

OPERATION MANUAL

MODEL: DMNC-400

YUASA INTERNATIONAL

INDEX

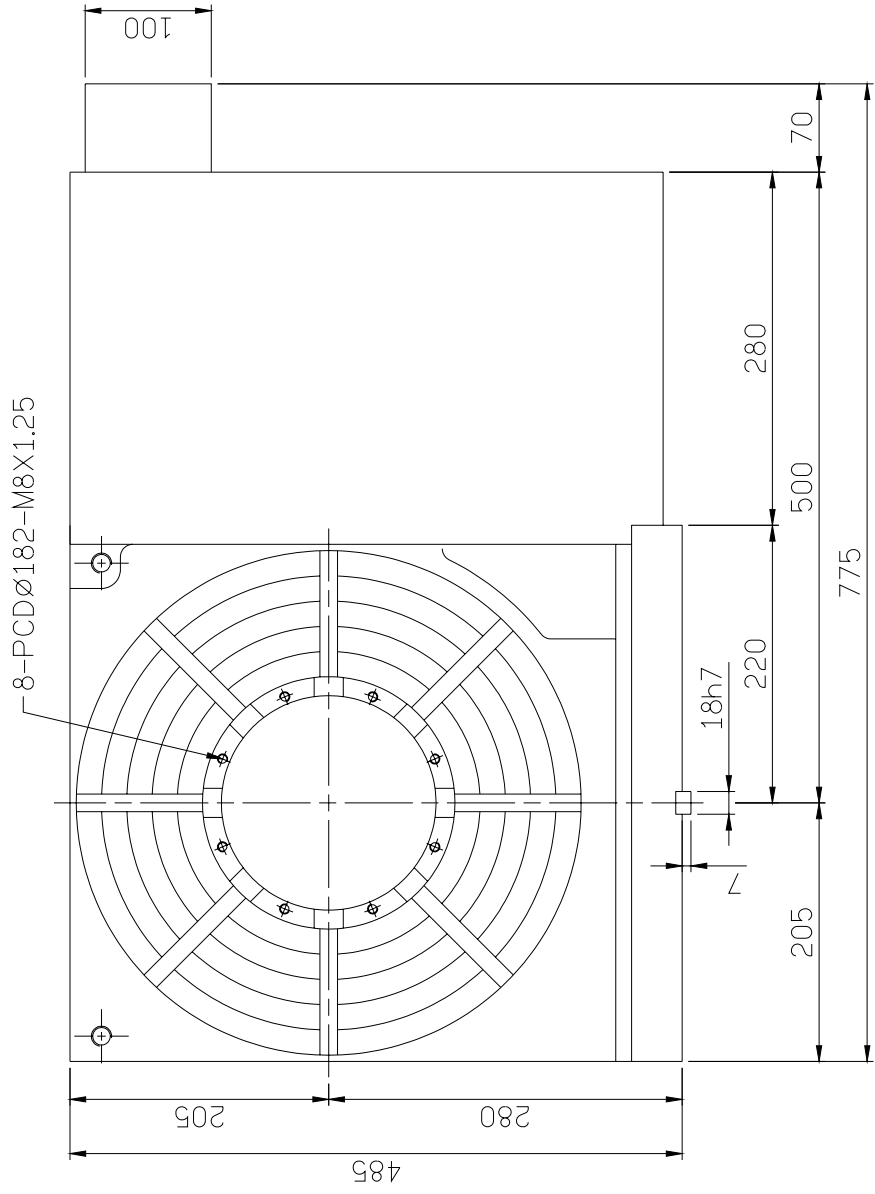
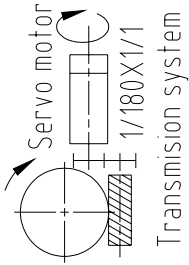
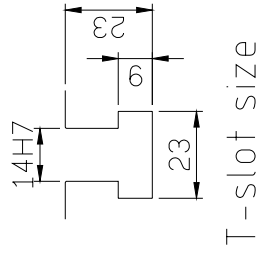
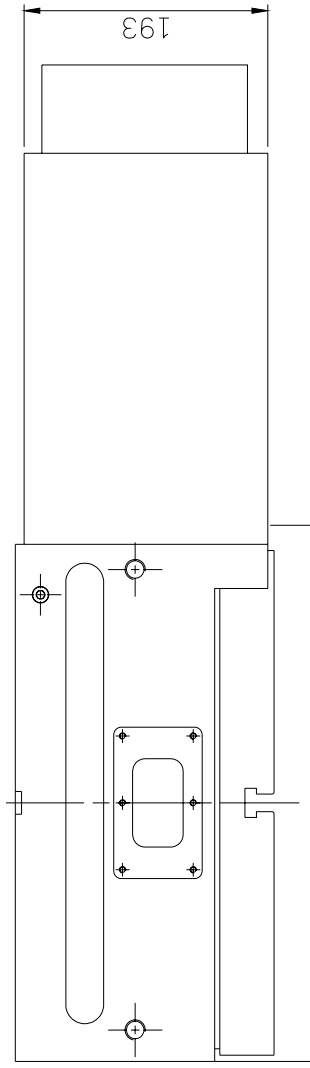
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[1] SPECIFICATION

