



## HVZ Adhesive anchor

Mortar system	Benefits
 <p>Hilti HVU-TZ foil capsule</p>  <p>HAS-TZ HAS-R-TZ HAS-HCR-TZ rod</p>	<ul style="list-style-type: none"> <li>- suitable for cracked and non-cracked concrete C 20/25 to C 50/60</li> <li>- high loading capacity</li> <li>- suitable for dry and water saturated concrete</li> </ul>



Concrete



Tensile zone



Fire resistance



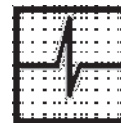
Corrosion resistance



High corrosion resistance



Fatigue



Shock



European Technical Approval



CE conformity



PROFIS Anchor design software

### Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval <sup>a)</sup>	DIBt, Berlin	ETA-03/0032 / 2008-09-29
Approval for shockproof fastenings in civil defence installations	Federal Office for Civil Protection, Bern	BZS D 09-602 / 2009-10-28
Fatigue loading	DIBt, Berlin	Z-21.3-1692 / 2012-03-07
Fire test report ZTV-Tunnel	IBMB, Braunschweig	UB 3357/0550-2 / 2001-06-26
Fire test report	IBMB, Brunswick	UB 3357/0550-1 / 2001-04-17
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26

a) All data given in this section according ETA-03/0032, issue 2008-09-29.

### 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
- Steel failure
- Base material thickness, as specified in the table
- Embedment depth, as specified in the table
- One anchor material, as specified in the tables
- Concrete C 20/25,  $f_{ck,cube} = 25 \text{ N/mm}^2$
- Temperature range I  
(min. base material temperature  $-40^\circ\text{C}$ , max. long term/short term base material temperature:  $+50^\circ\text{C}/80^\circ\text{C}$ )
- Installation temperature range  $0^\circ\text{C}$  to  $+40^\circ\text{C}$

For details see Simplified design method

**Embedment depth and base material thickness for the basic loading data.**  
**Mean ultimate resistance, characteristic resistance, design resistance, recommended loads.**

Anchor size	M10x75	M12x95	M16x105	M16x125	M20x170
Embedment depth [mm]	75	95	105	125	170
Base material thickness [mm]	150	190	210	250	340

**Mean ultimate resistance <sup>a)</sup>: concrete C 20/25 –  $f_{ck,cube} = 25 \text{ N/mm}^2$ , anchor HVZ**

Data according ETA-03/0032, issue 2008-09-29							
Anchor size			M10x75	M12x95	M16x105	M16x125	M20x170
Non cracked concrete							
Tensile $N_{Ru,m}$	HVZ	[kN]	36,8	53,3	72,4	94,1	149,2
Shear $V_{Ru,m}$	HVZ	[kN]	18,9	28,4	53,6	53,6	92,4
Cracked concrete							
Tensile $N_{Ru,m}$	HVZ	[kN]	31,2	44,4	51,6	67,1	106,4
Shear $V_{Ru,m}$	HVZ	[kN]	18,9	28,4	53,6	53,6	92,4

**Characteristic resistance: concrete C 20/25 –  $f_{ck,cube} = 25 \text{ N/mm}^2$ , anchor HVZ**

Data according ETA-03/0032, issue 2008-09-29							
Anchor size			M10x75	M12x95	M16x105	M16x125	M20x170
Non cracked concrete							
Tensile $N_{Rk}$	HVZ	[kN]	32,8	40,0	54,3	70,6	111,9
Shear $V_{Rk}$	HVZ	[kN]	18,0	27,0	51,0	51,0	88,0
Cracked concrete							
Tensile $N_{Rk}$	HVZ	[kN]	23,4	33,3	38,7	50,3	79,8
Shear $V_{Rk}$	HVZ	[kN]	18,0	27,0	51,0	51,0	88,0

