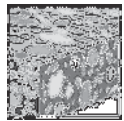


## HKD Push-in anchor, Single anchor application

|                                                                                   | Anchor version                                           | Benefits                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | HKD<br>Carbon steel<br>with lip                          | <ul style="list-style-type: none"> <li>- simple and well proven</li> <li>- approved, tested and confirmed by everyday jobsite experience</li> <li>- reliable setting thanks to simple visual check</li> <li>- versatile</li> <li>- for medium-duty fastening with bolts or threaded rods</li> <li>- available in various materials and sizes for maximized coverage of possible applications</li> </ul> |
|  | HKD-S(R)<br>Carbon steel,<br>stainless steel with lip    |                                                                                                                                                                                                                                                                                                                                                                                                         |
|  | HKD-E(R)<br>Carbon steel,<br>stainless steel without lip |                                                                                                                                                                                                                                                                                                                                                                                                         |



Concrete



Corrosion  
resistance



European  
Technical  
Approval



CE  
conformity



Hilti anchor  
design  
software



PROFIS  
Anchor  
design  
software

### Approvals / certificates

| Description                               | Authority / Laboratory | No. / date of issue      |
|-------------------------------------------|------------------------|--------------------------|
| European technical approval <sup>a)</sup> | DIBt, Berlin           | ETA-02/0032 / 2010-04-22 |

a) Anchors with anchorage depth  $h_{ef} = 25\text{mm}$  are not covered by ETA

### 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
- Concrete as specified in the table
- **Steel** failure
- Minimum base material thickness
- Concrete C 20/25,  $f_{ck, cube} = 25 \text{ N/mm}^2$
- screw or rod with steel strength 5.8 (carbon steel) and/or A4-70 (stainless steel)

For details see Simplified design method

### Mean Ultimate Resistance

| Anchor size         | Hilti technical data |       |        |        |       |       |       |        |        |        |        |        |
|---------------------|----------------------|-------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|
|                     | M6x25                | M8x25 | M10x25 | M12x25 | M6x30 | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
| Tensile $N_{Ru,m}$  |                      |       |        |        |       |       |       |        |        |        |        |        |
| HKD [kN]            | 8,4                  | 8,4   | 8,4    | 8,4    | -     | 11,0  | 13,1  | 11,0   | 17,0   | 23,8   | 32,9   | 48,1   |
| HKD-S, HKD-E [kN]   | 8,2                  | -     | -      | -      | 10,6  | 10,8  | 16,6  | 10,8   | 16,6   | 23,3   | 34,5   | 47,1   |
| HKD-SR, HKD-ER [kN] | 8,2                  | -     | -      | -      | 10,6  | 10,8  | -     | -      | 16,6   | 23,3   | 34,5   | 47,1   |
| Shear $V_{Ru,m}$    |                      |       |        |        |       |       |       |        |        |        |        |        |
| HKD [kN]            | 5,5                  | 6,9   | 6,9    | 6,9    | -     | 9,4   | 10,1  | 11,0   | 12,2   | 20,1   | 37,1   | 53,9   |
| HKD-S, HKD-E [kN]   | 6,5                  | -     | -      | -      | 6,5   | 9,1   | 9,1   | 9,6    | 10,4   | 18,3   | 28,5   | 45,1   |
| HKD-SR, HKD-ER [kN] | 8,3                  | -     | -      | -      | 7,0   | 10,9  | -     | -      | 13,7   | 24,3   | 41,7   | 66,3   |

### Characteristic Resistance

| Anchor size         | Hilti technical data |       |        |        | according ETA-02/0032, issue 2010-04-22 |       |       |        |        |        |        |        |
|---------------------|----------------------|-------|--------|--------|-----------------------------------------|-------|-------|--------|--------|--------|--------|--------|
|                     | M6x25                | M8x25 | M10x25 | M12x25 | M6x30                                   | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
| Tensile $N_{Rk}$    |                      |       |        |        |                                         |       |       |        |        |        |        |        |
| HKD [kN]            | 6,3                  | 6,3   | 6,3    | 6,3    | -                                       | 8,3   | 9,0   | 8,3    | 12,8   | 17,8   | 26,4   | 36,1   |
| HKD-S, HKD-E [kN]   | 6,3                  | -     | -      | -      | 8,3                                     | 8,3   | 9,0   | 8,3    | 12,8   | 17,8   | 26,4   | 36,1   |
| HKD-SR, HKD-ER [kN] | 6,3                  | -     | -      | -      | 8,3                                     | 8,3   | -     | -      | 12,8   | 17,8   | 26,4   | 36,1   |
| Shear $V_{Rk}$      |                      |       |        |        |                                         |       |       |        |        |        |        |        |
| HKD [kN]            | 5,0                  | 6,3   | 6,3    | 6,3    | -                                       | 8,6   | 9,2   | 10,0   | 11,0   | 18,3   | 33,8   | 49,0   |
| HKD-S, HKD-E [kN]   | 5,0                  | -     | -      | -      | 5,0                                     | 7,0   | 7,0   | 7,4    | 8,0    | 14,1   | 21,9   | 34,7   |
| HKD-SR, HKD-ER [kN] | 6,2                  | -     | -      | -      | 6,4                                     | 8,4   | -     | -      | 10,5   | 18,7   | 32,1   | 51,0   |

### Design Resistance

| Anchor size         | Hilti technical data |       |        |        | according ETA-02/0032, issue 2010-04-22 |       |       |        |        |        |        |        |
|---------------------|----------------------|-------|--------|--------|-----------------------------------------|-------|-------|--------|--------|--------|--------|--------|
|                     | M6x25                | M8x25 | M10x25 | M12x25 | M6x30                                   | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
| Tensile $N_{Rd}$    |                      |       |        |        |                                         |       |       |        |        |        |        |        |
| HKD [kN]            | 4,2                  | 4,2   | 4,2    | 4,2    | -                                       | 5,5   | 6,0   | 5,5    | 8,5    | 11,9   | 17,6   | 24,0   |
| HKD-S, HKD-E [kN]   | 3,0                  | -     | -      | -      | 4,6                                     | 4,6   | 5,0   | 4,6    | 7,1    | 9,9    | 17,6   | 24,0   |
| HKD-SR, HKD-ER [kN] | 3,0                  | -     | -      | -      | 4,6                                     | 4,6   | -     | -      | 7,1    | 9,9    | 17,6   | 24,0   |
| Shear $V_{Rd}$      |                      |       |        |        |                                         |       |       |        |        |        |        |        |
| HKD [kN]            | 4,0                  | 4,2   | 4,2    | 4,2    | -                                       | 6,9   | 7,3   | 8,0    | 8,8    | 14,6   | 27,0   | 39,4   |
| HKD-S, HKD-E [kN]   | 3,9                  | -     | -      | -      | 3,9                                     | 5,5   | 5,5   | 5,9    | 6,4    | 11,3   | 17,5   | 27,8   |
| HKD-SR, HKD-ER [kN] | 4,1                  | -     | -      | -      | 4,2                                     | 5,5   | -     | -      | 6,9    | 12,3   | 21,1   | 33,6   |

## Recommended load

| Anchor size                     | Hilti technical data |       |        |        | according ETA-02/0032, issue 2010-04-22 |       |       |        |        |        |        |        |
|---------------------------------|----------------------|-------|--------|--------|-----------------------------------------|-------|-------|--------|--------|--------|--------|--------|
|                                 | M6x25                | M8x25 | M10x25 | M12x25 | M6x30                                   | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
| Tensile $N_{rec}$ <sup>a)</sup> |                      |       |        |        |                                         |       |       |        |        |        |        |        |
| HKD [kN]                        | 3,0                  | 3,0   | 3,0    | 3,0    | -                                       | 3,9   | 4,3   | 3,9    | 6,1    | 8,5    | 12,6   | 17,2   |
| HKD-S, HKD-E [kN]               | 2,1                  | -     | -      | -      | 3,3                                     | 3,3   | 3,6   | 3,3    | 5,1    | 7,1    | 12,6   | 17,2   |
| HKD-SR, HKD-ER [kN]             | 2,1                  | -     | -      | -      | 3,3                                     | 3,3   | -     | -      | 5,1    | 7,1    | 12,6   | 17,2   |
| Shear $V_{rec}$ <sup>a)</sup>   |                      |       |        |        |                                         |       |       |        |        |        |        |        |
| HKD [kN]                        | 2,9                  | 3,0   | 3,0    | 3,0    | -                                       | 4,9   | 5,2   | 5,7    | 6,3    | 10,5   | 19,3   | 28,3   |
| HKD-S, HKD-E [kN]               | 2,8                  | -     | -      | -      | 2,8                                     | 3,9   | 4,2   | 3,9    | 4,6    | 8,1    | 12,5   | 19,8   |
| HKD-SR, HKD-ER [kN]             | 2,9                  | -     | -      | -      | 3,0                                     | 3,9   | -     | -      | 4,9    | 8,8    | 15,1   | 24,0   |

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.

