STAHLFIX EASF - Styrene Free

Features and Benefits

Version: 01/01/2020

- *High bond strength with High load resistance*
- *Used with all grades of threaded rod and rebar*
- *Used in concrete and masonry*
- *Fast gelling and curing*
- *Used in dry/wet concrete and flooded holes*
- *Resistance to chemicals and damp conditions*
- *Close edge distance and small spacing*
- *European approval for use in masonry with nylon sleeves*
- *Economical fixing resin*
- *Extremely versatile*
- *Styrene free with low odour*
- *Manual cleaning up to 20mm diameter and embedment depths of 240mm*
- *Independently tested and approved*

Contents

Shelf Life and Storage

This product should be stored between +5˚C & +25˚C.
The Shelf life of the product is 24 months from the manufacture date.

IMPORTANT The information and data given is based on our own experience, research and testing and is believed to be reliable and accurate. However, as we cannot know the varied uses to which its products may be applied, or the methods of application used, no warranty as to the fitness or suitability of its products is given or implied. It is the users responsibility to determine suitability of use. For further information please contact Our Technical Department.

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Product Description

Stahlfix EASF is a 2 component high strength 10:1 ratio chemical anchoring resin system. It is designed as a fast curing high strength resin fixing anchor for high loads and medium loads and is particularly advantageous for fixings in damp environments or with chemical exposure.

Specific Benefits

- European Approved
- High loads possible
- Chemical resistance
- Studs and rebar
- Approved for Masonry
- Styrene Free Low odour
- Economical fixing resin

Approvals

- ETA - 14/0287 - ETAG 029 for Masonry
- ETA - 19/0651 for use in non-cracked concrete: Sizes M8 to M24, rebar Ø8 to Ø25mm
- ETA - 19/0652 for post installed rebar connections
- Tested according to LEED 2009 EQ c4.1, SCAQMD rule 1168 (2005).
- A+ Rating VOC content

Loads, Edge and Spacings based on Characteristic bond strengths - Showing steel failure

	Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)		Characteristic distances (mm)			Min Edge and Spacing (mm)	Nominal	Hole Diameter	Hole Diameter	Max
Size	Tension	Shear	Tension	Shear	Tension	Shear	Edge	Spacing	Edge		Embedment	concrete	fixture	Torque
(mm)	N_{rk}	V_{rk}	N_{rd}	V_{rd}	N_{rec}	V_{rec}	$C_{cr,N}$	$S_{cr,N}$	$C_{cr,V}$	C_{min}, S_{min}	(mm)	(mm)	(mm)	(Nm)
8	18,90		10,50		7,50						60	10	9	10
	19,00	9,00	12,70	7,20	9,07	5,14	80	160	80	40	80			
	19,00		12,70		9,07						160			
10	23,58		13,10		9,36						60	12	12	20
	35,33	15,00	19,63	12,00	14,02	8,57	100	200	90	50	90			
	30,20		20,10		14,36						200			
12	31,68		17,60		12,57						70	14	14	40
	41,40	21,00	27,60	16,80	19,71	12,00	120	240	110	60	110			
	43,80		29,20		20,86						240			
16	48,24		26,80		19,14						80	18	18	80
	75,40	39,00	41,89	31,20	29,92	22,29	160	320	125	80	125			
	81,60		54,40		38,86						320			
20	65,03		36,13		25,81						90	24	22	120
	122,84	61,00	68,24	48,80	48,75	34,86	200	400	180	100	170			
	127,40		84,90		60,64						400			
24	82,94		46,08		32,91						100	28	26	160
	174,17	88,00	96,76	70,40	69,12	50,29	240	480	220	120	210			
	183,60		122,40		87,43						480			
27	93,30		51,83		37,02						110	32	30	180
	203,70	115,00	113,17	92,00	80,83	65,71	270	540	240	135	240			
	238,00		159,10		113,64						540			
30	101,79		56,55		40,39						120	35	32	200
	237,50	142,50	131,94	114,00	94,25	81,43	280	560	280	150	280			
	292,00		194,50		138,93						600			

= steel failure Partial safety factor = 1.5

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Design Resistance used with various stud strengths, material and rebar.

