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

European Technical Assessment

ETA-10/0215 of 20 November 2014

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	String stair system Treppenmeister
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	Treppenmeister GmbH Emminger Straße 38 71131 Jettingen DEUTSCHLAND
Manufacturing plant	Treppenmeister, Werk 1 bis Werk 85
This European Technical Assessment contains	16 pages including 11 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 string stair system Treppenmeister 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. Handrail and barrier can be part of the stair system, but they are not necessary for the load-bearing capacity of the stair.

The steps, the landing, the strings, the handrail and the posts are made of solid wood, the balusters are made of steel or solid wood and 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 A6
Fire resistance	No performance determined (NPD)

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 determined (NPD)
Equipment of the stair for a safe use	Handrail and barrier can be part of the stair system (see Annex A3 and A4). If vertical balusters, arranged between step and handrail, are used as fill-in elements, climb ability for infants will not be supported Tactility and visibility: No performance determined (NPD)
Safe breakage of stair components	No brittle failure of individual stair components made of wood or steel ESG-H: type C according to EN 12600:2002-11 VSG: type B according to EN 12600:2002-11
Impact resistance	Verified for filling elements made of glass up to a pendulum fall height of twin tyres (weight 50 kg) of 450 mm (Type I and Type III) and 350 mm (Type II) Pendulum tests: test assembly according to EN 12600:2002-11 test performance according to TRAV[1]

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)

The sustainable use of natural resources was not investigated.

[1] TRAV: Technische Regeln für die Verwendung von absturzsichernden Verglasungen, Fassung Januar 2003

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 of the Commission of 3 February 1999 (99/89/EC) (OJ 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 of the Commission of 8 January 2001 (2001/596/EC) (OJ 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 A6, 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 24 November 2014 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Wittstock

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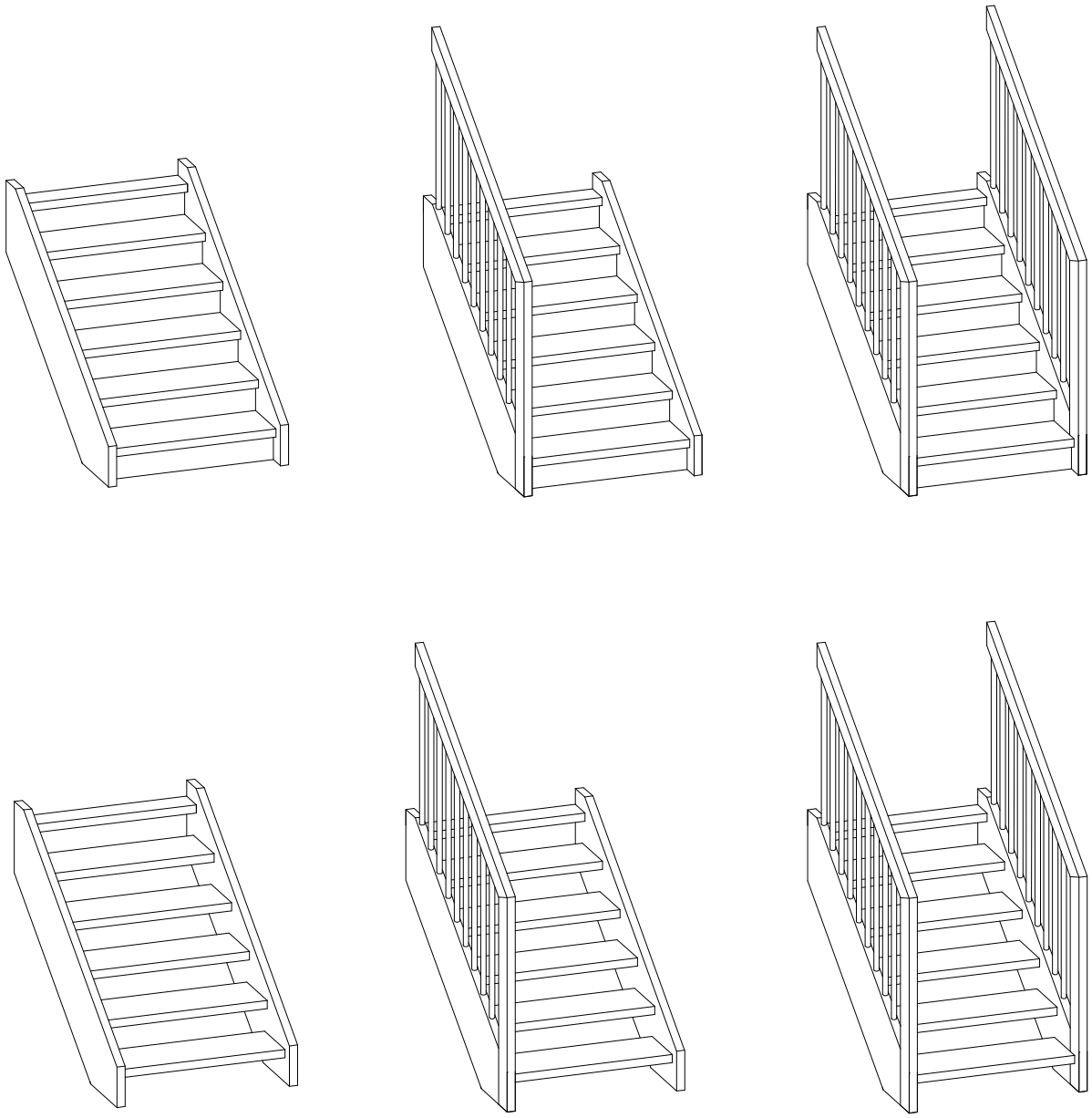
Types of construction



