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-18/0184 of 17 August 2018

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	HVU2
Product family to which the construction product belongs	Bonded fastener for use in concrete
Manufacturer	Hilti AG Feldkircherstraße 100 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Corporation
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	EAD 330499-00-0601
This version replaces	ETA-18/0184 issued on 14 May 2018

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Specific Part

1 Technical description of the product

The HVU2 is a bonded anchor consisting of a mortar capsule Hilti HVU2 M10 to M30 and a steel element Hilti HAS-(E) with washer and hexagon nut of sizes M10 to M30.

The mortar capsule is placed in the hole and the steel element is driven by machine as specified in Annex B5.

The anchor rod is anchored via the bond between steel element, chemical mortar and concrete.

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 to tension load (static and quasi-static loading)	No performance assessed
Characteristic resistance to shear load (static and quasi-static loading)	
Displacements (static and quasi-static loading)	
Characteristic resistance for seismic performance category C1 and C2, displacements	see Annex C 1 to C 2

3.2 Hygiene, health and the environment (BWR 3)

Essential characteristics	Performance
Content, emission and/or release of dangerous substances	No performance assessed

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

In accordance with European Assessment Document EAD 330499-00-0601 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 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 17 August 2018 by Deutsches Institut für Bautechnik

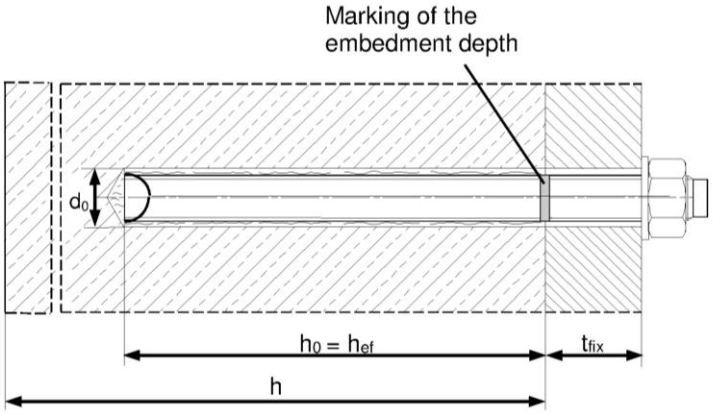
Dr.-Ing. Lars Eckfeldt
p. p. Head of Department

beglaubigt:
Lange

Deutsches Institut für Bautechnik

Installed condition

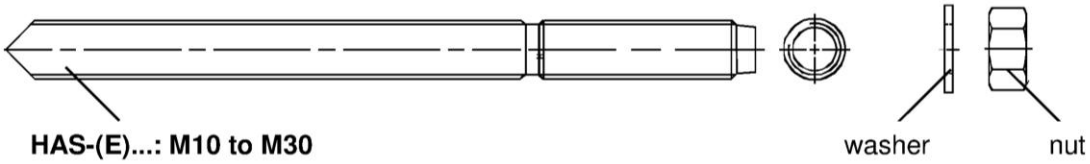
Figure A1:
HAS-(E)…



Product description: Mortar capsule and steel elements

Adhesive anchor capsule HVU2 M10 to M30: resin and hardener with aggregate

Steel elements



HVU2	
Product description Installed condition Adhesive anchor capsule / Steel elements	**Annex A1**

