

**EXPANDET®****Declaration of Performance**

Svendebuen 2-6 DK-3230

Tlf.: +45 70227979

salg@kyocera-senco.dk

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: $\leq \text{M24}$: A4-70 ; $> \text{M24}$ 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: $\leq \text{M24}$: class 70 ; $> \text{M24}$ 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



No. DEA990910 (ver.2)

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



No. DEA990910 (ver.2)

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 · 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	τ _{Rk,ucr}	[N/mm²]	10	12	12	12	12	11	10	9
	flooded bore hole	τ _{Rk,ucr}	[N/mm²]	7,5	8,5	8,5	8,5	not admissible			
Temperature range II: 80°C/50°C	dry and wet concrete	τ _{Rk,ucr}	[N/mm²]	7,5	9	9	9	9	8,5	7,5	6,5
	flooded bore hole	τ _{Rk,ucr}	[N/mm²]	5,5	6,5	6,5	6,5	not admissible			
Temperature range III: 120°C/72°C	dry and wet concrete	τ _{Rk,ucr}	[N/mm²]	5,5	6,5	6,5	6,5	6,5	6,5	5,5	5,0
	flooded bore hole	τ _{Rk,ucr}	[N/mm²]	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	τ _{Rk,cr}	[N/mm²]	4,0	5,0	5,5	5,5	5,5	5,5	6,5	6,5
		τ _{Rk,C1}	[N/mm²]	2,5	3,1	3,7	3,7	3,7	3,8	4,5	4,5
	flooded bore hole	τ _{Rk,cr}	[N/mm²]	4,0	4,0	5,5	5,5	not admissible			
		τ _{Rk,C1}	[N/mm²]	2,5	2,5	3,7	3,7	not admissible			
Temperature range II: 80°C/50°C	dry and wet concrete	τ _{Rk,cr}	[N/mm²]	2,5	3,5	4,0	4,0	4,0	4,0	4,5	4,5
		τ _{Rk,C1}	[N/mm²]	1,6	2,2	2,7	2,7	2,7	2,8	3,1	3,1
	flooded bore hole	τ _{Rk,cr}	[N/mm²]	2,5	3,0	4,0	4,0	not admissible			
		τ _{Rk,C1}	[N/mm²]	1,6	1,9	2,7	2,7	not admissible			
Temperature range III: 120°C/72°C	dry and wet concrete	τ _{Rk,cr}	[N/mm²]	2,0	2,5	3,0	3,0	3,0	3,0	3,5	3,5
		τ _{Rk,C1}	[N/mm²]	1,3	1,6	2,0	2,0	2,0	2,1	2,4	2,4
	flooded bore hole	τ _{Rk,cr}	[N/mm²]	2,0	2,5	3,0	3,0	not admissible			
		τ _{Rk,C1}	[N/mm²]	1,3	1,6	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_B	[-]	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]	$10 \cdot h_{ef} \leq 2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}} \right) \leq 2,4 \cdot h_{ef}$	
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 • A _s • f _{uk}							
	V _{Rk,s,C1}	[kN]	0,35 • A _s • 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 • W _{el} • 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 Factor k in equation (5.7) of Technical Report TR 029	k ₍₃₎		2,0							
Installation safety factor	γ ₂ = γ _{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	γ ₂ = γ _{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/mm²]	10	12	12	12	12	12	11	10	8,5
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	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/mm²]	7,5	9	9	9	9	9	8,0	7,0	6,0
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	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/mm²]	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/mm²]	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/mm²]	4,0	5,0	5,5	5,5	5,5	5,5	5,5	6,5	6,5
		$\tau_{Rk,C1}$	[N/mm²]	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/mm²]	4,0	4,0	5,5	5,5	5,5	not admissible			
		$\tau_{Rk,C1}$	[N/mm²]	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/mm²]	2,5	3,5	4,0	4,0	4,0	4,0	4,0	4,5	4,5
		$\tau_{Rk,C1}$	[N/mm²]	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/mm²]	2,5	3,0	4,0	4,0	4,0	not admissible			
		$\tau_{Rk,C1}$	[N/mm²]	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/mm²]	2,0	2,5	3,0	3,0	3,0	3,0	3,0	3,5	3,5
		$\tau_{Rk,C1}$	[N/mm²]	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/mm²]	2,0	2,5	3,0	3,0	3,0	not admissible			
		$\tau_{Rk,C1}$	[N/mm²]	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]	$10 \cdot h_{ef} \leq 2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}} \right) \leq 2,4 \cdot h_{ef}$	
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 · A _s · f _{uk}								
	V ⁰ _{Rk,s,C1}	[kN]	not admissible		0,35 · A _s · 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 · W _{el} · 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 Factor k in equation (5.7) of Technical Report TR 029	k ₍₃₎		2,0								
Installation safety factor	γ ₂ = γ _{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	γ ₂ = γ _{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