HAS-U A4 FATIGUE
Bonded anchor system

Technical Datasheet
Update: Apr. 24

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		Benefits
	Hilti HIT-HY 200-A V3 (available as 330 ml or 500 ml foil pack)	Standard and complete solution for fatigue applications, with HAS-U A4 anchor rod and alternatively HIT injection mortars or HVU2 capsules
	Hilti HIT-HY 200-R V3 (available as 330 ml or 500 ml foil pack)	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
	Hilti HIT-RE 500 V4 (available as 330 ml, 500 ml or 1400 ml foil pack)	Flexible embedment depth
	HVU2 Anchor Capsule	
	HAS-U A4 anchor rod (M8 – M24)	
	Filling Set or Locking Nut accessory	

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.

Base material

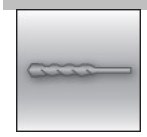
Concrete (uncracked)

Concrete (cracked)

Load conditions

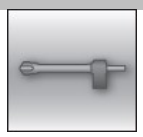
Fatigue

Installation conditions



Hammer drilled holes

Diamond drilled with roughening tool holes



Hollow Drill Bit drilled holes

Other information

… [1)]

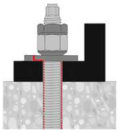
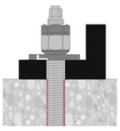
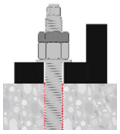
PROFIS Engineering design Software

[1)] For complete list of Installation conditions, see ETAs of the HIT mortars or HVU2

Approval/Certificates

Description	Product	Autority	No. / date of issue
European Technical Assessment	HAS-U A4 with HIT-HY 200-A V3/R V3 HIT-RE 500 V4 HVU2	DIBt, Berlin	ETA-23/0277 / 08-02-2024

As stated in ETA-23/0277, issue date 08-02-2024, the application can be covered with 3 different installation options (depending on the HAS-U A4 rod diameter):

#	Annular gap		HAS-U A4	Accessories needed	Allowed fatigue loading direction		To install with Hilti	
1		Filled	M8 – M24	Filling set including locking nut 		Tension and shear	HIT-HY 200-A V3 HIT-HY 200-R V3 HIT-RE 500 V4 HVU2 anchor capsule	
2		Not filled	M8 – M24	Filling set including locking nut 		Tension	HIT-HY 200-A V3 HIT-HY 200-R V3 HIT-RE 500 V4 HVU2 anchor capsule	
3		Not filled	M8 – M12	Locking Nut		Tension	HIT-HY 200-A V3 HIT-HY 200-R V3 HIT-RE 500 V4 HVU2 anchor capsule	

Fatigue design according to EN 1992-4 and EOTA TR 061
Based on ETA-23/0277

All data in this section applies to:

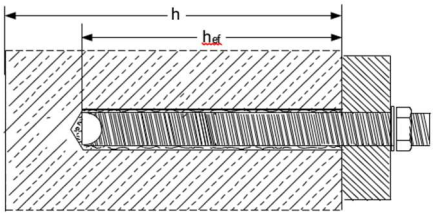
- Correct setting (see setting instruction)
- Single anchor HAS-U A4 with HIT-HY 200-A V3 or HIT-HY 200-R V3
- Hammer drilled holes, hammer drilled holes with Hilti hollow drill bit
- No edge distance and spacing influence (see setting detail tables with characteristic distances)
- Minimum base material 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

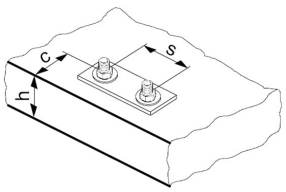
The design example in the table below has been done in accordance to TR061 design method I (case 2), all loads are considered fatigue relevant and different resistance of the anchor is provide with a different number of load cycles (up to 100 million cycles).

For specific design cases refer to PROFIS Engineering (e.g combined tension and shear loads, anchor group).

