GF256H

CNC Tilting Rotary Table

Operation Manual

detron machine co., LTD.

http:www.detron.com.tw e-mail:detron.tc@msa.hinet.net

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

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

2011.07.12

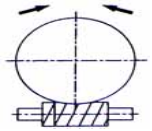
INDEX

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.

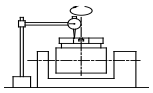
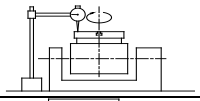
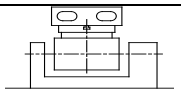
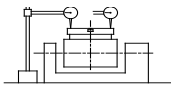
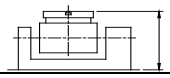
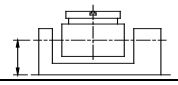
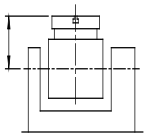
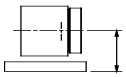
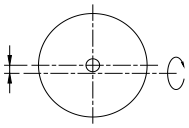
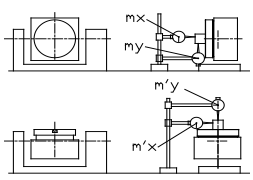
Item	(2) Specifications

No.	Item		Unit	Specification		Remark
				Rotary	Tilting	
1	Worktable Diameter		mm	φ 255		
2	Center Bore Diameter		mm	φ 50H7		
3	Worktable Height in		mm	325 mm		
4	Height of Center		mm	225 mm		
5	Height of Table		mm	375mm		
6	Width of T-Slots			12H7		
7	Tilting Angle Range		deg	+30 ≈ − 120 °		
8	Drive Pressure / Method		kg/cm^2	50 / Hyd.		
9	Clamping Torque		kg-m	70	70	
10	Servo Motor	FANUC		α 4i	α 8i	
		MITSUBISHI		HF104T	HF154T	
		SIEMENS		1FK7060	1FK7063	
		HEIDENHAIN		QSY116C	QSY116E	
		YASKAWA		SGMGH09A	SGMGH09A	
11	Transmission Ratio			1 : 90	1 : 120	
12	Max. Table Speed			22.2	16.6	
13	Allowable Loading Inertia		$kg\text{-}cm\text{-}sec^2$	8.3		
14	Resolution		deg	0.001°		
15	Indexing Accuracy		sec	15	50	
16	Repeatability		sec	6	8	
17	Net Weight(W/O Motor)		kg	370		
18	Allowable Loading Capacity	Horizontal	kg	100		
		Vertical	kg	75		
19	Allowable Cutting Torque		kg-m	25		

