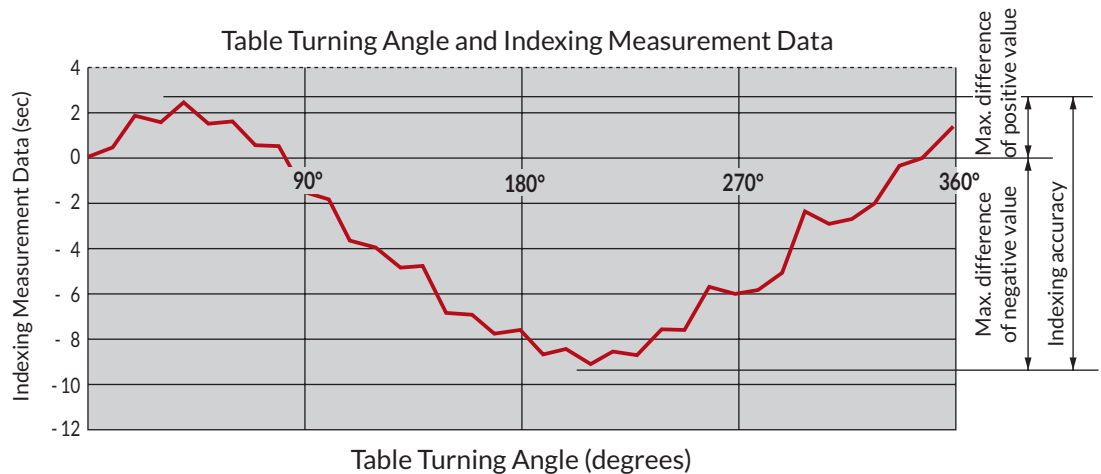


1. INDEXING ACCURACY

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.

APPLICABLE SERVO MOTORS

FANUC Alpha (α) type servo motors are standard for Tsudakoma rotary tables. The table below shows additional servo motors classified according to FANUC Alpha (α) type motor capacity.

Motor Manufacturer	Motor Model				
FANUC	Alpha 2i (5,000)	Alpha 4i (5,000)	Alpha 8i (4,000)	Alpha 12i (4,000)	Alpha 22i (3,000)
MITSUBISHI	-	HC52T	HC102T	HC202S	-
	HG75T	HG54T	HG104T	HG204S	HG354S
	HF75T	HF54T	HF104T	HF204S	HF354S
YASKAWA	SGMP-04	SGMG-05	SGMG-09	SGMG-20	SGMG-30
YASKAWA Sigma V	SGMGV-05	SGMGV-09	SGMGV-09	SGMGV-30	
OKUMA	BL-ME24MJ	BL-ME40MJ	BL-ME80MJ	BL-ME150MJ	BL-ME200MJ
	BL-ME24M	BL-ME40M	BL-ME80M	BL-ME150M	BL-ME200M
SIEMENS	1FK7042	1FK7060	1FK7063	1FK7083	1FK7101
HEIDENHAIN	QSY96A	QSY116C	QSY116E	QSY155B	QSY155D

Notes:

1. For non-FANUC motors, the table speed reduction ratio or motor dimensions may be different from FANUC motors.
2. Motors described above are selected for the equivalent motor torque capacity. The motor which is actually used on your rotary table is determined by the specifications of your machine tool NC controller.
3. Motors other than those listed above are available.

INDEXING CYCLE TIME

The graphs below show the required indexing time, which includes the time for the control command for the machine tool. This information helps you examine the working cycle time when operating the rotary table. The table rotation speed and the acceleration and deceleration constant may differ depending of the model of the rotary table. additional indexing time charts available for your review

Table rotation speed, 12,000 deg/min (33.3rpm)
 Acceleration/deceleration constant, 150msec

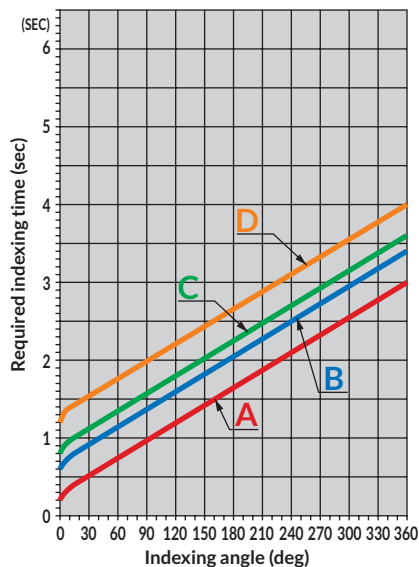
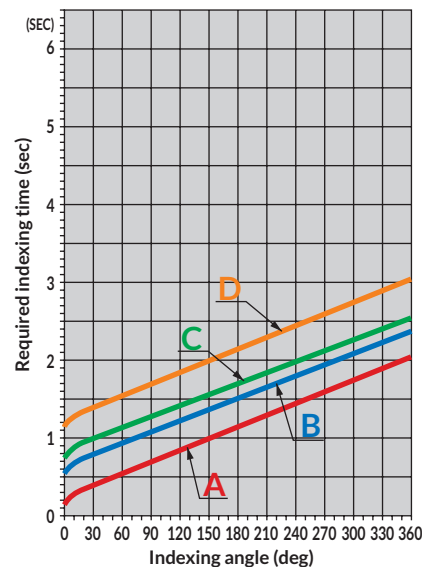


