

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-14/0178
of 21 August 2014

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

FHS string stair

Product family
to which the construction product belongs

Prefabricated stair with steps and strings made of solid
wood or wood based products for use as an indoor stair in
buildings

Manufacturer

FHS Treppen GmbH
Kampenwandstraße 8
83224 Grassau
DEUTSCHLAND

Manufacturing plant

Frisch Holz-Systembau

This European Technical Assessment
contains

14 pages including 9 annexes which form an integral part
of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

Guideline for European technical approval of
"Prefabricated stair kits", ETAG 008 Part 1: "Prefabricated
stair kits in general (excluding severe climatic conditions)",
used as European Assessment Document (EAD)
according to Article 66 Paragraph 3 of Regulation (EU)
No 305/2011.

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Specific Part

1 Technical description of the product

The FHS string stair is a prefabricated stair system, which consists of steps, strings and system fasteners. The steps are connected with the strings by system fasteners on both sides. The steps and strings are made of solid wood, the system fasteners are made of steel.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the stair is used in compliance with the specifications and conditions given in Annex B.

The verification and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the stair of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Load-bearing capacity	See Annex C2
Load/displacement behaviour	See Annex C2
Vibration behaviour	First natural frequency: $f_1 \geq 5$ Hz (inclusive a single mass of 100 kg) Deflection under a single load $F = 1$ kN: $w \leq 5$ mm
Prevention of progressive collapse	Failure of individual components of the stair does not lead to a progressive collapse of the complete stair
Residual load-bearing capacity	Local material failure does not lead to an abrupt total loss of load-bearing capacity of the stair.
Long-term behaviour	Load-bearing capacity is ensured under an appropriate use and maintenance over the indicated working life
Resistance to earthquakes	No performance determined (NPD)
Resistance of fixings	See technical documentation of this European Technical Assessment

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	See Annex A5
Fire resistance	No performance determined (NPD)

3.3 Hygiene, health and the environment (BWR 3)

The wood based products used fulfil the Class E1 according to EN 13986.

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

Essential characteristic	Performance
Geometry	See Annex C1
Slipperiness	No performance determined (NPD)
Equipment of the stair for a safe use	No performance determined (NPD)
Safe breakage of stair components	No brittle failure of individual stair components
Impact resistance	No performance determined (NPD)

3.5 Protection against noise (BWR 5)

Not applicable.

3.6 Energy economy and heat retention (BWR 6)

Not applicable.

3.7 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources was not investigated.

3.8 General aspects

Essential characteristic	Performance
Resistance to deterioration caused by physical, chemical and biological agents	Adequate resistance for the intended use under an appropriate use and maintenance
Finishes and surface layers	Stair components made of solid wood can be coated with varnish on all sides or they are oiled

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

According to Decision 99/89/EG of the Commission of 3 February 1999 (Official Journal of the European Communities L 029 of 25.01.1999 p. 34-37)) the system of assessment and verification of constancy of performance (see Annex V and Article 65 Paragraph 2 to Regulation (EU) No 305/2011) given in the following table applies.

Product	Intended use	Level or class	System
Prefabricated stair kits	For dwellings and other buildings	-	2+

Additional according to Decision 2001/596/EG of the Commission of 8 January 2001 (Official Journal of the European Communities L 209 of 02.08.2001 p. 33-42) the system of assessment and verification of constancy of performance (see Annex V and Article 65 Paragraph 2 to Regulation (EU) No 305/2011) given in the following table applies.

Product	Intended use	Level or class	System
Prefabricated stair kits	For uses subject to regulations on reaction to fire	According to Annex A5, Table 1	4

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

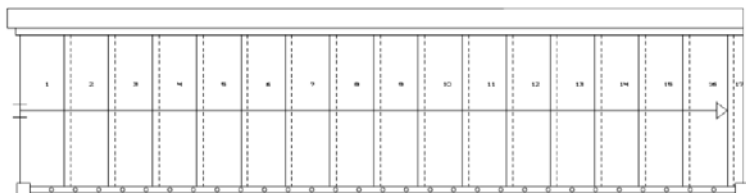
Issued in Berlin on 21 August 2014 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

