Features:	
	- internal thread and small depth of embedment
	- anchor flush with surface
	- movement-controlled expansion
	- approved for suspended ceilings
Material:	
HKD-S/-E:	- galvanised >5 µm
HKD-SR/-ER:	- stainless steel : 1.4401, EN 10088

HKD-S / HKD-SR

HKD-E/-ER

CONC Concrete | A4 316 Corrosion resistance | Fire resistance | Hilti Anchor Programme

Basic loading data (for a single anchor): HKD-S /-E

All data on this section applies to

- concrete: as specified in the table
- no edge distance and spacing influence
- correct setting (See setting operations page 107)
- *steel* failure

For detailed design method, see pages 108 – 112.

CONC non-cracked concrete

Mean ultimate resistance, $R_{u,m}$ [kN]: concrete ≅ C20/25

Anchor size	M6x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
Tensile $N_{Ru,m}$	8.2	10.6	10.8	16.6	10.8	16.6	23.3	34.5	47.1
Shear $V_{Ru,m}$	*6.5*	*6.5*	*9.1*	*9.1*	*9.6*	*10.4*	*18.3*	*28.5*	*45.1*

Characteristic Resistance, R_K [kN]: concrete ≅ C20/25

Anchor size	M6x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
Tensile N_{Rk}	6.2	8.3	8.3	9.0	8.3	12.8	17.8	26.4	36.1
Shear V_{Rk}	*5.0*	*5.0*	*7.0*	*7.0*	*7.4*	*8.0*	*14.1*	*21.9*	*34.7*

Following values according the:

Concrete Capacity Method

Design resistance, R_d [kN]: concrete $f_{ck,cube}$= 25 N/mm

Anchor size	M6x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
Tensile N_{Rd}	3.0	4.6	4.6	5.0	4.6	7.1	9.9	17.6	24.1
Shear V_{Rd}	3.0	3.0	5.5	5.5	5.9	6.4	11.3	17.5	27.8

Recommended load L_{rec} [kN]: $f_{ck,cube}$= 25 N/mm

Anchor size	M6x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
Tensile N_{Rec}	2.1	3.3	3.3	3.6	3.3	5.1	7.1	12.6	17.2
Shear V_{Rec}	2.1	2.1	3.9	3.9	4.2	4.6	8.1	12.5	19.9

Bolt: 5.6, EN ISO 898-1
Min. length of thread engagement = bolt thread size + 2mm

Basic loading data (for a single anchor): HKD-SR /-ER

All data on this section applies to
- concrete: as specified in the table
- no edge distance and spacing influence
- correct setting (See setting operations page 107)
- *steel* failure

For detailed design method, see pages 108 – 112.

CONC **non-cracked concrete**

Mean ultimate resistance, $R_{u,m}$ [kN]: concrete ≅ C20/25

Anchor size	M6x25	M8x30	M10x40	M12x50	M16x65	M20x80
Tensile $N_{Ru,m}$	8.2	10.8	16.6	23.3	34.5	47.1
Shear $V_{Ru,m}$	8.3	10.9	13.7	24.3	41.7	66.3

Characteristic Resistance, R_K [kN]: concrete ≅ C20/25

Anchor size	M6x25	M8x30	M10x40	M12x50	M16x65	M20x80
Tensile N_{Rk}	6.2	8.3	12.8	17.8	26.4	36.1
Shear V_{Rk}	6.4	8.4	10.5	18.7	32.1	51.0

Following values according the:

Concrete Capacity Method

Design resistance, R_d [kN]: concrete $f_{ck,cube}$= 25 N/mm

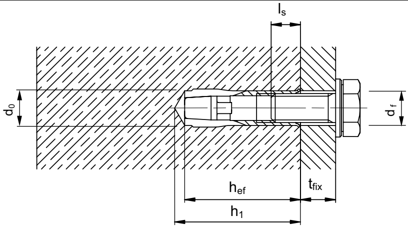
Anchor size	M6x25	M8x30	M10x40	M12x50	M16x65	M20x80
Tensile N_{Rd}	3.0	4.6	7.1	9.9	17.6	24.1
Shear V_{Rd}	4.1	5.5	6.9	12.3	21.1	33.6

Recommended load L_{rec} [kN]: $f_{ck,cube}$= 25 N/mm

Anchor size	M6x25	M8x30	M10x40	M12x50	M16x65	M20x80
Tensile N_{Rec}	2.1	3.3	5.1	7.1	12.6	17.2
Shear V_{Rec}	3.0	3.9	4.9	8.8	15.1	24.0

