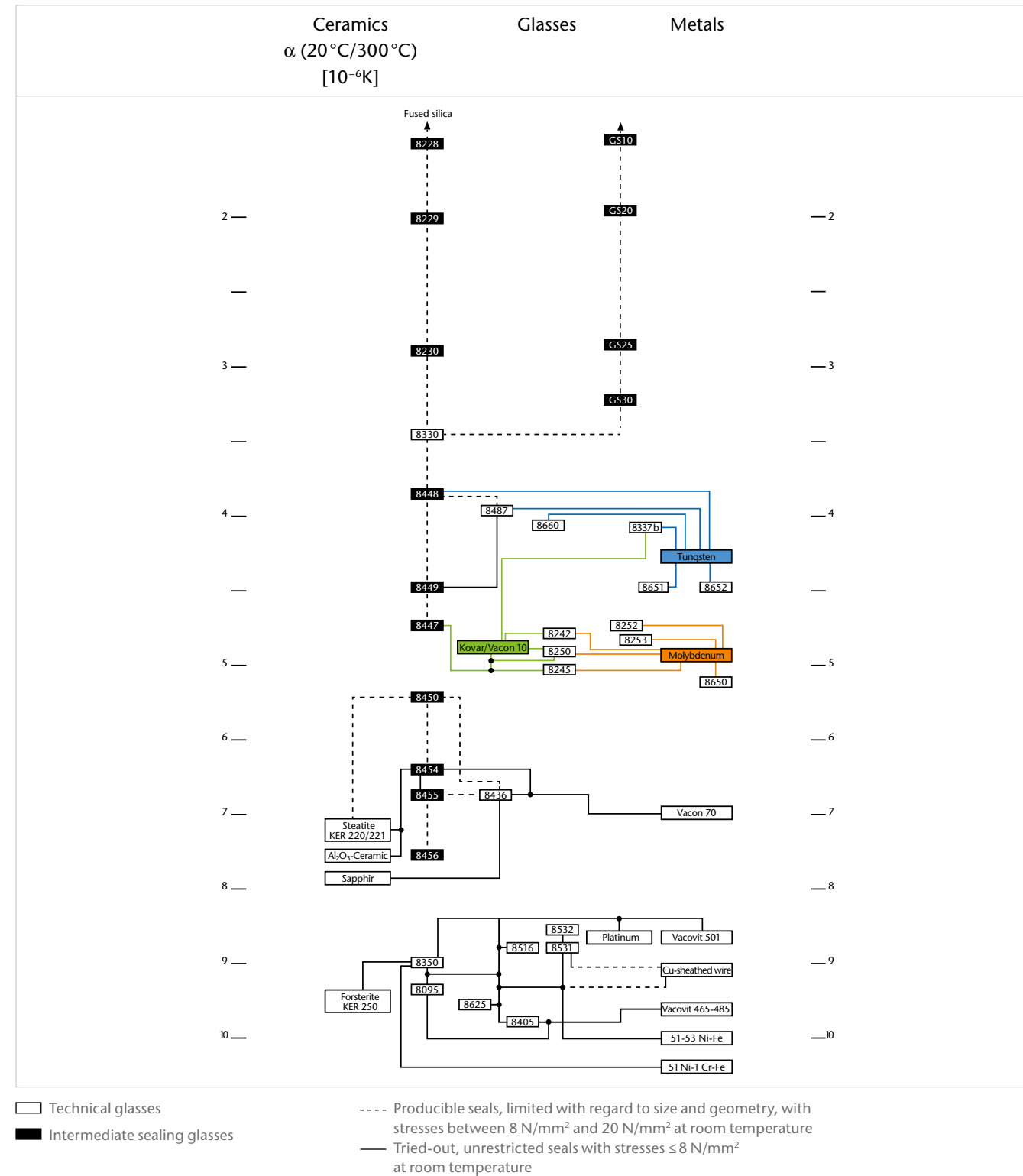


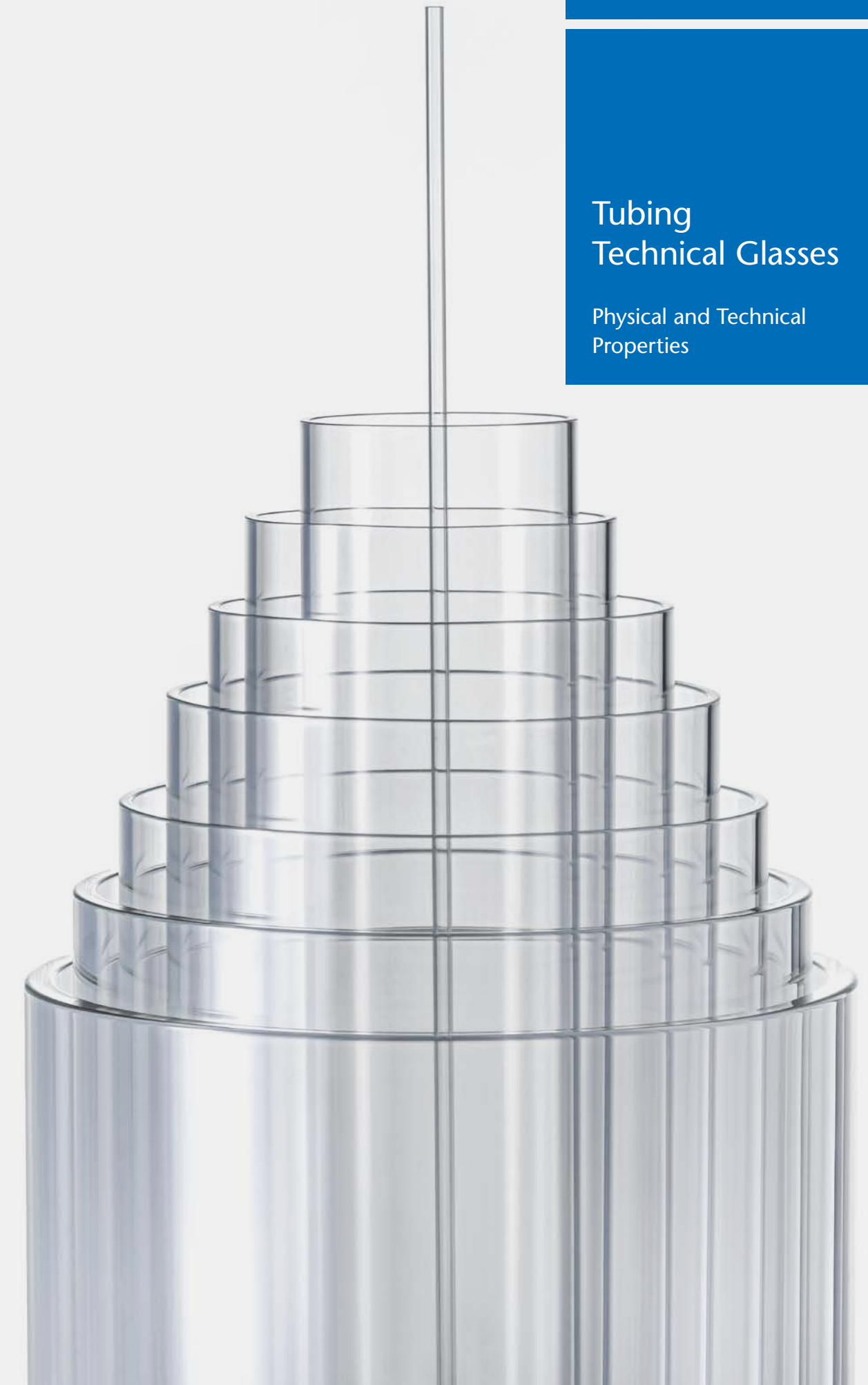
Graded Seals



Sealing and intermediate Sealing Glasses

Glass no.	Sealing partners	$\alpha_{20/300}$ [10 ⁻⁶ /K]	Transformation temperature [°C]	Glass temperature at viscosities			Density [g/cm ³]	t_{100} [°C]
				10 ¹³ dPa·s [°C]	10 ^{7.6} dPa·s [°C]	10 ⁴ dPa·s [°C]		
8228	Fused silica, 8229	1.3	700	700	1135	1665	2.15	-
8229	8228, 8230	2.0	600	637	930	1440	2.17	350
8230	8229	2.7	570	590	915	1425	2.19	255
8447	8245, 8250, 8412, 8449, 8486, Kovar	4.6	475	505	720	1045	2.26	270
8448	8330, 8449, 8486, 8487, Tungsten	3.8	510	560	800	1210	2.25	265
8449	8412, 8447, 8448, 8487	4.5	535	550	785	1150	2.29	350
8450	8412, 8436, KER 220	5.4	570	575	778	1130	2.44	200
8454	KER 221, Al ₂ O ₃ , Vacon 70	6.4	565	575	750	1070	2.49	210
8455	8436, 8454, 8456	6.7	565	-	740	1030	2.44	-
8456	8350, 8455	7.4	445	-	685	1145	2.49	-
GS10	Fused silica, GS20	1.25	700	730	1195	1710	2.17	420
GS20	GS10, GS25, GS30	1.9	690	730	1175	1680	2.22	465
GS25	GS20, GS30	2.65	610	640	1055	1605	2.21	440
GS30	GS20, GS25, 8330	3.05	620	635	1055	1570	2.24	440

Note: type designation of the ceramics to DIN 40685; manufacturer of Vacon-alloys: Vacuumschmelze Hanau (VAC)



Tubing
Technical Glasses

Physical and Technical
Properties



8 D gb 15.05.2020 KN

Glass Types

8095	Lead glass (28% PbO), electrically highly insulating, for general electro-technical applications
8100	Lead glass (33.5% PbO), electrically highly insulating highly X-ray-absorbing
8228	Intermediate sealing glass
8229	Intermediate sealing glass
8230	Intermediate sealing glass
