

TECHNICAL INFORMATION

Temperature Conversion Table

To convert - Fahrenheit to Centigrade:

Subtract 32 degrees and divide the remainder by 1.8

To convert - Centigrade to Fahrenheit:

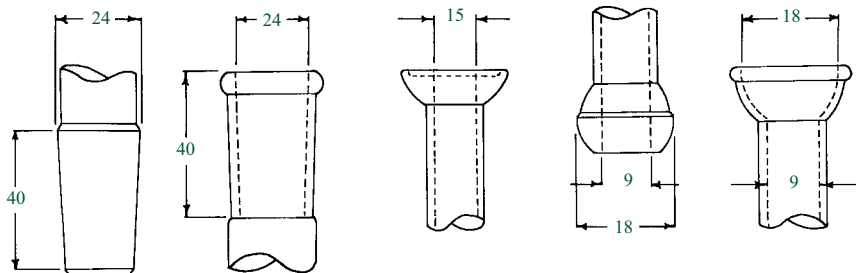
Multiply by 1.8 and add 32 degrees to the result

This temperature table can be used to convert Centigrade to Fahrenheit or Fahrenheit to Centigrade. The temperature listed in the middle is the known temperature °C or °F. To convert to °C use the temperature listed on the left; To convert to °F use the temperature on the right.

°C Temp °F			°C Temp °F			°C Temp °F			°C Temp °F		
-95.5	-140	-220	3.3	38	100.4	2.2	90	194	266	510	950
-90	-130	-202	3.9	39	102.2	32.8	91	195.8	271	520	968
-84.4	-120	-184	4.4	40	104	33.3	92	197.6	277	530	986
-78.9	-110	-166	5	41	105.8	33.9	93	199.4	282	540	1004
-73.3	-100	-148	5.6	42	107.6	34.4	94	201.2	288	550	1022
-67.6	-90	-130	6.1	43	109.4	35	95	203	293	560	1040
-62.2	-80	-112	6.7	44	111.2	35.6	96	204.8	299	570	1058
-56.6	-70	-94	7.2	45	113	36.1	97	206.6	304	580	1076
-51.1	-60	-76	7.8	46	114.8	36.7	98	208.4	310	590	1094
-45.5	-50	-58	8.3	47	116.6	37.2	99	210.2	316	600	1112
-40	-40	-40	8.9	48	118.4	37.8	100	212	321	610	1130
-34.4	-30	-22	9.4	49	120.2	43	110	230	327	620	1148
-28.9	-20	-4	10	50	122	49	120	238	332	630	1166
-23.3	-10	14	10.6	51	123.8	54	130	266	338	640	1184
-17.8	0	32	11.1	52	125.6	60	140	284	343	650	1202
-17.2	1	33.8	11.7	53	127.4	66	150	302	349	660	1220
-16.7	2	35.6	12.2	54	129.2	71	160	320	354	670	1238
-16.1	3	37.4	12.8	55	131	77	170	338	360	680	1256
-15.6	4	39.2	13.3	56	132.8	82	180	256	366	690	1274
-15	5	41	13.9	57	134.6	88	190	374	371	700	1292
-14.4	6	42.8	14.4	58	136.4	93	200	392	377	710	1310
13.9	7	44.6	15	59	138.2	99	210	410	382	720	1328
-13.3	8	46.4	15.6	60	140	100	212	414	388	730	1346
-12.8	9	48.2	16.1	61	141.8	104	220	428	393	740	1364
-12.2	10	50	16.7	62	143.6	110	230	446	399	750	1382
-11.7	11	51.8	17.2	63	145.4	116	240	464	404	760	1400
-11.1	12	53.6	17.8	64	147.2	121	250	482	410	770	1418
-10.6	13	55.4	18.3	65	149	127	260	500	416	780	1436
-10	14	57.2	18.9	66	150.8	132	270	518	421	790	1454
-9.4	15	59	19.4	67	152.6	138	280	536	427	800	1472
-8.9	16	60.8	20	68	154.4	143	290	554	432	810	1490
-8.3	17	62.6	20.6	69	156.2	149	300	572	438	820	1508
-7.8	18	64.4	21.1	70	158	154	310	590	443	830	1526
-7.2	19	66.2	21.7	71	159.8	160	320	608	449	840	1544
-6.7	20	68	22.2	72	161.6	166	330	626	454	850	1562
-6.1	21	69.8	22.8	73	163.4	171	340	644	460	860	1580
-5.6	22	71.6	23.3	74	165.2	177	350	662	466	870	1598
-5	23	73.4	23.9	75	167	182	360	680	471	880	1616
-4.4	24	75.2	24.4	76	168.8	188	370	698	477	890	1634
-3.9	25	77	25	77	170.6	193	380	716	482	900	1652
-3.3	26	78.8	25.6	78	172.4	199	390	734	488	910	1670
-2.8	27	80.6	26.1	79	174.2	204	400	752	493	920	1688
-2.2	28	82.4	26.7	80	176	210	410	770	499	930	1706
-1.7	29	84.2	27.2	81	177.8	216	420	806	504	940	1724
-1.1	30	86	27.8	82	179.6	221	430	824	510	950	1742
-0.6	31	87.8	28.3	83	181.4	227	440	842	516	960	1760
0	32	89.6	28.9	84	183.2	232	450	860	521	970	1778
0.6	33	91.4	29.4	85	185	238	460	878	527	980	1796
1.1	34	93.2	30	86	186.8	243	470	896	532	990	1814
1.7	35	95	30.6	87	188.6	249	480	914	538	1000	1832
2.2	36	96.8	31.1	88	190.4	254	490	932	543	1010	1850
2.8	37	98.6	31.7	89	192.2	260	500	950	549	1020	1868

