



HAS-U system for applications subjected to fatigue loading

Product Technical Datasheet
Steel-to-concrete
Update: Aug 25



HAS-U system for applications subjected to fatigue loading

Stainless steel HAS-U A4 anchor rods with Hilti HIT injection mortars HIT-HY 200-A V3 and -R V3, HIT-RE 500 V4 or HVU2 capsule.

HAS-U Fatigue System



Hilti HIT-HY 200-A V3
(available as 330 ml
or 500 ml foil pack)



Hilti HIT-HY 200-R V3
(available as 330 ml
or 500 ml foil pack)



Hilti HIT-RE 500 V4
(available as 330 ml,
500 ml or 1400 ml foil
pack)



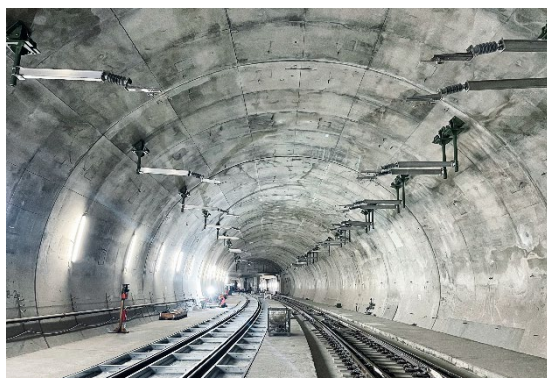
HVU2 Anchor Capsule



HAS-U A4 anchor rod
(M8 – M24)



Filling Set or Locking
Nut accessory



Benefits

- Standard and complete solution for fatigue applications, with HAS-U A4 anchor rod and alternatively HIT injection mortars or HVU2 capsules
- Full design through PROFIS Engineering suite
- HAS-U A4 anchor rods have engraved marking on the head for easy verification of steel grade and bar length even after installation
- Flexible embedment depth

Application

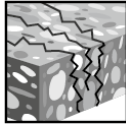
- According to the current guidelines TR061, fastening systems subjected to more than 100 load cycles in case of shear or 1000 in case of tension, need to be designed for fatigue loading.
- The role of the anchors is to ensure a safer connection during its entire service life under a large number of load cycles that may induce a fatigue failure of the fastening system.
- The HAS-U fatigue-approved portfolio offers both a comprehensive diameter coverage, from M8 to M24, as well as embedment flexibility to cover the majority of relevant fastening applications in rail-tunnels such as catenaries, handrails and signs. Other typical fatigue relative applications include fastening of cranes, robots and machines.
- The approved anchor incorporates optimized group and interaction factors to ensure a highly efficient and robust design.



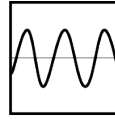
Base material **Load conditions**



Concrete (non-cracked)

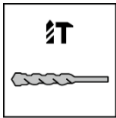


Concrete (cracked)

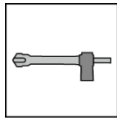


Fatigue

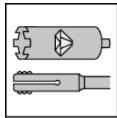
Drilling, cleaning, setting **Other information**



Hammer drilled holes



Hollow Drill Bit drilled holes ¹⁾



Diamond drilled with roughening tool holes ¹⁾



[PROFIS Engineering software](#)



[Steel to concrete handbook](#)

¹⁾ Please refer ETA and IFU section for more details.

Linked Approvals/Certificates and Instructions for use.

Approvals/certificates

Approval no	Application / loading condition	Authority / Laboratory	Date of issue
ETA-23/0277	Fatigue	DIBt, Berlin	02-07-2025

The instructions for use can be viewed using the link in the instructions for use table or the QR code/link in the Hilti webpage table

Link to Instructions for use(IFU)

Material				
Injection mortar / Anchor capsule	IFU Hilti HIT-HY 200-A V3	IFU Hilti HIT-HY 200-R V3	IFU Hilti HIT-RE 500 V4	IFU HVU2
Locking nuts	IFU Locking nuts			-
Filling set	IFU Filling set			
Dispenser	IFU HDM	IFU HDE 500-A12	IFU HDE-500 22	-

Links to Hilti Webpage

Injection mortars / Anchor Capsule / Threaded rod					
HIT-HY 200-A V3	HIT-HY 200-R V3	Hilti HIT-RE 500 V4	HVU2	HAS-U A4	
Dispenser / Accessories					
HDE 500-22	HDE 500-A12	HDM 500	Filling set		

