



# TOIMIVUSDEKLARATSIOON

No: 18-EUS2-A4-HCR [ET]

# ESSVE

GET IT DONE

Tootetüübi kordumatu identifitseerimiskood:

ESSVE Betoonikruvi EUS2 (carbon steel)

ESSVE Betoonikruvi EUSA4

ESSVE Betoonikruvi EUSHCR

Tootja:

ESSVE Produkter AB

BOX 7091

164 07 Kista

Sweden

Euroopa tehniline hinnang (ETA)	Kavandatud kasutusala(d)	Välisläbimõõt ja (külviku) mõõt [mm]	Artikli number
ETA-18/1138 (2019-02-13)	<ul style="list-style-type: none"><li>Single anchor or anchor groups for use in structural applications under static or quasi-static actions in cracked and uncracked concrete.</li><li>Installation with adjustment (ETA Annex B 4)</li><li>Resistance to Fire for all embedment depths and dimensions</li><li>Seismic resistance for maximum embedment depth</li></ul>	7,5(6)	Kõik tootegrupi artiklid omavad ETA sertifikaati.
		10,6(8)	
		12,6(10)	
		14,6(12)	
		16,6(14)	

Euroopa tehniline hinnang (ETA)	Toimivuse püsivuse hindamise ja kontrolli süsteem (AVCP)	Euroopa hindamisdokument	Tehnilise hindamise asutus (TAB)	Teavitatud asutus(ed) (NB)
ETA-18/1138 (2019-02-13)	1	EAD 330232-00-0601, (2016-10)	Deutsches Institut für Bautechnik (DIBt)	2873 (FPC)
ETA-18/1138 (2019-02-13)	1	EAD 330011-00-0601, (2015-03)	Deutsches Institut für Bautechnik (DIBt)	2873 (FPC)



# TOIMIVUSDEKLARATSIOON

No: 18-EUS2-A4-HCR [ET]

**ESSVE**  
GET IT DONE

Euroopa tehniline hinnang (ETA)	Põhiomadused	Toimivus
ETA-18/1138 (2019-02-13)	Characteristic resistance under static and quasi-static loading	ETA-18/1138 Annex C 1 & Annex C 2
	Displacements (static and quasi-static loading)	ETA-18/1138 Annex C 3
	Characteristic resistance and displacements for seismic performance category C1	ETA-18/1138 Annex C 4
	Reaction to fire	Class A1
	Resistance to fire	ETA-18/1138 Annex C 5

Eespool kirjeldatud toote toimivus vastab deklareeritud toimivusele. Käesolev toimivusdeklaratsioon on välja antud kooskõlas määrusega (EL) nr 305/2011 eespool nimetatud tootja ainuvastutusel.

Tootja poolt ja nimel allkirjastanud:

Viktor Bukowski  
Product Manager – Concrete Fasteners

Kista 2021-01-21

[ETA attached as an appendix]

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

ETA-18/1138  
of 13 February 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

EUS2, EUSA4, EUSHCR

Product family  
to which the construction product belongs

Mechanical fastener for use in concrete

Manufacturer

ESSVE Produkter AB  
Esbogatan 14  
164 74 KISTA  
SCHWEDEN

Manufacturing plant

ESSVE plants

This European Technical Assessment  
contains

16 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 330232-00-0601  
EAD 330011-00-0601

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**Specific Part**

**1 Technical description of the product**

The ESSVE Concrete Screw EUS2, EUSA4 and EUSHCR is an anchor in size 6, 8, 10, 12 and 14 mm made of galvanised steel respectively steel with zinc flake coating, made of stainless or high corrosion resistant steel. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

Product and 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)	See Annex C 1 and C 2
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1 and C 2
Displacements (static and quasi-static loading)	See Annex C 3
Characteristic resistance and displacements for seismic performance category C1	See Annex C 4

**3.2 Safety in case of fire (BWR 2)**

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C 5



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

In accordance with European Assessment Documents EAD No. 330232-00-0601 and EAD No. 330011-00-0601, 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 EAD**

