***TAIYE* Machinery Equipment** 台业机械设备

**TZC2-966型双室油淬加压气冷真空炉**

**TZC2-966** Double chamber oil quenching pressurized air cooled vacuum furnace

**技 术 协 议**

Technology Agreement

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***TAIYE* Machinery Equipment Co., Ltd**

**台业机械设备有限公司**

 电话(Tel) : +8618680029835 传真(Fax) : +86-571-88567830

**1． 概述 (Overview)**

TZC2-966型真空淬火炉是兼有油冷和加压气冷功能的双室卧式真
空热处理设备。适用于高速钢、高合金钢工模具、精密轴承、油泵油
嘴偶件、液压件、气轮机及燃气轮机叶片等精密机器零件的油淬、气
淬、退火、钎焊、烧结等多种真空热处理工艺。

TZC2-966 Double chamber oil quenching pressurized air cooled vacuum furnace is double chamber horizontal vacuum heat treatment equipment with oil cooling and pressurized air cooling. Suitable for various vacuum heat treatment processes such as high-speed steel, high-alloy steel molds, precision bearings, oil pump nozzles, hydraulic parts, gas turbines and gas turbine blades, such as oil quenching, gas quenching, annealing, brazing, sintering, etc. .

该设备在结构和使用性能方面具有以下优点：

The equipment has the following advantages in terms of structure and performance

1. 1总体结构紧凑，占地面积小，耗氮气量低。

 Compact overall structure, small footprint and low nitrogen consumption

1. 2加热室和冷却室之间装有复合闸门，可以大大缩短生产辅助
时间以节约能源，热闸阀框和阀板都有水冷通道，可以保证在高温下
长期工作。密封件使用寿命长。

 A composite gate is installed between the heating chamber and the cooling chamber, which can greatly shorten the production auxiliary time to save energy. The hot gate valve frame and the valve plate have water cooling channels, which can ensure long-term operation at high temperatures. Long seal life.

1.3加热室的发热元件，布置合理，炉温均匀性好，升温迅速，
使用寿命长。

 The heating element of the heating chamber is arranged reasonably, the furnace temperature is uniform, the temperature rises rapidly, and the service life is long.

1.4送料机构采用升降式结构，不入油，冷却室短，节约回充气
体用量，降低生产成本。

 The feeding mechanism adopts a lifting structure, which does not enter the oil, and the cooling chamber is short, which saves the amount of the inflated body and reduces the production cost.

1.5配备了快速充气系统，工件淬火时冷却室的压力由工作真空
度充至2 X 105Pa仅需数秒钟。

 Equipped with a fast inflation system, the pressure in the cooling chamber is quenched by the working vacuum to 2 X 105Pa in just a few seconds.

1.6设备上配备有油加热器及强力搅拌装置，可以实现热油淬火。
并装有性能较好的风冷系统，气淬效果良好。

 The equipment is equipped with an oil heater and a powerful agitation device to achieve hot oil quenching. And equipped with air cooling system with good performance, good gas quenching effect.

1.7电控系统采用微机进行程序控制，可靠性强，自动化程度较
高。温度控制采用智能化仪表控温精度高。

 The electronic control system adopts a microcomputer to perform program control with high reliability and high degree of automation. Temperature control adopts intelligent instrument with high temperature control precision

1. **主要技术参数及规格**

 **Main technical parameters and specifications**

|  |  |
| --- | --- |
| 有效加热区尺寸（mm）Effective heating zone size | （L）900×600（W）×600（H） |
| 额定装炉量Rated load | 500kg （包括料筐，夹具 Including baskets, fixtures） |
| 最高温度Maximum temperature |  1320℃ |
| 炉温均匀性（℃） Furnace temperature uniformity |  ≤±5 (空炉、1000°C、九点测温)( Empty furnace, 1000°C, Nine-point temperature measurement) |
| 极限真空度（Pa）Ultimate vacuum | 4×10-1 (空炉,经烘炉净化处理后）(Empty furnace, after purification by oven) |
| 压升率（Pa/h）Pressure rise rate | ≤6. 5×10ˉ1Pa /h |
| 加热功率heating power | 130Kw |
| 风机功率Fan power | 22Kw |
| 气冷压强Air-cooled pressure | ≤0.2MPa(2×105Pa) |
| 适用介质Applicable medium | 氮气 Nitrogen |
| 总安装功率Total installed power | ≤145Kw |
| 耗水量（m3 /h）Water Consumption | 40 |
| 工件转移时间Workpiece transfer time | ≤25s　 |

1. **标准结构及组成**

 **Standard structure and composition**

 TZC2-755型真空炉是由主机、真空系统、加压气淬系统，电控加热系统、回充气体系统、气动系统、水冷却系统和炉外料车等组成的。

 TZC2-755 The vacuum furnace is composed of a main engine, a vacuum system, a pressurized gas quenching system, an electronically controlled heating system, a regenerative gas system, a pneumatic system, a water cooling system, and an external furnace.

