.6	1.8	2.3	2.3	2.9	3.4	3.8
-20 to 0	0.9	0.9	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.8	2.3	2.3	2.8	3.4	3.8
-40 to -20	1.0	1.1	1.2	1.3	1.4	1.5	1.5	1.6	1.7	1.9	2.3	2.4	2.9	3.4	3.8
-60 to -40(ref.)	1.2	1.3	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.1	2.5	2.5	3.0	3.5	3.9
-70 to -60(ref.)	1.5	1.5	1.6	1.7	1.8	1.9	2.0	2.0	2.1	2.3	2.7	2.7	3.2	3.7	4.0

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	0.0	0.0	0.2	0.3	0.5	0.6	0.6	0.7	0.9	1.1	1.6	1.7	2.3	3.0	3.4
60 to 80	-0.1	-0.1	0.1	0.2	0.3	0.4	0.5	0.5	0.7	0.9	1.4	1.5	2.1	2.8	3.2
40 to 60	-0.3	-0.3	-0.1	0.0	0.1	0.2	0.3	0.3	0.5	0.7	1.2	1.2	1.8	2.5	2.9
20～40	-0.5	-0.5	-0.3	-0.2	-0.1	0.0	0.1	0.1	0.3	0.5	0.9	1.0	1.6	2.2	2.6
0 to 20	-0.7	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1	-0.1	0.1	0.3	0.7	0.7	1.3	1.8	2.2
-20 to 0	-0.9	-0.8	-0.7	-0.6	-0.5	-0.4	-0.3	-0.3	-0.2	0.0	0.4	0.5	1.0	1.5	1.9
-40 to -20	-1.0	-1.0	-0.9	-0.8	-0.7	-0.6	-0.5	-0.5	-0.4	-0.2	0.2	0.2	0.7	1.2	1.6
-60 to -40	-1.2	-1.2	-1.1	-1.0	-0.9	-0.8	-0.8	-0.7	-0.6	-0.4	0.0	0.0	0.5	0.9	1.3
-70 to -60	-1.4	-1.3	-1.2	-1.1	-1.0	-0.9	-0.9	-0.9	-0.7	-0.6	-0.2	-0.2	0.3	0.7	1.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.14272540E-01
Q1	8.36598442E+01
P2	1.16097513E-02
Q2	5.03232551E-02
P3	2.98780426E-01
Q3	6.54971242E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	5.0
Frac. eq. (ref.)	0.9	4.7

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-TIL1	HOYA	E-FEL1
C.D.G.M	H-QF1	SCHOTT	N-LLF1

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LLF2

nd = 1.540720　　ne = 1.543455

νd = 46.97　　νe = 46.68

Glass code (d)
541470
Glass code (e)
543467

Spectral l.	Refractive idx
2.058	1.51518
1.970	1.51636
1.530	1.52179
1.129	1.52671
1.064	1.52762
t	1.52838
s	1.53136
A'	1.533429
r	1.535348
C	1.537280
C'	1.537824
He-Ne	1.538332
D	1.540618
d	1.540720
e	1.543455
F	1.548793
F'	1.549466
g	1.555303
h	1.560866
0.389	1.564340
i	1.570753

Coef. disp. form. (pwr ser.)	
A0	2.32991556E+00
A1	-8.66190637E-03
A2	-5.64810656E-05
A3	1.50203800E-02
A4	4.20176461E-04
A5	-1.21206332E-05
A6	2.27699343E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.011513
F'-C'	0.011642
C-t	0.008899
C-A'	0.003851
d-C	0.003440
e-C	0.006175
g-d	0.014583
g-F	0.006510
h-g	0.005563
i-g	0.015450
C'-t	0.009443
e-C'	0.005631
F'-e	0.006011
i-F'	0.021287

Relative partial dispersion	
C-t／F-C	0.7730
C-A'／F-C	0.3345
d-C／F-C	0.2988
e-C／F-C	0.5364
g-d／F-C	1.2667
g-F／F-C	0.5654
h-g／F-C	0.4832
i-g／F-C	1.3420
C'-t／F'-C'	0.8111
e-C'／F'-C'	0.4837
F'-e／F'-C'	0.5163
i-F'／F'-C'	1.8285

Deviation of relative partial disp.	
ΔPdC	0.0004
ΔPgF	-0.0001

Specific gravity	2.53

Thermal properties	
CTE(-30,70) [1E-7/℃]	88
CTE(100,300) [1E-7/℃]	107
Tg [℃]	460
At [℃]	522
Ht cndct. [W/m･K]	1.129
Sp. heat [kJ/kg･K]	0.771
Ht diffus. [1E-6 m2/sec]	0.577

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	3
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	455 (5)
Abrasion hardness	120
Young's mod. [GPa]	69.8
Shear mod. [GPa]	28.4
Poisson's ratio	0.227
Stress optical coef. [1E-5 nm/cm／Pa]	2.95

Color Code (80%/5%)	38/34
Internal CC	368/342

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.02
350	0.29
360	0.64
365	0.75
370	0.83
380	0.915
390	0.956
400	0.976
420	0.988
440	0.990
460	0.992
480	0.993
500	0.993
550	0.996
600	0.995
650	0.994
700	0.995
800	0.991
900	0.997
1000	0.998
1200	0.999
1400	0.999
1600	0.990
1800	0.964
2000	0.920
2200	0.84
2400	0.79

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.5	0.6	0.7	0.9	1.0	1.1	1.2	1.2	1.4	1.6	2.0	2.1	2.7	3.3	3.7
60 to 80(ref.)	0.5	0.5	0.7	0.8	0.9	1.1	1.1	1.1	1.3	1.5	2.0	2.0	2.6	3.2	3.6
40 to 60	0.4	0.5	0.7	0.8	0.9	1.0	1.1	1.1	1.3	1.5	1.9	2.0	2.5	3.1	3.5
20 to 40	0.4	0.5	0.6	0.8	0.9	1.0	1.0	1.1	1.2	1.4	1.9	1.9	2.4	3.0	3.4
0 to 20	0.5	0.5	0.7	0.8	0.9	1.0	1.1	1.1	1.3	1.4	1.8	1.9	2.4	2.9	3.3
-20 to 0	0.6	0.6	0.8	0.9	1.0	1.1	1.1	1.2	1.3	1.5	1.9	1.9	2.4	2.9	3.3
-40 to -20	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.3	1.4	1.6	2.0	2.0	2.5	3.0	3.4
-60 to -40(ref.)	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.5	1.6	1.8	2.2	2.2	2.7	3.2	3.5
-70 to -60(ref.)	1.2	1.2	1.4	1.5	1.6	1.7	1.7	1.7	1.9	2.0	2.4	2.4	2.9	3.3	3.7

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-0.4	-0.4	-0.2	-0.1	0.0	0.2	0.2	0.2	0.4	0.6	1.1	1.1	1.7	2.3	2.8
60 to 80	-0.6	-0.5	-0.3	-0.2	-0.1	0.0	0.1	0.1	0.3	0.5	0.9	1.0	1.5	2.1	2.5
40 to 60	-0.7	-0.7	-0.5	-0.4	-0.3	-0.2	-0.1	-0.1	0.1	0.3	0.7	0.8	1.3	1.9	2.3
20～40	-0.9	-0.8	-0.7	-0.6	-0.4	-0.3	-0.3	-0.3	-0.1	0.1	0.5	0.5	1.1	1.6	2.0
0 to 20	-1.0	-1.0	-0.8	-0.7	-0.6	-0.5	-0.5	-0.4	-0.3	-0.1	0.3	0.3	0.8	1.4	1.7
-20 to 0	-1.2	-1.1	-1.0	-0.9	-0.8	-0.7	-0.7	-0.6	-0.5	-0.3	0.1	0.1	0.6	1.1	1.5
-40 to -20	-1.3	-1.3	-1.2	-1.1	-1.0	-0.9	-0.8	-0.8	-0.7	-0.5	-0.1	-0.1	0.4	0.8	1.2
-60 to -40	-1.5	-1.5	-1.3	-1.2	-1.1	-1.0	-1.0	-1.0	-0.8	-0.7	-0.4	-0.3	0.1	0.6	0.9
-70 to -60	-1.6	-1.6	-1.5	-1.4	-1.3	-1.2	-1.1	-1.1	-1.0	-0.8	-0.5	-0.5	-0.1	0.4	0.7

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.13935561E-01
Q1	8.42051318E+01
P2	1.02232092E-02
Q2	5.03254636E-02
P3	2.96865573E-01
Q3	6.54412936E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	3.9
Frac. eq. (ref.)	0.6	3.8

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-TIL2	HOYA	E-FEL2
C.D.G.M	H-QF8	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LLF6

nd = 1.531720　　ne = 1.534311

νd = 48.78　　νe = 48.49

Glass code (d)
532488
Glass code (e)
534485

Spectral l.	Refractive idx
2.058	1.50694
1.970	1.50811
1.530	1.51350
1.129	1.51831
1.064	1.51920
t	1.51993
s	1.52280
A'	1.524781
r	1.526614
C	1.528453
C'	1.528970
He-Ne	1.529453
D	1.531624
d	1.531720
e	1.534311
F	1.539353
F'	1.539988
g	1.545481
h	1.550696
0.389	1.553942
i	1.559910

Coef. disp. form. (pwr ser.)	
A0	2.30465477E+00
A1	-8.42372028E-03
A2	-8.53219261E-05
A3	1.43763145E-02
A4	3.30848944E-04
A5	-4.10026783E-06
A6	1.57001947E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.010900
F'-C'	0.011018
C-t	0.008520
C-A'	0.003672
d-C	0.003267
e-C	0.005858
g-d	0.013761
g-F	0.006128
h-g	0.005215
i-g	0.014429
C'-t	0.009037
e-C'	0.005341
F'-e	0.005677
i-F'	0.019922

Relative partial dispersion	
C-t／F-C	0.7817
C-A'／F-C	0.3369
d-C／F-C	0.2997
e-C／F-C	0.5374
g-d／F-C	1.2625
g-F／F-C	0.5622
h-g／F-C	0.4784
i-g／F-C	1.3238
C'-t／F'-C'	0.8202
e-C'／F'-C'	0.4848
F'-e／F'-C'	0.5152
i-F'／F'-C'	1.8081

Deviation of relative partial disp.	
ΔPdC	0.0005
ΔPgF	-0.0003

Specific gravity	2.50

Thermal properties	
CTE(-30,70) [1E-7/℃]	85
CTE(100,300) [1E-7/℃]	105
Tg [℃]	463
At [℃]	519
Ht cndct. [W/m･K]	1.090
Sp. heat [kJ/kg･K]	0.773
Ht diffus. [1E-6 m2/sec]	0.563

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	2

Mechanical properties	
Knoop hardness	436 (4)
Abrasion hardness	99
Young's mod. [GPa]	69.2
Shear mod. [GPa]	28.3
Poisson's ratio	0.224
Stress optical coef. [1E-5 nm/cm／Pa]	3.35

Color Code (80%/5%)	37/34
Internal CC	362/339

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.07
350	0.44
360	0.75
365	0.83
370	0.89
380	0.944
390	0.970
400	0.983
420	0.988
440	0.988
460	0.989
480	0.991
500	0.992
550	0.992
600	0.993
650	0.992
700	0.993
800	0.991
900	0.996
1000	0.996
1200	0.997
1400	0.993
1600	0.989
1800	0.959
2000	0.914
2200	0.83
2400	0.77

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	1.1	1.1	1.2	1.4	1.5	1.7	1.7	1.8	1.9	2.1	2.6	2.7	3.2	3.8	4.3
60 to 80(ref.)	1.0	1.1	1.3	1.4	1.5	1.6	1.7	1.7	1.9	2.1	2.5	2.6	3.1	3.7	4.1
40 to 60	1.0	1.0	1.2	1.3	1.4	1.5	1.6	1.6	1.8	2.0	2.4	2.5	3.0	3.5	3.9
20 to 40	1.0	1.0	1.2	1.3	1.4	1.5	1.5	1.6	1.7	1.9	2.3	2.4	2.9	3.4	3.8
0 to 20	1.0	1.0	1.2	1.3	1.4	1.5	1.5	1.6	1.7	1.9	2.3	2.3	2.8	3.3	3.6
-20 to 0	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.7	1.9	2.3	2.3	2.8	3.2	3.6
-40 to -20	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.7	1.8	2.0	2.3	2.4	2.8	3.3	3.6
-60 to -40(ref.)	1.4	1.4	1.5	1.6	1.7	1.8	1.9	1.9	2.0	2.2	2.5	2.5	2.9	3.4	3.7
-70 to -60(ref.)	1.6	1.6	1.8	1.9	2.0	2.1	2.1	2.1	2.2	2.4	2.7	2.7	3.1	3.5	3.8

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	0.1	0.2	0.3	0.5	0.6	0.7	0.8	0.8	1.0	1.2	1.6	1.7	2.2	2.9	3.3
60 to 80	0.0	0.0	0.2	0.3	0.4	0.6	0.6	0.6	0.8	1.0	1.4	1.5	2.0	2.6	3.0
40 to 60	-0.2	-0.1	0.0	0.1	0.3	0.4	0.4	0.4	0.6	0.8	1.2	1.3	1.8	2.3	2.7
20～40	-0.3	-0.3	-0.2	0.0	0.1	0.2	0.2	0.2	0.4	0.6	1.0	1.0	1.5	2.0	2.4
0 to 20	-0.5	-0.5	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.2	0.4	0.7	0.8	1.2	1.7	2.1
-20 to 0	-0.7	-0.7	-0.5	-0.4	-0.3	-0.2	-0.2	-0.2	0.0	0.1	0.5	0.5	1.0	1.4	1.7
-40 to -20	-0.9	-0.8	-0.7	-0.6	-0.5	-0.4	-0.4	-0.4	-0.2	-0.1	0.2	0.3	0.7	1.1	1.4
-60 to -40	-1.0	-1.0	-0.9	-0.8	-0.7	-0.6	-0.6	-0.6	-0.4	-0.3	0.0	0.0	0.4	0.8	1.1
-70 to -60	-1.2	-1.1	-1.0	-0.9	-0.9	-0.8	-0.7	-0.7	-0.6	-0.5	-0.2	-0.1	0.2	0.6	0.8

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.07557274E-01
Q1	7.94538219E+01
P2	9.79586899E-03
Q2	4.86675152E-02
P3	2.93267192E-01
Q3	6.39526758E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	5.3
Frac. eq. (ref.)	0.5	5.9

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-TIL6	HOYA	E-FEL6
C.D.G.M	H-QF6	SCHOTT	N-LLF6

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LF5

nd = 1.581440　　ne = 1.584805

νd = 40.98　　νe = 40.70

Glass code (d)
581410
Glass code (e)
585407

Spectral l.	Refractive idx
2.058	1.55179
1.970	1.55308
1.530	1.55908
1.129	1.56464
1.064	1.56570
t	1.56659
s	1.57010
A'	1.572581
r	1.574895
C	1.577238
C'	1.577900
He-Ne	1.578520
D	1.581315
d	1.581440
e	1.584805
F	1.591428
F'	1.592268
g	1.599606
h	1.606684
0.389	1.611153
i	1.619523

Coef. disp. form. (pwr ser.)	
A0	2.44484793E+00
A1	-9.36437503E-03
A2	-9.46881204E-05
A3	1.93135291E-02
A4	2.36834809E-04
A5	7.55993911E-05
A6	-7.53407578E-06
A7	5.41756865E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.014190
F'-C'	0.014368
C-t	0.010652
C-A'	0.004657
d-C	0.004202
e-C	0.007567
g-d	0.018166
g-F	0.008178
h-g	0.007078
i-g	0.019917
C'-t	0.011314
e-C'	0.006905
F'-e	0.007463
i-F'	0.027255

Relative partial dispersion	
C-t／F-C	0.7507
C-A'／F-C	0.3282
d-C／F-C	0.2961
e-C／F-C	0.5333
g-d／F-C	1.2802
g-F／F-C	0.5763
h-g／F-C	0.4988
i-g／F-C	1.4036
C'-t／F'-C'	0.7874
e-C'／F'-C'	0.4806
F'-e／F'-C'	0.5194
i-F'／F'-C'	1.8969

Deviation of relative partial disp.	
ΔPdC	0.0004
ΔPgF	0.0007

Specific gravity	2.58

Thermal properties	
CTE(-30,70) [1E-7/℃]	75
CTE(100,300) [1E-7/℃]	90
Tg [℃]	576
At [℃]	623
Ht cndct. [W/m･K]	1.127
Sp. heat [kJ/kg･K]	0.822
Ht diffus. [1E-6 m2/sec]	0.531

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	3
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	477 (5)
Abrasion hardness	105
Young's mod. [GPa]	75.6
Shear mod. [GPa]	30.9
Poisson's ratio	0.223
Stress optical coef. [1E-5 nm/cm／Pa]	3.17

Color Code (80%/5%)	39/35
Internal CC	379/353

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.01
360	0.25
365	0.43
370	0.61
380	0.81
390	0.907
400	0.950
420	0.979
440	0.985
460	0.989
480	0.991
500	0.992
550	0.994
600	0.995
650	0.993
700	0.993
800	0.989
900	0.995
1000	0.995
1200	0.997
1400	0.992
1600	0.991
1800	0.972
2000	0.949
2200	0.89
2400	0.86

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.4	2.4	2.5	2.7	2.9	3.1	3.1	3.2	3.4	3.7	4.3	4.4	5.2	6.0	6.6
60 to 80(ref.)	2.3	2.3	2.5	2.6	2.8	3.0	3.0	3.1	3.3	3.6	4.2	4.2	5.0	5.8	6.4
40 to 60	2.2	2.2	2.4	2.5	2.7	2.9	2.9	3.0	3.2	3.4	4.0	4.1	4.8	5.6	6.1
20 to 40	2.1	2.2	2.3	2.5	2.6	2.8	2.8	2.9	3.1	3.3	3.9	3.9	4.6	5.4	5.9
0 to 20	2.1	2.1	2.3	2.4	2.6	2.7	2.8	2.8	3.0	3.2	3.8	3.8	4.5	5.2	5.7
-20 to 0	2.1	2.1	2.3	2.4	2.5	2.7	2.7	2.8	3.0	3.2	3.7	3.8	4.4	5.1	5.6
-40 to -20	2.2	2.2	2.3	2.5	2.6	2.8	2.8	2.8	3.0	3.2	3.7	3.8	4.4	5.1	5.5
-60 to -40(ref.)	2.4	2.4	2.5	2.6	2.8	2.9	2.9	3.0	3.1	3.4	3.8	3.9	4.5	5.1	5.5
-70 to -60(ref.)	2.6	2.6	2.7	2.8	2.9	3.1	3.1	3.2	3.3	3.5	4.0	4.0	4.6	5.2	5.6

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.4	1.4	1.6	1.8	1.9	2.1	2.2	2.2	2.4	2.7	3.3	3.4	4.2	5.0	5.6
60 to 80	1.2	1.3	1.4	1.6	1.7	1.9	2.0	2.0	2.2	2.5	3.1	3.2	3.9	4.7	5.3
40 to 60	1.0	1.0	1.2	1.3	1.5	1.7	1.7	1.7	2.0	2.2	2.8	2.8	3.6	4.4	4.9
20～40	0.8	0.8	0.9	1.1	1.2	1.4	1.4	1.5	1.7	1.9	2.5	2.5	3.2	4.0	4.5
0 to 20	0.6	0.6	0.7	0.8	1.0	1.1	1.2	1.2	1.4	1.6	2.2	2.2	2.9	3.6	4.1
-20 to 0	0.3	0.3	0.5	0.6	0.7	0.9	0.9	1.0	1.1	1.4	1.8	1.9	2.6	3.2	3.7
-40 to -20	0.1	0.1	0.2	0.4	0.5	0.6	0.7	0.7	0.9	1.1	1.5	1.6	2.2	2.9	3.3
-60 to -40	-0.1	-0.1	0.0	0.1	0.2	0.4	0.4	0.4	0.6	0.8	1.2	1.3	1.9	2.5	2.9
-70 to -60	-0.3	-0.3	-0.2	-0.1	0.0	0.2	0.2	0.2	0.4	0.6	1.0	1.1	1.6	2.2	2.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.12159838E-01
Q1	7.90009989E+01
P2	1.17641971E-02
Q2	5.54494399E-02
P3	3.13327895E-01
Q3	7.14680751E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	8.2
Frac. eq. (ref.)	1.3	11.1

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-TIL25	HOYA	E-FL5
C.D.G.M	H-QF50	SCHOTT	N-LF5

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LF6

nd = 1.567320　　ne = 1.570480

νd = 42.58　　νe = 42.29

Glass code (d)
567426
Glass code (e)
570423

Spectral l.	Refractive idx
2.058	1.53950
1.970	1.54071
1.530	1.54633
1.129	1.55153
1.064	1.55252
t	1.55336
s	1.55666
A'	1.558991
r	1.561168
C	1.563371
C'	1.563993
He-Ne	1.564576
D	1.567203
d	1.567320
e	1.570480
F	1.576695
F'	1.577484
g	1.584361
h	1.590985
0.389	1.595163
i	1.602977

Coef. disp. form. (pwr ser.)	
A0	2.40368894E+00
A1	-8.44989386E-03
A2	-1.22270670E-04
A3	1.83786358E-02
A4	9.28895588E-05
A5	9.23801901E-05
A6	-9.14295770E-06
A7	5.77555194E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.013324
F'-C'	0.013491
C-t	0.010016
C-A'	0.004380
d-C	0.003949
e-C	0.007109
g-d	0.017041
g-F	0.007666
h-g	0.006624
i-g	0.018616
C'-t	0.010638
e-C'	0.006487
F'-e	0.007004
i-F'	0.025493

Relative partial dispersion	
C-t／F-C	0.7517
C-A'／F-C	0.3287
d-C／F-C	0.2964
e-C／F-C	0.5335
g-d／F-C	1.2790
g-F／F-C	0.5754
h-g／F-C	0.4971
i-g／F-C	1.3972
C'-t／F'-C'	0.7885
e-C'／F'-C'	0.4808
F'-e／F'-C'	0.5192
i-F'／F'-C'	1.8896

Deviation of relative partial disp.	
ΔPdC	0.0000
ΔPgF	0.0024

Specific gravity	2.61

Thermal properties	
CTE(-30,70) [1E-7/℃]	91
CTE(100,300) [1E-7/℃]	106
Tg [℃]	499
At [℃]	557
Ht cndct. [W/m･K]	1.070
Sp. heat [kJ/kg･K]	0.784
Ht diffus. [1E-6 m2/sec]	0.524

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	476 (5)
Abrasion hardness	119
Young's mod. [GPa]	73.4
Shear mod. [GPa]	29.8
Poisson's ratio	0.232
Stress optical coef. [1E-5 nm/cm／Pa]	2.69

Color Code (80%/5%)	38/35
Internal CC	372/349

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.08
360	0.47
365	0.65
370	0.77
380	0.89
390	0.946
400	0.969
420	0.983
440	0.985
460	0.987
480	0.989
500	0.991
550	0.993
600	0.992
650	0.991
700	0.993
800	0.990
900	0.996
1000	0.994
1200	0.997
1400	0.993
1600	0.987
1800	0.963
2000	0.933
2200	0.86
2400	0.82

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.6	0.6	0.8	1.0	1.1	1.3	1.3	1.3	1.6	1.8	2.4	2.4	3.2	4.0	4.5
60 to 80(ref.)	0.5	0.6	0.8	0.9	1.0	1.2	1.2	1.3	1.5	1.7	2.3	2.3	3.0	3.8	4.4
40 to 60	0.4	0.5	0.7	0.8	1.0	1.1	1.1	1.2	1.4	1.6	2.1	2.2	2.9	3.6	4.1
20 to 40	0.4	0.5	0.6	0.8	0.9	1.0	1.1	1.1	1.3	1.5	2.0	2.1	2.7	3.5	4.0
0 to 20	0.4	0.5	0.6	0.8	0.9	1.0	1.1	1.1	1.3	1.5	2.0	2.0	2.6	3.3	3.8
-20 to 0	0.5	0.5	0.7	0.8	0.9	1.1	1.1	1.1	1.3	1.5	2.0	2.0	2.6	3.2	3.7
-40 to -20	0.6	0.6	0.8	0.9	1.0	1.1	1.2	1.2	1.4	1.6	2.0	2.1	2.6	3.2	3.7
-60 to -40(ref.)	0.8	0.8	1.0	1.1	1.2	1.3	1.4	1.4	1.6	1.7	2.2	2.2	2.7	3.3	3.7
-70 to -60(ref.)	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.8	1.9	2.3	2.4	2.9	3.4	3.8

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-0.4	-0.3	-0.2	0.0	0.1	0.3	0.3	0.4	0.6	0.8	1.4	1.5	2.2	3.0	3.5
60 to 80	-0.5	-0.5	-0.3	-0.2	0.0	0.1	0.2	0.2	0.4	0.7	1.2	1.3	1.9	2.7	3.3
40 to 60	-0.7	-0.7	-0.5	-0.4	-0.2	-0.1	-0.1	0.0	0.2	0.4	0.9	1.0	1.6	2.4	2.9
20～40	-0.9	-0.9	-0.7	-0.6	-0.4	-0.3	-0.3	-0.2	-0.1	0.2	0.7	0.7	1.3	2.0	2.5
0 to 20	-1.1	-1.1	-0.9	-0.8	-0.7	-0.5	-0.5	-0.5	-0.3	-0.1	0.4	0.4	1.0	1.7	2.2
-20 to 0	-1.3	-1.3	-1.1	-1.0	-0.9	-0.7	-0.7	-0.7	-0.5	-0.3	0.1	0.2	0.7	1.4	1.8
-40 to -20	-1.5	-1.4	-1.3	-1.2	-1.1	-1.0	-0.9	-0.9	-0.7	-0.6	-0.1	-0.1	0.4	1.0	1.5
-60 to -40	-1.7	-1.6	-1.5	-1.4	-1.3	-1.2	-1.2	-1.1	-1.0	-0.8	-0.4	-0.4	0.1	0.7	1.1
-70 to -60	-1.8	-1.8	-1.7	-1.6	-1.5	-1.3	-1.3	-1.3	-1.2	-1.0	-0.6	-0.6	-0.1	0.4	0.8

Coef. disp. form. (frac. eq.)(ref.)	
P1	9.96589303E-02
Q1	7.47533697E+01
P2	1.06620520E-02
Q2	5.58428365E-02
P3	3.08177533E-01
Q3	7.01297392E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	10.1
Frac. eq. (ref.)	1.2	9.1

Prod. Freq. (A to F)	E

Similar glass type			
OHARA	S-TIL26	HOYA	E-FL6
C.D.G.M	H-QF56	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LF7

nd = 1.575010　　ne = 1.578295

νd = 41.51　　νe = 41.23

Glass code (d)
575415
Glass code (e)
578412

Spectral l.	Refractive idx
2.058	1.54615
1.970	1.54740
1.530	1.55322
1.129	1.55862
1.064	1.55965
t	1.56051
s	1.56394
A'	1.566362
r	1.568621
C	1.570908
C'	1.571555
He-Ne	1.572160
D	1.574888
d	1.575010
e	1.578295
F	1.584760
F'	1.585581
g	1.592745
h	1.599656
0.389	1.604022
i	1.612203

Coef. disp. form. (pwr ser.)	
A0	2.42574282E+00
A1	-8.90909885E-03
A2	-1.08092631E-04
A3	1.90630501E-02
A4	1.17245652E-04
A5	9.74566345E-05
A6	-9.93663901E-06
A7	6.41905453E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.013852
F'-C'	0.014026
C-t	0.010395
C-A'	0.004546
d-C	0.004102
e-C	0.007387
g-d	0.017735
g-F	0.007985
h-g	0.006911
i-g	0.019458
C'-t	0.011042
e-C'	0.006740
F'-e	0.007286
i-F'	0.026622

Relative partial dispersion	
C-t／F-C	0.7504
C-A'／F-C	0.3282
d-C／F-C	0.2961
e-C／F-C	0.5333
g-d／F-C	1.2803
g-F／F-C	0.5765
h-g／F-C	0.4989
i-g／F-C	1.4047
C'-t／F'-C'	0.7873
e-C'／F'-C'	0.4805
F'-e／F'-C'	0.5195
i-F'／F'-C'	1.8980

Deviation of relative partial disp.	
ΔPdC	0.0002
ΔPgF	0.0017

Specific gravity	2.60

Thermal properties	
CTE(-30,70) [1E-7/℃]	80
CTE(100,300) [1E-7/℃]	98
Tg [℃]	535
At [℃]	590
Ht cndct. [W/m･K]	1.179
Sp. heat [kJ/kg･K]	0.782
Ht diffus. [1E-6 m2/sec]	0.579

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	490 (5)
Abrasion hardness	115
Young's mod. [GPa]	75.7
Shear mod. [GPa]	30.8
Poisson's ratio	0.230
Stress optical coef. [1E-5 nm/cm／Pa]	2.83

Color Code (80%/5%)	39/35
Internal CC	378/352
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.02
360	0.29
365	0.48
370	0.64
380	0.82
390	0.911
400	0.952
420	0.977
440	0.983
460	0.986
480	0.989
500	0.991
550	0.994
600	0.994
650	0.992
700	0.993
800	0.991
900	0.996
1000	0.995
1200	0.996
1400	0.992
1600	0.990
1800	0.975
2000	0.961
2200	0.911
2400	0.900

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	1.7	1.7	1.9	2.1	2.2	2.4	2.4	2.5	2.7	3.0	3.6	3.7	4.4	5.3	5.9
60 to 80(ref.)	1.6	1.6	1.9	2.0	2.1	2.3	2.3	2.4	2.6	2.9	3.5	3.5	4.3	5.1	5.6
40 to 60	1.5	1.5	1.7	1.9	2.0	2.2	2.2	2.3	2.5	2.7	3.3	3.4	4.1	4.8	5.4
20 to 40	1.4	1.5	1.7	1.8	1.9	2.1	2.1	2.2	2.4	2.6	3.2	3.2	3.9	4.6	5.2
0 to 20	1.4	1.4	1.6	1.7	1.9	2.0	2.1	2.1	2.3	2.5	3.0	3.1	3.7	4.4	5.0
-20 to 0	1.4	1.5	1.6	1.7	1.9	2.0	2.0	2.1	2.3	2.5	3.0	3.1	3.7	4.3	4.8
-40 to -20	1.5	1.5	1.7	1.8	1.9	2.1	2.1	2.1	2.3	2.5	3.0	3.1	3.6	4.3	4.7
-60 to -40(ref.)	1.7	1.7	1.9	2.0	2.1	2.2	2.2	2.3	2.5	2.7	3.1	3.2	3.7	4.3	4.7
-70 to -60(ref.)	1.9	1.9	2.1	2.2	2.3	2.4	2.4	2.5	2.6	2.8	3.3	3.3	3.8	4.4	4.8

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	0.7	0.8	1.0	1.1	1.3	1.4	1.5	1.5	1.7	2.0	2.6	2.7	3.4	4.2	4.8
60 to 80	0.5	0.6	0.8	0.9	1.1	1.2	1.3	1.3	1.5	1.8	2.4	2.5	3.2	4.0	4.5
40 to 60	0.3	0.4	0.5	0.7	0.8	1.0	1.0	1.1	1.3	1.5	2.1	2.1	2.8	3.6	4.1
20～40	0.1	0.1	0.3	0.4	0.6	0.7	0.8	0.8	1.0	1.2	1.8	1.8	2.5	3.2	3.7
0 to 20	-0.2	-0.1	0.1	0.2	0.3	0.5	0.5	0.5	0.7	1.0	1.4	1.5	2.1	2.8	3.3
-20 to 0	-0.4	-0.3	-0.2	-0.1	0.1	0.2	0.2	0.3	0.5	0.7	1.1	1.2	1.8	2.4	2.9
-40 to -20	-0.6	-0.6	-0.4	-0.3	-0.2	-0.1	0.0	0.0	0.2	0.4	0.8	0.9	1.4	2.1	2.5
-60 to -40	-0.8	-0.8	-0.6	-0.5	-0.4	-0.3	-0.3	-0.3	-0.1	0.1	0.5	0.6	1.1	1.7	2.1
-70 to -60	-1.0	-1.0	-0.8	-0.7	-0.6	-0.5	-0.5	-0.5	-0.3	-0.1	0.3	0.3	0.8	1.4	1.8

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.06655195E-01
Q1	7.73737086E+01
P2	1.07806800E-02
Q2	5.66985919E-02
P3	3.11436527E-01
Q3	7.16172753E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	7.2
Frac. eq. (ref.)	1.4	9.7

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-TIL27	HOYA	
C.D.G.M	H-QF3	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-F1

nd = 1.625880　　ne = 1.630026

ν d = 35.72　　ν e = 35.46

Glass code (d)
626357
Glass code (e)
630355

Spectral l.	Refractive idx
2.058	1.59141
1.970	1.59282
1.530	1.59944
1.129	1.60574
1.064	1.60696
t	1.60800
s	1.61214
A'	1.615109
r	1.617899
C	1.620742
C'	1.621548
He-Ne	1.622305
D	1.625727
d	1.625880
e	1.630026
F	1.638263
F'	1.639316
g	1.648579
h	1.657647
0.389	1.663446
i	–

Coef. disp. form. (pwr ser.)	
A0	2.57291645E+00
A1	-1.04210510E-02
A2	-1.02025424E-04
A3	2.37163029E-02
A4	4.42698668E-04
A5	9.19547318E-05
A6	-8.93128864E-06
A7	7.90992496E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.017521
F'-C'	0.017768
C-t	0.012744
C-A'	0.005633
d-C	0.005138
e-C	0.009284
g-d	0.022699
g-F	0.010316
h-g	0.009068
i-g	–
C'-t	0.013550
e-C'	0.008478
F'-e	0.009290
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7274
C-A'／F-C	0.3215
d-C／F-C	0.2932
e-C／F-C	0.5299
g-d／F-C	1.2955
g-F／F-C	0.5888
h-g／F-C	0.5176
i-g／F-C	–
C'-t／F'-C'	0.7626
e-C'／F'-C'	0.4771
F'-e／F'-C'	0.5229
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0001
ΔPgF	0.0044

Specific gravity	2.69

Thermal properties	
CTE(-30,70) [1E-7/℃]	81
CTE(100,300) [1E-7/℃]	91
Tg [℃]	576
At [℃]	616
Ht cndct. [W/m･K]	1.150
Sp. heat [kJ/kg･K]	0.767
Ht diffus. [1E-6 m2/sec]	0.557

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	489 (5)
Abrasion hardness	111
Young's mod. [GPa]	81.5
Shear mod. [GPa]	33.1
Poisson's ratio	0.231
Stress optical coef. [1E-5 nm/cm／Pa]	3.59

Color Code (80%/5%)	39/36
Internal CC	383/359

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.08
365	0.24
370	0.45
380	0.75
390	0.88
400	0.941
420	0.976
440	0.985
460	0.988
480	0.990
500	0.992
550	0.994
600	0.994
650	0.994
700	0.995
800	0.991
900	0.997
1000	0.997
1200	0.999
1400	0.989
1600	0.988
1800	0.968
2000	0.950
2200	0.87
2400	0.83

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.7	2.8	3.0	3.2	3.4	3.7	3.7	3.8	4.1	4.5	5.3	5.4	6.5	7.7	8.6
60 to 80(ref.)	2.5	2.6	2.9	3.0	3.2	3.5	3.5	3.6	3.9	4.2	5.0	5.1	6.2	7.4	8.2
40 to 60	2.3	2.4	2.6	2.8	3.0	3.2	3.3	3.3	3.6	3.9	4.7	4.8	5.8	6.9	7.7
20 to 40	2.1	2.2	2.4	2.6	2.8	3.0	3.0	3.1	3.3	3.7	4.4	4.5	5.4	6.5	7.3
0 to 20	1.9	2.0	2.2	2.4	2.6	2.8	2.8	2.9	3.1	3.4	4.1	4.2	5.1	6.1	6.8
−20 to 0	1.8	1.9	2.1	2.3	2.4	2.6	2.7	2.7	2.9	3.2	3.9	3.9	4.8	5.8	6.5
−40 to −20	1.8	1.9	2.1	2.2	2.4	2.5	2.6	2.6	2.8	3.1	3.7	3.8	4.6	5.5	6.2
−60 to −40(ref.)	1.9	1.9	2.1	2.2	2.4	2.5	2.6	2.6	2.8	3.1	3.6	3.7	4.4	5.3	6.0
−70 to −60(ref.)	2.0	2.0	2.2	2.3	2.5	2.6	2.7	2.7	2.9	3.1	3.7	3.7	4.4	5.3	5.9

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.7	1.8	2.0	2.2	2.4	2.7	2.7	2.8	3.1	3.5	4.3	4.4	5.4	6.7	7.6
60 to 80	1.4	1.5	1.8	2.0	2.1	2.4	2.4	2.5	2.8	3.1	3.9	4.0	5.0	6.2	7.1
40 to 60	1.1	1.1	1.4	1.6	1.8	2.0	2.0	2.1	2.3	2.7	3.4	3.5	4.5	5.6	6.4
20～40	0.7	0.8	1.0	1.2	1.4	1.5	1.6	1.7	1.9	2.2	2.9	3.0	3.9	5.0	5.8
0 to 20	0.4	0.4	0.6	0.8	1.0	1.1	1.2	1.2	1.5	1.8	2.4	2.5	3.4	4.4	5.1
−20 to 0	0.0	0.1	0.3	0.4	0.6	0.7	0.8	0.8	1.1	1.3	1.9	2.0	2.8	3.8	4.5
−40 to −20	−0.4	−0.3	−0.1	0.0	0.2	0.3	0.4	0.4	0.6	0.9	1.5	1.5	2.3	3.2	3.9
−60 to −40	−0.7	−0.7	−0.5	−0.4	−0.2	−0.1	0.0	0.0	0.2	0.4	1.0	1.0	1.8	2.6	3.2
−70 to −60	−1.0	−0.9	−0.8	−0.6	−0.5	−0.4	−0.3	−0.3	−0.1	0.1	0.6	0.7	1.3	2.1	2.7

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.23165675E-01
Q1	8.24765904E+01
P2	1.63187357E-02
Q2	5.73814106E-02
P3	3.27670057E-01
Q3	7.43227866E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	3.1
Frac. eq. (ref.)	1.2	5.6

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-TIM1	HOYA	E-F1
C.D.G.M	H-F13	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-F2

nd = 1.620040　　ne = 1.624072

ν d = 36.40　　ν e = 36.13

Glass code (d)
620364
Glass code (e)
624361

Spectral l.	Refractive idx
2.058	1.58620
1.970	1.58759
1.530	1.59416
1.129	1.60039
1.064	1.60159
t	1.60260
s	1.60665
A'	1.609544
r	1.612266
C	1.615037
C'	1.615823
He-Ne	1.616559
D	1.619891
d	1.620040
e	1.624072
F	1.632073
F'	1.633095
g	1.642086
h	1.650877
0.389	1.656494
i	1.667178

Partial dispersion	
F-C	0.017036
F'-C'	0.017272
C-t	0.012433
C-A'	0.005493
d-C	0.005003
e-C	0.009035
g-d	0.022046
g-F	0.010013
h-g	0.008791
i-g	0.025092
C'-t	0.013219
e-C'	0.008249
F'-e	0.009023
i-F'	–

Specific gravity	2.66

Thermal properties	
CTE(-30,70) [1E-7/℃]	73
CTE(100,300) [1E-7/℃]	91
Tg [℃]	581
At [℃]	613
Ht cndct. [W/m･K]	1.180
Sp. heat [kJ/kg･K]	0.762
Ht diffus. [1E-6 m2/sec]	0.580

Color Code (80%/5%)	40/36
Internal CC	387/360

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.05
365	0.18
370	0.37
380	0.67
390	0.84
400	0.912
420	0.963
440	0.976
460	0.982
480	0.985
500	0.988
550	0.992
600	0.993
650	0.992
700	0.992
800	0.988
900	0.996
1000	0.996
1200	0.997
1400	0.985
1600	0.988
1800	0.973
2000	0.957
2200	0.88
2400	0.85

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	493 (5)
Abrasion hardness	109
Young's mod. [GPa]	82.5
Shear mod. [GPa]	33.5
Poisson's ratio	0.231
Stress optical coef. [1E-5 nm/cm/Pa]	3.15

Coef. disp. form. (pwr ser.)	
A0	2.55848782E+00
A1	-1.11821288E-02
A2	0.00000000E+00
A3	2.03054502E-02
A4	2.04096825E-03
A5	-4.37338902E-04
A6	8.55288881E-05
A7	-7.96769390E-06
A8	3.26555576E-07

Relative partial dispersion	
C-t／F-C	0.7298
C-A'／F-C	0.3224
d-C／F-C	0.2937
e-C／F-C	0.5303
g-d／F-C	1.2941
g-F／F-C	0.5878
h-g／F-C	0.5160
i-g／F-C	1.4729
C'-t／F'-C'	0.7653
e-C'／F'-C'	0.4776
F'-e／F'-C'	0.5224
i-F'／F'-C'	1.9733

Deviation of relative partial disp.	
ΔPdC	0.0000
ΔPgF	0.0045

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.4	2.5	2.7	2.9	3.1	3.3	3.4	3.5	3.8	4.1	4.9	5.0	6.1	7.3	8.1
60 to 80(ref.)	2.3	2.4	2.6	2.8	3.0	3.2	3.3	3.3	3.6	3.9	4.7	4.8	5.9	7.0	7.8
40 to 60	2.2	2.3	2.5	2.7	2.9	3.0	3.1	3.2	3.4	3.8	4.5	4.6	5.6	6.7	7.4
20 to 40	2.1	2.2	2.4	2.6	2.7	2.9	3.0	3.0	3.3	3.6	4.3	4.4	5.3	6.3	7.0
0 to 20	2.1	2.1	2.3	2.5	2.7	2.8	2.9	2.9	3.2	3.5	4.1	4.2	5.1	6.1	6.7
-20 to 0	2.1	2.1	2.3	2.5	2.6	2.8	2.8	2.9	3.1	3.4	4.0	4.1	4.9	5.8	6.4
-40 to -20	2.1	2.2	2.3	2.5	2.7	2.8	2.9	2.9	3.1	3.4	4.0	4.0	4.8	5.7	6.2
-60 to -40(ref.)	2.3	2.3	2.5	2.6	2.8	2.9	3.0	3.0	3.2	3.5	4.0	4.1	4.8	5.6	6.1
-70 to -60(ref.)	2.5	2.5	2.7	2.8	2.9	3.1	3.1	3.2	3.4	3.6	4.1	4.2	4.9	5.6	6.1

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.5	1.5	1.7	1.9	2.1	2.3	2.4	2.5	2.7	3.1	3.9	4.0	5.1	6.3	7.1
60 to 80	1.3	1.3	1.5	1.7	1.9	2.1	2.2	2.2	2.5	2.8	3.6	3.7	4.7	5.9	6.7
40 to 60	1.0	1.1	1.3	1.4	1.6	1.8	1.9	1.9	2.2	2.5	3.2	3.3	4.3	5.4	6.1
20～40	0.8	0.8	1.0	1.2	1.3	1.5	1.6	1.6	1.9	2.2	2.8	2.9	3.9	4.9	5.6
0 to 20	0.5	0.5	0.7	0.9	1.0	1.2	1.3	1.3	1.5	1.8	2.5	2.6	3.4	4.4	5.0
-20 to 0	0.2	0.3	0.5	0.6	0.8	0.9	1.0	1.0	1.2	1.5	2.1	2.2	3.0	3.9	4.5
-40 to -20	0.0	0.0	0.2	0.3	0.5	0.6	0.7	0.7	0.9	1.2	1.7	1.8	2.6	3.4	3.9
-60 to -40	-0.3	-0.2	-0.1	0.0	0.2	0.3	0.4	0.4	0.6	0.8	1.3	1.4	2.1	2.9	3.4
-70 to -60	-0.4	-0.4	-0.3	-0.2	0.0	0.1	0.1	0.2	0.4	0.6	1.1	1.1	1.8	2.5	3.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.04096463E-01
Q1	7.05431896E+01
P2	1.38585424E-02
Q2	5.95211317E-02
P3	3.27695044E-01
Q3	7.58005779E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	1.0	6.2
Frac. eq. (ref.)	2.0	12.3

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-TIM2	HOYA	E-F2
C.D.G.M	H-F4	SCHOTT	N-F2

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-F3

nd = 1.612930 ne = 1.616857

ν d = 36.95 ν e = 36.68

Glass code (d)
613370
Glass code (e)
617367

Spectral l.	Refractive idx
2.058	1.57955
1.970	1.58095
1.530	1.58751
1.129	1.59369
1.064	1.59487
t	1.59587
s	1.59986
A'	1.602690
r	1.605350
C	1.608054
C'	1.608820
He-Ne	1.609538
D	1.612785
d	1.612930
e	1.616857
F	1.624644
F'	1.625638
g	1.634371
h	1.642901
0.389	1.648344
i	–

Coef. disp. form. (pwr ser.)	
A0	2.53547360E+00
A1	-1.04298990E-02
A2	-9.00763853E-05
A3	2.22719327E-02
A4	4.43442601E-04
A5	7.40581279E-05
A6	-6.90525545E-06
A7	6.52621989E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.016590
F'-C'	0.016818
C-t	0.012185
C-A'	0.005364
d-C	0.004876
e-C	0.008803
g-d	0.021441
g-F	0.009727
h-g	0.008530
i-g	–
C'-t	0.012951
e-C'	0.008037
F'-e	0.008781
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7345
C-A'／F-C	0.3233
d-C／F-C	0.2939
e-C／F-C	0.5306
g-d／F-C	1.2924
g-F／F-C	0.5863
h-g／F-C	0.5142
i-g／F-C	–
C'-t／F'-C'	0.7701
e-C'／F'-C'	0.4779
F'-e／F'-C'	0.5221
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	0.0000
ΔPgF	0.0040

Specific gravity	2.64

Thermal properties	
CTE(-30,70) [1E-7/℃]	74
CTE(100,300) [1E-7/℃]	89
Tg [℃]	588
At [℃]	631
Ht cndct. [W/m･K]	1.064
Sp. heat [kJ/kg･K]	0.748
Ht diffus. [1E-6 m2/sec]	0.539

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	509 (5)
Abrasion hardness	100
Young's mod. [GPa]	80.6
Shear mod. [GPa]	33.0
Poisson's ratio	0.221
Stress optical coef. [1E-5 nm/cm／Pa]	3.13

Color Code (80%/5%)	39/36
Internal CC	384/358

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.09
365	0.25
370	0.45
380	0.74
390	0.87
400	0.928
420	0.967
440	0.977
460	0.982
480	0.985
500	0.988
550	0.992
600	0.994
650	0.993
700	0.993
800	0.990
900	0.996
1000	0.994
1200	0.996
1400	0.987
1600	0.989
1800	0.978
2000	0.967
2200	0.912
2400	0.89

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.8	2.8	3.0	3.2	3.4	3.6	3.7	3.7	4.0	4.4	5.1	5.2	6.2	7.3	8.1
60 to 80(ref.)	2.7	2.7	2.9	3.1	3.3	3.4	3.5	3.6	3.8	4.2	4.9	5.0	6.0	7.0	7.8
40 to 60	2.5	2.6	2.8	2.9	3.1	3.3	3.3	3.4	3.6	4.0	4.7	4.8	5.7	6.7	7.4
20 to 40	2.4	2.4	2.6	2.8	2.9	3.1	3.2	3.2	3.4	3.8	4.4	4.5	5.4	6.4	7.1
0 to 20	2.3	2.4	2.5	2.7	2.8	3.0	3.0	3.1	3.3	3.6	4.2	4.3	5.1	6.1	6.7
-20 to 0	2.3	2.3	2.5	2.6	2.8	2.9	3.0	3.0	3.2	3.5	4.1	4.2	5.0	5.8	6.5
-40 to -20	2.3	2.4	2.5	2.6	2.8	2.9	2.9	3.0	3.2	3.5	4.0	4.1	4.8	5.7	6.3
-60 to -40(ref.)	2.4	2.5	2.6	2.7	2.8	3.0	3.0	3.1	3.3	3.5	4.1	4.1	4.8	5.6	6.2
-70 to -60(ref.)	2.6	2.6	2.8	2.9	3.0	3.1	3.2	3.2	3.4	3.6	4.1	4.2	4.9	5.6	6.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.8	1.9	2.1	2.2	2.4	2.6	2.7	2.7	3.0	3.3	4.1	4.2	5.2	6.3	7.1
60 to 80	1.6	1.6	1.8	2.0	2.2	2.4	2.4	2.5	2.7	3.1	3.8	3.9	4.8	5.9	6.7
40 to 60	1.3	1.4	1.5	1.7	1.9	2.0	2.1	2.1	2.4	2.7	3.4	3.5	4.4	5.4	6.1
20～40	1.0	1.1	1.2	1.4	1.5	1.7	1.8	1.8	2.0	2.3	3.0	3.1	3.9	4.9	5.6
0 to 20	0.7	0.8	0.9	1.1	1.2	1.4	1.4	1.5	1.7	2.0	2.6	2.7	3.5	4.4	5.1
-20 to 0	0.4	0.5	0.6	0.8	0.9	1.0	1.1	1.1	1.4	1.6	2.2	2.3	3.0	3.9	4.5
-40 to -20	0.2	0.2	0.3	0.5	0.6	0.7	0.8	0.8	1.0	1.3	1.8	1.9	2.6	3.4	4.0
-60 to -40	-0.1	-0.1	0.0	0.2	0.3	0.4	0.4	0.5	0.7	0.9	1.4	1.5	2.1	2.9	3.4
-70 to -60	-0.3	-0.3	-0.2	-0.1	0.0	0.1	0.2	0.2	0.4	0.6	1.1	1.2	1.8	2.5	3.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.34356723E-01
Q1	8.86091303E+01
P2	1.55524745E-02
Q2	5.69109653E-02
P3	3.23009944E-01
Q3	7.25932793E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	3.5
Frac. eq. (ref.)	1.1	5.5

Prod. Freq. (A to F)	F

Similar glass type			
OHARA	S-TIM3	HOYA	E-F3
C.D.G.M	H-F2	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-F5

nd = 1.603420 ne = 1.607179

ν d = 38.03 ν e = 37.76

Glass code (d)
603380
Glass code (e)
607378

Spectral l.	Refractive idx
2.058	1.57152
1.970	1.57286
1.530	1.57909
1.129	1.58497
1.064	1.58610
t	1.58706
s	1.59088
A'	1.593601
r	1.596154
C	1.598747
C'	1.599482
He-Ne	1.600170
D	1.603281
d	1.603420
e	1.607179
F	1.614615
F'	1.615562
g	1.623865
h	1.631934
0.389	1.637063
i	1.646748

Coef. disp. form. (pwr ser.)	
A0	2.50730433E+00
A1	-9.63920240E-03
A2	-1.08925344E-04
A3	2.17730330E-02
A4	2.15713900E-04
A5	1.15184205E-04
A6	-1.21949895E-05
A7	8.47741632E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.015868
F'-C'	0.016080
C-t	0.011688
C-A'	0.005146
d-C	0.004673
e-C	0.008432
g-d	0.020445
g-F	0.009250
h-g	0.008069
i-g	0.022883
C'-t	0.012423
e-C'	0.007697
F'-e	0.008383
i-F'	0.031186

Relative partial dispersion	
C-t／F-C	0.7366
C-A'／F-C	0.3243
d-C／F-C	0.2945
e-C／F-C	0.5314
g-d／F-C	1.2884
g-F／F-C	0.5829
h-g／F-C	0.5085
i-g／F-C	1.4421
C'-t／F'-C'	0.7726
e-C'／F'-C'	0.4787
F'-e／F'-C'	0.5213
i-F'／F'-C'	1.9394

Deviation of relative partial disp.	
ΔPdC	0.0001
ΔPgF	0.0024

Specific gravity	2.63

Thermal properties	
CTE(-30,70) [1E-7/℃]	77
CTE(100,300) [1E-7/℃]	92
Tg [℃]	583
At [℃]	624
Ht cndct. [W/m･K]	1.085
Sp. heat [kJ/kg･K]	0.751
Ht diffus. [1E-6 m2/sec]	0.547

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	3
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	485 (5)
Abrasion hardness	103
Young's mod. [GPa]	77.2
Shear mod. [GPa]	31.4
Poisson's ratio	0.227
Stress optical coef. [1E-5 nm/cm／Pa]	3.49

Color Code (80%/5%)	39/36
Internal CC	381/356

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.14
365	0.33
370	0.53
380	0.78
390	0.89
400	0.942
420	0.974
440	0.981
460	0.986
480	0.990
500	0.993
550	0.996
600	0.996
650	0.995
700	0.995
800	0.994
900	0.999
1000	0.996
1200	0.998
1400	0.992
1600	0.991
1800	0.973
2000	0.950
2200	0.88
2400	0.86

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.4	2.4	2.6	2.9	3.1	3.3	3.3	3.4	3.7	4.0	4.7	4.8	5.7	6.8	7.4
60 to 80(ref.)	2.3	2.3	2.6	2.7	2.9	3.1	3.2	3.3	3.5	3.8	4.5	4.6	5.5	6.5	7.1
40 to 60	2.2	2.2	2.4	2.6	2.8	3.0	3.0	3.1	3.3	3.6	4.3	4.4	5.3	6.2	6.8
20 to 40	2.1	2.1	2.3	2.5	2.7	2.9	2.9	3.0	3.2	3.5	4.1	4.2	5.0	6.0	6.5
0 to 20	2.0	2.1	2.2	2.4	2.6	2.8	2.8	2.9	3.1	3.3	3.9	4.0	4.9	5.7	6.3
-20 to 0	2.0	2.0	2.2	2.4	2.6	2.7	2.8	2.8	3.0	3.3	3.8	3.9	4.7	5.5	6.0
-40 to -20	2.1	2.1	2.3	2.4	2.6	2.8	2.8	2.8	3.0	3.3	3.8	3.9	4.6	5.4	5.9
-60 to -40(ref.)	2.2	2.2	2.4	2.6	2.7	2.9	2.9	3.0	3.1	3.4	3.9	3.9	4.7	5.4	5.9
-70 to -60(ref.)	2.4	2.4	2.6	2.7	2.9	3.0	3.1	3.1	3.3	3.5	4.0	4.1	4.8	5.5	5.9

