Extrusion Load Capacity Calculations

Deflection Calculations

The following pages assist in extrusion selection by providing a quick Load vs. Deflection Chart (below) and calculation formulas (right page). In general, load for aluminum frames is calculated assuming that both ends of the extrusion are supported.

Selection Example

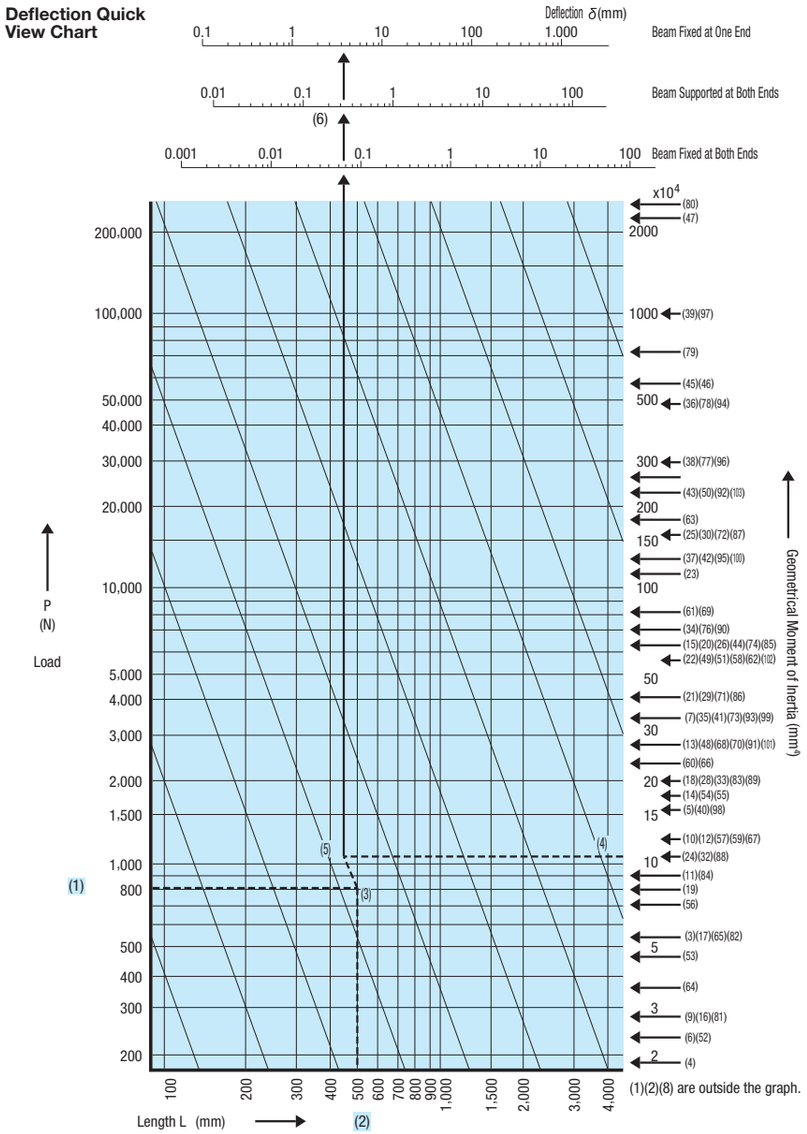
Values used for this example	
Load	800N
Extrusions	HFS8-4040
Length	500 mm

Step
(1) Find a point (1) on the Y (Load) axis for the applied load P (Unit: N).
(2) Find a point (2) on the X (Length) axis for the extrusion length.
(3) Draw a horizontal line from (1) and a vertical line from (2), and name the intersection of the two as (3).
(4) Find a point (4) on the right hand Y axis for the Cross Sectional Moment of Inertia of the extrusion used.
(5) Draw a horizontal line from (4), and draw a parallel line to the graph's diagonal lines from (3).
(6) Name the intersection of the lines as (5).
(7) Draw a line upwards from (5) and locate an intersection (6) corresponding to the extrusion support method used.
Result: According to the example values used and the calculation based on the values, the deflection amount would be 0.3mm when the extrusion is supported at both ends.

