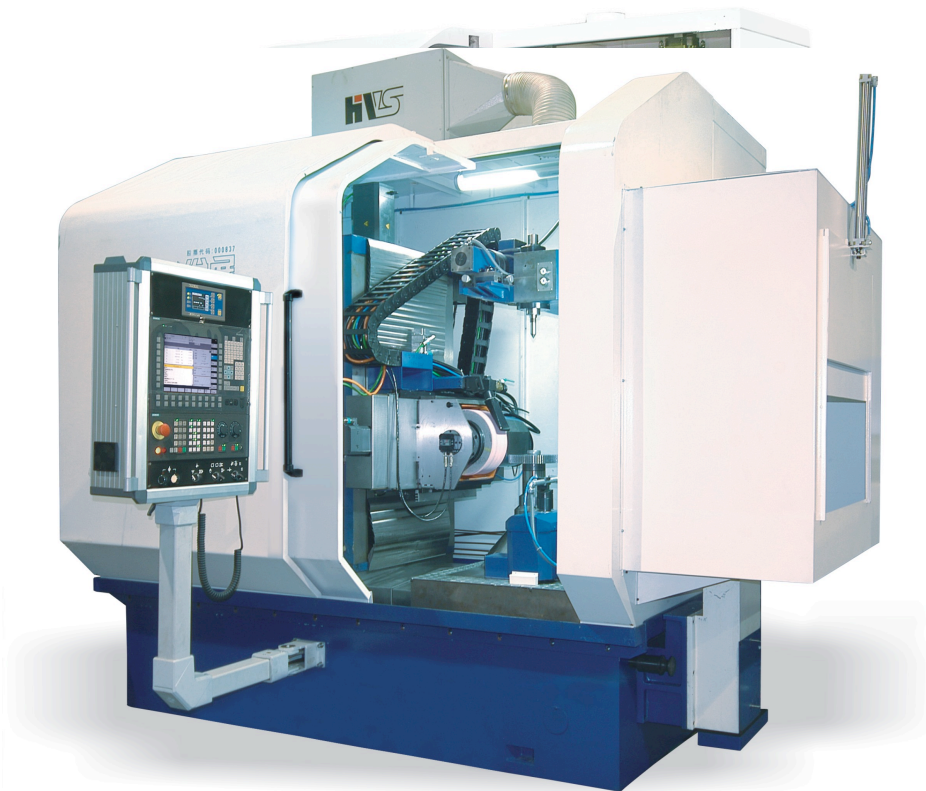




## **QC YK7230**

### **CNC Worm Wheel Gear Grinding Machine**

The #YK7230 CNC Worm Wheel Gear Grinding Machine is the latest generating gear grinder development from QC. During our review of high production automotive and industrial gears, it became very apparent that truly integrated, on-board automation was absolutely critical to increase throughput of the machine in question. The #YK7230, with a Siemens 840D control, 300,0mm capacity (12”), direct drive spindle, and multi-start capability fits this need admirably. With a small footprint and large enclosed area to accommodate a flexible load and unload station of workpieces, the #7230 is well positioned to provide outstanding service in a dedicated, high-production grinding environment.



