

CNC WHEEL LATHE

TECHNICAL SPECIFICATION



Technical Specification

1. In General

The name of this machine is “CNC Wheel lathe” and it is the equipment which cuts and processes the rail wheel into a regular and specified form.

It is equipment for recovery of the worn and deformed wheel form, installed on the rail of heavy repair factory which performs the cutting of the wheel separated from the car-bogie.

It suggests the economical cutting depth to restore the wheel profile through automatic measurement and calculation, and performs the operation in “One pass cutting” mode which continuously performs the wheel profiling and flange cutting.

1.1 Scope of Supply

(1) Main body of CNC Wheel lathe manufacturing

- Main bed & Leveling block
- Head stock & AC Spindle motor
- Base table
- Tool slide & AC servo motor
- Loading & unloading device
- Wheel center inspection device
- Lifting device
- Wheel measuring device

(2) Auxiliary equipments manufacturing

- Hydraulic & auto lubricating system
- Electric control panel
- Operating panel
- CNC controller
- Chip disposal device
- Exhausting device
- Wheel management device
- Drain pump

(3) Machine & Electric installation (According to condition of contract)

(4) Provide Technical data

- Basic technical data
- Basic drawings (Layout / Foundation / Machine assembly).
- Operating manual
- Maintenance manual
- Interface & utility information

(5) Provide Spare & consumable parts

- Spare parts
- Consumable parts

(6) Provide tools

- General tools for maintenance
- Special tools for maintenance

2. Technical Specification

2.1 Basic Data

- (1) Rail gauge : According to customer needs
- (2) Diameter of profiling wheel
 - Maximum wheel diameter r : 1,100 mm
 - Minimum wheel diameter : 780 mm
- (3) Width of cutting wheel tire : 140 mm
- (4) Maximum allowed axle load : 5 ton

2.2 Functional Specifications

- (1) Cutting for : CNC shelf manufacture
- (2) Measurement method
 - Measurement of diameter and flange form : Touch Probe measurement method
- (3) Adjustment scope by composition
 - Main axis rotation speed adjustment scope : 0 ~ 24 rpm
(step-less speed change)
 - Transportation speed adjustment scope : CNC Auto Control System
0~3 mm/rev
(step-less speed change)
- (4) Self load of the machine : Approx 46,000 kg

2.3 Specifications

- (1) Cutting area : Max. 10 mm²
(Cutting area of the wheel when removed scars as abrasion, desquamation, etc)
- (2) Cutting depth : Max. 10 mm
(On the wheel which has been removed scars as abrasion, desquamation,
with transportation speed under 1mm/rev)
- (3) Degree of precision of manufacture
Difference between both diameters of wheel : 0.2 mm

2.4 AC Operation system

- (1) AC Motor : 37 kW × 2 Units
- (2) Difference of total motor's wheel diameter : 0.2 mm
- (3) Total motor capacity : 74 kW
- (4) Rotation scope : 0 ~ 1,500 rpm (Constant Torque)
: 1,500 ~ 6,500 rpm (Constant Power)
- (5) Torque : 236 Nm
- (6) Quantity : 2 Units

2.5 Tool slide drive system

- (1) X Axis motor's capacity : AC Servo Motor 4.55 kW × 2 Units
(Rated Power)
- (2) Z Axis motor's capacity : AC Servo Motor 4.55 kW × 2 Units
(Rated Power)
- (3) Total motor capacity : 18.2 kW
- (4) Rotation scope : Max 3,000 rpm (Rated speed)
- (5) Torque : 14.5 Nm (Rated torque)
- (6) Quantity : 4 Units

2.6 Centering system

- (1) Center sleeve : 1 set each for both sides.
- (2) Chucking device : 1 set each for both sides.

