

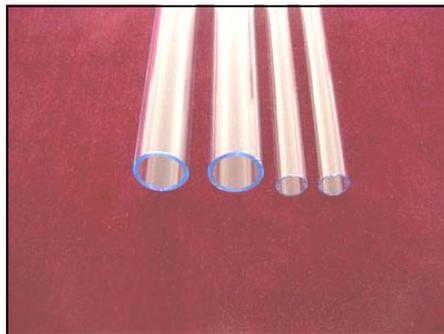
TYPE	FEATURE	MAIN USE
STANDARD MODEL		
HR1 TYPE TUBE	Standard transparent melt-congealed quartz material in industry, economical and have various kinds of dimensions and spec, especially clear in appearance and have strong heat capability and machine capability, low content of hydroxide, exact tolerance and dimension.	Be applied in lamps of high capability and high temperature. Eg. hydrargyrum lamp, quartz halogen lamp, ultraviolet lamp, thermocouple, semiconductor quartz products, wave-guide management and other high-temperature products.
LIGHTING TYPE		
HR2 TYPE TUBE	A kind of transparent melt-congealed quartz tube which is added with titanium oxide to prevent dense ultraviolet radiation. It shares the same appearance, dimesion, heat capability and machine capability. It is commonly called “sterilization” or “no ozone” quartz.	It is suitable for sterilization lamps whose sterilization range are transmitted by ultraviolet or other lamps, not suitable for short ultraviolet or lamps with ozone.
HR3 TYPE TUBE	Transparent melt-congealed quartz mixed within cerium and ultraviolet, mainly absorb all ultraviolet far radiation and near radiation to maintain strongest transition efficiency of light in visible spectrum. It is commonly called “ultraviolet-sift” quartz and “UV” .	It is suitable to use ultraviolet-sensitivity and high-temperature lamp when individual and substance are endangered, including halogen lamp and gas discharge lamp, so that metallic-membrane plating previously needed, filter and ultraviolet proof lens can be subtracted.
HR4 TYPE TUBE	It has big amount of small air bulbs, suitable for nontransparent melt-congealed quartz tube which emits infrared and visible-light-transmitted infrared. It is called “Milky” quartz.	It is used in infrared heating, electrical equipments for family, paper making, heater in printing and dyeing industry,etc.
HR5 TYPE TUBE	Melt-congealed quartz of high-consistency ozone generated by inter-effect between dense ultraviolet radiation and the air, usually called “High ozone” quartz.It shares the same dimension, tolerance,heat capability and machine capability with HR1 type.	Sterilization of pure water, ion water, water for medicine, ect. Deplete the organic matter in the waste water by light-catalyzed accelerant
SEMICONDUCTOR TYPE		
HS1 TYPE ROD	Transparent melt-congealed quartz rod with little air, relatively high purity, strict dimension and tolerance	Suitable for rod used in light-fine producing, hand rod and lamp for bearing machine in semiconductor industry.
HR6 TYPE TUBE	This transparent melt-congealed quartz tube has the same capability with HR1, but with higher purity and lower content of alkali, aluminium and hydroxide.	Suitable for clients who have some requirements on the content of alkali, aluminium and hydroxide.
HR7 TYPE TUBE	Transparent melt-congealed quartz thick-outer tube, shares the same capability as HR5 type.	Suitable for light-fine tube making and semiconductor technology.

HR1 TYPE

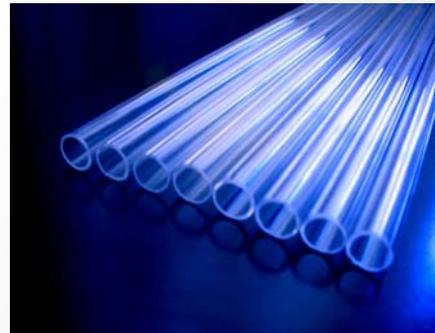
HR1-type transparent melt-congealed quartz tube with no color is an anti-high-temperature material which has high purity, strong transmission, low content of hydroxide. HR1 type has features of clear appearance, strong heat capability, strong machine capability and strict dimension and tolerance. It can be broadly used in hydrargyrum lamp, halogen lamp and other quartz lamp.

