Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment

ETA-18/0543 of 28 November 2019

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	STF-Post bases
Product family to which the construction product belongs	Three-Dimensional Nailing Plates
Manufacturer	Arndt Bohrenkämper Holzverbindung GmbH Pestalozzistraße 16 32257 Bünde DEUTSCHLAND
Manufacturing plant	HSW1
This European Technical Assessment contains	20 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	ETAG 015, used as 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

STF-Post bases are single- or multi-component timber fasteners made from S235 galvanised steel sheet in accordance with EN 10346[1] with steel cast head plates from ZG230-450 comparable with GE 240 of material number 1.0446 according to EN 10293[2], which are fastened to timber members (see Annex 2) with screws and to concrete members with anchor bolts or by embedding.

Connection to concrete members is achieved for post bases STF B500 and STF M600 through embedding in concrete and for the height-adjustable post bases STF 140+50, STF 190+100 and STF 300+150 post bases using anchor bolts. Galvanized HECO full-thread screws according to ETA-11/0284 are used for the connection to the wooden component.

Dimensions, hole pattern and steel grades are given in Annex 1.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the STF-Post bases are used in compliance with the specifications and conditions given in Annex 1 up to 3.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the STF-Post bases 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
Joint strength	See Annex 3
Joint stiffness	No performance assessed
Joint ductility	No performance assessed
Durability	See Annex 2

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Release of dangerous substances	No performance assessed

[1] EN 10346:2009 Continuously hot-dip coated steel flat products – Technical delivery conditions
[2] EN 10293:2015 Steel castings - Steel castings for general engineering uses

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with ETAG 015 the applicable European legal act is: [97/638/EC (EU)].
The system to be applied is: 2+

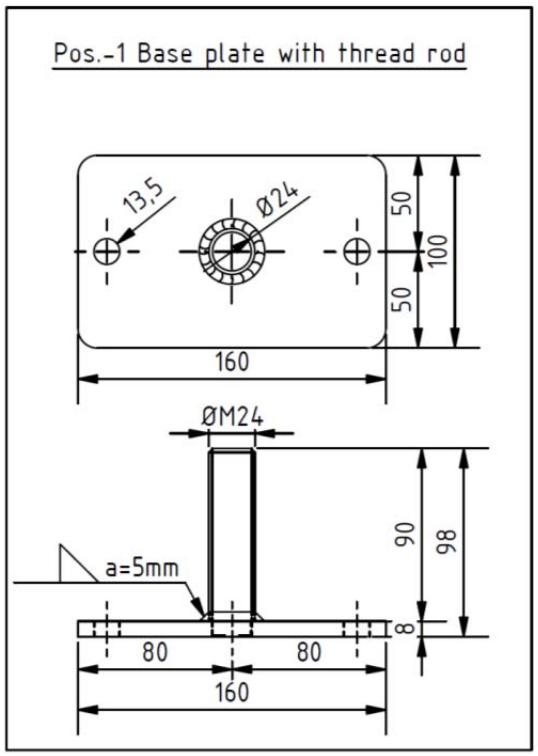
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

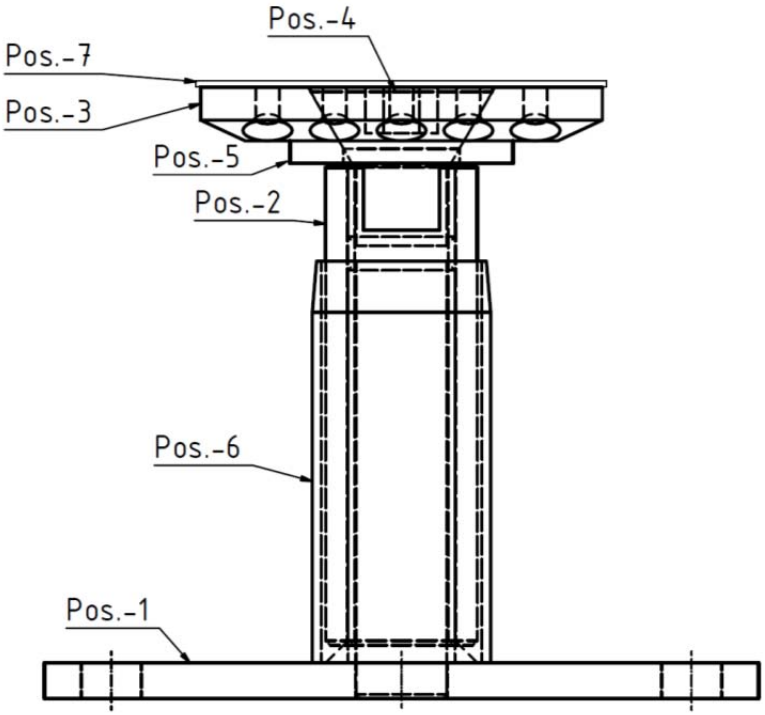
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 28 November 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Baumann





Post base STF 140+50, hot-dip galvanized or zinc-nickel coating	
Pos.-No.	Designation
1	Base plate 160x100x8 mm, S235; and threaded bolt M24, H=90 mm, 5.6
2	Threaded sleeve d=34 mm, Inner thread M24, H=108mm, wrench size 30, S235
3	Head plate 90x90x12 mm, ZG230-450 comparable with GE-240 1.0446
4	Countersunk head screw M24x35, S235
5	Washer $d_{outside}$= 50mm, d_{hole}=26mm T=5 mm, S235
6	Protection sleeve d=40 mm, T=2 mm, H=90 mm, S235
7	EPDM- seal
8	HECO TOPIX fully threaded screw 5,0x80 mm carbon steel- special coating- / stainless steel A2-special coating

STF-Post bases	Annex 1.1
Hight-adjustable post base for embedding in concrete STF 140+50	

