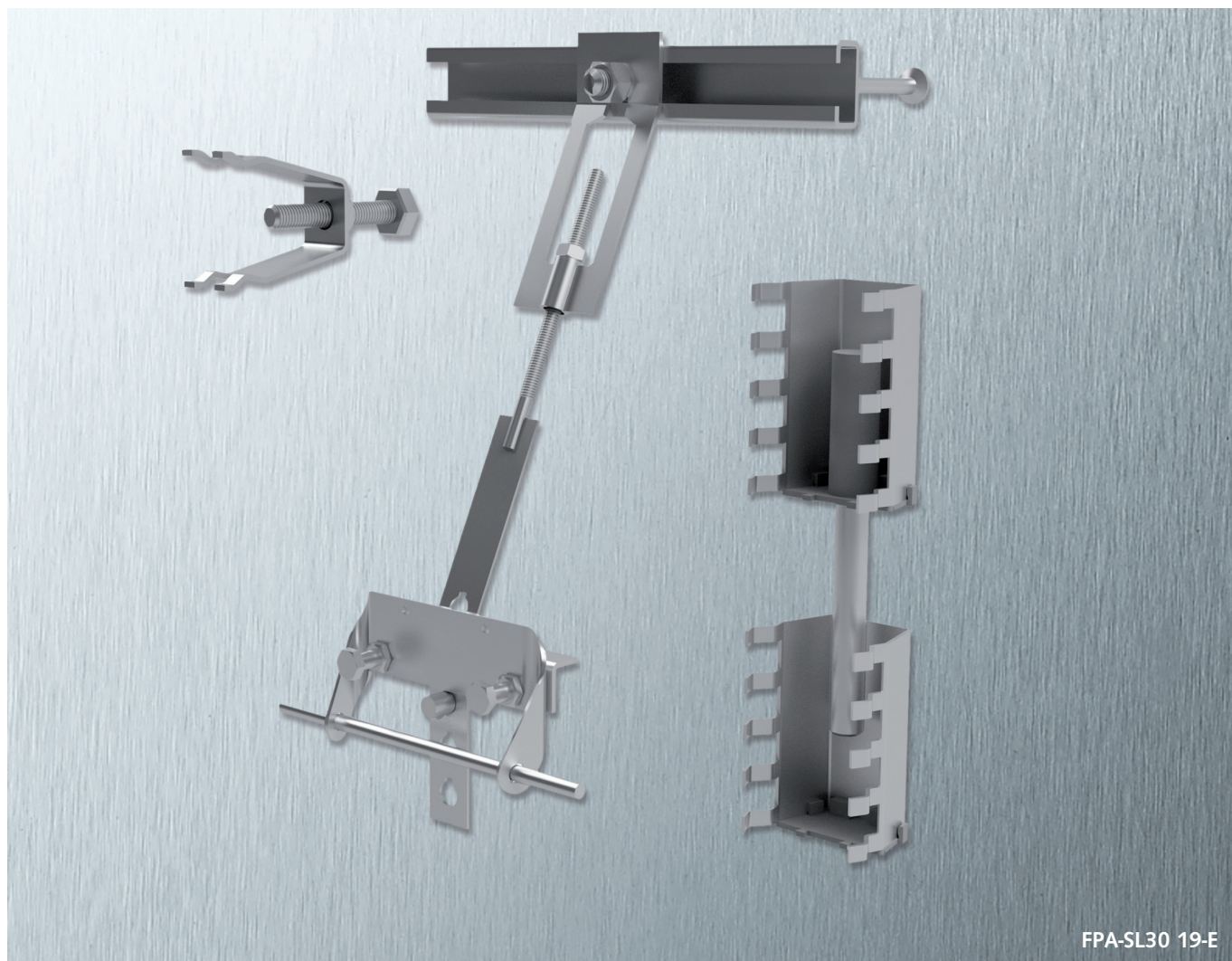




**HALFEN**

# **HALFEN FPA-SL30 SYSTEM**

## **Technical Product Information**



- Fixing system for thin, large-format concrete façade panels
- Façade panel anchor and horizontal anchorages building authority approved for façade panel thicknesses from 3 - 5 cm



We imagine, model and make engineered products and innovative construction solutions that help turn architectural visions into reality and enable our construction partners to build better, safer, stronger and faster.

**Leviat is a world leader in connecting, fixing, lifting and anchoring technology.**

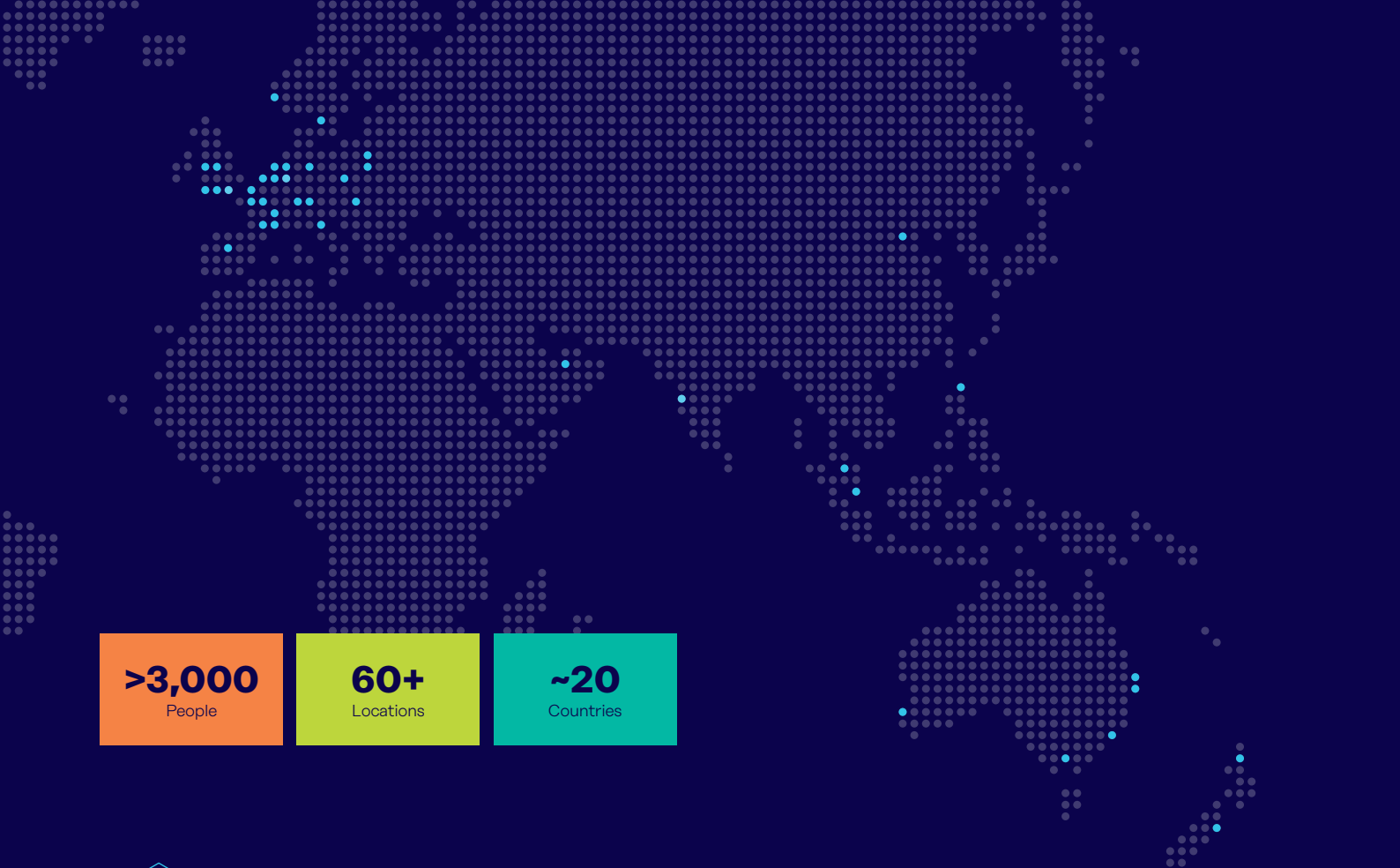
From the build of new schools, hospitals, homes and infrastructure, to the repair and maintenance of heritage structures, our engineering skills are making a difference around the world.

We provide technical design assistance at every stage of a project, from initial planning to installation and beyond.

Our technical support services range from simple product selection through to the development of a fully customised project-specific design solution.

Every promise we make locally, has the commitment and dedication of our global team behind it. We employ almost 3,000 people at 60 locations across North America, Europe and Asia-Pacific, providing an agile and responsive service worldwide.

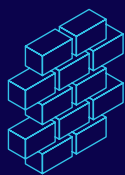




**>3,000**  
People

**60+**  
Locations

**~20**  
Countries

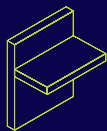


### Façade Support & Restraint

Systems for the safe and thermally-efficient fixing of the external building envelope, including brick and natural stone, insulated sandwich panels, curtain walling and suspended concrete façades, and also the repair and strengthening of existing masonry installations.

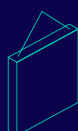
- Masonry Support Systems
- Windposts
- Lintels
- Brick Slip Systems
- Wall Ties & Restraints
- Masonry Reinforcement
- Natural Stone Façade Systems
- Cavity Trays
- Sandwich Panel anchor
- Suspended concrete façade
- Masonry Repair

### Other areas of expertise:



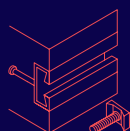
#### Structural Connections

Systems to form robust, efficient connections, and continuity of concrete reinforcement as necessary, between walls, slabs, columns, beams and balconies, providing structural integrity as well as enhanced thermal and acoustic performance.



#### Lifting & Bracing

Systems for the safe and efficient transportation, lifting and temporary bracing of cast concrete elements and tilt-up panels before permanent structural connections are made.



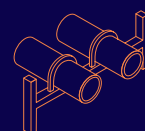
#### Anchoring & Fixing

Systems for fixing secondary fixtures to concrete, including anchor channels, bolts and inserts; also tension rod systems for roofs and canopies.



#### Formwork & Site Accessories

Non-structural accessories that complement our engineered solutions and help keep your construction environment operating safely and efficiently, including moulds for casting standard and special concrete elements and construction essentials such as reinforcing bar spacers.



#### Industrial Technology

Mounting channels, pipe clamps and other versatile framing systems that provide safe fixing in a wide range of industrial applications.

### Leviat product ranges:

Ancon | Aschwanden | Connolly | Halfen | Helifix | Isedio | Meadow Burke | Modersohn | Moment | Plaka | Scaldex | Thermomass

## HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

We are global market leader for concrete façades fastening systems



Picture provided by the Max Bögl Business Group/ tomjasny.com

Project: maxmodul – administration building TF2



Picture provided by the Max Bögl Business Group/ tomjasny.com

# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

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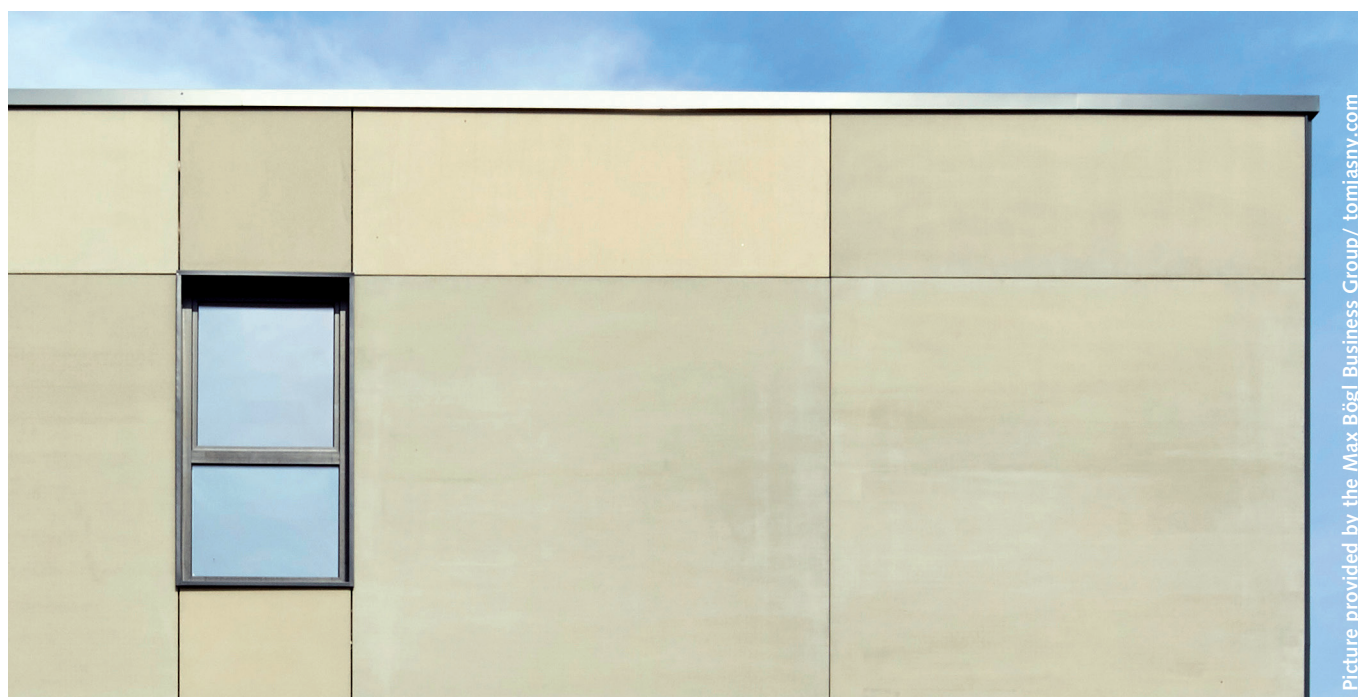
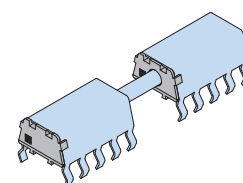
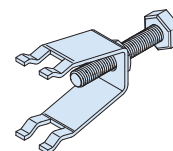
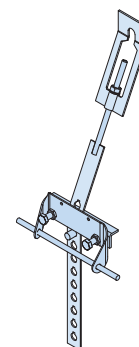
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Picture provided by the Max Bögl Business Group/ tomjasny.com

### Reliable and economical project planning

This catalogue includes information on necessary constructive planning and dimensioning, the corresponding details for the constructive design of concrete façades, and the necessary anchoring and fixing materials.

We have a comprehensive range of product and we have also competent engineers available with extensive experience to assistance with planning,

calculation and static consultation from the beginning of a project through to final installation of the elements.

In addition to one-on-one consultation and the project support provided by the engineers in our technical service team, we also provide easy-to-use dimensioning software to facilitate your projects.

Our products provide reliability, quality and safety - for you and your company.

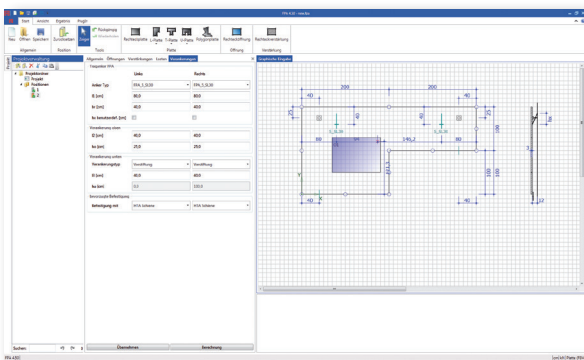


#### Design software — The perfect tool for reliable planning

The HALFEN FPA Design software is user-friendly and easy to use. A calculation is provided after entering the façade panel dimensions, selecting the anchors and if required, various other options.

##### FPA Software features

- design of asymmetrical slabs  
i.e. anchor positioning using the integrated FE core
- FPA and spacer bolts allow increased wall spacing
- all accessories are integrated in the software (horizontal anchors, suction restraints, fixing material)
- pre-set slab geometries (U, L, T, etc.)
- itemized parts listed according to installation and assembly components
- integrated wind load tool
- transfer of dowel loads
- installation plan with anchor positions and type designation
- detailed drawings of all anchoring positions



##### FPA calculation results

- designation of the calculated anchor type
- loads per anchor
- designation of the spacer bolts i.e. dowels
- horizontal anchorage loads
- suction restraints, if required
- results output/printout with drawing



Free and easy-to-use design software  
available at

[www.halfen.com](http://www.halfen.com) ▶ Downloads ▶ Software/CAD



More information about **HALFEN Façade panel anchors** fixings can be found in our technical information catalogue "**HALFEN Anchoring system concrete façades**"  
[www.halfen.com](http://www.halfen.com) ▶ Publications ▶ Catalogues ▶ Concrete façades



## The advantages of the HALFEN FPA-SL30-System at a glance

The use of textile reinforcement eliminates the need for concrete coverings  $\geq 25$  mm. This allows production of concrete slabs with minimal thickness, i.e. as low as 3 cm. In addition to the direct increase of usable floor space compared to the overall footprint of the building, this also has other advantages:

- **Sustainability (resource efficient construction)**
- **Production costs (low material costs)**
- **Transport costs (reduced slab weight)**

Using thin façade slabs also provide an interesting solution for renovating or upgrading existing façades.

### System overview

The HALFEN FPA-SL30 system consists of the following components:

#### ① FPA-SL30

Adjustable suspended, tension-anchor system for transferring the dead-load of façade slabs to the main support structure.

#### ② DS13-SL30

Anchoring element and adjustable spacer bolt for setting the distance to the wall and for transferring horizontal loads

#### ③ HFV-SL30

Adjustable dowel system which provides a positive-locking connection between two façade panel elements

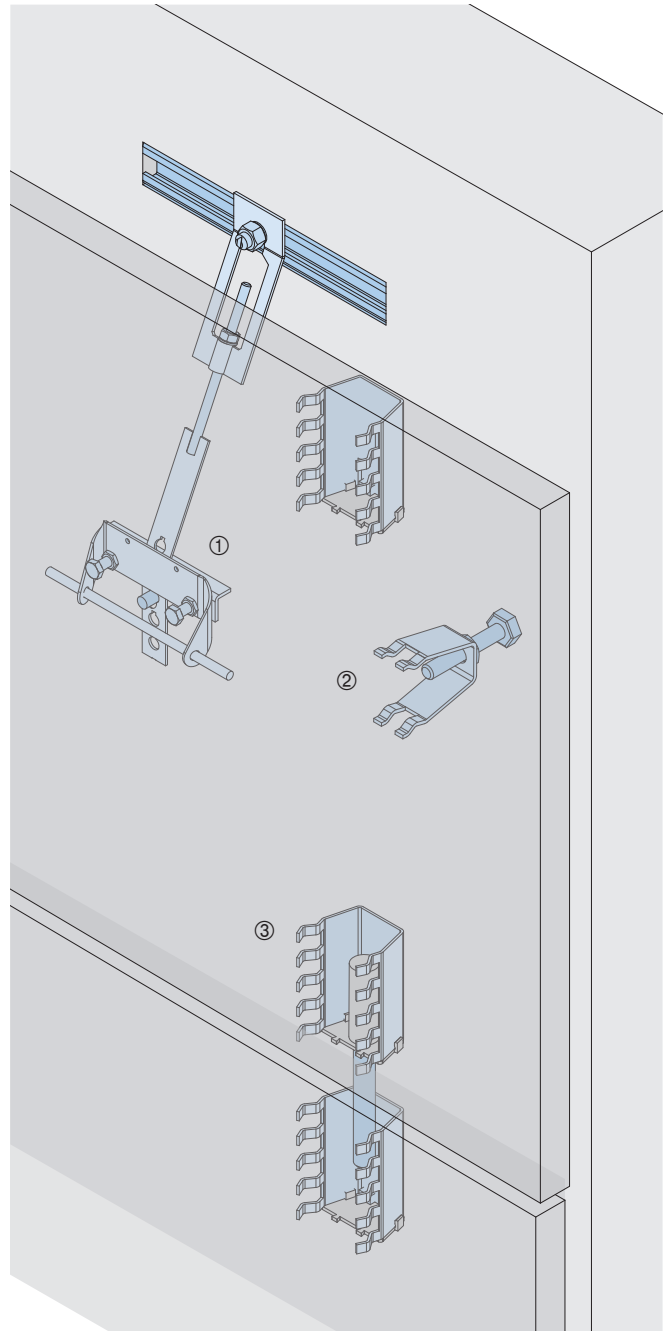
With the building authority approved FPA-SL30 system, statically determined and constraint-free suspended façade panels as thin as 3-5cm are possible. The quick and simple installation of the tried and tested FPA system has not been changed; a supporting structure is not required.

#### Requirements on the concrete:

- Concrete grade  $\geq C50/60$
- Aggregate size  $\leq 8$ mm

#### Requirements on the slab reinforcement:

- no specific demands (stainless steel or non-steel mesh reinforcement allowed)
- according to static requirements

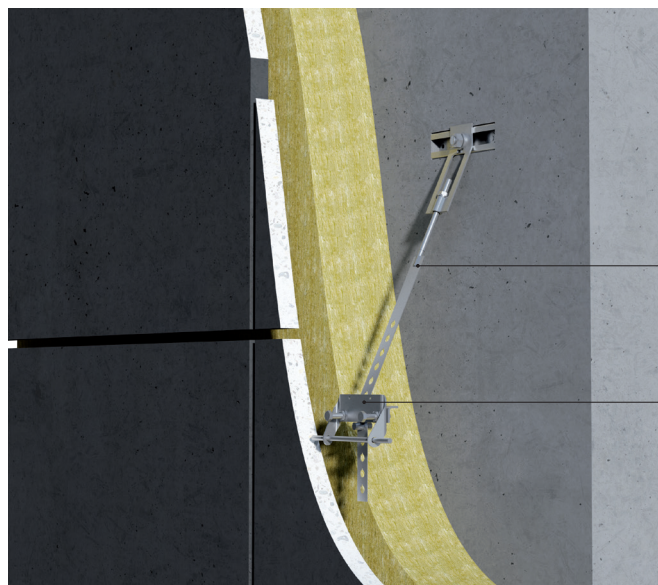


#### Material: Abbreviations and description

|       |                                                                                              |
|-------|----------------------------------------------------------------------------------------------|
| A4/L4 | Steel, corrosion resistance class (CRC) III according to DIN EN 1993-1-4: 2015-10, table A.3 |
|-------|----------------------------------------------------------------------------------------------|

## HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

### HALFEN FPA-SL30 Façade Panel Anchor

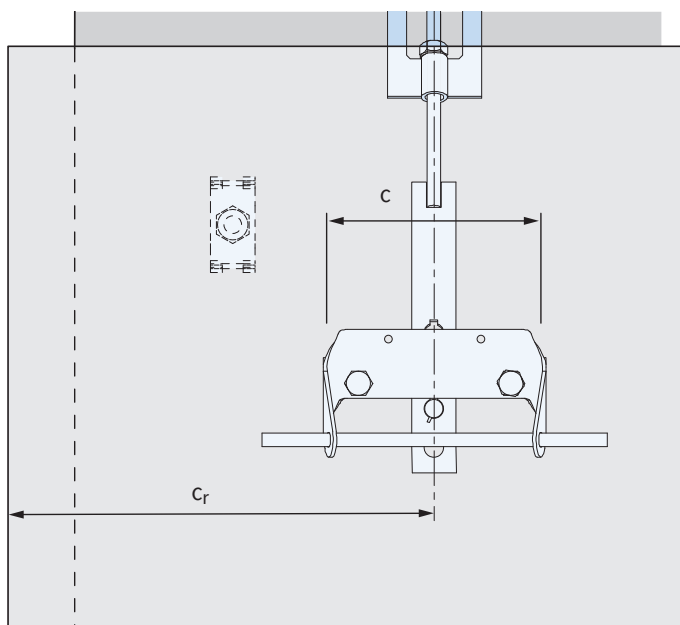
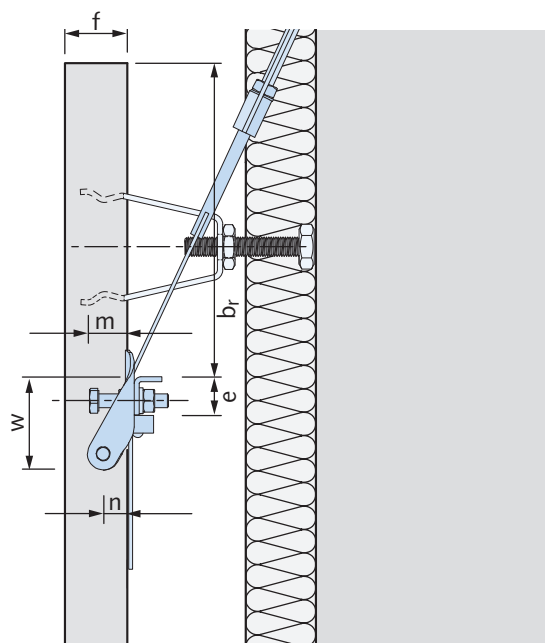


#### Product components

- FPA - M** (Installation component):  
Perforated strap, nut, washer, locking bolt and top bracket  
(Colour code: yellow)
- FPA - E - SL30** (Cast-in component):  
Bracket element with angled bracket, cross bar and recess former  
(Colour code: yellow/turquoise)

#### FPA-E-SL30 Cast-in component for the precast element

The cast-in component of the SL30 Façade panel anchor system is the same for all types.  
The dimensions are listed in the table below, installation instructions can be found on pages 12-13.