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.4	1.5	1.7	1.9	2.1	2.3	2.3	2.4	2.7	3.0	3.6	3.7	4.7	5.7	6.4
60 to 80	1.3	1.3	1.5	1.7	1.9	2.1	2.1	2.2	2.4	2.7	3.4	3.5	4.4	5.4	6.0
40 to 60	1.0	1.0	1.2	1.4	1.6	1.8	1.8	1.9	2.1	2.4	3.0	3.1	4.0	5.0	5.5
20～40	0.7	0.7	0.9	1.1	1.3	1.5	1.5	1.6	1.8	2.1	2.7	2.8	3.6	4.5	5.1
0 to 20	0.5	0.5	0.7	0.8	1.0	1.2	1.2	1.3	1.5	1.7	2.3	2.4	3.2	4.1	4.6
-20 to 0	0.2	0.2	0.4	0.6	0.7	0.9	0.9	1.0	1.2	1.4	2.0	2.0	2.8	3.6	4.1
-40 to -20	0.0	0.0	0.1	0.3	0.4	0.6	0.6	0.7	0.9	1.1	1.6	1.7	2.4	3.2	3.6
-60 to -40	-0.3	-0.3	-0.2	0.0	0.1	0.3	0.3	0.4	0.6	0.8	1.2	1.3	2.0	2.7	3.2
-70 to -60	-0.5	-0.5	-0.4	-0.2	-0.1	0.1	0.1	0.2	0.3	0.5	1.0	1.0	1.7	2.4	2.8

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.03312268E-01
Q1	7.25877221E+01
P2	1.31044204E-02
Q2	5.75938132E-02
P3	3.21354498E-01
Q3	7.45537642E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	4.5
Frac. eq. (ref.)	2.1	10.6

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-TIM5	HOYA	E-F5
C.D.G.M	H-F1	SCHOTT	F5

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-F8

nd = 1.595510 ne = 1.599109

ν d = 39.21 ν e = 38.94

Glass code (d)
596392
Glass code (e)
599389

Spectral l.	Refractive idx
2.058	1.56450
1.970	1.56581
1.530	1.57196
1.129	1.57773
1.064	1.57884
t	1.57977
s	1.58346
A'	1.586081
r	1.588536
C	1.591028
C'	1.591733
He-Ne	1.592393
D	1.595377
d	1.595510
e	1.599109
F	1.606214
F'	1.607118
g	1.615031
h	1.622705
0.389	1.627568
i	–

Partial dispersion	
F-C	0.015186
F'-C'	0.015385
C-t	0.011262
C-A'	0.004947
d-C	0.004482
e-C	0.008081
g-d	0.019521
g-F	0.008817
h-g	0.007674
i-g	–
C'-t	0.011967
e-C'	0.007376
F'-e	0.008009
i-F'	–

Relative partial dispersion	
C-t/F-C	0.7416
C-A'/F-C	0.3258
d-C/F-C	0.2951
e-C/F-C	0.5321
g-d/F-C	1.2855
g-F/F-C	0.5806
h-g/F-C	0.5053
i-g/F-C	–
C'-t/F'-C'	0.7778
e-C'/F'-C'	0.4794
F'-e/F'-C'	0.5206
i-F'/F'-C'	–

Deviation of relative partial disp.	
ΔPdC	0.0002
ΔPgF	0.0020

Specific gravity	2.63

Thermal properties	
CTE(-30,70) [1E-7/℃]	78
CTE(100,300) [1E-7/℃]	91
Tg [℃]	580
At [℃]	627
Ht cndct. [W/m·K]	1.070
Sp. heat [kJ/kg·K]	0.732
Ht diffus. [1E-6 m2/sec]	0.556

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	483 (5)
Abrasion hardness	112
Young's mod. [GPa]	77.3
Shear mod. [GPa]	31.4
Poisson's ratio	0.231
Stress optical coef. [1E-5 nm/cm/Pa]	3.07

Color Code (80%/5%)	39/36
Internal CC	379/355

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.19
365	0.39
370	0.58
380	0.81
390	0.912
400	0.953
420	0.978
440	0.983
460	0.986
480	0.988
500	0.989
550	0.992
600	0.991
650	0.990
700	0.990
800	0.989
900	0.996
1000	0.993
1200	0.993
1400	0.987
1600	0.986
1800	0.972
2000	0.954
2200	0.89
2400	0.88

Coef. disp. form. (pwr ser.)	
A0	2.48625113E+00
A1	-1.00589301E-02
A2	-3.66798847E-05
A3	1.96315837E-02
A4	7.63732181E-04
A5	-3.17124943E-05
A6	5.33168997E-06
A7	0.00000000E+00
A8	0.00000000E+00

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.3	2.3	2.5	2.7	2.9	3.1	3.1	3.2	3.5	3.8	4.4	4.5	5.4	6.4	7.0
60 to 80(ref.)	2.2	2.2	2.4	2.6	2.8	3.0	3.0	3.1	3.3	3.6	4.3	4.4	5.2	6.1	6.8
40 to 60	2.1	2.1	2.3	2.5	2.6	2.8	2.9	2.9	3.2	3.4	4.1	4.2	5.0	5.8	6.4
20 to 40	2.0	2.0	2.2	2.4	2.5	2.7	2.7	2.8	3.0	3.3	3.9	4.0	4.7	5.6	6.2
0 to 20	1.9	2.0	2.1	2.3	2.4	2.6	2.7	2.7	2.9	3.2	3.8	3.8	4.6	5.4	5.9
-20 to 0	1.9	2.0	2.1	2.3	2.4	2.6	2.6	2.7	2.9	3.1	3.7	3.7	4.4	5.2	5.7
-40 to -20	2.0	2.0	2.2	2.3	2.5	2.6	2.7	2.7	2.9	3.1	3.6	3.7	4.4	5.1	5.6
-60 to -40(ref.)	2.2	2.2	2.3	2.5	2.6	2.7	2.8	2.8	3.0	3.2	3.7	3.8	4.4	5.1	5.6
-70 to -60(ref.)	2.3	2.4	2.5	2.6	2.8	2.9	2.9	3.0	3.2	3.4	3.8	3.9	4.5	5.2	5.6

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.3	1.4	1.5	1.7	1.9	2.1	2.1	2.2	2.5	2.8	3.4	3.5	4.4	5.3	6.0
60 to 80	1.1	1.2	1.3	1.5	1.7	1.9	1.9	2.0	2.2	2.5	3.2	3.3	4.1	5.0	5.6
40 to 60	0.9	0.9	1.1	1.2	1.4	1.6	1.6	1.7	1.9	2.2	2.8	2.9	3.7	4.6	5.2
20～40	0.6	0.7	0.8	1.0	1.1	1.3	1.4	1.4	1.6	1.9	2.5	2.6	3.3	4.1	4.7
0 to 20	0.4	0.4	0.6	0.7	0.9	1.0	1.1	1.1	1.3	1.6	2.1	2.2	2.9	3.7	4.2
-20 to 0	0.1	0.2	0.3	0.4	0.6	0.7	0.8	0.8	1.0	1.3	1.8	1.9	2.5	3.3	3.8
-40 to -20	-0.1	-0.1	0.0	0.2	0.3	0.5	0.5	0.5	0.7	1.0	1.4	1.5	2.1	2.8	3.3
-60 to -40	-0.4	-0.3	-0.2	-0.1	0.0	0.2	0.2	0.2	0.4	0.6	1.1	1.2	1.8	2.4	2.9
-70 to -60	-0.6	-0.5	-0.4	-0.3	-0.2	0.0	0.0	0.0	0.2	0.4	0.8	0.9	1.5	2.1	2.5

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.23388650E-01
Q1	8.57201552E+01
P2	1.44977538E-02
Q2	5.45737083E-02
P3	3.16679170E-01
Q3	7.07804359E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.9	6.0
Frac. eq. (ref.)	0.9	5.5

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-TIM8	HOYA	E-F8
C.D.G.M	H-QF14	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-F16

nd = 1.592700 ne = 1.596673

ν d = 35.27 ν e = 35.00

Glass code (d)
593353
Glass code (e)
597350

Spectral l.	Refractive idx
2.058	1.56023
1.970	1.56153
1.530	1.56767
1.129	1.57358
1.064	1.57472
t	1.57570
s	1.57961
A'	1.582422
r	1.585077
C	1.587788
C'	1.588558
He-Ne	1.589281
D	1.592554
d	1.592700
e	1.596673
F	1.604592
F'	1.605607
g	1.614567
h	1.623384
0.389	1.629044
i	1.639866

Coef. disp. form. (pwr ser.)	
A0	2.47262695E+00
A1	-1.01687674E-02
A2	0.00000000E+00
A3	1.97436840E-02
A4	1.81579852E-03
A5	-3.58960460E-04
A6	7.21398135E-05
A7	-6.71121675E-06
A8	2.80287467E-07

Partial dispersion	
F-C	0.016804
F'-C'	0.017049
C-t	0.012091
C-A'	0.005366
d-C	0.004912
e-C	0.008885
g-d	0.021867
g-F	0.009975
h-g	0.008817
i-g	0.025299
C'-t	0.012861
e-C'	0.008115
F'-e	0.008934
i-F'	0.034259

Relative partial dispersion	
C-t／F-C	0.7195
C-A'／F-C	0.3193
d-C／F-C	0.2923
e-C／F-C	0.5287
g-d／F-C	1.3013
g-F／F-C	0.5936
h-g／F-C	0.5247
i-g／F-C	1.5055
C'-t／F'-C'	0.7544
e-C'／F'-C'	0.4760
F'-e／F'-C'	0.5240
i-F'／F'-C'	2.0094

Deviation of relative partial disp.	
ΔPdC	-0.0008
ΔPgF	0.0084

Specific gravity	2.64

Thermal properties	
CTE(-30,70) [1E-7/℃]	86
CTE(100,300) [1E-7/℃]	99
Tg [℃]	494
At [℃]	553
Ht cndct. [W/m･K]	0.968
Sp. heat [kJ/kg･K]	0.721
Ht diffus. [1E-6 m2/sec]	0.509

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	419 (4)
Abrasion hardness	154
Young's mod. [GPa]	64.2
Shear mod. [GPa]	25.8
Poisson's ratio	0.245
Stress optical coef. [1E-5 nm/cm／Pa]	3.22

Color Code (80%/5%)	38/35
Internal CC	371/351

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.03
360	0.41
365	0.64
370	0.79
380	0.913
390	0.955
400	0.970
420	0.976
440	0.977
460	0.978
480	0.982
500	0.985
550	0.991
600	0.990
650	0.989
700	0.990
800	0.989
900	0.996
1000	0.995
1200	0.998
1400	0.994
1600	0.988
1800	0.980
2000	0.980
2200	0.945
2400	0.940

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	-0.5	-0.4	-0.3	-0.1	0.1	0.3	0.4	0.4	0.7	1.0	1.8	1.9	2.9	4.0	4.8
60 to 80(ref.)	-0.6	-0.5	-0.3	-0.2	0.0	0.2	0.3	0.3	0.6	0.9	1.6	1.7	2.7	3.8	4.5
40 to 60	-0.7	-0.7	-0.5	-0.3	-0.1	0.1	0.1	0.2	0.4	0.7	1.4	1.5	2.4	3.5	4.2
20 to 40	-0.8	-0.7	-0.6	-0.4	-0.2	-0.1	0.0	0.0	0.3	0.6	1.2	1.3	2.2	3.2	3.9
0 to 20	-0.8	-0.8	-0.6	-0.5	-0.3	-0.2	-0.1	-0.1	0.2	0.4	1.1	1.2	2.0	3.0	3.6
-20 to 0	-0.8	-0.8	-0.6	-0.5	-0.3	-0.2	-0.1	-0.1	0.1	0.4	1.0	1.1	1.9	2.8	3.4
-40 to -20	-0.8	-0.7	-0.6	-0.5	-0.3	-0.2	-0.1	-0.1	0.1	0.4	0.9	1.0	1.8	2.7	3.3
-60 to -40(ref.)	-0.6	-0.6	-0.5	-0.3	-0.2	0.0	0.0	0.0	0.2	0.5	1.0	1.1	1.8	2.7	3.2
-70 to -60(ref.)	-0.4	-0.4	-0.3	-0.1	0.0	0.1	0.2	0.2	0.4	0.6	1.1	1.2	1.9	2.7	3.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-1.4	-1.4	-1.2	-1.0	-0.9	-0.7	-0.6	-0.5	-0.3	0.0	0.8	0.9	1.9	3.0	3.8
60 to 80	-1.6	-1.6	-1.4	-1.2	-1.1	-0.9	-0.8	-0.8	-0.5	-0.2	0.5	0.6	1.6	2.7	3.4
40 to 60	-1.9	-1.8	-1.7	-1.5	-1.3	-1.2	-1.1	-1.1	-0.8	-0.5	0.2	0.2	1.2	2.2	2.9
20～40	-2.1	-2.1	-1.9	-1.8	-1.6	-1.4	-1.4	-1.4	-1.1	-0.8	-0.2	-0.1	0.8	1.8	2.4
0 to 20	-2.4	-2.3	-2.2	-2.0	-1.9	-1.7	-1.7	-1.6	-1.4	-1.2	-0.5	-0.5	0.4	1.3	2.0
-20 to 0	-2.6	-2.6	-2.5	-2.3	-2.2	-2.0	-2.0	-1.9	-1.7	-1.5	-0.9	-0.8	0.0	0.9	1.5
-40 to -20	-2.9	-2.9	-2.7	-2.6	-2.5	-2.3	-2.3	-2.2	-2.0	-1.8	-1.3	-1.2	-0.4	0.4	1.0
-60 to -40	-3.1	-3.1	-3.0	-2.9	-2.7	-2.6	-2.6	-2.5	-2.3	-2.1	-1.6	-1.5	-0.8	0.0	0.5
-70 to -60	-3.3	-3.3	-3.2	-3.1	-2.9	-2.8	-2.8	-2.7	-2.6	-2.4	-1.9	-1.8	-1.1	-0.4	0.2

Coef. disp. form. (frac. eq.)(ref.)	
P1	9.48272387E-02
Q1	6.81020799E+01
P2	1.61938727E-02
Q2	5.90567549E-02
P3	3.12759244E-01
Q3	7.46626033E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	8.0
Frac. eq. (ref.)	2.0	15.3

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-FTM16	HOYA	FF5
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF1

nd = 1.717360 ne = 1.723086

ν d = 29.57 ν e = 29.34

Glass code (d)
717296
Glass code (e)
723293

Spectral l.	Refractive idx
2.058	1.67538
1.970	1.67679
1.530	1.68368
1.129	1.69085
1.064	1.69233
t	1.69361
s	1.69888
A'	1.702770
r	1.706496
C	1.710337
C'	1.711433
He-Ne	1.712463
D	1.717150
d	1.717360
e	1.723086
F	1.734595
F'	1.736078
g	1.749237
h	1.762313
0.389	1.770782
i	–

Coef. disp. form. (pwr ser.)	
A0	2.84777930E+00
A1	-1.14171302E-02
A2	0.00000000E+00
A3	3.10426999E-02
A4	2.54456183E-03
A5	-4.60296278E-04
A6	1.02222014E-04
A7	-1.01220546E-05
A8	4.62539051E-07

Partial dispersion	
F-C	0.024258
F'-C'	0.024645
C-t	0.016731
C-A'	0.007567
d-C	0.007023
e-C	0.012749
g-d	0.031877
g-F	0.014642
h-g	0.013076
i-g	–
C'-t	0.017827
e-C'	0.011653
F'-e	0.012992
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6897
C-A'／F-C	0.3119
d-C／F-C	0.2895
e-C／F-C	0.5256
g-d／F-C	1.3141
g-F／F-C	0.6036
h-g／F-C	0.5390
i-g／F-C	–
C'-t／F'-C'	0.7234
e-C'／F'-C'	0.4728
F'-e／F'-C'	0.5272
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0010
ΔPgF	0.0089

Specific gravity	3.07

Thermal properties	
CTE(-30,70) [1E-7/℃]	93
CTE(100,300) [1E-7/℃]	109
Tg [℃]	587
At [℃]	620
Ht cndct. [W/m･K]	1.098
Sp. heat [kJ/kg･K]	0.720
Ht diffus. [1E-6 m2/sec]	0.493

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	496 (5)
Abrasion hardness	194
Young's mod. [GPa]	87.5
Shear mod. [GPa]	34.9
Poisson's ratio	0.255
Stress optical coef. [1E-5 nm/cm／Pa]	2.78

Color Code (80%/5%)	42/37
Internal CC	393/364
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.01
365	0.06
370	0.21
380	0.55
390	0.76
400	0.86
420	0.935
440	0.959
460	0.968
480	0.976
500	0.981
550	0.990
600	0.991
650	0.990
700	0.990
800	0.987
900	0.993
1000	0.993
1200	0.995
1400	0.994
1600	0.987
1800	0.966
2000	0.950
2200	0.905
2400	0.86

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.4	0.6	0.8	1.1	1.3	1.5	1.6	1.7	2.1	2.6	3.7	3.9	5.4	7.1	8.5
60 to 80(ref.)	0.3	0.5	0.8	0.9	1.1	1.4	1.5	1.5	1.9	2.4	3.5	3.7	5.2	6.8	8.1
40 to 60	0.2	0.4	0.6	0.8	1.0	1.2	1.3	1.4	1.8	2.2	3.3	3.5	4.9	6.5	7.7
20 to 40	0.2	0.3	0.6	0.7	0.9	1.1	1.2	1.3	1.6	2.1	3.1	3.3	4.6	6.1	7.3
0 to 20	0.1	0.3	0.5	0.7	0.8	1.1	1.1	1.2	1.5	2.0	3.0	3.1	4.4	5.8	6.9
−20 to 0	0.2	0.3	0.5	0.7	0.8	1.0	1.1	1.2	1.5	1.9	2.9	3.0	4.2	5.6	6.6
−40 to −20	0.3	0.4	0.6	0.7	0.9	1.1	1.1	1.2	1.5	1.9	2.8	2.9	4.1	5.4	6.4
−60 to −40(ref.)	0.4	0.5	0.8	0.9	1.0	1.2	1.3	1.3	1.6	2.0	2.9	3.0	4.1	5.3	6.3
−70 to −60(ref.)	0.7	0.8	1.0	1.1	1.2	1.4	1.5	1.5	1.8	2.2	3.0	3.1	4.2	5.4	6.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	−0.6	−0.5	−0.2	0.0	0.2	0.5	0.5	0.6	1.0	1.5	2.6	2.8	4.3	6.0	7.3
60 to 80	−0.8	−0.7	−0.4	−0.2	0.0	0.2	0.3	0.4	0.8	1.2	2.4	2.5	3.9	5.6	6.9
40 to 60	−1.0	−0.9	−0.7	−0.5	−0.3	−0.1	0.0	0.1	0.4	0.9	2.0	2.1	3.5	5.1	6.3
20～40	−1.3	−1.2	−0.9	−0.8	−0.6	−0.4	−0.3	−0.2	0.1	0.6	1.6	1.7	3.0	4.6	5.7
0 to 20	−1.5	−1.4	−1.2	−1.0	−0.9	−0.6	−0.6	−0.5	−0.2	0.2	1.2	1.3	2.6	4.0	5.1
−20 to 0	−1.8	−1.7	−1.4	−1.3	−1.1	−0.9	−0.9	−0.8	−0.5	−0.1	0.8	1.0	2.1	3.5	4.5
−40 to −20	−2.0	−1.9	−1.7	−1.6	−1.4	−1.2	−1.2	−1.1	−0.8	−0.4	0.4	0.6	1.7	3.0	3.9
−60 to −40	−2.3	−2.2	−2.0	−1.8	−1.7	−1.5	−1.5	−1.4	−1.1	−0.8	0.1	0.2	1.2	2.4	3.4
−70 to −60	−2.5	−2.3	−2.2	−2.0	−1.9	−1.7	−1.7	−1.6	−1.4	−1.0	−0.2	−0.1	0.9	2.0	2.9

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.09129972E-01
Q1	8.10331506E+01
P2	2.10593358E-02
Q2	6.04288183E-02
P3	3.59828783E-01
Q3	8.39419828E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.9	4.1
Frac. eq. (ref.)	1.8	8.6

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-TIH1	HOYA	E-FD1
C.D.G.M	H-ZF3	SCHOTT	N-SF1

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF2

nd = 1.647690 ne = 1.652232

νd = 33.73 νe = 33.47

Glass code (d)
648337
Glass code (e)
652335

Spectral l.	Refractive idx
2.058	1.61216
1.970	1.61348
1.530	1.61980
1.129	1.62610
1.064	1.62736
t	1.62843
s	1.63280
A'	1.635977
r	1.638993
C	1.642082
C'	1.642960
He-Ne	1.643784
D	1.647523
d	1.647690
e	1.652232
F	1.661287
F'	1.662448
g	1.672677
h	1.682722
0.389	1.689162
i	–

Coef. disp. form. (pwr ser.)	
A0	2.63768374E+00
A1	-1.04781511E-02
A2	0.00000000E+00
A3	2.39749005E-02
A4	1.92856512E-03
A5	-3.66733662E-04
A6	7.71499779E-05
A7	-7.46498850E-06
A8	3.25251898E-07

Partial dispersion	
F-C	0.019205
F'-C'	0.019488
C-t	0.013654
C-A'	0.006105
d-C	0.005608
e-C	0.010150
g-d	0.024987
g-F	0.011390
h-g	0.010045
i-g	–
C'-t	0.014532
e-C'	0.009272
F'-e	0.010216
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7110
C-A'／F-C	0.3179
d-C／F-C	0.2920
e-C／F-C	0.5285
g-d／F-C	1.3011
g-F／F-C	0.5931
h-g／F-C	0.5230
i-g／F-C	–
C'-t／F'-C'	0.7457
e-C'／F'-C'	0.4758
F'-e／F'-C'	0.5242
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0004
ΔPgF	0.0053

Specific gravity	2.72

Thermal properties	
CTE(-30,70) [1E-7/℃]	90
CTE(100,300) [1E-7/℃]	117
Tg [℃]	540
At [℃]	577
Ht cndct. [W/m･K]	1.002
Sp. heat [kJ/kg･K]	0.742
Ht diffus. [1E-6 m2/sec]	0.495

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	490 (5)
Abrasion hardness	151
Young's mod. [GPa]	80.5
Shear mod. [GPa]	32.3
Poisson's ratio	0.247
Stress optical coef. [1E-5 nm/cm／Pa]	2.70

Color Code (80%/5%)	40/36
Internal CC	386/360

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.06
365	0.20
370	0.40
380	0.70
390	0.85
400	0.922
420	0.969
440	0.981
460	0.986
480	0.989
500	0.992
550	0.995
600	0.995
650	0.994
700	0.994
800	0.990
900	0.996
1000	0.994
1200	0.998
1400	0.996
1600	0.989
1800	0.967
2000	0.947
2200	0.89
2400	0.85

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.1	0.2	0.3	0.6	0.8	1.0	1.1	1.2	1.5	1.9	2.7	2.9	4.0	5.3	6.3
60 to 80(ref.)	0.0	0.1	0.3	0.5	0.7	0.9	1.0	1.1	1.4	1.8	2.6	2.7	3.8	5.1	6.0
40 to 60	0.0	0.0	0.2	0.4	0.6	0.8	0.9	1.0	1.2	1.6	2.4	2.5	3.6	4.8	5.7
20 to 40	−0.1	0.0	0.2	0.3	0.5	0.7	0.8	0.9	1.1	1.5	2.3	2.4	3.4	4.5	5.4
0 to 20	−0.1	−0.1	0.1	0.3	0.5	0.7	0.8	0.8	1.1	1.4	2.1	2.2	3.2	4.3	5.1
−20 to 0	−0.1	0.0	0.2	0.3	0.5	0.7	0.8	0.8	1.1	1.4	2.1	2.2	3.1	4.1	4.9
−40 to −20	0.1	0.1	0.3	0.4	0.6	0.8	0.8	0.9	1.1	1.4	2.1	2.2	3.0	4.0	4.7
−60 to −40(ref.)	0.2	0.3	0.4	0.6	0.8	0.9	1.0	1.0	1.3	1.6	2.2	2.3	3.1	4.0	4.7
−70 to −60(ref.)	0.5	0.5	0.7	0.8	1.0	1.1	1.2	1.2	1.5	1.7	2.3	2.4	3.2	4.1	4.7

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	−0.9	−0.8	−0.6	−0.4	−0.2	0.0	0.1	0.1	0.5	0.9	1.7	1.8	3.0	4.3	5.2
60 to 80	−1.1	−1.0	−0.8	−0.6	−0.4	−0.2	−0.1	0.0	0.3	0.6	1.5	1.6	2.7	3.9	4.8
40 to 60	−1.3	−1.2	−1.0	−0.8	−0.6	−0.4	−0.4	−0.3	0.0	0.3	1.1	1.2	2.3	3.5	4.4
20～40	−1.5	−1.4	−1.3	−1.1	−0.9	−0.7	−0.6	−0.6	−0.3	0.0	0.8	0.9	1.9	3.0	3.9
0 to 20	−1.7	−1.7	−1.5	−1.3	−1.1	−0.9	−0.9	−0.8	−0.6	−0.2	0.5	0.6	1.5	2.6	3.4
−20 to 0	−1.9	−1.9	−1.7	−1.6	−1.4	−1.2	−1.1	−1.1	−0.8	−0.5	0.1	0.2	1.1	2.1	2.9
−40 to −20	−2.1	−2.1	−1.9	−1.8	−1.6	−1.5	−1.4	−1.4	−1.1	−0.8	−0.2	−0.1	0.7	1.7	2.4
−60 to −40	−2.3	−2.3	−2.2	−2.0	−1.9	−1.7	−1.7	−1.6	−1.4	−1.1	−0.5	−0.4	0.4	1.2	1.9
−70 to −60	−2.5	−2.5	−2.3	−2.2	−2.1	−1.9	−1.9	−1.8	−1.6	−1.3	−0.8	−0.7	0.1	0.9	1.5

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.16164065E-01
Q1	8.55335644E+01
P2	1.75342706E-02
Q2	5.79488130E-02
P3	3.35341056E-01
Q3	7.82326842E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	3.9
Frac. eq. (ref.)	1.2	8.4

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-TIM22	HOYA	E-FD2
C.D.G.M	H-ZF1	SCHOTT	N-SF2

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF4

nd = 1.755200　　ne = 1.761659

νd = 27.57　　νe = 27.35

Glass code (d)
755276
Glass code (e)
762274

Spectral l.	Refractive idx
2.058	1.70897
1.970	1.71047
1.530	1.71783
1.129	1.72563
1.064	1.72725
t	1.72866
s	1.73450
A'	1.738835
r	1.743000
C	1.747305
C'	1.748535
He-Ne	1.749691
D	1.754963
d	1.755200
e	1.761659
F	1.774696
F'	1.776381
g	1.791384
h	1.806389
0.389	1.816164
i	–

Coef. disp. form. (pwr ser.)	
A0	2.96384442E+00
A1	-1.22384397E-02
A2	0.00000000E+00
A3	3.57090539E-02
A4	2.72484712E-03
A5	-4.37315556E-04
A6	1.03210102E-04
A7	-1.04209554E-05
A8	5.02488681E-07

Partial dispersion	
F-C	0.027391
F'-C'	0.027846
C-t	0.018649
C-A'	0.008470
d-C	0.007895
e-C	0.014354
g-d	0.036184
g-F	0.016688
h-g	0.015005
i-g	–
C'-t	0.019879
e-C'	0.013124
F'-e	0.014722
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6808
C-A'／F-C	0.3092
d-C／F-C	0.2882
e-C／F-C	0.5240
g-d／F-C	1.3210
g-F／F-C	0.6093
h-g／F-C	0.5478
i-g／F-C	–
C'-t／F'-C'	0.7139
e-C'／F'-C'	0.4713
F'-e／F'-C'	0.5287
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	-0.0014
ΔPgF	0.0112

Specific gravity	3.22

Thermal properties	
CTE(-30,70) [1E-7/℃]	84
CTE(100,300) [1E-7/℃]	99
Tg [℃]	617
At [℃]	648
Ht cndct. [W/m･K]	1.040
Sp. heat [kJ/kg･K]	0.671
Ht diffus. [1E-6 m2/sec]	0.480

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	504 (5)
Abrasion hardness	145
Young's mod. [GPa]	91.2
Shear mod. [GPa]	36.5
Poisson's ratio	0.251
Stress optical coef. [1E-5 nm/cm／Pa]	2.75

Color Code (80%/5%)	43/37
Internal CC	398/367

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	–
365	0.02
370	0.12
380	0.45
390	0.69
400	0.82
420	0.920
440	0.952
460	0.967
480	0.975
500	0.981
550	0.991
600	0.991
650	0.991
700	0.992
800	0.991
900	0.996
1000	0.995
1200	0.997
1400	0.997
1600	0.988
1800	0.971
2000	0.960
2200	0.922
2400	0.89

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.7	0.7	1.0	1.3	1.7	2.0	2.1	2.2	2.6	3.2	4.5	4.7	6.5	8.8	10.5
60 to 80(ref.)	0.6	0.6	0.9	1.2	1.5	1.8	1.9	2.0	2.5	3.0	4.2	4.4	6.2	8.4	10.0
40 to 60	0.4	0.5	0.7	1.0	1.3	1.6	1.7	1.8	2.2	2.7	3.9	4.1	5.8	7.8	9.3
20 to 40	0.3	0.4	0.6	0.9	1.2	1.5	1.6	1.6	2.0	2.5	3.6	3.8	5.4	7.3	8.7
0 to 20	0.3	0.3	0.5	0.8	1.1	1.4	1.4	1.5	1.9	2.3	3.4	3.5	5.0	6.8	8.1
-20 to 0	0.2	0.3	0.5	0.8	1.0	1.3	1.4	1.4	1.8	2.2	3.2	3.3	4.7	6.4	7.6
-40 to -20	0.3	0.3	0.5	0.8	1.0	1.3	1.4	1.4	1.8	2.2	3.1	3.2	4.5	6.1	7.1
-60 to -40(ref.)	0.4	0.5	0.7	0.9	1.1	1.4	1.4	1.5	1.8	2.2	3.1	3.2	4.4	5.8	6.8
-70 to -60(ref.)	0.6	0.7	0.9	1.1	1.3	1.5	1.6	1.7	2.0	2.3	3.1	3.2	4.4	5.7	6.6

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-0.4	-0.3	0.0	0.3	0.6	0.9	1.0	1.1	1.6	2.1	3.4	3.6	5.4	7.7	9.3
60 to 80	-0.6	-0.6	-0.3	0.0	0.3	0.7	0.7	0.8	1.3	1.8	3.0	3.2	5.0	7.1	8.7
40 to 60	-0.9	-0.8	-0.6	-0.3	0.0	0.3	0.4	0.5	0.9	1.4	2.5	2.7	4.4	6.4	7.9
20～40	-1.2	-1.1	-0.9	-0.6	-0.3	0.0	0.0	0.1	0.5	1.0	2.1	2.2	3.8	5.7	7.1
0 to 20	-1.5	-1.4	-1.2	-0.9	-0.7	-0.4	-0.3	-0.2	0.1	0.6	1.6	1.7	3.2	5.0	6.2
-20 to 0	-1.7	-1.7	-1.5	-1.2	-1.0	-0.7	-0.7	-0.6	-0.2	0.2	1.1	1.3	2.6	4.3	5.4
-40 to -20	-2.0	-2.0	-1.8	-1.6	-1.3	-1.1	-1.0	-0.9	-0.6	-0.2	0.6	0.8	2.1	3.6	4.6
-60 to -40	-2.3	-2.3	-2.1	-1.9	-1.7	-1.4	-1.4	-1.3	-1.0	-0.6	0.2	0.3	1.5	2.9	3.8
-70 to -60	-2.5	-2.5	-2.3	-2.1	-1.9	-1.7	-1.6	-1.6	-1.3	-1.0	-0.2	-0.1	1.0	2.3	3.2

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.10339135E-01
Q1	8.00300370E+01
P2	2.34104129E-02
Q2	6.14797788E-02
P3	3.71956970E-01
Q3	8.66099124E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	5.3
Frac. eq. (ref.)	2.5	10.1

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-TIH4	HOYA	E-FD4
C.D.G.M	H-ZF6	SCHOTT	N-SF4

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF5

nd = 1.672700 ne = 1.677639

νd = 32.19 νe = 31.94

Glass code (d)
673322
Glass code (e)
678319

Spectral l.	Refractive idx
2.058	1.63483
1.970	1.63621
1.530	1.64279
1.129	1.64942
1.064	1.65076
t	1.65191
s	1.65660
A'	1.660023
r	1.663279
C	1.666619
C'	1.667570
He-Ne	1.668463
D	1.672518
d	1.672700
e	1.677639
F	1.687520
F'	1.688788
g	1.700004
h	1.711077
0.389	1.718210
i	–

Coef. disp. form. (pwr ser.)	
A0	2.71072072E+00
A1	-1.02160186E-02
A2	-9.06763794E-05
A3	2.88337808E-02
A4	5.57561753E-04
A5	1.33564048E-04
A6	-1.34358407E-05
A7	1.19202152E-06
A8	0.00000000E+00

Partial dispersion	
F-C	0.020901
F'-C'	0.021218
C-t	0.014710
C-A'	0.006596
d-C	0.006081
e-C	0.011020
g-d	0.027304
g-F	0.012484
h-g	0.011073
i-g	–
C'-t	0.015661
e-C'	0.010069
F'-e	0.011149
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7038
C-A'／F-C	0.3156
d-C／F-C	0.2909
e-C／F-C	0.5272
g-d／F-C	1.3063
g-F／F-C	0.5973
h-g／F-C	0.5298
i-g／F-C	–
C'-t／F'-C'	0.7381
e-C'／F'-C'	0.4745
F'-e／F'-C'	0.5255
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0008
ΔPgF	0.0069

Specific gravity	2.90

Thermal properties	
CTE(-30,70) [1E-7/℃]	85
CTE(100,300) [1E-7/℃]	102
Tg [℃]	582
At [℃]	612
Ht cndct. [W/m･K]	1.091
Sp. heat [kJ/kg･K]	0.723
Ht diffus. [1E-6 m2/sec]	0.520

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	500 (5)
Abrasion hardness	151
Young's mod. [GPa]	83.3
Shear mod. [GPa]	33.4
Poisson's ratio	0.249
Stress optical coef. [1E-5 nm/cm／Pa]	2.71

Color Code (80%/5%)	41/36
Internal CC	391/363

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.02
365	0.10
370	0.27
380	0.60
390	0.79
400	0.88
420	0.947
440	0.966
460	0.975
480	0.981
500	0.985
550	0.990
600	0.992
650	0.990
700	0.990
800	0.988
900	0.994
1000	0.994
1200	0.998
1400	0.998
1600	0.990
1800	0.973
2000	0.960
2200	0.917
2400	0.89

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.7	0.8	1.0	1.2	1.4	1.7	1.8	1.8	2.2	2.6	3.6	3.7	5.1	6.6	7.8
60 to 80(ref.)	0.6	0.7	1.0	1.1	1.3	1.6	1.6	1.7	2.0	2.5	3.4	3.6	4.8	6.3	7.5
40 to 60	0.5	0.6	0.8	1.0	1.2	1.4	1.5	1.6	1.9	2.3	3.2	3.3	4.5	6.0	7.0
20 to 40	0.5	0.5	0.8	0.9	1.1	1.3	1.4	1.5	1.8	2.2	3.0	3.2	4.3	5.6	6.6
0 to 20	0.5	0.5	0.7	0.9	1.1	1.3	1.4	1.4	1.7	2.1	2.9	3.0	4.1	5.3	6.2
−20 to 0	0.5	0.6	0.8	0.9	1.1	1.3	1.3	1.4	1.7	2.0	2.8	2.9	3.9	5.1	5.9
−40 to −20	0.6	0.7	0.9	1.0	1.2	1.3	1.4	1.5	1.7	2.0	2.8	2.9	3.8	4.9	5.7
−60 to −40(ref.)	0.8	0.9	1.0	1.2	1.3	1.5	1.6	1.6	1.9	2.2	2.8	2.9	3.8	4.8	5.5
−70 to −60(ref.)	1.0	1.1	1.3	1.4	1.5	1.7	1.7	1.8	2.0	2.3	3.0	3.1	3.9	4.8	5.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	−0.3	−0.3	0.0	0.2	0.4	0.6	0.7	0.8	1.1	1.6	2.6	2.7	4.0	5.6	6.7
60 to 80	−0.5	−0.4	−0.2	0.0	0.2	0.4	0.5	0.6	0.9	1.3	2.3	2.4	3.7	5.2	6.3
40 to 60	−0.7	−0.6	−0.4	−0.2	0.0	0.2	0.2	0.3	0.6	1.0	1.9	2.0	3.2	4.6	5.7
20～40	−0.9	−0.9	−0.7	−0.5	−0.3	−0.1	0.0	0.0	0.3	0.7	1.6	1.7	2.8	4.1	5.1
0 to 20	−1.2	−1.1	−0.9	−0.7	−0.6	−0.4	−0.3	−0.3	0.0	0.4	1.2	1.3	2.3	3.6	4.5
−20 to 0	−1.4	−1.3	−1.1	−1.0	−0.8	−0.6	−0.6	−0.5	−0.3	0.1	0.8	0.9	1.9	3.0	3.9
−40 to −20	−1.6	−1.6	−1.4	−1.2	−1.1	−0.9	−0.9	−0.8	−0.6	−0.2	0.5	0.6	1.5	2.5	3.3
−60 to −40	−1.8	−1.8	−1.6	−1.5	−1.3	−1.2	−1.1	−1.1	−0.8	−0.5	0.1	0.2	1.0	2.0	2.7
−70 to −60	−2.0	−2.0	−1.8	−1.7	−1.5	−1.4	−1.3	−1.3	−1.1	−0.8	−0.2	−0.1	0.7	1.6	2.2

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.26549349E-01
Q1	9.15118960E+01
P2	1.95616062E-02
Q2	5.84865283E-02
P3	3.43630919E-01
Q3	7.87974955E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	3.7
Frac. eq. (ref.)	1.4	5.8

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-TIM25	HOYA	E-FD5
C.D.G.M	H-ZF2	SCHOTT	N-SF5

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF6

nd = 1.805180　　ne = 1.812633

νd = 25.45　　νe = 25.24

Glass code (d)
805255
Glass code (e)
813252

Spectral l.	Refractive idx
2.058	1.75397
1.970	1.75551
1.530	1.76319
1.129	1.77161
1.064	1.77341
t	1.77497
s	1.78153
A'	1.786439
r	1.791185
C	1.796109
C'	1.797519
He-Ne	1.798846
D	1.804907
d	1.805180
e	1.812633
F	1.827749
F'	1.829709
g	1.847229
h	1.864867
0.389	1.876421
i	–

Coef. disp. form. (pwr ser.)	
A0	3.11993645E+00
A1	-1.26679163E-02
A2	0.00000000E+00
A3	4.21698355E-02
A4	3.04768926E-03
A5	-4.20720196E-04
A6	1.06770582E-04
A7	-1.09382035E-05
A8	5.57077794E-07

Partial dispersion	
F-C	0.031640
F'-C'	0.032190
C-t	0.021142
C-A'	0.009670
d-C	0.009071
e-C	0.016524
g-d	0.042049
g-F	0.019480
h-g	0.017638
i-g	–
C'-t	0.022552
e-C'	0.015114
F'-e	0.017076
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6682
C-A'／F-C	0.3056
d-C／F-C	0.2867
e-C／F-C	0.5223
g-d／F-C	1.3290
g-F／F-C	0.6157
h-g／F-C	0.5575
i-g／F-C	–
C'-t／F'-C'	0.7006
e-C'／F'-C'	0.4695
F'-e／F'-C'	0.5305
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0020
ΔPgF	0.0140

Specific gravity	3.34

Thermal properties	
CTE(-30,70) [1E-7/℃]	86
CTE(100,300) [1E-7/℃]	110
Tg [℃]	571
At [℃]	611
Ht cndct. [W/m･K]	1.070
Sp. heat [kJ/kg･K]	0.662
Ht diffus. [1E-6 m2/sec]	0.484

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	482 (5)
Abrasion hardness	182
Young's mod. [GPa]	119.8
Shear mod. [GPa]	47.4
Poisson's ratio	0.264
Stress optical coef. [1E-5 nm/cm／Pa]	2.95

Color Code (80%/5%)	45/37
Internal CC	398/365

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	–
365	0.05
370	0.18
380	0.51
390	0.71
400	0.82
420	0.914
440	0.948
460	0.965
480	0.974
500	0.980
550	0.988
600	0.988
650	0.986
700	0.986
800	0.989
900	0.995
1000	0.995
1200	0.998
1400	0.999
1600	0.990
1800	0.975
2000	0.966
2200	0.936
2400	0.89

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	-0.7	-0.6	-0.3	0.0	0.3	0.7	0.8	0.9	1.4	2.1	3.6	3.8	5.9	8.5	10.7
60 to 80(ref.)	-0.9	-0.7	-0.4	-0.1	0.2	0.5	0.6	0.7	1.2	1.9	3.3	3.5	5.5	8.1	10.2
40 to 60	-1.0	-0.9	-0.5	-0.3	0.0	0.3	0.4	0.5	1.0	1.6	3.0	3.2	5.1	7.5	9.4
20 to 40	-1.1	-1.0	-0.7	-0.4	-0.1	0.2	0.3	0.4	0.8	1.4	2.7	2.9	4.7	6.9	8.7
0 to 20	-1.2	-1.0	-0.7	-0.5	-0.3	0.0	0.1	0.2	0.7	1.2	2.5	2.6	4.3	6.4	8.1
-20 to 0	-1.2	-1.1	-0.8	-0.5	-0.3	0.0	0.1	0.1	0.6	1.1	2.3	2.4	4.0	5.9	7.5
-40 to -20	-1.1	-1.0	-0.7	-0.5	-0.3	0.0	0.1	0.1	0.5	1.0	2.1	2.3	3.7	5.5	7.0
-60 to -40(ref.)	-0.9	-0.8	-0.6	-0.4	-0.2	0.1	0.2	0.2	0.6	1.1	2.1	2.2	3.6	5.2	6.6
-70 to -60(ref.)	-0.7	-0.6	-0.4	-0.2	0.0	0.3	0.3	0.4	0.8	1.2	2.2	2.3	3.6	5.1	6.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-1.8	-1.7	-1.4	-1.1	-0.8	-0.4	-0.3	-0.2	0.3	1.0	2.5	2.7	4.7	7.4	9.5
60 to 80	-2.1	-1.9	-1.6	-1.3	-1.0	-0.7	-0.6	-0.5	0.0	0.7	2.1	2.3	4.3	6.8	8.9
40 to 60	-2.3	-2.2	-1.9	-1.6	-1.4	-1.0	-0.9	-0.9	-0.4	0.2	1.6	1.8	3.7	6.0	8.0
20～40	-2.6	-2.5	-2.2	-2.0	-1.7	-1.4	-1.3	-1.2	-0.8	-0.2	1.1	1.3	3.0	5.2	7.1
0 to 20	-2.9	-2.8	-2.5	-2.3	-2.0	-1.7	-1.7	-1.6	-1.1	-0.6	0.6	0.8	2.4	4.5	6.2
-20 to 0	-3.2	-3.1	-2.8	-2.6	-2.4	-2.1	-2.0	-1.9	-1.5	-1.0	0.1	0.3	1.8	3.7	5.3
-40 to -20	-3.5	-3.4	-3.1	-2.9	-2.6	-2.5	-2.4	-2.3	-1.9	-1.4	-0.4	-0.2	1.2	2.9	4.4
-60 to -40	-3.8	-3.7	-3.4	-3.2	-3.0	-2.8	-2.7	-2.7	-2.3	-1.8	-0.9	-0.7	0.6	2.2	3.5
-70 to -60	-4.0	-3.9	-3.7	-3.5	-3.3	-3.1	-3.0	-2.9	-2.6	-2.2	-1.2	-1.1	0.1	1.6	2.8

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.01435791E-01
Q1	7.59148418E+01
P2	2.72714884E-02
Q2	6.17300189E-02
P3	3.86525039E-01
Q3	8.91225912E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.9	3.7
Frac. eq. (ref.)	3.3	11.4

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-TIH6	HOYA	FD60
C.D.G.M	H-ZF7LA	SCHOTT	N-SF6

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF7

nd = 1.639800　　ne = 1.644181

νd = 34.55　　νe = 34.29

Glass code (d)
640346
Glass code (e)
644343

Spectral l.	Refractive idx
2.058	1.60479
1.970	1.60615
1.530	1.61255
1.129	1.61881
1.064	1.62005
t	1.62111
s	1.62539
A'	1.628474
r	1.631397
C	1.634385
C'	1.635233
He-Ne	1.636029
D	1.639639
d	1.639800
e	1.644181
F	1.652905
F'	1.654022
g	1.663859
h	1.673512
0.389	1.679697
i	–

Coef. disp. form. (pwr ser.)	
A0	2.61297958E+00
A1	-9.85563637E-03
A2	-1.06186576E-04
A3	2.54765452E-02
A4	3.92630585E-04
A5	1.21161036E-04
A6	-1.21702106E-05
A7	9.86930857E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.018520
F'-C'	0.018789
C-t	0.013279
C-A'	0.005911
d-C	0.005415
e-C	0.009796
g-d	0.024059
g-F	0.010954
h-g	0.009653
i-g	–
C'-t	0.014127
e-C'	0.008948
F'-e	0.009841
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7170
C-A'／F-C	0.3192
d-C／F-C	0.2924
e-C／F-C	0.5289
g-d／F-C	1.2991
g-F／F-C	0.5915
h-g／F-C	0.5212
i-g／F-C	–
C'-t／F'-C'	0.7519
e-C'／F'-C'	0.4762
F'-e／F'-C'	0.5238
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0004
ΔPgF	0.0051

Specific gravity	2.76

Thermal properties	
CTE(-30,70) [1E-7/℃]	79
CTE(100,300) [1E-7/℃]	97
Tg [℃]	584
At [℃]	624
Ht cndct. [W/m･K]	1.030
Sp. heat [kJ/kg･K]	0.722
Ht diffus. [1E-6 m2/sec]	0.518

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	495 (5)
Abrasion hardness	122
Young's mod. [GPa]	78.8
Shear mod. [GPa]	31.8
Poisson's ratio	0.238
Stress optical coef. [1E-5 nm/cm／Pa]	2.80

Color Code (80%/5%)	40/36
Internal CC	385/360

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.04
365	0.18
370	0.38
380	0.70
390	0.86
400	0.929
420	0.972
440	0.983
460	0.986
480	0.989
500	0.991
550	0.993
600	0.994
650	0.992
700	0.993
800	0.992
900	0.996
1000	0.997
1200	0.998
1400	0.993
1600	0.988
1800	0.967
2000	0.947
2200	0.88
2400	0.85

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	1.4	1.5	1.7	1.9	2.1	2.4	2.4	2.5	2.8	3.2	4.0	4.1	5.3	6.5	7.4
60 to 80(ref.)	1.3	1.4	1.6	1.8	2.0	2.2	2.3	2.4	2.6	3.0	3.8	3.9	5.0	6.3	7.1
40 to 60	1.2	1.3	1.5	1.7	1.9	2.1	2.1	2.2	2.5	2.8	3.6	3.7	4.8	5.9	6.7
20 to 40	1.2	1.2	1.4	1.6	1.8	2.0	2.0	2.1	2.3	2.7	3.4	3.5	4.5	5.6	6.4
0 to 20	1.1	1.1	1.3	1.5	1.7	1.9	1.9	2.0	2.2	2.6	3.3	3.4	4.3	5.4	6.1
−20 to 0	1.1	1.2	1.3	1.5	1.7	1.9	1.9	2.0	2.2	2.5	3.2	3.3	4.2	5.2	5.9
−40 to −20	1.2	1.2	1.4	1.5	1.7	1.9	1.9	2.0	2.2	2.5	3.1	3.2	4.1	5.0	5.7
−60 to −40(ref.)	1.4	1.4	1.5	1.7	1.8	2.0	2.1	2.1	2.3	2.6	3.2	3.3	4.1	5.0	5.6
−70 to −60(ref.)	1.6	1.6	1.7	1.9	2.0	2.2	2.2	2.3	2.5	2.7	3.3	3.4	4.2	5.0	5.6

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	0.4	0.5	0.7	0.9	1.1	1.3	1.4	1.5	1.8	2.1	3.0	3.1	4.2	5.5	6.3
60 to 80	0.3	0.3	0.5	0.7	0.9	1.1	1.2	1.2	1.5	1.9	2.7	2.8	3.9	5.1	5.9
40 to 60	0.0	0.0	0.2	0.4	0.6	0.8	0.9	0.9	1.2	1.6	2.3	2.4	3.5	4.6	5.4
20～40	−0.2	−0.2	0.0	0.2	0.3	0.5	0.6	0.7	0.9	1.2	2.0	2.1	3.1	4.1	4.9
0 to 20	−0.5	−0.5	−0.3	−0.1	0.1	0.3	0.3	0.4	0.6	0.9	1.6	1.7	2.6	3.7	4.4
−20 to 0	−0.7	−0.7	−0.5	−0.4	−0.2	0.0	0.0	0.1	0.3	0.6	1.2	1.3	2.2	3.2	3.9
−40 to −20	−1.0	−1.0	−0.8	−0.6	−0.5	−0.3	−0.3	−0.2	0.0	0.3	0.9	1.0	1.8	2.7	3.3
−60 to −40	−1.2	−1.2	−1.1	−0.9	−0.8	−0.6	−0.6	−0.5	−0.3	−0.1	0.5	0.6	1.4	2.2	2.8
−70 to −60	−1.4	−1.4	−1.3	−1.1	−1.0	−0.8	−0.8	−0.7	−0.5	−0.3	0.2	0.3	1.1	1.9	2.4

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.16414550E-01
Q1	8.32585149E+01
P2	1.64966821E-02
Q2	5.83433442E-02
P3	3.33217429E-01
Q3	7.71106562E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	5.9
Frac. eq. (ref.)	1.3	7.3

Prod. Freq. (A to F)	E

Similar glass type			
OHARA	S-TIM27	HOYA	E-FD7
C.D.G.M	H-F51	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF8

nd = 1.688930 ne = 1.694153

νd = 31.16 νe = 30.92

Glass code (d)
689312
Glass code (e)
694309

Spectral l.	Refractive idx
2.058	1.64983
1.970	1.65119
1.530	1.65778
1.129	1.66454
1.064	1.66592
t	1.66710
s	1.67198
A'	1.675565
r	1.678988
C	1.682509
C'	1.683512
He-Ne	1.684454
D	1.688738
d	1.688930
e	1.694153
F	1.704616
F'	1.705961
g	1.717865
h	1.729635
0.389	1.737225
i	–

Coef. disp. form. (pwr ser.)	
A0	2.76136798E+00
A1	-1.08932344E-02
A2	0.00000000E+00
A3	2.79459967E-02
A4	2.32580023E-03
A5	-4.32657789E-04
A6	9.28149250E-05
A7	-9.03546717E-06
A8	4.01729395E-07

Partial dispersion	
F-C	0.022107
F'-C'	0.022449
C-t	0.015408
C-A'	0.006944
d-C	0.006421
e-C	0.011644
g-d	0.028935
g-F	0.013249
h-g	0.011770
i-g	–
C'-t	0.016411
e-C'	0.010641
F'-e	0.011808
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6970
C-A'／F-C	0.3141
d-C／F-C	0.2905
e-C／F-C	0.5267
g-d／F-C	1.3089
g-F／F-C	0.5993
h-g／F-C	0.5324
i-g／F-C	–
C'-t／F'-C'	0.7310
e-C'／F'-C'	0.4740
F'-e／F'-C'	0.5260
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0008
ΔPgF	0.0072

Specific gravity	2.93

Thermal properties	
CTE(-30,70) [1E-7/℃]	92
CTE(100,300) [1E-7/℃]	116
Tg [℃]	544
At [℃]	582
Ht cndct. [W/m･K]	1.083
Sp. heat [kJ/kg･K]	0.746
Ht diffus. [1E-6 m2/sec]	0.494

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	492 (5)
Abrasion hardness	180
Young's mod. [GPa]	86.4
Shear mod. [GPa]	34.5
Poisson's ratio	0.252
Stress optical coef. [1E-5 nm/cm／Pa]	2.68

Color Code (80%/5%)	41/36
Internal CC	390/362
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.03
365	0.13
370	0.30
380	0.63
390	0.80
400	0.89
420	0.957
440	0.975
460	0.983
480	0.987
500	0.990
550	0.995
600	0.995
650	0.993
700	0.993
800	0.991
900	0.996
1000	0.994
1200	0.997
1400	0.994
1600	0.987
1800	0.967
2000	0.946
2200	0.900
2400	0.85

