VAP SPIN GLASS CAPSULES WITH VA RODS

PRODUCT FEATURES

- High load and high efficient in series applications.
- Fast curing minimises on-site delay.
- Can be used in horizontal fixings.
- For use in dry and wet concrete without loss of performance.
- High durability; tested based on a 50 years working life of anchor according to ETA.
- ETA Approval for use in non-cracked concrete.

RESIN SPECIFICATIONS

- Epoxy Acrylate Resin.
- Specific weight: 1.6 g/cm³.
- Compressive Strength (BS 6319): 70 N/mm².

SHELF LIFE

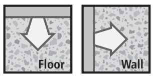
- Shelf life is 12 months with the capsules kept in cool dry conditions (+5°C to + 25°C) out of direct sunlight.

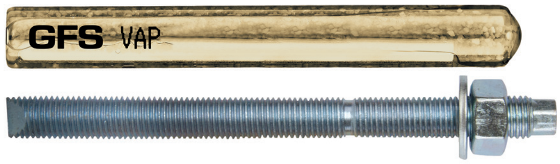
SUBSTRATES

- RC concrete C20/25 to C50/60 at maximum according to EN 206-1:2000-12.
- Solid stone, concrete block & other solid masonry.

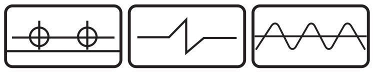
CONC | STONE

HOLE ORIENTATION





LOADING ZONES



APPROVALS / CERTIFICATIONS

- ETA-06/0100 according to ETAG 001 Part 1 & 5 Option 8.
- F120 Fire Test Report No. 3084/206/07.
- VOC A Rating (Volatile Organic Compound).

VA RODS AVAILABILITY

Z ZINC | G | A2 INOX | A4 INOX

BASIC LOADING DATA

- For static and quasi-static loadings.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Loading applicable to dry and wet concrete.
- For non-cracked concrete only.
- Concrete compressive strength C20/25 ($f_{ck,cube}$ = 25 N/mm²).
- Loading data conformed to ETA 06/0100.

CHARACTERISTIC RESISTANCE [F_{Rk}]						STEEL CLASS 5.8	
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile Load, N_{Rk}	[kN]	***18.0***	***29.0***	40.0	50.0	75.0	90.0
Shear Load, V_{Rk}	[kN]	9.0	14.0	21.0	39.0	61.0	88.0

DESIGN RESISTANCE [F_{Rd}]							
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile Load, N_{Rd}	[kN]	11.1	16.7	22.2	27.8	41.7	50.0
Shear Load, V_{Rd}	[kN]	7.2	11.2	16.8	31.2	48.8	70.4

RECOMMENDED LOAD [F_{Rec}]							
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile Load, N_{Rec}	[kN]	7.9	11.9	15.9	19.8	29.8	35.7
Shear Load, V_{Rec}	[kN]	5.1	8.0	12.0	22.3	34.9	50.3

** Bold Italic numbers represent steel failure.*

CHARACTERISTIC RESISTANCE [F_{Rk}]						HIGH TENSILE STEEL CLASS 8.8	
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile Load, N_{Rk}	[kN]	***18.0***	30.0	40.0	50.0	75.0	90.0
Shear Load, V_{Rk}	[kN]	15.0	23.0	33.0	63.0	98.0	141.0

DESIGN RESISTANCE [F_{Rd}]							
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile Load, N_{Rd}	[kN]	11.1	16.7	22.2	27.8	41.7	50.0
Shear Load, V_{Rd}	[kN]	12.0	18.4	26.4	50.4	78.4	112.8

RECOMMENDED LOAD [F_{Rec}]							
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile Load, N_{Rec}	[kN]	7.9	11.9	15.9	19.8	29.8	35.7
Shear Load, V_{Rec}	[kN]	8.6	13.1	18.9	36.0	56.0	80.6

** Bold Italic numbers represent steel failure.*

VAP SPIN GLASS CAPSULES WITH VA RODS

CHARACTERISTIC RESISTANCE [F_{Rk}]						STAINLESS STEEL CLASS A2/A4	
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile Load, N_{Rk}	[kN]	20.0	30.0	40.0	50.0	75.0	90.0
Shear Load, V_{Rk}	[kN]	13.0	20.0	29.0	55.0	86.0	124.0

