***** Hei-Cast 8400 *****

1.Description

Hei-Cast 8400 and 8400N are 3 component type polyurethane elastomers used for vacuum molding applications which have the following characteristics:

(1) Through the use of "C component" in the formulation, any hardness in the range of Type A10~90 can be obtained/selected.
(2) Hei-Cast 8400 and 8400N are low in viscosity and show excellent flow property.
(3) Hei-Cast 8400 and 8400N cure very well and exhibit excellent rebound elasticity.

2.Basic Properties

Item		Value		Remarks
Product		8400	8400N	
Appearance	A Comp.	Black	Clear,colorless	Polyol(Freezes below 15°C)
	B Comp.	Clear, pale yellow		Isocyanate
	C Comp.	Clear, pale yellow		Polyol
Color of article		Black	Milky white	Standard color is black
Viscosity (mPa.s 25°C)	A Comp.	630	600	Viscometer Type BM
	B Comp.	40		
	C Comp.	1100		
Specific gravity (25°C)	A Comp.	1.11		Standard Hydrometer
	B Comp.	1.17		
	C Comp.	0.98		
Pot life	25°C	6min.		Resin 100g
		6min.		Resin 300g
	35°C	3min.		Resin 100g

Remarks:A component freezes at temperatures below 15°C. Melt by heating and use after shaking it well.

3.Basic physical properties ≪A90・A80・A70・A60≫

Mixing ratio	A:B:C	100:100:0	100:100:50	100:100:100	100:100:150
Hardness	Type A	90	80	70	60
Tensile strength	MPa	18	14	8.0	7.0
Elongation	%	200	240	260	280
Tear strength	N/mm	70	60	40	30
Rebound Elasticity	%	50	52	56	56
Shrinkage	%	0.6	0.5	0.5	0.4
Density of final product	g/cm^3	1.13	1.10	1.08	1.07

4.Basic physical properties ≪A50・A40・A30・A20≫

Mixing ratio	A:B:C	100:100:200	100:100:300	100:100:400	100:100:500
Hardness	Type A	50	40	30	20
Tensile strength	MPa	5.0	2.5	2.0	1.5
Elongation	%	300	310	370	490
Tear strength	N/mm	20	13	10	7.0
Rebound Elasticity	%	60	63	58	55
Shrinkage	%	0.4	0.4	0.4	0.4
Density of final product	g/cm^3	1.06	1.05	1.04	1.03

5.Basic physical properties ≪A10≫

Mixing ratio	A:B:C	100:100:650
Hardness	Type A	10
Tensile strength	MPa	0.9
Elongation	%	430
Tear strength	N/mm	4.6
Shrinkage	%	0.4
Density of final product	g/cm^3	1.02

Remarks: Mechanical properties:JIS K-7213. Shrinkage:Inhouse specification.

Curing condition: Mold temperature:60^{0}C 60^{0}C x 60 min.+ 60°C x 24hrs. + 25^{0}C x 24 hrs.

Physical properties listed above are typical values measured in our laboratory and not the values for specification. When using our product, it must be noted that physical properties of final product may differ depending on the contour of article and the molding condition.

6. Resistance against heat, hot water and oil ≪A90・A50・A30≫

(1) Heat resistance【kept in 80°C thermostatic oven with circulating warm air】

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A90	Hardness	Type A	88	86	87	86
	Tensile strength	MPa	18	21	14	12
	Elongation	%	220	240	200	110
	Tear resistance	N/mm	75	82	68	52
	Surface condition			No change	←	←

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A60	Hardness	Type A	58	58	56	57
	Tensile strength	MPa	7.6	6.1	6.1	4.7
	Elongation	%	230	270	290	310
	Tear resistance	N/mm	29	24	20	13
	Surface condition			No change	←	←

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A30	Hardness	Type A	27	30	22	22
	Tensile strength	MPa	1.9	1.5	1.4	1.3
	Elongation	%	360	350	380	420
	Tear resistance	N/mm	9.2	10	6.7	6.0
	Surface condition			No change	←	←

Remarks:Curing condition: Mold temperature:60^{0}C 60^{0}C x 60 min.+ 60°C x 24hrs. + 25^{0}C x 24 hrs.

Physical properties are measured after leaving exposed samples at 25^{0}C for 24 hrs. Hardness, tensile strength and tear Strength are tested according to JIS K-6253, JIS K-7312 and JIS K-7312 respectively.