**HR2 TYPE**

HR2-type quartz tube is an ideal material to produce sterilization lamp and various UV uses. This product has no color on the surface and slightly purple on the section. This product can basically stop ultraviolet radiation ahead of 220nm in the spectrum, and the ultraviolet permeance rate can achieve more than 90% at 253.7nm, the ultraviolet radiation at this wave length has relatively strong ability of sterilization.

**HR3 TYPE**

HR3-type ultraviolet-radiation-sift quartz tube is no color or lightly blue on the surface, with slightly blue on the section. This product has good capability of standard melt-congealed quartz, and can effectively prevent all ultraviolet of wave length 190-320nm in the spectrum., furthermore, with its capability of penetrating and cutting 350-400nm wave length, it is an ideal material which is made almost completely UV-proof, and has the biggest visibility and transmission degree. It is suitable for sheltering under the exposure of ultraviolet radiation, or some quartz halogen lamp, metal halide lamp and other UV lamp-house.

**HR4 TYPE**

HR4-type milky melt-congealed quartz tube, milky on the surface, even and lubricous intexture, nontransparent, pearl-blared, is propitious to emit infrared or infrared transformed form visible light, because of full content of small air bulbles. This products have features of high purity, corruption endurance, quick heat reflection, good heat stability, long lifespan, energy saving, etc. It has achieved international standard from specs, appearance to inside quality, and can serve as best material for something such as far-infrared heater, warm heater, insulated tube, oven, paper making, heater for printing and dyeing industry, water heater, etc.





HR5 TYPE

HR5-type melt-congealed quartz can give birth to ozone with high oxidation effect, by means of interactive effect between dense ultraviolet radiation of 185nm and the air. The ozone produced by this products has quite strong sterilization effects, and can serve as an ideal material for water sterilization, dealing with waste water and environmental conservation sterilization.

● Typical dimension, transparent melt-congealed quartz tube

ID×OD (mm)	THICKNESS	ID×OD (mm)	THICKNESS	ID×OD (mm)	THICKNESS
1×3	1.00	10×12	1.00	25×28.8	1.90
1.2×3	0.90	10.5×12.75	1.13	27×30	1.50
1.6×3	0.70	11×13	1.00	30×33	1.50
2×3	0.50	11.7×14.1	1.20	32×35	1.50
2×4	1.00	12×14	1.00	34×38	2.00
2×6	2.00	12.75×15	1.13	35×38	1.50
2.3×3.6	0.60	13×15	1.00	37×40	1.50
2.35×3.65	0.65	15×17	1.00	38×44	3.00
2.35×4	0.83	15×18	1.50	38.1×72.1	2.00
2.35×4.35	1.00	16×18	1.00	40×43	1.50
3×5	1.00	18×20.5	1.25	42×45	1.50
4×6	1.00	18×21.6	1.80	45×48	1.50
5×7	1.00	19×25	3.00	47×50	1.50
6×8	1.00	20×22	1.00	48×52	2.00
6×10	2.00	20×22.8	1.40	50×54	2.00
7×9	1.00	20×23	1.50	50×55	2.50
7.75×9.75	1.00	20.2×23	1.40	53×57	2.00
7.8×10	1.10	22×25	1.50	55×59	2.00
8×10	1.00	22×25.3	1.65	57×61	2.00
8×12	2.00	22×25.8	1.90	60×64	2.00
8.5×10.5	1.00	23×26	1.50	63×67	2.00
9×11	1.00	25×27.5	1.25	65×69	2.00
9×11.8	1.40	25×28	1.50	66×70	2.00

Tip: Other dimension of products can be supplied as to clients` requirement

● Dimension tolerance

OUTER DIAMETER RANGE	OD	THICKNESS	DEFLECTION DEGREE	ELLIPSE DEGREE	CAMBER
<5mm	±2.50%	±10%	10%	2.0%	2.44mm
5—13	±2.00%	±10%	10%	1.5%	2.0mm
13—30	±1.50%	±8%	8%	1.5%	2.0mm
30—60	±1.50%	±10%	10%	1.5%	2.0mm

Tip: More exact tolerance can be made as requested.

