



Declaration of Performance

Svendebuen 2-6 DK-3230
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No. DEA990910 (ver.2)

Expandet ESI Extreme Pro, EVL Extreme Pro (galvanized or stainless steel bonded anchor)

Intended use or uses of the construction product according to ETAG 001 parts 1 and 5		
Generic type		Bonded anchor for anchorage of threaded rod
Base material		Cracked and Un-cracked concrete C20/25 to C50/60 acc. to EN 206-1:2003
A	Material	Steel, zinc plated $\geq 5 \mu\text{m}$ acc. to EN ISO 4042:1999 or hot-dip galvanised $\geq 40 \mu\text{m}$ acc. to EN ISO 1461:2009 and EN ISO 10684:2004+AC:2009 Property class 4.6 , 4.8 , 5.8 , 8.8 acc. EN 898-1 & EN 898-2
	Durability	Internal dry conditions
B	Material	Stainless steel: \leq M24: A4-70 ; $>$ M24 A4-50 according to EN ISO 3506
	Durability	Dry internal conditions, external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions if no particular aggressive conditions exist.
C	Material	Stainless steel 1.4529 & 1.4565: \leq M24: class 70 ; $>$ M24 class 50 according to EN ISO 3506
	Durability	dry internal conditions, external atmospheric exposure, in permanently damp internal conditions or in other particular aggressive conditions - e.g. permanent, alternating immersion in seawater, 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).
Loading (A,B,C)		Static, quasi-static & seismic.
Fire Resistance		NPD
Fire Reaction		A1 according to EN13501-1
Generic type		Bonded anchor for anchorage of reinforcing bar
Base material		Cracked and Un-cracked concrete C20/25 to C50/60 acc. to EN 206-1:2003
D	Material of reinforcing bar	Class B and C as EN 1992-1-1 Annex C
	Loading	Static, quasi-static & Seismic
Fire Reaction		A1 according to EN13501-1
Service temperature range		I: -40°C to +40°C (max. short term temperature +40°C and max. long term temperature +24°C). II: -40°C to +80°C (max. short term temperature +80°C and max. long term temperature +50°C). III: -40°C to +120°C (max. short term temperature +120°C and max. long term temperature +72°C).
Use category		Category 1 & 2: dry and wet concrete, flooded holes are allowed. Drilling method: Hammer drilling.
ETA – 16/0959 issued by		DIBT
On the basis of		ETAG 001, according to Article 29 of the Regulation (EU) No 305/2011
Notified Body		NB 2873



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Installation parameters for threaded rod

Anchor size		M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30	
Nominal drill hole diameter	d_0 [mm] =	10	12	14	18	24	28	32	35	
Effective anchorage depth	$h_{ef,min}$ [mm] =	60	60	70	80	90	96	108	120	
	$h_{ef,max}$ [mm] =	160	200	240	320	400	480	540	600	
Diameter of clearance hole in the fixture	d_f [mm] ≤	9	12	14	18	22	26	30	33	
Diameter of steel brush	d_b [mm] ≥	12	14	16	20	26	30	34	37	
Torque moment	T_{inst} [Nm] ≤	10	20	40	80	120	160	180	200	
Thickness of fixture	$t_{fix,min}$ [mm] >	0								
	$t_{fix,max}$ [mm] <	1500								
Minimum thickness of member	h_{min} [mm]	$h_{ef} + 30$ mm ≥ 100 mm			$h_{ef} + 2d_0$					
Minimum spacing	s_{min} [mm]	40	50	60	80	100	120	135	150	
Minimum edge distance	c_{min} [mm]	40	50	60	80	100	120	135	150	

Installation parameters for rebar

Rebar size		Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Nominal drill hole diameter	d_0 [mm] =	12	14	16	18	20	24	32	35	40
Effective anchorage depth	$h_{ef,min}$ [mm] =	60	60	70	75	80	90	100	112	128
	$h_{ef,max}$ [mm] =	160	200	240	280	320	400	480	540	640
Diameter of steel brush	d_b [mm] ≥	14	16	18	20	22	26	34	37	41,5
Minimum thickness of member	h_{min} [mm]	$h_{ef} + 30$ mm ≥ 100 mm			$h_{ef} + 2d_0$					
Minimum spacing	s_{min} [mm]	40	50	60	70	80	100	125	140	160
Minimum edge distance	c_{min} [mm]	40	50	60	70	80	100	125	140	160



