

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-13/0321
of 7 April 2016

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 - close 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 HolztreppeInstitut e.V.
Von der Heydt
66115 Saarbrücken
DEUTSCHLAND

Manufacturing plant

Werk 1 bis 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

Guideline for European technical approval of
"Prefabricated stair kits", ETAG 008 Part 1: "Prefabricated
stair kits in general (excluding severe climatic
conditions)", January 2002,
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 DHTI close 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.

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 assessed
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 assessed

3.3 Hygiene, health and the environment (BWR 3)

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 assessed
Equipment of the stair for a safe use	No performance assessed
Safe breakage of stair components	No brittle failure of individual stair components
Impact resistance	No performance assessed

3.5 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

In accordance with guideline for European technical approval ETAG 008, January 2002, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011, the applicable European legal act is: 99/89/EC

The System to be applied is: 2+

In addition, with regard to reaction to fire for products covered by the guideline for European technical approval ETAG 008, January 2002, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011, the applicable European legal act is: 2001/596/EC

The System to be applied is: 4

English translation prepared by DIBt

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 7 April 2016 by Deutsches Institut für Bautechnik

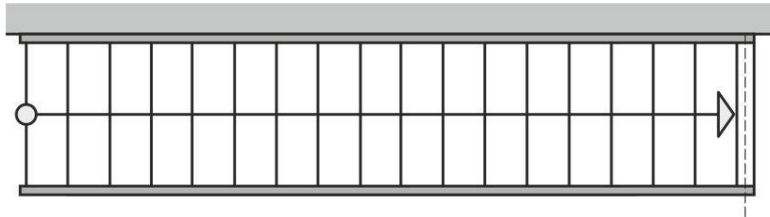
Andreas Kummerow
p.p. Head of Department

