

## HILTI TECHNICAL DATA

Date	18.01.2021
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For information	BU Anchor Technical Marketing

**Hilti HIT-RE 500 V4**

**Technical data for threaded rods M33, M36, M39 and rebars  $\phi$ 36 and  $\phi$ 40  
assessment based on ETA-20/0541**

### 1 Scope

These data are intended for BU Anchor Technical Marketing to be applicable for threaded rods M33, M36, M39 and rebars  $\phi$ 36 and  $\phi$ 40 and shall be released for PROFIS as Hilti Technical Data, only.

These data are not covered by ETA-20/0541 (issued 21.11.2020).

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:



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## 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	Dry and wet concrete condition <b>Excluded:</b> installation in flooded borehole
Embedment depth	acc. Table 3 and Table 4
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. ETA-20/0541 (issued 21.11.2020) / MPII <b>NOTE:</b> Compressed air cleaning ( $\geq 140$ m <sup>3</sup> /h); accessories are available in each size as a Hilti product (if not stated otherwise) (see Table 2)
Setting	acc. ETA-20/0541 (issued 21.11.2020); accessories are available in each size as a Hilti product (if not stated otherwise) (see Table 2)

## 3 Installation parameters

In Table 3 and Table 4 installation parameters are given.

**Table 2: Parameters of drilling, cleaning and setting tools (metric elements)**

Elements		Drill and clean		Installation
Threaded rod	Rebar	Hammer drilling	Brush	Piston plug
Size	Size	$d_0$ [mm]	HIT-RB	HIT-SZ
M33	-	37	37	37
M36	-	40	40	40
M39	-	42 <sup>1)</sup>	42 <sup>1)</sup>	42 <sup>1)</sup>
-	$\phi 36$	45 <sup>1)</sup>	45 <sup>1)</sup>	45 <sup>1)</sup>
-	$\phi 40$	55 <sup>1)</sup>	55 <sup>1)</sup>	55 <sup>1)</sup>

<sup>1)</sup> not available as Hilti product

**Table 3: Installation parameters – threaded rods**

Threaded rod		M33	M36	M39
min. $h_{ef}$	[mm]	132	144	156
max. $h_{ef}$	[mm]	660	720	780
Minimum base material thickness $h_{min}$	[mm]	$h_{ef} + 2 d_0$		
Diameter of clearance hole in the fixture $d_f$	[mm]	36	39	42
Minimum spacing $s_{min}$	[mm]	165	180	195
Minimum edge distance $c_{min}$	[mm]	165	180	195
Installation torque max. $T_{inst}$	[Nm]	330	360	390

**Table 4: Installation parameters – rebars**

Rebar		φ36	φ40
min. $h_{ef}$	[mm]	144	160
max. $h_{ef}$	[mm]	720	800
Minimum base material thickness $h_{min}$	[mm]	$h_{ef} + 2 d_0$	
Minimum spacing $s_{min}$	[mm]	180	200
Minimum edge distance $c_{min}$	[mm]	180	200

#### 4 Essential characteristics for threaded rods

In Table 5 to Table 8 the essential characteristics for threaded rods are summarized.