#### Specifications, Cast-in component FPA-E-SL30 [mm]

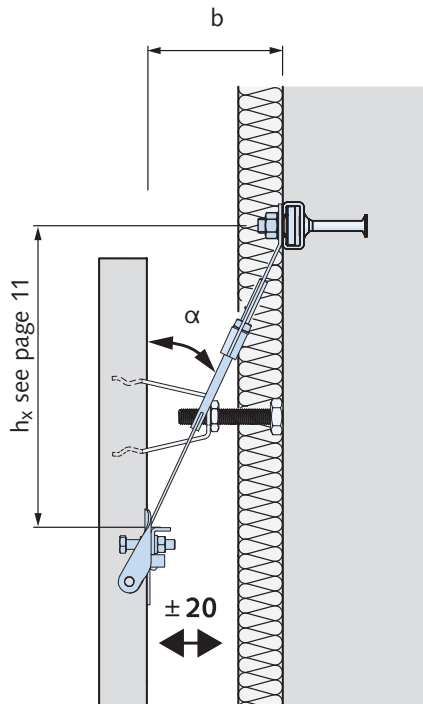
| Load group | Load capacity<br>$F_{V,Rd}$<br>[kN] | Cast-in component FPA-E-SL30 for FPA-5, FPA-5A, FPA-5S |              |              |     |    |    |    |    |
|------------|-------------------------------------|--------------------------------------------------------|--------------|--------------|-----|----|----|----|----|
|            |                                     | f                                                      | $b_r$<br>min | $c_r$<br>min | c   | e  | m  | n  | w  |
| 5.0        | 6.75 ①                              | 30-50                                                  | 60           | 150          | 122 | 22 | 26 | 16 | 54 |

① See general building authority approval no. Z-21.8-2067 for edge spacings < 60 cm ( $b_r$ ) or < 75 cm ( $c_r$ ),

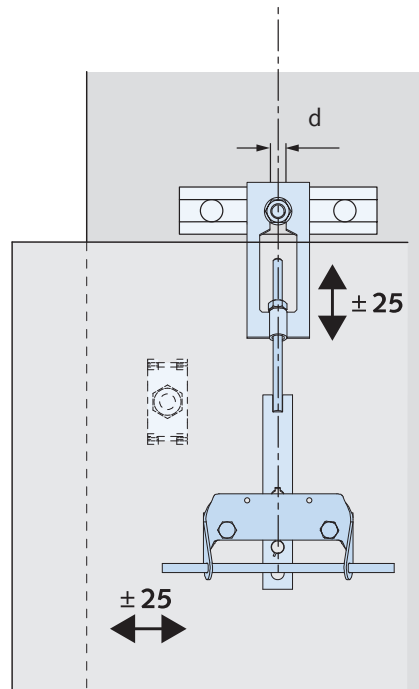
# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

## HALFEN FPA-5-SL30 Façade Panel Anchor

### FPA-5-SL30 Façade Panel Anchor



Dimensions in [mm]



### Notes: Use of fixings for façade anchors

We recommend using HALFEN HTA Cast-in channels or dowels suitable for tensile zones. If dowels are used, which are not suitable for use in tensile zones, then these must be verified before application. All fixings must be verified using the effective loads.

Material: A4/L4  
(Material specifications, see page 5)

### Scope of delivery FPA-5-SL30

**FPA - 5 - M** (Installation component):  
Perforated strap, nut, washer, and top bracket

**FPA - E - SL30** (Cast-in component):  
Bracket element with angled bracket, cross bar and recess former

**FPA - 5 - G - SL30** (Set): includes:  
**FPA - 5 - M**  
**+ FPA - 5 - E - SL30**

### Order example

**FPA - 5 - M - 5,0 - 200**

① ② ③ ④ ⑤

- ① Type
- ② Version
- ③ Scope of delivery
- ④ Load class
- ⑤ Wall spacing b

Please order spacer bolts and sleeves separately, see page 15

### Specifications FPA-5-SL30

| Load group | Load capacity<br>$F_{V,Rd}$ [kN] | Nominal angle $\alpha$ ②<br>with walls spacing = 80 - 350 mm | Hole diameter<br>Installation component<br>d [mm] |
|------------|----------------------------------|--------------------------------------------------------------|---------------------------------------------------|
| 5.0        | 6.75 ①                           | 25.0°                                                        | 13                                                |

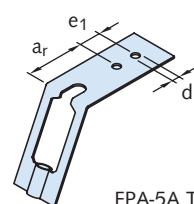
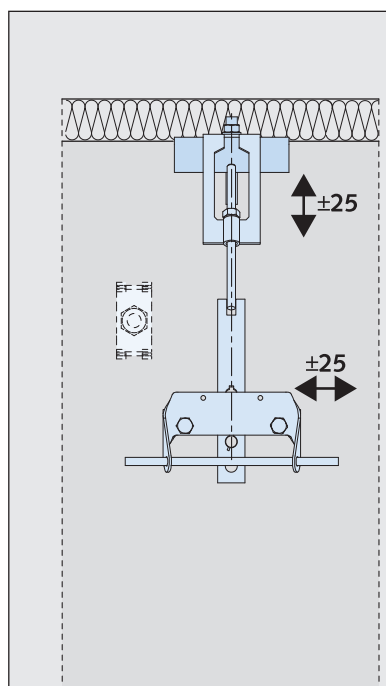
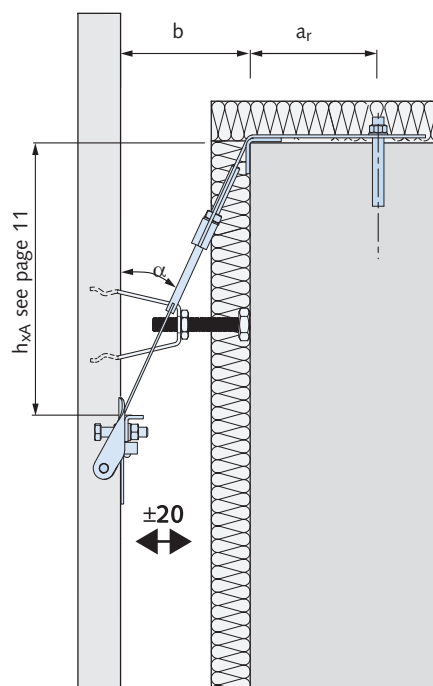
① See general building authority approval no. Z-21.8-2067 for edge spacings < 60 cm ( $b_r$ ) or < 75 cm ( $c_r$ )

② More information about the perforated strap can be found on page 11.

# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

## HALFEN FPA-5A-SL30 Façade Panel Anchor

### FPA-5A-SL30 Façade Panel Anchor



FPA-5A Top bracket

Material: A4/L4  
(Material specifications, see page 5)

Dimensions in [mm]

### Scope of delivery FPA-5A-SL30

**FPA - 5A - M** (Installation component):  
Perforated strap, nut and washer,  
locking bolt, top bracket and edge  
protector

**FPA - E - SL30** (Cast-in component):  
Bracket element with angled bracket,  
cross bar and recess former

**FPA - 5A - G - SL30** (set):  
**FPA - 5A - M**  
+ **FPA - E - SL30**

Please order spacer bolts and sleeves  
separately, see page 15

### Order example

**FPA - 5A - M - 5,0 - 200**

- ① Type
- ② Version
- ③ Scope of delivery
- ④ Load class
- ⑤ Wall spacing b

### Specifications FPA-5A-SL30

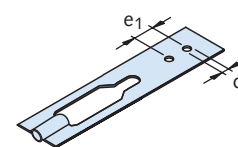
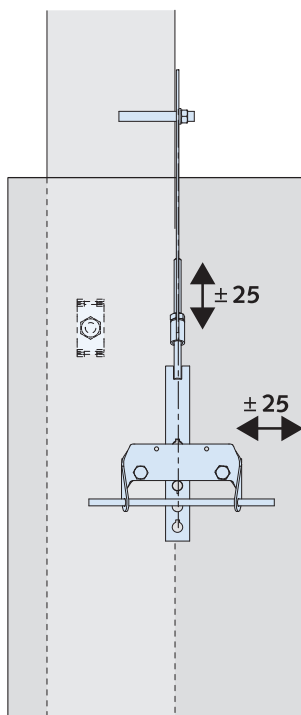
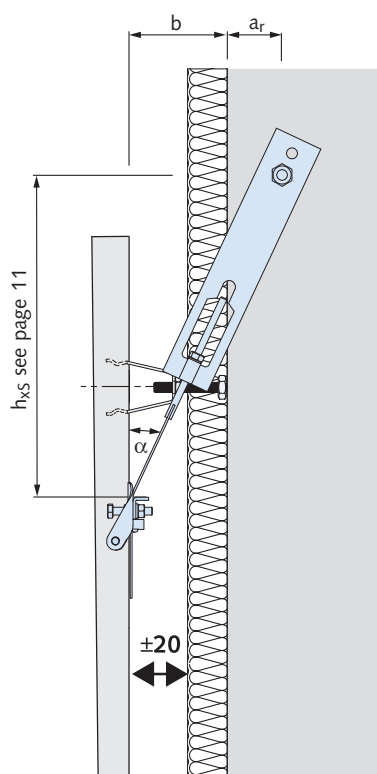
| Load group | Load capacity<br>$F_{V,Rd}$ ①<br>[kN] | Nominal angle $\alpha$<br>②<br>with walls spacing $b = 80 - 350$ mm | Hole diameter,<br>installation component<br>$d$<br>[mm] | Hole<br>spacing<br>$e_1$<br>[mm] | Edge<br>spacing<br>$a_r$<br>[mm] |
|------------|---------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------|----------------------------------|----------------------------------|
| 5.0        | 6.75                                  | 25.0°                                                               | Ø 11                                                    | 24                               | 110                              |

- ① See general building authority approval no. Z-21.8-2067 for edge spacings < 60 cm ( $b_r$ ) or < 75 cm ( $c_r$ ),
- ② More information about the perforated strap can be found on page 11

# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

## HALFEN FPA-5S-SL30 Façade Panel Anchor

### FPA-5S-SL30 Façade Panel Anchor



FPA-5S Top bracket

Material: A4/L4  
(Material specifications, see page 5)

Dimensions in [mm]

### Scope of delivery FPA-5S-SL30

**FPA - 5S - M** (Installation component):  
Perforated strap, nut, washer, locking bolt and top bracket

**FPA - E - SL30** (Cast-in component):  
Bracket element with angled bracket, cross bar and recess former

**FPA - 5S - G - SL30** (set):  
**FPA - 5S - M**  
+ **FPA - E - SL30**

Please order spacer bolts and sleeves separately, see page 15

### Order example

**FPA - 5S - M - 5,0 - 200**

① ② ③ ④ ⑤

- ① Type
- ② Version
- ③ Scope of delivery
- ④ Load class
- ⑤ Wall spacing b

### Specifications FPA-5S

| Load group | Load capacity<br>$F_{V,Rd}$ ①<br>[kN] | Nominal angle $\alpha$<br>②<br>with walls spacing $b = 80 - 350\text{mm}$ | Hole diameter,<br>installation component<br>$d$<br>[mm] | Hole<br>spacing<br>$e_1$<br>[mm] | Edge<br>spacing<br>$a_r$<br>[mm] |
|------------|---------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------|----------------------------------|
| 5,0        | 6,75                                  | 25,0°                                                                     | Ø 11                                                    | 24                               | 100                              |

- ① See general building authority approval no. Z-21.8-2067 for edge spacings < 60 cm ( $b_r$ ) or < 75 cm ( $c_r$ ),  
② More information about the perforated strap can be found on page 11

# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

## Static Fundamentals

### Calculating the anchor loads

To install a concrete façade panel two façade panel anchors are required as support anchors for the vertical loads (dead load), and four horizontal anchors to ensure correct wall spacing (Standard is two spacer bolts at the top of the panel and two at the bottom).

