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**Specifier's comments:**

**1 Input data**

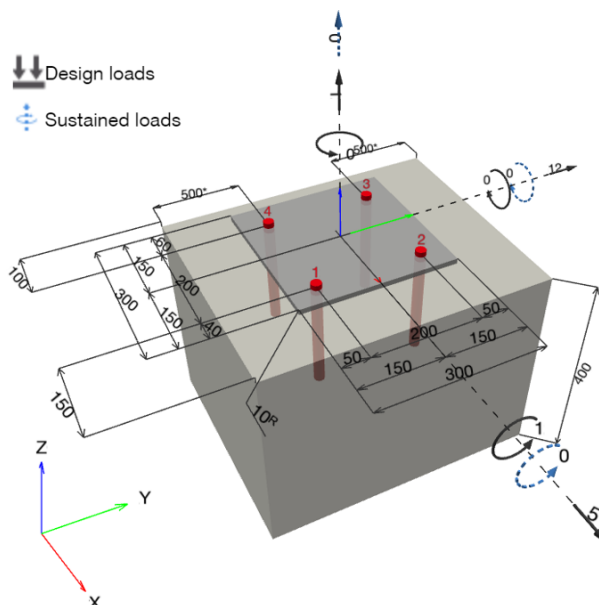


<b>Anchor type and diameter:</b>	<b>HIT-HY 200-R V3 + HAS-U 8.8 M20</b>
Return period (service life in years):	50
Item number:	2223887 HAS-U 8.8 M20x260 (element) / 2262134 HIT-HY 200-R V3 (adhesive)
Effective embedment depth:	$h_{ef,act} = 200.0 \text{ mm}$ ( $h_{ef,limit} = - \text{ mm}$ )
Material:	8.8
Evaluation Service Report:	ETA 19/0601
Issued   Valid:	2/12/2021   -
Proof:	Design Method EN 1992-4, Chemical
Stand-off installation:	$e_b = 0.0 \text{ mm}$ (no stand-off); $t = 10.0 \text{ mm}$
Anchor plate <sup>R</sup> :	$l_x \times l_y \times t = 300.0 \text{ mm} \times 300.0 \text{ mm} \times 10.0 \text{ mm}$ ; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, C30/37, $f_{c,cyl} = 30.00 \text{ N/mm}^2$ ; $h = 400.0 \text{ mm}$ , Temp. short/long: 30/30 °C, User-defined partial material safety factor $\gamma_c = 1.500$
<b>Installation:</b>	<b>hammer drilled hole, Installation condition: Dry</b>
Reinforcement:	no reinforcement or reinforcement spacing $\geq 150 \text{ mm}$ (any $\varnothing$ ) or $\geq 100 \text{ mm}$ ( $\varnothing \leq 10 \text{ mm}$ ) no longitudinal edge reinforcement

**Application also possible with HVU2 + HAS-U 8.8 M20 under the selected boundary conditions. More information in section Alternative fastening data of this report.**

<sup>R</sup> - The anchor calculation is based on a rigid anchor plate assumption.

**Geometry [mm] & Loading [kN, kNm]**



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1.1 Load combination

Case	Description	Forces [kN] / Moments [kNm]	Seismic	Fire	Max. Util. Anchor [%]
1	Combination 1	N = 1.000; V <sub>x</sub> = 5.000; V <sub>y</sub> = 12.000; M <sub>x</sub> = 1.000; M <sub>y</sub> = 0.000; M <sub>z</sub> = 0.000; N <sub>sus</sub> = 0.000; M <sub>x,sus</sub> = 0.000; M <sub>y,sus</sub> = 0.000;	no	no	∞

