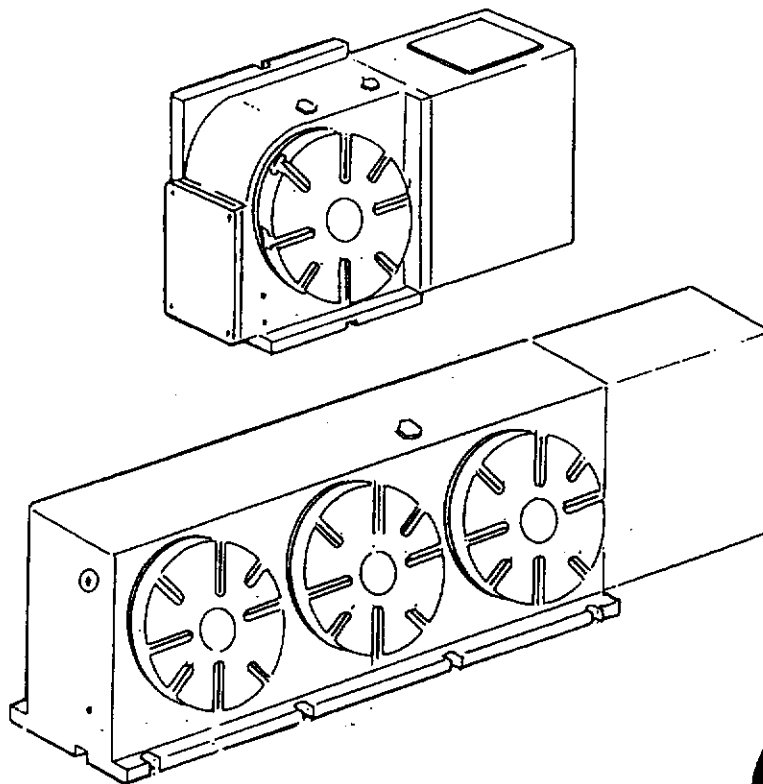


NIKKEN CNC ROTARY TABLE
CNC200 SERIES
INDIVIDUAL INSTRUCTION MANUAL

TENTH EDITION



CE

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This manual was produced using NIKKEN CNC rotary table CNC200 series. CNC200 series includes CNC200, CNC200B, CNC200T and CNC200 multiple table with any kind of motor.

It is essential that you read the instructions and safety regulations before you attempt to use CNC rotary table.



: This is the industry safety symbol. This symbol is used to bring you attention to items or operations that could cause danger to you or other persons using CNC rotary tables. Please read these messages and follow these instructions carefully.



: This is the industry safety symbol. This symbol is used to bring you attention to items or operations that could be potentially hazardous to you or other persons using CNC rotary tables. Please read these messages and follow these instructions carefully.



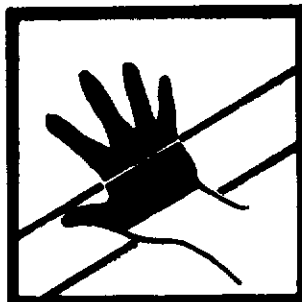
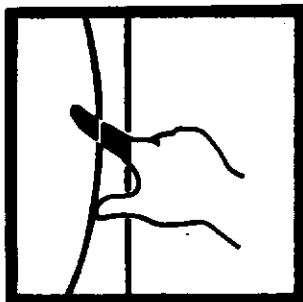
: Use CNC rotary table on the machine with safety door in combination with interlock system.



: Switch off main power of machine tool before setting, inspection or maintenance.



: Make sure your hand is out of the area marked as follows:



: Do not attempt to modify CNC rotary table.



: Never hammer CNC rotary table or workpiece.



: Never attempt to operate CNC rotary table while under the influence of alcohol or drugs.



: Gloves and ties should not be worn when operating CNC rotary table.

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APPENDIX

- 1 Relation between work dia. and length for allowable max. load
- 2 Relation between work dia. and length for allowable work inertia

1 Adjustment of backlash

The worm screw rotates in the totally-enclosed oil bath and the reduction mechanism is composed of a combination of the special ion-nitrided worm wheel and the hardened worm screw, so that it is not necessary to adjust the backlash until four to five years have elapsed after the rotary table is put in service. However, if necessary, the backlash can be adjusted according to the following procedures.

1.1 Measurement of backlash

- 1) Unclamping the brake.
Execute unclamp command.
- 2) Confirming the backlash

Read a deflection of the dial gauge (G) by inserting the flat plate (H) into a T-slot and manoeuvre the faceplate clockwise and anticlockwise through the plate by hand. A backlash of within 5 ~ 15 microns is normal when shipped (It means that at least 5 microns of backlash amount is required for CNC rotary table.), and the adjustment should be done in the event when a backlash of 50 microns or more is observed. The confirmation is to be done on four spots of every 45° of table.

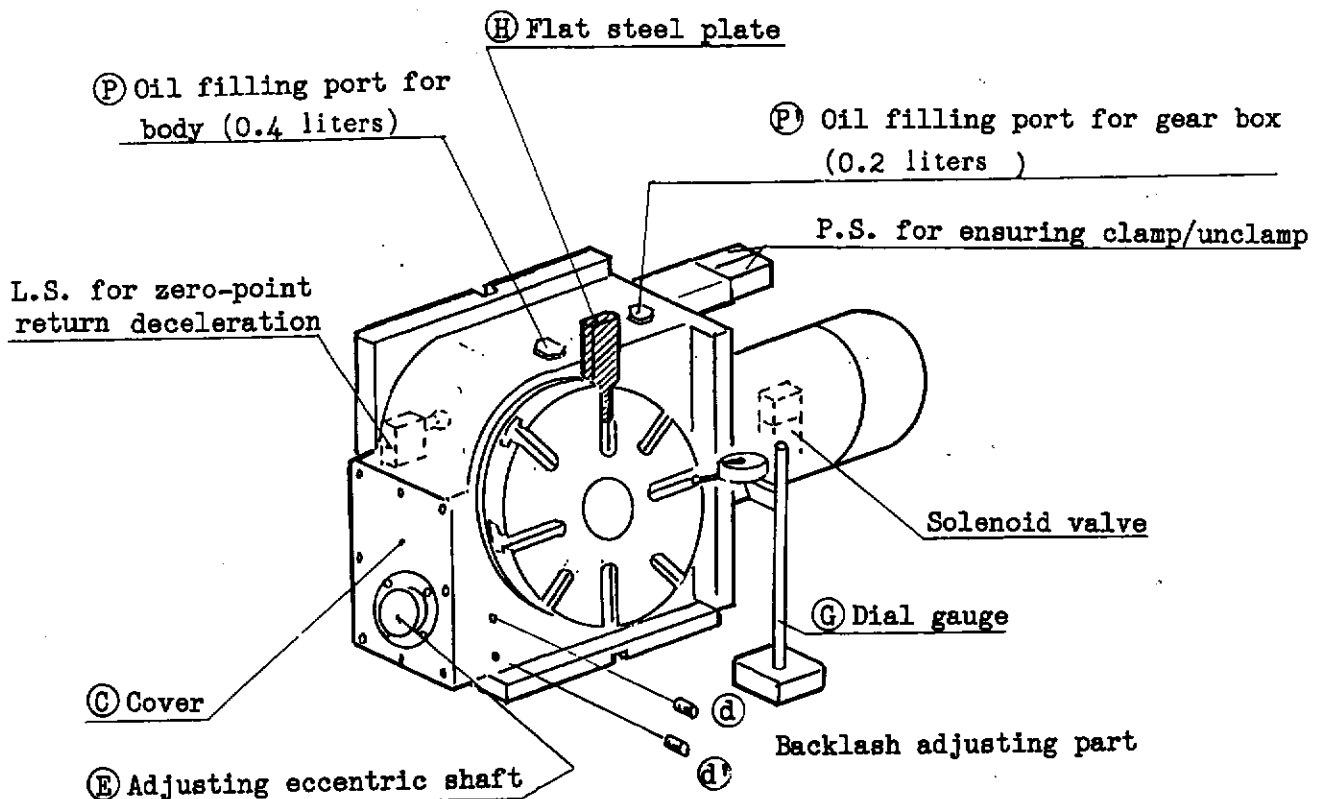


Fig.1

1.2 Adjustment of backlash : for CNC200 and CNC200B



- 1) Switch off main power of machine tool.
- 2) Loosen out cap screws for cover C and remove the cover.
- 3) Loosen four cap bolts which tighten the eccentric shaft E .
- 4) Take out the tapered screw plugs d and d' of Fig.2 and the backlash adjusting bolts h and g will be provided therein.
- 5) Here, reset the dial guage G as shown in Fig.1, loosen the bolt h and tighten the bolt g clockwise, then the eccentric shaft will turn in direction of arrow. Thus, the backlash between the worm wheel and the worm screw will get near to 0(zero). Adjust the backlash to 10~15 microns by using the bolts h and g watching the deflection of the dial guage G while shaking the outer periphery of CNC rotary table, then securely lock them again.
- 6) After completion of above adjustment, tighten the plugs d and d' and bolts for eccentric shaft E .
- 7) Measure the backlash again and confirm to that it has been adjusted to 5~15 microns.
- 8) After completion of the adjustment of backlash, make sure of the motor load. Switch on the power supply, let CNC rotary table rotate on the jog mode to check the gear noise.

