THE TSUDAKOMA DUAL LEAD GEARING SYSTEM

THE TSUDAKOMA DUAL LEAD GEARING SYSTEM DELIVERS THE OPTIMUM BALANCE BETWEEN POWER, DURABILITY, AND SMOOTH CUTTING PERFORMANCE.

TORQUE TRANSFER EFFICIENCY

The Tsudakoma dual lead gearing system features the largest tooth engagement of any rotary table manufacturer. This system generates up to 85% torque transfer efficiency.

GEARING MATERIALS

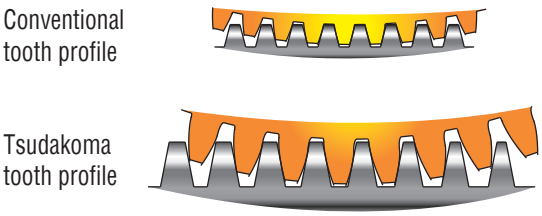
PROPRIETARY HIGH TENSILE STRENGTH BRASS

Worm Wheel Material	Tensile Strength (N/mm^2)	Elongation (%)	Hardness (HB)
Bronze	245	15	70
Phosphor Bronze	295	5	80
Aluminum Bronze	490	20	120
Tsudakoma Proprietary Brass	650	15	170
Worm Spindle	Case hardened alloy steel		

Tsudakoma's dual lead gearing system features exceptionally smooth cutting due to the inherent lubricating properties of the gear materials.

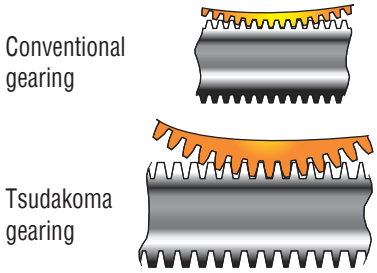
TOOTH PROFILE

Tsudakoma utilizes full tooth depth engagement along with a larger gear module. The results are a larger surface contact area yielding a substantially stronger worm gear system.



OVERSIZE WORM WHEEL

The Tsudakoma worm wheel uses an oversize diameter pitch circle resulting in reduced pressure on the contact surface compared to a conventional gearing system.



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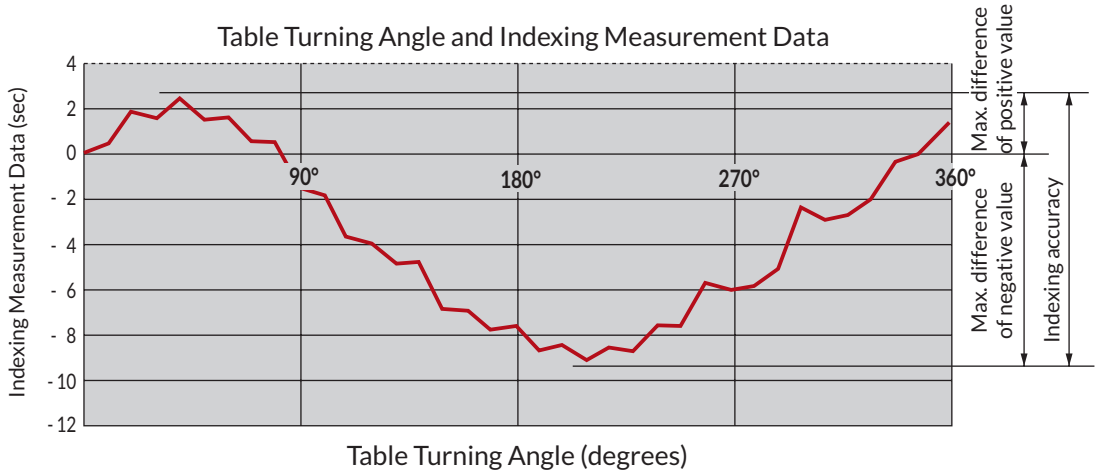
1. INDEXING ACCURACY

By indexing one rotation of the table equally to coincide with the tooth number of the worm gear and measuring the result, the difference between the theoretical turning angle of the table and actual measurement is obtained. As shown below, the indexing accuracy is equal to the sum of the maximum difference of the positive value and that of the negative value, as an absolute value.



2. REPEATABILITY

Indexing operations for positioning at four determined angular positions as 0°, 90°, 180°, and 270° are carried out five times for positive rotation, and the indexing angles are measured. As a result, the difference between the maximum and the minimum of the measurement at each angular position is obtained. Indexing operations for positioning for negative rotation and the measurement of the indexing angles are similarly carried out, and the difference between the maximum and the minimum of the measurement is obtained. The repeatability is equal to the maximum value of the difference obtained through both measurements.

