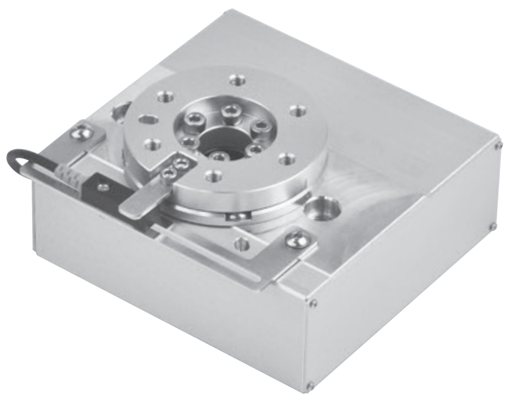


Specification

Model		MERE
Size		30
Rotation angle	(°)	320, 360
Lead	(°)	12
Max. rotating torque *1,3,4	(N·m)	1
Max. moment of inertia	(kg·m^2)	0.015
Max. angular speed *1,2	(°/s)	≤420
Max. angular acceleration/ deceleration	(°/s^2)	3000
Backlash	(°)	±0.3
Positioning repeatability	(°)	±0.05
Max. operating frequency	(cpm)	60
Motor size	(mm)	□28
Rated voltage		DC 24V±10%
Sensor switch		RJF
Weight	(kg)	1.1

*1. The angular speed and rotating torque may change depending on the cable length, load, stroke and mounting conditions.
*2. The max. angular speed is 30°/s with push motion function.
*3. The torque accuracy is ±20%.
*4. The range of rotating torque is 30% ~ 90%.

Order example

MERE — 30 — 1 — CK10 03 N 015

Model: MERE

Size: 30

Rotation angle

1	320°
2	360°

Controller	Motor
CK10	SM
CM20 *1	BM

I/O type

N	NPN

I/O cable length

015	1.5 m
03	3 m

* Standard: 1.5 m

Power + Encoder cable of motor

01	1 m *2
015	1.5 m *3
03	3 m
05	5 m

* Standard: 3 m

*1. Sensors would be needed.
*2. Only for CM20.
*3. Only for CK10.

Accessory kits

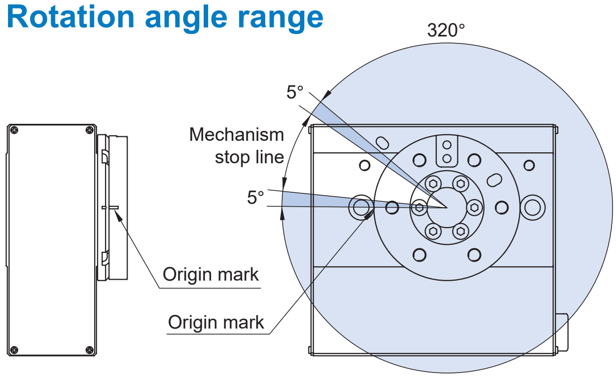
AK — ER1 — 30

Accessory kits: AK

Size
30

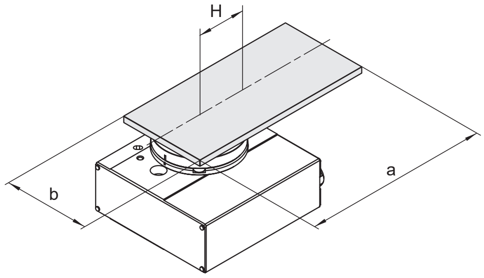
* With sensing sheet, mounting seat and bolt.

Rotation angle range



Flange rotating angle

Operating conditions



Electric rotary actuator	MERE-30	
Installation direction	Horizontal	
Load type	Inertial load Ta	
Configuration of load	150×80 mm (Rectangular plate)	
Rotation angle	180°	θ
Angular acceleration / deceleration	1000°/sec^2	$\dot{\omega}$
Angular speed	420°/sec	ω
Load mass	2 kg	m
Distance between shaft and center of gravity	40mm	H

Step 1: Moment of inertia – Angular acceleration / deceleration

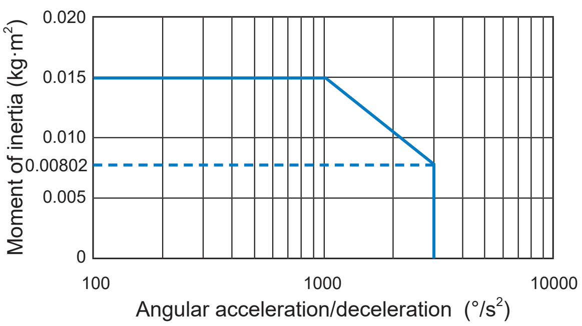
1. Calculate moment of inertia
2. Check the angular acceleration / deceleration
   Confirm the setting range from the <Angular Acceleration / Deceleration - Moment of Inertia graph>.

