TOIMIVUSDEKLARATSIOON

No: DoP-170566 [ET]

Tootetüübi kordumatu identifitseerimiskood:

Laienevad ankrud (Wedge Anchor) EST1

Tootja:

ESSVE Produkter AB
BOX 7091
164 07 Kista
Sweden

info@essve.se

Euroopa tehniline hinnang (ETA)	Mõõdud & Materjal	Artikli number
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

Euroopa tehniline hinnang (ETA)	Kavandatud kasutusala(d)	Betooni kvaliteet
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. • Strength classes C20/25 to C50/60 according to EN 206-1:2000

Euroopa tehniline hinnang (ETA)	Toimivuse püsivuse hindamise ja kontrolli süsteem (AVCP)	Euroopa hindamisdokument	Tehnilise hindamise asutus (TAB)	Teavitatud asutus(ed) (NB)
ETA-17/0566 (2017-08-10)	1	EAD 330232-00-0601, (2016-10)	DEUTSCHES INSTITUT FÜR BAUTECHNIK (DiBt)	1343 (FPC)

TOIMIVUSDEKLARATSIOON

No: DoP-170566 [ET]

Euroopa tehniline hinnang (ETA)	Mõõdud & Materjal	Põhiomadused	Toimivus
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 M8 to M24 A4 / HCR	Reaction to fire	Class A1
		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

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:

Kista 2017-08-21

Viktor Bukowski
Product Developer/Technical expert – Fasteners

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						
Steel failure									
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	60	86	126	196
Partial safety factor	γ_{Ms}	[-]	1,53		1,5		1,6	1,5	
Pull-out									
Standard anchorage depth									
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	9	16	25	1)	1)	1)
Reduced anchorage depth									
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	7,5	1)	1)	-	-	-
Increasing factor for $N_{Rk,p}$	ψc	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$						
Concrete cone failure									
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100	115	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 2)	40	50	65	-	-	-
Factor k_1 for cracked concrete	$k_{cr,N}$	[-]	7,7						

1) Pull-out is not decisive.
2) Use restricted to anchoring of structural components statically indeterminate

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

1) Pull-out is not decisive.

2) Use restricted to anchoring of structural components statically indeterminate

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	γ_{inst}	[-]	1,0						
Steel failure									
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	60	86	126	196
Partial safety factor	γ_{Ms}	[-]	1,53		1,5		1,6	1,5	
Pull-out									
Standard anchorage depth									
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	25	35	1)	1)	1)
Reduced anchorage depth									
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	9	1)	1)	-	-	-
Splitting									
Standard anchorage depth									
Splitting for **standard thickness of concrete member** (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
Case 1									
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}						
Case 2									
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}
Splitting for **minimum thickness of concrete member**									
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}						
Reduced anchorage depth									
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 $N^0_{Rk,sp}$	ψc	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$						
Concrete cone failure									
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100	115	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 2)	40	50	65	-	-	-
Factor k_1 for non-cracked concrete	$k_{ucr,N}$	[-]	11,0						

1) Pull-out is not decisive.

2) Use restricted to anchoring of structural components statically indeterminate

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	γ_{inst}	[-]	1,0					
Steel failure								
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	64	108	110
Partial safety factor	γ_{Ms}	[-]	1,5				1,68	1,5
Pull-out								
Standard anchorage depth								
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	25	35	1)	1)
Reduced anchorage depth								
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	9	1)	1)	-	-
Splitting								
Standard anchorage depth								
Splitting for **standard thickness of concrete member** (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
Case 1								
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}					
Case 2								
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
Splitting for **minimum thickness of concrete member**								
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}					
Reduced anchorage depth								
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 $N^0_{Rk,sp}$	ψc	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$					
Concrete cone failure								
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 2)	40	50	65	-	-
Factor k_1 for non-cracked concrete	$k_{ucr,N}$	[-]	11,0					

1) Pull-out is not decisive.