3. CLAMP TORQUE

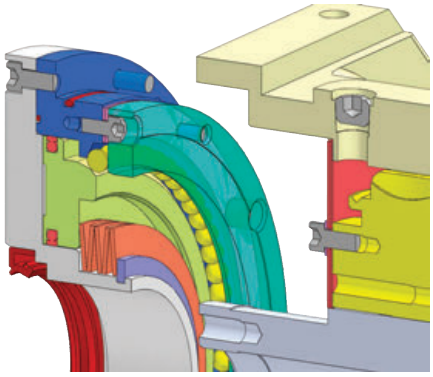
The clamp torque specifications cover only the clamping mechanism; the self-locking caused by the worm gear is not included. The clamp torque specifications in the catalog are obtained when the rated pressure (500 PSI for hydraulic pressure, and 72 PSI for pneumatic pressure) is supplied to the table. If a more powerful clamp torque than specified in the catalog is required, the supply pressure can be elevated to the maximum allowable pressure (700 PSI for hydraulic pressure, and 100 PSI for pneumatic pressure), and the clamp torque will be proportionally increased.

4. ALLOWABLE WHEEL TORQUE

The allowable wheel torque is equal to the allowable torque for the worm wheel when the table rotation speed is 1 RPM. The allowable torque for the worm wheel is subject to the standard stipulated by the Japan Gear Manufacturers Association.

DUAL TAPER PNEUMATIC CLAMPING MECHANISM

APPLIES TO: RWA/RWA,B-SERIES TABLES • TWA-130/160/200 • TWA-160,B/201,B



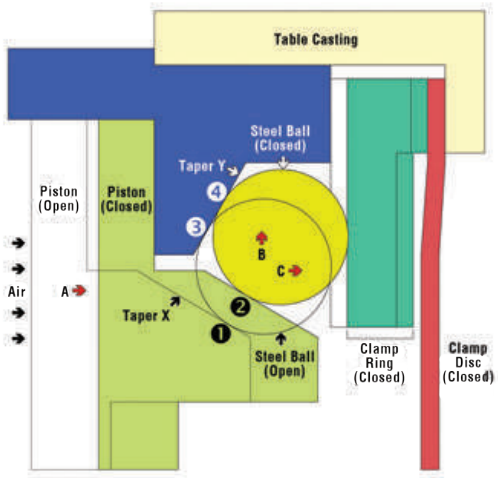
Tsudakoma Dual Taper Clamping Mechanism

1) Air pressure moves Piston in Direction A

2) Steel Ball moves in Direction B along Taper X from Position 1 to Position 2. Force is multiplied by a factor of 1.73

3) As Steel Ball moves in Direction B, Taper forces Steel Ball to move in Direction C from Position 3 to Position 4. Force is multiplied by a factor of 1.73

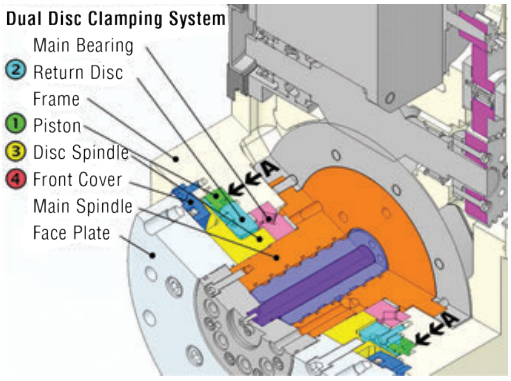
4) Steel Ball moving in Direction C forces Clamp Ring against Clamp Disc. The movement of the Steel Ball along Taper X and Taper Y results in the applied force being multiplied by a factor of 1.73 x 1.73 = 3.0



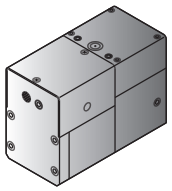
Tsudakoma Dual Disc Clamping Mechanism

1) Hydraulic pressure* moves Piston ① in Direction A.

2) Piston ① presses Return Disc ② against Disc Spindle ③ which clamps the Disc Spindle against the Front Cover ④.



*If the machine tool does not have a hydraulic source to power the rotary table clamp mechanism, a Tsudakoma air/hydraulic booster is used to power the clamping. An air source is plumbed to the inlet port of the booster, and the outlet port of the booster is plumbed to the rotary table hydraulic inlet port. Air/hydraulic boosters are either built-in internal units (for RWB-Series tables) or compact externally mounted units.

Booster Type	Table models	Booster
External (enclosure size varies)	Rotary table diameter is 300mm or more	

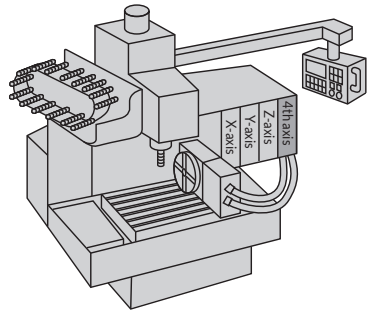
See page 83 for additional booster information.