TECHNICAL INFORMATION

Dimensions of § and § Joints



The dimensions for § and § joints as listed in the National Bureau of Standards Commercial Standard CS-21 are reproduced below for your convenience.

We manufacture our ground joints to precision tolerances which are substantially closer than required by NBS Standard CS-21

Standard Dimensions for Full Length Interchangeable Taper-Ground Joints

Joint Size Number (§ Designation)	Approximate Diameter at Small End mm	Approximate Length of Ground Zone mm	Diameter of large End of Ground Zone (Gauging Point) mm
7/25	5	25	7.5
10/30	7	30	10.0
12/30	9.5	30	12.5
14/35	11	35	12.5
19/38	15	38	18.8
24/40	20	40	24.0
29/42	25	42	29.0
34/45	30	45	34.5
40/50	35	50	40.0
45/50	40	50	45.0
50/50	45	50	50.0
55/50	50	50	50.0
60/55	55	50	60.0
71/60	65	60	71.0
103/60	97	60	103.0

Standard Dimensions for Medium Length Interchangeable Taper-Ground Joints

Joint Size Number (§ Designation)	Approximate Diameter at Small End mm	Approximate Length of Ground Zone mm	Diameter of large End of Ground Zone (Gauging Point) mm
5/12	3.8	12	5.0
7/15	6.0	15	7.5
10/18	8.2	18	10.0
12/18	10.7	18	12.5
14/20	12.5	20	14.5
19/22	16.6	22	18.8
24/25	21.5	25	24.0
29/26	26.6	26	29.2
34/28	31.7	28	34.5
40/35	36.5	35	40.0

Standard Dimensions for Short Length Interchangeable Taper-Ground Joints

Joint Size Number (§ Designation)	Approximate Diameter at Small End mm	Approximate Length of Ground Zone mm	Diameter of large End of Ground Zone (Gauging Point) mm
7/10	6.3	10	7.0
10/10	9.0	10	10.0
14/10	13.5	10	14.5
24/12	22.8	12	24.0
29/12	28.0	12	29.2
34/12	28.0	12	29.2
40/12	38.8	12	40.0
45/12	43.8	12	45.0
50/12	48.8	12	50.0
55/12	53.8	12	55.0
60/12	58.8	12	60.0
71/15	69.5	15	71.0