(2) Heat resistance【kept in 120°C thermostatic oven with circulating warm air】

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A90	Hardness	Type A	88	82	83	83
	Tensile strength	MPa	18	15	15	7.0
	Elongation	%	220	210	320	120
	Tear resistance	N/mm	75	52	39	26
	Surface condition			No change	←	←

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A60	Hardness	Type A	58	55	40	38
	Tensile strength	MPa	7.6	7.7	2.8	1.8
	Elongation	%	230	240	380	190
	Tear resistance	N/mm	29	15	5.2	Not measurable
	Surface condition			No change	←	Melt and tack

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A30	Hardness	Type A	27	9	6	6
	Tensile strength	MPa	1.9	0.6	0.4	0.2
	Elongation	%	360	220	380	330
	Tear resistance	N/mm	9.2	2.7	0.8	Not measurable
	Surface condition			Tack	Melt and tack	←

(3) Hot water resistance【immersed in 80°C tap water】

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A90	Hardness	Type A	88	85	83	84
	Tensile strength	MPa	18	18	16	17
	Elongation	%	220	210	170	220
	Tear resistance	N/mm	75	69	62	66
	Surface condition			No change	←	←

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A60	Hardness	Type A	58	55	52	46
	Tensile strength	MPa	7.6	7.8	6.8	6.8
	Elongation	%	230	250	260	490
	Tear resistance	N/mm	29	32	29	27
	Surface condition			No change	←	←

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A30	Hardness	Type A	27	24	22	15
	Tensile strength	MPa	1.9	0.9	0.9	0.8
	Elongation	%	360	320	360	530
	Tear resistance	N/mm	9.2	5.4	4.9	4.2
	Surface condition			Tack	←	←

(4) Oil resistance【Immersed in 80°C engine oil】

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A90	Hardness	Type A	88	88	89	86
	Tensile strength	MPa	18	25	26	28
	Elongation	%	220	240	330	390
	Tear resistance	N/mm	75	99	105	100
	Surface condition			No change	←	←

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A60	Hardness	Type A	58	58	57	54
	Tensile strength	MPa	7.6	7.9	6.6	8.0
	Elongation	%	230	300	360	420
	Tear resistance	N/mm	29	30	32	40
	Surface condition			No change	←	←

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A30	Hardness	Type A	27	28	18	18
	Tensile strength	MPa	1.9	1.4	1.6	0.3
	Elongation	%	360	350	490	650
	Tear resistance	N/mm	9.2	12	9.5	2.4
	Surface condition			Swelling	←	←

(5) Oil resistance【Immersed in gasoline】

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A90	Hardness	Type A	88	86	85	84
	Tensile strength	MPa	18	14	15	13
	Elongation	%	220	190	200	260
	Tear resistance	N/mm	75	60	55	41
	Surface condition			Swelling	←	←

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A60	Hardness	Type A	58	58	55	53
	Tensile strength	MPa	7.6	5.7	5.1	6.0
	Elongation	%	230	270	290	390
	Tear resistance	N/mm	29	28	24	24
	Surface condition			Swelling	←	←

	Item	Unit	Blank	100 hrs	200 hrs	500 hrs
A30	Hardness	Type A	27	30	28	21
	Tensile strength	MPa	1.9	1.4	1.4	0.2
	Elongation	%	360	350	380	460
	Tear resistance	N/mm	9.2	6.8	7.3	2.8
	Surface condition			Swelling	←	←

(6)Chemical resistance

Chemicals	Hardness	Loss of gloss	Discoloration	Crack	Warpage	Swelling	Degradation	Dissolution
Distilled water	A90	○	○	○	○	○	○	○
	A60	○	○	○	○	○	○	○
	A30	○	○	○	○	○	○	○
10%Sulfuric acid	A90	○	○	○	○	○	○	○
	A60	○	○	○	○	○	○	○
	A30	○	○	○	○	○	○	○
10%Hydrochloric acid	A90	○	○	○	○	○	○	○
	A60	○	○	○	○	○	○	○
	A30	△	○	○	○	○	○	○
10%Sodium hydroxide	A90	○	○	○	○	○	○	○
	A60	○	○	○	○	○	○	○
	A30	△	○	○	○	○	○	○
10%Ammonia water	A90	○	○	○	○	○	○	○
	A60	○	○	○	○	○	○	○
	A30	○	△	○	○	○	○	○
Acetone*1	A90	○	○	○	○	○	○	○
	A60	△	○	○	×	○	○	○
	A30	△	○	○	×	○	○	○
Toluene	A90	○	○	○	×	△	○	○
	A60	○	○	○	×	×	○	○
	A30	○	○	×	×	×	○	○
Methylene chloride*1	A90	○	○	○	×	○	○	○
	A60	△	○	○	×	△	○	○
	A30	△	○	○	×	△	○	○
Ethyl acetate*1	A90	△	○	○	○	○	○	○
	A60	△	○	○	×	○	○	○
	A30	△	○	○	×	○	○	○
Ethanol	A90	○	○	○	×	○	○	○
	A60	△	○	○	×	△	○	○
	A30	△	○	○	×	×	○	○

Remarks:Changes after 24 hrs. immersion in each chemicals were observed. Those marked with *1 mark were immersed for 15 min. respectively.

