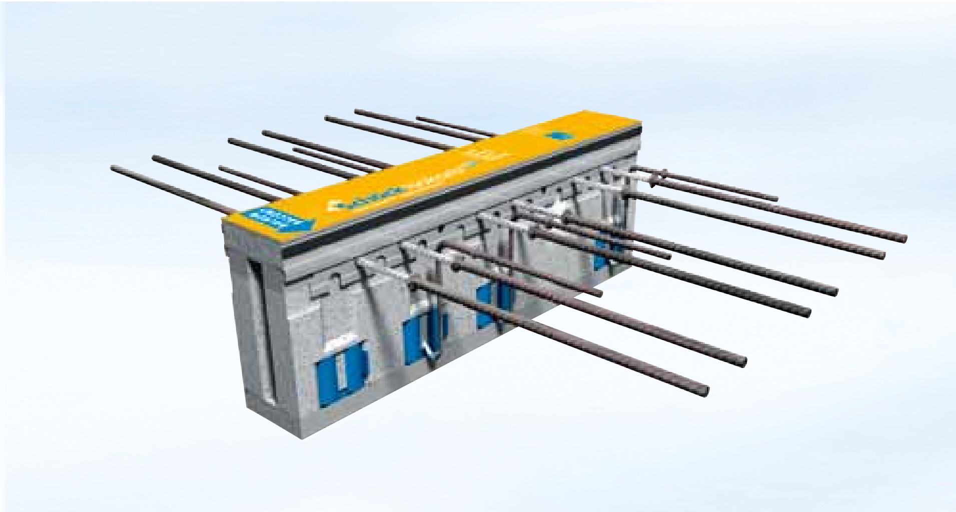
Schöck Isokorb®



# Technical Information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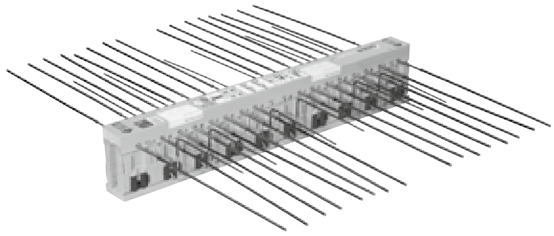
# Schöck Isokorb®
## Features

### Schöck Isokorb® with HTE modules for thermally efficient load-bearing connection between reinforced concrete-to-reinforced concrete

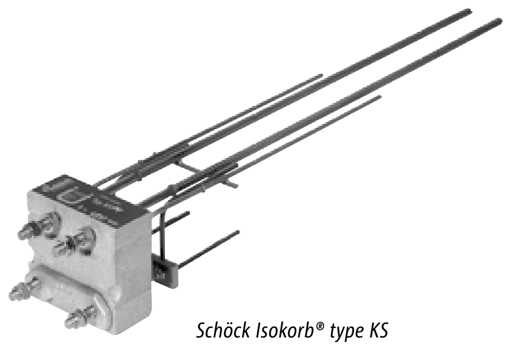
- provides a thermal break between external reinforced concrete components and the building
- reduces thermal losses to a minimum by virtue of innovative technology (HTE module pressure bearings)
- plastic jackets on the concrete pressure bearings provide trouble-free movement
- thus helps to save heating bills and conserve natural energy resources
- eliminates the risk of condensation
- flush-mounted pressure bearings (HTE modules) facilitate installation on the construction site and in prefabricating plants
- Schöck Isokorb® type K20 E/K60 E/K80 E can also be delivered in lengths of 250mm and 500mm



*Schöck Isokorb® type K*

### Schöck Isokorb® for thermally efficient load-bearing connection between reinforced concrete-to-steel

- allows thermally insulated connections between steel to reinforced concrete components
- enables a high level of prefabrication
- minimises on-site assembly time
- components exposed to the weather are made of stainless steel, thus offering protection against corrosion



*Schöck Isokorb® type KS*

### Schöck Isokorb® for thermally efficient load-bearing connection between steel-to-steel

- allows thermal breaks to be incorporated in steel structures, whilst simultaneously being capable of transmitting high loads
- state-of-the-art components for the avoidance of thermal bridges in steel construction
- enables a high level of prefabrication
- modular layout means that the system can be used for connections with all profile sizes and structural loads
- short planning and assembly time

*Schöck Isokorb® type KST*

# Schöck Isokorb®
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# Building physics
## Thermal bridges

### Definition of thermal bridges

Thermal bridges are localised regions in building envelope details which display increased thermal losses. The increased thermal losses can be caused by the component geometry ("geometric thermal bridge") or by the localised inclusion of materials with a higher thermal conductivity in the affected component ("material-based thermal bridge").

### Effects of thermal bridges

In the area of a thermal bridge, the local increase in thermal losses causes the temperature of inside surfaces to drop. Mould will form as soon as the surface temperature drops below the so-called "mould temperature" $\theta_S$. If the surface temperature drops even further – to below the dew point temperature $\theta_\tau$ – the moisture present in the room air will condense on the cold surfaces in the form of droplets.

Once mould has formed in the area of a thermal bridge, the spores released by it into the room can represent a serious health hazard to anybody living in the room. Mould spores are allergens which can cause severe allergic reactions in humans, such as sinusitis, rhinitis and asthma. As exposure inside the house or apartment is usually prolonged, there is a high risk that these allergic reactions can develop into chronic conditions.

In summary, the effects of thermal bridges are therefore:

- Risk of mould formation
- Risk of health damage (allergies etc.)
- Risk of condensation
- Increased wastage of heating energy

### Dew point temperature

The dew point temperature $\theta_\tau$ of a room is the temperature at which the moisture present in the air in the room can no longer be contained by the air and condenses in the form of water droplets. At this point the relative humidity is then 100 %.

Room air which is in direct contact with the surfaces of colder areas takes the temperature of the cold surface as a result of this direct contact. If the minimum surface temperature of a thermal bridge is below the dew point temperature, then the temperature of the air directly adjacent to this surface will also be below the dew point temperature. As a consequence, the moisture contained in this layer of room air condenses on the cold surface.

The dew point temperature only depends on the temperature and the humidity of the air in the room (see figure 1, page 5). The higher the humidity and temperature of the air in the room, the higher the dew point temperature – i.e. the sooner condensation forms on colder surfaces.

On average, standard climatic conditions in a room are around 20 °C with a relative humidity of approximately 50 %. This results in a dew point temperature of 9.3 °C. In rooms where the humidity is higher, e.g. in a bathroom, the humidity may also reach a value of 60 % or higher. The dew point temperature is correspondingly higher, and the risk of condensation forming increases. For example, if the humidity of the room air is 60 % the dew point temperature is already 12.0 °C (see figure 1, page 5). The steeply ascending curve in Figure 1 gives a very clear indication of how closely the dew point temperature depends on the humidity of the room air: even slight increases in the humidity of the room air lead to a significant increase in the dew point temperature of the room air. This results in a significant increase in the risk of condensation forming on the cold component surfaces.

# Building physics
## Thermal bridges

### Mould temperature

At room air relative humidity values of 80 % or higher the surface moisture on components is sufficient for mould to grow, i.e. mould will grow on the surface of cold components if the component surface is cold enough to generate a humidity of 80 % in the layer of air directly adjacent to the component. The temperature at which this occurs is referred to as the socalled “mould temperature” $\theta_S$.

This means that mould growth already takes place at temperatures above the dew point temperature. At a room climate of 20 °C/50 % the mould temperature is 12.6 °C, i.e. 3.3 °C higher than the dew point temperature. As a result, from the point of view of avoiding building damage (i.e. mould formation), the mould temperature is therefore more important than the dew point temperature. It is not sufficient for the inside surfaces to be warmer than the dew point temperature of the room air – the surface temperatures must also be above the mould temperature.

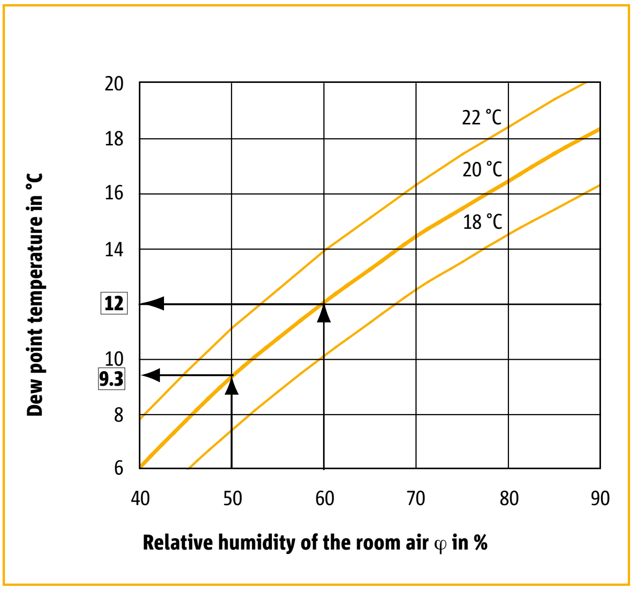


*Figure 1: Dependency of the dew point temperature on the room air humidity and temperature*

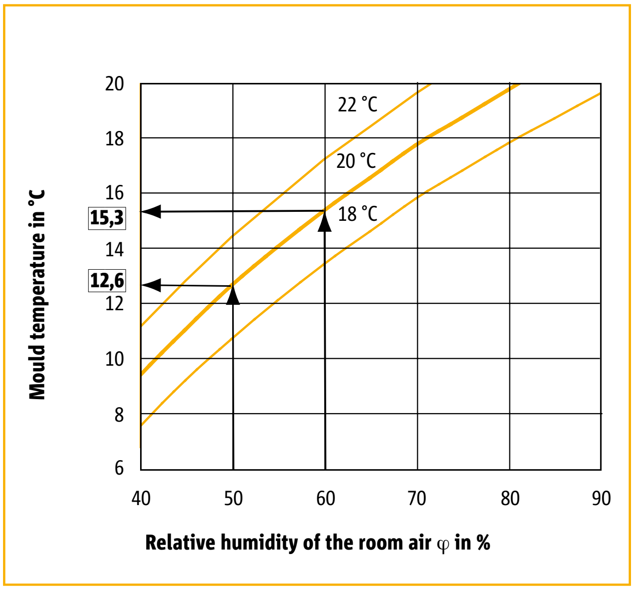


*Figure 2: Dependency of the mould temperature on the room air humidity and temperature*

# Building physics
## Thermal bridges

### Thermal characteristics of thermal bridges

The thermal effects of thermal bridges are described by the following thermal characteristics:

| Thermal effects | Characteristic values | |
|---|---|---|
| | Qualitative representation | Quantitative single value representation |
| ▸ Formation of mould<br>▸ Formation of condensation | ▸ Isothermals | ▸ Minimum surface temperature $\theta_{min}$<br>▸ Temperature factor $f_{Rsi}$ |
| ▸ Thermal loss | ▸ Heat flow lines | ▸ $\psi$ value<br>▸ $\chi$ value |

These characteristic values can only be determined by means of a thermal FE calculation of the thermal bridge. To do this, the geometric layout of the structure in the area of the thermal bridge is modelled on a computer together with the thermal conductivity values of the materials used. The boundary conditions which should be applied to the calculations and to the models are governed by NS-EN ISO 10211:2008.

In addition to the quantitative characteristic values, the FE calculation also yields a representation of the temperature distribution within the structure (representation of "isothermals") and the layout of the heat flow lines. The heat flow line representation shows the paths on which heat is lost through the structure and offers good insight into the weak spots of the thermal bridge. The "isothermals" are lines or areas of the same temperature. They show the temperature distribution within the analysed component. Isothermals are often graded with a temperature increment of 1 °C. Heat flow lines and isothermals are always perpendicular to each other (see Figures 3 and 4).

### The thermal transmission coefficients $\psi$ and $\chi$

The linear thermal transmission coefficient $\psi$ ("psi value") describes the additional thermal losses per meter of a linear thermal bridge. Correspondingly, the thermal transmission coefficient $\chi$ ("chi value") describes the additional thermal losses through a point-shaped thermal bridge.

Depending on whether the surfaces used to determine the $\psi$ value relate to external or internal dimensions, a distinction is made between $\psi$ values which relate to external and internal dimensions. The thermal insulation calculations in accordance with the Energy Saving Directive must be based on $\psi$ values which relate to external dimensions. Unless specified otherwise, all of the $\psi$ values in this technical information document relate to external dimensions.

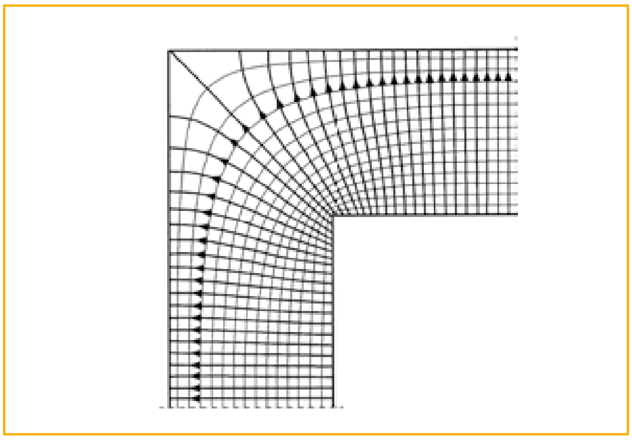

*Figure 3: Example of a thermal bridge which is caused purely by the geometry of the component ("geometric thermal bridge"). Representation of the isothermals and heat flow lines (arrows).*

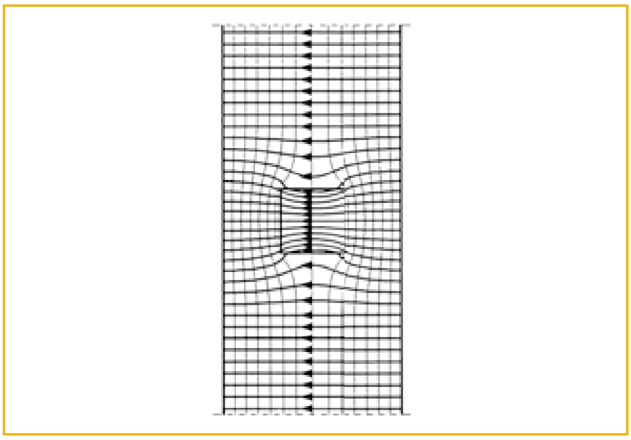

*Figure 4: Example of a thermal bridge which is caused purely by the choice of materials ("material-based thermal bridge"). Representation of the isothermals and heat flow lines (arrows).*

# Building physics
## Thermal bridges

### The minimum surface temperature $\theta_{min}$ and the temperature factor $f_{Rsi}$

The minimum surface temperature $\theta_{min}$ is the lowest inside surface temperature occurring in the region of a thermal bridge. The value of the minimum surface temperature is the deciding factor which determines whether condensation forms at a thermal bridge or whether mould starts to grow there. Accordingly, the minimum surface temperature is an indicator of the effects of a thermal bridge in terms of dampness.

The characteristic values $\theta_{min}$ and the $\psi$ value depend on the layout and structure of the thermal bridge (geometry and thermal conductivity of the materials which form the thermal bridge). In addition, the minimum surface temperature also depends on the prevailing outside temperature. The lower the outside air temperature, the lower the minimum surface temperature (see Figure 5).

As an alternative to the minimum surface temperature, the temperature factor $f_{Rsi}$ can also be used as a dampness indicator. The temperature factor $f_{Rsi}$ is the temperature difference between the minimum surface temperature and the outside air temperature ($\theta_{min} - \theta_e$) divided by the temperature difference between the inside temperature and outside temperature ($\theta_i - \theta_e$):

$$f_{Rsi} = \frac{\theta_{min} - \theta_e}{\theta_i - \theta_e}$$

As the $f_{Rsi}$ value is a relative value, it offers the advantage that it only depends on the construction of the thermal bridge, and not on the prevailing inside and outside temperatures like $\theta_{min}$. If the $f_{Rsi}$ value of a thermal bridge is known, the minimum surface temperature can be calculated for specific inside and outside air temperatures:

$$\theta_{min} = \theta_e + f_{Rsi} \times (\theta_i - \theta_e)$$

Figure 5 shows the dependency of the minimum surface temperature on the adjacent outside temperature as a function of different $f_{Rsi}$ values with a constant inside temperature of 20 °C.
Figure 6 showes the relation between $\theta_{min}$ and $f_{Rsi}$, under the assumption of an outside temperature of -5°C.

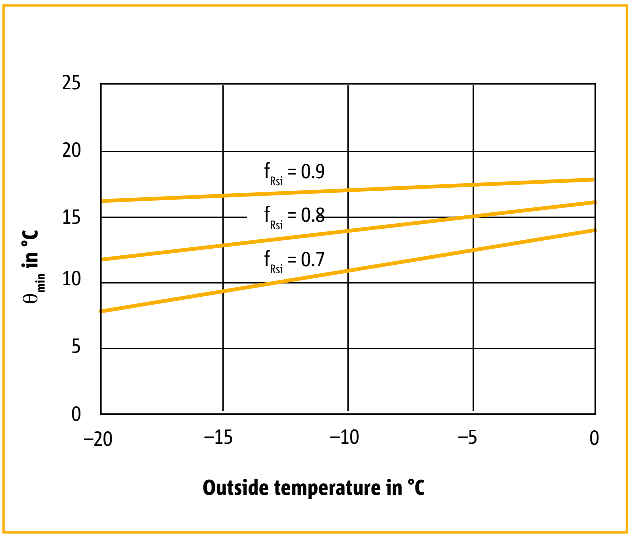


*Figure 5: Dependency of the minimum surface temperature on the adjacent outside temperature (Inside temperature at a constant value of 20 °C).*

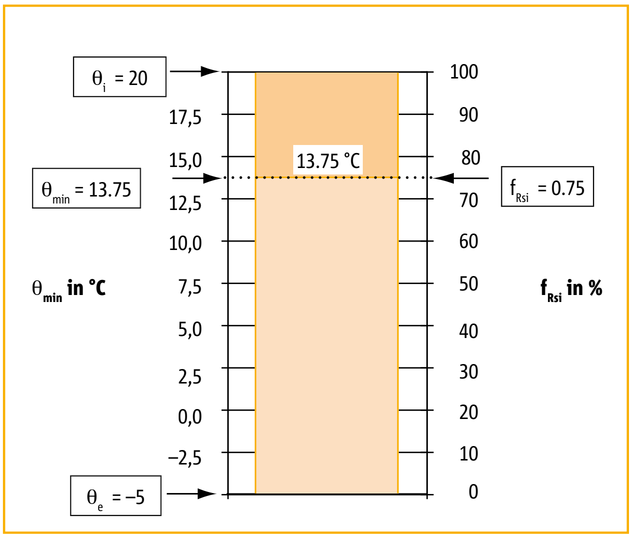


*Figure 6: The relation between $\vartheta_{min}$ and $f_{Rsi}$, under the assumption of an outside temperature of -5 °C.*

# Building physics
## The balcony as a thermal bridge



### Non-insulated cantilever building elements

In the case of non-insulated cantilever building elements such as reinforced concrete balconies or steel girders, the combination of geometrical thermal bridge (cooling fin effect of the cantilever) and material-related thermal bridge (penetration of the heat insulation level by reinforced concrete or steel) leads to a great deal of thermal outflow. This makes cantilevers one of the most critical thermal bridges in the building envelope. Considerable thermal losses and a significant reduction in surface temperature are the result of non-insulated cantilevers. This leads to significantly higher heating costs and a very high risk of mould near the cantilever connection area.

### Effective thermal insulation using Schöck Isokorb®

Thanks to its thermal and structurally optimised design (minimised reinforcement cross-section combined with optimised load bearing capacity and use of particularly good thermal insulating materials), Schöck Isokorb® is a very effective way of insulating cantilevers.

**Schöck Isokorb® for reinforced concrete balconies**
The Schöck Isokorb® divides the otherwise continuous reinforced concrete slab near the balcony connection area. The concrete and reinforced concrete, which have good and very good heat-conducting properties respectively, are replaced by Neopor®[1)] insulating material and stainless steel, which has very poor heat-conducting properties compared with reinforced concrete, as well as by optimised HTE modules made of high-strength fine concrete in the pressure area (see Table 2). This results in a reduction of thermal conductivity by around 94% e.g. for the Schöck Isokorb® type K50 compared with a traditional reinforced concrete connection (see Fig. 7).

**Schöck Isokorb® for steel balconies**
Near the steel girder connection point, the use of Schöck Isokorb® replaces the structural steel, which has poor thermal insulation properties, with insulation and stainless steel, the thermal conductivity of which is almost 4 times lower than that of structural steel (see Table 2). This results in a reduction in thermal conductivity by about 94 % for Schöck Isokorb® type KS14 compared with a non-insulated connection (see Fig. 7).

**Schöck Isokorb® for steel girder connections in steel construction**
Near the steel girder connection point, the highly thermal conductive structural steel is replaced by insulation material or stainless steel, which has very poor thermal conductivity properties compared with structural steel (see Table 2). This results in a reduction of thermal conductivity by around 90 % e.g. for the Schöck Isokorb® type KST 16 compared with a continuous steel girder (see Fig. 7).

| | Non-insulated balcony connection | Balcony connection with Schöck Isokorb® | Reduction of thermal conductivity in comparison to non-insulated design by |
|---|---|---|---|
| Materials Balcony connection | Concrete/structural steel<br>$\lambda$ = 50 W/m × K | Stainless steel (material no. 1.4362)<br>$\lambda$ = 15 W/m × K | 70 % |
| | | High-strength fine concrete<br>$\lambda$ = 0.83 W/m × K | 98 % |
| | Concrete<br>$\lambda$ = 1.65 W/m × K | Neopor®<br>$\lambda$ = 0.031 W/m × K | 98 % |

*Table 2: Comparison of the thermal conductivity values of different materials in use for balcony connections*

[1)] Neopor® is a registered trademark of BASF

# Building physics
## The balcony as a thermal bridge

### The equivalent thermal conductivity $\lambda_{eq}$

The equivalent thermal conductivity $\lambda_{eq}$ is the overall thermal conductivity of the Isokorb® insulating element averaged over the contributions of the different surface proportions. Given the same insulating element thickness it is an indicator of the thermal insulation effect of the connection. The smaller $\lambda_{eq}$, the higher the thermal insulation of the balcony connection. As the equivalent thermal conductivity takes into account the contributions from the different surface proportions of the materials used, $\lambda_{eq}$ depends on the load capacity of the Schöck Isokorb®.

**In comparison to a connection which is not insulated, the Schöck Isokorb® types K, KS and KST can achieve a reduction in thermal conductivity in the connection area of up between 90 % and 94 % for the standard load range.**

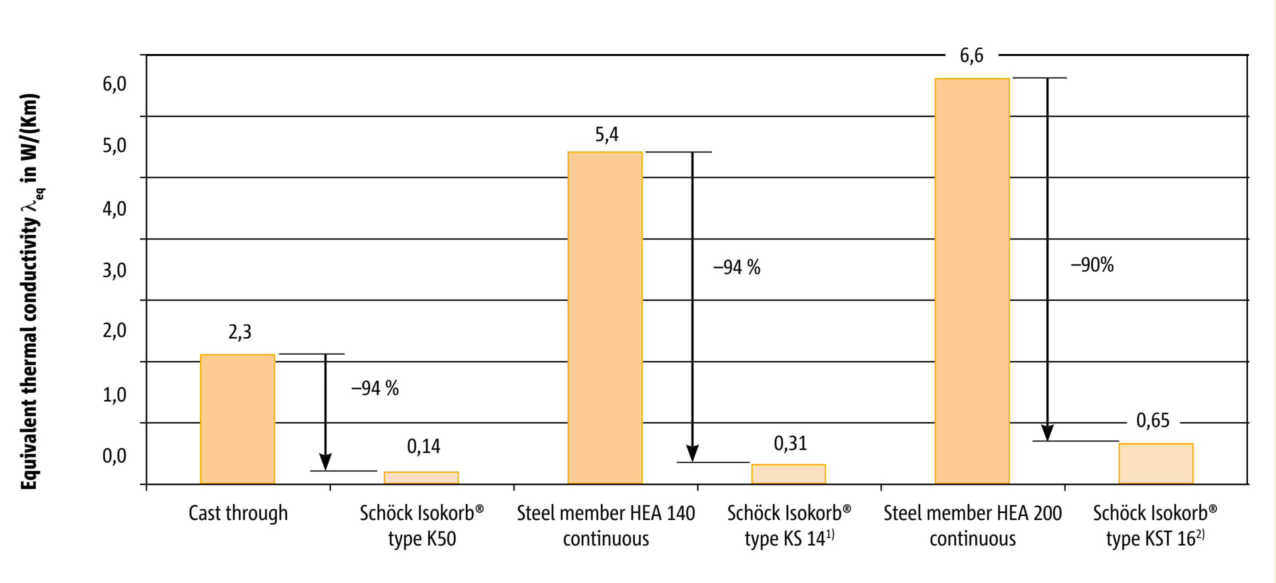


*Figure 7: A comparison of equivalent thermal conductivity values $\lambda_{eq}$ for different balcony slab connections.*

### Difference between the $\psi$ value and $\lambda_{eq}$

The equivalent thermal conductivity $\lambda_{eq}$ of the insulating element of the Schöck Isokorb® is a measure of the thermal insulation effect of the element, whereas the $\psi$ value indicates the thermal insulation of the balcony as an overall structure. The $\psi$ will always vary according to the design, even if the connection element is unchanged.

Conversely, if the design of the structure is fixed then the $\psi$ value will depend on the equivalent thermal conductivity $\lambda_{eq}$ of the connection element: the lower $\lambda_{eq}$, the lower the $\psi$ value (and the higher the minimum surface temperature).

[1] Reference area: 180 × 180 mm²
[2] Reference area: 250  x 180 mm²

# Building physics
## The balcony as a thermal bridge

### Thermal bridge characteristic values for balcony connections with Schöck Isokorb®

The thermal bridge characteristic values resulting from a typical construction type and different Isokorb® types are shown in Table 3 below. The underlying construction types are shown in Figures 9a, 10a and 11a. Other construction types which do not match the ones shown here will have different thermal bridge characteristic values.

| Schöck Isokorb® type | Equivalent thermal conductivity (3-dim.) W/(m × K) | Thermal transmission coefficient $\psi$ in W/(m × K) (in relation to external dimensions) or $\chi$ in W/K | Temperature factor $f_{Rsi}$ |
|---|---|---|---|
| K 50 | $\lambda_{eq} = 0.13$ | $\psi = 0.20$ | $f_{Rsi} = 0.91$ |
| KS 14 | $\lambda_{eq} = 0.31$[1)] | $\chi = 0.097$ | $f_{Rsi} = 0.93$ |
| KST 16 | $\lambda_{eq} = 0.70$[2)] | $\chi = 0.26$ | $f_{Rsi} = 0.82$ |
| The characteristic values were determined on the basis of the construction types shown in Figures 9a, 10a, 11a with the following thermal boundary conditions: Heat transfer resistance outside: $R_{Si}$ = 0.04 Km²/W, heat transfer resistance inside: $R_{Si}$ = 0.13 Km²/W | | | |

*Table 3: Typical thermal bridge characteristic values that can be achieved with Schöck Isokorb® elements.*

There are two options of connecting a balcony with Isokorb®. Either by connecting the balcony in its full length or by a partial connection with settled distances. Notice that the value of $\psi$ differs for Isokorb® compared to the insulation next to it. You can calculate an average value of $\psi$ as follows:

$$\psi_m = \frac{l_{Isokorb} \cdot \psi_{Isokorb} + l_{insulation} \cdot \psi_{insulation}}{l_{Isokorb} + l_{Isolering}}$$

equation:

$\psi_m$: Average resistance of thermal transmission for an intermittent attachment with Isokorb®
$l_{Isokorb}$: Isokorb® length of the attachment of the balcony
$\psi_{Isokorb}$: Resistance of thermal transmission for the Isokorb®
$l_{insulation}$: Insulation length of the balcony, which is seperated from the frame by insulation
$\psi_{insulation}$: Resistance of thermal transmission for the cold bridge next to the insulation (for a construction as Figure 8, with a thickness of 80 mm and a thermal transmission on 0,031 W/(mK), is $\psi_{insulation}$ = 0,11 W/(mK))

### Example: attachment of a balcony with a length of 4,2 m and a total Isokorb® length of 1,5 m.

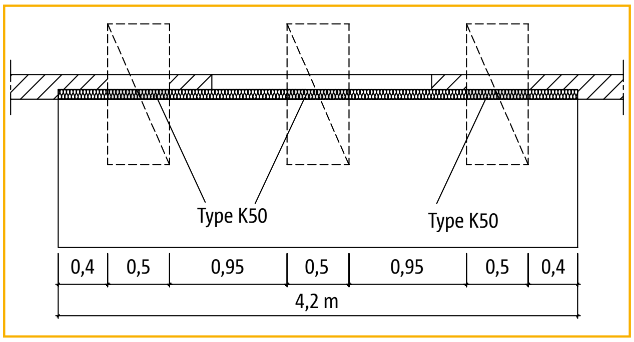


*Figure 8: Plan over balcony with Isokorb® type K50*

$$\psi_m = \frac{1,5m \cdot 0,20\,\frac{W}{mK} + 2,7m \cdot 0,11\,\frac{W}{mK}}{4,2m} = 0,14\,\frac{W}{mK}$$

[1)] Reference area: 180 × 180 mm²
[2)] Reference area: 250 × 180 mm²

# Building physics
## The balcony as a thermal bridge



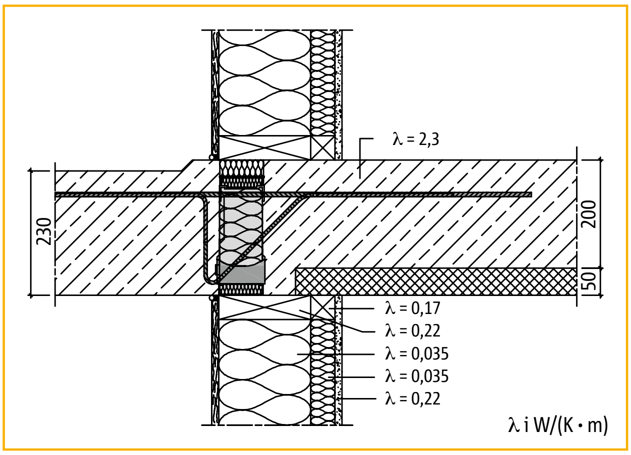


*Figure 9a: Balcony slab connection with Schöck Isokorb® type K50 and a composite thermal insulation system*

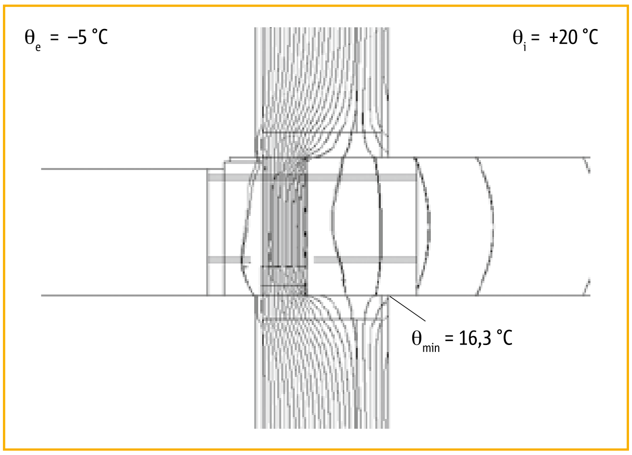


*Figure 9b: Isothermals for connection 9a*

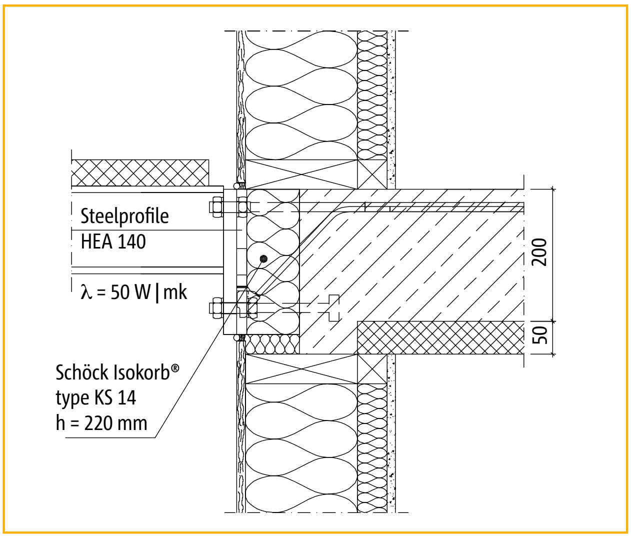


*Figure 10a: Connection of steel member HEA 140 with Schöck Isokorb® type KS14 and a composite thermal insulation system*

