Schöck Sconnex® type P

â€€ 0,75

Schöck Sconnex® type P
Thermally separating thermal insulation elements for square reinforced concrete columns with the dimensions 250 × 250 mm. The element transfers primarily compressive forces.

Element arrangement

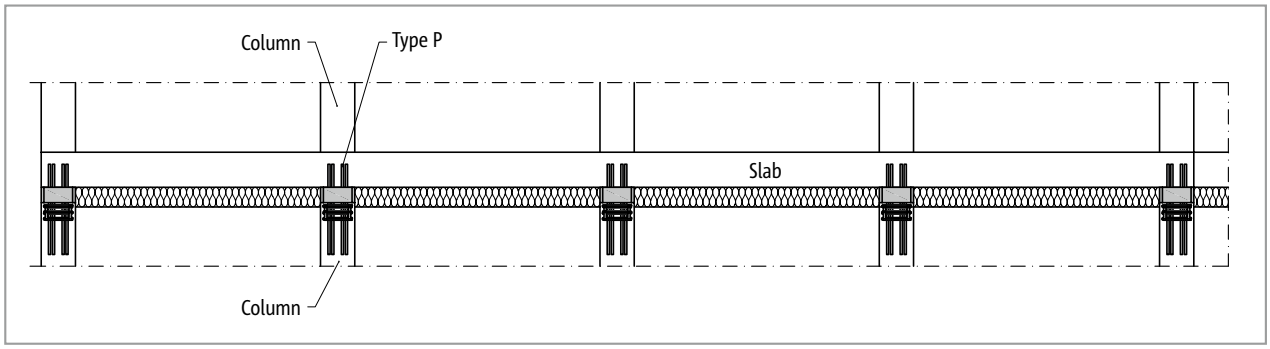


Fig. 123: Schöck Sconnex® type P: Column connection to the floor above

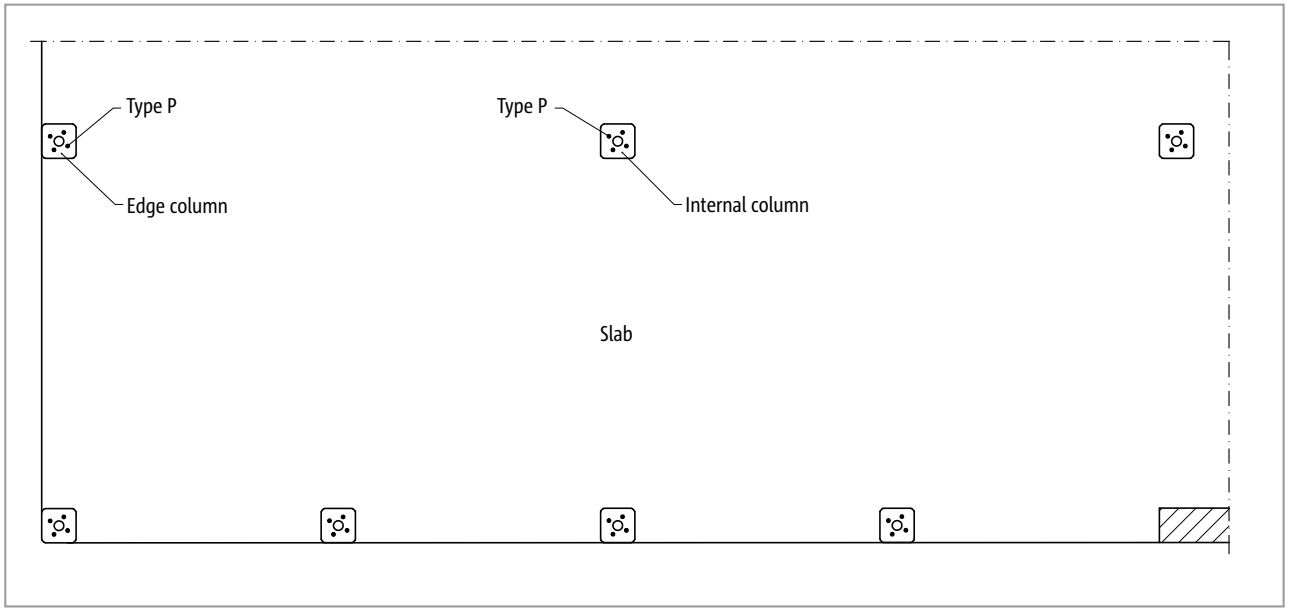


Fig. 124: Schöck Sconnex® type P: Element arrangement in the floor plan

Installation cross sections | Application at column head

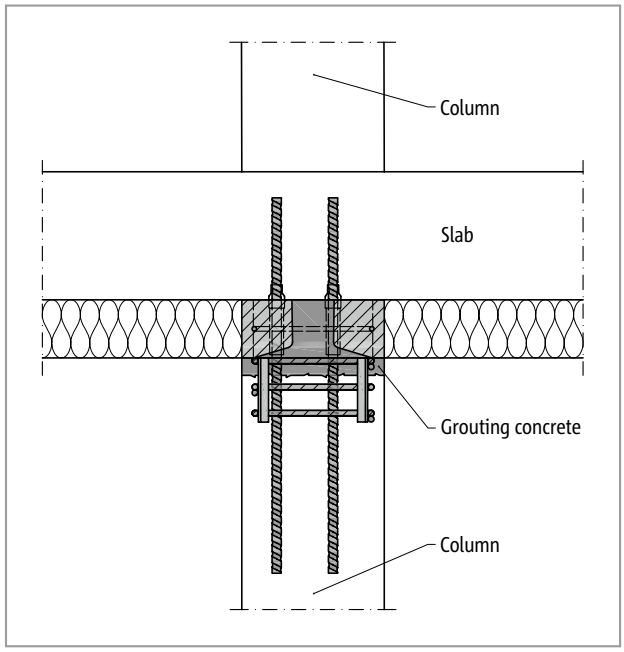


Fig. 125: Schöck Sconnex® type P: Connection of an internal column to the above lying floor

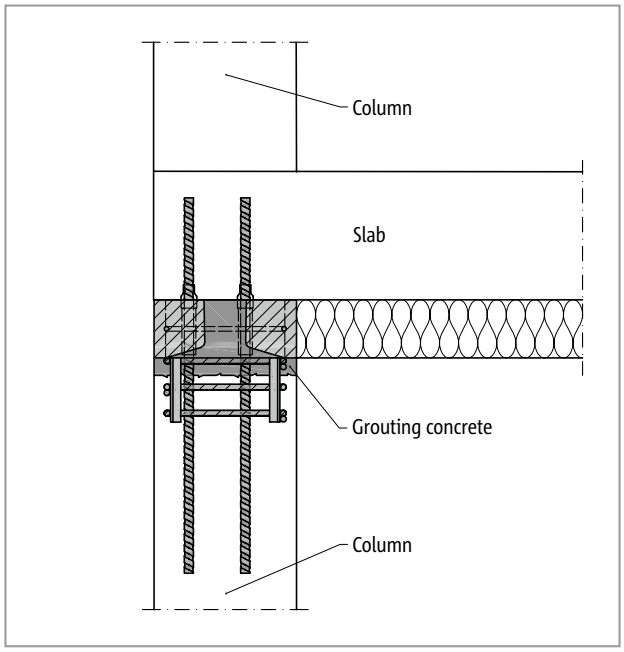


Fig. 126: Schöck Sconnex® type P: Connection of an edge column to the above lying floor

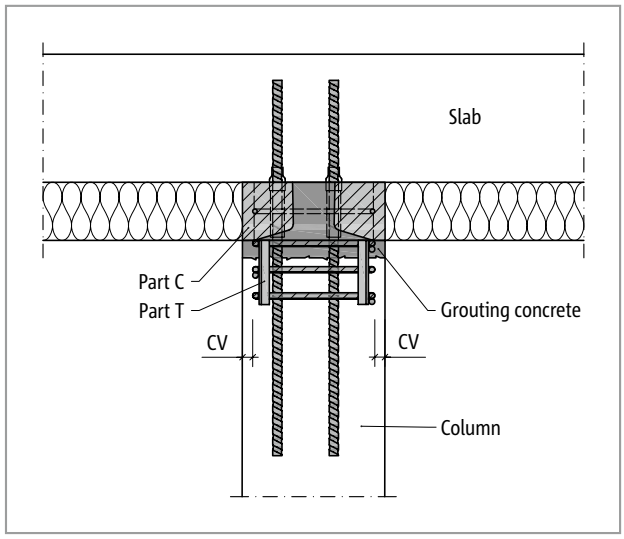


Fig. 127: Schöck Sconnex® type P: Installation section; connection column – floor with Part C and Part T

Application at the top of the column only

In accordance with the Approval only application at the top of the column is permitted. An application at the foot of the column is not part of the Approval.

Product selection | Type designations | Grouting concrete

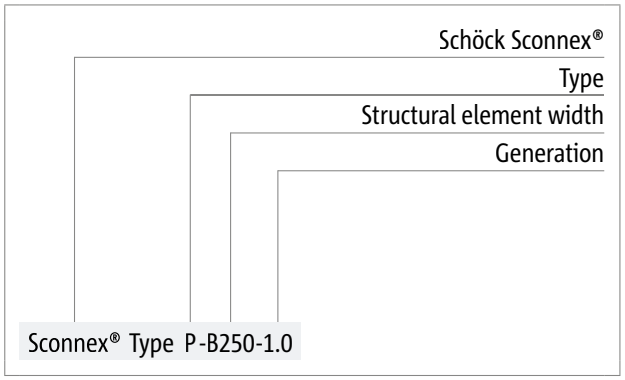
Schöck Sconnex® type P

The version of the Schöck Sconnex® type P consists of Part C (lightweight concrete element) and Part T (reinforcement element). For the column-floor connection type p the following features and notations apply:

- Square column cross-section
- Width of the column cross-section:
  B250 = 250 mm
- Lightweight concrete element:
  Schöck Sconnex® type P Part C
- Reinforcement element:
  Schöck Sconnex® type P Part T
- Grouting concrete:
  PAGEL® grouting V1/50
- Generation:
  1.0
- Fire resistance class:
  R 30 to R 90
  Depending on the fire resistance class there are various load-bearing resistances for which a verification with the aid of the dimensioning diagrams must be carried out.

The lightweight concrete element Part C is to be combined with the reinforcement element Part T for the application.

Type designations in planning documents



Fire protection

- Schöck Sconnex® type P may be employed in columns without requirement on the fire resistance as well as in columns of fire resistance classes R 30, R 60 and R 90.

Poured concrete: PAGEL® grouting V1/50

- Schöck Sconnex® type P is supplied together with a dry mortar for the production of PAGEL® grouting V1/50 poured concrete. The delivered quantity is dimensioned for the production of tight fits on column-floor connections.

