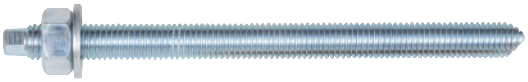
BONDED ANCHOR / CAPSULE SYSTEM W-VD

W-VD

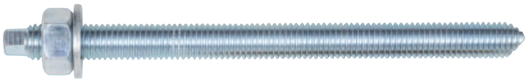
Vinylester resin, quartz sand and hardener

W-VD-A/S



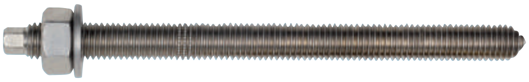
Galvanized (5 microns): M8 - M24

W-VD-A/F



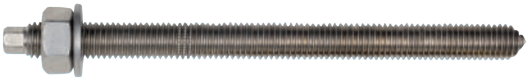
Hot-dipped (≥ 40 microns): M8 - M24

W-VD-A/A4



A4 (AISI 316): M8 - M24

W-VD-A/HCR



A4 (AISI 316): M8 - M24

Approved for:
Concrete C20/25 to C50/60, non-cracked

Suitable for:
Concrete C12/15, Natural stone with dense structure

Benefits:
- The pre-portioned resin volume guarantees always safe adhesion and thus avoids application errors.
- The short curing time allows to proceed speedily.
- The included setting tool allows always smooth installations.
- The usability can easily be checked and thus avoids application errors.
- The capsule can be used as long the resin flows honey like while shaking it.

Applications

W-VD

Approvals and Certificates

Description	Authority/ Laboratory	Guideline for Assessment	No./date of issue
European Technical Approval	DIBt, Berlin	ETAG 001-T5	ETA-06/0074 / 2013-06-04
Fire resistance	iBMB, Braunschweig	DIN 4102-2: 1977-09	(3333/273/08)-NB / 2013-03-05

Basic loading data (for a single anchor)

All data in this section applies to:

- Correct setting (See setting instruction).
- No edge distance and spacing influence.
- Base material thickness, as specified in the table.
- Embedment depth, as specified in the table.
- Anchor material, as specified in the tables, steel grade 5.8.
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm².
- Temperate range I (min. base material temperature -40°C, max. long term/short term base material temperature: +50°C/80°C).
- Dry or wet conditions of drill hole, hammer drilling.
- Installation temperature range +5°C to +40°C.

Characteristic resistance

Anchor type: W-VD

Thread size				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Effective anchorage depth		$h_{ef,\ typ}$	[mm]	80	90	110	125	170	210
Non-cracked concrete									
Tensile	C20/25	N_{Rk}	[kN]	20.0	30.0	40.0	50.0	75.0	90.0
Shear	≥ C20/25	V_{Rk}	[kN]	9.2	14.5	21.1	39.2	61.2	88.1

Design resistance

Anchor type: W-VD

Thread size				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Effective anchorage depth		$h_{ef,\ typ}$	[mm]	80	90	110	125	170	210
Non-cracked concrete									
Tensile	C20/25	N_{Rd}	[kN]	11.1	16.7	22.2	27.8	41.7	50.0
Shear	≥ C20/25	V_{Rd}	[kN]	7.4	11.6	16.9	31.4	49.0	70.5

Recommended / Allowable loads [1)]

Anchor type: W-VD

Thread size				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Effective anchorage depth		$h_{ef,\ typ}$	[mm]	80	90	110	125	170	210
Non-cracked concrete									
Tensile	C20/25	N_{rec}	[kN]	7.9	11.9	15.9	19.8	29.8	35.7
Shear	≥ C20/25	V_{rec}	[kN]	5.3	8.3	12.1	22.4	35.0	50.3

[1)] Material safety factor γ_M and safety factor for action γ_L = 1.4 are included. The material safety factor depends on the failure mode.

