KEM-H

STYRENE FREE
HYBRID RESIN

PRODUCT DESCRIPTION

Hybrid two-component anchoring mass (resin and hardener) for the installation of threaded rods and Rebars in cracked and un-cracked concrete and for post-installed Rebars reinforcement.

APPLY

Designed for fastening heavy components (steel structures, railing, handrails, stairs, Sound-absorbing screens and barriers, energy-absorbing barriers, fixing of machines and equipment, anchoring columns, post installation rebars) in cracked and un-cracked concrete. Recommended for dynamic and seismic loads.
Available in two different cartridges, 280 ml capacity for use with one piston standard dispenser and 380 ml capacity, designed for use with a special chemical anchor dispenser. Each cartridge comes with two mixers.

CAPACITY

Cod.	Capacity [ml]	Unit /Quantity/Bulk [pcs]
P344616	280	1/12/12
P344617	380	1/10/10

CURING TIME

Substrate temperature	Gelling/machining time	Min curing time in dry concrete	Min. Curing time in wet concrete
- 5 °C do - 1 °C	50 min	5 h	10 h
0 °C do + 4 °C	25 min	3,5 h	7 h
+ 5 °C do + 9 °C	15 min	2 h	4 h
+ 10°C do +14°C	10 min	1 h	2 h
+ 15°C do +19°C	6 min	40min	8 min
+ 20 °C do + 29 °C	3 min	30 min	60 min
+ 30 °C do + 40 °C	2 min	30 min	60 min
cartridge temperature	+5°C do +40°C		

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EUROPEAN TECHNICAL ASSESSMENT ETA-16/0957

CHARACTERISTIC OF TENSION LOADS FOR TREATED RODS IN CRACKED AND UN-CRACKED CONCRETE

Installation parameters			d	M8	M10	M12	M16	M20	M24	M27	M30
d_0	Nominal diameter of drill bit			10	12	14	18	22	28	30	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]	160	200	240	320	400	480	540	600
h_{min}	Minimum thickness of the concrete member			$h_{ef} + 30 \geq 100$mm			$h_{ef} + 2 \cdot d_0$				
T_{inst}	Torque moment (max)			10	20	40	60	100	170	250	300
s_{min}	Minimum spacing			40	50	60	75	95	115	125	140
c_{min}	Minimum edge distance			35	40	45	50	60	65	75	80
TENSION Steel failure											
$N_{Rk,s}$	Tension Steel characteristic failure	cl. 4.8 - 4.6	[kN]	15	23	34	63	98	141	184	224
		cl. 5.8 - 5.6	[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)
$\gamma_{m,sN}$ [1)]	Partial safety factor	cl. 4.6-5.6	[-]	2,0							
		cl. 4.8-5.8-8.8	[-]	1,5							
		A4-70 (50)	[-]	1,87						(2,86)	
Combined pull-out and concrete failure				M8	M10	M12	M16	M20	M24	M27	M30
$\tau_{Rk,ucr}$	Characteristic bond resistance for **un-cracked concrete** C20/25	80°/50°C	[MPa]	17	17	16	15	14	13	13	13
		120°/72°C	[Mpa]	15	14	14	13	12	12	11	11
		160°/100°C	[MPa]	12	11	11	10	9.5	9	9	9
$\tau_{Rk,cr}$ $\tau_{Rk,seisC1}$	Characteristic bond resistance for**cracked concrete** C20/25 and **Seismic Category C1**	80°/50°C	[MPa]	7,0	7,5	8	9	8,5	7	7	7
		120°/72°C	[Mpa]	6	6,5	7	7,5	7	6	6	6
		160°/100°C	[MPa]	5,5	5,5	6	6,5	6	5,5	5,5	5,5
$\tau_{Rk,seisC2}$	Characteristic bond resistance for **Seismic Category C2**	80°/50°C	[MPa]	-	-	3,6	3,5	3,3	2,3	-	-
		120°/72°C	[Mpa]	-	-	3,1	3	2,8	2	-	-
		160°/100°C	[MPa]	-	-	2,5	2,7	2,5	1,8	-	-
ψ_c	Increasing factor for concrete	C30/37	[-]	1,04							
		C40/50	[-]	1,08							
		C50/60	[-]	1,10							
ψ_c	Increasing factor for concrete for **Seismic** action	from C25/30 to C50/60	[-]	1,0							
ψ^0_{sus}	Reduction factor for concrete C20/25 cracked, un-cracked and Seismic action	80°/50°C	[-]	0,79							
		120°/72°C	[-]	0,75							
		160°/100°C	[-]	0,66							
Concrete cone failure											
$K_{cr,N}$	Factor acc. to EN 1992-4 § 7.2.1.4 cracked		[-]	7,7							
$K_{ucr,N}$	Factor acc. to EN 1992-4 § 7.2.1.4 un-cracked		[-]	11,0							
$c_{cr,N}$	Critical edge distance		[mm]	$1,5 \cdot h_{ef}$							
$s_{cr,N}$	Critical spacing		[mm]	$2,0 \cdot c_{cr,N}$							
Splitting failure											
$c_{cr,sp}$	Critical edge distance for Splitting	$h / h_{ef} \geq 2,0$	[mm]	$1,0 \cdot h_{ef}$							
		$2,0 > h / h_{ef} > 1,3$		$2,0 \cdot h_{ef} \cdot (2,5 - h / h_{ef})$							
		$h / h_{ef} \leq 1,3$		$2,4 \cdot h_{ef}$							
$s_{cr,sp}$	Critical spacing for Splitting		[mm]	$2,0 \cdot C_{cr,sp}$							
$\gamma_2 = \gamma_{inst}$	Installation safety factor **MAC** [1)]		[-]	1,2				-			
	Installation safety factor **CAC (HDB)** [1)]		[-]	1,0 (1,2)							
	Installation safety factor **CAC** [1)] for flooded borehole		[-]	1,4							