8240	Alkaline earth aluminosilicate glass for high temperature application in electrical engineering, for sealing to molybdenum, free from alkali, blue colored, defined absorption
8241	Alkaline earth aluminosilicate glass for high temperature application in electrical engineering, for sealing to molybdenum, free from alkali, blue colored, defined absorption
8242	Borosilicate glass for Fe-Ni-Co-alloys and molybdenum, electrically highly insulating
8245	Sealing glass for Fe-Ni-Co alloys and molybdenum, minimum X-ray absorption, chemically highly resistant
8250	Sealing glass for Fe-Ni-Co alloys and molybdenum, electrically highly insulating
8252	Alkaline earth aluminosilicate glass for high temperature applications, for sealing to molybdenum
8253	Alkaline earth aluminosilicate glass for higher temperature applications, for sealing to molybdenum
NEO 1730	Alkaline earth, Neodymium containing, violet color aluminosilicate glass for high temperature applications in electrical engineering, for sealing to molybdenum, free from alkali
8270	Borosilicate glass for sealing to KOVAR metal and molybdenum, electrically highly insulating, defined UV absorption, stabilized against solarization
8326	SBW glass, neutral glass tubing, chemically highly resistant
8330	DURAN® borosilicate glass, all-purpose glass mainly for technical applications such as apparatus for the chemical industry, pipelines and laboratories
8337B	Borosilicate glass, highly UV-transmitting, for sealing to glasses and metals of the Kovar /Vacon-10/11 range and Tungsten
8347	Colorless, highly transmitting 8330
8350	AR-GLAS®, soda-lime silicate glass
8360	Soft glass, lead-free
