

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

ETA-07/0068  
of 7 December 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

Stair System "treppen arte"

Product family  
to which the construction product belongs

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

Manufacturer

treppen arte Auburger GmbH  
Hacklsberg 8  
93170 Bernhardswald/Pettenreuth  
DEUTSCHLAND

Manufacturing plant

Auburger GmbH, Werk 1-6

This European Technical Assessment  
contains

17 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

**European Technical Assessment**  
**ETA-07/0068**

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English translation prepared by DIBt

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## Specific Part

### 1 Technical description of the product

The Stair System "treppen arte" is a prefabricated stair, which consists of steps, a railing (consisting of handrail, posts and balusters), fasteners, load-bearing bolts and wall ties.

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 two wall ties which are anchored in the staircase wall. Alternatively, the staircase wall may also be replaced by a stringer or as on the wall-free side by a load-bearing handrail.

The steps, the handrail and the posts are made of solid wood or wood-based products, the balusters and the distance sleeves are made of steel or solid wood and the fasteners, load-bearing bolts 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<sup>1</sup>.

### 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.

<sup>1</sup> 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 C3
Load-bearing capacity of fixings	See technical documentation of this European Technical Assessment
Load/displacement behaviour	See Annex C3
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 A7
Fire resistance	No performance assessed

#### 3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Release of formaldehyde	Class E1
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 and C2
Slipperiness	No performance assessed
Equipment of the stair for a safe use	Barrier and handrail are components of the stair (see Annexes A4, C1 and C2) 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
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

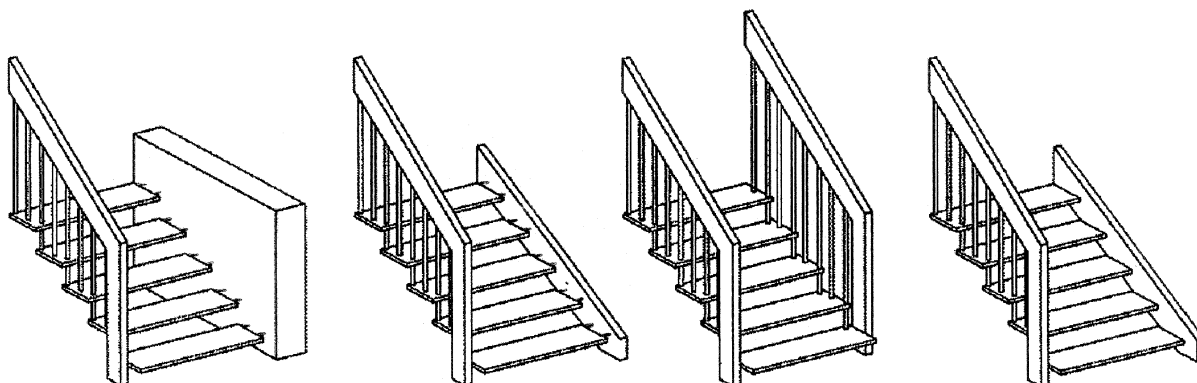
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 7 December 2017 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow  
Head of Department