Fastener special dimensions

Mechanical properties and dimensions HAS-U A4

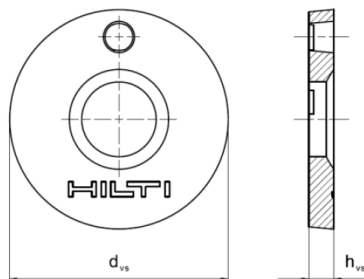
Mechanical properties and dimensions of the threaded rods are standardized and can be taken from the ETA listed in the table Approvals / Certificates.

Mechanical properties of filling washer can be taken from the ETA listed in the table Approvals / Certificates.

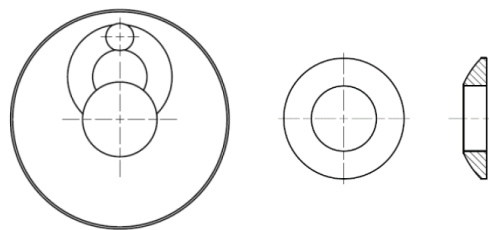
Hilti Filling Set to fill the annular gap between steel element and fixture

Anchor size		M10	M12	M16	M20	M24
Diameter	d_{vs} [mm]	42	44	52	60	70
Height of filling washer	h_{vs} [mm]	5	5	6	6	6
Height of filling washer and spherical washer	h_{fs} [mm]	9	10	11	13	15

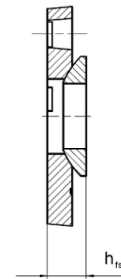
Sealing washer



Spherical washer



Filling Set



The application can be covered by four different installation options, as specified in ETA-23/0277. Depending on the HAS-U A4 Threaded rod diameter and annular gap.

Annular gap		Filled		Not filled	
Installation option		Pre-setting or through-setting	Through-setting ¹⁾	Pre-setting or through-setting	
Accessories needed		Filling set including lock nut	Washer, nut and lock nut	Filling set including lock nut	
HAS-U A4		M8-M24	M8-M12	M8-M24	
Allowed fatigue loading direction	Tension	Yes			
	Shear	Yes		No	
To install with Hilti	HY 200 A/R V3	✓	✓	✓	
	RE 500 V4		—		
	HVU2 capsule				

¹⁾ Maximum fixture thickness 2·d, even/flat concrete surface.



Fatigue loading based on ETA-23/0277 and Design according to EN 1992-4 and TR 061

All data in this section applies to:

- Correct setting (see Instructions for use (IFU))
- Single anchor
- Hammer drilled holes, hammer drilled holes with Hilti hollow drill bit
- No edge distance and spacing influence (see setting information tables with characteristic distances)
- Minimum base material thickness, as specified in the table of this section
- Embedment depth, as specified in the table of this section
- Concrete C20/25
- In-service temperature range I
min. base material temp. -40°C, max. long/short term base material temp.: +24°C/40°C
- The design example in the table below has been done in accordance to TR061 design method I (case 2), all loads are considered fatigue relevant and different resistance of the anchor is provide with a different number of load cycles (up to 100 million cycles).

Note : Design scenarios involving combined tension and shear loads, as well as anchor group effects, are not covered in this example. However, both factors significantly influence the overall design and should be considered.

For specific design cases refer to [PROFIS Engineering](#).

Embedment depth

HAS-U A4 with HIT-HY 200-A V3 or HIT-HY 200-R V3 or HIT-RE 500 V4 or HUV2								
Anchor size			M8	M10	M12	M16	M20	M24
Embedment depth	h_{ef}	[mm]	80	90	110	125	170	210
Base material thickness	h	[mm]	110	120	140	170	220	270