beglaubigt:
Wittstock

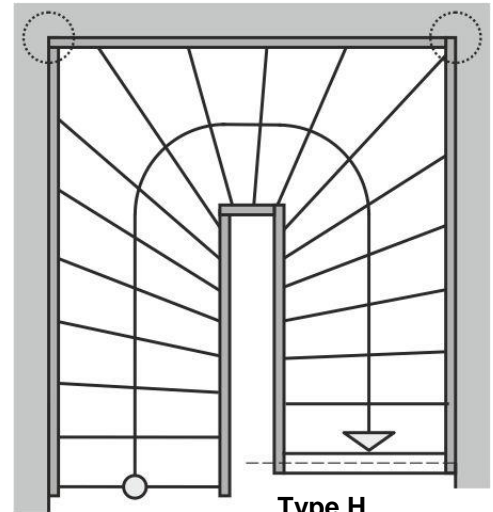
Types of plan without landing

Location of cross bracings according to the technical documentation

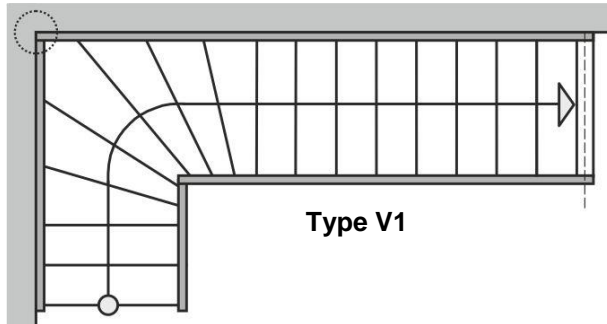
- Support for vertical loads



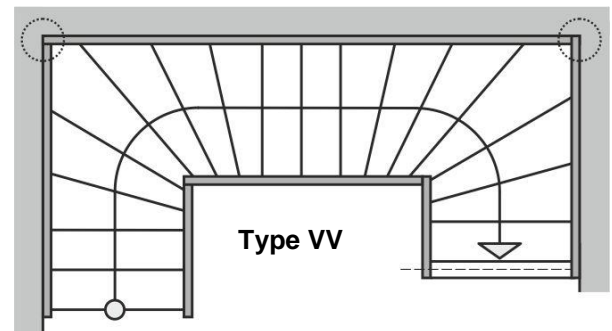
Type G



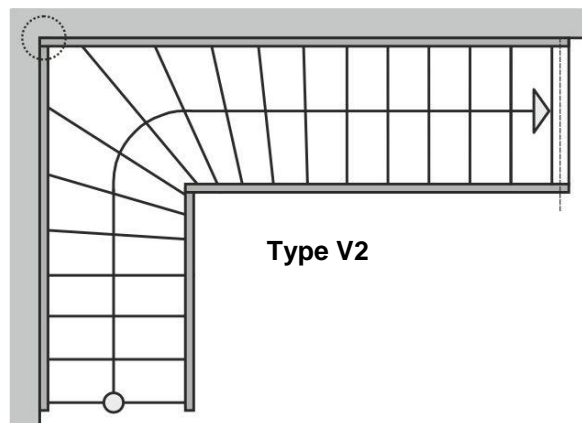
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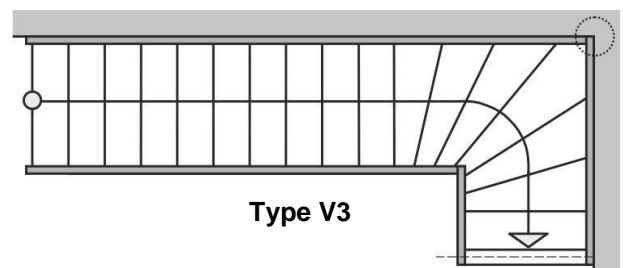
Type V1



Type VV



Type V2



Type V3

DHTI – close string stair

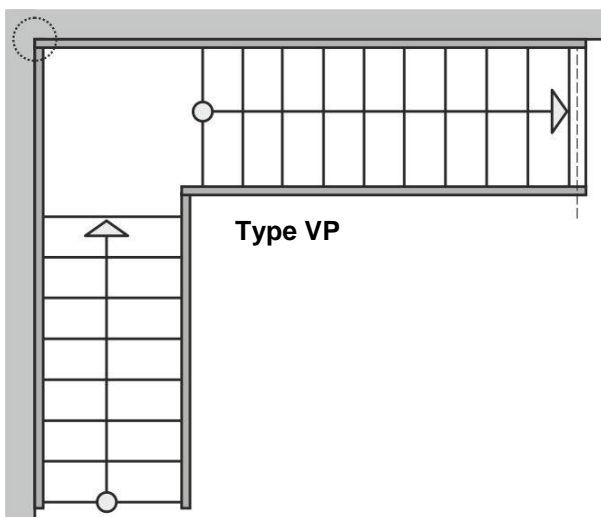
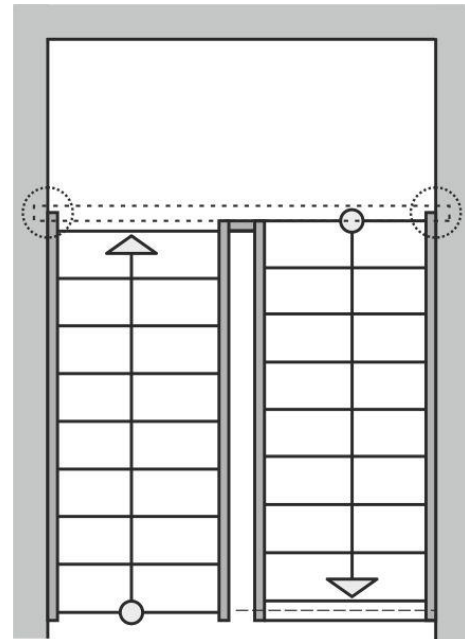
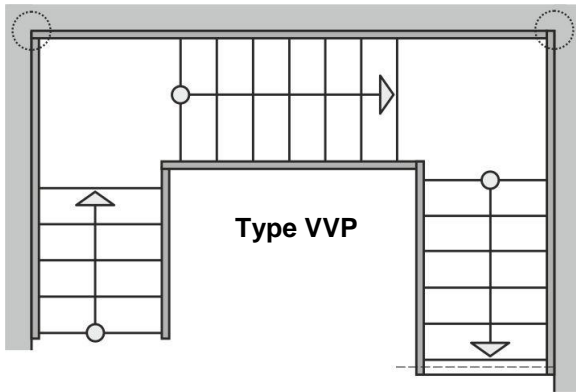
Product and intended use (types of plan without landing)

