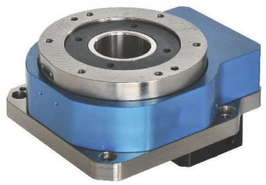
INOTEK

Hollow Rotary Actuator

ZK



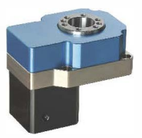
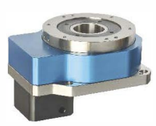


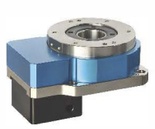
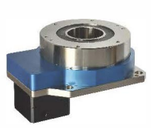


- Working objects can be locked directly
  The rotating disk surface can directly lock the working objects, and therefore improve the convenience of the workpiece transfer.
- Wiring convenience
  Featured with a hollow design, the rotating platform is convenient for wiring or piping.

- Alternative D.D motor and cam splitter

Straight lines motions and circular motions are two kinds of mechanical movements. Linear motion are mainly based on various types of slides, while circular motions are the most representative motion of cam indexers. And due to the maturity of technology and the accuracy requirement of equipment, D.D motor is becoming more and more popular. However, the traditional splitter has been unable to meet the needs of any segmentation. Though D. D Motor can be applied in multiple ways and with high precision, its high price is the main factors that make user reconsider. ZK series hollow rotating table has successfully got a balance between the cam indexers and D.D motor. It fills the functional requirements that not only can greatly reduce the cost of D.D Motor, but also can meet the high-precision and digital control that the cam divider can't provide.

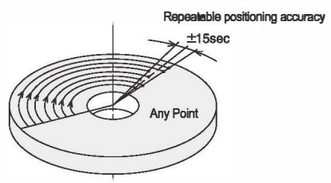



ZK60–5–5A　ZK100–8　ZK130–10　ZK200–10　ZK275–10

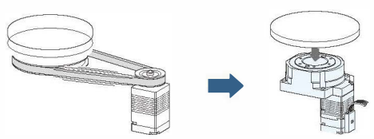
- High positioning accuracy. Repeatable positioning accuracy is ± 15 sec and idling accuracy is 2 min

Ultra-precision machined gears are used in the speed reduction mechanism to eliminate the backlash through its own adjustment mechanism, thus there will be no backlash in the part of mechanism. As repeated positioning accuracy is ±15 sec in one direction and idling precision is 2 min in two directions, positioning with high accuracy is possible.



- Direct connection – simple design enhances trust

The worktable and robot arm of the equipment can be installed directly on the hollow output platform. When the general equipment positions and operates by means of pulleys and other mechanical parts. It is mostly affected by the transmission efficiency of the mechanical parts and therefore the accuracy is reduced, or there is a need to maintain the parts of the mechanism. While the ZK series hollow rotary actuators can be installed directly without intermediate parts. Therefore, in addition to the direct use of the accuracy of the actuator itself, maintenance can be avoided.



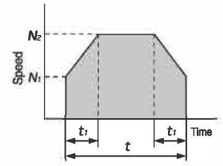
Calculation of Selection

Pre-calculation should be done in order to select suitable products of equipment. The introduction of calculation methods of the ZK series are as follow.

The calculation of the necessary torque

1 Firstly, calculate the inertia of the working object.
  The work inertia should be under the 30 times of the inertia of the transmission equipment.
2 Determine the positioning angle
3 If there is no friction torque, please refer to the positioning time chart of ZK series to confirm the positioning time.
4 Determine the positioning time and acceleration and deceleration time.
  Observe the following two conditions:
  Positioning time ⩾ Calculating the shortest positioning time according to the positioning time chart.
  Time of acceleration and deceleration t x 2 ⩽ Positioning time
5 Determine the start speed N1, then calculate the speed N2 according to the following formula. Please set N1 to low speed 0~ number r/min]. Be careful not to set it too large.

$$N_2\,[\mathrm{r/min}] = \frac{\theta - 6N_1 t_1}{6(t - t_1)}$$



N_2 : Speed (r/min) [r/min]
θ : Positioning angle[°]
N_1 : Start speed[r/min]
t : Positioning time [s]
t_1 : Acceleration (deceleration) time [s]

If the result calculated by the above formula can not satisfy the condition of N1 < N2 <⩽200 (r/min), please return to procedure 4 and confirm the conditions again.

6 Calculate the acceleration torque according to the following formula

$$\text{Acceleration torque } Ta[\mathrm{N\cdot m}] = (J_1 + J_L) \times \frac{\pi}{30} \times \frac{(N_2 - N_1)}{t}$$

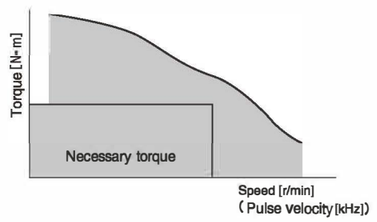
J_1 : Inertia of a rotating drive [kg·m²]
J_L : Inertia [kg·m²]
N_2 : [r/min]
N_1 : Starting speed [r/min]
t_1 : Acceleration (deceleration) time [s]

7 Calculate the necessary torque, the necessary torque is the load torque caused by the friction impedance plus the acceleration torque caused by the inertia, and then multiplied by the safety factor.

$$\text{Necessary torque} = (\text{Load torque } [\mathrm{N\cdot m}] + \text{Acceleration torque } [\mathrm{N\cdot m}]) \times \text{Safety factor} = (T_L + Ta) \times S$$

Please set safety factor S above 1.5.

8 Verify that the necessary torque T is included in the range of speed and torque characteristics. If not, please turn back to step 4, then change the conditions and recalculate.



