











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

**A4-80 Stainless Steel Studding**

Stud Diameter (mm)	Hole Diameter (mm)	Embedment Depth hef (mm)																			hef failure (mm)	F <sub>d,s</sub> design load (kN)	
		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	480	540	600	660			720
8	10	6.9	8.1	9.2	10.4	11.5	12.7	13.8	15.0	15.7											136	15.7	
10	12		9.0	10.3	11.6	12.9	14.2	15.5	16.7	18.0	20.6	24.8									193	24.8	
12	14		10.8	12.4	13.9	15.5	17.0	18.6	20.1	21.6	24.7	30.9	36.1								233	36.1	
16	18			15.5	17.4	19.4	21.3	23.2	25.2	27.1	31.0	38.7	46.5	54.2	61.9						347	67.2	
20	24			17.1	19.2	21.4	23.5	25.6	27.8	29.9	34.2	42.7	51.3	59.8	68.4	85.5					491	104.8	
24	28				21.5	23.6	25.8	27.9	30.1	34.4	43.0	51.6	60.2	68.8	86.0	103.2					615	132.1	
27	32					25.2	27.5	29.8	32.1	36.6	45.8	55.0	64.1	73.3	80.2						2	350	80.2
30	35						27.1	29.4	31.7	36.2	45.2	54.3	63.3	72.4	90.5	98.1					2	434	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 F<sub>yk</sub>=500N/mm<sup>2</sup>**

Rebar Diameter (mm)	Hole Diameter (mm)	Embedment Depth hef (mm)																			hef failure (mm)	F <sub>d,s</sub> yield load (kN)	
		60	70	80	90	100	110	120	130	140	160	200	240	280	320	400	500	560	640	720			800
8	12	6.1	7.1	8.1	9.1	10.1	11.1	12.2	13.2	14.2	16.2										216	21.9	
10	14	7.3	8.5	9.7	10.9	12.1	13.3	14.6	15.8	17.0	19.4	24.3									281	34.1	
12	16		9.1	10.4	11.7	13.0	14.3	15.6	16.9	18.2	20.8	25.9	31.1								379	49.2	
16	20			12.7	14.3	15.9	17.5	19.1	20.7	22.3	25.5	31.9	38.2	44.6	51.0						549	87.4	
20	25			13.6	15.3	17.0	18.7	20.4	22.1	23.8	27.1	33.9	40.7	47.5	54.3	67.9					805	136.6	
25	30				17.8	19.5	21.3	23.1	24.9	28.4	35.5	42.6	49.7	56.8	71.0	88.8					1107	196.5	
28	35					20.6	22.5	24.4	26.2	30.0	37.5	45.0	52.5	60.0	75.0	93.7	104.9				1429	267.8	
32	40						25.5	27.4	31.4	39.2	47.1	54.9	62.7	78.4	98.0	109.8	125.5				1783	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/mm<sup>2</sup>
- \*2 = Tensile strength 700N/mm<sup>2</sup>



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

Size (mm)	Non Cracked Concrete						Cracked Concrete						Nominal Embedment (mm)
	Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)		Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)		
	Tension $N_{rk}$	Shear $V_{rk}$	Tension $N_{rd}$	Shear $V_{rd}$	Tension $N_{rec}$	Shear $V_{rec}$	Tension $N_{rk}$	Shear $V_{rk}$	Tension $N_{rd}$	Shear $V_{rd}$	Tension $N_{rec}$	Shear $V_{rec}$	
8	14.85	9.00	6.87	7.20	4.91	5.14	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	60
	19.80		9.17		6.55								80
	39.60		18.33		13.10								160
10	16.57	15.00	7.67	12.00	5.48	8.57	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	60
	24.85		11.50		8.22								90
	55.22		25.56		18.26								200
12	21.82	21.00	10.10	16.80	7.22	12.00	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	70
	34.29		15.88		11.34								110
	74.82		34.64		24.74								240
16	31.54	39.00	14.60	31.20	10.43	22.29	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	80
	49.28		22.81		16.30								125
	126.17		58.41		41.72								320
20	41.20	61.00	19.07	48.80	13.62	34.86	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	90
	77.82		36.03		25.73								170
	183.10		84.77		60.55								400
24	46.31	88.00	21.44	70.40	15.31	50.29	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	100
	97.26		45.03		32.16								210
	222.30		102.92		73.51								480
18 mont	57.70	142.50	26.71	114.00	19.08	81.43	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	120
	134.66		62.34		44.53								280
	288.56		133.59		95.42								600