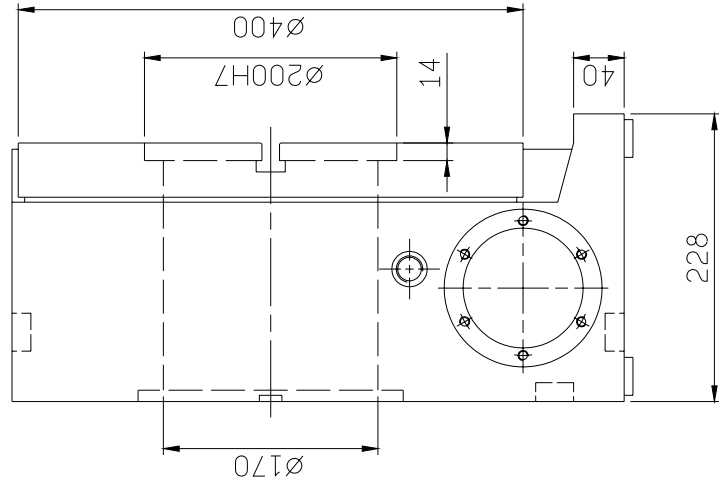
CNC ROTARY TABLE SPECIFICATION

	Item	Unit	DMNC-400	Remark
1	Table Diameter	mm	Φ400	
2	Center High in Vertical	mm	280	
3	Overall High in Vertical	mm	205	
4	Overall Length	mm	485	
5	Overall Width	mm	775	
6	Dia. For Through Hole	mm	Φ170	
7	Dia. For Based Hole	mm	200H7	
8	Width for Guide Block	mm	18h7	
9	Width for T-Slot	mm	14H7	
10	Servo Motor	Sanyo	P60B13200	
		Fanuc	α 12i	
11	Gear Ratio		1:180	
12	Max. Indexing Resolution	Degree	0.001	
13	Max. Speed for Rotating	r.p.m.	11.1	2000r.p.m
14	Max. Loading Weight	Kg	500	
15	Max. Machine Force	kg-m	350	
16	Positioning Accuracy	sec	15	
17	Repeatability	sec	±2	
18	Max. Braking Torque	Kg-m	240	Hydraulic 50kg/cm ²
19	Net Weight	kg	275	

[2] DIMENSION LAYOUT

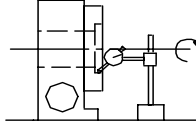
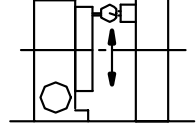
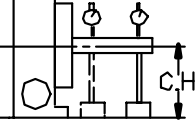
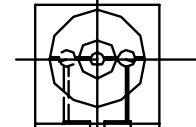

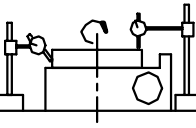
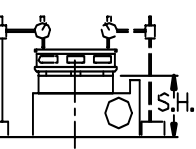
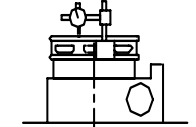


8-PCD ϕ 182-M8X1.25



[3] INSPECTION REPORT

CNC ROTARY TABLE INSPECTION REPORT

NO.	INSPECTION ITEM	Model	DMNC 320	Measuring
1	Centering Concentricity	Inlet Side	0.01	
2	The perpendicularity between table top and bottom	Length 300mm	0.02	
3	Parallelism of center axe and lower	Length 300mm	0.02	
4	Center High		280	
5	Parallelism for center axe of through hole and base surface	Length 300mm	0.02	
6	Deviation for center axe of through hole and base surface	Length 300mm	0.02	
7	Table Warping / Rotation	Max. Dia.	0.02	
8	Parallelism between table and bottom base	Overall Length	0.015	
9	Table height from table top to bottom base		160	
10	Flatness of upper surface	Overall Length	0.01	
11	Indexing Accuracy	Cumulated	15"	Measured by Optical Devise
12	Repeatability Accuracy	Cumulated	±4"	

[4] PREPARATION FOR OPERATION

4-1 Lubricating Oil

- (1) Select the lubricating oil which has the features such as strong oil film, strong rust proof and good stability of oxidation. Also viscosity grade should be around ISO, VG100-150. Since the same oil circulates among worm, wheel and other mechanical parts, purchase the quality oil so that the unit can operate in good condition for many years to come.

***** Recommended oil *****

Jomo - Lathus 100 (or150)

Mobil - Gear 629

Shell - Omela Oil 100 (or150)

Esso - Spartan 100 (or 150)

- (2) When putting the oil in the unit, make sure to clean the area of oil inlet so that dirt or chip won't get into the system. Once they get into, they will not only ruin the worm and wheel gear drive system, but also damage other mechanism in the short period of time.
- (3) Put the oil slowly up to the center line of the gage. The amount of oil you are putting in is very important, and make sure to put neither too much nor too little. When checking the oil level, check approximately 30 minutes after stopped the operation.
- (4) Change the entire oil with fresh one in once every six months. When draining the oil completely, set the unit in horizontal position to enable easy draining from the unit

3-2. Pneumatic For Table Clamping

- (1) Connect the hose with hydraulic inlet and supply the pressurized oil. Although clamping mechanism is designed to stand for max. 8 kg/cm² of pneumatic pressure and 6kg/cm² is safety value, however, plenty good to obtain the sufficient clamping force. The relationship between hydraulic pressure and clamping force is shown below and select the proper hydraulic pressure to your need.