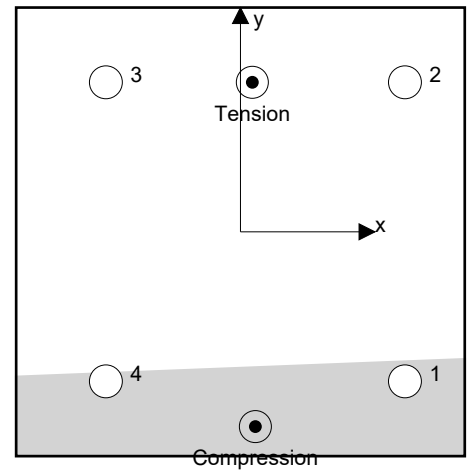
2 Load case/Resulting anchor forces

Anchor reactions [kN]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0.000	3.055	1.100	2.850
2	2.404	3.175	1.400	2.850
3	2.505	3.447	1.400	3.150
4	0.000	3.337	1.100	3.150

max. concrete compressive strain: 0.02 [‰]  
 max. concrete compressive stress: 0.49 [N/mm<sup>2</sup>]  
 resulting tension force in (x/y)=(7.9/100.0): 4.909 [kN]  
 resulting compression force in (x/y)=(10.0/-130.3): 3.909 [kN]



Anchor forces are calculated based on the assumption of a rigid anchor plate.

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### 3 Tension load (EN 1992-4, Section 7.2.1)

	Load [kN]	Capacity [kN]	Utilization $\beta_N$ [%]	Status
Steel Strength*	2.505	130.667	2	OK
Combined pullout-concrete cone failure**	4.909	41.030	12	OK
Concrete Breakout Failure**	4.909	47.390	11	OK
Splitting failure**	4.909	73.520	7	OK

\* highest loaded anchor    \*\*anchor group (anchors in tension)

#### 3.1 Steel Strength

$$N_{Ed} \leq N_{Rd,s} = \frac{N_{Rk,s}}{\gamma_{M,s}} \quad \text{EN 1992-4, Table 7.1}$$

$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$N_{Rd,s}$ [kN]	$N_{Ed}$ [kN]
196.000	1.500	130.667	2.505

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**3.2 Combined pullout-concrete cone failure**

$$N_{Ed} \leq N_{Rd,p} = \frac{N_{Rk,p}}{\gamma_{M,p}} \quad \text{EN 1992-4, Table 7.1}$$

$$N_{Rk,p} = N_{Rk,p}^0 \cdot \frac{A_{p,N}}{A_{p,N}^0} \cdot \psi_{g,Np} \cdot \psi_{s,Np} \cdot \psi_{re,N} \cdot \psi_{ec1,Np} \cdot \psi_{ec2,Np} \quad \text{EN 1992-4, Eq. (7.13)}$$

$$N_{Rk,p}^0 = \psi_{sus} \cdot \tau_{Rk} \cdot \pi \cdot d \cdot h_{ef} \quad \text{EN 1992-4, Eq. (7.14)}$$

$$\psi_{sus} = 1 \quad \text{EN 1992-4, Eq. (7.14a)}$$

$$s_{cr,Np} = 7.3 \cdot d \cdot \sqrt{\psi_{sus} \cdot \tau_{Rk}} \leq 3 \cdot h_{ef} \quad \text{EN 1992-4, Eq. (7.15)}$$

$$\psi_{g,Np} = \psi_{g,Np}^0 \cdot \left( \frac{s}{s_{cr,Np}} \right)^{0.5} \cdot (\psi_{g,Np}^0 - 1) \geq 1.00 \quad \text{EN 1992-4, Eq. (7.17)}$$

$$\psi_{g,Np}^0 = \sqrt{n} - (\sqrt{n} - 1) \cdot \left( \frac{\tau_{Rk}}{\tau_{Rk,c}} \right)^{1.5} \geq 1.00 \quad \text{EN 1992-4, Eq. (7.18)}$$

$$\tau_{Rk,c} = \frac{k_3}{\pi \cdot d} \cdot \sqrt{h_{ef} \cdot f_{ck}} \quad \text{EN 1992-4, Eq. (7.19)}$$

$$\psi_{s,Np} = 0.7 + 0.3 \cdot \frac{c}{c_{cr,Np}} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.20)}$$

$$\psi_{ec1,Np} = \frac{1}{1 + \left( \frac{2 \cdot e_{c1,N}}{s_{cr,Np}} \right)} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.21)}$$

$$\psi_{ec2,Np} = \frac{1}{1 + \left( \frac{2 \cdot e_{c2,N}}{s_{cr,Np}} \right)} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.21)}$$