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Displacement under Tension Load in Concrete				M8	M10	M12	M16	M20	M24	M27	M30
δ_{N0}	Short term displacement **un-cracked concrete**	80°/50°C	[mm/ MPa]	0,031	0,032	0,034	0,037	0,039	0,042	0,044	0,046
		120°/72°C		0,032	0,034	0,035	0,038	0,041	0,044	0,046	0,048
		160°/100°C		0,121	0,126	0,131	0,142	0,153	0,163	0,171	0,179
$\delta_{N\infty}$	Long term displacement **un-cracked concrete**	80°/50°C	[mm/ MPa]	0,040	0,042	0,044	0,047	0,051	0,054	0,057	0,060
		120°/72°C		0,042	0,044	0,045	0,049	0,053	0,056	0,059	0,062
		160°/100°C		0,124	0,129	0,135	0,146	0,157	0,168	0,176	0,184
δ_{N0}	Short term displacement **cracked concrete and Seismic C1**	80°/50°C	[mm/ MPa]	0,081	0,083	0,085	0,090	0,095	0,099	0,103	0,106
		120°/72°C		0,084	0,086	0,088	0,093	0,098	0,103	0,107	0,110
		160°/100°C		0,312	0,321	0,330	0,349	0,367	0,385	0,399	0,412
$\delta_{N\infty}$	Long term displacement **cracked concrete and Seismic C1**	80°/50°C	[mm/ MPa]	0,104	0,107	0,110	0,116	0,122	0,128	0,133	0,137
		120°/72°C		0,108	0,111	0,114	0,121	0,127	0,133	0,138	0,143
		160°/100°C		0,321	0,330	0,340	0,358	0,377	0,396	0,410	0,424
$\delta_{N,eq(DLS)}$	Displacement for **Seismic C2** at DLS		[mm]	-	-	0,24	0,27	0,29	0,27	-	-
$\delta_{N,eq(ULS)}$	Displacement for **Seismic C2** at ULS			-	-	0,55	0,51	0,50	0,58	-	-

