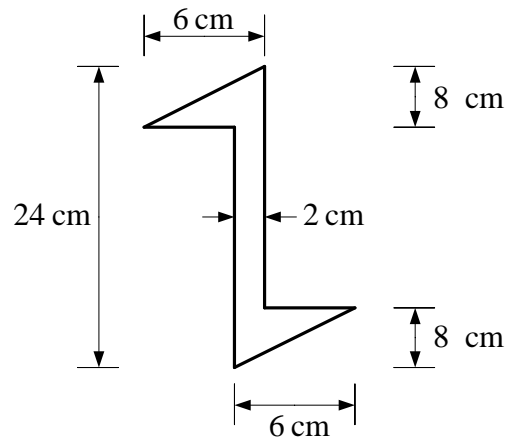


Baumechanik II Tutorium 3

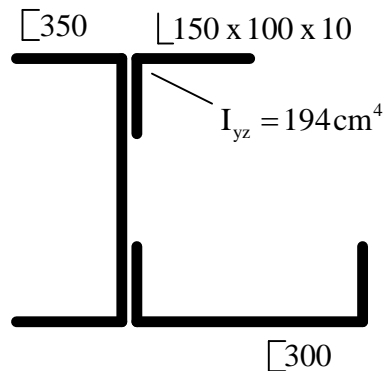
Aufgabe 3.1:



gesucht:

- axiale Flächenträgheitsmomente I_y, I_z , Deviationsmoment I_{yz}
- Hauptträgheitsmomente I_1, I_2 und Richtung der Hauptachsen φ^*
- Trägheitsradius i_y, i_z

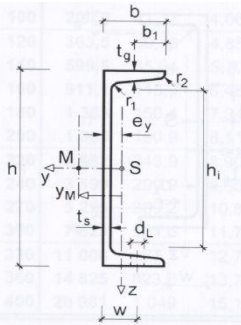
Aufgabe 3.2:



gesucht:

- axiale Flächenträgheitsmomente I_y, I_z , Deviationsmoment I_{yz}
- Hauptträgheitsmomente I_1, I_2 und Richtung der Hauptachsen φ^*
- Trägheitsradius i_y, i_z

Für die Aufgabe 3.2 werden Profiltafeln von Walzprofilen benötigt. Deswegen bitte **Schneider, Bautabellen für Ingenieure** oder **Wendehorst, Bautechnische Zahlentafeln** mitbringen.



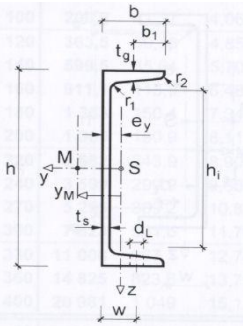
$h \leq 300$: Flanschneigung = 8 %, $b_1 = b / 2$
 $h > 300$: Flanschneigung = 5 %, $b_1 = (b - t_s) / 2$

