Deutsches Institut für Bautechnik

DIBt

Member of EOTA

www.eota.eu

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment

ETA-13/0321 of 14 December 2021

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	DHTI - String Stair
Product family to which the construction product belongs	Prefabricated stair with steps and strings made of solid wood for use as an indoor stair in buildings
Manufacturer	Deutsches HolztreppenInstitut e.V. Von der Heydt 66115 Saarbrücken DEUTSCHLAND
Manufacturing plant	Plant 1 to 150
This European Technical Assessment contains	14 pages including 3 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	EAD 340006-00-0506
This version replaces	ETA-13/0321 issued on 7 April 2016

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may only be made with the written consent of the issuing Technical Assessment Body. Any partial reproduction shall be identified as such.

This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission in accordance with Article 25(3) of Regulation (EU) No 305/2011.

1 Technical description of the product

The DHTI - String Stair is a prefabricated stair system, which consists of steps, landings, strings and system fasteners. The steps and strings are connected with the strings by system fasteners on both sides.

The steps, the landings and the strings are made of solid wood, the system fasteners are made of steel.

The product description is given in Annex A. The material values, dimensions and tolerances of the components of the stair not indicated in the annexes shall correspond to the values laid down in the technical documentation[1].

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.

[1] The technical documentation comprises all information of the manufacturer necessary for the production, installation and maintenance of the stair; these are in particular the structural analysis, design drawings and the manufacturer's installation instructions. The part to be treated confidentially is deposited with Deutsches Institut für Bautechnik and, as far as this is relevant to the tasks of the approved bodies involved in the procedure of attestation of the AVCP-System, shall be handed over to the approved body.

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 - Load-bearing capacity of the stair	Q_{Rk}, q_{Rk} and h_{Rk}: See Annex C2 H_{Rk}: No performance assessed
- Load-bearing capacity of components of the stair	M_{Rk}, V_{Rk}, N_{Rk}, E, G, f_{mk} und f_{vk}: See technical documentation of this European Technical Assessment
- Load-bearing capacity of fixings	See technical documentation of this European Technical Assessment
Load-Displacement behaviour	w_q and w_Q: See Annex C2
Vibration behaviour	First natural frequency: $f_1 \geq 5$ Hz Deflection under a single load F = 1 kN: $w_{Q1} \leq 5$ 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 are ensured under an appropriate use and maintenance over the indicated working life
Resistance to earthquakes	No performance assessed
Durability against physical, chemical, biological agents	Adequate durability for the intended use under an appropriate use and maintenance

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	See Annex A5
Resistance to fire	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Release of formaldehyde	No performance assessed
Release of pentachlorophenol	No performance assessed
Radioactive emission	No performance assessed

3.4 Safety in use (BWR 4)

Essential characteristic	Performance
Geometry	See Annex C1
Slipperiness	No performance assessed
Safety equipment	No performance assessed
Safe breakage	No brittle failure of stair components
Impact resistance	No performance assessed

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

In accordance with the European Assessment Document EAD No. 340006-00-0506 the applicable European legal act is: 1999/89/EC

The System to be applied is: 2+

In addition, with regard to reaction to fire for products covered by the European Assessment Document EAD No. 340006-00-0506 the applicable European legal act is: 2001/596/EC

The System to be applied is: 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 14 December 2021 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

