PENOSIL
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TECHNICAL DATA SHEET

PENOSIL SpeedFix Chemical Anchor 597

- High bond strength with high load resistance
- Used with all grades of threaded rod and rebar in accordance with TR029
- Used in non-cracked and cracked concrete
- Fast gelling and curing
- Used in dry and wet concreteand flooded holes
- Used in critical or overhead applications
- Used in corrosive environments
- ETA tested based on life of anchor 50 years
- Used for post installed rebar installations under TR029 and TR023
- Used for solid and hollow masonry
- Low shrinkage enables large diameter installations
- Close edge distance and small spacing
- 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 18 months from the manufacture date.

IMPORTANT: The instructions in the present documentation are based on tests carried out by the manufacturer and are presented in good faith. Due to variations in materials and substrates as well as the various application possibilities that are beyond our control, the manufacturer is not liable for the results achieved. In any case, it is recommended to test the product suitability at the place of application.

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Product Description

2 component high strength 10:1 ratio chemical anchoring resin system. It is designed as a fast curing high strength resin fixing anchor for very high loads and critical and overhead fixings especially in corrosive environments, or damp conditions.

Available in sizes : 300ml

Specific Benefits

- European Approved
- High loads possible
- High chemical resistance
- Use with potable water
- Studs and rebar
- Hammer drilling and dust free drilling
- Cracked or Non-Cracked
- A+ Rating VOC content
- Styrene Free, low odour
- Fire approved
- Suitable underwater

Approvals

- ETA Option 7 acc. to EAD 330499 for uncracked concrete with studs and rebar TR029
- ETA Option 1 acc. to EAD 330499 for cracked concrete with studs
- ETA for post installed rebar with fire acc. to EAD 330087
- ETA for application in masonry acc. to EAD 330076
- Tested to BS6920 for use with potable water
- Tested according to LEED (VOC A+)

Loads, Edge and Spacing 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 Embedment (mm)	Hole Diameter concrete (mm)	Hole Diameter fixture (mm)	Max Torque (Nm)
Size (mm)	Tension N_{rk}	Shear V_{rk}	Tension N_{rd}	Shear V_{rd}	Tension N_{rec}	Shear V_{rec}	Edge $C_{cr,N}$	Spacing $S_{cr,N}$	Edge $C_{cr,V}$	C_{min}, S_{min}				
	19,00		12,70		9,07						60			
8	19,00	9,00	12,70	7,20	9,07	5,14	80	160	80	40	80	10	9	10
	19,00		12,70		9,07						160			
	22,62		15,08		10,77						60			
10	30,20	15,00	20,10	12,00	14,36	8,57	100	200	90	50	90	12	12	12
	30,20		20,10		14,36						200			
	29,82		19,88		14,20						70			
12	43,80	21,00	29,20	16,80	20,86	12,00	120	240	110	60	110	14	14	20
	43,80		29,20		20,86						240			
	43,43		28,95		20,68						80			
16	67,86	39,00	45,24	31,20	32,31	22,29	160	320	125	80	125	18	18	40
	81,60		54,40		38,86						320			
	55,42		36,95		26,39						90			
20	104,68	61,00	69,79	48,80	49,85	34,86	200	400	180	100	170	22	22	70
	127,40		84,90		60,64						400			
	63,33		42,22		30,16						100			
24	133,00	88,00	88,67	70,40	63,33	50,29	230	460	220	120	210	28	26	90
	183,60		122,40		87,43						480			
	70,91		47,27		33,77						110			
27	154,72	115,00	103,15	92,00	73,68	65,71	270	540	240	135	240	30	30	120
	238,00		159,10		113,64						540			
	78,04		52,02		37,16						120			
30	182,09	142,50	121,39	114,00	86,71	81,43	280	560	280	150	280	35	32	150
	292,00		194,50		138,93						600			
	88,95		59,30		42,36						130			
33	205,27	173,50	136,85	138,80	97,75	121,43	310	620	310	165	300	37	36	200
	360,00		240,60		171,86						660			
	108,57		72,38		51,70						150			
36	246,10	212,50	164,07	170,00	117,19	121,43	330	660	330	180	340	40	38	250
	425,00		283,33		202,38						720			

= steel failure

Table notes : see back page

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Design Resistance used with various stud strengths, material and rebar

5.8 Grade Steel Studding

= steel failure

Stud Diameter (mm)	Hole Diameter (mm)	Embedment Depth hef 60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720	h_{ef} failure (mm)	$F_{d,s}$ design load (kN)
8	10	12,7																				59	12,7
10	12	15,1	17,6	20,1																		80	20,1
12	14		19,9	22,7	25,6	28,4	29,2															103	29,2
16	18			29,0	32,6	36,2	39,8	43,4	47,1	50,7	54,4											150	54,4
20	22			32,8	36,9	41,1	45,2	49,3	53,4	57,5	65,7	82,1	84,9									207	84,9
24	28					42,2	46,5	50,7	54,9	59,1	67,6	84,5	101,3	118,2	122,4							290	122,4
27	30						47,3	51,6	55,9	60,2	68,8	86,0	103,2	120,3	137,5	159,1						370	159,1
30	35							52,0	56,4	60,7	69,4	86,7	104,1	121,4	138,8	173,4	194,5					449	194,5
33	38								59,3	63,9	73,0	91,2	109,5	127,7	146,0	182,5	219,0	240,6				527	240,6
36	40									67,6	77,2	96,5	115,8	135,1	154,4	193,0	231,6	260,6	283,2			587	283,2
Depth (mm)		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720		