RNCV-801K-BB

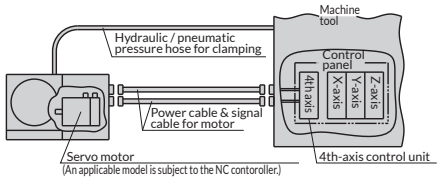
ROTARY TABLE SELECTION

1. Determine the controller system that will drive the rotary table.

Control System #1: A 4th axis (or 5th axis) feature is installed in the machine tool control.



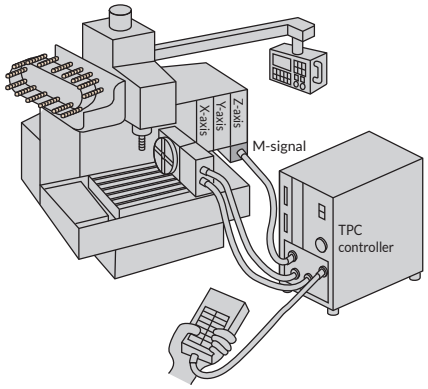
Structure



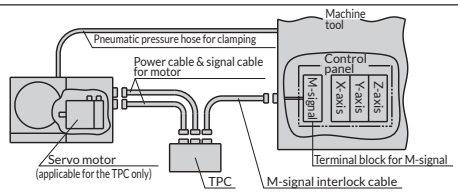
Features

- Simultaneous and continuous contour cutting in the X, Y, and Z-axes is possible subject to the capabilities of the machine tool control.
- Rotary table programming is input at the machine tool control.

Control System #2: (1) or (2) Tsudakoma TPC single axis NC controllers are used (M-signal sent from the machine tool).



Structure

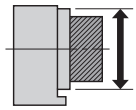


Features

- If the machine tool control does not have 4th axis capabilities, but an M-signal is available, a TPC controller can be used to control the rotary table.
- This control system is only for indexing.
- Rotary table programming should be input directly into the TPC. At the machine tool an M-signal is indexed and input as a start command.

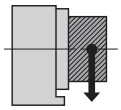
2. Select a rotary table by determining the workpiece parameters and the machining operations to be performed.

- Workpiece diameter



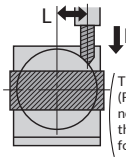
(Should not be larger than the rotary table diameter.)

- Workpiece weight



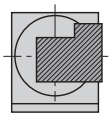
(Should not exceed the maximum specified figure.)

- Workpiece positioning



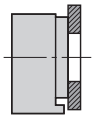
(The value of (F×L) should not be greater than the clamp force.)

- Workpiece with eccentric load



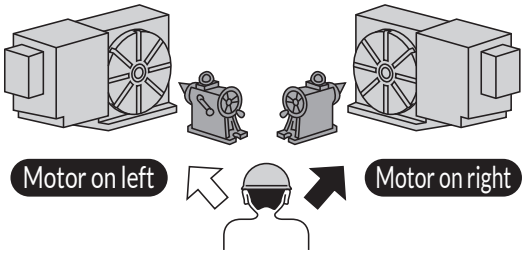
(The workpiece inertia should not exceed the maximum specified figure. The part must not have any machine tool interference.)

- Workpiece of larger diameter, but lighter weight



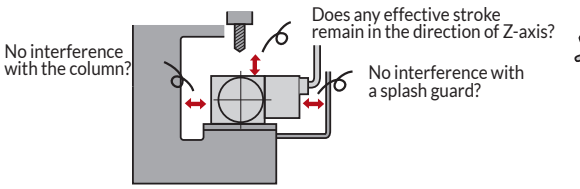
(The workpiece must not have any machine tool interference.)

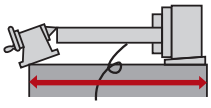
3. Determine the motor location on the rotary table.



Pay careful attention to any interference with the ATC automatic tool changer and also easy operation before determining the setting direction.

4. Ensure there is no rotary table / workpiece / machine tool interference.





Will the combined size of the workpiece and the rotary table fit on the machine tool?

- No interference with the ATC?
- Does the combined weight of the workpiece & rotary table remain with the allowable load for the machine tool?

