Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Member of EOTA

www.eota.eu

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

European Technical Assessment ETA-11/0307 of 16 May 2023

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	Load-bearing bolt stair system Treppenmeister
Product family to which the construction product belongs	Prefabricated stair kits
Manufacturer	Treppenmeister GmbH Emminger Straße 38 71131 Jettingen DEUTSCHLAND
Manufacturing plant	Treppenmeister Werk 1 bis 85
This European Technical Assessment contains	15 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-11/0307 issued on 7 September 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This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission in accordance with Article 25(3) of Regulation (EU) No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.

Specific Part

1 Technical description of the product

The Load-bearing bolt stair system Treppenmeister is a prefabricated stair system, which consists of steps, load-bearing bolts and wall ties. The stair can also be formed as a folded plate stair by additional risers.

The steps of the WF2-stair are connected with each other by one load-bearing bolt on the wall-free side and one load-bearing bolt on the wall side. On the wall side each step is equipped with one or two walls tie, which are anchored in the staircase wall. The steps of the WE1-stair are connected with each other by one load-bearing bolt on the wall-free side. On the wall side each step is equipped with two walls tie, which are anchored in the staircase wall. Alternatively, the staircase wall may also be replaced by a string or a cut string.

The steps and risers are either made of solid wood or wood-based products. The load-bearing bolts are made of solid wood and steel, the fasteners and wall ties 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 - Load-bearing capacity of components of the stair - Load-bearing capacity of fixings	 Q_{Rk}, q_{Rk} and h_{Rk}: See Annex C2 H_{Rk}: No performance assessed M_{Rk}, V_{Rk}, N_{Rk}, E, G, f_{mk} und f_{vk}: See technical documentation of this European Technical Assessment 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
Fire resistance	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Release of formaldehyde	Solid wood panels: wood adhesive does not contain formaldehyde Other wood-based products: Class E1
Release of pentachlorophenol	No pentachlorophenol treated materials are used
Radioactive emission	No performance assessed

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 components	No brittle failure of individual 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 16 May 2023 by Deutsches Institut für Bautechnik

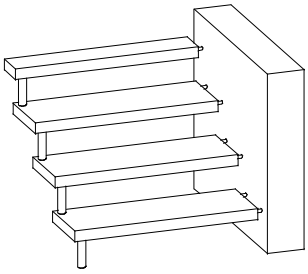
Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Stiller

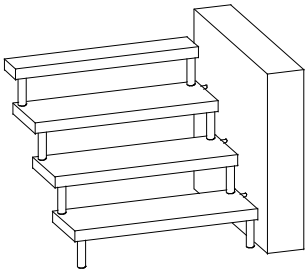
Deutsches Institut für Bautechnik DIBt

Types of construction

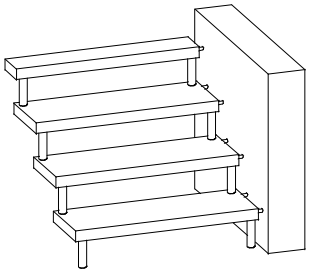
WE1 (2 wall ties)



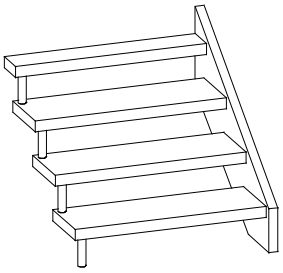
WF2 (1 wall tie)



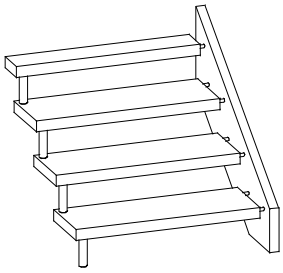
WF2 (2 wall ties)



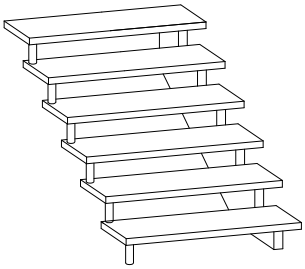
WE1 (close string)



