

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-10/0094
of 27 April 2015

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 bold stair WE1 and WF2 System "Thumm"

Product family
to which the construction product belongs

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

Manufacturer

Thumm & Co.
In der Au 14
72622 Nürtingen
DEUTSCHLAND

Manufacturing plant

Thumm & Co., Werk 1-20

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

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.

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 has to 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This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission according to Article 25 Paragraph 3 of Regulation (EU) No 305/2011.

Specific Part

1 Technical description of the product

The load-bearing bolt stair WE1 and WF2 System "Thumm" is a prefabricated stair system which consists of steps made of natural stone or artificial stone (cement bonded or reaction resin bonded), load-bearing bolts and wall ties.

The steps consist of two plates that are glued together by an intermediate GFK-layer.

On the wall side and on the wall-free side the steps of the WF2-stair are connected with each other by one load-bearing bolt per side. On the wall side each step is equipped with one wall tie, which is anchored in the staircase wall. In the area of openings in the wall alternatively a construction with fixed load-bearing bolts and strengthened wall ties at the beginning and at the end or a steel beam (wall-replacement-beam according to Annex A3) can be used.

The steps of the WE1-stair are connected with each other by a load-bearing bolt on the wall-free side. On the wall side the steps are embedded in the wall.

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 C3
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
Resistance of fixings	See technical documentation of this European Technical Assessment

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	See Annex A5
Fire resistance	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

Essential characteristic	Performance
Geometry	See Annex C1
Slipperiness	No performance assessed
Equipment of the stair for a safe use	No performance assessed
Safe breakage of components	No brittle failure of individual components
Impact resistance	Verified for steps made of natural stone or artificial stone up to a fall height of a steel weight (50 kg) of 200 mm

English translation prepared by DIBt

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.

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	Surfaces of components from natural stone and artificial stone (steps) non-treated or polished

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 A5, Table 2	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.

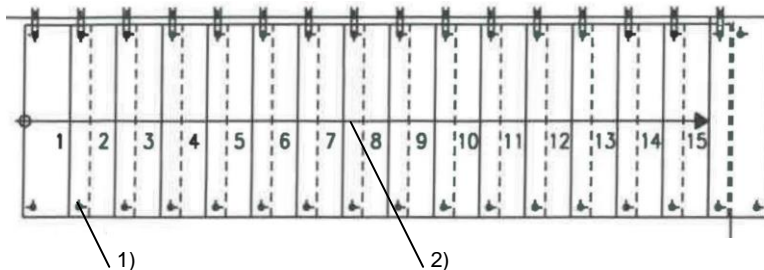
Issued in Berlin on 27 April 2015 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Wittstock

Types of plan

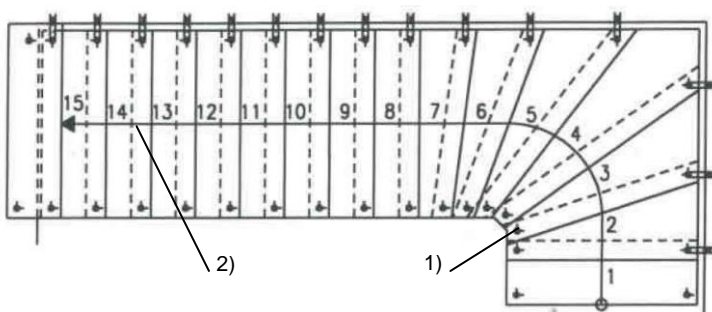
Type 16G



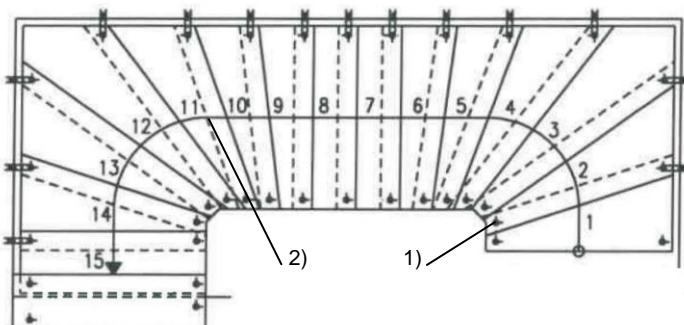
In the area of openings wall-replacement-beams are possible (see Annex A3).