$A_{p,N}$ [mm <sup>2</sup> ]	$A_{p,N}^0$ [mm <sup>2</sup> ]	$\tau_{Rk,ucr,20}$ [N/mm <sup>2</sup> ]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	$c_{min}$ [mm]	$f_{c,cyl}$ [N/mm <sup>2</sup> ]
254,455	319,740	15.00	565.5	282.7	100.0	30.00
$\psi_c$	$\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]	$k_3$	$\tau_{Rk,c}$ [N/mm <sup>2</sup> ]	$\psi_{g,Np}^0$	$\psi_{g,Np}$	
1.041	7.29	7.700	9.49	1.135	1.055	
$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$	
2.1	0.993	0.0	1.000	0.806	1.000	
$\psi_{sus}^0$	$\alpha_{sus}$	$\psi_{sus}$				
0.890	0.000	1.000				
$N_{Rk,p}^0$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$N_{Rd,p}$ [kN]	$N_{Ed}$ [kN]		
91.605	61.544	1.500	41.030	4.909		

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**3.3 Concrete Breakout Failure**

$$N_{Ed} \leq N_{Rd,c} = \frac{N_{Rk,c}}{\gamma_{M,c}} \quad \text{EN 1992-4, Table 7.1}$$

$$N_{Rk,c} = N_{Rk,c}^0 \cdot \frac{A_{c,N}}{A_{c,N}^0} \cdot \psi_{s,N} \cdot \psi_{re,N} \cdot \psi_{ec1,N} \cdot \psi_{ec2,N} \cdot \psi_{M,N} \quad \text{EN 1992-4, Eq. (7.1)}$$

$$N_{Rk,c}^0 = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1,5} \quad \text{EN 1992-4, Eq. (7.2)}$$

$$A_{c,N}^0 = s_{cr,N} \cdot s_{cr,N} \quad \text{EN 1992-4, Eq. (7.3)}$$

$$\psi_{s,N} = 0.7 + 0.3 \cdot \frac{c}{c_{cr,N}} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.4)}$$

$$\psi_{ec1,N} = \frac{1}{1 + \left( \frac{2 \cdot e_{N,1}}{s_{cr,N}} \right)} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.6)}$$

$$\psi_{ec2,N} = \frac{1}{1 + \left( \frac{2 \cdot e_{N,2}}{s_{cr,N}} \right)} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.6)}$$

$$\psi_{M,N} = 1 \quad \text{EN 1992-4, Eq. (7.7)}$$

$A_{c,N}$ [mm <sup>2</sup> ]	$A_{c,N}^0$ [mm <sup>2</sup> ]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	$f_{c,cyl}$ [N/mm <sup>2</sup> ]		
270,000	360,000	300.0	600.0	30.00		
$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	
2.1	0.993	0.0	1.000	0.800	1.000	
$z$ [mm]	$\psi_{M,N}$	$k_1$	$N_{Rk,c}^0$ [kN]	$\gamma_{M,c}$	$N_{Rd,c}$ [kN]	$N_{Ed}$ [kN]
230.3	1.000	7.700	119.288	1.500	47.390	4.909

