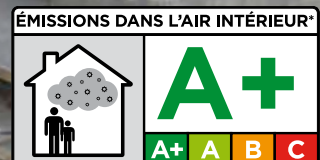


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Product Information for the
Installation of Threaded Rods and
Rebar Dowels in Concrete

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Styrene
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Product Information for the Installation of Threaded Rods & Rebar Dowels in Concrete



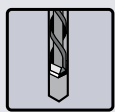
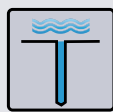
Features

- ETA Assessed for Threaded Rods M8 - M30 and Rebar Dowels Ø8 - 32 mm
- ETA Approved for Rebar Dowels Ø8 - 25 mm
- For Cracked & Uncracked Concrete
- For Flooded Holes
- Fire Test Report
- Seismic Approval C1
- VOC Rating A+
- Leed Tested
- NSF Certificate (Drinking Water)
- High Chemical Resistance
- Fast Curing
- Good Performance at low temperatures
- Styrene Free

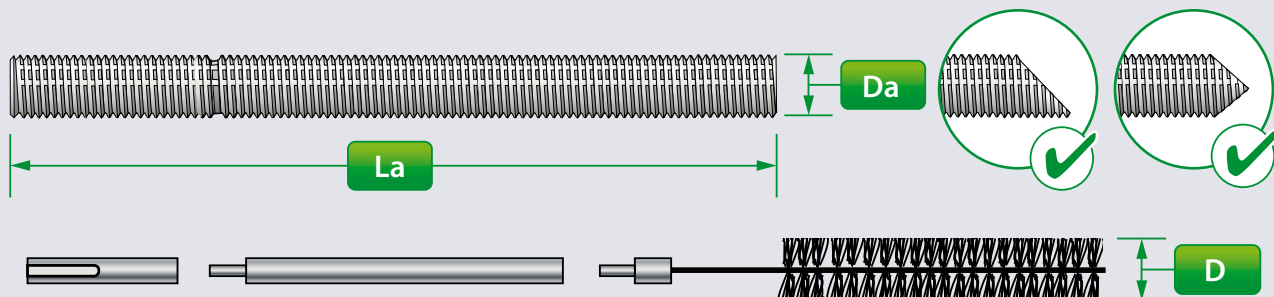
For the Installation

- | | |
|-----------------------------|---|
| ■ of Threaded Rods: | ✓ |
| ■ of Rebar Dowels: | ✓ |
| ■ in hammer drilled holes: | ✓ |
| ■ in diamond drilled holes: | ✗ |
| ■ in dry bore holes: | ✓ |
| ■ in damp bore holes: | ✓ |
| ■ in flooded bore holes: | ✓ |
| ■ in uncracked concrete: | ✓ |
| ■ in cracked concrete: | ✓ |
| ■ in hollow brick: | ✓ |
| ■ in ceilings: | ✓ |

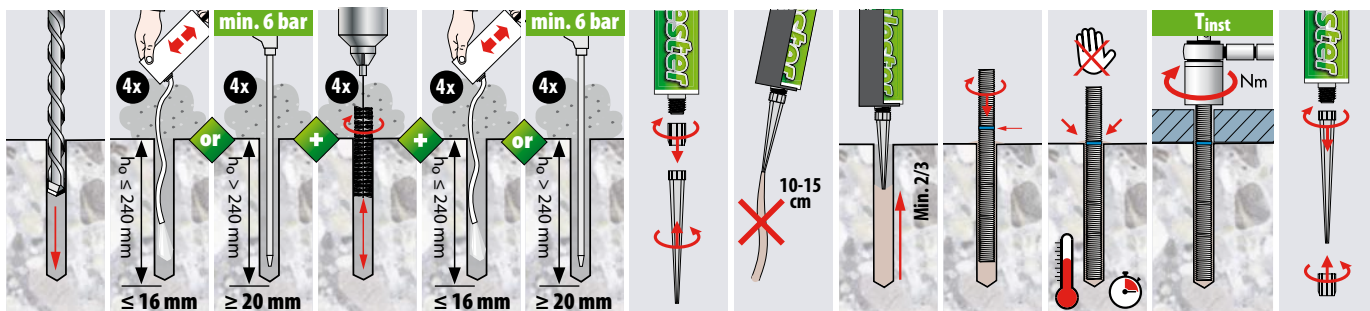
 ETA - 14/0323	M12 - M30 Ø12 - 32	M8 - M30 Ø8 - 32	M12 - M16 Ø12 - 16	M8 - M16 Ø8 - 16	✓	✗	✓	✗	C1: M12-M30 Ø12-Ø32	F120	✓	✓	✓	✓
 ETA - 10/0135	✗	Ø8 - 25	✗	✗	✗	✓	✓	✗	✗	F120	✓	✓	✓	✓