Bolt: A 4-70, EN ISO 3506
Min. length of thread engagement = bolt thread size + 2mm

Setting details



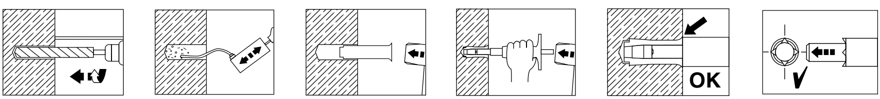
HKD-E/-S

Setting details / Anchor size			M6x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
d_0	[mm]	Drill bit diameter	8	8	10	10	12	12	15	20	25
h_1	[mm]	Hole depth	27	32	33	43	33	43	54	70	85
h_{ef}	[mm]	effect. anchorage depth	25	30	30	40	30	40	50	65	80
$l_{s,min/max}$	[mm]	Screwing depth	8/11	8/11	10/13	10/13	12/12	12/16	14/22	18/28	23/34
T_{inst}	[Nm]	Tightening torque	4	4	8	8	15	15	35	60	120
d_f	[mm]	Clearance hole	7	7	9	9	12	12	14	18	22
h	[mm]	Min. base material thickness	100	100	100	100	100	100	100	130	160
Drill bit			TE-CX-8/17		TE-CX-10/17		TE-CX-12/17 TE-TX-12/22		TE-CX-15/17 TE-TX-15/22	TE-C-20/22S TE-Y-20/32S	TE-C-25/27S TE-Y-25/32S

Installation equipment

A rotary hammer (TE2, TE6,TE6-A, TE 15, TE 15-C, TE 18-M, TE 35, TE 55, TE 76-ATC,TE 76); a blow out pump;
Manual setting tool HSD-G (M6 – M20);
Mechanical setting tool HSD-M (M6 – M20);

Setting operations



Drill hole. | Blow out dust and fragments. | Install the anchor. | Push in until marking is visible.

HILTI

HKD push-in anchor

Anchor mechanical properties

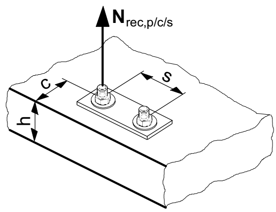
Anchor size				M6	M8	M10	M12	M16	M20
f_{uk}	[N/mm²]	Nominal tensile strength	HKD-S/-E	560	560	510	510	460	460
			HKD-SR/-ER	540	540	540	540	540	540
f_{yk}	[N/mm²]	Yield strength	HKD-S/-E	440	440	410	410	375	375
			HKD-SR/-ER	355	355	355	355	355	355
A_s	[mm²]	Stressed cross-section		20.9	26.1	28.8[1)] 31.6[2)]	58.7	102.8	163.8

1) h_{nom} = 30 mm
2) h_{nom} = 40 mm

Detailed design method - Hilti CC

(The Hilti CC-Method is a simplified Version of ETAG Annex C)

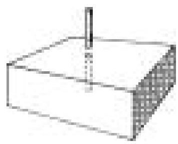
TENSION



The tensile design resistance of a single anchor is the lower of,

$N_{Rd,p}$: concrete pull-out resistance
$N_{Rd,c}$: concrete cone resistance
$N_{Rd,s}$: steel resistance

$N_{Rd,p}$: Pull-out resistance



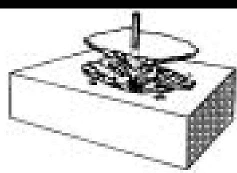
Pull-out failure mode is not determinating, except for HKD-E/-S M8x40

- $N_{Rd,p} = N^o_{Rd,p} \cdot f_B$

Anchor size HKD-E/-S	M8x40
$N^0_{Rd,p}$[1)] [kN]	5.0

1) The tensile design resistance is calculated from the tensile characteristic resistance $N^o_{Rk,p}$ by $N^o_{Rd,p} = N^o_{Rk,p}/\gamma_{Mp}$, where the partial safety factor γ_{Mp} is equal to 1.8.

