Reference No: 20250702C

DS-WC300S Centerless Lathe

Technology Solution

Issued by : Shandong Desheng Robot Co., ltd

Date: July 3, 2025

一、The Introduction of The Machine

The "DS-WC" series centerless lathe produced by our company is based on absorbing and digesting foreign advanced technology, combined with the specific situation of domestic enterprises, bold innovation, research and development of high-tech equipment with independent intellectual property rights. Technology has reached the domestic advanced level, and efficiency exceeds the conventional process several times. Reliable performance, high quality and low price.

The products are suitable for processing all kinds of metal materials, such as structural steel, alloy steel, spring steel, bearing steel, tool steel and other ferrous metal materials, Copper and copper alloy, aluminum and aluminum alloy, magnesium alloy, titanium and titanium alloy and other non-ferrous metal materials.

DS-WC series centerless lathe is an efficient special lathe for cylindrical roughing and finishing slender shafts and other bar materials. Not only can we quickly remove the bar decarburization layer, cracks and other defects, but also can achieve high accuracy, especially suitable for processing super long, large processing allowance bar.

The design, manufacture and inspection standards and basis of the equipment:

GB/T9061-2006 Metal cutting machine general technical conditions

GB191-90 packaging storage and transportation icon mark

General technical requirements for GB307-84 rolling bearings

GB699-88 high quality carbon structural steel technical conditions

GB700-88 carbon structural steel

The basic form and size of welding groove of GB985-88 gas welding, manual arc welding and gas shielded welding

GB1591-88 low alloy structural steel

GB5117-85 carbon steel welding rod

GB5118-85 low alloy steel electrode

GB8923-88 Rust grade and rust removal grade of steel surface before painting

GB11345-89 steel welding seam manual ultrasonic inspection classification and inspection result classification

GB11352-89 Cast carbon steel parts for general engineering

GB/T13306-91 signage

GB/T13384-92 General technical conditions for packaging of mechanical and electrical products

二、Main Technical Parameters

2.1 Equipment parameters (Table 1) for DS-WC300S

No	Items	Specification
Raw Materials		
1	Turning Dia Range	Φ95~Φ305 mm
2	Turning Length Range	4400~ unlimited
3	Tensile strength	≤1300 Mpa
4	Surface hardness	≤HB400
5	Curvature (mm/m)	≤2mm/m or 6mm/ full length
6	Diameter tolerance	Diameter difference within ±2.5mm
7	Roundness	≤ 50% of the diameter tolerance
8	Surface roughness (Ra)	≤25 ~ 50 um
Finished Products		
1	Diameter Range	Φ90 ~ 300 mm
2	Single Side Cutting Depth	1 ~ 5 mm
3	Diameter Tolerance	within ±0.05mm for full length
4	Surface roughness (Ra)	≤3.2μm
5	Roundness (mm)	≤0.03 mm
6	Coaxially (mm)	≤0.5 (reserve 1–2 mm for centering and finish turning if high precision is required.)
7	Turning speed (stepless speed m/min)	0.05~2.0m/min (continuous chip, high strength, high hardness material must be slowed down)
8	Cutter speed (stepless) (r/min)	0 ~ 450 r/min
9	Main motor (kW)	200 Kw (special motor for servo spindle)
10	Clamping motor (kW)	1x6 units (servo)
11	Pull out motor power (kW)	1x4 units (servo)
12	Main Engine Dimensions	6.8 mm x2.7mm X3.0 mm
13	Auxiliary Equipment Dimension	According to customer requirement
14	Main Engine Weight	42 Tons
15	General Power (kW)	266

Note 1: The smaller the curvature of the raw materials, the better, so as to better ensure the accuracy of the finished product, the efficiency and life of the equipment. If the straightness of the raw material is large, it must be straightened before turning, otherwise it will seriously affect the accuracy of the finished product, the efficiency and life of the equipment. If the head of the raw material has serious flash, flat head and bending, the flat head and bending part and the flash chamfering must be cut out before turning. The bending degree of the finished material will increase when the diameter is less than 30.

2.2 Production planning requirements (Table 2)

Material length	Raw Materials Dia	Finished Product Dia	Speed	Processing time
13.5 m	272.6	264.3	0.1 m/min	90min
13.5 m	119.8	112.7	0.6 m/min	22.5 min

Note: The above table is for reference only, because there are many capacity constraints, such as: turning amount, material hardness, raw material straightness, ellipticity, etc., can not give an accurate capacity budget.

2.3 Equipment Storage and Operating Conditions

This equipment is designed for indoor use. The microclimatic conditions listed in Table 3 should be considered during the design process.

Items	Value
Storage temperature of mechanical, electrical, and hydraulic equipment, °C	> 0 / < 40
Temperature within the production area, °C	> 5 / < 40
Relative humidity, %	> 10 / < 90

