



Basic Refractories for Iron & Steel Industry



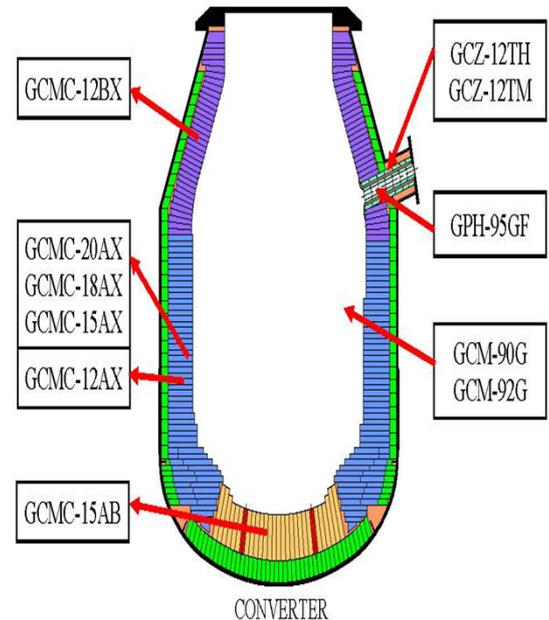
Magnesia Carbon Bricks for Converter

Method for steel refining process at Converter is as follows;

Input melting pig iron and scrap iron obtained by deoxidizing iron ore into a furnace and blowing air into the furnace at high speed. During this process, five impurities such as [c], [Mn], [P], [S], [Si] oxidizes and oxides absorbed into slag are eliminated. It is general refining method for refining steel. Our MgO-C Brick were designed to fit actual working conditions as a characteristic of each part of furnace.

These refractories are classified roughly and produced by strict quality system as follows.

- Charging wall that was mainly damaged by charging of scrap iron and hot metal
- Trunnion section that has many chemical damage by contact of slag
- Mouth section that is used an exposed external air in refining progress
- Upper cone section
- Tapping hole section that has erosion by abrasion and slag and thermal spalling due to flowing of molten steel into the interior of narrow hall



Technical Data

ITEMS	GCMC - 20AX	GCMC - 18AX	GCMC - 15AX	GCMC - 15AB	GCMC - 12AX	GCMC - 12BX
Apparent Porosity (%)	7 ≥	6 ≥	5 ≥	5 ≥	5 ≥	7 ≥
Bulk Density (kg/cm ³)	2.85 ≤	2.85 ≤	2.85 ≤	2.85 ≤	2.90 ≤	2.90 ≤
Cold Crushing Strength (MPa)	30 ≤	30 ≤	30 ≤	30 ≤	35 ≤	30 ≤
MgO (%)	70 ≤	72 ≤	75 ≤	72 ≤	76 ≤	76 ≤
C (%)	19 ≤	17 ≤	14 ≤	14 ≤	10 ≤	8 ≤
Applications	Trunnion & Knuckle	Trunnion & Knuckle	Trunnion & Knuckle	Bottom	Charging Side Wall	Mouse & Cone

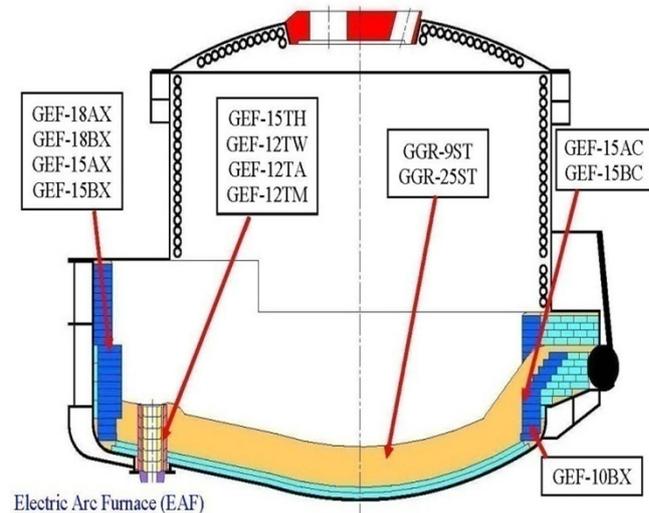
Magnesia Carbon Bricks for Electric Arc Furnace (EAF)

Method for Refining steel using EAF is as follows;

Main raw material for EAF is scrap iron. It is smelted in EAF by 3 phases AC arc that is created among three graphite electrodes. Recently, furnace capacity became bigger and working conditions changed RP (Regular Power), HP (High Power) to UHP (Ultra High Power) to improve productivity more.