$N_{Rd,c}$: Concrete cone resistance



$$N_{Rd,c} = N^o_{Rd,c} \cdot f_B \cdot f_{AN} \cdot f_{RN}$$

$N^0_{Rd,c}$: Design concrete cone resistance

- Concrete compressive strength $f_{ck,cube(150)}$ = 25 N/mm²

Anchor size HKD-E/HKD-S		M6x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
$N^0_{Rd,c}$[1)]	[kN]	3.0	4.6	4.6	7.1	4.6	7.1	9.9	17.6	24.1
h_{ef}	[mm]	25	30	30	40	30	40	50	65	80

Anchor size HKD-ER/HKD-SR		M6x25	M8x30	M10x40	M12x50	M16x65	M20x80
$N^0_{Rd,c}$[1)]	[kN]	3.0	4.6	7.1	9.9	17.6	24.1
h_{ef}	[mm]	25	30	40	50	65	80

1) The tensile design resistance is calculated from the tensile characteristic resistance $N^o_{Rk,p}$ by $N^o_{Rd,c} = N^o_{Rk,c}/\gamma_{Mc,N}$, where the partial safety factor $\gamma_{Mc,N}$ is equal to 1.8 for M6 to M12 and 1.5 for M16 to M20.

f_B: Influence of concrete strength

Concrete strength designation (ENV 206)	Cylinder compressive strength $f_{ck,cyl}$ [N/mm²]	**Cube compressive strength $f_{ck,cube}$ [N/mm²]**	**f_B**
C20/25	20	**25**	**1.0**
C25/30	25	**30**	**1.1**
C30/37	30	**37**	**1.22**
C35/45	35	**45**	**1.34**
C40/50	40	**50**	**1.41**
C45/55	45	**55**	**1.48**
C50/60	50	**60**	**1.55**
	Concrete cylinder: height 30cm, 15cm diameter	Concrete cube: side length 15cm	
	Concrete test specimen geometry		

$$f_B = \sqrt{\frac{f_{ck,cube}}{25}}$$

Limits:
$25\ N/mm^2 \leq f_{ck,cube(150)} \leq 60\ N/mm^2$

f_{AN}: Influence of anchor spacing

Anchor spacing s [mm]	HKD-S/SR/-E/-ER								
	M6x25	**M6x30**	**M8x30**	**M8x40**	**M10x30**	**M10x40**	**M12x50**	**M16x65**	**M20x80**
50	0.83								
60	0.90	0.83	0.83		0.83				
80		0.94	0.94	0.83	0.94	0.83			
90		1.00	1.00	0.88	1.00	0.88			
100				0.92		0.92			
110				0.96		0.96			
120				1.00		1.00			
130							0.93	0.83	
140							0.97	0.86	
150							1.00	0.88	
160								0.91	0.83
175								0.95	0.86
190								0.99	0.90
205									0.93
220									0.96
235									0.99
s_{min}	50	60	60	80	60	80	125	130	160

$$f_{AN} = 0.5 + \frac{s}{6 \cdot h_{ef}}$$

Limits:
$s_{min} \leq s \leq s_{cr,N}$

$s_{cr,N} = 3 \cdot h_{ef}$

f_{RN}: Influence of edge distance

$f_{RN}=1$

Limit $c_{min} \geq 3.5 \cdot h_{ef}$

Anchor size HKD-E/-S/-ER/-SR	**M6x25**	**M6x30**	**M8x30**	**M8x40**	**M10x30**	**M10x40**	**M12x50**	**M16x65**	**M20x80**
c_{min} [mm]	88	105	105	140	105	140	175	227	280

$N_{Rd,s}$: Steel design tensile resistance

Anchor size HKD-E/HKD-S		**M6x25**	**M6x30**	**M8x30**	**M8x40**	**M10x30**	**M10x40**	**M12x50**	**M16x65**	**M20x80**
$N_{Rd,s}$ [1)] [kN]	steel 4.6	4.0	4.0	7.3	7.3	11.6	11.6	16.9	31.4	49.0
$N_{Rd,s}$ [1)] [kN]	steel 5.6	5.0	5.1	9.2	9.2	12.4	13.4	21.1	37.2	59.1
$N_{Rd,s}$ [1)] [kN]	steel 5.8	6.7	6.7	11.4	11.4	12.4	13.4	23.7	37.2	59.1
$N_{Rd,s}$ [1)] [kN]	steel 8.8	8.7	8.8	11.4	11.4	12.4	13.4	23.7	37.2	59.1

Anchor size HKD-ER/HKD-SR	**M6x25**	**M8x30**	**M10x40**	**M12x50**	**M16x65**	**M20x80**
$N_{Rd,s}$ [1)] [kN]	6.9	9.1	11.5	20.4	35.1	55.7

[1)] The tensile design resistance is calculated from the tensile characteristic resistance $N_{Rd,s}$ by $N_{Rd,s}= N_{Rk,s}/\gamma_{Ms}$, where the partial safety factor γ_{Ms} varies with anchor types and sizes.

N_{Rd} : System design tensile resistance

N_{Rd} = lower of $N_{Rd,p}$, $N_{Rd,c}$ and $N_{Rd,s}$

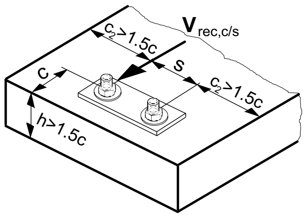
Combined loading: Only if tensile load and shear load applied (See page 31 and section 4 "Examples").

