

RES-TECH VNSF 410

Features and Benefits

Version 23/12/2013

- 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 concrete
- Used in critical or overhead applications
- Used in corrosive environments
- ETA tested based on life of anchor 50 years
- Used for elevated temperatures - temperature ranges I, II and III
- Used for post installed rebar installations under TR029 and TR023
- 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

- PAGE 1 - Features and Benefits
- PAGE 2 - Loads, Edge and Spacings based on Characteristic bond strengths Showing steel failure
- PAGE 3 - Design Resistance of resin used with various stud strengths, material and rebar.
- PAGE 4 - Characteristic and Design load resistances based on characteristic bond strengths for hef 4d (minimum embedment) to 20d
- PAGE 5 - Bond Strength Factors
- PAGE 6 - Characteristic and Design load resistances for REBAR based on characteristic bond strengths for hef 4d (minimum embedment) to 20d
- PAGE 7 - Bond Strength Factors for REBAR
- PAGE 8 - Material properties for threaded rods and rebar
- PAGE 9 - Tension Edge and Spacing reduction factors
- PAGE 10 - Curing Time / Temperature Range
- PAGE 11 - Installation parameters: drilling hole cleaning and installation

Shelf Life and Storage

This product should be stored between +5°C & +25°C.

The Shelf life of the product is 12 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.



RES-TECH VNSF 410

Product Description

RES-TECH VNSF 410 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 very high loads and critical and overhead fixings especially in corrosive environments, or damp conditions.

Available in sizes : 410ml Coaxial Cartridges

Specific Benefits

- European Approved
- High loads possible
- High chemical resistance
- Use with potable water
- Studs and rebar
- Cracked or Non-Cracked
- Concrete fixings
- Styrene Free Low odour
- Fire approved
- Suitable underwater

Approvals

- ETA Option 7 ETAG 001 for uncracked concrete with studs and rebar TR029
- ETA Option 1 ETAG 001 for cracked concrete with studs
- ETA for post installed Rebar TR023
- WRC Water Approval BS 6920
- Tested by Imperial College London

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

Size (mm)	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)
	Tension	Shear	Tension	Shear	Tension	Shear	Edge	Spacing	Edge					
	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}				
8	19.00		12.70		9.07						60			
	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			
10	22.62		15.08		10.77						60			
	30.20	15.00	20.10	12.00	14.36	8.57	100	200	90	50	90	12	12	20
	30.20		20.10		14.36						200			
12	29.82		19.88		14.20						70			
	43.80	21.00	29.20	16.80	20.86	12.00	120	240	110	60	110	14	14	40
	43.80		29.20		20.86						240			
16	43.43		28.95		20.68						80			
	67.86	39.00	45.24	31.20	32.31	22.29	160	320	125	80	125	18	18	80
	81.60		54.40		38.86						320			
20	55.42		36.95		26.39						90			
	104.68	61.00	69.79	48.80	49.85	34.86	200	400	180	100	170	24	22	120
	127.40		84.90		60.64						400			
24	63.33		42.22		30.16						100			
	133.00	88.00	88.67	70.40	63.33	50.29	230	460	220	120	210	28	26	160
	183.60		122.40		87.43						480			
27	70.91		47.27		33.77						110			
	154.72	115.00	103.15	92.00	73.68	65.71	270	540	240	135	240	32	30	180
	230.00		153.33		109.52						540			
30	78.04		52.02		37.16						120			
	182.09	142.50	121.39	114.00	86.71	81.43	280	560	280	150	280	35	32	200
	280.00		186.67		133.34						600			
33	88.95		59.30		42.36						130			
	205.27	173.50	136.85	138.80	97.75	121.43	310	620	310	165	300	37	36	250
	347.00		231.33		165.24						660			
36	108.57		72.38		51.70						150			
	246.10	212.50	164.07	170.00	117.19	121.43	330	660	330	180	340	40	38	300
	425.00		283.33		202.38						720			

