

PHOENIX CRUCIBLE



NIPPON CRUCIBLE CO., LTD.

PHOENIX CRUCIBLE

Nippon Crucible Co., Ltd.—the first manufacturer of Graphite Crucibles in Japan—was established in 1885 and has obtained a high reputation over the years since then from its many customers both in Japan and worldwide by meeting their widely diversified operation conditions through the utilization of Nippon Crucible's own original in-house refractory know-how.

Present market demands require non-ferrous foundry products to have higher quality and greater reliability while non-ferrous foundries must improve and increase production yields to remain competitive. All of this means harsher and more varied operation conditions for Graphite Crucibles which now need to be able to achieve higher stability and longer performance even under such severe operation conditions.

To meet these rigorous operation conditions, Nippon Crucible has introduced a new high pressure uniform forming process and more stringent quality control procedures into its production process. And—developed new grades for "PHOENIX" Crucible which offer greatly improved quality and performance.

CHARACTERISTICS

1. Spalling resistance:

"PHOENIX" CRUCIBLE eliminates the problem of spalling because of its strong resistance to thermal shock caused by quick heating and cooling.

2. Corrosion resistance:

"PHOENIX" CRUCIBLE offers high corrosion resistance against molten metal and flux because of its uniform and dense structure.

3. Mechanical shock resistance:

"PHOENIX" CRUCIBLE achieves more stable performance because of its excellent strength at both low and high temperatures.

4. Oxidation resistance:

"PHOENIX" CRUCIBLE uses high grade raw materials and improved coating material which enhances oxidation resistance—greatly increasing crucible life.

5. Higher thermal conductivity:

"PHOENIX" CRUCIBLE contains more Fixed Carbon which results in good thermal conductivity—saving energy costs by reducing melting time.

6. No metal inclusion:

"PHOENIX" CRUCIBLE eliminates the problem of impurity inclusion during operations because raw materials are strictly controlled and selected.

7. Product reliability:

"PHOENIX" CRUCIBLE assures stable and dependable performance because of uniform forming and excellent QC.



PHYSICAL PROPERTIES

Apparent porosity (%)	18 ~ 24
Bulk specific gravity	1.80 ~ 2.10
Thermal conductivity (kcal/m.hr.°C)	17 ~ 45
Electric resistance (ohm cm)	$1.5 \sim 6 \times 10^{-3}$
Modulus of rupture at R. T. (kg/cm ²)	70 ~ 180
at 1200°C (kg/cm ²)	50 ~ 135
Wt. loss by oxidation at 850°C × 24hrs. (%)	less than 1.0
Thermal expansion at 800°C (%)	0.25 ~ 0.35

CHEMICAL COMPOSITION

Fixed carbon (%)	30 ~ 55
SiC (%)	32 ~ 50

NOTE: Figures listed in the physical properties and chemical composition tables cover the full range of available grades. For suitable grade, please contact Nippon Crucible Co., Ltd. with your operation conditions.

CARBON BONDED SIC-GRAPHITE CRUCIBLES

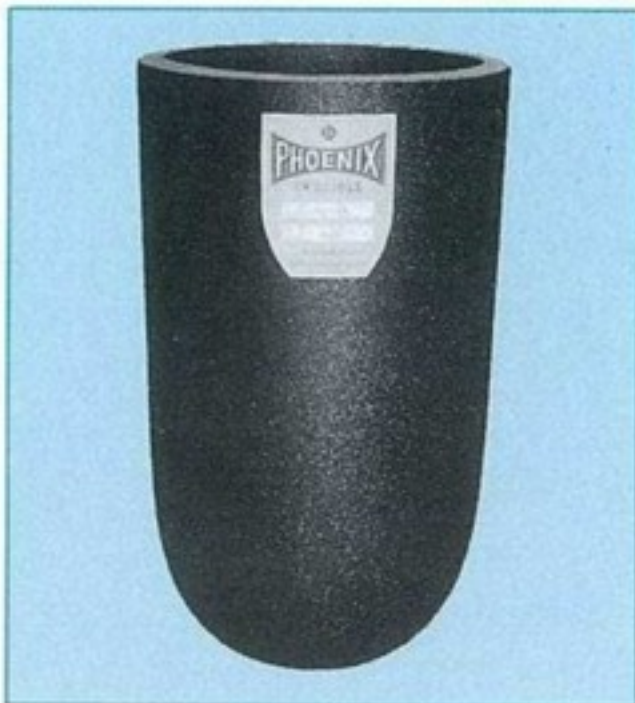
"STANDARD" SHAPES



Type (#)	Top Outer Dia. (mm)	Height (mm)	Bottom Outer Dia. (mm)	Brim—full water(ℓ)
8 HP	135	175	85	1.3
10 HP	147	167	98	1.5
15 HP	185	200	126	2.6
20 HP	185	250	126	3.7
30 HP	210	280	146	4.7
40 HP	241	310	170	7.4
50 HP	241	330	170	8.3
60 HP	275	370	180	11.2
70 HP	292	395	202	13.5
80 HP	296	390	210	13.6
90 HP	310	417	219	16.8
A100 HP	320	395	214	18
100 HP	335	395	210	18
120 HP	335	460	210	22
150 HP	373	470	254	26
170 HP	408	495	255	31
200 HP	410	595	255	40
210 HP	434	495	230	41
230 HP	434	535	230	43
250 HP	434	585	230	49
260 HP	434	600	230	52
300 HP	468	595	280	60
320 HP	468	615	280	62
300S HP	468	595	280	58
320S HP	468	615	280	60
300V HP	505	605	280	60
320V HP	505	625	280	62
400J HP	508	645	257	71
400JH HP	508	700	257	79
400 HP	527	705	273	95
480 HP	550	680	300	94
500 HP	550	710	300	99
500J HP	550	740	300	106
500JH HP	550	780	300	113
480S HP	560	680	300	96
500S HP	560	710	300	101
500JS HP	560	740	300	107
500JHS HP	560	780	300	114
620 HP	602	700	270	104
650 HP	602	710	270	106
680 HP	602	745	270	113
700 HP	602	800	270	125
740 HP	620	770	300	140
750 HP	602	835	270	132
780 HP	602	910	270	148
900 HP	620	900	300	170
1000 HP	620	930	300	177
1200 HP	635	1010	366	179
1400 HP	635	1140	366	211
1600 HP	635	1235	366	234
1700L HP	680	1220	390	260
1700 HP	680	1350	390	295