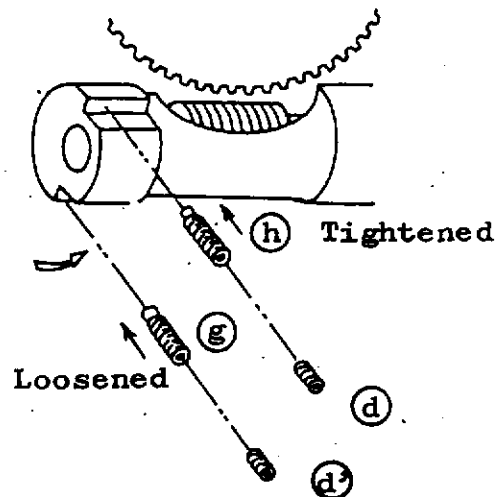


Fig. 2

! NOTE In case of CNC200, if abnormal sound is recognized, loosen the mounting bolts of motor in Fig. 3 and slowly turn adjusting bolt clockwise, then it will become normal sound. (This means the adjustment of backlash between the main gear and the motor gear.)

! NOTE The adjustment of backlash is a very delicate work, so be careful when executing it.

! NOTE Be sure to apply each sealing agent (shown in Fig. 2) to its corresponding part assembling the worm screw, so that no ingress of coolant etc. is permitted.

! NOTE By no means turn the table at the rapid speed immediately after the adjustment. Be sure to turn it at the low speed (2 r.p.m) for trial running first, then turn it at the rapid speed.

! NOTE In case of CNC200B, be sure to commence the trial running after adjusting the backlash of gears in gear box as described in 1.3.

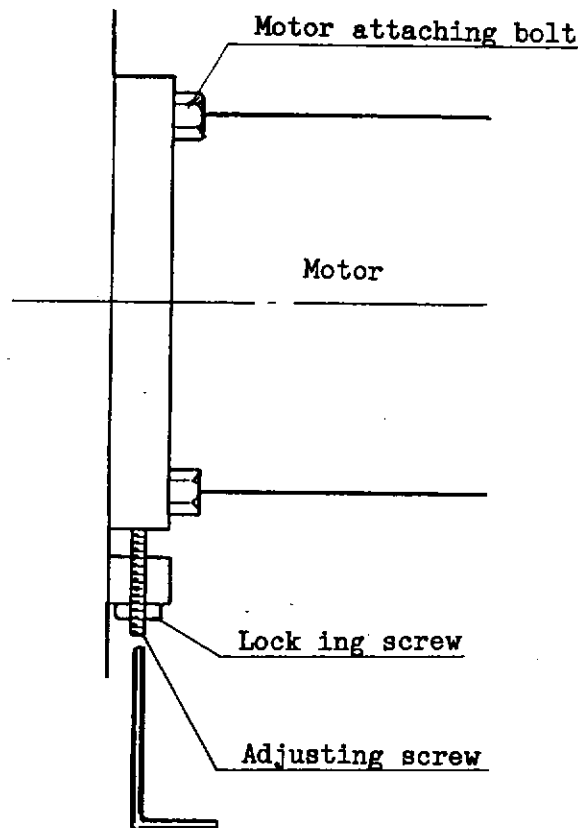


Fig. 3

1.3 Backlash adjustment of gears in gear box : for CNC200B only

After completion of backlash adjustment between worm wheel and worm screw, carry out the backlash adjustment of gears in gear box according to the following procedures.



1) Switch off main power of machine tool.

2) Drain oil from the gear box.

3) Remove the gear box cover.

4) Adjustment of backlash between gears Z1 and Z2
(Optimum backlash:0.02~0.03mm)

Since Z2 and Z3 gears are fastened to the eccentric shaft A, adjust the backlash after loosening the four tightening bolts. Apply the dial guage on a tooth surface of Z3 gear, adjust the backlash so that a pointer indicates within a range of 0.05~0.07mm, then tighten the four tightening bolts.

5) Adjustment of backlash between gears Z3 and Z4
(Optimum backlash:0.02~0.03mm)

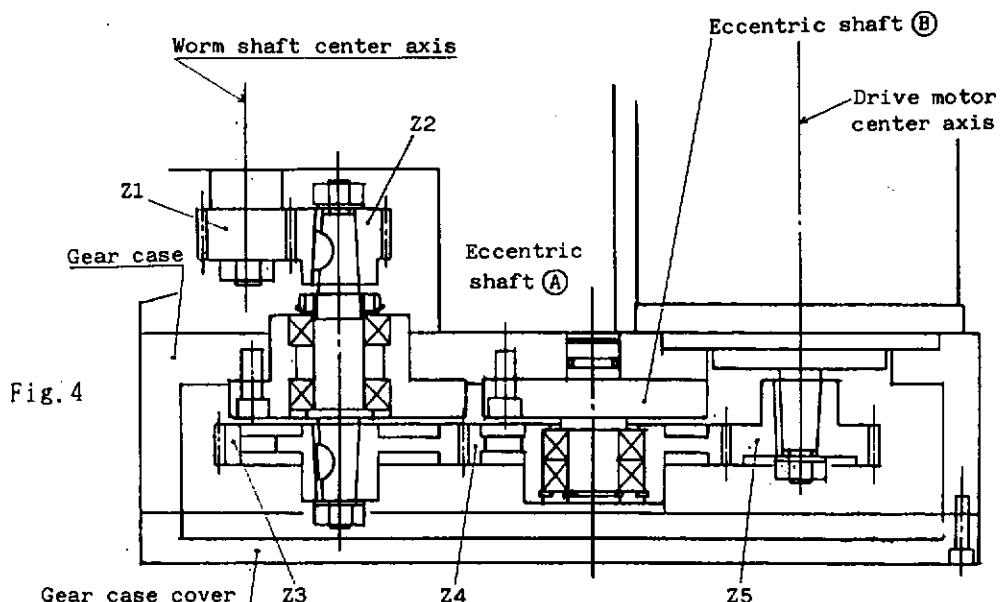
Since Z4 gear are fastened to the eccentric shaft B, adjust the backlash after loosening the four tightening bolts. Apply the dial guage on a tooth surface of Z4 gear, adjust the backlash so that a pointer indicates within a range of 0.02~0.03mm, then tighten the four tightening bolts.

6) Adjustment of backlash between gears Z4 and Z5
(Optimum backlash:0.02~0.03mm)

Loosen four tightening bolts for the drive motor. The backlash can be adjusted by depressing the motor toward the Z4 gear. Measure the backlash by applying the dial guage on the tooth surface of Z5 gear. After confirming, the backlash has been adjusted to within 0.02~0.03mm, tighten the four tightening bolts.



Be sure to adjust the backlash from the table side in sequence as Z1,Z2, Z3,Z4 to Z5 gears.



1.4 Adjustment of backlash : for CNC200T only

1.4.1 Adjustment of backlash between worm wheel and worm screw



- 1) Switch off main power of machine tool.
- 2) Loosen out cap screws for cover (C) and remove the cover.
- 3) Loosen four cap bolts which tighten the eccentric shaft (E).
- 4) Take out the tapered screw plugs (d) and (d') of Fig.5 and the backlash adjusting bolts (h) and (g) will be provided therein.
- 5) Here, reset the dial guage (G) as shown in Fig.5, loosen the bolt (h) and tighten the bolt (g) clockwise, then the eccentric shaft will turn in direction of arrow. Thus, the backlash between the worm wheel and the worm screw will get near to 0 (zero). Adjust the backlash to 10 ~ 15 microns by using the bolts (h) and (g) watching the deflection of the dial guage (G) while shaking the outer periphery of CNC rotary table, then securely lock them again.
- 6) After completion of above adjustment, tighten the plugs (d) and (d') and bolts for eccentric shaft (E).
- 7) Measure the backlash again and confirm to that it has been adjusted to 5~15 microns.

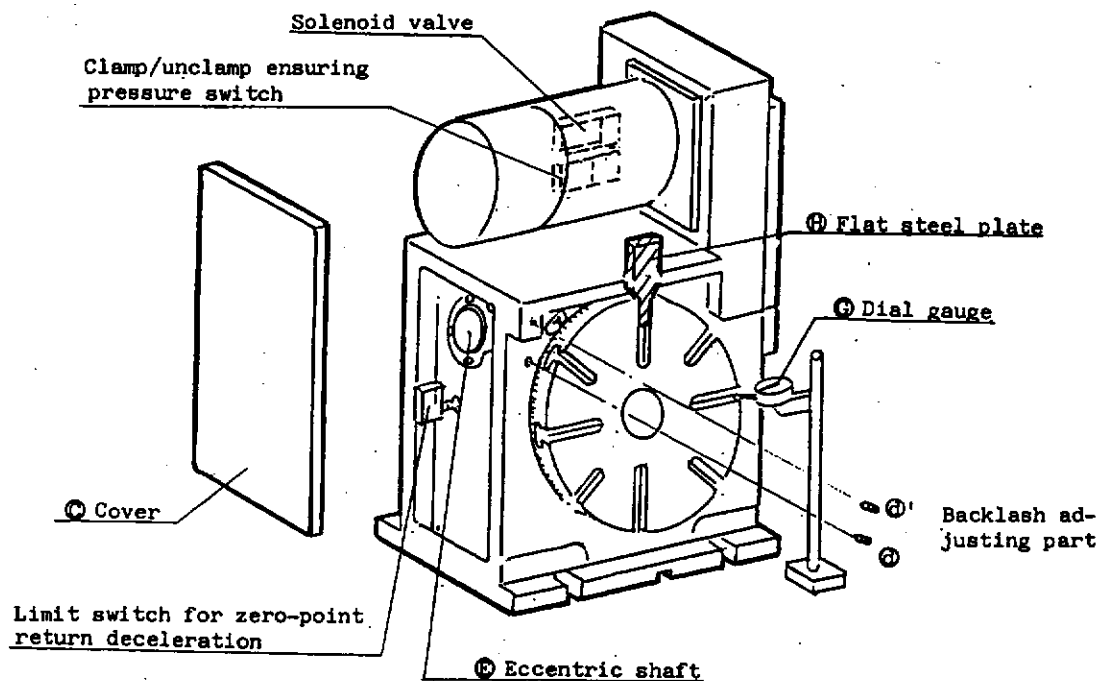


Fig. 5

1.4.2 Adjustment of backlash of gears in gear box

After completion of backlash adjustment between worm wheel and worm screw, carry out the backlash adjustment of gears in gear box according to the following procedures.