Formula

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

Selection example

$I = 2 \times (0.15^2 + 0.08^2)/12 + 2 \times 0.04^2$
$= 0.00802\ kg \cdot m^2$
→ Angular acceleration / deceleration 1000°/sec^2 OK



Step 2: Necessary torque

* Please refer to page 3.

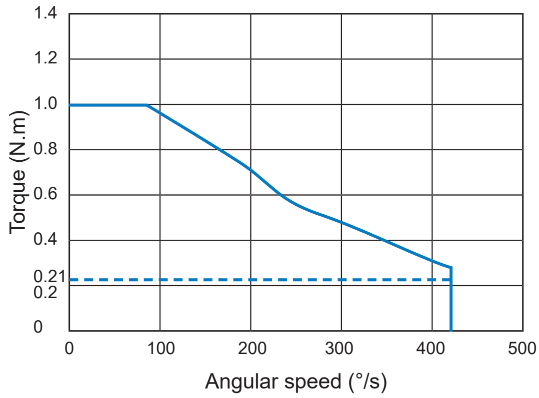
1. Load type
   · Static load Ts
   · Resistance Tf
   · Inertial load Ta
2. Check the effective torque
   Confirm the setting range from the <Angular Speed – Torque graph>.

Formula

Effective torque ≥ Ts
Effective torque ≥ Tf×1.5
Effective torque ≥ Ta×1.5

Selection example

Inertial load: Ta
$Ta \times 1.5 = I \times \dot{\omega} \times 2\pi / 360 \times 1.5$
$= 0.00802 \times 1000 \times 0.0175 \times 1.5$
$= 0.21$ N.m → Angular speed 420°/sec^2 OK



Step 3: Allowable load

* Please refer to page 4.

1. Check the allowable load
   · Radial load
   · Thrust load
   · Moment

Formula

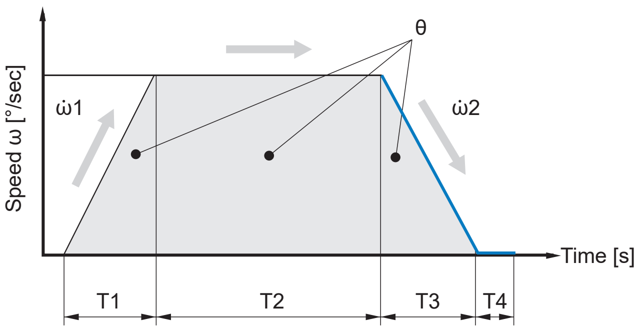
Allowable thrust load ≥ m×9.8
Allowable moment ≥ m×9.8×H

Selection example

· Thrust load
  2.0×9.8=19.6N < Allowable thrust load OK
· Allowable moment
  2.0×9.8×0.04=0.784 N.m < Allowable moment OK

Step 4: Rotation time

1. Calculate cycle time (rotation time)



θ	Rotation angle	[°]	
ω	Angular speed	[°/sec]	
$\dot{\omega}$1	Angular acceleration	[°/sec^2]	
$\dot{\omega}$2	Angular deceleration	[°/sec^2]	
T1	Acceleration time	[s]	Time until reaching the set speed
T2	Constant speed time	[s]	Time while the actuator is operating at a constant speed
T3	Deceleration time	[s]	Time from the beginning of the constant speed operation to stop
T4	Settling time	[s]	Time until positioning is completed

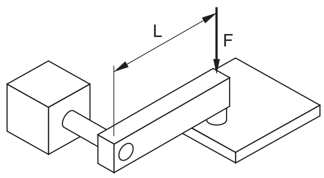
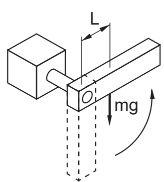
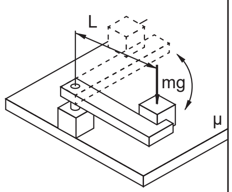
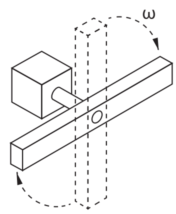
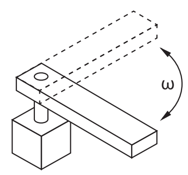
Formula

Angular acceleration time	T1 = ω / $\dot{\omega}$1
Constant speed time	T2 = { θ - 0.5 × ω × (T1 + T3) } / ω
Angular deceleration time	T3 = ω / $\dot{\omega}$2
Settling time	T4 = 0.2 (sec)
Cycle time	T=T1+T2+T3+T4