2) Use restricted to anchoring of structural components statically indeterminate

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		γ_{inst}	[-]	1,0						
Steel failure without lever arm, Steel zinc plated										
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		γ_{Ms}	[-]	1,25				1,33	1,25	1,25
Steel failure without lever arm, Stainless steel A4, HCR										
Characteristic shear resistance		$V_{Rk,s}$	[kN]	13	20	30	55	86	123,6	-
Factor for ductility		k_7	[-]	1,0						
Partial safety factor		γ_{Ms}	[-]	1,25				1,4	1,25	
Steel failure with lever arm, Steel zinc plated										
Characteristic bending resistance		$M^0_{Rk,s}$	[Nm]	23	47	82	216	363	898	1331,5
Partial safety factor		γ_{Ms}	[-]	1,25				1,33	1,25	1,25
Steel failure with lever arm, Stainless steel A4, HCR										
Characteristic bending resistance		$M^0_{Rk,s}$	[Nm]	26	52	92	200	454	785,4	-
Partial safety factor		γ_{Ms}	[-]	1,25				1,4	1,25	
Concrete pry-out failure										
Factor		k_8	[-]	2,4				2,8		
Concrete edge failure										
Effective length of anchor in shear loading with $\mathbf{h_{ef}}$	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 $\mathbf{h_{ef,red}}$	Steel zinc plated	$l_{f,red}$	[mm]	35[1)]	40	50	65	-	-	-
	Stainless steel A4, HCR	$l_{f,red}$	[mm]	35[1)]	40	50	65			
Outside diameter of anchor		d_{nom}	[mm]	8	10	12	16	20	24	27

[1)] Use restricted to anchoring of structural components statically indeterminate.

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

Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**
Tension loads							
Installation safety factor	γ_{inst}	*[-]*	1,0				
Steel failure, Steel zinc plated							
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	γ_{Ms}	[-]	1,53		1,5		1,6
Steel failure, Stainless steel A4, HCR							
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	γ_{Ms}	[-]	1, 5				1,68
Pull-out (steel zinc plated, stainless steel A4 and HCR)							
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
Shear loads							
Steel failure without lever arm, Steel zinc plated							
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	γ_{Ms}	[-]	1, 25				1,33
Steel failure without lever arm, Stainless steel A4, HCR							
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	γ_{Ms}	[-]	1, 25				1,4

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**
Tension load										
Steel failure										
Steel, galvanised										
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
Stainless steel A4, HCR										
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	
Shear load										
Steel failure without lever arm										
Steel, galvanised										
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
Stainless steel A4, HCR										
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	
Steel failure with lever arm										
Steel, galvanised										
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
Stainless steel A4, HCR										
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 $N^0_{Rk,c}$.

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**
Tension load							
Steel failure							
Steel, galvanised							
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
Stainless steel A4, HCR							
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
Shear load							
Steel failure without lever arm							
Steel, galvanised							
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
Stainless steel A4, HCR							
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
Steel failure with lever arm							
Steel, galvanised							
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
Stainless steel A4, HCR							
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 $N^0_{Rk,c}$.

Table C9 - Displacements under tension load, ESSVE EST1

Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**
Standard anchorage depth									
Steel zinc plated									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	21,1	24
Displacement	δ_{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	δ_{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
Displacements under seismic tension loads **C2**									
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		
Stainless steel A4, HCR									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	19,0	
Displacement	δ_{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	δ_{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	
Displacements under seismic tension loads **C2**									
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		
Reduced anchorage depth									
Steel zinc plated, stainless steel A4, HCR									
Tension load in cracked concrete	N	[kN]	2,4	3,6	6,1	9,0			
Displacement	δ_{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	δ_{N0}	[mm]	0,1	0,2	0,2	0,2	-	-	-
	$\delta_{N\infty}$	[mm]	0,7	0,7	0,7	0,7			