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

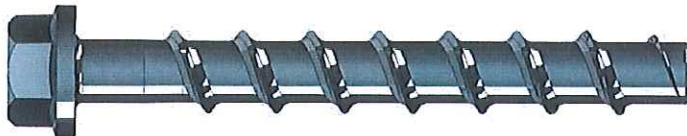
Issued in Berlin on 13 February 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow  
Head of Department

*beglaubigt:*  
Tempel

**Product and installed condition**

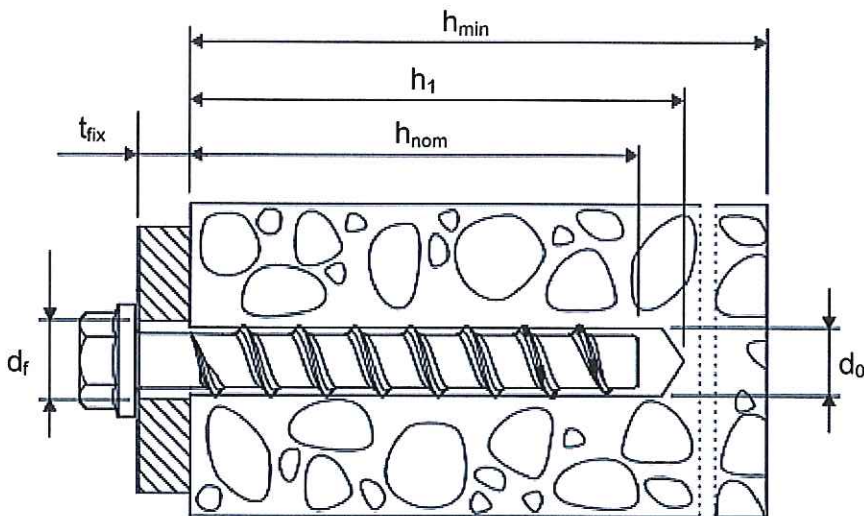
**ESSVE concrete screw EUS2, EUSA4, EUSHCR**



**carbon steel**



**stainless steel A4 and HCR**



- |           |   |   |
|-----------|---|---|
| $d_0$     | = | nominal drill bit diameter                |
| $h_{nom}$ | = | nominal anchorage depth                   |
| $h_1$     | = | depth of the drill hole                   |
| $h_{min}$ | = | minimum thickness of member               |
| $t_{fix}$ | = | thickness of fixture                      |
| $d_r$     | = | diameter of clearance hole in the fixture |























**ESSVE concrete screw EUS2, EUSA4, EUSHCR**

**Product description**

Installed condition

**Annex A 1**

**Table A1: Materials and variants**

part	name	Material				
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Concrete screw	EUS2	Steel EN 10263-4:2017 galvanized acc. to EN ISO 4042:2018 or zinc flake coating acc. to EN ISO 10683:2018 ( $\geq 5\mu\text{m}$ )			
		EUSA4	1.4401, 1.4404, 1.4571, 1.4578			
		EUSHCR	1.4529			
						EUS2, EUSA4, EUSHCR
		nominal characteristic steel yield strength		$f_{yk}$	[N/mm <sup>2</sup> ]	560
		nominal characteristic steel ultimate strength		$f_{uk}$	[N/mm <sup>2</sup> ]	700
		elongation at rupture		$A_5$	[%]	$\leq 8$
				1)	Anchor version with connection thread and hexagon socket e.g. EUS2 8x105 M10 SW5	
				2)	Anchor version with connection thread and hexagon drive e.g. EUS2 8x105 M10 SW7	
				3)	Anchor version with washer, hexagon head and TORX e.g. EUS2-HF 8x80 SW13 TX40	
				4)	Anchor version with washer and hexagon head e.g. EUS2-HF 8x80 SW13	
		5)	Anchor version with hexagon head e.g. EUS2-H 8x80 SW13			
		6)	Anchor version with countersunk head e.g. EUS2-C 8x80 TX40			
		7)	Anchor version with pan head e.g. EUS2-PS 8x80 TX40			
		8)	Anchor version with large pan head e.g. EUS2-PL 8x80 TX40			
		9)	Anchor version with countersunk head and connection thread e.g. EUS2-E 6x55 M8			
		10)	Anchor version with hexagon drive and connection thread e.g. EUS2-E 6x55 SW10			
		11)	Anchor version with internal thread and hexagon drive e.g. EUS2-I 6x55 M8/10			