**Design resistance: concrete C 20/25 –  $f_{ck,cube} = 25 \text{ N/mm}^2$ , anchor HVZ**

Data according ETA-03/0032, issue 2008-09-29							
Anchor size			M10x75	M12x95	M16x105	M16x125	M20x170
Non cracked concrete							
Tensile $N_{Rd}$	HVZ	[kN]	21,9	26,7	36,2	47,1	74,6
Shear $V_{Rd}$	HVZ	[kN]	14,4	21,6	40,8	40,8	70,4
Cracked concrete							
Tensile $N_{Rd}$	HVZ	[kN]	15,6	22,2	25,8	33,5	53,2
Shear $V_{Rd}$	HVZ	[kN]	14,4	21,6	40,8	40,8	70,4

**Recommended loads <sup>a)</sup>: concrete C 20/25 –  $f_{ck,cube} = 25 \text{ N/mm}^2$ , anchor HVZ**

Data according ETA-03/0032, issue 2008-09-29							
Anchor size			M10x75	M12x95	M16x105	M16x125	M20x170
Non cracked concrete							
Tensile $N_{rec}$	HVZ	[kN]	15,6	19,0	25,9	33,6	53,3
Shear $V_{rec}$	HVZ	[kN]	10,3	15,4	29,1	29,1	50,3
Cracked concrete							
Tensile $N_{rec}$	HVZ	[kN]	11,1	15,9	18,4	24,0	38,0
Shear $V_{rec}$	HVZ	[kN]	10,3	15,4	29,1	29,1	50,3

a) With overall partial safety factor for action  $\gamma = 1,4$ . The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

## Service temperature range

Hilti HVZ adhesive anchor with anchor rod HAS-TZ may be applied in the temperature ranges given below. An elevated base material temperature may lead to a reduction of the design bond resistance.

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

### Max short term base material temperature

Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

### Max long term base material temperature

Long-term elevated base material temperatures are roughly constant over significant periods of time.

## Materials

### Mechanical properties of HAS-TZ

			Data according ETA-03/0032, issue 2008-09-29				
Anchor size			M10x75	M12x95	M16x105	M16x125	M20x170
Nominal tensile strength $f_{uk}$	HAS-(R) (HCR)TZ	[N/mm <sup>2</sup> ]	800				
Yield strength $f_{yk}$	HAS-(R) (HCR)TZ	[N/mm <sup>2</sup> ]	640				
Stressed cross-section $A_s$	tension	[mm <sup>2</sup> ]	44,2	63,6	113	113	227
	shear	[mm <sup>2</sup> ]	50,3	73,9	141	141	245
Moment of resistance W	HAS-(R) (HCR)TZ	[mm <sup>3</sup> ]	50,3	89,6	236	236	541

### Material quality

Part	Material
HAS-TZ	carbon steel strength class 8.8
HAS-R-TZ	stainless steel 1.4401 and 1.4571
HAS-HCR-TZ	high corrosion resistance steel 1.4529 and 1.4547

## Anchor dimensions

Anchor size	M10x75	M12x95	M16x105	M16x125	M20x170
Anchor embedment depth [mm]	75	95	105	125	170

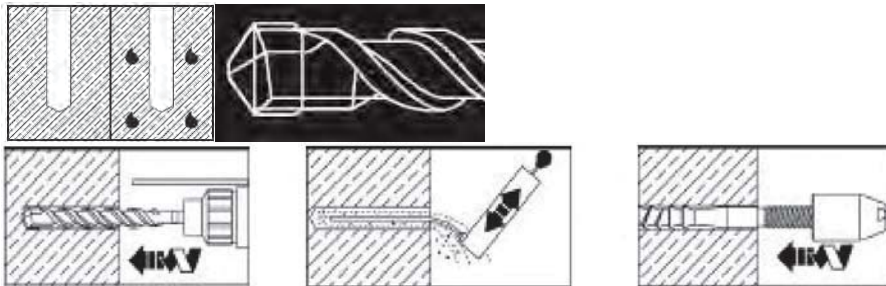
### Setting

#### installation equipment

Anchor size	M10x75	M12x95	M16x105	M16x125	M20x170
Rotary hammer	TE 2 – TE 16 / TE30/40				TE 50 – TE 70
Tools	Setting tools				

#### Setting instruction

Dry and water-saturated concrete, hammer drilling



For detailed information on installation see instruction for use given with the package of the product.

