

FRC Global Flow Control

Innovation

High Temp

FRC
Global

Expert Teams.

Global Networks.

Quality Products.

Who We Are

FRC Global is a leading supplier of refractories, electrodes, and high temperature combustion systems.

FRC Global provides outstanding results for our clients within the iron, steel, and non-ferrous industries. Our company's reputation is built by delivering high quality products made with premium raw materials. We are more global now than ever before.

We give you a competitive advantage by offering you superior proven products that positively impact your bottom line and perform better. Our knowledgeable engineers ensure the proper application of our products to give you the maximum level of output and safety.

With over 25 warehouse facilities in the United States, Canada, Mexico, and South America we assure your products are readily available when you need them in these regions.

Through the use of vast global resources, all of us at FRC Global are committed to being the value creators and problem solvers for our industry.

Mission Statement

Embrace modern technology to increase innovation, efficiency, and transparency. Inspire the next generation by driving change, promoting curiosity, and shaping sustainable solutions in the high temp world.



About Us



Background information

FRC Global is a second generation family owned company with a 30-year history.

FRC Global has offices, agents, or partners in 20 countries around the world.

Global Offices:

- ◆ North America: United States and Canada
- ◆ South America: Colombia
- ◆ Asia: China

We provide quality engineered products and services for all your high temperature applications.

FRC Global facts

Our quality control employees thoroughly inspect shipments to ensure products are within specification and are properly packaged.

Sales force and service needs are available in the following:

- ◆ North America
- ◆ Central America
- ◆ South America
- ◆ Europe
- ◆ Middle East

Products



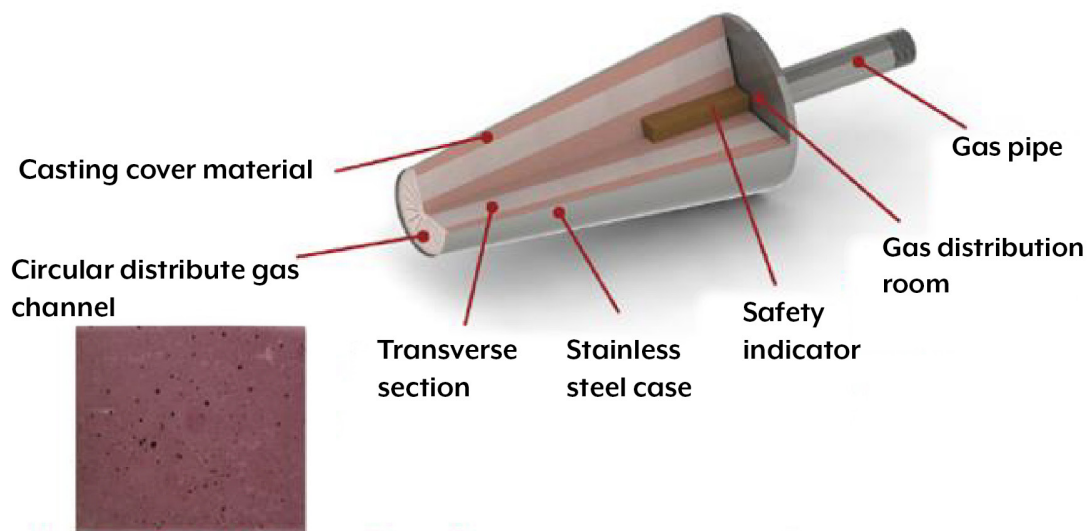
Purging plugs are an important element in high temperature refining metallurgy and are widely used in many industries including iron and steel, ferro alloy, and non-ferrous metals. With the development of ladle refining technology and ladle lining refractories, higher requirements on the blowing rate and lifetime of purging refractories are necessary.

In order to meet the metallurgical needs of different steel types and different refining processes, our purging plugs are available in different types:

- ◆ Slot
- ◆ Directional
- ◆ Porous
- ◆ Hybrid

Due to exceptional workmanship, particular maintenance method, and high temperature firing technology, our purging products feature a long service life and high blowing rate while meeting the safety and reliability standards you have come to expect.

Slot Plug



Material and Chemical Composition

The slot plug is the most common structure of purging plug. The gas channel can be designed and customized according to actual on-site using conditions, including refining steel grade, refining workmanship, ladle capacity, temperature, hydrostatic pressure of liquid steel, etc. High-quality materials with anti-liquid steel and slag erosion features ensure the blow through performance of the purging plug.