8.8 Grade Steel Studding

= steel failure

Stud Diameter (mm)	Hole Diameter (mm)	Embedment Depth hef 60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720	h_{ef} failure (mm)	$F_{d,s}$ design load (kN)
8	10	12,9	15,0	17,2	19,3	19,5																91	19,5
10	12	15,1	17,6	20,1	22,6	25,1	27,6	30,2	30,9													123	30,9
12	14		19,9	22,7	25,6	28,4	31,2	34,1	36,9	39,8	45,0											158	45,0
16	18			29,0	32,6	36,2	39,8	43,4	47,1	50,7	57,9	72,4	83,7									231	83,7
20	22			32,8	36,9	41,1	45,2	49,3	53,4	57,5	65,7	82,1	98,5	114,9	130,7							318	130,7
24	28					42,2	46,5	50,7	54,9	59,1	67,6	84,5	101,3	118,2	135,1	168,9	188,3					446	188,3
27	30						47,3	51,6	55,9	60,2	68,8	86,0	103,2	120,3	137,5	171,9	206,3	232,1				570	244,8
30	35							52,0	56,4	60,7	69,4	86,7	104,1	121,4	138,8	173,4	208,1	234,1	260,2			690	299,2
33	38								59,3	63,9	73,0	91,2	109,5	127,7	146,0	182,5	219,0	246,4	273,7	301,1		811	370,1
36	40									67,6	77,2	96,5	115,8	135,1	154,4	193,0	231,6	260,6	289,5	318,5	347,4	903	435,7
Depth (mm)		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720		

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Design Resistance used with various stud strengths, material and rebar

10.9 Grade Steel Studding

(blue shaded cell) = steel failure

Stud Diameter (mm)	Hole Diameter (mm)	60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720	h_{ef} failure (mm)	$F_{d,s}$ design load (kN)
		Embedment Depth hef																					
8	10	12,9	15,0	17,2	19,3	21,4	23,6	25,7	27,2													127	27,2
10	12	15,1	17,6	20,1	22,6	25,1	27,6	30,2	32,7	35,2	40,2	43,1										171	43,1
12	14		19,9	22,7	25,6	28,4	31,2	34,1	36,9	39,8	45,4	56,8	62,6									220	62,6
16	18			29,0	32,6	36,2	39,8	43,4	47,1	50,7	57,9	72,4	86,9	101,3	115,8	116,6						322	116,6
20	22			32,8	36,9	41,1	45,2	49,3	53,4	57,5	65,7	82,1	98,5	114,9	131,4	164,2						443	182,0
24	28					42,2	46,5	50,7	54,9	59,1	67,6	84,5	101,3	118,2	135,1	168,9	202,7					621	262,2
27	30						47,3	51,6	55,9	60,2	68,8	86,0	103,2	120,3	137,5	171,9	206,3	232,1				793	341,0
30	35							52,0	56,4	60,7	69,4	86,7	104,1	121,4	138,8	173,4	208,1	234,1	260,2			961	416,7
33	38								59,3	63,9	73,0	91,2	109,5	127,7	146,0	182,5	219,0	246,4	273,7	301,1		1130	515,5
36	40									67,6	77,2	96,5	115,8	135,1	154,4	193,0	231,6	260,6	289,5	318,5	347,4	1258	606,9
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

(blue shaded cell) = steel failure

Stud Diameter (mm)	Hole Diameter (mm)	60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720	h_{ef} failure (mm)	$F_{d,s}$ design load (kN)
		Embedment Depth hef																					
8	10	12,9	13,7																			64	13,7
10	12	15,1	17,6	20,1	21,7																	86	21,7
12	14		19,9	22,7	25,6	28,4	31,2	31,6														111	31,6
16	18			29,0	32,6	36,2	39,8	43,4	47,1	50,7	57,9	58,8										162	58,8
20	22			32,8	36,9	41,1	45,2	49,3	53,4	57,5	65,7	82,1	91,7									223	91,7
24	28					42,2	46,5	50,7	54,9	59,1	67,6	84,5	101,3	118,2	132,1							313	132,1
27	30						47,3	51,6	55,9	60,2	68,8	80,2									*1	187	80,2
30	35							52,0	56,4	60,7	69,4	86,7	98,1								*1	226	98,1
33	38								59,3	63,9	73,0	91,2	109,5	121,3							*1	266	121,3
36	40									67,6	77,2	96,5	115,8	135,1	142,8						*1	296	142,8
Depth (mm)		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720		

*1 = Tensile strength 500 N/mm²

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Design Resistance used with various stud strengths, material and rebar