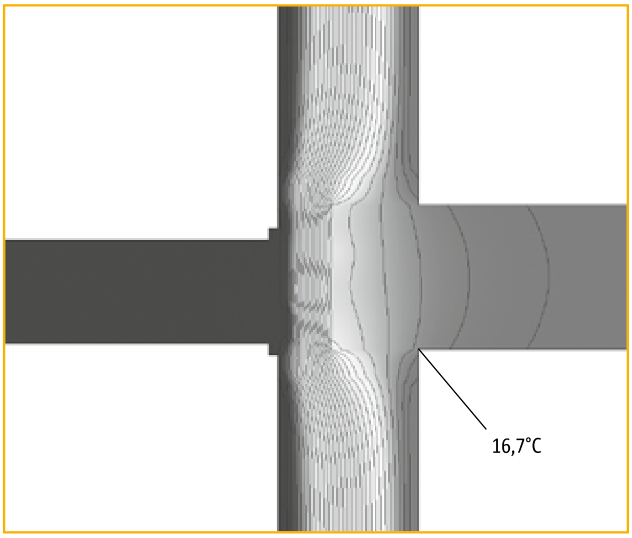


*Figure 10b: Isothermals for connection 10a*

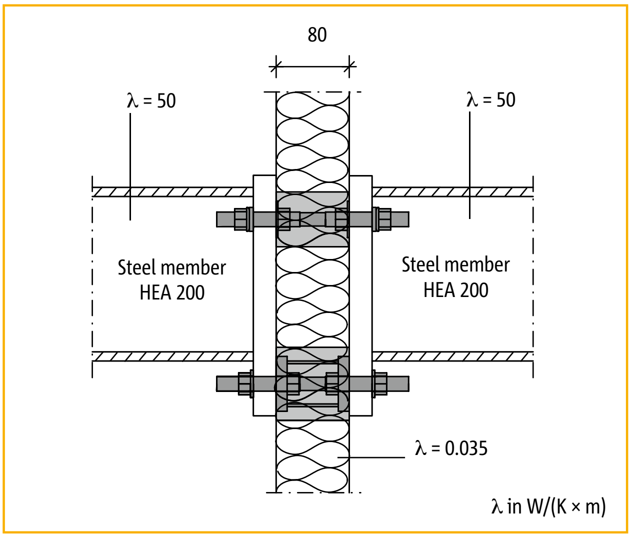


*Figure 11a: Connection of steel member HEA 200 with Schöck Isokorb® type KST16*

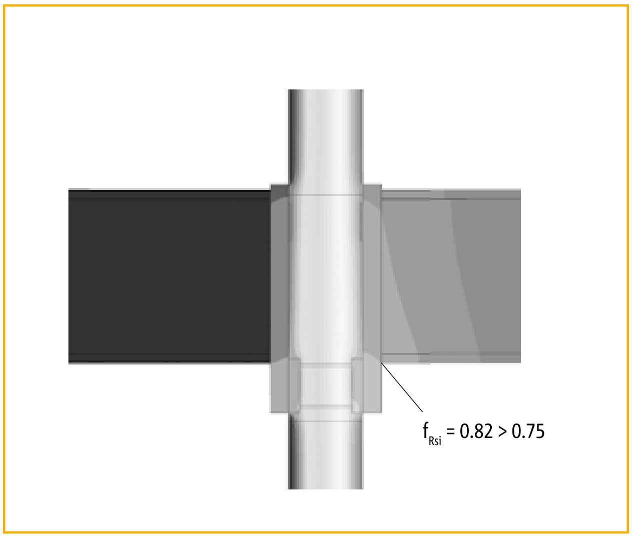


*Figure 11b: Isothermals for connection 11a*

# Building physics

## Equivalent thermal conductivity $\lambda_{eq}$

### $\lambda_{eq}$ (1-dim.) in W/(m × K) for Schöck Isokorb® types

| Schöck Isokorb® type[1] | Heigth of Isokorb H [mm] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 160 | | 170 | | 180 | | 190 | | 200 | |
| | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 |
| K10-CV35 | 0,078 | 0,099 | 0,076 | 0,095 | 0,073 | 0,092 | 0,071 | 0,089 | 0,070 | 0,086 |
| K20-CV35-V8 | 0,139 | 0,160 | 0,133 | 0,152 | 0,128 | 0,146 | 0,123 | 0,140 | 0,118 | 0,135 |
| K30-CV35 | 0,142 | 0,162 | 0,135 | 0,155 | 0,130 | 0,148 | 0,125 | 0,142 | 0,120 | 0,136 |
| K40-CV35 | 0,139 | 0,160 | 0,133 | 0,152 | 0,127 | 0,146 | 0,123 | 0,140 | 0,118 | 0,134 |
| K50-CV35 | 0,156 | 0,177 | 0,149 | 0,168 | 0,143 | 0,161 | 0,137 | 0,154 | 0,132 | 0,148 |
| K60-CV35-V8 | 0,189 | 0,209 | 0,180 | 0,199 | 0,172 | 0,190 | 0,164 | 0,181 | 0,158 | 0,174 |
| K70-CV35-V8 | 0,233 | 0,254 | 0,222 | 0,241 | 0,211 | 0,229 | 0,202 | 0,219 | 0,194 | 0,210 |
| K70-CV35-VV | 0,252 | 0,273 | 0,239 | 0,259 | 0,228 | 0,246 | 0,218 | 0,235 | 0,209 | 0,225 |
| K80-CV35-V8 | 0,245 | 0,265 | 0,232 | 0,251 | 0,221 | 0,239 | 0,211 | 0,229 | 0,202 | 0,219 |
| K90-CV35-V8 | 0,258 | 0,278 | 0,245 | 0,264 | 0,233 | 0,251 | 0,222 | 0,240 | 0,213 | 0,229 |
| K90-CV35-VV | 0,277 | 0,297 | 0,262 | 0,282 | 0,250 | 0,268 | 0,238 | 0,256 | 0,228 | 0,244 |
| K100-CV35-V10 | 0,267 | 0,288 | 0,254 | 0,273 | 0,241 | 0,259 | 0,230 | 0,248 | 0,221 | 0,237 |
| K100-CV35-VV | 0,253 | 0,274 | 0,240 | 0,259 | 0,229 | 0,247 | 0,219 | 0,236 | 0,209 | 0,226 |
| Q10 | 0,064 | - | 0,062 | 0,081 | 0,061 | 0,079 | 0,059 | 0,076 | 0,058 | 0,074 |
| Q40 | 0,094 | - | 0,090 | 0,110 | 0,087 | 0,105 | 0,084 | 0,102 | 0,082 | 0,098 |
| Q80 | 0,110 | - | 0,106 | 0,125 | 0,102 | 0,120 | 0,098 | 0,115 | 0,095 | 0,111 |
| Q100 | - | - | 0,126 | - | 0,121 | - | 0,116 | 0,133 | 0,112 | 0,128 |
| Q120 | - | - | - | - | 0,144 | - | 0,138 | 0,155 | 0,133 | 0,149 |
| QP10 | 0,114 | - | 0,110 | 0,143 | 0,105 | 0,138 | 0,102 | 0,133 | 0,098 | 0,129 |
| QP20 | - | - | 0,089 | - | 0,086 | - | 0,083 | 0,109 | 0,081 | 0,106 |
| QP30 | 0,154 | - | 0,147 | 0,177 | 0,141 | 0,170 | 0,135 | 0,163 | 0,130 | 0,157 |
| QP60 | - | - | - | - | 0,159 | - | 0,153 | 0,184 | 0,147 | 0,177 |
| QP70 | - | - | 0,172 | - | 0,165 | - | 0,158 | 0,186 | 0,152 | 0,179 |
| QP90 | - | - | - | - | 0,246 | - | 0,235 | 0,267 | 0,225 | 0,256 |
| Q10+Q10 | 0,074 | - | 0,072 | 0,091 | 0,070 | 0,088 | 0,068 | 0,085 | 0,066 | 0,083 |
| Q40+Q40 | 0,115 | - | 0,110 | 0,129 | 0,106 | 0,124 | 0,102 | 0,119 | 0,099 | 0,115 |
| Q80+Q80 | 0,148 | - | 0,141 | 0,160 | 0,135 | 0,153 | 0,130 | 0,147 | 0,125 | 0,141 |
| Q100+Q100 | - | - | 0,181 | - | 0,173 | - | 0,166 | 0,183 | 0,159 | 0,175 |
| Q120+Q120 | - | - | - | - | 0,219 | - | 0,209 | 0,226 | 0,200 | 0,217 |
| QP10+QP10 | 0,146 | - | 0,139 | 0,173 | 0,133 | 0,166 | 0,133 | 0,160 | 0,123 | 0,154 |
| QP20+QP20 | - | - | 0,117 | - | 0,112 | - | 0,108 | 0,134 | 0,105 | 0,129 |
| QP30+QP30 | 0,201 | - | 0,192 | 0,222 | 0,183 | 0,212 | 0,175 | 0,203 | 0,168 | 0,195 |
| QP60+QP60 | - | - | - | - | 0,222 | - | 0,212 | 0,244 | 0,203 | 0,234 |
| QP70+QP70 | - | - | 0,351 | - | 0,334 | - | 0,318 | 0,349 | 0,304 | 0,334 |
| QP90+QP90 | - | - | - | - | 0,372 | - | 0,354 | 0,386 | 0,338 | 0,369 |

[1] Same $\lambda_{eq}$ values for CV30 and CV50, min. H = 180mm for CV50

# Building physics

## Equivalent thermal conductivity $\lambda_{eq}$

### $\lambda_{eq}$ (1-dim.) in W/(m × K) for Schöck Isokorb® types

| Schöck Isokorb® type[1] | Heigth of Isokorb H [mm] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 210 | | 220 | | 230 | | 240 | | 250 | |
| | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 |
| K10-CV35 | 0,068 | 0,083 | 0,066 | 0,081 | 0,065 | 0,079 | 0,064 | 0,077 | 0,062 | 0,076 |
| K20-CV35-V8 | 0,114 | 0,130 | 0,111 | 0,125 | 0,107 | 0,121 | 0,104 | 0,118 | 0,101 | 0,114 |
| K30-CV35 | 0,116 | 0,132 | 0,112 | 0,127 | 0,109 | 0,123 | 0,106 | 0,119 | 0,103 | 0,116 |
| K40-CV35 | 0,114 | 0,130 | 0,110 | 0,125 | 0,107 | 0,121 | 0,104 | 0,118 | 0,101 | 0,114 |
| K50-CV35 | 0,127 | 0,143 | 0,123 | 0,138 | 0,119 | 0,133 | 0,115 | 0,129 | 0,112 | 0,125 |
| K60-CV35-V8 | 0,152 | 0,167 | 0,147 | 0,161 | 0,142 | 0,156 | 0,137 | 0,151 | 0,133 | 0,146 |
| K70-CV35-V8 | 0,186 | 0,202 | 0,179 | 0,194 | 0,173 | 0,187 | 0,167 | 0,181 | 0,162 | 0,175 |
| K70-CV35-VV | 0,200 | 0,216 | 0,193 | 0,208 | 0,186 | 0,200 | 0,179 | 0,193 | 0,174 | 0,187 |
| K80-CV35-V8 | 0,194 | 0,210 | 0,187 | 0,202 | 0,180 | 0,195 | 0,174 | 0,188 | 0,169 | 0,182 |
| K90-CV35-V8 | 0,205 | 0,220 | 0,197 | 0,212 | 0,190 | 0,204 | 0,183 | 0,197 | 0,177 | 0,190 |
| K90-CV35-VV | 0,219 | 0,234 | 0,210 | 0,225 | 0,203 | 0,217 | 0,196 | 0,209 | 0,189 | 0,202 |
| K100-CV35-V10 | 0,212 | 0,227 | 0,204 | 0,218 | 0,196 | 0,210 | 0,189 | 0,203 | 0,183 | 0,196 |
| K100-CV35-VV | 0,201 | 0,217 | 0,193 | 0,208 | 0,186 | 0,201 | 0,180 | 0,194 | 0,174 | 0,187 |
| Q10 | 0,057 | 0,072 | 0,056 | 0,071 | 0,055 | 0,069 | 0,054 | 0,068 | 0,053 | 0,066 |
| Q40 | 0,080 | 0,095 | 0,078 | 0,092 | 0,076 | 0,090 | 0,074 | 0,088 | 0,072 | 0,085 |
| Q80 | 0,092 | 0,108 | 0,089 | 0,104 | 0,087 | 0,101 | 0,085 | 0,098 | 0,083 | 0,096 |
| Q100 | 0,108 | 0,124 | 0,105 | 0,120 | 0,102 | 0,116 | 0,099 | 0,113 | 0,096 | 0,109 |
| Q120 | 0,128 | 0,144 | 0,124 | 0,139 | 0,120 | 0,134 | 0,116 | 0,130 | 0,113 | 0,126 |
| QP10 | 0,095 | 0,125 | 0,092 | 0,122 | 0,090 | 0,118 | 0,088 | 0,115 | 0,085 | 0,113 |
| QP20 | 0,079 | 0,103 | 0,077 | 0,100 | 0,075 | 0,098 | 0,073 | 0,095 | 0,072 | 0,093 |
| QP30 | 0,126 | 0,152 | 0,122 | 0,147 | 0,118 | 0,143 | 0,114 | 0,139 | 0,111 | 0,135 |
| QP60 | 0,141 | 0,171 | 0,137 | 0,166 | 0,132 | 0,161 | 0,128 | 0,156 | 0,124 | 0,152 |
| QP70 | 0,146 | 0,172 | 0,141 | 0,166 | 0,136 | 0,161 | 0,132 | 0,156 | 0,128 | 0,152 |
| QP90 | 0,216 | 0,246 | 0,208 | 0,237 | 0,200 | 0,229 | 0,193 | 0,221 | 0,187 | 0,214 |
| Q10+Q10 | 0,065 | 0,080 | 0,063 | 0,078 | 0,062 | 0,076 | 0,061 | 0,075 | 0,060 | 0,073 |
| Q40+Q40 | 0,096 | 0,111 | 0,093 | 0,108 | 0,090 | 0,105 | 0,088 | 0,102 | 0,086 | 0,099 |
| Q80+Q80 | 0,121 | 0,136 | 0,117 | 0,132 | 0,113 | 0,127 | 0,110 | 0,124 | 0,107 | 0,120 |
| Q100+Q100 | 0,153 | 0,169 | 0,148 | 0,162 | 0,143 | 0,157 | 0,138 | 0,152 | 0,134 | 0,147 |
| Q120+Q120 | 0,192 | 0,208 | 0,185 | 0,200 | 0,179 | 0,193 | 0,173 | 0,186 | 0,167 | 0,180 |
| QP10+QP10 | 0,119 | 0,149 | 0,115 | 0,144 | 0,112 | 0,140 | 0,108 | 0,136 | 0,105 | 0,133 |
| QP20+QP20 | 0,101 | 0,125 | 0,098 | 0,122 | 0,095 | 0,118 | 0,093 | 0,115 | 0,090 | 0,112 |
| QP30+QP30 | 0,162 | 0,188 | 0,156 | 0,181 | 0,151 | 0,175 | 0,146 | 0,170 | 0,141 | 0,214 |
| QP60+QP60 | 0,195 | 0,225 | 0,188 | 0,217 | 0,181 | 0,210 | 0,175 | 0,203 | 0,169 | 0,197 |
| QP70+QP70 | 0,304 | 0,321 | 0,279 | 0,308 | 0,268 | 0,297 | 0,259 | 0,287 | 0,250 | 0,277 |
| QP90+QP90 | 0,324 | 0,353 | 0,310 | 0,340 | 0,298 | 0,327 | 0,287 | 0,315 | 0,277 | 0,305 |

[1] Same $\lambda_{eq}$ values for CV30 and CV50, min. H = 180mm for CV50

# Building physics

## Equivalent thermal conductivity $\lambda_{eq}$

### $\lambda_{eq}$ (1-dim.) in W/(m × K) for Schöck Isokorb® types

| Schöck Isokorb® type | Heigth of Isokorb H [mm] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 160 | | 170 | | 180 | | 190 | | 200 | |
| | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 |
| **QZ10** | 0,045 | - | 0,044 | 0,063 | 0,043 | 0,062 | 0,043 | 0,062 | 0,042 | 0,059 |
| **QZ40** | 0,055 | - | 0,054 | 0,073 | 0,053 | 0,071 | 0,052 | 0,069 | 0,051 | 0,067 |
| **QZ80** | 0,072 | - | 0,069 | 0,089 | 0,067 | 0,086 | 0,066 | 0,083 | 0,064 | 0,080 |
| **QZ100** | - | - | 0,089 | - | 0,086 | - | 0,083 | 0,101 | 0,081 | 0,097 |
| **QZ120** | - | - | - | - | 0,109 | - | 0,105 | 0,122 | 0,102 | 0,118 |
| **QPZ10** | 0,065 | - | 0,064 | 0,097 | 0,062 | 0,094 | 0,060 | 0,092 | 0,059 | 0,090 |
| **QPZ20** | - | - | 0,062 | - | 0,060 | - | 0,059 | 0,085 | 0,058 | 0,082 |
| **QPZ30** | 0,081 | - | 0,078 | 0,108 | 0,076 | 0,105 | 0,074 | 0,102 | 0,072 | 0,099 |
| **QPZ60** | - | - | - | - | 0,097 | - | 0,093 | 0,125 | 0,090 | 0,121 |
| **QPZ70** | - | - | 0,103 | - | 0,099 | - | 0,096 | 0,124 | 0,093 | 0,120 |
| **QPZ90** | - | - | - | - | 0,159 | - | 0,153 | 0,184 | 0,147 | 0,177 |
| **D30-VV8** | 0,196 | 0,217 | 0,187 | 0,206 | 0,178 | 0,196 | 0,171 | 0,188 | 0,164 | 0,180 |
| **D50-VV8** | 0,239 | 0,259 | 0,226 | 0,246 | 0,216 | 0,234 | 0,206 | 0,223 | 0,198 | 0,214 |
| **D70-VV8** | 0,302 | 0,322 | 0,286 | 0,305 | 0,272 | 0,290 | 0,260 | 0,277 | 0,248 | 0,265 |
| **D90-VV8** | 0,344 | 0,365 | 0,326 | 0,345 | 0,310 | 0,328 | 0,295 | 0,313 | 0,282 | 0,299 |
| **O** | - | - | - | - | 0,145 | 0,176 | 0,139 | 0,169 | 0,134 | 0,163 |
| **F** | 0,094 | 0,127 | 0,091 | 0,122 | 0,088 | 0,118 | 0,085 | 0,114 | 0,082 | 0,111 |
| **A** | 0,145 | 0,178 | 0,138 | 0,170 | 0,133 | 0,163 | 0,127 | 0,157 | 0,123 | 0,151 |
| **W1 (H=1500mm)** | 0,083 | 0,103 | 0,080 | 0,099 | 0,078 | 0,096 | 0,078 | 0,096 | 0,073 | 0,090 |
| **W2 (H=1500mm)** | 0,102 | 0,122 | 0,098 | 0,117 | 0,094 | 0,112 | 0,091 | 0,108 | 0,088 | 0,105 |
| **W3 (H=1500mm)** | 0,132 | 0,153 | 0,127 | 0,146 | 0,121 | 0,140 | 0,117 | 0,134 | 0,113 | 0,129 |
| **W4 (H=1500mm)** | 0,169 | 0,190 | 0,161 | 0,180 | 0,154 | 0,172 | 0,148 | 0,165 | 0,142 | 0,158 |

| Schöck Isokorb® type | Elementbreedte B [mm] | | | | | |
|---|---|---|---|---|---|---|
| | 180 | | 220 | | 280 | |
| | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 |
| **S 20/2 (H= 400mm)** | 0,222 | 0,251 | - | - | - | - |
| **S 20/3 (H= 400mm)** | - | - | 0,284 | 0,310 | - | - |
| **S 20/4 (H= 400mm)** | - | - | - | - | 0,298 | 0,320 |

# Building physics

## Equivalent thermal conductivity $\lambda_{eq}$

### $\lambda_{eq}$ (1-dim.) in W/(m × K) for Schöck Isokorb® types

| Schöck Isokorb® type | Heigth of Isokorb H [mm] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 210 | | 220 | | 230 | | 240 | | 250 | |
| | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 | F 0 | F 120 |
| QZ10 | 0,042 | 0,058 | 0,042 | 0,057 | 0,041 | 0,056 | 0,041 | 0,055 | 0,041 | 0,054 |
| QZ40 | 0,050 | 0,066 | 0,049 | 0,064 | 0,049 | 0,063 | 0,048 | 0,062 | 0,048 | 0,061 |
| QZ80 | 0,063 | 0,078 | 0,061 | 0,076 | 0,060 | 0,074 | 0,059 | 0,073 | 0,058 | 0,071 |
| QZ100 | 0,079 | 0,094 | 0,077 | 0,092 | 0,075 | 0,089 | 0,073 | 0,087 | 0,072 | 0,085 |
| QZ120 | 0,098 | 0,114 | 0,096 | 0,110 | 0,093 | 0,107 | 0,090 | 0,104 | 0,088 | 0,101 |
| QPZ10 | 0,058 | 0,088 | 0,057 | 0,086 | 0,056 | 0,084 | 0,055 | 0,083 | 0,054 | 0,081 |
| QPZ20 | 0,056 | 0,081 | 0,055 | 0,079 | 0,054 | 0,077 | 0,054 | 0,076 | 0,053 | 0,074 |
| QPZ30 | 0,070 | 0,096 | 0,068 | 0,094 | 0,067 | 0,092 | 0,065 | 0,090 | 0,064 | 0,088 |
| QPZ60 | 0,088 | 0,118 | 0,085 | 0,114 | 0,083 | 0,112 | 0,081 | 0,109 | 0,079 | 0,107 |
| QPZ70 | 0,090 | 0,116 | 0,087 | 0,113 | 0,085 | 0,110 | 0,083 | 0,107 | 0,081 | 0,105 |
| QPZ90 | 0,141 | 0,171 | 0,137 | 0,166 | 0,132 | 0,161 | 0,128 | 0,156 | 0,124 | 0,152 |
| D30-VV8 | 0,158 | 0,173 | 0,152 | 0,167 | 0,147 | 0,161 | 0,142 | 0,156 | 0,138 | 0,151 |
| D50-VV8 | 0,190 | 0,205 | 0,183 | 0,198 | 0,176 | 0,190 | 0,170 | 0,184 | 0,165 | 0,178 |
| D70-VV8 | 0,238 | 0,254 | 0,229 | 0,244 | 0,220 | 0,235 | 0,213 | 0,226 | 0,206 | 0,219 |
| D90-VV8 | 0,270 | 0,286 | 0,260 | 0,275 | 0,250 | 0,264 | 0,241 | 0,255 | 0,233 | 0,246 |
| O | 0,129 | 0,157 | 0,125 | 0,152 | 0,250 | 0,264 | 0,117 | 0,143 | 0,233 | 0,246 |
| F | 0,080 | 0,108 | 0,078 | 0,105 | 0,076 | 0,103 | 0,074 | 0,100 | 0,073 | 0,098 |
| A | 0,118 | 0,146 | 0,115 | 0,142 | 0,111 | 0,138 | 0,108 | 0,134 | 0,105 | 0,130 |
| W1 (H=1500mm) | 0,071 | 0,087 | 0,070 | 0,084 | 0,068 | 0,082 | 0,067 | 0,080 | 0,065 | 0,070 |
| W2 (H=1500mm) | 0,086 | 0,101 | 0,083 | 0,098 | 0,081 | 0,095 | 0,079 | 0,093 | 0,077 | 0,086 |
| W3 (H=1500mm) | 0,109 | 0,125 | 0,106 | 0,120 | 0,102 | 0,117 | 0,100 | 0,113 | 0,097 | 0,106 |
| W4 (H=1500mm) | 0,137 | 0,153 | 0,132 | 0,147 | 0,128 | 0,142 | 0,124 | 0,138 | 0,121 | 0,129 |

**Schöck Isokorb® type D**

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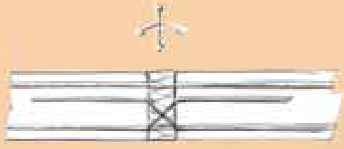
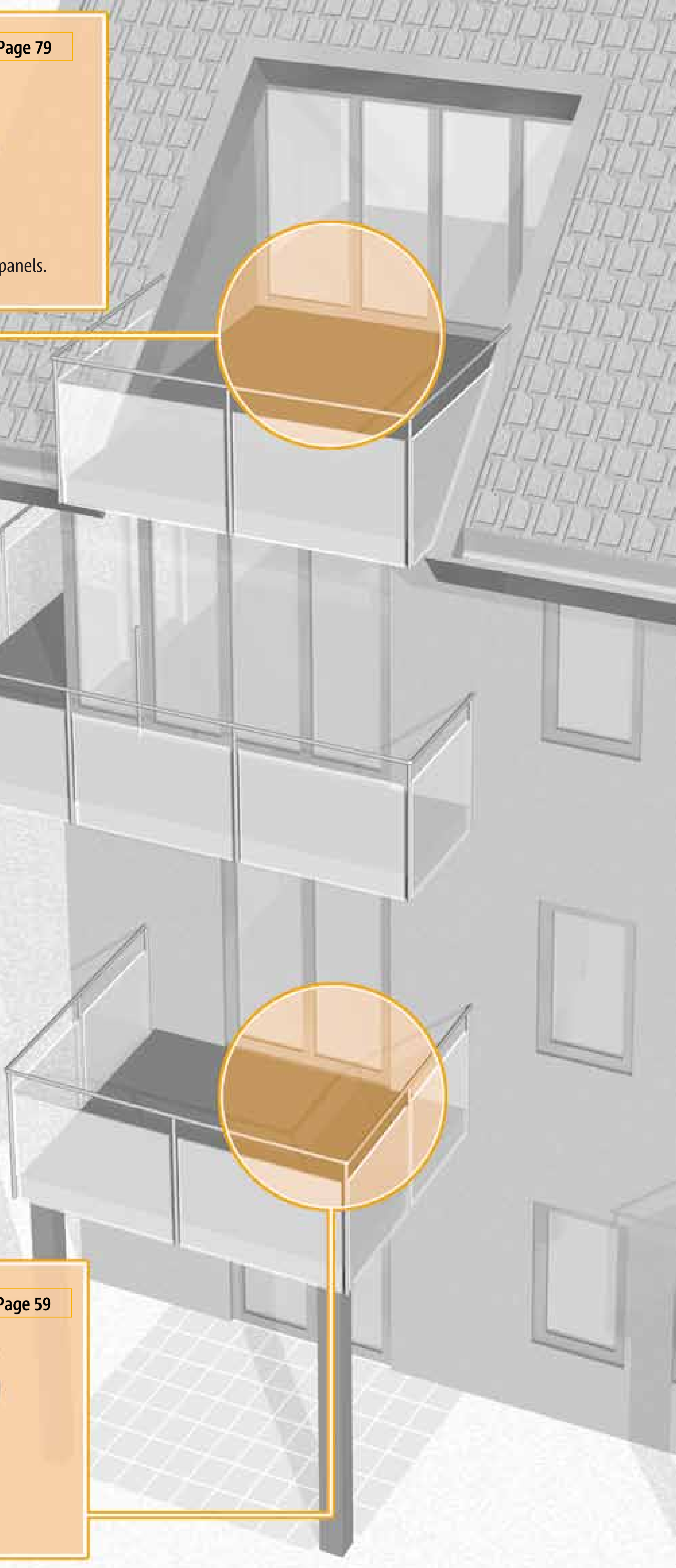
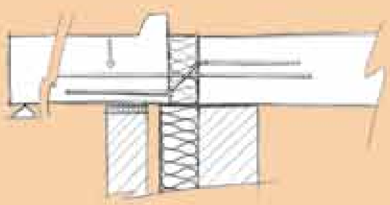


For balcony slabs which extend into ceiling panels.

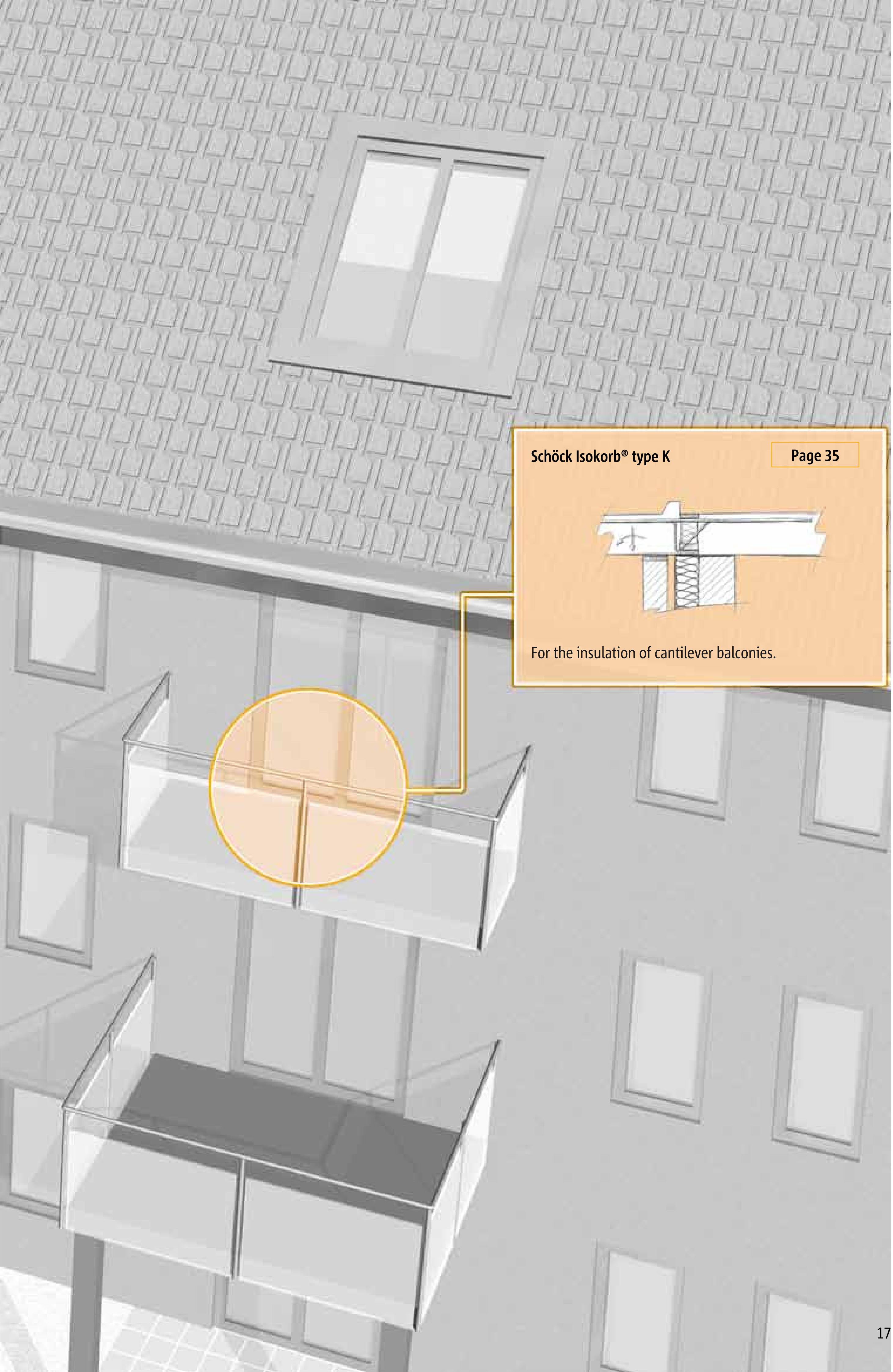


**Schöck Isokorb® type Q**

Page 59



For the connection of supported balconies.



**Schöck Isokorb® type K**

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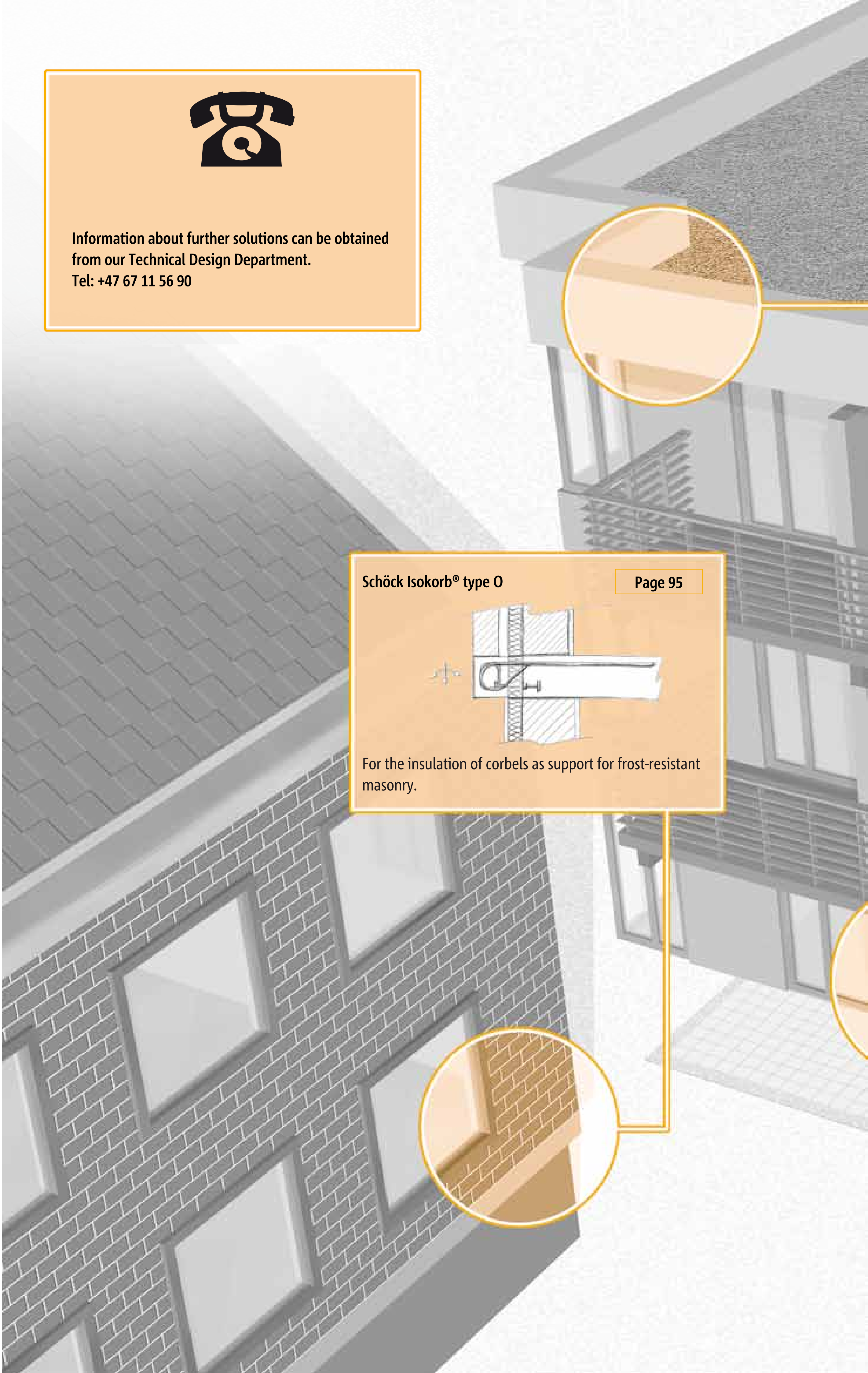
For the insulation of cantilever balconies.



Information about further solutions can be obtained from our Technical Design Department.
Tel: +47 67 11 56 90

**Schöck Isokorb® type O**

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For the insulation of corbels as support for frost-resistant masonry.

**Schöck Isokorb® type A**

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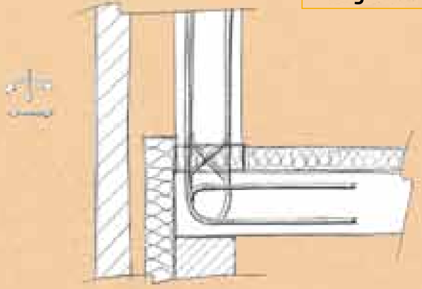
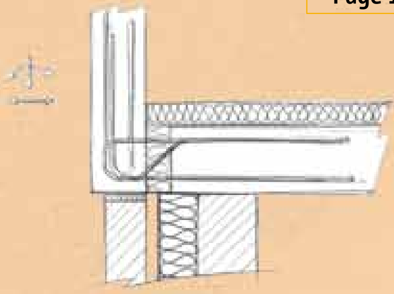


For insulation between RC upstand and slab.

**Schöck Isokorb® type F**

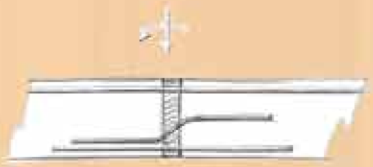
Page 101



For insulation between RC upstand balustrade and face of slab.

**Schöck Isokorb® type S**

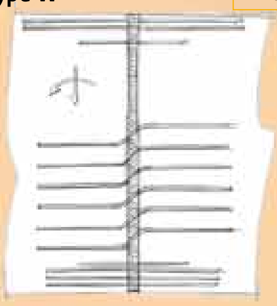
Page 113



For the insulation of cantilever beams.

**Schöck Isokorb® type W**

Page 121



For the insulation of fin walls.

# Schöck Isokorb®

## Constructional thermal breaks

### The original Schöck Isokorb®

In 1979 during his holiday, Eberhard Schöck, the founder of the company, encountered the phenomenon „thermal bridges in building constructions“. These thermal bridges, which manifested themselves as mould forming in the corner of the inner walls with the ceiling of his hotel room, were apparently caused by the traditionally concrete connection between the balcony and the floor. Being someone who was always in search of improvements in building methods he was unable to free himself of this serious constructional physics problem. It finally culminated in a development program of 4 years and the introduction of the Schöck Isokorb® thermal break system in 1983.

### The principle

The Schöck Isokorb® system is a ready made junction solution for structural connections, which combines extremely good thermal properties with very high absorption forces. The most important properties for the choice of materials are resistance to thermal conductivity, durability and strength. For force transfer the system is based on the so-called “parallel to structural frame“ which can also be used for the working details of the reinforcement in junctions in concrete construction. (see Figure 12).