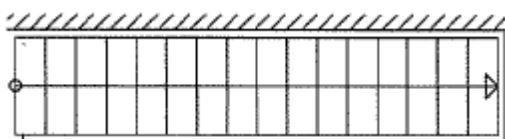
*beglaubigt:*  
Stiller

## Types of construction

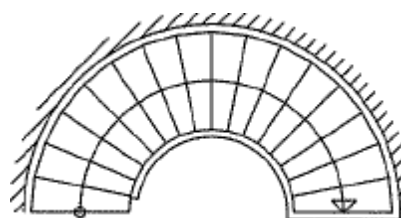
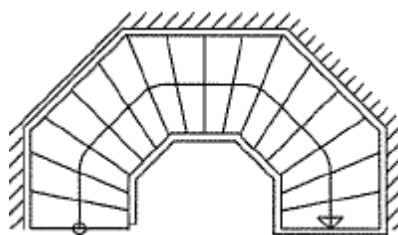
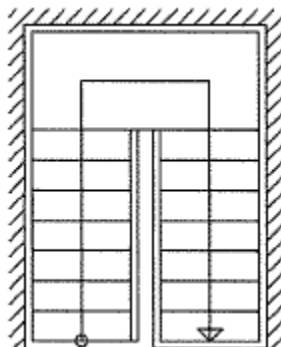
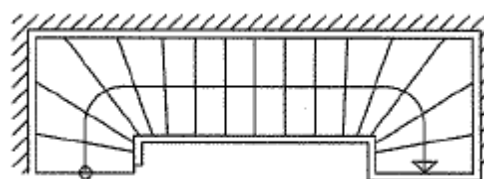
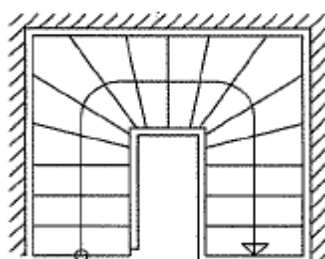
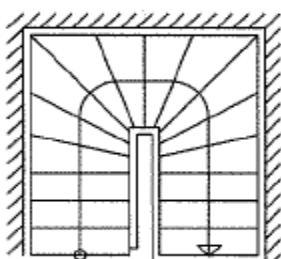
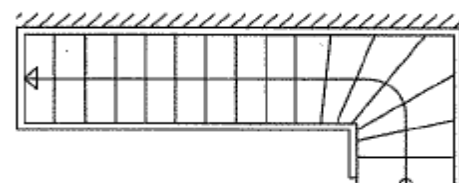
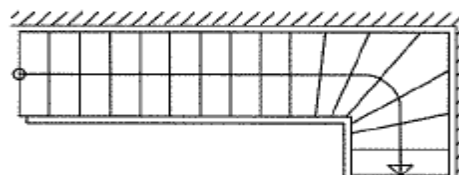


constructions with stringer or handrail on both sides:  
horizontal wall fastening according to the technical documentation

## Types of plan



walking line is 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

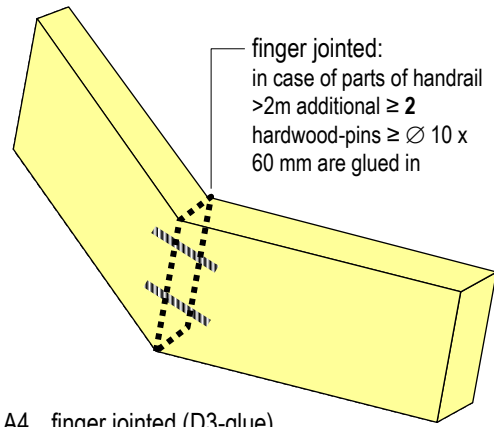
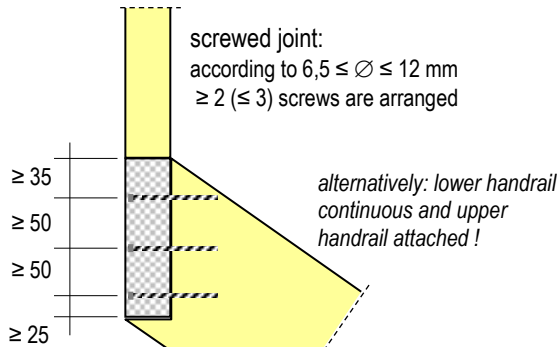


Treppen-System "treppen arte"

Product

Annex A1

**Principle: handrail corner joint (possible types)**



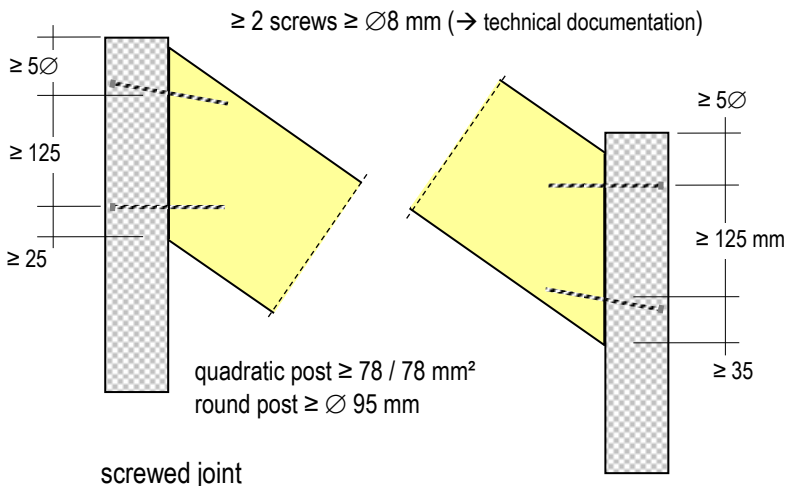
types:

- A1...hexagon head wood screw
- A2...hexagon head bolt with Rampa screwed insert\*
- A3...special screw\*

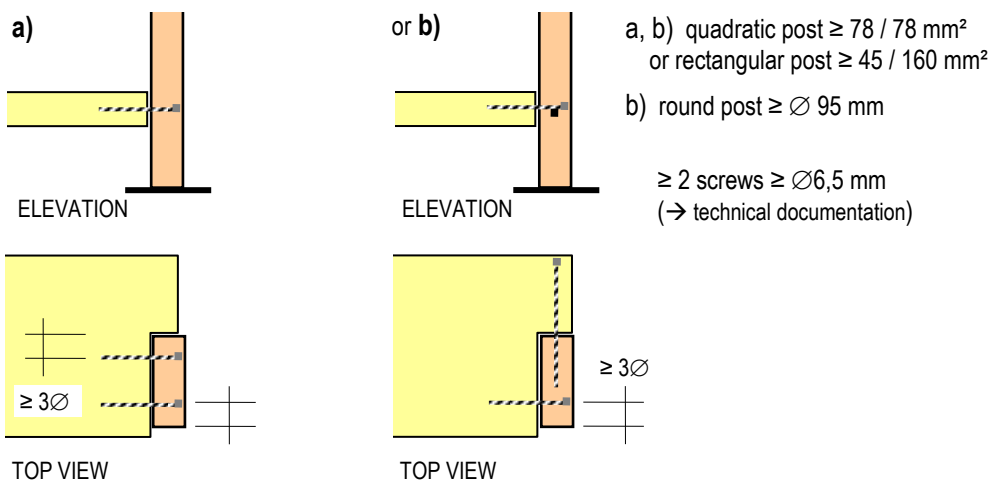
A4...finger jointed (D3-glue)

\*more details according to technical documentation

**Principle: post – handrail joint (possible types)** → A1, A2, A3, A4



**Principle: step – post joint (possible types)** → A1, A2, A3

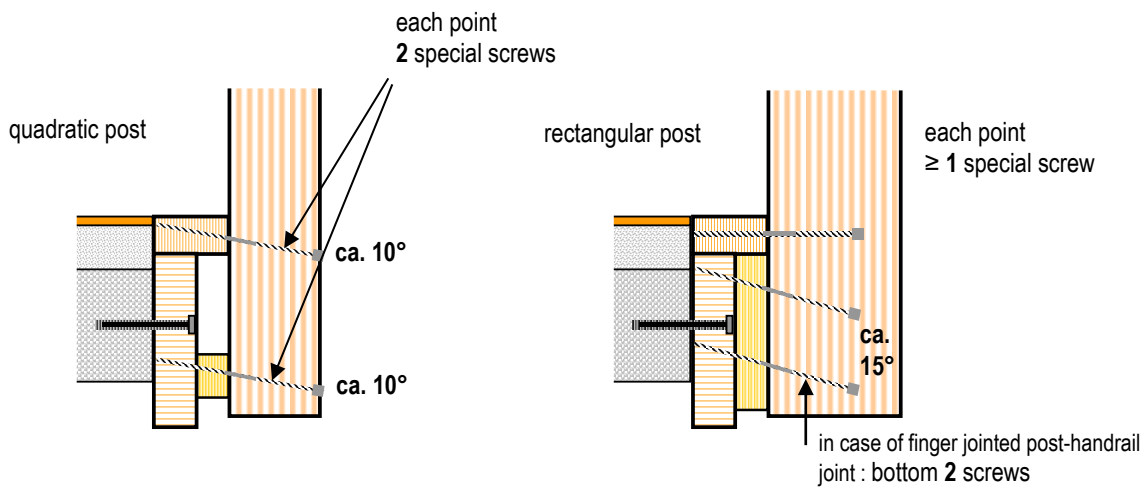
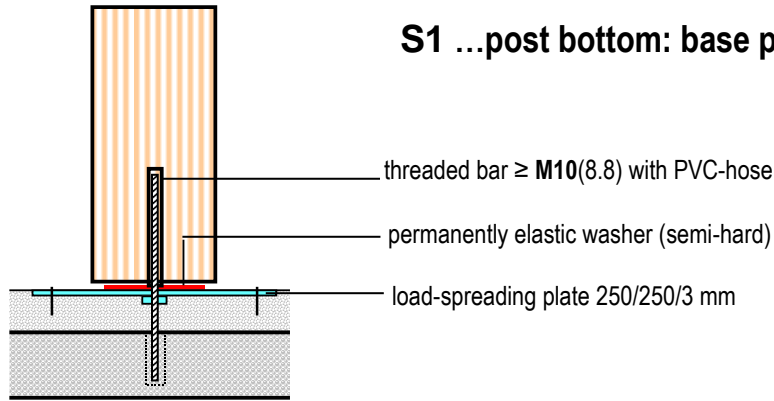