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	-0.1	-0.1	0.1	0.4	0.6	0.9	1.0	1.1	1.4	1.9	2.9	3.0	4.4	6.1	7.3
60 to 80(ref.)	-0.2	-0.2	0.1	0.3	0.6	0.8	0.9	1.0	1.3	1.8	2.7	2.9	4.2	5.8	7.0
40 to 60	-0.3	-0.2	0.0	0.2	0.4	0.7	0.8	0.8	1.2	1.6	2.5	2.7	3.9	5.4	6.5
20 to 40	-0.3	-0.3	-0.1	0.1	0.4	0.6	0.7	0.8	1.1	1.5	2.4	2.5	3.7	5.1	6.1
0 to 20	-0.3	-0.3	-0.1	0.1	0.3	0.6	0.6	0.7	1.0	1.4	2.2	2.4	3.5	4.8	5.8
-20 to 0	-0.3	-0.2	-0.1	0.1	0.4	0.6	0.6	0.7	1.0	1.4	2.2	2.3	3.4	4.6	5.5
-40 to -20	-0.2	-0.1	0.0	0.2	0.4	0.7	0.7	0.8	1.1	1.4	2.2	2.3	3.3	4.5	5.3
-60 to -40(ref.)	0.0	0.1	0.2	0.4	0.6	0.8	0.9	0.9	1.2	1.5	2.3	2.3	3.3	4.4	5.2
-70 to -60(ref.)	0.3	0.3	0.5	0.6	0.8	1.0	1.1	1.1	1.4	1.7	2.4	2.5	3.4	4.4	5.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-1.2	-1.1	-0.9	-0.6	-0.4	-0.1	0.0	0.0	0.4	0.8	1.8	2.0	3.3	5.0	6.2
60 to 80	-1.3	-1.3	-1.1	-0.8	-0.6	-0.3	-0.2	-0.2	0.2	0.6	1.6	1.7	3.0	4.6	5.7
40 to 60	-1.5	-1.5	-1.3	-1.1	-0.8	-0.6	-0.5	-0.4	-0.1	0.3	1.2	1.4	2.6	4.1	5.2
20～40	-1.7	-1.7	-1.5	-1.3	-1.1	-0.8	-0.8	-0.7	-0.4	0.0	0.9	1.0	2.2	3.6	4.6
0 to 20	-2.0	-1.9	-1.7	-1.5	-1.3	-1.1	-1.0	-1.0	-0.7	-0.3	0.5	0.6	1.8	3.1	4.0
-20 to 0	-2.2	-2.2	-2.0	-1.8	-1.6	-1.4	-1.3	-1.2	-0.9	-0.6	0.2	0.3	1.3	2.6	3.5
-40 to -20	-2.4	-2.4	-2.2	-2.0	-1.8	-1.6	-1.6	-1.5	-1.2	-0.9	-0.2	-0.1	0.9	2.1	2.9
-60 to -40	-2.6	-2.6	-2.4	-2.3	-2.1	-1.9	-1.8	-1.8	-1.5	-1.2	-0.5	-0.4	0.5	1.6	2.3
-70 to -60	-2.8	-2.8	-2.6	-2.4	-2.3	-2.1	-2.0	-2.0	-1.7	-1.4	-0.8	-0.7	0.2	1.2	1.9

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.02971181E-01
Q1	7.75985325E+01
P2	1.94900806E-02
Q2	5.94772898E-02
P3	3.50160674E-01
Q3	8.19360173E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.9	5.3
Frac. eq. (ref.)	1.4	10.5

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-TIM28	HOYA	E-FD8
C.D.G.M	H-ZF10	SCHOTT	N-SF8

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF10

nd = 1.728250 ne = 1.734304

νd = 28.38 νe = 28.15

Glass code (d)
728284
Glass code (e)
734282

Spectral l.	Refractive idx
2.058	1.68423
1.970	1.68570
1.530	1.69287
1.129	1.70036
1.064	1.70191
t	1.70324
s	1.70878
A'	1.712868
r	1.716791
C	1.720838
C'	1.721994
He-Ne	1.723080
D	1.728028
d	1.728250
e	1.734304
F	1.746500
F'	1.748075
g	1.762074
h	1.776040
0.389	1.785117
i	–

Coef. disp. form. (pwr ser.)	
A0	2.87916509E+00
A1	-1.19049122E-02
A2	0.00000000E+00
A3	3.28054585E-02
A4	2.70047713E-03
A5	-4.76826023E-04
A6	1.07927203E-04
A7	-1.07672748E-05
A8	5.00986227E-07

Partial dispersion	
F-C	0.025662
F'-C'	0.026081
C-t	0.017595
C-A'	0.007970
d-C	0.007412
e-C	0.013466
g-d	0.033824
g-F	0.015574
h-g	0.013966
i-g	–
C'-t	0.018751
e-C'	0.012310
F'-e	0.013771
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6856
C-A'／F-C	0.3106
d-C／F-C	0.2888
e-C／F-C	0.5247
g-d／F-C	1.3181
g-F／F-C	0.6069
h-g／F-C	0.5442
i-g／F-C	–
C'-t／F'-C'	0.7190
e-C'／F'-C'	0.4720
F'-e／F'-C'	0.5280
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	-0.0012
ΔPgF	0.0101

Specific gravity	3.06

Thermal properties	
CTE(-30,70) [1E-7/℃]	89
CTE(100,300) [1E-7/℃]	105
Tg [℃]	600
At [℃]	637
Ht cndct. [W/m･K]	1.092
Sp. heat [kJ/kg･K]	0.722
Ht diffus. [1E-6 m2/sec]	0.493

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	513 (5)
Abrasion hardness	159
Young's mod. [GPa]	88.6
Shear mod. [GPa]	35.4
Poisson's ratio	0.251
Stress optical coef. [1E-5 nm/cm／Pa]	2.79

Color Code (80%/5%)	42/37
Internal CC	395/366

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	–
365	0.04
370	0.16
380	0.51
390	0.74
400	0.85
420	0.931
440	0.957
460	0.969
480	0.976
500	0.981
550	0.990
600	0.990
650	0.990
700	0.991
800	0.989
900	0.993
1000	0.992
1200	0.995
1400	0.995
1600	0.988
1800	0.972
2000	0.961
2200	0.927
2400	0.89

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.6	0.7	0.9	1.2	1.5	1.8	1.9	2.0	2.4	3.0	4.2	4.3	6.1	8.1	9.7
60 to 80(ref.)	0.5	0.6	0.9	1.1	1.4	1.7	1.8	1.9	2.3	2.8	4.0	4.1	5.8	7.8	9.2
40 to 60	0.4	0.5	0.7	1.0	1.2	1.5	1.6	1.7	2.1	2.6	3.7	3.8	5.4	7.3	8.7
20 to 40	0.3	0.4	0.6	0.9	1.1	1.4	1.5	1.6	1.9	2.4	3.5	3.6	5.1	6.8	8.1
0 to 20	0.3	0.3	0.6	0.8	1.1	1.3	1.4	1.5	1.8	2.3	3.3	3.4	4.8	6.4	7.7
-20 to 0	0.3	0.4	0.6	0.8	1.0	1.3	1.3	1.4	1.8	2.2	3.1	3.2	4.6	6.1	7.2
-40 to -20	0.4	0.4	0.7	0.9	1.1	1.3	1.4	1.4	1.8	2.2	3.0	3.2	4.4	5.8	6.9
-60 to -40(ref.)	0.6	0.6	0.8	1.0	1.2	1.4	1.5	1.6	1.9	2.2	3.1	3.2	4.3	5.7	6.6
-70 to -60(ref.)	0.8	0.8	1.0	1.2	1.4	1.6	1.7	1.7	2.0	2.4	3.2	3.3	4.4	5.6	6.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-0.4	-0.4	-0.1	0.2	0.5	0.8	0.8	0.9	1.3	1.9	3.1	3.2	4.9	7.0	8.6
60 to 80	-0.6	-0.6	-0.3	0.0	0.2	0.5	0.6	0.7	1.1	1.6	2.8	2.9	4.6	6.5	8.0
40 to 60	-0.9	-0.8	-0.6	-0.3	-0.1	0.2	0.3	0.4	0.8	1.2	2.3	2.5	4.0	5.9	7.3
20～40	-1.1	-1.1	-0.8	-0.6	-0.4	-0.1	0.0	0.1	0.4	0.9	1.9	2.1	3.5	5.3	6.6
0 to 20	-1.4	-1.3	-1.1	-0.9	-0.7	-0.4	-0.3	-0.3	0.1	0.5	1.5	1.6	3.0	4.6	5.8
-20 to 0	-1.6	-1.6	-1.4	-1.2	-1.0	-0.7	-0.6	-0.6	-0.3	0.2	1.1	1.2	2.5	4.0	5.1
-40 to -20	-1.9	-1.9	-1.6	-1.5	-1.2	-1.0	-1.0	-0.9	-0.6	-0.2	0.7	0.8	2.0	3.4	4.4
-60 to -40	-2.1	-2.1	-1.9	-1.7	-1.5	-1.3	-1.3	-1.2	-0.9	-0.6	0.2	0.3	1.4	2.7	3.7
-70 to -60	-2.3	-2.3	-2.1	-1.9	-1.8	-1.6	-1.5	-1.5	-1.2	-0.8	-0.1	0.0	1.1	2.3	3.1

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.05750615E-01
Q1	7.65392188E+01
P2	2.21567515E-02
Q2	6.12519187E-02
P3	3.62700744E-01
Q3	8.59469460E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.9	5.3
Frac. eq. (ref.)	2.0	12.4

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-TIH10	HOYA	FD110
C.D.G.M	H-ZF4	SCHOTT	N-SF10

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF11

nd = 1.784720　　ne = 1.791929

νd = 25.64　　νe = 25.43

Glass code (d)
785256
Glass code (e)
792254

Spectral l.	Refractive idx
2.058	1.73456
1.970	1.73612
1.530	1.74381
1.129	1.75213
1.064	1.75389
t	1.75541
s	1.76180
A'	1.766569
r	1.771171
C	1.775941
C'	1.777306
He-Ne	1.778590
D	1.784456
d	1.784720
e	1.791929
F	1.806548
F'	1.808444
g	1.825394
h	1.842474
0.389	1.853672
i	–

Coef. disp. form. (pwr ser.)	
A0	3.05304325E+00
A1	-1.27339910E-02
A2	0.00000000E+00
A3	3.99774262E-02
A4	3.16619134E-03
A5	-5.02824259E-04
A6	1.22491876E-04
A7	-1.25325941E-05
A8	6.19354223E-07

Partial dispersion	
F-C	0.030607
F'-C'	0.031138
C-t	0.020531
C-A'	0.009372
d-C	0.008779
e-C	0.015988
g-d	0.040674
g-F	0.018846
h-g	0.017080
i-g	–
C'-t	0.021896
e-C'	0.014623
F'-e	0.016515
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6708
C-A'／F-C	0.3062
d-C／F-C	0.2868
e-C／F-C	0.5224
g-d／F-C	1.3289
g-F／F-C	0.6157
h-g／F-C	0.5580
i-g／F-C	–
C'-t／F'-C'	0.7032
e-C'／F'-C'	0.4696
F'-e／F'-C'	0.5304
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0019
ΔPgF	0.0144

Specific gravity	3.25

Thermal properties	
CTE(-30,70) [1E-7/℃]	86
CTE(100,300) [1E-7/℃]	100
Tg [℃]	605
At [℃]	643
Ht cndct. [W/m･K]	1.060
Sp. heat [kJ/kg･K]	0.697
Ht diffus. [1E-6 m2/sec]	0.468

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	501 (5)
Abrasion hardness	130
Young's mod. [GPa]	91.9
Shear mod. [GPa]	36.5
Poisson's ratio	0.260
Stress optical coef. [1E-5 nm/cm／Pa]	2.75

Color Code (80%/5%)	44/37
Internal CC	401/370

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	–
365	0.01
370	0.06
380	0.35
390	0.63
400	0.79
420	0.913
440	0.953
460	0.968
480	0.976
500	0.982
550	0.989
600	0.993
650	0.991
700	0.991
800	0.988
900	0.998
1000	0.996
1200	0.999
1400	0.999
1600	0.990
1800	0.973
2000	0.964
2200	0.931
2400	0.89

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.4	0.5	0.8	1.1	1.4	1.8	1.9	2.0	2.5	3.2	4.6	4.9	6.9	9.5	11.6
60 to 80(ref.)	0.2	0.4	0.7	1.0	1.3	1.6	1.7	1.8	2.3	2.9	4.4	4.6	6.6	9.0	11.0
40 to 60	0.1	0.2	0.5	0.8	1.1	1.4	1.5	1.6	2.0	2.6	4.0	4.2	6.1	8.4	10.3
20 to 40	0.0	0.1	0.4	0.6	0.9	1.2	1.3	1.4	1.8	2.4	3.7	3.8	5.6	7.8	9.6
0 to 20	−0.1	0.0	0.3	0.5	0.7	1.0	1.1	1.2	1.6	2.2	3.4	3.5	5.2	7.3	8.9
−20 to 0	−0.2	−0.1	0.2	0.4	0.7	0.9	1.0	1.1	1.5	2.0	3.1	3.3	4.9	6.8	8.3
−40 to −20	−0.1	0.0	0.2	0.4	0.7	0.9	1.0	1.1	1.4	1.9	3.0	3.1	4.6	6.4	7.8
−60 to −40(ref.)	0.0	0.1	0.4	0.5	0.7	1.0	1.1	1.1	1.5	1.9	2.9	3.1	4.4	6.1	7.3
−70 to −60(ref.)	0.2	0.3	0.5	0.7	0.9	1.1	1.2	1.3	1.6	2.0	3.0	3.1	4.4	5.9	7.1

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	−0.7	−0.6	−0.2	0.0	0.3	0.7	0.8	0.9	1.4	2.0	3.5	3.7	5.8	8.4	10.4
60 to 80	−0.9	−0.8	−0.5	−0.2	0.1	0.4	0.5	0.6	1.1	1.7	3.1	3.3	5.3	7.8	9.7
40 to 60	−1.2	−1.1	−0.8	−0.6	−0.3	0.0	0.1	0.2	0.7	1.3	2.6	2.8	4.7	7.0	8.8
20～40	−1.6	−1.4	−1.1	−0.9	−0.7	−0.4	−0.3	−0.2	0.3	0.8	2.1	2.3	4.0	6.2	7.9
0 to 20	−1.9	−1.8	−1.5	−1.3	−1.0	−0.7	−0.7	−0.6	−0.2	0.4	1.6	1.7	3.4	5.4	7.0
−20 to 0	−2.2	−2.1	−1.8	−1.6	−1.4	−1.1	−1.0	−1.0	−0.6	−0.1	1.0	1.2	2.7	4.6	6.1
−40 to −20	−2.5	−2.4	−2.1	−1.9	−1.7	−1.5	−1.4	−1.3	−1.0	−0.5	0.5	0.7	2.1	3.8	5.2
−60 to −40	−2.8	−2.7	−2.5	−2.3	−2.1	−1.9	−1.8	−1.7	−1.4	−1.0	0.0	0.1	1.4	3.0	4.3
−70 to −60	−3.0	−2.9	−2.7	−2.5	−2.4	−2.2	−2.1	−2.0	−1.7	−1.3	−0.4	−0.3	1.0	2.4	3.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	9.29465786E-02
Q1	6.79977659E+01
P2	2.55330790E-02
Q2	6.29260605E-02
P3	3.80476109E-01
Q3	9.01929143E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	1.0	9.5
Frac. eq. (ref.)	2.7	14.1

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-TIH11	HOYA	E-FD11
C.D.G.M	H-ZF13	SCHOTT	N-SF11

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF13

nd = 1.740770　　ne = 1.747068

νd = 27.74　　νe = 27.52

Glass code (d)
741277
Glass code (e)
747275

Spectral l.	Refractive idx
2.058	1.69539
1.970	1.69688
1.530	1.70418
1.129	1.71187
1.064	1.71347
t	1.71484
s	1.72056
A'	1.724801
r	1.728868
C	1.733069
C'	1.734269
He-Ne	1.735397
D	1.740539
d	1.740770
e	1.747068
F	1.759772
F'	1.761414
g	1.776029
h	1.790639
0.389	1.800152
i	–

Coef. disp. form. (pwr ser.)	
A0	2.91742250E+00
A1	-1.21278695E-02
A2	0.00000000E+00
A3	3.44734103E-02
A4	2.66756706E-03
A5	-4.32503622E-04
A6	1.00646069E-04
A7	-1.00610625E-05
A8	4.80261151E-07

Partial dispersion	
F-C	0.026703
F'-C'	0.027145
C-t	0.018225
C-A'	0.008268
d-C	0.007701
e-C	0.013999
g-d	0.035259
g-F	0.016257
h-g	0.014610
i-g	–
C'-t	0.019425
e-C'	0.012799
F'-e	0.014346
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6825
C-A'／F-C	0.3096
d-C／F-C	0.2884
e-C／F-C	0.5242
g-d／F-C	1.3204
g-F／F-C	0.6088
h-g／F-C	0.5471
i-g／F-C	–
C'-t／F'-C'	0.7156
e-C'／F'-C'	0.4715
F'-e／F'-C'	0.5285
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0013
ΔPgF	0.0110

Specific gravity	3.10

Thermal properties	
CTE(-30,70) [1E-7/℃]	86
CTE(100,300) [1E-7/℃]	103
Tg [℃]	604
At [℃]	636
Ht cndct. [W/m･K]	1.132
Sp. heat [kJ/kg･K]	0.718
Ht diffus. [1E-6 m2/sec]	0.506

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	492 (5)
Abrasion hardness	160
Young's mod. [GPa]	89.5
Shear mod. [GPa]	35.7
Poisson's ratio	0.254
Stress optical coef. [1E-5 nm/cm／Pa]	2.79

Color Code (80%/5%)	43/37
Internal CC	399/367
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	–
365	–
370	0.12
380	0.45
390	0.69
400	0.81
420	0.911
440	0.945
460	0.960
480	0.969
500	0.976
550	0.986
600	0.988
650	0.987
700	0.988
800	0.988
900	0.993
1000	0.992
1200	0.995
1400	0.994
1600	0.987
1800	0.971
2000	0.961
2200	0.925
2400	0.89

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.7	0.8	1.1	1.4	1.7	2.0	2.1	2.2	2.6	3.2	4.4	4.6	6.4	8.6	10.2
60 to 80(ref.)	0.5	0.6	1.0	1.3	1.5	1.8	1.9	2.0	2.4	3.0	4.2	4.4	6.1	8.2	9.8
40 to 60	0.4	0.5	0.8	1.1	1.4	1.7	1.7	1.8	2.2	2.7	3.9	4.0	5.7	7.6	9.2
20 to 40	0.3	0.4	0.7	1.0	1.2	1.5	1.6	1.6	2.0	2.5	3.6	3.8	5.3	7.2	8.6
0 to 20	0.2	0.3	0.6	0.9	1.1	1.4	1.4	1.5	1.9	2.3	3.4	3.5	5.0	6.7	8.1
−20 to 0	0.2	0.3	0.6	0.8	1.0	1.3	1.4	1.4	1.8	2.2	3.2	3.3	4.7	6.3	7.6
−40 to −20	0.3	0.4	0.6	0.8	1.1	1.3	1.4	1.4	1.8	2.2	3.1	3.2	4.5	6.0	7.2
−60 to −40(ref.)	0.4	0.5	0.8	1.0	1.2	1.4	1.5	1.5	1.8	2.2	3.1	3.2	4.4	5.8	6.9
−70 to −60(ref.)	0.6	0.7	0.9	1.1	1.3	1.6	1.6	1.7	2.0	2.3	3.1	3.3	4.4	5.8	6.8

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	−0.4	−0.3	0.1	0.3	0.6	0.9	1.0	1.1	1.5	2.1	3.3	3.5	5.3	7.4	9.1
60 to 80	−0.6	−0.5	−0.2	0.1	0.4	0.7	0.8	0.8	1.3	1.8	3.0	3.1	4.8	6.9	8.5
40 to 60	−0.9	−0.8	−0.5	−0.2	0.0	0.3	0.4	0.5	0.9	1.4	2.5	2.7	4.3	6.2	7.8
20〜40	−1.2	−1.1	−0.8	−0.5	−0.3	0.0	0.1	0.1	0.5	1.0	2.1	2.2	3.7	5.6	7.0
0 to 20	−1.5	−1.4	−1.1	−0.9	−0.6	−0.4	−0.3	−0.2	0.1	0.6	1.6	1.7	3.2	4.9	6.2
−20 to 0	−1.7	−1.7	−1.4	−1.2	−0.9	−0.7	−0.6	−0.6	−0.2	0.2	1.1	1.3	2.6	4.2	5.5
−40 to −20	−2.0	−2.0	−1.7	−1.5	−1.3	−1.1	−1.0	−0.9	−0.6	−0.2	0.7	0.8	2.0	3.6	4.7
−60 to −40	−2.3	−2.2	−2.0	−1.8	−1.6	−1.4	−1.3	−1.3	−1.0	−0.6	0.2	0.3	1.5	2.9	4.0
−70 to −60	−2.5	−2.5	−2.2	−2.0	−1.9	−1.7	−1.6	−1.5	−1.3	−0.9	−0.1	0.0	1.1	2.4	3.4

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.12550486E-01
Q1	8.07969473E+01
P2	2.33049439E-02
Q2	6.13187337E-02
P3	3.66354523E-01
Q3	8.63804110E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.9	4.8
Frac. eq. (ref.)	2.3	10.7

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-TIH13	HOYA	E-FD13
C.D.G.M	H-ZF50	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF14

nd = 1.761820　　ne = 1.768573

νd = 26.58　　νe = 26.37

Glass code (d)
762266
Glass code (e)
769264

Spectral l.	Refractive idx
2.058	1.71383
1.970	1.71538
1.530	1.72298
1.129	1.73105
1.064	1.73273
t	1.73418
s	1.74025
A'	1.744758
r	1.749094
C	1.753580
C'	1.754862
He-Ne	1.756069
D	1.761573
d	1.761820
e	1.768573
F	1.782237
F'	1.784006
g	1.799796
h	1.815656
0.389	1.826028
i	–

Coef. disp. form. (pwr ser.)	
A0	2.98193445E+00
A1	-1.26593840E-02
A2	0.00000000E+00
A3	3.70386685E-02
A4	2.96054842E-03
A5	-4.81643932E-04
A6	1.14549779E-04
A7	-1.16507463E-05
A8	5.68089035E-07

Partial dispersion	
F-C	0.028657
F'-C'	0.029144
C-t	0.019396
C-A'	0.008822
d-C	0.008240
e-C	0.014993
g-d	0.037976
g-F	0.017559
h-g	0.015860
i-g	–
C'-t	0.020678
e-C'	0.013711
F'-e	0.015433
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6768
C-A'／F-C	0.3078
d-C／F-C	0.2875
e-C／F-C	0.5232
g-d／F-C	1.3252
g-F／F-C	0.6127
h-g／F-C	0.5534
i-g／F-C	–
C'-t／F'-C'	0.7095
e-C'／F'-C'	0.4705
F'-e／F'-C'	0.5295
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	-0.0017
ΔPgF	0.0130

Specific gravity	3.17

Thermal properties	
CTE(-30,70) [1E-7/℃]	83
CTE(100,300) [1E-7/℃]	99
Tg [℃]	617
At [℃]	647
Ht cndct. [W/m･K]	1.020
Sp. heat [kJ/kg･K]	0.694
Ht diffus. [1E-6 m2/sec]	0.465

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	513 (5)
Abrasion hardness	165
Young's mod. [GPa]	91.7
Shear mod. [GPa]	36.6
Poisson's ratio	0.254
Stress optical coef. [1E-5 nm/cm／Pa]	3.17

Color Code (80%/5%)	43/37
Internal CC	398/369
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	–
365	–
370	0.07
380	0.39
390	0.67
400	0.82
420	0.924
440	0.958
460	0.971
480	0.978
500	0.982
550	0.990
600	0.992
650	0.993
700	0.992
800	0.989
900	0.997
1000	0.993
1200	0.998
1400	0.994
1600	0.989
1800	0.977
2000	0.972
2200	0.944
2400	0.922

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	1.3	1.4	1.7	2.0	2.2	2.6	2.7	2.8	3.2	3.9	5.3	5.5	7.5	9.9	11.8
60 to 80(ref.)	1.2	1.3	1.6	1.8	2.1	2.4	2.5	2.6	3.0	3.6	5.0	5.2	7.1	9.4	11.3
40 to 60	1.0	1.1	1.4	1.6	1.9	2.1	2.2	2.3	2.8	3.3	4.6	4.8	6.6	8.8	10.5
20 to 40	0.9	1.0	1.2	1.4	1.7	2.0	2.0	2.1	2.5	3.1	4.3	4.5	6.2	8.2	9.8
0 to 20	0.8	0.9	1.1	1.3	1.5	1.8	1.9	2.0	2.3	2.9	4.0	4.2	5.8	7.7	9.2
-20 to 0	0.8	0.8	1.1	1.2	1.5	1.7	1.8	1.8	2.2	2.7	3.8	3.9	5.4	7.2	8.6
-40 to -20	0.8	0.9	1.1	1.2	1.4	1.7	1.7	1.8	2.1	2.6	3.6	3.8	5.2	6.8	8.1
-60 to -40(ref.)	0.9	1.0	1.2	1.3	1.5	1.7	1.8	1.9	2.2	2.6	3.6	3.7	5.0	6.5	7.7
-70 to -60(ref.)	1.1	1.2	1.3	1.5	1.7	1.9	1.9	2.0	2.3	2.7	3.6	3.7	5.0	6.4	7.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	0.2	0.3	0.6	0.9	1.2	1.5	1.6	1.7	2.1	2.8	4.2	4.4	6.3	8.8	10.6
60 to 80	0.0	0.1	0.4	0.6	0.9	1.2	1.3	1.4	1.8	2.4	3.8	4.0	5.9	8.2	10.0
40 to 60	-0.3	-0.2	0.1	0.3	0.5	0.8	0.9	1.0	1.4	2.0	3.3	3.4	5.2	7.4	9.1
20～40	-0.6	-0.5	-0.3	-0.1	0.2	0.4	0.5	0.6	1.0	1.5	2.7	2.9	4.6	6.6	8.2
0 to 20	-0.9	-0.8	-0.6	-0.4	-0.2	0.0	0.1	0.2	0.6	1.1	2.2	2.4	4.0	5.9	7.3
-20 to 0	-1.2	-1.2	-0.9	-0.8	-0.6	-0.3	-0.3	-0.2	0.2	0.6	1.7	1.9	3.3	5.1	6.4
-40 to -20	-1.5	-1.5	-1.3	-1.1	-0.9	-0.7	-0.6	-0.6	-0.2	0.2	1.2	1.3	2.7	4.3	5.6
-60 to -40	-1.9	-1.8	-1.6	-1.5	-1.3	-1.1	-1.0	-1.0	-0.7	-0.3	0.7	0.8	2.0	3.5	4.7
-70 to -60	-2.1	-2.0	-1.9	-1.7	-1.6	-1.4	-1.3	-1.3	-1.0	-0.6	0.3	0.4	1.6	3.0	4.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.05344766E-01
Q1	7.48265970E+01
P2	2.43859017E-02
Q2	6.24217837E-02
P3	3.73151673E-01
Q3	8.83028805E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	5.7
Frac. eq. (ref.)	2.8	10.3

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-TIH14	HOYA	FD140
C.D.G.M	H-ZF12	SCHOTT	N-SF14

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF15

nd = 1.698950 ne = 1.704427

νd = 30.13 νe = 29.89

Glass code (d)
699301
Glass code (e)
704299

Spectral l.	Refractive idx
2.058	1.65842
1.970	1.65981
1.530	1.66653
1.129	1.67350
1.064	1.67493
t	1.67616
s	1.68124
A'	1.684973
r	1.688547
C	1.692227
C'	1.693276
He-Ne	1.694263
D	1.698749
d	1.698950
e	1.704427
F	1.715424
F'	1.716840
g	1.729392
h	1.741843
0.389	1.749895
i	–

Coef. disp. form. (pwr ser.)	
A0	2.79018804E+00
A1	-1.10845992E-02
A2	0.00000000E+00
A3	2.97256583E-02
A4	2.19337541E-03
A5	-3.59769888E-04
A6	8.12762977E-05
A7	-8.02301606E-06
A8	3.73019506E-07

Partial dispersion	
F-C	0.023197
F'-C'	0.023564
C-t	0.016067
C-A'	0.007254
d-C	0.006723
e-C	0.012200
g-d	0.030442
g-F	0.013968
h-g	0.012451
i-g	–
C'-t	0.017116
e-C'	0.011151
F'-e	0.012413
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6926
C-A'／F-C	0.3127
d-C／F-C	0.2898
e-C／F-C	0.5259
g-d／F-C	1.3123
g-F／F-C	0.6021
h-g／F-C	0.5368
i-g／F-C	–
C'-t／F'-C'	0.7264
e-C'／F'-C'	0.4732
F'-e／F'-C'	0.5268
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	-0.0010
ΔPgF	0.0083

Specific gravity	2.95

Thermal properties	
CTE(-30,70) [1E-7/℃]	92
CTE(100,300) [1E-7/℃]	113
Tg [℃]	571
At [℃]	606
Ht cndct. [W/m･K]	1.071
Sp. heat [kJ/kg･K]	0.738
Ht diffus. [1E-6 m2/sec]	0.490

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	468 (5)
Abrasion hardness	167
Young's mod. [GPa]	84.2
Shear mod. [GPa]	33.6
Poisson's ratio	0.254
Stress optical coef. [1E-5 nm/cm／Pa]	2.84

Color Code (80%/5%)	42/36
Internal CC	395/364

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.01
365	0.07
370	0.22
380	0.54
390	0.74
400	0.84
420	0.926
440	0.951
460	0.963
480	0.972
500	0.978
550	0.989
600	0.991
650	0.990
700	0.991
800	0.988
900	0.993
1000	0.993
1200	0.996
1400	0.991
1600	0.988
1800	0.970
2000	0.951
2200	0.907
2400	0.86

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	-0.1	0.0	0.2	0.5	0.7	1.0	1.1	1.2	1.5	2.0	3.1	3.2	4.7	6.5	7.8
60 to 80(ref.)	-0.2	-0.1	0.2	0.4	0.6	0.9	1.0	1.0	1.4	1.8	2.9	3.0	4.5	6.2	7.4
40 to 60	-0.3	-0.2	0.0	0.3	0.5	0.7	0.8	0.9	1.2	1.7	2.7	2.8	4.2	5.8	6.9
20 to 40	-0.4	-0.3	0.0	0.2	0.4	0.6	0.7	0.8	1.1	1.5	2.4	2.6	3.9	5.4	6.5
0 to 20	-0.4	-0.3	-0.1	0.1	0.3	0.5	0.6	0.7	1.0	1.4	2.3	2.4	3.6	5.1	6.1
-20 to 0	-0.4	-0.3	-0.1	0.1	0.3	0.5	0.6	0.6	0.9	1.3	2.2	2.3	3.5	4.8	5.8
-40 to -20	-0.3	-0.2	0.0	0.2	0.4	0.6	0.6	0.7	1.0	1.3	2.1	2.2	3.3	4.6	5.5
-60 to -40(ref.)	-0.1	0.0	0.2	0.3	0.5	0.7	0.8	0.8	1.1	1.4	2.2	2.3	3.3	4.5	5.3
-70 to -60(ref.)	0.1	0.2	0.4	0.5	0.7	0.9	0.9	1.0	1.3	1.6	2.3	2.4	3.4	4.5	5.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-1.1	-1.1	-0.8	-0.6	-0.3	0.0	0.0	0.1	0.5	0.9	2.0	2.2	3.6	5.4	6.7
60 to 80	-1.3	-1.2	-1.0	-0.8	-0.5	-0.3	-0.2	-0.1	0.2	0.7	1.7	1.9	3.3	5.0	6.2
40 to 60	-1.6	-1.5	-1.2	-1.0	-0.8	-0.6	-0.5	-0.4	-0.1	0.3	1.3	1.5	2.8	4.4	5.6
20～40	-1.8	-1.7	-1.5	-1.3	-1.1	-0.8	-0.8	-0.7	-0.4	0.0	0.9	1.1	2.4	3.9	4.9
0 to 20	-2.0	-2.0	-1.8	-1.6	-1.4	-1.1	-1.1	-1.0	-0.7	-0.3	0.6	0.7	1.9	3.3	4.3
-20 to 0	-2.3	-2.2	-2.0	-1.8	-1.6	-1.4	-1.4	-1.3	-1.0	-0.7	0.2	0.3	1.4	2.8	3.7
-40 to -20	-2.5	-2.5	-2.3	-2.1	-1.9	-1.7	-1.7	-1.6	-1.3	-1.0	-0.2	-0.1	1.0	2.2	3.1
-60 to -40	-2.8	-2.7	-2.5	-2.4	-2.2	-2.0	-2.0	-1.9	-1.7	-1.3	-0.6	-0.5	0.5	1.6	2.4
-70 to -60	-3.0	-2.9	-2.7	-2.6	-2.4	-2.2	-2.2	-2.1	-1.9	-1.6	-0.9	-0.8	0.1	1.2	2.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.11922422E-01
Q1	8.31931901E+01
P2	2.08150315E-02
Q2	5.98208007E-02
P3	3.52661928E-01
Q3	8.29447247E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	5.0
Frac. eq. (ref.)	1.9	9.8

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-TIM35	HOYA	E-FD15
C.D.G.M	H-ZF11	SCHOTT	N-SF15

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SF03

nd = 1.846660　　ne = 1.855032

νd = 23.80　　νe = 23.61

Glass code (d)
847238
Glass code (e)
855236

Spectral l.	Refractive idx
2.058	1.79055
1.970	1.79217
1.530	1.80027
1.129	1.80936
1.064	1.81132
t	1.81303
s	1.82027
A'	1.825725
r	1.831009
C	1.836505
C'	1.838080
He-Ne	1.839564
D	1.846354
d	1.846660
e	1.855032
F	1.872084
F'	1.874302
g	1.894197
h	1.914364
0.389	1.927659
i	–

Partial dispersion	
F-C	0.035579
F'-C'	0.036222
C-t	0.023473
C-A'	0.010780
d-C	0.010155
e-C	0.018527
g-d	0.047537
g-F	0.022113
h-g	0.020167
i-g	–
C'-t	0.025048
e-C'	0.016952
F'-e	0.019270
i-F'	–

Specific gravity	3.53

Color Code (70%/5%)	42/37
Internal CC	407/370
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	–
365	–
370	0.05
380	0.34
390	0.60
400	0.74
420	0.87
440	0.922
460	0.947
480	0.961
500	0.970
550	0.985
600	0.985
650	0.982
700	0.982
800	0.983
900	0.993
1000	0.992
1200	0.997
1400	0.999
1600	0.991
1800	0.983
2000	0.977
2200	0.962
2400	0.938

Thermal properties	
CTE(-30,70) [1E-7/℃]	81
CTE(100,300) [1E-7/℃]	102
Tg [℃]	615
At [℃]	648
Ht cndct. [W/m･K]	0.970
Sp. heat [kJ/kg･K]	0.590
Ht diffus. [1E-6 m2/sec]	0.466

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	492 (5)
Abrasion hardness	179
Young's mod. [GPa]	94.4
Shear mod. [GPa]	37.3
Poisson's ratio	0.266
Stress optical coef. [1E-5 nm/cm/Pa]	2.92

Relative partial dispersion	
C-t/F-C	0.6597
C-A'/F-C	0.3030
d-C/F-C	0.2854
e-C/F-C	0.5207
g-d/F-C	1.3361
g-F/F-C	0.6215
h-g/F-C	0.5668
i-g/F-C	–
C'-t/F'-C'	0.6915
e-C'/F'-C'	0.4680
F'-e/F'-C'	0.5320
i-F'/F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0025
ΔPgF	0.0171

Coef. disp. form. (pwr ser.)	
A0	3.25089291E+00
A1	−1.33244110E-02
A2	0.00000000E+00
A3	4.84040988E-02
A4	3.26383680E-03
A5	−4.01470701E-04
A6	1.16583198E-04
A7	−1.27242455E-05
A8	6.96171808E-07

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	−0.4	−0.3	0.0	0.4	0.7	1.1	1.2	1.3	1.9	2.7	4.4	4.6	7.1	10.2	12.7
60 to 80(ref.)	−0.6	−0.4	0.0	0.2	0.5	0.9	1.0	1.1	1.7	2.4	4.1	4.3	6.7	9.6	12.0
40 to 60	−0.7	−0.6	−0.2	0.0	0.3	0.7	0.8	0.9	1.4	2.1	3.7	3.9	6.1	8.9	11.2
20 to 40	−0.9	−0.7	−0.4	−0.1	0.2	0.5	0.6	0.7	1.2	1.8	3.3	3.5	5.6	8.3	10.3
0 to 20	−1.0	−0.8	−0.5	−0.3	0.0	0.3	0.4	0.5	1.0	1.6	3.0	3.2	5.2	7.6	9.6
−20 to 0	−1.0	−0.9	−0.6	−0.3	−0.1	0.2	0.3	0.4	0.9	1.4	2.8	3.0	4.8	7.1	8.9
−40 to −20	−0.9	−0.8	−0.5	−0.3	−0.1	0.2	0.3	0.4	0.8	1.3	2.6	2.8	4.5	6.6	8.2
−60 to −40(ref.)	−0.8	−0.7	−0.4	−0.2	0.0	0.3	0.4	0.4	0.8	1.4	2.5	2.7	4.3	6.2	7.7
−70 to −60(ref.)	−0.6	−0.5	−0.2	0.0	0.2	0.4	0.5	0.6	1.0	1.4	2.6	2.7	4.2	6.0	7.4

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	−1.6	−1.4	−1.0	−0.7	−0.4	0.0	0.1	0.2	0.8	1.5	3.2	3.4	5.9	9.0	11.4
60 to 80	−1.8	−1.7	−1.3	−1.0	−0.7	−0.3	−0.2	−0.1	0.4	1.2	2.8	3.0	5.4	8.3	10.7
40 to 60	−2.1	−2.0	−1.6	−1.4	−1.1	−0.7	−0.6	−0.5	0.0	0.7	2.2	2.5	4.7	7.4	9.7
20～40	−2.4	−2.3	−2.0	−1.7	−1.4	−1.1	−1.0	−0.9	−0.4	0.2	1.7	1.9	4.0	6.6	8.6
0 to 20	−2.7	−2.6	−2.3	−2.1	−1.8	−1.5	−1.4	−1.3	−0.9	−0.2	1.1	1.3	3.3	5.7	7.6
−20 to 0	−3.1	−2.9	−2.7	−2.4	−2.2	−1.9	−1.8	−1.7	−1.3	−0.7	0.6	0.8	2.6	4.8	6.6
−40 to −20	−3.4	−3.3	−3.0	−2.8	−2.6	−2.3	−2.2	−2.1	−1.7	−1.2	0.0	0.2	1.9	3.9	5.6
−60 to −40	−3.7	−3.6	−3.3	−3.1	−2.9	−2.7	−2.6	−2.5	−2.1	−1.7	−0.5	−0.4	1.2	3.1	4.5
−70 to −60	−3.9	−3.8	−3.6	−3.4	−3.2	−3.0	−2.9	−2.8	−2.5	−2.0	−0.9	−0.8	0.7	2.4	3.8

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.11923941E-01
Q1	8.28410074E+01
P2	3.04841319E-02
Q2	6.23699294E-02
P3	3.97973273E-01
Q3	9.10166610E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.9	6.0
Frac. eq. (ref.)	3.4	11.1

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-TIH53	HOYA	FDS90
C.D.G.M	H-ZF52A	SCHOTT	N-SF57

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SFS3

nd = 1.784700 ne = 1.791740

νd = 26.27 νe = 26.06

Glass code (d)
785263
Glass code (e)
792261

Spectral l.	Refractive idx
2.058	1.73526
1.970	1.73683
1.530	1.74451
1.129	1.75275
1.064	1.75448
t	1.75598
s	1.76226
A'	1.766938
r	1.771447
C	1.776116
C'	1.777451
He-Ne	1.778708
D	1.784442
d	1.784700
e	1.791740
F	1.805989
F'	1.807834
g	1.824304
h	1.840840
0.389	1.851648
i	–

Coef. disp. form. (pwr ser.)	
A0	3.05623339E+00
A1	-1.28486167E-02
A2	0.00000000E+00
A3	3.87408706E-02
A4	3.39109066E-03
A5	-6.05526065E-04
A6	1.41221664E-04
A7	-1.44464234E-05
A8	6.88155857E-07

Partial dispersion	
F-C	0.029873
F'-C'	0.030383
C-t	0.020135
C-A'	0.009178
d-C	0.008584
e-C	0.015624
g-d	0.039604
g-F	0.018315
h-g	0.016536
i-g	–
C'-t	0.021470
e-C'	0.014289
F'-e	0.016094
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6740
C-A'／F-C	0.3072
d-C／F-C	0.2873
e-C／F-C	0.5230
g-d／F-C	1.3257
g-F／F-C	0.6131
h-g／F-C	0.5535
i-g／F-C	–
C'-t／F'-C'	0.7066
e-C'／F'-C'	0.4703
F'-e／F'-C'	0.5297
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	-0.0017
ΔPgF	0.0128

Specific gravity	3.28

Thermal properties	
CTE(-30,70) [1E-7/℃]	84
CTE(100,300) [1E-7/℃]	104
Tg [℃]	581
At [℃]	626
Ht cndct. [W/m･K]	1.080
Sp. heat [kJ/kg･K]	0.630
Ht diffus. [1E-6 m2/sec]	0.415

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	492 (5)
Abrasion hardness	196
Young's mod. [GPa]	92.8
Shear mod. [GPa]	37.0
Poisson's ratio	0.256
Stress optical coef. [1E-5 nm/cm／Pa]	3.03

Color Code (80%/5%)	44/37
Internal CC	399/367

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	–
365	–
370	0.13
380	0.45
390	0.68
400	0.81
420	0.912
440	0.948
460	0.963
480	0.972
500	0.979
550	0.989
600	0.989
650	0.988
700	0.990
800	0.989
900	0.996
1000	0.993
1200	0.996
1400	0.993
1600	0.988
1800	0.976
2000	0.967
2200	0.933
2400	0.89

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.1	0.2	0.6	0.8	1.1	1.4	1.5	1.6	2.1	2.8	4.3	4.5	6.4	8.9	11.0
60 to 80(ref.)	-0.1	0.1	0.5	0.7	1.0	1.3	1.4	1.5	2.0	2.6	4.0	4.2	6.0	8.4	10.4
40 to 60	-0.2	0.0	0.3	0.5	0.8	1.1	1.1	1.2	1.7	2.3	3.6	3.8	5.6	7.8	9.7
20 to 40	-0.3	-0.1	0.2	0.4	0.6	0.9	1.0	1.1	1.5	2.1	3.3	3.5	5.1	7.2	9.0
0 to 20	-0.4	-0.2	0.1	0.3	0.5	0.7	0.8	0.9	1.3	1.9	3.1	3.2	4.7	6.6	8.3
-20 to 0	-0.4	-0.2	0.1	0.2	0.4	0.7	0.7	0.8	1.2	1.7	2.8	3.0	4.4	6.2	7.7
-40 to -20	-0.4	-0.2	0.1	0.2	0.4	0.7	0.7	0.8	1.2	1.7	2.7	2.8	4.1	5.8	7.1
-60 to -40(ref.)	-0.2	-0.1	0.2	0.4	0.5	0.7	0.8	0.9	1.2	1.7	2.7	2.8	4.0	5.4	6.7
-70 to -60(ref.)	0.0	0.1	0.4	0.5	0.7	0.9	1.0	1.0	1.4	1.8	2.7	2.8	3.9	5.3	6.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-1.0	-0.8	-0.5	-0.2	0.0	0.3	0.4	0.5	1.0	1.7	3.1	3.3	5.2	7.7	9.8
60 to 80	-1.2	-1.1	-0.7	-0.5	-0.2	0.1	0.2	0.2	0.7	1.4	2.8	2.9	4.8	7.1	9.1
40 to 60	-1.5	-1.4	-1.0	-0.8	-0.6	-0.3	-0.2	-0.1	0.3	0.9	2.2	2.4	4.1	6.3	8.2
20～40	-1.8	-1.7	-1.3	-1.2	-0.9	-0.7	-0.6	-0.5	-0.1	0.5	1.7	1.9	3.5	5.6	7.3
0 to 20	-2.1	-2.0	-1.7	-1.5	-1.3	-1.0	-0.9	-0.9	-0.5	0.1	1.2	1.4	2.9	4.8	6.4
-20 to 0	-2.4	-2.3	-2.0	-1.8	-1.6	-1.4	-1.3	-1.2	-0.9	-0.3	0.7	0.9	2.2	4.0	5.5
-40 to -20	-2.7	-2.6	-2.3	-2.1	-2.0	-1.8	-1.7	-1.6	-1.2	-0.8	0.2	0.4	1.6	3.2	4.6
-60 to -40	-3.0	-2.9	-2.6	-2.5	-2.3	-2.1	-2.0	-2.0	-1.6	-1.2	-0.3	-0.2	1.0	2.4	3.7
-70 to -60	-3.2	-3.1	-2.8	-2.7	-2.6	-2.4	-2.3	-2.3	-1.9	-1.5	-0.7	-0.5	0.5	1.8	3.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	9.33352719E-02
Q1	6.79499207E+01
P2	2.66834997E-02
Q2	6.09673098E-02
P3	3.79672929E-01
Q3	8.70602218E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	1.1	10.3
Frac. eq. (ref.)	2.0	18.0

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-TIH23	HOYA	FDS30
C.D.G.M		SCHOTT	N-SF56

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SFH1

nd = 1.808090　　ne = 1.816440

ν d = 22.74　　ν e = 22.55

Glass code (d)
808227
Glass code (e)
816226

Spectral l.	Refractive idx
2.058	1.75156
1.970	1.75327
1.530	1.76173
1.129	1.77098
1.064	1.77295
t	1.77466
s	1.78187
A'	1.787287
r	1.792532
C	1.797989
C'	1.799554
He-Ne	1.801030
D	1.807785
d	1.808090
e	1.816440
F	1.833527
F'	1.835758
g	1.855872
h	1.876462
0.389	1.890157
i	–

Partial dispersion	
F-C	0.035538
F'-C'	0.036204
C-t	0.023326
C-A'	0.010702
d-C	0.010101
e-C	0.018451
g-d	0.047782
g-F	0.022345
h-g	0.020590
i-g	–
C'-t	0.024891
e-C'	0.016886
F'-e	0.019318
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6564
C-A'／F-C	0.3011
d-C／F-C	0.2842
e-C／F-C	0.5192
g-d／F-C	1.3445
g-F／F-C	0.6288
h-g／F-C	0.5794
i-g／F-C	–
C'-t／F'-C'	0.6875
e-C'／F'-C'	0.4664
F'-e／F'-C'	0.5336
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0032
ΔPgF	0.0226

Specific gravity	3.31

Thermal properties	
CTE(-30,70) [1E-7/℃]	91
CTE(100,300) [1E-7/℃]	113
Tg [℃]	581
At [℃]	619
Ht cndct. [W/m･K]	0.862
Sp. heat [kJ/kg･K]	0.635
Ht diffus. [1E-6 m2/sec]	0.408

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	408 (4)
Abrasion hardness	341
Young's mod. [GPa]	83.0
Shear mod. [GPa]	33.0
Poisson's ratio	0.259
Stress optical coef. [1E-5 nm/cm／Pa]	3.31

Color Code (80%/5%)	46/38
Internal CC	404/374
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	–
365	–
370	0.01
380	0.21
390	0.55
400	0.75
420	0.89
440	0.936
460	0.954
480	0.965
500	0.974
550	0.987
600	0.991
650	0.989
700	0.990
800	0.989
900	0.994
1000	0.993
1200	0.996
1400	0.997
1600	0.989
1800	0.974
2000	0.966
2200	0.939
2400	0.908

Coef. disp. form. (pwr ser.)	
A0	3.11637039E+00
A1	−1.40103252E−02
A2	0.00000000E+00
A3	4.55295459E−02
A4	3.79129507E−03
A5	−5.76203793E−04
A6	1.53793977E−04
A7	−1.65780029E−05
A8	8.81480500E−07

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	−3.9	−3.8	−3.6	−3.3	−2.9	−2.6	−2.5	−2.4	−1.8	−1.2	0.4	0.6	3.1	6.4	9.1
60 to 80(ref.)	−3.9	−3.9	−3.6	−3.3	−3.0	−2.7	−2.6	−2.5	−2.0	−1.3	0.2	0.4	2.8	6.0	8.6
40 to 60	−4.0	−4.0	−3.7	−3.4	−3.1	−2.8	−2.7	−2.6	−2.1	−1.5	0.0	0.2	2.4	5.4	7.8
20 to 40	−4.0	−4.0	−3.7	−3.5	−3.2	−2.9	−2.8	−2.7	−2.2	−1.6	−0.2	0.0	2.1	4.9	7.2
0 to 20	−4.0	−4.0	−3.8	−3.5	−3.2	−2.9	−2.8	−2.7	−2.3	−1.7	−0.4	−0.2	1.8	4.4	6.5
−20 to 0	−3.9	−3.9	−3.7	−3.5	−3.2	−2.9	−2.8	−2.7	−2.3	−1.8	−0.5	−0.3	1.6	4.0	5.9
−40 to −20	−3.8	−3.8	−3.6	−3.3	−3.1	−2.8	−2.7	−2.6	−2.2	−1.7	−0.6	−0.4	1.4	3.7	5.4
−60 to −40(ref.)	−3.5	−3.5	−3.4	−3.1	−2.9	−2.6	−2.5	−2.5	−2.1	−1.6	−0.5	−0.3	1.4	3.5	5.0
−70 to −60(ref.)	−3.3	−3.3	−3.1	−2.9	−2.6	−2.4	−2.3	−2.2	−1.9	−1.4	−0.3	−0.2	1.4	3.4	4.8

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	−5.0	−4.9	−4.7	−4.4	−4.0	−3.7	−3.6	−3.5	−3.0	−2.3	−0.8	−0.5	1.9	5.2	7.9
60 to 80	−5.1	−5.1	−4.8	−4.5	−4.2	−3.9	−3.8	−3.7	−3.2	−2.6	−1.1	−0.8	1.5	4.7	7.3
40 to 60	−5.3	−5.3	−5.1	−4.8	−4.5	−4.2	−4.1	−4.0	−3.5	−2.9	−1.5	−1.2	1.0	4.0	6.4
20～40	−5.5	−5.5	−5.3	−5.0	−4.7	−4.4	−4.3	−4.2	−3.8	−3.2	−1.9	−1.7	0.5	3.2	5.5
0 to 20	−5.7	−5.7	−5.5	−5.3	−5.0	−4.7	−4.6	−4.5	−4.1	−3.6	−2.3	−2.1	−0.1	2.5	4.6
−20 to 0	−6.0	−5.9	−5.7	−5.5	−5.3	−5.0	−4.9	−4.8	−4.4	−3.9	−2.7	−2.5	−0.6	1.8	3.7
−40 to −20	−6.2	−6.2	−6.0	−5.8	−5.5	−5.2	−5.2	−5.1	−4.7	−4.2	−3.1	−2.9	−1.1	1.1	2.8
−60 to −40	−6.4	−6.4	−6.2	−6.0	−5.8	−5.5	−5.4	−5.4	−5.0	−4.5	−3.5	−3.3	−1.7	0.4	1.9
−70 to −60	−6.5	−6.5	−6.4	−6.2	−6.0	−5.7	−5.6	−5.6	−5.2	−4.8	−3.8	−3.6	−2.1	−0.2	1.2

Coef. disp. form. (frac. eq.)(ref.)	
P1	9.85730452E−02
Q1	6.72412004E+01
P2	3.04158799E−02
Q2	6.53413919E−02
P3	3.82916992E−01
Q3	9.40813164E−03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.9	4.3
Frac. eq. (ref.)	4.8	16.9

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-NPH1	HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-SFH2

nd = 1.860740　　ne = 1.869508

νd = 23.08　　νe = 22.89

Glass code (d)
861231
Glass code (e)
870229

Spectral l.	Refractive idx
2.058	1.80120
1.970	1.80300
1.530	1.81192
1.129	1.82167
1.064	1.82375
t	1.82555
s	1.83315
A'	1.838854
r	1.844377
C	1.850120
C'	1.851766
He-Ne	1.853318
D	1.860420
d	1.860740
e	1.869508
F	1.887417
F'	1.889752
g	1.910759
h	1.932175
0.389	1.946358
i	–

Coef. disp. form. (pwr ser.)	
A0	3.29659106E+00
A1	-1.51583913E-02
A2	0.00000000E+00
A3	4.96966192E-02
A4	3.87657158E-03
A5	-5.33127104E-04
A6	1.43134944E-04
A7	-1.50873439E-05
A8	8.02061962E-07

Partial dispersion	
F-C	0.037297
F'-C'	0.037986
C-t	0.024570
C-A'	0.011266
d-C	0.010620
e-C	0.019388
g-d	0.050019
g-F	0.023342
h-g	0.021416
i-g	–
C'-t	0.026216
e-C'	0.017742
F'-e	0.020244
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6588
C-A'／F-C	0.3021
d-C／F-C	0.2847
e-C／F-C	0.5198
g-d／F-C	1.3411
g-F／F-C	0.6258
h-g／F-C	0.5742
i-g／F-C	–
C'-t／F'-C'	0.6901
e-C'／F'-C'	0.4671
F'-e／F'-C'	0.5329
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	-0.0029
ΔPgF	0.0202

Specific gravity	3.82

Thermal properties	
CTE(-30,70) [1E-7/℃]	84
CTE(100,300) [1E-7/℃]	98
Tg [℃]	589
At [℃]	630
Ht cndct. [W/m･K]	0.813
Sp. heat [kJ/kg･K]	0.572
Ht diffus. [1E-6 m2/sec]	0.372

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	441 (4)
Abrasion hardness	309
Young's mod. [GPa]	88.8
Shear mod. [GPa]	35.0
Poisson's ratio	0.268
Stress optical coef. [1E-5 nm/cm／Pa]	3.04

Color Code (70%/5%)	41/37
Internal CC	403/371

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	–
365	–
370	0.04
380	0.36
390	0.65
400	0.78
420	0.87
440	0.913
460	0.933
480	0.948
500	0.959
550	0.979
600	0.987
650	0.989
700	0.991
800	0.986
900	0.994
1000	0.995
1200	0.998
1400	0.999
1600	0.991
1800	0.981
2000	0.976
2200	0.945
2400	0.912

Relative Δn/ΔT [1E-6/℃]															
Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	-2.9	-2.8	-2.5	-2.2	-1.8	-1.5	-1.4	-1.2	-0.7	0.0	1.7	2.0	4.5	7.9	10.7
60 to 80(ref.)	-3.0	-2.9	-2.6	-2.3	-2.0	-1.6	-1.5	-1.4	-0.9	-0.2	1.4	1.7	4.1	7.4	10.0
40 to 60	-3.1	-3.1	-2.8	-2.5	-2.2	-1.8	-1.7	-1.6	-1.1	-0.5	1.1	1.3	3.6	6.7	9.2
20 to 40	-3.2	-3.2	-2.9	-2.6	-2.3	-2.0	-1.9	-1.8	-1.3	-0.7	0.8	1.0	3.2	6.0	8.3
0 to 20	-3.3	-3.2	-3.0	-2.7	-2.4	-2.1	-2.0	-1.9	-1.5	-0.9	0.5	0.7	2.8	5.4	7.5
-20 to 0	-3.3	-3.2	-3.0	-2.7	-2.5	-2.2	-2.1	-2.0	-1.6	-1.0	0.3	0.5	2.4	4.8	6.8
-40 to -20	-3.2	-3.2	-2.9	-2.7	-2.5	-2.2	-2.1	-2.0	-1.6	-1.1	0.1	0.3	2.1	4.4	6.1
-60 to -40(ref.)	-3.0	-3.0	-2.8	-2.6	-2.3	-2.1	-2.0	-1.9	-1.5	-1.0	0.1	0.3	1.9	4.0	5.6
-70 to -60(ref.)	-2.8	-2.8	-2.6	-2.4	-2.1	-1.9	-1.8	-1.7	-1.4	-0.9	0.2	0.3	1.9	3.8	5.3

