Deutsches Institut für Bautechnik DIBt

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

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European Technical Assessment   ETA-23/0428 of 29 January 2024

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	Peikko HULCO® Anchor Bolt
Product family to which the construction product belongs	Cast-in anchor bolts under fatigue or seismic actions
Manufacturer	PEIKKO GROUP CORPORATION Voimakatu 3 15101 Lahti FINNLAND
Manufacturing plant	PEIKKO manufacturing plants
This European Technical Assessment contains	12 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	330924-01-0601-v01, Edition 10/2023

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Z110740.23

8.06.01-122/23

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Specific Part

1 Technical description of the product

The Peikko HULCO® Anchor Bolt consists of smooth steel of the diameters 27,6, 33,2, 36,2, 41,9 and 48,5 mm, two hexagon nuts and two washers. One of the ends of the bolt is provided with an anchor head and the other end with a thread of the sizes M30, M36, M39, M45 and M52.

The anchor bolt is embedded in concrete up to the marking of the embedment depth.

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 anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor 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
Characteristic resistance under static and quasi-static tension load	See Annex B2 and C1
Characteristic resistance under static and quasi-static shear load	See Annex C2
Characteristic resistance under static and quasi-static tension and shear load	See Annex C2
Displacement under static and quasi-static tension or shear load	See Annex C3
Characteristic resistance under fatigue cyclic loading	No performance assessed
Characteristic resistance and displacement for seismic performance categories C1 and C2	No performance assessed

3.2 Safety in case of fire (BWR 2)

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

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

In accordance with EAD No. 330924-01-0601-v01, the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

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 29 January 2024 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock   *beglaubigt:*
Head of Section   Müller
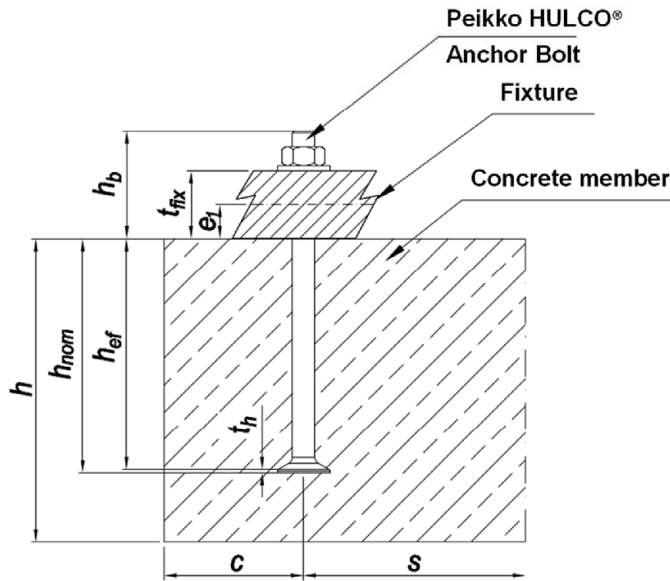
h = thickness of the concrete member
h_{nom} = overall length of the anchor bolt in the concrete
h_{ef} = effective embedment depth
t_h = thickness of the anchor bar head
h_b = protrusion height / thread length above concrete member
c = edge distance
s = spacing
t_{fix} = thickness of the fixture
e_1 = distance between shear load and concrete surface