Detron

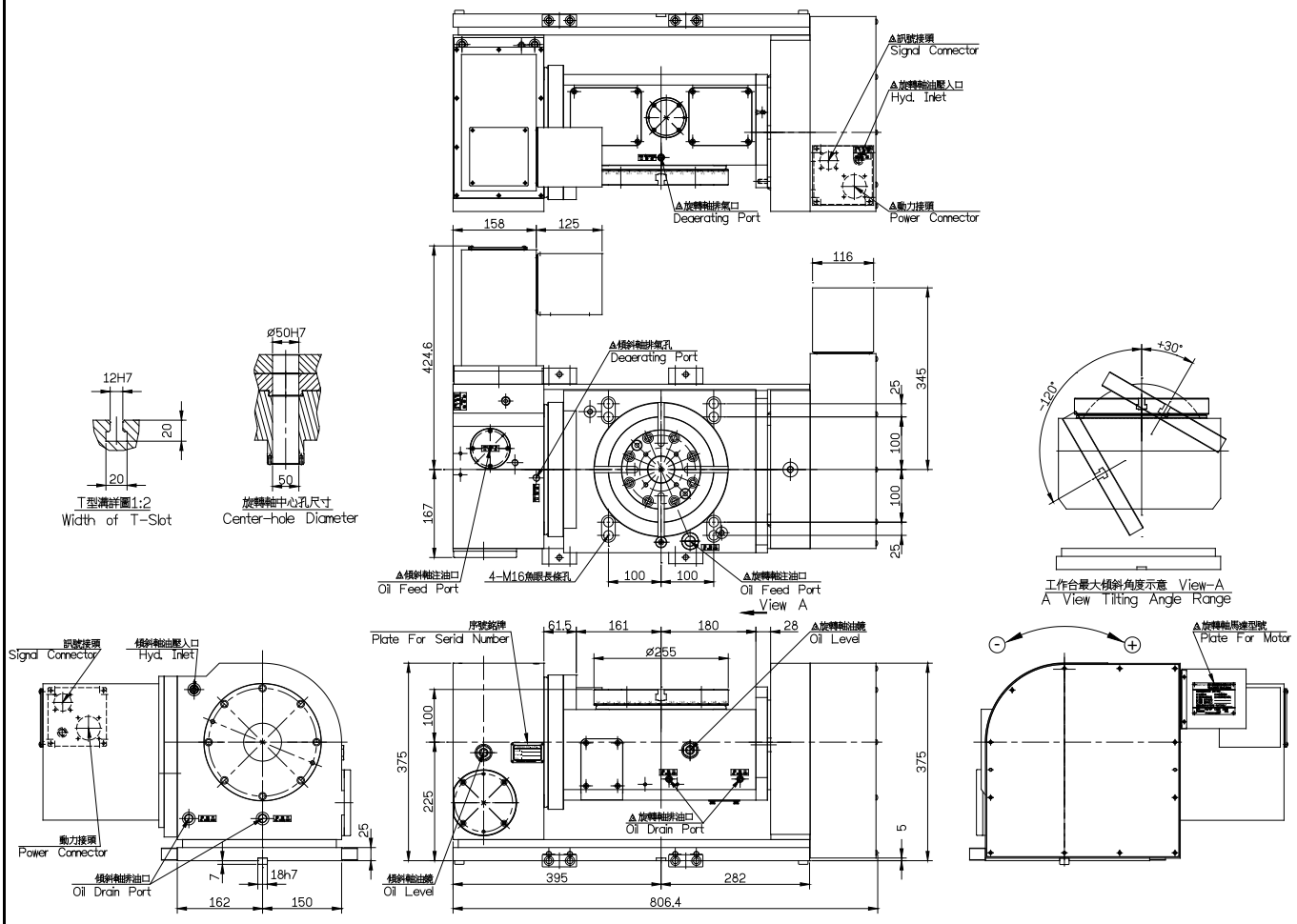
Item	(3) Accuracy Inspections

型 式 MODEL ： 單位：mm

ITEM	檢 查 項 目 DESCRIPTION OF INSPECTION		許 容 值 PERMISSIBLE ERROR	測 定 值 MEASUREMENT	測 定 方 法 INDICATION
1	分度盤中心孔旋轉偏擺 Hole Dia. Run-out of Center Hole ϕ_____		0.01		
2	分度盤面偏擺度 Run-out of Table Surface		0.015/Dia.		
3	分度盤面真直度 Flatness of Table Surface		0.02		
4	分度盤面與底座之平行度 Parallelism Between Table and Base Plate		0.02		
5	分度盤面高 Table Height		實際測 Actual Value		
6	傾斜軸中心高 Center Height of Tilting		實際測 Actual Value		
7	傾斜軸中心到分度盤之距離 Distance Between Center of Tilting and Table Surface 第五項-第六項=第七項		實際測 Actual Value		
8	分度盤中心孔高 Center Height		實際測 Actual Value		
9	傾斜軸中心到分度盤中心孔之距離 Distance Between Center of Tilting Axis and Rotarting Axis 第六項-第八項=第九項		實際測 Actual Value		
10	分割精度 Repeatability	Rotating	20 sec.		Indicated by RON287
		Tilting	50 sec.		
11	重覆精度 Repeatability	Rotating	6 sec.		
		Tilting	8 sec.		
12	傾斜軸中心線與底板之平度 Parallelism Between Center Line of Tilt Axis and Base Plate			mx	
				my	
				m'x	
				m'y	
			0.02/Dia.		