W-VD

BONDED ANCHOR / CAPSULE SYSTEM W-VD

Design Method (simplified)

Simplified version of the design method according ETAG 001, Annex C. Design resistance according data given in ETA-06/0074, issue 2012-06-04:

- Influence of concrete strength.
- Influence of edge distance.
- Influence of spacing.
- Valid for a group of anchors. (The influencing factors must then be considered for each edge distance and spacing. The calculated design loads are then on the save side. They will be lower than the exact values according ETAG 001, Annex C. To avoid this, it is recommended to use the anchor design software of Würth).
- The design method is based on the following simplification: No different loads are acting on individual anchors (no eccentricity).
- Temperate range I (min. base material temperature -40°C, max. long term/short term base material temperature: +50°C/80°C).
- Dry or wet conditions of drill hole, hammer drilling.
- Installation temperature range +5°C to +40°C.

Tension loading

The decisive design resistance in tension is the lowest value of the following failure modes:

Steel failure: $N_{Rd,s}$

Pull out failure: $N_{Rd,p} = N^0_{Rd,p}$

Concrete cone failure: $N_{Rd,c} = N^0_{Rd,c} \cdot f_{sx} \cdot f_{sy} \cdot f_{cx,1} \cdot f_{cx,2} \cdot f_{cy}$

Concrete splitting failure: $N_{Rd,sp} = N^0_{Rd,sp} \cdot f_{sx,sp} \cdot f_{sy,sp} \cdot f_{cx,1,sp} \cdot f_{cx,2,sp} \cdot f_{cy,sp} \cdot f_h$

Design steel resistance $N_{Rd,s}$ of a single anchor

Anchor type: W-VD

steel grade	Thread size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
5.8	$N_{Rd,s}$	[kN]	12.2	19.3	28.1	52.2	81.6	117.5
8.8	$N_{Rd,s}$	[kN]	19.5	30.9	44.9	83.6	130.6	188.0
A4-70	$N_{Rd,s}$	[kN]	13.7	21.7	31.5	58.6	91.6	131.9

Design pull-out resistance $N_{Rd,p}$ of a single anchor

$N_{Rd,p} = N^0_{Rd,p}$

Anchor type: W-VD

Thread size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
$h_{ef,typ}$	[mm]	80	90	110	125	170	210
Non-cracked concrete							
$N^0_{Rd,p}$	[kN]	11.1	16.7	22.2	27.8	41.7	50.0

Design concrete cone resistance $N_{Rd,c}$ and splitting resistance $N_{Rd,sp}$ of a single anchor

Concrete cone failure: $N_{Rd,c} = N^0_{Rd,c} \cdot f_{sx} \cdot f_{sy} \cdot f_{cx,1} \cdot f_{cx,2} \cdot f_{cy}$

Concrete splitting failure: $N_{Rd,sp} = N^0_{Rd,sp} \cdot f_{sx,sp} \cdot f_{sy,sp} \cdot f_{cx,1,sp} \cdot f_{cx,2,sp} \cdot f_{cy,sp} \cdot f_h$

No verification of splitting is required if at least one of the conditions is fulfilled:

a) The edge distance in all directions is $c \geq c_{cr,sp}$ for single fasteners and $c \geq 1.2\ c_{cr,sp}$ for fastener groups and the member depth is $h \geq h_{min}$ in both cases.

b) The characteristic resistance for concrete cone failure and pull-out failure is calculated for cracked concrete and reinforcement resists the splitting forces and limits the crack width to $w_k \leq 0.3mm$.

Basic design concrete cone resistance $N^0_{Rd,c}$ of a single anchor

Anchor type: W-VD

Thread size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
$h_{ef,typ}$	[mm]	80	90	110	125	170	210
Non-cracked concrete							
$N^0_{Rd,c}$	[kN]	11.1	16.7	22.2	27.8	41.7	50.0

W-VD

Concrete cone failure

Characteristic edge distance $c_{cr,N}$ and spacing $s_{cr,N}$

Anchor type: W-VD

Thread size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
$h_{ef,typ}$	[mm]	80	90	110	125	170	210
$s_{cr,N}$	[mm]	240	180	220	250	340	420
$c_{cr,N}$	[mm]	120	90	110	125	170	210

BONDED ANCHOR / CAPSULE SYSTEM W-VD

Concrete cone failure - Influence of spacing

$$f_{sx} = f_{sy} = \left(1 + \left(n_{x(y)} - 1\right)\frac{s_{x(y)}}{s_{cr,N}}\right) \cdot \frac{1}{n_{x(y)}} \leq 1$$