Application Schöck Sconnex® type P

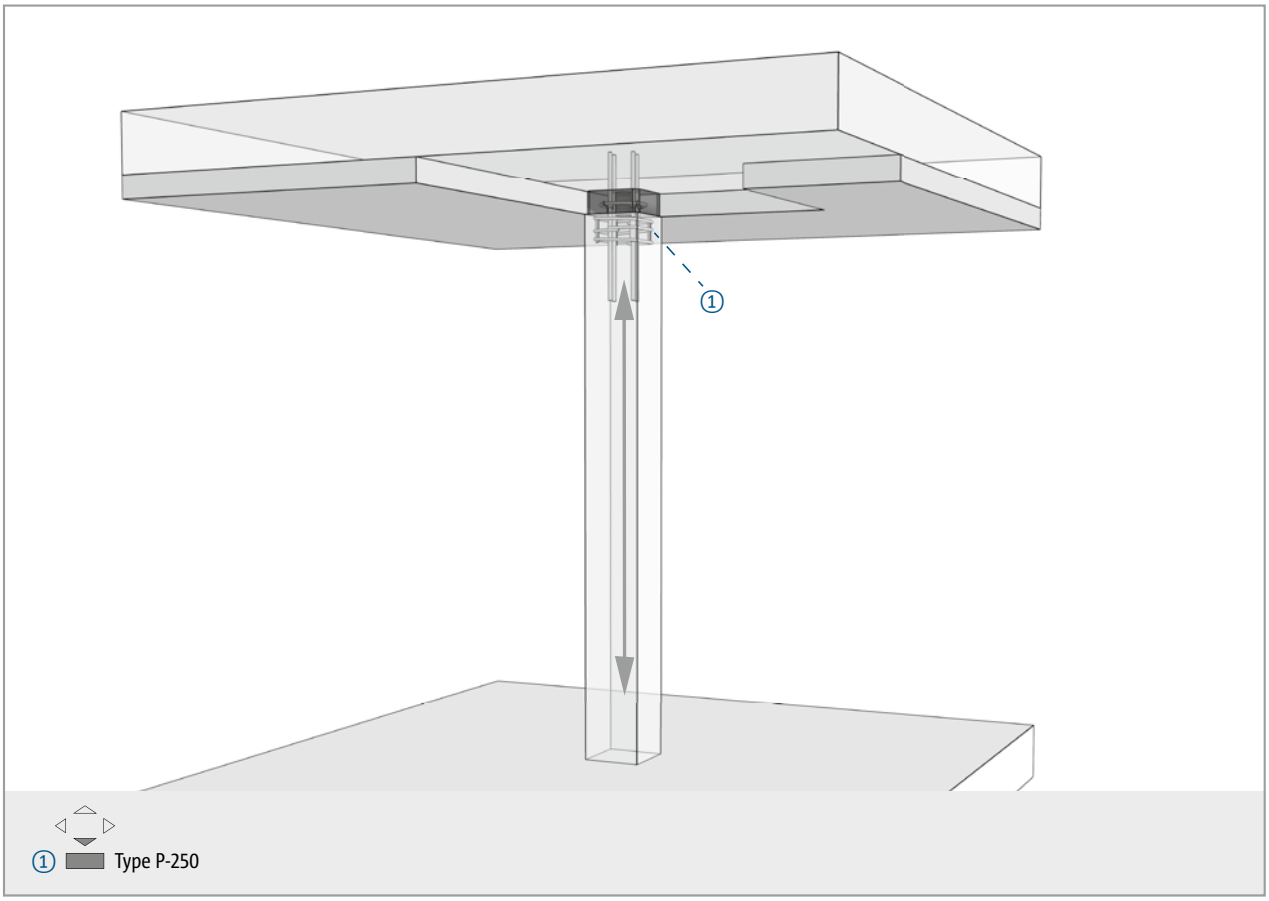


Fig. 128: Column connection with under-slab insulation

Columns are highly loaded compression elements. Typically, columns are treated as hinged supports (without restraint moments). For this case Schöck Sconnex® type P is placed in the insulation layer below the floor. Any horizontal forces that appear (e.g. normative impact loads in garage doors), despite the articulated effect of the column, can be safely transferred into the above lying floor. Depending on the constraints two verification variants are available, the simplified and the accurate. With observance of the constraints (see page 93) a standard eccentricity of 20 mm may be reckoned with. On the other hand, with the accurate procedure, this is to be determined by the engineer. For a possible verification of the fire protection, a separate load-bearing capacity verification in the case of fire must be carried out.

Sign convention | Design

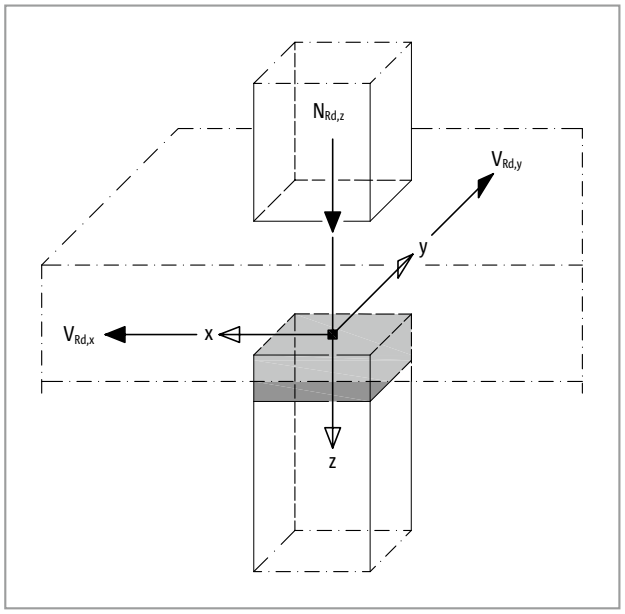


Fig. 129: Schöck Sconnex® type P: Sign convention for the design

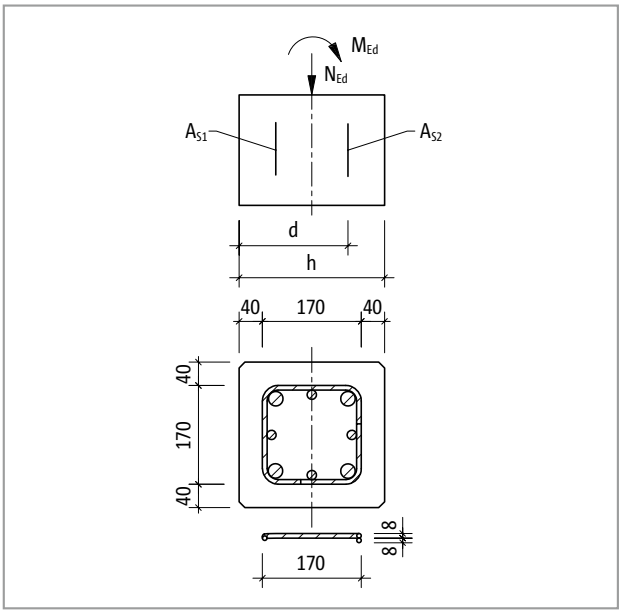


Fig. 130: Schöck Sconnex® type P: Limitation of the external dimension of the stirrups; see warning note

Application conditions

- Static or quasi-static effects
- Application in horizontal stiffened systems
- For the thermally insulated connection of columns with square cross-section and 250 mm side length
- Column headroom ≥ 2.50 m with application of the simplified dimensioning procedure
- Column headroom ≤ 2.85 m with requirements on fire resistance

Notes on design

- Installation in hinged column heads
- For the transmission of compressive forces in the core area of the column cross-section. Maximum permitted eccentricity of the resultant compressive force is b/6 and, with the application of the general dimensioning procedure, is to be verified.
- Column dimensioning without planned horizontal forces (e.g. as a result of cantilevers).
  Exception: Vehicle impact must be considered according to page 96.
- The static verification for the redirection of the forces in the column and floor is to be carried out (e.g. buckling and punching shear). The immediately adjacent column areas are excluded from this.

Warning note

- Due to the stirrup external measurement of 170 mm the static effective height for the buckling dimensioning results. This must be considered by the structural engineer for the buckling verification of the column.

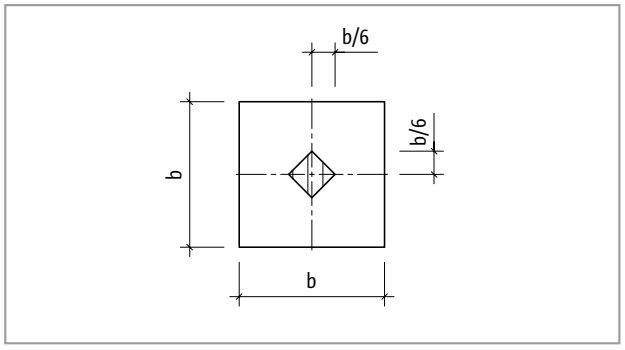


Fig. 131: Schöck Sconnex® type P: Limitation of the eccentricity on the core area of the column cross-section with $e_x + e_y \leq b / 6$, gaping joint not permitted

Design

Cold dimensioning: Simplified design procedure

With the basic application conditions the permitted compressive force $N_{Rd,z}$ [kN] may be calculated without further verification of floor displacement with a planned eccentricity (single axis eccentricity) of e = 20 mm. The verification of gaping joints may be omitted if all following boundary limitations are complied with:

- Interior columns within the limits of the normal high rise as per BS EN 1992-1-1 and BS EN 1992-1-1/NA
- Evenly distributed live loads ≤ 5 kN/m²
- Span length ratio of the edge span of the 1st interior span 0.5 ≤ L1/L2 ≤ 2
- Floor span width ≤ 7.5 m
- Floor height ≥ 25 cm, whereby for each 0.5 m smaller floor span width the floor height may be reduced by 1 cm

Schöck Sconnex® type P						
Design values with	Concrete strength class of the column					
	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
Centre distance of longitudinal bars of the column [mm]	Normal force (compression with e = 20 mm) $N_{Rd,z}$ [kN/element]					
≤ 150	904	1016	1119	1207	1207	1207
≤ 75	954	1069	1171	1207	1207	1207
≤ 50	974	1090	1191	1207	1207	1207

Cold dimensioning: General design procedure using the accurate load eccentricity

With an accurate calculation of the eccentric load application, the eccentricity determined by the user employing the following equation as well as the maximum compressive force with centric compression in accordance with the following table can be taken into account. Accordingly the design value of the load-bearing capacity $N_{Rd,z}$ results as:

$$N_{Rd,z} = N_{Rd,z,0} \cdot (1 - 2 \cdot e_x / 250\ mm) \cdot (1 - 2 \cdot e_y / 250\ mm)$$

with:

e_x:	Eccentricity in x-direction ($e_x \leq 250 / 6$)
e_y:	Eccentricity in y-direction ($e_y \leq 250 / 6$)
$N_{Rd,z,0}$:	Max. load-bearing capacity with centric pressure as per table [kN]
$N_{Rd,z}$:	Load-bearing capacity of the column connection [kN]

Schöck Sconnex® type P						
Design values with	Concrete strength class of the column					
	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
Centre distance of longitudinal bars of the column [mm]	Normal force (compression with e = 0 mm) $N_{Rd,z,0}$ [kN/element]					
≤ 150	1076	1210	1332	1443	1443	1443
≤ 75	1136	1273	1394	1443	1443	1443
≤ 50	1160	1298	1418	1443	1443	1443

Notes on design

- In-situ concrete is standard for blank boxes.
- The lightweight concrete element is standard for values with grey shading.
- The degree of reinforcement has no appreciable influence on the load-bearing capacity of the column connection.

Design

Hot dimensioning: Load-bearing capacity in case of fire

The verification of the load-bearing capacity in the case of fire in the first instance takes place through the conventional verification of an unimpaired column as per BS EN 1992-1-2 and on the other hand through additional cross-section verification in the area of the column head, whereby for the cross-section verification, the dimensioning diagrams for the fire resistance classes R 30, R 60 and R 90 can be used.