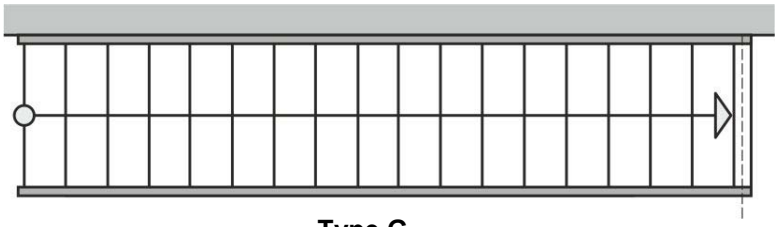
beglaubigt:
Pascal Stiller

Deutsches Institut für Bautechnik DIBt

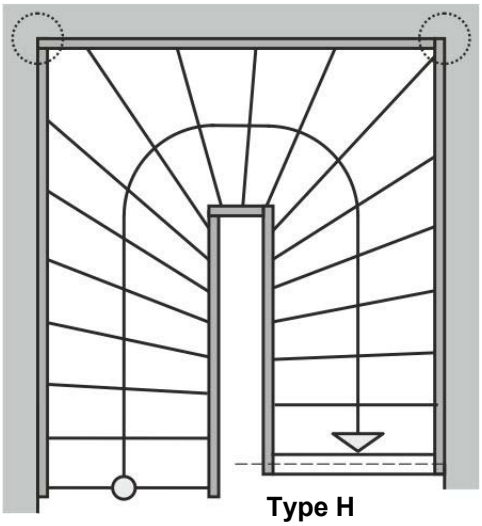
Types of plan without landing

Location of cross bracings and maximal number of risers according to the technical documentation

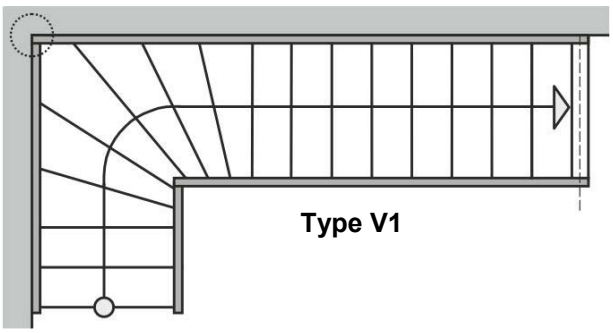
○ Support for vertical loads



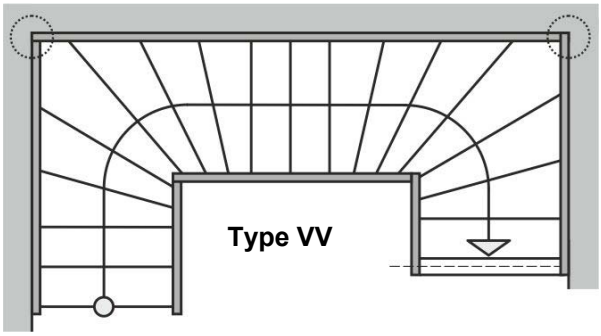
Type G



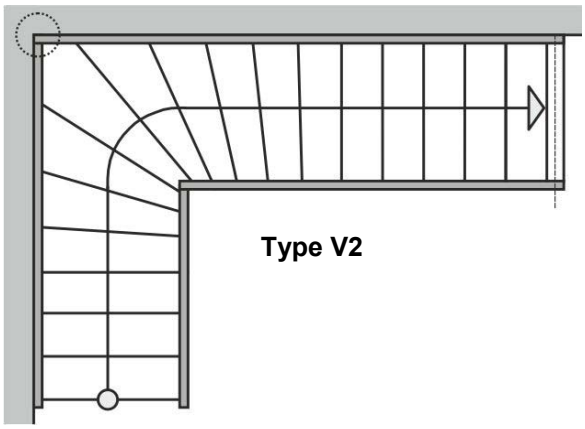
Type H



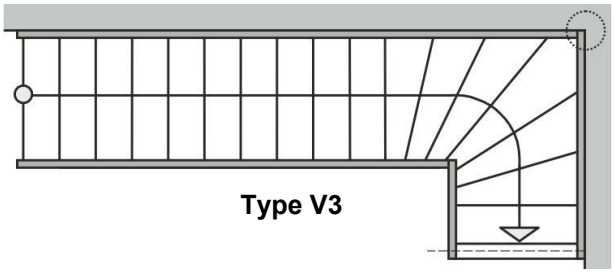
Type V1



Type VV



Type V2



Type V3

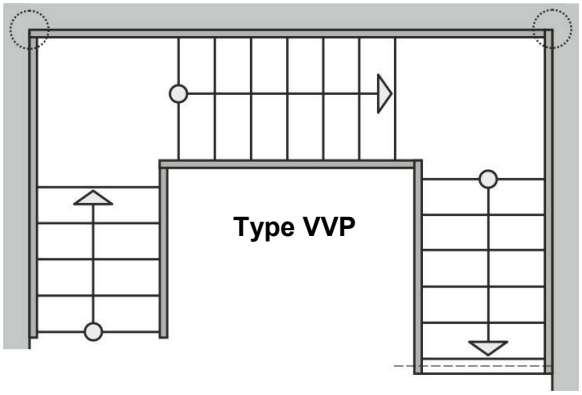
DHTI – String Stair	Annex A1
Product (Types of plan without landing)	