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## Main Features

- **Compact machine design featuring a single, ribbed cast iron bed.** The #YK7230 adopts a vertical structure design with grinding wheel dressing and workpiece grinding positions in the same plane, rather than different planes with other designs and the inherent inaccuracies therein.
  - **Direct Drive Spindle with integrated balancing device (see below) and built-in internal cooling for thermal stability.**
  - **Workholding Flexibility built-in.** Featuring a table-type design (similar to our vertically oriented form grinding machine designs), or a traditional arbor and live center design (similar to our traditional generating machine designs).
  - **Fully Automatic Control.** 11 CNC axes in play, including automatic tool adjustment, coolant nozzle positioning, workpiece load/unload, etc.
  - **Direct Drive workpiece spindle.** Zero backlash, no friction and no wear.
- 2 clamping modes of workpiece
- **Ergonomic design with complete machine access from the ground floor and through a well-designed and completely lit automatically operated enclosure.**
  - **SIEMENS 840D (German Made – USA Serviced) CNC control.**
  - **High Efficiency Grinding.** By using 3 start threading capability, with linear velocity up to 63m/second (1600ipm), continuous shift grinding, automatic stock sensing and dividing and automatic load unload, QC has produced a world-class gear grinding machine tool.
  - **For improving the efficiency of gear finishing processes, the continuous shift grinding strategy QC incorporates in this line of machines replaces the reciprocating grinding method found in earlier designs.** Based on earlier Csepel (Hungarian) designs, the QC #72xx series have been greatly enhanced by adopting the continuous shift grinding process successfully used in Reishauer AG brand machine designs and adopted by other builders, such as Kapp Niles. In most rough grinding operations, the single ‘start’ of the continuous shift grinding process can be 3 to 5 times faster than that of the reciprocating grinding process! The precision of

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finish grinding is typically much greater as well.

- **The Electric Gear Box (EGB).** The EGB of this CNC grinding system can carry out the continuous synchronized movement of the workpiece and grinding wheel rotational axes. This EGB also coordinates the workpiece and tangential feed axes. The indexing drive and differential drive coordination also allow for grinding of spur and helical gear designs.
- **Profile and longitudinal modification.** Per the requests of our customers, we can make special diamond wheels for profile dressing. The longitudinal modification is realized by the CNC system controlling simultaneous work piece radial feed axis and work piece axial feed axis movements. As a result, all manner of longitudinal profiles may be obtained.
- **The special Human Machine Interface (HMI) was developed by QC** according to the working characteristics of continuous shift grinding. Based on a conversational programming protocol, programming is simplified by entering work piece parameters and relevant technical parameters as called out by the operator.
- **Multiple Grinding Model Selection.** Manual, Automatic Grinding with Manual Clamping, or Fully Automatic Grinding Cycles are available on this machine. The manual grinding cycle is suitable for grinding a single workpiece, clamping and unclamping of the workpiece collet or start/stop of grinding wheel feed. The automatic grinding cycle is suitable for grinding workpieces in batch production. Wide grinding wheel and tangential shift movements ensure grinding accuracy and uniformity of workpieces.
- **The on-board automatic dressing cycle of the grinding wheel improves the uptime and efficiency of this machine tool.**
- **An Acoustic Emission Monitoring Sonar (AEMS) sensor is utilized to carry out the automatic stock dividing of two flanks on the workpiece.** This system is provided by SBS of Oregon, USA. (This is standard on our stock machines). This system and programming is highly recommended for high throughput and unique for machines in this class.
- **SBS – USA dynamic grinding wheel balancing unit (Standard).**

## Technical Data

<b>Tip Diameter</b>	<b>Max /Min</b>	<b>300/20mm</b>	<b>11.81”/0.79”</b>
<b>Number of Teeth</b>		<b>5-600</b>	
<b>Module (Diametral Pitch)</b>		<b>1-6mm</b>	<b>25.4 - 4.233</b>
<b>Max Face Width (Spur Gear)</b>	<b>Max</b>	<b>300mm</b>	<b>11.81”</b>
<b>Helix Angle</b>		<b>± 45°</b>	
<b>Maximum Part Weight Total</b>	<b>Spur</b>	<b>200 Kg</b>	<b>440 Lb</b>
<b>Maximum Part Weight</b>	<b>Spur</b>	<b>12 KG</b>	<b>27 Lb</b>

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(Automation)			
Distance Between Centers	Max /Min	870/230mm	34.25"/9.055"
Stroke Length Radial (X1 Axis)	Max	400mm	15.74"
Stroke Length Axial (Z1 Axis)	Max	430mm	16.93"
Distance from slide center to wheel axis	Max /Min	180/440mm	7.09"/17.32"
Travel of Wheel Slide	Max	260mm	10.24"
Travel of Dresser in Wheel Spindle Direction	Max (Axial)	165mm	6.50"
	Max (Radial)	85mm	3.35"
Tangential Stroke of Column	Y1 Axis	220mm	8.66"