PHOENIX

"N" SHAPES



Type (#)	Top Outer Dia. (mm)	Height (mm)	Bottom Outer Dia. (mm)	Brim—full water(ℓ)
N 15 HP	151	232	98	2.2
N 100 HP	296	450	210	15
N 130 HP	320	540	214	26
N 150 HP	335	540	210	27
N 200 HP	373	600	254	35
N 250 HP	410	615	255	43
N 300 HP	410	690	255	51
N 280 HP	434	635	230	53
GN 300 HP	434	690	230	59
N 330 HP	434	715	230	61
GN 350 HP	434	795	230	70
N 350 HP	468	645	280	65
N 380 HP	468	690	280	71
N 350S HP	468	645	280	64
N 380S HP	468	690	280	70
N 350V HP	505	655	280	66
N 380V HP	505	700	280	72
N 550 HP	550	765	300	110
N 600 HP	550	795	300	115
N 620 HP	550	810	300	118
N 550S HP	560	765	300	111
N 600S HP	560	795	300	117
N 620S HP	560	810	300	119

"T" SHAPES



Type (#)	Top Outer Dia. (mm)	Height (mm)	Bottom Outer Dia. (mm)	Brim—full water(ℓ)
T 190A HP	325	685	210	36
T 190 HP	335	685	210	36
T 150 HP	373	510	254	28
T 170 HP	373	540	254	30
T 250 HP	373	735	254	45
T 350 HP	410	840	255	65
T 410 HP	468	745	280	78
T 440 HP	468	790	280	83
T 410S HP	468	745	280	76
T 440S HP	468	790	280	82
T 410V HP	505	755	280	79
T 440V HP	505	800	280	85
T 470 HP	480	850	320	96

CARBON BONDED SIC-GRAPHITE CRUCIBLES

"SP" SHAPES



Type (#)	Top Outer Dia. (mm)	Height (mm)	Bottom Outer Dia. (mm)	Spout Length (mm)	Brim—full water (ℓ)
SP PL 50 HP	222	384	138	135	7
SP PL 100 HP	288	450	210	122	11
SP PL 150 HP	302	535	208	204	20
SP 100 HP	290	430	150	160	13
SP 150 HP	310	510	208	195	16
SP 220 HP	360	540	265	178	26
SP 240 HP	378	605	226	170	34
SP 330 HP	403	660	280	165	43
SP 380 HP	440	640	250	145	50
SP 425 HP	455	750	280	150	62
SP 550 HP	468	790	280	160	65
SP 480 HP	480	790	280	138	80
SP 400 HP	500	650	300	138	68
SP 520 HP	540	730	270	160	87
SP 570 HP	543	795	300	140	94
SP 780 HP	550	765	300	160	85
SP 800 HP	602	910	300	200	142
SP PL 1200 HP	620	630	380	340	133

"BOWL" SHAPES



HA

Type (#)	Top Outer Dia. (mm)	Height (mm)	Bottom Outer Dia. (mm)	Brim—full water (ℓ)
HB 250 HP	525	350	270	40
HB 300 HP	525	395	270	47
HB 340 HP	525	447	270	55
HB 370 HP	525	485	270	62
HB 430 HP	525	545	270	72
HB 450 HP	525	595	270	80
HB 500 HP	525	645	270	88
NA 250 HP	527	355	273	36
NA 300 HP	527	405	273	44
NA 340 HP	527	455	273	52
NA 370 HP	527	505	273	60
NB 300 HP	550	400	300	41
NB 340 HP	550	450	300	49
NB 370 HP	550	500	300	58
NB 400 HP	550	550	300	67
NC 400 HP	577	450	304	68
NC 450 HP	577	500	304	79
NC 600 HP	577	600	304	99
L 450 HP	577	550	304	90
L 500 HP	577	625	304	104
L 550 HP	577	700	304	120
L 450B HP	590	560	304	90
L 500B HP	590	635	304	104
L 550B HP	590	710	304	120
PG 450 HP	590	550	270	82
PG 500 HP	590	625	270	98
PG 500J HP	590	655	270	104
PG 550 HP	590	700	270	114
PG 600 HP	590	750	270	125
HA 450S HP	620	510	270	79
HA 500S HP	620	555	270	90
HA 600S HP	620	638	270	110
HA 700S HP	620	710	270	125
HA 780S HP	620	810	270	149

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PB

Type (#)	Top Outer Dia. (mm)	Height (mm)	Bottom Outer Dia. (mm)	Brim-full water (ℓ)
PF 500 HP	650	500	300	92
PF 600 HP	650	550	300	105
PF 700 HP	650	650	300	131
PB 450 HP	716	450	300	92
PB 480 HP	719	480	300	104
PB 550 HP	718	520	300	114
PB 620 HP	720	600	300	140
PB 750 HP	722	690	300	169
PB 800 HP	723	750	300	189
PB 850 HP	725	785	300	200
PB 950 HP	725	835	300	216
PB 700 HP	773	500	300	121
PC 850 HP	775	590	300	155
PC 1100 HP	775	750	300	215
PC 1330 HP	775	900	300	272
PC 1400 HP	775	950	300	291