8405	Highly UV-transmitting soft glass
8412	DUROBAX® clear, neutral glass, chemically highly resistant
8414	DUROBAX® amber, neutral glass, chemically highly resistant
8415	ILLAX®, amber glass for pharmaceutical packaging
8436	Glass, particularly resistant to sodium vapors and alkaline solutions, suitable for sealing to sapphire
8447	Intermediate sealing glass
8448	Intermediate sealing glass
8449	Intermediate sealing glass
8450	Intermediate sealing glass
8454	Intermediate sealing glass
8455	Intermediate sealing glass
8456	Intermediate sealing glass
8487	Sealing glass for Tungsten
8516	IR-absorbing sealing glass for Fe-Ni, lead-free, low-evaporating
8531	Soft glass, sodium-free, high lead content, for encapsulation of semiconductor components at low temperatures (diodes)
8532	Soft glass, sodium-free, highly lead-containing, for encapsulation of semiconductor components at low temperatures (diodes)
8625	IR-absorbing biocompatible glass for (implantable) transponders
8650	Na- and K-free sealing glass for molybdenum, especially for implosion diodes, highly lead-containing, passivation glass
8651	Tungsten sealing glass for power and PIN diodes, passivation glass
8652	Tungsten sealing glass for power and PIN diodes, low melting passivation glass
8660	Borosilicate glass for sealing to Tungsten of high cesium content
8689	Borosilicate glass, highly UV-blocked, stabilized against solarization, sealing glass to Tungsten
8800R	Neutral glass, highly chemical resistant
GS10	Intermediate sealing glass
GS20	Intermediate sealing glass
GS25	Intermediate sealing glass
GS30	Intermediate sealing glass

