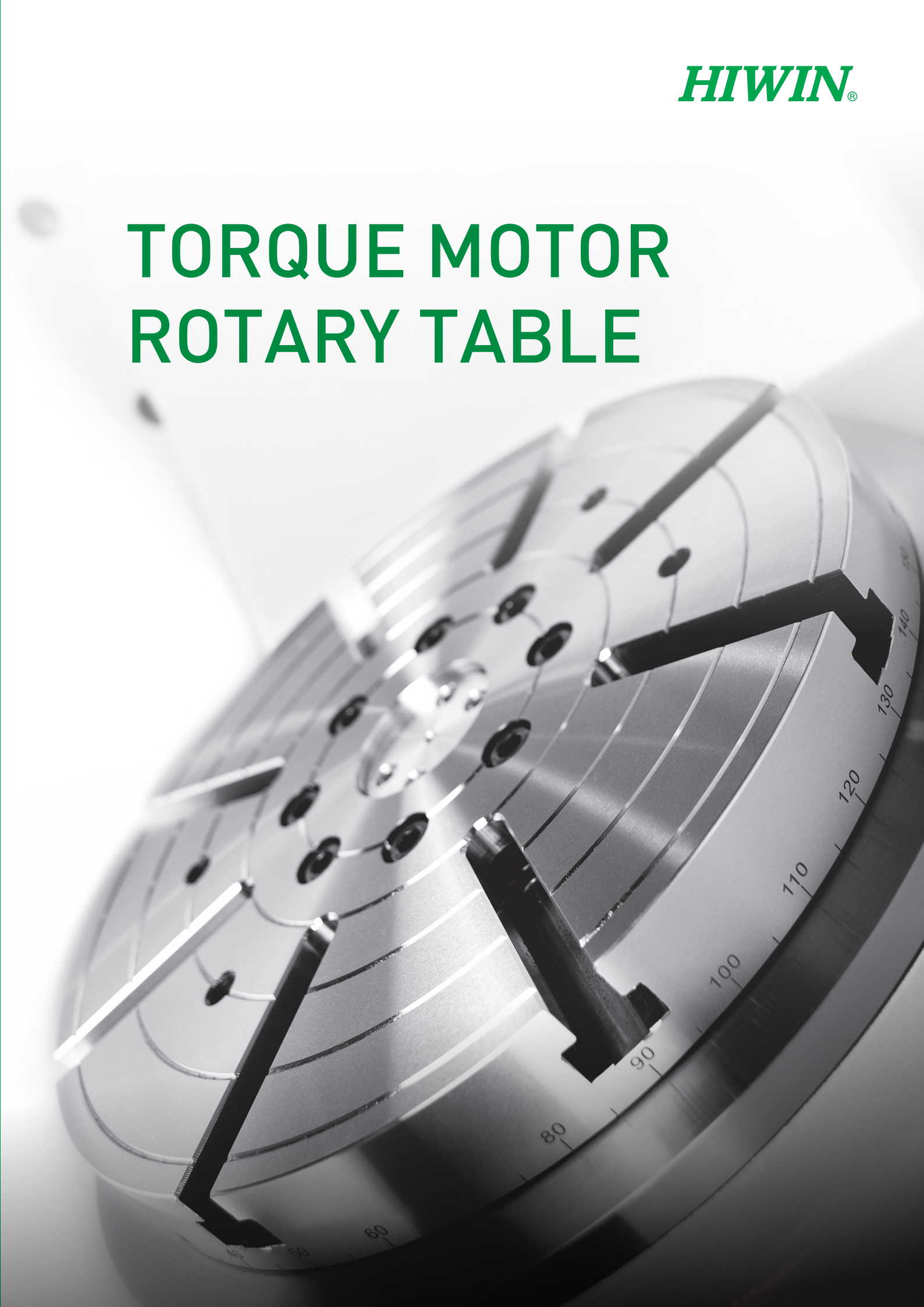
HIWIN®

TORQUE MOTOR ROTARY TABLE



HIWIN®

Torque Motor Rotary Table

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(The contents and specifications of this catalog are subject to change without notice)

Introduction

Torque Motor Rotary Table

HIWIN Torque Motor Rotary Table adopts water-cooled torque motor, built-in high rigidity and high precision bearing, absolute angle encoder and strong clamping system. Compared with the mechanical indexing plate, HIWIN Torque Motor Rotary Table has the characteristics of high speed, high torque and high precision, and is suitable for various precision machining industries.

HIWIN Torque Motor Rotary Table adopts a direct drive transmission structure, which is different from the traditional mechanical indexing plate. HIWIN Torque Motor Rotary Table remove the mechanical transmission structure of the traditional rotary table, such as worm gears, roller cams, which greatly reduces the wear of the mechanical transmission, resulting in nearly zero backlash and improves the stability of machining accuracy. By adding a torque motor rotary table, the original machining equipment can be upgraded to a 3+1-axis, 4-axis or 5-axis machine to achieve one-time clamping machining and improve machining efficiency and productivity.

