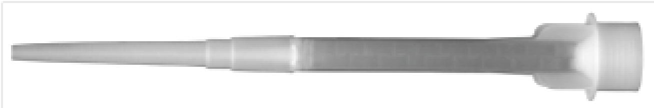
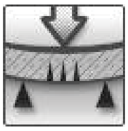
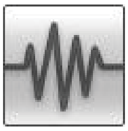
Hilti HIT-HY 200 mortar with HIT-Z rod

Injection mortar system		Benefits
	Hilti HIT-HY 200-A 500 ml foil pack (also available as 330 ml foil pack)	- **SAFEset** technology: drilling and installing the HIT-Z rod without borehole cleaning - unmatched seismic performance with the highest ETA C1 and C2 approvals - maximum load performance in cracked concrete and uncracked concrete - suitable for cracked and non-cracked concrete C 20/25 to C 50/60 - suitable for use with diamond cored holes in non-cracked or cracked concrete with no load reductions - two mortar (Hilti HIT-HY 200-A and Hilti HIT-HY 200-R) versions available with different curing times and same performance
	Hilti HIT-HY 200-R 500 ml foil pack (also available as 330 ml foil pack)	
	Static mixer	
	HIT-Z HIT-Z-R rod	

Concrete



Tensile zone



Seismic ETA-C1/C2

Fire resistance

A4 316

Corrosion resistance

No cleaning required for approved loads

SAFEset

Hilti SAFEset technology with HIT-Z rod

European Technical Approval

CE conformity

PROFIS Anchor design software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	DIBt, Berlin	ETA-12/0006 / 2013-03-15 (HIT-HY 200-A) ETA-12/0028 / 2013-03-15 (HIT-HY 200-R)
Fire test report	IBMB, Brunswick	3501/676/13 / 2012-08-03

a) All data given in this section according ETA-12/0006 and ETA-12/0028, issue 2013-03-15.

Basic loading data (for a single anchor)

All data in this section applies to

For details see Simplified design method

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Base material thickness, as specified in the table
- Embedment depth, as specified in the table
- One anchor material, as specified in the tables
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Temperate range I
  (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C)
- Installation temperature range +5°C to +40°C

Embedment depth and base material thickness for the basic loading data. Mean ultimate resistance, characteristic resistance, design resistance, recommended loads.

Anchor size	M8	M10	M12	M16	M20
Typical embedment depth [mm]	70	90	110	145	180
Base material thickness [mm]	130	150	170	245	280

Mean ultimate resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², element HIT-Z

Anchor size			M8	M10	M12	M16	M20
Non-cracked concrete							
Tensile $N_{Ru,m}$	HIT-Z	[kN]	*25,2*	*39,9*	*57,8*	*100,8*	*153,3*
Shear $V_{Ru,m}$	HIT-Z	[kN]	*12,6*	*20,0*	*28,4*	*50,4*	*76,7*
Cracked concrete							
Tensile $N_{Ru,m}$	HIT-Z	[kN]	*25,2*	*39,9*	55,1	83,4	115,4
Shear $V_{Ru,m}$	HIT-Z	[kN]	*12,6*	*20,0*	*28,4*	*50,4*	*76,7*

Characteristic resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², element HIT-Z

Anchor size			M8	M10	M12	M16	M20
Non-cracked concrete							
Tensile N_{Rk}	HIT-Z	[kN]	*24,0*	*38,0*	54,3	88,2	122,0
Shear V_{Rk}	HIT-Z	[kN]	*12,0*	*19,0*	*27,0*	*48,0*	*73,0*
Cracked concrete							
Tensile N_{Rk}	HIT-Z	[kN]	21,1	30,7	41,5	62,9	86,9
Shear V_{Rk}	HIT-Z	[kN]	*12,0*	*19,0*	*27,0*	*48,0*	*73,0*

Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², element HIT-Z

Anchor size			M8	M10	M12	M16	M20
Non-cracked concrete							
Tensile N_{Rd}	HIT-Z	[kN]	16,0	25,3	36,2	58,8	81,3
Shear V_{Rd}	HIT-Z	[kN]	9,6	15,2	21,6	38,4	58,4
Cracked concrete							
Tensile N_{Rd}	HIT-Z	[kN]	14,1	20,5	27,7	41,9	58,0
Shear V_{Rd}	HIT-Z	[kN]	9,6	15,2	21,6	38,4	58,4

Recommended loads [a)]: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², element HIT-Z

Anchor size			M8	M10	M12	M16	M20
Non-cracked concrete							
Tensile N_{rec}	HIT-Z	[kN]	11,4	18,1	25,9	42,0	58,1
Shear V_{rec}	HIT-Z	[kN]	6,9	10,9	15,4	27,4	41,7
Cracked concrete							
Tensile N_{rec}	HIT-Z	[kN]	10,0	14,6	19,8	29,9	41,4
Shear V_{rec}	HIT-Z	[kN]	6,9	10,9	15,4	27,4	41,7

a) With overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Service temperature range

Hilti HIT-HY 200 injection mortar with anchor rod HIT-Z may be applied in the temperature ranges given below. An elevated base material temperature leads to a reduction of the design bond resistance.

Temperature range	Base material temperature	Maximum long term base material temperature	Maximum short term base material temperature
Temperature range I	-40 °C to +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +80 °C	+40 °C	+80 °C
Temperature range III	-40 °C to +120 °C	+72 °C	+120 °C

Max short term base material temperature
Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Max long term base material temperature
Long-term elevated base material temperatures are roughly constant over significant periods of time.

Materials

Mechanical properties of HIT-Z and HIT-Z-R

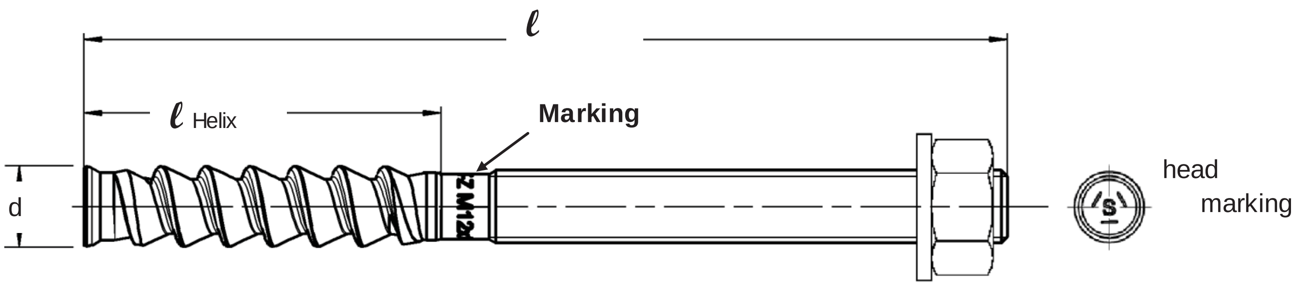
Anchor size			M8	M10	M12	M16	M20
Nominal tensile strength f_{uk}	HIT-Z / HIT-Z-R	[N/mm²]	650	650	650	610	595
Yield strength f_{yk}	HIT-Z / HIT-Z-R	[N/mm²]	520	520	520	490	480
Stressed cross-section of thread A_s	HIT-Z	[mm²]	36,6	58,0	84,3	157	245
Moment of resistance W	HIT-Z	[mm³]	31,9	62,5	109,7	278	542

Material quality

Part	Material
HIT-Z	C-steel cold formed, steel galvanized ≥ 5µm
HIT-Z-R	stainless steel cold formed, A4

Anchor dimensions

Anchor size			M8	M10	M12	M16	M20
Length of anchor	min ℓ	[mm]	80	95	105	155	215
	max ℓ	[mm]	120	160	196	240	250
Helix length	ℓ_{Helix}	[mm]	50	60	60	96	100



Installation equipment

Anchor size	M8	M10	M12	M16	M20
Rotary hammer	TE 2 – TE 40			TE 40 - TE 70	

Curing and working time

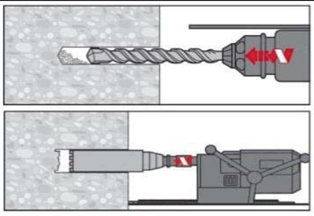
Temperature of the base material	HIT-HY 200-R	
	Working time in which anchor can be inserted and adjusted t_{work}	Curing time before anchor can be loaded t_{cure}
5 °C	1 hour	4 hour
6 °C to 10 °C	40 min	2,5 hour
11 °C to 20 °C	15 min	1,5 hour
21 °C to 30 °C	9 min	1 hour
31 °C to 40 °C	6 min	1 hour

Curing and working time

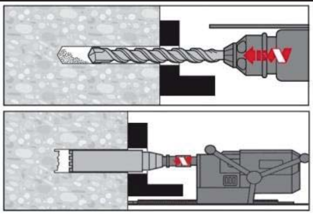
Temperature of the base material	HIT-HY 200-A	
	Working time in which anchor can be inserted and adjusted t_{work}	Curing time before anchor can be loaded t_{cure}
5 °C	25 min	2 hour
6 °C to 10 °C	15 min	75 min
11 °C to 20 °C	7 min	45 min
21 °C to 30 °C	4 min	30 min
31 °C to 40 °C	3 min	30 min

Setting instruction

Bore hole drilling



Pre-setting: Drill hole to the required drilling depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.
Diamond coring is permissible when diamond core drilling machine and the corresponding core bit are used.

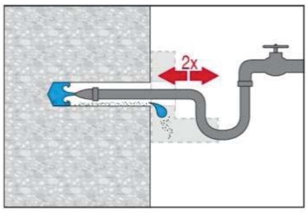


Through-setting: Drill hole through the clearance hole in the fixture to the required drilling depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.
Diamond coring is permissible when diamond core drilling machine and the corresponding core bit are used.

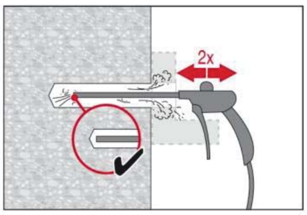
Bore hole cleaning[a)]

a) No cleaning required for hammer drilled boreholes

b) Hole flushing and evacuation for wet-drilled diamond cored holes or flooded holes

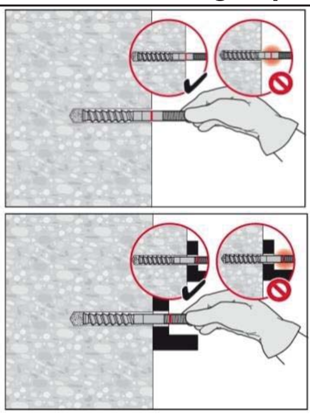


Flush 2 times from the back of the hole over the hole length.



Blow 2 times the hole with oil-free compressed air (min. 6 bar at 6 m³/h) to evacuate the water

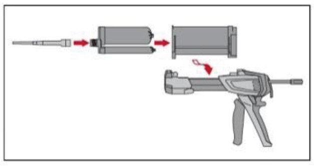
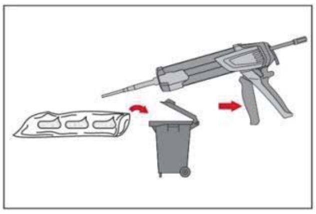
Check of setting depth and compress of the drilling dust



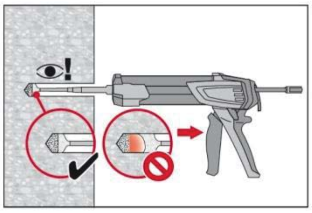
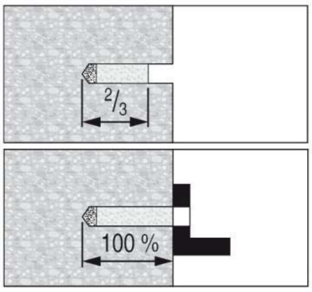
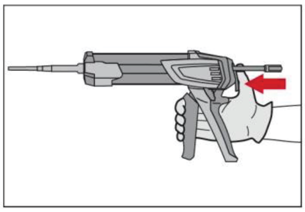
Mark the element and check the setting depth and compress the drilling dust. The element has to fit in the hole until the required embedment depth.
If it is not possible to compress the dust, remove the dust in the drill hole or drill deeper.

a) When drilling downward with non-cleaning the required drilling depths can vary due to accumulation of dust in the hole.

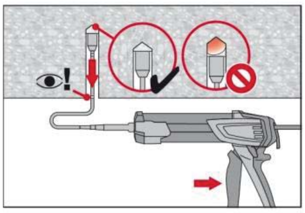
Injection preparation

	Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle. Observe the instruction for use of the dispenser. Check foil pack holder for proper function. Do not use damaged foil packs / holders. Swing foil pack holder with foil pack into HIT-dispenser.
	Discard initial adhesive. 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. Discard quantities are 2 strokes for 330 ml foil pack 3 strokes for 500 ml foil pack

Inject adhesive from the back of the borehole without forming air voids

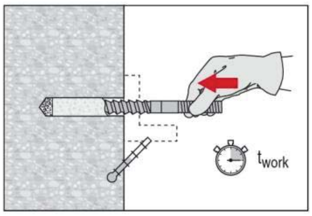
	Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull.
	Fill holes approximately 2/3 full for Pre-setting and 100% full for through-setting, or as required to ensure that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment length.
	After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

Overhead installation

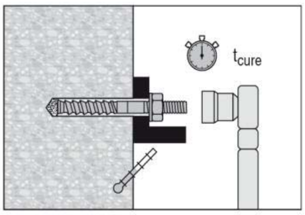


For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately piston plug HIT-SZ. Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the bore hole by the adhesive pressure

Setting the element



Before use, verify that the element is dry and free of oil and other contaminants. Set element to the required embedment depth until working time t_{work} has elapsed.
After setting the element the annular gap between the anchor and the fixture (through-setting) or concrete (pre-setting) has to be completely filled with mortar.



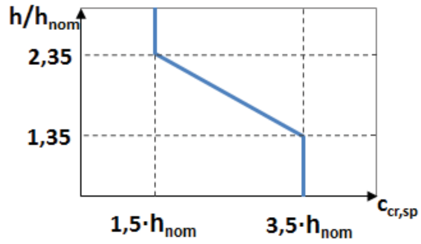
After required curing time t_{cure} remove excess mortar.
Apply indicated torque moment to activate anchor functioning principles.
The anchor can be loaded.

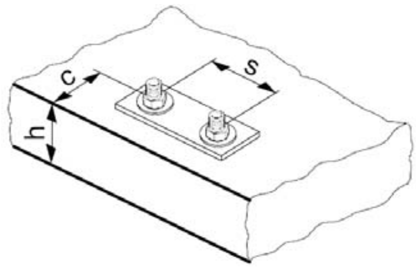
For detailed information on installation see instruction for use given with the package of the product.

Setting details

Anchor size			M8	M10	M12	M16	M20
Nominal diameter of drill bit	d_0	[mm]	10	12	14	18	22
Nominal embedment depth range	$h_{nom,min}$	[mm]	60	60	60	96	100
	$h_{nom,max}$	[mm]	100	120	150	200	220
Borehole condition 1 Minimum base material thickness	h_{min}	[mm]	h_{nom} + 60 mm			h_{nom} + 100 mm	
Borehole condition 2 Minimum base material thickness	h_{min}	[mm]	h_{nom} + 30 mm ≥100 mm			h_{nom} + 45 mm ≥45 mm	
Pre-setting: Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	12	14	18	22
Through-setting: Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	11	14	16	20	24
Torque moment	T_{inst}	[Nm]	10	25	40	80	150

Critical edge distance and critical spacing

Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$
Critical edge distance for splitting failure	$c_{cr,sp}$	[mm]	$1{,}5 \cdot h_{nom}$ for $h / h_{nom} \geq 2{,}35$ $6{,}2\ h_{nom} - 2{,}0\ h$ for $2{,}35 > h / h_{nom} > 1{,}35$ $3{,}5\ h_{nom}$ for $h / h_{nom} \leq 1{,}35$ 
Critical spacing for concrete cone failure	$s_{cr,N}$	[mm]	$2\ c_{cr,N}$
Critical edge distance for concrete cone failure	$c_{cr,N}$	[mm]	$1{,}5\ h_{nom}$

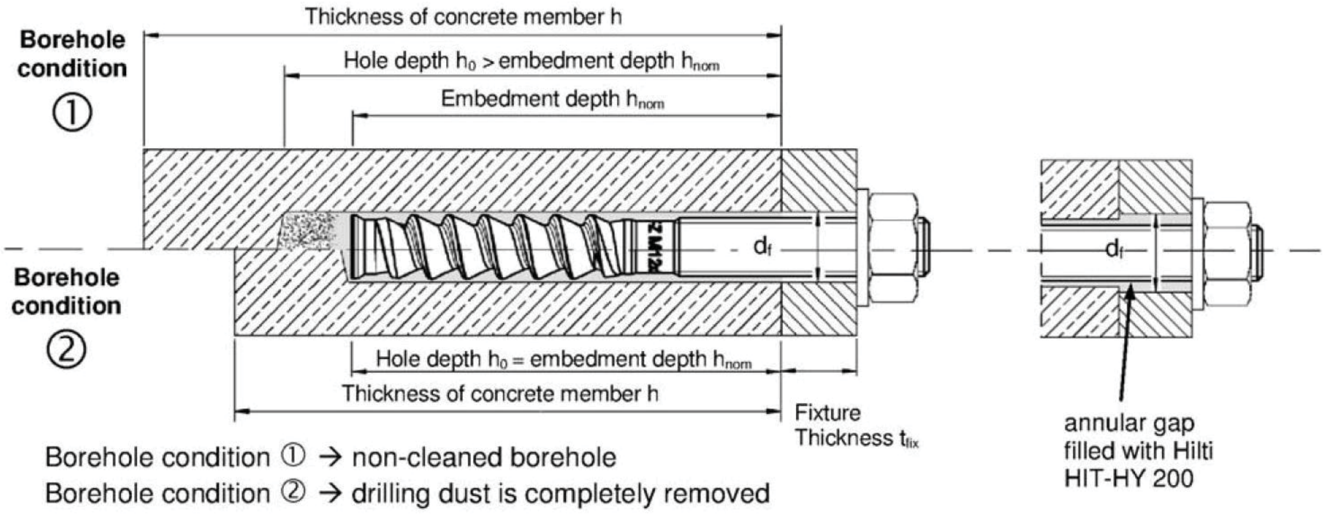


For spacing (or edge distance) smaller than critical spacing (or critical edge distance) the design loads have to be reduced.

a) Embedment depth range: $h_{nom,min} \leq h_{nom} \leq h_{nom,max}$

Pre-setting:
Install anchor before positioning fixture

Through-setting:
Install anchor through positioned fixture



Minimum edge distance and spacing

For the calculation of minimum spacing and minimum edge distance of anchors in combination with different embedment depth and thickness of concrete member the following equation shall be fulfilled:

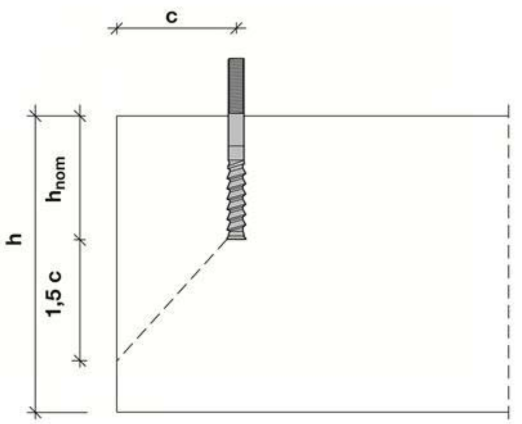
$$A_{i,req} < A_{i,cal}$$

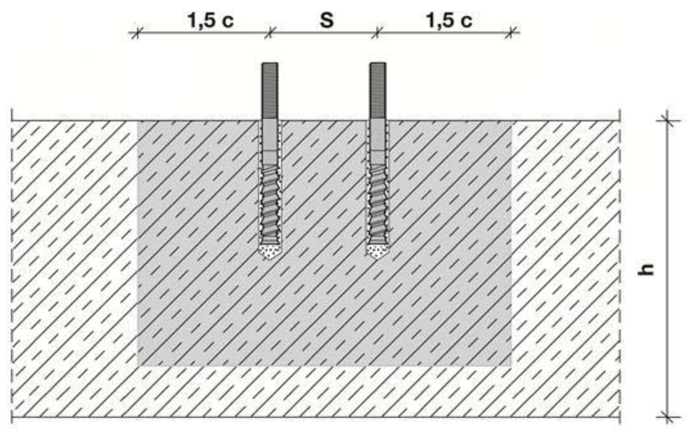
Required interaction area $A_{i,req}$

Anchor size		M8	M10	M12	M16	M20
Cracked concrete	[mm²]	19200	40800	58800	94700	148000
Uncracked concrete	[mm²]	22200	57400	80800	128000	198000

Calculate interaction area $A_{i,cal}$

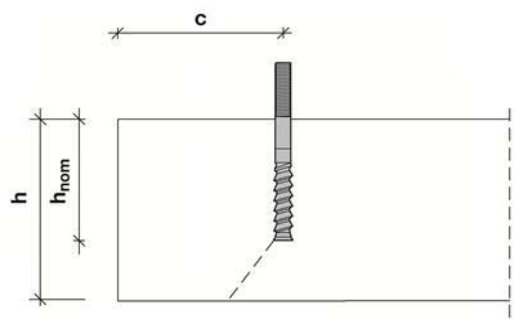
Member thickness $h \geq h_{nom} + 1{,}5 \cdot c$

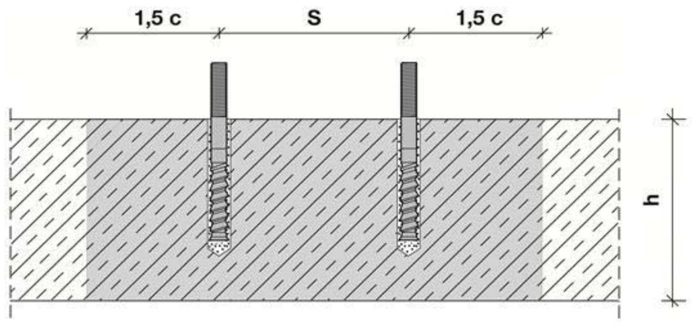




Single anchor and group of anchors with s > 3·c	[mm²]	$A_{i,cal} = (6 \cdot c) \cdot (h_{nom} + 1{,}5 \cdot c)$	with c ≥ 5·d
Group of anchors with s ≤ 3·c	[mm²]	$A_{i,cal} = (3 \cdot c + s) \cdot (h_{nom} + 1{,}5 \cdot c)$	with c ≥ 5·d and s ≥ 5·d

Member thickness $h \leq h_{nom} + 1{,}5 \cdot c$





Single anchor and group of anchors with s > 3·c	[mm²]	$A_{i,cal} = (6 \cdot c) \cdot h$	with c ≥ 5·d
Group of anchors with s ≤ 3·c	[mm²]	$A_{i,cal} = (3 \cdot c + s) \cdot h$	with c ≥ 5·d and s ≥ 5·d

Best case minimum edge distance and spacing with required member thickness and embedment depth

Anchor size			M8	M10	M12	M16	M20
Cracked concrete							
Member thickness	h ≥	[mm]	140	200	240	300	370
Embedment depth	h_{nom} ≥	[mm]	80	120	150	200	220
Minimum spacing	s_{min}	[mm]	40	50	60	80	100
Corresponding edge distance	c ≥	[mm]	40	55	65	80	100
Minimum edge distance	c_{min} =	[mm]	40	50	60	80	100
Corresponding spacing	s ≥	[mm]	40	60	65	80	100
Non cracked concrete							
Member thickness	h ≥	[mm]	140	230	270	340	410
Embedment depth	h_{nom} ≥	[mm]	80	120	150	200	220
Minimum spacing	s_{min}	[mm]	40	50	60	80	100
Corresponding edge distance	c ≥	[mm]	40	70	80	100	130
Minimum edge distance	c_{min}	[mm]	40	50	60	80	100
Corresponding spacing	s ≥	[mm]	40	145	160	160	235

Best case minimum member thickness and embedment depth with required minimum edge distance and spacing (borehole condition 1)

Anchor size			M8	M10	M12	M16	M20
Cracked concrete							
Member thickness	h_{min}	[mm]	120	120	120	196	200
Embedment depth	$h_{nom,min}$	[mm]	60	60	60	96	100
Minimum spacing	s_{min}	[mm]	40	50	60	80	100
Corresponding edge distance	c ≥	[mm]	40	100	140	135	215
Minimum edge distance	c_{min} =	[mm]	40	60	90	80	125
Corresponding spacing	s ≥	[mm]	40	160	220	235	365
Non cracked concrete							
Member thickness	h_{min}	[mm]	120	120	120	196	200
Embedment depth	$h_{nom,min}$	[mm]	60	60	60	96	100
Minimum spacing	s_{min}	[mm]	40	50	60	80	100
Corresponding edge distance	c ≥	[mm]	50	145	200	190	300
Minimum edge distance	c_{min}	[mm]	40	80	115	110	165
Corresponding spacing	s ≥	[mm]	65	240	330	310	495

Minimum edge distance and spacing – Explanation

Minimum edge and spacing geometrical requirements are determined by testing the installation conditions in which two anchors with a given spacing can be set close to an edge without forming a crack in the concrete due to tightening torque.