- 1) Switch off main power of machine tool.
- 2) Drain oil from the gear box.
- 3) Remove the gear box cover.
- 4) Adjustment of backlash between gears Z1 and Z2
(Optimum backlash: 0.02~0.03mm)

Since Z2 gear is fastened to the eccentric shaft, adjust the backlash after loosening the four tightening bolts. Apply the dial gauge on a tooth surface of Z2 gear, adjust the backlash so that a pointer indicates within a range of 0.02~0.03mm, then tighten the four tightening bolts.

- 5) Adjustment of backlash between gears Z2 and Z3
(Optimum backlash: 0.02~0.03mm)

Loosen four tightening bolts for the motor. The backlash can be adjusted by depressing the motor toward the Z2 gear. Measure the backlash by applying the dial gauge on the tooth surface of Z3 gear. After confirming, the backlash has been adjusted to within 0.02~0.03mm, tighten the four tightening bolts.



Be sure to adjust the backlash from the table side in sequence as Z1, Z2 to Z3 gears.

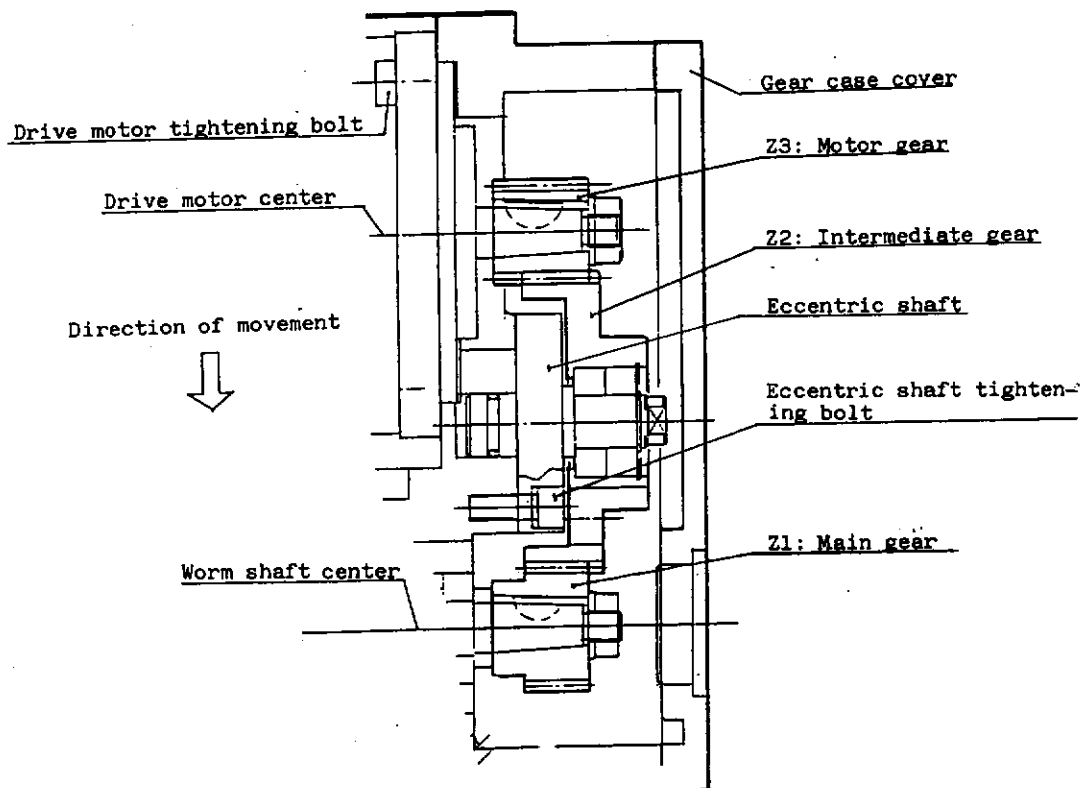


Fig. 6

1.5 Adjustment of backlash : for multiple type

The adjustment of backlash is conducted by varying the meshing pitch between the spindle center and the worm shaft center.

The adjusting mechanism is as shown by Fig.9 to decrease the meshing pitch, remove the shim plate and grind it with a surface grinder etc. In order to decrease the backlash by 0.01mm, thin the shim plate by about 0.019mm.

!
NOTE

To avoid excessive thinning of shim plate, be sure to thin it gradually.

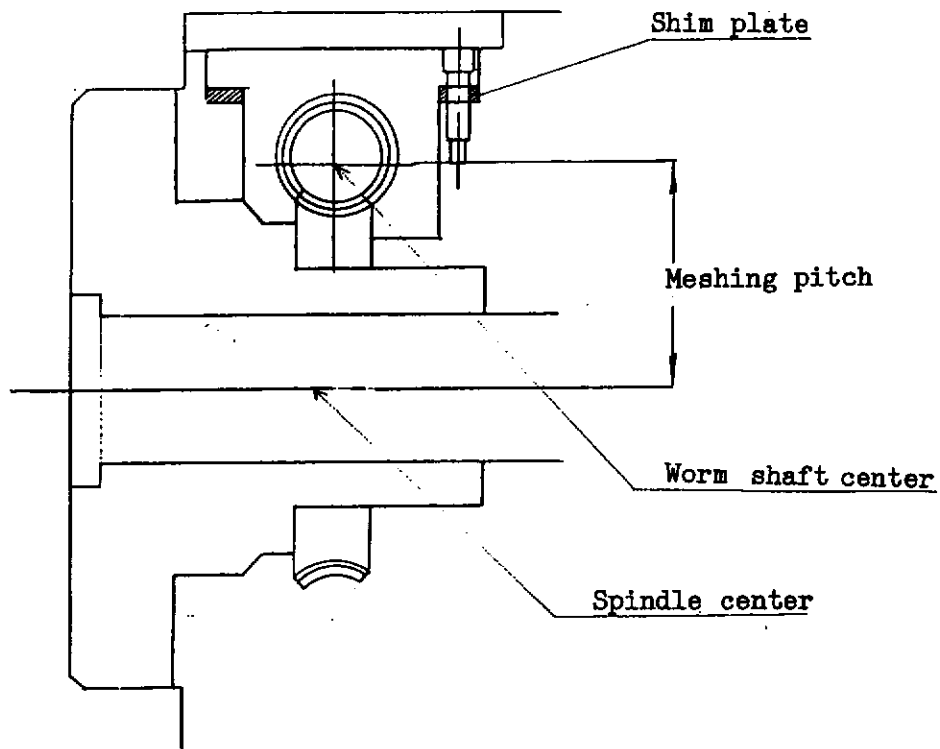


Fig.7

2 Brake mechanism

The brake mechanism is illustrated on Fig.10.

!
NOTE

Since this brake mechanism requires a fine adjustment, by no means disassemble it indiscriminately.

Further, installing positions of solenoid valve and pressure switches might be changed depending on the kind of CNC200 type and motor to be mounted.