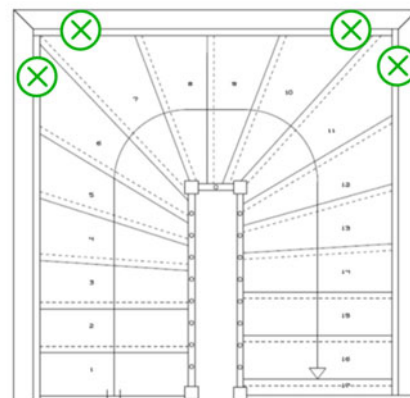
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Types of Plan

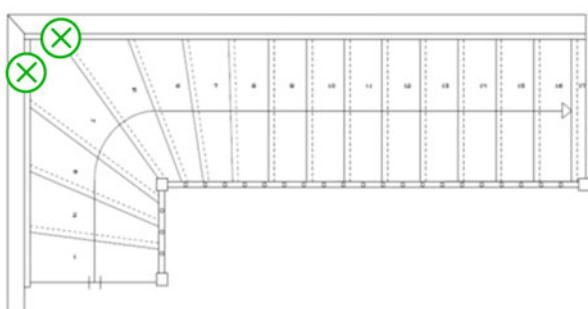
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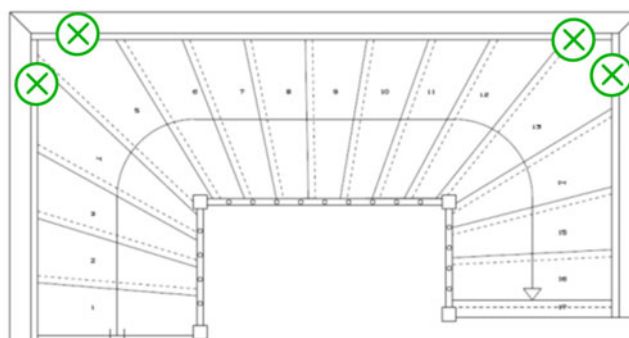
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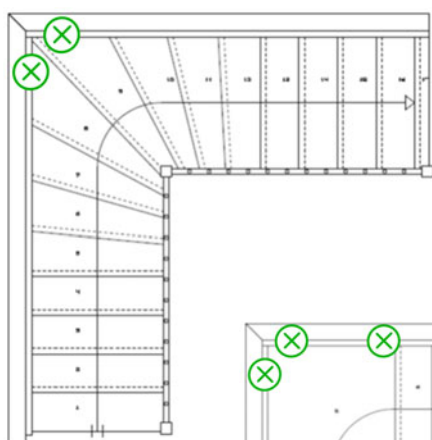
Type V1



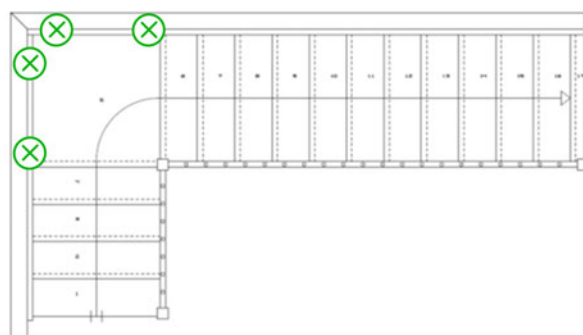
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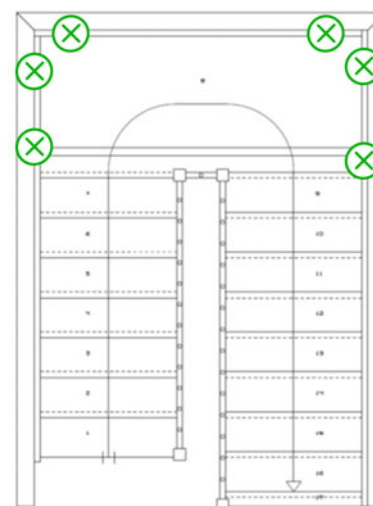
Type V2