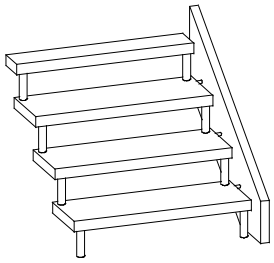
WE1 (2 wall ties)



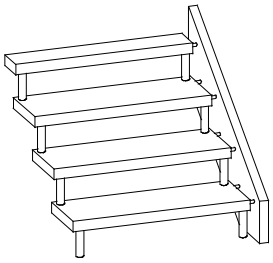
WE1 (cut string)



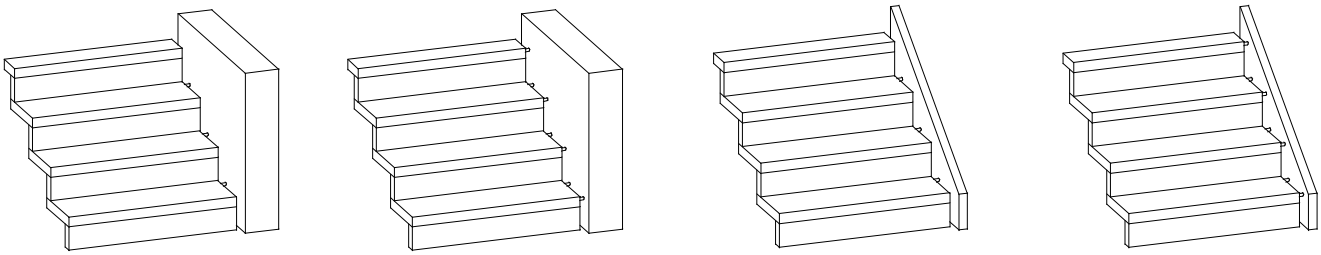
WF2 (1 wall tie)



WF2 (2 wall ties)



Folded plate style



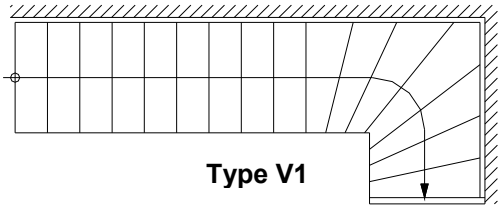
Support of the strings and cut strings on the wall side according to technical

Load-bearing bolt stair system Treppenmeister	**Annex A1**
Product (Types of construction)	

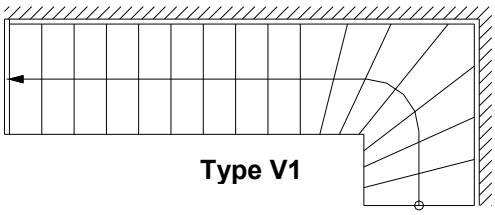
Deutsches Institut für Bautechnik DIBt

Types of plan

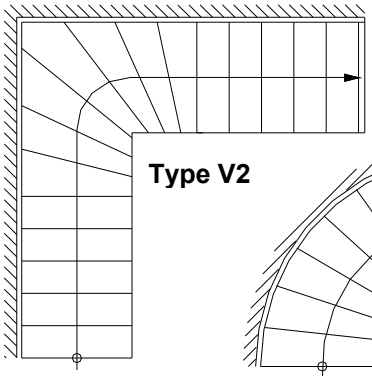
Walking line exemplified, position may be chosen freely within the walking zone, walking zone is 20 % of the clear width of the stair in the middle of the stair