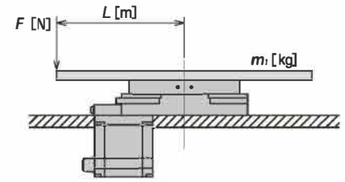
In addition, when the speed is converted to the pulse speed, please calculate the following the below formula.

$$f\,[\mathrm{Hz}] = \frac{6N}{\theta s}$$

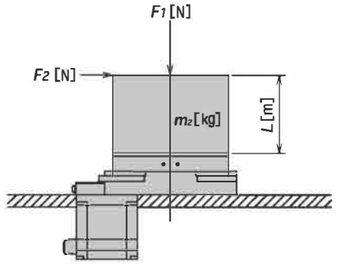
f : Pulse velocity [Hz]
N : speed [r/min]
θs : The step angle of the rotating platform[° /step]

The calculation method of the steering load and the inertia load

As shown below, when the load is loaded on the rotary platform, please calculate the axial load and mass load according to the formula below, and confirm whether it is within the specification value.



Axial load [N]　$Fs = F + m_1 \times g$
Inertial load [N·m]　$M = F \times L$

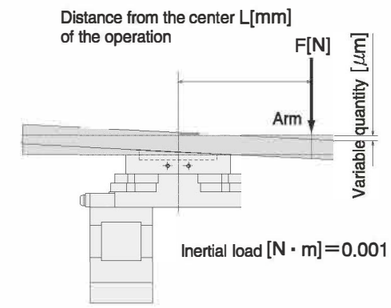


Product Name	a
ZK–60	0.01
ZK–100	0.02
ZK–130	0.03
ZK–200	0.04
ZK–275	0.05

$Fs = F_1 + m_2 \times g$
$M = F_2 \times (L + a)$

Variable quantity (reference value) caused by an inertial load

When attaching the inertia load to the rotating platform, the position will change. The variable quantity in the chart shows the change of inertia load on the L position of the center of rotation from the rotating platform to a fixed direction. If the inertia load acts on the positive and negative two directions, the variable quantity will be about 2 times.



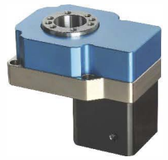
Inertial load [N · m] = 0.001 × F × L

INOTEK

Model Identification

ZK — 60 — R — 5 — 5A

ZK	60	R	5	5A
Hollow Rotating Series	Specifications	Optional	Ratio	Motor



Weight: 2kg

R: Right angle steering deceleration F: with motor connection seat	V1: Servo Ø8 PCD45,M3 V2: Servo Ø8 PCD46,M4	T1: Stepper Ø5 PCD43.8, M3 T2: Stepper Ø6 PCD43.8, M3 5A: 42H5K–2A
	100W AC servo motor for each brand	42 stepper motor for each brand

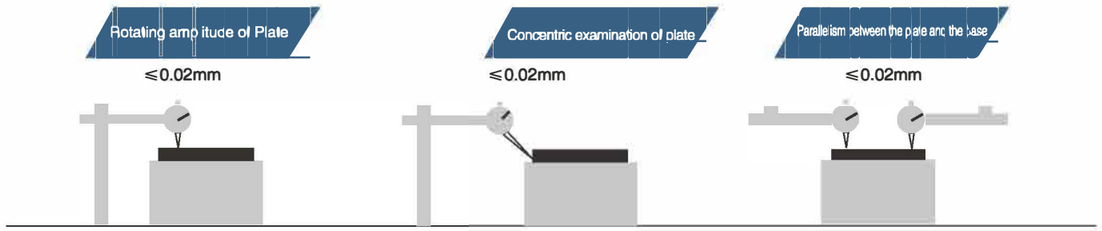
Specification

Model	ZK60	ZK60R
Bearing of rotate table	Deep groove ball+Thrust ball bearing	
Allowable torque (N.m)	5	
Precision lifetime	15000Hrs	
Allowable speed (rpm)	200(Plate)	
Ratio	5	15
Repeated accuracy(arc–sec)	≤15	≤20
Positioning accuracy(arc–min)	≤1	≤1
Parallelism of rotate plate(mm)	≤0.02	
Coaxiality of rotate plate(mm)	≤0.02	
Protection Class	IP40	

P.S: Circumferential unit：1 rpm=360°　1°　=60'(arc–min)　1'=60"(arc–sec)
Circumferential error conversion linear error:Disc diameter × 3.14159 ÷ (360°　× 60' × 60")The value of backlash

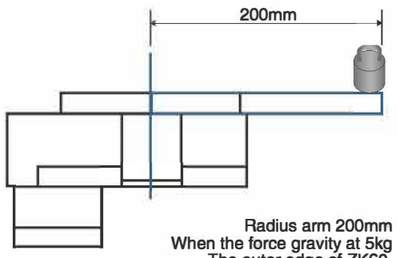
Positioning Accuracy Examination

The accuracy of this specification is tested by this ratio



Positioning precision radius of any point of outer diameter 19mm≤1min

Precision radius of repeated positioning 19mm≤15sec

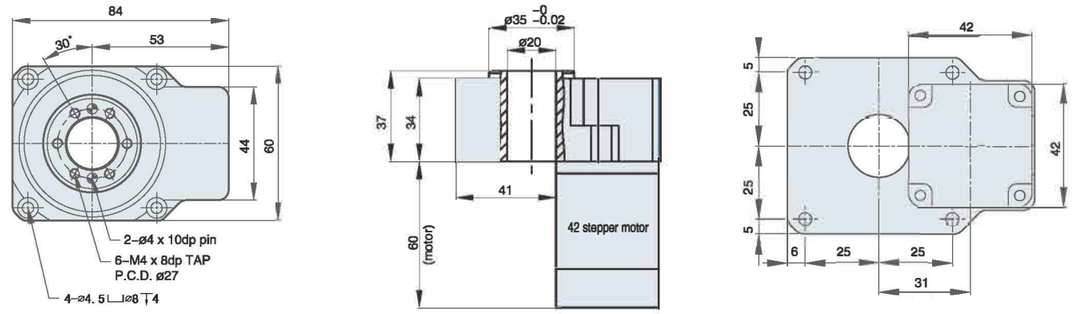


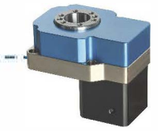
Radius arm 200mm
When the force gravity at 5kg
The outer edge of ZK60
was measured ≤0.02mm

