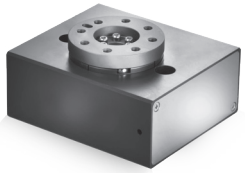
ETB series Electric Rotary Table

Product features/ Code of order

CHELIC

Feature

- Belt and screw moving type
- Close-Loop step motor
- High precision and large torque



Specification

Item \ Model		10	30	50
Rotating torque	N-m	0.2	0.8	7.0
Work load	N	10	50	150
Rotation angle	°	330		
Max speed	°/s	420		
Actuation type		Worm screw + Worm wheel + Belt drive		
Ambient and fluid temperature	°C	5~40		
Operating humidity range	%	35~85		
Motor size		20 □	25 □	42 □
Position repeatability	°	±0.05		
Backlash	°	±0.3		

Note: 1. Idling stroke:Reference value when correcting the error caused by reciprocating motion.
2. The speed and thrust will change base on the length of the wire, load weight and mounting conditions...etc. If the length of the wire over 5m, the speed and thrust will reduce 10% per 5m.
3. If the load weight over the recommended value, the lifetime will shorter.

Code of order **ETB – 50 – 03 – P**

1 2 3

1

Mark	Motor size □
10	20
30	25
50	42

2

Mark	Wire length(m)
01	1
03	3
05	5
10	10

● Standard: 3M

3

Mark	Actuator
P	P-servo

● Standard component Refer to P6-1.89

ETB series Electric Rotary Table

Model selection

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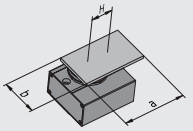
Seq 1 Moment of Inertia – Angular acceleration/ deceleration → Seq 2 Required torque → Seq 3 Allowable load → Seq 4 Oscillation time

Conditions of use



- Electric oscillation: ETB 30
- Load type: Inertia load Ta
- Load shape: 150mm x 80mm (rectangular)
- Angular acceleration • Deceleration ώ: 1,000°/sec
- Distance between the centers of gravity of shafts H: 40mm
- Oscillation angle: 180°
- Angular velocity ω: 420°/sec
- Load mass m: 2.0kg
- Installation method: Vertical

Seq 1 Moment of Inertia – Angular acceleration/ Deceleration

1. Calculation of moment of Inertia
2. Refer to the moment of inertia–angular acceleration/ deceleration graph for the related information.
   The adequate model should be selected depending on the moment of inertia and angular acceleration/ deceleration.

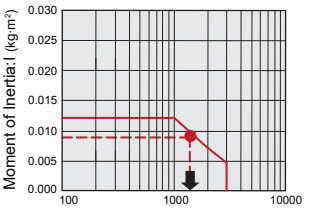
Formula

$I = m \times (a^2 + b^2)/12 + m \times H^2$

Example

$I = 2.0 \times (0.15^2 + 0.08^2)/12 + 2.02 \times 0.04^2$
$= 0.00802 kg \cdot m$

ETB 30



Seq 2 Required torque

1. Load types
   - Static load: Ts
   - Resistive load: Tf
   - Inertia load: Ta
2. Refer to the effective torque – rotary speed graph for the related information. The controllable value in regard with velocity should be confirmed via the effective torque from rotary speed.

Formula

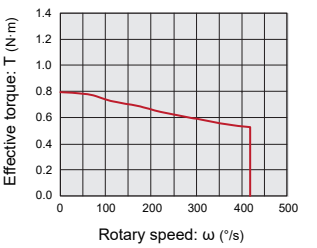
Effective torque ≧ Ts
Effective torque ≧ Tf × 1.5
Effective torque ≧ Ta × 1.5

Example

Inertial load: Ta

$Ta \times 1.5 = I \times \dot{\omega} \times 2/360 \times 1.5$
$= 0.00802 \times 1{,}000 \times 0.0175 \times 1.5$
$= 0.21 N \cdot m$

ETB 30



Seq 3 Allowable load

1. Confirm the allowable load
   - Radial load
   - Axial load
   - Torque

Formula

Allowable axial load ≧ m × 9.8
Allowable torque ≧ m × 9.8 × H

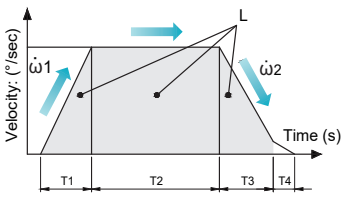
Example

Inertial load: Ta

$Ta \times 1.5 = I \times \omega \times 2/360 \times 1.5$
$= 0.00802 \times 1{,}000 \times 0.0175 \times 1.5$
$= 0.21 N \cdot m$

Seq 4 Oscillation time

1. Calculation of production cycle time (oscillation time)



θ : Oscillation angle (°)
ω: Angular velocity (°/sec)
ώ1: Angular acceleration (°/sec)
ώ2: Angular deceleration (°/sec)

T1:
Acceleration time (s) -----
The time before reaching the preset velocity

T2:
Time of constant velocity(s) --
The time of operation with a constant speed

T3:
Deceleration time (s) -----
The time from constant speed to operation stop

T4:
Time of stability (s) -----
The time before positioning is completed

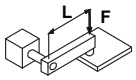
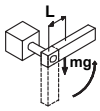
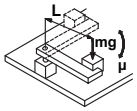
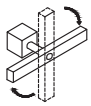
Formula

Time of angular acceleration T1 = ω/ώ1
Time of angular deceleration T3 = ω/ώ2
Time of constant velocity T2 = {θ-0.5 × ω ×(T1+T3)}/ω
Time of stability T = T1+T2+T3+T4

Example

- Time of angular acceleration T1=400/1,000=0.40sec
- Time of angular deceleration T3=400/1,000=0.40sec
- Time of constant velocity
  T2 ={180–0.5 × 400 ×(0.40+0.40)}/400=0.05sec

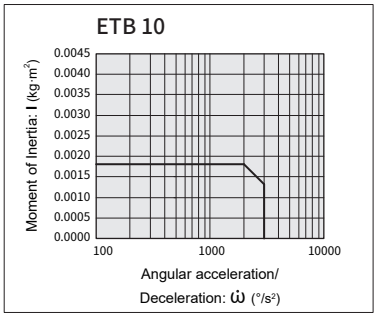
- Time cycle T=T1+T2+T3+T4=0.40+0.05+0.40+0.2=1.05(sec)

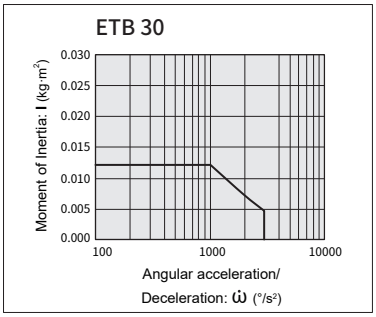
Load type		
Static load: Ts	Resistive load: Tf	Inertial load: Ta
When only thrust force is necessary (gripping, etc.)	When gravity in reverse direction overlaps friction	When a load with inertia is reversing
	<Gravity reaction>  <Friction reaction> 	<Reverse center and load center are the same point>  <Reverse axis is vertical> 
Ts = F·L Ts: Static load (N·m) F : Gripping force (N) L : Distance between the center of oscillation and gripping position (m)	Reverse direction When gravity is working Tf: =m·g·L Reverse direction When friction is working Tf: = μ·m·g·L Tf: Resistive load(N·m) m: Load mass(kg) g : Gravitational acceleration 9.8(m/s^2) L : Distance between the center of oscillation and the working point of gravity of friction(m) μ: COF	Ta=I·ώ·2/360 (Ta=I·ώ·0.0175) Ta: Inertia load (N·m) I : Moment of Inertia (kg·m^2) ώ : Angular acceleration/ Deceleration(°/sec^2) ω : Rotary speed (°/sec)
Torque required T=Ts	Torque required T=Tf × 1.5	Torque required T=Ta × 1.5

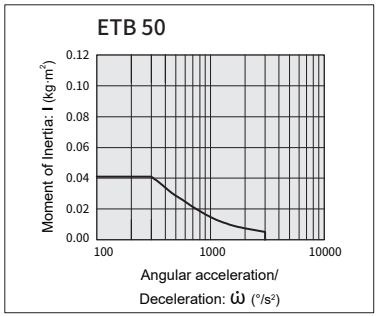
- For resistive Load → gravity and friction react with each other in reverse direction
  EX1. If the reverse axis is horizontal, the reverse center and the load center will differ
  EX2. If a load is sliding on the lathe
  ※ The required torque is the sum of resistive load and inertia load.
  T=(Tf+Ta)× 1.5

- For non-resistive load → gravity and friction do not react with each other in reverse direction
  EX1. If the reverse axis is vertical
  EX2. If the reverse axis is horizontal, the reverse center and the load center will be the same point
  ※ The only torque required is inertia load.
  T=Ta × 1.5

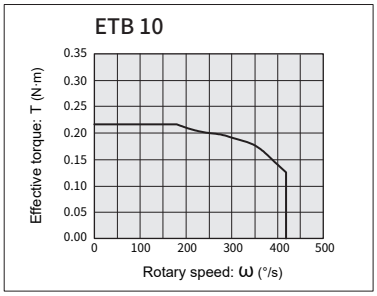
Moment of Inertia – Angular acceleration/ Deceleration

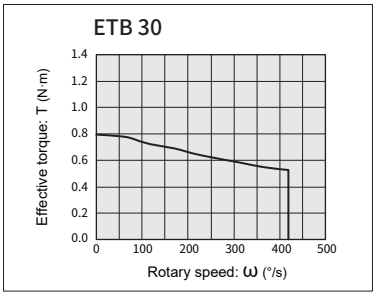


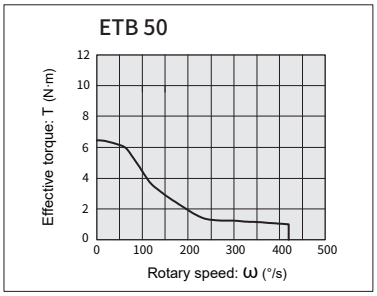




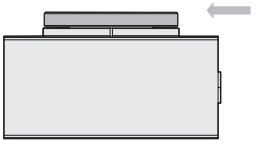
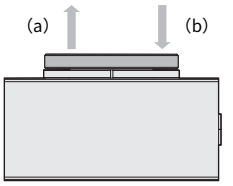
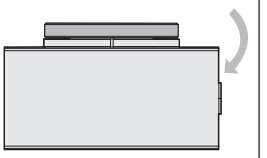
Effective torque – Rotary speed







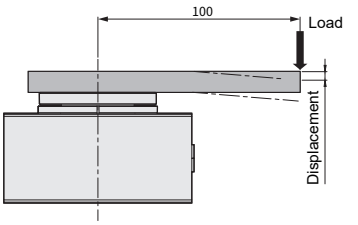
Allowable load

Image				

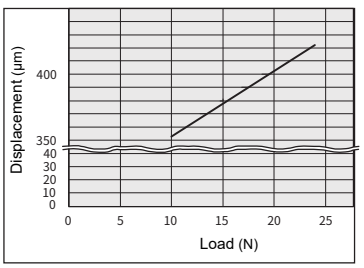
Size	Allowable radial load (N)		Allowable radial load(N)				Allowable torque(N·m)	
			(a)		(b)			
	Basic type	High precision type	Basic type	High precision type	Basic type	High precision type	Basic type	High precision type
10	78	86	74		78	107	2.4	2.9
30	196	233	197		363	398	5.3	6.4
50	314	378	296		398	517	9.7	12.0

Displacement of slider (Reference)

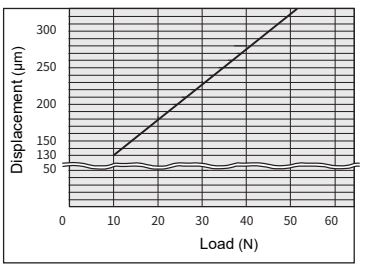
The offset of the load on point **A** which is 100mm away from the reverse center.



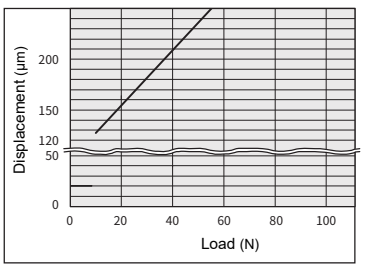
ETB 10



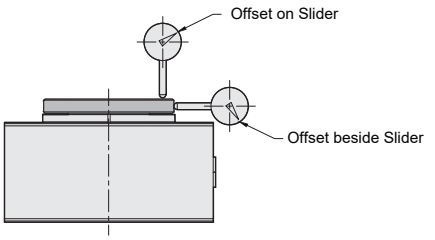
ETB 30



ETB 50



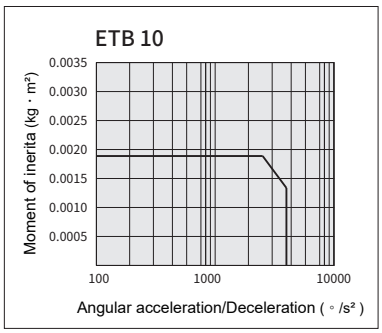
Offset precision: Offset of oscillation at 180° (Approximately)

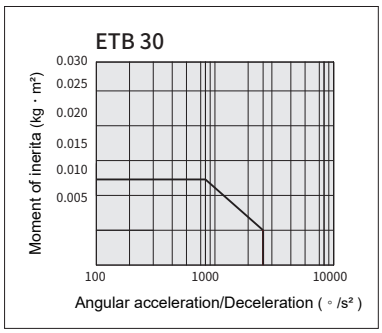


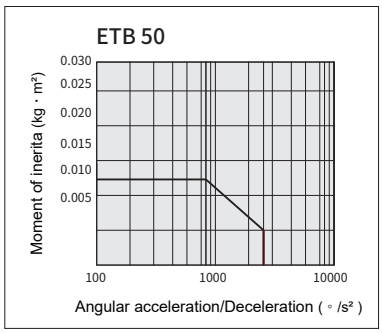
Unit: mm

Measure Point	ETB Series
Offset on Slider	0.1
Offset beside Slider	0.1

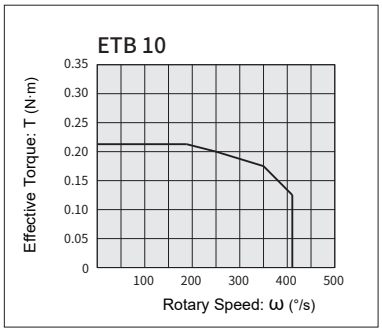
Moment of inerita graph

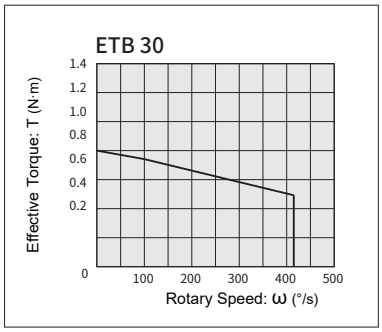


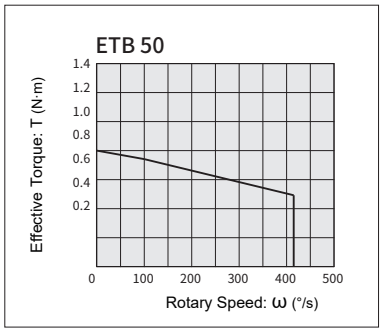




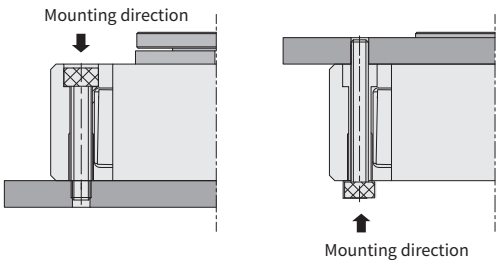
Rotating torque graph



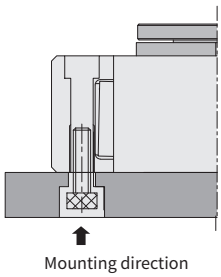




Body through hole installation



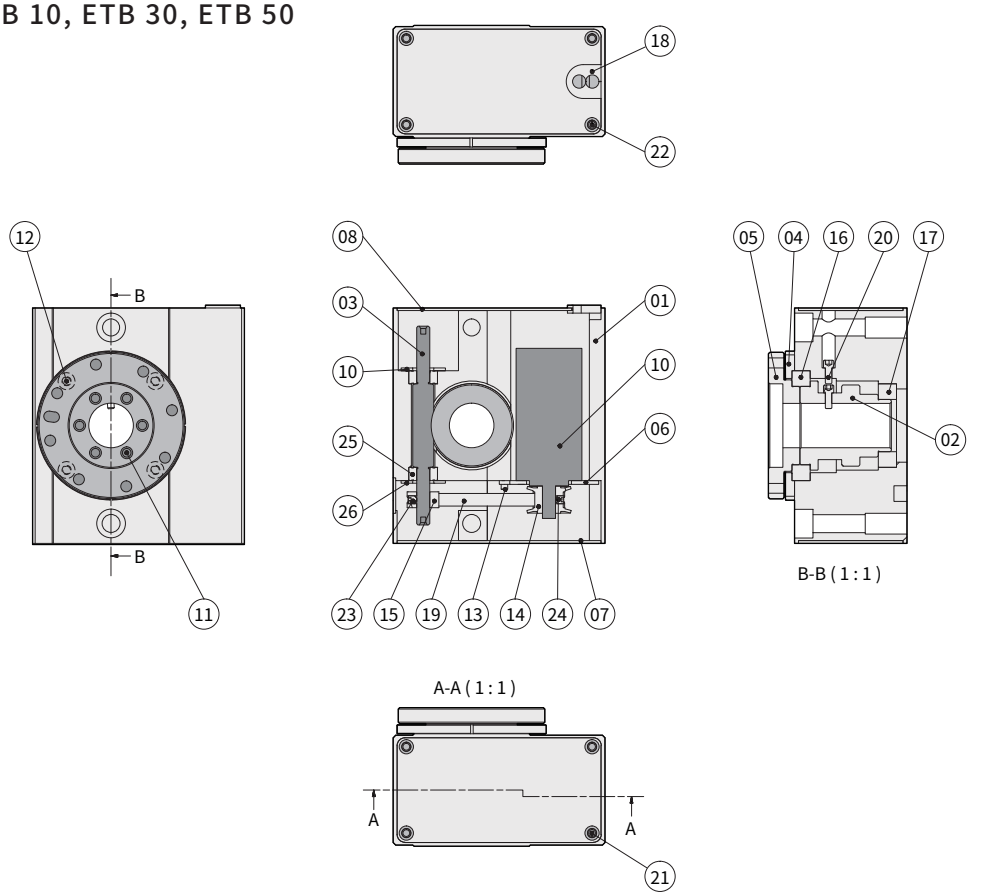
Body screw hole installation



Product weight

Item \ Model	10	30	50
Weight (kg)	0.5	0.8	1.5

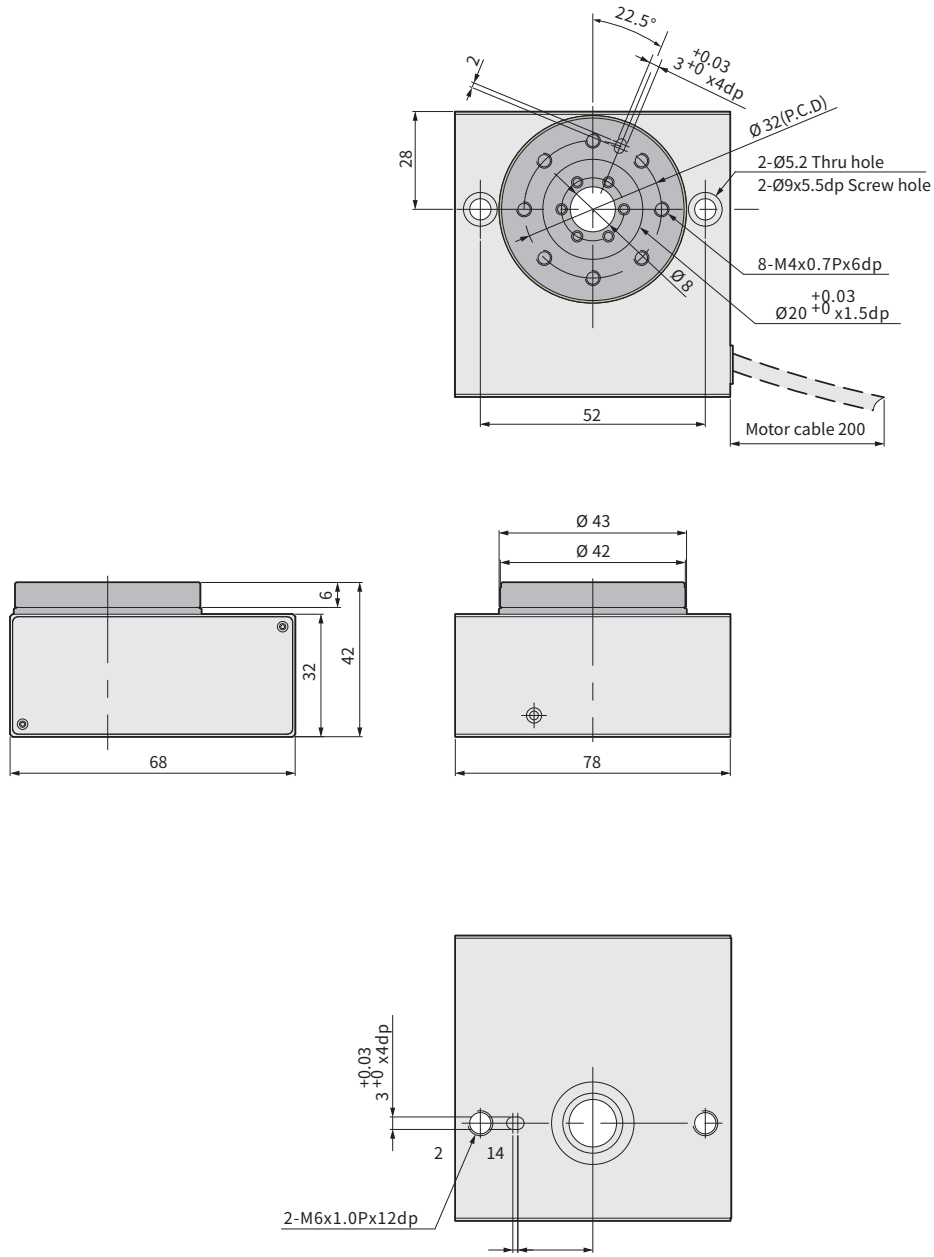
ETB 10, ETB 30, ETB 50



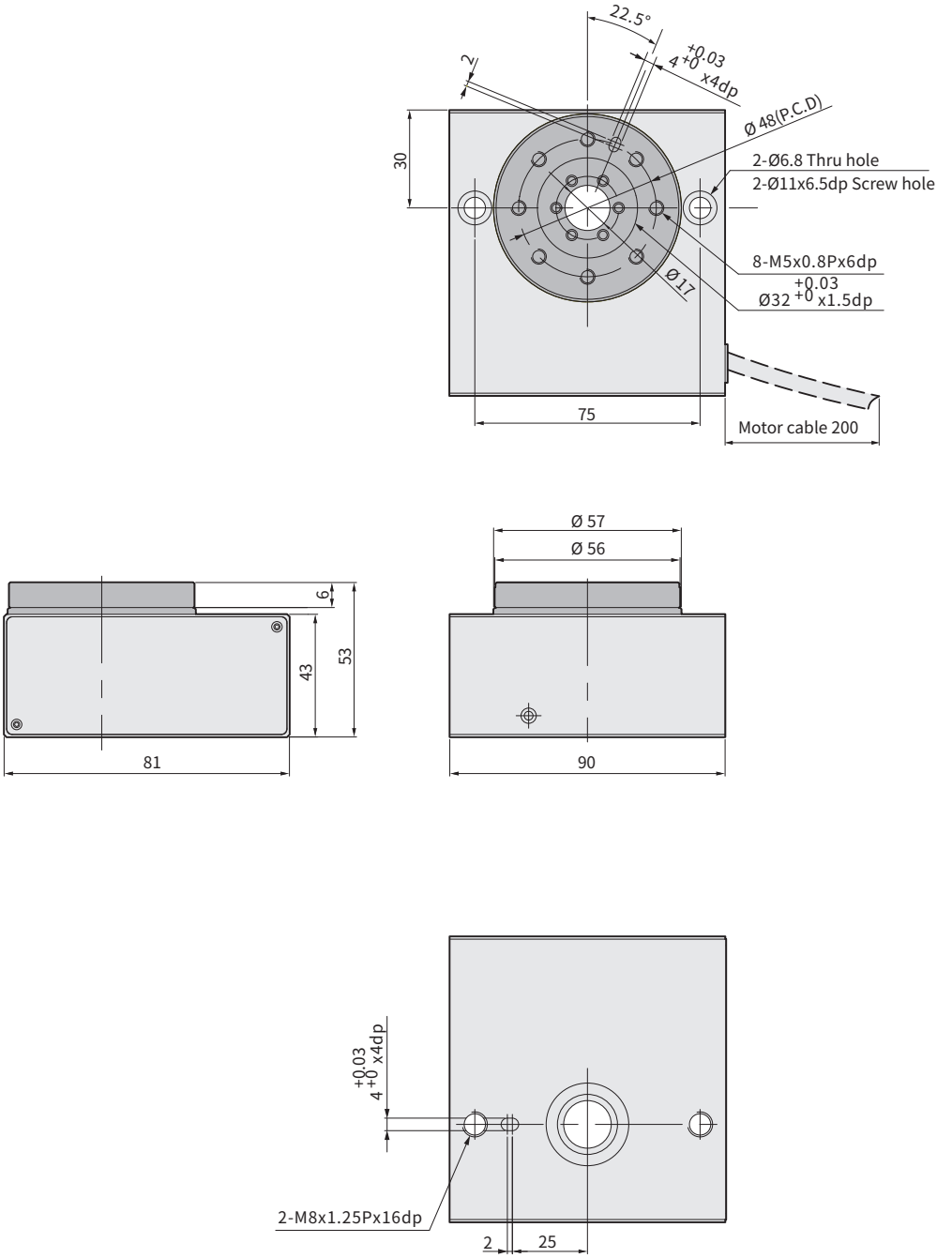
Components and material list

No.	Name	Material	No.	Name	Material
01	ETB 10 Body	Aluminum alloy(A6063)	14	Motor belt pulley	Aluminum alloy(A6061)
02	ETB 10 Gear shaft	Alloy steel	15	Worm belt pulley	Aluminum alloy(A6061)
03	ETB 10 Worm wheel	Alloy steel	16	Gear shaft bearing (large)	Bearing steel
04	ETB 10 Bearing cap	Aluminum alloy(A6061)	17	Gear shaft bearing (small)	Bearing steel
05	ETB 10 Dial scale	Aluminum alloy(A6061)	18	Outlet rubber	Rubber
06	ETB 10 Motor stopper	Stainless	19	Pulley belt	Customized
07	ETB 10 Stopper	Stainless	20	Blocking screw	Alloy steel
08	ETB 10 Cabel stopper	Stainless	21	Stopper set screws	Alloy steel
09	ETB 30 Screw stopper	Stainless	22	Cable stopper set screw	Alloy steel
10	Closed loop motor 20	Customized	23	Motor pulley set screw	Alloy steel
11	Dial set screw	Alloy steel	24	Worm pulley stop screw	Alloy steel
12	Bearing cover set screw	Alloy steel	25	Worm Bearing	Bearing steel
13	Motor stopper set screw	Alloy steel	26	Screw stopper set screw	Alloy steel

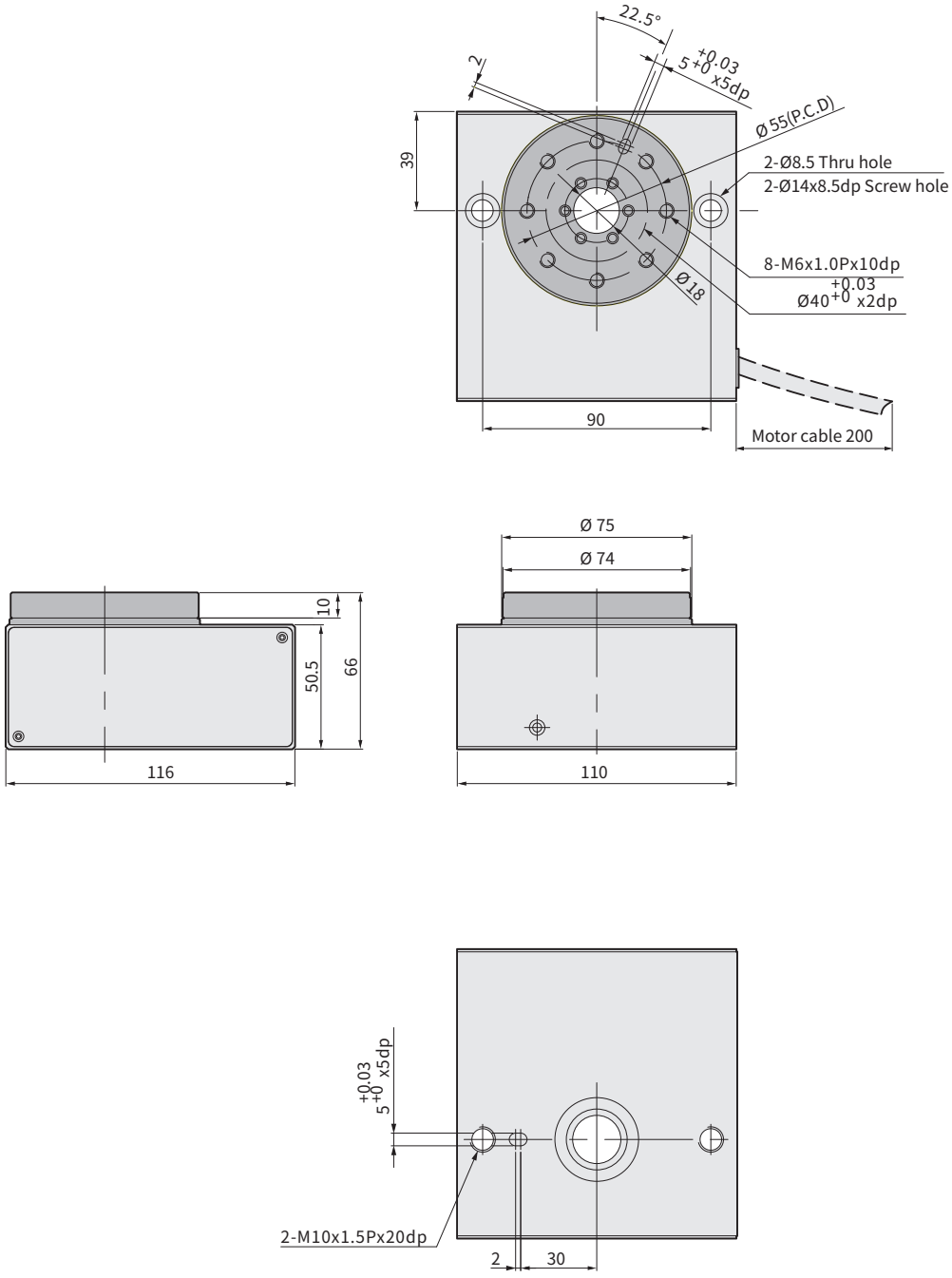
ETB 10


22.5°
2
3 +0.03 +0 x4dp
Ø 32(P.C.D)
28
2-Ø5.2 Thru hole
2-Ø9x5.5dp Screw hole
8-M4x0.7Px6dp
Ø8
Ø20 +0.03 +0 x1.5dp
52
Motor cable 200
6
32
42
68
Ø 43
Ø 42
78
3 +0.03 +0 x4dp
2
14
2-M6x1.0Px12dp

ETB 30


22.5°
2
4 +0.03 +0 x4dp
Ø 48(P.C.D)
30
2-Ø6.8 Thru hole
2-Ø11x6.5dp Screw hole
8-M5x0.8Px6dp
Ø17
Ø32 +0.03 +0 x1.5dp
75
Motor cable 200
6
43
53
81
Ø 57
Ø 56
90
4 +0.03 +0 x4dp
2-M8x1.25Px16dp
2
25

ETB 50


22.5°
2
5 +0.03 +0 x5dp
Ø 55(P.C.D)
39
2-Ø8.5 Thru hole
2-Ø14x8.5dp Screw hole
8-M6x1.0Px10dp
Ø40 +0.03 +0 x2dp
Ø 18
90
Motor cable 200
10
50.5
66
116
Ø 75
Ø 74
110
5 +0.03 +0 x5dp
2-M10x1.5Px20dp
2
30