*1) Conversion: 1kgf=9.80665N (Ex.) 81.6kgf=800N

•MISUMI defines the Load Capacity (Max Allowable Load) to be a deflection 1/1000 of the extrusion length.

- Deflection Quick View Chart

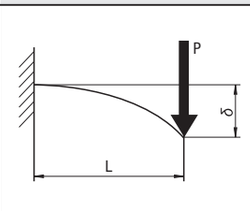
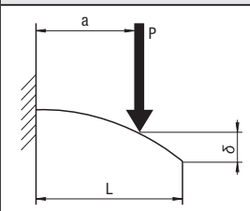
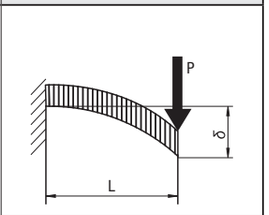


(1): Load 800N
(2): Frame Length
(3): Intersection of (1) and (2): Applicable extrusion HSF8-4040
(5): Intersection of a parallel line from (3) and (4)

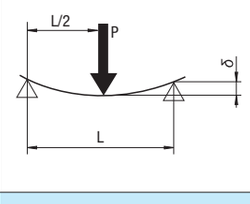
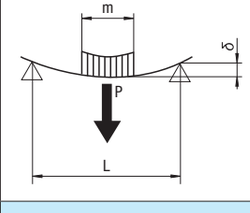
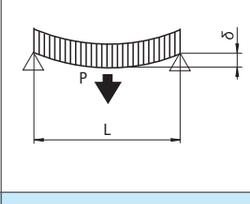
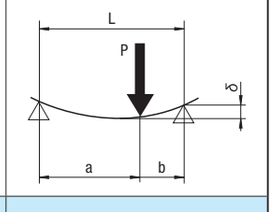
The numbers in O corresponds to the extrusion numbers on **P.2432·2433** left hand tables.

(1)(2)(8) are outside the graph.

- Deflection Calculations

	1	2	3
Cantilever			
Deflection δ	$\delta = \frac{P \cdot L3}{3E \cdot I}$	$\delta = \frac{P \cdot a^3}{3E \cdot I}$	$\delta = \frac{P \cdot L^3}{8E \cdot I}$

means that the load is equally distributed.

	4	5	6	7
Both Ends Supported				
Deflection δ	$\delta = \frac{P \cdot L^3}{48E \cdot I}$	$\delta = \frac{P \cdot L^3}{(48 + \frac{29m}{I}) \cdot E \cdot I}$	$\delta = \frac{5P \cdot L^3}{384E \cdot I}$	$\delta = \frac{P \cdot a^2 \cdot b^2}{3E \cdot I \cdot L}$

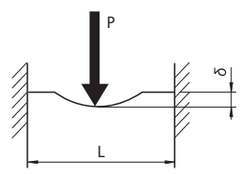
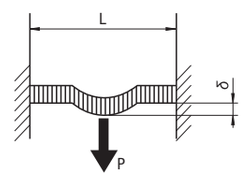
Example of No.4 as "Beam Supported on Both Ends"

P	(N)	Load
L	(mm)	Extrusion Length
E	(N/mm²)	Young's Modulus 69,972N/mm²
I	(mm⁴)	Second Moment of Inertia of Cross Section
δ	(mm)	Deflection

When the selection is calculated as "Beam Supported on Both Ends"

$$\delta = \frac{800 \times 500^3}{48 \times 69{,}972 \times 10.4 \times 10^4}$$

≈0.29 (mm)

	8	9
Both Ends Fixed		
Deflection δ	$\delta = \frac{P \cdot L^3}{192E \cdot I}$	$\delta = \frac{P \cdot L^3}{384E \cdot I}$