Glasses for the Chemical Industry and Electrical Engineering

1 Glass no.	2 $\alpha_{20/300}$ [10 ⁻⁶ /K]	3 Transformation temperature T _g [°C]	4 Glass temperature at viscosities			5 Density at 25 °C [g/cm ³]	6 Young's modulus [10 ⁹ N/mm ²]	7 Poisson's-ratio μ	8 Heat conductivity λ at 90 °C [W/(m·K)]	9 t_{k100} [°C]	10 Logarithm of the electric volume resistance in Ω cm at		11 Dielectric properties for 1 MHz at 25 °C		12 Refractive index nd ($\lambda_d = 587.6$ nm)	13 Stress-optical coefficient K [10 ⁻⁶ mm ² /N]	14 Classes of chemical stability			15 Glass no.
			10 ¹³ dPa·s	10 ⁷ dPa·s	10 ⁴ dPa·s						250 °C	350 °C	ϵ_r	tan δ [10 ⁻⁴]			Water	Acid	Alkaline solution	
			[°C]	[°C]	[°C]															
8095	9.1	430	435	630	982	3.01	60	0.22	0.9	330	9.6	7.6	6.6	11	1.556	3.1	3	2	3	8095
8100	9.6	465	465	655	960	3.28	–	–	–	–	–	–	–	–	1.595	–	3	–	–	8100
8240	4.7	790	795	1005	1305	2.67	83	0.23	1.1	630	13.0	11.0	6.6	15	1.546	2.7	1	2	2	8240
8241	4.7	790	795	1005	1305	2.67	83	0.23	1.1	630	13.0	11.0	6.6	15	1.546	2.7	1	2	2	8241
8242	4.7	465	480	715	1130	2.27	–	–	–	–	–	–	–	–	1.480	–	2	4	3	8242
8245	5.1	505	515	720	1040	2.31	68	0.22	1.2	215	7.4	5.9	5.7	80	1.488	3.8	3	4	3	8245
8250	5.0	490	500	720	1055	2.28	64	0.21	1.2	375	10	8.3	4.9	22	1.487	3.6	3	4	3	8250
8252	4.6	720	725	935	1240	2.63	81	0.24	1.1	660	–	12	6.1	11	1.538	2.8	1	3	2	8252
8253	4.7	790	795	1005	1305	2.7	83	0.23	1.1	630	13	11	6.6	15	1.547	2.7	1	2	2	8253
NEO 1730	4.5	715	725	935	1210	2.67	–	–	–	–	–	–	–	–	1.548	–	1	3	2	NEO 1730
8270	5.0	490	505	705	1040	2.27	64	0.21	1.2	377	10.3	8.4	5.3	127	1.487	3.6	3	4	3	8270
8326	6.6	565	570	770	1125	2.45	75	0.20	1.2	210	7.3	6.0	6.4	65	1.506	2.8	1	1	2	8326
