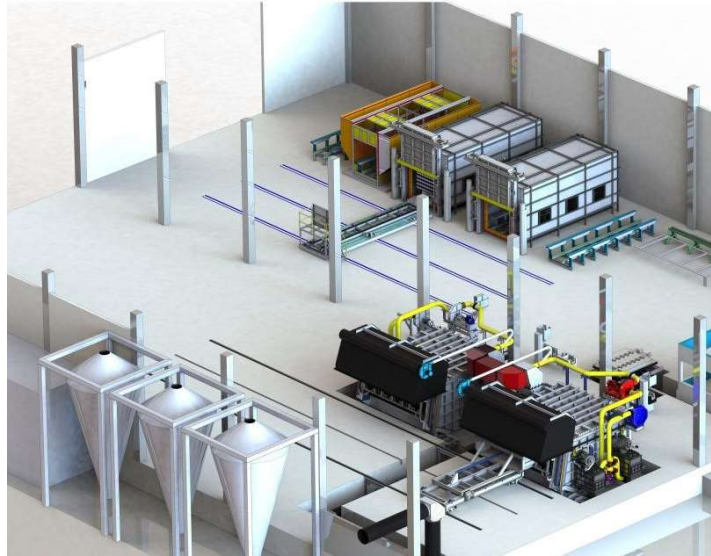


Technical Proposal for 20T Air-slip Casting



A. Contract Content: (all photos only for reference)

1. Hydraulic cylinder 20T 1 set
2. 7"×48 pcs Air slip casting table 1 set
3. Oil and air station with supply & system of graphite tester 1 set
4. Degassing system (online type) 1 set
5. Foam ceramic filter box (with heater) 1 set
6. Water supply system include 500T cooling tower, water in pump, water out pump and water pipes within 30meter PLC control 1 set
7. Flux feeder and Alit5b1 feeder with PID control 1 set

B. Obligation of Buyer

1. Foundation for the machines;
2. Supply the water, electricity, oxygen, acetylene, hoister, level and manpower etc. for the Seller during installation;
3. Organize the technician to assist during the commissioning process;
4. Be responsible for the accommodation, Fee of visa, round-trip air-tickets and the local transportation for Seller's technicians assigned to conduct installation & commissioning

at Buyer's site. Besides, the buyer need to pay the installation charge USD 150/day per technician.

5. Be responsible for the necessary work insurance coverage, including but not limited to industrial hospitalization, medication and transport accident etc. for the technician assigned to work at Buyer's site;

6. Unload and keep the goods.

C. Obligation of Seller

1. Manufacturing the machines;

2. Sending technicians for installation & commissioning of machine;

3. Supply the manual of the machine to the customer;

4. Loading the goods and transport to the destination which show in the contract;

5. Directing buyer's technician to operate the machines for maximum one week (begin from commissioning);

6. Provide the foundation drawing of equipment and Layout to Buyer after the contract become valid. Provide the electrical maintenance drawing as well as relevant technical information to Buyer after commissioning accepted.

7. Check the situation of the machine continuously and supply the best after-sold service.

D. Others:

1. Power line from outer power station to each control cabinet of WA equipment and tube of pressure air from air compressor to each section which need the press air and cooling water pipe to each section which need the cooling water and fuel pipe to each section which need the gas or oil shall be covered by Buyer.

2. Others, PLC control line from each control cabinet to each machine and compress air tube on the machine will be covered by Seller.

3. Design of the machine in the contact is accepted by both parties. Any amendment of design must be approved by both parties and it will charge the party who requires to amend it.

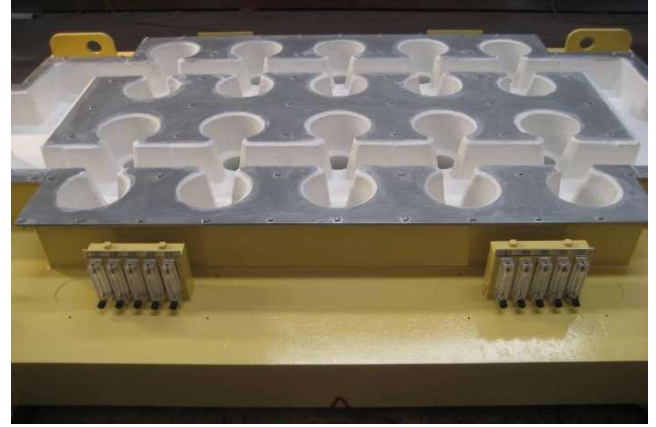


P.O.Box:5090-DUBAI-UAE
Tel : 009714 225 31 50
Fax :009714 225 31 51
Metlineco@gmail.com

E. Specification of the machines: (See Appendix #1)

F. Civil belong to Buyer's duty.

Air-slip casting system



7” Air-slip casting mold technical specification

(一)、: Process description and main technical parameters

1、 Equipment name

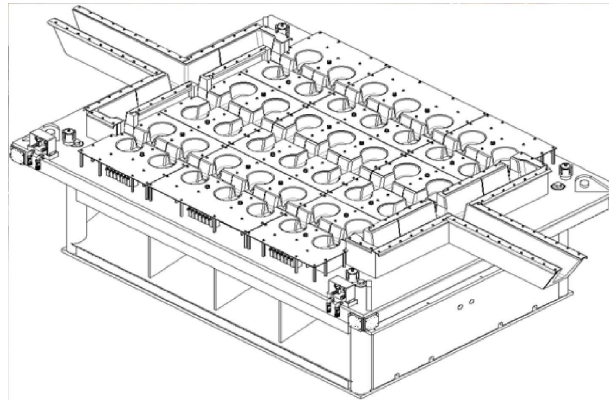
Air-slip casting mold (below picture as example)

2、 Usage of equipment

For casting oil and gas lubrication billets

3、: The basic requirements

Air-slip casting mold consists of mold tool (including graphite rings, adapter plate, adapter plate pressing, connecting sleeve, seal rings, pressure equalization rings), starting head & baseboard, mold platform (water tank, oil and gas pipeline, oiler components, gas flowmeter), metal distribution systems, starting head support table (starting stand), heating system, fall prevention frame, sling device, disassembling pneumatic wrench and feeler gauge. During the period of casting, it can be casting billets whose surface is smooth, through supply lubrication oil in the chamber of mold tool. Fit for casting 1XXX~8XXX series.



