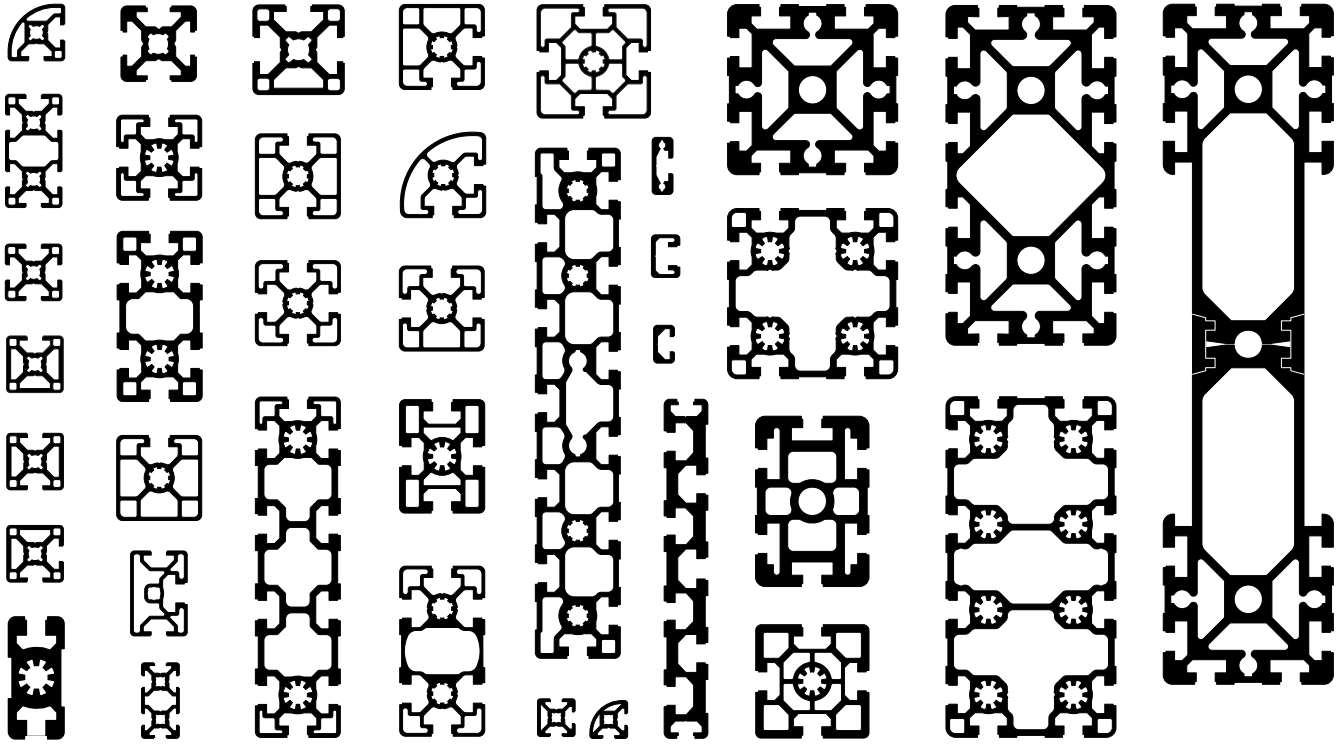


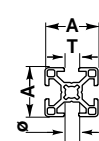
Section 16-Engineering Data and Specifications

Technical data



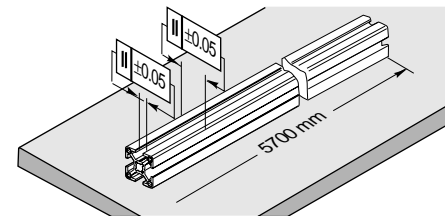
	Metric	U.S. Equivalent
Material designation according to DIN (ISO) for Bosch profiles	AlMgSi 0.5 F25	6063 T6
Material number according to DIN (ISO)	3.3206.7	6063 T6
Tensile strength (expected)	$R_m = 250 \text{ N/mm}^2$	(36,000 lb./in.²)
0.2% proof stress (expected)	$R_{p0.2} = 200 \text{ N/mm}^2$	(29,000 lb./in.²)
Elongation at rupture A_5 or A_{10}		$A_5 = 10\%$ $A_{10} = 8\%$
Modulus of elasticity E	$E = 70,000 \text{ N/mm}^2$	($10 \times 10^6 \text{ lb./in.}^2$)
Brinell hardness		75 HB
Coefficient of linear expansion	$\alpha_{(-50 \dots +20^\circ\text{C})} = 21.8 \times 10^{-6} / \text{K}$ $\alpha_{(-58 \dots +68^\circ\text{F})} = 12.1 \times 10^{-6} \text{ in./in./}^\circ\text{F}$ $\alpha_{(+20 \dots +100^\circ\text{C})} = 23.4 \times 10^{-6} / \text{K}$ $\alpha_{(+68 \dots +212^\circ\text{F})} = 13.0 \times 10^{-6} \text{ in./in./}^\circ\text{F}$	
Poisson's ratio	$\mu = 0.34$	
Anodizing process-layer thickness-layer hardness	E6/EV1-12μm - 300HV	R204-(.0003 in-300HV)