MgO-C bricks are used as body brick for EAF. Types of main damages are as follows:

1) pore increase by oxidizing 2) slag attack into the matrix 3) formation of decarburized layers by iron oxide among slag 4) materials creation of low melting point by slag reaction in the decarburized section 5) melting of materials of low melting point in the slag and wear peeling by molten steel. We have a wide experience and produce excellent goods in accord with various working conditions in EAF.



Technical Data

ITEMS	GEF-18AX	GEF-18BX	GEF-15AX	GEF-15BX	GEF-15AC	GEF-15BC	GEF-10BX
Apparent Porosity (%)	6 ≥	6 ≥	5 ≥	5 ≥	5 ≥	5 ≥	7 ≥
Bulk Density (kg/cm ³)	2.90 ≤	2.85 ≤	2.92 ≤	2.85 ≤	2.90 ≤	2.85 ≤	2.85 ≤
Cold Crushing Strength (MPa)	30 ≤	25 ≤	30 ≤	25 ≤	30 ≤	25 ≤	25 ≤
MgO (%)	72 ≤	72 ≤	76 ≤	74 ≤	75 ≤	72 ≤	77 ≤
C (%)	17 ≤	17 ≤	14 ≤	14 ≤	14 ≤	14 ≤	10 ≤
Applications	Slag Line	Slag Line	Slag Line	Slag Line	Metal Line	Metal Line	Metal Line

Tapping Hole Bricks of Converter & Electric Arc Furnace(EAF)

Tapping hole bricks for Converter & Electric Arc Furnace(EAF)

Tapping hole bricks are normally used in converter and EAF in steel refining. Unlike refractories used the body of the furnace, tapping hole bricks are frequently replaced and regarded as a main factor influencing service life of furnace.

The service life time is influenced by charging volume, times and the inside diameter of the tap hole. When the molten steel flows out from the tap hole, extreme vortex of molten steel, O₂ in molten steel, FeO among slag, and thermal spalling by temperature changing are the main causes of damages.

MgO-C bricks are generally and designed used as material for EAF and converter. MgO-Al₂O₃-C, Al₂O₃-MgO-C bricks are used in the parts which can be easily exposed external air. Our tapping hole bricks have an excellent quality and a good reputation from steel & iron makers using them.

Technical Data						
ITEMS	GEF -15TH	GEF -12TW	GEF -12TA	GEF -12TM	GCZ -12TH	GCZ -12TM
Apparent Porosity (%)	5 ≥	6 ≥	9 ≥	9 ≥	5 ≥	8 ≥
Bulk Density (kg/cm ³)	2.92 ≤	2.89 ≤	2.95 ≤	2.90 ≤	2.93 ≤	2.90 ≤
Cold Crushing Strength (MPa)	30 ≤	25 ≤	30 ≤	25 ≤	30 ≤	25 ≤
MgO (%)	72 ≤	71 ≤	12 ≤	65 ≤	72 ≤	65 ≤
Al ₂ O ₃ (%)	-	-	62 ≤	9 ≤	-	9 ≤
C (%)	12 ≤	10 ≤	10 ≤	10 ≤	12 ≤	10 ≤
Applications	Electric Tapping Tube	Electric Surround Brick	Electric End Brick	Electric End Brick	Converter Tapping Tube	Converter End Brick

Data are average results of tests conducted under standard procedures and are subject to variation. Data contained in this data sheet are supplied in good faith as a technical service and are subject to change without notice. Misprint and errors excepted.

Basic Refractory for Steel Ladle(I)

Molten Steel charged at EAF or converter is conveyed by continuous casting equipments. The molten steel is manufactured through refining process such as LF, VD, RH-OB and so on during these transfers by continuous casting equipments. As the kinds of steel products, each steel maker decides to adopt whether use all refining method or not.