Type GPoV



Type GPoH



⊗ Additional support for vertical loads

Horizontal fixings to the wall according to technical documentation

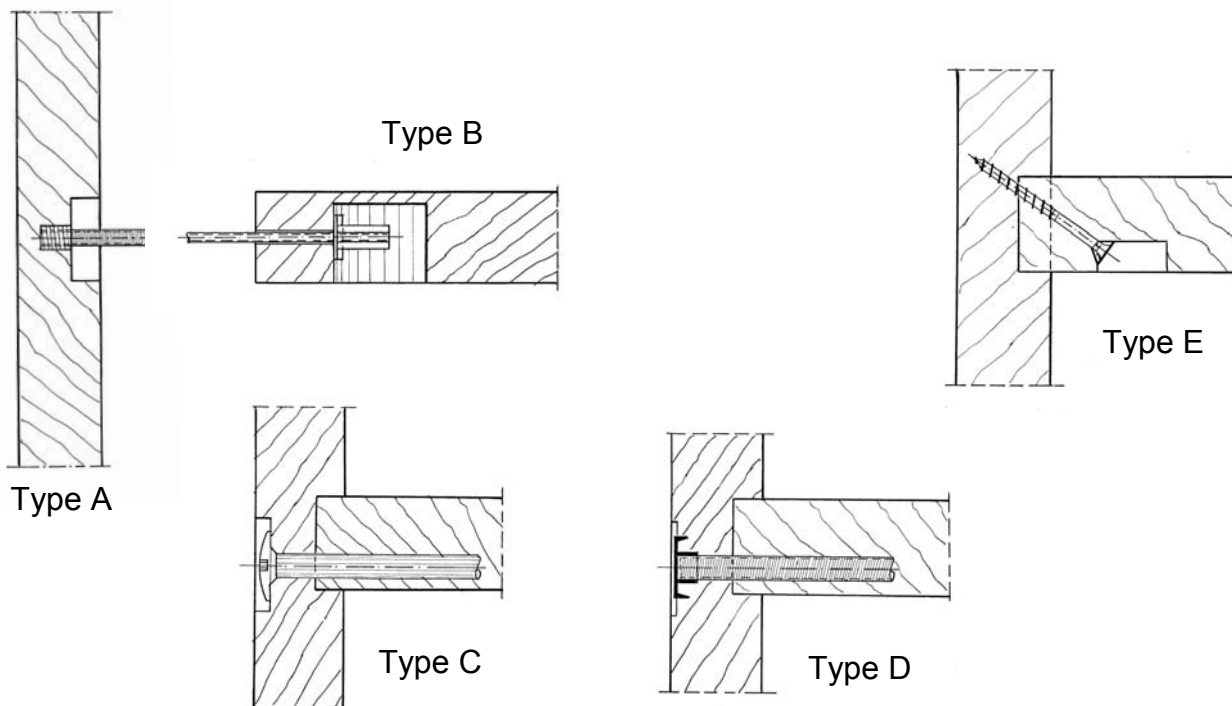
FHS string stair

Product and intended use

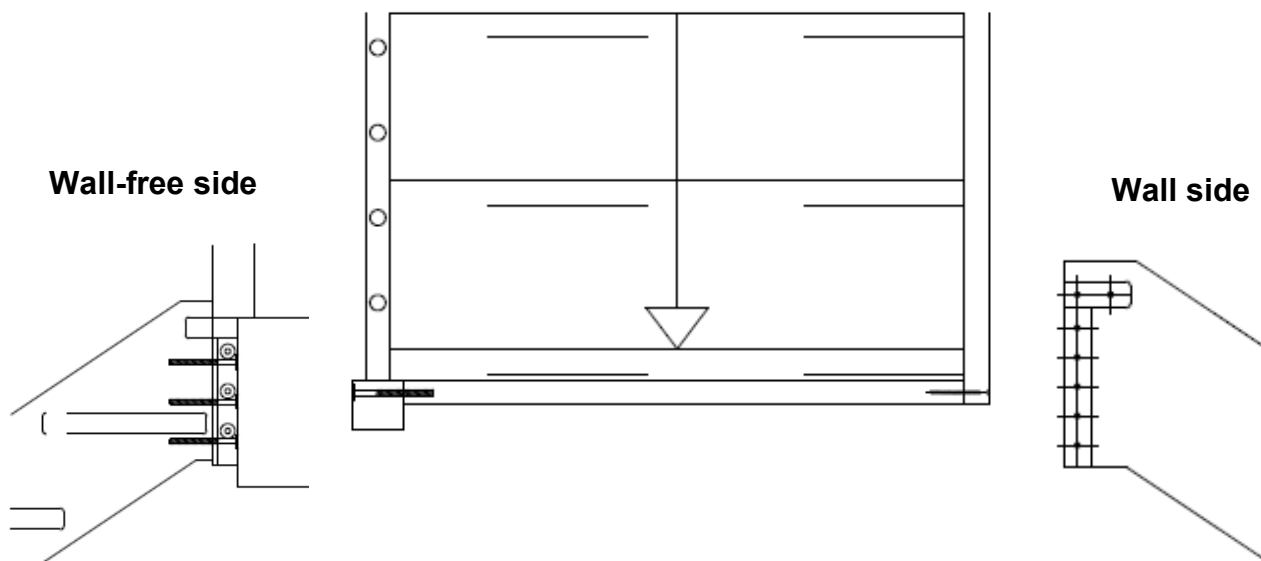
Annex A1

Step-string-joint

(Relationship of joints to the wood species and types of plan according to the technical documentation)



Joint at top



FHS string stair