2.4 Energy Medium Characteristics

Power supply condition: power supply voltage 380±10%V, frequency 50±0.2Hz,AC

Table 4_ Compressed air supply conditions

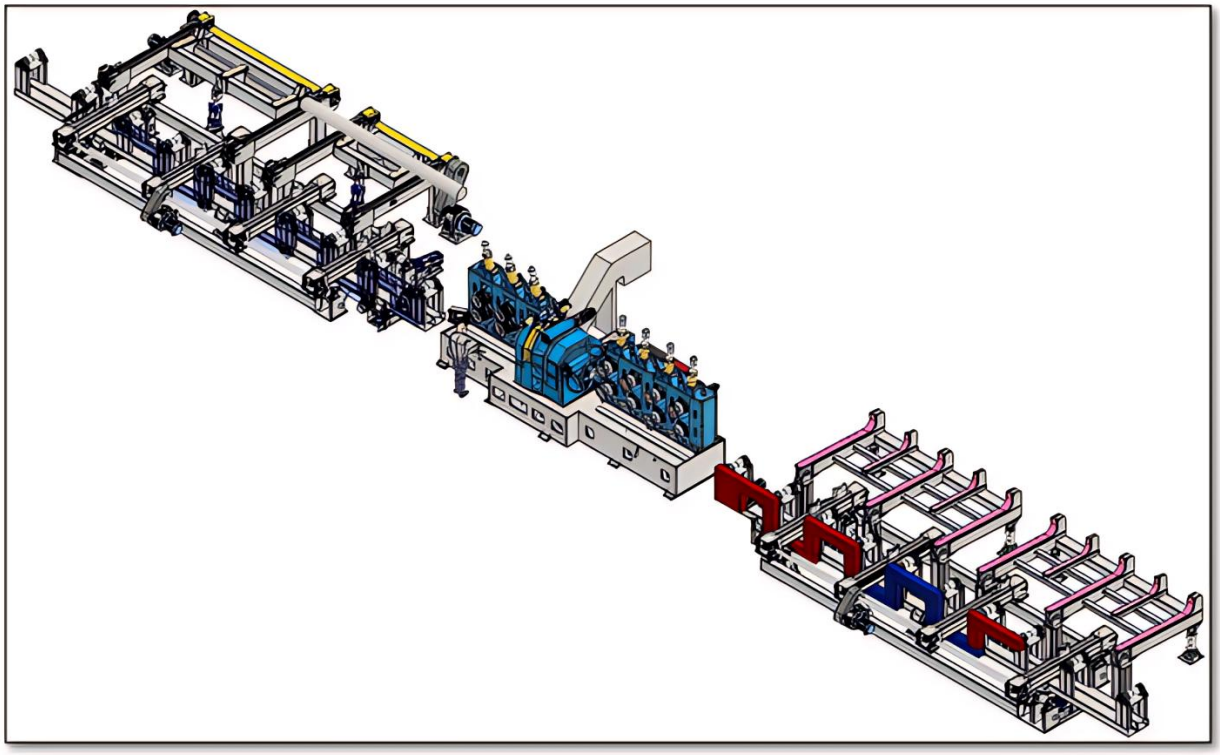
Parameters of the compressed air in the workshop at the connection point (not less than the following standards)	
Centralized system pressure, MPa	0.6
Compressed air dew point temperature, ºC	-40
Oil concentration, mg/m3	< 0.01
Maximum amount of suspended particulate matter, mg/m3;	1
Maximum diameter of suspended particles, μm	1

三、Equipment Structure And Description

3.1. Equipment Composition

No	Item	Unit	Qty
1	Main Engine	Set	1
2	Emulsion Cooling System	Set	1
3	Chips Conveyor	Set	1
	Hydraulic System	Set	1
4	Electrical & Control System	Set	1

5	Loading Bench	Set	1
6	Loading Roller Conveyor	Set	1
7	Unloading Bench	Set	1
8	Unloading Roller Conveyer	Set	1



3.2 Equipment Function Description

3.2.1 Main Machine

The main engine primarily comprises the bed, spindle, oil-air lubrication system, front feeding unit, rear pull-out unit, front/middle/rear guiding assemblies, and the main drive system.

The spindle is driven by a direct-coupled gearbox from the main drive, rotating a cutter head equipped with four simultaneously adjustable tools. This enables high-speed, high-precision cutting. The bar stock is fed linearly by the front feeding unit. The front guide assembly performs initial centering of the bar, after which the cutter head commences the cutting operation. The machined bar then passes through the middle and rear guide assemblies for further centering and stabilization.

As the machining approaches the tail end of the bar, the discharge clamping unit automatically grips the bar and, in synchronization with the front feeding unit, pulls it out. The rear pull-out rollers then transfer the finished bar to the discharge roller conveyor, ensuring high-speed processing with no surface indentation.

To facilitate tool head replacement and maintenance, the front guide adopts an integrated hydraulic flip-type clamping structure.

The oil-air lubrication system is specifically designed to ensure effective lubrication of high-speed rotating components. It provides a reliable and economical solution for high-speed bearing lubrication. Only Great Wall brand (or equivalent or higher-grade) mechanical oil or anti-wear hydraulic oil shall be used: No. 68 in summer and No. 46 in winter. The use of recycled or previously used oil is strictly prohibited.

3.2.2 Emulsion Cooling System

The emulsion cooling system primarily consists of a circulation pump, piping, spray nozzles, and a magnetic mechanical coolant filtration unit (no additional filtration device is required).

The circulation pump delivers the cooled emulsion from the reservoir through the piping to the spray nozzles located near the cutter head. The emulsion is sprayed directly onto the cutting edge and chips, effectively removing the majority of the cutting heat. The fluid, along with the chips, then falls into the chip discharge port located beneath the cutter head. From there, it flows through the piping into a sedimentation tank, where all impurities are settled out before the emulsion returns to the reservoir for recooling and reuse.

3.2.3 Chain-plate Chips Conveyor

The chain plate chip conveyor serves as a critical auxiliary system for efficient removal of machining chips. During the cutting process, chips fall through the discharge port located beneath the cutter head onto the conveyor’s chain plates. Driven by the transmission system, the chips are transported to the chip collection cart for centralized collection and disposal.

3.2.4 Hydraulic System

The hydraulic system is primarily composed of a pump motor unit, various control valves, a hydraulic oil tank, and hydraulic piping. Hydraulic cylinders integrated into the front and rear feeding units enable the clamping and releasing of the bar stock, ensuring stable operation and automated control throughout the machining process.

3.2.5 Electrical Control System

3.2.5.1 System Configuration

The electrical system comprises a power supply and a control system based on **SIEMENS S7-1500**. It includes one main power distribution cabinet, one pendant control cabinet, and two remote I/O stations,

all interconnected via **Profinet**. The system provides centralized control for the main drive, front and rear feeding systems, cooling system, hydraulic system, chip conveyor, and auxiliary equipment.

3.2.5.2 Network Integration

An Ethernet-based communication network is provided, with reserved Ethernet ports to support future system expansion and seamless integration with the user's automation infrastructure.

3.2.5.3 Drive and Control Modes

The main drive and auxiliary loading/unloading roller tables adopt **variable frequency stepless speed control**, while the front and rear feeding systems utilize **servo-driven stepless speed control**. The control system supports both **automatic and manual modes**, enabling precise control of roller table movement (forward/reverse) and lifting/lowering operations.

3.2.5.4 Cabinet Design and Environmental Control

The enclosed electrical cabinets are equipped with a **microclimate control system** (ventilation and fans). All supplied distribution cabinets, control panels, and junction boxes (including those for motors) are fitted with **cable glands (compression-type)** and support continuous routing through **metal flexible conduits** installed in pre-defined openings.

3.2.5.5 Software and Parameter Configuration

The system is delivered with the complete **PLC program** and **inverter parameter settings** for commissioning, operation, and maintenance.