Annex A1

Types of plan with landing

Location of cross bracings according to the technical documentation

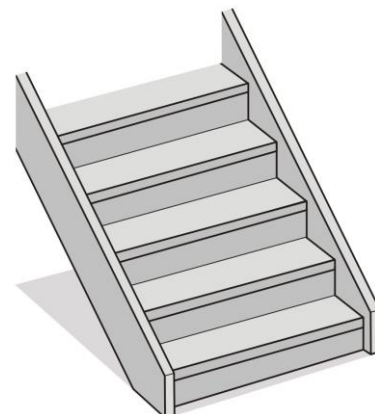
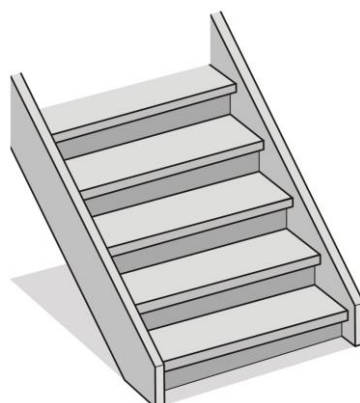
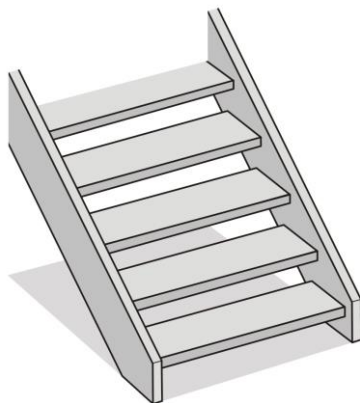
○ Support for vertical loads



