

| Coordinate calculating equation for table centre in relation to tilting angle | | | |
|--|----------|--------------|--------------|
| E= | 70 | | |
| F= | 0 | | |
| Tilting angle | | Table centre | |
| (θ°) | (rad) | X | Z |
| 0 | 0 | 0 | 0 |
| 5 | 0.087266 | -6.100901985 | -0.266371133 |
| 10 | 0.174533 | -12.15537242 | -1.063457287 |
| 15 | 0.261799 | -18.11733314 | -2.385192154 |
| 20 | 0.349066 | -23.94141001 | -4.221516535 |
| 25 | 0.436332 | -29.58327829 | -6.558454893 |
| 30 | 0.523599 | -34.99999996 | -9.378221714 |
| 35 | 0.610865 | -40.1503505 | -12.65935687 |
| 40 | 0.698132 | -44.99513264 | -16.37688895 |
| 45 | 0.785398 | -49.49747464 | -20.50252527 |
| 50 | 0.872665 | -53.62311097 | -25.00486727 |
| 55 | 0.959931 | -57.34064306 | -29.84964939 |
| 60 | 1.047198 | -60.62177822 | -34.99999993 |
| 65 | 1.134464 | -63.44154505 | -40.4167216 |
| 70 | 1.22173 | -65.77848342 | -46.05858988 |
| 75 | 1.308997 | -67.61480781 | -51.88266674 |
| 80 | 1.396263 | -68.93654269 | -57.84462745 |
| 85 | 1.48353 | -69.73362886 | -63.89909789 |
| 90 | 1.570796 | -70 | -69.99999987 |
| 95 | 1.658063 | -69.73362888 | -76.10090186 |
| 100 | 1.745329 | -68.93654274 | -82.1553723 |
| 105 | 1.832596 | -67.61480788 | -88.11733302 |

6-4. Rapid feed indexing time

The following times are fixed as standard setting when driven by Alpha21 controller.

1) Pre-proceeding time before indexing (PRM#59)

2) Final positioning time

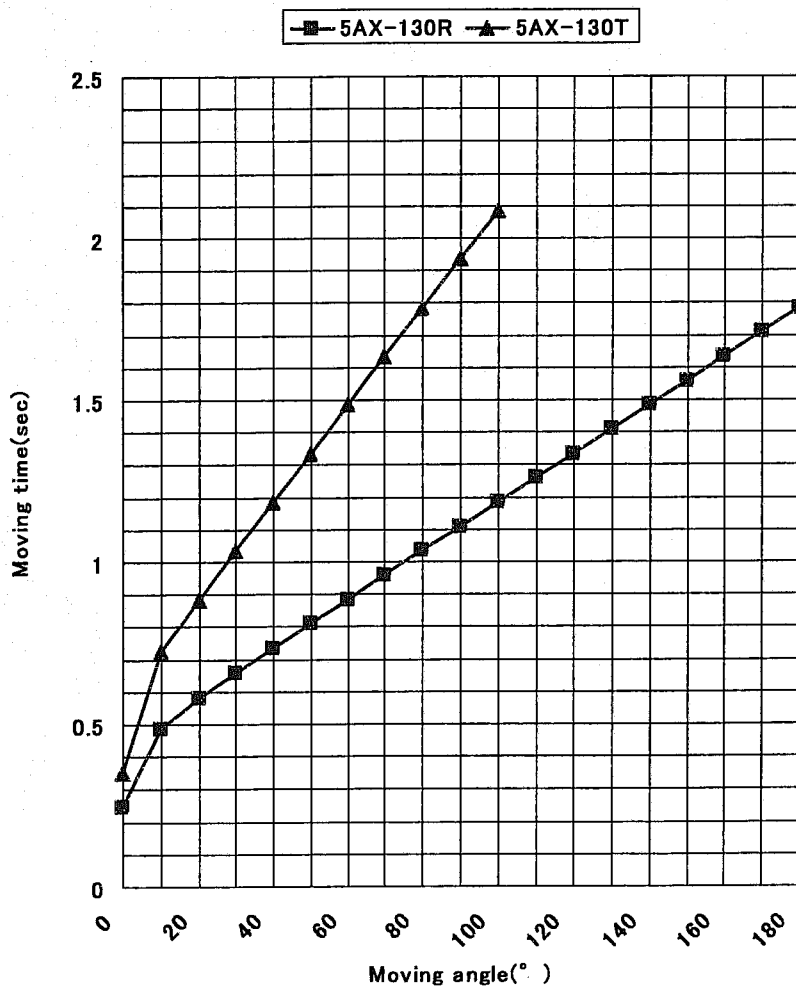
Therefore, when reducing of the indexing time is required, please contact us.