For technical data for anchors in diamond drilled holes please contact the Hilti Technical advisory service.

#### Curing time for general conditions

Data according ETA-04/0084, issue 2007-01-03	
Temperature of the base material	Curing time before anchor can be fully loaded $t_{cure}$
$\geq 20 \text{ }^\circ\text{C}$	20 min
10 $^\circ\text{C}$ to 20 $^\circ\text{C}$	30 min
0 $^\circ\text{C}$ to 10 $^\circ\text{C}$	60 min

These data are valid for dry concrete only. In wet concrete the curing time must be doubled.

**Setting details**

			Data according ETA-03/0032, issue 2008-09-29				
Anchor size			M10x75	M12x95	M16x105	M16x125	M20x170
Nominal diameter of drill bit	$d_0$	[mm]	12	14	18	18	25
Diameter of element	$d$	[mm]	10	12	16	16	20
Effective anchorage depth	$h_{ef}$	[mm]	75	95	105	125	170
Drill hole depth	$h_1$	[mm]	90	110	125	145	195
Minimum base material thickness	$h_{min}^{a)}$	[mm]	150	190	210	250	340
Diameter of clearance hole in the fixture	$d_f$	[mm]	12	14	18	18	22
Cracked concrete							
Minimum spacing	$s_{min}$	[mm]	50	60	70	70	80
Minimum edge distance	$c_{min}$	[mm]	50	60	70	70	80
Non cracked concrete							
Minimum spacing	$s_{min}$	[mm]	50	60	70	70	80
Minimum edge distance	$c_{min}$	[mm]	50	70	85	85	80
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	$2 c_{cr,sp}$				
Critical edge distance for splitting failure	$c_{cr,sp}$	[mm]	$1,5 h_{ef}$				
Critical spacing for concrete cone failure	$s_{cr,N}$		$2 c_{cr,N}$				
Critical edge distance for concrete cone failure	$c_{cr,N}^{b)}$		$1,5 h_{ef}$				
Torque moment <sup>c)</sup>	$T_{max}$	[Nm]	40	50	90	90	150

For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.

- a)  $h$ : base material thickness ( $h \geq h_{min}$ )
- b) The critical edge distance for concrete cone failure depends on the embedment depth  $h_{ef}$  and the design bond resistance. The simplified formula given in this table is on the safe side.
- c) This is the maximum recommended torque moment to avoid splitting failure during installation for anchors with minimum spacing and/or edge distance.

### Simplified design method

Simplified version of the design method according ETAG 001, Annex C. Design resistance according data given in ETA-03/0032, issue 2007-01-03.

- Influence of concrete strength
- Influence of edge distance
- Influence of spacing
- Valid for a group of two anchors. (The method may also be applied for anchor groups with more than two anchors or more than one edge distance. 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 PROFIS anchor)

The design method is based on the following simplification:

- No different loads are acting on individual anchors (no eccentricity)

The values are valid for one anchor.

For more complex fastening applications please use the anchor design software PROFIS Anchor.

### Tension loading

#### The design tensile resistance is the lower value of

- Steel resistance:

$$N_{Rd,s}$$

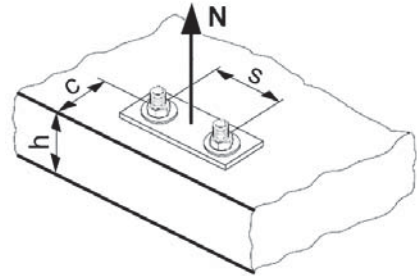
- Combined pull-out and concrete cone resistance:

$$N_{Rd,p} = N_{Rd,p}^0 \cdot f_{B,p} \cdot f_{h,p}$$

- Concrete cone resistance:  $N_{Rd,c} = N_{Rd,c}^0 \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,N} \cdot f_{re,N}$

- Concrete splitting resistance (only non-cracked concrete):

$$N_{Rd,sp} = N_{Rd,c}^0 \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,sp} \cdot f_{re,N}$$