4、 Process description and main technical parameters

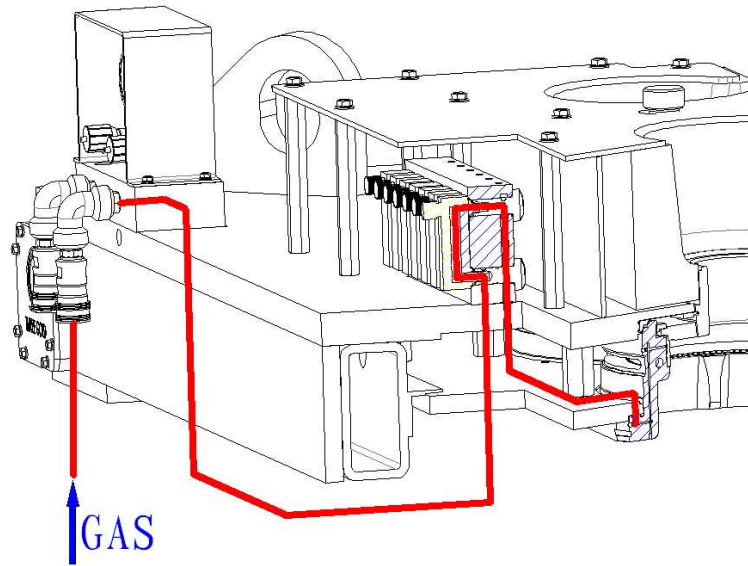
4.1、

Item	Billet specification	Casting technology	quantity per one casting	weight per one casting
1	Φ7inches (Φ177.8mm) ×6500mm	oil and gas lubrication	48EA	20.500T

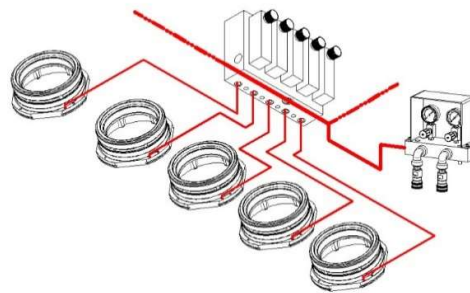
4.2、 Tortuosity: 1.0mm/m, totally: ≤4mm

4.3、 Oil, gas and water parameters of equipment

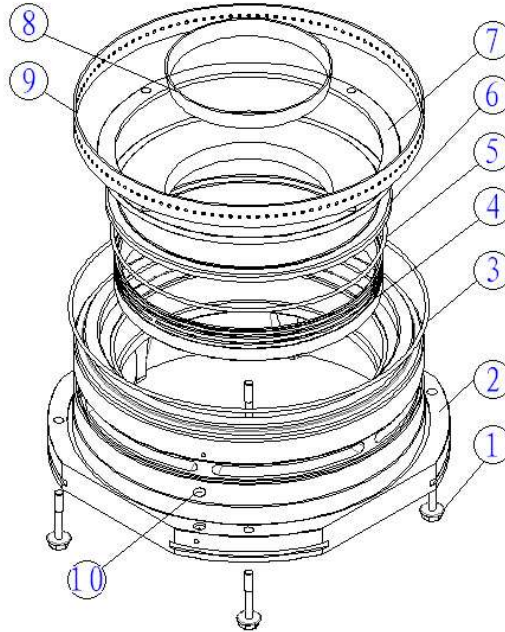
- Casting gas: compressed air 10-12kg/cm², filtering accuracy 1μm;
- Casting gas dosage 60Nm³/hr
- Casting oil 45kg/cm², filtering accuracy 1μm;
- Casting oil consumption: 200mL per one casting (determined by billet size and length)
- Casting water consumption: 70-350m³
- Casting water pressure: 0.25-0.4MPa, hydrodynamic pressure ≤0.05Mpa
- Oils and fats in cooling water: <10ppm
- Solid particle in cooling water: solid particle which size >1.0mm should be filtered
- PH value of cooling water: 7.5-8.6
- Gross of dissolved solid in cooling water: 1000ppm Max.
- Capacity of emergency cooling water tank: ≥150m³
- Pressure of emergency cooling water: 0.2~0.3Mpa
- Alloy designation: 1XXX~8XXX series
- Hydrogen content in melt entered into casting table: ≤ 0.20cc/gAl
- Particle size of melt entered into casting table: ≤ 320μm
- Casting temperature: (measured in low temperature end) according to diameter and alloy designation, from 682°C (1260°F) to 712°C (1315°F)
- Depth of casting water: advice 2m, 1m min. for soft alloy; for hard alloy, below top plate but higher than debris in casting well
- Gap between top plate and casting well: (make sure no obstructive in well before casting) advice 150mm, 75mm min.



5、 Oil Lubricated Pulse Mold consists of mold tool (including graphite rings, adapter plate, adapter plate pressing, connecting sleeve, seal rings, pressure equalization rings), starting head & baseboard, mold platform (water tank, oil and gas pipeline, oiler components, gas flowmeter), metal distribution systems, starting head support table (starting stand), heating system, fall prevention frame, sling device, disassembling pneumatic wrench and feeler gauge. During the period of casting, it can be casting billets whose surface is smooth, through supply lubrication oil in the chamber of mold tool. Fit for casting 1XXX~8XXX series.



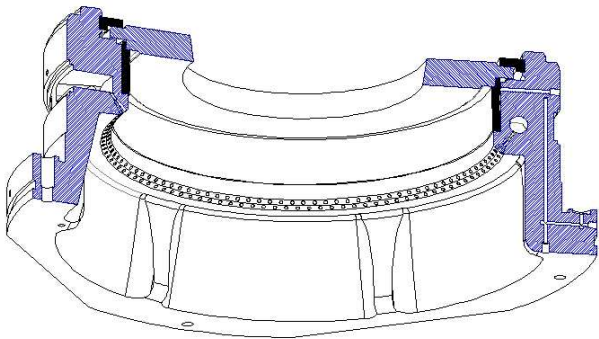
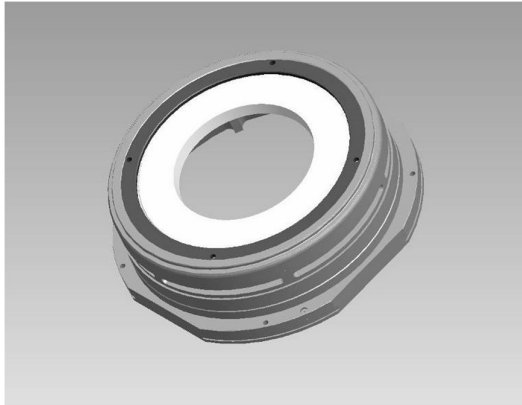
5.1、 We design pulse oil lubrication type large billet mold frock based on excellent design concept of mold at home and abroad ,especially the reference of successful oil lubrication mold frock design from foreign countries, combing many years of our experiences in researching and



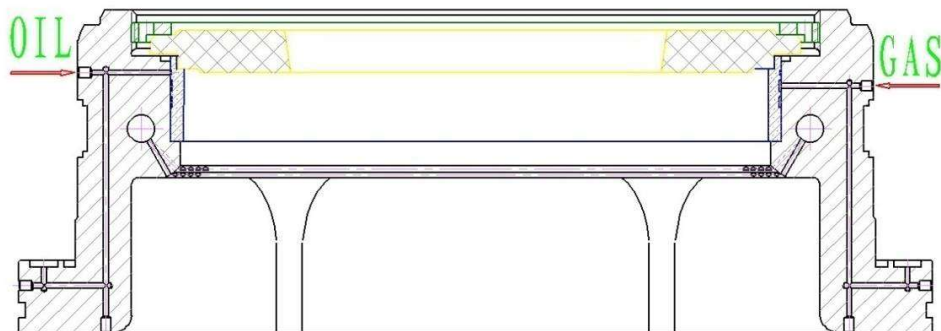
developing aluminum alloy casting technique. The mold material adopt the 6061T651 state wrought aluminum alloys, it Will increased density and intensity after forging process and equipped with good processing properties and heat distortion. All molds were processed in the professional processing center to make sure all molds have the same dimensions. Oil and gas passages are drilled in every mold that make the oil and gas can be pushed out and supply to graphite annulus through compressing air during the casting process. The casting oil permeates the graphite annulus evenly and forming a thin film between billet and mold lining to reducing the friction between the aluminum billet and mold. It makes the surface more smooth, and reduces the reduction of nodule forming, cold shut and indentation.

