Hilti injection technique HIT C100 – HAS, HAS-R

Features:
- An anchor fastening without expansion forces
- High loading capacity
- Short distances between anchors from edges
- Simple handling and setting by hand insertion

Material:

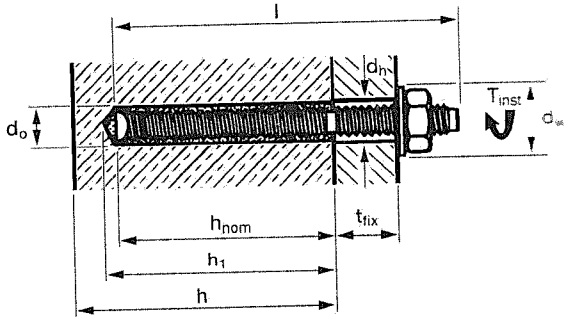
Anchor rod: HAS: Galvanized to min. 5 microns; 5.8
HAS-R: Stainless steel, A4-70, 1.4401

Mortar cartridge: HIT C100: Synthetic resin mortar based on modified epoxy acrylate

Dispenser: HIT P 2000, HIT P 3000, HIT P 5000

A4 316
Corrosion resistance

Edge distance/ spacing



Setting details

Setting details	Anchor size	M8	M10	M12	M16	M20
d_o (mm) Drill bit diameter		9	11	13	17	22
h_1 (mm) Hole depth		82	92	115	130	175
h_{nom} (mm) Minimum depth of embedment		80	90	110	125	170
t_{fix} (mm) Maximum fastened thickness		14	21	28	38	48
d_h (mm) Maximum clearance hole		11	13	15	19	26
l (mm) Rod length		110	130	160	190	240
T_{inst} (Nm) Maximum tightening torque	HAS	15	30	50	90	120
	HAS-R	12	25	40	90	120
S_W (mm) Width across flats		13	17	19	24	30
h (mm) Minimum base material thickness		120	140	160	180	220
Filling volume (Trigger pulls) P 2000		1	2	3	5	10
Drill bit		TE-C-9/15	TE-C-11/20	TE-C-13/20	TE-C-17/20	TE-Y-22/32
Drilling system		TE10, TE14, TE18-M	TE14, TE18-M, TE24, TE54			TE54, TE74

Recommended load F_{30}, in kN, in concrete

f_{cc} = 30 N/mm², ν = 3

Anchor size		M8	M10	M12	M16	M20
Tensile N	0°	3.5	5.1	7.1	10.7	16.0
Combined load	30°	3.7	5.2	7.6	11.6	17.8
	45°	3.8	5.3	7.8	12.1	18.8
	60°	3.8	5.4	8.0	12.6	19.7
Shear V	90°	4.0	5.5	8.5	13.5	21.5

Recommended load
for specific application:
$F_{rec} = F_{30} \cdot f_B \cdot f_T \cdot f_A \cdot f_R$

Influence of concrete strength f_B

$f_B = 1 + 0.01 \cdot (1 - \frac{\alpha}{90})\ (f_{cc,act} - 30)$

$(20 \leq f_{cc,act} \leq 55)$

Influence of depth of embedment f_T

$f_T = \frac{h_{act}}{h_{nom}}$

Limiting depth of embedment
$h_{lim} = 2.0\ h_{nom}$
h_{act} . . actual embedment depth

Characteristic loads R_k, in kN

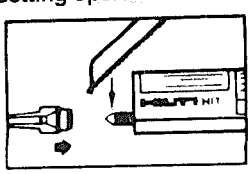
Type of loading	Concrete f_{cc} (N/mm²)	M8	M10	M12	M16	M20
Tensile N_{Rk}	20	9.5	13.8	19.2	28.9	43.2
	30	10.5	15.3	21.3	32.1	48.0
	50	12.6	18.4	25.6	38.5	57.6
Shear V_{Rk}	≥ 20	12.0	16.5	25.5	40.5	64.5

Setting conditions

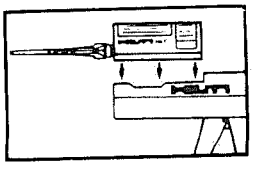
Temperature (°C)	Gel (working) time (min)	Curing time
– 5	45	6 h
0	25	3 h
5	12	1.5 h
20	4	45 min
30	3	25 min
40	2	15 min

The cartridge must have a temperature of at least +5°C when working.