## Materials

### Mechanical properties of HKD, HKD-S, HKD-E, HKD-SR and HKD-ER

| Anchor size                                           |                             |                      | M6   | M8   | M10  | M12  | M16 | M20  |
|-------------------------------------------------------|-----------------------------|----------------------|------|------|------|------|-----|------|
| Nominal tensile strength $f_{uk}$                     | HKD                         | [N/mm <sup>2</sup> ] | 570  | 570  | 570  | 570  | 640 | 590  |
|                                                       | HKD-S                       | [N/mm <sup>2</sup> ] | 560  | 560  | 510  | 510  | -   | 460  |
|                                                       | HKD-E                       | [N/mm <sup>2</sup> ] |      |      |      |      |     |      |
|                                                       | HKD-SR<br>HKD-ER            | [N/mm <sup>2</sup> ] | 540  | 540  | 540  | 540  | -   | 540  |
| Yield strength $f_{yk}$                               | HKD                         | [N/mm <sup>2</sup> ] | 460  | 460  | 460  | 480  | 510 | 470  |
|                                                       | HKD-S                       | [N/mm <sup>2</sup> ] | 440  | 440  | 410  | 410  | -   | 375  |
|                                                       | HKD-E                       | [N/mm <sup>2</sup> ] |      |      |      |      |     |      |
|                                                       | HKD-SR<br>HKD-ER            | [N/mm <sup>2</sup> ] | 355  | 355  | 355  | 355  | -   | 355  |
| Stressed cross-section $A_s$                          | HKD                         | [mm <sup>2</sup> ]   | 20,7 | 26,7 | 32,7 | 60,1 | 105 | 167  |
|                                                       | HKD-S (R)                   | [mm <sup>2</sup> ]   | 20,9 | 26,1 | 28,8 | 58,7 | -   | 163  |
|                                                       | HKD-E (R)                   | [mm <sup>2</sup> ]   |      |      |      |      |     |      |
| Moment of resistance $W$                              | HKD                         | [mm <sup>3</sup> ]   | 32,3 | 54,6 | 82,9 | 184  | 431 | 850  |
|                                                       | HKD-S (R)                   | [mm <sup>3</sup> ]   | 50   | 79   | 110  | 264  | 602 | 1191 |
|                                                       | HKD-E (R)                   | [mm <sup>3</sup> ]   |      |      |      |      |     |      |
| Char. bending resistance for rod or bolt $M_{Rk,s}^0$ | With 5.8 Gr. Steel          | [Nm]                 | 7,6  | 18,7 | 37,4 | 65,5 | 167 | 325  |
|                                                       | HKD-SR<br>HKD-ER with A4-70 | [Nm]                 | 11   | 26   | 52   | 92   | 187 | 454  |

### Material quality

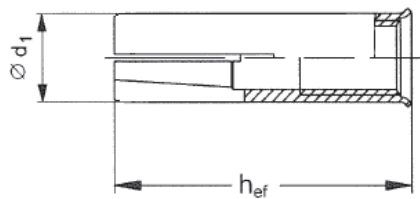
| Part                   |                  | Material                                |
|------------------------|------------------|-----------------------------------------|
| Anchor Body            | HKD              | Steel Fe/Zn5 galvanised to min. 5 µm    |
|                        | HKD-S<br>HKD-E   | Steel Fe/Zn5 galvanised to min. 5 µm    |
|                        | HKD-SR<br>HKD-ER | Stainless steel, 1.4401, 1.4404, 1.4571 |
|                        |                  |                                         |
| Tapered expansion plug | HKD              | Steel material                          |
|                        | HKD-S<br>HKD-E   | Steel material                          |
|                        | HKD-SR<br>HKD-ER | Stainless steel, 1.4401, 1.4404, 1.4571 |
|                        |                  |                                         |

### Anchor dimensions

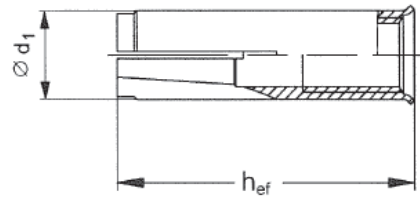
| Anchor size<br>Anchor version<br>HKD<br>HKD-S (R)<br>HKD-E (R) |          |      | M6x25 | M8x25 | M10x25 | M12x25 | M6x30 | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
|----------------------------------------------------------------|----------|------|-------|-------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|
| Effective anchorage depth                                      | $h_{ef}$ | [mm] | 25    | 25    | 25     | 25     | 30    | 30    | 40    | 30     | 40     | 50     | 60     | 80     |
| Anchor diameter                                                | $d_1$    | [mm] | 7,9   | 9,95  | 11,9   | 14,9   | 8     | 9,95  | 9,95  | 11,8   | 11,95  | 14,9   | 19,75  | 24,75  |
| Plug diameter                                                  | $d_2$    | [mm] | 5,1   | 6,35  | 8,1    | 9,7    | 5     | 6,5   | 6,35  | 8,2    | 8,2    | 10,3   | 13,8   | 16,4   |
| Plug length                                                    | $l_1$    | [mm] | 10    | 7     | 7      | 7,2    | 15    | 12    | 16    | 12     | 16     | 20     | 29     | 30     |