Figure 1. (a) General installation
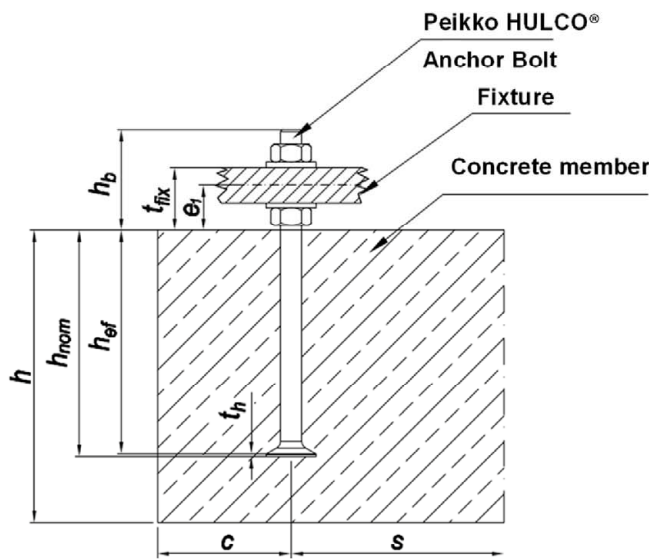
h = thickness of the concrete member
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t_h = thickness of the anchor bar head
h_b = protrusion height / thread length above concrete member
c = edge distance
s = spacing
t_{fix} = thickness of the fixture
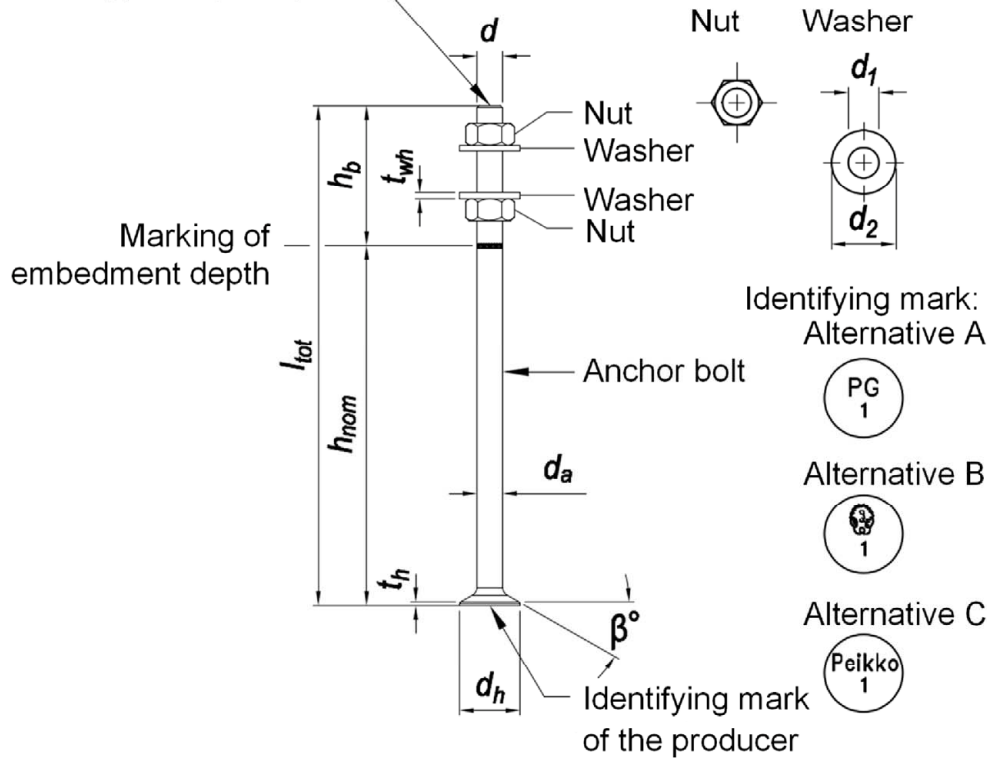e_1 = distance between shear load and concrete surface

Figure 2. (b) Steel to steel contact

Peikko HULCO® Anchor Bolt	
Product description **Installed conditions**	**Annex A1**

l_{tot} = length of the anchor bolt
h_{nom} = overal length of the anchor bolt in the concrete
h_b = protrusion heigth / thread length above concrete member
t_h = thickness of the anchor bar head

d = thread diameter
d_h = diameter of the anchor bar head
d_a = diameter of the anchor bar
t_{wh} = thickness of the washer
d_1 = hole diameter of the washer
d_2 = outside diamter of the washer
β = inclination angle of the anchor bar head