Standard Dimensions for Interchangeable Spherical Ground Joints

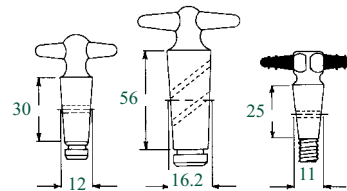
Joint Size Number (§ Designation)	National Diameter of Ball mm	Nominal Tube Inside Diameter mm
12/1	12	1
12/1.5	12	1.5
12/2	12	2
12/3	12	3
12/5	12	5
18/7	18	7
18/9	18	9
28/12	28	12
28/15	28	15
35/20	35	20
35/25	35	25
40/25	40	25
50/30	50	30
65/40	65	40
75/50	75	50
102/75	102	75

TECHNICAL INFORMATION

The dimensions for § and § stopcocks as listed in the National Bureau of Standards Commercial Standard CS-21 are reproduced below for your convenience.

We manufacture our stopcocks to precision tolerances which are substantially closer than required by NBS Standard CS-21.

Dimensions for § and § Stopcocks



Stopcocks with Glass Plugs

Single Straight-Bore Stopcocks

Stopcock Size (§ Designation and Bore of Hole in Plug mm)	Diameter of Plug at Centerline of bore mm	Length of Shell $\pm 0.5\text{mm}$
1-m(1mm)	7	30
1	12	30
1-1/2	12	30
2	12	30
3	17	40
4	17	40
5	20	40
6	20	44
8	25	52
10	35	56

Single Oblique-Bore Stopcocks

Stopcock Size (§ Designation and Bore of Hole in Plug mm)	Diameter of Plug at Opening Nearest Large End mm (Gauging Point)	Distance of Gauging Point From Large End mm	Length of Shell $\pm 0.5\text{ mm}$
1	12.60	14.0	40
1-1/2	12.60	14.0	40
2	12.60	14.0	40
3	17.35	16.5	50
4	17.35	16.5	50

T-Bore 120° Bore Stopcocks

Stopcock Size (§ Designation and Bore of Hole in Plug mm)	Diameter of Plug at Centerline of bore mm	Length of Shell $\pm 0.5\text{mm}$
1	17	40
1-1/2	17	40
2	17	40
3	20	44
4	20	44

Double Oblique-Bore Stopcocks

Stopcock Size (§ Designation and Bore of Hole in Plug mm)	Diameter of Plug at Gauging Point (Center of Plug) mm	Distance of Gauging Point From Centerline of Hole Nearest Large End mm	Length of Shell $\pm 0.5\text{ mm}$
1	14.5	12.5	50
1-1/2	14.5	12.5	50
2	14.5	12.5	50
3	16.2	14.0	56
4	16.2	14.0	56

Stopcocks with Teflon Plugs §

Single Straight-Bore Stopcocks

Stopcock Size (§ Designation and Bore of Hole in Plug mm)	Diameter of Plug at Centerline of bore mm	Length of Shell $\pm 0.5\text{mm}$
1	11	25
2	11	25
3	15.2	30
4	15.2	30
6	16	35

Single Oblique-Bore Stopcocks

Stopcock Size (§ Designation and Bore of Hole in Plug mm)	Diameter of Plug at Opening Nearest Large End mm (Gauging Point)	Distance of Gauging Point From Large End mm	Length of Shell $\pm 0.5\text{ mm}$
2	15.9	11.5	30

T-Bore and 120° Bore Stopcocks

Stopcock Size (§ Designation and Bore of Hole in Plug mm)	Diameter of Plug at Centerline of bore mm	Length of Shell $\pm 0.5\text{mm}$
1	15.2	30
2	15.2	30
4	16	35

Double Oblique-Bore Stopcocks

Stopcock Size (§ Designation and Bore of Hole in Plug mm)	Diameter of Plug at Opening Nearest Large End mm (Gauging Point)	Distance of Gauging Point From Large End mm	Length of Shell $\pm 0.5\text{ mm}$
1	12.9	9.4	44
2	12.9	9.4	44
3	14.4	10.4	44
4	14.4	10.4	44