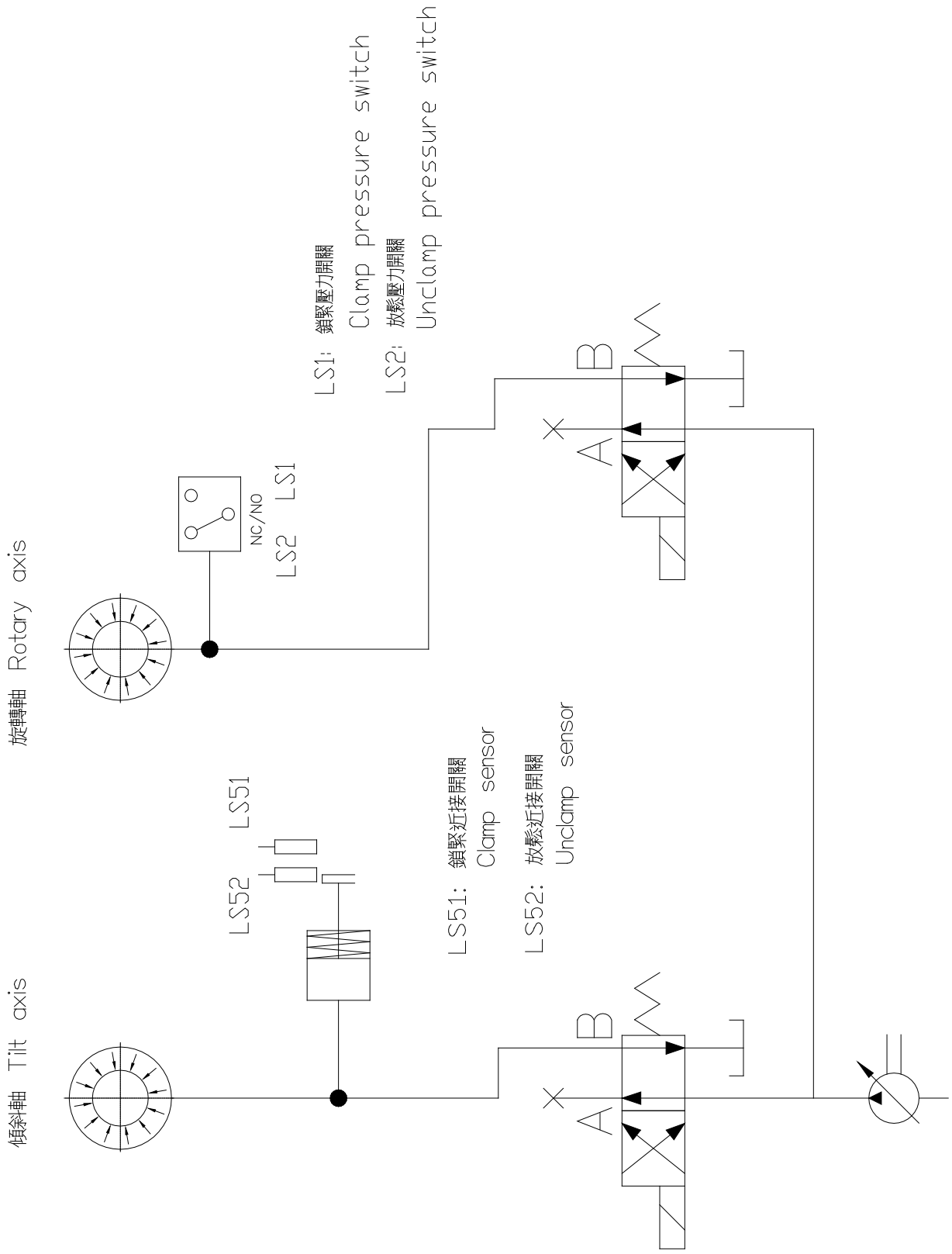
Detron

Item	(4) Outline Drawing



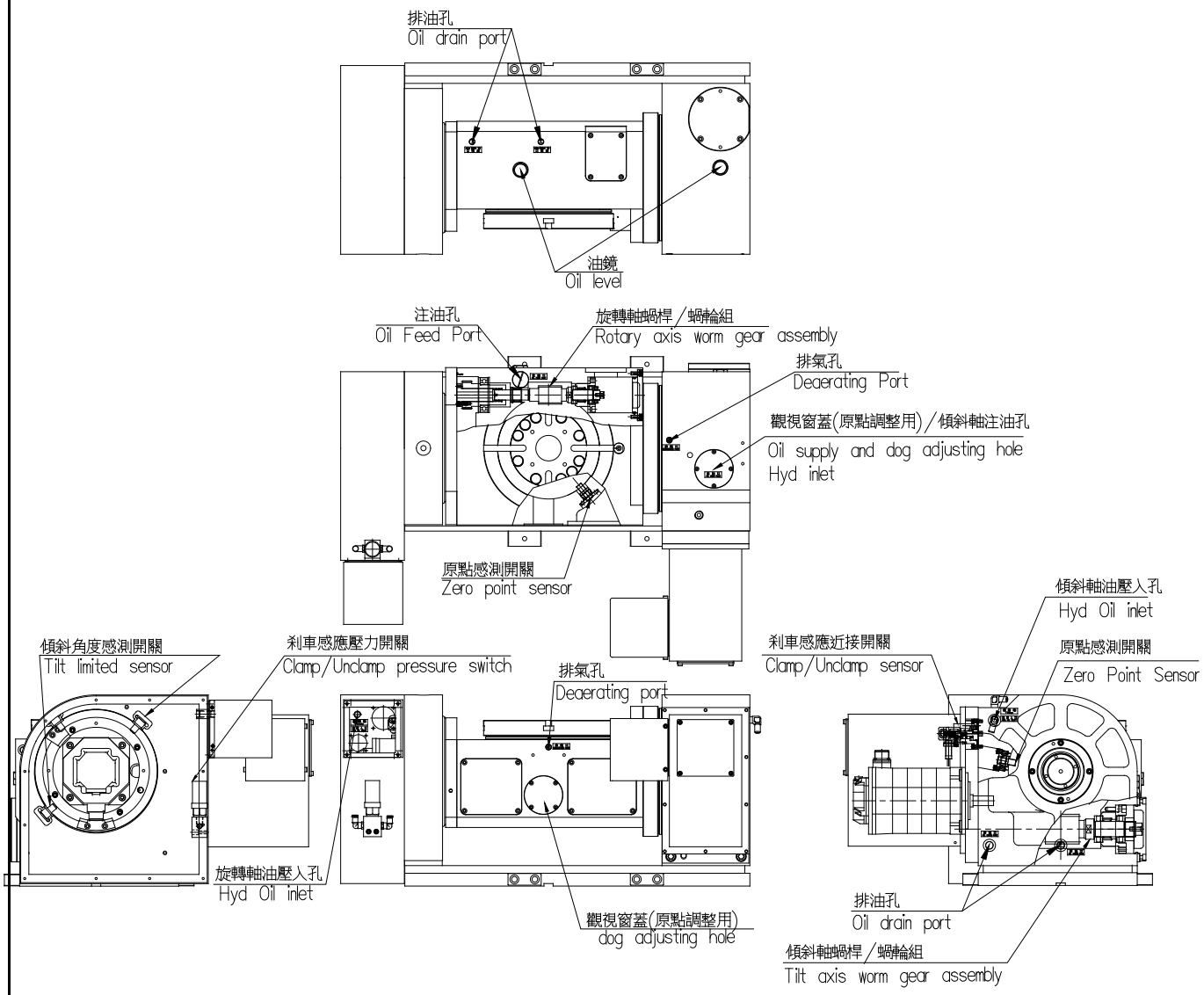
Detron

Item	(5) Pneumatic Circuit Diagram



Item	(6) Electric Circuit Diagram

Item	(7) Mechanism of Major Components



Item	(8) 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	(9) Zero Setting and Adjustment of Dog

Proximity limit switch has no function causing by：