Note: Apply a quality hydraulic hose to sustain the pressure well

[5] TRIAL RUNNING

After making sure the preparation, let's operate the rotary table with the following steps:

5-1. Before starting motor driving, check the following points:

- A. AS it is important to make a trial running under free from the load, do not mount any work piece, jig, fixture or even chuck on the table surface.
- B. Check the program whether N/C is providing the correct signals.
- C. Repeat clamp and unclamp and make sure whether their Signals are executed accordingly. When the motor operates, clamp must be off, "UNCLAMP".

Note: Do not turn the table while clamp is "ON".

5-2. Trial Running

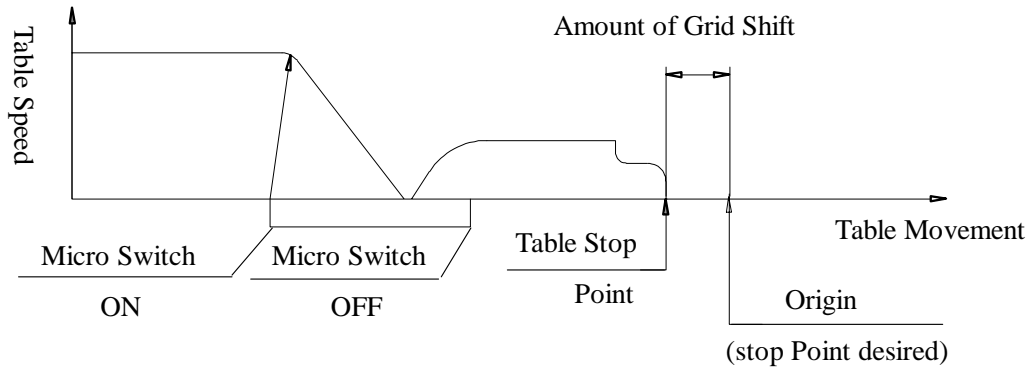
- A. When rotating the table either clockwise or counterclockwise, start out slowly and then increase the speed (R.P.M.).
- B. Give plenty of warn-up time, 20 to 30 minutes at an initial installation.

5-3. Setting the distance of grid shift on zero-return with the zero-return signal from N/C.

- A. The table returns to the origin very accurately in a fixed rotating direction..... generally speaking in clockwise direction looking from the table with the following procedures:
 - a. The table starts to rotate at the rapid feed.
 - b. When it hits the dog, micro switch activates and slows down the speed on the level which can execute an accurate sudden stop and positioning at any time.
 - c. After slowing down the speed, the signal from the motor detector stops the table at the position of origin.
- B. Zero-return mechanism is set to reduce the speed at just before the T slot on the table in vertical position becomes parallel to the rotary table base.
- C. Repeat the zero-return several times and check if the table stops at the position as programmed.

Note: Generally speaking, the zero-return is set at the position where T slot of the table becomes parallel to the base of the table becomes parallel to the base of rotary table. If there's any difference, that is the amount to be off-set in the N/C as the grid shift of zero-return.

HOME POSITION INDICIATING



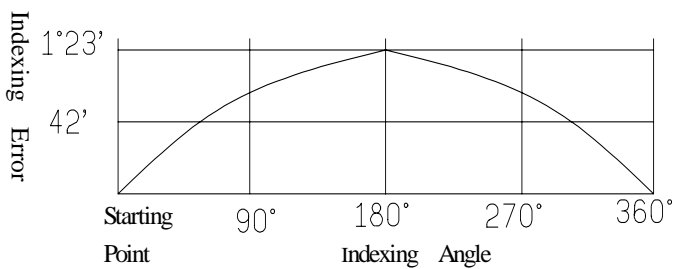
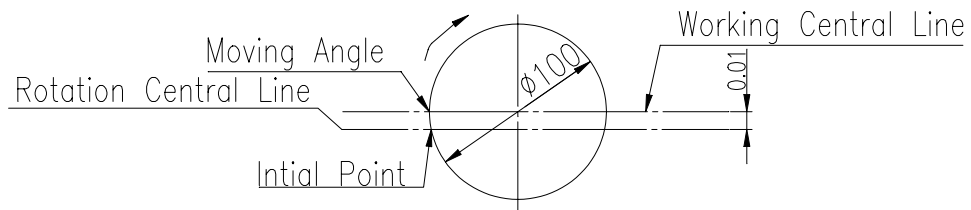
[6] MOUNTING WROKPIECE

When mounting a work-piece on the rotary table , make sure the following points to avoid operator's accident, cutter or machine damages:

- 6-1. Check the table face whether any return, nick, dent, etc. exist or not.
- 6-2. Avoid of mount the work-piece directly on the table which has poor flatness or perpendicularity. They may strain the table and prevent it from a smooth rotation, and which may result very poor indexing accuracy.

Note: Provide the maximum bearing surface to the work-piece by even shimming up if necessary.

- 6-3. If the work-piece is mounted on the rotary table at the off-centered position, it may cause inaccurate indexing.



6-4. Location of work piece clamping may be restricted depending upon the shape of work piece or cutting conditions, however, clamp down firmly on the surface of rotary table at the locations spaced out equally. The smaller the bearing surface may require for the more number of clampings to stabilize the work piece without straining the table.

Note: If it is a manual rotary table, you can feel whether the rotary table is strained or not due to uneven clamping of work piece, however, when it comes to N/C rotary table, you just don't get that kind of feeling at all. Therefore, an extra caution must be taken for work piece must be taken for work piece clamping.