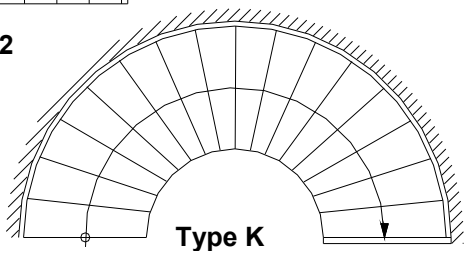
Type V1



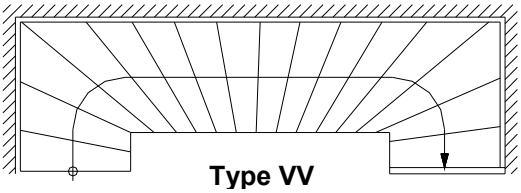
Type V1



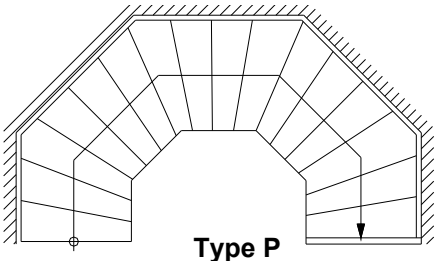
Type V2



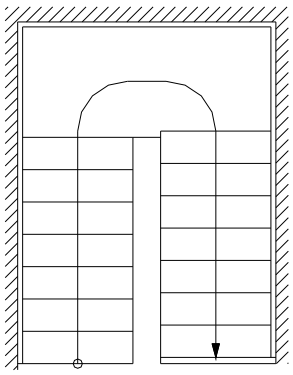
Type K



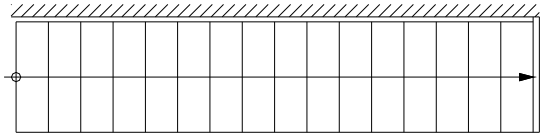
Type VV



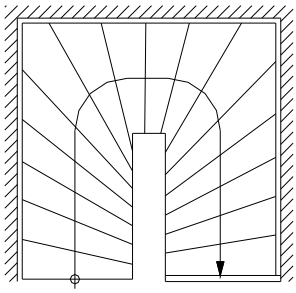
Type P



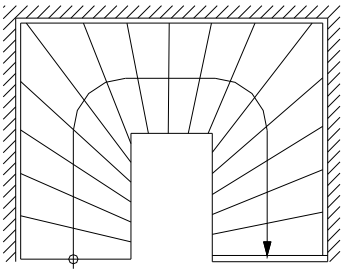
Type G



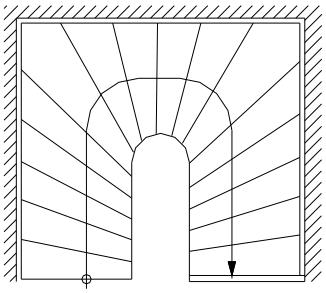
Type G



Type H



Type H



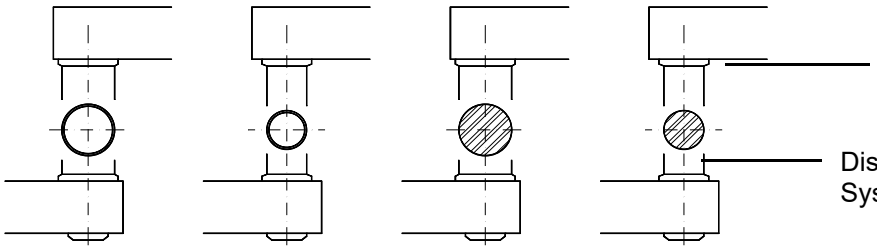
Type H

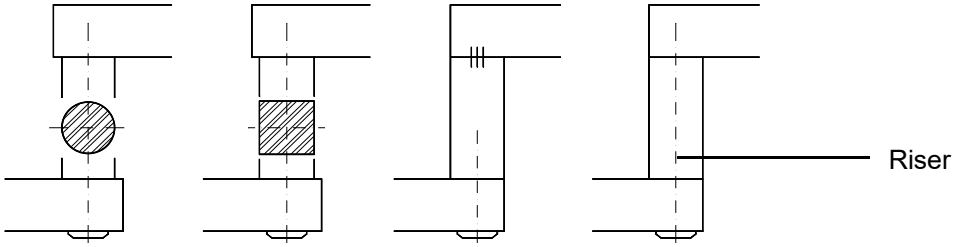
Additional support according to Annex A6

