GF320H

CNC Tilting Rotary Table

Operation Manual

detron machine co., LTD.

http:www.detron.com.tw

No 47-5, Zunqian Rd, Shengang Township, Taichung County 429, Taiwan

TEL:886-4-2561-6000 FAX:886-4-2562-7872

2014.12.05

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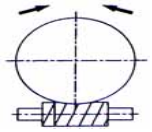
Item	(1) Introduction

Thank you for purchasing a "detron" - NC Rotary Table，To achieve optimum performance, take the time to read this manual carefully. Handling instructions, tips for maintenance and inspection, and much more, are all here at your fingertips. They will help you to maintain the machine's inherent accuracy for a long-term period of time.

This manual should be made available for reference at all times.

Item	(2) Specifications

No.	Item		Unit	Specification		Remark
				Rotary	Tilting	
1	Worktable Diameter		mm	φ 320		
2	Center Bore Diameter		mm	φ 70H7		
3	Worktable Height in		mm	355 mm		
4	Height of Center		mm	225 mm		
5	Height of Table		mm	425mm		
6	Width of T-Slots			14H7		
7	Tilting Angle Range		deg	+30 ∾ − 120 ◦		
8	Drive Pressure / Method		kg/cm^2	50 / Hyd.		
9	Clamping Torque		kg-m	118	118	
10	Servo Motor	FANUC		α 8i	α 12i	
		MITSUBISHI		HF153S	HF204S	
		SIEMENS		1FK7063	1FK7083	
		HEIDENHAIN		QSY116E	QSY155B	
		YASKAWA		SGMGH13A	SGMGH20A	
11	Transmission Ratio			1 : 120	1 : 120	
12	Max. Table Speed			16.6	11.1	
13	Allowable Loading Inertia		$kg\text{-}cm\text{-}sec^2$	45.7		
14	Resolution		deg	0.001°		
15	Indexing Accuracy		sec	15	50	
16	Repeatability		sec	6	8	
17	Net Weight(W/O Motor)		kg	560		
18	Allowable Loading Capacity	Horizontal	kg	200		
		Vertical	kg	150		
19	Allowable Cutting Torque		kg-m	40		

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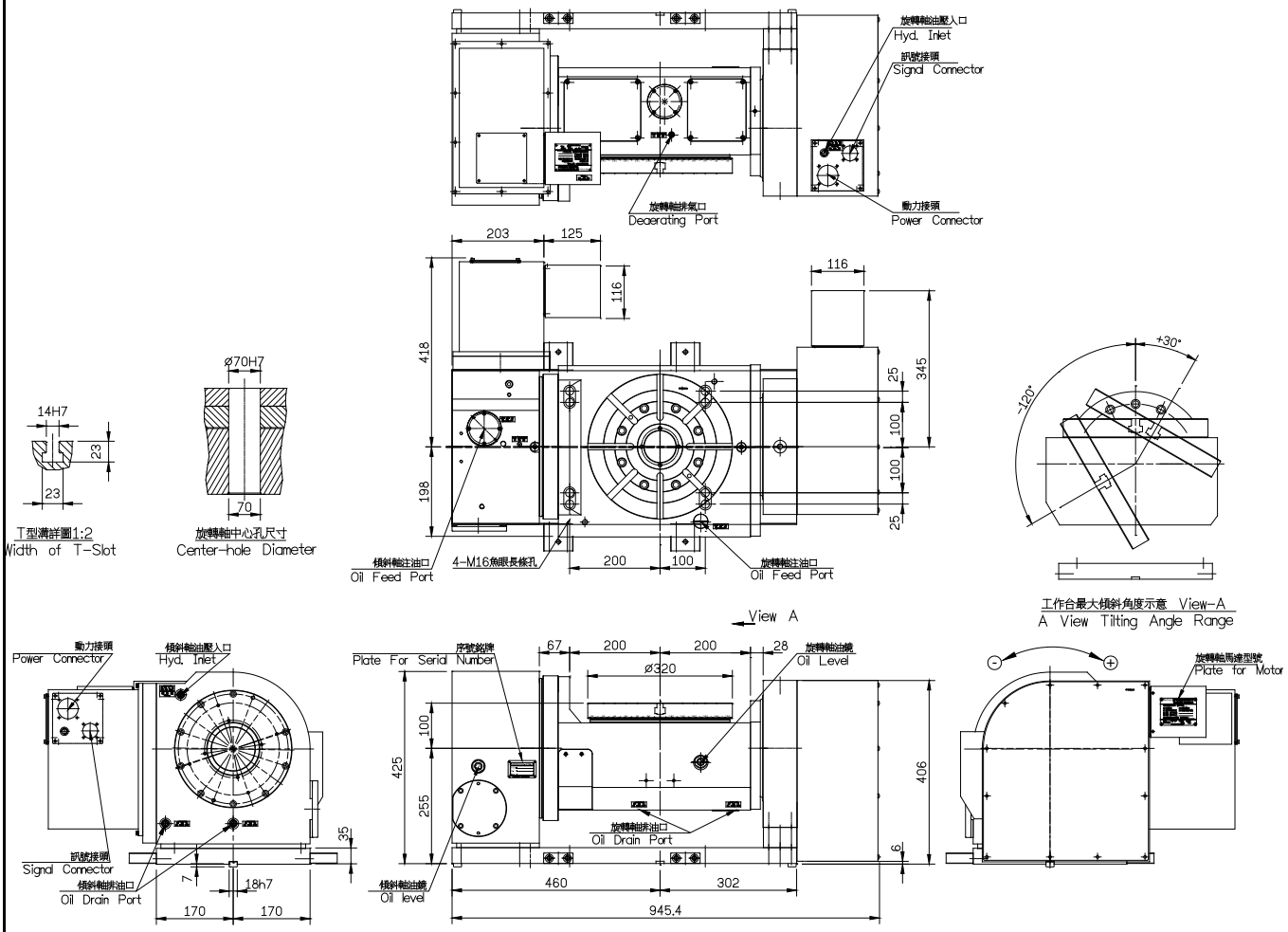
Item	(3) Outline Drawing