(1) CAC = Cleaning with Compressed air, MAC = Cleaning with Manual Hand Pump and HDB = cleaning with Hollow drill bit system

CHARACTERISTIC OF SHEAR LOADS FOR TREATED RODS IN CRACKED AND UN-CRACKED CONCRETE

SHEAR Steel failure				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
$V_{Rk,s}$	Shear Steel characteristic failure	cl. 4.8 - 4.6	[kN]	9	14	20	38	59	85	110	135
		cl. 5.8 - 5.6	[kN]	11	17	25	47	74	106	138	168
		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 **Seismic C1**		[kN]	$0,70 \cdot V_{Rk,s}$							
$V_{Rk,s,eq,C2}$	Shear Steel characteristic failure **Seismic C2**		[kN]	-	-	$0,70 \cdot V_{Rk,s}$				-	-
$M^0_{Rk,s}$	Characteristic Bending Moment	cl. 4.8 - 4.6	[Nm]	15	30	52	133	260	449	666	900
		cl. 5.8 - 5.6	[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)
$M^0_{Rk,s,C1}$	Characteristic Bending Moment Seismic C1		[kN]	NPD [No Performance Data]							
$M^0_{Rk,s,C2}$	Characteristic Bending Moment Seismic C2		[kN]	NPD [No Performance Data]							
$\gamma_{m,sV}$	Partial safety factor	cl. 4.6-5.6	[-]	1,67							
		cl. 4.8-5.8-8.8	[-]	1,25							
		A4-70 (50)	[-]	1,56						(2,38)	
k_7	Ductility factor acc. to EN 1992-4 § 7.2.2.3.1			1,0							
Concrete pry-out failure											
k_8	Factor acc. to EN 1992-4 § 7.2.2.4		[-]	2,0							
$\gamma_2 = \gamma_{inst}$	Installation safety factor		[-]	1,0							
Concrete edge failure				*see CEN/TS 1992-4-5 Section 6.3.4*							
l_f	Effective length of anchor		[-]	$l_f = \min(h_{ef}; 12 \cdot d_{nom})$						$l_f = \min(h_{ef}; 300mm)$	
d_{nom}	Outside diameter of anchor		[mm]	8	10	12	16	20	24	27	30
$\gamma_2 = \gamma_{inst}$	Installation safety factor		[-]	1,0							
Displacement under Shear Load				M8	M10	M12	M16	M20	M24	M27	M30
δ_{V0}	Short term displacement in **Concrete** and **Seismic C1**		[mm/kN]	0,06	0,06	0,05	0,04	0,04	0,03	0,03	0,03
$\delta_{V\infty}$	Long term displacement in **Concrete** and **Seismic C1**			0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05
$\delta_{V,eq(DLS)}$	Displacement for **Seismic C2** at DLS(1)		[mm]	-	-	3,6	3,0	3,1	3,5	-	-
$\delta_{V,eq(ULS)}$	Displacement for **Seismic C2** at ULS(1)			-	-	7	6,6	7,0	9,3	-	-

(1)DLS= damage limitation state, ULS=ultimate limit state

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CHARACTERISTIC OF TENSION LOADS FOR REBARS IN CRACKED AND UN-CRACKED CONCRETE

