

MERE series

ROTARY ELECTRIC ACTUATOR (WITH MOTOR)



Selector table



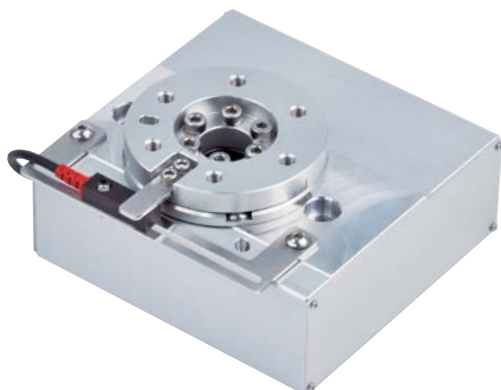
Applications



Motor selection



Controller



Specification

Model	MERE		
Size	10	30	50
Rotation angle (°)	310, 360	320, 360	
Lead (°)	12		
Max. rotating torque *1,3,4 (N·m)	0.3	0.65	3.3
Max. moment of inertia (kg·m ²)	0.0018	0.015	0.05
Max. angular speed *1,2 (°/s)	≤420		
Max. angular acceleration/ deceleration (°/s ²)	3000		
Backlash (°)	±0.5	±0.3	
Positioning repeatability (°)	±0.05		
Max. operating frequency (cpm)	60		
Motor size (mm)	□20	□28	□42
Rated voltage	DC 24V±10%		
Sensor switch	RJF 		
Weight (kg)	0.47	1.1	3

*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

Model

Size

Rotation angle

Controller

Motor

I/O type

I/O cable length

Motor + Encoder cable

Model

Size

Rotation angle

Controller

Motor

I/O type

I/O cable length

Motor + Encoder cable

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Motor + Encoder cable

Model

*1. Sensors would be needed.

*2. Only for CM20.

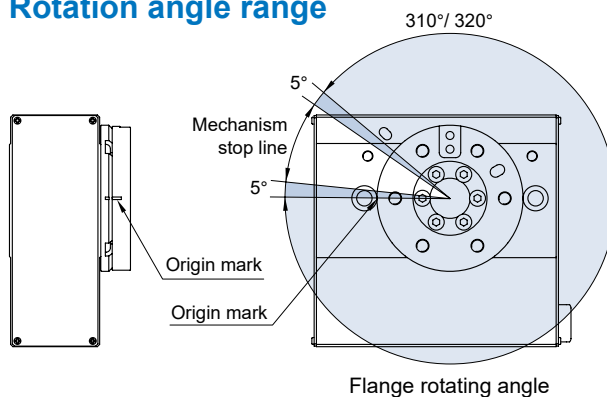
*3. Only for CK10.

Accessory kits

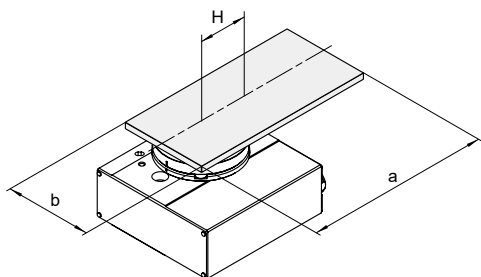
AK — ER1 — 30		
Accessory kits		Size
		10
		30
		50

* With sensing sheet, mounting seat and bolt.

Rotation angle range



Operating conditions



Electric rotary actuator	MERE-30
Installation direction	Horizontal
Load type	Inertial load T_a
Configuration of load	150×80 mm (Rectangular plate)
Rotation angle	180° θ
Angular acceleration / deceleration	1000°/sec ² ω
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

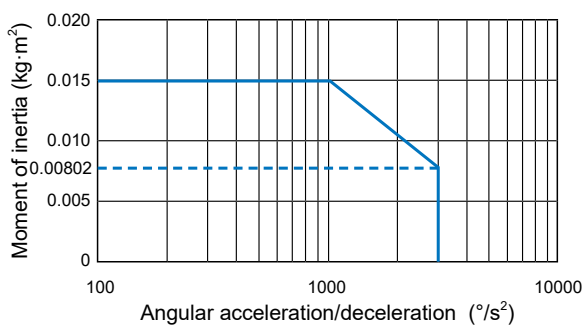
$$I = m \times (a^2 + b^2) / 12 + m \times H^2$$

Selection example

$$I = 2 \times (0.15^2 + 0.08^2) / 12 + 2 \times 0.04^2$$

$$= 0.00802 \text{ kg} \cdot \text{m}^2$$

→ Angular acceleration / deceleration 1000°/sec² OK



Step 2: Necessary torque

* Please refer to "Load type" .