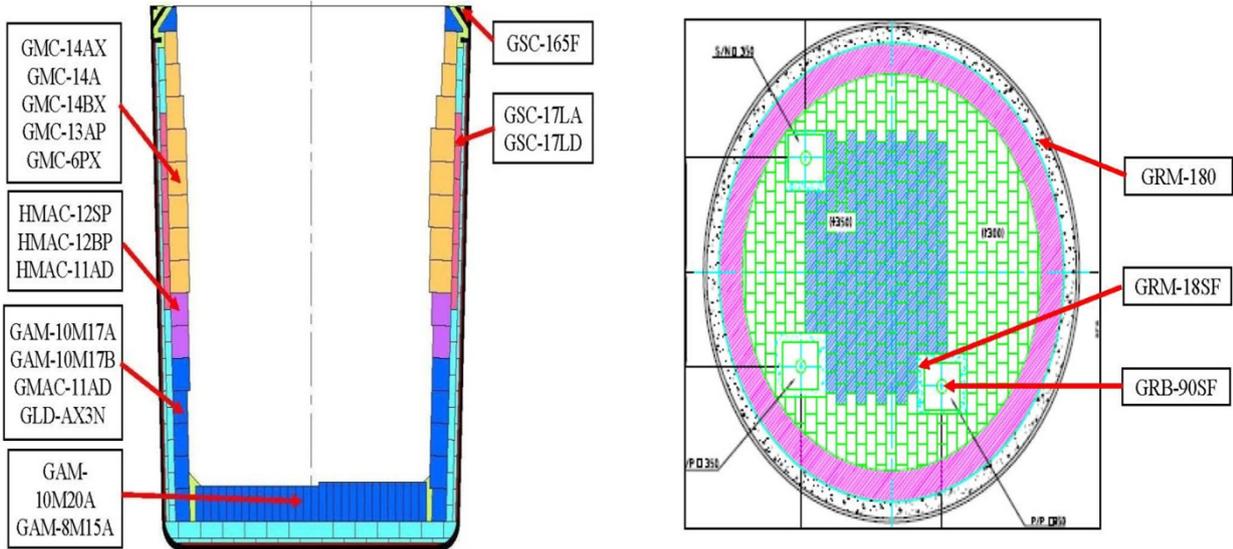
Therefore, refractories for steel ladle should be designed as a material characteristic of each parts of ladle refractory in accord with working conditions. The parts influenced on the life time of refractories are classified and managed as slag line, metal line, bottom area.

The service time shows a remarkable difference under these influences of reaction temperature of molten steel, reaction time, resistance time, and slag composition ratio. Therefore, these various factors should be in consideration when manufacturing basic refractory.

Technical Data						
ITEMS	GMC -14AX	GMC -14A	GMC -14BX	GMC -13AP	GMC -6PX	GLD -AX3N
Apparent Porosity (%)	4 ≥	5 ≥	6 ≥	4 ≥	3 ≥	9 ≥
Bulk Density (kg/cm ³)	2.95 ≤	2.93 ≤	2.93 ≤	2.97 ≤	3.0 ≤	3.3 ≤
Cold Crushing Strength (MPa)	35 ≤	35 ≤	30 ≤	35 ≤	40 ≤	40 ≤
MgO (%)	72 ≤	72 ≤	65 ≤	74 ≤	83 ≤	2.5 ≤
Al ₂ O ₃ (%)	-	-	-	-	-	86 ≤
C (%)	13 ≤	13 ≤	12 ≤	12 ≤	6 ≤	-
Applications	Slag Line (LF, VD)	Slag Line (LF)	Below Slag Line	Slag Line (LF)	Slag Line	Metal Line Bottom

Data are average results of tests conducted under standard procedures and are subject to variation. Data contained in this data sheet are supplied in good faith as a technical service and are subject to change without notice. Misprint and errors excepted.

Basic Refractory for Steel Ladle(II)



Technical Data

ITEMS	GMAC-12SP	GMAC-12BP	GMAC-11AD	GAM-10M17A	GAM-10M17B	GAM-10M20A	GAM-8M15A
Apparent Porosity (%)	7 ≥	7 ≥	8 ≥	6 ≥	8 ≥	8 ≥	8 ≥
Bulk Density (kg/cm ³)	3.0 ≤	2.95 ≤	2.87 ≤	3.20 ≤	3.05 ≤	3.0 ≤	2.95 ≤
Cold Crushing Strength (MPa)	35 ≤	30 ≤	25 ≤	40 ≤	35 ≤	35 ≤	30 ≤
MgO(%)	62 ≤	62 ≤	62 ≤	15 ≤	17 ≤	20 ≤	15 ≤
Al ₂ O ₃ (%)	9 ≤	9 ≤	9 ≤	60 ≤	55 ≤	55 ≤	60 ≤
C (%)	10 ≤	10 ≤	8 ≤	9 ≤	9 ≤	10 ≤	8 ≤
Applications	Below Slag Line (LF, VD)	Below Slag Line (LF)	Metal Line (LF)	Metal Line (LF,VD)	Metal Line (LF,VD)	Bottom (Impact)	Bottom (Normal)

