

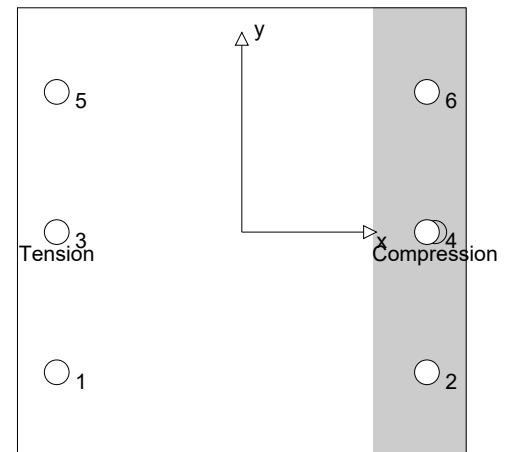
2 Load case/Resulting anchor forces

Load case: Design loads

Anchor reactions [kN]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	1.571	7.405	7.313	-1.162
2	0.000	7.405	7.313	1.162
3	1.571	6.537	6.433	-1.162
4	0.000	6.537	6.433	1.162
5	1.571	5.674	5.553	-1.162
6	0.000	5.674	5.553	1.162



max. concrete compressive strain: 0.01 [‰]
 max. concrete compressive stress: 0.28 [N/mm²]
 resulting tension force in (x/y)=(-165/0): 4.714 [kN]
 resulting compression force in (x/y)=(172/0): 4.714 [kN]

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

3 Tension load SOFA (fib (07/2011), section 16.2.1)

	Load [kN]	Capacity [kN]	Utilisation β_N [%]	Status
Steel failure*	1.571	130.667	2	OK
Combined pullout-concrete cone failure**	4.714	95.878	5	OK
Concrete cone failure**	4.714	83.548	6	OK
Splitting failure**	4.714	202.103	3	OK

* most unfavourable anchor **anchor group (anchors in tension)

3.1 Steel failure

$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$N_{Rd,s}$ [kN]	N_{Sd} [kN]
196.000	1.500	130.667	1.571

3.2 Combined pullout-concrete cone failure

$A_{p,N}$ [mm ²]	$A_{p,N}^0$ [mm ²]	$\psi_{A,Np}$	$\tau_{Rk,ucr,25}$ [N/mm ²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]
266,400	197,136	1.351	12.00	444	222	175
ψ_c	$\tau_{Rk,ucr}$ [N/mm ²]	$\max \tau_{Rk,ucr}$ [N/mm ²]	$\psi_{g,Np}^0$	$\psi_{g,Np}$		
1.018	12.22	10.65	1.000	1.000		
$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$	
0	1.000	0	1.000	0.936	1.000	
$N_{Rk,p}^0$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$N_{Rd,p}$ [kN]	N_{Sd} [kN]		
113.643	143.817	1.500	95.878	4.714		

3.3 Concrete cone failure

$A_{c,N}$ [mm ²]	$A_{c,N}^0$ [mm ²]	$\psi_{A,N}$	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]		
266,400	197,136	1.351	222	444		
$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	
0	1.000	0	1.000	0.936	1.000	
k_1	$N_{Rk,c}^0$ [kN]	$\gamma_{M,c}$	$N_{Rd,c}$ [kN]	N_{Sd} [kN]		
11.000	99.027	1.500	83.548	4.714		

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3.4 Splitting failure

$A_{c,N}$ [mm ²]	$A_{c,N}^0$ [mm ²]	$\Psi_{A,N}$	$c_{cr,sp}$ [mm]	$s_{cr,sp}$ [mm]	$\Psi_{h,sp}$	
161,616	87,616	1.845	148	296	1.660	
$e_{c1,N}$ [mm]	$\Psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\Psi_{ec2,N}$	$\Psi_{s,N}$	$\Psi_{re,N}$	k_1
0	1.000	0	1.000	1.000	1.000	11.000
$N_{Rk,c}^0$ [kN]	$\gamma_{M,sp}$	$N_{Rd,sp}$ [kN]	N_{Sd} [kN]			
99.027	1.500	202.103	4.714			

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4 Shear load SOFA (fib (07/2011), section 16.2.2)

	Load [kN]	Capacity [kN]	Utilisation β_v [%]	Status
Steel failure (without lever arm)*	7.405	78.400	10	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout failure**	38.600	245.699	16	OK
Concrete edge failure in direction x+**	19.612	19.793	100	OK

* most unfavourable anchor **anchor group (relevant anchors)