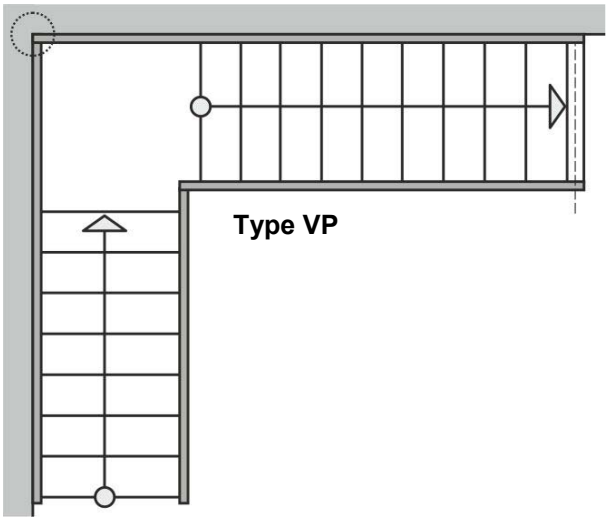
Deutsches Institut für Bautechnik DIBt

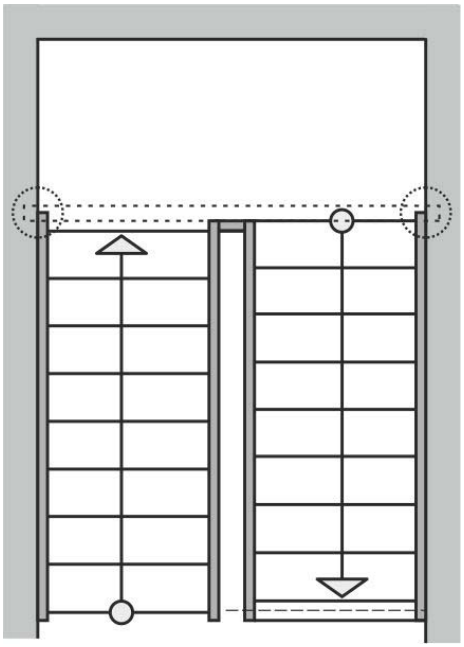
Types of plan with landing

Location of cross bracings and maximal number of risers to the technical documentation