## Grinding Wheel

Motor HP	Max	15.5KWH	20.78HP
Size	Max	300X160X125mm	11.81X6.3X4.92"
Speed	Max	2200-4000rpm	

## Machine with Auxiliary Units

- Net Weight	Approx	6,000KG	13,200 lbs
- Space Requirement LxWxH	Approx	5400x3400x2500 mm	212.6"x133.9"x98.4"
- Total Connected Load	Amps		100
- Voltage Requirement	Volts		460/480

## 1 Base Machine

### 1.1 Assembly Group

- **Machine Base** of rigid design, made of cast iron. Installation on leveling/vibration isolation pads.
- **Column** made of cast iron with slide guideway.
- **Wheel Stock** made of cast iron. Wheel stock radial infeed utilizes precision ball screw, powered directly by an AC servo motor.
- **CNC Dressing Device** Automatic dressing by an on-board diamond dresser. The dressing paths are generated by two slides ('V' and 'U' axis) movement.
- **Enclosure (Full)** Multiple access points through enclosure to key areas of machine facilitates easy dresser, grinding wheel and workpiece changeovers.

### 1.2 Electrical Equipment

#### 1.2.1 Power Supply

Operating voltage is 460/480 Volt/3Phase/60Hz.

#### 1.2.2 SIEMENS 840D CNC controller

#### Operator Features

- Operator station with TFT color flat screen and control panel in front of the control cabinet.

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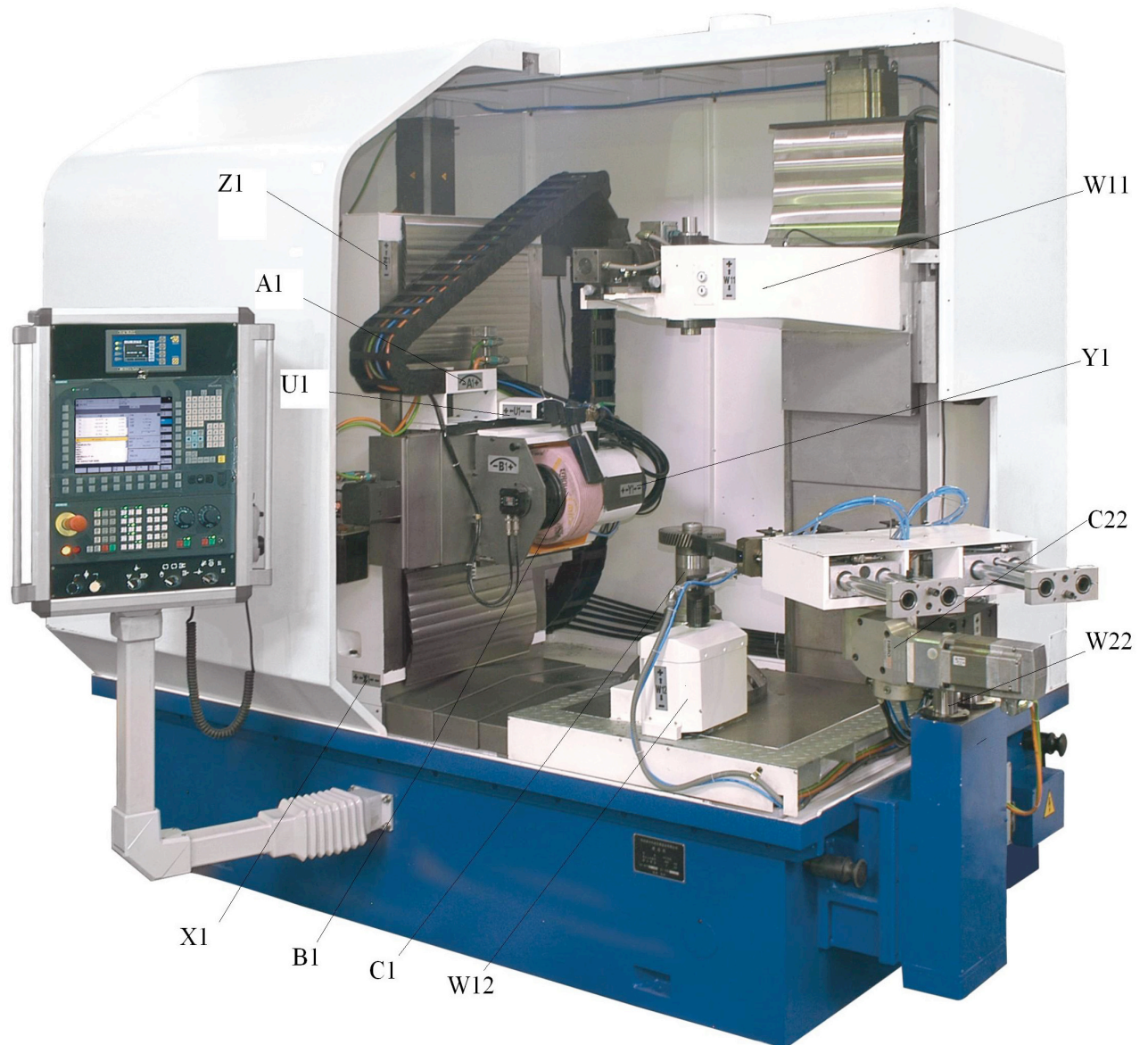
- Hand-held operating panel for more convenient set-up of the machine.
- The machining program uses standard CNC conversational programming language, and the interface program uses SIEMENS software.
- German-owned SIEMENS is serviced out of New York, USA. QC American provides front-line service regardless.