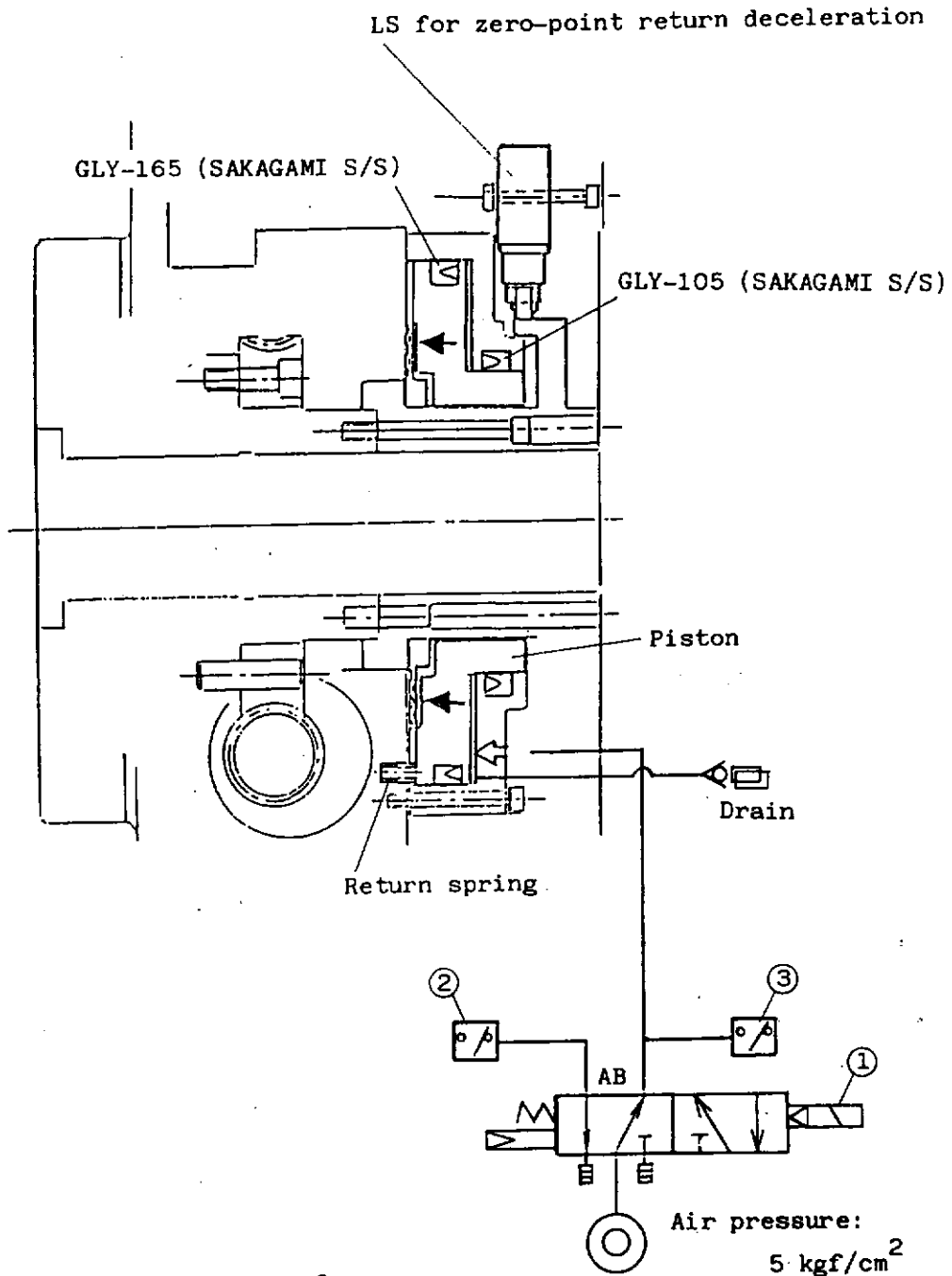


Fig. 8

3. Zero-point return mechanism

Remove the backside cover of table, and the zero-point return mechanism will be found. The dog ring for deceleration (DEC*) for zero-point return is fastened by two set screws.

NOTE

In case of CNC200B, the motor must be removed first in order to remove the backside cover.

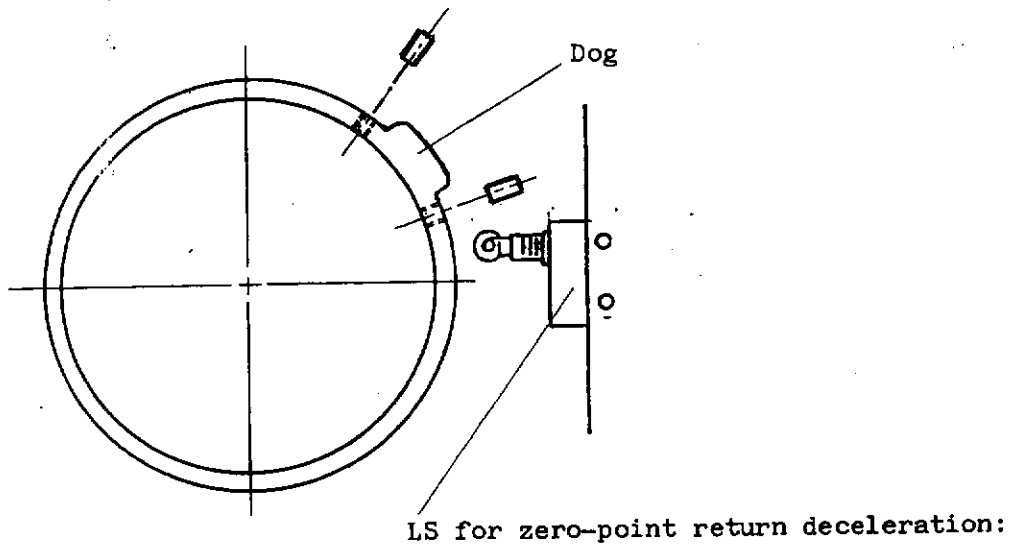


Fig. 9

4 Changing of cables, receptacles and air hose direction

There are two type of motor cover on which cables or receptacles direction can be changed.

4.1 Handling of two-directional-mounting motor cover

The attaching plate of receptacle has been fitted to the B-plane when the CNC rotary table is shipped, unless otherwise specified. The procedures of changing the attaching plate of receptacle and air hose are described hereunder.



1) Switch off main power of machine tool.



2) Remove the air coupler to stop the air supply.

3) Remove the receptacles and air hose.

4) Remove a blank plate in order for easy changing work.

5) Remove the attaching plate of receptacle.

6) Pull out the attaching plate and remove the air hose from inside. Remove four screws attaching the receptacle.

7) Change directions of receptacles and air hose and attach them to the attaching plate.

8) Fasten the attaching plate to motor cover.

9) Fasten the blank plate.

10) Connect the cables and air hose.

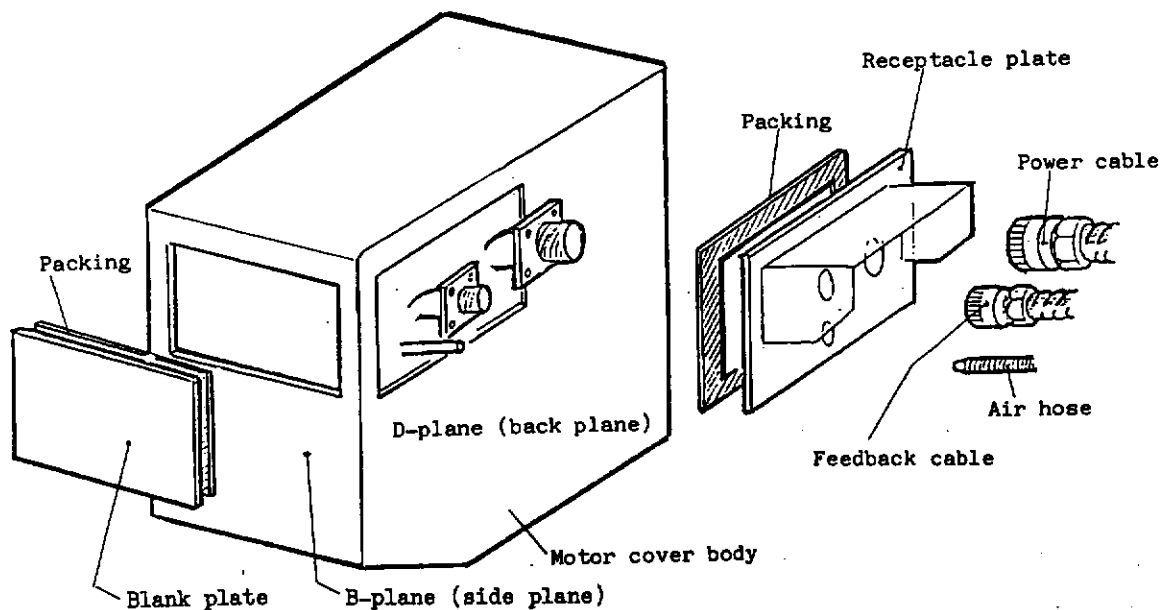


Fig.10

4.2 Handling of three-directional-mounting motor cover

The cables and air hose direction has been fitted to the B-direction when the CNC rotary table is shipped, unless otherwise specified. The procedures of changing direction are described hereunder.



1) Switch off the main power of machine tool.



2) Remove the air coupler to stop the air supply.

3) Remove the receptacles and air hose at machine tool side.

4) Remove three-directional-mounting plate.

5) Change directions of three-directional-mounting plate and fasten it to the motor cover.

6) Connect the receptacles and air hose.

5 Connection of multi type worm screw

Triple type connection of worm shaft is shown in Fig. 11.
In case of the double type, the worm shaft A, worm shaft C and one coupling are used.

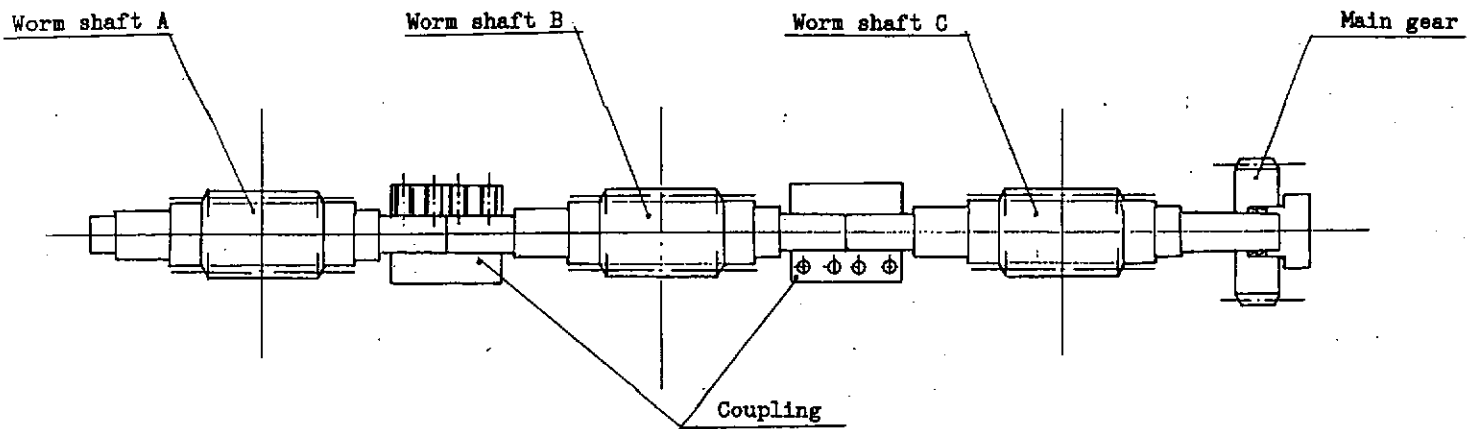
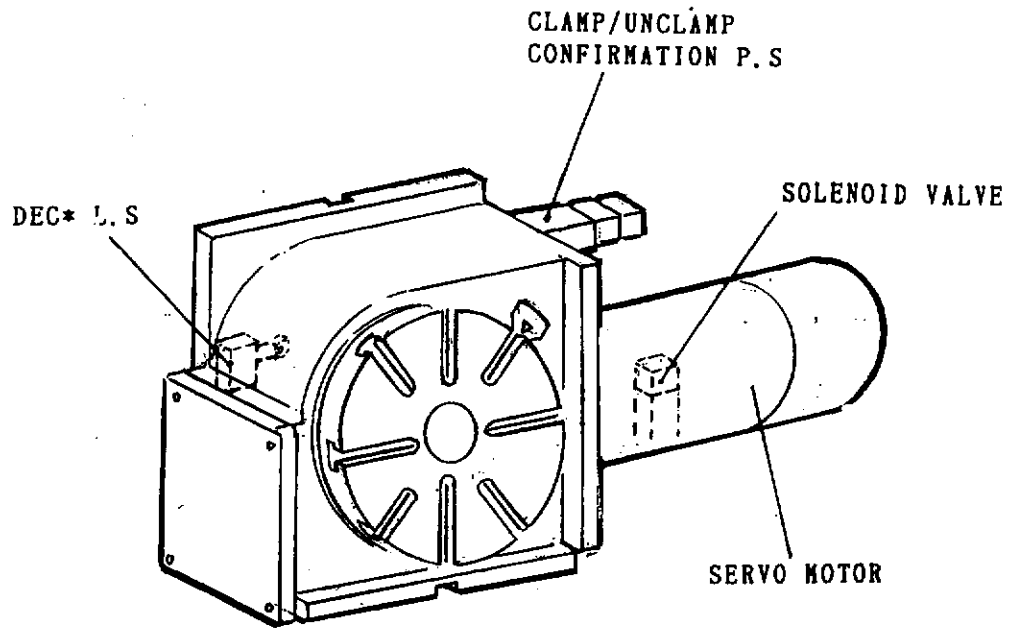