A4-80 Stainless Steel Studding

(blue cell) = steel failure

Stud Diameter (mm)	Hole Diameter (mm)	60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720	h_{ef} failure (mm)	$F_{d,s}$ design load (kN)
		Embedment Depth hef																					
8	10	12,9	15,0	15,7																		73	15,7
10	12		17,6	20,1	22,6	24,8																99	24,8
12	14		19,9	22,7	25,6	28,4	31,2	34,1	36,1													127	36,1
16	18			29,0	32,6	36,2	39,8	43,4	47,1	50,7	57,9	67,2										186	67,2
20	22			32,8	36,9	41,1	45,2	49,3	53,4	57,5	65,7	82,1	98,5	104,8								255	104,8
24	28					42,2	46,5	50,7	54,9	59,1	67,6	84,5	101,3	118,2	132,1						*2	313	132,1
27	30						47,3	51,6	55,9	60,2	68,8	80,2									*1	187	80,2
30	35							52,0	56,4	60,7	69,4	86,7	98,1								*1	226	98,1
33	38								59,3	63,9	73,0	91,2	109,5	121,3							*1	266	121,3
36	40									67,6	77,2	96,5	115,8	135,1	142,8						*1	296	142,8
Depth (mm)		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660	720		

*1 = Tensile strength 500N/mm^2
*2 = Tensile strength 700N/mm^2

High bond reinforcing bars Fyk=500N/mm^2

(blue cell) = steel failure

Rebar Diameter (mm)	Hole Diameter (mm)	60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	500	560	640	720	800	h_{ef} failure (mm)	$F_{d,s}$ yield load (kN)
		Embedment Depth hef																					
8	10	8,7	10,2	11,7	13,1	14,6	16,0	17,5	19,0	20,4	21,9											150	21,9
10	12	10,4	12,1	13,8	15,6	17,3	19,0	20,7	22,5	24,2	27,6	34,1										198	34,1
12	14		13,7	15,7	17,6	19,6	21,6	23,5	25,5	27,4	31,4	39,2	47,1	49,2								251	49,2
16	20			19,3	21,7	24,1	26,5	29,0	31,4	33,8	38,6	48,3	57,9	67,6	77,2							362	87,4
20	25			21,0	23,6	26,2	28,9	31,5	34,1	36,7	42,0	52,5	63,0	73,5	84,0	105,0						521	136,6
25	30					28,3	31,1	33,9	36,8	39,6	45,2	56,6	67,9	79,2	90,5	113,1	141,4					695	196,5
28	35						33,4	36,4	39,5	42,5	48,6	60,7	72,8	85,0	97,1	121,4	151,8	170,0				882	267,8
32	40								43,1	46,5	53,1	66,4	79,6	92,9	106,2	132,7	165,9	185,8	212,3			1054	349,7
36	44									52,3	59,7	74,7	89,6	104,5	119,4	149,3	186,6	209,0	238,9	268,8		1188	443,5
40	50										66,4	82,9	99,5	116,1	132,7	165,9	207,4	232,3	265,4	298,6	331,8	1317	546,3
Depth (mm)		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	500	560	640	720	800		

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Characteristic and Design Load resistances based on characteristic bond strengths for hef 4d (minimum embedment) to 20d

	Non Cracked Concrete						Cracked Concrete						
	Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)		Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)		Nominal Embed-ment
Size	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	(mm)
(mm)	N_{rk}	V_{rk}	N_{rd}	V_{rd}	N_{rec}	V_{rec}	N_{rk}	V_{rk}	N_{rd}	V_{rd}	N_{rec}	V_{rec}	
8	19,30		12,87		9,19		7,92		5,28		3,77		60
8	**25,74**	9,00	**17,16**	7,20	**12,26**	5,14	**10,56**	9,00	**7,04**	7,20	**5,03**	5,14	**80**
8	51,47		34,31		24,51		21,11		14,07		10,05		160
10	22,62		15,08		10,77		10,40		6,94		4,96		60
10	**33,93**	15,00	**22,62**	12,00	**16,16**	8,57	**15,60**	15,00	**10,40**	12,00	**7,43**	8,57	**90**
10	75,40		50,27		35,90		34,68		23,12		16,52		200
12	29,82		19,88		14,20		13,12		8,75		6,24		70
12	**46,86**	21,00	**31,24**	16,80	**22,31**	12,00	**20,62**	21,00	**13,75**	16,80	**9,82**	12,00	**110**
12	102,24		68,16		48,69		44,98		29,98		21,42		240
16	43,43		28,95		20,68		17,37		11,58		8,27		80
16	**67,86**	39,00	**45,24**	31,20	**32,31**	22,29	**27,14**	39,00	**18,10**	31,20	**12,93**	22,29	**125**
16	173,72		115,81		82,72		69,50		46,33		33,10		320
20	55,42		36,95		26,39		21,06		14,04		10,00		90
20	**104,68**	61,00	**69,79**	48,80	**49,85**	34,86	**39,78**	61,00	**26,52**	48,80	**18,94**	34,86	**170**
20	246,30		164,20		117,29		93,60		62,40		44,59		400
24	63,33		42,22		30,16		22,80		15,20		10,86		100
24	**133,00**	88,00	**88,67**	70,40	**63,33**	50,29	**47,88**	88,00	**31,92**	70,40	**22,80**	50,29	**210**
24	304,01		202,67		144,76		109,44		72,96		52,12		480
27	70,91		47,27		33,77		24,11		16,07		11,48		110
27	**154,72**	115,00	**103,15**	92,00	**73,68**	65,71	**52,60**	115,00	**35,07**	92,00	**25,05**	65,71	**240**
27	348,11		232,08		165,77		118,36		78,91		56,36		540
30	78,04		52,02		37,16		24,97		16,65		11,89		120
30	**182,09**	142,50	**121,39**	114,00	**86,71**	81,43	**58,27**	142,50	**38,85**	114,00	**27,75**	81,43	**280**
30	390,19		260,12		185,80		124,86		83,24		59,46		600
33	88,95		59,30		42,36								130
33	**205,27**	173,50	**136,85**	138,80	**97,75**	99,14	Not Applicable		Not Applicable		Not Applicable		**300**
33	451,60		301,07		215,05								660
36	108,57		72,38		51,70								150
36	**246,10**	212,50	**164,07**	170,00	**117,19**	121,43	Not Applicable		Not Applicable		Not Applicable		**340**
36	521,15		347,44		248,17								720