DESIGN RESISTANCE [F_{Rd}]							
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile Load, N_{Rd}	[kN]	11.1	16.7	22.2	27.8	41.7	50.0
Shear Load, V_{Rd}	[kN]	8.3	12.8	18.6	35.3	55.1	79.5

RECOMMENDED LOAD [F_{Rec}]							
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile Load, N_{Rec}	[kN]	7.9	11.9	15.9	19.8	29.8	35.7
Shear Load, V_{Rec}	[kN]	6.0	9.2	13.3	25.2	39.4	56.8

** Bold Italic numbers represent steel failure.*

SERVICE TEMPERATURE RANGE

The Statheros VAP Epoxy Acrylate Resin Glass Capsule performance based on the tabulated temperature range as given below. A gradual temperature increase in base material may lead to a reduction of design bond stress.

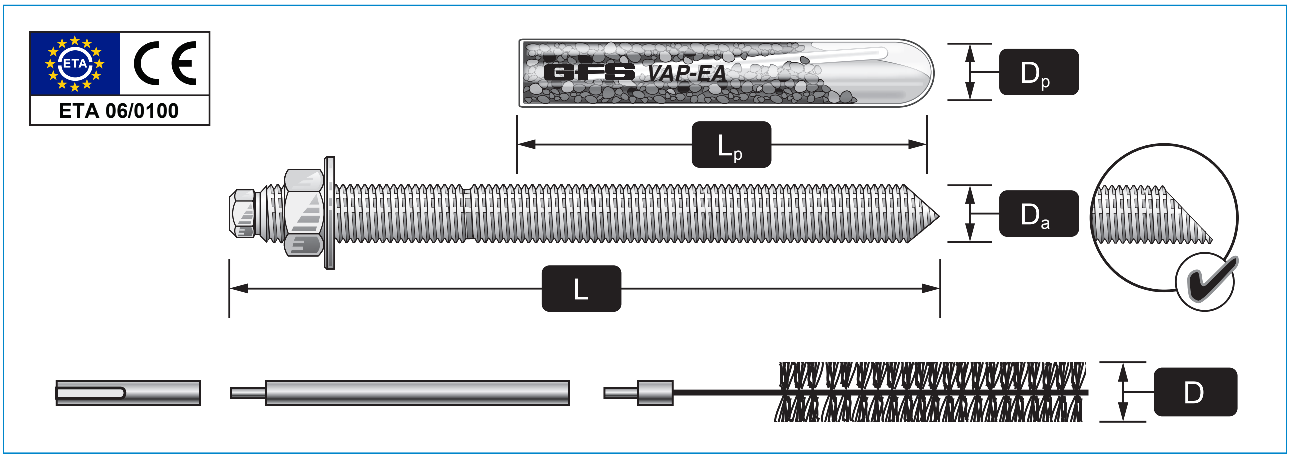
TEMPERATURE RANGE	BASE MATERIAL TEMPERATURE	MAXIMUM LONG TERM BASE MATERIAL TEMPERATURE	MAXIMUM SHORT TERM BASE MATERIAL TEMPERATURE
Temperature Range	-40 °C to + 80 °C	+ 50 °C	+80 °C

Maximum Short Term Base Material Temperature
Short term temperature refers to those elevated base material temperature occurred over brief moment such as diurnal cycling intervals.

Maximum Long Term Base Material Temperature
Long term temperature refers to those elevated base material temperature occurred over a significant long period of time.

VAP SPIN GLASS CAPSULES DIMENSION

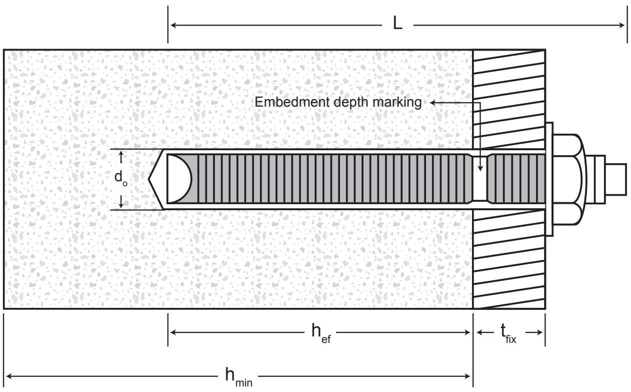
ANCHOR (CAPSULE) SIZE		M8	M10	M12	M16	M20	M24
Capsule Diameter, D_p	[mm]	9	11	13	17	22	24
Capsule Length, L_p	[mm]	80	80	95	95	175	210
Capsule Volume, V_p	[ml]	4.0	5.5	9.0	15.8	53.0	76.0
Required Volume/Anchorage Depth, V_s	[ml/cm]	0.44	0.59	0.75	1.09	2.64	2.87
Recommended Stud Rods Length, L	[mm]	110	130	160	190	260	300