String stair system Treppenmeister

Product and intended use (types of construction)

Annex A1

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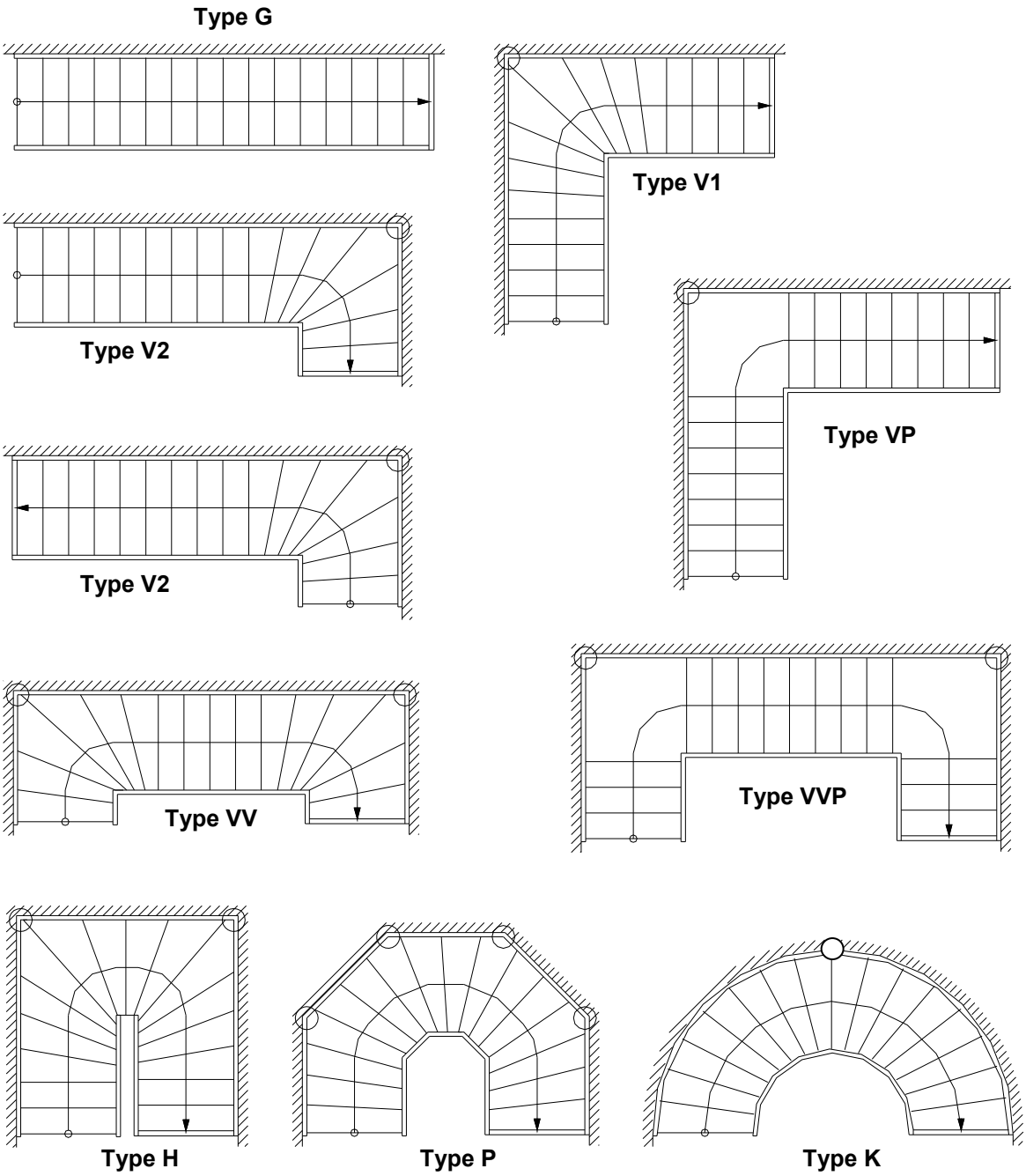
Types of plan