Load-bearing bolt stair system Treppenmeister	**Annex A2**
Product (Types of plan)	

Deutsches Institut für Bautechnik DIBt

Load-bearing bolts

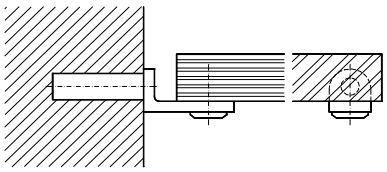




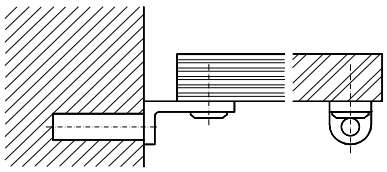
Wall tie

Minimum wall thickness and minimum strength of the wall material as well as distances to the wall according to the technical documentation

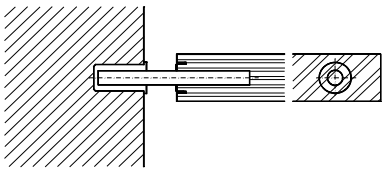
Wall tie: angle

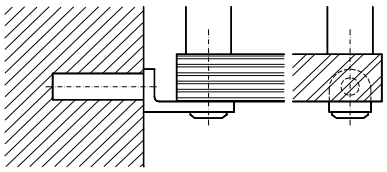


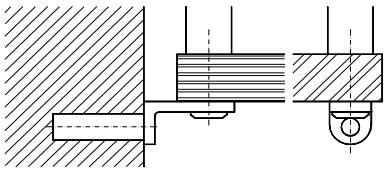
Wall tie: angle

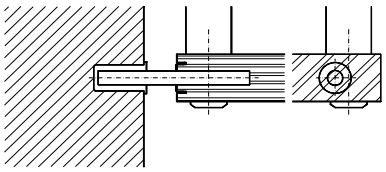


Wall tie: bolt







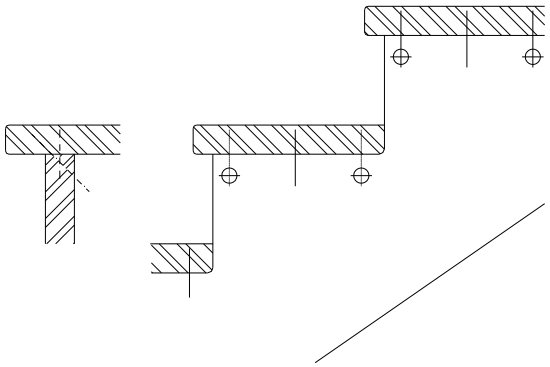


Further details according to the technical documentation

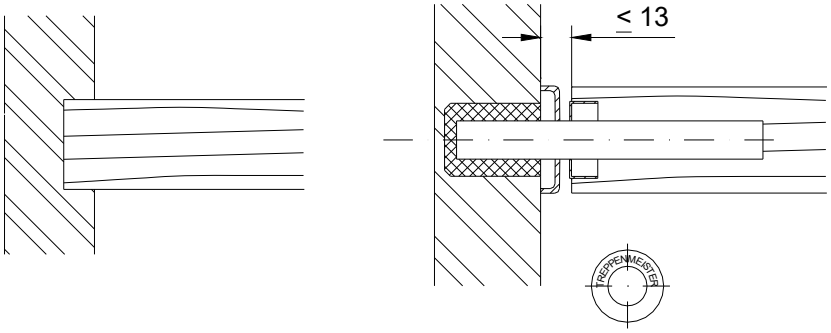
Load-bearing bolt stair system Treppenmeister	Annex A3
Load-bearing bolts and wall ties	