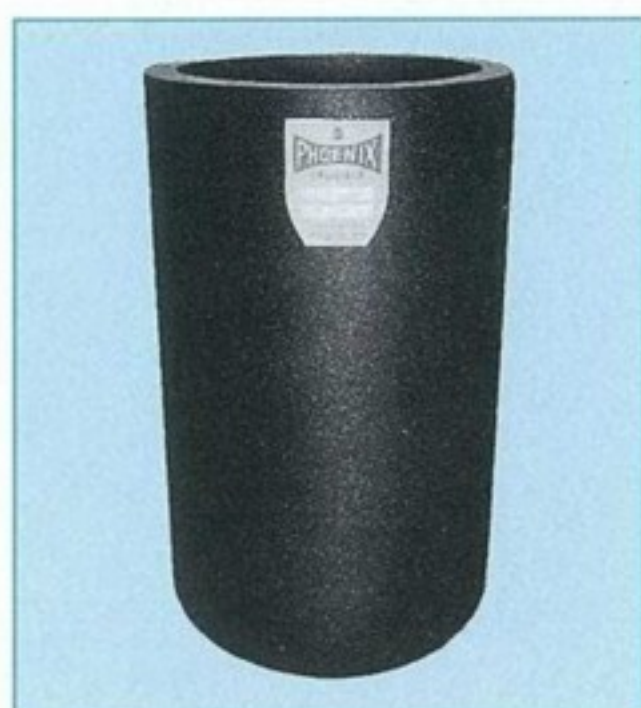


PA

Type (#)	Top Outer Dia. (mm)	Height (mm)	Bottom Outer Dia. (mm)	Brim-full water (ℓ)
PA 1000 HP	855	680	300	208
PA 1200 HP	855	740	300	237
PA 1300 HP	855	800	300	265
PA 1500 HP	855	845	300	286
PA 1600 HP	855	900	300	312
PA 1800 HP	855	970	300	345
PA 1800S HP	855	970	300	325
PA 2000S HP	855	1070	300	372
PA 2400S HP	855	1140	300	405
PA 2600S HP	855	1240	300	452
PA 2250B HP	1002	800	410	360
PA 3300 HP	1010	1060	410	530
PA 3300B HP	1020	1065	410	530
PA 3300V HP	1026	1075	410	586
PA 4300V HP	1026	1325	410	760
PE 1000 HP	834	680	300	226
PE 2300 HP	840	940	300	341
PE 2500 HP	846	1000	300	367
PE 2600 HP	847	1030	300	381
PE 2800 HP	848	1130	300	426
PE 3000 HP	850	1140	300	431
PE 3200 HP	850	1240	300	476
PE 3300 HP	850	1300	300	504
PL 1350 HP	726	800	726	225
PL 1750 HP	835	750	520	270
PL 1850 HP	835	800	520	292
PL 2300 HP	835	940	520	355
PL 2500 HP	920	750	620	344
PL 2700 HP	920	800	620	370
PL 4600 HP	1054	1050	324	651

CARBON BONDED SIC-GRAPHITE CRUCIBLES

"D" SHAPES



Type (#)	Top Outer Dia. (mm)	Height (mm)	Bottom Outer Dia. (mm)	Brim-full water (ℓ)
EK 105 HP	300	350	300	18
CD 60 HP	229	365	160	10
CD 100 HP	269	515	194	17
CD 200 HP	340	600	242	32
CD 300 HP	376	720	270	48
DK 280T HP	389	570	380	42
DK 300T HP	389	600	380	45
DK 330T HP	389	650	380	50
D 310 HP	410	600	300	48
D 330 HP	410	650	300	53
D 400 HP	410	750	300	63
D 350T HP	445	540	435	50
D 450T HP	445	720	435	70
DN 510T HP	445	765	435	75
DN 550T HP	445	825	435	81
D 570T HP	445	855	435	82
DY 550T HP	457	850	435	90
DY 600T HP	457	950	435	102
DA 500T HP	480	700	470	78
D 600T HP	512	875	500	118
D 600LT HP	512	780	500	104
DT 550T HP	510	800	495	99
DT 600T HP	510	880	495	110
DT 700T HP	510	900	495	113
DT 750T HP	510	985	495	125
DT 900T HP	510	1150	495	149
DT 1300T HP	510	1450	495	193
DH 1350T HP	535	1490	520	202
DH 1400T HP	535	1520	520	215
D 550T HP	570	550	555	83
D 700T HP	570	680	555	108
*D 900T HP	570	860	555	138
*D 1000T HP	570	960	555	162
DK 1000T HP	570	960	545	137
DK 1050T HP	570	1000	545	144
DA 800T HP	640	600	620	118
DA 900T HP	640	800	620	169
*D 1100T HP	640	850	620	181
*D 1300T HP	640	990	620	214
*D 1600T HP	640	1090	620	239
*D 1800T HP	640	1150	620	254
*D 2000T HP	640	1240	620	276
*D 2300T HP	640	1500	620	341
DN 1350T HP	690	900	380	217
DN 1400T HP	690	940	380	228
DN 1500T HP	690	1000	380	245
DN 1650T HP	690	1200	380	301
DN 1750T HP	690	1320	380	335

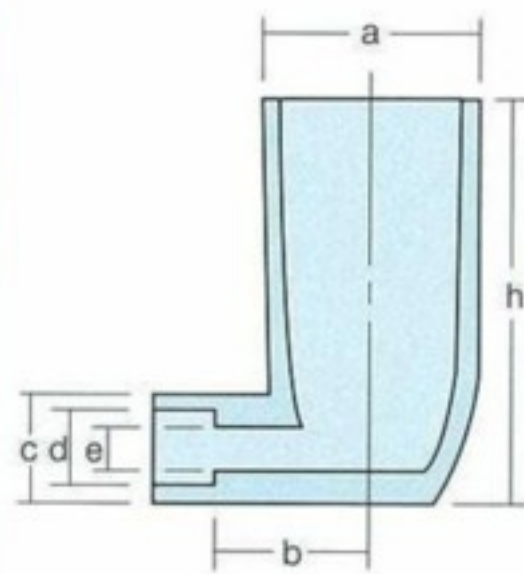
* These crucible types are also available with thicker walls (top outer dia. +6~10mm).

PHOENIX

Type (#)	Top Outer Dia. (mm)	Height (mm)	Bottom Outer Dia. (mm)	Brim—full water (ℓ)
D 2200T HP	745	1000	735	288
D 2800T HP	745	1300	735	385
D 3000T HP	745	1400	735	417
D 3300T HP	850	1300	840	532
D 3400T HP	850	1350	840	554
D 4000T HP	850	1500	840	621
DS 1200T HP	859	635	840	225
D 3500T HP	1035	850	1025	534
D 4500T HP	1035	1050	1025	674
D 5000T HP	1035	1200	1025	781
DB 900T HP	570	860	560	127
DB 1000T HP	570	960	560	144
DB 1050T HP	560	1000	540	151
DB 1300T HP	650	990	640	208
DB 1600T HP	650	1090	640	232
DB 1800T HP	650	1150	640	246
DB 1900T HP	650	1200	640	258
DB 2000T HP	650	1240	640	268
DB 3300T HP	850	1300	830	483
DB 3400T HP	850	1350	830	504
DB 4000T HP	850	1500	830	567

Remarks : "DB" crucible types are our standard thick wall types.