Specification Data for the use in Cracked & Uncracked Concrete and Carbide/Air Drilled Holes according to ETAG TR029 and CEN/TS 1992-4



Installation Procedures



Installation Dimensions

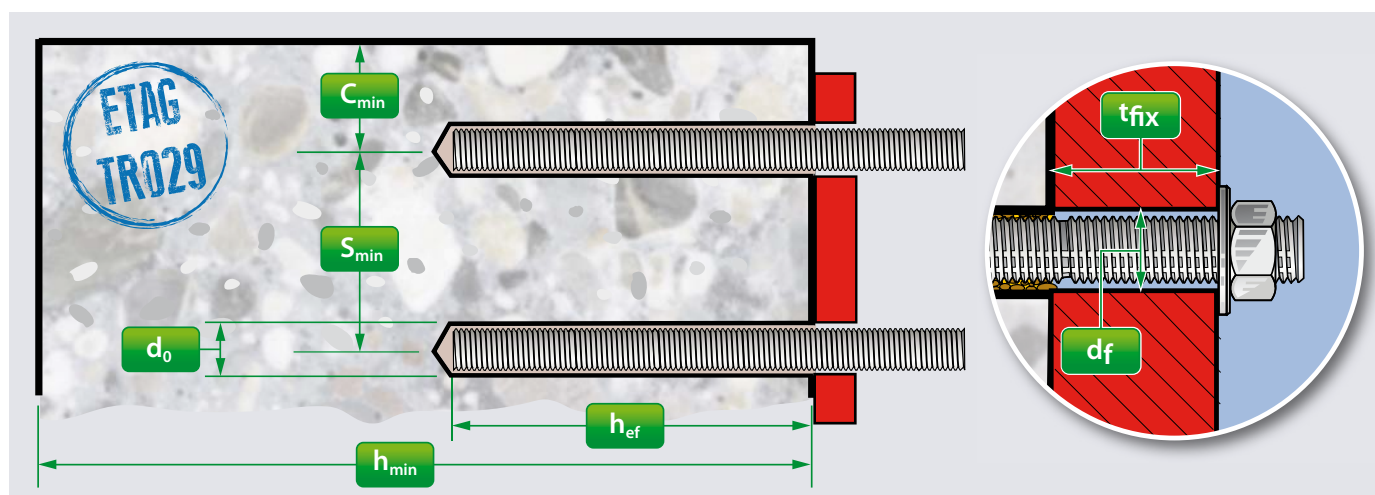
Anchor Size	Da	M8	M10	M12	M16	M20	M24	M27	M30
Rod Length	La ≥ [mm]	110	130	160	190	260	300	340	360
Effective Anchorage Depth	hef [mm]	60-160	60-200	70-240	80-320	90-400	96-480	108-540	120-600
Hole Diameter	do [mm]	10	12	14	18	24	28	32	35
Depth of Drill Hole	ho [mm]	80	90	110	125	170	210	240	280
Diameter Fixture Hole	df [mm]	9	12	14	18	22	26	30	33
Fixture Thickness	tfix ≤ [mm]	20	30	35	45	70	65	70	50
Recommended Torque	Tinst [Nm]	10	20	40	80	120	160	180	200
Required Volume per cm Embedment Depth	Vs [ml/cm]	0,44	0,59	0,75	1,09	2,25	2,87	3,72	4,37

Member Thickness, Edge Distance & Spacing

Anchor Size	Da	M8	M10	M12	M16	M20	M24	M27	M30
Min. Member Thickness	hmin [mm]	110	120	140	160	220	265	305	350
Min. Edge Distance	Cmin [mm]	40	50	60	80	100	120	135	150
Min. Spacing	Smin [mm]	40	50	60	80	100	120	135	150

Steel Brush Dimensions

Anchor Size	Da	M8	M10	M12	M16	M20	M24	M27	M30
Brush Diameter	D [mm]	12	14	16	20	26	30	34	37
Min. Brush Diameter	Dmin [mm]	10,5	12,5	14,5	18,5	24,5	28,5	32,5	35,5



Recommended Tension Loads¹⁾

Uncracked Concrete.