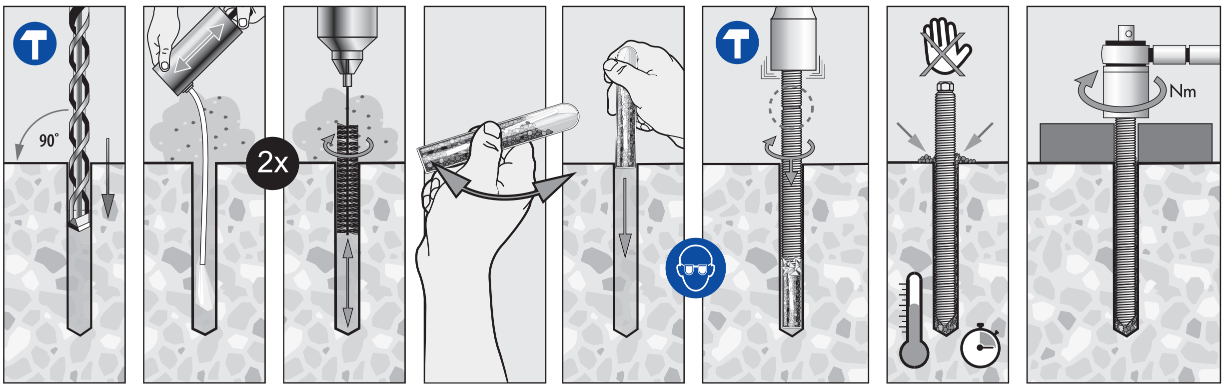
SETTING DETAILS

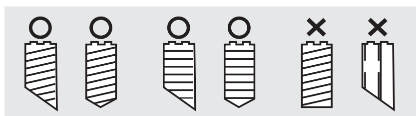
ANCHOR SIZE		M8	M10	M12	M16	M20	M24
Nominal Drill Hole Diameter, d_0	[mm]	10	12	14	18	25	28
Fixture Hole Diameter, d_{fix}	[mm]	9	12	14	18	22	26
Maximum Fixture Thickness, t_{fix}	[mm]	15	20	30	40	50	55
Recommended Torque, T_{inst}	[Nm]	10	20	40	80	120	180
Standard Anchorage Depth: $h_{ef,std}$							
Standard Anchorage Depth, $h_{ef,std}$	[mm]	80	90	110	125	175	210
Minimum Spacing, s_{min}	[mm]	40	45	55	65	85	105
Minimum Edge Distance, c_{min}	[mm]	40	45	55	65	85	105
Minimum Concrete Thickness, h_{min}	[mm]	110	120	140	160	220	265
Maximum Anchorage Depth, $h_{ef,max}$							
Maximum Anchorage Depth, $h_{ef,max}$	[mm]	160	180	220	250	350	420
Minimum Spacing, s_{min}	[mm]	50	60	70	95	120	145
Minimum Edge Distance, c_{min}	[mm]	50	60	70	95	120	145
Minimum Concrete Thickness, h_{min}	[mm]	$h_{ef,max}$ + 30mm				$h_{ef,max}$ + $2d_o$	

SETTING DIAGRAM



INSTALLATION PROCEDURES





1. Drill hole either with an electric rotary hammer or a diamond drilling machine.
   (Refer to setting table for diameter and depth)
2. In reinforced concrete, the use of diamond drilling machine is recommended.
3. Clean anchor hole at least twice thoroughly using a brush and compressed air or with clean water when the substate is in wet condition.
4. Before inserting the VAP™ capsules into the hole, check the viscosity of the resin. At lukewarm temperature, it should run easily inside the glass capsule.
5. Clean anchor rod before inserting into the hole. The anchor rod should be free from any grease or oil.
6. Rotation of the anchor rod should be done with a power tool that will rotate with a rotating and hammering motion, which will provide sufficient rotation to mix the components completely. Stop rotating immediately upon reaching the bottom of the anchor hole. Be sure not to over spin the rod. **DO NOT ATTEMPT TO INSTALL THE RODS BY HAND ROTATION**. *(Always wear safety goggles when installing the anchors).*
7. Observe curing time. The installed anchor can not be disturbed or loaded before the specified curing time has lapsed.
8. Observe recommended torque.