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**3.4 Splitting failure**

$$N_{Ed} \leq N_{Rd,sp} = \frac{N_{RK,sp}}{\gamma_{Msp}} \quad \text{EN 1992-4, Table 7.1}$$

$$N_{RK,sp} = N_{RK,sp}^0 \cdot \frac{A_{c,N}}{A_{c,N}^0} \cdot \psi_{s,N} \cdot \psi_{re,N} \cdot \psi_{ec1,N} \cdot \psi_{ec2,N} \cdot \psi_{h,sp} \quad \text{EN 1992-4, Eq. (7.23)}$$

$$N_{RK,sp}^0 = \min(N_{RK,p}^0, N_{RK,c}^0) \quad \text{EN 1992-4, Eq. (7.3)}$$

$$A_{c,N}^0 = s_{cr,sp} \cdot s_{cr,sp} \quad \text{EN 1992-4, Eq. (7.3)}$$

$$\psi_{s,N} = 0.7 + 0.3 \cdot \frac{c}{c_{cr,sp}} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.4)}$$

$$\psi_{ec1,N} = \frac{1}{1 + \left( \frac{2 \cdot e_{N,1}}{s_{cr,sp}} \right)} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.6)}$$

$$\psi_{ec2,N} = \frac{1}{1 + \left( \frac{2 \cdot e_{N,2}}{s_{cr,sp}} \right)} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.6)}$$

$$\psi_{h,sp} = \left( \frac{h}{h_{min}} \right)^{2/3} \leq \max \left\{ 1; \left( \frac{h_{ef} + 1.5 \cdot c_1}{h_{min}} \right)^{2/3} \right\} \leq 2.00 \quad \text{EN 1992-4, Eq. (7.24)}$$

$A_{c,N}$ [mm <sup>2</sup> ]	$A_{c,N}^0$ [mm <sup>2</sup> ]	$c_{cr,sp}$ [mm]	$s_{cr,sp}$ [mm]	$\psi_{h,sp}$	$f_{c,cyl}$ [N/mm <sup>2</sup> ]	
180,000	160,000	200.0	400.0	1.272	30.00	
$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	$k_1$
2.1	0.990	0.0	1.000	0.850	1.000	7.700
$N_{RK,sp}^0$ [kN]	$\gamma_{Msp}$	$N_{Rd,sp}$ [kN]	$N_{Ed}$ [kN]			
91.605	1.500	73.520	4.909			

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#### 4 Shear load (EN 1992-4, Section 7.2.2)

	Load [kN]	Capacity [kN]	Utilization $\beta_v$ [%]	Status
Steel Strength (without lever arm)*	3.447	0.000	5	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	13.000	115.167	12	OK
Concrete edge failure in direction y+**	12.322	21.104	59	OK

\* highest loaded anchor    \*\*anchor group (relevant anchors)

##### 4.1 Steel Strength (without lever arm)

$$V_{Ed} \leq V_{Rd,s} = \frac{V_{Rk,s}}{\gamma_{M,s}} \quad \text{EN 1992-4, Table 7.2}$$

$$V_{Rk,s} = k_7 \cdot V_{Rk,s}^0 \quad \text{EN 1992-4, Eq. (7.35)}$$

V <sub>Rk,s</sub> <sup>0</sup> [kN]	k <sub>7</sub>	V <sub>Rk,s</sub> [kN]	γ <sub>M,s</sub>	V <sub>Rd,s</sub> [kN]	V <sub>Ed</sub> [kN]
98.000	1.000	98.000	1.250	0.000	3.447

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**4.2 Pryout Strength (Bond Strength controls)**

$$V_{Ed} \leq V_{Rd,cp} = \frac{V_{Rk,cp}}{\gamma_{M,c,p}} \quad \text{EN 1992-4, Table 7.2}$$

$$V_{Rk,cp} = k_8 \cdot \min \{N_{Rk,c}; N_{Rk,p}\} \quad \text{EN 1992-4, Eq. (7.39c)}$$

$$N_{Rk,p} = N_{Rk,p}^0 \cdot \frac{A_{p,N}}{A_{p,N}^0} \cdot \psi_{g,Np} \cdot \psi_{s,Np} \cdot \psi_{re,N} \cdot \psi_{ec1,Np} \cdot \psi_{ec2,Np} \quad \text{EN 1992-4, Eq. (7.13)}$$