[7] BACKLASH ADJUSTMENT OF WORM GEAR

The Worm Gear is split in the middle and sandwiches wheel teeth from both directions to establish a perfect gear engagement of every single tooth.

The method of backlash adjustment is that by twisting both right and left hand side worms, inside of each worm tooth becomes closer to outside of each wheel tooth, and thus backlash can be adjusted to the most ideal value at 0.005 ~ 0.008m/m.

Too much of backlash means poor indexing accuracy and causes chattering in machining and poor finish.

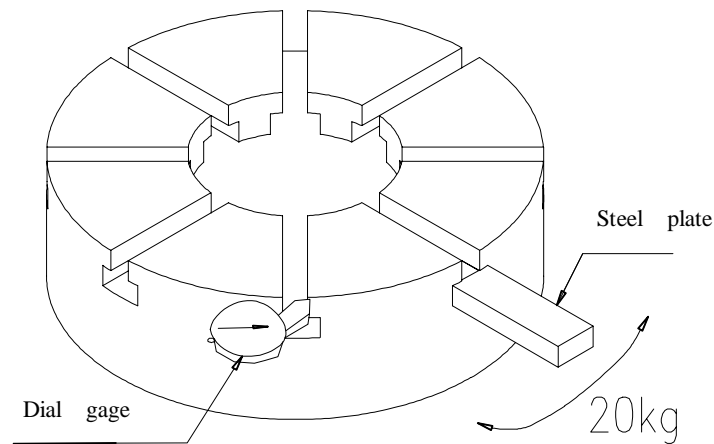
Again too little or no backlash may cause the serious due to Proper amount of backlash is about 0.008 m/m at the tooth face by taking into consideration of off-setting the heat displacement in relation to the accuracy of every moving part involved.

Note: When setting at smaller backlash than 0.005 m/m, be sure to check whether the rotary table can be rotated smoothly by HAND or not.

By the way, backlash of 0.008 m/m at the tooth face means 0.01 m/m at the position of table circumference. At the time of shipment from the factory, backlash is precisely adjusted, however, if necessary, you might be able to adjust it with following procedures:

7-1. Measuring the Amount of Backlash

A. Set a test indicator at the lock-nut near by the circumference of the table as shown below.

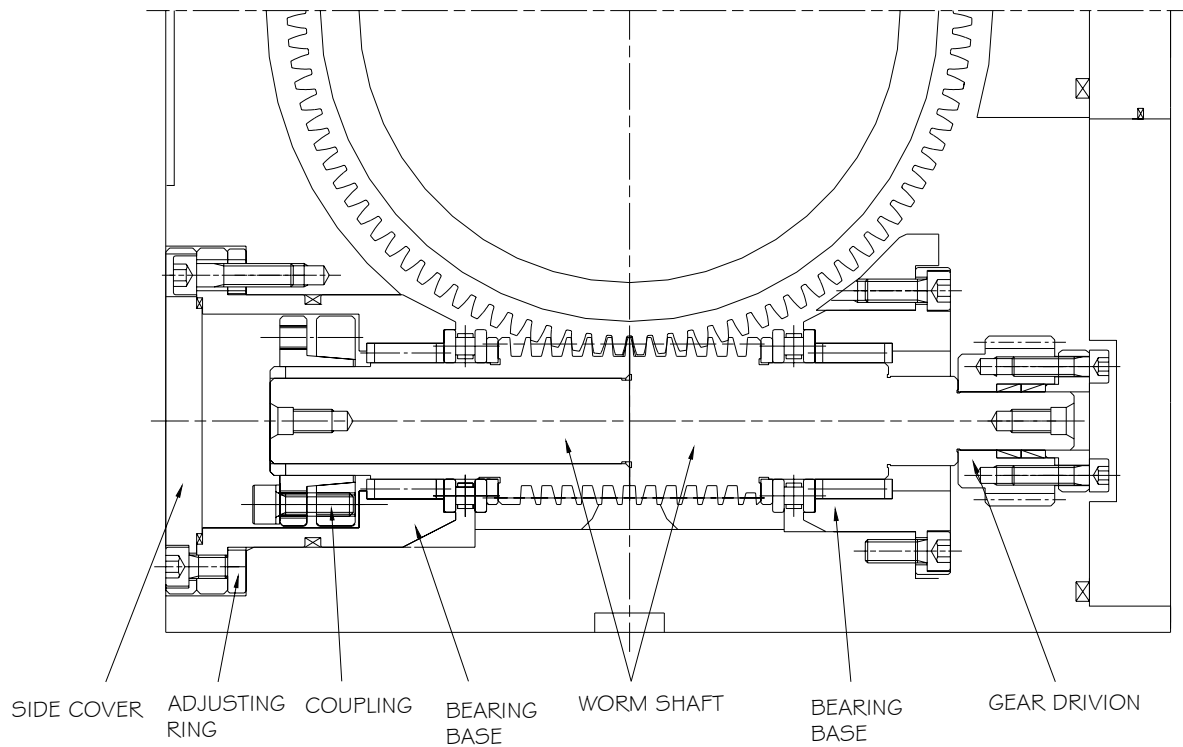


B. Insert the steel plate into the T slot and move back and forth with approximately 20kg force. With the force toward clockwise direction, the test indicator moves, and by releasing the force, it then returns to certain amount. However, this is not the backlash and caused an elastic force occurring at the worm gear and other parts involved. It is the same thing in counterclockwise direction. To obtain the exact amount of backlash, add up the indicator reading of the position after releasing the force both clockwise and anti clockwise direction. In other words, the total amount of indicator travel by force less indicator return after releasing the force is the amount of backlash. But, don't forget to check always both clockwise and clockwise and counterclockwise direction.