○ Support for vertical loads

String stair system Treppenmeister	Annex A2
Product and intended use (types of plan)	

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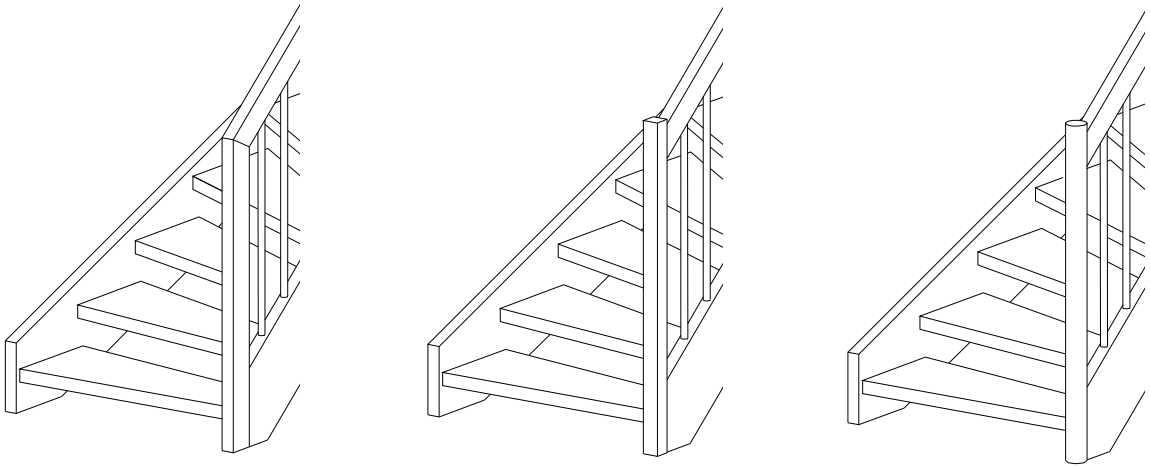
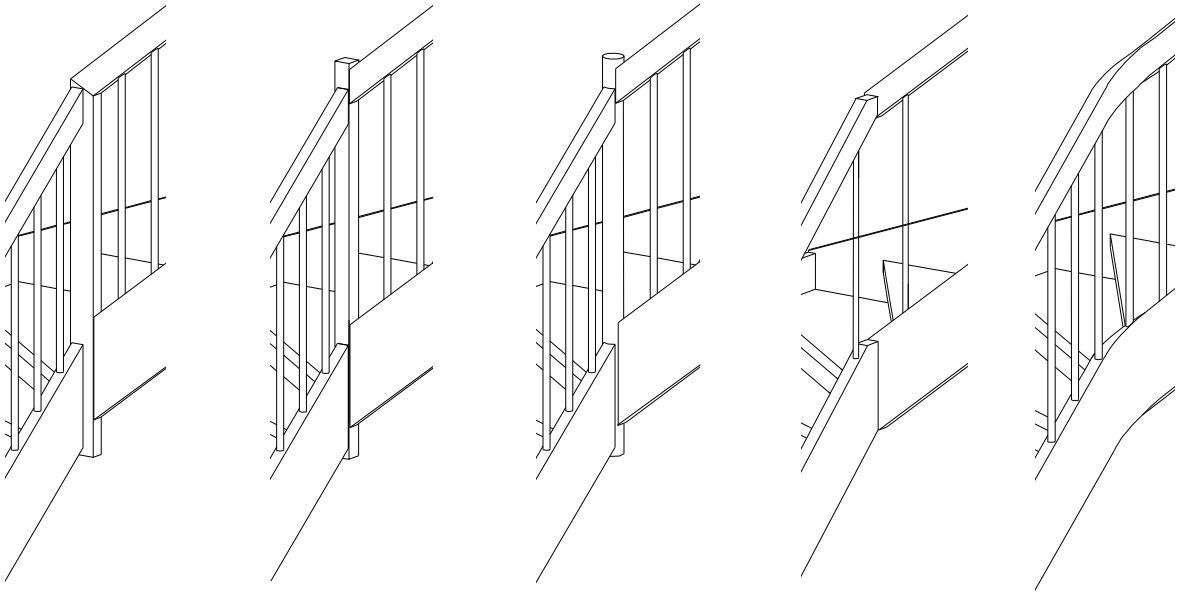
Barrier constructions (posts)