○ Support for vertical loads

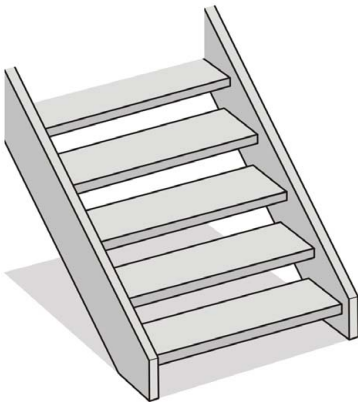


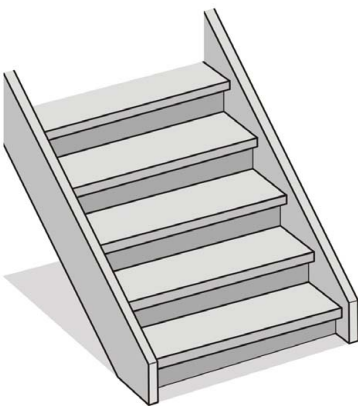


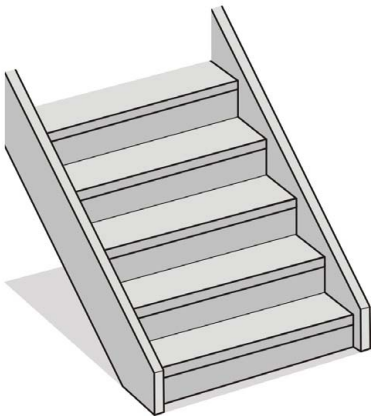


Type GP
Landing is not part of the ETA

Types of construction





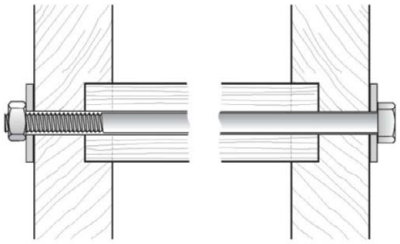


DHTI – String Stair	Annex A2
Product (Types of plan with landing and types of construction)	