$$N_{Rk,p}^0 = \psi_{sus} \cdot \tau_{Rk} \cdot \pi \cdot d \cdot h_{ef} \quad \text{EN 1992-4, Eq. (7.14)}$$

$$\psi_{sus} = 1 \quad \text{EN 1992-4, Eq. (7.14a)}$$

$$s_{cr,Np} = 7.3 \cdot d \cdot \sqrt{\psi_{sus} \cdot \tau_{Rk}} \leq 3 \cdot h_{ef} \quad \text{EN 1992-4, Eq. (7.15)}$$

$$\psi_{g,Np} = \psi_{g,Np}^0 \cdot \left( \frac{s}{s_{cr,Np}} \right)^{0.5} \cdot (\psi_{g,Np}^0 - 1) \geq 1.00 \quad \text{EN 1992-4, Eq. (7.17)}$$

$$\psi_{g,Np}^0 = \sqrt{n} - (\sqrt{n} - 1) \cdot \left( \frac{\tau_{Rk}}{\tau_{Rk,c}} \right)^{1.5} \geq 1.00 \quad \text{EN 1992-4, Eq. (7.18)}$$

$$\tau_{Rk,c} = \frac{k_3}{\pi \cdot d} \cdot \sqrt{h_{ef} \cdot f_{ck}} \quad \text{EN 1992-4, Eq. (7.19)}$$

$$\psi_{s,Np} = 0.7 + 0.3 \cdot \frac{c}{c_{cr,Np}} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.20)}$$

$$\psi_{ec1,Np} = \frac{1}{1 + \left( \frac{2 \cdot e_{c1,N}}{s_{cr,Np}} \right)} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.21)}$$

$$\psi_{ec2,Np} = \frac{1}{1 + \left( \frac{2 \cdot e_{c2,N}}{s_{cr,Np}} \right)} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.21)}$$

$A_{p,N}$ [mm <sup>2</sup> ]	$A_{p,N}^0$ [mm <sup>2</sup> ]	$\tau_{Rk,ucr,20}$ [N/mm <sup>2</sup> ]	$c_{cr,Np}$ [mm]	$s_{cr,Np}$ [mm]	$c_{min}$ [mm]	$f_{c,cyl}$ [N/mm <sup>2</sup> ]
344,455	319,740	15.00	282.7	565.5	100.0	30.00
$\psi_c$	$\tau_{Rk,cr}$ [N/mm <sup>2</sup> ]	$k_3$	$\tau_{Rk,c}$ [N/mm <sup>2</sup> ]	$k_8$	$\psi_{g,Np}^0$	
1.041	7.29	7.700	9.49	2.000	1.327	
$\psi_{g,Np}$	$e_{c1,V}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,V}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	
1.133	0.0	0.971	0.0	0.988	0.806	
$\psi_{re,Np}$	$\psi_{sus}^0$	$\alpha_{sus}$	$\psi_{sus}$			
1.000	0.890	0.000	1.000			
$N_{Rk,p}^0$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,c,p}$	$V_{Rd,cp}$ [kN]	$V_{Ed}$ [kN]		
91.605	86.375	1.500	115.167	13.000		

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**4.3 Concrete edge failure in direction y+**

$$V_{Ed} \leq V_{Rd,c} = \frac{V_{Rk,c}}{\gamma_{M,c}} \quad \text{EN 1992-4, Table 7.2}$$

$$V_{Rk,c} = k_T \cdot V_{Rk,c}^0 \cdot \frac{A_{c,V}}{A_{c,V}^0} \cdot \psi_{s,V} \cdot \psi_{h,V} \cdot \psi_{\alpha,V} \cdot \psi_{ec,V} \cdot \psi_{re,V} \quad \text{EN 1992-4, Eq. (7.40)}$$