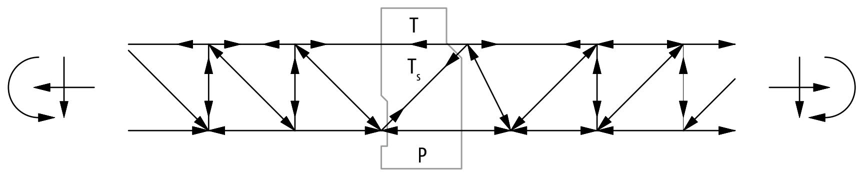


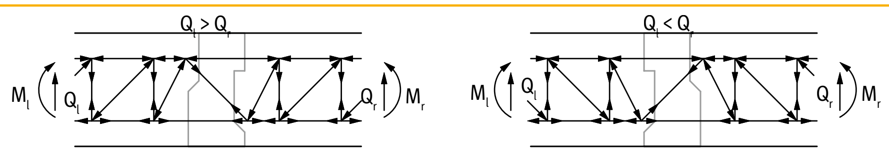

*Figure 12: Lattice structure for Schöck Isokorb® type K*

### Parallel to structural frame

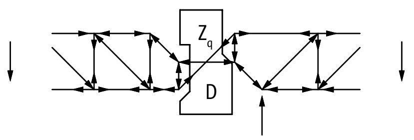
Diagrams based on the lattice structure can be used for making detailed plans of junctions in concrete constructions. The lattice structure is based on:

- Tensile reinforcement which acts as the tie bar in the model based on structural frame.
- The pressure zone of concrete as pressure bar of the structural frame.
- The pressure diagonals that are formed in the concrete as diagonal pressure bars.
- The vertical reinforcement or bent up bars that form the vertical tie of the structural frame..

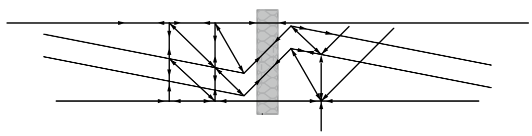
The force transfer of the Schöck Isokorb® system is based on the same principle and corresponds well with the junction solutions in concrete constructions. The tie bar in the Schöck Isokorb® elements is provided by the tensile reinforcement, the pressure component by compression elements or compression bars and the shear forces by the inclined reinforcement of the system. The advantage is a minimal thermal transmission and a clear force transfer. The drawings below illustrate the lattice structure of the Schöck Isokorb® types D, Q and S.




*Lattice structure for Schöck Isokorb® type D*




*Lattice structure for Schöck Isokorb® type Q*



*Lattice structure for Schöck Isokorb® type S*

# Schöck Isokorb®
Constructional thermal breaks

## Application area

The Schöck Isokorb® elements for concrete-to-concrete connections are load-bearing connection elements. The elements are positioned between two concrete construction components without forming a thermal bridge. The system transfers shear forces or a combination of shear forces and bending moments. Depending on the type, the Isokorb® elements have a standard insulation thickness of 60, 80 or 120 mm.

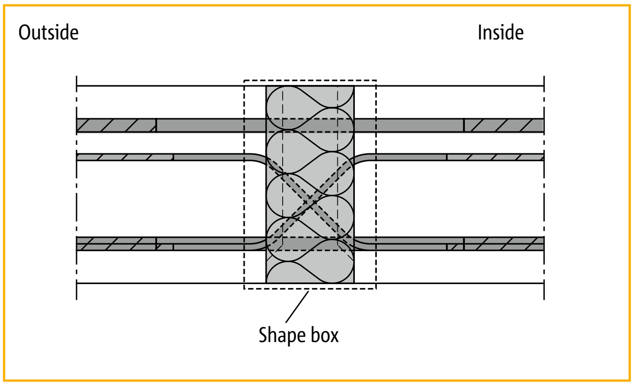
The strength (resistance) in the Isokorb® elements' ultimate limit state is determined by (concrete) strength class C20/25 or higher and, at most, environmental classes XC4, XD3 and XF4 in accordance with EN 206-1.

## Alternative load path

In order to guarantee load-bearing resistance of a Schöck Isokorb® anchor, as explained in EN 1990 2.1 (5), there must be evidence of a sufficient second load path by providing an alternative method for bearing the loads. For this reason, at least 2 bars or pairs of bars are always included in the Schöck Isokorb® elements to ensure transfer of the forces for which the element is used.

## Customized solutions

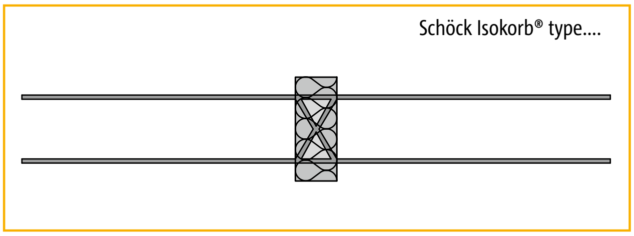
In addition to standard elements, custom solutions are also developed. These special solutions are bound by the condition that the Isokorb® centre may not be modified inside the shape box. Only the manufacturer may supply bent bars outside of the shape box, if the requirements of the EN 1992 are fulfilled, and if the delivery is based on a drawing approved by the responsible structural engineer.



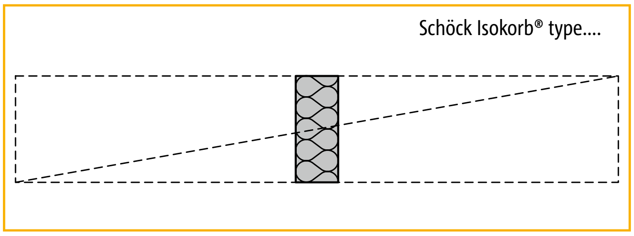
*Heart of the Schöck Isokorb® inside the shape box*

## Symbols on drawings

The following symbols may be used for Schöck Isokorb® elements on structural drawings:
Section view: Scale 1 : 20
Plan view: Scale 1 : 50 and 1 : 100



*Symbol for Schöck Isokorb® section drawing 1:20*



*Symbol for Schöck Isokorb® plan view drawing 1 : 50 and 1 : 100*

**For Isokorb® CAD-drawings see www.schoeck.no**

Reinforced concrete-to-reinforced concrete

# Schöck Isokorb®

Requirements



## Loads and combinations according to NS-EN 1991/1992

### Permanent load

The permanent load is caused by the self-weight of the components of the structure or by other components that are part of the building. The range of permanent loading varies therefore marginally, since the shape of the building is well known.

### Live load

The live load is the load that is not always present and depends on usage. Normally, the values for the distributed loads stated in the table are not exceeded for the given function. The psi-factor ($\psi_2$), indicates the portion of the load which is present at a certain point in time.

| Function | Expected floor loading | |
|---|---|---|
| | kN/m² | $\psi_2$ |
| Balcony | 4,0 | 0,30 |
| Roof/Canopy (not accessible) | 1,0 | 0,00 |

### Load combinations

Load combinations must be used to check the resistance at the ultimate limit state and the serviceability at the service ability limit state. For the assessment of individual elements the most unfavourable combination must be examined.

### Permanent load

Strength design: In combination with live load a safety factor for the load of 1.2 must be used, unless the load has a favourable effect, in which case the safety factor must be 1.0.
Serviceability limit state design: to check the serviceability for i.e. the deformation, a load factor of 1.0 must be used.

### Live load

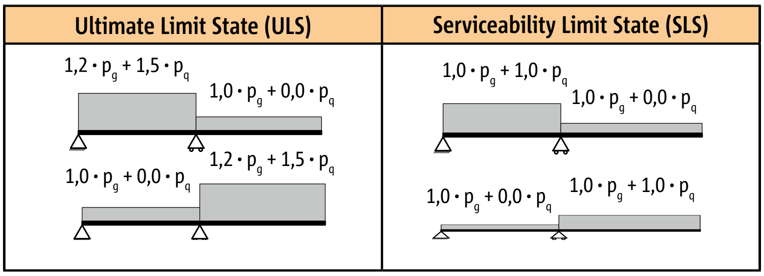
Strength design: In combination with permanent load, a safety factor of 1.5 must be used. If the load has a favourable effect, a factor 0 must be used for the design.
Serviceability limit state design: to check the serviceability for i.e. the deformation, a load factor of 1.0 must be used. If the load has a favourable effect, a factor of 0 must be used for the calculations.

### Accidental cases

In the event of an exceptional, accidental load according to NS-EN 1990 6.4.3.3, all frequent loads ($\psi_1$ x load) must be calculated using a load factor of 1.0. If a component of the structure cannot withstand this load (e.g. an impact load on a column), then no more than one floor section is allowed to collapse. For multiple floors the remaining structure must not collapse with a load factor of 1.0. Schöck will gladly provide advice on applicable material factors.

### Loaded/Unloaded situations

At locations where loads can have a favourable effect, the structure must be checked for both the fully-loaded as well as the partially loaded, unfavourable design situation.



# Schöck Isokorb®
## Requirements

### (Concrete) strength class

The minimum concrete grade for two structural elements that will be connected by a Schöck Isokorb® must be C20/25 in accordance with EN 1992.
With special situations, or with customised solutions, or when structural calculation software for the calculations of structural parts is used, situations can arise when other (concrete) strength classes are used for the calculation (e.g. with the calculation of the minimum required anchorage length in precast concrete with a concrete grade C35/45).

Table: Materialproperties concrete

| Strength classes | $f_{ck}$ [N/mm²] | $f_{cd}$ [N/mm²] | $f_{ctd}$ [N/mm²] | $E_{cm}$ [N/mm²] | $E_{c,eff}$ [N/mm²] |
|---|---|---|---|---|---|
| C20/25 | 20 | 11,3 | 0,9 | 29962 | 8600 |
| C25/30 | 25 | 14,2 | 1,0 | 31476 | 10200 |
| C30/37 | 30 | 17,0 | 1,1 | 32837 | 11300 |
| C35/45 | 35 | 19,8 | 1,3 | 34077 | 12600 |
| C45/55 | 45 | 25,5 | 1,5 | 36283 | 15100 |
| C55/67 | 55 | 31,2 | 1,7 | 38214 | 17400 |

### Concrete cover

The concrete cover for corrosion susceptible parts of Schöck Isokorb® types is at least 35 mm. This cover satisfies the application in concrete structures like: balconies, walkways, canopies, walls, corbels, curbs etc. in an environmental class no higher than XC4 and XF4. For higher demands also elements with a cover of 50 mm are available.
For the Schöck Isokorb® type S, especially for corbels and balconies, a minimum concrete cover of 35 or 50 mm is applied, depending on the environmental class and the diameter of the link reinforcement.
Type S and type W are usually supplied as customised solutions.

Table: Concrete cover on the reinforcement in accordance with NS-EN 1992.

| Environmental requirement for $c_{nom}$ ( $c_{min}+\Delta c_{dev}$) | | |
|---|---|---|
| Environmental classes | Proof class | $c_{nom}$ |
| XC1 | M60 | 25 |
| XC2/XC3/XC4 | M60 | 35 |
| XD1/XS1 | M45 | 50 |
| XD2/XD3/XS2 | M40 | 50 |
| XS3 | M40 | 60 |

- Reference period 100 years instead of 50 years: cv + 10mm
- Special Quality Control of the concrete production ensured: cv - 5mm

# Schöck Isokorb®
## Requirements

### Lap and anchorage lengths according to NS-EN 1992-1-1: 8.4 (B500)

The reinforcement bars in the Schöck Isokorb® elements satisfy the anchorage lengths set in NS-EN 1992. The reinforcing bars have been applied with a poor bond condition with a minimal (concrete) strength as indicated in capacity-tables and a minimal allowable concrete cover in accordance with NS-EN 1992-1-1: 4.4.1.

Anchorage lengths $l_{bd}$ can be adapted for special situations and customized solutions. In such cases all calculations must be reconfirmed.

### Design anchorage length $l_{bd}$ acc. NS-EN 1992-1-1: 8.4.4 (for $\sigma_{sd} = f_{yd}$)

| $ø_k$ | C20/25 | | | | | good bond conditions * |
|---|---|---|---|---|---|---|
| | cv=15 | cv=20 | cv=25 | cv=30 | cv=40 | cv=50 |
| 6 | 220 | 200 | 200 | 200 | 200 | 200 |
| 8 | 330 | 290 | 270 | 270 | 270 | 270 |
| 10 | 440 | 400 | 370 | 330 | 330 | 330 |
| 12 | 550 | 510 | 480 | 440 | 400 | 400 |
| 14 | 650 | 620 | 580 | 550 | 480 | 460 |
| 16 | – | 730 | 690 | 660 | 590 | 530 |
| 20 | – | 630 | 910 | 890 | 800 | 730 |
| 25 | – | – | 1180 | 1140 | 1070 | 1000 |

| $ø_k$ | C20/25 | | | | | poor bond conditions * |
|---|---|---|---|---|---|---|
| | cv=15 | cv=20 | cv=25 | cv=30 | cv=40 | cv=50 |
| 6 | 320 | 290 | 290 | 290 | 290 | 290 |
| 8 | 470 | 420 | 380 | 380 | 380 | 380 |
| 10 | 620 | 570 | 520 | 470 | 470 | 470 |
| 12 | 780 | 730 | 680 | 630 | 570 | 570 |
| 14 | 930 | 880 | 830 | 780 | 680 | 660 |
| 16 | – | 1030 | 980 | 930 | 830 | 750 |
| 20 | – | 1340 | 1290 | 1240 | 1140 | 1040 |
| 25 | – | – | 1680 | 1630 | 1530 | 1430 |

| $ø_k$ | C25/30 | | | | | good bond conditions * |
|---|---|---|---|---|---|---|
| | cv=15 | cv=20 | cv=25 | cv=30 | cv=40 | cv=50 |
| 6 | 190 | 170 | 170 | 170 | 170 | 170 |
| 8 | 280 | 250 | 230 | 230 | 230 | 230 |
| 10 | 380 | 350 | 320 | 290 | 290 | 290 |
| 12 | 470 | 440 | 410 | 380 | 340 | 340 |
| 14 | 560 | 530 | 500 | 470 | 410 | 400 |
| 16 | – | 630 | 600 | 570 | 500 | 460 |
| 20 | – | 810 | 780 | 750 | 680 | 630 |
| 25 | – | – | 1010 | 980 | 920 | 860 |

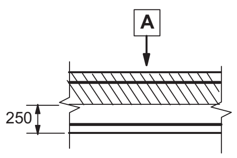
| $ø_k$ | C25/30 | | | | | poor bond conditions * |
|---|---|---|---|---|---|---|
| | cv=15 | cv=20 | cv=25 | cv=30 | cv=40 | cv=50 |
| 6 | 270 | 250 | 250 | 250 | 250 | 250 |
| 8 | 410 | 360 | 330 | 330 | 330 | 330 |
| 10 | 540 | 490 | 450 | 410 | 410 | 410 |
| 12 | 670 | 630 | 580 | 540 | 490 | 490 |
| 14 | 800 | 760 | 720 | 670 | 590 | 570 |
| 16 | – | 890 | 850 | 810 | 720 | 650 |
| 20 | – | 1160 | 1110 | 1070 | 980 | 890 |
| 25 | – | – | 1450 | 1400 | 1320 | 1230 |

| $ø_k$ | C30/37 | | | | | good bond conditions * |
|---|---|---|---|---|---|---|
| | cv=15 | cv=20 | cv=25 | cv=30 | cv=40 | cv=50 |
| 6 | 170 | 150 | 150 | 150 | 150 | 150 |
| 8 | 250 | 230 | 200 | 200 | 200 | 200 |
| 10 | 340 | 310 | 280 | 250 | 250 | 250 |
| 12 | 420 | 390 | 360 | 340 | 300 | 300 |
| 14 | 500 | 470 | 450 | 420 | 370 | 350 |
| 16 | – | 550 | 530 | 500 | 450 | 400 |
| 20 | – | 720 | 690 | 670 | 610 | 560 |
| 25 | – | – | 900 | 870 | 820 | 760 |

| $ø_k$ | C30/37 | | | | | poor bond conditions * |
|---|---|---|---|---|---|---|
| | cv=15 | cv=20 | cv=25 | cv=30 | cv=40 | cv=50 |
| 6 | 240 | 220 | 220 | 220 | 220 | 220 |
| 8 | 360 | 320 | 290 | 290 | 290 | 290 |
| 10 | 480 | 440 | 400 | 360 | 360 | 360 |
| 12 | 590 | 560 | 520 | 480 | 430 | 430 |
| 14 | 710 | 670 | 640 | 600 | 520 | 500 |
| 16 | – | 790 | 750 | 710 | 640 | 580 |
| 20 | – | 1030 | 990 | 950 | 870 | 800 |
| 25 | – | – | 1280 | 1240 | 1170 | 1090 |

Reduced $l_{bd}$ in case $\sigma_{sd} < f_{yd}$: $l_{b,min} = (\sigma_{sd} / f_{yd}) \cdot l_{bd}$
but not less then the max of: $0{,}3 \cdot l_{bd}$ or $10 \cdot ø$ or 100mm
Overlap Isokorb® bars - floor reinforcement: (>50%)
EN 1992-1-1:8.7.3: $l_o = \alpha_6 \times l_{bd}$ where $\alpha_6 = 1{,}5$

In case of bundled bars $l_{bd}$ and $l_o$ acc. NS-EN 1992-1-1: 8.9




*according to EN 1992: Figure 8.3.

Hatched = poor bond conditions
Unhatched = poor bond conditions

A: direction of concreting
Note: prefabricated concrete might be concreted upside down!

# Schöck Isokorb®

## Fire protection

The types K, Q and Q+Q of Schöck Isokorb® concrete-concrete, can be delivered in F120. The other types of Schöck Isokorb® concrete-concrete can be delivered in F90.

### Fire resistance class F30

The demands of fire resistance class F30 is fulfilled with the standard Schöck Isokorb® element (no fire protecting plates are necessary). In this case the Schöck Isokorb® is used inside the wall. Other demands are shown in the examples below.

### Fire resistance class F120 or F90

When there are certain demands regarding the fire resistance class for balconies, Schöck Isokorb® can be delivered with F120/F90-protection (i.e. Schöck Isokorb® type K50-CV35-H180-F120). For the elements with a length of 1m, fire protecting plates are attached to the top and bottom of the Schöck Isokorb® (see Figure 1) and on the intermittent elements plates are also attached to the ends of the element (i.e. type QP and W). To reach the F120/F90-classification it is also necessary that the balcony and the framework fulfill the demands of fire resistance class F120/F90.

The fire protecting plates and the fire protecting ribbons guarantee that the joints which arise during a fire are kept effectively shut so no hot gases can reach the reinforcement in Schöck Isokorb® (see Figures 3 and 4). Only when all the above described demands are fulfilled the fire protection of F120/F90 can be guaranteed without any further fire protecting measures.



### Types with equally integrated fire protection joints:

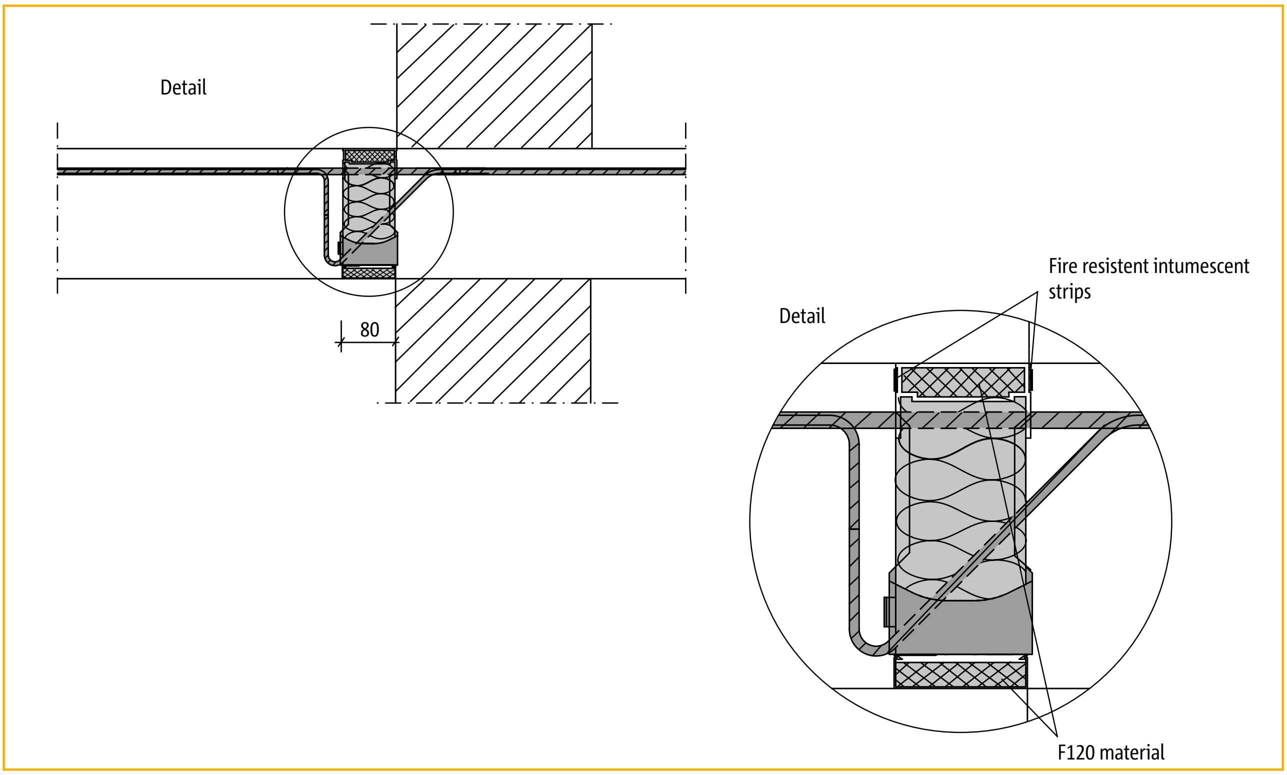



*Figure 1: Schöck Isokorb® type K50-C35-H180-F120*

# Schöck Isokorb®
## Fire protection

### Types with overlapping fire protection plates

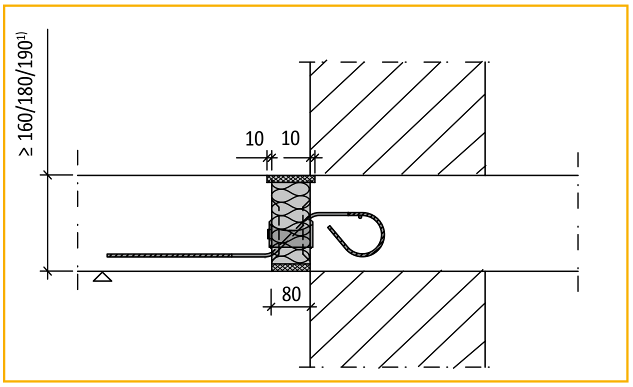



*Figure 2: I.e: Schöck Isokorb® type Q10-H180-F90*

### Directions for intermittent use

- Building parts that connect to the Schöck Isokorb® may not be attached to the lower fire protection plate with bolts, screws or similar.
- If Schöck Isokorb® is assembled intermittent with F120/F90-protection in walls (i.e. type W) or framework (i.e. type K), the isolation provided by the customer has to be made of mineral fiber with a melting point > 1000 °C (i.e. Rockwool).
- If the intermittent assembled elements have demands on fire resisting class the isolation bodies of the Schöck Isokorb® elements have to be covered in fire protecting plates on all sides. The thickness of the boards should be at least t=15mm. The intermittent elements QP, QP+QP and W are covered in F120/F90-protection already in the production. If the customer uses cut 1m elements (i.e. K or Q) for intermittent assembling, the cut ends should be covered in 15mm fire protecting plates by the customer. These plates have to stick even longer than 90 minutes during flame exposure.

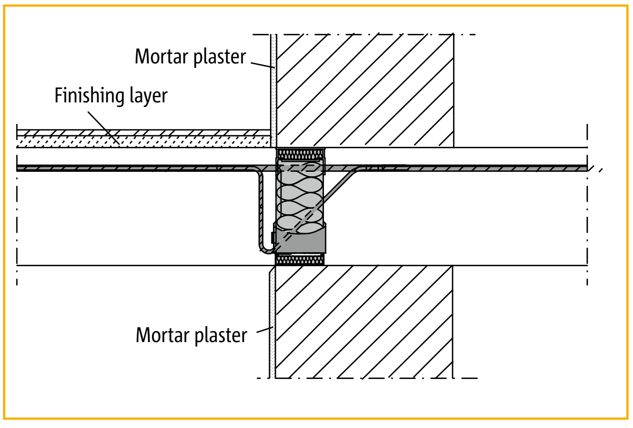



*Figure 3: I.e.: Schöck Isokorb® type K10-H180-F90*

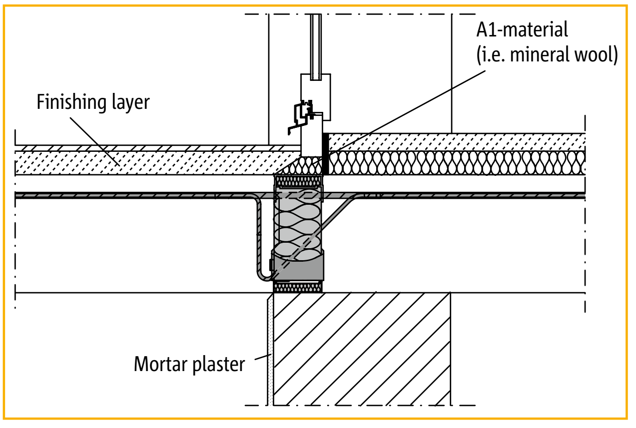


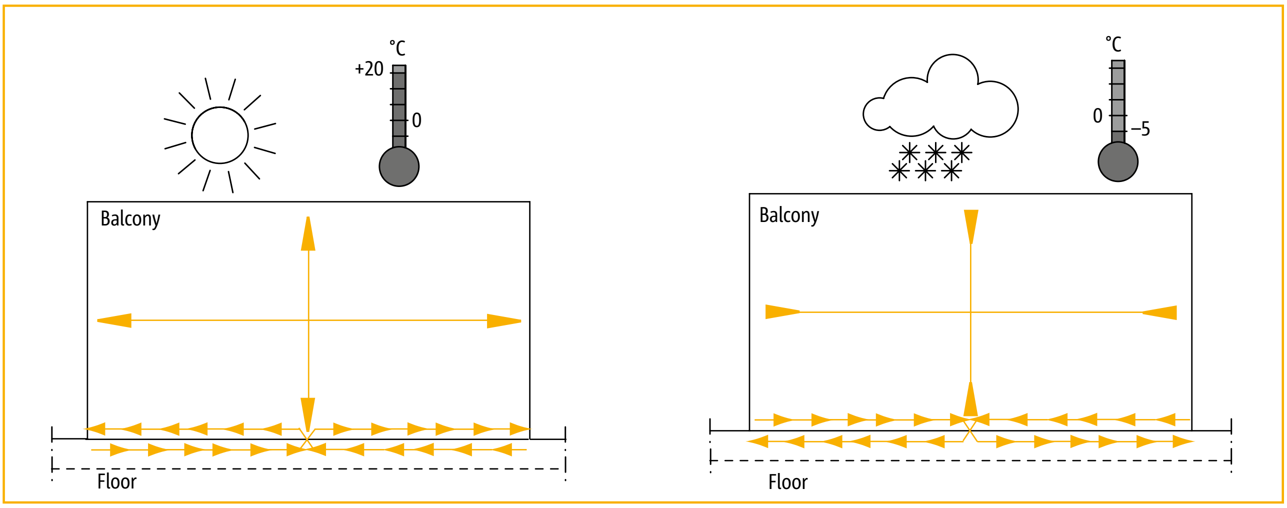

*Figure 4: I.e.: Schöck Isokorb® type K10-H180-F90*

[1] Min. H for F90 acc. to pages 61 and 65 depending on the selected load range

# Schöck Isokorb®
## Resistance to fatigue

### Influences of temperature fluctuations

If a construction is under influence of a constantly changing load, besides the stability of the construction also the resistance to fatigue is to be shown. The security or safety concerning fatigue is provided by using the appropriate materials which are tested for fatiguing over the planned reference period.
Outside construction elements as balconies, galleries and canopies are influenced by different and varying weather conditions. This comes with changes in temperature which cause considerable deformations and changes in length.



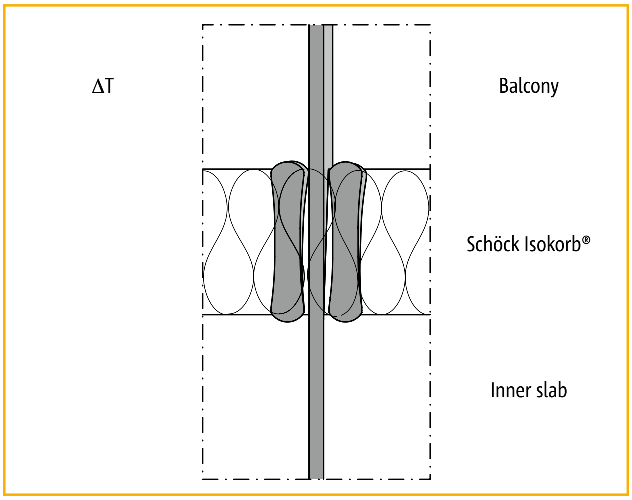
*Floor plan: Thermal deformations cause constraints in the connection area resulting in stresses.*

To guarantee the structural durability and system reliability for constructions with heat-insulating load-bearing elements incorporated, full-scale tests has to be performed. That is the only way to get 100% certainty for the construction parts over the planned reference period regarding fatigue due to thermal deformations.

The effect on a connection with Schöck Isokorb® in this matter is: The expansion and shrinkage of balcony elements will lead to transversal deflection of the rods and compression elements to max several millimeters. To be sure that the bars, compression elements and surrounding concrete will withstand the thousands of temperature changes, the prescribed maximum distance between the Isokorb®elements may not be exceeded. By following the design rules for expansion joints, the safety concerning fatigue is secured.

### Influences of temperature fluctuations

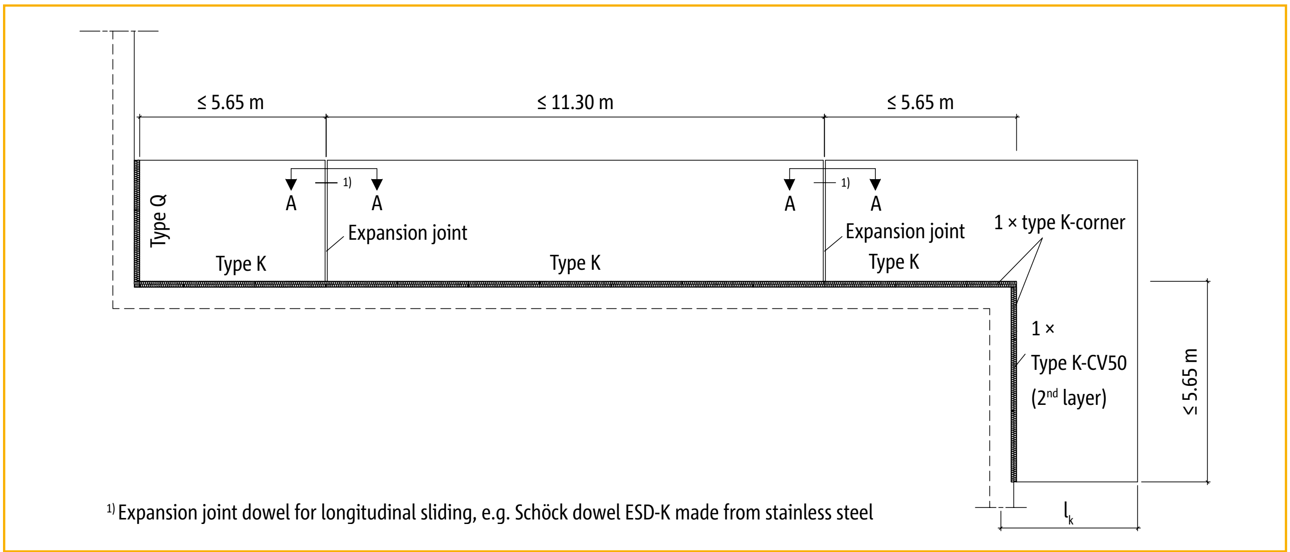
Using Isokorb® elements in compliance with the maximum indicated expansion joint distance will result in a connection which is durable and reliable in respect towards fatigue.




*Deflection due to temperature difference*

The maximum allowed expansion joint distance is depending on the thickness of the used bar diameter and is listed in Table 3 below.

Below an example is shown of a fatigue-resistant design of a balcony in compliance with the maximum indicated expansion joint distance using Isokorb® type K-elements.




[1] Expansion joint dowel for longitudinal sliding, e.g. Schöck dowel ESD-K made from stainless steel

*Expansion joint spacing*

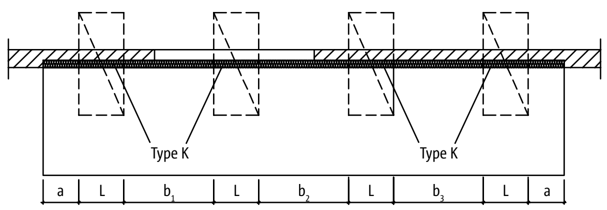
| Thickness of the insulation joint [mm] | Bar diameter [mm] | | | |
|---|---|---|---|---|
| | ≤ 12 | 14 | 16 | 20 |
| **$\geq$ 80** | 11.3 m | 10.1 m | 9.2 m | 8.0 m |

*Table 3: Maximal rebar distance*

# Schöck Isokorb®

## Construction- and calculation rules for intermittently use of Schöck Isokorb®

The intermittently use of Isokorb® makes it possible to connect the balconies with regular distance.
The used types are K (free cantilever) and Q (supported balconies).




L = Isokorb® length = 0,25m/0,5m/1,0m
a = edge distance ≤ 0,4m
b = free distance between Isokorb® elements ≤ 1m

### Situation 1: Simplified determination of force resultants with symmetrical placement and load

**Situation 1a: Placement for regular Schöck Isokorb® force resultants**
$a = 0{,}4*b$
$b = b_1 = b_2 = b_3 = b_i$

Force resultants:
$Q_1 = Q_2 = Q_3 = Q_i$
$M_1 = M_2 = M_3 = M_i$

This arrangement shall be chosen in order to achieve an optimal Isokorb® use.

**Situation 1b: Isokorb® placement at the edge**
$a = 0$
$b = b_1 = b_2 = b_3 = b_i$

Force resultants:
$Q_R = (L+b/2)*q$
$Q_i = (L+b)*1{,}1*q$
$M_R = M_i$

References:
- $M_R$ = Moment on edge reinforcement, $M_i$ = Moment on inside reinforcement
- This is a simplified approximation for indication use. A precise calculation of the pressure resultants must be made with
- FEM-analysis, see the following page.

### Situation 2: Asymmetric situations

In asymmetric situations, special assessments must be made and for each case it requires a FEM-analysis, see the following pages.

Examples of asymmetric situations
- Greatly varying stiffness between the balcony and floor
- Asymmetric and from Situation 1 deviant geometric placement of the Isokorb®-units
- Asymmetric balcony geometry
- Asymmetric loading e.g. local individual loads such as line loads on the side.

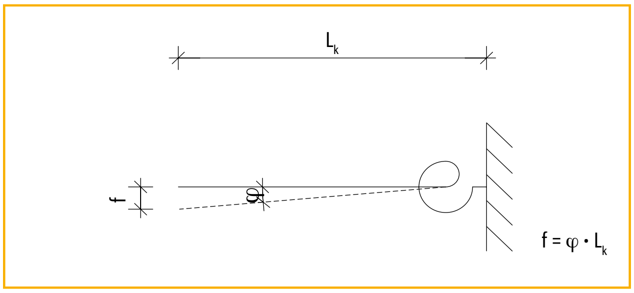
With asymmetric abnormal situations, we recommend the customer to contact us.