2.7 Electrical data

- (1) Main power : AC 380V, 3Ø, 60Hz
- (2) Allowed voltage difference : +10% / -10%
- (3) Allowed frequency difference : +2% / -2%
- (4) Installation capacity : Approx. 140 kW
(137.05kW)

2.8 Hydraulic pump- motor capacity

- (1) Three-phase motor main pump : AC 380V, 3Ø, 60Hz, 22kW x 6P
- (2) Quantity : 1 EA
- (3) Three-phase motor Sub. Pump : AC 380V, 3Ø, 60Hz, 3.7kW x 4P
- (4) Quantity : 1 EA

2.9 Chip crusher

- (1) Chip crusher motor : AC 380V, 3Ø, 60Hz, 11kW x 4P
- (2) Quantity : 1 EA

2.10 Chip conveyor

- (1) Chip conveyor motor : AC 380V, 3Ø, 60Hz, 3.7kW x 4P
- (2) Quantity : 1 EA

2.11 Chip box

- (1) Chip conveyor motor : Volume 1.2 m³ x Capacity 400 kg/ea
- (2) Quantity : 2 EA

2.12 Exhausting Device

- (1) Electrical capacity : AC 380V, 3Ø, 60Hz, 3.7kW
- (2) Capacity : 60 m³/min x 230mmAq
- (3) Type : Bag filter
- (4) Quantity : 1 EA

2.13 Drain pump

- (1) Pump motor : AC 220V, 1Ø, 60Hz, 0.75kW
- (2) Capacity : Developed head 12 m
- Discharged quantity : 24,000 l/hr
- (3) Quantity : 1 EA

3. Specification for each part

3.1 Main bed & Leveling block

A welded structure which is the base of fixing of each part of the machine, which in the upper part each elements are firmly fixed and installed to support every load during the cutting operation. The lower base is constructed adjusting the anchor plate to the FL-1,230, and it is composed by leveling block which is horizontally adjustable

3.2 Head stock & AC Spindle motor

It is composed symmetrically to the left/right of the main bed's upper part, and by the head stock body, main spindle motor & gear box, center sleeve and chucking device.

(1) Head stock body

As a strong casted structure, which the upper part is composed by main spindle motor, and the interior by gear box and center sleeve, chucking device.

(2) Main spindle motor & gear box

In the upper part of the head stock body there is assembled the main spindle motor and it is connected to the 1st gear shaft in V-belt to transfer the power. The final output gear of the gear box is assembled with the chucking device to be the power source to rotate the wheel.

The main axis shall be installed to be supported by 2 high-definition taper roller bearing and to rotate the face plate through the gear drive.

(3) Center sleeve

The center sleeve is composed with hydraulic system which allows the accurate measurement and concentric operation of the both side wheels by stocking the axle center of the wheel-set and maintains a regular pressure.

The center sleeve is ram-cylinder type and it's manufactured to support the both side of the taper roller bearing from the front and rear, and it rotates with the wheel through the chucking device.

(4) Chucking device

It is composed by 3sets of jaw body divided and assembled in 120° each for left/right and 1set of face plate according to the method which fixes the external rim of the wheel.

The Jaw body is a hydraulic cylinder and slider structure which the radial direction and location is adjustable according to the wheel diameter, and in the adjusted location it automatically fixes the wheel with the hydraulic cylinder.

3.3 Base table

As the device which transports the head stock to the wheel cutting location, the base table is composed by base & slider, hydraulic cylinder and clamping unit.

It is symmetrically composed in left/right by strong casted material.

In the base and slider there is assembled a hydraulic cylinder which performs the front and rear movement. In the front position for cutting, the clamping unit and the hydraulic control prevent the axial vibration due to the cutting load.

3.4 Tool slide & AC Servo motor

The tool slide is composed by the hydraulic transportation part which performs the front/rear movement through the hydraulic cylinder and by the servo motor which performs the front/rear movement through the AC servo motor.

The hydraulic transportation part performs the front/rear movement which allows the pass of the cutting wheel.