Anchor Size	D _a	M8	M10	M12	M16	M20	M24	M27	M30
Temp. range 24 - 40°C	[kN]	8,6	13,5	19,7	28,0	44,4	61,0	74,5	93,9
Temp. range 50 - 80°C	[kN]	7,2	10,1	14,8	22,4	38,1	53,4	60,6	68,1

Flooded Holes in Uncracked Concrete.



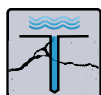
Anchor Size	D _a	M8	M10	M12	M16	M20	M24	M27	M30
Temp. range 24 - 40°C	[kN]	5,1	8,2	12,0	18,2	--	--	--	--
Temp. range 50 - 80°C	[kN]	3,8	6,3	9,2	13,9	--	--	--	--

Cracked Concrete.



Anchor Size	D _a	M8	M10	M12	M16	M20	M24	M27	M30
Temp. range 24 - 40°C	[kN]	--	--	9,1	13,7	23,3	34,6	52,5	68,1
Temp. range 50 - 80°C	[kN]	--	--	6,6	10,0	17,0	25,1	36,4	47,1

Flooded Holes in Cracked Concrete.



Anchor Size	D _a	M8	M10	M12	M16	M20	M24	M27	M30
Temp. range 24 - 40°C	[kN]	--	--	9,1	13,7	--	--	--	--
Temp. range 50 - 80°C	[kN]	--	--	6,6	10,0	--	--	--	--

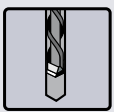
Recommended Shear Loads²⁾

Anchor Size	D _a	M8	M10	M12	M16	M20	M24	M27	M30
Steel 5.8	[kN]	5,1	8,6	12,0	22,3	34,9	50,3	65,7	80,0
Steel 8.8	[kN]	8,6	13,1	19,4	36,0	56,0	80,6	105,1	128,0
Stainless Steel A4-50	[kN]	--	--	--	--	--	--	34,5	42,0
Stainless Steel A4-70	[kN]	6,0	9,2	13,7	25,2	39,4	56,8	--	--