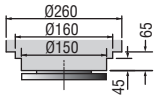
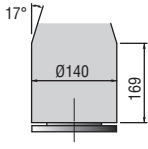

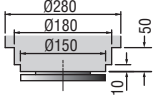
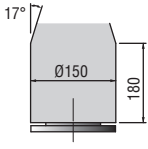

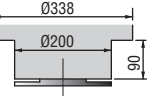
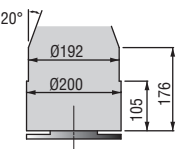

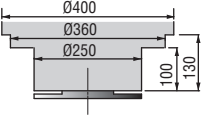
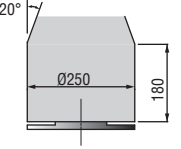
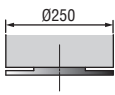
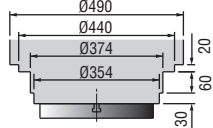
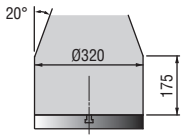
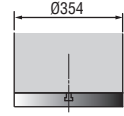
Table rotation speed, 8,000 deg/min (22.2rpm)
 Acceleration/deceleration constant, 150msec



- A:** Without clamp command
- B:** For hydraulic clamp
- C:** For pneumatic clamp
- D:** For air/hydraulic clamp

Note: For the above B and C cases, the indexing required time includes the time to respond to the clamp and un-clamp confirmation signals

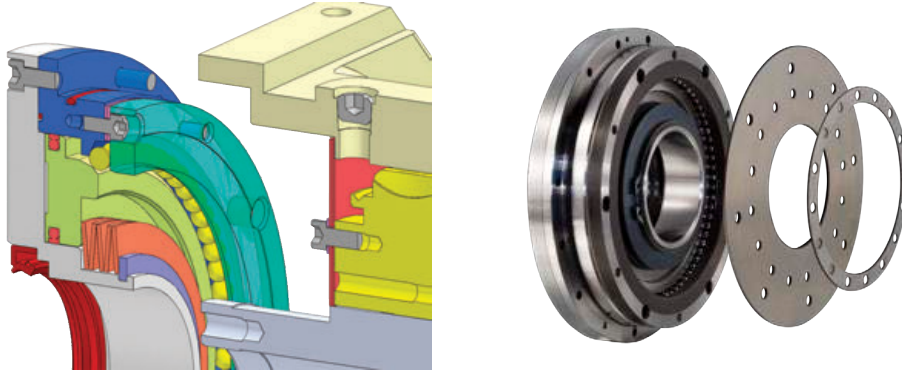
WORKPIECE MOUNTING SPACE FOR TILTING ROTARY TABLES

TN-101	0 ~ + 90°	0 ~ + 107°	- 17° ~ 0
			
TWA-130	0 ~ + 90°	0 ~ + 107°	- 17° ~ 0
			
TWA-160	0 ~ + 90°	0 ~ + 110°	- 30° ~ 0
			
TWA-200	0 ~ + 90°	0 ~ + 110°	- 30° ~ 0
			
TN-320	0 ~ + 90°	0 ~ + 110°	- 30° ~ 0
			

Note: To ensure workpiece, rotary table, and machine tool integration, contact for 3D CAD support.