3) The following graph shows the indexing times including clamping/unclamping times.

| Item | Axis | Rotary | Tilt |
|--|------|--------|------|
| Servo loop gain (sec ⁻¹) | | 30 | |
| Acceleration/deceleration time constant (msec) | | 150 | 200 |
| Rapid speed (min ⁻¹) | | 22.2 | 11.1 |

| Item | Axis | Rotary | Tilt |
|-----------------------|------|--------|------|
| Unclamping time(msec) | | 150 | 200 |
| Clamping time (msec) | | 100 | 150 |

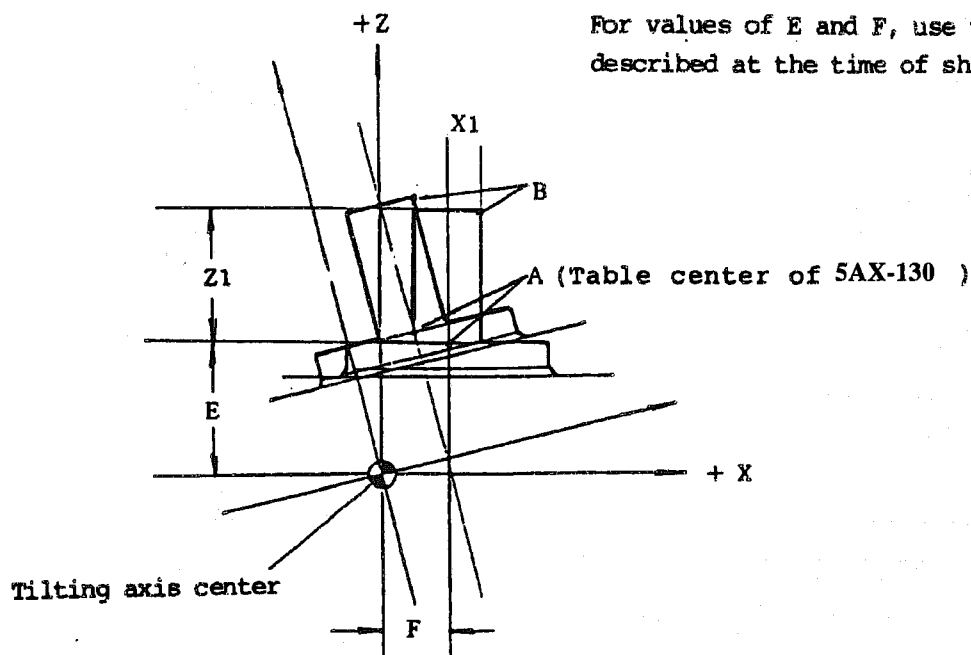
5AX-130 Rapid feed indexing time



How to use above graph

On the rotary axis, it will takes approximately 1.1 sec to index 90 degrees including clamping/unclamping time.

6-5. Relation between tilting angle and X & Z coordinate value.



For values of E and F, use those values described at the time of shipping.

Assuming that the tilting centre is at coordinate values (0, 0), coordinate values of respective Points become as follows:

When the tilting angle is 0, the coordinate values of A-point is:

$$X_{a0} = F$$

$$Z_{a0} = E$$

When the tilting angle is θ , the coordinate values of A-point is:

$$X_{A \theta} = F \cos \theta - E \sin \theta$$

$$Z_{A \theta} = E \cos \theta + F \sin \theta$$

When the tilting angle is 0, the coordinate values of B-point is:

$$X_{B0} = F + X_1$$

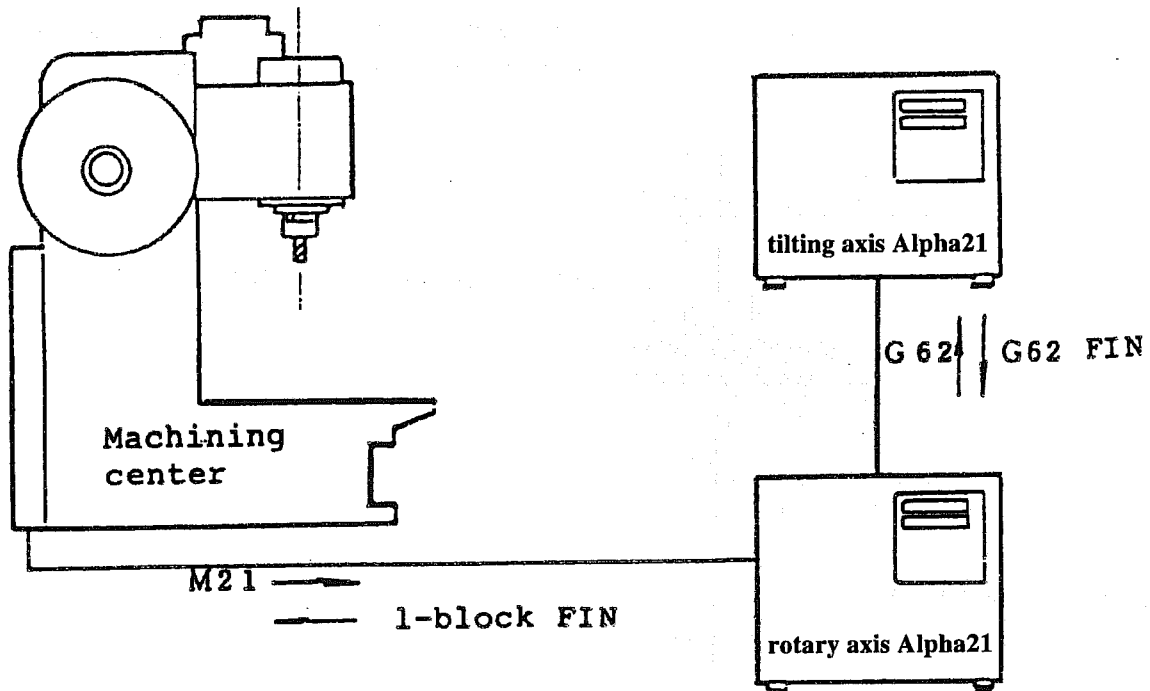
$$Z_{B0} = E + Z_1$$

When the tilting angle is θ , the coordinate values of B-point is:

$$X_{B \theta} = (F + X_1) \cos \theta - (E + Z_1) \sin \theta$$

$$Z_{B \theta} = (E + Z_1) \cos \theta + (F + X_1) \sin \theta$$

6-6. Composition of 5AX-130WA21(Standard specifications)



The emergency stop signal to the Alpha21 controller for rotary axis can be entered only through B-contact.

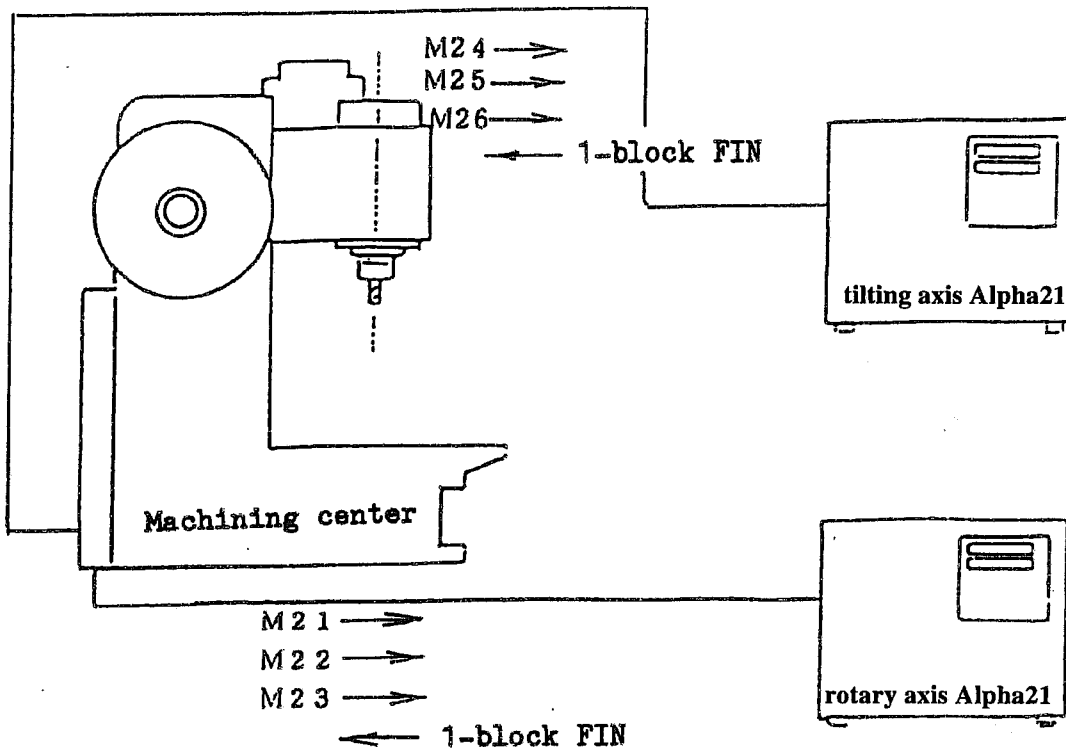
M21: Any number will do for M-signal of M/C, however, it should be valid only for the relevant block under the DISTRIBUTION END mode.