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Characteristic values of *tension* loads under static, quasi-static action and seismic action (performance category C1)

Anchor size threaded rod				M 8	M 10	M 12	M 16	M 20	M24	M27	M30
Steel failure											
Characteristic tension resistance		$N_{Rk,s} = N_{Rk,s,seis}$	[kN]	$A_s \cdot f_{uk}$							
Combined pull-out and concrete failure											
Characteristic bond resistance in non-cracked concrete C20/25											
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm ²]	10	12	12	12	12	11	10	9
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm ²]	7,5	8,5	8,5	8,5	not admissible			
Temperature range II: 80°C/50°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm ²]	7,5	9	9	9	9	8,5	7,5	6,5
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm ²]	5,5	6,5	6,5	6,5	not admissible			
Temperature range III: 120°C/72°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm ²]	5,5	6,5	6,5	6,5	6,5	6,5	5,5	5,0
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm ²]	4,0	5,0	5,0	5,0	not admissible			
Characteristic bond resistance in cracked concrete C20/25											
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm ²]	4,0	5,0	5,5	5,5	5,5	5,5	6,5	6,5
		$\tau_{Rk,C1}$	[N/mm ²]	2,5	3,1	3,7	3,7	3,7	3,8	4,5	4,5
	flooded bore hole	$\tau_{Rk,cr}$	[N/mm ²]	4,0	4,0	5,5	5,5	not admissible			
		$\tau_{Rk,C1}$	[N/mm ²]	2,5	2,5	3,7	3,7	not admissible			
Temperature range II: 80°C/50°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm ²]	2,5	3,5	4,0	4,0	4,0	4,0	4,5	4,5
		$\tau_{Rk,C1}$	[N/mm ²]	1,6	2,2	2,7	2,7	2,7	2,8	3,1	3,1
	flooded bore hole	$\tau_{Rk,cr}$	[N/mm ²]	2,5	3,0	4,0	4,0	not admissible			
		$\tau_{Rk,C1}$	[N/mm ²]	1,6	1,9	2,7	2,7	not admissible			
Temperature range III: 120°C/72°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm ²]	2,0	2,5	3,0	3,0	3,0	3,0	3,5	3,5
		$\tau_{Rk,C1}$	[N/mm ²]	1,3	1,6	2,0	2,0	2,0	2,1	2,4	2,4
	flooded bore hole	$\tau_{Rk,cr}$	[N/mm ²]	2,0	2,5	3,0	3,0	not admissible			
		$\tau_{Rk,C1}$	[N/mm ²]	1,3	1,6	2,0	2,0	not admissible			



No. DEA990910 (ver.2)

Characteristic values of *tension* loads under static, quasi-static action and seismic action (performance category C1)

Increasing factors for concrete (only static or quasi-static actions) ψ_c	C25/30			1,02
	C30/37			1,04
	C35/45			1,07
	C40/50			1,08
	C45/55			1,09
	C50/60			1,10
Factor according to CEN/TS 1992-4-5 Section 6.2.2.3	Non-cracked concrete	k_8	[-]	10,1
	Cracked concrete			7,2
Concrete cone failure				
Factor according to CEN/TS 1992-4-5 Section 6.2.3.1	Non-cracked concrete	k_{ucr}	[-]	10,1
	Cracked concrete	k_{cr}	[-]	7,2
Edge distance	$c_{cr,N}$	[mm]		$1,5 h_{ef}$
Axial distance	$s_{cr,N}$	[mm]		$3,0 h_{ef}$
Splitting				
Edge distance	$c_{cr,sp}$	[mm]		$1,0 \cdot h_{ef} \leq 2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}} \right) \leq 2,4 \cdot h_{ef}$
Axial distance	$s_{cr,sp}$	[mm]		$2 c_{cr,sp}$
Installation safety factor (dry and wet concrete)	$\gamma_2 = \gamma_{inst}$		1,0	1,2
Installation safety factor (flooded bore hole)	$\gamma_2 = \gamma_{inst}$		1,4	not admissible