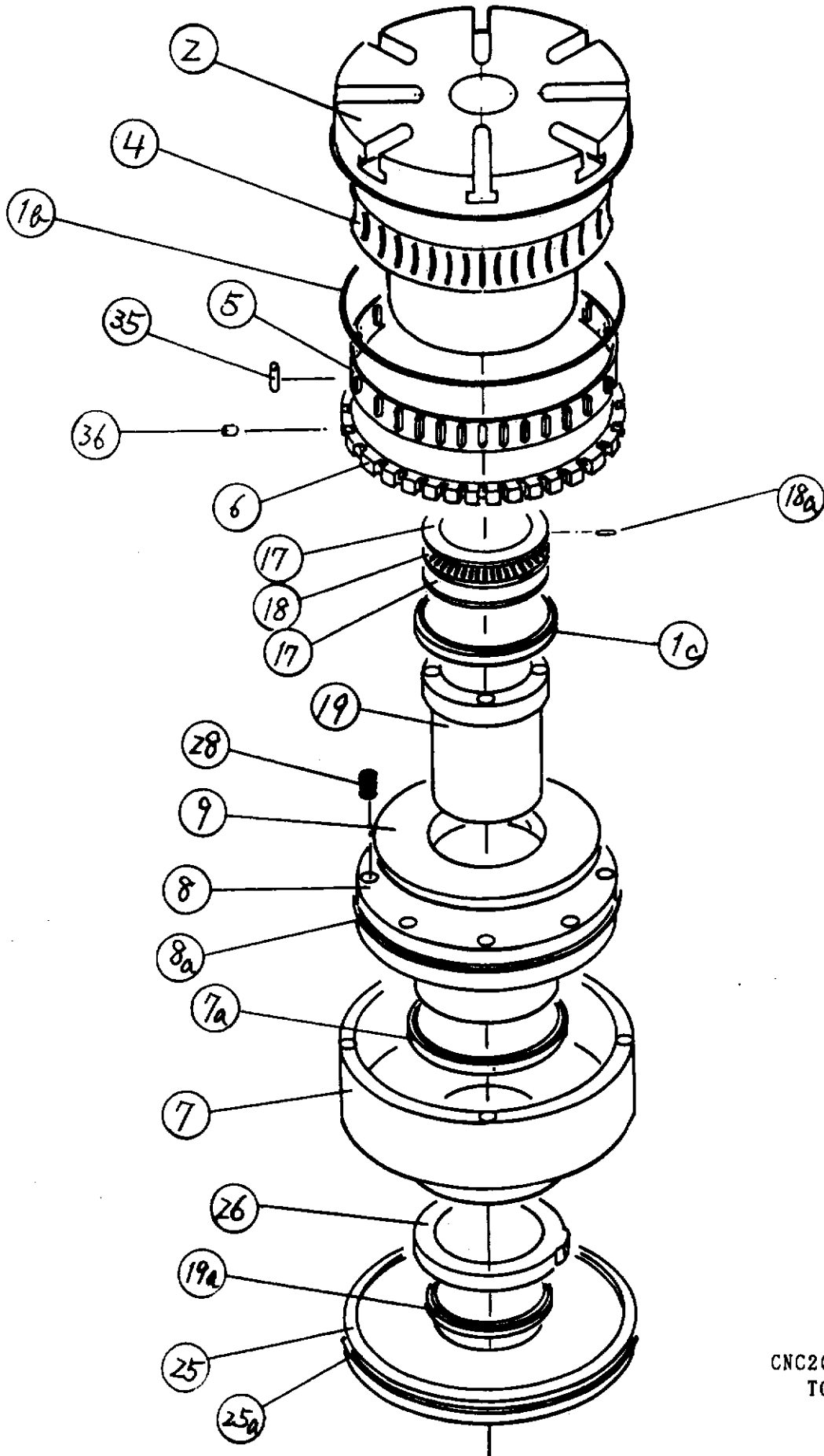
Fig. 11

6 Layout of electric parts



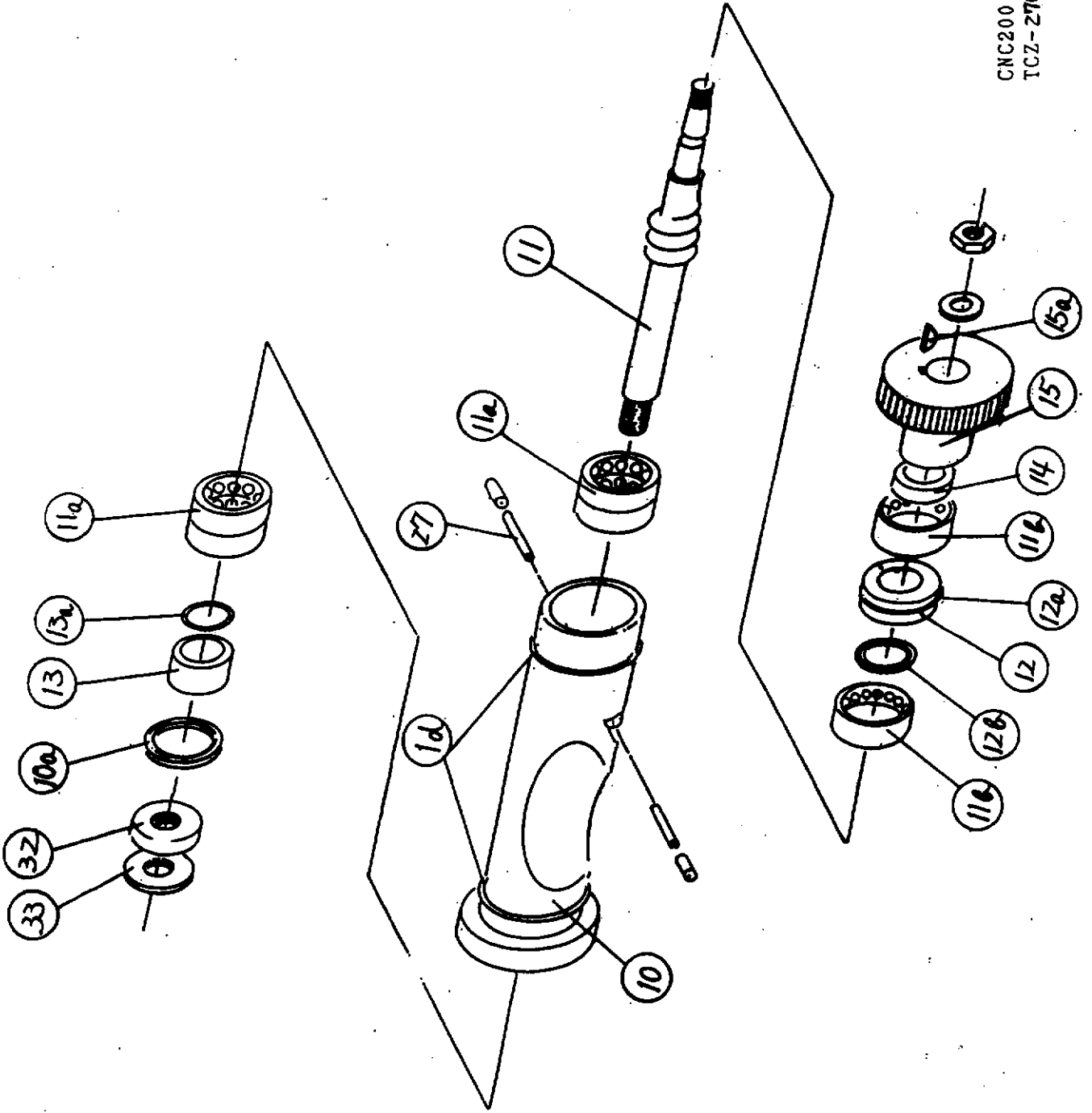
CNC200 LAYOUT OF
ELECTRIC PARTS
TCZ-27001