Dimensions Unit:mm

ZK60–5–5A

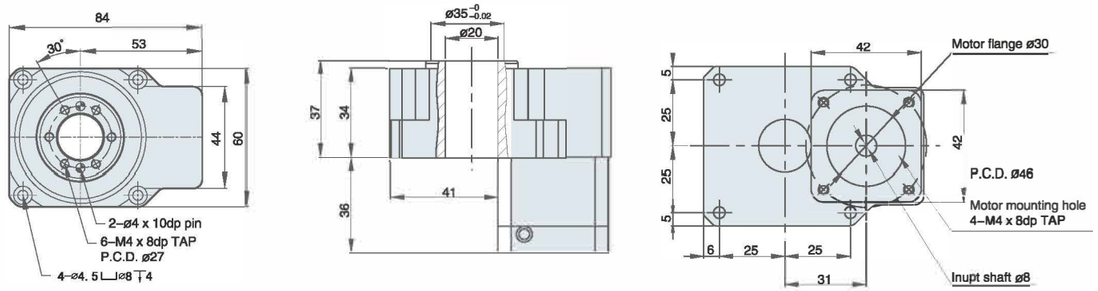
(This model contains stepper motor 42H5K–2A)

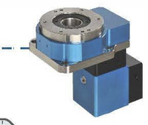




ZK60F–5

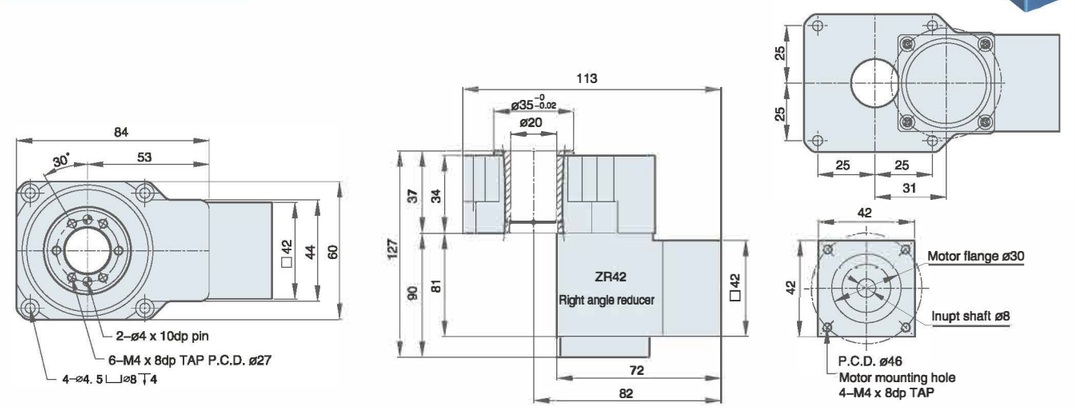
(A self assembled motor with a connecting seat)





ZK60R–15

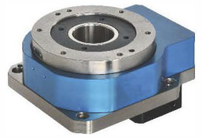
(Right angle steering 1:15)



※ Please provide the size of the motor flange when ordering
P.S：Origin Sensor specification (selection) OMRON EE–SX672

iNOTEK

Model Identification



ZK — 100 — R — 8 — V2

Hollow Rotating Series	Specifications	Optional	Ratio	Motor
ZK	100	R	8	V2

Weight: 2.5kg

R：Right angle steering deceleration
P：Attached planetary reducer

V1: Servo Ø14 PCD70 M4 V2: Servo Ø14 PCD70 M5	T1: Stepper Ø8 PCD66.67,M4 T2: Stepper Ø8 PCD70,M4 T3: Stepper Ø10 PCD70,M4
200~400W AC servo motor for each brand	60 stepper motor for each brand

Specification

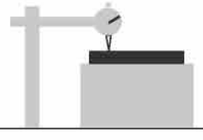
Model	ZK100	ZK100R	ZK100P
Bearing of rotate table	Tapered roller bearing		
Allowable torque (N.m)	45		
Precision lifetime	20000Hrs		
Allowable speed (rpm)	200(Plate)		
Ratio	8	16,24	24,32,40
Repeated accuracy(arc-sec)	≤10	≤20	≤60
Positioning accuracy(arc-min)	≤1	≤1	≤2
Parallelism of rotate plate(mm)	≤0.02		
Coaxiality of rotate plate(mm)	≤0.015		
Protection Class	IP40		

P.S: Circumferential unit：1 rpm=360° 1° =60'(arc-min) 1'=60"(arc-sec)
Circumferential error conversion linear error:Disc diameter × 3.14159 ÷ (360° × 60' × 60")The value of backlash