U Profile nach DIN 1026-1

Profil	Abmessungen						Flächen A	Mantel U	Gewicht G	Biegung um die y-Achse			Biegung um die z-Achse			LÖc dL
	h	b	ts	tg	r ₁	r ₂				I _y	i _y	W _y	I _z	i _z	W _z	
U	mm	mm	mm	mm	mm	mm	cm ²	m ² /m	kg/m	cm ⁴	mm	cm ³	cm ⁴	mm	cm ³	mm
30x15	30.00	15.00	4.00	4.50	4.50	2.00	2.21	0.10	1.73	2.53	10.70	1.69	0.38	4.20	0.39	-
30	30.00	33.00	5.00	7.00	7.00	3.50	5.44	0.17	4.27	6.39	10.80	4.26	5.33	9.90	2.68	-
40	40.00	35.00	5.00	7.00	7.00	3.50	6.21	0.20	4.87	14.10	15.00	7.05	6.68	10.40	3.08	-
40x20	40.00	20.00	5.00	5.50	5.00	2.50	3.66	0.14	2.87	7.58	14.40	3.79	1.14	5.60	0.86	-
50	50.00	38.00	5.00	7.00	7.00	3.50	7.12	0.23	5.59	26.40	19.20	10.56	9.12	11.30	3.75	-
50x25	50.00	25.00	5.00	6.00	6.00	3.00	4.92	0.18	3.86	16.80	18.50	6.72	2.49	7.10	1.47	-
60	60.00	30.00	6.00	6.00	6.00	3.00	6.46	0.22	5.07	31.60	22.10	10.53	4.51	8.40	2.16	-
65	65.00	42.00	5.50	7.50	7.50	4.00	9.03	0.27	7.09	57.50	25.20	17.69	14.10	12.50	5.07	-
80	80.00	45.00	6.00	8.00	8.00	4.00	11.00	0.31	8.64	106.00	31.00	26.50	19.40	13.30	6.36	-
100	100.00	50.00	6.00	8.50	8.50	4.50	13.50	0.37	10.60	206.00	39.10	41.20	29.30	14.70	8.49	11.00
120	120.00	55.00	7.00	9.00	9.00	4.50	17.00	0.43	13.35	364.00	46.20	60.67	43.20	15.90	11.08	13.00
140	140.00	60.00	7.00	10.00	10.00	5.00	20.40	0.49	16.01	605.00	54.50	86.43	62.70	17.50	14.75	13.00
160	160.00	65.00	7.50	10.50	10.50	5.50	24.00	0.55	18.84	925.00	62.10	115.63	85.30	18.90	18.30	17.00
180	180.00	70.00	8.00	11.00	11.00	5.50	28.00	0.61	21.98	1350.00	69.50	150.00	114.00	20.20	22.44	21.00
200	200.00	75.00	8.50	11.50	11.50	6.00	32.20	0.66	25.28	1910.00	77.00	191.00	148.00	21.40	26.96	21.00
220	220.00	80.00	9.00	12.50	12.50	6.50	37.40	0.72	29.36	2690.00	84.80	244.55	197.00	23.00	33.62	21.00
240	240.00	85.00	9.50	13.00	13.00	6.50	42.30	0.77	33.21	3600.00	92.20	300.00	248.00	24.20	39.55	25.00
260	260.00	90.00	10.00	14.00	14.00	7.00	48.30	0.83	37.92	4820.00	99.90	370.77	317.00	25.60	47.74	25.00
280	280.00	95.00	10.00	15.00	15.00	7.50	53.30	0.89	41.84	6280.00	109.00	448.57	399.00	27.40	57.25	28.00
300	300.00	100.00	10.00	16.00	16.00	8.00	58.80	0.95	46.16	8030.00	117.00	535.33	495.00	29.00	67.81	28.00
320	320.00	100.00	14.00	17.50	17.50	8.80	75.80	0.98	59.50	10870.00	121.00	679.38	597.00	28.10	80.68	25.00
350	350.00	100.00	14.00	16.00	16.00	8.00	77.30	1.05	60.68	12840.00	129.00	733.71	570.00	27.20	75.00	28.00
380	380.00	102.00	13.50	16.00	16.00	8.00	80.40	1.11	63.11	15760.00	140.00	829.47	615.00	27.70	78.64	28.00
400	400.00	110.00	14.00	18.00	18.00	9.00	91.50	1.18	71.83	20350.00	149.00	1017.50	846.00	30.40	101.32	28.00



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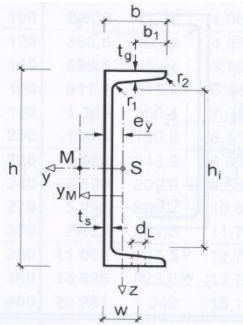


$h \leq 300$: Flanschneigung = 8 %, $b_1 = b / 2$
 $h > 300$: Flanschneigung = 5 %, $b_1 = (b - t_s) / 2$