#### Actions:

$G$  = Vertical weight from the proportionate weight of the façade panel

For symmetrically suspended anchors,  $G$  per anchor =  $\frac{1}{2}$  slab weight

$w_d$  = Wind pressure load per horizontal anchor

$w_s$  = Wind suction load per horizontal anchor

#### Partial safety factor for load actions:

$\gamma_G$  = 1.35 permanent loads (dead load)

$\gamma_Q$  = 1.50 variable actions (wind load)

#### Anchor loads:

$V_d$  = Vertical load in the anchor =  $G \times \gamma_G$

$H_d$  = Horizontal load in the anchor =  $V_d \times \tan \alpha$

$R_d$  = Resulting diagonal load in the anchor =  $\sqrt{V_d^2 + H_d^2}$

$Do_d$  = Horizontal load, top (from  $Do_{g,d} + Do_{w,d}$ )

$Du_d$  = Horizontal load, bottom (from  $Du_{g,d} + Du_{w,d}$ )

$Do_{g,d}$  = Horizontal load, top, from dead load  $\times \gamma_G$

max.  $Do_{w,d}$  = Horizontal load, top, wind load ( $w_d \times \gamma_Q$ )

min.  $Do_{w,d}$  = Horizontal load, top, wind load ( $w_s \times \gamma_Q$ )

$Du_{g,d}$  = Horizontal load, bottom, from dead load  $\times \gamma_G$

max.  $Du_{w,d}$  = Horizontal load, bottom, wind load ( $w_d \times \gamma_Q$ )

min.  $Du_{w,d}$  = Horizontal load, bottom, wind load ( $w_s \times \gamma_Q$ )

#### Requirements:

If min  $Do_d < 0 \rightarrow$  } Suction restraint required (e.g. Adjustable restraint)  
If min  $Du_d < 0 \rightarrow$  }

#### Verification:

$\Sigma M_A \rightarrow Du_{g,d} = (H_d \times h_2 + V_d \times f/2) / h_1$

max.  $Du_d = Du_{g,d} + \max Du_{w,d}$

min.  $Du_d = Du_{g,d} - \min Du_{w,d}$

$\Sigma H \rightarrow Do_{g,d} = H_d - Du_{g,d}$

max.  $Do_d = Do_{g,d} + \max Do_{w,d}$

min.  $Do_d = Do_{g,d} - \min Do_{w,d}$

#### Verifying suction restraint:

If min.  $Do_d$  i.e. min  $Du_d < 0 \rightarrow$  Suction restraint required (for example, adjustable restraint)

According to Expert's report; global safety factor of 1.2 to prevent lift-off (mandatory)

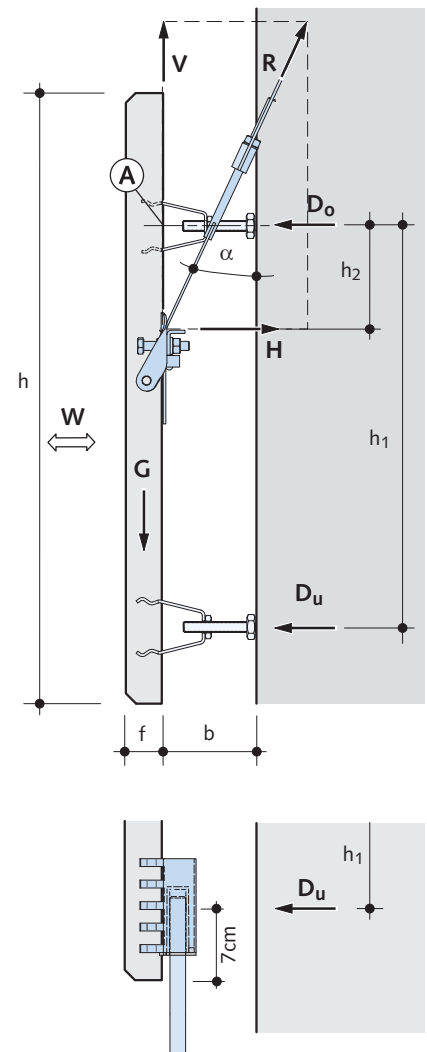
$\rightarrow$  min.  $Do_d, Sog = Do_{g,k} - \min. Do_{w,k} \times 1,2$

$\rightarrow$  min.  $Du_d, Sog = Du_{g,k} - \min. Du_{w,k} \times 1,2$

In stacked suspended façade panels the bottom spacer bolts can be replaced with HFV dowels. Depending on the expected wind loads, and the shape and size of the slab, additional suction protection may be required for horizontal anchors (for example, compression bolts and Adjustable restraint).



No more than two façade panel anchors may be installed in a single precast element!



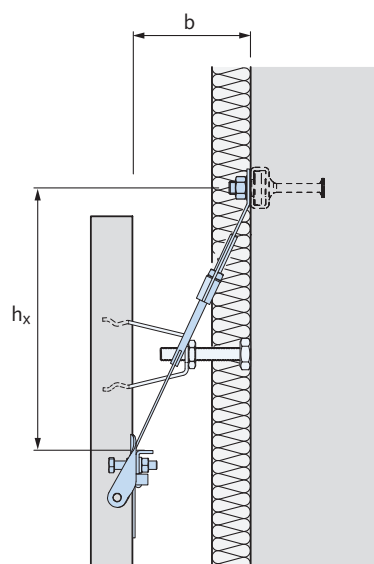
$\alpha$  = Angle of inclination  
(see tables on page 7-9)

# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

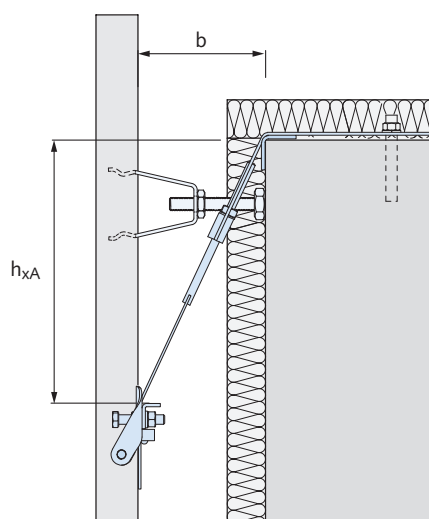
## Perforated strap for the HALFEN FPA-SL30 Façade Panel Anchor

### Perforated strap for the FPA-SL30 Façade Panel Anchor

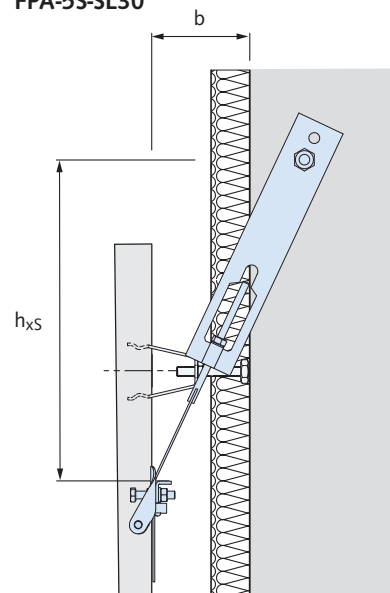
FPA-5-SL30



FPA-5A-SL30



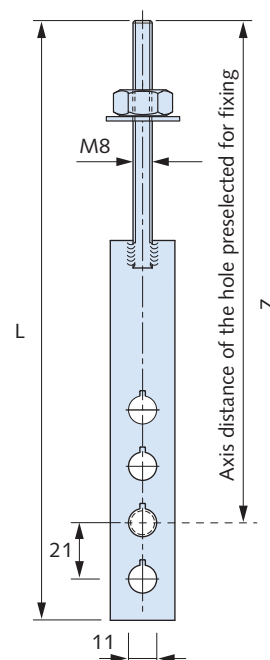
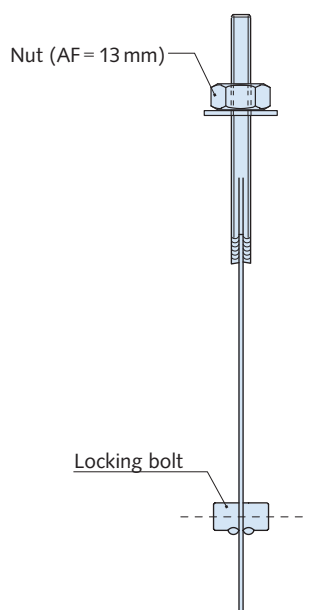
FPA-5S-SL30



### Specifications Perforated strap for FPA-5/ -5A/ -5S -SL30

| Load group                | 5.0            |                 |                 |                    |     |
|---------------------------|----------------|-----------------|-----------------|--------------------|-----|
| Wall spacing<br>b<br>[mm] | h <sub>x</sub> | h <sub>xA</sub> | h <sub>xS</sub> | L<br>①             | Z   |
| 80                        | 190            | 175             | 390             | 246                | 188 |
| 90                        | 210            | 195             | 410             | (4/S)              | 209 |
| 100                       | 230            | 215             | 430             | 435<br>(12/<br>M)  | 230 |
| 110                       | 255            | 240             | 455             |                    | 251 |
| 120                       | 275            | 260             | 475             |                    | 272 |
| 130                       | 295            | 280             | 495             |                    | 293 |
| 140                       | 315            | 305             | 520             |                    | 314 |
| 150                       | 340            | 325             | 540             |                    | 356 |
| 160                       | 360            | 345             | 560             |                    | 377 |
| 170                       | 380            | 365             | 580             |                    | 398 |
| 180                       | 405            | 390             | 605             | 645<br>(12/<br>L)  | 419 |
| 190                       | 425            | 410             | 625             |                    | 440 |
| 200                       | 445            | 430             | 645             |                    | 461 |
| 210                       | 470            | 455             | 670             |                    | 482 |
| 220                       | 490            | 475             | 690             |                    | 524 |
| 230                       | 510            | 495             | 710             |                    | 545 |
| 240                       | 530            | 515             | 730             |                    | 566 |
| 250                       | 555            | 540             | 755             | 855<br>(12/<br>XL) | 587 |
| 260                       | 575            | 560             | 775             |                    | 608 |
| 270                       | 595            | 580             | 795             |                    | 629 |
| 280                       | 620            | 605             | 820             |                    | 650 |
| 290                       | 640            | 625             | 840             |                    | 671 |
| 300                       | 660            | 645             | 860             |                    | 692 |
| 310                       | 680            | 665             | 880             |                    | 734 |
| 320                       | 705            | 690             | 905             |                    | 755 |
| 330                       | 725            | 710             | 925             |                    | 776 |
| 340                       | 745            | 730             | 945             |                    | 797 |
| 350                       | 770            | 755             | 970             |                    | 818 |