- 1) additional support (according to Annex C2)
- 2) 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

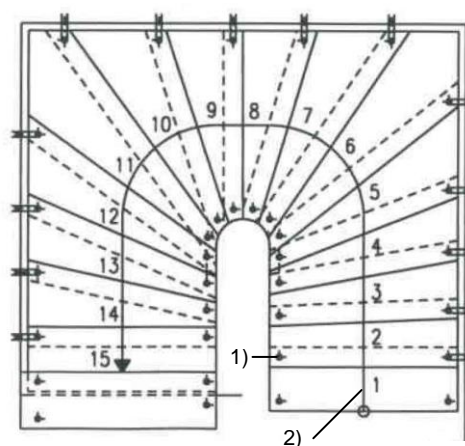
Type 16V



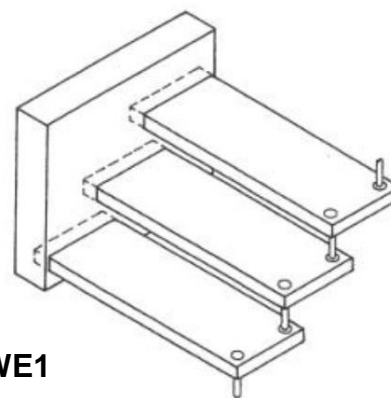
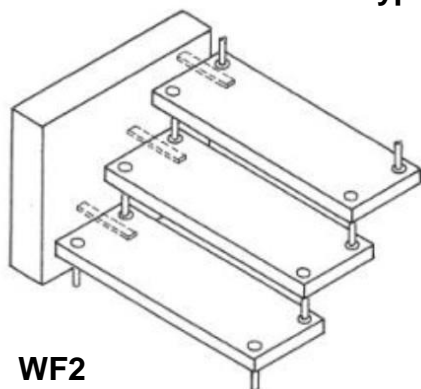
Type 16VV