Table notes : see back page

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Bond Strength Factors

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

Concrete Strength N/mm2 (Mpa)	C15/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
non cracked fc =	0,96	1,00	1,03	1,05	1,06	1,07	1,08	1,10
cracked fc =	0,96	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	M27	M30	M33	M36
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

Influence of environmental conditions in cracked concrete

		M8	M10	M12	M16	M20	M24	M27	M30
Temp I 40°C / 24°C	Dry and Wet	0,46	0,46	0,44	0,40	0,38	0,36	0,34	0,32

Table notes : see back page

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Characteristic and Design Load resistances for REBAR based on characteristic bond strengths for hef 4d (min embedment) to 20d

	Non Cracked Concrete						Cracked Concrete						
	Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)		Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)		Nominal Embed-ment
Rebar	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	(mm)
ø	N_{rk}	V_{rk}	N_{rd}	V_{rd}	N_{rec}	V_{rec}	N_{rk}	V_{rk}	N_{rd}	V_{rd}	N_{rec}	V_{rec}	
	15,68		8,71		6,22								60
8	20,91	13,95	11,62	9,30	8,30	6,64							**80**
	41,82		23,23		16,60		Not Applicable		Not Applicable		Not Applicable		160
	18,66		10,37		7,41								60
10	27,99	21,45	15,55	14,30	11,11	10,21							**90**
	62,20		34,56		24,68								200
	24,70		13,72		9,80		10,56		5,86		4,19		70
12	38,82	31,05	21,56	20,70	15,40	14,79	16,59	31,05	9,22	20,70	6,58	14,79	**110**
	84,69		47,05		33,61		36,19		20,11		14,36		240
	31,67		17,59		12,57		13,72		7,62		5,45		80
14	45,52	42,45	25,29	28,30	18,06	20,21	19,73	42,45	10,96	28,10	7,83	20,07	**115**
	110,84		61,58		43,98		48,03		26,68		19,06		280
	34,74		19,30		13,79		15,28		8,49		6,06		80
16	54,29	55,50	30,16	37,00	21,54	26,43	23,88	55,50	13,26	37,00	9,47	26,43	**125**
	138,97		77,21		55,15		61,12		33,96		24,26		320
	37,55		20,86		14,90		16,51		9,17		6,55		80
18	70,40	69,66	39,11	46,44	27,94	33,17	30,96	69,66	17,20	46,44	12,29	33,17	**150**
	168,97		93,87		67,05		74,31		41,28		29,49		360
	36,76		20,42		14,59		19,79		11,00		7,85		90
20	69,43	86,55	38,57	57,70	27,55	41,21	37,39	86,55	20,77	57,70	14,84	41,21	**170**
	163,36		90,76		64,83		87,96		48,87		34,91		400
	44,92		24,96		17,83		24,19		13,44		9,60		100
22	85,36	104,01	47,42	69,34	33,87	49,53	45,96	104,00	25,53	69,34	18,24	49,53	**190**
	197,67		109,82		78,44		106,44		59,13		42,24		440
	51,05		28,36		20,26		27,49		15,27		10,91		100
25	107,21	135,00	59,56	90,00	42,54	64,29	57,73	135,00	32,07	90,00	22,91	64,29	**210**
	255,26		141,81		101,29		137,45		76,36		54,54		500
	61,08		33,93		24,24								112
28	152,71	168,75	84,84	112,50	60,60	80,36							**280**
	305,41		169,67		121,20								560
	77,21		42,89		30,64		Not Applicable		Not Applicable		Not Applicable		128
32	193,02	220,95	107,23	147,30	76,60	105,21							**320**
	386,04		214,47		153,19								640

Table notes : see back page

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Bond Strength Factors - REBAR

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

Concrete Strength N/mm2 (MPa)	C15/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
non cracked fc =	0,96	1,00	1,03	1,05	1,06	1,07	1,08	1,10
cracked fc =	0,96	1,00	1,03	1,05	1,06	1,07	1,08	1,09

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

Influence of environmental conditions in 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	n/a	n/a	0,43	0,43	0,43	0,43	0,53	0,53	0,53	n/a	n/a

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Material Properties for grades of other threaded rod and rebar