**Treppen-System “treppen arte“**

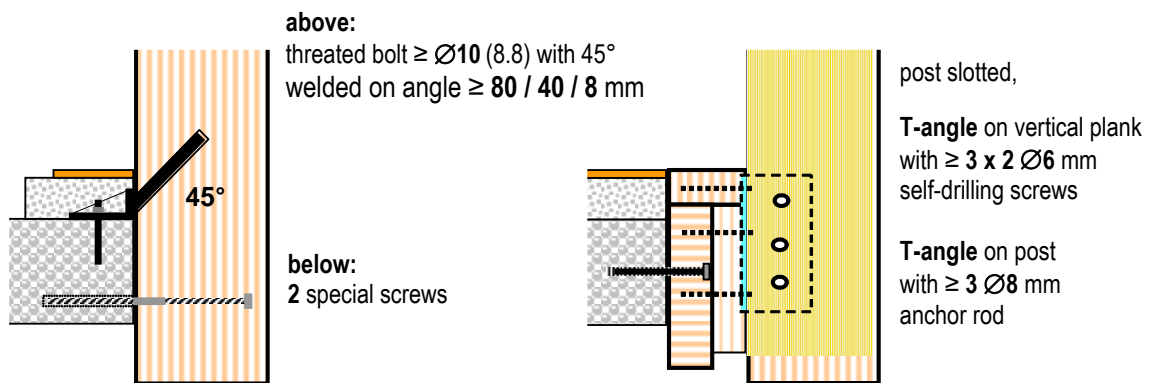
Handrail corner joint, post – handrail joint,  
Step – post joint

**Annex A2**

### S1 ...post bottom: base point



### S2 ...post at the top: post-plank-joint



### S3 ...post at the top: post-floor slab-joint

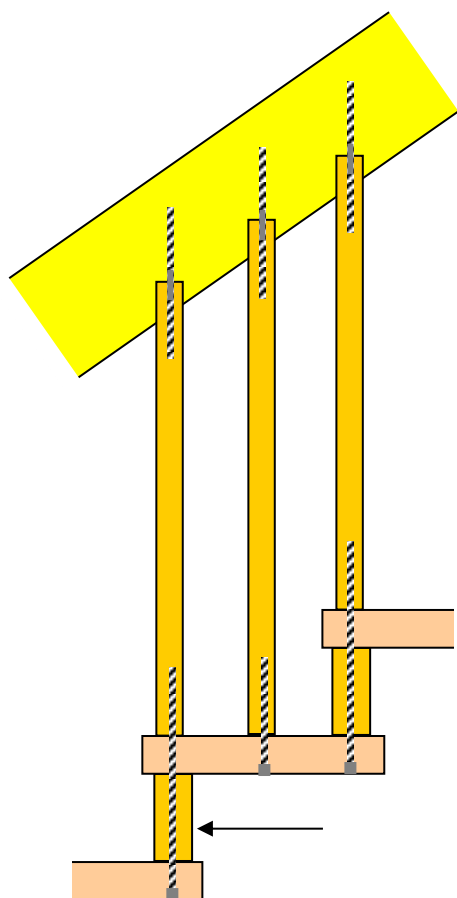
## Treppen-System "treppen arte"

"S1" special base point post bottom  
"S2, S3" special fastening post at the top

Annex A3



### Step-baluster-handrail-joint



**Joint:** V1...double ending screw with Rampa screwed insert  
V2...hexagon head bolt (steel baluster)  
V3...special screw

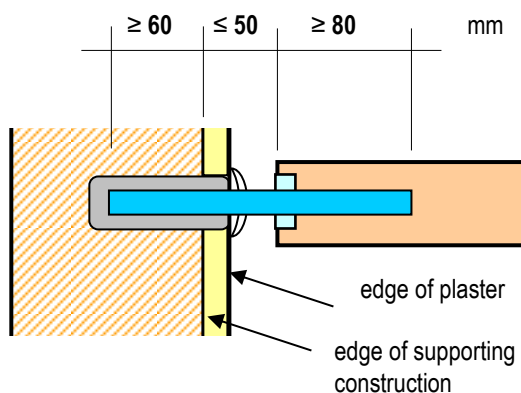
**Baluster:** G1...wood  $\geq \varnothing 26$  mm  
G2...steel pipe  $\geq \varnothing 16$  mm  
G3...wood core  $\geq \varnothing 18$  mm +steel pipe  $\geq \varnothing 20$  mm  
cross drilling in wood balusters  
according to technical documentation.