Figure 3. Dimensions of Peikko HULCO® Anchor Bolt

Anchor bolt	Anchor bolt								Washer			Nut [1]
	d_a	d_h	d	l_{tot}	h_{nom}	h_b	t_h	A_h	d_1	d_2	t_{wh}	
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm²]	[mm]	[mm]	[mm]	[-]
HULCO® 30	27,6	70	30	580	445	135	4	3250	32	65	8	M30
HULCO® 36	33,2	80	36	730	570	160	4	4161	39	80	8	M36
HULCO® 39	36,2	90	39	815	640	175	4	5333	41	90	10	M39
HULCO® 45	41,9	100	45	970	780	190	5	6475	47	100	10	M45
HULCO® 52	48,5	110	52	1170	950	220	5	7656	54	100	12	M52

1) Dimensions according EN ISO 4032:2012

Peikko HULCO® Anchor Bolt

**Product description
Dimensions, components,   and product marking**

Annex A2

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Table 2: Materials of Peikko HULCO® Anchor Bolt

Component	Type		Material	Mechanical properties
Anchor bolt	1a	HULCO® **	Smooth bar 8.8 according to EN 10263-4:2017	$f_{uk} \geq 800$ N/mm^2 $f_{yk} \geq 640$ N/mm^2
	1b	HULCO® ** HDG	Smooth bar 8.8 According to EN 10263-4:2017, hot dip galvanized according to EN ISO 1461:2022 or EN ISO 10684:2004 + AC:2009	$f_{uk} \geq 800$ N/mm^2 $f_{yk} \geq 640$ N/mm^2
Hexagonal nut	1a	HULCO® **	According to EN ISO 4032:2012	Strength class 8 or 10 according to EN ISO 898-2:2022
	1b	HULCO® ** HDG	According to EN ISO 4032:2012, hot dip galvanized according to EN ISO 1461:2022 or EN ISO 10684:2004 + AC:2009	Strength class 8 according to EN ISO 898-2:2022
Washer	1a	HULCO® **	Steel S355J2 according to EN 10025:2004	According to EN 10025:2004
	1b	HULCO® ** HDG	Steel S355J2 according to EN 10025:2004, hot dip galvanized according to EN ISO 1461:2022 or EN ISO 10684:2004 + AC:2009	According to EN 10025:2004

Peikko HULCO® Anchor Bolt

**Product description
Materials**

Annex A3

Specifications of intended use

Anchor bolts subject to:

- Static and quasi-static tension, shear or combination of tension and shear.

Base materials:

- Reinforced compacted normal weight concrete without fibres according to EN 206:2013 + A2:2021.
- Strength classes C20/25 to C90/105 according to EN 206:2013 + A2:2021.
- Cracked or uncracked concrete.

Intended use and environmental conditions:

- Anchor bolts made of smooth bar, washer and hexagonal nut are made of steel:
  Anchor bolts for use in structures subject to dry internal conditions.

- Anchor bolts made of smooth bar, washer and hexagonal nut are made of hot dip galvanized steel according to EN ISO 1461:2022 or EN ISO 10684:2004 + AC:2009 with at least 50 μm thickness:
  Anchor bolts for use in structures subject to internal conditions with usual humidity
  (exceptional permanently damp conditions and applications under water).

- Anchor bolts made of smooth bar, washer and hexagonal nut are made of steel with concrete cover according to EN 1992-1-1:2004 + AC:2010 + A1:2014:
  Anchor bolts for use in structures subject to appropriate exposition relating to the concrete cover.

Design:

- Anchor bolts are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor bolts are indicated on the design drawings (e.g. position of the anchor bolts relative to reinforcement or to supports).
- For static and quasi-static loading the anchor bolts are designed in accordance with EN 1992-4:2018.
- The occurring splitting forces are resisted by the reinforcement. The required cross section of the minimum reinforcement is determined according EN 1992-4:2018, section 7.2.1.7.

Peikko HULCO® Anchor Bolt	
Intended use **Specifications**	**Annex B1**

Installation:

Placing anchor bolts into concrete

- The installation of anchor bolts is carried out by appropriately qualified personnel under the supervision of the person responsible for the technical matters on site.
- Use of the product only as supplied by the manufacturer, without any manipulation or exchanging of components.
- Installation in accordance with the manufacturer's product installation instructions given in Annex B3.
- The anchor bolts are fixed to the formwork, reinforcement or auxiliary construction such that no movement of the product will occur during the time of laying the reinforcement and of placing and compacting the concrete.
- The anchor bolts are embedded in concrete up to the marking of embedment depth.
- The concrete under the anchor bar head is properly compacted.
- The max. installation torque according to Table 3 must not be exceeded.