Reinforced concrete-to-reinforced concrete

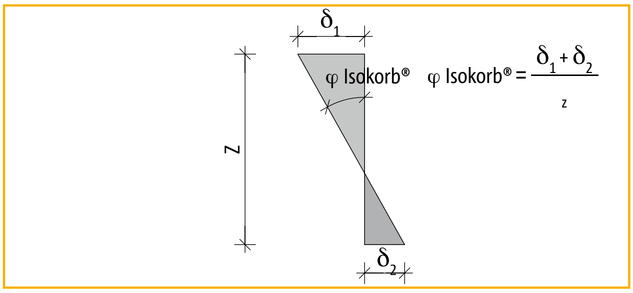
# Schöck Isokorb®
## Construction and design rules

### Rotation for anchors that are subject to a bending moment

For Schöck Isokorb® anchors that have a bending moment resistance, it must be noted that when the anchor is loaded, a minor rotation ($\varphi_{Isokorb}$) will occur in the anchor. This rotation, the angular deflection, ($\varphi_{Isokorb}$) will develop a deflection of $f=\varphi_{Isokorb} \cdot L_k$ for e.g. cantilevered balcony elements. The angular deflection is caused by the fact that during the loading of the anchor the bars stretch slightly by either tension ($\delta_1$) or compression ($\delta_2$).



*Deformation f as result of rotation spring*



*Angle of rotation φ occuring in Schöck Isokorb®-momenttypes*

### Remarks:

- If one wishes to prevent this deflection during the service life, then the relevant concrete elements must be adjusted (or precambered) during the construction stage by putting extra concrete elements on the end of the cantilever.
- Deflection as a result of direct deformation, concrete creep and any extra measures for dewatering must be superimposed on $f_{Isokorb}$.
- The angular deflection of the Schöck Isokorb® is a linear, elastic deformation. After unloading the anchor, the angular deflection/sagging will disappear.
- In order to determine the angular deflection a rotational spring constant C in [kNm/rad] is included for Schöck Isokorb®-moment types for each element in the capacity tables.

$$\varphi_{rep} = \frac{M_{rep}}{c} \text{ [rad]}$$

### Preventing discomforting vibrations with cantilevers

To prevent discomforting vibrations with cantilevers, the additional deformation as a result of the quasi-permanent live load depending on the length of the overhang $L_k$ must be limited to 2-2.5 mm.

It is furthermore advisable to aim for a natural frequency $f_e = \sqrt{\frac{a}{\delta}}$ of at least 6 Hz, with a = 0,384 m/s² (mass equally distributed) and where the calculated sag δ is the value $f_{QP}$ which can be taken out of the Schöck Isokorb® calculation (see example calculation page 49).

A practical design rule is to ensure that the minimum element depth (h) of the Schöck Isokorb® element is not less than 1/11th of the overhang $L_k$. For different situations, please contact the Schöck Service department (see front page).

# Schöck Isokorb®

## Construction and design rules

### FEM analysis

If a linear calculation provides insufficient clarity about the load distribution and internal forces within Schöck Isokorb® elements, then a FEM-analysis can be used. A 2D-slab program can provide a structural analysis of the balcony and its connection to the floor. Using a FEM-model the distribution of internal forces at ultimate limit state inside the concrete elements as well as the distribution between the various elements can be reviewed. For the service limit state analysis the deformations can be reviewed.

**Examples:**

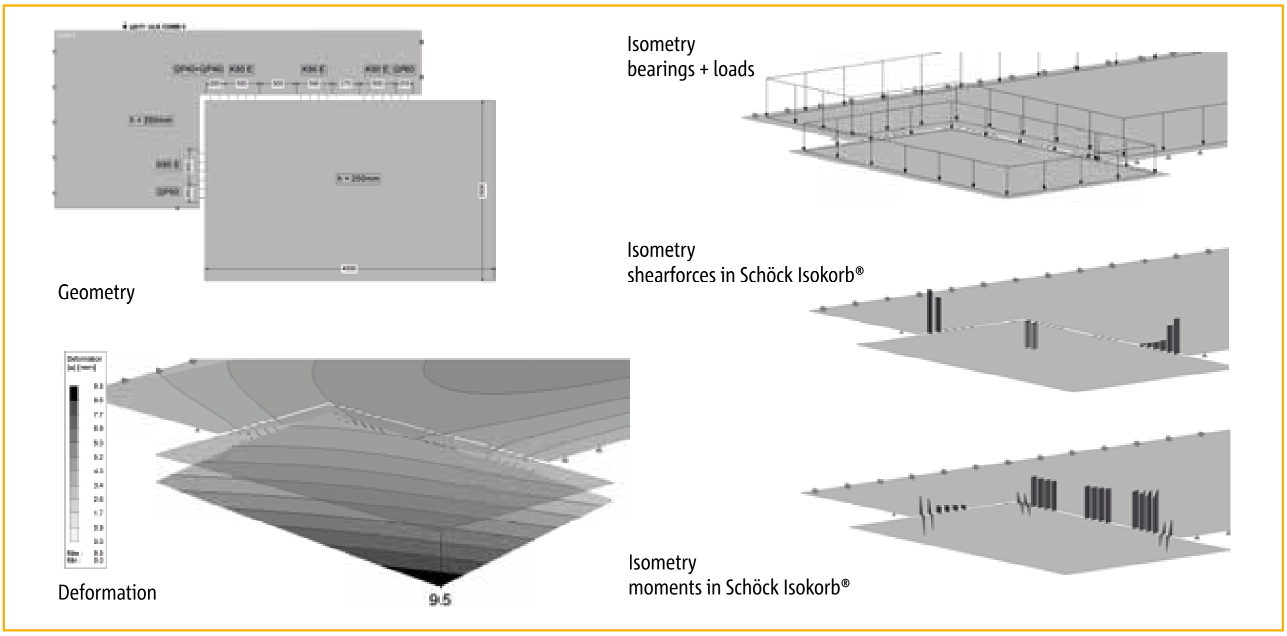
- The combination of a slender floor and a stiff balcony element with a large cantilever can result in the floor hanging on and consequently loading the balcony element. In this case, then it is required to perform a more detailed analysis.
- In strongly asymmetrical situations it is sometimes unclear what elements transfer the various internal forces. This can be determined using a FEM-analysis.
- In situations where the distribution of forces is depending on the stiffness of the concrete and the Schöck Isokorb® elements, a FEM analysis provides clarity.



### Loading Situation

In order to achieve usable information from the FEM analysis, it is very important to make a good schematization of the connection between the balcony element and the adjacent concrete floor. The floor and the balcony element must be modelled separately and then joined with FE-members. In order to adequately model the distribution of forces in a Schöck Isokorb® element, it is advised to use a division into elements of 250 mm. The FE-elements must be designed so that they simulate the behaviour of 250 mm wide Schöck Isokorb®.

### Example 1




*Slender floor/Stiff balcony*

From this example it is apparent that on the side where the floor is supported using hinges, the shear force in the Schöck Isokorb® element is highly concentrated at the ends. By using a Schöck Isokorb® with a large shear force capacity any occurring problems can be prevented. At best the model of the Schöck Isokorb® must have an equal distribution of the shear forces.

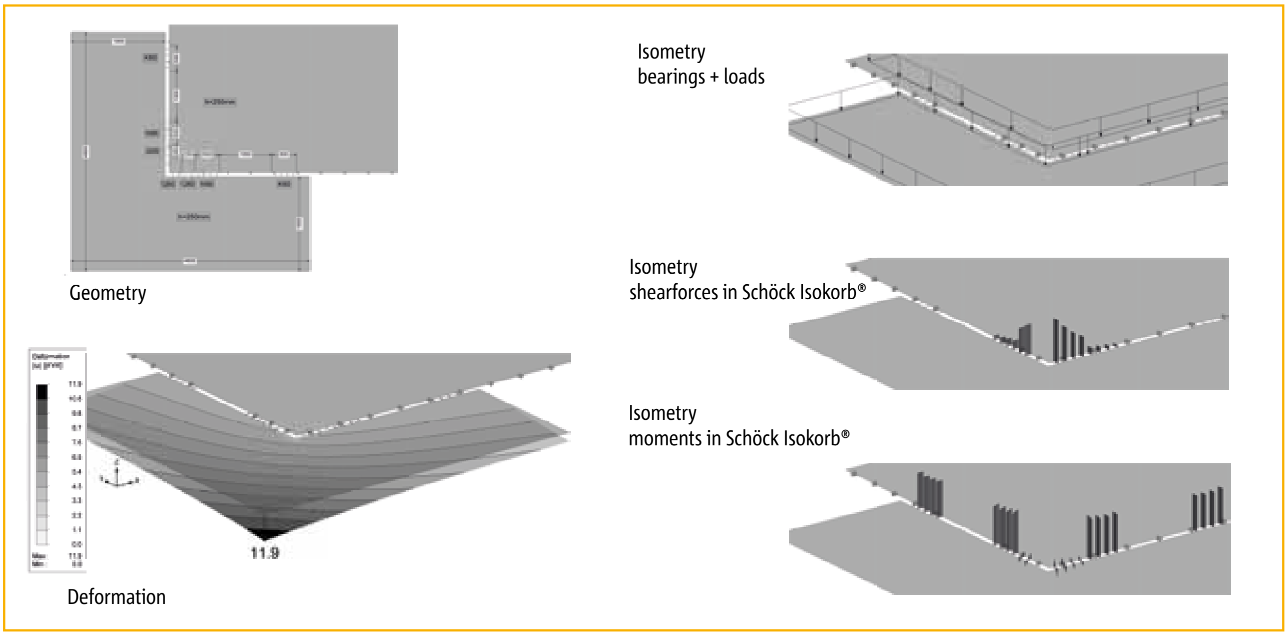
# Schöck Isokorb®
## Construction and design rules

### Stiffness of the Schöck Isokorb® elements

The connection between the balcony elements and the adjacent floor can be modelled by member elements. The stiffness of these member elements determines the interaction between the floor and balcony. In order to make a good loading situation  3 properties are important:

- **Rotational stiffness;** this is the required bending moment required to cause a rotation of 1 radial. The factor C is given in the table for each Schöck Isokorb® element, mostly per meter element length (see also information on page 30).
- **Torsional stiffness;** this is the required torsional moment required to cause a rotation of 1 radial. This value must be set to zero.
- **The vertical stiffness;** this is the required force to cause a deformation of 1 meter. This value consists of an elastic part (strain of the bar) and from a plastic part (yielding) and must be examined on a case by case basis. Schöck's Service department (see front page) will be happy to provide you with further advice.

### Example 2




*A-symmetrical situation*

An example calculation has been made for Schöck Isokorb® type D using a FEM-program. This is an example of an analysis in which the contribution of the Schöck Isokorb® elements is determined in relation to the concrete slabs. Additionally a good indication of the deformation is obtained. One can find this example on page 89.

# Schöck Isokorb®
## Materials for concrete-to-concrete applications

### Schöck Isokorb®

| | |
|---|---|
| **Reinforcing steel** | BSt 500 S acc. to EN 10800 |
| **Structural steel** | S 235 JR |
| **Stainless steel** | Ribbed reinforcing steel BSt 500 NR: material no. 1.4362 or no. 1.4571<br>Tensile rebars: material no. 1.4362 ($f_{yk}$ = 700 N/mm²)<br>Plain rebars: material no. 1.4571, hardening level S 460, |
| **Pressure bearings** | HTE module (pressure bearings made of microfibre-reinforced high-performance fine concrete)<br>PE-HD plastic jackets |
| **Insulating material** | Neopor®[1)] hard foam ($\lambda$ = 0.031 W/(m × K)) |
| **Fire protection boards** | Lightweight building boards, materials class A1,<br>Cement-bound fire safety boards, mineral wool: $\rho \geq 150$ kg/m³,<br>Melting point T ≥ 1000 °C with integrated fire protection strips |



### Connecting components

| | |
|---|---|
| **Reinforcing steel** | B500A, B500B or B500C |
| **Concrete** | Standard concrete acc. to NS EN 206-1 with a dry apparent density of 2000 kg/m³ to 2600 kg/m³ (lightweight concrete is not permissible)<br><br>Concrete grade<br>At least C20/25, plus according to the environmental classification acc. to EC 2 National Annex |

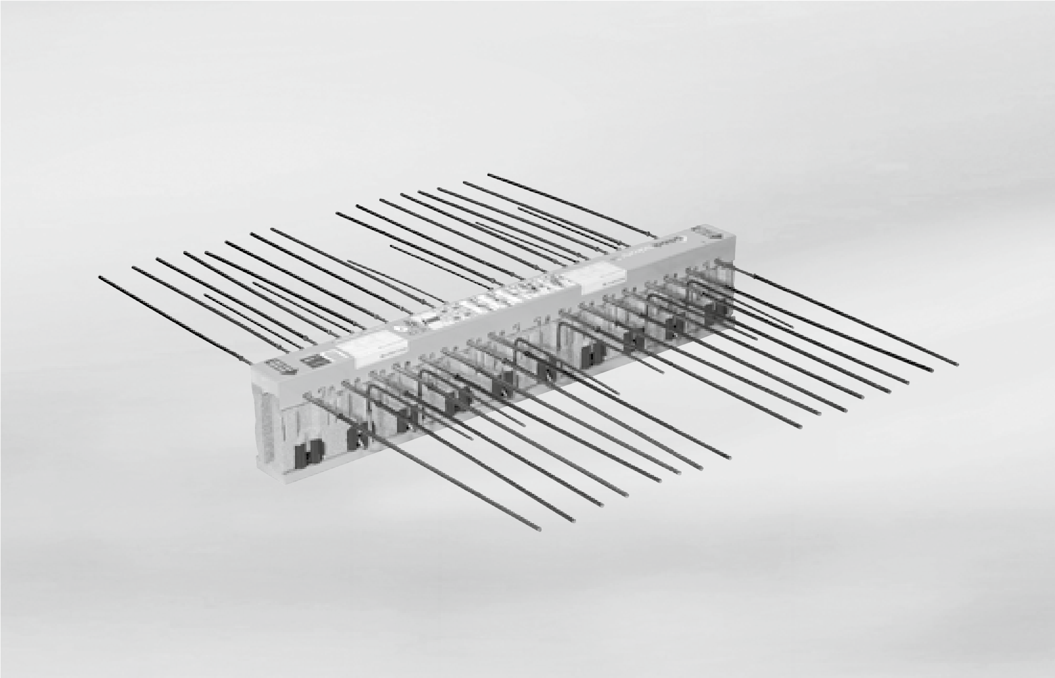
### Note concerning the bending of reinforcement steel

The production of Schöck Isokorb® is carefully monitored at the factory to ensure that all bars are bent in accordance to our technical approval and EC2.

Caution: If original Schöck Isokorb® rebars are bent on site, or bent and bent back, the monitoring of compliance with regards to the required conditions (technical approval, EC2) of such actions is not the responsibility of Schöck GmbH. Our warranty will be voided in such cases.

1) Neopor® is a registered trademark of BASF

# Schöck Isokorb® type K



*Schöck Isokorb® type K*

HTE MODUL

K

Reinforced concrete-to-reinforced concrete

**Contents** **Page**

# Schöck Isokorb® type K
## Examples of element arrangements/Cross-sections

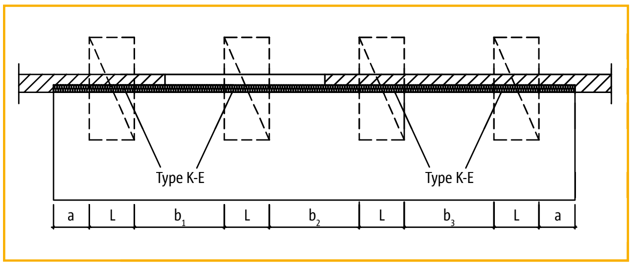



*Figure 1: Balcony, free cantilevered with intermitent solution*

**Designations used in planning documents**
(Structural calculations, specification documents, implementation plans, orders, e.g.)

Ex. V8 and fire protection **K70-CV35-V6-H180-F120**

Type +load range
Concrete cover
Shear force variant
Height of Isokorb®
Fire protection class

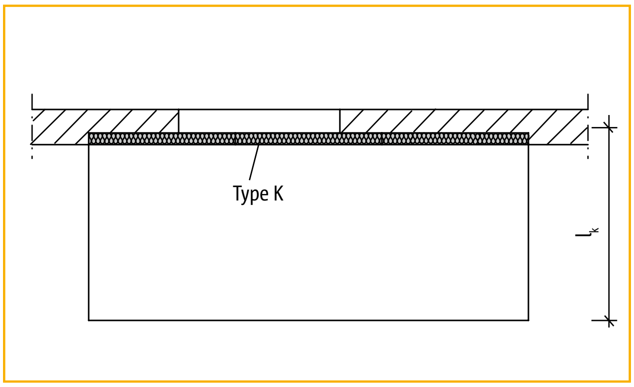



*Figure 2: Free cantilever balcony*

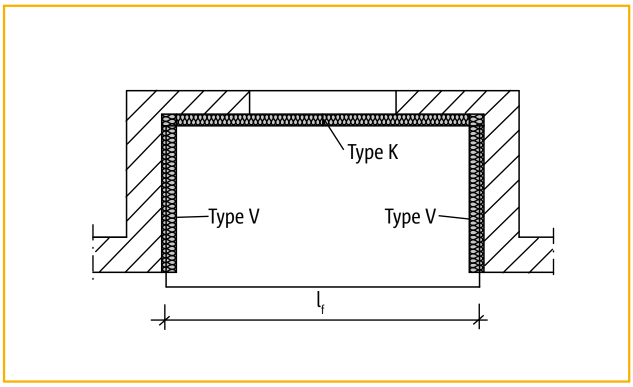



*Figure 3: Balcony supported on three sides*

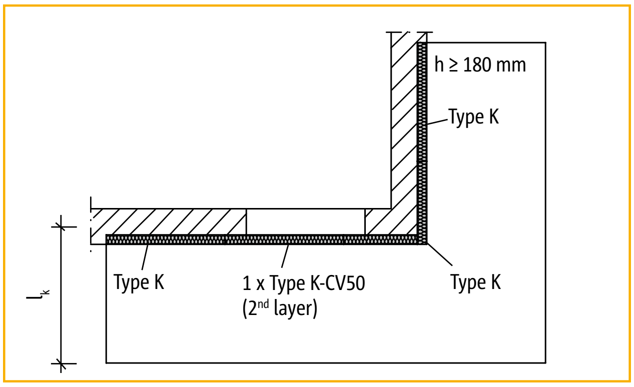



*Figure 4: Balcony on an outside corner*

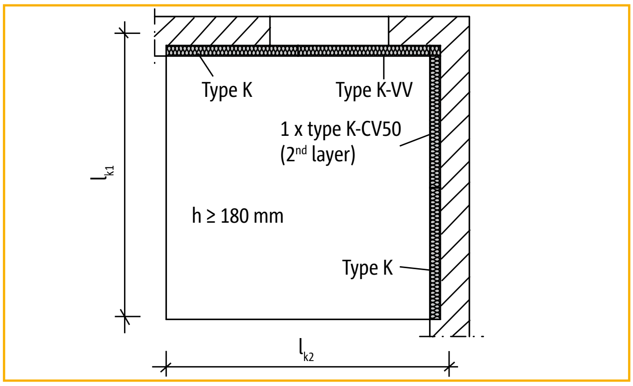



*Figure 5: Balcony supported on two sides*

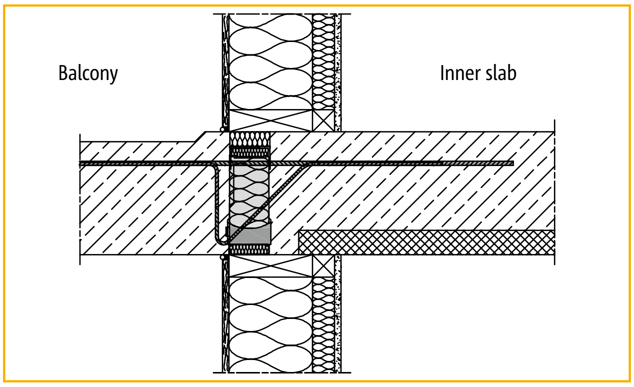



*Figure 6: Balcony at the same level as the inside slap*

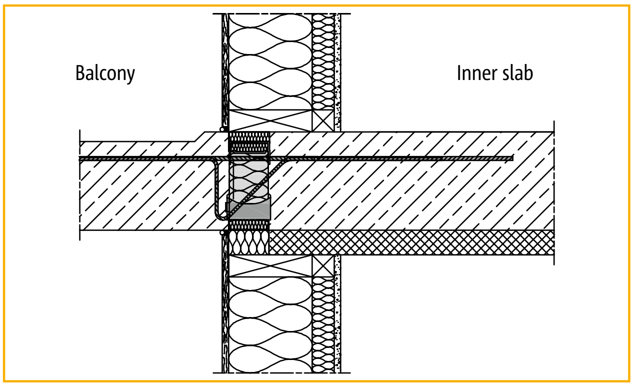
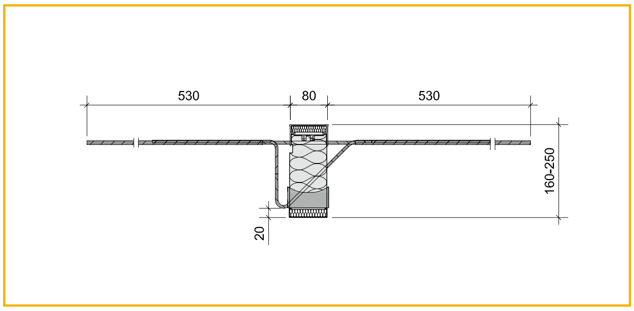



*Figure 7: Balconies and slap with different heights*

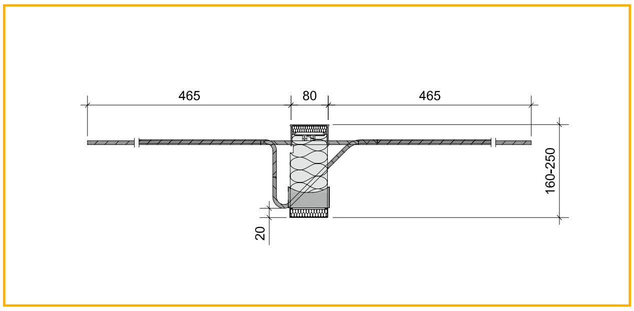
# Schöck Isokorb® type K
## Product Description

| Schöck Isokorb® type | K10[2)] | K20-E[1)] | K30[2)] | K40[2)] | K50[2)] |
|---|---|---|---|---|---|
| Isokorb® length [mm] | 1000 | 1000 | 1000 | 1000 | 1000 |
| Tension bars | 4Ø8 | 8Ø8 | 12Ø8 | 14 Ø 8 | 16 Ø 8 |
| Shearforce bars V6 | 4Ø6 | – | 6Ø6 | 6 Ø 6 | 6 Ø 6 |
| Shearforce bars V8 | – | 8Ø8 | – | – | – |
| Pressure bearings (qty) | 4 | 8 | 10 | 8 | 10 |

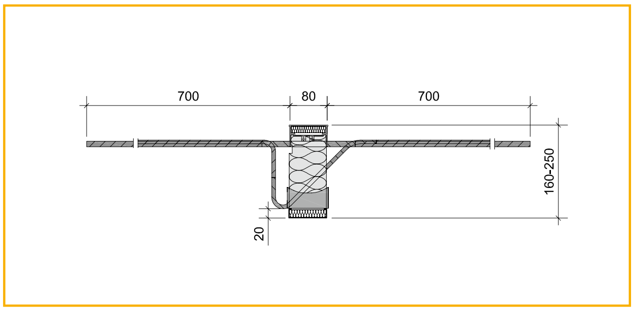
| Schöck Isokorb® type | K60-E[1)] | K70[2,3)] | K80-E[1,3)] | K90[2,3)] | K100[2,3)] |
|---|---|---|---|---|---|
| Isokorb® length [mm] | 1000 | 1000 | 1000 | 1000 | 1000 |
| Tension bars | 8 Ø 12 | 10 Ø 12 | 8 Ø 14 | 12 Ø 12 | 14 Ø 12 |
| Shearforce bars V8 | 8 Ø 8 | 8 Ø 8 | 8 Ø 8 | 8 Ø 8 | – |
| Shearforce bars V10 | – | – | – | – | 10 Ø 8 |
| Shearforce bars VV[4)] | – | 8 Ø 8 + 4 Ø 8 | – | 8 Ø 8 + 4 Ø 8 | 10 Ø 8 + 4 Ø 8 |
| Pressure bearings (qty) | 12 | 16 | 16 | 18 | 18 |
| Special hoops (qty) | – | 4 | 4 | 4 | 4 |



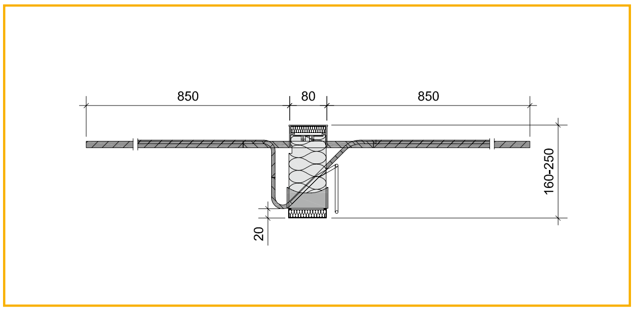
*Cross-section: Schöck Isokorb® type K10, K30, K401, K50*



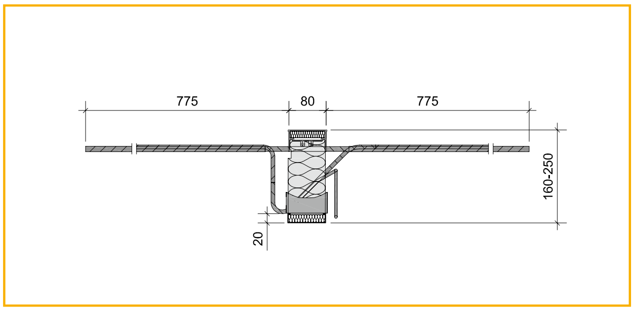
*Cross-section: Schöck Isokorb® type K20-E*



*Cross-section: Schöck Isokorb® type K60-E*



*Cross-section: Schöck Isokorb® type K80-E*

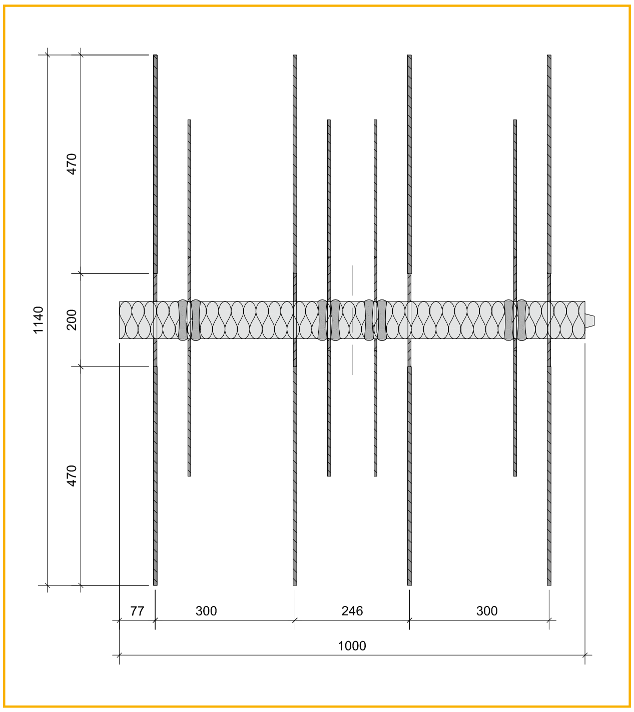


*Cross-section: S chöck Isokorb® type K70, K90, K100*

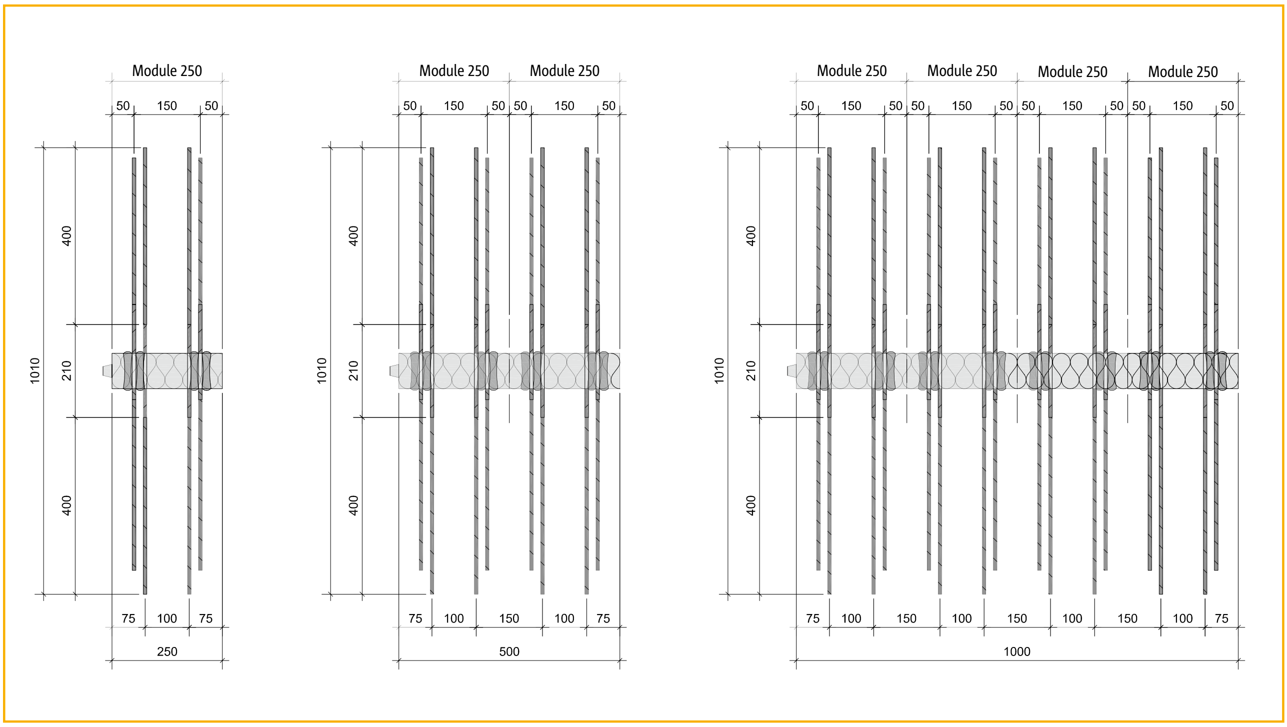
[1)] Standard preferred types; Elements are also available as modules of 250 and 500 mm
[2)] Elements also available as module of 500 mm
[3)] Element with special hoops on the floor side directly behind the compression bearings
[4)] Shear force bars in both directions for positive and negative shear forces