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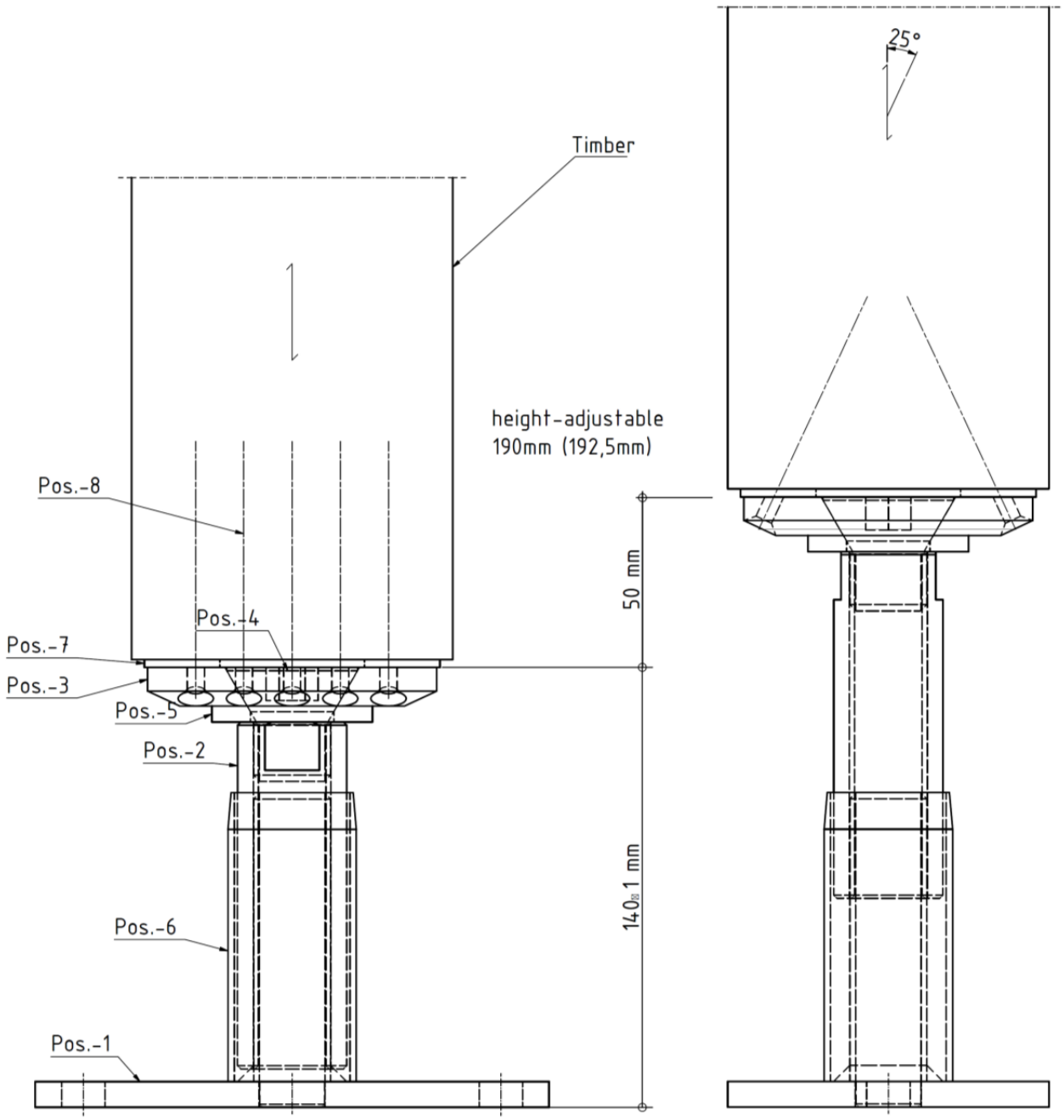
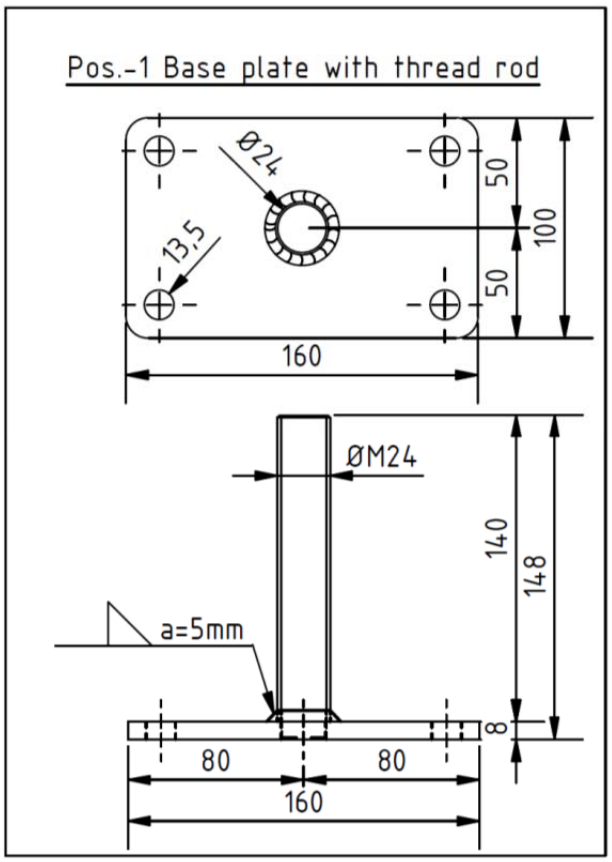
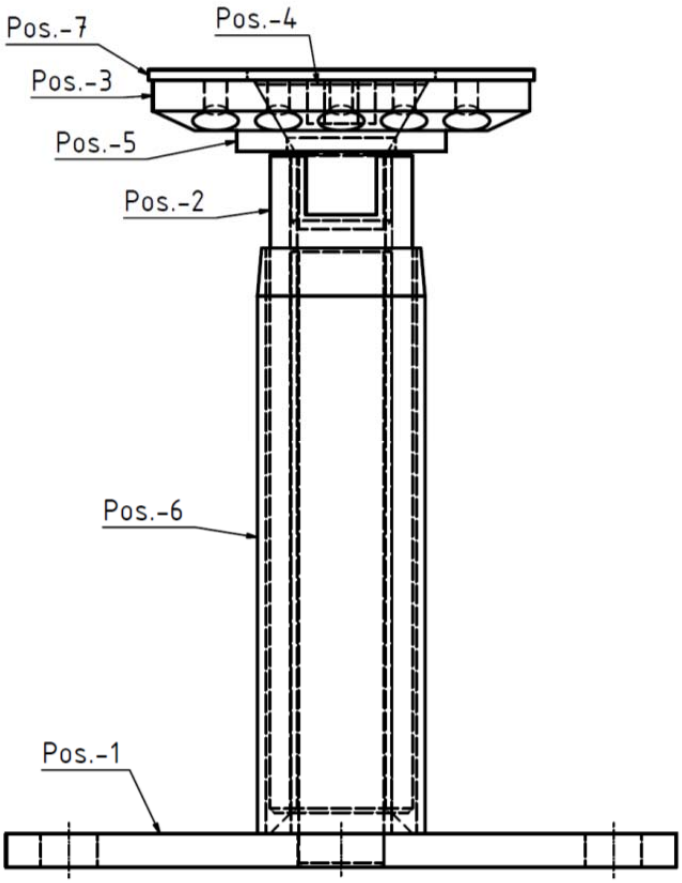


STF-Post bases	Annex 1.2
Hight-adjustable post base for embedding in concrete STF 140+50	





Post base STF 190+100, hot-dip galvanized or zinc-nickel coating	
Pos.-No.	Designation
1	Base plate 160x100x8 mm, S235; and threaded bolt M24, H=140 mm, 5.6
2	Threaded sleeve d=34 mm, Inner thread M24, H=158mm, Wrench size 30, S235
3	Headplate 90x90x12 mm, ZG230-450 comparable with GE-240 1.0446
4	Countersunk head screw M24x35, S235
5	Washer $d_{outside}$= 50mm, d_{hole}=26mm T=5 mm, S235
6	Protection sleeve d=40 mm, T=2 mm, H=140 mm, S235
7	EPDM-seal
8	HECO TOPIX fully threaded screw 5,0x80 mm carbon steel- special coating- / stainless steel A2-special coating

STF-Post bases	Annex 1.3
Hight-adjustable post base for embedding in concrete STF 190+100	