### Anchor body

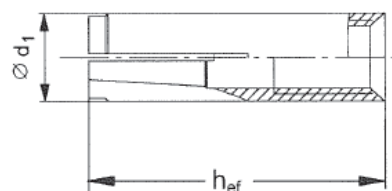
HKD



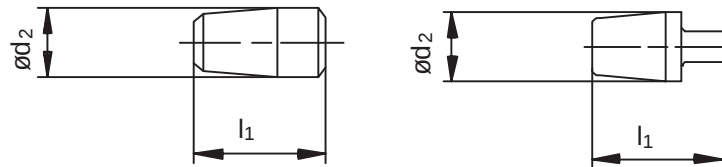
HKD-S and HKD-SR



HKD-E and HKD ER



## Expansions plugs

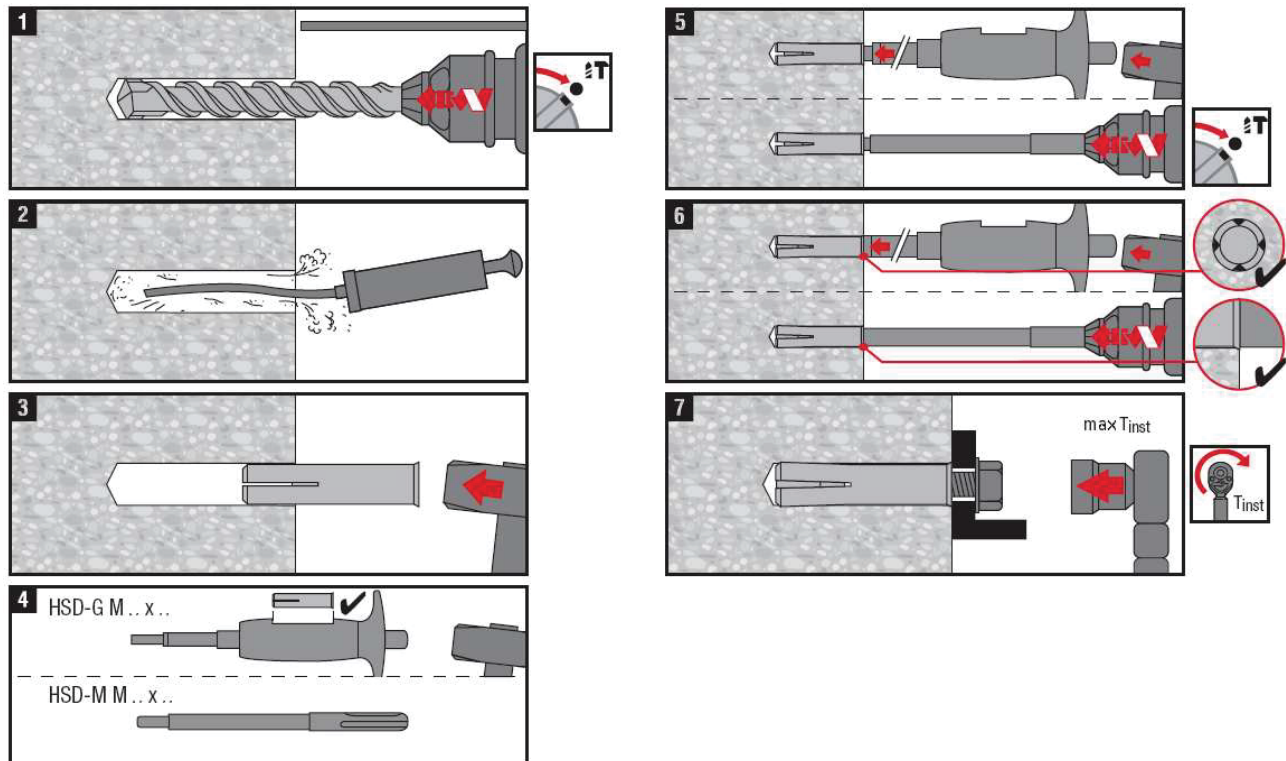


## Setting

### Installation equipment

| Anchor size          |       |                                      | M6x25        | M6x30 | M8x25    | M8x30 | M8x40 | M10x25 | M10x30 | M10x40 | M12x25 | M12x50 | M16x65     | M20x80 |
|----------------------|-------|--------------------------------------|--------------|-------|----------|-------|-------|--------|--------|--------|--------|--------|------------|--------|
|                      |       |                                      |              |       |          |       |       |        |        |        |        |        |            |        |
| Rotary hammer        |       |                                      | TE 2 – TE 16 |       |          |       |       |        |        |        |        |        | TE 40 – 80 |        |
| Machine setting tool | HSD-M | 6x25/30                              | 8x25/30      | 8x40  | 10x25/30 | 10x40 | 12x25 | 12x50  | 16x65  | 20x80  |        |        |            |        |
| Hand Setting tool    | HSD-G |                                      |              |       |          |       |       |        |        |        |        |        |            |        |
| Other tools          |       | hammer, torque wrench, blow out pump |              |       |          |       |       |        |        |        |        |        |            |        |

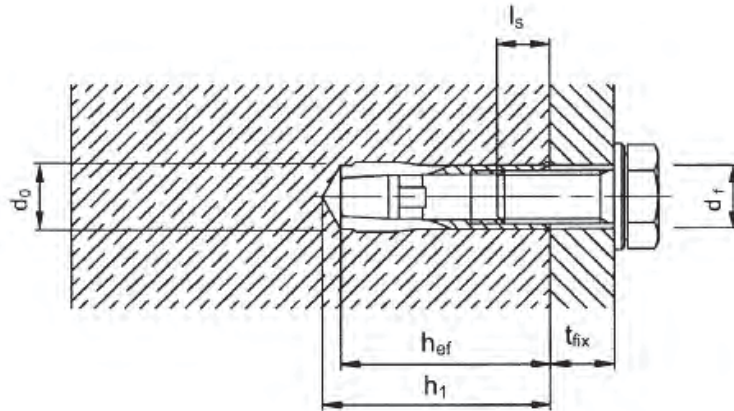
### Setting instruction



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

For technical data for anchors in diamond drilled holes please contact the Hilti Technical advisory service.

Setting details: depth of drill hole  $h_1$  and effective anchorage depth  $h_{ef}$

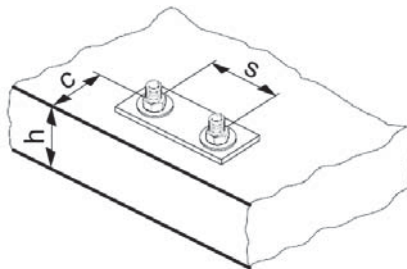


### Setting details

| Anchor size                               |                     | M6x25 | M8x25 | M10x25 | M12x25 | M6x30 | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
|-------------------------------------------|---------------------|-------|-------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|
| Nominal diameter of drill bit             | $d_o$ [mm]          | 8     | 10    | 12     | 15     | 8     | 10    | 10    | 12     | 12     | 15     | 20     | 25     |
| Cutting diameter of drill bit             | $d_{cut} \leq$ [mm] | 8,45  | 10,5  | 12,5   | 15,5   | 8,45  | 10,5  | 10,5  | 12,5   | 12,5   | 15,5   | 20,5   | 25,5   |
| Depth of drill hole                       | $h_1 \geq$ [mm]     | 27    | 27    | 27     | 27     | 32    | 33    | 43    | 33     | 43     | 54     | 70     | 85     |
| Screwing depth                            | $l_{s,min}$ [mm]    | 6     | 8     | 10     | 12     | 6     | 8     | 8     | 10     | 10     | 12     | 16     | 20     |
|                                           | $l_{s,max}$ [mm]    | 12    | 11,5  | 12     | 12     | 12,5  | 14,5  | 17,5  | 13     | 18     | 22     | 30,5   | 42     |
| Diameter of clearance hole in the fixture | $d_f \leq$ [mm]     | 7     | 9     | 12     | 14     | 7     | 9     | 9     | 12     | 12     | 14     | 18     | 22     |
| Effective anchorage depth                 | $h_{ef}$ [mm]       | 25    | 25    | 25     | 25     | 30    | 30    | 40    | 30     | 40     | 50     | 65     | 80     |
| Max. torque moment                        | $T_{inst}$ [Nm]     | 4     | 8     | 15     | 35     | 4     | 8     | 8     | 15     | 15     | 35     | 60     | 120    |

**Base material thickness, anchor spacing and edge distances**

| Anchor size                                                         |                        |             | M6x25<br>M8x25<br>M10x25<br>M12x25 | M6x30<br>M8x30<br>M10x30 | M8x40<br>M10x40 | M12x50 | M16x65 | M20x80 |
|---------------------------------------------------------------------|------------------------|-------------|------------------------------------|--------------------------|-----------------|--------|--------|--------|
| Minimum base material thickness                                     | $h_{min}$              | [mm]        | 100                                | 100                      | 100             | 100    | 130    | 160    |
| Minimum spacing and minimum edge distance<br>HKD-S (R)<br>HKD-E (R) | $s_{min}$              | [mm]        | 60                                 | 60                       | 80              | 125    | 130    | 160    |
|                                                                     | $c_{min}$              | [mm]        | 88                                 | 105                      | 140             | 175    | 230    | 280    |
| Minimum spacing<br>HKD                                              | $s_{min}$              | [mm]        | 80                                 | 60                       | 80              | 125    | 130    | 160    |
|                                                                     | for $c \geq$           | [mm]        | 140                                | 105                      | 140             | 175    | 230    | 280    |
| Minimum edge distance<br>HKD                                        | $c_{min}$              | [mm]        | 100                                | 80                       | 140             | 175    | 230    | 280    |
|                                                                     | for $s \geq$           | [mm]        | 150                                | 120                      | 80              | 125    | 130    | 160    |
| Critical spacing and edge distance for concrete cone failure        | $s_{cr,N}$             | [mm]        | 80                                 | 90                       | 120             | 150    | 200    | 240    |
| HKD<br>HKD-S (R)<br>HKD-E (R)                                       | $c_{cr,N}$             | [mm]        | 40                                 | 45                       | 60              | 75     | 100    | 120    |
| Critical spacing and edge distance for splitting failure            | HKD                    | $s_{cr,sp}$ | 200                                | 210                      | 280             | 350    | 455    | 560    |
|                                                                     |                        | $c_{cr,sp}$ | 100                                | 105                      | 140             | 175    | 227    | 280    |
|                                                                     | HKD-S (R)<br>HKD-E (R) | $s_{cr,sp}$ | 176                                | 210                      | 280             | 350    | 455    | 560    |
|                                                                     |                        | $c_{cr,sp}$ | 88                                 | 105                      | 140             | 175    | 227    | 280    |



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

### Simplified design method

Simplified version of the design method according ETAG 001, Annex C. Design resistance according data given in ETA-02/0032, issue 2010-04-22 .