3.2.6 Loading And Unloading Device

The loading system is equipped with a roller conveyor platform featuring a lifting mechanism, enabling smooth and accurate positioning of the workpieces. The unloading system utilizes a cushioned U-shaped trough, with all contact surfaces protected to prevent scratching or deformation. Both the loading and unloading frames are fitted with hydraulic lifting devices to ensure stable and reliable height adjustment. The roller conveyors for loading and unloading are electrically adjustable to align precisely with the center height of the main engine, facilitating seamless automation.

3.2.7 Dry Oiling System

The dry lubrication system is designed to lubricate bearings and the contact surfaces of various moving components in mechanical equipment, ensuring operational reliability and extended service life.

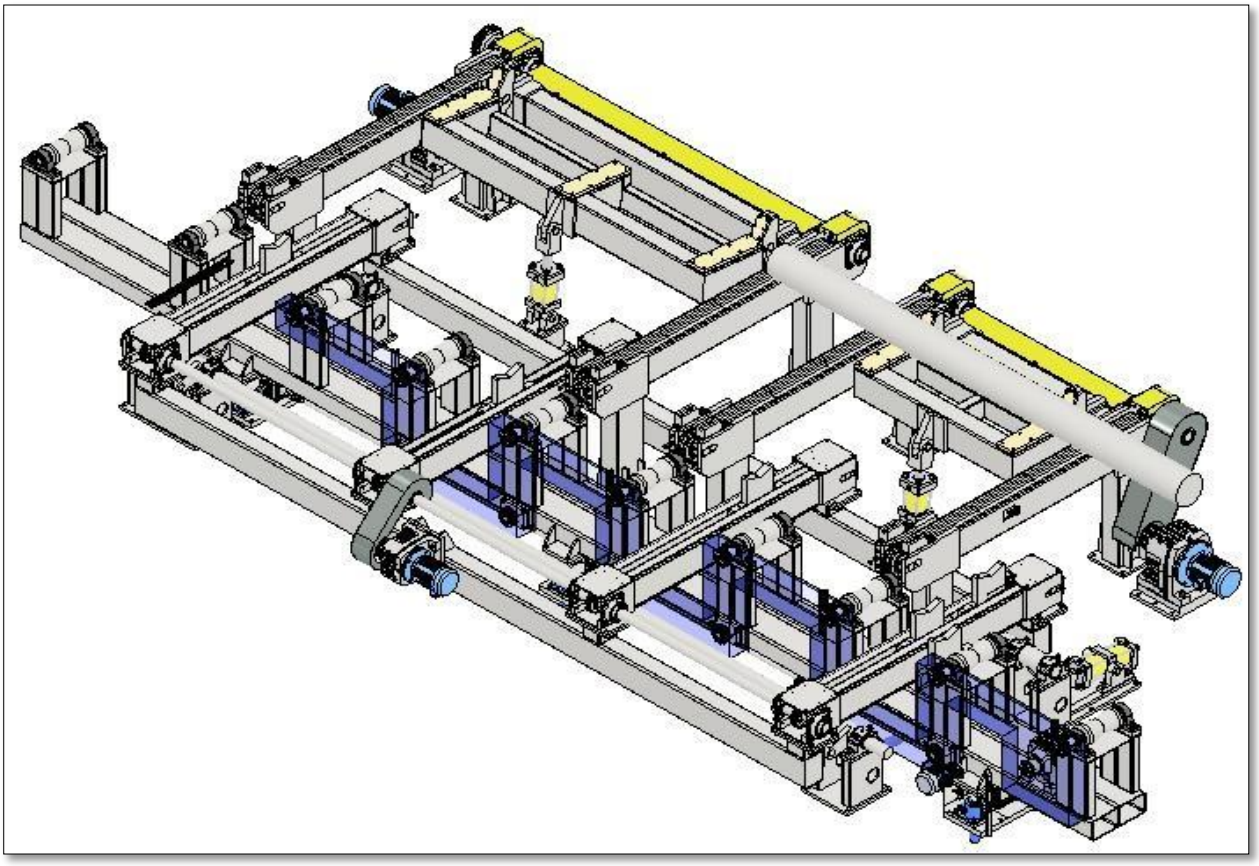
If the number of dry lubrication points on the equipment does not exceed 10 and the points are located in hard-to-reach areas, the standalone lubrication station may be replaced with connection points for a

mobile lubrication unit, or manual grease fittings may be relocated to a centralized distribution panel. For such centralized dry lubrication configurations, a **progressive metering distributor** is recommended for accurate and consistent grease delivery.

四、Production Process Description

Loading Bench → hydraulic lifting and Pushing Arm → loading roller Conveyor → Main Engine → Unloading Roller Conveyor → hydraulic lifting &Pushing Arm→ receiving trough