### Basic design tensile resistance

#### Design steel resistance $N_{Rd,s}$

		Data according ETA-03/0032, issue 2008-09-29					
Anchor size		M10x75	M12x95	M16x105	M16x125	M20x170	
$N_{Rd,s}$	HAS-TZ HAS-R-TZ HAS-HCR-TZ	[kN]	23,3	34,0	60,0	60,0	121,3

#### Design combined pull-out and concrete cone resistance $N_{Rd,p} = N_{Rd,p}^0 \cdot f_{B,p} \cdot f_{h,p}$

		Data according ETA-03/0032, issue 2008-09-29					
Anchor size		M10x75	M12x95	M16x105	M16x125	M20x170	
Embedment depth $h_{ef}$ [mm]		75	95	105	125	170	
Non cracked concrete							
$N_{Rd,p}^0$	Temperature range I	[kN]	21,9	26,7	36,2	47,1	74,6
Cracked concrete							
$N_{Rd,p}^0$	Temperature range I	[kN]	15,6	22,2	25,8	33,5	53,2

**Design concrete cone resistance**  $N_{Rd,c} = N_{Rd,c}^0 \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,N} \cdot f_{re,N}$

**Design splitting resistance** <sup>a)</sup>  $N_{Rd,sp} = N_{Rd,c}^0 \cdot f_B \cdot f_{h,N} \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{re,N}$

		Data according ETA-03/0032, issue 2008-09-29				
Anchor size		M10x75	M12x95	M16x105	M16x125	M20x170
$N_{Rd,c}^0$	Non cracked concrete [kN]	21,9	31,2	36,2	47,1	74,6
$N_{Rd,c}^0$	Cracked concrete [kN]	15,6	22,2	25,8	33,5	53,2

a) Splitting resistance must only be considered for non-cracked concrete

## Influencing factors

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

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_{B,p} = (f_{ck,cube}/25N/mm^2)^{0.1}$ <sup>a)</sup>	1	1,02	1,04	1,06	1,07	1,08	1,09

a)  $f_{ck,cube}$  = concrete compressive strength, measured on cubes with 150 mm side length

### Influence of embedment depth on combined pull-out and concrete cone resistance

$f_{h,p} = h_{ef}/h_{ef,typ}$
-------------------------------

### Influence of concrete strength on concrete cone resistance

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25N/mm^2)^{1/2}$ <sup>a)</sup>	1	1,1	1,22	1,34	1,41	1,48	1,55

a)  $f_{ck,cube}$  = concrete compressive strength, measured on cubes with 150 mm side length

### Influence of edge distance <sup>a)</sup>

$c/c_{cr,N}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$c/c_{cr,sp}$										
$f_{1,N} = 0,7 + 0,3 \cdot c/c_{cr,N} \leq 1$										
$f_{1,sp} = 0,7 + 0,3 \cdot c/c_{cr,sp} \leq 1$	0,73	0,76	0,79	0,82	0,85	0,88	0,91	0,94	0,97	1
$f_{2,N} = 0,5 \cdot (1 + c/c_{cr,N}) \leq 1$										
$f_{2,sp} = 0,5 \cdot (1 + c/c_{cr,sp}) \leq 1$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1

a) The edge distance shall not be smaller than the minimum edge distance  $c_{min}$  given in the table with the setting details. These influencing factors must be considered for every edge distance.

### Influence of anchor spacing <sup>a)</sup>

$s/s_{cr,N}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$s/s_{cr,sp}$										
$f_{3,N} = 0,5 \cdot (1 + s/s_{cr,N}) \leq 1$										
$f_{3,sp} = 0,5 \cdot (1 + s/s_{cr,sp}) \leq 1$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1

a) The anchor spacing shall not be smaller than the minimum anchor spacing  $s_{min}$  given in the table with the setting details. This influencing factor must be considered for every anchor spacing.