## Axis Information

### Eleven (11) CNC Axes

- 'X1'-axis with linear guideway. Radial movement of the grinding wheel slide. Heidenhain #LS477 with 0.0001mm resolution. 400,0mm travel, up to 300mm/min working speed. Grease Lubrication.
- 'Z1'-axis with slide guideway. Axial vertical movement of the workpiece stock stroke slide. 450,0mm travel, up to 300mm/min working speed and up to 3000mm/min rapid feed. Grease Lubrication.
- 'Y1'-axis with roller/slide guideway. Tangential movement of the grinding slide. Built-in rotary encoder with .0001 degree resolution. 220,0mm maximum travel, up to 3000mm/min working speed. Grease Lubrication.
- 'B1'-axis. Rotary movement of the grinding wheel. Direct drive AC Motor with Heidenhain #ERN180 with .0036 Degree Resolution. Grease Lubrication.
- 'C1'-axis. Indexing and rotary movement of the work piece stock. Heidenhain #RON285/9000 with 0.0001 degree resolution. Servo motor and gearbox. Oil Lubrication.
- 'W11'-axis. Axial movement axis of workpiece column. 640,0mm max. travel with 3000mm/min workspeed maximum.
- 'A1'-axis. Rotation of column for grinding helix gear and meshing with grinding wheel.  $\pm 45^\circ$  maximum travel @ 1000°/min working speed max.
- 'U1'-axis. Extension and retraction of coolant nozzle.
- 'C22/W22'-axis. Spindles for automatic load/unload.
- 'W12'-axis. Up and down movement of probe for automatic tool aligning.

The positioning feedback devices of each axis utilize high-precision encoders throughout.



## Service Functions

Integrated modem for remote diagnostics connection between QC computers.

### 1.3 Peripherals

#### 1.3.1 Hydraulics/Lubrication

- Complete hydraulic system for lubrication, clamping, and tailstock operation.

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- 
- Common operating hydraulic system.
  - The rotation axis of part (C Axis) is oil lubrication.
  - Other axes are via grease lubrication.

### **1.3.2 Coolant Filtration System**

Machine design utilizes coolant for cooling the machine base. The coolant filtration system cleans the coolant using a centrifugal machine design and includes the following:

- Filter capacity = 200L/min.
- Multiple circuit coolant chilling equipment: With automatic temperature regulation for cooling oil.
- Oil mist recovery and electrostatic air filter.
- Multiple coolant system design options are available; please contact one of our associates.