1. Load type

- Static load T_s
- Resistance T_f
- Inertial load T_a

2. Check the effective torque

Confirm the setting range from the <Angular Speed – Torque graph>.

Formula

$$\text{Effective torque} \geq T_s$$

$$\text{Effective torque} \geq T_f \times 1.5$$

$$\text{Effective torque} \geq T_a \times 1.5$$

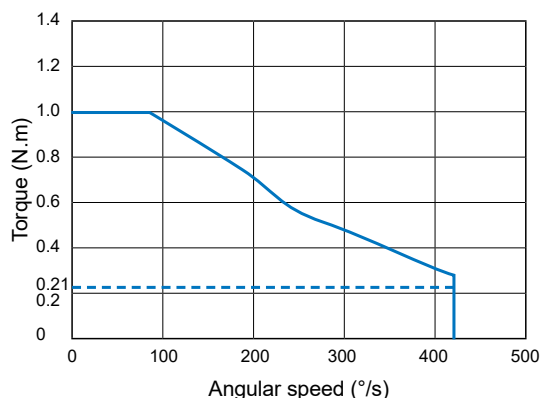
Selection example

Inertial load: T_a

$$T_a \times 1.5 = I \times \omega \times 2\pi / 360 \times 1.5$$

$$= 0.00802 \times 1000 \times 0.0175 \times 1.5$$

$$= 0.21 \text{ N} \cdot \text{m} \rightarrow \text{Angular speed } 420^\circ/\text{sec}^2 \text{ OK}$$



Step 3: Allowable load

* Please refer to "Allowable load" .

1. Check the allowable load

- Radial load
- Thrust load
- Moment

Formula

$$\text{Allowable thrust load} \geq m \times 9.8$$

$$\text{Allowable moment} \geq m \times 9.8 \times H$$

Selection example

· Thrust load

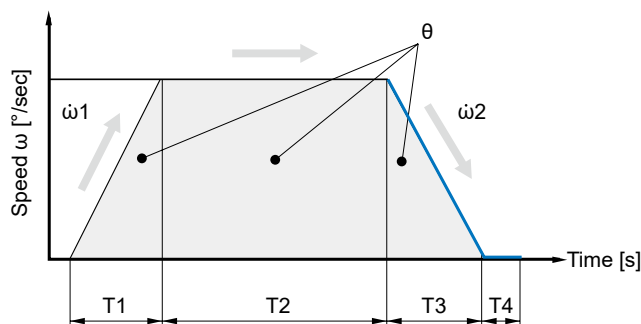
$$2.0 \times 9.8 = 19.6 \text{ N} < \text{Allowable thrust load OK}$$

· Allowable moment

$$2.0 \times 9.8 \times 0.04 = 0.784 \text{ N} \cdot \text{m} < \text{Allowable moment OK}$$

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

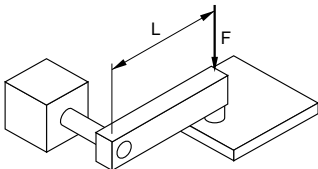
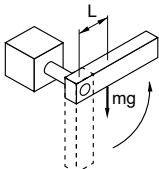
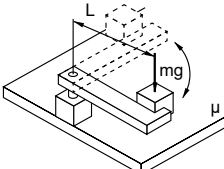
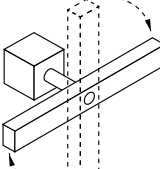
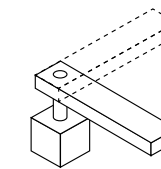
Formula