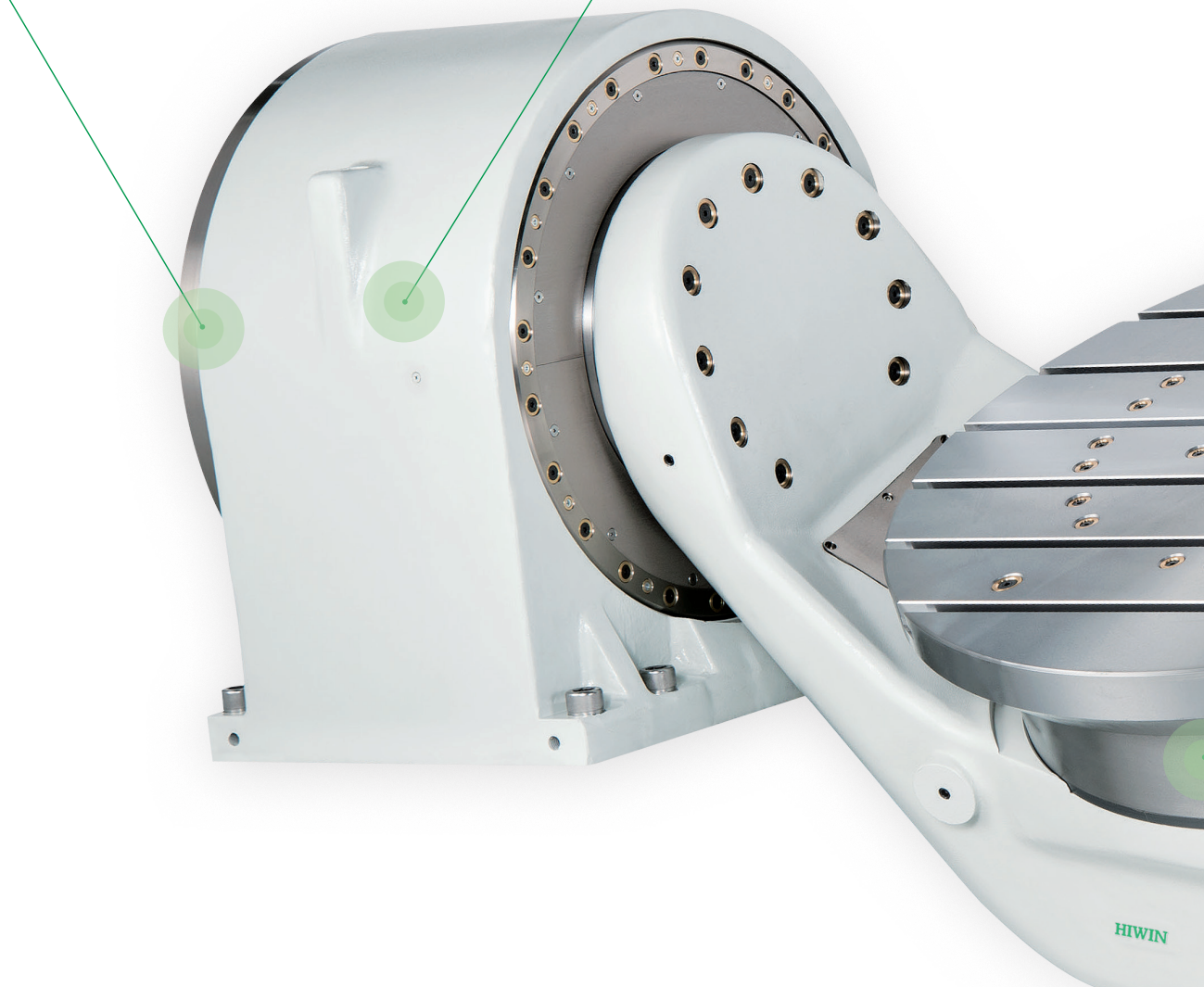
· **Close loop control encoder**

High dynamic accuracy

· **Torque Motor**

Zero backlash

Improve the consistency of product accuracy

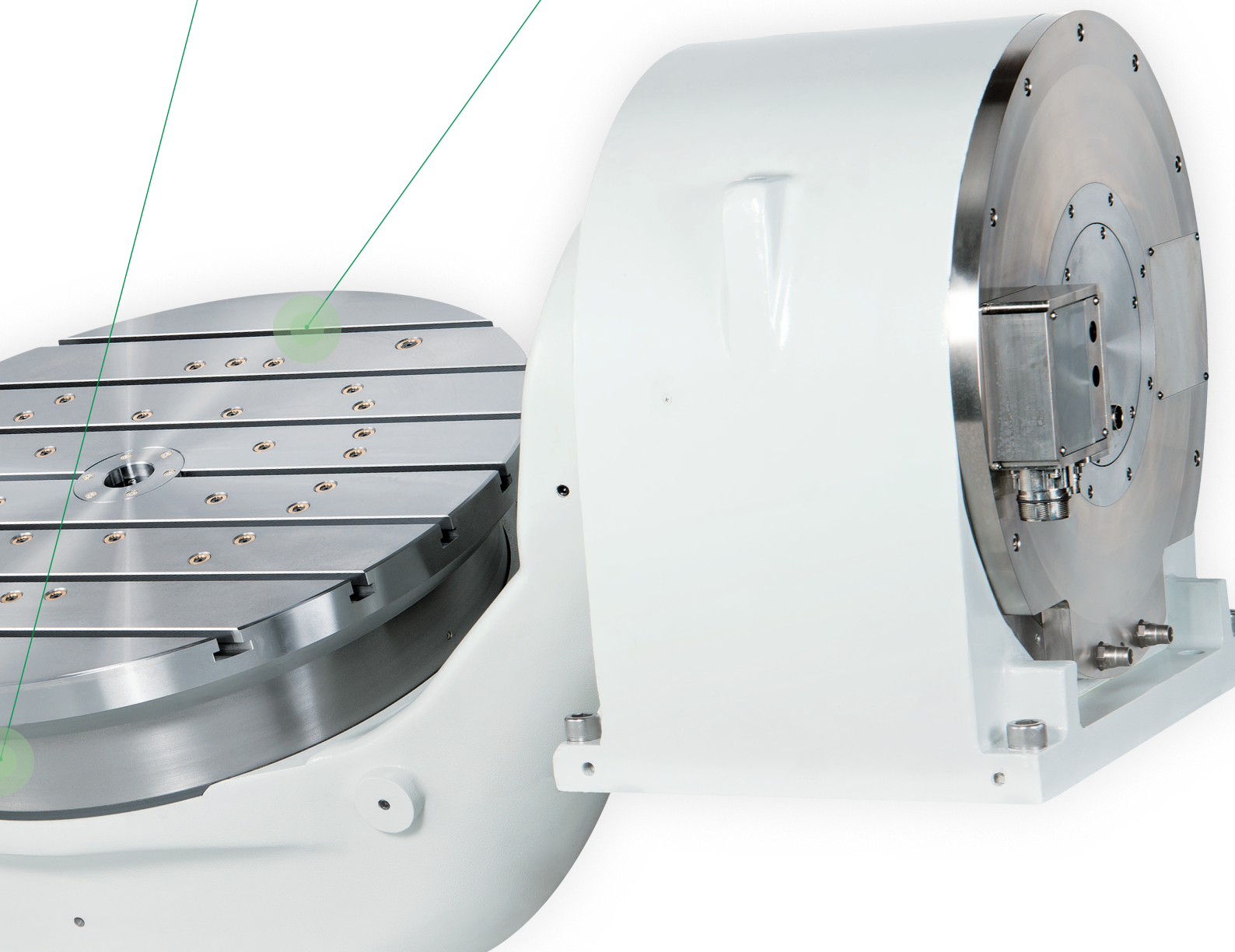


· High rotation speed

Can be applied to turning and milling machining, improve yield and efficiency

· Compact structure design

Save machine space



Core Technology

Torque Motor

· High Torque

The combination of a high torque stator and rotor meets the most demanding specifications in high precision industry. By using a water-cooled design, not only can reduce the thermal deformation of the motor, but high torque can be achieved as well.

· Zero Backlash

The torque motor is a direct drive system without reduction mechanism. There is no contact between the rotor and the stator, so there is no backlash, improving the reliability of the rotary table and the consistency of product accuracy.

High Accuracy Absolute Encoder

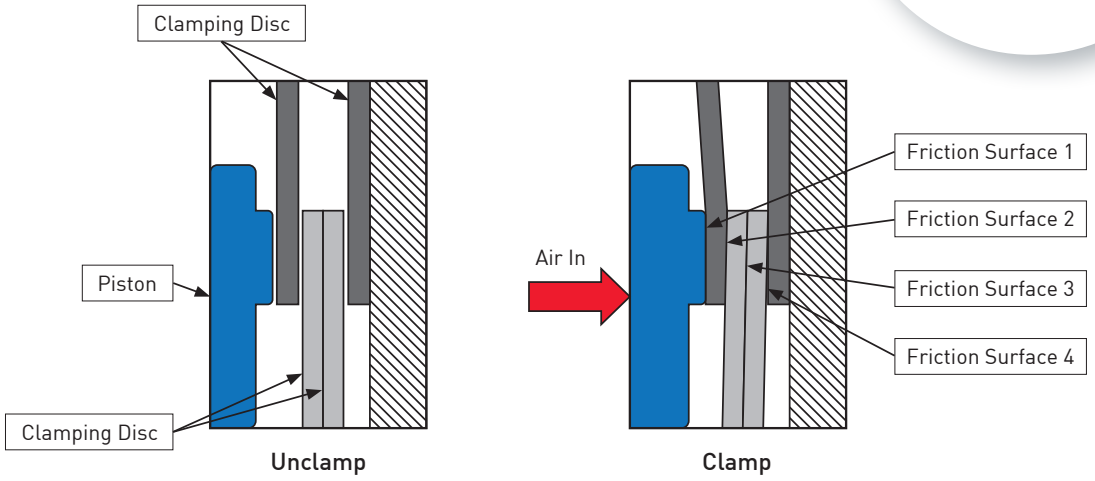
· High Dynamic Accuracy

The HIWIN Torque Motor Rotary Table is equipped with a high-precision absolute encoder, which can perform full closed-loop control, and can immediately feedback the accuracy tolerance generated on the rotating shaft to the control system to achieve high dynamic accuracy. The standard positioning accuracy of HIWIN Torque Motor Rotary Table is ±5" (the actual positioning accuracy depends on each model). Any requirements for positioning accuracy, please contact HIWIN.

Clamping System

1.Disc Clamping System

The disc brakes are installed on the seat and rotary shaft, the piston is pressed against the disc brake by air pressure, and the clamping function is achieved through the friction between the discs.

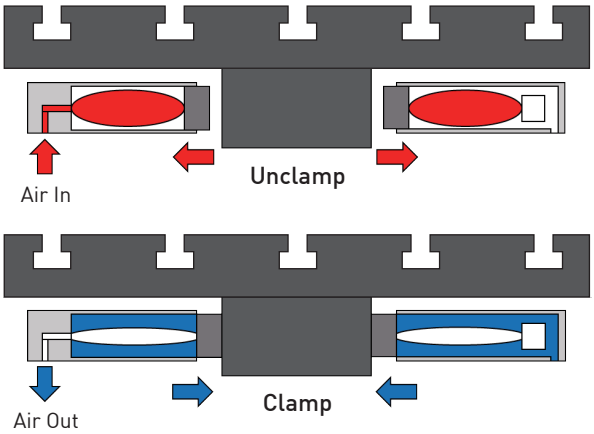


2-1. Full Circumference Pneumatic Clamping System

The clamping force is high, and the variation of the accuracy error after clamping is low. Since the clamping system is a pneumatic system, the reaction time is rapid. Extremely short clamping time are achieved by connecting the rapid exhaust valve and solenoid valve directly to the clamping mechanism.

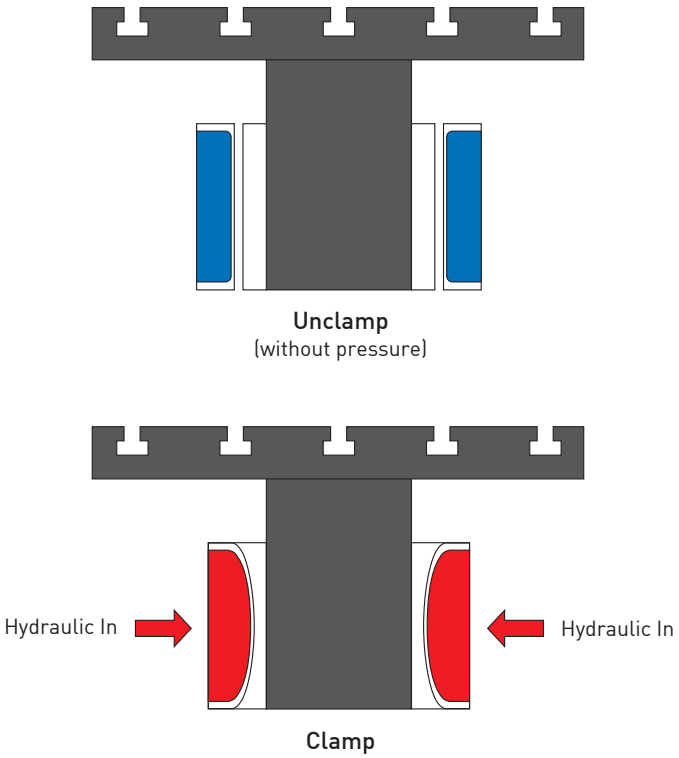
· Safety clamp

If the air pressure system fails, the clamping system will clamp immediately.