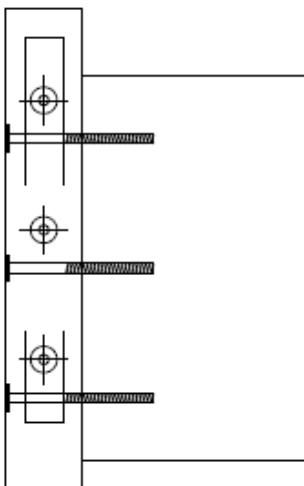
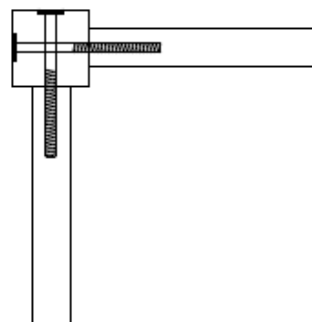
Step-string-joint,
Joint at top

Annex A2

String-corner-joint

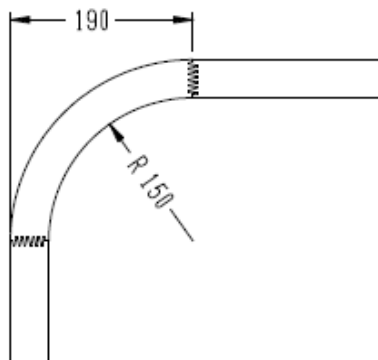
Wall-free side

Type post

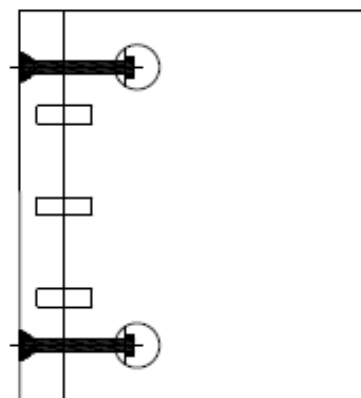
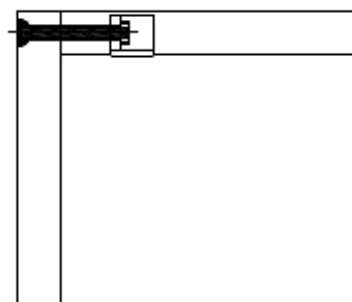


Wall-free side

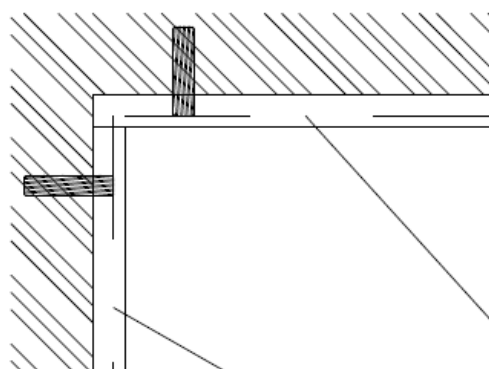
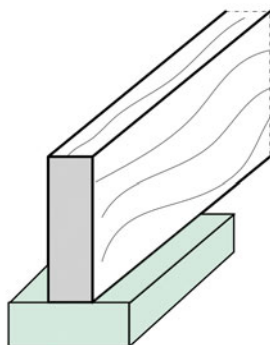
Type finger jointed