TECHNICAL INFORMATION

Glass Properties

Unless otherwise stated, all Chemglass Brand Glassware meets ASTM Specification E438, Type 1, Class A, and is made from Schott Duran®, Kimble KG-33, Pyrex® 7740 glass or equivalent. Specifications for Duran® glass is as follows:

Maximum Short Time Use Temperature.....	500 °C
Annealing Point	560 °C
Softening Point	815 °C
Working Temperature.....	1270 °C
Linear Coefficient of Expansion.....	32.5 x 10 ⁻⁷ /°C
(according to DIN 52328)	
Refractive Index.....	1.473

Pressure Conversions

ABSOLUTE PRESSURE

GAUGE PRESSURE

cm of Hg	Torr or mm of Hg	Micron	Atmos- phere	lb / in ²	ton / ft ²	gram / cm ²	ft of H ₂ O	in of Hg	lb / in	in of Hg
76	760	760000	1	14.7	1.06	1033	33.9	29.9	0.00	0.00
70	700	700000	0.921	13.53	0.975	952	31.2	27.6	1.16	2.36
60	600	600000	0.79	11.6	0.835	816	26.8	23.6	3.10	6.30
50	500	500000	0.659	9.67	0.696	680	22.3	19.7	5.03	10.2
40	400	400000	0.526	7.74	0.557	545	17.8	15.7	6.97	14.2
30	300	300000	0.395	5.8	0.417	408	13.4	11.8	8.90	18.1
20	200	200000	0.263	3.87	0.278	272	8.92	7.87	10.8	22.0
10	100	100000	0.132	1.94	0.139	136	4.46	3.94	12.8	26.0
5	50	50000	0.006	0.967	0.07	68	2.23	1.97	13.7	27.9
1	10	10000	0.013	0.194	0.014	13.6	0.446	0.394	14.5	29.5
0.1	1	1000	0.001	0.019	0.001	1.36	0.045	0.039	14.68	29.88
0	0	0	0	0	0	0	0	0	14.7	29.92

Conversion Factors

Volume		Capacity	
1 cubic centimeter (cc)	0.001 liter	1 milliliter (mL)	0.03382 ounce
1 cubic centimeter	0.0610 cubic inch	1 ounce	29.573 milliliters
1 cubic inch	16.3872 cubic centimeters	1 liter	1.05671 quarts
1 cubic meter	35.314 cubic feet	1 quart	0.94633 liter
1 cubic foot	0.02832 cubic meter	1 liter	0.26418 gallon
		1 gallon	3.78533 liters
Length		Mass	
1 millimeter (mm)	0.1 centimeter	1 gram	0.03527 ounce
1 centimeter	0.01 meter	1 ounce	28.3495 grams
1 centimeter	0.394 inches	1 Kilogram	2.20462 pounds
1 inch	2.540 centimeters	1 pound	0.45359 kilogram
1 meter	3.2808 feet		
1 foot	0.305 meter		