5.8 Grade Steel Studding

Stud Diameter	Hole Diameter	Embedment Depth hef																				h_{ef} failure	$F_{d,s}$ design load
(mm)	(mm)	60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720	(mm)	(kN)
8	10	10,5	12,2	12,7																		73	12,7
10	12	13,1	15,3	17,5	19,6	20,1																92	20,1
12	14		17,6	20,1	22,6	25,1	27,6	29,2														116	29,2
16	18			26,8	30,2	33,5	36,9	40,2	43,6	46,9	53,6	54,4										162	54,4
20	24			32,1	36,1	40,1	44,2	48,2	52,2	56,2	64,2	80,3	84,9									212	84,9
24	28					46,1	50,7	55,3	59,9	64,5	73,7	92,2	110,6	122,4								266	122,4
27	32						51,8	56,6	61,3	66,0	75,4	94,3	113,1	132,0	150,8	159,1						338	159,1
30	35							56,6	61,3	66,0	75,4	94,3	113,1	132,0	150,8	188,5	194,5					413	194,5
Depth (mm)		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720		

steel failure

8.8 Grade Steel Studding

Stud Diameter	Hole Diameter	Embedment Depth hef																				h_{ef} failure	$F_{d,s}$ design load
(mm)	(mm)	60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720	(mm)	(kN)
8	10	10,5	12,2	14,0	15,7	17,5	19,2	19,5														112	19,5
10	12	13,1	15,3	17,5	19,6	21,8	24,0	26,2	28,4	30,5	30,9											142	30,9
12	14		17,6	20,1	22,6	25,1	27,6	30,2	32,7	35,2	40,2	45,0										179	45,0
16	18			26,8	30,2	33,5	36,9	40,2	43,6	46,9	53,6	67,0	80,4	83,7								250	83,7
20	24			32,1	36,1	40,1	44,2	48,2	52,2	56,2	64,2	80,3	96,4	112,4	128,5	130,7						325	130,7
24	28					46,1	50,7	55,3	59,9	64,5	73,7	92,2	110,6	129,0	147,5	184,3	188,3					409	188,3
27	32						51,8	56,6	61,3	66,0	75,4	94,3	113,1	132,0	150,8	188,5	226,2	244,8				519	244,8
30	35							56,6	61,3	66,0	75,4	94,3	113,1	132,0	150,8	188,5	226,2	254,5	282,8			635	299,2
Depth (mm)		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720		

= steel failure

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Design Resistance used with various stud strengths, material and rebar.

10.9 Grade Steel Studding

Stud Diameter	Hole Diameter	Embedment Depth hef																				h_{ef} failure	$F_{d,s}$ design load
(mm)	(mm)	60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720	(mm)	(kN)
8	10	10,5	12,2	14,0	15,7	17,5	19,2	20,9	22,7	24,4	27,2											156	27,2
10	12	13,1	15,3	17,5	19,6	21,8	24,0	26,2	28,4	30,5	34,9	43,1										197	43,1
12	14		17,6	20,1	22,6	25,1	27,6	30,2	32,7	35,2	40,2	50,3	60,3									249	62,6
16	18			26,8	30,2	33,5	36,9	40,2	43,6	46,9	53,6	67,0	80,4	93,8	107,2							348	116,6
20	24			32,1	36,1	40,1	44,2	48,2	52,2	56,2	64,2	80,3	96,4	112,4	128,5	160,6						453	182,0
24	28					46,1	50,7	55,3	59,9	64,5	73,7	92,2	110,6	129,0	147,5	184,3	221,2					569	262,2
27	32						51,8	56,6	61,3	66,0	75,4	94,3	113,1	132,0	150,8	188,5	226,2	254,5				723	341,0
30	35							56,6	61,3	66,0	75,4	94,3	113,1	132,0	150,8	188,5	226,2	254,5	282,8			884	416,7
Depth (mm)		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720		