Type 16H



Types of construction

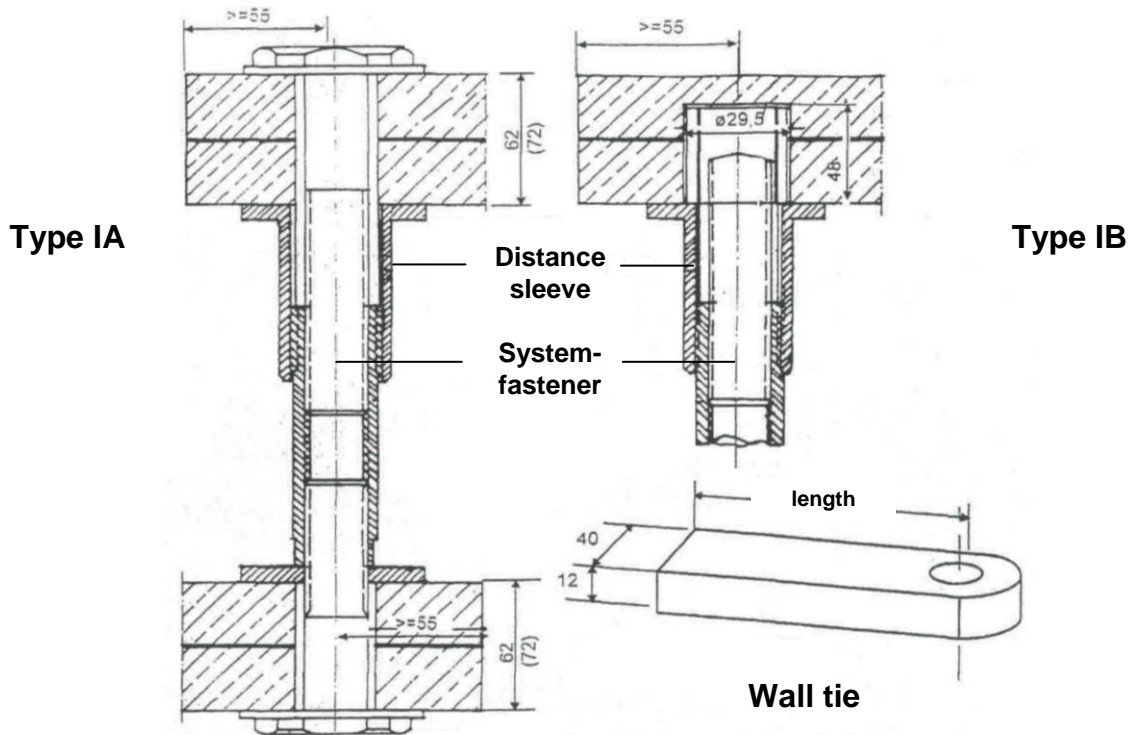


Load-bearing bolt stair WE1 and WF2 System "Thumm"

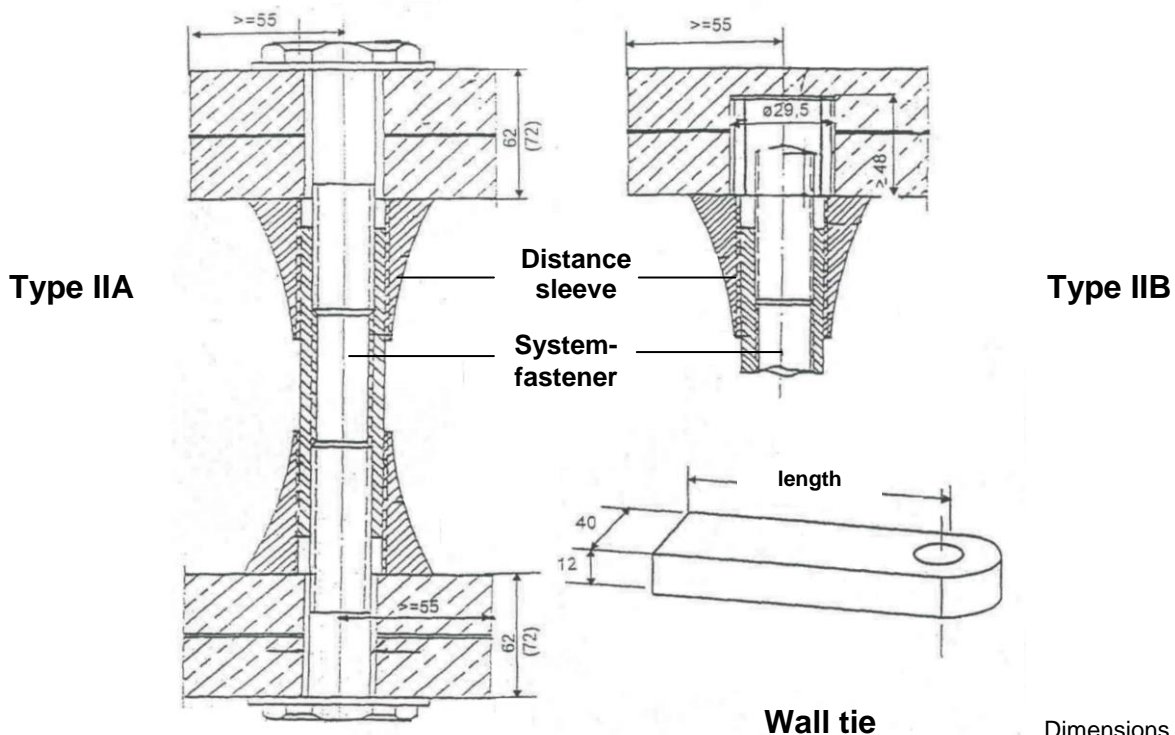
Product and intended use

Annex A1

Load-bearing bolt joint Type I



Load-bearing bolt joint Type II



Dimensions in mm

Load-bearing bolt stair WE1 and WF2 System "Thumm"

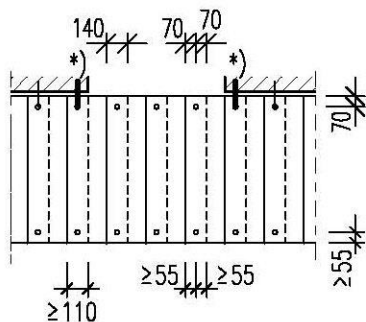
Load-bearing bolt joint and wall tie (standard joint)