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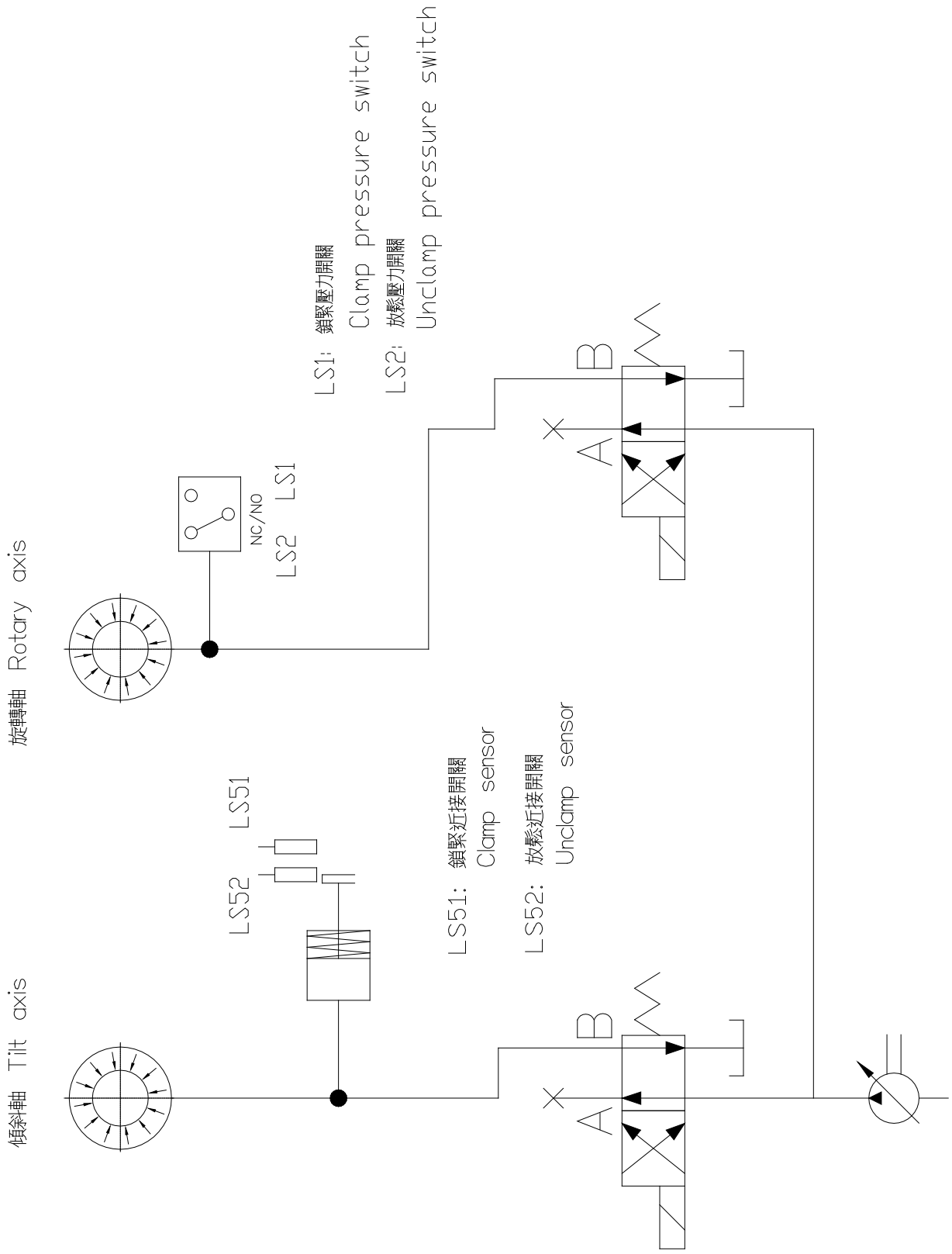
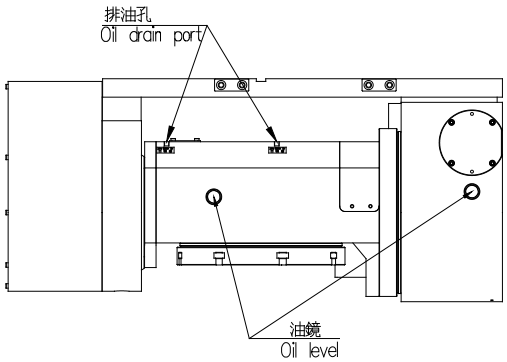
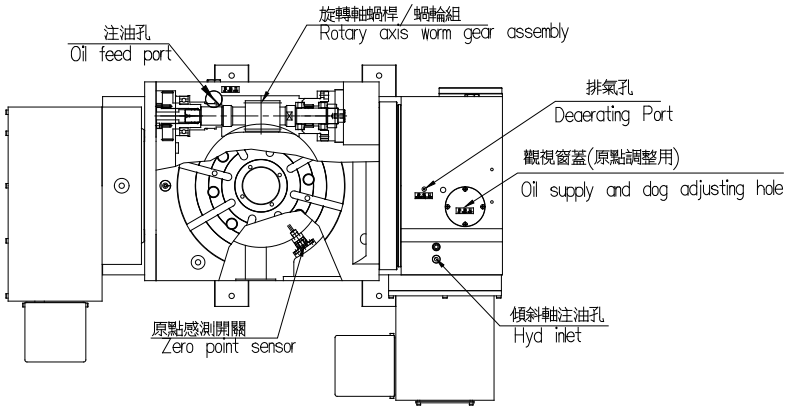
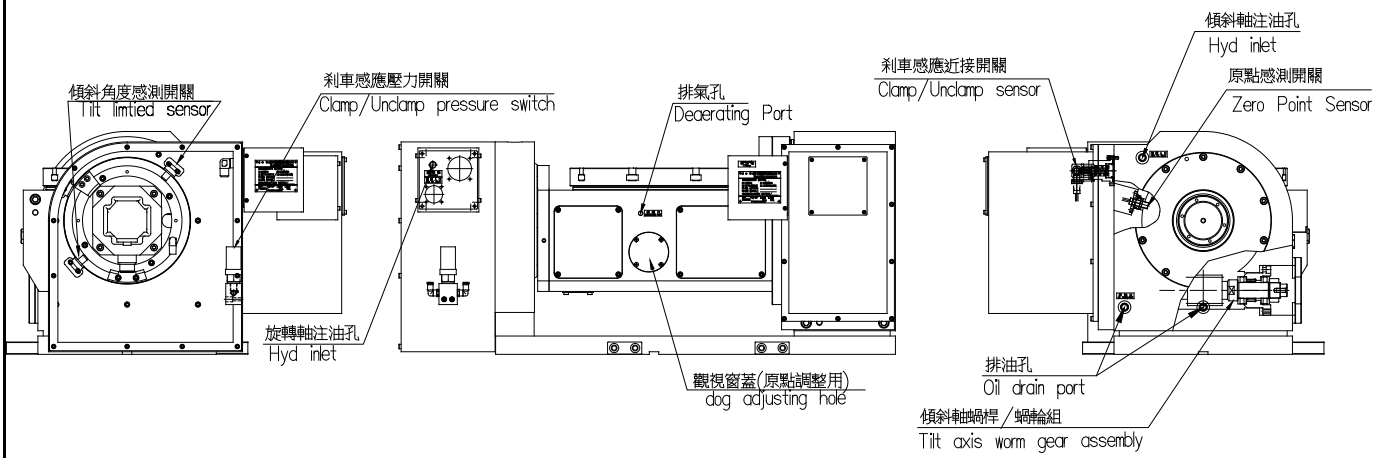
Item	(4) Hydraulic Circuit Diagram



Item	(5) Mechanism of Major Components







Item	(6) Preparation

The following preliminary steps, including a test run, are necessary before operating the CNC Rotary Table：

A. Installation and Preparation

(1) Unpacking, and moving the table to the site and setting up onto a mated machine tool.

(2) Lubrication and Cleaning.

(3) Supply of clamping Hydraulic pressure and elimination of hydraulic oil in the air.

(※: The hydraulic oil must be filtered). ◦

(4) Test run and accuracy check.

(5) Table zero return shift setting.

B .Test Run

(1) Check the table top of the mated machine tool and the CNC Rotary Table bottom for burrs and flaws.

(2) Perform a test run without loading applied to the turntable.

(3) Check the turntable for normal operation by repeatedly clamping and unclamping the table.

(4) Increase the speed slowly when checking the rotational speed of the turntable both in the clockwise and counter clockwise directions.

(5) Check the table zero return function.

(6) Check various operations using the commands from the NC unit.

※ Before operating; please set the angle limitation of tilting axis to avoid the mechanism over stroke and brake.

※ To avoid damaging the mechanism; please do not operate the rotary table until the above procedures are completed.