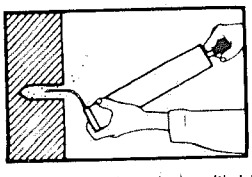
Setting operations



Cut open cartridge. Screw on mixer. Change mixer after long work breaks.



Put cartridge into dispenser. Give trigger 1-2 pulls (to remove unusable mortar).



Thoroughly clean hole with **blow-pump** or with **compressed air**. Do not clean with water when using HIT. All water must be removed before injecting the mortar. Films of water on the hole wall act as a separating agent and reduce the failure (ultimate) loads.

HIT C-100

Influence of anchor spacing and edge distance f_A, f_R

Reduction Factors (Anchor Spacing) f_A					
Tensile/Shear					
Spacing s (mm)	Anchor size				
	M8	M10	M12	M16	M20
40	0.78	0			
50	0.83	0.80	0		
60	0.89	0.85	0.80	0	
70	0.94	0.90	0.84	0.80	0
80	1.0	0.95	0.88	0.84	0
90		1.0	0.92	0.87	0.79
110			1.0	0.95	0.84
130				1.0	0.89
150				1.0	0.95
170					1.0

Reduction Factors (Edge Distance) f_R													
	Tensile f_{RN}					Shear f_{RV}							
Edge Distance c (mm)	Anchor size					Anchor size							
	M8	M10	M12	M16	M20	M8	M10	M12	M16	M20	M8	M10	M12	M16	M20
40	0.70	0				0.40	0								
50	0.74	0.72	0			0.50	0.44	0							
60	0.78	0.75	0.71	0		0.60	0.53	0.44	0						
70	0.81	0.78	0.74	0.72	0	0.70	0.62	0.51	0.45	0					
80	0.85	0.82	0.77	0.74	0	0.80	0.71	0.58	0.51	0					
90	0.89	0.85	0.80	0.77	0.71	0.90	0.80	0.65	0.58	0.42					
100	0.93	0.88	0.82	0.79	0.73	1.0	0.89	0.73	0.64	0.47					
120	1.0	0.95	0.88	0.84	0.76		1.0	0.87	0.77	0.56					
140		1.0	0.93	0.89	0.80			1.0	0.90	0.66					
170			1.0	0.96	0.85				1.0	0.80					
190				1.0	0.89				1.0	0.89					
220				1.0	0.94					1.0					
260					1.0										

Formula:
$s_{min} = 0.5\ h_{nom}$, $s_{cr} = 1.0\ h_{nom}$

$$f_A = 0.45 \frac{s}{h_{nom}} + 0.55$$

Formula:
$c_{min} = 0.5\ h_{nom}$, $c_{cr} = 1.5\ h_{nom}$

$$f_{RN} = 0.3 \frac{c}{h_{act}} + 0.55$$

Formula:
$c_{min} = 0.5\ h_{nom}$, $c_{cr} = 1.25\ h_{nom}$

$$f_{RV} = 0.8 \frac{c}{h_{nom}}$$

For combined loads: $f_{R\alpha} = f_{RN} - (f_{RN} - f_{RV}) \frac{\alpha}{90}$

Anchor mechanical properties

Property		Anchor size	M8	M10	M12	M16	M20
$f_{u,k}$ (N/mm²)	Nominal tensile strength	HAS	520	520	520	520	520
		HAS-R	700	700	700	700	700
$f_{y,k}$ (N/mm²)	Yield strength	HAS	420	420	420	420	420
		HAS-R	450	450	450	450	450
A_S (mm²)	Stressed cross section		32.8	52.3	76.2	144	225
W (mm³)	Moment of resistance (section modulus)		26.5	53.3	93.8	244	476
M (Nm)	Recommended bending moment	HAS	6.9	13.9	24.4	63.4	124
		HAS-R	7.9	16.0	28.1	73.1	143

