


Intended use or uses of the construction product according to ETAG001 p.1-5 (EN 1992-4) and ETAG001 Annex E (TR045)

Generic type	Bonded anchor for anchorage of threaded rod and reinforcing rebar.
Base material	Cracked and un-cracked concrete C20/25 to C50/60 acc. to EN206-1
Use category	> Installation in dry, wet concrete and flooded holes > Overhead installation
Material of threaded rod and Durability	> Galvanised steel cl. 5.8 and 8.8 acc. to EN ISO898 for dry internal conditions > <u>Stainless steel AISI316</u> cl. A4-70 acc. to EN ISO3506 for dry internal conditions, external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions if no particular aggressive conditions exist > <u>High resistant corrosion stainless steel</u> cl. 70 acc. to EN ISO3506 for all conditions
Material of reinforcing bar	Class B and C as EN 1992-1-1 Annex C
Loading	Static, quasi-static and Seismic
Temperature Range	> -40°C to +40°C max long term temperature +24°C and max short term temperature +40°C > -40°C to +60°C max long term temperature +43°C and max short term temperature +60°C > -40°C to +72°C max long term temperature +43°C and max short term temperature +72°C
Fire Resistance	F120 (TR020)
Fire Reaction	A1 according to EN13501-1
ETA-09/0061 issued by	DIBT approval body nr.0756
On the basis of	ETAG001 p.1-5 and TR029
Certificate of Conformity 0756-CPD-0258 issued by	DIBT notified body nr.0756
Under System (AVCP)	1

Intended use or uses of the construction product according to ETAG001 p.1-5 (EN 1992-4)

Generic type	Bonded anchor for anchorage of Post installed rebar connection.
Base material	Non-carbonated concrete C12/15 to C50/60 acc. to EN206-1:2000 (Cl.0,40 max)
Use category	Installation use in dry and wet concrete (not flooded holes)
Material of reinforcing bar	Class B and C as EN 1992-1-1 Annex C
Loading	Static, quasi-static (see Eurocode 2 EN 1992-1-1)
Temperature Range	-40°C to +80°C max long term temperature +50°C and max short term temperature +80°C
ETA-12/0542 issued by	DIBT approval body nr.0756
On the basis of	ETAG001 p.1-5 and TR023
Certificate of Conformity 0756-CPD-0512 issued by	DIBT notified body nr.0756
Under System (AVCP)	1

Intended use or uses of the construction product according to ETAG001 p.1-5 (EN 1992-4)

Generic type	Bonded anchor for anchorage of threaded rod and reinforcing rebar.
Base material	Un-cracked concrete C20/25 to C50/60 acc. to EN206-1
Use category	> Installation in dry, wet concrete and flooded holes > Overhead installation > Diamond-drilling
Material of threaded rod and Durability	> Galvanised steel cl. 5.8 and 8.8 acc. to EN ISO898 for dry internal conditions > <u>Stainless steel AISI316</u> cl. A4-70 acc. to EN ISO3506 for dry internal conditions, external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions if no particular aggressive conditions exist > <u>High resistant corrosion stainless steel</u> cl.70 acc. to EN ISO3506 for all conditions
Material of reinforcing bar	Class B and C as EN 1992-1-1 Annex C
Loading	Static, quasi-static
Temperature Range	> -40°C to +40°C max long term temperature +24°C and max short term temperature +40°C > -40°C to +60°C max long term temperature +43°C and max short term temperature +60°C > -40°C to +72°C max long term temperature +43°C and max short term temperature +72°C
Fire Reaction	A1 according to EN13501-1
ETA-12/0602 issued by	DIBT approval body nr.0756
On the basis of	ETAG001 p.1-5
Certificate of Conformity 0756-CPD-0520 issued by	DIBT notified body nr.0756
Under System (AVCP)	1