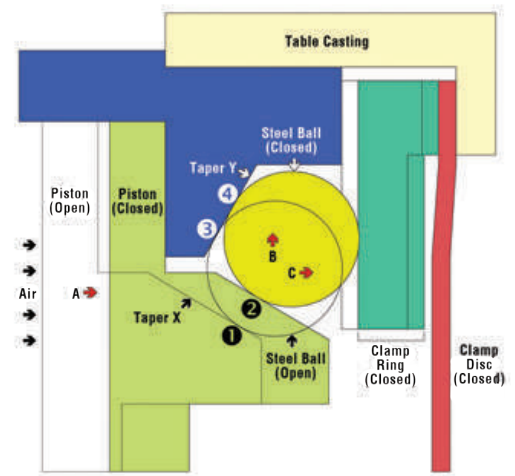
DUAL TAPER PNEUMATIC CLAMPING MECHANISM

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



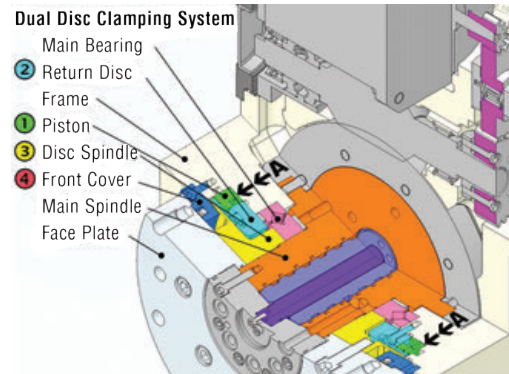
Tsudakoma Dual Taper Clamping Mechanism

- 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 $1.73 \times 1.73 = 3.0$

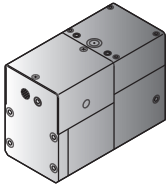


Tsudakoma Dual Disc Clamping Mechanism

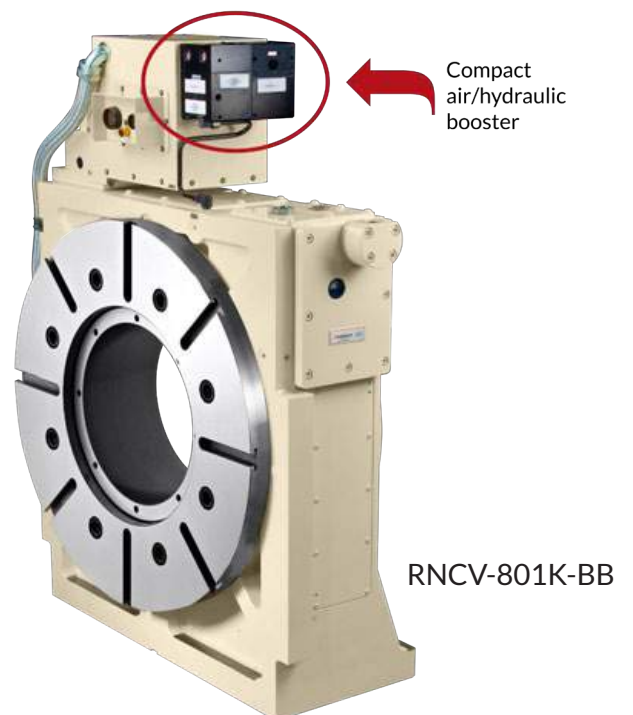
- 1) Hydraulic pressure* moves Piston ① in Direction A.
- 2) Piston ① presses Return Disc ② against Disc Spindle ③ which clamps the Disc Spindle against the Front Cover ④.



*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	

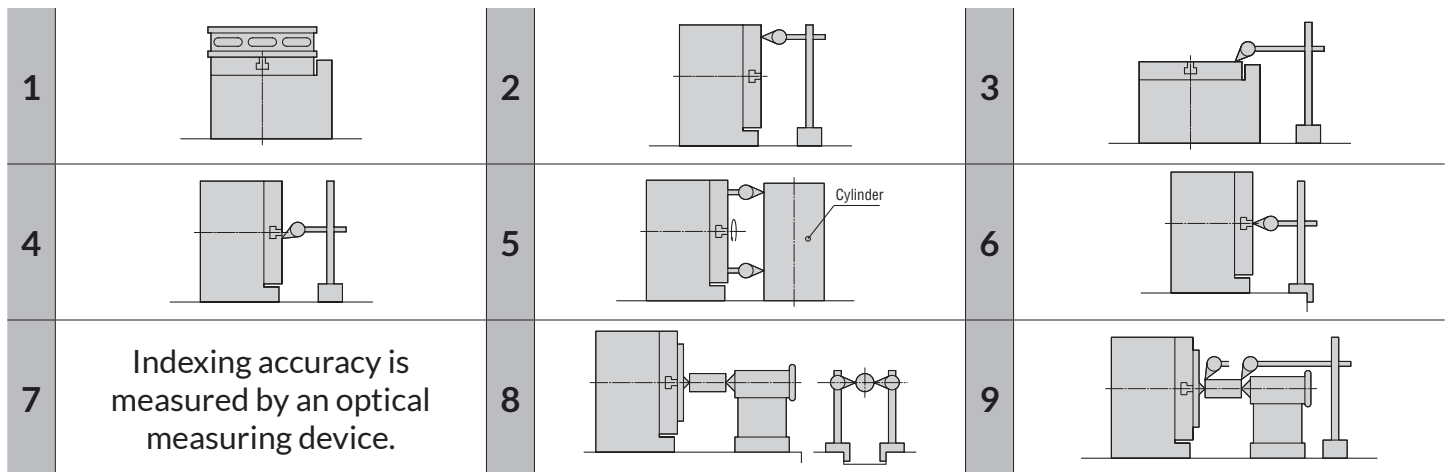
See page 83 for additional booster information.



