HILTI TECHNICAL DATA

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For information	Hilti: AMT, ARA, Hilti technical departments; -*** no publication outside of Hilti ***-

Hilti HIT-RE 500 V3
Technical data for threaded rods M33 to M80 and rebars in uncracked concrete

This document contains technical data for large diameter sizes used with HIT-RE 500 V3.

NOTE: The sizes **M33 to M39 and rebar ϕ 36 and ϕ 40 are already assessed** for hammer drilling and the Technical data is released for use in PROFIS.

This technical data is intended for use in **application consulting** and special cases of application case by case.

As the borehole dimensions are towards extreme conditions it is especially needed that **borehole cleaning** is performed following the MPII. Special interest shall be put on blowing out with compressed air **until the borehole is completely dried**.

1 Application scope and restrictions

In Table 1 the application scope and limits are given.

Table 1: Application scope

Base material	Concrete C20/25 to C50/60
Concrete condition	Uncracked concrete; Dry and wet concrete, no flooded borehole
Embedment depth	4xd to 20xd
Type of loading	Static, long term and short term
Installation direction	Downwards; Horizontal: only it the threaded rod is supported from sinking and movement in the borehole during installation and curing
Installation temperature	-5° C to +40° C
Maximum application temperature	T1: lt: 24° C / st: 40° C T2: lt: 43° C / st: 70° C
Drilling	Diamond coring, hammer drilling, Rock drilling NOTE: Bond strength data are given for diamond coring, they apply for hammer drilling and rock drilling as well.
Cleaning	As required by the drilling method; Brushes are available in each size as a Hilti product
Setting	With piston plug in each case. Piston plugs are available in each size as a Hilti product
Torque, Minimum h, s and c	Torque moment and the minimum values for member thickness, edge distance and spacing are depending on each other. The values given in Table 2, Table 3 and Table 4 are conservative proposal.

2 Installation parameters

In Table 2, Table 3 and Table 4 the installation parameters are given for the available elements from M33 to M80, as well as the rebars in that range. For some drill bit diameters, the available diameter size of hammer drills does not fit to the diameters size of core bits, thus hammer drill bits and core bits are given separately.

Table 2: Installation parameters metric threaded rods

		M33	M36	M39	M42	M45	M48	M52	M56	M60	M64	M72	M80
O.D. Element	[mm]	33	36	39	42	45	48	52	56	60	64	72	80
Hammer drilling Ø drill bit d_0 Ø brush, Ø piston plug	[mm]	37	40	42	-	52	52	-	-	-	-	-	-
Diamond drilling Ø drill bit d_0 Ø brush, Ø piston plug	[mm]	37	40	42	47	52	52	57	62	67	72	77	92
min h_{ef}	[mm]	132	144	156	168	180	192	208	224	240	256	288	320
max h_{ef}	[mm]	660	720	780	840	900	960	1040	1120	1200	1280	1440	1600
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	45	48	52	58	62	66	70	78	88
Proposed combination													
Minimum spacing s_{min}	[mm]	165	180	195	210	225	240	260	280	300	320	360	400
Minimum edge distance c_{min}	[mm]	165	180	195	210	225	240	260	280	300	320	360	400
maxTorque moment T_{max}	[Nm]	330	360	390	420	450	480	520	560	600	640	720	800

Table 3: Installation parameters fractional threaded rods

		1 3/8"	1 1/2"	1 3/4"	2"	2 1/4"	2 1/2"	2 3/4"	3"
O.D. Element	[mm]	34,9	38,1	44,5	50,8	57,2	63,5	69,9	76,2
	[in.]	1 3/8	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
Hammer drilling Ø drill bit d_0 Ø brush, Ø piston plug	[mm]	38,1	41,3	50,8	-	-	-	-	-
	[in.]	1 1/2	1 5/8	2	-	-	-	-	-
Diamond drilling Ø drill bit d_0 Ø brush, Ø piston plug	[mm]	38,1	44,5	50,8	57,2	63,5	69,9	76,2	88,9
	[in.]	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/2
min h_{ef}	[mm]	139,7	152,4	177,8	203,2	228,6	254,0	279,4	304,8
	[in.]	5 1/2	6	7	8	9	10	11	12
max h_{ef}	[mm]	698,5	762,0	889,0	1016,0	1143,0	1270,0	1397,0	1524,0
	[in.]	27 1/2	30	35	40	45	50	55	60
Minimum base material thickness h_{min}	[mm] [in.]	h_{ef} + 2 d_0							
Diameter of clearance hole in the fixture d_f	[mm]	38,1	41,3	47,6	57,2	63,5	69,9	76,2	82,6
	[in.]	1 1/2	1 5/8	1 7/8	2 1/4	2 1/2	2 3/4	3	3 1/4
Minimum spacing s_{min}	[mm]	175	191	223	254	286	318	350	381
	[in.]	6,90	7,53	8,79	10,04	11,30	12,55	13,81	15,06
Minimum edge distance c_{min}	[mm]	175	191	223	254	286	318	350	381
	[in.]	6,90	7,53	8,79	10,04	11,30	12,55	13,81	15,06
maxTorque moment T_{max}	[Nm]	349	381	445	508	572	635	699	762
	[ft*lb]	257	281	328	375	422	468	516	562