New Safety-Concept (EUROCODE 1)

$$F_{act} \cdot \gamma_F = F_d \leq R_d = \frac{R_k}{\gamma_M}$$

F_{act} . . . actual load

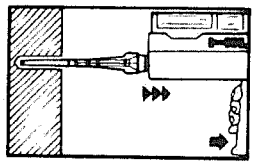
F_d . . . design action (load)

R_d . . . design resistance (anchor)

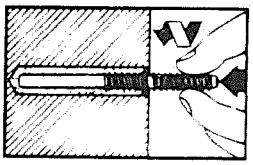
R_k . . . characteristic anchor resistance
N_k . . . tensile load
V_k . . . shear load

γ_F . . . partial safety factor (action/load) = 1.4

γ_M . . . partial safety factor (resistance) = 2.15



Insert mixer to bottom of hole. Inject mortar trigger pull by trigger pull.

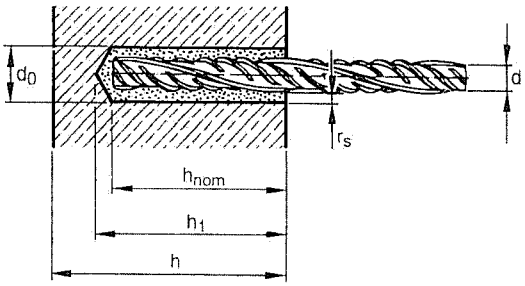


Insert anchor rod or rebar section slowly into mortar up to centering mark in desired depth of embedment.

Hilti HIT C100 injection technique – Starter Bar Fastenings

Features:
- An anchor fastening without expansion forces
- High loading capacity
- Short distances between anchors from edges
- Simple handling and setting by hand insertion

Material:
Mortar cartridge: HIT C100: Synthetic resin mortar based on modified epoxy acrylate
Rebar: Steel of the grade Bst 500 S (material no. 1.0438) DIN 488, ribbed, yield point 500 N/mm²
Dispenser: HIT P 2000, HIT P3000, HIT P 5000



Setting details

Setting details	Rebar nominal diameter	∅ 8	∅ 12	∅ 16	∅ 20
d_b	(mm) Over rebar ribs	9	13.5	18.5	23
d_o	(mm) Drill bit diameter	10	14	20	25
h_1	(mm) Hole depth	82	115	130	175
r_s*)	(mm) Annular space	1.1	1.1	2.1	2.6
h	(mm) Minimum base material thickness	120	160	180	220
**)	Filling volume (trigger pulls) P 2000	2	2	3	6
Drill bit		TE-C-10/20	TE-C-14/25	TE-C-20/25 TE-Y-20/32	TE-Y-25/32
Drilling system		TE10, TE14, TE18-M TE24		TE24, TE54 TE74	

*) relative to drill bit width across tip corners and nominal diameter of rebar
**) 1 cartridge = approx. 30 trigger pulls

Recommended load F_{30}, in kN, in concrete

f_{cc} = 30 N/mm², [1] = 3

Anchor size		∅ 8	∅ 12	∅ 16	∅ 20
Tensile N	0°	3.6	6.1	8.2	12.5
Combined load	30°	3.7	6.9	10.0	15.5
	45°	3.8	7.3	10.9	17.0
	60°	3.9	7.7	10.7	18.5
Shear V	90°	4.0	8.5	13.5	21.5

Setting conditions

Temperature (°C)	Gel (working) time (min)	Curing time
– 5	45	6 h
0	25	3 h
5	12	1.5 h
20	4	45 min
30	3	25 min
40	2	15 min

The cartridge must have a temperature of at least +5°C when working.