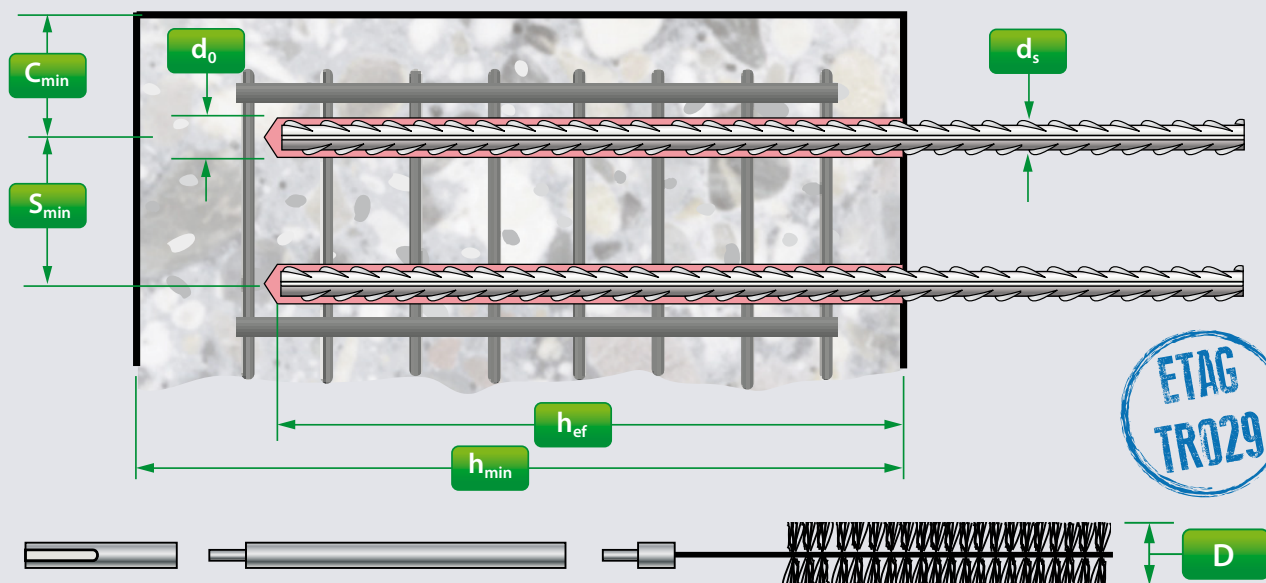
Curing Times

Temperature ³⁾	-C	-10 ⁴⁾	-5	0	+5	+10	+20	+30 ⁵⁾	+35 ⁵⁾	+40 ⁵⁾
Processing Time		90 min	90 min	45 min	25 min	15 min	6 min	4 min	2 min	1,5 min
Curing Time Dry Holes		24 h	14 h	7 h	2 h	80 min	45 min	25 min	20 min	15 min
Curing Time Wet Holes		48 h	28 h	14 h	4 h	160 min	90 min	50 min	40 min	30 min

1) Loads in kN for a single anchor Grade 5.8 in concrete C20/C25. Temperature for long/short term. No Influence of Edge Distances or Spacing.
 Safety factor $\gamma_s = 1,4$. Increasing factors for concrete ψ_c : **C30/37**: 1,04 **C40/50**: 1,08 **C50/60**: 1,10 2) Steel strength in kN without bending moment. 3) Concrete Temperature 4) Cartridge Temperature **must** be min. +15°C. 5) Cartridge Temperature **must** be under +20°C.

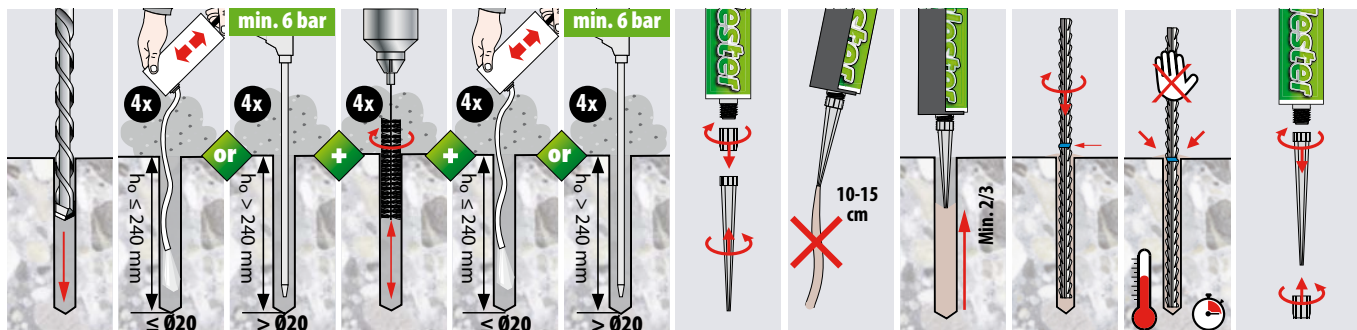


Specification Data for the use in Cracked & Uncracked Concrete and Carbide/Air Drilled Holes according to ETAG TR029 and CEN/TS 1992-4



6

Installation Procedures



Installation Dimensions

Dowel Size	d_s	8	10	12	14	16	20	25	28	32
Hole Diameter	d_0 [mm]	12	14	16	18	20	24	32	35	40
Effective Anchorage Depth	h_{ef} [mm]	60-160	60-200	70-240	75-280	80-320	90-400	100-500	112-560	128-640
Required Volume per cm Embedment Depth	V_s [ml/cm]	0,76	0,91	1,06	1,21	1,36	2,12	3,76	4,20	5,50

Member Thickness, Edge Distance & Spacing

Dowel Size	d_s	8	10	12	14	16	20	25	28	32
Min. Member Thickness	h_{min} [mm]	100-190	100-230	105-275	110-320	120-360	140-450	165-565	180-630	210-720
Min. Edge Distance	C_{min} [mm]	40	50	60	70	80	100	125	140	160
Min. Spacing	S_{min} [mm]	40	50	60	70	80	100	125	140	160

Steel Brush & Piston Plug Dimensions

Dowel Size	d_s	8	10	12	14	16	20	25	28	32
Brush Diameter	D [mm]	14	16	18	20	22	26	34	37	41,5
Min. Brush Diameter	D _{min} [mm]	12,5	14,5	16,5	18,5	20,5	24,5	32,5	35,5	40,5
Piston Plug	[#]						24	32	35	38