※ Strongly recommend to delay 500mmsec. after clamp/unclamp command; to avoid the mechanism broken or overheat to make the servo motor alarm.

Item	(7) Zero Setting and Adjustment of Dog

Proximity limit switch has no function causing by：

A. Proximity limit switch is broken。

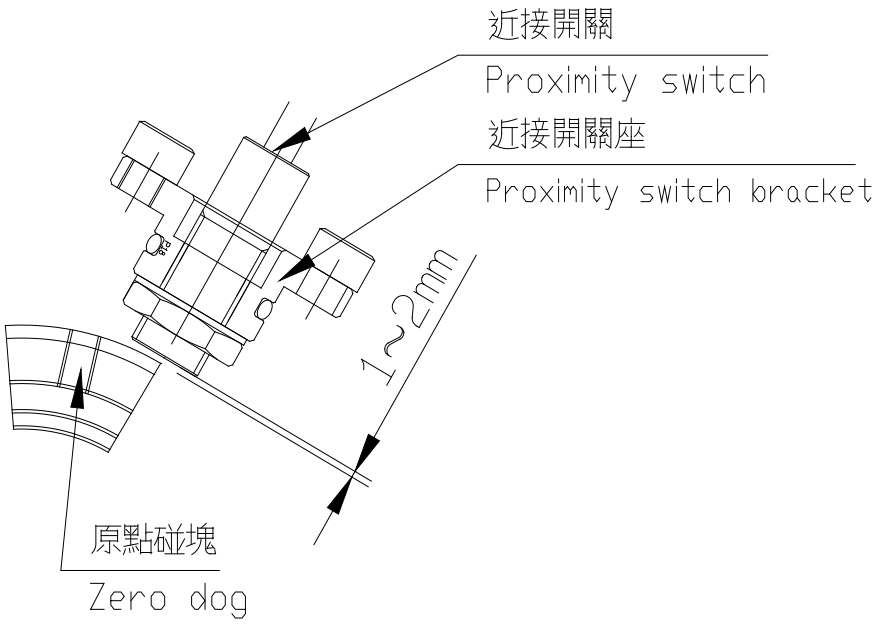
B. The clearance between the proximity switch and the dog is too far; the correct clearance is 1~2mm。

How to adjust the dog：

(1) Remove the top cover(see P9)。

(2) Turn the spindle, and loosen the dog lock bolts (M4) 。

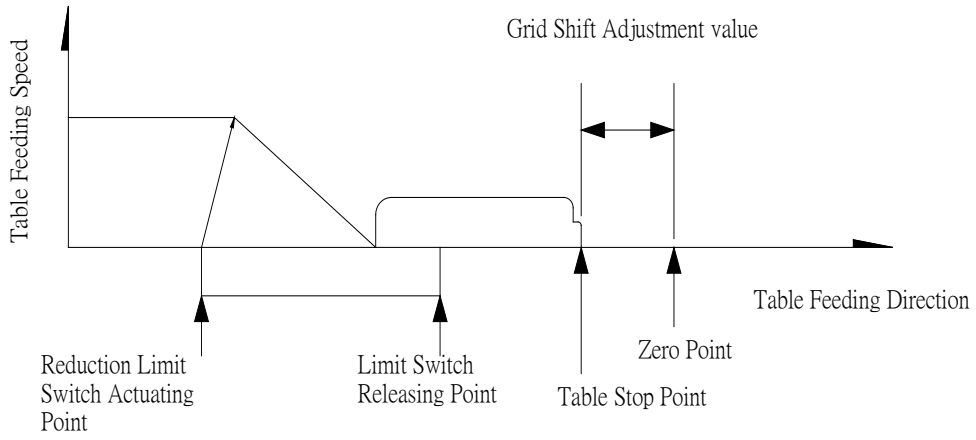
(3) The dog adjustment range is about ±5°。After adjustment, tighten the dog lock bolts。



Item	(8) Zero Return and Grid Shift Amount Setting

Upon receiving of a Zero Return command from the NC unit, the turntable begins to rotate in a specified direction in the rapid traverse mode。When the limit switch is tripped by the speed reduction dog, the table starts decelerating. When the turntable has decelerated to a speed such that the position is not uneven, even with instantaneous stop, it stops upon receipt of a reference signal from the detector of the motor。

Repeat the zero return operation of the table several times, measure the difference between the table stop position and the scheduled stop position in degrees, and input the measured value to the zero return grid shift amount of the NC unit as a correction value。



Item	(9) Worm Gear Backlash Check

The CNC Rotary Table is a highly reliable, maintenance-free product. To keep the table in the proper state for a long period of time, however, maintenance and adjustment are needed。

If the backlash is too large, some play occurs between the worm wheel and the worm shaft, causing vibration or chattering due to the cutting resistance during continuous cutting. If the backlash is too small, the worm gear overheats, which will cause seizure. For the long-term operation, please check the backlash periodically.

Backlash check :

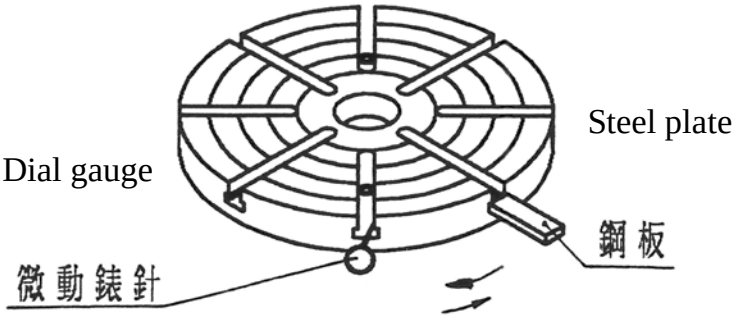
(1) Set the dial gauge on the T-slot surface near the circumference of the turntable。 (drawing shown below)

(2) Inset a steel plate into another T-slot and move it slowly in one direction with a force of 15 to 20 kg. Release the steel plate and read the indication on the dial gauge. Repeat the same procedure in the reverse direction, and read the indication on the dial gauge. The difference between the two measured values is the backlash.

(3) Measure the backlash on the circumference of the turntable at intervals of 90 degrees.

(4) The minimum backlash of the worm gear is 10” to 15” at 20°C.

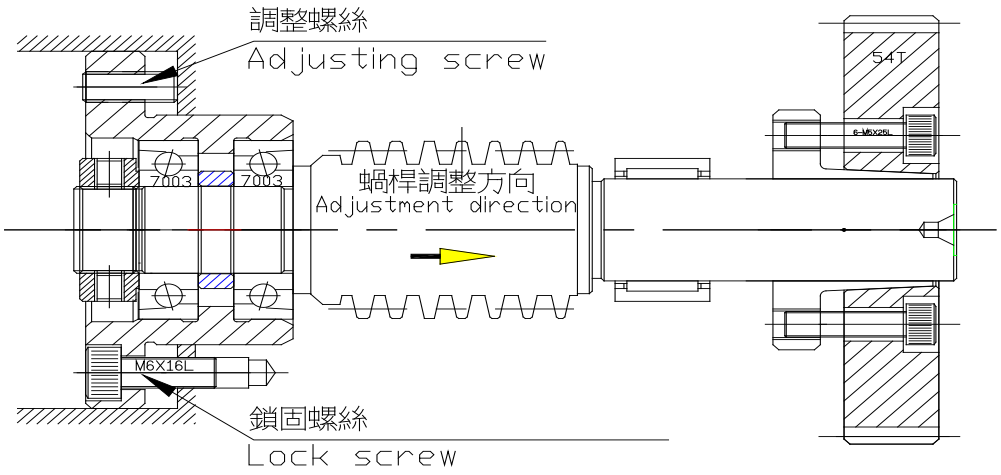
※The backlash will be varied during temperature changes and properly adjust the backlash are necessary.Even if the backlash exceeds the upper limit of the above range, the turntable can be operated. Adjust the backlash when necessary. If the backlash correction value is input to the NC unit as a parameter, the apparent backlash is 0。



