



# DECLARATION OF PERFORMANCE

No: DoP-170566 [EN]



Unique identification code of the product-type:

Wedge Anchor EST1

Manufacturer:

ESSVE Produkter AB

BOX 7091

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European Technical Assessment (ETA)	Dimension & Material	Article numbers
ETA-17/0566 (2017-08-10)	M8 to M27 Zinc plated	123301, 123303, 123305, 123307, 123309, 123311, 123313, 123315, 123317, 123319, 123321, 123323, 123325, 123327, 123329, 123331, 123333, 123335, 123337, 123339, 123341, 123343, 123345, 123347, 123349, 123351, 123353, 123355, 123357, 123359, 123361, 123363, 123365, 123367, 123369, 123371, 123373, 123375, 123377, 123379, 123381, 123383, 123385
ETA-17/0566 (2017-08-10)	M8 to M24 A4 / HCR	123387, 123389, 123391, 123393, 123395, 123397, 123399, 123401, 123403, 123405, 123407, 123409, 123411, 123413, 123415, 123417, 123419, 123421, 123423, 123425, 123427, 123429, 123431, 123433, 123435, 123437, 123439, 123441, 123443, 123445, 123447, 123449, 123451, 123453, 123455, 123457, 123459, 123461, 123463, 123465, 123467, 123469, 123471

European Technical Assessment (ETA)	Intended use	Concrete quality
ETA-17/0566 (2017-08-10)	Anchor(s) for use in structural applications under static or quasi-static actions in cracked and non-cracked concrete.	Reinforced or unreinforced normal weight concrete according to EN 206-1:2000. <ul style="list-style-type: none"> <li>Strength classes C20/25 to C50/60 according to EN 206-1:2000</li> </ul>

European Technical Assessment (ETA)	System of AVCP	European Assessment Document	Technical Assessment Body (TAB)	Notified Body (NB)
ETA-17/0566 (2017-08-10)	1	EAD 330232-00-0601, (2016-10)	DEUTSCHES INSTITUT FÜR BAUTECHNIK (DIBt)	1343 (FPC)



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European Technical Assessment (ETA)	Dimension & Material	Essential characteristics	Declared performance
ETA-17/0566 (2017-08-10)	M8 to M27 Zinc plated	Characteristic resistance for static and quasi-static loading	Table C1, C3 & C5
		Displacements under tension and shear loads	Table C9 & C10
ETA-17/0566 (2017-08-10)	M8 to M24 A4 / HCR	Characteristic resistance for static and quasi-static loading	Table C2, C4 & C5
		Displacements under tension and shear loads	Table C9 & C10
ETA-17/0566 (2017-08-10)	M8 to M20 Zinc plated / A4 / HCR	Characteristic resistance for seismic performance category C1 and C2	Table C6
ETA-17/0566 (2017-08-10)	M8 to M27 Zinc plated	Reaction to fire	Class A1
	M8 to M24 A4 / HCR	Resistance to fire	Table C7 & C8
ETA-17/0566 (2017-08-10)	EST1-IG M6 to M12 Zinc plated / A4 / HCR	Characteristic resistance for static and quasi-static loading	Table C11, C12 & C13
		Reaction to fire	Class A1
		Resistance to fire	Table C14
		Displacements under tension and shear loads	Table C15 & C16

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer above.

Signed for and on behalf of the manufacturer by:

Viktor Bukowski  
Product Developer/Technical expert – Fasteners

Kista 2017-08-21



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Table C1 - Characteristic values for tension loads ESSVE EST1 zinc plated, cracked concrete, static and quasi-static action