4.1 Feeding Section : as shown in the picture below

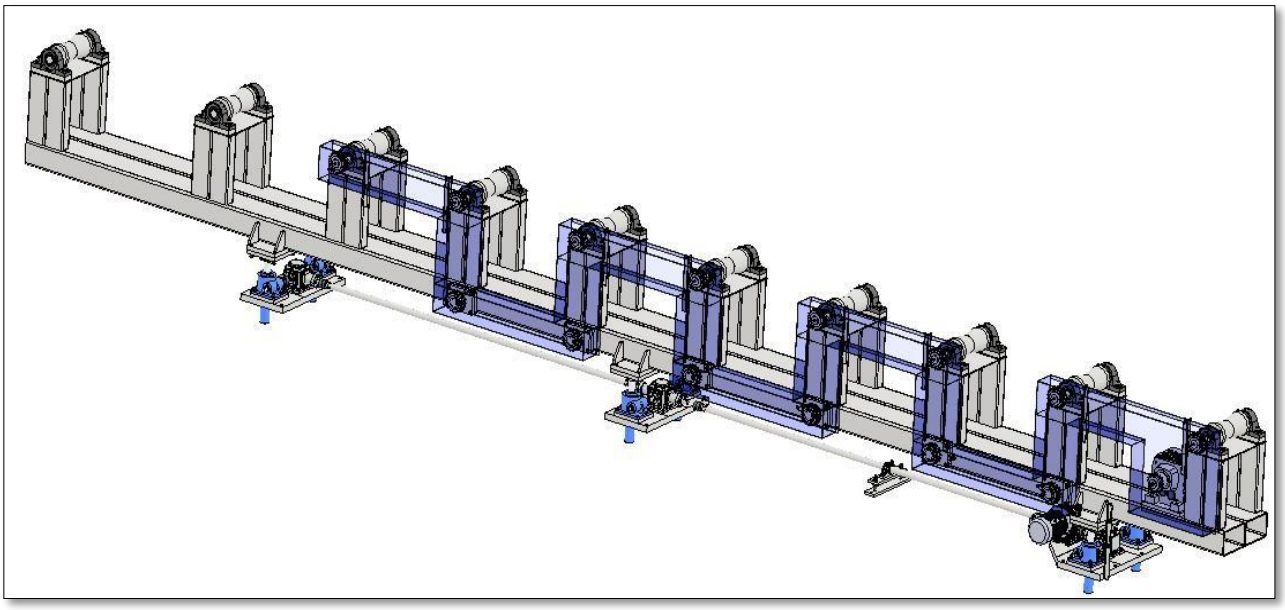


The bar stock rolls downward along the loading rack and is stopped by a material stopper rod. Depending on the diameter of the bar, the stroke of the stopper cylinder can be adjusted to accommodate different sizes, ensuring that only one bar is released at a time.

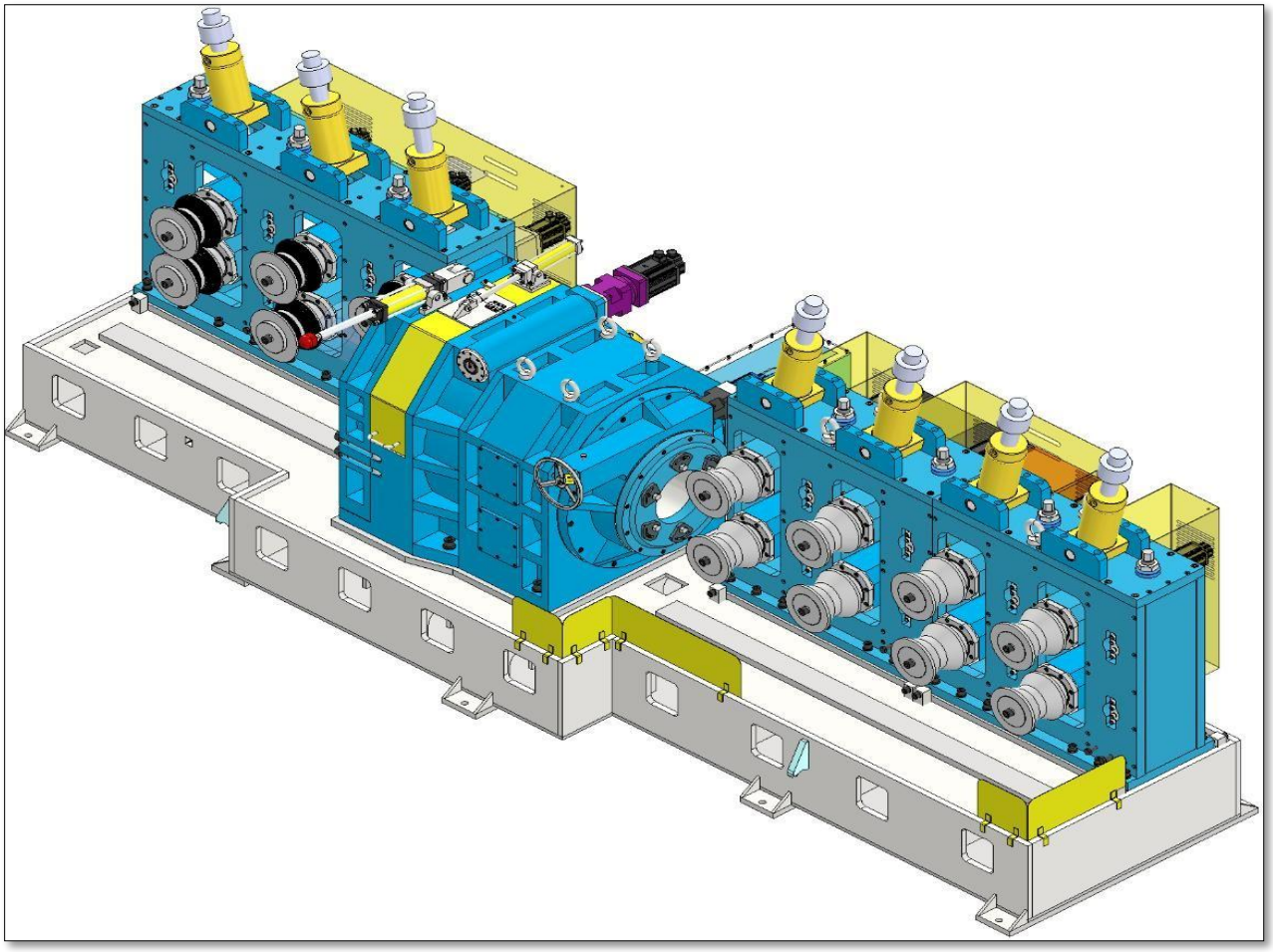
When actuated by the hydraulic cylinder, the pusher rod lifts the bar upward, allowing it to roll downward. The cylinder is controlled by a solenoid valve; when the cylinder rod retracts, it drives the pusher rod to lower, allowing the bar to gently fall onto the roller conveyor, minimizing impact.

The roller conveyor motor then drives the rollers to transport the bar to the main engine for turning operations.

As shown in the diagram below, the roller conveyor height is adjusted by six screw jacks, each equipped with limit protection. This system eliminates the need for manual adjustment, offering fast and convenient height control.