Item	(10) Worm Gear Backlash Adjustment

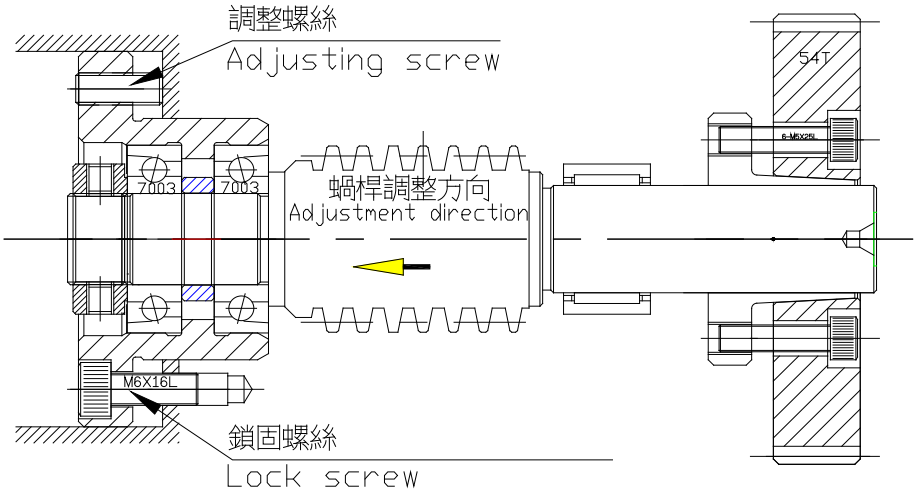
Backlash too large:

Turn the adjusting screw c.c.w. one to fourth uniformly→tighten lock screws uniformly→the worm shaft move forward and reduce the backlash→check the data; Repeat the adjustment and measurement until the proper backlash is obtained。



Backlash too small:

Slightly loosen lock screws→Turn the adjusting screw c.w. one to fourth uniformly→tighten lock screws uniformly→the worm shaft moves backward and increases the backlash→check the data; Repeat the adjustment and measurement until the proper backlash is obtained。

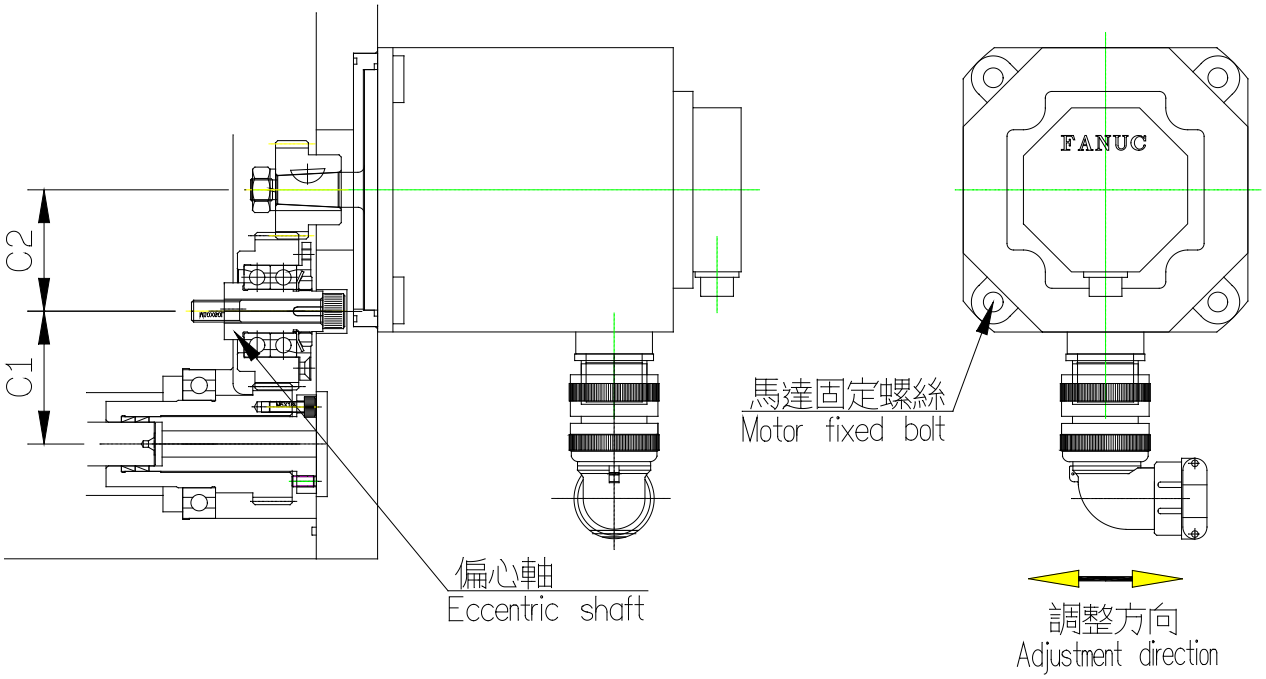


Item	(11) Driving Gear Backlash Adjustment

A: Rotary Axis Gear Backlash Adjustment procedure :

Gear center distance C1 adjusting：loosen ”locking bolt”→turn ”gear spindle” (The distance between axes can be adjusted up to 0.5mm by the gear spindle) until obtain a proper backlash around 0.03~0.04mm→tighten ” locking bolt”。

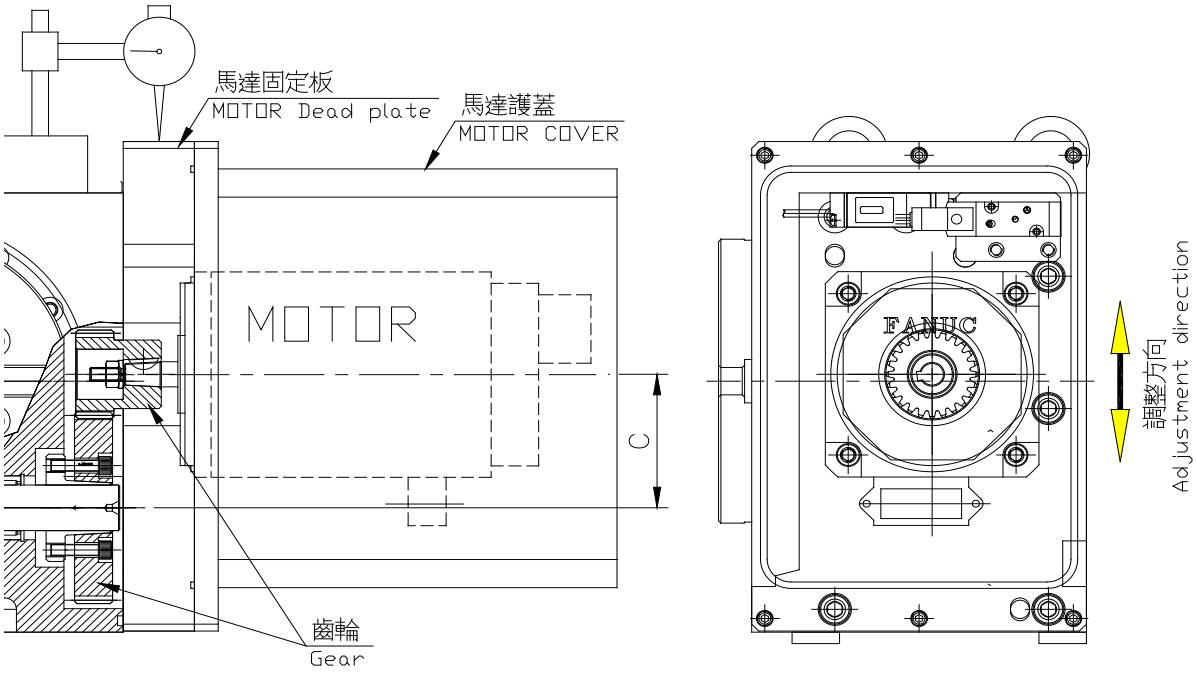
Gear center distance C2 adjusting：loosen ”motor locking bolt”→turn adjustable shaft sleeve by rod”(The distance between axes can be adjusted up to 0.5mm) until obtain a proper backlash around 0.03~0.04mm→tighten ”motor locking bolt”。