$$V_{Rk,c}^0 = k_g \cdot d_{nom}^\alpha \cdot l_f^\beta \cdot \sqrt{f_{ck}} \cdot c_1^{1.5} \quad \text{EN 1992-4, Eq. (7.41)}$$

$$\alpha = 0.1 \cdot \left( \frac{l_f}{c_1} \right)^{0.5} \quad \text{EN 1992-4, Eq. (7.42)}$$

$$\beta = 0.1 \cdot \left( \frac{d_{nom}}{c_1} \right)^{0.2} \quad \text{EN 1992-4, Eq. (7.43)}$$

$$A_{c,V}^0 = 4.5 \cdot c_1^2 \quad \text{EN 1992-4, Eq. (7.44)}$$

$$\psi_{s,V} = 0.7 + 0.3 \cdot \frac{c_2}{1.5 \cdot c_1} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.45)}$$

$$\psi_{h,V} = \left( \frac{1.5 \cdot c_1}{h} \right)^{0.5} \geq 1.00 \quad \text{EN 1992-4, Eq. (7.46)}$$

$$\psi_{ec,V} = \frac{1}{1 + \left( \frac{2 \cdot e_V}{3 \cdot c_1} \right)} \leq 1.00 \quad \text{EN 1992-4, Eq. (7.47)}$$

$$\psi_{\alpha,V} = \sqrt{\frac{1}{(\cos \alpha_V)^2 + (0.5 \cdot \sin \alpha_V)^2}} \geq 1.00 \quad \text{EN 1992-4, Eq. (7.48)}$$

$$c_1 = \max \left( \frac{c_{2,max}}{1.5}, \frac{h}{1.5}, \frac{s_{2,max}}{3} \right) \quad \text{EN 1992-4, Eq. (7.50)}$$

$l_f$ [mm]	$d_{nom}$ [mm]	$k_g$	$\alpha$	$\beta$	$f_{c,cyl}$ [N/mm <sup>2</sup> ]
200.0	20.00	1.700	0.087	0.060	30.00
$c_1$ [mm]	$c_1$ [mm]	$A_{c,V}$ [mm <sup>2</sup> ]	$A_{c,V}^0$ [mm <sup>2</sup> ]		
500.0	266.7	180,000	320,000		
$\psi_{s,V}$	$\psi_{h,V}$	$\psi_{\alpha,V}$	$e_{c,V}$ [mm]	$\psi_{ec,V}$	$\psi_{re,V}$
0.775	1.000	1.020	4.9	0.988	1.000
$V_{Rk,c}^0$ [kN]	$k_T$	$\gamma_{M,c}$	$V_{Rd,c}$ [kN]	$V_{Ed}$ [kN]	
72.061	1.0	1.500	21.104	12.322	

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### 5 Combined tension and shear loads (EN 1992-4, Section 7.2.3)

Steel failure

$\beta_N$	$\beta_V$	$\alpha$	Utilization $\beta_{N,V}$ [%]	Status
0.019	0.044	2.000	1	OK

$$\beta_N^\alpha + \beta_V^\alpha \leq 1.0$$

Concrete failure

$\beta_N$	$\beta_V$	$\alpha$	Utilization $\beta_{N,V}$ [%]	Status
0.120	0.584	1.500	49	OK

$$\beta_N^\alpha + \beta_V^\alpha \leq 1.0$$

### 6 Displacements (highest loaded anchor)

Short term loading:

$N_{Sk}$	=	1.855 [kN]	$\delta_N$	=	0.0148 [mm]
$V_{Sk}$	=	2.553 [kN]	$\delta_V$	=	0.1021 [mm]
			$\delta_{NV}$	=	0.1032 [mm]

Long term loading:

$N_{Sk}$	=	1.855 [kN]	$\delta_N$	=	0.0325 [mm]
$V_{Sk}$	=	2.553 [kN]	$\delta_V$	=	0.1532 [mm]
			$\delta_{NV}$	=	0.1566 [mm]

Comments: Tension displacements are valid with half of the required installation torque moment for uncracked concrete! Shear displacements are valid without friction between the concrete and the anchor plate! The gap due to the drilled hole and clearance hole tolerances are not included in this calculation!