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GEL AND CURING TIME

BASE MATERIAL TEMPERATURE $T_{base\ material}$ (°C)	CURE TIME IN DRY CONCRETE $t_{cure,dry}$ (mins)	CURE TIME IN WET CONCRETE $t_{cure,wet}$ (mins)
$-5 \leq T_{base\ material} < +5$	300	600
$+5 \leq T_{base\ material} < +20$	60	120
$+20 \leq T_{base\ material} < +30$	20	40
+30 & above	10	20

MATERIAL SPECIFICATIONS

DESIGNATION	MATERIAL
VA Rods - Class 5.8 & 8.8 M8 - M30	Strength class 5.8, 8.8 to EN ISO 898-1 Steel, zinc plated ≥ 5μm to EN ISO 4042 Steel, hot dipped galvanised ≥ 40μm to EN ISO 10684
Washer ISO 7089	Steel, zinc plated to EN ISO 4042 Steel, hot dipped galvanised to EN ISO 10684
Hexagon Nut EN ISO 4032	Strength class 5.8, 8.8 to EN ISO 898-2 Steel galvanised ≥ 5μm to EN ISO 4042 Hot dipped galvanised ≥ 40μm to EN ISO 10684
VAS Rods - Class A2 & A4 M8 - M30	Strength class A2-70 & A4-70 to EN ISO 3506-1 Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 to EN 10088
Washer ISO 7089	Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088
Hexagon Nut EN ISO 4032	Strength class A2-70 & A4-70 to EN ISO 3506-2 Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 to EN 10088

MECHANICAL PROPERTIES

ANCHOR SIZE		M8	M10	M12	M16	M20	M24
Cross Sectional Area, A_s	[mm²]	36.6	58.0	84.3	157.0	245.0	353.0
Nominal Tensile Strength, f_{uk}	[N/mm²]						
~ Carbon Steel: Class 5.8		500	500	500	500	500	500
~ High Tensile Steel: Class 8.8		800	800	800	800	800	800
~ Stainless Steel: Class A2/A4		700	700	700	700	700	700
Nominal Yield Strength, f_{yk}	[N/mm²]						
~ Carbon Steel: Class 5.8		400	400	400	400	400	400
~ High Tensile Steel: Class 8.8		640	640	640	640	640	640
~ Stainless Steel: Class A2/A4		450	450	450	450	450	450
Elastic Moment Of Resistance, W_{el}	[mm³]	31.2	62.3	109.2	277.5	540.9	935.5
Design Bending Moment, $M_{Rd,s}$	[Nm]						
~ Carbon Steel: Class 5.8		15.2	29.6	52.8	132.8	260.0	448.8
~ High Tensile Steel: Class 8.8		24.0	48.0	84.0	212.8	415.2	718.4
~ Stainless Steel: Class A2/A4		16.7	33.3	59.0	149.4	291.0	503.8

The design bending moment is derived from $M_{Rd,s} = M_{Rk,s} / \gamma_{Ms,N}$ where the partial safety factor is 1.25 for carbon steel 5.8 and high tensile steel 8.8; 1.56 for stainless steel A2/A4. The recommended bending moment is derived from $M_{Rec,s} = M_{Rd,s} / \gamma_F$ where the partial safety factor is 1.4.

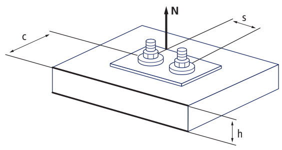
TENSION LOAD [N_{Rd}]

Design Tensile Resistance, N_{Rd}: lower value of [$N_{Rd,s}$; $N_{Rd,p}$; $N_{Rd,c}$]

Design Steel Tensile Resistance: $N_{Rd,s}$

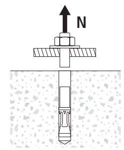
Design Pull-Out Resistance: $N_{Rd,p} = N^0_{Rd,p} \cdot \Psi_{h,N} \cdot \Psi_{\beta,N}$

Design Concrete Cone Resistance: $N_{Rd,c} = N^0_{Rd,c} \cdot \Psi_{h,N} \cdot \Psi_{\beta,N} \cdot \Psi_{s,N} \cdot \Psi_{c,N}$



STEEL TENSILE RESISTANCE [$N_{Rd,s}$]

- For static and quasi-static loadings.
- Only a single anchor is considered.
- For non-cracked concrete only.
- Data valid only for specified steel grade.
- Loading data conformed to ETA-06/0100.