### Influence of embedment depth on concrete cone resistance

$f_{h,N} = (h_{ef}/h_{ef,typ})^{1,5}$
---------------------------------------

### Influence of reinforcement

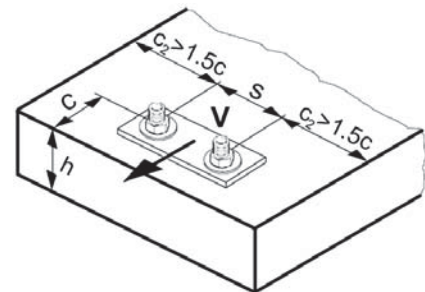
$h_{ef}$ [mm]	40	50	60	70	80	90	$\geq 100$
$f_{re,N} = 0,5 + h_{ef}/200\text{mm} \leq 1$	0,7 <sup>a)</sup>	0,75 <sup>a)</sup>	0,8 <sup>a)</sup>	0,85 <sup>a)</sup>	0,9 <sup>a)</sup>	0,95 <sup>a)</sup>	1

a) This factor applies only for dense reinforcement. If in the area of anchorage there is reinforcement with a spacing  $\geq 150$  mm (any diameter) or with a diameter  $\leq 10$  mm and a spacing  $\geq 100$  mm, then a factor  $f_{re} = 1$  may be applied.

### Shear loading

The design shear resistance is the lower value of

- Steel resistance:  $V_{Rd,s}$
- Concrete pryout resistance:  $V_{Rd,cp} = k \cdot \text{lower value of } N_{Rd,p} \text{ and } N_{Rd,c}$
- Concrete edge resistance:  $V_{Rd,c} = V_{Rd,c}^0 \cdot f_B \cdot f_{\beta} \cdot f_h \cdot f_4$



### Basic design shear resistance

Design steel resistance  $V_{Rd,s}$

			Data according ETA-03/0032, issue 2008-09-29				
Anchor size			M10x75	M12x95	M16x105	M16x125	M20x170
$V_{Rd,s}$	HAS-TZ	[kN]	14,4	21,6	40,8	40,8	70,4
$V_{Rd,s}$	HAS-R-TZ HAS-HCR-TZ	[kN]	16,0	24,0	44,8	44,8	78,4

Design concrete pryout resistance  $V_{Rd,cp} = \text{lower value}^a)$  of  $k \cdot N_{Rd,p}$  and  $k \cdot N_{Rd,c}$

$$k = 1 \text{ for } h_{ef} < 60 \text{ mm}$$

$$k = 2 \text{ for } h_{ef} \geq 60 \text{ mm}$$

- a)  $N_{Rd,p}$ : Design combined pull-out and concrete cone resistance  
 $N_{Rd,c}$ : Design concrete cone resistance

Design concrete edge resistance<sup>a)</sup>  $V_{Rd,c} = V_{Rd,c}^0 \cdot f_B \cdot f_{\beta} \cdot f_h \cdot f_4$

			Non-cracked concrete					Cracked concrete				
Anchor size			M10x 75	M12x 95	M16x 105	M16x 125	M20x 170	M10x 75	M12x 95	M16x 105	M16x 125	M20x 170
$V_{Rd,c}^0$		[kN]	3,7	6,7	9,9	10,3	11,0	2,7	3,8	5,3	5,5	7,9

- a) For anchor groups only the anchors close to the edge must be considered.

### Influencing factors

Influence of concrete strength

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25\text{N/mm}^2)^{1/2}$ <sup>a)</sup>	1	1,1	1,22	1,34	1,41	1,48	1,55

- a)  $f_{ck,cube}$  = concrete compressive strength, measured on cubes with 150 mm side length



**Influence of angle between load applied and the direction perpendicular to the free edge**

Angle $\beta$	0°	10°	20°	30°	40°	50°	60°	70°	80°	≥ 90°
$f_{\beta} = \sqrt{\frac{1}{(\cos \alpha_V)^2 + \left(\frac{\sin \alpha_V}{2,5}\right)^2}}$	1	1,01	1,05	1,13	1,24	1,40	1,64	1,97	2,32	2,50

**Influence of base material thickness**

h/c	0,15	0,3	0,45	0,6	0,75	0,9	1,05	1,2	1,35	≥ 1,5
$f_h = \{h/(1,5 \cdot c)\}^{2/3} \leq 1$	0,22	0,34	0,45	0,54	0,63	0,71	0,79	0,86	0,93	1,00

