PRO V200 VINYLESTER RESIN TECHNICAL DATA

PRODUCT DESCRIPTION

PRO V200 is a two component high strength 10:1 ratio vinylester chemical anchoring resin system. It has been developed as a fast curing high strength resin anchor for high loads and critical applications including over head use. It is especially effective in corrosive environments and damp conditions.

Pack size: 410ml 10:1 Co-axial cartridge + 1 mixer

SPECIFIC BENEFITS

European approved
High bond strength
High chemical resistance
Hammer and dust free drilling
WRAS approved
Use with studs and rebar
Cracked or non-cracked concrete
Fire approved
Suitable for underwater use
A+ Rating VOC content

APPROVALS

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

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.

Version 7 : 18/05/2022

PRO V200 VINYLESTER INJECTION RESIN

Features and Benefits

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 and flooded holes
Used in critical or overhead applications
Used in corrosive environments
Anchor life of 50 years according to ETA
Used for post installed rebar installations under TR029 and TR023
Used for solid and hollow masonry
Low shrinkage enables large diameter installations
Close to the edge distance and anchor spacing
Manual cleaning up to 20mm diameter and embedment depths of 240mm
Independently tested and approved

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				
Stud Ø (mm)	Tension	Shear	Tension	Shear	Tension	Shear	Edge	Spacing	Edge	(mm)	Nominal Embed-ment	Hole Diameter concrete	Hole Diameter fixture	Max Torque
	Nrk	Vrk	Nrd	Vrd	Nrec	Vrec	Ccr,N	Scr,N	Ccr,V	Cmin, Smin	(mm)	(mm)	(mm)	(Nm)
	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**	**20**
	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**	**40**
	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**	**80**
	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**	**120**
	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**	**160**
	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**	**180**
	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**	**200**
	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**	**250**
	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**	**300**
	425.00		283.33		202.38						720			

= steel failure

All data is based on correct installation - see instructions page 17/18
No influence of edge and spacing. Minimum base material thickness hef +30mm >100mm for M8 to M12 and for M16 to M30 hef +2d. hef range minimum or 4d whichever is greatest to 20d
Concrete strength C20/25 - fc cube = 25N/mm² (25MPa)
5.8 grade stud
Temperature range I : maximum long term temperature:+24ºC / maximum short term temperature +40ºC
Partial safety factors : 1.5 for all stud sizes/ 1.8 for all rebar sizes

Design resistance of PRO V200 resin used with various stud strengths, material and rebar

5.8 grade steel studding

Stud Diam	Hole Diam	Embedment depth hef																				hef failure	Fd,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	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

Stud Diam	Hole Diam	Embedment depth hef																				hef failure	Fd,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	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	57.9	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		

= steel failure

Partial safety factors : 1.5 for all stud sizes/ 1.8 for all rebar sizes

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

Design resistance of PRO V200 resin used with various stud strengths, material and rebar

10.9 grade steel studding

Stud Diam	Hole Diam	Embedment depth hef																				hef failure	Fd,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	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	13.1	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

Stud Diam	Hole Diam	Embedment depth hef																				hef failure	Fd,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	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							* 1	266	121.3
36	40									67.6	77.2	96.5	115.8	135.1	143						* 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		

= steel failure

* 1 = Tensile strength 500N/mm²
Note 1 for stainless steel tensile strength is 500N/mm² (500MPa)

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

Partial safety factors : 1.5 for all stud sizes/ 1.8 for all rebar sizes

Design resistance of PRO V200 resin used with various stud strengths, material and rebar

A4-80 stainless steel studding

Stud Diam	Hole Diam	Embedment depth hef																				hef failure	Fd,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	12.9	15.0	15.7																		73	15.7
10	12		17.6	2.1	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		

High bond reinforcing bars Fyk=500N/mm2

Rebar Diam	Hole Diam	Embedment depth hef																					hef failure	Fd,s Design 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	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			

= steel failure

* 1 = Tensile strength 500N/mm²
* 2 = Tensile strength 700N/mm²

Note 1 for stainless steel tensile strength is 500N/mm² (500MPa)
Note 2 for stainless steel tensile strength is 700N/mm² (700MPa)
Data shown below the minimum embedment depth is for reference only.
Please refer to our technical department for advice.

