

### General

Load bearing components made from glued laminated timber (Glulam) are designed and carefully manufactured, top-quality construction components made from an improved material. Glulam may only be manufactured by companies who have a corresponding certification concerning the gluing suitability of load bearing timber construction components according to German standard DIN 1052. A list of companies who have provided this certification can be found on the website [www.brettschichtholz.de](http://www.brettschichtholz.de)

In the following a few generally accepted, material dependent rules shall be explained, adherence to which assures long-term stability of the structure and preservation of the appearance. In addition a few important terms and definitions for the quality determination of Glulam will be explained.

### Strength classes

Glulam is, according to DIN 1052: 2008-12, produced and divided into strength classes. The strength classes and correlation to the previous strength classes according to DIN 1052-1/A1: 1996-10 can be taken from table 1. The numerical value of the

Glulam classes stands for the characteristic value of the bending strength (for Glulam according to DIN 1052: 2008-12) in N/mm<sup>2</sup>. The „h“ and/or „c“ with the designation of DIN 1052: 2008-12 stands for homogeneous and/or combined symmetrical built up Glulam. A classification to a “combination” strength class GL XX c can be achieved by the manufacturer of the glued laminated timber by means of various cross sectional layups. Glulam of higher strength classes can be exceedingly economically manufactured with a combined layup since the higher strength boards accumulated in a grading process can then be directed to the areas of greater tensile loads and the boards of lower strength to the core or the compression loads. Greater quantities of higher strength glued laminated timber with an homogeneous lay up construction (strength classes GL 28h and GL 32h) can only be produced with considerable time expenditure and extra costs. Therefore an attempt should always be made to use combined glued laminated timber.

If, with an order, no indication of a desired lay up is implied then, depending on the selected strength class, the following standard qualities will be supplied: GL 24h, GL 28c, GL 32c. Without an indication of a strength class GL24h will be supplied.

With the ordering of GL 32c or h, in addition, one has to bear in mind that not all sorting machines required for the manufacturing allow for the sorting of another type of wood other than spruce/fir.

**Table 1: Strength classes**

DIN 1052: 2008-12	Previous, no longer applicable, designations according to: DIN 1052-1/A1: 1996-10
GL 24h oder GL 24c	BS 11
GL 28h oder GL 28c	BS 14
GL 32h oder GL 32c	BS 16

### Cross sectional layup of members of various heights

Large volume, order related Glulam construction members manufacturing of a higher strength class than GL 24 have, as a rule, a combined layup. At the point of maximum bending stress *M/W*, the layup required for the respective strength class must be given. The reduction of the proportionate height of a boundary area with higher strength lamellae in the direction of the support is regarded as structurally unquestionable.

**Table 2: Surface qualities of Glulam**

Criteria <sup>1</sup>	Industrial quality	Visible quality	Selection quality
1 Firmly grown knots <sup>2, 3</sup>	Permitted	Permitted	Permitted
2 Fallen and loose knots <sup>2, 3</sup>	Permitted	Up to < 20 mm <sup>4</sup> permitted from > 20 mm <sup>4</sup> to be replaced in the works	To be replaced in the works
3 Resin gall <sup>3, 5</sup>	Permitted	Resin galls are permitted up to 5 mm	Resin galls are permitted up to 3 mm
4 Knots and faulty points improved by means of knot hole plugs or „ships“ <sup>3</sup>	Not necessary	Permitted	Permitted
5 Knots and resin galls improved by means of filler compound <sup>3</sup>	Not necessary	Permitted <sup>6</sup>	Permitted <sup>6</sup>
6 Insect attack <sup>3</sup>	Permitted are burrows up to 2 mm	Permitted are holes up to 2 mm	Not permitted
7 Pith	Permitted	Permitted	Pith visibly on the outer lamellas is not permitted
8 Cracks caused by shrinking <sup>3, 5, 7</sup>	No limit	Up to 4 mm	Up to 3 mm
9 Discolorations as a result of blue stain, red and brown stripes <sup>5</sup>	No limit	Up to 10 % of the visible surface of the whole construction component	Not permitted
10 Mould <sup>5</sup>	Not permitted	Not permitted	Not permitted
11 Contamination of the surface <sup>5</sup>	Permitted	Not permitted	Not permitted
12 Distance between fingerjoints	No limit	No limit	On visible remaining outer lamellas, the distance between one another has to be at least 1 m
13 Surface	Levelled out	Planed and chamfered chatter permitted up to a depth of 1 mm	Planed and chamfered chatter permitted up to a depth of 0.5 mm

<sup>1</sup> Deviations from the limit values defined in the following in lines 2, 3, 6-9, 12, 13 are to be tolerated to the following extent: maximum of three deviations/m<sup>2</sup> visible surface for the quality of vision, maximum of one deviation/m<sup>2</sup> visible surface for selection quality.