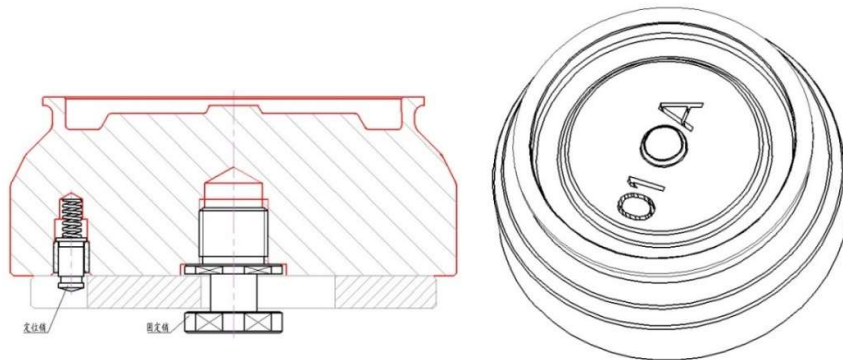
- | | |
|--|---------------------------|
| 1: mold mounting bolts | 2: mould body |
| 3: sealing ring for mould and platform | 4: graphite ring |
| 5: sealing ring for graphite | 6: adapter plate |
| 7: adapter plate clamp | 8: sealing gasket |
| 9: cooling Water deflectors | 10: sealing for oil & gas |

The graphite rings is imported from (Germany&Japan), keep a long service life for 300-500 casting times.



The mould components is designed to maximum cooling effect which consist of a graphite rings, an adapter plate, an adapter plate pressing, a connecting sleeve, a seal ring and a pressure equalization ring. There is a double-row cooling hole on the mould which enhances cooling effect and improve the quality of billets.

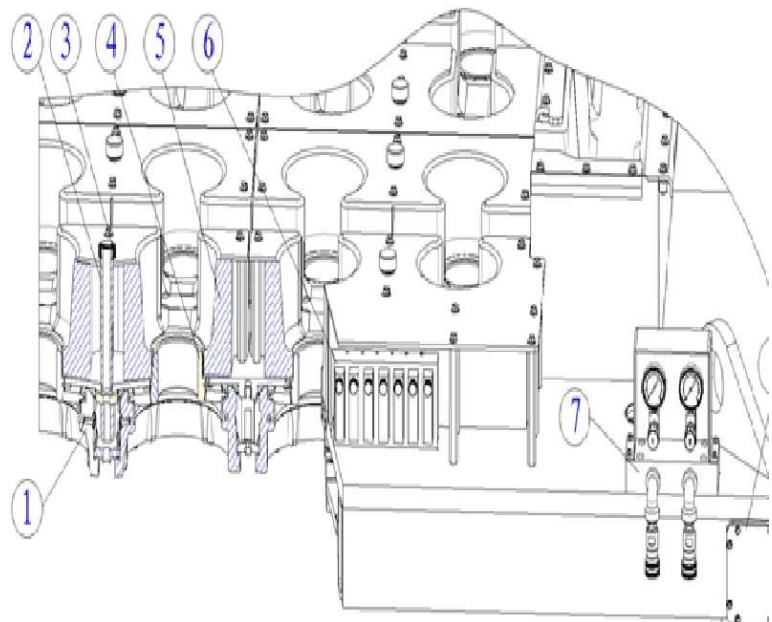




There is a security assurance on the casting table: the water seal effect detection system. The system can stop the cooling water entering the mold.
 The start head is made of ZG45. The gap between it and mould is less than 0.5mm.
 The adapter plate pressing is made of 6061-T651 material.
 The mould itself should be hard oxidation coloring processed. The thickness of chemical conversion coating is 0.04mm with the hardness of HV450 and base material of HB60-90. Before coating, the numbers (characters cut in bas-relief, 001-005) should be lettered in bold-face on the bottom of mould with a height of 10mm. The position of oil and gas hole should be clearly lettered in bold-face with a high of 10mm. Before leaving factory, every mould should do oil and gas permeability testing.
 The lettering logo of 25mm high should be on every mould which is corresponding with the logo on the table.

5.2、Casting table

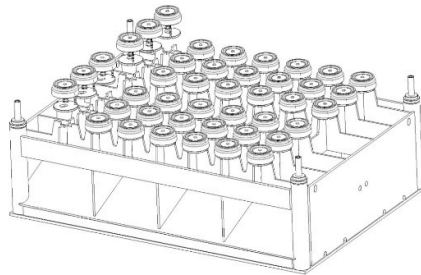
- ① Mould component
- ② Drain clean tube
- ③ clean tube cap nut
- ④ Connecting sleeve
- ⑤ Melt distribution system
- ⑥ Flow meter components
- ⑦ Oil and gas interface components



Water tank is made up by rectangular tube and Q345 after the annealing treatment. Around the water tank, there are 12 cleaning holes which is convenient for people to clean it when necessary.

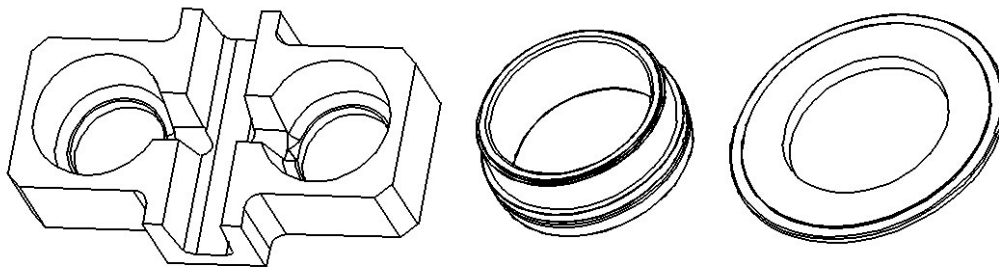
There are two flushing ports which is connected to tilting arms. The cooling water is distributed through rectangular tubes. The positions of the flushing ports are determined by the quantity of billets. Thus, to ensure evenness of the cooling water.

The moulds connect to the table by dead plate on which there are branch pipelines of oil & gas, monomer oiler and gas flow controller. This parts all connect to the main oil and gas pipeline. There are O type rings on the connection parts to prevent leakage.



5.3、 Melt distribution system

The melt distribution system is the key part of casting which is consist of distribution plate, connecting sleeve and adapter plate with the material of high quality ceramic fiber. This system has the features of



good heat preservation, anti-scouring. The N17 plate is made of non-asbestos carbon fiber.

Smaller area of exposure can prevent reducing thermos stress of the melt. On steady casting state, if the temperature difference is less than 10°C, the life of refractory matter can reach one year. When repair or replace the refractory matter, it is unnecessary to replace all the table but the worn parts.

5.4、 Start head base

The start head base is the connecting base of start head which is made by 30mm thickness steel to a box

shape. The start head is located on every node on the base. The start head can move a bit little on the node. When centering, the mould and start head can automatically interact. The gap between mould and start is less than 0.5mm. The bottom of the base is slope structures, which has the diversion function for the cooling water and when aluminum leak. There are vent holes on the slope structures which can eliminate the air resistance when the base enters into water.

