

4. Angles

L-shape steel angles that can have equal or unequal legs, commonly used in construction where structural stability is required by joining with other steel members.

4.1 Equal Angles

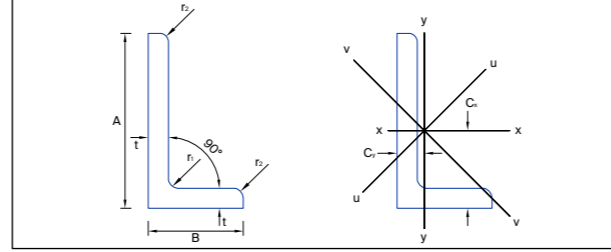
4.2 Unequal Angles

Equal and Unequal Angles Standard specifications

Material	Yield strength			Tensile strength N/mm ²	Min. Elongation L ₀ =5.65√S ₀	Min. Charpy V-notch.	Dimensions & Tolerances
	≤11mm	>11 - <40mm	≥40mm				
AS 3679.1							AS 3679.1
Grade 300	320	300	280	min. 440	22%	27J @ 0°C	
Grade 350	360	340	330	min. 480	20%	27J @ 0°C	
ASTM A36 (1996)		min. 250		400-550	20-21 %	-	ASTM A6
ASTM A572							
Grade 42		min. 290		min. 415	20-24 %	-	
Grade 50		min. 345		min. 450	18-21 %	-	
Grade 60		min. 415		min. 520	16-18 %	-	
Grade 65		min. 450		min. 550	15-17 %	-	
ASTM A992		345 - 450		min. 450	18-21 %	-	
EN 10025							EN 10279
S275JR	275	>16 - ≤40mm 265	>40 - ≤150mm 255 - 225	3-100mm 410-560	18-23 %	27J @ 20°C	
S355JR	355	345	335 - 295	470-630	17-22 %	27J @ 20°C	
S355J0	355	345	335 - 295	470-630	17-22 %	27J @ 0°C	
S355J2	355	345	335 - 295	470-630	17-22 %	27J @ -20°C	
JIS 3101							JIS 3192
SS400	245	>16 - ≤40mm 235	>40 - ≤100mm 215	t<100mm 400-510	17-23 %	-	
SS490	285	275	255	490-610	15-21 %	-	
SS540	400	390	-	min. 540	13-17 %	-	
JIS 3106							
SM400A	245	>16 - ≤40mm 235	>40mm 215	t<100mm 400-510	18-24 %	-	
SM400B	245	235	215	400-510	18-24 %	27J @ 0°C	
SM400C	245	235	215	400-510	18-24 %	47J @ 0°C	
SM490A	325	315	295	490-610	17-23 %	-	
SM490B	325	315	295	490-610	17-23 %	27J @ 0°C	
SM490C	325	315	295	490-610	17-23 %	47J @ 0°C	
SM490YA	365	355	335	490-610	15-21 %	-	
SM490YB	365	355	335	490-610	15-21 %	27J @ 0°C	
SM520B	365	355	335	520-640	15-21%	27J @ 0°C	
SM520C	365	355	335	520-640	15-21 %	47J @ 0°C	



4.2 Unequal Angles



Designation		Mass per Metre	Radius		Area of Section	Distance Centre of Gravity		Second Moment of Area				Radius of Gyration				Elastic Modulus		Angle
Size	Thick-ness		Root	Toe		Cx	Cy	Axis x-x	Axis y-y	Axis u-u	Axis v-v	Axis x-x	Axis y-y	Axis u-u	Axis v-v	Axis x-x	Axis y-y	
mm	mm	kg/m	mm	mm	cm ²	cm	cm	cm ⁴	cm ⁴	cm ⁴	cm ⁴	cm	cm	cm	cm	cm ³	cm ³	
63x38	4.5	3.45	6	2.4	4.4	2.10	0.870	18.0	4.90	20.0	3.00	2.01	1.06	2.12	0.820	4.20	1.68	0.362
	6	4.43	6	2.4	5.75	2.17	0.930	23.0	6.30	25.0	3.80	1.99	1.04	2.10	0.820	5.50	2.18	0.358
75x50	6	5.65	7	2.4	7.22	2.45	1.21	40.9	14.6	47.1	8.48	2.38	1.42	2.55	1.08	8.10	3.87	0.436
	8	7.39	7	2.4	9.44	2.53	1.29	52.4	18.6	60.1	10.9	2.36	1.40	2.52	1.07	10.5	5.01	0.430
100x65	7	8.8	10	4.8	11.2	3.23	1.52	113	37.7	128	22.1	3.18	1.84	3.39	1.41	16.7	7.56	0.415
	8	9.4	10	4.8	12.7	3.28	1.56	127	42.3	144	24.9	3.17	1.83	3.38	1.40	18.9	8.57	0.414
	9	11.0	10	7.0	14.0	3.31	1.58	138	45.5	157	26.8	3.14	1.80	3.34	1.38	20.6	9.26	0.410
	10	12.3	10	4.8	15.6	3.36	1.64	154	51.1	175	30.2	3.14	1.81	3.35	1.39	23.2	10.5	0.410
100x75	7	9.3	10	5.0	11.9	3.06	1.84	118	56.9	144	30.7	3.15	2.19	3.49	1.61	17.0	10.1	0.548
	8	10.6	10	4.8	13.5	3.11	1.88	133	64.2	163	34.6	3.14	2.18	3.48	1.60	19.3	11.4	0.548
	9	11.8	10	4.8	15.1	3.15	1.92	148	71.1	181	38.4	3.13	2.17	3.46	1.60	21.6	12.7	0.546
	10	13.0	10	4.8	16.6	3.19	1.96	162	77.7	198	42.2	3.12	2.16	3.45	1.59	23.8	14.0	0.545
125x75	6.5	10.0	11	4.8	12.7	4.07	1.62	206	56.6	228	34.4	4.02	2.11	4.23	1.64	24.4	9.63	0.360
	7	10.7	11	4.8	13.7	4.10	1.64	220	60.5	244	36.7	4.01	2.10	4.22	1.64	26.2	10.3	0.360
	8	12.2	11	4.8	15.5	4.14	1.69	249	68.1	275	41.3	4.00	2.10	4.21	1.63	29.7	11.7	0.360
	9	13.5	11	4.8	17.4	4.19	1.73	276	75.5	306	45.8	3.99	2.09	4.20	1.62	33.2	13.1	0.359
125x75	10	15.0	11	4.8	19.2	4.23	1.77	303	82.6	336	50.2	3.98	2.08	4.18	1.62	36.7	14.4	0.358
	12	17.8	11	4.8	22.7	4.32	1.84	355	96.0	392	58.8	3.95	2.06	4.16	1.61	43.4	17.0	0.354
	13	19.1	10	7.0	24.3	4.35	1.87	376	101	414	61.9	3.93	2.04	4.13	1.60	46.1	17.9	0.352

