

## INSTALL THE PRODUCT – PRECAST FACTORY

### Identification of the product

HPKM Column Shoes are available in standard models (16, 20, 24, 30 and 39) analogous to M-thread sizes of the HPM Anchor Bolts. The model of column shoe can be identified by the name in the label on the product and also according to the color of the product. Color codes are shown in the table hereafter. Color codes of recess boxes are corresponding to the color codes of HPKM Column Shoes.

*HPKM Column Shoe with corresponding recess box.*

Column Shoe	Anchor Bolt	Corner recess	Middle recess	Color code
HPKM 16	HPM 16	HPKM 16 CBOX	HPKM 16 MBOX	yellow
HPKM 20	HPM 20	HPKM 20 CBOX	HPKM 20 MBOX	blue
HPKM 24	HPM 24	HPKM 24 CBOX	HPKM 24 MBOX	gray
HPKM 30	HPM 30	HPKM 30 CBOX	HPKM 30 MBOX	green
HPKM 39	HPM 39	HPKM 39 CBOX	HPKM 39 MBOX	orange

### Installation of the column shoes

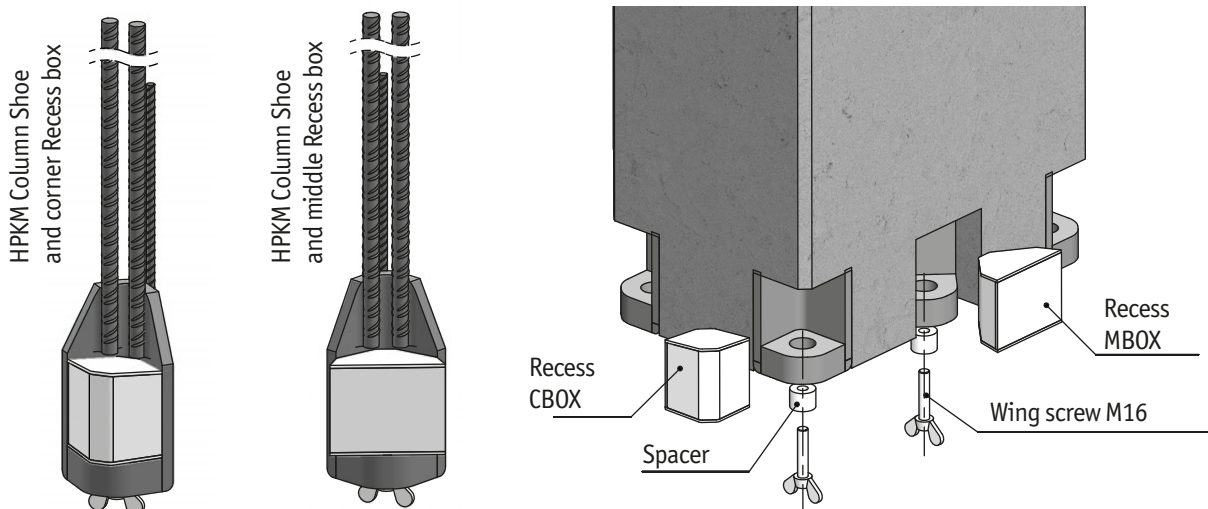
The HPKM Column Shoes are placed into the reinforcement of the column and fixed through their base plates to the end plate of the mould with recess boxes. Installation tolerance of column shoe in crosswise direction of the column is  $\pm 2$  mm. Supplementary reinforcement must be placed at the area of column base, according to drawings (Technical Manual Annex A). After casting the column, boxes are removed from shoes and voids are checked that they are clean from concrete.

Recess boxes are fixing accessories used to form pockets in concrete column for anchor bolts. There are separate recess boxes available for all types of column shoes and depending on the column shoe position in column's cross section:

- CBOX is used with column shoes fixed in corner of the column
- MBOX is used with column shoes fixed in middle of the column

Recess boxes enable the shoes to be fastened and positioned to the end plate of the mould. The wing screw M16, which comes with a spacer equal to the size of the column shoe's bolt hole, is used for fixing. With the help of the spacer, the shoe can be fixed to the correct place in the end plate. Environmental friendly formers are very durable and re-usable. It is recommended to maintain them to achieve long operating life.