SHEAR

The design shear resistance of a single anchor is the lower of,

$V_{Rd,c}$: concrete edge resistance

$V_{Rd,s}$: steel resistance

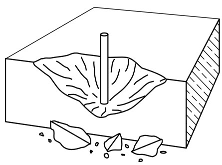


Note: If the conditions regarding h and c_2 are not met, consult your **Hilti technical advisory service.**

$V_{Rd,c}$: Concrete edge design resistance

The lowest concrete edge resistance must be calculated. All nearby edges must be checked, (not only the edge in the direction of shear). Shear direction is accounted for by the factor $f_{\beta,V}$.

$$V_{Rd,c} = V^{o}_{Rd,c} \cdot f_B \cdot f_{\beta,V} \cdot f_{AR,V}$$



$V^0_{Rd,c}$: Concrete edge design resistance

- Concrete compressive strength $f_{ck,cube(150)}$ = 25 N/mm^2
- at a <u>minimum</u> edge distance c_{min}

Anchor size HKD-E/-S	M6x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
$V^0_{Rd,c}$ [1] [kN]	6.4	8.3	8.9	14.5	9.4	15.4	24.0	40.7	62.0
c_{min} [mm]	88	105	105	140	105	140	175	227	280

Anchor size HKD-ER/-SR	M6x25	M8x30	M10x40	M12x50	M16x65	M20x80
$V^0_{Rd,c}$ [1] [kN]	6.4	8.9	14.5	24.0	40.7	62.0
c_{min} [mm]	88	105	140	175	227	280

[1] The shear design resistance is calculated from the shear characteristic resistance $V^o_{Rk,c}$ by $V^o_{Rd,c} = V^o_{Rk,c}/\gamma_{Mc,V}$, where the partial safety factor $\gamma_{Mc,V}$ is equal to 1.5.

f_B : Influence of concrete strength

Concrete strength designation (ENV 206)	Cylinder compressive strength $f_{ck,cyl}$ [N/mm²]	**Cube compressive strength $f_{ck,cube}$ [N/mm²]**	**f_B**
C20/25	20	**25**	**1.0**
C25/30	25	**30**	**1.1**
C30/37	30	**37**	**1.22**
C35/45	35	**45**	**1.34**
C40/50	40	**50**	**1.41**
C45/55	45	**55**	**1.48**
C50/60	50	**60**	**1.55**

Concrete cylinder: height 30cm, 15cm diameter	Concrete cube: side length 15cm
Concrete test specimen geometry	

$$f_B = \sqrt{\frac{f_{ck,cube}}{25}}$$

Limits:
25 N/mm^2 $\leq f_{ck,cube(150)} \leq$ 60 N/mm^2

$f_{\beta,V}$: Influence of shear load direction

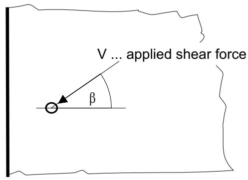
Angle β [°]	$f_{\beta,V}$
0 to 55	**1**
60	**1.1**
70	**1.2**
80	**1.5**
90 to 180	**2**

Formulae:

$f_{\beta,V} = 1$ for $0° \le \beta \le 55°$

$f_{\beta,V} = \dfrac{1}{\cos\beta + 0.5\sin\beta}$ for $55° < \beta \le 90°$

$f_{\beta,V} = 2$ for $90° < \beta \le 180°$



$f_{AR,V}$: Influence of spacing and edge distance

Formula for **single** anchor fastening influenced only by edge

$$f_{AR,V} = \frac{c}{c_{min}}\sqrt{\frac{c}{c_{min}}}$$

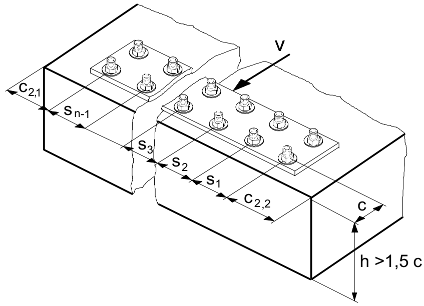
Formula for two-anchor fastening valid for s < 3c

$$f_{AR,V} = \frac{3c + s}{6c_{min}}\sqrt{\frac{c}{c_{min}}}$$

results tabulated below

General formula for **n** anchors (edge distance plus n-1 spacing) only valid where s_1 to s_{n-1} are all < 3c and c_2 > 1.5c

$$f_{AR,V} = \frac{3c + s_1 + s_2 + \ldots + s_{n-1}}{3nc_{min}} \cdot \sqrt{\frac{c}{c_{min}}}$$