### **1.4 Automatic Balancing System (standard on stock machines)**

Dynamic balancing system for automatic balancing of grinding wheel. Grinding Wheel Balancing system manufactured by SBS Systems of Oregon, USA.

### **1.5 Acoustic Emission Monitoring System (standard on stock machines)**

SBS Systems also manufactures an Acoustic Emission Monitoring System (AEMS) that facilitates automatic and rapid stock division and enhanced wheel dressing cycles. There is a sonar-type sensor for measuring the proximity of the grinding wheel to the workpiece. Both the automatic balancing system and the AEMS have been fitted by SBS to the machines in stock on our floor.

### **1.6 Software for Siemens 840D Control**

This QC Developed software package enables the user to generate, edit and optimize grinding programs and analyze processing data on the PC on the machine or a remote PC. The software interface is identical with the machine control menu and may even be used for rudimentary training purposes.

- **Gear parameters calculation module – Input and storage of workpiece data.** This module consists of a conversational interface for geometrical parameter data entry, technical parameters and measuring parameters to facilitate computing of standard gears, gears with addendum modification, modified spur (helical) cylindrical gears. Basic work piece data is recorded into a database for later editing or processing.

### Adjust Data Input

Origin position of wheel	X0	+260.4573	mm
Center position of workpiece	Z0	150.0000	mm
Length of stroke	ZL	45.0	mm
Offset of Z0	ZF	0	mm
setting angle of workpiece	A	0	°
Offset of C axis	C	150.0000	mm
Origin position of profile dressing	Fa_U0	-30.0000	mm
Origin position of O.D dressing	O.D_U0	-30.0000	mm

Please confirm U0

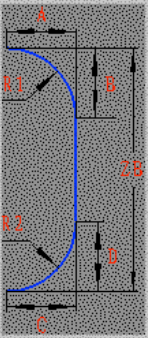
F1: return

X0	Z0	ZL	ZF	C	Fa_U0	O.D_U0	Pos.	CONFIRM U0
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- **Profile and Lead Modification.** Profile and Lead modifications are finished by an on-board diamond dresser and automatic dressing cycle.

### Crowning Data Input

Facewidth		35.0	mm
Amount	A	0.10	mm
Start point	B	15.000	mm
Radius	R1	15.000	m
	R1min	15.000	m
Amount	C	0.10	mm
Start point	D	15.000	mm
Radius	R2	15.000	m
	R2min	15.000	m
Compensation of X	E	0	mm



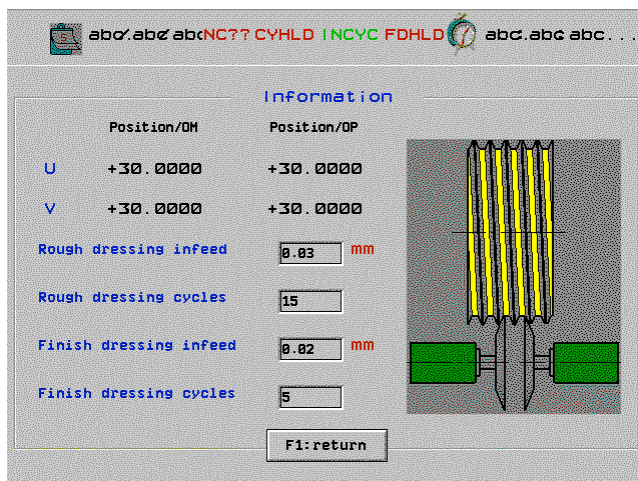
F1: return

A	B	R1	C	D	R2	E
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### Dress Data Input

Rough dressing infeed	Ur	0.03	mm
Rough dressing cycles	Cr	10	
Finish dressing infeed	Uf	0.02	mm
Finish dressing cycles	Cf	5	
Pitch_Left_Number	P_L	10	
Pitch_Right_Number	P_R	5	
O.D dressing cycles	C_O.D	0	

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- **Conversational Control Design.** The G code will be automatically created based on the gear processing and grinding parameters entered by the user. In addition, the customers can even directly use and upload straight G code if desired.