- 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. 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, Annex C. 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)

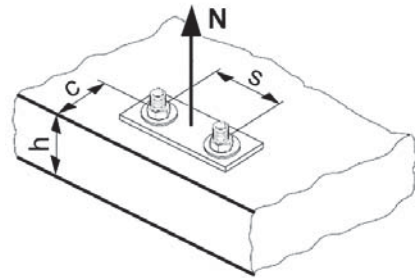
The values are valid for one anchor.

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



### Basic design tensile resistance

Design steel resistance  $N_{Rd,s}$  for HKD / HKD-E/S Steel Strength 5.8 and for HKD-ER/SR A4-70

|             |                   |      | Hilti technical data |       |        |        | according ETA-02/0032, issue 2010-04-22 |       |       |        |        |        |        |        |
|-------------|-------------------|------|----------------------|-------|--------|--------|-----------------------------------------|-------|-------|--------|--------|--------|--------|--------|
| Anchor size |                   |      | M6x25                | M8x25 | M10x25 | M12x25 | M6x30                                   | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
| $N_{Rd,s}$  | HKD               | [kN] | 6,7                  | 10,3  | 12,6   | 23,6   | -                                       | 11,4  | 12,2  | 13,3   | 14,7   | 24,4   | 45,0   | 65,3   |
|             | HKD-S,<br>HKD-E   | [kN] | 6,7                  | -     | -      | -      | 6,7                                     | 11,4  | 11,4  | 12,4   | 13,4   | 23,7   | 37,2   | 59,1   |
|             | HKD-SR,<br>HKD-ER | [kN] | 6,9                  | -     | -      | -      | 7,0                                     | 9,2   | -     | -      | 11,5   | 20,4   | 35,1   | 55,7   |

**Design pull-out resistance  $N_{Rd,p} = N_{Rd,p}^0 \cdot f_B$** 

|                                |                   |      | Non-cracked concrete |       |        |        |                                         |       |       |        |        |        |        |        |
|--------------------------------|-------------------|------|----------------------|-------|--------|--------|-----------------------------------------|-------|-------|--------|--------|--------|--------|--------|
|                                |                   |      | Hilti technical data |       |        |        | according ETA-02/0032, issue 2010-04-22 |       |       |        |        |        |        |        |
| Anchor size                    |                   |      | M6x25                | M8x25 | M10x25 | M12x25 | M6x30                                   | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
| N <sup>0</sup> <sub>Rd,p</sub> | HKD               | [kN] | -                    | -     | -      | -      | -                                       | -     | 6,0   | -      | -      | -      | -      | -      |
|                                | HKD-S,<br>HKD-E   | [kN] | -                    | -     | -      | -      | -                                       | -     | 5,0   | -      | -      | -      | -      | -      |
|                                | HKD-SR,<br>HKD-ER | [kN] | -                    | -     | -      | -      | -                                       | -     | -     | -      | -      | -      | -      | -      |

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

|                                |                   |      | Non-cracked concrete |       |        |        |                                         |       |       |        |        |        |        |        |
|--------------------------------|-------------------|------|----------------------|-------|--------|--------|-----------------------------------------|-------|-------|--------|--------|--------|--------|--------|
|                                |                   |      | Hilti technical data |       |        |        | according ETA-02/0032, issue 2010-04-22 |       |       |        |        |        |        |        |
| Anchor size                    |                   |      | M6x25                | M8x25 | M10x25 | M12x25 | M6x30                                   | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
| N <sup>0</sup> <sub>Rd,c</sub> | HKD               | [kN] | 4,2                  | 4,2   | 4,2    | 4,2    | -                                       | 5,5   | 8,5   | 5,5    | 8,5    | 11,9   | 17,6   | 24,0   |
|                                | HKD-S,<br>HKD-E   | [kN] | 3,0                  | -     | -      | -      | 4,6                                     | 4,6   | 7,1   | 4,6    | 7,1    | 9,9    | 17,6   | 24,0   |
|                                | HKD-SR,<br>HKD-ER | [kN] | 3,0                  | -     | -      | -      | 4,6                                     | 4,6   | -     | -      | 7,1    | 9,9    | 17,6   | 24,0   |

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

**Influencing factors**
**Influence of concrete strength**

| Concrete strength designation<br>(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 edge distance<sup>a)</sup>**

| $c/c_{cr,N}$                                    | 0,1  | 0,2  | 0,3  | 0,4  | 0,5  | 0,6  | 0,7  | 0,8  | 0,9  | 1 |
|-------------------------------------------------|------|------|------|------|------|------|------|------|------|---|
| $c/c_{cr,sp}$                                   | 0,1  | 0,2  | 0,3  | 0,4  | 0,5  | 0,6  | 0,7  | 0,8  | 0,9  | 1 |
| $f_{1,N} = 0,7 + 0,3 \cdot c/c_{cr,N} \leq 1$   | 0,73 | 0,76 | 0,79 | 0,82 | 0,85 | 0,88 | 0,91 | 0,94 | 0,97 | 1 |
| $f_{1,sp} = 0,7 + 0,3 \cdot c/c_{cr,sp} \leq 1$ | 0,73 | 0,76 | 0,79 | 0,82 | 0,85 | 0,88 | 0,91 | 0,94 | 0,97 | 1 |
| $f_{2,N} = 0,5 \cdot (1 + c/c_{cr,N}) \leq 1$   | 0,55 | 0,60 | 0,65 | 0,70 | 0,75 | 0,80 | 0,85 | 0,90 | 0,95 | 1 |
| $f_{2,sp} = 0,5 \cdot (1 + c/c_{cr,sp}) \leq 1$ | 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  $c_{min}$  given in the table with the setting details. These influencing factors must be considered for every edge distance.

### Influence of anchor spacing <sup>a)</sup>

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

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 base material thickness

| $h/h_{ef}$                              | 2,0 | 2,2  | 2,4  | 2,6  | 2,8  | 3,0  | 3,2  | 3,4  | 3,6  | $\geq 3,68$ |
|-----------------------------------------|-----|------|------|------|------|------|------|------|------|-------------|
| $f_{h,sp} = [h/(2 \cdot h_{ef})]^{2/3}$ | 1   | 1,07 | 1,13 | 1,19 | 1,25 | 1,31 | 1,37 | 1,42 | 1,48 | 1,5         |

### Influence of reinforcement

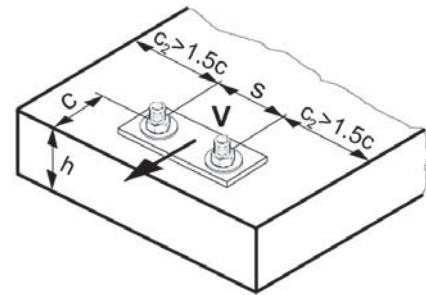
| Anchor size                                   | M6x25              | M8x25              | M10x25             | M12x25             | M6x30              | M8x30              | M8x40             | M10x30             | M10x40            | M12x50             | M16x65             | M20x80            |
|-----------------------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|--------------------|-------------------|--------------------|--------------------|-------------------|
| $f_{re,N} = 0,5 + h_{ef}/200\text{mm} \leq 1$ | 0,63 <sup>a)</sup> | 0,63 <sup>a)</sup> | 0,63 <sup>a)</sup> | 0,63 <sup>a)</sup> | 0,65 <sup>a)</sup> | 0,65 <sup>a)</sup> | 0,7 <sup>a)</sup> | 0,65 <sup>a)</sup> | 0,7 <sup>a)</sup> | 0,75 <sup>a)</sup> | 0,83 <sup>a)</sup> | 0,9 <sup>a)</sup> |

a) This factor applies only for dense reinforcement. If in the area of anchorage there is reinforcement with a spacing  $\geq 150$  mm (any diameter) or with a diameter  $\leq 10$  mm and a spacing  $\geq 100$  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:  $V_{Rd,cp} = k \cdot N_{Rd,c}$
- Concrete edge resistance:  $V_{Rd,c} = V_{Rd,c}^0 \cdot f_B \cdot f_{Bh} \cdot f_4 \cdot f_{hef} \cdot f_c$