Type GP

Landing is not part of the ETA

Types of construction

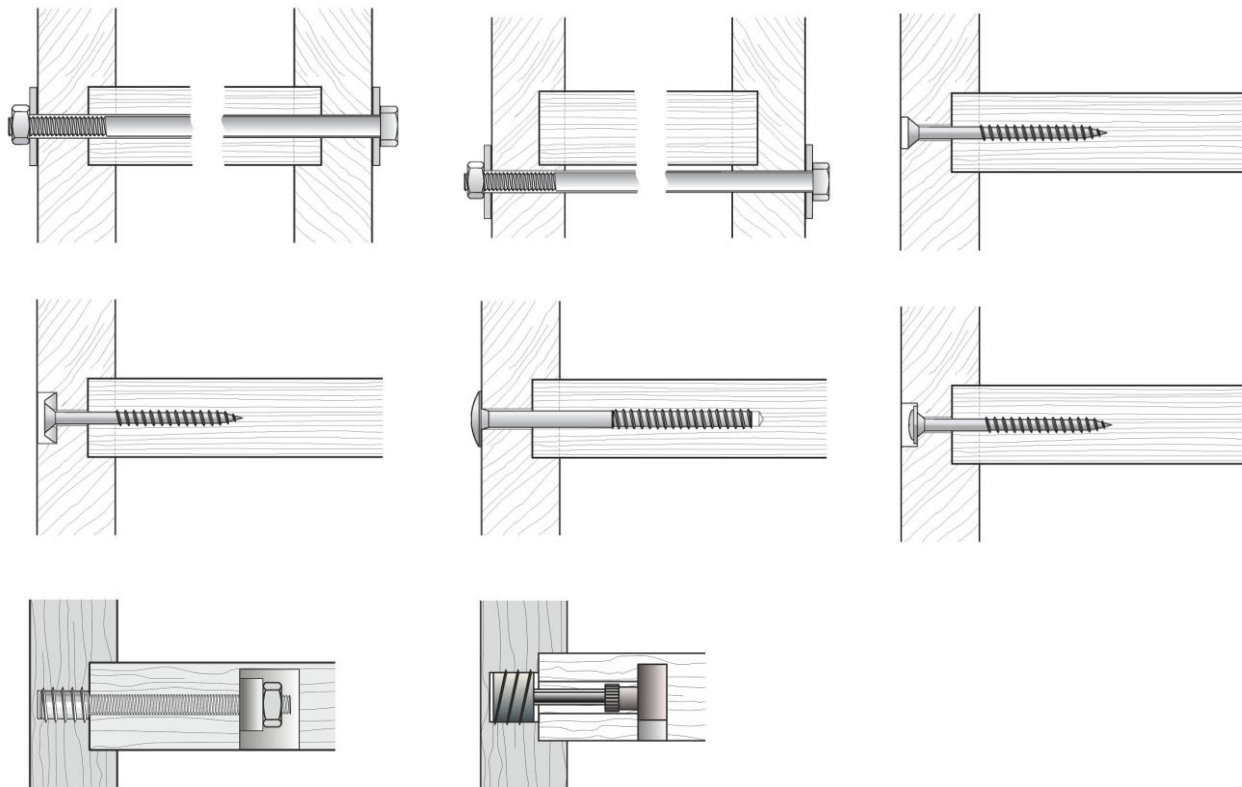


DHTI – close string stair

Product and intended use
(types of plan with landing and types of construction)

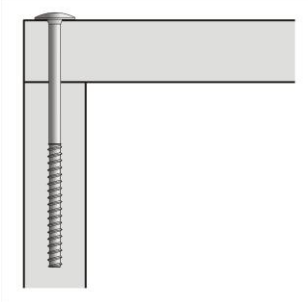
Annex A2

Step – String joint (possible variations)

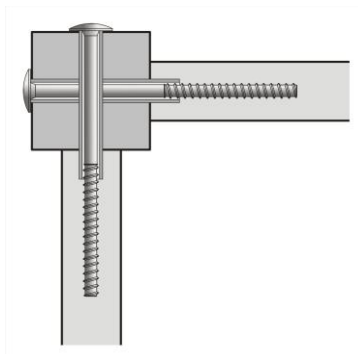


String corner joint (possible variations)

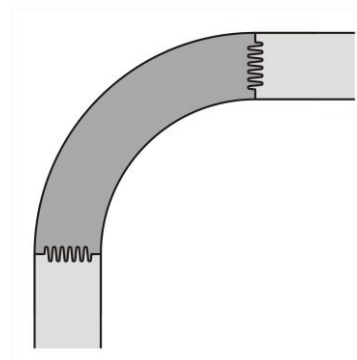
Screwed



Screwed with post



Finger jointed



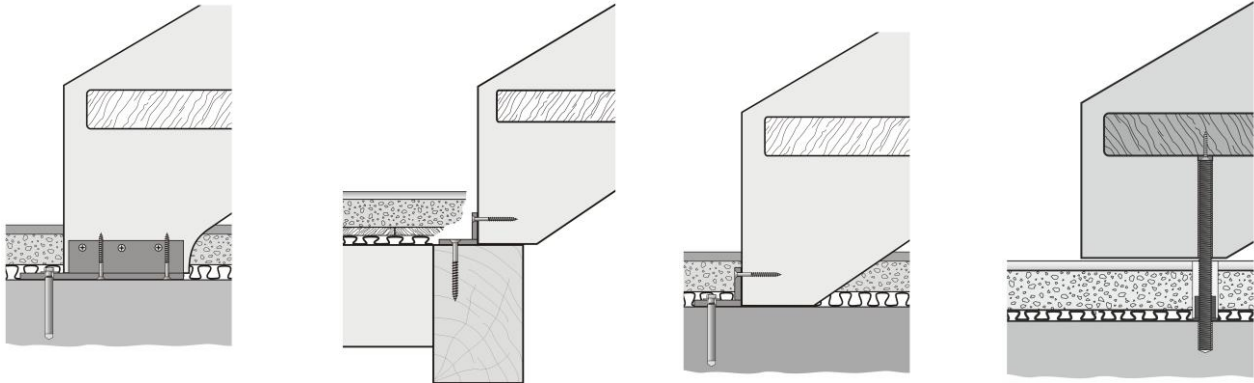
Allocation of joints depending on the wood species and the type of plan and more details according to the technical documentation