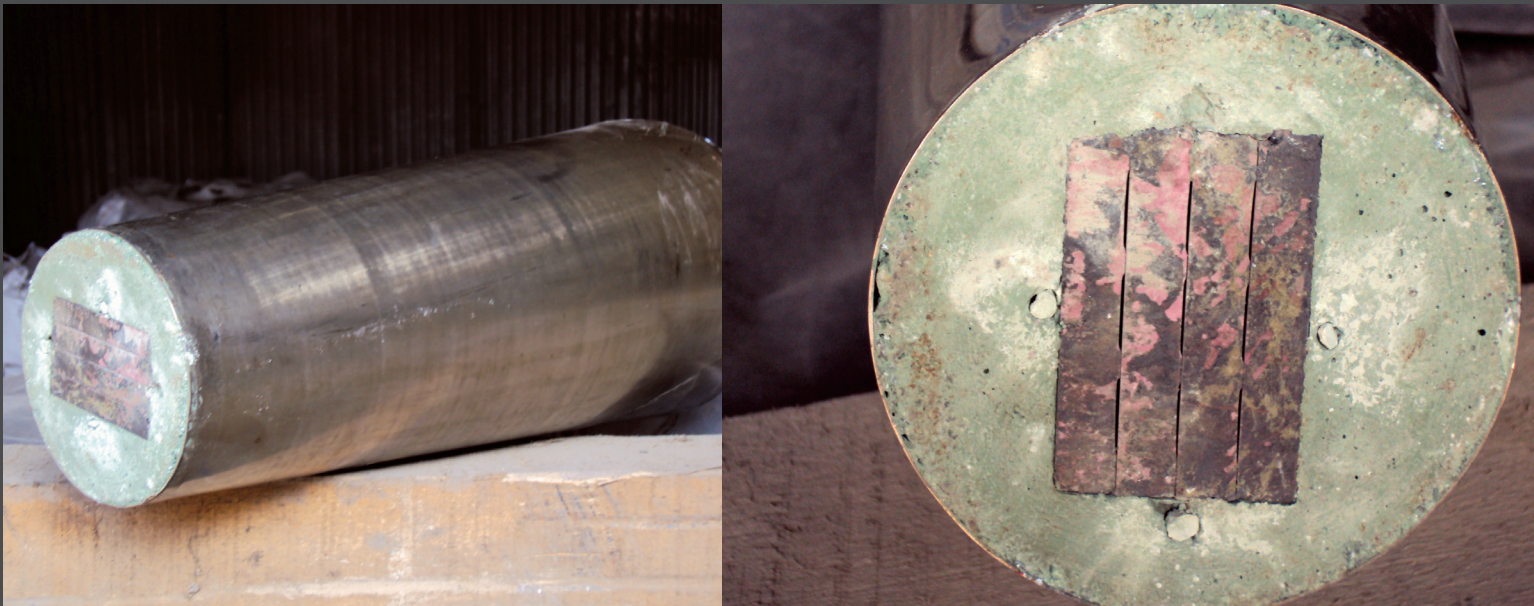
Our slot plugs also have excellent thermal shock resistance to avoid the reduction of air blowing rate caused by layered peeling or fracture under high temperature.

The main features of this plug are a high blowing rate and a wide range of adjustable flow rates, making it easier for operational control during the refining process. By selecting different raw materials and design, we can provide slot plugs with flow rate ranges from 12% to 20% and temperatures from low to high in order to meet different application conditions.

Application Characteristics

- ◆ Produced by vibration casting and molding of high-performance corundum spinel castable
- ◆ Firing under high temperature
- ◆ High temperature strength
- ◆ Excellent high temperature erosion resistance
- ◆ Easy production procedure, with much wider adjustable range of on-site refining operation flow

Directional Plug



Material and Chemical Composition

The directional plug is composed of anti-stripping materials. The block body will not easily fracture and has longer service life. The cracks between different plates will not expand, enabling the segment plug design to avoid failure of bottom blowing caused by brick fracture.