HORIZONTAL CASTING



Type (#)	a (mm)	b (mm)	c (mm)	d (mm)	e (mm)	h (mm)
HC 1100HP	450	365	430	300	260	930
HC 2200HP	585	420	330	230	170	1500

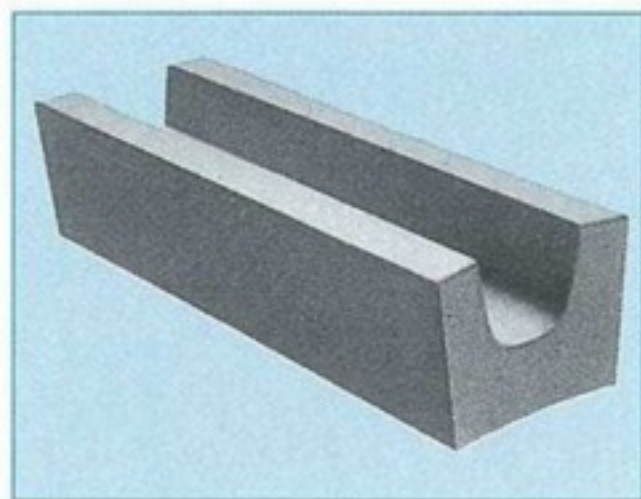
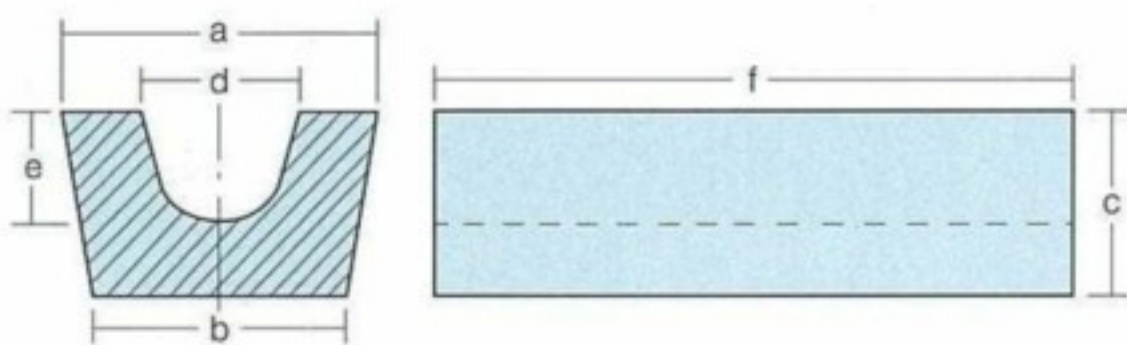
LADLE BOWLS



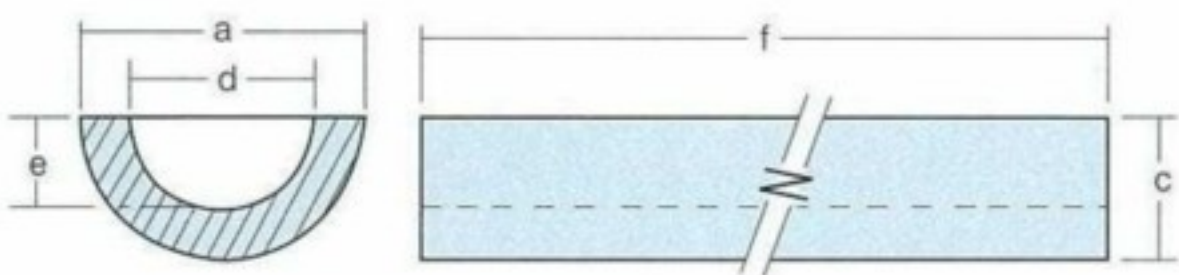
Type (#)	Top Outer Dia. (mm)	Height (mm)	Brim—full water (ℓ)
Q 6HP	160	110	1.0
Q 8HP	175	110	1.2
Q 10HP	185	115	1.4

CARBON BONDED SIC-GRAPHITE CRUCIBLES

RUNNER BRICKS



No. 45



STANDARD BRICKS

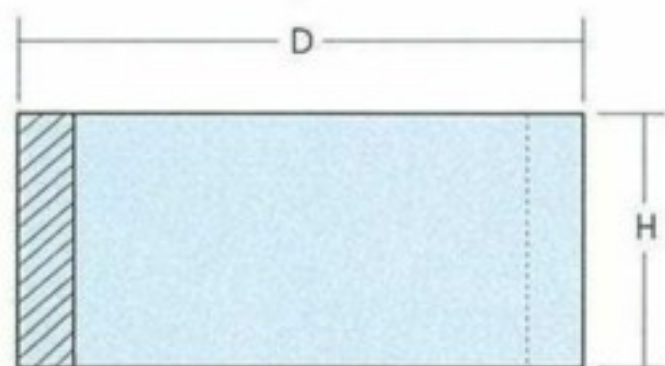
Type (#)	a (mm)	b (mm)	c (mm)	d (mm)	e (mm)	f (mm)
No. 45	150	130	112	80	62	460
No. 60	190	180	120	100	70	450
No. 80	230	200	130	155	85	500

LONG BRICKS

Type (#)	a (mm)	c (mm)	d (mm)	e (mm)	f (mm)
TA 90 HP	120	56	60	26	1200
TA 120 HP	150	71	95	42	1200
TA 200 HP	200	96	150	71	1200