RNCV-801K-BB

INSPECTION STANDARDS

SINGLE AXIS ROTARY TABLES



RN/RWE/RWA-SERIES

Unit: mm

No.	Inspection items			RN-100	RWA-160		RWA-200		RWA-250		RWA-320	
					Std.	Scale	Std.	Scale	Std.	Scale	Std.	Scale
2	Table top runout			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
3	Parallelism of table top to frame bottom	Per overall length	Horizontal	0.015	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
4	Center bore runout	Spindle nose		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
5	Perpendicularity of table top to frame bottom	Per overall length	Vertical	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
6	Perpendicularity of table top to frame bottom guide blocks	Per overall length	Vertical	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
7	Indexing accuracy (arc sec.)			±22.5	±12.5	±5	±12.5	±5	±10	±3	±10	±3
8	Parallelism of center line between rotary table and tailstock to frame bottom guide blocks	Per 300mm	Vertical	-	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
9	Height difference of both center lines of headstock and tailstock		Vertical	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03

Notes: 1. For RN-100, RWA-160 and 201 models, "Spindle end" replaces "Table top" 2. Indexing accuracy for tables with scales reflects Heidenhain encoder accuracies.

RCV-SERIES

Unit: mm

No.	Inspection items			RCV-800		RCV-1000		RCV-1250	
				Std.	Scale	Std.	Scale	Std.	Scale
1	Table top flatness (concave)	Per overall length		0.04	0.02	0.04	0.02	0.04	0.02
2	Table top runout			0.03	0.02	0.03	0.02	0.03	0.02
3	Parallelism of table top to frame bottom	Per overall length	Horizontal	0.04	0.02	0.04	0.02	0.04	0.02
4	Center bore runout	Spindle nose		0.01	0.01	0.01	0.01	0.01	0.01
5	Perpendicularity of table top to frame bottom	Per overall length	Vertical	0.04	0.03	0.04	0.03	0.04	0.03
6	Perpendicularity of table top to frame bottom guide blocks	Per overall length	Vertical	0.04	0.03	0.04	0.03	0.04	0.03
7	Indexing accuracy (arc sec.)			±7.5	±3	±7.5	±3	±7.5	±3
8	Parallelism of center line between rotary table and tailstock to frame bottom guide blocks	Per 300mm	Vertical	0.02	0.02	0.02	0.02	0.02	0.02
9	Height difference of both center lines of rotary table and tailstock (Tailstock center line should be higher)		Vertical	0.02	0.02	0.02	0.02	0.02	0.02

Note: Indexing accuracy for tables with scales reflects Heidenhain encoder accuracies.

INSPECTION STANDARDS

SINGLE AXIS ROTARY TABLES

RNCV-SERIES

Unit: mm

No.	Inspection items			RNCV-1501	
				Std.	Scale
1	Table top flatness (concave)	Per overall length		0.04	0.02
2	Table top runout			0.03	0.02
3	Parallelism of table top to frame bottom	Per overall length	Horizontal	0.04	0.02
4	Center bore runout	Spindle nose		0.01	0.01
5	Perpendicularity of table top to frame bottom	Per overall length	Vertical	0.04	0.03
6	Perpendicularity of table top to frame bottom guide blocks	Per overall length	Vertical	0.04	0.03
7	Indexing accuracy (arc sec.)			±7.5	±3
8	Parallelism of center line between rotary table and tailstock to frame bottom guide blocks	Per 300mm	Vertical	0.03	0.03
9	Height difference of both center lines of rotary table and tailstock (Tailstock center line should be higher)		Vertical	0.04	0.04

Note: Indexing accuracy for tables with scales reflects Heidenhain encoder accuracies.