Partial safety factors : 1.5 for all stud sizes/ 1.8 for all rebar sizes

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

Stud Ø (mm)	Non cracked concrete						Cracked concrete						Nominal Embed-ment
	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	(mm)
	Nrk	Vrk	Nrd	Vrd	Nrec	Vrec	Nrk	Vrk	Nrd	Vrd	Nrec	Vrec	
M8	19.30	9.00	12.87	7.20	9.19	5.14	7.92	9.00	5.28	7.20	3.77	5.14	60
	25.74		**17.16**		**12.26**		**10.56**		**7.04**		**5.03**		**80**
	51.47		34.31		24.51		21.11		14.07		10.05		160
M10	22.62	15.00	15.08	12.00	10.77	8.57	10.40	15.00	6.94	12.00	4.96	8.57	60
	33.93		**22.62**		**16.16**		**15.60**		**10.40**		**7.43**		**90**
	75.40		50.27		35.90		34.68		23.12		16.52		200
M12	29.82	21.00	19.88	16.80	14.20	12.00	13.12	21.00	8.75	16.80	6.24	12.00	70
	46.86		**31.24**		**22.31**		**20.62**		**13.75**		**9.82**		**110**
	102.24		68.16		48.69		44.98		29.98		21.42		240
M16	43.43	39.00	28.95	31.20	20.68	22.29	17.37	39.00	11.58	31.20	8.27	22.29	80
	67.86		**45.24**		**32.31**		**27.14**		**18.10**		**12.93**		**125**
	173.72		115.81		82.72		69.50		46.33		33.10		320
M20	55.42	61.00	36.95	48.80	26.39	34.86	21.06	61.00	14.04	48.80	10.00	34.86	90
	104.68		**69.79**		**49.85**		**39.78**		**26.52**		**18.94**		**170**
	246.30		164.20		117.29		93.60		62.40		44.59		400
M24	63.33	88.00	42.22	70.40	30.16	50.29	22.80	88.00	15.20	70.40	10.86	50.29	100
	133.00		**88.67**		**63.33**		**47.88**		**31.92**		**22.80**		**210**
	304.01		202.67		144.76		109.44		72.96		52.12		480
M27	70.91	115.00	47.27	92.00	33.77	65.71	24.11	115.00	16.07	92.00	11.48	65.71	110
	154.72		**103.15**		**73.68**		**52.60**		**35.07**		**25.05**		**240**
	348.11		232.08		165.77		118.36		78.91		56.36		540
M30	78.04	142.50	52.02	114.00	37.16	81.43	24.97	142.50	16.65	114.00	11.89	81.43	120
	182.09		**121.39**		**86.71**		**58.27**		**38.85**		**27.75**		**280**
	390.19		260.12		185.80		124.86		83.24		59.46		600
M33	88.95	173.50	59.30	138.80	42.36	99.14	Not Applicable		Not Applicable		Not Applicable		130
	205.27		**136.85**		**97.75**								**300**
	451.60		301.07		215.05								660
M36	108.57	212.5	72.38	170.00	51.70	121.43							150
	246.10		**164.07**		**117.19**								**340**
	521.15		347.44		248.17								720

All data is based on correct installation - see instructions on page 17 / 18
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/mm² (25MPa)
Temperature range 1: maximum long term / short term temperature +24/40°C

Partial safety factors : 1.5 for all stud sizes/ 1.8 for all rebar sizes

Characteristic and design load resistances for **rebar** based on characteristic bond strengths for hef 4d (min embedment) to 20d

Rebar Ø (mm)	Non cracked concrete						Cracked concrete						Nominal Embed-ment
	Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)		Characteristic Resistance (kN)		Design Resistance (kN)		Recommended Load (kN)		
	Tension Nrk	Shear Vrk	Tension Nrd	Shear Vrd	Tension Nrec	Shear Vrec	Tension Nrk	Shear Vrk	Tension Nrd	Shear Vrd	Tension Nrec	Shear Vrec	(mm)
	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								160
	18.66		10.37		7.41		Not Applicable		Not Applicable		Not Applicable		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		Not Applicable		Not Applicable		Not Applicable		560
	77.21		42.89		30.64								128
32	193.02	220.95	107.23	147.30	76.60	105.21							**320**
	386.04		214.47		153.19								640