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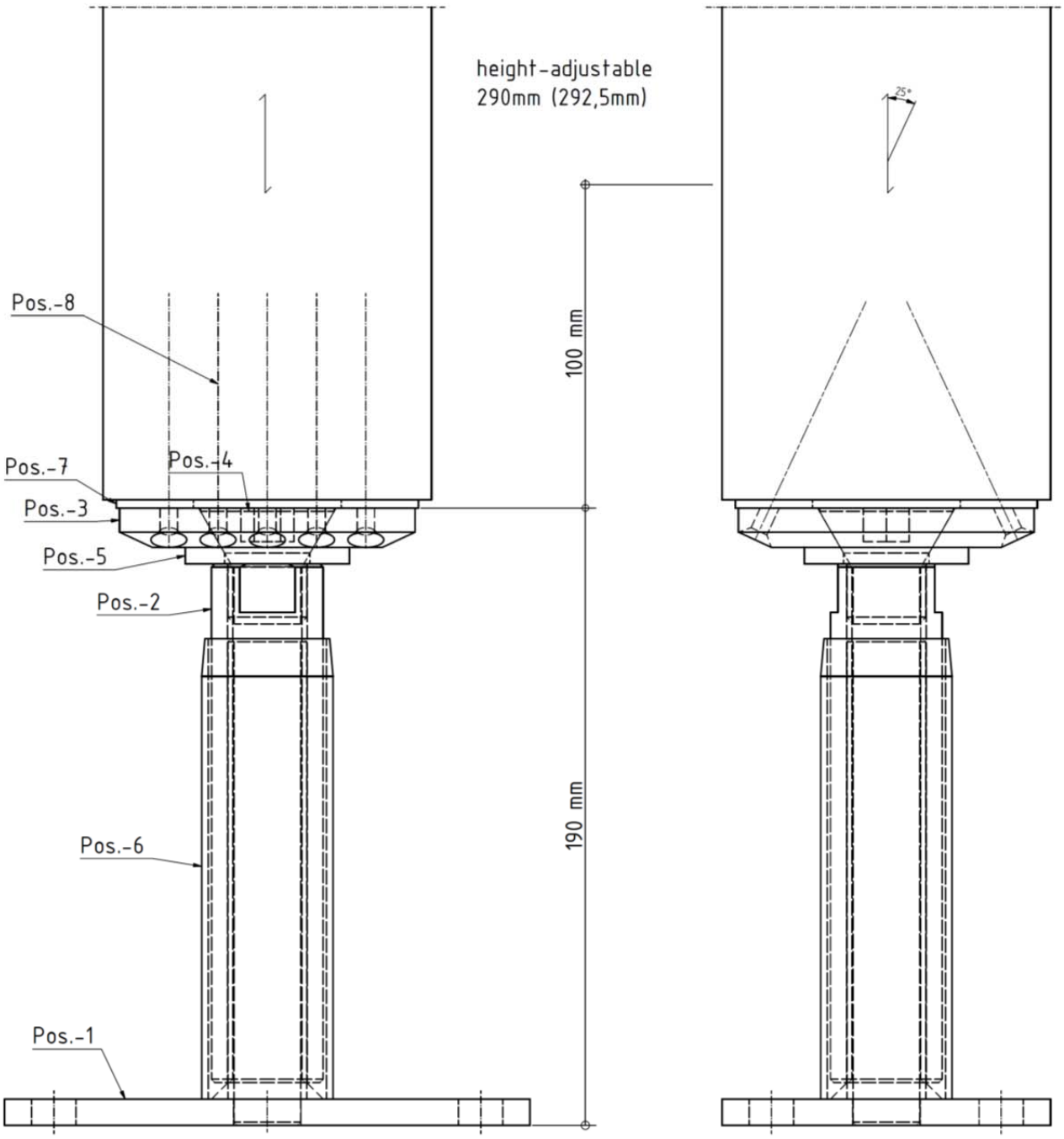
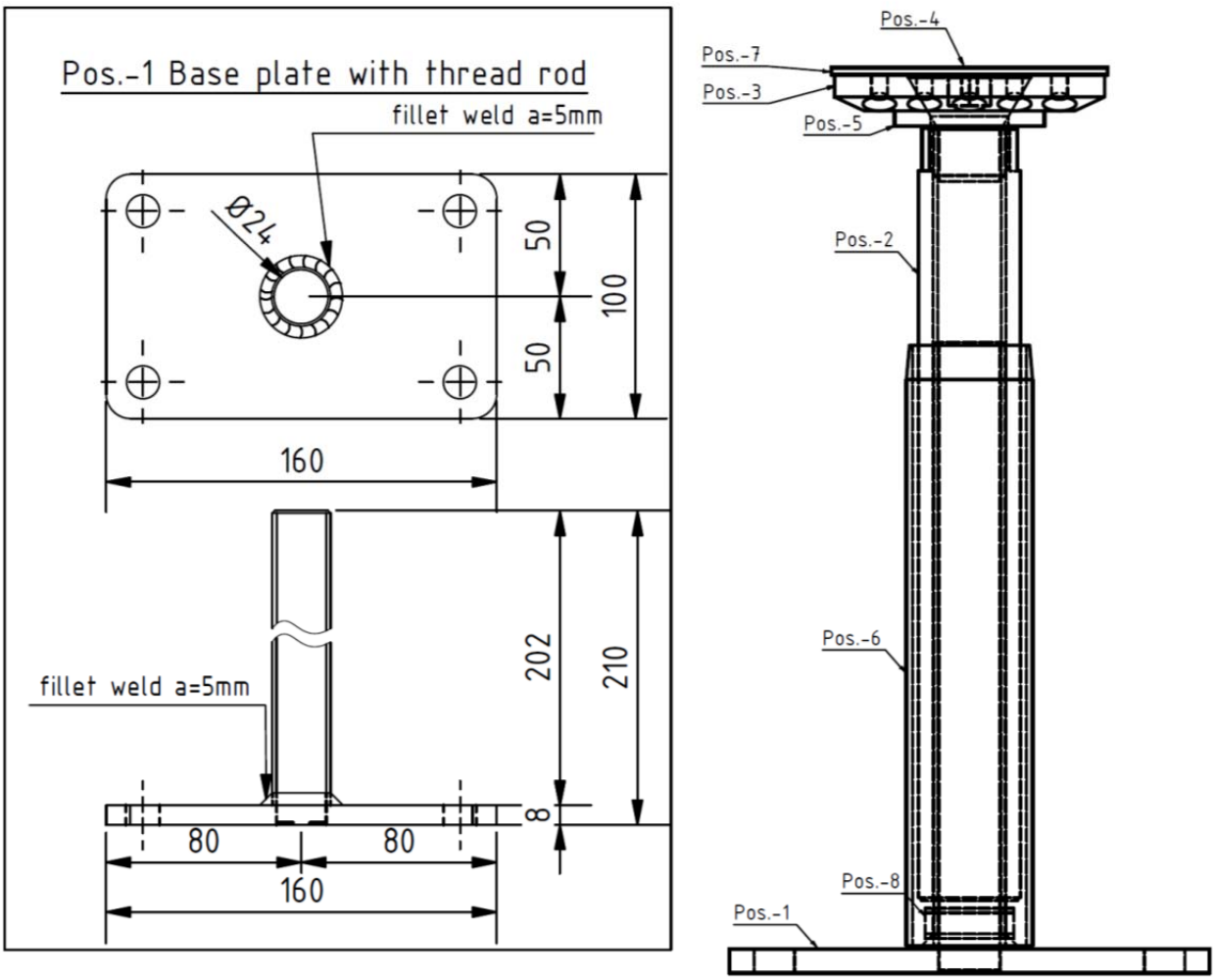


STF-Post bases	Annex 1.4
Hight-adjustable post base for embedding in concrete STF 190+100	



Post base STF 300+150, hot-dip galvanized or zinc-nickel coating	
Pos.-No.	Designation
1	Base plate 160x100x8 mm, S235; and threaded bolt M24, H=202 mm, 5.6
2	Threaded sleeve d=34 mm, Inner thread M24, H=258mm, SW 30, S235
3	Head plate 90x90x12 mm, ZG230-450 comparable with GE-240 1.0446
4	Countersunk head screw M24x35, S235
5	Washer $d_{outside}$= 50mm, d_{hole}=26mm T=5 mm, S235
6	Protection sleeve d=40 mm, T=2 mm, H=200 mm, S235
7	EPDM-seal
8	Shaft lock nut M24, d=10 mm, SW 30
9	HECO TOPIX fully threaded screw 5,0x80 mm carbon steel- special coating- / stainless steel A2-special coating

STF-Post bases	Annex 1.5
Hight-adjustable post base for embedding in concrete STF 300+150	

