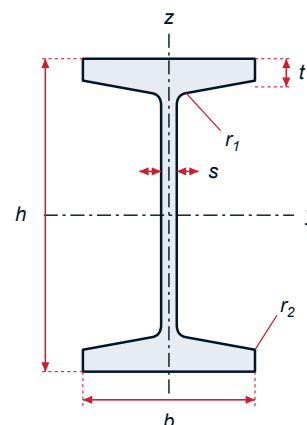


I-beam Sections: Mass of 1 m, Dimensions and Section Properties

The tables list I-beams No. 10–60 with sloped inner flange faces: height, flange width, web and flange thickness and the mass of 1 m. For sizes No. 14–45 and the M-series beams they add the section area, the moments of inertia and resistance, the radii of gyration and the hole positions.

I-beams No. 10–60: dimensions and mass of 1 m

The beam number equals its height in centimetres. The letter "a" in the number marks a profile of the same height with a wider flange.



I-beam section: dimensions and axes

Hot-rolled steel I-beams with sloped inner flange faces · ГОСТ 8239-89

Section	h, mm	b, mm	s, mm	t, mm	Mass of 1 m, kg	Metres per tonne
10	100	55	4.5	7.2	9.46	106
12	120	64	4.8	7.3	11.5	87
14	140	73	4.9	7.5	13.7	73
16	160	81	5	7.8	15.9	62.9
18	180	90	5.1	8.1	18.4	54.3
18a	180	100	5.1	8.3	19.9	50.3
20	200	100	5.2	8.4	21	47.6
20a	200	110	5.2	8.6	22.7	44.1
22	220	110	5.4	8.7	24	41.7
22a	220	120	5.4	8.9	25.8	38.8
24	240	115	5.6	9.5	27.3	36.6
24a	240	125	5.6	9.8	29.4	34
27	270	125	6	9.8	31.5	31.7
27a	270	135	6	10.2	33.9	29.5
30	300	135	6.5	10.2	36.5	27.4
30a	300	145	6.5	10.7	39.2	25.5
33	330	140	7	11.2	42.2	23.7
36	360	145	7.5	12.3	48.6	20.6
40	400	155	8.3	13	57	17.5
45	450	160	9	14.2	66.5	15
50	500	170	10	15.2	78.6	12.7
55	550	180	11	16.5	92.6	10.8
60	600	190	12	17.8	108	9.26

The mass of 1 m is calculated for a steel density of 7850 kg/m³. The dimensions h, b, s and t are in millimetres; t is the mean flange thickness.

Section properties

The moments of inertia and resistance are needed to check a beam for strength and deflection. The values are given for the sizes of the DSTU 8768:2018 range, where the beams are 12 m long and made of 3ps (S245) steel.

Hot-rolled steel I-beams · ДСТУ 8768:2018

Section	h, mm	b, mm	s, mm	t, mm	r1, mm	r2, mm	A, cm ²	Mass of 1 m, kg	Metres per tonne	Jy, cm ⁴	Wy, cm ³	iy, mm	Sy, cm ³	Jz, cm ⁴	Wz, cm ³	iz, mm
14	140	73	4.9	7.5	8	3	17.4	13.7	73	572	81.7	57.3	46.8	41.9	11.5	15.5
16	160	81	5	7.8	8.5	3.5	20.2	15.9	62.9	873	109	65.7	62.3	58.6	14.5	17
18	180	90	5.1	8.1	9	3.5	23.4	18.4	54.3	1290	143	74.2	81.4	82.6	18.4	18.8
20	200	100	5.2	8.4	9.5	4	26.8	21	47.6	1840	184	82.8	104	115	23.1	20.7
30	300	135	6.5	10.2	12	5	46.5	36.5	27.4	7080	472	123	268	337	49.9	26.9
36	360	145	7.5	12.3	14	6	61.9	48.6	20.6	13380	743	147	423	516	71.1	28.9
45	450	160	9	14.2	16	7	84.7	66.5	15	27696	1231	181	708	808	101	30.9

A is the section area; Jy, Wy, iy, Sy are the moment of inertia, section modulus, radius of gyration and first moment of half the section about the y–y axis (the strong axis); Jz, Wz, iz are the same about the z–z axis.