4.1 Steel failure (without lever arm)

$V_{Rk,s}$ [kN]	$\gamma_{M,s}$	$V_{Rd,s}$ [kN]	V_{Sd} [kN]
98.000	1.250	78.400	7.405

4.2 Pryout failure (concrete cone relevant)

$A_{c,N}$ [mm ²]	$A_{c,N}^0$ [mm ²]	$\psi_{A,N}$	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	k_4
464,400	197,136	2.356	222	444	2.000
$e_{c1,V}$ [mm]	$\psi_{ec1,N}$	$e_{c2,V}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
0	1.000	41	0.843	0.936	1.000
$N_{Rk,c}^0$ [kN]	$\gamma_{M,c,p}$	$V_{Rd,cp}$ [kN]	V_{Sd} [kN]		
99.027	1.500	245.699	38.600		

4.3 Concrete edge failure in direction x+

l_f [mm]	d_{nom} [mm]	k_v	α	β		
148	20.0	2.400	0.061	0.055		
c_1 [mm]	c_1' [mm]	$A_{c,V}$ [mm ²]	$A_{c,V}^0$ [mm ²]	$\psi_{A,V}$		
1,330	400	360,000	720,000	0.500		
$\psi_{s,V}$	$\psi_{h,V}$	$\psi_{a,V}$	$e_{c,V}$ [mm]	$\psi_{ec,V}$	$\psi_{re,V}$	$\psi_{90^\circ,V}$
0.788	1.000	1.014	11	0.982	1.000	2.500
$V_{Rk,c}^0$ [kN]	n_1	$\gamma_{M,c}$	$V_{Rd,c}$ [kN]	V_{Sd} [kN]		
151.572	2	1.500	19.793	19.612		

Note: Resistance limit acc. to fib (07/2011) Eq. (10.2-6) is governing

5 Combined tension and shear loads SOFA (fib (07/2011), section 10.3)

	β_N	β_v	α	Utilisation $\beta_{N,v}$ [%]	Status
steel	0.012	0.094	2.000	1	OK
concrete	0.056	0.991	1.500	100	OK

$$\beta_N^\alpha + \beta_v^\alpha \leq 1$$

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6 Displacements (highest loaded anchor)

Short term loading:

$$\begin{array}{ll} N_{Sk} = 0.000 \text{ [kN]} & \delta_N = 0.000 \text{ [mm]} \\ V_{Sk} = 9.570 \text{ [kN]} & \delta_V = 0.383 \text{ [mm]} \\ & \delta_{NV} = 0.383 \text{ [mm]} \end{array}$$

Long term loading:

$$\begin{array}{ll} N_{Sk} = 0.000 \text{ [kN]} & \delta_N = 0.000 \text{ [mm]} \\ V_{Sk} = 9.570 \text{ [kN]} & \delta_V = 0.574 \text{ [mm]} \\ & \delta_{NV} = 0.574 \text{ [mm]} \end{array}$$

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 baseplate! 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!

7 Warnings

- The anchor design methods in PROFIS Anchor require rigid baseplates per current regulations (ETAG 001/Annex C, EOTA TR029, etc.). This means load re-distribution on the anchors due to elastic deformations of the baseplate are not considered - the baseplate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Anchor calculates the minimum required baseplate thickness with FEM to limit the stress of the baseplate based on the assumptions explained above. The proof if the rigid baseplate assumption is valid is not carried out by PROFIS Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Your design has selected filled holes. Please ensure that there is a proper method to fill the annular gap between the fixture and HIT-RE 500 V3 + HIT-V-F (8.8) M20, and contact Hilti in case of any questions.
- 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.
- Characteristic bond resistances depend on short- and long-term temperatures.
- Please contact Hilti to check feasibility of HIT-V rod supply.
- The design method fib (07/2011) assumes that no hole clearance between the anchors and the fixture is present. This can be achieved by filling the gap with mortar of sufficient compressive strength (e.g. by using the HILTI Seismic/Filling set) or by other suitable means
- The compliance with current standards (e.g. EC3) is the responsibility of the user
- Checking the transfer of loads into the base material is required in accordance with fib (07/2011)!

Fastening meets the design criteria!

