

LFJ114 Cut Off Machinery Specification

Version: 1.0

Model: LFJ114

Serial: SRET20180104-2-L01

SRET Equipment Co., Ltd.

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Catalogue

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1.0 General

The series of LFJ cut off is the most advanced automatic equipment for HFW (high frequency longitudinal seam welded pipe/tube). The working mode is cold sawing by numerical controlled.

1.1 Principle

The measuring rolls on the pipe/tube mill measure the length and speed of the pipe/tube and send the data to the computer. The computer controls the servo motor to drive the saw carriage for automatic tracking. When the carriage speed is synchronous with the pipe/tube, the cutting starts. The saw blade is drove by servo motor and adjusts cutting speed automatically by microprocessor controlling for pipe/tube size. The advanced technology and equipment are used for high cutting precision and speed, like dynamic response servo control, error compensation, anti-backlash, PID, high resolution encoder and high performance motion controller.

1.2 Advantage

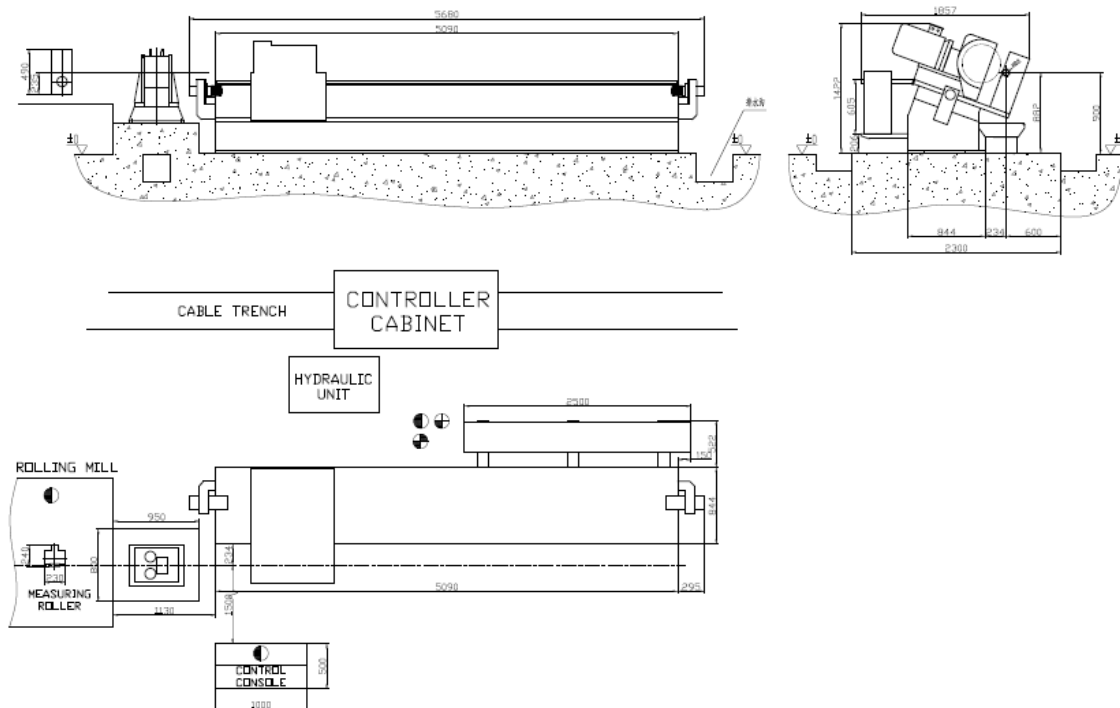
Lower noise, lower energy cost, no burr, stable running, easy adjustment, high-level precision, high cutting efficiency and long service life of saw blade.