1 Block Fin: Finish signal for M21

G62: G62 signal on the rotary axis Alpha21 get the tilting axis Alpha21 start. When the rotary axis movement instruction and G62 instruction are given in the same block, the both axis move almost simultaneously. Viewing from the tilt axis Alpha21 side, the G62 signal is same type of signal as M21(start signal)

G62 Fin: Viewing from the tilt axis Alpha21 side, G62 Fin signal is same type of signal as 1-block Fin signal.

6-7. Composition of 5AX-130WA21(special specifications: Automatic program Selection Spec.)



Both emergency stop signal for rotary and tilt axis Alpha21 Controllers are given to B-contact.

M21: Rotary axis Program start

M22: Rotary axis Program Jump to program executed address

M23: Rotary axis Reset to machine zero point and N000

M24: Tilt axis Program start

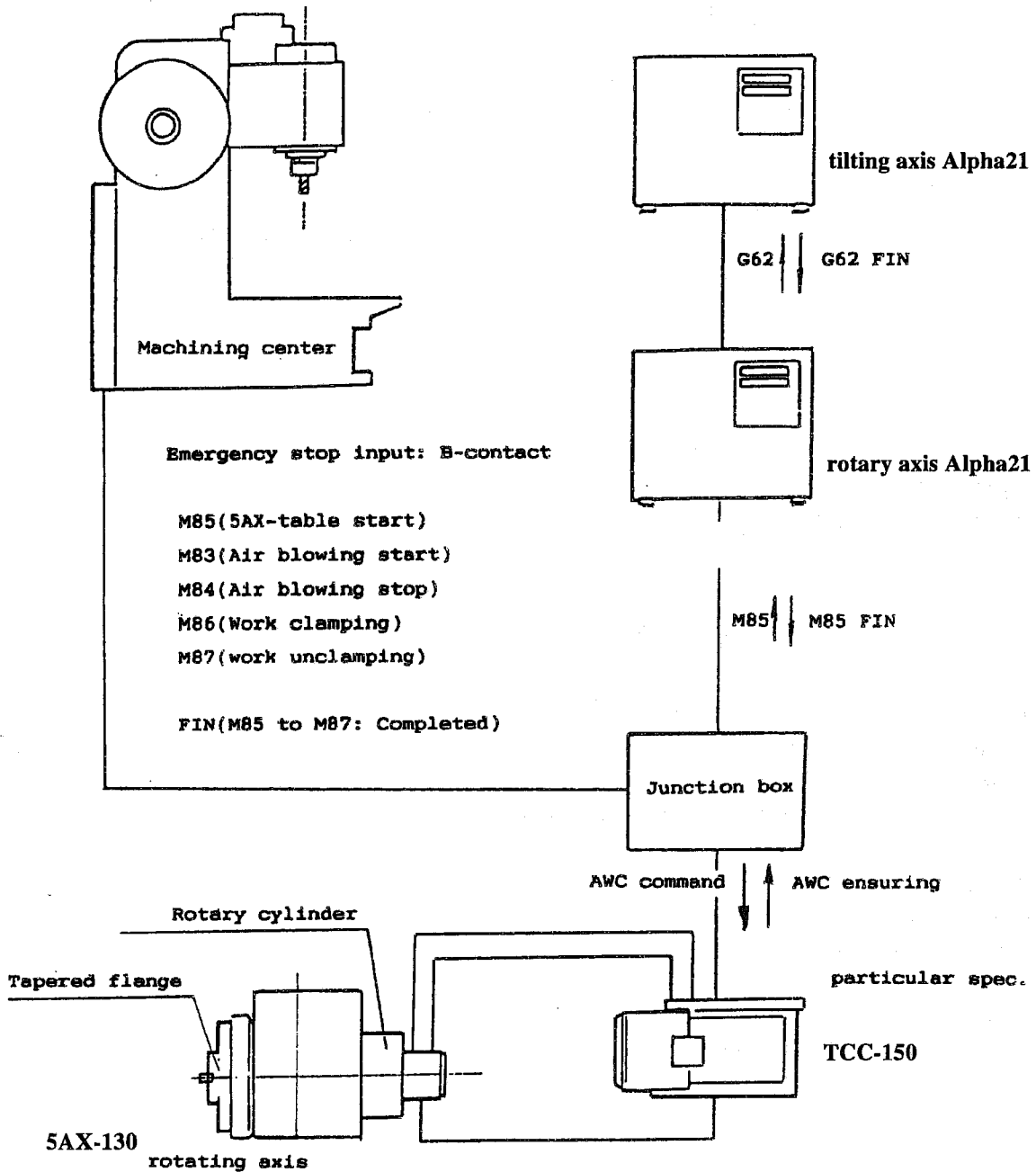
M25: Tilt axis Program Jump to program executed address