Anchor size		M8	M10	M12	M16	M20	M24	M27
Installation safety factor	$\gamma_2 = \gamma_{inst}$ [-]	1,0						
<b>Steel failure</b>								
Characteristic tension resistance	$N_{Rk,s}$ [kN]	16	27	40	60	86	126	196
Partial safety factor	$\gamma_{Ms}$ [-]	1,53		1,5		1,6	1,5	
<b>Pull-out</b>								
<b>Standard anchorage depth</b>								
Characteristic resistance in concrete C20/25	$N_{Rk,p}$ [kN]	5	9	16	25	1)	1)	1)
<b>Reduced anchorage depth</b>								
Characteristic resistance in concrete C20/25	$N_{Rk,p}$ [kN]	5	7,5	1)	1)	-	-	-
Increasing factor for $N_{Rk,p}$	$\psi_c$ [-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$						
<b>Concrete cone failure</b>								
Effective anchorage depth	$h_{ef}$ [mm]	46	60	70	85	100	115	125
Reduced anchorage depth	$h_{ef,red}$ [mm]	35 <sup>2)</sup>	40	50	65	-	-	-
Factor $k_1$ for cracked concrete	$k_{Cr,N}$ [-]	7,7						

<sup>1)</sup> Pull-out is not decisive.

<sup>2)</sup> Use restricted to anchoring of structural components statically indeterminate



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Table C2 - Characteristic values for tension loads, ESSVE EST1 A4 / HCR, cracked concrete, static and quasi-static action

Anchor size			M8	M10	M12	M16	M20	M24
Installation safety factor	$\gamma_{inst}$	[-]	1,0					
<b>Steel failure</b>								
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	64	108	110
Partial safety factor	$\gamma_{Ms}$	[-]	1,5				1,68	1,5
<b>Pull-out</b>								
<b>Standard anchorage depth</b>								
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	9	16	25	<sup>1)</sup>	40
<b>Reduced anchorage depth</b>								
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	7,5	<sup>1)</sup>	<sup>1)</sup>	-	-
Increasing factor for $N_{Rk,p}$	$\psi_c$	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$					
<b>Concrete cone failure</b>								
Effective anchorage depth	$h_{ef}$	[mm]	46	60	70	85	100	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 <sup>2)</sup>	40	50	65	-	-
Factor $k_1$ for cracked concrete	$k_{cr,N}$	[-]	7,7					

<sup>1)</sup> Pull-out is not decisive.

<sup>2)</sup> Use restricted to anchoring of structural components statically indeterminate



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Table C3 - Characteristic values for tension loads, ESSVE EST1 zinc plated, non-cracked concrete, static and quasi-static action

Anchor size			M8	M10	M12	M16	M20	M24	M27	
Installation safety factor	$\gamma_{inst}$	[-]	1,0							
<b>Steel failure</b>										
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	60	86	126	196	
Partial safety factor	$\gamma_{Ms}$	[-]	1,53		1,5		1,6	1,5		
<b>Pull-out</b>										
<b>Standard anchorage depth</b>										
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	25	35	1)	1)	1)	
<b>Reduced anchorage depth</b>										
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	9	1)	1)	-	-	-	
<b>Splitting</b>										
<b>Standard anchorage depth</b>										
Splitting for <b>standard thickness of concrete member</b> (The higher resistance of case 1 and case 2 may be applied; the values $s_{cr,sp}$ and $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min,2} < h < h_{min,1}$ (Case 2); $\psi_{h,sp} = 1,0$ )										
Standard thickness of concrete	$h_{min,1} \geq$	[mm]	100	120	140	170	200	230	250	
<b>Case 1</b>										
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	9	12	20	30	40	62,3	50	
Spacing (edge distance)	$c_{cr,sp}$	[mm]	1,5 $h_{ef}$							
<b>Case 2</b>										
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	12	16	25	35	50,5	62,3	70,6	
Spacing (edge distance)	$c_{cr,sp}$	[mm]	2 $h_{ef}$				2,2 $h_{ef}$	1,5 $h_{ef}$	2,5 $h_{ef}$	
<b>Splitting for minimum thickness of concrete member</b>										
Minimum thickness of concrete	$h_{min,2} \geq$	[mm]	80	100	120	140				
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	12	16	25	35	-	-	-	
Spacing (edge distance)	$c_{cr,sp}$	[mm]	2,5 $h_{ef}$							
<b>Reduced anchorage depth</b>										
Minimum thickness of concrete	$h_{min,3} \geq$	[mm]	80	80	100	140				
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	7,5	9	17,9	26,5	-	-	-	
Spacing (edge distance)	$c_{cr,sp}$	[mm]	100	100	125	150				
Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$	$\psi_c$	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$							
<b>Concrete cone failure</b>										
Effective anchorage depth	$h_{ef}$	[mm]	46	60	70	85	100	115	125	
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 <sup>2)</sup>	40	50	65	-	-	-	
Factor $k_1$ for non-cracked concrete	$k_{ucr,N}$	[-]	11,0							

<sup>1)</sup> Pull-out is not decisive.