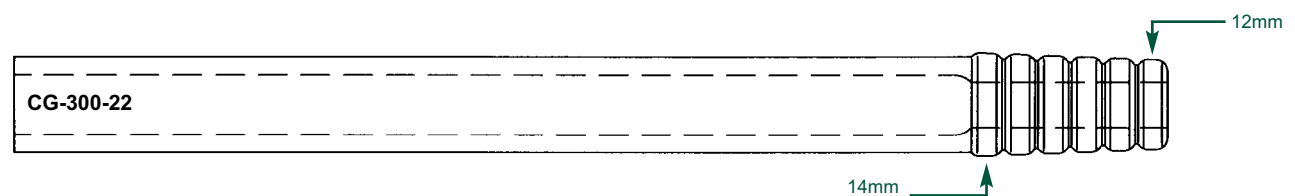
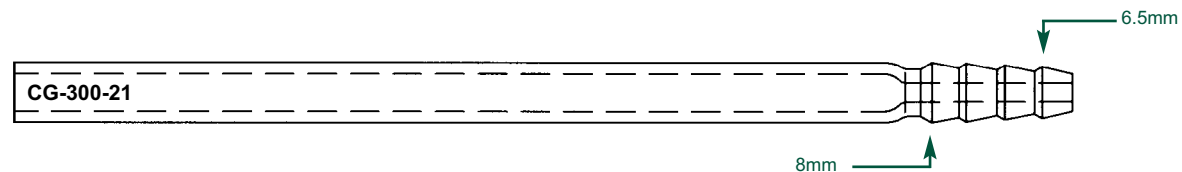
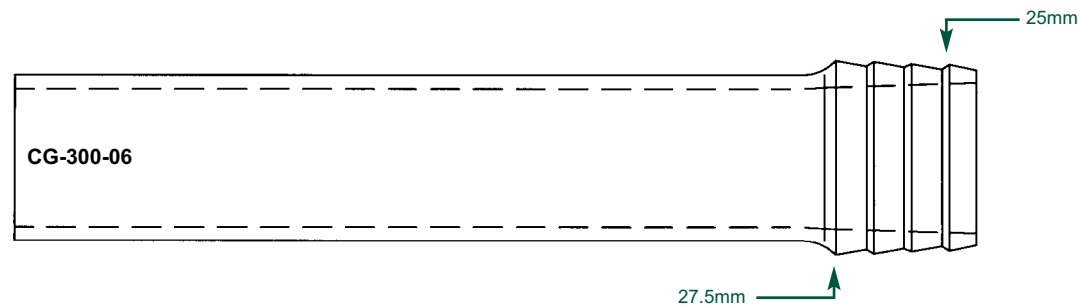
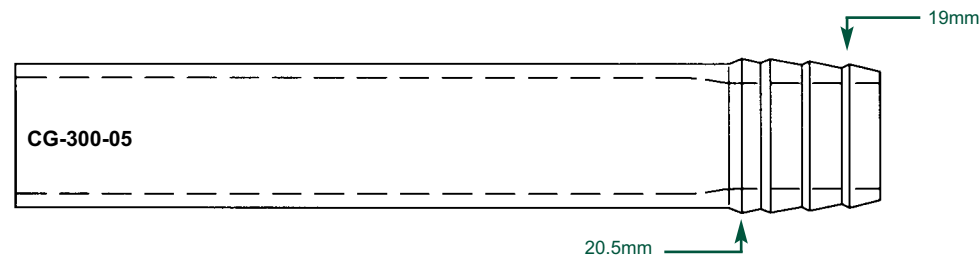
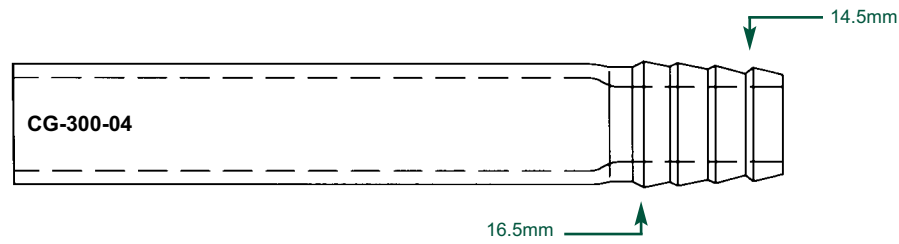
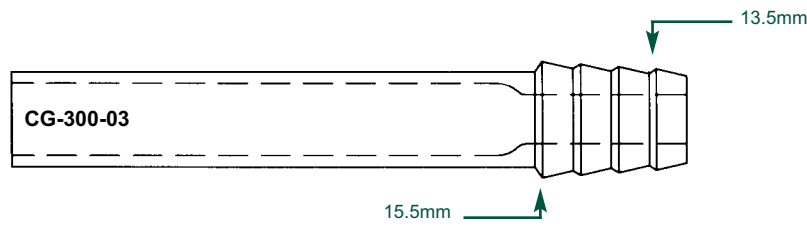
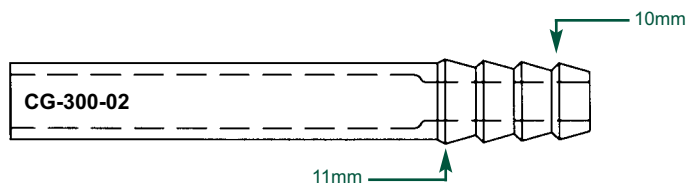
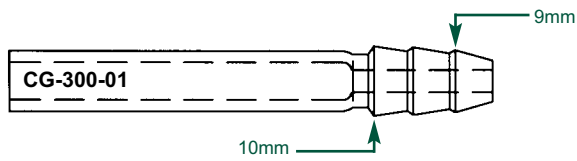
Pressure Equivalents