Design resistance according to EOTA TR 061 – Method I

Anchor size		M8	M10	M12	M16	M20	M24	
HAS-U A4 with HIT-HY 200-A V3 or HIT-HY 200-R V3								
Number of cycles	$\leq 10^4$	Uncracked concrete Tension: $\Delta N_{Rd,0,n}$ [kN]	5,1	8,1	14,3	26,6	41,6	59,9
	$2 \cdot 10^5$		3,0	4,8	9,7	18,0	28,1	40,5
	10^6		2,2	3,6	7,8	14,5	22,6	32,6
	$5 \cdot 10^6$		1,7	2,6	6,2	11,6	18,1	26,1
	10^7		1,6	2,5	6,0	11,1	17,3	24,9
	10^8		1,3	2,0	5,1	9,5	14,9	21,5
	$> 10^8$		1,3	2,0	5,1	9,5	14,9	21,4
HAS-U A4 with HIT-RE 500 V4								
Number of cycles	$\leq 10^4$	Uncracked concrete Tension: $\Delta N_{Rd,0,n}$ [kN]	5,1	8,1	14,3	26,6	41,6	59,9
	$2 \cdot 10^5$		3,0	4,8	9,7	18,0	28,1	40,5
	10^6		2,2	3,6	7,8	14,5	22,6	32,6
	$5 \cdot 10^6$		1,7	2,6	6,2	11,6	18,1	26,1
	10^7		1,6	2,5	6,0	11,1	17,3	24,9
	10^8		1,3	2,0	5,1	9,5	14,9	21,5
	$> 10^8$		1,3	2,0	5,1	9,5	14,9	21,4
HAS-U A4 with HVU2								
Number of cycles	$\leq 10^4$	Uncracked concrete Tension: $\Delta N_{Rd,0,n}$ [kN]	5,1	8,1	14,3	26,6	41,6	59,9
	$2 \cdot 10^5$		3,0	4,8	9,7	18,0	28,1	40,5
	10^6		2,2	3,6	7,8	14,5	22,6	32,6
	$5 \cdot 10^6$		1,7	2,6	6,2	11,6	18,1	26,1
	10^7		1,6	2,5	6,0	11,1	17,3	24,9
	10^8		1,3	2,0	5,1	9,5	14,9	21,5
HAS-U A4 with HIT-HY 200 R V3 / HIT-HY 200 A V3 / HIT-RE 500 V4 / HVU2								
Number of cycles	$\leq 10^4$	Uncracked concrete Shear: $\Delta V_{Rd,0,n}$ [kN]	3,5	5,6	8,1	15,0	23,5	33,8
	$2 \cdot 10^5$		2,3	3,7	5,4	10,0	15,6	22,5
	10^6		1,9	3,0	4,3	8,0	12,5	18,0
	$5 \cdot 10^6$		1,5	2,4	3,4	6,4	10,0	14,4
	10^7		1,4	2,3	3,3	6,1	9,6	13,8
	10^8		1,2	1,9	2,8	5,3	8,2	11,8
HAS-U A4 with HIT-HY 200 R V3 / HIT-HY 200 A V3 / HIT-RE 500 V4								
Number of cycles	$> 10^8$	Uncracked concrete Shear: $\Delta V_{Rd,0,n}$ [kN]	1,2	1,9	2,8	5,3	8,2	11,8



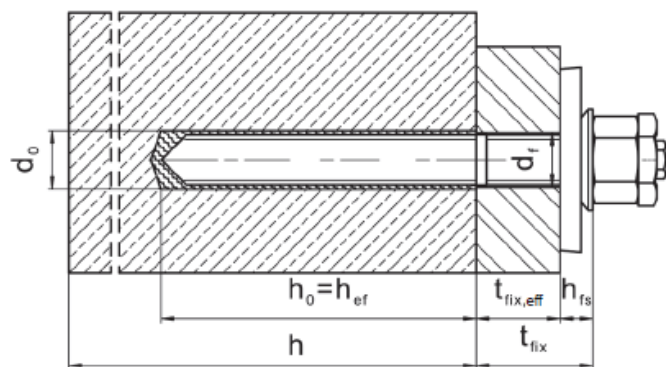
Design resistance according to EOTA TR 061 – Method I