2.0 Parameter

No.	Type	Description/Value
1	Cut off type	Cold saw
2	Positioning	Center
3	Height of pass line	1100mm
4	Flow direction	Left to right
5	Max. OD	Ø108mm
6	Min. OD	Ø21mm
7	Square pipe/tube size	15*15mm
8	Rectangular pipe/tube size	80*80mm
9	Thickness of pipe/tube	2.0-5.0mm
10	Cut off length	3.5-10.5m
11	Surface speed	50~55m/min, at Φ108mm; 95m/min, at Φ21mm
12	Tolerance	±2.0mm
13	Dia. of measuring roll	Ø111mm

No.	Type	Description/Value
14	Tube material	Hot and Cold roll steel
15	Yield strength	190~440N/mm2
16	Tensile strength	270~490N/mm2
17	Dia. of saw blade	Ø450~500mm(TCT/HSS: Ø450mm)
18	Dia. of saw blade center hole	Ø50mm(TCT/HSS)
19	Thickness of saw blade	2.8mm(TCT)/ 3.0mm(HSS)
20	Power voltage	380V±10%
21	Power frequency	50HZ
22	Power of drive motor	15KW
23	Power of saw motor	15KW
24	Power of feed motor	3.1KW

3.0 General Layout



4.0 Equipment and Operation

4.1 Equipment

No.	Unit/System	Including	Annotation
1	Base bed	---	---

No.	Unit/System	Including	Annotation
2	Saw unit	Servo motor	The saw blades are driven by the servo motor. The cutting speed is controlled by the gear box.
		Gear box	
		Saw blades	
3	Clamp unit	Hydraulic cylinders	The clamping jaws are driven by the hydraulic cylinders and they must be installed to match the size of the pipes/tubes for cutting stability. New size of clamp jaws diagram must be offered by machine supplier.
		Clamping jaws	
		Fixtures	
4	Feed unit	Feed table	The clamp unit is installed on the feed table. The feed speed is controlled by the ball screws moving which are driving by the servo motor. Different pipe/tube lengths working process can be implemented automatically for fast lead in/out.
		Servo motor	
		Ball screws	
5	Carriage/Drive unit	----	The carriage is moved by the gears and racks moving which are driven by the servo motor. The gear box makes the carriage move fast. The carriage drives the saw unit, makes the cutting plane and the horizontal plane to form a 15-degree angle. This cutting mode ensures the cutting is beginning from a square pipe/tube corner for high cutting efficiency and cooling water discharging.
6	Measure unit	Measuring roll	The measuring roll is pressed on the moving pipe/tube and rotated with it. The encoder of the photoelectric pulse generator is also rotated with them, gets the movement speed and sends it as a pulse signal to the computer. The lifting gear is set for different height in different pipe/tube sizes.
		Photoelectric pulse generator	
		Lifting gear	
7	Hydraulic system	----	Refer to Operation Manual of AMO .
8	Lubrication system	Lubrication pump	Lubrication system lubricates the linear guides and ball screws automatically.
		Oil pipe	
		Etc. (details as per lubrication manual)	

4.2 Process

After the pipe/tube comes out from the mill, the measuring roll makes the pulse encoder get the movement situation. The encoder offers command and controls the position and speed of the carriage, including like tracking, clamping, cutting, unclamping, carriage returning, etc.

The pipe/tube moving order is going into the holdup roll, the clamp unit, the saw unit, the back clamp unit and the back holdup roll.