RNCM-SERIES

Unit: mm

No.	Inspection items			RNCM-251, 301		RNCM-401, 501		RNCM-631	
				Standard	With scale	Standard	With scale	Standard	With scale
1	Table top flatness (concave)	Per overall length		0.01	0.01	0.02	0.01	0.03	0.02
2	Table top runout			0.015	0.01	0.015	0.01	0.02	0.01
3	Parallelism of table top to frame bottom	Per overall length	Horizontal	0.02	0.01	0.02	0.01	0.03	0.02
4	Center bore runout	Spindle nose		0.01	0.005	0.01	0.005	0.01	0.005
5	Perpendicularity of table top to frame bottom	Per overall length	Vertical	0.02	0.01	0.02	0.01	0.03	0.02
6	Perpendicularity of table top to frame bottom guide blocks	Per overall length	Vertical	0.02	0.01	0.02	0.01	0.03	0.03
7	Indexing accuracy (arc sec.)			±7.5	±3	±7.5	±3	±7.5	±3
8	Parallelism of center line between rotary table and tailstock to frame bottom guide blocks	Per 300mm	Vertical	0.02	0.01	0.02	0.01	0.02	0.02
9	Height difference of both center lines of rotary table and tailstock (Tailstock center line should be higher)		Vertical	0.02	0.01	0.02	0.01	0.02	0.02

Note: Indexing accuracy for tables with scales reflects Heidenhain encoder accuracies.

RWB,RWB-K SERIES

Unit: mm

No.	Inspection items			RWB-250, 250K RWB-320, 320K		RWB-400, 400K RWB-500, 500K	
				Standard	With scale	Standard	With scale
1	Table top flatness (concave)	Per overall length		0.01	0.01	0.02	0.01
2	Table top runout			0.015	0.01	0.015	0.01
3	Parallelism of table top to frame bottom	Per overall length	Horizontal	0.02	0.01	0.02	0.01
4	Center bore runout	Spindle nose		0.01	0.005	0.01	0.005
5	Perpendicularity of table top to frame bottom	Per overall length	Vertical	0.02	0.01	0.02	0.01
6	Perpendicularity of table top to frame bottom guide blocks	Per overall length	Vertical	0.02	0.01	0.02	0.01
7	Indexing accuracy (arc sec.)			±7	±3	±7	±3
8	Parallelism of center line between rotary table and tailstock to frame bottom guide blocks	Per 300mm	Vertical	0.02	0.01	0.02	0.01
9	Height difference of both center lines of rotary table and tailstock (Tailstock center line should be higher)		Vertical	0.02	0.01	0.02	0.01

Notes: 1. Indexing accuracy for tables with scales reflects Heidenhain encoder accuracies. 2. For RWB-K models, No. 3 does not apply.

INSPECTION STANDARDS

RNCK-SERIES

Unit: mm

No.	Inspection items		RNCK-501		RNCK-631	
			Standard	With scale	Standard	With scale
1	Table top flatness (concave)	Per overall length	0.03	0.02	0.03	0.02
2	Table top runout		0.02	0.01	0.02	0.01
3	Center bore runout	Spindle nose	0.01	0.005	0.01	0.005
4	Perpendicularity of table top to frame bottom	Per overall length	0.03	0.02	0.03	0.02
5	Perpendicularity of table top to frame bottom guide blocks	Per overall length	0.03	0.03	0.03	0.03
6	Indexing accuracy (arc sec.)		±7.5	±3	±7.5	±3
7	Parallelism of center line between rotary table and tailstock to frame bottom guide blocks	Per 300mm	0.02	0.02	0.02	0.02
8	Height difference of both center lines of rotary table and tailstock (Tailstock center line should be higher)		0.02	0.02	0.02	0.02

Note: Indexing accuracy for tables with scales reflects Heidenhain encoder accuracies.

RCH/RNC-SERIES

Unit: mm

No.	Inspection items		RCH-800		RCH-1000, 1200		RNC-1501,2001	
			Standard	With scale	Standard	With scale	Standard	With scale
1	Table top flatness (concave)	Per overall length	0.03	0.02	0.04	0.02	0.04	0.03
2	Table top runout		0.02	0.01	0.03	0.02	0.03	0.02
3	Parallelism of table top to frame bottom	Per overall length	0.03	0.02	0.04	0.02	0.04	0.03
4	Center bore runout	Spindle nose	0.01	0.005	0.01	0.01	0.01	0.01
7	Indexing accuracy (arc sec.)		±7.5	±3	±7.5	±3	±7.5	±3

Note: Indexing accuracy for tables with scales reflects Heidenhain encoder accuracies.

