

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-05/0081
of 16 January 2017

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

Bucher-Stair

Product family
to which the construction product belongs

Prefabricated stair with steps and a load-bearing handrail
made of solid wood for use as an indoor stair in buildings

Manufacturer

Treppenmeister GmbH
Emminger Straße 38
71131 Jettingen

Manufacturing plant

Treppenmeister, Werk 1 bis Werk 85

This European Technical Assessment
contains

18 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

European Assessment Document (EAD)
340006-00-0506

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Specific Part

1 Technical description of the product

The Bucher stair is a prefabricated stair, which consists of steps, railing (consisting of handrail, posts and balusters), fasteners, load-bearing bolts, wall ties and, where required, an intermediate landing.

On the wall-free side the steps are connected with each other by a load-bearing bolt and via balusters with the load-bearing handrail. On the wall side each step is equipped with a wall tie which is anchored in the staircase wall. Alternatively, the staircase wall may also be replaced by a wall string, a cut string or as on the wall-free side by a load-bearing handrail.

The steps, the handrail and the posts are made of solid wood, the distance sleeves and the balusters are made of steel or solid wood and the fasteners, load-bearing bolts and wall ties are made of steel. The intermediate landing consists of a substructure with a plate made of solid wood.

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 documentation¹.

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 holder of this ETA 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 conformity, 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 of stair	See Annex C2
Load-bearing capacity of fixings	See technical documentation of this European Technical Assessment
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 steps.
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 and 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 A6
Fire resistance	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Release of formaldehyde	Wood adhesive does not contain formaldehyde
Release of pentachlorophenol	No pentachlorophenol treated materials are used
Radioactive emission	Not relevant

English translation prepared by DIBt

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	Barrier and handrail are components of the stair (see Annexes A2 to A4 and C1) If vertical balusters, arranged between step and handrail, used as fill-in elements, a climb ability for infants will not be supported Tactility and visibility: No performance assessed
Safe breakage of 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 350 mm. Pendulum tests: test assembly according to EN 12600:2002-11 test performance according to TRAV ²

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

² TRAV: Technical rules for glazings used as barrier against falling down, Version January 2003
(Technische Regeln für die Verwendung von absturzsichernden Verglasungen, Fassung Januar 2003)

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.

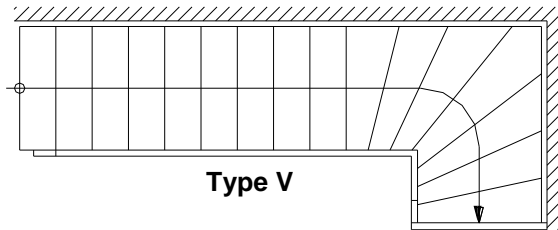
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Uwe Bender
Head of Department

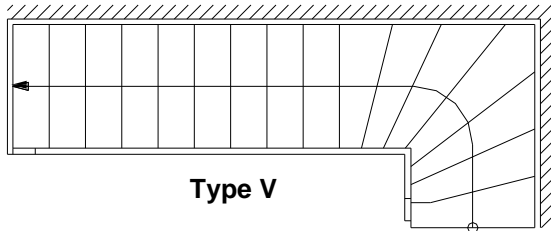
beglaubigt:
Stiller

Types of plan

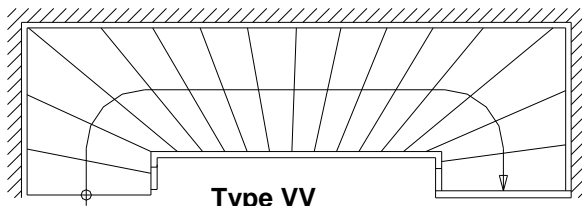
Walking line exemplified, position may be chosen freely within the walking zone, walking zone is 20 % of the clear width of the stair in the middle of the stair



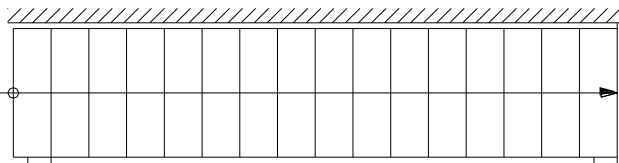
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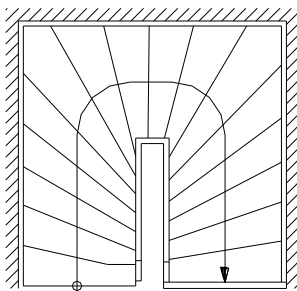
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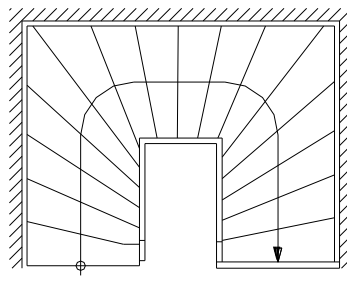
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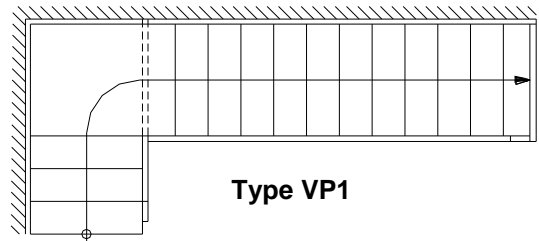
Type G