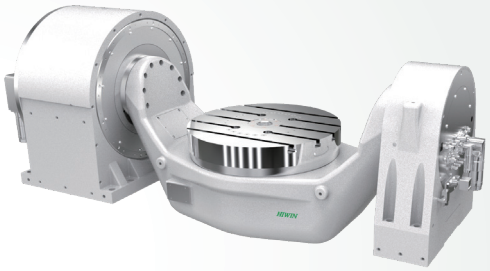


2-2. Full Circumference Hydraulic Clamping System

The use of full circumference hydraulic clamping system can effectively avoid the problem of plate runout. The full circumference hydraulic clamping system has a larger clamping area and can maintain stable clamping force.



Torque Motor Rotary Table
RAB Series



Features

- Adopts high acceleration, high torque, high accuracy, zero backlash torque motor.
- Rigid and symmetrical mechanical design.
- High positioning accuracy, suitable for high accuracy simultaneous machining.
- Built-in powerful clamping system.
- Precise stop and swing angle settings.
- Widely used in 3+2-axis, 4+1-axis positioning processing or 5-axis simultaneous processing.

Applications

- Automotive parts machining, mold machining, laser machining, forging machining, etc.

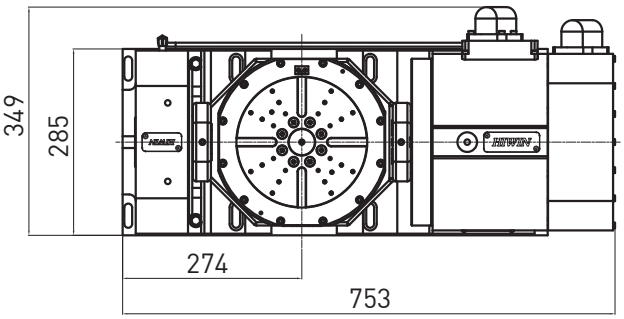
Cooling Method	-	Natural Cooling		Water cooling	
Spec/Model	Unit	RAB-200		RAB-500	
Table Diameter	mm	200		500	
Center Height	mm	195		325	
Table Height	mm	240		265	
T-slot Width	mm	12H8		14H8	
Drive Type	-	Single Drive		Single Drive	
Axis	-	Rotary	Tilting ±120°	Rotary	Tilting ±120°
Max. Rotation Speed *2	r.p.m	400	150	100	40
Continuous Torque	N-m	28	65	600	2000
Max. Torque	N-m	81	188	1100	3600
Encoder Type *3	-	RESA		RCN/D90	
Positioning Accuracy	arc-sec	±5		±5	
Repeatability Accuracy	arc-sec	4		4	
Clamping Type	-	Pneumatic (6 bar)			
Clamping Torque	N-m	200	300/200	2400	6600
Cooling Power	W	-	-	4077	9900
Max. Allowable Work Inertia	kg-m²	1.6		23.8	
Net Weight	kg	180		1190	
Allowable Load	kg	50		850	

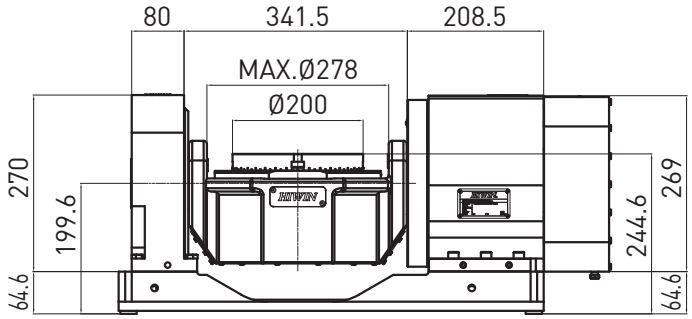
*1：All models in the above table are standard specifications, any special requirements, please contact HIWIN.
*2：The rotation speed will vary depending on the voltage of power supply.
*3：For detailed specifications, please refer to P16 [Angle Measurement System]

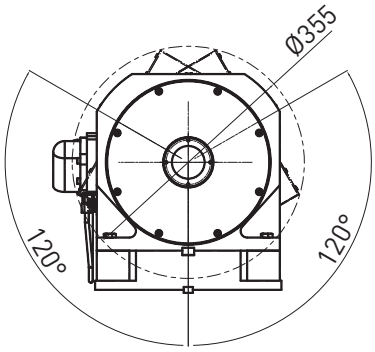
Dimension

RAB-200

(Unit：mm)

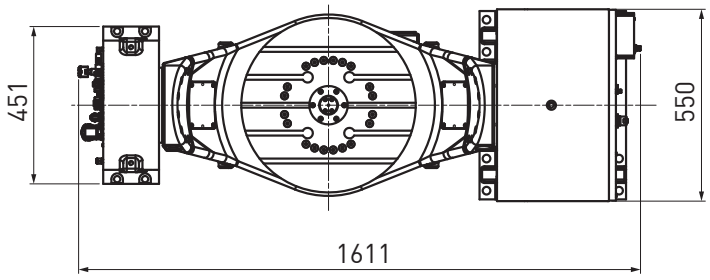


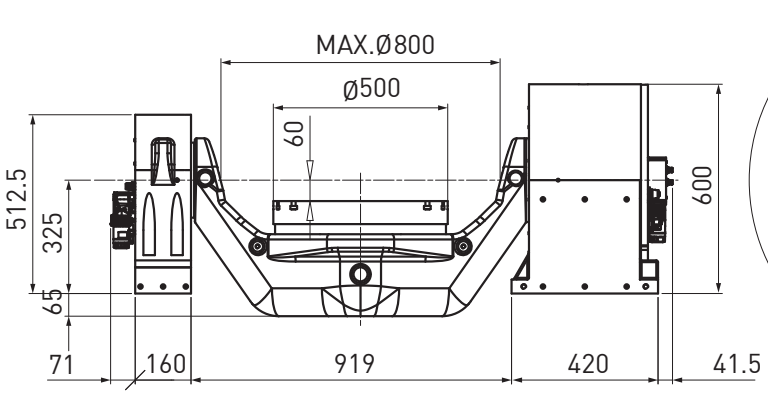


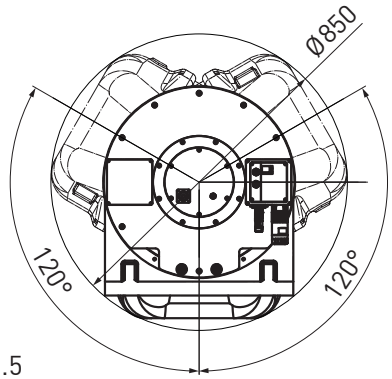


RAB-500

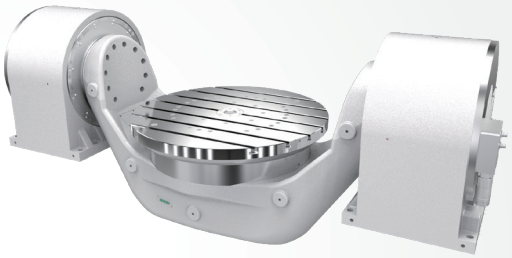
(Unit：mm)







Torque Motor Rotary Table
RAB Series



Features

- Adopts high acceleration, high torque, high accuracy, zero backlash torque motor.
- Rigid and symmetrical mechanical design.
- High positioning accuracy, suitable for high accuracy simultaneous machining.
- Built-in powerful clamping system.
- Precise stop and swing angle settings.
- Widely used in 3+2-axis, 4+1-axis positioning processing or 5-axis simultaneous processing.

Applications

- Automotive parts machining, mold machining, laser machining, forging machining, etc.

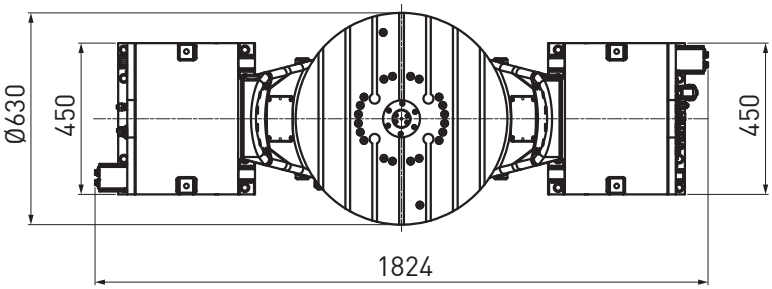
Cooling Method	-	Water cooling			
Spec/Model	Unit	RAB-630		RAB-800	
Table Diameter	mm	630		800	
Center Height	mm	325		325	
Table Height	mm	265		225	
T-slot Width	mm	14H8		14H8	
Drive Type	-	Dual Drive		Dual Drive	
Axis	-	Rotary	Tilting ±120°	Rotary	Tilting ±120°
Max. Rotation Speed *2	r.p.m	100	60	90	60
Continuous Torque	N-m	600	2580	2200	4400
Max. Torque	N-m	1100	4800	3900	7800
Encoder Type *3	-	RCN/D90			
Positioning Accuracy	arc-sec	±5		±5	
Repeatability Accuracy	arc-sec	4		4	
Clamping Type	-	Pneumatic (6 bar)			
Clamping Torque	N-m	2400	4800	4200	8400
Cooling Power	W	4077	16524	9900	19800
Max. Allowable Work Inertia	kg-m²	23.8		177.6	
Net Weight	kg	1190		2200	
Allowable Load	kg	850		1200	