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Characteristic values of *shear* loads under static, quasi-static action and seismic action (performance category C1)

Anchor size threaded rod			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Steel failure without lever arm										
Characteristic shear resistance	$V_{Rk,s}$	[kN]	$0,50 \cdot A_s \cdot f_{uk}$							
	$V_{Rk,s,C1}$	[kN]	$0,35 \cdot A_s \cdot f_{uk}$							
Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1	k_2		0,8							
Steel failure with lever arm										
Characteristic bending moment	$M_{Rk,s}^0$	[Nm]	$1.2 \cdot W_{el} \cdot f_{uk}$							
	$M_{Rk,s,C1}^0$	[Nm]	No Performance Determined (NPD)							
Concrete pry-out failure										
Factor k_3 in equation (27) of CEN/TS 1992-4-5 Section 6.3.3	$k_{(3)}$		2,0							
Factor k in equation (5.7) of Technical Report TR 029										
Installation safety factor	$\gamma_2 = \gamma_{inst}$		1,0							
Concrete edge failure										
Effective length of anchor	l_f	[mm]	$l_f = \min(h_{ef}; 8 d_{nom})$							
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16	20	24	27	30
Installation safety factor	$\gamma_2 = \gamma_{inst}$		1,0							



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Characteristic values of tension loads under static, quasi-static action and seismic action (performance category C1)

Anchor size reinforcing bar				Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure												
Characteristic tension resistance	$N_{Rk,s} = N_{Rk,s,seis}$	[kN]	$A_s \cdot f_{uk}$									
Combined pull-out and concrete failure												
Characteristic bond resistance in non-cracked concrete C20/25												
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm ²]	10	12	12	12	12	12	11	10	8,5
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm ²]	7,5	8,5	8,5	8,5	8,5	not admissible			
Temperature range II: 80°C/50°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm ²]	7,5	9	9	9	9	9	8,0	7,0	6,0
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm ²]	5,5	6,5	6,5	6,5	6,5	not admissible			
Temperature range III: 120°C/72°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm ²]	5,5	6,5	6,5	6,5	6,5	6,5	6,0	5,0	4,5
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm ²]	4,0	5,0	5,0	5,0	5,0	not admissible			
Characteristic bond resistance in cracked concrete C20/25												
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm ²]	4,0	5,0	5,5	5,5	5,5	5,5	5,5	6,5	6,5
		$\tau_{Rk,C1}$	[N/mm ²]	2,5	3,1	3,7	3,7	3,7	3,7	3,8	4,5	4,5
	flooded bore hole	$\tau_{Rk,cr}$	[N/mm ²]	4,0	4,0	5,5	5,5	5,5	not admissible			
		$\tau_{Rk,C1}$	[N/mm ²]	2,5	2,5	3,7	3,7	3,7	not admissible			
Temperature range II: 80°C/50°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm ²]	2,5	3,5	4,0	4,0	4,0	4,0	4,0	4,5	4,5
		$\tau_{Rk,C1}$	[N/mm ²]	1,6	2,2	2,7	2,7	2,7	2,7	2,8	3,1	3,1
	flooded bore hole	$\tau_{Rk,cr}$	[N/mm ²]	2,5	3,0	4,0	4,0	4,0	not admissible			
		$\tau_{Rk,C1}$	[N/mm ²]	1,6	1,9	2,7	2,7	2,7	not admissible			
Temperature range III: 120°C/72°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm ²]	2,0	2,5	3,0	3,0	3,0	3,0	3,0	3,5	3,5
		$\tau_{Rk,C1}$	[N/mm ²]	1,3	1,6	2,0	2,0	2,0	2,0	2,1	2,4	2,4
	flooded bore hole	$\tau_{Rk,cr}$	[N/mm ²]	2,0	2,5	3,0	3,0	3,0	not admissible			
		$\tau_{Rk,C1}$	[N/mm ²]	1,3	1,6	2,0	2,0	2,0	not admissible			