Recommended Tension Loads¹⁾



Uncracked
Concrete

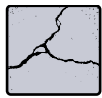
Dowel Size ►	d_s	8	10	12	14	16	20	25	28	32
▼ Embedment Depth h_{ef}										
60		7,2	9,0							
70		8,4	10,5	11,7	11,7					
80		9,6	12,0	14,3	14,3	14,3				
90		10,8	13,5	16,2	17,1	17,1	17,1			
100		12,0	15,0	18,0	20,0	20,0	20,0	20,0		
110		13,2	16,5	19,7	23,0	23,1	23,1	23,1	23,1	
130		14,1	19,4	23,3	27,2	29,7	29,7	29,7	29,7	29,7
200			22,0	31,7	41,9	47,9	56,7	56,7	56,7	56,7
240					43,2	56,4	71,8	74,5	74,5	74,5
320							88,2	109,7	111,7	108,5
360								123,4	125,7	122,1
440								137,7	153,6	149,2
500									172,8	169,5
560										189,9
640										217,0



Flooded Holes in
Uncracked Concrete

Dowel Size ►	d_s	8	10	12	14	16	20	25	28	32
▼ Embedment Depth h_{ef}										
60		3,8	5,4							
70		4,5	6,4	7,6						
80		5,1	7,3	8,7	10,2	11,6				
90		5,8	8,2	9,8	11,4	13,1				
100		6,4	9,1	10,9	12,7	14,5				
110		7,1	10,0	12,0	14,0	16,0				
120		7,7	10,9	13,1	15,3	17,4				
130		8,3	11,8	14,2	16,5	18,9				
140		9,0	12,7	15,3	17,8	20,3				
150		9,6	13,6	16,3	19,1	21,8				
160		10,3	14,5	17,4	20,3	23,3				
200		12,8	18,2	21,8	25,4	29,1				
240		14,1	21,8	26,2	30,5	34,9				
280			22,0	30,5	35,6	40,7				
400				31,7	43,2	56,4				
$n_{rec,s}$		14,1	22,0	31,7	43,2	56,4	88,2	137,7	172,8	225,7

Recommended Tension Loads¹⁾



**Cracked
Concrete**

Dowel Size ►	d_s		12	14	16	20	25	28	32
▼ Embedment Depth h_{ef}									
70			5,8						
80			6,6	7,7	8,8				
90			7,4	8,6	9,9	12,2			
100			8,2	9,6	11,0	13,7	14,3		
110			9,1	10,6	12,1	15,1	16,5	16,5	
130			10,7	12,5	14,3	17,8	21,2	21,2	21,2
200			16,5	19,2	21,9	27,4	34,3	40,4	40,4
240			19,7	23,0	26,3	32,9	41,1	53,1	53,1
320			26,3	30,7	35,1	43,9	54,9	72,6	81,8
360			29,6	34,6	39,5	49,4	61,7	81,7	93,4
440			31,7	42,2	48,3	60,3	75,4	99,8	114,1
500				43,2	54,9	68,6	85,7	113,4	129,7
560					56,4	76,8	96,0	127,1	145,2
640						87,8	109,7	145,2	166,0



**Flooded Holes in
Cracked Concrete**

8

Dowel Size ►	d_s		12	14	16	20	25	28	32
▼ Embedment Depth h_{ef}									
70			4,9						
80			5,6	6,6	7,5				
90			6,3	7,4	8,5				
100			7,1	8,2	9,4				
110			7,8	9,1	10,3				
120			8,5	9,9	11,3				
130			9,2	10,7	12,2				
140			9,9	11,5	13,2				
150			10,6	12,3	14,1				
160			11,3	13,2	15,0				
200			14,1	16,5	18,8				
240			16,9	19,7	22,6				
360			25,4	29,6	33,9				
420				34,6	39,5				
480					45,1				
$n_{rec,s}$			31,7	43,2	56,4	88,2	137,7	172,8	225,7

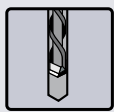
Recommended Shear Loads²⁾

Dowel Size	d_s	8	10	12	14	16	20	25	28	32
Recomm. Shear Load	[kN]	6,7	10,5	14,8	20,0	26,2	41,0	64,3	80,5	105,2