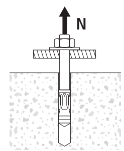


ANCHOR SIZE		M8	M10	M12	M16	M20	M24
Carbon Steel: Class 5.8							
$N_{Rd,s}$	[kN]	12.0	19.3	28.0	52.0	82.0	118.0
High Tensile Steel: Class 8.8							
$N_{Rd,s}$	[kN]	19.3	30.7	44.7	84.0	130.7	188.0
Stainless Steel: Class A2/A4							
$N_{Rd,s}$	[kN]	13.9	21.4	31.6	58.8	92.0	132.1

The design steel tensile resistance is derived from $N_{Rd,s} = N_{Rk,s} / \gamma_{Ms,N}$ where the partial safety factor is 1.5 for carbon steel 5.8 and high tensile steel 8.8; 1.87 for stainless steel A2/A4. The recommended load is derived from $N_{Rec,s} = N_{Rd,s} / \gamma_F$ where the partial safety factor is 1.4.

PULL-OUT RESISTANCE [$N_{Rd,p}$]

- For static and quasi-static loadings.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Loading applicable to dry and wet concrete.
- For non-cracked concrete only.
- Concrete compressive strength C20/25 ($f_{ck,cube}$ = 25 N/mm²).
- Loading data conformed to ETA-06/0100.

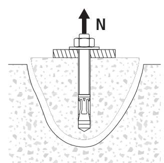


ANCHOR SIZE		M8	M10	M12	M16	M20	M24
$h_{ef,std}$	[mm]	80	90	110	125	175	210
$N^0_{Rd,p}$	[kN]	11.1	16.7	22.2	27.8	41.7	50.0

The design pull-out resistance is derived from $N^0_{Rd,p} = N^0_{Rk,p} / \gamma_{Mc,N}$ where the partial safety factor is 1.8. The recommended load is derived from $N^0_{Rec,p} = N^0_{Rd,p} / \gamma_F$ where the partial safety factor is 1.4.

CONCRETE CONE RESISTANCE [$N_{Rd,c}$]

- For static and quasi-static loadings.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Loading applicable to dry and wet concrete.
- For non-cracked concrete only.
- Concrete compressive strength C20/25 ($f_{ck,cube}$ = 25 N/mm²).
- Loading data conformed to ETA-06/0100.



ANCHOR SIZE		M8	M10	M12	M16	M20	M24
$h_{ef,std}$	[mm]	80	90	110	125	175	210
$N^0_{Rd,c}$	[kN]	20.1	24.0	32.4	39.2	64.9	85.4

The design concrete cone resistance is derived from $N^0_{Rd,c} = N^0_{Rk,c} / \gamma_{Mc,N}$ where the partial safety factor is 1.8. The recommended load is derived from $N^0_{Rec,c} = N^0_{Rd,c} / \gamma_F$ where the partial safety factor is 1.4.

VAP SPIN GLASS CAPSULES WITH VA RODS

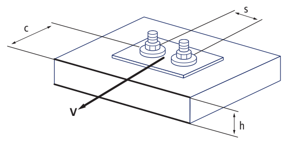
SHEAR LOAD [V_{Rd}]

Design Shear Resistance, V_{Rd}: lower value of [$V_{Rd,s}$; $V_{Rd,c}$; $V_{Rd,cp}$]

Design Steel Shear Resistance: $V_{Rd,s}$

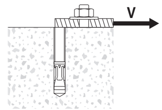
Design Concrete Edge Shear Resistance: $V_{Rd,c} = V^0_{Rd,c} \cdot \Psi_{\beta,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{sc,V}$

Design Concrete Pry-Out Resistance: $V_{Rd,cp} = V^0_{Rd,cp} \cdot \Psi_{\beta,V} \cdot \Psi_{s,N} \cdot \Psi_{c,N}$



STEEL SHEAR RESISTANCE [$V_{Rd,s}$]

- For static and quasi-static loadings.
- Only a single anchor is considered.
- For non-cracked concrete only.
- Data valid only for specified steel grade.
- Loading data conformed to ETA-06/0100.