When finish welding, the base will be annealed totally. The location accuracy of the base and water tank can be controlled in 1mm. The base can be swing together with water tank.

5.5、 Preservative treatment

The start head base, fall prevention frame, inner & bottom of water tank are all coated with corrosion prevention Marine paint.



5.6.: Heat system for casting table



Item	Description	Size	Quantity
1	Φ7inch(Φ177.8mm) oil and gas lubrication pulse mold		
1.1	Water tank	Φ7inch(Φ177.8mm)	1 SET
1.2	Start head base		1 SET
1.3	Distribute plates		48 EA
1.4	Connecting sleeves		48 EA
1.5	Adapter plates		48 EA
1.6	Pressure plates		48 EA
1.7	Moulds		48 EA
1.8	Graphite rings		48 EA
1.9	Start heads		48 EA

1.10	Fall prevention frame		1 SET
1.11	Melt distribution system		1 SET
1.12	Cooling water deflectors		48 EA
1.13	Gas flowmeters		48 EA
1.14	Oiler components		48 EA
1.15	Seal rings		48 EA
1.16	Heating system		1 SET
1.17	Sling		1 SET
1.18	Pneumatic impact wrench		1 SET
1.19	Feeler gauge		2 SET

The heating apparatus is made up of steel which is used heating before casting.

5.7、 Oil & gas control station

The Φ7inch (Φ177.8mm) mold should be fit for the casting machine and oil & gas control station. And also it should be fit for the newest oil & gas control station buyer may purchase from producer.

(二)、 Scope of supply

The seller is response for completeness, newness and uniformity of equipment. The casting mold contains below goods (but not limited).

(三)、 Technical and material guarantee from buyer

1: Service scope of buyer's technician

1.1 Provide size of curtained billet section and some related technical requirements.

1.2 Provide entire technological conditions for producer's design.

1.3 Communication and coordination with the third party to confirm layout chart, fall pictures, communication control and related data.

2、: Material guarantee

2.1 All the infrastructure, pipe laying, embedded parts (should meet the demands of producer).

2.2 The locations of compressed air, power supply, cooling water and gas according to producer's layout chart.

2.2.1 Guarantee value of controls parameter of casting machine

- Casting speed: 15-280mm/min (step less speed regulation)
- The length accuracy of casting: $\leq \pm 0.5\%$ mm (relative value Change)
- The speed accuracy of casting: $\leq \pm 1\%$
- Tortuosity of billet: ≤ 1.0 mm/m, totally ≤ 4 mm
- Tilting angle: 0-85°
- Tilting arm reset accuracy: ± 1 mm
- Tilting arm mold mounting surface contour deviation: 1.5mm
- Cooling water regulating range: 70-350m³/h
- Cooling water flow accuracy: $\leq \pm 1.5\%$
- Casting table: Horizontal drift ≤ 2 mm/hr

Vertical direction drift ≤ 2 m (L=4000mm, unbalance loading 64kN.m)

Platform no-load rotation: ± 4 arcminute

- Casting water pressure: 0.25-0.35MPa, hydrodynamic pressure ≤ 0.05 MPa
- Inlet temperature of cooling water: 20~30°C, target temperature is 25°C
- Concentration of TDS: ≤ 1000 ppm
- PH value: 6.0-8.0 (advice PH range for hard alloy: 8.00 \pm 0.4)
- Solid particle in cooling water: solid particle which size > 1.0 mm should be filtered
- Temperature fluctuation during casting: ± 1.5 °C
- Sweep pressure of compressed air: 0.4-0.7Mpa, flow: 5m³/h
- Natural gas pressure: 0.2~0.3Mpa, flow: 5m³/h

2.2.2: Guarantee value of controls parameter of casting mold

- Casting gas dosage: 60Nm³/h
- Casting gas: compressed air 1-1.2Mpa, flow: 5m³/h, filtering accuracy 1 μ m;
- Casting oil: 4.5Mpa, filtering accuracy 1 μ m;
- Casting oil consumption: 200mL per one casting (determined by billet size and length)

-
- Casting water consumption: 70-350m³
 - Casting water pressure: 0.25-0.35MPa, hydrodynamic pressure ≤ 0.05 MPa
 - Inlet temperature of cooling water: 20~30°C, target temperature is 25°C
 - PH value of cooling water: 7.5-8.6, gross of dissolved solid in cooling water: 1000ppm Max.
 - Capacity of emergency cooling water tank: ≥ 150 m³
 - Pressure of emergency cooling water: 0.2~0.3Mpa
 - Casting temperature: (measured in low temperature end) according to diameter and alloy designation, from 682°C (1260°F) to 712°C (1315°F)
 - Hydrogen content in melt entered into casting table: ≤ 0.14 cc/gAl
 - Particle size of melt entered into casting table: ≤ 320 μ m
 - Depth of casting water: advice 2m, 1m min. for soft alloy; for hard alloy, below top plate but higher than debris in casting well
 - Gap between top plate and casting well: (make sure no obstructive in well before casting) advice 150mm, 75mm min.

2.3 The buyer should provide ≥ 16 T travelling crane and operation staff

2.4 Power, auxiliary materials and tools for test run, such as shovel, crowbar, etc.

2.5 lubricating oil advised by producer.

2.6 Cable from casting table to main power source.

2.7 All the infrastructure, pipe laying, embedded parts: according to producer' demands (includes cooling water circulation pool, cooling tower, water supply pump, emergency cooling water tank).

Note: buyer responses for connection point beyond; producer responses for connection point within.

2.8 The buyer shall be responsible for all transportation, board and lodging of seller's installation and commissioning men at the project site.

2.9 The buyer shall be responsible for picking up and ticketing of seller's installation and commissioning men to Iran.

Installation, commissioning, performance inspection and acceptance of equipment

1 The producer is in charge of Installation and commissioning. Buyer is in charge of performance inspection and acceptance when it is under the condition.

2 Installation and commissioning

2.1 Range

The installation range is $\Phi 7$ inch ($\Phi 177.8$ mm) oil & gas lubrication casting mold.

The commissioning contains Non-load and load commissioning

2.2 Installation and commissioning cycle

See the delivery schedule

2.3 Producer's responsibilities during installation and commissioning cycle

2.3.1 The producer should elaborate according to the requirements of contract. According to the schedule target, Network organization construction schedules which includes Installation and commissioning should be given.

2.3.2 Project manager for this item should has the feature of excellent work ability, good technology and comprehensive management ability.

2.3.3 The producer should advice work plan and scheme to buyer and supervising engineer according to contract.

2.3.4 The producer should do security work and civilized construction. Producer should take charge of damage to property and injury to person caused by producer.

2.3.5 Before delivery to buyer, producer should responses for the the finished project. After finish the whole project, producer should clean construction site.

2.3.6 The producer should not refuse any change of design proposed by buyer in validity of contract.

2.4 Buyer's responsibilities during installation and commissioning cycle

2.4.1 Buyer should provide water and electricity resource freely.

2.4.2 Before working, buyers should provide Elevation point and coordinate control point in written form to producer and ask supervising engineer join it.