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			12	14	16	18	20	25	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]	160	200	240	280	320	400	500	560	640
h_{min}	Minimum thickness of the concrete member			$h_{ef} + 30 \geq 100$		$h_{ef} + 2 \cdot d_0$						
s_{min}	Minimum spacing			40	50	60	70	75	95	120	130	150
c_{min}	Minimum edge distance			35	40	45	50	50	60	70	75	85
TENSION Steel failure												
$N_{Rk,s}$	Tension Steel characteristic failure		[kN]	$A_s \cdot f_{uk}$ [2]								
$A_{,s}$	Area resistant		[mm²]	50	79	113	154	201	314	491	616	804
$\gamma_{m,sN}$	Partial safety factor			1,4 [3]								
Combined pull-out and concrete cone failure				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**	80°/50°C	[MPa]	14	14	14	14	13	13	13	13	13
		120°/72°C	[MPa]	13	12	12	12	12	11	11	11	11
		160°/100°C	[MPa]	9,5	9,5	9,5	9	9	9	9	8,5	8,5
$\tau_{Rk,cr}$	Characteristic bond resistance in **cracked concrete C20/25**	80°/50°C	[MPa]	5,5	5,5	6	6	7,5	7,5	7,5	7,5	8
		120°/72°C	[MPa]	4,5	5	5	5,5	6,5	6,5	6,5	6,5	7
		160°/100°C	[MPa]	4	4,5	4,5	5	5,5	6	6	5,5	6,5
ψ_c	Increasing factor for concrete	C30/37	[-]	1,04								
		C40/50	[-]	1,08								
		C50/60	[-]	1,10								
ψ_c	Increasing factor for concrete for **Seismic** action	C25/30 - C50/60	[-]	1,0								
ψ^0_{sus}	Reduction factor for concrete C20/25 cracked, un-cracked and Seismic action	80°/50°C	[-]	0,79								
		120°/72°C	[-]	0,75								
		160°/100°C	[-]	0,66								
Concrete cone failure												
$k_{cr,N}$	Factor acc. to EN 1992-4 § 7.2.1.4 cracked		[-]	7,7								
$k_{ucr,N}$	Factor acc. to EN 1992-4 § 7.2.1.4 un-cracked		[-]	11								
$c_{cr,N}$	Critical edge distance		[mm]	$1,5 \cdot h_{ef}$								
$s_{cr,N}$	Critical spacing		[mm]	$2,0 \cdot c_{cr,N}$								
Splitting failure				Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
$c_{cr,sp}$	Critical edge distance for Splitting	h / hef ≥ 2,0	[mm]	$1,0 \cdot h_{ef}$								
		2,0 > h / hef > 1,3		$2,0 \cdot h_{ef} \cdot (2,5 - h / h_{ef})$								
		h / hef ≤ 1,3		$2,4 \cdot h_{ef}$								
$s_{cr,sp}$	Critical spacing for Splitting		[mm]									
$\gamma_2 = \gamma_{inst}$	Installation safety factor MAC [1]		[-]							-		
	Installation safety factor CAC (HDB) [1]		[-]									
	Installation safety factor CAC [1] for flooded borehole		[-]									

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Displacement under Tension Load				Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
δ_{N0}	Short term displacement **un-cracked concrete**	80°/50°C	[mm/MPa]	0,031	0,032	0,034	0,035	0,037	0,039	0,043	0,045	0,048
		120°/72°C		0,032	0,034	0,035	0,036	0,038	0,041	0,045	0,047	0,050
		160°/100°C		0,121	0,126	0,131	0,137	0,142	0,153	0,164	0,172	0,186
$\delta_{N\infty}$	Long term displacement **un-cracked concrete**	80°/50°C	[mm/MPa]	0,040	0,042	0,044	0,045	0,047	0,051	0,055	0,058	0,063
		120°/72°C		0,042	0,044	0,045	0,047	0,049	0,053	0,057	0,060	0,065
		160°/100°C		0,124	0,129	0,135	0,141	0,146	0,157	0,169	0,177	0,192
δ_{N0}	Short term displacement **cracked concrete** and **Seismic C1**	80°/50°C	[mm/MPa]	0,081	0,083	0,085	0,087	0,090	0,095	0,099	0,103	0,108
		120°/72°C		0,084	0,086	0,088	0,090	0,093	0,098	0,103	0,107	0,113
		160°/100°C		0,312	0,321	0,330	0,340	0,349	0,367	0,385	0,399	0,425
$\delta_{N\infty}$	Long term displacement **cracked concrete** and **Seismic C1**	80°/50°C	[mm/MPa]	0,104	0,107	0,110	0,113	0,116	0,122	0,128	0,133	0,141
		120°/72°C		0,108	0,111	0,114	0,118	0,121	0,127	0,133	0,138	0,148
		160°/100°C		0,321	0,330	0,340	0,349	0,358	0,377	0,396	0,410	0,449

[1] CAC = Cleaning with Compressed air, MAC = Cleaning with Manual Hand Pump and HDB = cleaning with Hollow drill bit system

[2] f_{uk} shall be taken from the specifications of reinforcing bars

[3] In absence of other national regulations.