# Schöck Isokorb® type K
Plan views





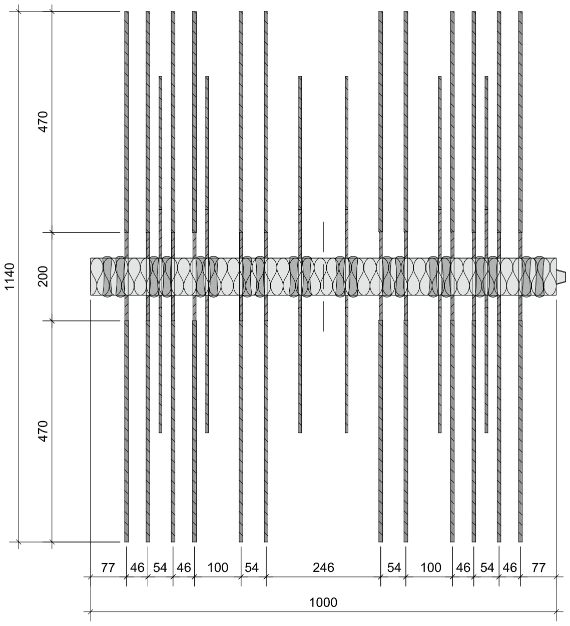

*Plan view: Schöck Isokorb® type K10*



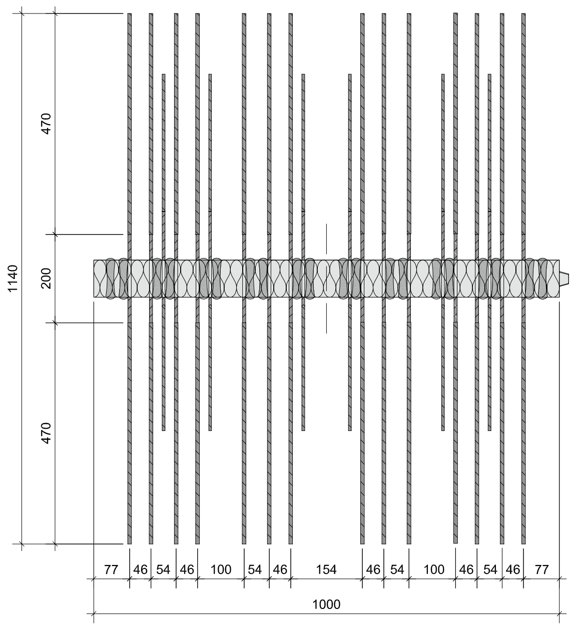

*Plan view: Schöck Isokorb® type K20 E*

# Schöck Isokorb® type K

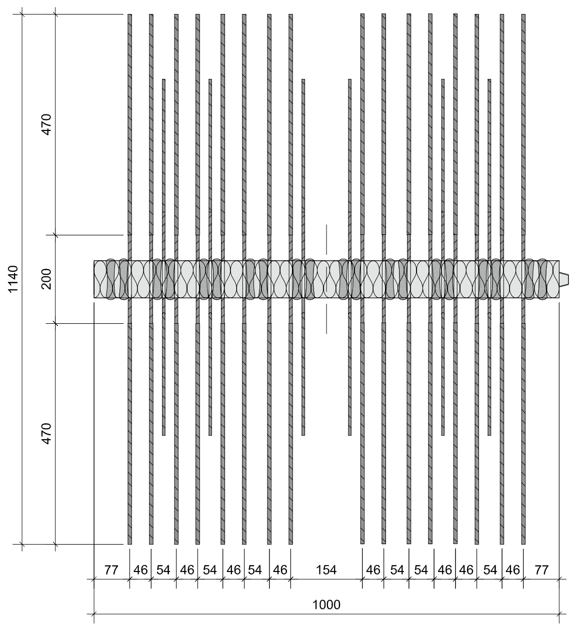
## Plan views




*Plan view: Schöck Isokorb® type K30*



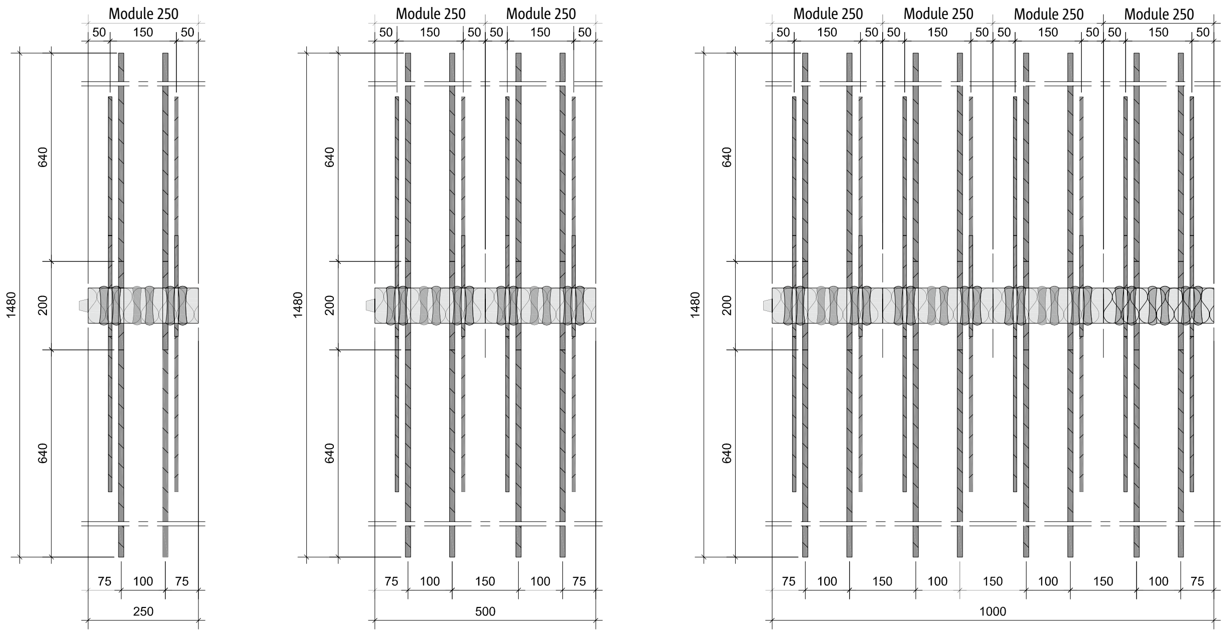

*Plan view: Schöck Isokorb® type K40*



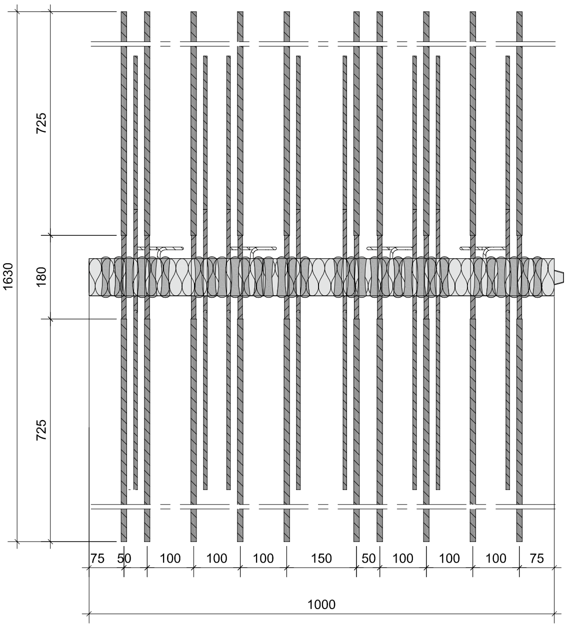

*Plan view: Schöck Isokorb® type K50*

# Schöck Isokorb® type K

## Plan views

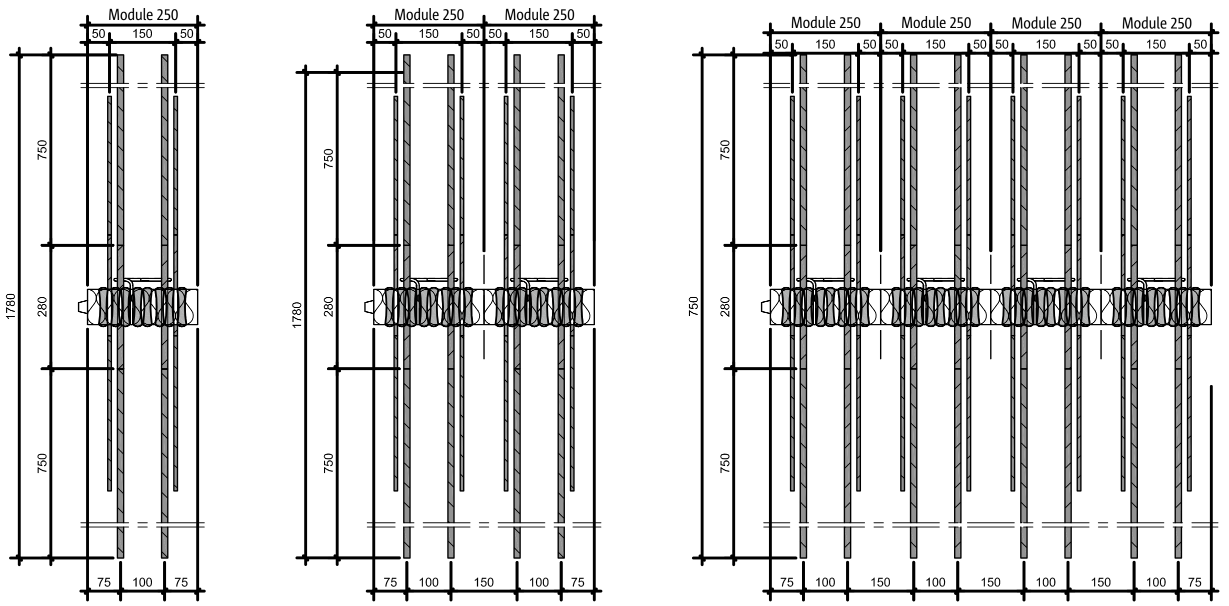



*Plan view: Schöck Isokorb® type K60 E*

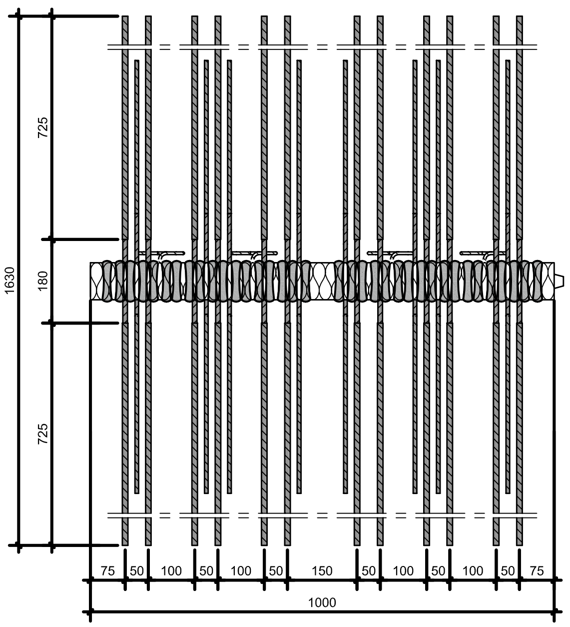



*Plan view: Schöck Isokorb® type K70*

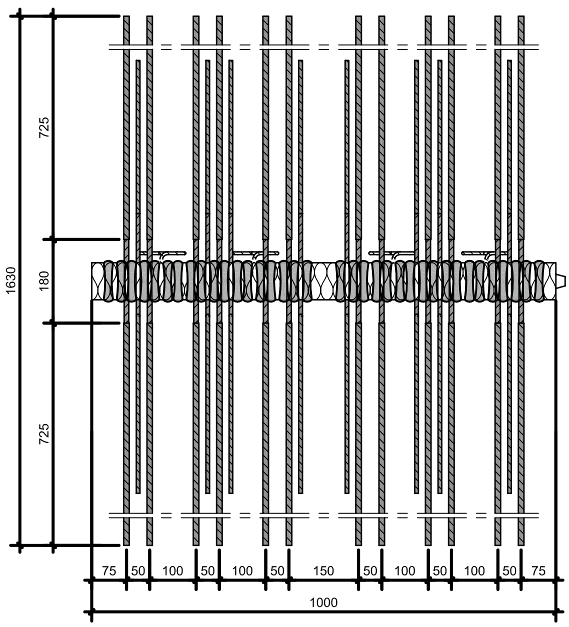
# Schöck Isokorb® type K
## Plan views




*Plan view: Schöck Isokorb® type K80 E*




*Plan view: Schöck Isokorb® type K90*




*Plan view: Schöck Isokorb® type K100*

# Schöck Isokorb® type K
## Capacity tables

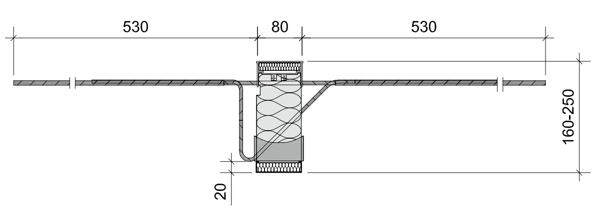
**Capacities are design values in the ultimate limit state (ULS). (Example of calculation on page 49). For capacities elements CV50 look at page 45-46.**

| K10-CV35-... | | | | | | |
|---|---|---|---|---|---|---|
| C25/30 Element-heigth H [mm] | $M_{Rd}$ [kNm/m] | V6 $V_{Rd}$ [kN/m] | V8 $V_{Rd}$ [kN/m] | V10 $V_{Rd}$ [kN/m] | VV $V_{Rd}$ [kN/m] | Rotation-stiffness C[1)] [kNm/rad] |
| **160** | 7,3 | 28,0 | – | – | - / - | 729 |
| **170** | 8,1 | 28,0 | – | – | - / - | 923 |
| **180** | 9,0 | 28,0 | – | – | - / - | 1140 |
| **190** | 9,9 | 28,0 | – | – | - / - | 1379 |
| **200** | 10,8 | 28,0 | – | – | - / - | 1641 |
| **210** | 11,6 | 28,0 | – | – | - / - | 1926 |
| **220** | 12,5 | 28,0 | – | – | - / - | 2234 |
| **230** | 13,4 | 28,0 | – | – | - / - | 2564 |
| **240** | 14,3 | 28,0 | – | – | - / - | 2917 |
| **250** | 15,1 | 28,0 | – | – | - / - | 3293 |

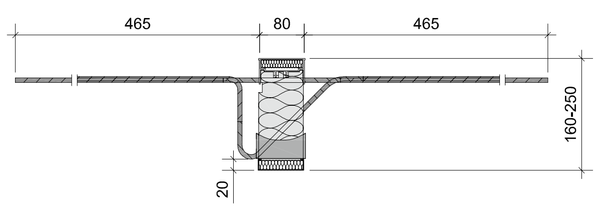
| K20-CV35-...E | | | | | | |
|---|---|---|---|---|---|---|
| C25/30 Element-heigth H [mm] | $M_{Rd}$ [kNm/m] | V6 $V_{Rd}$ [kN/m] | V8 $V_{Rd}$ [kN/m] | V10 $V_{Rd}$ [kN/m] | VV $V_{Rd}$ [kN/m] | Rotation-stiffness C[1)] [kNm/rad] |
| **160** | 14,5 | – | 99,5 | – | - / - | 1671 |
| **170** | 16,3 | – | 99,5 | – | - / - | 2115 |
| **180** | 18,0 | – | 99,5 | – | - / - | 2612 |
| **190** | 19,8 | – | 99,5 | – | - / - | 3160 |
| **200** | 21,5 | – | 99,5 | – | - / - | 3761 |
| **210** | 23,3 | – | 99,5 | – | - / - | 4413 |
| **220** | 25,0 | – | 99,5 | – | - / - | 5119 |
| **230** | 26,7 | – | 99,5 | – | - / - | 5876 |
| **240** | 28,5 | – | 99,5 | – | - / - | 6686 |
| **250** | 30,2 | – | 99,5 | – | - / - | 7547 |

| K30-CV35-... | | | | | | |
|---|---|---|---|---|---|---|
| C25/30 Element-heigth H [mm] | $M_{Rd}$ [kNm/m] | V6 $V_{Rd}$ [kN/m] | V8 $V_{Rd}$ [kN/m] | V10 $V_{Rd}$ [kN/m] | VV $V_{Rd}$ [kN/m] | Rotation-stiffness C[1)] [kNm/rad] |
| **160** | 20,0 | 42,0 | – | – | - / - | 1898 |
| **170** | 22,4 | 42,0 | – | – | - / - | 2402 |
| **180** | 24,8 | 42,0 | – | – | - / - | 2965 |
| **190** | 27,2 | 42,0 | – | – | - / - | 3588 |
| **200** | 29,6 | 42,0 | – | – | - / - | 4270 |
| **210** | 32,0 | 42,0 | – | – | - / - | 5011 |
| **220** | 34,4 | 42,0 | – | – | - / - | 5812 |
| **230** | 36,8 | 42,0 | – | – | - / - | 6672 |
| **240** | 39,3 | 42,0 | – | – | - / - | 7591 |
| **250** | 41,7 | 42,0 | – | – | - / - | 8569 |

| K40-CV35-... | | | | | | |
|---|---|---|---|---|---|---|
| C25/30 Element-heigth H [mm] | $M_d$ [kNm/m] | V6 $V_{Rd}$ [kN/m] | V8 $V_{Rd}$ [kN/m] | V10 $V_{Rd}$ [kN/m] | VV $V_{Rd}$ [kN/m] | Rotation-stiffness C[1)] [kNm/rad] |
| **160** | 22,8 | 42,0 | – | – | - / - | 2076 |
| **170** | 25,6 | 42,0 | – | – | - / - | 2628 |
| **180** | 28,4 | 42,0 | – | – | - / - | 3244 |
| **190** | 31,1 | 42,0 | – | – | - / - | 3925 |
| **200** | 33,9 | 42,0 | – | – | - / - | 4672 |
| **210** | 36,6 | 42,0 | – | – | - / - | 5483 |
| **220** | 39,4 | 42,0 | – | – | - / - | 6358 |
| **230** | 42,1 | 42,0 | – | – | - / - | 7299 |
| **240** | 44,9 | 42,0 | – | – | - / - | 8305 |
| **250** | 47,6 | 42,0 | – | – | - / - | 9375 |




*Cross-section: Schöck Isokorb® type K10, K30, K40, K50*




*Cross-section: Schöck Isokorb® type K20 E*

[1)] Rotational spring for the analysis of the deflection for a cantilever as the result of the Schöck Isokorb® anchor being loaded (see page 49).

# Schöck Isokorb® type K
## Capacity tables



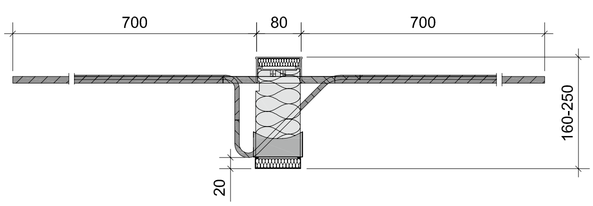
**Capacities are design values in the ultimate limit state (ULS). ((Example of calculation on page 49). For capacities elements CV50 look at page 45-46.**

| K50-CV35-... | | | | | | |
|---|---|---|---|---|---|---|
| | | V6 | V8 | V10 | VV | |
| C25/30 Element-heigth H [mm] | $M_{Rd}$ [kNm/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | Rotation-stiffness C[1] [kNm/rad] |
| **160** | 28,6 | 42,0 | – | – | - / - | 2465 |
| **170** | 32,0 | 42,0 | – | – | - / - | 3120 |
| **180** | 35,4 | 42,0 | – | – | - / - | 3851 |
| **190** | 38,9 | 42,0 | – | – | - / - | 4660 |
| **200** | 42,3 | 42,0 | – | – | - / - | 5546 |
| **210** | 45,8 | 42,0 | – | – | - / - | 6509 |
| **220** | 49,2 | 42,0 | – | – | - / - | 7549 |
| **230** | 52,6 | 42,0 | – | – | - / - | 8665 |
| **240** | 56,1 | 42,0 | – | – | - / - | 9859 |
| **250** | 59,5 | 42,0 | – | – | - / - | 11130 |

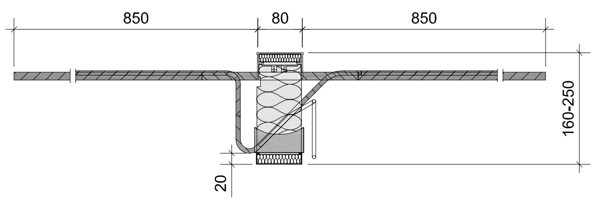
| K60-CV35-...E | | | | | | |
|---|---|---|---|---|---|---|
| | | | V8 | V10 | VV | |
| Element-heigth H [mm] | C25/30 $M_{Rd}$ [kNm/m] | C30/37 $M_{Rd}$ [kNm/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | Rotation-stiffness C[1] [kNm/rad] |
| **160** | 30,9 | 31,9 | 99,5 | – | | 2673 |
| **170** | 34,7 | 35,8 | 99,5 | – | | 3402 |
| **180** | 38,5 | 39,7 | 99,5 | – | | 4219 |
| **190** | 42,4 | 43,7 | 99,5 | – | | 5124 |
| **200** | 46,2 | 47,6 | 99,5 | – | | 6116 |
| **210** | 50,0 | 51,5 | 99,5 | – | | 7197 |
| **220** | 53,8 | 55,5 | 99,5 | – | | 8366 |
| **230** | 57,6 | 59,4 | 99,5 | – | | 9622 |
| **240** | 61,4 | 63,3 | 99,5 | – | | 10966 |
| **250** | 65,3 | 67,3 | 99,5 | – | | 12398 |

| K70-CV35-... | | | | | | |
|---|---|---|---|---|---|---|
| | | V6 | V8 | V10 | VV | |
| C25/30 Element-heigth H [mm] | $M_{Rd}$ [kNm/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | Rotation-stiffness C[1] [kNm/rad] |
| **160** | 33,1 | – | 99,5 | – | +99,5 −49,8 | 2892 |
| **170** | 37,1 | – | 99,5 | – | +99,5 −49,8 | 3681 |
| **180** | 41,2 | – | 99,5 | – | +99,5 −49,8 | 4565 |
| **190** | 45,3 | – | 99,5 | – | +99,5 −49,8 | 5545 |
| **200** | 49,4 | – | 99,5 | – | +99,5 −49,8 | 6619 |
| **210** | 53,5 | – | 99,5 | – | +99,5 −49,8 | 7788 |
| **220** | 57,5 | – | 99,5 | – | +99,5 −49,8 | 9053 |
| **230** | 61,6 | – | 99,5 | – | +99,5 −49,8 | 10412 |
| **240** | 65,7 | – | 99,5 | – | +99,5 −49,8 | 11867 |
| **250** | 69,8 | – | 99,5 | – | +99,5 −49,8 | 13417 |

| K80-CV35-...E | | | | | | |
|---|---|---|---|---|---|---|
| | | | V8 | V10 | VV | |
| Element-heigth H [mm] | C25/30 $M_{Rd}$ [kNm/m] | C30/37 $M_d$ [kNm/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | Rotation-stiffness C[1] [kNm/rad] |
| **160** | 40,7 | 42,8 | 99,5 | – | – | 3317 |
| **170** | 45,8 | 48,2 | 99,5 | – | – | 4234 |
| **180** | 50,9 | 53,5 | 99,5 | – | – | 5263 |
| **190** | 56,0 | 58,9 | 99,5 | – | – | 6404 |
| **200** | 61,1 | 64,3 | 99,5 | – | – | 7657 |
| **210** | 66,1 | 69,6 | 99,5 | – | – | 9022 |
| **220** | 71,2 | 75,0 | 99,5 | – | – | 10499 |
| **230** | 76,3 | 80,3 | 99,5 | – | – | 12088 |
| **240** | 81,4 | 85,7 | 99,5 | – | – | 13788 |
| **250** | 86,5 | 91,0 | 99,5 | – | – | 15600 |




*Cross-section: Schöck Isokorb® type K60 E*




*Cross-section: Schöck Isokorb® type K80 E*

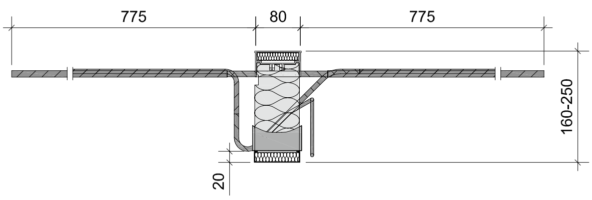
[1] Rotational spring for the analysis of the deflection for a cantilever as the result of the Schöck Isokorb® anchor being loaded (see page 49).

# Schöck Isokorb® type K
## Capacity tables

**Capacities are design values in the ultimate limit state (ULS). (Example of calculation on page 49).**

| K90-CV35-... | | | | | | |
|---|---|---|---|---|---|---|
| C25/30 | | V6 | V8 | V10 | VV | Rotation-stiffness |
| Element-heigth H [mm] | $M_{Rd}$ [kNm/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | C[1] [kNm/rad] |
| **160** | 46,4 | – | 99,5 | – | +99,5<br>−49,8 | 3398 |
| **170** | 52,1 | – | 99,5 | – | +99,5<br>−49,8 | 4325 |
| **180** | 57,8 | – | 99,5 | – | +99,5<br>−49,8 | 5364 |
| **190** | 63,5 | – | 99,5 | – | +99,5<br>−49,8 | 6515 |
| **200** | 69,3 | – | 99,5 | – | +99,5<br>−49,8 | 7777 |
| **210** | 75,0 | – | 99,5 | – | +99,5<br>−49,8 | 9151 |
| **220** | 80,7 | – | 99,5 | – | +99,5<br>−49,8 | 10637 |
| **230** | 86,4 | – | 99,5 | – | +99,5<br>−49,8 | 12235 |
| **240** | 92,2 | – | 99,5 | – | +99,5<br>−49,8 | 13944 |
| **250** | 97,9 | – | 99,5 | – | +99,5<br>−49,8 | 15765 |

| K100-CV35-... | | | | | | |
|---|---|---|---|---|---|---|
| | | C30/37 | V8 | V10 | VV | Rotation-stiffness |
| Element-heigth H [mm] | C25/30 $M_{Rd}$ [kNm/m] | $M_d$ [kNm/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | C[1] [kNm/rad] |
| **160** | 46,4 | 50,2 | – | 124,4 | +124,4<br>−49,8 | 3756 |
| **170** | 52,1 | 56,3 | – | 124,4 | +124,4<br>−49,8 | 4781 |
| **180** | 57,8 | 62,5 | – | 124,4 | +124,4<br>−49,8 | 5929 |
| **190** | 63,5 | 68,7 | – | 124,4 | +124,4<br>−49,8 | 7201 |
| **200** | 69,3 | 74,9 | – | 124,4 | +124,4<br>−49,8 | 8596 |
| **210** | 75,0 | 81,1 | – | 124,4 | +124,4<br>−49,8 | 10115 |
| **220** | 80,7 | 87,3 | – | 124,4 | +124,4<br>−49,8 | 11757 |
| **230** | 86,4 | 93,5 | – | 124,4 | +124,4<br>−49,8 | 13523 |
| **240** | 92,2 | 99,7 | – | 124,4 | +124,4<br>−49,8 | 15412 |
| **250** | 97,9 | 105,9 | – | 124,4 | +124,4<br>−49,8 | 17424 |




*Cross-section: Schöck Isokorb® type K70, K90, K100*

[1] Rotational spring for the analysis of the deflection for a cantilever as the result of the Schöck Isokorb® anchor being loaded (see page 49).

# Schöck Isokorb® type K

## Capacity tables K-CV50



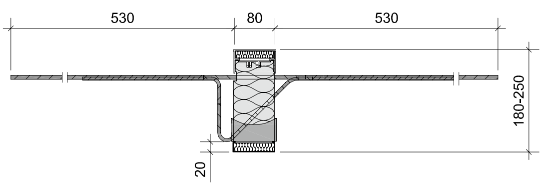
**Capacities are design values in the ultimate limit state (ULS). (Example of calculation on page 49).**

| K10-CV50-... | | | | | | |
|---|---|---|---|---|---|---|
| C25/30 Element-heigth H [mm] | $M_{Rd}$ [kNm/m] | V6 $V_{Rd}$ [kN/m] | V8 $V_{Rd}$ [kN/m] | V10 $V_{Rd}$ [kN/m] | VV $V_{Rd}$ [kN/m] | Rotation-stiffness C[1)] [kNm/rad] |
| **160** | – | – | – | – | - / - | – |
| **170** | – | – | – | – | - / - | – |
| **180** | 7,7 | 28,0 | – | – | - / - | 823 |
| **190** | 8,6 | 28,0 | – | – | - / - | 1028 |
| **200** | 9,4 | 28,0 | – | – | - / - | 1256 |
| **210** | 10,3 | 28,0 | – | – | - / - | 1507 |
| **220** | 11,2 | 28,0 | – | – | - / - | 1781 |
| **230** | 12,1 | 28,0 | – | – | - / - | 2077 |
| **240** | 12,9 | 28,0 | – | – | - / - | 2396 |
| **250** | 13,8 | 28,0 | – | – | - / - | 2738 |

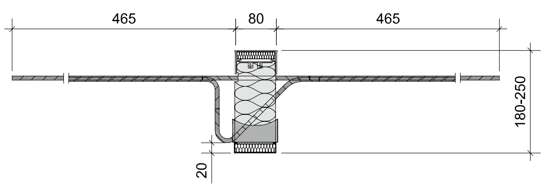
| K20-CV50-...E | | | | | | |
|---|---|---|---|---|---|---|
| C25/30 Element-heigth H [mm] | $M_{Rd}$ [kNm/m] | V6 $V_{Rd}$ [kN/m] | V8 $V_{Rd}$ [kN/m] | V10 $V_{Rd}$ [kN/m] | VV $V_{Rd}$ [kN/m] | Rotation-stiffness C[1)] [kNm/rad] |
| **160** | – | – | – | – | - / - | – |
| **170** | – | – | – | – | - / - | – |
| **180** | 15,4 | – | 99,5 | – | - / - | 1887 |
| **190** | 17,1 | – | 99,5 | – | - / - | 2357 |
| **200** | 18,9 | – | 99,5 | – | - / - | 2879 |
| **210** | 20,6 | – | 99,5 | – | - / - | 3454 |
| **220** | 22,4 | – | 99,5 | – | - / - | 4081 |
| **230** | 24,1 | – | 99,5 | – | - / - | 4760 |
| **240** | 25,9 | – | 99,5 | – | - / - | 5491 |
| **250** | 27,6 | – | 99,5 | – | - / - | 6274 |

| K30-CV50-... | | | | | | |
|---|---|---|---|---|---|---|
| C25/30 Element-heigth H [mm] | $M_{Rd}$ [kNm/m] | V6 $V_{Rd}$ [kN/m] | V8 $V_{Rd}$ [kN/m] | V10 $V_{Rd}$ [kN/m] | VV $V_{Rd}$ [kN/m] | Rotation-stiffness C[1)] [kNm/rad] |
| **160** | – | – | – | – | - / - | – |
| **170** | – | – | – | – | - / - | – |
| **180** | 21,2 | 42,0 | – | – | - / - | 2142 |
| **190** | 23,6 | 42,0 | – | – | - / - | 2676 |
| **200** | 26,0 | 42,0 | – | – | - / - | 3269 |
| **210** | 28,4 | 42,0 | – | – | - / - | 3921 |
| **220** | 30,8 | 42,0 | – | – | - / - | 4633 |
| **230** | 33,2 | 42,0 | – | – | - / - | 5404 |
| **240** | 35,6 | 42,0 | – | – | - / - | 6234 |
| **250** | 38,1 | 42,0 | – | – | - / - | 7124 |

| K40-CV50-... | | | | | | |
|---|---|---|---|---|---|---|
| C25/30 Element-heigth H [mm] | $M_{Rd}$ [kNm/m] | V6 $V_{Rd}$ [kN/m] | V8 $V_{Rd}$ [kN/m] | V10 $V_{Rd}$ [kN/m] | VV $V_{Rd}$ [kN/m] | Rotation-stiffness C[1)] [kNm/rad] |
| **160** | – | – | – | – | - / - | – |
| **170** | – | – | – | – | - / - | – |
| **180** | 24,2 | 42,0 | – | – | - / - | 2344 |
| **190** | 27,0 | 42,0 | – | – | - / - | 2928 |
| **200** | 29,7 | 42,0 | – | – | - / - | 3577 |
| **210** | 32,5 | 42,0 | – | – | - / - | 4290 |
| **220** | 35,2 | 42,0 | – | – | - / - | 5069 |
| **230** | 38,0 | 42,0 | – | – | - / - | 5912 |
| **240** | 40,7 | 42,0 | – | – | - / - | 6821 |
| **250** | 43,5 | 42,0 | – | – | - / - | 7794 |




*Cross-section: Schöck Isokorb® type K10, K30, K40, K50*




*Cross-section: Schöck Isokorb® type K20 E*

[1)] Rotational spring for the analysis of the deflection for a cantilever as the result of the Schöck Isokorb® anchor being loaded (see page 49).

# Schöck Isokorb® type K

## Capacity tables K-CV50

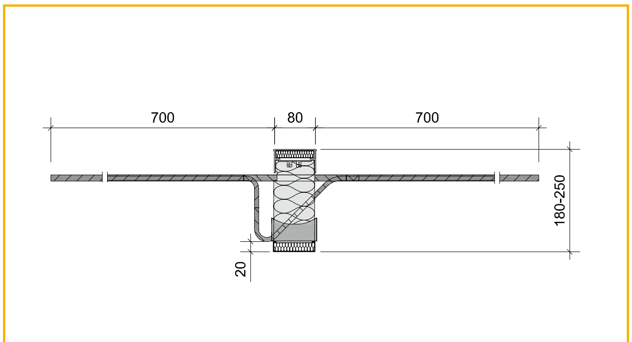
**Capacities are design values in the ultimate limit state (ULS). (Example of calculation on page 49).**

| K50-CV50-... | | | | | | |
|---|---|---|---|---|---|---|
| C25/30 Element-heigth H [mm] | | V6 | V8 | V10 | VV | Rotation-stiffness C¹⁾ [kNm/rad] |
| | $M_{Rd}$ [kNm/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | |
| **160** | – | – | – | – | - / - | – |
| **170** | – | – | – | – | - / - | – |
| **180** | 30,3 | 42,0 | – | – | - / - | 2783 |
| **190** | 33,7 | 42,0 | – | – | - / - | 3476 |
| **200** | 37,2 | 42,0 | – | – | - / - | 4246 |
| **210** | 40,6 | 42,0 | – | – | - / - | 5093 |
| **220** | 44,0 | 42,0 | – | – | - / - | 6018 |
| **230** | 47,5 | 42,0 | – | – | - / - | 7019 |
| **240** | 50,9 | 42,0 | – | – | - / - | 8097 |
| **250** | 54,4 | 42,0 | – | – | - / - | 9253 |

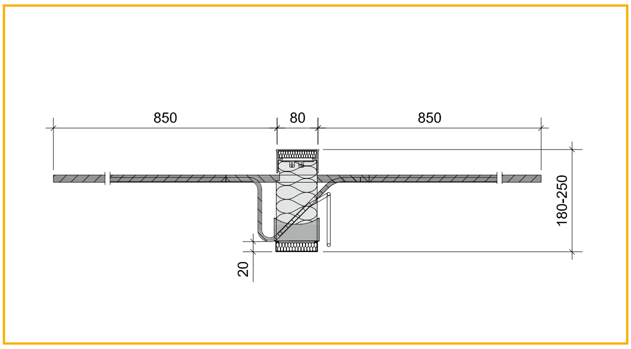
| K60-CV50-...E | | | | | | |
|---|---|---|---|---|---|---|
| Element-heigth H [mm] | C25/30 | C30/37 | V8 | V10 | VV | Rotation-stiffness C¹⁾ [kNm/rad] |
| | $M_{Rd}$ [kNm/m] | $M_d$ [kNm/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | |
| **160** | – | – | – | – | - / - | – |
| **170** | – | – | – | – | - / - | – |
| **180** | 32,8 | 33,8 | 99,5 | – | - / - | 3026 |
| **190** | 36,6 | 37,8 | 99,5 | – | - / - | 3799 |
| **200** | 40,4 | 41,7 | 99,5 | – | - / - | 4660 |
| **210** | 44,3 | 45,6 | 99,5 | – | - / - | 5609 |
| **220** | 48,1 | 49,6 | 99,5 | – | - / - | 6646 |
| **230** | 51,9 | 53,5 | 99,5 | – | - / - | 7770 |
| **240** | 55,7 | 57,4 | 99,5 | – | - / - | 8983 |
| **250** | 59,5 | 61,4 | 99,5 | – | - / - | 10283 |

| K70-CV50-... | | | | | | |
|---|---|---|---|---|---|---|
| C25/30 Element-heigth H [mm] | | V6 | V8 | V10 | VV | Rotation-stiffness C¹⁾ [kNm/rad] |
| | $M_{Rd}$ [kNm/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | |
| **160** | – | – | – | – | – | – |
| **170** | – | – | – | – | – | – |
| **180** | 43,8 | – | 99,5 | – | +99,5 −49,8 | 3275 |
| **190** | 48,8 | – | 99,5 | – | +99,5 −49,8 | 4111 |
| **200** | 53,9 | – | 99,5 | – | +99,5 −49,8 | 5043 |
| **210** | 59,0 | – | 99,5 | – | +99,5 −49,8 | 6070 |
| **220** | 64,1 | – | 99,5 | – | +99,5 −49,8 | 7192 |
| **230** | 69,2 | – | 99,5 | – | +99,5 −49,8 | 8409 |
| **240** | 74,3 | – | 99,5 | – | +99,5 −49,8 | 9721 |
| **250** | 79,4 | – | 99,5 | – | +99,5 −49,8 | 11128 |

| K80-CV50-...E | | | | | | |
|---|---|---|---|---|---|---|
| Element-heigth H [mm] | C25/30 | C30/37 | V8 | V10 | VV | Rotation-stiffness C¹⁾ [kNm/rad] |
| | $M_{Rd}$ [kNm/m] | $M_d$ [kNm/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | |
| **160** | – | – | – | – | - / - | – |
| **170** | – | – | – | – | - / - | – |
| **180** | 43,2 | 45,5 | 99,5 | – | - / - | 3761 |
| **190** | 48,3 | 50,9 | 99,5 | – | - / - | 4735 |
| **200** | 53,4 | 56,2 | 99,5 | – | - / - | 5820 |
| **210** | 58,5 | 61,6 | 99,5 | – | - / - | 7017 |
| **220** | 63,6 | 66,9 | 99,5 | – | - / - | 8326 |
| **230** | 68,7 | 72,3 | 99,5 | – | - / - | 9747 |
| **240** | 73,8 | 77,6 | 99,5 | – | - / - | 11279 |
| **250** | 78,9 | 83,0 | 99,5 | – | - / - | 12924 |




*Cross-section: Schöck Isokorb® type K60 E*




*Cross-section: Schöck Isokorb® type K80 E*

¹⁾ Rotational spring for the analysis of the deflection for a cantilever as the result of the Schöck Isokorb® anchor being loaded (see page 49).