2.4.3 The buyer should organize producer and design organization clarification project design and installation drawings.

2.4.4 Buyer should organize confirmation of commissioning process with producer.

2.4.5 Buyer should coordinate the producer and other construction organization.

2.5 Two months before starting installation, both sides should send a representative to response for works from installation to acceptance and note each other in form of written. Two sides work together to finish the project.

In any condition, both sides have no rights to modify contract. Once dispute occurs, two sides should negotiate friendly.

2.6 After finish installation, representatives from both sides should do non-load commissioning according to related documents.

Representatives from both sides should write the actual performance guarantee value down.

Representatives from both sides should confirm relevant clause of contract and sign Install completion certificate in 7 days. The signature of Install completion certificate is regarded as the finish day of installation and non-load commissioning. But the certificate cannot remove the responsibility of problems occur in load commissioning and quality assurance date.

2.7 After signature the certificate, buyer should organize load commissioning with both sides in site according outlines.

2.8 During load commissioning, producer have enough time to adjust the equipment. When the equipment runs excellently, the producer can write related guarantee value.

3 Performance appraisal and acceptance

3.1 Performance appraisal and acceptance is arranged during period of commissioning production. Two sides talk to confirm the starting date.

Performance appraisal and acceptance should be arranged by buyer.

3.2 Responsibility of the buyer during performance inspection and acceptance stage

3.2.1 Make sure the performance inspection and acceptance plan with producer.

3.2.2 Provide records of commissioning

3.2.3 Prepare enough data according to contract.

3.2.4 Provide manage and operation staffs.

3.2.5 Make sure that the site is safe and well-protected.

3.3 Producer's responsibilities during installation and commissioning cycle

3.3.1 Provide performance inspection and acceptance plan.

3.3.2 Realize inspection one by one according to contract.

3.3.3 People who participates in inspection should know production process and art very well and have the ability to face emergency.

3.4 Every result of inspections should be written in assessment report and sign by representatives from both sides in 3 days.

During assessment, producer have the obligation to optimize and change the equipment under condition of no harm to production.

3.5 During the assessment, if all the target are realized, then representatives from both sides should sign a acceptance certificate in 7days, in quadruplicate and each hold two copies. This certificate is regarded as the acceptance of the buyer.

If it is failed in the assessment due to the producer, producer should optimization, repair, replace or modify.

All the fees should assume by producer if the equipment should send to overseas to repair. The producer send the repaired equipment to buyer.

3.6 During the assessment, if buyer ask or it is necessary for producer to modify, thus, both sides should negotiate friendly and make sure there is no harm to quality, quantity and other values. Both sides should sign on the modified pic.

3.7 During assessment, if the equipment can not catch all the values, both sides should work together to find reasons and distinguish responsibility. And do like this.

If the producer is responsible party, buyer should give one more month for producer to modify the equipment. All the fees should take by producer. And improvement measure should have written in related document.

The unqualified items can be inspected up to three times and the interval time of every assessment is up to one month.

After three inspections, the items still cannot reach the requirement, follow the contract items.

4 During the inspection, if producer itself broke some parts, producer can borrow from buyer after conducting related formalities. The seller should carry plenty easy wear parts and special materials according to their own judgment, to ensure the smooth progress of commissioning and inspection acceptance.

5 During the inspection, the broken of the equipment due to technicity mistaken guidance from producer or the technical documents, producer should take charge of it. If it is caused by buyer, then buyer should shoulder the responsibility.

6 During the inspection, some alloy stated in contract cannot be test due to the buyer, then, this alloy or size is regarded to be passed.

7 The acceptance of the contract cannot remove the responsibility of producer during quality assurance date.

8 During execution of the contract, personnel accident injury insurance cost shall be borne by themselves.

9、Project of acceptance and method

9.1 After load commissioning, the producer and buyer do acceptance jointly. And the acceptance report shall be issued by buyer.

9.2 Inspection alloy: 6063 alloy, six continuous casts; Mold size: $\Phi 7$ inch ($\Phi 177.8$ mm)

9.3 Inspection method: according to the following data in the form.

一、Φ7inch (Φ177.8mm) ×6300mm oil & gas lubrication casting mold		
No.	Item	set value
1	tortuosity	≤1.0mm/m, totally≤4mm
2	diameter tolerance	≤D×±0.5%
3	surface segregation	6063 alloy <210μm
4	Total shell width	6063 alloy <1550μm
5	distance between secondary dendrites	6063 alloy <50μm
6	average grain size	6063 alloy <200μm
7	Surface breaking crack depth	≤1.5mm
8	Crack position	Except the top and end of 100mm, defect is not allow.
9	Grain refining additives	6063 alloy <6ppm boron
10	molten metal temperature	6063 alloy: 675-695°C
11	Cutting length of the top and end	Top: ≤D×1.0; end: ≤D×0.7
12	rate of finished products	6063 alloy: 90-95%

9.3.1 Design according to technology agreement. Manufacture and inspection according to Chinese national legal measurement unit.

9.3. 。 Design and manufacturing according to < Mechanical products precision inspection standard>.

9.3.3 The conditions of the qualified: under the good condition of casting machine and cooling water, continuously cast for 6 times with the finished products reach 90-95%.

9.3.4 The producer provides production process, parameters and materials during testing.

9.3.5 The producer provides the spare parts specifications, as well as the performance of the material parameters and parts drawings.

9.3.6 Demand that casting platform with short launder in order to meet the equipment configuration structure.

9.3.7 The quality of ingot should be in line with industrial standards. Defects such as cold lap, oxide, blowhole and impurities should not be allowed existing in the ingots.



P.O.Box:5090-DUBAI-UAE
Tel : 009714 225 31 50
Fax :009714 225 31 51
Metlineco@gmail.com

9.4 Acceptance work will do by acceptance group consisted by people from both sides. After the completion of the acceptance, both sides should jointly sign acceptance certificate.

9.5 The conditions of the qualified: continuously cast for 3 times the finished products reach 90-95%.

Hydraulic Cylinder for casting 20T

CASTING CYLINDER



Type	Single acting, internally guided		
Max stroke	6800 mm Max		
Cast length	6500mm		
Cylinder rod diameter	Ø420mm		
Angular rotation	0,1 degree max		
CASTING SPEED RANGE	20 – 180 mm/min		
MANUEL SPEED RANGE	600 mm/min max		

This is built for reliability and longevity and is designed to integrate with line of billet and rolling ingot products and the **Automated Control System**. This system is equipped with a single acting, internally guided casting cylinder, torque limiter, cylinder mounting ring and leveling wedges, a precision machined steel platen, and a hydraulic power unit. The hydraulic power unit serves the casting machine. A recirculation oil system is provided to filter the oil to 10 micron and includes a water cooled heat exchanger with thermostatic control valve. The casting machine and melting furnace have dedicated pumps and valve manifolds and in this respect are totally independent. The hydraulic cylinder is a single acting displacement type, specially designed and constructed for DC casting operation. The ram is high quality solid steel bar with nickel and hard chrome plate to a thickness of 60 micron.

The cylinder is fitted with two low friction rod seals for smooth jolt free non slip stick application. The seals are replaceable without removing the cylinder from the casting pit.

The cylinder rod is prevented from twisting by means of a key attached to the inside of the outer tube and follower attached to the rod. Repairable wear pads are incorporated to keep

maintenance costs to a minimum. The maximum angle of rotation over full stroke is limited to 0,1 degree.