Dimensions

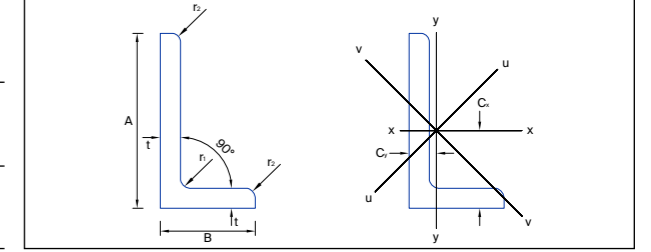
EN 10056/ JIS G 3192

Specification

EN10025/ ASTM A36/ ASTM A572/ JIS G 3101

Size Range

30mm x 20mm to 200mm x 150mm



Designation		Mass per Metre	Radius		Area of Section	Distance Centre of Gravity		Second Moment of Area				Radius of Gyration				Elastic Modulus		Angle	
Size	Thick-ness		Root	Toe		Cx	Cy	Axis x-x	Axis y-y	Axis u-u	Axis v-v	Axis x-x	Axis y-y	Axis u-u	Axis v-v	Axis x-x	Axis y-y		
mm	mm	kg/m	mm	mm	cm ²	cm	cm	cm ⁴	cm ⁴	cm ⁴	cm ⁴	cm	cm	cm	cm	cm ³	cm ³		
150x75	7	12.1	12	5.0	15.5	5.17	1.50	364	63.1	386	40.8	4.85	2.02	5.00	1.62	37.0	10.5	0.263	
	8	13.8	11	4.8	17.5	5.23	1.54	411	71.2	436	45.8	4.84	2.02	4.99	1.62	42.1	11.9	0.263	
	9	15.3	12	8.5	19.4	5.25	1.55	447	75.3	473	48.7	4.79	1.97	4.93	1.58	45.8	12.7	0.259	
	10	17.0	11	4.8	21.7	5.32	1.62	503	86.3	533	55.8	4.82	2.00	4.96	1.60	52.0	14.7	0.261	
	12	20.2	11	4.8	25.7	5.41	1.70	591	100	626	65.3	4.79	1.98	4.93	1.59	61.6	17.3	0.259	
150x90	8	14.3	10	5.0	18.7	4.93	1.97	436	121	484	72.7	4.83	2.54	5.09	1.97	43.3	17.2	0.364	
	9	16.4	12	6.0	20.9	4.95	2.00	485	133	537	80.5	4.81	2.52	5.06	1.96	48.2	19.0	0.361	
	10	18.2	12	4.8	23.2	5.00	2.04	536	147	595	89.2	4.81	2.52	5.06	1.96	53.7	21.2	0.361	
	12	21.6	12	4.8	27.6	5.09	2.12	630	172	698	105	4.78	2.50	5.03	1.95	63.6	25.0	0.359	
150x100	8	15.2	12	8.5	19.4	4.70	2.24	441	158	508	90.9	4.77	2.86	5.12	2.17	42.8	20.3	0.437	
	9	17.1	12	6.0	21.8	4.77	2.30	502	181	579	104	4.79	2.88	5.15	2.18	49.1	23.5	0.439	
	10	19.0	13	6.5	24.2	4.80	2.34	552	198	635	114	4.78	2.86	5.13	2.17	54.1	25.8	0.437	
	12	22.4	12	8.5	28.6	4.88	2.41	642	228	738	132	4.74	2.83	5.08	2.15	63.4	30.1	0.435	
150x100	15	27.7	12	8.5	35.2	5.01	2.53	781	276	897	161	4.71	2.80	5.04	2.14	78.2	37.0	0.431	
	200x100	10	23.0	15	4.8	29.4	6.95	2.03	1233	215	1309	138	6.48	2.70	6.68	2.17	94.5	27.0	0.264
		12	27.3	15	4.8	34.9	7.04	2.11	1454	252	1544	162	6.45	2.68	6.65	2.16	112	31.9	0.263
15		33.7	15	4.8	43.1	7.17	2.23	1772	303	1879	197	6.41	2.65	6.60	2.14	138	39.0	0.260	
200x150	12	32.0	15	4.8	40.9	6.10	3.63	1667	813	2046	434	6.38	4.45	7.07	3.26	120	71.5	0.554	
	15	39.6	15	4.8	50.6	6.22	3.75	2037	989	2496	530	6.34	4.42	7.02	3.23	148	87.9	0.552	
	18	47.4	15	4.8	60.1	6.34	3.86	2390	1155	2923	622	6.30	4.38	6.97	3.22	175	104	0.549	