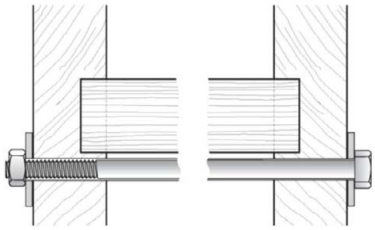
Deutsches Institut für Bautechnik DIBt

Step – string joint

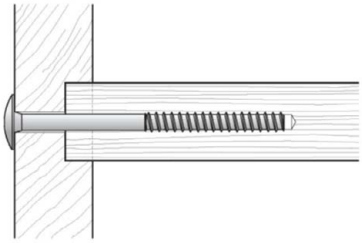
Type 1



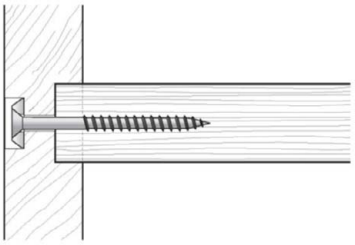
Type 2



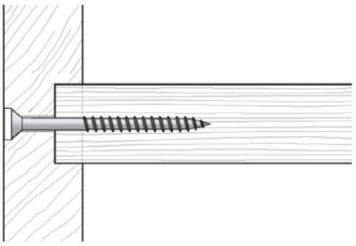
Type 3



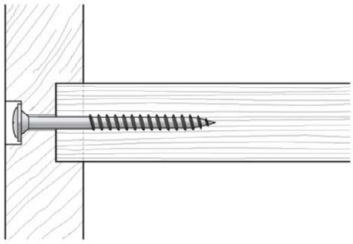
Type 4



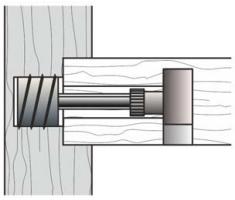
Type 5



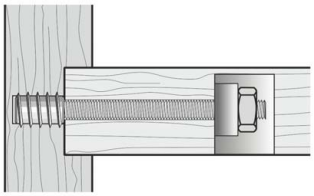
Type 6



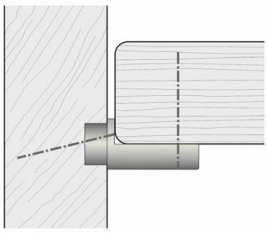
Type 7



Type 8

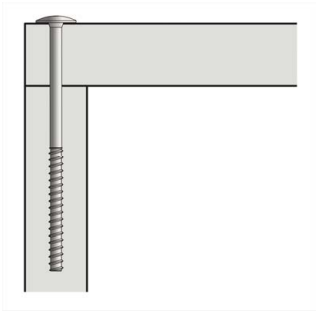


Type 9

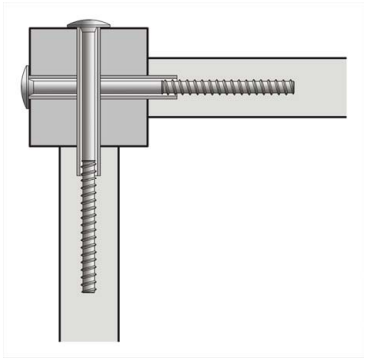


String - corner joint

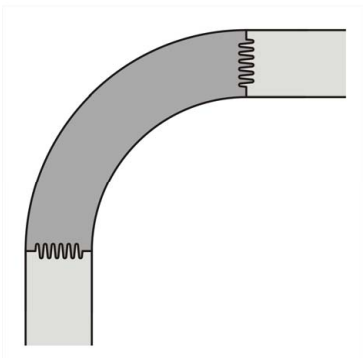
Screwed



Screwed with post



Finger jointed

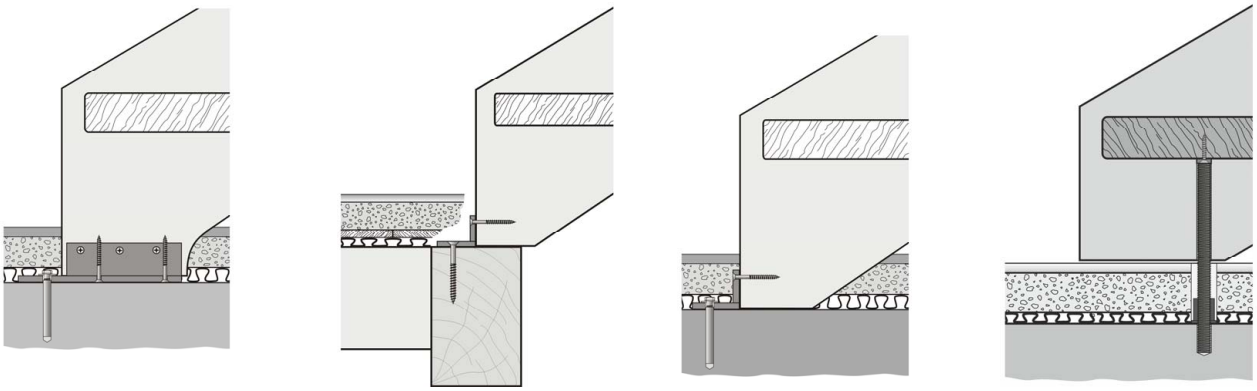


Allocation of joints depending on the wood species and the type of plan and more details according to the technical documentation

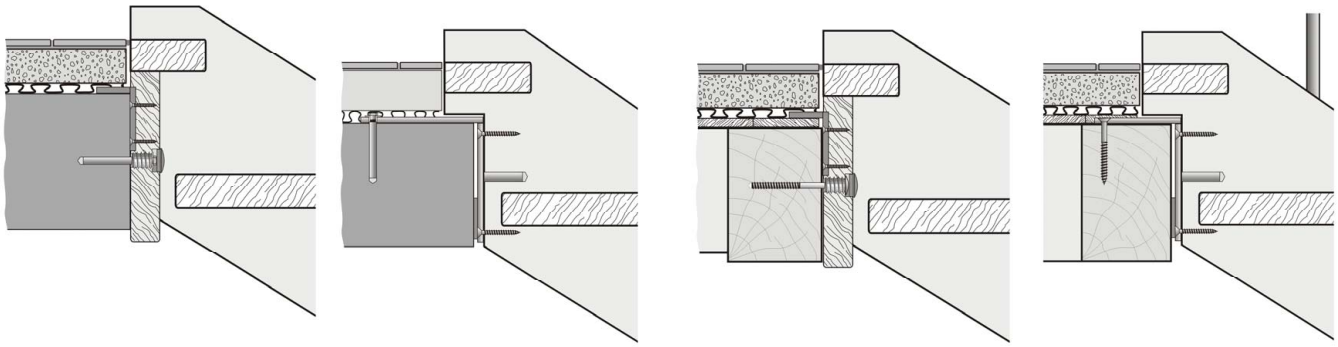
DHTI – String Stair	Annex A3
Types of construction, Step – String joint, String corner joints	