ESSVE concrete screw EUS2, EUSA4, EUSHCR

Product descriptions

Materials and variants

Annex A 2



**Table A2: Dimensions and markings**

Anchor size EUS2, EUSA4, EUSHCR		6		8			10			
Nominal embedment depth $h_{nom}$ [mm]		$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	
		40	55	45	55	65	55	75	85	
Length of the anchor $L \leq$	[mm]	500								
Diameter of shaft $d_k$	[mm]	5,1		7,1			9,1			
Diameter of thread $d_s$	[mm]	7,5		10,6			12,6			
Anchor size EUS2, EUSA4, EUSHCR		12			14					
Nominal embedment depth $h_{nom}$ [mm]		$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$			
		65	85	100	75	100	115			
Length of the anchor $L \leq$	[mm]	500								
Diameter of shaft $d_k$	[mm]	11,1			13,1					
Diameter of thread $d_s$	[mm]	14,6			16,6					



**Marking:**

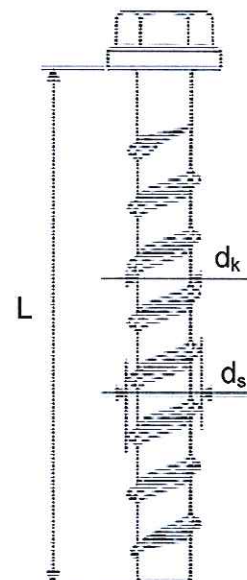
EUS2  
Anchor size: 10  
Length of the anchor: 100  
Identification code: TSM



EUSA4  
Anchor size: 10  
Length of the anchor: 100  
Identification code: TSM  
Material: A4



EUSHCR  
Anchor size: 10  
Length of the anchor: 100  
Identification code: TSM  
Material: HCR



ESSVE concrete screw EUS2, EUSA4, EUSHCR

**Product descriptions**

Dimensions and markings

**Annex A 3**

## Intended use

### Anchorage subject to:

- static and quasi-static loads, all sizes and all embedment depth,
- Used for anchorages with requirements related to resistance of fire, all sizes and all embedment depth,
- used for anchorages with seismic actions category C1, sizes 8-14 for maximum embedment depth  $h_{nom3}$ .

### Base materials:

- reinforced and unreinforced concrete without fibres according to EN 206:2013,
- strength classes C20/25 to C50/60 according to EN 206:2013,
- cracked and uncracked concrete.

### Use conditions (Environmental conditions):

- The anchor may only be used in dry internal conditions: All screw types,
- Structural subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition no particular aggressive conditions exists: screw types made of stainless steel with marking A4,
- Structural subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition if particular aggressive conditions exists: screw types made of stainless steel with marking HCR.

Note: Such 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 chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials 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 are designed according to EN 1992-4:2018 and EOTA Technical Report TR 055,
- The design for shear load according to EN 1992-4:2018, Section 6.2.2 applies for all specified diameters  $d_f$  of clearance hole in the fixture in Annex B 2, Table B1.

### Installation:

- Hammer drilling only.
- Anchor installation carried out by appropriately qualified personal and under the supervision of the person responsible for technical matters of the site.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of aborted hole or smaller distance if the aborted hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of the load application.
- After installation further turning of the anchor is not possible. The head of the anchor is supported on the fixture and is not damaged.
- The drill hole may be filled with injection mortar.
- Adjustability according to Annex B 4: sizes 8-14, all anchorage depths.