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

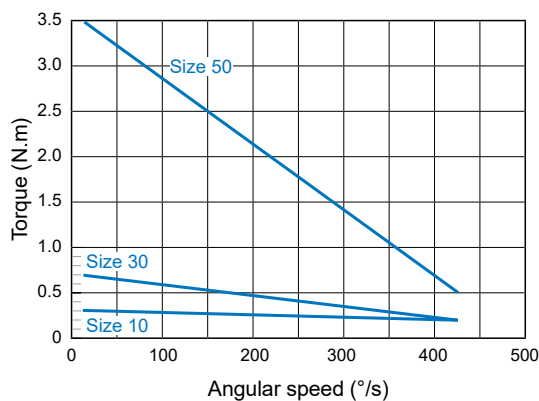
Selection example

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

Load type

Load type		
Static load: Ts	Resistance load: Tf	Inertial load: Ta
When force is applied for pressurization. (e.g. for clamping)	Resistance to gravity or friction is required during rotation.	Rotate the load with inertia.
	<Gravity>  <Friction> 	Center of rotation and center of gravity of the load are concentric  Rotation shaft is vertical (up and down) 
$Ts = F \cdot L$ Ts: Static load (N.m) F: Clamping force (N) L: Distance from the rotation center to the clamping position (m)	Gravity needs to be resisted when rotating. $Tf = m \cdot g \cdot L$ Tf: Resistance (N.m) m: Load mass (kg) g: Gravitational acceleration 9.8(m/s²) L: Distance from the rotation center to the point of application of the gravity or friction force (m) μ: Friction coefficient	$Ta = I \cdot \dot{\omega} \cdot 2\pi / 360$ $(Ta = I \cdot \dot{\omega} \cdot 0.0175)$ Ta: Inertial load (N.m) I: Moment of inertia (kg·m²) $\dot{\omega}$: Angular acceleration/deceleration (°/sec²) ω: Angular speed (°/sec)
Necessary torque: $T = Ts$	Necessary torque: $T = Tf \times 1.5^{*1}$	Necessary torque: $T = Ta \times 1.5^{*1}$
• Resistance load: Gravity or friction needs to be resisted during rotating. Ex.1) The rotation shaft is horizontal (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. $T = (Tf + Ta) \times 1.5$		
• Non-resistance load: Neither gravity nor friction needs to be resisted during rotation. Ex.1) The rotation shaft is vertical (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. $T = Ta \times 1.5$ *1. To adjust the speed, a reserved margin is required for Tf and Ta.		

Angular speed – Torque



Angular Acceleration / Deceleration – Moment of Inertia

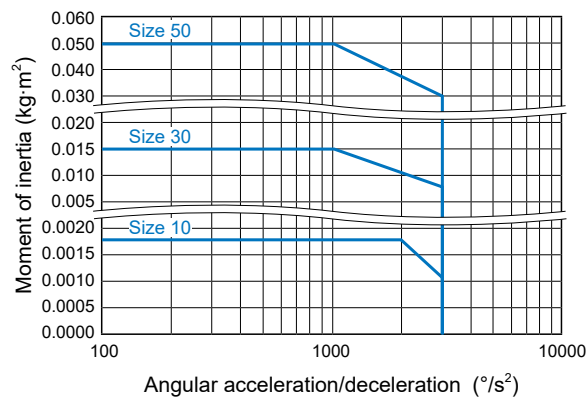
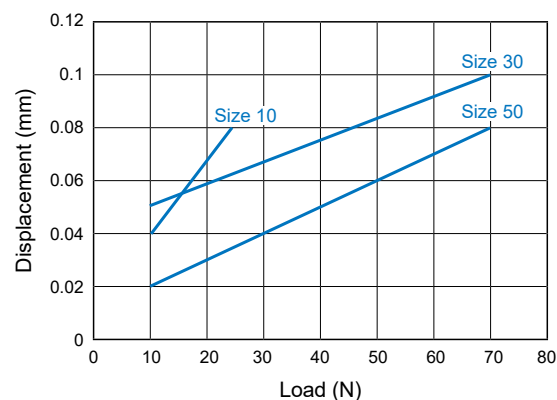
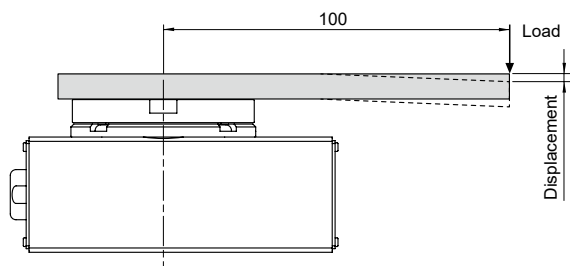
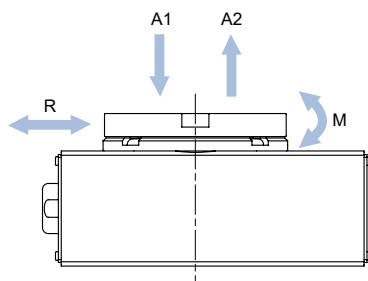