7. Electrical properties

	Measurement	Unit/Condition		Value
A90	Surface resistivity	Ω		3.38×10^{13}
	Volume resistivity	Ω・cm		3.40×10^{11}
	Dielectric constant ε	25°C	60Hz	5.98
			1MHz	4.49
		60°C	60Hz	5.79
			1MHz	4.94
	Dielectric loss tangent tanδ	25°C	60Hz	0.040
			1MHz	0.091
		60°C	60Hz	0.295
			1MHz	0.0589
	Thermal conductivity	W/m･k		0.234

	Measurement	Unit/Condition		Value
A30	Surface resistivity	Ω		1.65×10^{12}
	Volume resistivity	Ω・cm		5.62×10^{10}
	Dielectric constant ε	25°C	60Hz	5.39
			1MHz	4.87
		60°C	60Hz	5.29
			1MHz	4.63
	Dielectric loss tangent tanδ	25°C	60Hz	0.129
			1MHz	0.0394
		60°C	60Hz	0.637
			1MHz	0.0215
	Thermal conductivity	W/m･k		0.181

Remarks:The measurement temperature of surface resistivity, volume resistivity , and thermal conductivity is 25 °C.

8. Vacuum Molding Process

(1) Weighing

Decide the amount of "C component" according to the hardness you desire and add it to A component.

Weigh the same amount by weight of B component as A component in a separate cup taking into account the amount which may remain in the cup.

(2) Pre-degassing

Perform pre-degassing in degassing chamber for about 5 minutes.

Degass as much as you need.

We recommend to degass after heating material to a liquid temperature of 25~35°C.

(3) Temperature of resin

Keep temperature of 25~35°C for both A (containing C component) and B component.

When the temperature of material is high, the pot life of mixture will become short and when the temperature of material is low, the pot life of mixture will become long.

(4) Mold temperature

Keep temperature of silicone mold pre-heated to 60 ~ 70^{0}C.

Too low mold temperatures may cause improper curing to result in lower physical properties. Mold temperatures should be controlled precisely as they will affect the dimensional accuracy of the article.

(5) Casting

Containers are set in such a way that B component is added to A component (containing C component).

Apply vacuum to the chamber and de-gass A component for 5 ~ 10 minutes while it is stirred from time to time.

Add B component to A component (containing C component) and stir for 30 ~ 40 seconds and then cast the mixture speedily into the silicone mold.