In the cutting and measurement of the wheel the AC servo motor and CNC controller accurately transport the servo motor transportation part, and it is composed by X axis and Z axis slides structure.

Due to the frequent transportation during the wheel processing, the friction assembled part is manufactured to maintain enough strength and precision.

3.5 Loading & unloading device

The loading & unloading device is composed by the loading rail which the wheel is oriented and by the unloading rail, hydraulic cylinder.

The wheel which the first measurement from centering device is finished it shall be rolled until the lifting location by the cylinder and link structure.

After finish the cutting, it shall be installed / assembled in the extension of the rail within the factory to discharge the wheel through the unloading rail in the moment of descent of the lifting unit.

3.6 Wheel center inspection device

To cutting the wheel it is necessary to lift until the main spindle location, and the lifting height varies according to the diameter of the wheel.

The wheel center inspection device is manufactured to primarily inspect the wheel diameter and to calculate the lifting height value which allows the wheel chucking.

It is composed by inspection probe, hydraulic cylinder, rotary encoder, and the measured value is automatically calculated by the CNC controller and it's reflected on the lifting height value.

3.7 Lifting device

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3.8 Hydraulic & auto lubricating system

(1) Hydraulic system

As the secondary power source of the Lathe for wheel re-profiling it is composed by power switching part, power control part and power generation part.

As the characteristics of the oil pressure system, it is composed with particular power switching part, and in the Head stock's left/right backside there is composed the power controlling part.

The oil pressure which the pressure, direction and speed is controlled, is transferred to the operation part of left and right. There is a control device for safety and operation feature for the load and it is safer with the composition of Inter-lock.

In the oil pressure unit there are composed various oil cleaner and oil temperature controllers to prevent the degeneration of the pressure oil and perform an accurate operation.

(2) Auto lubricating system

There is composed automatic lubricant in the left/right side head stock.

In the tool post slide part which requires accurate friction, the lubricant is automatically spread.

The cycle and quantity of lubrication can be modified according to the adjustment and the users can randomly spread the lubricant.

The auto lubricating system detects the filling volume of the lubricant, and displays the charge (lubricant) message on the operating panel.

3.9 Electric Control Panel

The electric control panel is composed by power module and CNC control part, PLC control part, and other electrical relay devices.

The power module provides the proper power for CNC control part and PLC control part, from the secondary power/electricity provided from voltage regulator.

In case of the CNC control part, it is composed by control drive which controls the servo motor and spindle motor assembled in the main body.

In the PLC control part, except the servo mechanism, there are composed electric & hydraulic actuator's sequential operation and delayed operation, PLC drive with inter-lock programming, and for the stable and efficient operation of the motor and electric devices it is composed by safety/electrical products as relay, power supply, circuit breaker, EOCR.

3.10 Operating panel

It is the panel operated by the user to process the wheel.

The user may verify the operation of the machine through the operating panel display, and also can verify the wheel data before/after cutting.

As the value entry switch is composed, there can be entered the cutting value according to the measured value and the value also can be modified.

It is composing the automatic/manual operation panel switch, and also counts with the emergency stop button which can stop every operation in case of emergency.

The operation status and failure can be verified in real-time in the monitor.

3.11 CNC Controller

The CNC (Computer Numerical Control) is a system which operates/controls the operation of each machine according to the data and servo mechanism.

In the Lathe for wheel re-profiling, the measured value of the wheel to process is calculated, and reveals the size before/after wheel cutting and profile in the operating panel.

There can be verified the spindle speed and feed rate, and according to the characteristics of the process objective its speed can be adjusted.

There can be verified the transported location of the tool rest through the servo motor and drive, and randomly can operate the transportation location.

There can be saved information as machine data for operation and control, manufacture program of the wheel and information of the wheel, and can be linked with the wheel management device data.

3.12 Chip Disposal Device

The chip disposal device is a device which transports the chip from the lower part of the main body to the chip box (location where the files are collected), and is composed with chip crusher, chip conveyor, chip box.

