

## Company Profile

Zhejiang Shangguijuli Special Material Technology Co., Ltd. is a leading manufacturer specializing in R&D and production of high-performance silicon nitride ceramic material in China. With the advanced production process of silicon nitride ceramic and precision machining technology, we provide professional and most suitable solution of silicon nitride material for customers in the field of advanced equipment, new energy, electric vehicles, aerospace etc.

SG-28, a new silicon nitride material for the aluminum industry developed by us, its thermal and mechanical properties have been significantly improved over similar products, especially our L-type high thermal conductivity diving heater R&D based on SG-28, it will bring revolutionary progress to the aluminum industry equipment.



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## Advantages

In view of the high temperature and corrosive characteristics of molten aluminum liquid, there are very few types of materials suitable for the core components of degassing rotor, riser tube and protective tube in aluminum liquid. Commonly used materials are cast iron, graphite, SiSiC, SiC-Si<sub>3</sub>N<sub>4</sub>, Al<sub>2</sub>TiO<sub>5</sub> and Si<sub>3</sub>N<sub>4</sub>. In terms of comprehensive comparison, silicon nitride ceramics has obvious advantages in cost performance.

Due to the unique high temperature strength, strong thermal shock resistance and good corrosion resistance of Si<sub>3</sub>N<sub>4</sub> ceramics, the service life is generally more than one year, which reduces the replacement and maintenance costs for customers;

Si<sub>3</sub>N<sub>4</sub> has low wettability to molten metal and hardly reacts with the aluminum liquid, it will not cause secondary pollution to the aluminum liquid, therefore it can greatly help customers to make high quality die casting parts.

Si<sub>3</sub>N<sub>4</sub> ceramic can maintain the flexural strength of over 500MPa and good thermal shock resistance below 800°C, so the product wall thickness can be smaller, and its low wettability with molten metal, so there is no need for surface coating, which also makes the installation and maintenance of ceramic components to be easier and more convenient.

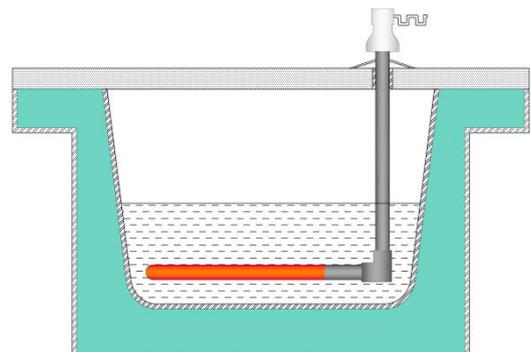
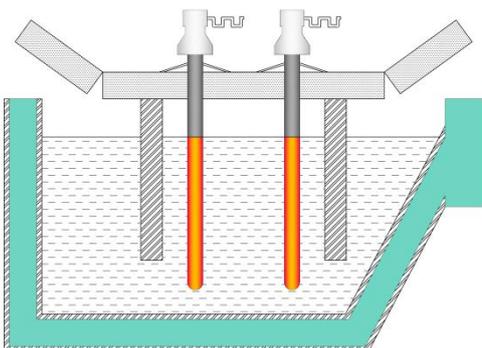
Item	Material	Si <sub>3</sub> N <sub>4</sub>	Al <sub>2</sub> O <sub>3</sub>	SiC	Al <sub>2</sub> TiO <sub>5</sub>	Cast Iron	Bearing Steel
	Density	g/cm <sup>3</sup>	3.15-3.3	3.0-3.95	2.8-3.2	3.2-3.4	7.2-7.8
Hardness	HRC	80-85	70-80	85-90	55-70	50-60	60-66
Fracture Toughness	MPa.m <sup>½</sup>	7	4.2	3.9	3.5	15-20	25
Young's modulus	GPa	300	340	208	200	150	200
Compressive strength	MPa	2500	2200	1800	1200	1000	1200
Bending Strength	MPa	600-900	150-300	500-800	35-60	200	280
Coefficient of linear expansion	X10-6/°C	3.2	8.5	3	0-1.6	16	12.5
Thermal Conductivity	W/m.k	20-50	26	120	1-2	55	40
Max Operation Temperature	°C	1300	1600	1400	1450	850	150
Rolling fatigue failure		Flaking	Broken	Broken	Broken	Flaking	Flaking

## High Thermal Conductivity Diving Heater



The high thermal conductivity diving heater (including L type) subverts the installation and application scenes of traditional electric heaters in the aluminum industry. It has many advantages, such as small size, high power, high efficiency, long life and easy maintenance, which solves the difficulties and demands of the electric heating in the field of aluminum industry.