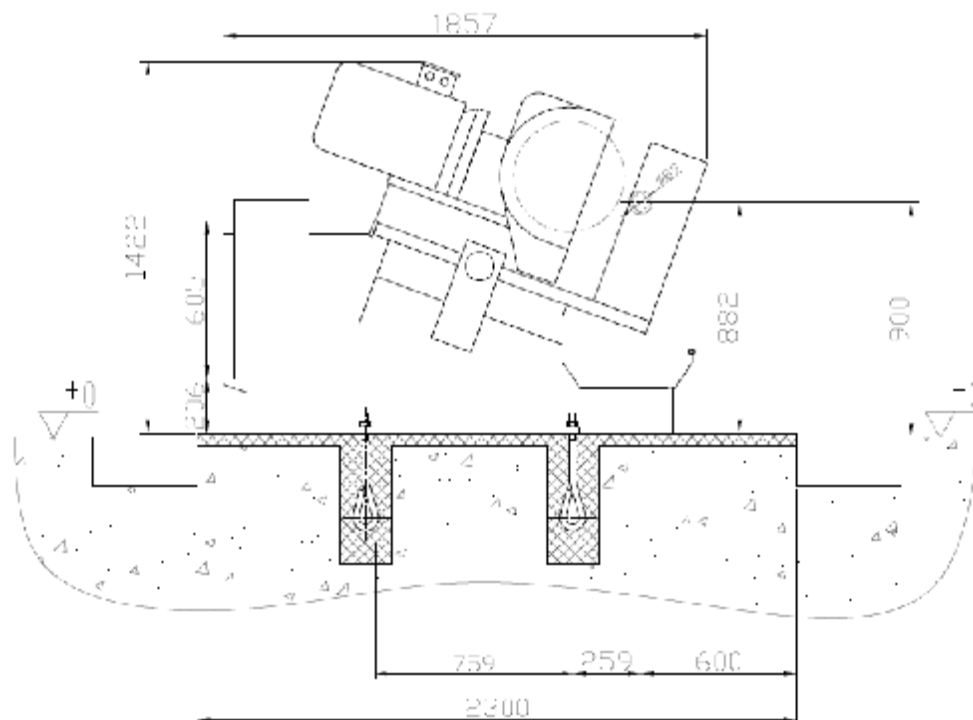
5.0 Installation

5.1 Before Installation

Unpack the equipment carefully after arriving. Read all the enclosed documents carefully. Acquaint every part, overall structure and working principle for installing correctly. Check the goods according to the packing list and find if there is something missed, damaged or unmatched with the design drawing. If there is something wrong, connect the supplier (us) at once.

5.2 Installation Order

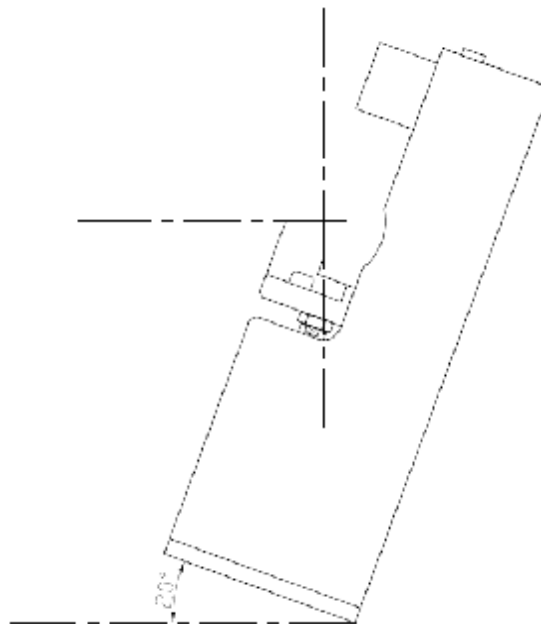
5.2.1 Read and understand the foundation plot and layout before installation. The following drawing is the left view of the layout.