U Profile nach DIN 1026-1

Profil	Flächen					Querschnittsgewicht		S- und M-Lage			Torsion	Wölb torsion					
	A _y	A _z	A _{v,y}	A _{v,z}	AG	V	Am/V	e _y	YM	YM,FEM	I _t	I _ω	W _ω	ω _{max}	S _{ω,max}	W _{pl,ω}	α _{pl,ω}
U	cm ²	cm ²	cm ²	cm ²	cm ²	cm ³ /m	1/m	mm	mm	mm	cm ⁴	cm ⁶	cm ⁴	cm ²	cm ⁴	cm ⁴	
30x15	0.78	0.90	1.69	1.24	0.84	221.00	466.06	5.20	-7.40	-6.90	0.17	0.4080	0.39	1.05	0.19	0.70	1.81
30	3.45	0.84	5.22	1.66	0.80	544.00	319.85	13.10	-22.20	-20.20	0.91	4.36	2.17	2.01	1.21	4.20	1.94
40	3.43	1.29	5.50	2.15	1.30	621.00	320.45	13.30	-23.20	-21.70	1.00	11.90	3.91	3.04	1.93	7.40	1.89
40x20	1.26	1.52	2.73	2.04	1.45	366.00	387.98	6.70	-10.10	-9.40	0.36	2.12	1.11	1.90	0.55	2.20	1.98
50	3.53	1.75	5.92	2.64	1.80	712.00	325.84	13.70	-24.70	-23.50	1.12	27.80	6.41	4.34	3.02	12.00	1.87
50x25	1.68	1.94	3.55	2.58	1.90	492.00	367.89	8.10	-13.40	-12.70	0.88	8.25	2.71	3.04	1.22	5.00	1.84
60	2.04	2.82	4.32	3.58	2.88	646.00	332.82	9.10	-15.00	-14.40	0.94	21.90	4.80	4.56	2.22	9.30	1.94
65	3.89	2.67	7.02	3.71	2.75	903.00	302.33	14.20	-26.00	-25.10	1.61	77.30	11.88	6.51	5.43	22.20	1.87
80	4.18	3.73	8.04	4.92	3.84	1100.00	283.64	14.50	-26.70	-25.90	2.16	168.00	18.89	8.89	8.59	35.60	1.88
100	4.58	4.87	9.37	6.23	4.98	1350.00	275.56	15.50	-29.30	-28.60	2.81	414.00	32.57	12.71	14.66	61.30	1.88
120	5.14	6.94	11.02	8.54	7.14	1700.00	255.29	16.00	-30.30	-29.60	4.15	900.00	51.95	17.32	23.59	99.40	1.91
140	5.89	8.26	13.19	10.10	8.40	2040.00	239.71	17.50	-33.70	-33.00	5.68	1800.00	81.20	22.17	36.68	155.00	1.91
160	6.48	10.23	15.00	12.24	10.40	2400.00	227.50	18.40	-35.60	-34.90	7.39	3260.00	116.86	27.90	52.90	224.00	1.92
180	7.13	12.38	16.92	14.69	12.60	2800.00	218.21	19.20	-37.50	-36.90	9.55	5570.00	162.41	34.30	73.88	312.00	1.92
200	1.81	14.72	18.95	17.25	15.00	3220.00	205.28	20.10	-39.40	-38.80	11.90	9070.00	219.60	41.30	100.20	424.00	1.93
220	8.82	17.23	21.94	20.09	17.60	3740.00	191.98	21.40	-42.00	-41.40	16.00	14600.00	300.48	48.59	136.87	580.00	1.93
240	9.61	19.93	24.24	23.13	20.30	4230.00	183.22	22.30	-43.90	-43.30	19.70	22100.00	388.65	56.86	177.84	752.00	1.94
260	10.73	22.81	27.60	26.46	23.20	4830.00	172.67	23.60	-46.60	-45.90	25.50	33300.00	509.86	65.31	233.09	987.00	1.94
280	11.83	24.66	31.00	28.55	25.00	5330.00	166.98	25.30	-50.20	-49.60	31.00	48500.00	655.51	73.99	298.19	1260.00	1.92
300	12.99	26.49	34.60	30.96	26.80	5880.00	161.57	27.00	-54.10	-53.30	37.40	69100.00	830.86	83.17	375.76	1590.00	1.91
320	14.63	39.15	39.41	46.31	39.90	7580.00	129.55	26.00	-48.20	-48.10	66.70	96100.00	1034.29	92.91	469.93	2040.00	1.97
350	12.91	43.36	36.20	50.10	44.50	7730.00	135.45	24.00	-44.50	-44.60	61.20	114000.00	1080.55	105.50	496.06	2130.00	1.97
380	12.50	45.77	36.62	52.48	47.00	8040.00	138.06	23.80	-45.80	-45.20	59.10	146000.00	1235.21	118.20	570.43	2440.00	1.98
400	15.00	49.94	44.08	57.66	51.00	9150.00	129.18	26.50	-51.10	-51.20	81.60	221000.00	1676.04	131.86	766.41	3310.00	1.98

$I_{\omega, FEM}$
cm⁶
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217000.00



$h \leq 300$: Flanschneigung = 8 %, $b_1 = b / 2$
 $h > 300$: Flanschneigung = 5 %, $b_1 = (b - t_s) / 2$