<sup>2</sup> Permissible knot size according to DIN 4074

<sup>3</sup> Without limitation of the number

<sup>4</sup> Measurement of the diameter of the knots analogue to the measurement of the diameter of individual knots for scantlings according to DIN 4074-1: 2008-12, 5.1.2.1.

<sup>5</sup> Delivery condition

<sup>6</sup> Filler compound which can be painted over is to be demanded explicitly.

<sup>7</sup> As in all constructional solid wood products cracks can be present. The depth of the crack, measured with a 0.1 mm thick feeler gauge and independent of the quality of the surface for construction components, may be, for members not being subject to tensile-stresses perpendicular to the grain up to 1/6 of the width of the construction component, for members being subject to tensile-stresses perpendicular to the grain, up to 1/8 of the width of the component from each side. With deeper cracks the non-critical state should be checked by an expert.

A more comprehensive and illustrated description of the surface qualities can be found in the article RADOVIC/WIEGAND „Oberflächenqualität von Brettschichtholz“ [Surface quality of glued laminated timber, German language only], which is located in the download area of the website [www.brettschichtholz.de](http://www.brettschichtholz.de)

### Labelling

Components made from Glulam comply with the building authorities requirements. They are labelled by the manufacturer with the German compliance mark (Ü mark).

At the time of this bulletin's printing, Glulam labelled only with the CE mark according to DIN EN 14080:2005 is not applicable in Germany.

### Surface qualities

Glulam components can be manufactured with various surface qualities and thus fulfil variable creative requirements. The desired surface characteristics are, in each case, contractually agreed upon and are, for example, itemised in the technical specifications. If nothing else is stipulated visible quality is applied.

### Reinforcements for tension perpendicular to the grain

DIN 1052: 2008 allows for the dimensioning of members subjected to tension perpendicular to grain without or with lateral reinforcement. For pitched cambered beams basically a construction with lateral reinforcement according to DIN 1052: 2008 is recommended.

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Elfriede-Stremmel-Straße 69  
D-42369 Wuppertal, Germany

+49 (0)2 02 · 978 35 81 Telefon  
+49 (0)2 02 · 978 35 79 Fax  
www.brettschichtholz.de  
info@brettschichtholz.de

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### Transport and Assembly

Transport and assembly of Glulam components should categorically only be carried out by experienced and therefore fully equipped certified specialists. Thereby, among other things, the following is to be observed:

- Sufficient bracing, also whilst under construction.
- Soiling prevention.
- During the lifting process, as a rule, the entire section should be encompassed with heavy duty binding or some other suitable device.

### Subsequent block outs, notches, openings, drilled holes and cuttings

In every case they call for a new static analysis.

### Structural-physical analysis

Predominantly the outer layers of the Glulam, under construction, absorb moisture. This moisture must be gradually dispersed, until a uniform cross-sectional moisture is achieved. Careful heating and ventilation and the resulting accompanying slow reduction of the relative humidity of air and the corresponding wood moisture serves this purpose.

On the surfaces of the Glulam components and also along the glued joints **Shrinkage cracks** can appear. As in all constructional timber products cracks can be present. The depth of the crack, measured with a 0.1 mm thick feeler gauge and independent of the quality of the surface for construction components, may be, for members not being subject to tensile-stresses perpendicular to the grain up to 1/6 of the width of the construction component, for members being subject to tensile-stresses perpendicular to the grain, up to 1/8 of the width of the component from each side. With deeper cracks the non-critical state should be checked by an expert.

With **direct exposure** and strong changing climatic conditions the inclination towards crack formation increases. Even during the planning, protective measures are also provided for the construction in progress. These are, in particular, coverings and backwater free drains.

### Surface protection

To avoid non-beneficial moisture absorption during transportation and assembly as well as for improving the cleanability, the surfaces, with larger construction components and also the cross-grained wood, should be provided with a suitable temporary weather protection coating.

Priority is to be given to the structural wood protection over the preservative treatment. For this it is necessary, for example, to quickly close the roof and exterior wall surfaces immediately after assembly and also regularly remove building site conditional, structural work moisture from the structure by means of ventilation. In the utilization classes 1 and 2, according to experience, no infestation of wood destroying insects is to be expected in the usage class 1 according to DIN 68800. In so far as lamellas with a higher natural resistance are to be used, larch and Douglas heart wood are, as a rule, available for this purpose. If, in special cases, a preservative treatment is required, products approved by the German building authorities with the required proof rating for the corresponding hazard classification are to be used.