<sup>2)</sup> Use restricted to anchoring of structural components statically indeterminate



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Table C4 - Characteristic values for tension loads, ESSVE EST1 A4 / HCR, non-cracked concrete, static and quasi-static action

Anchor size			M8	M10	M12	M16	M20	M24
Installation safety factor	$\gamma_{inst}$	[-]	1,0					
<b>Steel failure</b>								
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	64	108	110
Partial safety factor	$\gamma_{Ms}$	[-]	1,5			1,68		
<b>Pull-out</b>								
<b>Standard anchorage depth</b>								
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	25	35	1)	1)
<b>Reduced anchorage depth</b>								
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	9	1)	1)	-	-
<b>Splitting</b>								
<b>Standard anchorage depth</b>								
Splitting for <b>standard thickness of concrete member</b> (The higher resistance of case 1 and case 2 may be applied; the values $s_{cr,sp}$ and $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min,2} < h < h_{min,1}$ (Case 2); $\psi_{h,sp} = 1,0$ )								
Standard thickness of concrete	$h_{min,1} \geq$	[mm]	100	120	140	160	200	250
<b>Case 1</b>								
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	9	12	20	30	40	-
Spacing (edge distance)	$c_{cr,sp}$	[mm]	1,5 $h_{ef}$					
<b>Case 2</b>								
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	12	16	25	35	50,5	70,6
Spacing (edge distance)	$c_{cr,sp}$	[mm]	115	125	140	200	220	250
<b>Splitting for minimum thickness of concrete member</b>								
Minimum thickness of concrete	$h_{min,2} \geq$	[mm]	80	100	120	140	-	-
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	12	16	25	35		
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	5 $h_{ef}$					
<b>Reduced anchorage depth</b>								
Minimum thickness of concrete	$h_{min,3} \geq$	[mm]	80	80	100	140	-	-
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	7,5	9	17,9	26,5		
Spacing (edge distance)	$c_{cr,sp}$	[mm]	100	100	125	150		
Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$	$\psi_c$	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$					
<b>Concrete cone failure</b>								
Effective anchorage depth	$h_{ef}$	[mm]	46	60	70	85	100	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 <sup>2)</sup>	40	50	65	-	-
Factor $k_1$ for non-cracked concrete	$k_{ucr,N}$	[-]	11,0					

<sup>1)</sup> Pull-out is not decisive.

<sup>2)</sup> Use restricted to anchoring of structural components statically indeterminate



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Table C5 - Characteristic values for shear loads, ESSVE EST1, cracked and non-cracked concrete, static or quasi static action

Anchor size			M8	M10	M12	M16	M20	M24	M27	
Installation safety factor	$\gamma_{inst}$	[-]	1,0							
<b>Steel failure without lever arm, Steel zinc plated</b>										
Characteristic shear resistance	$V_{Rk,s}$	[kN]	12,2	20,1	30	55	69	114	169,4	
Factor for ductility	$k_7$	[-]	1,0							
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			1,33		1,25	1,25	
<b>Steel failure without lever arm, Stainless steel A4, HCR</b>										
Characteristic shear resistance	$V_{Rk,s}$	[kN]	13	20	30	55	86	123,6	-	
Factor for ductility	$k_7$	[-]	1,0							
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			1,4		1,25		
<b>Steel failure with lever arm, Steel zinc plated</b>										
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	23	47	82	216	363	898	1331,5	
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			1,33		1,25	1,25	
<b>Steel failure with lever arm, Stainless steel A4, HCR</b>										
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	200	454	785,4	-	
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			1,4		1,25		
<b>Concrete pry-out failure</b>										
Factor	$k_8$	[-]	2,4			2,8				
<b>Concrete edge failure</b>										
Effective length of anchor in shear loading with $h_{ef}$	Steel zinc plated	$l_f$	[mm]	46	60	70	85	100	115	125
	Stainless steel A4, HCR	$l_f$	[mm]	46	60	70	85	100	125	-
Effective length of anchor in shear loading with $h_{ef,red}$	Steel zinc plated	$l_{f,red}$	[mm]	35 <sup>1)</sup>	40	50	65	-	-	-
	Stainless steel A4, HCR	$l_{f,red}$	[mm]	35 <sup>1)</sup>	40	50	65			
Outside diameter of anchor	$d_{nom}$	[mm]	8	10	12	16	20	24	27	