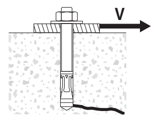


ANCHOR SIZE		M8	M10	M12	M16	M20	M24
Carbon Steel: Class 5.8							
$V_{Rd,s}$	[kN]	7.2	11.2	16.8	31.2	48.8	70.4
High Tensile Steel: Class 8.8							
$V_{Rd,s}$	[kN]	12.0	18.4	26.4	50.4	78.4	112.8
Stainless Steel: Class A2/A4							
$V_{Rd,s}$	[kN]	8.3	12.8	18.6	35.3	55.1	79.5

The design steel shear resistance is derived from $V_{Rd,s} = V_{Rk,s} / \gamma_{Ms,v}$ where the partial safety factor is 1.25 for carbon steel 5.8 and high tensile steel 8.8; 1.56 for stainless steel A2/A4. The recommended load is derived from $V_{Rec,s} = V_{Rd,s} / \gamma_F$ where the partial safety factor is 1.4.

CONCRETE EDGE SHEAR RESISTANCE [$V_{Rd,c}$]

- For static and quasi-static loadings.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Loading applicable to dry and wet concrete.
- For non-cracked concrete only.
- Concrete compressive strength C20/25 ($f_{ck,cube}$ = 25 N/mm²).
- Loading data conformed to ETA-06/0100.

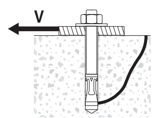


ANCHOR SIZE		M8	M10	M12	M16	M20	M24
$h_{ef,std}$	[mm]	80	90	110	125	175	210
c_{min}	[mm]	40	45	55	65	85	105
$V^0_{Rd,c}$	[kN]	3.6	4.7	6.9	10.1	17.8	25.8

The design concrete edge shear resistance is derived from $V^0_{Rd,c} = V^0_{Rk,c} / \gamma_{Mc,V}$ where the partial safety factor is 1.5. The recommended load is derived from $V^0_{Rec,c} = V^0_{Rd,c} / \gamma_F$ where the partial safety factor is 1.4.

CONCRETE PRY-OUT RESISTANCE [$V_{Rd,cp}$]

- For static and quasi-static loadings.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Loading applicable to dry and wet concrete.
- For non-cracked concrete only.
- Concrete compressive strength C20/25 ($f_{ck,cube}$ = 25 N/mm²).
- Loading data conformed to ETA-06/0100.



ANCHOR SIZE		M8	M10	M12	M16	M20	M24
$h_{ef,std}$	[mm]	80	90	110	125	175	210
$V^0_{Rd,cp}$	[kN]	40.1	47.9	64.7	78.4	129.9	170.8

The design concrete pry-out resistance is derived from $V^0_{Rd,cp} = V^0_{Rk,cp} / \gamma_{Mp,v}$ where the partial safety factor is 1.5. The recommended load is derived from $V^0_{Rec,cp} = V^0_{Rd,cp} / \gamma_F$ where the partial safety factor is 1.4.

COMBINED TENSION & SHEAR

Combined Tension & Shear: $\frac{N_{Sd}}{N_{Rd}} + \frac{V_{Sd}}{V_{Rd}} \leq 1.2$

The resultant force must be satisfied to the above conditions. The designer must cross check the loading conditions, types of applied loads and substrate to ensure the recommended anchor is applicable to the actual site applications. This would avoid any design faults which commonly caused by inconclusive load requirements with respective to actual site conditions.