Declared Performances acc. to ETA-09/0061 - ETAG001 p.1-5 - Design method acc. to EN 1992-4:2018											
Declared Performances acc. to ETA-09/0061 - ETAG001 Annex E - Design method acc. to EN 1992-4:2018											
ESSENTIAL CHARACTERISTICS			PERFORMANCE - <u>THREADED ROD</u>								
Installation parameters			M8	M10	M12	M16	M20	M24	M27	M30	
d₀	Nominal diameter of drill bit	[mm]	10	12	14	18	24	28	32	35	
h_{ef}	Effective embedment depth	h_{ef,min} [mm]	60	60	70	80	90	96	108	120	
		h_{ef,std} [mm]	80	90	110	125	170	210	240	270	
		h_{ef,max} [mm]	96	120	144	192	240	288	324	360	
h_{min}	Minimum thickness of the concrete member	[mm]	$h_{ef} + 30 \geq 100$				$h_{ef} + 2d_0$				
T_{inst}	Torque moment (max)	[Nm]	10	20	40	80	120	160	180	200	
S_{min}	Minimum spacing	[mm]	40	50	60	80	100	120	135	150	
C_{min}	Minimum edge distance	[mm]	40	50	60	80	100	120	135	150	
TENSION Steel failure											
N_{Rk,s}	Tension Steel characteristic failure (= $N_{Rk,s,seis}^0$)	cl. 4.6 [kN]	15	23	34	63	98	141	184	224	
		cl. 5.8 [kN]	18	29	42	78	122	176	230	280	
		cl. 8.8 [kN]	29	46	67	125	196	282	368	449	
		A4-70 (50) [kN]	26	41	59	110	171	247	(230)	(281)	
Combined pull-out and concrete cone failure: "DRY & WET"			M8	M10	M12	M16	M20	M24	M27	M30	
τ_{Rk,ucr}	Characteristic bond resistance in un-cracked concrete C20/25	40°/24°C [MPa]	15	15	15	14	13	12	12	12	
		60°/43°C [MPa]	9,5	9,5	9	8,5	8	7,5	7,5	7,5	
		72°/43°C [MPa]	8,5	8,5	8	7,5	7	7	6,5	6,5	
τ_{Rk,cr}	Characteristic bond resistance in cracked concrete C20/25	40°/24°C [MPa]			7,5	6,5	6	5,5	5,5	5,5	
		60°/43°C [MPa]			4,5	4	3,5	3,5	3,5	3,5	
		72°/43°C [MPa]			4	3,5	3	3	3	3	
τ_{Rk,seis,C1}	Characteristic bond resistance under Seismic C1 action C20/25	40°/24°C [MPa]			7,1	6,2	5,7	5,5	5,5	5,5	
		60°/43°C [MPa]			4,3	3,8	3,4	3,5	3,5	3,5	
		72°/43°C [MPa]			3,9	3,4	3	3	3	3	
τ_{Rk,seis,C2}	Characteristic bond resistance under Seismic C2 action C20/25	40°/24°C [MPa]			2,4	2,2					
		60°/43°C [MPa]			1,4	1,4					
		72°/43°C [MPa]			1,3	1,2					
γ_{inst}	Installation safety factor	[-]	1,2				1,4				
γ_{m,c}¹⁾	Partial safety factor	[-]	1,8				2,1				
Combined pull-out and concrete cone failure: "FLOODED hole"			M8	M10	M12	M16	M20	M24	M27	M30	
τ_{Rk,ucr}	Characteristic bond resistance in un-cracked concrete C20/25	40°/24°C [MPa]	15	14	13	10	9,5	8,5	7,5	7	
		60°/43°C [MPa]	9,5	9,5	9	8,5	7,5	7	6,5	6	
		72°/43°C [MPa]	8,5	8,5	8	7,5	7	6	5,5	5,5	
τ_{Rk,cr}	Characteristic bond resistance in cracked concrete C20/25	40°/24°C [MPa]			7,5	6	5	4,5	4	4	
		60°/43°C [MPa]			4,5	4	3,5	3,5	3,5	3,5	
		72°/43°C [MPa]			4	3,5	3	3	3	3	
τ_{Rk,seis,C1}	Characteristic bond resistance under Seismic C1 action C20/25	40°/24°C [MPa]			7,1	5,8	4,8	4,5	4	4	
		60°/43°C [MPa]			4,3	3,8	3,4	3,5	3,5	3,5	
		72°/43°C [MPa]			3,9	3,4	3	3	3	3	
τ_{Rk,seis,C2}	Characteristic bond resistance under Seismic C2 action C20/25	40°/24°C [MPa]			2,4	2,1					
		60°/43°C [MPa]			1,4	1,4					
		72°/43°C [MPa]			1,3	1,2					
γ_{inst}	Installation safety factor	[-]	1,4								
γ_{m,c}¹⁾	Partial safety factor	[-]	2,1								
ψ_c	Increasing factor for concrete	C30/37 [-]	1,04								
		C40/50 [-]	1,08								
		C50/60 [-]	1,10								
Concrete cone failure											
k_{ucr,N}	Factor acc. to EN 1992-4 § 7.2.1.4 un-cracked	[-]	11,0								
k_{cr,N}	Factor acc. to EN 1992-4 § 7.2.1.4 cracked	[-]	7,7								
C_{cr,N}	Critical edge distance (<i>single anchor see TR029</i>)	[mm]	1,5xh _{ef}								
S_{cr,N}	Critical spacing (<i>single anchor see TR029</i>)	[mm]	3,0xh _{ef}								
Splitting failure											
C_{cr,sp}	Critical edge distance (for splitting)	[mm]	$1,0xh_{ef} \leq 2xh_{ef}(2,5 - h / h_{ef}) \leq 2,4xh_{ef}$								
S_{cr,sp}	Critical spacing (for splitting)	[mm]	$2xC_{cr,sp}$								
γ_{inst}	Installation safety factor	[-]	See above γ _{inst}								
γ_{m,sp}¹⁾	Partial safety factor	[-]	See above γ _{m,c}								