ESSVE concrete screw EUS2, EUSA4, EUSHCR

Intended use

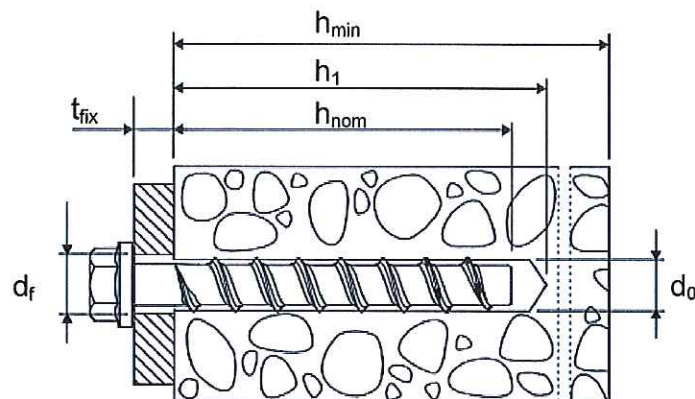
Specifications

Annex B 1



**Table B1: Installation parameters**

Anchor size EUS2, EUSA4, EUSHCR			6		8			10			
Nominal embedment depth $h_{nom}$ [mm]			$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	
			40	55	45	55	65	55	75	85	
Nominal drill bit diameter	$d_0$	[mm]	6		8			10			
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,40		8,45			10,45			
Depth of drill hole	$h_1 \geq$	[mm]	45	60	55	65	75	65	85	95	
Diameter of clearing hole in the fixture	$d_f \leq$	[mm]	8		12			14			
Installation torque for version with connection thread	$T_{inst} \leq$	[Nm]	10		20			40			
Impact screw driver max. capacity		[Nm]	Max. torque according to manufacturer's instructions								
			160		300			400			
Anchor size EUS2, EUSA4, EUSHCR			12			14					
Nominal embedment depth $h_{nom}$ [mm]			$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$			
			65	85	100	75	100	115			
Nominal drill bit diameter	$d_0$	[mm]	12			14					
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12,50			14,50					
Depth of drill hole	$h_1 \geq$	[mm]	75	95	110	85	110	125			
Diameter of clearing hole in the fixture	$d_f \leq$	[mm]	16			18					
Installation torque for version with connection thread	$T_{inst} \leq$	[Nm]	60			80					
Impact screw driver max. capacity		[Nm]	Max. torque according to manufacturer's instructions								
			650			650					