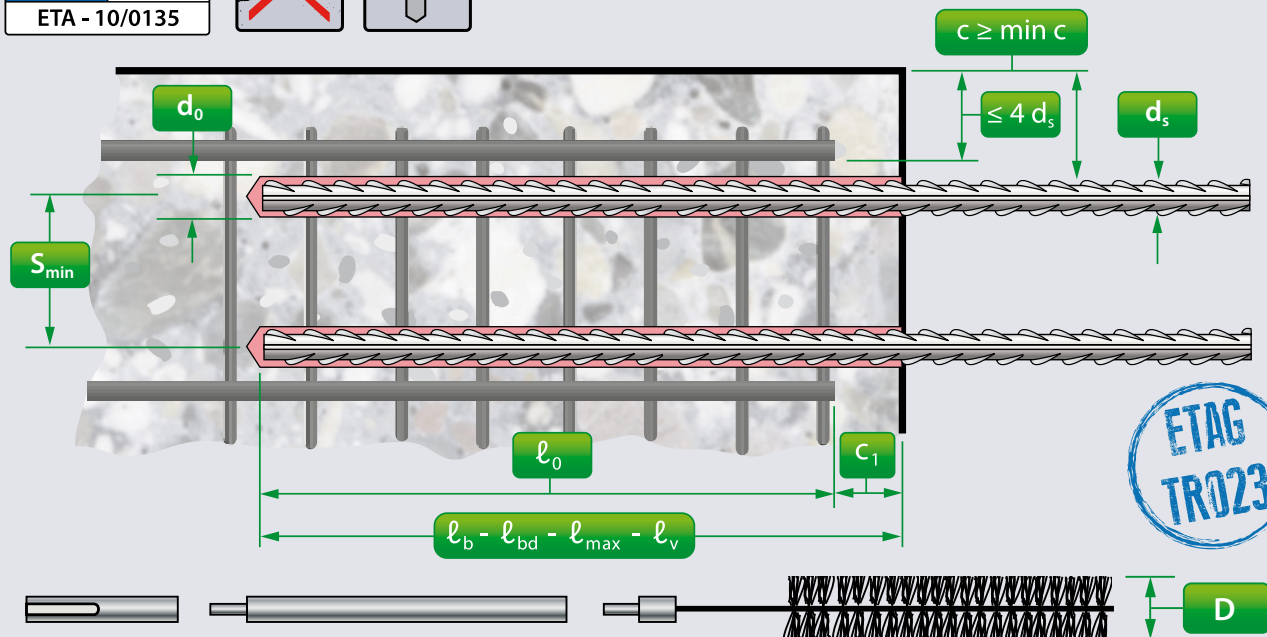
Curing Times

Temperature ³⁾	°C	-10 ⁴⁾	-5	0	+5	+10	+20	+30 ⁵⁾	+35 ⁵⁾	+40 ⁵⁾
Processing Time		90 min	90 min	45 min	25 min	15 min	6 min	4 min	2 min	1,5 min
Curing Time Dry Holes		24 h	14 h	7 h	2 h	80 min	45 min	25 min	20 min	15 min
Curing Time Wet Holes		48 h	28 h	14 h	4 h	160 min	90 min	50 min	40 min	30 min

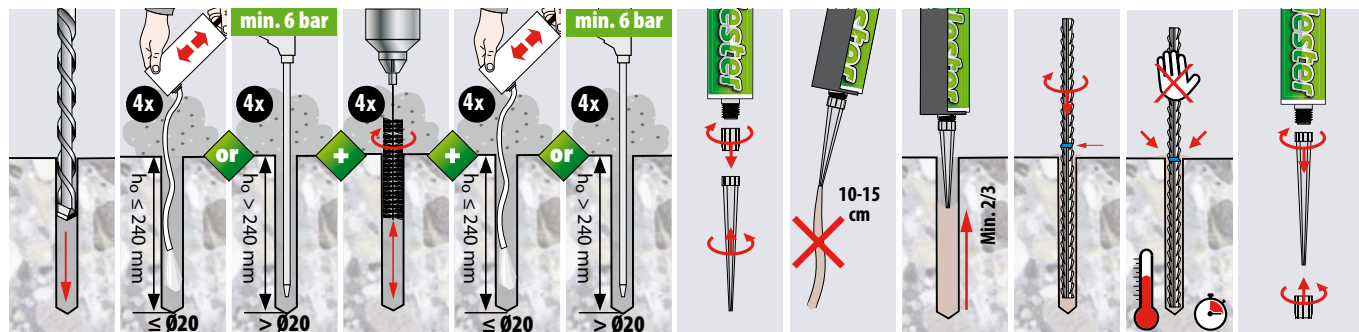
- 1) Loads in kN for a single dowel in Dry/Damp concrete C20/C25*. Temperature range 24°C/40°C for long/short term. Safety Factor $\gamma_G = 1,4$. * Increasing factors for concrete ψ_c : **C30/37**: 1,04 **C40/50**: 1,08 **C50/60**: 1,10
- 2) Steel strength in kN for BSt 500 S without bending moment.
- 3) Concrete Temperature
- 4) Cartridge Temperature must be min. +15°C.
- 5) Cartridge Temperature **must** be under +20°C.