Stud Diameter (mm)	Stud Grade 8.8		Stud Grade 10.9		Stud Grade A4-70		Stud Grade A4-80		
	$N_{rk,s}$ (kN)	$N_{rd,s}$ (kN)	$N_{rk,s}$ (kN)	$N_{rd,s}$ (kN)	$N_{rk,s}$ (kN)	$N_{rd,s}$ (kN)	$N_{rk,s}$ (kN)	$N_{rd,s}$ (kN)	
M8	29,2	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	67,4	44,9	87,7	62,6	59,0	31,6	67,4	36,0	
M16	125,6	83,7	163,0	116,4	109,9	58,8	125,7	67,2	
M20	196,1	130,7	255,0	182,1	171,5	91,7	196,0	104,8	
M24	282,5	188,3	367,0	262,1	247,1	132,1	293,0	132,1	
M27	367,0	244,7	477,4	341,0	229,4	80,2	229,4	80,2	*1
M30	448,8	299,2	583,0	416,4	280,6	98,1	280,6	98,1	*1
M36	653,6	435,7	849,7	606,9	408,4	142,8	408,4	142,8	*1

*1 = Tensile strength 500N/mm²

Stud Diameter (mm)	Stud Grade 8.8		Stud Grade 10.9		Stud Grade A4-70		Stud Grade A4-80	
	$V_{rk,s}$ (kN)	$V_{rd,s}$ (kN)	$V_{rk,s}$ (kN)	$V_{rd,s}$ (kN)	$V_{rk,s}$ (kN)	$V_{rd,s}$ (kN)	$V_{rk,s}$ (kN)	$V_{rd,s}$ (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
M27	183,5	146,8	238,7	191,0	114,7	48,4	114,7	48,4
M30	224,4	179,5	291,5	215,9	140,3	59,2	140,3	59,2
M36	326,8	261,4	424,8	283,2	204,2	86,2	204,2	86,2

Rebar Diameter (mm)	Rebar BSt 500 to DIN 488		Rebar BSt 500 to DIN 488	
	$N_{rk,s}$ (kN)	$N_{rd,s}$ (kN)	$V_{rk,s}$ (kN)	$V_{rd,s}$ (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
14	84,4	67,0	42,5	28,3
16	111,0	79,3	55,5	37,0
18	139,5	100,0	70,0	46,7
20	173,0	123,6	86,5	57,7
22	208,3	149,3	104,5	69,7
25	270,0	192,9	135,0	90,0
28	339,0	242,1	169,0	112,7
32	442	315,7	221	147,3
36	563,2	443,5	281,6	187,7
40	693,8	546,3	346,9	231,3

More notes : see back page

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Effect of Anchor Spacing - Tension

Anchor Spacing	Stud / Rebar Diameter										
(mm)	8	10	12	16	20	24	27	30	33	36	40
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	0,64	0,63			
160	1,00	0,88	0,82	0,74	0,70	0,66	0,65	0,63	0,62		0,63
180		0,93	0,86	0,77	0,72	0,68	0,65	0,65	0,64	0,64	0,64
200		1,00	0,90	0,80	0,74	0,69	0,67	0,66	0,65	0,65	0,65
225			0,95	0,84	0,77	0,72	0,69	0,68	0,67	0,67	0,66
240			1,00	0,86	0,79	0,73	0,71	0,69	0,69	0,68	0,67
250				0,87	0,80	0,74	0,72	0,70	0,70	0,68	0,68
275				0,91	0,83	0,76	0,74	0,72	0,72	0,70	0,69
280				0,92	0,84	0,77	0,75	0,73	0,72	0,70	0,69
300				0,95	0,86	0,79	0,76	0,74	0,74	0,72	0,71
320				1,00	0,88	0,81	0,78	0,76	0,75	0,73	0,72
350					0,92	0,83	0,81	0,78	0,78	0,75	0,73
400					1,00	0,88	0,86	0,82	0,82	0,78	0,76
440						0,92	0,89	0,85	0,85	0,81	0,79
460						1,00	0,91	0,87	0,87	0,82	0,80
500							0,95	0,90	0,90	0,85	0,82
540							1,00	0,93	0,93	0,88	0,84
560								1,00	0,95	0,89	0,86
620									1,00	0,93	0,89
660										1,00	0,91
720											1,00

Effect of Edge Distance - Tension

Edge Distance	Stud / Rebar Diameter										
(mm)	8	10	12	16	20	24	27	30	33	36	40
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	0,63			
160				1,00	0,84	0,72	0,70	0,65	0,62		
180					0,91	0,78	0,75	0,66	0,70	0,67	0,68
200					1,00	0,84	0,81	0,76	0,76	0,78	0,71
220						0,89	0,86	0,81	0,81	0,82	0,75
240						1,00	0,92	0,86	0,86	0,87	0,78
270							1,00	0,94	0,94	0,93	0,83
280								1,00	0,97	0,96	0,85
310									1,00	0,98	0,90
330										1,00	0,93
360											1,00

Effect of Edge Distance - Shear

Edge Distance	Stud / Rebar Diameter										
(mm)	8	10	12	16	20	24	27	30	33	36	40
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	0,44	0,30			
160					0,91	0,62	0,57	0,35	0,34		
180					1,00	0,77	0,69	0,46	0,41	0,33	
200						0,92	0,82	0,57	0,50	0,42	0,32
220						1,00	0,94	0,68	0,59	0,51	0,53
240							1,00	0,78	0,68	0,60	0,59
280								1,00	0,86	0,78	0,72
310									1,00	0,91	0,82
330										1,00	0,89
360											1,00

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Post installed rebar connections

Minimum anchorage length [1)] and lap splice length for C20/25 and maximum installation length (l_{max})