3．1真空炉主机

 Vacuum oven host

 真空炉主机为卧式双室结构，由炉体、炉盖、加热室、油淬火室、淬火风机，换热导流，真空隔热闸门、工件传送机构以及水冷电极、安全装置等附件所组成。

 The main body of the vacuum furnace is a horizontal double-chamber structure consisting of a furnace body, a furnace cover, a heating chamber, an oil quenching chamber, a quenching fan, a heat transfer diversion, a vacuum insulation gate, a workpiece conveying mechanism, a water-cooled electrode, and a safety device.

3.1.1炉体和炉盖为双壁水冷结构，内外壁均为碳素钢制造。加热室炉体和淬火室炉体设计制造成整体式结构，减少了密封面，有利于真空的获得和维持。淬火室炉体与炉盖之间的密封采用双向锁圈式密封结构，保证了正反压两个方向的密封，操作简单，安全可靠。

 The furnace body and the furnace cover are double-walled water-cooled structure, and the inner and outer walls are made of carbon steel. The heating chamber furnace body and the quenching chamber body are designed and manufactured into a monolithic structure, which reduces the sealing surface and facilitates the acquisition and maintenance of the vacuum. The seal between the quenching chamber body and the furnace cover adopts a two-way lock ring sealing structure to ensure the sealing in both directions of forward and reverse pressure, and the operation is simple, safe and reliable.

3.1.2加热室由隔热层、加热器、料台等部分组成。

 隔热层为多层石墨毡与高温陶瓷毡组成的。

 加热器由石墨管、石墨连接板，石墨螺母、高铝绝缘子等组成。石墨加热管沿隔热层均布，可保证长期使用不变形、寿命长、加热均匀。

 料台由石墨炉床、石墨支柱和炉床上镶嵌的陶瓷隔条组成的。

 The heating chamber is composed of a heat insulating layer, a heater, a material table and the like.

The insulation layer is composed of a multi-layer graphite felt and a high-temperature ceramic felt.

The heater consists of graphite tube, graphite connecting plate, graphite nut, high aluminum insulator, etc.

The graphite heating tube is evenly distributed along the heat insulation layer to ensure long-term use without deformation, long life and uniform heating.

The table is composed of a graphite hearth, a graphite pillar and ceramic spacers embedded in the hearth.

3.1.3油淬室由双壁水冷淬火油槽、淬火油循环装置和油加热器组成的。

 油循环装置由油循环泵及真空阀门等组成，经分配板喷射，淬火油均匀柔性流动，因此该装置的故障率低，工件变形小，对工件快速均匀淬火提供了良好的条件。

 加压气淬是由高速风机，大面积换热器，气流分配系统组成，该系统淬火介质270度经工件快速循环，具有冷速快，淬火均匀的功能。

 油加温器由电加热管组成，通过加热管对油进行加热，以使油温达到最佳淬火温度。

 The oil quenching chamber is composed of a double-walled water-cooled quenching oil tank, a quenching oil circulation device and an oil heater.

The oil circulation device is composed of an oil circulation pump and a vacuum valve. The quenching oil is uniformly and flexiblely flowed through the distribution plate. Therefore, the failure rate of the device is low, the deformation of the workpiece is small, and the workpiece is provided with good conditions for rapid and uniform quenching.

Pressurized gas quenching is composed of high-speed fan, large-area heat exchanger and air distribution system. The quenching medium of the system is circulated 270 degrees quickly through the workpiece, and has the functions of fast cooling speed and uniform quenching.

The oil warmer is composed of an electric heating tube, and the oil is heated by a heating tube to achieve an optimum quenching temperature of the oil.