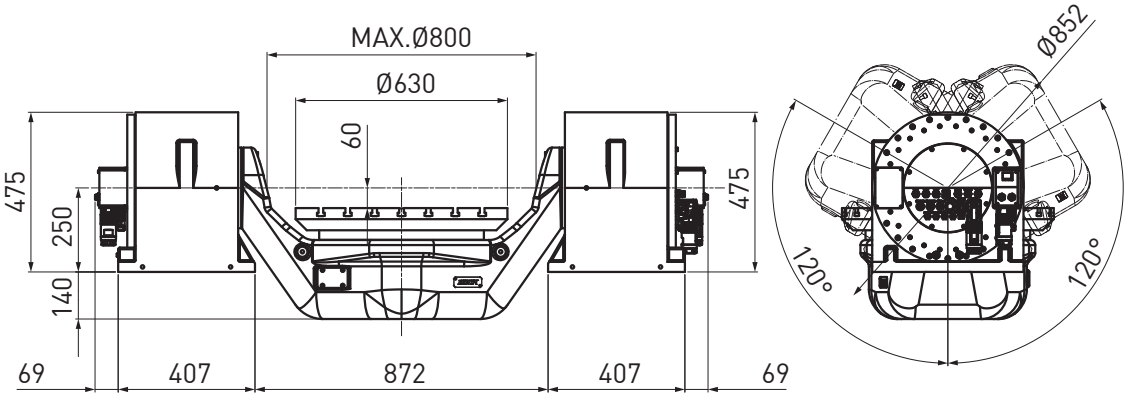
*1：All models in the above table are standard specifications, any special requirements, please contact HIWIN.
*2：The rotation speed will vary depending on the voltage of power supply.
*3：For detailed specifications, please refer to P16 [Angle Measurement System]

Dimension

RAB-630

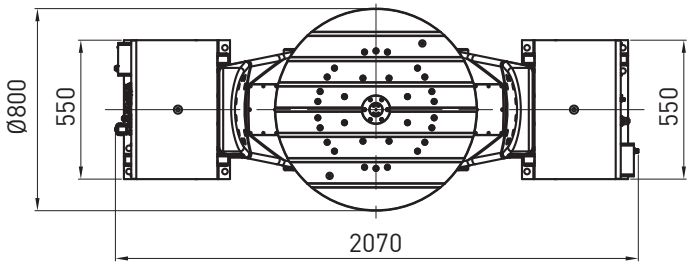
(Unit：mm)

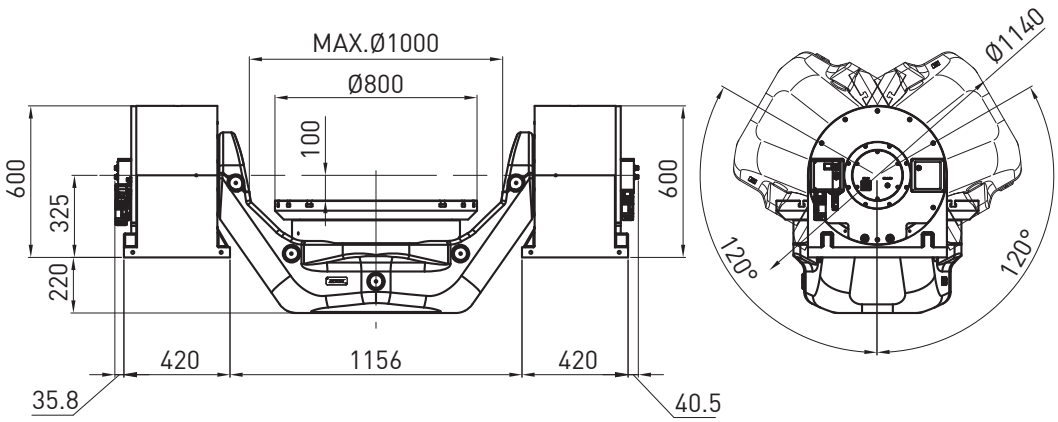




RAB-800

(Unit：mm)





Torque Motor Rotary Table
RAS Series

Features

- Adopts high acceleration, high torque, high accuracy, zero backlash torque motor.
- Single-arm swing rotary table with compact structure, suitable for five-axis machine design with limited space.
- High-response simultaneous machining performance.
- Widely used in 3+2-axis, 4+1-axis positioning processing or 5-axis simultaneous processing.

Applications

- Automotive parts machining, medical equipment, mold machining, laser machining, jewelry machining, precision tool machining, welding equipment, forging machining, etc.

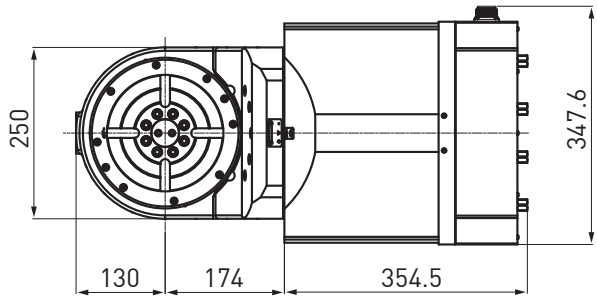
Spec/Model	Unit	RAS-170		RAS-650	
Table Diameter	mm	170		650	
Center Height	mm	260		300	
Table Height	mm	260		250	
T-slot Width	mm	14H8		14H8	
Axis	-	Rotary	Tilting ±120°	Rotary	Tilting ±120°
Max. Rotation Speed *2	r.p.m	200	100	100	60
Continuous Torque	N-m	35	205	600	2000
Max. Torque	N-m	66.5	390	1100	3600
Encoder Type *3	-	ECA		RCN/D90	
Positioning Accuracy	arc-sec	±5		±5	
Repeatability Accuracy	arc-sec	4		4	
Clamping Type	-	Pneumatic (6 bar)			
Clamping Torque	N-m	342	840	2400	4200
Cooling Power	W	609	1666	4077	9900
Max. Allowable Work Inertia	kg-m²	0.5		23.5	
Net Weight	kg	250		1300	
Allowable Load	kg	30		300	

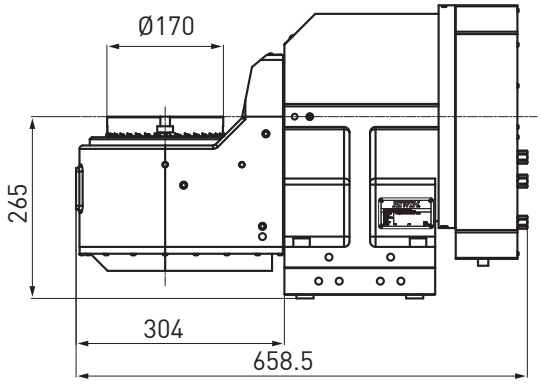
*1 : All models in the above table are standard specifications, any special requirements, please contact HIWIN.
*2 : The rotation speed will vary depending on the voltage of power supply.
*3 : For detailed specifications, please refer to P16 [Angle Measurement System]

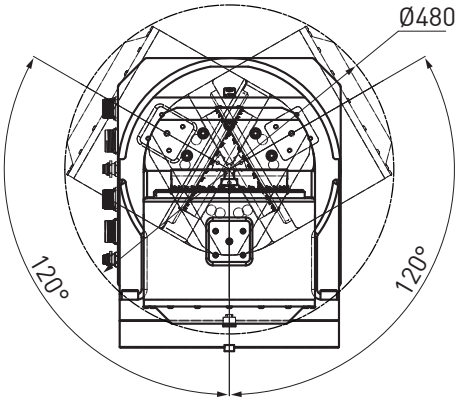
Dimension

RAS-170

(Unit：mm)

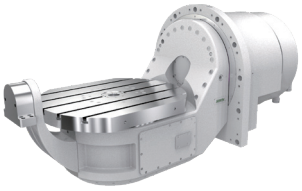


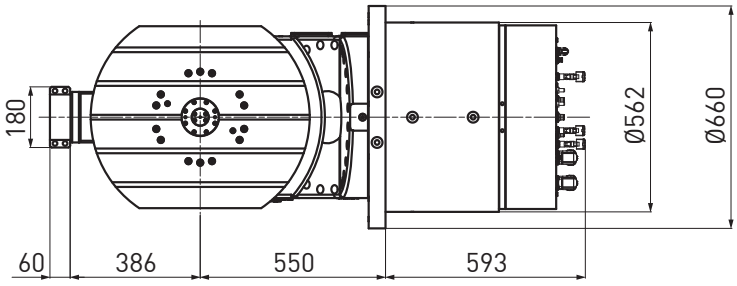


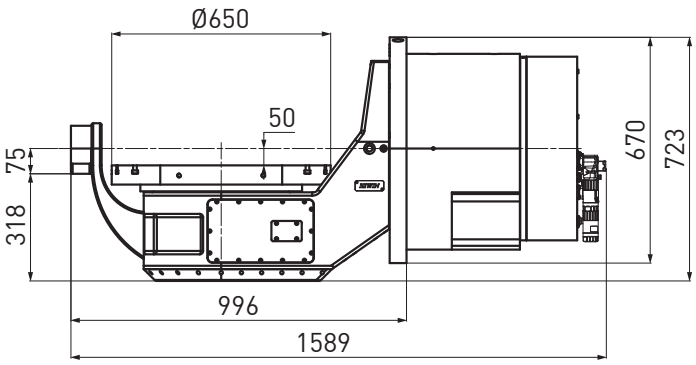


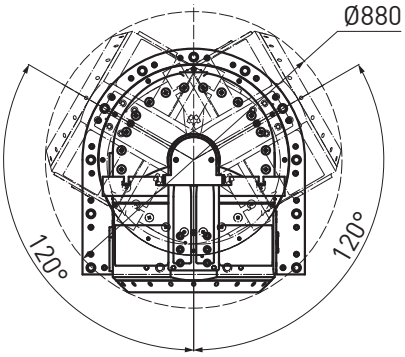
RAS-650

(Unit：mm)

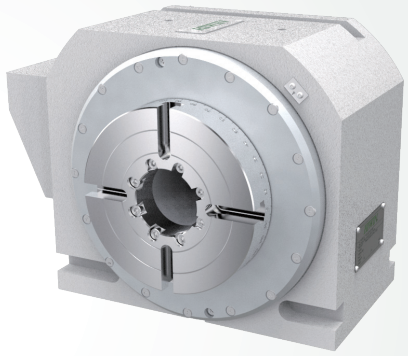








Torque Motor Rotary Table
RCV Series



Features

- Adopts high acceleration, high torque, high accuracy, zero backlash torque motor.
- Adopts bearing with high rigidity.
- Equipped with high accuracy encoder, able to achieve high positioning and high repeatability accuracy.
- Suitable for vertical and horizontal install.
- Better choice for upgrading the machine center to 3+1 axis.