Absolute Δn/ΔT [1E-6/℃]															
Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-4.0	-3.9	-3.6	-3.3	-3.0	-2.6	-2.5	-2.4	-1.9	-1.1	0.5	0.8	3.3	6.7	9.5
60 to 80	-4.2	-4.2	-3.8	-3.6	-3.2	-2.9	-2.8	-2.7	-2.2	-1.5	0.2	0.4	2.8	6.0	8.7
40 to 60	-4.5	-4.4	-4.2	-3.9	-3.6	-3.2	-3.1	-3.0	-2.5	-1.9	-0.4	-0.1	2.2	5.2	7.6
20～40	-4.8	-4.7	-4.5	-4.2	-3.9	-3.6	-3.5	-3.4	-2.9	-2.3	-0.9	-0.7	1.5	4.3	6.6
0 to 20	-5.1	-5.0	-4.8	-4.5	-4.3	-4.0	-3.9	-3.8	-3.3	-2.8	-1.4	-1.2	0.8	3.4	5.5
-20 to 0	-5.4	-5.3	-5.1	-4.9	-4.6	-4.3	-4.2	-4.2	-3.7	-3.2	-1.9	-1.7	0.1	2.6	4.5
-40 to -20	-5.7	-5.6	-5.4	-5.2	-4.9	-4.7	-4.6	-4.5	-4.1	-3.6	-2.4	-2.3	-0.5	1.7	3.5
-60 to -40	-6.0	-5.9	-5.7	-5.5	-5.3	-5.0	-5.0	-4.9	-4.5	-4.1	-3.0	-2.8	-1.2	0.8	2.4
-70 to -60	-6.2	-6.1	-5.9	-5.7	-5.5	-5.3	-5.2	-5.2	-4.8	-4.4	-3.4	-3.2	-1.7	0.2	1.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.10507518E-01
Q1	7.39541338E+01
P2	3.18957625E-02
Q2	6.34615914E-02
P3	4.01415757E-01
Q3	9.05242609E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	1.1	6.7
Frac. eq. (ref.)	4.3	12.7

Prod. Freq. (A to F)	A

Similar glass type			
OHARA		HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK7

nd = 1.651600　　ne = 1.654253

νd = 58.57　　νe = 58.34

Glass code (d)
652586
Glass code (e)
654583

Spectral l.	Refractive idx
2.058	1.62263
1.970	1.62418
1.530	1.63114
1.129	1.63704
1.064	1.63808
t	1.63893
s	1.64215
A'	1.644307
r	1.646266
C	1.648206
C'	1.648747
He-Ne	1.649252
D	1.651501
d	1.651600
e	1.654253
F	1.659331
F'	1.659962
g	1.665356
h	1.670353
0.389	1.673398
i	1.678861

Coef. disp. form. (pwr ser.)	
A0	2.68232720E+00
A1	-1.19713031E-02
A2	-1.43724360E-04
A3	1.64555463E-02
A4	2.17295781E-04
A5	4.69383509E-06
A6	3.49394854E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.011125
F'-C'	0.011215
C-t	0.009279
C-A'	0.003899
d-C	0.003394
e-C	0.006047
g-d	0.013756
g-F	0.006025
h-g	0.004997
i-g	0.013505
C'-t	0.009820
e-C'	0.005506
F'-e	0.005709
i-F'	0.018899

Relative partial dispersion	
C-t／F-C	0.8341
C-A'／F-C	0.3505
d-C／F-C	0.3051
e-C／F-C	0.5436
g-d／F-C	1.2365
g-F／F-C	0.5416
h-g／F-C	0.4492
i-g／F-C	1.2139
C'-t／F'-C'	0.8756
e-C'／F'-C'	0.4909
F'-e／F'-C'	0.5091
i-F'／F'-C'	1.6852

Deviation of relative partial disp.	
ΔPdC	0.0014
ΔPgF	-0.0045

Specific gravity	3.30

Thermal properties	
CTE(-30,70) [1E-7/℃]	66
CTE(100,300) [1E-7/℃]	82
Tg [℃]	651
At [℃]	681
Ht cndct. [W/m･K]	0.953
Sp. heat [kJ/kg･K]	0.670
Ht diffus. [1E-6 m2/sec]	0.431

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	4
Climate resistance	1
Water res. (powder)	3
Acid res. (powder)	5

Mechanical properties	
Knoop hardness	583 (6)
Abrasion hardness	106
Young's mod. [GPa]	100.3
Shear mod. [GPa]	39.0
Poisson's ratio	0.285
Stress optical coef. [1E-5 nm/cm／Pa]	2.02

Color Code (80%/5%)	35/28
Internal CC	333/280

Internal trans. (10mm)	
λ [nm]	τ
280	0.07
290	0.20
300	0.36
310	0.52
320	0.66
330	0.77
340	0.86
350	0.911
360	0.945
365	0.958
370	0.968
380	0.979
390	0.985
400	0.989
420	0.992
440	0.992
460	0.994
480	0.995
500	0.996
550	0.996
600	0.996
650	0.994
700	0.993
800	0.989
900	0.997
1000	0.994
1200	0.996
1400	0.993
1600	0.990
1800	0.981
2000	0.963
2200	0.900
2400	0.70

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.0	2.1	2.1	2.3	2.4	2.5	2.6	2.6	2.7	2.9	3.2	3.3	3.7	4.0	4.3
60 to 80(ref.)	1.9	2.0	2.1	2.2	2.3	2.4	2.4	2.5	2.6	2.8	3.1	3.2	3.5	3.9	4.1
40 to 60	1.8	1.8	2.0	2.1	2.2	2.3	2.3	2.3	2.5	2.6	3.0	3.0	3.3	3.7	3.9
20 to 40	1.7	1.8	1.9	2.0	2.1	2.2	2.2	2.2	2.4	2.5	2.8	2.9	3.2	3.5	3.7
0 to 20	1.7	1.7	1.8	1.9	2.0	2.1	2.1	2.2	2.3	2.4	2.7	2.8	3.1	3.4	3.6
-20 to 0	1.7	1.7	1.8	1.9	2.0	2.1	2.1	2.1	2.3	2.4	2.7	2.7	3.0	3.3	3.5
-40 to -20	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.7	2.7	3.0	3.3	3.5
-60 to -40(ref.)	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.6	2.8	2.9	3.1	3.4	3.6
-70 to -60(ref.)	2.1	2.1	2.2	2.3	2.4	2.5	2.5	2.5	2.6	2.8	3.0	3.0	3.3	3.6	3.7

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.0	1.1	1.2	1.3	1.4	1.5	1.5	1.6	1.7	1.9	2.2	2.2	2.6	3.0	3.2
60 to 80	0.8	0.9	1.0	1.1	1.2	1.3	1.3	1.3	1.5	1.7	2.0	2.0	2.4	2.7	2.9
40 to 60	0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.1	1.2	1.4	1.7	1.7	2.0	2.4	2.6
20～40	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.8	0.9	1.1	1.4	1.4	1.7	2.0	2.2
0 to 20	0.1	0.1	0.2	0.3	0.4	0.5	0.5	0.5	0.6	0.8	1.1	1.1	1.4	1.7	1.9
-20 to 0	-0.2	-0.2	-0.1	0.0	0.1	0.2	0.2	0.2	0.3	0.5	0.7	0.8	1.1	1.3	1.5
-40 to -20	-0.5	-0.4	-0.4	-0.3	-0.2	-0.1	-0.1	-0.1	0.1	0.2	0.4	0.5	0.7	1.0	1.2
-60 to -40	-0.7	-0.7	-0.6	-0.5	-0.5	-0.4	-0.4	-0.3	-0.2	-0.1	0.1	0.2	0.4	0.7	0.8
-70 to -60	-0.9	-0.9	-0.8	-0.7	-0.7	-0.6	-0.6	-0.5	-0.4	-0.3	-0.1	-0.1	0.2	0.4	0.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.23367890E-01
Q1	7.50281422E+01
P2	7.86744637E-02
Q2	1.56987933E-02
P3	2.80638114E-01
Q3	3.60652473E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	2.9
Frac. eq. (ref.)	0.4	3.1

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-LAL7	HOYA	LAC7
C.D.G.M	H-LaK50A	SCHOTT	N-LAK7

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK8

nd = 1.713000 ne = 1.716150

ν d = 53.96 ν e = 53.73

Glass code (d)
713540
Glass code (e)
716537

Spectral l.	Refractive idx
2.058	1.67966
1.970	1.68141
1.530	1.68925
1.129	1.69596
1.064	1.69714
t	1.69812
s	1.70186
A'	1.704390
r	1.706694
C	1.708982
C'	1.709622
He-Ne	1.710219
D	1.712882
d	1.713000
e	1.716150
F	1.722196
F'	1.722950
g	1.729400
h	1.735396
0.389	1.739061
i	1.745653

Coef. disp. form. (pwr ser.)	
A0	2.87779172E+00
A1	-1.35972618E-02
A2	-2.08866139E-04
A3	2.03518573E-02
A4	2.44901642E-04
A5	1.23070041E-05
A6	-1.32629677E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.013214
F'-C'	0.013328
C-t	0.010857
C-A'	0.004592
d-C	0.004018
e-C	0.007168
g-d	0.016400
g-F	0.007204
h-g	0.005996
i-g	0.016253
C'-t	0.011497
e-C'	0.006528
F'-e	0.006800
i-F'	0.022703

Relative partial dispersion	
C-t／F-C	0.8216
C-A'／F-C	0.3475
d-C／F-C	0.3041
e-C／F-C	0.5425
g-d／F-C	1.2411
g-F／F-C	0.5452
h-g／F-C	0.4538
i-g／F-C	1.2300
C'-t／F'-C'	0.8626
e-C'／F'-C'	0.4898
F'-e／F'-C'	0.5102
i-F'／F'-C'	1.7034

Deviation of relative partial disp.	
ΔPdC	0.0025
ΔPgF	-0.0086

Specific gravity	3.85

Thermal properties	
CTE(-30,70) [1E-7/℃]	54
CTE(100,300) [1E-7/℃]	70
Tg [℃]	641
At [℃]	672
Ht cndct. [W/m･K]	0.902
Sp. heat [kJ/kg･K]	0.577
Ht diffus. [1E-6 m2/sec]	0.407

Chemical properties [class]	
Acid res. (surface)	6
Alkaline detergent res.	4
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	623 (6)
Abrasion hardness	81
Young's mod. [GPa]	110.8
Shear mod. [GPa]	42.8
Poisson's ratio	0.295
Stress optical coef. [1E-5 nm/cm／Pa]	2.09

Color Code (80%/5%)	37/29
Internal CC	350/291

Internal trans. (10mm)	
λ [nm]	τ
280	0.01
290	0.04
300	0.11
310	0.22
320	0.38
330	0.54
340	0.69
350	0.80
360	0.88
365	0.904
370	0.925
380	0.954
390	0.970
400	0.978
420	0.987
440	0.990
460	0.993
480	0.995
500	0.997
550	0.997
600	0.998
650	0.997
700	0.996
800	0.992
900	0.999
1000	0.998
1200	0.999
1400	0.994
1600	0.993
1800	0.983
2000	0.960
2200	0.89
2400	0.63

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.5	4.5	4.7	4.8	5.0	5.1	5.1	5.2	5.4	5.6	6.0	6.0	6.5	7.0	7.3
60 to 80(ref.)	4.3	4.4	4.6	4.7	4.8	5.0	5.0	5.0	5.2	5.4	5.8	5.9	6.3	6.8	7.1
40 to 60	4.2	4.2	4.4	4.5	4.7	4.8	4.8	4.9	5.0	5.2	5.6	5.7	6.1	6.6	6.9
20 to 40	4.1	4.1	4.3	4.4	4.5	4.7	4.7	4.7	4.9	5.1	5.4	5.5	5.9	6.4	6.7
0 to 20	4.0	4.0	4.2	4.3	4.4	4.6	4.6	4.6	4.8	4.9	5.3	5.4	5.8	6.2	6.5
-20 to 0	4.0	4.0	4.2	4.3	4.4	4.5	4.5	4.6	4.7	4.9	5.2	5.3	5.7	6.1	6.4
-40 to -20	4.0	4.0	4.2	4.3	4.4	4.5	4.6	4.6	4.7	4.9	5.2	5.3	5.7	6.1	6.4
-60 to -40(ref.)	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.7	4.8	5.0	5.3	5.4	5.8	6.2	6.4
-70 to -60(ref.)	4.3	4.3	4.5	4.6	4.7	4.8	4.8	4.9	5.0	5.2	5.5	5.5	5.9	6.3	6.6

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.4	3.5	3.7	3.8	3.9	4.0	4.1	4.1	4.3	4.5	4.9	4.9	5.4	5.9	6.2
60 to 80	3.2	3.3	3.4	3.6	3.7	3.8	3.8	3.9	4.0	4.2	4.6	4.7	5.1	5.6	5.9
40 to 60	2.9	3.0	3.1	3.2	3.4	3.5	3.5	3.6	3.7	3.9	4.3	4.3	4.8	5.2	5.5
20～40	2.6	2.7	2.8	2.9	3.0	3.2	3.2	3.2	3.4	3.6	3.9	4.0	4.4	4.8	5.1
0 to 20	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.9	3.1	3.2	3.6	3.6	4.0	4.5	4.7
-20 to 0	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.6	2.7	2.9	3.2	3.3	3.7	4.1	4.3
-40 to -20	1.7	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.6	2.9	2.9	3.3	3.7	4.0
-60 to -40	1.4	1.5	1.6	1.7	1.8	1.9	1.9	1.9	2.1	2.2	2.5	2.6	2.9	3.3	3.6
-70 to -60	1.2	1.2	1.4	1.5	1.5	1.6	1.7	1.7	1.8	2.0	2.3	2.3	2.7	3.0	3.3

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.18244084E-01
Q1	6.79365479E+01
P2	3.54569746E-02
Q2	2.27963420E-02
P3	3.49564309E-01
Q3	4.95985311E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	11.3
Frac. eq. (ref.)	0.7	13.1

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-LAL8	HOYA	LAC8
C.D.G.M	H-LaK7	SCHOTT	N-LAK8

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK9

nd = 1.691000　　ne = 1.693998

ν d = 54.93　　ν e = 54.71

Glass code (d)
691549
Glass code (e)
694547

Spectral l.	Refractive idx
2.058	1.65866
1.970	1.66037
1.530	1.66808
1.129	1.67465
1.064	1.67580
t	1.67675
s	1.68036
A'	1.682783
r	1.684987
C	1.687171
C'	1.687781
He-Ne	1.688350
D	1.690888
d	1.691000
e	1.693998
F	1.699750
F'	1.700467
g	1.706596
h	1.712290
0.389	1.715768
i	1.722021

Coef. disp. form. (pwr ser.)	
A0	2.80700795E+00
A1	-1.35938061E-02
A2	-1.53406686E-04
A3	1.88808096E-02
A4	2.80739188E-04
A5	5.33547368E-06
A6	1.19947182E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.012579
F'-C'	0.012686
C-t	0.010417
C-A'	0.004388
d-C	0.003829
e-C	0.006827
g-d	0.015596
g-F	0.006846
h-g	0.005694
i-g	0.015425
C'-t	0.011027
e-C'	0.006217
F'-e	0.006469
i-F'	0.021554

Relative partial dispersion	
C-t／F-C	0.8281
C-A'／F-C	0.3488
d-C／F-C	0.3044
e-C／F-C	0.5427
g-d／F-C	1.2398
g-F／F-C	0.5442
h-g／F-C	0.4527
i-g／F-C	1.2263
C'-t／F'-C'	0.8692
e-C'／F'-C'	0.4901
F'-e／F'-C'	0.5099
i-F'／F'-C'	1.6990

Deviation of relative partial disp.	
ΔPdC	0.0024
ΔPgF	-0.0079

Specific gravity	3.48

Thermal properties	
CTE(-30,70) [1E-7/℃]	59
CTE(100,300) [1E-7/℃]	75
Tg [℃]	658
At [℃]	686
Ht cndct. [W/m･K]	0.946
Sp. heat [kJ/kg･K]	0.648
Ht diffus. [1E-6 m2/sec]	0.420

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	4
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	679 (7)
Abrasion hardness	79
Young's mod. [GPa]	113.9
Shear mod. [GPa]	44.2
Poisson's ratio	0.289
Stress optical coef. [1E-5 nm/cm／Pa]	2.01

Color Code (80%/5%)	38/30
Internal CC	357/303

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	0.11
320	0.24
330	0.41
340	0.58
350	0.73
360	0.83
365	0.87
370	0.900
380	0.937
390	0.960
400	0.973
420	0.985
440	0.989
460	0.991
480	0.994
500	0.995
550	0.997
600	0.995
650	0.993
700	0.989
800	0.982
900	0.997
1000	0.998
1200	0.998
1400	0.985
1600	0.984
1800	0.973
2000	0.944
2200	0.84
2400	0.60

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.2	3.3	3.4	3.5	3.6	3.8	3.8	3.8	4.0	4.2	4.6	4.6	5.1	5.5	5.8
60 to 80(ref.)	3.1	3.1	3.3	3.4	3.5	3.6	3.7	3.7	3.9	4.0	4.4	4.5	4.9	5.3	5.6
40 to 60	3.0	3.0	3.1	3.2	3.4	3.5	3.5	3.5	3.7	3.9	4.2	4.3	4.7	5.1	5.4
20 to 40	2.9	2.9	3.0	3.1	3.2	3.4	3.4	3.4	3.6	3.7	4.1	4.1	4.5	4.9	5.2
0 to 20	2.8	2.8	3.0	3.1	3.2	3.3	3.3	3.3	3.5	3.6	4.0	4.0	4.4	4.8	5.0
-20 to 0	2.8	2.8	2.9	3.0	3.1	3.2	3.3	3.3	3.4	3.6	3.9	3.9	4.3	4.7	4.9
-40 to -20	2.8	2.9	3.0	3.1	3.2	3.3	3.3	3.3	3.4	3.6	3.9	3.9	4.3	4.6	4.8
-60 to -40(ref.)	3.0	3.0	3.1	3.2	3.3	3.4	3.4	3.4	3.6	3.7	4.0	4.0	4.4	4.7	4.9
-70 to -60(ref.)	3.2	3.2	3.3	3.4	3.5	3.6	3.6	3.6	3.7	3.9	4.2	4.2	4.5	4.8	5.0

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.2	2.2	2.4	2.5	2.6	2.7	2.7	2.8	2.9	3.1	3.5	3.6	4.0	4.4	4.7
60 to 80	2.0	2.0	2.1	2.3	2.4	2.5	2.5	2.5	2.7	2.9	3.3	3.3	3.7	4.2	4.4
40 to 60	1.7	1.7	1.9	2.0	2.1	2.2	2.2	2.2	2.4	2.6	2.9	3.0	3.4	3.8	4.0
20～40	1.4	1.5	1.6	1.7	1.8	1.9	1.9	1.9	2.1	2.3	2.6	2.6	3.0	3.4	3.6
0 to 20	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.6	1.8	1.9	2.3	2.3	2.7	3.0	3.2
-20 to 0	0.9	0.9	1.0	1.1	1.2	1.3	1.3	1.3	1.5	1.6	1.9	2.0	2.3	2.6	2.8
-40 to -20	0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.6	1.6	1.9	2.2	2.4
-60 to -40	0.3	0.3	0.4	0.5	0.6	0.7	0.7	0.7	0.8	1.0	1.2	1.3	1.6	1.9	2.1
-70 to -60	0.1	0.1	0.2	0.3	0.4	0.5	0.5	0.5	0.6	0.7	1.0	1.0	1.3	1.6	1.8

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.34618096E-01
Q1	7.60858750E+01
P2	8.04951206E-02
Q2	1.70486934E-02
P3	2.95434912E-01
Q3	3.64440992E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	2.7
Frac. eq. (ref.)	0.6	2.9

Prod. Freq. (A to F)	F

Similar glass type			
OHARA	S-LAL9	HOYA	LAC9
C.D.G.M	H-LaK59	SCHOTT	N-LAK9

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK10

nd = 1.719990　　ne = 1.723401

ν d = 50.27　　ν e = 50.01

Glass code (d)
720503
Glass code (e)
723500

Spectral l.	Refractive idx
2.058	1.68749
1.970	1.68901
1.530	1.69598
1.129	1.70225
1.064	1.70341
t	1.70438
s	1.70818
A'	1.710805
r	1.713235
C	1.715672
C'	1.716357
He-Ne	1.716996
D	1.719863
d	1.719990
e	1.723401
F	1.729995
F'	1.730821
g	1.737911
h	1.744540
0.389	1.748610
i	1.755962

Coef. disp. form. (pwr ser.)	
A0	2.89571408E+00
A1	-1.20013315E-02
A2	-1.36916169E-04
A3	2.19522159E-02
A4	3.57973143E-04
A5	8.26304425E-06
A6	2.73881720E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.014323
F'-C'	0.014464
C-t	0.011287
C-A'	0.004867
d-C	0.004318
e-C	0.007729
g-d	0.017921
g-F	0.007916
h-g	0.006629
i-g	0.018051
C'-t	0.011972
e-C'	0.007044
F'-e	0.007420
i-F'	0.025141

Relative partial dispersion	
C-t／F-C	0.7880
C-A'／F-C	0.3398
d-C／F-C	0.3015
e-C／F-C	0.5396
g-d／F-C	1.2512
g-F／F-C	0.5527
h-g／F-C	0.4628
i-g／F-C	1.2603
C'-t／F'-C'	0.8277
e-C'／F'-C'	0.4870
F'-e／F'-C'	0.5130
i-F'／F'-C'	1.7382

Deviation of relative partial disp.	
ΔPdC	−0.0073
ΔPgF	0.0016

Specific gravity	3.74

Thermal properties	
CTE(-30,70) [1E-7/℃]	65
CTE(100,300) [1E-7/℃]	82
Tg [℃]	629
At [℃]	664
Ht cndct. [W/m･K]	0.870
Sp. heat [kJ/kg･K]	0.560
Ht diffus. [1E-6 m2/sec]	0.415

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	3
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	629 (6)
Abrasion hardness	100
Young's mod. [GPa]	106.0
Shear mod. [GPa]	40.9
Poisson's ratio	0.295
Stress optical coef. [1E-5 nm/cm／Pa]	2.05

Color Code (80%/5%)	38/31
Internal CC	355/307

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	0.01
310	0.08
320	0.23
330	0.42
340	0.60
350	0.75
360	0.85
365	0.88
370	0.910
380	0.946
390	0.967
400	0.978
420	0.988
440	0.991
460	0.993
480	0.996
500	0.997
550	0.998
600	0.997
650	0.997
700	0.997
800	0.991
900	0.999
1000	0.996
1200	0.999
1400	0.999
1600	0.992
1800	0.979
2000	0.962
2200	0.901
2400	0.72

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.6	3.7	3.9	4.0	4.2	4.3	4.4	4.4	4.6	4.9	5.5	5.5	6.1	6.7	7.2
60 to 80(ref.)	3.6	3.6	3.8	3.9	4.1	4.2	4.3	4.3	4.5	4.8	5.3	5.4	6.0	6.6	7.0
40 to 60	3.5	3.5	3.7	3.8	4.0	4.1	4.1	4.2	4.4	4.7	5.2	5.2	5.8	6.3	6.7
20 to 40	3.4	3.5	3.6	3.8	3.9	4.0	4.1	4.1	4.3	4.6	5.0	5.1	5.6	6.2	6.6
0 to 20	3.4	3.5	3.6	3.7	3.8	4.0	4.0	4.0	4.2	4.5	5.0	5.0	5.5	6.0	6.4
−20 to 0	3.4	3.5	3.6	3.7	3.8	4.0	4.0	4.1	4.2	4.5	4.9	5.0	5.5	6.0	6.3
−40 to −20	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.1	4.3	4.5	5.0	5.0	5.5	5.9	6.3
−60 to −40(ref.)	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.3	4.5	4.7	5.1	5.2	5.6	6.0	6.4
−70 to −60(ref.)	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.5	4.7	4.9	5.3	5.3	5.8	6.2	6.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.6	2.7	2.9	3.0	3.1	3.3	3.3	3.3	3.6	3.8	4.4	4.4	5.0	5.6	6.0
60 to 80	2.4	2.5	2.7	2.8	2.9	3.1	3.1	3.1	3.4	3.6	4.1	4.2	4.8	5.3	5.8
40 to 60	2.2	2.2	2.4	2.5	2.7	2.8	2.8	2.9	3.1	3.3	3.8	3.9	4.4	5.0	5.4
20～40	1.9	2.0	2.2	2.3	2.4	2.5	2.6	2.6	2.8	3.0	3.5	3.6	4.1	4.6	5.0
0 to 20	1.7	1.8	1.9	2.0	2.1	2.3	2.3	2.3	2.5	2.8	3.2	3.3	3.8	4.3	4.6
−20 to 0	1.4	1.5	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.5	2.9	3.0	3.4	3.9	4.2
−40 to −20	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.8	2.0	2.2	2.6	2.7	3.1	3.5	3.8
−60 to −40	1.0	1.0	1.2	1.3	1.4	1.5	1.5	1.5	1.7	1.9	2.3	2.3	2.8	3.2	3.5
−70 to −60	0.8	0.9	1.0	1.1	1.2	1.3	1.3	1.3	1.5	1.7	2.1	2.1	2.5	2.9	3.2

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.18612501E-01
Q1	7.86740795E+01
P2	4.18812526E-02
Q2	2.43324368E-02
P3	3.45358995E-01
Q3	4.99355035E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	2.3
Frac. eq. (ref.)	0.6	2.3

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-LAL10	HOYA	LAC10
C.D.G.M	H-LaK8A	SCHOTT	N-LAK10

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK12

nd = 1.677900　　ne = 1.680819

ν d = 55.35　　ν e = 55.09

Glass code (d)
678554
Glass code (e)
681551

Spectral l.	Refractive idx
2.058	1.64867
1.970	1.65010
1.530	1.65664
1.129	1.66240
1.064	1.66345
t	1.66432
s	1.66767
A'	1.669970
r	1.672081
C	1.674187
C'	1.674777
He-Ne	1.675328
D	1.677791
d	1.677900
e	1.680819
F	1.686435
F'	1.687136
g	1.693135
h	1.698714
0.389	1.702124
i	1.708258

Coef. disp. form. (pwr ser.)	
A0	2.76331704E+00
A1	-1.11612524E-02
A2	-1.29016401E-04
A3	1.84973677E-02
A4	2.56863267E-04
A5	6.55822525E-06
A6	7.62548252E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.012248
F'-C'	0.012359
C-t	0.009872
C-A'	0.004217
d-C	0.003713
e-C	0.006632
g-d	0.015235
g-F	0.006700
h-g	0.005579
i-g	0.015123
C'-t	0.010462
e-C'	0.006042
F'-e	0.006317
i-F'	0.021122

Relative partial dispersion	
C-t／F-C	0.8060
C-A'／F-C	0.3443
d-C／F-C	0.3032
e-C／F-C	0.5415
g-d／F-C	1.2439
g-F／F-C	0.5470
h-g／F-C	0.4555
i-g／F-C	1.2347
C'-t／F'-C'	0.8465
e-C'／F'-C'	0.4889
F'-e／F'-C'	0.5111
i-F'／F'-C'	1.7090

Deviation of relative partial disp.	
ΔPdC	0.0010
ΔPgF	-0.0045

Specific gravity	3.78

Thermal properties	
CTE(-30,70) [1E-7/℃]	78
CTE(100,300) [1E-7/℃]	91
Tg [℃]	640
At [℃]	669
Ht cndct. [W/m･K]	0.803
Sp. heat [kJ/kg･K]	0.527
Ht diffus. [1E-6 m2/sec]	0.402

Chemical properties [class]	
Acid res. (surface)	6
Alkaline detergent res.	4
Climate resistance	2
Water res. (powder)	3
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	497 (5)
Abrasion hardness	144
Young's mod. [GPa]	93.6
Shear mod. [GPa]	36.3
Poisson's ratio	0.291
Stress optical coef. [1E-5 nm/cm／Pa]	2.06

Color Code (80%/5%)	37/30
Internal CC	349/295

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.02
300	0.10
310	0.23
320	0.39
330	0.55
340	0.69
350	0.80
360	0.88
365	0.907
370	0.928
380	0.954
390	0.969
400	0.977
420	0.984
440	0.987
460	0.990
480	0.992
500	0.994
550	0.995
600	0.994
650	0.994
700	0.994
800	0.992
900	0.998
1000	0.996
1200	0.997
1400	0.998
1600	0.992
1800	0.982
2000	0.969
2200	0.921
2400	0.74

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	0.3	0.3	0.4	0.6	0.7	0.8	0.9	0.9	1.1	1.2	1.6	1.7	2.1	2.6	2.8
60 to 80(ref.)	0.2	0.2	0.4	0.5	0.6	0.7	0.8	0.8	1.0	1.1	1.5	1.5	2.0	2.4	2.7
40 to 60	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.7	0.8	1.0	1.4	1.4	1.8	2.3	2.5
20 to 40	0.1	0.1	0.2	0.3	0.5	0.6	0.6	0.6	0.8	0.9	1.3	1.3	1.7	2.1	2.4
0 to 20	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.6	0.7	0.9	1.2	1.3	1.7	2.0	2.3
-20 to 0	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.6	0.7	0.9	1.2	1.2	1.6	2.0	2.2
-40 to -20	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.7	0.8	1.0	1.3	1.3	1.7	2.0	2.2
-60 to -40(ref.)	0.4	0.4	0.5	0.6	0.7	0.8	0.8	0.9	1.0	1.1	1.4	1.5	1.8	2.2	2.4
-70 to -60(ref.)	0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.1	1.2	1.3	1.6	1.7	2.0	2.4	2.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	-0.7	-0.7	-0.6	-0.4	-0.3	-0.2	-0.2	-0.1	0.0	0.2	0.5	0.6	1.0	1.5	1.7
60 to 80	-0.9	-0.9	-0.7	-0.6	-0.5	-0.4	-0.4	-0.3	-0.2	0.0	0.3	0.4	0.8	1.2	1.5
40 to 60	-1.1	-1.1	-1.0	-0.9	-0.8	-0.6	-0.6	-0.6	-0.4	-0.3	0.1	0.1	0.5	0.9	1.2
20～40	-1.4	-1.3	-1.2	-1.1	-1.0	-0.9	-0.9	-0.8	-0.7	-0.5	-0.2	-0.2	0.2	0.6	0.8
0 to 20	-1.6	-1.6	-1.4	-1.3	-1.2	-1.1	-1.1	-1.1	-1.0	-0.8	-0.5	-0.4	-0.1	0.3	0.5
-20 to 0	-1.8	-1.8	-1.7	-1.6	-1.5	-1.4	-1.4	-1.3	-1.2	-1.1	-0.8	-0.7	-0.4	0.0	0.2
-40 to -20	-2.1	-2.0	-1.9	-1.8	-1.7	-1.6	-1.6	-1.6	-1.5	-1.3	-1.0	-1.0	-0.6	-0.3	-0.1
-60 to -40	-2.3	-2.3	-2.2	-2.1	-2.0	-1.9	-1.9	-1.8	-1.7	-1.6	-1.3	-1.3	-0.9	-0.6	-0.4
-70 to -60	-2.5	-2.4	-2.3	-2.2	-2.2	-2.1	-2.1	-2.0	-1.9	-1.8	-1.5	-1.5	-1.2	-0.9	-0.7

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.18309052E-01
Q1	7.97713112E+01
P2	4.45527521E-02
Q2	2.07866430E-02
P3	3.25656493E-01
Q3	4.64629751E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	3.3
Frac. eq. (ref.)	0.5	3.3

Prod. Freq. (A to F)	E

Similar glass type			
OHARA	S-LAL12	HOYA	LAC12
C.D.G.M	H-LaK5A	SCHOTT	N-LAK12

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK13

nd = 1.693500　　ne = 1.696606

νd = 53.21　　νe = 52.96

Glass code (d)
694532
Glass code (e)
697530

Spectral l.	Refractive idx
2.058	1.66203
1.970	1.66360
1.530	1.67073
1.129	1.67697
1.064	1.67809
t	1.67903
s	1.68261
A'	1.685063
r	1.687310
C	1.689551
C'	1.690178
He-Ne	1.690764
D	1.693384
d	1.693500
e	1.696606
F	1.702585
F'	1.703332
g	1.709727
h	1.715682
0.389	1.719326
i	1.725887

Coef. disp. form. (pwr ser.)	
A0	2.81256049E+00
A1	-1.23338559E-02
A2	-1.46274016E-04
A3	1.96331804E-02
A4	3.19216380E-04
A5	3.67504765E-06
A6	2.77132755E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.013034
F'-C'	0.013154
C-t	0.010526
C-A'	0.004488
d-C	0.003949
e-C	0.007055
g-d	0.016227
g-F	0.007142
h-g	0.005955
i-g	0.016160
C'-t	0.011153
e-C'	0.006428
F'-e	0.006726
i-F'	0.022555

Relative partial dispersion	
C-t／F-C	0.8076
C-A'／F-C	0.3443
d-C／F-C	0.3030
e-C／F-C	0.5413
g-d／F-C	1.2450
g-F／F-C	0.5480
h-g／F-C	0.4569
i-g／F-C	1.2398
C'-t／F'-C'	0.8479
e-C'／F'-C'	0.4887
F'-e／F'-C'	0.5113
i-F'／F'-C'	1.7147

Deviation of relative partial disp.	
ΔPdC	0.0018
ΔPgF	-0.0071

Specific gravity	3.69

Thermal properties	
CTE(-30,70) [1E-7/℃]	60
CTE(100,300) [1E-7/℃]	74
Tg [℃]	619
At [℃]	653
Ht cndct. [W/m･K]	0.876
Sp. heat [kJ/kg･K]	0.599
Ht diffus. [1E-6 m2/sec]	0.396

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	4
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	618 (6)
Abrasion hardness	124
Young's mod. [GPa]	102.3
Shear mod. [GPa]	39.6
Poisson's ratio	0.292
Stress optical coef. [1E-5 nm/cm／Pa]	2.26

Color Code (80%/5%)	37/29
Internal CC	348/285

Internal trans. (10mm)	
λ [nm]	τ
280	0.03
290	0.08
300	0.16
310	0.27
320	0.42
330	0.57
340	0.71
350	0.81
360	0.89
365	0.910
370	0.931
380	0.958
390	0.971
400	0.979
420	0.985
440	0.988
460	0.990
480	0.991
500	0.992
550	0.992
600	0.993
650	0.993
700	0.994
800	0.992
900	0.991
1000	0.993
1200	0.998
1400	0.992
1600	0.988
1800	0.973
2000	0.954
2200	0.88
2400	0.66

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.3	4.4	4.6	4.8	4.9	5.1	5.1	5.1	5.4	5.6	6.1	6.1	6.7	–	–
60 to 80(ref.)	4.2	4.3	4.5	4.6	4.8	4.9	5.0	5.0	5.2	5.4	5.9	6.0	6.5	–	–
40 to 60	4.1	4.1	4.3	4.5	4.6	4.7	4.8	4.8	5.0	5.2	5.7	5.7	6.3	–	–
20 to 40	3.9	4.0	4.2	4.3	4.5	4.6	4.6	4.7	4.9	5.1	5.5	5.6	6.1	–	–
0 to 20	3.9	3.9	4.1	4.2	4.4	4.5	4.5	4.6	4.7	4.9	5.4	5.4	5.9	–	–
-20 to 0	3.8	3.9	4.1	4.2	4.3	4.4	4.5	4.5	4.7	4.9	5.3	5.3	5.8	–	–
-40 to -20	3.9	3.9	4.1	4.2	4.3	4.5	4.5	4.5	4.7	4.9	5.2	5.3	5.7	–	–
-60 to -40(ref.)	4.0	4.1	4.2	4.3	4.5	4.6	4.6	4.6	4.8	5.0	5.3	5.4	5.8	–	–
-70 to -60(ref.)	4.2	4.2	4.4	4.5	4.6	4.7	4.8	4.8	4.9	5.1	5.5	5.5	5.9	–	–

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.3	3.4	3.6	3.7	3.9	4.0	4.1	4.1	4.3	4.5	5.0	5.1	5.6	–	–
60 to 80	3.1	3.1	3.3	3.5	3.6	3.8	3.8	3.9	4.1	4.3	4.7	4.8	5.3	–	–
40 to 60	2.8	2.8	3.0	3.2	3.3	3.5	3.5	3.5	3.7	3.9	4.4	4.4	5.0	–	–
20～40	2.5	2.6	2.7	2.9	3.0	3.1	3.2	3.2	3.4	3.6	4.0	4.1	4.6	–	–
0 to 20	2.2	2.3	2.4	2.6	2.7	2.8	2.9	2.9	3.1	3.2	3.6	3.7	4.2	–	–
-20 to 0	1.9	2.0	2.1	2.3	2.4	2.5	2.5	2.6	2.7	2.9	3.3	3.3	3.8	–	–
-40 to -20	1.6	1.7	1.8	2.0	2.1	2.2	2.2	2.2	2.4	2.6	2.9	3.0	3.4	–	–
-60 to -40	1.3	1.4	1.5	1.6	1.8	1.9	1.9	1.9	2.1	2.2	2.6	2.6	3.0	–	–
-70 to -60	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.7	1.8	2.0	2.3	2.3	2.7	–	–

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.16019105E-01
Q1	7.26275723E+01
P2	6.52063855E-02
Q2	1.91186180E-02
P3	3.11433626E-01
Q3	4.17724888E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	2.6
Frac. eq. (ref.)	0.4	2.6

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-LAL13	HOYA	LAC13
C.D.G.M	H-LaK6A	SCHOTT	LAKL13

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK14

nd = 1.696800 ne = 1.699792

ν d = 55.52 ν e = 55.30

Glass code (d)
697555
Glass code (e)
700553

Spectral l.	Refractive idx
2.058	1.66396
1.970	1.66573
1.530	1.67367
1.129	1.68037
1.064	1.68155
t	1.68251
s	1.68615
A'	1.688581
r	1.690789
C	1.692974
C'	1.693585
He-Ne	1.694153
D	1.696688
d	1.696800
e	1.699792
F	1.705525
F'	1.706239
g	1.712340
h	1.718001
0.389	1.721457
i	1.727665

Coef. disp. form. (pwr ser.)	
A0	2.82679870E+00
A1	-1.40346783E-02
A2	-1.70936348E-04
A3	1.89011366E-02
A4	2.75933670E-04
A5	5.15919094E-06
A6	9.87059817E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.012551
F'-C'	0.012654
C-t	0.010465
C-A'	0.004393
d-C	0.003826
e-C	0.006818
g-d	0.015540
g-F	0.006815
h-g	0.005661
i-g	0.015325
C'-t	0.011076
e-C'	0.006207
F'-e	0.006447
i-F'	0.021426

Relative partial dispersion	
C-t／F-C	0.8338
C-A'／F-C	0.3500
d-C／F-C	0.3048
e-C／F-C	0.5432
g-d／F-C	1.2381
g-F／F-C	0.5430
h-g／F-C	0.4510
i-g／F-C	1.2210
C'-t／F'-C'	0.8753
e-C'／F'-C'	0.4905
F'-e／F'-C'	0.5095
i-F'／F'-C'	1.6932

Deviation of relative partial disp.	
ΔPdC	0.0026
ΔPgF	-0.0082

Specific gravity	3.63

Thermal properties	
CTE(-30,70) [1E-7/℃]	56
CTE(100,300) [1E-7/℃]	70
Tg [℃]	662
At [℃]	686
Ht cndct. [W/m･K]	0.971
Sp. heat [kJ/kg･K]	0.610
Ht diffus. [1E-6 m2/sec]	0.437

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	4
Climate resistance	2
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	644 (6)
Abrasion hardness	114
Young's mod. [GPa]	109.0
Shear mod. [GPa]	42.3
Poisson's ratio	0.289
Stress optical coef. [1E-5 nm/cm／Pa]	1.90

Color Code (80%/5%)	37/29
Internal CC	349/285

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.11
300	0.18
310	0.29
320	0.43
330	0.58
340	0.71
350	0.81
360	0.88
365	0.904
370	0.927
380	0.953
390	0.968
400	0.977
420	0.985
440	0.989
460	0.991
480	0.993
500	0.994
550	0.995
600	0.995
650	0.994
700	0.993
800	0.990
900	0.995
1000	0.996
1200	0.998
1400	0.997
1600	0.992
1800	0.980
2000	0.958
2200	0.88
2400	0.61

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.1	3.2	3.3	3.5	3.6	3.7	3.7	3.8	3.9	4.1	4.4	4.5	4.9	5.3	5.6
60 to 80(ref.)	3.0	3.1	3.2	3.3	3.5	3.6	3.6	3.6	3.8	4.0	4.3	4.4	4.8	5.2	5.4
40 to 60	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.5	3.6	3.8	4.2	4.2	4.6	5.0	5.2
20 to 40	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.4	3.5	3.7	4.0	4.1	4.4	4.8	5.1
0 to 20	2.8	2.8	3.0	3.1	3.2	3.3	3.3	3.3	3.5	3.6	3.9	4.0	4.3	4.7	5.0
-20 to 0	2.8	2.8	3.0	3.1	3.2	3.3	3.3	3.3	3.4	3.6	3.9	3.9	4.3	4.7	4.9
-40 to -20	2.8	2.9	3.0	3.1	3.2	3.3	3.3	3.4	3.5	3.6	3.9	4.0	4.3	4.7	4.9
-60 to -40(ref.)	3.0	3.0	3.2	3.3	3.4	3.5	3.5	3.5	3.6	3.8	4.1	4.1	4.5	4.8	5.0
-70 to -60(ref.)	3.2	3.2	3.4	3.5	3.6	3.7	3.7	3.7	3.8	4.0	4.3	4.3	4.6	5.0	5.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.1	2.1	2.3	2.4	2.5	2.6	2.7	2.7	2.8	3.0	3.4	3.4	3.8	4.2	4.5
60 to 80	1.9	1.9	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.8	3.1	3.2	3.6	4.0	4.2
40 to 60	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.5	2.8	2.9	3.3	3.6	3.9
20～40	1.4	1.4	1.6	1.7	1.8	1.9	1.9	1.9	2.1	2.2	2.5	2.6	2.9	3.3	3.5
0 to 20	1.1	1.1	1.3	1.4	1.5	1.6	1.6	1.6	1.8	1.9	2.2	2.3	2.6	3.0	3.2
-20 to 0	0.8	0.9	1.0	1.1	1.2	1.3	1.3	1.4	1.5	1.6	1.9	2.0	2.3	2.6	2.9
-40 to -20	0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.1	1.2	1.3	1.6	1.6	2.0	2.3	2.5
-60 to -40	0.3	0.4	0.5	0.6	0.7	0.7	0.8	0.8	0.9	1.0	1.3	1.3	1.7	2.0	2.2
-70 to -60	0.1	0.2	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.8	1.1	1.1	1.4	1.7	1.9

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.29541724E-01
Q1	7.14831691E+01
P2	9.73740252E-02
Q2	1.55700037E-02
P3	2.81115754E-01
Q3	3.25551411E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	4.0
Frac. eq. (ref.)	0.7	4.1

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-LAL14	HOYA	LAC14
C.D.G.M	H-LaK51	SCHOTT	N-LAK14

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK18

nd = 1.729160 ne = 1.732343

ν d = 54.61 ν e = 54.39

Glass code (d)
729546
Glass code (e)
732544

Spectral l.	Refractive idx
2.058	1.69519
1.970	1.69698
1.530	1.70502
1.129	1.71188
1.064	1.71309
t	1.71409
s	1.71789
A'	1.720449
r	1.722782
C	1.725097
C'	1.725745
He-Ne	1.726348
D	1.729041
d	1.729160
e	1.732343
F	1.738449
F'	1.739210
g	1.745716
h	1.751757
0.389	1.755445
i	1.762072

Coef. disp. form. (pwr ser.)	
A0	2.93263885E+00
A1	-1.42564324E-02
A2	-1.92506617E-04
A3	2.06017616E-02
A4	2.93008969E-04
A5	6.61918495E-06
A6	7.33494598E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.013352
F'-C'	0.013465
C-t	0.011009
C-A'	0.004648
d-C	0.004063
e-C	0.007246
g-d	0.016556
g-F	0.007267
h-g	0.006041
i-g	0.016356
C'-t	0.011657
e-C'	0.006598
F'-e	0.006867
i-F'	0.022862

Relative partial dispersion	
C-t／F-C	0.8245
C-A'／F-C	0.3481
d-C／F-C	0.3043
e-C／F-C	0.5427
g-d／F-C	1.2400
g-F／F-C	0.5443
h-g／F-C	0.4524
i-g／F-C	1.2250
C'-t／F'-C'	0.8657
e-C'／F'-C'	0.4900
F'-e／F'-C'	0.5100
i-F'／F'-C'	1.6979

Deviation of relative partial disp.	
ΔPdC	0.0024
ΔPgF	-0.0085

Specific gravity	4.17

Thermal properties	
CTE(-30,70) [1E-7/℃]	56
CTE(100,300) [1E-7/℃]	70
Tg [℃]	668
At [℃]	694
Ht cndct. [W/m･K]	0.876
Sp. heat [kJ/kg･K]	0.525
Ht diffus. [1E-6 m2/sec]	0.400

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	3
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	738 (7)
Abrasion hardness	68
Young's mod. [GPa]	118.7
Shear mod. [GPa]	46.0
Poisson's ratio	0.292
Stress optical coef. [1E-5 nm/cm／Pa]	1.68

Color Code (80%/5%)	37/29
Internal CC	343/288
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.08
300	0.22
310	0.33
320	0.54
330	0.67
340	0.78
350	0.85
360	0.907
365	0.928
370	0.943
380	0.962
390	0.975
400	0.981
420	0.988
440	0.991
460	0.993
480	0.994
500	0.995
550	0.996
600	0.995
650	0.995
700	0.994
800	0.990
900	0.996
1000	0.993
1200	0.996
1400	0.992
1600	0.988
1800	0.979
2000	0.953
2200	0.87
2400	0.60

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.5	3.6	3.7	3.9	4.0	4.1	4.2	4.2	4.4	4.6	4.9	5.0	5.4	5.8	6.1
60 to 80(ref.)	3.4	3.5	3.7	3.8	3.9	4.0	4.0	4.1	4.2	4.4	4.8	4.8	5.3	5.7	6.0
40 to 60	3.3	3.3	3.5	3.6	3.7	3.9	3.9	3.9	4.1	4.3	4.6	4.7	5.1	5.5	5.8
20 to 40	3.2	3.2	3.4	3.5	3.6	3.8	3.8	3.8	4.0	4.2	4.5	4.6	5.0	5.4	5.6
0 to 20	3.1	3.2	3.3	3.5	3.6	3.7	3.7	3.8	3.9	4.1	4.4	4.5	4.9	5.3	5.5
-20 to 0	3.1	3.2	3.3	3.5	3.6	3.7	3.7	3.8	3.9	4.1	4.4	4.5	4.8	5.2	5.5
-40 to -20	3.2	3.2	3.4	3.5	3.6	3.7	3.8	3.8	3.9	4.1	4.4	4.5	4.9	5.2	5.5
-60 to -40(ref.)	3.4	3.4	3.6	3.7	3.8	3.9	3.9	4.0	4.1	4.3	4.6	4.6	5.0	5.4	5.6
-70 to -60(ref.)	3.6	3.6	3.8	3.9	4.0	4.1	4.1	4.2	4.3	4.5	4.8	4.8	5.2	5.6	5.8

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.5	2.5	2.7	2.8	2.9	3.1	3.1	3.1	3.3	3.5	3.8	3.9	4.3	4.7	5.0
60 to 80	2.3	2.3	2.5	2.6	2.7	2.8	2.9	2.9	3.1	3.2	3.6	3.7	4.1	4.5	4.7
40 to 60	2.0	2.0	2.2	2.3	2.4	2.6	2.6	2.6	2.8	2.9	3.3	3.3	3.7	4.1	4.4
20～40	1.7	1.8	1.9	2.0	2.2	2.3	2.3	2.3	2.5	2.6	3.0	3.0	3.4	3.8	4.1
0 to 20	1.4	1.5	1.6	1.8	1.9	2.0	2.0	2.0	2.2	2.4	2.7	2.7	3.1	3.5	3.7
-20 to 0	1.2	1.2	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.1	2.4	2.4	2.8	3.2	3.4
-40 to -20	0.9	0.9	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.8	2.1	2.1	2.5	2.8	3.1
-60 to -40	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.2	1.3	1.5	1.8	1.8	2.1	2.5	2.7
-70 to -60	0.4	0.5	0.6	0.7	0.8	0.9	0.9	1.0	1.1	1.2	1.5	1.6	1.9	2.2	2.5

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.18293410E-01
Q1	6.70082181E+01
P2	7.73335459E-02
Q2	1.69418126E-02
P3	3.14497232E-01
Q3	3.89398254E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	6.6
Frac. eq. (ref.)	0.7	7.0

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-LAL18	HOYA	TAC8
C.D.G.M	H-LaK52	SCHOTT	N-LAK34

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK01

nd = 1.640000　　ne = 1.642536

νd = 60.20　　νe = 59.99

Glass code (d)
640602
Glass code (e)
643600

Spectral l.	Refractive idx
2.058	1.61017
1.970	1.61186
1.530	1.61943
1.129	1.62567
1.064	1.62673
t	1.62760
s	1.63083
A'	1.632955
r	1.634863
C	1.636739
C'	1.637261
He-Ne	1.637746
D	1.639905
d	1.640000
e	1.642536
F	1.647371
F'	1.647972
g	1.653088
h	1.657818
0.389	1.660696
i	1.665852

Coef. disp. form. (pwr ser.)	
A0	2.64746203E+00
A1	-1.31056736E-02
A2	-1.66347533E-04
A3	1.55169536E-02
A4	1.92870468E-04
A5	4.84379496E-06
A6	-7.97499057E-09
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.010632
F'-C'	0.010711
C-t	0.009136
C-A'	0.003784
d-C	0.003261
e-C	0.005797
g-d	0.013088
g-F	0.005717
h-g	0.004730
i-g	0.012764
C'-t	0.009658
e-C'	0.005275
F'-e	0.005436
i-F'	0.017880

Relative partial dispersion	
C-t／F-C	0.8593
C-A'／F-C	0.3559
d-C／F-C	0.3067
e-C／F-C	0.5452
g-d／F-C	1.2310
g-F／F-C	0.5377
h-g／F-C	0.4449
i-g／F-C	1.2005
C'-t／F'-C'	0.9017
e-C'／F'-C'	0.4925
F'-e／F'-C'	0.5075
i-F'／F'-C'	1.6693

Deviation of relative partial disp.	
ΔPdC	0.0023
ΔPgF	-0.0056

Specific gravity	3.01

Thermal properties	
CTE(-30,70) [1E-7/℃]	60
CTE(100,300) [1E-7/℃]	77
Tg [℃]	655
At [℃]	679
Ht cndct. [W/m･K]	1.170
Sp. heat [kJ/kg･K]	0.775
Ht diffus. [1E-6 m2/sec]	0.501

Chemical properties [class]	
Acid res. (surface)	6
Alkaline detergent res.	4
Climate resistance	4
Water res. (powder)	4
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	622 (6)
Abrasion hardness	92
Young's mod. [GPa]	131.6
Shear mod. [GPa]	49.7
Poisson's ratio	0.323
Stress optical coef. [1E-5 nm/cm／Pa]	2.22

Color Code (80%/5%)	37/30
Internal CC	357/303

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.01
300	0.03
310	0.10
320	0.23
330	0.40
340	0.58
350	0.72
360	0.83
365	0.87
370	0.900
380	0.939
390	0.961
400	0.975
420	0.985
440	0.989
460	0.992
480	0.994
500	0.995
550	0.995
600	0.993
650	0.993
700	0.993
800	0.988
900	0.996
1000	0.994
1200	0.998
1400	0.993
1600	0.990
1800	0.976
2000	0.955
2200	0.87
2400	0.62

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.9	2.9	3.0	3.1	3.2	3.3	3.4	3.4	3.5	3.7	4.0	4.0	4.4	4.8	5.0
60 to 80(ref.)	2.8	2.8	2.9	3.0	3.1	3.2	3.2	3.3	3.4	3.5	3.9	3.9	4.3	4.6	4.8
40 to 60	2.7	2.7	2.8	2.9	3.0	3.1	3.1	3.1	3.2	3.4	3.7	3.7	4.1	4.4	4.6
20 to 40	2.6	2.6	2.7	2.8	2.9	3.0	3.0	3.0	3.1	3.3	3.6	3.6	3.9	4.2	4.4
0 to 20	2.5	2.5	2.6	2.7	2.8	2.9	2.9	2.9	3.0	3.2	3.5	3.5	3.8	4.1	4.3
-20 to 0	2.5	2.5	2.6	2.7	2.8	2.8	2.9	2.9	3.0	3.1	3.4	3.4	3.7	4.0	4.2
-40 to -20	2.5	2.6	2.6	2.7	2.8	2.9	2.9	2.9	3.0	3.2	3.4	3.5	3.7	4.0	4.2
-60 to -40(ref.)	2.7	2.7	2.8	2.9	2.9	3.0	3.0	3.1	3.2	3.3	3.5	3.6	3.8	4.1	4.3
-70 to -60(ref.)	2.9	2.9	3.0	3.0	3.1	3.2	3.2	3.2	3.3	3.4	3.7	3.7	4.0	4.3	4.4