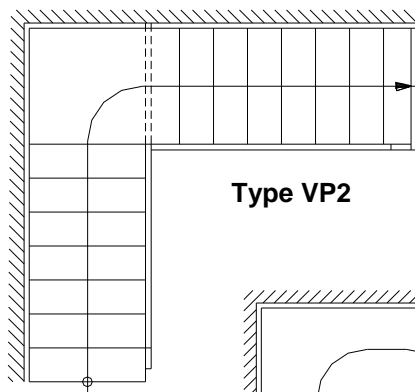
Type H



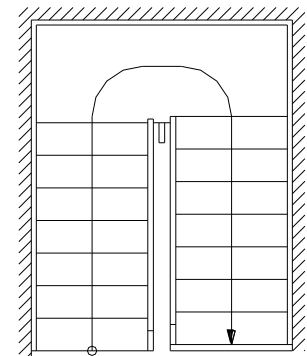
Type H



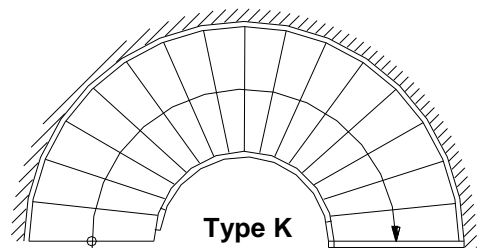
Type VP1



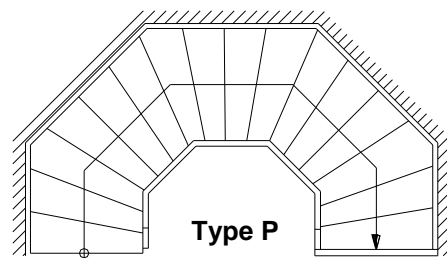
Type VP2



Type HP



Type K



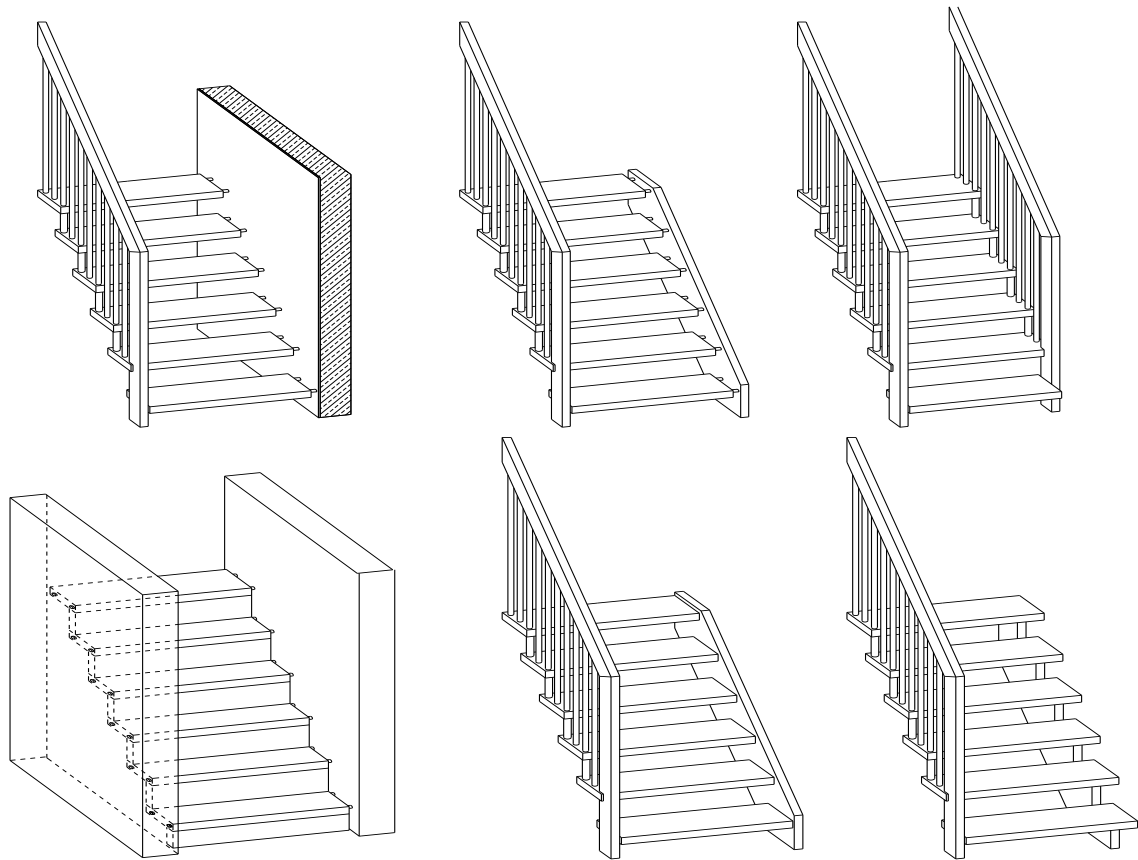
Type P

Bucher - Stair

Product and intended use

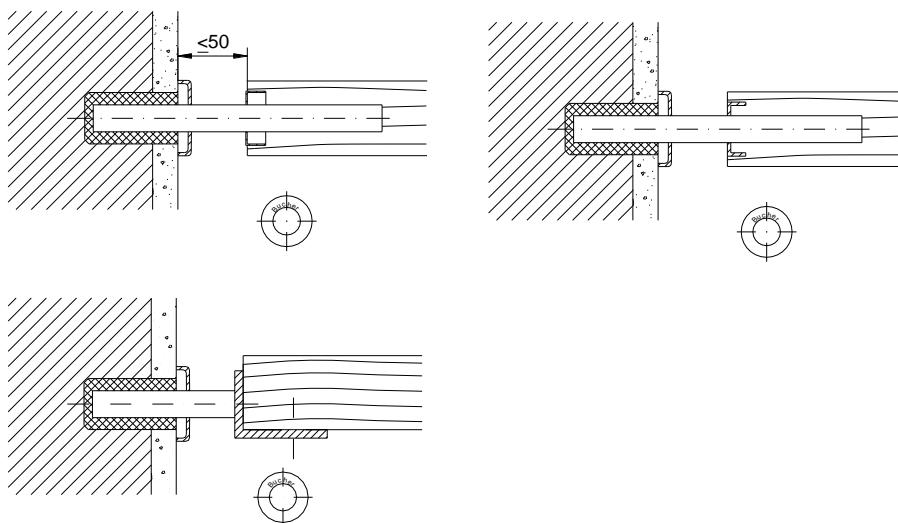
Annex A1