A4-70 Stainless Steel Studding

Stud Diameter	Hole Diameter	steel failure Embedment Depth hef																				h_{ef} failure	$F_{d,s}$ design load
(mm)	(mm)	60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720	(mm)	(kN)
8	10	10,5	12,2	13,7																		78	13,7
10	12	13,1	15,3	17,5	19,6	21,7																100	21,7
12	14		17,6	20,1	22,6	25,1	27,6	30,2	31,6													126	31,6
16	18			26,8	30,2	33,5	36,9	40,2	43,6	46,9	53,6	58,8										175	58,8
20	24			32,1	36,1	40,1	44,2	48,2	52,2	56,2	64,2	80,3	91,7									228	91,7
24	28					46,1	50,7	55,3	59,9	64,5	73,7	92,2	110,6	129,0	132,1							287	132,1
27	32						51,8	56,6	61,3	66,0	75,4	80,2									1	170	80,2
30	35							56,6	61,3	66,0	75,4	94,3	98,1								1	208	98,1
Depth (mm)		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720		

Notes

1 Tensile strength 500N/mm2

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Design Resistance used with various stud strengths, material and rebar.

A4-80 Stainless Steel Studding

Stud Diameter	Hole Diameter	Embedment Depth hef																				h_{ef} failure	$F_{d,s}$ design load
(mm)	(mm)	60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720	(mm)	(kN)
8	10	10,5	12,2	14,0	15,7																	90	15,7
10	12		15,3	17,5	19,6	21,8	24,0	24,8														114	24,8
12	14		17,6	20,1	22,6	25,1	27,6	30,2	32,7	35,2	36,1											143	36,1
16	18			26,8	30,2	33,5	36,9	40,2	43,6	46,9	53,6	67,2										200	67,2
20	24			32,1	36,1	40,1	44,2	48,2	52,2	56,2	64,2	80,3	96,4	104,8								261	104,8
24	28					46,1	50,7	55,3	59,9	64,5	73,7	92,2	110,6	129,0	132,1						2	287	132,1
27	32						51,8	56,6	61,3	66,0	75,4	80,2									1	170	80,2
30	35							56,6	61,3	66,0	75,4	94,3	98,1								1	208	98,1
Depth (mm)		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720		

High bond reinforcing bars Fyk=500N/mm2

Rebar Diameter	Hole Diameter	Embedment Depth hef																				h_{ef} failure	$F_{d,s}$ yield load
(mm)	(mm)	60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	500	560	640	720	800	(mm)	(kN)
8	12	9,2	10,8	12,3	13,8	15,4	16,9	18,4	20,0	21,5	21,9											142	21,9
10	14	11,5	13,4	15,4	17,3	19,2	21,1	23,0	25,0	26,9	30,7	34,1										178	34,1
12	16		16,1	18,4	20,7	23,0	25,3	27,6	30,0	32,3	36,9	46,1	49,2									213	49,2
16	20			22,3	25,1	27,9	30,7	33,5	36,3	39,1	44,7	55,9	67,0	78,2	87,4							313	87,4
20	25			27,9	31,4	34,9	38,4	41,9	45,4	48,9	55,9	69,8	83,8	97,8	111,7	136,6						391	136,6
25	30					43,6	48,0	52,4	56,7	61,1	69,8	87,3	104,7	122,2	139,6	174,6	196,5					450	196,5
28	35						48,4	52,8	57,2	61,6	70,4	88,0	105,6	123,2	140,8	176,0	219,9	246,3				609	267,8
32	40								65,4	70,4	80,4	100,5	120,7	140,8	160,9	201,1	251,4	281,5	321,7			696	349,7
Depth (mm)		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	500	560	640	720	800		

*1 = Tensile strength 500N/mm2

*2 = Tensile strength 700N/mm2

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Bond Strength Factors

Influence of concrete strength on combined pull out and concrete cone resistance

Concrete Strength N/mm2	C15/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
Non-Cracked fc =	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00

Influence of environmental conditions in non cracked concrete

		M8	M10	M12	M16	M20	M24	M30
Temp I 40°C / 24°C	Dry and Wet	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Temp II 80°C / 50°C	Dry and Wet	0,70	0,70	0,70	0,70	0,70	0,70	0,70

Select concrete strength and environmental condition and apply to bond strength table on pages 3 to 5

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Material Properties for grades of threaded rod and rebar