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Table A1: Materials

Designation	Material
Metal parts made of zinc coated steel	
HAS-(E)	M10 to M16: Strength class 5.8, f_{uk} = 570 N/mm², f_{yk} = 456 N/mm² M20 and M24: Strength class 5.8, f_{uk} = 500 N/mm², f_{yk} = 400 N/mm² Elongation after fracture A_f > 0,22 (equal to A (l_0 = 5d) > 8% ductile) M10 to M30: Strength class 8.8, f_{uk} = 800 N/mm², f_{yk} = 640 N/mm² Rupture elongation A (l_0 = 5d) > 12% ductile Electroplated zinc coated ≥ 5 µm, (F) hot dip galvanized ≥ 45 µm
Washer	Electroplated zinc coated ≥ 5 µm, hot dip galvanized ≥ 45 µm
Nut	Strength class of nut adapted to strength class of threaded rod. Electroplated zinc coated ≥ 5 µm, hot dip galvanized ≥ 45 µm
Metal parts made of stainless steel	
HAS-(E)R	M10 to M16: Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 500 N/mm² M20 and M24: Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm² M27 and M30: Strength class 70, f_{uk} = 500 N/mm², f_{yk} = 210 N/mm² Rupture elongation A (l_0 = 5d) > 12% ductile Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Washer	Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Nut	Strength class of nut adapted to strength class of threaded rod. Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Metal parts made of high corrosion resistant steel	
HAS-(E)HCR	M10 to M20: f_{uk} = 800 N/mm², f_{yk} = 640 N/mm² M24: f_{uk} = 700 N/mm², f_{yk} = 400 N/mm² Rupture elongation A (l_0 = 5d) > 12% ductile High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014
Washer	High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014
Nut	Strength class of nut adapted to strength class of threaded rod. High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014

HVU2	**Annex A2**
Product description Materials	

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Specifications of intended use

Anchorages subject to:

- Seismic performance category C1 size M10 to M30.
- Seismic performance category C2 size M16 and M20.

Base material:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Cracked and uncracked concrete.

Temperature in the base material:

- **At installation**
  0 °C to +40 °C
- **In-service**
  Temperature range I: -40 °C to +40 °C
  (max. long term temperature +24 °C and max. short term temperature +40 °C)
  Temperature range II: -40 °C to +80 °C
  (max. long term temperature +50 °C and max. short term temperature +80 °C)
  Temperature range III: -40 °C to +120 °C
  (max. long term temperature +72 °C and max. short term temperature +120 °C)

Table B1: Specifications of intended use

	Foil capsule HVU2 with …
Elements	Threaded rod HAS-(E)… 
Hammer drilling with hollow drill bit TE-CD or TE-YD 	M12 to M30
Hammer drilling	M10 to M30

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Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
  (zinc coated steel, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal conditions, if no particular aggressive conditions exist
  (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal conditions, if other particular aggressive conditions exist
  (high corrosion resistant steel).
  Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing products are used).

Design:

- Anchorages 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 is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages under seismic loading are designed in accordance with:
  FprEN1992-4:2017 and EOTA Technical Report TR055.
  Anchorages shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure. Fastening in stand-off installation or with a grout layer under seismic action are not covered in this European technical assessment (ETA).

Installation:

- Concrete condition I1:
  Installation in dry or wet (water saturated) concrete and use in service in dry or wet concrete.
- Drilling technique: hammer drilling, hammer drilling with hollow drill bit TE-CD, TE-YD.
- Installation direction:
  D2: downward and horizontal installation for threaded rod (HAS) M10 to M30.
  D3: downward and horizontal and upward (e.g. overhead) installation for threaded rod (HAS) M10 to M24.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

HVU2	Annex B2
Intended Use Specifications	

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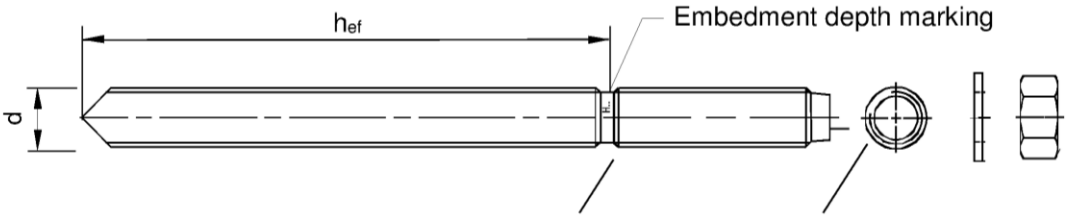
Table B2: Installation parameters of HAS-(E)…