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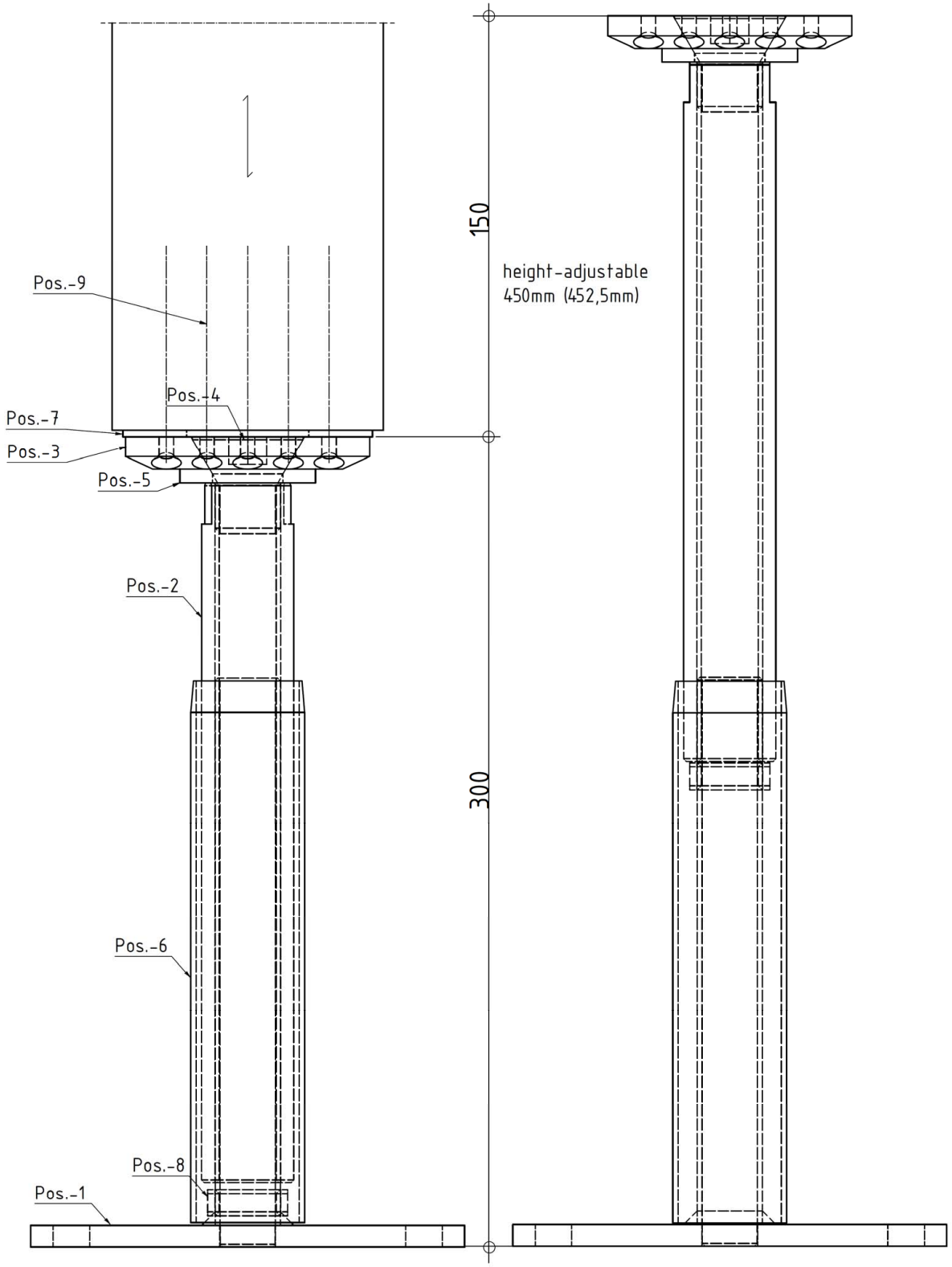
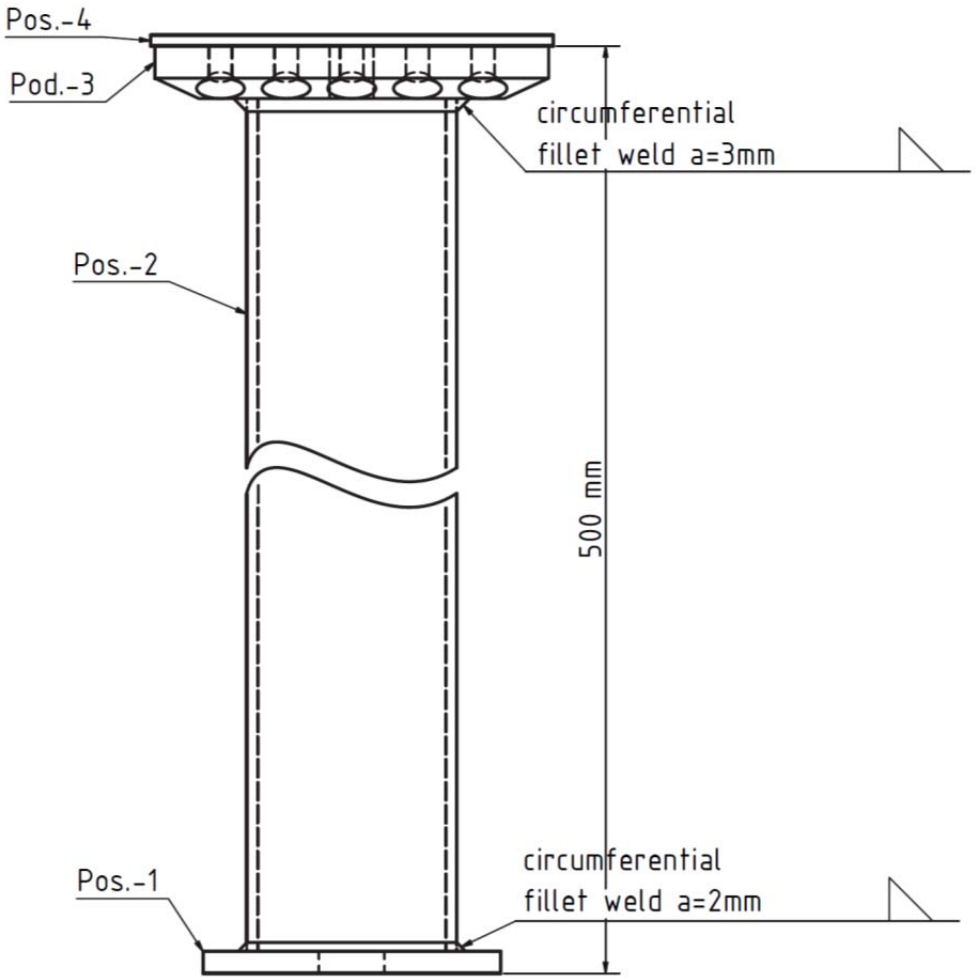


STF-Post bases	Annex 1.6
Hight-adjustable post base for embedding in concrete STF 300+150	



Post base STF B500, hot-dop galvanised or zinc-nickel coating	
Pos.-No.	Designation
1	Steel plate d=68x15x5 mm, S235
2	Steel tube d=48, T=2,5 mm, H=483 mm, S235
3	Head plate 90x90x12 mm, ZG230-450 comparable with GE-240 1.0446
4	EPDM-seal
5	HECO TOPIX fully threaded screw 5,0x80 mm carbon steel- special coating- / stainless steel A2-special coating