Deutsches Institut für Bautechnik DIBt

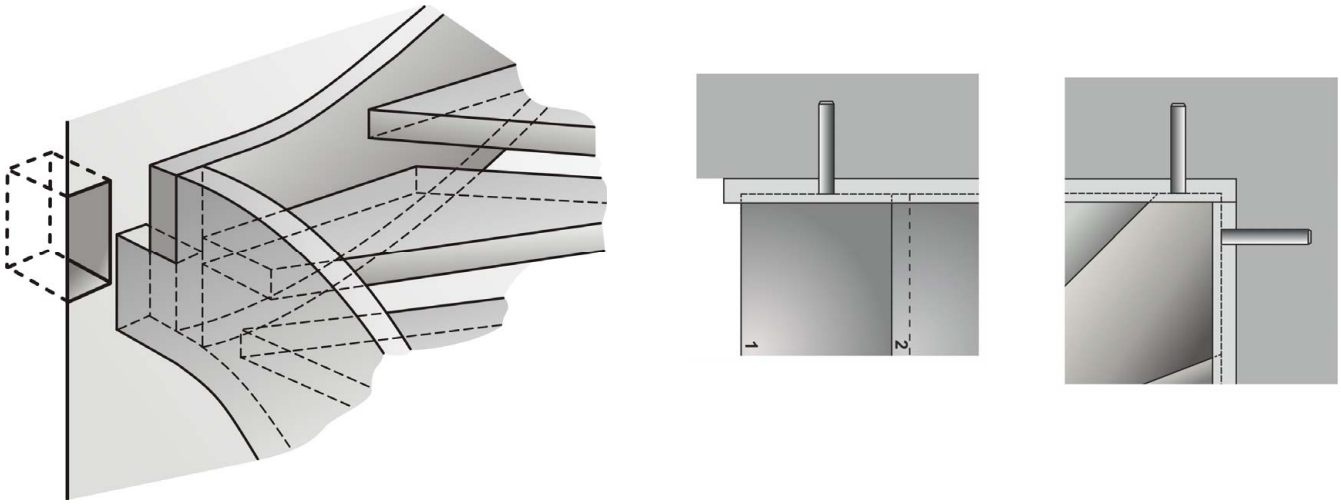
Joint at bottom



Joint at the top



Wall support



More details according to the technical documentation

DHTI – String Stair	Annex A4
Joint at bottom, Joint at the top, wall support	

Deutsches Institut für Bautechnik DIBt

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

Component of stair		Material [1]	Dimension		Value	Reaction to fire
Step, Landing	Max. 17 rises, clear width of stair 900 mm,	Solid wood [2]	Thickness	[mm]	40	D-s2, d0
	Max. 17 or 18 rises, clear width of stair 1000 mm [6]	Solid wood [2] [3]	Thickness	[mm]	44	
String	Max. 17 rises, clear width of stair 900 mm	Solid wood [2]	Width x Height	[mm]	40 x 265...320 [4]	
	Max. 17 or 18 rises, clear width of stair 1000 mm [6]	Solid wood [2] [3]	Width x Height	[mm]	44 x 265...320 [4]	
Cross bracing, system fasteners, support angles		Steel	-[5]			A1

[1] Characteristic values of material according to the technical documentation
[2] Only wood of wood species group 1: beech, oak, ash, maple, sipo, merbau
[3] Only wood of wood species group 2: havea
[4] Depending on the number of rises, the type of plan, possible barriers and more details according to technical documentation
[5] According to the technical documentation
[6] Stairs made of wood species havea and stairs with step-string joints Type 9: only max. 17 rises possible

DHTI – String Stair	Annex A5
Minimum dimensions of components of the stair and reaction to fire	

Deutsches Institut für Bautechnik DIBt

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 the European Technical Assessment.
- Values of this ETA apply to all types of stairs according to Annex A1 and A2; the real dimensions follow in accordance with the relevant case of use.

Stair subject to:

- Static or 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 may be attached to the stair optionally. Conditions for possible barrier/handrail:

  Dead load ≤ 0,15 kN/m

  Height ≤ 1,00 m

  Distance of baluster ≤ 0,26 m

Design:

- Design of the stair according to the annexes and the technical documentation to this European Technical Assessment
- Fastening of the stair to the construction works according to the annexes and the technical documentation to this European Technical 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 1991-1-1:2002 + AC:2009

  $\gamma_Q = 1,5$: 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 oft the partial factors mentioned above; see Table 5

DHTI – String Stair	Annex B1
Specification of intended use (Part 1)	