The acceptable anchor displacements depend on the fastened construction and must be defined by the designer!

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## 7 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Checking the transfer of loads into the base material is required in accordance with EN 1992-4, Annex A!
- The design is only valid if the clearance hole in the fixture is not larger than the value given in Table 6.1 of EN 1992-4! For larger diameters of the clearance hole see section 6.2.2 of EN 1992-4!
- The accessory list in this report is for the information of the user only. In any case, the instructions for use provided with the product have to be followed to ensure a proper installation.
- For the determination of the  $\psi_{re,v}$  (concrete edge failure) the minimum concrete cover defined in the design settings is used as the concrete cover of the edge reinforcement.
- Bore hole cleaning must be performed according to instructions for use (blow twice with oil-free compressed air (min. 6 bar), brush twice, blow twice with oil-free compressed air (min. 6 bar)).
- Characteristic bond resistances depend on short- and long-term temperatures.
- Edge reinforcement is not required to avoid splitting failure
- The characteristic bond resistances depend on the return period (service life in years): 50

## Fastening meets the design criteria!

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### 8 Installation data

Anchor plate, steel: S 235; E = 210,000.00 N/mm<sup>2</sup>; f<sub>yk</sub> = 235.00 N/mm<sup>2</sup>

Profile: no profile

Hole diameter in the fixture: d<sub>f</sub> = 22.0 mm

Plate thickness (input): 10.0 mm

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and diameter: HIT-HY 200-R V3 + HAS-U 8.8 M20

Item number: 2223887 HAS-U 8.8 M20x260 (element) / 2262134 HIT-HY 200-R V3 (adhesive)

Maximum installation torque: 150 Nm

Hole diameter in the base material: 22.0 mm

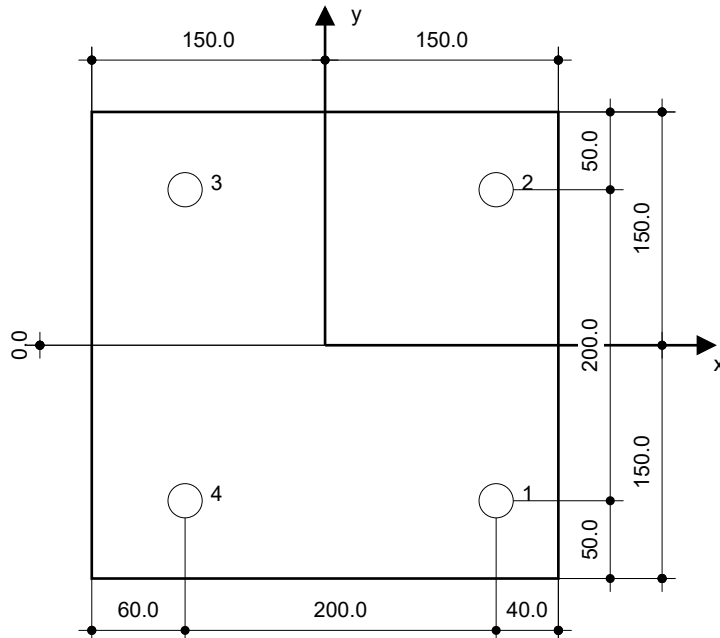
Hole depth in the base material: 200.0 mm

Minimum thickness of the base material: 244.0 mm

Hilti HAS-U threaded rod with HIT-HY 200-R V3 injection mortar with 200 mm embedment h<sub>ef</sub>, M20, Steel galvanized, Hammer drilled installation per ETA 19/0601