Special Bricks for steel Ladle

The special bricks for steel ladle are generally used in the bottom area. Molten steel is processed to refine and conveyed to continuous casting equipments and then opened. It is the charging part for molten steel. This area requires a strict quality management when manufacturing. As the manufacture method, casting block can be made by one body, but mainly used in MgO-C or Al₂O₃-C because of severe conditions in refining works. These kinds of bricks have a high height and big volume. So, these products should be given enough pressure per unit in order to manufacture regular standard quality refractories. We used this technical skill to manufacture for a long time and applied to most of steel & iron makers wildly.

Technical Data

Brand				
Spec	GMC-10TN	GAC-3XN	GMC-12XSN	GMC-12SSN
Apparent Porosity (%)	10 ≥	18 ≥	8 ≥	9 ≥
Bulk Density (kg/cm ³)	2.90 ≤	3.0 ≤	2.90 ≤	2.90 ≤
Cold Crushing Strength (MPa)	25 ≤	-	30 ≤	25 ≤
MgO (%)	72 ≤	4 ≤	72 ≤	65 ≤
Al ₂ O ₃ (%)	-	90 ≤	-	9 ≤
C (%)	9 ≤	-	10 ≤	10 ≤
Applications	Ladle Upper nozzle	Ladle Lower nozzle	Ladle Lower Well Block	Ladle Upper Well Block

Data are average results of tests conducted under standard procedures and are subject to variation. Data contained in this data sheet are supplied in good faith as a technical service and are subject to change without notice. Misprint and errors excepted.

Unburned Magnesia Brick of Storage Heaters

Most of heat storage bricks are manufactured through a very high temperature sintering. Therefore, the existing manufacturing method costs highly by energy consumption during bricks manufacturing for long time and has a bad influence by CO generation in the environment pollution. Our products are manufactured through a simple drying process. Our products have competitive in the economic, environmental and supply aspects against the existing storage bricks. We developed them in cooperation with the professional heat storage company and our product was certificated by national authority through actual test. Our product stores heat in cheaper supply time zone of electric power in winter. When heating needed, heat storage bricks throw off heat without supplying electric power to spend winter in pleasant surroundings automatically. Our products will be in the spotlight products from the world in the future.

Technical Data

ITEMS		GMQ-89J
Apparent Porosity (%)		20 ≥
Bulk Density (kg/cm ³)		2.75 ≤
Cold Crushing Strength (MPa)	250°C	30 ≤
	700°C	30 ≤
	1500°C	60 ≤
Chemical Composition (%)	MgO	85 ≤
	Al ₂ O ₃	1.5 ≥
	CaO	2.0 ≥
	Fe ₂ O ₃	3.0 ≥
Applications		Bricks for Electro Storage Heater

Data are average results of tests conducted under standard procedures and are subject to variation. Data contained in this data sheet are supplied in good faith as a technical service and are subject to change without notice. Misprint and errors excepted.

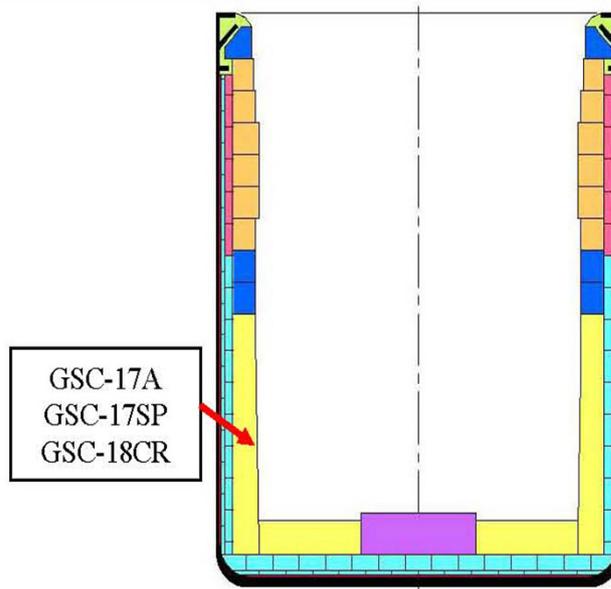
Monolithic Refractory for converter, EAF & ladle furnace (I)

We treat monolithic refractory expertly and manufacture hot repairing product for converter, EAF and ladle, cold repairing product, flowing material for ladle and so on.