QUARTZ ROD

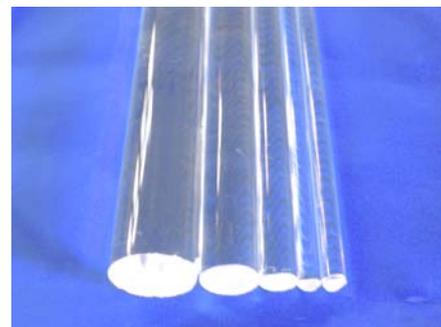
HS1-type melt-congealed quartz rod has some features, such as high purity, high temperature endurance, acid endurance, strong alkalescence, low swelling coefficient, strong tensile force on the surface, low content of hydroxide, etc. which are necessary for silicon-weight-bearing machine and rod in the course of processing semiconductor silicon plate. Simultaneously, HS1-type melt-congealed quartz rod is an ideal material of quartz ray-fine and quartz fiber used for communication and aviation.

HS1-type material can be applied to lamp-house, medication, communication, aviation, semiconductor, optical or high-temperature quartz appliance.

Typical dimension of HS1-type melt-congealed quartz rod

Diameter (mm)	Tolerance (mm)	elliptical degree
1.0	0.20	0.10
1.5	0.20	0.12
2.0	0.20	0.15
2.5	0.20	0.10
3.0	0.20	0.10
3.5	0.20	0.10
4.0	0.20	0.10
5.0	0.20	0.10
6.0	0.20	0.10
6.4	0.20	0.10
7.0	0.20	0.10
8.0	0.20	0.08
9.0	0.20	0.08
10.0	0.20	0.08
12.0	0.20	0.08
13.0	0.20	0.08
14.0	0.15	0.08
15.0	0.25	0.10
19.0	0.25	0.10
20.0	0.25	0.10
22.0	0.25	0.10
25.0	0.25	0.10
30.0	0.25	0.10

Tip: Other dimension can also be supplied.

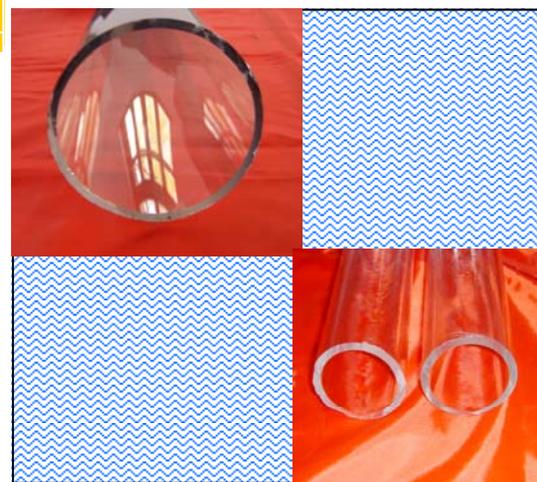


HR6-type melt-congealed quartz tube is suitable to new requirements of semiconductor industry on high-purified, much big, much long, high-temperature endured, high-pressure endured, low-hydroxide materials, and the products' low content of alkali, aluminum element can make quartz tube endure a big range of heat and temperature changes as well as bad circumstances while processing the semiconductor. This material is applied to chemical industry, smelt, IC-produced extended furnace tube, IC electric power component and sediment tubes, etc.

HR6-type melt-congealed quartz typical dimension.