• Other sizes of runners are available

MUFFLE RINGS

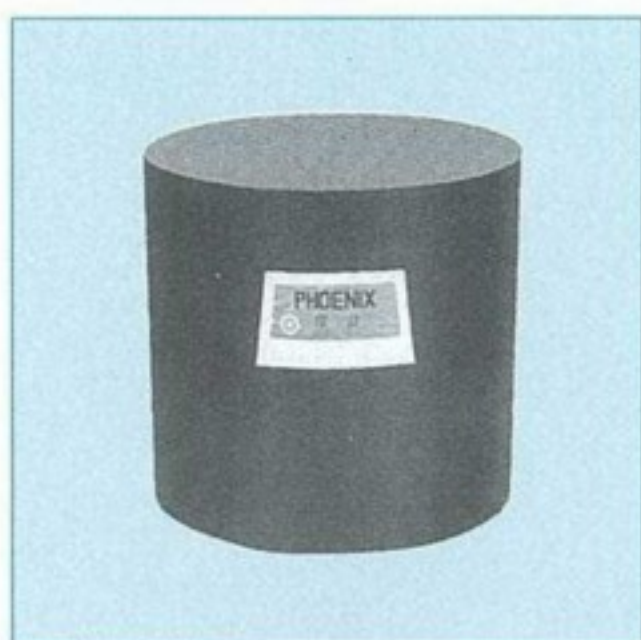
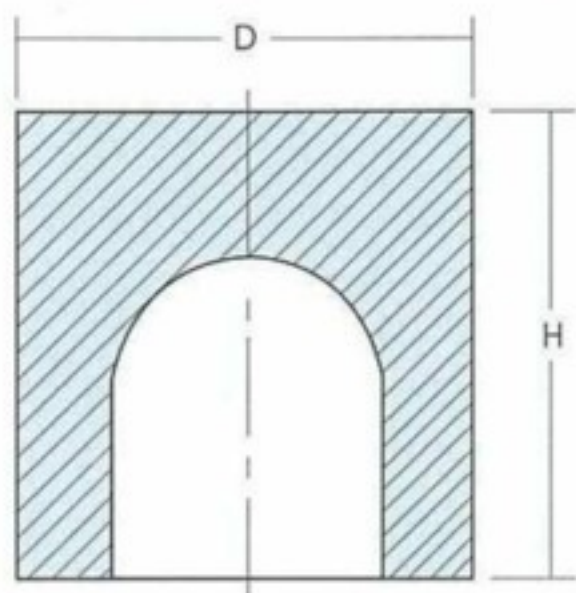


Outer dia. D(mm)	Height : H(mm) (#)					
296	155 (40)					
320	130 (35)	180 (50)				
335	150 (50)	180 (60)				
373	95 (35)	150 (50)	180 (65)	230 (75)		
410	110 (45)	130 (50)	150 (55)	200 (70)	230 (85)	250 (90)
434	140 (70)	160 (75)	190 (90)			
468	150 (100)	180 (110)	200 (120)	250 (150)		
480	130 (75)	180 (100)	200 (110)	270 (150)		
508	110 (90)	130 (100)	200 (150)	270 (200)		
550	150 (110)	200 (150)	260 (200)			
602	160 (160)	200 (200)				

PHOENIX

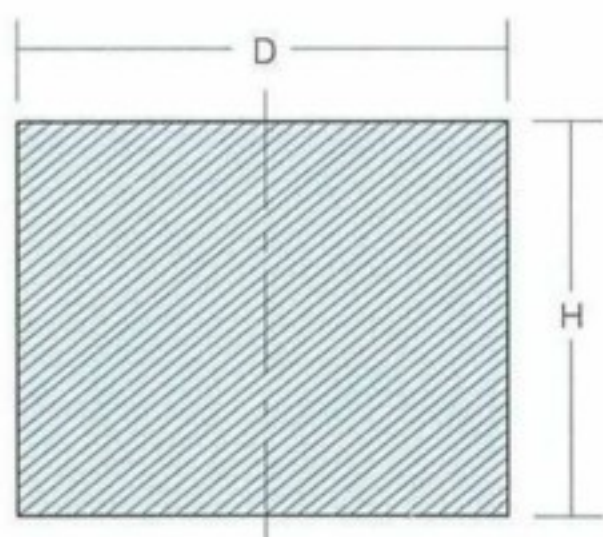
CRUCIBLE STANDS

I, J, K, L, M & N Types



25-L 24

A, B, C, D, E, F, G, O, R & S Types



I, J, K, L, M & N Types

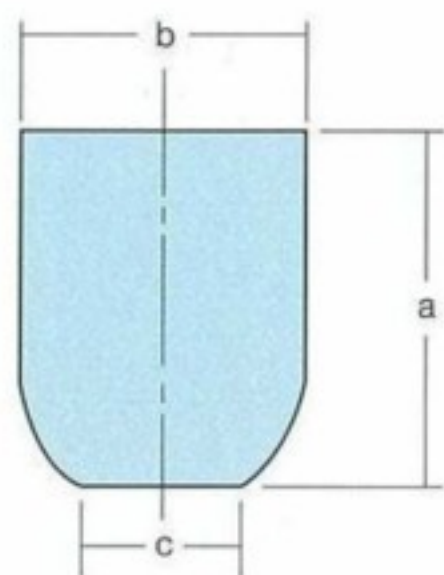
Type	Outer dia. D(mm)	Height H(mm)
20-N 13	203	130
20-N 16		160
20-N 18		180
20-N 20		200
20-N 22		220
20-N 24		240
20-N 26	224	260
22-M 13		130
22-M 15		150
22-M 17		170
22-M 19		190
22-M 21		210
22-M 24	254	240
22-M 27		270
22-M 30		300
22-M 35		350
25-L 12		120
25-L 14		140
25-L 16	270	160
25-L 18		180
25-L 20		200
25-L 22		220
25-L 24		240
25-L 27		270
25-L 30	304	300
25-L 36		360
27-J 15		150
27-J 18		180
27-J 20		200
27-J 22		220
27-J 24	400	240
27-J 26		260
27-J 29		290
27-J 30		300
30-K 12		120
30-K 15		150
30-K 18	380	180
30-K 20		200
30-K 22		220
30-K 24		240
30-K 26		260
30-K 28		280
30-K 30	600	300
30-K 35		350
30-K 36		360
38-I 18		180
38-I 20		200
38-I 22		220
38-I 24	380	240
38-I 26		260
38-I 30		300
38-I 34		340
38-I 35		350
38-I 36		360