M26: Tilt axis Reset to machine zero point and N000

1 block Fin: For rotary axis, Finish of M21 ~ M23

For tilt axis, Finish of M24 ~ M26

6-8. 5AX-130WA21(AWC specifications)



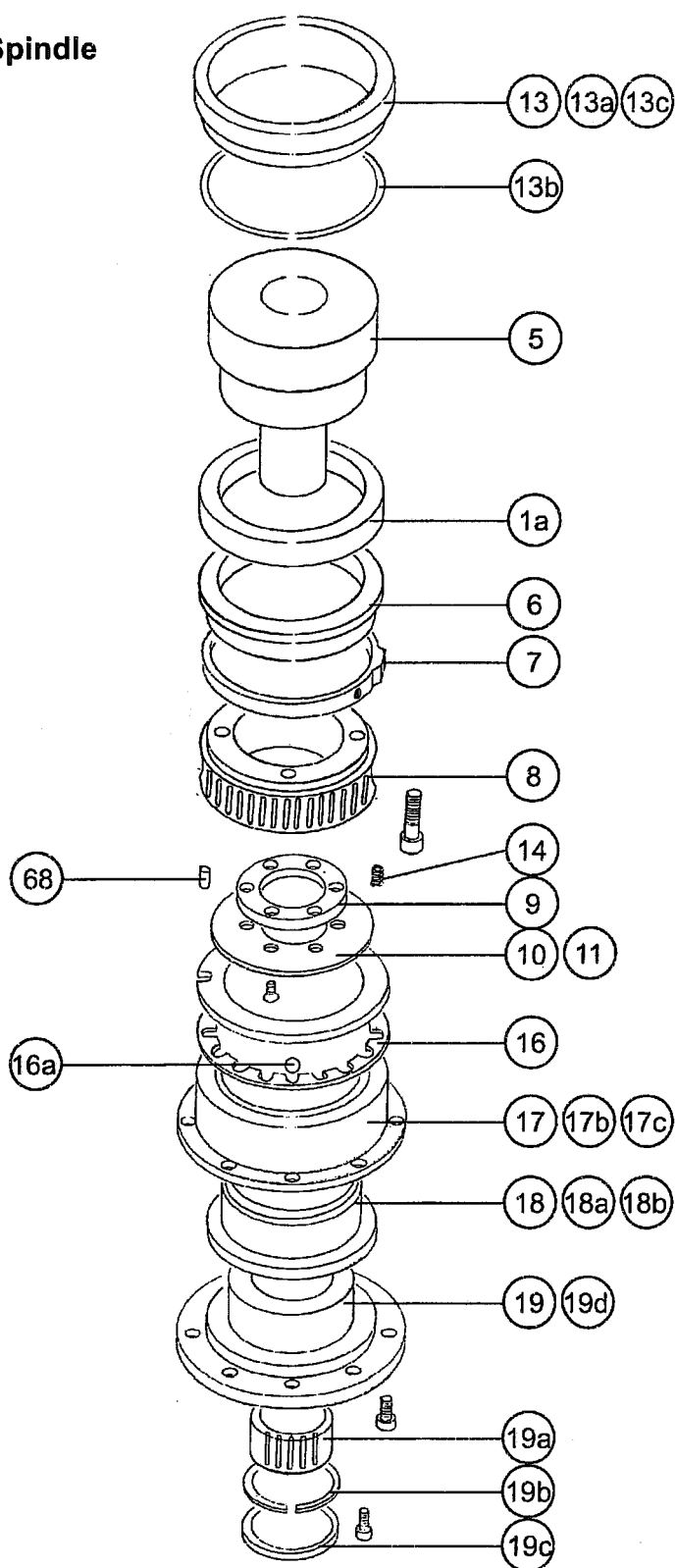
M83/M84 are not required to be confirmed.