## Basic design shear resistance

Design steel resistance  $V_{Rd,s}$  for HKD / HKD-E/S Steel Strength 5.8 and for HKD-ER/SR A4-70

|                   |                     | Hilti technical data |       |        |        | according ETA-02/0032, issue 2010-04-22 |       |       |        |        |        |        |        |
|-------------------|---------------------|----------------------|-------|--------|--------|-----------------------------------------|-------|-------|--------|--------|--------|--------|--------|
| Anchor size       |                     | M6x25                | M8x25 | M10x25 | M12x25 | M6x30                                   | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
| V <sub>Rd,s</sub> | HKD [kN]            | 4,0                  | 6,2   | 7,5    | 14,1   | -                                       | 6,9   | 7,3   | 8,0    | 8,8    | 14,6   | 27,0   | 39,6   |
|                   | HKD-S, HKD-E [kN]   | 3,9                  | -     | -      | -      | 3,9                                     | 5,5   | 5,5   | 5,9    | 6,4    | 11,3   | 17,5   | 27,8   |
|                   | HKD-SR, HKD-ER [kN] | 4,1                  | -     | -      | -      | 4,2                                     | 5,5   | -     | -      | 6,9    | 12,3   | 21,1   | 33,6   |

**Design concrete pryout resistance  $V_{Rd,cp} = k \cdot N_{Rd,c}$ <sup>a)</sup>**

|             | Hilti technical data |       |        |        | according ETA-02/0032, issue 2010-04-22 |       |       |        |        |        |        |        |
|-------------|----------------------|-------|--------|--------|-----------------------------------------|-------|-------|--------|--------|--------|--------|--------|
| Anchor size | M6x25                | M8x25 | M10x25 | M12x25 | M6x30                                   | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
| k           | 1                    |       |        |        | 2                                       |       |       |        |        |        |        |        |

a)  $N_{Rd,c}$ : Design concrete cone resistance

**Design concrete edge resistance<sup>a)</sup>  $V_{Rd,c} = V_{Rd,c}^0 \cdot f_B \cdot f_{f_4} \cdot f_{f_h} \cdot f_{f_{hef}} \cdot f_c$**

| Anchor size       | M6x25 | M8x25 | M10x25 | M12x25 | M6x30 | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
|-------------------|-------|-------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|
| $V_{Rd,c}^0$ [kN] | 5,8   | 8,4   | 11,3   | 16,4   | 5,9   | 8,5   | 8,5   | 11,4   | 11,5   | 16,8   | 27,1   | 39,2   |

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 |
|-----------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|
| $f_B = (f_{ck,cube}/25\text{N/mm}^2)^{1/2}$ <sup>a)</sup> | 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 $\beta$                                                                                                                                                                 | 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 <sup>a)</sup> for concrete edge resistance:  $f_4$

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

| c/h <sub>ef</sub> | Single anchor | Group of two anchors s/h <sub>ef</sub> |      |      |      |      |      |      |      |      |      |      |      |       |       |       |
|-------------------|---------------|----------------------------------------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
|                   |               | 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                                | M6x25 | M8x25 | M10x25 | M12x25 | M6x30 | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |
|--------------------------------------------|-------|-------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|
| $f_{hef} = 0,05 \cdot (h_{ef} / d)^{1,68}$ | 0,34  | 0,23  | 0,17   | 0,12   | 0,46  | 0,32  | 0,51  | 0,23   | 0,38   | 0,38   | 0,36   | 0,35   |

### Influence of edge distance <sup>a)</sup>

| 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".

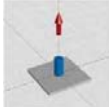
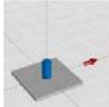
### Precalculated values

Design resistance calculated according ETAG 001, Annex C and data given in ETA-02/0032, issue 2010-04-22 .  
All data applies to concrete C 20/25 –  $f_{ck,cube} = 25 \text{ N/mm}^2$  and steel strength 5.8 and/or A4-70.

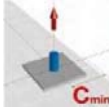
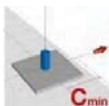
Recommended loads can be calculated by dividing the design resistance by an overall partial safety factor for action  $\gamma = 1,4$ . The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

## Design resistance

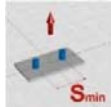
### Single anchor, no edge effects

|                                                                                   |                                    | Non-cracked concrete |       |        |        |                                         |       |       |        |        |        |        |        |      |
|-----------------------------------------------------------------------------------|------------------------------------|----------------------|-------|--------|--------|-----------------------------------------|-------|-------|--------|--------|--------|--------|--------|------|
|                                                                                   |                                    | Hilti technical data |       |        |        | according ETA-02/0032, issue 2010-04-22 |       |       |        |        |        |        |        |      |
| Anchor size                                                                       |                                    | M6x25                | M8x25 | M10x25 | M12x25 | M6x30                                   | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |      |
| Min. base material thickness $h_{min}$                                            | [mm]                               | 100                  | 100   | 100    | 100    | 100                                     | 100   | 100   | 100    | 100    | 100    | 130    | 160    |      |
|  | Tensile $N_{Rd}$                   |                      |       |        |        |                                         |       |       |        |        |        |        |        |      |
|                                                                                   | HKD                                | [kN]                 | 4,2   | 4,2    | 4,2    | 4,2                                     | -     | 5,5   | 8,5    | 5,5    | 8,5    | 11,9   | 17,6   | 24,0 |
|                                                                                   | HKD-S HKD-E                        | [kN]                 | 3,0   | -      | -      | -                                       | 4,6   | 4,6   | 5,0    | 4,6    | 7,1    | 9,9    | 17,6   | 24,0 |
|                                                                                   | HKD-SR HKD-ER                      | [kN]                 | 3,0   | -      | -      | -                                       | 4,6   | 4,6   | -      | -      | 7,1    | 9,9    | 17,6   | 24,0 |
|  | Shear $V_{Rd}$ , without lever arm |                      |       |        |        |                                         |       |       |        |        |        |        |        |      |
|                                                                                   | HKD                                | [kN]                 | 4,0   | 4,2    | 4,2    | 4,2                                     | -     | 6,9   | 7,4    | 8,0    | 8,8    | 14,6   | 27,0   | 39,6 |
|                                                                                   | HKD-S HKD-E                        | [kN]                 | 3,9   | -      | -      | -                                       | 3,9   | 5,5   | 5,6    | 5,8    | 6,4    | 11,3   | 17,5   | 27,8 |
|                                                                                   | HKD-SR HKD-ER                      | [kN]                 | 4,1   | -      | -      | -                                       | 4,2   | 5,5   | -      | -      | 6,9    | 12,3   | 21,1   | 33,6 |

### Single anchor, min. edge distance ( $c = c_{min}$ )

|                                                                                     |                                    | Non-cracked concrete |       |        |        |                                         |       |       |        |        |        |        |        |      |
|-------------------------------------------------------------------------------------|------------------------------------|----------------------|-------|--------|--------|-----------------------------------------|-------|-------|--------|--------|--------|--------|--------|------|
|                                                                                     |                                    | Hilti technical data |       |        |        | according ETA-02/0032, issue 2010-04-22 |       |       |        |        |        |        |        |      |
| Anchor size                                                                         |                                    | M6x25                | M8x25 | M10x25 | M12x25 | M6x30                                   | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |      |
| Min. base material thickness $h_{min}$                                              | [mm]                               | 100                  | 100   | 100    | 100    | 100                                     | 100   | 100   | 100    | 100    | 100    | 130    | 160    |      |
| Min. edge distance $c_{min}$                                                        | [mm]                               | 100                  | 100   | 100    | 100    | 105                                     | 105   | 140   | 105    | 140    | 175    | 230    | 280    |      |
|  | Tensile $N_{Rd}$                   |                      |       |        |        |                                         |       |       |        |        |        |        |        |      |
|                                                                                     | HKD                                | [kN]                 | 4,2   | 4,2    | 4,2    | 4,2                                     | -     | 5,5   | 8,5    | 5,5    | 8,5    | 11,9   | 17,6   | 24,0 |
|                                                                                     | HKD-S HKD-E                        | [kN]                 | 3,0   | -      | -      | -                                       | 4,6   | 4,6   | 7,1    | 4,6    | 7,1    | 9,9    | 17,6   | 24,0 |
|                                                                                     | HKD-SR HKD-ER                      | [kN]                 | 3,0   | -      | -      | -                                       | 4,6   | 4,6   | -      | -      | 7,1    | 9,9    | 17,6   | 24,0 |
|  | Shear $V_{Rd}$ , without lever arm |                      |       |        |        |                                         |       |       |        |        |        |        |        |      |
|                                                                                     | HKD                                | [kN]                 | 4,0   | 4,2    | 4,2    | 4,2                                     | -     | 6,9   | 7,4    | 8,0    | 8,8    | 14,6   | 26,0   | 36,0 |
|                                                                                     | HKD-S HKD-E                        | [kN]                 | 3,9   | -      | -      | -                                       | 4,0   | 5,5   | 5,6    | 5,8    | 6,4    | 11,3   | 17,5   | 27,8 |
|                                                                                     | HKD-SR HKD-ER                      | [kN]                 | 4,1   | -      | -      | -                                       | 4,2   | 5,5   | -      | -      | 6,9    | 12,3   | 21,1   | 33,6 |