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Characteristic values of tension loads under static, quasi-static action and seismic action (performance category C1)

Increasing factors for concrete (only static or quasi-static actions) ψ_c	C25/30			1,02
	C30/37			1,04
	C35/45			1,07
	C40/50			1,08
	C45/55			1,09
	C50/60			1,10
Factor according to CEN/TS 1992-4-5 Section 6.2.2.3	Non-cracked concrete	k_8	[-]	10,1
	Cracked concrete			7,2
Concrete cone failure				
Factor according to CEN/TS 1992-4-5 Section 6.2.3.1	Non-cracked concrete	k_{ucr}	[-]	10,1
	Cracked concrete	k_{cr}	[-]	7,2
Edge distance	$C_{cr,N}$	[mm]		$1,5 h_{ef}$
Axial distance	$S_{cr,N}$	[mm]		$3,0 h_{ef}$
Splitting				
Edge distance	$C_{cr,sp}$	[mm]		$1,0 \cdot h_{ef} \leq 2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}} \right) \leq 2,4 \cdot h_{ef}$
Axial distance	$S_{cr,sp}$	[mm]		$2 C_{cr,sp}$
Installation safety factor (dry and wet concrete)	$\gamma_2 = \gamma_{inst}$		1,0	1,2
Installation safety factor (flooded bore hole)	$\gamma_2 = \gamma_{inst}$		1,4	not admissible



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Characteristic values of shear loads under static, quasi-static action and seismic action (performance category C1)

Anchor size reinforcing bar		Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32	
Steel failure without lever arm											
Characteristic shear resistance	$V_{Rk,s}$	[kN]	$0,50 \cdot A_s \cdot f_{uk}$								
	$V^0_{Rk,s,C1}$	[kN]	not admissible	$0,35 \cdot A_s \cdot f_{uk}$							
Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1	k_2		0,8								
Steel failure with lever arm											
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	$1,2 \cdot W_{el} \cdot f_{uk}$								
	$M^0_{Rk,s,C1}$	[Nm]	No Performance Determined (NPD)								
Concrete pry-out failure											
Factor k_3 in equation (27) of CEN/TS 1992-4-5 Section 6.3.3	$k_{(3)}$		2,0								
Factor k in equation (5.7) of Technical Report TR 029											
Installation safety factor	$\gamma_2 = \gamma_{inst}$		1,0								
Concrete edge failure											
Effective length of anchor	l_f	[mm]	$l_f = \min(h_{ef}; 8 d_{nom})$								
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	14	16	20	25	28	32
Installation safety factor	$\gamma_2 = \gamma_{inst}$		1,0								



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Displacements under tension load¹⁾ (threaded rod)

Anchor size threaded rod			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Non-cracked concrete C20/25										
Temperature range I: 40°C/24°C	δ_{N0} -factor	[mm/(N/mm ²)]	0,021	0,023	0,026	0,031	0,036	0,041	0,045	0,049
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,030	0,033	0,037	0,045	0,052	0,060	0,065	0,071
Temperature range II: 80°C/50°C	δ_{N0} -factor	[mm/(N/mm ²)]	0,050	0,056	0,063	0,075	0,088	0,100	0,110	0,119
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,072	0,081	0,090	0,108	0,127	0,145	0,159	0,172
Temperature range III: 120°C/72°C	δ_{N0} -factor	[mm/(N/mm ²)]	0,050	0,056	0,063	0,075	0,088	0,100	0,110	0,119
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,072	0,081	0,090	0,108	0,127	0,145	0,159	0,172
Cracked concrete C20/25										
Temperature range I: 40°C/24°C	δ_{N0} -factor	[mm/(N/mm ²)]	0,090		0,070					
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,105		0,105					
Temperature range II: 80°C/50°C	δ_{N0} -factor	[mm/(N/mm ²)]	0,219		0,170					
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,255		0,245					
Temperature range III: 120°C/72°C	δ_{N0} -factor	[mm/(N/mm ²)]	0,219		0,170					
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,255		0,245					