Dimension tolerance tol [mm] for profiles from different shipments

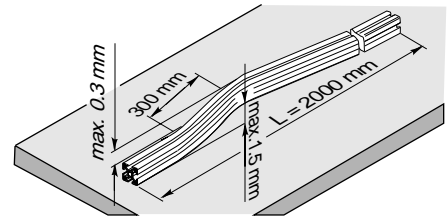


T ± tol	6 ±0.3	8.2 ±0.1	10.2 ±0.2						
Ø	5.5 / 7.3	10	15						
T ± tol	+0.2 / -0.1	±0.15	±0.15						
A	11 - 20	22.5	30	45	60	90	180	270	360
± tol	±0.2	±0.15	±0.3	±0.4	±0.6	±1.0	±1.5		

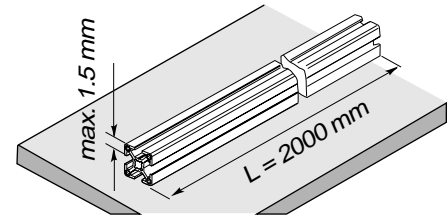
Average accuracy [mm] within a profile bar



Lengthwise profile straightness tolerance



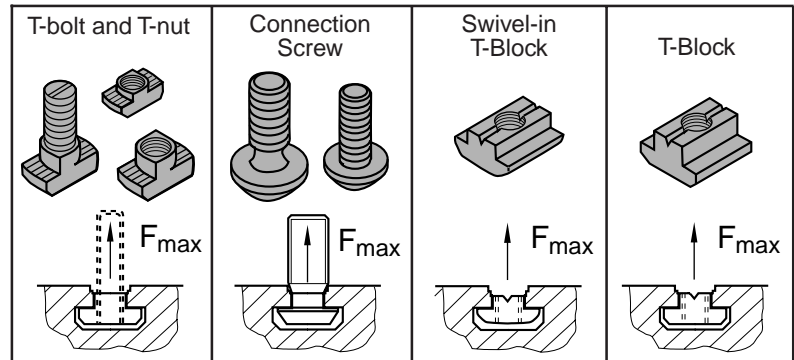
Torsional tolerance in the lengthways direction of the profile



Load Carrying Capacity

The load carrying data on the following pages has been determined by actual testing in an independent laboratory. Exceeding any of the published maximum values may cause permanent deformation of the profile T-slot or connector. As with any structural design, it is critical to consider all legal and technical safety requirements. This data supersedes all previous published data and we reserve the right to make technical changes without notice.

T-slot load carrying capacities



Profile	Connector	Number of Connectors	T-bolt and T-nut	Connection Screw	Swivel-in T-Block	T-Block
20x20		6	$F_{max} = 1700 \text{ N}$ (382 lbs)	$F_{max} = 2000 \text{ N}$ (450 lbs)	NA	$F_{max} = 3000 \text{ N}$ (674 lbs)
20x20 2SA		6				
20x20 3S		6				
20x20R		6				
20x40		6				
20x40x40		6				
20x60		6	$F_{max} = 4000 \text{ N}$ (899 lbs)	$F_{max} = 5000 \text{ N}$ (1124 lbs)	$F_{max} = 2200 \text{ N}$ (495 lbs)	$F_{max} = 6000 \text{ N}$ (1349 lbs)
11x20		8				
11x30		8				
15x22.5		10				
22.5x180		8				
30x30		8				
30x30 1S		8				
30x30 2S		8				
30x30 2SA		8				
30x30 3S		8				
30x30R		8				

