

# DESIGN DATA



TABLE 1

Properties and stresses data for straight glulam units of rectangular cross-section and planed surface. Bending across largest measure.

h mm	No. of laminations	Breadth = 42 mm			Breadth = 56 mm			Breadth = 66 mm			Breadth = 78 mm			Breadth = 90 mm		
		$M_R^{3)}$	$W_x$	$I_x$	$M_R^{3)}$	$W_x$	$I_x$	$M_R^{3)}$	$W_x$	$I_x$	$M_R^{3)}$	$W_x$	$I_x$	$M_R^{3)}$	$W_x$	$I_x$
		kNm	mm <sup>3</sup> *10 <sup>3</sup>	mm <sup>4</sup> *10 <sup>5</sup>	kNm	mm <sup>3</sup> *10 <sup>3</sup>	mm <sup>4</sup> *10 <sup>5</sup>	kNm	mm <sup>3</sup> *10 <sup>3</sup>	mm <sup>4</sup> *10 <sup>5</sup>	kNm	mm <sup>3</sup> *10 <sup>3</sup>	mm <sup>4</sup> *10 <sup>5</sup>	kNm	mm <sup>3</sup> *10 <sup>3</sup>	mm <sup>4</sup> *10 <sup>5</sup>
180	4	5.1	227	204	6.8	302	272	8.0	356	321	9.5	421	379	11.0	486	437
225	5	8.0	354	399	10.7	473	532	12.6	557	626	14.8	658	740	17.1	759	854
270	6	11.5	510	689	15.3	680	919	18.1	802	1083	21.4	948	1279	24.6	1094	1476
315	7	15.5	695	1094	20.7	926	1459	24.4	1091	1719	28.8	1290	2032	33.2	1488	2344
360	8	19.7	907	1633	26.3	1210	2177	31.0	1426	2566	36.6	1685	3033	42.2	1944	3499
405	9	24.4	1148	2325	32.5	1531	3100	38.3	1804	3654	45.2	2132	4318	52.2	2460	4982
450	10	29.5	1418	3189	39.3	1890	4253	46.3	2228	5012	54.7	2633	5923	63.1	3038	6834
495	11	35.0	1715	4245	46.6	2287	5660	54.9	2695	6671	64.9	3185	7884	74.9	3675	9097
540	12	40.9	2041	5511	54.5	2722	7348	64.3	3208	8661	75.9	3791	10235	87.6	4374	11810
585	13	47.2	2396	7007	63.0	3194	9343	74.2	3764	11011	87.7	4449	13013	101.2	5133	15015
630	14	54.5	2778	8752	72.6	3704	11669	85.6	4366	13753	101.1	5160	16253	116.7	5954	18754
675	15				83.4	4253	14352	98.2	5012	16915	116.1	5923	19991	134.0	6834	23066
720	16				94.8	4838	17418	111.8	5702	20529	132.1	6739	24261	152.4	7776	27994
765	17				107.1	5462	20893	126.2	6437	24623	149.1	7608	29100	172.1	8778	33577
810	18				120.0	6124	24801	141.5	7217	29229	167.2	8529	34544	192.9	9842	39858
855	19				133.7	6823	29168	157.6	8041	34376	186.3	9503	40627	214.9	10965	46877
900	20							174.6	8910	40095	206.4	10530	47385	238.2	12150	54675
945	21							192.5	9823	46415	227.6	11609	54854	262.6	13395	63293
990	22							211.3	10781	53366	249.7	12741	63069	288.2	14702	72772
1035	23										273.0	13926	72067	315.0	16068	83154
1080	24										297.2	15163	81881	342.9	17496	94478
1125	25										322.5	16453	92549	372.1	18984	106787
1170	26													402.5	20534	120121
1215	27													434.0	22143	134521
1260	28															
1305	29															
1350	30															
1395	31															
1440	32															
1485	33															
1530	34															
1575	35															
1620	36															
		$i_y = 12.1\text{mm}$			$i_y = 16.2\text{mm}$			$i_y = 19.1\text{mm}$			$i_y = 22.5\text{mm}$			$i_y = 26.0\text{mm}$		

<sup>3)</sup> The table values apply to designs of safety class 2, where there is no risk of tilting and the shortest duration load in the combination is type B. Climate classes 0, 1 or 2. For other conditions, please refer to notes 1-6 in Table 2.