**Influence of anchor spacing and edge distance <sup>a)</sup> for concrete edge resistance:  $f_4$**

$$f_4 = (c/h_{ef})^{1,5} \cdot (1 + s / [3 \cdot c]) \cdot 0,5$$

c/h <sub>ef</sub>	Single anchor	Group of two anchors s/h <sub>ef</sub>															
		0,75	1,50	2,25	3,00	3,75	4,50	5,25	6,00	6,75	7,50	8,25	9,00	9,75	10,50	11,25	
0,50	0,35	0,27	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35
0,75	0,65	0,43	0,54	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65
1,00	1,00	0,63	0,75	0,88	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
1,25	1,40	0,84	0,98	1,12	1,26	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40
1,50	1,84	1,07	1,22	1,38	1,53	1,68	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
1,75	2,32	1,32	1,49	1,65	1,82	1,98	2,15	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32
2,00	2,83	1,59	1,77	1,94	2,12	2,30	2,47	2,65	2,83	2,83	2,83	2,83	2,83	2,83	2,83	2,83	2,83
2,25	3,38	1,88	2,06	2,25	2,44	2,63	2,81	3,00	3,19	3,38	3,38	3,38	3,38	3,38	3,38	3,38	3,38
2,50	3,95	2,17	2,37	2,57	2,77	2,96	3,16	3,36	3,56	3,76	3,95	3,95	3,95	3,95	3,95	3,95	3,95
2,75	4,56	2,49	2,69	2,90	3,11	3,32	3,52	3,73	3,94	4,15	4,35	4,56	4,56	4,56	4,56	4,56	4,56
3,00	5,20	2,81	3,03	3,25	3,46	3,68	3,90	4,11	4,33	4,55	4,76	4,98	5,20	5,20	5,20	5,20	5,20
3,25	5,86	3,15	3,38	3,61	3,83	4,06	4,28	4,51	4,73	4,96	5,18	5,41	5,63	5,86	5,86	5,86	5,86
3,50	6,55	3,51	3,74	3,98	4,21	4,44	4,68	4,91	5,14	5,38	5,61	5,85	6,08	6,31	6,55	6,55	6,55
3,75	7,26	3,87	4,12	4,36	4,60	4,84	5,08	5,33	5,57	5,81	6,05	6,29	6,54	6,78	7,02	7,26	7,26
4,00	8,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75	7,75
4,25	8,76	4,64	4,90	5,15	5,41	5,67	5,93	6,18	6,44	6,70	6,96	7,22	7,47	7,73	7,99	8,25	8,25
4,50	9,55	5,04	5,30	5,57	5,83	6,10	6,36	6,63	6,89	7,16	7,42	7,69	7,95	8,22	8,49	8,75	8,75
4,75	10,35	5,45	5,72	5,99	6,27	6,54	6,81	7,08	7,36	7,63	7,90	8,17	8,45	8,72	8,99	9,26	9,26
5,00	11,18	5,87	6,15	6,43	6,71	6,99	7,27	7,55	7,83	8,11	8,39	8,66	8,94	9,22	9,50	9,78	9,78
5,25	12,03	6,30	6,59	6,87	7,16	7,45	7,73	8,02	8,31	8,59	8,88	9,17	9,45	9,74	10,02	10,31	10,31
5,50	12,90	6,74	7,04	7,33	7,62	7,92	8,21	8,50	8,79	9,09	9,38	9,67	9,97	10,26	10,55	10,85	10,85

a) The anchor spacing and the edge distance shall not be smaller than the minimum anchor spacing  $s_{min}$  and the minimum edge distance  $c_{min}$ .

**Combined tension and shear loading**

For combined tension and shear loading see section “Anchor Design”.