ID×OD (mm)	OD (mm)	ID×OD (mm)	OD (mm)
70×74	74.0±2.0	130×136	136±2.0
75×80	80±2.0	135×141	141±2.0
80×84	84±2.0	135×142.7	142.7±2.0
80×85	85±2.0	135×141	141±2.0
85×90	90±2.0	135×147.7	147.7±2.0
90×95	95±2.0	140×146	146±2.0
95×100	100±2.0	140×152.7	152.7±2.0
100.6×106.6	106.6±2.0	145×151	151±2.0
105×117.7	117.7±2.0	145×157.7	157.7±2.0
110×115	115±2.0	150×156	156±2.0
115×120	120±2.0	150×162.7	162.7±2.0
115×127.7	127.7±2.0	155×161	161±2.0
120×125	125±2.0	160×166	166±2.0
130×135	135±2.0		

Tip: Other dimension can also be supplied



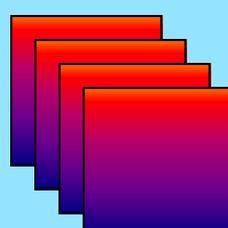
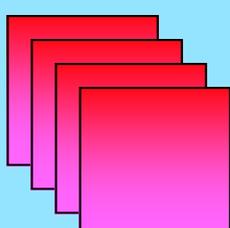
HR7-type melt-congealed quartz tube with thick outer, has the same capability and quality as HR6-type, furthermore, for its low hydroxide content, this product can be produced by ray-fine tube or can be produced into silicon plate, light wave, light conductor, etc by semiconductor technology.

HEATING CAPABILITY

Melt-congealed quartz is a product which is processed from the material of natural ore SiO_2 by special arts and crafts. Because of melt-congealed quartz's low swelling coefficient and high purity, it can endure big changes of temperature, therefore, it can't burst into crack when put into cold water at the heating temperature of 1100°C , so its short-term temperature for use can upgrade to 1450°C .

Melt-congealed quartz of high purity has capability of anti-crystal transformation, and contamination on the surface can affect the effect of crystal transformation. (1) Contamination is able to promote cristobalite the effect of crystal nucleus. (2) It has the effect of assist-solvent, promoting cristobalite to transform to (high)squama quartz. In some instances, the crystal transformation of squama quartz will deepen and come into being inside the melt-congealed quartz, which makes the quartz glass loosen and crack, thus damage the quartz glass and shorten the usage lifespan of quartz., so any contamination formed is detrimental. (3) The high content of hydroxide will speedup the growth of cristobalite.

The important factor leading to drooping melt-congealed quartz is the content of hydroxide, which is the less, the stronger of the anti-drooping degree of melt-congealed quartz. Secondly, the thicker of the melt-congealed quartz, the less of the drooping degree. When the outer thickness is fixed, the shorter of the tube diameter, the less of the drooping degree.



CHEMICAL INGREDIENT

The chemical ingredient of melt-congealed quartz determines the product capability of transparent silicon.

	Al, Fe, Ca, Mg, Cu, Co, Ni, Mn, Ti, Na, K, Li, B, 13 categories of impurity elements, overall content no more than	OH
HR1	Overall content <50ppm Fe<2, Cu<0.8, Na<2, K<2, Li<2, B<0.3	<150
HR2	Overall content <150ppm K≤0.6, Na≤0.9, Li≤0.9, B≤0.9	<5
HR3	Overall content <550ppm K, Na, Ca, Mg, Fe, Cu, Ni <30ppm	<5
HR4	Overall content <100ppm	<5
HR5	Overall content <50ppm K≤0.6, Na≤0.9, Li≤0.9, B≤0.9	<5
HS1	Overall content <30ppm K≤0.6, Na≤0.9, Li≤0.9, B≤0.08	<5
HR6	Overall content <30ppm K≤0.6, Na≤0.9, Li≤0.9, B≤0.08	<10
HR7	Overall content <30ppm K≤0.6, Na≤0.9, Li≤0.9, B≤0.08	<10

As clients requested, we can also produce quartz products with unique precision and anti-crystal transformation capability, so that quartz products are more high-pure and the content of impurity elements totals to Degree PPb, (OH) <3ppm.