# Schöck Isokorb® type K

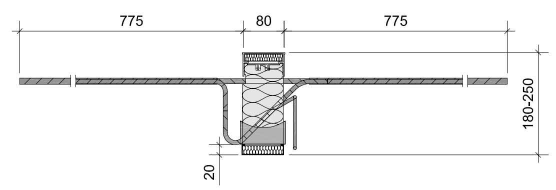
## Capacity tables K-CV50



**Capacities are design values in the ultimate limit state (ULS). (Example of calculation on page 49).**

| K90-CV50-... | | | | | | |
|---|---|---|---|---|---|---|
| C25/30 Element-heigth H [mm] | | V6 | V8 | V10 | VV | Rotation-stiffness C[1)] [kNm/rad] |
| | $M_{Rd}$ [kNm/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | |
| **160** | – | – | – | – | – | – |
| **170** | – | – | – | – | – | – |
| **180** | 49,2 | – | 99,5 | – | +99,5 −49,8 | 3848 |
| **190** | 55,0 | – | 99,5 | – | +99,5 −49,8 | 4831 |
| **200** | 60,7 | – | 99,5 | – | +99,5 −49,8 | 5926 |
| **210** | 66,4 | – | 99,5 | – | +99,5 −49,8 | 7132 |
| **220** | 72,1 | – | 99,5 | – | +99,5 −49,8 | 8450 |
| **230** | 77,9 | – | 99,5 | – | +99,5 −49,8 | 9880 |
| **240** | 83,6 | – | 99,5 | – | +99,5 −49,8 | 11422 |
| **250** | 89,3 | – | 99,5 | – | +99,5 −49,8 | 13075 |

| K100-CV50-... | | | | | | |
|---|---|---|---|---|---|---|
| Element-heigth H [mm] | C25/30 | C30/37 | V8 | V10 | VV | Rotation-stiffness C[1)] [kNm/rad] |
| | $M_{Rd}$ [kNm/m] | $M_d$ [kNm/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | $V_{Rd}$ [kN/m] | |
| **160** | – | – | – | – | – | – |
| **170** | – | – | – | – | – | – |
| **180** | 49,2 | 53,3 | – | 124,4 | +124,4 −49,8 | 4253 |
| **190** | 55,0 | 59,4 | – | 124,4 | +124,4 −49,8 | 5340 |
| **200** | 60,7 | 65,6 | – | 124,4 | +124,4 −49,8 | 6550 |
| **210** | 66,4 | 71,8 | – | 124,4 | +124,4 −49,8 | 7883 |
| **220** | 72,1 | 78,0 | – | 124,4 | +124,4 −49,8 | 9340 |
| **230** | 77,8 | 84,2 | – | 124,4 | +124,4 −49,8 | 10920 |
| **240** | 83,6 | 90,4 | – | 124,4 | +124,4 −49,8 | 12624 |
| **250** | 89,3 | 96,6 | – | 124,4 | +124,4 −49,8 | 14452 |



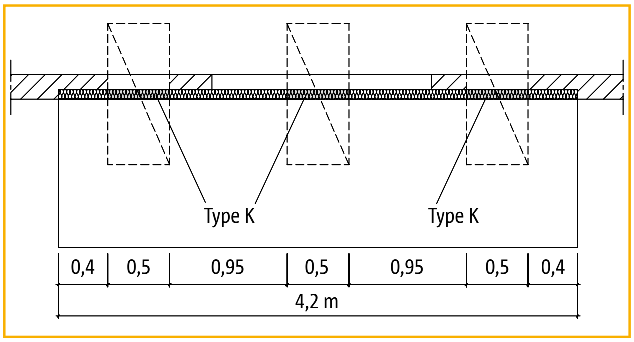

*Cross-section: Schöck Isokorb® type K70, K90, K100*

[1)] Rotational spring for the analysis of the deflection for a cantilever as the result of the Schöck Isokorb® anchor being loaded (see page 49).

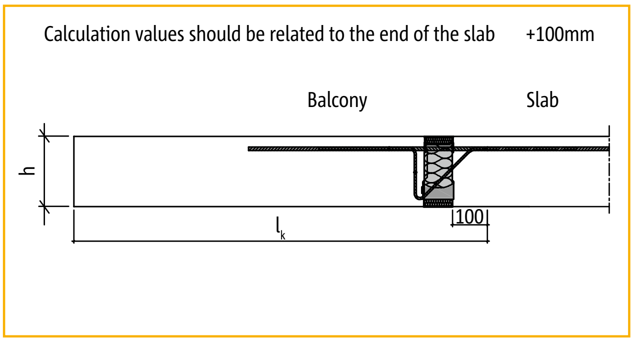
# Schöck Isokorb® type K
## Calculation example

### Calculation example

Given: free cantilevered balcony




*Plan view: Schöck Isokorb® type K*




*Cross-section: Schöck Isokorb® type K*

### Geometry

| | | |
|---|---|---|
| Cantilevery length | $l_k$ | = 2,00 m |
| Balcony slab thickness | h | = 0,20 m |
| Balcony length | B | = 4,20 m |
| Concrete | | C30/37 |

# Schöck Isokorb® type K
Calculation example



## Loads

| | | | | |
|---|---|---|---|---|
| **Permanent loads** | | | | |
| Balcony slab | 25 · 0,20 | $g_1$ = 5,00 kN/m² | $p_{1:min}$ = 5,00 kN/m² | $p_{1:max}$ = 6,00 kN/m² |
| Railing | | $G_2$ = 1,00 kN/m | $P_{2:min}$ = 1,00 kN/m | $P_{2:max}$ = 1,20 kN/m |
| Facade masonry | 35 % · 2,70 m · 1,8 kN/m² = | $G_3$ = 1,70 kN/m | $P_{3:min}$ = 1,70 kN/m | $P_{3:max}$ = 2,04 kN/m |

| | | | |
|---|---|---|---|
| Live load | q = 4,00 kN/m² | $q_{min}$ = 4,00 kN/m² | $q_{max}$ = 6,00 kN/m² |

Load combinations:

$p_d = 1.2 \cdot g_1 + 1{,}5 \cdot q = 12{,}0$ kN/m²
$P_d = 1{,}2 \cdot G_2 + 1{,}2 \cdot G_3 = 3{,}24$ kN/m

## Resulting compression forces

$V_{Ed} = l_k \cdot B \cdot p_d + P_d \cdot B$
$V_{Ed} = (2{,}0 \cdot 4{,}2 \cdot 12{,}0) + (3{,}24 \cdot 4{,}2) = 114{,}4$ kN

$M_{Ed} = p_d \cdot B \cdot l_k \cdot l_k/2 + P_d \cdot B \cdot l_k =$
$M_{Ed} = (12{,}0 \cdot 4{,}2 \cdot 2{,}0 \cdot 2{,}0/2) + (1{,}2 \cdot 4{,}2 \cdot 2{,}0) = 110{,}88$ kNm

## Chosen Schöck Isokorb®

Schöck Isokorb® type K100-CV35-V10-H200, placement acc. Situation 1a, page 29.

$M_{Rd}$ = 74,9 kNm    $V_{Rd}$ = 124,4 kN

Connection length: $L = M_{Ed} / M_{Rd} = 110{,}88 / 74{,}9 = 1{,}48$ m (decisive)
$L = V_{Ed} / V_{Rd} = 114{,}4 / 124{,}4 = 0{,}92$ m

Checking of the free distance:
$0{,}4 \cdot b + 2 \cdot b + 0{,}4 \cdot b + 1{,}5\text{m} = 4{,}2$ m    => $b = 0{,}96\text{m} < 1{,}0$ m

$M_{Rd} = 1{,}5 \cdot 74{,}9$ kNm = 112,4 kNm > $M_{Ed}$
$V_{Rd} = 1{,}5 \cdot 124{,}4$ kN = 186,6 kN > $V_{Ed}$

Checking of the deformation under quasi permanent loads
*Schöck Isokorb® rotation-stiffness C=8596 [kNm/rad]*
Resulting in *extra* deformation by quasi permanent loads:

$M_{mom} = ((1{,}0 \cdot 5{,}00 + 0{,}3 \cdot 4{,}0) \cdot 4{,}2 \cdot 2{,}0 \cdot 2{,}0/2) + (1{,}0 \cdot 4{,}2 \cdot 2{,}0) = 60{,}48$ kNm
Deformation = 60,48 / (1,5 · 8596) · 2000 = 9,4 mm
The deformation of the floor is not included in this calculation.

Look also to the checklist page 58.

# Schöck Isokorb® type K

## Additional reinforcement

### Splitting reinforcement

If the Schöck Isokorb® type K is located near the edge of a concrete element (e.g. balcony) or against the edge of the floor perpendicularly to the length of the Schöck Isokorb® element and the distance a is smaller than 100 mm, then a hairpin ø 6 mm must be added as splitting reinforcement at 50 mm from the Schöck Isokorb® element (see Figure 8).

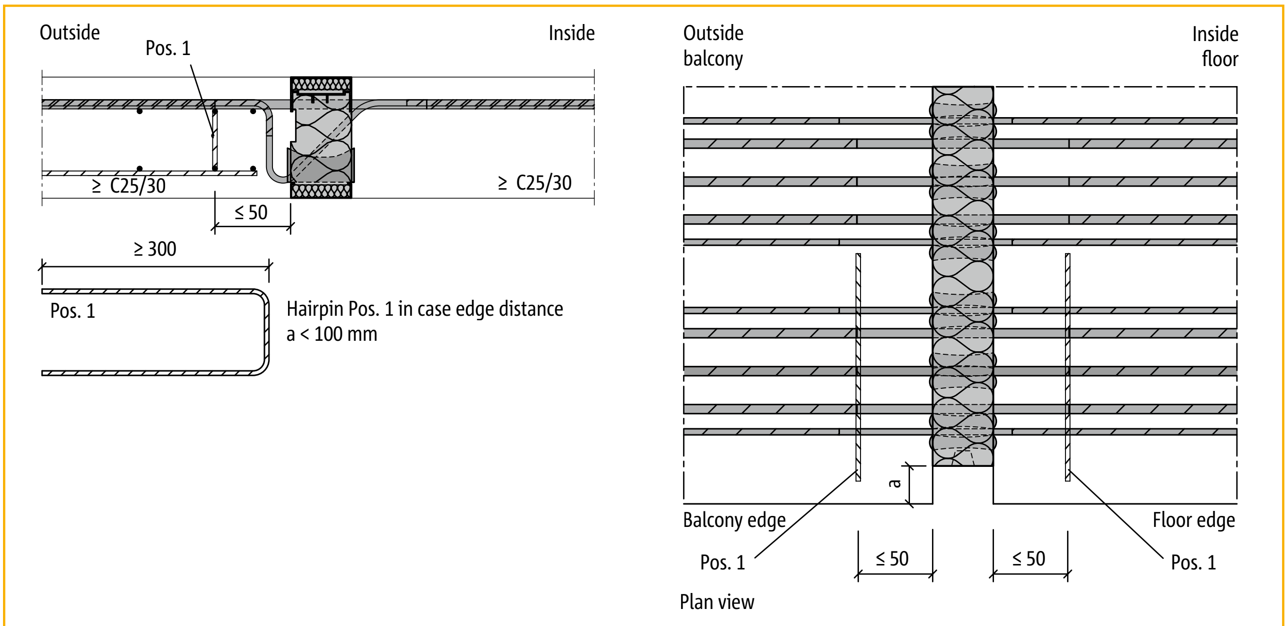



*Figure 8: Schöck Isokorb® type K.. additional reinforcement Pos. 1*

### Suspension reinforcement

For a proper introduction of the shear force in the Schöck Isokorb® type K it is advised to include additional reinforcement in the outside component (balcony). This reinforcement as hairpins is considered as so-called "suspension reinforcement" for the situations where the Isokorb® element is not placed at the bottom of the concrete element (see Figure 9).
The required amount of reinforcement is indicated in the table. This reinforcement may also be included as extra mm² in the already provided amount of reinforcement.

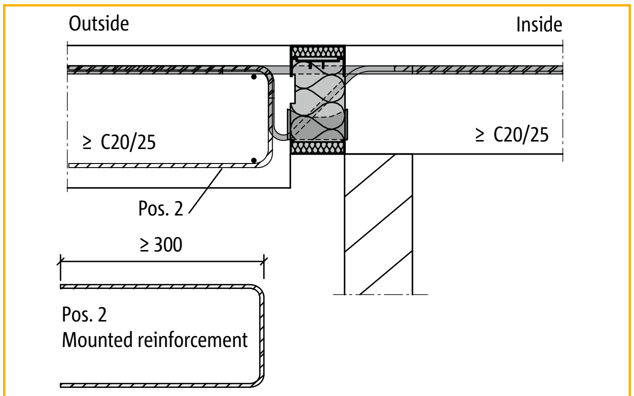



*Figure 9: Schöck Isokorb® type K.. additional reinforcement Pos. 2*

| Suspension reinforcement (Pos. 2) | | |
|---|---|---|
| Schöck Isokorb® type | $A_s$ [mm²] | $A_{s;selected}$ hairpins |
| K10-V6 | 64 | ø 6-250 |
| K20-E-V8 | 229 | ø 8-125 |
| K30-V6 | 97 | ø 8-250 |
| K40-V6 | 97 | ø 8-250 |
| K50-V6 | 97 | ø 8-250 |
| K60-E-V8 | 229 | ø 8-125 |
| K70-V8 | 171 | ø 8-150 |
| K80-E-V8 | 229 | ø 8-125 |
| K90-V8 | 200 | ø 8-125 |
| K100-V10 | 286 | ø 8-125 |

The responsible structural engineer must check/calculate if the adjacent concrete cross-section is capable of coping with the reaction forces that will develop at the location of the anchor. Depending on the design condition, like the size of the force, position in the cross-section and available concrete grades the analysis could indicate that any additional reinforcement is not required.

# Schöck Isokorb® type K

## Installation situation for precast concrete floor slabs

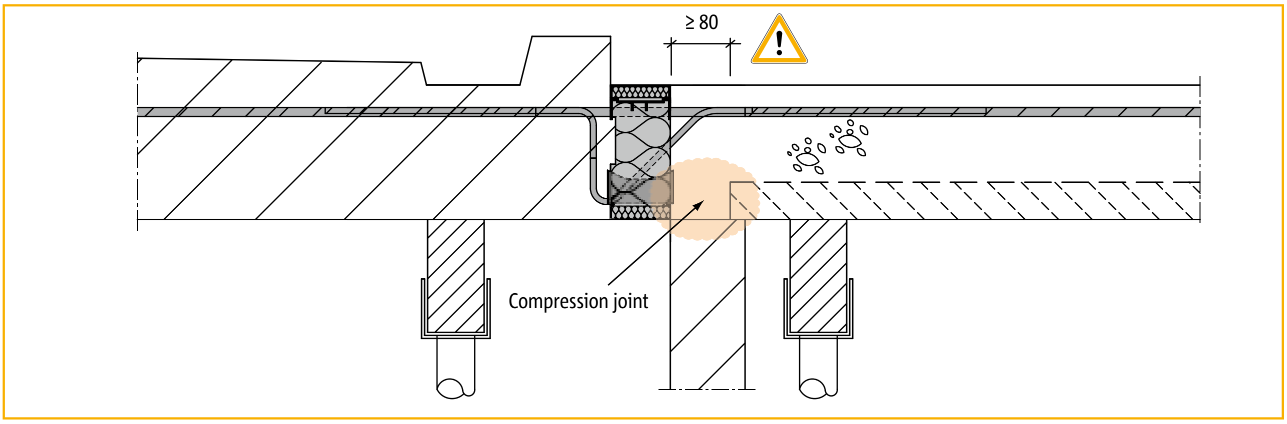
### Pressure joint between concrete precast planks and Schöck Isokorb® type K

In the case of installation with concrete precast planks the space between the plank and the Schöck Isokorb® type K must be at least 80 mm for proper filling and compacting of the concrete pour in order to ensure the proper transfer of compression forces.

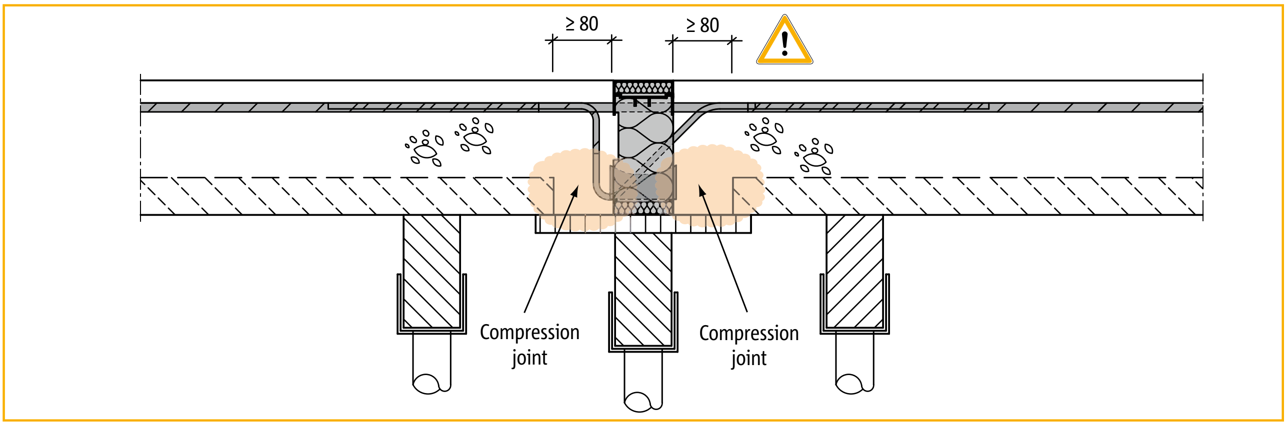
**Supplement:**
The size of 80 mm is in accordance with the regulations that apply to two adjoining precast planks, where it is desired to activate the entire construction height for the transfer of the internal moments. This execution is required in a situation with a Schöck Isokorb® type K to guarantee a proper transfer of the compression forces from the compression bearings to the adjacent concrete floor. In this case it is essential that proper filling and compacting of the concrete pour is ensured!



Note:
In no event shall openings, pipes, insulation, foam tape, PUR- foam etc. be present behind these Schöck Isokorb® compression bearings. This could seriously jeopardise the stability and structural safety!




*Installation situation 1: one-sided filigran floor slab connection with Schöck Isokorb® type K*

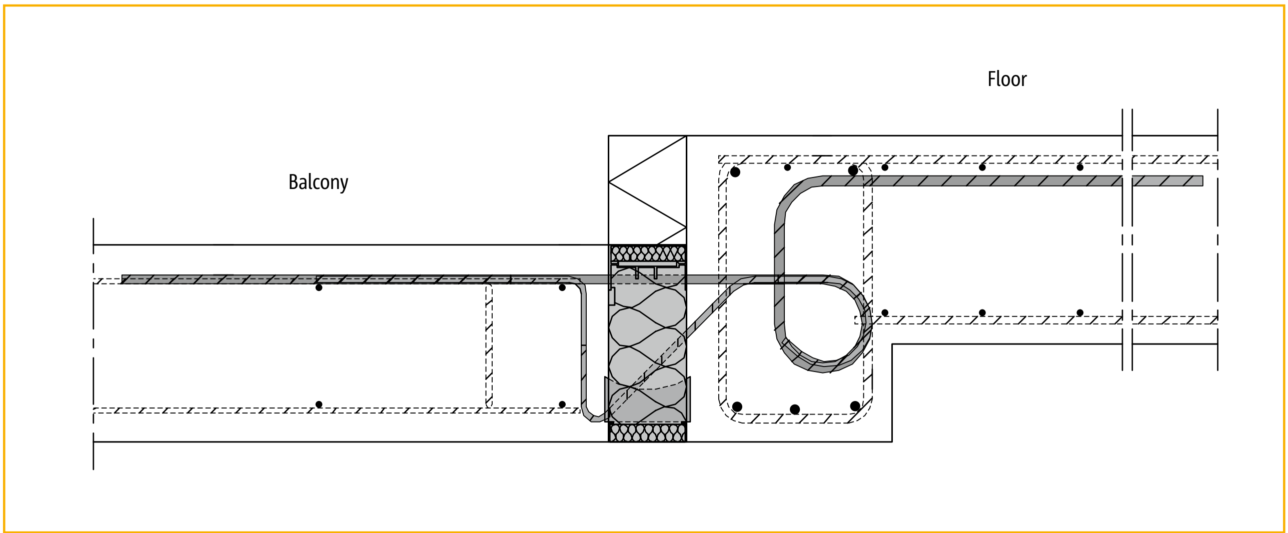



*Installation situation 2: two-sided filligran floor slab connection with Schöck Isokorb® type K*

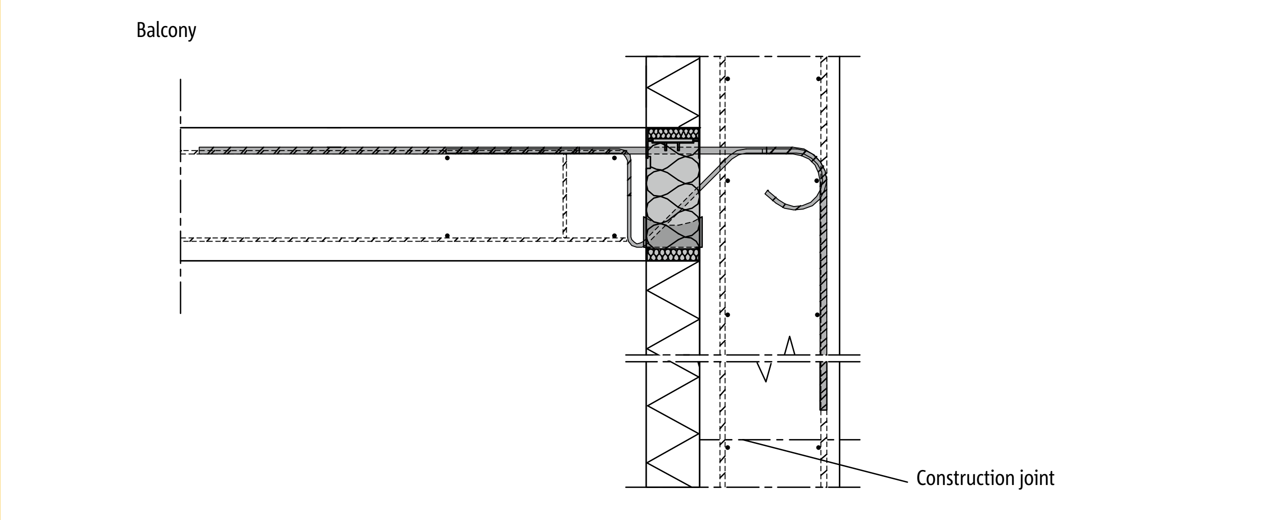
# Schöck Isokorb® type K

## Special designs/Custom made

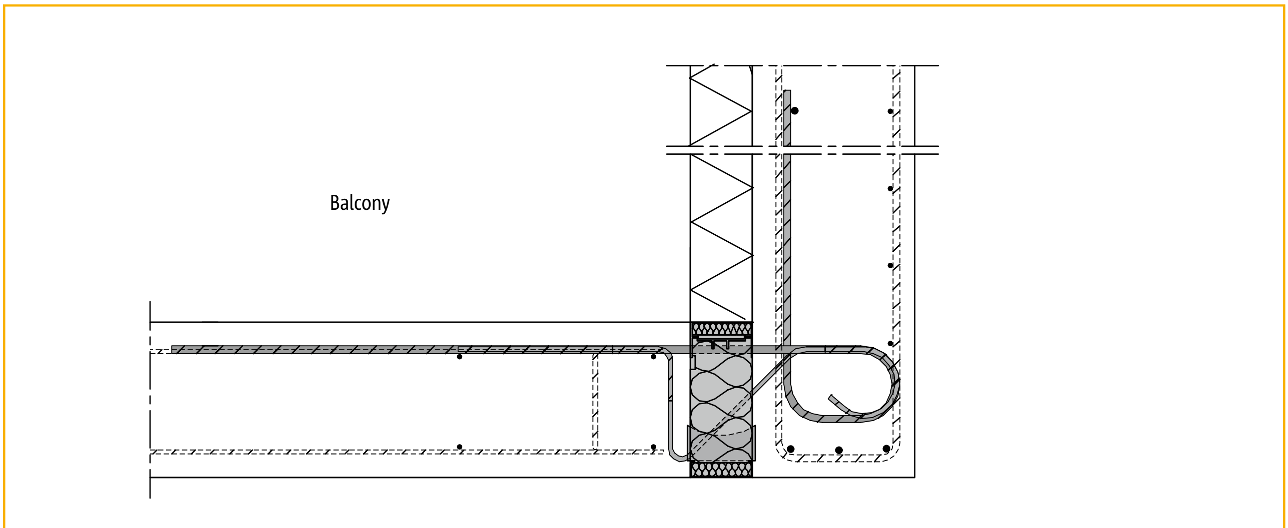





*Connection with schöck Isokorb® type K..sk (sk = special design beam-floor connection upwards)*

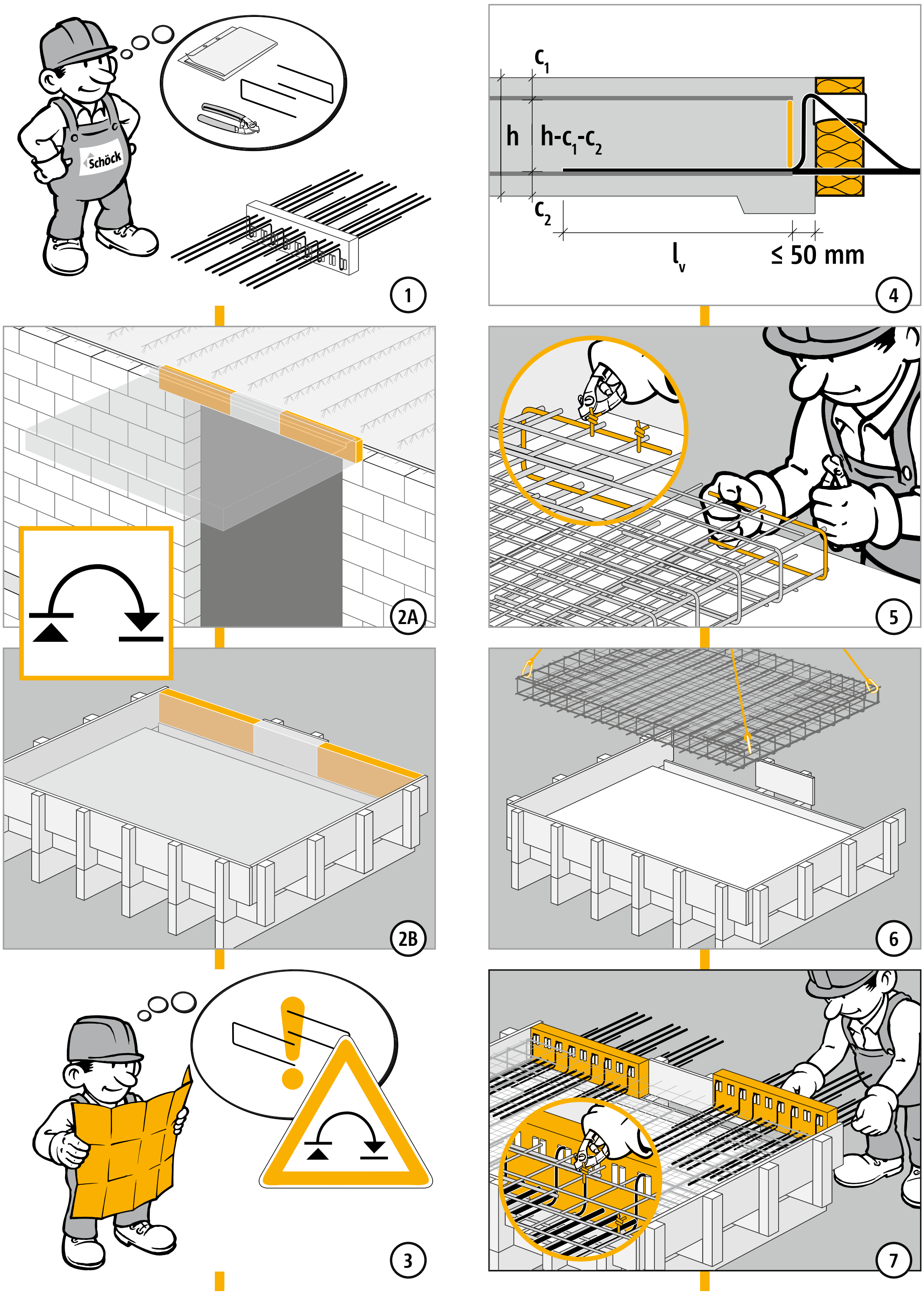



*Connection with schöck Isokorb® type K..sk (sk = special design wall connection downwards)*



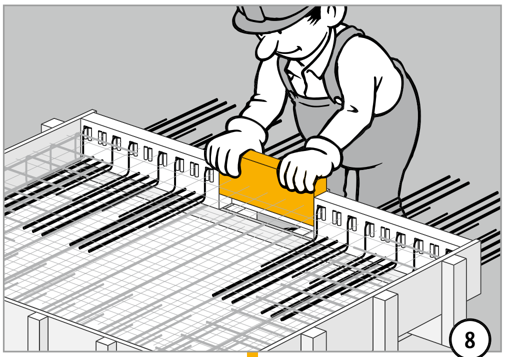

*Connection with schöck Isokorb® type K..sk (sk = special design wall connection upwards)*

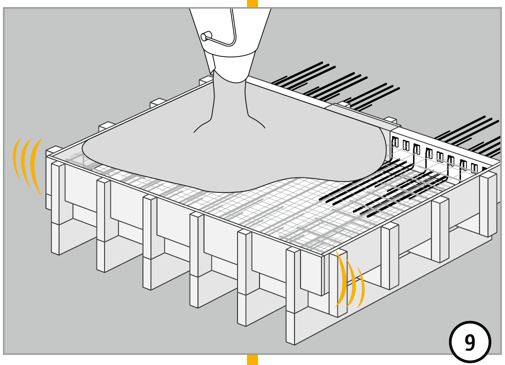
# Schöck Isokorb® type K
## Method statement precast

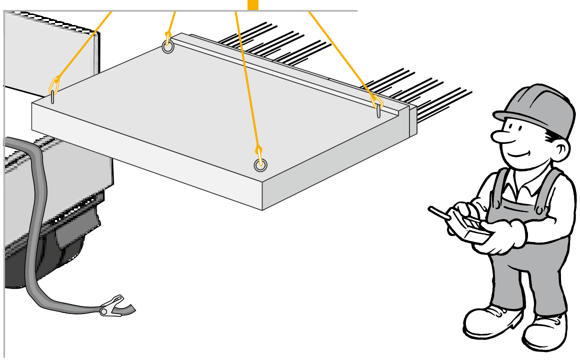


# Schöck Isokorb® type K
Method statement precast



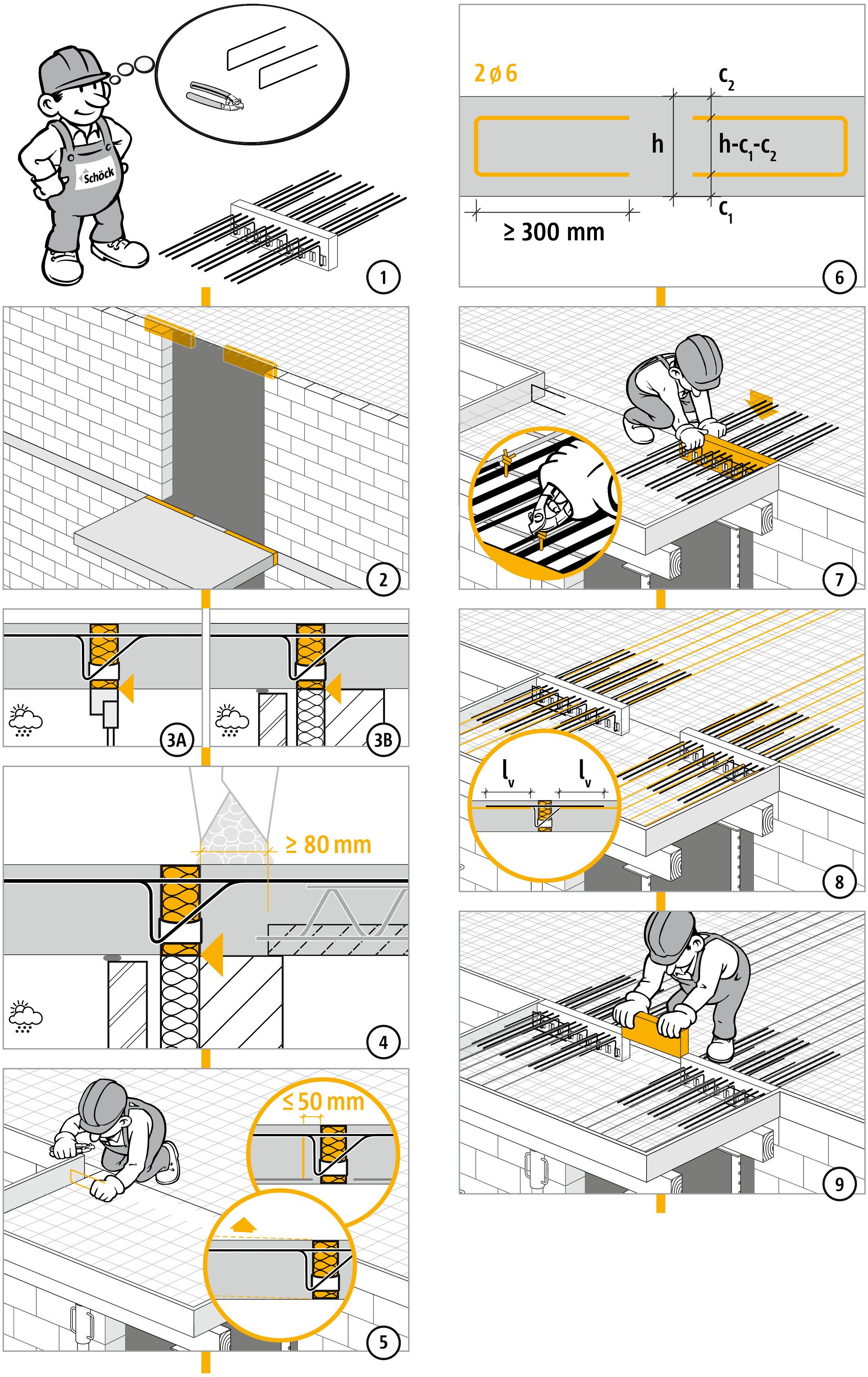


# Schöck Isokorb® type K

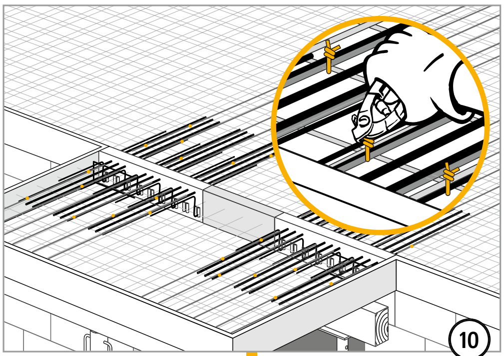
Method statement on site

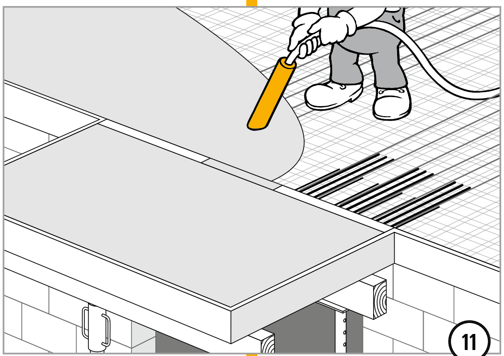



K

Reinforced concrete-to-reinforced concrete

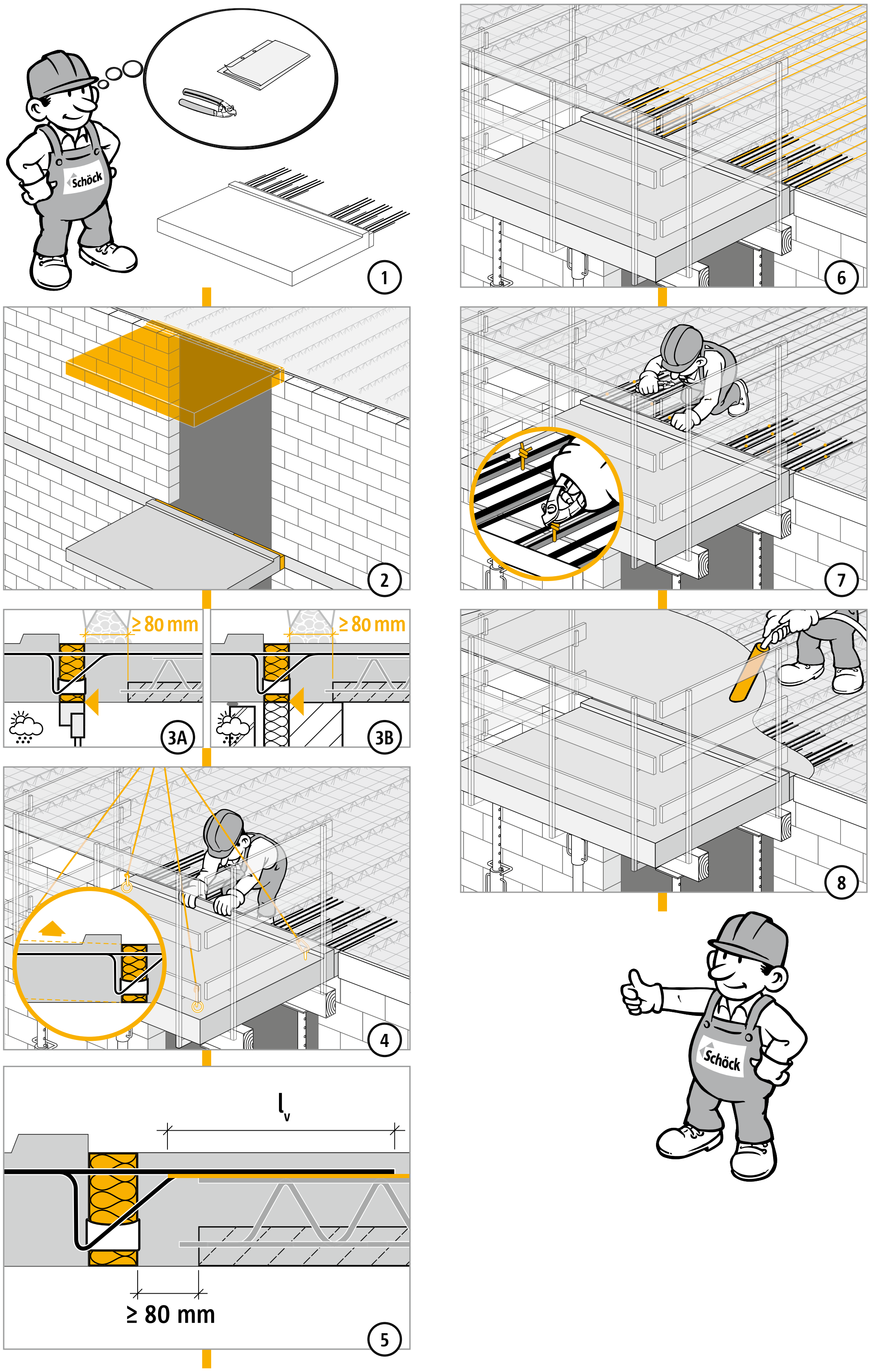
# Schöck Isokorb® type K
## Method statement on site