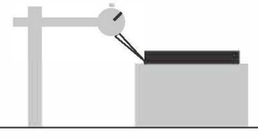
Positioning Accuracy Examination

The accuracy of this specification is tested by this ratio

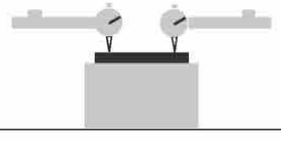
Rotating amplitude of Plate
≤0.005mm

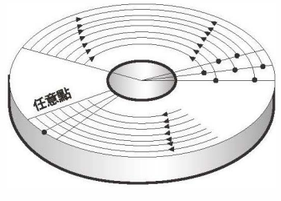


Concentric examination of plate
≤0.015mm



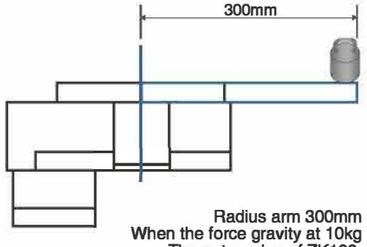
Parallelism between rotate plate and rotate base
≤0.02mm





Positioning precision radius of any point of outer diameter 50mm≤1min

Precision radius of repeated positioning 50mm≤10sec

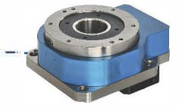


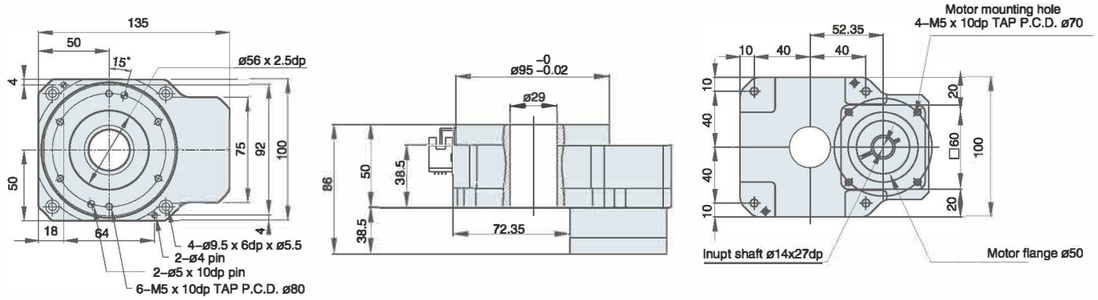
Radius arm 300mm
When the force gravity at 10kg
The outer edge of ZK100
was measured ≤0.01mm

Dimensions Unit:mm

ZK 100

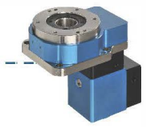
(A self assembled motor with a connecting seat)

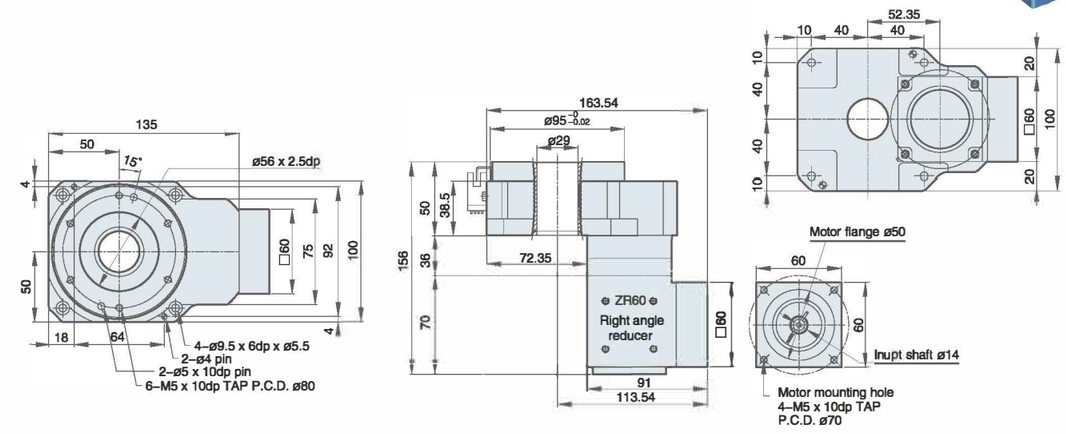




ZK 100R

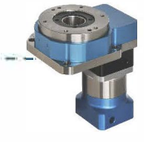
(Right angle steering 1:16)

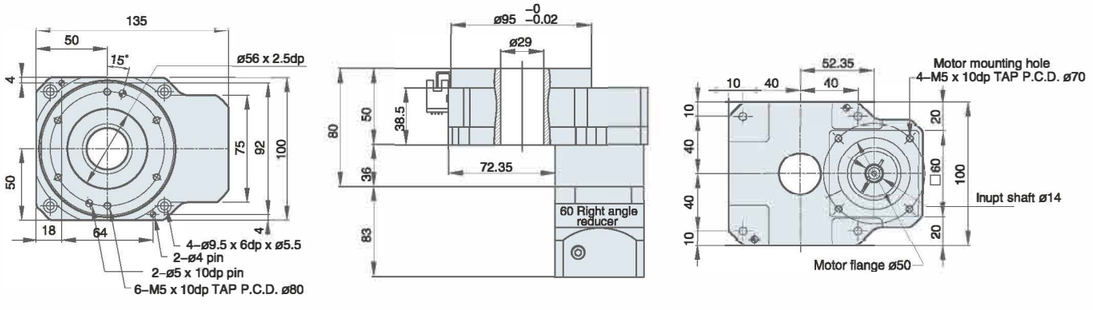




ZK 100P

(Attached planetary reducer ratio 24,32,40)





※ Please provide the size of the motor flange when ordering
P.S：Origin Sensor specification (selection) OMRON EE-SX672