A. Proximity limit switch is broken。

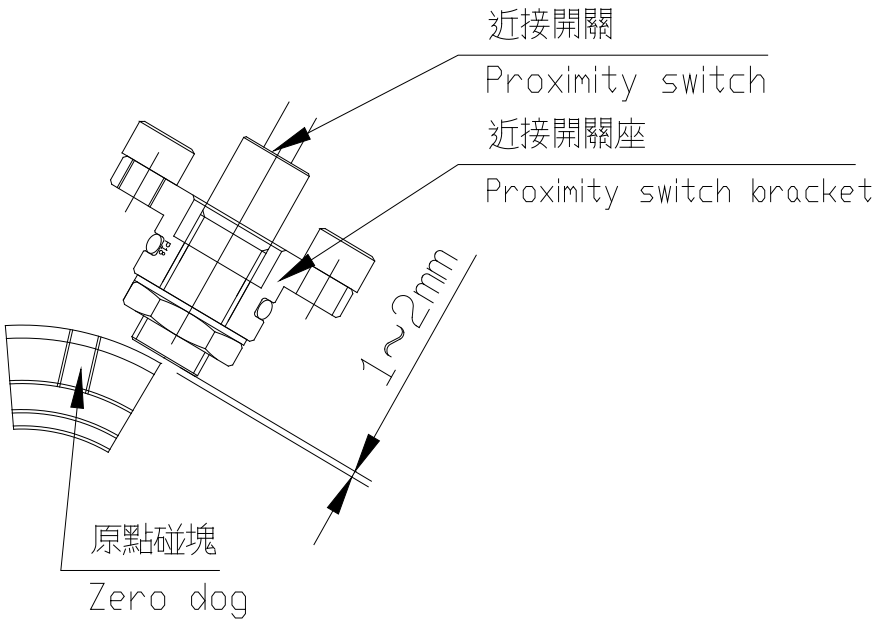
B. The clearance between the proximity switch and the dog is too far; the correct clearance is 1~2mm。

How to adjust the dog：

(1) Remove the top cover(see P9)。

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

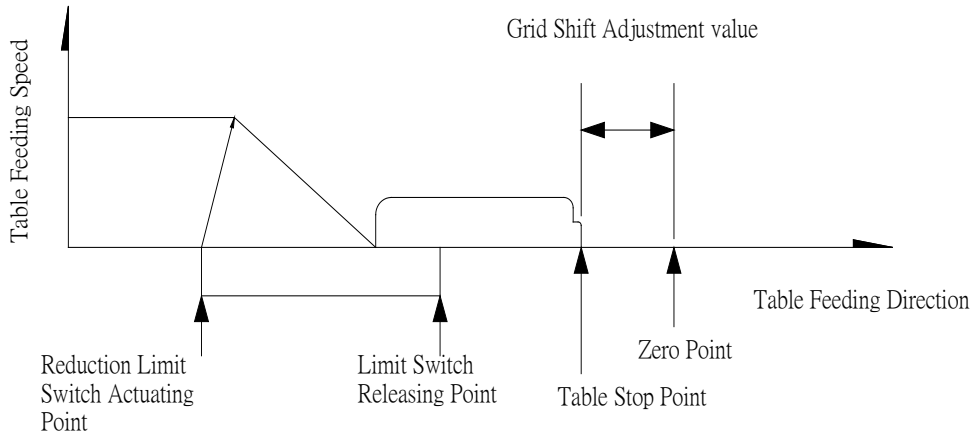
(3) The dog adjustment range is about ±5°。After adjustment, tighten the dog lock bolts。