Types of construction



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

Wall ties



Wall tie:

- bearing sleeve
(permanently elastic)
- round steel bar \varnothing 16 mm
- ferrule or U-section
- plastic cover rosette
- angle (for steps between two walls)

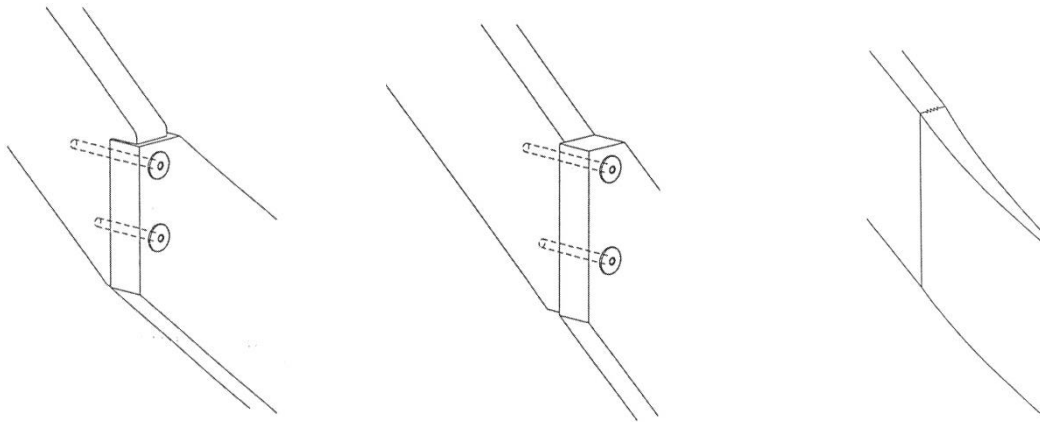
Further details according to the technical documentation