Micron or Millitor	Torr or mm of Hg
1000	10 ⁰
100	10 ⁻¹
10	10 ⁻²
1	10 ⁻³
0.05	5 x 10 ⁻⁴
0.1	10 ⁻⁴
0.01	10 ⁻⁵
0.001	10 ⁻⁶

Round Bottom Flask Diameters

Capacity mL	Diameter mm	Capacity mL	Diameter mm
5	25	500	102
10	31	1000	130
15	35	2000	161
20	38	3000	185
25	42	5000	221
50	48	6000	236
100	60	10000	279
125	65	12000	295
200	76	22000	350
250	83	50000	457
300	87	72000	520

TECHNICAL INFORMATION



Hose Connection Matching Chart

Use this chart to determine which size hose connection you need. Each hose connection is represented at actual size.

TECHNICAL INFORMATION

FUSED SILICA QUARTZ SPECIFICATIONS FOR QUARTZ PLATES

Measured at 20°C Unless Otherwise Noted

OZ INGOT AVERAGE IMPURITY CONTENTS

Elements	PPM by Wt.	MAX
Aluminium (Al)	40	53
Calcium (Ca)	2.5	3.5
Copper (Cu)	0.50	0.08
Hydroxyl (OH)	150	180
Iron (Fe)	0.9	1.2
Lithium (Li)	0.06	0.08
Magnesium (Mg)	0.3	0.45
Manganese (Mn)	0.03	0.04
Potassium (K)	1.7	2.3
Sodium (Na)	2.5	3.8
Titanium (Ti)	0.8	1.0

PHYSICAL & MECHANICAL PROPERTIES

	<i>Natural</i>
Specific Gravity	2.203
Mohs Hardness (Mohs)	5 to 7
Micro Hardness (kg/cm ²)	800 to 1000
Knoop Hardness (100g*load, kg/mm ²)	590 to 620
Young's Modulus (kg/cm ²)	743 x 10 ³
Rigidity Modulus (kg/cm ²)	318 x 10 ³
Poisson's Ratio	0.17
Compressive Strength (kg/cm ²)	11,500
Tensile Strength (kg/cm ²)	500
Bending Strength (kg/cm ²)	700
Torsional Strength (kg/cm ²)	300
Velocity of Sound for	5,720
Compressional Wave (m/sec)	
Shear Wave (m/sec)	3,620

REFRACTIVE INDEX OF QUARTZ GLASS

Wavelength (μ)	Refractive Index	Wavelength (μ)	Refractive Index
0.02	1.54727	0.80	1.45337
0.25	1.50745	0.90	1.45180
0.30	1.48594	1.00	1.45047
0.34	1.47867	1.30	1.44698
0.40	1.46968	1.60	1.44349
0.48(F)	1.46318	2.00	1.43317
0.55	1.46013	2.40	1.43173
0.59(d)	1.45845	2.80	1.42389
0.65(c)	1.45640	3.10	1.41694
0.70	1.45517	3.50	1.40601

TRANSMISSION (THICKNESS 10mm)

Wavelength (NM)	Percent (%)
220	23.6
230	60.8
240	69.2
250	78.8
260	89.1
270	91.9
280	92.2
290	92.4
300	92.5