<sup>1)</sup> Use restricted to anchoring of structural components statically indeterminate.



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Table C6 - Characteristic resistance for seismic loading, ESSVE EST1 standard anchorage depth, performance category C1 and C2

Anchor size		M8	M10	M12	M16	M20		
<b>Tension loads</b>								
Installation safety factor	$\gamma_{inst}$	[-]					1,0	
<b>Steel failure, Steel zinc plated</b>								
Characteristic resistance C1	$N_{Rk,s,eq,C1}$	[kN]	16	27	40	60	86	
Characteristic resistance C2	$N_{Rk,s,eq,C2}$	[kN]	16	27	40	60	86	
Partial safety factor	$\gamma_{Ms}$	[-]		1,53	1,5	1,6		
<b>Steel failure, Stainless steel A4, HCR</b>								
Characteristic resistance C1	$N_{Rk,s,eq,C1}$	[kN]	16	27	40	64	108	
Characteristic resistance C2	$N_{Rk,s,eq,C2}$	[kN]	16	27	40	64	108	
Partial safety factor	$\gamma_{Ms}$	[-]					1,5	1,68
<b>Pull-out (steel zinc plated, stainless steel A4 and HCR)</b>								
Characteristic resistance C1	$N_{Rk,p,eq,C1}$	[kN]	5	9	16	25	36	
Characteristic resistance C2	$N_{Rk,p,eq,C2}$	[kN]	2,3	3,6	10,2	13,8	24,4	
<b>Shear loads</b>								
<b>Steel failure without lever arm, Steel zinc plated</b>								
Characteristic resistance C1	$V_{Rk,s,eq,C1}$	[kN]	9,3	20	27	44	69	
Characteristic resistance C2	$V_{Rk,s,eq,C2}$	[kN]	6,7	14	16,2	35,7	55,2	
Partial safety factor	$\gamma_{Ms}$	[-]					1,25	1,33
<b>Steel failure without lever arm, Stainless steel A4, HCR</b>								
Characteristic resistance C1	$V_{Rk,s,eq,C1}$	[kN]	9,3	20	27	44	69	
Characteristic resistance C2	$V_{Rk,s,eq,C2}$	[kN]	6,7	14	16,2	35,7	55,2	
Partial safety factor	$\gamma_{Ms}$	[-]					1,25	1,4





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Table C7 - Characteristic values for tension and shear load under fire exposure, ESSVE EST1, standard anchorage depth, cracked and non-cracked concrete C20/25 to C50/60