Bucher - Stair

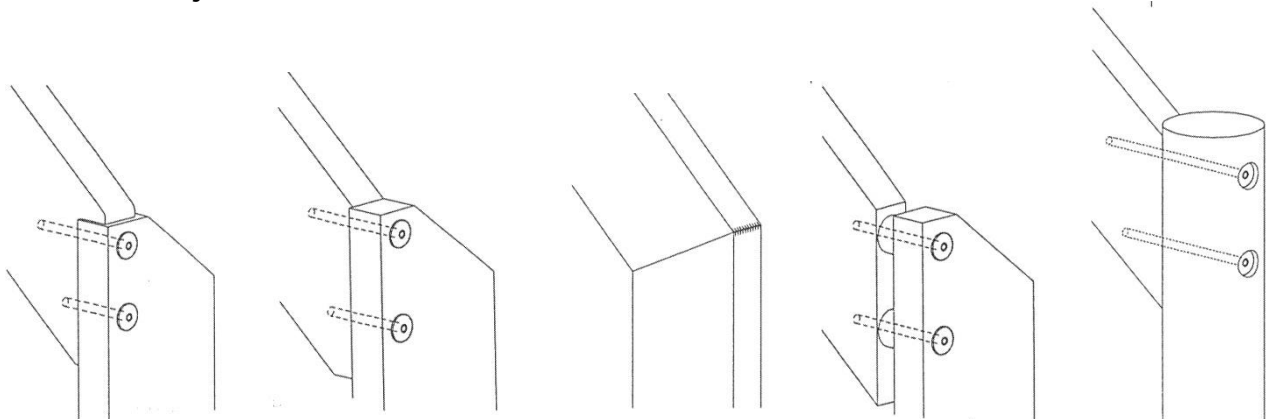
Product and intended use (Types of construction), Wall ties