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.5	2.7	3.0	3.0	3.4	3.7	3.9
60 to 80	1.7	1.7	1.8	1.9	2.0	2.1	2.1	2.2	2.3	2.4	2.7	2.8	3.1	3.5	3.6
40 to 60	1.4	1.5	1.5	1.6	1.7	1.8	1.8	1.9	2.0	2.1	2.4	2.5	2.8	3.1	3.3
20～40	1.2	1.2	1.3	1.4	1.4	1.5	1.6	1.6	1.7	1.8	2.1	2.1	2.5	2.8	2.9
0 to 20	0.9	0.9	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.5	1.8	1.8	2.1	2.4	2.6
-20 to 0	0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.0	1.1	1.2	1.5	1.5	1.8	2.1	2.2
-40 to -20	0.4	0.4	0.4	0.5	0.6	0.7	0.7	0.7	0.8	0.9	1.2	1.2	1.5	1.7	1.9
-60 to -40	0.1	0.1	0.2	0.2	0.3	0.4	0.4	0.4	0.5	0.6	0.8	0.9	1.1	1.4	1.5
-70 to -60	-0.1	-0.1	0.0	0.0	0.1	0.2	0.2	0.2	0.3	0.4	0.6	0.6	0.9	1.1	1.3

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.29784042E-01
Q1	7.09731124E+01
P2	7.95375652E-02
Q2	1.51159467E-02
P3	2.74972273E-01
Q3	3.44195443E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	1.3
Frac. eq. (ref.)	0.4	1.5

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-BSM81	HOYA	LACL60
C.D.G.M	H-LaK4L	SCHOTT	N-LAK21

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK02

nd = 1.670000　　ne = 1.672786

νd = 57.35　　νe = 57.12

Glass code (d)
670574
Glass code (e)
673571

Spectral l.	Refractive idx
2.058	1.64015
1.970	1.64172
1.530	1.64880
1.129	1.65483
1.064	1.65589
t	1.65677
s	1.66011
A'	1.662360
r	1.664409
C	1.666440
C'	1.667008
He-Ne	1.667537
D	1.669896
d	1.670000
e	1.672786
F	1.678123
F'	1.678787
g	1.684465
h	1.689730
0.389	1.692942
i	1.698708

Coef. disp. form. (pwr ser.)	
A0	2.74008995E+00
A1	-1.20461104E-02
A2	-1.75410927E-04
A3	1.76614454E-02
A4	1.89317290E-04
A5	1.04494737E-05
A6	-1.62215193E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.011683
F'-C'	0.011779
C-t	0.009670
C-A'	0.004080
d-C	0.003560
e-C	0.006346
g-d	0.014465
g-F	0.006342
h-g	0.005265
i-g	0.014243
C'-t	0.010238
e-C'	0.005778
F'-e	0.006001
i-F'	0.019921

Relative partial dispersion	
C-t／F-C	0.8277
C-A'／F-C	0.3492
d-C／F-C	0.3047
e-C／F-C	0.5432
g-d／F-C	1.2381
g-F／F-C	0.5428
h-g／F-C	0.4507
i-g／F-C	1.2191
C'-t／F'-C'	0.8692
e-C'／F'-C'	0.4905
F'-e／F'-C'	0.5095
i-F'／F'-C'	1.6912

Deviation of relative partial disp.	
ΔPdC	0.0016
ΔPgF	-0.0053

Specific gravity	3.75

Thermal properties	
CTE(-30,70) [1E-7/℃]	63
CTE(100,300) [1E-7/℃]	78
Tg [℃]	645
At [℃]	675
Ht cndct. [W/m･K]	0.788
Sp. heat [kJ/kg･K]	0.532
Ht diffus. [1E-6 m2/sec]	0.395

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	4
Climate resistance	2
Water res. (powder)	3
Acid res. (powder)	5

Mechanical properties	
Knoop hardness	631 (6)
Abrasion hardness	139
Young's mod. [GPa]	96.6
Shear mod. [GPa]	37.6
Poisson's ratio	0.283
Stress optical coef. [1E-5 nm/cm／Pa]	1.87

Color Code (80%/5%)	36/29
Internal CC	343/286

Internal trans. (10mm)	
λ [nm]	τ
280	0.02
290	0.08
300	0.19
310	0.34
320	0.50
330	0.65
340	0.77
350	0.86
360	0.912
365	0.932
370	0.947
380	0.966
390	0.978
400	0.983
420	0.988
440	0.990
460	0.992
480	0.994
500	0.995
550	0.996
600	0.996
650	0.995
700	0.994
800	0.991
900	0.997
1000	0.996
1200	0.997
1400	0.992
1600	0.988
1800	0.975
2000	0.954
2200	0.86
2400	0.65

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	1.4	1.4	1.5	1.7	1.8	1.9	1.9	2.0	2.1	2.3	2.6	2.6	3.0	3.4	3.6
60 to 80(ref.)	1.3	1.3	1.5	1.6	1.7	1.8	1.8	1.9	2.0	2.2	2.5	2.5	2.9	3.2	3.5
40 to 60	1.2	1.3	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.1	2.4	2.4	2.8	3.1	3.3
20 to 40	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.7	1.8	2.0	2.3	2.3	2.7	3.0	3.2
0 to 20	1.2	1.2	1.3	1.4	1.5	1.6	1.6	1.7	1.8	1.9	2.2	2.3	2.6	2.9	3.1
-20 to 0	1.2	1.2	1.4	1.5	1.5	1.6	1.7	1.7	1.8	1.9	2.2	2.3	2.6	2.9	3.1
-40 to -20	1.3	1.3	1.5	1.6	1.6	1.7	1.8	1.8	1.9	2.0	2.3	2.3	2.6	2.9	3.1
-60 to -40(ref.)	1.5	1.5	1.6	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.5	2.5	2.8	3.1	3.3
-70 to -60(ref.)	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.2	2.3	2.4	2.7	2.7	3.0	3.3	3.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	0.4	0.4	0.5	0.6	0.8	0.9	0.9	0.9	1.1	1.2	1.5	1.6	1.9	2.3	2.5
60 to 80	0.2	0.2	0.4	0.5	0.6	0.7	0.7	0.7	0.9	1.0	1.3	1.4	1.7	2.1	2.3
40 to 60	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.8	1.1	1.1	1.4	1.8	2.0
20～40	-0.3	-0.2	-0.1	0.0	0.1	0.2	0.2	0.2	0.4	0.5	0.8	0.8	1.2	1.5	1.7
0 to 20	-0.5	-0.4	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.1	0.3	0.5	0.6	0.9	1.2	1.4
-20 to 0	-0.7	-0.7	-0.5	-0.5	-0.4	-0.3	-0.3	-0.2	-0.1	0.0	0.3	0.3	0.6	0.9	1.1
-40 to -20	-0.9	-0.9	-0.8	-0.7	-0.6	-0.5	-0.5	-0.5	-0.4	-0.2	0.0	0.0	0.3	0.6	0.8
-60 to -40	-1.2	-1.1	-1.0	-0.9	-0.8	-0.8	-0.7	-0.7	-0.6	-0.5	-0.3	-0.2	0.0	0.3	0.5
-70 to -60	-1.3	-1.3	-1.2	-1.1	-1.0	-0.9	-0.9	-0.9	-0.8	-0.7	-0.5	-0.4	-0.2	0.1	0.3

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.16396191E-01
Q1	7.13715725E+01
P2	2.60772282E-02
Q2	2.34562516E-02
P3	3.41070979E-01
Q3	5.05461332E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	9.8
Frac. eq. (ref.)	0.7	10.2

Prod. Freq. (A to F)	E

Similar glass type			
OHARA		HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK04

nd = 1.651000　　ne = 1.653760

νd = 56.24　　νe = 55.98

Glass code (d)
651562
Glass code (e)
654560

Spectral l.	Refractive idx
2.058	1.62280
1.970	1.62421
1.530	1.63062
1.129	1.63623
1.064	1.63724
t	1.63808
s	1.64129
A'	1.643482
r	1.645487
C	1.647485
C'	1.648044
He-Ne	1.648566
D	1.650897
d	1.651000
e	1.653760
F	1.659061
F'	1.659722
g	1.665373
h	1.670621
0.389	1.673825
i	1.679580

Coef. disp. form. (pwr ser.)	
A0	2.67775568E+00
A1	-1.09363526E-02
A2	-1.12368235E-04
A3	1.71233781E-02
A4	2.57310134E-04
A5	2.54752519E-06
A6	1.89782794E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.011576
F'-C'	0.011678
C-t	0.009409
C-A'	0.004003
d-C	0.003515
e-C	0.006275
g-d	0.014373
g-F	0.006312
h-g	0.005248
i-g	0.014207
C'-t	0.009968
e-C'	0.005716
F'-e	0.005962
i-F'	0.019858

Relative partial dispersion	
C-t／F-C	0.8128
C-A'／F-C	0.3458
d-C／F-C	0.3036
e-C／F-C	0.5421
g-d／F-C	1.2416
g-F／F-C	0.5453
h-g／F-C	0.4534
i-g／F-C	1.2273
C'-t／F'-C'	0.8536
e-C'／F'-C'	0.4895
F'-e／F'-C'	0.5105
i-F'／F'-C'	1.7005

Deviation of relative partial disp.	
ΔPdC	0.0011
ΔPgF	-0.0047

Specific gravity	3.27

Thermal properties	
CTE(-30,70) [1E-7/℃]	66
CTE(100,300) [1E-7/℃]	83
Tg [℃]	647
At [℃]	687
Ht cndct. [W/m･K]	0.979
Sp. heat [kJ/kg･K]	0.636
Ht diffus. [1E-6 m2/sec]	0.471

Chemical properties [class]	
Acid res. (surface)	6
Alkaline detergent res.	4
Climate resistance	2
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	612 (6)
Abrasion hardness	96
Young's mod. [GPa]	100.2
Shear mod. [GPa]	39.0
Poisson's ratio	0.284
Stress optical coef. [1E-5 nm/cm／Pa]	2.04

Color Code (80%/5%)	36/30
Internal CC	346/296

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	0.02
300	0.08
310	0.19
320	0.37
330	0.57
340	0.73
350	0.84
360	0.914
365	0.934
370	0.953
380	0.974
390	0.984
400	0.990
420	0.995
440	0.996
460	0.996
480	0.997
500	0.998
550	0.999
600	0.999
650	0.998
700	0.997
800	0.993
900	0.998
1000	0.997
1200	0.999
1400	0.997
1600	0.992
1800	0.978
2000	0.964
2200	0.900
2400	0.79

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.2	3.2	3.3	3.5	3.6	3.7	3.8	3.8	4.0	4.2	4.6	4.6	5.1	5.6	5.8
60 to 80(ref.)	3.1	3.1	3.3	3.4	3.5	3.6	3.7	3.7	3.9	4.1	4.5	4.5	5.0	5.4	5.7
40 to 60	3.0	3.0	3.2	3.3	3.4	3.5	3.6	3.6	3.7	3.9	4.3	4.4	4.8	5.2	5.5
20 to 40	2.9	2.9	3.1	3.2	3.3	3.4	3.5	3.5	3.7	3.8	4.2	4.2	4.7	5.1	5.3
0 to 20	2.9	2.9	3.0	3.2	3.3	3.4	3.4	3.4	3.6	3.8	4.1	4.2	4.5	4.9	5.2
-20 to 0	2.9	2.9	3.1	3.2	3.3	3.4	3.4	3.4	3.6	3.7	4.1	4.1	4.5	4.9	5.1
-40 to -20	3.0	3.0	3.1	3.2	3.3	3.5	3.5	3.5	3.6	3.8	4.1	4.2	4.5	4.9	5.1
-60 to -40(ref.)	3.2	3.2	3.3	3.4	3.5	3.6	3.6	3.7	3.8	3.9	4.2	4.3	4.6	5.0	5.2
-70 to -60(ref.)	3.4	3.4	3.5	3.6	3.7	3.8	3.8	3.9	4.0	4.1	4.4	4.5	4.8	5.1	5.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.2	2.2	2.3	2.5	2.6	2.7	2.8	2.8	3.0	3.1	3.5	3.6	4.1	4.5	4.8
60 to 80	2.0	2.0	2.2	2.3	2.4	2.5	2.6	2.6	2.8	2.9	3.3	3.4	3.8	4.2	4.5
40 to 60	1.7	1.8	1.9	2.0	2.1	2.3	2.3	2.3	2.5	2.7	3.0	3.1	3.5	3.9	4.2
20～40	1.5	1.5	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.4	2.7	2.8	3.2	3.6	3.8
0 to 20	1.3	1.3	1.4	1.5	1.6	1.7	1.8	1.8	1.9	2.1	2.4	2.5	2.9	3.2	3.5
-20 to 0	1.0	1.1	1.2	1.3	1.4	1.5	1.5	1.5	1.7	1.8	2.1	2.2	2.5	2.9	3.1
-40 to -20	0.8	0.8	0.9	1.0	1.1	1.2	1.2	1.3	1.4	1.5	1.8	1.9	2.2	2.6	2.7
-60 to -40	0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.5	1.6	1.9	2.2	2.4
-70 to -60	0.4	0.4	0.5	0.6	0.7	0.8	0.8	0.8	0.9	1.1	1.3	1.4	1.7	2.0	2.1

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.21788068E-01
Q1	8.13149626E+01
P2	7.22172241E-02
Q2	1.69321714E-02
P3	2.86455337E-01
Q3	3.94241726E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	4.0
Frac. eq. (ref.)	0.4	4.0

Prod. Freq. (A to F)	F

Similar glass type			
OHARA	S-LAL54	HOYA	
C.D.G.M	H-LaK10	SCHOTT	N-LAK22

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK06

nd = 1.677900 ne = 1.681085

ν d = 50.67 ν e = 50.39

Glass code (d)
678507
Glass code (e)
681504

Spectral l.	Refractive idx
2.058	1.64833
1.970	1.64966
1.530	1.65584
1.129	1.66150
1.064	1.66256
t	1.66345
s	1.66693
A'	1.669359
r	1.671612
C	1.673877
C'	1.674514
He-Ne	1.675110
D	1.677781
d	1.677900
e	1.681085
F	1.687256
F'	1.688030
g	1.694688
h	1.700934
0.389	1.704781
i	1.711758

Coef. disp. form. (pwr ser.)	
A0	2.75830673E+00
A1	-1.04979587E-02
A2	-8.63280601E-05
A3	1.98026568E-02
A4	3.88736963E-04
A5	-3.98876195E-07
A6	8.98869177E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.013379
F'-C'	0.013516
C-t	0.010432
C-A'	0.004518
d-C	0.004023
e-C	0.007208
g-d	0.016788
g-F	0.007432
h-g	0.006246
i-g	0.017070
C'-t	0.011069
e-C'	0.006571
F'-e	0.006945
i-F'	0.023728

Relative partial dispersion	
C-t／F-C	0.7797
C-A'／F-C	0.3377
d-C／F-C	0.3007
e-C／F-C	0.5388
g-d／F-C	1.2548
g-F／F-C	0.5555
h-g／F-C	0.4669
i-g／F-C	1.2759
C'-t／F'-C'	0.8190
e-C'／F'-C'	0.4862
F'-e／F'-C'	0.5138
i-F'／F'-C'	1.7555

Deviation of relative partial disp.	
ΔPdC	0.0006
ΔPgF	-0.0038

Specific gravity	3.83

Thermal properties	
CTE(-30,70) [1E-7/℃]	63
CTE(100,300) [1E-7/℃]	75
Tg [℃]	650
At [℃]	690
Ht cndct. [W/m･K]	0.843
Sp. heat [kJ/kg･K]	0.522
Ht diffus. [1E-6 m2/sec]	0.419

Chemical properties [class]	
Acid res. (surface)	6
Alkaline detergent res.	3
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	523 (5)
Abrasion hardness	138
Young's mod. [GPa]	89.5
Shear mod. [GPa]	34.9
Poisson's ratio	0.281
Stress optical coef. [1E-5 nm/cm／Pa]	2.33

Color Code (80%/5%)	38/34
Internal CC	366/335

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	0.01
340	0.16
350	0.47
360	0.71
365	0.79
370	0.85
380	0.913
390	0.949
400	0.967
420	0.982
440	0.987
460	0.989
480	0.992
500	0.994
550	0.996
600	0.995
650	0.995
700	0.995
800	0.991
900	0.997
1000	0.995
1200	0.997
1400	0.993
1600	0.992
1800	0.985
2000	0.974
2200	0.933
2400	0.82

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.4	3.4	3.4	3.8	3.9	4.1	4.1	4.2	4.4	4.6	5.1	5.2	5.7	6.3	6.7
60 to 80(ref.)	3.2	3.3	3.3	3.6	3.8	3.9	4.0	4.0	4.2	4.5	4.9	5.0	5.5	6.1	6.5
40 to 60	3.0	3.1	3.1	3.5	3.6	3.7	3.8	3.8	4.0	4.2	4.7	4.8	5.3	5.8	6.2
20 to 40	2.9	3.0	3.0	3.3	3.4	3.6	3.6	3.6	3.8	4.1	4.5	4.5	5.0	5.5	5.9
0 to 20	2.8	2.9	2.9	3.2	3.3	3.4	3.5	3.5	3.7	3.9	4.3	4.4	4.8	5.3	5.7
-20 to 0	2.8	2.8	2.8	3.1	3.2	3.4	3.4	3.4	3.6	3.8	4.2	4.2	4.7	5.1	5.5
-40 to -20	2.8	2.8	2.8	3.1	3.2	3.4	3.4	3.4	3.6	3.8	4.2	4.2	4.6	5.0	5.4
-60 to -40(ref.)	2.9	3.0	3.0	3.2	3.3	3.4	3.5	3.5	3.7	3.8	4.2	4.2	4.6	5.0	5.4
-70 to -60(ref.)	3.0	3.1	3.1	3.4	3.5	3.6	3.6	3.6	3.8	4.0	4.3	4.4	4.7	5.1	5.4

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.3	2.4	2.4	2.8	2.9	3.0	3.1	3.1	3.3	3.6	4.1	4.1	4.7	5.2	5.7
60 to 80	2.1	2.2	2.2	2.5	2.6	2.8	2.8	2.9	3.1	3.3	3.8	3.8	4.4	4.9	5.3
40 to 60	1.8	1.9	1.9	2.2	2.3	2.5	2.5	2.5	2.7	2.9	3.4	3.4	3.9	4.5	4.8
20～40	1.5	1.5	1.5	1.9	2.0	2.1	2.1	2.2	2.4	2.6	3.0	3.1	3.5	4.0	4.4
0 to 20	1.2	1.2	1.2	1.5	1.6	1.8	1.8	1.8	2.0	2.2	2.6	2.7	3.1	3.6	3.9
-20 to 0	0.9	0.9	0.9	1.2	1.3	1.4	1.5	1.5	1.7	1.9	2.2	2.3	2.7	3.1	3.5
-40 to -20	0.5	0.6	0.6	0.9	1.0	1.1	1.1	1.1	1.3	1.5	1.8	1.9	2.3	2.7	3.0
-60 to -40	0.2	0.3	0.3	0.5	0.6	0.7	0.8	0.8	0.9	1.1	1.5	1.5	1.9	2.2	2.5
-70 to -60	0.0	0.1	0.1	0.3	0.4	0.5	0.5	0.5	0.7	0.8	1.2	1.2	1.5	1.9	2.2

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.21365270E-01
Q1	8.80127306E+01
P2	1.94847920E-02
Q2	3.35885569E-02
P3	3.50024335E-01
Q3	5.68536774E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	2.6
Frac. eq. (ref.)	0.6	2.2

Prod. Freq. (A to F)	F

Similar glass type			
OHARA	S-LAL56	HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK09

nd = 1.734000　　ne = 1.737395

νd = 51.51　　νe = 51.28

Glass code (d)
734515
Glass code (e)
737513

Spectral l.	Refractive idx
2.058	1.69915
1.970	1.70092
1.530	1.70893
1.129	1.71586
1.064	1.71710
t	1.71813
s	1.72207
A'	1.724765
r	1.727227
C	1.729680
C'	1.730367
He-Ne	1.731008
D	1.733873
d	1.734000
e	1.737395
F	1.743930
F'	1.744746
g	1.751739
h	1.758257
0.389	1.762247
i	1.769439

Coef. disp. form. (pwr ser.)	
A0	2.94471329E+00
A1	-1.39489672E-02
A2	-2.08989528E-04
A3	2.21246396E-02
A4	2.96283761E-04
A5	1.28986233E-05
A6	-4.34524857E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.014250
F'-C'	0.014379
C-t	0.011553
C-A'	0.004915
d-C	0.004320
e-C	0.007715
g-d	0.017739
g-F	0.007809
h-g	0.006518
i-g	0.017700
C'-t	0.012240
e-C'	0.007028
F'-e	0.007351
i-F'	0.024693

Relative partial dispersion	
C-t／F-C	0.8107
C-A'／F-C	0.3449
d-C／F-C	0.3032
e-C／F-C	0.5414
g-d／F-C	1.2448
g-F／F-C	0.5480
h-g／F-C	0.4574
i-g／F-C	1.2421
C'-t／F'-C'	0.8512
e-C'／F'-C'	0.4888
F'-e／F'-C'	0.5112
i-F'／F'-C'	1.7173

Deviation of relative partial disp.	
ΔPdC	0.0027
ΔPgF	-0.0099

Specific gravity	4.00

Thermal properties	
CTE(-30,70) [1E-7/℃]	49
CTE(100,300) [1E-7/℃]	63
Tg [℃]	640
At [℃]	670
Ht cndct. [W/m･K]	0.851
Sp. heat [kJ/kg･K]	0.546
Ht diffus. [1E-6 m2/sec]	0.389

Chemical properties [class]	
Acid res. (surface)	2
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	666 (7)
Abrasion hardness	70
Young's mod. [GPa]	97.7
Shear mod. [GPa]	37.7
Poisson's ratio	0.297
Stress optical coef. [1E-5 nm/cm／Pa]	2.23

Color Code (80%/5%)	37/28
Internal CC	346/283

Internal trans. (10mm)	
λ [nm]	τ
280	0.03
290	0.11
300	0.22
310	0.35
320	0.49
330	0.63
340	0.75
350	0.83
360	0.900
365	0.918
370	0.938
380	0.961
390	0.974
400	0.983
420	0.990
440	0.993
460	0.994
480	0.995
500	0.995
550	0.996
600	0.996
650	0.994
700	0.993
800	0.987
900	0.996
1000	0.996
1200	0.998
1400	0.993
1600	0.989
1800	0.975
2000	0.949
2200	0.86
2400	0.60

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	5.7	5.7	5.9	6.1	6.2	6.4	6.4	6.5	6.7	6.9	7.4	7.4	8.0	8.5	8.8
60 to 80(ref.)	5.6	5.6	5.8	5.9	6.1	6.2	6.2	6.3	6.5	6.7	7.2	7.3	7.8	8.3	8.6
40 to 60	5.4	5.4	5.6	5.7	5.9	6.0	6.1	6.1	6.3	6.5	7.0	7.0	7.5	8.0	8.3
20 to 40	5.3	5.3	5.5	5.6	5.7	5.9	5.9	5.9	6.1	6.3	6.8	6.8	7.3	7.8	8.1
0 to 20	5.2	5.2	5.4	5.5	5.6	5.7	5.8	5.8	6.0	6.2	6.6	6.7	7.1	7.6	7.9
-20 to 0	5.1	5.2	5.3	5.4	5.5	5.7	5.7	5.8	5.9	6.1	6.5	6.6	7.0	7.5	7.7
-40 to -20	5.1	5.1	5.3	5.4	5.6	5.7	5.7	5.8	5.9	6.1	6.5	6.6	7.0	7.4	7.7
-60 to -40(ref.)	5.3	5.3	5.4	5.6	5.7	5.8	5.8	5.9	6.0	6.2	6.6	6.6	7.0	7.4	7.7
-70 to -60(ref.)	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.0	6.2	6.4	6.7	6.8	7.2	7.5	7.8

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	4.6	4.7	4.9	5.0	5.1	5.3	5.3	5.4	5.6	5.8	6.3	6.3	6.9	7.4	7.7
60 to 80	4.4	4.4	4.6	4.8	4.9	5.0	5.1	5.1	5.3	5.5	6.0	6.1	6.6	7.1	7.4
40 to 60	4.1	4.1	4.3	4.4	4.6	4.7	4.7	4.8	5.0	5.2	5.6	5.7	6.2	6.6	7.0
20～40	3.8	3.8	4.0	4.1	4.2	4.4	4.4	4.4	4.6	4.8	5.2	5.3	5.8	6.2	6.5
0 to 20	3.5	3.5	3.7	3.8	3.9	4.0	4.1	4.1	4.3	4.5	4.9	4.9	5.4	5.8	6.1
-20 to 0	3.2	3.2	3.3	3.4	3.6	3.7	3.7	3.8	3.9	4.1	4.5	4.5	5.0	5.4	5.7
-40 to -20	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.4	3.6	3.8	4.1	4.2	4.6	5.0	5.2
-60 to -40	2.5	2.6	2.7	2.8	2.9	3.0	3.0	3.1	3.2	3.4	3.7	3.8	4.2	4.5	4.8
-70 to -60	2.3	2.3	2.4	2.5	2.6	2.8	2.8	2.8	3.0	3.1	3.5	3.5	3.9	4.2	4.5

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.14720056E-01
Q1	6.62725947E+01
P2	3.41846070E-02
Q2	2.44930862E-02
P3	3.59153591E-01
Q3	5.17125611E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	5.1
Frac. eq. (ref.)	0.7	5.4

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-LAL59	HOYA	TAC4
C.D.G.M	H-LaK54	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAK011

nd = 1.741000　　ne = 1.744347

νd = 52.77　　νe = 52.53

Glass code (d)
741528
Glass code (e)
744525

Spectral l.	Refractive idx
2.058	1.70674
1.970	1.70848
1.530	1.71632
1.129	1.72312
1.064	1.72434
t	1.72536
s	1.72924
A'	1.731896
r	1.734323
C	1.736741
C'	1.737418
He-Ne	1.738050
D	1.740875
d	1.741000
e	1.744347
F	1.750784
F'	1.751588
g	1.758468
h	1.764870
0.389	1.768784
i	1.775829

Coef. disp. form. (pwr ser.)	
A0	2.96970289E+00
A1	-1.38160772E-02
A2	-1.88539623E-04
A3	2.18448120E-02
A4	3.20709012E-04
A5	8.12772786E-06
A6	7.94854532E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.014043
F'-C'	0.014170
C-t	0.011384
C-A'	0.004845
d-C	0.004259
e-C	0.007606
g-d	0.017468
g-F	0.007684
h-g	0.006402
i-g	0.017361
C'-t	0.012061
e-C'	0.006929
F'-e	0.007241
i-F'	0.024241

Relative partial dispersion	
C-t／F-C	0.8107
C-A'／F-C	0.3450
d-C／F-C	0.3033
e-C／F-C	0.5416
g-d／F-C	1.2439
g-F／F-C	0.5472
h-g／F-C	0.4559
i-g／F-C	1.2363
C'-t／F'-C'	0.8512
e-C'／F'-C'	0.4890
F'-e／F'-C'	0.5110
i-F'／F'-C'	1.7107

Deviation of relative partial disp.	
ΔPdC	0.0023
ΔPgF	-0.0086

Specific gravity	4.19

Thermal properties	
CTE(-30,70) [1E-7/℃]	53
CTE(100,300) [1E-7/℃]	68
Tg [℃]	655
At [℃]	685
Ht cndct. [W/m･K]	0.910
Sp. heat [kJ/kg･K]	0.540
Ht diffus. [1E-6 m2/sec]	0.403

Chemical properties [class]	
Acid res. (surface)	6
Alkaline detergent res.	3
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	635 (6)
Abrasion hardness	50
Young's mod. [GPa]	101.8
Shear mod. [GPa]	39.2
Poisson's ratio	0.299
Stress optical coef. [1E-5 nm/cm／Pa]	1.82

Color Code (80%/5%)	37/29
Internal CC	346/284

Internal trans. (10mm)	
λ [nm]	τ
280	0.02
290	0.10
300	0.22
310	0.33
320	0.50
330	0.63
340	0.74
350	0.83
360	0.89
365	0.910
370	0.928
380	0.953
390	0.967
400	0.975
420	0.983
440	0.987
460	0.989
480	0.991
500	0.992
550	0.994
600	0.994
650	0.993
700	0.993
800	0.991
900	0.997
1000	0.993
1200	0.996
1400	0.993
1600	0.988
1800	0.977
2000	0.954
2200	0.88
2400	0.63

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.7	4.8	4.9	5.1	5.2	5.4	5.4	5.5	5.7	5.9	6.3	6.4	6.9	7.5	7.8
60 to 80(ref.)	4.6	4.7	4.9	5.0	5.1	5.3	5.3	5.4	5.6	5.8	6.2	6.3	6.8	7.3	7.6
40 to 60	4.5	4.5	4.7	4.9	5.0	5.2	5.2	5.2	5.4	5.6	6.1	6.1	6.6	7.1	7.4
20 to 40	4.4	4.5	4.6	4.8	4.9	5.1	5.1	5.1	5.3	5.5	5.9	6.0	6.5	6.9	7.3
0 to 20	4.4	4.4	4.6	4.7	4.9	5.0	5.0	5.1	5.2	5.4	5.8	5.9	6.4	6.8	7.1
-20 to 0	4.4	4.4	4.6	4.7	4.9	5.0	5.0	5.1	5.2	5.4	5.8	5.9	6.3	6.8	7.1
-40 to -20	4.5	4.5	4.7	4.8	4.9	5.1	5.1	5.1	5.3	5.5	5.8	5.9	6.3	6.8	7.1
-60 to -40(ref.)	4.6	4.7	4.9	5.0	5.1	5.2	5.3	5.3	5.4	5.6	6.0	6.0	6.5	6.9	7.2
-70 to -60(ref.)	4.8	4.9	5.1	5.2	5.3	5.4	5.5	5.5	5.6	5.8	6.2	6.2	6.6	7.1	7.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.6	3.7	3.9	4.0	4.2	4.3	4.4	4.4	4.6	4.8	5.2	5.3	5.8	6.3	6.7
60 to 80	3.4	3.5	3.7	3.8	4.0	4.1	4.1	4.2	4.4	4.6	5.0	5.1	5.6	6.1	6.4
40 to 60	3.2	3.2	3.4	3.6	3.7	3.8	3.9	3.9	4.1	4.3	4.7	4.8	5.2	5.7	6.0
20～40	2.9	3.0	3.2	3.3	3.4	3.5	3.6	3.6	3.8	4.0	4.4	4.4	4.9	5.4	5.7
0 to 20	2.7	2.7	2.9	3.0	3.1	3.3	3.3	3.3	3.5	3.7	4.1	4.1	4.6	5.0	5.3
-20 to 0	2.4	2.5	2.6	2.7	2.9	3.0	3.0	3.1	3.2	3.4	3.8	3.8	4.2	4.7	5.0
-40 to -20	2.1	2.2	2.4	2.5	2.6	2.7	2.7	2.8	2.9	3.1	3.4	3.5	3.9	4.3	4.6
-60 to -40	1.9	1.9	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.8	3.1	3.2	3.6	4.0	4.2
-70 to -60	1.7	1.7	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.6	2.9	2.9	3.3	3.7	4.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.13952119E-01
Q1	6.75478386E+01
P2	7.11110326E-02
Q2	1.82745831E-02
P3	3.25258407E-01
Q3	4.14014530E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	4.5
Frac. eq. (ref.)	0.7	4.4

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-LAL61	HOYA	TAC2
C.D.G.M	H-LaK61	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASKH2

nd = 1.755000 ne = 1.758438

ν d = 52.34 ν e = 52.10

Glass code (d)
755523
Glass code (e)
758521

Spectral l.	Refractive idx
2.058	1.72014
1.970	1.72189
1.530	1.72981
1.129	1.73670
1.064	1.73794
t	1.73898
s	1.74294
A'	1.745658
r	1.748146
C	1.750628
C'	1.751323
He-Ne	1.751971
D	1.754872
d	1.755000
e	1.758438
F	1.765054
F'	1.765879
g	1.772953
h	1.779538
0.389	1.783566
i	1.790817

Coef. disp. form. (pwr ser.)	
A0	3.01618042E+00
A1	-1.39280117E-02
A2	-2.04284446E-04
A3	2.27027519E-02
A4	3.17846393E-04
A5	1.01400049E-05
A6	3.63521536E-08
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.014426
F'-C'	0.014556
C-t	0.011653
C-A'	0.004970
d-C	0.004372
e-C	0.007810
g-d	0.017953
g-F	0.007899
h-g	0.006585
i-g	0.017864
C'-t	0.012348
e-C'	0.007115
F'-e	0.007441
i-F'	0.024938

Relative partial dispersion	
C-t／F-C	0.8078
C-A'／F-C	0.3445
d-C／F-C	0.3031
e-C／F-C	0.5414
g-d／F-C	1.2445
g-F／F-C	0.5476
h-g／F-C	0.4565
i-g／F-C	1.2383
C'-t／F'-C'	0.8483
e-C'／F'-C'	0.4888
F'-e／F'-C'	0.5112
i-F'／F'-C'	1.7132

Deviation of relative partial disp.	
ΔPdC	0.0022
ΔPgF	-0.0090

Specific gravity	4.29

Thermal properties	
CTE(-30,70) [1E-7/℃]	61
CTE(100,300) [1E-7/℃]	72
Tg [℃]	670
At [℃]	697
Ht cndct. [W/m･K]	0.823
Sp. heat [kJ/kg･K]	0.510
Ht diffus. [1E-6 m2/sec]	0.377

Chemical properties [class]	
Acid res. (surface)	2
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	678 (7)
Abrasion hardness	62
Young's mod. [GPa]	118.8
Shear mod. [GPa]	45.8
Poisson's ratio	0.297
Stress optical coef. [1E-5 nm/cm／Pa]	1.82

Color Code (80%/5%)	37/29
Internal CC	347/285

Internal trans. (10mm)	
λ [nm]	τ
280	0.01
290	0.09
300	0.21
310	0.31
320	0.49
330	0.62
340	0.74
350	0.82
360	0.89
365	0.911
370	0.929
380	0.953
390	0.969
400	0.977
420	0.985
440	0.989
460	0.991
480	0.993
500	0.993
550	0.994
600	0.993
650	0.993
700	0.992
800	0.988
900	0.997
1000	0.995
1200	0.998
1400	0.993
1600	0.988
1800	0.974
2000	0.947
2200	0.86
2400	0.61

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.9	3.9	4.1	4.3	4.4	4.5	4.6	4.6	4.8	5.0	5.5	5.6	6.1	6.7	7.0
60 to 80(ref.)	3.8	3.8	4.0	4.1	4.3	4.4	4.4	4.5	4.7	4.9	5.3	5.4	6.0	6.5	6.8
40 to 60	3.6	3.7	3.8	4.0	4.1	4.2	4.3	4.3	4.5	4.7	5.1	5.2	5.7	6.2	6.5
20 to 40	3.5	3.5	3.7	3.8	4.0	4.1	4.1	4.2	4.3	4.5	5.0	5.0	5.5	6.0	6.3
0 to 20	3.4	3.5	3.6	3.8	3.9	4.0	4.0	4.1	4.2	4.4	4.8	4.9	5.4	5.8	6.1
-20 to 0	3.4	3.4	3.6	3.7	3.8	4.0	4.0	4.0	4.2	4.4	4.7	4.8	5.3	5.7	5.9
-40 to -20	3.5	3.5	3.6	3.8	3.9	4.0	4.0	4.1	4.2	4.4	4.7	4.8	5.2	5.7	5.9
-60 to -40(ref.)	3.6	3.6	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.5	4.8	4.9	5.3	5.7	5.9
-70 to -60(ref.)	3.8	3.8	4.0	4.1	4.2	4.3	4.3	4.4	4.5	4.7	5.0	5.0	5.5	5.8	6.0

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.8	2.9	3.0	3.2	3.3	3.5	3.5	3.5	3.7	3.9	4.4	4.5	5.0	5.6	5.8
60 to 80	2.6	2.6	2.8	2.9	3.1	3.2	3.3	3.3	3.5	3.7	4.1	4.2	4.7	5.2	5.5
40 to 60	2.3	2.3	2.5	2.6	2.8	2.9	2.9	3.0	3.1	3.3	3.8	3.8	4.3	4.8	5.1
20～40	2.0	2.0	2.2	2.3	2.5	2.6	2.6	2.7	2.8	3.0	3.4	3.5	4.0	4.4	4.7
0 to 20	1.7	1.7	1.9	2.0	2.1	2.3	2.3	2.3	2.5	2.7	3.0	3.1	3.6	4.0	4.2
-20 to 0	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.0	2.2	2.3	2.7	2.7	3.2	3.6	3.8
-40 to -20	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.7	1.8	2.0	2.3	2.4	2.8	3.2	3.4
-60 to -40	0.9	0.9	1.0	1.1	1.2	1.3	1.3	1.4	1.5	1.6	2.0	2.0	2.4	2.8	3.0
-70 to -60	0.6	0.6	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.4	1.7	1.7	2.1	2.5	2.7

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.09833774E-01
Q1	6.56037326E+01
P2	4.70337592E-02
Q2	2.11653374E-02
P3	3.54937207E-01
Q3	4.78614953E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	6.7
Frac. eq. (ref.)	0.6	6.7

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-YGH51	HOYA	TAC6
C.D.G.M	H-LaK53A	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAF2

nd = 1.744000　　ne = 1.747948

νd = 44.81　　νe = 44.54

Glass code (d)
744448
Glass code (e)
748445

Spectral l.	Refractive idx
2.058	1.70914
1.970	1.71064
1.530	1.71761
1.129	1.72413
1.064	1.72537
t	1.72642
s	1.73058
A'	1.733521
r	1.736267
C	1.739042
C'	1.739825
He-Ne	1.740557
D	1.743853
d	1.744000
e	1.747948
F	1.755647
F'	1.756617
g	1.765006
h	1.772952
0.389	1.777884
i	1.786912

Coef. disp. form. (pwr ser.)	
A0	2.96796358E+00
A1	-1.19454184E-02
A2	-1.21022641E-04
A3	2.50950364E-02
A4	5.91997830E-04
A5	-3.88364981E-06
A6	2.08885425E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.016605
F'-C'	0.016792
C-t	0.012624
C-A'	0.005521
d-C	0.004958
e-C	0.008906
g-d	0.021006
g-F	0.009359
h-g	0.007946
i-g	0.021906
C'-t	0.013407
e-C'	0.008123
F'-e	0.008669
i-F'	0.030295

Relative partial dispersion	
C-t／F-C	0.7603
C-A'／F-C	0.3325
d-C／F-C	0.2986
e-C／F-C	0.5363
g-d／F-C	1.2650
g-F／F-C	0.5636
h-g／F-C	0.4785
i-g／F-C	1.3192
C'-t／F'-C'	0.7984
e-C'／F'-C'	0.4837
F'-e／F'-C'	0.5163
i-F'／F'-C'	1.8041

Deviation of relative partial disp.	
ΔPdC	0.0012
ΔPgF	-0.0056

Specific gravity	4.16

Thermal properties	
CTE(-30,70) [1E-7/℃]	58
CTE(100,300) [1E-7/℃]	73
Tg [℃]	620
At [℃]	650
Ht cndct. [W/m･K]	0.778
Sp. heat [kJ/kg･K]	0.511
Ht diffus. [1E-6 m2/sec]	0.366

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	607 (6)
Abrasion hardness	118
Young's mod. [GPa]	97.4
Shear mod. [GPa]	37.6
Poisson's ratio	0.297
Stress optical coef. [1E-5 nm/cm／Pa]	2.32

Color Code (80%/5%)	39/34
Internal CC	372/341
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.03
350	0.28
360	0.58
365	0.69
370	0.77
380	0.87
390	0.925
400	0.952
420	0.977
440	0.985
460	0.990
480	0.993
500	0.996
550	0.998
600	0.997
650	0.996
700	0.995
800	0.989
900	0.999
1000	0.997
1200	0.999
1400	0.997
1600	0.993
1800	0.986
2000	0.970
2200	0.922
2400	0.76

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	5.2	5.2	5.4	5.6	5.9	6.1	6.2	6.2	6.5	6.8	7.4	7.5	8.4	9.2	9.7
60 to 80(ref.)	5.0	5.0	5.3	5.5	5.7	5.9	6.0	6.0	6.3	6.6	7.2	7.3	8.1	8.9	9.4
40 to 60	4.8	4.8	5.0	5.2	5.5	5.7	5.7	5.8	6.0	6.3	6.9	7.0	7.8	8.6	9.0
20 to 40	4.6	4.6	4.8	5.1	5.3	5.5	5.5	5.6	5.8	6.1	6.7	6.8	7.5	8.3	8.7
0 to 20	4.5	4.5	4.7	4.9	5.1	5.3	5.4	5.4	5.6	5.9	6.5	6.5	7.3	8.0	8.4
-20 to 0	4.4	4.4	4.6	4.8	5.0	5.2	5.2	5.3	5.5	5.8	6.3	6.4	7.1	7.8	8.2
-40 to -20	4.4	4.4	4.6	4.8	5.0	5.2	5.2	5.2	5.5	5.7	6.2	6.3	7.0	7.7	8.0
-60 to -40(ref.)	4.5	4.5	4.7	4.8	5.0	5.2	5.3	5.3	5.5	5.7	6.2	6.3	7.0	7.6	7.9
-70 to -60(ref.)	4.6	4.6	4.8	5.0	5.2	5.3	5.4	5.4	5.6	5.8	6.3	6.4	7.0	7.7	8.0

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	4.1	4.1	4.3	4.6	4.8	5.0	5.1	5.1	5.4	5.7	6.3	6.4	7.3	8.1	8.5
60 to 80	3.8	3.9	4.1	4.3	4.5	4.7	4.8	4.8	5.1	5.4	6.0	6.1	6.9	7.7	8.2
40 to 60	3.5	3.5	3.7	3.9	4.1	4.3	4.4	4.5	4.7	5.0	5.6	5.7	6.4	7.2	7.6
20～40	3.1	3.2	3.3	3.6	3.8	4.0	4.0	4.1	4.3	4.6	5.1	5.2	6.0	6.7	7.1
0 to 20	2.8	2.8	3.0	3.2	3.4	3.6	3.6	3.7	3.9	4.1	4.7	4.8	5.5	6.2	6.6
-20 to 0	2.4	2.4	2.6	2.8	3.0	3.2	3.2	3.3	3.5	3.7	4.3	4.3	5.0	5.7	6.1
-40 to -20	2.1	2.1	2.3	2.4	2.6	2.8	2.8	2.9	3.1	3.3	3.8	3.9	4.6	5.2	5.5
-60 to -40	1.7	1.7	1.9	2.1	2.2	2.4	2.5	2.5	2.7	2.9	3.4	3.4	4.1	4.7	5.0
-70 to -60	1.5	1.5	1.6	1.8	2.0	2.1	2.2	2.2	2.4	2.6	3.1	3.1	3.7	4.3	4.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.03643520E-01
Q1	7.22792806E+01
P2	1.60518064E-02
Q2	4.20912167E-02
P3	3.80053566E-01
Q3	6.33681438E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	4.7
Frac. eq. (ref.)	0.6	7.2

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-LAM2	HOYA	LAF2
C.D.G.M	H-LaF3A	SCHOTT	N-LAF2

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAF3

nd = 1.717000 ne = 1.720556

νd = 47.98 νe = 47.71

Glass code (d)
717480
Glass code (e)
721477

Spectral l.	Refractive idx
2.058	1.68438
1.970	1.68584
1.530	1.69261
1.129	1.69881
1.064	1.69998
t	1.70095
s	1.70480
A'	1.707495
r	1.709998
C	1.712517
C'	1.713226
He-Ne	1.713889
D	1.716868
d	1.717000
e	1.720556
F	1.727462
F'	1.728330
g	1.735809
h	1.742854
0.389	1.747207
i	1.755135

Coef. disp. form. (pwr ser.)	
A0	2.88297779E+00
A1	-1.15922463E-02
A2	-1.15749419E-04
A3	2.24704179E-02
A4	4.75179381E-04
A5	-1.96471810E-06
A6	1.41116684E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.014945
F'-C'	0.015104
C-t	0.011564
C-A'	0.005022
d-C	0.004483
e-C	0.008039
g-d	0.018809
g-F	0.008347
h-g	0.007045
i-g	0.019326
C'-t	0.012273
e-C'	0.007330
F'-e	0.007774
i-F'	0.026805

Relative partial dispersion	
C-t／F-C	0.7738
C-A'／F-C	0.3360
d-C／F-C	0.3000
e-C／F-C	0.5379
g-d／F-C	1.2585
g-F／F-C	0.5585
h-g／F-C	0.4714
i-g／F-C	1.2931
C'-t／F'-C'	0.8126
e-C'／F'-C'	0.4853
F'-e／F'-C'	0.5147
i-F'／F'-C'	1.7747

Deviation of relative partial disp.	
ΔPdC	0.0011
ΔPgF	-0.0053

Specific gravity	3.93

Thermal properties	
CTE(-30,70) [1E-7/℃]	61
CTE(100,300) [1E-7/℃]	79
Tg [℃]	640
At [℃]	681
Ht cndct. [W/m･K]	0.767
Sp. heat [kJ/kg･K]	0.516
Ht diffus. [1E-6 m2/sec]	0.378

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	526 (5)
Abrasion hardness	131
Young's mod. [GPa]	99.0
Shear mod. [GPa]	38.4
Poisson's ratio	0.291
Stress optical coef. [1E-5 nm/cm／Pa]	2.35

Color Code (80%/5%)	38/34
Internal CC	365/337

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.11
350	0.45
360	0.71
365	0.79
370	0.85
380	0.917
390	0.949
400	0.966
420	0.980
440	0.986
460	0.989
480	0.992
500	0.994
550	0.996
600	0.995
650	0.995
700	0.995
800	0.992
900	0.995
1000	0.998
1200	0.998
1400	0.993
1600	0.993
1800	0.986
2000	0.970
2200	0.921
2400	0.77

Relative Δn/ΔT [1E-6/℃]															
Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.7	3.7	3.9	4.1	4.2	4.4	4.5	4.5	4.8	5.0	5.6	5.7	6.4	7.1	7.5
60 to 80(ref.)	3.6	3.6	3.8	4.0	4.1	4.3	4.4	4.4	4.6	4.9	5.4	5.5	6.2	6.8	7.3
40 to 60	3.4	3.5	3.7	3.8	4.0	4.2	4.2	4.2	4.5	4.7	5.2	5.3	5.9	6.6	7.0
20 to 40	3.4	3.4	3.6	3.7	3.9	4.0	4.1	4.1	4.3	4.6	5.1	5.1	5.7	6.4	6.7
0 to 20	3.3	3.3	3.5	3.7	3.8	4.0	4.0	4.0	4.2	4.5	4.9	5.0	5.6	6.2	6.5
-20 to 0	3.3	3.3	3.5	3.6	3.8	3.9	4.0	4.0	4.2	4.4	4.9	4.9	5.5	6.1	6.4
-40 to -20	3.4	3.4	3.6	3.7	3.8	4.0	4.0	4.1	4.2	4.4	4.9	4.9	5.5	6.0	6.3
-60 to -40(ref.)	3.5	3.6	3.7	3.9	4.0	4.1	4.2	4.2	4.4	4.6	5.0	5.0	5.5	6.0	6.3
-70 to -60(ref.)	3.7	3.8	3.9	4.0	4.2	4.3	4.3	4.4	4.5	4.7	5.1	5.2	5.7	6.2	6.5

Absolute Δn/ΔT [1E-6/℃]															
Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.6	2.7	2.8	3.0	3.2	3.4	3.4	3.5	3.7	3.9	4.5	4.6	5.3	5.9	6.4
60 to 80	2.4	2.5	2.6	2.8	3.0	3.1	3.2	3.2	3.5	3.7	4.2	4.3	5.0	5.6	6.1
40 to 60	2.2	2.2	2.4	2.5	2.7	2.8	2.9	2.9	3.1	3.4	3.9	4.0	4.6	5.2	5.6
20～40	1.9	1.9	2.1	2.2	2.4	2.6	2.6	2.6	2.8	3.1	3.6	3.6	4.2	4.8	5.2
0 to 20	1.6	1.7	1.8	2.0	2.1	2.3	2.3	2.3	2.5	2.7	3.2	3.3	3.8	4.4	4.8
-20 to 0	1.4	1.4	1.5	1.7	1.8	2.0	2.0	2.0	2.2	2.4	2.9	2.9	3.5	4.0	4.3
-40 to -20	1.1	1.1	1.3	1.4	1.5	1.7	1.7	1.7	1.9	2.1	2.5	2.6	3.1	3.6	3.9
-60 to -40	0.8	0.9	1.0	1.1	1.2	1.4	1.4	1.4	1.6	1.8	2.2	2.2	2.7	3.2	3.5
-70 to -60	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.2	1.4	1.5	1.9	2.0	2.4	2.9	3.1

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.07530916E-01
Q1	7.45015661E+01
P2	1.48535752E-02
Q2	3.95541614E-02
P3	3.70747892E-01
Q3	6.11229540E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	4.2
Frac. eq. (ref.)	0.6	4.8

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-LAM3	HOYA	LAF3
C.D.G.M	H-LaF2	SCHOTT	N-LAF3

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAF7

nd = 1.749500　　ne = 1.754533

νd = 35.25　　νe = 34.99

Glass code (d)
750353
Glass code (e)
755350

Spectral l.	Refractive idx
2.058	1.70948
1.970	1.71102
1.530	1.71826
1.129	1.72539
1.064	1.72681
t	1.72801
s	1.73292
A'	1.736472
r	1.739834
C	1.743271
C'	1.744248
He-Ne	1.745164
D	1.749314
d	1.749500
e	1.754533
F	1.764535
F'	1.765812
g	1.777040
h	1.787997
0.389	1.794980
i	–

Coef. disp. form. (pwr ser.)	
A0	2.96739544E+00
A1	-1.18139418E-02
A2	-1.33628078E-04
A3	3.10749099E-02
A4	6.54571893E-04
A5	9.85567905E-05
A6	-8.83112540E-06
A7	8.38843732E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.021264
F'-C'	0.021564
C-t	0.015256
C-A'	0.006799
d-C	0.006229
e-C	0.011262
g-d	0.027540
g-F	0.012505
h-g	0.010957
i-g	–
C'-t	0.016234
e-C'	0.010285
F'-e	0.011279
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7175
C-A'／F-C	0.3197
d-C／F-C	0.2929
e-C／F-C	0.5296
g-d／F-C	1.2951
g-F／F-C	0.5881
h-g／F-C	0.5153
i-g／F-C	–
C'-t／F'-C'	0.7528
e-C'／F'-C'	0.4770
F'-e／F'-C'	0.5230
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0002
ΔPgF	0.0029

Specific gravity	3.62

Thermal properties	
CTE(-30,70) [1E-7/℃]	73
CTE(100,300) [1E-7/℃]	88
Tg [℃]	587
At [℃]	631
Ht cndct. [W/m･K]	0.820
Sp. heat [kJ/kg･K]	0.552
Ht diffus. [1E-6 m2/sec]	0.411

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	540 (5)
Abrasion hardness	149
Young's mod. [GPa]	91.5
Shear mod. [GPa]	35.5
Poisson's ratio	0.288
Stress optical coef. [1E-5 nm/cm／Pa]	2.64

Color Code (80%/5%)	42/36
Internal CC	393/358
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.08
365	0.21
370	0.36
380	0.62
390	0.77
400	0.86
420	0.934
440	0.961
460	0.973
480	0.981
500	0.986
550	0.991
600	0.991
650	0.990
700	0.991
800	0.987
900	0.998
1000	0.995
1200	0.998
1400	0.996
1600	0.990
1800	0.978
2000	0.959
2200	0.904
2400	0.76

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.2	2.3	2.6	2.9	3.2	3.4	3.5	3.6	3.9	4.4	5.4	5.5	6.7	8.2	9.2
60 to 80(ref.)	2.1	2.2	2.5	2.8	3.0	3.3	3.3	3.4	3.8	4.2	5.1	5.3	6.5	7.8	8.8
40 to 60	2.0	2.0	2.3	2.6	2.8	3.1	3.1	3.2	3.5	4.0	4.8	5.0	6.1	7.4	8.3
20 to 40	1.8	1.9	2.2	2.4	2.7	2.9	3.0	3.0	3.4	3.7	4.6	4.7	5.8	7.0	7.9
0 to 20	1.8	1.8	2.1	2.3	2.6	2.8	2.8	2.9	3.2	3.6	4.4	4.5	5.5	6.7	7.5
−20 to 0	1.7	1.8	2.1	2.3	2.5	2.7	2.8	2.8	3.1	3.5	4.2	4.3	5.3	6.4	7.1
−40 to −20	1.8	1.9	2.1	2.3	2.5	2.7	2.8	2.8	3.1	3.4	4.1	4.2	5.1	6.2	6.9
−60 to −40(ref.)	1.9	2.0	2.2	2.4	2.6	2.8	2.9	2.9	3.2	3.5	4.2	4.3	5.1	6.0	6.7
−70 to −60(ref.)	2.1	2.2	2.4	2.6	2.8	3.0	3.0	3.1	3.3	3.6	4.3	4.4	5.2	6.0	6.7

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.2	1.3	1.6	1.8	2.1	2.3	2.4	2.5	2.8	3.3	4.2	4.4	5.6	7.0	8.0
60 to 80	0.9	1.0	1.3	1.6	1.8	2.1	2.2	2.2	2.6	3.0	3.9	4.0	5.2	6.6	7.5
40 to 60	0.6	0.7	1.0	1.3	1.5	1.7	1.8	1.9	2.2	2.6	3.5	3.6	4.7	6.0	6.9
20～40	0.3	0.4	0.7	0.9	1.2	1.4	1.5	1.5	1.8	2.2	3.0	3.2	4.2	5.4	6.3
0 to 20	0.1	0.1	0.4	0.6	0.8	1.0	1.1	1.2	1.5	1.8	2.6	2.7	3.7	4.8	5.6
−20 to 0	−0.2	−0.2	0.1	0.3	0.5	0.7	0.8	0.8	1.1	1.4	2.2	2.3	3.2	4.3	5.0
−40 to −20	−0.5	−0.5	−0.2	0.0	0.2	0.4	0.4	0.5	0.7	1.0	1.7	1.8	2.7	3.7	4.4
−60 to −40	−0.8	−0.8	−0.5	−0.4	−0.2	0.0	0.1	0.1	0.4	0.7	1.3	1.4	2.2	3.1	3.7
−70 to −60	−1.0	−1.0	−0.8	−0.6	−0.4	−0.3	−0.2	−0.2	0.1	0.4	1.0	1.0	1.8	2.7	3.3