8330	3.3	525	560	825	1260	2.23	63	0.20	1.2	250	8.0	6.5	4.6	37	1.473	4.0	1	1	2	8330
8337B	4.1	440	465	705	1085	2.22	51	0.22	1.0	315	9.2	7.5	4.7	22	1.476	4.1	3	4	3	8337B
8347	3.3	525	560	825	1260	2.23	63	0.20	1.2	250	8.0	6.5	4.6	37	1.473	4.0	1	1	2	8347
8350	9.1	525	530	720	1040	2.50	73	0.22	1.1	200	7.2	5.7	7.2	70	1.514	2.7	3	1	2	8350
8360	9.1	465	470	575	745	2.66	85	0.23	–	275	8.5	6.7	7.3	24	1.566	2.9	3	4	3	8360
8405	9.7	460	470	665	1000	2.51	65	0.21	1.0	280	8.5	6.9	6.5	45	1.505	2.8	5	3	2	8405
8412	4.9	565	565	785	1160	2.34	73	0.20	1.2	215	7.4	6.0	5.7	80	1.492	3.4	1	1	2	8412
8414	5.4	550	560	770	1165	2.42	71	0.19	1.2	200	7.1	5.6	6.3	107	1.523	2.2	1	1	2	8414
8415	7.8	535	540	720	1050	2.50	74	0.21	1.1	180	6.7	5.3	7.1	113	1.521	3.2	2	2	2	8415
8436	6.6	635	–	–	1100	2.77	–	–	–	–	–	–	–	–	–	–	2	2	1	8436
8487	3.9	525	560	775	1135	2.25	66	0.20	1.2	300	8.3	6.9	4.9	36	1.479	3.6	4	3	3	8487
8516	8.9	447	445	646	990	2.56	72	0.21	1.1	250	8.1	6.4	6.5	25	1.516	3.0	3	1	2	8516
8531	9.1	435	430	585	820	4.31	52	0.24	0.7	450	11	9.8	9.5	9	1.700	2.2	1	4	3	8531
8532	8.7	435	430	560	760	4.46	56	0.24	0.7	440	11	9.4	10.2	9	1.724	1.7	1	4	3	8532
8625	9.2	514	520	710	1023	2.52	73	0.22	1.1	210	7.2	5.8	7.1	68	1.525	–	3	1	2	8625
8650	5.1	475	475	625	885	3.57	62	0.23	0.5	–	–	–	7.6	33	1.618	2.8	1	4	3	8650
8651	4.4	549	540	736	1034	2.91	59	0.24	0.9	–	11.2	10.0	6.0	31	1.552	3.6	1	4	3	8651
8652	4.5	495	490	638	900	3.18	58	0.25	0.9	–	–	–	6.9	35	1.589	3.4	1	4	3	8652
8660	4.1	550	–	830	1215	2.44	–	–	–	550	12.7	10.7	–	–	1.486	–	3	3	3	8660
8689	3.8	515	565	770	1110	2.27	65	0.20	1.2	314	9.1	7.5	5.0	20	1.498	3.9	3	3	3	8689
8800R	5.5	565	570	790	1175	2.34	73	–	–	191	7.0	5.7	5.9	143	1.490	3.3	1	1	2	8800R