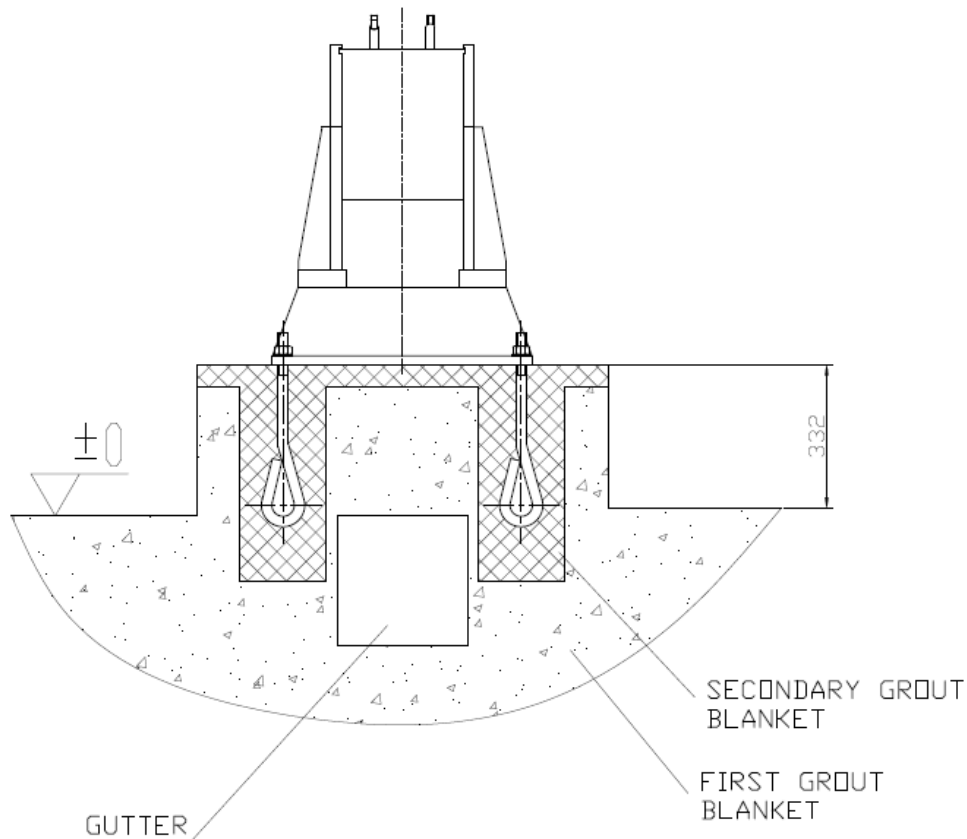
5.2.2 Lift up the main part of the equipment by crane and put it down after the foundation bolts are put into the equipment base. The putting down process must be slowly to ensure the foundation bolts will be put into the correct holes. Some necessary protection should be done for preventing equipment damaged during lifting.

5.2.3 Adjust the equipment level and parallelism generally.

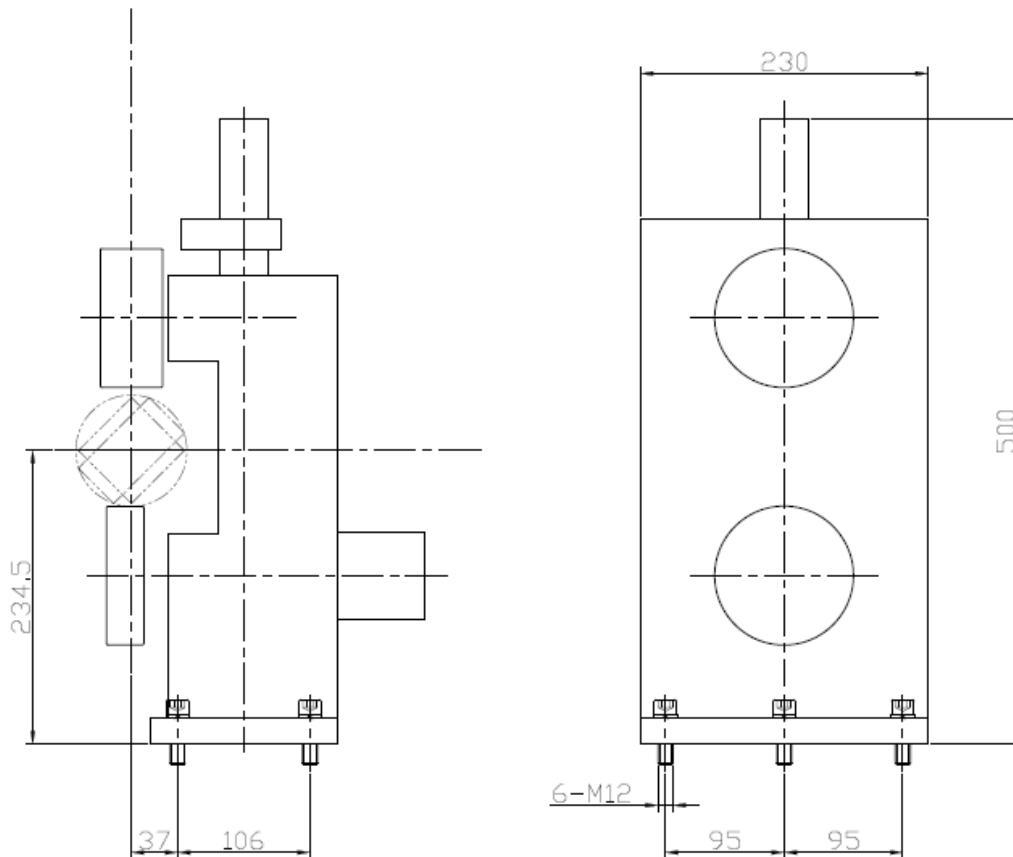
5.2.4 Install the measuring part on the lower clamping jaw and ensure the piston rod of hydraulic cylinder is completely released. At this time, the top surface and vertical plane of the measuring part are the horizontal rolling centerline and vertical rolling centerline as the following drawing. Adjust the equipment's level and vertical position to make the base planes of measuring part is coincident with the mill rolling centerline. Move the carriage manually in all position and ensure all the tolerance should be less than 0.5mm.