HAS-(E)…			M10	M12	M16	M20	M24	M27	M30
Foil capsule HVU2 M…			**10x90**	**12x110**	**16x125**	**20x170**	**24x210**	**27x240**	**30x270**
Diameter of fastener	$d = d_{nom}$	[mm]	10	12	16	20	24	27	30
Nominal diameter of drill bit	d_0	[mm]	12	14	18	22	28	30	35
Effective embedment depth and drill hole depth	$h_{ef} = h_0$	[mm]	90	110	125	170	210	240	270
Maximum diameter of clearance hole in the fixture	d_f	[mm]	12	14	18	22	26	30	33
Minimum allowed thickness of concrete member	h_{min}	[mm]	120	140	160	220	270	300	340
Maximum torque moment	max T_{fix}	[Nm]	20	40	80	150	200	270	300
Minimum allowable spacing	s_{min}	[mm]	50	60	75	90	115	120	140
Minimum allowable edge distance	c_{min}	[mm]	45	45	50	55	60	75	80

HAS-(E)…



Marking:
identifying mark - H, embossing "1" HAS-(E)
identifying mark - H, embossing "=" HAS-(E)R
identifying mark - H, embossing "CR" HAS-(E)HCR

Table B3: Minimum curing time

Temperature in the base material T	Minimum curing time t_{cure}
0 °C to 4 °C	40 min
5 °C to 9 °C	20 min
10 °C to 19 °C	10 min
20 °C to 40 °C	5 min

HVU2	Annex B3
Intended Use Installation parameters Minimum curing time	

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Table B4: Parameters of drilling and cleaning tools

Elements	Drill and clean	
HAS-(E)…	Hammer drilling	
	Standard drill bit TE-C, TE-Y	Hollow drill bit TE-CD, TE-YD
		
Size	d_0 [mm]	d_0 [mm]
M10	12	-
M12	14	14
M16	18	18
M20	22	22
M24	28	28
M27	30	-
M30	35	35

Cleaning alternatives

Manual Cleaning (MC):
Hilti hand pump for blowing out drill holes with diameters $d_0 \leq 18$ mm and drill hole depths $h_0 \leq 10 \cdot d$.

Compressed Air Cleaning (CAC):
Air nozzle with an orifice opening of minimum 3,5 mm in diameter.

Automatic Cleaning (AC):
Cleaning is performed during drilling with Hilti TE-CD and TE-YD drilling system including vacuum cleaner.

HVU2	
Intended Use Cleaning tools	**Annex B4**

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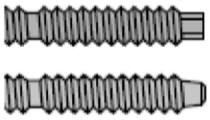
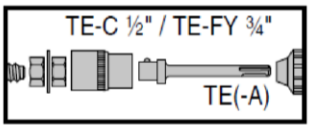
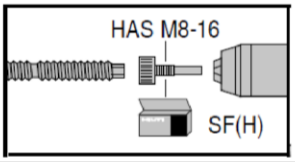
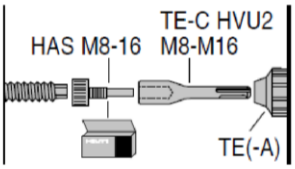
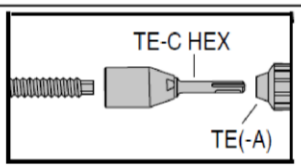
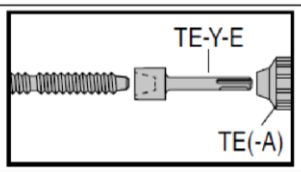
Table B5: Parameters of setting tools HAS-(E)…

Elements	Setting tools		Operating mode
HAS-(E) M10 to M30 		HAS-(E) with double nut and TE-C ½" or TE-FY ¾" adapter	Rotary hammer tool in rotation hammer mode
HAS M10 to M16 		HAS with setting tool delivered in the HAS box	Drill driver in rotation mode or rotation hammer mode
		HAS with setting tool delivered in the HAS box and TE-C HVU2 adapter	Rotary hammer tool in rotation hammer mode
		HAS with TE-C HEX adapter	Rotary hammer tool in rotation hammer mode
HAS-E M20 		HAS E with TE-Y-E adapter	Rotary hammer tool in rotation hammer mode

HVU2	**Annex B5**
Intended Use Setting tools	

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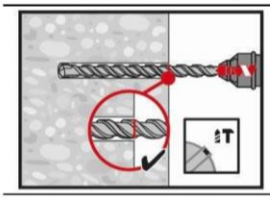
Installation instruction

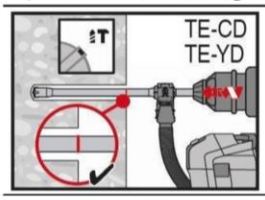
Hole drilling

a) Hammer drilling: For dry or wet concrete



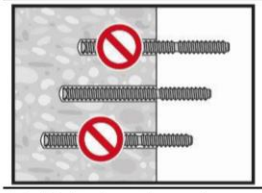
Drill hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

b) Hammer drilling with Hilti hollow drill bit: For dry and wet concrete only.



Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment. This drilling system removes the dust and cleans the drill hole during drilling when used in accordance with the user's manual. After drilling is completed, proceed to the "setting the element" step in the installation instruction.

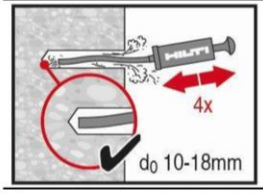
Check setting depth



Check the setting depth with the marked element.
The element has to fit in the hole until the required embedment depth, not deeper.
If it is not possible to insert the element to the required embedment depth, drill deeper.

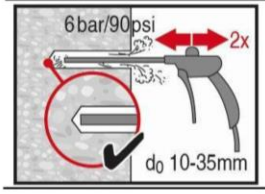
Drill hole cleaning: Just before setting an anchor, the drill hole must be free of dust and debris.
Inadequate hole cleaning = poor load values.

Manual Cleaning (MC): For drill hole diameters $d_0 \leq 18$ mm and drill hole depths $h_0 \leq 10 \cdot d$.



The Hilti hand pump may be used for blowing out drill holes.
Blow out at least 4 times from the back of the drill hole until return air stream is free of noticeable dust.

Compressed Air Cleaning (CAC): For all drill hole diameters d_0 and all drill hole depths h_0.



Blow 2 times from the back of the hole (if needed with nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust.

HVU2	Annex B6
Intended Use Installation instructions	

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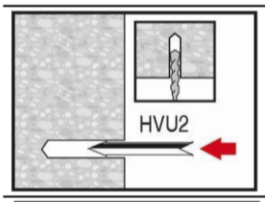
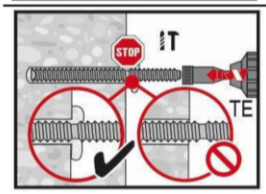
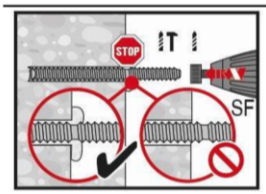
Setting the element



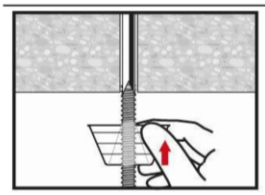
Overhead application is permitted for HVU2 size M10 to M24
Insert the foil capsule with the peak ahead to the back of the hole.



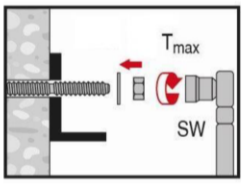
Drive the anchor rod with the plugged tool into the hole, applying moderate pressure.
Rotary hammer tool in rotation hammer mode (450 RPM to maximum 1300 RPM).
Setting tool see Annex B5.
After reaching the embedment depth switch off setting machine immediately.



For HAS-(E) M10 to M16 a drill driver in rotation mode or rotation hammer mode can be used.



Overhead installation.
For overhead installation use the overhead dripping cup HIT-OHC.



Loading the anchor: After required curing time t_{cure} (see Table B3) the anchor can be loaded.
The applied installation torque shall not exceed the values T_{max} given in Table B2.

HVU2	
Intended Use Installation instructions	**Annex B7**

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Table C1: Essential characteristics for HAS-(E) under tension loads for seismic performance category C1