STF-Post bases	Annex 1.7
Post base for embedding in concrete STF B500	

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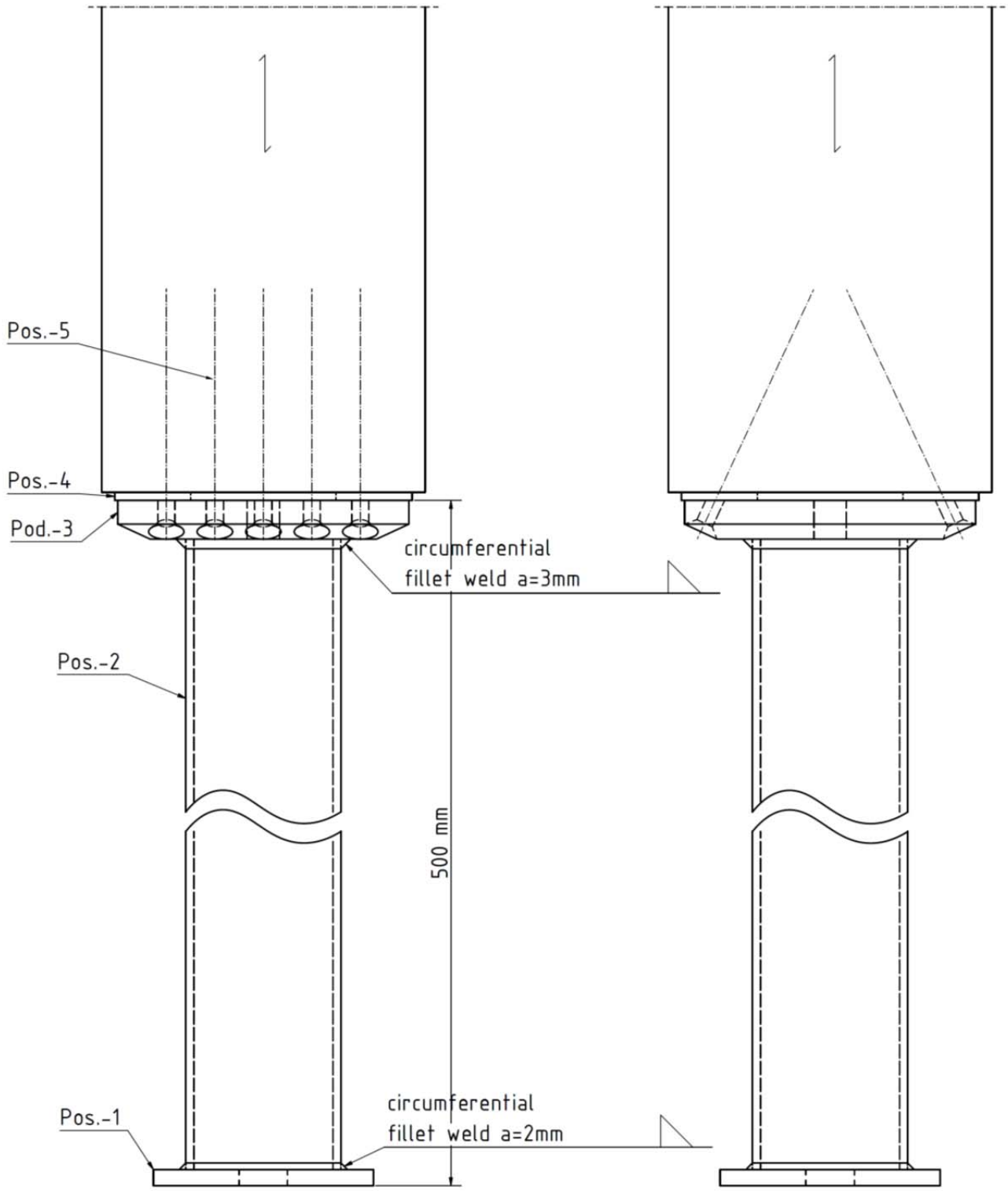
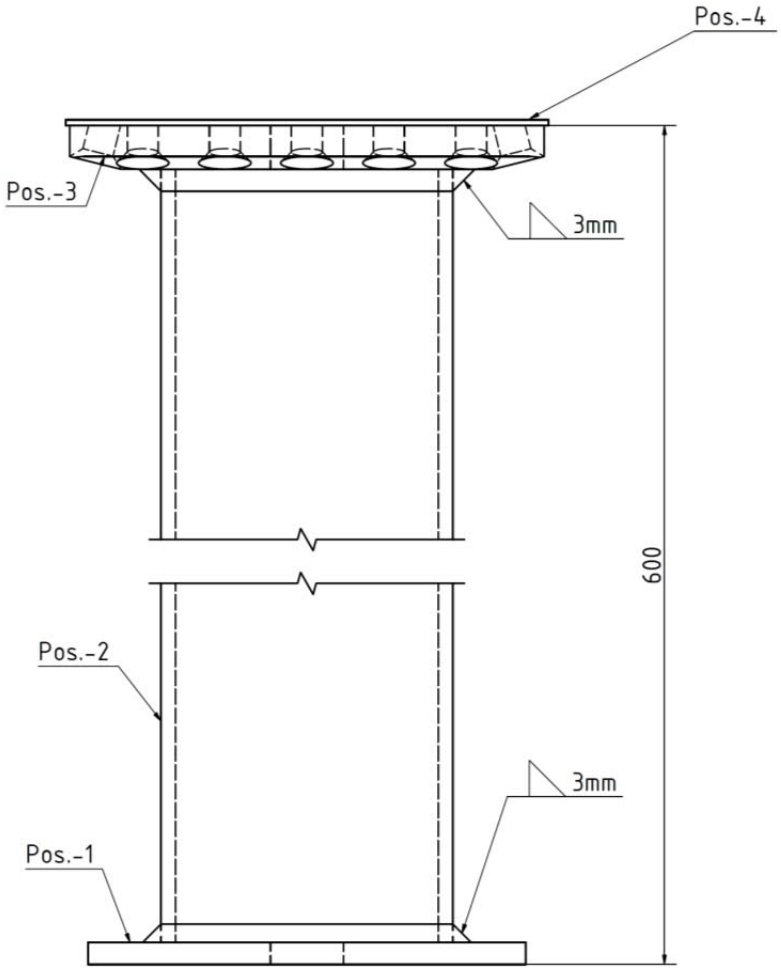
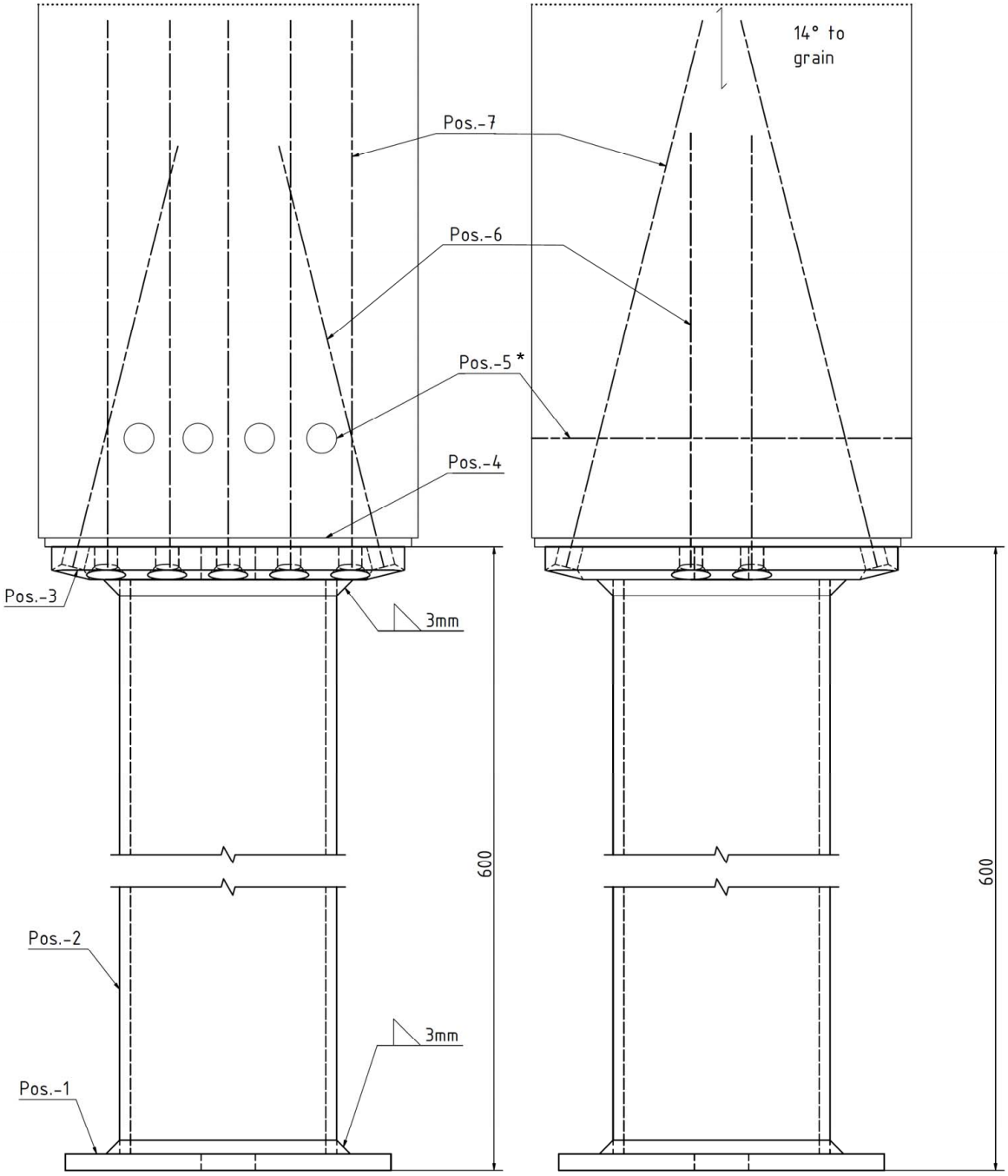