Displacement under Tension Load ²⁾				M8	M10	M12	M16	M20	M24	M27	M30
Un-cracked concrete under Static, quasi-static action											
$\delta_{N0,ucr}$	Short term displacement	40°/24°C	[mm/MPa]	0,011	0,013	0,015	0,020	0,024	0,029	0,032	0,035
		60°/43°C and 72°/43°C		0,013	0,015	0,018	0,023	0,028	0,033	0,037	0,043
$\delta_{N\infty,ucr}$	Long term displacement	40°/24°C	[mm/MPa]	0,044	0,052	0,061	0,079	0,096	0,114	0,127	0,140
		60°/43°C and 72°/43°C		0,050	0,060	0,070	0,091	0,111	0,131	0,146	0,161
Cracked concrete under Static, quasi-static, Seismic C1 action											
$\delta_{N0,cr}$	Short term displacement	40°/24°C	[mm/MPa]			0,032	0,037	0,042	0,048	0,053	0,058
		60°/43°C and 72°/43°C				0,037	0,043	0,049	0,055	0,061	0,067
$\delta_{N\infty,cr}$	Long term displacement	40°/24°C	[mm/MPa]					0,21			
		60°/43°C and 72°/43°C						0,24			
Under Seismic C2 action											
$\delta_{N0,eq,C2}$	Short term displacement	all temperature range		[mm/MPa]			0,03	0,05			
$\delta_{N\infty,eq,C2}$	Long term displacement			[mm/MPa]			0,06	0,09			
SHEAR Steel failure mode				M8	M10	M12	M16	M20	M24	M27	M30
$V_{Rk,s}$	Shear Steel characteristic failure under Static, quasi-static action	cl. 4.6	[kN]	7	12	17	31	49	71	92	112
		cl. 5.8	[kN]	9	15	21	39	61	88	115	140
		cl. 8.8	[kN]	15	23	34	63	98	141	184	224
		A4-70 (50)	[kN]	13	20	30	55	86	124	(115)	(140)
$V_{Rk,s,eq,C1}$	Shear Steel characteristic failure under Seismic C1 action	cl. 4.6	[kN]			14	27	42	56	72	88
		cl. 5.8	[kN]			18	34	53	70	91	111
		cl. 8.8	[kN]			30	55	85	111	145	177
		A4-70 (50)	[kN]			26	48	75	98	(91)	(111)
$V_{Rk,s,eq,C2}$	Shear Steel characteristic failure under Seismic C2 action	cl. 4.6	[kN]			13	25				
		cl. 5.8	[kN]			17	31				
		cl. 8.8	[kN]			27	50				
		A4-70 (50)	[kN]			24	44				
$M^0_{Rk,s}$	Bending Moment characteristic failure under Static, quasi-static action	cl. 4.6	[Nm]	15	30	52	133	260	449	666	900
		cl. 5.8	[Nm]	19	37	65	166	324	560	833	1123
		cl. 8.8	[Nm]	30	60	105	266	519	896	1333	1797
		A4-70 (50)	[Nm]	26	52	92	232	454	784	(832)	(1125)
k_7	Ductility factor acc. to EN 1992-4 § 7.2.2.3.1	[-]		0,8							
Concrete Pryout failure											
k_8	Factor acc. to EN 1992-4 § 7.2.2.4	[-]		2							
γ_{inst}	Installation safety factor	[-]		1,0							
$\gamma_{m,cp}^{1)}$	Partial safety factor	[-]		1,5							
Concrete Edge failure											
see TR029 Section 5.2.3.4											
γ_{inst}	Installation safety factor	[-]		1,0							
$\gamma_{m,c}^{1)}$	Partial safety factor	[-]		1,5							
Concrete Edge failure											
see CEN/TS 1992-4-5 Section 6.3.3											
l_f	Effective length of anchor	[-]		$l_f \leq \min(h_{ef}; 8x_{d,nom})$							
d_{nom}	Outside diameter of anchor	[mm]		8	10	12	16	20	24	27	30
γ_{inst}	Installation safety factor	[-]		1,0							
$\gamma_{m,c}^{1)}$	Partial safety factor	[-]		1,5							
Displacement under Shear Load ³⁾				M8	M10	M12	M16	M20	M24	M27	M30
Static, quasi-static and seismic C1 action											
δ_{V0}	Short term displacement	[mm/kN]		0,06	0,06	0,05	0,04	0,04	0,03	0,03	0,03
				0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05
$\delta_{V\infty}$	Long term displacement	[mm/kN]									
Under Seismic C2 action											
$\delta_{V0,eq,C2}$	Short term displacement	[mm/kN]				0,2	0,1				
$\delta_{V\infty,eq,C2}$	Long term displacement	[mm/kN]				0,2	0,1				