Applications

- Automotive parts machining, mold machining, light metal machining, tool grinding machine, EDM, special equipment machine, automation equipment, measuring equipment, electronic parts machining, etc.

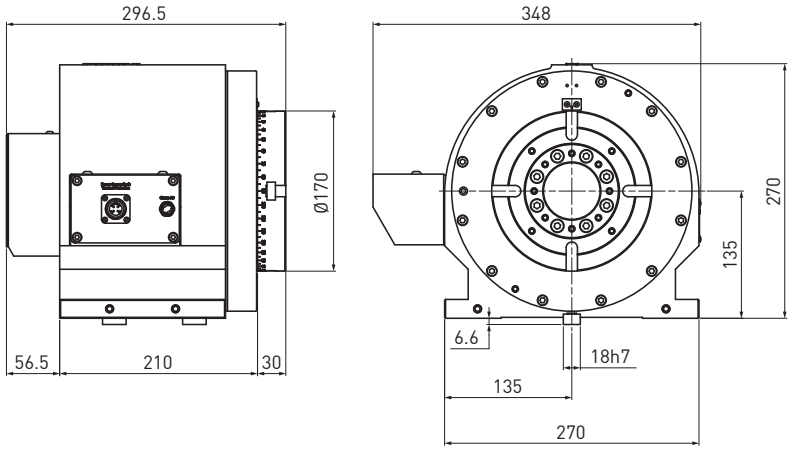
Cooling Method	-	Natural Cooling	Water Cooling	
Spec/Model	Unit	RCV-170	RCV-170	RCV-250
Table Diameter	mm	170	170	250
Center Height	mm	135	135	160
Center Through Hole	mm	Ø60	Ø60	Ø60
T-slot Width	mm	12H8	12H8	12H8
Max. Rotation Speed*2	r.p.m	150	200	140
Continuous Torque	N-m	65	106	148
Max. Torque	N-m	188	203	280
Encoder Type*3	-	-	RESA	
Positioning Accuracy	arc-sec	±15	±5	±5
Repeatability Accuracy	arc-sec	8	4	4
Clamping Type	-	Pneumatic (6 bar)		
Clamping Torque	N-m	300	300	600
Cooling Power	W	-	1002	1272
Max. Allowable Work Inertia	kg-m²	4.3	2.7	4.3
Net Weight	kg	60	95	150
Allowable Load	kg	50	75	160

*1：All models in the above table are standard specifications, any special requirements, please contact HIWIN.
*2：The rotation speed will vary depending on the voltage of power supply.
*3：For detailed specifications, please refer to P16 [Angle Measurement System]

Dimension

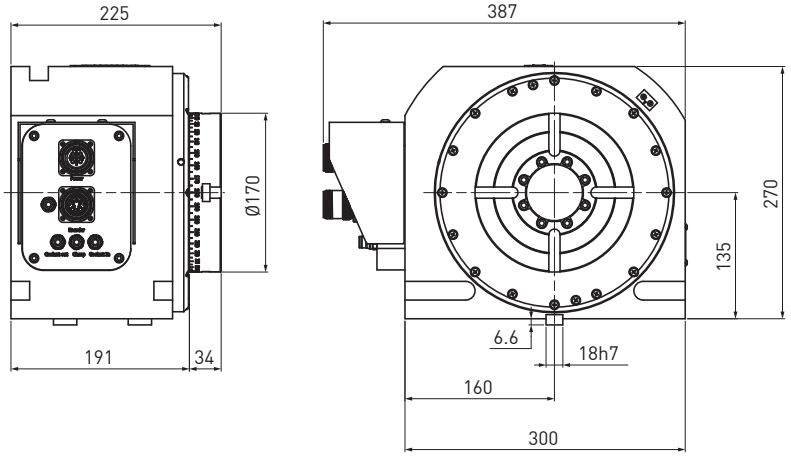
RCV-170 (Natural Cooling)

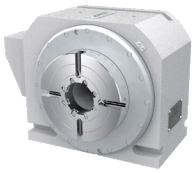
(Unit : mm)



RCV-170 (Water Cooling)

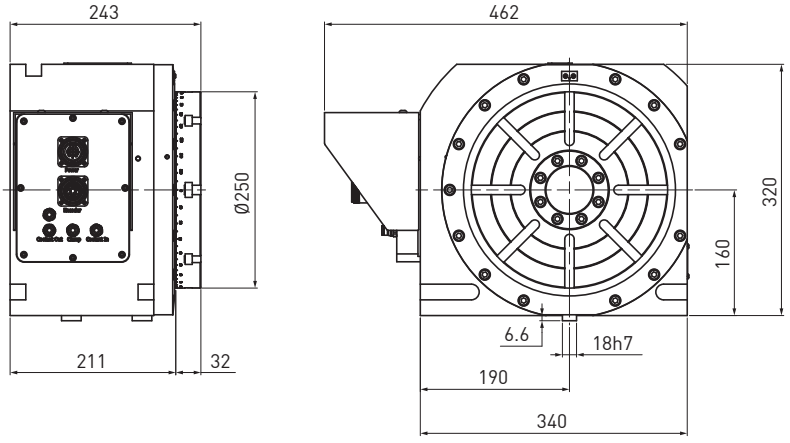
(Unit : mm)

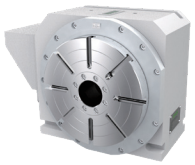




RCV-250 (Water Cooling)

(Unit : mm)





Torque Motor Rotary Table
RCH Series

Features

- Adopts high acceleration, high torque, high accuracy, zero backlash torque motor.
- High dynamic performance positioning rotary table.
- High allowable yaw accuracy.
- Integrated milling, turning and grinding machining.

Applications

- Automotive parts machining, mold machining, appearance inspection equipment, chemical mechanical polishing(CMP), electronic parts machining, etc.

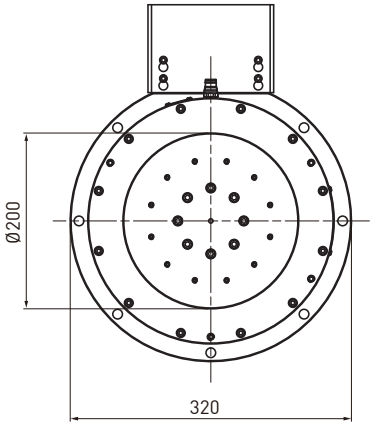
Spec/Model	Unit	RCH-200	RCH-400	RCH-600
Table Diameter	mm	200	400	600
Max. Rotation Speed*2	r.p.m	250	115	100
Continuous Torque	N-m	148	480	1290
Max. Torque	N-m	280	910	2400
Encoder Type*3	-	RESA		
Positioning Accuracy	arc-sec	±5	±5	±5
Repeatability Accuracy	arc-sec	4	4	4
Clamping Type	-	Pneumatic (6 bar)	Hydraulic (70 bar)	
Clamping Torque	N-m	600	2000	3200
Cooling Power	W	1272	3483	7600
Max. Allowable Work Inertia	kg-m²	4.3	14.8	57.7
Net Weight	kg	130	190	430
Allowable Load	kg	100	500	850

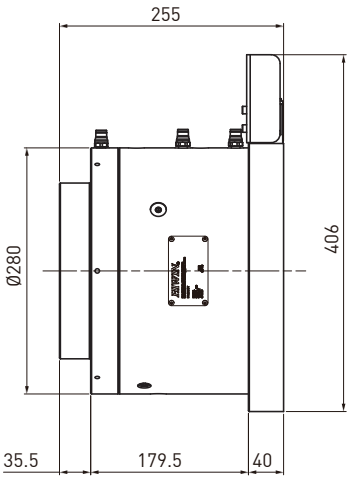
*1：All models in the above table are standard specifications, any special requirements, please contact HIWIN.
*2：The rotation speed will vary depending on the voltage of power supply.
*3：For detailed specifications, please refer to P16 [Angle Measurement System]

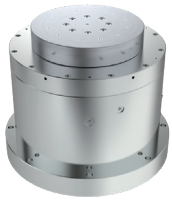
Dimension

RCH-200

(Unit：mm)