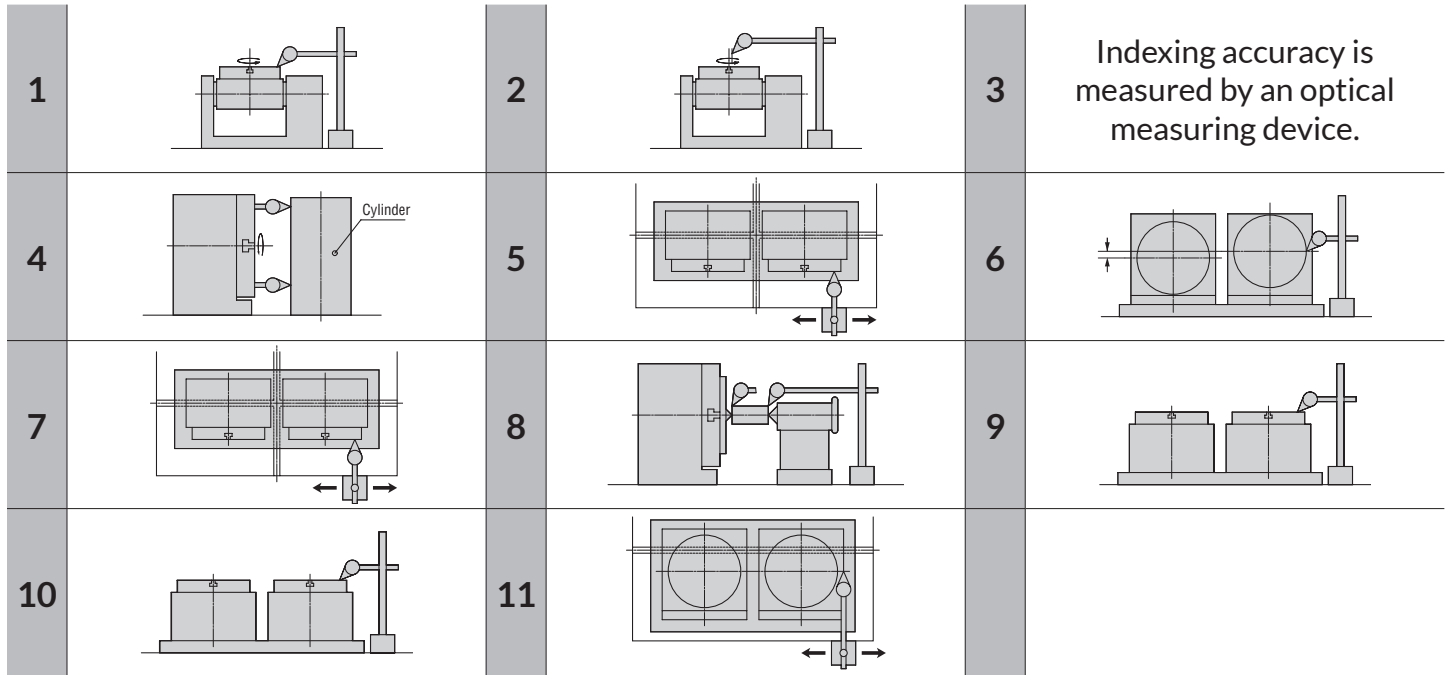
RWE-SERIES INDEXERS

Unit: mm

No.	Inspection items			RWE-160 TPC	RWE-200 TPC
2	Spindle end runout			0.015	0.015
3	Parallelism of spindle to frame bottom	Per overall length	Horizontal	0.02	0.02
4	Center bore runout	Spindle nose		0.015	0.02
5	Perpendicularity of spindle end to frame bottom	Per overall length	Vertical	0.02	0.02
6	Perpendicularity of spindle end to frame bottom guide	Per overall length	Vertical	0.02	0.02
7	Indexing accuracy (arc sec.)			±22.5	±22.5
9	Height difference of both center lines of headstock and tailstock		Vertical	0.03	0.03