Table 4: Installation parameters reinforcing bars (rebars)

		35M	No° 11	ϕ 36	ϕ 40	No° 14	45M	ϕ 50	55M	No° 18
O.D. Element	[mm]	35,7	35,8	36	40	43,0	43,7	50,0	56,4	57,3
	[in.]									
Hammer drilling Ø drill bit, Ø brush Ø piston plug	[mm]	44,5	44,5	45	55	-	-	-	-	-
	[in.]	1 3/4	1 3/4	-	-	-	-	-	-	-
Diamond drilling Ø drill bit, Ø brush Ø piston plug	[mm]	44,5	44,5	47	52	57,2	57,2	62	69,9	69,9
	[in.]	1 3/4	1 3/4	-	-	2 1/4	2 1/4		2 3/4	2 3/4
min h_{ef}	[mm]	143	140	144	160	178	175	200	226	229
	[in.]		5 1/2			7				9
max h_{ef}	[mm]	714	711	720	800	864	874	1000	1128	1143
	[in.]		28			34				45
Minimum base material thickness h_{min}	[mm]	h_{ef} + 2 d_0								
	[in.]									
Minimum spacing s_{min}	[mm]	180	180	180	200	220	220	250	300	300
	[in.]	7,11	7,11	7,11	7,91	8,70	8,70	9,88	11,86	11,86
Minimum edge distance c_{min}	[mm]	180	180	180	200	220	220	250	300	300
	[in.]	7,11	7,11	7,11	7,91	8,70	8,70	9,88	11,86	11,86

3 Performance

In Table 5, Table 6 and Table 7 the bond strength values and safety factors for bond strength are given for the available elements from M33 to M80, as well as the rebars in that range.

Table 5: Characteristic resistance for metric threaded rods under tension load in concrete

Threaded rod			M33	M36	M39	M42	M45	M48	M52	M56	M60	M64	M72	M80
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,4											
Combined pullout and concrete cone failure														
Characteristic bond resistance in non-cracked concrete C20/25 in diamond drilled holes														
Temperature range I: 40°C / 24°C	$\tau_{Rk,ucr}$	[N/mm²]	9	9	9	8,5	8,5	8,5	8,5	8	7,5	7	6	5
Temperature range II: 70°C / 43°C	$\tau_{Rk,ucr}$	[N/mm²]	7	6,5	6,5	6,5	6,5	6,5	6,5	6	5,5	5,5	4,5	4
Increasing factors for τ_{Rk} in concrete	ψ_c	C30/37	1,04											
		C40/50	1,07											
		C50/60	1,09											

Table 6: Characteristic resistance for fractional threaded rods under tension load in concrete

Threaded rod		[in.]	1 3/8"	1 1/2"	1 3/4"	2"	2 1/4"	2 1/2"	2 3/4"	3"
		[mm]	34,9	38,1	44,5	50,8	57,2	63,5	69,9	76,2
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,4							
Combined pullout and concrete cone failure										
Characteristic bond resistance in non-cracked concrete C20/25 in diamond drilled holes										
Temperature range I: 40°C / 24°C	$\tau_{Rk,ucr}$	[N/mm²]	9	9	8,5	8,5	8	7	6,5	5,5
Temperature range II: 70°C / 43°C	$\tau_{Rk,ucr}$	[N/mm²]	6,5	6,5	6,5	6,5	6	5,5	5	4
Increasing factors for τ_{Rk} in concrete	ψ_c	C30/37	1,04							
		C40/50	1,07							
		C50/60	1,09							

Table 7: Characteristic resistance for rebars under tension load in concrete

Rebar			35M	# 11	ϕ 36	ϕ 40	# 14	45M	ϕ 50	55M	# 18
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,4								
Combined pullout and concrete cone failure											
Characteristic bond resistance in non-cracked concrete C20/25 in diamond drilled holes											
Temperature range I: 40°C / 24°C	$\tau_{Rk,ucr}$	[N/mm²]	9	9	9	9	8,5	8,5	8,5	8	8
Temperature range II: 70°C / 43°C	$\tau_{Rk,ucr}$	[N/mm²]	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6	6
Increasing factors for τ_{Rk} in concrete	ψ_c	C30/37	1,04								
		C40/50	1,07								
		C50/60	1,09								

Assessment done by

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X

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