**ESSVE concrete screw EUS2, EUSA4, EUSHCR**

**Intended use**

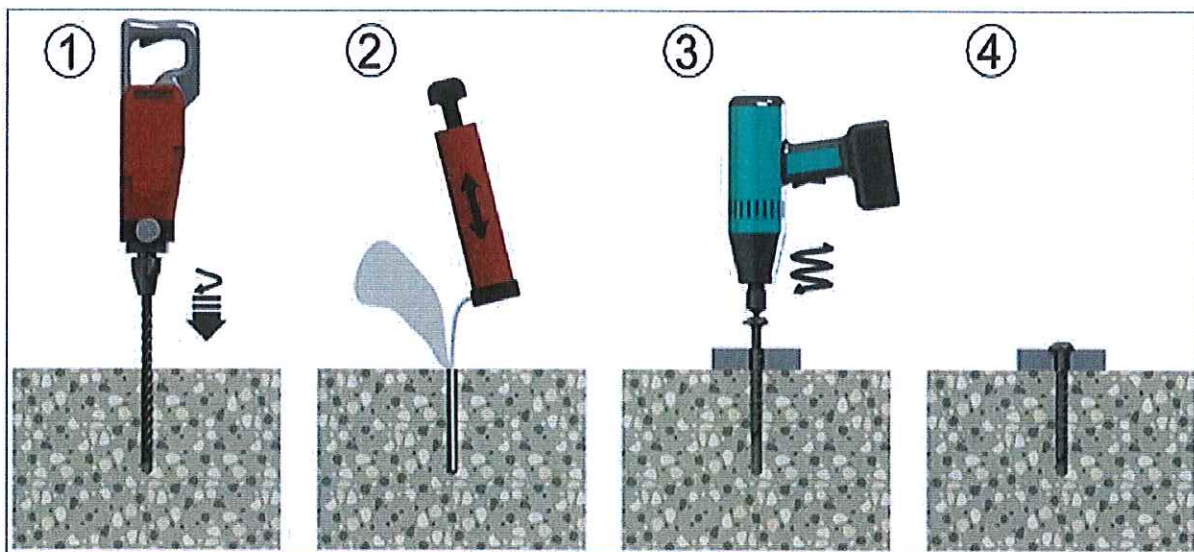
Installation parameters

**Annex B 2**

**Table B2: Minimum thickness of member, minimum edge distance and minimum spacing**

Anchor size EUS2, EUSA4, EUSHCR			6		8			10		
Nominal embedment depth $h_{nom}$ [mm]			$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
			40	55	45	55	65	55	75	85
Minimum thickness of member	$h_{min}$	[mm]	100		100		120	100	130	130
Minimum edge distance	$c_{min}$	[mm]	40		40	50		50		
Minimum spacing	$s_{min}$	[mm]	40		40	50		50		
Anchor size EUS2, EUSA4, EUSHCR			12			14				
Nominal embedment depth $h_{nom}$ [mm]			$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$		
			65	85	100	75	100	115		
Minimum thickness of member	$h_{min}$	[mm]	120	130	150	130	150	170		
Minimum edge distance	$c_{min}$	[mm]	50		70	50	70			
Minimum spacing	$s_{min}$	[mm]	50		70	50	70			