**Table notes** : see back page



## Bond Strength Factors

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

Concrete Strength N/mm <sup>2</sup>	C15/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
Non-Cracked $f_c =$	0.97	1.00	1.02	1.04	1.07	1.10	1.12	1.15

### 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	0.90	0.88	0.87	0.86	0.85	0.84	0.82

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

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

Rebar Ø	Non Cracked Concrete						Cracked Concrete						Nominal Embedment (mm)																		
	Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)		Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)																				
	Tension N <sub>rk</sub>	Shear V <sub>rk</sub>	Tension N <sub>rd</sub>	Shear V <sub>rd</sub>	Tension N <sub>rec</sub>	Shear V <sub>rec</sub>	Tension N <sub>rk</sub>	Shear V <sub>rk</sub>	Tension N <sub>rd</sub>	Shear V <sub>rd</sub>	Tension N <sub>rec</sub>	Shear V <sub>rec</sub>																			
8	12.87	13.95	6.13	9.30	4.38	6.64	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	60																		
	17.16		8.17		5.84								80																		
	34.33		16.35		11.68								160																		
10	15.40	21.45	7.33	14.30	5.24	10.21							Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	60												
	23.10		11.00		7.86														90												
	51.38		24.47		17.48														200												
12	19.20	31.05	9.14	20.70	6.53	14.79													Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	70						
	30.18		14.37		10.27																				110						
	65.86		31.36		22.40																				240						
16	26.98	55.50	12.85	37.00	9.18	26.43																			Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	80
	42.15		20.07		14.34																										125
	107.90		51.38		36.70																										320
20	31.20	86.55	14.86	57.70	10.61	41.21	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable																			90
	58.93		28.06		20.04																										170
	138.68		66.04		47.17																										400
25	37.56	135.00	17.89	90.00	12.78	64.29							Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable													100
	78.87		37.56		26.83																										210
	187.78		89.42		63.87																										500
18 mont	44.82	168.75	21.34	112.50	15.24	80.36													Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable							112
	112.06		53.36		38.12																										280
	224.11		106.72		76.23																										560
32	52.32	220.95	24.91	147.30	17.80	105.22																			Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	128
	130.79		62.28		44.49																										320
	261.58		124.56		88.97																										640

**Table notes** : see back page





## Bond Strength Factors - REBAR

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

Concrete Strength N/mm <sup>2</sup> (MPa)	C15/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
non cracked $f_c$ =	0.97	1.00	1.02	1.04	1.07	1.10	1.12	1.15

### Influence of environmental conditions in non cracked concrete

		Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	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
Temp II 80°C / 50°C	Dry and Wet	0.90	0.90	0.88	0.88	0.86	0.86	0.84	0.84

The Sh **Table notes** : see back page



**Material Properties for grades of threaded rod**

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)
<b>M8</b>	29.2	19.5	38.1	27.2	25.6	13.7	29.2	15.6
<b>M10</b>	46.4	30.9	60.3	43.1	40.6	21.7	46.4	24.8
<b>M12</b>	67.4	44.9	87.7	62.6	59.0	31.6	67.4	36.0
<b>M16</b>	125.6	83.7	163.0	116.4	109.9	58.8	125.7	67.2
<b>M20</b>	196.1	130.7	255.0	182.1	171.5	91.7	196.0	104.8
<b>M24</b>	282.5	188.3	367.0	262.1	247.1	132.1	293.0	132.1
<b>M30</b>	448.8	299.2	583.0	416.4	280.5	150.0	392.7	210.0

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)
<b>M8</b>	14.6	11.7	19.0	15.2	12.8	8.2	14.6	9.4
<b>M10</b>	23.2	18.6	30.2	24.1	20.3	13.0	23.2	14.9
<b>M12</b>	33.7	27.0	43.8	35.1	29.5	18.9	33.7	21.6
<b>M16</b>	62.8	50.2	81.6	65.3	55.0	35.2	62.8	40.3
<b>M20</b>	98.0	78.4	127.4	101.9	85.8	55.0	98.0	62.8
<b>M24</b>	141.2	113.0	183.6	146.8	123.6	79.2	141.2	90.5
<b>M30</b>	224.4	179.5	291.5	215.9	140.3	89.9	196.4	125.9

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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)
<b>8</b>	28.0	20.0	14.0	9.3
<b>10</b>	43.0	30.7	21.5	14.3
<b>12</b>	62.0	44.3	31.0	20.7
<b>14</b>	85.0	60.7	42.5	28.3
<b>16</b>	111.0	79.3	55.5	37.0
<b>20</b>	173.0	123.6	86.5	57.7
<b>25</b>	270.0	192.9	135.0	90.0
<b>32</b>	442	315.7	221	147.3