**Coupling:** K1...hexagon head wood screw  $\varnothing 12$  mm  
K2...hexagon head bolt (steel baluster)  
K3...special screw

### Load-bearing bolt

distance sleeve made of wood ( $\varnothing 40$ mm)  
or steel pipe ( $\geq \varnothing 16$ mm, with cap plate  $\geq \varnothing 40$ mm)  
screws: types K1, K2 or K3 (Auburger-Systems)

### Wall tie



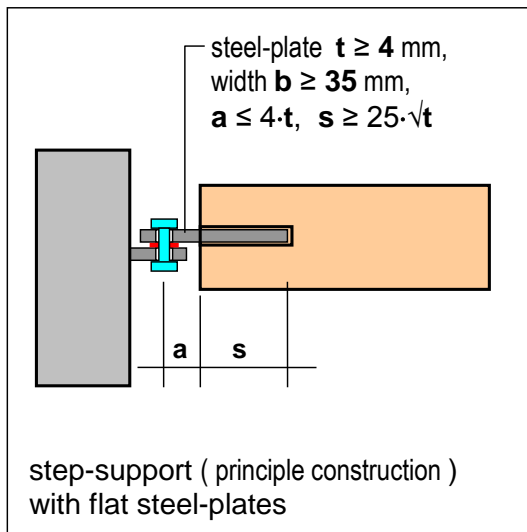
wall tie ( alternative see Annex 5 )...

...permanently elastic bearing sleeve "Auburger"  
...round steel bar  $\varnothing 16$  mm  
...ferrule  
...plastic cover rosette

### Treppen-System "treppen arte"

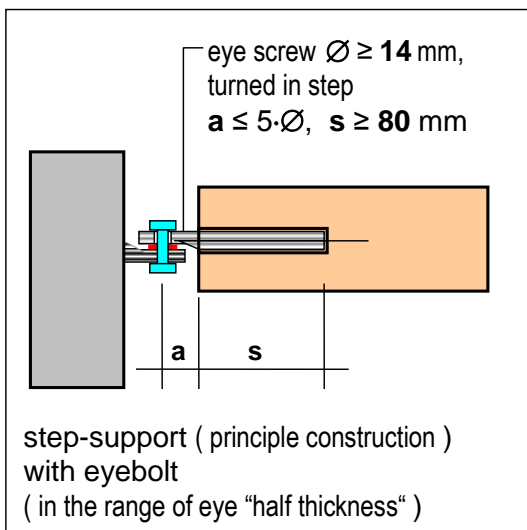
Step-baluster-handrail-joint  
Load-bearing bolt, Wall tie

Annex A4

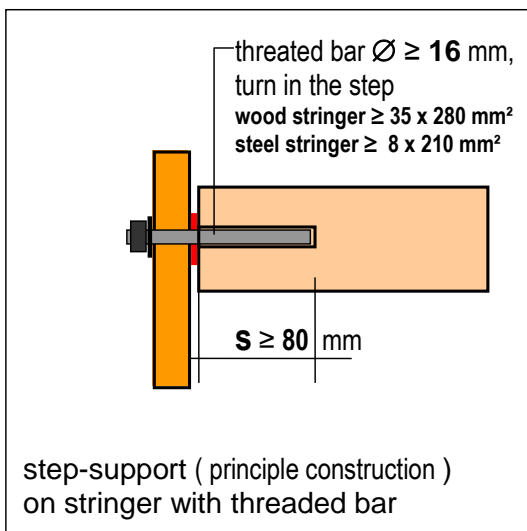


### St1 ...support

*steps made of wood-based panel products:  
cross tension locking according to  
technical documentation*



