KEM-E

STYREN FREE
EPOXY RESIN

PRODUCT DESCRIPTION

A pure epoxy slow-curing anchoring mass (resin and hardener) for installation of threaded rods, rebar rods in cracked and un-cracked concrete and for post-installed rebars structure.

APPLY

Designed for fastening heavy elements (steel constructions, rebars for reinforced concrete, renovation of engineering facilities, reinforcement renovation, foundations, anchoring columns) to cracked and un-cracked concrete. Suitable for water flooded holes. Recommended for dynamic and seismic loads. Available in 585 ml capacity for use with special twin piston dispencer. One mixer with extension is attached to the cartridge.

CAPACITY

Cod	Capacity [ml]	Packing Pc./box/ [pcs.]
P344846	585	1/12/12

CURING TIME

Substrate temperature	Gel time	Curing time on dry base material	Curing time on wet base material
≥ 5°C	120 min	50 h	100 h
≥ + 10 °C	90 min	30 h	60 h
≥ +20°C	30 min	10 h	20 h
≥ +30°C	20 min	6 h	12 h
≥ +40°C	12 min	4 h	8 h

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EUROPEAN TECHNICAL ASSESSMENT ETA-09/0061

CHARACTERISTIC TENSION AND SHEAR LOADS FOR THREADED ROD IN CONCRETE												
ESSENTIAL CHARACTERISTICS					**PERFORMANCE - 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	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 ($= N^0_{Rk,s,seis}$)		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
$\tau_{Rk,ucr}$	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
$\tau_{Rk,cr}$	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
$\tau_{Rk,seis,C1}$	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
$\tau_{Rk,seis,C2}$	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			
$\gamma_{m,c}$ [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
$\tau_{Rk,ucr}$	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
$\tau_{Rk,cr}$	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
$\tau_{Rk,seis,C1}$	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
$\tau_{Rk,seis,C2}$	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							
$\gamma_{m,c}$ [1)]	Partial safety factor			[-]	2,1							
ψ_c	Increasing factor for concrete		C30/37	[-]	1,04							
			C40/50	[-]	1,08							
			C50/60	[-]	1,10							

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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 *(single anchor see TR029)*		[mm]	$1{,}5xh_{ef}$						
$s_{cr,N}$	Critical spacing *(single anchor see TR029)*		[mm]	$3{,}0xh_{ef}$						
Splitting failure										
$c_{cr,sp}$	Critical edge distance (for splitting)		[mm]	$1{,}0xh_{ef} \le 2xh_{ef}(2{,}5 - h / h_{ef}) \le 2{,}4xh_{ef}$						
$s_{cr,sp}$	Critical spacing (for splitting)		[mm]	$2xC_{cr,sp}$						
γ_{inst}	Installation safety factor		[-]	See above γ_{inst}						
$\gamma_{m,sp}$ [1]	Partial safety factor		[-]	See above $\gamma_{m,c}$						
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							

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$\gamma_{m,cp}$ [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	[-]	$l_f \leq \min(h_{ef}; 8xd_{nom})$						
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
$\delta_{V\infty}$	Long term displacement		0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05
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				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**	**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

CHARACTERISTIC TENSION AND SHEAR LOADS FOR REBAR IN CONCRETE

ESSENTIAL CHARACTERISTICS				**PERFORMANCE - REBAR**								
Installation parameters			**[d]**	**Ø8**	**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**	**Ø 28**	**Ø 32**
d_0	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]	$h_{ef} + 30 \geq 100$		$h_{ef} + 2d_0$						
s_{min}	Minimum spacing		[mm]	40	50	60	70	80	100	125	140	160
c_{min}	Minimum edge distance		[mm]	40	50	60	70	80	100	125	140	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
$\tau_{Rk,ucr}$	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
$\tau_{Rk,cr}$	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

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$\tau_{Rk,eq,C1}$	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			
$\gamma_{m,c}$ [1)]	Partial safety factor		[-]	1,8					2,1			
Combined pull-out and concrete cone failure: "FLOODED hole"												
$\tau_{Rk,ucr}$	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
$\tau_{Rk,cr}$	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
$\tau_{Rk,eq,C1}$	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								
$\gamma_{m,c}$ [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]	$1,0xh_{ef} \le 2xh_{ef}(2,5 - h / h_{ef}) \le 2,4xh_{ef}$								
$s_{cr,sp}$	Critical spacing (splitting)		[mm]	$2xC_{cr,sp}$								
γ_{inst}	Installation safety factor		[-]	See above γ_2								
$\gamma_{m,sp}$ [1)]	Partial safety factor		[-]	See above $\gamma_{m,c}$								
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												
$\delta_{N0,ucr}$	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		0,013	0,015	0,018	0,020	0,023	0,028	0,034	0,038	0,043
$\delta_{N\infty,ucr}$	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		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				**Ø8**	**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**	**Ø 28**	**Ø 32**
$\delta_{N0,cr}$	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				0,037	0,040	0,043	0,049	0,056	0,063	0,070
$\delta_{N\infty,cr}$	Long term displacement	40°/24°C	[mm/MPa]			0,21						
		60°/43°C and 72°/43°C				0,24						