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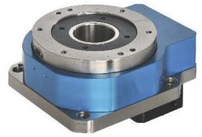
Model Identification



ZK — 130 — R — 10 — V2

Hollow Rotating Series	Specifications	Optional	Ratio	Motor

Weight:4.5kg

R: Right angle steering deceleration
P: Attached planetary reducer

V1: Servo Ø14 PCD70 M4 V2: Servo Ø14 PCD70 M5	T1: Stepper Ø8 PCD66.67,M4 T2: Stepper Ø8 PCD70,M4 T3: Stepper Ø10 PCD70,M4
200~400W AC servo motor for each brand	60 stepper motor for each brand

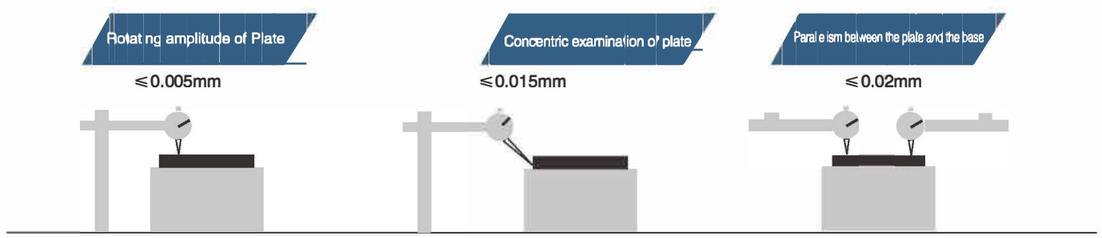
Specification

Model	ZK130	ZK130R	ZK130P
Bearing of rotate table	Tapered roller bearing		
Allowable torque (N.m)	45		
Precision lifetime	20000Hrs		
Allowable speed (rpm)	200(Plate)		
Ratio	10	20,30	30,40,50
Repeated accuracy(arc-sec)	≤10	≤20	≤60
Positioning accuracy(arc-min)	≤1	≤1	≤2
Parallelism of rotate plate(mm)	≤0.02		
Coaxiality of rotate plate(mm)	≤0.015		
Protection Class	IP40		

P.S: Circumferential unit：1 rpm=360°　1°　=60'(arc-min)　1'=60"(arc-sec)
Circumferential error conversion linear error:Disc diameter × 3.14159 ÷ (360°　× 60' × 60")The value of backlash

Positioning Accuracy Examination

The accuracy of this specification is tested by this ratio

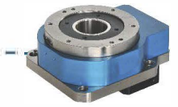


Positioning precision radius of any point of outer diameter 60mm≤1min

Precision radius of repeated positioning 60mm≤10sec

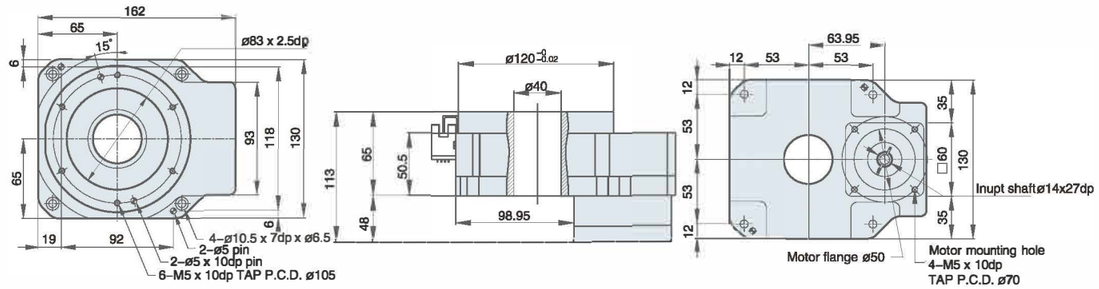
Radius arm 300mm
When the force gravity at 15kg
The outer edge of ZK130
was measured ≤0.01mm

Dimensions　Unit:mm



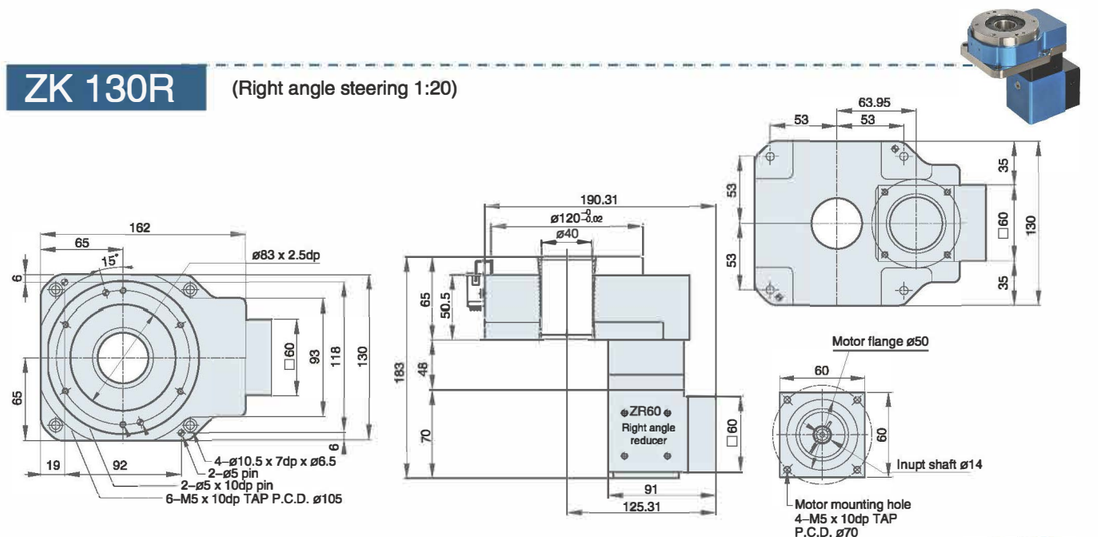
ZK 130

(A self assembled motor with a connecting seat)