**Table 5: Essential characteristics under tension load in concrete**

Threaded rod		M33	M36	M39	
<b>Steel failure</b>					
Characteristic resistance	$N_{Rk,s}$ [kN]	$A_s \cdot f_{uk}$			
Partial factor grade 5.8, 8.8	$\gamma_{Ms,N}^{1)}$ [-]	1,5			
Partial factor HAS-U A4, HIT-V-R	$\gamma_{Ms,N}^{1)}$ [-]	2,86			
Partial factor HAS-U HCR, HIT-V-HCR	$\gamma_{Ms,N}^{1)}$ [-]	2,4			
<b>Installation factor</b>					
Hammer drilling (dry and wet concrete)	$\gamma_{inst}$ [-]	1,2			
<b>Concrete cone failure</b>					
Factor for uncracked concrete	$k_{ucr,N}$ [-]	11,0			
Edge distance	$c_{cr,N}$ [mm]	$1,5 \cdot h_{ef}$			
Spacing	$s_{cr,N}$ [mm]	$3,0 \cdot h_{ef}$			
<b>Splitting failure</b>					
Edge distance $c_{cr,sp}$ [mm] for	$h / h_{ef} \geq 2,0$	$1,0 \cdot h_{ef}$			
	$2,0 > h / h_{ef} > 1,3$	$4,6 \cdot h_{ef} - 1,8 \cdot h$			
	$h / h_{ef} \leq 1,3$	$2,26 \cdot h_{ef}$			
Spacing	$s_{cr,sp}$ [mm]	$2 \cdot c_{cr,sp}$			
<b>Combined pullout and concrete cone failure</b>					
Characteristic resistance in uncracked concrete C20/25					
Temperature range I:	40°C / 24°C	$\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ]	12	11	11
Temperature range II:	55°C / 43°C	$\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ]	10	9,5	8,5
Temperature range III:	75°C / 55°C	$\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ]	4,0	3,5	3,5
<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	

<sup>1)</sup> In absence of national regulations.

**Table 6: Essential characteristics under shear load in concrete**

Threaded rod		M33	M36	M39
<b>Steel failure without lever arm</b>				
Characteristic resistance	$V_{RK,s}^0$ [kN]	$0,5 \cdot A_s \cdot f_{uk}$		
Partial factor grade 5.8, 8.8	$\gamma_{Ms,v}^{1)}$ [-]	1,25		
Partial factor HAS-U A4, HIT-V-R	$\gamma_{Ms,v}^{1)}$ [-]	2,38		
Partial factor HAS-U HCR, HIT-V-HCR	$\gamma_{Ms,v}^{1)}$ [-]	2,0		
Ductility factor	$k_7$ [-]	1,0		
<b>Steel failure with lever arm</b>				
Characteristic resistance	$M_{RK,s}^0$ [Nm]	$1,2 \cdot W_{el} \cdot f_{uk}$		
Ductility factor	$k_7$ [-]	1,0		
<b>Concrete pry-out failure</b>				
Pry-out factor	$k_8$ [-]	2,0		
<b>Concrete edge failure</b>				
Effective length of fastener	$l_f$ [mm]	$\min(h_{ef}; 12 \cdot d_{nom}; 300)$		
Outside diameter of the anchor	$d_{nom}$ [mm]	33	36	39

<sup>1)</sup> In absence of national regulations.

**Table 7: Essential characteristics – displacements under tension load**

Threaded rod		M33	M36	M39
Displacement in uncracked concrete				
Temperature range I: 40°C / 24°C	$\delta_{N0}$ [mm/(N/mm <sup>2</sup> )]	0,09	0,09	0,10
	$\delta_{N\infty}$ [mm/(N/mm <sup>2</sup> )]	0,20	0,22	0,23
Temperature range II: 55°C / 43°C	$\delta_{N0}$ [mm/(N/mm <sup>2</sup> )]	0,11	0,11	0,12
	$\delta_{N\infty}$ [mm/(N/mm <sup>2</sup> )]	0,24	0,26	0,27
Temperature range III: 75°C / 55°C	$\delta_{N0}$ [mm/(N/mm <sup>2</sup> )]	0,11	0,11	0,12
	$\delta_{N\infty}$ [mm/(N/mm <sup>2</sup> )]	0,25	0,27	0,28

**Table 8: Essential characteristics – displacements under shear load**

Threaded rod, HAS-U-..., HIT-V-..., AM...8.8		M33	M36	M39
Displacement	$\delta_{V0}$ [mm/kN]	0,02	0,02	0,01
	$\delta_{V\infty}$ [mm/kN]	0,03	0,02	0,02

