


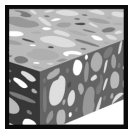


Hilti HIT-ICE with HIS-(R)N

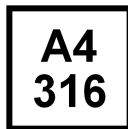
Injection mortar system		Benefits
	Hilti HIT-ICE 296 ml cartridge	<ul style="list-style-type: none"> - suitable for non-cracked concrete C 20/25 to C 50/60 - high loading capacity - suitable for dry and water saturated concrete - odourless resin - low installation temperature (range -23 °C to +32 °C)
	Statik mixer	
	HIS-(R)N sleeve	



Concrete



Small edge distance and spacing



Corrosion resistance



PROFIS Anchor design software

Basic loading data (for a single anchor)

All data in this section applies to

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Steel failure
- Screw strength class 8.8
- 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, $f_{ck,cube} = 25 \text{ N/mm}^2$
- Installation temperature range -18°C to +32°C

For details see Simplified design method

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
Embedment depth [mm]	90	110	125	170	205
Base material thickness [mm]	120	150	170	230	270

Mean ultimate resistance ^{a)}: concrete C 20/25 – $f_{ck,cube} = 25 \text{ N/mm}^2$, anchor HIS-N

			Hilti technical data				
Anchor size			M8	M10	M12	M16	M20
Tensile $N_{Ru,m}$	HIS-N	[kN]	27,3	48,2	61,0	105,6	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 – $f_{ck,cube} = 25 \text{ N/mm}^2$, anchor HIS-N

			Hilti technical data				
Anchor size			M8	M10	M12	M16	M20
Tensile N_{Rk}	HIS-N	[kN]	24,2	36,1	45,8	79,2	94,7
Shear V_{Rk}	HIS-N	[kN]	13,0	23,0	39,0	59,0	55,0

Design resistance: concrete C 20/25 – $f_{ck,cube} = 25 \text{ N/mm}^2$, anchor HIS-N

			Hilti technical data				
Anchor size			M8	M10	M12	M16	M20
Tensile N_{Rd}	HIS-N	[kN]	11,5	17,2	21,8	37,7	45,1
Shear V_{Rd}	HIS-N	[kN]	10,4	18,4	26,0	39,3	36,7

Recommended loads ^{a)}: concrete C 20/25 – $f_{ck,cube} = 25 \text{ N/mm}^2$, anchor HIS-N

			Hilti technical data				
Anchor size			M8	M10	M12	M16	M20
Tensile N_{rec}	HIS-N	[kN]	8,2	12,3	15,6	26,9	32,2
Shear V_{rec}	HIS-N	[kN]	7,4	13,1	18,6	28,1	26,2

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

Service temperature range

Hilti HIT-ICE 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 +70 °C	+43 °C	+70 °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			Hilti technical data				
			M8	M10	M12	M16	M20
Nominal tensile strength f_{uk}	HIS-N	[N/mm ²]	490	490	460	460	460
	Screw 8.8	[N/mm ²]	800	800	800	800	800
	HIS-RN	[N/mm ²]	700	700	700	700	700
	Screw A4-70	[N/mm ²]	700	700	700	700	700
Yield strength f_{yk}	HIS-N	[N/mm ²]	410	410	375	375	375
	Screw 8.8	[N/mm ²]	640	640	640	640	640
	HIS-RN	[N/mm ²]	350	350	350	350	350
	Screw A4-70	[N/mm ²]	450	450	450	450	450
Stressed cross-section A_s	HIS-(R)N	[mm ²]	51,5	108,0	169,1	256,1	237,6
	Screw	[mm ²]	36,6	58	84,3	157	245
Moment of resistance W	HIS-(R)N	[mm ³]	145	430	840	1595	1543
	Screw	[mm ³]	31,2	62,3	109	277	541

Material quality

Part	Material
internally threaded sleeves ^{a)} HIS-N	C-steel 1.0718, steel galvanized $\geq 5\mu\text{m}$
internally threaded sleeves ^{b)} HIS-RN	stainless steel 1.4401 and 1.4571

a) related fastening screw: strength class 8.8, A5 > 8% Ductile steel galvanized $\geq 5\mu\text{m}$