[4] Calculation of the displacement = $\delta_N \times \tau$ ($\tau = \tau_{rk} / \gamma_2 \times 1,5 \times 1,4$)

CHARACTERISTIC OF SHEAR LOADS FOR REBARS IN CRACKED AND UN-CRACKED CONCRETE												
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	[kN]	$0,5 \cdot N_{rk,s}$								
$V_{Rk,s,eq,C1}$	Shear Steel characteristic failure Seismic C1	[kN]	$0,37 \cdot N_{rk,s}$								
$M^0_{Rk,s}$	Bending Moment characteristic failure	[Nm]	$1,2 \cdot W_{el} \cdot f_{uk}$ [1]								
$M^0_{Rk,s,eq,C1}$	Bending Moment characteristic failure Seismic C1	[Nm]	NPD [No Performance Data]								
W_{el}	Elastic section modulus	[mm³]	50	98	170	269	402	785	1534	2155	3217
$\gamma_{m,sV}$	Partial safety factor	[-]									
k_7	Ductility factor acc. to EN 1992-4 § 7.2.2.3.1	[-]									
Concrete Pryout failure											
k_8	Factor acc. to EN 1992-4 § 7.2.2.4	[-]	2,0								
$\gamma_2 = \gamma_{inst}$	Installation safety factor	[-]	1,0								
Concrete Edge failure											
l_f	Effective length of anchor	[-]	min (h_{ef}; 12·d_{nom})						min (h_{ef}; 300mm)		
d_{nom}	Outside diameter of anchor	[mm]	8	10	12	14	16	20	25	28	32
$\gamma_2 = \gamma_{inst}$	Installation safety factor	[-]	1,0								
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 in Concrete and Seismic C1	[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 in Concrete and Seismic C1		0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,04	0,04

[1] f_{uk} shall be taken from the specifications of reinforcing bars

[2] In absence of other national regulations

[3] Calculation of the displacement = $\delta_V \times V$ ($V = V_{Rk,s} / \gamma_2 \times 1,5 \times 1,4$)

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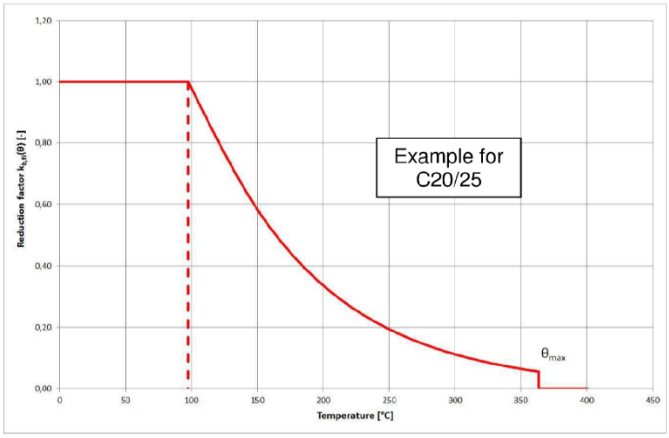
EUROPEAN TECHNICAL ASSESSMENT ETA-16/0961