## 5 Essential characteristics for rebars

**Table 9: Essential characteristics under tension load in concrete**

Rebar		$\phi 36$	$\phi 40$	
<b>Steel failure</b>				
Characteristic resistance	$N_{Rk,s}$ [kN]	560	691	
Partial factor	$\gamma_{Ms,N}^{1)}$ [-]	1,4		
<b>Installation factor</b>				
Hammer drilling (dry and wet concrete)	$\gamma_{inst}$ [-]	1,2		
<b>Concrete cone failure</b>				
Factor for uncracked concrete	$k_{ucr,N}$ [-]	11,0		
Edge distance	$c_{cr,N}$ [mm]	$1,5 \cdot h_{ef}$		
Spacing	$s_{cr,N}$ [mm]	$3,0 \cdot h_{ef}$		
<b>Splitting failure</b>				
Edge distance $c_{cr,sp}$ [mm] for	$h / h_{ef} \geq 2,0$	$1,0 \cdot h_{ef}$		
	$2,0 > h / h_{ef} > 1,3$	$4,6 \cdot h_{ef} - 1,8 \cdot h$		
	$h / h_{ef} \leq 1,3$	$2,26 \cdot h_{ef}$		
Spacing	$s_{cr,sp}$ [mm]	$2 \cdot c_{cr,sp}$		
<b>Combined pullout and concrete cone failure</b>				
Characteristic resistance in uncracked concrete C20/25				
Temperature range I:	40°C / 24°C	$\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ]	11,0	
Temperature range II:	55°C / 43°C	$\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ]	9,5	
Temperature range III:	75°C / 55°C	$\tau_{Rk,ucr}$ [N/mm <sup>2</sup> ]	4,0	
<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

<sup>1)</sup> In absence of national regulations.

**Table 10: Essential characteristics under shear load in concrete**

Rebar		$\phi 36$	$\phi 40$
<b>Steel failure without lever arm</b>			
Characteristic resistance	$V_{Rk,s}^0$ [kN]	280	346
Partial factor	$\gamma_{Ms,v}^{1)}$ [-]	1,5	
Ductility factor	$k_7$ [-]	1,0	
<b>Steel failure with lever arm</b>			
Characteristic resistance	$M_{Rk,s}^0$ [Nm]	3023	4147
Ductility factor	$k_7$ [-]	1,0	
<b>Concrete pry-out failure</b>			
Pry-out factor	$k_8$ [-]	2,0	
<b>Concrete edge failure</b>			
Effective length of fastener	$l_f$ [mm]	$\min(h_{ef}; 12 \cdot d_{nom}; 300)$	
Outside diameter of the anchor	$d_{nom}$ [mm]	36	40

<sup>1)</sup> In absence of national regulations.

**Table 11: Essential characteristics – displacements under tension load**

Rebar		$\phi 36$	$\phi 40$
Displacement in uncracked concrete			
Temperature range I: 40°C / 24°C	$\delta_{N0}$ [mm/(N/mm <sup>2</sup> )]	0,09	0,09
	$\delta_{N\infty}$ [mm/(N/mm <sup>2</sup> )]	0,24	0,26
Temperature range II: 55°C / 43°C	$\delta_{N0}$ [mm/(N/mm <sup>2</sup> )]	0,11	0,11
	$\delta_{N\infty}$ [mm/(N/mm <sup>2</sup> )]	0,25	0,27
Temperature range III: 75°C / 55°C	$\delta_{N0}$ [mm/(N/mm <sup>2</sup> )]	0,12	0,12
	$\delta_{N\infty}$ [mm/(N/mm <sup>2</sup> )]	0,26	0,28

**Table 12: Essential characteristics – displacements under shear load**

Rebar		$\phi 36$	$\phi 40$
Displacement	$\delta_{V0}$ [mm/kN]	0,02	0,02
	$\delta_{V\infty}$ [mm/kN]	0,03	0,03