- The internal forces $M_{Ed,fi}$ and $N_{Ed,fi}$ of the exceptional dimensioning situation of exposure to fire, in accordance with the standard time-temperature curve may be determined as for an unimpaired column.
- The assumption of an unimpaired column can be applied for the replacement length of the column in the case of a fire. The connection moments as a result of compatibility and Theory II. Regulations are to be taken into account in the dimensioning and may be approximated over a minimum eccentricity of the normal force of 20 mm.

In addition, the following three cross-section verifications are to be carried out in the area of the pressure connection:

- Cross-section verification of the Schöck Sconnex® type P pressure connection at the transition to the reinforced concrete column for $M_{Ed,fi}$ and $N_{Ed,fi}$ (dashed curve of the diagrams)
- Verification of the column cross-section considered as unreinforced at the transition to the Schöck Sconnex® type P for $M_{Ed,fi}$ and $N_{Ed,fi}$ (drawn-through curves of the diagrams, arranged according to concrete strength class)
- Verification of an over-pressured joint between the two above-named cross-sections through observation of the core values: $e_{d,fi} = M_{Ed,fi} / N_{Ed,fi} \leq b/6$ (drawn-through straight line of the diagrams)

Calculation example, see page 101

Diagrams for fire protection dimensioning

The design values $N_{Rd,concrete}$ and $N_{Rd,\ type\ P}$ can be presented as diagram curves depending on the load eccentricity. This results in individual diagram curves for the concrete strength classes considered and for the Schöck Sconnex® type P. For the load eccentricity the relationship e = M / N applies. If the moment $M_{Rd} = N_{Ed} \cdot e$ is determined as input parameter for the diagram, then from the associated curve values $N_{Rd,concrete}$ and $N_{Rd,\ type\ P}$ the minimum for the design value $N_{Rd,SDA}$ is relevant.

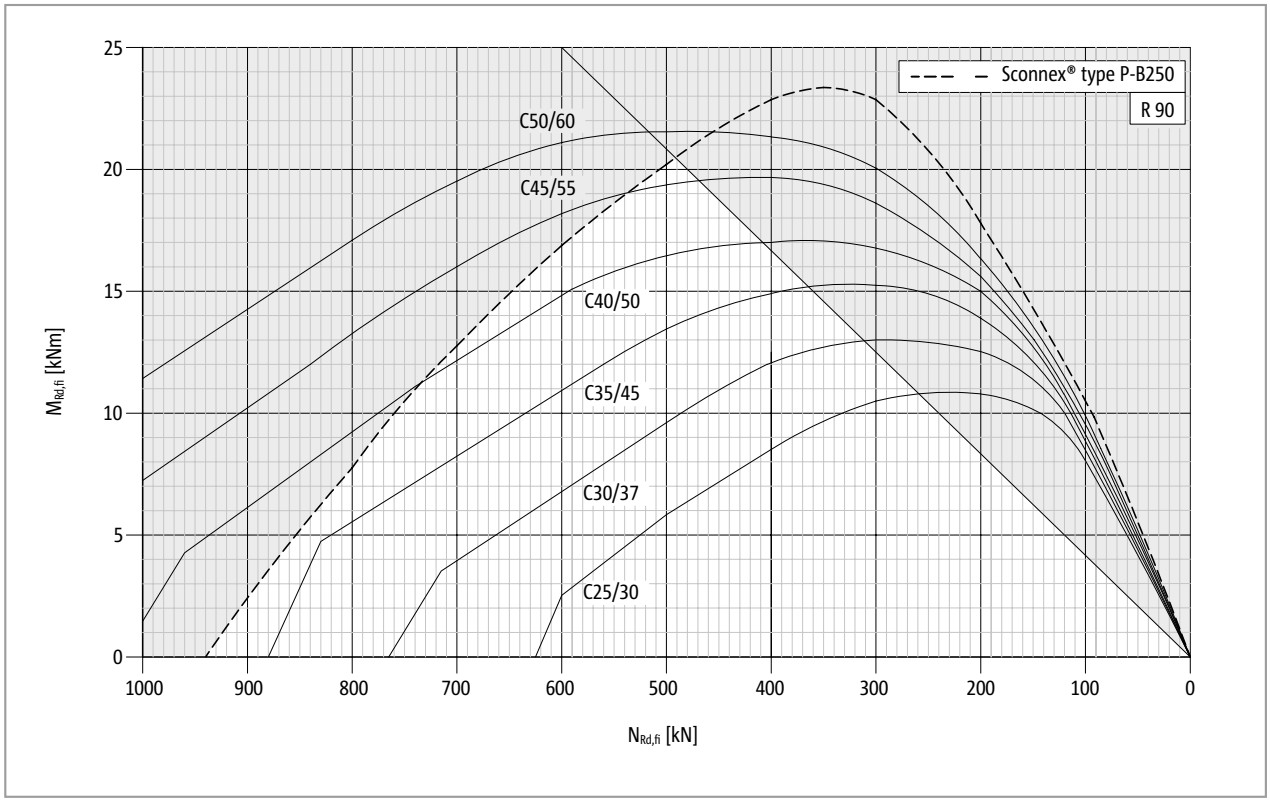


Fig. 132: Schöck Sconnex® type P: Interaction diagram for the dimensioning for the case of fire, fire resistance class R 90

Design

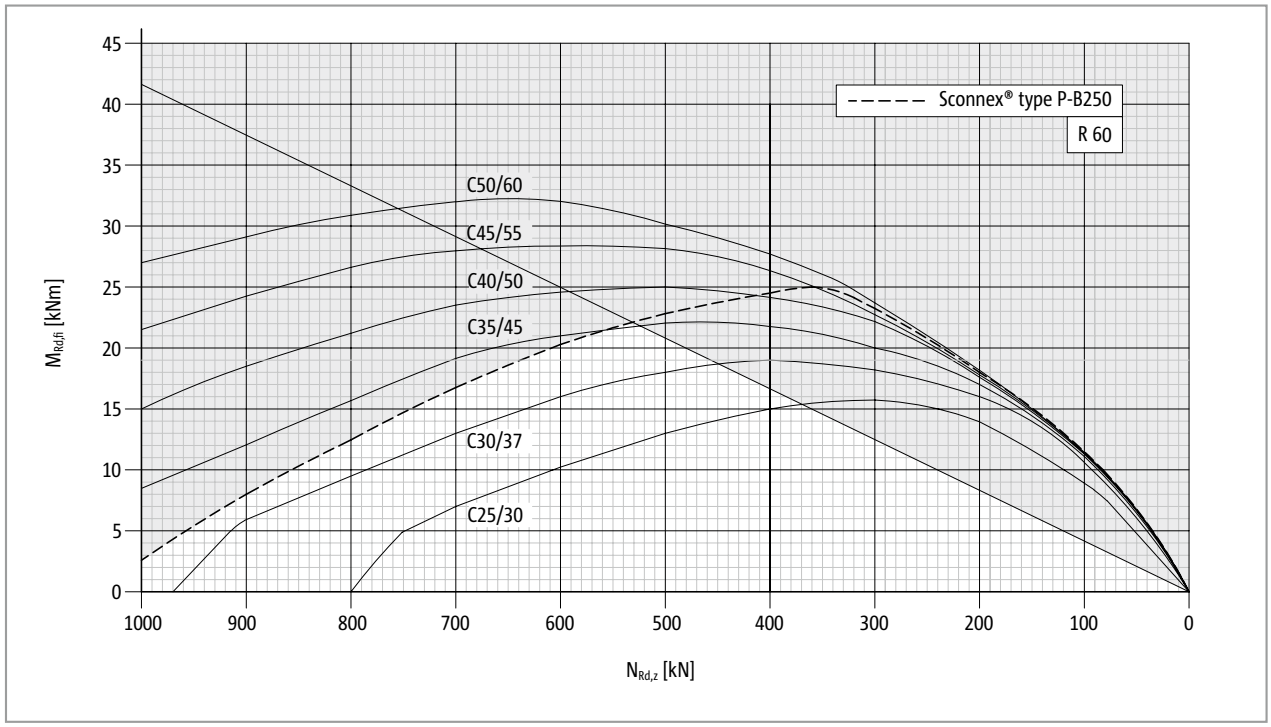


Fig. 133: Schöck Sconnex® type P: Interaction diagram for the dimensioning for the case of fire, fire resistance class R 60

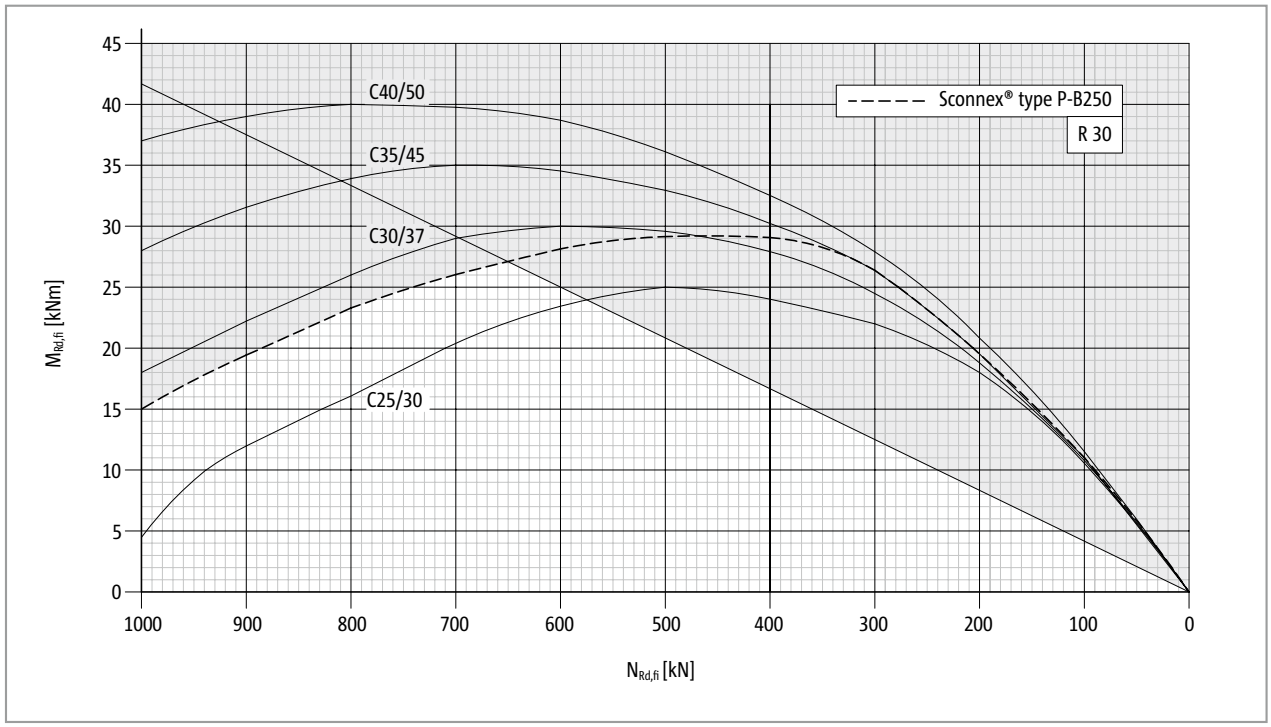


Fig. 134: Schöck Sconnex® type P: Interaction diagram for the dimensioning for the case of fire, fire resistance class R 30

Fire protection

- Schöck Sconnex® type P may be employed in columns without requirement on the fire resistance as well as in columns of fire resistance classes R 30, R 60 and R 90.