### St2 ...support



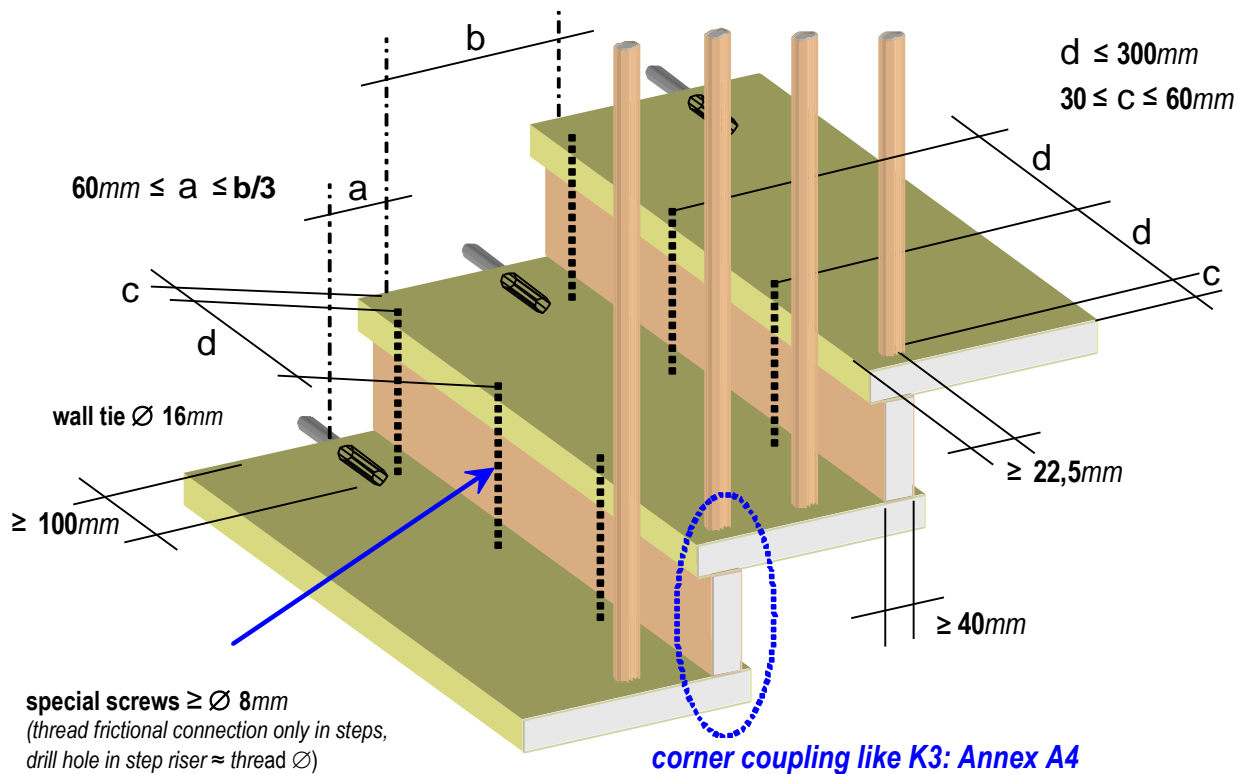
### St3 ...support

*horizontal wall fastening of the stringers  
according to technical documentation*

## Treppen-System "treppen arte"

"St 1,2,3" special step-supports

Annex A5



"KTS" ... special-step-coupling (connection between step tread and step riser with special screws)

Treppen-System "treppen arte"

"KTS" special-step-coupling

Annex A6

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

component of stair	material <sup>4)</sup>	dimension		value	reaction to fire <sup>6)</sup>
steps	solid wood or wood-based products <sup>1)</sup>	thickness	[mm]	45 <sup>2)</sup>	D-s2, d0
upper flange of the railing / handrail	solid wood or wood-based products <sup>1)</sup>	height / width	[mm]	160 / 45 <sup>2)</sup>	D-s2, d0
post	solid wood or wood-based products <sup>1)</sup>	cross section a / b	[mm]	78 / 78 bzw. 160 / 45 <sup>2)</sup>	D-s2, d0
		diameter	[mm]	95	
baluster	solid wood <sup>1)</sup>	diameter	[mm]	26	D-s2, d0
	steel	diameter x wall thickness	[mm]	16 x 1,5	A1
	wood core with steel pipe	diameter wood core	[mm]	18	no performance assessed
load-bearing bolt	steel	- <sup>3)</sup>		- <sup>3)</sup>	A1
distance sleeve (load-bearing bolt)	steel	diameter	[mm]	16 <sup>5)</sup>	
		solid wood <sup>1)</sup>	diameter	[mm]	40
system fasteners	steel	- <sup>3)</sup>		- <sup>3)</sup>	A1
wall ties	round steel	- <sup>3)</sup>		- <sup>3)</sup>	A1
		embedment depth wall	[mm]	60	
		embedment depth step	[mm]	80	
bearing sleeve (wall tie)	plastics	diameter	[mm]	30	not relevant