Number of fixing per direction	$s/s_{cr,N}$ [1)]	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	≥ 1.0
2	f_{sx}, f_{sy}	0.55	0.58	0.60	0.63	0.65	0.68	0.70	0.73	0.75	0.78	0.80	0.83	0.85	0.88	0.90	0.93	0.95	0.98	1.00
3	f_{sx}, f_{sy}	0.40	0.43	0.47	0.50	0.53	0.57	0.60	0.63	0.67	0.70	0.73	0.77	0.80	0.83	0.87	0.90	0.93	0.97	1.00
4	f_{sx}, f_{sy}	0.33	0.36	0.40	0.44	0.48	0.51	0.55	0.59	0.63	0.66	0.70	0.74	0.78	0.81	0.85	0.89	0.93	0.96	1.00
5	f_{sx}, f_{sy}	0.28	0.32	0.36	0.40	0.44	0.48	0.52	0.56	0.60	0.64	0.68	0.72	0.76	0.80	0.84	0.88	0.92	0.96	1.00

[1)] Choose always the lowest value of the spacing s, when there are different spacings in one row.

Concrete cone failure - Influence of edge distance

$$f_{cx,1} = 0.7 + 0.3\frac{c_x}{c_{cr,N}} \leq 1\,; \quad f_{cx,2} = f_{cy} = \left(1 + \frac{c_{x(y)}}{c_{cr,N}}\right) \cdot \frac{1}{2} \leq 1$$

$c/c_{cr,N}$	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	≥ 1.0
$f_{cx,1}$	0.73	0.75	0.76	0.78	0.79	0.81	0.82	0.84	0.85	0.87	0.88	0.90	0.91	0.93	0.94	0.96	0.97	0.99	1.00
$f_{cx,2}$ / f_{cy}	0.55	0.58	0.60	0.63	0.65	0.68	0.70	0.73	0.75	0.78	0.80	0.83	0.85	0.88	0.90	0.93	0.95	0.98	1.00

Concrete splitting failure

Characteristic edge distance $c_{cr,sp}$ and spacing $s_{cr,sp}$

Anchor type: W-VD

Thread size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
$h_{ef,typ}$	[mm]	80	90	110	125	170	210
$s_{cr,sp}$	[mm]	240	180	220	250	340	420
$c_{cr,sp}$	[mm]	120	90	110	125	170	210
h_{min}	[mm]	110	120	140	160	220	260

Concrete splitting failure - Influence of spacing

$$f_{sx,sp} = f_{sy,sp} = \left(1 + \left(n_{x(y)} - 1\right)\frac{s_{x(y)}}{s_{cr,sp}}\right) \cdot \frac{1}{n_{x(y)}} \leq 1$$

Number of fixing per direction	$s/s_{cr,sp}$ [1)	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	≥ 1.0
2	$f_{sx,sp}$, $f_{sy,sp}$	0.55	0.58	0.60	0.63	0.65	0.68	0.70	0.73	0.75	0.78	0.80	0.83	0.85	0.88	0.90	0.93	0.95	0.98	1.00
3	$f_{sx,sp}$, $f_{sy,sp}$	0.40	0.43	0.47	0.50	0.53	0.57	0.60	0.63	0.67	0.70	0.73	0.77	0.80	0.83	0.87	0.90	0.93	0.97	1.00
4	$f_{sx,sp}$, $f_{sy,sp}$	0.33	0.36	0.40	0.44	0.48	0.51	0.55	0.59	0.63	0.66	0.70	0.74	0.78	0.81	0.85	0.89	0.93	0.96	1.00
5	$f_{sx,sp}$, $f_{sy,sp}$	0.28	0.32	0.36	0.40	0.44	0.48	0.52	0.56	0.60	0.64	0.68	0.72	0.76	0.80	0.84	0.88	0.92	0.96	1.00

[1) Choose always the lowest value of the spacing s, when there are different spacings in one row.