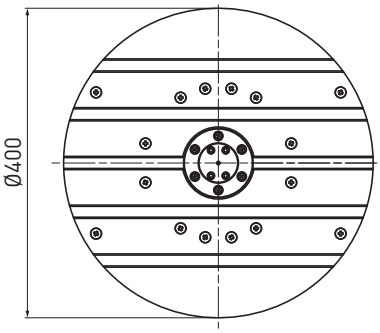


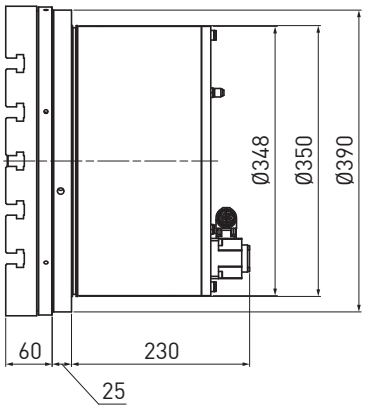




RCH-400

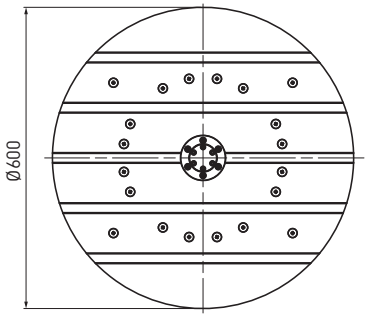
(Unit：mm)

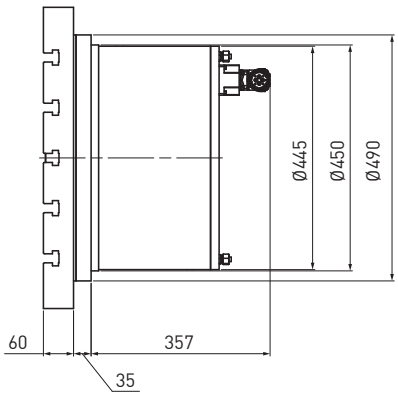




RCH-600

(Unit：mm)





Angle Measurement System(Encoder)

Renishaw, RESA30USA100B		
Model	arc-sec	Note
RA23FAA100B10F(Fanuc, 23bit)	±2.86	ϕ80mm
RA23NAA100B10N(Mitsubishi, 23bit)	±2.86	ϕ80mm
RA26DAA100B10F(Siemens, 26bit)	±2.86	ϕ80mm
RA26BAA100B10A(BiSS, 26bit)	±2.86	ϕ80mm

Heidenhain		
Model	arc-sec	Note
ECA 4412(Heidenhain/Siemens, 27bit)	±2.5	ϕ80mm
ECA 4492F(Fanuc, 27bit)	±2.5	ϕ80mm
ECA 4492M(Mitsubishi, 27bit)	±2.5	ϕ80mm
RCN 2380(Heidenhain/Siemens, 26bit)	±5	ϕ20mm
RCN 2390F(Fanuc, 26bit)	±5	ϕ20mm
RCN 2390M(Mitsubishi, 26bit)	±5	ϕ20mm

Fagor		
Model	arc-sec	Note
HAF-23-D90(Fanuc, 23bit)	±5	ϕ20mm
HAM-23-D90(Mitsubishi, 23bit)	±5	ϕ20mm
HAD-23-D90(Siemens, 23bit)	±5	ϕ20mm

* : Original product model is subject to modification without prior notice

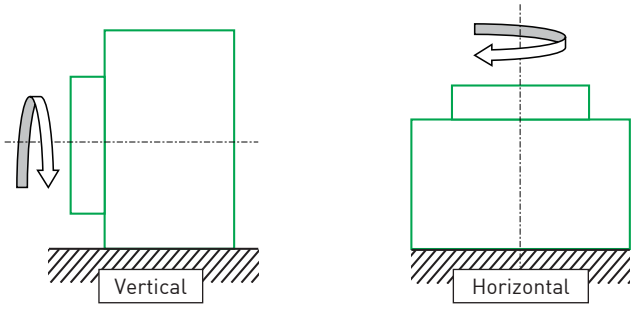
Unit Conversion Table

Item	SI Unit	Gravity Unit	Imperial Unit	Conversion
Max. Rotation Speed	min^{-1} rad/s	rpm	-	$1min^{-1}$ = 1rpm 1 min^{-1}= 2π rad / 60 s
Continuous Torque	N·m	kgf·m	lb-in	1kgf·m = 9.8N·m 1kgf·m = 8.849lb-in
Clamping Torque				
Pneumatic/ Hydraulic	MPa	kgf·/cm2=bar	psi	1kgf·/cm^2 = 1bar = 0.098MPa 1kgf·/cm^2 = 0.007psi

Glossary

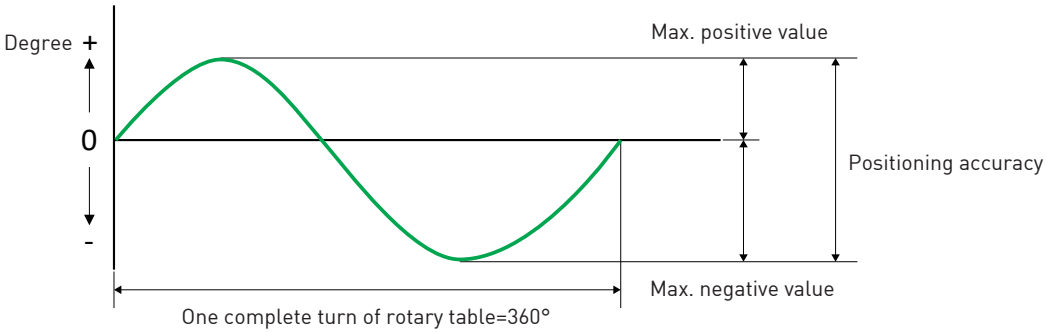
1.Vertical/Horizontal

The vertical rotary table is installed with the table surface perpendicular with the table surface of the machine tool, while the horizontal rotary table is installed with the table surface parallel with the table surface of the machine tool.



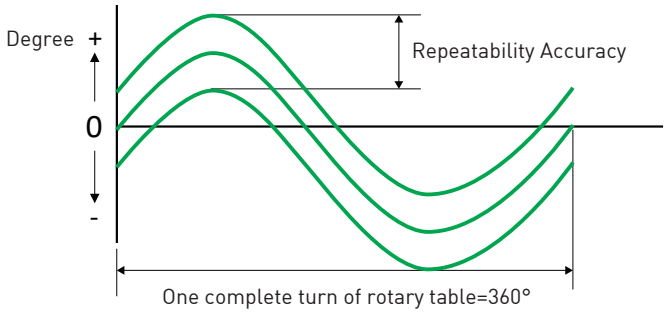
2.Positioning Accuracy

Starting from the reference point of 0 degrees, the rotary table indexing one rotation and the measured value is recorded. The positioning accuracy is the sum of the maximum difference in positive values and negative values



3.Repeatability Accuracy

Positioning at every specific angle is carried out 5 times for clockwise rotation to measure the positioning angle, then obtain the difference between the minimum and maximum values measured at each angular position. The average value between the maximum value and the minimum value is the repeatability of the rotary table.



4.Clamping Torque

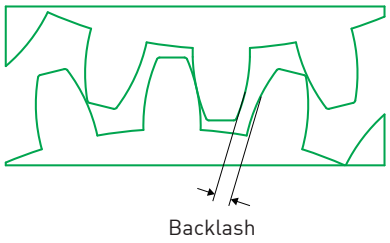
Indicates the clamping force that locks the rotary table mechanism to ensure that the rotary table does not slip off during machining.

5.Allowable Load

The value indicated is the maximum mass that can be carried on the rotary table.

6.Backlash

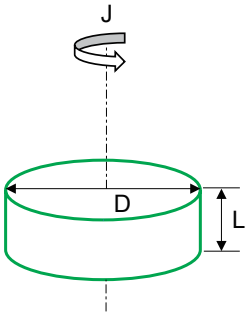
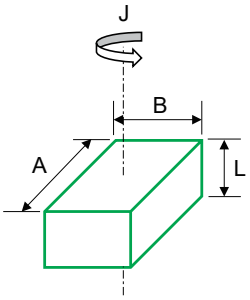
The backlash is the gap between the two workpieces when they are combined and is also called the return difference. For example, there is a backlash in the gear set, which is the gap between the gear tooth.



7.Allowable Work Inertia

Inertia is the amount of load need to against when a static object needs to rotate or a rotating object needs to stop. Inertia is represented by weight and diameter. If the weight of the fixture and workpiece on the table is large, the inertia will be larger and greater acceleration and deceleration torque will be required.