Table 3:   Installation parameters of Peikko HULCO® Anchor Bolt

| HULCO® ...			30	36	39	45	52
Effective embedment depth	h_{ef}	[mm]	441	566	636	775	945
Minimum spacing	s_{min}	[mm]	130	160	180	200	280
Minimum edge distance	c_{min}	[mm]	120	140	150	160	180
Protrusion height / thread length above concrete member	h_b	[mm]	135	160	175	190	220
Min. thickness of concrete member	h_{min}	[mm]	$h_{ef} + t_h + c_{nom}$ [1]				
Max. installation torque General installation, case (a)	$T_{inst,g}$	[Nm]	200	300	400	600	900
Max. installation torque Steel to steel contact, case (b)	$T_{inst,s}$	[Nm]	700	1200	1600	2600	4000

1)   Required concrete cover according to EN 1992-1-1:2004 + AC:2010 + A1:2014

Peikko HULCO® Anchor Bolt

**Intended use
Installation parameters**

Annex B2

Installation instruction:
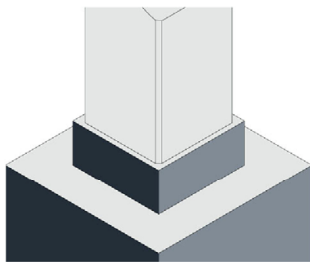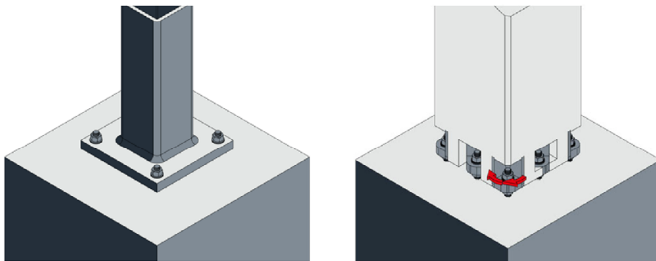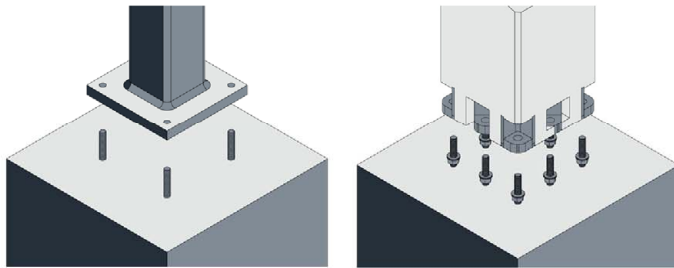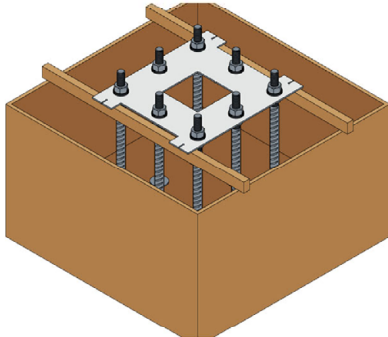
- Install the anchor bolts to the formwork by using a Peikko® installation template according design drawings to ensure the correct position, size and protrusion height (h_b) of the anchor bolts.
- Pay attention to a strong fixing of the anchor bolts to avoid moving during pouring.
- Compact concrete properly around and under the anchor bar head.
- After hardening of the concrete the installation template can be removed.

- For the installation of a steel column according to figure 1 (general installation) all nuts are removed.
- For the installation of a precast concrete column or steel column according to figure 2 (steel to steel contact) the lower levelling nuts are adjusted to the correct level.

- The connection is fixed by tightening the upper nuts.
The installation torque T_{inst} acc. to Annex B2 must not be exceeded.

- The joint between the base structure and the column must be filled properly with non-shrinking mortar.