Embedment depth and dimensions

Anchor size			M8	M10	M12	M16	M20	M24
HAS-U A4								
Embedment depth	h_{ef}	[mm	80	90	110	125	170	210
Base material thickness	h	[mm	110	120	140	170	220	270
Edge distance for concrete cone failure	$c_{cr,N}$	[mm	120	135	165	188	255	315
Spacing for concrete cone failure	$s_{cr,N}$	[mm	240	270	330	375	510	630





Design resistance according to EOTA TR 061 – Method I

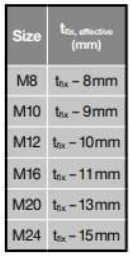
Anchor size		M8	M10	M12	M16	M20	M24
Uncracked concrete							
Number of cycles							
≤ 10^4	Tension: $\Delta N_{Rd,0,n}$ [kN]	5,1	8,1	14,3	26,6	41,6	59,9
$2 \cdot 10^5$		3,0	4,8	9,7	18,0	28,1	40,5
10^6		2,2	3,6	7,8	14,5	22,6	32,6
$5 \cdot 10^6$		1,7	2,6	6,2	11,6	18,1	26,1
10^7		1,6	2,5	6,0	11,1	17,3	24,9
10^8		1,3	2,0	5,1	9,5	14,9	21,5
Number of cycles							
≤ 10^4	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
Anchor size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Cracked concrete							
Number of cycles							
≤ 10^4	Tension: $\Delta N_{Rd,0,n}$ [kN]	4,0	7,3	11,7	18,3	33,1	46,3
$2 \cdot 10^5$		3,0	4,8	9,2	14,4	26,1	38,8
10^6		2,2	3,6	7,8	12,7	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
Number of cycles							
≤ 10^4	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

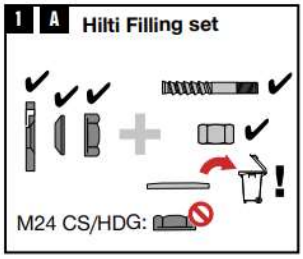
Installation instructions

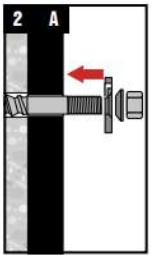
The installation of the Hilti HIT mortar or Hilti HVU2 anchor capsule follows the indication given in the corresponding instructions for use (IFU), available on product packaging.

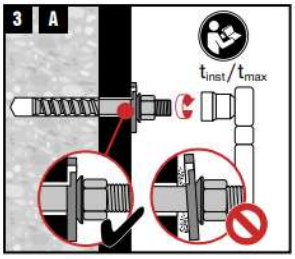
Once the HIT mortar / HVU2 has been installed, depending on which application is to be covered the installer will need to use either the Hilti Filling set (installation Options 1 or 2) or the Hilti Locking Nut (installation Option 3).

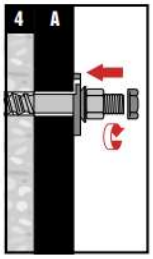
Installation Options 1 and 2, with Hilti Filling set
Installations with Filling set follow the IFU reported below. Note that the steps 7A and 8A apply only for the Option 1

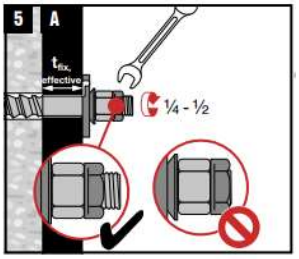


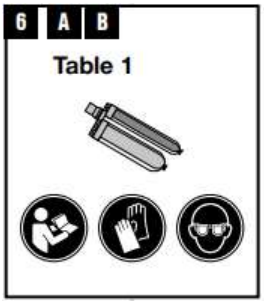


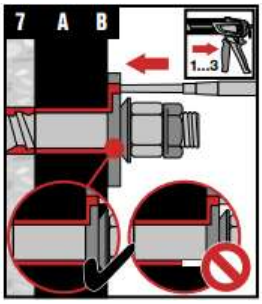


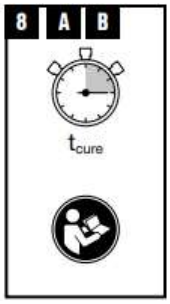












Installation Option 3, with Hilti Locking Nut

Installation Option 3 with Hilti Locking Nut only follows the IFU reported below. If the visual check to confirm that the mortar passes the borehole level (pictures 2 or 3 below) is not passed, it will be necessary to use the Hilti Filling Set.