**Installation instructions**



**ESSVE concrete screw EUS2, EUSA4, EUSHCR**

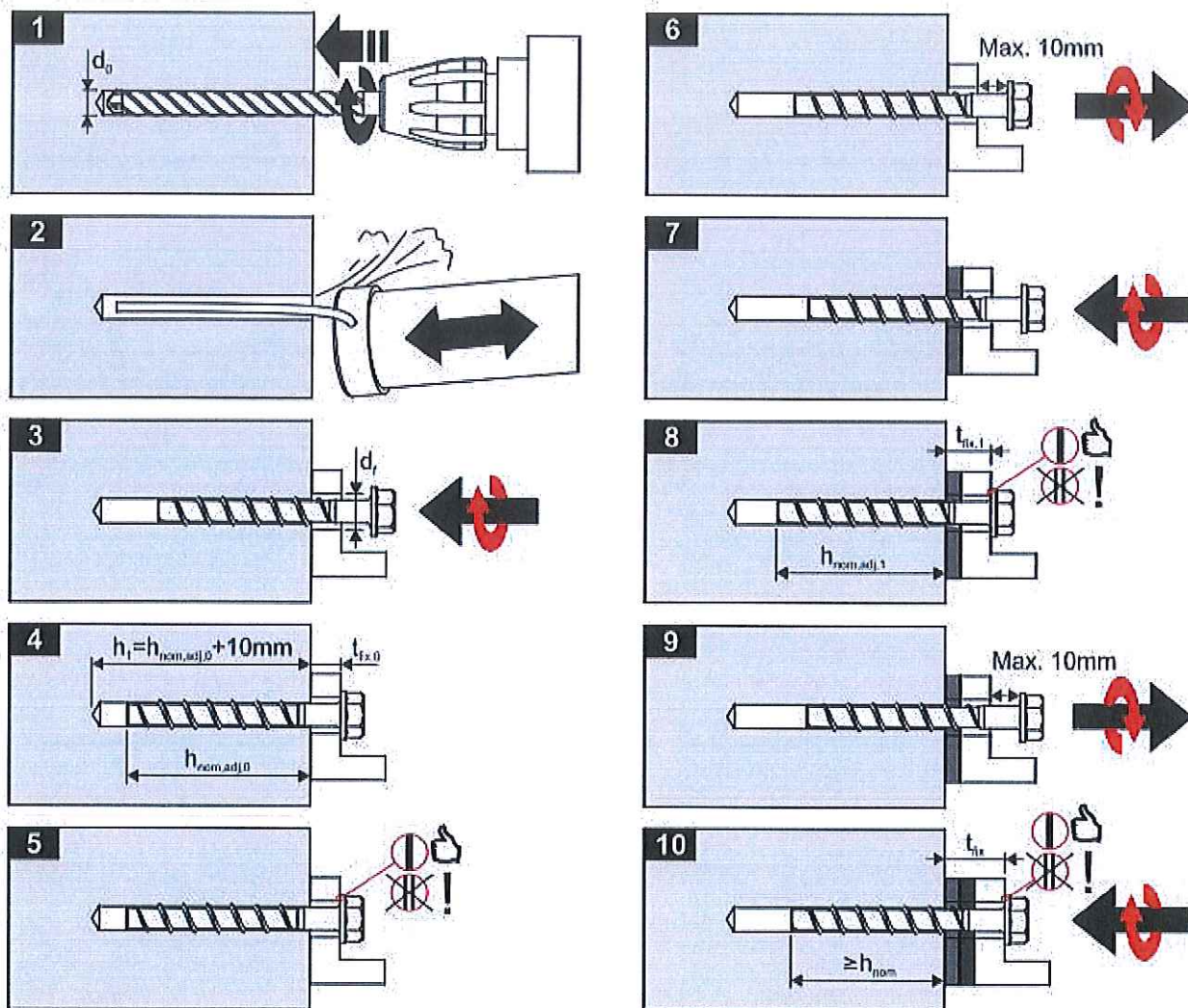
**Intended use**

Minimum thickness of member, minimum spacing, minimum edge distance and installation instructions

**Annex B 3**



### Installation instructions for adjustability



### Installation instructions

The anchor may be adjusted maximum two times while the anchor may turn back at most 10 mm.  
The total allowed thickness of shims added during the adjustment process is 10mm.  
The final embedment depth after adjustment process must be equal or larger than  $h_{nom}$ .

ESSVE concrete screw EUS2, EUSA4, EUSHCR

Intended use

Installation instruction for adjustability

Annex B 4

**Table C1: Characteristic values for design method A according to  
EN 1992-4 for anchor size 6, 8 and 10**

Anchor size EUS2, EUSA4, EUSHCR			6		8			10			
Nominal embedment depth $h_{nom}$ [mm]			$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	
			40	55	45	55	65	55	75	85	
<b>steel failure for tension- and shear load</b>											
characteristic load	$N_{Rk,s}$	[kN]	14,0		27,0			45,0			
	$V_{Rk,s}$	[kN]	7,0		13,5		17,0	22,5		34,0	
	$k_7$	[-]	0,8		0,8			0,8			
	$M^0_{Rk,s}$	[Nm]	10,9		26,0			56,0			
<b>pull-out failure</b>											
characteristic tension load in cracked concrete C20/25	$N_{Rk,p}$	[kN]	2,0	4,0	5,0	9,0	12,0	9,0	$\geq N^0_{Rk,c}$		
characteristic tension load in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	4,0	9,0	7,5	12,0	16,0	12,0	20,0	26,0	
increasing factor for $N_{Rk,p}$	$\Psi_C$	C30/37	1,22								
		C40/50	1,41								
		C50/60	1,58								
<b>concrete cone and splitting failure</b>											
effective anchorage depth	$h_{ef}$	[mm]	31	44	35	43	52	43	60	68	
factor for	cracked	$k_{cr,N}$	7,7								
	uncracked	$k_{ucr,N}$	11,0								
concrete cone failure	spacing	$s_{cr,N}$	$3 \times h_{ef}$								
	edge distance	$c_{cr,N}$	$1,5 \times h_{ef}$								
splitting failure	spacing	$s_{cr,Sp}$	120	160	120	140	150	140	180	210	
	edge distance	$c_{cr,Sp}$	60	80	60	70	75	70	90	105	
installation factor	$\gamma_{inst}$	[-]	1,0								
<b>concrete pry out failure (pry-out)</b>											
k-Factor	$k_8$	[-]	1,0						2,0		
<b>concrete edge failure</b>											
effective length of anchor	$l_f = h_{ef}$	[mm]	31	44	35	43	52	43	60	68	
outside diameter of anchor	$d_{nom}$	[mm]	6		8			10			