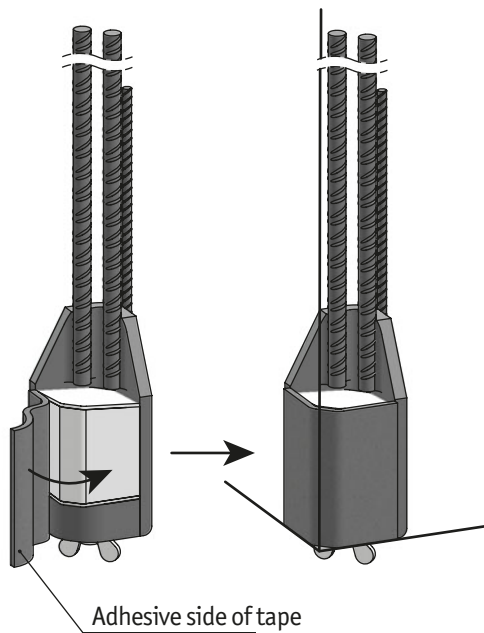
*Recess boxes for corner and middle position of HPKM Column Shoe.*



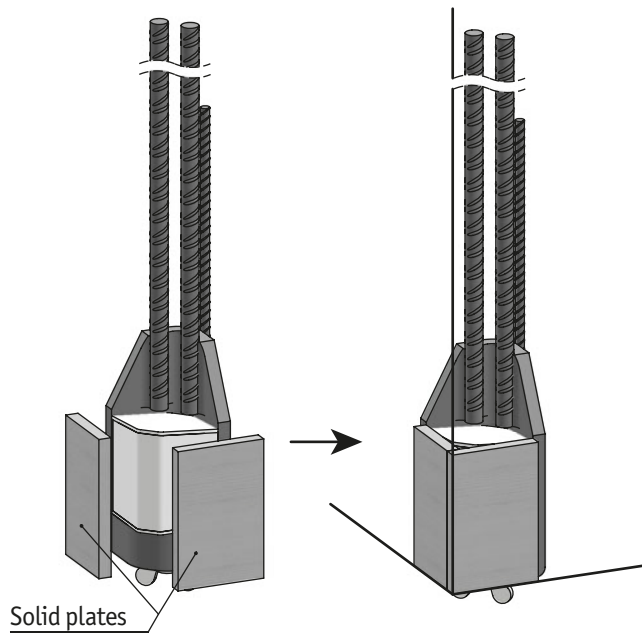
To ensure higher values of concrete cover thicknesses of main anchor bars, in accordance with chapter 1.2.3 of the technical manual, follow these instructions for increased values  $\Delta_c$  of concrete cover:

- $\Delta_c < 5 \text{ mm}$ , there is no special request for recess boxes; instructions are same as for standard concrete cover of column shoes. The gap is too small to be filled up with concrete. However if the gap is filled or partially filled, the concrete shell can be easily crushed after removing mould.
- $5 \text{ mm} \leq \Delta_c \leq 10 \text{ mm}$ , self-adhesive foam tape or equivalent can be used to prevent the fill up of the gap. Foam tape of corresponding thickness  $\Delta_c$  is fixed on two sides of the recess box.
- $\Delta_c > 10 \text{ mm}$ , to prevent the concrete to fill up the gap, it is recommended to use some kind of solid plate – e.g. plywood or hardened polystyrene of corresponding thickness  $\Delta_c$ . These plates can be fixed to the surface of the mould.

Use of **self-adhesive foam tape** to prevent the fill up the gap with concrete.



Use of **solid plates** to prevent the fill up the gap with concrete.



Ensure of thicker concrete cover by self-adhesive foam tape or solid plates

HPKM Column Shoes before and after casting








## INSTALL THE PRODUCT – CONSTRUCTION SITE

### Identification of the product

HPKM Column Shoes are available in standard models (16, 20, 24, 30 and 39) analogous to HPM Anchor Bolts M-thread sizes. The model of column shoe can be identified by the name in the label on the product and also according to the color of the product. Color codes are shown in the table hereafter.

*HPKM Column Shoe color identification*

Column Shoe	Color code	Anchor Bolt	Installation template
HPKM 16	 yellow	HPM 16	PPL 16
HPKM 20	 blue	HPM 20	PPL 20
HPKM 24	 gray	HPM 24	PPL 24
HPKM 30	 green	HPM 30	PPL 30
HPKM 39	 orange	HPM 39	PPL 39

### Erection of precast column

#### 1. To level precast concrete column

Before erecting the column, upper nuts and washers are removed from anchor bolts. Lower leveling nuts and washers are adjusted at the correct level. The column is erected directly on the pre-leveled washers and nuts.