Unlike shaped refractory, the manufacturing process of monolithic refractory is simple, but need to manufacture with more attention and inspect to obtain a good effect accurately. Therefore, we fully have all factory automation line to minimize deviation of properties and compositions. We produce a good quality product with regular and stable properties.

Technical Data					
ITEMS		GRM-180	GRM-18SF	GSC-17LA	
Max. Service Temp. (°C)		1800	1800	1750	
Material Required of Estimating (g/cm ³)		2.90≤	3.0≤	2.75≤	
Cold Crushing Strength (MPa)	110°Cx24hrs	25≤	3≤	30≤	
	1350°Cx3hrs	-	-	50≤	
	1500°Cx3hrs	80≤	100≤	50≤	
Permanent Linear Change (%)	110°Cx24hrs	-0.05	-0.05	-0.05	
	1350°Cx3hrs	-	-	-0.5	
	1500°Cx3hrs	-1.0	-0.5	-1.0	
Chemical Composition (%)	MgO	5≤		2≤	
	CaO	5≥	2≥	2≥	
	Al ₂ O ₃	80≤	87≤	80≤	
Grain Size (mm)		0-5	0-3	0-8	
Required Water (%)		10~13	6~8	10~13	
Applications		Cold repair material for metal line & Bottom of ladle furnace	Cold repair filling material for PP & SN well block of ladle furnace	Hot face & backup vibrating material for ladle furnace	

Monolithic Refractory for converter EAF & ladle furnace (II)



Technical Data

ITEMS		GSC-17A	GSC-17SP	GSC-18CR	GSC-165F
Max. Service Temp. (°C)		1700	1700	1800	1650
Material Required of Estimating (g/cm ³)		2.50 ≤	2.70 ≤	3.0 ≤	2.40 ≤
Cold Crushing Strength (MPa)	110°Cx24hrs	25 ≤	30 ≤	40 ≤	15 ≤
	1350°Cx3hrs	45 ≤	50 ≤	-	30 ≤
	1500°Cx3hrs	-	50 ≤	70 ≤	-
Permanent Linear Change (%)	110°Cx24hrs	-0.05	-0.05	-0.05	-0.05
	1350°Cx3hrs	-1.5	-1.0	-0.3	-0.5
	1500°Cx3hrs	-	-1.5	-0.7	-
Chemical Composition (%)	MgO	2 ≤	10 ≤	-	-
	CaO	3 ≥	2.5 ≥	-	7 ≥
	Al ₂ O ₃	75 ≤	75 ≤	75 ≤	60 ≤
	Cr ₂ O ₃	-	-	9 ≤	-
Grain Size (mm)		0 - 8	0 - 8	0 - 8	0 - 8
Required Water (%)		10 ~ 13	8 ~ 11	5 ~ 7	13 ~ 16
Applications		Backup vibrating material for ladle furnace	Hot face vibrating material for ladle furnace	Hot face vibrating material for ladle furnace	Hot face flange castable material for ladle furnace

Gunning Refractories

Gunning refractories can be applied for converter, EAF and ladle. It is generally used to expand a service life of area for continuous repairing. We use raw material of MgO selected according to the working conditions of a steel makers.

First of all, we consider the improvement of adherence ratio to prevent gunning refractories flowing problem after installation under optimal temperature. We minimize the volume of bonding binders with low melting point. Our gunning refractories have a high competitive price due to high life and efficiency in prime cost units.

Technical Data					
ITEMS		GCM-90G	GCM-92G	GLD-90MG	GPH-95GF
Max. Service Temp (°C)		1800	1800	1800	1800
Material Required of Estimating (g/cm ³)		2.50 ≤	2.60 ≤	2.50 ≤	2.75 ≤
Cold Crushing Strength (MPa)	110°C x24hrs	3 ≤	5 ≤	4 ≤	20 ≤
	1500°C x3hrs	25 ≤	25 ≤	25 ≤	25 ≤
Permanent Linear Change (%)	110°C x24hrs	-0.1	-0.05	-0.1	-0.1
	1500°C x3hrs	-1.5	-1.0	-1.5	-0.5
Chemical Composition (%)	MgO	89 ≤	91 ≤	90 ≤	87 ≤
	CaO	5 ≥	3 ≥	3 ≥	2 ≥
	Al ₂ O ₃	-	-	-	-
	Fe ₂ O ₃	-	-	-	2 ≥
Grain Size (mm)		0 - 3	0 - 3	0 - 3	0 - 3
Required Water (%)		15 ~ 25	15 ~ 25	15 ~ 25	10 ~ 13
Applications		Hot repair gunning material of converter & EAF	Hot repair gunning material of Converter & EAF	Hot repair gunning material of Ladle furnace	Filling material of converter tapping brick

