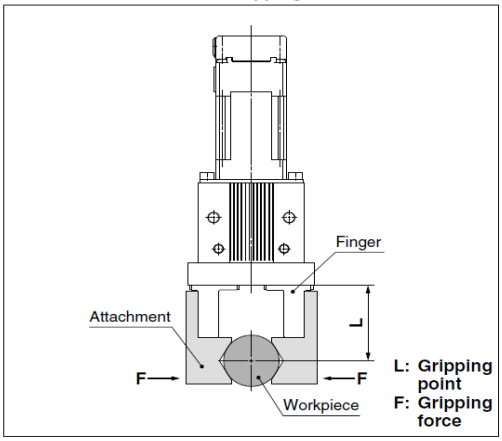
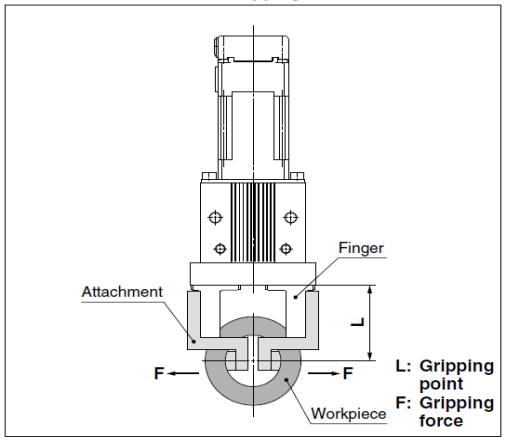
Electric Gripper Sizing

Number of Gripping Fingers:
Load Weight:
Physical Size of the load:
Coefficient of friction between fingers and the part:
Distance to the gripping point:
Please provide a diagram of the load. The following formats in order of preference
1) Solidworks
2) Autocad
3) Hand drawn sketch with all dimensions

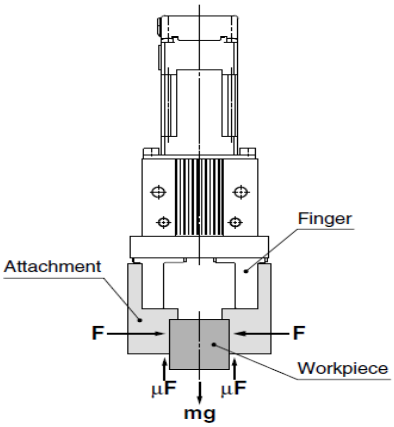
External Gripping State



Internal Gripping State



Calculation of required gripping force



When gripping a workpiece as in the figure to the left, and with the following definitions,

- **F: Gripping force (lbf)**
- **μ: Coefficient of friction between the attachments and the workpiece**
- **m: Workpiece mass (lb)**
- **g: Gravitational acceleration (= 9.8 m/s²)**
- **mg: Workpiece weight (lbf)**

the conditions under which the workpiece will not drop are

$$\underset{\text{Number of fingers}}{2} \times \mu F > mg$$

and therefore, $F > \dfrac{mg}{2 \times \mu}$

With "a" representing the extra margin, "F" is determined by the following formula:

$$F = \frac{mg}{2 \times \mu} \times a$$

"Gripping force at least 10 to 20 times the workpiece weight"

- The "10 to 20 times or more of the workpiece weight" recommended by SMC is calculated with a safety margin of a = 4, which allows for impacts that occur during normal transportation, etc.

When μ = 0.2	When μ = 0.1
$F = \dfrac{mg}{2 \times 0.2} \times 4 = 10 \times mg$	$F = \dfrac{mg}{2 \times 0.1} \times 4 = 20 \times mg$
10 x Workpiece weight	20 x Workpiece weight

(Reference) Coefficient of friction μ (depends on the operating environment, contact pressure, etc.)

Coefficient of friction μ	Attachment – Material of work pieces (guideline)
0.1	Metal (surface roughness Rz3.2 or less)
0.2	Metal
0.2 or more	Rubber, Resin, etc.

Note)
- Even in cases where the coefficient of friction is greater than μ = 0.2, for reasons of safety, select a gripping force which is at least 10 to 20 times greater than the workpiece weight, as recommended by SMC.
- If high acceleration or impact forces are encountered during motion, a further margin of safety should be considered.