Wall side



Intermediate support



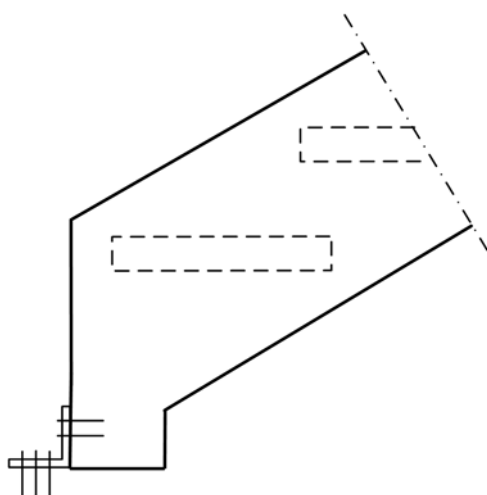
More details according to technical documentation

FHS string stair

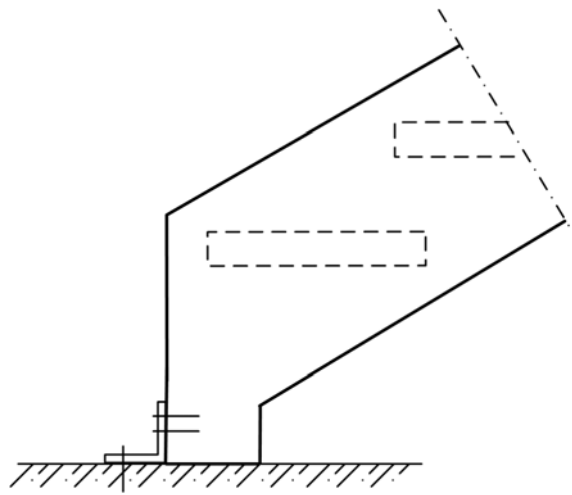
String-corner-joint, Intermediate support

Annex A3

**Joint at bottom
(Wall side, wall-free side)**



3 Spax at wooden beam ceiling

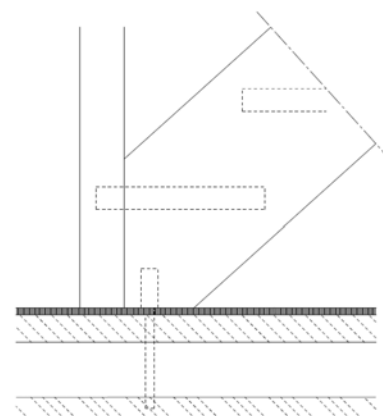
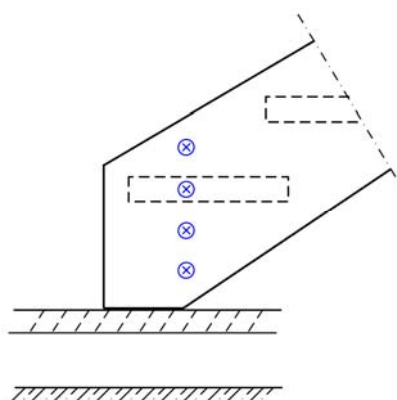
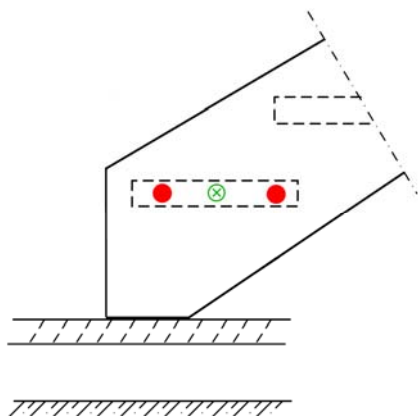


1 FAZ II at concrete ceiling

Joint at bottom

Wall side

Wall-free side



More details according to technical documentation

FHS string stair

Joint at bottom

Annex A4

Table 1: Minimum dimensions of components of stair and reaction to fire

Component of stair	Material ¹⁾		Dimension		Value	Reaction to fire ³⁾
Step	Solid wood/wood based product ²⁾		Thickness	[mm]	40	D-s2, d0 (2003/593/EC)
String	Solid wood/ wood based product ²⁾	Group 1 Type V2	Width x Height	[mm]	40 x 300	D-s2, d0 (2003/593/EC)
		Group 2				
		Group 1 all other Types			40 x 280	
Angle	Steel				- ⁴⁾	A1 (96/603/EC)
System fastener	Steel				- ⁴⁾	A1 (96/603/EC)