¹⁾ In absence of other national regulations; ²⁾ Calculation of the displacement = $\delta_N * \tau$; ³⁾ Calculation of the displacement = $\delta_V * V$

FIRE Resistance											
Design method acc. to TR020											
ESSENTIAL CHARACTERISTICS				PERFORMANCE							
				FIRE RESISTANCE - THREADED ROD							
Installation parameters			[d]	M8	M10	M12	M16	M20	M24	M27	M30
d_0	Nominal diameter of drill bit		[mm]	10	12	14	18	24	28	35	
h_{ef}	Effective embedment depth		[mm]	80	90	110	125	170	210	280	
$N_{Rum,fi,30}$	For Fire resistance duration = 30 minutes		[kN]	≤ 1,6	≤ 2,6	≤ 3,3	≤ 6,3	≤ 9,8	≤ 14,0	≤ 18,3	
$N_{Rum,fi,60}$	For Fire resistance duration = 60 minutes		[kN]	≤ 1,1	≤ 1,8	≤ 2,6	≤ 4,8	≤ 7,5	≤ 10,8	≤ 14,1	
$N_{Rum,fi,90}$	For Fire resistance duration = 90 minutes		[kN]	≤ 0,6	≤ 0,9	≤ 1,8	≤ 3,4	≤ 5,3	≤ 7,6	≤ 9,9	
$N_{Rum,fi,120}$	For Fire resistance duration = 120 minutes		[kN]	≤ 0,3	≤ 0,5	≤ 1,4	≤ 2,7	≤ 4,2	≤ 6,0	≤ 7,9	

Declared Performances acc. to ETA-09/0061 - ETAG001 p.1-5 - Design method acc. to EN 1992-4:2018
Declared Performances acc. to ETA-09/0061 - ETAG001 Annex E - Design method acc. to EN 1992-4:2018