3.1.4真空隔热阀门设在加热室与油淬室之间，该阀由阀体、隔热层、四连杆机构、气缸、导向轨和减震装置等组成。

 The vacuum insulation valve is arranged between the heating chamber and the oil quenching chamber, and the valve is composed of a valve body, a heat insulation layer, a four-bar linkage mechanism, a cylinder, a guide rail and a damping device.

3.1.5油淬室工件传送机构由水平送取料机构与油淬火升降机构组成的。

 a.升降机构由双速电机减速器带动，链轮链条转动，带动升降台升降完成工件油淬火升降。[该结构升降双向传动，彻底解决丝杠老结构淬火料车卡住现象]

 b.水平送取料机构由电机、减速器带动链条，使工件车前进后退完成工件进出加热室。

该炉整套工件传送机构的结构简单合理，各零部件精密加工，所以故障率低、操作维修简单。

c.设备进取料完全可以通过摄像头监视。确保了工件车的运行位置。

The workpiece transfer mechanism of the oil quenching chamber is composed of a horizontal feeding mechanism and an oil quenching lifting mechanism.

a. The lifting mechanism is driven by the two-speed motor reducer, and the chain of the sprocket rotates to drive the lifting platform to complete the quenching and lifting of the workpiece oil. [The structure lifts two-way transmission, completely solves the stuck phenomenon of the old structure quenching material of the lead screw]

b. The horizontal feeding and retracting mechanism drives the chain by the motor and the reducer, so that the workpiece car advances and retreats to complete the workpiece entering and leaving the heating chamber. The structure of the whole set of workpiece conveying mechanism of the furnace is simple and reasonable, and the parts are precisely processed, so the failure rate is low and the operation and maintenance are simple.

c. Equipment intake and feed can be monitored by the camera. The operating position of the workpiece car is ensured.

3．2真空系统

真空系统由真空机组及真空测量组成。

a.真空机组；由zJ-1200罗茨泵、H-150滑阀泵和高真空挡板阀，真空波纹管组成的两级泵组。

 b.真空测量由数显电阻真空计、真空测量传感器组成的真空测量系统。并带有真空节点的设定。

 Vacuum system

The vacuum system consists of a vacuum unit and vacuum measurement.

a. Vacuum unit; a two-stage pump set consisting of a zJ-1200 Roots pump, an H-150 spool valve pump, a high vacuum flapper valve, and a vacuum bellows.

b. Vacuum measurement A vacuum measurement system consisting of a digital resistance vacuum gauge and a vacuum measurement sensor. And with the settings of the vacuum node.

3．3回充气体系统

 充气系统由大通径快充阀、微调阀、手动开关、高真空电磁阀、管路等组成。可实现快速回充气体，同时也可对炉内真空度进行调节与控制。该系统可实现；加热时炉内的分压控制；冷却时炉内的压强控制。

 Inflated body system

The inflation system consists of a large-diameter quick-charge valve, a trimmer valve, a manual switch, a high-vacuum solenoid valve, and a pipeline. It can realize fast returning to the inflatable body, and can also adjust and control the vacuum degree in the furnace. The system can realize the partial pressure control in the furnace during heating and the pressure control in the furnace during cooling.

3.4电气控制系统：该系统由调压器、可控硅和温度可编程序控制器组成的温度可编程序控制和由PLC组成的机械动作可编程序控制。

控制显示采用彩色显示触摸屏操作，可直观显示设备运行过程中的工艺曲线及操作界面。

设备的工艺曲线（温度和真空度等）可通过U盘转移到电脑，以报表和曲线的形式打印需要的时间段工艺。具有曲线、棒图、数字、总览、历史曲线等多种显示方式。

通过外部U盘使数据得到双重保护，通过PC软件，对保存到U盘的数据进行处理、打印和转换成用户所需的格。

并具有断水 超温 过流 及误操作等声光报警和连锁保护功能，操作方便，控制精度高

可直观显示设备工况及数据记录，并装有断水、超温、过流及误操作等声光报警和联锁保护功能，操作方便，控制精度高，可靠性好。

Electrical control system: The system is controlled by temperature programmable control consisting of voltage regulator, thyristor and temperature programmable controller and mechanical action consisting of PLC.

The control display uses a color display touch screen operation to visually display the process curve and operation interface during the operation of the device.

The process curve of the equipment (temperature and vacuum, etc.) can be transferred to the computer via a USB flash drive to print the required time period process in the form of reports and curves. It has various display modes such as curves, bar graphs, numbers, overviews, and historical curves.