① Number of slots/Type of perforated strap  
(S/M/L/XL) see values in bracket

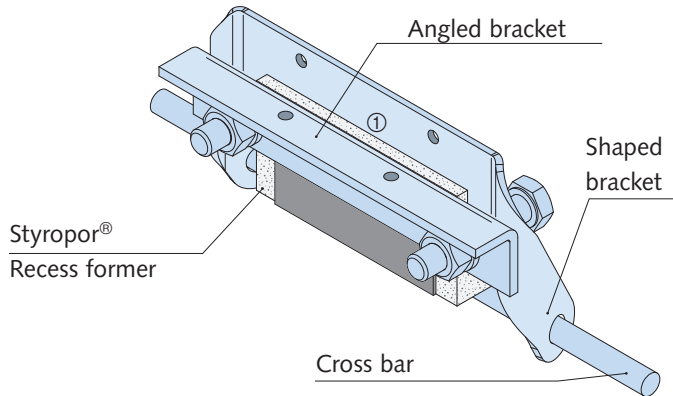


Note: Perforated straps for larger wall spacings are available on request

# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

## Installation of the FPA-SL30 Façade Panel Anchor

### 1. Installation of the FPA-E-SL30 Cast-in component



**i** The FPA-E-SL30 Cast-in component is delivered preassembled.

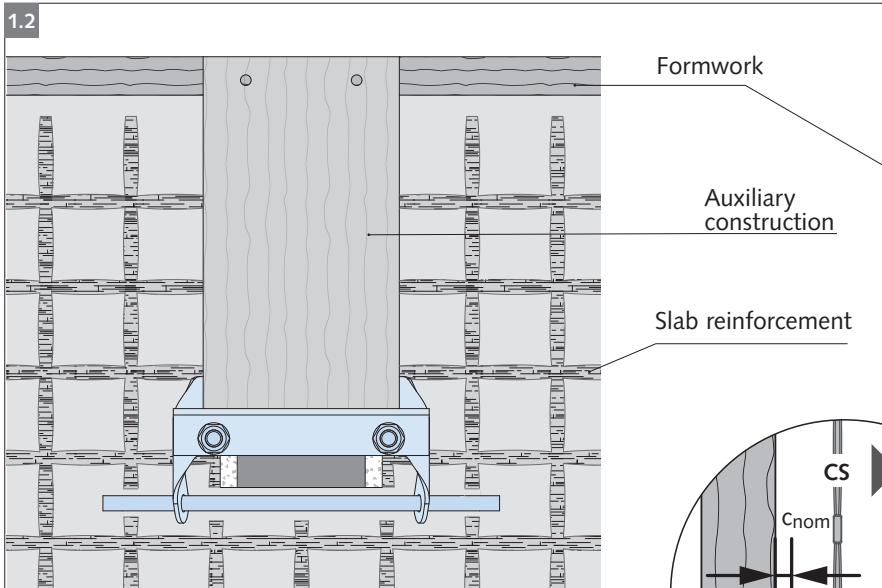
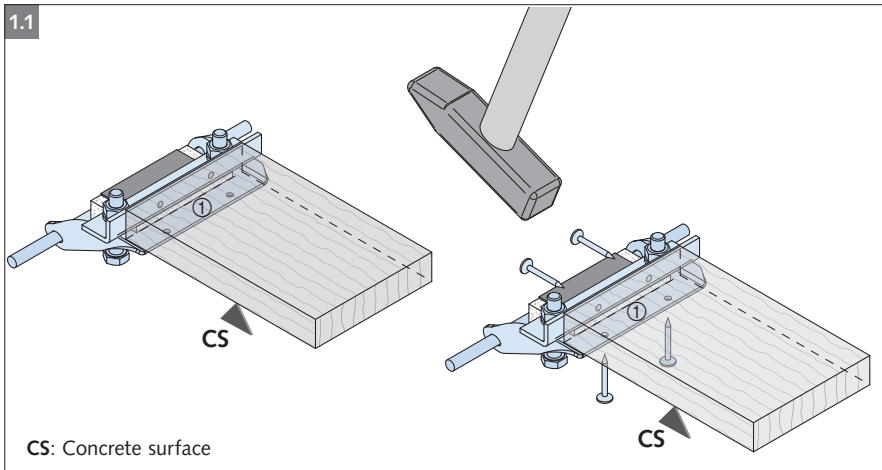
**1.1** Fix the cast-in element (shaped bracket) with nails to the auxiliary aid. Nail holes are provided in the shaped bracket and in the angled bracket.

**!** The auxiliary aid must be flush with the final concrete surface! ①  
**CS = bottom surface auxiliary aid!**

**1.2** Fix the auxiliary aid to the formwork. Planned concrete cover at the (hexagon) bolts;  
**nom = f - 26 mm.**

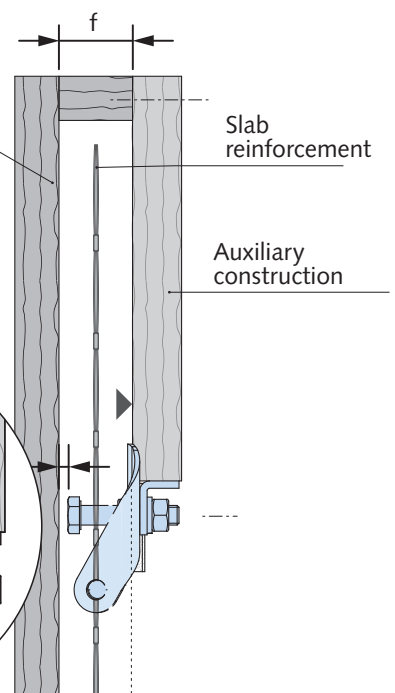
Install the slab reinforcement over the cast-in element up to the edge.

**1.3** Pour the concrete for the precast component and compact the concrete properly (not illustrated).



**!** **NOTE:**  
Minimal concrete cover  
compact properly!

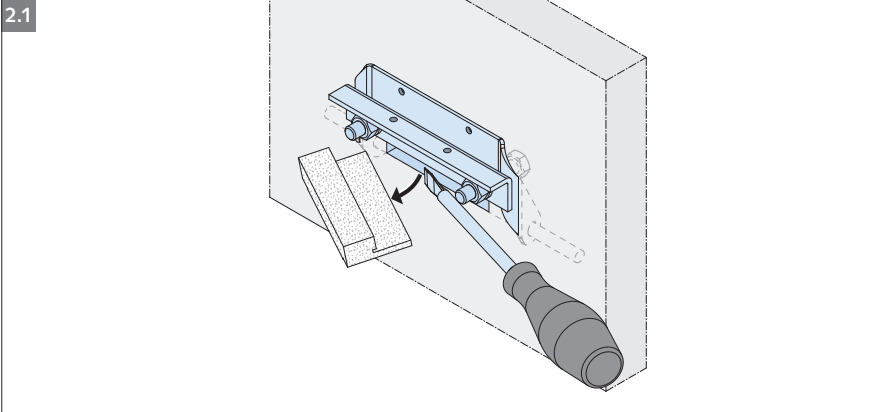
CS: Concrete surface



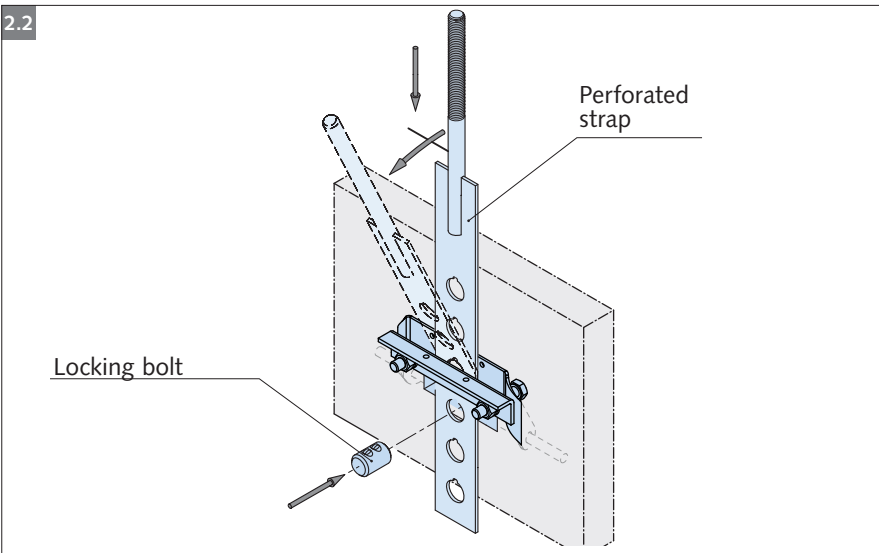
## HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

### Installation of the FPA-SL30 Façade Panel Anchor

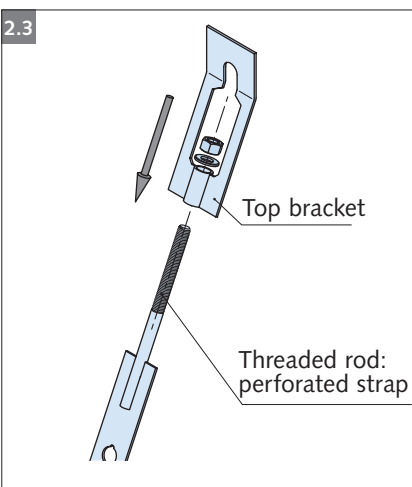
#### 2. Fixing the façade panel to the load-bearing component



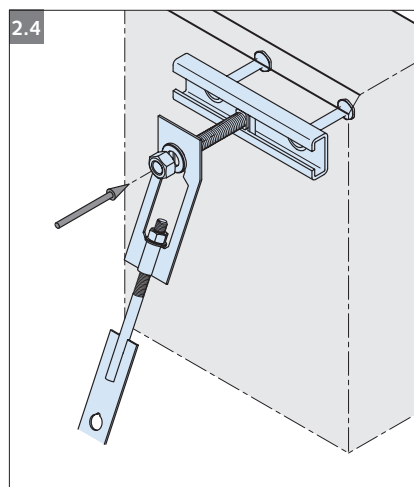
- 2.1 Before installation of the panel remove the polystyrene recess former. Any polystyrene left in the gap between the shaped bracket and the angled bracket can be removed using the perforated strap. Retighten any loosened nuts (nut size 13 mm) with a torque wrench set to 5 Nm.



- 2.2 Insert the perforated strap between the shaped bracket and angled bracket. Pre-assemble the perforated strap to the required length according to the specified length. Secure the perforated strap using the locking bolt (rotate the bolt half a turn = 180°) and bend the strap over the angled bracket.



- 2.3 Attach the top bracket to the threaded rod of the perforated strap using washers and nuts. For type FPA-5A-SL30 we recommend using the top bracket as a template to facilitate correct positioning of the drill holes for assembly.



- 2.4 Fasten the precast façade panel with the fitted, pre-assembled FPA-5-SL30 to the load bearing structure (on site drilled dowel or cast-in HALFEN Channel). Adjust the precast element by turning the nut on the perforated strap.



During adjustment the precast panel remains suspended from the crane hook.



The hexagon nuts in the FPA-system are factory coated with Molykote® HSC-Spray.

In some cases, for example after pro-longed outside storage, it may be necessary to renew this coating.



# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

## Horizontal Anchorage and Dowels

### Notes:

We provide two different building authority approved systems for transferring horizontal pressure and tensile loads and adjusting correct wall spacings:

- DS13-SL30 spacer bolts with tensile/compressive sockets are installed at the upper edge of the panel to transfer compression from dead load and wind pressure.
- To facilitate assembly, dowels are commonly used to connect façade panels together which are installed one on top of another. This is done with HFV-SL30 anchoring elements installed close to the edges of adjacent panel edges and connected to each other using HFV 3 dowels and grout.

Appropriate anchors may be required to account for wind suction due to the low dead weight of thin façade panels.

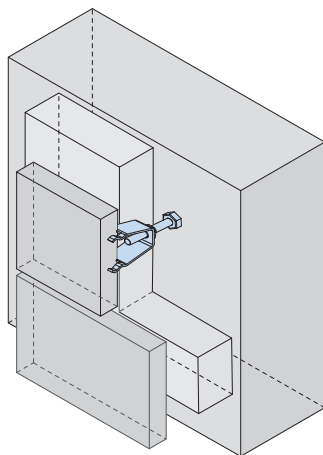
The LD and LD-A Adjustable restraints used together with DS13-SL30 tension/pressure anchorage provide an effective solution.