Concrete splitting failure - Influence of edge distance

$$f_{cx,1,sp} = 0.7 + 0.3\frac{c_x}{c_{cr,sp}} \leq 1; \quad f_{cx,2,sp} = f_{cy,sp} = \left(1 + \frac{c_{x(y)}}{c_{cr,sp}}\right) \cdot \frac{1}{2} \leq 1$$

$c/c_{cr,sp}$	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	≥ 1.0
$f_{cx,1,sp}$	0.73	0.75	0.76	0.78	0.79	0.81	0.82	0.84	0.85	0.87	0.88	0.90	0.91	0.93	0.94	0.96	0.97	0.99	1.00
$f_{cx,2,sp}$ $f_{cy,sp}$	0.55	0.58	0.60	0.63	0.65	0.68	0.70	0.73	0.75	0.78	0.80	0.83	0.85	0.88	0.90	0.93	0.95	0.98	1.00

Concrete splitting failure - Influence of concrete member thickness

$$f_h = \left(\frac{h}{h_{min}}\right)^{2/3} \leq max\left(1; \left(\frac{h_{ef} + 1.5c_1}{h_{min}}\right)^{2/3}\right) \leq 2$$

h/h_{min}	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00	2.10	2.20	2.30	2.40	2.50	2.60	2.70	2.80	≥2.90
f_h	1.00	1.07	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.53	1.59	1.64	1.69	1.74	1.79	1.84	1.89	1.94	1.99	2.00

BONDED ANCHOR / CAPSULE SYSTEM W-VD

Shear loading

The decisive design resistance in shear is the lowest value of the following failure modes:

Steel failure: $V_{Rd,s}$

Concrete pry-out failure: $V_{Rd,cp} = k \cdot min\{N_{Rd,p}; N_{Rd,c}\}$

Concrete edge failure: $V_{Rd,c} = V^0_{Rd,c} \cdot f_{s,V} \cdot f_{c2,V} \cdot f_\alpha \cdot f_h$

Design steel resistance $V_{Rd,s}$ of a single anchor

Anchor type: W-VD

steel grade	Thread size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
5.8	$V_{Rd,s}$	[kN]	7.4	11.6	16.9	31.4	49.0	70.5
8.8	$V_{Rd,s}$	[kN]	11.7	18.6	27.0	50.2	78.3	112.8
A4-70	$V_{Rd,s}$	[kN]	8.2	13.0	18.9	35.1	54.9	79.1

Design concrete pry-out resistance $V_{Rd,cp}$ of a single anchor

$V_{Rd,cp} = k \cdot min\{N_{Rd,p}; N_{Rd,c}\}$

Anchor type: W-VD

Thread size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
$h_{ef,typ}$	[mm]	80	90	110	125	170	210
k	[-]	2	2	2	2	2	2

Design concrete edge resistance $V_{Rd,c}$

$V_{Rd,c} = V^0_{Rd,c} \cdot f_{s,V} \cdot f_{c2,V} \cdot f_\alpha \cdot f_h$

Verification of concrete edge failure may be omitted for single fasteners and groups with an edge distance in all directions $c \geq \max(10h_{ef}; 60d)$. For anchorages with more than one edge, the resistance for all edges shall be calculated. The smallest value should be used in the verification.

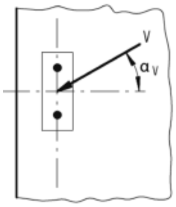
Basic design concrete edge resistance $V^0_{Rd,c}$ of a single anchor