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	M8	M10	M12	M16	M20
Internal sleeve HIS-(R)N	M8x90	M10x110	M12x125	M16x170	M20x205
Anchor embedment depth [mm]	90	110	125	170	205

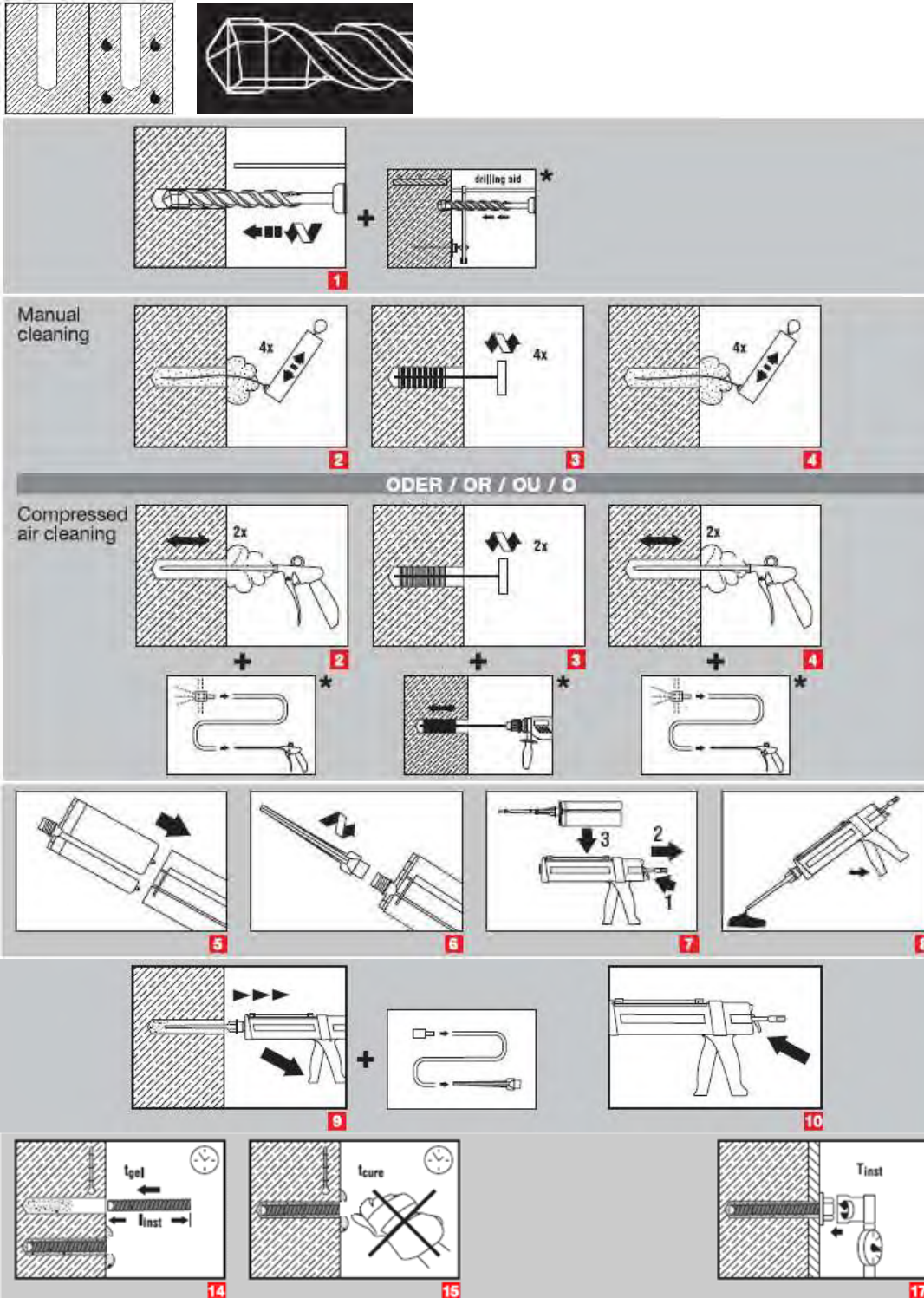
Setting

installation equipment

Anchor size	M8	M10	M12	M16	M20
Rotary hammer	TE 2 – TE 16		TE 40 – TE 50		
Other tools	compressed air gun or blow out pump, set of cleaning brushes, dispenser				