¹⁾ Characteristic values of material according to technical documentation

²⁾ Only wood of following species:

Group 1: birch, beech, oak, acacia, maple, ash, pine, merbau, doussie, larch, nut tree, elm, cheery tree

Group 2: spruce, wood based product multiplex

³⁾ According to the decisions of European Commission

⁴⁾ According to technical documentation

FHS string stair

Minimum dimensions of stair components and reaction to fire

Annex A5

Specification of intended use (Part 1)

Intended use:

- European Technical Assessment applies for a construction system.
- For the specific case of use the corresponding type of stair is manufactured within the context of the values defined in this European Technical Assessment.
- Values of this ETA apply to all types of stairs, the real dimensions follow in accordance with the relevant case of use.

Stair subject to:

- Static and quasi static loads

Use conditions:

- Indoor stair
- Air temperatures between +5 °C and +30 °C
- Relative air humidity between 30% and 70%
- To the individual requirements handrail and barrier can be attached to the stair optionally. Conditions for possible handrail/barrier:

Dead load ≤ 0.15 kN/m

Height ≤ 1.00 m

Distance of baluster ≤ 0.27 m

Design:

- Design of the stair according to the annexes and the technical documentation of this European Technical Assessment.
- Fastening of the stair to the construction works according to the annexes and the technical documentation of this Technical European Assessment.
- Verification of the transmission of loads to the construction works by the civil engineer responsible for the construction works.
- Load bearing capacity at ultimate limit state:

$$q_k \cdot \gamma_Q \leq q_{RK} / \gamma_M$$

$$Q_k \cdot \gamma_Q \leq Q_{RK} / \gamma_M$$

$$h_k \cdot \gamma_Q \cdot \psi_0 \leq h_{RK} / \gamma_M$$

with

q_{RK}, Q_{RK}, h_{RK} : characteristic values of resistance; see Table 3

γ_M : recommended material partial safety factor; see Table 3

q_k, Q_k, h_k : characteristic values of imposed loads according to EN 1991-1-1:2010-12

$\gamma_Q = 1,5$: recommended partial safety factor, in absence of other national regulations

$\psi_0 = 0,7$: recommended combination factor, in absence of other national regulations

- Maximum characteristic values of imposed loads under consideration of the partial factors mentioned above; see Table 5

FHS string stair

Specification of intended use (Part 1)

Annex B1

Specification of intended use (Part 2)

Installation:

- Installation by personal appropriately trained and authorized by the holder of the approval by means of the technical documentation of this European Technical Assessment
- Installation only in the way as specified in the technical documentation of this European Technical Assessment
- Installation of timber components when moisture content of timber components is $8 \pm 2 \%$
- Sufficient support of the stair when assembling
- Installation of stair components without imposed deformations
- Installation of stair components without significant defects and cracks
- Replacing of stair components, which begin tearing when assembling
- Bolted connection are protected such that they will not be loosened by vibrations

Indication of the manufacturer:

- Ensure that all persons involved will be appropriately informed about the specific conditions according to sections 1 and 2 (including the annexes to which reference is being made as well as the not confidential parts of the technical documentation deposited to this European Technical Assessment)
- Packaging of timber components such that the wood moisture is $8 \pm 2 \%$ during transport and storage
- Instructions for use should provide information as to use, maintenance and repair of the stair. Including the information of avoidance of moisture penetration of the timber components

FHS string stair

Specifications of intended use (Part 2)