4.2 Main engine section



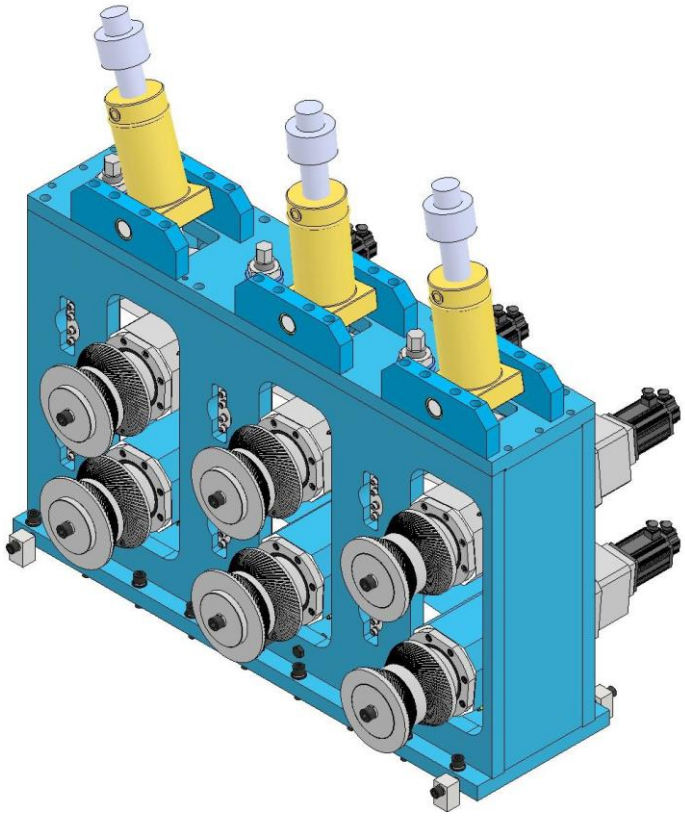
Feeding Clamping Rollers

The feeding clamping rollers grip the raw bar stock delivered by the loading roller conveyor. Once clamped, the pressure rollers rotate to feed the material into the front guiding section. The clamping roller assembly features a **self-centering mechanism** and allows for **fine adjustment**, ensuring that the clamping center aligns precisely with the spindle axis.

Under the action of a hydraulic cylinder, the rollers securely clamp the bar stock. By adjusting the clamping pressure, the system ensures that the bar remains stationary during machining and does not rotate. The rotational feeding of the clamping rollers is driven by a **servo motor**, which is connected via a **planetary gear reducer**.

A **guide sleeve** is installed at the feeding inlet to assist with bar alignment and smooth entry.

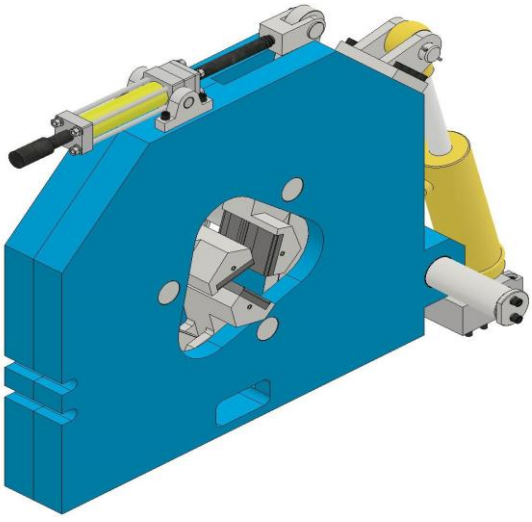
As illustrated in the diagram below.



Front Guide

The front guide supports the bar stock during the turning process to prevent vibration. It uses **three clamping plates** to securely hold the bar, and the clamping pressure can be adjusted via a hydraulic cylinder to ensure stable feeding.

The entire front guide assembly is mounted on a **hydraulic tilting cylinder**, allowing it to flip as a whole. This design facilitates convenient tool replacement and maintenance

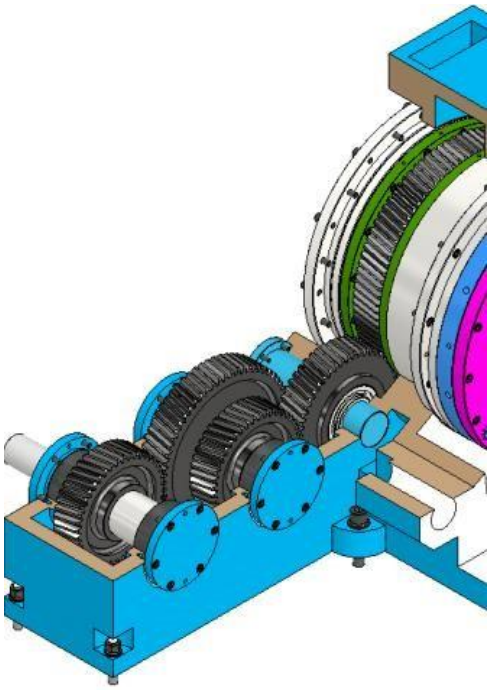


Spindle

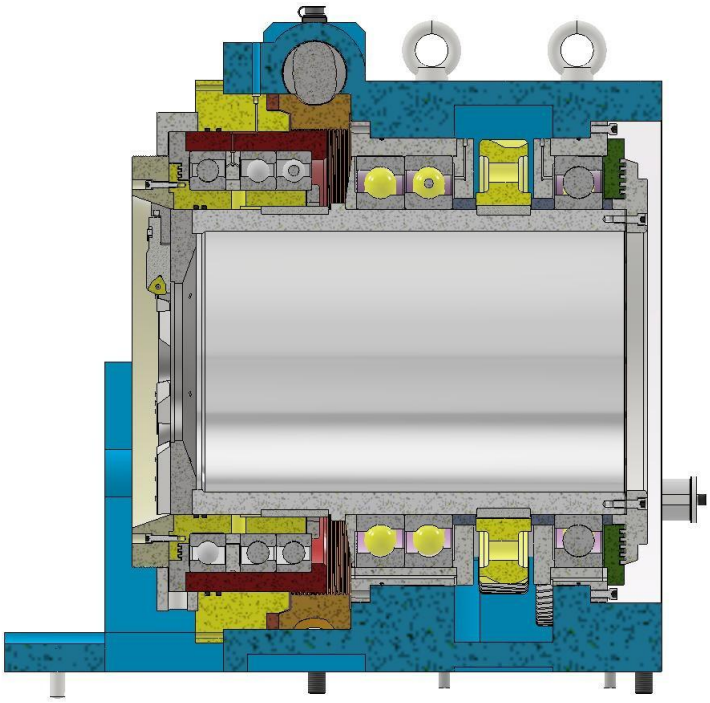
The spindle drives the cutter head to perform high-speed rotation for turning operations on the bar stock. It is powered by a **servo motor**, which transmits torque through a **fully geared gearbox**, enabling robust and precise spindle rotation.

The servo motor provides **high torque** and a **wide speed regulation range**, making the system adaptable to various material types and bar diameters as required by the end user.