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SHEAR Steel failure			Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
$V_{Rk,s}$	Shear Steel characteristic failure under **Static, quasi-static** action	[kN]	$0,5 \times A_s \times f_{uk}$								
$V^0_{Rk,s,seis,C1}$	Shear Steel characteristic failure under **Seismic C1** action	[kN]	-	-	$0,44 \times A_s \times f_{uk}$						
$M^0_{Rk,s}$	Bending Moment characteristic failure under **Static, quasi-static** action	[Nm]	$1,2 \times W_{el} \times f_{uk}$								
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	[-]	$l_f \leq \min(h_{ef}; 8xd_{nom})$								
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	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
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 = $\delta_N * \tau$; [3)] Calculation of the displacement = $\delta_V * V$

EUROPEAN TECHNICAL ASSESSMENT ETA-12/0542

CHARACTERISTIC TENSION AND SHEAR LOADS FOR POST_INSTALLED REBAR												
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 lenght (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]		$\geq 5Ø \geq 50$ mm								
c	Minimum concrete cover min c	hammer drilling	[mm]		$30 \text{ mm} + 0,06\ l_v \geq 2Ø$ [4)]								
		compr. air drilling	[mm]		$50 \text{ mm} + 0,08\ l_v$ [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 $l_v \geq 2Ø$; [5)] 60 mm + 0,08 l_v; [6)] for all other bond conditions multiply the values for f_{bd} by 0.7.

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EUROPEAN TECHNICAL ASSESSMENT ETA-12/0602

CHARACTERISTIC TENSION AND SHEAR LOADS FOR THREADED ROD IN DIAMOND DRILLED CONCRETE

ESSENTIAL CHARACTERISTICS				PERFORMANCE DIAMOND DRILLED - THREADED ROD				
Installation parameters			**[d]**	**M10**	**M12**	**M16**	**M20**	**M24**
d_0	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
$\gamma_{m,sN}$ [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
$\tau_{Rk,ucr}$	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"								
$\tau_{Rk,ucr}$	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			
$\gamma_{m,c}$ [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]	$2xC_{cr,sp}$				
$\gamma_{m,sp}$ [1)]	Partial safety factor (dry, wet and flooded holes)		[-]	1,5	1,8			
Displacement under Tension Load in Concrete				M10	M12	M16	M20	M24
$\delta_{N0,ucr}$	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		0,015	0,018	0,023	0,028	0,033
$\delta_{N\infty,ucr}$	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		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
$M^0_{Rk,s}$	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
$\gamma_{m,sV}$ [1)]	Partial safety factor	cl. 5.8-8.8	[-]	1,25				
		A4-70	[-]	1,56				

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Concrete Pryout failure							
k_8	Factor acc. to EN 1992-4 § 7.2.2.4	[-]	2				
$\gamma_{m,cp}$ [1)]	Partial safety factor	[-]	1,5				
Concrete Edge failure			*see TR029 section 5.2.3.4*				
$\gamma_{m,c}$ [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
$\delta_{V\infty}$	Long term displacement		0,08	0,08	0,06	0,06	0,05

CHARACTERISTIC TENSION AND SHEAR LOADS FOR REBAR IN DIAMOND DRILLED CONCRETE

ESSENTIAL CHARACTERISTICS				**PERFORMANCE DIAMOND DRILLED - REBAR**					
Installation parameters			**[d]**	**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**
d_0	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]	$h_{ef} + 30 \geq 100$			$h_{ef} + 2d_0$		
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
$\gamma_{m,sN}$ [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
$\tau_{Rk,ucr}$	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"									
$\tau_{Rk,ucr}$	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		
$\gamma_{m,c}$ [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 (splitting)		[mm]	$2xC_{cr,sp}$					
$\gamma_{m,sp}$ [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
$\delta_{N0,ucr}$	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		0,015	0,018	0,02	0,023	0,08	0,034
$\delta_{N\infty,ucr}$	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		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
$M^0_{Rk,s}$	Bending Moment characteristic failure	**B500**	[Nm]	65	112	178	265	518	1012
$\gamma_{m,sV}$ [1)]	Partial safety factor		[-]	1,5					
Concrete Pryout failure									
k_8	Factor acc. to EN 1992-4 § 7.2.2.4		[-]	2					
$\gamma_{m,cp}$ [1)]	Partial safety factor		[-]	1,5					
Concrete Edge failure				*see TR029 section 5.2.3.4*					
$\gamma_{m,c}$ [1)]	Partial safety factor		[-]	1,5					
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
$\delta_{V\infty}$	Long term displacement			0,08	0,07	0,06	0,06	0,05	0,05

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OTHER PERFORMANCE FEATURES

BASE MATERIAL:	REINFORCED OR UNREINFORCED CONCRETE C20/25 TO C50/60 UNCRACKED CONCRETE SOLID AND HOLLOW BRICKS DIAMOND DRILLING
CARTRIGE VOLUME:	*585 [ml]*
TEMERATURE RANGE:	*INSTALLATION: +5°C –+40°C*
INSTALLATION:	*DRY AND WET* *FLOODED HOLE*
ACESSORIES:	*THREADED ROD* *MESH SLEEVE* *AIR BLOW PUMP* *BRUSH FOR CLEANING THE HOLE* *MIXER* *EXTENSION* *GUN FOR 585ML CARTRIDGES*

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