**Precalculated values**

Recommended loads can be calculated by dividing the design resistance by an overall partial safety factor for action  $\gamma = 1,4$ . The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Design resistance: concrete C 20/25 –  $f_{ck,cube} = 25 \text{ N/mm}^2$

		Data according ETA-03/0032, issue 2008-09-29				
Anchor size		M10x75	M12x95	M16x105	M16x125	M20x170
Embedment depth	$h_{ef} =$ [mm]	75	95	105	125	170
Base material thickness	$h_{min} =$ [mm]	150	190	210	250	340
<b>Tensile <math>N_{Rd}</math>: single anchor, no edge effects</b>						
Non cracked concrete						
HVZ						
HVZ-R [kN]		21,9	26,7	36,2	47,1	74,6
HVZ-HCR						
Cracked concrete						
HVZ						
HVZ-R [kN]		15,6	22,2	25,8	33,5	53,2
HVZ-HCR						
<b>Shear <math>V_{Rd}</math>: single anchor, no edge effects, without lever arm</b>						
Non cracked and cracked concrete						
HVZ						
HVZ-R [kN]		14,4	21,6	40,8	40,8	70,4
HVZ-HCR						
HVZ-R [kN]		16,0	24,0	44,8	44,8	78,4

Design resistance: concrete C 20/25 –  $f_{ck,cube} = 25 \text{ N/mm}^2$

		Data according ETA-03/0032, issue 2008-09-29				
Anchor size		M10x75	M12x95	M16x105	M16x125	M20x170
Embedment depth	$h_{ef} =$ [mm]	75	95	105	125	170
Base material thickness	$h_{min} =$ [mm]	150	190	210	250	340
<b>Tensile <math>N_{Rd}</math>: single anchor, min. edge distance (<math>c = c_{min}</math>)</b>						
Non cracked concrete						
$c_{min}$ [mm]		50	70	85	85	80
HVZ						
HVZ-R [kN]		13,2	15,7	21,8	26,2	38,9
HVZ-HCR						
Cracked concrete						
$c_{min}$ [mm]		50	60	70	70	80
HVZ						
HVZ-R [kN]		9,4	14,0	17,1	20,4	27,7
HVZ-HCR						
<b>Shear <math>V_{Rd}</math>: single anchor, min. edge distance (<math>c = c_{min}</math>), without lever arm</b>						
Non cracked concrete						
$c_{min}$ [mm]		50	70	85	85	80
HVZ						
HVZ-R [kN]		3,5	5,1	7,2	7,4	10,3
HVZ-HCR						
Cracked concrete						
$c_{min}$ [mm]		50	60	70	70	80
HVZ						
HVZ-R [kN]		2,5	4,6	6,9	7,1	7,4
HVZ-HCR						

Design resistance: concrete C 20/25 –  $f_{ck,cube} = 25 \text{ N/mm}^2$   
 (load values are valid for single anchor)

		Data according ETA-03/0032, issue 2008-09-29				
Anchor size		M10x75	M12x95	M16x105	M16x125	M20x170
Embedment depth	$h_{ef} = [\text{mm}]$	75	95	105	125	170
Base material thickness	$h_{min} = [\text{mm}]$	150	190	210	250	340
Spacing	$s = s_{min} = [\text{mm}]$	50	60	70	70	80
<b>Tensile <math>N_{Rd}</math>: double anchor, no edge effects, min. spacing (<math>s = s_{min}</math>)</b>						
Non cracked concrete						
HVZ						
HVZ-R [kN]		13,4	16,1	22,1	27,9	43,2
HVZ-HCR						
Cracked concrete						
HVZ						
HVZ-R [kN]		9,5	13,5	15,8	19,9	30,8
HVZ-HCR						
<b>Shear <math>V_{Rd}</math>: double anchor, no edge effects, min. spacing (<math>s = s_{min}</math>), without lever arm</b>						
Non cracked concrete						
HVZ [kN]		14,4	21,6	40,8	40,8	70,4
HVZ-R [kN]		16,0	24,0	44,3	44,8	78,4
HVZ-HCR						
Cracked concrete						
HVZ [kN]		14,4	21,6	31,6	39,8	61,5
HVZ-R [kN]		16,0	24,0	31,6	39,8	61,5
HVZ-HCR						