Post at bottom and post at the top



Middle post



More details according to the technical documentation

String stair system Treppenmeister	Annex A3
Barrier constructions (posts)	

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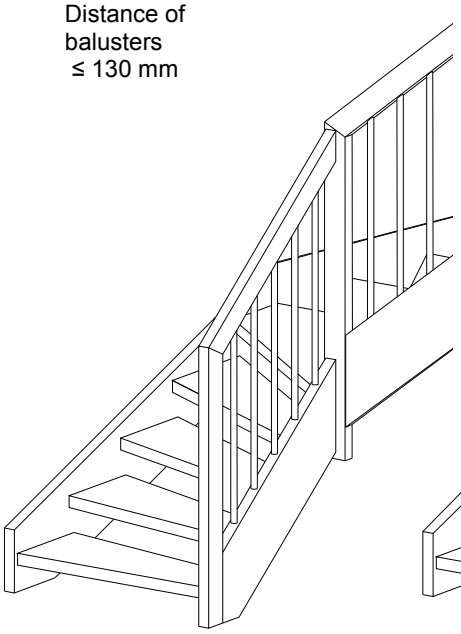
Barrier constructions
(Filling elements with dead load maximum of 0.23 kN/m)

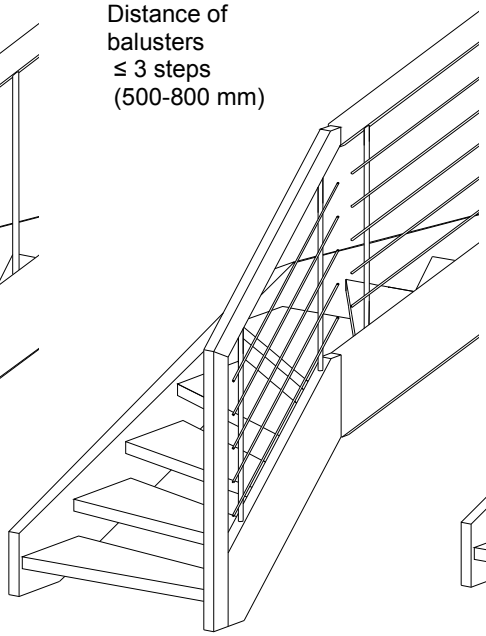
Standard barrier

Distance of balusters ≤ 130 mm



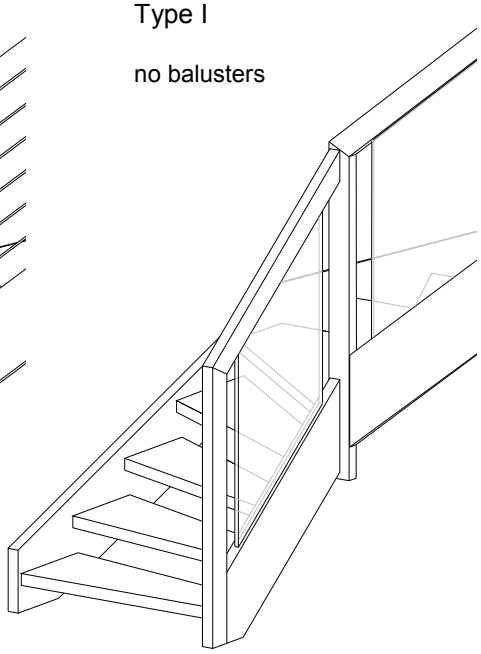
Railing barrier

Distance of balusters ≤ 3 steps (500-800 mm)