Double anchor, no edge effects, min. spacing ( $s = s_{min}$ ),  
(load values are valid for one anchor)

|                                                                                   |                                    | Non-cracked concrete |       |        |        |                                         |       |       |        |        |        |        |        |      |
|-----------------------------------------------------------------------------------|------------------------------------|----------------------|-------|--------|--------|-----------------------------------------|-------|-------|--------|--------|--------|--------|--------|------|
|                                                                                   |                                    | Hilti technical data |       |        |        | according ETA-02/0032, issue 2010-04-22 |       |       |        |        |        |        |        |      |
| Anchor size                                                                       |                                    | M6x25                | M8x25 | M10x25 | M12x25 | M6x30                                   | M8x30 | M8x40 | M10x30 | M10x40 | M12x50 | M16x65 | M20x80 |      |
| Min. base material thickness $h_{min}$                                            | [mm]                               | 100                  | 100   | 100    | 100    | 100                                     | 100   | 100   | 100    | 100    | 100    | 130    | 160    |      |
| Min. spacing $s_{min}$                                                            | [mm]                               | 80                   | 80    | 80     | 80     | 60                                      | 60    | 80    | 60     | 80     | 125    | 130    | 160    |      |
|  | Tensile $N_{Rd}$                   |                      |       |        |        |                                         |       |       |        |        |        |        |        |      |
|                                                                                   | HKD                                | [kN]                 | 2,9   | 2,9    | 2,9    | 2,9                                     | -     | 3,5   | 5,5    | 3,5    | 5,5    | 8,1    | 11,3   | 15,5 |
|                                                                                   | HKD-S HKD-E                        | [kN]                 | 2,0   | -      | -      | -                                       | 3,0   | 3,0   | 4,6    | 3,0    | 4,6    | 6,7    | 11,3   | 15,5 |
|                                                                                   | HKD-SR HKD-ER                      | [kN]                 | 2,0   | -      | -      | -                                       | 3,0   | 3,0   | -      | -      | 4,6    | 6,7    | 11,3   | 15,5 |
|  | Shear $V_{Rd}$ , without lever arm |                      |       |        |        |                                         |       |       |        |        |        |        |        |      |
|                                                                                   | HKD                                | [kN]                 | 4,0   | 4,2    | 4,2    | 4,2                                     | -     | 6,9   | 7,4    | 8,0    | 8,8    | 14,6   | 27,0   | 39,6 |
|                                                                                   | HKD-S HKD-E                        | [kN]                 | 3,8   | -      | -      | -                                       | 3,9   | 5,5   | 5,6    | 5,8    | 6,4    | 11,3   | 17,5   | 27,8 |
|                                                                                   | HKD-SR HKD-ER                      | [kN]                 | 3,8   | -      | -      | -                                       | 4,2   | 5,5   | -      | -      | 6,9    | 12,3   | 21,1   | 33,6 |

## HKD Push-in anchor, Redundant fastening

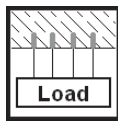
|                                                                                   | Anchor version                                              | Benefits                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | HKD<br>Carbon steel<br>with lip                             | <ul style="list-style-type: none"> <li>- simple and well proven</li> <li>- approved, tested and confirmed by everyday jobsite experience</li> <li>- reliable setting thanks to simple visual check</li> <li>- versatile</li> <li>- for medium-duty fastening with bolts or threaded rods</li> <li>- available in various materials and sizes for maximized coverage of possible applications</li> </ul> |
|  | HKD-S(R)<br>Carbon steel,<br>stainless steel with<br>lip    |                                                                                                                                                                                                                                                                                                                                                                                                         |
|  | HKD-E(R)<br>Carbon steel,<br>stainless steel<br>without lip |                                                                                                                                                                                                                                                                                                                                                                                                         |



Concrete



Tensile  
zone <sup>a)</sup>



Redundant  
fastening



Sprinkler  
approved



Fire  
resistance



Corrosion  
resistance



European  
Technical  
Approval



CE  
conformity

a) Redundant fastening only

### Approvals / certificates

| Description                               | Authority / Laboratory | No. / date of issue      |
|-------------------------------------------|------------------------|--------------------------|
| European technical approval <sup>a)</sup> | DIBt, Berlin           | ETA-06/0047 / 2011-03-14 |
| Fire test report                          | DIBt, Berlin           | ETA-06/0047 / 2011-03-14 |
| Assessment report (fire)                  | warringtonfire         | WF 166402 / 2007-10-26   |

a) All data given in this section for HKD-S(R) and HKD-E(R), according ETA-06/0047, issue 2011-03-14 . The anchor is to be used only for redundant fastening for non-structural applications.

### Basic loading data for all load directions according design method B of ETAG 001

#### All data in this section applies to

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Concrete C 20/25  $f_{ck,cube} = 25 \text{ N/mm}^2$  to C50/60,  $f_{ck,cube} = 60 \text{ N/mm}^2$
- Minimum base material thickness
- Anchors in redundant fastening

## Characteristic Resistance, all load directions

| Anchor size    |    | M6x25 | M6x30 | M8x25 | M8x30 | M8x40 | M10x25 | M10x30 | M10x40 | M12x25 | M12x50 | M16x65 |
|----------------|----|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| Load $F_{Rk}$  |    |       |       |       |       |       |        |        |        |        |        |        |
| HKD            | kN | 2,0   | -     | 3,0   | 5,0   | 5,0   | 4,0    | 5,0    | 7,5    | 4,0    | 9,0    | 16,0   |
| HKD-S, HKD-E   | kN | -     | 3,0   | -     | 3,0   | 5,0   | -      | 4,0    | 6,0    | -      | 6,0    | -      |
| HKD-SR, HKD-ER | kN | -     | 3,0   | -     | 3,0   | -     | -      | -      | 6,0    | -      | 6,0    | -      |

## Design Resistance, all load directions

| Anchor size    |    | M6x25 | M6x30 | M8x25 | M8x30 | M8x40 | M10x25 | M10x30 | M10x40 | M12x25 | M12x50 | M16x65 |
|----------------|----|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| Load $F_{Rd}$  |    |       |       |       |       |       |        |        |        |        |        |        |
| HKD            | kN | 1,3   | -     | 2,0   | 2,8   | 3,3   | 2,2    | 3,3    | 5,0    | 2,7    | 6,0    | 10,7   |
| HKD-S, HKD-E   | kN | -     | 2,0   | -     | 2,0   | 3,3   | -      | 2,7    | 4,0    | -      | 4,0    | -      |
| HKD-SR, HKD-ER | kN | -     | 2,0   | -     | 2,0   | -     | -      | -      | 4,0    | -      | 4,0    | -      |

## Recommended loads <sup>a)</sup>, all load directions

| Anchor size    |    | M6x25 | M6x30 | M8x25 | M8x30 | M8x40 | M10x25 | M10x30 | M10x40 | M12x25 | M12x50 | M16x65 |
|----------------|----|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| Load $F_{rec}$ |    |       |       |       |       |       |        |        |        |        |        |        |
| HKD            | kN | 1,0   | -     | 1,4   | 2,0   | 2,4   | 1,6    | 2,4    | 3,6    | 1,9    | 4,3    | 7,6    |
| HKD-S, HKD-E   | kN | -     | 1,4   | -     | 1,4   | 2,4   | -      | 1,9    | 2,9    | -      | 2,9    | -      |
| HKD-SR, HKD-ER | kN | -     | 1,4   | -     | 1,4   | -     | -      | -      | 2,9    | -      | 2,9    | -      |

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.