¹⁾ Calculation of the displacement: $\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; τ : action bond stress for tension

$$\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau;$$

Displacements under shear load¹⁾ (threaded rod)

Anchor size threaded rod			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
For non-cracked concrete C20/25										
All temperature ranges	δ_{V0} -factor	[mm/(kN)]	0,06	0,06	0,05	0,04	0,04	0,03	0,03	0,03
	$\delta_{V\infty}$ -factor	[mm/(kN)]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05
For cracked concrete C20/25										
All temperature ranges	δ_{V0} -factor	[mm/(kN)]	0,12	0,12	0,11	0,10	0,09	0,08	0,08	0,07
	$\delta_{V\infty}$ -factor	[mm/(kN)]	0,18	0,18	0,17	0,15	0,14	0,13	0,12	0,10

¹⁾ Calculation of the displacement: $\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; V : action shear load

$$\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V;$$



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Displacements under tension load¹⁾ (rebar)

Anchor size reinforcing bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Non-cracked concrete C20/25											
Temperature range I: 40°C/24°C	δ _{NO} -factor	[mm/(N/mm ²)]	0,021	0,023	0,026	0,028	0,031	0,036	0,043	0,047	0,052
	δ _{N∞} -factor	[mm/(N/mm ²)]	0,030	0,033	0,037	0,041	0,045	0,052	0,061	0,071	0,075
Temperature range II: 80°C/50°C	δ _{NO} -factor	[mm/(N/mm ²)]	0,050	0,056	0,063	0,069	0,075	0,088	0,104	0,113	0,126
	δ _{N∞} -factor	[mm/(N/mm ²)]	0,072	0,081	0,090	0,099	0,108	0,127	0,149	0,163	0,181
Temperature range III: 120°C/72°C	δ _{NO} -factor	[mm/(N/mm ²)]	0,050	0,056	0,063	0,069	0,075	0,088	0,104	0,113	0,126
	δ _{N∞} -factor	[mm/(N/mm ²)]	0,072	0,081	0,090	0,099	0,108	0,127	0,149	0,163	0,181
Cracked concrete C20/25											
Temperature range I: 40°C/24°C	δ _{NO} -factor	[mm/(N/mm ²)]	0,090				0,070				
	δ _{N∞} -factor	[mm/(N/mm ²)]	0,105				0,105				
Temperature range II: 80°C/50°C	δ _{NO} -factor	[mm/(N/mm ²)]	0,219				0,170				
	δ _{N∞} -factor	[mm/(N/mm ²)]	0,255				0,245				
Temperature range III: 120°C/72°C	δ _{NO} -factor	[mm/(N/mm ²)]	0,219				0,170				
	δ _{N∞} -factor	[mm/(N/mm ²)]	0,255				0,245				

¹⁾ Calculation of the displacement: $\delta_{NO} = \delta_{NO\text{-factor}} \cdot \tau$; τ : action bond stress for tension

$\delta_{N\infty} = \delta_{N\infty\text{-factor}} \cdot \tau$;

Displacement under shear load¹⁾ (rebar)

Anchor size reinforcing bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Non-cracked concrete C20/25											
All temperature ranges	δ _{V0} -factor	[mm/(kN)]	0,06	0,05	0,05	0,04	0,04	0,04	0,03	0,03	0,03
	δ _{V∞} -factor	[mm/(kN)]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,04	0,04
Cracked concrete C20/25											
All temperature ranges	δ _{V0} -factor	[mm/(kN)]	0,12	0,12	0,11	0,11	0,10	0,09	0,08	0,07	0,06
	δ _{V∞} -factor	[mm/(kN)]	0,18	0,18	0,17	0,16	0,15	0,14	0,12	0,11	0,10

¹⁾ Calculation of the displacement: $\delta_{V0} = \delta_{V0\text{-factor}} \cdot V$; V : action shear load

$\delta_{V\infty} = \delta_{V\infty\text{-factor}} \cdot V$;



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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 identified above.

Signed for and on behalf of Expandet Screw Anchors A/S by:

Place and date of issue: Græsted, 23-02-2022

Lars Mortensen, Head of Technical Department