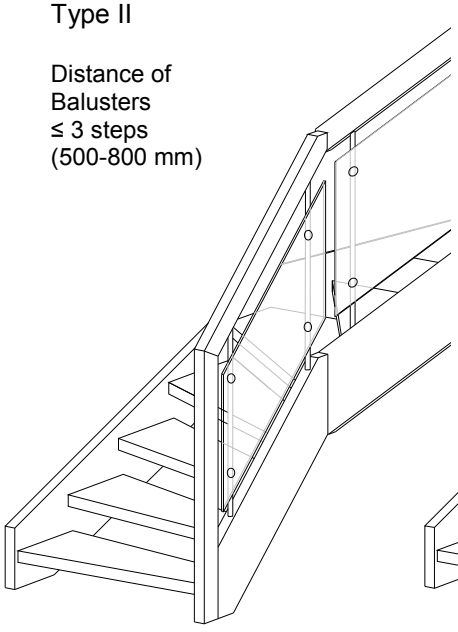
Glass barrier Type I

no balusters



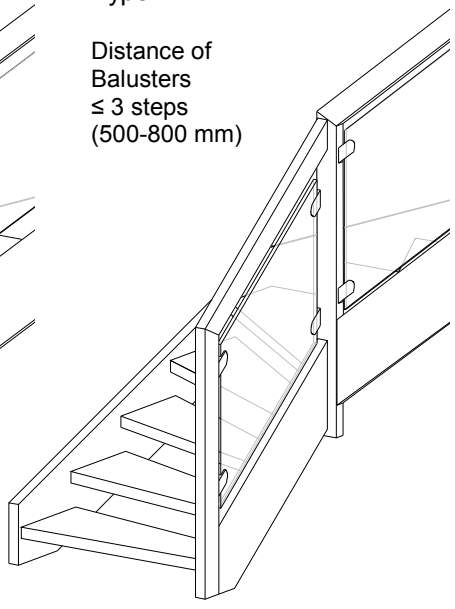
Glass barrier Type II

Distance of Balusters ≤ 3 steps (500-800 mm)



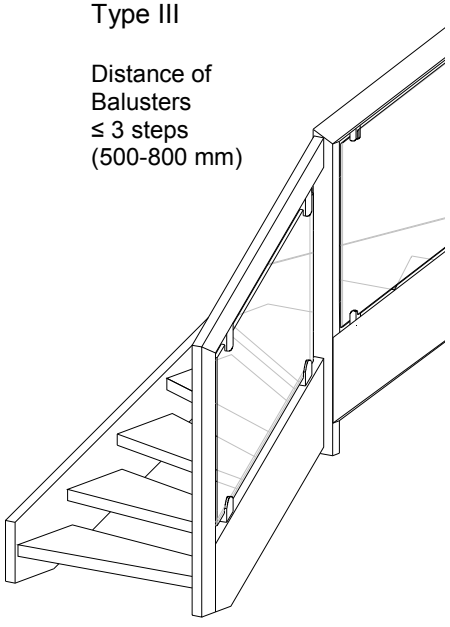
Glass barrier Type III

Distance of Balusters ≤ 3 steps (500-800 mm)



Glass barrier Type III

Distance of Balusters ≤ 3 steps (500-800 mm)



More details according to the technical documentation

String stair system Treppenmeister	Annex A4
Barrier constructions (fillings)	

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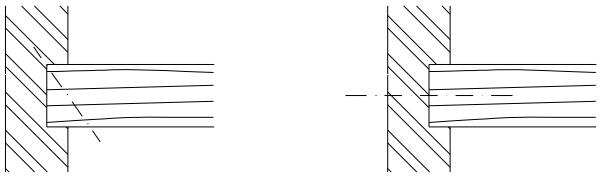
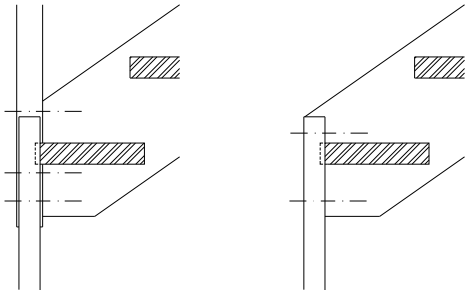
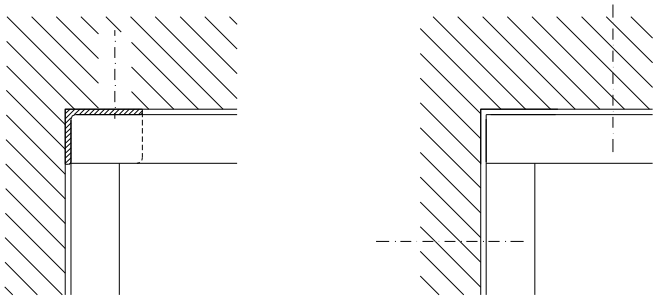
Step-string-joint