8.Inertia Moment Formula

<table>
<tr>
<td rowspan="2"> 
</td>
<td>$W=\frac{\pi D^2}{4}\times L\rho$</td>
<td rowspan="2"> 
</td>
<td>$W=ABL\rho$</td>
</tr>
<tr>
<td>$J=\frac{WD^2}{8}$</td>
<td>$J=\frac{1}{12}W(a^2+b^2)$</td>
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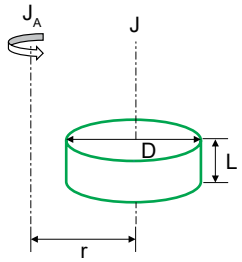
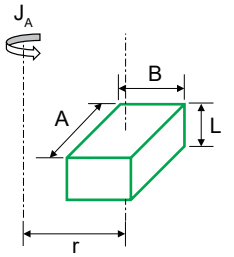
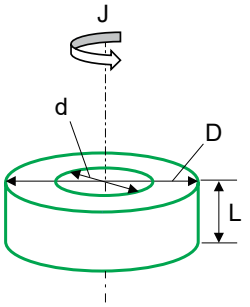
<td rowspan="2"> 
</td>
<td>$W=\frac{\pi D^2}{8}\times L\rho$</td>
<td rowspan="2"> 
</td>
<td>$W=ABL\rho$</td>
</tr>
<tr>
<td>$J=\frac{WD^2}{8}$
$J_A=J\times W\cdot r^2$</td>
<td>$J_A=\frac{1}{12}W(a^2+b^2+12^r)$</td>
</tr>
<tr>
<td rowspan="2"> 
</td>
<td>$W=[\frac{\pi D^2}{4}\times L\rho]-[\frac{\pi d^2}{4}\times L\rho]$</td>
<td rowspan="2">D : Diameter(mm)
L : Length(mm)
W: Mass(kg)
ρ : Density(kg/m^3)
J : Moment of inertia(kgm^2)
J_A : Moment of inertia of the round-bar at the center A(kgm^2)</td>
<td rowspan="2">Densities of the material(ρ)
Copper : 8.94×103 kg/m^3
Brass : 8.5×103 kg/m^3
Cast iron : 7.35×103 kg/m^3
Aluminium : 2.7×103 kg/m^3</td>
</tr>
<tr>
<td>$J=\frac{1}{8}W(D^2+d^2)$</td>
</tr>
</table>

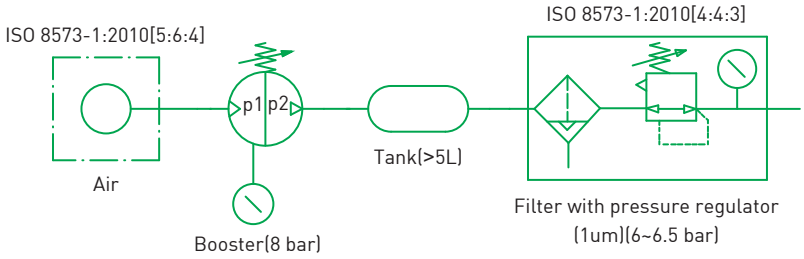
Precautions

1.IP Level

The standard waterproof level of the Torque Motor Rotary Table in the machining area is IP66 [6: Completely dustproof; 6: Water projected in powerful jets (12.5 mm (0.49 in)) against the enclosure from any direction shall have no harmful effects]. If a waterproof level above IP66 is needed, please contact HIWIN.

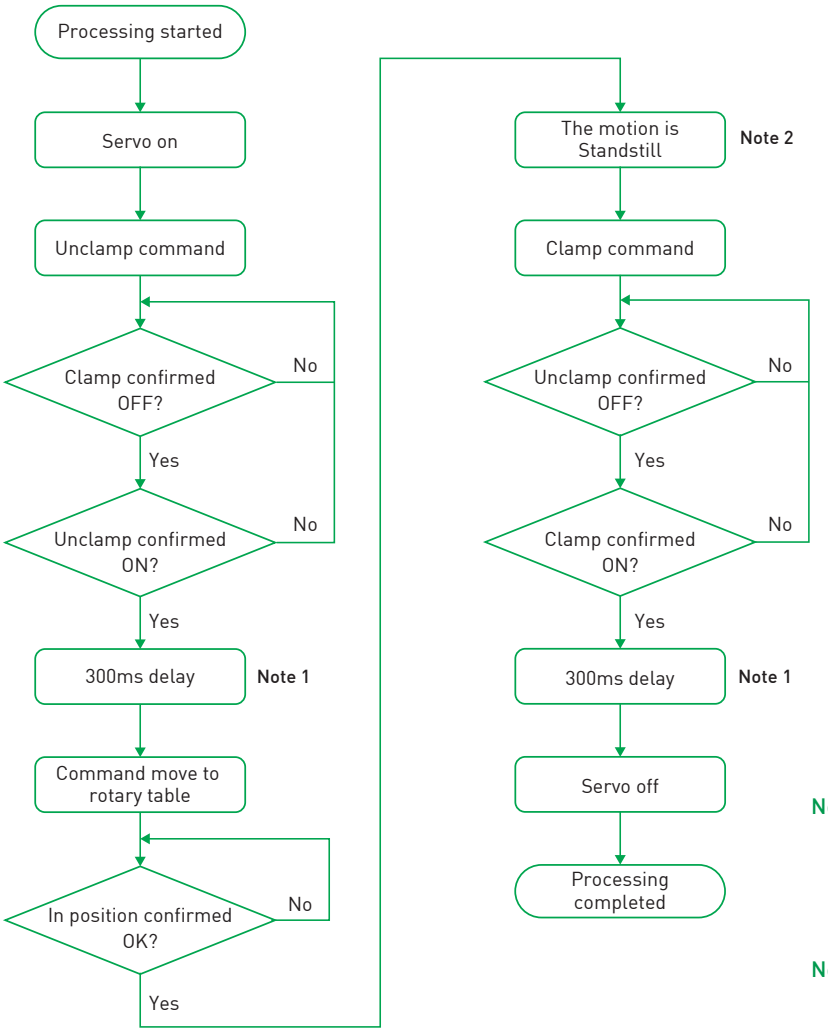
2.About the Pneumatic Components and Air Purity

If the pneumatic clamping system is used on the HIWIN Torque Motor Rotary Table, it needs to be equipped with the pneumatic components to provide sufficient air pressure for the normal operation of the clamping system. The purity of the air supply must be in accordance with the ISO standard indicated in the clamp circuit diagram to ensure that the electronic components inside the rotary table will not malfunction or rust due to moisture from the air supply.



3.Time Sequence for Clamping System

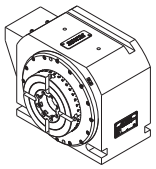
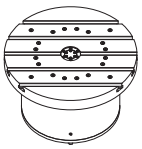
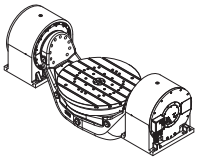
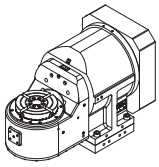
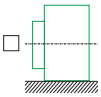
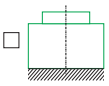
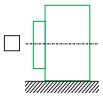
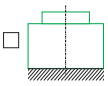
The time sequence for clamping system must be programmed according to the flowchart as shown in the figure below to prevent the damage of the torque motor and clamping system.



Note 1：The delay time here is recommended value. It may differ with different parameters or specification.

Note 2：The velocity is equal to zero.

Torque Motor Rotary Table Selection Guide

Company Name*1		Industry*1		Date	
Specification of the Machine*1	Machine	Brand Name：		Model No.：	
	Controller	☐ HEIDENHAIN ☐ SIEMENS ☐ MITSUBISHI ☐ FANUC ☐ Other _____			
	Driver Interface	☐ Cable ☐ EtherCAT ☐ Pulse ☐ Analog ☐ Other _____			
	Driven Voltage*3	☐ 220V	☐ 380V	☐ Other _____	
	Demand of Rotary Table	☐ New machine ☐ Machine upgrade or retrofit： The brand or model of rotary table used in the past _____			
	Machining Type	☐ Milling ☐ Turning ☐ Grinding ☐ EDM ☐ Inspection Equipment ☐ Automation Equipment ☐ Other _____			
	Machining Application	☐ Index ☐ Simultaneous			
Schematic diagram					
Type*1		☐ RCV	☐ RCH	☐ RAB	☐ RAS
Installation Type*1		☐  ☐ 	☐  ☐ 	-	-
Table Diameter*1		☐ 170 mm ☐ 250 mm ☐ Other _____ mm	☐ 200 mm ☐ 400 mm ☐ 600 mm ☐ Other _____ mm	☐ 200 mm ☐ 500 mm ☐ 630 mm ☐ 800 mm ☐ Other _____ mm	☐ 170 mm ☐ 650 mm ☐ Other _____ mm
Positioning Accuracy/ Repeatability*1		☐ ±5"/4" ☐ ±15"/8" ☐ Other _____	☐ ±5"/4" ☐ Other _____	☐ ±5"/4" ☐ Other _____	☐ ±5"/4" ☐ Other _____
Workpiece Specifiation		Workpiece weight: _____ kg ; Workpiece size: _____ mm ; Workpiece inertia: _____ kgm^2			

Machining and Motion Condition*1		
Machining Condition		Motion Condition
☐ Milling Workpiece material： _____ Spindle rotation speed： _____ rpm Cutting tool diameter： _____ mm Flutes： _____ Feed rate： _____ mm/min Cutting depth： _____ mm Cutting width： _____ mm	☐ Drilling and tapping Drill diameter： _____ mm Tapping specifications： _____ Spindle rotation speed： _____ rpm Feed rate： _____ mm/min	Cycle time： _____ Dwell time： _____ Acceleration/ deceleration time： _____

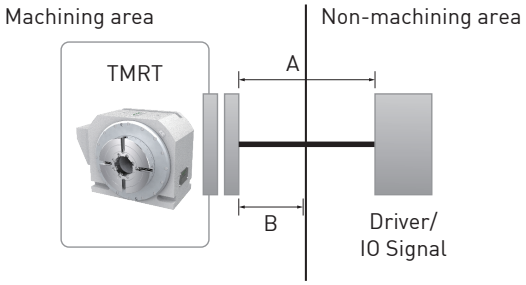
*1：Required *2：Please refer to the second page for the selection of accessories
*3：Voltage will affect the maximum speed of the rotary table

Torque Motor Rotary Table Selection Guide(2)