Note: : In case of adjusting the amount of backlash, an accurate amount of backlash can't be obtained if any play exists at the bearings which support the worm gear. Therefore, remove the worm gear cover shown at the next page and check the play at the next page and check the play at the both O.D. and ace of (A) worm gear shaft with a test indicator.
If any play, adjust by tightening the adjusting collar and then check the backlash again.

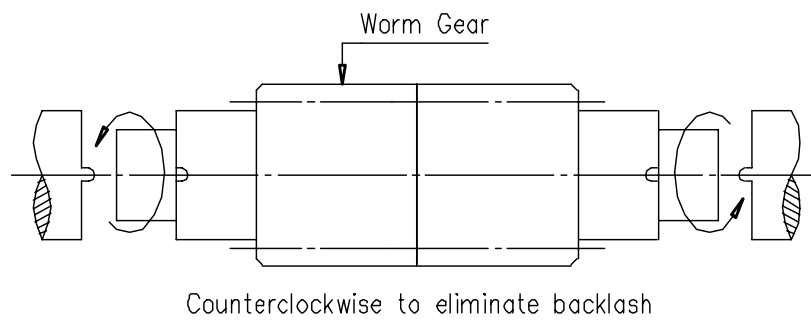
Note : After adjusted the backlash; make sure again to check the play existence at the face of (A).

C. After adjusted the backlash, if it is much more than 0.01m/m re-adjustment may be required for.

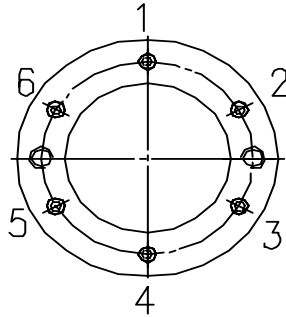


7-2. Adjusting the Amount of Backlash

- a. Remove the cover.
- b. Drain the lubricating oil completely from the unit thru "Oil Outlet".
- c. Remove all of the screws from the motor cover.
- d. By removing 4 pieces M10 cap screws, the bracket can be removed together with the motor and motor cover. The motor is pretty heavy, and watch out when moving around. Also be careful not to damage the wiring from micro switches or lubricating vinyl hose.
- e. Remove the cover for adjusting the worm.
- f. Loosen 6 pieces hex bolts holding the tightening ring.
- g. The worm gear , consisting of two sections a little by little in view from the end of shaft as shown below:



h. After a proper adjustment is done, tighten the hex bolts which hold the adjusting collar, a little by little in order from NO.1 to NO.6 as shown below, and be careful that the tightening ring never contacts the end of bearing support (B).



Note: If you tighten too much, it does contact. The tightening ring should be tightened with 4.62 ft. -1bs .torque at the final. Put all these parts back in the reversed order from e. and on. In putting the bracket back, wipe off the adhesive material and put new liquid adhesive plaster.

[8] BACKLASH ADJUSTMENT OF GEARS IN THE GEAR BOX

Power transmission between servo motor and worm gear shaft consists of 2 pieces. Hardened and precision ground spur gears. Each engagement should have 0.03m/m to 0.04m/m backlash. If it's less than 0.03m/m, you may not get a smooth rotation due to the heat deformation.

Assuming that the servo motor is at the locked position, and let's say that a spur gear at the end of worm gear shaft has 0.10m/m backlash. What's the indexing accuracy of rotary table? It is 3.3 seconds which means that a very small amount of influence was given to the accuracy. By the way, 3.3 seconds become approximately 1 pulse as far as the servo motor is concerned.

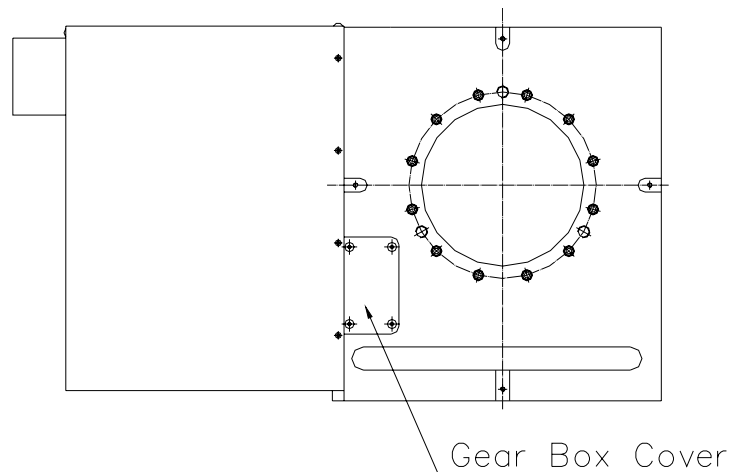
As another example, if 0.10 m/m backlash exist at the worm and wheel engagement, an indexing accuracy can be calculated as an approximately 10 seconds. Further more, if the backlash at the spur gear is kept consistently under control at a certain amount, it can be off-set by N/C. Therefore, it is not a big draw to have a certain amount of backlash like 0.03m/m to 0.04m/m at all as far as an indexing accuracy is concerned.