Annex A2

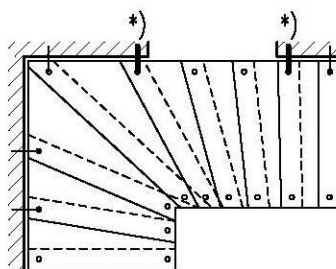
Wall-replacement-beam

a) Load-bearing bolt Type III or IV with strengthened wall ties

4 goings in the area
of straight steps



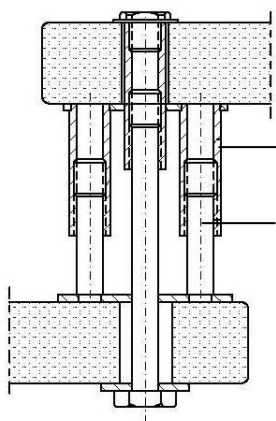
3 goings in the area
of tapered steps



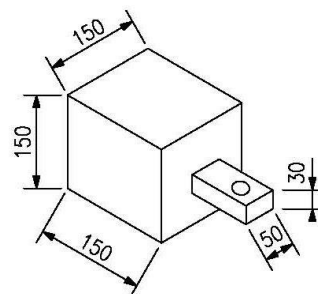
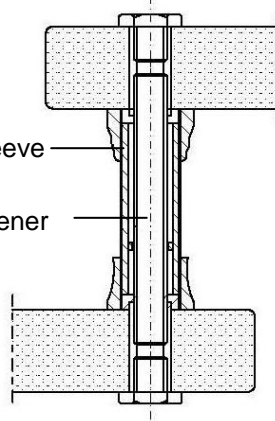
Load-bearing bolt joint Type III

Load-bearing bolt joint Type IV

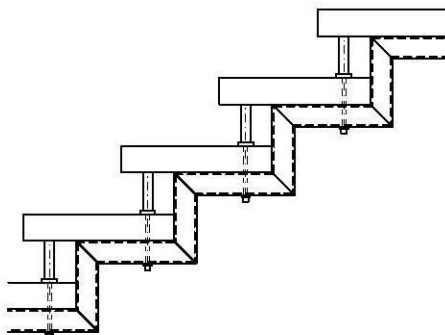
*) Wall tie (alternatively
in-situ concrete
≥ C16/20)



Distance sleeve
System-fastener



b) Cascaded steel beam (hollow section 60/60/5)



Dimensions in mm

Further details according to technical documentation

Load-bearing bolt stair WE1 and WF2 System "Thumm"

Wall-replacement-beam

Annex A3

Table 1: Characteristic values of materials of relevant stair components ²⁾

component of stair		material	characteristic values (minimum values)				
components made of natural stone			$E_{0,mean}$	G_{mean}	$f_{m,k}$	$f_{v,k}$	$\gamma_M^{1)}$
			[N/mm ²]	[N/mm ²]	[N/mm ²]	[N/mm ²]	[-]
steps	resistance class I	30000	10000	6.90	6.25	1.8	
	resistance class II			7.50	7.50		
	resistance class III			8.75	8.75		
	resistance class IV			10.00	10.00		
	resistance class V			11.25	11.25		
	resistance class VI			12.50	12.50		
components made of artificial stones			$E_{0,mean}$	G_{mean}	$f_{m,k}$	$f_{v,k}$	$\gamma_M^{1)}$
			[N/mm ²]	[N/mm ²]	[N/mm ²]	[N/mm ²]	[-]
steps	resistance class I	30000	10000	6.25	6.25	1.6	
	resistance class II			7.50	7.50		
	resistance class III			8.75	8.75		
	resistance class IV			10.00	10.00		
	resistance class V			11.25	11.25		
	resistance class VI			12.50	12.50		
components made of steel			$E_{0,mean}$	G_{mean}	$f_{y,k}$	$f_{u,k}$	$\gamma_M^{1)}$
			[N/mm ²]	[N/mm ²]	[N/mm ²]	[N/mm ²]	[-]
system-fastener	steel	210000	81000	240	400	1.1	
distance sleeve	GD-Al Si 8 Cu 3	70000	27000	160	240	1.1	
wall tie	steel	210000	81000	360	600	1.1	
cascaded beam	steel	210000	81000	240	360	1.1	

1) recommended partial safety factor, in absence of other national regulations

2) For each laminate process but at least each 100 m² the torsion resistance of at least one step have to be tested. On the basis of the ultimate torsion resistance reached the material is to be classified to the resistance classes. The ultimate torsion resistance shall not be less than values $f_{v,k}$ of the appropriate resistance class. More details see control plan.