The HIT-Z boundary conditions for edge and spacing geometry can be found in the tables to the left. If the embedment depth and slab thickness are equal to or greater than the values in the table, then the edge and spacing values may be utilized.

PROFIS Anchor software is programmed to calculate the referenced equations in order to determine the optimized related minimum edge and spacing based on the following variables:

Cracked or uncracked concrete	For cracked concrete it is assumed that a reinforcement is present which limits the crack width to 0,3 mm, allowing smaller values for minimum edge distance and minimum spacing
Anchor diameter	For smaller anchor diameter a smaller installation torque is required, allowing smaller values for minimum edge distance and minimum spacing
Slab thickness and embedment depth	Increasing these values allows smaller values for minimum edge distance and minimum spacing

Simplified design method

Simplified version of the design method according ETAG 001, TR 029. Design resistance according data given in ETA-12/0006 (HIT-HY 200-A) and ETA-12/0028 (HIT-HY 200-R) issued on 2013-03-15

- Influence of concrete strength
- Influence of edge distance
- Influence of spacing
- Valid for a group of two anchors. (The method may also be applied for anchor groups with more than two anchors or more than one edge distance. The influencing factors must then be considered for each edge distance and spacing. The simplified calculated design loads take a conservative approach: They will be lower than the exact values according to ETAG 001, TR 029. For an optimized design, anchor calculation can be performed using PROFIS anchor design software.

The design method is based on the following simplification:

- No different loads are acting on individual anchors (no eccentricity)

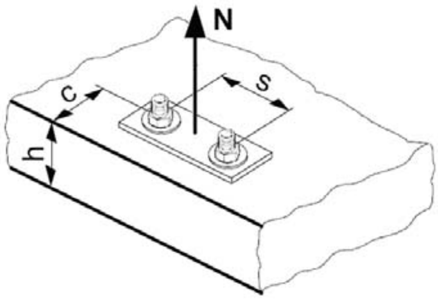
The values are valid for one anchor.

For more complex fastening applications please use the anchor design software PROFIS Anchor.

Tension loading

The design tensile resistance is the lower value of

- Steel resistance: $N_{Rd,s}$
- Combined pull-out and concrete cone resistance: $N_{Rd,p}$
- Concrete cone resistance: $N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,N} \cdot f_{re,N}$
- Concrete splitting resistance (only non-cracked concrete): $N_{Rd,sp} = N^0_{Rd,c} \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,N} \cdot f_{re,N}$



Basic design tensile resistance

Design steel resistance $N_{Rd,s}$

Anchor size		M8	M10	M12	M16	M20
$N_{Rd,s}$ HIT-Z / HIT-Z-R	[kN]	16,0	25,3	36,7	64,0	97,3

Design combined pull-out and concrete cone resistance $N_{Rd,p}$ a)

Anchor size		M8	M10	M12	M16	M20
Non-cracked concrete						
$N^0_{Rd,p}$ Temperature range I	[kN]	20,1	30,2	36,2	77,2	100,5
$N^0_{Rd,p}$ Temperature range II	[kN]	18,4	27,6	33,2	70,8	92,2
$N^0_{Rd,p}$ Temperature range III	[kN]	16,8	25,1	30,2	64,3	83,8
Cracked concrete						
$N^0_{Rd,p}$ Temperature range I	[kN]	18,4	27,6	33,2	70,8	92,2
$N^0_{Rd,p}$ Temperature range II	[kN]	16,8	25,1	30,2	64,3	83,8
$N^0_{Rd,p}$ Temperature range III	[kN]	15,1	22,6	27,1	57,9	75,4

a) The combined pull-out and concrete cone resistance is independent from the embedment depth.

Design concrete cone resistance $N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,N} \cdot f_{re,N}$
Design splitting resistance [a)] $N_{Rd,sp} = N^0_{Rd,c} \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,N} \cdot f_{re,N}$

Anchor size			M8	M10	M12	M16	M20
$h_{nom,typ}$		[mm]	70	90	110	145	180
$N^0_{Rd,c}$	Non cracked concrete	[kN]	19,7	28,7	38,8	58,8	81,3
$N^0_{Rd,c}$	Cracked concrete	[kN]	14,1	20,5	27,7	41,9	58,0

a) Splitting resistance must only be considered for non-cracked concrete.

Influencing factors

Influence of concrete strength on combined pull-out and concrete cone resistance

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_{B,p}$ =	1,00	1,00	1,00	1,00	1,00	1,00	1,00

Influence of concrete strength on concrete cone resistance

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25N/mm^2)^{0,5}$ a)	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of edge distance [a)]

$c/c_{cr,N}$ / $c/c_{cr,sp}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$f_{1,N} = 0,7 + 0,3 \cdot c/c_{cr,N} \le 1$ $f_{1,sp} = 0,7 + 0,3 \cdot c/c_{cr,sp} \le 1$	0,73	0,76	0,79	0,82	0,85	0,88	0,91	0,94	0,97	1
$f_{2,N} = 0,5 \cdot (1 + c/c_{cr,N}) \le 1$ $f_{2,sp} = 0,5 \cdot (1 + c/c_{cr,sp}) \le 1$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1

a) The edge distance shall not be smaller than the minimum edge distance c_{min}. These influencing factors must be considered for every edge distance smaller than the critical edge distance.

Influence of anchor spacing [a)]

$s/s_{cr,N}$ / $s/s_{cr,sp}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$f_{3,N} = 0,5 \cdot (1 + s/s_{cr,N}) \le 1$ $f_{3,sp} = 0,5 \cdot (1 + s/s_{cr,sp}) \le 1$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1

a) The anchor spacing shall not be smaller than the minimum anchor spacing s_{min}. This influencing factor must be considered for every anchor spacing.

Influence of embedment depth on concrete cone resistance

$$f_{h,N} = (h_{nom}/h_{nom,typ})^{1,5}$$

Influence of reinforcement

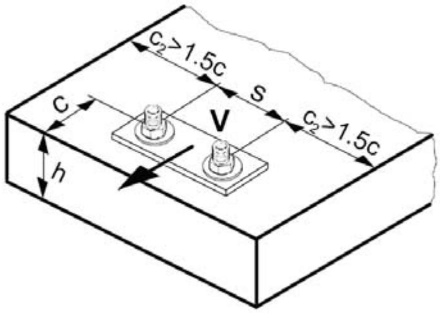
h_{nom} [mm]	60	70	80	90	≥ 100
$f_{re,N} = 0,5 + h_{nom}/200mm \le 1$	0,8 a)	0,85 a)	0,9 a)	0,95 a)	1

a) This factor applies only for dense reinforcement. If in the area of anchorage there is reinforcement with a spacing ≥ 150 mm (any diameter) or with a diameter ≤ 10 mm and a spacing ≥ 100 mm, then a factor $f_{re,N}$ = 1 may be applied.

Shear loading

The design shear resistance is the lower value of

- Steel resistance: $V_{Rd,s}$
- Concrete pryout resistance: $V_{Rd,cp} = k \cdot$ lower value of $N_{Rd,p}$ and $N_{Rd,c}$
- Concrete edge resistance: $V_{Rd,c} = V^{0}_{Rd,c} \cdot f_B \cdot f_ß \cdot f_h \cdot f_4 \cdot f_{hef} \cdot f_c$



Basic design shear resistance

Design steel resistance $V_{Rd,s}$

Anchor size			M8	M10	M12	M16	M20
$V_{Rd,s}$	HIT-Z	[kN]	9,6	15,2	21,6	38,4	58,4
$V_{Rd,s}$	HIT-Z-R	[kN]	11,2	18,4	26,4	45,6	70,4

Design concrete pryout resistance $V_{Rd,cp}$ = lower value[a)] of $k \cdot N_{Rd,p}$ and $k \cdot N_{Rd,c}$

k = 2 for $h_{ef} \geq 60$ mm

a) $N_{Rd,p}$: Design combined pull-out and concrete cone resistance
$N_{Rd,c}$: Design concrete cone resistance

Design concrete edge resistance [a)] $V_{Rd,c} = V^{0}_{Rd,c} \cdot f_B \cdot f_ß \cdot f_h \cdot f_4$

		Non-cracked concrete					Cracked concrete				
Anchor size		M8	M10	M12	M16	M20	M8	M10	M12	M16	M20
$V^{0}_{Rd,c}$	[kN]	5,8	8,6	11,6	18,9	27,4	4,1	6,0	8,2	13,3	19,4

a) For anchor groups only the anchors close to the edge must be considered.

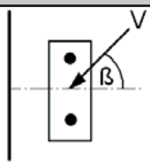
Influencing factors

Influence of concrete strength

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25N/mm^2)^{1/2}$ [a)]	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of angle between load applied and the direction perpendicular to the free edge

Angle ß	0°	10°	20°	30°	40°	50°	60°	70°	80°	≥ 90°
$f_\beta = \frac{1}{\sqrt{(\cos\alpha_V)^2 + \left(\frac{\sin\alpha_V}{2,5}\right)^2}}$ 	1	1,01	1,05	1,13	1,24	1,40	1,64	1,97	2,32	2,50

Influence of base material thickness

h/c	0,15	0,3	0,45	0,6	0,75	0,9	1,05	1,2	1,35	≥ 1,5
$f_h = \{h/(1,5 \cdot c)\}^{1/2} \leq 1$	0,32	0,45	0,55	0,63	0,71	0,77	0,84	0,89	0,95	1,00

Influence of anchor spacing and edge distance a) for concrete edge resistance: f_4

$f_4 = (c/h_{nom})^{1,5} \cdot (1 + s / [3 \cdot c]) \cdot 0,5$

c/h_{nom}	Single anchor	Group of two anchors s/h_{nom}														
		0,75	1,50	2,25	3,00	3,75	4,50	5,25	6,00	6,75	7,50	8,25	9,00	9,75	10,50	11,25
0,50	0,35	0,27	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35
0,75	0,65	0,43	0,54	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65
1,00	1,00	0,63	0,75	0,88	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
1,25	1,40	0,84	0,98	1,12	1,26	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40
1,50	1,84	1,07	1,22	1,38	1,53	1,68	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
1,75	2,32	1,32	1,49	1,65	1,82	1,98	2,15	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32
2,00	2,83	1,59	1,77	1,94	2,12	2,30	2,47	2,65	2,83	2,83	2,83	2,83	2,83	2,83	2,83	2,83
2,25	3,38	1,88	2,06	2,25	2,44	2,63	2,81	3,00	3,19	3,38	3,38	3,38	3,38	3,38	3,38	3,38
2,50	3,95	2,17	2,37	2,57	2,77	2,96	3,16	3,36	3,56	3,76	3,95	3,95	3,95	3,95	3,95	3,95
2,75	4,56	2,49	2,69	2,90	3,11	3,32	3,52	3,73	3,94	4,15	4,35	4,56	4,56	4,56	4,56	4,56
3,00	5,20	2,81	3,03	3,25	3,46	3,68	3,90	4,11	4,33	4,55	4,76	4,98	5,20	5,20	5,20	5,20
3,25	5,86	3,15	3,38	3,61	3,83	4,06	4,28	4,51	4,73	4,96	5,18	5,41	5,63	5,86	5,86	5,86
3,50	6,55	3,51	3,74	3,98	4,21	4,44	4,68	4,91	5,14	5,38	5,61	5,85	6,08	6,31	6,55	6,55
3,75	7,26	3,87	4,12	4,36	4,60	4,84	5,08	5,33	5,57	5,81	6,05	6,29	6,54	6,78	7,02	7,26
4,00	8,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75
4,25	8,76	4,64	4,90	5,15	5,41	5,67	5,93	6,18	6,44	6,70	6,96	7,22	7,47	7,73	7,99	8,25
4,50	9,55	5,04	5,30	5,57	5,83	6,10	6,36	6,63	6,89	7,16	7,42	7,69	7,95	8,22	8,49	8,75
4,75	10,35	5,45	5,72	5,99	6,27	6,54	6,81	7,08	7,36	7,63	7,90	8,17	8,45	8,72	8,99	9,26
5,00	11,18	5,87	6,15	6,43	6,71	6,99	7,27	7,55	7,83	8,11	8,39	8,66	8,94	9,22	9,50	9,78
5,25	12,03	6,30	6,59	6,87	7,16	7,45	7,73	8,02	8,31	8,59	8,88	9,17	9,45	9,74	10,02	10,31
5,50	12,90	6,74	7,04	7,33	7,62	7,92	8,21	8,50	8,79	9,09	9,38	9,67	9,97	10,26	10,55	10,85

a) The anchor spacing and the edge distance shall not be smaller than the minimum anchor spacing s_{min} and the minimum edge distance c_{min}.

Influence of embedment depth

h_{nom}/d	4	4,5	5	6	7	8	9	10	11
$f_{hef} = 0,05 \cdot (h_{nom} / d)^{1,68}$	0,51	0,63	0,75	1,01	1,31	1,64	2,00	2,39	2,81
h_{ef}/d	12	13	14	15	16	17	18	19	20
$f_{hef} = 0,05 \cdot (h_{nom} / d)^{1,68}$	3,25	3,72	4,21	4,73	5,27	5,84	6,42	7,04	7,67

Influence of edge distance a)

c/d	4	6	8	10	15	20	30	40
$f_c = (d / c)^{0,19}$	0,77	0,71	0,67	0,65	0,60	0,57	0,52	0,50

a) The edge distance shall not be smaller than the minimum edge distance c_{min}.

Combined tension and shear loading

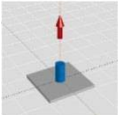
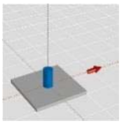
For combined tension and shear loading see section “Anchor Design”.

Precalculated values – design resistance values

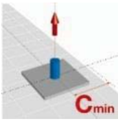
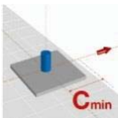
All data applies to:
- temperature range I (see service temperature range)
- no effects of dense reinforcement
- borehole condition 1

Recommended loads can be calculated by dividing the design resistance by an overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

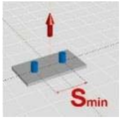
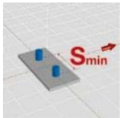
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm²

	Anchor size		M8	M10	M12	M16	M20
	Embedment depth $h_{nom,min}$ =	[mm]	60	60	60	96	100
	Base material thickness h_{min}=	[mm]	120	120	120	196	200
	Tensile N_{Rd}: single anchor, no edge effects						
	Non-cracked concrete						
	HIT-Z / HIT-Z-R	[kN]	15,6	15,6	15,6	31,7	33,7
	Cracked concrete						
	HIT-Z / HIT-Z-R	[kN]	11,2	11,2	11,2	22,6	24,0
	Shear V_{Rd}: single anchor, no edge effects, without lever arm						
	Non-cracked concrete						
	HIT-Z	[kN]	9,6	15,2	21,6	38,4	58,4
	HIT-Z-R	[kN]	11,2	18,4	26,4	45,6	67,3
	Cracked concrete						
	HIT-Z	[kN]	9,6	15,2	21,6	38,4	48,0
	HIT-Z-R	[kN]	11,2	18,4	22,3	45,1	48,0

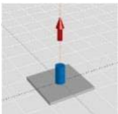
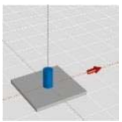
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm²

	Anchor size		M8	M10	M12	M16	M20
	Embedment depth $h_{nom,min}$ =	[mm]	60	60	60	96	100
	Base material thickness h_{min}=	[mm]	120	120	120	196	200
	Tensile N_{Rd}: single anchor, min. edge distance ($c = c_{min}$)						
	Non-cracked concrete						
	c_{min}	[mm]	40	80	115	110	165
	HIT-Z / HIT-Z-R	[kN]	7,8	10,5	13,2	20,1	25,7
	Cracked concrete						
	c_{min}	[mm]	40	80	115	110	165
	HIT-Z / HIT-Z-R	[kN]	6,7	10,2	11,2	18,5	24,0
	Shear V_{Rd}: single anchor, min. edge distance ($c = c_{min}$), without lever arm						
	Non-cracked concrete						
	c_{min}	[mm]	40	80	115	110	165
	HIT-Z	[kN]	3,5	9,2	12,8	16,3	26,0
	HIT-Z-R	[kN]	3,5	9,2	12,8	16,3	26,0
	Cracked concrete						
	c_{min}	[mm]	40	80	115	110	165
	HIT-Z	[kN]	2,5	6,5	9,1	11,6	18,4
	HIT-Z-R	[kN]	2,5	6,5	9,1	11,6	18,4

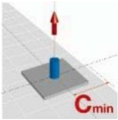
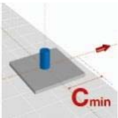
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm²
(load values are valid for single anchor)

		M8	M10	M12	M16	M20
Anchor size		**M8**	**M10**	**M12**	**M16**	**M20**
Embedment depth	$h_{nom,min}$ = [mm]	60	60	60	96	100
Base material thickness	h_{min}= [mm]	120	120	120	196	200
	Tensile N_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$)					
	Non-cracked concrete					
	s_{min} [mm]	40	50	60	80	100
	HIT-Z / HIT-Z-R [kN]	8,9	9,2	9,5	18,7	20,3
	Cracked concrete					
	s_{min} [mm]	40	50	60	80	100
	HIT-Z / HIT-Z-R [kN]	6,8	7,1	7,4	14,4	16,0
	Shear V_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$) , without lever arm					
	Non-cracked concrete					
	s_{min} [mm]	40	50	60	80	100
	HIT-Z [kN]	9,6	15,2	20,9	38,4	44,9
	HIT-Z-R [kN]	11,2	18,4	20,9	40,5	44,9
	Cracked concrete					
	s_{min} [mm]	40	50	60	80	100
	HIT-Z [kN]	9,6	14,3	14,9	28,8	32,0
	HIT-Z-R [kN]	11,2	14,3	14,9	28,8	32,0

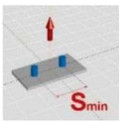
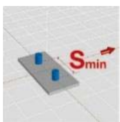
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm²

		M8	M10	M12	M16	M20
Anchor size		**M8**	**M10**	**M12**	**M16**	**M20**
Embedment depth	$h_{nom,typ}$ = [mm]	70	90	110	145	180
Base material thickness	h_{min}= [mm]	130	150	170	245	280
	Tensile N_{Rd}: single anchor, no edge effects					
	Non-cracked concrete					
	HIT-Z / HIT-Z-R [kN]	16,0	25,3	36,2	58,8	81,3
	Cracked concrete					
	HIT-Z / HIT-Z-R [kN]	14,1	20,5	27,7	41,9	58,0
	Shear V_{Rd}: single anchor, no edge effects, without lever arm					
	Non-cracked concrete					
	HIT-Z [kN]	9,6	15,2	21,6	38,4	58,4
	HIT-Z-R [kN]	11,2	18,4	26,4	45,6	70,4
	Cracked concrete					
	HIT-Z [kN]	9,6	15,2	21,6	38,4	58,4
	HIT-Z-R [kN]	11,2	18,4	26,4	45,6	70,4

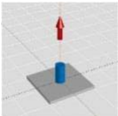
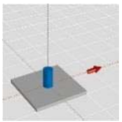
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm²

	Anchor size		M8	M10	M12	M16	M20
	Embedment depth $h_{nom,typ}$ =	[mm]	70	90	110	145	180
	Base material thickness h_{min}=	[mm]	130	150	170	245	280
	Tensile N_{Rd}: single anchor, min. edge distance (c = c_{min})						
	Non-cracked concrete						
	c_{min}	[mm]	40	65	80	90	120
	HIT-Z / HIT-Z-R	[kN]	9,1	13,7	18,1	27,0	37,2
	Cracked concrete						
	c_{min}	[mm]	40	65	80	90	120
	HIT-Z / HIT-Z-R	[kN]	7,9	12,8	17,4	24,4	34,9
	Shear V_{Rd}: single anchor, min. edge distance (c = c_{min}) , without lever arm						
	Non-cracked concrete						
	c_{min}	[mm]	40	65	80	90	120
	HIT-Z	[kN]	3,6	7,5	10,6	13,8	21,8
	HIT-Z-R	[kN]	3,6	7,5	10,6	13,8	21,8
	Cracked concrete						
	c_{min}	[mm]	40	65	80	90	120
	HIT-Z	[kN]	2,6	5,3	7,5	9,8	15,5
	HIT-Z-R	[kN]	2,6	5,3	7,5	9,8	15,5

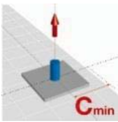
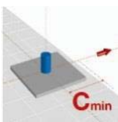
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm²
(load values are valid for single anchor)

	Anchor size		M8	M10	M12	M16	M20
	Embedment depth $h_{nom,typ}$ =	[mm]	70	90	110	145	180
	Base material thickness h_{min}=	[mm]	130	150	170	245	280
	Tensile N_{Rd}: double anchor, no edge effects, min. spacing (s = s_{min})						
	Non-cracked concrete						
	s_{min}	[mm]	40	50	60	80	100
	HIT-Z / HIT-Z-R	[kN]	10,9	15,7	21,0	32,1	44,1
	Cracked concrete						
	s_{min}	[mm]	40	50	60	80	100
	HIT-Z / HIT-Z-R	[kN]	8,4	12,1	16,4	24,8	34,3
	Shear V_{Rd}: double anchor, no edge effects, min. spacing (s = s_{min}) , without lever arm						
	Non-cracked concrete						
	s_{min}	[mm]	40	50	60	80	100
	HIT-Z	[kN]	9,6	15,2	21,6	38,4	58,4
	HIT-Z-R	[kN]	11,2	18,4	26,4	45,6	70,4
	Cracked concrete						
	s_{min}	[mm]	40	50	60	80	100
	HIT-Z	[kN]	9,6	15,2	21,6	38,4	58,4
	HIT-Z-R	[kN]	11,2	18,4	26,4	45,6	68,7

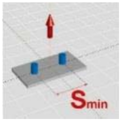
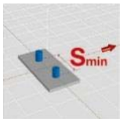
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm²

Anchor size			M8	M10	M12	M16	M20
Embedment depth	$h_{nom,max}$ =	[mm]	100	120	150	200	220
Base material thickness	h_{min}=	[mm]	160	180	210	300	320
	Tensile N_{Rd}: single anchor, no edge effects						
	Non-cracked concrete						
	HIT-Z / HIT-Z-R	[kN]	16,0	25,3	36,2	64,0	97,3
	Cracked concrete						
	HIT-Z / HIT-Z-R	[kN]	16,0	25,3	33,2	64,0	78,3
	Shear V_{Rd}: single anchor, no edge effects, without lever arm						
	Non-cracked concrete						
	HIT-Z	[kN]	9,6	15,2	21,6	38,4	58,4
	HIT-Z-R	[kN]	11,2	18,4	26,4	45,6	70,4
	Cracked concrete						
	HIT-Z	[kN]	9,6	15,2	21,6	38,4	58,4
	HIT-Z-R	[kN]	11,2	18,4	26,4	45,6	70,4

Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm²

Anchor size			M8	M10	M12	M16	M20
Embedment depth	$h_{nom,max}$ =	[mm]	100	120	150	200	220
Base material thickness	h_{min}=	[mm]	160	180	210	300	320
	Tensile N_{Rd}: single anchor, min. edge distance ($c = c_{min}$)						
	Non-cracked concrete						
	c_{min}	[mm]	40	55	65	80	105
	HIT-Z / HIT-Z-R	[kN]	10,1	15,6	18,6	38,7	46,3
	Cracked concrete						
	c_{min}	[mm]	40	55	65	80	105
	HIT-Z / HIT-Z-R	[kN]	9,2	14,3	17,1	33,5	41,1
	Shear V_{Rd}: single anchor, min. edge distance ($c = c_{min}$), without lever arm						
	Non-cracked concrete						
	c_{min}	[mm]	40	55	65	80	105
	HIT-Z	[kN]	3,9	6,4	8,7	13,0	19,6
	HIT-Z-R	[kN]	3,9	6,4	8,7	13,0	19,6
	Cracked concrete						
	c_{min}	[mm]	40	55	65	80	105
	HIT-Z	[kN]	2,8	4,6	6,2	9,2	13,9
	HIT-Z-R	[kN]	2,8	4,6	6,2	9,2	13,9

Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm²
(load values are valid for single anchor)

Anchor size			M8	M10	M12	M16	M20
Embedment depth	$h_{nom,max}$ =	[mm]	100	120	150	200	220
Base material thickness	h_{min}=	[mm]	160	180	210	300	320
	Tensile N_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$)						
	Non-cracked concrete						
	s_{min}	[mm]	40	50	60	80	100
	HIT-Z / HIT-Z-R	[kN]	11,5	17,2	20,6	44,0	57,9
	Cracked concrete						
	s_{min}	[mm]	40	50	60	80	100
	HIT-Z / HIT-Z-R	[kN]	10,5	15,8	18,9	38,5	45,1
	Shear V_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$) , without lever arm						
	Non-cracked concrete						
	s_{min}	[mm]	40	50	60	80	100
	HIT-Z	[kN]	9,6	15,2	21,6	38,4	58,4
	HIT-Z-R	[kN]	11,2	18,4	26,4	45,6	70,4
	Cracked concrete						
	s_{min}	[mm]	40	50	60	80	100
	HIT-Z	[kN]	9,6	15,2	21,6	38,4	58,4
	HIT-Z-R	[kN]	11,2	18,4	26,4	45,6	70,4

Seismic design C1 and C2

Basic loading data for concrete C20/25 – C50/60

All data in this section applies to:

- Seismic design according to TR045

The following technical data are based on: ETA-12/0006 and ETA-12/0028, issue 2013-03-15

Anchorage depth range

Anchor size			M8	M10	M12	M16	M20
Nominal anchorage depth range	$h_{nom,min}$	[mm]	60	60	60	96	100
	$h_{nom,max}$	[mm]	100	120	144	192	220

Tension resistance in case of seismic performance category C1

Anchor size			M8	M10	M12	M16	M20
Characteristic tension resistance to steel failure							
HIT-Z / HIT-Z-R	$N_{Rk,s,seis}$	[kN]	24	38	55	96	146
Partial safety factor	$\gamma_{Ms,seis}$	[-]			1,5		
Characteristic bond resistance in cracked concrete C20/25 to C50/60							
Temperature range I: 24°C/40°C	$\tau_{Rk,seis}$	[N/mm²]			21		
Temperature range II: 50°C/80°C	$\tau_{Rk,seis}$	[N/mm²]			19		
Temperature range III: 72°C/120°C	$\tau_{Rk,seis}$	[N/mm²]			17		
Partial safety factor	$\gamma_{Mp,seis}$	[-]			1,5		
Concrete cone resistance and splitting resistance							
Partial safety factor	$\gamma_{Mc,seis} = \gamma_{Msp,seis}$	[-]			1,5		

Displacement under tension load in case of seismic performance category C1 1)

Anchor size			M8	M10	M12	M16	M20
Displacement (HIT-Z / HIT-Z-R)	$\delta_{N,seis}$	[mm]	1,2	1,9	1,7	1,3	1,8

1) Maximum displacement during cycling (seismic event).