Impact damage

Horizontal load transfer via the joint with impact

Due to the specification of a stiffened system no scheduled horizontal forces are to be removed for the Schöck Sconnex® type P:

- For the determination of internal forces for horizontal effects such as vehicle impact as per BS EN 1991-1-7 in building construction with multi-storey car parks and structures with permitted traffic, the columns may be dimensioned as hinged columns (articulated mounting).
- The joint between Schöck Sconnex® type P and adjoining floor or column must not be verified separately.

Product description

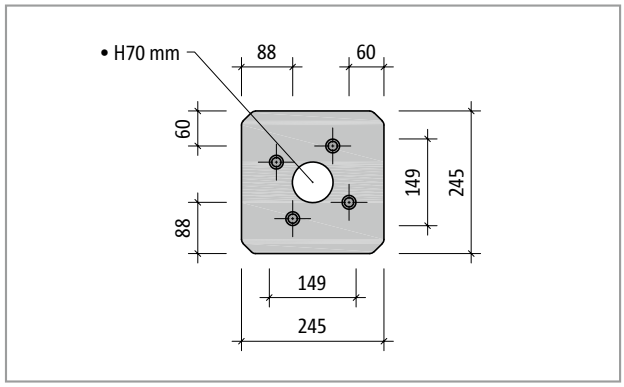


Fig. 135: Schöck Sconnex® type P: Top view

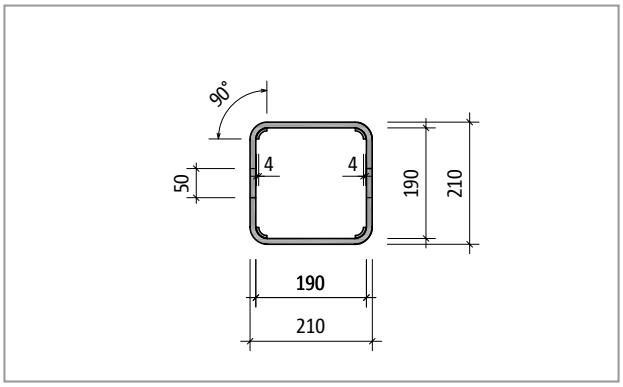


Fig. 136: Schöck Sconnex® type P: Part T; welded stirrup and bending mould segment made of stainless steel

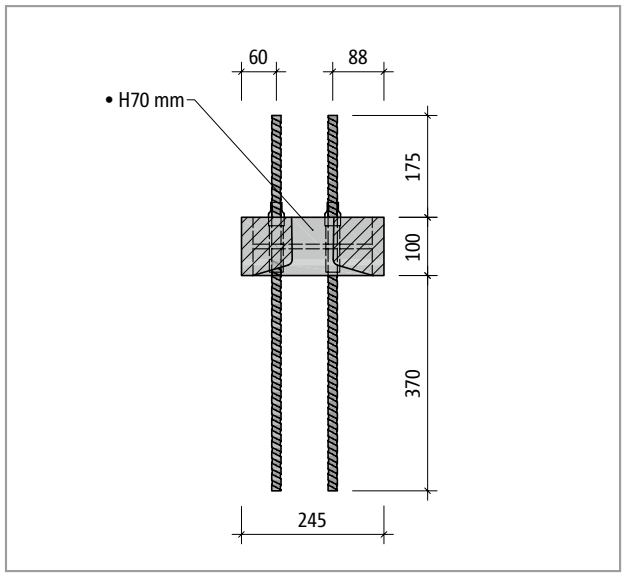


Fig. 137: Schöck Sconnex® type P: Product section Part C

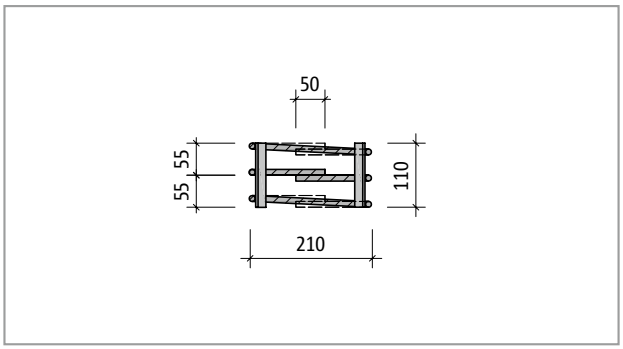


Fig. 138: Schöck Sconnex® type P: Side view Part T; welded stirrup and bending form segments made of stainless steel

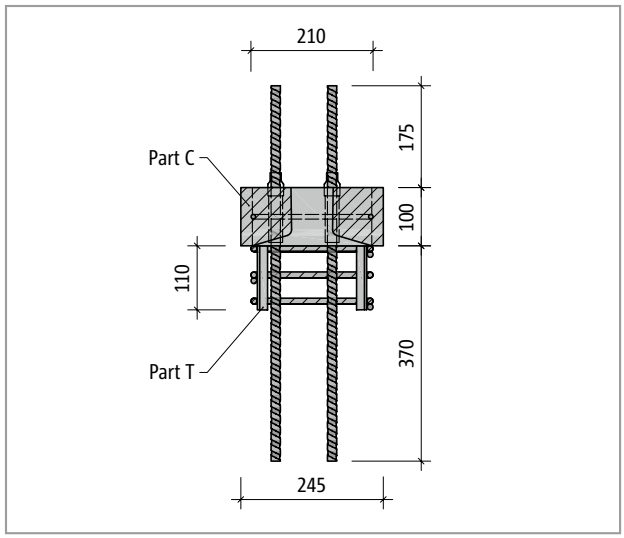


Fig. 139: Schöck Sconnex® type P: Product section Part C and part T

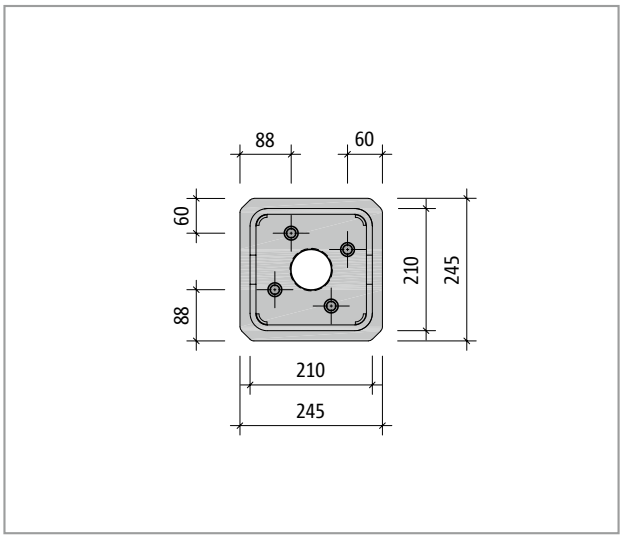


Fig. 140: Schöck Sconnex® type P: Bottom view

Product information

- It is imperative, that in every application, Part C is combined with Part T.

On-site reinforcement

Column reinforcement

The column reinforcement and the number of the longitudinal reinforcement bars in the column are to be determined by the structural engineer according to the valid building codes. In this respect the degree of reinforcement and the number of longitudinal reinforcement bars can be determined independent of Schöck Sconnex® type P.

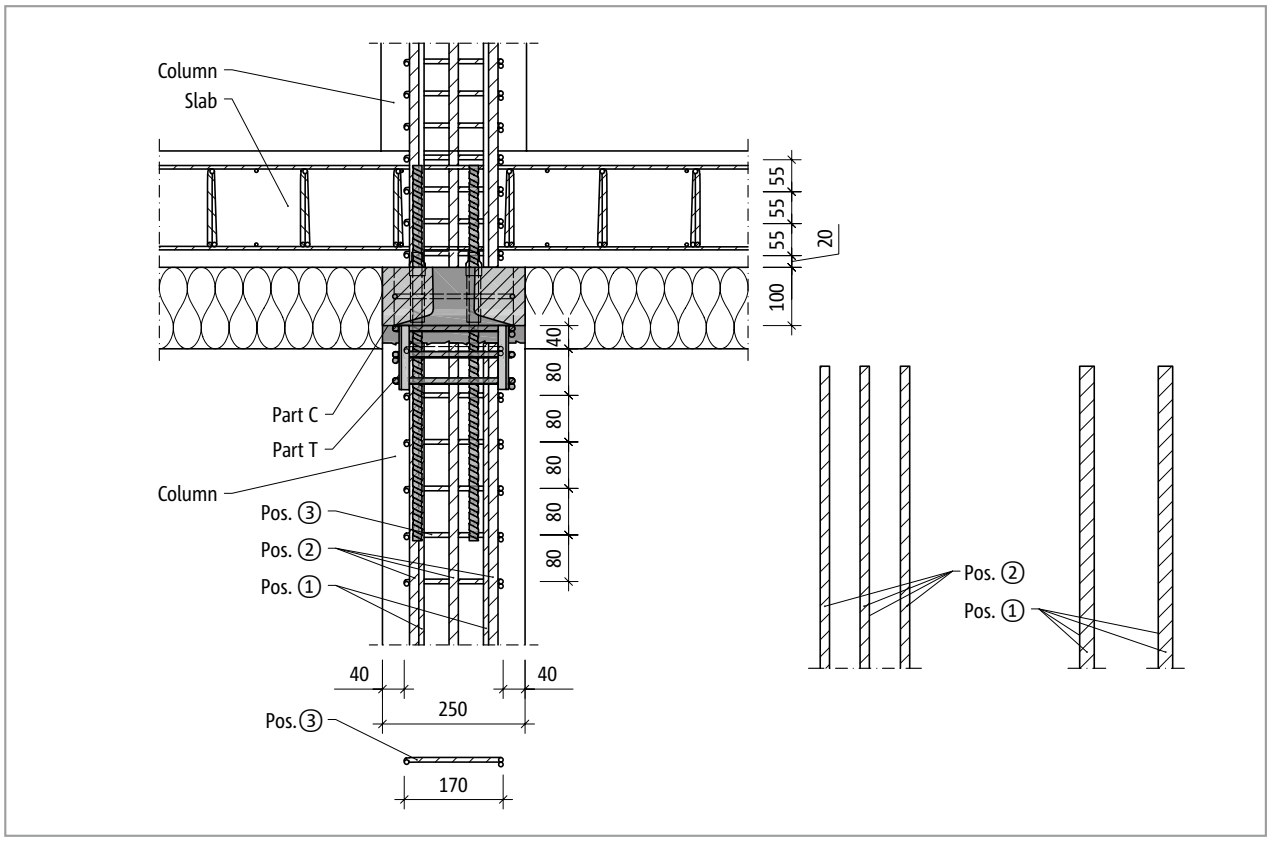


Fig. 141: Schöck Sconnex® type P: On-site reinforcement in column cross-section A-A