#### 8.1 Recommended accessories

Drilling	Cleaning	Setting
<ul style="list-style-type: none"> <li>• Suitable Rotary Hammer</li> <li>• Properly sized drill bit</li> </ul>	<ul style="list-style-type: none"> <li>• Compressed air with required accessories to blow from the bottom of the hole</li> <li>• Proper diameter wire brush</li> </ul>	<ul style="list-style-type: none"> <li>• Dispenser including cassette and mixer</li> <li>• Torque wrench</li> </ul>



#### Coordinates Anchor [mm]


Anchor	x	y	c <sub>-x</sub>	c <sub>+x</sub>	c <sub>-y</sub>	c <sub>+y</sub>
1	110.0	-100.0	300.0	150.0	500.0	700.0
2	110.0	100.0	300.0	150.0	700.0	500.0
3	-90.0	100.0	100.0	350.0	700.0	500.0
4	-90.0	-100.0	100.0	350.0	500.0	700.0

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## 9 Alternative fastening

### 9.1 Alternative fastening data

<b>Anchor type and diameter:</b>	<b>HVU2 + HAS-U 8.8 M20</b>	
Return period (service life in years):	50	
Item number:	2223887 HAS-U 8.8 M20x260 (element) / 2164509 HVU2 M20x170 (capsule)	
Effective embedment depth:	$h_{ef,act} = 170.0$ mm, $h_{nom} = 170.0$ mm	
Material:	8.8	
Evaluation Service Report:	ETA-16/0515	
Issued   Valid:	23/08/2022   -	
Proof:	Design Method EN 1992-4, Chemical	
Stand-off installation:	$e_b = 0.0$ mm (no stand-off); $t = 10.0$ mm	
Anchor plate <sup>R</sup> :	$l_x \times l_y \times t = 300.0$ mm x $300.0$ mm x $10.0$ mm; (Recommended plate thickness: not calculated)	
Profile:	no profile	
Base material:	cracked concrete, C30/37, $f_{c,cyl} = 30.00$ N/mm <sup>2</sup> ; $h = 400.0$ mm, Temp. short/long: 30/30 °C, User-defined partial material safety factor $\gamma_c = 1.500$	
<b>Installation:</b>	<b>hammer drilled hole, Installation condition: Dry</b>	
Reinforcement:	no reinforcement or reinforcement spacing $\geq 150$ mm (any $\emptyset$ ) or $\geq 100$ mm ( $\emptyset \leq 10$ mm) no longitudinal edge reinforcement	

**Max. Utilization with HVU2 + HAS-U 8.8 M20: 61 %  
Fastening meets the design criteria!**

### 9.2 Installation data

Anchor plate, steel: S 235; $E = 210,000.00$ N/mm <sup>2</sup> ; $f_{yk} = 235.00$ N/mm <sup>2</sup>	Anchor type and diameter: HVU2 + HAS-U 8.8 M20
Profile: no profile	Item number: 2223887 HAS-U 8.8 M20x260 (element) / 2164509 HVU2 M20x170 (capsule)
Hole diameter in the fixture: $d_f = 22.0$ mm	Maximum installation torque: 150 Nm
Plate thickness (input): 10.0 mm	Hole diameter in the base material: 22.0 mm
Recommended plate thickness: not calculated	Hole depth in the base material: 170.0 mm
Drilling method: Hammer drilled	Minimum thickness of the base material: 220.0 mm
Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required	

Hilti HAS-U threaded rod with HVU2 capsule mortar with 170 mm embedment  $h_{ef}$ , M20, Steel galvanized, Hammer drilled installation per ETA-16/0515

#### 9.2.1 Recommended accessories

Drilling	Cleaning	Setting
<ul style="list-style-type: none"> <li>Suitable Rotary Hammer</li> <li>Properly sized drill bit</li> </ul>	<ul style="list-style-type: none"> <li>Compressed air with required accessories to blow from the bottom of the hole</li> <li>Proper diameter wire brush</li> </ul>	<ul style="list-style-type: none"> <li>HVA square drive shafts</li> <li>Torque wrench</li> </ul>



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## 10 Remarks; Your Cooperation Duties

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