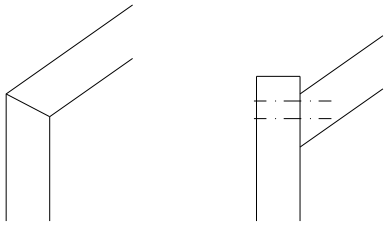
String-corner-joint



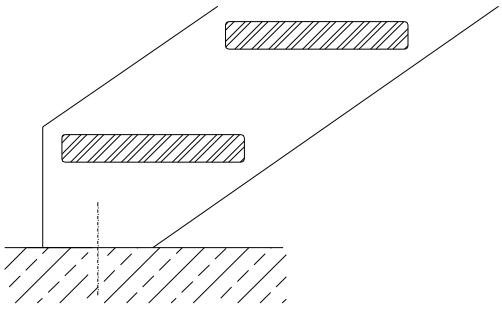
Corner-support of strings



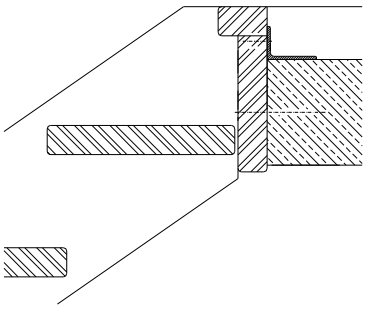
Post-handrail-joint



String joint at the top



String joint at bottom



Relationship of joints to the wood species and types of plan and more details see technical documentation

String stair system Treppenmeister	**Annex A5**
Step-string-joint, String-corner-joint, Corner-support of strings, Post-handrail-joint String joint at the top, String joint at bottom	

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

Component of stair		Material [1]	Dimension		Value	Reaction to fire [5]
Step		Solid wood [2) 3) 4)]	Thickness	[mm]	44	D-s2, d0 (2003/593/EC)
String	String at the wall	Solid wood [2) 3) 4)]	Width x height	[mm]	44 x 240...310 [6)]	D-s2, d0 (2003/593/EC)
	Wall-free string	Solid wood [2) 3) 4)]	Width x height	[mm]	44 x 240...300 [6)]	
Post	At bottom, at the top	Solid wood [2)]	Width x height	[mm]	44 x 70, 55 x 55 [6)]	D-s2, d0 (2003/593/EC)
	Middle post (only glass barrier Type I)	Solid wood [2)]	Width x height	[mm]	55 x 55	
Handrail		Solid wood [2)]	Width x height	[mm]	44 x 70 [7)]	D-s2, d0 (2003/593/EC)
Baluster		Solid wood [2)]	Diameter	[mm]	29	D-s2, d0 (2003/593/EC)
		Steel	Diameter	[mm]	16 (21,3) [8)]	A1 (96/603/EC)
Barrier fillings Type I		Glass ESG-H	Thickness	[mm]	8	A1 (96/603/EC)
Barrier fillings Type II and Type III		Glass ESG-H	Thickness	[mm]	8	A1 (96/603/EC)
		Glass VSG [9)]	Thickness	[mm]	2 x 4 mm [9)]	F (NPD - no performance determined)
Angle joints, wall ties, system fastener		Steel	Diameter	[mm]	- [10)]	A1 (96/603/EC)