The data is double protected by an external USB flash drive, and the data saved to the USB flash drive is processed, printed, and converted into a user-required grid by the PC software.

It has sound and light alarm and interlock protection functions such as water cut, over-temperature, over-current and misoperation. It is easy to operate and has high control precision.

It can visually display equipment working conditions and data records, and is equipped with sound and light alarm and interlock protection functions such as water cut, over temperature, over current and misoperation. It is easy to operate, with high control precision and good reliability.

3,4,1采用Fp23智能化温度控制仪（日本岛电）控温精度±0.1级，可存储20条工艺曲线，每条曲线20步带10组PID输出调节，并有PID参数自整定功能。

 Using Fp23 intelligent temperature controller (Japan Island Power) temperature control accuracy ± 0.1 level, can store 20 process curves, each curve 20 steps with 10 sets of PID output adjustment, and PID parameter self-tuning function.

3.4.2采用CP1H可编程程序控制器（欧姆龙），实现操作过程自动化。

 Automate operation with CP1H programmable program controller (OMRON)

3.4.3采用大电流.低电压供电方式，使用晶闸管调压器与智能控温仪表配合，可实现温度的连续调节。

 Adopting high current and low voltage power supply mode, using thyristor voltage regulator and intelligent temperature control instrument to achieve continuous temperature adjustment

3.4.4测温元件采用双只“S”偶，一芯用于控温，一芯用于记录和报警并可作为测温备用偶。

 The temperature measuring component adopts two "S" couples, one core is used for temperature control, and one core is used for recording and alarming and can be used as a temperature measuring spare coupler.

3.4.5控制柜设有大型触摸显示器，可直观显示设备工作状态，并可通过有关按钮进行手动操作。

 The control cabinet features a large touch display that visually displays the operating status of the unit and can be manually operated via the relevant buttons

3.4.6为直观显示操作流程，方便观察冷室操作情况，观察灯采用高清红外线摄像，在控制柜带有高清显示屏，方便操作。杜绝内置灯低压静电打火隐患，有效提高安全操作系数。

 In order to visually display the operation flow, it is convenient to observe the operation of the cold room. The observation lamp adopts high-definition infrared camera, and the control cabinet has a high-definition display for convenient operation. Eliminate the hidden danger of low-voltage static ignition of the built-in lamp and effectively improve the safe operating coefficient.

3.5气动系统

由压力启动器，油雾器，油水分离器，换向阀，气缸，管路等组成，管路走向明朗，整洁，美观。

 Pneumatic system

It consists of pressure starter, oil mister, oil-water separator, reversing valve, cylinder, pipeline, etc. The pipeline is clear, neat and beautiful.

3.6水冷却系统

水冷却系统根据客户，现场情况可分为开放式和密闭循环式。由不锈钢截止阀，不锈钢水箱，厚壁管路，电接点压力表，水流量报警器等组成。

Water cooling system

The water cooling system can be divided into open and closed circulation according to the customer's situation. It consists of stainless steel globe valve, stainless steel water tank, thick-walled pipeline, electric contact pressure gauge and water flow alarm.

3.7炉外料车

炉外料车采用重型材料焊接加工成型，可收集工件落下的淬火油，配料车

固定装置，进出料安全，准确。

Furnace truck

The furnace outside the car is made of heavy-duty material welding, which can collect the quenching oil falling from the workpiece, the batching car, the fixing device, and the feeding and discharging are safe and accurate.

**4. 主要配置**

Main configuration

|  |  |
| --- | --- |
| 触摸屏touch screen | （昆仑通态10寸）(Kunlun 10 inches screen) |
| FP23智能化控温仪FP23 intelligent temperature controller | （日本岛电）(Japan Island Power) |
| CP1H可编程控制器CP1H programmable controller | （日本欧姆龙）(Japan Omron) |
| 数显真空计Digital vacuum gauge | （成都正华）(Chengdu Zhenghua) |
| KTF1调压器KTF1 regulator | （江阴东技电子）(Jiangyin Dongji Electronics) |
| 气动执行件Pneumatic actuator | （台湾亚德客 ）(Taiwan Ya Deke) |
| ZJ-1200罗茨泵 ZJ-1200 Roots pump | (四川南光)(Sichuan Nanguang) |
| H-150滑阀泵H-150 slide valve pump | (四川南光)(Sichuan Nanguang) |