STF-Post bases	Annex 1.8
Post base for embedding in concrete STF B500	



Post base STF M600, hot-dip galvanized or zinc-nickel coating	
Pos.-No.	Designation
1	Base plate 120x120x6 mm, S235
2	Steel tube 80x80x4 mm, H=582 mm, S235
3	Head plate 130x130x12 mm, ZG230-450 comparable with GE-240 1.0446
4	EPDM-seal
5	HECO-TOPIX-CC fully thread screw 6,5x120 mm carbon steel- special coating- / stainless steel A2-special coating
6	HECO-TOPIX fully thread screw 8,0x160 mm carbon steel- special coating- / stainless steel A2-special coating
7	HECO-TOPIX fully thread screw 8,0x200 mm carbon steel- special coated- / stainless steel A2-special coating

STF-Post bases	Annex 1.9
Post base for embedding in concrete STF M600	



- Distance of screws Pos 5 to the end of crosscut ≥ 5d

STF-Post bases	Annex 1.10
Post base for embedding in concrete STF M600	

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Annex 2 Specifications of intended use

A.2.1 Intended use

The STF-Post bases are intended to be used for structural timber-to-concrete connections in timber constructions.

The structural behaviour of the construction elements and the support conditions correspond to the indications given in Annex 3. The post bases may be used in service classes 1, 2 and 3 in accordance with EN 1995-1-1[1]. All post bases are designed to withstand loads due to vertical actions and the types of post bases embedded in concrete are also designed to withstand loads due to horizontal actions perpendicular to the axis of the post bases.

A.2.2 Loading:

Non-fatigue-relevant static and quasi-static actions

A.2.3 Connection materials

A.2.3.1 Timber:

The timber members are made from solid timber, glued laminated timber or comparable glued wood-based members. The following softwood materials are suitable for connections with STF-Post bases:

- solid timber (softwood) of strength class ≥ C24 in accordance with EN 338[2] / EN 14081-1[3]
- glued laminated timber in accordance with EN 1194[4] / EN 14080[5] as well as
- similarly glued members with the following minimum dimensions:
  b x h = 10 cm x 10 cm for post base STF 140+50, STF 190+100, STF 300+150 und STF B500 und
  b x h = 14 cm x 14 cm for post base STF M600.

Characteristic values of load-carrying capacities for connections with post bases (see Annex 3) have been determined for a characteristic density of timber components of 350 kg/m³. For load-carrying capacities the density higher than 350 kg/m³ must not be taken into account when determining the load capacities.

A.2.3.2 Concrete:

Strength class ≥ C20/25.

A.2.4 Use conditions (Environmental conditions)

A.2.4.1 Durability against corrosion

The steel components of the post base and their connections are either hot-dip galvanised with a minimum contact length of 25 µm according to Z350 of EN 10346[6] or or with a zinc-nickel coating.

The allowable ambient atmospheric conditions in accordance with EN ISO 12944-2[7] are observed.

Coated full-thread screws made from carbon steel are used for connecting the top plate to the timber member in service classes 1 and 2. Corrosion protection through use of a metallic coating exists.

Full-thread screws made from stainless steel 1.4567 or 1.4578 are used for service class 3. The allowable ambient atmospheric conditions in accordance with EN ISO 12944-2 have been considered.

1	EN 1995-1-1:2004 + AC:2006 + A1:2008	Eurocode 5: Design of timber structures – Part 1-1: Common rules and rules for buildings
2	EN 338:2009	Structural timber - Strength classes
3	EN 14081-1:2005+A1:2011	Timber structures - Strength graded structural timber with rectangular cross section – Part 1: General requirements
4	EN 1194:1999	Timber structures - Glued laminated timber - Strength classes and determination of characteristic values
5	EN 14080:2013	Timber structures - Glued laminated timber - Requirements
6	EN 10346:2015	Continuously hot-dip coated steel flat products for cold forming – Technical delivery conditions
7	EN ISO 12944:2018	Paint and varnishes – Corrosion protection of steel structures by protective paint systems - Part 2: Classification of environments

STF-Pfostenträgers	Annex 2.1
Specification of intended use Intended use, loading, connection materials, use conditions	

A.2.4.2 Wood preservative

It is assumed that a possible wood preservative treatment is taken into account and that effects of wood preservative on corrosion resistance are taken into consideration.

A.2.5 Installation

General

The connection of timber and concrete members using post bases is carried out as follows:

- Screws:
  Fully threaded screws "HECO-TOPIX" and "HECO-TOPIX-CC" according to ETA-11/0284 are used as follows:
  d= 5 mm / L=80 mm for STF 140+50, STF 190+100, STF 300+150 and STF B500
  d= 8 mm / L=200 mm or L=160 mm as well as transverse reinforcement d= 6,5 mm / L≥ 120 mm for STF M600
  see Annex 1 also
- Screw arrangement:
  All holes of the head plate of the post base marked according to Annex 1 are provided with screws.
- Orientation of Post base STF M600:
  The shear resistance according to Table 3.3 applies only to a horizontal load which is perpendicular to the rows of bolts.

Corresponding to the shear resistance the experimentally determined bending capacity for post base STF M600 applies under the condition that the horizontal force acts perpendicularly to the two screw rows of the connection, resulting in bending about the major axis of the connection such that 5 screws are subjected to tensile stress in the axial direction.