THERMAL PROPERTIES

	<i>Natural</i>
Strain Point (°C)	1,070
Annealing Point (°C)	1,140
Softening Point (°C)	1,630
MAX Temperature (°C)	
Continuous	1,000
Limited Life	1,300
Coefficient of Expansion	Approx. 5 X 10 ⁻⁷
Thermal Conductivity (Cal/cm ² sec°C)	
at 0°C	0.0032
at 100°C	0.0037
Specific Heat (cal/gm°C)	
at 20°C	0.213
at 100°C	0.273

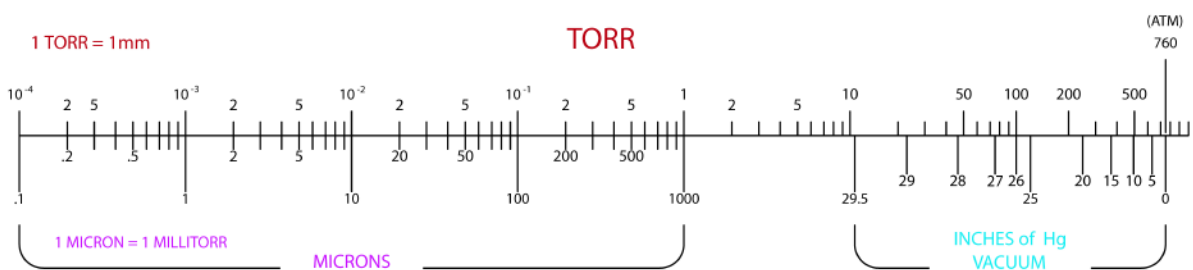
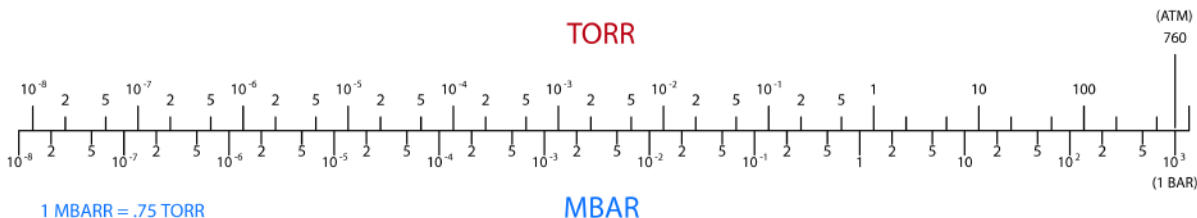
DISPERSION OF GLASS

Wavelength (A)	dn/d
3000	-2.471 X 10 ⁻⁵
4000	-1.102 X 10 ⁻⁵
5000	-0.512 X 10 ⁻⁵
6000	-0.350 X 10 ⁻⁵
7000	-0.163 X 10 ⁻⁵

This is also available as a pdf download
at www.chemglass.com.

Surface Finish: 80/50 scratch dig
Flatness: 10 bands (10 wavelengths) per inch
10 bands = 0.0001075" = 0.003mm

CHEMGLASS Vacuum Conversion Chart



REUNITING ORGANIC-FILLED THERMOMETERS

Separated columns in organic-filled (spirit) thermometers require a somewhat different technique in order to be reunited.

- The simplest and safest method is to force the liquid down the capillary by using a centrifuge, if one is available, with a cup deep enough to ensure that the centrifugal force is below the liquid column.
- Carefully insert the thermometer, bulb down, in the centrifuge. Have some cotton wadding at the bottom of the cup to prevent any damage to the bulb.
- Turn on the centrifuge and in just a few seconds all the liquid will be forced past the separation. If the cup is not deep enough and all the centrifugal force is not below the column, the column will split, forcing part of the liquid down.
- The remainder will be forced up, filling the expansion chamber. If a centrifuge is not available, the column can be reunited by coaxing the liquid to run down.
- This can be accomplished by holding the thermometer in an upright position and gingerly tapping the stem above the separation against the palm of your hand.
- As you gently tap the thermometer, observe the liquid above the separation until it breaks away from the wall of the capillary and runs down to join the main column.



TECHNICAL INFORMATION

Testing & Using Dewar / Evacuated Flasks

This should be done in a cool dry location.