Selection example

Angular acceleration time	T1=420/1000=0.42 sec
Constant speed time	T2={180-0.5×420×(0.42+0.42)}/420 =0.009 sec
Angular deceleration time	T3=420/1000=0.42 sec
Cycle time	T=T1+T2+T3+T4 =0.42+0.009+0.42+0.2 =1.049 sec

Load type

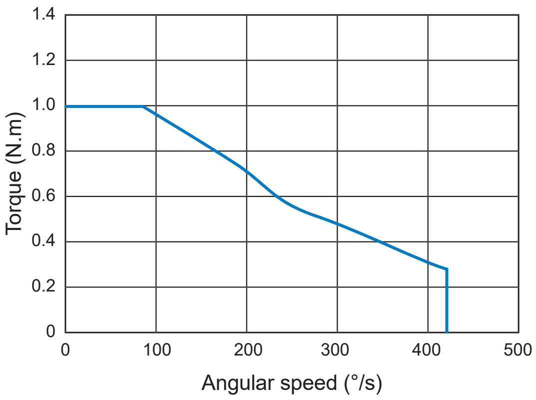
<table>
<tr><th colspan="5">Load type</th></tr>
<tr><th>Static load: Ts</th><th colspan="2">Resistance load: Tf</th><th colspan="2">Inertial load: Ta</th></tr>
<tr><td>When force is applied for pressurization. (e.g. for clamping)</td><td colspan="2">Resistance to gravity or friction is required during rotation.</td><td colspan="2">Rotate the load with inertia.</td></tr>
<tr><td></td><td><Gravity></td><td><Friction></td><td>Center of rotation and center of gravity of the load are concentric</td><td>Rotation shaft is vertical (up and down)</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Ts=F·L
Ts: Static load (N.m)
F: Clamping force (N)
L: Distance from the rotation center to the clamping position (m)</td><td colspan="2">Gravity needs to be resisted when rotating.
Tf=m·g·L
Friction force needs to be resisted when rotating.
Tf=μ·m·g·L
Tf: Resistance (N.m)
m: Load mass (kg)
g: Gravitational acceleration 9.8(m/s^2)
L: Distance from the rotation center to the point of application of the gravity or friction force (m)
μ: Friction coefficient</td><td colspan="2">Ta= I·$\dot{\omega}$·2π/360
(Ta= I·$\dot{\omega}$·0.0175)
Ta : Inertial load (N.m)
I : Moment of inertia (kg·m^2)
$\dot{\omega}$: Angular acceleration/deceleration (°/sec^2)
ω: Angular speed (°/sec)</td></tr>
<tr><td>Necessary torque: T=Ts</td><td colspan="2">Necessary torque: T=Tf×1.5*1</td><td colspan="2">Necessary torque: T=Ta×1.5*1</td></tr>
</table>

· Resistance load: Gravity or friction needs to be resisted during rotating.
  Ex.1) The rotation shaft is horzontal (lateral), and the rotation center and the center of gravity of the load are not concentric.
  Ex.2) The load moves by sliding on the floor
  * The total of resistance load and inertial load is the necessary torque.
  T=(Tf+Ta)×1.5

· Non-resistance load: Neither gravity nor friction needs to be resisted during rotation.
  Ex.1) The rotation shaft is vertial (up and down).
  Ex.2) The rotation shaft is horizontal (lateral), and rotation center and the center of gravity of the load are concentric.
  * The necessary torque is solely due to inertial load. **T=Ta×1.5**

*1. To adjust the speed, a reserved margin is required for **Tf** and **Ta**.

Angular speed – Torque



Angular Acceleration / Deceleration – Moment of Inertia

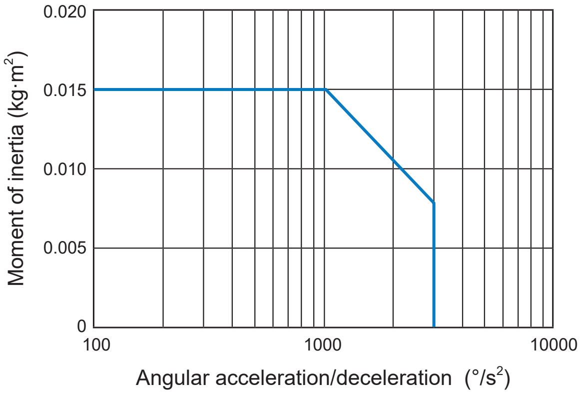
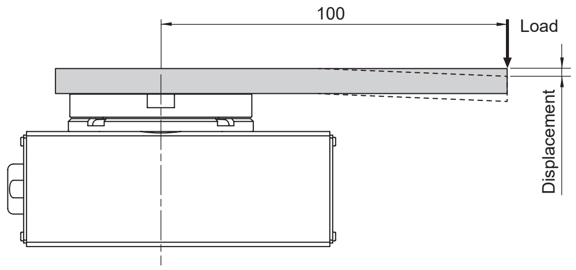
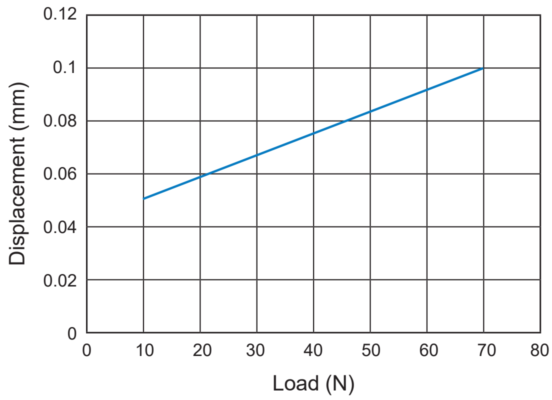