Table Displacement (Reference Value)

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

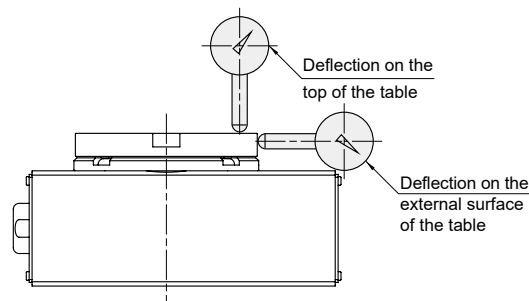


Allowable Load



Size	10	30	50
Allowable thrust load A1	78 N	363 N	398 N
Allowable thrust load A2	74 N	197 N	296 N
Allowable radial load R	78 N	196 N	314 N
Allowable moment M	2.4 N.m	5.3 N.m	9.7 N.m

Deflection Accuracy (Reference Value)



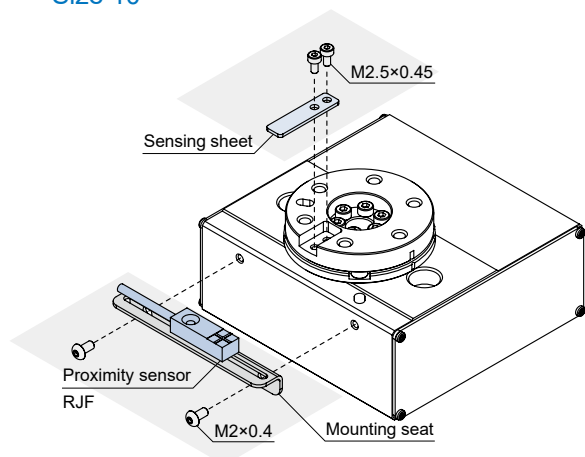
Max. deflection at 360° rotation	
Deflection on the top of the table	0.05 mm
Deflection on the external surface of the table	0.05 mm