Rebar		$l_{b,min}$ (mm)	$l_{0,min}$ (mm)	$l_{max,min}$ (mm)
Ø d_s (mm)	$f_{y,k}$ (N/mm²)			
8	500	113	200	1000
10	500	142	204	1000
12	500	170	200	1200
14	500	198	210	1400
16	500	227	240	1600

N/mm² = MPa

1) According to EN 1992-1-1:2004 $l_{b,min}$ (8.6) and $l_{0,min}$ (8.11) for good bond conditions and a_δ = 1,0 with maximum yield stress for rebar B500 B and γ_M = 1,15

Design values of the ultimate bond resistance f_{bd} [1)] in N/mm² for all drilling methods for good conditions

Rebar Ø	Concrete Class								
Ø d_s	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/60	C50/60
8 mm	1,6	2	2,3	2,3	2,3	2,3	2,3	2,3	2,3
10 mm	1,6	2	2,3	2,3	2,3	2,7	2,7	2,7	2,7
12 mm	1,6	2	2,3	2,3	2,3	2,7	2,7	2,7	2,7
14 mm	1,6	2	2,3	2,7	3	3	3	3	3
16 mm	1,6	2	2,3	2,7	3	3,4	3,7	4	4,3

1) Tabulated values for fbd are valid for good bond condition according to EN1992-1-1:2004. For all other bond conditions multiply the values for fbd by 0.7.

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Post installed rebar connections

Values for pre-calculation of anchoring

Rebar - Ø ds	$\alpha_1=\alpha_2=\alpha_3=\alpha_4=\alpha_5=1.0$			α_2 or $\alpha_5=0.7$; $\alpha_1=\alpha_3=\alpha_4=1.0$		
	Anchorage length l_{bd}	Design value N_{rd}	Mortar volume	Anchorage length l_{bd}	Design value N_{rd}	Mortar volume
(mm)	(mm)	(kN)	(ml)	(mm)	(kN)	(ml)
8	163*	9,42	12	163*	9,42	12
	180	10,40	14	175	10,11	13
	250	14,44	19	190	10,98	14
	378	21,84	28	265	15,31	20
10	204*	14,73	18	204*	14,73	18
	220	15,89	20	220	15,89	20
	310	22,39	28	240	17,33	22
	390	28,17	35	280	20,22	25
	473	34,16	43	331	23,90	30
12	170*	14,73	18	170*	14,73	18
	270	23,40	29	230	19,93	24
	370	32,07	39	280	24,27	30
	470	40,73	50	340	29,47	36
	567	49,14	60	397	34,41	42
14	198*	20,02	24	198*	20,02	24
	310	31,34	37	260	26,29	31
	430	43,48	52	330	33,37	40
	550	55,61	66	400	40,44	48
	662	66,93	80	463	46,81	56
16	227*	26,23	31	227*	26,23	31
	360	41,60	49	300	34,67	41
	490	56,62	67	380	43,91	52
	620	71,64	84	450	52,00	61
	756	87,36	103	529	61,13	72

* Minimum anchorage length. The design value is valid for "good bond conditions" according to EN 1992-1-1.
All other condition: multiply value by 0.7. Mortar volume based on equation: $V = 1.2 \cdot (d_0^2 - d_d^2) \cdot \pi \cdot l_b / 4$

Example For:
C20/25;
good bond condition;
Rebar Yield Strength
500 N/mm^2 (500 MPa)

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Post installed rebar connections

Values for pre-calculation of overlap joints

Rebar - Ø ds	$\alpha_1=\alpha_2=\alpha_3=\alpha_4=\alpha_5=1.0$			α_2 or $\alpha_5=0.7$; $\alpha_1=\alpha_3=\alpha_4=1.0$		
	Anchorage length l_{bd}	Design value N_{rd}	Mortar volume	Anchorage length l_{bd}	Design value N_{rd}	Mortar volume
(mm)	(mm)	(kN)	(ml)	(mm)	(kN)	(ml)
8	200	11,56	15	200	11,56	15
	240	13,87	18	220	12,71	17
	290	16,76	22	230	13,29	17
	378	21,84	29	265	15,31	20
10	204	10,25	18	204	14,73	18
	270	13,56	24	230	16,61	21
	340	17,08	31	270	19,50	24
	400	20,10	36	300	21,67	27
	473	23,76	43	331	23,90	30
12	200	17,33	21	200	17,33	21
	290	25,13	31	250	21,67	26
	380	32,93	40	300	26,00	32
	480	41,60	51	350	30,33	37
	567	49,14	60	397	34,41	42
14	210	21,23	25	210	21,23	25
	320	32,35	39	270	27,30	33
	440	44,49	53	340	34,38	41
	550	55,61	66	400	40,44	48
	662	66,93	80	463	46,81	56
16	240	27,73	33	240	27,73	33
	370	42,75	50	310	35,82	42
	500	57,78	68	380	43,91	52
	630	72,80	86	460	53,15	62
	756	87,36	103	529	61,13	72

* Minimum anchorage length. The design value is valid for "good bond conditions" according to EN 1992-1-1.
All other condition: multiply value by 0.7. Mortar volume based on equation: $V = 1.2 \cdot (d_0^2 - d_d^2) \cdot \pi \cdot l_b / 4$

Example For:

C20/25;
good bond condition;
Rebar Yield Strength
500 N/mm^2 (500 MPa)

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Post installed rebar schematics

Application examples of post-installed rebar

Figure 1: Overlap joints in slabs and beams.