Table C10 - Displacements under shear load, ESSVE EST1

Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**
Standard anchorage depth									
Steel zinc plated									
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	δ_{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
Displacements under seismic shear loads **C2**									
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		
Stainless steel A4, HCR									
Shear load in cracked and non-cracked concrete	V	[kN]	7,3	11,4	17,1	31,4	43,8	70,6	-
Displacement	δ_{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	
Displacements under seismic shear loads **C2**									
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		
Reduced anchorage depth									
Steel zinc plated									
Shear load in cracked and non-cracked concrete	V	[kN]	6,9	11,4	17,1	31,4	-	-	-
Displacement	δ_{V0}	[mm]	2,0	3,2	3,6	3,5			
	$\delta_{V\infty}$	[mm]	3,0	4,7	5,5	5,3			
Stainless steel A4, HCR									
Shear load in cracked and non-cracked concrete	V	[kN]	7,3	11,4	17,1	31,4	-	-	-
Displacement	δ_{V0}	[mm]	1,9	2,4	4,0	4,3			
	$\delta_{V\infty}$	[mm]	2,9	3,6	5,9	6,4			

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	γ_{inst}	[-]	1,2			
Steel failure						
Characteristic tension resistance, **steel zinc plated**	$N_{Rk,s}$	[kN]	16,1	22,6	26,0	56,6
Partial safety factor	γ_{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	γ_{Ms}	[-]	1,87			
Pull-out failure						
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	9	12	20
Increasing factor for $N_{Rk,p}$	ψc	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$			
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	45	58	65	80
Factor for k_1	$k_{cr,N}$	[-]	7,7			

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	γ_{inst}	[-]	1,2			
Steel failure						
Characteristic tension resistance, **steel zinc plated**	$N_{Rk,s}$	[kN]	16,1	22,6	26,0	56,6
Partial safety factor	γ_{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	γ_{Ms}	[-]	1,87			
Pull-out						
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	20	30
Splitting (The higher resistance of Case 1 and Case 2 may be applied)						
Minimum thickness of concrete member	h_{min}	[mm]	100	120	130	160
Case 1						
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}			
Case 2						
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 $N^0_{Rk,sp}$	ψc	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$			
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	45	58	65	80
Factor k_1 for non-cracked concrete	$k_{ucr,N}$	[-]	11,0			

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	γ_{inst}	[-]	1,0			
steel zinc plated						
Steel failure without lever arm, Installation type V						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,8	6,9	10,4	25,8
Steel failure without lever arm, Installation type D						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,1	7,6	10,8	24,3
Steel failure with lever arm, Installation type V						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12,2	30,0	59,8	104,6
Steel failure with lever arm, Installation type D						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	36,0	53,2	76,0	207
Partial safety factor for $V_{Rk,s}$ and $M^0_{Rk,s}$	γ_{Ms}	[-]	1,25			
Factor of ductility	k_7	[-]	1,0			
stainless steel A4, HCR						
Steel failure without lever arm, Installation type V						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,7	9,2	10,6	23,6
Partial safety factor	γ_{Ms}	[-]	1,25			
Steel failure without lever arm, Installation type D						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	7,3	7,6	9,7	29,6
Partial safety factor	γ_{Ms}	[-]	1,25			
Steel failure with lever arm, Installation type V						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	10,7	26,2	52,3	91,6
Partial safety factor	γ_{Ms}	[-]	1,56			
Steel failure with lever arm, Installation type D						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	28,2	44,3	69,9	191,2
Partial safety factor	γ_{Ms}	[-]	1,25			
Factor of ductility	k_7	[-]	1,0			
Concrete pry-out failure						
Factor	k_8	[-]	1,5	1,5	2,0	2,0
Concrete edge failure						
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

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**
Tension load							
Steel failure							
Steel zinc plated							
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
Stainless steel A4, HCR							
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
Shear load							
Steel failure without lever arm							
Steel zinc plated							
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
Stainless steel A4, HCR							
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
Steel failure with lever arm							
Steel zinc plated							
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
Stainless steel A4, HCR							
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

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
Displacements	δ_{N0}	[mm]	0,6	0,6	0,8	1,0
	$\delta_{N\infty}$	[mm]	0,8	0,8	1,2	1,4
Tension load in non-cracked concrete	N	[kN]	4,8	6,4	8,0	12,0
Displacements	δ_{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
Displacements	δ_{V0}	[mm]	2,8	2,9	2,5	3,6
	$\delta_{V\infty}$	[mm]	4,2	4,4	3,8	5,3