Deutsches Institut für Bautechnik DIBt

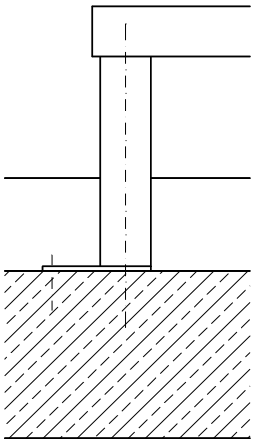
Step – cut string - joint



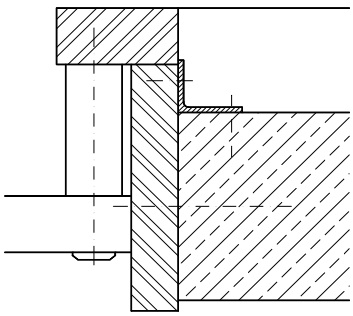
Step – string - joint



Support bottom



Support at the top



Further details according to the technical documentation

Load-bearing bolt stair system Treppenmeister	**Annex A4**
Step-string-joints, support bottom and at the top	

Deutsches Institut für Bautechnik DIBt

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

Component	Material [1)]	Dimension		Value	Reaction to fire
Step	Solid wood [2)]	Thickness	[mm]	54 [5)]	D-s2, d0
	Wood-based product [3)]	Thickness	[mm]	54 [5)]	D-s2, d0
Riser	Solid wood [2)]	Thickness	[mm]	54 [5)]	D-s2, d0
Load-bearing bolt / rod	Steel	Diameter	[mm]	12	A1
Load bearing bolt distance sleeve	Steel pipe	Diameter	[mm]	40 [4)]	
	Solid wood [2)]	Diameter	[mm]	40 [4)]	D-s2, d0
Wall tie (bolt)	Round steel	Diameter	[mm]	16	A1
		Embedment depth Wall	[mm]	55	
		Embedment depth Step	[mm]	80	
Wall tie (angle)	Steel	Angle	[mm]	50x100x10	A1
		Diameter screw	[mm]	10	
		Embedment depth Wall	[mm]	100	
Bearing sleeve for wall tie (bolt)	Plastics	Diameter	[mm]	30	not relevant
Bearing sleeve for wall tie (angle)	Plastics	Diameter	[mm]	30	not relevant
String	Solid wood [2)]	Width x thickness	[mm]	44 x 240…310 [6)]	D-s2, d0
Cut string	Solid wood [2)]	Width x thickness	[mm]	44 x 150…210 [7)]	

1) Characteristic values of material according to technical documentation

2) Only solid wood of following species:
Group 1: Amazakoué, Bangkirai, Bongossi, Beech, Oak, Ash, Merbau, Wengé, Zebrano
Group 2: Maple, Acacia, Birch, Bubinga, Cherry tree, Hevea, Nut tree, Teak

3) Beech with high-density fibreboard (equivalent to Group 2, layer composition according to technical documentation)

4) With washer d = 50 mm,
more details and assigning of load-bearing bolts – types of stairs according to technical documentation

5) Types of plan K, P, VV without additional support,
all other types of plan with additional support according to Table 2

6) Dimensions according to ETA-10/0215 of 09.02.2023

7) Dimensions according to ETA-13/0197 of 14.05.2018

Load-bearing bolt stair system Treppenmeister	**Annex A5**
Minimum dimensions of relevant stair components and reaction to fire	

Deutsches Institut für Bautechnik DIBt

Table 2: Additional support for maximum clear width of the stair [1)]

Construction		WE1		WF2		Folded plate
Wall tie		Bolt	Angle	Bolt	Angle	Bolt / Angle
Type	Rises	Required additional support on step				
G	≤ 17	3 + 7 + 12	5 + 11	5 + 11	5 + 11	1 + 9
	≤ 15	1 + 5 + 10	4 + 10	4 + 10	4 + 10	7
	≤ 14	4 + 9	2 + 8	2 + 8	2 + 8	6
	≤ 13	3 + 8	1 + 7	1 + 7	1 + 7	5
	≤ 12	2 + 7	6	6	6	4
	≤ 11	1 + 6	5	5	5	3
	≤ 10	5	4	4	4	2
	≤ 9	4	3	3	3	1
	≤ 8	3	2	2	2	-
	≤ 7	2	1	1	1	-
	≤ 6	1	-	-	-	-
V1	≤ 17	5	4	4	4	2
	≤ 15	3	2	2	2	-
V2	≤ 17	4 + 14	1	4	3	3
	≤ 15	4	-	3	2	1
H	≤ 17	1	-	-	-	-
	≤ 15	-	-	-	-	-