Item	(10) 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	(11) 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 :

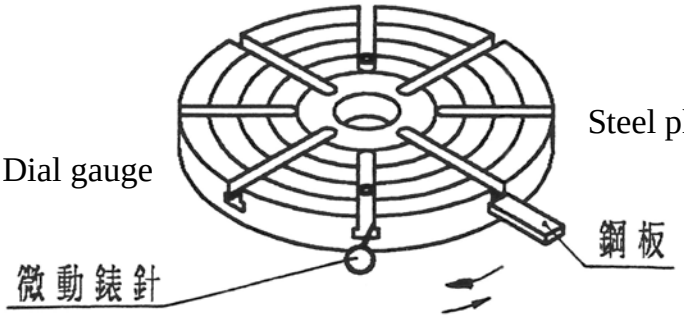
(1) Set the dial gauge on the T-slot surface near the circumference of the turntable。 (drawing shown below)

(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.

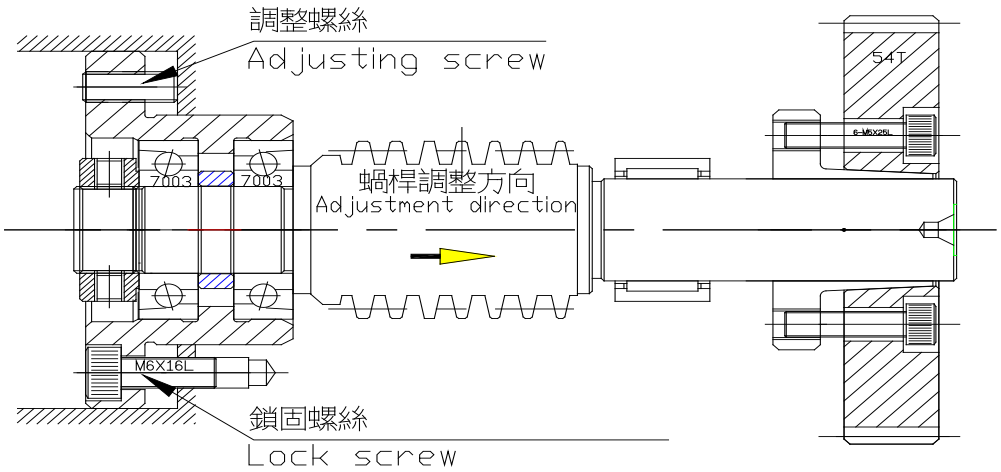
※The backlash will be varied during temperature changes and properly adjust the backlash are necessary.Even if the backlash exceeds the upper limit of the above range, the turntable can be operated. Adjust the backlash when necessary. If the backlash correction value is input to the NC unit as a parameter,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



Item	(12) Worm Gear Backlash Adjustment

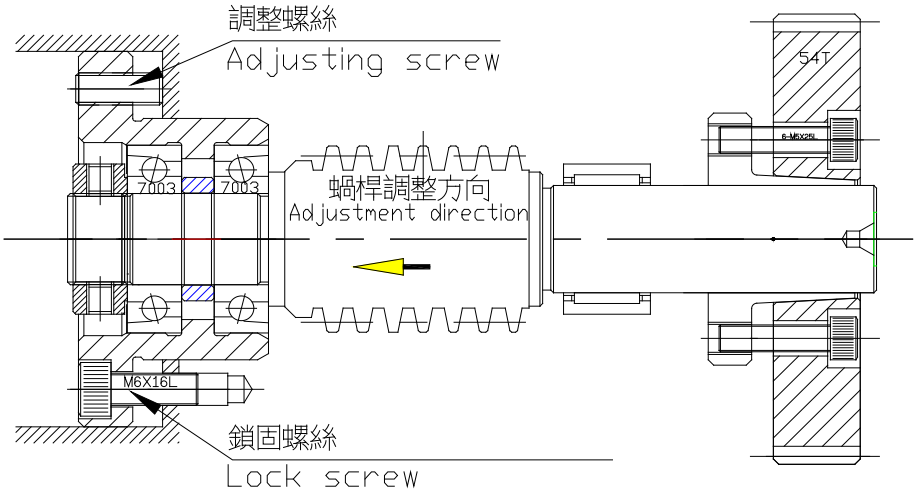
Backlash too large:

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。

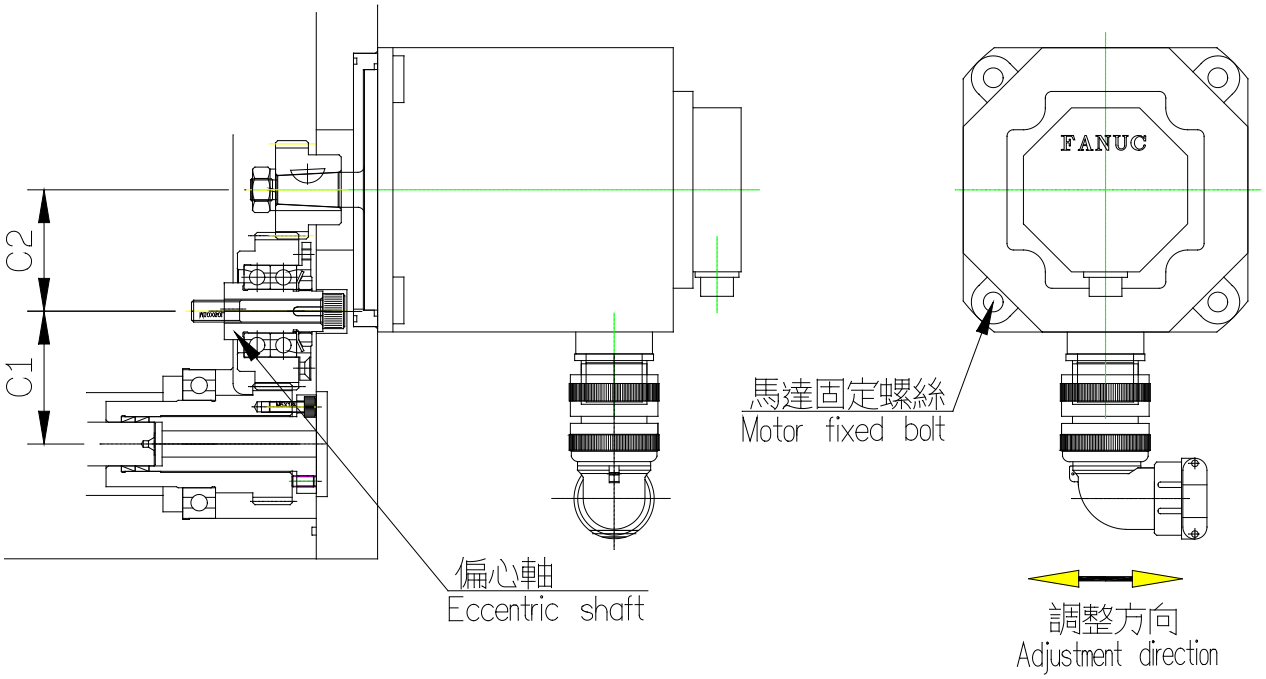


Item	(13) Driving Gear Backlash Adjustment

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”。

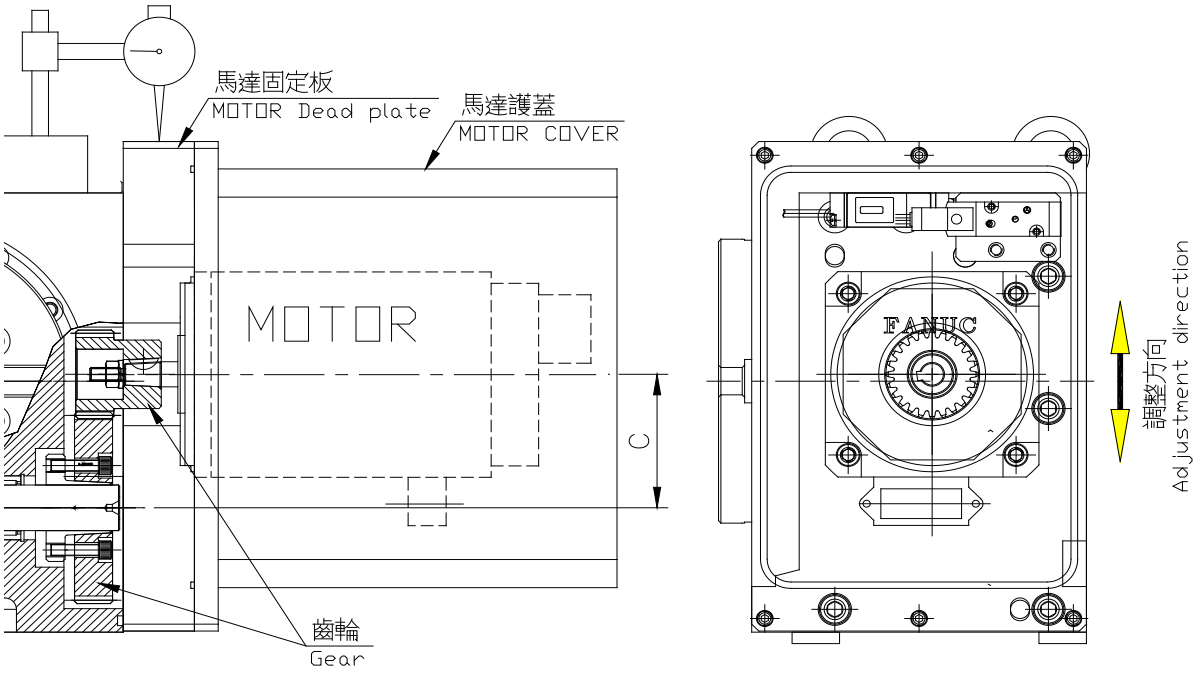
Gear center distance C2 adjusting：loosen ”motor locking bolt”→turn adjustable shaft sleeve by rod”(The distance between axes can be adjusted up to 0.5mm) until obtain a proper backlash around 0.03~0.04mm→tighten ”motor locking bolt”。



Item	(13) 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	(14) 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	(15) 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.

Detron

Item	(16) 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	(16) Trouble Shooting

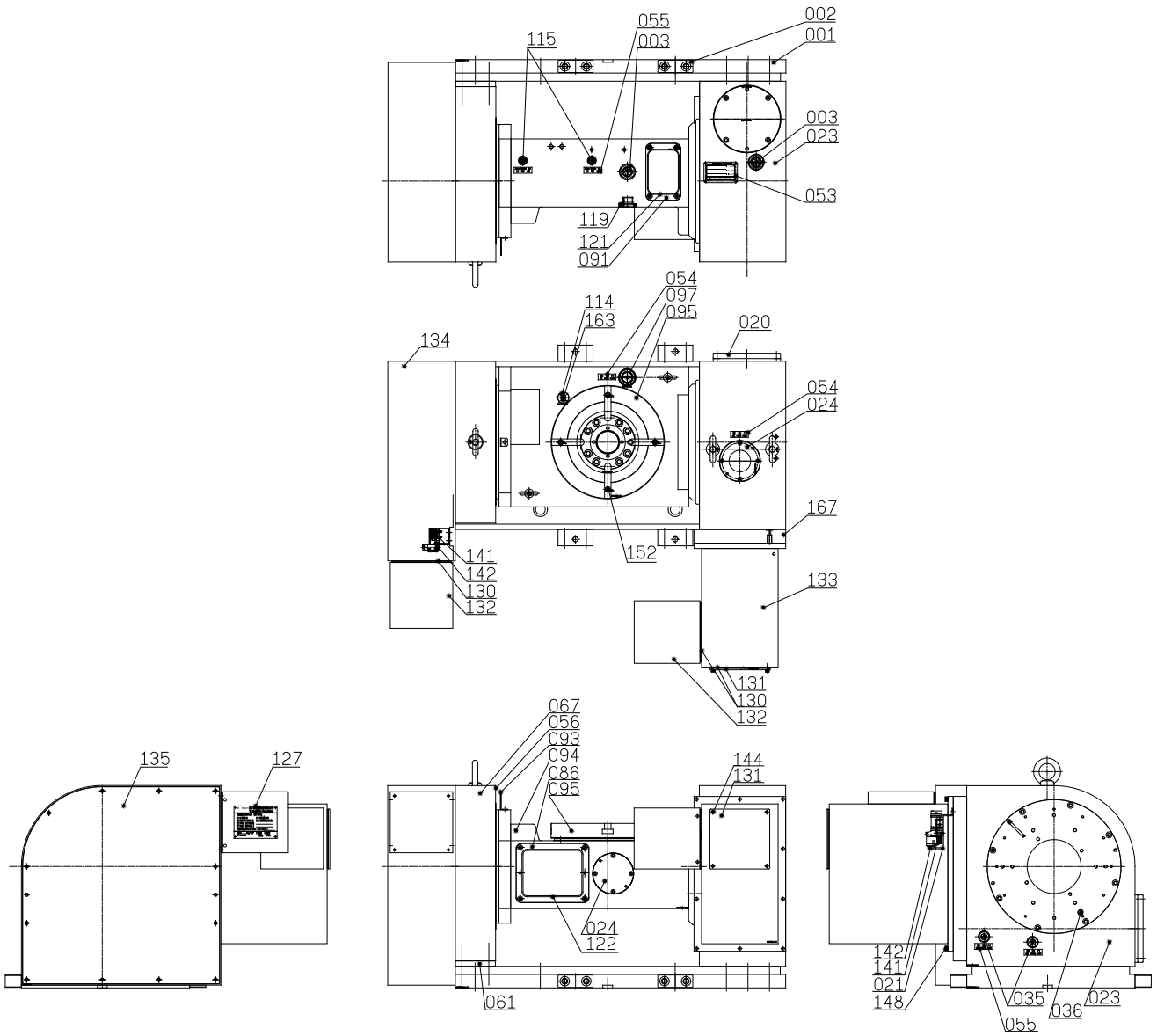
	Symptom	Probable cause	Isolation instruction	Remedy	Ref. Item in text
3		• Insufficient warm up or parameter setting	• Check program	• Correct program	• Routine checking work
		• Lube oil: Overfilling Over viscosity Low temp	• In these cases, current value often increases	• Replace oil	• Lubrication
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	(16) 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	