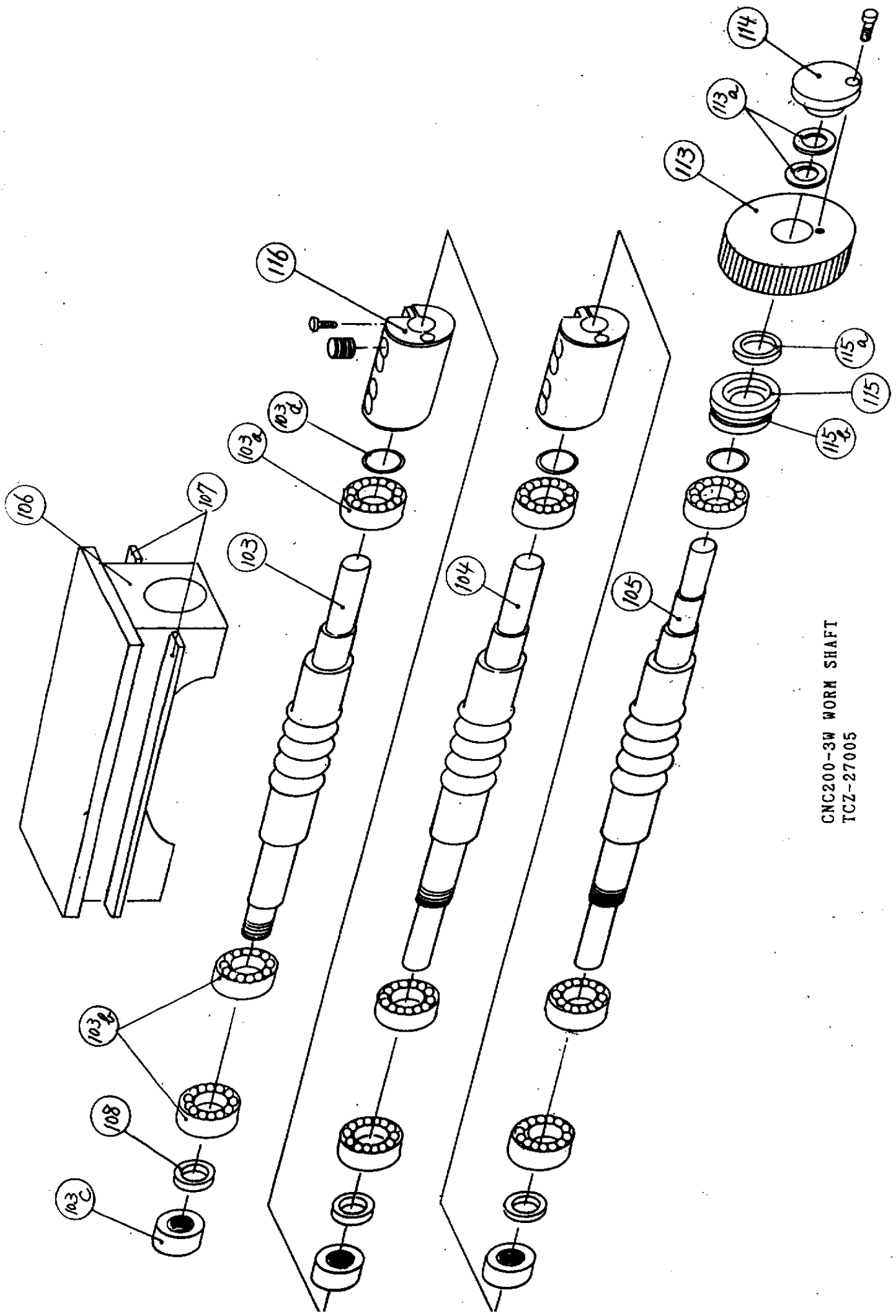
7 Spare parts list



CNC200 SPINDLE
TCZ-27002

CNC200 WORM SHAFT
TCZ-27003





CNC200-3W WORM SHAFT
ICZ-27005

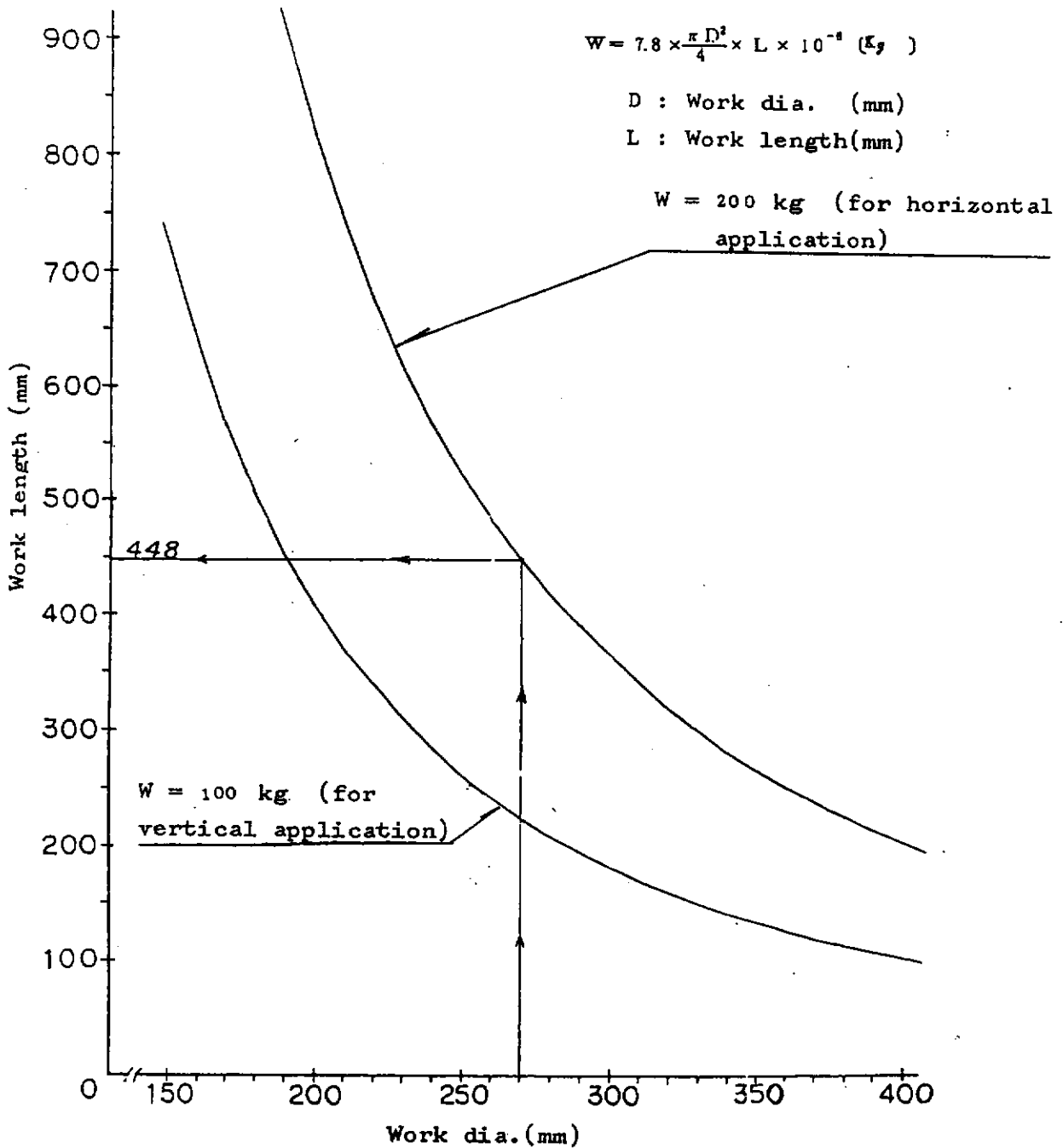
No.	REFERENCE	ITEM	PIECES	REMARKS
2	TCZ-27002	CIRCULAR TABLE	1	
4	TCZ-27002	WORM WHEEL	1	
5	TCZ-27002	RETAINER FOR #35	1	
6	TCZ-27002	RETAINER FOR #36	1	
7	TCZ-27002	BRAKE CYLINDER	1	
8	TCZ-27002	BRAKE PISTON	1	
9	TCZ-27002	BRAKE DISC	1	
17	TCZ-27002	THRUST RING	2	#17,#18 AND #18a ARE SET.
18	TCZ-27002	THRUST RETAINER	1	
19	TCZ-27002	HOLDER FOR THRUST BEARING	1	
25	TCZ-27002	BACK COVER	1	
26	TCZ-27002	DOG RING	1	
28	TCZ-27002	SPRING	12	
35	TCZ-27002	NEEDLE ROLLER	30	φ 4 * 11L
36	TCZ-27002	TUBULAR ROLLER	24	φ 8 * 8L
1b	TCZ-27002	FACE SEAL & O-RING	1	φ 182
1c	TCZ-27002	OIL SEAL	1	SB100*120*12
7a	TCZ-27002	SEAL	1	GLY105
8a	TCZ-27002	SEAL	1	GLY165
18a	TCZ-27002	NEEDLE ROLLER	24	φ 2 * 7.5L
19a	TCZ-27002	SEAL	1	VR80A
25a	TCZ-27002	O-RING	1	JIS W1517-42
10	TCZ-27003	ECCENTRIC HOUSING	1	
11	TCZ-27003	WORM SHAFT	1	
12	TCZ-27003	COLLAR FOR SEAL	1	
13	TCZ-27003	COLLAR FOR BEARING	1	
14	TCZ-27003	SPACER RING	1	
15	TCZ-27003	MAIN GEAR	1	
27	TCZ-27003	ADJUST SCREW	1	
32	TCZ-27003	NUT #A	1	
33	TCZ-27003	NUT #B	1	
1d	TCZ-27003	O-RING	1	G-55
10a	TCZ-27003	OIL SEAL	1	SC24*38*8
11a	TCZ-27003	BEARING	1	7202BDT
11b	TCZ-27003	BEARING	1	#6003
12a	TCZ-27003	O-RING	1	N-31.5
12b	TCZ-27003	OIL SEAL	1	SC17*28*7
13a	TCZ-27003	O-RING	1	P-15
15a	TCZ-27003	WOODRUFF KEY	1	φ 16 * 5t
52	TCZ-27004	IDLE GEAR #1	1	SAME AS MOTOR GEAR OF CNC200
B3	TCZ-27004	MOTOR GEAR	1	
B4	TCZ-27004	SHAFT FOR IDLE GEAR #3	1	
B5	TCZ-27004	IDLE GEAR #3	1	
B6	TCZ-27004	SLEEVE	1	
B7	TCZ-27004	SHAFT FOR IDLE GEAR #1 AND #2	1	
B8	TCZ-27004	IDLE GEAR #2	1	
B9	TCZ-27004	SPACER	1	
B4a	TCZ-27004	O-RING	1	P-16
B4b	TCZ-27004	BEARING	2	#6004
B7a	TCZ-27004	NUT	1	AN-04
B7b	TCZ-27004	WASHER	1	AW-04
B7c	TCZ-27004	BEARING	1	#6004
B7d	TCZ-27004	SNAP RING	1	IRTW-42

No.	REFERENCE	ITEM	PIECES	REMARKS
103	TCZ-27005	WORM SHAFT #A	1	
104	TCZ-27005	WORM SHAFT #B	1	
105	TCZ-27005	WORM SHAFT #C	1	
106	TCZ-27005	WORM SHAFT HOUSING	1	
107	TCZ-27005	SHIM PLATE	1	
108	TCZ-27005	SPACER	1	
113	TCZ-27005	MAIN GEAR	1	
114	TCZ-27005	HOLDER FOR SPAN RING	1	
116	TCZ-27005	COUPLING	1	
103a	TCZ-27005	BEARING	1	#6004
103b	TCZ-27005	BEARING	2	#7004
103c	TCZ-27005	LOCK NUT	1	ZN20
103d	TCZ-27005	SNAP RING	1	STW-20
113a	TCZ-27005	SPAN RING	2	TLK300 16*20
115a	TCZ-27005	OIL SEAL	1	SC18358
115b	TCZ-27005	O-RING	1	G-35

APPENDIX

1 Relation between work dia. and length for allowable max. load (for steel)

Note) For a work having a diameter of more than that of circular table, be sure to observe the specified allowable work inertia even if a weight of work is within the max. load

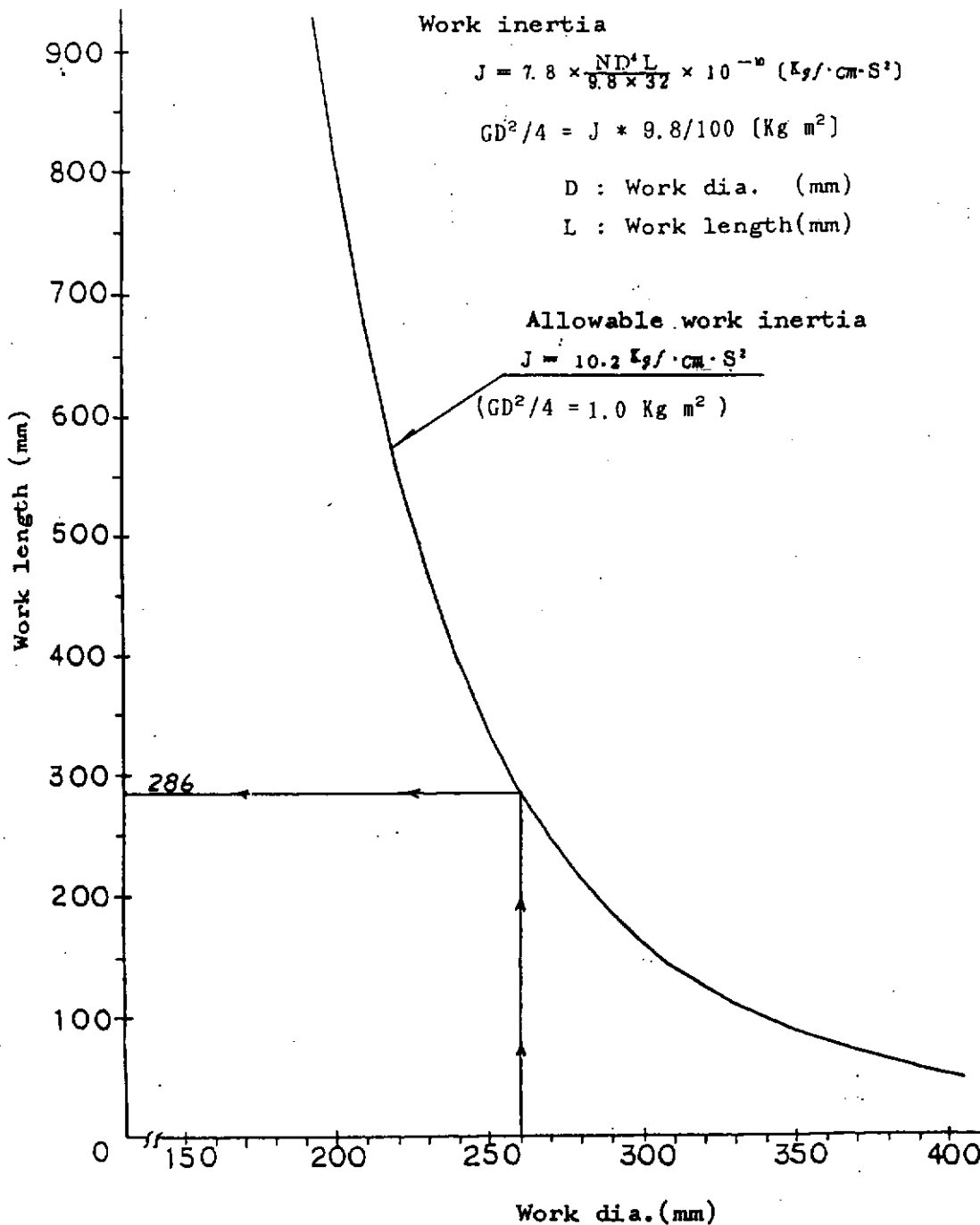


Utilizing method of above figure

A work, having ϕ 270 mm dia. and a length of within 448 mm, will have an allowable max. load of within 100 kg.

APPENDIX

2 Relation between work dia. and length for allowable work inertia (for steel)

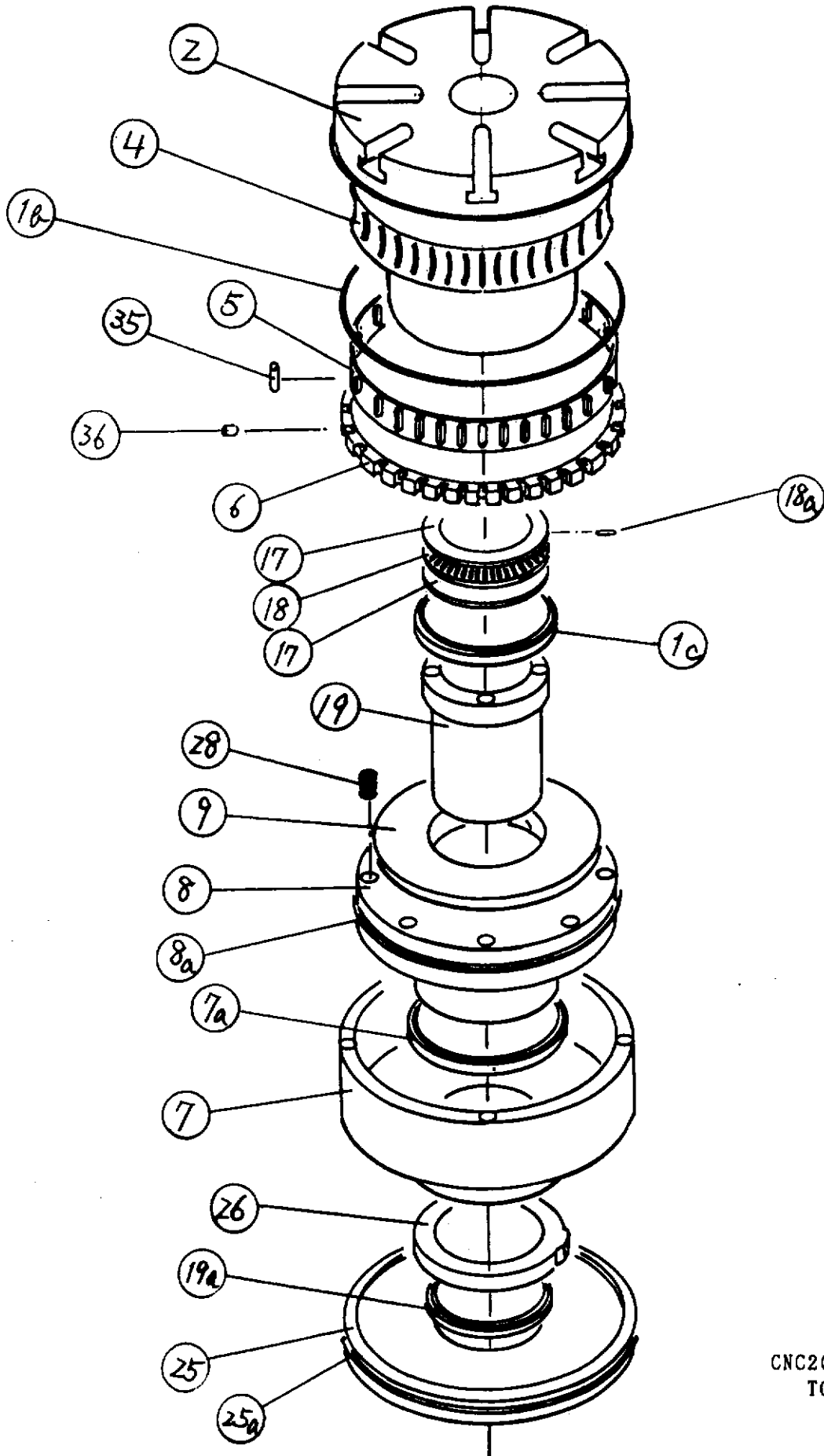


Utilizing method of above figure

A work, having ϕ 260 mm dia. and a length of within 286 mm, will have an allowable work inertia of within 10.2 kgf.cm.s².

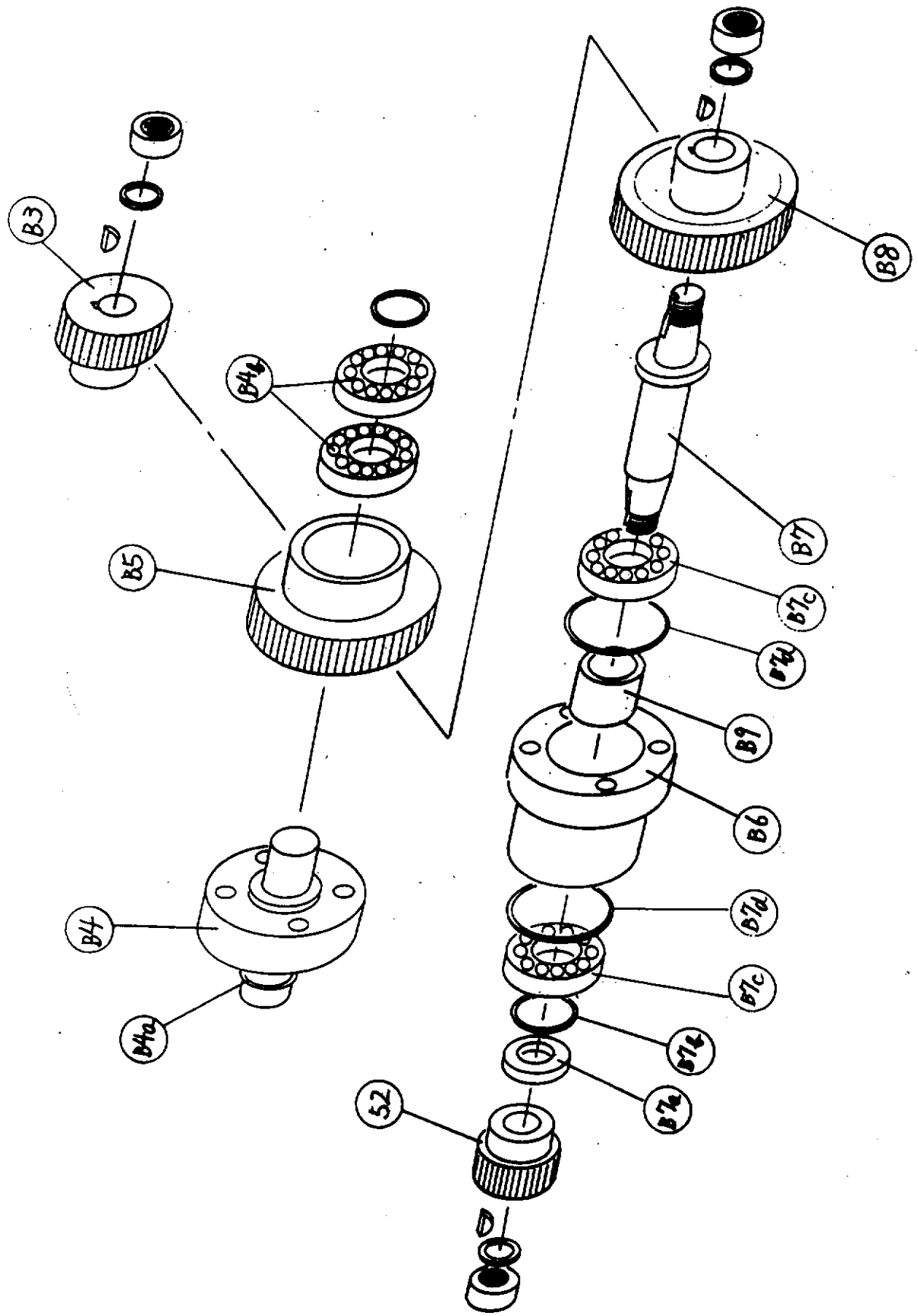
($GD^2/4 = 1.0 \text{ Kg.m}^2$)

7 Spare parts list



CNC200 SPINDLE
TCZ-27002

CNC200B GEAR BOX
TCZ-27004



No.	REFERENCE	ITEM	PIECES	REMARKS
2	TCZ-27002	CIRCULAR TABLE	1	
4	TCZ-27002	WORM WHEEL	1	
5	TCZ-27002	RETAINER FOR #35	1	
6	TCZ-27002	RETAINER FOR #36	1	
7	TCZ-27002	BRAKE CYLINDER	1	
8	TCZ-27002	BRAKE PISTON	1	
9	TCZ-27002	BRAKE DISC	1	
17	TCZ-27002	THRUST RING	2	#17,#18 AND #18a ARE SET.
18	TCZ-27002	THRUST RETAINER	1	
19	TCZ-27002	HOLDER FOR THRUST BEARING	1	
25	TCZ-27002	BACK COVER	1	
26	TCZ-27002	DOG RING	1	
28	TCZ-27002	SPRING	12	
35	TCZ-27002	NEEDLE ROLLER	30	φ 4 * 11L
36	TCZ-27002	TUBULAR ROLLER	24	φ 8 * 8L
1b	TCZ-27002	FACE SEAL & O-RING	1	φ 182
1c	TCZ-27002	OIL SEAL	1	SB100*120*12
7a	TCZ-27002	SEAL	1	GLY105
8a	TCZ-27002	SEAL	1	GLY165
18a	TCZ-27002	NEEDLE ROLLER	24	φ 2 * 7.5L
19a	TCZ-27002	SEAL	1	VR80A
25a	TCZ-27002	O-RING	1	JIS W1517-42
10	TCZ-27003	ECCENTRIC HOUSING	1	
11	TCZ-27003	WORM SHAFT	1	
12	TCZ-27003	COLLAR FOR SEAL	1	
13	TCZ-27003	COLLAR FOR BEARING	1	
14	TCZ-27003	SPACER RING	1	
15	TCZ-27003	MAIN GEAR	1	
27	TCZ-27003	ADJUST SCREW	1	
32	TCZ-27003	NUT #A	1	
33	TCZ-27003	NUT #B	1	
1d	TCZ-27003	O-RING	1	G-55
10a	TCZ-27003	OIL SEAL	1	SC24*38*8
11a	TCZ-27003	BEARING	1	7202BDT
11b	TCZ-27003	BEARING	1	#6003
12a	TCZ-27003	O-RING	1	N-31.5
12b	TCZ-27003	OIL SEAL	1	SC17*28*7
13a	TCZ-27003	O-RING	1	P-15
15a	TCZ-27003	WOODRUFF KEY	1	φ 16 * 5t
52	TCZ-27004	IDLE GEAR #1	1	SAME AS MOTOR GEAR OF CNC200
B3	TCZ-27004	MOTOR GEAR	1	
B4	TCZ-27004	SHAFT FOR IDLE GEAR #3	1	
B5	TCZ-27004	IDLE GEAR #3	1	
B6	TCZ-27004	SLEEVE	1	
B7	TCZ-27004	SHAFT FOR IDLE GEAR #1 AND #2	1	
B8	TCZ-27004	IDLE GEAR #2	1	
B9	TCZ-27004	SPACER	1	
B4a	TCZ-27004	O-RING	1	P-16
B4b	TCZ-27004	BEARING	2	#6004
B7a	TCZ-27004	NUT	1	AN-04
B7b	TCZ-27004	WASHER	1	AW-04
B7c	TCZ-27004	BEARING	1	#6004
B7d	TCZ-27004	SNAP RING	1	IRTW-42

No.	REFERENCE	ITEM	PIECES	REMARKS
103	TCZ-27005	WORM SHAFT #A	1	
104	TCZ-27005	WORM SHAFT #B	1	
105	TCZ-27005	WORM SHAFT #C	1	
106	TCZ-27005	WORM SHAFT HOUSING	1	
107	TCZ-27005	SHIM PLATE	1	
108	TCZ-27005	SPACER	1	
113	TCZ-27005	MAIN GEAR	1	
114	TCZ-27005	HOLDER FOR SPAN RING	1	
116	TCZ-27005	COUPLING	1	
103a	TCZ-27005	BEARING	1	#6004
103b	TCZ-27005	BEARING	2	#7004
103c	TCZ-27005	LOCK NUT	1	ZN20
103d	TCZ-27005	SNAP RING	1	STW-20
113a	TCZ-27005	SPAN RING	2	TLK300 16*20
115a	TCZ-27005	OIL SEAL	1	SC18358
115b	TCZ-27005	O-RING	1	G-35