A, B, C, D, E, F, G, O, R & S Types

Type	Outer dia. D(mm)	Height H(mm)
14-F 13	146	130
14-F 15		150
18-E 13	185	130
18-E 15		150
20-D 6	203	60
20-D 10		100
20-D 13		130
20-D 15		150
20-D 16	224	160
22-C 6		60
22-C 13		130
22-C 15		150
22-C 17	254	170
22-C 30		300
25-B 6		60
25-B 14		140
25-B 16	270	160
25-B 18		180
25-B 22		220
27-R 6	304	60
30-A 6		60
30-A 9		90
30-A 12		120
30-A 14		140
30-A 15		150
30-A 16	380	160
30-A 18		180
30-A 20		200
30-A 22		220
30-A 24	400	240
30-A 26		260
30-A 30		300
38-O 6		60
40-G 22		220
40-G 24		240
40-G 25	400	250
40-G 27		270
40-G 29		290
40-G 30		300
40-G 34	600	340
40-G 35		350
60-S 5		50
60-S 7		70
60-S 10	100	

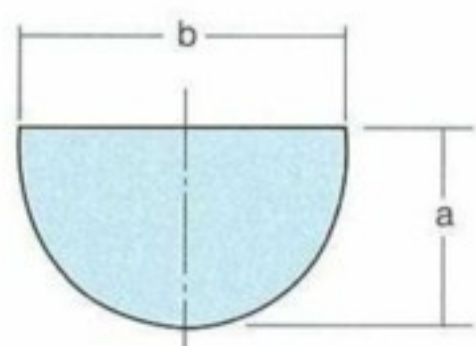
CLAY BONDED GRAPHITE CRUCIBLES

"STANDARD" SHAPES



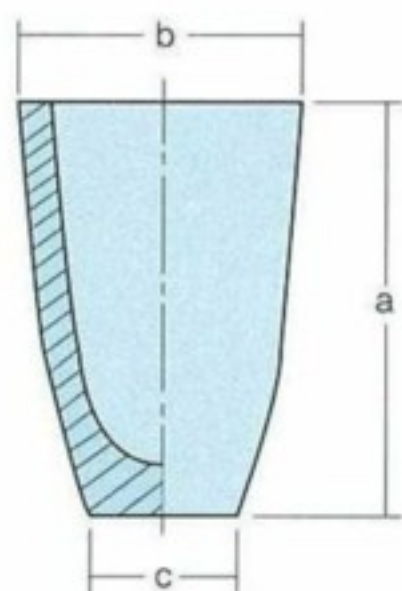
Type (#)	Top Outer Dia. b(mm)	Height a(mm)	Bottom Outer Dia. c(mm)	Brim—full water (ℓ)
3/8	45	55	30	0.04
1/2	57	60	38	0.06
1	70	85	45	0.16
2	85	106	60	0.29
4	105	130	70	0.53
6	120	158	80	0.86
8	135	173	85	1.3
10	147	182	94	1.6
15	165	210	110	2.5
20	184	235	125	4.0
30	205	270	140	4.8

LADLE BOWLS



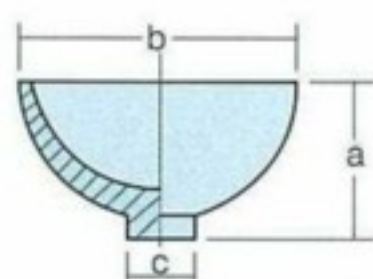
Type (#)	Top Outer Dia. b(mm)	Height a(mm)	Brim—full water (ℓ)
3	121	81	0.36
4	135	85	0.52
5	152	91	0.71
6	154	98	0.80
8	160	105	0.89

FIRECLAY CRUCIBLES



Type (#)	Top Outer Dia. b(mm)	Height a(mm)	Bottom Outer Dia. c(mm)	Brim—full water(ml)
No. 1	65	88	38	100
2	77	117	44	210
3	93	134	47	320
4	93	157	52	380
5	118	178	59	700
6	136	186	72	1020
7	170	221	80	1830
10	148	192	94	1500
15	166	227	112	2300
20	188	255	125	3650
30	210	275	138	4720

SCORIFIERS



Type (#)	Top Outer Dia. b(mm)	Height a(mm)	Bottom Outer Dia. c(mm)
No. 1	58	22	30
2	67	26	32
3	71	30	35
4	74	30	39

WHITE PHOENIX CRUCIBLES

(For High Frequency Electric Induction Furnace)

1) Characteristics

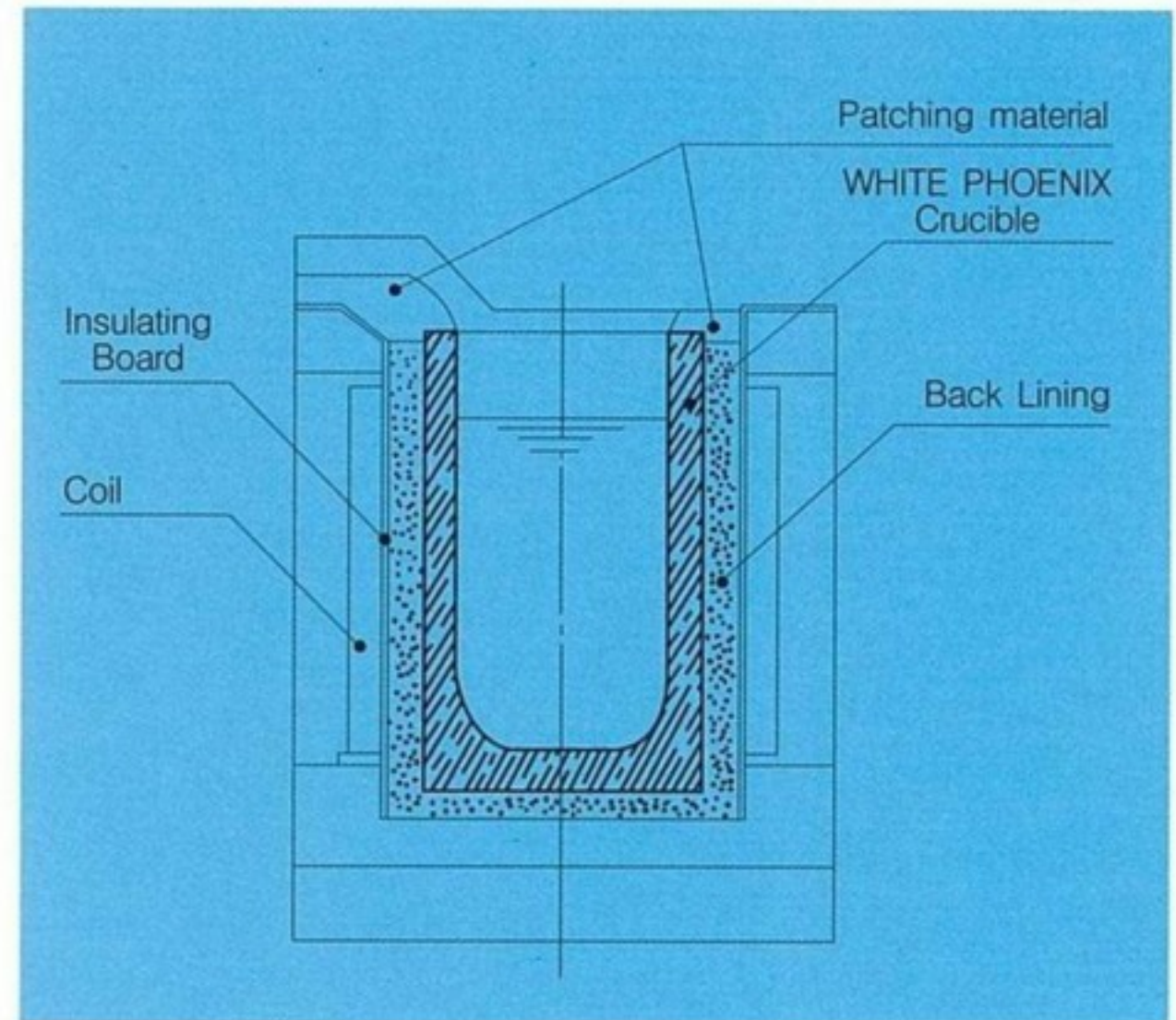
1. Higher spalling resistance (Less cracking)
2. Higher corrosion resistance (Longer life)
3. Higher purity (No metal contamination)
4. High pressure uniform forming (Stable quality)