Anchor size		M8	M10	M12	M16	M20	M24	M27		
<b>Tension load</b>										
<b>Steel failure</b>										
<b>Steel, galvanised</b>										
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	1,5	2,6	4,1	7,7	9,4	13,6	17,6
	R60			1,1	1,9	3,0	5,6	8,2	11,8	15,3
	R90			0,8	1,4	2,4	4,4	6,9	10,0	13,0
	R120			0,7	1,2	2,2	4,0	6,3	9,1	11,8
<b>Stainless steel A4, HCR</b>										
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	3,8	6,9	12,7	23,7	33,5	48,2	-
	R60			2,9	5,3	9,4	17,6	25,0	35,9	
	R90			2,0	3,6	6,1	11,5	16,4	23,6	
	R120			1,6	2,8	4,5	8,4	12,1	17,4	
<b>Shear load</b>										
<b>Steel failure without lever arm</b>										
<b>Steel, galvanised</b>										
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	1,6	2,6	4,1	7,7	11	16	20,6
	R60			1,5	2,5	3,6	6,8	11	15	19,8
	R90			1,2	2,1	3,5	6,5	10	15	19,0
	R120			1,0	2,0	3,4	6,4	10	14	18,6
<b>Stainless steel A4, HCR</b>										
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	3,8	6,9	12,7	23,7	33,5	48,2	-
	R60			2,9	5,3	9,4	17,6	25,0	35,9	
	R90			2,0	3,6	6,1	11,5	16,4	23,6	
	R120			1,6	2,8	4,5	8,4	12,1	17,4	
<b>Steel failure with lever arm</b>										
<b>Steel, galvanised</b>										
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	1,7	3,3	6,4	16,3	29	50	75
	R60			1,6	3,2	5,6	14	28	48	72
	R90			1,2	2,7	5,4	14	27	47	69
	R120			1,1	2,5	5,3	13	26	46	68
<b>Stainless steel A4, HCR</b>										
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	3,8	9,0	19,7	50,1	88,8	153,5	-
	R60			2,9	6,8	14,6	37,2	66,1	114,3	
	R90			2,1	4,7	9,5	24,2	43,4	75,1	
	R120			1,6	3,6	7,0	17,8	32,1	55,5	

The characteristic resistance for pull-out failure, concrete cone failure, concrete pry-out and concrete edge failure can be calculated according to EN 1992-4, Annex D. If pull-out is not decisive in equation (D.4) and (D.5),  $N_{Rk,p}$  must be replaced by  $N^0_{Rk,c}$ .



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Table C8 - Characteristic values for tension and shear load under fire exposure, ESSVE EST1, reduced anchorage depth, cracked and non-cracked concrete C20/25 to C50/60

Anchor size				M8	M10	M12	M16
<b>Tension load</b>							
<b>Steel failure</b>							
<b>Steel, galvanised</b>							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	1,5	2,6	4,1	7,7
	R60			1,1	1,9	3,0	5,6
	R90			0,8	1,3	1,9	3,5
	R120			0,6	1,0	1,3	2,5
<b>Stainless steel A4, HCR</b>							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	3,2	6,9	12,7	23,7
	R60			2,5	5,3	9,4	17,6
	R90			1,9	3,6	6,1	11,5
	R120			1,6	2,8	4,5	8,4
<b>Shear load</b>							
<b>Steel failure without lever arm</b>							
<b>Steel, galvanised</b>							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	1,5	2,6	4,1	7,7
	R60			1,1	1,9	3,0	5,6
	R90			0,8	1,3	1,9	3,5
	R120			0,6	1,0	1,3	2,5
<b>Stainless steel A4, HCR</b>							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	3,2	6,9	12,7	23,7
	R60			2,5	5,3	9,4	17,6
	R90			1,9	3,6	6,1	11,5
	R120			1,6	2,8	4,5	8,4
<b>Steel failure with lever arm</b>							
<b>Steel, galvanised</b>							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	1,5	3,3	6,4	16,3
	R60			1,2	2,5	4,7	11,9
	R90			0,8	1,7	3,0	7,5
	R120			0,6	1,2	2,1	5,3
<b>Stainless steel A4, HCR</b>							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	3,2	8,9	19,7	50,1
	R60			2,6	6,8	14,6	37,2
	R90			2,0	4,7	9,5	24,2
	R120			1,6	3,6	7,0	17,8

The characteristic resistance for pull-out failure, concrete cone failure, concrete pry-out and concrete edge failure can be calculated according to EN 1992-4, Annex D. If pull-out is not decisive in equation (D.4) and (D.5),  $N_{Rk,p}$  must be replaced by  $N^0_{Rk,c}$ .