All data is based on correct installation - see instructions page 17 / 18
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/mm² (25MPa)
Temperature range 1: maximum long term / short term temperature +24/40°C

Partial safety factors : 1.5 for all stud sizes/ 1.8 for all rebar sizes

Bond strength factors - threaded rod

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

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

Select concrete strength and environmental conditions and apply bond strength

Partial safety factors : 1.5 for all stud sizes/ 1.8 for all rebar sizes

Material properties for grades of other threaded rod and rebar

	Stud Grade 8.8		Stud Grade 10.9		Stud Grade A4-70		Stud Grade A4-80	
Stud Diameter	Nrk, s	Nrd, s	Nrk, s	Nrd, s	Nrk, s	Nrd, s	Nrk, s	Nrd, s
(mm)	(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 * 1
M30	448.8	299.2	583.0	416.4	280.5	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 Grade 8.8		Stud Grade 10.9		Stud Grade A4-70		Stud Grade A4-80	
Stud Diameter	Vrk, s	Vrd, s	Vrk, s	Vrd, s	Vrk, s	Vrd, s	Vrk, s	Vrd, 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
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	59.9	140.3	59.2
M36	326.8	261.4	424.8	283.2	204.2	86.2	204.2	86.2

	Rebar BSt 500 to DIN 488		Rebar BSt 500 to DIN 488	
Rebar Diameter	Nrk, s	Nrd, s	Vrk, s	Vrd, 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
14	85.0	60.7	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	W112.7
32	442.0	315.7	221.0	147.3
36	563.2	443.5	281.6	187.7
40	693.8	546.3	346.9	231.3

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

Anchor spacing and edge distance reduction factors

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	.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

Anchor Spacing	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

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 Φ	Concrete Class								
Φ d_s	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/60	C50/60
8mm	1.6	2	2.3	2.3	2.3	2.3	2.3	2.3	2.3
10mm	1.6	2	2.3	2.3	2.3	2.7	2.7	2.7	2.7
12mm	1.6	2	2.3	2.3	2.3	2.7	2.7	2.7	2.7
14mm	1.6	2	2.3	2.7	3	3	3	3	3
16mm	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.

Post installed rebar connections

Values for pre-calculation of anchoring

Rebar Φ d_s	α1=α2=α3=α4=α5=1.0			α2 or α5=0.7; α1=α3=α4=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*	6.55	12	163*	9.42	12
	180	7.23	14	175	10.11	13
	250	10.05	19	190	10.98	14
	378	15.19	28	265	15.31	20
10	204*	10.25	18	204*	14.73	18
	220	11.05	20	220	15.89	20
	310	15.57	28	240	17.33	22
	390	19.59	35	280	20.22	25
	473	23.76	43	331	23.90	30
12	170*	14.74	18	170*	21.06	18
	270	23.41	29	230	28.49	24
	370	32.08	39	280	34.68	30
	470	40.75	50	340	42.12	36
	567	49.16	60	397	49.18	42
14	198*	20.03	24	198*	28.61	24
	310	31.36	37	260	37.57	31
	430	43.5	52	330	47.69	40
	550	55.64	66	400	57.81	48
	662	66.97	80	463	66.91	56
16	227*	26.24	31	227*	37.49	31
	360	41.62	49	300	49.55	41
	490	56.65	67	380	62.76	52
	620	71.68	84	450	74.32	61
	756	87.4	103	529	87.37	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: $V = 1.2 \cdot (d^2_0 - d^2_d) \cdot \Pi \cdot l_b / 4$

Example for:
C20/25;
good bond condition;
Rebar yield strength
500 N/mm2 (500MPa)