Shear resistance in case of seismic performance category C1 1)

Anchor size			M8	M10	M12	M16	M20
Characteristic shear resistance to steel failure							
HIT-Z	$V_{Rk,s,seis}$	[kN]	7	17	16	28	45
HIT-Z-R	$V_{Rk,s,seis}$	[kN]	8	19	22	31	48
Partial safety factor	$\gamma_{Ms,seis}$	[-]			1,25		
Concrete pryout resistance and concrete edge resistance							
Partial safety factor	$\gamma_{Mcp,seis} = \gamma_{Mc,seis}$	[-]			1,5		

1) Reduction factor α_{gap} = 1,0 when using the Hilti Dynamic Set

Displacement under shear load in case of seismic performance category C1 1)

Anchor size			M8	M10	M12	M16	M20
Displacement (HIT-Z)	$\delta_{V,seis}$	[mm]	4,0	5,0	4,9	4,3	5,5
Displacement (HIT-Z-R)	$\delta_{V,seis}$	[mm]	5,0	5,6	5,9	6,0	6,4

1) Maximum displacement during cycling (seismic event).

Tension resistance in case of seismic performance category C2

Anchor size			M12	M16
Characteristic tension resistance to steel failure				
HIT-Z / HIT-Z-R	$N_{Rk,s,seis}$	[kN]	55	96
Partial safety factor [1]	$\gamma_{Ms,seis}$	[-]	1,5	
Characteristic bond resistance in cracked concrete C20/25 to C50/60				
Temperature range I: 24°C/40°C	$\tau_{Rk,seis}$	[N/mm²]	13	19
Temperature range II: 50°C/80°C	$\tau_{Rk,seis}$	[N/mm²]	12	17
Temperature range III: 72°C/120°C	$\tau_{Rk,seis}$	[N/mm²]	10	16
Partial safety factor	$\gamma_{Mp,seis}$	[-]	1,5	
Concrete cone resistance and splitting resistance				
Partial safety factor	$\gamma_{Mc,seis} = \gamma_{Msp,seis}$	[-]	1,5	

Displacement under tension load in case of seismic performance category C2

Anchor size			M12	M16
Displacement DLS (HIT-Z / HIT-Z-R)	$\delta_{N,seis}$	[mm]	1,3	1,9
Displacement ULS (HIT-Z / HIT-Z-R)	$\delta_{N,seis}$	[mm]	3,2	3,6

Shear resistance in case of seismic performance category C2 [1)]

Anchor size			M12	M16
Characteristic shear resistance to steel failure				
HIT-Z	$V_{Rk,s,seis}$	[kN]	11	17
HIT-Z-R	$V_{Rk,s,seis}$	[kN]	16	21
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25	
Concrete pryout resistance and concrete edge resistance				
Partial safety factor	$\gamma_{Mcp,seis} = \gamma_{Mc,seis}$	[-]	1,5	

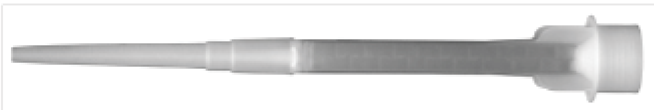
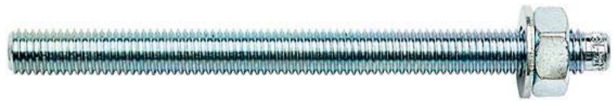
1) Reduction factor α_{gap} = 1,0 when using the Hilti Dynamic Set

Displacement under shear load in case of seismic performance category C2

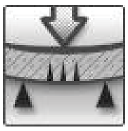
Anchor size			M12	M16
Displacement DLS (HIT-Z)	$\delta_{V,seis}$	[mm]	2,8	3,1
Displacement ULS (HIT-Z)	$\delta_{V,seis}$	[mm]	4,6	6,2
Displacement DLS (HIT-Z-R)	$\delta_{V,seis}$	[mm]	3,0	3,1
Displacement ULS (HIT-Z-R)	$\delta_{V,seis}$	[mm]	6,2	6,2

For seismic resistent fastening applications please use the anchor design software PROFIS Anchor.

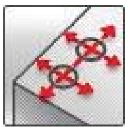
Hilti HIT-HY 200 mortar with HIT-V rod

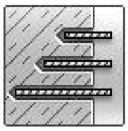
Injection mortar system		Benefits
	Hilti HIT-HY 200-A 500 ml foil pack (also available as 330 ml foil pack)	- **SAFE**set technology: drilling and borehole cleaning in one step with Hilti hollow drill bit - Suitable for non-cracked and cracked concrete C 20/25 to C 50/60 - ETA seismic approval C1 - High loading capacity, excellent handling and fast curing - Small edge distance and anchor spacing possible - Large diameter applications - Max In service temperature range up to 120°C short term/ 72°C long term - Manual cleaning for borehole diameter up to 20mm and hef ≤ 10d for non-cracked concrete only - Embedment depth range: from 60 ... 160 mm for M8 to 120 ... 600 mm for M30 - Two mortar (A and R) versions available with different curing times and same performance
	Hilti HIT-HY 200-R 500 ml foil pack (also available as 330 ml foil pack)	
	Static mixer	
	HIT-V rods HIT-V-R rods HIT-V-HCR rods	


Concrete


Tensile zone


Seismic ETA-C1


Small edge distance and spacing


Variable embedment depth


Fire resistance

Approved automatic cleaning while drilling

SAFE**set**
Hilti SAFE**set** technology with hollow drill bit

A4 316
Corrosion resistance

HCR highMo
High corrosion resistance

European Technical Approval

CE conformity


PROFIS Anchor design software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	DIBt, Berlin	ETA-11/0493 / 2013-06-20 (Hilti HIT-HY 200-A) ETA-12/0084 / 2013-06-20 (Hilti HIT-HY 200-R)
Fire test report	IBMB, Brunswick	3501/676/13 / 2012-08-03

a) All data given in this section according ETA-11/0493 and ETA-12/0084, issue 2013-06-20.

Basic loading data (for a single anchor)

All data in this section applies to

For details see Simplified design method

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Base material thickness, as specified in the table
- One typical embedment depth, as specified in the table
- One anchor material, as specified in the tables
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Temperate range I
  (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C)
- Installation temperature range -10°C to +40°C

Embedment depth [a)] and base material thickness for the basic loading data. Mean ultimate resistance, characteristic resistance, design resistance, recommended loads.

Anchor size	M8	M10	M12	M16	M20	M24	M27	M30
Typical embedment depth h_{ef} [mm]	80	90	110	125	170	210	240	270
Base material thickness h [mm]	110	120	140	165	220	270	300	340

a) The allowed range of embedment depth is shown in the setting details. The corresponding load values can be calculated according to the simplified design method.

Mean ultimate resistance: concrete C 20/25 , anchor HIT-V 5.8

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tensile $N_{Ru,m}$	HIT-V 5.8	[kN]	*18,9*	*30,5*	*44,1*	*83,0*	*129,2*	*185,9*	*241,5*	*295,1*
Shear $V_{Ru,m}$	HIT-V 5.8	[kN]	*9,5*	*15,8*	*22,1*	*41,0*	*64,1*	*92,4*	*120,8*	*147,0*
Cracked concrete										
Tensile $N_{Ru,m}$	HIT-V 5.8	[kN]	16,0	22,5	44,0	66,7	105,9	145,4	177,7	212,0
Shear $V_{Ru,m}$	HIT-V 5.8	[kN]	*9,5*	*15,8*	*22,1*	*41,0*	*64,1*	*92,4*	*120,8*	*147,0*

Characteristic resistance: concrete C 20/25 , anchor HIT-V 5.8

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tensile N_{Rk}	HIT-V 5.8	[kN]	*18,0*	*29,0*	*42,0*	70,6	111,9	153,7	187,8	224,0
Shear V_{Rk}	HIT-V 5.8	[kN]	*9,0*	*15,0*	*21,0*	*39,0*	*61,0*	*88,0*	*115,0*	*140,0*
Cracked concrete										
Tensile N_{Rk}	HIT-V 5.8	[kN]	12,1	17,0	33,2	50,3	79,8	109,6	133,9	159,7
Shear V_{Rk}	HIT-V 5.8	[kN]	*9,0*	*15,0*	*21,0*	*39,0*	*61,0*	*88,0*	*115,0*	*140,0*

Design resistance: concrete C 20/25 , anchor HIT-V 5.8

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tensile N_{Rd}	HIT-V 5.8	[kN]	12,0	19,3	28,0	39,2	62,2	85,4	104,3	124,5
Shear V_{Rd}	HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0
Cracked concrete										
Tensile N_{Rd}	HIT-V 5.8	[kN]	6,7	9,4	18,4	27,9	44,3	60,9	74,4	88,7
Shear V_{Rd}	HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0

Recommended loads a): concrete C 20/25 , anchor HIT-V 5.8

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tensile N_{rec}	HIT-V 5.8	[kN]	8,6	13,8	20,0	28,0	44,4	61,0	74,5	88,9
Shear V_{rec}	HIT-V 5.8	[kN]	5,1	8,6	12,0	22,3	34,9	50,3	65,7	80,0
Cracked concrete										
Tensile N_{rec}	HIT-V 5.8	[kN]	4,8	6,7	13,2	19,9	31,7	43,5	53,1	63,4
Shear V_{rec}	HIT-V 5.8	[kN]	5,1	8,6	12,0	22,3	34,9	50,3	65,7	80,0

a) With overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Service temperature range

Hilti HIT-HY 200 injection mortar may be applied in the temperature ranges given below. An elevated base material temperature may lead to a reduction of the design bond resistance.

Temperature range	Base material temperature	Maximum long term base material temperature	Maximum short term base material temperature
Temperature range I	-40 °C to +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +80 °C	+50 °C	+80 °C
Temperature range III	-40 °C to +120 °C	+72 °C	+120 °C

Max short term base material temperature
Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Max long term base material temperature
Long-term elevated base material temperatures are roughly constant over significant periods of time.

Materials

Mechanical properties of HIT-V

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Nominal tensile strength f_{uk}	HIT-V 5.8	[N/mm²]	500	500	500	500	500	500	500	500
	HIT-V 8.8	[N/mm²]	800	800	800	800	800	800	800	800
	HIT-V-R	[N/mm²]	700	700	700	700	700	700	500	500
	HIT-V-HCR	[N/mm²]	800	800	800	800	800	700	700	700
Yield strength f_{yk}	HIT-V 5.8	[N/mm²]	400	400	400	400	400	400	400	400
	HIT-V 8.8	[N/mm²]	640	640	640	640	640	640	640	640
	HIT-V -R	[N/mm²]	450	450	450	450	450	450	210	210
	HIT-V-HCR	[N/mm²]	640	640	640	640	640	400	400	400
Stressed cross-section A_s	HIT-V	[mm²]	36,6	58,0	84,3	157	245	353	459	561
Moment of resistance W	HIT-V	[mm³]	31,2	62,3	109	277	541	935	1387	1874

Material quality

Part	Material
Threaded rod HIT-V(F)	Strength class 5.8, A_5 > 8% ductile steel galvanized ≥ 5 µm, (F) hot dipped galvanized ≥ 45 µm,
Threaded rod HIT-V(F)	Strength class 8.8, A_5 > 8% ductile steel galvanized ≥ 5 µm, (F) hot dipped galvanized ≥ 45 µm,
Threaded rod HIT-V-R	Stainless steel grade A4, A_5 > 8% ductile strength class 70 for ≤ M24 and class 50 for M27 to M30, 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362
Threaded rod HIT-V-HCR	High corrosion resistant steel, 1.4529; 1.4565 strength ≤ M20: R_m = 800 N/mm², $R_{p\ 0.2}$ = 640 N/mm², A_5 > 8% ductile M24 to M30: R_m = 700 N/mm², $R_{p\ 0.2}$ = 400 N/mm², A_5 > 8% ductile
Washer ISO 7089	Steel galvanized, hot dipped galvanized,
	Stainless steel, 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362
	High corrosion resistant steel, 1.4529; 1.4565
Nut EN ISO 4032	Strength class 8, steel galvanized ≥ 5 µm, hot dipped galvanized ≥ 45 µm,
	Strength class 70, stainless steel grade A4, 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362
	Strength class 70, high corrosion resistant steel, 1.4529; 1.4565

Anchor dimensions

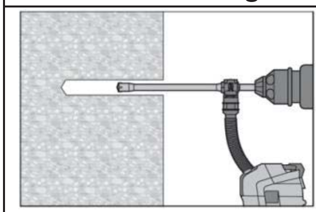
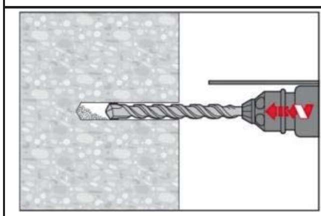
Anchor size	M8	M10	M12	M16	M20	M24	M27	M30
Anchor rod HIT-V, HIT-V-R, HIT-V-HCR	Anchor rods HIT-V (-R / -HCR) are available in variable length							

Setting

installation equipment

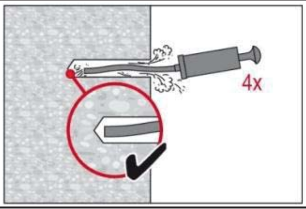
Anchor size	M8	M10	M12	M16	M20	M24	M27	M30
Rotary hammer	TE 2 – TE 16				TE 40 – TE 70			
Other tools, hammer drilling	compressed air gun or blow out pump, set of cleaning brushes, dispenser							

Setting instruction

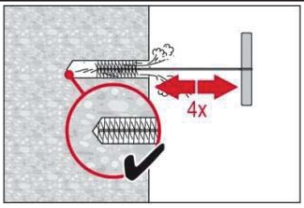
Bore hole drilling	
	Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment. This drilling method properly cleans the borehole and removes dust while drilling. After drilling is complete, proceed to the "injection preparation" step in the instructions for use.
	Drill Hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

Bore hole cleaning Just before setting an anchor, the bore hole must be free of dust and debris.

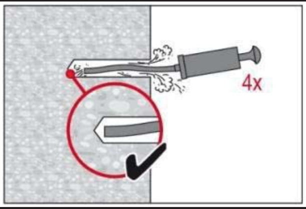
a) Manual Cleaning (MC) non-cracked concrete only
for bore hole diameters $d_0 \leq$ 20mm and bore hole depth $h_0 \leq$ 10d



The Hilti manual pump may be used for blowing out bore holes up to diameters $d_0 \leq$ 20 mm and embedment depths up to $h_{ef} \leq$ 10d.
Blow out at least 4 times from the back of the bore hole until return air stream is free of noticeable dust

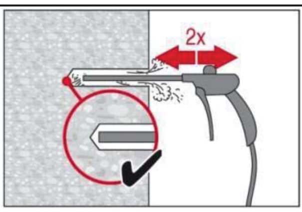


Brush 4 times with the specified brush size by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small and must be replaced with the proper brush diameter.

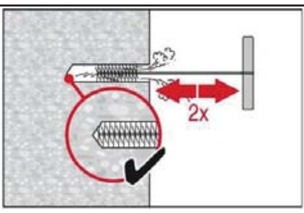


Blow out again with manual pump at least 4 times until return air stream is free of noticeable dust.

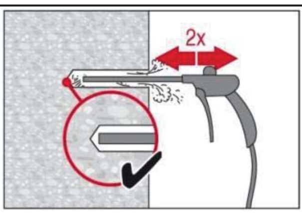
b) Compressed air cleaning (CAC)
for all bore hole diameters d_0 and all bore hole depth h_0



Blow 2 times from the back of the hole (if needed with nozzle extension) over the hole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust. Bore hole diameter ≥ 32 mm the compressor must supply a minimum air flow of 140 m³/hour.

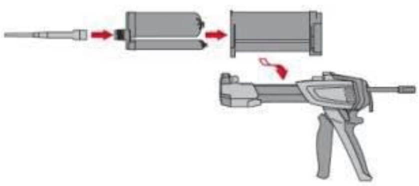


Brush 2 times with the specified brush size by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small and must be replaced with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

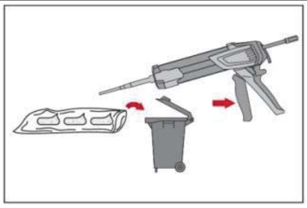


Blow again with compressed air 2 times until return air stream is free of noticeable dust.

Injection preparation



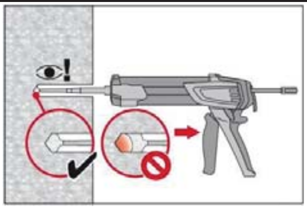
Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle. Observe the instruction for use of the dispenser. Check foil pack holder for proper function. Do not use damaged foil packs / holders. Swing foil pack holder with foil pack into HIT-dispenser.



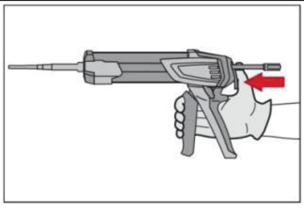
Discard initial adhesive. The foil pack opens automatically as dispensing is initiated. Depending on the size of the foil pack an initial amount of adhesive has to be discarded.
Discard quantities are:

- 2 strokes for 330 ml foil pack,
- 3 strokes for 500 ml foil pack,
- 4 strokes for 500 ml foil pack ≤ 5°C.

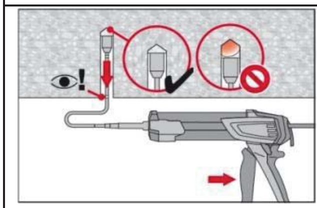
Inject adhesive from the back of the borehole without forming air voids



Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull. Fill holes approximately 2/3 full, or as required to ensure that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment length.

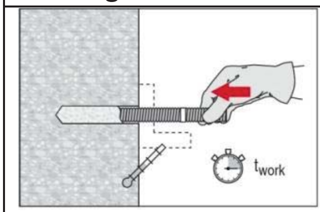


After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

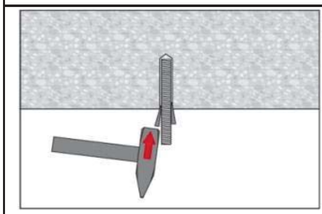


Overhead installation and/or installation with embedment depth h_{ef} > 250mm. For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug. Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the bore hole by the adhesive pressure.

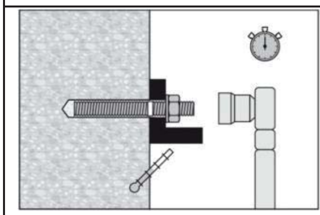
Setting the element



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



For overhead installation use piston plugs and fix embedded parts with e.g. wedges



Loading the anchor:
After required curing time t_{cure} the anchor can be loaded.
The applied installation torque shall not exceed T_{max}.

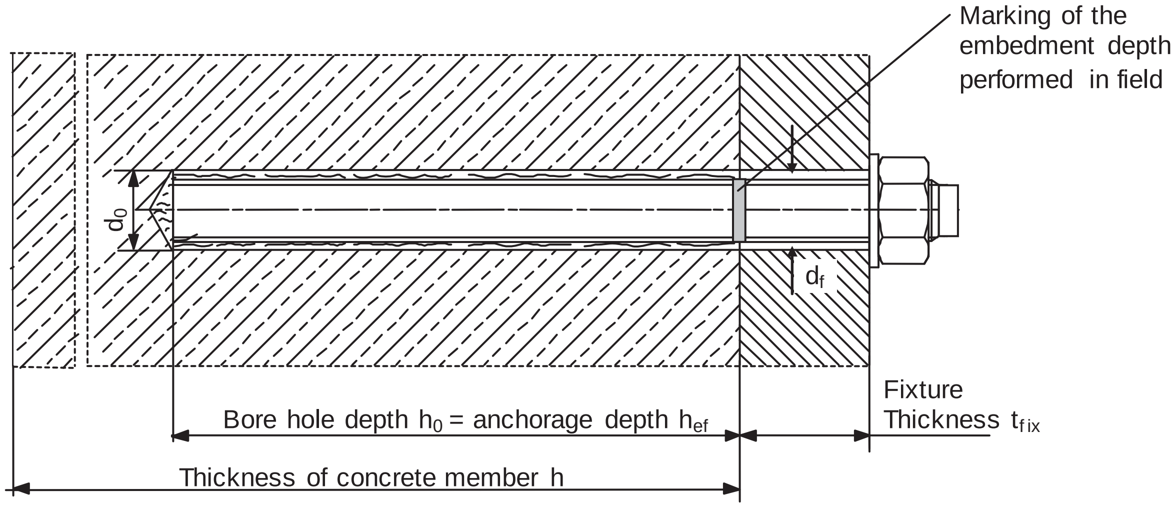
For detailed information on installation see instruction for use given with the package of the product.

Working time, curing time

Temperature of the base material	Hilti HIT-HY 200-R	
	Working time in which anchor can be inserted and adjusted t_{work}	Curing time before anchor can be loaded t_{cure}
-10 °C to -5 °C	3 hour	20 hour
-4 °C to 0 °C	2 hour	8 hour
1 °C to 5 °C	1 hour	4 hour
6 °C to 10 °C	40 min	2,5 hour
11 °C to 20 °C	15 min	1,5 hour
21 °C to 30 °C	9 min	1 hour
31 °C to 40 °C	6 min	1 hour

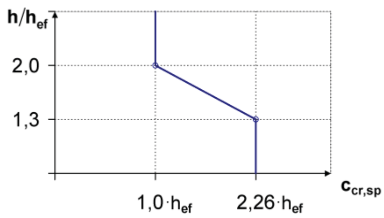
Temperature of the base material	Hilti HIT-HY 200-A	
	Working time in which anchor can be inserted and adjusted t_{work}	Curing time before anchor can be loaded t_{cure}
-10 °C to -5 °C	1,5 hour	7 hour
-4 °C to 0 °C	50 min	4 hour
1 °C to 5 °C	25 min	2 hour
6 °C to 10 °C	15 min	75 min
11 °C to 20 °C	7 min	45 min
21 °C to 30 °C	4 min	30 min
31 °C to 40 °C	3 min	30 min

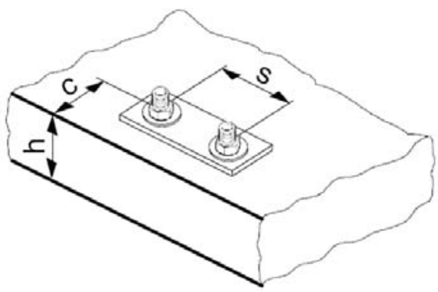
Setting details



Setting details

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Nominal diameter of drill bit	d_0	[mm]	10	12	14	18	22	28	30	35
Effective embedment and drill hole depth range a)	$h_{ef,min}$	[mm]	60	60	70	80	90	96	108	120
for HIT-V	$h_{ef,max}$	[mm]	160	200	240	320	400	480	540	600
Minimum base material thickness	h_{min}	[mm]	h_{ef} + 30 mm			h_{ef} + 2 d_0				
Diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22	26	30	33
Torque moment	T_{max} b)	[Nm]	10	20	40	80	150	200	270	300
Minimum spacing	s_{min}	[mm]	40	50	60	80	100	120	135	150
Minimum edge distance	c_{min}	[mm]	40	50	60	80	100	120	135	150
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	2 $c_{cr,sp}$							
Critical edge distance for splitting failure c)	$c_{cr,sp}$	[mm]	**1,0 · h_{ef}**	for $h / h_{ef} \geq 2,0$						
			4,6 h_{ef} - 1,8 h	for $2,0 > h / h_{ef} > 1,3$						
			2,26 h_{ef}	for $h / h_{ef} \leq 1,3$						
Critical spacing for concrete cone failure	$s_{cr,N}$	[mm]	2 $c_{cr,N}$							
Critical edge distance for concrete cone failure d)	$c_{cr,N}$	[mm]	1,5 h_{ef}							





For spacing (or edge distance) smaller than critical spacing (or critical edge distance) the design loads have to be reduced.

a) Embedment depth range: $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$

b) Maximum recommended torque moment to avoid splitting failure during installation with minimum spacing and/or edge distance.

c) h: base material thickness ($h \geq h_{min}$), h_{ef}: embedment depth

d) The critical edge distance for concrete cone failure depends on the embedment depth h_{ef} and the design bond resistance. The simplified formula given in this table is on the safe side.