	Stud Grade 8.8		Stud Grade 10.9		Stud Grade A4-70		Stud Grade A4-80	
Stud Diameter	$N_{rk,\,s}$	$N_{rd,\,s}$	$N_{rk,\,s}$	$N_{rd,\,s}$	$N_{rk,\,s}$	$N_{rd,\,s}$	$N_{rk,\,s}$	$N_{rd,\,s}$
(mm)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)
M8	29,3	19,5	38,1	27,2	25,6	13,7	29,2	15,6
M10	46,4	30,9	60,3	43,1	40,6	21,7	46,4	24,8
M12	67,5	45,0	87,7	62,6	59,0	31,6	67,4	36,1
M16	125,6	83,7	163,2	116,6	109,9	58,8	125,7	67,2
M20	196,1	130,7	254,8	182,0	171,5	91,7	196,0	104,8
M24	282,5	188,3	367,1	262,2	247,1	132,1	293,0	132,1
M30	448,8	299,2	583,4	416,7	280,5	150,0	392,7	210,0

	Stud Grade 8.8		Stud Grade 10.9		Stud Grade A4-70		Stud Grade A4-80	
Stud Diameter	$V_{rk,\,s}$	$V_{rd,\,s}$	$V_{rk,\,s}$	$V_{rd,\,s}$	$V_{rk,\,s}$	$V_{rd,\,s}$	$V_{rk,\,s}$	$V_{rd,\,s}$
(mm)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)
M8	14,6	11,7	19,0	15,2	12,8	8,2	14,6	9,4
M10	23,2	18,6	30,2	24,1	20,3	13,0	23,2	14,9
M12	33,7	27,0	43,8	35,1	29,5	18,9	33,7	21,6
M16	62,8	50,2	81,6	65,3	55,0	35,2	62,8	40,3
M20	98,0	78,4	127,4	101,9	85,8	55,0	98,0	62,8
M24	141,2	113,0	183,6	146,8	123,6	79,2	141,2	90,5
M30	224,4	179,5	291,5	215,9	140,3	89,9	196,4	125,9

	Rebar BSt 500 to DIN 488		Rebar BSt 500 to DIN 488	
Rebar Diameter	$N_{rk,\,s}$	$N_{rd,\,s}$	$V_{rk,\,s}$	$V_{rd,\,s}$
(mm)	(kN)	(kN)	(kN)	(kN)
8	28,0	20,0	14,0	9,3
10	43,0	30,7	21,5	14,3
12	62,0	44,3	31,0	20,7
16	111,0	79,3	55,5	37,0
20	173,0	123,6	86,5	57,7
25	270,0	192,8	135,0	90,0
28	339,0	242,1	169,0	112,7
32	442,0	315,7	221	147,3

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Bond Strength Factors - REBAR

Influence of concrete strength on combined pull out and concrete cone resistance

Concrete Strength N/mm2	C15/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
non-cracked fc =	0,97	1,00	1,03	1,06	1,09	1,12	1,16	1,20

Influence of environmental conditions in non cracked concrete

		Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 18	Ø 20	Ø 22	Ø 25	Ø 28	Ø 32
Temp I 40°C / 24°C	Dry and Wet	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Temp II 80°C / 50°C	Dry and Wet	0,70	0,70	0,70	0,70	0,70	0,70	0,70	0,70	0,70	0,70	0,70

Select concrete strength and environmental condition and apply to bond strength table on page 5

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Effect of Anchor Spacing - Tension

Anchor Spacing	Stud / Rebar Diameter						
(mm)	8	10	12	16	20	24	30
40	0,64						
50	0,67	0,63					
60	0,70	0,65	0,63				
70	0,73	0,67	0,64				
80	0,76	0,69	0,66	0,63			
90	0,79	0,72	0,68	0,64			
100	0,82	0,74	0,70	0,65	0,63		
120	0,87	0,79	0,74	0,68	0,65	0,63	
150	0,96	0,86	0,80	0,73	0,68	0,65	0,63
160	1,00	0,88	0,82	0,74	0,70	0,66	0,63
175		0,92	0,85	0,76	0,71	0,67	0,64
200		1,00	0,90	0,80	0,74	0,69	0,66
225			0,95	0,84	0,77	0,72	0,68
240			1,00	0,86	0,79	0,73	0,69
250				0,87	0,80	0,74	0,70
275				0,91	0,83	0,76	0,72
280				0,92	0,84	0,77	0,73
300				0,95	0,86	0,79	0,74
320				1,00	0,88	0,81	0,76
350					0,92	0,83	0,78
400					1,00	0,88	0,82
440						0,92	0,85
460						1,00	0,87
500							0,90
560							1,00