Horizontal loading of the post bases parallel to the screw rows is not allowed.

Wane

A wane is not intended; the timber post's end face fully contacts the top plate of the post base.

Storage conditions

The construction elements connected by post bases are secured against rotation.

Base plates

The base plates are connected to the supporting substructure by means of anchor bolts or through embedding. The connection is not subject of this European technical assessment. The national provisions valid at the installation site are applied.

The members have a thickness exceeding the penetration depth of the screws into the member.

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Annex 3 – Load-bearing capacity of post bases

The load bearing capacities for tension, compression and lateral force shall be calculated according to the national regulations with the partial safety factors[1] according to equations B1, B2 and B3.

Tensile stress

$$N_{t,d} = \min\left\{\frac{k_{mod} \times N_{t,k,Timber}}{\gamma_M}; \frac{N_{t,k,Steel}}{\gamma_{M0}}; \frac{N_{t,k,Steel}}{\gamma_{M1}}; \frac{N_{t,k,Steel}}{\gamma_{M2}}; \frac{N_{t,k,Concret}}{\gamma_C}\right. \quad \text{(B1)}$$

Compressive stress

$$N_{c,d} = \min\left\{\frac{k_{mod} \times N_{c,k,Timber}}{\gamma_M}; \frac{N_{c,k,Steel}}{\gamma_{M0}}; \frac{N_{c,k,Steel}}{\gamma_{M1}}; \frac{N_{c,k,Steel}}{\gamma_{M2}}; \frac{N_{c,k,Concret}}{\gamma_C}\right. \quad \text{(B2)}$$

Lateral force stress

$$V_d = \min\left\{\frac{k_{mod} \times V_{k,Timber}}{\gamma_M}; \frac{V_{k,Steel}}{\gamma_{M0}}; \frac{V_{k,Steel}}{\gamma_{M1}}; \frac{V_{k,Steel}}{\gamma_{M2}}\right. \quad \text{(B3)}$$

With simultaneous loading by a vertical load N_d and a horizontal load V_d for the components threaded bolt, steel tube, head and foot plate and the connection shall be proven steel-timber, that

$$\frac{N_d}{N_{Rd}} + \frac{V_d}{V_{Rd}} \le 1 \quad \text{(B4)}$$

To calculate the design values, the characteristic load-carrying capacities given in Annex 3 shall be divided by partial safety factors for the material property and multiplied by the coefficient k_{mod} for the screw connection and the timber components with regard to the load duration and the service class defined in EN 1995-1-1.

According to the standard EN 1990:2002 paragraph 6.3.5 the design value of the load-carrying capacity can be determined by reducing the values of the load-carrying capacity with the material-specific partial safety factors.

The characteristic values of the load-carrying capacity were determined for the failure of timber or wood-based material $F_{Rk,H}$ (reaching of the load-carrying capacity of screws subjected to shear) as well as for the steel sheet failure $F_{Rk,S}$ (reaching of the tensile or bending strength of the sheet metal or the bending strength of the base plate) and also for the failure of concrete $F_{Rk,C}$. The design value of the load-carrying capacity F_{Rd} is the minimum value as determined by formula (B1) up to (B3).

Therefore, for timber or wood-based material failure the load duration class and the service class are taken into account. The various partial safety factors γ_M for steel and timber or wood-based material as well as γ_C for concrete are also taken into account.

[1] For Germany, the following partial safety factors apply: Timber γ_M = 1.30,
Steel γ_{M0} = 1.00, γ_{M1} = 1.10, γ_{M2} = 1.25,
Concrete γ_C = 1.50

STF-Post base	Annex 3.1
Calculation of load-carrying capacity	

Table 3.1: Characteristic values and corresponding partial safety factors (γ) for post bass STF 140+50, STF 190+100, STF 300+150

Post base	Tension $N_{t,k}$ [kN]	Compression $N_{c,k}$ [kN]
STF 140+50	9,2 (γ_{M0})	50 (γ_{M1})
STF 190+100	9,2 (γ_{M0})	28 (γ_{M1})
STF 300+150	9,2 (γ_{M0})	12 (γ_{M1})

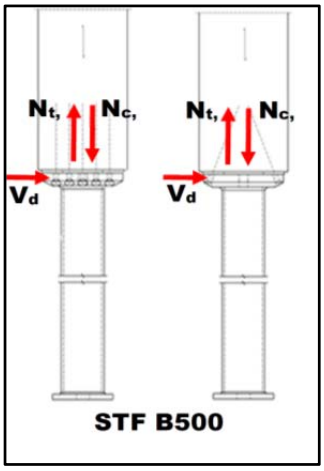

Table 3.2: Characteristic values and corresponding partial safety actors (γ) for post base STF B500

Component / Connection	Tension $N_{t,k}$ [kN]	Compression $N_{c,k}$ [kN]	Lateral Force V_k [kN]
Connection steel-timber	29 (γ_M)	170 (γ_M)	7,0 (γ_M)
Steel tube	84 (γ_{M0})	81 (γ_{M1})	4,5 (γ_{M0})
Connection steel tube-concrete C20/25	36 (γ_C)	68 (γ_C)	-

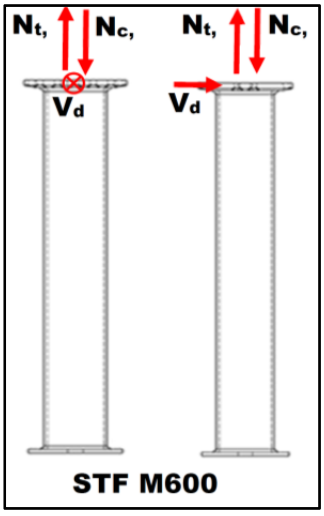

Table 3.3: Characteristic values and corresponding partial safety factors (γ) for post base STF M600

Component / Connection	Tension $N_{t,k}$ [kN]	Compression $N_{c,k}$ [kN]	Lateral Force V_k [kN]
Connection steel-timber	150 (γ_M)	355 (γ_M)	36 (γ_M)
Steel tube	282 (γ_{M0})	282 (γ_{M0})	33 (γ_{M0})
Head plate	150 (γ_{M0})	140 (γ_{M0})	-
Connection Steel tube-concrete C20/25	160 (γ_C)	197 (γ_C)	-

STF-Post bases	Annex 3.2
Characteristic values and corresponding partial safety factors f post bases STF 140+50, STF 190+100, STF 300+150, STF B500 and STF M600	

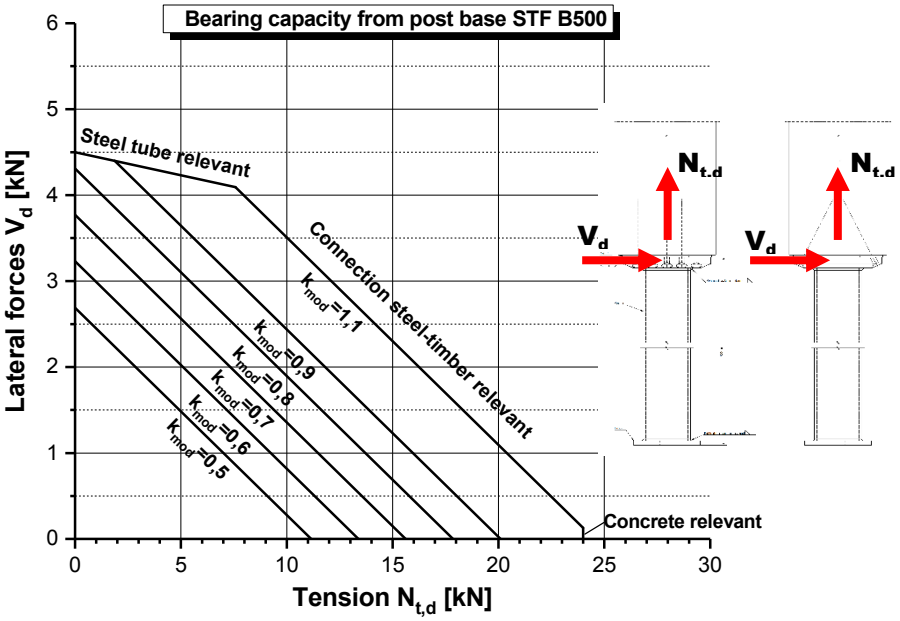

Illustration 3.1: Load-bearing capacity of post base STF B500 in interaction with tension and lateral forces with the adopted partial safety factors γ_M = 1,3 (timber), $\gamma_{M,0}$ = 1,0 (steel), γ_C = 1,5 (concrete)