ESSVE concrete screw EUS2, EUSA4, EUSHCR

Performances

Characteristic values for size 6, 8 and 10

Annex C 1



**Table C2: Characteristic values for design method A according to  
EN 1992-4 for anchor size 12 and 14**

Anchor size EUS2, EUSA4, EUSHCR			12			14		
Nominal embedment depth $h_{nom}$ [mm]			$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
			65	85	100	75	100	115
<b>steel failure for tension- and shear load</b>								
characteristic load	$N_{Rk,s}$	[kN]	67,0			94,0		
	$V_{Rk,s}$	[kN]	33,5	42,0		56,0		
	$k_7$	[-]	0,8			0,8		
	$M^0_{Rk,s}$	[Nm]	113,0			185,0		
<b>pull-out failure</b>								
characteristic tension load in cracked concrete C20/25	$N_{Rk,p}$	[kN]	12,0	$\geq N^0_{Rk,c}$		$\geq N^0_{Rk,c}$		
characteristic tension load in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	16,0					
increasing factor for $N_{Rk,p}$	$\psi_c$	C30/37	1,22					
		C40/50	1,41					
		C50/60	1,58					
<b>concrete cone and splitting failure</b>								
effective anchorage depth	$h_{ef}$	[mm]	50	67	80	58	79	92
factor for	cracked	$k_{cr,N}$	7,7					
	uncracked	$k_{ucr,N}$	11,0					
concrete cone failure	spacing	$s_{cr,N}$	3 x $h_{ef}$					
	edge distance	$c_{cr,N}$	1,5 x $h_{ef}$					
splitting failure	spacing	$s_{cr,Sp}$	150	210	240	180	240	280
	edge distance	$c_{cr,Sp}$	75	105	120	90	120	140
installation factor	$\gamma_{inst}$	[-]	1,0					
<b>concrete pry out failure (pry-out)</b>								
k-Factor	$k_8$	[-]	1,0	2,0		1,0	2,0	
<b>concrete edge failure</b>								
effective length of anchor	$l_f = h_{ef}$	[mm]	50	67	80	58	79	92
outside diameter of anchor	$d_{nom}$	[mm]	12			14		

ESSVE concrete screw EUS2, EUSA4, EUSHCR

Performances

Characteristic values for size 12 and 14

Annex C 2

**Table C3: Displacements under tension load**

Anchor size EUS2, EUSA4, EUSHCR				6		8			10		
Nominal embedment depth $h_{nom}$ [mm]				$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
				40	55	45	55	65	55	75	85
Cracked concrete	tension load	N	[kN]	0,95	1,9	2,4	4,3	5,7	4,3	7,9	9,6
	displacement	$\delta_{N0}$	[mm]	0,3	0,6	0,6	0,7	0,8	0,6	0,5	0,9
		$\delta_{N\infty}$	[mm]	0,4	0,4	0,6	1,0	0,9	0,4	1,2	1,2
un- cracked concrete	tension load	N	[kN]	1,9	4,3	3,6	5,7	7,6	5,7	9,5	11,9
	displacement	$\delta_{N0}$	[mm]	0,4	0,6	0,7	0,9	0,5	0,7	1,1	1,0
		$\delta_{N\infty}$	[mm]	0,4	0,4	0,6	1,0	0,9	0,4	1,2	1,2

Anchor size EUS2, EUSA4, EUSHCR				12			14		
Nominal embedment depth $h_{nom}$ [mm]				$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
				65	85	100	75	100	115
Cracked concrete	tension load	N	[kN]	5,7	9,4	12,3	7,6	12,0	15,1
	displacement	$\delta_{N0}$	[mm]	0,9	0,5	1,0	0,5	0,8	0,7
		$\delta_{N\infty}$	[mm]	1,0	1,2	1,2	0,9	1,2	1,0
un- cracked concrete	tension load	N	[kN]	7,6	13,2	17,2	10,6	16,9	21,2
	displacement	$\delta_{N0}$	[mm]	1,0	1,1	1,2	0,9	1,2	0,8
		$\delta_{N\infty}$	[mm]	1,0	1,2	1,2	0,9	1,2	1,0

**Table C4: Displacements under shear load**

Anchor size EUS2, EUSA4, EUSHCR				6		8			10		
Nominal embedment depth $h_{nom}$ [mm]				$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
				40	55	45	55	65	55	75	85
shear load	V	[kN]		3,3		8,6			16,2		
displacement	$\delta_{V0}$	[mm]		1,55		2,7			2,7		
	$\delta_{V\infty}$	[mm]		3,10		4,1			4,3		