Anchor type: W-VD

Thread size		M8	M10	M12	M16	M20	M24
h_{ef}	[mm]	80	90	110	125	170	210
Edge distance c_1		$V^0_{Rd,c}$					
[mm]		[kN]					
40		3.8					
45		4.4	4.7				
50		5.1	5.4				
55		5.7	6.1	6.6			
60		6.4	6.8	7.4			
65		7.1	7.6	8.2	8.9		
70		7.9	8.3	9.0	9.8		
75		8.6	9.1	9.8	10.7		
80		9.4	9.9	10.7	11.6		
85		10.2	10.8	11.5	12.5	14.3	
90		11.0	11.6	12.4	13.4	15.3	
95		11.9	12.5	13.3	14.4	16.4	
100		12.7	13.4	14.3	15.4	17.4	
110		14.5	15.2	16.2	17.4	19.6	21.5
120		16.3	17.1	18.1	19.4	21.9	23.9
130		18.1	19.0	20.1	21.5	24.2	26.3
140		20.1	21.0	22.2	23.7	26.5	28.8
150		22.1	23.0	24.4	26.0	28.9	31.4
160		24.1	25.2	26.6	28.3	31.4	34.0
170		26.2	27.3	28.8	30.6	34.0	36.6
180		28.4	29.5	31.1	33.0	36.5	39.4
190		30.6	31.8	33.5	35.5	39.2	42.1
200		32.8	34.1	35.9	38.0	41.9	45.0
250		44.8	46.4	48.6	51.2	56.0	59.8
300		57.8	59.7	62.3	65.5	71.2	75.6
350		71.8	74.0	77.1	80.7	87.4	92.5
400		86.6	89.2	92.7	96.9	104.5	110.3
450		102.3	105.3	109.2	113.9	122.5	129.0
500		118.8	122.1	126.5	131.7	141.2	148.4
550		136.0	139.6	144.5	150.3	160.8	168.6
600		153.9	157.9	163.2	169.5	181.0	189.6
650		172.5	176.9	182.6	189.5	202.0	211.2
700		191.7	196.4	202.7	210.1	223.6	233.5
750		211.6	216.7	223.4	231.4	245.8	256.5
800		232.0	237.5	244.7	253.2	268.7	280.0
850		253.0	258.9	266.6	275.7	292.1	304.2
900		274.6	280.9	289.0	298.7	316.2	329.0
950		296.8	303.4	312.0	322.3	340.8	354.3
1000			326.4	335.6	346.4	365.9	380.1
1100				384.2	396.2	417.8	433.4
1200				434.9	448.0	471.7	488.8
1300				487.4	501.7	527.5	546.1
1400					557.2	585.2	605.2
1500					614.6	644.7	666.2

Influence of load direction

$$f_\alpha = \sqrt{\frac{1}{\cos^2\alpha_V + \left(\frac{\sin\alpha_V}{2.5}\right)^2}} \leq 2.5$$



α[1]	0	10	20	30	40	50	60	70	80	90
$f_{\alpha,V}$	1.00	1.01	1.05	1.13	1.24	1.40	1.64	1.97	2.32	2.50

[1] For α ≥ 90° the component of the shear load acting away from the edge may be neglected and the verification may be done with component acting parallel to the edge only.

Influence of spacing

In groups loaded perpendicular to the edge only two adjacent anchors closest and parallel to the edge carry the load. The smallest spacing should be used for the verification.

$$f_{s,V} = \frac{1}{3} \cdot \frac{s}{c_1} + 1 \leq 2$$

s/c_1[1]	0.50	0.60	0.70	0.80	0.90	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00
$f_{s,V}$	1.17	1.20	1.23	1.27	1.30	1.33	1.40	1.47	1.53	1.60	1.67	1.73	1.80	1.87	1.93	2.00

[1] Choose always the lowest value of the spacing s, when there are different spacings in the row closest to the edge.

Influence of edge distance

$$f_{c2,V} = \left(\frac{1}{2} + \frac{1}{3}\frac{c_2}{c_1}\right)\left(0.7 + 0.3\frac{c_2}{1.5c_1}\right) \leq 1$$

c_2/c_1[1]	1.00	1.10	1.20	1.30	1.40	1.50
$f_{c,V}$	0.75	0.80	0.85	0.90	0.95	1.00

[1] Distance to the second edge: $c_1 \leq c_2$.

Influence of concrete member thickness

$$f_{h,V} = \left(\frac{h}{1.5c_1}\right)^{1/2}$$

h/c_1	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	≥ 1.50
$f_{h,V}$	0.26	0.37	0.45	0.52	0.58	0.63	0.68	0.73	0.77	0.82	0.86	0.89	0.93	0.97	1.00

Structural Verification

Tension $N_{Sd}^{h} \leq N_{Rd} = \min\left(N_{Rd,s}; N_{Rd,p}; N_{Rd,c}; N_{Rd,sp}\right)$

$$\beta_N = max\left(\frac{N_{Sd}^{h}}{N_{Rd,s}}; \frac{N_{Sd}^{h}}{N_{Rd,p}}; \frac{N_{Sd}^{h}}{N_{Rd,c}}; \frac{N_{Sd}^{h}}{N_{Rd,sp}}\right) \leq 1$$