5.2.5 Install the guide roll. Reserve the gutter as the following drawing.



- 5.2.6 Fastening anchor bolts and do secondary grouting. Please keep stable during grouting.
- 5.2.7 Maintain base after grouting to keep its strength.
- 5.2.8 Adjust the equipment level and parallelism finally after maintaining, then fastening all bolts. Set butters around the base. The width and depth of the butter are decided by user.
- 5.2.9 The installing position of measuring roll is determined by production condition, but the height should be ensure that the measuring roll can be pressed on the pipe/tube firmly. Install as the following drawing. Connect the encoder and test the measuring roll.



5.2.10 Install hydraulic unit, electric cabinets and control console in the suitable position.

5.2.11 Connect the hydraulic system, cooling water system and electric system after above installation. Connect oil pipes of hydraulic unit and make sure there is no leakage. Connect cooling water pipes to the cooling supply. Connect the electric system by referring to the electric circuit diagram.

6.0 Adjustment and Test Run

6.1 Adjustment

This cut off is made up by mechanical, electrical, hydraulic and computer system. Some necessary adjustment must be done for fast and accurately running. Finish the adjustment in the following requirement.

6.1.1 Open the saw cover and clean the locknut. Install the saw blade. Tighten the locknut and close the cover.

6.1.2 Install the clamping jaws according to the pipe/tube size.

- 6.1.3 Adjust the measuring roll and make it pressed on the pipe/tube firmly. If the roll has some wear, move it axially and continue to use, or change a new one.
- 6.1.4 Adjust the position of horizontal and vertical roll according to the position of coming pipe/tube.
- 6.1.5 Adjust the position of the travel switch on the base bed to match the production length and speed.
- 6.1.6 If the pipe/tube thickness is more than 3mm, change to TCT saw blade.
- 6.1.7 Adjust the hydraulic pressure according to the pipe/tube size, make sure the clamping jaws can clamp the pipe/tube tightly.
- 6.1.8 Lubricating point:

Position	Qty.
Carriage linear guides	4
Ball screw	1
Feed guide way	4
Total	9

6.2 Test Run

Perform the test run in the following requirement.

6.2.1 Preparation

Before test run beginning, serious inspecting and debugging of mechanical, electrical, hydraulic system is necessary.