**6 成套供应范围**

 Complete supply range

|  |
| --- |
| 设备配置 (Device Configuration) |
| 真空炉主体Vacuum furnace body | 1 Set |
| 真空机组 Vacuum unit | 1 Set |
| 电控柜Electric control cabinet | 1 Set |
| 变压器transformer | 1 Set |
| 料框Material frame | 1 Pcs |
| 炉外料车Furnace truck | 1 Set |
| 备件及工具Spare parts and tools |
| 密封件Seals | 1 Set |
| 石墨件Graphite parts | 1 Set |
| 绝缘件Insulation | 1 Set |
| 规管随机工具Regulatory random tool | 1 Set |
| 随机文件 random document |
| 设备使用说明书Equipment instruction manual | 2 Set |
| 平面布置基础图 Plane layout base map | 2 Set |
| 电气原理接线图Electrical principle wiring diagram | 2 Set |
| 真空 充气系统图Vacuum inflation system diagram | 2 Set |
| 气动 水路系统图Pneumatic water system diagram | 2 Set |
| 易损件图 Consumable parts diagram | 2 Set |
| 主要配套说明书Main supporting instructions | 1 Set |
| 产品合格证Product certification | 2 Set |

**7．安装 (Installing)**

7.1参照图纸提供的炉子各部位和土建条件，选好设备永久安装地点并进行土建施工。安装地点应无烟尘污染、环境清洁、空气干燥、地面平整光洁，保持室温在10～30℃。

7.2安装石墨制元件时，要极为小心，要可靠地拧紧螺栓，以达到良好的电接触，不要用力太大，避免螺纹断扣。

7.3按真空系统图将真空机组定位、组装并与炉体连接，装配时应将密封圈涂上一层薄薄的真空脂，均匀地拧紧法兰。

7.4按水冷系统图将进水管、排水管分别接到炉子的进、排水口。提供压强为

0.15～0.25MPa，温度为15～ 25℃ ，经过软化处理的水源。建议采用软水封闭循环冷却系统。

7.5提供压强最小为0.5MPa气动气源，在炉子操作的全过程中必须保持充足的气源，可用工业氮气或压缩空气。如无压缩空气，建议备一台产量为0.6m3/min的空气压缩机。

7.6按回充气体系统图将管路接至炉子充气口和放气口，并建议提供纯度为99.999%的高纯氮气为回充气体。

7.7按电气接线图把电源接到相应的电接点上，校核电源电压，连接控制箱、晶闸管调压器和炉体间的电线电缆。

7.8安装其余零部件：包括导管、仪器仪表等。

7.9炉体、控制箱均接地，接地电阻≤4Ω，仪表和真空继电器的规管电缆也要接地。

7.1 Refer to the various parts of the furnace and the civil construction conditions provided in the drawings, select the permanent installation location of the equipment and carry out civil construction. The installation site should be smoke-free dust, clean environment, dry air, and the floor should be smooth and clean, and keep the room temperature at 10~30 °C.

7.2 When installing graphite components, be extremely careful, and tighten the bolts reliably to achieve good electrical contact. Do not use too much force to avoid thread breakage.

7.3 According to the vacuum system diagram, the vacuum unit is positioned, assembled and connected to the furnace body. When assembling, the sealing ring should be coated with a thin layer of vacuum grease to evenly tighten the flange.

7.4 According to the water cooling system diagram, connect the inlet pipe and the drain pipe to the inlet and outlet of the furnace. Provide pressure for

0.15 ~ 0.25MPa, the temperature is 15 ~ 25 ° C, the softened water source. A soft water closed loop cooling system is recommended.

7.5 Provide a pneumatic air source with a minimum pressure of 0.5 MPa. In the whole process of furnace operation, sufficient air source must be maintained, and industrial nitrogen or compressed air can be used. If there is no compressed air, it is recommended to have an air compressor with a production of 0.6m3/min.

7.6 Press the back of the inflatable system diagram to connect the pipeline to the furnace inlet and outlet, and it is recommended to provide high purity nitrogen with a purity of 99.999%.

7.7 According to the electrical wiring diagram, connect the power supply to the corresponding electrical contact, check the power supply voltage, and connect the wire and cable between the control box, the thyristor regulator and the furnace body.