Shear $V_{Sd}^{h} \leq V_{Rd} = \min\left(V_{Rd,s}; V_{Rd,cp}; {}^{V_{Rd,c}}/_{n}\right)$

$$\beta_V = max\left(\frac{V_{Sd}^{h}}{V_{Rd,s}}; \frac{V_{Sd}^{h}}{V_{Rd,cp}}; \frac{V_{Sd}^{g}}{V_{Rd,c}}\right) \leq 1$$

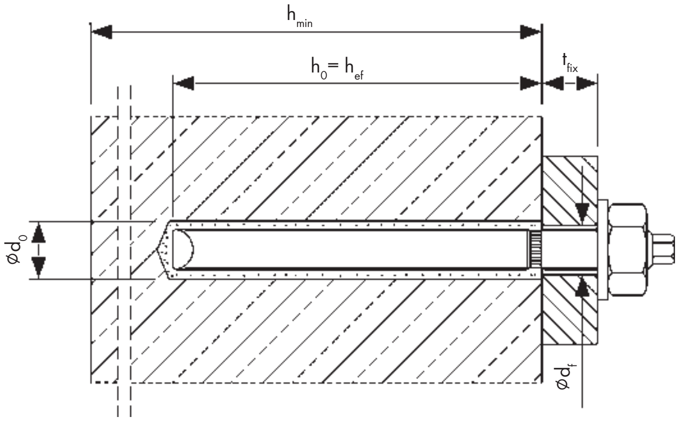
Combined tension and shear $\beta_N + \beta_V \leq 1.2$

BONDED ANCHOR / CAPSULE SYSTEM W-VD

Anchor characteristics

Anchor type: W-VD

Thread size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Effective anchorage depth	h_{ef}	[mm]	80	90	110	125	170	210
Nominal drill hole diameter	d_0	[mm]	10	12	14	18	25	28
Drill depth	$h_0 \geq$	[mm]	$= h_{ef}$					
Diameter of steel brush	db ≥	[mm]	11	13	16	20	27	30
Clearance-hole in fixture to be attached	d_f	[mm]	9	12	14	18	22	26
Wrench size	SW	[mm]	13	17	19	24	30	36
Required torque	T_{inst}	[Nm]	10	20	40	80	120	180
Min. thickness of concrete member	h_{min}	[mm]	110	120	140	160	220	260
Minimum spacing	s_{min}	[mm]	40	45	55	65	85	105
Minimum edge distances	c_{min}	[mm]	40	45	55	65	85	105



W-VD

Mechanical characteristics

Anchor type: W-VD

steel grade	Thread size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
	Stressed cross section	A_s	[mm²]	37	58	84	157	245	352
	Section Modulus	W	[mm³]	31	62	109	277	540	933
5.8	Yield strength	f_y	[N/mm²]	400	400	400	400	400	400
	Tensile strength	f_u	[N/mm²]	500	500	500	500	500	500
	Design bending moment	$M^0_{Rd,s}$	[Nm]	15	30	52	133	259	448
8.8	Yield strength	f_y	[N/mm²]	640	640	640	640	640	640
	Tensile strength	f_u	[N/mm²]	800	800	800	800	800	800
	Design bending moment	$M^0_{Rd,s}$	[Nm]	24	48	84	212	415	717
A4-70	Yield strength	f_y	[N/mm²]	450	450	450	450	450	450
		f_u	[N/mm²]	700	700	700	700	700	700
	Design bending moment	$M^0_{Rd,s}$	[Nm]	17	34	59	149	292	504