8-1 measuring the Backlash at the spur gears

To measure the backlash of spur gears easily, a cover is provided at the back face as shown at the next page. Remove it and set a test indicator point at the tooth face spur gear at the worm gear shaft.

Then, give several pulses clockwise or counterclockwise direction with manual pulse generator, and measure the difference. As one pulse is set at 0.001, the backlash becomes 0.10m/m per pulse.

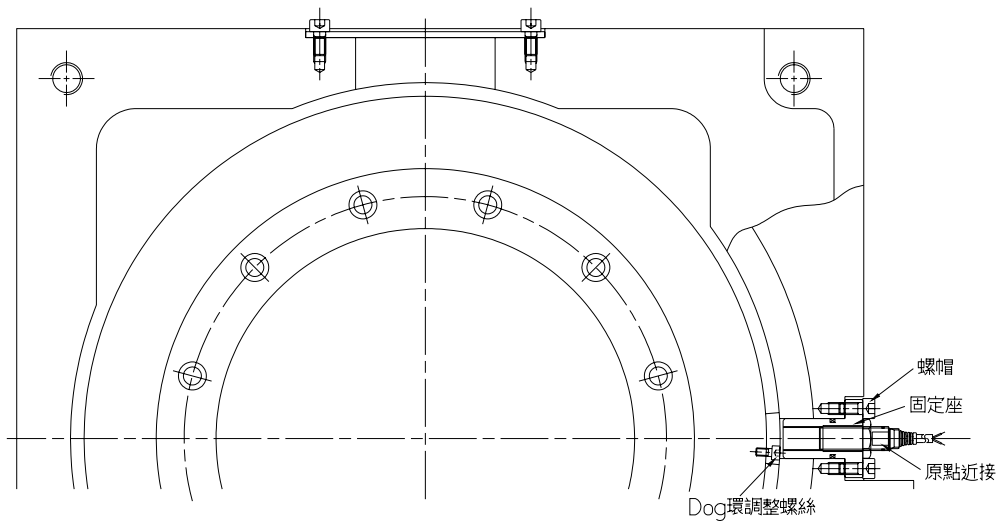
Note: An accumulative backlash at the spur gear (on the worm gear shaft) becomes greater than 0.10m/m, you may have to adjust it with the following procedures. Since the amount of backlash at the worm gear, it is highly recommended to check both of them at the same time.



Backlash Adjustment of Spur Gear on the worm and servo motor shaft gear.

- a. Assemble the bracket with servo motor and gear. Clean well and apply liquid adhesive plaster on the mating faces of the bracket and table body.
- b. Loosen 4 pieces motor attaching bolts.
- c. Put a pin into ϕ 7mm hole and swing the eccentric ring clockwise or counterclockwise. As whole motor moves, you can find the right amount of backlash easily. (0.03-0.05m/m)
- d. Tighten the motor attaching bolts firmly.

[9] ZERO-RETURN SETTING AND ADJUSTING DOG.



9-1 Zero-Return Setting

To get the single of speed down from the micro switch, when speed stopping it's meaning zero-position.

****How to adjust the height of micro switch****

- Turning back to the home position by clockwise direction.
- The switch already set the travel stroke for the micro switch.
- When the switch fixed, please install the switch set into the body and test with the connect cable.

7-2 Adjusting Dog

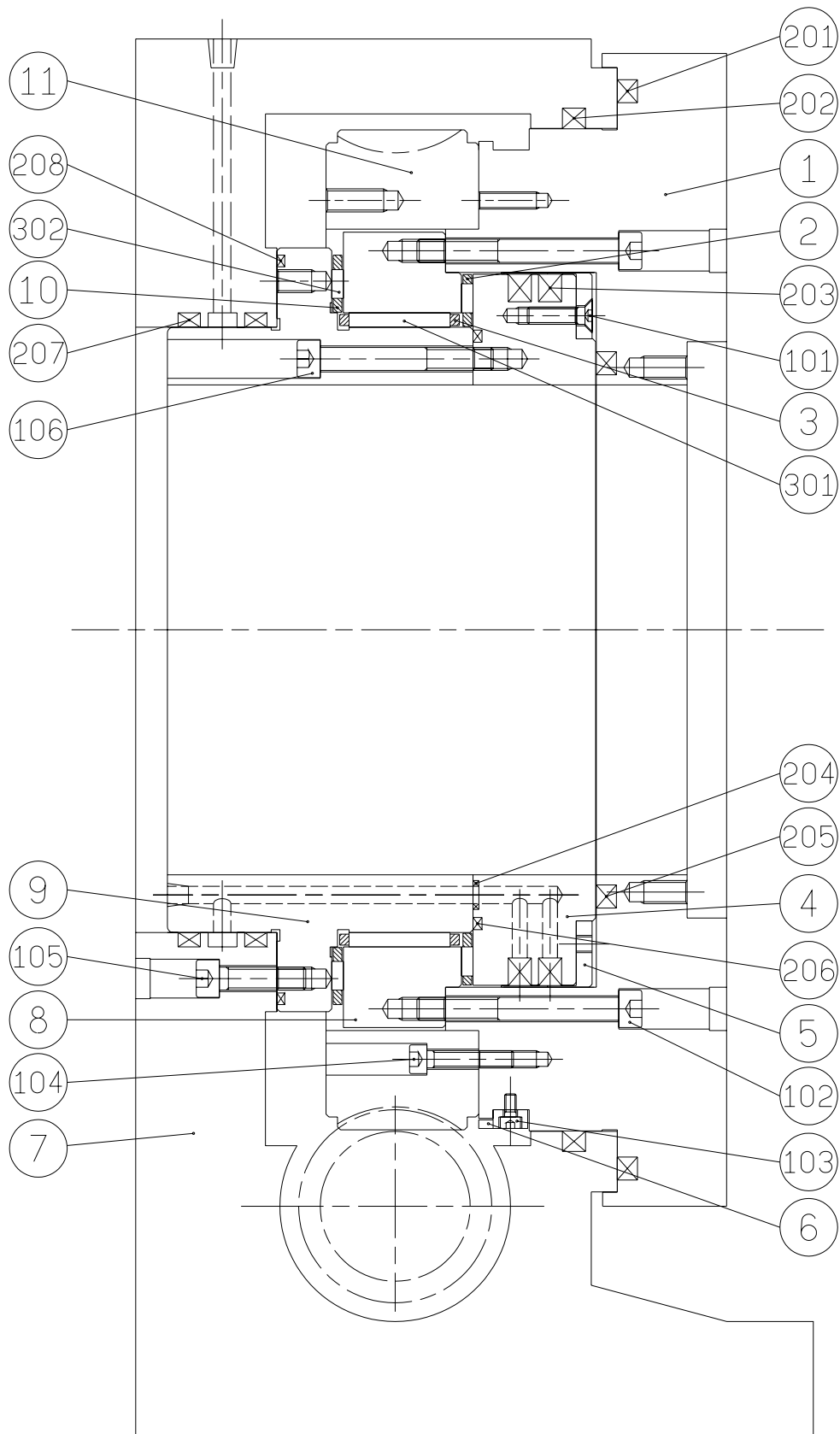
- Loosen the screw bolt of the Dog, and through the window to confirm the Dog position.
- To adjust the dog to the correct position by clockwise or ccw direction.
- Through the parameter setting to get the dog zero-return.