Recommended load
for specific application:
$F_{rec} = F_{30} \cdot f_B \cdot f_T$

Influence of concrete strength f_B

$$f_B = 1 + 0.01 \cdot (1 - \frac{\alpha}{90}) (f_{cc,act} - 30)$$

$(20 \leq f_{cc,act} \leq 55)$

Influence of depth of embedment f_T

$$f_T = \frac{h_{act}}{h_{nom}}$$

Limiting depth of embedment
$h_{lim} = 2.0\ h_{nom}$
If greater depths of embedment are required, loading test must be carried out on the site.
h_{act} . . . actual embedment depth

Distance from edge
c_{cr} = 1.5 × effective depth of embedment h_{act}

Distance between rebar sections
s_{cr} = 1.5 × effective depth of embedment h_{act}
If the min. distances between rebars are not kept to and smaller, it will be necessary to carry out loading test on the site.

Characteristic loads R_k, in kN

Type of loading	Concrete f_{cc} (N/mm²)	∅ 8	∅ 12	∅ 16	∅ 20
Tensile N_{Rk}	20	9.7	16.5	22.1	33.7
	30	10.8	18.3	24.6	37.5
	50	13.0	22.0	29.5	45.0
Shear V_{Rk}	≥ 20	12.0	25.5	40.5	64.5

HIT C100 Starter Bar

Tips

All recommended loads apply to holes cleaned well with a blow-pump or a jet of compressed air.
Holes for HIT fastenings should not be cleaned with water. Any water in holes must be removed before injecting the mortar. Films of water on the hole wall act as a separating agent and reduce the ultimate loads.
The best ultimate loads are obtained with HIT C100 rebar anchoring when the rebar section is set in homogeneous material in high strength. It is recommended that the rebar be turned in his hole to mix the remaining drilling dust and to achieve good filling of the voids and spaces.

New Safety-Concept (EUROCODE 1)

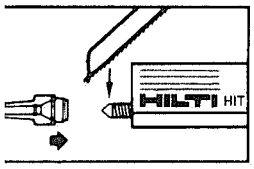
Partial safety factor: $\gamma_F = 1.4$, $\gamma_M = 2.15$ $\quad F_{act} \cdot \gamma_F = F_d \leq R_d = \frac{R_k}{\gamma_M}$

Ultimate loads, $N_{u,m}$, in kN, in concrete, Bst 500

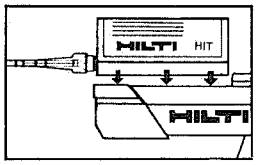
Thread size / Rebar nominal diameter		∅ 8	∅ 12	∅ 16	∅ 20
Concrete $f_{cc} = 24$ N/mm²	$N_{u,m}$ (kN)	17.8	30.3	34.4	51.0
	ν (%)	20.0	20.0	20.0	20.0
Concrete $f_{cc} = 53$ N/mm²	$N_{u,m}$ (kN)	24.8	41.3	56.3	90.2
	ν (%)	10.0	10.0	10.0	10.0

The ultimate loads $N_{u,m}$ were determined at room temperature.

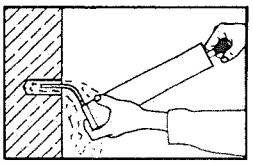
Setting operations



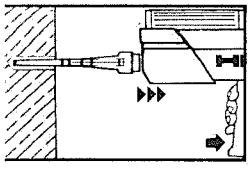
Cut open capsule. Screw on mixer. Change mixer after long work breaks.



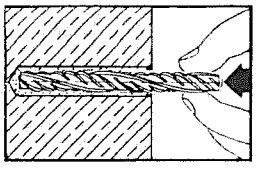
Put capsule into dispenser. Give trigger 1-2 pulls (to remove unusable mortar).



Thoroughly clean hole with **blow-pump** or with **compressed air**. Do not clean with water when using HIT. All water must be removed before injecting the mortar. Films of water on the hole wall act as a separating agent and reduce the failure (ultimate) loads



Insert mixer to bottom of hole. Inject mortar trigger pull by trigger pull.



Insert anchor rod or rebar section slowly into mortar up to centering mark to desired depth of embedment.