(1) Chip crusher

The chip crusher is installed in the lower part of Lathe for wheel re-profiling main body and cuts the chip produced during the cutting to ease the transportation in the chip conveyor.

- Operation-method : Gear speed reduction
- Power : AC 380V, 3Ø, 60Hz
- Motor power : 11kW x 4P
- Smashing blade : Diameter-Ø295, thickness-15mm
- Axis rotation speed : High speed axis 18.9 rpm,
Low speed axis 9.13 rpm

(2) Chip conveyor

The chip conveyor is a device which transports the chip from the chip crusher to the chip box (location where the files are collected).

It is a conveyor where there is installed a pipeline and the link chain installed inside with a proper distance composed by the right angled round plates, which make a pipe type chain conveyor.

- Motor power : AC 380V, 3Ø, 60Hz, 3.7kW x 4P
- Chip process capacity : 400 kg/hr
- Transportation speed : 10 m/min
- Sizing : 6 " (Pipe)

(3) Chip box

- Volume : 1.2 m³
- Capacity : 400 kg/ea
- Quantity : 2 sets

3.13 Exhausting Device

It is a device which operates the suction of the cutting fume of the wheel. The back of the main body is composed with suction hood, and it is composed to form an exclusive dust collector.

With the filter changing method, there is not composed a second / particular exhaust pipe line. The filter disposes the fine dust and sparks produced during the cutting, and with the porous fiber and activated carbon, it collects the odor.

- Electrical capacity : AC 380V, 3Ø, 60Hz, 3.7kW
- Air flow : 60 m³/min
- Rated voltage : 230 mmAq

3.15 Wheel Management Device

The wheel management device is composed by exclusive personal computer, monitor, printer, management program, and the measuring data before/after the wheel process and the daily manufacture data can be recorded/saved in it.

The recorded/saved wheel data may also be edited, and through the network can be connected with the data of the integral management system of the factory.

The PC composing the system has the following specifications, and shall be composed with the latest specification in the moment of delivery.

- | | | |
|------------------------|---|-----------------------|
| (1) S/W | : | Windows 7 or newer. |
| (2) CPU | : | Core 2 quad or better |
| (3) Memory | : | 4GB or more |
| (4) HDD | : | 1TB or more |
| (5) Monitor | : | 20" Color |
| (6) CD-Rom | : | DVD-Multi |
| (7) Printer | : | Laser, A4 Size |
| (8) Communication port | : | LAN |

3.16 Drain Pump

There shall be installed under the machine room, the Water pool, and there shall be composed drain pump for underwater. To protect the equipment from the rainwater and washing water flooded into the machine room, the drain pump may not exceed the level of water pool and if it exceeds it shall automatically drain the flooded water.

- | | | |
|----------------|---|-----------------------------------|
| (1) Pump motor | : | AC 220V, 1Ø, 60Hz, 0.75kW |
| (2) Capacity | : | Developed head 12 m x 24,000 l/hr |

5. Spare & consumable parts & Tool

Recommended perishable and non-perishable spares required for two years normal maintenance to cover complete range of mechanical, hydraulic and electrical equipments (including controls) are supplied along with the machine.

6. Inspection and Testing

The supplier confirms that all facilities to carry out factory acceptance test are available and can be used by the inspecting authority.

A sample inspection chart is supplied along with the bid. The inspection chart indicates all tests that are carried out during manufacture.

A copy of the quality assurance followed at the manufacturer' works for ensuring quality of the product is offered.

A full load capacity test is carried out at the manufacturer' works to the satisfaction of the appointed Inspector or Inspecting Agency.

Machine capability in regard to productivity and accuracy is established during factory acceptance test.

7. Training

The supplier trains adequate number of personnel in operation and maintenance of the machine. The training covers all mechanical, hydraulic, electrical and electronic equipment.