6.2.2 Test run steps

- ① Inspect and test run mechanical, electrical and hydraulic system respectively, and then do the joint debugging.
- ② Finish the manual operation before automatic operation. Finish the no-load test run before on-load test run.

6.2.3 Attention and recording

Watch carefully and prepare the safety protection during test run. Record necessary information in details for further adjustment.

6.2.4 No-load test run

- ① Adjust the clamp unit. Make it move smoothly.
- ② Adjust the guide roll unit. Make it move smoothly and midmost.
- ③ Adjust the feed unit. Make it move smoothly and agilely.
- ④ Adjust the carriage. Make it move smoothly and no vibration.
- ⑤ Adjust the drive unit. Make the gears and racks contact well and move smoothly.

6.2.5 Simulated cutting test run

Set the clamp unit ready. Test cutting without pipe/tube. Keep the saw blade in the surface speed of 2-8m/s. Watch the cutting trajectory and adjust the parameter to prospective.

6.2.6 Static cutting test run

- ① Set the pipe/tube in the cutting position.
- ② Clamp the pipe/tube.
- ③ Cut by using the simulated data and record the real cutting data, including cutting time and cutting angle.
- ④ Adjust the parameter to prospective.

6.2.7 Hydraulic system test run

Adjust the oil pressure to the target scope. Adjust all pressure regulating valves and flow valves on branches according to the running speed and working pressure of operation unit oil cylinder.

6.2.8 Joint test run

- ① Start the joint test run after everything goes well in each step above.
- ② Supply power to each part and make sure everything goes well, then supply power to the whole machine/system.
- ③ Finish the joint test run of mechanical, electrical and hydraulic system by design.

7.0 Hydraulic Specifications

7.1 Main Parameters

No.	Type	Description/Value
1	Rated pressure	7MPa
2	Rated flow	41L/min
3	Pump motor	Y-132S-4B35
4	Pump motor power	5.5kW
5	Pump motor speed	1460rpm
6	Gear pump	A10VSO28DR
7	Pump rated pressure	20MPa
8	Pump flow volume	28mL/r
9	Power supply	AC380V、50Hz
10	Power supply solenoid valve	DC24V
	Air cooling	DC24V
11	Volume	200L
12	Hydraulic medium	YB-N46 anti-wear hydraulic oil
13	Working cleanliness	NAS10(Standard NAS1638)
14	Working temperature	20°C≤t≤55°C

7.2 Installation

Perform the installation in the following requirement.

- 7.2.1 Unpack the hydraulic unit carefully after arriving. Check the goods according to the packing list and find if there is something missed, damaged or unmatched with the design drawing. If there is something wrong, connect the supplier (us) at once.
- 7.2.2 Keep all oil pipe terminals covered or wrapped in case of pollution until pipe installation starts.
- 7.2.3 Install the hydraulic unit tightly on the base according to the design drawing for working well.
- 7.2.4 Install and connect pipes according to the general layout after positioning.
- 7.2.5 After pipe installation, install and connect wires according to the element numbers of hydraulic wiring diagram or hydraulic design drawing.

7.3 Test Run

Perform the test run in the following requirement.

7.3.1 Before test run, recheck the whole installation and pipe/wire connection according to the hydraulic system schematic diagram, electrical control drawing and all construction drawings.

7.3.2 After rechecking, perform the test run according to the hydraulic system schematic diagram in the following order.

- ① Inject hydraulic medium oil to the air cleaner[2] of oil tank until the liquid in the liquid level meter[1] reach the upper limit.
- ② Adjust the bolts.
- ③ Turn on the motor and watch if it rotates right, if not, readjust the circuit.
- ④ Turn on the oil pump and make it runs 2-3 minutes without load. If there is no noise during running, screw the adjustable bolt on the pump head. Watch the pressure gage, when the system pressure reaches the schematic diagram requirement (Default value is 7MPa), screw the bolt to stable the system pressure.
- ⑤ Find leak point in all pipe connections, valve installation surfaces and manifold block installation surfaces. Inspect all fastening bolts and ensure them tightly.