Post installed rebar connections

Values for pre-calculation of overlap joints

Rebar Φ d_s	α1=α2=α3=α4=α5=1.0			α2 or α5=0.7; α1=α3=α4=1.0		
	Anchorage length l_{bd}	Design value N_{rd}	Mortar volume	Anchorage length l_{bd46}	Design value N_{rd}	Mortar volume
(mm)	(mm)	(kN)	(ml)	(mm)	(kN)	(ml)
8	200	8.04	15	200	11.56	15
	240	9.65	18	220	12.71	17
	290	11.66	22	230	13.29	17
	378	15.19	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	24.77	21
	290	25.13	31	250	30.97	26
	380	32.93	40	300	37.16	32
	480	41.6	51	350	43.35	37
	567	49.14	60	397	49.18	42
14	210	21.24	25	210	30.35	25
	320	32.37	39	270	39.02	33
	440	44.51	53	340	49.13	41
	550	55.64	66	400	57.81	48
	662	66.97	80	463	66.91	56
16	240	27.75	33	240	39.64	33
	370	42.78	50	310	51.2	42
	500	57.81	68	380	62.76	52
	630	72.83	86	460	75.97	62
	756	87.4	103	529	87.37	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: $V = 1.2 \cdot (d^2_0 - d^2_d) \cdot \Pi \cdot l_b / 4$

Example for:
C20/25;
good bond condition;
Rebar yield strength
500 N/mm2 (500MPa)

Post installed rebar schematics

Application examples of post-installed rebar

Figure 1: Overlap joints in slabs and beams.

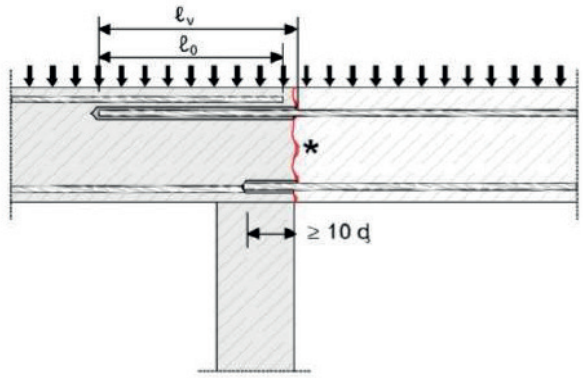


Figure 2: Overlap joint in foundation of a column or wall where the rebars are stressed in tension.

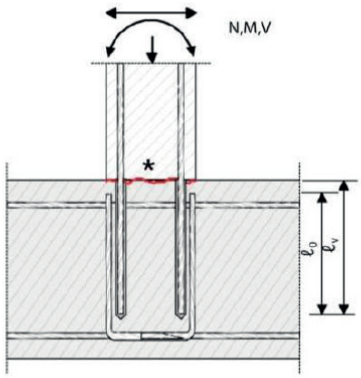


Figure 3: End anchoring of slabs or beams. designed as simply supported.

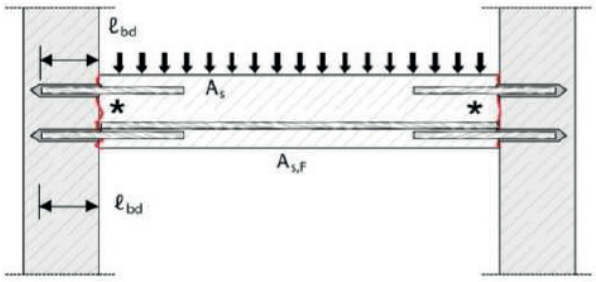


Figure 4: Rebar connection of components stressed primarily in compression. The rebar are stressed in compression.

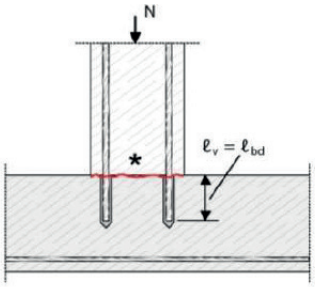
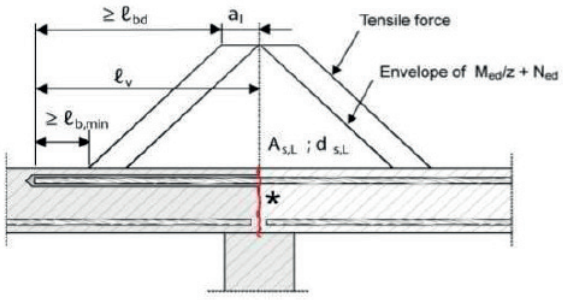


Figure 5: Anchoring of reinforcement to cover the line of acting tensile force.