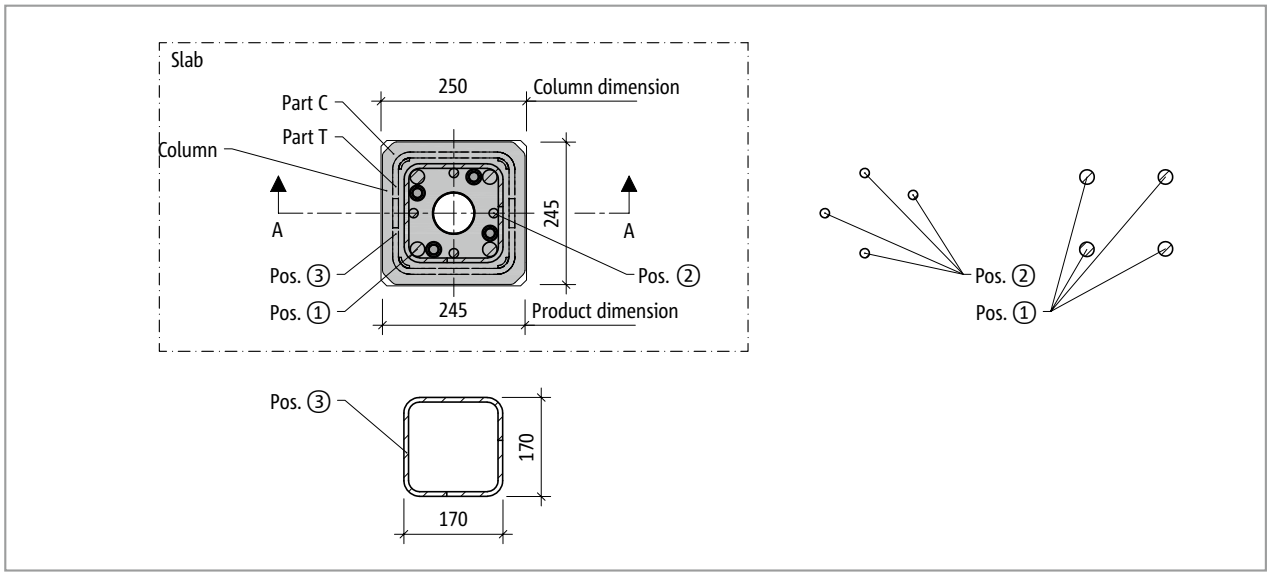


Fig. 142: Schöck Sconnex® type P: On-site reinforcement in column cross-section

On-site reinforcement

Schöck Sconnex® type		P
On-site reinforcement	Location	Concrete strength class ≥ C25/30
Longitudinal reinforcement		
Pos. 1	Column	4 • Hx; x in accordance with column design specified by the structural engineer
Longitudinal reinforcement (optional)		
Pos. 2	Column	4 • Hx; x in accordance with column design specified by the structural engineer
Transverse reinforcement as stirrup		
Pos. 3	Column	6 • Hx / 80; x in accordance with column dimensioning specified by the structural engineer

On-site reinforcement

- Pos. 2, in accordance with the column dimensioning by the structural engineer, can be dispensed with.
- Pos. 3: The lateral lengths of the stirrup are as external dimension to be limited to a maximum of 170 mm. This specification enables the correct installation of Schöck Sconnex® type P Part T and the dimensioning for the case of fire. This can have an impact on the static effective height used for the calculation.
- Smaller stirrup spacings than those given are permitted.
- The distance of Pos. 3 to the lower edge of Part C is 40 mm, see specifications in the column longitudinal sections for the on-site reinforcement.
- As the column longitudinal reinforcement cannot be carried out through the Schöck Sconnex® type P Part C, an unreinforced area appears under Part C and the poured concrete layer. The load-bearing capacity of this connection area is regulated in the German Approval and is taken into account in the load-bearing values.
- With rising columns the spacing of vertical column longitudinal reinforcement is between 0 and 25 mm from the lower edge of Part C.

Warning note

- In the area 20 cm above Part C to 35 cm below Part C only angled hooks in accordance with BS EN 1992-1-1, Figure 8.5.b may be used. D-locks with 135° hooks in accordance with Figure 8.5.a lead to collisions with the Combar® of Part C.

Tight fit | Grouting concrete | Strapping | Installation

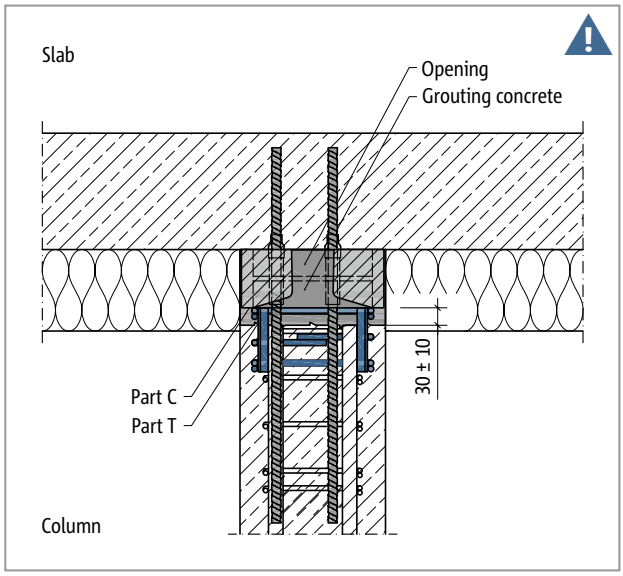


Fig. 143: Schöck Sconnex® type P: Installation section; connection column – floor using integrated Part T for the load-bearing safety in combination with Part C

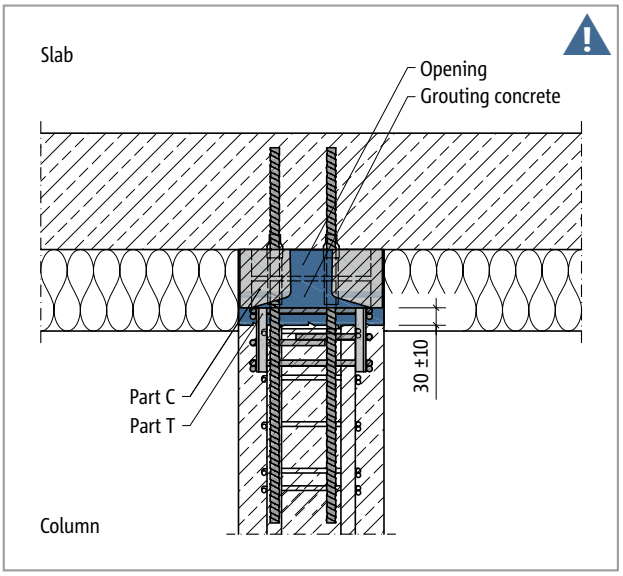


Fig. 144: Schöck Sconnex® type P: Installation section; connection column – floor using form fit to the column concrete using PAGEL® grouting V1/50

Poured concrete: PAGEL® grouting V1/50

- Schöck Sconnex® type P is supplied together with a dry mortar for the production of PAGEL® grouting V1/50 poured concrete. The delivered quantity is dimensioned for the production of tight fits on column-floor connections.

Hazard note, form fit with poured concrete

- The tight fit of the Schöck Sconnex® type P Part C to the column concrete is to be achieved using PAGEL® grouting V1/50 poured concrete. The opening in Part C must be filled up to the top edge.
- The grouting (depending on the temperature, see installation instructions) may, at the earliest, take place 24 hours after concreting of the column.
- The installation instructions for Schöck Sconnex® type P is to be taken into account for the correct installation of the components Part C and Part T.

Hazard note, strapping of the column concrete

- In the application the combination Schöck Sconnex® type P Part C with Part T is absolutely necessary in order to achieve a three-dimensional compressive stress status.
- Part T acts as additional stirrup under Part C at the top of the column for the acceptance of the hoop tension force from the end-anchorage of the column longitudinal reinforcement and for the strapping of the column concrete.

Installation

- The installation and the processing of Schöck Sconnex® type P require particular knowledge and special care. If an installation or processing does not take place professionally this has an influence on the statics of the complete building and can impair its stability. Therefore, we strongly recommend the successful completion of the E-learning provided by us. Also have your operating personnel successfully complete the E-learning. You can find he E-learning under: www.schoeck.com/de-at/e-learning-sconnex.
- In case of questions, please contact our master installer.

Design example

Simplified design procedure

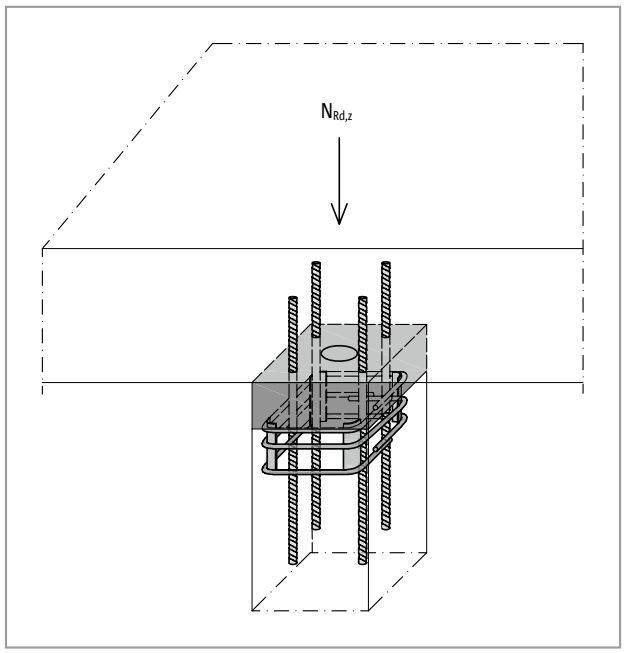


Fig. 145: Schöck Sconnex® type P: Sign convention for the design

Static system:

Bearing:	Installation in hinged column head without planned horizontal forces
Installation situation:	Internal column
Live load:	Office areas Category B q ≤ 5 kN/m²
Ceiling spans:	≤ 7.5 m
Span length ratio:	Span length ratio of the edge span of the 1st internal section 0.5 ≤ L1/L2 ≤ 2
Design procedure:	Simplified design procedure

geometries:

Clear support height:	l = 2.6 m ≥ 2.50 m; use of the simplified design procedure permitted
	l = 2.6 m ≤ 2.85 m; requirements on the fire resistance according to Approval met
Column dimensions:	b = 250 mm
	d = 250 mm

Minimum eccentricity specified by structural engineer ①:
e = 20 mm

Exposure classes:

Column/Floor:	internal XC1, external XD3
Selected:	Concrete strength class of the column C35/45
	Spacing of longitudinal bars of the column: 134 mm ≤ 150 mm
Fire protection requirements:	R 90

Internal forces from static calculation:

Compressive force:	$N_{Ed,z}$ = 900 kN
	$N_{Ed,z,fi}$ = 500 kN in the case of fire load combination according to BS EN 1992-1-2

Design example

Verifications in the ultimate limit state for cold dimensioning

Schöck Sconnex® type P						
Design values with	Concrete strength class of the column					
	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
Centre distance of longitudinal bars of the column [mm]	Normal force (compression with e = 20 mm) $N_{Rd,z}$ [kN/element]					
→ ≤ 150	904	1016	1119	1207	1207	1207
≤ 75	954	1069	1171	1207	1207	1207
≤ 50	974	1090	1191	1207	1207	1207