The time chart for M83, M84, M86 & M87 will be determined by separate agreement.

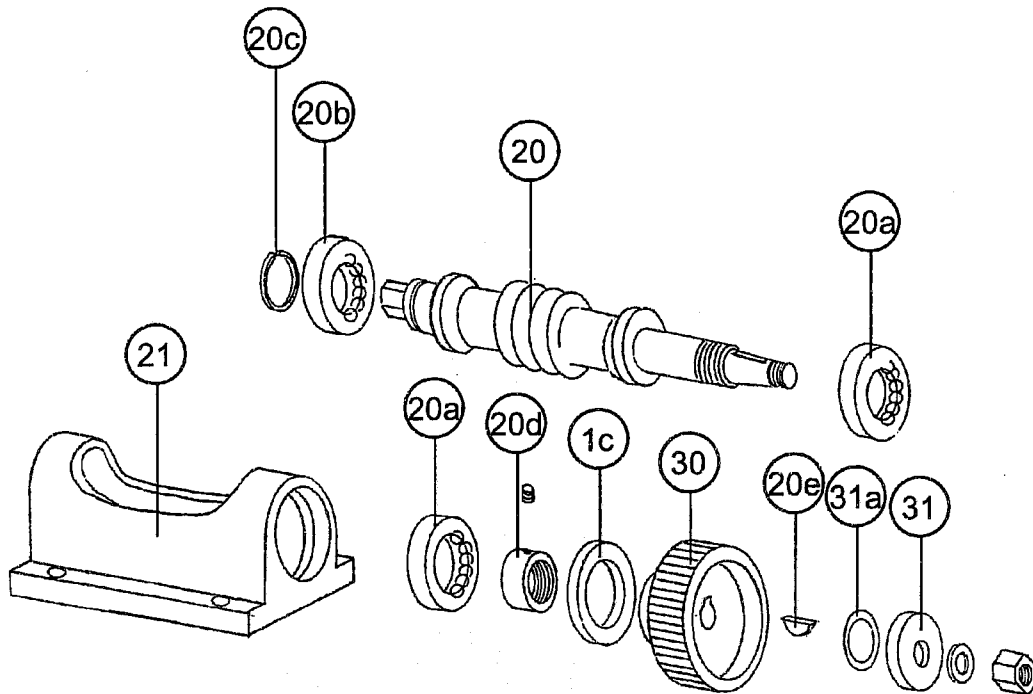
The following items are supplied with the Nikken TCC-150 Hydraulic Unit as standard:

- Solenoid valve for Work Clamp
- Solenoid valve(Pneumatic) for Air blow
- Pressure switch for work clamp confirmation
- Pressure switch for work unclamp confirmation