To keep constant casting speed an encoder is fixed into the cylinder. The encoder and a servo valve on hydraulic power unit sets speed continuously.

Platen

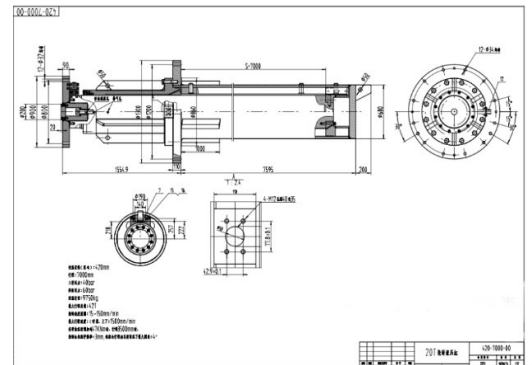
The platen is a heavy duty fully welded construction comprising of rolled steel sections with

a gridwork of reinforcing members.

The cylinder rod is bolted to the platen through a torque limiter with special shear pin to protect the internal cylinder guide in the event of a tilted billet or metal spillage jamming the platen against the casting pit wall. Interchangeable starting head base assemblies to suit the various mould configurations are mounted to the top of platen.

The overall platen weight is calculated to generate a hydraulic pressure at the start of cast sufficiently high enough to give a smooth non slip stick decent of the platen over the full casting speed range.

For corrosion protection platen surface is galvanized.



Tilting Mould Frame

The tilting mould frame provides water to the mould table and incorporates the tilting movement via two hydraulic cylinders to enable easy discharge of the billets from the casting pit. The water chambers are constructed from stainless steel for long trouble free operation. Water is fed to the frame via two rotary couplings positioned on the pivot axis which ensures symmetrical water flow to the mould table.

The mould frame pivots on bearings mounted to a structural frame which incorporates the mounting brackets for the two double acting hydraulic cylinders.

Cylinder Base

The cylinder base is a heavy duty precision machined steel plate with levelling wedges for initial installation of the cylinder.

Beneath the base there is protection tube to prevent water ingress around the cylinder.



Mould Tooling

Water distributor

The water distributor mounts to the tilting mould frame with bolted brackets. Water is fed into the water distributor via steel pipes to achieve symmetrical water flow to all the of the moulds.

The water seal between the tilting mould frame and water distributor is effected by rubber seals.

The water distributor is constructed from stainless steel.

Four guide bushes are incorporated into the water distributor to ensure correct alignment of the starting head base at the start of a cast.

The guide posts on the starting head base that protrude through the water box act as the platen height indicator gauge and are also used to unitize the starting head base to the water distributor for removal and installation of the mould tooling. The water distributor is considered to be the basic chassis of the mould tooling, the mould, oil distribution pipework, injectors, metal distributor and starting head base (via the unitize) are all attached to the water distributor by screw fixing.

Hot top mould

Advantages:

- Molds attached to the table from the top allowing simple mould maintenance while the table is horizontal.
- Simple and fast replacement of the hot top refractory rings without the need to remove the complete mould from the table.
- Improved billet surface quality.
- Improved shell structure (segregation) by correct proportion of the mold height.
- Higher casting speed yielding higher productivity and lower mould maintenance time between casts.
- More uniform filling of the moulds during starting.

Starting head base

The starting head base is a heavy duty one piece fully welded steel fabrication, comprising of a thick steel base plate to which the tubular stools (one per billet strand) are fully welded. Four hollow guide posts are incorporated for alignment of the starting head base to the water distributor which are also used for unitizing purposes.

The self centering starting heads are manufactured from aluminum alloy and mount directly to the top of the starting head base stool.

Platen height indicator gauge

To ensure the self centering starting heads are correctly located in the moulds before the start of a cast, a visual height indicator is provided on the mould table.

Anti tilt grid guard

At the end of the cast the billets are raised by a small amount to allow the billet to be lifted out of the pit.

To prevent the billets from falling against the sides of the casting machine pit an anti tilt grid guard complete with guides is incorporated into the starting head base.

Metal distributor (Basin)

The metal distributor serves to receive metal from the furnace launder and uniformly feed the metal to the individual moulds. The distributor is secured to the water distributor by screw fixings and can be easily removed for maintenance purposes.

During normal production the distributor is permanently attached to the water distributor. The metal distributor consists of a one-piece lightweight steel fabrication reinforced as necessary. The distributor is refractory lined with a light weight insulating castable which is totally non wetting to aluminum. The refractory lining is easily installed without the need for special moulds or tools.



 Filter Box

TJB1960 Foam ceramic filter box Design and Quotation



1.0 Summary

1.1 MTFB (METAL FILTER BOX) main features

- High thermal shock resistance, Low coefficient of thermal expansion. The shape is kept stable under working temperature.
- It can effectively use standard 17"40PPI filter board.
- Electric heating cover has effective heating capacity. The time to heat up to 700°C from normal temperature is not more than 2 hours and the temperature of the aluminum liquid in the filter box does not decrease in the interval of casting.
- Service life of heating elements is 2 months.
- The filter box adopts electric lifting up cover system.
- The motor uses a power supply of three-phase 380 VAC.50 Hz and the control power supply adopts single phase 220VAC.50Hz.Power of the equipment is 21KW.It has Strong anti-interference ability, suitable for on-site working.
- The lining of the filter box has excellent non-infiltration properties with aluminum. Does not stick to the aluminum after aluminum liquid flowing. Easy to clean and durable. Service life of lining is 12 months.

2.0 Terms of quotation

2.1 supply scope

2.1.1 supply scope of supplier

- One 1740 Heating filter box
- Installation foundation drawing
- Two sets of operation and maintenance manuals
- 3 days of installation guidance and operation training

2.1.2 supply scope of non-supplier

Basic preparation of equipment, foundation fixed anchor bolt and initial installation of equipment.
Preparation of circuits and pipelines.

2.2 TERMS OF QUOTATION

Quotation of Single TJB1960 Filter box (**Electrical heating**)

2.3 Date of delivery

2.4 Consumable parts and spare parts

2.4.1

Consumable parts and spare parts (Electric heating)

- **Special attention: The quantity of consumable parts and accessories can only meet the needs of equipment commissioning and trial production. Customers are requested to decide the**

purchase quantity according to the actual situation.

2.5 Quotation's term of validity

60 days after receiving the quotation.

2.6 Warranties

- Part B shall manufacture the device in accordance with the requirements of the contract after signing. Part B shall ensure that the device is confirm to the requirements in technologies and qualities of the contract which can meet Part A's stable production and long-term operation.
- Part B shall ensure the technical documents will be complete, correct and clear for the device to testing, operating and maintaining after signing the contract.
- Part B shall replace or repair the device which is damaged by Part B's technicians who provide wrong guidance or faults in technical documents, drawings and instructions which supplied by Part B between Device test and acceptance check.
- Quality assurance period of the device is 12 months. (After test and acceptance)
- It is Part B's responsibility that the device supplied by Part B has any defects or contrary to the clauses in the contract. Part B shall adjust, repair or replace the device during the quality assurance period.
- Part B shall strictly ensure the security of the device. The safety accidents made by the device itself are in responsibility of Part B if Part A strictly using the device in accordance with the process of operation provided by Part B.
- Part B has the duty to provide assistance for Part A to replacing the parts and standard components which damaged by Part A's miss operation and improper usage during quality assurance period. These expenses shall be covered by Part A. Quality assurance period do **not** postpone in this situation.