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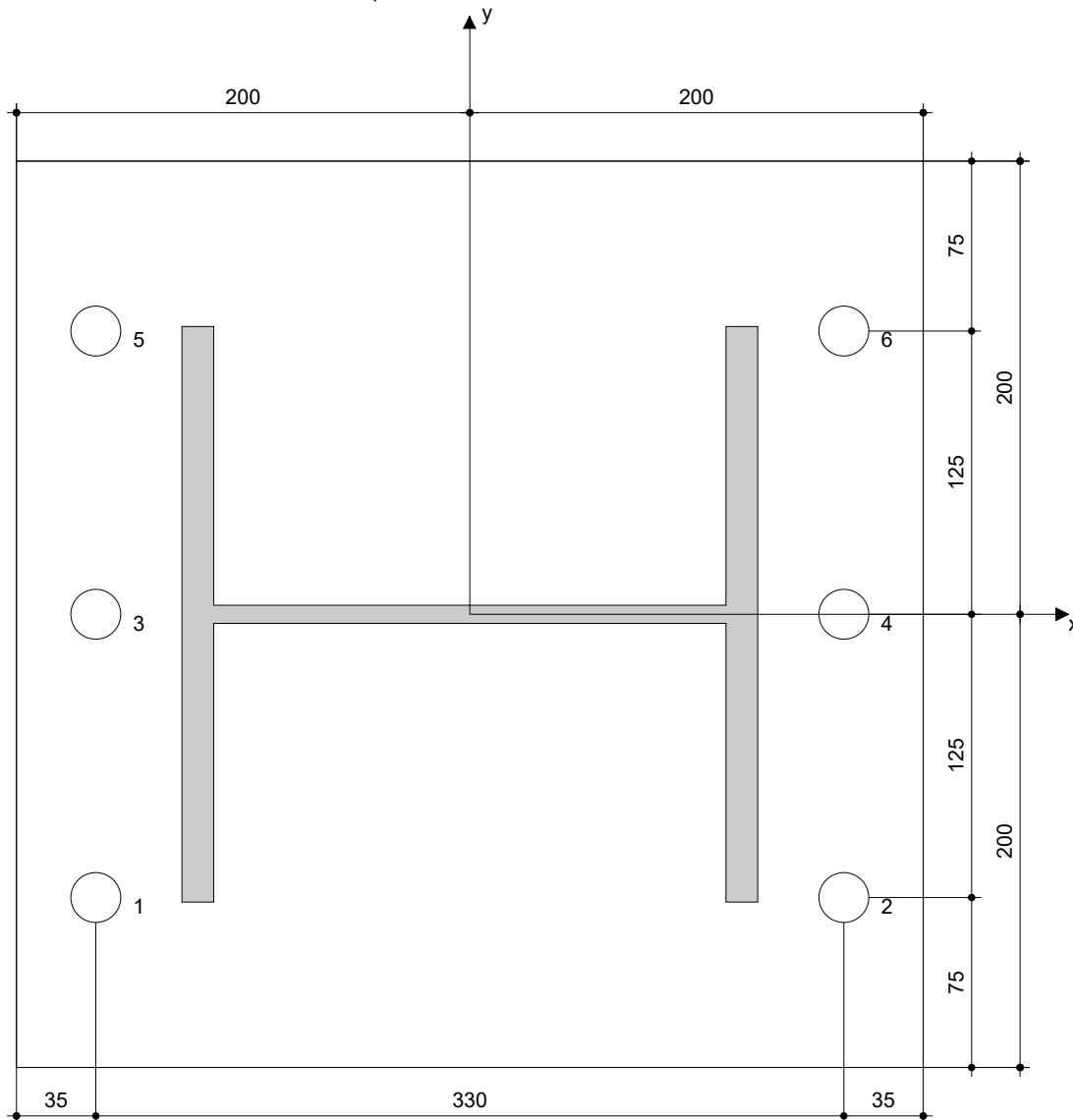
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8 Installation data

Baseplate, steel: -	Anchor type and size: HIT-RE 500 V3 + HIT-V-F (8.8) M20
Profile: I profile; (L x W x T x FT) = 254 mm x 254 mm x 8 mm x 14 mm	Installation torque: 0.150 kNm
Hole diameter in the fixture: $d_r = 22$ mm	Hole diameter in the base material: 22 mm
Plate thickness (input): 20 mm	Hole depth in the base material: 148 mm
Recommended plate thickness: not calculated	Minimum thickness of the base material: 192 mm
Drilling method: Hammer drilled	
Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required	

8.1 Recommended accessories

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



Coordinates Anchor [mm]

Anchor	x	y	C _{-x}	C _{+x}	C _{-y}	C _{+y}	Anchor	x	y	C _{-x}	C _{+x}	C _{-y}	C _{+y}
1	-165	-125	964	1,330	175	425	4	165	0	1,294	1,000	300	300
2	165	-125	1,294	1,000	175	425	5	-165	125	964	1,330	425	175
3	-165	0	964	1,330	300	300	6	165	125	1,294	1,000	425	175

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9 Remarks; Your Cooperation Duties

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