CHARACTERISTIC LOADS FOR POST-INSTALLED REBARDS CONNECTION													
Installation parameters				d	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø22	Ø24	Ø25	Ø28	Ø32
d_0	Nominal diameter of drill bit			[mm]	12	14	16	18	20	25	28	32	32	35	40
$\ell_{v,MAX}$	Maximum embedment depth			[mm]	See tabel B6 of ETA-16/0961										
$\ell_{b,min}$	Minimum anchorage length			[mm]	§ 8.6 - § 8.7 EN 1992-1-1:2004+AC2010										
$\ell_{0,min}$	Lap length			[mm]	§ 8.11 EN 1992-1-1:2004+AC2010										
α_{lb}	Amplification factor for $\ell_{b,min}$ and $\ell_{0,min}$			[-]	1,0										
c [1) 2)]	Minimum concrete cover min c	Without drilling Aid	hammer drilling HD	[mm]	30 mm + 0,06·l_v ≥ 2·Ø								40 mm + 0,06·l_v ≥ 2·Ø		
			compr. air drilling CD	[mm]	50 mm + 0,08·l_v								60 mm + 0,08·l_v		
		With drilling Aid	hammer drilling HD	[mm]	30 mm + 0,02·l_v ≥ 2·Ø								40 mm + 0,02·l_v ≥ 2·Ø		
			compr. air drilling CD	[mm]	50 mm + 0,02·l_v								60 mm + 0,02·l_v		
s_{min}	Minimum spacing			[mm]	≥ 5·Ø ≥ 50 mm										
Design values of ultimate bond resistance															
f_{bd}	**Bond design value resistance "for all drilling methods for good conditions"**		C12/15	[N/mm²]	**1,6**										
			C16/20	[N/mm²]	**2,0**										
			C20/25	[N/mm²]	**2,3**										
			C25/30	[N/mm²]	**2,7**										
			C30/37	[N/mm²]	**3,0**										
			C35/45	[N/mm²]	**3,4**										
			C40/50	[N/mm²]	**3,7**										
			C45/55	[N/mm²]	**4,0**										
			C50/60	[N/mm²]	**4,3**										
$f_{bd,c}$	***"for all other bond conditions"***			[N/mm²]	**f_{bd} · 0,7**										
FIRE EXPOSURE Design method acc. to EN 1992-1-1:2004+AC:2008															
$f_{bd,fi}$	**Bond design value resistance Under FIRE EXPOSURE**			[N/mm²]	[3)] $f_{bd,fi} = k_{b,fi}(\theta) \cdot f_{bd} \cdot \gamma_c / \gamma_{M,fi}$										

1) Not allowed Diamond Drilling
2) The minimum concrete cover acc. EC 1992-1-1:2004+AC:2010 must be observed
3) With: $k_{b,fi}(\theta)$ = reduction factor under fire exposure (see graphics below)
   f_{bd} = see table above
   γ_c = partial safety factor acc.to EN 1992-1-1
   $\gamma_{M,fi}$ = partial safety factor acc.to EN 1992-1-2 under fire exposure

Example graph of Reduction factor $k_{b,fi}(\theta)$ for concrete classes C20/25 for good bond conditions:



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OTHER PERFORMANCE FEATURES

SUBSTRATE MATERIAL:	REINFORCED OR UNREINFORCED CONCRETE C20/25 TO C50/60 CONCRETE UNCRACKED/CRACKED SOLID AND HOLLOW BRICKS
CARTREDGES CAPACITY:	*280, 380 [ml]*
TEMPERATURE RANGE:	*EXCEPTIONAL RESISTANCE TO HIGH TEMPERATURES (UP TO 160°C)* *INSTALLATION: -5°C - +40°C*
INSTALLATION IN HOLES:	*DRY & WET*
ACCESSORIES:	*THREADED ROD* *PLASTIC MESH* *PUMP FOR BLOWING* *BRUSH TO CLEAN THE HOLE* *MIXER* *EXTENSION* *GUN 280/380*

LEED tested

ÉMISSIONS DANS L'AIR INTÉRIEUR A+ A+ A B C

C1 SEISMIC

C2 SEISMIC

CE ETE 16/0957 - Op. 7

CE ETE 16/0957 - Op. 1

CE ETE 16/0957 - TR 029

CE ETE 16/0961 - TR 023

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