Annex A2

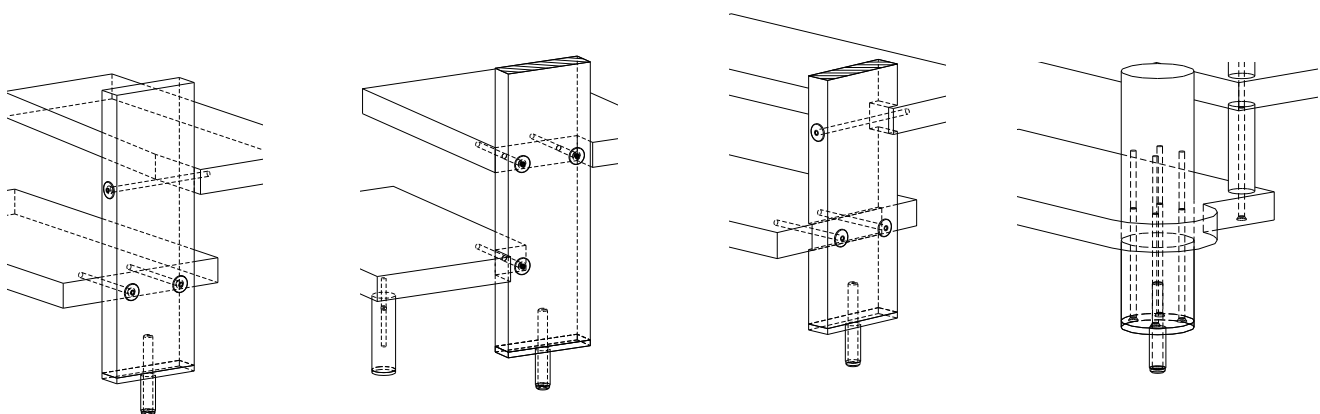
Handrail corner joint



Post - handrail joint



Step - post joint at bottom step



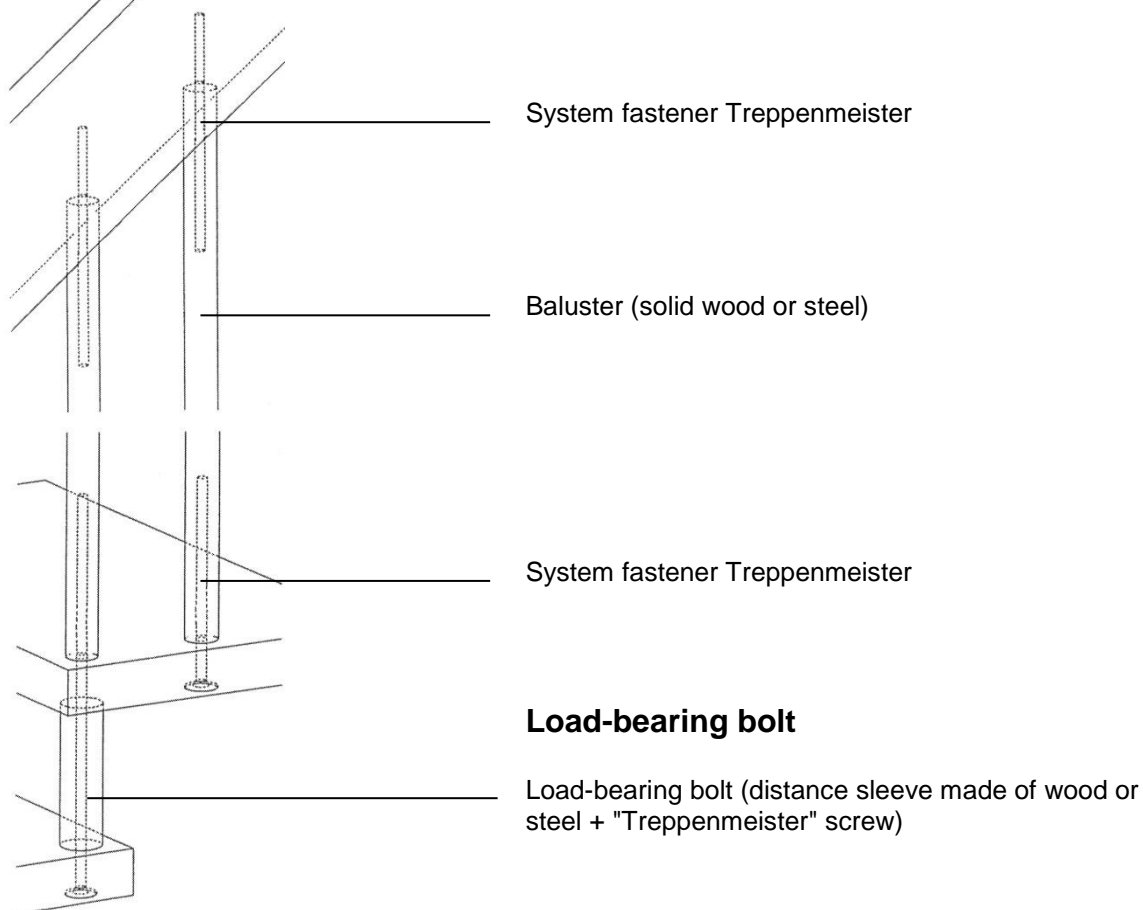
Further details according to the technical documentation