# Schöck Isokorb® type K

## Method statement precastelement on site



# Schöck Isokorb® type K
## Checklist

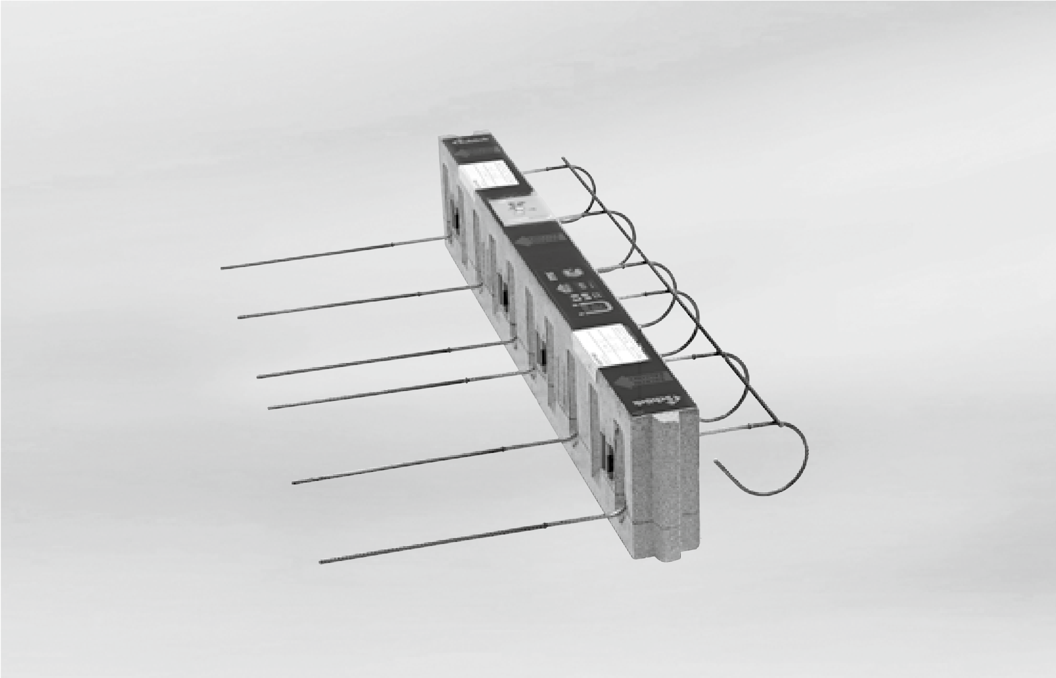
HTE MODUL

K

Reinforced concrete-to-reinforced concrete

- ☐ Does the design comply with the minimal requirements for the (concrete) strength class and environmental class?
- ☐ Is this a situation for which the construction must be checked as an accidental case or is there a special loading situation during the construction stage?
- ☐ Have the member forces on the Schöck Isokorb® connection been determined at the design level?
- ☐ Has the concrete cover and (concrete) strength class been taken into account as stipulated in the capacity table (page 42 - 47)?
- ☐ Has the maximum allowable bar distance been taken into account (page 28)?
- ☐ Is there a difference in stiffness of the supports (statically indeterminate structure), which must be taken into account during the design of the dimensions (page 32)?
- ☐ For the calculation of the deformation in the service limit state of the structure next to the direct deformation and concrete creep, has also the additional deformation from the Schöck Isokorb® anchor been taken into account by the responsible structural engineer (page 30, 48-49)?
- ☐ Have the discomforting vibrations from cantilevers been prevented in the design (page 30)?
- ☐ Have the adjacent concrete components (inside and outside) of Schöck Isokorb® element been checked by the responsible structural engineer for the calculation design values of $M_{Ed}$ and $V_{Ed}$?
- ☐ Is the required additional reinforcement determined (page 50)?
- ☐ Has the right type of Schöck Isokorb® been chosen in the case of multi-sided (2, 3, 4 sides) supports of the concrete element in order to avoid restraining effects?
- ☐ Is in the structural connection for the Schöck Isokorb® type K behind the compression bearing (at least 80 mm) sufficient spacing been provided, so that this zone (compression joint) can be properly filled and compacted (page 51)?
- ☐ Has the required deflection for dewatering been taken into account for a proper alignment of the concrete element, next to the calculated deformation by the concrete and the Schöck Isokorb®?
- ☐ For the design of the corners zones have the minimal concrete depth (> 180 mm) and lateral reinforcement been taken into account (reinforcement in the 2nd layer)?
- ☐ For special customised solutions have the conditions been satisfied for the Schöck Isokorb® anchor within the shape box and the requirements of the EN 1992 for anchorage of the Schöck Isokorb® reinforcement bars outside the "shape box" (page 21)?
- ☐ Have the fire protection requirements been clarified, and are they reflected in the chosen type designation (F 120 execution) (page 25 - 26)?
- ☐ Is the Schöck Isokorb® type clearly described on structural drawings (page 129)? Example: Schöck Isokorb® type K50 CV35-H200-D80-L1000

# Schöck Isokorb® type Q, QP, Q+Q, QP+QP



*Schöck Isokorb® type Q 10*



**Contents** **Pagina**

# Schöck Isokorb® type Q, QP, Q+Q, QP+QP

## Examples of element arrangements and cross-sections

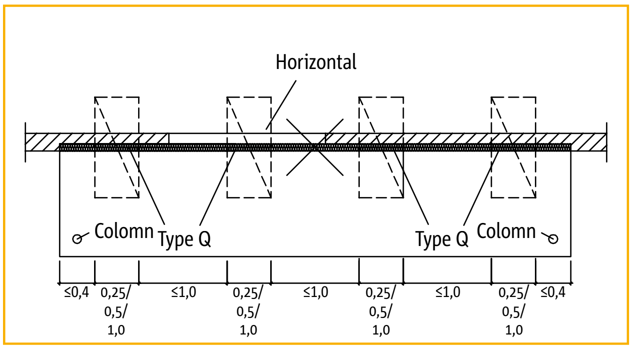



*Figure 1: Balcony supported with intermitent solution*

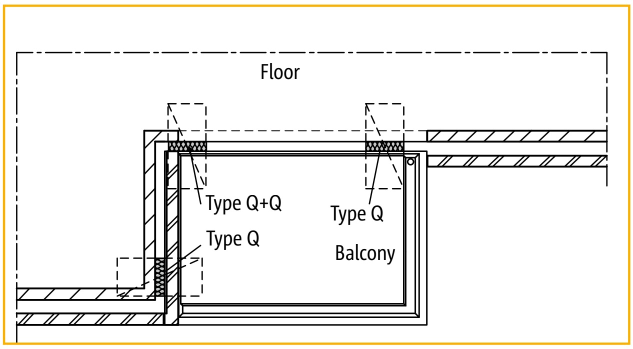



*Figure 2: Balcony supported on two sides with shearforce elements*

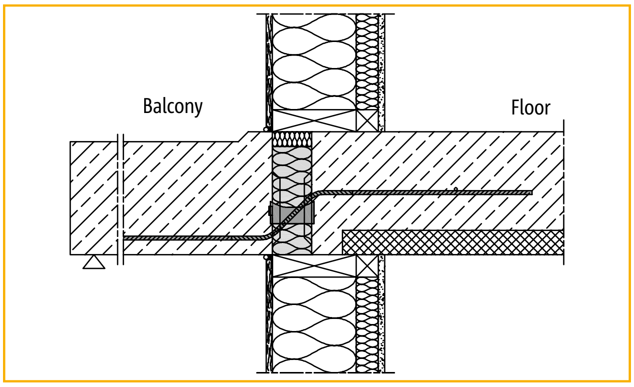



*Figure 3: Balcony at the same level as the inside slap*

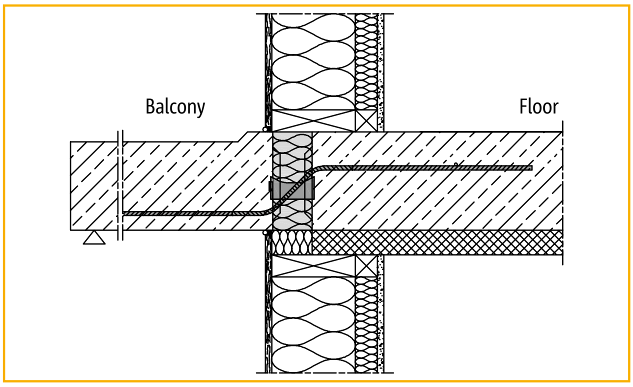



*Figure 4: Balconies and slap with different heights*

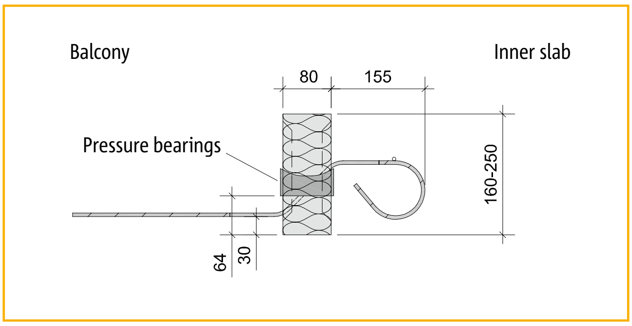
# Schöck Isokorb® type Q, QP

## Product description/Capacity tables and cross-sections

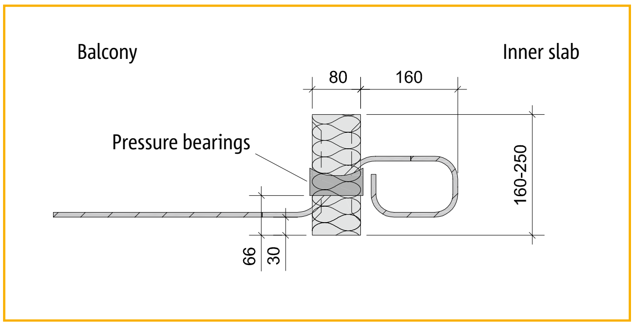
| Schöck Isokorb® type[1] | Reinforcement | | Element | | $V_{Rd}$ | |
|---|---|---|---|---|---|---|
| | Shearforce bars | Pressure bearings | Length [mm] | Standard height [mm] (F120) | C20/25 [kN/Element] | C25/30 [kN/Element] |
| **Q10** | 4 ø 6 | 4 | 1000 | 160 (170) | +30,2 | +34,8 |
| **Q40** | 8 ø 6 | 8 | 1000 | 160 (170) | +60,4 | +69,5 |
| **Q80 E** | 8 ø 8 | 8 | 1000 | 160 (170) | +105,2 | +123,7 |
| **Q100 E** | 8 ø 10 | 8 | 1000 | 170 (190) | +152,8 | +193,3 |
| **Q120 E** | 8 ø 12 | 8 | 1000 | 180 (190) | +241,2 | +275,2 |

| Schöck Isokorb® type[1][2] | Reinforcement | | Element | | $V_{Rd}$ | |
|---|---|---|---|---|---|---|
| | Shearforce bars | Pressure bearings | Length [mm] | Standard height* [mm] (F120) | C20/25 [kN/Element] | C25/30 [kN/Element] |
| **QP10 E[3]** | 2 ø 8 | 2 | 250 | 160 (170) | +26,3 | +30,9 |
| **QP20 E[3]** | 2 ø 10 | 2 | 250 | 170 (190) | +38,2 | +48,3 |
| **QP30 E** | 4 ø 8 | 4 | 500 | 160 (170) | +52,6 | +61,9 |
| **QP60 E[3]** | 2 ø 12 | 2 | 250 | 180 (190) | +60,3 | +68,8 |
| **QP80 E** | 4 ø 10 | 4 | 500 | 170 (190) | +76,4 | +96,6 |
| **QP90 E** | 4 ø 12 | 4 | 500 | 180 (190) | +120,6 | +137,6 |

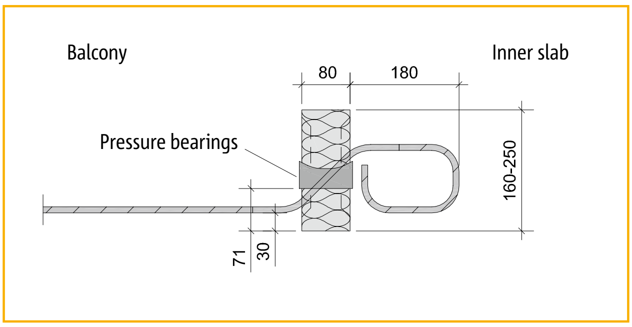
* Standard height is minimum height. Also available in heights ≤ 250 mm



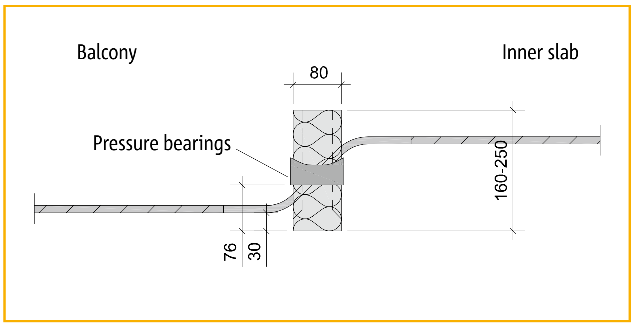

*Cross-section: Schöck Isokorb® type Q10, Q40*




*Cross-section: Schöck Isokorb® type Q80 E, QP10 E, QP30 E*




*Cross-section: Schöck Isokorb® type Q100 E, QP20 E, QP80 E*

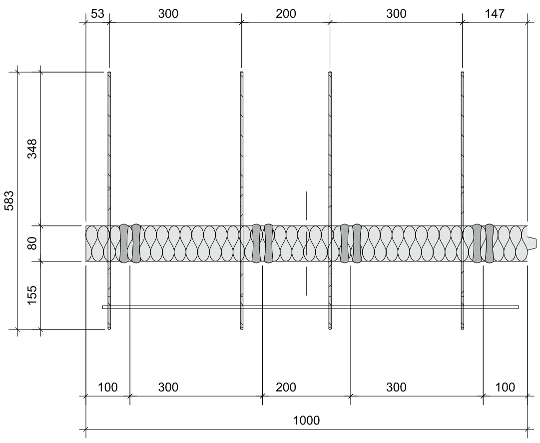



*Cross-section: Schöck Isokorb® type Q120 E, QP60 E, QP90 E*

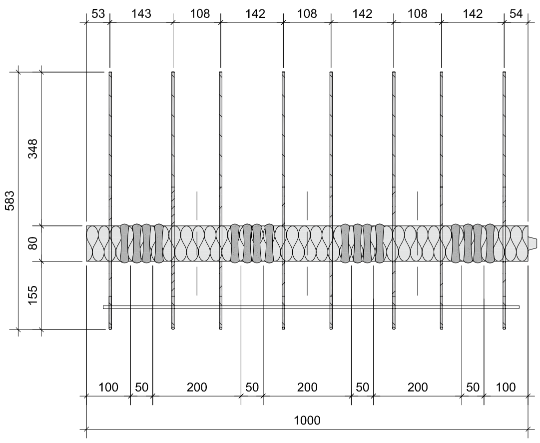
[1] All the types on this page are also available without pressurebearing elements, named QZ.. and QPZ.. These types must be applied if expansion of the concrete must be followed without high stresses.
[2] QP..; Isokorb® modul (multiple of 250 mm): Standard preferred type.
[3] When using this type it must be proven that failure of this element does not lead to progressive collapse. This will automatically fulfilled if not more than 83% of the capacity is used for testing the strength in the ultimate limit state (strength).

# Schöck Isokorb® type Q, QP

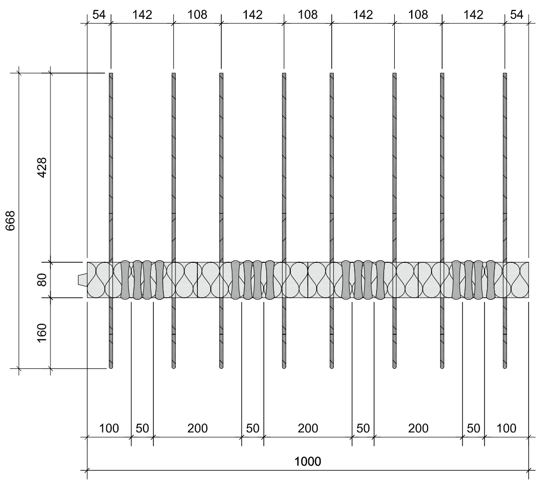
## Plan views



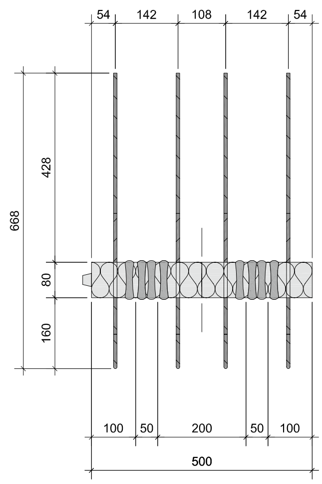

*Plan view: Schöck Isokorb® type Q10*



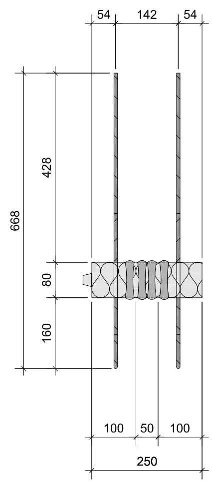

*Plan view: Schöck Isokorb® type Q40*




*Plan view: Schöck Isokorb® type Q80 E*



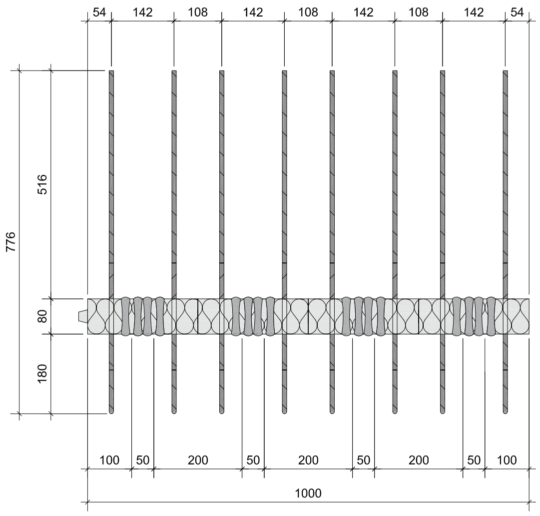

*type QP30 E*



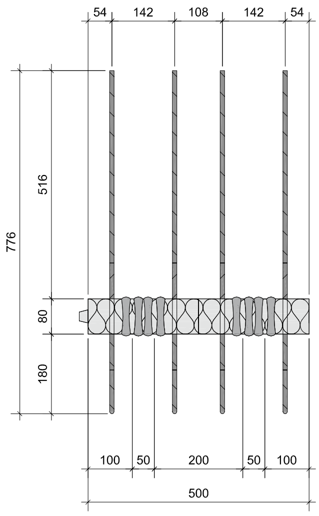

*type QP10 E*

# Schöck Isokorb® type Q, QP

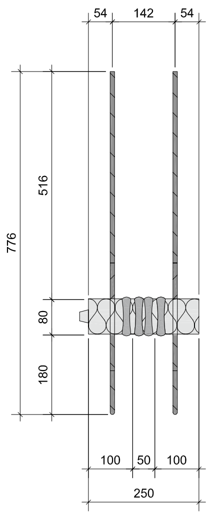
## Plan views



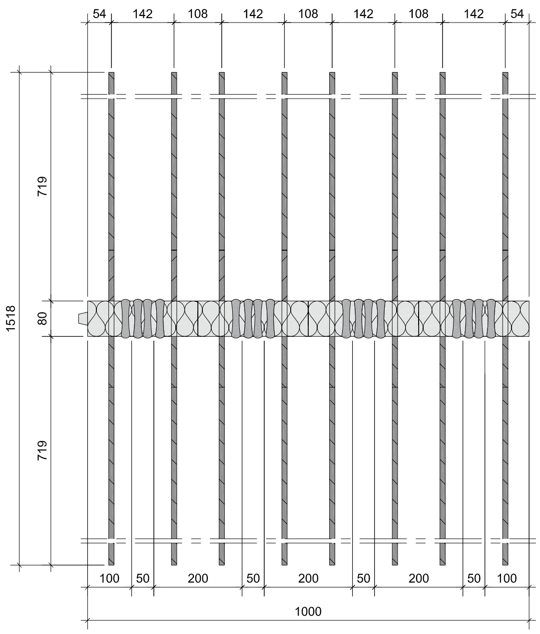

*Plan view: Schöck Isokorb® type Q100 E*



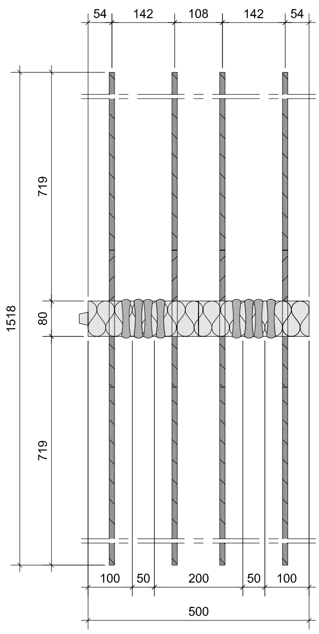

*type QP80 E*



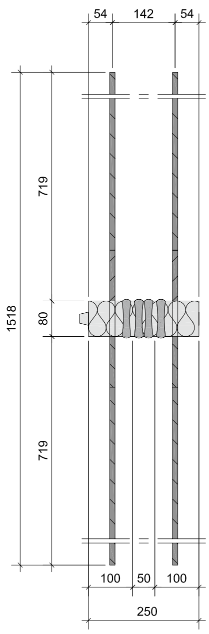

*type QP20 E*




*Plan view: Schöck Isokorb® type Q120 E*




*type QP90 E*




*type QP60 E*

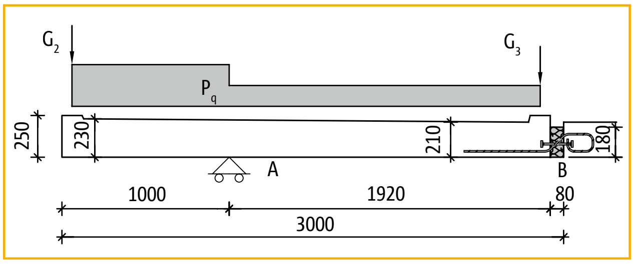
# Schöck Isokorb® type Q

## Calculation example

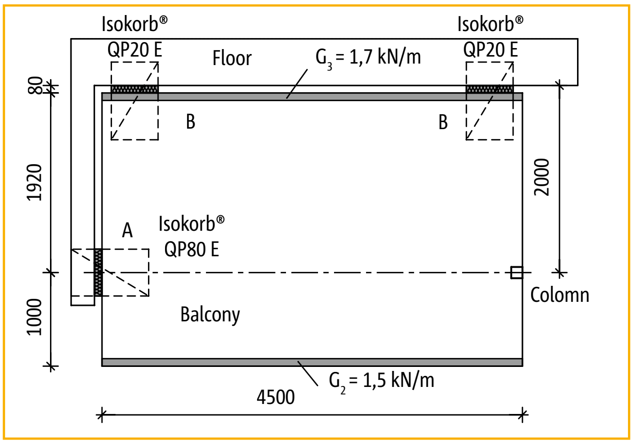
### Geometry

| | |
|---|---|
| Width | = 4500 mm |
| Cantilevery length[1)] | = 3000 mm |
| Balcony slab thickness | = 220 mm |
| Distance from floor edge to heart imposition | = 2000 mm |
| Concrete | C20/25 |

### Cross-section




### Plan view




### Loads

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Permanent loads** | | | | | | | |
| Balcony slab | 0,22 m · 25,0 kN/m³ = | $g_1$ | = 5,50 kN/m² | $g_{1:min}$ | = 5,50 kN/m² | $g_{1:max}$ | = 6,60 kN/m² |
| Railing | | $G_2$ | = 1,50 kN/m | $G_{2:min}$ | = 1,50 kN/m | $G_{2:max}$ | = 1,80 kN/m |
| Facade masonry | 35 % · 2,70 m · 1,8 kN/m² = | $G_3$ | = 1,70 kN/m | $G_{3:min}$ | = 1,70 kN/m | $G_{3:max}$ | = 2,04 kN/m |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Live load** | $q$ | = 4,00 kN/m² | $q_{min}$ | = 0,00 kN/m² | $q_{max}$ | = 6,00 kN/m² |

### Resulting compression forces

**Wear plate length per Isokorb® element = 2250 mm**

| | **Isokorb® element A** | | **Isokorb® element B** | | **Isokorb® element B** |
|---|---|---|---|---|---|
| **Permanent loads** | $V_{Ed,max}$ [kN] | | $V_{Ed,max}$ [kN] | | $V_{Ed,max}$ [kN] |
| $g_1$: 2,25 · 6,60 · (3,0 – 0,08) · 0,5 · (3,0 + 0,08)/2,0 = | 33,4 | 2,25 · 6,60 · 0,5 · (2,0 + 0,08)²/2,0 | | 2,25 · 5,5 · 0,5 · (2,0 + 0,08)²/2,0 | |
| | | – 2,25 · 5,5 · 0,5 · (3,0 – 2,0)²/2,0 = | 13,0 | – 2,25 · 6,60 · 0,5 · (3,0 – 2,0)²/2,0 = | 9,7 |
| $G_2$: 2,25 · 1,80 · 3,0/2,0 | = 6,1 | 2,25 · 1,5 · (3,0 – 2,0)/2,0 = | – 1,7 | 2,25 · 1,80 · (3,0 – 2,0)/– 2,0 = | – 2,0 |
| $G_3$: 2,25 · 2,04 · 0,08/2,0 | = 0,2 | 2,25 · 2,04 · (2,0 – 0,08)/2,0 = | 4,4 | 2,25 · 1,70 · (2,0 – 0,08)/2,0 = | 4,0 |
| Total Permanent loads | 39,7 | | 15,7 | | 11,7 |
| **Live loads** | | | | | |
| q: 2,25 · 6,0 · (3,0 – 0,08) · 0,5 · (3,0 + 0,08)/2,0 = | 30,4 | 2,25 · 6,0 · 0,5 · (2,0 + 0,08)²/2,0 = | 14,6 | – 2,25 · 6,0 · 0,5 · (3,0 – 2,0)²/2,0 = | – 3,4 |
| **Total perm. load + live load** | **70,1** | | **30,3** | | **8,3** |

### Chosen Schöck Isokorb®

**Element A: Schöck Isokorb® QP80 E, h=170, L500** $V_{Rd}$ = 76,4 kN > $V_{Ed}$ = 70,1 kN U.C. = 92 %
**Element B: Schöck Isokorb® QP20 E, h=170, L=250** $V_{Rd}$ = 38,2 kN > $V_{Ed}$ = 30,3 kN U.C. = 79 %
No upward reaction, otherwise apply type Q+Q!

**Look also to the checklist page 77.**

[1)] Included isolation thickness of the Schöck Isokorb®

# Schöck Isokorb® type Q+Q, QP+QP

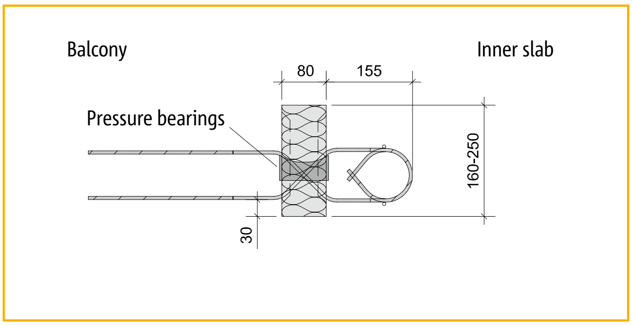
## Product description/Capacity tables type Q+Q

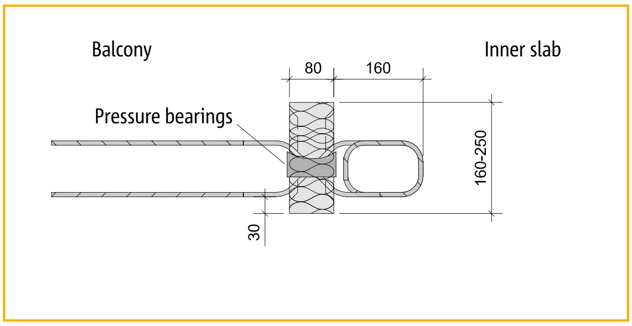


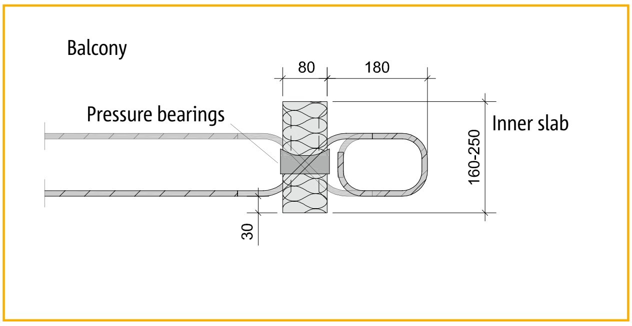
| Schöck Isokorb® type[1)] | Reinforcement | | Element | | $V_{Rd}$ | |
|---|---|---|---|---|---|---|
| | Shearforce bars | Pressure bearings | Length [mm] | Standard height* [mm] (F120) | C20/25 [kN/element] | C25/30 [kN/element] |
| Q10+Q10 | 2 x 4 Ø 6 | 4 | 1000 | 160 (170) | +30,2 | +34,8 |
| Q40+Q40 | 2 x 8 Ø 6 | 8 | 1000 | 160 (170) | +60,4 | +69,5 |
| Q80+Q80 E | 2 x 8 Ø 8 | 8 | 1000 | 160 (170) | +105,2 | +123,7 |
| Q100+Q100 E | 2 x 8 Ø10 | 8 | 1000 | 170 (190) | +152,8 | +193,3 |
| Q120+Q120 E | 2 x 8 Ø12 | 8 | 1000 | 180 (190) | +241,2 | +275,2 |

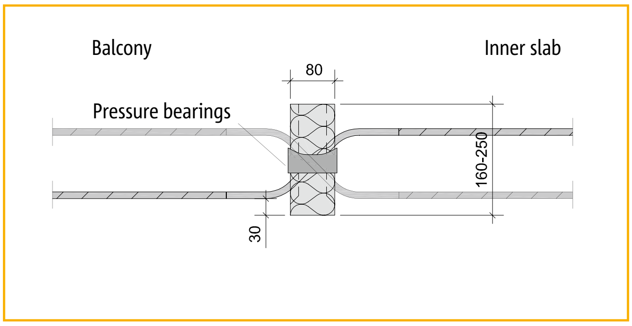
| Schöck Isokorb® type[1)2)] | Reinforcement | | Element | | $V_{Rd}$ | |
|---|---|---|---|---|---|---|
| | Shearforce bars | Pressure bearings | Length [mm] | Standard height* [mm] (F120) | C20/25 [kN/element] | C25/30 [kN/element] |
| QP10+QP10 E[2)] | 2 x 2 Ø 8 | 2 | 250 | 160 (170) | +26,3 | +30,9 |
| QP20+QP20 E[2)] | 2 x 2 Ø10 | 2 | 250 | 170 (190) | +38,2 | +48,3 |
| QP30+QP30 E | 2 x 4 Ø 8 | 4 | 500 | 160 (170) | +52,6 | +61,9 |
| QP60+QP60 E[2)] | 2 x 2 Ø12 | 2 | 250 | 180 (190) | +60,3 | +68,8 |
| QP80+QP80 E | 2 x 4 Ø10 | 4 | 500 | 170 (190) | +76,4 | +96,6 |
| QP90+QP90 E | 2 x 4 Ø12 | 4 | 500 | 180 (190) | +120,6 | +137,6 |

* Standard height is minimum height. Also available in heights ≤ 250 mm



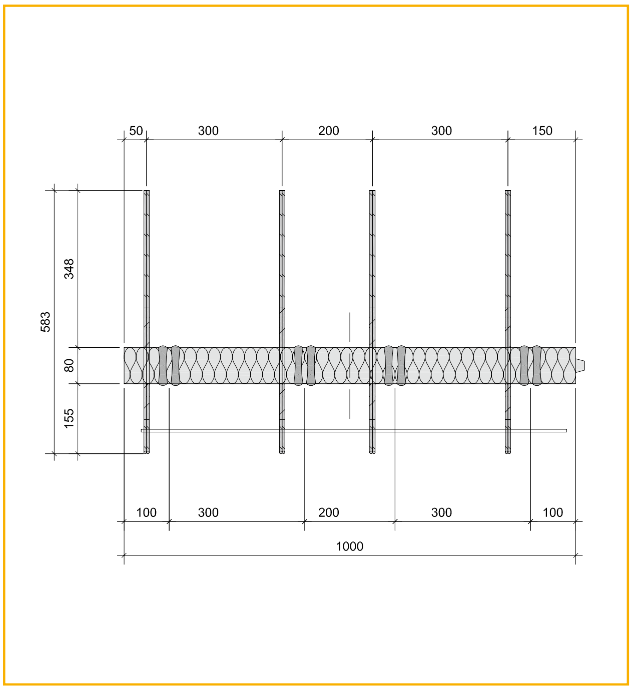



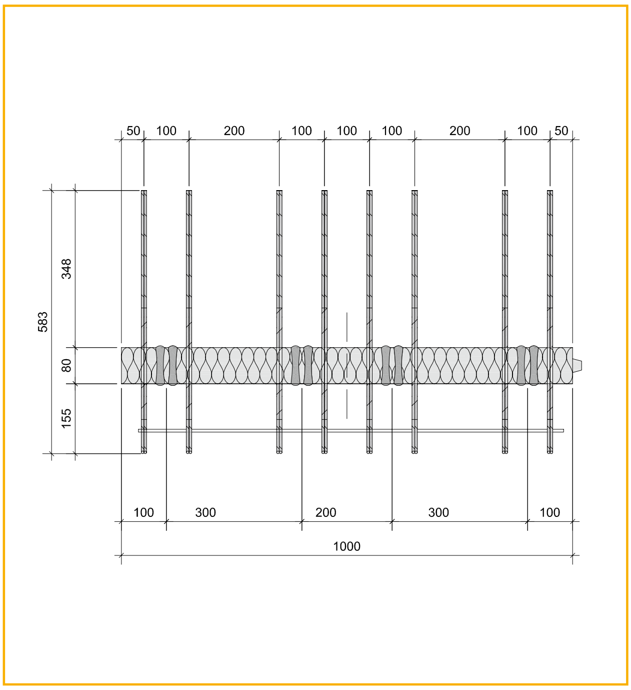

[1)] QP..; Isokorb® modul (multiple of 250 mm): Standard preferred type.
[2)] When using this type it must be proven that failure of this element does not lead to progressive collapse. This will automatically ful lled if not more than 83% of the capacity is used for testing the strength in the ultimate limit state (strength).