2) Melting Applications

Cast Steels, Special Steels, Stainless Steels.
Cast Irons, etc.

3) WHITE PHOENIX Crucible Grades

Available in Magnesia, Spinel, Alumina and Mullite base grades.



Type	Dimensions (mm)				Brim—full water (ℓ)	Melting Capacity (Ref. Data) (kg)	Other Available Inner Depths Type(mm)
	Inner Dia.	Outer Dia.	Inner Depth	Outer Height			
70A	70	90	165	180	0.5	3	B(115)
80A	80	95	170	180	0.8	5	
85A	85	105	210	225	1.0	6	B(175)
100A	100	120	300	313	2.0	12	B(230), C(185)
110A	110	130	235	250	2.0	12	
110B	110	135	235	250	2.0	12	
125A	125	150	230	245	2.5	15	
125B	125	145	230	245	2.5	15	
145A	145	175	275	290	4.0	25	B(250)
180A	180	220	405	435	9.5	60	B(330), C(310)
200A	200	240	400	425	11.5	70	B(345), C(325), D(310)
230A	230	275	520	550	19.5	120	B(490), C(420), D(370)
270A	270	315	510	540	27.0	165	
300A	300	350	550	585	35.0	215	B(490), C(455)
320A	320	365	720	750	55.0	335	B(690), C(500), D(430)
350A	350	410	650	690	58.0	355	B(550)
365A	365	425	650	690	65.0	395	B(550)
375A	375	445	785	825	80.0	490	B(725), C(680)
400A	400	480	800	845	95.0	580	B(750), C(655)
440A	440	512	835	875	120.0	730	B(740), C(610)

- Above dimensions are subject to change without notice.
- Because the outer surface of WHITE PHOENIX Crucible is not machined, please inform us beforehand if WHITE PHOENIX Crucible will be used as a crucible liner.
- For safety purposes and longer life, it is recommended to apply a back lining. (See above sketch)

PRECAUTIONS FOR CRUCIBLE USAGE

1) STORAGE

Store in a dry place.



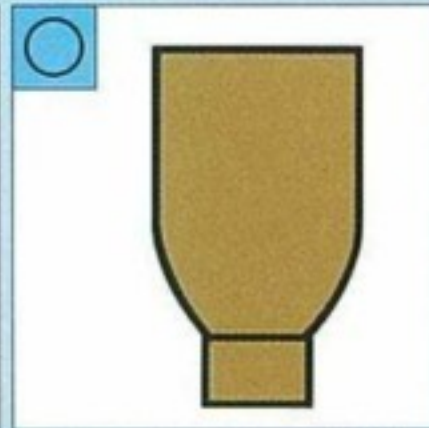
2) HANDLING

Crucibles should always be handled with care.

3) INSTALLATION

Use the proper crucible stand. (Same material and right size)
Place ceramic wool between crucible bottom and crucible stand to prevent them from sticking together.

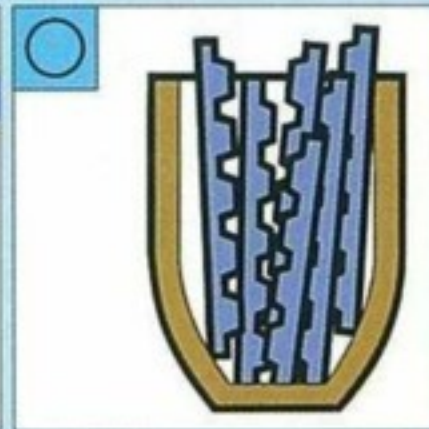
Leave the recommended expansion allowance between the Crucible and supporting refractory at all points of contact.