DHTI – close string stair

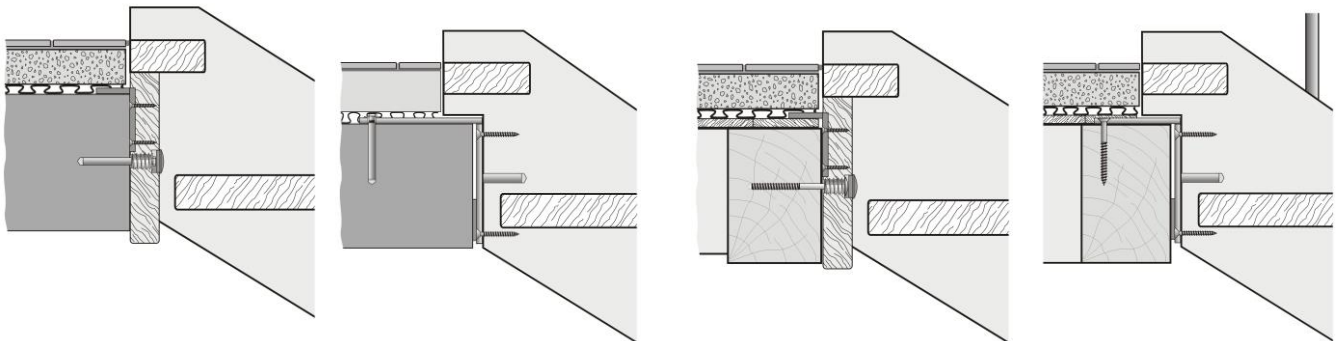
Types of construction, Step – String joint, String corner joints