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INFLUENCING FACTORS - TENSION

INFLUENCE OF ANCHORAGE DEPTH [$\Psi_{h,N}$]

$\Psi_{h,N} = \frac{h_{act}}{h_{ef,std}}$ Limits: $h_{ef,std} \leq h_{act} \leq h_{ef,max}$

INFLUENCE OF CONCRETE STRENGTH ON PULL-OUT AND CONCRETE CONE RESISTANCE [$\Psi_{\beta,N}$]

$\Psi_{\beta,N} = \left(\frac{f_{ck,cube}}{25}\right)^{0.3}$ Limits: 25 MPa $\leq f_{ck,cube} \leq$ 60 MPa

Concrete Strength Designation (ENV 206)		C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 50/60
Concrete Cylinder Strength, $f_{ck,cyl}$	[MPa]	20	25	30	35	40	50
Concrete Cube Strength, $f_{ck,cube}$	[MPa]	25	30	37	45	50	60
Concrete Strength Factor, $\psi_{\beta,N}$		1.00	1.06	1.12	1.19	1.23	1.30

INFLUENCE OF ANCHOR SPACING [$\psi_{s,N}$]

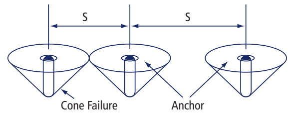
Anchor Spacing 's' [mm]	M8	M10	M12	M16	M20	M24
40	0.63					
45	0.64	0.63				
55	0.67	0.65	0.63			
65	0.70	0.68	0.65	0.63		
85	0.77	0.74	0.69	0.67	0.62	
105	0.83	0.79	0.74	0.71	0.65	0.63
135	0.92	0.88	0.81	0.77	0.69	0.66
150	0.97	0.92	0.84	0.80	0.71	0.68
160	1.00	0.94	0.86	0.82	0.73	0.69
180		1.00	0.91	0.86	0.76	0.71
220			1.00	0.94	0.81	0.76
250				1.00	0.86	0.80
350					1.00	0.92
420						1.00
Critical Spacing 's_{cr}' [mm]	160	180	220	250	350	420
Minimum Spacing 's_{min}' [mm]	40	45	55	65	85	105

$\Psi_{s,N} = 0.5 + \frac{s}{4^{*} h_{ef,std}}$

Limits: $s_{min} \leq s \leq s_{cr}$

$s_{min} = 0.5 * h_{ef,std}$

$s_{cr} = 2.0 * h_{ef,std}$



INFLUENCE OF EDGE DISTANCE [$\psi_{c,N}$]

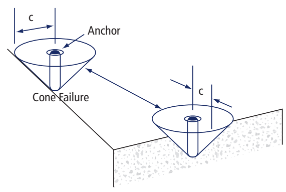
Edge Distance 'c' [mm]	M8	M10	M12	M16	M20	M24
40	0.65					
45	0.69	0.65				
55	0.78	0.73	0.65			
65	0.87	0.81	0.71	0.66		
80	1.00	0.92	0.81	0.75		
85		0.96	0.84	0.78	0.64	
90		1.00	0.87	0.80	0.66	
105			0.97	0.89	0.72	0.65
110			1.00	0.92	0.74	0.67
125				1.00	0.80	0.72
175					1.00	0.88
210						1.00
Critical Edge Distance 'c_{cr}' [mm]	80	90	110	125	175	210
Minimum Edge Distance 'c_{min}' [mm]	40	45	55	65	85	105

$\Psi_{c,N} = 0.3 + 0.7 * \frac{c}{h_{ef,std}}$

Limits: $c_{min} \leq c \leq c_{cr}$

$c_{min} = 0.5 * h_{ef,std}$

$c_{cr} = 1.0 * h_{ef,std}$



INFLUENCING FACTORS - SHEAR

INFLUENCE OF CONCRETE STRENGTH ON CONCRETE EDGE SHEAR AND CONCRETE PRY-OUT RESISTANCE [$\Psi_{\beta,V}$]

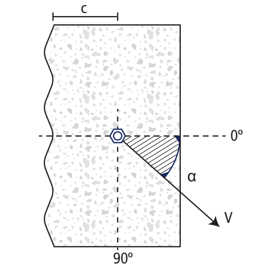
$$\Psi_{\beta,V} = \sqrt{\frac{f_{ck,cube}}{25}}$$

Limits: $25\ \text{MPa} \leq f_{ck,cube} \leq 60\ \text{MPa}$

Concrete Strength Designation (ENV 206)		C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 50/60
Concrete Cylinder Strength, $f_{ck,cyl}$	[MPa]	20	25	30	35	40	50
Concrete Cube Strength, $f_{ck,cube}$	[MPa]	25	30	37	45	50	60
Concrete Strength Factor, $\psi_{\beta,V}$		1.00	1.10	1.22	1.34	1.41	1.55

INFLUENCE OF SHEAR LOAD DIRECTION [$\Psi_{\alpha,V}$]