BONDED ANCHOR / CAPSULE SYSTEM W-VD

Material specification of anchor

Anchor type: W-VD

Designation	Material
Steel, zinc plated ≥ 5µm, EN ISO 4042	
Threaded rod	Steel Property class 5.8, 8.8, acc. to EN ISO 898-1
Hexagon nut acc. to DIN 934	Property class 8, acc. to EN ISO 898-2, galvanised
Washer	Steel, galvanised
Glass capsule	Glass, quarz, resin, hardener
Steel, hot-dip galvanised ≥ 40µm, EN ISO 1461	
Threaded rod	Steel Property class 5.8, 8.8, acc. to EN ISO 898-1
Hexagon nut acc. to DIN 934	Property class 8, acc. to EN ISO 898-2, hot-dip galvanised
Washer	Steel, hot-dip galvanised
Glass capsule	Glass, quarz, resin, hardener
Stainless steel A4	
Threaded rod	Property class 70, acc. To EN ISO 3506, Stainless steel 1.4401, 1.4404, 1.4571, 1.4578 or 1.4362, EN 10088
Hexagon nut acc. to DIN 934	Property class 70, acc. To EN ISO 3506, Stainless steel 1.4401, 1.4404, 1.4571 or 1.4362, EN 10088
Washer	Material 1.4401, 1.4404, 1.4571 or 1.4362, EN 10088
Glass capsule	Glass, quarz, resin, hardener
High corrosion resistance steel	
Threaded rod	Property class 70, acc. To EN ISO 3506, High corrosion resistant steel 1.4529 or 1.4565, EN 10088
Hexagon nut acc. to DIN 934	Property class 70, acc. To EN ISO 3506, High corrosion resistant steel 1.4529 or 1.4565, EN 10088
Washer	High corrosion resistant steel 1.4529 or 1.4565, EN 10088
Glass capsule	Glass, quarz, resin, hardener

Use category: Temperature range

Temperature range	**Base material temperature**	**Maximum long term base material temperature**	**Maximum short term base material temperature**
Temperature range I	-40°C to +80°C	+50°C	+80°C

Curing time

Temperature of Concrete	**Minimum Curing time in dry concrete**	**Minimum Curing time in wet concrete**
-5°C bis 4°C	5 h	10 h
5°C bis 19°C	1 h	2 h
20°C bis 29°C	20 min	40 min
≥ 30°C	10 min	20 min

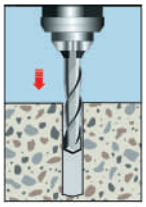
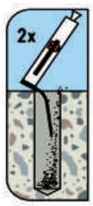
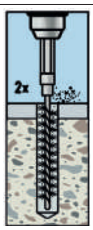
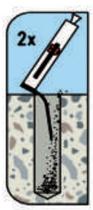
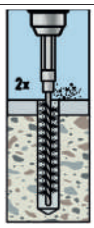
[1)] Capsule temperature must be at min. 5°C.

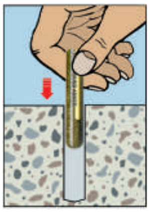
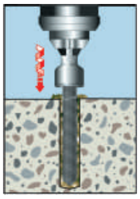
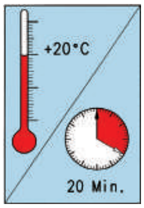
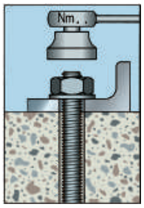
W-VD

BONDED ANCHOR / CAPSULE SYSTEM W-VD

Installation instruction

Anchor type: W-VD

	Installation	**Control**
	Choose the right tools.	There is a clearly defined set of tools for producing a safe fixture: drilling machine, drill bit, hand-pump, brush, brush diameter gauge. (See table „Accessories“). Check availability of those system tools before starting.
	Drill hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit. (For drill bit diameter and drill hole depth (see table „Anchor characteristics“).	Working length of drill bit must be bigger than the given drill hole depth.
	Blow out from the back of the bore hole until return air stream is free of noticeable dust.	
	Brush with the specified brush size by inserting the brush to the back of the hole in a twisting motion and removing it.	The brush must produce natural resistance as it enters the drill hole - if not, the brush is too small and must be replaced with the proper brush diameter (use the brush diameter gauge).
	Blow out from the back of the bore hole until return air stream is free of noticeable dust.	
	Brush with the specified brush size by inserting the brush to the back of the hole in a twisting motion and removing it.	

	Installation	Control
	Inserting the glass capsule into the bore hole. The air bubble to the surface.	
	Set the anchor rod with an hammer driller and a setting tool which is in every package of anchor rods.	
	Do not move or load the anchor until the mortar is fully cured. (see table „Working and cure times“)	
	After required curing time, the anchor element can be loaded. The applied installation torque shall not exceed. (see table „Anchor characteristic“).	Check the max. torque by using a calibrated torque wrench.