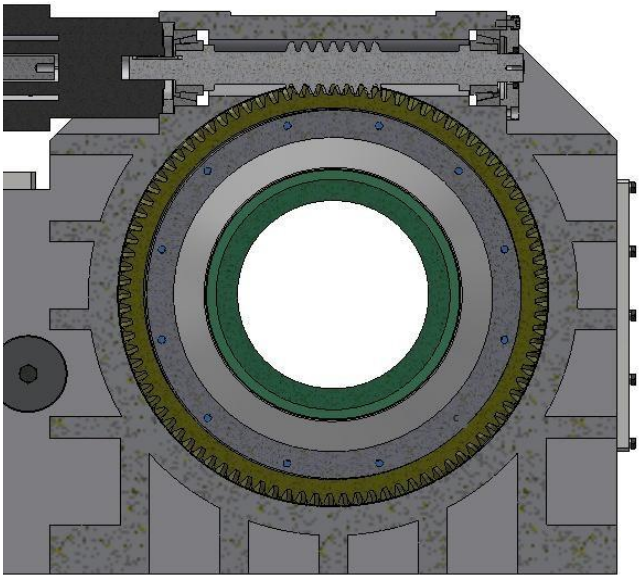
As illustrated in the diagram below.

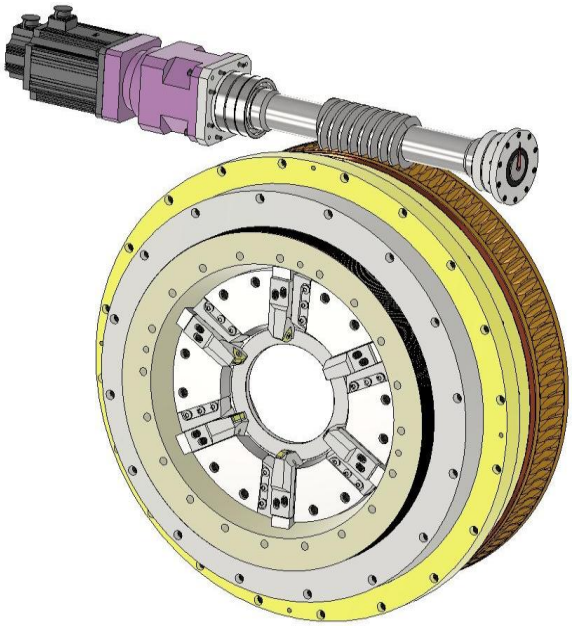


The main shaft bearing is 3+2+1 structure, which can ensure reliable rigidity and accuracy.



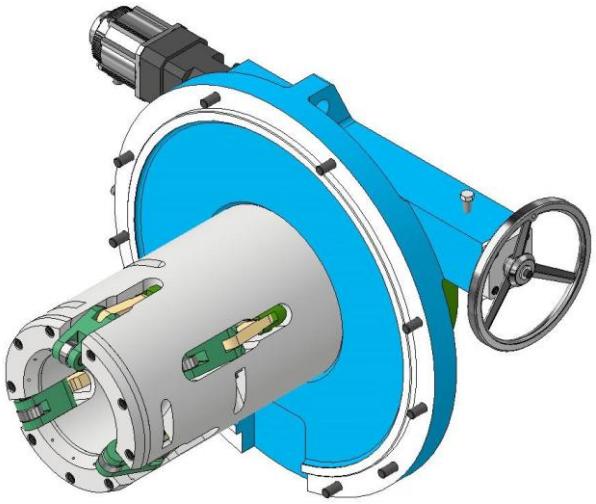
The tool adjustment mechanism utilizes a servo motor-driven worm gear system to synchronize six different tool heads. This configuration enables fast, convenient, and precise tool changes. Tool positioning is controlled via a touchscreen interface, where users can input parameters to automatically advance the selected tool. However, retraction of the tool requires manual intervention, as the system supports only automatic forward movement.



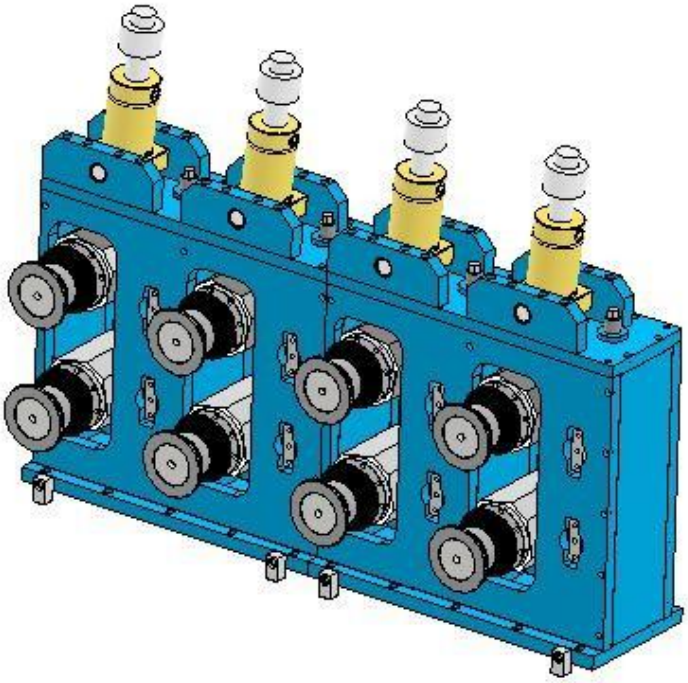


The spindle is lubricated using an oil-air lubrication system, which automatically activates when the spindle is powered on. This system ensures continuous and efficient lubrication of the spindle during operation. In the event of a malfunction in the oil-air lubrication system, both the spindle and the feed mechanism will automatically cease operation, and an alarm notification will be triggered to alert the operator.

Rear and middle guides support the bar stock along the coaxial axis during feeding, preventing vibration during turning operations. Clamping and support of the bar stock are achieved through a worm gear-driven threaded sleeve, which rotates to apply pressure via a linkage mechanism. The worm gear is powered by a servo motor, allowing for precise torque control. Fine alignment between the guide center and the spindle center can be achieved using an adjustment rod.