Bucher - Stair

Handrail corner joint, Post-handrail joint,
Step-post joint

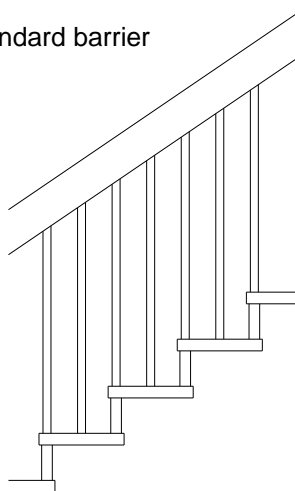
Annex A3

Step-baluster-handrail joint

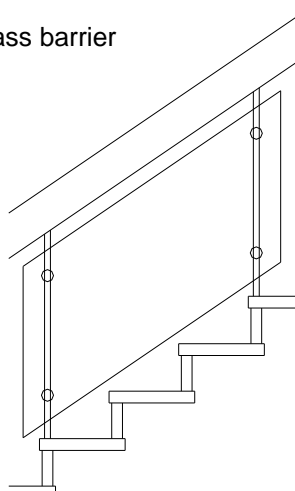


Barrier

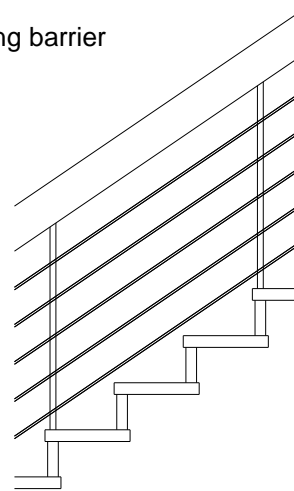
Standard barrier



Glass barrier



Railing barrier



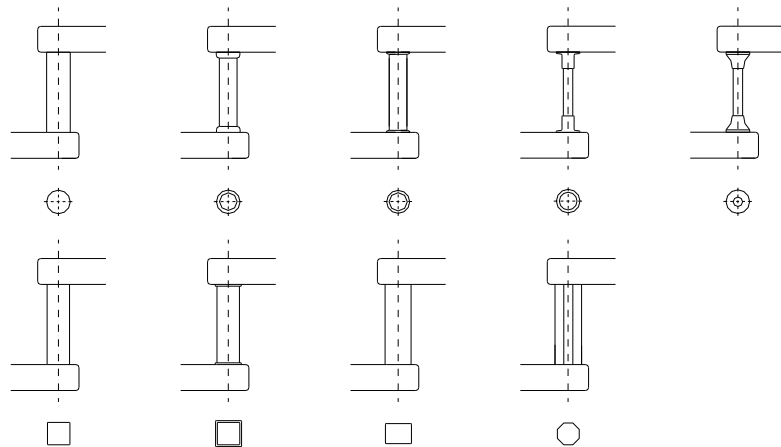
Further details according to the technical documentation

Bucher - Stair

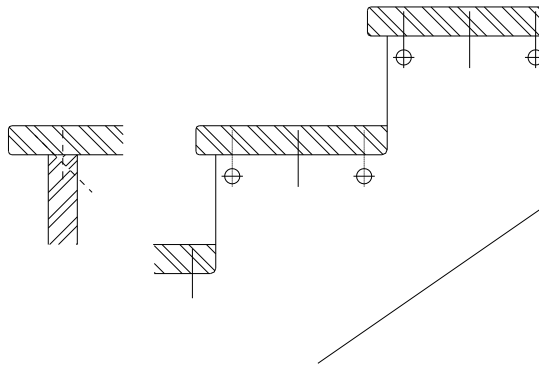
Step-baluster-handrail joint,
Load-bearing bolt, Barrier

Annex A4

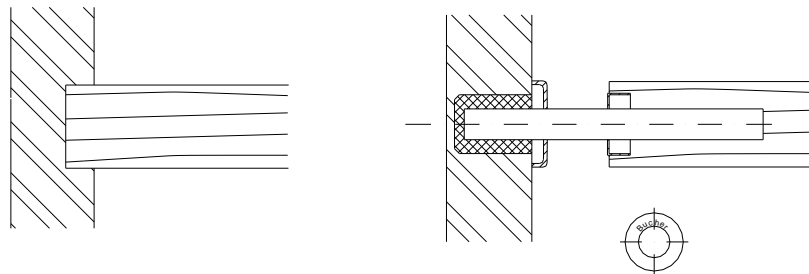
Load-bearing bolt



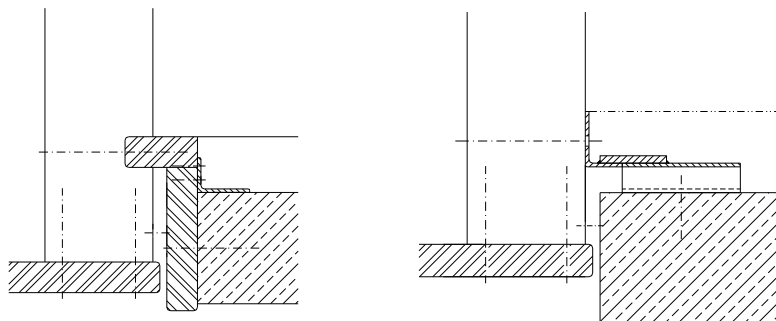
Step - cut string - joint



Step - string - joint



Post joint at the top



Further details according to the technical documentation

Bucher - Stair

Load-bearing bolt, step - string - joints,
post joint at the top

Annex A5

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

Component of stair		Material ¹⁾	Dimension		Value	Reaction to fire
Step		Solid wood ²⁾	Thickness	[mm]	44	D-s2, d0
Upper flange of the railing (handrail)		Solid wood ²⁾	Height / width	[mm]	- ³⁾	D-s2, d0
Post		Solid wood ²⁾	Height / width	[mm]	as handrail 90 / 90	D-s2, d0
Baluster	Standard	Solid wood ²⁾	Diameter	[mm]	30 (26) ⁴⁾	D-s2, d0
		Steel pipe	Ø x thickness	[mm]	16 x 1,5	A1
	Glass or railing	Steel pipe	Ø x thickness	[mm]	21,3 x 2,0	A1
Filling elements		Glass ESG-H	Thickness	[mm]	8	A1
		Glass VSG ⁶⁾	Thickness	[mm]	2 x 4 mm ⁶⁾	no performance assessed
Load-bearing bolt / system fastener		Steel	Diameter	[mm]	10	A1
Distance sleeve (load-bearing bolt)		Solid wood ²⁾	Diameter	[mm]	40 (30) ⁵⁾	D-s2, d0
		Steel	Diameter	[mm]	16 ⁵⁾	A1
Wall ties		Round steel	Diameter	[mm]	16	A1
			Embedment depth wall	[mm]	55	
			Embedment depth step	[mm]	80	
Bearing sleeve (wall tie)		Plastic	Diameter	[mm]	30	Not relevant
Wall string		Solid wood ²⁾	Height / width	[mm]	44 x 240...310 ⁷⁾	D-s2, d0
Cut string			Height / width	[mm]	44 x 150...210 ⁸⁾	