- ❖ Small heater size, high power, silicon nitride jacket's diameter is from 38mm to 68mm, and its heating power can be from 3.5KW to 28KW;
- ❖ Because it is filled with high thermal conductivity material, its heating efficiency is as high as 99%. Compared with the traditional electric heater, it can help customer to save the electricity by 30%-50% , and its service life is greatly extended;
- ❖ This heater is very convenient to install and maintain, meanwhile it keeps high mechanical strength when temperature rises quickly, and it will be much safer to be used in the vacuum burning & baking industrial furnace.

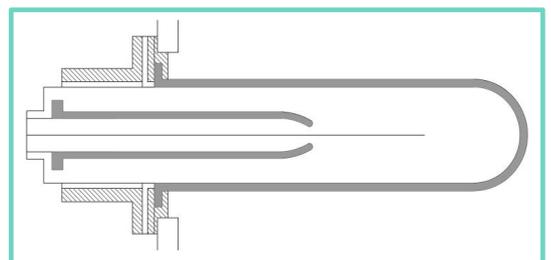
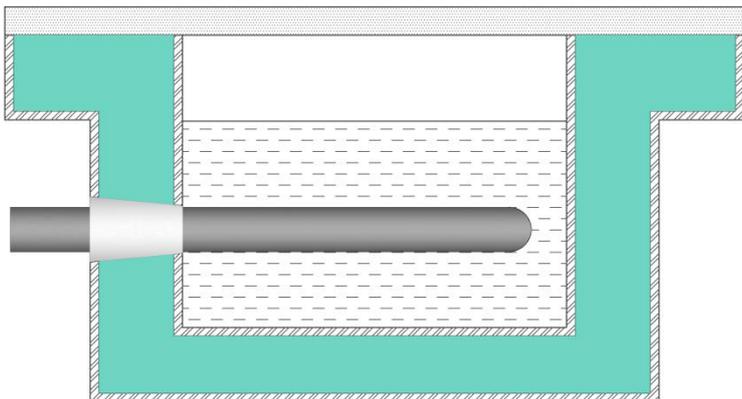


## Heater Protection Tube



Because of its excellent high temperature performance, silicon nitride ceramic has become the first choice material of the electric or gas heater's protective tube.

- ❖ Due to its excellent high temperature resistance and strong thermal shock resistance, silicon nitride ceramic product can withstand the heat load of a high temperature heating element or burner for a long time, and the service life is up to more than one year;
- ❖ Silicon nitride ceramics hardly react with the aluminum liquid, so it will not pollute the aluminum liquid, which is conducive to improve the purity of aluminum liquid under high temperature;
- ❖ Compared with the traditional upper radiant heating method, its energy efficiency can achieve 20%-30%, and it effectively avoids the aluminum liquid at the upper side to be excessive oxidation.

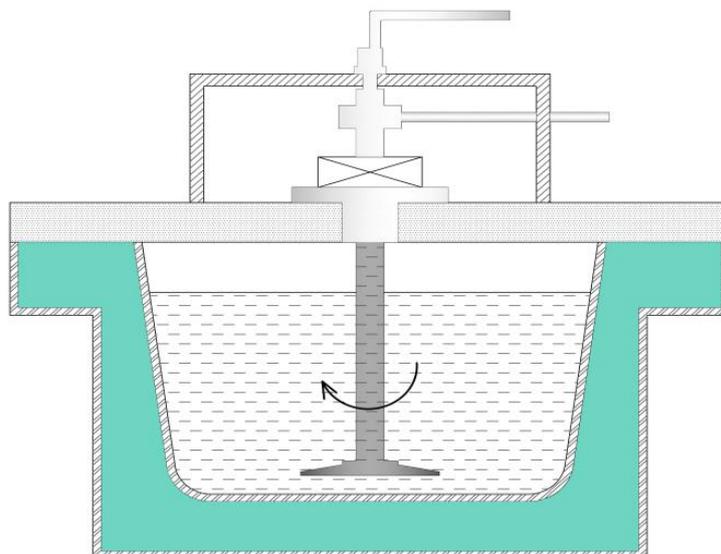


## Degassing Rotor



In order to remove hydrogen in the aluminum liquid, the silicon nitride hollow degassing rotor is used to feed nitrogen or argon, and the gas is dispersed by high-speed agitation, finally achieve the effect of neutralizing and discharging hydrogen.

- ❖ Compared with graphite rotor, silicon nitride will not be oxidized under high temperature environment, so it will not pollute the aluminum liquid, and the service life is much longer;
- ❖ The property of high thermal shock resistance ensures that the degassing rotor will not break during frequent intermittent operation;
- ❖ Because silicon nitride is of high density and high strength, it assures that degassing rotor can be reliable and stable operation in high speed rotation.



