

## HILTI TECHNICAL DATA

Date	18.01.2021
From	Corinna Müller, ARAMc
For information	BU Anchor Technical Marketing

**Hilti HIT-RE 500 V4**  
**Technical data for submerged concrete**  
**assessment based on ETA-20/0541**

### 1 Scope

These data are intended for BU Anchor Technical Marketing to be applicable for submerged concrete and shall be released for PROFIS as Hilti Technical Data, only.  
These data are valid for a service life of 50 years, only.

For further information see: Report ARA 20-003.

Application is restricted to static and quasi-static loading.

Released by:



Corinna Müller  
Technical Data and Approvals  
18.01.2020



Michael Roessle  
Group Manager Technical Data and Approvals  
20.01.2020

## 2 Intended use and restrictions

In Table 1 the application scope and limits are given.

**Table 1: Application scope**

Anchorage subject to	Static and quasi static loading
Base material	Concrete strength C20/25 to C50/60; Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013+A1:2016 <b>Uncracked concrete, only</b>
Concrete condition	Submerged concrete
Embedment depth	acc. ETA-20/0541 (issued 21.11.2020)
Installation direction	acc. ETA-20/0541 (issued 21.11.2020)
Temperature in base material at installation	acc. ETA-20/0541 (issued 21.11.2020)
Temperature in base material in-service	acc. ETA-20/0541 (issued 21.11.2020)
Drilling technique	<b>Hammer drilling, only</b>
Cleaning	acc. chapter 4
Setting	acc. ETA-20/0541 (issued 21.11.2020) and chapter 4

## 3 Installation parameters

The installation parameters are given in Table 2.

**Table 2: Installation parameters**

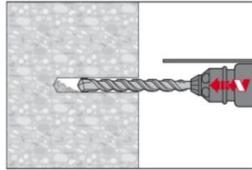
Installation parameter	acc. ETA-20/0541 (issued 21.11.2020)
------------------------	--------------------------------------

## 4 Installation instructions

For installation in submerged concrete the following procedure is covered by this data:

### Hole Drilling

#### Hammer drilling:

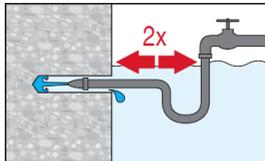


Drill hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

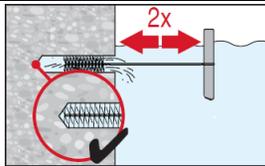
#### Drill hole cleaning:

Just before setting an anchor, the drill hole must be free of dust and debris. Inadequate hole cleaning = poor load values.

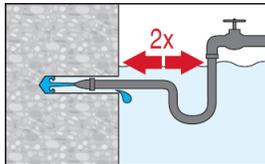
#### Cleaning for submerged concrete: For all drill hole diameters $d_0$ and all drill hole depths $h_0$ .



Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.

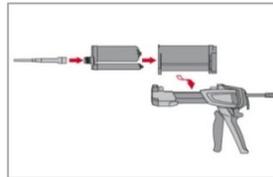


Brush 2 times with the specified brush size (see MPII) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it. The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small and must be replaced with the proper brush diameter.

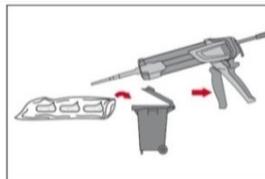


Flush again 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.

### Injection preparation

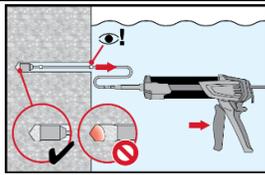


Tightly attach Hilti mixing nozzle HIT-RE-M to foil pack manifold. Do not modify the mixing nozzle. Observe the instruction for use of the dispenser. Check foil pack holder for proper function. Insert foil pack into foil pack holder and put holder into dispenser.

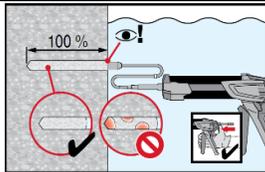


The foil pack opens automatically as dispensing is initiated. Depending on the size of the foil pack an initial amount of adhesive has to be discarded.

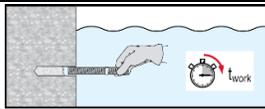
Discarded quantities are:	3 strokes	for 330 ml foil pack,
	4 strokes	for 500 ml foil pack,
	65 ml	for 1400 ml foil pack.

**Inject adhesive from the back of the drill hole without forming air voids.**


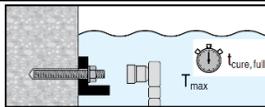
For submerged concrete application the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug (see MPII). Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the drill hole by the adhesive pressure.



Fill bore hole completely with mortar. After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

**Setting the element**


Before use, verify that the element is dry and free of oil and other contaminants. Mark and set element to the required embedment depth before working time  $t_{work}$  has elapsed. The working time  $t_{work}$  is given in the MPII.



Loading the anchor: After required curing time  $t_{cure, full}$  (see MPII) the anchor can be loaded. The applied installation torque shall not exceed the values  $T_{max}$  given in the MPII.

## 5 Essential characteristics

In Table 3 the essential characteristics are summarized.