Application Characteristics

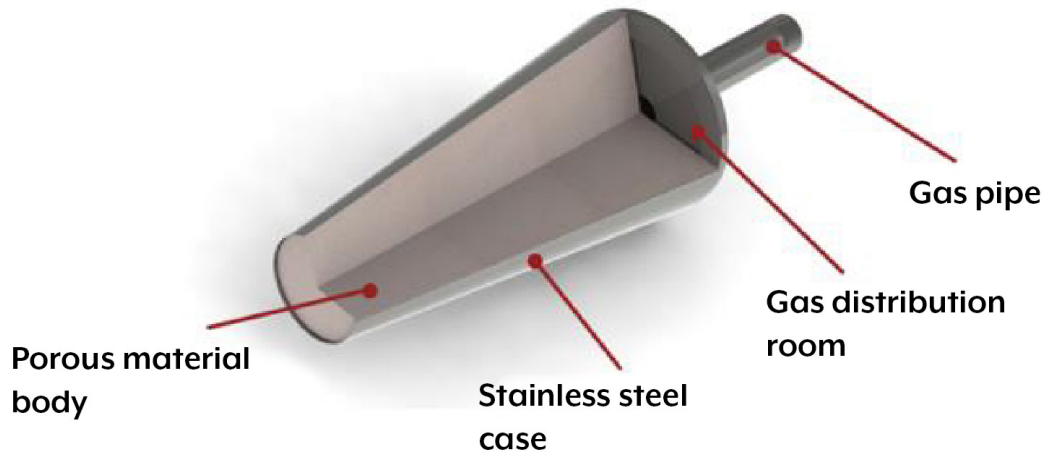
In order to adapt to stricter refining conditions (especially special steel), and to meet the requirements of increasing ladle life, the volume of the plug increases. However, the traditional slot type plug has single material and single structure. The directional plug has successfully solved the problem of fractures existing in traditional slot plugs, increasing the stability of the refining process and improving the quality of refined steel.

Advantages of our directional plug:

- ◆ Improved thermal shock resistance and erosion resistance
- ◆ Thermal conductivity and low stress characteristic due to the design and structure of segment (plate)
- ◆ Increased air blowing rate
- ◆ Stable flowing rate, exceptional blow through performance, higher stability in refining process operation
- ◆ Almost no fracture layer, reducing the labor strength during oxygen cleaning of plugs after casting
- ◆ Increased lifetime, synchronized with the slag line

The thermal stress for slot and directional plugs is equally the same after heating and steel tapping finishes, but after argon blowing, the structure of the directional type is much better than the slot type plug.

Porous Plug



Material and Chemical Composition

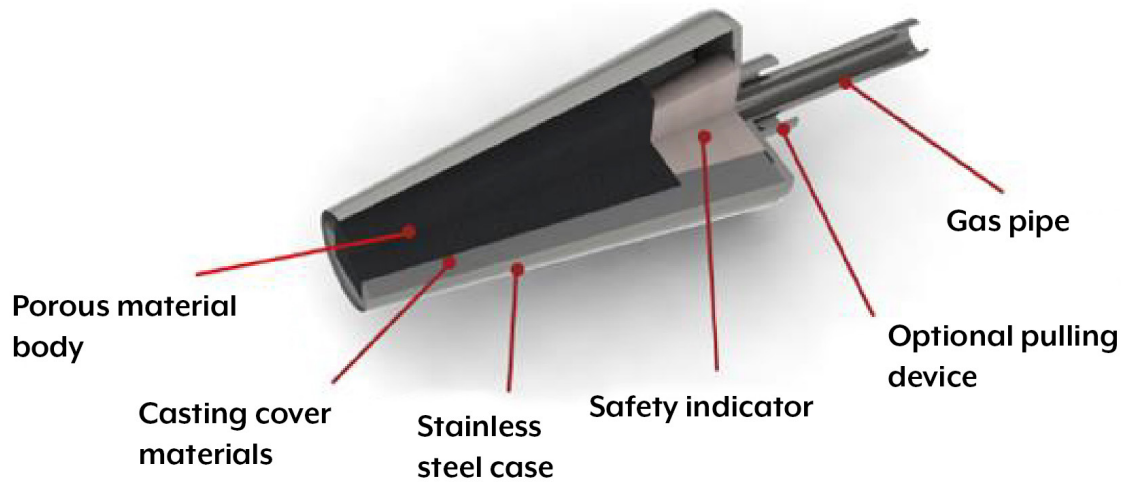
Porous plugs have increased porosity and permeability. A carbon-containing compound is added since it can burn out without residue at low temperature. This produces initial porosity. Porous plugs distribute interpenetrating gas channels in different sizes. When blowing stops, the steel and slag from the ladle will infiltrate into the deep areas of the plug forming a secure layer on the working surface.