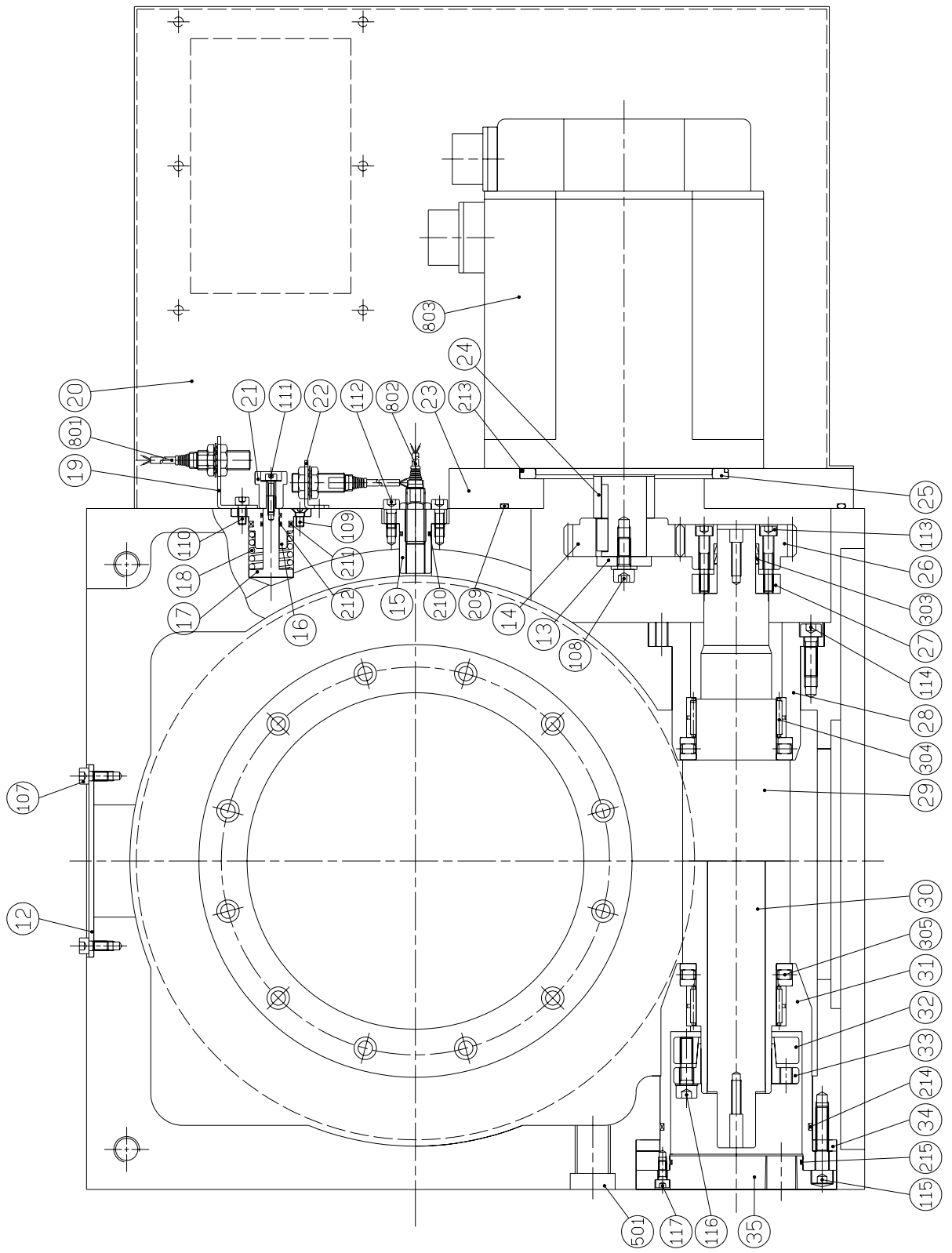
[10] MAINTENANC & SERVICE

Check the following points EVERY MORNING before operation.