Item	(11) Driving Gear Backlash Adjustment

B: Tilting Axis Gear Backlash Adjustment procedure :

Remove motor cover→Loosen lock screw for motor adapter→push motor adapter downward→put dial gauge on the frame(drawing show as bellow)→ push motor adapter upward; to enlarge the backlash→until obtain a proper backlash around 0.05~0.065mm→Re-tighten “lock screw”→put motor cover back。



Item	(12) Clamping Device

To reach high clamping torque; the hyd. pressure should be 50 kg/cm^2 ;when use the lower operating hyd. Pressure will decrease the clamping torque. An end connection (PT 3/8) is provided at two locations, that is, on the top and back. Use one of them, whichever is preferable。

When workpiece has been set-up, clamp the turntable. If a workpiece is machined with the turntable unclamped, the worm gear will be worn out quickly or damaged。The tool and the workpiece may also be damaged。

The clamping mechanism construction is that the brakedrum (connected to the rotary table shaft) is controlled by the braking force enforced, as brakshoe , with deformation of the circumference of thin cylinder by the hyd. oil pressure; the amount of braking force can be calculated。

The confirming device is almost installed inside of motor cover. At the time in clamp the piston shifts upwards and hits the sensor(LS51). At the time in unclamp, the piston shifts down-wards by spring forces, hits the sensor(LS52)

Clamping confirm more than 10 kg/cm^2。

Unclamping confirm less than 8 kg/cm^2。

If use the pressure switch; the Clamping confirm pressure set 10~15 kg/cm^2。

A hydraulic hose and cylinder in the unit contain a certain amount of air mixed with oil. How to exhaust the air entirely from the system; the procedure as bellow:

1.Set the hyd. Pressure around 20 kg/ cm^2。
2.Loosen the set screw around 1/4~1/2 turns on the top of mainbody。
3.Repeat the clamp/unclamp until white bubbles no longer appear from this draiport; tighten the set screw。

Item	(13) Lubrication

To maintain the CNC rotary table in the proper operating condition for a longer period of time, lubricating oil is indispensable.

Oil required on tilting axis around : 1.7 liters

Oil required on rotary axis around : 1 liters

(1) There are some criteria for choosing correct oil, such as anti-rust, anti-oxidant, and the grade of viscosity should be around ISO-VG100~150.
Use high quality oil could maintain good operation.

※Recommended lubricating oil list is as bellow：

Manufacturer	Trade name
Shell	Omala 150
Esso	Spartanep 150
Mobile	Mobile Gear 629
JoMo	Reductus 100

※Note the following:

(2) Keep lubricating oil clean, including all the accessories in order to avoid the chips and dusts into the oil tank during oil supply.

(3) Different brands lubricating composition are different, mixed use will undermine the performance.

(4) Supply lubricating oil up to the central line of the oil gauge (see P9).

(5) The cycle of oil replacement depends on the operation frequency.
It is recommended that a complete oil change should be done semi-annually.

Item	(14) Trouble Shooting

	Symptom	Probable cause	Isolation instruction	Remedy	Ref. Item in text
1	Turntable fails to rotate 1) Motor does not rotate 2) Motor rotates normally	• Burnout • Gear 1ocking s1eeve	• Check cab1e terminals • Check gears inside the gear case	• Reinstall	• E1ectrical diagram • Adjustment of gears in gear case
2	Rotation is not smooth **Abnormal noise is generated during rotation**	• Overload • Gears inside the gear case • Motor setup • Lubrication • Worm gear or gears in the gear case • Unclamping operation(residual pressure)	• Check weight and inertia of workpiece • Measure current values of motor • Check rotation during low speed operation • Check assembly • Measure backlash • Rotation conditions with motor by itself • Check oil level and impurities See clamping device and table clamp/unclamp limit switch unit	• Change workpiece cutting method and conditions • Reassembly adjustment • Replenish or replace • Correct tooth surface or rep[lace	• Specifications • Adjustment of gears in gear case • Lubrication
3	Current value rises	• Clamped table not released • Overload • Worm gear backlash too small or not uniform	• Inspect hydraulic hose and signal line, for connection • Check value function and LS signals • Check for residual pressure when table is unclamped • Check workpiece and cutting conditions	See clamping device and table clamp/unclamp limit switch unit • Change workpiece and cutting conditions	• Feeding oil pressure for table clamp deaeration

Item	(14) Trouble Shooting

	Symptom	Probable cause	Isolation instruction	Remedy	Ref. Item in text
3		• Insufficient warm up or parameter setting	• Check program	• Correct program	• Routine checking work
		• Lube oil: Overfilling Over viscosity Low temp	• In these cases, current value often increases	• Replace oil	• Lubrication
4	Impaired accuracy 1) Index accuracy 2) Runout in table shaft hole	• Worm wheel tooth surface • Worm wheel; deformation or alignment • Bearing nut on shaft	• Measure backlash • Measure variations in backlash • Compare with specified value	• Adjust backlash • Contact detron or dealers	• Worm gear backlash adjustment
5	Chattering during cutting operation 1) When positioning cutting operation takes place	• External force • Clamping function • Excessive worm gear backlash • Excessive gear backlash • Worm shaft MSR locknut	• Check cutting conditions • Clamping device and table clamp/unclamp limit switch unit • Measure backlash • Measure backlash • Inspect look nut	• Correct cutting conditions • Backlash adjustment • Backlash adjustment • Retighten and lock worm nut, MSR	• Worm gear backlash adjustment • Adjustment of gears in gear case • Worm gear backlash adjustment

Item	(14) Trouble Shooting

	Symptom	Probable cause	Isolation instruction	Remedy	Ref. Item in text
6	1) No clamp signal	• Limit switch	• Table clamp/unclamp limit switch ass'y • Clamping sleeve • Check limit switch	• P9 • Contact detron to disassemble the table • replace	Clamping device and table clamp/unclamp limit switch unit
	2) No unclamp signal	• Limit switch dog position • Piston • Signal	• Check position • Check the motion	• Correct mounting positions • Replace O-ring spring, etc.	
	3) Unclamp signal delay 4) Clamp hydraulic fluid (oil) is leaking	• Hydraulic discharge line resistance excessive • Return spring fatigue • Hose connection	• Check lines including valves, hoses, etc. • Check for viscosity and impurities • Check piston fatigue	• Replace with large caliber pipes. • Replace • Correct setting or replace	
7	Zero resetting 1) Table fails to move	• Signal line connection			Zero return limit switch unit structure
	2) Table does not stop; decelerating speed reduction and stop are unattainable	• Limit switch	• Inspect limit switch	• Replace limit switch	
	3) Table does not stop	• MS dos stepping allowance • Dog position • Plunger	• Check dog operation • Check operation • Inspect parts for damage	• Remount and adjust • Readjust • Replace O-ring, spring	