Simplified design method

Simplified version of the design method according ETAG 001, TR 029. Design resistance according data given in ETA-11/0493 issued 2013-06-20 for HIT-HY 200-A and ETA-12/0084 issued 2013-06-20 for HIT-HY 200-R. Both mortars possess identical technical load performance.

- Influence of concrete strength
- Influence of edge distance
- Influence of spacing
- Valid for a group of two anchors. (The method may also be applied for anchor groups with more than two anchors or more than one edge distance. The influencing factors must then be considered for each edge distance and spacing. The simplified calculated design loads take a conservative approach: They will be lower than the exact values according to ETAG 001, TR 029. For an optimized design, anchor calculation can be performed using PROFIS anchor design software.

The design method is based on the following simplification:

- No different loads are acting on individual anchors (no eccentricity)

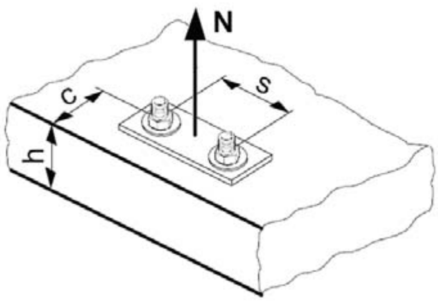
The values are valid for one anchor.

For more complex fastening applications please use the anchor design software PROFIS Anchor.

Tension loading

The design tensile resistance is the lower value of

- Steel resistance: $N_{Rd,s}$
- Combined pull-out and concrete cone resistance:
$$N_{Rd,p} = N^0_{Rd,p} \cdot f_{B,p} \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,p} \cdot f_{re,N}$$
- Concrete cone resistance: $N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,N} \cdot f_{re,N}$
- Concrete splitting resistance (only non-cracked concrete):
$$N_{Rd,sp} = N^0_{Rd,c} \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,N} \cdot f_{re,N}$$



Basic design tensile resistance

Design steel resistance $N_{Rd,s}$

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
$N_{Rd,s}$	HIT-V 5.8	[kN]	12,0	19,3	28,0	52,7	82,0	118,0	153,3	187,3
	HIT-V 8.8	[kN]	19,3	30,7	44,7	84,0	130,7	188,0	244,7	299,3
	HIT-V-R	[kN]	13,9	21,9	31,6	58,8	92,0	132,1	80,4	98,3
	HIT-V-HCR	[kN]	19,3	30,7	44,7	84,0	130,7	117,6	152,9	187,1

Design combined pull-out and concrete cone resistance

$N_{Rd,p} = N^0_{Rd,p} \cdot f_{B,p} \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,p} \cdot f_{re,N}$

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Typical embedment depth $h_{ef} = h_{ef,typ}$		[mm]	80	90	110	125	170	210	240	270
Non-cracked concrete										
$N^0_{Rd,p}$	Temperature range I	[kN]	22,3	31,4	46,1	69,8	118,7	175,9	169,6	212,1
$N^0_{Rd,p}$	Temperature range II	[kN]	19,0	26,7	39,2	59,3	100,9	149,5	135,7	169,6
$N^0_{Rd,p}$	Temperature range III	[kN]	15,6	22,0	32,3	48,9	83,1	123,2	124,4	155,5
Cracked concrete										
$N^0_{Rd,p}$	Temperature range I	[kN]	6,7	9,4	18,4	27,9	47,5	70,4	90,5	113,1
$N^0_{Rd,p}$	Temperature range II	[kN]	5,0	7,1	15,0	22,7	38,6	57,2	73,5	91,9
$N^0_{Rd,p}$	Temperature range III	[kN]	4,5	6,3	12,7	19,2	32,6	48,4	62,2	77,8

Design concrete cone resistance $N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,N} \cdot f_{re,N}$

Design splitting resistance a) $N_{Rd,sp} = N^0_{Rd,c} \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,N} \cdot f_{re,N}$

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
$N^0_{Rd,c}$	Non-cracked concrete	[kN]	20,1	24,0	32,4	39,2	62,2	85,4	104,3	124,5
$N^0_{Rd,c}$	Cracked concrete	[kN]	14,3	17,1	23,1	28,0	44,3	60,9	74,4	88,7

a) Splitting resistance must only be considered for non-cracked concrete.

Influencing factors

Influence of concrete strength on combined pull-out and concrete cone resistance

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_{B,p}$ =	1,00	1,00	1,00	1,00	1,00	1,00	1,00

Influence of embedment depth on combined pull-out and concrete cone resistance

$$f_{h,p} = h_{ef}/h_{ef,typ}$$

Influence of concrete strength on concrete cone resistance

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25N/mm^2)^{0,5}$ a)	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of edge distance a)

$c/c_{cr,N}$ / $c/c_{cr,sp}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$f_{1,N} = 0,7 + 0,3 \cdot c/c_{cr,N} \leq 1$ / $f_{1,sp} = 0,7 + 0,3 \cdot c/c_{cr,sp} \leq 1$	0,73	0,76	0,79	0,82	0,85	0,88	0,91	0,94	0,97	1
$f_{2,N} = 0,5 \cdot (1 + c/c_{cr,N}) \leq 1$ / $f_{2,sp} = 0,5 \cdot (1 + c/c_{cr,sp}) \leq 1$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1

a) The edge distance shall not be smaller than the minimum edge distance c_{min}. These influencing factors must be considered for every edge distance smaller than the critical edge distance.

Influence of anchor spacing [a]

$s/s_{cr,N}$ $s/s_{cr,sp}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$f_{3,N} = 0{,}5\cdot(1 + s/s_{cr,N}) \leq 1$ $f_{3,sp} = 0{,}5\cdot(1 + s/s_{cr,sp}) \leq 1$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1

a) The anchor spacing shall not be smaller than the minimum anchor spacing s_{min}. This influencing factor must be considered for every anchor spacing.

Influence of embedment depth on concrete cone resistance

$$f_{h,N} = (h_{ef}/h_{ef,typ})^{1,5}$$

Influence of reinforcement

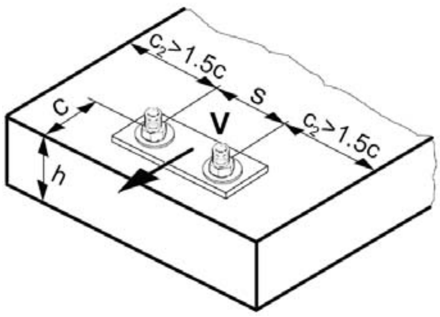
h_{ef} [mm]	60	70	80	90	≥ 100
$f_{re,N} = 0{,}5 + h_{ef}/200mm \leq 1$	0,8 [a]	0,85 [a]	0,9 [a]	0,95 [a]	1

a) This factor applies only for dense reinforcement. If in the area of anchorage there is reinforcement with a spacing ≥ 150 mm (any diameter) or with a diameter ≤ 10 mm and a spacing ≥ 100 mm, then a factor $f_{re,N} = 1$ may be applied.

Shear loading

The design shear resistance is the lower value of

- Steel resistance: $V_{Rd,s}$
- Concrete pryout resistance: $V_{Rd,cp} = k \cdot$ lower value of $N_{Rd,p}$ and $N_{Rd,c}$
- Concrete edge resistance: $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_ß \cdot f_h \cdot f_4 \cdot f_{hef} \cdot f_c$



Basic design shear resistance

Design steel resistance $V_{Rd,s}$

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
$V_{Rd,s}$	HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0
	HIT-V 8.8	[kN]	12,0	18,4	27,2	50,4	78,4	112,8	147,2	179,2
	HIT-V-R	[kN]	8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8
	HIT-V-HCR	[kN]	12,0	18,4	27,2	50,4	78,4	70,9	92,0	110,3

Design concrete pryout resistance $V_{Rd,cp}$ = lower value[a] of $k \cdot N_{Rd,p}$ and $k \cdot N_{Rd,c}$

$$k = 2$$

a) $N_{Rd,p}$: Design combined pull-out and concrete cone resistance, $N_{Rd,c}$: Design concrete cone resistance

Design concrete edge resistance $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_ß \cdot f_h \cdot f_4 \cdot f_{hef} \cdot f_c$

Anchor size		M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete									
$V^0_{Rd,c}$	[kN]	5,9	8,6	11,6	18,7	27,0	36,6	44,5	53,0
Cracked concrete									
$V^0_{Rd,c}$	[kN]	4,2	6,1	8,2	13,2	19,2	25,9	31,5	37,5

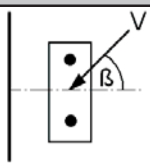
Influencing factors

Influence of concrete strength

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25N/mm^2)^{1/2\ a)}$	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of angle between load applied and the direction perpendicular to the free edge

Angle ß	0°	10°	20°	30°	40°	50°	60°	70°	80°	≥ 90°
$f_\beta = \sqrt{\dfrac{1}{(\cos\alpha_V)^2 + \left(\dfrac{\sin\alpha_V}{2,5}\right)^2}}$ 	1	1,01	1,05	1,13	1,24	1,40	1,64	1,97	2,32	2,50

Influence of base material thickness

h/c	0,15	0,3	0,45	0,6	0,75	0,9	1,05	1,2	1,35	≥ 1,5
$f_h = \{h/(1,5 \cdot c)\}^{1/2} \leq 1$	0,32	0,45	0,55	0,63	0,71	0,77	0,84	0,89	0,95	1,00

Influence of anchor spacing and edge distance a) for concrete edge resistance: f_4

$$f_4 = (c/h_{ef})^{1,5} \cdot (1 + s / [3 \cdot c]) \cdot 0,5$$

c/h_{ef}	Single anchor	Group of two anchors s/h_{ef}														
		0,75	1,50	2,25	3,00	3,75	4,50	5,25	6,00	6,75	7,50	8,25	9,00	9,75	10,50	11,25
0,50	0,35	0,27	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35
0,75	0,65	0,43	0,54	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65
1,00	1,00	0,63	0,75	0,88	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
1,25	1,40	0,84	0,98	1,12	1,26	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40
1,50	1,84	1,07	1,22	1,38	1,53	1,68	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
1,75	2,32	1,32	1,49	1,65	1,82	1,98	2,15	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32
2,00	2,83	1,59	1,77	1,94	2,12	2,30	2,47	2,65	2,83	2,83	2,83	2,83	2,83	2,83	2,83	2,83
2,25	3,38	1,88	2,06	2,25	2,44	2,63	2,81	3,00	3,19	3,38	3,38	3,38	3,38	3,38	3,38	3,38
2,50	3,95	2,17	2,37	2,57	2,77	2,96	3,16	3,36	3,56	3,76	3,95	3,95	3,95	3,95	3,95	3,95
2,75	4,56	2,49	2,69	2,90	3,11	3,32	3,52	3,73	3,94	4,15	4,35	4,56	4,56	4,56	4,56	4,56
3,00	5,20	2,81	3,03	3,25	3,46	3,68	3,90	4,11	4,33	4,55	4,76	4,98	5,20	5,20	5,20	5,20
3,25	5,86	3,15	3,38	3,61	3,83	4,06	4,28	4,51	4,73	4,96	5,18	5,41	5,63	5,86	5,86	5,86
3,50	6,55	3,51	3,74	3,98	4,21	4,44	4,68	4,91	5,14	5,38	5,61	5,85	6,08	6,31	6,55	6,55
3,75	7,26	3,87	4,12	4,36	4,60	4,84	5,08	5,33	5,57	5,81	6,05	6,29	6,54	6,78	7,02	7,26
4,00	8,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75
4,25	8,76	4,64	4,90	5,15	5,41	5,67	5,93	6,18	6,44	6,70	6,96	7,22	7,47	7,73	7,99	8,25
4,50	9,55	5,04	5,30	5,57	5,83	6,10	6,36	6,63	6,89	7,16	7,42	7,69	7,95	8,22	8,49	8,75
4,75	10,35	5,45	5,72	5,99	6,27	6,54	6,81	7,08	7,36	7,63	7,90	8,17	8,45	8,72	8,99	9,26
5,00	11,18	5,87	6,15	6,43	6,71	6,99	7,27	7,55	7,83	8,11	8,39	8,66	8,94	9,22	9,50	9,78
5,25	12,03	6,30	6,59	6,87	7,16	7,45	7,73	8,02	8,31	8,59	8,88	9,17	9,45	9,74	10,02	10,31
5,50	12,90	6,74	7,04	7,33	7,62	7,92	8,21	8,50	8,79	9,09	9,38	9,67	9,97	10,26	10,55	10,85

a) The anchor spacing and the edge distance shall not be smaller than the minimum anchor spacing s_{min} and the minimum edge distance c_{min}.

Influence of embedment depth

h_{ef}/d	4	4,5	5	6	7	8	9	10	11
$f_{hef} = 0,05 \cdot (h_{ef} / d)^{1,68}$	0,51	0,63	0,75	1,01	1,31	1,64	2,00	2,39	2,81
h_{ef}/d	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
$f_{hef} = 0,05 \cdot (h_{ef} / d)^{1,68}$	3,25	3,72	4,21	4,73	5,27	5,84	6,42	7,04	7,67

Influence of edge distance a)

c/d	4	6	8	10	15	20	30	40
$f_c = (d / c)^{0,19}$	0,77	0,71	0,67	0,65	0,60	0,57	0,52	0,50

a) The edge distance shall not be smaller than the minimum edge distance c_{min}.

Combined tension and shear loading

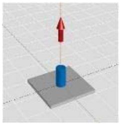
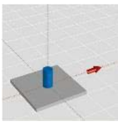
For combined tension and shear loading see section “Anchor Design”.

Precalculated values – design resistance values

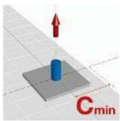
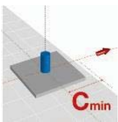
All data applies to:
- non-cracked concrete C 20/25 – $f_{ck,cube}$ =25 N/mm²
- temperature range I (see service temperature range)
- minimum thickness of base material
- no effects of dense reinforcement

Recommended loads can be calculated by dividing the design resistance by an overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

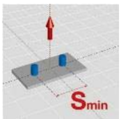
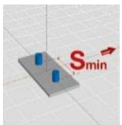
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm² - minimum embedment depth

Anchor size		M8	M10	M12	M16	M20	M24	M27	M30
Embedment depth $h_{ef} = h_{ef,min}$	[mm]	60	60	70	80	90	96	108	120
Base material thickness $h = h_{min}$	[mm]	90	90	100	116	138	152	168	190
Tensile N_{Rd}: single anchor, no edge effects									
 Non-cracked concrete									
HIT-V 5.8	[kN]	12,0	13,0	16,4	20,1	24,0	26,4	31,5	36,9
HIT-V 8.8	[kN]	13,0	13,0	16,4	20,1	24,0	26,4	31,5	36,9
HIT-V-R	[kN]	13,0	13,0	16,4	20,1	24,0	26,4	31,5	36,9
HIT-V-HCR	[kN]	13,0	13,0	16,4	20,1	24,0	26,4	31,5	36,9
Cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	5,0	6,3	11,7	14,3	17,1	18,8	22,4	26,3
Shear V_{Rd}: single anchor, no edge effects, without lever arm									
 Non-cracked concrete									
HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	63,3	75,6	88,5
HIT-V 8.8	[kN]	12,0	18,4	27,2	48,2	57,5	63,3	75,6	88,5
HIT-V-R	[kN]	8,3	12,8	19,2	35,3	55,1	63,3	48,3	58,8
HIT-V-HCR	[kN]	12,0	18,4	27,2	48,2	57,5	63,3	75,6	88,5
Cracked concrete									
HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	41,0	45,1	53,9	63,1
HIT-V 8.8	[kN]	12,0	15,1	27,2	34,3	41,0	45,1	53,9	63,1
HIT-V-R	[kN]	8,3	12,8	19,2	34,3	41,0	45,1	48,3	58,8
HIT-V-HCR	[kN]	12,0	15,1	27,2	34,3	41,0	45,1	53,9	63,1

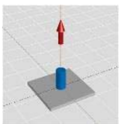
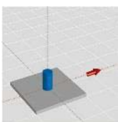
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm² - minimum embedment depth

Anchor size		M8	M10	M12	M16	M20	M24	M27	M30
Embedment depth $h_{ef} = h_{ef,min}$	[mm]	60	60	70	80	90	96	108	120
Base material thickness $h = h_{min}$	[mm]	90	90	100	116	134	152	168	190
Edge distance $c = c_{min}$	[mm]	40	50	60	80	100	120	135	150
Tensile N_{Rd}: single anchor, min. edge distance ($c = c_{min}$)									
 Non-cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	7,1	7,8	9,7	12,8	16,5	20,7	24,2	28,9
Cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	3,0	4,2	8,0	10,7	13,7	16,4	19,5	22,9
Shear V_{Rd}: single anchor, min. edge distance ($c = c_{min}$), without lever arm									
 Non-cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	3,5	4,9	6,6	10,2	13,9	17,9	21,5	25,9
Cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	2,5	3,5	4,7	7,2	9,9	12,7	15,3	18,3

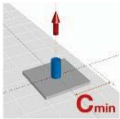
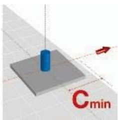
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm² - minimum embedment depth (load values are valid for single anchor)

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Embedment depth	$h_{ef} = h_{ef,min}$	[mm]	60	60	70	80	90	96	108	120
Base material thickness	$h = h_{min}$	[mm]	90	90	100	116	134	152	168	190
Spacing	$s = s_{min}$	[mm]	40	50	60	80	100	120	135	150
	Tensile N_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$)									
	Non-cracked concrete									
	HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	7,7	7,9	10,0	12,6	15,4	17,9	21,2	25,0
	Cracked concrete									
	HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	3,5	4,4	7,5	9,5	11,7	13,3	15,9	18,6
	Shear V_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$), without lever arm									
	Non-cracked concrete									
	HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	39,4	44,9	53,5	62,7
	HIT-V 8.8	[kN]	12,0	18,4	25,4	32,1	39,4	44,9	53,5	62,7
	HIT-V-R	[kN]	8,3	12,8	19,2	32,1	39,4	44,9	48,3	58,8
	HIT-V-HCR	[kN]	12,0	18,4	25,4	32,1	39,4	44,9	53,5	62,7
	Cracked concrete									
	HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	7,2	9,6	16,8	22,9	28,1	32,0	38,2	44,7

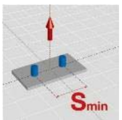
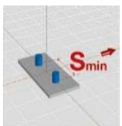
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm² - typical embedment depth

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Embedment depth	$h_{ef} = h_{ef,typ}$	[mm]	80	90	110	125	170	210	240	270
Base material thickness	$h = h_{min}$	[mm]	110	120	140	161	214	266	300	340
	Tensile N_{Rd}: single anchor, no edge effects									
	Non-cracked concrete									
	HIT-V 5.8	[kN]	12,0	19,3	28,0	39,2	62,2	85,4	104,3	124,5
	HIT-V 8.8	[kN]	19,3	24,0	32,4	39,2	62,2	85,4	104,3	124,5
	HIT-V-R	[kN]	13,9	21,9	31,6	39,2	62,2	85,4	80,4	98,3
	HIT-V-HCR	[kN]	19,3	24,0	32,4	39,2	62,2	85,4	104,3	124,5
	Cracked concrete									
	HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	6,7	9,4	18,4	27,9	44,3	60,9	74,4	88,7
	Shear V_{Rd}: single anchor, no edge effects, without lever arm									
	Non-cracked concrete									
	HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0
	HIT-V 8.8	[kN]	12,0	18,4	27,2	50,4	78,4	112,8	147,2	179,2
	HIT-V-R	[kN]	8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8
	HIT-V-HCR	[kN]	12,0	18,4	27,2	50,4	78,4	70,9	92,0	110,3
	Cracked concrete									
	HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0
	HIT-V 8.8	[kN]	12,0	18,4	27,2	50,4	78,4	112,8	147,2	179,2
	HIT-V-R	[kN]	8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8
	HIT-V-HCR	[kN]	12,0	18,4	27,2	50,4	78,4	70,9	92,0	110,3

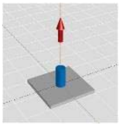
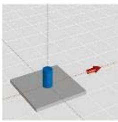
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm² - typical embedment depth

Anchor size		M8	M10	M12	M16	M20	M24	M27	M30
Embedment depth $h_{ef} = h_{ef,typ}$	[mm]	80	90	110	125	170	210	240	270
Base material thickness $h = h_{min}$	[mm]	110	120	140	161	214	266	300	340
Edge distance $c = c_{min}$	[mm]	40	50	60	80	100	120	135	150
Tensile N_{Rd}: single anchor, min. edge distance ($c = c_{min}$) 									
Non-cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	9,6	11,6	15,5	19,9	30,5	41,5	50,5	60,0
Cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	3,6	5,2	10,2	16,5	25,2	34,2	41,5	49,3
Shear V_{Rd}: single anchor, min. edge distance ($c = c_{min}$), without lever arm 									
Non-cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	3,7	5,3	7,3	11,5	17,2	23,6	29,0	34,8
Cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	2,6	3,8	5,2	8,1	12,2	16,7	20,5	24,7

Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm² - typical embedment depth (load values are valid for single anchor)

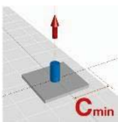
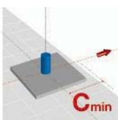
Anchor size		M8	M10	M12	M16	M20	M24	M27	M30
Embedment depth $h_{ef} = h_{ef,typ}$	[mm]	80	90	110	125	170	210	240	270
Base material thickness $h = h_{min}$	[mm]	110	120	140	161	214	266	300	340
Spacing s	[mm]	40	50	60	80	100	120	135	150
Tensile N_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$) 									
Non-cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	11,2	13,5	18,1	22,4	35,1	48,1	58,6	69,9
Cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	4,6	6,4	11,6	17,0	26,5	36,2	44,2	52,6
Shear V_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$), without lever arm 									
Non-cracked concrete									
HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0
HIT-V 8.8	[kN]	12,0	18,4	27,2	50,4	78,4	112,8	147,2	177,0
HIT-V-R	[kN]	8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8
HIT-V-HCR	[kN]	12,0	18,4	27,2	50,4	78,4	70,9	92,0	110,3
Cracked concrete									
HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0
HIT-V 8.8	[kN]	9,4	13,4	26,1	40,7	63,6	86,9	106,0	126,2
HIT-V-R	[kN]	8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8
HIT-V-HCR	[kN]	9,4	13,4	26,1	40,7	63,6	70,9	92,0	110,3

Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm² - embedment depth = 12 d [a)]

Anchor size		M8	M10	M12	M16	M20	M24	M27	M30
Embedment depth h_{ef} = 12 d [a)]	[mm]	96	120	144	192	240	288	324	360
Base material thickness h = h_{min}	[mm]	126	150	174	228	284	344	384	430
 **Tensile N_{Rd}: single anchor, no edge effects**									
Non-cracked concrete									
HIT-V 5.8	[kN]	12,0	19,3	28,0	52,7	82,0	118,0	153,3	187,3
HIT-V 8.8	[kN]	19,3	30,7	44,7	74,6	104,3	137,1	163,6	191,6
HIT-V-R	[kN]	13,9	21,9	31,6	58,8	92,0	132,1	80,4	98,3
HIT-V-HCR	[kN]	19,3	30,7	44,7	74,6	104,3	117,6	152,9	187,1
Cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	8,0	12,6	24,1	42,9	67,0	96,5	116,6	136,6
 **Shear V_{Rd}: single anchor, no edge effects, without lever arm**									
Non-cracked concrete									
HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0
HIT-V 8.8	[kN]	12,0	18,4	27,2	50,4	78,4	112,8	147,2	179,2
HIT-V-R	[kN]	8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8
HIT-V-HCR	[kN]	12,0	18,4	27,2	50,4	78,4	70,9	92,0	110,3
Cracked concrete									
HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0
HIT-V 8.8	[kN]	12,0	18,4	27,2	50,4	78,4	112,8	147,2	179,2
HIT-V-R	[kN]	8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8
HIT-V-HCR	[kN]	12,0	18,4	27,2	50,4	78,4	70,9	92,0	110,3