T-slot load carrying capacities

	T-bolt and T-nut	Connection Screw	Swivel-in T-Block	T-Block
30x30°R	$F_{max} = 4000 \text{ N}$ (899 lbs)	$F_{max} = 5000 \text{ N}$ (1124 lbs)	$F_{max} = 2200 \text{ N}$ (495 lbs)	$F_{max} = 6000 \text{ N}$ (1349 lbs)
30x45°R				
30x60°R				
30x45				
30x60				
30x60x60				
22.5x45	$F_{max} = 7000 \text{ N}$ (1574 lbs)	$F_{max} = 10000 \text{ N}$ (2248 lbs)	$F_{max} = 9000 \text{ N}$ (2023 lbs)	$F_{max} = 12000 \text{ N}$ (2698 lbs)
22.5x45x45				
22.5x180				
30x45				
45x45				
45x45 1S				
45x45 2S				
45x45 2SA				
45x45 3S				
45x45R				



T-slot load carrying capacities

	T-bolt and T-nut	Connection Screw	Swivel-in T-Block	T-Block
45x30°R	$F_{max} = 7000 \text{ N}$ (1574 lbs)	$F_{max} = 10000 \text{ N}$ (2248 lbs)	$F_{max} = 9000 \text{ N}$ (2023 lbs)	$F_{max} = 12000 \text{ N}$ (2698 lbs)
45x45°R				
45x60°R				
45x90				
60x60	$F_{max} = 12000 \text{ N}$ (2698 lbs)	$F_{max} = 15000 \text{ N}$ (3372 lbs)	$F_{max} = 13000 \text{ N}$ (2922 lbs)	$F_{max} = 17000 \text{ N}$ (3822 lbs)
45x45H				
45x60H				
45x90H				
45x180H				
45x270H				
60x60H				
90x90				
90x180	$F_{max} = 18000 \text{ N}$ (4046 lbs)	$F_{max} = 22000 \text{ N}$ (4946 lbs)	$F_{max} = 18000 \text{ N}$ (4046 lbs)	$F_{max} = 24000 \text{ N}$ (5395 lbs)
60x90H				
90x90H				
90x180H				
90x360H				

Load carrying capacities of gussets

	20x20 5 Nm (44 lb-in)	6	700 N (157 lbs)	6 Nm (53 lb-in)	25 Nm (221 lb-in)	-
	20x40 5 Nm (44 lb-in)	6	1400 N (315 lbs)	15 Nm (132 lb-in)	50 Nm (443 lb-in)	8 Nm (71 lb-in)
	30x30 10 Nm (89 lb-in)	8	1250 N (281 lbs)	25 Nm (221 lb-in)	75 Nm (664 lb-in)	-
	30x60 10 Nm (89 lb-in)	8	2500 N (562 lbs)	100 Nm (885 lb-in)	170 Nm (1505 lb-in)	25 Nm (221 lb-in)
	60x60 10 Nm (89 lb-in)	8	5000 N (1124 lbs)	320 Nm (2832 lb-in)	370 Nm (3275 lb-in)	110 Nm (973 lb-in)
	45x45 25 Nm (221 lb-in)	10	3000 N (674 lbs)	60 Nm (531 lb-in)	160 Nm (1416 lb-in)	-
	45x90 25 Nm (221 lb-in)	10	6000 N (1349 lbs)	180 Nm (1593 lb-in)	400 Nm (3540 lb-in)	60 Nm (531 lb-in)
	60x60 25 Nm (221 lb-in)	10	3000 N (674 lbs)	125 Nm (1106 lb-in)	150 Nm (1328 lb-in)	-
	90x90 25 Nm (221 lb-in)	10	12000 N (2698 lbs)	370 Nm (3275 lb-in)	800 Nm (7081 lb-in)	200 Nm (1770 lb-in)
	30x120 10 Nm (89 lb-in)	8	3750 N (843 lbs)	100 Nm (885 lb-in)		47 Nm (416 lb-in)
	45x180 25 Nm (221 lb-in)	10	9000 N (2023 lbs)	250 Nm (2213 lb-in)		65 Nm (575 lb-in)