Special I-beams for suspended tracks (M series) · ГОСТ 19425-74

Section	h, mm	b, mm	s, mm	t, mm	Mass of 1 m, kg	Metres per tonne
18M	180	90	7	12	25.8	38.8
24M	240	110	8.2	14	38.3	26.1
30M	300	130	9	15	50.2	19.9
36M	360	130	9.5	16	57.9	17.3
45M	450	150	10.5	18	77.6	12.9

Hole positions · Hot-rolled steel I-beams

Section	a1, mm	d1 max, mm	a2, mm	d2 max, mm
14	40	13	40	15
16	45	13	40	15
18	50	15	50	21
20	55	17	50	19
30	70	21	65	25
36	80	25	70	25
45	90	25	70	25

a1 and a2 are the distances to the hole axes in the flange and the web, d1 max and d2 max are the largest hole diameters. The values are for reference.

I-beams with parallel flange faces: series B, Sh and K

In I-beams to GOST 26020-83 the inner flange faces are parallel to the outer ones. The number in the designation is the profile height in centimetres, the letter is the series (B normal, Sh wide-flange, K column), and the last digit is the size number within the series. The actual height does not equal the number exactly: 20B1 is 200 mm high and 26B1 is 258 mm.

I-beams with parallel flange faces: normal flange (B) · ГОСТ 26020-83

Section	h, mm	b, mm	s, mm	t, mm	Mass of 1 m, kg	Metres per tonne
10B1	100	55	4.1	5.7	8.1	123
12B1	117.6	64	3.8	5.1	8.7	115
12B2	120	64	4.4	6.3	10.4	96.2
14B1	137.4	73	3.8	5.6	10.5	95.2
14B2	140	73	4.7	6.9	12.9	77.5

Section	h, mm	b, mm	s, mm	t, mm	Mass of 1 m, kg	Metres per tonne
16B1	157	82	4	5.9	12.7	78.7
16B2	160	82	5	7.4	15.8	63.3
18B1	177	91	4.3	6.5	15.4	64.9
18B2	180	91	5.3	8	18.8	53.2
20B1	200	100	5.6	8.5	22.4	44.6
23B1	230	110	5.6	9	25.8	38.8
26B1	258	120	5.8	8.5	28	35.7
26B2	261	120	6	10	31.2	32.1
30B1	295	140	5.8	8.5	32.9	30.4
30B2	299	140	6	10	36.6	27.3
35B1	346	155	6.2	8.5	38.9	25.7
35B2	349	155	6.5	10	43.3	23.1
40B1	392	165	7	9.5	48.1	20.8
40B2	396	165	7.5	11.5	54.7	18.3
45B1	443	180	7.8	11	59.8	16.7
45B2	447	180	8.4	13	67.5	14.8
50B1	492	200	8.8	12	73	13.7
50B2	496	200	9.2	14	80.7	12.4
55B1	543	220	9.5	13.5	89	11.2
55B2	547	220	10	15.5	97.9	10.2
60B1	593	230	10.5	15.5	106.2	9.42
60B2	597	230	11	17.5	115.6	8.65
70B1	691	260	12	15.5	129.3	7.73
70B2	697	260	12.5	18.5	144.2	6.93
80B1	791	280	13.5	17	159.5	6.27
80B2	798	280	14	20.5	177.9	5.62
90B1	893	300	15	18.5	194	5.15
90B2	900	300	15.5	22	213.8	4.68
100B1	990	320	16	21	230.6	4.34
100B2	998	320	17	25	258.2	3.87
100B3	1006	320	18	29	285.7	3.5
100B4	1013	320	19.5	32.5	314.5	3.18

I-beams with parallel flange faces: wide flange (Sh) · ГОСТ 26020-83

Section	h, mm	b, mm	s, mm	t, mm	Mass of 1 m, kg	Metres per tonne
20Sh1	193	150	6	9	30.6	32.7
23Sh1	226	155	6.5	10	36.2	27.6
26Sh1	251	180	7	10	42.7	23.4
26Sh2	255	180	7.5	12	49.2	20.3
30Sh1	291	200	8	11	53.6	18.7
30Sh2	295	200	8.5	13	61	16.4
30Sh3	299	200	9	15	68.3	14.6
35Sh1	338	250	9.5	12.5	75.1	13.3
35Sh2	341	250	10	14	82.2	12.2
35Sh3	345	250	10.5	16	91.3	11
40Sh1	388	300	9.5	14	96.1	10.4
40Sh2	392	300	11.5	16	111.1	9
40Sh3	396	300	12.5	18	123.4	8.1
50Sh1	484	300	11	15	114.4	8.74
50Sh2	489	300	14.5	17.5	138.7	7.21
50Sh3	495	300	15.5	20.5	156.4	6.39