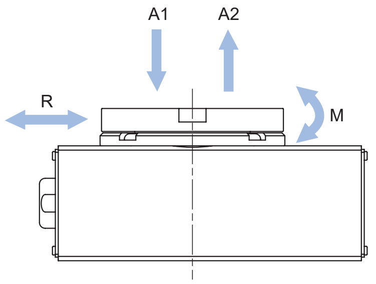
Table Displacement (Reference Value)

The displacement caused by applying a load
100 mm away from the center of rotation.



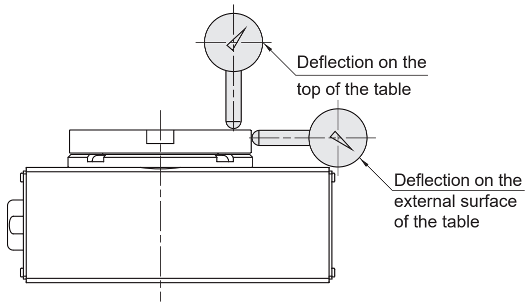


Allowable Load



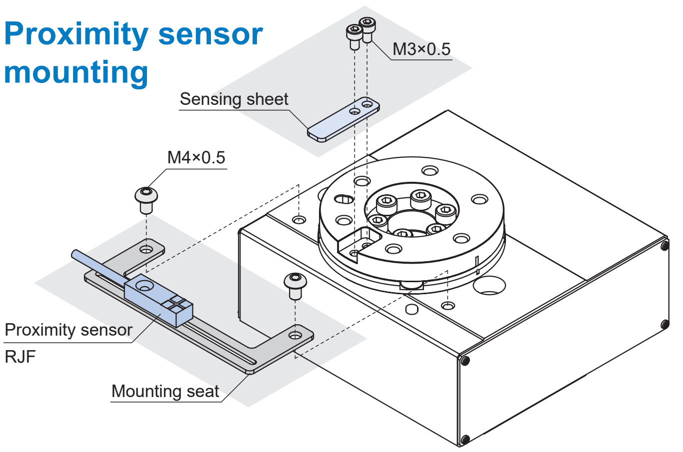
Allowable thrust load A1	363 N
Allowable thrust load A2	197 N
Allowable radial load R	196 N
Allowable moment M	5.3 N.m

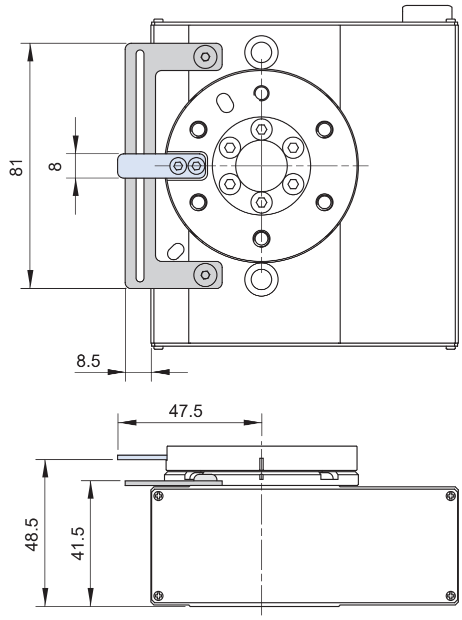
Deflection Accuracy (Reference Value)



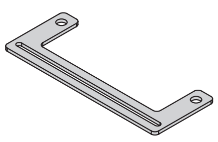
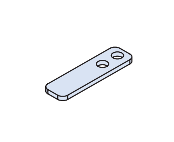
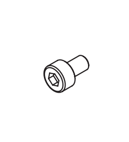
Max. deflection at 360° rotation	
Deflection on the top of the table	0.05 mm
Deflection on the external surface of the table	0.05 mm

Proximity sensor mounting





Accessory kits

			
Mounting seat (×1)	Bolt (×2)	Sensing sheet (×1)	Bolt (×2)

Dimensions