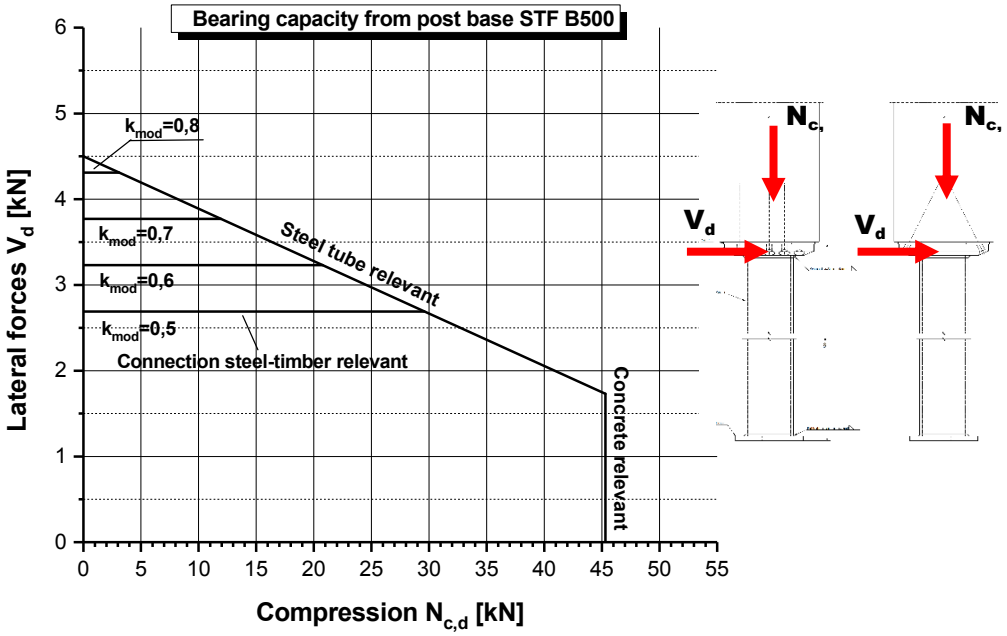

Illustration 3.2: Load-bearing capacity of post base STF B500 in interaction with compression and lateral forces with the adopted partial safety factors γ_M = 1,3 (timber), γ_C = 1,5 (concrete), $\gamma_{M,0}$ = 1,0 und $\gamma_{M,1}$ = 1,1 (steel)

STF-Post bases	Annex 3.3
Load-bearing capacity of post base STF B500 in interaction with tension and lateral forces with as well as compression and lateral forces for adopted partial safety factors for timber, steel and concrete	

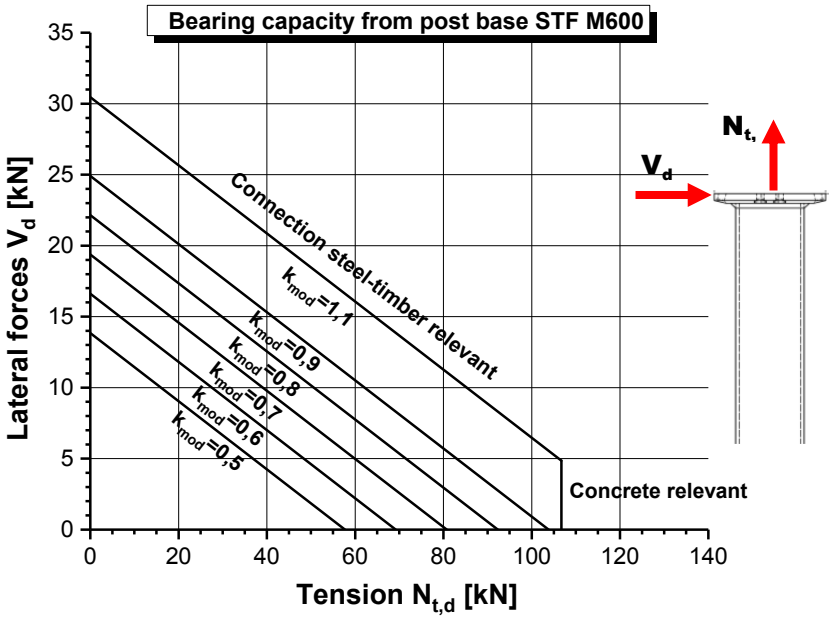

Illustration 3.3: Load-bearing capacity of post base STF M600 in interaction with tension and lateral forces with the adopted partial safety factors γ_M = 1,3 (timber), $\gamma_{M,0}$ = 1,0 (steel), γ_C = 1,5 (concrete)

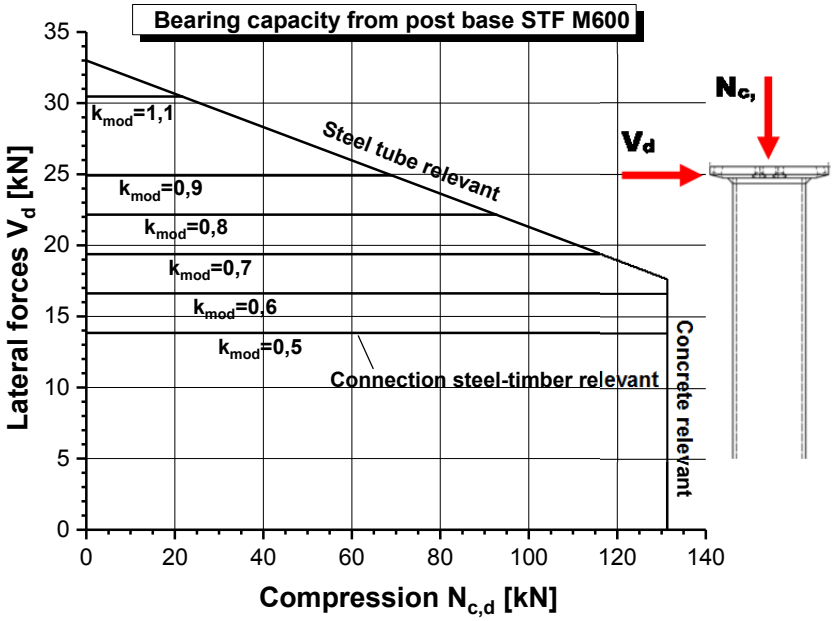

Illustration 3.4: Load-bearing capacity of post base STF M600 in interaction with compression and lateral forces with the adopted partial safety factors γ_M = 1,3 (timber), γ_C = 1,5 (concrete), $\gamma_{M,0}$ = 1,0 und $\gamma_{M,1}$ = 1,1 (steel)

STF-Post bases	Annex 3.4
Load-bearing capacity of post base STF M600 in interaction with tension and lateral forces with as well as compression and lateral forces for adopted partial safety factors for timber, steel and concrete	