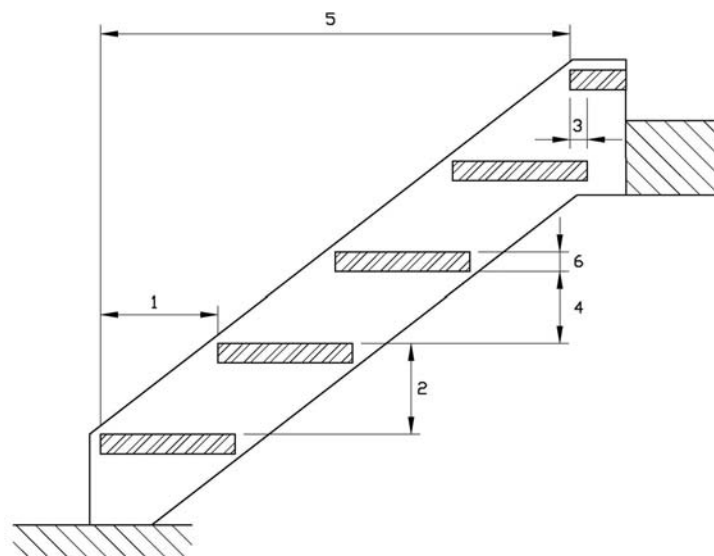
Annex B2

Table 2: Geometry

Designation			Dimension	
			Minimum	Maximum
Going	Step on walking line ¹⁾	[mm]	210	370 ²⁾
	Tapered step	[mm]	100 ^{2) 3)}	570 ^{2) 4)}
Rise of the stairs ¹⁾		[mm]	140 ²⁾	210
Pitch of the walking line ¹⁾		[°]	21	45
Overlap of the steps	Wall side	[mm]	0	- ⁵⁾
	Wall-free side	[mm]	0	- ⁵⁾
Number of rises	Group 1	[-]	3	17 ⁶⁾
	Group 2	[-]	3	16
Openings	Between stair and wall	[mm]	- ⁵⁾	0
	Between consecutive steps	[mm]	- ⁵⁾	170
Clear width of stairs		[mm]	500	960
Minimum headroom		[mm]	- ⁵⁾	
Length of the flight	Group 1	[mm]	- ⁵⁾	4320 ^{6) 7)}
	Group 2	[mm]	- ⁵⁾	4050
Thickness of steps		[mm]	40	- ⁵⁾

- 1) Values are constant within one flight
- 2) Tolerance between nominal value and actual value = ± 5 mm
- 3) Wall-free side of tapered step
- 4) Wall side of tapered step
- 5) Not relevant
- 6) Type V2 in wood species elm, cherry tree, pine and larch max. 16 rises (L = 4050 mm)
- 7) Landing stair max. 4995 mm

- 1 **Going**
- 2 **Rise**
- 3 **Overlap**
- 4 **Opening between consecutive steps**
- 5 **Length of the flight**
- 6 **Thickness of steps**



FHS string stair

Geometry

Annex C1

Table 3: Load-bearing capacity - Characteristic values of resistance

Component	Type of loading	Characteristic values of resistance			γ_M
Flight	vertical variable uniformly distributed load	$q_{R,k}$	[kN/m ²]	6.75	1.5 ¹⁾
	vertical variable single load	$Q_{R,k}$	[kN]	4.5	
	horizontal variable uniformly distributed load on barrier	$h_{R,k}$	[kN/m]	0.8	
Joint at bottom	vertical variable uniformly distributed load	$q_{R,k}$	[kN/m ²]	5.0	1.1 ²⁾
	vertical variable single load	$Q_{R,k}$	[kN]	3.3	
	horizontal variable uniformly distributed load on barrier	$h_{R,k}$	[kN/m]	0.6	

1) Recommended partial safety factor (wood decisive), in absence of other national regulations

2) Recommended partial safety factor (steel decisive), in absence of other national regulations

Table 4: Deflections under loading

Deflections of the flight under uniformly distributed load				
Uniformly distributed load		q_k	[kN/m ²]	3.0
Length of the median line of the flight	Group 1	L	[mm]	4320
	Group 2	L	[mm]	4050
	Landing stair	L	[mm]	4995
Deflection related to the median line of flight		w	[-]	≤ L/200
Deflection of the step under single point load				
Single load		Q_k	[kN]	2.0
Clear width of the stair		L	[mm]	960
Deflection related to the clear width of stair		w	[-]	≤ L/200

Table 5: Imposed loads

Type of loading	Imposed loads		
Vertical variable uniformly distributed load	q_k	[kN/m ²]	3.0
Vertical variable single load	Q_k	[kN]	2.0
Horizontal variable uniformly distributed load on barrier	h_k	[kN/m]	0.5

FHS string stair

Load-bearing-capacity – Characteristic values of resistance
Deflections under loading
Imposed loads

Annex C2