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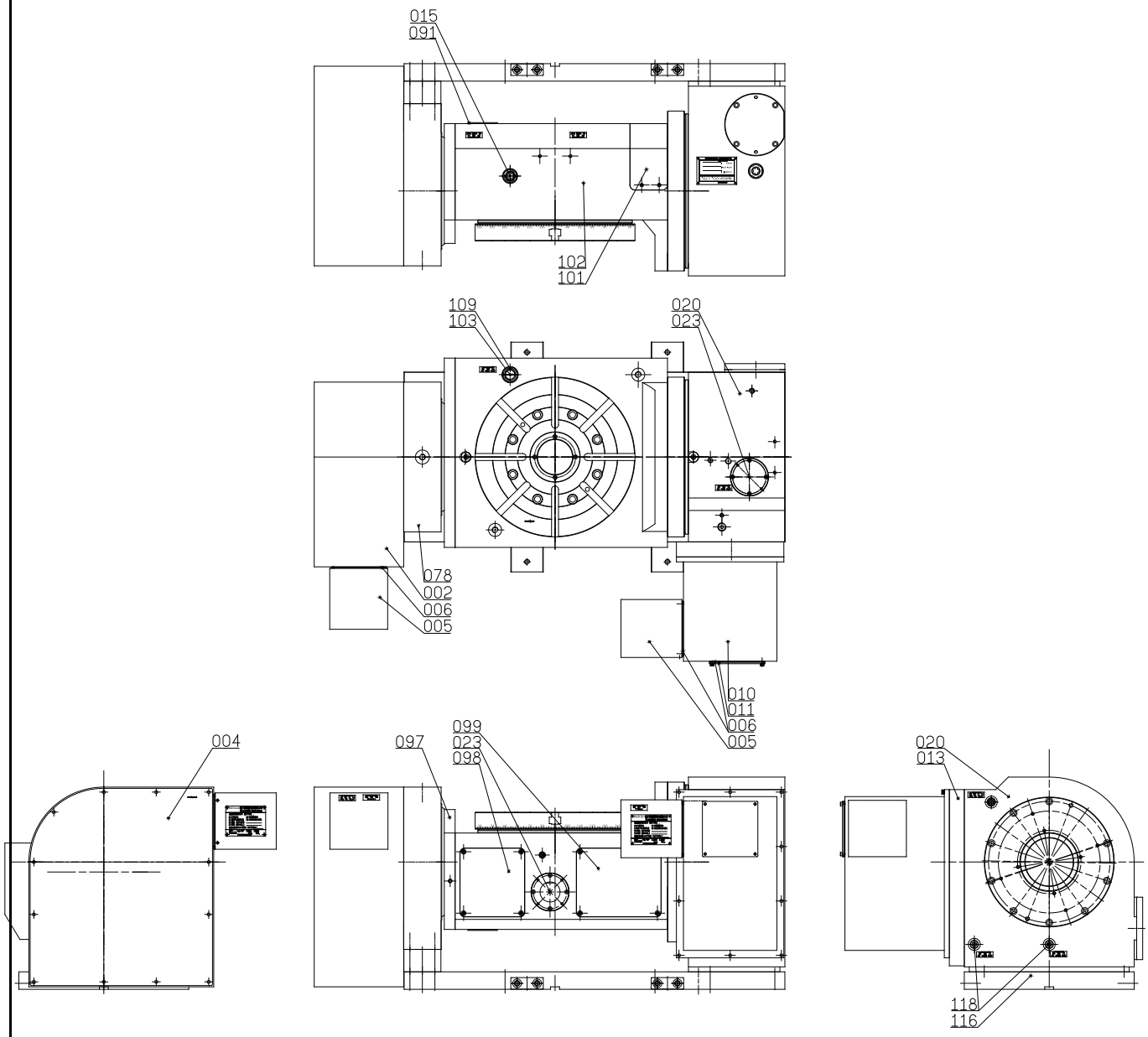
Item	(15) Parts List



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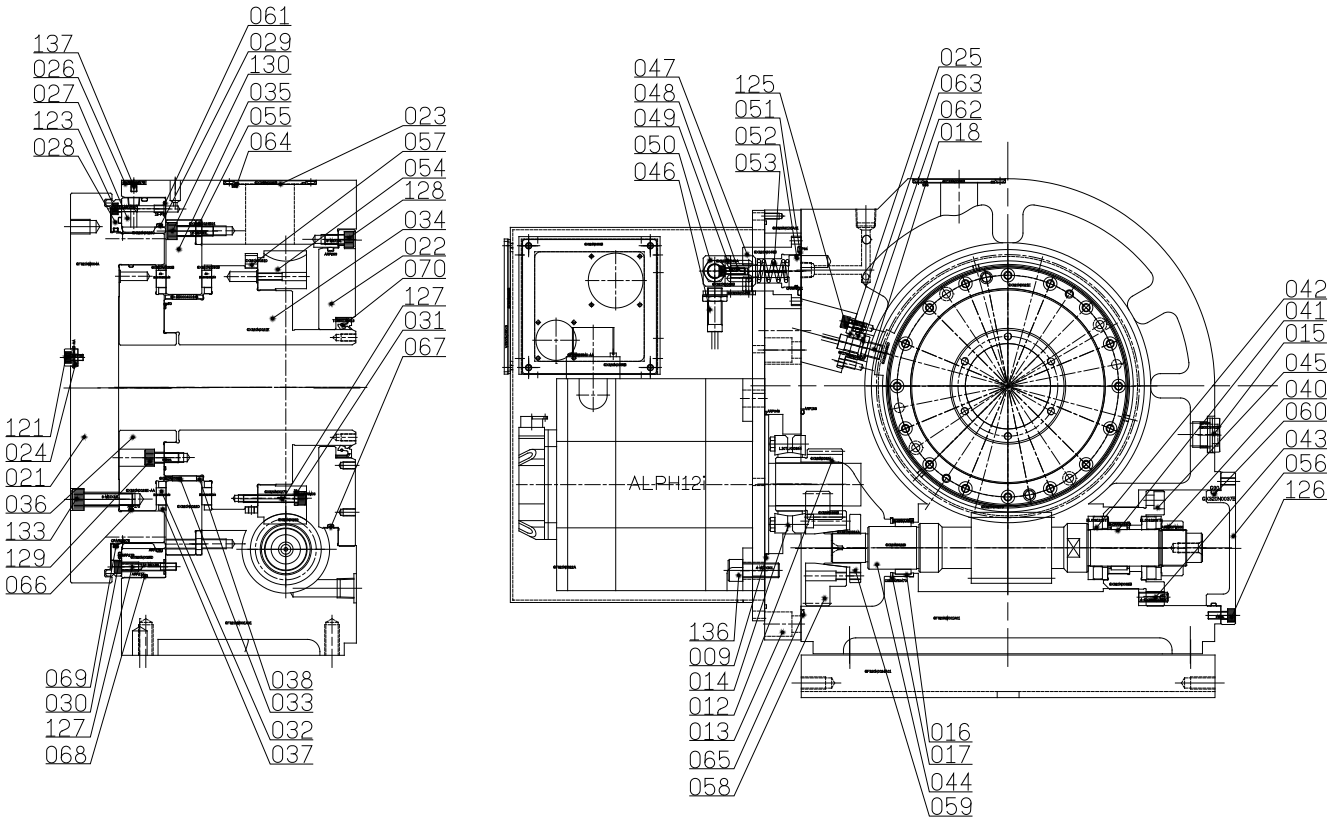