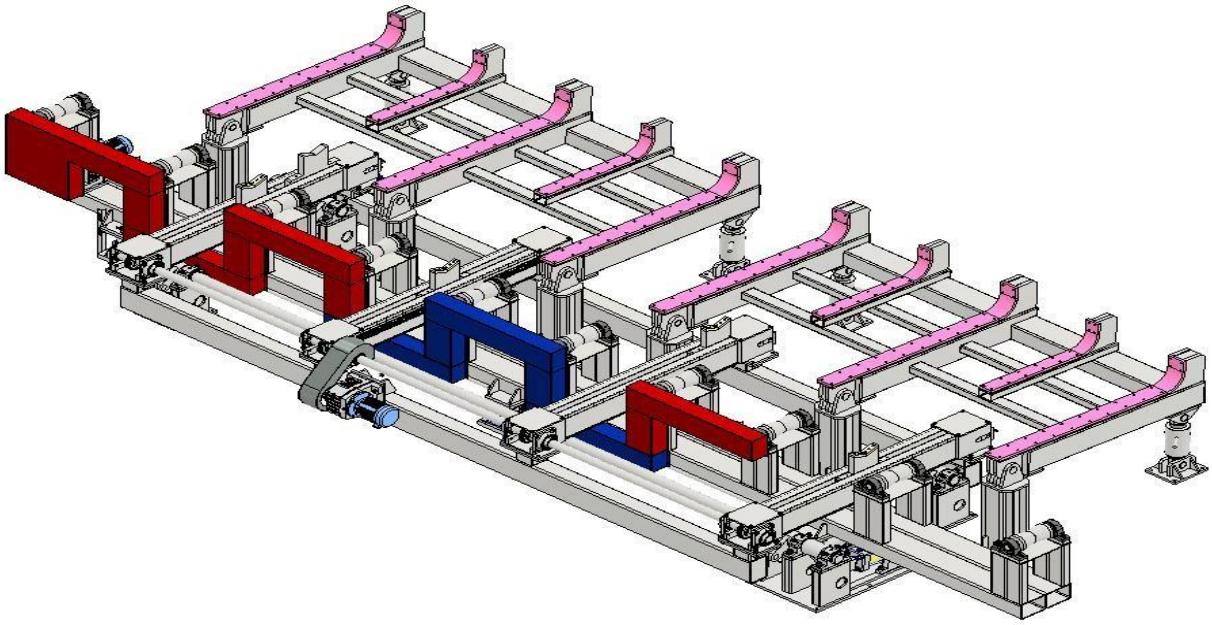


Pull-out rollers consist of four sets of smooth-surface pressure rollers and feature a self-centering mechanism with fine adjustment capability. This ensures that the clamping center of the rollers aligns precisely with the spindle center. Under the action of a hydraulic cylinder, the rollers firmly clamp the bar stock. By adjusting the hydraulic pressure, the system ensures that the bar remains stationary and does not rotate during machining. (As illustrated in the diagram below.)



Unloading Section:

After turning it is completed, the pull-out rollers feed the bar stock into the discharge roller conveyor. The conveyor motor then drives the rollers to transport the material forward. Once the leading end of the bar reaches the sensor, the material-pushing lever is activated, guiding the bar into the unloading rack. The unloading rack is equipped with a hydraulic cushioning system to ensure smooth and safe material handling.



五、Scope of Supply

5.1 Suppled By Seller

No	Items	Qty	Configuration
1	Main machine	1	Standard
2	Loading Bench	1	13500mm
3	Loading Roller Conveyor	1	
4	Unloading Bench	1	
5	Unloading Roller Conveyor	1	
6	Chips Conveyor	1	Standard
7	Hydraulic Station	1	Standard
8	Electrical cabinet	1	Standard
9	Water pump	1	Standard
10	Calipers	1	Optional
11	Laptop (includes machine tool control program)	1	Optional

5.2 Supplied By Buyers

No	Items	Qty	Configuration
1	Air source (air compressor)	1 Set	Flow rate: not less than 0.6 m^3/min; Pressure: not less than 0.5 MPa
2	16 Air Tubes, T-connectors, and 1/2" Ball Valves		The buyer shall procure these components independently based on site layout and planning requirements.
3	46# anti-wear hydraulic oil	3	About 510 kg for hydraulic and transmission systems
4	68# anti-wear hydraulic oil	1	About 20 L, spindle oil lubricated for use
5	Nylon cable tie 6 x 300	2	2 Packages
6	Cable 3*150+1		Length to be measured on-site by the buyer; copper wire must be used from workshop main power to main distribution cabinet.
7	Underground cooling water tank		The buyer shall make the underground water tank according to the basic drawing provided by the seller; If the buyer does not allow the underground water tank due to site conditions can also do not less than 3 cubic surface water tank (can be welded iron plate, the ground water tank must add sewage pump return water), because the location of the water tank and water pump in the buyer's site is uncertain, then the water tank and water pump and the main engine

			connection pipe by the buyer according to the site location to purchase connection installation.

六、Main Component Brand

Items	Specification	Manufacturer/ Brand
Spindle Bearings		Luoyang Bearing Research Institute
Main Motor	200kW	Jiangsu Intellmotor Technology Co., Ltd.
Servo motor		Inovance Technology
Mixing valve		Bijur Delimon International
Pneumatic pump	YBK-L	ISHAN Precision Ind. Co., Ltd.
Electrical cabinet	Tailed	Yantai HNA
Cantilever	Tailed	Shanghai Yued Electric Co., Ltd
PLC	S7-1500	Siemens
HMI screen		Weinview Technologies Co., Ltd.
Low-voltage appliances		Schneider
Inverter	E5 Series	Shenzhen INVT Electric Co., Ltd.
Sensors		Panasonic, Ottonix
Relays		Panasonic
Hydraulic valve		YUKEN
Hydraulic cylinder	HSG Series	YOLON
Chip Conveyor		Yantai Bosen auxiliary machine
Water Pump		Jiangsu Fengchao

七、Acceptance procedures and contents

7.1 Inbound Inspection

Upon arrival at the buyer's site, the buyer shall conduct an inbound inspection of the equipment based on the packing list provided by the supplier. The inspection shall include, but is not limited to, the following aspects:

- Verifying that the equipment model, specifications, and quantity match the contract and packing list;
- Checking the equipment's appearance for any damage incurred during transportation;

- Confirming that all accompanying technical documents, certificates, and manuals are complete;
- Performing a preliminary check on key components to ensure there are no missing or abnormal items.

If any issues are identified, the buyer shall promptly notify the supplier and coordinate appropriate resolution.