$N_{Rd,z}$ = 1119 kN
$N_{Ed,z}/N_{Rd,z}$ = 900 kN / 1119 kN = 0.81 < 1.0

Verifications in the ultimate limit state for hot dimensioning

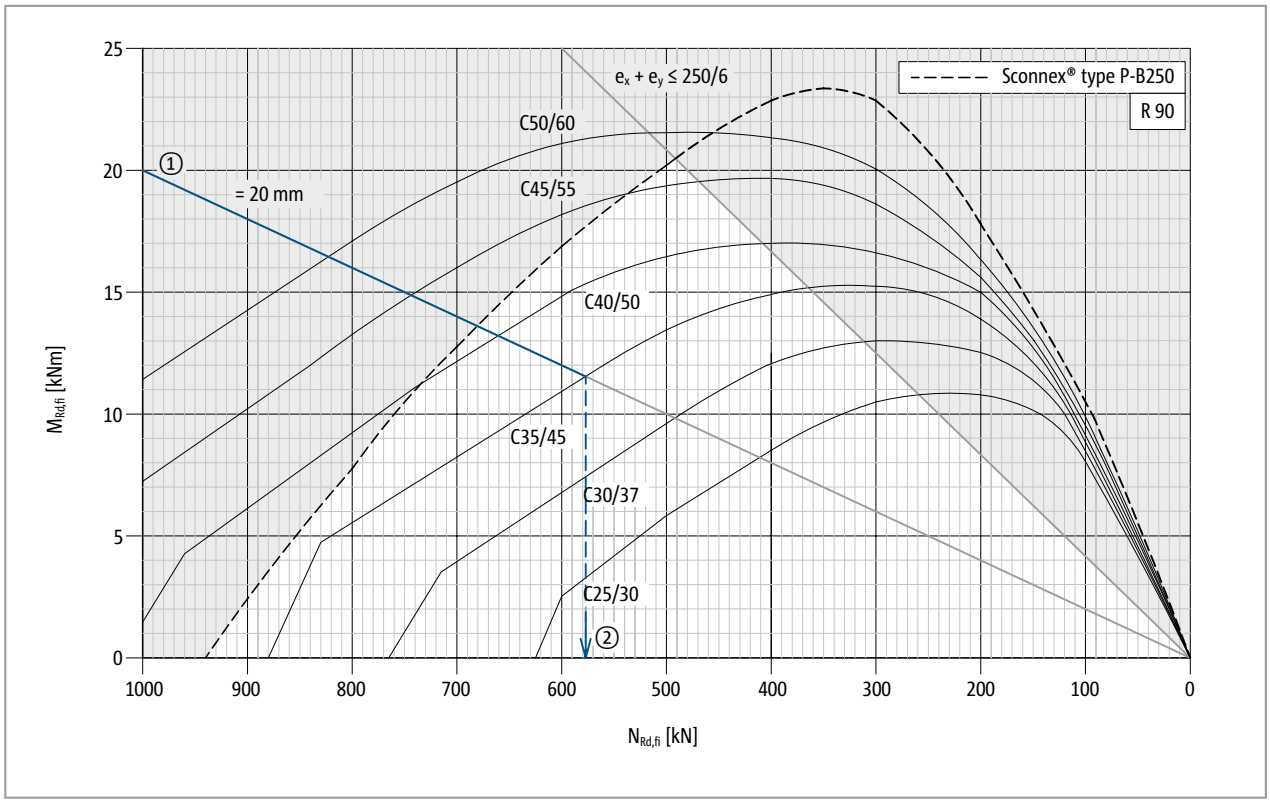


Fig. 146: Schöck Sconnex® type P: Interaction diagram for the dimensioning for the case of fire, fire resistance class R 90

② $N_{Rd,z,fi}$ = 575 kN
$N_{Ed,z,fi}/N_{Rd,z,fi}$ = 500 kN/ 575 kN = 0.87 < 1.0

Design example

General design procedure using the accurate load eccentricity

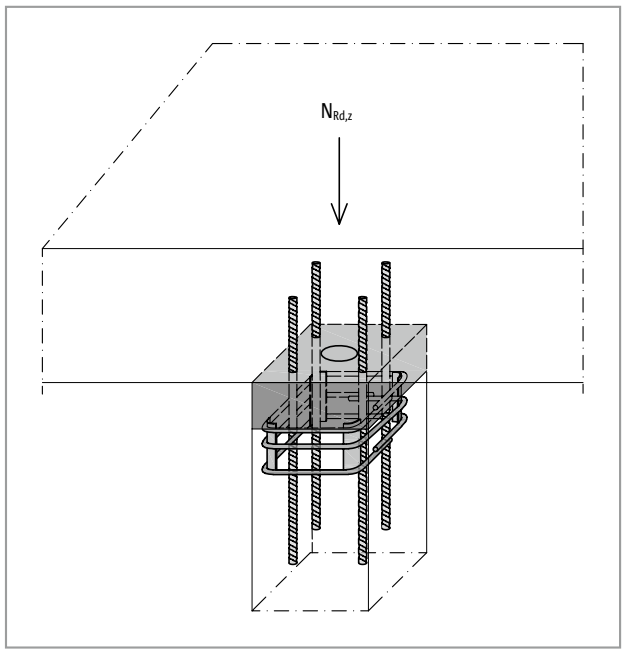


Fig. 147: Schöck Sconnex® type P: Sign convention for the design

Static system:

Bearing:	Installation in hinged column head without scheduled horizontal forces
Installation situation:	Edge column – non-admissible for simplified design procedure
Live load:	Plant rooms Category E q = 7,5 kN/m² – non-admissible for simplified design procedure
Ceiling span:	≤ 7.5 m
Span length ratio:	Span length ratio of the edge span of the 1st internal section 0.5 ≤ L1/L2 ≤ 2
Design procedure:	General design procedure using the accurate load eccentricity

Geometries:

Column headroom:	l = 2.6 m ≤ 2.85 m; requirements on the fire resistance following approval of possible
column dimensions:	b = 250 mm
	d = 250 mm

Exposure classes:

Column/floor:	internal XC1, external XD3
Selected:	Concrete strength class of the column C35/45
	Concrete cover c_{nom} = CV = 40 mm for Pos. 3 (see page 98)
	Spacing of longitudinal bars of the column: 134 mm ≤ 150 mm
Fire protection requirements:	R 90

Internal forces from static calculation:

Compressive force:	$N_{Ed,z}$ = 900 kN
Moments:	$M_{Ed,x}$ = 8 kNm, $M_{Ed,y}$ = 13 kNm
Eccentricity:	$e_x = M_{Ed,x} / N_{Ed,z}$ = 9 mm, $e_y = M_{Ed,y} / N_{Ed,z}$ = 14 mm
Compressive force (case of fire):	$N_{Ed,z,fi}$ = 650 kN in the case of fire load combination as per BS EN 1992-1-2
Moments (case of fire):	$M_{Ed,fi,x}$ = 4.6 kNm; $M_{Ed,fi,y}$ = 6.5 kNm load combination in the case of fire as per BS EN 1992-1-2
Eccentricity (case of fire):	$e_{fi,x} = M_{Ed,fi,x} / N_{Ed,fi,z}$ 7 mm ≤ 250/6
	$e_{fi,y} = M_{Ed,fi,y} / N_{Ed,fi,z}$ = 10 mm ≤ 250/6
	① $e_{fi} = \sqrt{(e_{fi,x}^2 + e_{fi,y}^2)}$ = 12 mm ≤ 250/6

Design example

Verifications in the ultimate limit state for cold dimensioning

Schöck Sconnex® type P						
Design values with	Concrete strength class of the column					
	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
Centre distance of longitudinal bars of the column [mm]	Normal force (compression with e = 0 mm) $N_{Rd,z,0}$ [kN/element]					
→ ≤ 150	1076	1210	1332	1443	1443	1443
≤ 75	1136	1273	1394	1443	1443	1443
≤ 50	1160	1298	1418	1443	1443	1443

$N_{Rd,z}$ = $N_{Rd,z,0} \cdot (1 - 2 \cdot e_x / 250\ mm) \cdot (1 - 2 \cdot e_y / 250\ mm)$
= $1332 \cdot (1 - 2 \cdot 9 / 250) \cdot (1 - 2 \cdot 14 / 250) = 1097.6$ kN
$N_{Ed,z}/N_{Rd,z}$ = 900 kN / 1097.6 kN = 0.82 < 1.0

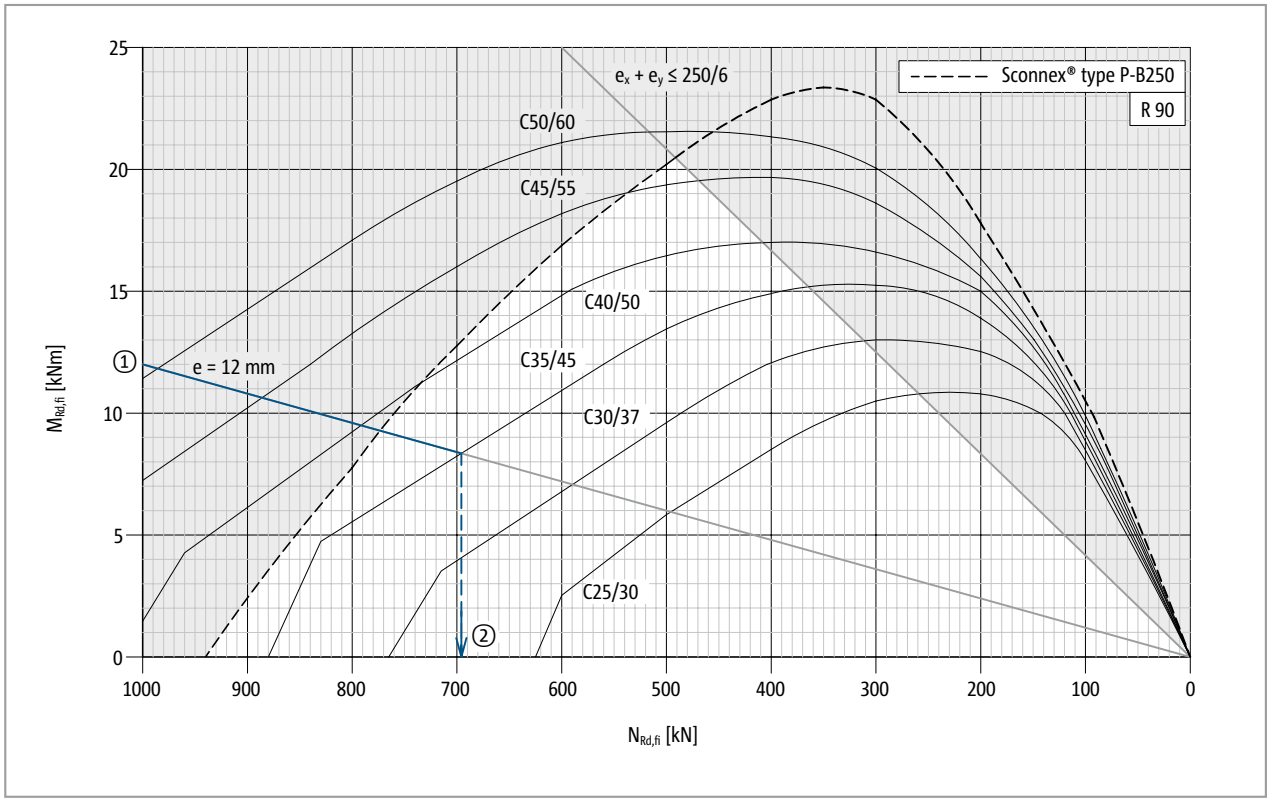
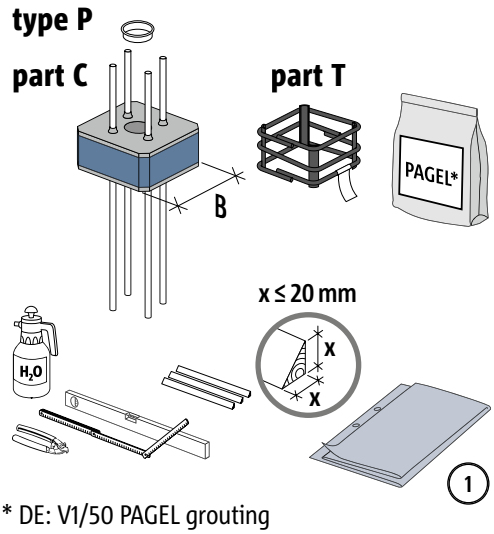