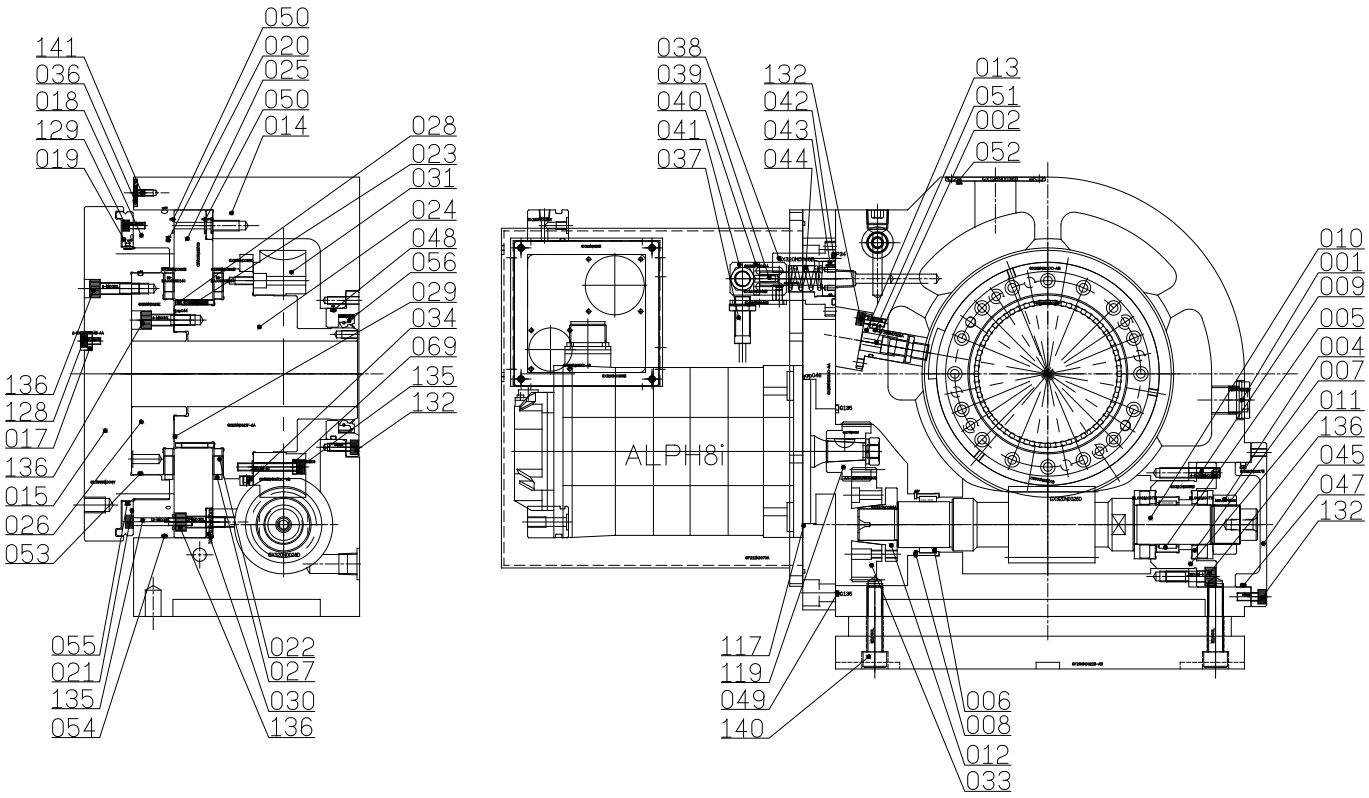
Detron

Item	(17) Parts List



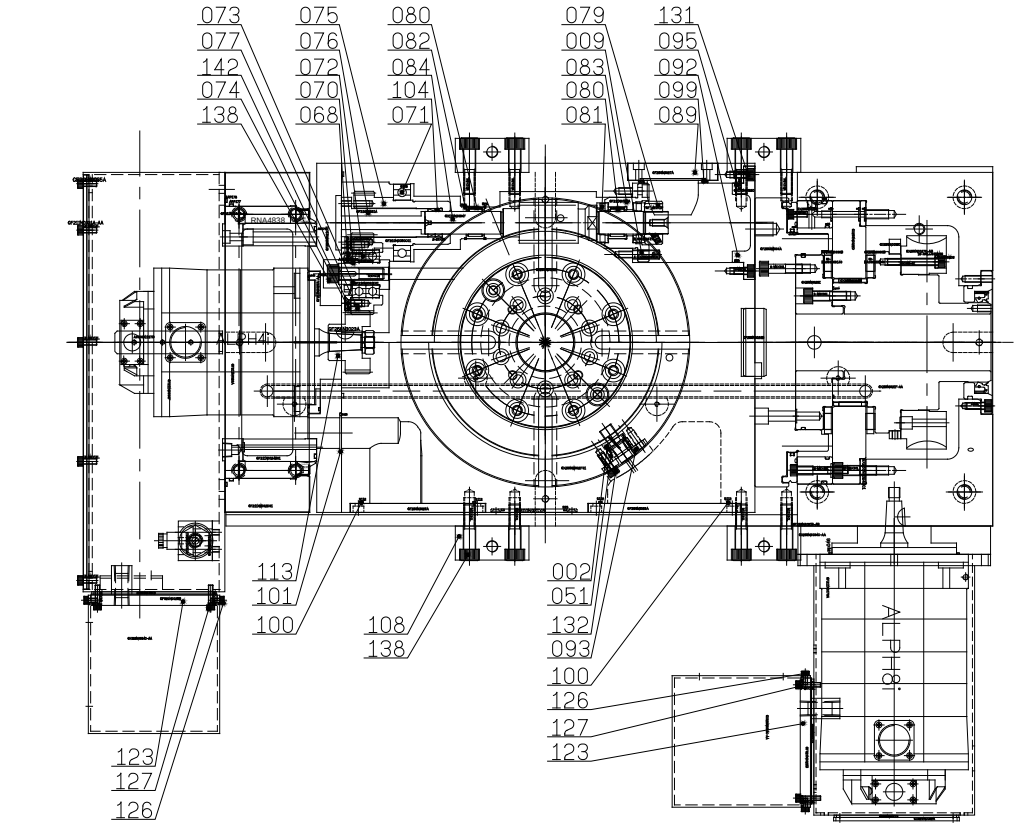
Detron

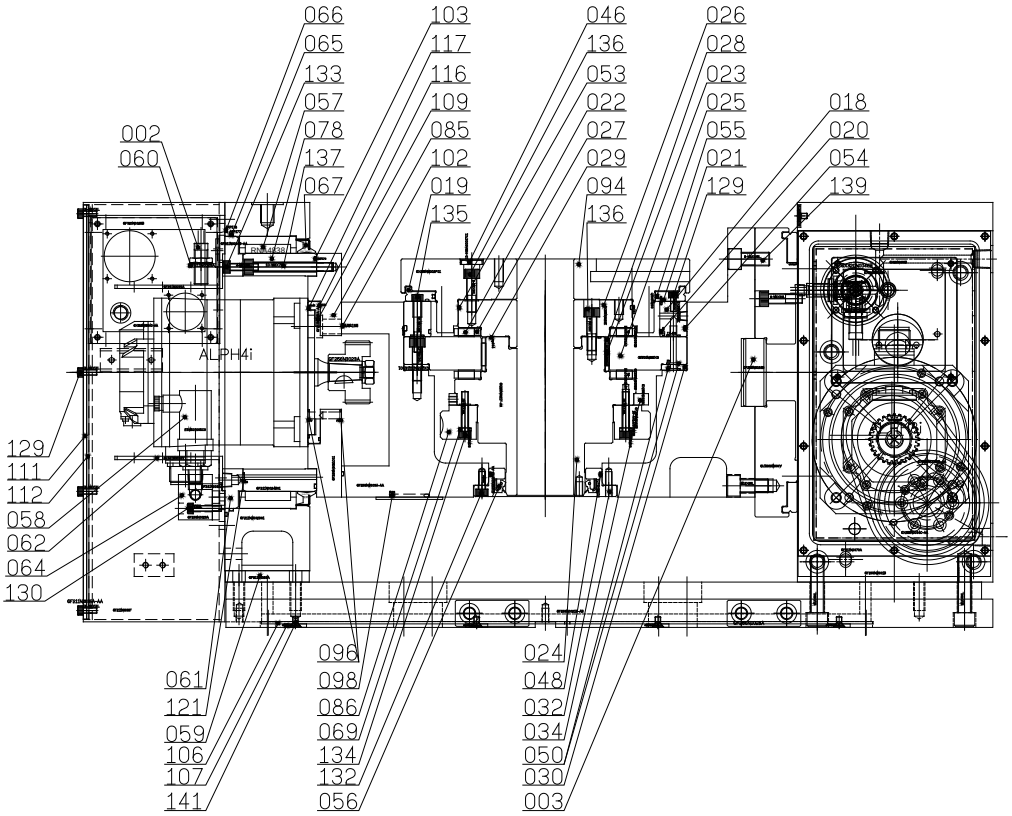
Item	(17) Parts List



Detron

Item	(17) Parts List





Detron

Item	(17) Parts List

No	Part number	Part	Qty	Spec.
1	A200CS0012F	Oil serl	2	PF1/2
2	ES0E2EX3D20	Proximity switch	4	(φ12;NC 兩線式)E2E-X3D2-N-2M
3	GF255N3028B	Location ring	1	
4	A35JJ0PM300	Precision nut	1	
5	BH0RNA49050	Bearing	1	RNA4905
6	BH0RNA49060	Bearing	1	RNA4906
7	BL0081206TN	Taper roller	2	81206TN
8	C06000R0470	Retainer	1	R47
9	GX255N0061A	Skt .Set .Screw	8	M8*24L
10	GX320N0028D	Worm shaft	1	
11	GX320N0035B	Sleeve of worm shaft	1	
12	GX320N0064A	Flange of pulley	1	
13	GF256N0022A	Bracket	1	
14	GF256NW001B	Main body of tilting	1	
15	GF256NW004A	Worktable	1	
16	GX125N0036B	Cover	2	
17	GX125N0044B	Key	2	
18	GX255N0025E	outside disk	2	
19	GX255N0026A	Indisk -I	2	
20	J26000AS171	O ring	2	ARP171
21	J26000AS172	O ring	2	ARP172
22	BA00080D140	Roller	128	
23	BB00040D198	Needle	90	
24	GX255N0021F	Main shaft	2	
25	GX255N0022D	Main shaft ring	2	
26	GX255N0023E	Main shaft coupling	2	
27	GX255N0030B	Retaining ring	4	114.2*160.6*6
28	GX255N0031B	Retaining ring	2	335*27*3
29	J26000AS044	O ring	2	ARP44
30	GX255N0024B01	Washer	2	