Application Characteristics

Thermal shock resistant: Introducing spinel phase into the structure of the purging plug increases its thermal resistance to prevent thermal shock. The oxide and non-oxide added into the porous plug will form into a solid solution phase with aggregate under high temperature which will increase the high temperature strength, air permeability, and resistance to slags of the plug. After high temperature burning for the plug, the performance is increased to meet different steelmaking conditions.

Resistant to slag: To increase resistance ability to slag and liquid steel penetration, Cr_2O_3 (chromium corundum) is added into corundum spinel. Cr_2O_3 has the same crystal structure as Al_2O_3 . This also improves the gas channel blocking condition caused by liquid steel penetration. The aluminum-chrome solid solution and independent chrome-bearing glass phase formed by Cr_2O_3 fine powder and Al_2O_3 under high temperature forms a liquid with certain viscosity when met with the slag in the steel smelting process. This liquid phase avoids the slag erosion to porous plugs and absorbs the iron oxide and magnesium oxide, forming dense spinel on the plug's working surface, thus further improving the slag resistance of the plug.

Hybrid Plug



Secondary refining technology is the most important part of the steelmaking process. It can adjust the steel alloy type and liquid temperature. The purging plug and block are the key functional components to this process.

As ladles become more efficient, higher quality refractory materials are even more important. Therefore, it is necessary to further improve the performance of purging plugs and blocks to meet the increasing demands of current steelmaking technology.

Specifications

Slot Plug

DESCRIPTION	Corundum	Corundum-Spinel	Chromite Corundum	Chrome Corundum Alumina Spinel
CHEMICAL COMPOSITION (%)				
Al ₂ O ₃	98	97	88	88
MgO	/	2	/	1.4
Cr ₂ O ₃	/	/	10	8
CaO	1	1	1	1
SiO ₂	0.2	0.2	0.2	0.2
PHYSICAL PROPERTIES				
BULK DENSITY (g/cm ³)	3.1	3.16	3.2	3.25
MAX USING TEMPERATURE (C)	1850	1800	1800	1850

Directional Plug

DESCRIPTION	Directional Purging Plug		Housing Block
	Corundum-Mullite	Corundum-Spinel	Corundum-Spinel
CHEMICAL COMPOSITION (%)			
Al ₂ O ₃	≥90	≥90	≥90
PHYSICAL PROPERTIES			
BULK DENSITY (g/cm ³)	≥2.9	≥3.0	≥3.0
POROSITY (%)	≤18	≤20	≤15
CRUSHING STRENGTH (Mpa)	≥40	≥50	≥50
REFRACTORIES UNDERLOAD (C)	≥1700	≥1700	-
VENTILATION VOLUME (0.2-1.0Mpa), m ³ /h	6-50	-	-

* The data shown are average results and are subject to variation.

Specifications

Porous Plug

DESCRIPTION	Corundum	Corundum-Spinel	Chromite Corundum	Chrome Corundum Alumina Spinel	Periclase-Spinel	Periclase-Chromite
CHEMICAL COMPOSITION (%)						
Al ₂ O ₃	97	96	88	87	2.4	3.5
MgO	/	2	/	1.5	94	76
Cr ₂ O ₃	/	/	10	9	/	11
CaO	/	0.1	0.1	0.1	1.3	1.3
SiO ₂	0.6	0.6	0.6	0.6	0.6	0.6
PHYSICAL PROPERTIES						
BULK DENSITY (g/cm ³)	2.78	2.78	2.78	2.8	2.7	2.7
MAX USING TEMPERATURE (C)	1750	1750	1750	1800	1750	1750

Hybrid Plug

DESCRIPTION	Chrome Corundum Alumina Spinel	Corundum-Spinel	Corundum-Spinel	Periclase-Chromite
CHEMICAL COMPOSITION (%)				
Al ₂ O ₃	87	97	96	3.5
MgO	1.5	2	2	76
Cr ₂ O ₃	9	/	/	11
CaO	0.1	1	0.1	1.3
SiO ₂	0.6	0.2	0.6	0.6
PHYSICAL PROPERTIES				
BULK DENSITY (g/cm ³)	2.8	3.16	2.78	2.7
MAX USING TEMPERATURE (C)	1800	1800	1750	1750

* The data shown are average results and are subject to variation.

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