U Profile nach DIN 1026-1

Profil	Biegung											Hilfswerte		Grenzschnittgrößen für $f_y, d = 2$		
	S_y, \max	Wpl,y,max	Wpl,y,voll	apl,y,max	apl,y,voll	S_z, \max	Wpl,z	apl,z	Wz,min	Wz,max	ip	ip,M	rz,Kindem	rM,y	Npl,d	Vpl,z,d
U	cm ³	cm ³	cm ³			cm ³	cm ³		cm ³	cm ³	mm	mm	mm	mm	kN	kN
30x15	1.08	2.20	2.04	1.30	1.21	0.20	0.75	1.92	-0.73	0.39	11.50	13.70	12.80	27.60	48.27	12.85
30	2.08	5.59	5.45	1.31	1.28	1.15	4.56	1.70	-4.07	2.68	14.70	26.60	6.70	51.10	118.70	14.49
40	4.44	8.88	8.56	1.26	1.21	1.41	5.55	1.80	-5.02	3.08	18.30	29.50	10.40	56.80	135.50	20.78
40x20	2.41	4.88	4.51	1.29	1.19	0.43	1.63	1.90	-1.70	0.86	15.50	18.50	17.60	37.80	79.78	21.73
50	6.49	12.99	12.40	1.23	1.17	1.76	6.89	1.84	-6.66	3.75	22.30	33.30	15.30	64.70	155.30	27.08
50x25	4.18	8.41	7.78	1.25	1.16	0.75	2.79	1.89	-3.07	1.47	19.80	23.90	22.90	49.70	107.30	27.71
60	6.55	13.10	11.91	1.24	1.13	1.14	4.13	1.91	-4.96	2.16	23.60	28.00	30.30	60.30	141.00	40.81
65	10.71	21.42	20.21	1.21	1.14	2.45	9.48	1.87	-9.93	5.07	28.10	38.30	32.50	84.50	197.10	39.84
80	15.90	31.91	29.77	1.20	1.12	3.17	12.08	1.90	-13.38	6.36	33.70	43.00	34.30	87.70	240.50	54.42
100	24.50	48.98	45.42	1.19	1.10	4.28	16.20	1.91	-18.90	8.49	41.80	51.00	46.20	104.80	293.50	69.16
120	36.30	72.73	66.51	1.20	1.10	5.78	21.26	1.92	-27.00	11.08	48.90	57.50	64.80	125.40	370.60	97.88
140	51.40	102.82	94.20	1.19	1.09	7.68	28.31	1.92	-35.83	14.75	57.20	66.40	77.80	145.20	444.40	114.60
160	68.80	137.59	125.25	1.19	1.08	9.68	35.15	1.92	-46.36	18.30	64.90	74.00	93.70	164.90	523.90	141.20
180	89.60	179.19	162.22	1.20	1.08	12.00	43.05	1.92	-59.38	22.44	72.40	81.50	110.70	185.70	610.20	170.30
200	114.00	227.84	205.26	1.19	1.08	14.62	51.87	19.2	-73.63	26.96	79.90	89.10	129.50	208.30	702.20	201.80
220	146.00	291.60	262.59	1.19	1.07	18.16	64.35	1.91	-92.06	33.62	87.90	97.40	143.20	227.20	817.00	235.20
240	179.00	357.81	320.97	1.19	1.07	21.59	75.93	1.92	-111.21	39.55	95.30	104.90	162.30	250.10	923.10	271.60
260	221.00	442.58	397.01	1.19	1.07	26.02	91.88	1.92	-134.32	47.74	103.10	113.20	177.20	270.40	1053.00	309.90
280	266.00	532.18	479.21	1.19	1.07	30.76	109.77	1.92	-157.71	57.25	112.40	123.10	192.60	293.00	1166.00	333.80
300	316.00	632.63	571.69	1.18	1.07	35.98	129.86	1.92	-183.33	67.81	120.50	132.10	205.00	313.20	1282.00	357.70
320	413.00	825.71	729.71	1.22	1.07	44.41	151.91	1.88	-229.62	80.68	124.20	133.20	243.10	339.50	1653.00	533.50
350	459.00	899.67	780.62	1.23	1.06	42.92	142.48	1.90	-237.50	75.00	131.80	139.10	298.30	387.30	1686.00	589.00
380	507.00	1015.24	877.85	1.22	1.06	45.31	149.07	1.90	-258.40	78.64	142.70	149.90	243.00	334.60	1753.00	619.00
400	618.00	1236.55	1080.43	1.22	1.06	57.70	192.57	1.90	-319.25	101.32	152.10	160.40	342.90	445.10	1996.00	673.70

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