TABLE 2

Glulam manual. Table 3.5  
Dimensioning material values (MPa) for glulam L40, to estimate load bearing capacity. Climate class 0, 1 or 2<sup>1)</sup> Safety class 2<sup>2)3)</sup>

Shortest term load type in relevant combination			A	B	C
Example of loads:			Snow with common values. Fixed section of n load	Snow with characteristic values. Free section of n load	Wind with characteristic values
			$h \leq 300\text{ mm}$ $h \geq 600\text{ mm}$	$h \leq 300\text{ mm}$ $h \geq 600\text{ mm}$	$h \leq 300\text{ mm}$ $h \geq 600\text{ mm}$
Bending	Stiffest direction <sup>4)5)</sup> Weakest direction	$f_{mx}$ $f_{my}$	18.0 14.2	15.7 17.8	22.5 19.6 25.5 20.1
Tension	Parallel to grain <sup>4)</sup> Perp to grain	$f_t$ $f_{t90}$	12.8 0.16	11.1 0.24	16.0 13.9 18.1 0.32
Compression	Parallel to grain Perp to grain	$f_c$ $f_{c90}$	17.1 3.8	21.3 4.7	24.2 5.4
Longitudinal shear <sup>6)</sup>			$f_v$	1.9	2.4
Modulus of elasticity			$E_0$	4900	6200
Modulus of shear			G	350	400
<sup>1)</sup> In climate class 3, reduce table values by 15%. <sup>2)</sup> In safety class 1, increase table values by 10% and in safety class 3, reduce them by 10%. <sup>3)</sup> To dimension for accidents or continuous land slips, increase table values by 18% for all safety classes. <sup>4)</sup> For structural elements with a cross-section height between 300 and 600 mm, multiply the value by factor $x_h$ in equation (3.5), for $h \leq 300\text{ mm}$ . <sup>5)</sup> Applies to straight structural members. For curved structural elements, multiply table values by factor $x_{rad}$ in equation (3.23). <sup>6)</sup> Applies to rectangular cross sections. Use half the value for cross shear.					

All tables, values and conditions refer to the Swedish Code BKR 94.



TABLE 3

Dimensioning values of modulus of elasticity (MPa) for calculating the deformation contribution in the everyday use limit state.

Load type	P	A	B	C
Climate class	Dead weight	Ordinary snow. Tied n load	Char. snow. Free n load	Char. wind
0 or 1	7150	8450	10400	13000
2	5850	7150	9100	11700
3	3900	5200	7150	10400