 = steel failure

Table notes : see back page

RES-TECH VNSF 410

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

5.8 Grade Steel Studding

Stud Diameter	Hole Diameter													h_{ef} Failure	$F_{d,s}$ Design Load		
(mm)	(mm)													(mm)	(kN)		
8	10	8.6	10.7	12.7									59	12.7			
10	12	10.1	12.6	15.1	20.1								80	20.1			
12	14		14.2	17.0	22.7	28.4	29.2						103	29.2			
16	18					29.0	36.2	45.2	54.4					150	54.4		
Depth (mm)		40	50	60	80	100	125	160	200	240	280	320					
20	24	32.8	41.1	49.3	61.6	73.9	84.9									207	84.9
24	28		42.2	50.7	63.3	76.0	88.7	101.3	122.4							290	122.4
27	32		43.0	51.6	64.5	77.4	90.3	103.2	128.9	150.4	159.1					370	159.1
30	35			52.0	65.0	78.0	91.1	104.1	130.1	151.8	173.4	194.5				449	194.5
33	37			54.7	68.4	82.1	95.8	109.5	136.9	159.7	182.5	219.0	240.6			527	240.6
36	40					72.4	86.9	101.3	115.8	144.8	168.9	193.0	231.7	283.2			587
Depth (mm)		80	100	120	150	180	210	240	300	350	400	480	600	660	720		

8.8 Grade Steel Studding

Stud Diameter	Hole Diameter													h_{ef} Failure	$F_{d,s}$ Design Load		
(mm)	(mm)													(mm)	(kN)		
8	10	8.6	10.7	12.9	17.2	19.5							91	19.5			
10	12	10.1	12.6	15.1	20.1	25.1	30.9						123	30.9			
12	14		14.2	17.0	22.7	28.4	35.5	45.0					158	45.0			
16	18					29.0	36.3	45.4	58.1	72.6	83.7			231	83.7		
Depth (mm)		40	50	60	80	100	125	160	200	240	280	320					
20	24	32.8	41.0	49.2	61.6	73.9	86.2	98.5	123.1	130.7					318	130.7	
24	28		42.2	50.7	63.3	76.0	88.7	101.3	126.7	147.8	168.9	188.3			446	188.3	
27	32		43.0	51.6	64.5	77.4	90.3	103.2	129.0	150.5	172.0	206.5	244.8				
30	35		52.0		65.0	78.0	91.1	104.1	130.1	151.8	173.4	208.1	260.2			690	299.2
33	37		54.7	68.4	82.1	95.8	109.5	136.9	159.7	182.5	219.0	273.7	301.1			811	370.1
36	40				72.4	86.9	101.4	115.9	144.9	169.0	193.2	231.8	289.8	318.8	347.8	902	435.7
Depth (mm)		80	100	120	150	180	210	240	300	350	400	480	600	660	720		

 = steel failure

RES-TECH VNSF 410

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

10.9 Grade Steel Studding

Stud Diameter	Hole Diameter													h_{ef} Failure	$F_{d,s}$ Design Load		
(mm)	(mm)													(mm)	(kN)		
8	10	8.6	10.7	12.9	17.2	21.4	26.8	27.2							127	27.2	
10	12	10.1	12.6	15.1	20.1	25.1	31.4	40.2	43.1							171	43.1
12	14		14.2	17.0	22.7	28.4	35.5	45.4	56.8	62.6					221	62.6	
16	18					29.0	36.3	45.4	58.1	72.6	87.1	101.6	116.6	321	116.6		
Depth (mm)		40	50	60	80	100	125	160	200	240	280	320					
20	24	32.8	41.0	49.2	61.6	73.9	86.2	98.5	123.1	143.6	164.1					444	182.0
24	28		42.2	50.7	63.3	76.0	88.7	101.3	126.7	147.8	168.9	202.7				621	262.2
27	32		43.0	51.6	64.5	77.4	90.3	103.2	129.0	150.5	172.0	206.5	258.1	793	341.0		
30	35			52.0	65.0	78.0	91.1	104.1	130.1	151.8	173.4	208.1	260.2			961	416.7
33	37			54.7	68.4	82.1	95.8	109.5	136.9	159.7	182.5	219.0	273.7	301.1	1130	515.5	
36	40				72.4	86.9	101.4	115.9	144.9	169.0	193.2	231.8	289.8	318.8	347.8	1257	606.9
Depth (mm)		80	100	120	150	180	210	240	300	350	400	480	600	660	720		