1) Wash Dewar.

Inside of Dewar must be clean, dry, and free of any contaminants! We recommend using a dish brush with hot soapy water and rinsing with distilled or DI water. Avoid using laboratory brushes that have metal handles. The metal may scratch the glass and weaken the Dewar.

2) Temper / Chill Dewar.

LN2 will boil rapidly till Dewar has been Tempered / Chilled. Fill the Dewar fi to fl full with LN2 and cover. After 30 to 45 seconds, pour out LN2 turning the Dewar to insure that all inside walls of the Dewar have been Tempered. Repeat above steps until some frost is visible on inside of Dewar when it is empty.

Keep in mind that the boiling point for LN2 is -320.5° F and the Dewar is usually at room temperature, 72° to 73° F.

3) Refill Dewar and cover.

Please note that LN2 will become contaminated with repeated use in testing Dewars that will cause rapid boiling, thus giving the impression that the Dewar is defective.



Signs of Defective Dewar

- 1) Frost, not condensation, will appear on outside of Dewar.
- 2) Bottom of Dewar, Tar, will be cold to touch.
- 3) Excessive rapid boiling from the bottom of the Dewar continues after tempering.
- 4) Boiling on the top edge or side could indicate the wall of the Dewar is contaminated.

WARNING ! VACUUM FLASK - CAN SHATTER UNEXPECTEDLY, MAY CAUSE INJURY. WEAR SAFETY GLASSES AND, FOR BEST PROTECTION, GLOVES, LONG SLEEVES AND APRON.



TECHNICAL INFORMATION

FILTER APPARATUS

POROSITIES

The porosity for the pore diameter of the filter determined by the method specified in ASTM E-128 "MAXIMUM PORE DIAMETER AND PERMEABILITY OF RIGID POROUS FILTERS FOR LABORATORY USE."

<u>Porosity</u>	<u>Designation</u>	<u>Pore Size Microns</u>	<u>Principal Uses</u>
Fine	F	4-5.5	Filtration of fine precipitates. Extraction
Medium	M	10-16	Extraction. Filtration of crystalline precipitates.
Coarse	C	40-60	Gas dispersion. Gas washing. Extraction. Mercury filtration.
Extra Coarse	XC	170-220	Used as a support for other filter material. Gas dispersion. Gas washing.

PRESSURE

Fritted glassware is designed for low pressure vacuum filtration or gas flow. The **MAXIMUM** differential pressure should not exceed 15lbs. per square inch.

THERMAL LIMITS

Fritted ware should not be exposed to excessive temperature change or direct exposure to flame due to the fact that it has less resistance to thermal shock than standard borosilicate glassware.

Dry ware may be put in a furnace at the setting of 150°C. However, most drying to constant weight is done at 110°C. Fritted ware can be heated safely to 500°C provided that the cycle of heating and cooling is gradual.

CLEANING

New filters should be cleaned by suction with hot hydrochloric acid followed by a water rinse.

Used filters can usually be cleaned by rinsing with water, passed thru the underside of the filter disc at pressure not exceeding 15lbs. per square inch. There are some precipitates that tend to clog the pores of a fritted filter. Following are some suggestions for dealing with these precipitates that have to be removed by chemical means.

MATERIAL

Albumen
Aluminous and siliceous residues

Copper or Iron Oxides
Glucose

Fatty Materials
Mercuric Sulfide
Mercury
Organic Matter

Silver Chloride

CLEANING AGENT

Hot Ammonia or Hydrochloric Acid
2% Hydrofluoric Acid followed by concentrated sulfuric acid. Rinse immediately with water until no trace of acid can be detected.
Hot Hydrochloric Acid plus Potassium Chlorate
Hot mixed acid (H₂SO₄ + HNO₃)
Carbon Tetrachloride
Hot Aqua Regia
Hot Nitric Acid
Hot concentrated cleaning solution, or hot concentrated sulfuric acid with a few drops of Sodium Nitrate.
Ammonium or Sodium Hyposulfide

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