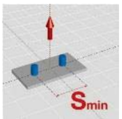
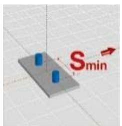
a) d = element diameter

Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm² - embedment depth = 12 d [a)]

Anchor size		M8	M10	M12	M16	M20	M24	M27	M30
Embedment depth h_{ef} = 12 d [a)]	[mm]	96	120	144	192	240	288	324	360
Base material thickness h = h_{min}	[mm]	126	150	174	228	284	344	384	430
Edge distance c = c_{min}	[mm]	40	50	60	80	100	120	135	150
 **Tensile N_{Rd}: single anchor, min. edge distance (c = c_{min})**									
Non-cracked concrete									
HIT-V 5.8	[kN]	11,8	16,5	21,7	33,4	46,7	61.3	73.2	85,7
HIT-V 8.8	[kN]	11,8	16,5	21,7	33,4	46,7	61.3	73.2	85,7
HIT-V-R	[kN]	11,8	16,5	21,7	33,4	46,7	61.3	73.2	85,7
HIT-V-HCR	[kN]	11,8	16,5	21,7	33,4	46,7	61.3	73.2	85,7
Cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	4,2	6,5	12,5	22,2	34,7	48,9	58,4	68,4
 **Shear V_{Rd}: single anchor, min. edge distance (c = c_{min}), without lever arm**									
Non-cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	3,9	5,7	7,8	12,9	18,9	25,9	31,8	38,1
Cracked concrete									
HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	2,8	4,0	5,5	9,1	13,4	18,4	22,5	27,0

a) d = element diameter

Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm² - embedment depth = 12 d [a)]
(load values are valid for single anchor)

	Anchor size		M8	M10	M12	M16	M20	M24	M27	M30
	Embedment depth h_{ef} = 12 d [a)]	[mm]	96	120	144	192	240	288	324	360
	Base material thickness $h = h_{min}$	[mm]	126	150	174	228	284	344	384	430
	Spacing $s = s_{min}$	[mm]	40	50	60	80	100	120	135	150
	Tensile N_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$)									
	Non-cracked concrete									
	HIT-V 5.8	[kN]	12,0	19,3	26,5	40,8	57,0	74,9	89,4	104,6
	HIT-V 8.8	[kN]	14,4	20,1	26,5	40,8	57,0	74,9	89,4	104,6
	HIT-V-R	[kN]	13,9	20,1	26,5	40,8	57,0	74,9	80,4	98,3
	HIT-V-HCR	[kN]	14,4	20,1	26,5	40,8	57,0	74,9	89,4	104,6
	Cracked concrete									
	HIT-V 5.8 / 8.8 HIT-V-R / -HCR	[kN]	5,5	8,5	15,4	26,5	40,1	55,7	66,4	77,8
	Shear V_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$) , without lever arm									
	Non-cracked concrete									
	HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0
	HIT-V 8.8	[kN]	12,0	18,4	27,2	50,4	78,4	112,8	147,2	179,2
	HIT-V-R	[kN]	8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8
	HIT-V-HCR	[kN]	12,0	18,4	27,2	50,4	78,4	70,9	92,0	110,3
	Cracked concrete									
	HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0
	HIT-V 8.8	[kN]	11,0	17,2	27,2	50,4	78,4	112,8	147,2	179,2
	HIT-V-R	[kN]	8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8
	HIT-V-HCR	[kN]	11,0	17,2	27,2	50,4	78,4	70,9	92,0	110,3

a) d = element diameter

Seismic design C1

Basic loading data for concrete C20/25 – C50/60

All data in this section applies to:
- Seismic design according to TR045

The following technical data are based on: ETA-11/0493 and ETA-12/0084, issue 2013-06-20

Anchorage depth range

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Effective anchorage depth range	$h_{ef,min}$	[mm]	60	60	70	80	90	96	108	120
	$h_{ef,max}$	[mm]	160	200	240	320	400	480	540	600

Tension resistance in case of seismic performance category C1

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Characteristic tension resistance to steel failure										
HIT-V-5.8(F)	$N_{Rk,s,seis}$	[kN]	-	29	42	79	123	177	230	281
HIT-V-8.8(F)	$N_{Rk,s,seis}$	[kN]	-	46	67	126	196	282	367	449
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,5							
HIT-V-R	$N_{Rk,s,seis}$	[kN]	-	41	59	110	172	247	230	281
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,87						2,86	
HIT-V-HCR	$N_{Rk,s,seis}$	[kN]	-	46	67	126	196	247	321	393
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,5					2,1		
Characteristic bond resistance in cracked concrete C20/25 to C50/60										
Temperature range I: 40°C/24°C	$\tau_{Rk,seis}$	[N/mm²]	-	5,2	7,0					
Temperature range II: 80°C/50°C	$\tau_{Rk,seis}$	[N/mm²]	-	3,9	5,7					
Temperature range III: 120°C/72°C	$\tau_{Rk,seis}$	[N/mm²]	-	3,5	4,8					
Partial safety factor	$\gamma_{Mp,seis}$	[-]	1,8							
Concrete cone resistance and splitting resistance										
Partial safety factor	$\gamma_{Mc,seis} = \gamma_{Msp,seis}$	[-]	1,8							

Displacement under tension load in case of seismic performance category C1 [1)]

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Displacement [1)]	$\delta_{N,seis}$	[mm]	-	0,8	0,8	0,8	0,8	0,8	0,8	0,8

1) Maximum displacement during cycling (seismic event).

Shear resistance in case of seismic performance category C1

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Characteristic shear resistance to steel failure										
for HIT-V-5.8(F)	$V_{Rk,s,seis}$	[kN]	-	11	15	27	43	62	81	98
for HIT-V-8.8(F)	$V_{Rk,s,seis}$	[kN]	-	16	24	44	69	99	129	157
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25							
for HIT-V-R	$V_{Rk,s,seis}$	[kN]	-	14	21	39	60	87	81	98
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,56						2,38	
for HIT-V-HCR	$V_{Rk,s,seis}$	[kN]	-	16	24	44	69	87	113	137
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25					1,75		
Concrete pryout resistance and concrete edge resistance										
Partial safety factor	$\gamma_{Mcp,seis} = \gamma_{Mc,seis}$	[-]	1,5							

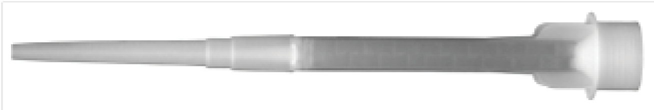
Displacement under shear load in case of seismic performance category C1 [1)]

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Displacement[1)]	$\delta_{V,seis}$	[mm]	-	3,5	3,8	4,4	5,0	5,6	6,1	6,5

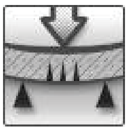
1) Maximum displacement during cycling (seismic event).

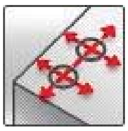
For seismic resistent fastening applications please use the anchor design software PROFIS Anchor.

Hilti HIT-HY 200 mortar with HIS-(R)N sleeve

Injection mortar system		Benefits
	Hilti HIT-HY 200-A 500 ml foil pack (also available as 330 ml)	- **SAFEset** technology: drilling and borehole cleaning in one step with Hilti hollow drill bit - Suitable for cracked and non-cracked concrete C 20/25 to C 50/60. - ETA seismic approval C1 - High loading capacity, excellent handling, and fast curing - Small edge distance and anchor spacing possible - Corrosion resistant - In service temperature range up to 120°C short term/72°C long term - Manual cleaning for anchor size M8 and M10 - Two mortar (A and R) versions available with different curing times and same performance
	Hilti HIT-HY 200-R 500 ml foil pack (also available as 330 ml)	
	Static mixer	
	Internal threaded sleeve HIS-N HIS-RN	


Concrete


Tensile zone


Small edge distance and spacing

A4 316

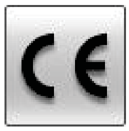
Corrosion resistance

Approved automatic cleaning while drilling

SAFEset

Hilti SAFEset technology with hollow drill bit


European Technical Approval


CE conformity


PROFIS Anchor design software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	DIBt, Berlin	ETA-11/0493 / 2013-06-20 (Hilti HIT-HY 200-A) ETA-12/0084 / 2013-06-08 (Hilti HIT-HY 200-R)

a) All data given in this section according ETA-11/0493 and ETA-12/0084, issue 2013-06-20.

Basic loading data (for a single anchor)

All data in this section applies to

For details see Simplified design method

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Steel failure
- Base material thickness, as specified in the table
- One anchor material, as specified in the tables
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Temperate range I
  (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C)
- Installation temperature range -10°C to +40°C

Embedment depth and base material thickness for the basic loading data. Mean ultimate resistance, characteristic resistance, design resistance, recommended loads.

Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
Embedment depth	h_{ef}	[mm]	90	110	125	170	205
Base material thickness	h	[mm]	120	150	170	230	270

Mean ultimate resistance: concrete C 20/25 , anchor HIS-N with screw 8.8

Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
Non cracked concrete							
Tensile $N_{Ru,m}$	HIS-N	[kN]	*26,3*	*48,3*	*70,4*	*123,9*	*114,5*
Shear $V_{Ru,m}$	HIS-N	[kN]	*13,7*	*24,2*	*41,0*	*62,0*	*57,8*
Cracked concrete							
Tensile $N_{Ru,m}$	HIS-N	[kN]	*26,3*	*48,3*	66,8	105,9	*114,5*
Shear $V_{Ru,m}$	HIS-N	[kN]	*13,7*	*24,2*	*41,0*	*62,0*	*57,8*

Characteristic resistance: concrete C 20/25 , anchor HIS-N with screw 8.8

Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
Non cracked concrete							
Tensile N_{Rk}	HIS-N	[kN]	*25,0*	*46,0*	*67,0*	111,9	*109,0*
Shear V_{Rk}	HIS-N	[kN]	*13,0*	*23,0*	*39,0*	*59,0*	*55,0*
Cracked concrete							
Tensile N_{Rk}	HIS-N	[kN]	24,7	39,9	50,3	79,8	105,7
Shear V_{Rk}	HIS-N	[kN]	*13,0*	*23,0*	*39,0*	*59,0*	*55,0*

Design resistance: concrete C 20/25 , anchor HIS-N with screw 8.8

Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
Cracked concrete							
Tensile N_{Rd}	HIS-N	[kN]	17,5	30,7	44,7	74,6	74,1
Shear V_{Rd}	HIS-N	[kN]	10,4	18,4	26,0	39,3	36,7
Non cracked concrete							
Tensile N_{Rd}	HIS-N	[kN]	16,5	26,6	33,5	53,2	70,4
Shear V_{Rd}	HIS-N	[kN]	10,4	18,4	26,0	39,3	36,7

Recommended loads [a)]: concrete C 20/25 , anchor HIS-N with screw 8.8

Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
Non cracked concrete							
Tensile N_{rec}	HIS-N	[kN]	12,5	27,9	31,9	53,3	53,0
Shear V_{rec}	HIS-N	[kN]	7,4	13,1	18,6	28,1	26,2
Cracked concrete							
Tensile N_{rec}	HIS-N	[kN]	11,8	19,0	24,0	38,0	50,3
Shear V_{rec}	HIS-N	[kN]	7,4	13,1	18,6	28,1	26,2

a) With overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Service temperature range

Hilti HIT-HY 200 injection mortar may be applied in the temperature ranges given below. An elevated base material temperature may lead to a reduction of the design bond resistance.

Temperature range	Base material temperature	Maximum long term base material temperature	Maximum short term base material temperature
Temperature range I	-40 °C to +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +80 °C	+50 °C	+80 °C
Temperature range III	-40 °C to +120 °C	+72 °C	+120 °C

Max short term base material temperature
Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Max long term base material temperature
Long-term elevated base material temperatures are roughly constant over significant periods of time.

Materials

Mechanical properties of HIS-(R)N

Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
Nominal tensile strength f_{uk}	HIS-N	[N/mm²]	490	460	460	460	460
	Screw 8.8	[N/mm²]	800	800	800	800	800
	HIS-RN	[N/mm²]	700	700	700	700	700
	Screw A4-70	[N/mm²]	700	700	700	700	700
Yield strength f_{yk}	HIS-N	[N/mm²]	410	375	375	375	375
	Screw 8.8	[N/mm²]	640	640	640	640	640
	HIS-RN	[N/mm²]	350	350	350	350	350
	Screw A4-70	[N/mm²]	450	450	450	450	450
Stressed cross-section A_s	HIS-(R)N	[mm²]	51,5	108,0	169,1	256,1	237,6
	Screw	[mm²]	36,6	58	84,3	157	245
Moment of resistance W	HIS-(R)N	[mm³]	145	430	840	1595	1543
	Screw	[mm³]	31,2	62,3	109	277	541

Material quality

Part	Material
Internal threaded sleeve [a] HIS-N	C-steel 1.0718, Steel galvanized ≥ 5µm
Internal threaded sleeve [b] HIS-RN	Stainless steel 1.4401 and 1.4571

a) related fastening screw: strength class 8.8, A5 > 8% Ductile
steel galvanized ≥ 5µm

b) related fastening screw: strength class 70, A5 > 8% Ductile
stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362

Anchor dimensions

Anchor size Internal threaded sleeve HIS-N / HIS-RN	M8x90	M10x110	M12x125	M16x170	M20x205
Embedment depth h_{ef} [mm]	90	110	125	170	205

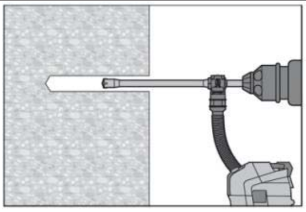
Setting

installation equipment

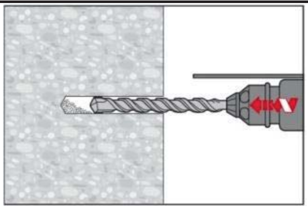
Anchor size	M8x90	M10x110	M12x125	M16x170	M20x205
Rotary hammer	TE 2 – TE 16		TE 40 – TE 70		
Other tools	compressed air gun or blow out pump, set of cleaning brushes, dispenser				

Setting instruction

Bore hole drilling



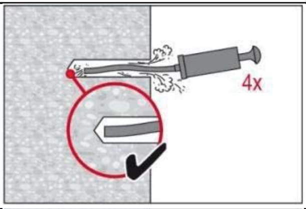
Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment. This drilling method properly cleans the borehole and removes dust while drilling.
After drilling is complete, proceed to the “injection preparation” step in the instructions for use.



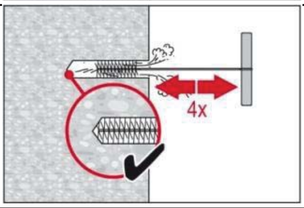
Drill Hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

Bore hole cleaning Just before setting an anchor, the bore hole must be free of dust and debris.

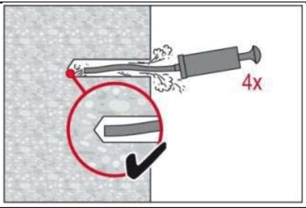
a) Manual Cleaning (MC) non-cracked concrete only
for bore hole diameters $d_0 \leq$ 20mm and bore hole depth $h_0 \leq$ 10d



The Hilti manual pump may be used for blowing out bore holes up to diameters $d_0 \leq$ 20 mm and embedment depths up to $h_{ef} \leq$ 10d.
Blow out at least 4 times from the back of the bore hole until return air stream is free of noticeable dust

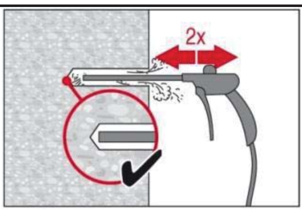


Brush 4 times with the specified brush size by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small and must be replaced with the proper brush diameter.

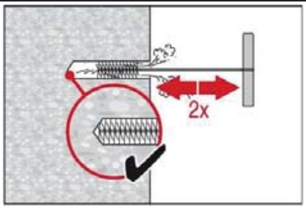


Blow out again with manual pump at least 4 times until return air stream is free of noticeable dust.

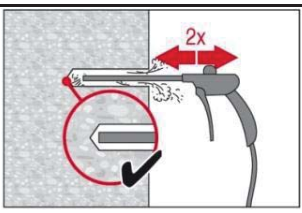
b) Compressed air cleaning (CAC)
for all bore hole diameters d_0 and all bore hole depth h_0



Blow 2 times from the back of the hole (if needed with nozzle extension) over the hole length with oil-free compressed air (min. 6 bar at 6 m^3/h) until return air stream is free of noticeable dust.

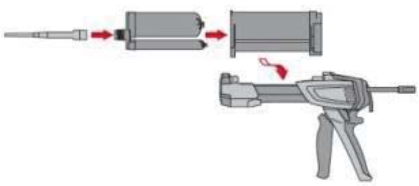


Brush 2 times with the specified brush size by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small and must be replaced with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

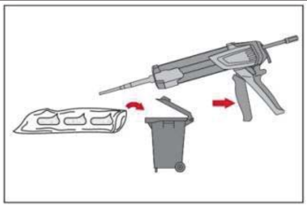


Blow again with compressed air 2 times until return air stream is free of noticeable dust.

Injection preparation



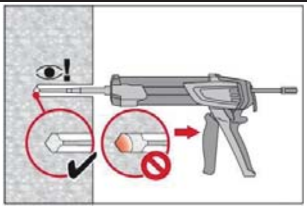
Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle. Observe the instruction for use of the dispenser. Check foil pack holder for proper function. Do not use damaged foil packs / holders. Swing foil pack holder with foil pack into HIT-dispenser.



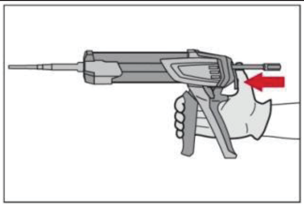
Discard initial adhesive. The foil pack opens automatically as dispensing is initiated. Depending on the size of the foil pack an initial amount of adhesive has to be discarded.
Discard quantities are:

- 2 strokes for 330 ml foil pack,
- 3 strokes for 500 ml foil pack,
- 4 strokes for 500 ml foil pack ≤ 5°C.

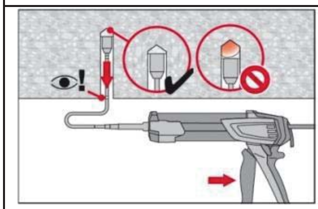
Inject adhesive from the back of the borehole without forming air voids



Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull. Fill holes approximately 2/3 full, or as required to ensure that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment length.

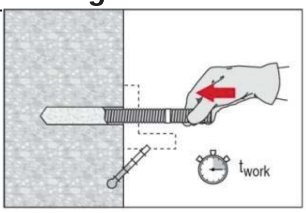


After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

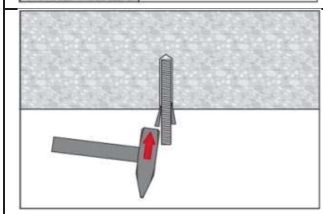


Overhead installation and/or installation with embedment depth h_{ef} > 250mm. For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug. Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the bore hole by the adhesive pressure.

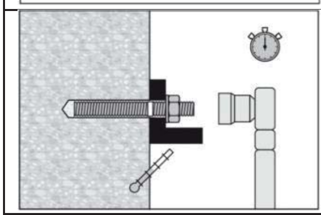
Setting the element



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



For overhead installation use piston plugs and fix embedded parts with e.g. wedges



Loading the anchor:
After required curing time t_{cure} the anchor can be loaded.
The applied installation torque shall not exceed T_{max}.

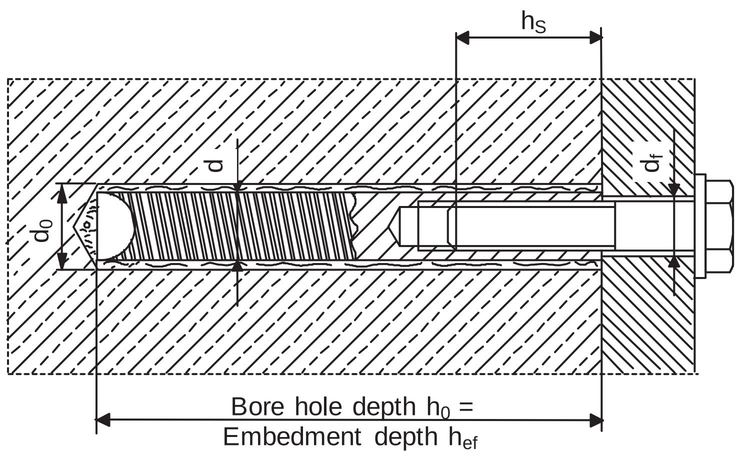
For detailed information on installation see instruction for use given with the package of the product.

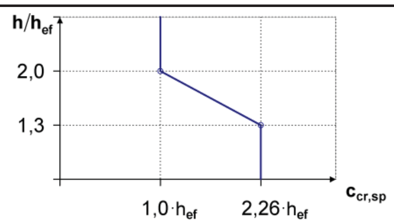
Working time, curing time

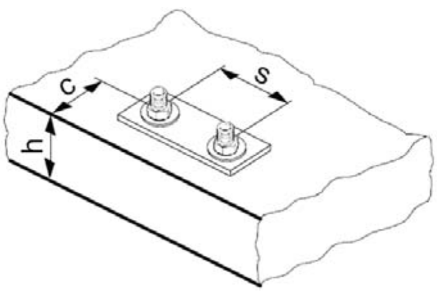
Temperature of the base material	Hilti HIT-HY 200-R	
	Working time in which anchor can be inserted and adjusted t_{work}	Curing time before anchor can be fully loaded t_{cure}
-10 °C to -5 °C	3 hour	20 hour
-4 °C to 0 °C	2 hour	8 hour
1 °C to 5 °C	1 hour	4 hour
6 °C to 10 °C	40 min	2,5 hour
11 °C to 20 °C	15 min	1,5 hour
21 °C to 30 °C	9 min	1 hour
31 °C to 40 °C	6 min	1 hour

Temperature of the base material	Hilti HIT-HY 200-A	
	Working time in which anchor can be inserted and adjusted t_{work}	Curing time before anchor can be fully loaded t_{cure}
-10 °C to -5 °C	1,5 hour	7 hour
-4 °C to 0 °C	50 min	4 hour
1 °C to 5 °C	25 min	2 hour
6 °C to 10 °C	15 min	75 min
11 °C to 20 °C	7 min	45 min
21 °C to 30 °C	4 min	30 min
31 °C to 40 °C	3 min	30 min

Setting details



Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
Nominal diameter of drill bit	d_0	[mm]	14	18	22	28	32
Diameter of element	d	[mm]	12,5	16,5	20,5	25,4	27,6
Effective anchorage and drill hole depth	h_{ef}	[mm]	90	110	125	170	205
Minimum base material thickness	h_{min}	[mm]	120	150	170	230	270
Diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22
Thread engagement length; min - max	h_s	[mm]	8-20	10-25	12-30	16-40	20-50
Torque moment [a]	T_{max}	[Nm]	10	20	40	80	150
Minimum spacing	s_{min}	[mm]	40	45	55	65	90
Minimum edge distance	c_{min}	[mm]	40	45	55	65	90
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$				
Critical edge distance for splitting failure [b]	$c_{cr,sp}$	[mm]	**$1{,}0 \cdot h_{ef}$** for $h / h_{ef} \geq 2{,}0$ **$4{,}6\ h_{ef} - 1{,}8\ h$** for $2{,}0 > h / h_{ef} > 1{,}3$ **$2{,}26\ h_{ef}$** for $h / h_{ef} \leq 1{,}3$				
Critical spacing for concrete cone failure	$s_{cr,N}$	[mm]	$2\ c_{cr,N}$				
Critical edge distance for concrete cone failure [c]	$c_{cr,N}$	[mm]	$1{,}5\ h_{ef}$				



For spacing (or edge distance) smaller than critical spacing (or critical edge distance) the design loads have to be reduced.

a) Maximum recommended torque moment to avoid splitting failure during installation with minimum spacing and/or edge distance.

b) h: base material thickness ($h \geq h_{min}$), h_{ef}: embedment depth

c) The critical edge distance for concrete cone failure depends on the embedment depth h_{ef} and the design bond resistance. The simplified formula given in this table is on the safe side.

Simplified design method

Simplified version of the design method according ETAG 001, TR 029. Design resistance according data given in ETA-11/0493 issued 2013-06-20 for HIT-HY 200-A and ETA-12/0084 issued 2013-06-20 for HIT-HY 200-R. Both mortars possess identical technical load performance.