Specification Data for the use in Uncracked Concrete and Carbide/Air Drilled Holes according to EC2 and ETAG TR023



Installation Procedures



Installation Dimensions

Dowel Size	ds	8	10	12	14	16	20	22	24	25
Hole Diameter	d0 [mm]	12	14	16	18	20	25	28	32	32
Min. Anchorage Depth	lb,min [mm]	170	213	255	298	340	425	468	510	532
Min. Lap Length	l0,min [mm]	300	300	300	315	360	450	495	540	563
Design Anchorage Length	lbd [mm]	378	473	567	662	756	945	1040	1134	1181
Max. Anchorage Length	lmax [mm]	1000	1000	1200	1400	1600	2000	2000	2000	2000
Min. Spacing	Smin [mm]	50	50	60	70	80	100	110	120	125
Required Volume per cm Embedment Depth	Vs [ml/cm]	0,75	0,90	1,06	1,21	1,36	2,12	2,83	4,22	3,76

Min. Concrete Cover

Drilling Method	d_s [mm]	Without Drilling Guide [mm]	With Drilling Guide [mm]
Hammer Drilling HD	<25	$30 + 0,06 \cdot \ell_v \geq 2d_s$	$30 + 0,02 \cdot \ell_v \geq 2d_s$
	=25	$40 + 0,06 \cdot \ell_v \geq 2d_s$	$40 + 0,02 \cdot \ell_v \geq 2d_s$
Air Drilling AD	<25	$50 + 0,08 \cdot \ell_v$	$50 + 0,02 \cdot \ell_v$
	=25	$60 + 0,08 \cdot \ell_v$	$60 + 0,02 \cdot \ell_v$

Steel Brush & Piston Plug Dimensions

Dowel Size	d_s	8	10	12	14	16	20	22	24	25
Brush Diameter D [mm]		14	16	18	20	22	27	30	34	34
Min. Brush Diameter D_{min} [mm]		12,5	14,5	16,5	18,5	20,5	25,5	28,5	32,5	32,5

Recommended Tension Loads¹⁾



**Uncracked
Concrete**

Dowel Size ▶	d_s	8	10	12	14	16	20	22	24	25
▼ Embedment Depth l, b										
170	9,8									
180	10,4									
200	11,6	14,5								
220	12,7	15,9								
240	13,9	17,3	20,8							
260	15,0	18,8	22,5							
280		20,2	24,3	28,3						
300		21,7	26,0	30,3	34,7					
350			30,3	35,4	40,5					
400			34,7	40,5	46,2	57,8				
450				45,5	52,0	65,0	71,5			
500					57,8	72,3	79,5	86,7		
550						79,5	87,4	95,4	99,4	
600						86,7	95,4	104,0	108,4	
700							111,3	121,4	126,4	
800								138,7	144,5	
$N_{rec,s}$		15,6	24,4	35,1	47,8	62,4	97,6	118,1	140,5	152,4

Curing Times

Temperature ²⁾	°C	-10 ³⁾	-5	0	+5	+10	+20	+30 ⁴⁾	+35 ⁴⁾	+40 ⁴⁾
Processing Time	90 min	90 min	45 min	25 min	15 min	6 min	4 min	2 min	1,5 min	
Curing Time Dry Holes	24 h	14 h	7 h	2 h	80 min	45 min	25 min	20 min	15 min	
Curing Time Wet Holes	48 h	28 h	14 h	4 h	160 min	90 min	50 min	40 min	30 min	

1) Loads in kN for a single dowel in Dry/Damp concrete C20/C25. $f_{bd} = 2,3 \text{ N/mm}^2$ No influence of edge- or center-to-center distances.

Steel strength $N_{rec,s}$ in kN incl. safety factor $\gamma_G = 1,4$

2) Concrete Temperature

3) Cartridge Temperature must be min. +15°C.

4) Cartridge Temperature **must** be under +20°C.