¹⁾ Characteristic values of material according to technical documentation

²⁾ Only wood of following species:

Group 1: Amazakoué, Bangkirai, Bongossi, Beech, Oak, Ash, Iroko/Kambala, Merbau, Wengé, Zebrano

Group 1*: Amazakoué, Bangkirai, Bongossi, Beech, Oak, Ash, Merbau, Wengé,

Group 2: Maple, Afzelia/Doussié, Acacia/Robinia, Birch, Bubinga, Cherry tree, Nut tree, Elm, Sapelli, Teak, Dibetou, Hevea

Group 2*: Maple, Afzelia/Doussié, Acacia/Robinia, Birch, Bubinga, Cherry tree, Nut tree, Teak

Group 2**: Maple, Acacia/Robinia, Birch, Teak

Group 3: Pine, Larch

³⁾ According to Table 2 and technical documentation

⁴⁾ Values in brackets only outside of the embedment range of the system fastener

⁵⁾ Only with a washer $\text{Ø} \geq 40$

⁶⁾ VSG consists of 2 x 4 mm TVG and 1.52 mm PVB-foil

⁷⁾ Dimensions according to ETA-10/0215

⁸⁾ Dimensions according to ETA-13/0197

Bucher - Stair

Minimum dimensions of components of the stair
and reaction to fire

Annex A6

Table 2: Minimum dimensions of handrail cross sections (P, H, VP1, VP2 and K)

Type of plan	Rises	Gr. of wood species	Dimensions of the handrail width x height in mm ¹⁾	
			screwed	finger jointed
P	≤ 17	1	44 x 150...160	44 x 150...160
	≤ 15	1	44 x 120...130	44 x 120...130
		2	44 x 130...140	44 x 130...140
		3	44 x 130...140	44 x 130...140
H	≤ 20	1*	44 x 160...170	44 x 160...170
		2**	44 x 180...190	44 x 180...190
	≤ 17	1	44 x 120...140	44 x 120...140
		2	44 x 130...140	44 x 130...140
		3	44 x 170...200	44 x 140...160
	≤ 15	1	44 x 120	44 x 120
		2	44 x 120	44 x 120
		3	44 x 120	44 x 120
	VP1	≤ 20	1*	-
2**			-	44 x 210
≤ 17		1	-	50 x 170...180
		1*	-	44 x 180
		2	-	50 x 190...200
		2*	-	44 x 190
≤ 15		1	-	44 x 140...160
		2	-	50 x 160...180
		2*	-	44 x 170
VP2	≤ 20	1*	-	44 x 200
		2*	-	44 x 210
	≤ 17	1	-	50 x 170...180
		1*	-	44 x 170...180
		2*	-	44 x 180...190
	≤ 15	1	-	44 x 150...160
		2	-	50 x 160...170
2*		-	44 x 160...170	
K	≤ 17	1	44 x 150...160	44 x 150...160
	≤ 15	1	44 x 120...130	44 x 120...130
		2	44 x 130...140	44 x 130...140
		3	44 x 130...140	44 x 130...140

¹⁾ From...to data depend on the clear width of the stair (850...1000 mm) and the type of barrier, Intermediate values according to technical documentation

Bucher - Stair

Minimum dimensions of handrail cross sections (P, H, VP1, VP2 and K)

Annex A7

Table 3: Minimum dimensions of handrail cross sections (G, HP, V and VV)