- Influence of concrete strength
- Influence of edge distance
- Influence of spacing
- Valid for a group of two anchors. (The method may also be applied for anchor groups with more than two anchors or more than one edge distance. The influencing factors must then be considered for each edge distance and spacing. The simplified calculated design loads take a conservative approach: They will be lower than the exact values according to ETAG 001, TR 029. For an optimized design, anchor calculation can be performed using PROFIS anchor design software.

The design method is based on the following simplification:

- No different loads are acting on individual anchors (no eccentricity)

The values are valid for one anchor.

For more complex fastening applications please use the anchor design software PROFIS Anchor.

Tension loading

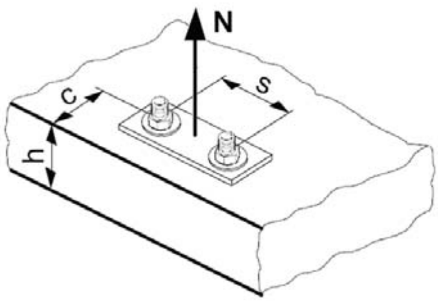
The design tensile resistance is the lower value of

- Steel resistance: $N_{Rd,s}$
- Combined pull-out and concrete cone resistance:

$$N_{Rd,p} = N^0_{Rd,p} \cdot f_{B,p} \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,p} \cdot f_{re,N}$$

- Concrete cone resistance: $N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,N} \cdot f_{re,N}$
- Concrete splitting resistance (only non-cracked concrete):

$$N_{Rd,sp} = N^0_{Rd,c} \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,N} \cdot f_{re,N}$$



Basic design tensile resistance

Design steel resistance $N_{Rd,s}$

Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
$N_{Rd,s}$	HIS-N with screw 8.8	[kN]	17,5	30,7	44,7	80,3	74,1
	HIS-RN with screw A4-70	[kN]	13,9	21,9	31,6	58,8	69,2

Design combined pull-out and concrete cone resistance
$N_{Rd,p} = N^0_{Rd,p} \cdot f_{B,p} \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,p} \cdot f_{re,N}$

Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
Embedment depth	h_{ef}	[mm]	90	110	125	170	205
Non cracked concrete							
$N^0_{Rd,p}$	Temperature range I	[kN]	30,6	49,4	69,8	117,6	154,7
$N^0_{Rd,p}$	Temperature range II	[kN]	25,9	41,8	59,0	99,5	130,4
$N^0_{Rd,p}$	Temperature range III	[kN]	22,4	36,1	51,0	85,9	112,6
Cracked concrete							
$N^0_{Rd,p}$	Temperature range I	[kN]	16,5	26,6	37,6	63,3	83,0
$N^0_{Rd,p}$	Temperature range II	[kN]	13,0	20,9	29,5	49,7	65,2
$N^0_{Rd,p}$	Temperature range III	[kN]	11,8	19,0	26,8	45,2	59,3

Design concrete cone resistance $N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,N} \cdot f_{re,N}$
Design splitting resistance a) $N_{Rd,sp} = N^0_{Rd,c} \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,N} \cdot f_{re,N}$

Anchor size		M8	M10	M12	M16	M20
Non cracked concrete						
$N^0_{Rd,c}$	[kN]	28,7	38,8	47,1	74,6	98,8
Cracked concrete						
$N^0_{Rd,c}$	[kN]	20,5	27,7	33,5	53,2	70,4

a) Splitting resistance must only be considered for non-cracked concrete.

Influencing factors

Influence of concrete strength on combined pull-out and concrete cone resistance

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_{B,p} = (f_{ck,cube}/25N/mm^2)^{0,10}$ a)	$f_{B,p} = 1$						

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of embedment depth on combined pull-out and concrete cone resistance

$f_{h,p} = 1$

Influence of concrete strength on concrete cone resistance

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25N/mm^2)^{0,5}$ a)	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of edge distance a)

$c/c_{cr,N}$ $c/c_{cr,sp}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$f_{1,N} = 0,7 + 0,3 \cdot c/c_{cr,N} \leq 1$ $f_{1,sp} = 0,7 + 0,3 \cdot c/c_{cr,sp} \leq 1$	0,73	0,76	0,79	0,82	0,85	0,88	0,91	0,94	0,97	1
$f_{2,N} = 0,5 \cdot (1 + c/c_{cr,N}) \leq 1$ $f_{2,sp} = 0,5 \cdot (1 + c/c_{cr,sp}) \leq 1$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1

a) The edge distance shall not be smaller than the minimum edge distance c_{min}. These influencing factors must be considered for every edge distance smaller than the critical edge distance.

Influence of anchor spacing [a)]

$s/s_{cr,N}$ / $s/s_{cr,sp}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$f_{3,N} = 0{,}5\cdot(1 + s/s_{cr,N}) \le 1$ / $f_{3,sp} = 0{,}5\cdot(1 + s/s_{cr,sp}) \le 1$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1

a) The anchor spacing shall not be smaller than the minimum anchor spacing s_{min}. This influencing factor must be considered for every anchor spacing.

Influence of embedment depth on concrete cone resistance

$f_{h,N} = 1$

Influence of reinforcement

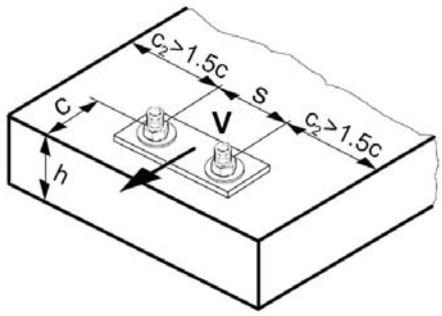
h_{ef} [mm]	40	50	60	70	80	90	≥ 100
$f_{re,N} = 0{,}5 + h_{ef}/200mm \le 1$	0,7 [a)]	0,75 [a)]	0,8 [a)]	0,85 [a)]	0,9 [a)]	0,95 [a)]	1

a) This factor applies only for dense reinforcement. If in the area of anchorage there is reinforcement with a spacing ≥ 150 mm (any diameter) or with a diameter ≤ 10 mm and a spacing ≥ 100 mm, then a factor $f_{re,N} = 1$ may be applied.

Shear loading

The design shear resistance is the lower value of

- Steel resistance: $V_{Rd,s}$
- Concrete pryout resistance: $V_{Rd,cp} = k \cdot$ lower value of $N_{Rd,p}$ and $N_{Rd,c}$
- Concrete edge resistance: $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_ß \cdot f_h \cdot f_4 \cdot f_{hef} \cdot f_c$



Basic design shear resistance

Design steel resistance $V_{Rd,s}$

Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
$V_{Rd,s}$	HIS-N with screw 8.8	[kN]	10,4	18,4	26,0	39,3	36,7
	HIS-RN with screw A4-70	[kN]	8,3	12,8	19,2	35,3	41,5

Design concrete pryout resistance $V_{Rd,cp}$ = lower value[a)] of $k \cdot N_{Rd,p}$ and $k \cdot N_{Rd,c}$

k = 2

a) $N_{Rd,p}$: Design combined pull-out and concrete cone resistance
$N_{Rd,c}$: Design concrete cone resistance

Design concrete edge resistance $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_ß \cdot f_h \cdot f_4 \cdot f_{hef} \cdot f_c$

Anchor size		M8	M10	M12	M16	M20
Non-cracked concrete						
$V^0_{Rd,c}$	[kN]	12,4	19,6	28,2	40,2	46,2
Cracked concrete						
$V^0_{Rd,c}$	[kN]	8,8	13,9	20,0	28,5	32,7

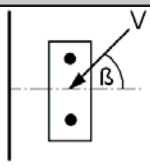
Influencing factors

Influence of concrete strength

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25N/mm^2)^{1/2}$ a)	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of angle between load applied and the direction perpendicular to the free edge

Angle ß	0°	10°	20°	30°	40°	50°	60°	70°	80°	≥ 90°
$f_\beta = \sqrt{\frac{1}{(\cos\alpha_V)^2 + \left(\frac{\sin\alpha_V}{2,5}\right)^2}}$ 	1	1,01	1,05	1,13	1,24	1,40	1,64	1,97	2,32	2,50

Influence of base material thickness

h/c	0,15	0,3	0,45	0,6	0,75	0,9	1,05	1,2	1,35	≥ 1,5
$f_h = \{h/(1,5 \cdot c)\}^{1/2} \leq 1$	0,32	0,45	0,55	0,63	0,71	0,77	0,84	0,89	0,95	1,00

Influence of anchor spacing and edge distance [a)] for concrete edge resistance: f_4

$f_4 = (c/h_{ef})^{1,5} \cdot (1 + s / [3 \cdot c]) \cdot 0,5$

c/h_{ef}	Single anchor	Group of two anchors s/h_{ef}														
		0,75	1,50	2,25	3,00	3,75	4,50	5,25	6,00	6,75	7,50	8,25	9,00	9,75	10,50	11,25
0,50	0,35	0,27	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35
0,75	0,65	0,43	0,54	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65
1,00	1,00	0,63	0,75	0,88	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
1,25	1,40	0,84	0,98	1,12	1,26	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40
1,50	1,84	1,07	1,22	1,38	1,53	1,68	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
1,75	2,32	1,32	1,49	1,65	1,82	1,98	2,15	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32
2,00	2,83	1,59	1,77	1,94	2,12	2,30	2,47	2,65	2,83	2,83	2,83	2,83	2,83	2,83	2,83	2,83
2,25	3,38	1,88	2,06	2,25	2,44	2,63	2,81	3,00	3,19	3,38	3,38	3,38	3,38	3,38	3,38	3,38
2,50	3,95	2,17	2,37	2,57	2,77	2,96	3,16	3,36	3,56	3,76	3,95	3,95	3,95	3,95	3,95	3,95
2,75	4,56	2,49	2,69	2,90	3,11	3,32	3,52	3,73	3,94	4,15	4,35	4,56	4,56	4,56	4,56	4,56
3,00	5,20	2,81	3,03	3,25	3,46	3,68	3,90	4,11	4,33	4,55	4,76	4,98	5,20	5,20	5,20	5,20
3,25	5,86	3,15	3,38	3,61	3,83	4,06	4,28	4,51	4,73	4,96	5,18	5,41	5,63	5,86	5,86	5,86
3,50	6,55	3,51	3,74	3,98	4,21	4,44	4,68	4,91	5,14	5,38	5,61	5,85	6,08	6,31	6,55	6,55
3,75	7,26	3,87	4,12	4,36	4,60	4,84	5,08	5,33	5,57	5,81	6,05	6,29	6,54	6,78	7,02	7,26
4,00	8,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75
4,25	8,76	4,64	4,90	5,15	5,41	5,67	5,93	6,18	6,44	6,70	6,96	7,22	7,47	7,73	7,99	8,25
4,50	9,55	5,04	5,30	5,57	5,83	6,10	6,36	6,63	6,89	7,16	7,42	7,69	7,95	8,22	8,49	8,75
4,75	10,35	5,45	5,72	5,99	6,27	6,54	6,81	7,08	7,36	7,63	7,90	8,17	8,45	8,72	8,99	9,26
5,00	11,18	5,87	6,15	6,43	6,71	6,99	7,27	7,55	7,83	8,11	8,39	8,66	8,94	9,22	9,50	9,78
5,25	12,03	6,30	6,59	6,87	7,16	7,45	7,73	8,02	8,31	8,59	8,88	9,17	9,45	9,74	10,02	10,31
5,50	12,90	6,74	7,04	7,33	7,62	7,92	8,21	8,50	8,79	9,09	9,38	9,67	9,97	10,26	10,55	10,85

a) The anchor spacing and the edge distance shall not be smaller than the minimum anchor spacing s_{min} and the minimum edge distance c_{min}.

Influence of embedment depth

Anchor size	M8	M10	M12	M16	M20
f_{hef} =	1,38	1,21	1,04	1,22	1,45

Influence of edge distance [a)]

c/d	4	6	8	10	15	20	30	40
$f_c = (d / c)^{0,19}$	0,77	0,71	0,67	0,65	0,60	0,57	0,52	0,50

a) The edge distance shall not be smaller than the minimum edge distance c_{min}.

Combined tension and shear loading

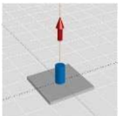
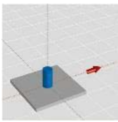
For combined tension and shear loading see section “Anchor Design”.

Precalculated values – design resistance values

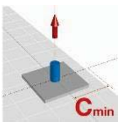
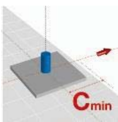
All data applies to:
- non-cracked concrete C 20/25 – $f_{ck,cube}$ =25 N/mm²
- temperature range I (see service temperature range)
- minimum thickness of base material
- no effects of dense reinforcement

Recommended loads can be calculated by dividing the design resistance by an overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

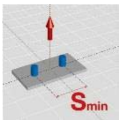
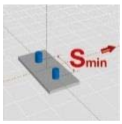
Design resistance: non-cracked- concrete C 20/25

Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
Embedment depth h_{ef}		[mm]	90	110	125	170	205
Base material thickness $h = h_{min}$		[mm]	120	150	170	230	270
	**Tensile N_{Rd}: single anchor, no edge effects**						
	Non-cracked concrete						
	HIS-N	[kN]	17,5	30,7	44,7	74,6	74,1
	HIS-RN	[kN]	13,9	21,9	31,6	58,8	69,2
	Cracked concrete						
	HIS-N	[kN]	16,5	26,6	33,5	53,2	70,4
	HIS-RN	[kN]	13,9	21,9	31,6	53,2	69,2
	**Shear V_{Rd}: single anchor, no edge effects, without lever arm**						
	Non-cracked concrete						
	HIS-N	[kN]	10,4	18,4	26,0	39,3	36,7
	HIS-RN	[kN]	8,3	12,8	19,2	35,3	41,5
	Cracked concrete						
	HIS-N	[kN]	10,4	18,4	26,0	39,3	36,7
	HIS-RN	[kN]	8,3	12,8	19,2	35,3	41,5

Design resistance: non-cracked- concrete C 20/25

Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
Embedment depth h_{ef}		[mm]	90	110	125	170	205
Base material thickness $h = h_{min}$		[mm]	120	150	170	230	270
Edge distance $c = c_{min}$		[mm]	40	45	55	65	90
	**Tensile N_{Rd}: single anchor, min. edge distance ($c = c_{min}$)**						
	Non-cracked concrete						
	HIS-N	[kN]	13,1	17,5	21,6	33,1	44,9
	HIS-RN	[kN]	13,1	17,5	21,6	33,1	44,9
	Cracked concrete						
	HIS-N	[kN]	8,4	13,2	17,1	25,9	35,9
	HIS-RN	[kN]	8,4	13,2	17,1	25,9	35,9
	**Shear V_{Rd}: single anchor, min. edge distance ($c = c_{min}$), without lever arm**						
	Non-cracked concrete						
	HIS-N	[kN]	4,2	5,5	7,6	10,8	17,2
	HIS-RN	[kN]	4,2	5,5	7,6	10,8	17,2
	Cracked concrete						
	HIS-N	[kN]	3,0	3,9	5,4	7,7	12,2
	HIS-RN	[kN]	3,0	3,9	5,4	7,7	12,2

Design resistance: non-cracked- concrete C 20/25

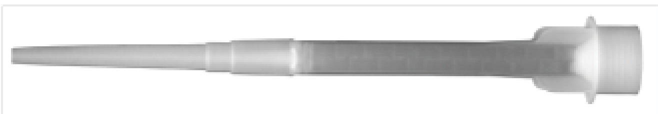
Anchor size	M8x90	M10x110	M12x125	M16x170	M20x205
Embedment depth h_{ef} [mm]	90	110	125	170	205
Base material thickness $h = h_{min}$ [mm]	120	150	170	230	270
Spacing $s = s_{min}$ [mm]	40	45	55	65	90
Tensile N_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$) 					
Non-cracked concrete					
HIS-N [kN]	15,8	21,3	25,9	40,6	54,3
HIS-RN [kN]	13,9	21,3	25,9	40,6	54,3
Cracked concrete					
HIS-N [kN]	10,1	15,4	19,2	30,0	40,4
HIS-RN [kN]	10,1	15,4	19,2	30,0	40,4
Shear V_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$), without lever arm 					
Non-cracked concrete					
HIS-N [kN]	10,4	18,4	26,0	39,3	36,7
HIS-RN [kN]	8,3	12,8	19,2	35,3	41,5
Cracked concrete					
HIS-N [kN]	10,4	18,4	26,0	39,3	36,7
HIS-RN [kN]	8,3	12,8	19,2	35,3	41,5

Hilti HIT-HY 200 mortar with rebar (as anchor)

Injection mortar system

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

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



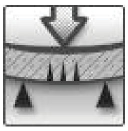
Static mixer

rebar BSt 500 S

Benefits

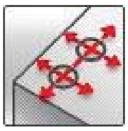
- **SAFEset** technology: drilling and borehole cleaning in one step with Hilti hollow drill bit
- suitable for cracked and non-cracked concrete C 20/25 to C 50/60
- ETA seismic approval C1
- high loading capacity, excellent handling
- HY 200-R version with extended curing time for rebar applications
- small edge distance and anchor spacing possible
- large diameter applications
- in service temperature range up to 120°C short term/72°C long term
- manual cleaning for anchor size Ø8 to Ø16 and embedment depth $h_{ef} \leq 10d$ for non-cracked concrete
- embedment depth range: from 60 ... 160 mm for Ø8 to 128 ... 640 mm for Ø32
- two mortar (A and R) versions available with different curing times and same performance

Concrete

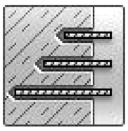


Tensile zone

Seismic ETA-C1



Small edge distance and spacing



Variable embedment depth

Approved automatic cleaning while drilling

SAFEset

Hilti SAFEset technology with hollow drill bit

European Technical Approval

CE conformity

PROFIS Anchor design software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	DIBt, Berlin	ETA-11/0493 / 2013-06-20 (Hilti HIT-HY 200-A) ETA-12/0084 / 2013-06-20 (Hilti HIT-HY 200-R)

a) All data given in this section according ETA-11/0493 and ETA-12/0084, issue 2013-06-20.

Basic loading data (for a single anchor)

All data in this section applies to — For details see Simplified design method

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Base material thickness, as specified in the table
- One typical embedment depth, as specified in the table
- One anchor material, as specified in the tables
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Temperate range I
  (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C)
- Installation temperature range +5°C to +40°C

Embedment depth a) and base material thickness for the basic loading data.

Mean ultimate resistance, characteristic resistance, design resistance, recommended loads.

	Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Typical embedment depth [mm]	80	90	110	125	145	170	210	270	300
Base material thickness [mm]	110	120	145	165	185	220	275	340	380

a) The allowed range of embedment depth is shown in the setting details. The corresponding load values can be calculated according to the simplified design method.

Mean ultimate resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², anchor rebar BSt 500S

			Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size			**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Non cracked concrete											
Tensile $N_{Ru,m}$	BSt 500 S	[kN]	*29,4*	45,0	*65,1*	87,6	116,1	148,6	204,0	297,4	348,4
Shear $V_{Ru,m}$	BSt 500 S	[kN]	*14,7*	*23,1*	*32,6*	*44,1*	*57,8*	*90,3*	*141,8*	*177,5*	*232,1*
Cracked concrete											
Tensile $N_{Ru,m}$	BSt 500 S	[kN]	-	18,8	38,5	51,1	67,7	99,3	145,4	212,0	248,3
Shear $V_{Ru,m}$	BSt 500 S	[kN]	-	*23,1*	*32,6*	*44,1*	*57,8*	*90,3*	*141,8*	*177,5*	*232,1*

Characteristic resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², anchor rebar BSt 500 S

			Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size			**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Non cracked concrete											
Tensile N_{Rk}	BSt 500 S	[kN]	24,1	33,9	49,8	66,0	87,5	111,9	153,7	224,0	262,4
Shear V_{Rk}	BSt 500 S	[kN]	*14,0*	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135,0*	*169,0*	*221,0*
Cracked concrete											
Tensile N_{Rk}	BSt 500 S	[kN]	-	14,1	29,0	38,5	51,0	74,8	109,6	159,7	187,1
Shear V_{Rk}	BSt 500 S	[kN]	-	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135,0*	*169,0*	*221,0*

Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², anchor rebar BSt 500 S

			Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size			**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Non cracked concrete											
Tensile N_{Rd}	BSt 500 S	[kN]	16,1	22,6	33,2	44,0	58,3	74,6	102,5	149,4	174,9
Shear V_{Rd}	BSt 500 S	[kN]	9,3	14,7	20,7	28,0	36,7	57,3	90,0	112,7	147,3
Cracked concrete											
Tensile N_{Rd}	BSt 500 S	[kN]	-	9,4	19,4	25,7	34,0	49,8	73,0	106,5	124,7
Shear V_{Rd}	BSt 500 S	[kN]	-	14,7	20,7	28,0	36,7	57,3	90,0	112,7	147,3

Recommended loads a): concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², anchor rebar BSt 500 S

			Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Non cracked concrete											
Tensile N_{rec}	BSt 500 S	[kN]	11,5	16,2	23,7	31,4	41,6	53,3	73,2	106,7	125,0
Shear V_{rec}	BSt 500 S	[kN]	6,7	10,5	14,8	20,0	26,2	41,0	64,3	80,5	105,2
Cracked concrete											
Tensile N_{rec}	BSt 500 S	[kN]	-	6,7	13,8	18,3	24,3	35,6	52,2	76,1	89,1
Shear V_{rec}	BSt 500 S	[kN]	-	10,5	14,8	20,0	26,2	41,0	64,3	80,5	105,2

a) With overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Service temperature range

Hilti HIT-HY 200 injection mortar may be applied in the temperature ranges given below. An elevated base material temperature may lead to a reduction of the design bond resistance.

Temperature range	Base material temperature	Maximum long term base material temperature	Maximum short term base material temperature
Temperature range I	-40 °C to +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +80 °C	+50 °C	+80 °C
Temperature range III	-40 °C to +120 °C	+72 °C	+120 °C

Max short term base material temperature
Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Max long term base material temperature
Long-term elevated base material temperatures are roughly constant over significant periods of time.

Materials

Mechanical properties of rebar BSt 500S

			Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Nominal tensile strength f_{uk}	BSt 500 S	[N/mm²]	550	550	550	550	550	550	550	550	550
Yield strength f_{yk}	BSt 500 S	[N/mm²]	500	500	500	500	500	500	500	500	500
Stressed cross-section A_s	BSt 500 S	[mm²]	50,3	78,5	113,1	153,9	201,1	314,2	490,9	615,8	804,2
Moment of resistance W	BSt 500 S	[mm³]	50,3	98,2	169,6	269,4	402,1	785,4	1534	2155	3217

Material quality

Part	Material
rebar BSt 500 S	Geometry and mechanical properties according to DIN 488-2:1986 or E DIN 488-2:2006

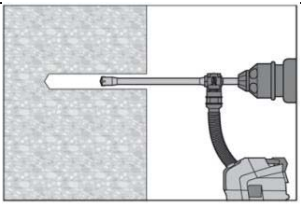
Setting

Installation equipment

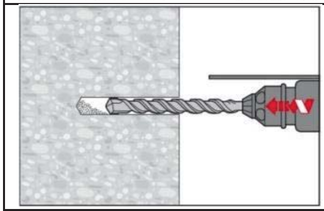
Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
Rotary hammer	TE 2 – TE 16					TE 40 – TE 70			
Other tools	compressed air gun or blow out pump, set of cleaning brushes, dispenser								

Setting instruction

Bore hole drilling



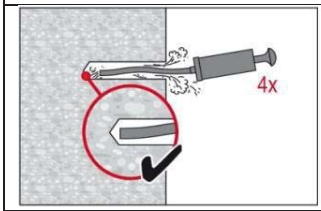
Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment. This drilling method properly cleans the borehole and removes dust while drilling. After drilling is complete, proceed to the “injection preparation” step in the instructions for use.



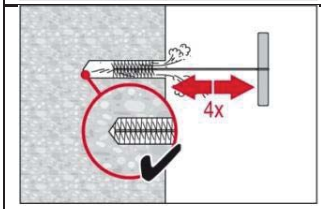
Drill Hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

Bore hole cleaning Just before setting an anchor, the bore hole must be free of dust and debris.

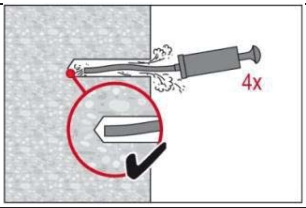
a) Manual Cleaning (MC) non-cracked concrete only
for bore hole diameters $d_0 \leq$ 20mm and bore hole depth $h_0 \leq 10d$



The Hilti manual pump may be used for blowing out bore holes up to diameters $d_0 \leq$ 20 mm and embedment depths up to $h_{ef} \leq 10d$.
Blow out at least 4 times from the back of the bore hole until return air stream is free of noticeable dust

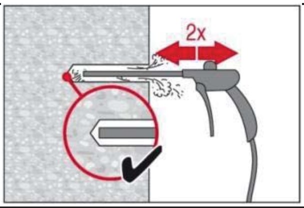


Brush 4 times with the specified brush size by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small and must be replaced with the proper brush diameter.