3.0 Technical terms

- The size selection of the filter board can be determined by strict scientific calculation.
- It is recommended that your factory adopt 17"*17"*2" (508*508*50mm) standard filter board, with a flow rate ranging from 15 tons per hour to 20 tons per hour.
- The filter system designed by us is a horizontal single chamber filter box, the initial head of the filter board is 250mm. The filter board with a maximum of 40PPI can be used. The lining material of filter box is MTN-200 material, the normal service life is not less than one year.

		Metal Flow Rate													
		tons/hr	2.5	5	10	15	20	25	30	35	40	45	50	55	60
		kg/min	42	83	167	250	333	417	500	583	667	750	833	917	1000
		lb/hr	5500	1100	2200	3300	4400	5500	66000	77000	88000	99000	110000	121000	132000
		lb/min	92	183	367	550	733	917	1100	1283	1467	1650	1833	2017	2200
commercial ingot & extrusion billet	Grade 10	7"	7"	12"	15"	17"	20"	20"	23"	23"	2x20"	2x20"	2x20"	2x20"	
	Grade 20	7"	7"	12"	15"	17"	20"	20"	23"	23"	2x20"	2x20"	2x20"	2x20"	
	Grade 30	7"	9"	15"	15"	17"	20"	23"	23"	2x20"	2x20"	2x20"	2x23"	2x23"	
	Grade 40	9"	9"	15"	17"	17"	20"	23"	23"	2x20"	2x20"	2x20"	2x23"	2x23"	
aerospace extrusion quality & high quality ingot (litho, foil, can stock)	Grade 30	9"	9"	15"	17"	20"	23"	2x20"	2x20"	2x20"	2x23"	2x23"	2x23"	3x20"	
	Grade 40	9"	9"	15"	17"	20"	23"	2x20"	2x20"	2x20"	2x23"	2x23"	2x23"	3x20"	
	Grade 50	9"	9"	15"	17"	20"	23"	2x20"	2x20"	2x20"	2x23"	2x23"	2x23"	3x20"	
	Grade 65	9"	12"	17"	20"	23"	23"	2x20"	2x20"	2x23"	2x23"	3x20"	3x20"	3x23"	
	Grade 80	9"	12"	17"	20"	23"	23"	2x20"	2x20"	2x23"	2x23"	3x20"	3x20"	3x23"	


- Heat insulation material of filter box adopts hard insulation board. The material has certain strength, low thermal conductivity, it has good thermal insulation effect and also has sufficient support strength. Upper cover adopts steel shell lining with high density fiber felt and automatically open by electric.
- The preheating system of the filter board adopts electric heating preheating, automatic temperature control and safe voltage, so the preheating efficiency is high.

Customers can choose filter board short flame preheater. Filter board short flame preheater (MTPH-1I) developed and produced by Shenzhen METAL Company effectively solves the problem of fast preheating of various types of filter plates and filter boxes. the surface and internal microcracks will not cause local overheating of the filter plate during the preheating process, which ensures the safe and reliable filtration accuracy of the filter board. Filter board short flame preheater (MTPH-II) is directly installed on the top cover of the filter box, and the heat cycle is formed by hot gas to achieve uniform and rapid heating. Easy to operate.

- Main performance parameters
 - Box external average temperature: $\leq 75^{\circ}\text{C}$
 - Aluminum liquid temperature in the box: $700-750^{\circ}\text{C}$
 - Max metal handling capacity 20t/hr
- Peripheral requirements
 - Power requirement: 380V 50Hz 21Kw

4.0 Operation Training

- After five days training with Part B's technicians' guidance during device test on site, Part A's technicians shall basically master the system principle ,usage, maintenance of the contract device and can operate it normally.

 Degassing system

Summary

1.1 Online DU-II Main features

- Precise control: Work station is adopted in degassing. The aluminum liquid can hold the temperature through electric heating during the operation gap. The heating system adopts immersion heating device to improve heating efficiency. The silicon carbide is used for heating component. The temperature is controlled by thyristor (silicon controlled), which has high precision and easy to use.
- Easy to operate: It adopts oblique transmission type rotor driving mechanism, which is simple and easy for operating. It reduces the complexity of the system and the maintenance cost of the equipment. At the same time, the customers' different requirements for casting quality are considered in the design of the equipment. The refined gas flow rate and rotor speed are adjustable.
- Easy to maintain: It's convenient to maintain the unit and replace the rotor. The rotatory nozzle and heater can be lifted separately to achieve maximum convenience for maintenance.

2 Terms of quota on

2.1 Supply scope

2.1.1 supply scope of supplier:

- **LDU-II: LDU-II TWO ROTORS ON-LINE DEGASSER, 1 set including:**
 - **Furnace body iron shell** 1set
 - **Furnace body refractory lining** 1set
 - **lining thermal insulation material** 1set
 - **Rotor rotating mechanism** 2sets
 - **Rotor lifting mechanism** 1set
 - **Electric cabinet** 1set
 - **Gas cabinet** 1set
 - **Heater protective sheath** 2sets
 - **Heating element** 2sets
 - **Silicon carbide rotors** 2sets
- Installation foundation drawing
- Two sets of operation and maintenance manuals
- 10 days of installation guidance and operation training.

2.1.2 supply scope of non-supplier

Basic preparation of equipment, foundation fixed anchor bolt and initial installation of equipment.
Preparation of circuits and pipelines.

2.2 Quick-wear parts and accessories

2.3 Warranties

- Part B shall manufacture the device in accordance with the requirements of the contract after signing. Part B shall ensure that the device is confirm to the requirements in technologies and qualities of the contract which can meet Part A's stable production and long-term operation.
- Part B shall ensure the technical documents will be complete, correct and clear for the device to testing, operating and maintaining after signing the contract.
- Part B shall replace or repair the device which is damaged by Part B's technicians who provide wrong guidance or faults in technical documents, drawings and instructions which supplied by Part B between Device test and acceptance check.
- Quality assurance period of the device is 12 months. (After test and acceptance)
- It is Part B's responsibility that the device supplied by Part B has any defects or contrary to the clauses in the contract. Part B shall adjust, repair or replace the device during the quality assurance period.
- Part B shall strictly ensure the security of the device. The safety accidents made by the device itself are in responsibility of Part B if Part A strictly using the device in accordance with the process of operation provided by Part B.
- Part B has the duty to provide assistance for Part A to replacing the parts and standard components which damaged by Part A's miss operation and improper usage during quality assurance period. These expenses shall be covered by Part A. Quality assurance period do **not** postpone in this situation.

1 Technical terms

1.1.1 Electric control cabinet:

- The electric control cabinet is used to control the heater to heat up the aluminum liquid, heat preservation and bake the furnace body when the furnace is empty, and the temperature can be controlled automatically by thyristor imported from Germany. The rotor control box controls the rotating speed of the rotor in order to optimize the effect of gas removal and slag removal. The rotation speed is steeples and adjustable through the frequency converter, adjustable range is 0-350rpm(Graphite rotor),0-600rpm(Silicon carbide rotor); At the same time, the safety and the reliability of the equipment are ensured through the interlocking device. And the switch of the working state and the idle state can be realized by controlling

the gas electromagnetic valve.