ESSENTIAL CHARACTERISTICS				PERFORMANCE - REBAR								
Installation parameters				Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
d₀	Nominal diameter of drill bit	[mm]		12	14	16	18	20	24	32	35	40
h_{ef}	Effective embedment depth	h _{ef,min}	[mm]	60	60	70	75	80	90	100	112	128
		h _{ef,std}	[mm]	80	90	110	115	125	170	210	250	280
		h _{ef,max}	[mm]	96	120	144	168	192	240	300	336	384
h_{min}	Minimum thickness of the concrete member	[mm]	h _{ef} + 30 ≥ 100			h _{ef} + 2d ₀						
s_{min}	Minimum spacing	[mm]	40	50	60	70	80	100	125	140	160	160
c_{min}	Minimum edge distance	[mm]	40	50	60	70	80	100	125	140	160	160
TENSION Steel failure												
N_{Rk,s}	Tension Steel characteristic failure = N ⁰ _{Rk,s,eq,C1}	[kN]	A _s x f _{uk}									
Combined pull-out and concrete cone failure: "DRY & WET"				Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
τ_{Rk,ucr}	Characteristic bond resistance in un-cracked concrete C20/25	40°/24°C	[MPa]	14	14	13	13	12	12	11	11	11
		60°/43°C	[MPa]	8,5	8,5	8	8	7,5	7	7	6,5	6,5
		72°/43°C	[MPa]	7,5	7,5	7,5	7	7	6,5	6	6	6
τ_{Rk,cr}	Characteristic bond resistance in cracked concrete C20/25	40°/24°C	[MPa]			7,5	7	6,5	6	5,5	5,5	5,5
		60°/43°C	[MPa]			4,5	4	4	3,5	3,5	3,5	3,5
		72°/43°C	[MPa]			4	3,5	3,5	3	3	3	3
τ_{Rk,eq,C1}	Characteristic bond resistance under Seismic C1 action C20/25	40°/24°C	[MPa]			6,9	6,4	6,2	5,7	5,5	5,5	5,5
		60°/43°C	[MPa]			4,1	3,7	3,8	3,3	3,5	3,5	3,5
		72°/43°C	[MPa]			3,7	3,2	3,3	2,9	3	3	3
γ_{inst}	Installation safety factor	[-]	1,2				1,4					
γ_{m,c}¹⁾	Partial safety factor	[-]	1,8				2,1					
Combined pull-out and concrete cone failure: "FLOODED hole"												
τ_{Rk,ucr}	Characteristic bond resistance in un-cracked concrete C20/25	40°/24°C	[MPa]	14	13	11	10	9,5	8,5	7,5	7	6
		60°/43°C	[MPa]	8,5	8,5	8	8	7,5	7	6	5,5	5
		72°/43°C	[MPa]	7,5	7,5	7,5	7	7	6	5,5	5	4,5
τ_{Rk,cr}	Characteristic bond resistance in cracked concrete C20/25	40°/24°C	[MPa]			7,5	6,5	6	5	4,5	4	4
		60°/43°C	[MPa]			4,5	4	4	3,5	3,5	3,5	3
		72°/43°C	[MPa]			4	4	4	3	3	3	3
τ_{Rk,eq,C1}	Characteristic bond resistance under Seismic C1 action C20/25	40°/24°C	[MPa]			6,9	6,0	5,7	4,8	4,5	4	4
		60°/43°C	[MPa]			4,1	3,7	3,8	3,3	3,5	3,5	3
		72°/43°C	[MPa]			3,7	3,2	3,3	2,9	3	3	3
γ_{inst}	Installation safety factor	[-]	1,4									
γ_{m,c}¹⁾	Partial safety factor	[-]	2,1									
ψ_c	Increasing factor for concrete	C30/37	[-]	1,04								
		C40/50	[-]	1,08								
		C50/60	[-]	1,10								
Concrete cone failure												
k_{ucr,N}	Factor acc. to EN 1992-4 § 7.2.1.4 un-cracked	[-]	10,1									
k_{cr,N}	Factor acc. to EN 1992-4 § 7.2.1.4 cracked	[-]	7,2									
c_{cr,N}	Critical edge distance	[mm]	1,5xh _{ef}									
s_{cr,N}	Critical spacing	[mm]	3,0xh _{ef}									
Splitting failure												
c_{cr,sp}	Critical edge distance (splitting)	[mm]	1,0xh _{ef} ≤ 2xh _{ef} (2,5 - h / h _{ef}) ≤ 2,4xh _{ef}									
s_{cr,sp}	Critical spacing (splitting)	[mm]	2xC _{cr,sp}									
γ_{inst}	Installation safety factor	[-]	See above γ ₂									
γ_{m,sp}¹⁾	Partial safety factor	[-]	See above γ _{m,c}									
Displacement under Tension Load ²⁾				Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Un-cracked concrete under Static, quasi-static action												
δ_{NO,ucr}	Short term displacement	40°/24°C	[mm/MPa]	0,011	0,013	0,015	0,018	0,02	0,024	0,03	0,033	0,037
		60°/43°C and 72°/43°C	[mm/MPa]	0,013	0,015	0,018	0,020	0,023	0,028	0,034	0,038	0,043
δ_{NO∞,ucr}	Long term displacement	40°/24°C	[mm/MPa]	0,044	0,052	0,061	0,07	0,079	0,096	0,188	0,132	0,149
		60°/43°C and 72°/43°C	[mm/MPa]	0,050	0,060	0,070	0,081	0,091	0,111	0,136	0,151	0,172
Cracked concrete under Static, quasi-static and seismic C1 action												
δ_{NO,cr}	Short term displacement	40°/24°C	[mm/MPa]			0,032	0,035	0,037	0,042	0,049	0,055	0,061
		60°/43°C and 72°/43°C	[mm/MPa]			0,037	0,040	0,043	0,049	0,056	0,063	0,070
δ_{NO∞,cr}	Long term displacement	40°/24°C	[mm/MPa]						0,21			
		60°/43°C and 72°/43°C	[mm/MPa]						0,24			