<sup>1)</sup> only **hardwood** of following species: maple, beech, oak <sup>B)</sup>, ash, jatoba, merbau as well as only **hardwood-based panel products\*** of following species: **(FS)** beech-multiplex <sup>C)</sup> and **(LS)** ..bamboo-II <sup>A)</sup>,..beech-**ALU** <sup>A)</sup>

abbreviation: **(FS)** veneer-laminated-wood, **(LS)** layer-laminated-wood, **ALU** aluminium.

**A)** only for steps...**B)** not used for parts of handrails > 3,0 m...**C)** not used for parts of handrails > 2,0 m

\*not allowed for balusters and load-bearing sleeves, layer composition according to technical documentation

<sup>2)</sup> more dimensions according to technical documentation

<sup>3)</sup> characteristic values according to technical documentation

<sup>4)</sup> characteristic values of materials according to technical documentation

<sup>5)</sup> only in connection with a metallic washer diameter ≥ 40 mm

**Treppen-System "treppen arte"**

Minimum dimensions of components of stair and reaction to fire

**Annex A7**

## 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 4

$\gamma_M$ : 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

**Treppen-System "treppen arte"**

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 A6 after the first heating season and the information on the relationship between moisture content of timber components, air temperature and relative air humidity

**Treppen-System "treppen arte"**

Specification of intended use (Part 2)

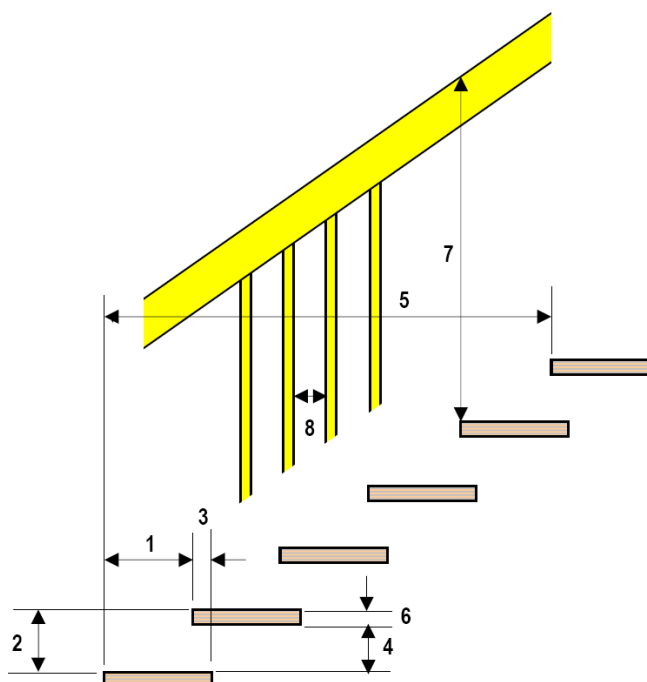
**Annex B2**

**Table 2: Geometry standard design**

Bezeichnung			Maß	
			minimal	maximal
going	step on walking line <sup>1)</sup>	[mm]	210	370 <sup>2)</sup>
	tapered step	[mm]	60 <sup>2) 3)</sup>	600 <sup>2) 4)</sup>
rise of the stair <sup>1)</sup>		[mm]	140 <sup>2)</sup>	210
pitch of the walking line <sup>1)</sup>		[°]	21	45
overlap of the steps		[mm]	30	- <sup>5)</sup>
number of rises		[-]	3	16 (17) <sup>6)</sup>
openings	between barrier and other parts of the stair	[mm]	0	0
	between stairs and wall	[mm]	- <sup>5)</sup>	50
	between consecutive steps	[mm]	- <sup>5)</sup>	165
	between balusters	[mm]	40	370
clear width of stairs		[mm]	500	1000
minimum headroom		[mm]	- <sup>5)</sup>	
length of the flight		[mm]	- <sup>5)</sup>	4000 (4250) <sup>6)</sup>
thickness of steps		[mm]	45	- <sup>5)</sup>
height of the railing (barrier) / handrail		[mm]	900	1000
handrail	width	[mm]	45	60
	height	[mm]	160	- <sup>5)</sup>
	clear distance to adjacent components	[mm]	50	- <sup>5)</sup>