Effect of Edge Distance - Tension

Edge Distance	Stud / Rebar Diameter						
(mm)	8	10	12	16	20	24	30
40	0,64						
50	0,73	0,63					
60	0,82	0,70	0,63				
70	0,90	0,77	0,68				
80	1,00	0,84	0,74	0,63			
90		0,91	0,80	0,67			
100		1,00	0,86	0,71	0,63		
110			0,92	0,76	0,66		
120			1,00	0,80	0,70	0,64	
140				0,89	0,77	0,67	0,63
160				1,00	0,84	0,72	0,65
180					0,91	0,78	0,70
200					1,00	0,84	0,76
220						0,89	0,81
240						1,00	0,86
280							1,00

Effect of Edge Distance - Shear

Edge Distance	Stud / Rebar Diameter						
(mm)	8	10	12	16	20	24	30
40	0,25						
50	0,44	0,30					
60	0,63	0,48	0,30				
70	0,81	0,65	0,44				
80	1,00	0,83	0,58	0,40			
90		1,00	0,72	0,53			
100			0,86	0,67	0,35		
110			1,00	0,80	0,44		
125				1,00	0,58	0,35	
140					0,72	0,46	0,30
160					0,91	0,62	0,35
180					1,00	0,77	0,46
200						0,92	0,57
220						1,00	0,68
240							0,78
280							1,00

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Minimum Curing Time

Concrete Temperature	Gel - Working Time	Minimum curing time in dry concrete	Minimum curing time in wet concrete
0°C ≤ Tbase material < 10°C	20 min	90 min	x2
10°C ≤ Tbase material < 20°C	9 min	60 min	x2
20°C ≤ Tbase material < 30°C	5 min	30 min	x2
30°C ≤ Tbase material < 40°C	3 min	20 min	x2

* Resin temperature must be at least 20°C

- All specifications based on supplied mixer

Temperature Ranges

Temperature Range	Concrete Service Temperature	Maximum Long Term Concrete Temp	Maximum Short Term Concrete Temp
Range I	-40°C to +40°C	+24°C	+40°C
Range II	-40°C to +80°C	+50°C	+80°C

Service temperature range: Range of ambient temperatures after installation and during the lifetime of the anchor.

Short term temperature: Temperatures within the service temperature range which vary over short intervals,

e.g. day/night cycles and freeze/thaw cycles.

Long term temperature: Temperature, within the service temperature range, which will be approximately constant

over significant periods of time.

Long term temperatures will include constant or near constant temperatures, such as those experienced in cold stores or next to heating installations.

Physical Properties

	N/mm2	Test Method
Flexural Strength	15,8	EN ISO 178 / ASTM 790
Flexural Modulus	1520	EN ISO 178 / ASTM 790
Tensile Strength	9,81	EN ISO 527 / ASTM 638
VOC Content	A+ Rating	-

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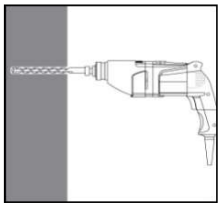
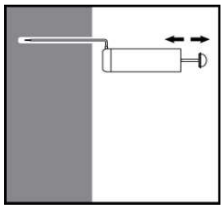
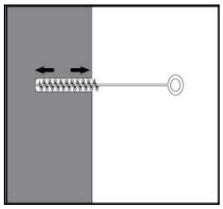
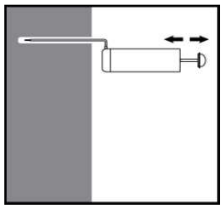
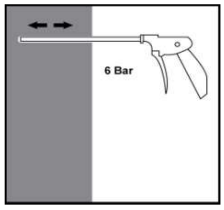
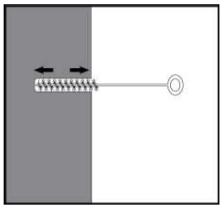
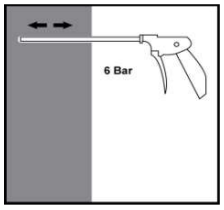
Installation parameters: drilling hole cleaning and installation