7.4 Principle

The hydraulic system supplies high pressure medium oil to the cut off by plunger pump.

The pump absorbs medium oil from the oil tank, outputs pressure oil to the main engine through the check valve[7], acts on the pressure gage[11] and the accumulator[8], sends pressure to the accumulator[8]. The oil goes back from the main engine to the oil tank through the oil filter[15].

In normal state, the oil cylinder retracts and releases when the motor starts, sticks out and clamps when the YV1 gets power.

7.5 Notice

7.5.1 Inspect the following before operation.

- ① Whether all adjusting handles/wheels are in the right position.

- ② Whether the oil level in tank is within the limits of the liquid level meter.
- ③ Whether all pipe connection points and fastening bolts are tight.

7.5.2 Inspect the following during operation.

- ① Temperature of the motor and oil pump
- ② System pressure
- ③ Whether the high pressure connection points are stable.

7.5.3 Record the following conditions for later repairing, maintaining and analyzing.

- ① Oil changing
- ② Components and auxiliary attachments changing
- ③ Fault handling

7.6 Maintenance

7.6.1 Replace the hydraulic medium oil in following conditions.

- ① After the test run
- ② Half year using after ①
- ③ Every year after ②

7.6.2 Inspect the oil filter at any time and clean or change it if it is blocked.

7.6.3 Keep storing some spare parts like easily damaged parts and auxiliary attachments.

7.7 Supplied Documents

No.	Name	Document Number	Pages
1	System schematic diagram	OL-LQJ-XRT-000	1
2	System assemble diagram	OL-LQJ-XRT-100	1
3	System terminal diagram	OL-LQJ-XRT-900	1

8.0 Lubrication System Operation manual

Refer to ***AMO Series Quantitative Pressured Centralized Lubricating System Operation Instruction.***

9.0 Electrical System Manual

Refer to ***Cold Saw Cut off Control System Operation Instruction.***

10.0 Safety Precautions

Comply with the following safety precautions in any time.

- ① DO NOT operate the equipment except authorized persons.
- ② DO NOT close to the running saw blade and its carriage.
- ③ Keep away from the cut off for more than 2 meters to avoid splashing iron dust.
- ④ Shut down the power before changing saw blade.

11.0 Maintenance

Regular inspection and maintenance can make the equipment work well and lower loss.

11.1 Mechanical System Maintenance

11.1.1 Inspect the following and handle the loose or damaged problem during every shift.

- ① Cut gear box
- ② Drive gear box
- ③ Clamp unit
- ④ Connection of linear guides and the carriage
- ⑤ Running conditions of pipes and chains

11.1.2 Clean iron dust on the base bed, the carriage and especially the linear guides after every shift. If there is too much iron dust, clean it during pause time.

11.1.3 Stop and check the wear condition of the saw blade for every 4 hours.

11.1.4 Generally, the drive gear box doesn't need maintenance. But for the long continuous running gear box, its oil should be changed for every 20,000 hours or every 2 years. The changing operation should be done by professional company. They should inject new oil into the gear box to replace the old oil completely. The injecting quantity should be filled 1/3 of the inner space. The output end of gear box is sealed by rotary shaft lip seal ring (TC type). If the seal ring leaks oil, change it. Inspect the temperature of gear boxes regularly. The temperature of cut gear box should be lower than 70°C, and the temperature of drive gear box should be lower than 60°C. If any temperature rises over 90°C, or some noise is heard, stop using immediately. Inspect and analyze the reason.

Do not restart unless the debugging is finished.

11.1.5 Inject lubrication oil into the cut gear box to the oil level sign before using because the supplier doesn't inject too much in case of transportation. Inject lubricating grease to the lubricant nozzles of the gear box tail.