4) CHARGING

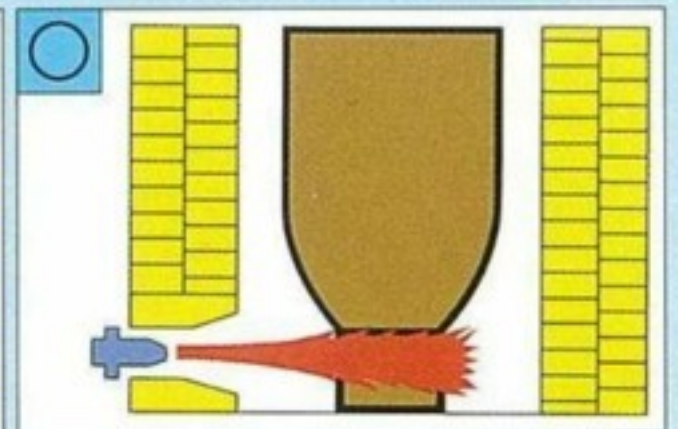
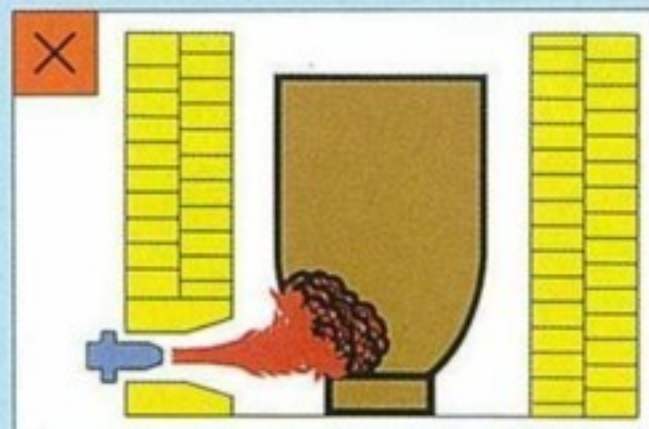
Charge ingot or scrap carefully into the Crucible.

Do not wedge.



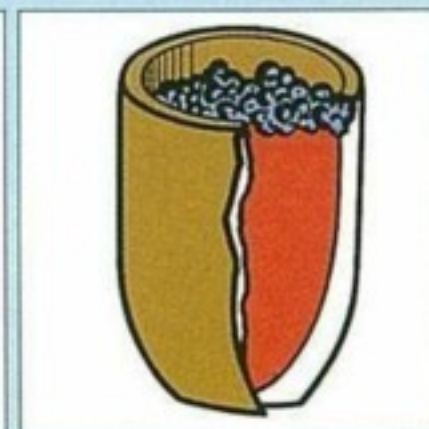
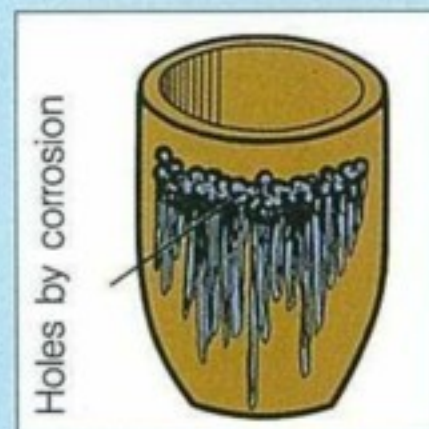
5) FLAME LOCATION

Do not allow the burner flame to impinge directly on the Crucible



6) FLUXING

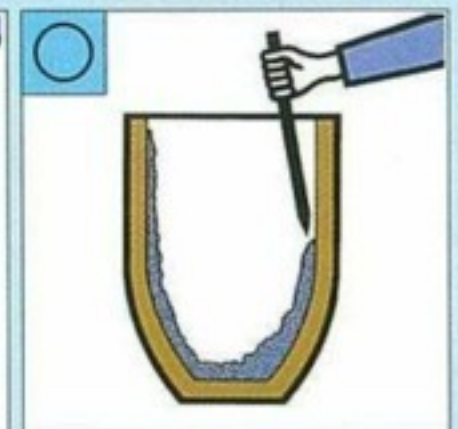
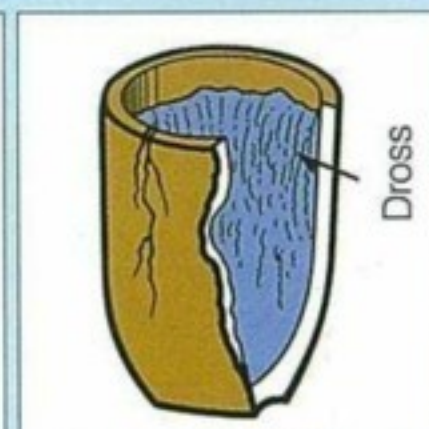
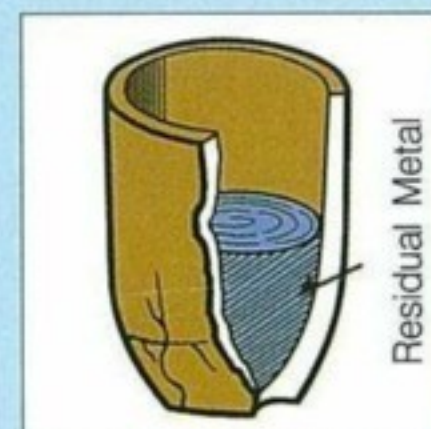
Use fluxes sparingly.



7) CLEANING

Keep the Crucible clean.

Soon after the operation stops, remove residual metal and/or dross build-up carefully.



8) DRYING AND PREHEATING

Before the initial melting operation, dry the Crucible and gradually heat it up to about 300°C over a three hour period. Then, the Crucible should be heated-up as rapidly as possible to the melting temperature to avoid oxidation of the graphite in the Crucible which occurs at the temperature of 300~700°C.
(Remarks : For WHITE PHOENIX Crucible, please contact us for Drying and Preheating schedules.)

9) WATER REMOVAL

Remove any water around the furnace to avoid the risk of steam explosion which occurs when leaking molten metal contacts water.

NOTES:

1. Crucibles must be handled and used properly or failure may result causing damage and/or injuries.
2. Crucibles are a type of ceramic and are fragile. Avoid any strong mechanical shock which may cause breakage.
3. Crucible performance varies from crucible user to crucible user depending on operation conditions so detailed operation conditions are needed for our crucible recommendations and selection of suitable crucible grade

NIPPON CRUCIBLE CO., LTD. ASSUMES NO LIABILITIES FOR ANY ACCIDENT, LOSS OR DAMAGE IF THE CRUCIBLE IS NOT PURCHASED IN ACCORDANCE WITH ITEM 3 OF "NOTES" OR IS NOT HANDLED AS INSTRUCTED IN "PRECAUTIONS FOR CRUCIBLE USAGE" AND "NOTES."



SINCE 1885

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