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Table C9 - Displacements under tension load, ESSVE EST1

Anchor size			M8	M10	M12	M16	M20	M24	M27
<b>Standard anchorage depth</b>									
<b>Steel zinc plated</b>									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	21,1	24
Displacement	$\delta_{N0}$	[mm]	0,6	1,0	0,4	1,0	0,9	0,7	0,9
	$\delta_{N\infty}$	[mm]	1,4	1,2	1,4	1,3	1,0	1,2	1,4
Tension load in non-cracked concrete	N	[kN]	5,7	7,6	11,9	16,7	23,8	29,6	34
Displacement	$\delta_{N0}$	[mm]	0,4	0,5	0,7	0,3	0,4	0,5	0,3
	$\delta_{N\infty}$	[mm]	0,8		1,4	0,8			1,4
<b>Displacements under seismic tension loads C2</b>									
Displacements for DLS	$\delta_{N,eq(DLS)}$	[mm]	2,3	4,1	4,9	3,6	5,1	-	-
Displacements for ULS	$\delta_{N,eq(ULS)}$	[mm]	8,2	13,8	15,7	9,5	15,2	-	-
<b>Stainless steel A4, HCR</b>									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	19,0	-
Displacement	$\delta_{N0}$	[mm]	0,7	1,8	0,4	0,7	0,9	0,5	
	$\delta_{N\infty}$	[mm]	1,2	1,4	1,4	1,4	1,0	1,8	
Tension load in non-cracked concrete	N	[kN]	5,8	7,6	11,9	16,7	23,8	33,5	-
Displacement	$\delta_{N0}$	[mm]	0,6	0,5	0,7	0,2	0,4	0,5	
	$\delta_{N\infty}$	[mm]	1,2	1,0	1,4	0,4	0,8	1,1	
<b>Displacements under seismic tension loads C2</b>									
Displacements for DLS	$\delta_{N,eq(DLS)}$	[mm]	2,3	4,1	4,9	3,6	5,1	-	-
Displacements for ULS	$\delta_{N,eq(ULS)}$	[mm]	8,2	13,8	15,7	9,5	15,2	-	-
<b>Reduced anchorage depth</b>									
<b>Steel zinc plated, stainless steel A4, HCR</b>									
Tension load in cracked concrete	N	[kN]	2,4	3,6	6,1	9,0	-	-	-
Displacement	$\delta_{N0}$	[mm]	0,8	0,7	0,5	1,0			
	$\delta_{N\infty}$	[mm]	1,2	1,0	0,8	1,1			
Tension load in non-cracked concrete	N	[kN]	3,7	4,3	8,5	12,6	-	-	-
Displacement	$\delta_{N0}$	[mm]	0,1	0,2	0,2	0,2			
	$\delta_{N\infty}$	[mm]	0,7	0,7	0,7	0,7			



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Table C10 - Displacements under shear load, ESSVE EST1

Anchor size			M8	M10	M12	M16	M20	M24	M27
<b>Standard anchorage depth</b>									
<b>Steel zinc plated</b>									
Shear load in cracked and non-cracked concrete	V	[kN]	6,9	11,4	17,1	31,4	36,8	64,9	96,8
Displacement	$\delta_{V0}$	[mm]	2,0	3,2	3,6	3,5	1,8	3,5	3,6
	$\delta_{V\infty}$	[mm]	3,0	4,7	5,5	5,3	2,7	5,3	5,4
<b>Displacements under seismic shear loads C2</b>									
Displacements for DLS	$\delta_{V,eq(DLS)}$	[mm]	3,0	2,7	3,5	4,3	4,7	-	-
Displacements for ULS	$\delta_{V,eq(ULS)}$	[mm]	5,9	5,3	9,5	9,6	10,1	-	-
<b>Stainless steel A4, HCR</b>									
Shear load in cracked and non-cracked concrete	V	[kN]	7,3	11,4	17,1	31,4	43,8	70,6	-
Displacement	$\delta_{V0}$	[mm]	1,9	2,4	4,0	4,3	2,9	2,8	-
	$\delta_{V\infty}$	[mm]	2,9	3,6	5,9	6,4	4,3	4,2	-
<b>Displacements under seismic shear loads C2</b>									
Displacements for DLS	$\delta_{V,eq(DLS)}$	[mm]	3,0	2,7	3,5	4,3	4,7	-	-
Displacements for ULS	$\delta_{V,eq(ULS)}$	[mm]	5,9	5,3	9,5	9,6	10,1	-	-
<b>Reduced anchorage depth</b>									
<b>Steel zinc plated</b>									
Shear load in cracked and non-cracked concrete	V	[kN]	6,9	11,4	17,1	31,4	-	-	-
Displacement	$\delta_{V0}$	[mm]	2,0	3,2	3,6	3,5	-	-	-
	$\delta_{V\infty}$	[mm]	3,0	4,7	5,5	5,3	-	-	-
<b>Stainless steel A4, HCR</b>									
Shear load in cracked and non-cracked concrete	V	[kN]	7,3	11,4	17,1	31,4	-	-	-
Displacement	$\delta_{V0}$	[mm]	1,9	2,4	4,0	4,3	-	-	-
	$\delta_{V\infty}$	[mm]	2,9	3,6	5,9	6,4	-	-	-