Setting instruction

Dry and water-saturated concrete, hammer drilling



a)

a) Note: Manual cleaning for HIS-(R)N M8 and HIS-(R)N M10 only!

Brush bore hole with required steel brush HIT-RB

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

Curing time for general conditions

Hilti technical data		
Temperature of the base material	Curing time before anchor can be fully loaded t_{cure}	Working time in which anchor can be inserted and adjusted t_{gel}
32 °C	35 min	1 min
21 °C	45 min	2,5 min
16 °C	1 h	5 min
4 °C	1 ½ h	15 min
- 7 °C	6 h	1 h
- 18 °C	24 h	1,5 h
- 23 °C	36 h	1,5 h

Setting details

			Hilti technical data				
Anchor size			M8	M10	M12	M16	M20
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 ^{a)}	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
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	$s_{cr,sp}$		$2 c_{cr,sp}$				
Critical edge distance for splitting failure ^{a)}	$c_{cr,sp}$	[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	$s_{cr,N}$		$2 c_{cr,N}$				
Critical edge distance for concrete cone failure	$c_{cr,N}$	^{b)}	$1.5 h_{ef}$				
Torque moment ^{c)}	T_{inst}	[Nm]	10	20	40	80	150

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

- h : base material thickness ($h \geq h_{min}$)
- 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.
- This is the maximum recommended torque moment to avoid splitting failure during installation for anchors with minimum spacing and/or edge distance.

Simplified design method

Simplified version of the design method according ETAG 001, TR 029. Design resistance according data given by Hilti.

- 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 calculated design loads are then on the save side: They will be lower than the exact values according ETAG 001, TR 029. To avoid this, it is recommended to use the anchor design software PROFIS anchor)

The design method is based on the following simplification:

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

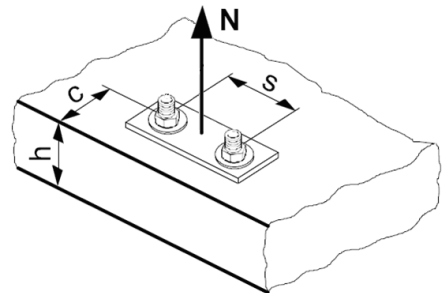
The values are valid for one anchor.

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



Basic design tensile resistance

Design steel resistance $N_{Rd,s}$

		Hilti technical data				
Anchor size		M8	M10	M12	M16	M20
$N_{Rd,s}$	HIS-N [kN]	17,4	30,7	44,7	80,3	74,1
	HIS-RN [kN]	13,9	21,9	31,6	58,8	69,2

Design combined pull-out and concrete cone resistance

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

		Hilti technical data				
Anchor size		M8	M10	M12	M16	M20
Embedment depth h_{ef} [mm]		90	110	125	170	205
$N_{Rd,p}^0$	Temperature range I [kN]	11,5	17,2	21,8	37,7	45,1

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

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

		Hilti technical data				
Anchor size		M8	M10	M12	M16	M20
$N_{Rd,c}^0$	[kN]	20,5	27,7	33,6	53,3	70,6

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	1,02	1,04	1,06	1,07	1,08	1,09

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
$f_B = (f_{ck,cube}/25N/mm^2)^{1/2}$ 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)

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

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)