h mm	Breadth = 115 mm			Breadth = 140 mm			Breadth = 165 mm			Breadth = 190 mm			Breadth = 215 mm			i <sub>x</sub> mm
	M <sub>R</sub> <sup>(3)</sup> kNm	W <sub>x</sub> mm <sup>3</sup> *10 <sup>3</sup>	I <sub>x</sub> mm <sup>4</sup> *10 <sup>5</sup>	M <sub>R</sub> <sup>(3)</sup> kNm	W <sub>x</sub> mm <sup>3</sup> *10 <sup>3</sup>	I <sub>x</sub> mm <sup>4</sup> *10 <sup>5</sup>	M <sub>R</sub> <sup>(3)</sup> kNm	W <sub>x</sub> mm <sup>3</sup> *10 <sup>3</sup>	I <sub>x</sub> mm <sup>4</sup> *10 <sup>5</sup>	M <sub>R</sub> <sup>(3)</sup> kNm	W <sub>x</sub> mm <sup>3</sup> *10 <sup>3</sup>	I <sub>x</sub> mm <sup>4</sup> *10 <sup>5</sup>	M <sub>R</sub> <sup>(3)</sup> kNm	W <sub>x</sub> mm <sup>3</sup> *10 <sup>3</sup>	I <sub>x</sub> mm <sup>4</sup> *10 <sup>5</sup>	
180	14.0	621	559	17.0	756	680	20.1	891	802	23.1	1026	923	26.2	1161	1045	52
225	21.9	970	1092	26.6	1181	1329	31.4	1392	1566	36.1	1603	1804	40.9	1814	2041	65
270	31.5	1397	1886	38.3	1701	2296	45.2	2005	2706	52.0	2309	3116	58.9	2612	3527	78
315	42.4	1902	2995	51.7	2315	3647	60.9	2729	4298	70.1	3142	4949	79.3	3556	5600	91
360	54.0	2484	4471	65.7	3024	5443	77.4	3564	6415	89.2	4104	7387	100.9	4644	8359	104
405	66.7	3144	6366	81.2	3827	7750	95.7	4511	9134	110.2	5194	10518	124.7	5878	11902	117
450	80.6	3881	8733	98.2	4725	10631	115.7	5569	12530	133.2	6413	14428	150.8	7256	16327	130
495	95.7	4696	11623	116.5	5717	14150	137.3	6738	16677	158.2	7759	19204	179.0	8780	21731	143
540	112.0	5589	15090	136.3	6804	18371	160.6	8019	21651	185.0	9234	24932	209.3	10449	28212	156
585	129.3	6559	19186	157.4	7985	23357	185.5	9411	27528	213.6	10837	31699	241.7	12263	35869	169
630	149.1	7607	23963	181.5	9261	29172	213.9	10915	34381	246.4	12569	39591	278.8	14222	44800	182
675	171.2	8733	29473	208.4	10631	35880	245.6	12530	42288	282.8	14428	48695	320.0	16327	55102	195
720	194.8	9936	35770	237.1	12096	43546	279.4	14256	51322	321.8	16416	59098	364.1	18576	66874	208
765	219.9	11217	42904	267.7	13655	52231	315.5	16094	61558	363.2	18532	70885	411.0	20971	80212	221
810	246.5	12575	50930	300.1	15309	62001	353.7	18043	73073	407.2	20777	84145	460.8	23510	95217	234
855	274.6	14011	59898	334.3	17057	72920	394.0	20103	85941	453.7	23149	98963	513.4	26195	111984	247
900	304.3	15525	69863	370.5	18900	85050	436.6	22275	100238	502.8	25650	115425	568.9	29025	130613	260
945	335.5	17116	80875	408.4	20837	98456	481.4	24558	116037	554.3	28279	133619	627.2	32000	151200	273
990	368.2	18785	92987	448.3	22869	113202	528.3	26953	133416	608.3	31037	153631	688.4	35120	173845	286
1035	402.4	20532	106252	489.9	24995	129350	577.4	29459	152449	664.9	33922	175547	752.4	38386	198645	299
1080	438.2	22356	120722	533.5	27216	146966	628.7	32076	173210	738.0	36936	199454	819.2	41796	225698	312
1125	475.5	24258	136450	578.8	29531	166113	682.2	34805	195776	785.6	40078	225439	888.9	45352	255103	325
1170	514.3	26237	153488	626.1	31941	186855	737.9	37645	220222	849.7	43349	253589	961.5	49052	286956	338
1215	554.6	28294	171888	675.2	34445	209255	795.7	40596	246622	916.3	46747	283989	1036.8	52898	321356	351
1260	596.4	30429	191703	726.1	37044	233377	855.7	43659	275052	985.4	50274	316726	1115.1	56889	358401	364
1305	639.8	32641	212985	778.9	39737	259286	918.0	46833	305587	1057.0	53929	351888	1196.1	61025	398189	377
1350	648.7	34931	235786	833.5	42525	287044	982.4	50119	338302	1131.2	57713	389559	1280.0	65306	440817	390
1395				890.0	45407	316716	1084.9	53516	373272	1207.9	61624	429828	1366.8	69733	486385	403
1440				948.4	48384	348365	1117.7	57024	410573	1287.1	65664	472781	1456.4	74304	534989	416
1485				1008.6	51455	382055	1188.7	60644	450279	1368.8	69832	518504	1548.9	79021	586728	429
1530				1070.6	54621	417851	1261.8	64375	492467	1453.0	74129	567083	1644.1	83882	641699	442
1575				1134.5	57881	455815	1337.1	68217	537210	1539.7	78553	618606	1742.3	88889	700001	455
1620				1200.3	61236	496012	1414.6	72171	584585	1628.9	83106	673159	1843.3	94041	761732	468
	i <sub>y</sub> = 33.5 mm			i <sub>y</sub> = 40.4 mm			i <sub>y</sub> = 47.6 mm			i <sub>y</sub> = 54.8 mm			i <sub>y</sub> = 61.8 mm			