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Table C11 - Characteristic values for tension loads, ESSVE EST1-IG, cracked concrete, static and quasi-static action

Anchor size			M6	M8	M10	M12
Installation safety factor	$\gamma_{inst}$	[-]	1,2			
<b>Steel failure</b>						
Characteristic tension resistance, <b>steel zinc plated</b>	$N_{Rk,s}$	[kN]	16,1	22,6	26,0	56,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,5			
Characteristic tension resistance, <b>stainless steel A4, HCR</b>	$N_{Rk,s}$	[kN]	14,1	25,6	35,8	59,0
Partial safety factor	$\gamma_{Ms}$	[-]	1,87			
<b>Pull-out failure</b>						
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	9	12	20
Increasing factor for $N_{Rk,p}$	$\psi_c$	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$			
<b>Concrete cone failure</b>						
Effective anchorage depth	$h_{ef}$	[mm]	45	58	65	80
Factor for $k_1$	$k_{cr,N}$	[-]	7,7			



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Table C12 - Characteristic values for tension loads, ESSVE EST1-IG, non-cracked concrete, static and quasi-static action

Anchor size			M6	M8	M10	M12
Installation safety factor	$\gamma_{inst}$	[-]	1,2			
<b>Steel failure</b>						
Characteristic tension resistance, steel zinc plated	$N_{Rk,s}$	[kN]	16,1	22,6	26,0	56,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,5			
Characteristic tension resistance, stainless steel A4, HCR	$N_{Rk,s}$	[kN]	14,1	25,6	35,8	59,0
Partial safety factor	$\gamma_{Ms}$	[-]	1,87			
<b>Pull-out</b>						
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	20	30
<b>Splitting</b> (The higher resistance of Case 1 and Case 2 may be applied)						
Minimum thickness of concrete member	$h_{min}$	[mm]	100	120	130	160
<b>Case 1</b>						
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	9	12	16	25
Spacing (edge distance)	$c_{cr,sp}$	[mm]	1,5 $h_{ef}$			
<b>Case 2</b>						
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	12	16	20	30
Spacing (edge distance)	$c_{cr,sp}$	[mm]	2,5 $h_{ef}$			
Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$	$\psi_c$	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$			
<b>Concrete cone failure</b>						
Effective anchorage depth	$h_{ef}$	[mm]	45	58	65	80
Factor $k_1$ for non-cracked concrete	$k_{ucr,N}$	[-]	11,0			



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Table C13 - Characteristic values for shear loads, ESSVE EST1-IG, cracked and non-cracked concrete, static and quasi-static action