Load carrying capacities of profile connectors

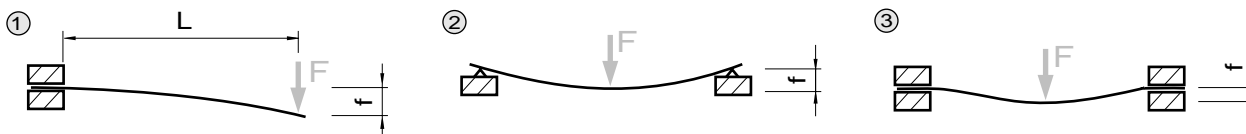
				 N (lbs)	 Nm (lb-in)	 Nm (lb-in)
Bolt Connector 	†11 (L = 30 mm) 6 Nm (53 lb-in) 8	2500 (562)	60 (531)	23 (204)		
	†17 (L = 45 mm) 25 Nm (221 lb-ft) 10	4000 (899)	180 (1593)	60 (531)		
	†17 (L = 60 mm) 25 Nm (221 lb-ft) 10	4000 (899)	200 (1770)	80 (708)		
	†17 (L = 90 mm) 25 Nm (221 lb-ft) 10	5000 (1124)	800 (7080)	200 (1770)		
Bolt Connector 	†11 (L = 11 mm) 7 Nm (62 lb-in) 8 10	500 (112)	50 (443)	7 (62)		
	†17 (L = 15 mm) 12 Nm (106 lb-in) 10	500 (112)	50 (443)	10 (89)		
Bolt Connector 	†28 (L = 19.5 mm) 25 Nm (221 lb-in) 10	500 (112)	50 (443)	-		
Quick Connector 	8 mm T-bolt †11 Barrel 12 Nm (106 lb-in) 8 > 8	500 (112)	40 (354)	-		
	10 mm T-bolt †11 Barrel 12 Nm (106 lb-in) 8 > 10	2000 (450)	70 (619)	-		
	10 mm T-bolt †17 Barrel 25 Nm (221 lb-in) 10 > 10	4000 (899)	140 (1239)	-		
Inside-to-Outside Gusset 	8 mm 12 Nm (106 lb-in) 8 > 8	2200 (495)	50 (443)	-		
	10 mm 15 Nm (133 lb-in) 10 > 10	2800 (629)	100 (886)	-		
Inside-to-Inside Gusset 	6 mm 3 Nm (26 lb-in) 6 > 6	600 (135)	10 (89)	-		
	8 mm 12 Nm (106 lb-in) 8 > 8	2500 (562)	50 (443)	-		
	10 mm 15 Nm (133 lb-in) 10 > 10	3000 (674)	100 (886)	-		
Connection Screw 	S6 x 16 mm 10 Nm (88 lb-in) 6	500 (112)	8 (71)	-		
	S8 x 25 mm 25 Nm (221 lb-in) 8	800 (180)	43 (381)	-		
	S12 x 30 mm 35 Nm (310 lb-in) 10	1300 (292)	80 (708)	-		
	M12 x 30 mm 35 Nm (310 lb-in) 10	3000 (674)	80 (708)	-		