Dry Ramming Material for Bottom of EAF & Hot Repair Material for Porous Plug

Dry ramming material is thickly installed at the bottom of EAF by ramming installation method. Steel makers have lots of troubles when using Dry ramming material because it should be repaired by cracking and peeling frequently. Therefore, we developed upgraded dry ramming material with the lowest of total flux content to minimize initial sintering layer. In case of continuous use, our dry ramming material is designed to minimize cracking and peeling of dead sintering layer through reaction inhibition system between over sintering layer and new sintering layer. We use raw materials with a suitable amount of iron oxide to solve the biggest weakness of dry ramming material as hydration ability problem. Our iron oxide have is excellent water-resisting qualities. CaO in the product arranges a discontinuous structure to improve against hydration.

GRB-90SF used as the hot repairing material is designed as the optimum dense filling ratio of high-purity fused alumina and sintered alumina. In hot running, a momentary hot liquidity performs at its optimal level by throwing and process initial sintering rapidly. From the correct mixing ratio of material, it can be used close to general life of Porous Plug(PP). Figure of sintering strength shows higher than PP brick. It means that GRB-90SF has excellent anti-corrosion and strong against initial peeling occurred easily in high temperature by using special anti-spalling agent.

Technical Data

ITEMS		GGR-9ST	GGR-25ST	GRB-90SF
Max. Service Temp. (°C)		1800	1800	1800
Material Required of Estimating (g/cm ³)		2.75 ≤	2.65 ≤	2.95 ≤
Cold Crushing Strength (MPa)	110°Cx24hrs	-	-	40 ≤
	1500°Cx3hrs	-	-	80 ≤
Permanent Linear Change (%)	110°Cx24hrs	-	-	-0.05
	1500°Cx3hrs	-	-	0.3
Chemical Composition (%)	MgO	80 ≤	70 ≤	4 ≤
	CaO	7 ≤	20 ≤	3 ≥
	Al ₂ O ₃	-	-	88 ≤
	Fe ₂ O ₃	7 ≥	5 ≥	2 ≥
Grain Size (mm)		0 - 8	0 - 8	0 - 5
Required Water (%)		-	-	7 ~ 9
Applications		Ramming material for bottom of EAF	Ramming material for bottom of EAF	Hot repair material for porous plug

Alumina-Chrome Mortar for SN plate

GMT-T3R is used for filling in cracks during replacement of SN plate, open nozzle, collect Nozzle used for controlling molten steel. HMT-T3R can be used safely and easily.

Production Method

1) Refined high purity alumina mixes with high quality of chrome oxide which has proper grading for controlling shrinkage and excellent anti-erosion. 2) Next, add special bonding agents for initial sintering strength in high temperature.

GMT-T3R can be applied for PP well block gaps when replacing Porous Plug widely. There are two types of mortar; dry and wet type as working convenience of steel & iron makers.

Technical Data

ITEMS		GMT-T3R	GMT-98	GMT-97	GAM-38	GAM-38B
Max. Service Temp.		1800°C	1800°C	1800°C	1700°C	1700°C
Material Required of Estimating (g/cm ³)		2.5 ≤	2.2 ≤	2.1 ≤	2.2 ≤	2.1 ≤
Particle Size (%)	+1mm	5 ≥	5 ≥	5 ≥	5 ≥	5 ≥
	-0.074 mm	60 ≤	70 ≤	70 ≤	70 ≤	70 ≤
Chemical Composition (%)	MgO	-	97 ≤	95 ≤	-	-
	Al ₂ O ₃	88 ≤	-	-	80 ≤	75 ≤
	Cr ₂ O ₃	3 ≤	-	-	-	-
Applications		Bonding mortar material of SN, PP, TN for of Ladle furnace	Bonding material of MgO-C	Bonding material of MgO-C	Bonding material of Al ₂ O ₃ -MgO-C	Bonding material of Al ₂ O ₃ -MgO-C