### Tension and pressure-resistant connections in the spacing between parallel elements

#### Spacer bolt DS13-SL30

Page 15

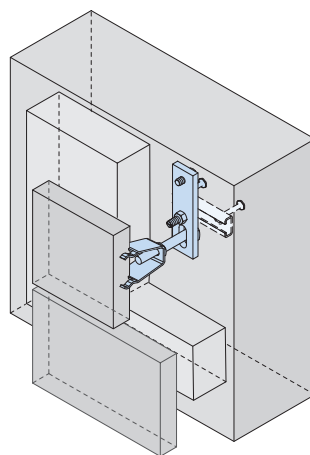
- Anchorage in concrete is building authority approved
- type-tested spacer bolt for wall spacing  $\leq 500$  mm



#### Adjustable restraint LD

Page 18

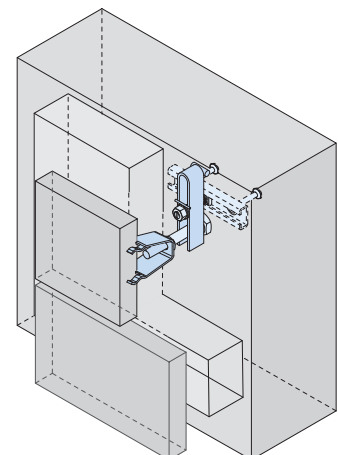
- for wall spacing  $\geq 10$ cm
- tension load capacity  $F_{Rd} = 5.25$  kN



#### Adjustable restraint LD-A

Page 19

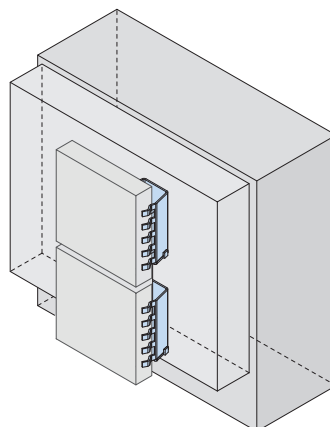
- for wall spacing  $\geq 12$ cm
- tension load capacity  $F_{Rd} = 5.25$  kN



#### HFV-SL30 Dowel System

Page 20

- building authority approved
- shear load capacity  $F_{Rd} = 2.7$  kN

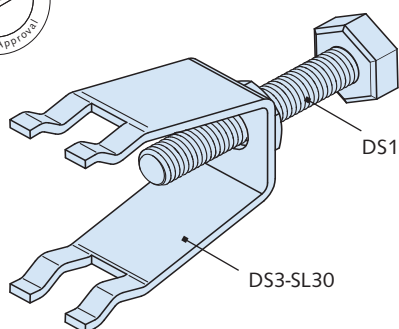


# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

## HALFEN DS13-SL30 Spacer bolt

### DS13-SL30

Type tested



### DS13-SL30 Spacer bolt

includes:

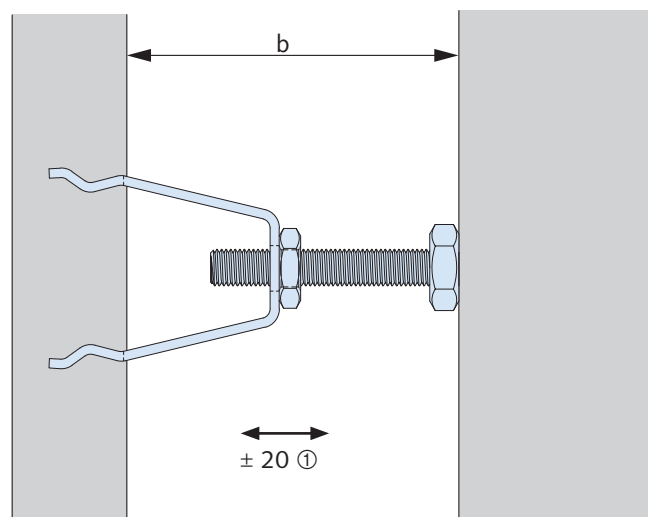
DS1 Spacer bolt and DS3-SL30 Tension/pressure sleeve

### Order example

DS 13 - SL30 - 12 - 120

① ② ③ ④

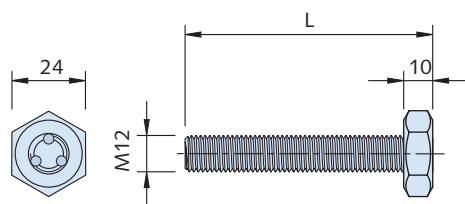
- ① Type
- ② Version
- ③ Thread
- ④ Wall spacing



① Reduced adjustment range for b=80mm (+20/-14mm)

Material: A4/L4  
(Material specifications, see page 5)

### DS1 dimensions

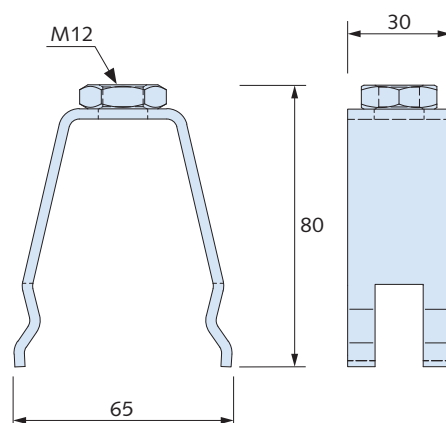


### Spacer bolt lengths

| b [mm] | 80 | 90 - 100 | 110 - 120 | 130 - 140 | 150 - 160 | 170 - 180 | 190 - 200 | 210 - 220 | 230 - 240 | 250 - 260 | 270 - 280 |
|--------|----|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| L [mm] | 52 | 72       | 92        | 112       | 132       | 152       | 172       | 192       | 212       | 232       | 252       |

further lengths are available on request

### DS3-SL30 dimensions



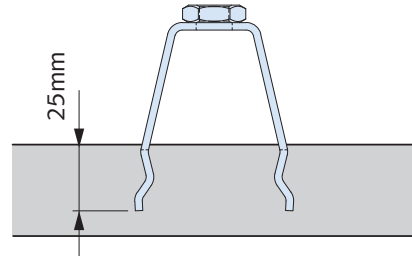
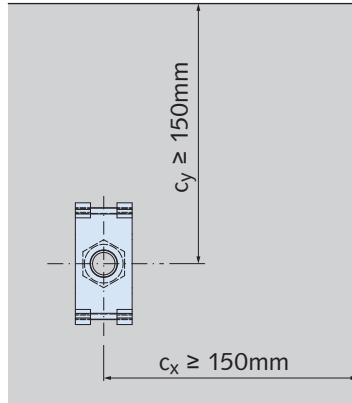
# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

## Installation Instructions DS3-SL30

### Edge distances, anchoring depth

The following specification must be observed for installation

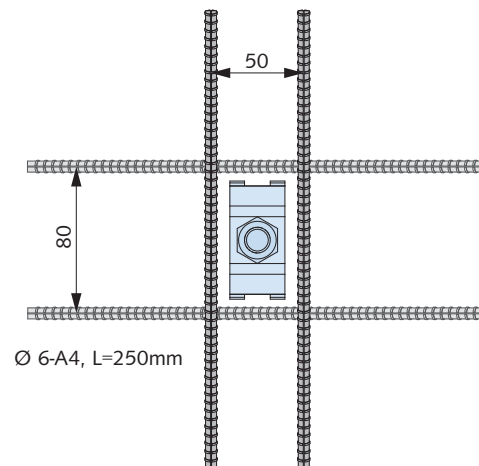
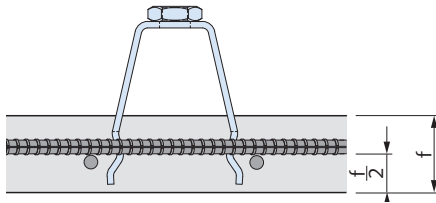
An axial distance of  $\geq 150$  mm to both edges of the panel.



DS3-SL30 are installed with an anchoring depth of 25 mm.

### Required additional reinforcement

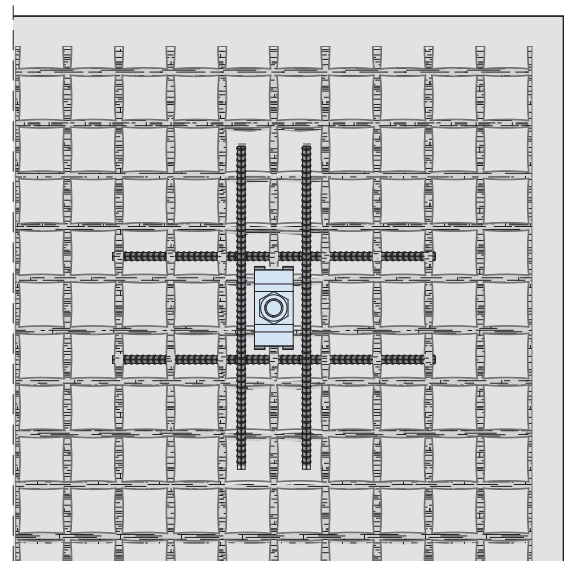
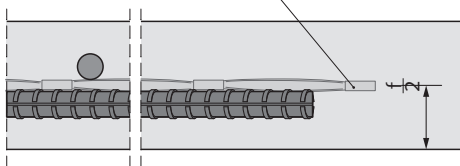
To avoid splitting failure, each DS3-SL30 tension/pressure sleeve must be reinforced with 4 rebars B500 A/B-Ø 6-A4, L=250mm arranged as shown:



### Slab Reinforcement

In accordance with the static requirements of the slab design, at least one single-layer of steel or non-steel mesh reinforcement must be installed in the area of the anchors. An installation with a solidian GRID Q121/121-AAE-38 mesh reinforcement is shown exemplarily.

*solidian GRID Q121/121-AAE-38*

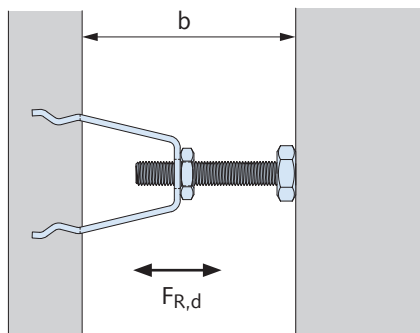


## HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

### Load capacities DS13-SL30

#### Load capacities DS13-SL30

The minimum strength of the two DS3-SL30 and DS1 components determines the compressive strength of the DS13-SL30. For tensile loads the load capacities of the DS3-SL30 apply.



Tension load capacities  $F_{Rd}$  [kN] DS3-SL30

| Condition  | for edge spacing $c_{x,cy} \geq 150$ | for edge spacing $c_{x,cy} \geq 250$ |
|------------|--------------------------------------|--------------------------------------|
| noncracked | 4.5                                  | 6.6                                  |
| cracked    | 2.6                                  | 3.8                                  |

Pressure load capacities  $F_{Rd}$  [kN] DS3-SL30

| Condition  | for edge spacing $c_{x,cy} \geq 150$ | for edge spacing $c_{x,cy} \geq 250$ |
|------------|--------------------------------------|--------------------------------------|
| noncracked | 7.0                                  | 7.5                                  |
| cracked    | 5.0                                  | 5.4                                  |

Pressure load capacities  $F_{Rd}$  [kN] DS1

| Wall spacing $b$ [mm] | 280 | 300 | 320 | 340 | 360 | 380 | 400 |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|
| 80 - 250              |     |     |     |     |     |     |     |
| $\geq 7.5$            | 6.3 | 5.7 | 4.8 | 4.3 | 3.6 | 3.3 | 3.0 |

The load capacities have been reduced compared to the values in the type test to take unfavourable influences during assembly into account.



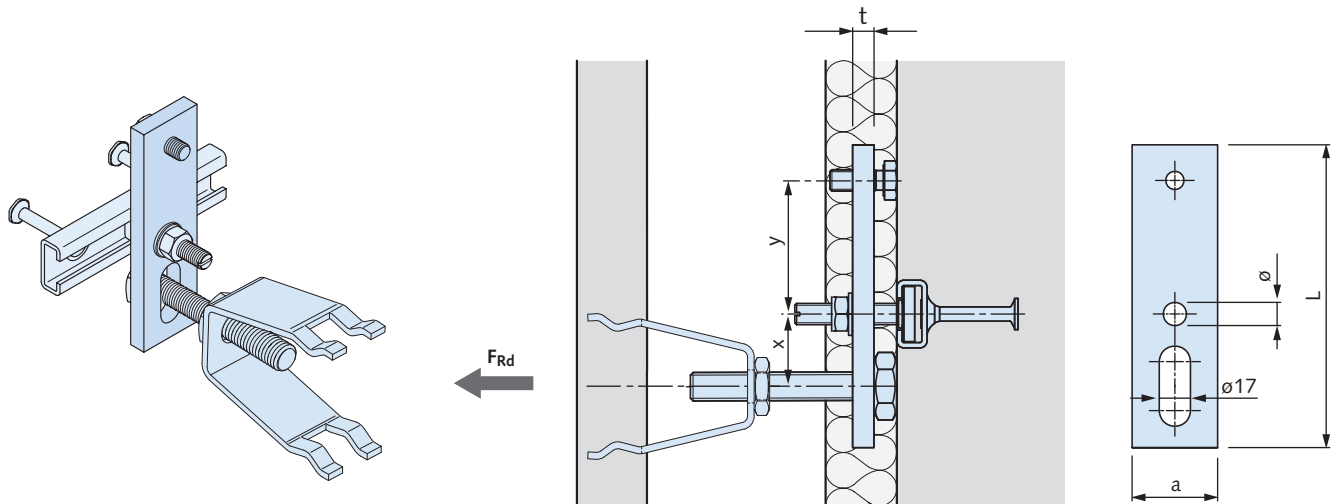
We recommend using the FPA Calculation software for the exact calculation of loads and resistances.

# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

## Tension and Compression Resistant Connections in the Spacing between Parallel Surfaces

### HALFEN LD Adjustable restraint

**Application:** For tension and compression loads



Material: A4/L4  
(Material specifications, see page 5)

#### Order example

Description:

**LD - 3,5**

① ②

① Type  
② Load group

#### Scope of delivery

##### Adjustable restraint with adjustment bolt

Approved dowels can also be used instead of the HALFEN Cast-in channel and T-bolt.

Order spacer bolt separately, see page 15

#### Installation

1. Insert the spacer bolt through the slot in the lug.
2. Screw the spacer bolt into the DS3-SL30 and adjust.
3. Roughly place the assembly in the HALFEN Channel.
4. Adjust the adjustment bolt so that the lug is parallel to the main support structure.
5. Tighten the HALFEN T-bolt.

#### HALFEN LD Adjustable restraint

| Type | Load group | Load capacity $F_{Rd}$<br>[kN] | L<br>[mm] | a<br>[mm] | t<br>[mm] | $x \pm 15$<br>[mm] | y<br>[mm] | Ø<br>[mm] | Recommended fixing<br>① | HALFEN T-bolt<br>② |
|------|------------|--------------------------------|-----------|-----------|-----------|--------------------|-----------|-----------|-------------------------|--------------------|
| LD   | 2.0        | 3.00                           | 161       | 40        | 10        | 38                 | 75        | 11        | HTA-CE 28/15            | HS 28/15 M10x40    |
|      | 3.5        | 5.25                           | 170       | 48        | 12        | 40                 | 75        | 13        | HTA-CE 38/17            | HS 38/17 M12x50    |

① 150, 200 and 250 mm short pieces must be ordered separately.

Verification of the anchorage must be provided taking the respective boundary conditions. into account

② Please order the HALFEN T-bolt separately

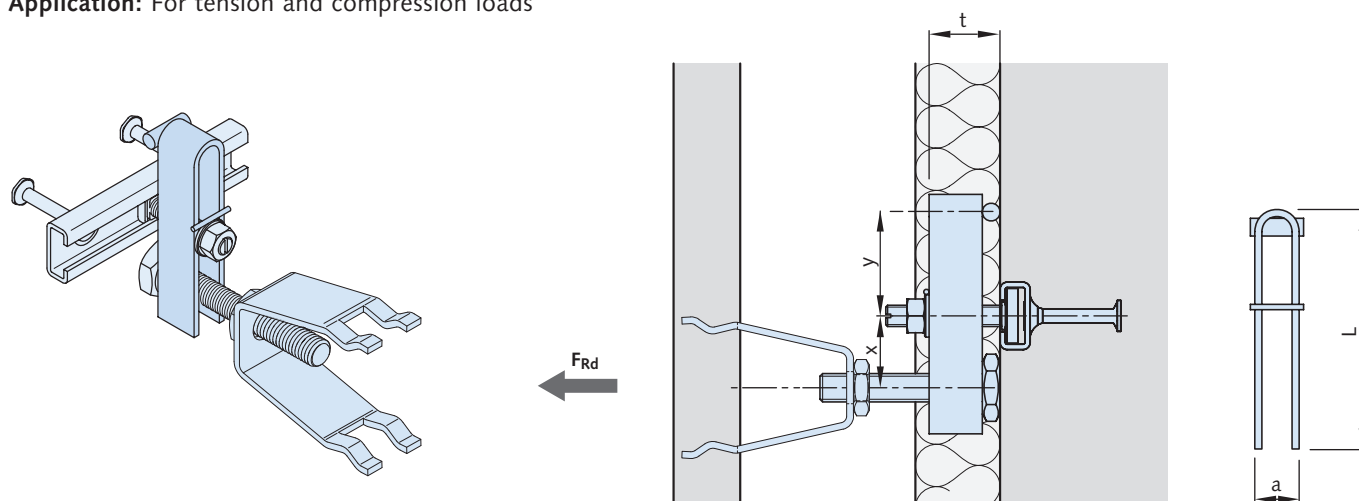
See tables on page 17 for allowable load capacities for the DS13-SL30

# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

## Tension and Compression Resistant Connections in the Spacing between Parallel Surfaces

### HALFEN LD-A Adjustable restraint

**Application:** For tension and compression loads



Material: A4/L4

(Material specifications, see page 5)

#### Order example

Description:

**LD-A - 3,5 - 12**  
 ① ② ③

- ① Type
- ② Load group
- ③ Spacer bolt thread size

#### Scope of delivery

**Fork clamp**

Order spacer bolt separately,  
see page 15

#### Application

Tension- and pressure-resistant  
connection of façade panels with the  
main support structure.  
Adjustable in three directions.

#### HALFEN LD-A Adjustable restraint

| Type | Load group | Load capacity $F_{Rd}$<br>[kN] | L<br>[mm] | a<br>[mm] | t<br>[mm] | x<br>$\pm 15$<br>[mm] | y<br>[mm] | Spacer bolt | Recommended fixing<br>① | HALFEN T-bolt<br>② | Washer<br>DIN |
|------|------------|--------------------------------|-----------|-----------|-----------|-----------------------|-----------|-------------|-------------------------|--------------------|---------------|
| LD-A | 1,8        | 2,70                           | 130       | 21        | 33        | 40                    | 60        | M12         | HTA-CE 28/15            | HS 28/15 M10×50    | DIN 9021      |
|      | 3,5        | 5,25                           | 135       | 21        | 41        | 40                    | 60        | M12         | HTA-CE 38/17            | HS 38/17 M12×80    | DIN 125       |

① 150, 200 and 250 mm short pieces must be ordered separately.

Verification of the anchorage must be provided taking the respective boundary conditions into account

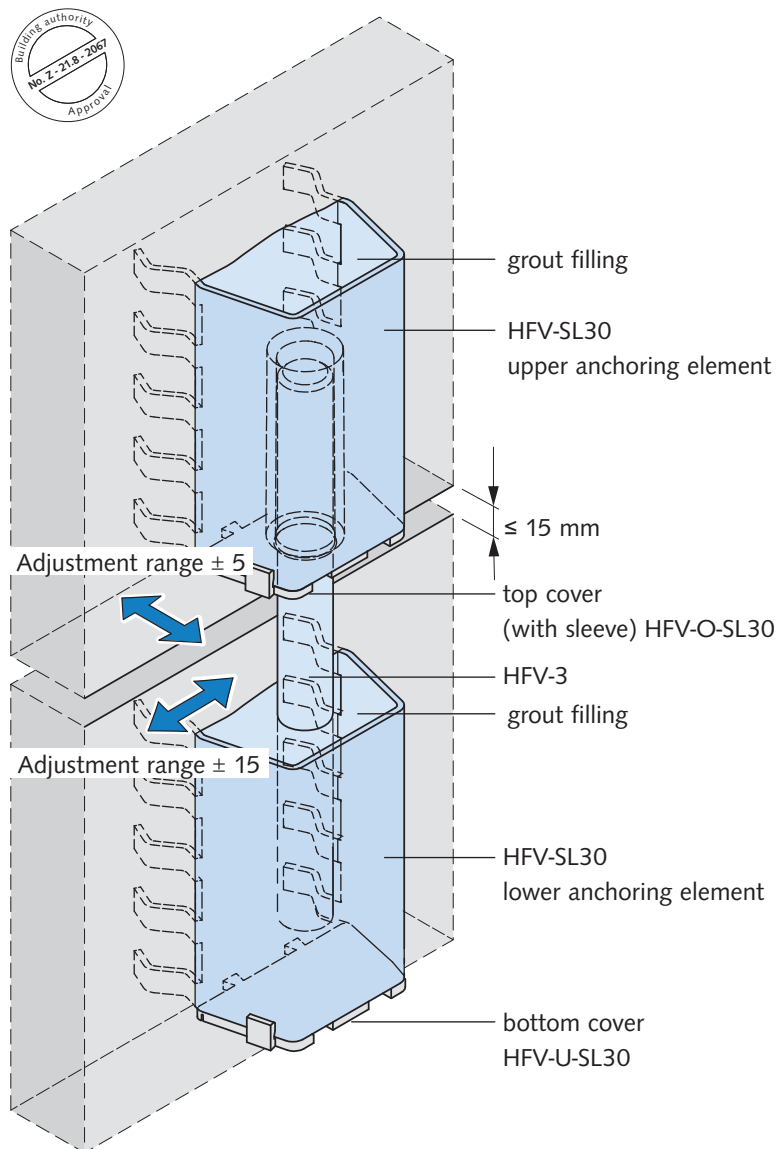
② Please order the HALFEN T-bolt separately

See tables on page 17 for allowable load capacities for the DS13-SL30

# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

## HALFEN HFV-SL30 Dowel system

### Overview



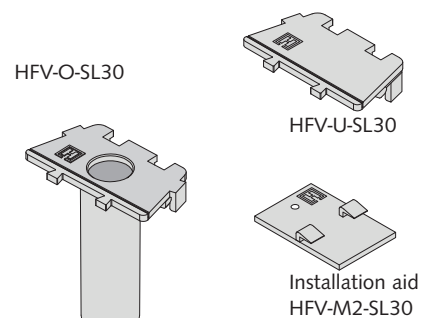
The HFV-SL30 system is used for the dowel connection of thin façade panels with a joint gap of  $\leq 15$  mm.

For the load transmission from the upper to the lower anchoring element, both HFV-SL30 must be filled with grout for example; PAGEL V1®/50 (see the general building authority approval or the our assembly instructions for grout specifications).

The upper anchoring body, which is sealed with a cover cap with fitted sleeve, can be previously filled with grout in the precast plant.

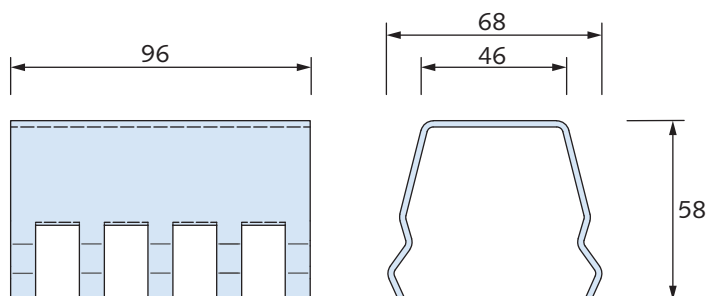
The lower anchoring body is filled with grout directly before assembly, so that the HFV 3 dowel which is inserted from above can be fixed in the specified position within the processing time of the grout.