Note: It is assumed that only the row of anchors closest to the free concrete edge carries the centric shear load

$f_{AR,V}$	c/c_{min} → 1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0
Single anchor with edge influence	1.00	1.31	1.66	2.02	2.41	2.83	3.26	3.72	4.19	4.69	5.20	5.72	6.27	6.83	7.41	8.00
s/c_{min} ↓ 1.0	0.67	0.84	1.03	1.22	1.43	1.65	1.88	2.12	2.36	2.62	2.89	3.16	3.44	3.73	4.03	4.33
1.5	0.75	0.93	1.12	1.33	1.54	1.77	2.00	2.25	2.50	2.76	3.03	3.31	3.60	3.89	4.19	4.50
2.0	0.83	1.02	1.22	1.43	1.65	1.89	2.13	2.38	2.63	2.90	3.18	3.46	3.75	4.05	4.35	4.67
2.5	0.92	1.11	1.32	1.54	1.77	2.00	2.25	2.50	2.77	3.04	3.32	3.61	3.90	4.21	4.52	4.83
3.0	1.00	1.20	1.42	1.64	1.88	2.12	2.37	2.63	2.90	3.18	3.46	3.76	4.06	4.36	4.68	5.00
3.5		1.30	1.52	1.75	1.99	2.24	2.50	2.76	3.04	3.32	3.61	3.91	4.21	4.52	4.84	5.17
4.0			1.62	1.86	2.10	2.36	2.62	2.89	3.17	3.46	3.75	4.05	4.36	4.68	5.00	5.33
4.5				1.96	2.21	2.47	2.74	3.02	3.31	3.60	3.90	4.20	4.52	4.84	5.17	5.50
5.0					2.33	2.59	2.87	3.15	3.44	3.74	4.04	4.35	4.67	5.00	5.33	5.67
5.5						2.71	2.99	3.28	3.57	3.88	4.19	4.50	4.82	5.15	5.49	5.83
6.0						2.83	3.11	3.41	3.71	4.02	4.33	4.65	4.98	5.31	5.65	6.00
6.5							3.24	3.54	3.84	4.16	4.47	4.80	5.13	5.47	5.82	6.17
7.0								3.67	3.98	4.29	4.62	4.95	5.29	5.63	5.98	6.33
7.5									4.11	4.43	4.76	5.10	5.44	5.79	6.14	6.50
8.0										4.57	4.91	5.25	5.59	5.95	6.30	6.67
8.5											5.05	5.40	5.75	6.10	6.47	6.83
9.0											5.20	5.55	5.90	6.26	6.63	7.00
9.5												5.69	6.05	6.42	6.79	7.17
10.0													6.21	6.58	6.95	7.33
10.5														6.74	7.12	7.50
11.0															7.28	7.67
11.5																7.83
12.0																8.00

These results are for a two-. Anchor fastening.

For fastening made with more than 2 anchors, use the general formulae for n anchors at the top of the page.

$V_{Rd,s}$: Steel design shear resistance

Anchor size HKD-E/HKD-S	M6x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
$V_{Rd,s}$ [1) [kN] steel 4.6	2.4	2.4	4.4	4.4	5.9	6.4	10.1	17.5	27.8
$V_{Rd,s}$ [1) [kN] steel 5.6	3.0	3.0	5.5	5.5	5.9	6.4	11.3	17.5	27.8
$V_{Rd,s}$ [1) [kN] steel 5.8	4.0	4.0	5.5	5.5	5.9	6.4	11.3	17.5	27.8
$V_{Rd,s}$ [1) [kN] steel 8.8	4.2	4.2	5.5	5.5	5.9	6.4	11.3	17.5	27.8

Anchor size HKD-ER/HKD-SR	M6x25	M8x30	M10x40	M12x50	M16x65	M20x80
$V_{Rd,s}$ [1) [kN]	4.1	5.5	6.9	12.3	21.1	33.6

[1) The shear design resistance is calculated from the shear characteristic resistance $V_{Rd,s}$ by $V_{Rd,s} = V_{Rk,s}/\gamma_{Ms}$, where the partial safety factor γ_{Ms} varies with anchor types and sizes.

V_{Rd} : System design shear resistance

V_{Rd} = lower of $V_{Rd,c}$ and $V_{Rd,s}$

Combined loading: Only if tensile load and shear load applied (See page 31 and section 4 “Examples”).