7.8 Install the remaining components: including conduits, instrumentation, etc.

7.9 The furnace body and control box are grounded, the grounding resistance is ≤ 4Ω, and the regulation cable of the instrument and vacuum relay should also be grounded.

**8． 调试与验收**

 **Commissioning and acceptance**

 全套设备按技术要求安装完毕后，无缺件并有良好的接地时，即可按下列项目进行调试验收：

8.1 检查项目

8.1.1外观质量检查：外表面应平整无严重压坑和机械碰伤。

8.1.2技术文件检查：真空炉质量合格证、技术说明书、主要配套件说明书、合格证的检查，如真空机组、调压器、温控仪表、记录仪、真空计等。

8.2 冷炉调试

8.2.1机械、电气联动调试、机械程序动作协调平稳，准确可靠。

8.2.2安装炉量要求进行联动试验，应无异常现象。

8.2.3油泵转动灵活，无反转现象。

8.2.4报警系统调试，准确无误，安装可靠。

8.2.5加热之前测量绝缘电阻≥20KΩ。

8.3 热调试

8.3.1烘炉，在炉子真空度不低于13.3Pa的情况下，通电烘炉，在炉温缓慢升至1300℃的整个过程中，炉子真空度不应低于13.3Pa，经过充分烘烤除气后，压升率达到技术要求值即可。

8.3.2极限真空度测量，应达到技术要求值。

8.3.3工作真空度测量，应达到技术要求值。

8.3.4压升率测量（整体）：在炉子加热至1200℃经过充分烘烤除气后，炉温冷却至100℃以下时再测压升率值。应达到技术要求值。

8.3.5回充气体调试：当气冷室真空度为6.67Pa时关闭真空隔热门、气冷室阀门，并立即向冷室充入氮气至0.8bar，并且加热室的真空度不低于133Pa，冷室不应有泄漏。

8.4附注

 全部试验和测定项目均应在油槽中没有加入真空淬火油的条件下进行。

After the complete set of equipment is installed according to the technical requirements, if there is no missing parts and there is good grounding, the test can be carried out according to the following items:

8.1 Inspection items

8.1.1 Appearance quality inspection: The outer surface should be flat without serious craters and mechanical bumps.

8.1.2 Technical document inspection: vacuum furnace quality certificate, technical specification, main accessory instructions, certificate of inspection, such as vacuum unit, pressure regulator, temperature control instrument, recorder, vacuum gauge, etc.

8.2 Cold furnace commissioning

8.2.1 Mechanical and electrical linkage debugging, mechanical program movement coordination, smooth, accurate and reliable.

8.2.2 Installation requirements The linkage test shall be carried out without any abnormality.

8.2.3 The oil pump is flexible and has no reversal.

8.2.4 Alarm system debugging, accurate and reliable installation.

8.2.5 Measure the insulation resistance ≥ 20KΩ before heating.

8.3 Thermal Commissioning

8.3.1 Oven, in the case that the vacuum degree of the furnace is not lower than 13.3Pa, the oven is energized. During the whole process of slowly increasing the temperature of the furnace to 1300 °C, the vacuum of the furnace should not be lower than 13.3Pa, and fully baked. After degassing, the pressure rise rate can reach the technical requirement value.

8.3.2 The ultimate vacuum measurement shall meet the technical requirements.

8.3.3 Working vacuum measurement should meet the technical requirements.

8.3.4 Measurement of pressure rise rate (whole): After the furnace is heated to 1200 ° C and fully baked and degassed, the pressure rise rate is measured when the furnace temperature is cooled to below 100 ° C. The technical requirements should be met.

8.3.5 Inverter body debugging: When the air cooling chamber vacuum degree is 6.67Pa, close the vacuum heat insulation door and the air cooling chamber valve, and immediately fill the cold chamber with nitrogen gas to 0.8 bar, and the heating chamber vacuum degree is not lower than 133Pa. There should be no leakage in the cold room.

8.4 Notes

All tests and determinations should be carried out in the oil tank without the addition of vacuum quenching oil.

1. 费用

 Cost

设备价格总计（RMB）： 陆拾万元整 ￥：600000元

付款方式：预付30%，余款发货前付清。

注：此价格含税，含运费(国内)，不含真空淬火油。

Total equipment price (RMB): 93000 （USD）

Payment method: 30% prepayment, balance payment before delivery

Note: This price includes tax, including shipping (domestic), does not contain vacuum quenching oil.