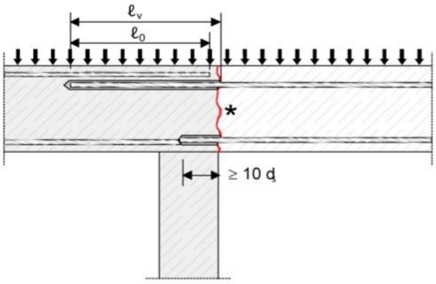


Figure 2: Overlap joint in foundation of a column or wall where the rebars are stressed in tension.

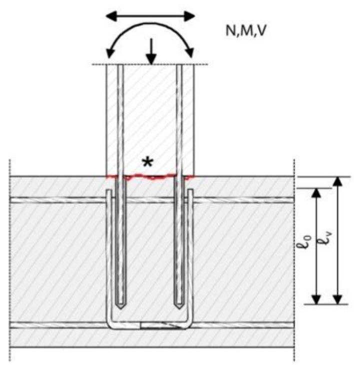


Figure 3: End anchoring of slabs or beams, designed as simply supported.

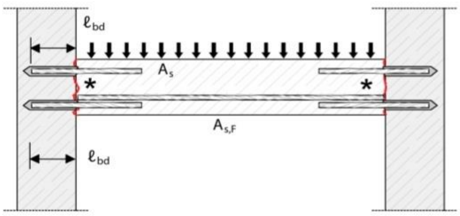


Figure 4: Rebar connection of components stressed primarily in compression. The rebar are stressed in compression.

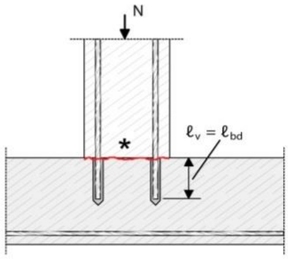
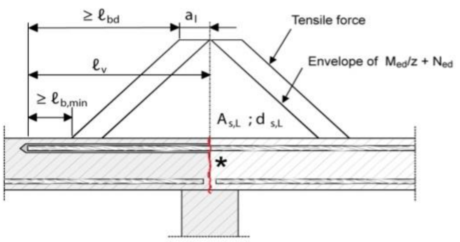


Figure 5: Anchoring of reinforcement to cover the line of acting tensile force.



Note to figure 1 to 5 :
In the figures no transverse reinforcement is plotted, the transverse reinforcement as required by EC 2 shall be present.
The shear transfer between old and new concrete shall be designed according to EC2. Description of the bonded-in rebars and overlap joints see Annex 4 and 5.

*** Roughened joint**

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Minimum Curing Time

Concrete Temperature	Gel - Working Time	Minimum curing time in dry concrete	Minimum curing time in wet concrete
- 10°C *	50 min	240 min	x2
-5°C *	40 min	180 min	x2
5°C	20 min	90 min	x2
15°C	9 min	60 min	x2
25°C	5 min	30 min	x2
35°C	3 min	20 min	x2

* Resin temperature must be at least 20°C

- Full cure 24 hours

- 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

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.

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Characteristic and recommended loads for masonry

The design details are fully disclosed in the ETA. The recommended load are valid under the following conditions:

- dry environment
- masonry mortar class more than M2.5
- space distance s ≥ scr
- edge distance c ≥ ccr
- joints (vertical and horizontal) are visible and filled with mortar
- no pre-stressing force on the wall
- steel strength of anchor 5.8 or higher
- no interaction of tension and shear loads considered
- temperature range from -40 to +40°C

Brick type and strength: solid clay brick with compressive strength ≥ 18 Mpa — **Bulk density 1,60 kg/dm3**

Brick "Mattone Pieno"

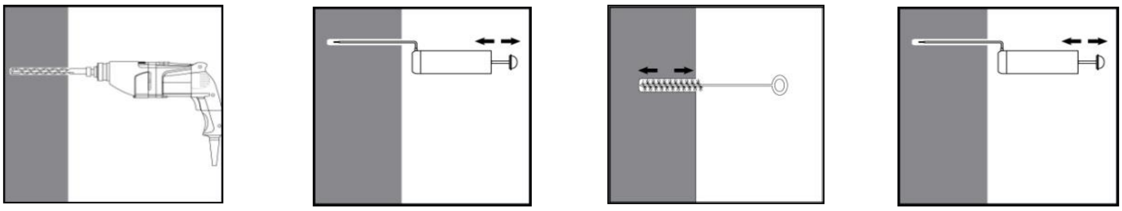
			M6	**M8**	**M10**	**M12**
Anchorage depth	h_{ef}	mm	80	80	85	85
Drill diameter (hole diameter)	d_0	mm	8	10	12	14
Minimum wall thickness	h_{min}	mm	h_{ef} + 5mm			
Minimal space distance	s_{min}	mm	240		255	
Minimal edge distance	c_{min}	mm	120		127,5	
Critical space distance	$s_{cr,N}$	mm	240		255	
Critical edge distance	$c_{cr,N}$	mm	120		127,5	
Installation torque	T_{ins}	Nm	1			
Characteristic tension load	N rk	kN	4	4	5	5
Recommended tension load	N rec	kN	1,14		1,43	
Characteristic shear load	V rk	kN	2	2	6	6
Recommended shear load	V rec	kN	0,57		1,71	