A4-70 Stainless Steel Studding

Stud Diameter	Hole Diameter													h_{ef} Failure	$F_{d,s}$ Design Load		
(mm)	(mm)													(mm)	(kN)		
8	10	8.6	10.7	12.9	13.7										64	13.7	
10	12	10.1	12.6	15.1	20.1	21.7							86	21.7			
12	14		14.2	17.0	22.7	28.4	31.6						111	31.6			
16	18					29.0	36.3	45.4	58.1	58.8				162	58.8		
Depth (mm)		40	50	60	80	100	125	160	200	240	280	320					
20	24	32.8	41.0	49.2	61.6	73.9	86.2	91.7							223	91.7	
24	28		42.2	50.7	63.3	76.0	88.7	101.3	126.7	132.1					313	132.1	
27	32		43.0	51.6	64.5	77.4	80.2						*1	187	80.2		
30	35				52.0	65.0	78.0	91.1	98.1						*1	226	98.1
33	37		54.7	68.4	82.1	95.8	109.5	121.3				*1	266	121.3			
36	40					72.4	86.9	101.4	115.9	142.8				*1	296	142.8	
Depth (mm)		80	100	120	150	180	210	240	300	350	400	480	600	660	720		

*1 = Tensile strength 500N/mm²

RES-TECH VNSF 410

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

A4-80 Stainless Steel Studding

Stud Diameter	Hole Diameter													h _{ef} Failure	F _{d,s} Design Load		
(mm)	(mm)													(mm)	(kN)		
8	10	8.6	10.7	12.9	15.7										73	15.7	
10	12		12.6	15.1	20.1	24.8							99	24.8			
12	14		14.2	17.0	22.7	28.4	35.5	36.1					127	36.1			
16	18					29.0	36.3	45.4	58.1	67.2					185	67.2	
Depth (mm)		40	50	60	80	100	125	160	200	240	280	320					
20	24	32.8	41.0	49.2	61.6	73.9	86.2	98.5	104.8						255	104.8	
24	28		42.2	50.7	63.3	76.0	88.7	101.3	126.7	132.1					*2	313	132.1
27	32		43.0	51.6	64.5	77.4	80.2								*1	187	80.2
30	35				52.0	65.0	78.0	91.1	98.1						*1	226	98.1
33	37				54.7	68.4	82.1	95.8	109.5	121.3					*1	266	121.3
36	40					72.4	86.9	101.4	115.9	142.8					*1	296	142.8
Depth (mm)		80	100	120	150	180	210	240	300	350	400	480	600	660	720		

High bond reinforcing bars F_{yk} = 500N/mm²

Rebar Diameter	Hole Diameter											h_{ef} Failure	$F_{d,s}$ Design Load				
(mm)	(mm)											(mm)	(kN)				
8	10 – 12	11.7	14.6	17.5	21.9						150	21.9					
10	12	13.8	17.3	20.7	25.9	31.1	34.1					198	34.1				
12	15	15.7	19.6	23.5	29.4	35.3	41.2	47.1	49.2				251	49.2			
14	16		22.0	26.4	33.0	39.6	46.2	52.8	66.0					304	67.0		
16	18		24.1	29.0	36.2	43.4	50.7	57.9	72.4	84.5				362	87.4		
18	22		26.0	31.2	39.0	46.8	54.6	62.4	78.0	91.1				425	110.7		
Depth (mm)		80	100	120	150	180	210	240	300	350							
20	25	22.6	27.1	33.9	40.7	47.5	54.3	61.1	67.9	79.2	90.5					604	136.6
22	27		29.9	37.3	44.8	52.3	59.7	67.2	74.7	87.1	99.5	124.4				664	165.3
25	30		33.9	42.4	50.9	59.4	67.9	76.4	84.8	99.0	113.1	141.4				695	196.5
28	35		36.4	45.5	54.6	63.7	72.8	81.9	91.1	106.2	121.4	151.8	182.1			882	267.8
32	40				49.8	59.7	69.7	79.6	89.6	99.5	116.1	132.7	165.9	199.1	238.9	1054	349.7
36	44					56.0	67.2	78.4	89.6	100.8	112.0	130.6	149.3	186.6	224.0	268.8	1188
40	50							112.0	124.4	145.2	165.9	207.4	248.8	298.6	331.8	1317	546.3
Depth (mm)		100	120	150	180	210	240	270	300	350	400	500	600	720	800		

