Granulated Glass for Metal Packages

Granulated glass is used extensively for sealing stems and leads, and for part support in metal packages. Owing to their free flow characteristics, they have excellent workability in the tablet forming process.

Glass for matching seals is used with Kovar stems and leads, while those for compression seals are used with iron or stainless steel stems and leads of iron-nickel, iron-chrome alloys or Kovar.

Glass for part support is used for stand-off.

Properties

Usage			Seal							Part Support	
			Compression Seal			Matching Seal				Stand Off	
Glass Code			**ST-W/K**	**ST-4W/K**	**FN-13W/K**	**BH-W/K**	**BH-7W/K**	**BH-8W/K**	**BH-14W/K**	**ST-4F/K**	**BH-FW/K**
Particle size	D_{50}	μ m	135	130	110	135	135	135	135	120	125
	D_{99}	μ m	265	250	215	265	265	265	265	235	245
Firing temperature: T_1		˚C	650-660		680-690		700-710	670-680	730-750	650-660	750-800
Sealing temperature: T_2		˚C	960			980		930	980	960	1050
Coefficient of thermal expansion	30-380˚C	$\times 10^{-7}$/K	95	95	75.5	45.5	49.5	62.5	31.5	94	57
Density		$\times 10^3$kg/m^3	2.60	2.60	2.51	2.28	2.32	2.41	2.13	2.65	2.83
Transformation point		˚C	450	460	510	470	505	510	—	460	515
Deformation point		˚C	510	520	570	550	565	570	—	520	635
Strain point		˚C	420	427	480	435	472	475	—	—	—
Annealing point		˚C	460	472	517	480	513	520	—	—	—
Softening point		˚C	663	672	687	698	715	685	782	—	—
Working point		˚C	980	1030	990	1050	1130	990	1090	—	—
Dielectric constant	1MHz, 25˚C		6.4	6.5	6.3	5.0	5.5	5.8	4.0	6.7	6.4
tan δ	1MHz, 25˚C	$\times 10^{-4}$	22	21	32	30	39	37	3	24	31
Volume resistivity Log ρ	150˚C	Ω·cm	11.4	11.2	11.2	11.5	10.8	11.1	15.5	11.4	—
	250˚C	Ω·cm	8.8	8.7	8.7	8.8	8.2	8.5	12.3	8.8	—
	350˚C	Ω·cm	6.9	7.0	7.0	7.0	6.4	6.8	10.2	7.0	—
Young's modulus		GPa	68	68	—	57	57	—	—	—	—
Poisson's ratio			0.21	0.21	—	0.22	0.22	—	—	—	—
Glass type			$Na_2O \cdot BaO \cdot SiO_2$		$Na_2O \cdot Al_2O_3 \cdot B_2O_3 \cdot SiO_2$					$Na_2O \cdot BaO \cdot SiO_2$	$Na_2O \cdot Al_2O_3 \cdot B_2O_3 \cdot SiO_2$
Application			Fe,Fe-Ni,Fe-Cr,Fe-Ni-Cr		Fe Kovar	Kovar Mo				Fe	Kovar

ST-4F/K, BH-FW/K: Composite glass
Please contact us about color variations.

Application Examples

1. Pressing

The mold pressure of 8-10MPa is suitable for making preforms. The preforms manufactured under this condition have enough green strength for handling and the organic binder decomposes easily during the pre-firing process.

2. Pre-firing

Pre-firing is carried out in an oxidizing atmosphere such as oxygen or air. Pre-firing temperature should be applied to the temperature T_1 in the property table on the opposite page.

Decomposition and firing of the organic binder take place most actively at 150-530°C, so gradual heating is necessary in this temperature range.

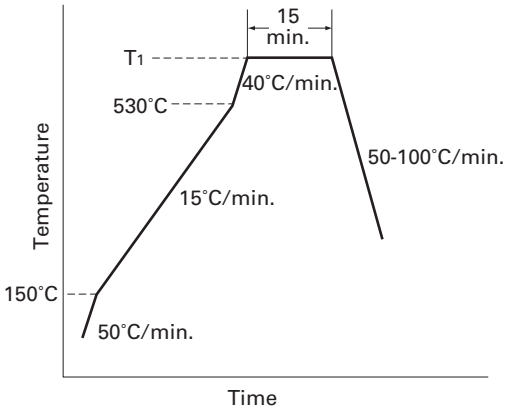

Fig. 1 Pre-firing profile

3. Sealing

Sealing is carried out in a nitrogen atmosphere. Sealing temperature should be applied to the temperature T_2 in the property table on the opposite page.

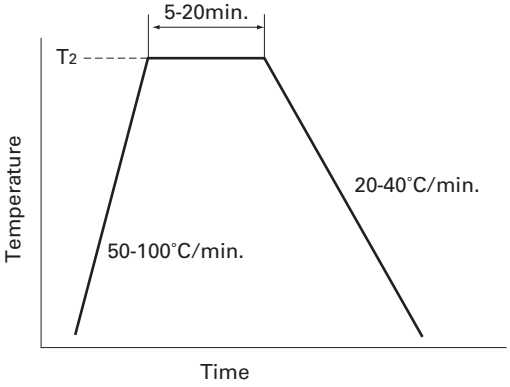

Fig. 2 Sealing profile

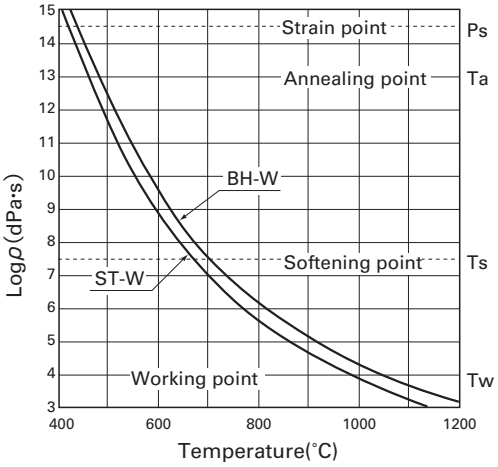

Fig. 3 Viscosity

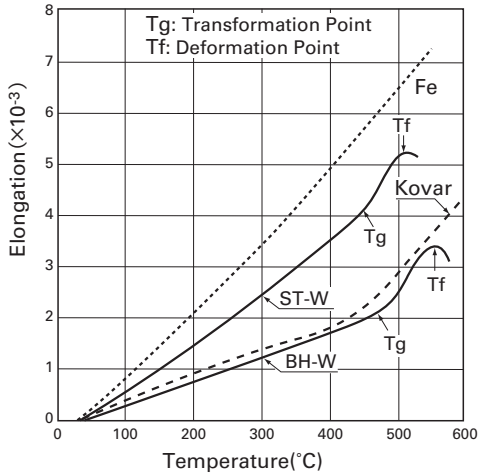

Fig. 4 Thermal expansion