## Requirements for redundant fastening

The definition of redundant fastening according to Member States is given in the ETAG 001 Part six, Annex 1. In Absence of a definition by a Member State the following default values may be taken

| Minimum number of fixing points | Minimum number of anchors per fixing point | Maximum design load of action $N_{Sd}$ per fixing point <sup>a)</sup> |
|---------------------------------|--------------------------------------------|-----------------------------------------------------------------------|
| 3                               | 1                                          | 2 kN                                                                  |
| 4                               | 1                                          | 3 kN                                                                  |

a) The value for maximum design load of actions per fastening point  $N_{Sd}$  is valid in general that means all fastening points are considered in the design of the redundant structural system. The value  $N_{Sd}$  may be increased if the failure of one (= most unfavourable) fixing point is taken into account in the design (serviceability and ultimate limit state) of the structural system e.g. suspended ceiling.

## Materials

### Mechanical properties of HKD, HKD-S, HKS-E, HKD-SR and HKD-ER

| Anchor size                                           |                             |                      | M6   | M8   | M10  | M12  | M16 |
|-------------------------------------------------------|-----------------------------|----------------------|------|------|------|------|-----|
| Nominal tensile strength $f_{uk}$                     | HKD                         | [N/mm <sup>2</sup> ] | 570  | 570  | 570  | 570  | 640 |
|                                                       | HKD-S                       | [N/mm <sup>2</sup> ] | 560  | 560  | 510  | 510  | -   |
|                                                       | HKD-E                       | [N/mm <sup>2</sup> ] | 560  | 560  | 510  | 510  | -   |
|                                                       | HKD-SR                      | [N/mm <sup>2</sup> ] | 540  | 540  | 540  | 540  | -   |
| Yield strength $f_{yk}$                               | HKD                         | [N/mm <sup>2</sup> ] | 460  | 460  | 460  | 480  | 510 |
|                                                       | HKD-S                       | [N/mm <sup>2</sup> ] | 440  | 440  | 410  | 410  | -   |
|                                                       | HKD-E                       | [N/mm <sup>2</sup> ] | 440  | 440  | 410  | 410  | -   |
|                                                       | HKD-SR                      | [N/mm <sup>2</sup> ] | 355  | 355  | 355  | 355  | -   |
| Stressed cross-section $A_s$                          | HKD                         | [mm <sup>2</sup> ]   | 20,7 | 26,7 | 32,7 | 60,1 | 105 |
|                                                       | HKD-S (R)<br>HKD-E (R)      | [mm <sup>2</sup> ]   | 20,9 | 26,1 | 28,8 | 58,7 | -   |
| Moment of resistance $W$                              | HKD                         | [mm <sup>3</sup> ]   | 32,3 | 54,6 | 82,9 | 184  | 431 |
|                                                       | HKD-S (R)<br>HKD-E (R)      | [mm <sup>3</sup> ]   | 50   | 79   | 110  | 264  | -   |
| Char. bending resistance for rod or bolt $M_{Rk,S}^0$ | With 5.8 Gr. Steel          | [Nm]                 | 7,6  | 18,7 | 37,4 | 65,5 | 167 |
|                                                       | HKD-SR<br>HKD-ER with A4-70 | [Nm]                 | 11   | 26   | 52   | 92   | -   |

### Material quality

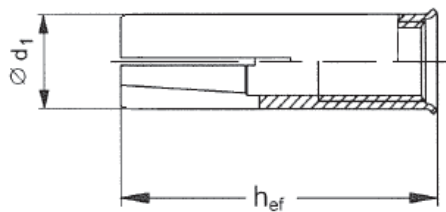
| Part                   | Material         |                                         |
|------------------------|------------------|-----------------------------------------|
| Anchor Body            | HKD              | Steel Fe/Zn5 galvanised to min. 5 µm    |
|                        | HKD-S<br>HKD-E   | Steel Fe/Zn5 galvanised to min. 5 µm    |
|                        | HKD-SR<br>HKD-ER | Stainless steel, 1.4401, 1.4404, 1.4571 |
| Tapered expansion plug | HKD              | Steel material                          |
|                        | HKD-S<br>HKD-E   | Steel material                          |
|                        | HKD-SR<br>HKD-ER | Stainless steel, 1.4401, 1.4404, 1.4571 |

### Anchor dimensions

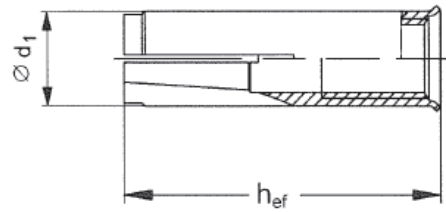
| Anchor size<br>Anchor version<br>HKD<br>HKD-S (R)<br>HKD-E (R) |          |      | M6x25 | M6x30 | M8x25 | M8x30 | M8x40 | M10x25 | M10x30 | M10x40 | M12x25 | M12x50 | M16x65 |
|----------------------------------------------------------------|----------|------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| Effective anchorage depth                                      | $h_{ef}$ | [mm] | 25    | 30    | 25    | 30    | 40    | 25     | 30     | 40     | 25     | 50     | 65     |
| Anchor diameter                                                | $d_1$    | [mm] | 7,9   | 8     | 9,95  | 9,95  | 9,95  | 11,9   | 11,8   | 11,95  | 14,9   | 14,9   | 19,75  |
| Plug diameter                                                  | $d_2$    | [mm] | 5,1   | 5     | 6,35  | 6,5   | 6,35  | 8,1    | 8,2    | 8,2    | 9,7    | 10,3   | 13,8   |
| Plug length                                                    | $l_1$    | [mm] | 10    | 15    | 7     | 12    | 16    | 7      | 12     | 16     | 7,2    | 20     | 29     |