Note:
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 EC 2.
* roughened joint

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

Full cure 24 hours
All specifications based on supplied mixer
* Resin temperature must be at least 20°C

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.

Physical properties

	N/mm2 (MPa)	Test Method
Flexural Strength	16.0	EN ISO 178 / ASTM 790
Flexural Modulus	1520.0	EN ISO 178 / ASTM 790
Tensile Strength	9.8	EN ISO 527 / ASTM 638
VOC Content	A+ Rating	-

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_o	mm	8	10	12	14
Minimum wall thickness	h_{min}	mm	h_{ef} + 5mm			
Minimum space distance	s_{min}	mm	240		255	
Minimum 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

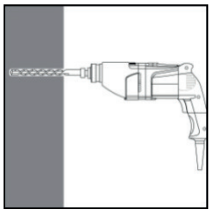
Brick "Doppio UNI"			M6	M8	M10	M12
Sleeve dimension (nylon or plastic)		mm	12 x 80		16 x 85	
Anchorage depth	h_{ef}	mm	80	80	85	85
Drill diameter (hole diameter)	d_o	mm	12	12	16	16
Minimum wall thickness	h_{min}	mm	h_{ef} + 5mm			
Critical space distance parallel to horizontal joint	$s_{cr,II}$	mm	250	250	250	250
Critical space distance perpendicular to horizontal joint	$s_{cr,I}$	mm	120	120	120	120
Minimal space distance parallel to horizontal joint	$s_{min,II}$	mm	250			
Minimal space distance perpendicular to horizontal joint	$s_{min,I}$	mm	120			
Critical edge distance	c_{cr}	mm	100	100	100	100
Minimum 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 instructions

Hole preparation: The hole can be prepared by either (1) hammer drilling followed by cleaning
or (2) dust free drilling using a hollow drill bit

(1)

Hammer drilling

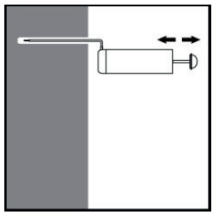


Drill hole in the substrate to the required diameter and embedment depth

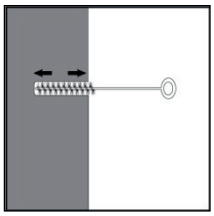
If hammer drilling, the hole must be thoroughly cleaned to ensure it is free of dust and debris before setting an anchor.

Cleaning

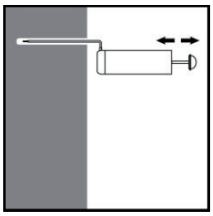
A **Manual blow out pump** can be used for blowing out drilled holes up to diameters ≤ 24mm and embedment depths up to 10 x drilled hole diameters.



Blow out at least **4 times** from the back of the drilled hole, (if required with an extension)



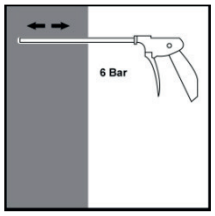
Brush 4 times with the specified brush size (see table page 19) by inserting the steel brush to the back of the hole (if required with an extension) in a twisting motion and



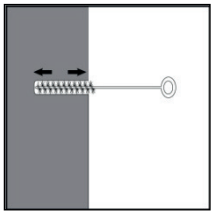
remove the debris. **Blow** out again with pump **at least 4 times.**

OR

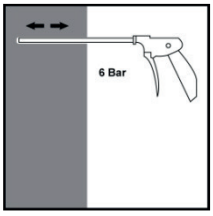
Clean with **compressed air,** which is suitable for all bore hole diameters and depths



Blow twice 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 m^3/h).



Brush twice with the specified brush size (see table page 19) by inserting the steel brush to the back of the hole (if required with an extension) in a twisting motion and remove the debris.



Blow out again with compressed air at least **twice**.

(2)

Dust free drilling using hollow drill bits

Select a suitable hollow drill bit and insert into the hammer drilling machine.

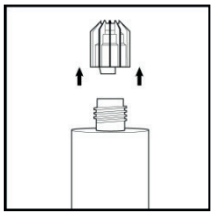
Connect the dust extraction system to the adaptor in the hollow drill bit.