### Effect of Anchor Spacing - Tension

Anchor Spacing (mm)	Stud / Rebar Diameter						
	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	0.64
175		0.92	0.85	0.76	0.71	0.68	0.65
200		1.00	0.90	0.80	0.74	0.71	0.68
225			0.95	0.84	0.77	0.74	0.70
240			1.00	0.86	0.79	0.76	0.72
250				0.87	0.80	0.77	0.73
275				0.91	0.83	0.80	0.75
280				0.92	0.84	0.80	0.76
300				0.95	0.86	0.82	0.78
320				1.00	0.88	0.85	0.80
350					0.92	0.88	0.83
400					1.00	0.94	0.88
425						0.97	0.90
450						1.00	0.93
480							0.96
520							1.00

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### Effect of Edge Distance - Tension

Edge Distance (mm)	Stud / Rebar Diameter						
	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	0.68	0.63
160				1.00	0.84	0.76	0.66
180					0.91	0.84	0.72
200					1.00	0.92	0.78
225						1.00	0.86
250							0.94
260							1.00

### Effect of Edge Distance - Shear

Edge Distance (mm)	Stud / Rebar Diameter						
	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	0.45	0.30
160					0.91	0.58	0.36
180					1.00	0.71	0.47
200						0.84	0.59
225						1.00	0.74
250							0.88
280							1.00



### 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
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.

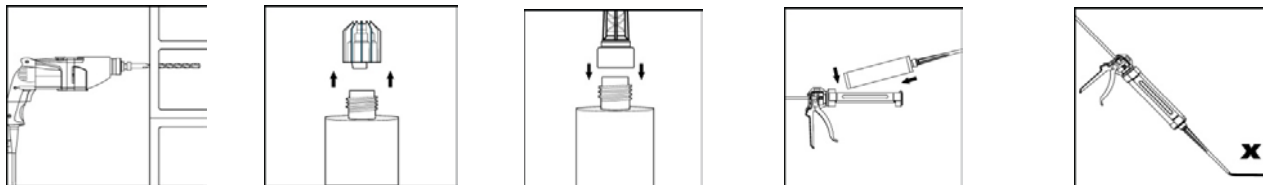
**Long term temperature:** Temperature, within the service temperature range, which will be approximately constant over significant periods of time.

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

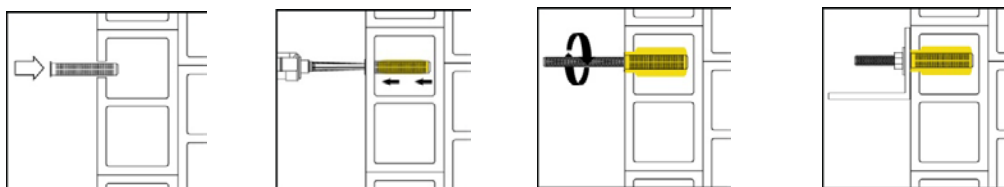
### The Shelf life of the product is 18 months from the manufacture date.

	N/mm2	Test Method
Compressive Strength	41.8	EN ISO 604 / ASTM 695
Flexural Strength	14.1	EN ISO 178 / ASTM 790
Flexural Modulus	2589.6	EN ISO 178 / ASTM 790
Tensile Strength	7.4	EN ISO 527 / ASTM 638
E Modulus	4365.5	EN ISO 527 / ASTM 638
VOC Content	A+ Rating	-

**Installation parameters: drilling hole cleaning and installation HOLLOW WALL**



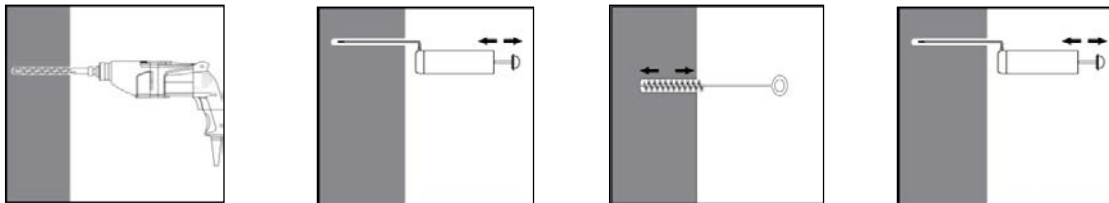
Drill hole in the substrate to the required embedment depth using the appropriately sized carbide drill bit. Bore hole cleaning Just before setting an anchor, the bore hole must be free of dust and debris. Remove the threaded cap from the cartridge. Tightly attach the mixing nozzle. Do not modify the 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 10ml of resin until an even colour is achieved.