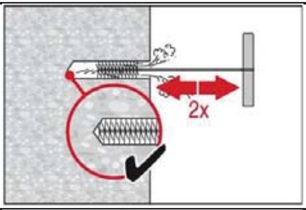


Blow out again with manual pump at least 4 times until return air stream is free of noticeable dust.

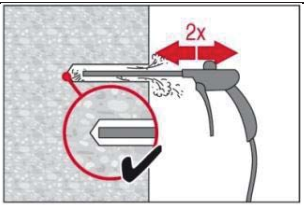
b) Compressed air cleaning (CAC)
for all bore hole diameters d_0 and all bore hole depth h_0



Blow 2 times from the back of the hole (if needed with nozzle extension) over the hole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust. Bore hole diameter ≥ 32 mm the compressor must supply a minimum air flow of 140 m³/hour.

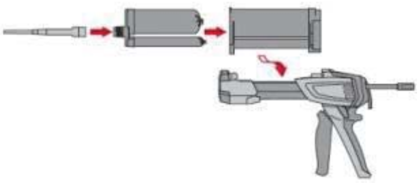


Brush 2 times with the specified brush size by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small and must be replaced with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

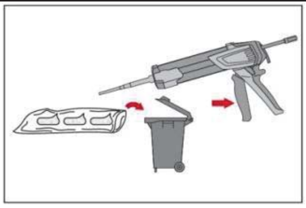


Blow again with compressed air 2 times until return air stream is free of noticeable dust.

Injection preparation

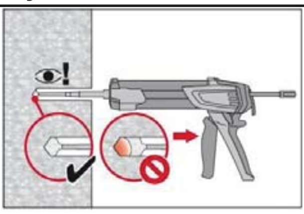


Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle. Observe the instruction for use of the dispenser. Check foil pack holder for proper function. Do not use damaged foil packs / holders. Swing foil pack holder with foil pack into HIT-dispenser.

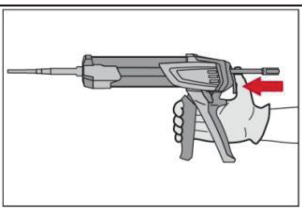


Discard initial adhesive. The foil pack opens automatically as dispensing is initiated. Depending on the size of the foil pack an initial amount of adhesive has to be discarded.
Discard quantities are:
- 2 strokes for 330 ml foil pack,
- 3 strokes for 500 ml foil pack,
- 4 strokes for 500 ml foil pack ≤ 5°C.

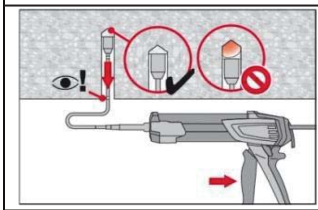
Inject adhesive from the back of the borehole without forming air voids



Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull. Fill holes approximately 2/3 full, or as required to ensure that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment length.

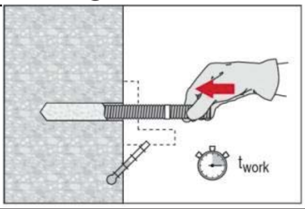
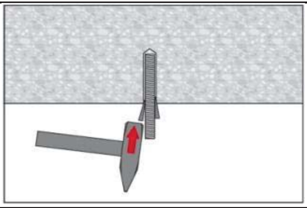
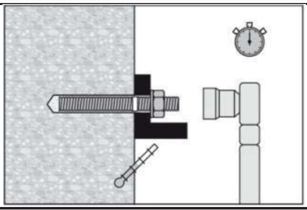


After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.



Overhead installation and/or installation with embedment depth h_{ef} > 250mm. For overhead installation 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. Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the bore hole by the adhesive pressure.

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 untill working time t_{work} has elapsed.
	For overhead installation use piston plugs and fix embedded parts with e.g. wedges
	Loading the anchor: After required curing time t_{cure} the anchor can be loaded. The applied installation torque shall not exceed T_{max}.

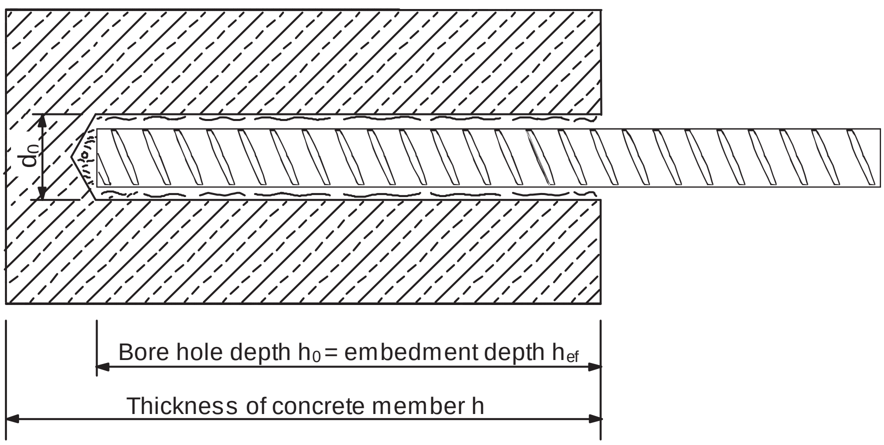
For detailed information on installation see instruction for use given with the package of the product.

Working time, curing time

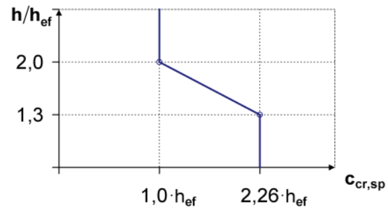
Temperature of the base material	Hilti HIT-HY 200-R	
	Working time in which anchor can be inserted and adjusted t_{work}	Curing time before anchor can be loaded t_{cure}
-10 °C to -5 °C	3 hour	20 hour
-4 °C to 0 °C	2 hour	8 hour
1 °C to 5 °C	1 hour	4 hour
6 °C to 10 °C	40 min	2,5 hour
11 °C to 20 °C	15 min	1,5 hour
21 °C to 30 °C	9 min	1 hour
31 °C to 40 °C	6 min	1 hour

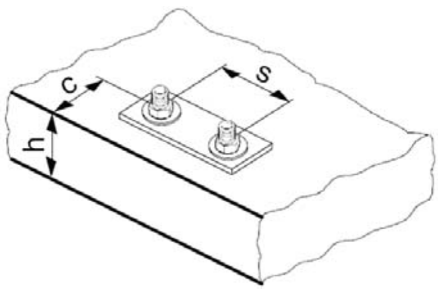
Temperature of the base material	Hilti HIT-HY 200-A	
	Working time in which anchor can be inserted and adjusted t_{work}	Curing time before anchor can be loaded t_{cure}
-10 °C to -5 °C	1,5 hour	7 hour
-4 °C to 0 °C	50 min	4 hour
1 °C to 5 °C	25 min	2 hour
6 °C to 10 °C	15 min	75 min
11 °C to 20 °C	7 min	45 min
21 °C to 30 °C	4 min	30 min
31 °C to 40 °C	3 min	30 min

Setting details



Setting details

			Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size			**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Nominal diameter of drill bit	d_0	[mm]	12 (10)a)	14 (12)a)	16 (14)a)	18	20	25	32	35	40
Effective anchorage and drill hole depth range b)	$h_{ef,min}$	[mm]	60	60	70	75	80	90	100	112	128
	$h_{ef,max}$	[mm]	160	200	240	280	320	400	500	560	640
Minimum base material thickness	h_{min}	[mm]	h_{ef} + 30 mm			h_{ef} + 2 d_0					
Minimum spacing	s_{min}	[mm]	40	50	60	70	80	100	125	140	160
Minimum edge distance	c_{min}	[mm]	40	50	60	70	80	100	125	140	160
Critical spacing for splitting failure	$s_{cr,sp}$		2 $c_{cr,sp}$								
Critical edge distance for splitting failure c)	$c_{cr,sp}$	[mm]	**1,0 · h_{ef}** for $h / h_{ef} \geq 2{,}0$								
			4,6 h_{ef} - 1,8 h for $2{,}0 > h / h_{ef} > 1{,}3$								
			2,26 h_{ef} for $h / h_{ef} \leq 1{,}3$								
Critical spacing for concrete cone failure	$s_{cr,N}$		2 $c_{cr,N}$								
Critical edge distance for concrete cone failure d)	$c_{cr,N}$		1,5 h_{ef}								



For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.

a) both given values for drill bit diameter can be used

b) $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$ (h_{ef}: embedment depth)

c) h: base material thickness ($h \geq h_{min}$)

d) The critical edge distance for concrete cone failure depends on the embedment depth h_{ef} and the design bond resistance. The simplified formula given in this table is on the save side.

Simplified design method

Simplified version of the design method according ETAG 001, TR 029. Design resistance according data given in ETA-11/0493 issued 2013-06-20 for HIT-HY 200-A and ETA-12/0084 issued 2013-06-20 for HIT-HY 200-R. Both mortars possess identical technical load performance.

- Influence of concrete strength
- Influence of edge distance
- Influence of spacing
- Valid for a group of two anchors. (The method may also be applied for anchor groups with more than two anchors or more than one edge distance. The influencing factors must then be considered for each edge distance and spacing. The simplified calculated design loads take a conservative approach: They will be lower than the exact values according to ETAG 001, TR 029. For an optimized design, anchor calculation can be performed using PROFIS anchor design software.

The design method is based on the following simplification:

- No different loads are acting on individual anchors (no eccentricity)

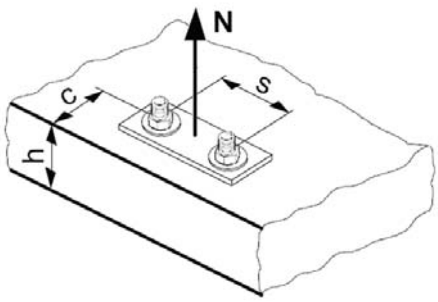
The values are valid for one anchor.

For more complex fastening applications please use the anchor design software PROFIS Anchor.

Tension loading

The design tensile resistance is the lower value of

- Steel resistance: $N_{Rd,s}$
- Combined pull-out and concrete cone resistance:
  $N_{Rd,p} = N^0_{Rd,p} \cdot f_{B,p} \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,p} \cdot f_{re,N}$
- Concrete cone resistance: $N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,N} \cdot f_{re,N}$
- Concrete splitting resistance (only non-cracked concrete):
  $N_{Rd,sp} = N^0_{Rd,c} \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,N} \cdot f_{re,N}$



Basic design tensile resistance

Design steel resistance $N_{Rd,s}$

	Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
$N_{Rd,s}$ BSt 500 S [kN]	20,0	30,7	44,3	60,7	79,3	123,6	192,9	242,1	315,7

Design combined pull-out and concrete cone resistance

$N_{Rd,p} = N^0_{Rd,p} \cdot f_{B,p} \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,p} \cdot f_{re,N}$

	Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Typical embedment depth $h_{ef,typ}$ [mm]	**80**	**90**	**110**	**125**	**145**	**170**	**210**	**270**	**300**
Non cracked concrete									
$N^0_{Rd,p}$ Temperature range I [kN]	16,1	22,6	33,2	44,0	58,3	85,5	131,9	190,0	241,3
$N^0_{Rd,p}$ Temperature range II [kN]	13,4	18,8	27,6	36,7	48,6	71,2	110,0	158,3	201,1
$N^0_{Rd,p}$ Temperature range III [kN]	11,4	16,0	23,5	31,2	41,3	60,5	93,5	134,6	170,9
Cracked concrete									
$N^0_{Rd,p}$ Temperature range I [kN]	-	9,4	19,4	25,7	34,0	49,8	77,0	110,8	140,7
$N^0_{Rd,p}$ Temperature range II [kN]	-	7,5	15,2	20,2	26,7	39,2	60,5	87,1	110,6
$N^0_{Rd,p}$ Temperature range III [kN]	-	6,6	13,8	18,3	24,3	35,6	55,0	79,2	100,5

Design concrete cone resistance $N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{h,N} \cdot f_{re,N}$

Design splitting resistance [a)] $N_{Rd,sp} = N^0_{Rd,c} \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,N} \cdot f_{re,N}$

	Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
$N^0_{Rd,c}$ Non cracked concrete [kN]	24,1	28,7	38,8	47,1	58,8	74,6	102,5	149,4	174,9
$N^0_{Rd,c}$ Cracked concrete [kN]	-	20,5	27,7	33,5	41,9	53,2	73,0	106,5	124,7

a) Splitting resistance must only be considered for non-cracked concrete

Influencing factors

Influence of concrete strength on combined pull-out and concrete cone resistance

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_{B,p} = (f_{ck,cube}/25N/mm^2)^{0,1}$ a)	1						

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of embedment depth on combined pull-out and concrete cone resistance

$$f_{h,p} = h_{ef}/h_{ef,typ}$$

Influence of concrete strength on concrete cone resistance

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25N/mm^2)^{1/2}$ a)	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of edge distance a)

	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$c/c_{cr,N}$ $c/c_{cr,sp}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$f_{1,N} = 0,7 + 0,3 \cdot c/c_{cr,N}$ $f_{1,sp} = 0,7 + 0,3 \cdot c/c_{cr,sp}$	0,73	0,76	0,79	0,82	0,85	0,88	0,91	0,94	0,97	1
$f_{2,N} = 0,5 \cdot (1 + c/c_{cr,N})$ $f_{2,sp} = 0,5 \cdot (1 + c/c_{cr,sp})$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1

a) The the edge distance shall not be smaller than the minimum edge distance c_{min} given in the table with the setting details. These influencing factors must be considered for every edge distance smaller than the critical edge distance.

Influence of anchor spacing a)

	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$s/s_{cr,N}$ $s/s_{cr,sp}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$f_{3,N} = 0,5 \cdot (1 + s/s_{cr,N})$ $f_{3,sp} = 0,5 \cdot (1 + s/s_{cr,sp})$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1

a) The anchor spacing shall not be smaller than the minimum anchor spacing s_{min} given in the table with the setting details. This influencing factor must be considered for every anchor spacing.

Influence of embedment depth on concrete cone resistance

$$f_{h,N} = (h_{ef}/h_{ef,typ})^{1,5}$$

Influence of reinforcement

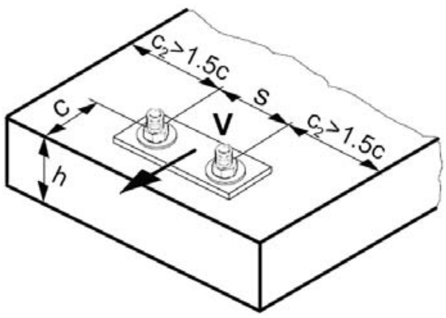
h_{ef} [mm]	60	70	80	90	≥ 100
$f_{re,N} = 0,5 + h_{ef}/200mm \le 1$	0,8 a)	0,85 a)	0,9 a)	0,95 a)	1

a) This factor applies only for dense reinforcement. If in the area of anchorage there is reinforcement with a spacing ≥ 150 mm (any diameter) or with a diameter ≤ 10 mm and a spacing ≥ 100 mm, then a factor $f_{re} = 1$ may be applied.

Shear loading

The design shear resistance is the lower value of

- Steel resistance: $V_{Rd,s}$
- Concrete pryout resistance: $V_{Rd,cp} = k \cdot$ lower value of $N_{Rd,p}$ and $N_{Rd,c}$
- Concrete edge resistance: $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_ß \cdot f_h \cdot f_4 \cdot f_{hef} \cdot f_c$



Basic design shear resistance

Design steel resistance $V_{Rd,s}$

	Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
$V_{Rd,s}$ BSt 500 S [kN]	9,3	14,7	20,7	28,0	36,7	57,3	90,0	112,7	147,3

Design concrete pryout resistance $V_{Rd,cp}$ = lower value[a)] of $k \cdot N_{Rd,p}$ and $k \cdot N_{Rd,c}$

k = 2

a) $N_{Rd,p}$: Design combined pull-out and concrete cone resistance
$N_{Rd,c}$: Design concrete cone resistance

Design concrete edge resistance $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_ß \cdot f_h \cdot f_4 \cdot f_{hef} \cdot f_c$

		Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size		**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Non-cracked concrete										
$V^0_{Rd,c}$	[kN]	5,9	8,6	11,6	15,0	18,7	27,0	39,2	47,3	59,0
Cracked concrete										
$V^0_{Rd,c}$	[kN]	-	6,1	8,2	10,6	13,2	19,2	27,7	33,5	41,8

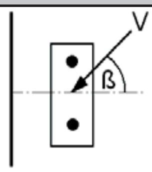
Influencing factors

Influence of concrete strength

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25N/mm^2)^{1/2\ a)}$	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of angle between load applied and the direction perpendicular to the free edge

Angle ß	0°	10°	20°	30°	40°	50°	60°	70°	80°	≥ 90°
$f_\beta = \sqrt{\frac{1}{(\cos\alpha_V)^2 + \left(\frac{\sin\alpha_V}{2,5}\right)^2}}$ 	1	1,01	1,05	1,13	1,24	1,40	1,64	1,97	2,32	2,50

Influence of base material thickness

h/c	0,15	0,3	0,45	0,6	0,75	0,9	1,05	1,2	1,35	≥ 1,5
$f_h = \{h/(1,5 \cdot c)\}^{1/2} \leq 1$	0,32	0,45	0,55	0,63	0,71	0,77	0,84	0,89	0,95	1,00

Influence of anchor spacing and edge distance a) for concrete edge resistance: f_4

$f_4 = (c/h_{ef})^{1,5} \cdot (1 + s / [3 \cdot c]) \cdot 0,5$

c/h_{ef}	Single anchor	Group of two anchors s/h_{ef}														
		0,75	1,50	2,25	3,00	3,75	4,50	5,25	6,00	6,75	7,50	8,25	9,00	9,75	10,50	11,25
0,50	0,35	0,27	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35
0,75	0,65	0,43	0,54	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65
1,00	1,00	0,63	0,75	0,88	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
1,25	1,40	0,84	0,98	1,12	1,26	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40
1,50	1,84	1,07	1,22	1,38	1,53	1,68	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
1,75	2,32	1,32	1,49	1,65	1,82	1,98	2,15	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32
2,00	2,83	1,59	1,77	1,94	2,12	2,30	2,47	2,65	2,83	2,83	2,83	2,83	2,83	2,83	2,83	2,83
2,25	3,38	1,88	2,06	2,25	2,44	2,63	2,81	3,00	3,19	3,38	3,38	3,38	3,38	3,38	3,38	3,38
2,50	3,95	2,17	2,37	2,57	2,77	2,96	3,16	3,36	3,56	3,76	3,95	3,95	3,95	3,95	3,95	3,95
2,75	4,56	2,49	2,69	2,90	3,11	3,32	3,52	3,73	3,94	4,15	4,35	4,56	4,56	4,56	4,56	4,56
3,00	5,20	2,81	3,03	3,25	3,46	3,68	3,90	4,11	4,33	4,55	4,76	4,98	5,20	5,20	5,20	5,20
3,25	5,86	3,15	3,38	3,61	3,83	4,06	4,28	4,51	4,73	4,96	5,18	5,41	5,63	5,86	5,86	5,86
3,50	6,55	3,51	3,74	3,98	4,21	4,44	4,68	4,91	5,14	5,38	5,61	5,85	6,08	6,31	6,55	6,55
3,75	7,26	3,87	4,12	4,36	4,60	4,84	5,08	5,33	5,57	5,81	6,05	6,29	6,54	6,78	7,02	7,26
4,00	8,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75
4,25	8,76	4,64	4,90	5,15	5,41	5,67	5,93	6,18	6,44	6,70	6,96	7,22	7,47	7,73	7,99	8,25
4,50	9,55	5,04	5,30	5,57	5,83	6,10	6,36	6,63	6,89	7,16	7,42	7,69	7,95	8,22	8,49	8,75
4,75	10,35	5,45	5,72	5,99	6,27	6,54	6,81	7,08	7,36	7,63	7,90	8,17	8,45	8,72	8,99	9,26
5,00	11,18	5,87	6,15	6,43	6,71	6,99	7,27	7,55	7,83	8,11	8,39	8,66	8,94	9,22	9,50	9,78
5,25	12,03	6,30	6,59	6,87	7,16	7,45	7,73	8,02	8,31	8,59	8,88	9,17	9,45	9,74	10,02	10,31
5,50	12,90	6,74	7,04	7,33	7,62	7,92	8,21	8,50	8,79	9,09	9,38	9,67	9,97	10,26	10,55	10,85

a) The anchor spacing and the edge distance shall not be smaller than the minimum anchor spacing s_{min} and the minimum edge distance c_{min}.

Influence of embedment depth

h_{ef}/d	4	4,5	5	6	7	8	9	10	11
$f_{hef} = 0,05 \cdot (h_{ef} / d)^{1,68}$	0,51	0,63	0,75	1,01	1,31	1,64	2,00	2,39	2,81
h_{ef}/d	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
$f_{hef} = 0,05 \cdot (h_{ef} / d)^{1,68}$	3,25	3,72	4,21	4,73	5,27	5,84	6,42	7,04	7,67

Influence of edge distance a)

c/d	4	6	8	10	15	20	30	40
$f_c = (d / c)^{0,19}$	0,77	0,71	0,67	0,65	0,60	0,57	0,52	0,50

a) The edge distance shall not be smaller than the minimum edge distance c_{min}.

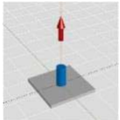
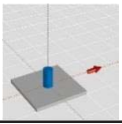
Combined tension and shear loading

For combined tension and shear loading see section "Anchor Design".