- Check the oil level, No oil leakage?
- Check whether the rotary table is used within the capacities of load (work-piece weight) and cutting force (drive torque).
- Check the operation of clamp / unclamp.
- No particular noise in table rotation.

[11] EXPLODED DRAWING & PART LIST





PART LIST

No.	Part No.	Item	Specification	Q'ty	REMARK
1.	110802010	TABLE	Ø400×97.5L	1	
2.	110802091	BEARING KEEPER (UP)		1	
3.	110802041	BEARING KEEPER	Ø219×41.5 L	1	
4.	110802021	BRAKING BASE	Ø246.7×42.5 L	1	
5.	110802080	BRAKING PIECE	Ø246.8×31.5L	1	
6.	110802070	ZERO DOG	18×9KEY	1	
7.	110801011	BODY		1	
8.	110802051	BEARING RING	Ø276×41L	1	
9.	110802061	SUPPORT BASE	Ø265×106L	1	
10.	110802101	BEARING KEEPER (DOWN)		1	
11.	110802030	WORM GEAR	Ø346.9×53 L	1	
12.	110801040	COVER OF BODY	119×69×3L	1	
13.	110808110	MOTOR GEAR PLATE	Ø34×6L	1	
14.	110808090	MOTOR GEAR	Ø75×24L	1	
15.	110704010	SWITCH BASE	Ø39×40L	1	
16.	110804050	CYLINDER BASE	Ø49×25L	1	
17.	110804040	PISTON	Ø27×53L	1	
18.	110804060	SPRING		1	
19.	110804010	SWITCH BASE (1)		1	
20.	110805010	PLATE		1	
21.	110804030	DOG	Ø20×23.5L	1	
22.	110804020	SWITCH BASE (2)		1	
23.	110808080	MOTOR FLANGE		1	
24.	110808100	MOTOR DRIVEN RING	Ø38×26.1L	1	
25.	110808120	MOTOR CENTER RING	Ø130×6.5L	1	
26.	110803140	WORM GEAR	Ø75×24L	1	
27.	110803090	FIXED BASE (2)	Ø54×18L	1	
28.	110803060	RIGHT BEARING BASE	Ø108×77.5L	1	
29.	110803040	WORM SHAFT (1)	Ø67×386L	1	
30.	110803050	WORM SHAFT (2)	Ø67×145L	1	
31.	110803030	LEFT BEARING BASE	Ø124.8×121.5L	1	
32.	110803080	FIXER (2)	Ø78×16L	1	
33.	110803070	FIXER (1)	Ø78×27L	1	
34.	110803010	SPACING RING	Ø125×7L	1	
35.	110803020	SIDE COVER	Ø125×21L	1	
101		COUNTERSUNK SCREW	M6×20L	12	
102		INNER HEXAGON SCREW	M8×70L	8	
103		INNER HEXAGON SCREW	M4×8L	1	
104		INNER HEXAGON SCREW	M6×30L	1	

PART LIST

No.	Part No.	Items	Specification	Q'ty	Remark
105		INNER HEXAGON SCREW	M8×30L	12	
106		INNER HEXAGON SCREW	M8×60L	12	
107		INNER HEXAGON SCREW	M6×12L	6	
108		INNER HEXAGON SCREW	M8×20L	1	
109		COUNTERSUNK SCREW	M5×12L	4	
110		INNER HEXAGON SCREW	M5×12L	2	
111		INNER HEXAGON SCREW	M4×20L	1	
112		INNER HEXAGON SCREW	M5×16L	2	
113		INNER HEXAGON SCREW	M6×35L	4	
114		INNER HEXAGON SCREW	M8×25L	6	
115		INNER HEXAGON SCREW	M8×40L	6	
116		INNER HEXAGON SCREW	M8×30L	6	
117		INNER HEXAGON SCREW	M5×12L	3	
201.		INNER HEXAGON SCREW	P360	1	
202.		INNER HEXAGON SCREW	P355	1	
203.		INNER HEXAGON SCREW	P230	2	
204.		INNER HEXAGON SCREW	P6	2	
205.		O-RING	P175	1	
206.		O-RING	AS265	1	
207.		O-RING	G210	2	
208.		O-RING	AS274	1	
209.		O-RING	AS264	1	
210.		O-RING	P16	1	
211.		O-RING	P22A	1	
212.		O-RING	P10	2	
213.		O-RING	G125	1	
214.		O-RING	S90	1	
215.		O-RING	S80	1	
301.		ROLLER NEEDLE	∅10×35L	80	
302.		ROLLER NEEDLE	∅4×10L	120	
303.		STOPPING RING	∅24×∅28×6.3L	2	
304.		BEARING	TAF506225	2	
305.		BEARING	AZ507014	2	
501.		OIL MIRROW	PF1/2"	1	IKO
801		ZERO MICRO SWITCH	E2E-X3D2-N	1	IKO
802		MICRO SWITCH	E2E-X3D1	2	
803		SERVO MOTOR	P60B13200	1	