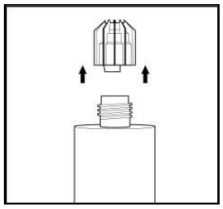
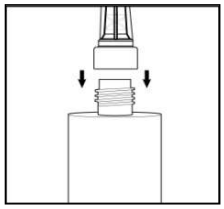
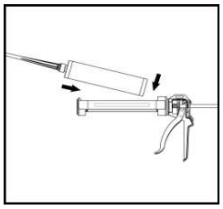
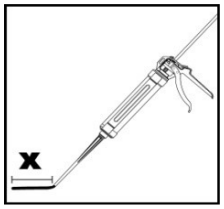
Drill hole in the substrate to the required embedment depth using the appropriately sized carbide drill bit. Bore hole cleaning Just before setting an anchor, the bore hole must be free of dust and debris. The manual pump shall be used for blowing out bore holes up to diameters do ≤ 24mm and embedment depths up to hef ≤ 10d. Blow out at least 4 times from the back of the bore hole, using an extension if needed. Brush 4 times with the specified brush size (see Table 6) by inserting the steel brush to the back of the hole (if needed with an extension) in a twisting motion and removing it. Blow out again with manual pump at least 4 times.

Compressed air cleaning (CAC) for all bore hole diameters do and all bore hole depths

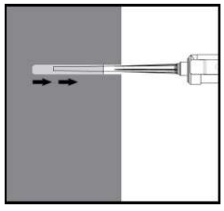
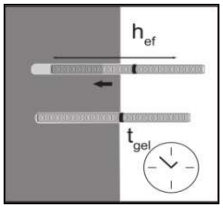


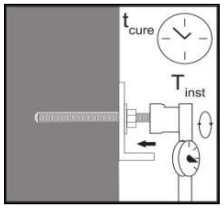



Blow 2 times from the back of the hole (if needed with a nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h). Brush 2 times with the specified brush size (see Table 6) by inserting the steel brush to the back of the hole (if needed with an extension) in a twisting motion and removing it.
X 2 Blow out again with compressed air at least 2 times.

Remove the threaded cap from the cartridge. Tightly attach the mixing nozzle. Do not modify the mixer in any way. Made sure the mixing element is inside the mixer. Use only the supplied mixer. Insert the cartridge into the dispenser gun. Discard the initial trigger pulls of adhesive. Discard the first 10ml of resin.



Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull. Fill holes approximately 2/3 full, to ensure that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment depth. Before use, verify that the threaded rod is dry and free of contaminants. Install the threaded rod to the required embedment depth during the open gel time tgel has elapsed. The working time tgel is given in Table 7. The anchor can be loaded after the required curing time tcure (see Table 7). The applied torque shall not exceed the values Tmax given in Table 1.

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Notes

PAGE 2 :

Typical characteristic and design resistance performance with 5.8 grade studding and associated installation data

All data is based on correct installation - see instructions

No influence of edge and spacing

Minimum base material thickness hef +30mm >100mm for M8 to M12 and for M16 to M30 hef +2 d

h_{ef} range minimum or 4d whichever is greatest to 20d

Concrete strength C20/25 - f_c cube = 25N/mm^2 (25MPa)

5.8 grade stud

Temperature range I maximum long term / short term temperature +24/40^{o}C

PAGE 3 to 5

Design Resistance with various stud strengths, material and rebar.

Note 1 for stainless steel tensile strength is 500N/mm^2 (500MPa)

Note 2 for stainless steel tensile strength is 700N/mm^2 (500MPa)

Data shown below the minimum embedment depth is for reference only. Please refer to manufacturer for advice.

PAGE 6 & 8:

Bond Strength Factors

Select concrete strength and environmental condition and apply to bond strength table on page 6 for threaded bars or 8 for rebar

PAGE 7 :

Material Properties for grades of other threaded rod and rebar

All grades shown for information

M30 studding is 8.8 grade instead of 5.8 grade

M30 for A4-70 tensile strength of 500N/mm2 (500MPa), instead of 700N/mm2 (700MPa)

Safety factor is 1.5 tension and 1.25 shear for all carbon steel except 10.9 grade which is 1.4 for tension

Safety factor is 1.87 for stainless steel, up to M24, M27 and M30 is

Safety factor is 1.4 tension and 1.5 shear for BSt 500 rebar

Partial Safety Factors for pages 2,3,4,5:

1.8 for all sizes studs

1.8 for all sizes rebar

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