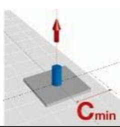
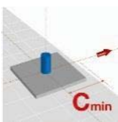
Precalculated values

Recommended loads can be calculated by dividing the design resistance by an overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

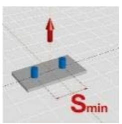
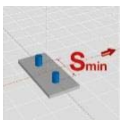
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², Temperature range I

	Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Embedment depth $h_{ef,1}$ = [mm]	60	60	72	84	96	120	150	168	192
Base material thickness h_{min}= [mm]	90	90	104	120	136	170	214	238	272
 **Tensile N_{Rd}: single anchor, no edge effects**									
Non cracked concrete									
BSt 500 S [kN]	12,1	15,1	20,6	25,9	31,7	44,3	61,8	73,3	89,6
Cracked concrete									
BSt 500 S [kN]	-	6,3	12,7	17,2	22,5	31,5	44,1	52,3	63,9
 **Shear V_{Rd}: single anchor, no edge effects, without lever arm**									
Non cracked concrete									
BSt 500 S [kN]	9,3	14,7	20,7	28,0	36,7	57,3	90,0	112,7	147,3
Cracked concrete									
BSt 500 S [kN]	-	12,6	20,7	28,0	36,7	57,3	88,2	104,5	127,7

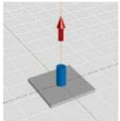
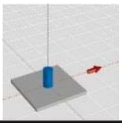
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², Temperature range I

	Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Embedment depth $h_{ef,1}$ = [mm]	60	60	72	84	96	120	150	168	192
Base material thickness h_{min}= [mm]	90	90	104	120	136	170	214	238	272
Edge distance $c = c_{min}$= [mm]	40	50	60	80	100	120	135	150	150
 **Tensile N_{Rd}: single anchor, min. edge distance ($c = c_{min}$)**									
Non cracked concrete									
BSt 500 S [kN]	7,3	9,4	12,0	16,0	20,4	27,9	37,2	43,7	50,4
Cracked concrete									
BSt 500 S [kN]	-	4,2	8,5	12,6	17,3	23,7	31,0	36,6	41,6
 **Shear V_{Rd}: single anchor, min. edge distance ($c = c_{min}$), without lever arm**									
Non cracked concrete									
BSt 500 S [kN]	3,5	4,9	6,7	10,3	13,7	19,3	25,2	30,2	32,0
Cracked concrete									
BSt 500 S [kN]	-	3,5	4,7	7,3	9,7	13,6	17,8	21,4	22,7

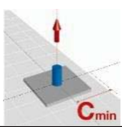
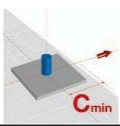
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², Temperature range I
(load values are valid for single anchor)

	Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Embedment depth $h_{ef,1}$ = [mm]	60	60	72	84	96	120	150	168	192
Base material thickness h_{min}= [mm]	90	90	104	120	136	170	214	238	272
Spacing $s = s_{min}$= [mm]	40	50	60	80	100	120	135	150	150
 **Tensile N_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$)**									
Non cracked concrete									
BSt 500 S [kN]	7,9	9,5	12,4	16,0	19,9	27,5	37,8	44,6	53,3
Cracked concrete									
BSt 500 S [kN]	-	4,5	8,4	11,6	15,2	21,0	28,7	33,9	40,2
 **Shear V_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$), without lever arm**									
Non cracked concrete									
BSt 500 S [kN]	9,3	14,7	20,7	28,0	36,7	57,3	80,4	95,1	112,9
Cracked concrete									
BSt 500 S [kN]	-	8,0	16,2	22,7	30,3	42,1	57,3	67,8	80,5

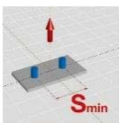
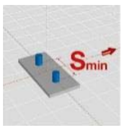
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², Temperature range I

		Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
	Anchor size	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
	Embedment depth $h_{ef,typ}$ = [mm]	80	90	110	125	145	170	210	270	300
	Base material thickness h_{min}= [mm]	110	120	142	161	185	220	274	340	380
	**Tensile N_{Rd}: single anchor, no edge effects**									
	Non cracked concrete									
	BSt 500 S [kN]	16,1	22,6	33,2	44,0	58,3	74,6	102,5	149,4	174,9
	Cracked concrete									
	BSt 500 S [kN]	-	9,4	19,4	25,7	34,0	49,8	73,0	106,5	124,7
	**Shear V_{Rd}: single anchor, no edge effects, without lever arm**									
	Non cracked concrete									
	BSt 500 S [kN]	9,3	14,7	20,7	28,0	36,7	57,3	90,0	112,7	147,3
	cracked concrete									
	BSt 500 S [kN]	-	14,7	20,7	28,0	36,7	57,3	90,0	112,7	147,3

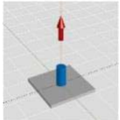
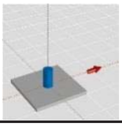
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², Temperature range I

		Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
	Anchor size	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
	Embedment depth $h_{ef,typ}$ = [mm]	80	90	110	125	145	170	210	270	300
	Base material thickness h_{min}= [mm]	110	120	142	161	185	220	274	340	380
	Edge distance $c = c_{min}$= [mm]	40	50	60	80	100	120	135	150	150
	**Tensile N_{Rd}: single anchor, min. edge distance ($c = c_{min}$)**									
	Non cracked concrete									
	BSt 500 S [kN]	9,2	12,9	18,6	23,7	30,4	38,9	51,7	72,0	81,9
	Cracked concrete									
	BSt 500 S [kN]	-	5,4	11,1	15,6	21,6	31,0	43,2	59,2	66,5
	**Shear V_{Rd}: single anchor, min. edge distance ($c = c_{min}$), without lever arm**									
	Non cracked concrete									
	BSt 500 S [kN]	3,7	5,3	7,3	11,2	15,8	21,5	27,5	34,3	36,5
	Cracked concrete									
	BSt 500 S [kN]	-	3,8	5,2	7,9	11,2	15,2	19,5	24,3	25,8

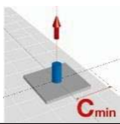
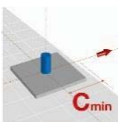
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², Temperature range I
(load values are valid for single anchor)

		Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
	Anchor size	**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
	Embedment depth $h_{ef,typ}$ = [mm]	80	90	110	125	145	170	210	270	300
	Base material thickness h_{min}= [mm]	110	120	142	161	185	220	274	340	380
	Spacing $s = s_{min}$= [mm]	40	50	60	80	100	120	135	150	150
	**Tensile N_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$)**									
	Non cracked concrete									
	BSt 500 S [kN]	10,6	14,5	20,8	26,9	33,9	43,1	58,5	83,9	97,1
	Cracked concrete									
	BSt 500 S [kN]	-	6,5	12,7	16,9	22,4	31,5	44,3	63,1	72,7
	**Shear V_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$), without lever arm**									
	Non cracked concrete									
	BSt 500 S [kN]	9,3	14,7	20,7	28,0	36,7	57,3	90,0	112,7	147,3
	Cracked concrete									
	BSt 500 S [kN]	-	14,7	20,7	28,0	36,7	57,3	88,7	112,7	145,5

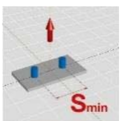
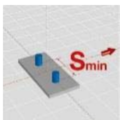
Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², Temperature range I

		Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size		**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Embedment depth $h_{ef,2}$ =	[mm]	96	120	144	168	192	240	300	336	384
Base material thickness h_{min}=	[mm]	126	150	176	204	232	290	364	406	464
	**Tensile N_{Rd}: single anchor, no edge effects**									
	Non cracked concrete									
	BSt 500 S [kN]	19,3	30,2	43,4	59,1	77,2	120,6	174,9	207,4	253,3
	Cracked concrete									
	BSt 500 S [kN]	-	12,6	25,3	34,5	45,0	70,4	110,0	137,9	180,2
	**Shear V_{Rd}: single anchor, no edge effects, without lever arm**									
	Non cracked									
	BSt 500 S [kN]	9,3	14,7	20,7	28,0	36,7	57,3	90,0	112,7	147,3
	Cracked concrete									
	BSt 500 S [kN]	-	14,7	20,7	28,0	36,7	57,3	90,0	112,7	147,3

Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², Temperature range I

		Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size		**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Embedment depth $h_{ef,2}$ =	[mm]	96	120	144	168	192	240	300	336	384
Base material thickness h_{min}=	[mm]	126	150	176	204	232	290	364	406	464
Edge distance $c = c_{min}$=	[mm]	40	50	60	80	100	120	135	150	150
	**Tensile N_{Rd}: single anchor, min. edge distance ($c = c_{min}$)**									
	Non cracked concrete									
	BSt 500 S [kN]	11,0	17,2	24,8	33,9	42,4	58,6	79,7	94,3	111,7
	Cracked concrete									
	BSt 500 S [kN]	-	7,2	14,5	20,9	28,5	43,7	64,0	75,7	88,6
	**Shear V_{Rd}: single anchor, min. edge distance ($c = c_{min}$) , without lever arm**									
	Non cracked and cracked concrete									
	BSt 500 S [kN]	3,9	5,7	7,8	12,0	16,9	23,6	30,5	36,7	39,6
	Cracked concrete									
	BSt 500 S [kN]	-	4,0	5,5	8,5	12,0	16,7	21,6	26,0	28,1

Design resistance: concrete C 20/25 – $f_{ck,cube}$ = 25 N/mm², Temperature range I
(load values are valid for single anchor)

		Data according ETA-11/0493 and ETA-12/0084, issue 2013-06-20								
Anchor size		**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø25**	**Ø28**	**Ø32**
Embedment depth $h_{ef,2}$ =	[mm]	96	120	144	168	192	240	300	336	384
Base material thickness h_{min}=	[mm]	126	150	176	204	232	290	364	406	464
Spacing $s = s_{min}$=	[mm]	40	50	60	80	100	120	135	150	150
	**Tensile N_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$)**									
	Non cracked concrete									
	BSt 500 S [kN]	12,9	19,9	28,1	38,4	49,9	69,5	96,2	113,9	137,6
	Cracked concrete									
	BSt 500 S [kN]	-	8,8	17,0	23,3	30,5	46,3	69,3	84,9	102,1
	**Shear V_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$) , without lever arm**									
	Non cracked concrete									
	BSt 500 S [kN]	9,3	14,7	20,7	28,0	36,7	57,3	90,0	112,7	147,3
	Cracked concrete									
	BSt 500 S [kN]	-	14,3	20,7	28,0	36,7	57,3	90,0	112,7	147,3

Seismic design C1

Basic loading data for concrete C20/25 – C50/60

All data in this section applies to:
- Seismic design according to TR045

The following technical data are based on: ETA-11/0493 and ETA-12/0084, issue 2013-06-20

Anchorage depth range

Anchor size			Φ8	Φ10	Φ12	Φ14	Φ16	Φ20	Φ25	Φ28	Φ32
Effective anchorage depth range	$h_{ef,min}$	[mm]	60	60	70	75	80	90	100	112	128
	$h_{ef,max}$	[mm]	160	200	240	280	320	400	500	560	640

Tension resistance in case of seismic performance category C1

Anchor size			Φ8	Φ10	Φ12	Φ14	Φ16	Φ20	Φ25	Φ28	Φ32
Characteristic tension resistance to steel failure											
Rebar B500B Acc. to DIN 488:2009-08	$N_{Rk,s,seis}$	[kN]	-	43	62	85	111	173	270	339	442
Partial safety factor Acc. to DIN 488:2009-08	$\gamma_{Ms,seis}$	[-]	1,4								
Characteristic bond resistance in cracked concrete C20/25 to C50/60											
Temp. range I: 40°C/24°C	$\tau_{Rk,seis}$	[N/mm²]	-	4,4	6,1						
Temp. range II: 80°C/50°C	$\tau_{Rk,seis}$	[N/mm²]	-	3,5	4,8						
Temp. range III: 120°C/72°C	$\tau_{Rk,seis}$	[N/mm²]	-	3	4,4						
Partial safety factor	$\gamma_{Mp,seis}$	[-]	1,5								
Concrete cone resistance and splitting resistance											
Partial safety factor	$\gamma_{Mc,seis} = \gamma_{Msp,seis}$	[-]	1,5								

Displacement under tension load in case of seismic performance category C1 [1)]

Anchor size			Φ8	Φ10	Φ12	Φ14	Φ16	Φ20	Φ25	Φ28	Φ32
Displacement [1)]	$\delta_{N,seis}$	[mm]	-	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3

1) Maximum displacement during cycling (seismic event).

Shear resistance in case of seismic performance category C1

Anchor size			Φ8	Φ10	Φ12	Φ14	Φ16	Φ20	Φ25	Φ28	Φ32
Characteristic shear resistance to steel failure											
Rebar B500B Acc. to DIN 488:2009-08	$N_{Rk,s,seis}$	[kN]	-	15	22	29	39	60	95	118	155
Partial safety factor Acc. to DIN 488:2009-08	$\gamma_{Ms,seis}$	[-]	1,5								
Concrete pryout resistance and concrete edge resistance											
Partial safety factor	$\gamma_{Mcp,seis} = \gamma_{Mc,seis}$	[-]	1,5								

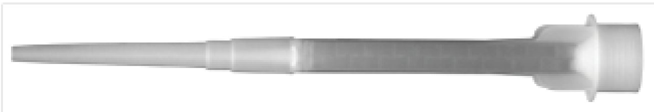
Displacement under shear load in case of seismic performance category C1 [1)]

Anchor size			Φ8	Φ10	Φ12	Φ14	Φ16	Φ20	Φ25	Φ28	Φ32
Displacement[1)]	$\delta_{V,seis}$	[mm]	-	3,5	3,8	4,1	4,4	5,0	5,8	6,2	6,8

1) Maximum displacement during cycling (seismic event).

For seismic resistent fastening applications please use the anchor design software PROFIS Anchor.

Hilti HIT-HY 200 mortar with rebar (as post-installed connection)

Injection mortar system		Benefits
	Hilti HIT-HY 200-R 330 ml foil pack (also available as 500 ml foil pack)	- **SAFEset** technology: drilling and borehole cleaning in one step with Hilti hollow drill bit - HY 200-R version is formulated for best handling and cure time specifically for rebar applications - Suitable for concrete C 12/15 to C 50/60 - Suitable for dry and water saturated concrete - For rebar diameters up to 32 mm - Non corrosive to rebar elements - Good load capacity at elevated temperatures - Suitable for embedment length up to 1000 mm - Suitable for applications down to -10 °C - Two mortar (A and R) versions available with different curing times and same performance
	Hilti HIT-HY 200-A 330 ml foil pack (also available as 500 ml foil pack)	
	Static mixer	
	Rebar	

Concrete	Fire resistance	European Technical Approval	Corrosion tested	PROFIS Rebar design software	Hilti SAFEset technology with hollow drill bit

Service temperature range

Temperature range: -40°C to +80°C (max. long term temperature +50°C, max. short term temperature +80°C).

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	DIBt, Berlin	ETA-12/0083 / 2013-06-05 (HIT-HY 200-R) ETA-11/0492 / 2013-06-05 (HIT-HY 200-A)
Fire test report	CSTB, Paris	26033756

a) All data given in this section according ETA-12/0083, issued 2013-06-05 and ETA-11/0492, issued 2013-06-05.

Materials

Reinforcement bars according to EC2 Annex C Table C.1 and C.2N.

Properties of reinforcement

Product form		**Bars and de-coiled rods**	
Class		B	C
Characteristic yield strength f_{yk} or $f_{0,2k}$ (MPa)		400 to 600	
Minimum value of $k = (f_t/f_y)_k$		≥ 1,08	≥ 1,15 < 1,35
Characteristic strain at maximum force, ε_{uk} (%)		≥ 5,0	≥ 7,5
Bendability		Bend / Rebend test	
Maximum deviation from nominal mass (individual bar) (%)	Nominal bar size (mm) ≤ 8 > 8	 ± 6,0 ± 4,5	
Bond: Minimum relative rib area, $f_{R,min}$	Nominal bar size (mm) 8 to 12 > 12	 0,040 0,056	

Setting details

For detailed information on installation see instruction for use given with the package of the product.

Working time, curing time[a)]

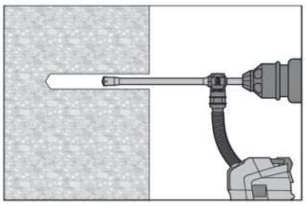
Temperature of the base material	**HIT-HY 200-R**	
	Working time in which anchor can be inserted and adjusted t_{work}	**Curing time before anchor can be fully loaded t_{cure}**
-10 °C to -5 °C	3 hour	20 hour
-4 °C to 0 °C	2 hour	7 hour
1 °C to 5 °C	1 hour	3 hour
6 °C to 10 °C	40 min	2 hour
11 °C to 20 °C	15 min	1 hour
21 °C to 30 °C	9 min	1 hour
31 °C to 40 °C	6 min	1 hour

Temperature of the base material	**HIT-HY 200-A**	
	Working time in which anchor can be inserted and adjusted t_{work}	**Curing time before anchor can be fully loaded t_{cure}**
-10 °C to -5 °C	1,5 hour	7 hour
-4 °C to 0 °C	50 min	4 hour
1 °C to 5 °C	25 min	2 hour
6 °C to 10 °C	15 min	1 hour
11 °C to 20 °C	7 min	30 min
21 °C to 30 °C	4 min	30 min
31 °C to 40 °C	3 min	30 min

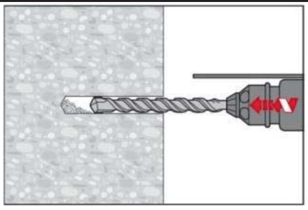
Setting instruction

a) Dry and water-saturated concrete, hammer drilling

Bore hole drilling



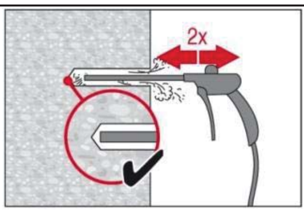
Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment. This drilling method properly cleans the borehole and removes dust while drilling.
After drilling is complete, proceed to the “injection preparation” step in the instructions for use.



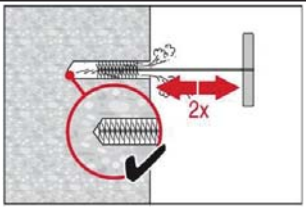
Drill hole to the required embedment depth using a hammer-drill with carbide drill bit set in rotation hammer mode, a Hilti hollow drill bit or a compressed air drill.

Bore hole cleaning Just before setting an anchor, the bore hole must be free of dust and debris by one of two cleaning methods described below

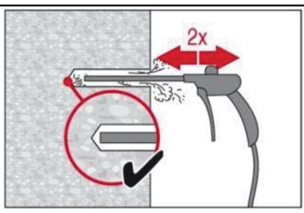
b) Compressed air cleaning (CAC)
For all bore hole diameters d_0 and all bore hole depth h_0



Blowing 2 times from the back of the hole with oil-free compressed air (min. 6 bar at 100 litres per minute (LPM)) until return air stream is free of noticeable dust. Bore hole diameter ≥ 32 mm the compressor must supply a minimum air flow of 140 m³/hour.
If required use additional accessories and extensions for air nozzle and brush to reach back of hole.



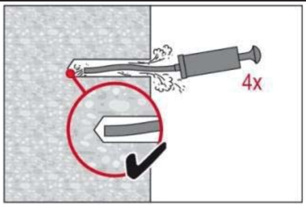
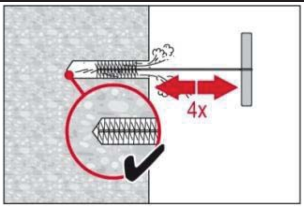
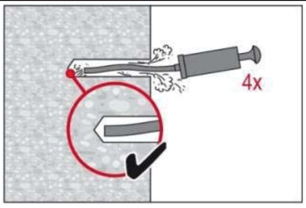
Brushing 2 times with the specified brush size (brush Ø ≥ borehole Ø) by inserting the round steel brush to the back of the hole in a twisting motion. The brush shall produce natural resistance as it enters the anchor hole. If this is not the case, please use a new brush or a brush with a larger diameter.



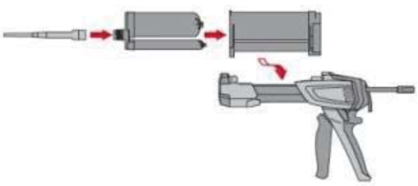
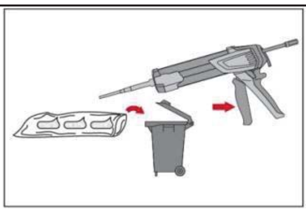
Blowing 2 times again with compressed air until return air stream is free of noticeable dust.

a) Manual Cleaning (MC)

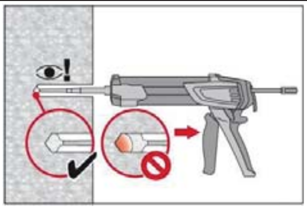
As an alternative to compressed air cleaning, a manual cleaning is permitted for hammer drilled boreholes up to hole diameters $d_0 \le 20mm$ and depths ℓ_v resp. $\ell_{e,ges.} \le 160mm$ or 10 * d. The borehole must be free of dust, debris, water, ice, oil, grease and other contaminants prior to mortar injection.

	4 strokes with Hilti blow-out pump from the back of the hole until return air stream is free of noticeable dust.
	4 times with the specified brush size (brush Ø ≥ borehole Ø) by inserting the round steel wire brush to the back of the hole with a twisting motion
	4 strokes with Hilti blow-out pump from the back of the hole until return air stream is free of noticeable dust.

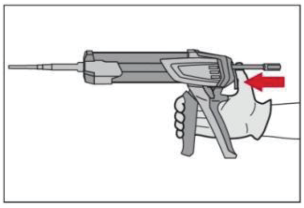
Injection preparation

	Observe the Instruction for Use of the dispenser. Observe the Instruction for Use of the mortar. Tightly attach Hilti HIT-RE-M mixing nozzle to foil pack manifold. Insert foil pack into foil pack holder and swing holder into the dispenser.
	Discard initial adhesive. 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. Discard quantities are 2 strokes for 330 ml foil pack, 3 strokes for 500 ml foil pack, 4 strokes for 500 ml foil pack ≤ 5°C.

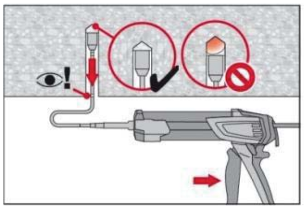
Inject adhesive from the back of the borehole without forming air voids



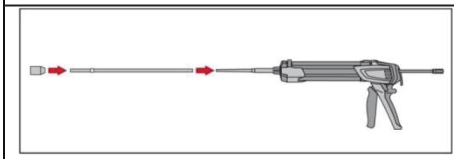
Injection method for borehole depth ≤ 250 mm:
Inject the mortar from the back of the hole towards the front and slowly withdraw the mixing nozzle step by step after each trigger pull. **Important! Use extensions for deep holes (> 250 mm)**. Fill holes approximately 2/3 full, or as required to ensure that the annular gap between the rebar and the concrete is completely filled with adhesive over the embedment length.



After injecting, depressurize the dispenser by pressing the release trigger (only for manual dispenser). This will prevent further mortar discharge from the mixing nozzle.

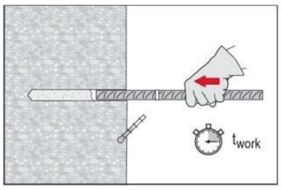


Piston plug injection for borehole depth > 250 mm or overhead applications: Assemble mixing nozzle, extension(s) and appropriately sized piston plug. Insert piston plug to back of the hole. Begin injection allowing the pressure of the injected adhesive mortar to push the piston plug towards the front of the hole. After injecting, depressurize the dispenser by pressing the release trigger. This will prevent further mortar discharge from the mixing nozzle.
The proper injection of mortar using a piston plug HIT-SZ prevents the creation of air voids. The piston plug must be insertable to the back of the borehole without resistance. During injection the piston plug will be pressed towards the front of the borehole slowly by mortar pressure. Attention! Pulling the injection or when changing the foil pack, the piston plug is rendered inactive and air voids may occur.

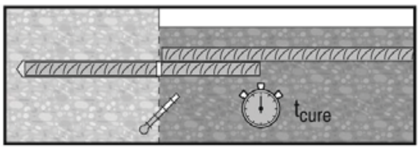


HDM 330	Manual dispenser	(330 ml)
HDM 500	Manual dispenser	(330 / 500 ml)
HDE 500-A22	Electric dispenser	(330 / 500 ml)

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 until working time t_{work} has elapsed.



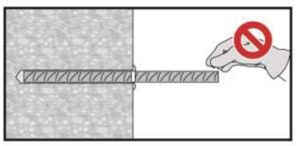
After installing the rebar the annular gap must be completely filled with mortar.

Proper installation can be verified when:

Desired anchoring embedment is reached ℓ_v:

Embedment mark at concrete surface.
Excess mortar flows out of the borehole after the rebar has been fully inserted until the embedment mark.

Overhead application: Support the rebar and secure it from falling till mortar started to harden.



Observe the working time "t_{work}", which varies according to temperature of base material. Minor adjustments to the rebar position may be performed during the working time. After t_{cure} preparation work may continue.

For detailed information on installation see instruction for use given with the package of the product.

Resistance to chemical substances

Chemical	Resistance	Chemical	Resistance
Air	+	Gasoline	+
Acetic acid 10%	+	Glycole	o
Acetone	o	Hydrogen peroxide 10%	o
Ammonia 5%	+	Lactic acid 10%	+
Benzyl alcohol	-	Maschinery oil	+
Chloric acid 10%	o	Methylethylketon	o
Chlorinated lime 10%	+	Nitric acid 10%	o
Citric acid 10%	+	Phosphoric acid 10%	+
Concrete plasticizer	+	Potassium Hydroxide pH 13,2	+
De-icing salt (Calcium chloride)	+	Sea water	+
Demineralized water	+	Sewage sludge	+
Diesel fuel	+	Sodium carbonate 10%	+
Drilling dust suspension pH 13,2	+	Sodium hypochlorite 2%	+
Ethanol 96%	-	Sulfuric acid 10%	+
Ethylacetate	-	Sulfuric acid 30%	+
Formic acid 10%	+	Toluene	o
Formwork oil	+	Xylene	o

+ resistant
o resistant in short term (max. 48h) contact
- not resistant

Electrical Conductivity

HIT-HY 200 in the hardened state **is not conductive electrically**. Its electric resistivity is $15{,}5{\cdot}10^9$ $\Omega{\cdot}$cm (DIN IEC 93 – 12.93). It is adapted well to realize electrically insulating anchorings (ex: railway applications, subway).

Drilling diameters

Rebar (mm)	Drill bit diameters d_0 [mm]	
	Hammer drill (HD)	Compressed air drill (CA)
8	12 (10 [a])	-
10	14 (12 [a])	-
12	16 (14 [a])	17
14	18	17
16	20	20
18	22	22
20	25	26
22	28	28
24	32	32
25	32	32
26	35	35
28	35	35
30	37	35
32	40	40

a) Max. installation length I = 250 mm.

Basic design data for rebar design according to ETA

Bond strength

Bond strength in N/mm² according to ETA for good bond conditions

Rebar (mm)	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8 - 32	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3

Minimum anchorage length

Minimum and maximum embedment depths and lap lengths for C20/25 according to ETA

Rebar		$l_{b,min}$* [mm]	$l_{0,min}$ * [mm]	Concrete temp. ≥ -10°C l_{max} [mm]	Concrete temp. ≥ 0°C l_{max} [mm]
Diameter d_s [mm]	$f_{y,k}$ [N/mm²]				
8	500	113	200	700	1000
10	500	142	200	700	1000
12	500	170	200	700	1000
14	500	198	210	700	1000
16	500	227	240	700	1000
18	500	255	270	700	1000
20	500	284	300	700	1000
22	500	312	330	700	1000
24	500	340	360	700	1000
25	500	354	375	700	1000
26	500	369	390	700	1000
28	500	397	420	700	1000
30	500	425	450	700	1000
32	500	454	480	700	1000

* $l_{b,min}$ (8.6) and $l_{0,min}$ (8.11) are calculated for good bond conditions with maximum utilisation of rebar yield strength f_{yk} = 500 N/mm² and α_6 = 1,0