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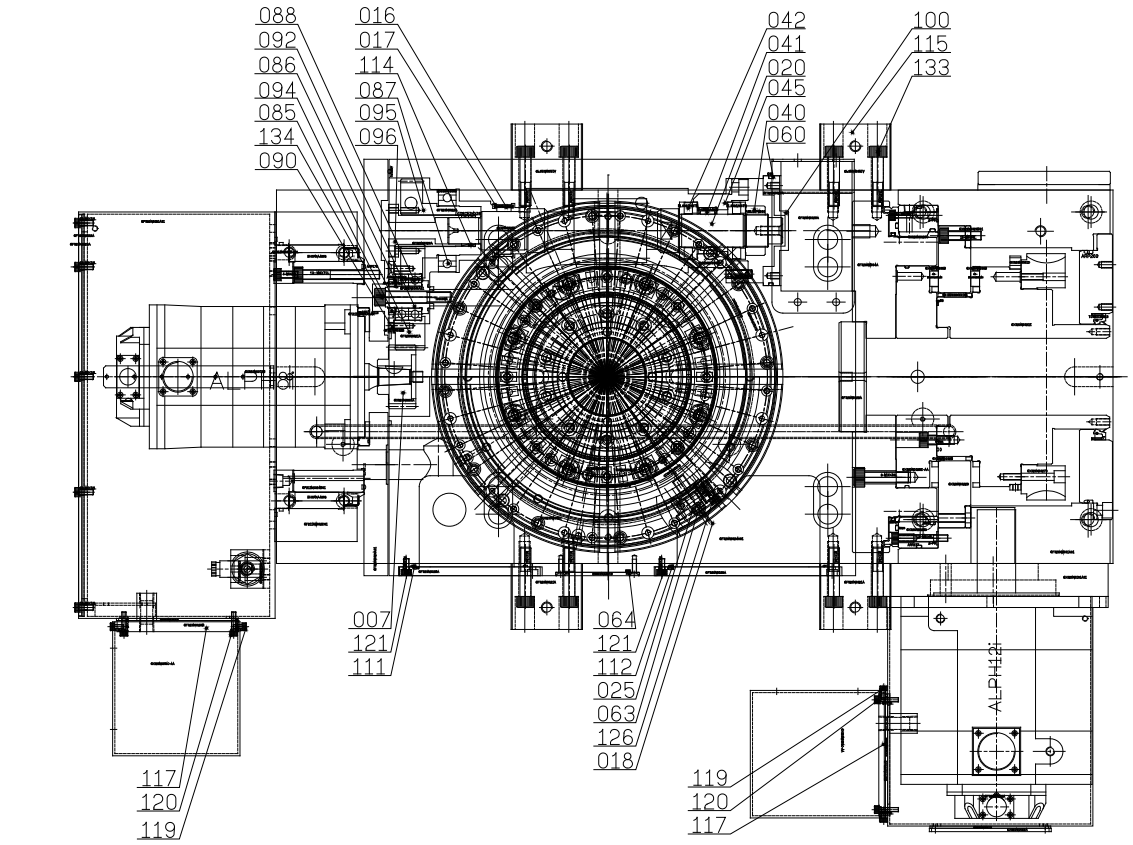

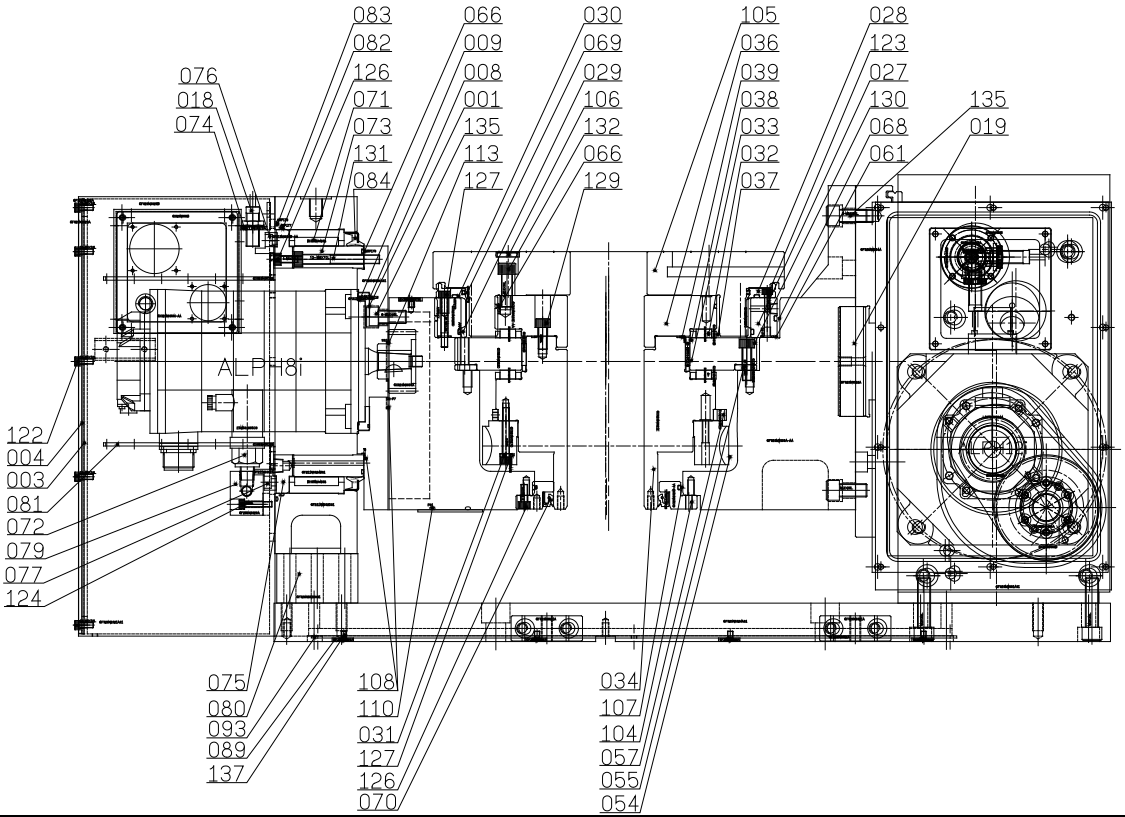

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Item	(15) Parts List

No	Part number	Part	Qty	Spec.
1	GF211N0025A	Adjustment Ring	1	
2	GF320N2021A01	Box of tail	1	
3	GF320N2022A	Rubber for cover	1	
4	GF320N2023A	Cover;box of tail	1	
5	GX320N0054C	Cover	2	
6	GX320N0056B	Cover for plate	2	
7	GX320N0060A	Gear	1	
8	J260000S115	O ring	1	S115
9	J26000AS046	O ring	2	ARP46
10	GF320N0022A	Cover for motor	1	
11	GX320N0052A	Cover	1	
12	GX320N0062A	Gear	1	
13	GX320N0101A01	Motor plate	1	
14	L10TLK60344	Shaft coupling	1	TLK603-44
15	A200CS0012F	Oil serl	2	1/2"PF
16	BH0RNA49060	Bearing	2	RNA4906
17	C06000R0470	Retainer	2	R47
18	ES0E2EX3D20	Proximity switch	4	E2E-X3D2-N-2 (φ 12;NC 兩線式)
19	GF320N3028A	Location ring	1	
20	GF320NW001A01	Main body of tilting	1	
21	GF320NW004A	Main body of tail	1	
22	GF320NW005A	Cover	1	
23	GX125N0036B	Cover	2	
24	GX125N0044B	Key	2	
25	GX170N0030A	Bracket	2	
26	GX255N0037B	Zero plate	2	
27	GX320N0025D	outside disk	2	
28	GX320N0026C	Indisk -disk	2	
29	J26000AS275	O ring	2	ARP275
30	J26000AS276	O ring	2	ARP276