Type of plan	Rises	Gr. of wood species	Dimensions of the handrail width x height in mm ¹⁾		
			screwed	finger jointed	
G, HP	≤ 20	1*	44 x 200	44 x 200	
		2**	-	44 x 210	
	≤ 17	1	50 x 160...180	50 x 160...180	
		1*	44 x 170...180	44 x 170...180	
		2	50 x 190...200	50 x 190...200	
		2*	-	44 x 180...190	
		3	-	53 x 180...200	
	≤ 15	1	50 x 140...160 (44 x 120...140) ²⁾	50 x 140...160 (44 x 120...140) ²⁾	
		1*	44 x 140...160	44 x 140...160	
		2	50 x 160...180 (44 x 130...150) ²⁾	50 x 160...180 (44 x 130...150) ²⁾	
		2*	-	44 x 150...170	
		3	50 x 180...200 (44 x 130...150) ²⁾	44 x 160...180 (44 x 130...150) ²⁾	
	V	≤ 20	1*	-	44 x 200
			2**	-	44 x 210
		≤ 17	1	50 x 170...180	50 x 170...180
1*			44 x 180	44 x 180	
2			-	58 x 180...220 ³⁾	
2**			-	44 x 190	
≤ 15		1	44 x 130...140	44 x 130...140	
		2	44 x 150...160	44 x 150...160	
		3	44 x 150...160	44 x 150...160	
VV	≤ 20	1*	44 x 170...180	44 x 170...180	
		2**	-	44 x 180...190	
	≤ 17	1	44 x 130...150	44 x 130...150	
		2	44 x 140...160	44 x 140...160	
		3	44 x 140...160	44 x 140...160	
	≤ 15	1	44 x 120...140	44 x 120...140	
		2	44 x 130...150	44 x 130...160	
		3	44 x 130...150	44 x 130...160	

¹⁾ From...to data depend on the clear width of the stair (850...1000 mm) and type of barrier, Intermediate values according to technical documentation

²⁾ Values in bracket for stairs with 10 rises maximum

³⁾ Maximum clear width of the stair: 950 mm

Bucher - Stair

Minimum dimensions of handrail cross sections (G, HP, V and VV)

Annex A8

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 applies 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 5

γ_M : recommended material partial safety factor; see Table 5

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 7

Bucher - 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 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 $8 \pm 2 \%$
- 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 and of retightens the bolting of the load-bearing bolts and connections according to Annexes A2 to A4 after the first heating season and the information on the relationship between moisture content of timber components, air temperature and relative air humidity

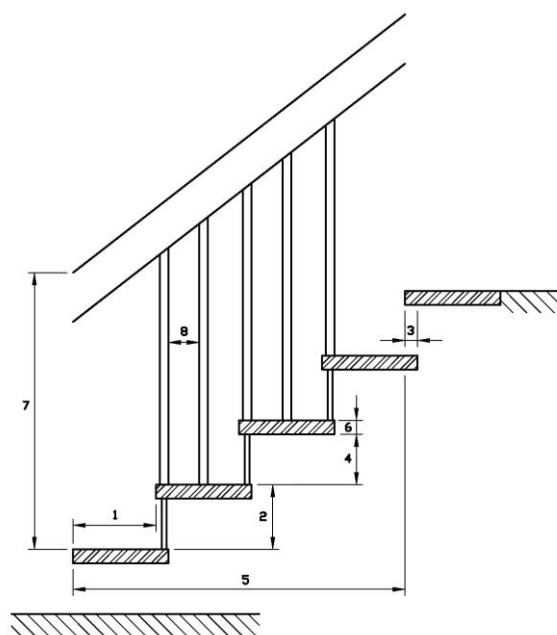
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Bucher - Stair	Annex B2
Specification of intended use (Part 2)	

Table 4: 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]	60	- ⁵⁾
Number of rises			3	20
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	840 ⁶⁾
Clear width of stairs		[mm]	500	1000
Minimum headroom		[mm]	- ⁵⁾	
Length of the flight		[mm]	- ⁵⁾	4940
Thickness of steps		[mm]	44	- ⁵⁾
Height of the barrier / handrail		[mm]	900	1000
Handrail	Width	[mm]	44	58
	Height	[mm]	120	210
	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) With filling elements according to Annex A4



- 1 Going**
- 2 Rise**
- 3 Overlap**
- 4 Opening between consecutive steps**
- 5 Length of the flight**
- 6 Thickness of steps**
- 7 Height of the railing / barrier**
- 8 Opening between balusters**

Bucher - Stair

Geometry of the stair

Annex C1

Table 5: Load-bearing capacity – Characteristic values of resistance

Type of loading	Characteristic values of resistance			γ_M ¹⁾
vertical variable uniformly distributed load	$q_{R,k}$	[kN/m ²]	5,0	1,1
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, in absence of other national regulations

Table 6: Deflections under loading

Deflection 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	L	[mm]	4940
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			
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	[-]	$\leq L/200$

Table 7: Imposed loads

Type of loading	Imposed loads		
vertical variable uniformly distributed load	q	[kN/m ²]	3.0
vertical variable single load	Q	[kN]	2.0
horizontal variable uniformly distributed load on barrier	h	[kN/m]	0.5

Bucher - Stair

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

Annex C2