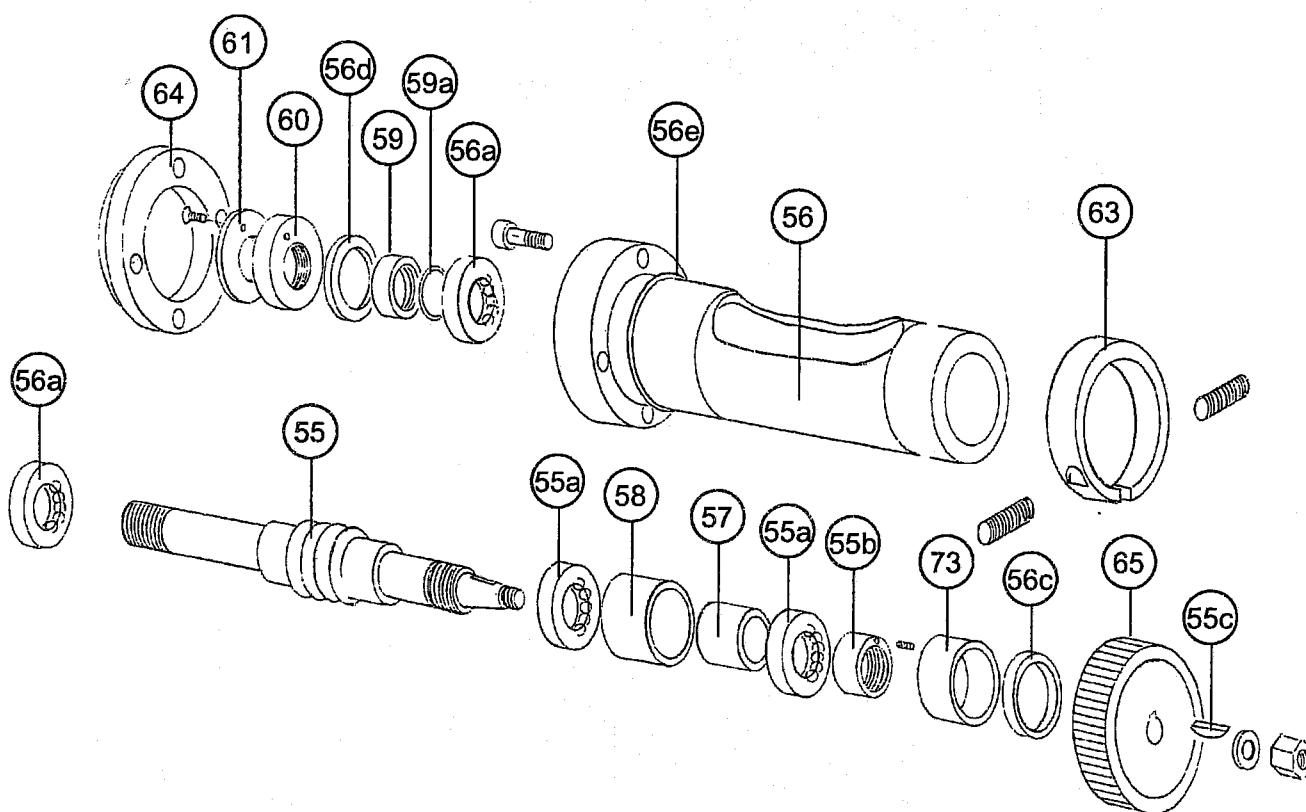
**6-9 Spare Parts List
5AX-130 Rotary Axis Spindle**



Spare Parts List
5AX-130 Rotary Axis Worm Screw Shaft



Spare Parts List
5AX-130 Tilting Axis Worm Screw Shaft



| | | | | |
|-----|-------------|------------------------|----|--|
| 2 | TCZ-A4003 | Tilting Axis Main Body | 1 | |
| 2a | TCZ-A4003 | Cross Roller Bearing | 1 | RU10020CC0 (THK), CRBH10020AT1 (THOMSON) |
| 3 | TCZ-A4003 | Tail Stock | 1 | |
| 3a | TCZ-A4003 | Cross Roller Bearing | 1 | RU12016CC (THK) |
| 5 | TCZ-A4001 | Rotary Axis Spindle | 1 | |
| 6 | TCZ-A4001 | Set Collar | 1 | |
| 7 | TCZ-A4001 | Dog Ring | 1 | |
| 8 | TCZ-A4001 | Worm Wheel | 1 | |
| 9 | TCZ-A4001 | Spacer Ring | 1 | |
| 10 | TCZ-A4001 | Brake Disk | 1 | |
| 11 | TCZ-A4001 | Brake Disk Set Ring | 1 | |
| 13 | TCZ-A4001 | Bearing Holder | 1 | |
| 13a | TCZ-A4001 | Cap O Ring | 1 | SOP-105 (MITSUBISHI) |
| 13b | TCZ-A4001 | O Ring | 1 | G-125 |
| 13c | TCZ-A4001 | Dia.105 Dust Seal | 1 | Dia.105mm with coating (MITSUBISHI) |
| 14 | TCZ-A4001,3 | Coil Spring | 14 | |
| 16 | TCZ-A4001 | Retainer | 1 | |
| 16a | TCZ-A4001 | Ball | 24 | Dia.8mm |
| 17 | TCZ-A4001 | Pilot Flange | 1 | |
| 17b | TCZ-A4001 | O Ring | 1 | G-90 |
| 17c | TCZ-A4001 | O Ring | 2 | G-115 |
| 18 | TCZ-A4001 | Piston | 1 | |
| 18a | TCZ-A4001 | O Ring | 1 | G-70 |
| 18b | TCZ-A4001 | O Ring | 1 | G-105 |
| 19 | TCZ-A4001 | Cylinder Cover | 1 | |
| 19a | TCZ-A4001 | Needle Bearing | 1 | TAF506225 (THOMSON) |
| 19b | TCZ-A4001 | Circlip | 1 | AR62 |
| 19c | TCZ-A4001 | Oil Seal | 1 | SC50689 |
| 19d | TCZ-A4001 | O Ring | 1 | G-105 |
| 20 | TCZ-A4002 | Worm Screw | 1 | |
| 20a | TCZ-A4002 | Angular Bearing | 2 | #7002(P5) (NTN) |
| 20b | TCZ-A4002 | Ball Bearing | 1 | #6002 (P5) (NTN) |
| 20c | TCZ-A4002 | Snap Ring | 1 | ISTW-15 (Ochiai) |
| 20d | TCZ-A4002 | Lock Nut | 1 | ZM15S |
| 20e | TCZ-A4002 | Key | 1 | |
| 21 | TCZ-A4002 | Worm Screw Hausing | 1 | |
| 24 | TCZ-A4003 | Cover for Worm Screw | 1 | |
| 30 | TCZ-A4002 | Main Gear | 1 | |
| 31 | TCZ-A4002 | Seal Collar | 1 | |
| 31a | TCZ-A4002 | Diethread | 1 | DT-1-6 (MITSUBISHI) |
| 32 | TCZ-A4003 | Tail Stock Flange | 1 | |