Deutsches Institut für Bautechnik DIBt

Specification of intended use (Part 2)

Installation:

- Installation by personal appropriately trained and authorized by the manufacturer 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 ± 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 ± 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

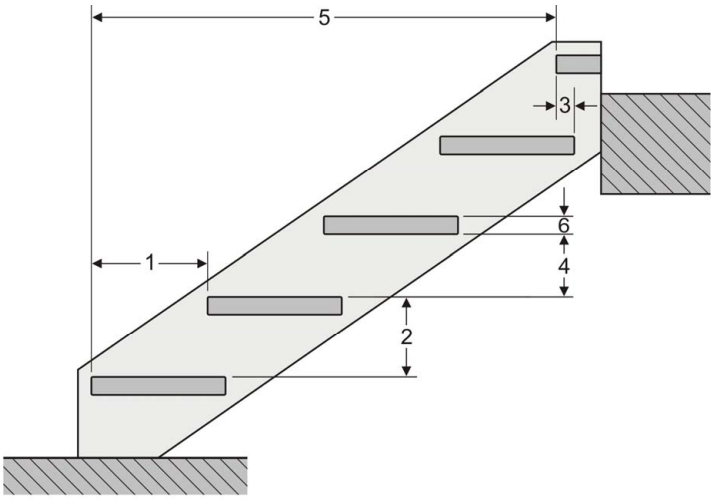
DHTI – String Stair	Annex B2
Specification of intended use (Part 2)	

Deutsches Institut für Bautechnik DIBt

Table 2: Geometry

Designation			Dimension	
			minimum	maximum
Going	step on walking line [1]	[mm]	210	370 [2]
	tapered step	[mm]	60 [2] [3]	600 [2] [4]
Rise of the stairs [1]		[mm]	140 [2]	210
Pitch of the walking line [1]		[°]	21	45
Overlap of steps		[mm]	40	- [5]
Number of rises		[-]	3	18 [7]
Openings	between stairs and wall	[mm]	- [5]	40
	between consecutive steps	[mm]	- [5]	170
Clear width of stairs	thickness of steps and strings 44 mm	[mm]	500	1000
	thickness of steps and strings 40 mm	[mm]	500	900
Length of the flight		[mm]	- [5]	4320 [6]
Thickness of steps	for b = 900 mm	[mm]	40	- [5]
	for b = 1000 mm	[mm]	44	- [5]

1) Values are constant within one flight
2) Tolerance between nominal value and actual value = ± 5 m
3) Wall side of tapered steps
4) Wall-free side of tapered steps
5) Not relevant
6) Stairs with landings according to the technical documentation
7) Depending on the wood species, step-string joint, thickness of steps and strings



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

DHTI – String Stair

Geometry

Annex C1

Deutsches Institut für Bautechnik DIBt

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_{Rk}	[kN/m²]	6,8	1,5 [1]
	vertical variable single load	Q_{Rk}	[kN]	4,5	
	horizontal variable uniformly distributed load on barrier	h_{Rk}	[kN/m]	0,8	
joint at bottom and at the top	vertical variable uniformly distributed load	q_{Rk}	[kN/m²]	5,0	1,1 [2]
	vertical variable single load	Q_{Rk}	[kN]	3,3	
	horizontal variable uniformly distributed load on barrier	h_{Rk}	[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

Deflection of the flight under uniformly distributed load			
Uniformly distributed load	q_k	[kN/m²]	3,0
length of the median line of the flight	L	[mm]	4320 [1]
deflection related to the median line of the flight	w_q	[mm]	≤ L/200
Deflection of the step under single point load			
single load	Q_k	[kN]	2,0
clear width of the stair	L	[mm]	1000
deflection related to the clear width of the stair	w_Q	[mm]	≤ L/200

[1] stairs with landing according to the technical documentation

Table 5: Imposed loads

Type of loading	Imposed loads		
vertical variable uniformly distributed load	q_k	[kN/m²]	3,0
vertical variable single load	Q_k	[kN]	2,0
horizontal variable uniformly distributed load on barrier	h_k	[kN/m]	0,5