Load-bearing bolt stair WE1 and WF2 System "Thumm"

Characteristic values of materials of relevant stair component

Annex A4

Table 2: Minimum dimensions of relevant stair components and reaction to fire

component	material	dimension		value	reaction to fire ¹⁾
steps	natural stone	thickness	[mm]	62 ¹⁾	A1
	artificial stone cement bonded	thickness	[mm]	62 ¹⁾	
	artificial stone reaction resin bonded	thickness	[mm]	62 ¹⁾	F (no performance determined – NPD)
system-fastener	steel	diameter	[mm]	14	A1
distance sleeve	GD-Al Si 8 Cu 3	inner diameter	[mm]	14	A1
wall tie	flat steel	height / width / length	[mm]	12 / 40 / 210	A1
		embedment depth - wall	[mm]	100	

¹⁾ two plates (minimum thickness 30 mm) and intermediate GFK-layer (thickness 2 mm)

Load-bearing bolt stair WE1 and WF2 System "Thumm"

Minimum dimensions of relevant stair components
and reaction to fire

Annex A5

Specification of intended use (Part 1)

Intended use:

- European Technical Assessment applies for a construction system.
- For the specific case of use the corresponding type of stair is manufactured within the context of the values defined in 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 ≤ 0.15 kN/m
 Height ≤ 1.00 m
 Distance of baluster ≤ 0.85 m

Design:

- Design of the stair according to the annexes and the technical documentation of this European Technical Assessment.
- Depending on the relevant type of plan the declared resistance class of the steps shall not be less than the required resistance class according to Annex C2.
- 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

Load-bearing bolt stair WE1 and WF2 System "Thumm"

Specification of intended use (Part 1)

Annex B1

Specification of intended use (Part 2)

Installation:

- Installation by personal appropriately trained and authorized by the holder of the 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
- 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)
- Instructions for use should provide information as to use, maintenance and repair of the stair. Including the information of retightens the bolting of the load-bearing bolts and connections according to Annex A2 and A3 after the first heating season

Load-bearing bolt stair WE1 and WF2 System "Thumm"

Specification of intended use (Part 2)