## GLULAM DIMENSIONS IN STOCK

Type	1042180	1042225	1056225	1056270	1066315	1090225	1090270	1090315	1090405	1115315	1115405	1115495	1115630	1090090	1115115
Breadth mm	42	42	56	56	66	90	90	90	90	115	115	115	115	90	115
Height mm	180	225	225	270	315	225	270	315	405	315	405	495	630	90	115
Volume m <sup>3</sup> /metre	0.008	0.009	0.013	0.015	0.021	0.020	0.024	0.028	0.036	0.036	0.047	0.057	0.072	0.008	0.013
Painted area, m <sup>2</sup> /per metre length	0.444	0.53	0.56	0.65	0.76	0.63	0.72	0.81	0.99	0.86	1.04	1.22	1.49	0.36	0.46
Self weight, kg/m	3.59	4.49	5.99	7.18	9.88	9.62	11.54	13.47	17.31	17.21	22.12	27.04	34.41	3.85	6.28



Stock beams are made of spruce. Surface class: planed. Strength class: L40.  
 NOTE! Type 13 and 14 LK30, Gluing class U. Untreated surface. Each beam is single wrapped in plastic. Stock dimensions and lengths vary. For exact information, please contact your stockist.

## Tolerances

### WIDTH

Deviations from nominal dimensions, measured at humidity = 12% must not exceed the following values:  
+5,-2 mm for surfaces cut to length, <sup>1)</sup>  
±2 mm for rough planed surfaces  
+0,-4 mm for clean planed surfaces <sup>1)</sup>

### HEIGHT

Deviations from nominal dimensions, measured at humidity = 12% must not exceed the following values:  
± 2 mm if height < 450 mm  
± 3 mm if height 450 - 675 mm  
± 5 mm if height 676 - 1125 mm  
± 8 mm if height 1126 - 1800 mm  
± 12 mm if height > 1800 mm

### LENGTH

Final dimensions must not exceed specified dimensions, and must not be less than the stated dimensions by the following values:  
10 mm if length < 6000 mm  
16 mm if length 6000 - 18000 mm  
24 mm if length > 18000 mm

### ANGLES

Cross-section angles and cut faces may deviate a maximum of 1° from a right angle or other, specially noted angle.

### STRAIGHTNESS

No point between two arbitrarily chosen points A and B along the edge of the glulam unit may deviate from a straight line or intended arch between A and B by more than 0.0015 times the distance between A - B, measured along the edge of the glulam unit.

### Gluing class

Normally, glulam units are made in class U (Dark joints).

### Strength class

Glulam units are normally made to class L40.

### Surface class

Three surface classes occur for the side surfaces ("height surfaces") in Swedish Standard SS 232 721.

### REGULARIZED SURFACES

The sides can be unworked and patches of adhesive may occur. On widths narrower than 90 mm, one of the top surfaces can be sawed. Laminations with waners are permitted.

*Trimmed surfaces are intended to be non-visible and are not intended for visible use except where very low demands are made on appearance, e.g. in some warehouses.*

### PLANED SURFACES

The sides are planed, occasional laminations may be unworked. Small patches of adhesive may occur.

*Planed surfaces are intended for use in buildings where function and strength are the most important, but where you still want to use glulam units as an environmental factor, e.g. in factories, agricultural buildings etc.*

### CLEAN PLANED SURFACES

The sides are clean planed. Small patches of adhesive may occur.

*Clean planed surfaces are recommended for visible use where the very strictest demands on appearance are not made, e.g. roof beams in gymnasias, commercial premises etc.*

### CLEAN PLANED AND MENDED SURFACES

The sides are clean planed. The surfaces are free from major defects, knot holes, pick-ups and glue spots on all surfaces where the construction will be visible after assembly. Visible edges chamfered.

*Clean planed and mended surfaces are intended for visible use where strict demands are placed on appearance, e.g. private houses, schools etc.*

### RE-CUT BEAM

Glulam units of smaller dimensions than 90 mm are re-cut from larger dimensions. The saw cut can then pass through open or glue-filled core cracks, which means that splinters and spots of glue can be seen on the re-cut edge. This applies to all surface classes. If there are stringent requirements for appearance, we recommend that columns narrower than 90 mm should be avoided.

### Dimensioning values

For glulam units dimensioned in accordance with the Swedish Laminated Wood Manual 1995 and made from L-marked glulam, use partial coefficient  $\gamma_m = 1.2$ . In tables 2 and 3 on the opposite page, the dimensioning values of strength and stiffness are given.

1) Tolerances for specially agreed dimensions ± 2 mm.

2) For resorcinol adhesive, dark brown, clearly visible.