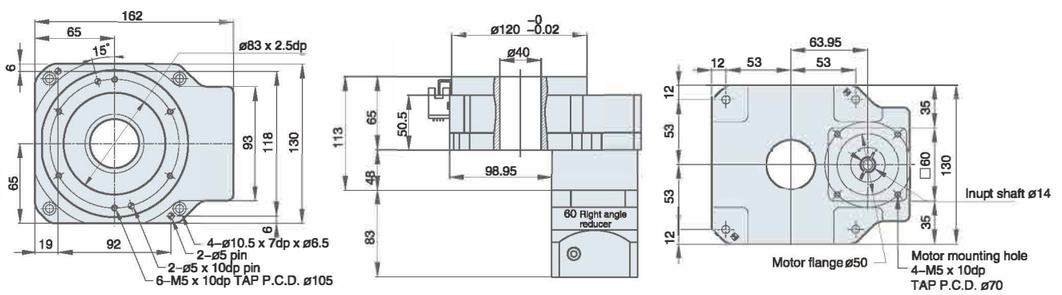
ZK 130R

(Right angle steering 1:20)



ZK 130P

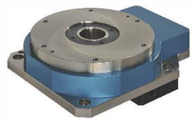
(Attached planetary reducer ratio 30,40,50)



※ Please provide the size of the motor flange when ordering
P.S：Origin Sensor specification (selection) OMRON EE-SX672

iNOTEK

Model Identification



ZK — 200 — R — 10 — V2

ZK	200	R	10	V2
Hollow Rotating Series	Specifications	Optional	Ratio	Motor

Weight:11.5kg

R: Right angle steering deceleration P: Attached planetary reducer	

V1: Servo Ø19 PCD90 M5 V2: Servo Ø19 PCD90 M6	T1: Stepper Ø14 PCD98.4, M5
750W AC servo motor for each brand	86 stepper motor for each brand

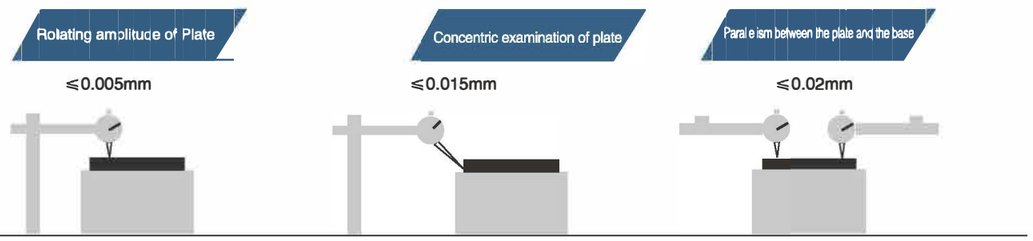
Specification

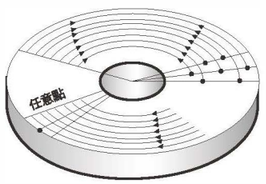
Model	ZK200	ZK200R	ZK200P
Bearing of rotate table	Tapered roller bearing		
Allowable torque (N.m)	80		
Precision lifetime	20000Hrs		
Allowable speed (rpm)	200(Plate)		
Ratio	10	20,30	30,40,50
Repeated accuracy(arc-sec)	≤10	≤20	≤60
Positioning accuracy(arc-min)	≤1	≤1	≤2
Parallelism of rotate plate(mm)	≤0.02		
Coaxiality of rotate plate(mm)	≤0.015		
Protection Class	IP40		

P.S: Circumferential unit: 1 rpm=360° 1° =60'(arc-min) 1'=60"(arc-sec)
Circumferential error conversion linear error:Disc diameter × 3.14159 ÷ (360° × 60' × 60")The value of backlash

Positioning Accuracy Examination

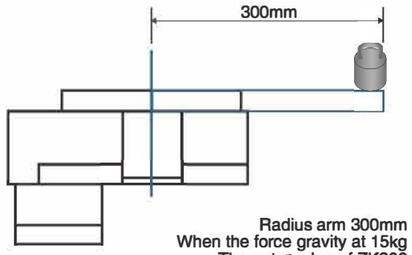
The accuracy of this specification is tested by this ratio





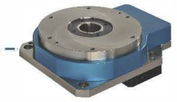
Positioning precision radius of any point of outer diameter 100mm≤1min

Precision radius of repeated positioning 100mm≤10sec



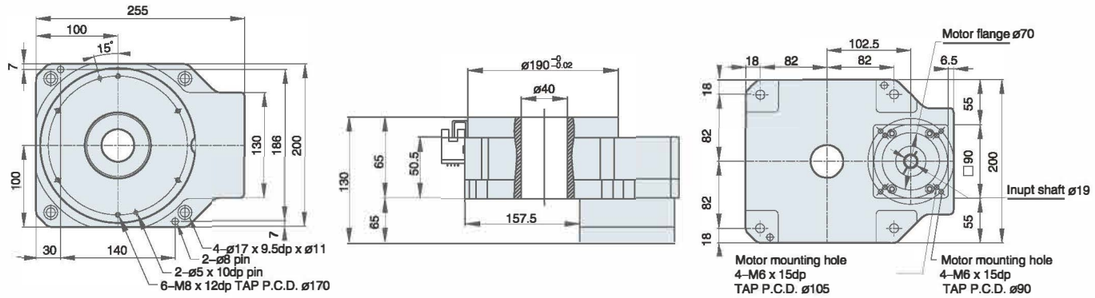
Radius arm 300mm
When the force gravity at 15kg
The outer edge of ZK200
was measured ≤0.01mm