[1)] Further possibilities of supports for smaller clear width of the stair according to technical documentation

Load-bearing bolt stair system Treppenmeister	Annex A6
Additional support	

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 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 ≤ 0,30 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 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 4

  γ_M: recommended material partial safety factor; see Table 4

  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 of the partial factors mentioned above; see Table 6

Load-bearing bolt stair system Treppenmeister	**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 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 connections 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 and retightens the bolting of the load-bearing bolts and connections according to Annex A3 after the first heating season and the information on the relationship between moisture content of timber components, air temperature and relative air humidity

Load-bearing bolt stair system Treppenmeister	**Annex B2**
Specification of intended use (Part 2)	

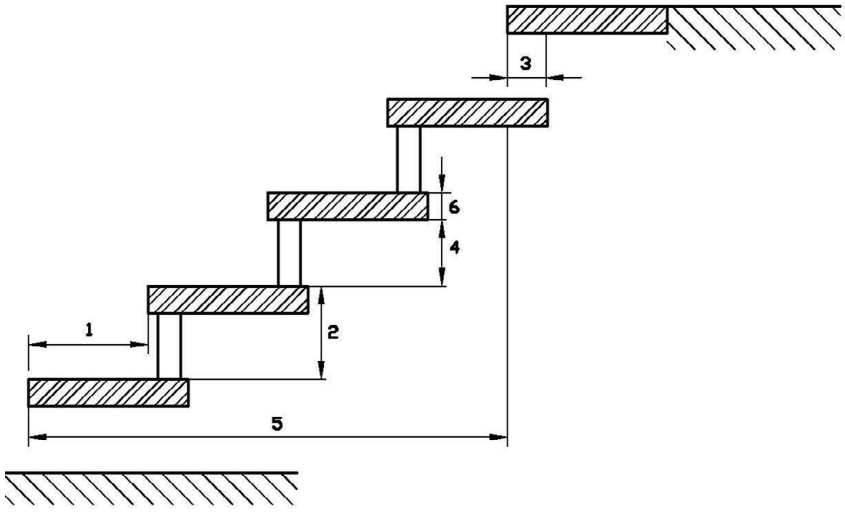
Deutsches Institut für Bautechnik DIBt

Table 3: Geometry

Designation			Dimension	
			Minimum	Maximum
Going	step on walking line [1]	[mm]	210	370 [2]
	tapered step	[mm]	70 [2] [3]	600 [2] [4]
Rise of the stairs [1]		[mm]	140 [2]	210
Pitch of the walking line [1]		[°]	21	45
Overlap of the steps		[mm]	70 [6]	- [5]
Number of rises		[-]	3	17
Openings	between stairs and wall	[mm]	- [5]	40
	between consecutive steps	[mm]	- [5]	156
Clear width of stairs		[mm]	500	1000
Minimum headroom		[mm]	- [5]	
Length of the flight		[mm]	- [5]	4160
Thickness of steps		[mm]	54	- [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] With riser overlap 0 mm

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



Load-bearing bolt stair system Treppenmeister

Geometry of the stair

Annex C1

Table 4: Load-bearing capacity - Characteristic values of resistance

Part of stair	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	
support on 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 (timber decisive), in absence of other national regulations
[2] Recommended partial safety factor (steel decisive), in absence of other national regulations

Table 5: 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]	4160 [1]
deflection related to the median line of the flight	w_q	[-]	≤ 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	[-]	≤ L/200

[1] L = reference length = distance between supports, (additional support according to Annex A6)

Table 6: 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

Load-bearing bolt stair system Treppenmeister

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

Annex C2