*1

= Tensile strength 500N/mm2

*2

= Tensile strength 700N/mm2

RES-TECH VNSF 410

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 (mm)	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	(mm)						
	N _{rk}	V _{rk}	N _{rd}	V _{rd}	N _{rec}	V _{rec}													
8	19.30	9.00	12.87	7.20	9.19	5.14	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	60						
	25.74		17.16		12.26								80						
	51.47		34.31		24.51								160						
10	22.62	15.00	15.08	12.00	10.77	8.57							Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	60	
	33.93		22.62		16.16													90	
	75.40		50.27		35.90													200	
12	29.82	21.00	19.88	16.80	14.20	12.00	6.60	21.00	4.40	16.80	3.14	12.00						70	
	46.86		31.24		22.31		9.90		6.60		4.71							110	
	102.24		68.16		48.69		21.99		14.66		10.47							240	
16	43.43	39.00	28.95	31.20	20.68	22.29	9.24	39.00	6.16	31.20	4.40	22.29	80						
	67.86		45.24		32.31		14.51		9.68		6.91		125						
	173.72		115.81		82.72		31.67		21.11		15.08		320						
20	55.42	61.00	36.95	48.80	26.39	34.86	14.07	61.00	9.38	48.80	6.70	34.86	90						
	104.68		69.79		49.85		21.99		14.66		10.47		170						
	246.30		164.20		117.29		56.30		37.53		26.81		400						
24	63.33	88.00	42.22	70.40	30.16	50.29	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	100						
	133.00		88.67		63.33								210						
	304.01		202.67		144.76								480						
27	70.91	115.00	47.27	92.00	33.77	65.71							Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	110
	154.72		103.15		73.68														240
	348.11		232.08		165.77														540
30	78.04	142.50	52.02	114.00	37.16	81.43	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable							120
	182.09		121.39		86.71														280
	390.19		260.12		185.80														600
33	88.95	173.50	59.30	138.80	42.36	99.14							Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	130
	205.27		136.85		97.75														300
	451.60		301.07		215.05														660
36	108.57	212.50	72.38	170.00	51.70	121.43	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable							150
	246.10		164.07		117.19														340
	521.15		347.44		248.17														720

Table notes : see back page

RES-TECH VNSF 410

Bond Strength Factors

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

Concrete Strength N/mm ² (Mpa)	C15/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
non cracked f_c =	0.94	1.00	1.06	1.12	1.17	1.23	1.26	1.30
cracked f_c =	0.96	1.00	1.03	1.05	1.06	1.07	1.08	1.09

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
Temp II 80°C / 50°C	Dry and Wet	0.90	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80

Influence of environmental conditions in cracked concrete

		M8	M10	M12	M16	M20	M24	M27	M30
Temp I 40°C / 24°C	Dry and Wet	n/a	0.46	0.44	0.40	0.38	n/a	n/a	n/a
Temp II 80°C / 50°C	Dry and Wet	n/a	0.45	0.43	0.40	0.38	n/a	n/a	n/a

Table notes : see back page

RES-TECH VNSF 410

Characteristic and Design Load resistances for REBAR based on characteristic bond strengths for $h_{ef} 4d$ (min embedment) to $20d$