MERE Sensor mounting **ROTARY ELECTRIC ACTUATOR (WITH MOTOR)**

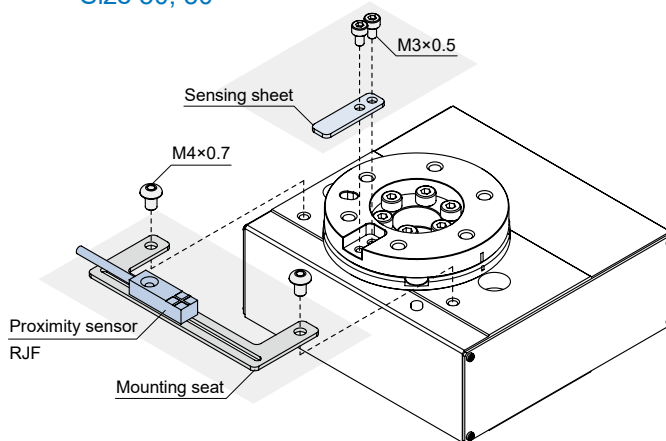


Proximity sensor mounting

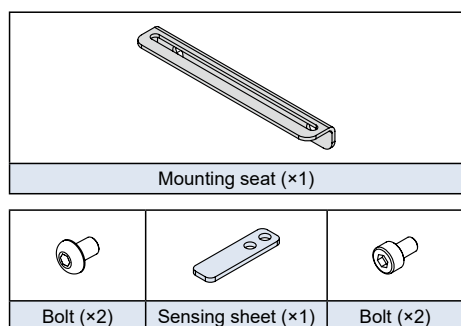
Size 10



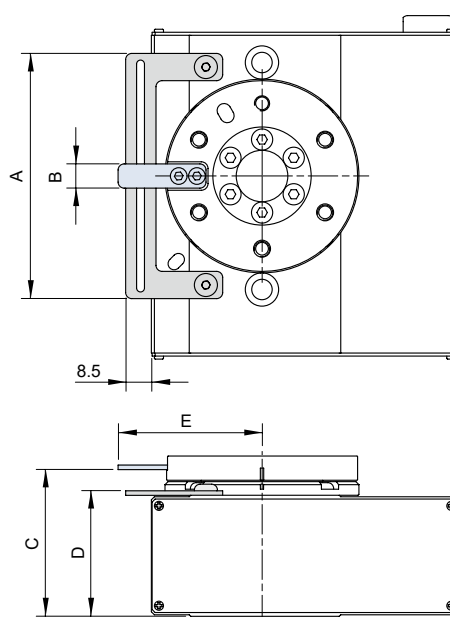
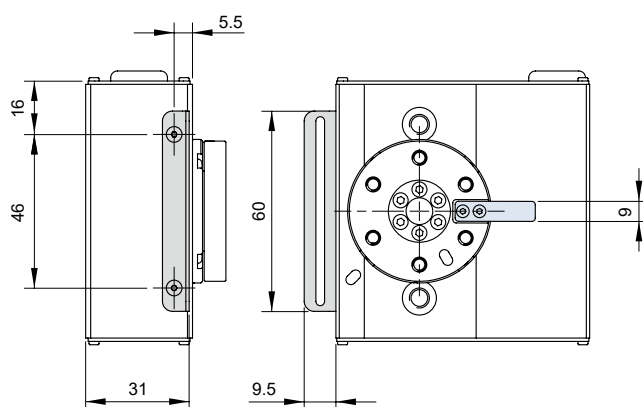
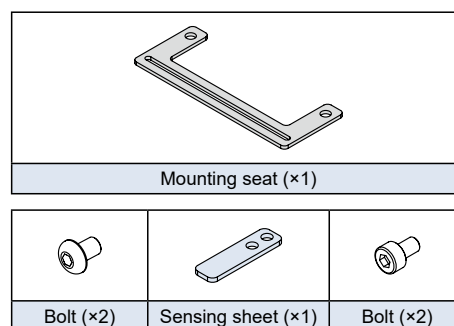
Size 30, 50