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

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

$f_{h,N} = 1$

Influence of reinforcement

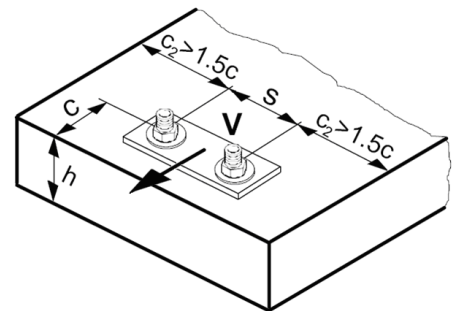
h_{ef} [mm]	80	90	≥ 100
$f_{re,N} = 0.5 + h_{ef}/200\text{mm} \leq 1$	0.9 ^{a)}	0.95 ^{a)}	1

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



Basic design shear resistance

Design steel resistance $V_{Rd,s}$

		Hilti technical data				
Anchor size		M8	M10	M12	M16	M20
$V_{Rd,s}$	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 concrete pryout resistance $V_{Rd,cp} = \text{lower value}^a)$ of $k \cdot N_{Rd,p}$ and $k \cdot N_{Rd,c}$

$$k = 1 \text{ for } h_{ef} < 60 \text{ mm}$$

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

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

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

Anchor size		M8	M10	M12	M16	M20
Non-cracked concrete						
$V_{Rd,c}^0$ [kN]		12,4	19,6	28,2	40,2	46,2

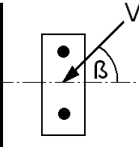
Influencing factors

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
$f_B = (f_{ck,cube}/25\text{N/mm}^2)^{1/2}$ 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 β	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} .

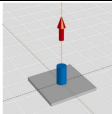
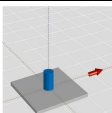
Combined tension and shear loading

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

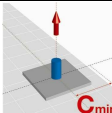
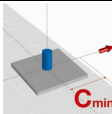
Precalculated values

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

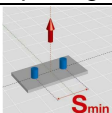
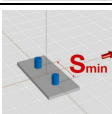
Design resistance: concrete C 20/25 – $f_{ck,cube} = 25 \text{ N/mm}^2$

		Hilti technical data				
Anchor size		M8	M10	M12	M16	M20
Embedment depth	$h_{ef} = [\text{mm}]$	90	110	125	170	205
Base material thickness	$h_{min} = [\text{mm}]$	120	150	170	230	270
	Tensile N_{Rd}: single anchor, no edge effects					
HIS-(R)N	[kN]	11,5	17,2	21,8	37,7	45,1
	Shear V_{Rd}: single anchor, no edge effects, without lever arm					
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: concrete C 20/25 – $f_{ck,cube} = 25 \text{ N/mm}^2$

		Hilti technical data				
Anchor size		M8	M10	M12	M16	M20
Embedment depth	$h_{ef} = [\text{mm}]$	90	110	125	170	205
Base material thickness	$h_{min} = [\text{mm}]$	120	150	170	230	270
Edge distance	$c = c_{min} = [\text{mm}]$	40	45	55	65	90
	Tensile N_{Rd}: single anchor, min. edge distance ($c = c_{min}$)					
HIS-(R)N	[kN]	6,1	8,8	11,3	19,1	25,5
	Shear V_{Rd}: single anchor, min. edge distance ($c = c_{min}$), without lever arm					
HIS-(R)N	[kN]	4,2	5,5	7,6	10,8	17,2

**Design resistance: concrete C 20/25 – $f_{ck,cube} = 25 \text{ N/mm}^2$
(load values are valid for single anchor)**

		Hilti technical data				
Anchor size		M8	M10	M12	M16	M20
Embedment depth	$h_{ef} = [\text{mm}]$	90	110	125	170	205
Base material thickness	$h_{min} = [\text{mm}]$	120	150	170	230	270
Spacing	$s = s_{min} = [\text{mm}]$	40	45	55	65	90
	Tensile N_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$)					
HIS-(R)N	[kN]	7,7	11,2	14,1	23,8	29,9
	Shear V_{Rd}: double anchor, no edge effects, min. spacing ($s = s_{min}$), without lever arm					
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