Torque Motor Rotary Table Accessories

1.Cable ■ Require ■ No require *if require, please fill in the following options

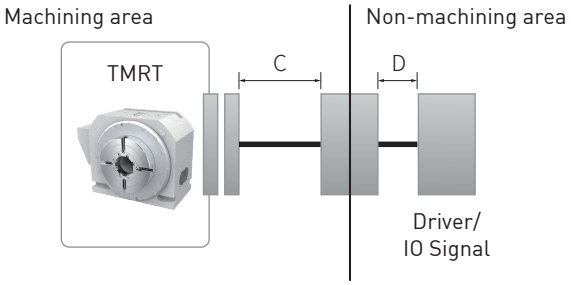
☐ Type 1



A：Power cable, Signal cable, Encoder cable (TMRT to driver)
☐ 3m ☐ 6m ☐ 9m ☐ 12m

B：Protective tube (Stainless steel wire hose)_____m

☐ Type 2[*4]

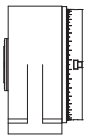


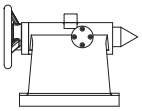
C：Cable from TMRT to machine metal sheet
(including protective tube)
Power cable, Signal cable, Encoder cable
☐ 1.5m ☐ 2m ☐ 3m ☐ 4m

D：Cable from machine metal sheet to driver
(not include protective tube)
Power cable, Signal cable, Encoder cable
☐ 3m ☐ 6m ☐ 9m ☐ 12m ☐ None

Connector type on the sheet metal
☐ Military ☐ HARTING

2.Tailstock ■ Require ■ No require *Only for RCV series, if require, please fill in the following options

☐ Rotary tailstock 

☐ Tailstock 

3.Pneumatic components ■ Require ■ No require *If require, please fill in the following options

Pneumatic Module	☐ Require ☐ No require (Connectors required for pneumatic components are included)		
Optional Accessories	☐ Require ☐ No require (Connectors required for pneumatic components are included)		
Booster[*5] (Example model：SMC,VBA10A-02GN)	☐ Require ☐ No require	Connector	☐ Require ☐ No require
Tank[*5] (Example model：SMC,VBAT05S1-V)	☐ Require ☐ No require	Connector	☐ Require ☐ No require
Filter with pressure regulator[*5] (Example model：SMC,AC30D-02CE-6-D)	☐ Require ☐ No require	Connector	☐ Require ☐ No require
Solenoid valve[*5] (Example model：SMC,SY5120-5LZE-02-F2,five-way two position) (Example model：SMC,SY5420-5LZE-02-F2,five-way two position)	☐ Require ☐ No require	Connector	☐ Require ☐ No require
Check valve[*5] (Example model：SMC,AKH08B-02S)	☐ Require ☐ No require		
Pressure sensor[*5] (Example model：SMC,ISE20A-Y-01-J)	☐ Require ☐ No require		
Rapid exhaust valve[*5] (Example model：SMC,AQ1510-01)	☐ Require ☐ No require		

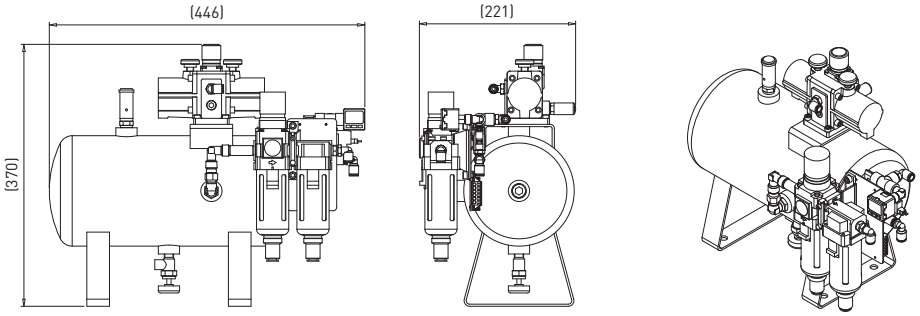
*4：Customer's machine metal sheet must perforate *5：No notification if the model of the original product is modified

Torque Motor Rotary Table Selection Guide(3)

Schematic diagram of pneumatic components

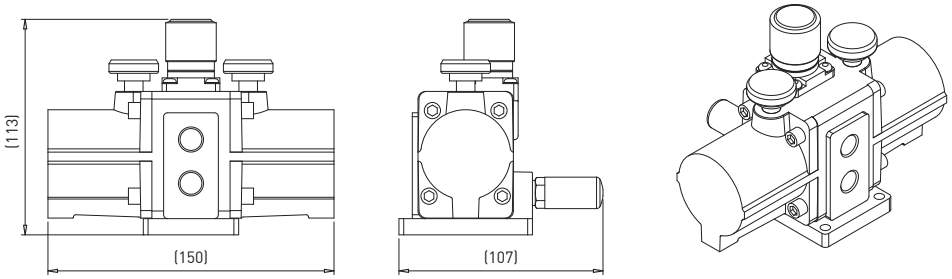
Pneumatic Components Module

Air in: ϕ8mm
Air out: ϕ8mm



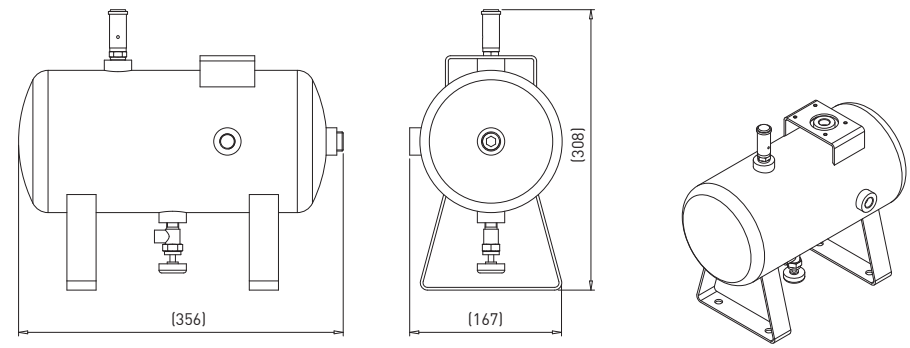
Booster

*6Air in:PT1/4× ϕ10mm
Air out:PT1/4× ϕ10mm



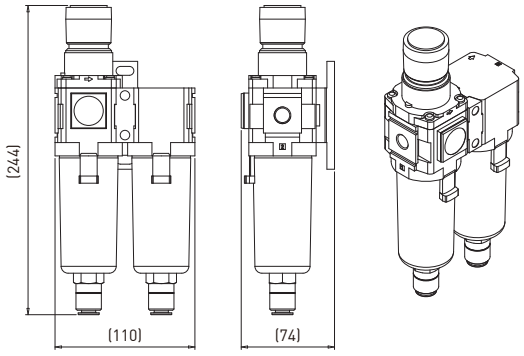
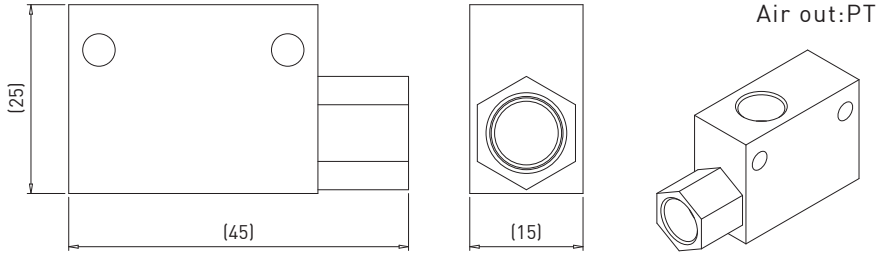
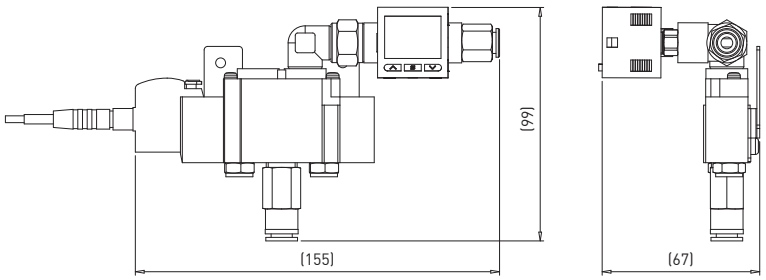
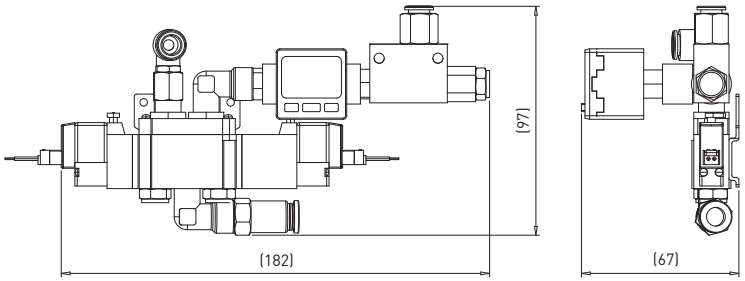
Tank

*6Air in:PT3/8× ϕ8mm
Air out:PT3/8× ϕ8mm



*6 Please refer to the second page of the selection table for corresponding connectors.

Torque Motor Rotary Table Selection Guide(4)

Schematic diagram of pneumatic components	
Filter with pressure regulator	 *6Air in:PT1/4×φ8mm Air out:PT1/4×φ8mm
Rapid exhaust valve	 *6Air in:PT1/4×φ8mm Air out:PT1/4×φ8mm
Solenoid Valve Module(Solenoid valve+Check valve+Pressure sensor)	
No.of port: 5, No.of position: 2	
	 *6Air in:φ8mm Air out:φ8mm
No.of port: 5, No.of position: 3	
	 *6Air in:φ8mm Air out:φ8mm

*6 Please refer to the second page of the selection table for corresponding connectors

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