Dimensions Unit:mm



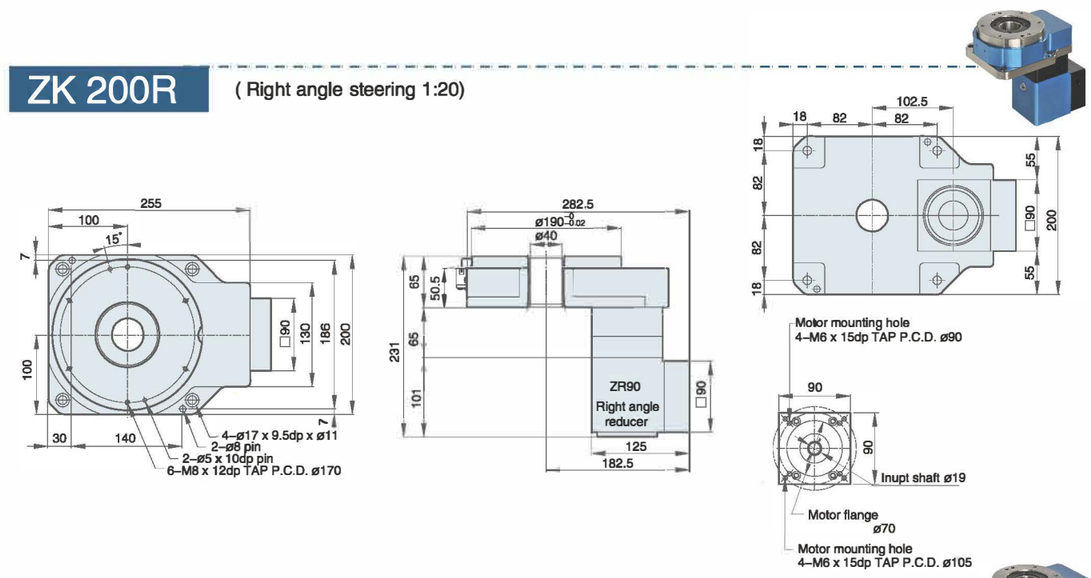
ZK 200

(A self assembled motor with a connecting seat)



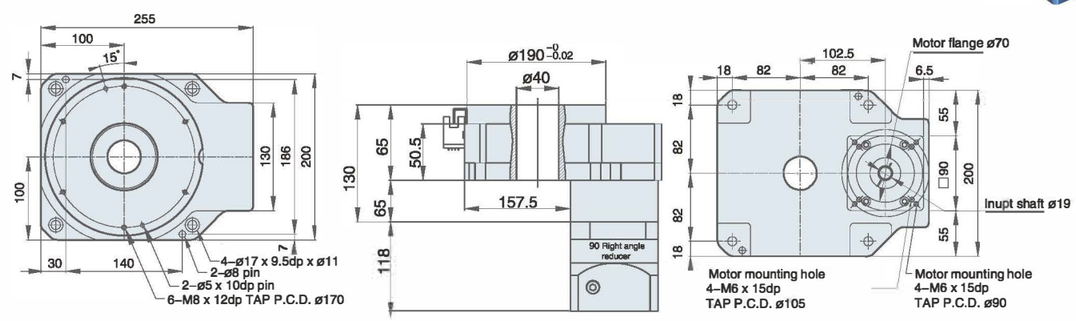
ZK 200R

(Right angle steering 1:20)



ZK 200P

(Attached planetary reducer ratio 30,40,50)

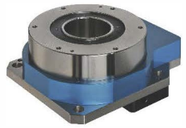


※ Please provide the size of the motor flange when ordering

P.S: Origin Sensor specification (selection) OMRON EE-SX672

iNOTEK

Model Identification



ZK — 275 — R — 10 — V2

Hollow Rotating Series	Specifications	Optional	Ratio	Motor

Weight:16kg

Optional
R: Right angle steering deceleration P: Attached planetary reducer

Motor	
V1: Servo Ø19 PCD90 M5 V2: Servo Ø19 PCD90 M6	T1: Stepper Ø14 PCD98.4, M5
750W AC servo motor for each brand	86 stepper motor for each brand

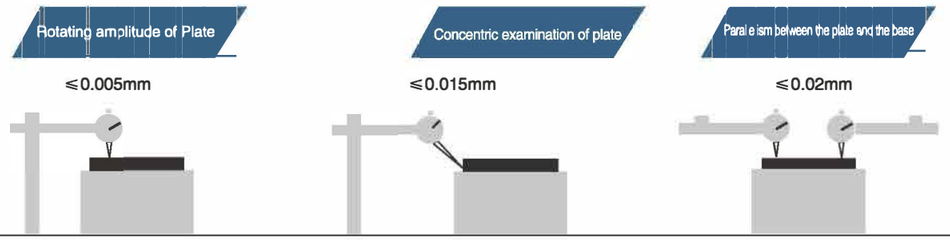
Specification

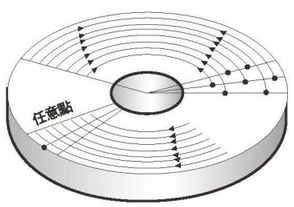
Model	ZK275	ZK275R	ZK275P
Bearing of rotate table	Tapered roller bearing		
Allowable torque (N.m)	80		
Precision lifetime	20000Hrs		
Allowable speed (rpm)	200(Plate)		
Ratio	10	20,30	30,40,50
Repeated accuracy(arc-sec)	≤10	≤20	≤60
Positioning accuracy(arc-min)	≤1	≤1	≤2
Parallelism of rotate plate(mm)	≤0.02		
Coaxiality of rotate plate(mm)	≤0.015		
Protection Class	IP40		