SHEAR Steel failure			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
$V_{Rk,s}$	Shear Steel characteristic failure under Static, quasi-static action	[kN]	0,5 x A _s x f _{uk}								
$V_{Rk,s,seis,C1}^0$	Shear Steel characteristic failure under Seismic C1 action	[kN]	-	-	0,44 x A _s x f _{uk}						
$M_{Rk,s}^0$	Bending Moment characteristic failure under Static, quasi-static action	[Nm]	1,2 x W _{el} x f _{uk}								
k_7	Ductility factor acc. to EN 1992-4 § 7.2.2.3.1	[-]	0,8								
Concrete Pryout failure											
k_8	Factor acc. to EN 1992-4 § 7.2.2.4	[-]	2								
γ_{inst}	Installation safety factor	[-]	1,0								
$\gamma_{m,cp}^{1)}$	Partial safety factor	[-]	1,5								
Concrete Edge failure			see TR029 Section 5.2.3.4								
γ_{inst}	Installation safety factor	[-]	1,0								
$\gamma_{m,c}^{1)}$	Partial safety factor	[-]	1,5								
Concrete Edge failure			see CEN/TS 1992-4-5 Section 6.3.4								
l_f	Effective length of anchor	[-]	$l_f \leq \min(h_{ef}, 8d_{nom})$								
d_{nom}	Outside diameter of anchor	[mm]	8	10	12	14	16	20	25	28	32
γ_{inst}	Installation safety factor	[-]	1,0								
$\gamma_{m,c}^{1)}$	Partial safety factor	[-]	1,5								
Displacement under Shear Load ³⁾			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
δ_{V0}	Short term displacement	[mm/kN]	0,06	0,05	0,05	0,04	0,04	0,04	0,03	0,03	0,03
$\delta_{V\infty}$	Long term displacement		0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,04	0,04

¹⁾ In absence of other national regulations; ²⁾ Calculation of the displacement = $\delta_N \cdot \tau$; ³⁾ Calculation of the displacement = $\delta_V \cdot V$

Declared performances acc. to ETA-12/0542 - ETAG001 p.1-5 and TR023

Design method acc. to EN1992-1-1*

ESSENTIAL CHARACTERISTICS			PERFORMANCE POST-INSTALLED REBAR CONNECTION									
Installation parameters		[d]	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø22	Ø24	Ø25	
d_0	Nominal diameter of drill bit	[mm]	12	14	16	18	20	25	28	32	32	
l	*Anchorage length (Rebar B500)	$l_{b, MIN}$	[mm]	113	142	170	198	227	284	312	340	354
		l_{MAX}	[mm]	1000	1000	1200	1400	1600	2000	2000	2000	2000
$l_{0 MIN}$	*Overlap joint length (Rebar B500)	[mm]	200	200	200	210	240	300	330	360	375	
s_{min}	Minimum spacing	[mm]	$\geq 5\phi \geq 50 \text{ mm}$									
c	Minimum concrete cover min c	hammer drilling	[mm]	30 mm + 0,06 l _v $\geq 2\phi$							4)	
		compr. air drilling	[mm]	50 mm + 0,08 l _v							5)	
Design values of ultimate bond resistance			for all drilling methods for good conditions ⁶⁾									
f_{bd}	*Bond design value resistance	C16/20	[MPa]	2,0								
		C20/25	[MPa]	2,3								
		C25/30	[MPa]	2,7								
		C30/37	[MPa]	3,0								
		C40/50	[MPa]	3,7								
		C45/55	[MPa]	4,0								
		C50/60	[MPa]	4,3								

⁴⁾ 40 mm + 0,06 l_v $\geq 2\phi$; ⁵⁾ 60 mm + 0,08 l_v; ⁶⁾ for all other bond conditions multiply the values for f_{bd} by 0.7.

Declared performances acc. to ETA-12/0602 - ETAG001 p.1-5
Design method acc. to EN 1992-4:2018