Introduce the sleeve of suitable dimensions. Insert the nozzle to the end of the sleeve and inject the resin so long till the sleeve will fill into 100%. Insert the anchor, slowly with a slight twisting motion into the sleeve. Remove excess resin and leave the fixing until minimum curing (loading) times has elapsed.

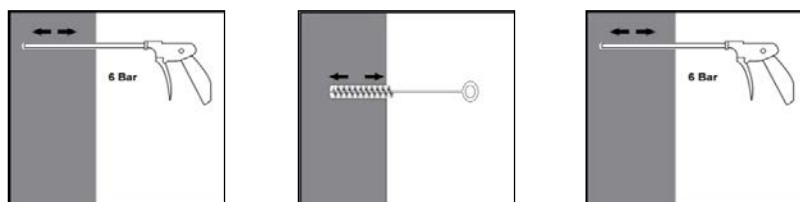
The Shelf life of the product is 18 months from the manufacture date.

**Installation parameters: drilling hole cleaning and installation**

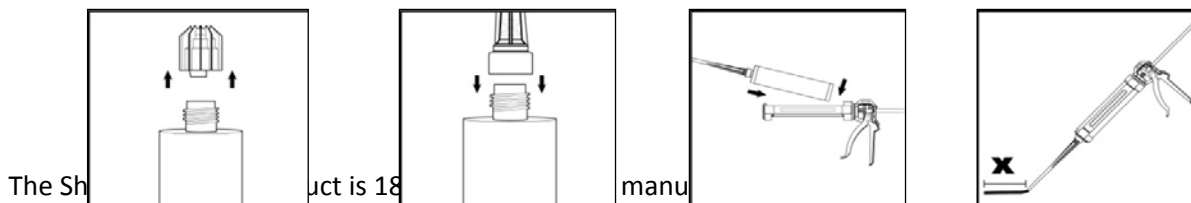


Drill hole in the substrate to the required embedment depth using the appropriately sized carbide drill bit. Bore hole cleaning Just before setting an anchor, the bore hole must be free of dust and debris. The manual pump shall be used for blowing out bore holes up to diameters  $d_o \leq 24\text{mm}$  and embedment depths up to  $h_{ef} \leq 10d$ . 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.

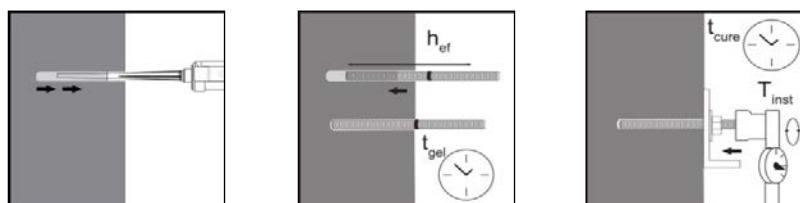
Compressed air cleaning (CAC) for all bore hole diameters  $d_o$  and all bore hole depths



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  $6\text{ m}^3/\text{h}$ ). 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  $t_{gel}$  has elapsed. The working time  $t_{gel}$  is given in Table 7. The anchor can be loaded after the required curing time  $t_{cure}$  (see Table 7). The applied torque shall not exceed the values  $T_{max}$  given in Table 1.



## 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

hef range minimum or 4d whichever is greatest to 20d

Concrete strength C20/25 -  $f_c$  cube = 25N/mm<sup>2</sup> (25MPa)

5.8 grade stud

Temperature range i maximum long term / short term temperature +24/40°C

PAGE 3 :

### ***Design Resistance with various stud strengths, material and rebar.***

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

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

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

PAGE 4 and 6 :

### ***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

hef range minimum or 4d whichever is greatest to 20d

Concrete strength C20/25 -  $f_c$  cube = 25N/mm<sup>2</sup> (25MPa)

Temperature range i maximum long term / short term temperature +24/40°C

PAGE 5 & 7 :

### ***The Shelf life of the product is 18 months from the manufacture date.***

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

PAGE 8 :

### ***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/mm<sup>2</sup> (500MPa), instead of 700N/mm<sup>2</sup> (700MPa)

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

Safety factor is 1.56 for stainless steel, up to M24, M30 and M36 is 2.0

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 :**

1.8 for all sizes studs

1.8 for all sizes rebar