## Riser Tube

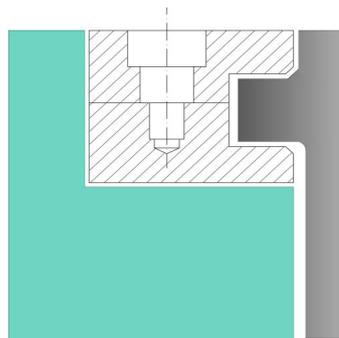
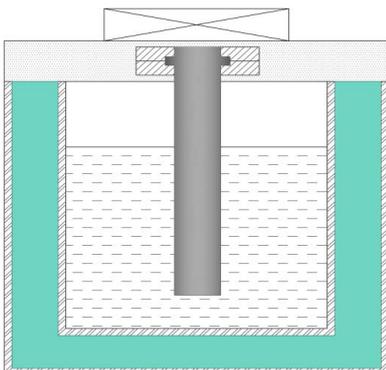


Practical application proves that silicon nitride ceramic SG-28 is very suitable for the riser tube & stalk of low-pressure casting;

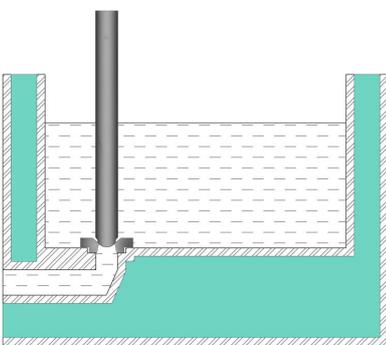
Compared with commonly used cast iron, aluminum titanate, silicon carbide and other materials, silicon nitride ceramic has the best thermal shock resistance and a service life of more than one year.

Due to the low wettability to aluminum liquid, it reduces the slagging of the inner and outer walls of the riser tube & stalk, which is convenient for daily maintenance;

Silicon nitride ceramic S-28 has excellent corrosion resistance, which can reduce the pollution of aluminum liquid, therefore, it will be beneficial to improve the quality of casting for customers.



## Stopper Pipe



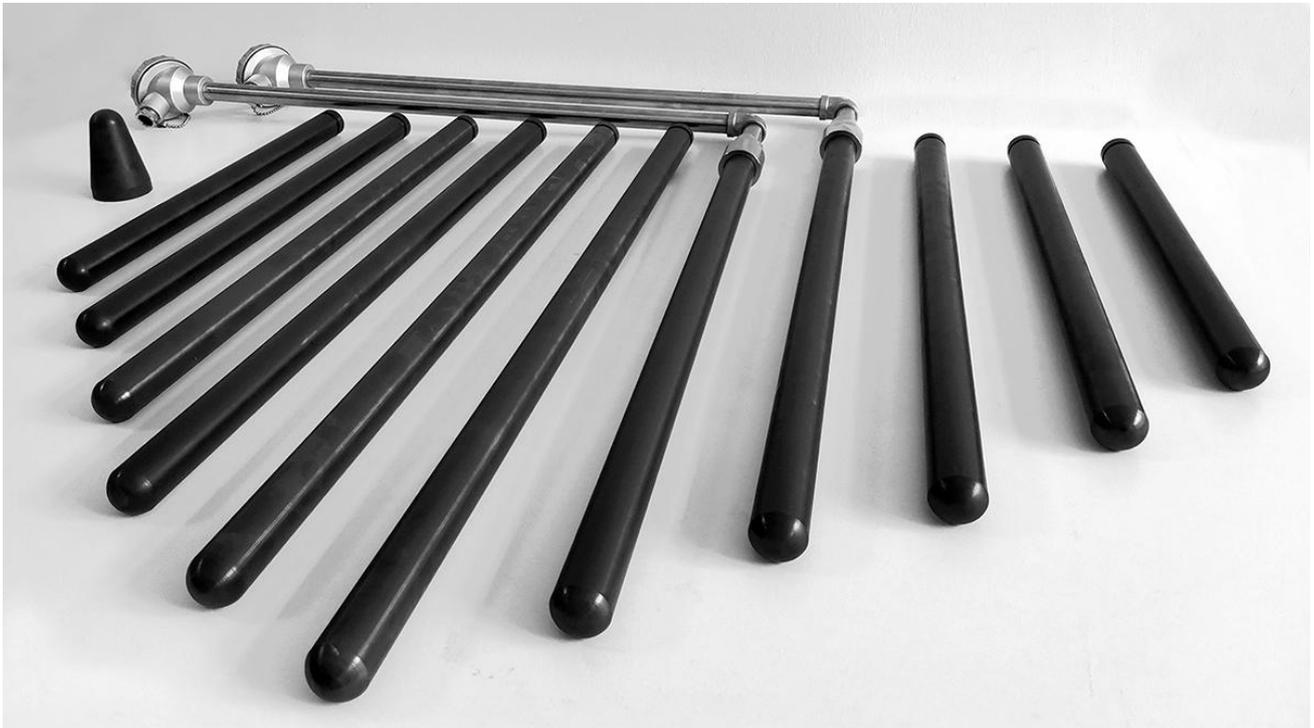
Because SG-28 silicon nitride ceramic has high density, high strength and high thermal shock resistance, it is the best choice for stopper tube in low pressure die casting.