- Display instruments: heater current display, aluminum temperature display, rotor rotating speed display.
- Fault alarm is equipped. When failure (gas outage) happen, the device can automatically alarm and the indicator lights flicker to remind the operator, and automatically switch to the standby gas.

1.1.2 Gas control cabinet:

- The gas control box is mainly used to control the working state of the working gas. There are 3 pipelines: working inert gas pipeline, emergency gas pipeline, idling pipeline. All 3 of the pipelines are provided with pressure gauge, flow control valve and display instrument. Digital flow meter is adopted. Working gas is used for degassing, idling gas is used in casting interval, emergency gas is used when main gas supply is in fault which can not supply gas. The pressure and flow rate of all gas pipelines can be adjusted manually.

1.1.3 Degassing box body:

- The design of the degassing box takes full account of the influence on the gas removal effect, adopts the asymmetric design of the import and export. Box body is made of high strength refractory, normal service life is 18 months. The heat-insulating layer is made of hard heat-insulating material and has good heat-insulating property. The cover is made of light castable. The shell is welded with steel plate.
- Keep the inert gas micro positive pressure state in the degassing box to avoid the oxidation of metal; There is aluminum outlet in bottom of the box.

1.1.4 Immersion heater

- The immersion heater is placed in protective sheath which set up in the box and immersed in aluminum liquid. It heat and insulate aluminum liquid by conduction and convection. Aluminum liquid is not required to be discharged when device is not in working state. Control accuracy of static aluminum liquid temperature is $\leq \pm 2^{\circ}\text{C}$. Heater protective sheath is made of silicon carbide combined with silicon nitride material, normal service life is 4 to 6 months. The heating element adopts silicon carbon rod heater, the is controlled by thyristors so temperature control is more gentle, service life is more than 2 months.

1.1.5 Rotating nozzle

- The rotary nozzle designed by the results of the water simulation test. The rotary nozzle has a variety of materials for customer selection. Service life of Graphite material is 15 to 30 days, Silicon carbide is 30 to 60 days and Silicon nitride is 360 days. The rotating nozzle speed is variable speed by variable frequency speed regulating motor, and the rotating speed can be adjusted arbitrarily in 0-600rpm to meet the needs of the process.

1.1.6 Lifting mechanism

- The box cover is lifted by electric transmission through mechanical transmission, so it is convenient to clean aluminum slag in the box after long time working. The motor and heater are connected by fast joint so it can be replaced easily. motor, rotor and heater can be lifted out.

2.4 Main performance parameters

- :Heater Power

Single power 20KW Total power 40KW

- : Heating mode

immersion heating

- : Temperature control method
intelligent instrument automatic control

- : Box external average temperature $\leq 65^{\circ}\text{C}$

- Temperature of molten aluminum inside the box: $700-820^{\circ}\text{C}$

Heat preservation capacity: The aluminum liquid of the designed capacity can meet the casting process requirement after long time shutdown

- : Furnace inner capacity < 1300kg

Rotating nozzle speed adjustment range: 0-350rpm(Graphite) 0-600rpm(Silicon carbide)

Max metal handling capacity: Tow rotors 35t/hr

- Statics aluminum liquid temperature control accuracy: $\leq \pm 2^{\circ}\text{C}$

- Service life of box lining: ≥ 18 months

2.5 : Degassing efficiency

- When the inlet flow rate is not more than 35 tons/hour and the inlet hydrogen content is not more than 0.3ml/100gAl, the hydrogen content in the aluminum liquid can be reduced to below 0.15ml/100g at $700-710^{\circ}\text{C}$. When the inlet hydrogen content is more than 0.3 ml/100 grAl, the degassing efficiency is not less than 50%.

2.6 Consumption

- Work gas Ar

- Single rotor working gas maximum capacity $6\text{m}^3/\text{h}$

- Input gas pressure $4-5\text{Kg}/\text{cm}^2$

-
- Purity of the gas: , $H_2O \leq 2\text{ppm}$ $O_2 \leq 3\text{ppm}$
 - power 380V 50Hz 50kw

2.7 Degassing Project acceptance

- The supplier shall strictly produce in accordance with the design drawings confirmed by both parties, ensure adequate aluminum liquid handling capacity. In strict accordance with the provisions of the supplier operating procedures, service life of lining is more than 18 months; Heater protective sheath is made of silicon carbide combined with silicon nitride material, normal service life is 4 to 6 months, the heating element adopts silicon carbon rod heater and service life is no less than 2 months.
- When the inlet flow rate is not more than 35 tons/hour and the inlet hydrogen content is not more than 0.3ml/100gAl, the hydrogen content in the aluminum liquid can be reduced to below 0.15ml/100g at 700-710 °C. When the inlet hydrogen content is more than 0.3 ml/100 gAl, the degassing efficiency is not less than 50%. The rotating nozzle speed is variable speed by variable frequency speed regulating motor, adjustable range is 0-350rpm(Graphite) 0-600rpm(Silicon carbide)
- Chain control is adopted, which means turn on the gas first then rotating and stop rotating first and turn off the gas. At the same time, lifting mechanism can automatically stop the rotor rotation when lifting rotor or cover to prevent aluminum liquid splashing from hurting people.
- In the event of failure (gas outage and rotor failure, etc.), the device can automatically alarm, the indicator light flashes, and the buzzer beeps to remind the operator.
- The device can effectively use argon. The device can display gas pressure, flow rotor rotating speed.
- The motor uses a power supply of three-phase 380 VAC.50 Hz and the control power supply adopts single phase 220VAC.50Hz. Power of the equipment is 50KW. It has Strong anti-interference ability, suitable for on-site working.
- Box external average max temperature is $\leq 65^\circ\text{C}$
- Party A provides aluminum liquid for on-site exhaust, purity of argon $\geq 99.996\%$ or dew point $< -70^\circ\text{C}$, $H_2O + O_2 \leq 5\text{PPm}$, and enough power supply for supplier to testing the device.
- Supplier shall provides operation instruction, electric control diagram and general troubleshooting guidance.
- All drawings and process parameters provided by Party A shall not be spread out to third parties. During the equipment design of the supplier, Party A shall conduct the final design review and confirmation at the location of the supplier at appropriate time. During the equipment manufacture and installation, Party A and Party B can make changes through the Change Notice confirmed by negotiation.
- The supplier shall be responsible for its own safety during installation and commissioning. After the acceptance of the equipment, the supplier shall be responsible for the training of two qualified staff who can operation the equipment correctly and troubleshooting.
- Part B shall be responsible for free maintenance 12 months warranty after equipment acceptance. Lifetime after-sales service.

3 Operation Training

- After five days training with Part B's technicians' guidance during device test on site, Part A's technicians shall basically master the system principle ,usage, maintenance of the contract device and can operate it normally.

4 After-sale service

- **LDU-II**
- Part B shall be responsible for free maintenance 12 months warranty after equipment acceptance. Part B have the duty to ensure the maintenance of the damage which made by Part A's incorrect operation during the quality assurance period and charge suitable material and maintenance costs. Part B promise to proving lifetime maintenance service for the device and Spare parts.