Detron

Item	(17) Parts List

No	Part number	Part	Qty	Spec.
31	GX255N0027C	Worm	1	
32	GX255N0029B	Cover	2	
33	GX255N0032B	Worm shaft gear	1	
34	GX255N0033C	Home dog	2	
35	GX255N0034C	Motor plate	1	
36	GX255N0037B	Zero plate	2	
37	ES0E2EX3D10	Proximity switch	2	φ12;NO 兩線式 E2E-X3D1-N-2M
38	GX320N0046B	Cylinder	1	
39	GX320N0047A	Piston	1	
40	GX320N0048A	Brake sensor ring	1	
41	GX320N0049B	Bracket	2	
42	J260000P034	O ring	1	P34
43	J2600AR4021	X seal	1	QRAR4021
44	S500RS16030	Spring	1	RS16X30L
45	GX320N0037B	Cover	1	
46	H36A00007C1	Plug	20	M12 密封塞頭
47	J260000G090	O ring	1	G90
48	J260000G095	O ring	3	G95
49	J260000G135	O ring	1	G135
50	J260000P009	O ring	38	P9
51	J260000P018	O ring	2	P18
52	J260000S055	O ring	2	S55
53	J26000AS161	O ring	2	ARP161
54	J26000AS272	O ring	2	ARP272
55	J2600AR4266	X seal	2	QRAR4266
56	J28AE3513E0	Oil seal	2	TC70*90*12
57	BH0RNA48380	Bearing	1	RNA4838
58	ESMS0100SC0	Proximity switch	1	MS100SC
59	GF211N0026A	Spacer of tail	1	
60	GF211N0029A	Bracket	2	

Item	(17) Parts List

No	Part number	Part	Qty	Spec.
61	GF211N0034A	Cover	1	
62	GF211N0090A	Bracket	2	
63	GF211NW002D01	Main body of tail	1	
64	GF256N0023A	Oil distribution block	1	
65	J26000AS177	O ring	1	ARP177
66	J26000AS178	O ring	1	ARP178
67	J27AR5129F0	Wiper ring		DKB 210*235*12*17
68	A34JJ00M020	nut	1	AN04
69	A41JJ00SM06	Washer	32	ϕ10.7Xϕ7X3T
70	A45JJ0AW040	Washer	1	AW04
71	BD006008000	Deep Groove ball	1	6008ZZ
72	BE0007004A0	Angular contact ball	1	7004-DB/GL
73	GF210N0031E01	Gear shaft	1	
74	GF210N0032B	Flange of pulley	1	
75	GF210N0050C01	Gear	1	
76	GF210N0051A	Flange of pulley	1	
77	GF211N0021A	Gear	1	
78	GF211N0024B01	Shaft of tail	1	
79	A35JJ0PM200	Precision nut	1	YSF-M20X1.5P
80	BH000NK2016	Bearing	2	NK20/16
81	BL0081104TN	Taper roller	2	81104TN
82	C06000R0280	Retainer	2	R28
83	GF211N0033A	Sleeve of worm shaft	1	
84	GX170N0034F	Worm shaft	1	
85	GF256N3021C01	Motor plate	1	
86	GF256N3022B	Worm	1	
87	GF256N3025A	Left front cover	1	
88	GF256N3026A	Right front cover	1	
89	GF256N3027A	Back ftont cover	1	
90	GF256NW003A	Cover;body of swing	1	

Item	(17) Parts List

No	Part number	Part	Qty	Spec.
91	GX170N0027A	Plug of oil	1	
92	GX170N0028D	Cover	1	
93	GX170N0030A	Bracket	1	
94	GX255NW002F01	Worktable	1	
95	J260000G065	O ring	1	G65
96	J260000P007	O ring	2	P7
97	J260000P022	O ring	1	P22
98	J260000P029	O ring	1	P29
99	J260000S075	O ring	1	S75
100	J260000S112	O ring	2	S112
101	J260000S31S	O ring	1	S31.5
102	J26000AS165	O ring	1	ARP165
103	J26000AS170	O ring	1	ARP170
104	L10SCE20X25	Shaft coupling	2	20X25
105	GF256N0021B	Plate	1	
106	GF256N0028A	Line Cover	1	
107	GF170N0030A	Tablet cover	4	
108	GF211N0039A	Block for ring	4	
109	GF211N0025A	Adjustment Ring	1	
110	GF211N0030F	Box of tail	1	
111	GF211N0031A	Cover;box of tail	1	
112	GF211N0035A	Rubber for cover	1	
113	GF256N3023A	Gear	1	
114	GX320N0054C	Cover	2	
115	GX320N0056B	Cover for plate	2	
116	J260000S115	O ring	1	S115
117	J26000AS046	O ring	2	ARP46
118	GX320N0052A	Cover	1	
119	GX170N0033C	Gear	1	
120	GF211N0070A	Cover for motor	1	

Item	(17) Parts List

No	Part number	Part	Qty	Spec.
121	J260000P005	O ring	1	P5
122	GF211N0069A	Cover of rotary	1	
123	GF320N0025B	Cover	2	
124	H36A000014T	Plug	2	1/4"PT
125	H36A000038T	Plug	2	3/8"PT
126	A06CB04X008	Skt.Hd.Cap.Screw	8	M4X08L
127	A06CB04X018	Skt.Hd.Cap.Screw	8	M4X18L
128	A06CB05X010	Skt.Hd.Cap.Screw	2	M5X10L
129	A06CB05X012	Skt.Hd.Cap.Screw	60	M5X12L
130	A06CB05X025	Skt.Hd.Cap.Screw	2	M5X25L
131	A06CB06X012	Skt.Hd.Cap.Screw	4	M6X12L
132	A06CB06X016	Skt.Hd.Cap.Screw	12	M6X16L
133	A06CB06X025	Skt.Hd.Cap.Screw	4	M6X25L
134	A06CB06X035	Skt.Hd.Cap.Screw	16	M6X35L
135	A06CB06X045	Skt.Hd.Cap.Screw	16	M6X45L
136	A06CB08X030	Skt.Hd.Cap.Screw	64	M8X30L
137	A06CB08X070	Skt.Hd.Cap.Screw	10	M8X70L
138	A06CB10X040	Skt.Hd.Cap.Screw	9	M10X40L
139	A06CB12X025	Skt.Hd.Cap.Screw	6	M12X25L
140	A06CB12X050	Skt.Hd.Cap.Screw	4	M12X50L
141	A08CB05X008	Flat Hd.Skt.Screw	5	M5X8L
142	A08CB06X012	Flat Hd.Skt.Screw	4	M6X12L
143				
144				
145				
146				
147				
148				
149				
150				