ESSENTIAL CHARACTERISTICS		PERFORMANCE					
		DIAMOND DRILLED - THREADED ROD					
Installation parameters		[d]	M10	M12	M16	M20	M24
d₀	Nominal DIAMOND DRILLED	[mm]	12	14	18	24	28
h_{ef}	Effective embedment depth	h_{ef,min} [mm]	60	70	80	90	96
		h_{ef,std} [mm]	90	110	125	170	210
		h_{ef,max} [mm]	200	240	320	400	480
h_{min}	Minimum thickness of the concrete member	[mm]	$h_{ef} + 30 \geq 100$		$h_{ef} + 2d_0$		
T_{inst}	Torque moment (max)	[Nm]	20	40	80	120	160
S_{min}	Minimum spacing	[mm]	50	60	80	100	120
C_{min}	Minimum edge distance	[mm]	50	60	80	100	120
TENSION Steel failure							
N_{Rk,s}	Tension Steel characteristic failure	cl. 5.8 [kN]	29	42	78	122	179
		cl. 8.8 [kN]	46	67	125	196	282
		A4-70 [kN]	41	59	110	171	247
γ_{m,sN}¹⁾	Partial safety factor	cl. 5.8-8.8 [-]	1,5				
		A4-70 [-]	1,87				
Combined pull-out and concrete cone failure: "DRY & WET"			M10	M12	M16	M20	M24
τ_{Rk,ucr}	Characteristic bond resistance in un-cracked concrete C20/25	40°/24°C [MPa]	11	10	10	9,5	9
		60°/43°C [MPa]	7	6,5	6	6	5,5
		72°/43°C [MPa]	6	6	5,5	5	5
Combined pull-out and concrete cone failure: "FLOODED hole"							
τ_{Rk,ucr}	Characteristic bond resistance in un-cracked concrete C20/25	40°/24°C [MPa]	9	10	9,5	9,5	8,5
		60°/43°C [MPa]	5,5	6,5	6	6	5,5
		72°/43°C [MPa]	5	6	5	5	5
γ_{inst}	Partial safety factor (dry, wet and flooded holes)	[-]	1,0	1,2			
γ_{m,c}¹⁾	Partial safety factor (dry, wet and flooded holes)	[-]	1,5	1,8			
Splitting failure							
C_{cr,sp}	Critical edge distance for splitting	[mm]	$1,0xh_{ef} \leq 2xh_{ef}(2,5 - h / h_{ef}) \leq 2,4xh_{ef}$				
S_{cr,sp}	Critical spacing for splitting	[mm]	$2xC_{cr,sp}$				
γ_{m,sp}¹⁾	Partial safety factor (dry, wet and flooded holes)	[-]	1,5	1,8			
Displacement under Tension Load in Concrete			M10	M12	M16	M20	M24
δ_{N0,ucr}	Short term displacement un-cracked concrete	40°/24°C [mm/MPa]	0,013	0,015	0,02	0,024	0,029
		60°/43°C and 72°/43°C [mm/MPa]	0,015	0,018	0,023	0,028	0,033
δ_{N∞,ucr}	Long term displacement un-cracked concrete	40°/24°C [mm/MPa]	0,052	0,061	0,079	0,096	0,114
		60°/43°C and 72°/43°C [mm/MPa]	0,06	0,07	0,091	0,111	0,131
SHEAR Steel failure			M10	M12	M16	M20	M24
V_{Rk,s}	Shear Steel characteristic failure	cl. 5.8 [kN]	15	21	39	61	88
		cl. 8.8 [kN]	23	34	63	98	141
		A4-70 [kN]	20	30	55	86	124
M⁰_{Rk,s}	Bending Moment characteristic failure	cl. 5.8 [Nm]	37	65	166	324	560
		cl. 8.8 [Nm]	60	105	266	519	896
		A4-70 [Nm]	52	92	232	454	784
γ_{m,sV}¹⁾	Partial safety factor	cl. 5.8-8.8 [-]	1,25				
		A4-70 [-]	1,56				
Concrete Pryout failure							
k₈	Factor acc. to EN 1992-4 § 7.2.2.4	[-]	2				
γ_{m,cp}¹⁾	Partial safety factor	[-]	1,5				
Concrete Edge failure			see TR029 section 5.2.3.4				
γ_{m,c}¹⁾	Partial safety factor	[-]	1,5				
Displacement under Shear Load			M10	M12	M16	M20	M24
δ_{V0}	Short term displacement	[mm/kN]	0,06	0,05	0,04	0,04	0,03
δ_{V∞}	Long term displacement	[mm/kN]	0,08	0,08	0,06	0,06	0,05

¹⁾ In absence of other national regulations.