Anchor size		M8	M10	M12	M16	M20	M24	
HAS-U A4 with HIT-HY 200-A V3 or HIT-HY 200-R V3								
Number of cycles	$\leq 10^4$	Cracked concrete Tension: $\Delta N_{Rd,0,n}$ [kN]	3,7	6,9	11,0	17,2	31,2	46,3
	$2 \cdot 10^5$		3,0	4,8	9,7	15,9	28,1	39,3
	10^6		2,2	3,6	7,8	14,5	22,6	32,6
	$5 \cdot 10^6$		1,7	2,6	6,2	11,6	18,1	26,1
	10^7		1,6	2,5	6,0	11,1	17,3	24,9
	10^8		1,3	2,0	5,1	9,5	14,9	21,5
	$> 10^8$		1,3	2,0	5,1	9,5	14,9	21,4
HAS-U A4 with HIT-RE 500 V4								
Number of cycles	$\leq 10^4$	Cracked concrete Tension: $\Delta N_{Rd,0,n}$ [kN]	3,7	6,6	12,7	19,9	32,8	46,3
	$2 \cdot 10^5$		3,0	4,8	9,7	18,0	28,1	39,3
	10^6		2,2	3,6	7,8	14,5	22,6	32,6
	$5 \cdot 10^6$		1,7	2,6	6,2	11,6	18,1	26,1
	10^7		1,6	2,5	6,0	11,1	17,3	24,9
	10^8		1,3	2,0	5,1	9,5	14,9	21,5
	$> 10^8$		1,3	2,0	5,1	9,5	14,9	21,4
HAS-U-A4 with HVU2								
Number of cycles	$\leq 10^4$	Cracked concrete Tension: $\Delta N_{Rd,0,n}$ [kN]	3,7	6,6	12,7	19,9	32,8	46,3
	$2 \cdot 10^5$		3,0	4,8	9,7	18,0	28,1	39,3
	10^6		2,2	3,6	7,8	14,5	22,6	32,6
	$5 \cdot 10^6$		1,7	2,6	6,2	11,6	18,1	26,1
	10^7		1,6	2,5	6,0	11,1	17,3	24,9
	10^8		1,3	2,0	5,1	9,5	14,9	21,5
	$> 10^8$		1,3	2,0	5,1	9,5	14,9	21,4
HAS-U A4 with HIT-HY 200 R V3 / HIT-HY 200 A V3 / HIT-RE 500 V4 / HVU2								
Number of cycles	$\leq 10^4$	Cracked concrete Shear: $\Delta V_{Rd,0,n}$ [kN]	3,5	5,6	8,1	15,0	23,5	33,8
	$2 \cdot 10^5$		2,3	3,7	5,4	10,0	15,6	22,5
	10^6		1,9	3,0	4,3	8,0	12,5	18,0
	$5 \cdot 10^6$		1,5	2,4	3,4	6,4	10,0	14,4
	10^7		1,4	2,3	3,3	6,1	9,6	13,8
	10^8		1,2	1,9	2,8	5,3	8,2	11,8
	$> 10^8$		1,2	1,9	2,8	5,3	8,2	11,8
HAS-U A4 with HIT-HY 200 R V3 / HIT-HY 200 A V3 / HIT-RE 500 V4								
Number of cycles	$> 10^8$	Cracked concrete Shear: $\Delta V_{Rd,0,n}$ [kN]	1,2	1,9	2,8	5,3	8,2	11,8





Setting information

Anchor size	HAS-U-A4	M8	M10	M12	M16	M20	M24	
Pre-setting: Maximum diameter of clearance hole in the fixture	d_f [mm]	9	12	14	18	22	26	
Through-setting: Maximum diameter of clearance hole in the fixture		11	14	16	20	24	30	
Minimum fixture thickness ¹⁾		$t_{fix,min}$	8	10	12	16	20	24
Thickness of Hilti Filling Set		h_{fs}	8	9	10	11	13	15
Effective fixture thickness with Hilti Filling Set		$t_{fix,eff}$	$t_{fix,eff} = t_{fix} - h_{fs} \geq t_{fix,min}$					

¹⁾ The minimum fixture thickness $t_{fix,min}$ can be replaced by a reduced minimum fixture thickness $t_{fix,min,red}$, please refer ETA-13/0277 for more details.



Please refer to the corresponding Product Technical Datasheet links for injection mortars and capsule for other setting information.

Hilti Anchor Capsule and injection mortars	Product Technical Datasheet link
 HIT-HY 200-A V3	Product Technical Datasheet HIT HY 200 A/R V3 Steel to concrete
 HIT-HY 200-R V3	
 HIT-RE 500 V4	Product Technical Datasheet HIT RE 500 V4 Steel to concrete
 HVU2 Capsule	Product Technical Datasheet HVU2 Capsule Steel to concrete

For specific design cases refer to [PROFIS Engineering](#)