Section	h, mm	b, mm	s, mm	t, mm	Mass of 1 m, kg	Metres per tonne
50Sh4	501	300	16.5	23.5	174.1	5.74
60Sh1	580	320	12	17	142.1	7.04
60Sh2	587	320	16	20.5	176.9	5.65
60Sh3	595	320	18	24.5	205.5	4.87
60Sh4	603	320	20	28.5	234.2	4.27
70Sh1	683	320	13.5	19	169.9	5.89
70Sh2	691	320	15	23	197.6	5.06
70Sh3	700	320	18	27.5	235.4	4.25
70Sh4	708	320	20.5	31.5	268.1	3.73
70Sh5	718	320	23	36.5	305.9	3.27

I-beams with parallel flange faces: column (K) · ГОСТ 26020-83

Section	h, mm	b, mm	s, mm	t, mm	Mass of 1 m, kg	Metres per tonne
20K1	195	200	6.5	10	41.5	24.1
20K2	198	200	7	11.5	46.9	21.3
23K1	227	240	7	10.5	52.2	19.2
23K2	230	240	8	12	59.5	16.8
26K1	255	260	8	12	65.2	15.3
26K2	258	260	9	13.5	73.2	13.7
26K3	262	260	10	15.5	83.1	12
30K1	296	300	9	13.5	84.8	11.8
30K2	300	300	10	15.5	96.3	10.4
30K3	304	300	11.5	17.5	108.9	9.18
35K1	343	350	10	15	109.7	9.12
35K2	348	350	11	17.5	125.9	7.94
35K3	353	350	13	20	144.5	6.92
40K1	393	400	11	16.5	138	7.25
40K2	400	400	13	20	165.6	6.04
40K3	409	400	16	24.5	202.3	4.94
40K4	419	400	19	29.5	242.2	4.13
40K5	431	400	23	35.5	291.2	3.43

The mass of 1 m is calculated for a steel density of 7850 kg/m³. The dimensions h, b, s and t are in millimetres.

How to get the mass of a beam from the table

The mass of a beam is its mass per metre times its length. A No. 30 I-beam weighs 36.5 kg/m, so a six-metre beam is 219 kg, and a tonne of this section is 27.4 m long. A No. 20 beam (21 kg/m) gives 47.6 m per tonne.

The "Metres per tonne" column helps when buying by weight: divide the length you need by this figure to get the mass in tonnes.

Where I-beams are used

An I-beam works in bending, so it is used for floor and roof beams, purlins, crane-runway girders and, in built-up sections, frame columns. The M series is meant for suspended tracks: hoists and overhead cranes run on its lower flange.

Calculator and ordering

The mass of any number of I-beams can be worked out in the rolled metal calculator. If you need the beams as part of a structure, send a drawing or a specification: the POLYGONAL company makes steel structures to the customer's drawings.

Frequently asked questions

How much does a No. 20 I-beam weigh?

A No. 20 I-beam weighs 21 kg per metre, and a No. 20a with a wider flange weighs 22.7 kg. A six-metre No. 20 beam is about 126 kg.

What does the I-beam number mean?

It is the height of the profile in centimetres: a No. 30 beam is 300 mm high. The letter "a" shows that the flange is wider than that of the base profile of this number.

How does an M-series I-beam differ from an ordinary one?

The M series is made for suspended tracks, so the profile has different proportions. The mass of 1 m is 38.3 kg for No. 24M and 57.9 kg for No. 36M.

How do I find how many metres of I-beam make a tonne?

Divide 1000 kg by the mass of 1 m. For a No. 16 beam (15.9 kg/m) it is about 63 m.

Reference information. Check the values against the current standard before using them in a project.