Load Type	Angle, α [°]	$\Psi_{\alpha,V}$
Oblique 0°	$0° < \alpha \leq 15°$	1.00
Oblique 30°	$15° < \alpha \leq 37.5°$	1.14
Oblique 45°	$37.5° < \alpha \leq 52.5°$	1.35
Oblique 60°	$52.5° < \alpha \leq 67.5°$	1.71
Oblique 90°	$67.5° < \alpha \leq 90°$	2.00

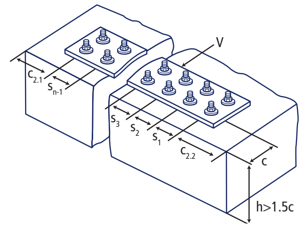


INFLUENCE OF ANCHOR SPACING AND EDGE DISTANCE ON CONCRETE EDGE SHEAR RESISTANCE [$\Psi_{sc,V}$]

$$\Psi_{sc,V} = \frac{c}{c_{min}} * \sqrt{\frac{c}{c_{min}}}$$ for single anchor towards a concrete edge

$$\Psi_{sc,V} = \frac{3c + s}{6c_{min}} * \sqrt{\frac{c}{c_{min}}}$$ for two anchors when $s \leq 3c$

$$\Psi_{sc,V} = \frac{3c + s_1 + s_2 + s_{n-1}}{3nc_{min}} * \sqrt{\frac{c}{c_{min}}}$$ for multiple anchors when s_1 to $s_{n-1} \leq 3c$ and $c_2 \geq 1.5c$



$\Psi_{sc,V}$		c / c_min															
		1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0
Edge influence with single anchor		1.00	1.31	1.66	2.02	2.41	2.83	3.26	3.72	4.19	4.69	5.20	5.72	6.27	6.83	7.41	8.00
	1.0	0.67	0.84	1.03	1.22	1.43	1.65	1.88	2.12	2.36	2.62	2.89	3.16	3.44	3.73	4.03	4.33
	1.5	0.75	0.93	1.12	1.33	1.54	1.77	2.00	2.25	2.50	2.76	3.03	3.31	3.60	3.89	4.19	4.50
	2.0	0.83	1.02	1.22	1.43	1.65	1.89	2.13	2.38	2.63	2.90	3.18	3.46	3.75	4.05	4.35	4.67
	2.5	0.92	1.11	1.32	1.54	1.77	2.00	2.25	2.50	2.77	3.04	3.32	3.61	3.90	4.21	4.52	4.83
	3.0	1.00	1.20	1.42	1.64	1.88	2.12	2.37	2.63	2.90	3.18	3.46	3.76	4.06	4.36	4.68	5.00
	3.5		1.30	1.52	1.75	1.99	2.24	2.50	2.76	3.04	3.32	3.61	3.91	4.21	4.52	4.84	5.17
	4.0			1.62	1.86	2.10	2.36	2.62	2.89	3.17	3.46	3.75	4.05	4.36	4.68	5.00	5.33
	4.5				1.96	2.21	2.47	2.74	3.02	3.31	3.60	3.90	4.20	4.52	4.84	5.17	5.50
	5.0					2.33	2.59	2.87	3.15	3.44	3.74	4.04	4.35	4.67	5.00	5.33	5.67
	5.5						2.71	2.99	3.28	3.57	3.88	4.19	4.50	4.82	5.15	5.49	5.83
	6.0						2.83	3.11	3.41	3.71	4.02	4.33	4.65	4.98	5.31	5.65	6.00
s / c_min	6.5							3.24	3.53	3.84	4.16	4.47	4.80	5.13	5.47	5.82	6.17
	7.0								3.67	3.98	4.29	4.62	4.95	5.29	5.63	5.98	6.33
	7.5									4.11	4.43	4.76	5.10	5.44	5.79	6.14	6.50
	8.0										4.57	4.91	5.25	5.59	5.95	6.30	6.67
	8.5											5.05	5.40	5.75	6.10	6.47	6.83
	9.0											5.20	5.55	5.90	6.26	6.63	7.00
	9.5												5.69	6.05	6.42	6.79	7.17
	10.0													6.21	6.58	6.95	7.33
	10.5														6.74	7.12	7.50
	11.0															7.28	7.67
	11.5																7.83
	12.0																8.00