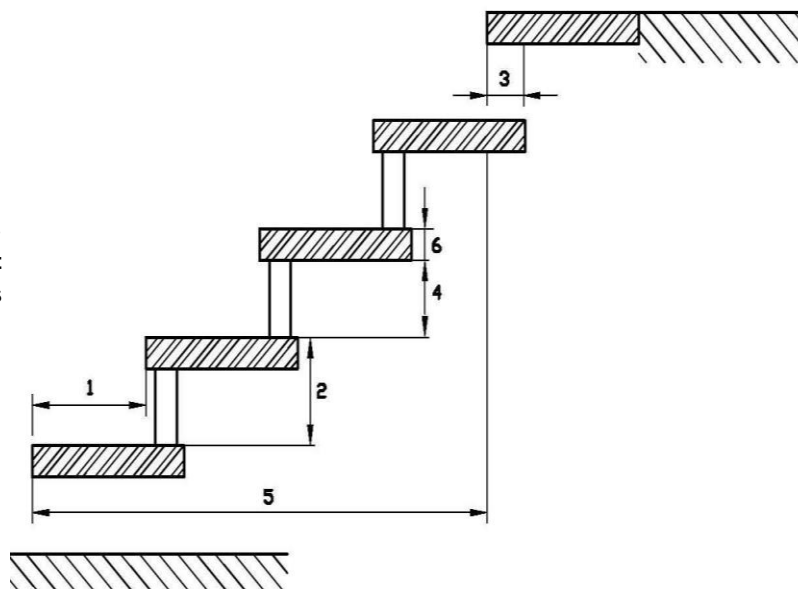
Annex B2

Table 3: Geometry

designation			dimension	
			minimum	maximum
going	step on walking line ¹⁾	[mm]	210	290 ²⁾
	tapered step	[mm]	100 ^{2) 3)}	550 ^{2) 4)}
rise of the stairs ¹⁾		[mm]	140 ²⁾	210
pitch of the walking line ¹⁾		[°]	21	45
overlap of the steps		[mm]	110	- ⁵⁾
number of rises		[-]	3	16
openings	between stairs and wall	[mm]	- ⁵⁾	55
	between consecutive steps	[mm]	- ⁵⁾	148
clear width of stairs		[mm]	500	1050
minimum headroom		[mm]	- ⁵⁾	
length of the flight		[mm]	- ⁵⁾	3900
thickness of steps		[mm]	62	- ⁵⁾

- 1) values are constant within one flight
- 2) tolerance between nominal value and actual value = ± 5 mm
- 3) inside of tapered step
- 4) outside of tapered step
- 5) not relevant

- 1 going
- 2 rise
- 3 overlap
- 4 opening between consecutive steps
- 5 length of the flight
- 6 thickness of steps



Load-bearing bolt stair WE1 and WF2 System "Thumm"

Geometry of the stair

Annex C1

Table 4: Required resistance classes according to Annex A4, Table 1 for types of plan according to Annex A1

type of plan	support at step	number of steps ²⁾	thickness of steps 62 mm		thickness of steps 72 mm	
			artificial stone	natural stone	artificial stone	natural stone
16G	-	15	IV	V	III	IV
	2	14	IV	V	II	III
	3	13	III	IV	II	III
	4	12	III	III	I	II
	5	11	II	III	I	I
	6	10	I	II	I	I
	7	9	I	I	I	I
16V	-	15	IV	V	III	III
	2	14	III	IV	II	III
	3	13	II	III	I	II
	4	12	II	II	I	I
	5	11	I	II ³⁾	I	I
16VV	-	15	IV	IV	II	III
	2	14	II	II (III) ¹⁾	I (II) ¹⁾	I (II) ¹⁾
	3	13	II	II (III) ¹⁾	I	II
	4	12	I	II	I	I
	5	11	I	II ³⁾	I	I
16H	-	15	IV	V	III	III
	2	14	IV	V	III	III
	3	13	IV	V	III	III
	4	12	III	IV	II	III
	5	11	III	III	I	II
	6	10	III	III	I	II
	7	9	II	III	I	II
Wall-replacement-beam			III		II	

¹⁾ values in brackets valid for plans with straight bottom step or straight top step

²⁾ number of steps without additional support

³⁾ resistance class I sufficiently if the length of the steps ≤ 940 mm

Load-bearing bolt stair WE1 and WF2 System "Thumm"

Required resistance classes

Annex C2

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

Material	Component	Type of loading	Characteristic values of resistance			γ_M ¹⁾
naturel stone	flight	vertical variable uniformly distributed load	q_{Rk}	[kN/m ²]	8.10	1.5
	step	vertical variable single load	Q_{Rk}	[kN]	5.40	
	barrier	horizontal variable uniformly distributed load on barrier	h_{Rk}	[kN/m]	0.95	
artificial stone	flight	vertical variable uniformly distributed load	q_{Rk}	[kN/m ²]	7.20	1.6
	step	vertical variable single load	Q_{Rk}	[kN]	4.80	
	barrier	horizontal variable uniformly distributed load on barrier	h_{Rk}	[kN/m]	0.84	

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]	3900 ¹⁾
deflection under load F_S related to the median line of the flight	w	[-]	$\leq L/200$
Deflection of the step under single point load			
single load	Q_k	[kN]	2.0
clear width of the stair	L	[mm]	1050
deflection under load F_S related to the clear width of the stair	w	[-]	$\leq L/200$

¹⁾ with additional support according to Annex C2, L = reference length = distance between supports

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

Load-bearing bolt stair WE1 and WF2 System "Thumm"

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

Annex C3