### Anchor body

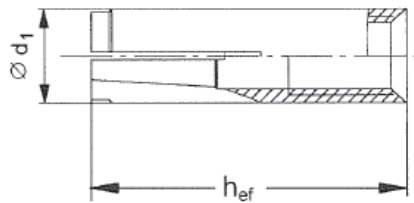
HKD



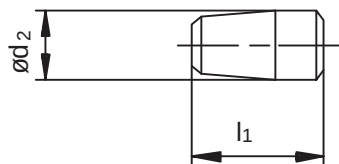
HKD-S and HKD-SR



HKD-E and HKD ER



### Expansions plugs

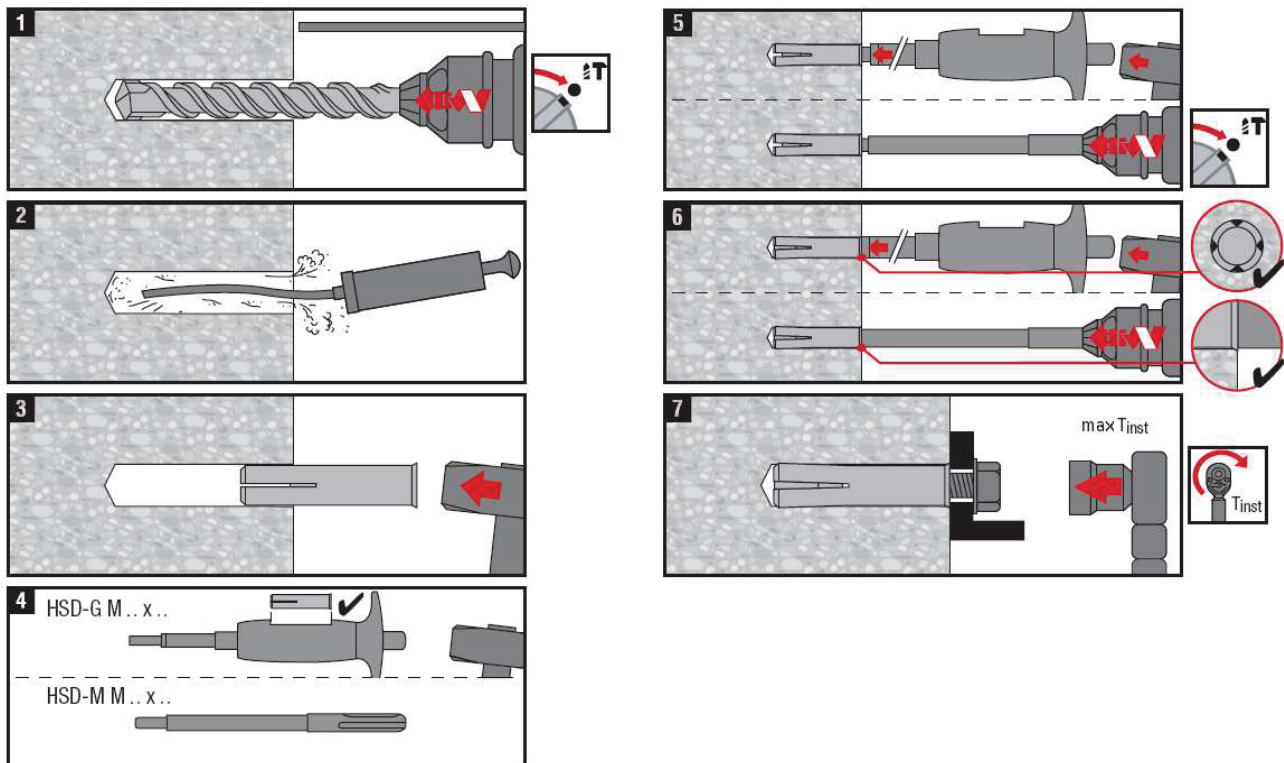


## Setting

### Installation equipment

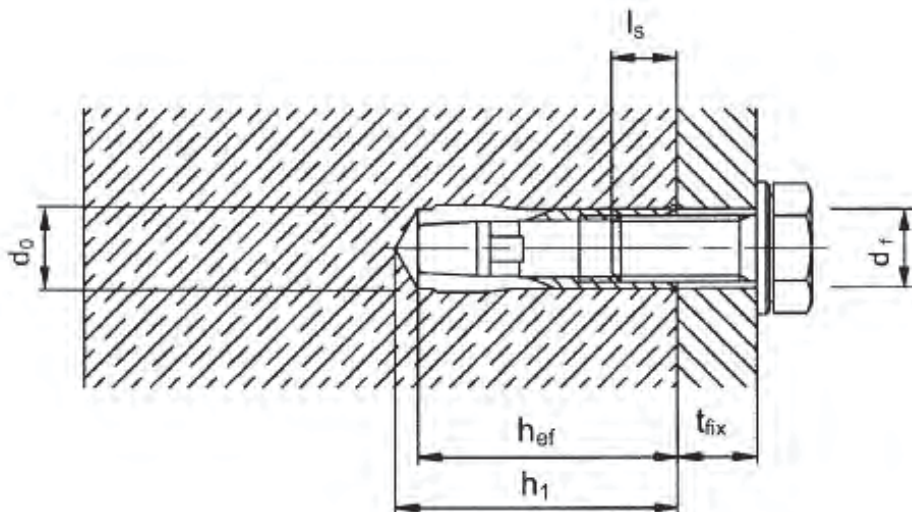
| Anchor size          |       | M6x25                                | M6x30   | M8x25 | M8x30    | M8x40 | M10x25 | M10x30 | M10x40 | M12x25 | M12x50     | M16x65 |
|----------------------|-------|--------------------------------------|---------|-------|----------|-------|--------|--------|--------|--------|------------|--------|
| Rotary hammer        |       | TE 2 – TE 16                         |         |       |          |       |        |        |        |        | TE 16 – 50 |        |
| Machine setting tool | HSD-M | 6x25/30                              | 8x25/30 | 8x40  | 10x25/30 | 10x40 | 12x25  | 12x50  | 16x65  |        |            |        |
| Hand Setting tool    | HSD-G |                                      |         |       |          |       |        |        |        |        |            |        |
| Other tools          |       | hammer, torque wrench, blow out pump |         |       |          |       |        |        |        |        |            |        |

### Setting instruction



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

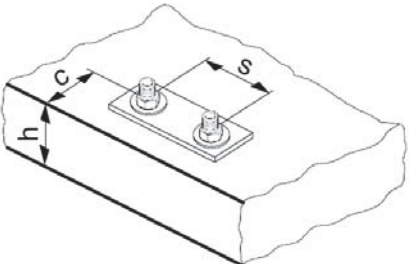
Setting details: depth of drill hole  $h_1$  and effective anchorage depth  $h_{ef}$



### Setting details

| Anchor size                               |                     | M6x25 | M6x30 | M8x25 | M8x30 | M8x40 | M10x25 | M10x30 | M10x40 | M12x25 | M12x50 | M16x65 |
|-------------------------------------------|---------------------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| Nominal diameter of drill bit             | $d_o$ [mm]          | 8     | 8     | 10    | 10    | 10    | 12     | 12     | 12     | 15     | 15     | 20     |
| Cutting diameter of drill bit             | $d_{cut} \leq$ [mm] | 8,45  | 8,45  | 10,5  | 10,5  | 10,5  | 12,5   | 12,5   | 12,5   | 15,5   | 15,5   | 20,5   |
| Depth of drill hole                       | $h_1 \geq$ [mm]     | 27    | 32    | 27    | 33    | 43    | 27     | 33     | 43     | 27     | 54     | 70     |
| Screwing depth                            | $l_{s,min}$ [mm]    | 6     | 6     | 8     | 8     | 8     | 10     | 10     | 10     | 12     | 12     | 16     |
|                                           | $l_{s,max}$ [mm]    | 12    | 12,5  | 11,5  | 14,5  | 17,5  | 12     | 13     | 18     | 12     | 22     | 30,5   |
| Diameter of clearance hole in the fixture | $d_f \leq$ [mm]     | 7     | 7     | 9     | 9     | 9     | 12     | 12     | 12     | 14     | 14     | 18     |
| Effective anchorage depth                 | $h_{ef}$ [mm]       | 25    | 30    | 25    | 30    | 40    | 25     | 30     | 40     | 25     | 50     | 65     |
| Max. torque moment                        | $T_{inst}$ [Nm]     | 4     | 4     | 8     | 8     | 8     | 15     | 15     | 15     | 35     | 35     | 60     |

**base material thickness, anchor spacing and edge distances**

| Anchor size                                                                          |                   | M6x25<br>M8x25<br>M10x25<br>M12x25 | M6x30<br>M8x30<br>M10x30 | M8x40<br>M10x40 | M12x50 | M16x65 |
|--------------------------------------------------------------------------------------|-------------------|------------------------------------|--------------------------|-----------------|--------|--------|
| Minimum base material thickness                                                      | $h_{min}$ [mm]    | 80                                 | 80                       | 80              | -      | -      |
| Minimum spacing and Minimum edge distance                                            | $s_{min}$ [mm]    | 200                                | 200                      | 200             | -      | -      |
| HKD<br>HKD-S (R)<br>HKD-E (R)                                                        | $c_{min}$ [mm]    | 150                                | 150                      | 150             | -      | -      |
|                                                                                      |                   |                                    |                          |                 |        |        |
| Minimum base material thickness                                                      | $h_{min}$ [mm]    | 100                                | 100                      | 100             | 100    | 130    |
| Minimum spacing and minimum edge distance                                            | $s_{min}$ [mm]    | 80                                 | 60                       | 80              | 125    | 130    |
| HKD-S (R)<br>HKD-E (R)                                                               | $c_{min}$ [mm]    | 140                                | 105                      | 140             | 175    | 230    |
| Minimum spacing HKD                                                                  | $s_{min}$ [mm]    | 80                                 | 60                       | 80              | 125    | 130    |
|                                                                                      | for $c \geq$ [mm] | 140                                | 105                      | 140             | 175    | 230    |
| Minimum edge distance HKD                                                            | $c_{min}$ [mm]    | 100                                | 80                       | 140             | 175    | 230    |
|                                                                                      | for $s \geq$ [mm] | 150                                | 120                      | 80              | 125    | 130    |
|  |                   |                                    |                          |                 |        |        |

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