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.05222300E-01
Q1	7.33807652E+01
P2	1.94995885E-02
Q2	5.42288787E-02
P3	3.76585353E-01
Q3	7.16474338E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	7.0
Frac. eq. (ref.)	1.2	8.6

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-LAM7	HOYA	E-LAF7
C.D.G.M	H-LaF4	SCHOTT	N-LAF7

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAF01

nd = 1.700000　　ne = 1.703462

ν d = 48.11　　ν e = 47.82

Glass code (d)
700481
Glass code (e)
703478

Spectral l.	Refractive idx
2.058	1.66933
1.970	1.67064
1.530	1.67675
1.129	1.68250
1.064	1.68359
t	1.68452
s	1.68819
A'	1.690785
r	1.693203
C	1.695645
C'	1.696333
He-Ne	1.696977
D	1.699871
d	1.700000
e	1.703462
F	1.710196
F'	1.711043
g	1.718350
h	1.725242
0.389	1.729503
i	–

Coef. disp. form. (pwr ser.)	
A0	2.82684251E+00
A1	-1.03793494E-02
A2	-7.59583803E-05
A3	2.16620460E-02
A4	4.72548975E-04
A5	-2.58637501E-06
A6	1.43317138E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.014551
F'-C'	0.014710
C-t	0.011126
C-A'	0.004860
d-C	0.004355
e-C	0.007817
g-d	0.018350
g-F	0.008154
h-g	0.006892
i-g	–
C'-t	0.011814
e-C'	0.007129
F'-e	0.007581
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7646
C-A'／F-C	0.3340
d-C／F-C	0.2993
e-C／F-C	0.5372
g-d／F-C	1.2611
g-F／F-C	0.5604
h-g／F-C	0.4736
i-g／F-C	–
C'-t／F'-C'	0.8031
e-C'／F'-C'	0.4846
F'-e／F'-C'	0.5154
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	0.0004
ΔPgF	-0.0033

Specific gravity	3.68

Thermal properties	
CTE(-30,70) [1E-7/℃]	73
CTE(100,300) [1E-7/℃]	85
Tg [℃]	657
At [℃]	693
Ht cndct. [W/m･K]	0.811
Sp. heat [kJ/kg･K]	0.545
Ht diffus. [1E-6 m2/sec]	0.403

Chemical properties [class]	
Acid res. (surface)	6
Alkaline detergent res.	3
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	575 (6)
Abrasion hardness	155
Young's mod. [GPa]	96.1
Shear mod. [GPa]	37.3
Poisson's ratio	0.287
Stress optical coef. [1E-5 nm/cm／Pa]	1.80

Color Code (80%/5%)	39/34
Internal CC	369/339

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.07
350	0.36
360	0.64
365	0.74
370	0.81
380	0.89
390	0.937
400	0.959
420	0.978
440	0.984
460	0.988
480	0.991
500	0.993
550	0.994
600	0.995
650	0.994
700	0.994
800	0.990
900	0.995
1000	0.993
1200	0.995
1400	0.994
1600	0.989
1800	0.980
2000	0.966
2200	0.925
2400	0.81

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.0	2.1	2.2	2.5	2.6	2.8	2.8	2.9	3.1	3.4	3.9	4.0	4.6	–	–
60 to 80(ref.)	1.9	2.0	2.2	2.4	2.5	2.7	2.7	2.8	3.0	3.2	3.8	3.8	4.5	–	–
40 to 60	1.8	1.9	2.1	2.2	2.4	2.5	2.6	2.6	2.8	3.1	3.6	3.7	4.3	–	–
20 to 40	1.7	1.8	2.0	2.1	2.3	2.5	2.5	2.5	2.7	3.0	3.5	3.5	4.1	–	–
0 to 20	1.7	1.8	2.0	2.1	2.2	2.4	2.4	2.5	2.7	2.9	3.4	3.4	4.0	–	–
-20 to 0	1.7	1.8	2.0	2.1	2.2	2.4	2.4	2.5	2.6	2.9	3.3	3.4	3.9	–	–
-40 to -20	1.8	1.9	2.0	2.2	2.3	2.4	2.5	2.5	2.7	2.9	3.3	3.4	3.9	–	–
-60 to -40(ref.)	2.0	2.0	2.2	2.3	2.5	2.6	2.6	2.7	2.8	3.0	3.5	3.5	4.0	–	–
-70 to -60(ref.)	2.2	2.2	2.4	2.5	2.7	2.8	2.8	2.9	3.0	3.2	3.6	3.7	4.2	–	–

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.0	1.0	1.2	1.4	1.6	1.7	1.8	1.8	2.0	2.3	2.8	2.9	3.5	–	–
60 to 80	0.8	0.8	1.1	1.2	1.4	1.5	1.6	1.6	1.8	2.1	2.6	2.7	3.3	–	–
40 to 60	0.5	0.6	0.8	0.9	1.1	1.3	1.3	1.3	1.5	1.8	2.3	2.3	2.9	–	–
20～40	0.3	0.3	0.5	0.7	0.8	1.0	1.0	1.1	1.3	1.5	2.0	2.0	2.6	–	–
0 to 20	0.0	0.1	0.3	0.4	0.6	0.7	0.7	0.8	1.0	1.2	1.6	1.7	2.2	–	–
-20 to 0	-0.2	-0.2	0.0	0.2	0.3	0.4	0.5	0.5	0.7	0.9	1.3	1.4	1.9	–	–
-40 to -20	-0.5	-0.4	-0.2	-0.1	0.0	0.1	0.2	0.2	0.4	0.6	1.0	1.0	1.5	–	–
-60 to -40	-0.7	-0.7	-0.5	-0.4	-0.2	-0.1	-0.1	-0.1	0.1	0.3	0.7	0.7	1.2	–	–
-70 to -60	-0.9	-0.8	-0.7	-0.6	-0.5	-0.3	-0.3	-0.3	-0.1	0.1	0.4	0.5	0.9	–	–

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.24405553E-01
Q1	9.40421199E+01
P2	1.85633188E-02
Q2	3.72381886E-02
P3	3.59893584E-01
Q3	5.90236401E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	3.3
Frac. eq. (ref.)	0.7	2.7

Prod. Freq. (A to F)	E

Similar glass type			
OHARA	S-LAM51	HOYA	
C.D.G.M	H-LaF51	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAF02

nd = 1.720000　　ne = 1.723923

νd = 43.61　　νe = 43.33

Glass code (d)
720436
Glass code (e)
724433

Spectral l.	Refractive idx
2.058	1.68740
1.970	1.68868
1.530	1.69475
1.129	1.70067
1.064	1.70184
t	1.70283
s	1.70681
A'	1.709672
r	1.712362
C	1.715094
C'	1.715867
He-Ne	1.716590
D	1.719855
d	1.720000
e	1.723923
F	1.731604
F'	1.732574
g	1.740986
h	1.748991
0.389	1.753979
i	1.763154

Coef. disp. form. (pwr ser.)	
A0	2.88586901E+00
A1	-1.02242298E-02
A2	-5.73302650E-05
A3	2.43594329E-02
A4	6.71639978E-04
A5	-1.38459487E-05
A6	2.96139784E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.016510
F'-C'	0.016707
C-t	0.012269
C-A'	0.005422
d-C	0.004906
e-C	0.008829
g-d	0.020986
g-F	0.009382
h-g	0.008005
i-g	0.022168
C'-t	0.013042
e-C'	0.008056
F'-e	0.008651
i-F'	0.030580

Relative partial dispersion	
C-t／F-C	0.7431
C-A'／F-C	0.3284
d-C／F-C	0.2972
e-C／F-C	0.5348
g-d／F-C	1.2711
g-F／F-C	0.5683
h-g／F-C	0.4849
i-g／F-C	1.3427
C'-t／F'-C'	0.7806
e-C'／F'-C'	0.4822
F'-e／F'-C'	0.5178
i-F'／F'-C'	1.8304

Deviation of relative partial disp.	
ΔPdC	0.0003
ΔPgF	-0.0029

Specific gravity	3.88

Thermal properties	
CTE(-30,70) [1E-7/℃]	68
CTE(100,300) [1E-7/℃]	83
Tg [℃]	577
At [℃]	626
Ht cndct. [W/m･K]	0.838
Sp. heat [kJ/kg･K]	0.560
Ht diffus. [1E-6 m2/sec]	0.386

Chemical properties [class]	
Acid res. (surface)	4
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	534 (5)
Abrasion hardness	184
Young's mod. [GPa]	98.9
Shear mod. [GPa]	38.4
Poisson's ratio	0.287
Stress optical coef. [1E-5 nm/cm／Pa]	2.33

Color Code (80%/5%)	39/34
Internal CC	369/342

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.03
350	0.29
360	0.63
365	0.74
370	0.82
380	0.906
390	0.945
400	0.965
420	0.980
440	0.984
460	0.988
480	0.991
500	0.993
550	0.996
600	0.995
650	0.994
700	0.994
800	0.994
900	0.997
1000	0.996
1200	0.998
1400	0.995
1600	0.992
1800	0.984
2000	0.972
2200	0.941
2400	0.86

Relative Δn/ΔT [1E-6/℃]															
Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.8	4.8	5.0	5.3	5.5	5.7	5.8	5.8	6.1	6.4	7.1	7.2	8.1	9.0	9.6
60 to 80(ref.)	4.7	4.7	5.0	5.2	5.4	5.6	5.6	5.7	6.0	6.3	7.0	7.1	7.9	8.8	9.4
40 to 60	4.6	4.6	4.8	5.0	5.2	5.4	5.5	5.5	5.8	6.1	6.8	6.9	7.7	8.5	9.1
20 to 40	4.5	4.5	4.7	4.9	5.1	5.3	5.3	5.4	5.6	5.9	6.6	6.7	7.5	8.3	8.8
0 to 20	4.4	4.4	4.6	4.8	5.0	5.2	5.3	5.3	5.5	5.8	6.4	6.5	7.3	8.1	8.6
-20 to 0	4.4	4.4	4.6	4.8	5.0	5.2	5.2	5.3	5.5	5.8	6.4	6.4	7.2	7.9	8.4
-40 to -20	4.5	4.5	4.7	4.8	5.0	5.2	5.2	5.3	5.5	5.8	6.3	6.4	7.1	7.9	8.3
-60 to -40(ref.)	4.6	4.6	4.8	5.0	5.2	5.3	5.4	5.4	5.6	5.9	6.4	6.5	7.2	7.9	8.3
-70 to -60(ref.)	4.8	4.8	5.0	5.2	5.3	5.5	5.5	5.6	5.8	6.1	6.6	6.7	7.3	8.0	8.4

Absolute Δn/ΔT [1E-6/℃]															
Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.8	3.8	4.0	4.2	4.4	4.6	4.7	4.8	5.0	5.4	6.1	6.2	7.0	7.9	8.5
60 to 80	3.5	3.6	3.8	4.0	4.2	4.4	4.5	4.5	4.8	5.1	5.8	5.9	6.7	7.6	8.1
40 to 60	3.3	3.3	3.5	3.7	3.9	4.1	4.2	4.2	4.5	4.8	5.4	5.5	6.3	7.2	7.7
20～40	3.0	3.0	3.2	3.4	3.6	3.8	3.9	3.9	4.1	4.4	5.1	5.1	5.9	6.7	7.2
0 to 20	2.7	2.8	2.9	3.1	3.3	3.5	3.5	3.6	3.8	4.1	4.7	4.8	5.5	6.3	6.8
-20 to 0	2.4	2.5	2.7	2.8	3.0	3.2	3.2	3.3	3.5	3.8	4.3	4.4	5.1	5.9	6.3
-40 to -20	2.2	2.2	2.4	2.5	2.7	2.9	2.9	3.0	3.2	3.4	4.0	4.1	4.8	5.4	5.9
-60 to -40	1.9	1.9	2.1	2.2	2.4	2.6	2.6	2.7	2.9	3.1	3.6	3.7	4.4	5.0	5.4
-70 to -60	1.7	1.7	1.9	2.0	2.2	2.3	2.4	2.4	2.6	2.8	3.3	3.4	4.1	4.7	5.1

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.05823487E-01
Q1	8.48047843E+01
P2	1.47351472E-02
Q2	4.55784241E-02
P3	3.71185501E-01
Q3	6.60196546E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	5.5
Frac. eq. (ref.)	1.0	5.7

Prod. Freq. (A to F)	E

Similar glass type			
OHARA	S-LAM52	HOYA	
C.D.G.M	H-LaF62	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAF04

nd = 1.757000　　ne = 1.760764

ν d = 47.86　　ν e = 47.62

Glass code (d)
757479
Glass code (e)
761476

Spectral l.	Refractive idx
2.058	1.72026
1.970	1.72204
1.530	1.73016
1.129	1.73733
1.064	1.73864
t	1.73973
s	1.74396
A'	1.746868
r	1.749551
C	1.752239
C'	1.752994
He-Ne	1.753699
D	1.756860
d	1.757000
e	1.760764
F	1.768055
F'	1.768969
g	1.776843
h	1.784245
0.389	1.788810
i	–

Coef. disp. form. (pwr ser.)	
A0	3.01765567E+00
A1	-1.44029325E-02
A2	-1.73403131E-04
A3	2.41938931E-02
A4	5.02913780E-04
A5	-1.18295424E-07
A6	1.26171561E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.015816
F'-C'	0.015975
C-t	0.012506
C-A'	0.005371
d-C	0.004761
e-C	0.008525
g-d	0.019843
g-F	0.008788
h-g	0.007402
i-g	–
C'-t	0.013261
e-C'	0.007770
F'-e	0.008205
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7907
C-A'／F-C	0.3396
d-C／F-C	0.3010
e-C／F-C	0.5390
g-d／F-C	1.2546
g-F／F-C	0.5556
h-g／F-C	0.4680
i-g／F-C	–
C'-t／F'-C'	0.8301
e-C'／F'-C'	0.4864
F'-e／F'-C'	0.5136
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	0.0022
ΔPgF	-0.0084

Specific gravity	4.07

Thermal properties	
CTE(-30,70) [1E-7/℃]	54
CTE(100,300) [1E-7/℃]	68
Tg [℃]	648
At [℃]	675
Ht cndct. [W/m･K]	0.844
Sp. heat [kJ/kg･K]	0.512
Ht diffus. [1E-6 m2/sec]	0.405

Chemical properties [class]	
Acid res. (surface)	4
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	645 (6)
Abrasion hardness	76
Young's mod. [GPa]	114.4
Shear mod. [GPa]	44.2
Poisson's ratio	0.295
Stress optical coef. [1E-5 nm/cm／Pa]	1.93

Color Code (80%/5%)	39/33
Internal CC	368/332
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	0.02
340	0.21
350	0.49
360	0.70
365	0.77
370	0.82
380	0.89
390	0.932
400	0.953
420	0.973
440	0.980
460	0.985
480	0.989
500	0.992
550	0.995
600	0.994
650	0.993
700	0.992
800	0.989
900	0.995
1000	0.994
1200	0.996
1400	0.993
1600	0.989
1800	0.978
2000	0.957
2200	0.88
2400	0.64

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.6	4.7	4.8	5.0	5.2	5.3	5.4	5.4	5.7	5.9	6.5	6.6	7.3	–	–
60 to 80(ref.)	4.4	4.5	4.7	4.9	5.0	5.2	5.2	5.3	5.5	5.7	6.3	6.4	7.1	–	–
40 to 60	4.3	4.3	4.5	4.7	4.8	5.0	5.0	5.1	5.3	5.5	6.0	6.1	6.8	–	–
20 to 40	4.1	4.2	4.4	4.5	4.7	4.8	4.8	4.9	5.1	5.3	5.8	5.9	6.5	–	–
0 to 20	4.0	4.1	4.3	4.4	4.5	4.7	4.7	4.7	4.9	5.1	5.6	5.7	6.3	–	–
-20 to 0	4.0	4.0	4.2	4.3	4.5	4.6	4.6	4.7	4.8	5.0	5.5	5.5	6.1	–	–
-40 to -20	4.0	4.1	4.2	4.3	4.4	4.6	4.6	4.6	4.8	5.0	5.4	5.5	6.0	–	–
-60 to -40(ref.)	4.1	4.2	4.3	4.4	4.5	4.7	4.7	4.7	4.9	5.1	5.5	5.5	6.0	–	–
-70 to -60(ref.)	4.3	4.3	4.5	4.6	4.7	4.8	4.8	4.9	5.0	5.2	5.6	5.6	6.1	–	–

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.5	3.6	3.8	3.9	4.1	4.3	4.3	4.3	4.6	4.8	5.4	5.5	6.2	–	–
60 to 80	3.3	3.3	3.5	3.7	3.8	4.0	4.0	4.1	4.3	4.5	5.1	5.2	5.8	–	–
40 to 60	3.0	3.0	3.2	3.3	3.5	3.6	3.7	3.7	3.9	4.2	4.7	4.7	5.4	–	–
20～40	2.6	2.7	2.9	3.0	3.1	3.3	3.3	3.4	3.5	3.8	4.3	4.3	4.9	–	–
0 to 20	2.3	2.4	2.5	2.7	2.8	2.9	3.0	3.0	3.2	3.4	3.8	3.9	4.5	–	–
-20 to 0	2.0	2.0	2.2	2.3	2.4	2.6	2.6	2.6	2.8	3.0	3.4	3.5	4.0	–	–
-40 to -20	1.7	1.7	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.6	3.0	3.1	3.6	–	–
-60 to -40	1.4	1.4	1.5	1.6	1.7	1.8	1.9	1.9	2.0	2.2	2.6	2.6	3.1	–	–
-70 to -60	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.6	1.8	1.9	2.3	2.3	2.8	–	–

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.15921577E-01
Q1	6.78156111E+01
P2	2.43802201E-02
Q2	3.30454930E-02
P3	3.77727144E-01
Q3	5.55046977E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	4.0
Frac. eq. (ref.)	0.6	5.0

Prod. Freq. (A to F)	E

Similar glass type			
OHARA	S-LAM54	HOYA	NBF2
C.D.G.M	H-LaF6LA	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAF05

nd = 1.762000　　ne = 1.766511

νd = 40.11　　νe = 39.85

Glass code (d)
762401
Glass code (e)
767399

Spectral l.	Refractive idx
2.058	1.72631
1.970	1.72760
1.530	1.73385
1.129	1.74018
1.064	1.74145
t	1.74254
s	1.74699
A'	1.750213
r	1.753266
C	1.756381
C'	1.757264
He-Ne	1.758092
D	1.761833
d	1.762000
e	1.766511
F	1.775377
F'	1.776499
g	1.786251
h	1.795554
0.389	1.801358
i	1.812041

Coef. disp. form. (pwr ser.)	
A0	3.01897142E+00
A1	-1.06135241E-02
A2	-3.56215294E-05
A3	2.84177137E-02
A4	8.43869366E-04
A5	-1.12827377E-05
A6	3.11337221E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.018996
F'-C'	0.019235
C-t	0.013839
C-A'	0.006168
d-C	0.005619
e-C	0.010130
g-d	0.024251
g-F	0.010874
h-g	0.009303
i-g	0.025790
C'-t	0.014722
e-C'	0.009247
F'-e	0.009988
i-F'	0.035542

Relative partial dispersion	
C-t／F-C	0.7285
C-A'／F-C	0.3247
d-C／F-C	0.2958
e-C／F-C	0.5333
g-d／F-C	1.2766
g-F／F-C	0.5724
h-g／F-C	0.4897
i-g／F-C	1.3577
C'-t／F'-C'	0.7654
e-C'／F'-C'	0.4807
F'-e／F'-C'	0.5193
i-F'／F'-C'	1.8478

Deviation of relative partial disp.	
ΔPdC	0.0005
ΔPgF	-0.0046

Specific gravity	3.94

Thermal properties	
CTE(-30,70) [1E-7/℃]	63
CTE(100,300) [1E-7/℃]	78
Tg [℃]	606
At [℃]	645
Ht cndct. [W/m･K]	0.960
Sp. heat [kJ/kg･K]	0.577
Ht diffus. [1E-6 m2/sec]	0.422

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	406 (4)
Abrasion hardness	109
Young's mod. [GPa]	116.3
Shear mod. [GPa]	47.3
Poisson's ratio	0.228
Stress optical coef. [1E-5 nm/cm／Pa]	2.85

Color Code (80%/5%)	39/33
Internal CC	365/332
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	0.02
340	0.25
350	0.55
360	0.74
365	0.80
370	0.85
380	0.907
390	0.939
400	0.958
420	0.974
440	0.981
460	0.985
480	0.989
500	0.991
550	0.993
600	0.994
650	0.993
700	0.992
800	0.989
900	0.995
1000	0.994
1200	0.996
1400	0.995
1600	0.991
1800	0.986
2000	0.978
2200	0.959
2400	0.87

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	8.0	8.1	8.3	8.6	8.9	9.2	9.3	9.3	9.7	10.2	11.1	11.2	12.3	13.5	14.2
60 to 80(ref.)	7.8	7.9	8.2	8.4	8.7	9.0	9.1	9.1	9.5	9.9	10.8	11.0	12.1	13.2	13.9
40 to 60	7.6	7.7	7.9	8.2	8.4	8.7	8.8	8.9	9.2	9.6	10.5	10.6	11.7	12.8	13.4
20 to 40	7.4	7.5	7.7	8.0	8.2	8.5	8.6	8.6	9.0	9.4	10.2	10.3	11.4	12.4	13.0
0 to 20	7.3	7.3	7.6	7.8	8.1	8.3	8.4	8.5	8.8	9.2	10.0	10.1	11.1	12.1	12.7
-20 to 0	7.2	7.2	7.5	7.7	7.9	8.2	8.2	8.3	8.6	9.0	9.8	9.9	10.8	11.8	12.4
-40 to -20	7.1	7.2	7.4	7.7	7.9	8.1	8.2	8.3	8.6	8.9	9.7	9.8	10.7	11.6	12.2
-60 to -40(ref.)	7.2	7.3	7.5	7.7	7.9	8.2	8.2	8.3	8.6	8.9	9.7	9.8	10.6	11.5	12.1
-70 to -60(ref.)	7.4	7.4	7.6	7.8	8.1	8.3	8.3	8.4	8.7	9.0	9.7	9.8	10.7	11.5	12.1

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	6.9	7.0	7.3	7.5	7.8	8.1	8.2	8.3	8.6	9.1	10.0	10.1	11.2	12.3	13.1
60 to 80	6.6	6.7	7.0	7.2	7.5	7.8	7.9	7.9	8.3	8.7	9.6	9.7	10.8	11.9	12.6
40 to 60	6.3	6.3	6.6	6.9	7.1	7.4	7.5	7.5	7.9	8.3	9.2	9.3	10.3	11.4	12.0
20～40	5.9	6.0	6.2	6.5	6.7	7.0	7.0	7.1	7.4	7.8	8.7	8.8	9.8	10.8	11.4
0 to 20	5.5	5.6	5.8	6.1	6.3	6.6	6.6	6.7	7.0	7.4	8.2	8.3	9.3	10.2	10.9
-20 to 0	5.2	5.2	5.5	5.7	5.9	6.2	6.2	6.3	6.6	7.0	7.7	7.8	8.7	9.7	10.3
-40 to -20	4.8	4.9	5.1	5.3	5.5	5.7	5.8	5.9	6.2	6.5	7.2	7.3	8.2	9.1	9.7
-60 to -40	4.4	4.5	4.7	4.9	5.1	5.3	5.4	5.5	5.7	6.1	6.8	6.9	7.7	8.6	9.1
-70 to -60	4.2	4.2	4.4	4.6	4.8	5.0	5.1	5.1	5.4	5.7	6.4	6.5	7.3	8.1	8.7

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.12020693E-01
Q1	9.19206483E+01
P2	2.91343182E-02
Q2	3.83429496E-02
P3	3.73059130E-01
Q3	6.25915395E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	7.2
Frac. eq. (ref.)	1.2	9.0

Prod. Freq. (A to F)	E

Similar glass type			
OHARA	S-LAM55	HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAF09

nd = 1.697000　　ne = 1.700423

νd = 48.45　　νe = 48.17

Glass code (d)
697485
Glass code (e)
700482

Spectral l.	Refractive idx
2.058	1.66612
1.970	1.66748
1.530	1.67375
1.129	1.67958
1.064	1.68068
t	1.68161
s	1.68528
A'	1.687864
r	1.690266
C	1.692687
C'	1.693369
He-Ne	1.694007
D	1.696873
d	1.697000
e	1.700423
F	1.707073
F'	1.707909
g	1.715111
h	1.721892
0.389	1.726081
i	–

Partial dispersion	
F-C	0.014386
F'-C'	0.014540
C-t	0.011076
C-A'	0.004823
d-C	0.004313
e-C	0.007736
g-d	0.018111
g-F	0.008038
h-g	0.006781
i-g	–
C'-t	0.011758
e-C'	0.007054
F'-e	0.007486
i-F'	–

Specific gravity	3.74

Thermal properties	
CTE(-30,70) [1E-7/℃]	69
CTE(100,300) [1E-7/℃]	83
Tg [℃]	629
At [℃]	678
Ht cndct. [W/m･K]	0.886
Sp. heat [kJ/kg･K]	0.560
Ht diffus. [1E-6 m2/sec]	0.422

Color Code (80%/5%)	38/34
Internal CC	367/337

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.11
350	0.43
360	0.69
365	0.78
370	0.84
380	0.910
390	0.944
400	0.962
420	0.977
440	0.980
460	0.984
480	0.988
500	0.990
550	0.993
600	0.992
650	0.991
700	0.992
800	0.991
900	0.993
1000	0.991
1200	0.995
1400	0.993
1600	0.990
1800	0.983
2000	0.974
2200	0.940
2400	0.85

Relative partial dispersion	
C-t／F-C	0.7699
C-A'／F-C	0.3353
d-C／F-C	0.2998
e-C／F-C	0.5377
g-d／F-C	1.2589
g-F／F-C	0.5587
h-g／F-C	0.4714
i-g／F-C	–
C'-t／F'-C'	0.8087
e-C'／F'-C'	0.4851
F'-e／F'-C'	0.5149
i-F'／F'-C'	–

Chemical properties [class]	
Acid res. (surface)	4
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	590 (6)
Abrasion hardness	125
Young's mod. [GPa]	98.4
Shear mod. [GPa]	38.4
Poisson's ratio	0.281
Stress optical coef. [1E-5 nm/cm／Pa]	1.92

Coef. disp. form. (pwr ser.)	
A0	2.81748246E+00
A1	-1.05788235E-02
A2	-1.00459117E-04
A3	2.14941409E-02
A4	4.33668886E-04
A5	3.15386350E-07
A6	1.19012861E-06
A7	0.00000000E+00
A8	0.00000000E+00

Deviation of relative partial disp.	
ΔPdC	0.0007
ΔPgF	-0.0043

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.7	2.7	2.8	3.0	3.2	3.3	3.4	3.4	3.6	3.9	4.5	4.6	5.4	6.4	–
60 to 80(ref.)	2.5	2.6	2.8	2.9	3.0	3.2	3.2	3.3	3.5	3.7	4.3	4.4	5.2	6.1	–
40 to 60	2.4	2.5	2.6	2.7	2.9	3.0	3.1	3.1	3.3	3.5	4.1	4.1	4.9	5.8	–
20 to 40	2.3	2.4	2.5	2.6	2.7	2.9	2.9	3.0	3.1	3.4	3.9	3.9	4.6	5.5	–
0 to 20	2.2	2.3	2.4	2.5	2.7	2.8	2.8	2.8	3.0	3.2	3.7	3.8	4.4	5.2	–
-20 to 0	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.8	3.0	3.2	3.6	3.7	4.3	5.0	–
-40 to -20	2.3	2.3	2.4	2.5	2.6	2.8	2.8	2.8	3.0	3.1	3.6	3.6	4.2	4.9	–
-60 to -40(ref.)	2.4	2.5	2.6	2.7	2.8	2.9	2.9	2.9	3.1	3.2	3.6	3.7	4.2	4.9	–
-70 to -60(ref.)	2.6	2.7	2.8	2.9	2.9	3.0	3.1	3.1	3.2	3.4	3.7	3.8	4.3	5.0	–

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.6	1.7	1.8	2.0	2.1	2.3	2.3	2.4	2.6	2.8	3.4	3.5	4.3	5.3	–
60 to 80	1.4	1.5	1.6	1.8	1.9	2.0	2.1	2.1	2.3	2.6	3.1	3.2	4.0	4.9	–
40 to 60	1.1	1.2	1.3	1.5	1.6	1.7	1.8	1.8	2.0	2.2	2.7	2.8	3.5	4.4	–
20～40	0.9	0.9	1.0	1.2	1.3	1.4	1.4	1.5	1.7	1.9	2.4	2.4	3.1	4.0	–
0 to 20	0.6	0.6	0.8	0.9	1.0	1.1	1.1	1.2	1.3	1.5	2.0	2.0	2.7	3.5	–
-20 to 0	0.3	0.3	0.5	0.6	0.7	0.8	0.8	0.8	1.0	1.2	1.6	1.7	2.3	3.0	–
-40 to -20	0.0	0.1	0.2	0.3	0.4	0.5	0.5	0.5	0.7	0.8	1.2	1.3	1.8	2.5	–
-60 to -40	-0.3	-0.2	-0.1	0.0	0.1	0.1	0.2	0.2	0.3	0.5	0.8	0.9	1.4	2.0	–
-70 to -60	-0.5	-0.4	-0.3	-0.3	-0.2	-0.1	-0.1	0.0	0.1	0.2	0.5	0.6	1.1	1.7	–

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.13255310E-01
Q1	8.32858494E+01
P2	1.63055541E-02
Q2	3.79087968E-02
P3	3.60955138E-01
Q3	6.03412046E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	6.7
Frac. eq. (ref.)	0.6	7.6

Prod. Freq. (A to F)	F

Similar glass type			
OHARA	S-LAM59	HOYA	LAFL2
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAF010

nd = 1.743200　　ne = 1.746793

ν d = 49.26　　ν e = 49.02

Glass code (d)
743493
Glass code (e)
747490

Spectral l.	Refractive idx
2.058	1.70838
1.970	1.71005
1.530	1.71766
1.129	1.72442
1.064	1.72567
t	1.72670
s	1.73073
A'	1.733512
r	1.736078
C	1.738649
C'	1.739371
He-Ne	1.740045
D	1.743066
d	1.743200
e	1.746793
F	1.753737
F'	1.754607
g	1.762074
h	1.769060
0.389	1.773349
i	1.781104

Coef. disp. form. (pwr ser.)	
A0	2.97218511E+00
A1	-1.32235298E-02
A2	-1.74821942E-04
A3	2.33639677E-02
A4	3.84261692E-04
A5	9.20777694E-06
A6	3.19655312E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.015088
F'-C'	0.015236
C-t	0.011947
C-A'	0.005137
d-C	0.004551
e-C	0.008144
g-d	0.018874
g-F	0.008337
h-g	0.006986
i-g	0.019030
C'-t	0.012669
e-C'	0.007422
F'-e	0.007814
i-F'	0.026497

Relative partial dispersion	
C-t／F-C	0.7918
C-A'／F-C	0.3405
d-C／F-C	0.3016
e-C／F-C	0.5398
g-d／F-C	1.2509
g-F／F-C	0.5526
h-g／F-C	0.4630
i-g／F-C	1.2613
C'-t／F'-C'	0.8315
e-C'／F'-C'	0.4871
F'-e／F'-C'	0.5129
i-F'／F'-C'	1.7391

Deviation of relative partial disp.	
ΔPdC	0.0022
ΔPgF	-0.0092

Specific gravity	4.15

Thermal properties	
CTE(-30,70) [1E-7/℃]	49
CTE(100,300) [1E-7/℃]	63
Tg [℃]	597
At [℃]	627
Ht cndct. [W/m･K]	0.820
Sp. heat [kJ/kg･K]	0.542
Ht diffus. [1E-6 m2/sec]	0.365

Chemical properties [class]	
Acid res. (surface)	5
Alkaline detergent res.	4
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	585 (6)
Abrasion hardness	64
Young's mod. [GPa]	106.8
Shear mod. [GPa]	40.8
Poisson's ratio	0.308
Stress optical coef. [1E-5 nm/cm／Pa]	2.63

Color Code (80%/5%)	38/30
Internal CC	354/303

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	0.02
310	0.14
320	0.32
330	0.49
340	0.64
350	0.76
360	0.84
365	0.88
370	0.904
380	0.939
390	0.960
400	0.971
420	0.982
440	0.987
460	0.990
480	0.992
500	0.994
550	0.994
600	0.994
650	0.993
700	0.992
800	0.989
900	0.994
1000	0.995
1200	0.998
1400	0.997
1600	0.992
1800	0.983
2000	0.958
2200	0.89
2400	0.65

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	7.8	7.9	8.1	8.3	8.5	8.7	8.7	8.8	9.0	9.3	10.0	10.0	10.8	11.5	11.9
60 to 80(ref.)	7.7	7.7	8.0	8.1	8.3	8.5	8.6	8.6	8.9	9.1	9.8	9.8	10.6	11.2	11.7
40 to 60	7.5	7.5	7.8	7.9	8.1	8.3	8.3	8.4	8.6	8.9	9.5	9.6	10.3	10.9	11.3
20 to 40	7.3	7.4	7.6	7.8	7.9	8.1	8.2	8.2	8.4	8.7	9.3	9.3	10.0	10.6	11.0
0 to 20	7.2	7.3	7.5	7.6	7.8	8.0	8.0	8.1	8.3	8.5	9.1	9.1	9.8	10.4	10.8
-20 to 0	7.2	7.2	7.4	7.5	7.7	7.9	7.9	8.0	8.2	8.4	8.9	9.0	9.6	10.2	10.6
-40 to -20	7.2	7.2	7.4	7.5	7.7	7.9	7.9	7.9	8.1	8.4	8.9	8.9	9.5	10.1	10.4
-60 to -40(ref.)	7.3	7.3	7.5	7.6	7.8	7.9	8.0	8.0	8.2	8.4	8.9	9.0	9.5	10.1	10.4
-70 to -60(ref.)	7.4	7.5	7.6	7.8	7.9	8.1	8.1	8.2	8.3	8.6	9.0	9.1	9.6	10.2	10.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	6.8	6.8	7.0	7.2	7.4	7.6	7.7	7.7	8.0	8.3	8.9	8.9	9.7	10.4	10.8
60 to 80	6.5	6.6	6.8	7.0	7.1	7.3	7.4	7.4	7.7	8.0	8.6	8.6	9.3	10.0	10.4
40 to 60	6.2	6.2	6.4	6.6	6.8	7.0	7.0	7.1	7.3	7.6	8.1	8.2	8.9	9.5	9.9
20～40	5.9	5.9	6.1	6.3	6.4	6.6	6.6	6.7	6.9	7.2	7.7	7.8	8.4	9.1	9.4
0 to 20	5.5	5.6	5.7	5.9	6.1	6.2	6.3	6.3	6.5	6.8	7.3	7.4	8.0	8.6	8.9
-20 to 0	5.2	5.2	5.4	5.6	5.7	5.9	5.9	6.0	6.2	6.4	6.9	7.0	7.6	8.1	8.5
-40 to -20	4.9	4.9	5.1	5.2	5.3	5.5	5.5	5.6	5.8	6.0	6.5	6.5	7.1	7.7	8.0
-60 to -40	4.5	4.6	4.7	4.8	5.0	5.1	5.2	5.2	5.4	5.6	6.1	6.1	6.7	7.2	7.5
-70 to -60	4.3	4.3	4.4	4.6	4.7	4.9	4.9	4.9	5.1	5.3	5.8	5.8	6.3	6.8	7.1

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.13189864E-01
Q1	7.01648764E+01
P2	3.86205423E-02
Q2	2.54497766E-02
P3	3.58049310E-01
Q3	5.15734963E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.4	5.1
Frac. eq. (ref.)	0.5	5.3

Prod. Freq. (A to F)	C

Similar glass type			
OHARA	S-LAM60	HOYA	NBF1
C.D.G.M	H-LaF53	SCHOTT	N-LAF35

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAF016

nd = 1.801000　　ne = 1.806432

νd = 34.92　　νe = 34.68

Glass code (d)
801349
Glass code (e)
806347

Spectral l.	Refractive idx
2.058	1.75702
1.970	1.75875
1.530	1.76688
1.129	1.77479
1.064	1.77635
t	1.77767
s	1.78303
A'	1.786896
r	1.790544
C	1.794267
C'	1.795323
He-Ne	1.796314
D	1.800800
d	1.801000
e	1.806432
F	1.817203
F'	1.818577
g	1.830628
h	1.842343
0.389	1.849780
i	–

Partial dispersion	
F-C	0.022936
F'-C'	0.023254
C-t	0.016596
C-A'	0.007371
d-C	0.006733
e-C	0.012165
g-d	0.029628
g-F	0.013425
h-g	0.011715
i-g	–
C'-t	0.017652
e-C'	0.011109
F'-e	0.012145
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7236
C-A'／F-C	0.3214
d-C／F-C	0.2936
e-C／F-C	0.5304
g-d／F-C	1.2918
g-F／F-C	0.5853
h-g／F-C	0.5108
i-g／F-C	–
C'-t／F'-C'	0.7591
e-C'／F'-C'	0.4777
F'-e／F'-C'	0.5223
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	0.0006
ΔPgF	−0.0004

Specific gravity	3.63

Thermal properties	
CTE(−30,70) [1E-7/℃]	62
CTE(100,300) [1E-7/℃]	75
Tg [℃]	632
At [℃]	671
Ht cndct. [W/m･K]	1.010
Sp. heat [kJ/kg･K]	0.603
Ht diffus. [1E-6 m2/sec]	0.462

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	649 (6)
Abrasion hardness	93
Young's mod. [GPa]	112.5
Shear mod. [GPa]	43.7
Poisson's ratio	0.288
Stress optical coef. [1E-5 nm/cm／Pa]	2.47

Color Code (80%/5%)	44/35
Internal CC	387/353

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.01
360	0.23
365	0.39
370	0.55
380	0.73
390	0.82
400	0.88
420	0.929
440	0.953
460	0.967
480	0.977
500	0.984
550	0.993
600	0.993
650	0.992
700	0.992
800	0.989
900	0.997
1000	0.996
1200	0.999
1400	0.999
1600	0.994
1800	0.987
2000	0.972
2200	0.924
2400	0.77

Coef. disp. form. (pwr ser.)	
A0	3.13977744E+00
A1	−1.36971027E-02
A2	−1.62026634E-04
A3	3.48771551E-02
A4	5.87991861E-04
A5	1.35087453E-04
A6	−1.23042975E-05
A7	9.55959268E-07
A8	0.00000000E+00

Relative Δn/ΔT [1E-6/℃]															
Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	5.1	5.2	5.5	5.8	6.0	6.3	6.4	6.5	6.8	7.3	8.2	8.4	9.6	11.0	12.0
60 to 80(ref.)	4.9	5.0	5.3	5.6	5.8	6.1	6.2	6.2	6.6	7.0	8.0	8.1	9.3	10.7	11.6
40 to 60	4.6	4.7	5.1	5.3	5.5	5.8	5.9	5.9	6.3	6.7	7.6	7.7	8.9	10.2	11.1
20 to 40	4.4	4.5	4.8	5.1	5.3	5.5	5.6	5.7	6.0	6.4	7.3	7.4	8.5	9.8	10.7
0 to 20	4.3	4.4	4.6	4.9	5.1	5.3	5.4	5.4	5.8	6.1	7.0	7.1	8.2	9.4	10.2
−20 to 0	4.2	4.2	4.5	4.7	4.9	5.2	5.2	5.3	5.6	5.9	6.7	6.8	7.9	9.0	9.9
−40 to −20	4.1	4.2	4.5	4.7	4.9	5.1	5.1	5.2	5.5	5.8	6.6	6.7	7.7	8.8	9.6
−60 to −40(ref.)	4.2	4.2	4.5	4.7	4.9	5.1	5.1	5.2	5.5	5.8	6.5	6.6	7.6	8.6	9.4
−70 to −60(ref.)	4.3	4.4	4.6	4.8	5.0	5.2	5.2	5.3	5.6	5.9	6.6	6.7	7.6	8.6	9.4

Absolute Δn/ΔT [1E-6/℃]															
Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	4.0	4.1	4.4	4.7	4.9	5.2	5.3	5.3	5.7	6.1	7.1	7.2	8.5	9.9	10.9
60 to 80	3.7	3.8	4.1	4.4	4.6	4.9	4.9	5.0	5.4	5.8	6.7	6.8	8.0	9.4	10.4
40 to 60	3.3	3.4	3.7	3.9	4.2	4.4	4.5	4.6	4.9	5.3	6.2	6.3	7.5	8.8	9.7
20〜40	2.9	3.0	3.3	3.5	3.7	4.0	4.0	4.1	4.4	4.8	5.7	5.8	6.9	8.1	9.0
0 to 20	2.5	2.6	2.9	3.1	3.3	3.5	3.6	3.7	4.0	4.3	5.1	5.2	6.3	7.5	8.4
−20 to 0	2.1	2.2	2.5	2.7	2.9	3.1	3.1	3.2	3.5	3.8	4.6	4.7	5.7	6.9	7.7
−40 to −20	1.7	1.8	2.0	2.2	2.4	2.6	2.7	2.8	3.0	3.4	4.1	4.2	5.1	6.2	7.0
−60 to −40	1.3	1.4	1.6	1.8	2.0	2.2	2.3	2.3	2.6	2.9	3.6	3.7	4.6	5.6	6.4
−70 to −60	1.0	1.1	1.3	1.5	1.7	1.9	1.9	2.0	2.2	2.5	3.2	3.3	4.1	5.1	5.9

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.24953414E-01
Q1	7.94266552E+01
P2	2.27890133E-02
Q2	5.07623993E-02
P3	3.93600073E-01
Q3	6.96293926E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	1.9
Frac. eq. (ref.)	1.1	2.2

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-LAM66	HOYA	
C.D.G.M	H-ZLaF66	SCHOTT	N-LASF45

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LAFH3

nd = 1.795040　　ne = 1.801577

νd = 28.69　　νe = 28.46

Glass code (d)
795287
Glass code (e)
802285

Spectral l.	Refractive idx
2.058	1.74752
1.970	1.74911
1.530	1.75684
1.129	1.76493
1.064	1.76660
t	1.76804
s	1.77401
A'	1.778428
r	1.782664
C	1.787036
C'	1.788284
He-Ne	1.789457
D	1.794800
d	1.795040
e	1.801577
F	1.814745
F'	1.816445
g	1.831551
h	1.846613
0.389	1.856401
i	–

Coef. disp. form. (pwr ser.)	
A0	3.10158920E+00
A1	-1.33474980E-02
A2	0.00000000E+00
A3	3.64605893E-02
A4	3.26400857E-03
A5	-6.24213023E-04
A6	1.40210775E-04
A7	-1.42247779E-05
A8	6.58468818E-07

Partial dispersion	
F-C	0.027709
F'-C'	0.028161
C-t	0.018999
C-A'	0.008608
d-C	0.008004
e-C	0.014541
g-d	0.036511
g-F	0.016806
h-g	0.015062
i-g	–
C'-t	0.020247
e-C'	0.013293
F'-e	0.014868
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6857
C-A'／F-C	0.3107
d-C／F-C	0.2889
e-C／F-C	0.5248
g-d／F-C	1.3177
g-F／F-C	0.6065
h-g／F-C	0.5436
i-g／F-C	–
C'-t／F'-C'	0.7190
e-C'／F'-C'	0.4720
F'-e／F'-C'	0.5280
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	-0.0013
ΔPgF	0.0103

Specific gravity	3.61

Thermal properties	
CTE(-30,70) [1E-7/℃]	68
CTE(100,300) [1E-7/℃]	85
Tg [℃]	629
At [℃]	680
Ht cndct. [W/m･K]	1.030
Sp. heat [kJ/kg･K]	0.615
Ht diffus. [1E-6 m2/sec]	0.463

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	2

Mechanical properties	
Knoop hardness	555 (6)
Abrasion hardness	149
Young's mod. [GPa]	98.5
Shear mod. [GPa]	38.8
Poisson's ratio	0.268
Stress optical coef. [1E-5 nm/cm／Pa]	2.91

Color Code (80%/5%)	45/37
Internal CC	404/368

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	–
365	–
370	0.08
380	0.36
390	0.61
400	0.76
420	0.89
440	0.939
460	0.961
480	0.972
500	0.979
550	0.990
600	0.992
650	0.992
700	0.994
800	0.992
900	0.998
1000	0.996
1200	0.999
1400	0.997
1600	0.991
1800	0.984
2000	0.977
2200	0.938
2400	0.89

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.8	2.9	3.2	3.5	3.8	4.2	4.3	4.4	4.8	5.4	6.7	6.9	8.6	–	–
60 to 80(ref.)	2.7	2.7	3.1	3.4	3.6	4.0	4.1	4.2	4.6	5.2	6.4	6.6	8.3	–	–
40 to 60	2.5	2.6	2.9	3.1	3.4	3.7	3.8	3.9	4.3	4.9	6.1	6.3	7.8	–	–
20 to 40	2.3	2.4	2.7	3.0	3.2	3.5	3.6	3.7	4.1	4.6	5.8	5.9	7.4	–	–
0 to 20	2.2	2.3	2.6	2.8	3.1	3.4	3.5	3.5	3.9	4.4	5.5	5.7	7.1	–	–
-20 to 0	2.2	2.3	2.5	2.8	3.0	3.3	3.3	3.4	3.8	4.3	5.3	5.4	6.8	–	–
-40 to -20	2.2	2.3	2.5	2.7	3.0	3.2	3.3	3.4	3.7	4.2	5.1	5.3	6.5	–	–
-60 to -40(ref.)	2.3	2.4	2.6	2.8	3.1	3.3	3.4	3.4	3.8	4.2	5.1	5.2	6.4	–	–
-70 to -60(ref.)	2.5	2.6	2.8	3.0	3.2	3.4	3.5	3.6	3.9	4.3	5.2	5.3	6.4	–	–

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.7	1.8	2.1	2.4	2.7	3.1	3.1	3.2	3.7	4.3	5.6	5.8	7.5	–	–
60 to 80	1.5	1.6	1.9	2.2	2.4	2.8	2.9	2.9	3.4	3.9	5.2	5.4	7.0	–	–
40 to 60	1.1	1.2	1.5	1.8	2.1	2.4	2.5	2.5	3.0	3.5	4.7	4.9	6.4	–	–
20～40	0.8	0.9	1.2	1.4	1.7	2.0	2.1	2.1	2.6	3.1	4.2	4.3	5.8	–	–
0 to 20	0.5	0.6	0.8	1.1	1.3	1.6	1.7	1.7	2.1	2.6	3.7	3.8	5.2	–	–
-20 to 0	0.2	0.2	0.5	0.7	0.9	1.2	1.3	1.3	1.7	2.2	3.2	3.3	4.6	–	–
-40 to -20	-0.2	-0.1	0.1	0.3	0.6	0.8	0.9	1.0	1.3	1.7	2.7	2.8	4.0	–	–
-60 to -40	-0.5	-0.4	-0.2	0.0	0.2	0.4	0.5	0.6	0.9	1.3	2.2	2.3	3.4	–	–
-70 to -60	-0.7	-0.7	-0.5	-0.3	-0.1	0.1	0.2	0.3	0.6	0.9	1.8	1.9	3.0	–	–

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.06417888E-01
Q1	7.52701722E+01
P2	2.36574681E-02
Q2	6.01210432E-02
P3	3.87982841E-01
Q3	8.15560229E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	1.0	7.7
Frac. eq. (ref.)	1.8	10.6

Prod. Freq. (A to F)	B

Similar glass type			
OHARA		HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF01

nd = 1.785900　　ne = 1.790131

νd = 44.17　　νe = 43.92

Glass code (d)
786442
Glass code (e)
790439

Spectral l.	Refractive idx
2.058	1.74786
1.970	1.74953
1.530	1.75730
1.129	1.76447
1.064	1.76583
t	1.76697
s	1.77148
A'	1.774649
r	1.777602
C	1.780582
C'	1.781422
He-Ne	1.782208
D	1.785743
d	1.785900
e	1.790131
F	1.798375
F'	1.799413
g	1.808383
h	1.816867
0.389	1.822124
i	1.831728

Coef. disp. form. (pwr ser.)	
A0	3.10918831E+00
A1	-1.37763126E-02
A2	-1.30545613E-04
A3	2.74334291E-02
A4	6.51189638E-04
A5	-1.58159803E-06
A6	1.87919051E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.017793
F'-C'	0.017991
C-t	0.013612
C-A'	0.005933
d-C	0.005318
e-C	0.009549
g-d	0.022483
g-F	0.010008
h-g	0.008484
i-g	0.023345
C'-t	0.014452
e-C'	0.008709
F'-e	0.009282
i-F'	0.032315

Relative partial dispersion	
C-t／F-C	0.7650
C-A'／F-C	0.3334
d-C／F-C	0.2989
e-C／F-C	0.5367
g-d／F-C	1.2636
g-F／F-C	0.5625
h-g／F-C	0.4768
i-g／F-C	1.3120
C'-t／F'-C'	0.8033
e-C'／F'-C'	0.4841
F'-e／F'-C'	0.5159
i-F'／F'-C'	1.7962

Deviation of relative partial disp.	
ΔPdC	0.0017
ΔPgF	-0.0078

Specific gravity	4.25

Thermal properties	
CTE(-30,70) [1E-7/℃]	59
CTE(100,300) [1E-7/℃]	76
Tg [℃]	617
At [℃]	648
Ht cndct. [W/m･K]	0.888
Sp. heat [kJ/kg･K]	0.539
Ht diffus. [1E-6 m2/sec]	0.388

Chemical properties [class]	
Acid res. (surface)	4
Alkaline detergent res.	3
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	621 (6)
Abrasion hardness	76
Young's mod. [GPa]	111.5
Shear mod. [GPa]	42.9
Poisson's ratio	0.300
Stress optical coef. [1E-5 nm/cm／Pa]	2.11

Color Code (80%/5%)	40/32
Internal CC	364/323
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	0.02
330	0.19
340	0.43
350	0.63
360	0.76
365	0.81
370	0.85
380	0.905
390	0.937
400	0.955
420	0.973
440	0.981
460	0.987
480	0.991
500	0.995
550	0.997
600	0.998
650	0.997
700	0.996
800	0.991
900	0.998
1000	0.998
1200	0.999
1400	0.999
1600	0.994
1800	0.987
2000	0.966
2200	0.914
2400	0.71

Relative Δn/ΔT [1E-6/℃]															
Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	5.0	5.1	5.3	5.5	5.7	5.9	5.9	6.0	6.2	6.5	7.2	7.3	8.1	8.9	9.3
60 to 80(ref.)	4.8	4.9	5.2	5.3	5.5	5.7	5.7	5.8	6.0	6.3	7.0	7.1	7.9	8.7	9.1
40 to 60	4.6	4.7	4.9	5.1	5.3	5.4	5.5	5.5	5.8	6.1	6.7	6.8	7.6	8.3	8.8
20 to 40	4.4	4.5	4.8	4.9	5.1	5.2	5.3	5.3	5.6	5.9	6.5	6.6	7.4	8.1	8.5
0 to 20	4.3	4.4	4.6	4.8	4.9	5.1	5.1	5.2	5.4	5.7	6.3	6.4	7.1	7.8	8.2
-20 to 0	4.2	4.3	4.5	4.7	4.8	5.0	5.0	5.0	5.3	5.5	6.2	6.2	7.0	7.7	8.0
-40 to -20	4.2	4.2	4.5	4.6	4.8	4.9	5.0	5.0	5.2	5.5	6.1	6.2	6.9	7.6	7.9
-60 to -40(ref.)	4.2	4.3	4.6	4.7	4.8	5.0	5.0	5.1	5.3	5.5	6.1	6.2	6.9	7.6	7.9
-70 to -60(ref.)	4.4	4.5	4.7	4.8	5.0	5.1	5.2	5.2	5.4	5.7	6.2	6.3	7.0	7.6	8.0

Absolute Δn/ΔT [1E-6/℃]															
Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.9	4.0	4.3	4.4	4.6	4.8	4.8	4.9	5.1	5.4	6.1	6.2	7.0	7.7	8.2
60 to 80	3.6	3.7	4.0	4.1	4.3	4.5	4.5	4.6	4.8	5.1	5.8	5.9	6.7	7.4	7.8
40 to 60	3.3	3.4	3.6	3.8	3.9	4.1	4.1	4.2	4.4	4.7	5.3	5.4	6.2	6.9	7.3
20～40	2.9	3.0	3.2	3.4	3.5	3.7	3.7	3.8	4.0	4.3	4.9	5.0	5.8	6.5	6.9
0 to 20	2.5	2.6	2.8	3.0	3.1	3.3	3.3	3.4	3.6	3.9	4.5	4.6	5.3	6.0	6.4
-20 to 0	2.2	2.2	2.5	2.6	2.8	2.9	2.9	3.0	3.2	3.5	4.1	4.1	4.9	5.5	5.9
-40 to -20	1.8	1.9	2.1	2.2	2.4	2.5	2.6	2.6	2.8	3.1	3.6	3.7	4.4	5.0	5.4
-60 to -40	1.4	1.5	1.7	1.9	2.0	2.1	2.2	2.2	2.4	2.6	3.2	3.3	4.0	4.6	4.9
-70 to -60	1.1	1.2	1.4	1.6	1.7	1.8	1.9	1.9	2.1	2.3	2.9	3.0	3.6	4.2	4.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.11014784E-01
Q1	7.11754946E+01
P2	2.40014797E-02
Q2	3.65054964E-02
P3	3.88792918E-01
Q3	5.94406203E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.5	6.4
Frac. eq. (ref.)	0.6	7.4

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-LAH51	HOYA	NBFD11
C.D.G.M	H-LaF52	SCHOTT	N-LAF33