Anchor size EUS2, EUSA4, EUSHCR				12			14		
Nominal embedment depth $h_{nom}$ [mm]				$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
				65	85	100	75	100	115
shear load	V	[kN]		20,0			30,5		
displacement	$\delta_{V0}$	[mm]		4,0			3,1		
	$\delta_{V\infty}$	[mm]		6,0			4,7		

ESSVE concrete screw EUS2, EUSA4, EUSHCR

Performances

Displacements under tension and shear loads

Annex C 3



**Table C5: Characteristic values for seismic category C1**

Anchor size EUS2, EUSA4, EUSHCR			8	10	12	14
Nominal embedment depth $h_{nom}$ [mm]			$h_{nom3}$			
			65	85	100	115
<b>steel failure for tension- and shear load</b>						
characteristic load	$N_{Rk,s,eq}$	[kN]	27,0	45,0	67,0	94,0
	$V_{Rk,s,eq}$	[kN]	8,5	15,3	21,0	22,4
<b>pull-out failure</b>						
characteristic tension load in cracked concrete C20/25	$N_{Rk,p,eq}$	[kN]	12,0	$\geq N_{Rk,c,eq}^0$		
<b>concrete cone failure</b>						
effective anchorage depth	$h_{ef}$	[mm]	52	68	80	92
concrete spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$			
concrete edge distance	$c_{cr,N}$	[mm]	$1,5 \times h_{ef}$			
installation factor	$\gamma_{inst}$	[-]	1,0			
<b>concrete pry out failure (pry-out)</b>						
k-Factor	$k_B$	[-]	1,0	2,0		
<b>concrete edge failure</b>						
effective length of anchor	$l_f = h_{ef}$	[mm]	52	68	80	92
outside diameter of anchor	$d_{nom}$	[mm]	8	10	12	14

**ESSVE concrete screw EUS2, EUSA4, EUSHCR**

**Performances**

Characteristic values for seismic category C1

**Annex C 4**

**Table C6: Characteristic values of resistance to fire exposure**

Anchor size EUS2, EUSA4, EUSHCR			6		8			10			12			14		
Nominal embedment depth	$h_{nom}$		1	2	1	2	3	1	2	3	1	2	3	1	2	3
	[mm]		40	55	45	55	65	55	75	85	65	85	100	75	100	115
<b>steel failure for tension- and shear load (<math>F_{RK,s,fl} = N_{RK,s,fl} = V_{RK,s,fl}</math>)</b>																
Fire resistance class																
R30	Characteristic Resistance	$F_{RK,s,fi30}$	[kN]	0,9	2,4	4,4	7,4	10,3								
R60		$F_{RK,s,fi60}$	[kN]	0,8	1,7	3,3	5,8	8,2								
R90		$F_{RK,s,fi90}$	[kN]	0,6	1,1	2,3	4,2	5,9								
R120		$F_{RK,s,fi120}$	[kN]	0,4	0,7	1,7	3,4	4,8								
R30		$M^0_{RK,s,fi30}$	[Nm]	0,7	2,4	5,9	12,3	20,4								
R60		$M^0_{RK,s,fi60}$	[Nm]	0,6	1,8	4,5	9,7	15,9								
R90		$M^0_{RK,s,fi90}$	[Nm]	0,5	1,2	3,0	7,0	11,6								
R120		$M^0_{RK,s,fi120}$	[Nm]	0,3	0,9	2,3	5,7	9,4								
<b>edge distance</b>																
R30 - R120	$c_{cr, fi}$	[mm]	2 x $h_{ef}$													
<b>spacing</b>																
R30 - R120	$s_{cr, fi}$	[mm]	4 x $h_{ef}$													

The characteristic resistance to fire exposure for pull-out failure, concrete cone failure, concrete pry-out failure and concrete edge failure shall be calculated according to EN 1992-4. If no value for  $N_{RK,p}$  is given, in equation D.4 and D.5 value of  $N^0_{RK,c}$  shall be inserted instead of  $N_{RK,p}$ .

**ESSVE concrete screw EUS2, EUSA4, EUSHCR**

**Performances**

Characteristic values of resistance to fire exposure

**Annex C 5**