- 1) values are constant within one flight
- 2) tolerance between nominal value and actual value ± 5 mm
- 3) inside of tapered steps
- 4) outside of tapered steps
- 5) not relevant
- 6) (special construction) 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
- 7 height of railing / barrier
- 8 opening between balusters



**Treppen-System "treppen arte"**

Geometry of stair  
standard design

**Annex C1**

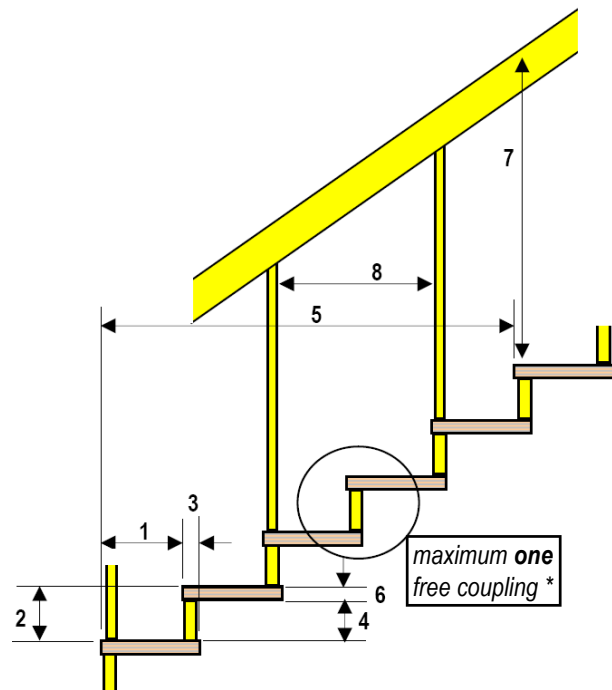
**Table 3: Geometry special design**

designation			dimension	
			minimum	maximum
going	Step on walking line <sup>1)</sup>	[mm]	210	370 <sup>2)</sup>
	tapered step	[mm]	60 <sup>2) 3)</sup>	600 <sup>2) 4)</sup>
rise of the stair <sup>1)</sup>		[mm]	140 <sup>2)</sup>	210
pitch of the walking line <sup>1)</sup>		[°]	21	45
overlap of the steps		[mm]	30	- <sup>5)</sup>
number of rises		[-]	3	16 (17) <sup>6)</sup>
opening	between barrier and other parts of the stair	[mm]	0	0
	between stairs and wall	[mm]	- <sup>5)</sup>	50
	between consecutive steps	[mm]	- <sup>5)</sup>	165
	between balusters	[mm]	40	740
clear width of stairs		[mm]	500	1000
minimum headroom		[mm]	- <sup>5)</sup>	
length of the flight		[mm]	- <sup>5)</sup>	4000 (4250) <sup>6)</sup>
thickness of steps		[mm]	45	- <sup>5)</sup>
height of the railing (barrier) / handrail		[mm]	900	1000
handrail	width	[mm]	45	60
	height	[mm]	160	- <sup>5)</sup>
	clear distance to adjacent components	[mm]	50	- <sup>5)</sup>

- 1) values are constant within one flight  
 2) tolerance between nominal value and actual value  $\pm 5$  mm  
 3) inside of tapered steps  
 4) outside of tapered steps  
 5) not relevant  
 6) (special construction) 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  
 7 height of the railing (baluster) / handrail  
 8 opening between balusters

*\* in the range of the inner winding  
 maximum 2 free couplings;  
 design of the free couplings  
 according to technical documentation*



**Treppen-System "treppen arte"**

Geometry of stair  
special design

**Annex C2**



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

Type of loading	Characteristic values of resistance			$\gamma_M$ <sup>1)</sup>
vertical variable uniformly distributed load	$q_{R,k}$	[kN/m <sup>2</sup> ]	6,8	1,5
vertical variable single load	$Q_{R,k}$	[kN]	4,5	
horizontal variable uniformly distributed load on barrier	$h_{R,k}$	[kN/m]	0,8	

<sup>1)</sup> Recommended partial safety factor, 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/m <sup>2</sup> ]	3.0
length of the median line of the flight	L	[mm]	4000 (4950) <sup>1)</sup>
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 6: Imposed loads**

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

**Treppen-System “treppen arte“**

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

**Annex C3**