Rebar Ø	Non Cracked Concrete						Cracked Concrete						Nominal Embed- ment (mm)												
	Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)		Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)														
	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear													
	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	15.68	13.95	8.71	9.30	6.22	6.64	Not Applicable		Not Applicable		Not Applicable		60												
	20.91		11.62		8.30								80												
	41.82		23.23		16.60								160												
10	18.66	21.45	10.37	14.30	7.41	10.21							Not Applicable		Not Applicable		Not Applicable		60						
	27.99		15.55		11.11														90						
	62.20		34.56		24.68														200						
12	24.70	31.05	13.72	20.70	9.80	14.79													10.56	31.05	5.86	20.70	4.19	14.79	70
	38.82		21.56		15.40														16.59		9.22		6.58		110
	84.69		47.05		33.61														36.19		20.11		14.36		240
14	31.67	42.45	17.59	28.30	12.57	20.21	13.72	42.45	7.62	28.10	5.45	20.07													
	45.52		25.29		18.06		19.73		10.96		7.83														
	110.84		61.58		43.98		48.03		26.68		19.06														
16	34.74	55.50	19.30	37.00	13.79	26.43	15.28	55.50	8.49	37.00	6.06	26.43	80												
	54.29		30.16		21.54		23.88		13.26		9.47		125												
	138.97		77.21		55.15		61.12		33.96		24.26		320												
18	37.55	69.66	20.86	46.44	14.90	33.17	16.51	69.66	9.17	46.44	6.55	33.17													
	70.40		39.11		27.94		30.96		17.20		12.29														
	168.97		93.87		67.05		74.31		41.28		29.49														
20	36.76	86.55	20.42	57.70	14.59	41.21	19.79	86.55	11.00	57.70	7.85	41.21	90												
	69.43		38.57		27.55		37.39		20.77		14.84		170												
	163.36		90.76		64.83		87.96		48.87		34.91		400												
22	44.92	104.01	24.96	69.34	17.83	49.53	24.19	104.00	13.44	69.34	9.60	49.53													
	85.36		47.42		33.87		45.96		25.53		18.24														
	197.67		109.82		78.44		106.44		59.13		42.24														
25	51.05	135.00	28.36	90.00	20.26	64.29	27.49	135.00	15.27	90.00	10.91	64.29	100												
	107.21		59.56		42.54		57.73		32.07		22.91		210												
	255.26		141.81		101.29		137.45		76.36		54.54		500												
28	61.08	168.75	33.93	112.50	24.24	80.36	Not Applicable		Not Applicable		Not Applicable		112												
	152.71		84.84		60.60								280												
	305.41		169.67		121.20								560												
32	77.21	220.95	42.89	147.30	30.64	105.21							Not Applicable		Not Applicable		Not Applicable		128						
	193.02		107.23		76.60														320						
	386.04		214.47		153.19														640						

Table notes : see back page

RES-TECH VNSF 410

Bond Strength Factors - REBAR

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

Concrete Strength N/mm ² (MPa)	C15/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
non cracked f_c =	0.94	1.00	1.06	1.12	1.17	1.23	1.26	1.30
cracked f_c =	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
Temp II 80°C / 50°C	Dry and Wet	0.90	0.90	0.88	0.88	0.88	0.86	0.86	0.86	0.86	0.84	0.84

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	0.50	0.50	0.50	0.50	0.50	0.50	0.50	n/a	n/a
Temp II 80°C / 50°C	Dry and Wet	n/a	n/a	0.44	0.44	0.44	0.43	0.43	0.43	0.43	n/a	n/a

Table notes : see back page

RES-TECH VNSF 410

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	
	$N_{rk, s}$	$N_{rd, s}$	$N_{rk, s}$	$N_{rd, s}$	$N_{rk, s}$	$N_{rd, s}$	$N_{rk, s}$	$N_{rd, s}$
	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(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
M30	448.8	299.2	583.0	416.4	280.6	98.1	280.6	98.1
M36	653.6	435.7	849.7	606.9	408.4	142.8	408.4	142.8

*1 = Tensile strength 500N/mm²

Stud Diameter (mm)	Stud Grade 8.8		Stud Grade 10.9		Stud Grade A4-70		Stud Grade A4-80	
	$V_{rk, s}$	$V_{rd, s}$	$V_{rk, s}$	$V_{rd, s}$	$V_{rk, s}$	$V_{rd, s}$	$V_{rk, s}$	$V_{rd, s}$
	(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
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	
	$N_{rk, s}$	$N_{rd, s}$	$V_{rk, s}$	$V_{rd, s}$
	(kN)	(kN)	(kN)	(kN)
8	28.0	20.0	16.6	11.1
10	43.0	30.7	25.9	17.3
12	62.0	44.3	37.3	24.9
14	84.4	67.0	50.8	33.5
16	111.0	79.3	66.4	44.3
18	139.5	110.7		55.4
20	173.0	123.6	103.9	69.3
22	208.3	165.3		82.7
25	270.0	192.9	162.0	108.0
32	442	315.7	265.1	176.7
36	563.2	443.5	337.9	225.3
40	693.8	546.3	416.4	276.4

More notes : see back page

RES-TECH VNSF 410

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

RES-TECH VNSF 410

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.