Annex A3

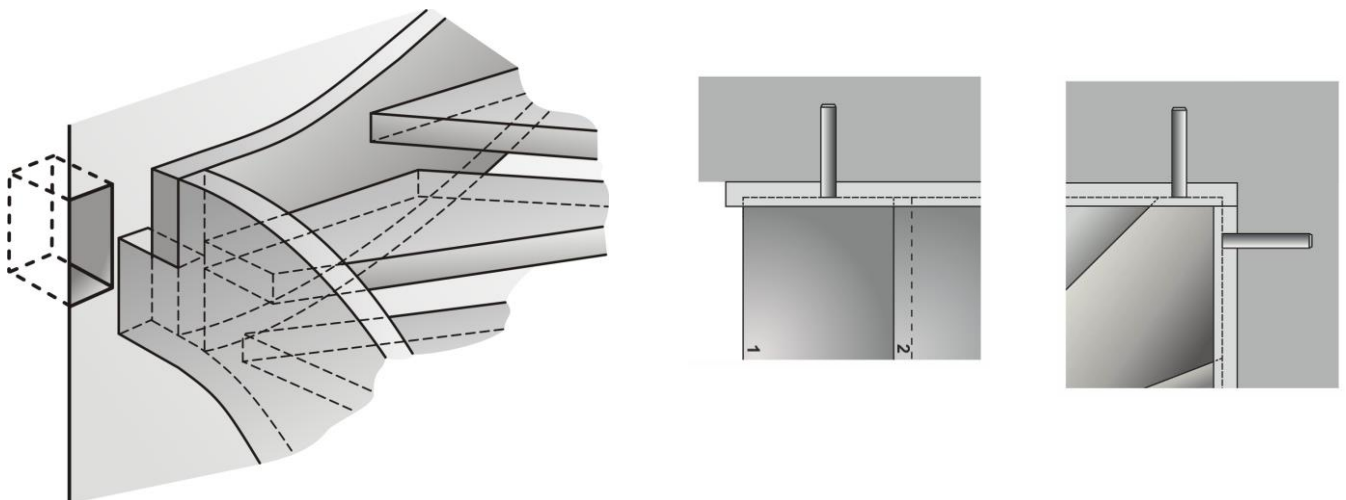
Joint at bottom



Joint at the top



Wall support



More details according to the technical documentation

DHTI – close string stair

Joint at bottom, Joint at the top, wall support

Annex A4

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. 18 rises, clear width of stair 1000 mm	Solid wood ²⁾	Thickness	[mm]	44	
String	Max. 17 rises, clear width of stair 900 mm	Solid wood ²⁾	Width x Height	[mm]	40 x 265...320 ³⁾	
	Max. 18 rises, clear width of stair 1000 mm	Solid wood ²⁾	Width x Height	[mm]	44 x 265...300 ³⁾	
Cross bracing, system fasteners, support angles		Steel	- ⁴⁾			A1

¹⁾ Characteristic values of material according to the technical documentation

²⁾ Only wood of following species: beech, oak, ash, maple, sipo, merbau

³⁾ Depending on the number of rises, the type of plan and possible barriers according to technical documentation

⁴⁾ According to the technical documentation

DHTI – close string stair

Minimum dimensions of components of the stair 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 the 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 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 1991-1-1:2010-12

$\gamma_Q = 1.5$: 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

DHTI – close 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 assessment 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

DHTI – close string stair

Specification of intended use (Part 2)

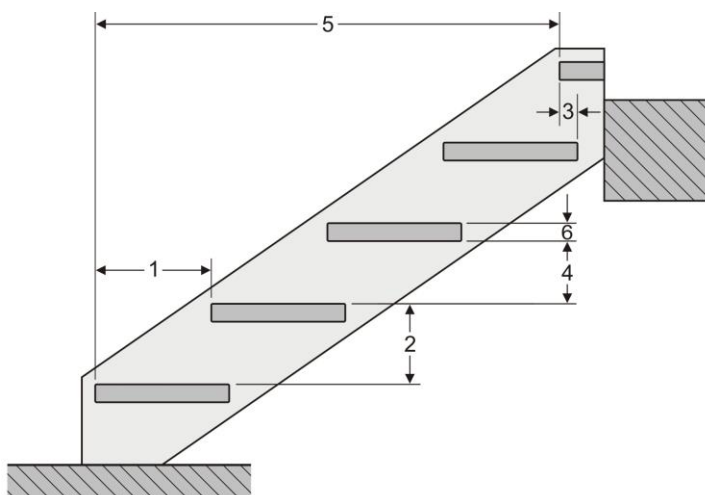
Annex B2

Table 2: Geometry

Designation			Dimension	
			minimum	maximum
Going	step on walking line ¹⁾	[mm]	210	370 ²⁾
	tapered step	[mm]	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
Openings	between stairs and wall	[mm]	- ⁵⁾	40
	between consecutive steps	[mm]	- ⁵⁾	170
Clear width of stairs		[mm]	500	1000
Length of the flight		[mm]	- ⁵⁾	4160 ⁶⁾
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 side of tapered steps
- 4) Wall-free side of tapered steps
- 5) Not relevant
- 6) Stairs with landings according to the technical documentation

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



DHTI – close 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]	6,8	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 and at the top	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

Deflection of the flight under uniformly distributed load			
load F_S	q_k	[kN/m ²]	3,0
length of the median line of the flight	L	[mm]	4160 ¹⁾
deflection under load F_S related to the median line of the flight	w	[-]	$\leq L/200$
Deflection of the step under single point load			
load F_S	Q_k	[kN]	2,0
clear width of the stair	L	[mm]	1000
deflection under load F_S related to the clear width of the stair	w	[-]	$\leq L/200$

¹⁾ stairs with landing according to the technical documentation

Table 5: Service loads

Type of loading	Service 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

DHTI – close string stair

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

Annex C2