11.1.6 Check the lubrication oil level in the lubrication oil pump before every shift. Inject immediately if the oil is not enough because the oil pump supplies oil to all linear guides and ball screws. Inject lubrication oil to the bearing block manually every 1 or 2 weeks.

11.1.7 Record the data of running condition, maintaining and saw blades using.

11.1.8 Clean up the equipment regularly (turn off the power before cleaning).

11.1.9 Replace all lubrication oil after 7 days running.

11.1.10 The cooling system is spray type. The cooling liquid is 1# emulsion cutting oil and mixed with 5-25% water. Refer to standard SH/TP365-92.

11.2 Hydraulic System Maintenance

11.2.1 Use only clean lubrication oil.

11.2.2 Inspect pipe fittings every 1000 hours and replace the bad ones.

12.0 Purchased Parts, Easily Damaged Parts and Bearing Parts

12.1 Purchased Parts

No.	Mode	Name	Qty.	Position
1	IPH8133-1AF13-1CA1	Saw motor	1	Saw unit
2	IPH8133-1FF13-1CA1	Drive motor	1	Drive unit
3	IFK7084-2AC71-1CB1-Z	Feed motor	1	Feed unit
4	SB 220-5-P2	Drive gear box	1	Drive unit
5	K613 AG 0073 ME40	Cut gear box	1	Saw unit
6	CXHC-A-EX-SD-50X20ST	Clamp cylinder (Upper)	2	Clamp unit
8	R50-10T4-FSI-380-596-0.05	Ball screw	1	Feed unit
9	HGH 35 HA 2R 680 ZAC II KK	Feed linear guide	2	Feed unit
10	HGW 55 HB 2R 5220 ZAC II KK	Carriage linear guide	2	Base bed
11	YK-HB 16-100-M	Buffer	2	Base bed
12	TL-2/90x300x3420/83X288 (R=300)	Plastic cable carrier	1	Base bed

13	LK11-104K-32-25	Diaphragm coupling	1	Feed unit
14	TCT Ø450/500	Saw blade	1+1	Saw unit
15	LMK30-UU	Linear bearing	4	Measure unit
16	MAL 40X150	Measure cylinder	1	Measure unit

12.2 Easily Damaged Parts

No.	Drawing number	Name	Material	Position
1	LFJ114-1-6	Rack	45	Base bed
2	LFJ114-2-6-5	Copper sleeve	Bronze	Clamp unit
3	LFJ114-2-6-6	Guide rod	40Cr	Clamp unit
4	LFJ114-2-11-2	Helical gear	40Cr	Drive unit
5	LFJ114-2-20-2-1	Shaft	45	Roll
6	LFJ114-2-20-2	Roll	45	Stop roll
7	LFJ114-2-20-2-2	Roll	45	Back roll
8	LFJ114-2-20-2-3	Roll	45	Back roll
9	LFJ114-2-21-3	Shaft	45	Back roll
10	LFJ114-3-3A	Measure roll (Upper)	Cr12	Measure unit
11	LFJ114-3-3B	Measure roll (Lower)	45	Measure unit
12	LFJ114-3-5	Long Shaft	45	Measure unit
13	LFJ114-3-8	Short Shaft	45	Measure unit
14	LFJ114-3-10	Guide rod	40Cr	Measure unit

12.3 Bearing Parts

No.	Name/Mode	Mode	Size	Qty.	Position	Drawing No.
1	GB/T283-1994	NU206	30x62x16	1	Feed unit	LFJ114-2-2
2	GB/T297-1994	33207	35x72x28	2	Feed unit	LFJ114-2-2
3	GB/T276-1994	6205-2Z	25x52x15	8	Hold up roll	LFJ114-2-16-2
4	GB/T276-1994	6205-2Z	25x52x15	2	Back up roll	LFJ114-2-17
5	GB/T276-1994	6006-2Z	30x55x13	4	Measure unit	LFJ114-3
6	GB/T276-1994	61904-2Z	20x37x9	2	Colling	LFJ114-6