W-VD

BONDED ANCHOR / CAPSULE SYSTEM W-VD

Chemical resistance

Chemical Agent	Concentration	Resistant
Adipic acid		●
Alcohols (2-10 atoms)		●
Aluminium sulphate aqueous solution		●
Ammonium Bromate aqueous solution		●
Ammonium Bromide aqueous solution		●
Ammonium Chloride aqueous solution		●
Ammonium hydroxide aqueous solution	< 25%	●
Ammonium Nitrate aqueous solution		●
Ammonium Phosphate aqueous solution		●
Ammonium Sulphate aqueous solution		●
Barium Chloride aqueous solution		●
Barium Nitrate aqueous solution		●
Benzoic acid		●
Boric acid		●
Brine, aqueous saturated		●
Calcium Chloride aqueous solution		●
Calcium hydroxide aqueous solutionup to 10 % concentration	< 10 %	●
Calcium hypochloride aqueous solution	< pH 12 / < 17 % active chlorine	●
Calcium Nitrate aqueous solution		●
Calcium Sulphate aqueous solution		●
Chlorinat lime aqueous solution		●
Chromic acid	< 10%	●
Citric acid		●
Cobalt Chloride aqueous solution		●
Cobalt Nitrate aqueous solution		●
Copper-I-Chloride aqueous solution		●
Copper-II-Chloride aqueous solution		●
Copper-II-Nitrate aqueous solution		●
Copper-II-Sulphate aqueous solution		●
Copper-I-Sulphate aqueous solution		●
Diesel oil, fuel oil (EN 590) (no aromatics, no methanol)		●
Fatty acids (>12C-atoms)		●
Ferric Chloride/Sulphate aqueous solution		●
Ferrous Chloride aqueous solution		●
Fruit syrups (3<pH<8)		●
Glycols		●
Hydrazine hydrate, aqueous solution		●
Hydrocarbons (5 – 10 atoms)		●
Hydrochloric acid	< 37%	●
Lactic acid (< 10 %)		●
Maganese-II-chloride aqueous solution		●
Maganese-II-nitrate aqueous solution		●
Magnesium chloride aqueous solution		●
Magnesium nitrate aqueous solution		●
Mercuric-I-chloride aqueous solution		●
Mercuric-II-nitrate aqueous solution		●
Mercury		●
Molasses		●
Nickel chloride aqueous solution		●
Nickel nitrate aqueous solution		●
Nitric acid	< 30%	●
Paraffin wax		●
Perchloric acid	< 20%	●
Phosphoric acid (< 80 %)		●

W-VD

Chemical Agent	**Concentration**	**Resistant**
Phthalates/Phthalic ester		●
Phthalic acid		●
Potassium aluminium sulphate aqueous solution		●
Potassium chloride aqueous solution		●
Potassium ferric aqueous solution		●
Potassium ferrous cyanide aqueous solution		●
Potassium hydroxide aqueous solution	< pH 10	●
Potassium nitrate aqueous solution		●
Seawater		●
Silicon oil/grease		●
Sodium acetate aqueous solution		●
Sodium aluminate aqueous solution	< pH 10	●
Sodium bicarbonate aqueous solution		●
Sodium bromide aqueous solution		●
Sodium chloride aqueous solution		●
Sodium fluoride aqueous solution		●
Sodium hydroxide aqueous solution	< 50%	●
Sodium hypochloride aqueous solution	< pH 12 / < 16 % active chlorine	●
Sodium nitrate aqueous solution		●
Sodium thiosulphate aqueous solution		●
Starch, aqueous solution; pH 5 – 8		●
Succinic acid		●
Sugar		●
Sulpuric acid	< 60%	●
Tartaric acid		●
Urea aqueous solution		●
Vegetable oils		●
Water, not deionised or destilled		●

- When ever no concentration is given the resin resists all concentration levels until the highest technically possible level.
- It is important to notice that this chemical resistance is only valid for the cured mortar.
- Results shown in the table are applicable to brief periods of chemical contact with full cured adhesive (e.g. temporary contact with adhesive during a spill).