Declared performances acc. to ETA-12/0602 - ETAG 001 p.1-5
Design method acc. to EN 1992-4:2018

ESSENTIAL CHARACTERISTICS				PERFORMANCE					
				DIAMOND DRILLED - REBAR					
Installation parameters				Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25
d₀	Nominal DIAMOND DRILLED	[mm]		14	16	18	20	24	32
h_{ef}	Effective embedment depth	h_{ef,min}	[mm]	60	70	75	80	90	100
		h_{ef,std}	[mm]	90	110	115	125	170	210
		h_{ef,max}	[mm]	200	240	280	320	400	480
h_{min}	Minimum thickness of the concrete member	[mm]	h _{ef} + 30 ≥ 100			h _{ef} + 2d ₀			
s_{min}	Minimum spacing	[mm]	50	60	70	80	100	125	
c_{min}	Minimum edge distance	[mm]	50	60	70	80	100	125	
TENSION Steel failure mode				Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25
N_{Rk,s}	Tension Steel characteristic failure	B500	[kN]	43	62	85	111	173	270
γ_{m,sN}¹⁾	Partial safety factor		[-]	1,4					
Combined pull-out and concrete cone failure: "DRY & WET"				Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25
τ_{Rk,ucr}	Characteristic bond resistance in un-cracked concrete C20/25	40°/24°C	[MPa]	11	10	10	10	9,5	9
		60°/43°C	[MPa]	7	6,5	6,5	6	6	5,5
		72°/43°C	[MPa]	6	6	6	5,5	5	5
Combined pull-out and concrete cone failure: "FLOODED hole"									
τ_{Rk,ucr}	Characteristic bond resistance in un-cracked concrete C20/25	40°/24°C	[MPa]	9	10	10	9,5	9,5	8,5
		60°/43°C	[MPa]	5,5	6,5	6,5	6	6	5,5
		72°/43°C	[MPa]	5	6	5,5	5,5	5	5
γ_{inst}	Partial safety factor (dry, wet and flooded holes)		[-]	1,0			1,2		
γ_{m,c}¹⁾	Partial safety factor (dry, wet and flooded holes)		[-]	1,5			1,8		
Splitting failure									
c_{cr,sp}	Critical edge distance for splitting	[mm]		1,0xh _{ef} ≤ 2xh _{ef} (2,5 - h / h _{ef}) ≤ 2,4xh _{ef}					
s_{cr,sp}	Critical spacing (splitting)	[mm]		2xc _{cr,sp}					
γ_{m,sp}¹⁾	Partial safety factor (dry, wet and flooded holes)		[-]	1,5			1,8		
Displacement under Tension Load				Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25
δ_{No,ucr}	Short term displacement	40°/24°C	[mm/MPa]	0,013	0,015	0,018	0,02	0,024	0,03
		60°/43°C and 72°/43°C	[mm/MPa]	0,015	0,018	0,02	0,023	0,08	0,034
δ_{Noo,ucr}	Long term displacement	40°/24°C	[mm/MPa]	0,052	0,061	0,07	0,079	0,096	0,118
		60°/43°C and 72°/43°C	[mm/MPa]	0,06	0,07	0,081	0,091	0,111	0,136
SHEAR Steel failure				Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25
V_{Rk,s}	Shear Steel characteristic failure		[kN]	22	31	42	55	86	135
M⁰_{Rk,s}	Bending Moment characteristic failure	B500	[Nm]	65	112	178	265	518	1012
γ_{m,sV}¹⁾	Partial safety factor		[-]	1,5					
Concrete Pryout failure									
k_g	Factor acc. to EN 1992-4 § 7.2.2.4		[-]	2					
γ_{m,cp}¹⁾	Partial safety factor		[-]	1,5					
Concrete Edge failure									
γ_{m,c}¹⁾	Partial safety factor		[-]	see TR029 section 5.2.3.4					
Displacement under Shear Load				Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25
δ_{V0}	Short term displacement		[mm/kN]	0,05	0,05	0,04	0,04	0,04	0,03
δ_{V∞}	Long term displacement		[mm/kN]	0,08	0,07	0,06	0,06	0,05	0,05

¹⁾ In absence of other national regulations.

We inform you that Friulsider is classified in the EC 1907/2006 Reach Directive as a Downstream-user of substances. The product supplied does not contain substances classified as SVHC according to the Candidate List in a concentration equal or greater than 0.1% (weight / weight). You can require the safety data sheet of the product at environmental@friulsider.com or download it at www.friulsider.com/sds.

The above performances apply for the following article numbers (for the batch or serial number see packaging):

Type of Cartridge	Format	Cod.
Side-by-side	385-585-1400 ml	9340000000 / 01-02-03-04-05-06-07-08 (585ml)

The performances of the product identified by the above identification code are in conformity with the declared performance.

This declaration of performance is issued under the sole responsibility of **Friulsider SpA**.

Signed for and behalf of the manufacturer by:

Function	Name	Signature	Place and date of issue
Technical Manager	Raffaele Palmieri		San Giovanni al Natisone, 21-02-2020