Anchor size			M6	M8	M10	M12
Installation safety factor	$\gamma_{inst}$	[-]	1,0			
<b>steel zinc plated</b>						
<b>Steel failure without lever arm, Installation type V</b>						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,8	6,9	10,4	25,8
<b>Steel failure without lever arm, Installation type D</b>						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,1	7,6	10,8	24,3
<b>Steel failure with lever arm, Installation type V</b>						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12,2	30,0	59,8	104,6
<b>Steel failure with lever arm, Installation type D</b>						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	36,0	53,2	76,0	207
Partial safety factor for $V_{Rk,s}$ and $M^0_{Rk,s}$	$\gamma_{Ms}$	[-]	1,25			
Factor of ductility	$k_7$	[-]	1,0			
<b>stainless steel A4, HCR</b>						
<b>Steel failure without lever arm, Installation type V</b>						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,7	9,2	10,6	23,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			
<b>Steel failure without lever arm, Installation type D</b>						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	7,3	7,6	9,7	29,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			
<b>Steel failure with lever arm, Installation type V</b>						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	10,7	26,2	52,3	91,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,56			
<b>Steel failure with lever arm, Installation type D</b>						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	28,2	44,3	69,9	191,2
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			
Factor of ductility	$k_7$	[-]	1,0			
<b>Concrete pry-out failure</b>						
Factor	$k_8$	[-]	1,5	1,5	2,0	2,0
<b>Concrete edge failure</b>						
Effective length of anchor in shear loading	$l_f$	[mm]	45	58	65	80
Effective diameter of anchor	$d_{nom}$	[mm]	8	10	12	16



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Table C14 - Characteristic values for tension and shear load under fire exposure, ESSVE EST1-IG, cracked and non-cracked concrete C20/25 to C50/60

Anchor size		M6	M8	M10	M12		
<b>Tension load</b>							
<b>Steel failure</b>							
<b>Steel zinc plated</b>							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	0,7	1,4	2,5	3,7
	R60			0,6	1,2	2,0	2,9
	R90			0,5	0,9	1,5	2,2
	R120			0,4	0,8	1,3	1,8
<b>Stainless steel A4, HCR</b>							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	2,9	5,4	8,7	12,6
	R60			1,9	3,8	6,3	9,2
	R90			1,0	2,1	3,9	5,7
	R120			0,5	1,3	2,7	4,0
<b>Shear load</b>							
<b>Steel failure without lever arm</b>							
<b>Steel zinc plated</b>							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	0,7	1,4	2,5	3,7
	R60			0,6	1,2	2,0	2,9
	R90			0,5	0,9	1,5	2,2
	R120			0,4	0,8	1,3	1,8
<b>Stainless steel A4, HCR</b>							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	2,9	5,4	8,7	12,6
	R60			1,9	3,8	6,3	9,2
	R90			1,0	2,1	3,9	5,7
	R120			0,5	1,3	2,7	4,0
<b>Steel failure with lever arm</b>							
<b>Steel zinc plated</b>							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	0,5	1,4	3,3	5,7
	R60			0,4	1,2	2,6	4,6
	R90			0,4	0,9	2,0	3,4
	R120			0,3	0,8	1,6	2,8
<b>Stainless steel A4, HCR</b>							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	2,2	5,5	11,2	19,6
	R60			1,5	3,9	8,1	14,3
	R90			0,7	2,2	5,1	8,9
	R120			0,4	1,3	3,5	6,2





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Table C15 - Displacements under tension load, ESSVE EST1-IG

Anchor size			M6	M8	M10	M12
Tension load in cracked concrete	N	[kN]	2,0	3,6	4,8	8,0
	$\delta_{N0}$	[mm]	0,6	0,6	0,8	1,0
Displacements	$\delta_{N\infty}$	[mm]	0,8	0,8	1,2	1,4
	N	[kN]	4,8	6,4	8,0	12,0
Tension load in non-cracked concrete	$\delta_{N0}$	[mm]	0,4	0,5	0,7	0,8
	$\delta_{N\infty}$	[mm]	0,8	0,8	1,2	1,4

Table C16 - Displacements under shear load, ESSVE EST1-IG

Anchor size			M6	M8	M10	M12
Shear load in cracked and non-cracked concrete	V	[kN]	4,2	5,3	6,2	16,9
	$\delta_{V0}$	[mm]	2,8	2,9	2,5	3,6
Displacements	$\delta_{V\infty}$	[mm]	4,2	4,4	3,8	5,3