### HFV-Z-SL30 Set



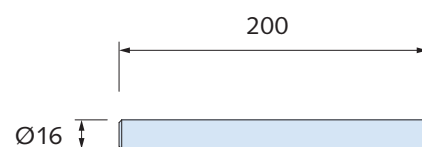
Material: Plastic

### HFV-SL30 Anchoring body



Material: A4/L4 (Material specification see page 5)

### HFV-3 Dowel



Material: A4/L4  
(Material specification see page 5)

# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

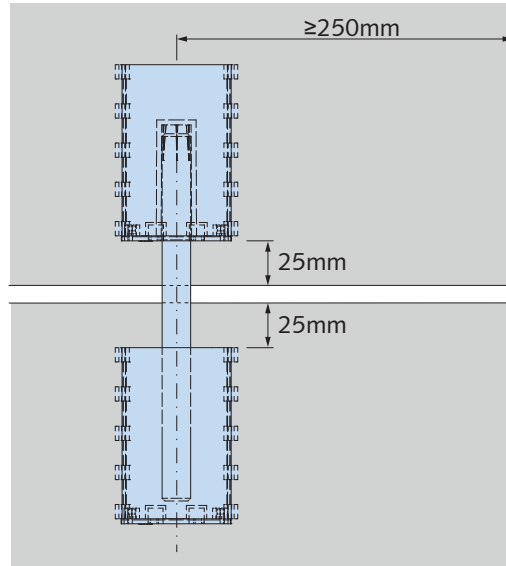
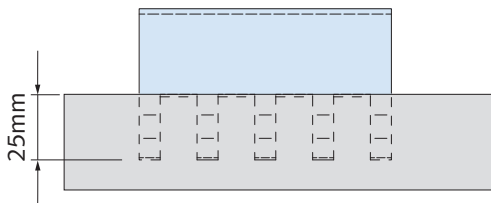
## HALFEN HFV-SL30 Dowel system - Installation Instructions

### Edge distances, anchoring depth

The following must be observed:

The design of the system requires an edge distance of 25 mm in the dowel direction. In the orthogonal direction a minimum edge distance of 250 mm must be maintained.

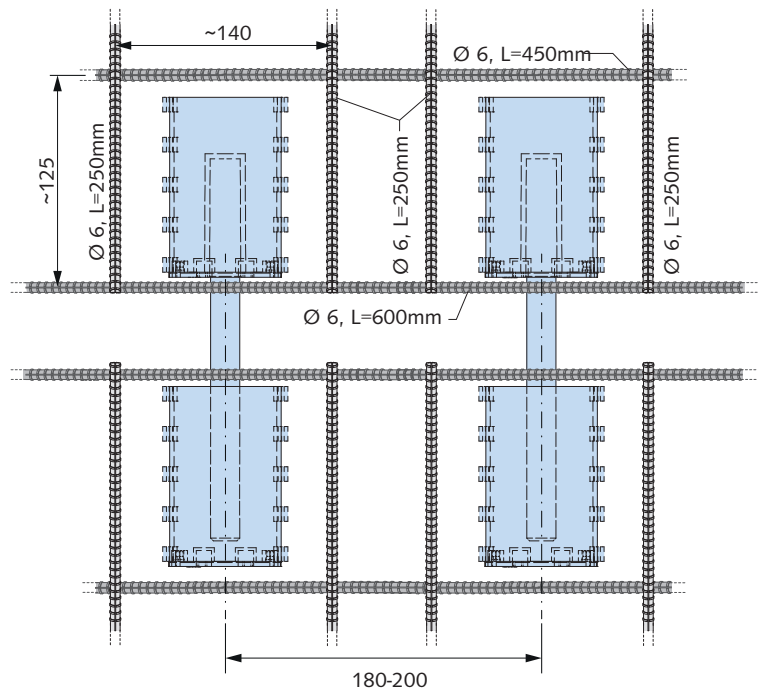
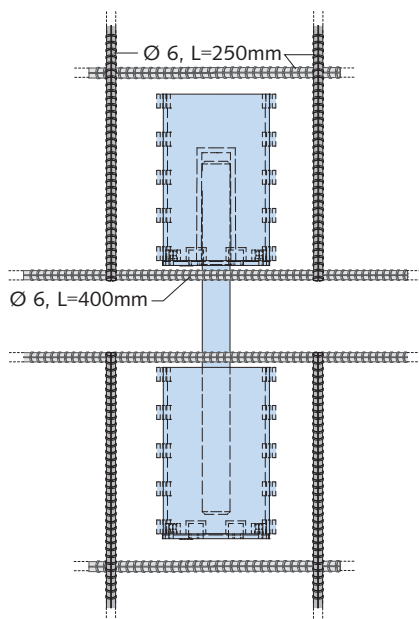
The anchoring element HFV-SL30 must be installed with an anchorage depth of 25 mm.



### Required additional reinforcement

To avoid splitting failure, four B500 A/B rebars  $\text{Ø } 6\text{-A4}$  (3 x L = 250 mm, 1 x L = 400 mm) must be arranged centrally at each HFV-SL30 anchoring element.

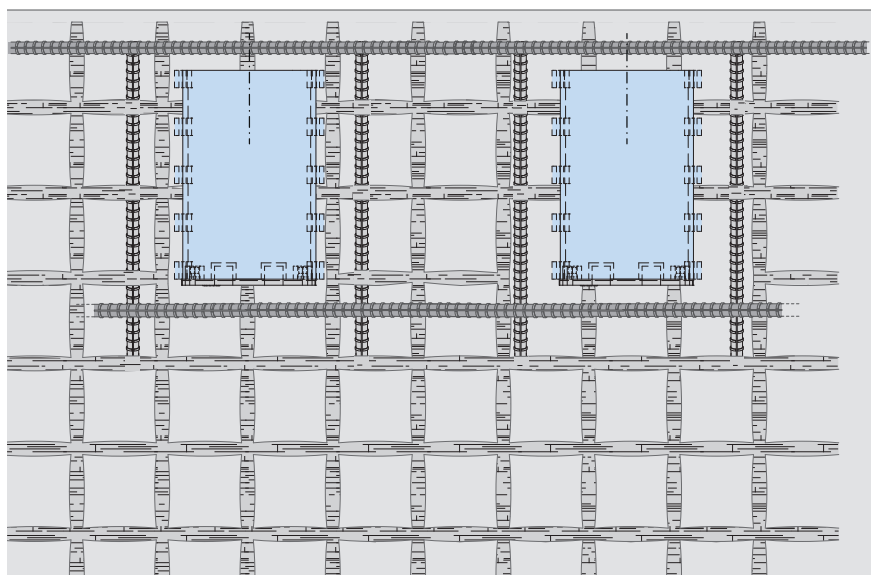
Double dowels must be installed with a axial spacing of 180 - 200 mm. Dimensions and spacings of the centrally arranged A4 additional reinforcement bars are shown in the following diagram:



# HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

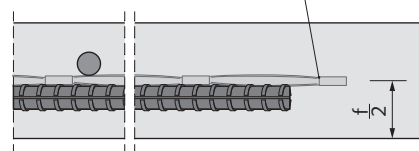
## HALFEN HFV-SL30 Dowel system

### Slab Reinforcement

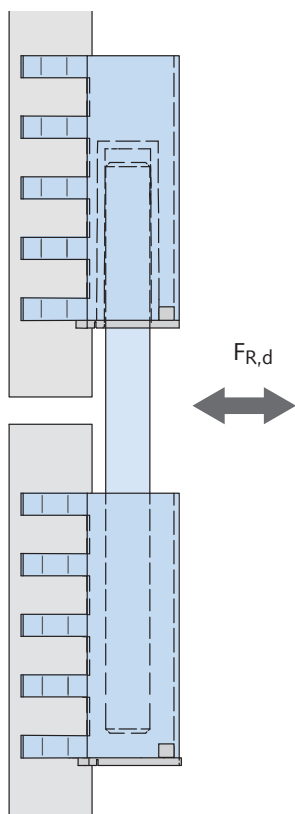


In accordance with the static requirements of the slab design, at least one single-layer of steel or non-steel mesh reinforcement must be installed in the area of the anchors. An installation with a solidian GRID Q121/121-AAE-38 mesh reinforcement is shown exemplarily.

solidian GRID Q121/121-AAE-38



### Load capacities HFV-SL30



| Load capacities $F_{R,d}$ [kN] |                |              |
|--------------------------------|----------------|--------------|
| Condition                      | Standard dowel | Double dowel |
| cracked/ noncracked            | 2.7            | 4.3          |



We recommend using our FPA software for precise calculation of loads and resistances.

## HALFEN ANCHORING SYSTEMS CONCRETE FAÇADES

### Calculation form - thermal transfer coefficient

The calculation of the heat transfer coefficient for HALFEN façade panel anchors and spacer bolts is based on the method shown.

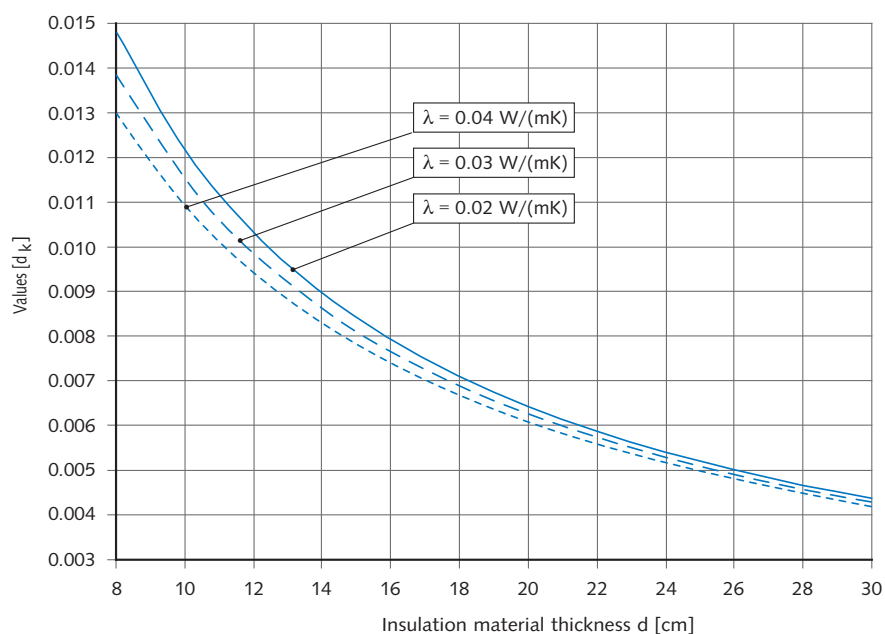


Confirmed by expert opinion,  
Certificate 18C096Y.

| Anchor value $A_{eq}$       |          |
|-----------------------------|----------|
| HALFEN FPA                  | $A_{eq}$ |
| FPA-SL30                    | 0,65     |
| HALFEN Horizontal anchorage | $A_{eq}$ |
| DS13-SL30                   | 1,5      |

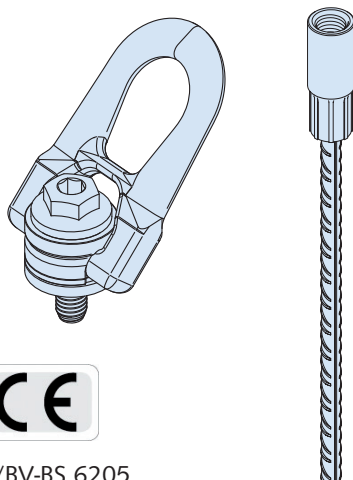
| Insulation         |  |
|--------------------|--|
| d [cm]             |  |
| $\lambda$ [W/(mK)] |  |
| $d_k$ [-]          |  |

Diagram: Insulation material value  $d_k$



| Calculation factor U Value;                                                                  |          |                              |                                                                          |                                  |
|----------------------------------------------------------------------------------------------|----------|------------------------------|--------------------------------------------------------------------------|----------------------------------|
|                                                                                              | $A_{eq}$ | $\chi_i = A_{eq} \times d_k$ | $n_a$<br>Number of FPA /<br>spacer bolts req.<br>for each m <sup>2</sup> | $\Delta U_i = \chi_i \times n_a$ |
| FPA -SL30                                                                                    |          |                              |                                                                          |                                  |
| DS13-SL30                                                                                    |          |                              |                                                                          |                                  |
| U Value; calculation factor for the exterior wall<br>$\Sigma \Delta U_i = \chi_i \times n_a$ |          |                              |                                                                          |                                  |

### Lifting anchor system for thin façade panels



VDI/BV-BS 6205

The HALFEN HD-SL30 Lifting anchor system in load group 0.8 was developed for reliable lifting and transporting of thin prefabricated concrete elements with a thickness of  $\geq 3.0$  cm.

As with all our Lifting anchor systems, the HD-SL30 system also complies with the requirements of the European Machinery Directive (MD) 2006/42/EC.

To ensure the load-bearing capacity when embedded, the HALFEN Lifting anchor systems are additionally subject to the requirements of VDI/BV-BS\* guideline 6205.

VDI/BV-BS\* = Bundesverband Bausysteme e.V. Association of structural systems



Get more information about **HALFEN Lifting anchor systems** at  
[www.halfen.com](http://www.halfen.com) ► Products ► Lifting systems



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