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF02

nd = 1.799520　　ne = 1.804034

νd = 42.09　　νe = 41.83

Glass code (d)
800421
Glass code (e)
804418

Spectral l.	Refractive idx
2.058	1.76084
1.970	1.76245
1.530	1.76995
1.129	1.77706
1.064	1.77843
t	1.77960
s	1.78427
A'	1.787593
r	1.790708
C	1.793865
C'	1.794756
He-Ne	1.795591
D	1.799353
d	1.799520
e	1.804034
F	1.812862
F'	1.813976
g	1.823628
h	1.832793
0.389	1.838492
i	1.848944

Coef. disp. form. (pwr ser.)	
A0	3.15037829E+00
A1	-1.26701101E-02
A2	-1.84342080E-04
A3	3.01788791E-02
A4	4.35495344E-04
A5	5.91055881E-05
A6	-3.81755339E-06
A7	2.51546253E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.018997
F'-C'	0.019220
C-t	0.014266
C-A'	0.006272
d-C	0.005655
e-C	0.010169
g-d	0.024108
g-F	0.010766
h-g	0.009165
i-g	0.025316
C'-t	0.015157
e-C'	0.009278
F'-e	0.009942
i-F'	0.034968

Relative partial dispersion	
C-t／F-C	0.7510
C-A'／F-C	0.3302
d-C／F-C	0.2977
e-C／F-C	0.5353
g-d／F-C	1.2690
g-F／F-C	0.5667
h-g／F-C	0.4824
i-g／F-C	1.3326
C'-t／F'-C'	0.7886
e-C'／F'-C'	0.4827
F'-e／F'-C'	0.5173
i-F'／F'-C'	1.8194

Deviation of relative partial disp.	
ΔPdC	0.0015
ΔPgF	-0.0070

Specific gravity	4.51

Thermal properties	
CTE(-30,70) [1E-7/℃]	53
CTE(100,300) [1E-7/℃]	71
Tg [℃]	598
At [℃]	630
Ht cndct. [W/m･K]	0.850
Sp. heat [kJ/kg･K]	0.518
Ht diffus. [1E-6 m2/sec]	0.363

Chemical properties [class]	
Acid res. (surface)	4
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	586 (6)
Abrasion hardness	64
Young's mod. [GPa]	109.1
Shear mod. [GPa]	41.6
Poisson's ratio	0.310
Stress optical coef. [1E-5 nm/cm／Pa]	2.23

Color Code (80%/5%)	40/34
Internal CC	369/336
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.12
350	0.42
360	0.66
365	0.74
370	0.81
380	0.88
390	0.921
400	0.945
420	0.966
440	0.976
460	0.982
480	0.987
500	0.990
550	0.993
600	0.992
650	0.993
700	0.993
800	0.988
900	0.996
1000	0.994
1200	0.997
1400	0.995
1600	0.990
1800	0.981
2000	0.964
2200	0.914
2400	0.72

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	7.9	8.0	8.2	8.5	8.7	9.0	9.1	9.1	9.5	9.8	10.7	10.8	11.8	12.8	13.4
60 to 80(ref.)	7.7	7.8	8.1	8.3	8.5	8.8	8.8	8.9	9.2	9.6	10.4	10.5	11.5	12.5	13.1
40 to 60	7.5	7.6	7.8	8.1	8.3	8.5	8.6	8.7	9.0	9.3	10.1	10.2	11.1	12.1	12.7
20 to 40	7.3	7.4	7.6	7.9	8.1	8.3	8.4	8.4	8.7	9.1	9.8	9.9	10.8	11.7	12.3
0 to 20	7.2	7.2	7.5	7.7	7.9	8.1	8.2	8.2	8.5	8.9	9.6	9.7	10.5	11.4	12.0
-20 to 0	7.1	7.2	7.4	7.6	7.8	8.0	8.0	8.1	8.4	8.7	9.4	9.5	10.3	11.2	11.7
-40 to -20	7.1	7.1	7.4	7.5	7.7	7.9	8.0	8.0	8.3	8.6	9.3	9.4	10.2	11.0	11.5
-60 to -40(ref.)	7.2	7.2	7.4	7.6	7.8	8.0	8.0	8.1	8.3	8.7	9.3	9.4	10.1	10.9	11.4
-70 to -60(ref.)	7.3	7.4	7.6	7.7	7.9	8.1	8.2	8.2	8.5	8.8	9.4	9.5	10.2	10.9	11.4

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	6.8	6.9	7.2	7.4	7.6	7.9	7.9	8.0	8.3	8.7	9.5	9.6	10.6	11.6	12.3
60 to 80	6.5	6.6	6.9	7.1	7.3	7.6	7.6	7.7	8.0	8.4	9.2	9.3	10.2	11.2	11.8
40 to 60	6.2	6.2	6.5	6.7	6.9	7.1	7.2	7.3	7.6	7.9	8.7	8.8	9.7	10.6	11.2
20～40	5.8	5.9	6.1	6.3	6.5	6.7	6.8	6.9	7.2	7.5	8.2	8.3	9.2	10.1	10.7
0 to 20	5.4	5.5	5.7	5.9	6.1	6.3	6.4	6.4	6.7	7.1	7.8	7.8	8.7	9.5	10.1
-20 to 0	5.1	5.1	5.3	5.5	5.7	5.9	6.0	6.0	6.3	6.6	7.3	7.4	8.2	9.0	9.5
-40 to -20	4.7	4.7	5.0	5.1	5.3	5.5	5.6	5.6	5.9	6.2	6.8	6.9	7.7	8.4	8.9
-60 to -40	4.3	4.4	4.6	4.7	4.9	5.1	5.2	5.2	5.4	5.7	6.3	6.4	7.1	7.9	8.4
-70 to -60	4.0	4.1	4.3	4.4	4.6	4.8	4.8	4.9	5.1	5.4	6.0	6.1	6.8	7.5	7.9

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.06784810E-01
Q1	7.32229118E+01
P2	2.04998014E-02
Q2	4.06036318E-02
P3	3.97089133E-01
Q3	6.38000144E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	9.5
Frac. eq. (ref.)	0.8	7.7

Prod. Freq. (A to F)	D

Similar glass type			
OHARA	S-LAH52	HOYA	NBFD12
C.D.G.M	H-LaF54	SCHOTT	N-LAF36

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF03

nd = 1.806100　　ne = 1.810772

νd = 40.97　　νe = 40.73

Glass code (d)
806410
Glass code (e)
811407

Spectral l.	Refractive idx
2.058	1.76515
1.970	1.76691
1.530	1.77510
1.129	1.78273
1.064	1.78419
t	1.78542
s	1.79030
A'	1.793753
r	1.796981
C	1.800248
C'	1.801171
He-Ne	1.802035
D	1.805927
d	1.806100
e	1.810772
F	1.819921
F'	1.821077
g	1.831111
h	1.840675
0.389	1.846641
i	1.857625

Coef. disp. form. (pwr ser.)	
A0	3.17262102E+00
A1	-1.44956612E-02
A2	-1.48050666E-04
A3	3.02384298E-02
A4	7.95161351E-04
A5	-3.21543048E-06
A6	3.05533181E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.019673
F'-C'	0.019906
C-t	0.014828
C-A'	0.006495
d-C	0.005852
e-C	0.010524
g-d	0.025011
g-F	0.011190
h-g	0.009564
i-g	0.026514
C'-t	0.015751
e-C'	0.009601
F'-e	0.010305
i-F'	0.036548

Relative partial dispersion	
C-t／F-C	0.7537
C-A'／F-C	0.3301
d-C／F-C	0.2975
e-C／F-C	0.5349
g-d／F-C	1.2713
g-F／F-C	0.5688
h-g／F-C	0.4861
i-g／F-C	1.3477
C'-t／F'-C'	0.7913
e-C'／F'-C'	0.4823
F'-e／F'-C'	0.5177
i-F'／F'-C'	1.8360

Deviation of relative partial disp.	
ΔPdC	0.0018
ΔPgF	-0.0068

Specific gravity	4.31

Thermal properties	
CTE(-30,70) [1E-7/℃]	52
CTE(100,300) [1E-7/℃]	65
Tg [℃]	620
At [℃]	650
Ht cndct. [W/m･K]	0.861
Sp. heat [kJ/kg･K]	0.499
Ht diffus. [1E-6 m2/sec]	0.400

Chemical properties [class]	
Acid res. (surface)	4
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	643 (6)
Abrasion hardness	78
Young's mod. [GPa]	114.0
Shear mod. [GPa]	43.9
Poisson's ratio	0.297
Stress optical coef. [1E-5 nm/cm／Pa]	2.38

Color Code (80%/5%)	41/33
Internal CC	371/331

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	0.03
340	0.23
350	0.48
360	0.66
365	0.73
370	0.79
380	0.86
390	0.911
400	0.937
420	0.964
440	0.975
460	0.983
480	0.988
500	0.992
550	0.994
600	0.995
650	0.995
700	0.995
800	0.990
900	0.996
1000	0.995
1200	0.997
1400	0.992
1600	0.989
1800	0.975
2000	0.953
2200	0.88
2400	0.67

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	5.9	6.0	6.2	6.5	6.7	6.9	7.0	7.1	7.4	7.8	8.6	8.7	9.6	10.6	11.3
60 to 80(ref.)	5.7	5.8	6.1	6.3	6.5	6.7	6.8	6.9	7.2	7.5	8.3	8.4	9.3	10.3	10.9
40 to 60	5.5	5.6	5.8	6.0	6.2	6.5	6.5	6.6	6.9	7.2	7.9	8.0	8.9	9.9	10.5
20 to 40	5.3	5.4	5.6	5.8	6.0	6.2	6.3	6.3	6.6	7.0	7.6	7.7	8.6	9.5	10.0
0 to 20	5.2	5.2	5.4	5.6	5.8	6.0	6.1	6.1	6.4	6.7	7.4	7.5	8.3	9.1	9.7
-20 to 0	5.1	5.1	5.3	5.5	5.7	5.9	5.9	6.0	6.3	6.6	7.2	7.3	8.0	8.8	9.4
-40 to -20	5.0	5.1	5.3	5.5	5.6	5.8	5.9	5.9	6.2	6.5	7.1	7.1	7.9	8.6	9.1
-60 to -40(ref.)	5.1	5.2	5.3	5.5	5.7	5.9	5.9	6.0	6.2	6.5	7.0	7.1	7.8	8.5	9.0
-70 to -60(ref.)	5.3	5.3	5.5	5.6	5.8	6.0	6.0	6.1	6.3	6.6	7.1	7.2	7.8	8.5	9.0

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	4.8	4.9	5.1	5.4	5.6	5.8	5.9	6.0	6.3	6.6	7.4	7.5	8.5	9.4	10.1
60 to 80	4.5	4.6	4.8	5.1	5.3	5.5	5.6	5.6	5.9	6.3	7.0	7.1	8.1	9.0	9.6
40 to 60	4.2	4.2	4.5	4.7	4.9	5.1	5.1	5.2	5.5	5.8	6.5	6.6	7.5	8.4	9.0
20～40	3.8	3.8	4.1	4.3	4.5	4.7	4.7	4.8	5.0	5.4	6.1	6.1	7.0	7.8	8.4
0 to 20	3.4	3.5	3.7	3.8	4.0	4.2	4.3	4.3	4.6	4.9	5.6	5.6	6.4	7.3	7.8
-20 to 0	3.0	3.1	3.3	3.4	3.6	3.8	3.9	3.9	4.2	4.5	5.1	5.1	5.9	6.7	7.2
-40 to -20	2.7	2.7	2.9	3.0	3.2	3.4	3.4	3.5	3.7	4.0	4.6	4.6	5.4	6.1	6.6
-60 to -40	2.3	2.3	2.5	2.6	2.8	3.0	3.0	3.1	3.3	3.5	4.1	4.1	4.8	5.5	5.9
-70 to -60	2.0	2.0	2.2	2.3	2.5	2.6	2.7	2.7	2.9	3.2	3.7	3.8	4.4	5.1	5.5

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.16842249E-01
Q1	7.25891074E+01
P2	2.16356451E-02
Q2	4.21702012E-02
P3	3.98366606E-01
Q3	6.31251150E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	2.5
Frac. eq. (ref.)	0.7	3.4

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-LAH53	HOYA	NBFD13
C.D.G.M	H-ZLaF52	SCHOTT	N-LASF43

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF05

nd = 1.834810　　ne = 1.839454

νd = 42.73　　νe = 42.48

Glass code (d)
835427
Glass code (e)
839425

Spectral l.	Refractive idx
2.058	1.79536
1.970	1.79697
1.530	1.80451
1.129	1.81173
1.064	1.81314
t	1.81433
s	1.81912
A'	1.822536
r	1.825740
C	1.828989
C'	1.829907
He-Ne	1.830766
D	1.834638
d	1.834810
e	1.839454
F	1.848524
F'	1.849668
g	1.859557
h	1.868920
0.389	1.874725
i	1.885334

Coef. disp. form. (pwr ser.)	
A0	3.27458352E+00
A1	-1.32752140E-02
A2	-1.35438033E-04
A3	3.11933067E-02
A4	7.11503841E-04
A5	3.51334559E-06
A6	1.88560229E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.019535
F'-C'	0.019761
C-t	0.014655
C-A'	0.006453
d-C	0.005821
e-C	0.010465
g-d	0.024747
g-F	0.011033
h-g	0.009363
i-g	0.025777
C'-t	0.015573
e-C'	0.009547
F'-e	0.010214
i-F'	0.035666

Relative partial dispersion	
C-t／F-C	0.7502
C-A'／F-C	0.3303
d-C／F-C	0.2980
e-C／F-C	0.5357
g-d／F-C	1.2668
g-F／F-C	0.5648
h-g／F-C	0.4793
i-g／F-C	1.3195
C'-t／F'-C'	0.7881
e-C'／F'-C'	0.4831
F'-e／F'-C'	0.5169
i-F'／F'-C'	1.8049

Deviation of relative partial disp.	
ΔPdC	0.0015
ΔPgF	-0.0079

Specific gravity	4.79

Thermal properties	
CTE(-30,70) [1E-7/℃]	55
CTE(100,300) [1E-7/℃]	77
Tg [℃]	674
At [℃]	708
Ht cndct. [W/m･K]	0.907
Sp. heat [kJ/kg･K]	0.501
Ht diffus. [1E-6 m2/sec]	0.378

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	611 (6)
Abrasion hardness	75
Young's mod. [GPa]	119.8
Shear mod. [GPa]	46.0
Poisson's ratio	0.303
Stress optical coef. [1E-5 nm/cm／Pa]	1.49

Color Code (80%/5%)	41/32
Internal CC	365/323

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	0.02
330	0.18
340	0.42
350	0.61
360	0.75
365	0.80
370	0.84
380	0.900
390	0.931
400	0.952
420	0.971
440	0.979
460	0.986
480	0.989
500	0.992
550	0.996
600	0.995
650	0.995
700	0.995
800	0.989
900	0.997
1000	0.994
1200	0.998
1400	0.999
1600	0.994
1800	0.988
2000	0.973
2200	0.938
2400	0.78

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.3	4.4	4.6	4.9	5.1	5.3	5.4	5.4	5.7	6.0	6.8	6.9	7.7	8.7	9.3
60 to 80(ref.)	4.2	4.3	4.6	4.7	4.9	5.2	5.2	5.3	5.6	5.9	6.6	6.7	7.5	8.5	9.1
40 to 60	4.1	4.1	4.4	4.6	4.8	5.0	5.0	5.1	5.4	5.7	6.4	6.5	7.3	8.2	8.8
20 to 40	3.9	4.0	4.3	4.5	4.7	4.8	4.9	5.0	5.2	5.5	6.2	6.3	7.1	7.9	8.5
0 to 20	3.9	4.0	4.2	4.4	4.6	4.8	4.8	4.9	5.1	5.4	6.0	6.1	6.9	7.7	8.3
-20 to 0	3.9	3.9	4.2	4.4	4.5	4.7	4.8	4.8	5.1	5.4	6.0	6.0	6.8	7.6	8.1
-40 to -20	3.9	4.0	4.2	4.4	4.6	4.8	4.8	4.9	5.1	5.4	5.9	6.0	6.7	7.5	8.1
-60 to -40(ref.)	4.1	4.2	4.4	4.6	4.7	4.9	4.9	5.0	5.2	5.5	6.0	6.1	6.8	7.6	8.1
-70 to -60(ref.)	4.3	4.4	4.6	4.8	4.9	5.1	5.1	5.2	5.4	5.7	6.2	6.3	7.0	7.7	8.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.2	3.3	3.5	3.7	3.9	4.2	4.2	4.3	4.6	4.9	5.6	5.7	6.6	7.5	8.1
60 to 80	3.0	3.1	3.3	3.5	3.7	3.9	4.0	4.0	4.3	4.6	5.3	5.4	6.3	7.2	7.8
40 to 60	2.7	2.8	3.0	3.2	3.4	3.6	3.6	3.7	4.0	4.3	4.9	5.0	5.8	6.7	7.3
20～40	2.4	2.5	2.7	2.9	3.1	3.3	3.3	3.4	3.6	3.9	4.6	4.6	5.4	6.3	6.8
0 to 20	2.1	2.2	2.4	2.6	2.7	2.9	3.0	3.0	3.3	3.6	4.2	4.3	5.0	5.8	6.4
-20 to 0	1.8	1.9	2.1	2.3	2.4	2.6	2.7	2.7	2.9	3.2	3.8	3.9	4.6	5.4	5.9
-40 to -20	1.5	1.6	1.8	1.9	2.1	2.3	2.3	2.4	2.6	2.9	3.4	3.5	4.2	4.9	5.4
-60 to -40	1.2	1.3	1.5	1.6	1.8	1.9	2.0	2.0	2.2	2.5	3.0	3.1	3.8	4.5	5.0
-70 to -60	1.0	1.0	1.2	1.4	1.5	1.7	1.7	1.8	2.0	2.2	2.8	2.8	3.5	4.2	4.6

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.07685998E-01
Q1	7.57647015E+01
P2	2.51666246E-02
Q2	3.62464825E-02
P3	4.06060216E-01
Q3	6.09115841E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	6.0
Frac. eq. (ref.)	0.6	7.2

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-LAH55	HOYA	TAFD5F
C.D.G.M	H-ZLaF55A	SCHOTT	N-LASF41

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF08

nd = 1.883000　　ne = 1.888162

νd = 40.66　　νe = 40.41

Glass code (d)
883407
Glass code (e)
888404

Spectral l.	Refractive idx
2.058	1.84071
1.970	1.84234
1.530	1.85005
1.129	1.85766
1.064	1.85917
t	1.86046
s	1.86567
A'	1.869418
r	1.872952
C	1.876545
C'	1.877561
He-Ne	1.878513
D	1.882809
d	1.883000
e	1.888162
F	1.898263
F'	1.899538
g	1.910574
h	1.921034
0.389	1.927523
i	–

Coef. disp. form. (pwr ser.)	
A0	3.44018604E+00
A1	-1.37727093E-02
A2	-1.15923849E-04
A3	3.55983882E-02
A4	8.03698998E-04
A5	1.22241789E-05
A6	1.64455247E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.021718
F'-C'	0.021977
C-t	0.016088
C-A'	0.007127
d-C	0.006455
e-C	0.011617
g-d	0.027574
g-F	0.012311
h-g	0.010460
i-g	–
C'-t	0.017104
e-C'	0.010601
F'-e	0.011376
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7408
C-A'／F-C	0.3282
d-C／F-C	0.2972
e-C／F-C	0.5349
g-d／F-C	1.2696
g-F／F-C	0.5669
h-g／F-C	0.4816
i-g／F-C	–
C'-t／F'-C'	0.7783
e-C'／F'-C'	0.4824
F'-e／F'-C'	0.5176
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	0.0017
ΔPgF	-0.0093

Specific gravity	5.47

Thermal properties	
CTE(-30,70) [1E-7/℃]	64
CTE(100,300) [1E-7/℃]	80
Tg [℃]	716
At [℃]	753
Ht cndct. [W/m･K]	0.805
Sp. heat [kJ/kg･K]	0.403
Ht diffus. [1E-6 m2/sec]	0.365

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	684 (7)
Abrasion hardness	60
Young's mod. [GPa]	124.6
Shear mod. [GPa]	47.8
Poisson's ratio	0.302
Stress optical coef. [1E-5 nm/cm／Pa]	1.43

Color Code (70%/5%)	38/33
Internal CC	372/332

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	0.03
340	0.21
350	0.46
360	0.65
365	0.72
370	0.78
380	0.86
390	0.902
400	0.931
420	0.957
440	0.969
460	0.977
480	0.983
500	0.987
550	0.992
600	0.992
650	0.993
700	0.993
800	0.988
900	0.990
1000	0.990
1200	0.996
1400	0.996
1600	0.988
1800	0.979
2000	0.968
2200	0.933
2400	0.80

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.5	3.6	3.8	4.1	4.3	4.6	4.7	4.7	5.1	5.5	6.3	6.4	7.4	8.4	9.0
60 to 80(ref.)	3.4	3.5	3.8	4.0	4.2	4.4	4.5	4.6	4.9	5.3	6.1	6.2	7.1	8.1	8.8
40 to 60	3.3	3.4	3.6	3.8	4.0	4.3	4.3	4.4	4.7	5.1	5.9	6.0	6.9	7.8	8.4
20 to 40	3.2	3.3	3.5	3.7	3.9	4.1	4.2	4.3	4.6	4.9	5.7	5.8	6.6	7.5	8.1
0 to 20	3.1	3.2	3.4	3.6	3.8	4.0	4.1	4.2	4.4	4.8	5.5	5.6	6.4	7.3	7.8
-20 to 0	3.1	3.2	3.4	3.6	3.8	4.0	4.1	4.1	4.4	4.7	5.4	5.5	6.3	7.1	7.6
-40 to -20	3.2	3.3	3.5	3.6	3.8	4.0	4.1	4.2	4.4	4.7	5.4	5.5	6.2	7.0	7.5
-60 to -40(ref.)	3.4	3.4	3.6	3.8	4.0	4.2	4.2	4.3	4.6	4.9	5.5	5.6	6.3	7.0	7.5
-70 to -60(ref.)	3.6	3.6	3.8	4.0	4.2	4.4	4.4	4.5	4.7	5.0	5.6	5.7	6.4	7.1	7.6

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.4	2.5	2.7	2.9	3.2	3.4	3.5	3.6	3.9	4.3	5.1	5.2	6.2	7.1	7.8
60 to 80	2.2	2.2	2.5	2.7	2.9	3.2	3.2	3.3	3.6	4.0	4.8	4.9	5.8	6.8	7.4
40 to 60	1.9	1.9	2.2	2.4	2.6	2.8	2.9	3.0	3.3	3.6	4.4	4.5	5.4	6.3	6.9
20～40	1.6	1.6	1.9	2.1	2.3	2.5	2.6	2.6	2.9	3.3	4.0	4.1	4.9	5.8	6.4
0 to 20	1.3	1.4	1.6	1.8	2.0	2.2	2.2	2.3	2.6	2.9	3.6	3.7	4.5	5.3	5.9
-20 to 0	1.0	1.1	1.3	1.4	1.6	1.8	1.9	1.9	2.2	2.5	3.2	3.3	4.0	4.8	5.3
-40 to -20	0.7	0.8	1.0	1.1	1.3	1.5	1.6	1.6	1.9	2.2	2.8	2.9	3.6	4.3	4.8
-60 to -40	0.4	0.5	0.6	0.8	1.0	1.2	1.2	1.3	1.5	1.8	2.4	2.5	3.2	3.8	4.3
-70 to -60	0.2	0.2	0.4	0.6	0.7	0.9	1.0	1.0	1.2	1.5	2.1	2.2	2.8	3.5	3.9

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.27960923E-01
Q1	9.18685870E+01
P2	3.83785671E-02
Q2	3.20607278E-02
P3	4.10178367E-01
Q3	5.82201056E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	4.0
Frac. eq. (ref.)	0.7	3.8

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-LAH58	HOYA	TAFD30
C.D.G.M		SCHOTT	N-LASF31A

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF09

nd = 1.816000　　ne = 1.820169

νd = 46.59　　νe = 46.34

Glass code (d)
816466
Glass code (e)
820463

Spectral l.	Refractive idx
2.058	1.77813
1.970	1.77981
1.530	1.78756
1.129	1.79472
1.064	1.79607
t	1.79721
s	1.80170
A'	1.804855
r	1.807788
C	1.810742
C'	1.811574
He-Ne	1.812352
D	1.815845
d	1.816000
e	1.820169
F	1.828257
F'	1.829272
g	1.838007
h	1.846205
0.389	1.851251
i	1.860396

Coef. disp. form. (pwr ser.)	
A0	3.21640776E+00
A1	-1.37992658E-02
A2	-1.61434942E-04
A3	2.81939284E-02
A4	5.09661263E-04
A5	1.00848603E-05
A6	6.06649264E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.017515
F'-C'	0.017698
C-t	0.013532
C-A'	0.005887
d-C	0.005258
e-C	0.009427
g-d	0.022007
g-F	0.009750
h-g	0.008198
i-g	0.022389
C'-t	0.014364
e-C'	0.008595
F'-e	0.009103
i-F'	0.031124

Relative partial dispersion	
C-t／F-C	0.7726
C-A'／F-C	0.3361
d-C／F-C	0.3002
e-C／F-C	0.5382
g-d／F-C	1.2565
g-F／F-C	0.5567
h-g／F-C	0.4681
i-g／F-C	1.2783
C'-t／F'-C'	0.8116
e-C'／F'-C'	0.4856
F'-e／F'-C'	0.5144
i-F'／F'-C'	1.7586

Deviation of relative partial disp.	
ΔPdC	0.0020
ΔPgF	-0.0095

Specific gravity	4.98

Thermal properties	
CTE(-30,70) [1E-7/℃]	58
CTE(100,300) [1E-7/℃]	76
Tg [℃]	700
At [℃]	723
Ht cndct. [W/m･K]	0.801
Sp. heat [kJ/kg･K]	0.449
Ht diffus. [1E-6 m2/sec]	0.358

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	2

Mechanical properties	
Knoop hardness	686 (7)
Abrasion hardness	53
Young's mod. [GPa]	128.2
Shear mod. [GPa]	49.3
Poisson's ratio	0.300
Stress optical coef. [1E-5 nm/cm／Pa]	1.46

Color Code (80%/5%)	39/32
Internal CC	358/319
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	0.06
330	0.28
340	0.52
350	0.71
360	0.82
365	0.86
370	0.89
380	0.928
390	0.952
400	0.966
420	0.978
440	0.984
460	0.987
480	0.990
500	0.992
550	0.993
600	0.994
650	0.993
700	0.991
800	0.983
900	0.43
1000	0.39
1200	0.996
1400	0.995
1600	0.990
1800	0.981
2000	0.962
2200	0.911
2400	0.72

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.8	3.8	4.0	4.3	4.5	4.7	4.7	4.8	5.0	5.3	5.9	6.0	6.6	7.3	7.8
60 to 80(ref.)	3.6	3.7	4.0	4.1	4.3	4.5	4.6	4.6	4.8	5.1	5.7	5.8	6.4	7.1	7.5
40 to 60	3.5	3.5	3.8	4.0	4.1	4.3	4.4	4.4	4.6	4.9	5.5	5.5	6.1	6.8	7.2
20 to 40	3.3	3.4	3.6	3.8	4.0	4.2	4.2	4.3	4.5	4.7	5.2	5.3	5.9	6.5	6.9
0 to 20	3.3	3.3	3.5	3.7	3.9	4.0	4.1	4.1	4.3	4.6	5.1	5.2	5.7	6.3	6.7
-20 to 0	3.2	3.3	3.5	3.7	3.8	4.0	4.0	4.1	4.3	4.5	5.0	5.0	5.6	6.1	6.5
-40 to -20	3.3	3.3	3.5	3.7	3.8	4.0	4.0	4.1	4.3	4.5	5.0	5.0	5.5	6.1	6.4
-60 to -40(ref.)	3.4	3.5	3.7	3.8	4.0	4.1	4.2	4.2	4.4	4.6	5.0	5.1	5.6	6.1	6.4
-70 to -60(ref.)	3.6	3.7	3.9	4.0	4.2	4.3	4.3	4.4	4.6	4.8	5.2	5.2	5.7	6.2	6.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.6	2.7	3.0	3.2	3.3	3.5	3.6	3.6	3.9	4.2	4.7	4.8	5.5	6.1	6.6
60 to 80	2.4	2.5	2.7	2.9	3.1	3.3	3.3	3.4	3.6	3.9	4.4	4.5	5.1	5.8	6.2
40 to 60	2.1	2.2	2.4	2.6	2.8	2.9	3.0	3.0	3.2	3.5	4.0	4.1	4.7	5.3	5.7
20～40	1.8	1.9	2.1	2.3	2.4	2.6	2.6	2.7	2.9	3.1	3.6	3.7	4.3	4.9	5.3
0 to 20	1.5	1.5	1.8	1.9	2.1	2.2	2.3	2.3	2.5	2.8	3.2	3.3	3.9	4.4	4.8
-20 to 0	1.2	1.2	1.4	1.6	1.7	1.9	1.9	2.0	2.2	2.4	2.9	2.9	3.4	4.0	4.3
-40 to -20	0.9	0.9	1.1	1.3	1.4	1.5	1.6	1.6	1.8	2.0	2.5	2.5	3.0	3.5	3.8
-60 to -40	0.5	0.6	0.8	0.9	1.1	1.2	1.2	1.3	1.5	1.7	2.1	2.1	2.6	3.0	3.3
-70 to -60	0.3	0.4	0.6	0.7	0.8	0.9	1.0	1.0	1.2	1.4	1.8	1.8	2.3	2.7	3.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.15385389E-01
Q1	7.56180251E+01
P2	3.69850126E-02
Q2	2.73461664E-02
P3	3.87927490E-01
Q3	5.40338260E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	8.7
Frac. eq. (ref.)	0.7	9.0

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-LAH59	HOYA	TAF5
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF010

nd = 1.834000　　ne = 1.839319

νd = 37.18　　νe = 36.94

Glass code (d)
834372
Glass code (e)
839369

Spectral l.	Refractive idx
2.058	1.78975
1.970	1.79154
1.530	1.79993
1.129	1.80799
1.064	1.80956
t	1.81089
s	1.81625
A'	1.820090
r	1.823703
C	1.827379
C'	1.828420
He-Ne	1.829395
D	1.833803
d	1.834000
e	1.839319
F	1.849808
F'	1.851140
g	1.862767
h	1.873960
0.389	1.881006
i	1.894125

Coef. disp. form. (pwr ser.)	
A0	3.25964047E+00
A1	-1.45636865E-02
A2	-1.71298494E-04
A3	3.51194196E-02
A4	6.30621917E-04
A5	9.80352299E-05
A6	-8.04182070E-06
A7	6.28587289E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.022429
F'-C'	0.022720
C-t	0.016489
C-A'	0.007289
d-C	0.006621
e-C	0.011940
g-d	0.028767
g-F	0.012959
h-g	0.011193
i-g	0.031358
C'-t	0.017530
e-C'	0.010899
F'-e	0.011821
i-F'	0.042985

Relative partial dispersion	
C-t／F-C	0.7352
C-A'／F-C	0.3250
d-C／F-C	0.2952
e-C／F-C	0.5323
g-d／F-C	1.2826
g-F／F-C	0.5778
h-g／F-C	0.4990
i-g／F-C	1.3981
C'-t／F'-C'	0.7716
e-C'／F'-C'	0.4797
F'-e／F'-C'	0.5203
i-F'／F'-C'	1.8919

Deviation of relative partial disp.	
ΔPdC	0.0012
ΔPgF	-0.0042

Specific gravity	4.28

Thermal properties	
CTE(-30,70) [1E-7/℃]	54
CTE(100,300) [1E-7/℃]	68
Tg [℃]	628
At [℃]	664
Ht cndct. [W/m･K]	0.947
Sp. heat [kJ/kg･K]	0.541
Ht diffus. [1E-6 m2/sec]	0.409

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	639 (6)
Abrasion hardness	71
Young's mod. [GPa]	116.7
Shear mod. [GPa]	45.0
Poisson's ratio	0.297
Stress optical coef. [1E-5 nm/cm／Pa]	2.21

Color Code (80%/5%)	43/35
Internal CC	378/346
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.14
360	0.46
365	0.59
370	0.69
380	0.81
390	0.88
400	0.913
420	0.949
440	0.966
460	0.976
480	0.982
500	0.987
550	0.993
600	0.995
650	0.993
700	0.993
800	0.989
900	0.997
1000	0.995
1200	0.998
1400	0.997
1600	0.992
1800	0.982
2000	0.965
2200	0.910
2400	0.72

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	6.3	6.4	6.7	7.0	7.3	7.6	7.7	7.7	8.1	8.5	9.4	9.6	10.7	12.0	12.9
60 to 80(ref.)	6.1	6.2	6.6	6.8	7.0	7.3	7.4	7.4	7.8	8.2	9.1	9.2	10.4	11.6	12.4
40 to 60	5.8	5.9	6.2	6.5	6.7	6.9	7.0	7.1	7.4	7.8	8.7	8.8	9.9	11.0	11.9
20 to 40	5.5	5.6	5.9	6.2	6.4	6.6	6.7	6.8	7.1	7.5	8.3	8.4	9.4	10.6	11.3
0 to 20	5.3	5.4	5.7	5.9	6.1	6.4	6.4	6.5	6.8	7.2	7.9	8.0	9.0	10.1	10.9
-20 to 0	5.1	5.2	5.5	5.7	5.9	6.1	6.2	6.3	6.6	6.9	7.7	7.8	8.7	9.7	10.4
-40 to -20	5.0	5.1	5.4	5.6	5.8	6.0	6.1	6.1	6.4	6.7	7.4	7.5	8.4	9.4	10.1
-60 to -40(ref.)	5.0	5.1	5.4	5.6	5.8	6.0	6.0	6.1	6.3	6.7	7.3	7.4	8.3	9.2	9.9
-70 to -60(ref.)	5.1	5.2	5.5	5.6	5.8	6.0	6.1	6.1	6.4	6.7	7.3	7.4	8.3	9.2	9.8

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	5.2	5.3	5.7	5.9	6.2	6.4	6.5	6.6	6.9	7.4	8.3	8.4	9.6	10.8	11.7
60 to 80	4.9	5.0	5.3	5.6	5.8	6.1	6.1	6.2	6.5	7.0	7.8	8.0	9.1	10.3	11.1
40 to 60	4.4	4.5	4.8	5.1	5.3	5.6	5.6	5.7	6.0	6.4	7.3	7.4	8.4	9.6	10.4
20～40	4.0	4.1	4.4	4.6	4.8	5.0	5.1	5.2	5.5	5.9	6.7	6.8	7.8	8.9	9.7
0 to 20	3.5	3.6	3.9	4.1	4.3	4.5	4.6	4.7	5.0	5.3	6.1	6.2	7.1	8.2	8.9
-20 to 0	3.1	3.1	3.4	3.6	3.8	4.0	4.1	4.2	4.4	4.8	5.5	5.6	6.5	7.5	8.2
-40 to -20	2.6	2.7	2.9	3.1	3.3	3.5	3.6	3.6	3.9	4.2	4.9	5.0	5.9	6.8	7.5
-60 to -40	2.2	2.2	2.5	2.7	2.8	3.0	3.1	3.1	3.4	3.7	4.3	4.4	5.2	6.1	6.8
-70 to -60	1.8	1.9	2.1	2.3	2.5	2.6	2.7	2.7	3.0	3.3	3.9	4.0	4.7	5.6	6.2

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.04623045E-01
Q1	6.64846075E+01
P2	2.01481579E-02
Q2	4.84277053E-02
P3	4.09502477E-01
Q3	6.84010411E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	6.8
Frac. eq. (ref.)	1.5	13.0

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-LAH60	HOYA	NBFD10
C.D.G.M	H-ZLaF53A	SCHOTT	N-LASF40

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF013

nd = 1.804400　　ne = 1.809220

νd = 39.61　　νe = 39.36

Glass code (d)
804396
Glass code (e)
809394

Spectral l.	Refractive idx
2.058	1.76221
1.970	1.76404
1.530	1.77251
1.129	1.78037
1.064	1.78186
t	1.78312
s	1.78814
A'	1.791690
r	1.795010
C	1.798372
C'	1.799322
He-Ne	1.800212
D	1.804221
d	1.804400
e	1.809220
F	1.818682
F'	1.819880
g	1.830298
h	1.840270
0.389	1.846513
i	1.858063

Coef. disp. form. (pwr ser.)	
A0	3.16350950E+00
A1	-1.45894059E-02
A2	-2.12587159E-04
A3	3.15033746E-02
A4	5.85519102E-04
A5	5.85508847E-05
A6	-3.44096993E-06
A7	3.17840715E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.020310
F'-C'	0.020558
C-t	0.015248
C-A'	0.006682
d-C	0.006028
e-C	0.010848
g-d	0.025898
g-F	0.011616
h-g	0.009972
i-g	0.027765
C'-t	0.016198
e-C'	0.009898
F'-e	0.010660
i-F'	0.038183

Relative partial dispersion	
C-t／F-C	0.7508
C-A'／F-C	0.3290
d-C／F-C	0.2968
e-C／F-C	0.5341
g-d／F-C	1.2751
g-F／F-C	0.5719
h-g／F-C	0.4910
i-g／F-C	1.3671
C'-t／F'-C'	0.7879
e-C'／F'-C'	0.4815
F'-e／F'-C'	0.5185
i-F'／F'-C'	1.8573

Deviation of relative partial disp.	
ΔPdC	0.0017
ΔPgF	-0.0060

Specific gravity	4.20

Thermal properties	
CTE(-30,70) [1E-7/℃]	51
CTE(100,300) [1E-7/℃]	67
Tg [℃]	618
At [℃]	649
Ht cndct. [W/m･K]	0.884
Sp. heat [kJ/kg･K]	0.530
Ht diffus. [1E-6 m2/sec]	0.395

Chemical properties [class]	
Acid res. (surface)	4
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	626 (6)
Abrasion hardness	76
Young's mod. [GPa]	112.6
Shear mod. [GPa]	43.4
Poisson's ratio	0.297
Stress optical coef. [1E-5 nm/cm／Pa]	2.31

Color Code (80%/5%)	41/34
Internal CC	372/336

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	0.13
350	0.41
360	0.64
365	0.71
370	0.78
380	0.86
390	0.911
400	0.939
420	0.967
440	0.979
460	0.985
480	0.990
500	0.993
550	0.997
600	0.998
650	0.997
700	0.996
800	0.992
900	0.999
1000	0.998
1200	0.999
1400	0.995
1600	0.990
1800	0.979
2000	0.951
2200	0.86
2400	0.63

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	6.2	6.3	6.5	6.8	7.0	7.2	7.3	7.4	7.7	8.0	8.9	9.0	9.9	11.0	11.7
60 to 80(ref.)	6.0	6.1	6.4	6.6	6.8	7.0	7.1	7.1	7.4	7.8	8.6	8.7	9.7	10.7	11.3
40 to 60	5.8	5.9	6.1	6.3	6.5	6.8	6.8	6.9	7.2	7.5	8.3	8.4	9.3	10.3	10.9
20 to 40	5.6	5.7	5.9	6.1	6.3	6.5	6.6	6.6	6.9	7.3	8.0	8.1	9.0	9.9	10.5
0 to 20	5.5	5.5	5.8	5.9	6.1	6.3	6.4	6.5	6.7	7.1	7.7	7.8	8.7	9.6	10.2
-20 to 0	5.4	5.5	5.7	5.8	6.0	6.2	6.3	6.3	6.6	6.9	7.6	7.6	8.4	9.3	9.9
-40 to -20	5.4	5.4	5.6	5.8	6.0	6.2	6.2	6.3	6.5	6.8	7.4	7.5	8.3	9.1	9.6
-60 to -40(ref.)	5.5	5.5	5.7	5.9	6.0	6.2	6.3	6.3	6.6	6.8	7.4	7.5	8.2	9.0	9.5
-70 to -60(ref.)	5.6	5.7	5.8	6.0	6.2	6.3	6.4	6.4	6.7	6.9	7.5	7.6	8.3	9.0	9.5

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	5.1	5.2	5.4	5.6	5.9	6.1	6.2	6.2	6.5	6.9	7.7	7.8	8.8	9.8	10.5
60 to 80	4.8	4.9	5.1	5.3	5.6	5.8	5.9	5.9	6.2	6.6	7.3	7.4	8.4	9.4	10.1
40 to 60	4.5	4.5	4.8	5.0	5.2	5.4	5.4	5.5	5.8	6.1	6.9	7.0	7.9	8.8	9.5
20～40	4.1	4.2	4.4	4.6	4.8	5.0	5.0	5.1	5.4	5.7	6.4	6.5	7.3	8.2	8.9
0 to 20	3.7	3.8	4.0	4.2	4.4	4.6	4.6	4.7	4.9	5.2	5.9	6.0	6.8	7.7	8.3
-20 to 0	3.4	3.4	3.6	3.8	4.0	4.1	4.2	4.2	4.5	4.8	5.4	5.5	6.3	7.1	7.7
-40 to -20	3.0	3.0	3.2	3.4	3.6	3.7	3.8	3.8	4.1	4.4	5.0	5.0	5.8	6.5	7.1
-60 to -40	2.6	2.7	2.8	3.0	3.1	3.3	3.4	3.4	3.6	3.9	4.5	4.5	5.2	6.0	6.5
-70 to -60	2.3	2.4	2.5	2.7	2.8	3.0	3.1	3.1	3.3	3.6	4.1	4.2	4.9	5.6	6.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.07014916E-01
Q1	6.46906731E+01
P2	2.05151386E-02
Q2	4.51374212E-02
P3	3.98531952E-01
Q3	6.50186587E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	9.7
Frac. eq. (ref.)	0.8	9.5

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-LAH63	HOYA	NBFD3
C.D.G.M	H-ZLaF51	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF014

nd = 1.788000　　ne = 1.791961

νd = 47.35　　νe = 47.11

Glass code (d)
788474
Glass code (e)
792471

Spectral l.	Refractive idx
2.058	1.75096
1.970	1.75266
1.530	1.76050
1.129	1.76759
1.064	1.76891
t	1.77001
s	1.77435
A'	1.777378
r	1.780181
C	1.782997
C'	1.783790
He-Ne	1.784530
D	1.787853
d	1.788000
e	1.791961
F	1.799638
F'	1.800601
g	1.808889
h	1.816670
0.389	1.821462
i	1.830154

Coef. disp. form. (pwr ser.)	
A0	3.12119480E+00
A1	-1.37527216E-02
A2	-1.86592469E-04
A3	2.63764849E-02
A4	4.53698660E-04
A5	1.09722341E-05
A6	6.11243363E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.016641
F'-C'	0.016811
C-t	0.012982
C-A'	0.005619
d-C	0.005003
e-C	0.008964
g-d	0.020889
g-F	0.009251
h-g	0.007781
i-g	0.021265
C'-t	0.013775
e-C'	0.008171
F'-e	0.008640
i-F'	0.029553

Relative partial dispersion	
C-t／F-C	0.7801
C-A'／F-C	0.3377
d-C／F-C	0.3006
e-C／F-C	0.5387
g-d／F-C	1.2553
g-F／F-C	0.5559
h-g／F-C	0.4676
i-g／F-C	1.2779
C'-t／F'-C'	0.8194
e-C'／F'-C'	0.4861
F'-e／F'-C'	0.5139
i-F'／F'-C'	1.7580

Deviation of relative partial disp.	
ΔPdC	0.0021
ΔPgF	-0.0090

Specific gravity	4.36

Thermal properties	
CTE(-30,70) [1E-7/℃]	57
CTE(100,300) [1E-7/℃]	74
Tg [℃]	683
At [℃]	707
Ht cndct. [W/m･K]	0.844
Sp. heat [kJ/kg･K]	0.501
Ht diffus. [1E-6 m2/sec]	0.386

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	632 (6)
Abrasion hardness	59
Young's mod. [GPa]	119.6
Shear mod. [GPa]	46.1
Poisson's ratio	0.297
Stress optical coef. [1E-5 nm/cm／Pa]	1.66

Color Code (80%/5%)	38/32
Internal CC	352/314

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	0.01
320	0.17
330	0.44
340	0.65
350	0.78
360	0.86
365	0.89
370	0.915
380	0.947
390	0.964
400	0.975
420	0.984
440	0.989
460	0.992
480	0.994
500	0.995
550	0.995
600	0.996
650	0.995
700	0.994
800	0.990
900	0.998
1000	0.995
1200	0.999
1400	0.997
1600	0.992
1800	0.978
2000	0.957
2200	0.89
2400	0.68

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.9	4.0	4.1	4.3	4.5	4.6	4.7	4.7	5.0	5.3	5.8	5.9	6.4	6.9	7.3
60 to 80(ref.)	3.8	3.8	4.1	4.2	4.3	4.5	4.6	4.6	4.8	5.1	5.7	5.7	6.3	6.8	7.1
40 to 60	3.6	3.7	3.9	4.0	4.2	4.3	4.4	4.4	4.7	4.9	5.5	5.5	6.1	6.6	6.9
20 to 40	3.5	3.6	3.8	3.9	4.1	4.2	4.3	4.3	4.5	4.8	5.3	5.4	5.9	6.4	6.7
0 to 20	3.4	3.5	3.7	3.8	4.0	4.1	4.2	4.2	4.4	4.7	5.2	5.3	5.8	6.3	6.6
-20 to 0	3.4	3.5	3.7	3.8	3.9	4.1	4.1	4.2	4.4	4.7	5.2	5.2	5.7	6.2	6.5
-40 to -20	3.5	3.5	3.7	3.9	4.0	4.1	4.2	4.2	4.4	4.7	5.2	5.2	5.7	6.2	6.5
-60 to -40(ref.)	3.6	3.7	3.9	4.0	4.1	4.3	4.3	4.4	4.6	4.8	5.3	5.4	5.8	6.3	6.6
-70 to -60(ref.)	3.8	3.9	4.1	4.2	4.3	4.5	4.5	4.5	4.8	5.0	5.5	5.5	6.0	6.4	6.7

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.8	2.9	3.1	3.2	3.4	3.5	3.6	3.6	3.9	4.1	4.7	4.7	5.3	5.8	6.1
60 to 80	2.6	2.7	2.9	3.0	3.1	3.3	3.3	3.4	3.6	3.9	4.4	4.5	5.0	5.5	5.9
40 to 60	2.3	2.4	2.6	2.7	2.8	3.0	3.0	3.1	3.3	3.6	4.1	4.1	4.7	5.1	5.5
20～40	2.0	2.1	2.2	2.4	2.5	2.7	2.7	2.8	3.0	3.2	3.7	3.8	4.3	4.8	5.1
0 to 20	1.7	1.8	1.9	2.1	2.2	2.3	2.4	2.4	2.7	2.9	3.4	3.5	3.9	4.4	4.7
-20 to 0	1.4	1.5	1.6	1.8	1.9	2.0	2.1	2.1	2.3	2.6	3.1	3.1	3.6	4.0	4.3
-40 to -20	1.1	1.2	1.3	1.5	1.6	1.7	1.8	1.8	2.0	2.2	2.7	2.8	3.2	3.7	4.0
-60 to -40	0.8	0.9	1.0	1.1	1.3	1.4	1.4	1.5	1.7	1.9	2.4	2.4	2.9	3.3	3.6
-70 to -60	0.6	0.6	0.8	0.9	1.0	1.2	1.2	1.2	1.4	1.7	2.1	2.2	2.6	3.0	3.3

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.09786177E-01
Q1	6.93481767E+01
P2	2.36064082E-02
Q2	3.22011336E-02
P3	3.90622283E-01
Q3	5.76163595E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	9.7
Frac. eq. (ref.)	0.8	10.0

Prod. Freq. (A to F)	B

Similar glass type			
OHARA	S-LAH64	HOYA	TAF4
C.D.G.M	H-LaF10L	SCHOTT	N-LAF21

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF015

nd = 1.804000　　ne = 1.808106

νd = 46.60　　νe = 46.35

Glass code (d)
804466
Glass code (e)
808464

Spectral l.	Refractive idx
2.058	1.76695
1.970	1.76858
1.530	1.77612
1.129	1.78310
1.064	1.78442
t	1.78553
s	1.78994
A'	1.793033
r	1.795917
C	1.798824
C'	1.799643
He-Ne	1.800408
D	1.803847
d	1.804000
e	1.808106
F	1.816078
F'	1.817079
g	1.825697
h	1.833795
0.389	1.838784
i	1.847835

Coef. disp. form. (pwr ser.)	
A0	3.17452404E+00
A1	-1.32156517E-02
A2	-1.65919934E-04
A3	2.76472367E-02
A4	4.83338934E-04
A5	1.20380702E-05
A6	6.02649728E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.017254
F'-C'	0.017436
C-t	0.013293
C-A'	0.005791
d-C	0.005176
e-C	0.009282
g-d	0.021697
g-F	0.009619
h-g	0.008098
i-g	0.022138
C'-t	0.014112
e-C'	0.008463
F'-e	0.008973
i-F'	0.030756

Relative partial dispersion	
C-t／F-C	0.7704
C-A'／F-C	0.3356
d-C／F-C	0.3000
e-C／F-C	0.5380
g-d／F-C	1.2575
g-F／F-C	0.5575
h-g／F-C	0.4693
i-g／F-C	1.2831
C'-t／F'-C'	0.8094
e-C'／F'-C'	0.4854
F'-e／F'-C'	0.5146
i-F'／F'-C'	1.7639

Deviation of relative partial disp.	
ΔPdC	0.0018
ΔPgF	-0.0087

Specific gravity	4.57

Thermal properties	
CTE(-30,70) [1E-7/℃]	60
CTE(100,300) [1E-7/℃]	75
Tg [℃]	697
At [℃]	728
Ht cndct. [W/m･K]	0.834
Sp. heat [kJ/kg･K]	0.470
Ht diffus. [1E-6 m2/sec]	0.387

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	670 (7)
Abrasion hardness	64
Young's mod. [GPa]	119.6
Shear mod. [GPa]	46.1
Poisson's ratio	0.298
Stress optical coef. [1E-5 nm/cm／Pa]	1.43

Color Code (80%/5%)	39/32
Internal CC	361/317
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	0.09
330	0.29
340	0.50
350	0.67
360	0.79
365	0.84
370	0.87
380	0.918
390	0.947
400	0.963
420	0.979
440	0.985
460	0.988
480	0.991
500	0.993
550	0.995
600	0.994
650	0.994
700	0.992
800	0.990
900	0.995
1000	0.994
1200	0.995
1400	0.994
1600	0.990
1800	0.980
2000	0.964
2200	0.916
2400	0.73

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.5	3.6	3.8	4.0	4.1	4.3	4.4	4.4	4.7	5.0	5.6	5.6	6.3	6.9	7.4
60 to 80(ref.)	3.4	3.5	3.7	3.9	4.0	4.2	4.2	4.3	4.5	4.8	5.4	5.5	6.1	6.8	7.3
40 to 60	3.3	3.4	3.6	3.7	3.9	4.1	4.1	4.2	4.4	4.7	5.3	5.3	5.9	6.6	7.0
20 to 40	3.2	3.3	3.5	3.7	3.8	4.0	4.0	4.1	4.3	4.6	5.1	5.2	5.8	6.4	6.8
0 to 20	3.2	3.3	3.5	3.6	3.7	3.9	3.9	4.0	4.2	4.5	5.0	5.1	5.7	6.2	6.7
-20 to 0	3.2	3.3	3.5	3.6	3.7	3.9	3.9	4.0	4.2	4.5	5.0	5.1	5.6	6.2	6.6
-40 to -20	3.3	3.4	3.6	3.7	3.8	4.0	4.0	4.1	4.3	4.5	5.0	5.1	5.6	6.2	6.6
-60 to -40(ref.)	3.5	3.6	3.8	3.9	4.0	4.1	4.2	4.2	4.4	4.7	5.2	5.2	5.7	6.3	6.7
-70 to -60(ref.)	3.7	3.8	4.0	4.1	4.2	4.4	4.4	4.4	4.6	4.9	5.4	5.4	5.9	6.4	6.8

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.4	2.5	2.7	2.9	3.0	3.2	3.2	3.3	3.5	3.8	4.4	4.5	5.1	5.8	6.3
60 to 80	2.2	2.3	2.5	2.7	2.8	3.0	3.0	3.1	3.3	3.6	4.2	4.2	4.9	5.5	6.0
40 to 60	1.9	2.0	2.2	2.4	2.5	2.7	2.7	2.8	3.0	3.3	3.9	3.9	4.5	5.1	5.6
20～40	1.7	1.8	2.0	2.1	2.2	2.4	2.4	2.5	2.7	3.0	3.5	3.6	4.2	4.7	5.2
0 to 20	1.4	1.5	1.7	1.8	2.0	2.1	2.2	2.2	2.4	2.7	3.2	3.3	3.8	4.4	4.8
-20 to 0	1.2	1.2	1.4	1.6	1.7	1.8	1.9	1.9	2.1	2.4	2.9	2.9	3.5	4.0	4.4
-40 to -20	0.9	1.0	1.2	1.3	1.4	1.5	1.6	1.6	1.8	2.1	2.5	2.6	3.1	3.6	4.0
-60 to -40	0.6	0.7	0.9	1.0	1.1	1.2	1.3	1.3	1.5	1.8	2.2	2.3	2.7	3.2	3.6
-70 to -60	0.4	0.5	0.7	0.8	0.9	1.0	1.1	1.1	1.3	1.5	2.0	2.0	2.5	3.0	3.3

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.10686191E-01
Q1	7.43053260E+01
P2	2.71367682E-02
Q2	3.09494207E-02
P3	3.93128419E-01
Q3	5.72630320E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	3.9
Frac. eq. (ref.)	0.9	4.0

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-LAH65	HOYA	TAF3
C.D.G.M	H-ZLaF50B	SCHOTT	N-LASF44

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF016

nd = 1.772500 ne = 1.776208

ν d = 49.62 ν e = 49.38

Glass code (d)
773496
Glass code (e)
776494

Spectral l.	Refractive idx
2.058	1.73631
1.970	1.73805
1.530	1.74600
1.129	1.75307
1.064	1.75436
t	1.75544
s	1.75961
A'	1.762492
r	1.765146
C	1.767801
C'	1.768547
He-Ne	1.769243
D	1.772362
d	1.772500
e	1.776208
F	1.783370
F'	1.784266
g	1.791961
h	1.799154
0.389	1.803567
i	1.811540