### Standard Machine Accessories

01	Special Tools	1set	
02	Diamond Dressing Wheel M=2-4	1set	
03	Grinding Wheel Flange	3sets	
04	Grinding wheel, 400X203X100	3pcs	
05	Gauge for wheel (Total: 16pcs)	1pc	
06	Diamond pen	1pc	
07	Cooling device for coolant tank	1set	
08	Leveling pads for machine foundation	1set	
09	Adjusting device of centre	1set	
10	Upper Live Center	1set	
11	Lower Arbor Dead Center	1set	
12	Workpiece Center for Examination	1set	
13	Operation Manual	1set	

### Standard Machine Accessories

01	Change gear for adjusting the parts' module will be ground to suit. Total: 14 pieces	1set	
02	Special Tools	1set	
03	Extended Length Live Center	1set	
04	Adjustable Live Center	1set	
05	Center Adjusting Device	1set	
06	Workholding Collet(s)	1set	
07	Paper Hydraulic Filter(s)	6pcs	
08	Diamond dressing wheel M=2-4 set	1set	
09	Grind wheel flange 200mm ID	3sets	
10	Gage for wheel	1pc	
11	Grinding wheel, Winterthur 400X203X100	3pcs	
12	Diamond pen	1pc	

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13	Coolant Chiller device for coolant tank	1set	
14	Workpiece center for Examination	1set	
15	Leveling Pads for Machine Foundation	1set	
16	Operation Manual	1set	

### 1.7 Machine Color

Machine and peripheral units: Blue  
Doors: White

### 1.8 Power-off Protection System

To provide controlled retreat of the machine into safety parking position in case of a power outage to protect workpiece and tools. Included.

### 1.9 Operator Training at QC American/Customer Facility

This program is designed in the following way: to prepare your operators to begin operating the machine directly before or after final acceptance at your facility, or at QC American Ypsilanti, Michigan USA.

## 2. Special Machine Accessories (Option – Included on stock machines)

Option A	Grinding Wheel Gauge	M1-M6 (Total: 17pcs)	1pc	
Option B	Root Roller	M=1-1.5 M=2-2.5 M=3 M=3.5-4 M=4.5-6	1pc 1pc 1pc 1pc 1pc	
Option C	Diamond Dresser Wheel Set	M=1-2 M=2-4 M=4-6 Special form	1set 1set 1set 1set	
Option D	Air Blowing Unit		1set	
Option E	Automatic Stock Dividing System	SBS –AEMS system	1set	
Option F	Grinding Wheel	400X203X100 6KS120C4VM250M2RA 400X203X100 92A100H5V111	1pc 1pc	
Option G	Grind wheel flange	160mm ID Special	1set	
Option H	Spring clamping head		1set	
Option I	Tail stock center		1set	
Option K	Special dresser	Confirm according to user's requirement		
Option L	Grinding arbor	Confirm according to user's requirement		
Option M	Balance core shaft for		1set	

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	grinding wheel balance			
Option N	Roll branch device		1set	
Option O	Balance frame for grinding wheel balance		1set	
Option P	SBS Balance device for grinding wheel		1set	
Option Q	Oil mist recovery and electrostatic air filter		1set	
Option R	Additional Change Gears for dresser system		1 set	
Option S	Ebbco Metalworking Filtration System – 80psi @ 100GPM Cartridge-Type System	#PMF-MWF5-623-T-FP BFH-FP-24K J-8705	1 Each	

### 3. Machine Warranty

A warranty period of 12 months on entire machine and accessories from time of final acceptance or 5,000 hours of use – whichever occurs first. An extended warranty is available per further negotiation(s).

### 3.5 Spare Parts Warranty

Spare Parts availability is guaranteed for 10 years from the date of machine commissioning with deliveries under current market conditions.



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