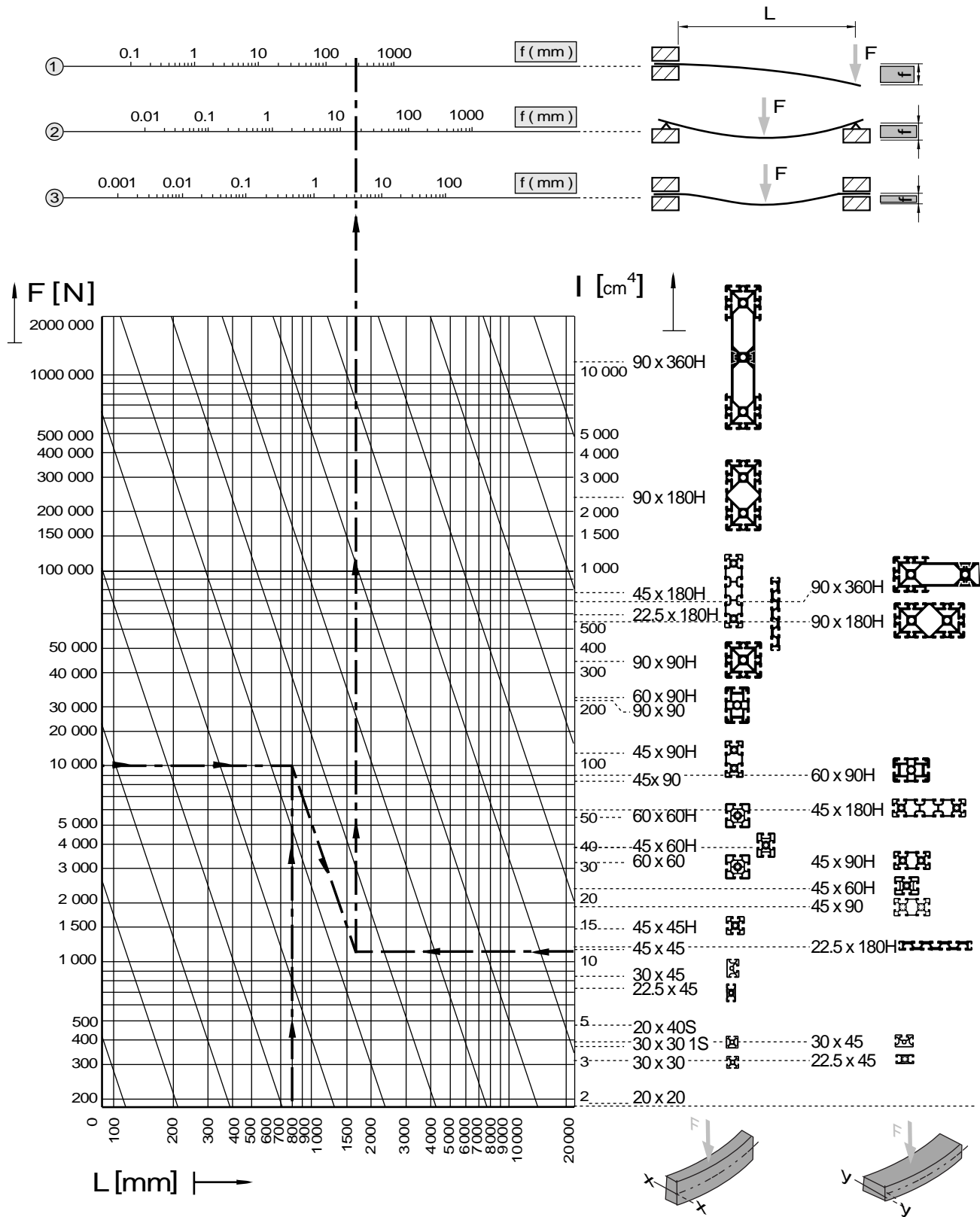
Bending deflection

	Metric	U.S. Equivalent
Profile bending deflection for static load cases ①②③ from force F.	$f_{①} = \frac{F \times L^3}{3E \times I \times 10^4}$	$f_{in} = \frac{FL^3}{3EI}$
	$f_{②} = \frac{F \times L^3}{48E \times I \times 10^4}$	$f_{in} = \frac{FL^3}{48EI}$
	$f_{③} = \frac{F \times L^3}{192E \times I \times 10^4}$	$f_{in} = \frac{FL^3}{192EI}$
Profile bending deflection from the profile's own weight	$f_{①} = \frac{F \times L^3}{8E \times I \times 10^4}$	$f_{in} = \frac{FL^3}{8EI}$
	$f_{②} = \frac{5 \times F \times L^3}{384E \times I \times 10^4}$	$f_{in} = \frac{5FL^3}{384EI}$
	$f_{③} = \frac{F \times L^3}{384E \times I \times 10^4}$	$f_{in} = \frac{FL^3}{384EI}$
Determination of maximum occurring bending stress	$\sigma_{①} = \frac{F \times L}{W \times 10^3}$	$\sigma_{in} = \frac{FL}{W}$
	$\sigma_{②} = \frac{F \times L}{4W \times 10^3}$	$\sigma_{in} = \frac{FL}{4W}$
	$\sigma_{③} = \frac{F \times L}{8W \times 10^3}$	$\sigma_{in} = \frac{FL}{8W}$
	$\sigma_{max} < 200 \text{ N/mm}^2$	$\sigma_{max} = \text{maximum allowable bending stress} = 28,000 \text{ lb/in}^2$

E = modulus of elasticity = 70,000 N/mm²
 (Young's modulus = 10x10⁶ lb/in²)

Force = F [N] (lb.)
 Amount of Deflection = f [mm] (in.)
 Length of Profile = L [mm] (in.)
 Inertia = I [cm⁴] (in.⁴)
 Section Modulus = W [cm³] (in.³)





Example: 1. $F = 10000$ N; 2. $L = 800$ mm; 3. $f_{\text{max}} = 4$ mm; $\rightarrow I_{\text{min}} = 11.0$ cm⁴ \rightarrow 45 x 45