P.S: Circumferential unit：1 rpm=360°　1°　=60'(arc-min)　1'=60"(arc-sec)
Circumferential error conversion linear error:Disc diameter × 3.14159 ÷ (360°　× 60' × 60")The value of backlash

Positioning Accuracy Examination

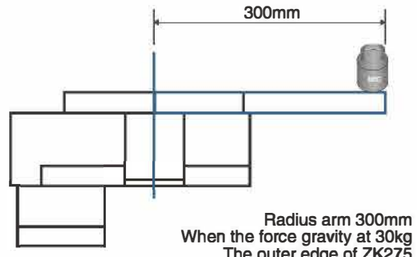
The accuracy of this specification is tested by this ratio





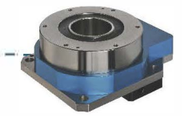
Positioning precision radius of any point of outer diameter 100mm≤1min

Precision radius of repeated positioning 100mm≤10sec



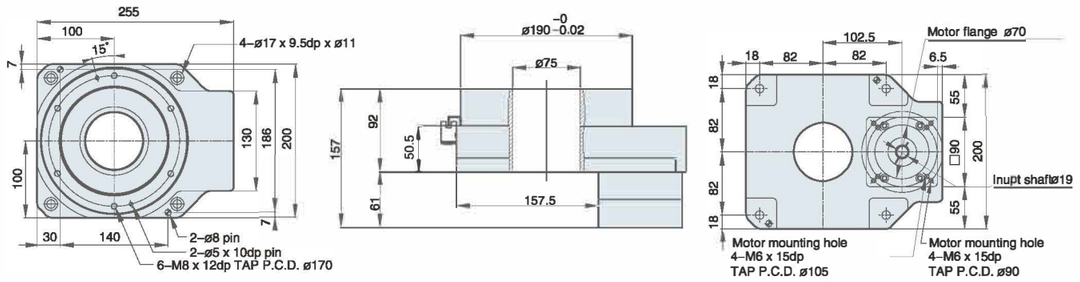
Radius arm 300mm
When the force gravity at 30kg
The outer edge of ZK275
was measured ≤0.01mm

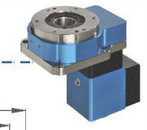
Dimensions Unit:mm



ZK 275

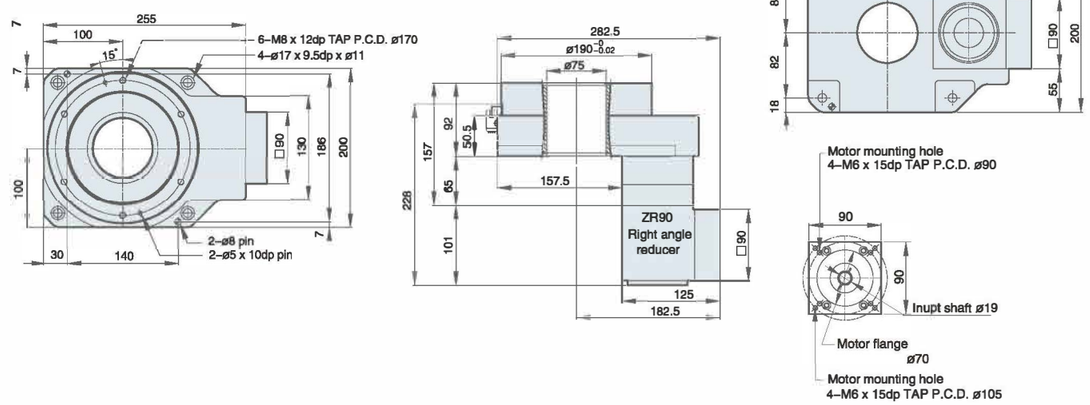
(A self assembled motor with a connecting seat)

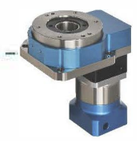




ZK 275R

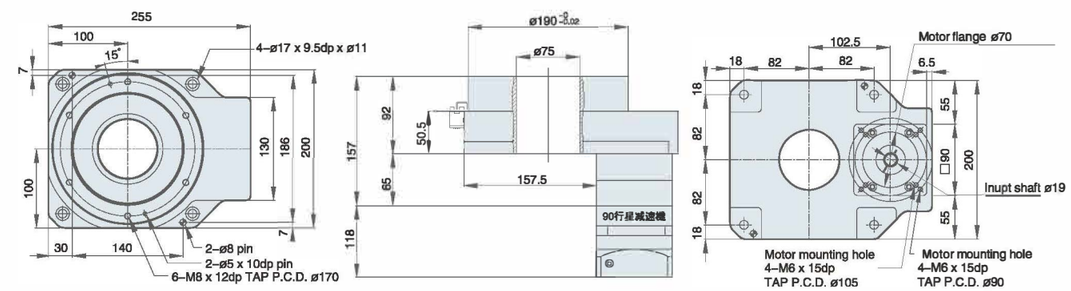
(Right angle steering 1:20)





ZK 275P

(Attached planetary reducer ratio 30,40,50)



※ Please provide the size of the motor flange when ordering

P.S：Origin Sensor specification (selection) OMRON EE-SX672

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