7.2 Installation and Commissioning Acceptance

During the installation and commissioning phase, both parties shall conduct acceptance procedures in accordance with the contract and technical agreement as follows:

7.2.1 Equipment Installation

- The buyer shall install the equipment based on the foundation layout and technical drawings;
- The supplier shall dispatch technical personnel to the site to provide installation guidance and ensure compliance with technical standards.

7.2.2 Equipment Commissioning

- The supplier is responsible for the full commissioning of the equipment, including system operation, functional testing, and performance verification;
- During commissioning, the supplier shall provide technical training to the buyer's operators to ensure they are capable of basic operation and maintenance.

7.2.3 Joint Acceptance

- Upon completion of installation and commissioning, both parties shall conduct a joint on-site acceptance inspection;
- The inspection shall be based on the technical agreement, contract terms, and relevant technical documentation;
- Acceptance criteria include operational status, functional performance, and achievement of specified performance indicators.

Note:

The buyer is responsible for connecting utilities such as water, electricity, and compressed air to the designated interfaces as specified in the foundation layout.

7.3 Content of Acceptance

The acceptance scope includes, but is not limited to: equipment appearance, machine tool precision, load test performance, operational compliance, and other items specified in the technical documentation.

八、Equipment Installation And Commissioning

8.1 Equipment Installation Foundation

The buyer (Party A) shall complete the equipment foundation construction in accordance with the dimensions and technical requirements specified in the foundation drawings provided by the supplier (Party B).

8.2 Main Engine Positioning and Leveling

Party B shall position the centerless lathe main unit at the designated location, ensuring that the spindle centerline aligns with the horizontal layout requirements of Party A's site, and perform precise leveling.

8.3 Auxiliary Equipment Installation

Party B shall sequentially adjust the positions of the infeed and outfeed roller conveyors, loading rack, unloading rack, chip cart, and hydraulic pump station according to the positions indicated in the foundation drawings

8.4 Overall equipment fine-tuning and no-load operation

Party B shall carry out fine adjustments of the entire equipment system and conduct no-load operation tests. Upon meeting the required performance standards, all connection points shall be re-inspected and securely fastened.

8.5 Overall commissioning and trial run

Party B shall complete the overall commissioning and trial run of the equipment. Once the equipment meets all technical requirements, Party A shall be responsible for carrying out the final grouting work

九、 Quality Guarantee

9.1 Design and manufacturing standards

The equipment shall be designed and manufactured in strict accordance with relevant national and industry standards, as well as the technical agreement signed by both parties.

9.2 Warranty Time

The warranty period for the equipment shall be twelve (12) months from the date of final acceptance.

十、After-Sales Service

10.1 Service Response and On-Site Repair Commitment:

In the event of equipment failure, the service provider shall respond within 24 hours upon receiving the notification and arrive on-site for repair within 72 hours.

10.2 Spare Parts and Components Supply Assurance:

The service provider shall ensure the timely supply of spare parts and components to support maintenance work and ensure continuous equipment operation.

十一、 Personnel Training

Party B undertakes to train Party A's operators to use and maintain the machine tools correctly.

十二、Miscellaneous Tools and Technical Documentation

- **Manual Operation Tools** – 1 set
- **Machine Installation Accessories** – 1 set
  Includes foundation anchor bolts, leveling pads, and shims. (Note: Embedded parts and safety barriers shall be provided by Party A.)
- **Machine Operation Manual (Mechanical & Hydraulic)** – 1 set
- **Machine Operation Manual (Electrical)** – 1 set
- **Certificate of Conformity** – 1 set
- **Packing List** – 1 set
- **Foundation Layout Drawing** – 1 sheet
- **Equipment Layout and Technical Drawings**
  Includes equipment floor layout, electrical wiring diagram, and hydraulic schematic.
  The supplier (Party B) shall provide the foundation layout, equipment layout, list of vulnerable parts, and relevant drawings within 35 days after the contract becomes effective, and complete the design review accordingly.
- **Two-Year Spare Parts Package**
  Party A shall confirm the spare parts list prior to contract signing. The spare parts shall be delivered together with the equipment.
- **Confidentiality Clause**
  All documents and materials provided by both Party A and Party B are strictly for use in this project only and shall not be disclosed to any third party.
- **Accommodation Support**
  Party A shall facilitate accommodation arrangements for Party B’s installation and commissioning personnel, and bear the associated costs.

Note:

All drawings and documents shall be provided in electronic format (PDF, editable DWG, or Word). The document language shall be in **Chinese-English-Russian** trilingual format.

十三、Technical Specification Statement

13.1 Tool Adjustment Mechanism

The tool adjustment mechanism adopts a servo motor-driven worm gear system with four synchronized tool holders. Tool advancement can be automatically controlled via touchscreen input, while tool retraction requires manual intervention.

13.2 Online Diameter Measurement System

The centerless lathe is equipped with an online diameter measurement system; however, it does not support automatic compensation. Measurement data is used for monitoring purposes only, and tool adjustments must be performed manually.

13.3 Tool Breakage Monitoring

The machine is not equipped with a tool breakage monitoring system

13.4 Spare Parts for 12-Month Operation

The list of spare parts required for each unit during a 12-month operational period shall be finalized through consultation between the supplier and maintenance personnel prior to contract signing

13.5 Spare Parts for Control and CNC Systems

The spare parts list for the control and CNC systems shall be determined in consultation with maintenance personnel before the supply contract is signed

13.6 Control System Configuration

The control system is based on the SIEMENS S7-1500 series. The Sinumerik ONE CNC system is not required

13.7 Software Licensing

All necessary software licenses and activation keys for equipment operation shall be provided

13.8 Special Maintenance Tools

A dedicated toolkit for equipment maintenance and installation shall be provided.

13.9 Special Fixtures and Tooling

Special fixtures and tooling required for full-range process operations shall be supplied.

13.10 Mandrel Straightness Retention

The original straightness of the mandrel must be maintained after all machining operations are completed.

13.11 Surface Integrity and Thermal Control

No surface defects shall occur at the contact points between the mandrel and guiding fixtures. Overheating in the cutting zone must be avoided to prevent structural changes in the metal surface.

13.12 Equipment Painting

The equipment shall be painted in strict accordance with the coating scheme provided by the purchaser.

This Agreement shall be annexed to the contract and have the same legal effect as the contract.

This Agreement shall come into force after being signed and sealed by the representatives of both parties.

There is no text following this line.

Party A: Party B: Shandong Desheng Robot Co., LTD

Party B: