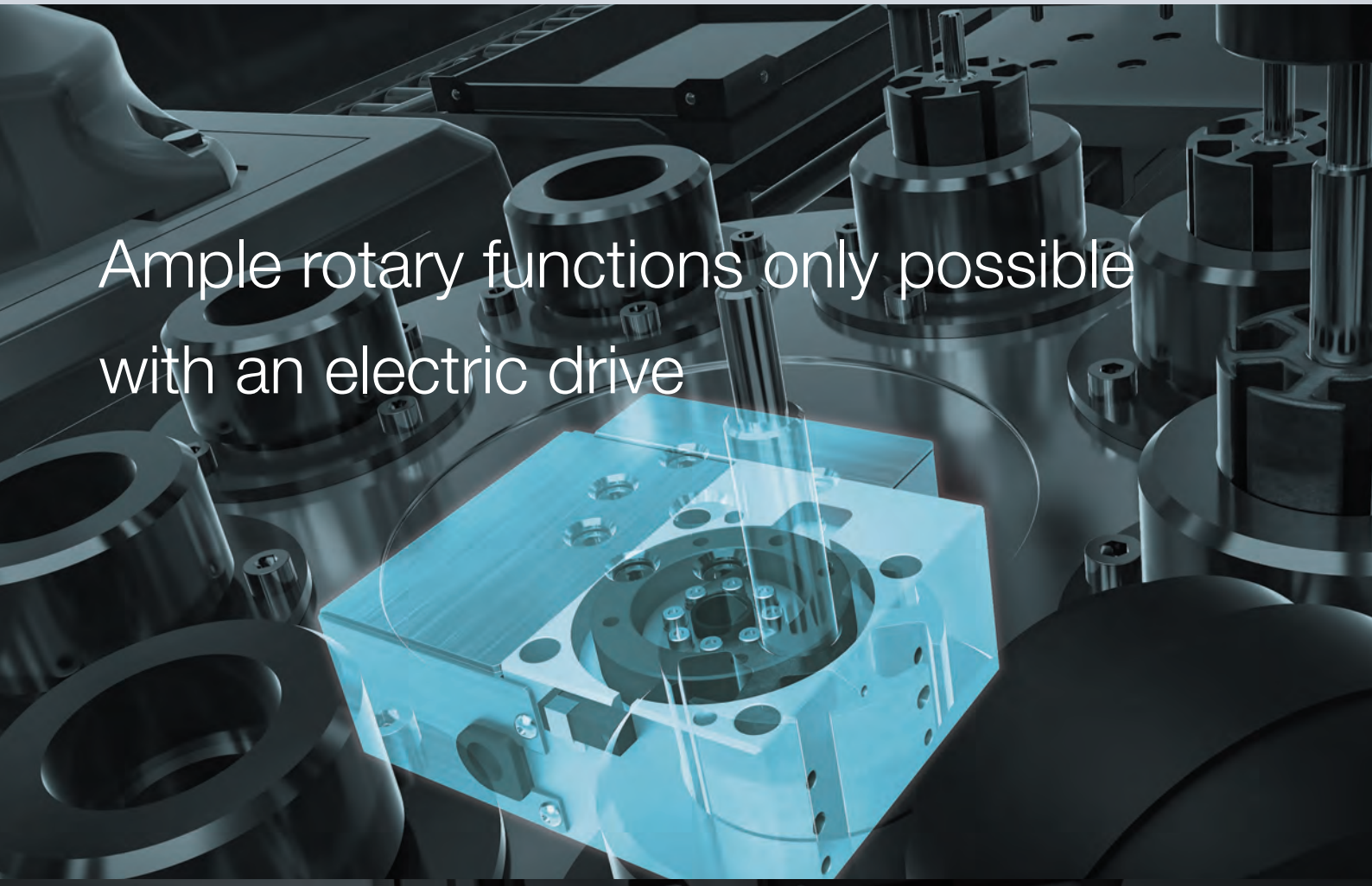
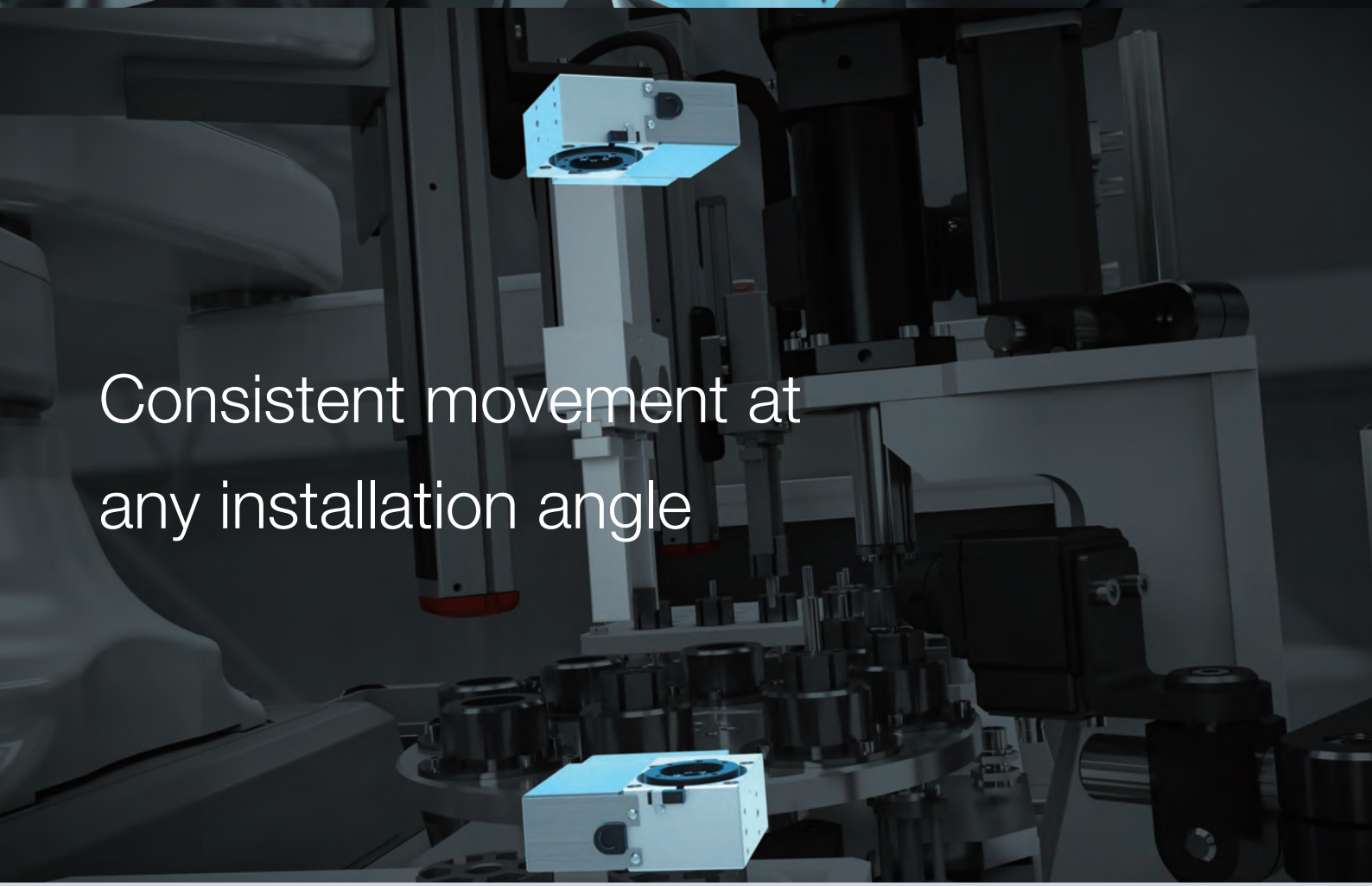
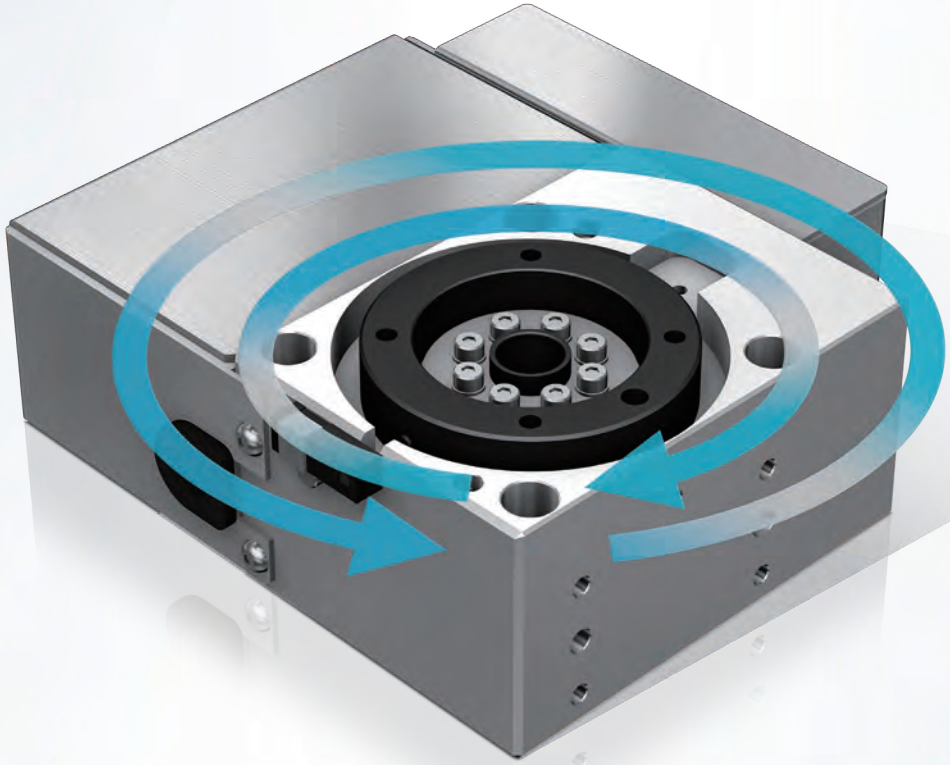
Thin Electric Turntable **ET**

High-precision multi-point positioning
with superior rotary performance


Ample rotary functions only possible
with an electric drive

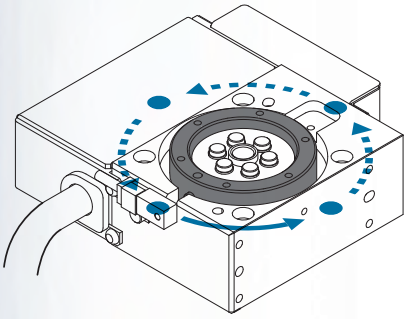

Consistent movement at
any installation angle

Thin Electric Turntable ET

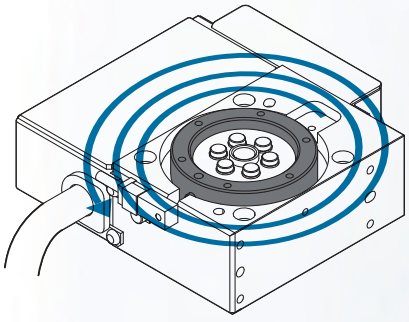


Multi-point positioning, multi-rotation control (speed can also be adjusted)

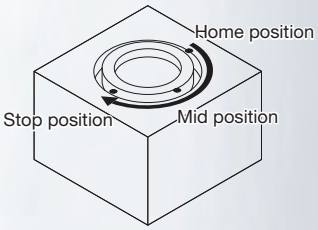
The combination of an electric drive with position control makes it possible to easily set three or more positions without stoppers.
Capable of multiple movements, including clockwise and counterclockwise rotation control, speed control, and continuous rotation.



Multi-point positioning



Continuous rotation in one direction



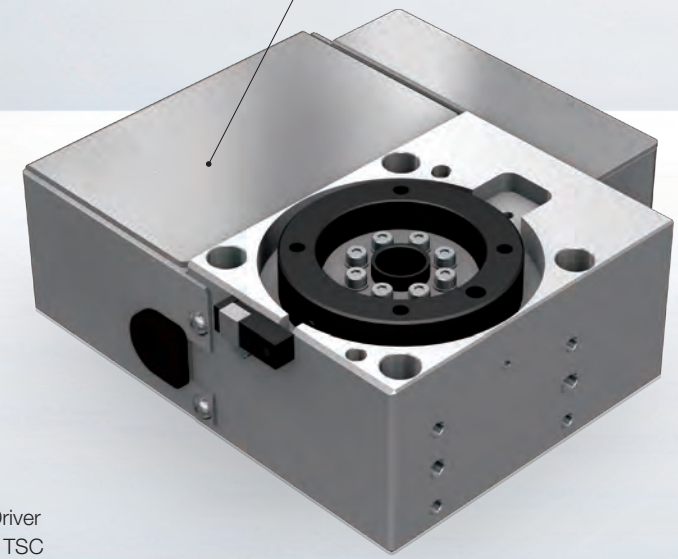
Up to three stop positions with pneumatics

ET

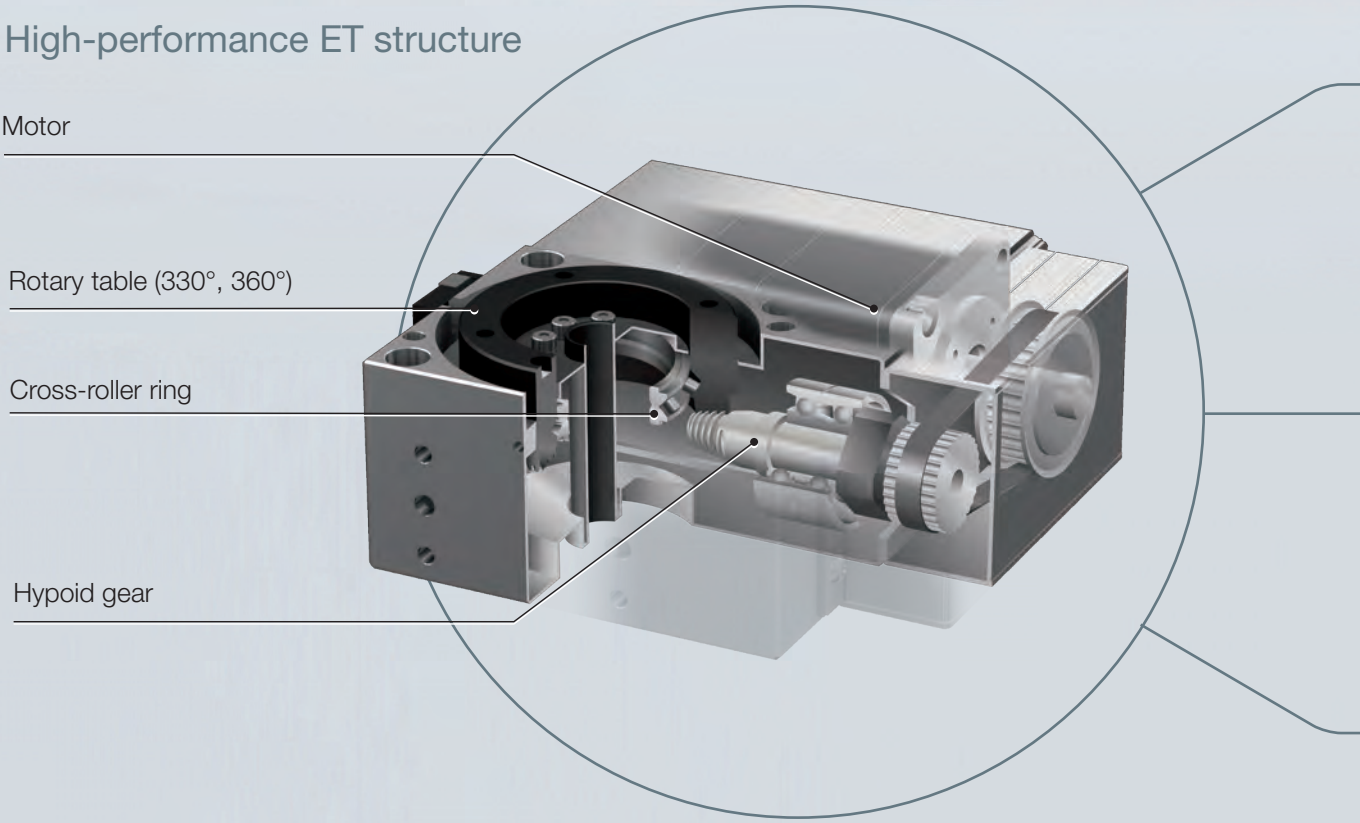
Multi-point positioning
Continuous rotation in one direction
Rotation speed control
Freely set at any angle
Positioning repeatability: ±0.04 degrees

TSC specifications

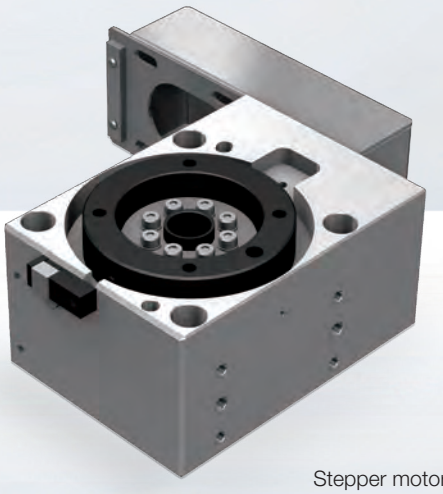
Stepper Driver
Controller TSC



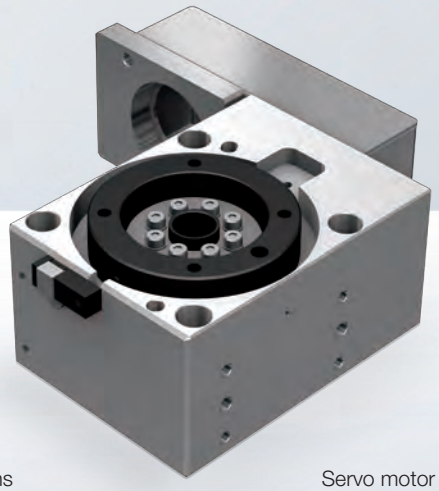
High-performance ET structure



Without motor



Stepper motor specifications

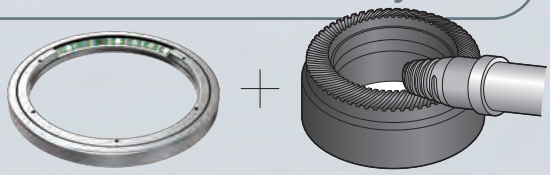


Servo motor specifications

Choose from 330° (mechanical homing type) or 360° (sensor homing type) to match your control application.

A mechanism that achieves high rotational accuracy

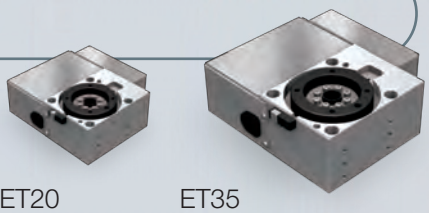
The rotary structure combines
a THK cross-roller ring and hypoid gear.



Cross-roller ring　　Hypoid gear

Thin structure

Product height is reduced by providing a compact rotary table and motor and integrating the cross-roller ring and hypoid gear. This helps equipment take up less space.



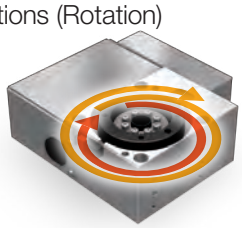
ET20　　ET35

Different varieties are available for purchase

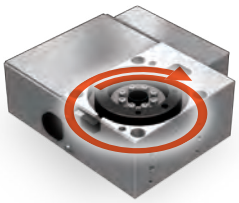
This product can come with a motor that pairs with the THK controller, a motor that you specify, or no motor installed.

Applications

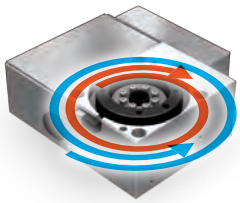
Basic Applications (Rotation)



330°/360° stroke rotation

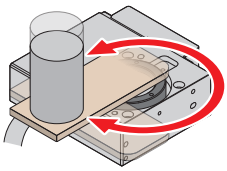


Continuous rotation in one direction

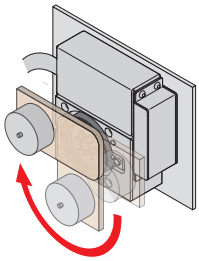


Clockwise/counterclockwise rotation

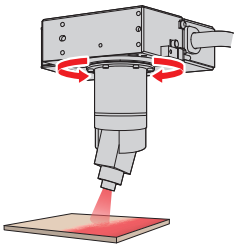
Diversified Applications



Applied moment



No speed fluctuations from varying loads

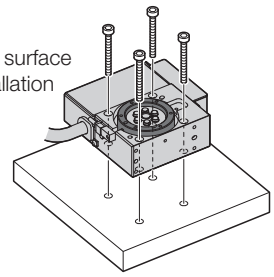


Suspended installation

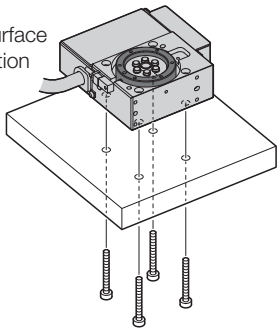
Mounting Methods

This product can be mounted from any surface, making it easy to install anywhere.

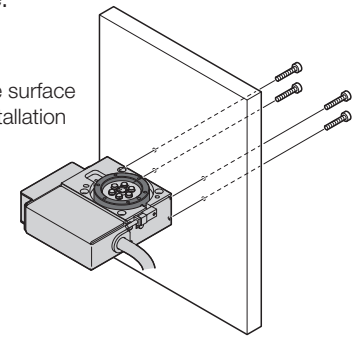
Upper surface installation



Lower surface installation



Side surface installation

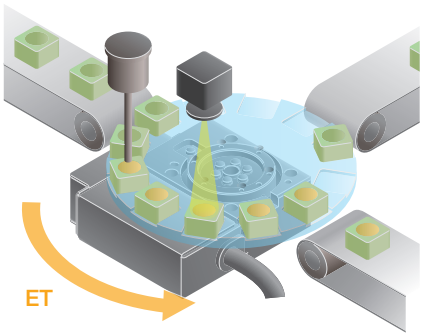


Note) This product cannot be installed with the pulley facing downward. See the instruction manual for details.

Example Applications

General industry

Index table

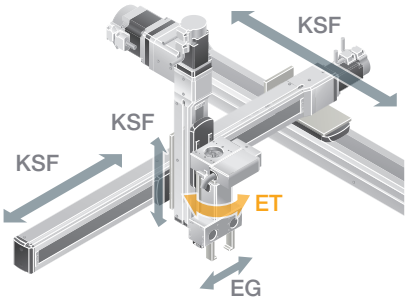


The ET is used in the parts that rotate the table. The rotary mechanism combines a cross-roller ring and a hypoid gear to achieve highly accurate indexing.

Model used — θ axis: ET

General industry

Orthogonal-axis robot



The ET is used in the hand rotary mechanism of the orthogonal-axis robot. The reduced weight of the thin structure allows for a decreased load on the lower axis.

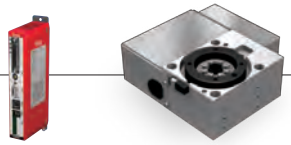
Models used — θ axis: ET
Hand: EG
X, Y, and Z axis: KSF

General Specifications

Two sizes are available: ET20 and ET35. The reduction ratio and motor size for each are given below.

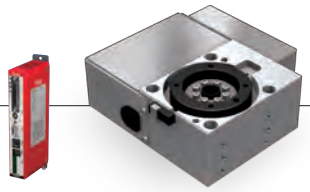
TSC specifications

ET20



Reduction ratio | 45: 1/45
Motor size: 40×40

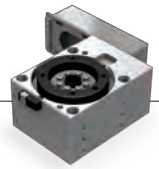
ET35



Reduction ratio | 20: 1/20 30: 1/30
Motor size: 35×35

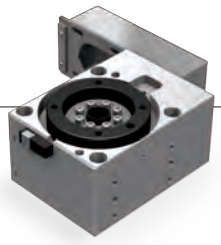
Without motor: Stepper motor specifications

ET20



Reduction ratio | 45: 1/45
Motor size: 40×40

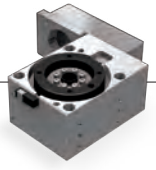
ET35



Reduction ratio | 20: 1/20 30: 1/30
Motor size: 35×35

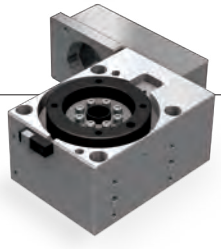
Without motor: Servo motor specifications

ET20



Reduction ratio | 45: 1/45
Motor size: 25×25

ET35

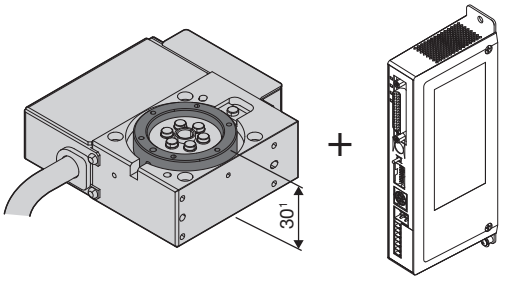
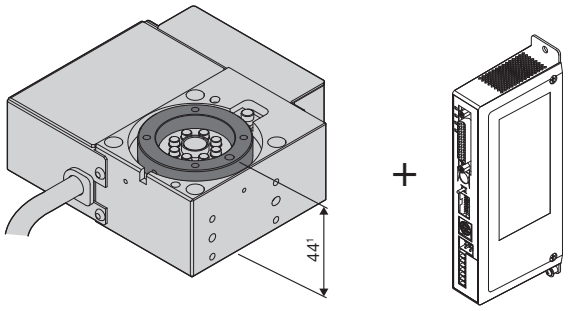


Reduction ratio | 20: 1/20 30: 1/30
Motor size: 40×40

ET (with Stepper Driver Controller TSC)

Combination with dedicated driver controller

Lineup

ET20+TSC	ET35+TSC
	

Users can select a reduction ratio.

[1] This dimension represents the distance from the bottom surface of the base to the top surface of the table.

Model Number Coding

Model ①	Reduction ratio ②	Stroke ③	Control device ④	Options ⑤	Motor size ⑥	Home position ⑦	Cable length ⑧
ET20 –	45 –	330 –	TS –		/ 20P –	D00 –	S3
ET20	20: 1/20	330: 330°	TS: Stepper Driver Controller TSC	No symbol: None	20P: Stepper motor 20×20	No symbol: Multi-rotation specifications	No symbol: None
ET35	30: 1/30	360: Multi-rotation specifications[2]		U: Sensor	35P: Stepper motor 35×35	D00: Counter-clockwise movement	S3: Standard 3 m
	45: 1/45					R00: Clockwise movement	S5: Standard 5 m
							SA: Standard 10 m

Controller must be procured separately. → p. 20

[2] There are conditions for using the product under TSC specifications in continuous rotation in one direction. Please contact THK for more information.

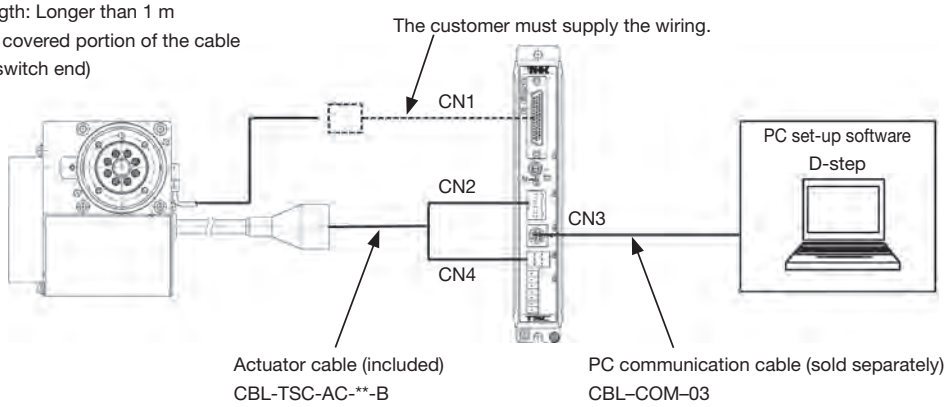
The available motor options vary based on the model.
ET20: 20P
ET35: 35P

D00 and R00 use mechanical homing.

System Configuration

The system configuration is as follows when “360: Multirotation specifications” is selected.
Magnetic proximity switch: AH003 (ASA ELECTRONICS INDUSTRY CO., LTD.)

- Cable ends: multi-conductor cable
- Cable length: Longer than 1 m (length of covered portion of the cable from the switch end)



Cable List

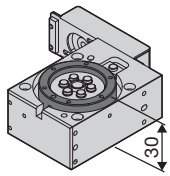
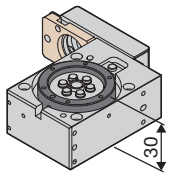
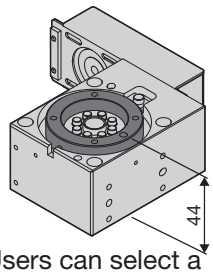
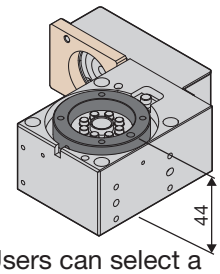
Cable	Quantity	Notes
Actuator cable for TSC	1	Comes with compatible actuator
I/O cable	1	Sold separately (I/O connector for TSC side only comes with TSC)
PC communication cable	1	Sold separately

Note) When using a 10 m actuator cable, please insert a noise filter in the TSC power source.
We recommend the RSAN-2003 noise filter from the TDK-Lambda Corporation.

ET (Without Motor)

Main actuator unit only or equipped with motor specified by customer

Lineup

ET20		ET35	
Stepper motor specifications	Servo motor specifications	Stepper motor specifications	Servo motor specifications
		 Users can select a reduction ratio.	 Users can select a reduction ratio.

Model Number Coding

Model		Reduction ratio		Stroke		With/without motor		Motor bracket		Options
①		②		③		④		⑤		⑥
ET20	–	45	–	360	–	0	–	A	–	U
ET20		20: 1/20		330: 330°		0: Without motor		A: Stepper motor		No symbol: None
ET35		30: 1/30		360: Multi-rotation specifications		1: With motor (THK will purchase and mount the motor you specify)		B: Servo motor		U: Sensor
		45: 1/45								

ET20

Turn table type | Stepper motor 20×20 | Motor wrap | Servo motor 20 W | Servo motor 30 W | Body height 30 mm

Model Number Coding

If "TS" is selected for ④ With or without motor/controller type, selections must be made for ⑦ to ⑨.

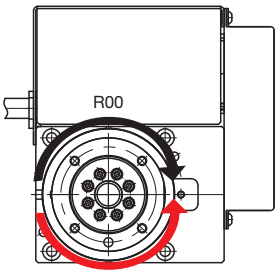
Model ①	Reduction ratio ②	Stroke ③	With or without motor/controller type ④	Motor bracket ⑤	Sensor ⑥	Motor size ⑦	Home position ⑧	Cable length ⑨
ET20	45	360	0	A	U	20P	D00	S3
ET20	45: 1/45	330: 330° 360: Multi-rotation specifications[1]	TS: Stepper Driver Controller TSC 0: Without motor 1: With motor (THK will purchase and mount the motor you specify)	No symbol: None A: Stepper motor type B: Servo motor type	No symbol: None U: Sensor	20P: Stepper motor 20×20	No symbol: Multi-rotation specifications D00: Counter-clockwise movement R00: Clockwise movement	No symbol: None S3: Standard 3 m S5: Standard 5 m SA: Standard 10 m

[1] There are conditions for using the product under TSC specifications in continuous rotation in one direction. Please contact THK for more information.

The available sensor options vary based on the stroke.
330: No Symbol
360: U

360° stroke (multi-rotation) uses a homing sensor (1 m cable).

D00 and R00 use mechanical homing.



Selection Information

Controller Specification

Control device	TSC
Motor size	20×20
Reduction ratio	1/45
Max. output torque[2] (N·m)	0.3
Max. permissible moment of inertia (kg·m^2)	0.0057

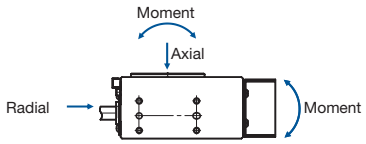
[2] Varies based on angular velocity. See p. 10 "Angular Velocity versus Output Torque" graph for details.

Basic Specifications

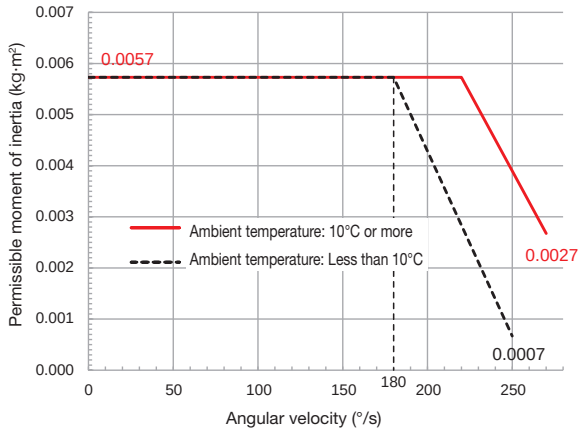
Motor size	20×20
Stroke (one side) (°)	330 or 360
Drive system	Hypoid gear
Output shaft bearing	Cross-roller ring
Reduction ratio	1/45
Max. permissible load torque (N·m)	0.3
Max. permissible moment of inertia (kg·m^2)	0.0057
Max. angular velocity (°/s)	270
Max. angular acceleration (°/s)	2000
Positioning repeatability (°)	±0.04
Backlash[3] (°)	0.2
Permissible axial load[4, 5] (N)	30
Permissible radial load[4, 5] (N)	13.2
Permissible moment[4, 5] (N·m)	3.6
Permissible input torque (N·m)	0.039
Mass[6] (kg)	0.52 (0.35)

[3] Depending on usage conditions, minor wear to the hypoid gear may cause increased backlash.
[4] Please use with a safety margin of 1.5 or greater.
[5] This is the permissible value when loaded in one direction.
[6] Values in parentheses are for no motor specifications.

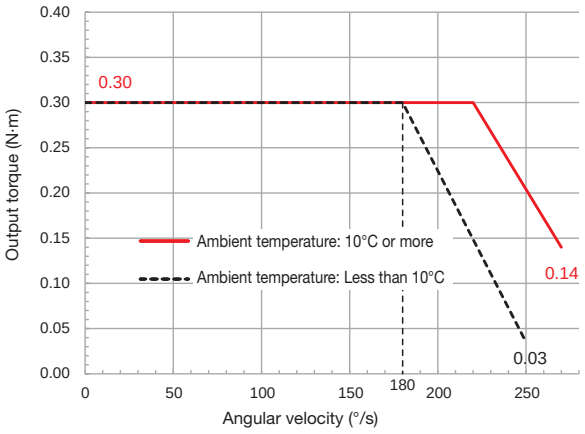
Permissible Load and Permissible Moment



Angular Velocity versus Permissible Moment of Inertia

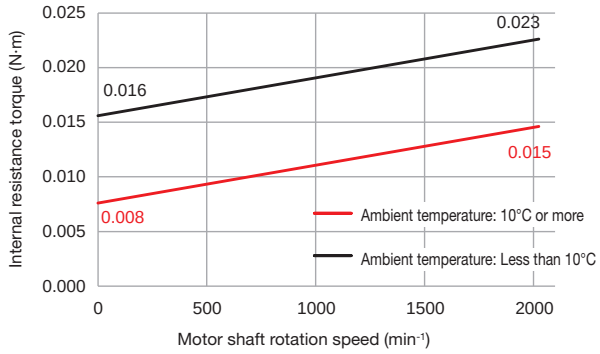


Angular Velocity versus Output Torque



Note 1) This graph represents cases where the angular acceleration is 2000°/s^2.
Note 2) When the ambient temperature is low (below 10°C), the permissible moment of inertia will decrease in the high angular velocity range.
Note 3) When the ambient temperature is low (below 10°C), the output torque will decrease in the high angular velocity range.
Note 4) Please use a safety margin of 1.5 or higher for the output torque.

Motor Shaft Rotation Speed versus Internal Resistance Torque



Note 5) Internal resistance torque increases in low-temperature environments (10°C and below).
Therefore, it is recommended to use a higher safety margin when selecting a product.

Motor Selection Information

Reduction ratio	Unit mass (with motor) (kg)	Unit mass (without motor) (kg)	Moving part mass (kg)	Unit inertia (kg·cm^2)	Efficiency	Timing pulley	Timing belt
1/45	0.52	0.35	0.07	0.004	0.47	P26-1.5GT-3-33F (Manufactured by Gates Unitta Asia Company)	100.5-1.5GT-3 (Manufactured by Gates Unitta Asia Company)

Compatible Motors

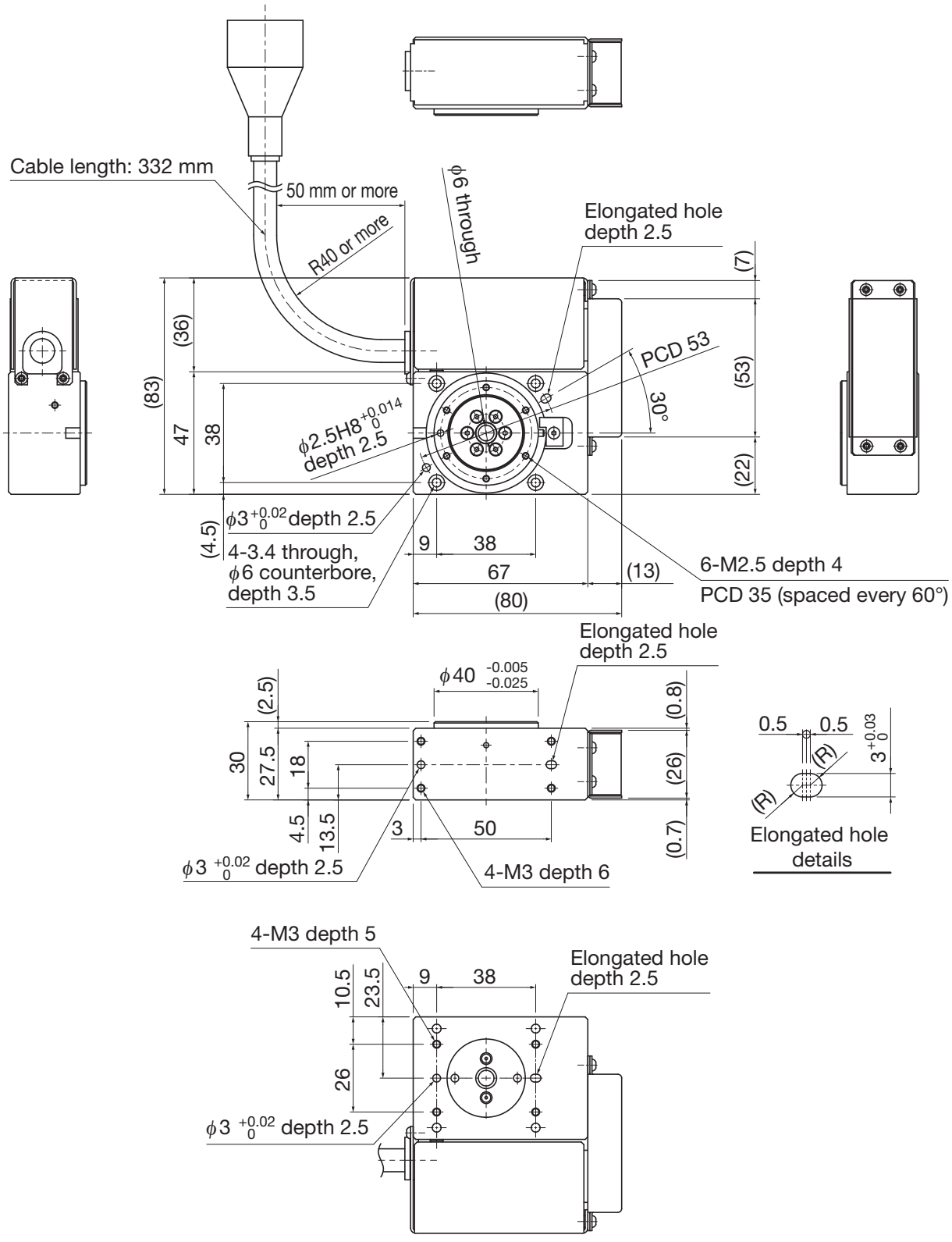
AC servo motor				Motor rated output (W)	Flange size	Motor bracket
YASKAWA Electric Corporation	Σ-Vmini		SGMMV–A2	20	25×25	B
			SGMMV–A3	30		
Mitsubishi Electric Corporation	MELSERVO	J4	HG–AK0236	20	25×25	B
			HG–AK0336	30		

Stepper motor			Flange size	Motor bracket
ORIENTAL MOTOR CO., LTD.	2-phase	PKP214D06*	20×20	A

Note 6) Please select and use a motor that is suited to the usage conditions. The table shows only a portion of the model numbers for motors. For details regarding model numbers, please see the catalog for each respective motor manufacturer.
Note 7) If the maximum torque of the installed motor will exceed the permissible input torque (p. 9), please consider a safety measure to limit the torque.
Note 8) Please select a D-cut type motor output shaft.
Note 9) Installation may not be possible depending on the motor options, so please verify in advance.

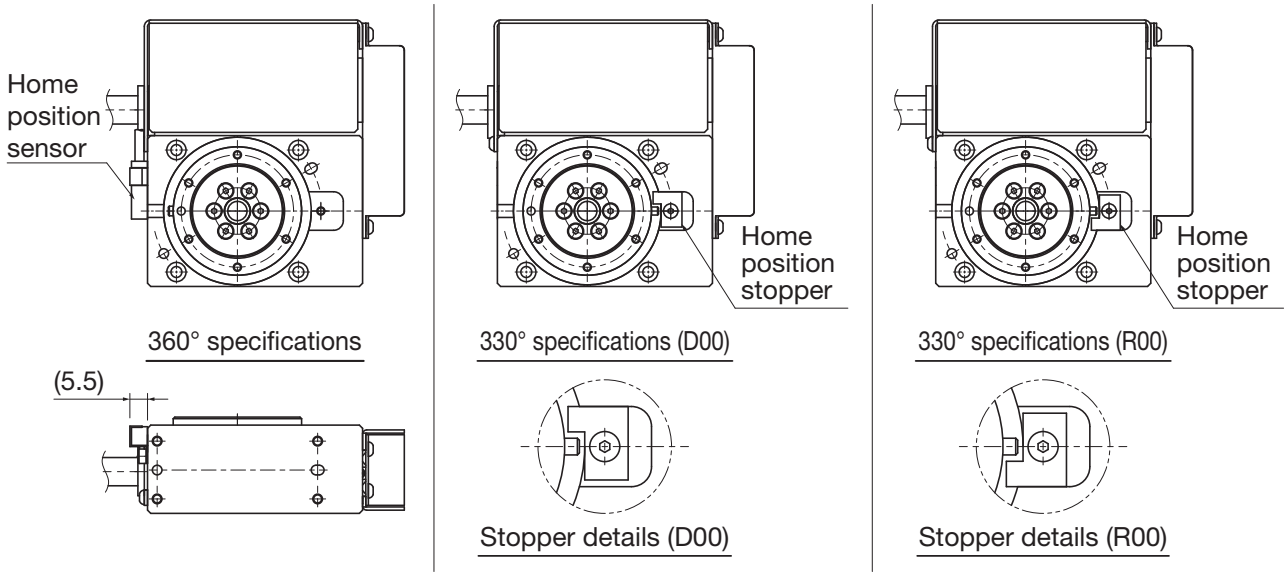
Dimensions

TSC Specifications

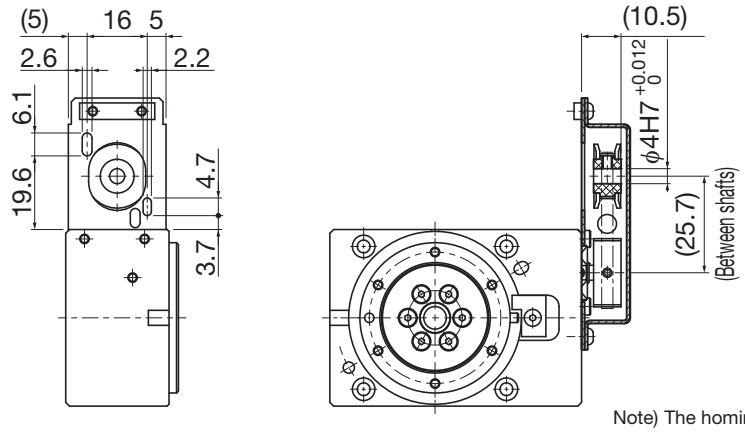


Dimensions

Homing Specifications

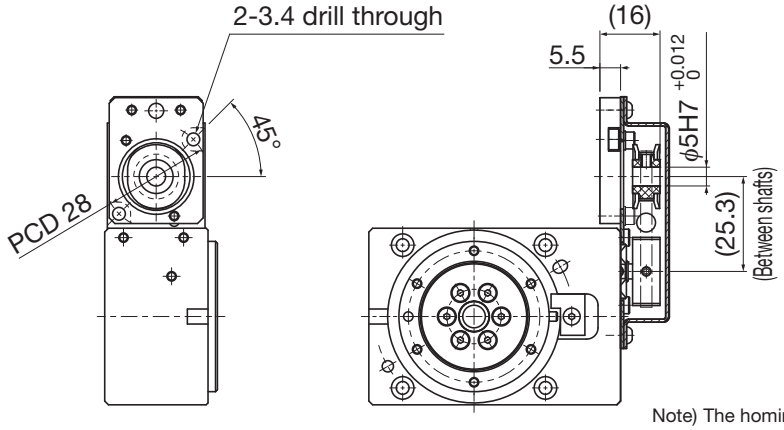


Without Motor (Stepper Motor Specifications)



Note) The homing stopper is for detecting the home position. If a stopper is necessary to prevent overrun, please prepare one separately.

Without Motor (Servo Motor Specifications)



Note) The homing stopper is for detecting the home position. If a stopper is necessary to prevent overrun, please prepare one separately.

ET35

Turn table type | Stepper motor 35×35 | Motor wrap | Servo motor 50 W | Servo motor 80 W | Servo motor 100 W | Body height 44 mm

Model Number Coding

If "TS" is selected for ④ With or without motor/controller type, selections must be made for ⑦ to ⑨.

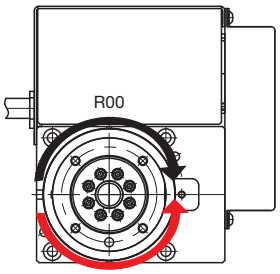
Model ①	Reduction ratio ②	Stroke ③	With or without motor/ controller type ④	Motor bracket ⑤	Sensor ⑥	Motor size ⑦	Home position ⑧	Cable length ⑨
ET35	20	360	TS	U	35P	D00	S3
ET35	20: 1/20 30: 1/30	330: 330° 360: Multi-rotation specifications[1]	TS: Stepper Driver Controller TSC 0: Without motor 1: With motor (THK will purchase and mount the motor you specify)	No symbol: None A: Stepper motor type B: Servo motor type	No symbol: None U: Sensor	35P: Stepper motor 35×35	No symbol: Multi-rotation specifications D00: Counter-clockwise movement R00: Clockwise movement	No symbol: None S3: Standard 3 m S5: Standard 5 m SA: Standard 10 m

[1] There are conditions for using the product under TSC specifications in continuous rotation in one direction. Please contact THK for more information.

The available sensor options vary based on the stroke.
330: No Symbol
360: U

360° stroke (multi-rotation) uses a homing sensor (1 m cable).

D00 and R00 use mechanical homing.



Selection Information

Controller Specifications

Control device	TSC	
Motor size	35×35	
Reduction ratio	1/20	1/30
Max. output torque[2] (N·m)	2.2	3.3
Max. permissible moment of inertia (kg·m^2)	0.028	0.042

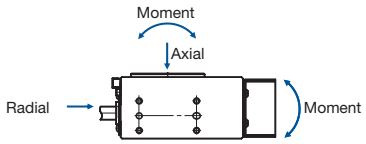
[2] Varies based on angular velocity. See p. 14 "Angular Velocity versus Output Torque" graph for details.

Basic Specifications

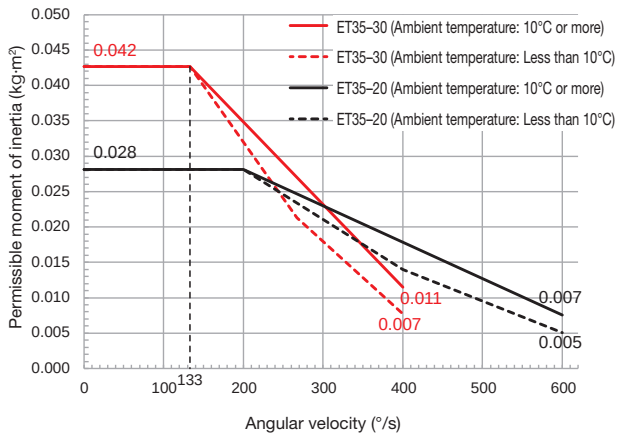
Motor size	35×35	
Stroke (one side) (°)	330 or 360	
Drive system	Hypoid gear	
Output shaft bearing	Cross-roller ring	
Reduction ratio	1/20	1/30
Max. permissible load torque (N·m)	2.2	3.3
Max. permissible moment of inertia (kg·m^2)	0.028	0.042
Max. angular velocity (°/s)	600	400
Max. angular acceleration (°/s)	3000	
Positioning repeatability (°)	±0.04	
Backlash[3] (°)	0.2	
Permissible axial load[4, 5] (N)	200	
Permissible radial load[4, 5] (N)	88	
Permissible moment[4, 5] (N·m)	17.7	
Permissible input torque (N·m)	0.248	
Mass[6] (kg)	1.2 (0.8)	

[3] Depending on usage conditions, minor wear to the hypoid gear may cause increased backlash.
[4] Please use with a safety margin of 1.5 or greater.
[5] This is the permissible value when loaded in one direction.
[6] Values in parentheses are for no motor specifications.

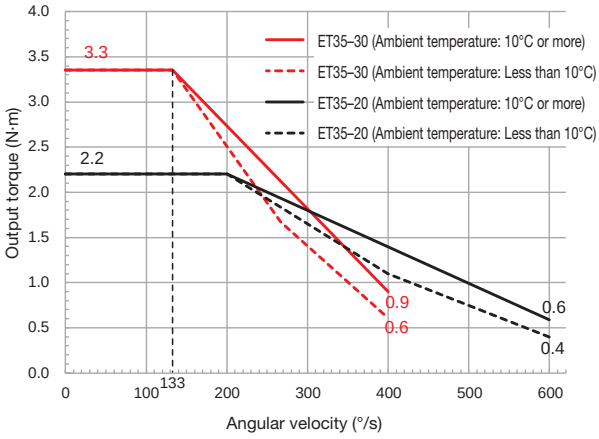
Permissible Load and Permissible Moment



Angular Velocity versus Permissible Moment of Inertia

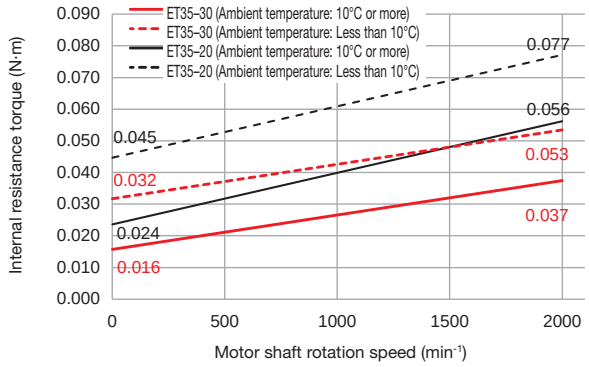


Angular Velocity versus Output Torque



Note 1) This graph represents cases where the angular acceleration is 3000°/s^2.
Note 2) Please use a safety margin of 1.5 or higher for the output torque.

Motor Shaft Rotation Speed versus Internal Resistance Torque



Note 3) Internal resistance torque increases in low-temperature environments (10°C and below). Therefore, it is recommended to use a higher safety margin when selecting a product.

Motor Selection Information

Reduction ratio	Unit mass (with motor) (kg)	Unit mass (without motor) (kg)	Moving part mass (kg)	Unit inertia (kg·cm^2)	Efficiency	Timing pulley	Timing belt
1/20	1.2	0.8	0.17	0.012	0.72	P26-2GT-6-33F (Manufactured by Gates Unitta Asia Company)	134-2GT-6 (Manufactured by Gates Unitta Asia Company)
1/30	1.2	0.8	0.17	0.015	0.71	P26-2GT-6-33F (Manufactured by Gates Unitta Asia Company)	148-2GT-6 (Manufactured by Gates Unitta Asia Company)

Compatible Motors

AC servo motor				Motor rated output (W)	Flange size	Motor bracket
YASKAWA Electric Corporation	Σ-V		SGMJV–A5	50	40×40	B
			SGMJV-01	100		
			SGMAV–A5	50		
			SGMAV-01	100		
	Σ–7		SGM7J–A5	50	40×40	B
			SGM7J-01	100		
			SGM7A–A5	50		
			SGM7A-01	100		
	Σ-X		SGMXJ–A5	50	40×40	B
			SGMXJ-01	100		
			SGMXA–A5	50		
			SGMXA-01	100		
Mitsubishi Electric Corporation	MELSERVO	J4	HG–KR053	50	40×40	B
			HG-KR13	100		
			HG–MR053	50		
			HG-MR13	100		
		J5	HK–KT053W	50	40×40	B
			HK-KT13W	100		

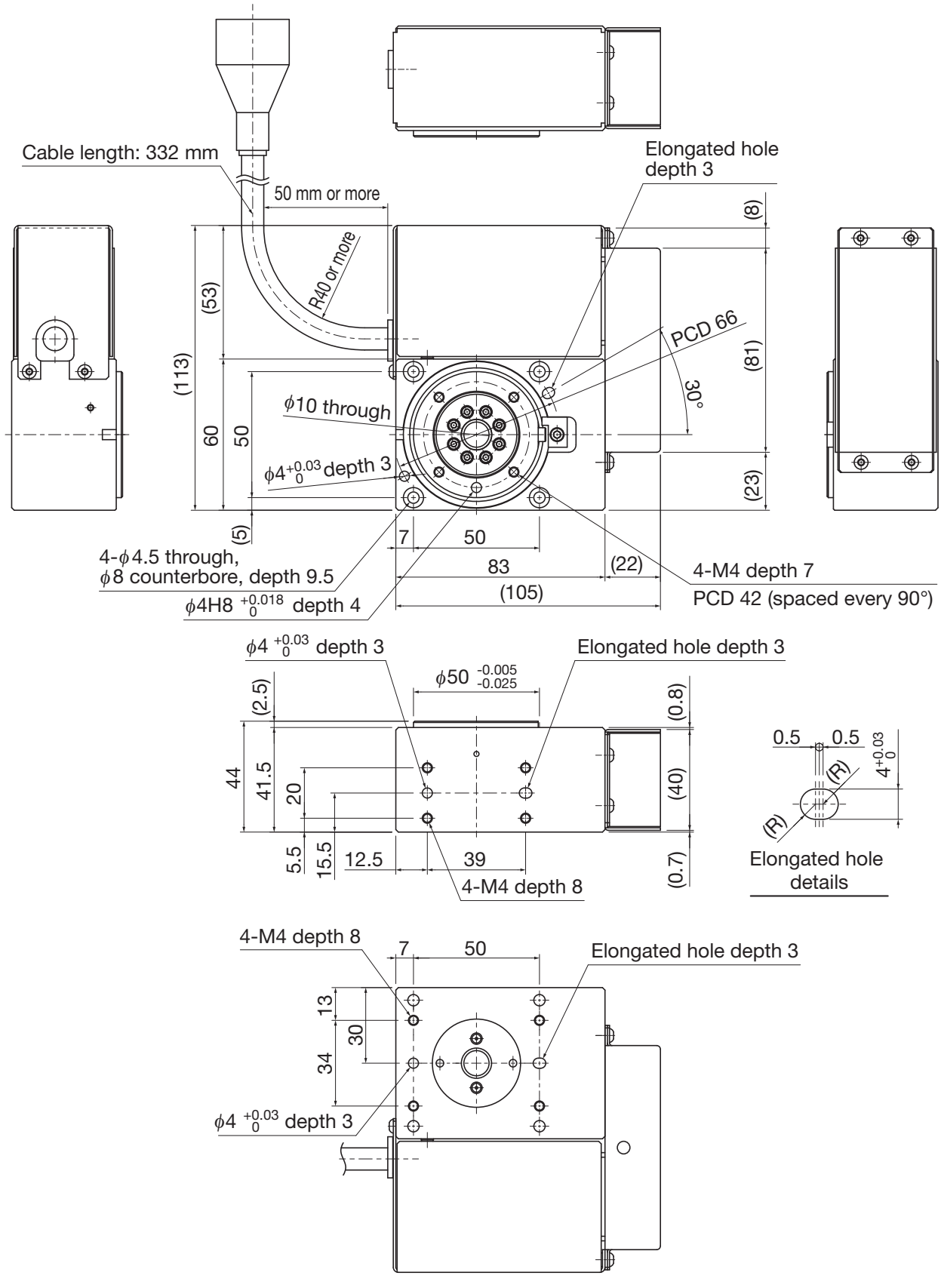
AC servo motor			Motor rated output (W)	Flange size	Motor bracket
TAMAGAWA SEIKI CO., LTD.	TBL-iⅡ	TS4602	50	40 × 40	B
		TS4603	100		
	TBL-iⅣ	TSM3102	50	40×40	B
		TSM3104	100		
SANYO DENKI CO., LTD.	SANMOTION R	R2*A04005	50	40×40	B
		R2EA04008	80		
		R2AA04010	100		

Stepper motor			Flange size	Motor bracket
ORIENTAL MOTOR CO., LTD.	2-phase	PKP235*	35×35	A

Note 4) Please select and use a motor that is suited to the usage conditions. The table shows only a portion of the model numbers for motors. For details regarding model numbers, please see the catalog for each respective motor manufacturer.
Note 5) If the maximum torque of the installed motor will exceed the permissible input torque (p. 13), please consider a safety measure to limit the torque.
Note 6) Please select a D-cut type motor output shaft.
Note 7) Installation may not be possible depending on the motor options, so please verify in advance.

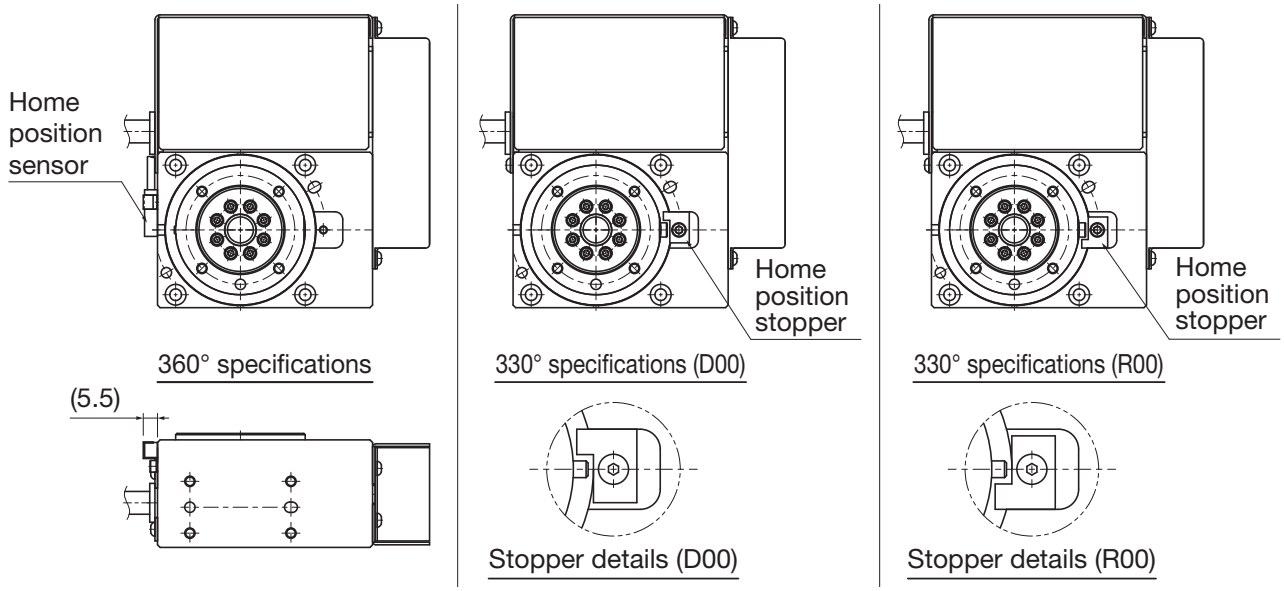
Dimensions

TSC Specifications

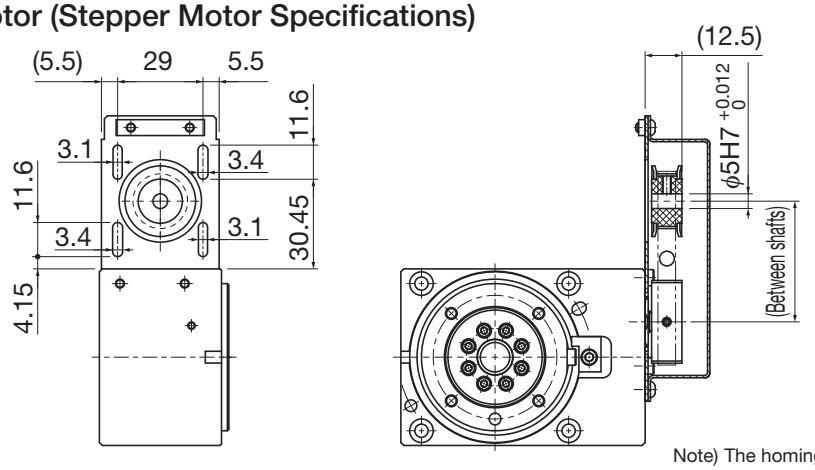


Dimensions

Homing Specifications



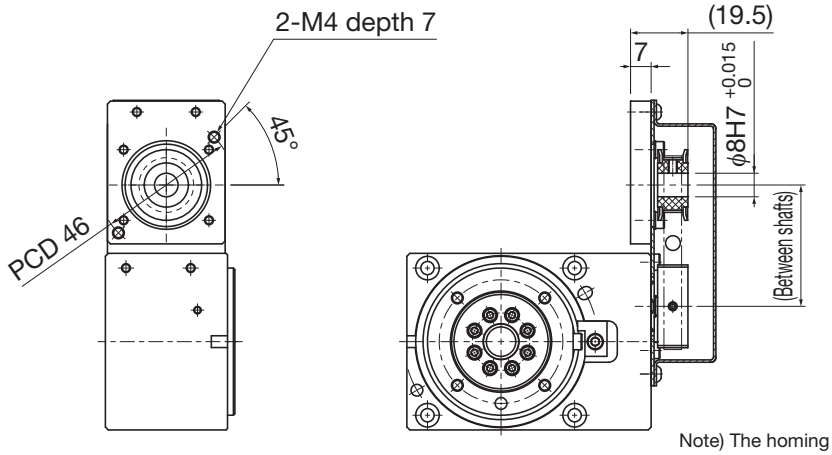
Without Motor (Stepper Motor Specifications)



Reduction ratio	(Between shafts)
1/20	41
1/30	41.3

Note) The homing stopper is for detecting the home position. If a stopper is necessary to prevent overrun, please prepare one separately.

Without Motor (Servo Motor Specifications)



Reduction ratio	(Between shafts)
1/20	41
1/30	41.3

Note) The homing stopper is for detecting the home position. If a stopper is necessary to prevent overrun, please prepare one separately.

Selection Method

When selecting a rotary shaft, calculate the moment of inertia and load torque for the usage conditions and make a selection where the permissible moment of inertia and maximum output torque will not be exceeded.
Refer to the formula below as a representative example and calculate the moment of inertia for the workpiece and mounting jigs you will be using.

Selection Procedure

● Calculating the moment of inertia

Confirm whether or not the calculated moment of inertia satisfies the requirements for the permissible moment of inertia for the model.

If the calculated moment of inertia is less than the permissible moment of inertia, the product may be used.

If the calculated moment of inertia is greater than or equal to the permissible moment of inertia, the product may not be used. Please select a different model or reduce the mass or rotational radius.

For the permissible moment of inertia for each model, please consult the "Angular Velocity versus Permissible Moment of Inertia" graph.

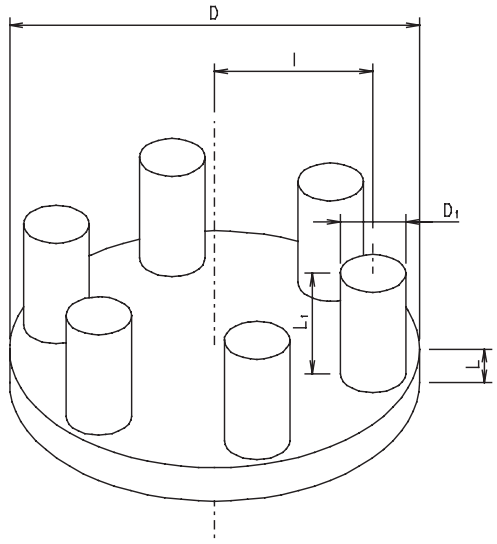
Confirm whether or not the calculated torque satisfies the requirements for the maximum output torque for the model.

If the calculated torque is less than the maximum output torque, the product can be used.

If the calculated torque is greater than or equal to the maximum output torque, the product cannot be used. Please select a different model or reduce the mass or rotational radius.

For the maximum output torque for each model, please consult the "Angular Velocity versus Output Torque" graph.

(Reference) Moment of Inertia for Multiple Cylindrical Columns Combined



$$I_X = \frac{1}{8}m \cdot D^2 + \frac{1}{8}n \cdot m \cdot (D_1{}^2 + 8l^2)\ [\mathrm{kg \cdot m^2}]$$

$$m:\ \frac{\pi}{4}\rho \cdot L \cdot D^2$$

$$m_1:\ \frac{\pi}{4}\rho \cdot L_1 \cdot D_1{}^2$$

Table

Diameter: D (m) Height: L (m)

Mass: m (kg)

Workpiece

Diameter: D_1 (m) Height: L_1 (m)

Mass: m_1 (kg) Quantity: n (pieces)

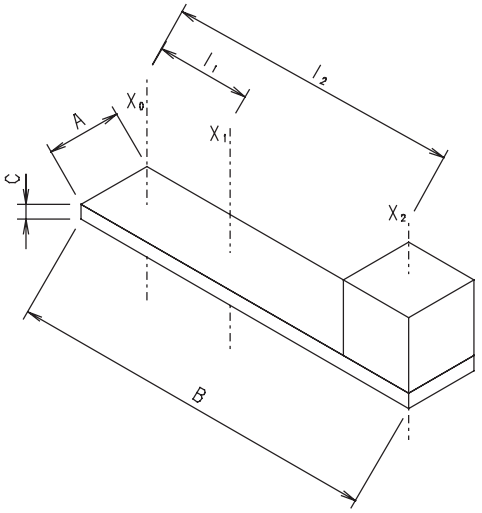
Density: ρ (kg/m^3)

(Notes)

・All workpieces are considered to be of the same shape and mass.

・All workpieces are considered to be at the same distance from the center point.

(Reference) Moment of Inertia for Multiple Rectangular Solids Combined



$$I_X = \frac{1}{12}m_1(A^2 + B^2 + 12 \cdot l_1^2) + \frac{1}{12}m_2(2 \cdot A^2 + 12 \cdot l_2^2)\ [\mathrm{kg \cdot m^2}]$$

m_1 : $\rho \cdot A \cdot B \cdot C$

m_2 : $\rho \cdot A^3$

l_1 : *Distance between X_0 and X_1 (center of rotation X_0)* (m)

l_2 : *Distance between X_0 and X_2 (center of rotation X_0)* (m)

Rectangular solid:

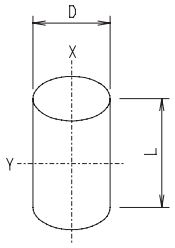
Depth A (m), height B (m), width C (m), mass m_1 (kg)

Cube:

Depth A (m), height A (m), width A (m), mass m_2 (kg)

Density: ρ (kg/m^3)

Moment of Inertia for a Cylinder

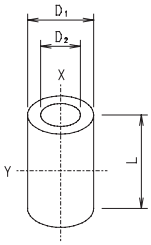


$$I_X = \frac{1}{8} m \cdot D^2 = \frac{\pi}{32} \rho \cdot L \cdot D^4 \, [\mathrm{kg \cdot m^2}]$$

$$I_Y = \frac{1}{4} m \left(\frac{D^2}{4} + \frac{L^2}{3} \right) [\mathrm{kg \cdot m^2}]$$

Outer diameter: D (m)
Length: L (m)
Mass: m (kg)
Density: ρ (kg/m^3)

Moment of Inertia for a Hollow Cylinder

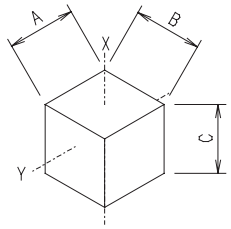


$$I_X = \frac{1}{8} m(D_1^2 + D_2^2) = \frac{\pi}{32} \rho \cdot L \cdot (D_1^4 - D_2^4) \, [\mathrm{kg \cdot m^2}]$$

$$I_Y = \frac{1}{4} m \left(\frac{D_1^2 + D_2^2}{4} + \frac{L^2}{3} \right) [\mathrm{kg \cdot m^2}]$$

Outer diameter: D_1 (m)
Inner diameter: D_2
Length: L (m)
Mass: m (kg)
Density: ρ (kg/m^3)

Moment of Inertia for a Rectangular Solid

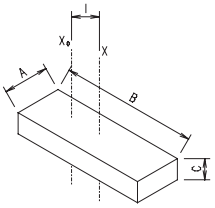


$$I_X = \frac{1}{12} m(A^2 + B^2) = \frac{1}{12} \rho \cdot A \cdot B \cdot C \cdot (A^2 + B^2) \, [\mathrm{kg \cdot m^2}]$$

$$I_Y = \frac{1}{12} m(B^2 + C^2) = \frac{1}{12} \rho \cdot A \cdot B \cdot C \cdot (B^2 + C^2) \, [\mathrm{kg \cdot m^2}]$$

Depth: A (m) Width: B (m)
Height: C (m) Mass: m (kg)
Density: ρ (kg/m^3)

Moment of Inertia for an Object with Different Centers of Rotation and Gravity



$$I_X = \frac{1}{12} m(A^2 + B^2 + 12 \cdot l^2) \, [\mathrm{kg \cdot m^2}]$$

m: $\rho \cdot A \cdot B \cdot C$

l: *Distance between X and X_0 (center of rotation X_0)* (m)

Rectangular solid:
Depth A (m), height B (m), width C (m), mass m (kg)
Cube:
Depth A (m), height A (m), width A (m), mass m (kg)
Density: ρ (kg/m^3)

If I is less than the permissible moment of inertia, the product can be used.

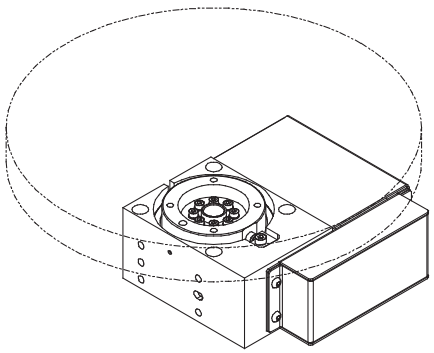
If I is greater than or equal to the permissible moment of inertia, the product cannot be used. Please select a different model or reduce the mass or rotational radius.

For the permissible moment of inertia for each model, please consult the "Angular Velocity versus Permissible Moment of Inertia" graph.

Calculating Torque in Horizontal Applications (Installed from the Bottom Surface)

$$T_1 = (I \times \omega' + \textit{external torque}) \times \textit{safety margin}$$

I: Moment of inertia (kg·m^2)
ω': Angular acceleration (rad/s^2)
Please ensure a safety margin of 1.5 or greater.



Example) External torque (friction torque)
External torque = $\mu \cdot m \cdot g \cdot r$

m: Workpiece mass (kg)		g: Gravitational acceleration (m/s^2)	
μ: Friction coefficient	ET20: 0.020	r: Rotary table radius	ET20: 29 (mm)
	ET35: 0.017		ET25: 34 (mm)

Confirm whether or not the calculated torque satisfies the requirements for the maximum output torque for the model.

If T_1 is less than the maximum output torque, the product can be used.

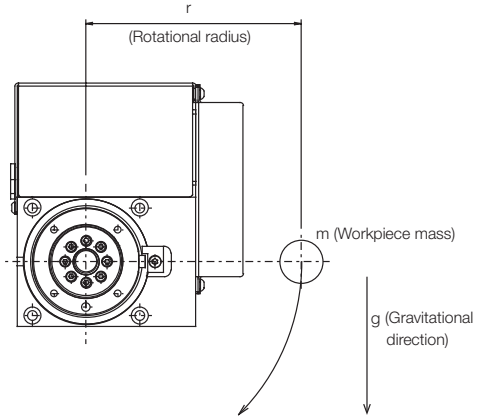
If T_1 is greater than or equal to the maximum output torque, the product cannot be used. Please select a different model or reduce the mass or rotational radius.

For the maximum output torque for each model, please consult the "Angular Velocity versus Output Torque" graph.

Calculating Torque in Horizontal Applications (Installed from a Side Surface)

$$T_2 = (m \cdot g \cdot r + I\omega' + \textit{external torque}) \times \textit{safety margin}$$

m: Workpiece mass (kg) g: Gravitational acceleration (m/s^2)
r: Radius (m) I: Moment of inertia (kg·m^2)
ω': Angular acceleration (rad/s^2)
Please ensure a safety margin of 1.5 or greater.



Confirm whether or not the calculated torque satisfies the requirements for the maximum output torque for the model.

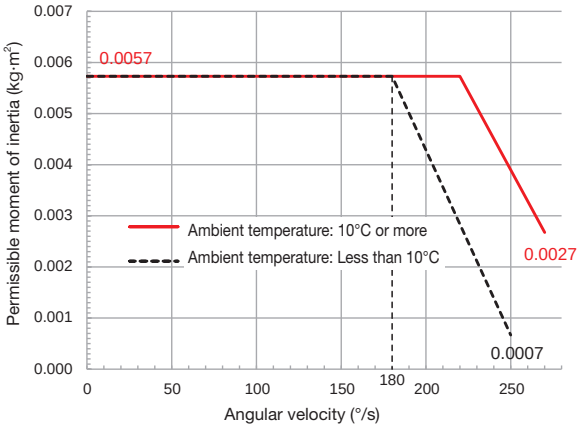
If T_2 is less than the maximum output torque, the product can be used.

If T_2 is greater than or equal to the maximum output torque, the product cannot be used.
Please select a different model or reduce the mass or rotational radius.

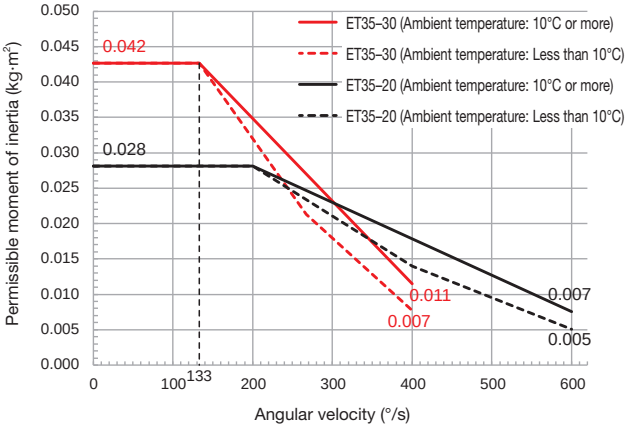
For the maximum output torque for each model, please consult the "Angular Velocity versus Output Torque" graph.

Angular Velocity versus Permissible Moment of Inertia

ET20

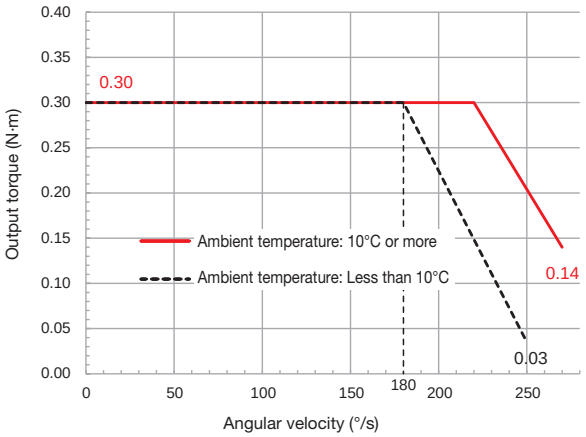


ET35

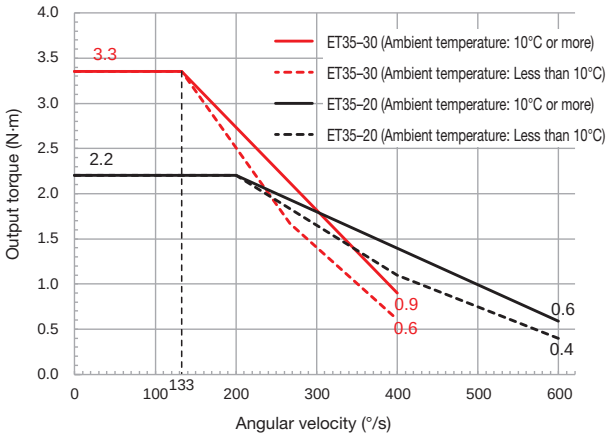


Angular Velocity versus Output Torque

ET20

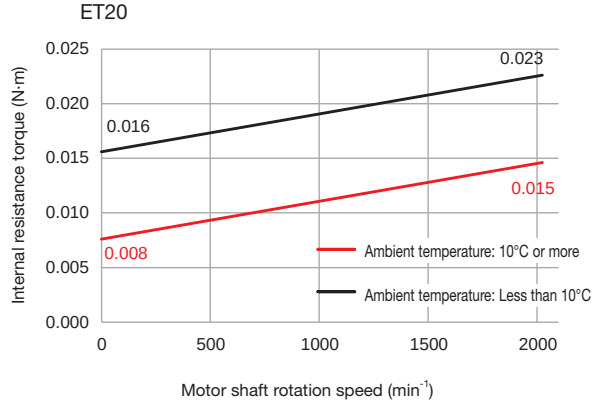


ET35

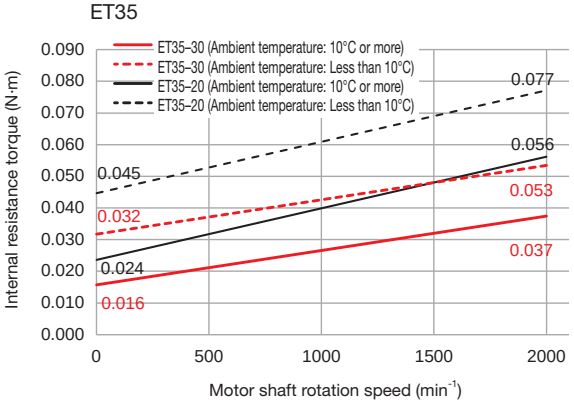


Motor Shaft Rotation Speed versus Internal Resistance Torque

ET20



ET35



Note) Internal resistance torque increases in low-temperature environments (10°C and below).
Therefore, it is recommended to use a higher safety margin when selecting a product.

TSC Stepper Driver Controller (for a single axis, position type)

Features

Use quickly with simple setup.

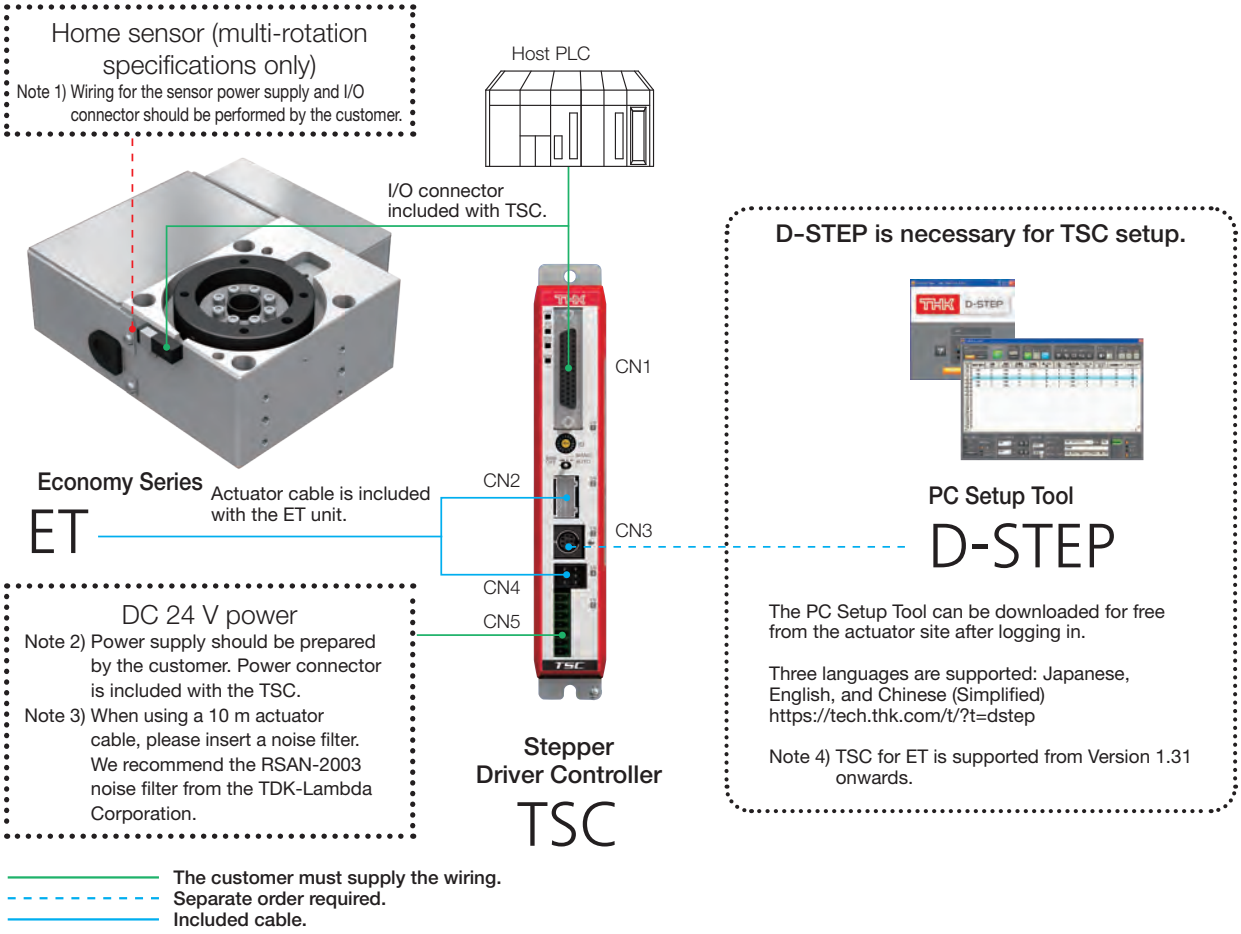
Simple operation

You can utilize a wealth of features simply by using the PC setup tool “D-STEP.”

Functions

· Choose function mode
(64-position mode, external input teaching type, 256-position mode, solenoid mode 1, solenoid mode 2)
· Step data count: Maximum 256 items (varies by function mode)
· Alarm log: Maximum 50 events (including power on log)
· Switch between automatic and manual
· Choose control method (positioning, pressing)
· Home sensor return method (only when paired with ET)

System Structure



Cable List

Cable	Quantity	Notes
Actuator cable for TSC	1	Comes with compatible actuator
I/O cable	1	Sold separately (I/O connector for TSC side only comes with TSC)
PC communication cable	1	Sold separately

Note) When using a 10 m actuator cable, please insert a noise filter in the TSC power source.
We recommend the RSAN-2003 noise filter from the TDK-Lambda Corporation.

Model Number Coding

Model ①	Electrical current value ②	Design symbol ③	Type ④	Actuator model ⑤	Reduction ratio ⑥	Stroke ⑦	Home return method ⑧
TSC	015	B	MOD	ET20	45	330	D
TSC	015: 1.5 A	B	MOD: Mode switch type	ET20 ET35	20: 1/20 30: 1/30 45: 1/45	330: 330° 360: Multi-rotation specification[1]	D: Counterclockwise R: Clockwise

[1] There are conditions for using the product under TSC specifications in continuous rotation in one direction. Please contact THK for more information.
Note) When the model number in ⑤ is ET20 or ET35, the product cannot be used to operate ES, EC, KRF, or other models.

Specifications

Basic specifications	Input power supply		DC 24 V ±10% (Maximum 2.5 A)				
Control	Number of axes controlled		1 axis				
	Motor type		Stepper motor (20×20, 35×35)				
	Control method		Feedback control (semi-closed loop)				
	Location detection method		Incremental				
	Acceleration/deceleration method		Trapezoidal				
Program	Function mode		64-position mode	External input teaching	256-position mode	Solenoid mode 1	Solenoid mode 2
	Step data count		64	64	256	7	3
	Data input/output method		D–STEP (PC Setup Tool)				
Input/output	Dedicated input/output	Input items	16 items: start, home return, pause, reset, servo on, designate step number, etc.[2]				
		Output items	16 items: home return complete, in position, servo ready, alarm, emergency stop on, etc.[2]				
	External power for input/output		DC 24 V ±10% (to be prepared by the customer)				
Communication	Serial communication	Connection device	D–STEP (PC Setup Tool)				
		Communication method	RS–485				
		Port count	Mini-DIN ×1				
Usage conditions	Operating temperature/Storage temperature		0°C to 40°C (no freezing) / -20°C to 85°C (no freezing)				
	Operating humidity/Storage humidity		90% RH or less (no condensation)				
	Ambient environment		Indoors (do not expose to direct sunlight); no exposure to corrosive gas, flammable gas, oil mist, or dust; no exposure to water, oil, or chemicals				
General specifications	Protective functions		Overload, overvoltage, excessive position deviation, software over limit errors, etc.				
	Accessories		Power connector ×1 I/O connector ×1				
	Options (sold separately)		I/O cable (3 m, 5 m, 7 m, 10 m) PC communication cable (Mini-DIN ⇔ USB)				
	External dimensions		32 mm (W) × 192.2 mm (H) × 77.6 mm (D)				
	Mass		0.3 kg or less				

[2] Varies depending on the function mode.

TSC Function Mode

There are five modes available for the TSC to suit different applications and purposes.

Function mode		Overview	Step data count	Pushing operation
Multi-point positioning type	0: 64-position mode	64-point multi-point positioning operation Area output available, P area output available	64	Available
	1: External input teaching	64-point multi-point positioning operation I/O external input teaching mode Area output not available, P area output available	64	Not Available
	2: 256-position mode	256-point multi-point positioning operation Area output not available, P area output available	256	Available
Electromagnetic valve type	4: Solenoid mode 1	7-point multi-point positioning operation Direct movement command input Area output available, P area output available	7	Available
	5: Solenoid mode 2	3-point multi-point positioning operation Direct movement command input Location detection auto switch output, area output, P area output available	3	Not Available

Pin Assignment by TSC Function Mode

I/O	CN1 pin number	Signal name				
		Function mode 0	Function mode 1	Function mode 2	Function mode 4	Function mode 5
		64-position mode	External input teaching	256-position mode	Solenoid mode 1	Solenoid mode 2
Input	3	PI 0	PI 0	PI 0	ST 0	ST 0
	4	PI 1	PI 1	PI 1	ST 1	ST 1
	5	PI 2	PI 2	PI 2	ST 2	ST 2
	6	PI 3	PI 3	PI 3	ST 3	—
	7	PI 4	PI 4	PI 4	ST 4	—
	8	PI 5	PI 5	PI 5	ST 5	—
	9	—	MODE	PI 6	ST 6	—
	10	—	JOG/INCHING	PI 7	—	-
	11	SENSOR	SENSOR	SENSOR	SENSOR	SENSOR
	12	BKRL	JOG N	BKRL	BKRL	BKRL
	13	STRT	STRT/PWRT	STRT	—	-
	14	MANU	MANU	MANU	MANU	MANU
	15	HOME	HOME	HOME	HOME	HOME
	16	PAUSE	PAUSE	PAUSE	PAUSE	PAUSE
	17	REST	REST	REST	REST	REST
	18	SV–ON	SV–ON	SV–ON	SV–ON	SV–ON
Output	19	PO 0	PO 0	PO 0	PE 0	LS 0
	20	PO 1	PO 1	PO 1	PE 1	LS 1
	21	PO 2	PO 2	PO 2	PE 2	LS 2
	22	PO 3	PO 3	PO 3	PE 3	—
	23	PO 4	PO 4	PO 4	PE 4	—
	24	PO 5	PO 5	PO 5	PE 5	—
	25	MOVE	MOVE	PO 6	PE 6	—
	26	AREA	MODES	PO 7	AREA	AREA
	27	P AREA	P AREA	P AREA	P AREA	P AREA
	28	MANU S	MANU S	MANU S	MANU S	MANU S
	29	HEND	HEND	HEND	HEND	HEND
	30	INPS	INPS	INPS	INPS	—
	31	LOAD/TRQS	WEND	LOAD/TRQS	LOAD/TRQS	—
	32	SVRDY	SVRDY	SVRDY	SVRDY	SVRDY
	33	EMGS	EMGS	EMGS	EMGS	EMGS
	34	ALM	ALM	ALM	ALM	ALM

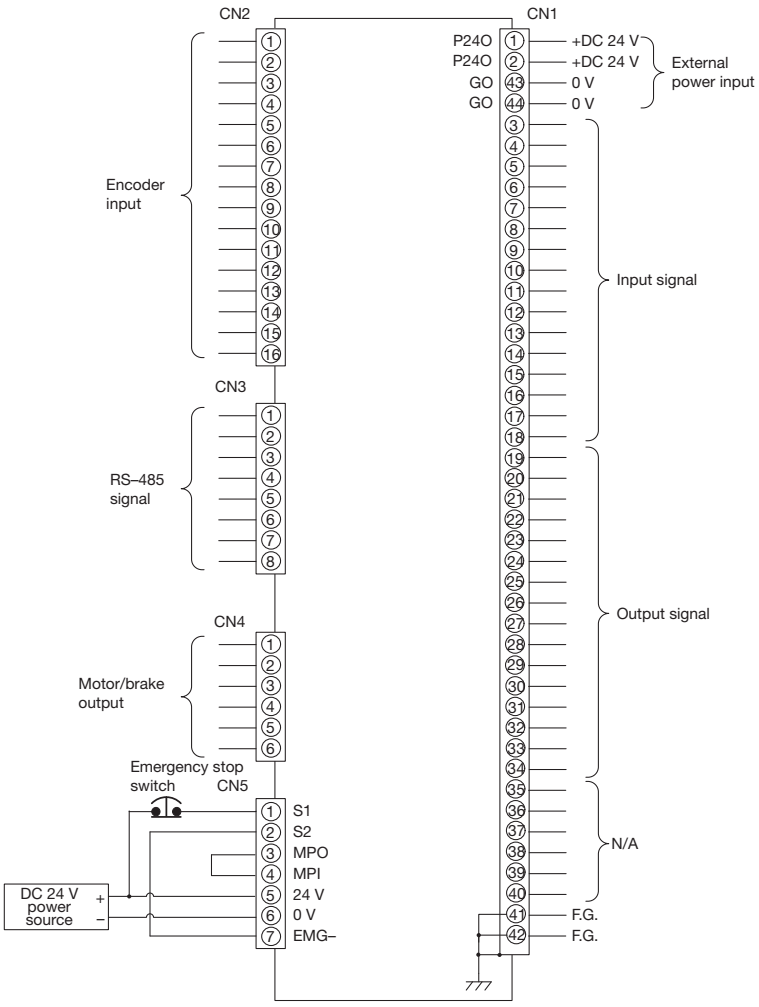
Input Signal Function Details

Input		
Signal name	Details	Notes
MANU	Run mode	Switch between AUTO/MANUAL from I/O. ON for MANUAL, OFF for AUTO.
STRT	Start	Program step start signal. ON to start program.
PI 0 to PI 7	Command position number	Input for position number designation. Program designation by signal level. Select program step and start program with “STRT” signal.
PAUSE	Temporary stop	Temporarily suspend operation. OFF for PAUSE input state (N.C. contact specification).
HOME	Home return	Start home return operation. ON to start home return.
SV–ON	Servo ON	Turn servo on and off. ON to turn servo on, OFF to turn servo off.
REST	Alarm reset	Reset the alarm. Reset remaining travel amount when paused. ON to reset.
BKRL	Break release	Force release the brake. ON to release brake.
MODE	External input teaching mode	Change to teaching mode. ON for teaching mode.
PWRT	In external input teaching mode: Write current position	Designate the position and turn this signal on for 20 ms or more while in teaching mode to write position.
JOG/INCHING	In external input teaching mode: Switch manual movement	Switch manual movement mode while in teaching mode. Movement is INCHING when ON, movement is JOG when OFF.
JOG P	In external input teaching mode: Movement direction +	Movement direction and start signal when in teaching mode. ON to move to each soft limit in + direction, OFF when moving for deceleration stop.
JOG N	In external input teaching mode: Movement direction -	Movement direction and start signal when in teaching mode. ON to move to each soft limit in - direction, OFF when moving for deceleration stop.
ST 0 to ST 6	Cylinder type START	Program start signal for position numbers ST 0 through ST 6. You can select level or edge for signal with Parameter No. 13 “Movement command method.” Furthermore, when two or more signals are ON simultaneously, the lesser value will be prioritized.
SENSOR	Sensor input	The input signal when sensor input is selected for home return method.

Output Signal Function Details

Output		
Signal name	Details	Notes
MANU S	Run mode status	Run mode output (AUTO/MANUAL) ON for MANUAL, OFF for AUTO.
PO 1 to PO 7	Complete position number	Outputs position number after positioning is completed (binary output).
MOVE	Moving	Signal output when motor is running.
INPS	Positioning finished	This is output when the motor enters the positioning completion boundary.
SVRDY	Run prep complete	This signal is output when the servo is ON.
ALM	Alarm	Alarm output signal.
MODES	External input teaching mode status	Teaching mode/normal run mode output judgment signal. ON for teaching mode. OFF for normal run mode.
WEND	Write completed	Once writing through PWRT signal is complete, this signal turns on for 30 ms.
HEND	Home return completed	Output signal when home return operation is completed.
AREA	Area upper limit/lower limit	ON when actuator’s current position is within the set range of the parameter.
P AREA	Position area	ON when actuator’s current position is within the set range of the program step.
EMGS	Emergency stop state	Judgment output for emergency stop input. ON when in normal state, OFF when emergency stop circuit is broken.
LOAD	Load output judgment status	ON when specified torque exceeds threshold for a set amount of time within judgment range.
TRQS	Torque level status	ON when load threshold is reached while moving. OFF when below load threshold.
PE 0 to PE 6	Cylinder type arrival complete output	This signal is output after position number operation is completed.
LS 0 to LS 2	Cylinder type position detection output	This signal is output once all current positions (3 points) enter the positioning range.

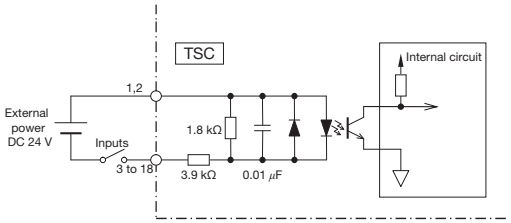
TSC Pin Assignment



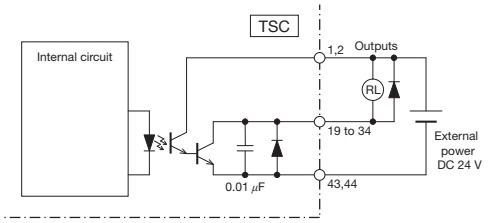
Note 1) DC 24 V power source for input/output circuit should be prepared by the customer.

TSC (CN1) Input/Output Circuit

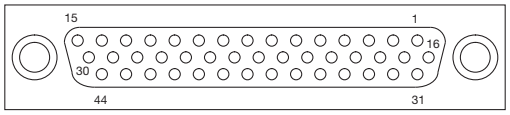
Input Circuit



Output Circuit

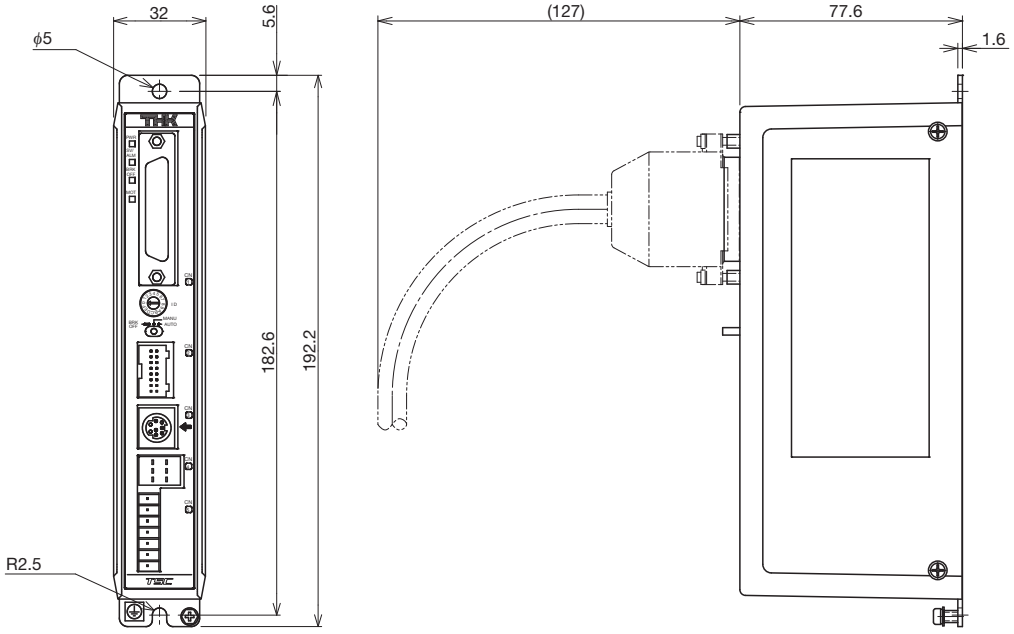


I/O Connector Pin Number



Note 2) This image shows the front of the TSC.

Dimensional Drawing



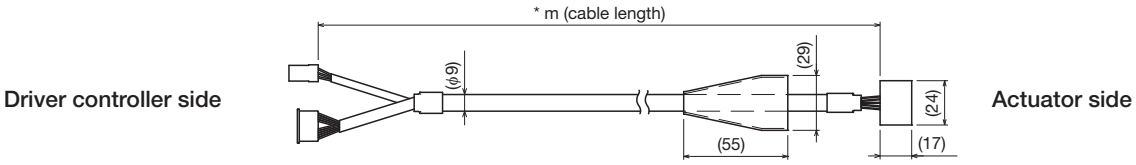
Note 3) Contact THK for details about dimensional drawings.

Cables

Actuator Cable

TSC Actuator Cable: CBL–TSC–AC–**–B (standard)

** is for cable length (03: 3 m, 05: 5 m, 10: 10 m)



Note 1) When using a 10 m actuator cable, please insert a noise filter in the TSC power source.
We recommend the RSAN-2003 noise filter from the TDK-Lambda Corporation.
Note 2) If using for a moving part, we recommend a bending radius of R95 or greater for the cable center. (For parts that are not movable, we recommend R50 or greater.)

Cable

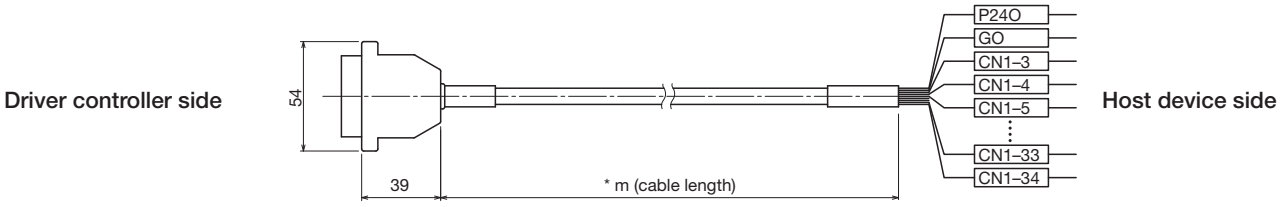
I/O cable: CBL–CON–IO–**

** is for cable length (03: 3 m, 05: 5 m, 10: 10 m)

(Sold separately)

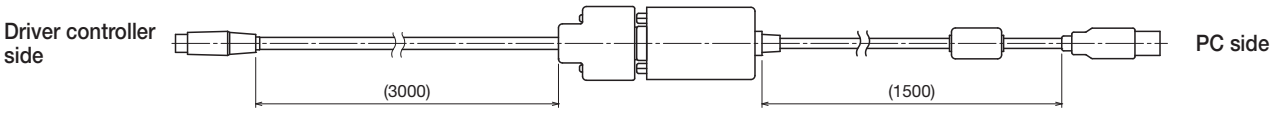
Can be used with driver controller TSC/TLC/THC.

Note 3) Multi-conductor cable on host device side will be shipped unprocessed.



PC communication cable: CBL–COM–03

(Sold separately)



D-STEP PC Setup Tool

Features

Simple interface that supports multi-functional TSC, TLC, and THC.

Simple operation

Operate and set up the TSC with your PC.
Includes useful features for maintenance such as data backup and operation state logging.

Functions

- Confirmation, editing, backup, and offline editing of step data
- Confirmation, editing, backup, and offline editing of parameters
- Actuator operations (home return, jog movement, inching movement, program execution, servo on/off)
- Monitoring (I/O, current position, position command, current command)
- Logging (speed/electrical current waveform display)
- Alarm (log display, log clear, alarm reset)
- Display language (Japanese, English, Chinese (Simplified))

Supported OS: Windows XP, Windows Vista, Windows 7, Windows 10
D-STEP can be downloaded for free from the THK Electric Actuator Site.
(https://tech.thk.com/t/?t=dstep)

Note 4) TSC for ET is supported from Version 1.31 onwards.

Available in three languages


User-friendly interface

MEMO

⚠Precautions on Use

Handling

- Do not disassemble the actuator or control devices unless necessary. This may result in debris entering the product and loss of functionality.
- Take care not to drop or strike the actuator or control devices. Otherwise, it may cause injury or damage the unit. Even if there is no outward indication of damage, a sudden impact could prevent the unit from functioning properly.
- Please contact THK when using the product in special environments such as locations exposed to constant vibrations, clean rooms, vacuums, and low/high temperatures.
- When using the product in a wall-mounted orientation, install with the pulley side up.
- The TSC controller for ET cannot be used to operate ES, EC, KRF, or other models.

Operating Environment

An improper usage environment may cause failure of the actuator and control devices. To avoid this, prepare an environment such as the following.

- Actuator: Ambient temperature between 0°C to 40°C, ambient humidity 80% RH or lower, no freezing, no condensation
- Controller: Ambient temperature between 0°C to 40°C, ambient humidity 90% RH or lower, no freezing, no condensation
- A location with no corrosive or flammable gas
- A location where electrically conductive particles such as steel dust, dust, oil mist, cutting oil, water content, salt content, or organic solvents will not be present in the air
- A location not exposed to direct sunlight or radiant heat
- A location where no strong electric fields or powerful magnetic fields are generated
- A location where vibrations or impacts are not transmitted to the main unit
- A location where inspections and cleanings can easily be performed

Safety precautions

- Do not touch any moving parts while the product is in operation or in an operable state. In addition, do not enter the operating range of the actuator.
- When installing, adjusting, inspecting, or performing maintenance on the actuator and connected peripherals, be sure to disconnect all power. Implement safety measures to ensure that no one else can turn the power on.
- If performing a task involving multiple people, confirm how to perform the work, what signals will be used, and how to handle problems before beginning, and assign another person to monitor the work.
- Carefully read JIS B8433 “Manipulating Industrial Robots - Safety” and the Japanese Ministry of Health, Labour and Welfare’s “Ordinance on Industrial Safety and Health” before working with the product, and follow the guidance within.
- Using this product in excess of the torque limit may damage the components or cause an accident.
- Do not set the torque control parameter higher than the torque limit.
- A stopper is installed inside the product. It is intended to limit the stroke, and may become damaged in the event of a strong impact.
- In applications where this product will be moved or transferred, the conditions of use may cause inertia from the motor’s mass to result in damage to the motor attachment (Housing A) or other parts. Please contact THK before using in this manner.

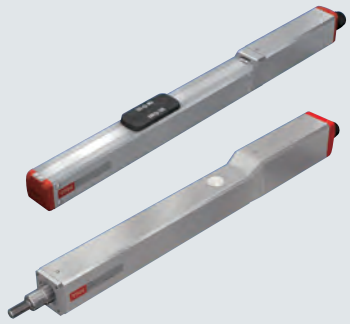
Lubrication

- Thoroughly wipe off anti-rust oil before using the product.
- The ET must be lubricated in order for it to demonstrate its full performance. Insufficient lubrication may increase wear on the rolling elements and lead to premature damage.
- Do not mix lubricants with different properties.
- Contact THK if a special lubricant will be used.
- Contact THK if oil lubricant will be used.
- The lubrication interval will vary depending on the usage conditions, so we recommend determining the lubrication interval based on the initial inspection.

Storage

- When storing the actuator, enclose it in a package designated by THK and store it in a horizontal orientation while avoiding high temperatures, low temperatures, and high humidity.
- Avoid storing control devices in an environment with high/low temperatures or high humidity.

Other Recommended Products



Economy Series Electric Actuator

ES/EC

- ○ Uses a ball screw to move with higher precision than air cylinders.
- ○ Modularized structure reduces number of components and both design and assembly time.
- ○ Uses the Caged Ball LM Guide to achieve long-term maintenance-free operation (ES only).

Electric Gripper

EG

- ○ Capable of multi-point positioning, opening and closing speed control, and gripping force setting.
- ○ Smooth motion that withstands repeated open/close operations.
- ○ Maintains gripping force even when power is lost.

LM Guide Actuator

SKR/KR

- ○ Modularized structure reduces number of components and both design and assembly time.
- ○ Can be used in a horizontal, wall-mounted, vertical, or suspended orientation.
- ○ Optimal for high-precision positioning and orthogonal-axis designs.

Thin Electric Turntable **ET**

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