| | | | | |
|-----|-------------|-------------------------|----|-------------------------------|
| 43 | TCZ-A4003 | Brake Disk Set Ring | 1 | |
| 45 | TCZ-A4003 | Bearing Holder | 1 | |
| 46 | TCZ-A4003 | Clamp Ring | 1 | |
| 47 | TCZ-A4003 | Retainer | 1 | |
| 47a | TCZ-A4003 | Ball | 24 | Dia.10mm |
| 48 | TCZ-A4003 | Pilot Flange | 1 | |
| 48b | TCZ-A4003 | O Ring | 1 | G-110 |
| 48c | TCZ-A4003 | O Ring | 2 | G-145 |
| 49 | TCZ-A4003 | Piston | 1 | |
| 49a | TCZ-A4003 | O Ring | 1 | G-90 |
| 49b | TCZ-A4003 | O Ring | 1 | G-130 |
| 50 | TCZ-A4003 | Cylinder Cover | 1 | |
| 50a | TCZ-A4003 | Needle Bearing | 1 | TAF607225 (THOMSON) |
| 50b | TCZ-A4003 | Circlip | 1 | AR72 (THOMSON) |
| 50c | TCZ-A4003 | Oil Seal | 1 | SC60789 (NOK) |
| 50d | TCZ-A4003 | O Ring | 1 | G-130 |
| 51 | TCZ-A4003 | Shaft for Dog Rings | 1 | |
| 52 | TCZ-A4003 | MZR Dog Ring | 1 | |
| 53 | TCZ-A4003 | OT Dog Ring | 1 | |
| 55 | TCZ-A4004 | Worm Screw | 1 | |
| 55a | TCZ-A4004 | Angular Bearing | 2 | 1set (2pcs) #7003(DB)P5 (NTN) |
| 55b | TCZ-A4004 | Lock Nut | 1 | ZMV17S |
| 55c | TCZ-A4004 | Key | 1 | |
| 56 | TCZ-A4004 | Eccentric housing | 1 | |
| 56a | TCZ-A4004 | Angular Bearing | 2 | #7003(P5) (NTN) |
| 56c | TCZ-A4004 | Oil Seal | 1 | SC15358 (NOK) |
| 56d | TCZ-A4004 | Oil Seal | 1 | SC25387 (NOK) |
| 56e | TCZ-A4004 | O Ring | 1 | G-50 |
| 57 | TCZ-A4004 | Spacer Collar A | 1 | |
| 58 | TCZ-A4004 | Spacer Collar B | 1 | |
| 59 | TCZ-A4004 | Seal Collar | 1 | |
| 59a | TCZ-A4004 | O Ring | 1 | WP-13 |
| 60 | TCZ-A4004 | Nut A for Worm Screw | 1 | |
| 61 | TCZ-A4004 | Nut B for Worm Screw | 1 | |
| 63 | TCZ-A4004 | Clamp Ring | 1 | |
| 64 | TCZ-A4004 | Cover for Eccentric Hau | 1 | |
| 68 | TCZ-A4001,3 | Pararell Pin | 2 | |
| 73 | TCZ-A4004 | Seal Collar | 1 | |



NIKKEN CNC ROTARY TABLE 5AX-150(151) (TILT AXIS)

Instruction Manual

First Edition

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