OPTICAL CAPABILITY

The conductivity of light can serve as a method to differentiate various categories of transparent silicon, in that transparency reflects the purity of materials and method of production.

Melt-congealed quartz can permeate ultraviolet radiation, visible light and infrared ray. Permeance rate is around 70% at the wavelength of 200nm, and around 85 at 230m. The permeance rate of visible light is 90%, with gradual attenuation at above 2000-3000nm.

● AVERAGE LIGHT PERMEANCE

Wavelength (um)	average light permeance rate(%)	average absorption coefficient(CM ⁻¹)	Wavelength (um)	average light permeance rate(%)	average absorption coefficient(CM ⁻¹)
0.160	4.6	29.57	0.450	92.2	0.09
0.162	7.4	27.33	0.550	92.5	0.07
0.164	7.4	24.89	0.650	92.7	0.06
0.166	8.4	23.64	0.750	92.9	0.04
0.168	10.9	21.04	1.00	93.1	0.03
0.170	18.5	15.75	1.50	93.2	0.03
0.175	43.6	7.22	2.00	93.5	0.02
0.180	60.4	4.01	2.50	93.4	0.05
0.185	66.1	3.12	2.65	93.5	0.04
0.190	70.4	2.52	2.75	92.9	0.11
0.195	71.3	2.41	2.80	93.0	0.10
0.200	73.4	2.14	2.90	92.9	0.12
0.205	76.1	1.80	3.00	92.7	0.15
0.210	79.4	1.39	3.10	92.7	0.16
0.220	85.3	0.69	3.20	92.8	0.17
0.230	87.3	0.49	3.30	92.8	0.18
0.240	86.5	0.60	3.43	92.7	0.20
0.245	86.6	0.57	3.80	81.2	1.62
0.250	87.7	0.48	3.92	81.0	1.66
0.260	89.5	0.28	4.20	67.5	3.62
0.270	90.2	0.21	4.25	66.0	3.92
0.280	90.7	0.17	4.30	57.5	5.40
0.290	90.9	0.16	4.45	43.1	8.56
0.300	91.1	0.15	4.58	49.7	6.97
0.350	91.7	0.11	4.70	36.1	10.61

ADVISE TO USAGE OF PRODUCTS

If used reasonably for years, the best effect can be obtained such as longest lifespan, highest economical profit.

■ STORAGE

The warehouses keeping quartz materials are to be clean and dry, in that humidity and dust will damage the pure degree and capability of the quartz tube and rod.

■ CLEANING

Quartz materials are to be cleaned in water containing grease-dissolved solvent to clean the greese, and after being cleaned by ion-removed water, be immersed and cleaned in hydrofluoric acid with the concentration of 5-10% (cubage ratio), finally dried instantly without water remains.

■ TEMPERATURE FOR USING QUARTZ TUBE

Quartz tubes and non-crystal substance only have a range of intenerated temperature, whereas tend to bend while used in a long period of time under 1200 °C. Distortion will be decreased when purity is increased, hydroxide dedeased, outer thickness increased. The normal temperature for long use is 1050 °C.

■ Increasing the lifespan of the quartz glass

The main shatter form of quartz glass is bursting into crack while cooled, in that quartz glass will transform into cristobalite crystal. Cristobalite has crystal transformation at 240 °C accompanied by changes of density and vol, which can cause quartz glass bursting into crack. The velocity of crystal transformation is relevant to contamination on the surface and temperature changes, basically with no crystal transformation below 1000 °C, with crystal transformation accelerating above 1100 °C. Anyway crystal layer of the qualified products is to be less than 100micron with heat preservation for 6 hours at 1400 °C. Therefore, in order to extend the lifespan of the quartz tube, circumstance for use is important and temperature is to be suitable.