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Item	(15) Parts List

No	Part number	Part	Qty	Spec.
31	A41JJ00SM06	Washer	32	
32	BA00080D140	Roller	160	
33	BB00040D198	Needle	120	
34	GX320N0021E	Main shaft	2	
35	GX320N0022D	Main shaft ring	2	
36	GX320N0023E	Main shaft coupling	2	
37	GX320N0030B	Retaining ring	4	
38	GX320N0032B	Retaining ring	2	
39	J26000AS050	O ring	2	ARP50
40	A35JJ0PM300	Precision nut	2	YSF-M30X1.5P
41	BH0RNA49050	Bearing	2	RNA4905
42	BL0081206TN	Taper roller	4	81206TN
43	GX255N0061A	Skt .Set .Screw	8	
44	GX320N0028D	Worm shaft	2	
45	GX320N0035B	Sleeve of worm shaft	2	
46	ES0E2EX3D10	Proximity switch	2	E2E-X3D1-N-2M (φ 12;NO 兩線式)
47	GX320N0046B	Cylinder	1	
48	GX320N0047A	Piston	1	
49	GX320N0048A	Brake sensor ring	1	
50	GX320N0049B	Bracket	2	
51	J260000P034	O ring	1	P34
52	J2600AR4021	X seal	1	QRAR4021
53	S500RS16030	Spring	1	RS16X30L
54	GX320N0027D	Worm	2	
55	GX320N0029B01	Washer	2	
56	GX320N0037B	Cover	1	
57	GX320N0051D	Home dog	2	
58	GX320N0063B	Worm shaft gear	1	
59	GX320N0064A	Flange of pulley	1	
60	J260000G090	O ring	1	G90

Item	(15) Parts List

No	Part number	Part	Qty	Spec.
61	J260000P009	O ring	36	P9
62	J260000P010	O ring	2	P10
63	J260000P018	O ring	2	P18
64	J260000S055	O ring	2	S55
65	J26000AS163	O ring	1	ARP163
66	J26000AS170	O ring	2	ARP170
67	J26000AS269	O ring	1	ARP269
68	J26000AS277	O ring	2	ARP277
69	J2600AR4275	O ring	2	QRAR4275
70	J28AE3984E0	Oil seal	2	TC95*115*13
71	BH0RNA48380	Bearing	1	RNA4838
72	ESMS0100SC0	Proximity switch	1	MS100SC
73	GF211N0024B01	Shaft of tail	1	
74	GF211N0029A	Bracket	2	
75	GF211N0034B	Cover	1	
76	GF211N0091A	Home dog	1	
77	GF211N0092A	Home dog	1	
78	GF211NW002D01	Main body of tail	1	
79	GF256N0023A	Oil distribution block	1	
80	GF320N0023A01	Spacer of tail	1	
81	GX320N0072B	Bracket	2	
82	J26000AS177	O ring	1	ARP177
83	J26000AS178	O ring	1	ARP178
84	J28STB21012	Oil seal	1	TB210X235X12
85	A34JJ00M020	Precision nut	1	AN04
86	A45JJ0AW040	Washer	1	AW04
87	BD006009000	Deep Groove ball	1	6009ZZ
88	BE0007004A0	Angular contact ball	1	7004-DB/GL
89	GF170N0030A	Tablet cover	4	
90	GF210N0032B	Flange of pulley	1	

Item	(15) Parts List

No	Part number	Part	Qty	Spec.
91	GF211N0069A	Cover of rotary	1	
92	GF255N3044A01	Gear shaft	1	
93	GF320N0032A01	Line Cover	1	
94	GF320N3021A	Gear	1	
95	GF320N3022A	Gear	1	
96	GF320N3023A	Flange of pulley	1	
97	GF320N3024A01	Motor plate	1	
98	GF320N3025A	Left front cover	1	
99	GF320N3026A	Right front cover	1	
100	GF320N3027A	Cover	1	
101	GF320N3029A	Cover of rotary	1	
102	GF320NW003A	Cover;body of swing	1	
103	GX170N0027A	Plug of oil	1	
104	GX320N0024B	Cover	1	
105	GX320NW002F01	Worktable	1	
106	H36A00007C1	Plug	8	
107	J260000G130	O ring	1	G130
108	J260000P007	O ring	2	P7
109	J260000P022	O ring	1	P22
110	J260000P031	O ring	2	P31
111	J260000S130	O ring	1	S130
112	J260000S155	O ring	1	S155
113	J260000S31S	O ring	1	S31.5
114	L10SCE24X28	Shaft coupling	2	24X28
115	GF320N0021A	Block for ring	4	
116	GF320N0024A01	Plate	1	
117	GF320N0025B	Cover	2	
118	H36A000038T	Plug	2	3/8"PT
119	A06CB04X008	Skt.Hd.Cap.Screw	8	M4X08L
120	A06CB04X018	Skt.Hd.Cap.Screw	8	M4X18L

Item	(15) Parts List

No	Part number	Part	Qty	Spec.
121	A06CB05X010	Skt.Hd.Cap.Screw	10	M5X10L
122	A06CB05X012	Skt.Hd.Cap.Screw	12	M5X12L
123	A06CB05X016	Skt.Hd.Cap.Screw	48	M5X16L
124	A06CB05X025	Skt.Hd.Cap.Screw	2	M5X25L
125	A06CB06X012	Skt.Hd.Cap.Screw	2	M6X12L
126	A06CB06X016	Skt.Hd.Cap.Screw	16	M6X16L
127	A06CB06X045	Skt.Hd.Cap.Screw	56	M6X45L
128	A06CB08X016	Skt.Hd.Cap.Screw	9	M8X16L
129	A06CB08X020	Skt.Hd.Cap.Screw	20	M8X20L
130	A06CB08X030	Skt.Hd.Cap.Screw	24	M8X30L
131	A06CB08X070	Skt.Hd.Cap.Screw	10	M8X70L
132	A06CB10X030	Skt.Hd.Cap.Screw	8	M10X30L
133	A06CB10X040	Skt.Hd.Cap.Screw	16	M10X40L
134	A06CB10X060	Skt.Hd.Cap.Screw	1	M10X60L
135	A06CB12X025	Skt.Hd.Cap.Screw	11	M12X25L
136	A06CB12X030	Skt.Hd.Cap.Screw	4	M12X30L
137	A08CB05X008	Flat Hd.Skt.Screw	5	M5X8L