**Table 3: Essential characteristics**

<b>TENSION LOAD</b>	
Steel failure	acc. ETA-20/0541 (issued 21.11.2020)
Combined pull-out and concrete cone failure	see Table 4, Table 5 and Table 6
Concrete cone failure	acc. ETA-20/0541 (issued 21.11.2020)
Splitting failure	acc. ETA-20/0541 (issued 21.11.2020)
Displacements	acc. ETA-20/0541 (issued 21.11.2020)
<b>SHEAR LOAD</b>	
Steel failure	acc. ETA-20/0541 (issued 21.11.2020)
Pry-out and concrete edge failure	acc. ETA-20/0541 (issued 21.11.2020)
Displacements	acc. ETA-20/0541 (issued 21.11.2020)

**Table 4: Essential characteristics for threaded rods under tension load in concrete**

Threaded rod, HAS-U-..., HIT-V-..., AM...8.8				M8	M10	M12	M16	M20	M24	M27	M30	
<b>Installation factor</b>												
Hammer drilling				$\gamma_{inst}$	[-]			1,4				
<b>Combined pullout and concrete cone failure</b>												
Characteristic resistance in uncracked concrete C20/25 in <b>hammer drilled holes in submerged concrete</b>												
Temperature range I:		40°C / 24°C	$\tau_{RK,ucr}$	[N/mm <sup>2</sup> ]	6,0	6,0	6,0	5,5	5,5	5,0	5,0	4,5
Temperature range II:		55°C / 43°C	$\tau_{RK,ucr}$	[N/mm <sup>2</sup> ]	5,0	5,0	5,0	4,5	4,5	4,0	4,0	4,0
Temperature range III:		75°C / 55°C	$\tau_{RK,ucr}$	[N/mm <sup>2</sup> ]	2,0	2,0	2,0	2,0	1,5	1,5	1,5	1,5
<b>Influence factors <math>\psi</math> on bond resistance <math>\tau_{RK}</math></b>												
Influence of concrete strength												
Uncracked concrete		in hammer drilled holes		$\psi_c$	C30/37		1,04					
					C40/50		1,07					
					C50/60		1,09					
Influence of sustained load												
Uncracked concrete		in hammer drilled holes		$\psi_{sus}^0$	40°C / 24°C		0,88					
					55°C / 43°C		0,72					
					75°C / 55°C		0,69					

**Table 5: Essential characteristics for HIS-(R)N under tension load in concrete**

HIS-(R)N				M8	M10	M12	M16	M20	
<b>Installation factor</b>									
Hammer drilling				$\gamma_{inst}$	[-]			1,4	
<b>Combined pullout and concrete cone failure</b>									
Characteristic resistance in uncracked concrete C20/25 in <b>hammer drilled holes in submerged concrete</b>									
Temperature range I:		40°C / 24°C	$\tau_{RK,ucr}$	[N/mm <sup>2</sup> ]	4,5	4,5	4,5	4,5	4,5
Temperature range II:		55°C / 43°C	$\tau_{RK,ucr}$	[N/mm <sup>2</sup> ]	4,0	4,0	4,0	4,0	4,0
Temperature range III:		75°C / 55°C	$\tau_{RK,ucr}$	[N/mm <sup>2</sup> ]	1,5	1,5	1,5	1,5	1,5
<b>Influence factors <math>\psi</math> on bond resistance <math>\tau_{RK}</math></b>									
Influence of concrete strength									
Uncracked concrete		in hammer drilled holes		$\psi_c$	C30/37		1,04		
					C40/50		1,07		
					C50/60		1,09		
Influence of sustained load									
Uncracked concrete		in hammer drilled holes		$\psi_{sus}^0$	40°C / 24°C		0,88		
					55°C / 43°C		0,72		
					75°C / 55°C		0,69		

**Table 6: Essential characteristics for rebar under tension load in concrete**

Rebar				φ 8	φ10	φ12	φ14	φ16	φ20	φ25	φ28	φ30	φ32	
<b>Installation factor</b>														
Hammer drilling				$\gamma_{inst}$	[-]			1,4						
<b>Combined pullout and concrete cone failure</b>														
Characteristic resistance in uncracked concrete C20/25 in <b>hammer drilled holes in submerged concrete</b>														
Temperature range I:		40°C / 24°C		$\tau_{RK,ucr}$	[N/mm <sup>2</sup> ]		3,0	4,5	4,5	4,5	4,5	4,5	4,5	4,5
Temperature range II:		55°C / 43°C		$\tau_{RK,ucr}$	[N/mm <sup>2</sup> ]		2,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5
Temperature range III:		75°C / 55°C		$\tau_{RK,ucr}$	[N/mm <sup>2</sup> ]		1,0	1,5	1,5	1,5	1,5	1,5	1,5	1,5
<b>Influence factors <math>\psi</math> on bond resistance <math>\tau_{Rk}</math></b>														
Influence of concrete strength														
Uncracked concrete		in hammer drilled holes		$\psi_c$	C30/37		1,04							
					C40/50		1,07							
					C50/60		1,09							
Influence of sustained load														
Uncracked concrete		in hammer drilled holes		$\psi_{sus}^0$	40°C / 24°C		0,88							
					55°C / 43°C		0,72							
					75°C / 55°C		0,69							