Brick type and strength: hollow brick with compressive strength ≥ 6 Mpa — **Bulk density 0,9 kg/dm3**

Brick "Doppio UNI"

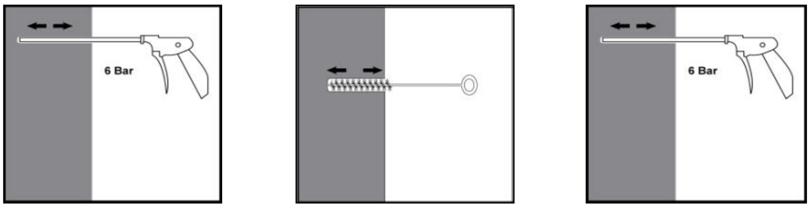
			M6	**M8**	**M10**	**M12**
Sleeve dimension (nylon or plastic)		mm	12 x 80		16 x 85	
Anchorage depth	h_{ef}	mm	80	80	85	85
Drill diameter (hole diameter)	d_0	mm	12	12	16	16
Minimum wall thickness	h_{min}	mm	h_{ef} + 5mm			
Critical space distance parallel to horizontal joint	$s_{cr,\parallel}$	mm	250	250	250	250
Critical space distance perpendicular to horizontal joint	$s_{cr,\perp}$	mm	120	120	120	120
Minimal space distance parallel to horizontal joint	$s_{min,\parallel}$	mm	250			
Minimal space distance perpendicular to horizontal joint	$s_{min,\perp}$	mm	120			
Critical edge distance	c_{cr}	mm	100	100	100	100
Minimal edge distance	c_{min}	mm	100			
Installation torque	T_{ins}	Nm	2			
Characteristic tension load	N rk	kN	0,75	0,75	1,5	1,5
Recommended tension load	N rec	kN	0,21		0,43	
Characteristic shear load	V rk	kN	1,5	1,5	1,5	1,5
Recommended shear load	V rec	kN	0,43			

Installation parameters: drilling hole cleaning and installation

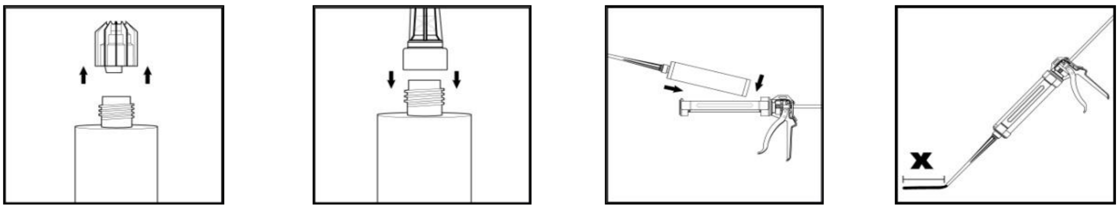


Drill hole in the substrate to the required embedment depth using the appropriately sized carbide drill bit. Bore hole cleaning Just before setting an anchor, the bore hole must be free of dust and debris. The manual pump shall be used for blowing out bore holes up to diameters do ≤ 24mm and embedment 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.

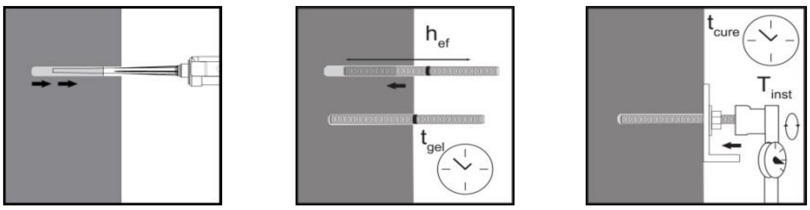
Compressed air cleaning (CAC) for all bore hole diameters do and all bore hole depths



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. Make 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 12ml of resin. Please note that after every subsequent mixer change, an initial 12ml of resin should be extruded to waste to continue with even mixing.



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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Cleaning
Use PENOSIL Cleaning Wipes or organic solvents such as acetone or white spirits for removing uncured adhesive sealant.
Cured adhesive sealant should be removed mechanically.

Colour
Grey.

Package
300ml Coaxial Cartridges, 12 pcs in box.

Safety regulations
Ensure sufficient ventilation during application. Avoid contact with skin and eyes. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Keep out of the reach of children. More information is available on the product safety data sheet (SDS).

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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 (700MPa)

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

PAGE 6 AND 8:

Characteristic and Design Load resistances based on characteristic bond strengths for hef 4d (minimum embedment) to 20d

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)

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

PAGE 7 AND 9:

Bond Strength Factors

Select concrete strength and environmental condition and apply to bond strength table on page 4

PAGE 10:

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. >M27 for A4-70 tensile strength of 500N/mm2, instead of 700N/mm^2

M30 for A4-70 tensile strength of 500N/mm^2 (500MPa), instead of 700N/mm^2 (700MPa)

Safety factor is 1.5 tension and 1.25 shear for all carbon steel

Safety factor is 1.87 for stainless steel, up to M24, M27 to M36 is 2.86

Safety factor is 1.56 for stainless steel in shear, up to M24, M27 to M36 is 2.37

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

Partial Safety Factors for pages 2,3,4,5,6,7:

1.5 for all sizes studs

1.8 for all sizes rebar