INSPECTION STANDARDS

MULTI-SPINDLE SINGLE AXIS ROTARY TABLES



RN MULTI-SPINDLE SERIES

Unit: mm

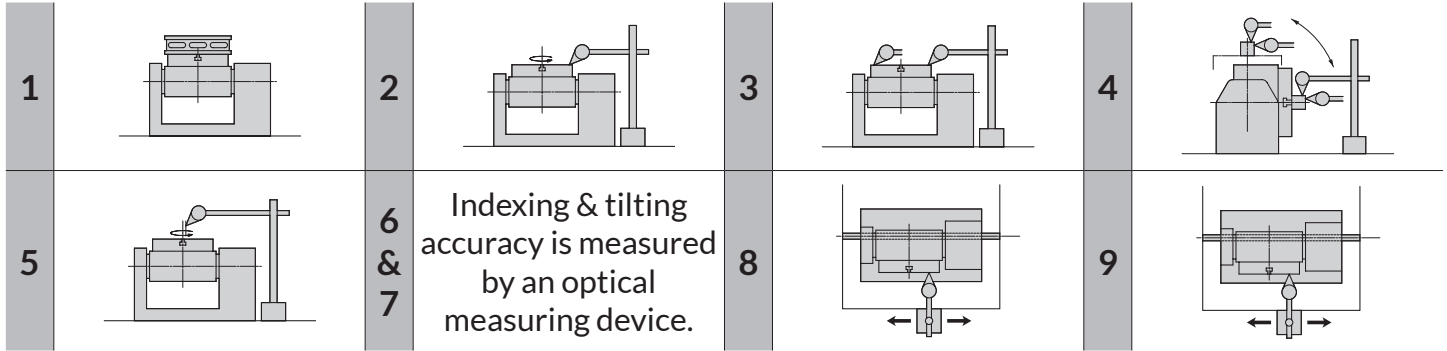
No.	Inspection items			RN-100,n	RN-150,n	RN-200,n	RN-250,n RN-300,n
1	Table top runout			0.015	0.015	0.015	0.02
2	Center bore runout			0.01	0.015	0.02	0.02
3	Indexing accuracy (arc sec.)			±30	±15	±15	±15
4	Perpendicularity of table top to frame bottom	Per overall length	Vertical	0.02	0.02	0.02	0.02
5	Parallelism & perpendicularity of table top to base bottom guide blocks	Per overall length	Vertical	0.02	0.02	0.02	0.03
6	Difference among all center heights		Vertical	0.02	0.02	0.02	0.02
7	Difference among distances between base bottom guide blocks & tailstock		Vertical	0.02	0.02	0.02	0.02
8	Height difference of both center lines of headstock and tailstock		Vertical	0.03	0.03	0.03	0.03
9	Parallelism of table top to base bottom	Per overall length	Horizontal	0.015	0.02	0.02	0.02
10	Difference among the average heights between base bottom and table top		Horizontal	0.02	0.02	0.02	0.02
11	Difference among the center bore positions based on base bottom guide blocks		Horizontal	0.02	0.02	0.02	0.02

Notes: 1. For RN-150 and RN-200 models, "spindle end" replaces "table top."

2. If guide blocks are not installed on the base, "base reference face" replaces "base bottom guide blocks" (No. 5, 7, and 11).

INSPECTION STANDARDS

TILTING ROTARY TABLES



Indexing & tilting accuracy is measured by an optical measuring device.

TN/TWA-SERIES

Unit: mm

No.	Inspection items		TN-101	TWA-130		TWA-160		TWA-200		TN-320	
				Standard	w/scale	Standard	w/scale	Standard	w/scale	Standard	w/scale
1	Table top flatness (concave)	Per overall length	—	—	—	—	—	—	—	0.01	0.01
2	Table top runout		0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
3	Parallelism of table top to frame bottom	Per overall length	0.015	0.015	0.015	0.02	0.02	0.02	0.02	0.02	0.02
4	Parallelism of tilt axis center to frame bottom	Per overall length	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
5	Center bore runout	Spindle nose	0.015	0.015	0.015	0.015	0.015	0.02	0.02	0.01	0.01
6	Tilting accuracy (arc sec.)	0° ~ + 90°	±22.5	±22.5	±7.5	±22.5	±7.5	±22.5	±3	±22.5	±3
		- 30° ~ + 90°	—	—	—	±30	±7.5	±30	±3	±30	±3
7	Indexing accuracy (arc sec.)		±20	±20	±7.5	±15	±7.5	±15	±3	±10	±3
8	Parallelism of spindle top to frame bottom guide blocks	Per overall length	0.015	0.015	0.015	0.02	0.02	0.02	0.02	0.02	0.02

Note: Indexing accuracy for tables with scales reflects Heidenhain encoder accuracies.

TTNC SERIES

Unit: mm

No.	Inspection items		TTNC-451		TTNC-631		TTNC-1001	
			Standard	With scale	Standard	With scale	Standard	With scale
1	Table top flatness (concave)	Per overall length	0.02	0.02	0.03	0.03	0.04	0.04
2	Table top runout		0.015	0.015	0.02	0.02	0.03	0.03
3	Parallelism of table top to frame bottom	Per overall length	0.02	0.02	0.03	0.03	0.04	0.04
4	Parallelism of tilt axis center to frame bottom	Per overall length	0.02	0.02	0.03	0.03	0.04	0.04
5	Center bore runout	Spindle nose	0.01	0.01	0.01	0.01	0.01	0.01
6	Tilting accuracy (arc sec.)	0° ~ + 90°	±30	±3	±30	±3	±30	±3
7	Indexing accuracy (arc sec.)		±7.5	±3	±7.5	±3	±7.5	±3
8	Parallelism of table top to frame bottom guide blocks	Per overall length	0.02	0.02	0.02	0.02	0.02	0.02

Note: Indexing accuracy for tables with scales reflects Heidenhain encoder accuracies.