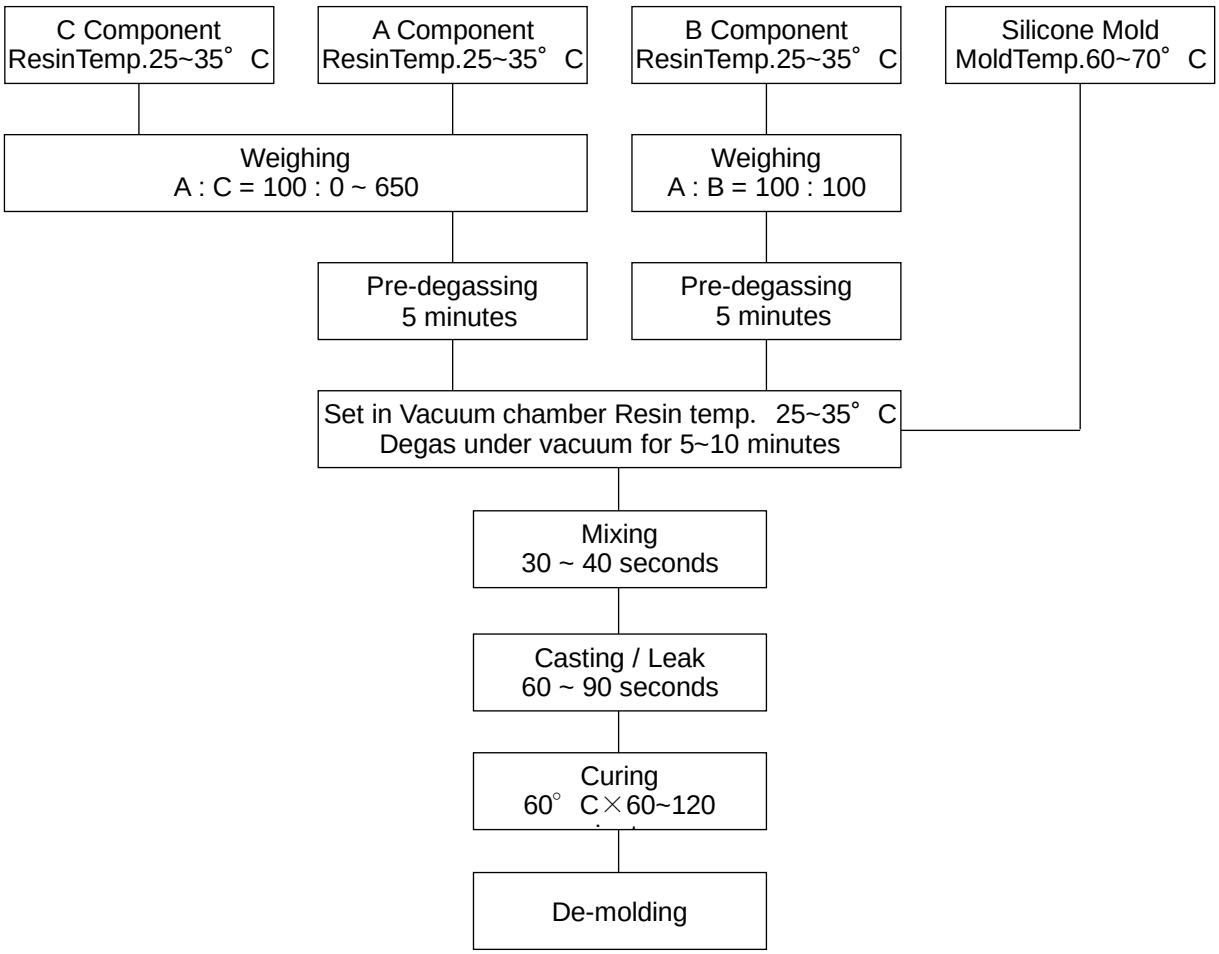
Release vacuum in 1 and half a minute after commencement of the mixing.

(6) Curing condition

Place filled mold in thermostatic oven of 60 ~ 70^{0}C for 60 minutes for Type A hardness 90 and for 120 minutes for Type A hardness 20 and demold.

Perform post curing at 60^{0}C for 2 ~ 3 hours depending on the requirements.

9. Flow chart of vacuum casting



10. Precautions in handling

(1) As all A, B and C component are sensitive to water, never allow water get into the material. Also refrain from material coming long contact with moisture. Close container tight after each use.

(2) Penetration of water into A or C component may lead to generation of much air bubbles in the cured product and if this should happen, we recommend to heat A or C component to 80°C and degass under vacuum for about 10 minutes.

(3) A component will freeze at temperatures below 15°C. Heat to 40~50°C and use after shaking it well.

(4) B component will react with moisture to become turbid or to cure into solid material. Do not use the material when it has lost the transparency or it has shown any hardening as these materials will lead to much lower physical properties.

(5) Prolonged heating of B component at temperatures over 50°C will affect quality of B component and the cans can be inflated by the increased inner pressure. Store at room temperature.

11. Precautions in Safety and Hygiene

(1) B component contains more than 1% of 4,4'-Diphenylmethane diisocyanate. Install local exhaust within the work shop to secure good ventilation of the air.

(2) Take care that hands or skin are not coming in direct contact with raw materials. In case of contact, wash with soap and water immediately. It may irritate hands or skin if they are left in contact with raw materials for longer period of time.

(3) If raw materials get into eyes, rinse with flowing water for 15 minutes and call a doctor.

(4) Install duct for vacuum pump to ensure that air is exhausted to the outside of the work shop.

12. Dangerous Materials Classification according to the Fire Services Act

A Component: Third Petroleum Group, Dangerous Materials Fourth Group.
B Component: Fourth Petroleum Group, Dangerous Materials Fourth Group.
C Component: Fourth Petroleum Group, Dangerous Materials Fourth Group.

13. Delivery Form

A Component: 1 kg Royal can.
B Component: 1 kg Royal can.
C Component: 1 kg Royal can.