In alternative method shims are placed between anchor bolts and adjusted at the proper level. Lower leveling nuts must be leveled at least 5 mm under the top level of shims to secure that column will rest first on the shims. This method is recommended for heavier columns for easier and faster alignment of the column.

#### 2. To align precast concrete column

Upper nuts and washers are screwed on the bolts and column is aligned in the vertical position by leveling nuts. It is practical to use two theodolites from different directions to ensure verticality. Nuts are tightened at least to minimum torque given in table below. Adequate torque can be achieved typically by 10-15 impacts of a slog ring spanner (DIN 7444) or open ended slogging spanner (DIN 133) and 1.5 kg sledgehammer.



*Recommended minimum  $T_{min}$  and maximum  $T_{max}$  torque values of nuts.*

	HPKM 16	HPKM 20	HPKM 24	HPKM 30	HPKM 39
$T_{min}$ [Nm]	120	150	200	250	350
$T_{max}$ [Nm]	170	330	570	1150	2640

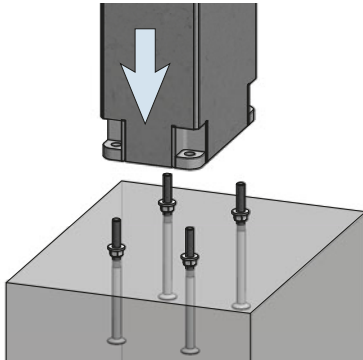
#### 3. To grout joint and recesses

Before loading the column by any other structures e.g. beams or columns, the joint underneath the column and bolt recesses must be grouted by following instructions of the grout supplier. The grout must be non-shrink grade and strength according to plans. To avoid air being trapped in the joint, it is recommended to pour grout from one side of the column only. Grouting formwork is made so that adequate concrete cover for column shoes and anchor bolts is achieved.

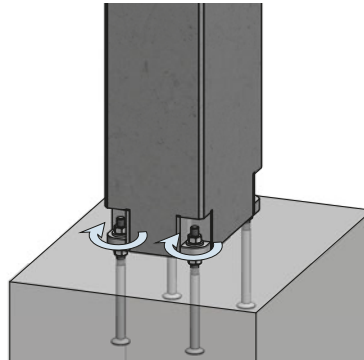
After grout has reached sufficient strength, the connection is finalized and joining structures may be erected on the column.

## Erection of precast concrete column step by step.

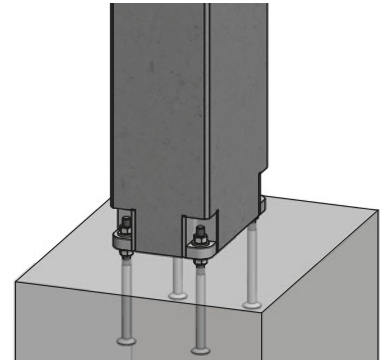
Column is installed directly on the pre-leveled washers and nuts



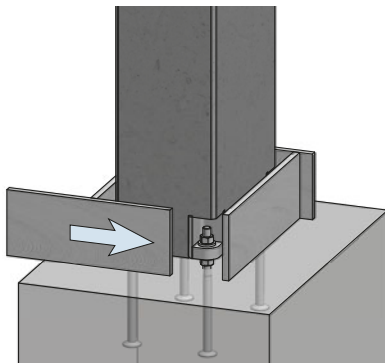
Upper nuts and washers are screwed on the bolts



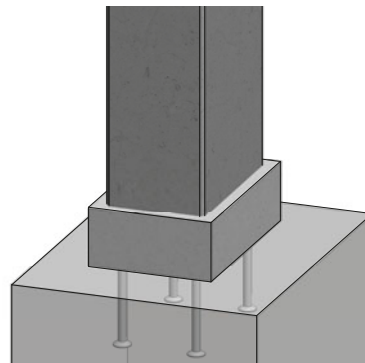
After the nuts are tightened, the crane can be released



Formwork for grouting joint and recesses



Finalized connection after grouting has hardened



In column to foundation connections wider grouting can be provided to ensure higher concrete cover if it is required. It is recommended to increase the cover in aggressive environment.

*Installation tolerances and the anchor bolt's protrusion from the surface of concrete when HPKM Column Shoes are used.*