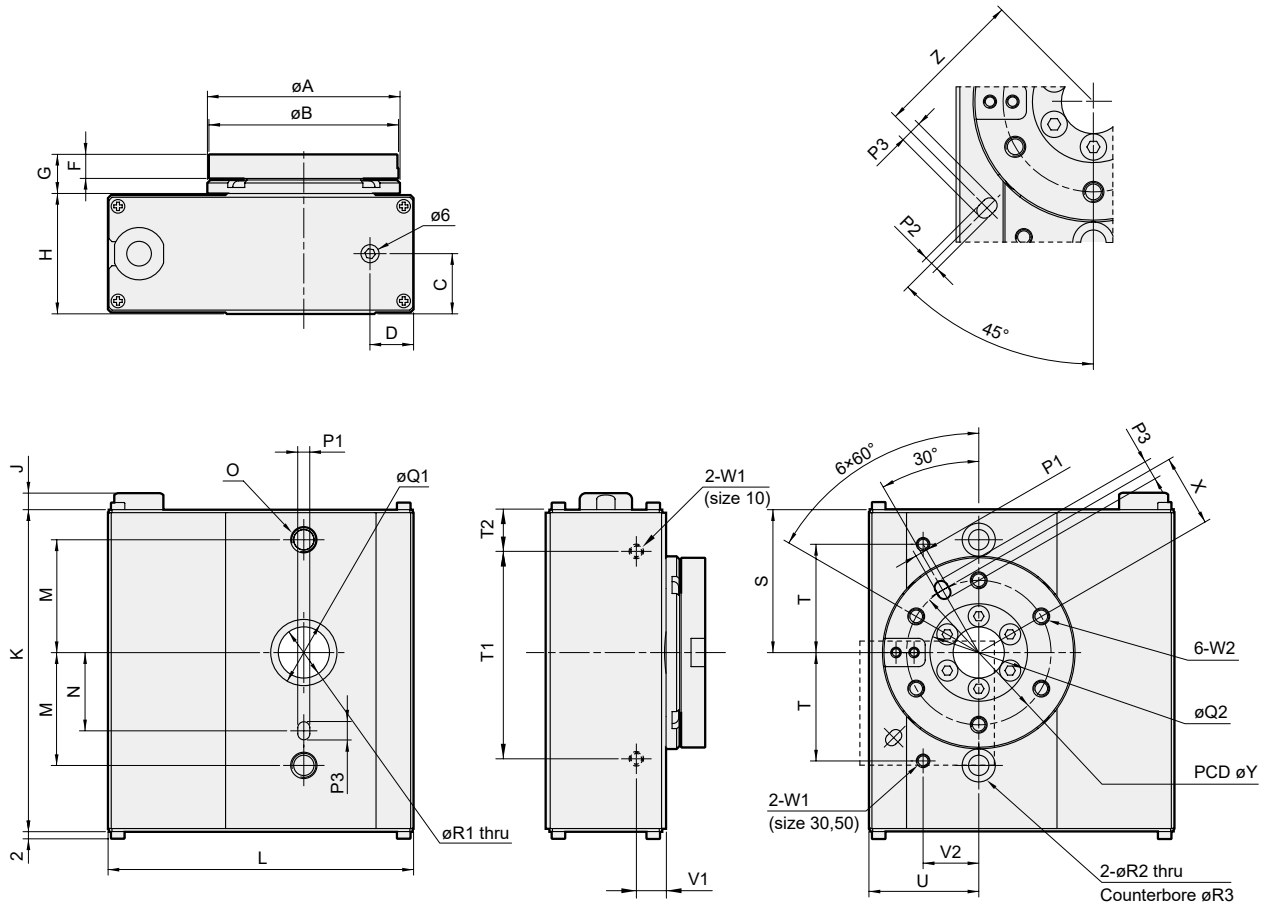
Accessory kits



Accessory kits



Code Size	A	B	C	D	E
30	81	8	48.5	41.5	47.5
50	100	10	63	54	57.5



Code Size	A	B	C	D	F	G	H	J	K	L	M	N	O	P1
10	ø43 h8 ⁰ _{-0.039}	ø42 h8 ⁰ _{-0.039}	16	10.2	6.5	10	32	3	78	76	26	15	2-M6×1.0×12 depth	3H8 ^{+0.014} ₀ ×4 depth
30	ø64 h8 ⁰ _{-0.046}	ø63 h8 ⁰ _{-0.046}	20	14.5	8	13	40	8	107	101.5	37.5	26	2-M8×1.25×16 depth	4H8 ^{+0.018} ₀ ×5 depth
50	ø76 h8 ⁰ _{-0.046}	ø74 h8 ⁰ _{-0.046}	26	18.8	10	16	52	4	125	133	45	31	2-M10×1.5×20 depth	5H8 ^{+0.018} ₀ ×5.5 depth

Code Size	P2	P3	Q1	Q2	R1	R2	R3	S	T	T1	T2	U
10	3H8 ^{+0.014} ₀ ×3.8 depth	5	ø15 H8 ^{+0.027} ₀ ×7 depth	ø18 H8 ^{+0.027} ₀ ×3 depth	ø8	ø5.2	ø9×5.5 depth	39	26	46	16	25
30	4H8 ^{+0.018} ₀ ×4.8 depth	6	ø22 H8 ^{+0.033} ₀ ×5 depth	ø32 H8 ^{+0.039} ₀ ×2 depth	ø17	ø6.8	ø11×6.5 depth	47.5	36	—	—	36.5
50	5H8 ^{+0.018} ₀ ×5.3 depth	7	ø26 H8 ^{+0.033} ₀ ×11 depth	ø35 H8 ^{+0.039} ₀ ×4 depth	ø20	ø8.5	ø14×8.5 depth	56	45	—	—	48

Code Size	V1	V2	W1	W2	X	Y	Z
10	5.5	—	M2.5×0.45×5 depth	M4×0.7×5 depth	16	ø32	28
30	—	18.5	M4×0.7×5 depth	M5×0.8×8 depth	24	ø48	40
50	—	26	M4×0.7×9 depth	M6×1.0×9 depth	27.5	ø55	46