HAS-(E)...			M10	M12	M16	M20	M24	M27	M30
Steel failure									
HAS-(E) 5.8	$N_{Rk,s,eq}$	[kN]	29	42	79	123	177	-	
HAS-(E) 8.8	$N_{Rk,s,eq}$	[kN]	46	67	126	196	282	367	449
HAS-R	$N_{Rk,s,eq}$	[kN]	41	59	110	172	247	230	281
HAS-HCR	$N_{Rk,s,eq}$	[kN]	46	67	126	196	247	-	
Combined pullout and concrete cone failure in cracked concrete C20/25 in **hammer drilled holes**									
Temperature range I: 40 °C / 24 °C	$\tau_{Rk,eq}$	[N/mm²]	8,5	8,5	8,3	6,9	8,1	6,5	7,6
Temperature range II: 80 °C / 50 °C	$\tau_{Rk,eq}$	[N/mm²]	6,5	6,5	6,4	5,3	6,2	5,0	5,8
Temperature range III: 120 °C / 72 °C	$\tau_{Rk,eq}$	[N/mm²]	4,0	4,0	3,9	3,3	3,8	3,1	3,6
Combined pullout and concrete cone failure in cracked concrete C20/25 in **hammer drilled holes with hollow drill bit TE-CD or TE-YD**									
Temperature range I: 40 °C / 24 °C	$\tau_{Rk,eq}$	[N/mm²]	-	8,5	8,3	6,9	8,1	6,5	7,6
Temperature range II: 80 °C / 50 °C	$\tau_{Rk,eq}$	[N/mm²]	-	6,5	6,4	5,3	6,2	5,0	5,8
Temperature range III: 120 °C / 72 °C	$\tau_{Rk,eq}$	[N/mm²]	-	4,0	3,9	3,3	3,8	3,1	3,6

Table C2: Essential characteristics for HAS-(E) under shear loads for seismic performance category C1

HAS-(E)...			M10	M12	M16	M20	M24	M27	M30
Factor for annular gap	α_{gap}	[-]	0,5						
Steel failure without lever arm									
HAS-(E) 5.8	$V_{Rk,s,eq}$	[kN]	11	15	27	43	62	-	-
HAS-(E) 8.8	$V_{Rk,s,eq}$	[kN]	16	24	44	69	99	129	157
HAS-R	$V_{Rk,s,eq}$	[kN]	14	21	39	60	87	81	98
HAS-HCR	$V_{Rk,s,eq}$	[kN]	16	24	44	69	87	-	-

HVU2	**Annex C1**
Performances Essential characteristics for seismic performance category C1	

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Table C3: Essential characteristics for HAS-(E) under tension loads for seismic performance category C2

HAS-(E)-...			**M16**	**M20**
Steel failure				
HAS-(E) 8.8, HAS-F 8.8	$N_{Rk,s,eq}$	[kN]	126	196
Combined pullout and concrete cone failure in cracked concrete C20/25 in **hammer drilled holes and with hollow drill bit TE-CD or TE-YD**				
Temperature range I: 40 °C / 24 °C	$\tau_{Rk,eq}$	[N/mm²]	2,9	2,6
Temperature range II: 80 °C / 50 °C	$\tau_{Rk,eq}$	[N/mm²]	2,3	2,1
Temperature range III: 120 °C / 72 °C	$\tau_{Rk,eq}$	[N/mm²]	1,4	1,3

Table C4: Essential characteristics for HAS-(E) under shear loads for seismic performance category C2

HAS-(E)-...			**M16**	**M20**
Factor for annular gap	α_{gap}	[-]	0,5	
Steel failure without lever arm				
HAS-(E) 8.8	$V_{Rk,s,eq}$	[kN]	40	71
HAS-F 8.8	$V_{Rk,s,eq}$	[kN]	30	46

Table C5: Displacements under tension load for seismic performance category C2

HAS-(E)-...			**M16**	**M20**
Displacement DLS	$\delta_{N,seis(DLS)}$	[mm]	0,2	0,2
Displacement ULS	$\delta_{N,seis(ULS)}$	[mm]	0,4	0,5

Table C6: Displacements under shear load for seismic performance category C2

HAS-(E)-...			**M16**	**M20**
Displacement DLS HAS-(E) 8.8	$\delta_{N,seis(DLS)}$	[mm]	3,2	2,5
Displacement DLS HAS-F 8.8	$\delta_{N,seis(DLS)}$	[mm]	2,3	3,8
Displacement ULS HAS-(E) 8.8	$\delta_{N,seis(ULS)}$	[mm]	9,2	7,1
Displacement ULS HAS-F 8.8	$\delta_{N,seis(ULS)}$	[mm]	4,3	9,1