Fig. 148: Schöck Sconnex® type P: Interaction diagram for the dimensioning for the case of fire, fire resistance class R 90

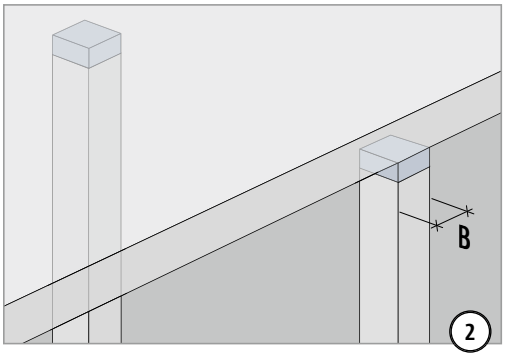
② $N_{Rd,z,fi}$ = 695 kN
$N_{Ed,z,fi}/N_{Rd,z,fi}$ = 650 kN/695 kN = 0.94 < 1.0

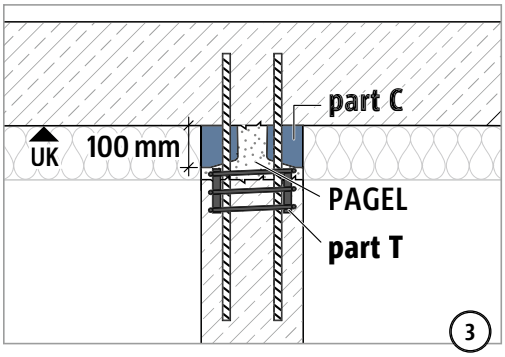
Installation instructions for building site in-situ concrete

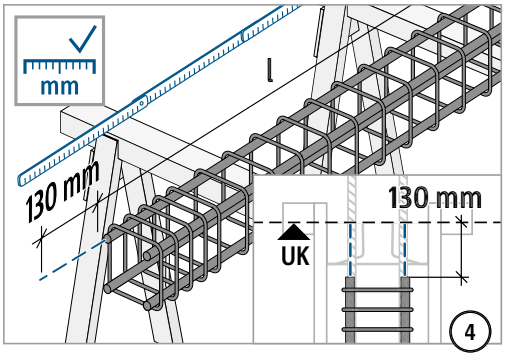


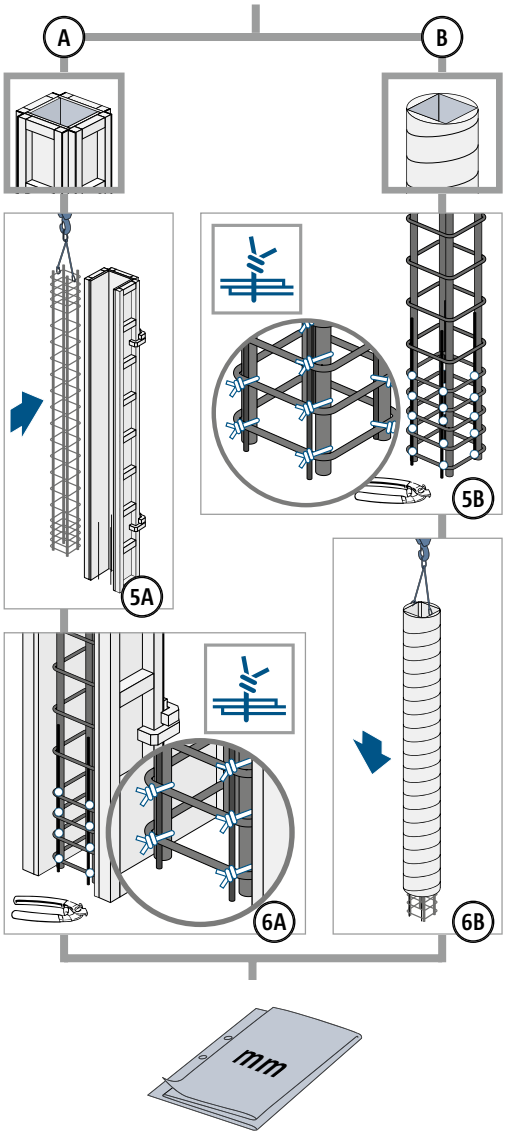
* DE: V1/50 PAGEL grouting

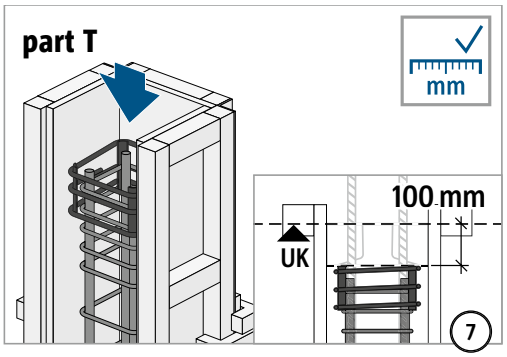
Use assembly report.



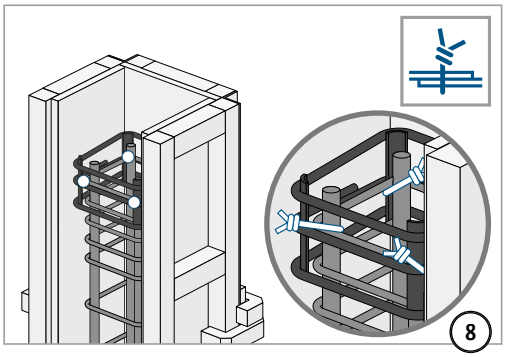


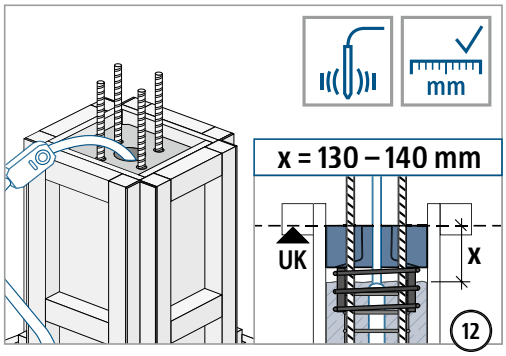


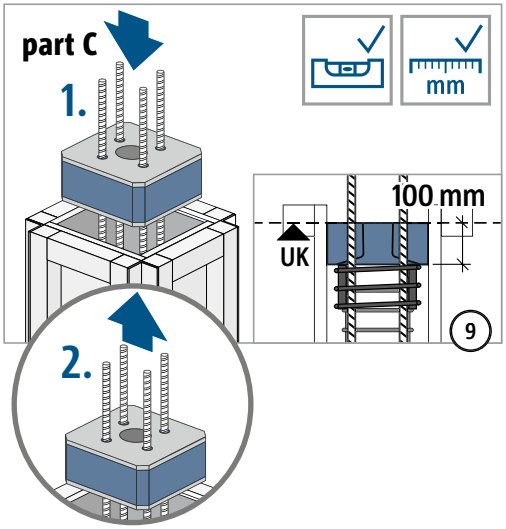


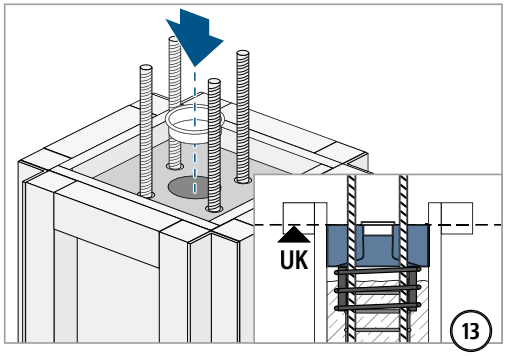


Installation instructions for building site in-situ concrete



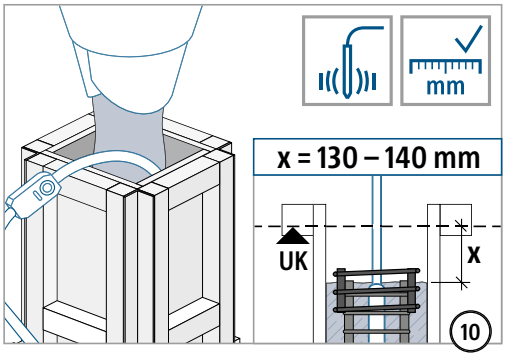




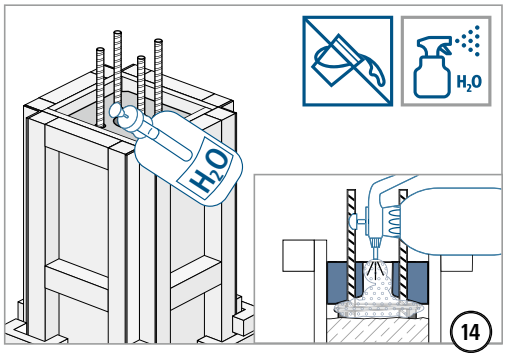


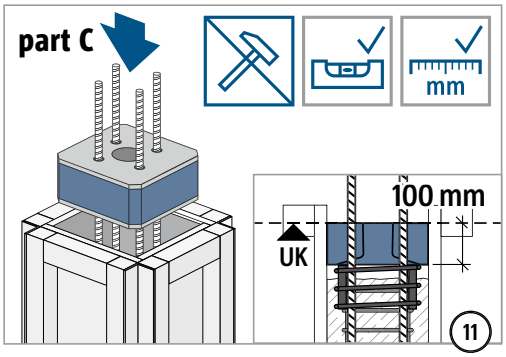
with 20 °C
min. 24 h

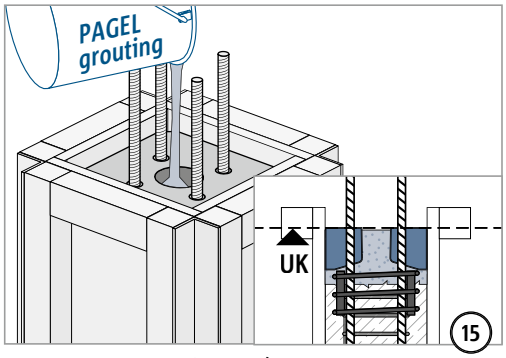
Temperature (C°)	Waiting time (h)
≥ 20	24
15	30
10	40
5	50



max. 5 Min.