THNC-SERIES

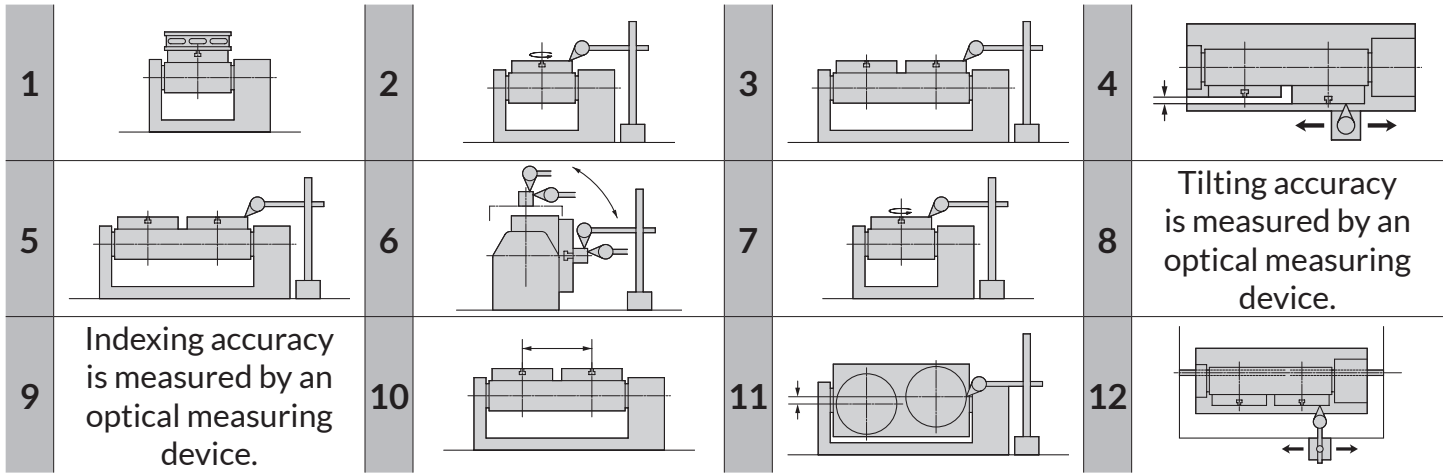
Unit: mm

No.	Inspection items		THNC-251, 301	
			Standard	With Scale
1	Table top flatness (concave)	Per overall length	0.01	0.01
2	Table top runout		0.015	0.015
3	Parallelism of table top to frame bottom	Per overall length	0.02	0.02
4	Parallelism of tilt axis center to frame bottom	Per overall length	0.02	0.02
5	Center bore runout	Spindle nose	0.01	0.01
6	Tilting accuracy (arc sec.)	0° ~ + 90°	±30	±30
7	Indexing accuracy (arc sec.)		±7.5	±5
8	Parallelism of table top to frame bottom guide blocks	Per overall length	0.02	0.02
9	Perpendicularity of table to frame bottom guide blocks	Per overall length	0.02	0.02

Note: Indexing accuracy for tables with scales reflects Heidenhain encoder accuracies.

INSPECTION STANDARDS

MULTI-SPINDLE TILTING ROTARY TABLES



TTNC MULTI-SPINDLE SERIES

Unit: mm

No.	Inspection items	TTNC-102,2	TTNC-101,4	TTNC-151,2	TTNC-201,2	
1	Table top flatness (concave)	Per overall length	—	—	0.02	0.01
2	Table top runout		0.015	0.015	0.015	0.015
3	Difference between average heights of both tables	at 0° position	0.02	0.02	0.02	0.02
4	Difference between distances between frame standard face and both table tops	at 90° position	0.02	0.02	0.02	0.02
5	Parallelism of table top to frame bottom	Per overall length	0.015	0.015	0.02	0.02
6	Parallelism of tilt axis center to frame bottom	Per overall length	0.02	0.02	0.02	0.02
7	Center bore runout	Spindle nose	0.015	0.01	0.01	0.01
8	Tilting accuracy (arc sec.)	0 ~ + 90°	±22.5	±30	±30	±30
9	Indexing accuracy (arc sec.)		±20	±30	±15	±7.5
10	Table center distance		± 0.02	± 0.02	± 0.02	± 0.02
11	Difference between both center heights	at 90° position	0.02	0.02	0.02	0.02
12	Parallelism of table top to frame bottom guide blocks	Per overall length at 90° position	0.015	0.015	0.02	0.02

Note: For the TTNC-102,2 and TTNC-101,4 all descriptions of "table top" seen in the inspection items above should be "spindle end surface."