Compared with aluminum titanate and alumina ceramics, silicon nitride has more excellent wear resistance and can ensure airtight of the stopper tube for a long time;

The high temperature strength of silicon nitride ceramic is very good, so it ensures that the stopper tube can still work for a long time under frequent operating conditions.

In view of the fragile property of silicon nitride ceramics, it is necessary to avoid large mechanical shocks, therefore, it must be careful and paid attention on the design and installation of the lifting transmission device.

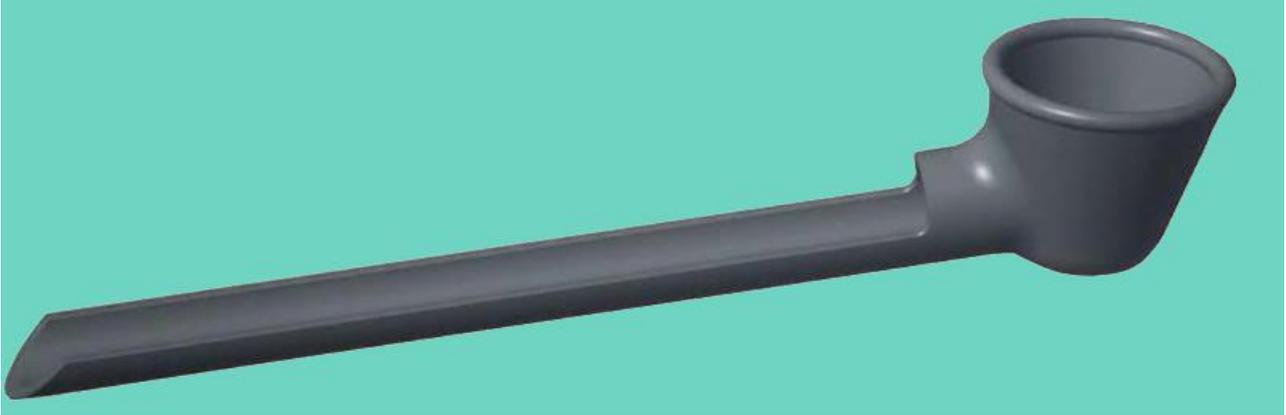
## Thermocouple Protection Tube



Silicon nitride ceramic SG-28 is widely used as the material of thermocouple protection tubes because of its excellent high temperature performance, so that the service life is up to more than one year. Compared with materials such as cast iron and graphite, silicon nitride will not be corroded by aluminum liquid, therefore it can make sure accuracy and sensitivity of the measured temperature; Silicon nitride ceramic is of low wettability to aluminum liquid, so basically it may not need the on-site maintenance.

Inner  $\Phi$ 16mm,  
Outside  $\Phi$ 28mm,  
Length 400mm-1100mm

## Flume



The flume with silicon nitride lining pioneered by our company solves the troubles that have plagued workers in the field of aluminum industry.

The silicon nitride lining is non-stick to the aluminum liquid, so our flume hardly needs cleaning, which greatly reduces the labor intensity of workers;

No need to spray anti-stick coating on the flume, thus ensuring the purity of the aluminum liquid;

## Precautions for operation

- ❖ In view of the brittleness of ceramics, please try to avoid external impact or knocking during handling, installation and maintenance;
- ❖ For safety, the product should be preheated and dried before use;
- ❖ When the electric heater is used for the first time, it should be slowly heated according to the heating curve;
- ❖ When installing flange, the appropriate washer should be selected and carefully leveled, in order to avoid air leakage or be infiltrated by molten aluminum liquid;
- ❖ The vertical accuracy should be adjusted when the degassing rotor is installed, and it should run away from the liquid surface for 5-10 seconds when stopped to avoid too much aluminum liquid sticking;
- ❖ In order to extend the service life of the product, it is recommended to clean and maintain the product regularly;
- ❖ If you have any questions, please contact our after-sales service team at any time.

## Ordering Process:

Please provide us as much technical information and requirements as possible.

Technical drawings or detailed requirements of required parts

Application environment;

Quantities;

Delivery date

Our company will recommend the product scheme that meets your requirements.

After confirming the sales contract, our company will start the production according to the strict quality control system.

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