Peikko HULCO® Anchor Bolt	
Intended use **Manufacturers product installation instructions (MPII)**	**Annex B3**

Table 4:   Characteristic resistances of Peikko HULCO® Anchor Bolts under tension load

HULCO® ...			30	36	39	45	52
Steel failure							
Characteristic resistance	$N_{Rk,s}$	[kN]	448,8	653,6	780,8	1044,8	1406,4
Partial factor	γ_{Ms}	[-]	1,5
Concrete failure: Pull-out							
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	683	874	1120	1359	1608
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	488	624	800	971	1148
Increase factor for higher concrete grades for $N_{Rk,p}$ $N_{Rk,p} = N_{Rk,p\,(C20/25)} \cdot \Psi_c$	Ψ_c	C25/30	1,25
		C30/37	1,50
		C35/45	1,75
		C40/50	2,00
		C45/55	2,25
		C50/60	2,50
		C55/67	2,75
		≥ C60/75	3,00
Partial factor	γ_{Mp}[1]	[-]	1,5
Concrete failure: Cone failure							
Effective embedment depth	h_{ef}	[mm]	441	566	636	775	945
Factor for the influence of the load transfer mechanism	$k_{ucr,N}$	[-]	12,7
	$k_{cr,N}$	[-]	8,9
Characteristic spacing	$s_{cr,N} = s_{cr,sp}$	[mm]	3 h_{ef}
Characteristic edge distance	$c_{cr,N} = c_{cr,sp}$	[mm]	1,5 h_{ef}
Partial factor	γ_{Mc}[1]	[-]	1,5
Concrete failure: Splitting							
A reinforcement has to be present to resist the splitting forces and limits the crack width to $w_k \leq 0,3$ mm. See EN 1992-4:2018, section 7.2.1.7							

1)   In absence of other national regulations

Peikko HULCO® Anchor Bolt	
Performance Characteristic resistances under tension load	**Annex C1**

Table 5: Characteristic resistances of Peikko HULCO® Anchor Bolts under shear load

HULCO® ...			30	36	39	45	52
Steel failure without lever arm							
Characteristic resistance	$V^0_{Rk,s}$	[kN]	224,4	326,8	390,4	522,4	703,2
Factor acc. EN 1992-4:2018, section 7.2.2.3.1	k_7	[-]			1,0		
Partial factor	γ_{Ms}	[-]			1,25		
Steel failure with lever arm							
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	1794	3175	4145	6401	9973
Partial factor	γ_{Ms}	[-]			1,5		
Concrete pry-out failure							
Factor acc. EN 1992-4:2018, section 7.2.2.4	k_8[1]	[-]			2,0		
Partial factor	γ_{Mcp}[2]	[-]			1,5		
Concrete edge failure							
Effective embedment depth under shear load	l_f	[mm]	240	288	312	360	416
Effective outer diameter	$d_{nom} = d$	[mm]	30	36	39	45	52
Partial factor	γ_{Mc}[2]	[-]			1,5		

1) If supplementary reinforcement is present, the factor k_8 has to be multiplied by 0,75
2) In absence of national regulations

Combined tension and shear load			
Exponent acc. EN 1992-4:2018, section 7.2.3	k_{11}	[-]	2/3

Table 6: Displacements of Peikko HULCO® Anchor Bolts under tension load

HULCO® ...			30	36	39	45	52
Tension load	N	[kN]	232	297	381	462	547
Short-term displacement	δ_{N0}	[mm]	1,7	1,9	2,1	2,3	2,4
Long-term displacement	$\delta_{N\infty}$	[mm]	3,4	3,8	4,2	4,6	4,8

Table 7: Displacements of Peikko HULCO® Anchor Bolts under shear load

HULCO® ...			30	36	39	45	52
Shear load	V	[kN]	128	187	223	299	402
Short-term displacement	δ_{V0}	[mm]	2,0	2,0	2,0	2,0	2,0
Long-term displacement	$\delta_{V\infty}$	[mm]	3,0	3,0	3,0	3,0	3,0

Peikko HULCO® Anchor Bolt

Performance **Characteristic resistances under shear load, combined tension and shear load** **Displacements under tension and/ or shear load**	**Annex C2**