1) Characteristic values of material according to technical documentation
2) Only wood of wood species 1:
Amazakoué, Bangkirai, Bongossi, Beech, Oak, Ash, Iroko/Kambala, Merbau, Wengé, Zebrano
3) Only wood of wood species 2:
Maple, Afzelia/Doussié, Acacia/Robinia, Birch, Bubinga, Cherry tree, Nut tree, Elm, Sapelli, Teak, Dibetou, Hevea
4) Only wood of wood species 3: Pine
5) According to the EC decisions
6) Depending on the width of the stair (800…1000 mm), the number of rises, wood species and type of plan according to technical documentation,
7) Depending on type of plan and number of rises according to technical documentation, differing sections see Table 2
8) Value in brackets for railing barrier
9) VSG consisting of 2 x 4 mm ESG and 1.52 mm PVB-foil
10) According to technical documentation

String stair system Treppenmeister

Minimum dimensions of components of the stair and reaction to fire

Annex A6

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Table 2: Differing minimum dimension of sections of posts and handrails

Type of plan	Component	Barrier type	Dimension width x height in mm [1)]
G	post bottom and top	Standard barrier	44 x 70 and 70…110 x 44
G	handrail	Standard barrier	44 x 70 and 70 x 44
		Railing- and Glass barrier Type II and III	44 x 70…110
		Glass barrier Type I	65…170 x 44
VVP	handrail	Glass barrier Type I	44 x 70 and 60…80 x 44
VP	handrail	Glass barrier Type I	44 x 70 and 60…75 x 44
V2	handrail	Railing- and Glass barrier Type II and III	44 x 70 and 70 x 44
		Glass barrier Type I	65…110 x 44
V1	handrail	Glass barrier Type I	44 x 70, 60…70 x 44
VV	handrail	Glass barrier Type I	65…95 x 44

[1)] from…to data and alternatives depend on number of rises
detailed values according to technical documentation

String stair system Treppenmeister	Annex A7
Minimum dimension of sections of posts and handrails	

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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%

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 1991-1-1:2010-12
$\gamma_Q = 1.5$:	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 6

String stair system Treppenmeister	Annex B1
Specification of intended use (Part 1)	

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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 ± 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

String stair system Treppenmeister	Annex B2
Specification of intended use (Part 2)	

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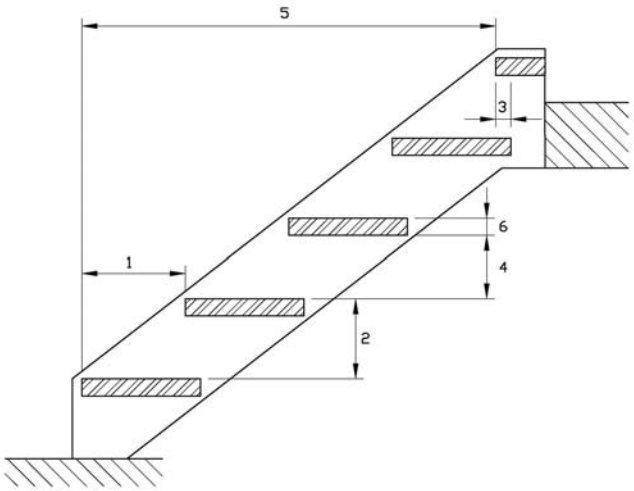
Table 3: Geometry

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	wall side	[mm]	30	- [5]
	wall-free side	[mm]	30	- [5]
Number of rises			3	17
Openings	between barrier and other parts of the stair	[mm]	0	0
	between stairs and wall	[mm]	- [5]	50
	between consecutive steps	[mm]	- [5]	166
	between balusters	[mm]	40	130 (800) [6]
Clear width of stairs		[mm]	500	1000
Minimum headroom		[mm]	- [5]	
Length of the flight		[mm]	- [5]	4160 (5210) [7]
Thickness of steps		[mm]	44	- [5]
Height of the barrier / handrail		[mm]	900	1000
Handrail	width	[mm]	44	170
	height	[mm]	44	110
	clear distance to adjacent components	[mm]	50	- [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) See also Annex A4
7) Value in brackets for stairs with landing



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

String stair system Treppenmeister

Geometry of the stair

Annex C1

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Table 4: 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 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 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 (5210) [1]
deflection under load F_S related to the median line of the 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]	1000
deflection under load F_S related to the clear width of the stair	w	[-]	≤ L/200

[1] Value in brackets for stairs with landing

Table 6: Imposed loads

Type of loading	Imposed loads		
vertical variable uniformly distributed load	q	[kN/m²]	3.0
vertical variable single load	Q	[kN]	2.0
horizontal variable uniformly distributed load on barrier	h	[kN/m]	0.5

String stair system Treppenmeister

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

Annex C2