Coef. disp. form. (pwr ser.)	
A0	3.07219058E+00
A1	-1.42144846E-02
A2	-1.67817254E-04
A3	2.44174902E-02
A4	4.25680243E-04
A5	6.77243763E-06
A6	4.02219194E-07
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.015569
F'-C'	0.015719
C-t	0.012365
C-A'	0.005309
d-C	0.004699
e-C	0.008407
g-d	0.019461
g-F	0.008591
h-g	0.007193
i-g	0.019579
C'-t	0.013111
e-C'	0.007661
F'-e	0.008058
i-F'	0.027274

Relative partial dispersion	
C-t／F-C	0.7942
C-A'／F-C	0.3410
d-C／F-C	0.3018
e-C／F-C	0.5400
g-d／F-C	1.2500
g-F／F-C	0.5518
h-g／F-C	0.4620
i-g／F-C	1.2576
C'-t／F'-C'	0.8341
e-C'／F'-C'	0.4874
F'-e／F'-C'	0.5126
i-F'／F'-C'	1.7351

Deviation of relative partial disp.	
ΔPdC	0.0022
ΔPgF	-0.0093

Specific gravity	4.26

Thermal properties	
CTE(-30,70) [1E-7/℃]	55
CTE(100,300) [1E-7/℃]	71
Tg [℃]	669
At [℃]	697
Ht cndct. [W/m･K]	0.826
Sp. heat [kJ/kg･K]	0.494
Ht diffus. [1E-6 m2/sec]	0.393

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	715 (7)
Abrasion hardness	57
Young's mod. [GPa]	120.0
Shear mod. [GPa]	46.3
Poisson's ratio	0.295
Stress optical coef. [1E-5 nm/cm／Pa]	1.71

Color Code (80%/5%)	38/31
Internal CC	348/306

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	0.01
310	0.12
320	0.35
330	0.56
340	0.71
350	0.81
360	0.89
365	0.910
370	0.931
380	0.958
390	0.973
400	0.982
420	0.990
440	0.993
460	0.995
480	0.997
500	0.996
550	0.997
600	0.996
650	0.996
700	0.995
800	0.993
900	0.999
1000	0.997
1200	0.999
1400	0.998
1600	0.990
1800	0.976
2000	0.951
2200	0.87
2400	0.63

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.2	4.3	4.4	4.6	4.7	4.9	4.9	5.0	5.2	5.5	6.0	6.0	6.6	7.1	7.5
60 to 80(ref.)	4.1	4.1	4.3	4.5	4.6	4.8	4.8	4.9	5.1	5.3	5.8	5.9	6.4	7.0	7.4
40 to 60	4.0	4.0	4.2	4.3	4.5	4.6	4.7	4.7	4.9	5.2	5.7	5.7	6.2	6.8	7.2
20 to 40	3.9	3.9	4.1	4.2	4.4	4.5	4.6	4.6	4.8	5.1	5.5	5.6	6.1	6.6	7.0
0 to 20	3.8	3.9	4.0	4.2	4.3	4.5	4.5	4.5	4.7	5.0	5.5	5.5	6.0	6.5	6.9
-20 to 0	3.8	3.9	4.0	4.2	4.3	4.4	4.5	4.5	4.7	5.0	5.4	5.5	6.0	6.5	6.9
-40 to -20	3.9	4.0	4.1	4.2	4.4	4.5	4.6	4.6	4.8	5.0	5.5	5.5	6.0	6.5	6.9
-60 to -40(ref.)	4.1	4.1	4.3	4.4	4.5	4.7	4.7	4.8	4.9	5.2	5.6	5.7	6.1	6.6	7.0
-70 to -60(ref.)	4.3	4.3	4.5	4.6	4.7	4.9	4.9	5.0	5.2	5.4	5.8	5.9	6.3	6.8	7.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.1	3.2	3.3	3.5	3.6	3.8	3.8	3.9	4.1	4.3	4.8	4.9	5.4	6.0	6.4
60 to 80	2.9	3.0	3.1	3.3	3.4	3.6	3.6	3.7	3.9	4.1	4.6	4.7	5.2	5.7	6.1
40 to 60	2.6	2.7	2.9	3.0	3.1	3.3	3.3	3.4	3.6	3.8	4.3	4.4	4.9	5.4	5.8
20～40	2.4	2.4	2.6	2.7	2.8	3.0	3.0	3.1	3.3	3.5	4.0	4.0	4.5	5.0	5.4
0 to 20	2.1	2.1	2.3	2.4	2.5	2.7	2.7	2.8	3.0	3.2	3.7	3.7	4.2	4.7	5.1
-20 to 0	1.8	1.9	2.0	2.1	2.3	2.4	2.4	2.5	2.7	2.9	3.4	3.4	3.9	4.3	4.7
-40 to -20	1.5	1.6	1.7	1.9	2.0	2.1	2.2	2.2	2.4	2.6	3.0	3.1	3.5	4.0	4.4
-60 to -40	1.3	1.3	1.5	1.6	1.7	1.8	1.9	1.9	2.1	2.3	2.7	2.8	3.2	3.7	4.0
-70 to -60	1.1	1.1	1.3	1.4	1.5	1.6	1.6	1.7	1.9	2.1	2.5	2.5	3.0	3.4	3.8

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.20365489E-01
Q1	7.25421180E+01
P2	5.80216137E-02
Q2	2.18135490E-02
P3	3.50533101E-01
Q3	4.51892348E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	2.4
Frac. eq. (ref.)	0.6	2.1

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-LAH66	HOYA	TAF1
C.D.G.M	H-LaF50A	SCHOTT	N-LAF34

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF017

nd = 1.795000　　ne = 1.799174

νd = 45.31　　νe = 45.06

Glass code (d)
795453
Glass code (e)
799451

Spectral l.	Refractive idx
2.058	1.75641
1.970	1.75817
1.530	1.76627
1.129	1.77364
1.064	1.77501
t	1.77616
s	1.78069
A'	1.783853
r	1.786787
C	1.789742
C'	1.790573
He-Ne	1.791351
D	1.794845
d	1.795000
e	1.799174
F	1.807287
F'	1.808308
g	1.817109
h	1.825410
0.389	1.830542
i	1.839897

Coef. disp. form. (pwr ser.)	
A0	3.14264424E+00
A1	-1.44687256E-02
A2	-1.59589924E-04
A3	2.73342436E-02
A4	6.08068420E-04
A5	1.80054470E-07
A6	1.58176253E-06
A7	0.00000000E+00
A8	0.00000000E+00

Partial dispersion	
F-C	0.017545
F'-C'	0.017735
C-t	0.013577
C-A'	0.005889
d-C	0.005258
e-C	0.009432
g-d	0.022109
g-F	0.009822
h-g	0.008301
i-g	0.022788
C'-t	0.014408
e-C'	0.008601
F'-e	0.009134
i-F'	0.031589

Relative partial dispersion	
C-t／F-C	0.7738
C-A'／F-C	0.3357
d-C／F-C	0.2997
e-C／F-C	0.5376
g-d／F-C	1.2601
g-F／F-C	0.5598
h-g／F-C	0.4731
i-g／F-C	1.2988
C'-t／F'-C'	0.8124
e-C'／F'-C'	0.4850
F'-e／F'-C'	0.5150
i-F'／F'-C'	1.7812

Deviation of relative partial disp.	
ΔPdC	0.0020
ΔPgF	-0.0085

Specific gravity	4.34

Thermal properties	
CTE(-30,70) [1E-7/℃]	64
CTE(100,300) [1E-7/℃]	71
Tg [℃]	660
At [℃]	686
Ht cndct. [W/m･K]	0.881
Sp. heat [kJ/kg･K]	0.502
Ht diffus. [1E-6 m2/sec]	0.405

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	2
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	707 (7)
Abrasion hardness	61
Young's mod. [GPa]	118.6
Shear mod. [GPa]	45.7
Poisson's ratio	0.297
Stress optical coef. [1E-5 nm/cm／Pa]	1.74

Color Code (80%/5%)	40/33
Internal CC	364/324
Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	0.01
330	0.16
340	0.40
350	0.62
360	0.76
365	0.81
370	0.85
380	0.907
390	0.938
400	0.956
420	0.973
440	0.981
460	0.986
480	0.989
500	0.992
550	0.995
600	0.995
650	0.995
700	0.994
800	0.990
900	0.997
1000	0.995
1200	0.997
1400	0.995
1600	0.990
1800	0.979
2000	0.960
2200	0.89
2400	0.67

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.7	4.7	4.8	5.1	5.3	5.5	5.5	5.6	5.8	6.1	6.7	6.8	7.6	8.4	8.8
60 to 80(ref.)	4.5	4.5	4.7	4.9	5.1	5.3	5.3	5.4	5.6	5.9	6.5	6.6	7.3	8.1	8.5
40 to 60	4.3	4.3	4.5	4.7	4.9	5.0	5.1	5.2	5.4	5.7	6.2	6.3	7.0	7.7	8.2
20 to 40	4.1	4.1	4.3	4.5	4.7	4.8	4.9	4.9	5.2	5.4	6.0	6.1	6.7	7.4	7.9
0 to 20	4.0	4.0	4.2	4.3	4.5	4.7	4.7	4.8	5.0	5.2	5.8	5.8	6.5	7.2	7.6
-20 to 0	3.9	3.9	4.1	4.2	4.4	4.6	4.6	4.7	4.9	5.1	5.6	5.7	6.3	7.0	7.4
-40 to -20	3.9	3.9	4.1	4.2	4.4	4.5	4.6	4.6	4.8	5.1	5.5	5.6	6.2	6.8	7.2
-60 to -40(ref.)	4.0	4.0	4.2	4.3	4.5	4.6	4.7	4.7	4.9	5.1	5.6	5.6	6.2	6.8	7.2
-70 to -60(ref.)	4.1	4.2	4.3	4.4	4.6	4.7	4.8	4.8	5.0	5.2	5.7	5.7	6.3	6.9	7.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.6	3.6	3.8	4.0	4.2	4.4	4.4	4.5	4.7	5.0	5.6	5.7	6.4	7.2	7.6
60 to 80	3.3	3.3	3.5	3.7	3.9	4.1	4.1	4.2	4.4	4.7	5.3	5.3	6.1	6.8	7.3
40 to 60	2.9	3.0	3.1	3.3	3.5	3.7	3.7	3.8	4.0	4.3	4.8	4.9	5.6	6.3	6.7
20～40	2.6	2.6	2.8	2.9	3.1	3.3	3.3	3.4	3.6	3.9	4.4	4.5	5.1	5.8	6.2
0 to 20	2.2	2.2	2.4	2.6	2.7	2.9	2.9	3.0	3.2	3.4	3.9	4.0	4.7	5.3	5.7
-20 to 0	1.9	1.9	2.0	2.2	2.4	2.5	2.6	2.6	2.8	3.0	3.5	3.6	4.2	4.8	5.2
-40 to -20	1.5	1.5	1.7	1.8	2.0	2.1	2.2	2.2	2.4	2.6	3.1	3.1	3.7	4.3	4.7
-60 to -40	1.2	1.2	1.3	1.4	1.6	1.7	1.8	1.8	2.0	2.2	2.6	2.7	3.3	3.8	4.1
-70 to -60	0.9	0.9	1.0	1.2	1.3	1.4	1.5	1.5	1.7	1.9	2.3	2.4	2.9	3.4	3.8

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.13511476E-01
Q1	6.97040915E+01
P2	2.39810663E-02
Q2	3.50738448E-02
P3	3.92647816E-01
Q3	5.82130127E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	5.9
Frac. eq. (ref.)	0.7	8.3

Prod. Freq. (A to F)	C

Similar glass type			
OHARA		HOYA	TAF2
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASF021

nd = 1.850260　　ne = 1.856474

νd = 32.35　　νe = 32.11

Glass code (d)
850324
Glass code (e)
856321

Spectral l.	Refractive idx
2.058	1.80323
1.970	1.80489
1.530	1.81290
1.129	1.82107
1.064	1.82273
t	1.82415
s	1.83001
A'	1.834300
r	1.838396
C	1.842602
C'	1.843800
He-Ne	1.844925
D	1.850031
d	1.850260
e	1.856474
F	1.868883
F'	1.870475
g	1.884512
h	1.898302
0.389	1.907144
i	–

Coef. disp. form. (pwr ser.)	
A0	3.30477446E+00
A1	-1.45925795E-02
A2	0.00000000E+00
A3	3.59916632E-02
A4	3.49591839E-03
A5	-7.43189237E-04
A6	1.55265866E-04
A7	-1.52961037E-05
A8	6.59677491E-07

Partial dispersion	
F-C	0.026281
F'-C'	0.026675
C-t	0.018451
C-A'	0.008302
d-C	0.007658
e-C	0.013872
g-d	0.034252
g-F	0.015629
h-g	0.013790
i-g	–
C'-t	0.019649
e-C'	0.012674
F'-e	0.014001
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7021
C-A'／F-C	0.3159
d-C／F-C	0.2914
e-C／F-C	0.5278
g-d／F-C	1.3033
g-F／F-C	0.5947
h-g／F-C	0.5247
i-g／F-C	–
C'-t／F'-C'	0.7366
e-C'／F'-C'	0.4751
F'-e／F'-C'	0.5249
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0004
ΔPgF	0.0046

Specific gravity	4.34

Thermal properties	
CTE(-30,70) [1E-7/℃]	68
CTE(100,300) [1E-7/℃]	83
Tg [℃]	626
At [℃]	660
Ht cndct. [W/m･K]	0.803
Sp. heat [kJ/kg･K]	0.502
Ht diffus. [1E-6 m2/sec]	0.369

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	573 (6)
Abrasion hardness	104
Young's mod. [GPa]	108.2
Shear mod. [GPa]	41.7
Poisson's ratio	0.297
Stress optical coef. [1E-5 nm/cm／Pa]	2.01

Color Code (70%/5%)	41/36
Internal CC	398/360

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.04
365	0.16
370	0.31
380	0.58
390	0.73
400	0.82
420	0.900
440	0.936
460	0.956
480	0.969
500	0.978
550	0.990
600	0.991
650	0.991
700	0.993
800	0.992
900	0.996
1000	0.993
1200	0.996
1400	0.998
1600	0.989
1800	0.980
2000	0.965
2200	0.918
2400	0.78

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.7	2.8	3.2	3.5	3.8	4.2	4.3	4.3	4.8	5.3	6.5	6.6	8.1	9.7	10.9
60 to 80(ref.)	2.6	2.7	3.1	3.4	3.7	4.0	4.1	4.2	4.6	5.1	6.2	6.4	7.8	9.4	10.5
40 to 60	2.5	2.6	2.9	3.2	3.5	3.8	3.9	4.0	4.4	4.9	6.0	6.1	7.5	8.9	10.0
20 to 40	2.4	2.5	2.8	3.1	3.4	3.7	3.8	3.8	4.2	4.7	5.7	5.9	7.1	8.5	9.5
0 to 20	2.3	2.4	2.8	3.0	3.3	3.6	3.7	3.7	4.1	4.6	5.5	5.7	6.9	8.2	9.1
−20 to 0	2.3	2.4	2.7	3.0	3.3	3.5	3.6	3.7	4.0	4.5	5.4	5.5	6.7	7.9	8.8
−40 to −20	2.4	2.5	2.8	3.1	3.3	3.6	3.6	3.7	4.0	4.5	5.3	5.4	6.5	7.7	8.5
−60 to −40(ref.)	2.5	2.6	3.0	3.2	3.4	3.7	3.8	3.8	4.2	4.5	5.4	5.5	6.5	7.6	8.3
−70 to −60(ref.)	2.8	2.9	3.2	3.4	3.6	3.9	3.9	4.0	4.3	4.7	5.5	5.6	6.6	7.6	8.3

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.6	1.7	2.1	2.4	2.7	3.0	3.1	3.2	3.6	4.2	5.3	5.4	6.9	8.5	9.7
60 to 80	1.4	1.5	1.9	2.2	2.4	2.8	2.9	2.9	3.4	3.9	5.0	5.1	6.5	8.1	9.2
40 to 60	1.1	1.2	1.5	1.8	2.1	2.4	2.5	2.6	3.0	3.5	4.5	4.7	6.0	7.5	8.5
20～40	0.8	0.9	1.2	1.5	1.8	2.1	2.2	2.2	2.6	3.1	4.1	4.2	5.5	6.9	7.8
0 to 20	0.5	0.6	0.9	1.2	1.5	1.7	1.8	1.9	2.3	2.7	3.6	3.8	5.0	6.3	7.2
−20 to 0	0.2	0.3	0.6	0.9	1.1	1.4	1.5	1.6	1.9	2.3	3.2	3.3	4.4	5.7	6.5
−40 to −20	−0.1	0.0	0.3	0.6	0.8	1.1	1.1	1.2	1.5	1.9	2.8	2.9	3.9	5.1	5.9
−60 to −40	−0.4	−0.3	0.0	0.3	0.5	0.7	0.8	0.9	1.2	1.5	2.3	2.4	3.4	4.5	5.2
−70 to −60	−0.6	−0.5	−0.2	0.0	0.2	0.5	0.5	0.6	0.9	1.3	2.0	2.1	3.0	4.0	4.7

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.02088736E-01
Q1	7.18066986E+01
P2	2.16492298E-02
Q2	5.59339860E-02
P3	4.12483323E-01
Q3	7.38988329E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	1.0	6.6
Frac. eq. (ref.)	1.3	10.8

Prod. Freq. (A to F)	A

Similar glass type			
OHARA	S-LAH71	HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASFH2

nd = 1.766840 ne = 1.770740

ν d = 46.78 ν e = 46.53

Glass code (d)
767468
Glass code (e)
771465

Spectral l.	Refractive idx
2.058	1.72933
1.970	1.73112
1.530	1.73930
1.129	1.74659
1.064	1.74792
t	1.74904
s	1.75337
A'	1.756369
r	1.759137
C	1.761914
C'	1.762694
He-Ne	1.763423
D	1.766695
d	1.766840
e	1.770740
F	1.778307
F'	1.779257
g	1.787448
h	1.795163
0.389	1.799930
i	–

Partial dispersion	
F-C	0.016393
F'-C'	0.016563
C-t	0.012877
C-A'	0.005545
d-C	0.004926
e-C	0.008826
g-d	0.020608
g-F	0.009141
h-g	0.007715
i-g	–
C'-t	0.013657
e-C'	0.008046
F'-e	0.008517
i-F'	–

Relative partial dispersion	
C-t／F-C	0.7855
C-A'／F-C	0.3383
d-C／F-C	0.3005
e-C／F-C	0.5384
g-d／F-C	1.2571
g-F／F-C	0.5576
h-g／F-C	0.4706
i-g／F-C	–
C'-t／F'-C'	0.8245
e-C'／F'-C'	0.4858
F'-e／F'-C'	0.5142
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	0.0022
ΔPgF	-0.0083

Specific gravity	4.11

Thermal properties	
CTE(-30,70) [1E-7/℃]	55
CTE(100,300) [1E-7/℃]	64
Tg [℃]	644
At [℃]	674
Ht cndct. [W/m･K]	0.890
Sp. heat [kJ/kg･K]	0.529
Ht diffus. [1E-6 m2/sec]	0.410

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	2
Acid res. (powder)	4

Mechanical properties	
Knoop hardness	666 (7)
Abrasion hardness	64
Young's mod. [GPa]	117.1
Shear mod. [GPa]	45.3
Poisson's ratio	0.293
Stress optical coef. [1E-5 nm/cm／Pa]	1.99

Color Code (80%/5%)	40/34
Internal CC	373/335

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	0.01
340	0.14
350	0.40
360	0.62
365	0.71
370	0.77
380	0.86
390	0.908
400	0.936
420	0.963
440	0.973
460	0.981
480	0.985
500	0.989
550	0.992
600	0.992
650	0.992
700	0.993
800	0.990
900	0.996
1000	0.994
1200	0.996
1400	0.994
1600	0.990
1800	0.980
2000	0.960
2200	0.900
2400	0.65

Coef. disp. form. (pwr ser.)	
A0	3.04927657E+00
A1	-1.45487808E-02
A2	-1.68864692E-04
A3	2.51825857E-02
A4	5.22534606E-04
A5	2.91654231E-06
A6	1.27935733E-06
A7	0.00000000E+00
A8	0.00000000E+00

Relative Δn/ΔT [1E-6/℃]															
Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.7	4.8	5.0	5.3	5.4	5.6	5.7	5.7	5.9	6.2	6.8	6.9	7.5	8.1	8.6
60 to 80(ref.)	4.6	4.7	5.0	5.1	5.3	5.4	5.5	5.5	5.8	6.0	6.6	6.7	7.3	7.9	8.4
40 to 60	4.4	4.5	4.8	4.9	5.1	5.2	5.3	5.3	5.6	5.8	6.4	6.4	7.0	7.6	8.1
20 to 40	4.3	4.4	4.6	4.8	4.9	5.1	5.1	5.2	5.4	5.6	6.2	6.2	6.8	7.4	7.8
0 to 20	4.2	4.3	4.5	4.7	4.8	5.0	5.0	5.0	5.3	5.5	6.0	6.1	6.6	7.2	7.6
-20 to 0	4.2	4.2	4.5	4.6	4.7	4.9	4.9	5.0	5.2	5.4	5.9	5.9	6.5	7.0	7.4
-40 to -20	4.2	4.3	4.5	4.6	4.8	4.9	4.9	5.0	5.2	5.4	5.9	5.9	6.4	6.9	7.3
-60 to -40(ref.)	4.3	4.4	4.6	4.7	4.9	5.0	5.0	5.1	5.3	5.5	5.9	6.0	6.5	7.0	7.3
-70 to -60(ref.)	4.5	4.6	4.8	4.9	5.0	5.2	5.2	5.2	5.4	5.6	6.1	6.1	6.6	7.1	7.4

Absolute Δn/ΔT [1E-6/℃]															
Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.7	3.8	4.0	4.2	4.3	4.5	4.6	4.6	4.8	5.1	5.7	5.7	6.4	7.0	7.4
60 to 80	3.4	3.5	3.8	3.9	4.1	4.2	4.3	4.3	4.6	4.8	5.4	5.4	6.0	6.7	7.1
40 to 60	3.1	3.2	3.4	3.6	3.7	3.9	3.9	4.0	4.2	4.5	5.0	5.0	5.6	6.2	6.6
20～40	2.8	2.9	3.1	3.3	3.4	3.6	3.6	3.6	3.8	4.1	4.6	4.7	5.2	5.8	6.2
0 to 20	2.5	2.6	2.8	2.9	3.1	3.2	3.2	3.3	3.5	3.7	4.2	4.3	4.8	5.3	5.7
-20 to 0	2.2	2.2	2.4	2.6	2.7	2.9	2.9	2.9	3.1	3.4	3.8	3.9	4.4	4.9	5.3
-40 to -20	1.8	1.9	2.1	2.2	2.4	2.5	2.5	2.6	2.8	3.0	3.4	3.5	4.0	4.5	4.8
-60 to -40	1.5	1.6	1.8	1.9	2.0	2.2	2.2	2.2	2.4	2.6	3.0	3.1	3.5	4.0	4.4
-70 to -60	1.3	1.4	1.5	1.7	1.8	1.9	1.9	2.0	2.1	2.3	2.7	2.8	3.2	3.7	4.0

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.19707434E-01
Q1	7.01444787E+01
P2	2.24070281E-02
Q2	3.52523493E-02
P3	3.83448965E-01
Q3	5.70886929E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.6	3.6
Frac. eq. (ref.)	0.6	4.4

Prod. Freq. (A to F)	B

Similar glass type			
OHARA		HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASFH6

nd = 1.806100　　ne = 1.811821

νd = 33.34　　νe = 33.10

Glass code (d)
806333
Glass code (e)
811331

Spectral l.	Refractive idx
2.058	1.76229
1.970	1.76385
1.530	1.77139
1.129	1.77905
1.064	1.78059
t	1.78192
s	1.78737
A'	1.791353
r	1.795145
C	1.799034
C'	1.800140
He-Ne	1.801179
D	1.805889
d	1.806100
e	1.811821
F	1.823209
F'	1.824665
g	1.837482
h	1.850008
0.389	1.857993
i	1.873117

Coef. disp. form. (pwr ser.)	
A0	3.15462091E+00
A1	-1.34426083E-02
A2	0.00000000E+00
A3	3.31718297E-02
A4	2.71221217E-03
A5	-5.03803783E-04
A6	1.00437086E-04
A7	-9.19121981E-06
A8	3.75808895E-07

Partial dispersion	
F-C	0.024175
F'-C'	0.024525
C-t	0.017112
C-A'	0.007681
d-C	0.007066
e-C	0.012787
g-d	0.031382
g-F	0.014273
h-g	0.012526
i-g	0.035635
C'-t	0.018218
e-C'	0.011681
F'-e	0.012844
i-F'	0.048452

Relative partial dispersion	
C-t／F-C	0.7078
C-A'／F-C	0.3177
d-C／F-C	0.2923
e-C／F-C	0.5289
g-d／F-C	1.2981
g-F／F-C	0.5904
h-g／F-C	0.5181
i-g／F-C	1.4740
C'-t／F'-C'	0.7428
e-C'／F'-C'	0.4763
F'-e／F'-C'	0.5237
i-F'／F'-C'	1.9756

Deviation of relative partial disp.	
ΔPdC	0.0000
ΔPgF	0.0020

Specific gravity	3.71

Thermal properties	
CTE(-30,70) [1E-7/℃]	72
CTE(100,300) [1E-7/℃]	87
Tg [℃]	658
At [℃]	703
Ht cndct. [W/m･K]	1.005
Sp. heat [kJ/kg･K]	0.625
Ht diffus. [1E-6 m2/sec]	0.434

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	3

Mechanical properties	
Knoop hardness	552 (6)
Abrasion hardness	107
Young's mod. [GPa]	108.3
Shear mod. [GPa]	42.2
Poisson's ratio	0.284
Stress optical coef. [1E-5 nm/cm／Pa]	2.19

Color Code (80%/5%)	43/36
Internal CC	387/357

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.13
365	0.29
370	0.46
380	0.70
390	0.83
400	0.89
420	0.941
440	0.963
460	0.974
480	0.981
500	0.986
550	0.994
600	0.995
650	0.995
700	0.995
800	0.990
900	0.998
1000	0.996
1200	0.997
1400	0.994
1600	0.990
1800	0.983
2000	0.970
2200	0.928
2400	0.83

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.7	2.8	3.1	3.4	3.6	3.9	4.0	4.1	4.5	5.0	6.0	6.2	7.5	9.1	10.2
60 to 80(ref.)	2.6	2.7	3.0	3.2	3.5	3.8	3.8	3.9	4.3	4.8	5.8	5.9	7.2	8.7	9.8
40 to 60	2.5	2.5	2.8	3.1	3.3	3.5	3.6	3.7	4.1	4.5	5.5	5.6	6.8	8.3	9.3
20 to 40	2.3	2.4	2.7	2.9	3.1	3.4	3.4	3.5	3.9	4.3	5.2	5.3	6.5	7.9	8.9
0 to 20	2.3	2.3	2.6	2.8	3.0	3.2	3.3	3.4	3.7	4.1	5.0	5.1	6.2	7.5	8.4
-20 to 0	2.2	2.3	2.5	2.7	2.9	3.2	3.2	3.3	3.6	4.0	4.8	4.9	6.0	7.2	8.1
-40 to -20	2.3	2.3	2.6	2.8	2.9	3.2	3.2	3.3	3.6	3.9	4.7	4.8	5.8	7.0	7.8
-60 to -40(ref.)	2.4	2.5	2.7	2.9	3.1	3.3	3.3	3.4	3.7	4.0	4.7	4.8	5.8	6.8	7.6
-70 to -60(ref.)	2.6	2.7	2.9	3.0	3.2	3.4	3.5	3.5	3.8	4.1	4.8	4.9	5.8	6.8	7.6

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.6	1.7	2.0	2.3	2.5	2.8	2.9	3.0	3.4	3.8	4.9	5.0	6.3	7.9	9.0
60 to 80	1.4	1.5	1.8	2.0	2.3	2.5	2.6	2.7	3.1	3.5	4.5	4.7	5.9	7.4	8.5
40 to 60	1.1	1.2	1.5	1.7	1.9	2.2	2.2	2.3	2.7	3.1	4.1	4.2	5.4	6.8	7.9
20～40	0.8	0.9	1.1	1.3	1.6	1.8	1.9	1.9	2.3	2.7	3.6	3.7	4.9	6.2	7.2
0 to 20	0.5	0.6	0.8	1.0	1.2	1.4	1.5	1.6	1.9	2.3	3.1	3.3	4.4	5.6	6.5
-20 to 0	0.2	0.3	0.5	0.7	0.9	1.1	1.1	1.2	1.5	1.9	2.7	2.8	3.8	5.0	5.9
-40 to -20	-0.1	-0.1	0.2	0.3	0.5	0.7	0.8	0.8	1.1	1.5	2.2	2.3	3.3	4.4	5.2
-60 to -40	-0.4	-0.4	-0.2	0.0	0.2	0.4	0.4	0.5	0.7	1.1	1.8	1.9	2.8	3.8	4.6
-70 to -60	-0.7	-0.6	-0.4	-0.3	-0.1	0.1	0.1	0.2	0.4	0.8	1.4	1.5	2.4	3.3	4.1

Coef. disp. form. (frac. eq.)(ref.)	
P1	9.87706769E-02
Q1	7.10909665E+01
P2	1.90691474E-02
Q2	5.57644489E-02
P3	3.98623922E-01
Q3	7.61374087E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	1.2	6.9
Frac. eq. (ref.)	2.2	12.1

Prod. Freq. (A to F)	D

Similar glass type			
OHARA		HOYA	NBFD15
C.D.G.M	H-ZLaF56A	SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASFH9

nd = 1.902650　　ne = 1.908641

νd = 35.73　　νe = 35.48

Glass code (d)
903357
Glass code (e)
909355

Spectral l.	Refractive idx
2.058	1.85630
1.970	1.85797
1.530	1.86593
1.129	1.87403
1.064	1.87567
t	1.87709
s	1.88288
A'	1.887103
r	1.891115
C	1.895219
C'	1.896384
He-Ne	1.897478
D	1.902429
d	1.902650
e	1.908641
F	1.920485
F'	1.921992
g	1.935151
h	1.947835
0.389	1.955824
i	1.970707

Coef. disp. form. (pwr ser.)	
A0	3.49709032E+00
A1	-1.38248635E-02
A2	-1.32935974E-04
A3	4.09278939E-02
A4	8.80758278E-04
A5	8.93285504E-05
A6	-6.61762620E-06
A7	6.24399823E-07
A8	0.00000000E+00

Partial dispersion	
F-C	0.025266
F'-C'	0.025608
C-t	0.018133
C-A'	0.008116
d-C	0.007431
e-C	0.013422
g-d	0.032501
g-F	0.014666
h-g	0.012684
i-g	0.035556
C'-t	0.019298
e-C'	0.012257
F'-e	0.013351
i-F'	0.048715

Relative partial dispersion	
C-t／F-C	0.7177
C-A'／F-C	0.3212
d-C／F-C	0.2941
e-C／F-C	0.5312
g-d／F-C	1.2864
g-F／F-C	0.5805
h-g／F-C	0.5020
i-g／F-C	1.4073
C'-t／F'-C'	0.7536
e-C'／F'-C'	0.4786
F'-e／F'-C'	0.5214
i-F'／F'-C'	1.9023

Deviation of relative partial disp.	
ΔPdC	0.0008
ΔPgF	-0.0039

Specific gravity	5.17

Thermal properties	
CTE(-30,70) [1E-7/℃]	65
CTE(100,300) [1E-7/℃]	80
Tg [℃]	694
At [℃]	732
Ht cndct. [W/m･K]	0.786
Sp. heat [kJ/kg･K]	0.418
Ht diffus. [1E-6 m2/sec]	0.363

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	631 (6)
Abrasion hardness	58
Young's mod. [GPa]	121.0
Shear mod. [GPa]	46.4
Poisson's ratio	0.304
Stress optical coef. [1E-5 nm/cm／Pa]	1.57

Color Code (70%/5%)	40/35
Internal CC	390/352

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	0.02
360	0.22
365	0.36
370	0.50
380	0.69
390	0.80
400	0.87
420	0.931
440	0.956
460	0.969
480	0.977
500	0.983
550	0.990
600	0.991
650	0.990
700	0.989
800	0.986
900	0.993
1000	0.990
1200	0.994
1400	0.996
1600	0.990
1800	0.983
2000	0.974
2200	0.946
2400	0.83

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	4.5	4.5	4.8	5.1	5.4	5.7	5.8	5.9	6.3	6.8	7.8	7.9	9.1	10.4	11.3
60 to 80(ref.)	4.2	4.3	4.6	4.8	5.1	5.4	5.5	5.6	6.0	6.4	7.4	7.5	8.7	10.0	10.8
40 to 60	3.8	3.9	4.2	4.4	4.7	5.0	5.1	5.2	5.5	6.0	6.9	7.0	8.2	9.4	10.2
20 to 40	3.5	3.6	3.8	4.1	4.4	4.6	4.7	4.8	5.1	5.6	6.5	6.6	7.7	8.9	9.6
0 to 20	3.2	3.3	3.5	3.8	4.0	4.3	4.4	4.4	4.8	5.2	6.1	6.2	7.2	8.4	9.1
-20 to 0	3.0	3.0	3.3	3.5	3.8	4.0	4.1	4.2	4.5	4.9	5.7	5.8	6.8	7.9	8.6
-40 to -20	2.8	2.9	3.1	3.4	3.6	3.8	3.9	4.0	4.3	4.7	5.4	5.6	6.5	7.6	8.3
-60 to -40(ref.)	2.8	2.8	3.1	3.3	3.5	3.7	3.8	3.9	4.2	4.5	5.3	5.4	6.3	7.3	8.0
-70 to -60(ref.)	2.9	2.9	3.1	3.3	3.5	3.8	3.8	3.9	4.2	4.5	5.3	5.4	6.3	7.2	7.9

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	3.3	3.4	3.7	4.0	4.3	4.6	4.7	4.7	5.1	5.6	6.6	6.7	7.9	9.2	10.0
60 to 80	2.9	3.0	3.3	3.6	3.8	4.1	4.2	4.3	4.7	5.1	6.1	6.2	7.4	8.6	9.5
40 to 60	2.4	2.5	2.7	3.0	3.3	3.6	3.6	3.7	4.1	4.5	5.4	5.6	6.7	7.9	8.7
20～40	1.9	1.9	2.2	2.5	2.7	3.0	3.1	3.1	3.5	3.9	4.8	4.9	6.0	7.1	7.9
0 to 20	1.4	1.4	1.7	1.9	2.2	2.4	2.5	2.6	2.9	3.3	4.1	4.2	5.3	6.4	7.1
-20 to 0	0.8	0.9	1.1	1.4	1.6	1.8	1.9	2.0	2.3	2.7	3.5	3.6	4.6	5.6	6.3
-40 to -20	0.3	0.4	0.6	0.8	1.0	1.3	1.3	1.4	1.7	2.1	2.8	2.9	3.9	4.9	5.5
-60 to -40	-0.2	-0.2	0.1	0.3	0.5	0.7	0.8	0.8	1.1	1.5	2.2	2.3	3.2	4.1	4.8
-70 to -60	-0.6	-0.6	-0.4	-0.2	0.0	0.3	0.3	0.4	0.7	1.0	1.7	1.8	2.6	3.6	4.2

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.06842075E-01
Q1	7.82912052E+01
P2	2.15021721E-02
Q2	4.79469212E-02
P3	4.32767545E-01
Q3	6.98349899E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.8	4.7
Frac. eq. (ref.)	1.7	7.6

Prod. Freq. (A to F)	B

Similar glass type			
OHARA		HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASFH13

nd = 1.903660　　ne = 1.910493

νd = 31.27　　νe = 31.04

Glass code (d)
904313
Glass code (e)
910310

Spectral l.	Refractive idx
2.058	1.85394
1.970	1.85556
1.530	1.86348
1.129	1.87190
1.064	1.87366
t	1.87518
s	1.88150
A'	1.886175
r	1.890648
C	1.895254
C'	1.896567
He-Ne	1.897801
D	1.903409
d	1.903660
e	1.910493
F	1.924149
F'	1.925900
g	1.941336
h	1.956483
0.389	1.966172
i	–

Coef. disp. form. (pwr ser.)	
A0	3.48496859E+00
A1	-1.34692969E-02
A2	-8.98801936E-05
A3	4.53620373E-02
A4	1.10287376E-03
A5	1.48043312E-04
A6	-1.27401645E-05
A7	1.28412516E-06
A8	0.00000000E+00

Partial dispersion	
F-C	0.028895
F'-C'	0.029333
C-t	0.020070
C-A'	0.009079
d-C	0.008406
e-C	0.015239
g-d	0.037676
g-F	0.017187
h-g	0.015147
i-g	–
C'-t	0.021383
e-C'	0.013926
F'-e	0.015407
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6946
C-A'／F-C	0.3142
d-C／F-C	0.2909
e-C／F-C	0.5274
g-d／F-C	1.3039
g-F／F-C	0.5948
h-g／F-C	0.5242
i-g／F-C	–
C'-t／F'-C'	0.7290
e-C'／F'-C'	0.4748
F'-e／F'-C'	0.5252
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0004
ΔPgF	0.0029

Specific gravity	4.66

Thermal properties	
CTE(-30,70) [1E-7/℃]	67
CTE(100,300) [1E-7/℃]	83
Tg [℃]	654
At [℃]	699
Ht cndct. [W/m･K]	0.910
Sp. heat [kJ/kg･K]	0.508
Ht diffus. [1E-6 m2/sec]	0.384

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	649 (6)
Abrasion hardness	105
Young's mod. [GPa]	111.5
Shear mod. [GPa]	42.8
Poisson's ratio	0.301
Stress optical coef. [1E-5 nm/cm／Pa]	1.68

Color Code (70%/5%)	41/36
Internal CC	397/359

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.08
365	0.21
370	0.37
380	0.61
390	0.74
400	0.82
420	0.900
440	0.929
460	0.946
480	0.959
500	0.967
550	0.979
600	0.984
650	0.985
700	0.986
800	0.982
900	0.992
1000	0.993
1200	0.997
1400	0.999
1600	0.990
1800	0.983
2000	0.971
2200	0.943
2400	0.85

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.4	3.5	3.7	4.1	4.5	4.9	5.0	5.1	5.7	6.4	7.8	8.0	9.6	11.6	13.2
60 to 80(ref.)	3.2	3.3	3.6	3.9	4.2	4.6	4.8	4.9	5.4	6.1	7.4	7.6	9.2	11.1	12.6
40 to 60	3.0	3.0	3.3	3.6	3.9	4.3	4.4	4.5	5.1	5.7	7.0	7.1	8.6	10.4	11.8
20 to 40	2.8	2.8	3.0	3.3	3.7	4.0	4.1	4.2	4.7	5.3	6.5	6.7	8.1	9.8	11.1
0 to 20	2.6	2.6	2.8	3.1	3.4	3.8	3.9	4.0	4.5	5.0	6.1	6.3	7.6	9.2	10.4
−20 to 0	2.5	2.5	2.7	3.0	3.2	3.6	3.7	3.8	4.2	4.8	5.8	6.0	7.2	8.6	9.8
−40 to −20	2.4	2.4	2.6	2.9	3.2	3.5	3.6	3.7	4.1	4.6	5.6	5.7	6.8	8.2	9.3
−60 to −40(ref.)	2.5	2.5	2.7	2.9	3.2	3.5	3.6	3.6	4.1	4.5	5.5	5.6	6.6	7.8	8.9
−70 to −60(ref.)	2.6	2.6	2.8	3.0	3.3	3.6	3.6	3.7	4.1	4.6	5.4	5.6	6.5	7.7	8.7

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.3	2.3	2.6	2.9	3.3	3.7	3.8	4.0	4.5	5.2	6.6	6.7	8.4	10.4	11.9
60 to 80	2.0	2.0	2.3	2.6	3.0	3.4	3.5	3.6	4.1	4.8	6.1	6.3	7.8	9.7	11.2
40 to 60	1.6	1.6	1.9	2.1	2.5	2.9	3.0	3.1	3.6	4.2	5.5	5.6	7.1	8.9	10.3
20～40	1.1	1.2	1.4	1.7	2.0	2.4	2.5	2.6	3.1	3.7	4.8	5.0	6.4	8.0	9.4
0 to 20	0.7	0.8	1.0	1.2	1.5	1.9	2.0	2.1	2.6	3.1	4.2	4.3	5.6	7.2	8.4
−20 to 0	0.3	0.3	0.5	0.8	1.1	1.4	1.5	1.6	2.0	2.6	3.6	3.7	4.9	6.3	7.5
−40 to −20	−0.1	−0.1	0.1	0.3	0.6	0.9	1.0	1.1	1.5	2.0	3.0	3.1	4.2	5.5	6.6
−60 to −40	−0.5	−0.5	−0.3	−0.1	0.1	0.4	0.5	0.6	1.0	1.4	2.3	2.4	3.4	4.6	5.6
−70 to −60	−0.8	−0.8	−0.7	−0.5	−0.2	0.0	0.1	0.2	0.6	1.0	1.9	2.0	2.9	4.0	4.9

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.33101966E-01
Q1	9.96219670E+01
P2	2.60138903E-02
Q2	5.27668833E-02
P3	4.27058488E-01
Q3	7.32785665E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	0.7	5.3
Frac. eq. (ref.)	1.6	7.9

Prod. Freq. (A to F)	A

Similar glass type			
OHARA		HOYA	TAFD25
C.D.G.M		SCHOTT	N-LASF46A

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASFH15

nd = 1.950000　　ne = 1.957643

νd = 29.37　　νe = 29.14

Glass code (d)
950294
Glass code (e)
958291

Spectral l.	Refractive idx
2.058	1.89577
1.970	1.89747
1.530	1.90583
1.129	1.91488
1.064	1.91680
t	1.91845
s	1.92538
A'	1.930544
r	1.935504
C	1.940626
C'	1.942088
He-Ne	1.943462
D	1.949719
d	1.950000
e	1.957643
F	1.972976
F'	1.974947
g	1.992390
h	2.009607
0.389	2.020683
i	–

Coef. disp. form. (pwr ser.)	
A0	3.64640666E+00
A1	-1.51039558E-02
A2	0.00000000E+00
A3	4.80157444E-02
A4	3.49072452E-03
A5	-5.73639028E-04
A6	1.30249514E-04
A7	-1.29576789E-05
A8	5.92144355E-07

Partial dispersion	
F-C	0.032350
F'-C'	0.032859
C-t	0.022174
C-A'	0.010082
d-C	0.009374
e-C	0.017017
g-d	0.042390
g-F	0.019414
h-g	0.017217
i-g	–
C'-t	0.023636
e-C'	0.015555
F'-e	0.017304
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6854
C-A'／F-C	0.3117
d-C／F-C	0.2898
e-C／F-C	0.5260
g-d／F-C	1.3104
g-F／F-C	0.6001
h-g／F-C	0.5322
i-g／F-C	–
C'-t／F'-C'	0.7193
e-C'／F'-C'	0.4734
F'-e／F'-C'	0.5266
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	−0.0007
ΔPgF	0.0050

Specific gravity	4.79

Thermal properties	
CTE(-30,70) [1E-7/℃]	74
CTE(100,300) [1E-7/℃]	84
Tg [℃]	690
At [℃]	732
Ht cndct. [W/m･K]	0.858
Sp. heat [kJ/kg･K]	0.473
Ht diffus. [1E-6 m2/sec]	0.380

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	545 (5)
Abrasion hardness	112
Young's mod. [GPa]	118.1
Shear mod. [GPa]	45.4
Poisson's ratio	0.301
Stress optical coef. [1E-5 nm/cm／Pa]	1.49

Color Code (70%/5%)	42/37
Internal CC	409/366

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	0.01
365	0.04
370	0.12
380	0.37
390	0.58
400	0.72
420	0.86
440	0.921
460	0.948
480	0.964
500	0.975
550	0.989
600	0.991
650	0.992
700	0.992
800	0.989
900	0.997
1000	0.994
1200	0.997
1400	0.999
1600	0.994
1800	0.988
2000	0.979
2200	0.957
2400	0.87

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	2.6	2.7	3.0	3.4	3.8	4.2	4.3	4.4	5.0	5.6	7.1	7.3	9.4	11.7	13.3
60 to 80(ref.)	2.5	2.5	2.9	3.2	3.6	4.0	4.1	4.2	4.7	5.3	6.8	7.0	9.0	11.2	12.7
40 to 60	2.3	2.3	2.7	3.0	3.4	3.7	3.8	3.9	4.4	5.0	6.4	6.6	8.5	10.6	12.0
20 to 40	2.1	2.1	2.5	2.8	3.1	3.5	3.6	3.7	4.1	4.7	6.0	6.2	8.0	10.0	11.3
0 to 20	2.0	2.0	2.3	2.6	2.9	3.3	3.4	3.5	3.9	4.5	5.7	5.9	7.6	9.5	10.7
−20 to 0	1.9	1.9	2.2	2.5	2.8	3.1	3.2	3.3	3.7	4.3	5.4	5.6	7.2	9.0	10.2
−40 to −20	1.9	1.9	2.2	2.5	2.8	3.1	3.2	3.3	3.7	4.1	5.2	5.4	6.9	8.6	9.7
−60 to −40(ref.)	2.0	2.0	2.3	2.6	2.9	3.1	3.2	3.3	3.7	4.1	5.2	5.3	6.8	8.3	9.3
−70 to −60(ref.)	2.2	2.2	2.5	2.7	3.0	3.3	3.4	3.4	3.8	4.2	5.2	5.4	6.7	8.2	9.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	1.5	1.5	1.9	2.2	2.6	3.0	3.1	3.2	3.7	4.4	5.9	6.1	8.1	10.4	12.0
60 to 80	1.2	1.2	1.6	1.9	2.3	2.7	2.8	2.9	3.4	4.0	5.4	5.6	7.6	9.8	11.3
40 to 60	0.8	0.9	1.2	1.5	1.9	2.2	2.3	2.4	2.9	3.5	4.9	5.0	6.9	9.0	10.4
20～40	0.4	0.5	0.8	1.1	1.4	1.8	1.9	2.0	2.4	3.0	4.3	4.5	6.2	8.2	9.5
0 to 20	0.1	0.1	0.4	0.7	1.0	1.4	1.4	1.5	2.0	2.5	3.7	3.9	5.6	7.4	8.7
−20 to 0	−0.3	−0.3	0.0	0.3	0.6	0.9	1.0	1.1	1.5	2.0	3.1	3.3	4.9	6.6	7.8
−40 to −20	−0.7	−0.7	−0.4	−0.1	0.2	0.5	0.5	0.6	1.0	1.5	2.5	2.7	4.2	5.8	6.9
−60 to −40	−1.0	−1.0	−0.8	−0.5	−0.3	0.0	0.1	0.2	0.5	1.0	2.0	2.1	3.5	5.0	6.0
−70 to −60	−1.3	−1.3	−1.1	−0.8	−0.6	−0.3	−0.2	−0.2	0.2	0.6	1.5	1.7	3.0	4.4	5.4

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.12808140E-01
Q1	8.53378336E+01
P2	2.63046433E-02
Q2	5.51236515E-02
P3	4.42143641E-01
Q3	7.63030279E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	1.2	4.0
Frac. eq. (ref.)	1.8	8.5

Prod. Freq. (A to F)	B

Similar glass type			
OHARA		HOYA	
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.

J-LASFH17

nd = 2.000690　　ne = 2.009954

νd = 25.46　　νe = 25.25

Glass code (d)
001255
Glass code (e)
010253

Spectral l.	Refractive idx
2.058	1.93788
1.970	1.93971
1.530	1.94886
1.129	1.95908
1.064	1.96128
t	1.96320
s	1.97130
A'	1.977399
r	1.983293
C	1.989413
C'	1.991165
He-Ne	1.992815
D	2.000351
d	2.000690
e	2.009954
F	2.028724
F'	2.031156
g	2.052860
h	2.074654
0.389	2.088894
i	–

Coef. disp. form. (pwr ser.)	
A0	3.81071676E+00
A1	-1.63737936E-02
A2	0.00000000E+00
A3	5.83672875E-02
A4	4.12726108E-03
A5	-5.52229126E-04
A6	1.41302816E-04
A7	-1.45517862E-05
A8	7.44426800E-07

Partial dispersion	
F-C	0.039311
F'-C'	0.039991
C-t	0.026211
C-A'	0.012014
d-C	0.011277
e-C	0.020541
g-d	0.052170
g-F	0.024136
h-g	0.021794
i-g	–
C'-t	0.027963
e-C'	0.018789
F'-e	0.021202
i-F'	–

Relative partial dispersion	
C-t／F-C	0.6668
C-A'／F-C	0.3056
d-C／F-C	0.2869
e-C／F-C	0.5225
g-d／F-C	1.3271
g-F／F-C	0.6140
h-g／F-C	0.5544
i-g／F-C	–
C'-t／F'-C'	0.6992
e-C'／F'-C'	0.4698
F'-e／F'-C'	0.5302
i-F'／F'-C'	–

Deviation of relative partial disp.	
ΔPdC	-0.0018
ΔPgF	0.0123

Specific gravity	4.69

Thermal properties	
CTE(-30,70) [1E-7/℃]	68
CTE(100,300) [1E-7/℃]	83
Tg [℃]	681
At [℃]	727
Ht cndct. [W/m･K]	1.020
Sp. heat [kJ/kg･K]	0.504
Ht diffus. [1E-6 m2/sec]	0.432

Chemical properties [class]	
Acid res. (surface)	1
Alkaline detergent res.	1
Climate resistance	1
Water res. (powder)	1
Acid res. (powder)	1

Mechanical properties	
Knoop hardness	605 (6)
Abrasion hardness	86
Young's mod. [GPa]	123.8
Shear mod. [GPa]	47.7
Poisson's ratio	0.298
Stress optical coef. [1E-5 nm/cm／Pa]	1.59

Color Code (70%/5%)	45/38
Internal CC	425/376

Internal trans. (10mm)	
λ [nm]	τ
280	–
290	–
300	–
310	–
320	–
330	–
340	–
350	–
360	–
365	–
370	–
380	0.11
390	0.32
400	0.52
420	0.76
440	0.87
460	0.921
480	0.948
500	0.965
550	0.985
600	0.992
650	0.991
700	0.993
800	0.992
900	0.995
1000	0.994
1200	0.996
1400	0.997
1600	0.992
1800	0.983
2000	0.976
2200	0.954
2400	0.88

Relative Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90(ref.)	3.4	3.6	4.0	4.5	4.9	5.4	5.6	5.7	6.4	7.2	9.2	9.4	12.2	15.5	17.9
60 to 80(ref.)	3.3	3.4	3.9	4.3	4.7	5.2	5.3	5.4	6.1	6.9	8.8	9.0	11.7	14.9	17.2
40 to 60	3.0	3.1	3.6	4.0	4.4	4.8	5.0	5.1	5.7	6.5	8.3	8.5	11.1	14.1	16.3
20 to 40	2.8	2.9	3.3	3.7	4.1	4.6	4.7	4.8	5.4	6.1	7.8	8.1	10.5	13.3	15.4
0 to 20	2.7	2.8	3.2	3.5	3.9	4.3	4.5	4.6	5.1	5.8	7.4	7.7	9.9	12.6	14.5
-20 to 0	2.6	2.7	3.0	3.4	3.8	4.2	4.3	4.4	4.9	5.6	7.1	7.3	9.4	11.9	13.7
-40 to -20	2.6	2.6	3.0	3.3	3.7	4.1	4.2	4.3	4.8	5.4	6.8	7.0	9.0	11.4	13.1
-60 to -40(ref.)	2.7	2.7	3.1	3.4	3.7	4.1	4.2	4.3	4.8	5.3	6.7	6.9	8.7	10.9	12.5
-70 to -60(ref.)	2.8	2.9	3.2	3.5	3.8	4.2	4.3	4.4	4.8	5.4	6.7	6.9	8.6	10.7	12.2

Absolute Δn/ΔT [1E-6/℃]

Temp. [℃]	1.083	t	s	A'	r	C	C'	He-Ne	d	e	F	F'	g	h	0.389
80 to 90	2.2	2.3	2.8	3.3	3.7	4.2	4.3	4.5	5.1	6.0	7.9	8.2	10.9	14.2	16.6
60 to 80	1.9	2.0	2.5	2.9	3.4	3.8	4.0	4.1	4.7	5.5	7.4	7.7	10.3	13.4	15.8
40 to 60	1.5	1.6	2.1	2.5	2.9	3.3	3.5	3.6	4.2	5.0	6.7	7.0	9.5	12.4	14.6
20～40	1.1	1.2	1.6	2.0	2.4	2.8	3.0	3.1	3.7	4.4	6.1	6.3	8.6	11.5	13.5
0 to 20	0.7	0.8	1.2	1.6	1.9	2.3	2.5	2.6	3.1	3.8	5.4	5.6	7.8	10.5	12.4
-20 to 0	0.3	0.4	0.8	1.1	1.5	1.9	2.0	2.1	2.6	3.2	4.7	4.9	7.0	9.5	11.3
-40 to -20	-0.1	0.0	0.4	0.7	1.0	1.4	1.5	1.6	2.1	2.7	4.1	4.3	6.2	8.5	10.2
-60 to -40	-0.5	-0.4	-0.1	0.2	0.5	0.9	1.0	1.1	1.5	2.1	3.4	3.6	5.4	7.5	9.0
-70 to -60	-0.8	-0.7	-0.4	-0.1	0.2	0.5	0.6	0.7	1.1	1.7	2.9	3.1	4.8	6.8	8.2

Coef. disp. form. (frac. eq.)(ref.)	
P1	1.00167110E-01
Q1	7.47066024E+01
P2	2.87199284E-02
Q2	6.00528312E-02
P3	4.54734535E-01
Q3	8.29318245E-03

Fitting error of disp. form. σ [1E-6]		
	Visible	Infrared
Power ser. eq.	1.0	4.8
Frac. eq. (ref.)	3.1	13.8

Prod. Freq. (A to F)	A

Similar glass type			
OHARA		HOYA	TAFD40
C.D.G.M		SCHOTT	

9/1/09	1st edition

HIKARI GLASS CO., LTD.