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ROTARY TABLE SELECTION FORM

☐ Dealer Company: _____ ☐ End User Company: _____

Contact: _____ Contact: _____

Address: _____ Address: _____

City: _____ State: _____ Zip Code: _____ City: _____ State: _____ Zip Code: _____

E-mail: _____ E-mail: _____

Phone #: _____ Cell #: _____ Phone #: _____ Cell #: _____

1. Machine Tool: Manufacturer: _____ Model _____

☐ New ☐ Existing NC Controller Make: _____ NC Controller Model: _____

2. Workpiece: Description _____ Material _____ Weight _____

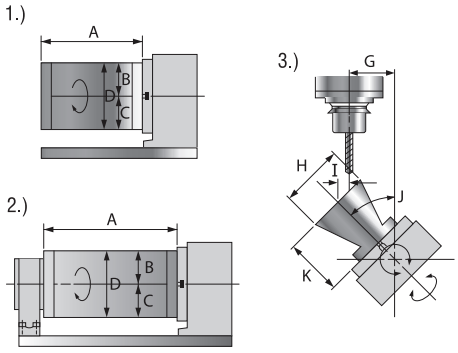
Dimensions:

1.) A: _____ B: _____ C: _____ D: _____

2.) A: _____ B: _____ C: _____ D: _____

3.) G: _____ H: _____ I: _____ J: _____ K: _____

Example:



3. Cutting Conditions

Application: ☐ Mill ☐ Drill

Cutter Size (number of teeth)	Cutting Speed (sfm)	Cutting Feed Rate	Cutting Depth (1 pass)	Cutting Process (indexing or continuous cutting)

Description of Application:

OPERATION MAINTENANCE

Operation Environment & Maintenance Recommended to Keep Performance & Function:

- **Do not use any coolant with chlorine or strong alkaline.**
- Do not use any corrosive gas, water, steam or chemicals that may damage sealing parts.
- Before using your rotary table, recommended lubricant must be supplied as described in the instruction manual. Periodic replacement of lubricant is also required.
- Install adequate covers for protection against cutting chips generated by machining.
- Operate a rotary table within the specified range of temperature.
- Depending on environment conditions, condensation may occur inside the motor cover. To eliminate condensation, air purge the motor cover. Make sure the exhaust port is clear. **See Fig. 1.**
- When attaching a face plate or fixture with the main spindle, use the inner diameter as the reference for fitting. **See Fig. 2.**
- Keep the clearance between the face plate and the main frame of the rotary table or the seals to be 3mm or more. Otherwise, cutting chips caught in the position may impede the rotation of main spindle or the waterproof capability of the seals. **See Fig. 2.**

Fig.1

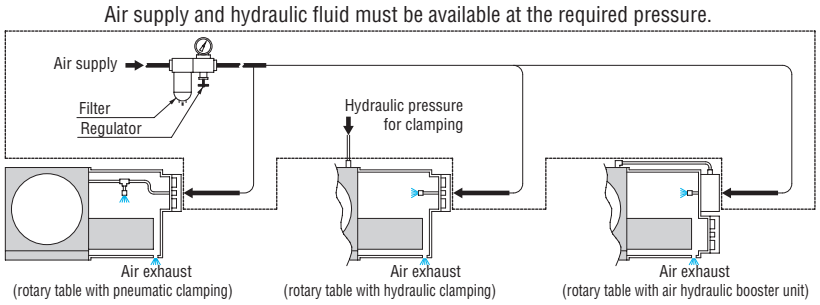
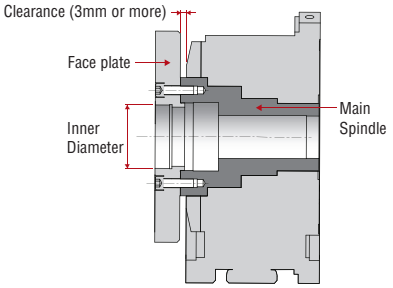


Fig.2



Setting on Machine Tool & Preparation Before Use:

- When moving a rotary table by a hanging method, observe the specific method in the operation manual.
- To fix a rotary table on a machine tool, use the specified fixing parts and follow the specified method.
- Connect each interface cable in accordance with the instructions on the electrical drawing.
- Provide protective measures not to add extraordinary force to any piping or any joint for each interface cable and each connector, to induce any damage, during the operation of a machine tool with a rotary table.
- Each piping is to be connected to the specific input port (connecting port) stated in the outlook drawing.
- Regarding each fluid to be supplied to a rotary table, make sure that **maximum pressure must not exceed the specified pressure** even if there is a pressure variation due to its pressure source or other factors.

Daily Operation, Periodical Check & Others:

- Make sure that the weight and size of the workpiece does not exceed the specified value of the workable force during machining.
- In case any abnormality is realized during operation, stop use immediately.
- When any work is carried out within the operational area of the machine tool, make sure to turn off the power for the machine tool as well as the Tsudakoma controller.
- When restarting operation after a long down time, perform a warm-up operation for the rotary table.
- Do not make any modifications of the rotary table without discussing with the manufacturer.