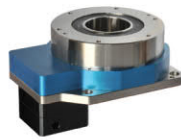
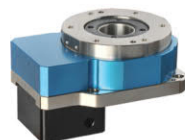
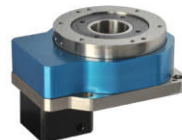
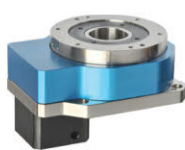
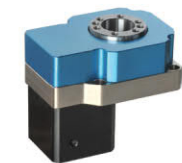
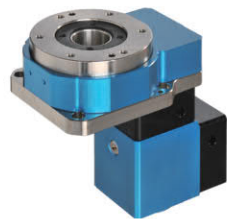
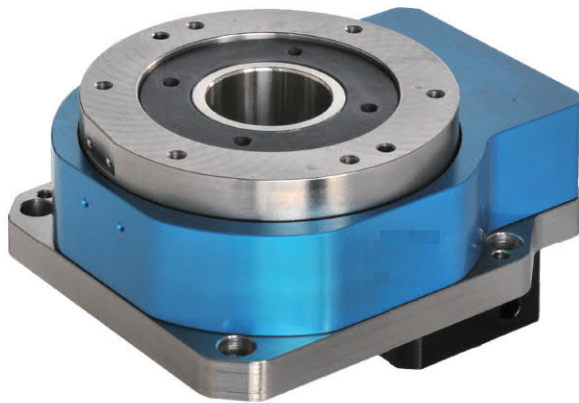


HOLLOW ROTARY ACTUATORS

中空軸旋轉平臺

ZK



ZK60-5-5A

ZK100-8

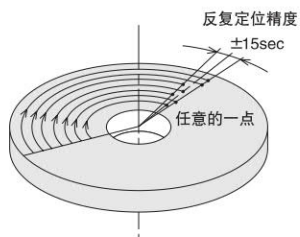
ZK130-10

ZK200-10

ZK275-10

● 定位精準度高-反復定位精度為 ± 15sec 空轉為(Lost Motion)2min

High positioning accuracy. Repeatable positioning accuracy is ± 15 sec and idling accuracy is 2 min
減速機構部分採用超精密處理的齒輪，通過自身的調整機構消除齒隙，因此機構部分不會有齒隙。因單一方向的反復定位精度為 ± 15 sec；而從兩方向定位時的空轉為 2min，所以可以進行精準度的定位。



● 工作物可直接鎖固

旋轉盤面可直接鎖固工作物，提升工件轉載之方便性。

● 配線方便

此旋轉平臺為中空式設計，無論是配線或配管均方便。

● 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.

● 可替代DD馬達和凸輪分割器

機械動作不外乎是直線、圓周運動，直線運動以各類型滑臺為主，而圓周運動則以分割器最具代表性，再則因技術的成熟與設備精度要求，使得D.D Motor日漸普及。然而，傳統分割器已無法滿足任意分割之需求；而D.D Motor雖能多元應用，且精度高，但其價格成本，也往往成為使用者欲採用的一大門檻。“中空旋轉盤”在兩者之間取得平衡，填補了功能上的需求。不但能大幅降低D.D Motor的成本，更能滿足分割器所無法提供的高精度及數位化控制。

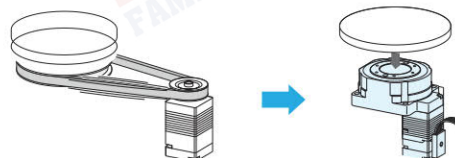
● Alternative D.D motor and cam splitter

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.

● 直接連結-簡易設計提升信賴

Direct connection - simple design enhances trust

中空的輸出平台上，可直接安裝設備的工作台及機器手臂。一般設備在通過皮帶輪等機構零件進行定位運行時，多受機構零件傳動效率的影響發生精度減低，或有維修機構零件的必要。而ZK系列因不需通過中間零件，便可直接安裝，所以除了能直接運用產品本身的精度以外，也可以免去維修的麻煩。



選用計算 Calculation of Selection

為了選擇適合設備規格的產品，必須進行事先的計算工作。以下介紹選用ZK系列時的計算方式。
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.

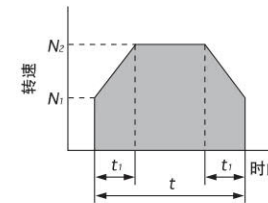
《必要轉矩的計算方式》

The calculation of the necessary torque

- 1 先計算工作物的慣性慣量。
工作慣性慣量請以傳動裝置慣性慣量的30倍以下為準。
- 2 決定定位角度。
- 3 沒有摩擦轉矩時，請參考ZK系列的定位時間圖來確認定位時間。
- 4 決定定位時間與加速減速時間。
但必須遵守以下兩個條件：
· 定位時間 $\geq$ 根據定位時間圖求出最短的定位時間
· 加速減速時間 $t_1 \times 2 <$ 定位時間
- 5 決定啟動轉速 N_1 ，然後按下面公式算出轉速 N_2 。請將 N_1 設為低速 $[0 \sim \text{數} \text{r/min}]$ ，注意不要設的太大。

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

N_2 : 轉速[r/min]
 θ : 定位角度[°]
 N_1 : 啟動轉速[r/min]
 t : 定位時間[s]
 t_1 : 加速(減速)時間[s]



按上述公式計算得出的結果若不能滿足 $N_1 \leq N_2 \leq 200[\text{r/min}]$ 的條件，則請返回4，再次確認條件。

- 6 按下列公式計算加速轉矩

$$\text{加速轉矩 } T_a [\text{N} \cdot \text{m}] = (J_1 + J_L) \times \frac{\pi}{30} \times \frac{(N_2 - N_1)}{t_1}$$

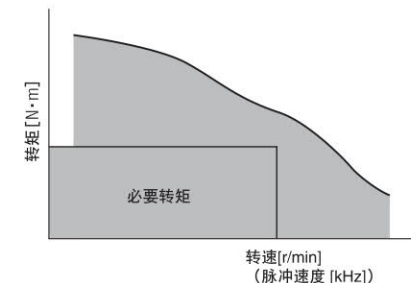
J_1 : 旋轉式傳動裝置的慣性慣量 $[\text{kg} \cdot \text{m}^2]$
 J_L : 全慣性慣量 $[\text{kg} \cdot \text{m}^2]$
 N_2 : 轉速[r/min]
 N_1 : 啟動轉速[r/min]
 t_1 : 加速(減速)時間[s]

- 7 算出必要轉矩。必要轉矩為由摩擦阻抗引起的負載轉矩與由慣性慣量引起的加速轉矩相加，再乘以安全係數後得出的數值。

$$\text{必要轉矩 } T = (\text{負載轉矩} [\text{N} \cdot \text{m}] + \text{加速轉矩} [\text{N} \cdot \text{m}]) \times \text{安全係數} \\ = (T_L + T_a) \times S$$

安全係數 S 請設定在 1.5 以上。

- 8 確認必要轉矩 T 是否包含在轉速-轉矩特性的範圍以內。若不在範圍內，請轉回4，變更條件並重新計算。



此外，將轉速換算成脈衝速度時，請按以下公式計算：

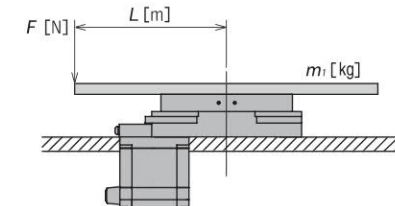
$$f [\text{Hz}] = \frac{6N}{\theta s}$$

f : 脈衝速度[Hz]
 N : 轉速[r/min]
 θs : 旋轉平台的步距角度[°/step]

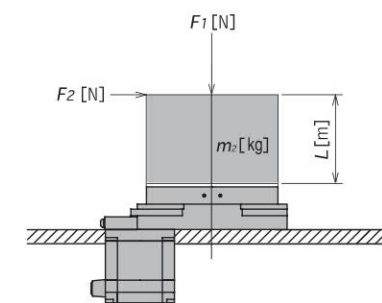
《轉向負載、慣性負載的計算方法》

The calculation method of the steering load and the inertia load

如下圖所示當旋轉平臺上載有負載時，請按下面的公式算出軸向負載與慣性負載，並確認是否在規格值內。
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.



軸向負載 [N] $F_s = F + m \times g$
慣性負載 $[N \cdot m]$ $M = F \times L$



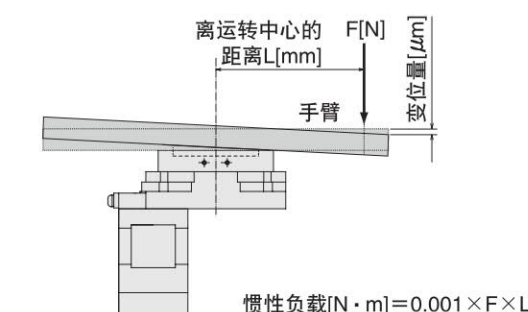
軸向負載 [N] $F_s = F_1 + m_2 \times g$
慣性負載 $[N \cdot m]$ $M = F_2 \times (L + a)$

品名	a
ZK-60	0.01
ZK-100	0.02
ZK-130	0.03
ZK-200	0.04
ZK-275	0.05

《因慣性負載引起的變為量(參考值)》

Variable quantity (reference value) caused by an inertial load

在旋轉平臺上附加慣性負載時，位置會發生變化。圖表中的變位量顯示慣性負載按固定方向作用時，在距離旋轉平臺轉心的L位置上的變化。慣性負載若從正負兩方向作用時，變位量約為2倍。



$$\text{慣性負載} [\text{N} \cdot \text{m}] = 0.001 \times F \times L$$

型號識別：Model Identification

ZK

60

R

5

5A

旋轉平臺系列
Hollow Rotating Series

規格
Specifications

選配
Optional

減速比
Ratio

馬達類型
Motor

重量Weight:2kg

R: 直角轉向減速
F: 附馬達連結座

V1: 伺服Servo Ø8 PCD45,M3
V2: 伺服Servo Ø8 PCD46,M4

T1:步進 Stepper Ø5 PCD43.8, M3
T2:步進 Stepper Ø6 PCD43.8, M3
5A: 含步進馬達42H5K-2A

各廠牌100W AC 伺服馬達
100W AC servo motor for each brand

各廠牌42型步進馬達
42 stepper motor for each brand

規格表 Specification

產品型號 Model	ZK60	ZK60R
旋轉平臺軸承 Bearing of rotate table	深溝滾珠+止推滾珠軸承 Deep groove ball+Thrust ball bearing	
容許轉矩 Allowable torque (N.m)	5	
精度壽命 Precision lifetime	15000Hrs	
允許轉速 Allowable speed (rpm)	200(盤面 Plate)	
減速比 Ratio	5	15
重複精度 Repeated accuracy(arc-sec)	≤15	≤20
定位精度 Positioning accuracy(arc-min)	≤1	≤1
旋轉平臺平行度 Parallelism of rotate plate(mm)	≤0.02	
旋轉平臺同心度 Coaxiality of rotate plate(mm)	≤0.02	
保護等級 Protection Class	IP40	

P.S:圓周單位 Circumferential unit: 1 rpm=360° 1° =60'(arc-min) 1'=60"(arc-sec)
圓周誤差換算直線誤差: 盤面直徑×3.14159÷(360°×60'×60")背隙值
Circumferential error conversion linear error:Disc diameter×3.14159÷(360°×60'×60")The value of backlash

定位精度檢測 Positioning Accuracy Examination

此規格定位精度謹以此比例檢驗 The accuracy of this specification is tested by this ratio

盤面旋轉振幅
Rotating amplitude of Plate

≤0.02mm

盤面同心檢測
Concentric examination of plate

≤0.02mm

盤面與底座平行度
Parallelism between the plate and the base

≤0.02mm

外徑任意點定位精度半徑 19mm≤1min
Positioning precision radius of any point of outer diameter 19mm≤1min

反復定位精度半徑19mm≤15sec
Precision radius of repeated positioning 19mm≤15sec

半徑懸臂200mm
施力重力5kg時
測得ZK60外緣
≤0.02mm

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

外形尺寸圖 Dimensions

ZK60-5-5A

(此型號含步進 This model contains stepper motor 42H5K-2A)

Unit:mm

ZK60F-5

(附連接座可自行組裝馬達)
(A self assembled motor with a connecting seat)

ZK60R-15

(直角轉向式 Right angle steering 1:15)

※訂購時請提供馬達法蘭尺寸
Please provide the size of the motor flange when ordering

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

-67-

-68-

型號識別 Model Identification



R: 直角轉向減速
P: 直向減速

V1: 伺服 Servo Ø14 PCD70 M4
V2: 伺服 Servo Ø14 PCD70 M5
T1: 步進 Stepper Ø8 PCD66.67, M4
T2: 步進 Stepper Ø8 PCD70, M4
T3: 步進 Stepper Ø10 PCD70, M4

各廠牌200~400W AC 伺服馬達
200~400W AC servo motor for each brand
各廠牌60型步進馬達
60 stepper motor for each brand

規格表 Specification

產品型號 Model	ZK100	ZK100R	ZK100P
旋轉平臺軸承 Bearing of rotate table	圓錐滾子軸承 Tapered roller bearing		
容許轉矩 Allowable torque (N.m)	45		
精度壽命 Precision lifetime	20000Hrs		
允許轉速 Allowable speed (rpm)	200(盤面 Plate)		
減速比 Ratio	8	16,24	24,32,40
重複精度 Repeated accuracy(arc-sec)	≤10	≤20	≤60
定位精度 Positioning accuracy(arc-min)	≤1	≤1	≤2
旋轉平臺平行度 Parallelism of rotate plate(mm)	≤0.02		
旋轉平臺同心度 Coaxiality of rotate plate(mm)	≤0.015		
保護等級 Protection Class	IP40		

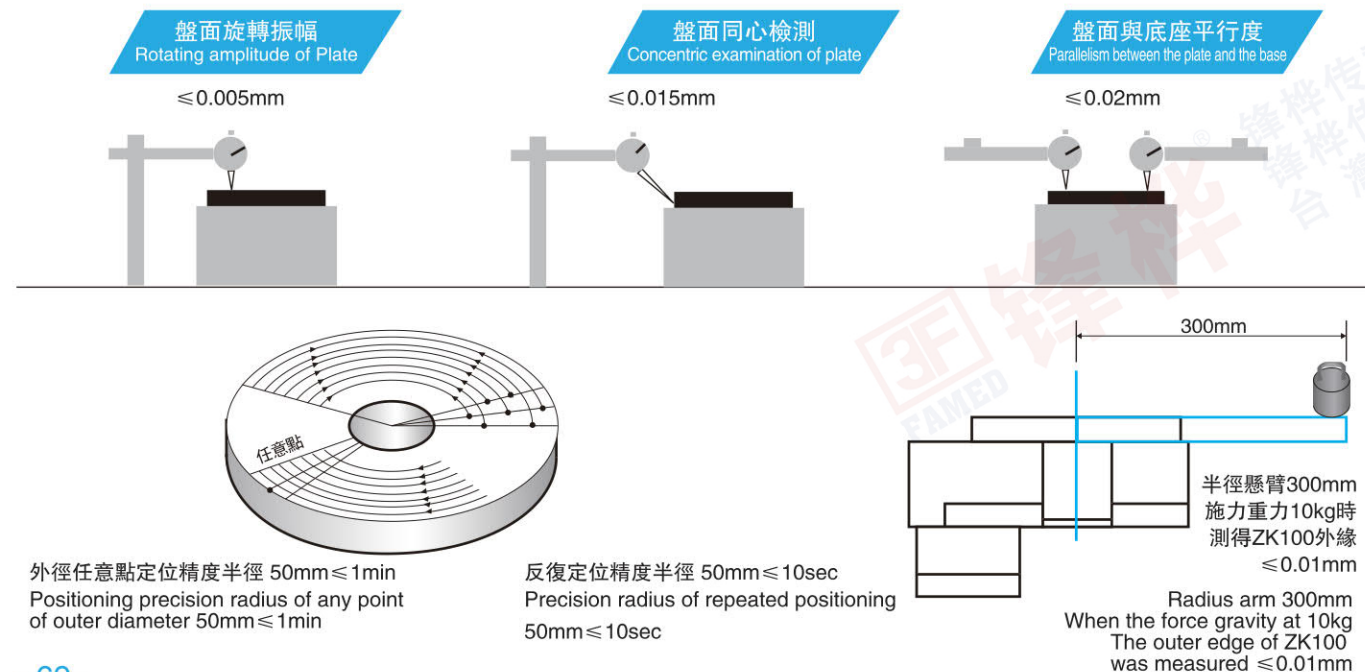
P.S: 圓周單位 Circumferential unit: 1 rpm=360° 1°=60'(arc-min) 1'=60"(arc-sec)

圓周誤差換算直線誤差: 盤面直徑 × 3.14159 ÷ (360° × 60' × 60") 背隙值

Circumferential error conversion linear error: Disc diameter × 3.14159 ÷ (360° × 60' × 60") The value of backlash

定位精度檢測 Positioning Accuracy Examination

此規格定位精度謹以此比例檢驗 The accuracy of this specification is tested by this ratio

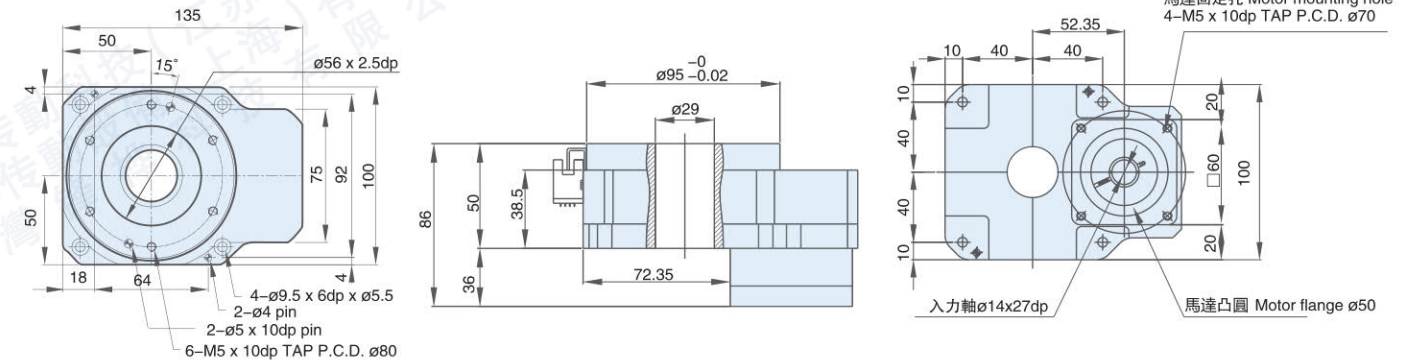


外形尺寸圖 Dimensions

Unit:mm

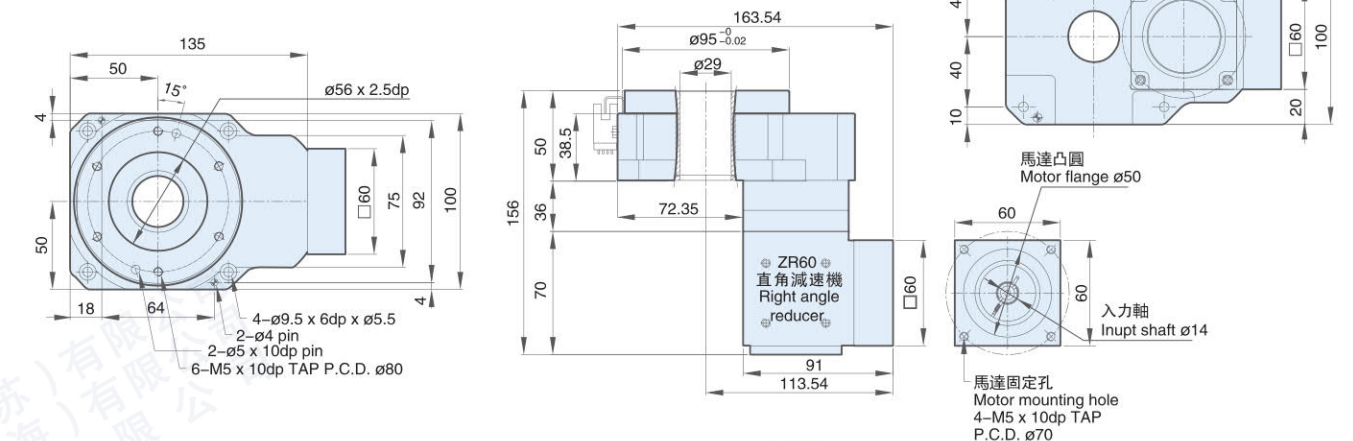
ZK 100

(附連接座可自行組裝馬達)
(A self assembled motor with a connecting seat)



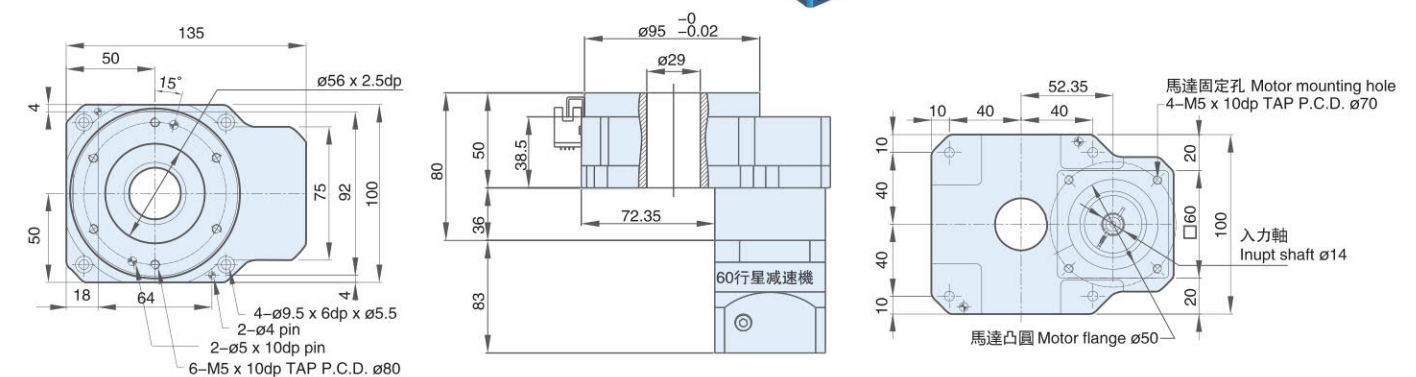
ZK 100R

(直角轉向式 Right angle steering 1:16)



ZK 100P

(附行星減速機速比 Attached planetary reducer ratio 24,32,40)



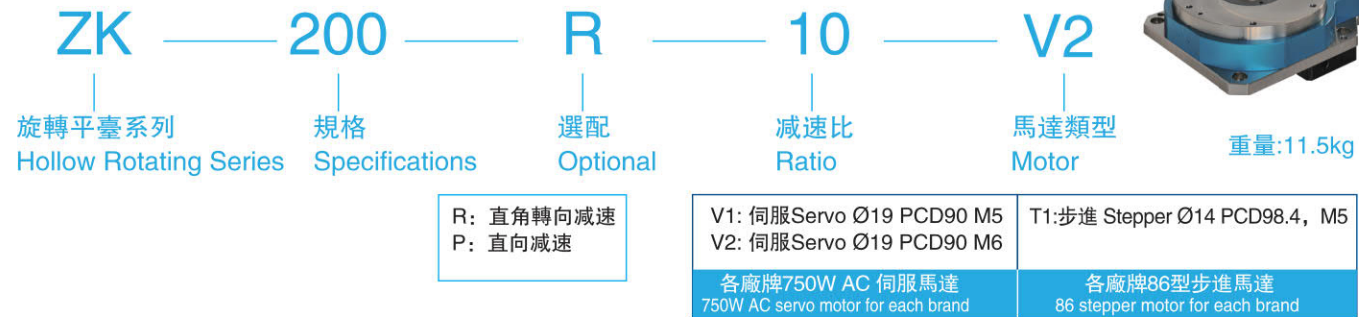
※訂購時請提供馬達法蘭尺寸

Please provide the size of the motor flange when ordering

P.S: 原點 Sensor 規格(選配) OMRON EE-SX672

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

型號識別 Model Identification



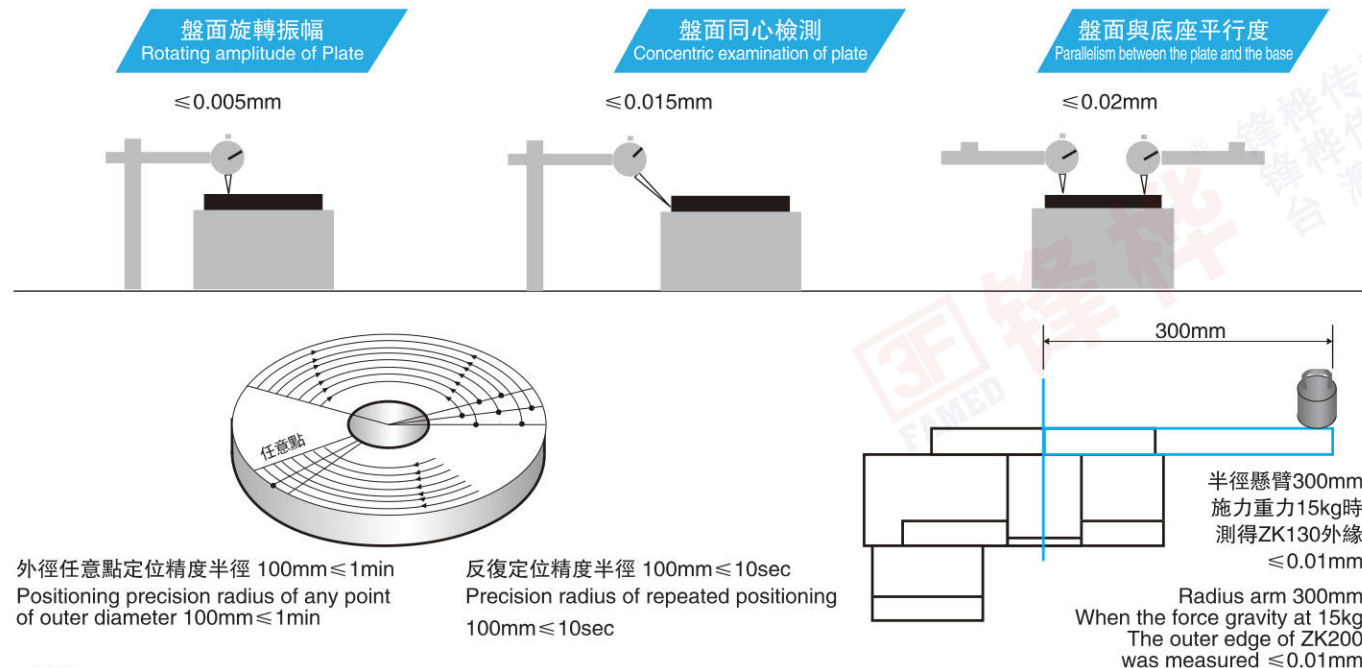
規格表 Specification

產品型號 Model	ZK200	ZK200R	ZK200P
旋轉平臺軸承 Bearing of rotate table	圓錐滾子軸承 Tapered roller bearing		
容許轉矩 Allowable torque (N.m)	80		
精度壽命 Precision lifetime	20000Hrs		
允許轉速 Allowable speed (rpm)	200(盤面 Plate)		
減速比 Ratio	10	20,30	30,40,50
重複精度 Repeated accuracy(arc-sec)	≤10	≤20	≤60
定位精度 Positioning accuracy(arc-min)	≤1	≤1	≤2
旋轉平臺平行度 Parallelism of rotate plate(mm)	≤0.02		
旋轉平臺同心度 Coaxiality of rotate plate(mm)	≤0.015		
保護等級 Protection Class	IP40		

P.S:圓周單位 Circumferential unit: 1 rpm=360° 1° =60'(arc-min) 1'=60"(arc-sec)
圓周誤差換算直線誤差: 盤面直徑 × 3.14159 ÷ (360° × 60' × 60")背隙值
Circumferential error conversion linear error: Disc diameter × 3.14159 ÷ (360° × 60' × 60")The value of backlash

定位精度檢測 Positioning Accuracy Examination

此規格定位精度謹以此比例檢驗 The accuracy of this specification is tested by this ratio

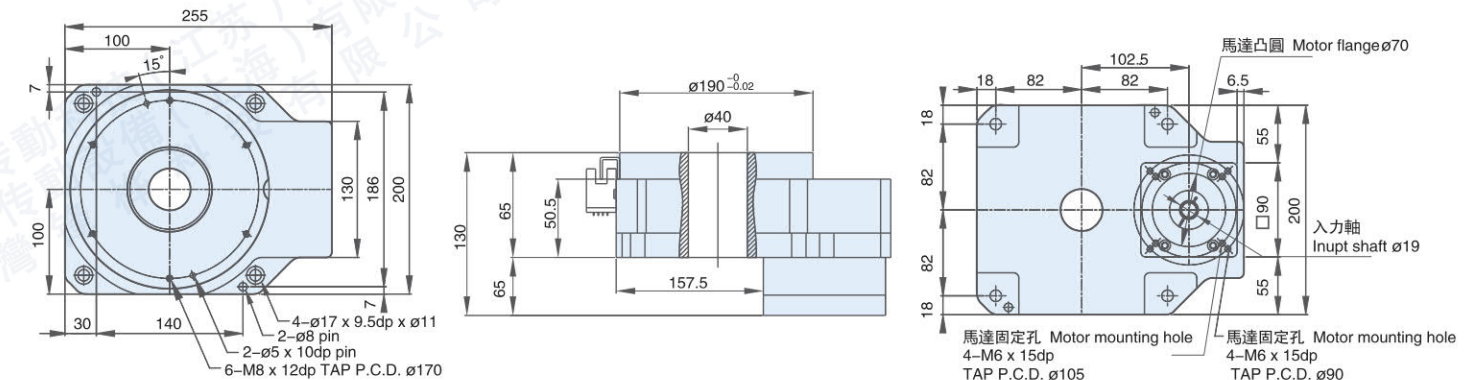


外形尺寸圖 Dimensions

ZK 130

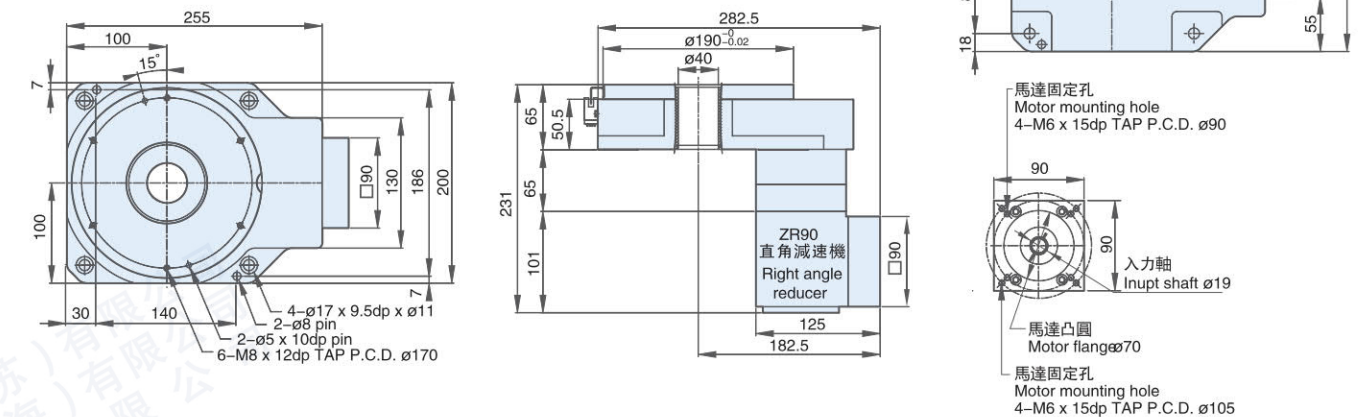
(附連接座可自行組裝馬達)
(A self assembled motor with a connecting seat)

Unit:mm



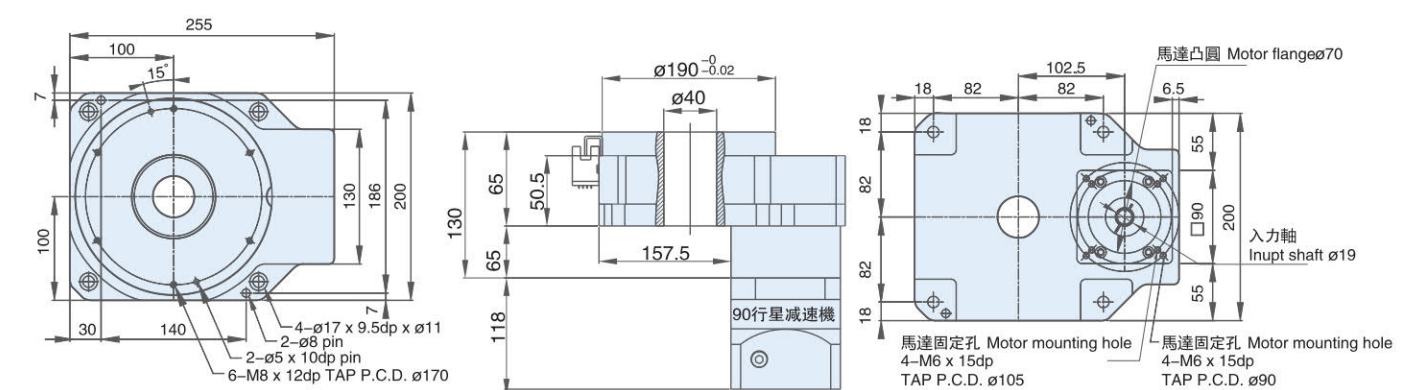
ZK 130R

(直角轉向式 Right angle steering 1:20)



ZK 130P

(附行星減速機速比 Attached planetary reducer ratio 30,40,50)



※訂購時請提供馬達法蘭尺寸

Please provide the size of the motor flange when ordering

P.S: 原點 Sensor 規格(選配) OMRON EE-SX672

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