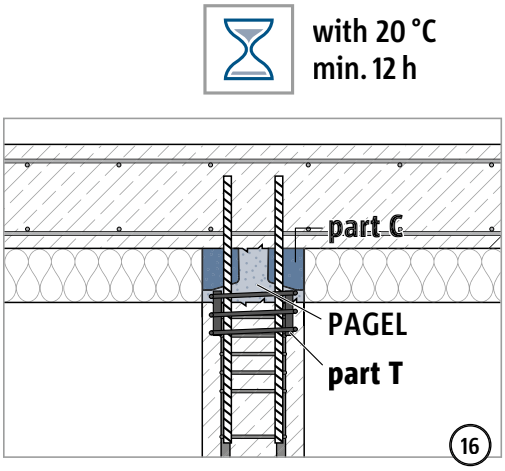




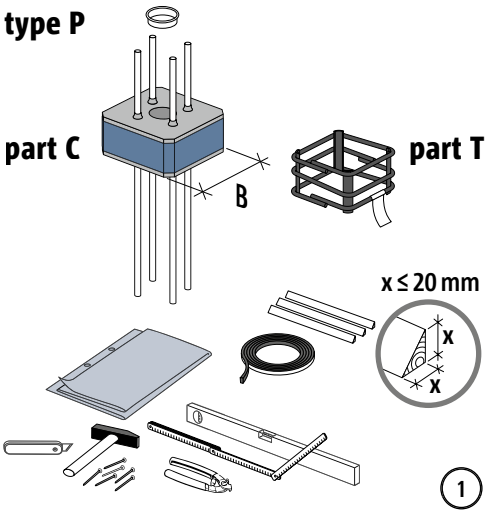


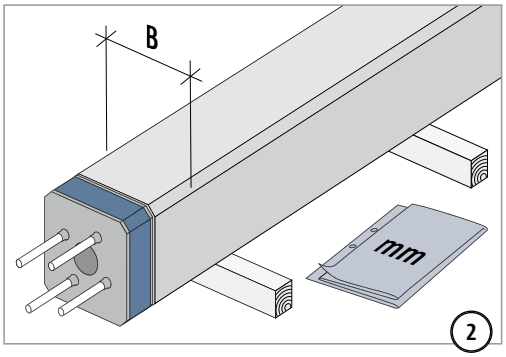
Grouting approx. 3 litre V1/50 PAGEL

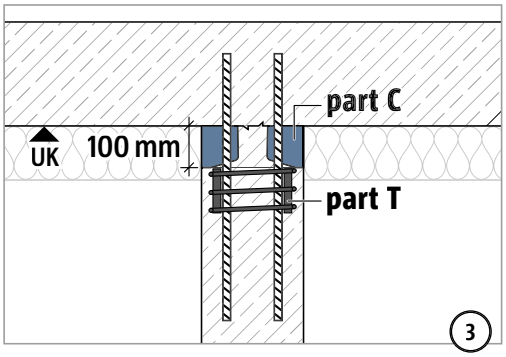
Installation instructions for building site in-situ concrete

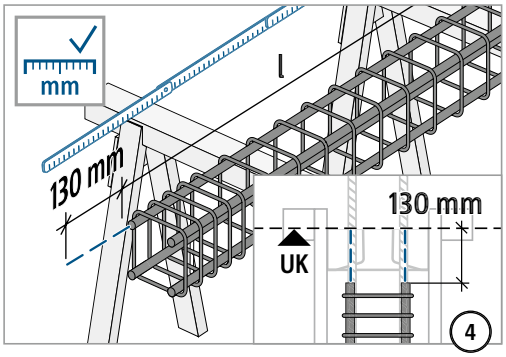


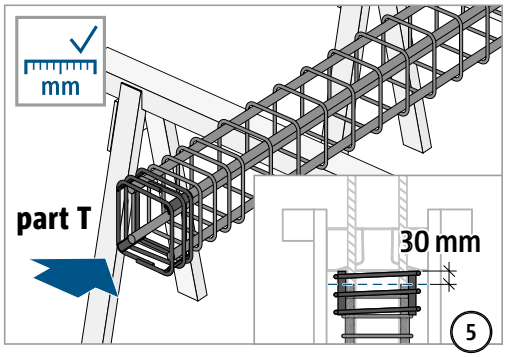
Installation instruction – Precast factory

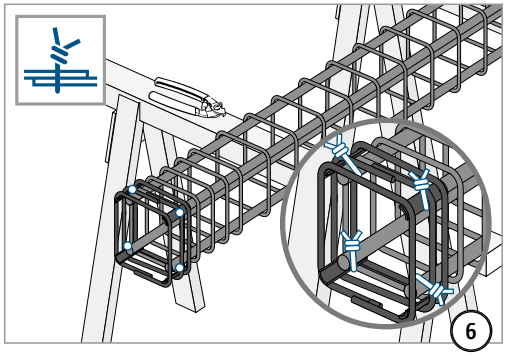


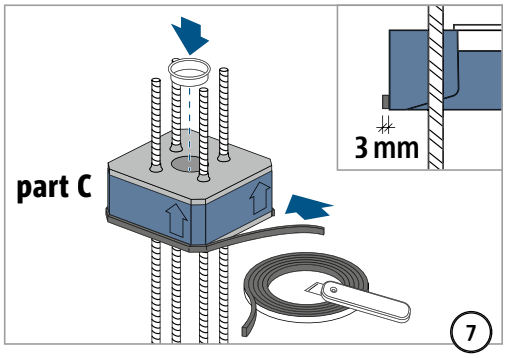


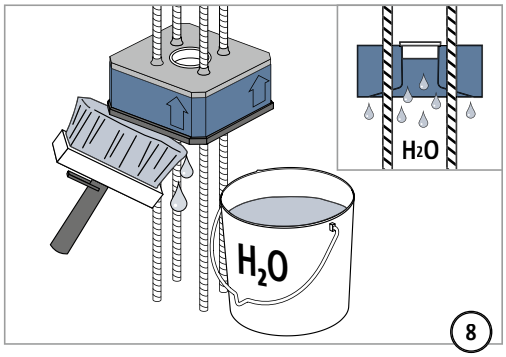


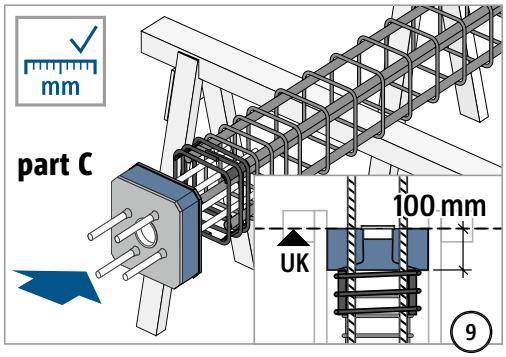




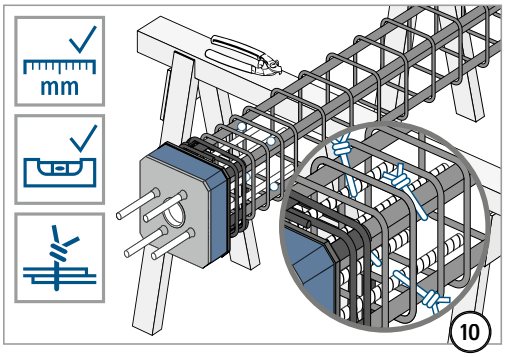


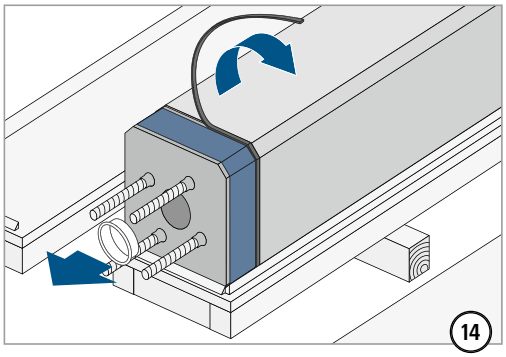


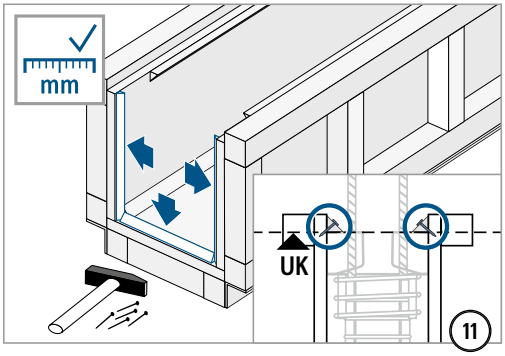


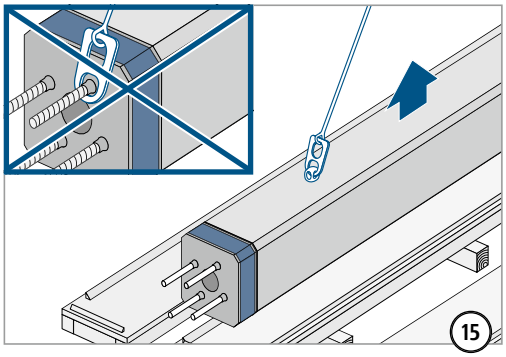


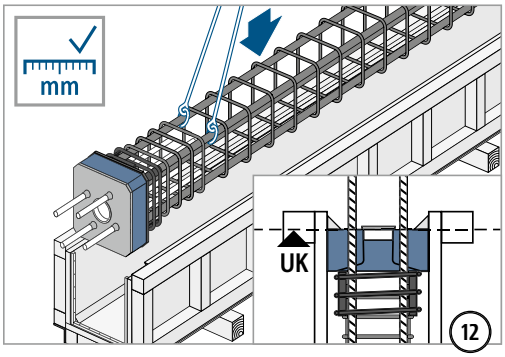
Installation instruction – Precast factory

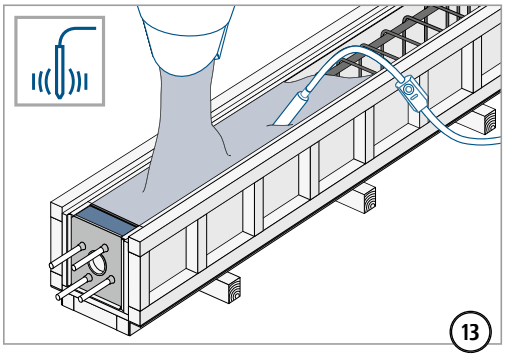












with 20 °C
min. 24 h

Temperature (C°)	Waiting time (h)
≥ 20	24
15	30
10	40
5	50

☑ Check list

- ☐ Are Schöck Sconnex® type P Part C and Part T taken into account in the planning documents for the column cross-section 250 mm × 250 mm?
- ☐ Are the influences on the Schöck Sconnex® connection determined at the dimensioning stage?
- ☐ Are the columns planned as compression elements in a horizontal non-displacable supporting structure?
- ☐ Is the relevant concrete strength class taken into account in the design?
- ☐ Are the boundary conditions complied with for the employment of simplified design procedures?
- ☐ For edge columns are the maximum permitted eccentricities complied with and is the load-bearing capacity dimensioned accordingly?
- ☐ Is the respective required column reinforcement defined?
- ☐ Is there a situation in which, during the construction phase, the construction had to be dimensioned for an emergency or a special load?
- ☐ Are the requirements with regard to fire protection clarified?
- ☐ Is dimensioning necessary for the case of fire?
- ☐ With fire protection dimensioning is the clear column length l ≤ 2.85 m taken into account?
- ☐ With the determination of the column reinforcement (e.g. buckling verification) has the correct static height been used?
- ☐ Are the on-site stirrups in the area of at least 20 cm above Part C to 35 cm below Part C planned as 90° angled hooks?
- ☐ Is the tight fit using PAGEL® grouting V1/50 poured concrete taken into account in the planning documents?
- ☐ Was the construction site advised of the mandatory certification?