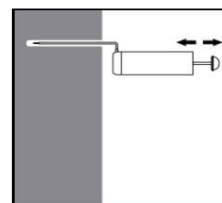
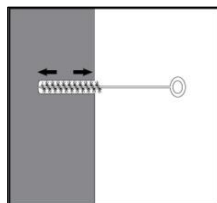
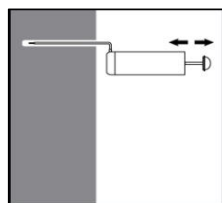
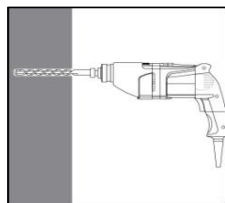
Long term temperatures will include constant or near constant temperatures, such as those experienced in cold stores or next to heating installations.

Physical Properties

	N/mm ² (MPa)	Test Method
Compressive Strength	73.0	EN ISO 604 / ASTM 695
Flexural Strength	25.0	EN ISO 178 / ASTM 790
Flexural Modulus	3850.0	EN ISO 178 / ASTM 790
Tensile Strength	14.6	EN ISO 527 / ASTM 638
E Modulus	8029.7	EN ISO 527 / ASTM 638
VOC Content	A+ Rating	-

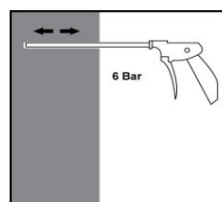
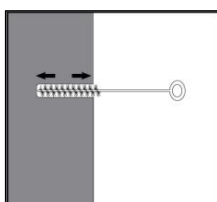
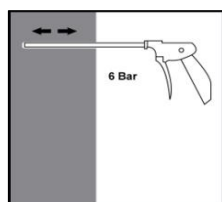
RES-TECH VNSF 410

Installation parameters: drilling hole cleaning and installation

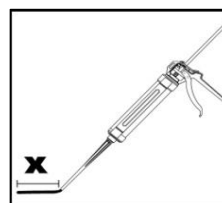
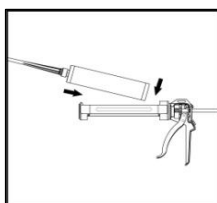
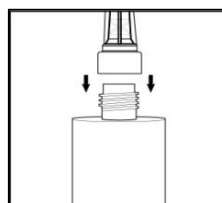
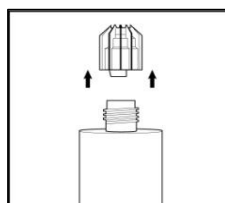


Drill hole in the substrate to the required embedment depth using the appropriately sized carbide drill bit. Bore hole cleaning Just before setting an anchor, the bore hole must be free of dust and debris. The manual pump shall be used for blowing out bore holes up to diameters $\leq 24\text{mm}$ and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

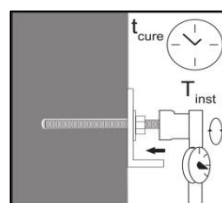
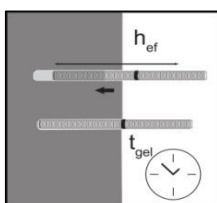
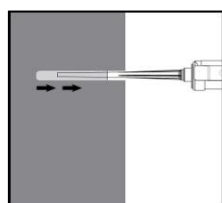
Compressed air cleaning (CAC) for all bore hole diameters do and all bore hole depths



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 $6\text{ m}^3/\text{h}$). 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.

RES-TECH VNSF 410

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/mm² (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/mm² (500MPa)

Note 2 for stainless steel tensile strength is 700N/mm² (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/mm² (25MPa)

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

PAGE 5 & 7 :

Bond Strength Factors

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

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

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