Drill hole to the required embedment depth with the hammer drill set in rotation hammer mode and with the dust extraction system working permanently at full power.

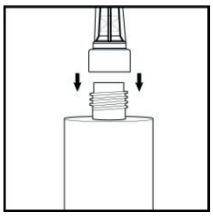
Drill hole cleaning is not necessary when using the self cleaning drilling method

Inject and Install

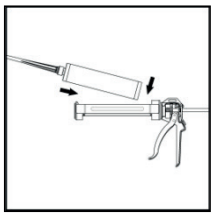
Inject



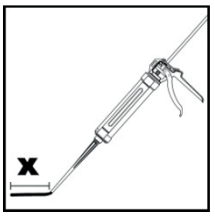
Remove the threaded cap from the cartridge.



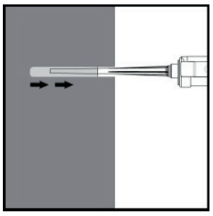
Tightly attach the mixing nozzle.
Do not modify the mixer in any way.
Make sure the mixing element is inside the mixer.
Use only the supplied mixer.



Insert the cartridge into the dispenser gun.

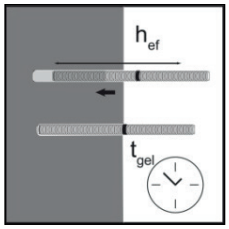


Discard the initial trigger pulls (10ml) of resin, until resin appears uniformly mixed.



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 resin along the embedment depth.

Install

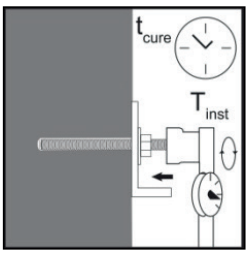


Before use, verify that the threaded rod is dry and free of contaminants. Install the threaded rod to the required embedment depth before the **gel working time** has elapsed. (see minimum curing times in table opposite)

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

Full cure 24 hours
All specifications based on supplied mixer
* Resin temperature must be at least 20°C



The anchor can be loaded after the required **curing time** (see minimum curing times in table above).

The applied torque should not exceed the maximum value given in the table below.

Maximum applied torque

Stud (mm)	8	10	12	16	20	24	27	30	33	36
Nominal embedment (mm)	80	90	110	125	170	210	240	280	300	340
Hole Ø Concrete (mm)	10	12	14	18	22	28	30	35	37	40
Max Torque (Nm)	10	20	40	80	120	160	180	200	250	300

Hole cleaning - required brush sizes

If hammer drilling, the hole must be thoroughly cleaned to ensure it is free of dust and debris before setting an anchor. The table below specifies brush size required for each drill hole diameter:

Drill hole diameter (mm)	Brush diameter (mm)	Description	Length (mm)	Item code
8	9	9 x 120mm hole cleaning brush (for 8mm hole)	120	HC8
10	11	11 x 120mm hole cleaning brush (for 10mm hole)	120	HC10
12	13	13 x 150mm hole cleaning brush (for 12mm hole)	150	HC12
14	16	16 x 250mm hole cleaning brush (for 14mm hole)	250	HC14
16 / 18	20	20 x 250mm hole cleaning brush (for 16/18mm hole)	250	HC16
20 / 22	25	25 x 180mm hole cleaning brush (for 20/22mm hole)	180	HC20
24	26	26 x 300mm hole cleaning brush (for 24mm hole)	300	HC24
25	27	27 x 300mm hole cleaning brush (for 25mm hole)	300	HC25
28	30	30 x 350mm hole cleaning brush (for 28mm hole)	350	HC28
30 / 32 / 35	40	40 x 400mm hole cleaning brush (for 30/32/35mm hole)	400	HC30
40 *	42	42 x 170mm hole cleaning brush (for 40mm hole)	170	HC40
45 *	47	47 x 170mm hole cleaning brush (for 45mm hole)	170	HC45
55 *	58	58 x 170mm hole cleaning brush (for 55mm hole)	170	HC55
		M8 x 420mm brush extension	420	HCEXT420
		90mm SDS adapter for brush (40mm hole and over)	90	HCEXT90SDS

* 90mm SDS adapter must be used with hole diameters 40mm and over.