# Schöck Isokorb® type Q+Q, QP+QP

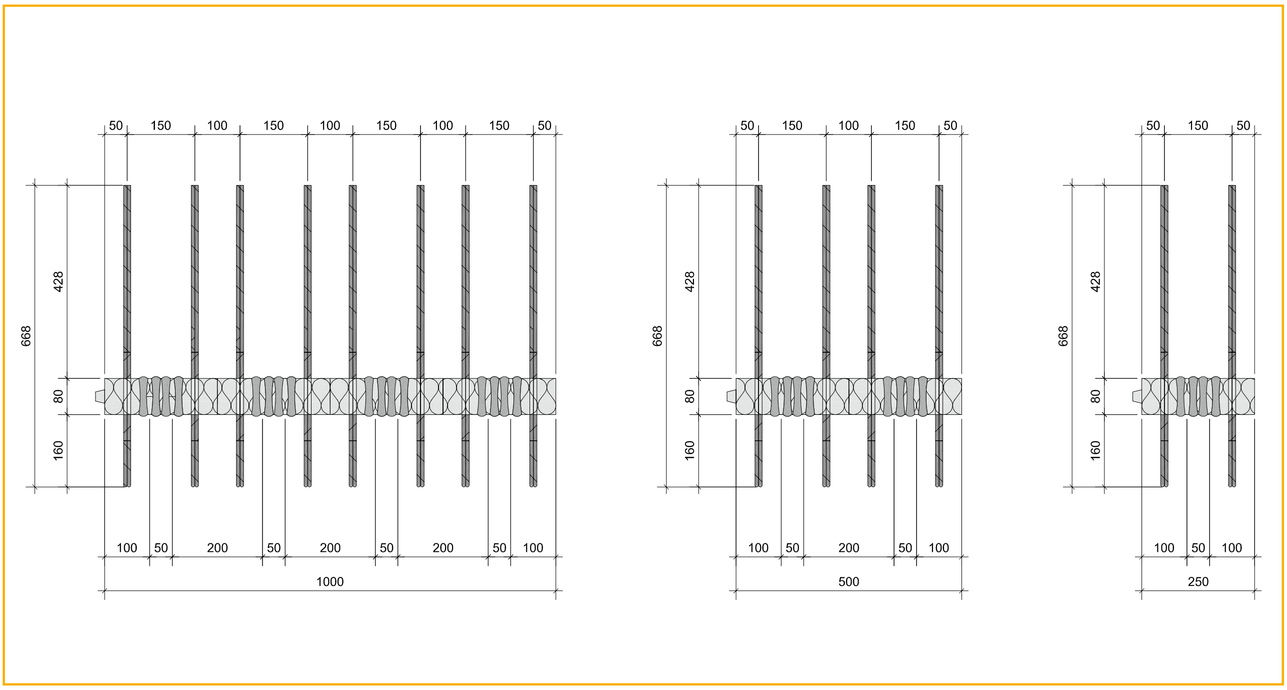
## Plan views




*Plan view: Schöck Isokorb® type Q10+Q10*




*Plan view: Schöck Isokorb® type Q40+Q40*



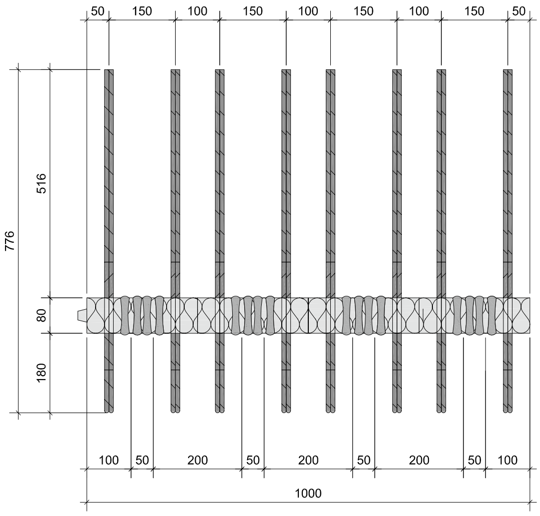

*Plan view: Schöck Isokorb® type Q80+Q80 E*

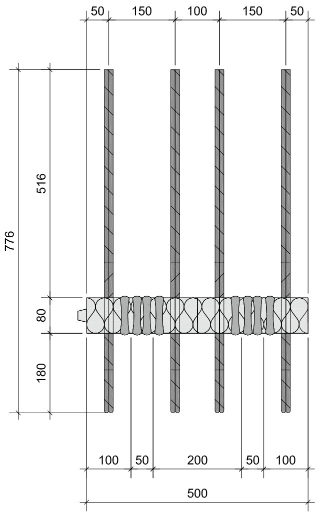
*type QP30+QP30 E*

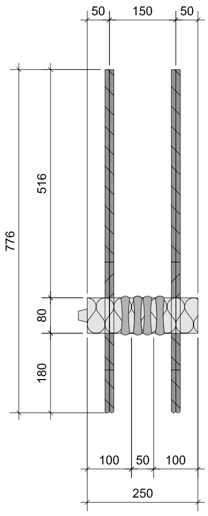
*type QP10+QP10 E*

# Schöck Isokorb® type Q+Q, QP+QP

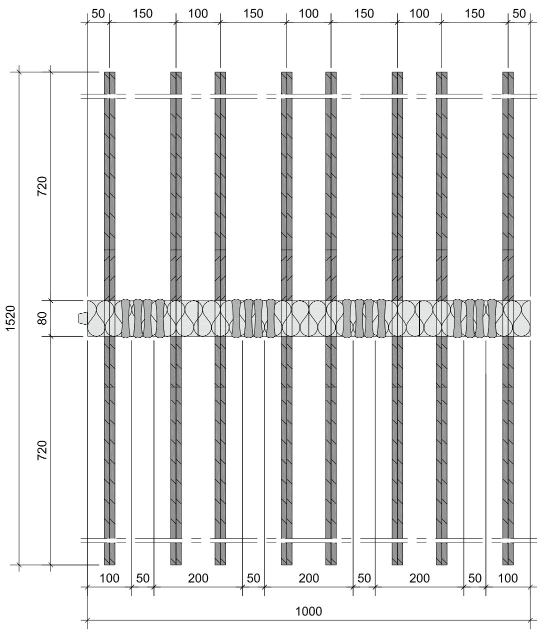
## Plan views

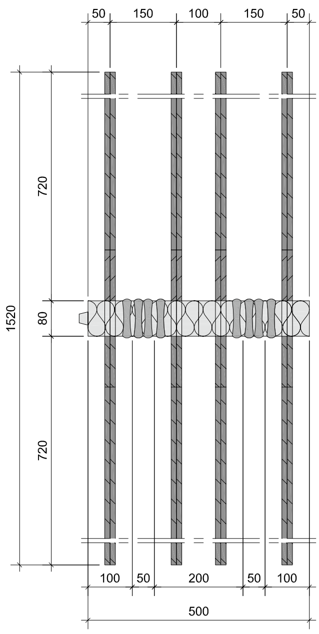


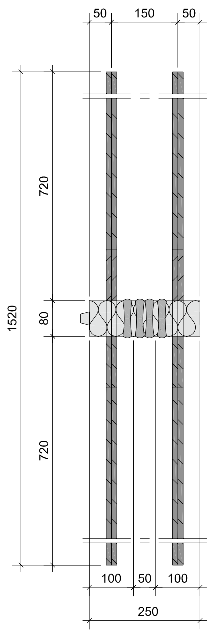




*Plan view: Schöck Isokorb® type Q100+Q100 E*     *type QP80+QP80 E*     *type QP20+QP20 E*




*Plan view: Schöck Isokorb® type Q120+Q120 E*     *type QP90+QP90 E*     *type QP60+QP60 E*

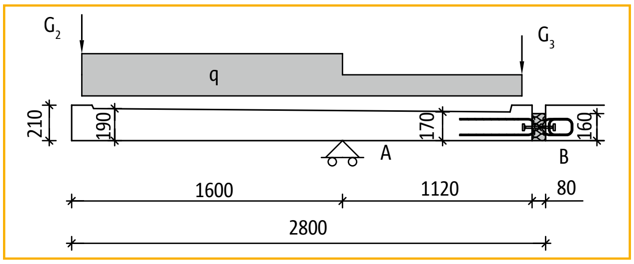
# Schöck Isokorb® type Q, Q+Q

## Calculation example type Q+Q

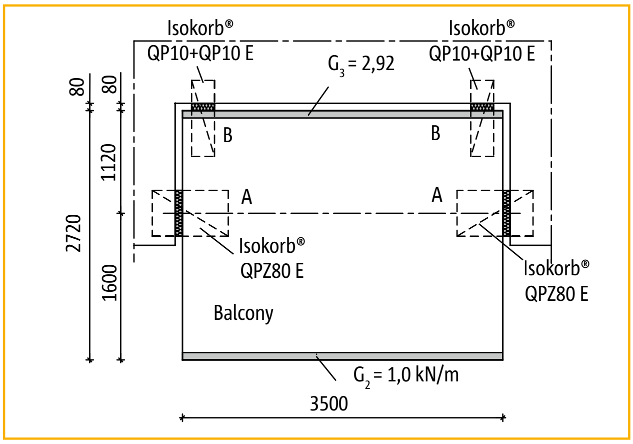
### Geometry

| | |
|---|---|
| Width | = 3500 mm |
| Cantilevery length | = 2800 mm |
| Balcony slab thickness | = 180 mm |
| Distance from floor edge to heart imposition | = 1200 mm |
| Concrete | C20/25 |

### Cross-section




### Plan view




### Loads

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Permanent loads** | | | | | | | |
| Balcony slab | 0,18 m · 25,0 kN/m³ = | $g_1$ | = 4,50 kN/m² | $g_{1:min}$ | = 4,50 kN/m² | $g_{1:max}$ | = 5,40 kN/m² |
| Railing | | $G_2$ | = 1,00 kN/m | $G_{2:min}$ | = 1,0 kN/m | $G_{2:max}$ | = 1,20 kN/m |
| Facade masonry | 60 % · 2,70 m · 1,8 kN/m² = | $G_3$ | = 2,92 kN/m | $G_{3:min}$ | = 2,62 kN/m | $G_{3:max}$ | = 3,50 kN/m |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Live load** | | $q$ | = 4,00 kN/m² | $q_{min}$ | = 4,00 kN/m² | $q_{max}$ | = 6,00 kN/m² |

### Resulting compression forces

**Wear plate length per Isokorb® element = 1750 mm**

| **Permanent loads** | **Isokorb® element A** $V_{Rd:max}$ **[kN]** | | **Isokorb® element B** $V_{Rd:max}$ **[kN]** | | **Isokorb® element B** $V_{Rd:max}$ **[kN]** |
|---|---|---|---|---|---|
| $g_1$: 1,75 · 5,40 · (2,8 – 0,08) · 0,5 · (2,8 + 0,08)/1,2 = | 30,8 | 1,75 · 5,40 · 0,5 · (1,2 + 0,08)²/1,2 | | 1,75 · 4,50 · 0,5 · (1,2 + 0,08)²/1,2 | |
| | | –1,75 · 4,50 · 0,5 · (2,8 – 1,2)²/1,2 = | –1,9 | –1,75 · 5,4 · 0,5 · (2,8 – 1,2)²/1,2 = | –4,7 |
| $G_2$: 1,75 · 1,2 · 2,8/1,2 = | 4,9 | 1,75 · 1,0 · (2,8 – 1,2)/– 1,2 = | –2,1 | 1,75 · 1,2 · (2,8 – 1,2)/– 1,2 = | –2,8 |
| $G_3$: 1,75 · 3,50 · 0,08/1,2 = | 0,4 | 1,75 · 3,50 · (1,2 – 0,08)/1,2 = | 5,7 | 1,75 · 0,66 · (1,2 – 0,08)/1,2 = | 4,3 |
| Total permanent loads | 36,1 | | 1,7 | | –3,2 |
| Live loads | | | | | |
| q: 1,75 · 6,0 · (2,8 – 0,08) · 0,5 · (2,8 + 0,08)/1,2 = | 34,4 | 1,75 · 6,0 · 0,5 · (1,2 + 0,08)²/1,2 = | 7,2 | 1,75 · 4,00 · 0,5 · (2,8 – 1,2)²/–1,2 = | –7,5 |
| **Total perm. load + live load** | **70,5** | | **8,9** | | **–10,7** |

### Chosen Schöck Isokorb®

**Element A: Schöck Isokorb® QPZ80 E, h=170, L500** $V_{Rd}$ = 76,4 kN > $V_{Ed}$ = 70,5 kN U.C. = 92 %

**Element B: Schöck Isokorb® QP10+QP10 E, h=160, L=250** $V_{Rd}$ = 26,3 kN > $V_{Ed}$ = –10,7 kN U.C. = 41 %

There can be an upward reaction in element B, thus QP+QP must be applied

**Look also at the checklist page 77.**

[1] Included isolation thickness of the Schöck Isokorb®

# Schöck Isokorb® type Q, QP, Q+Q, QP+QP
## Additional reinforcement

### Suspension reinforcement/Connection with hairpins

For a sound introduction of the shear force in the Schock Isokorb® type Q it is advised to include additional reinforcement in the outside component (balcony). This reinforcement as hairpins is considered as so-called "suspension reinforcement" for the situations, where the bent-up bars ($A_{s,q}$) of the Isokorb® element is not placed at the bottom or at the top of the concrete element (see Figure 5 and 6).
When applying a Schöck Isokorb® type Q + Q it is recommended that the additional reinforcement should also be placed at the inner slab.
The required amount of reinforcement is indicated in the tables below. This reinforcement may also be included as extra $mm^2$ in the already provided amount of reinforcement.

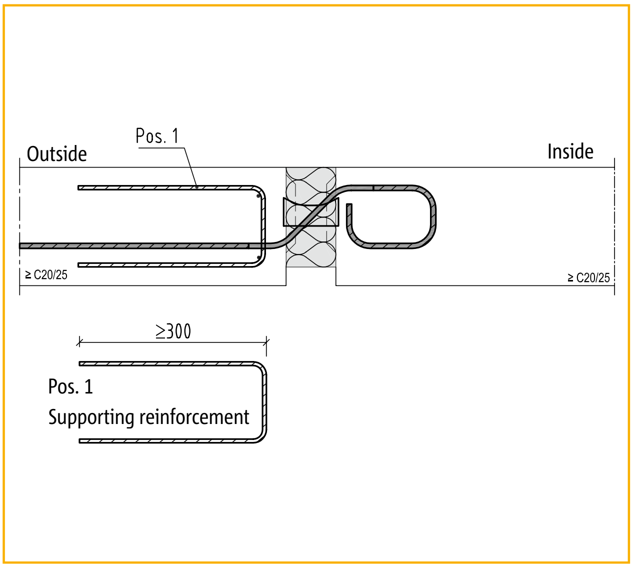



*Figure 5: Schöck Isokorb® type Q-HTE additional reinforcement*

| Schöck Isokorb® type | $A_{s,req}$ [$mm^2$/element] | $A_{s;hp}$ hairpins |
|---|---|---|
| Q10 | 80 | ø 6-150 |
| Q40 | 160 | ø 6-125 |
| Q80 | 284 | ø 8-150 |
| Q100 | 444 | ø 10-150 |
| Q120 | 633 | ø 10-125 |

| Schöck Isokorb® type | $A_{s,req}$ [$mm^2$/element] | $A_{s;hp}$ hairpins |
|---|---|---|
| QP10 | 71 | 2 Ø 8 |
| QP20 | 111 | 3 Ø 8 |
| QP30 | 142 | 4 Ø 8 |
| QP60 | 158 | 3 Ø10 |
| QP70 | 222 | 4 Ø10 |
| QP90 | 316 | 4 Ø12 |

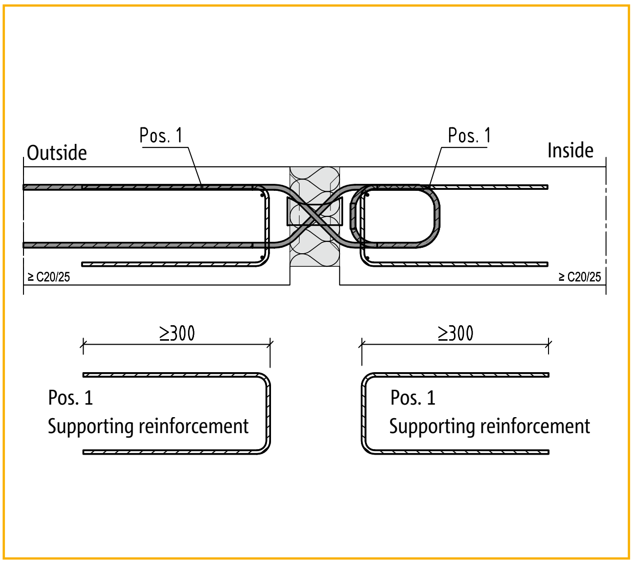



*Figure 6: Schöck Isokorb® type Q+Q...-HTE additional reinforcement*

| Schöck Isokorb® type | $A_{s,req}$ [$mm^2$/element] | $A_{s;hp}$ hairpins |
|---|---|---|
| Q10+Q10 | 80 | Ø6-150 |
| Q40+Q40 | 160 | Ø6-125 |
| Q80+Q80 | 284 | Ø8-150 |
| Q100+Q100 | 444 | Ø10-150 |
| Q120+Q120 | 633 | Ø10-125 |

| Schöck Isokorb® type | $A_{s,req}$ [$mm^2$/element] | $A_{s;hp}$ hairpins |
|---|---|---|
| QP10+QP10 | 71 | 2 Ø 8 |
| QP20+QP20 | 111 | 3 Ø 8 |
| QP30+QP30 | 142 | 4 Ø 8 |
| QP60+QP60 | 158 | 3 Ø10 |
| QP70+QP70 | 222 | 4 Ø10 |
| QP90+QP90 | 316 | 4 Ø12 |

The responsible structural engineer must check/calculate if the adjacent concrete cross-section is capable of coping with the reaction forces that will develop at the location of the anchor. Depending on the design condition, like the size of the force, position in the cross-section and available concrete grades the analysis could indicate that any additional reinforcement is not required.

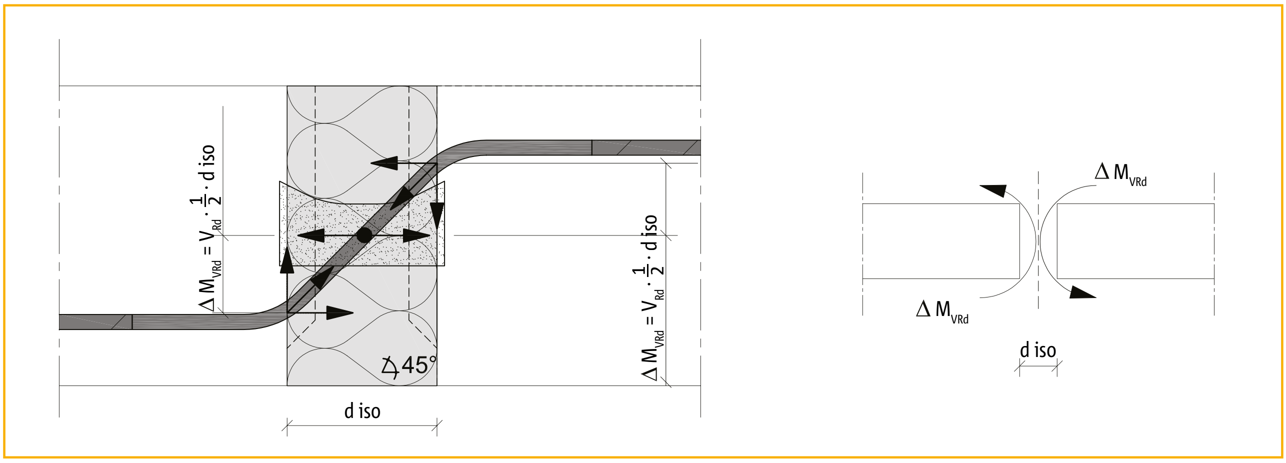
# Schöck Isokorb® type Q, Q+Q
## Moments from excentric connections

### Moments from excentric connections

When calculating the connection reinforcement on both sides of the Schöck Isokorb® type Q, moments arising from excentric connections also need to be taken into account additionally. These moments should be added to the moments resulting from the planned load if both values have the same sign.

| Schöck Isokorb® type | | $\Delta M_{VRd}$ [kNm/element] |
|---|---|---|
| Q | Q+Q | |
| Q10 | Q10+Q10 | 1,39 |
| Q40 | Q40+Q40 | 2,78 |
| Q80 E | Q80+Q80 E | 4,95 |
| Q100 E | Q100+Q100 E | 7,73 |
| Q120 E | Q120+Q120 E | 11,01 |

| Schöck Isokorb® type | | $\Delta M_{Rd}$ [kNm/element] |
|---|---|---|
| Q | Q+Q | |
| QP10 E | QP10+QP10 E | 1,24 |
| QP20 E | QP20+QP20 E | 1,93 |
| QP30 E | QP30+QP30 E | 2,48 |
| QP60 E | QP60+QP60 E | 2,75 |
| QP70 E | QP70+QP70 E | 3,86 |
| QP90 E | QP90+QP90 E | 5,50 |

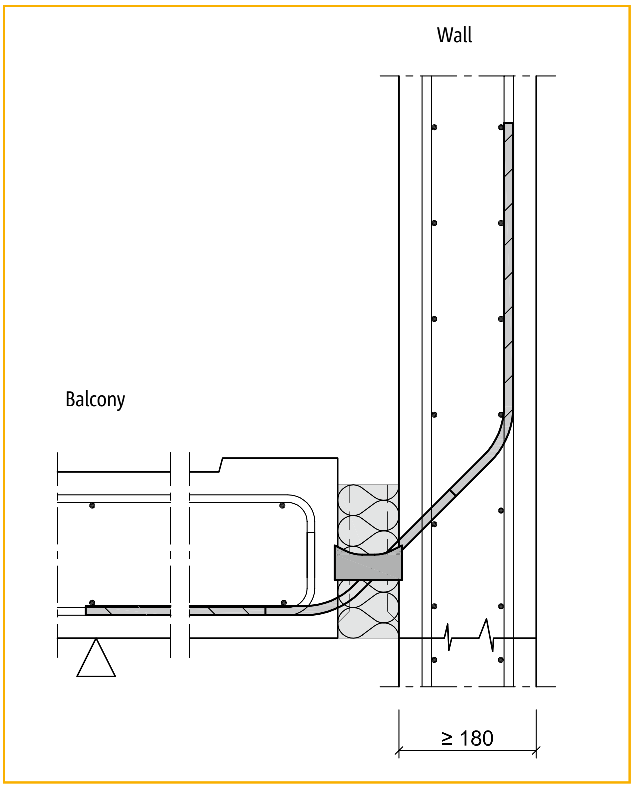



*Cross-section: Schöck Isokorb® type Q..*

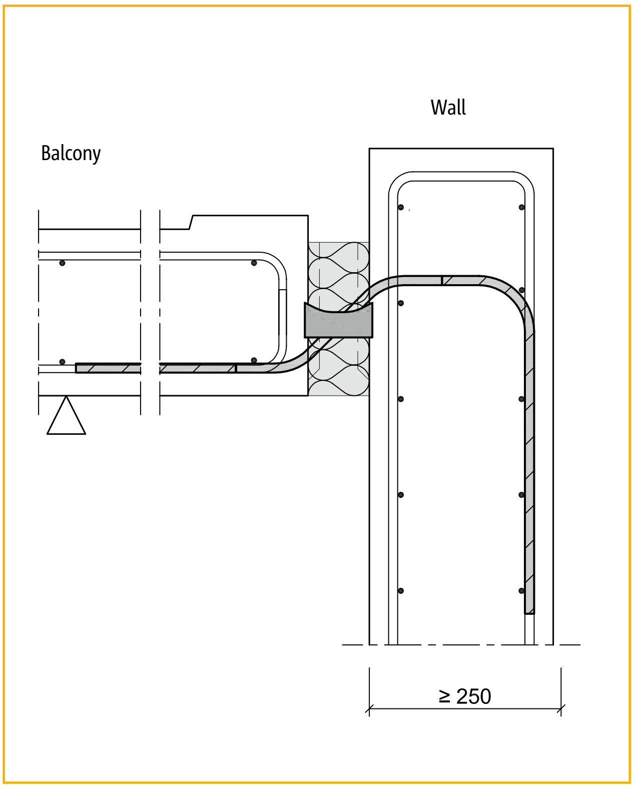
# Schöck Isokorb® type Q, Q+Q

## Special designs/Custom made

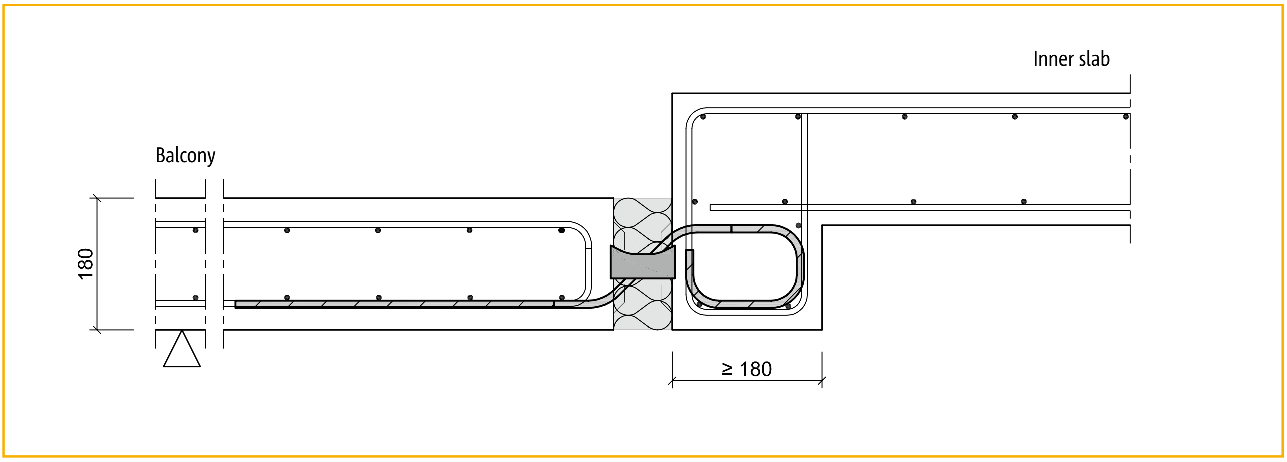





*Cross-section: Installation Schöck Isokorb® type Q.. sk, bent upwards in wall*




*Cross-section: Installation Schöck Isokorb® type Q.. sk, bent downwards in wall*

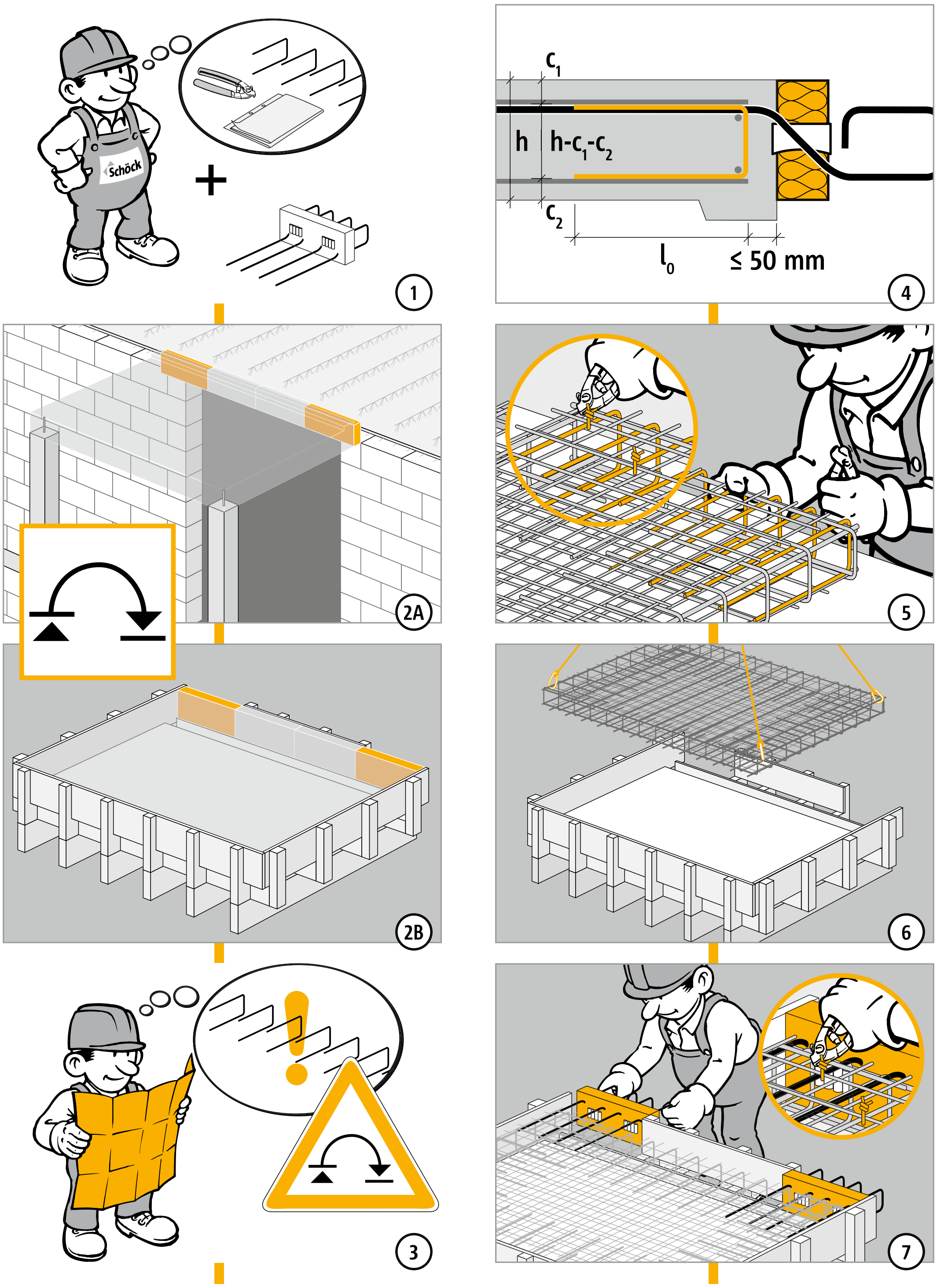



*Cross-section: Installation Schöck Isokorb® compact type Q.. in edge of the floor*

# Schöck Isokorf® type Q

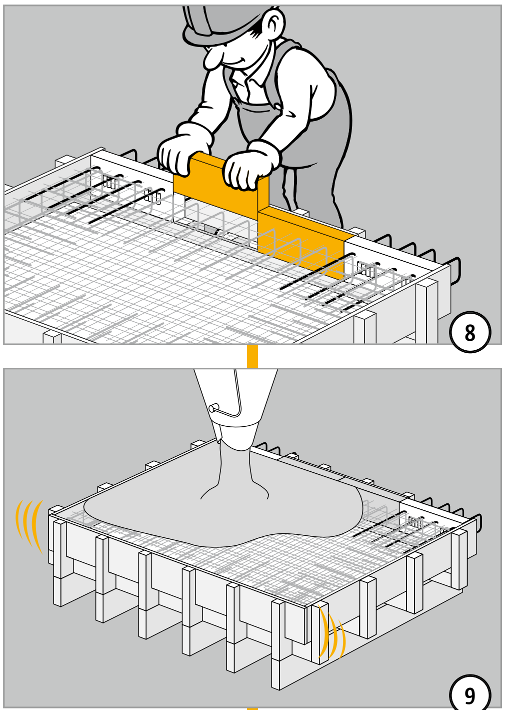
## Method statement precast

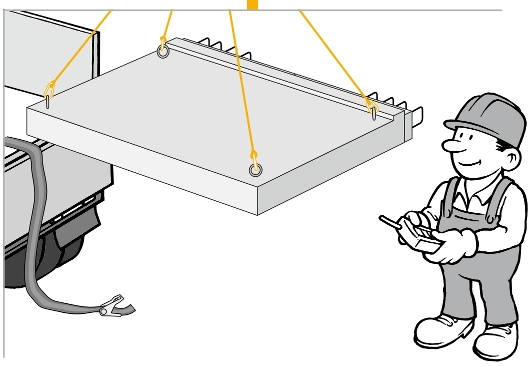




# Schöck Isokorf® type Q

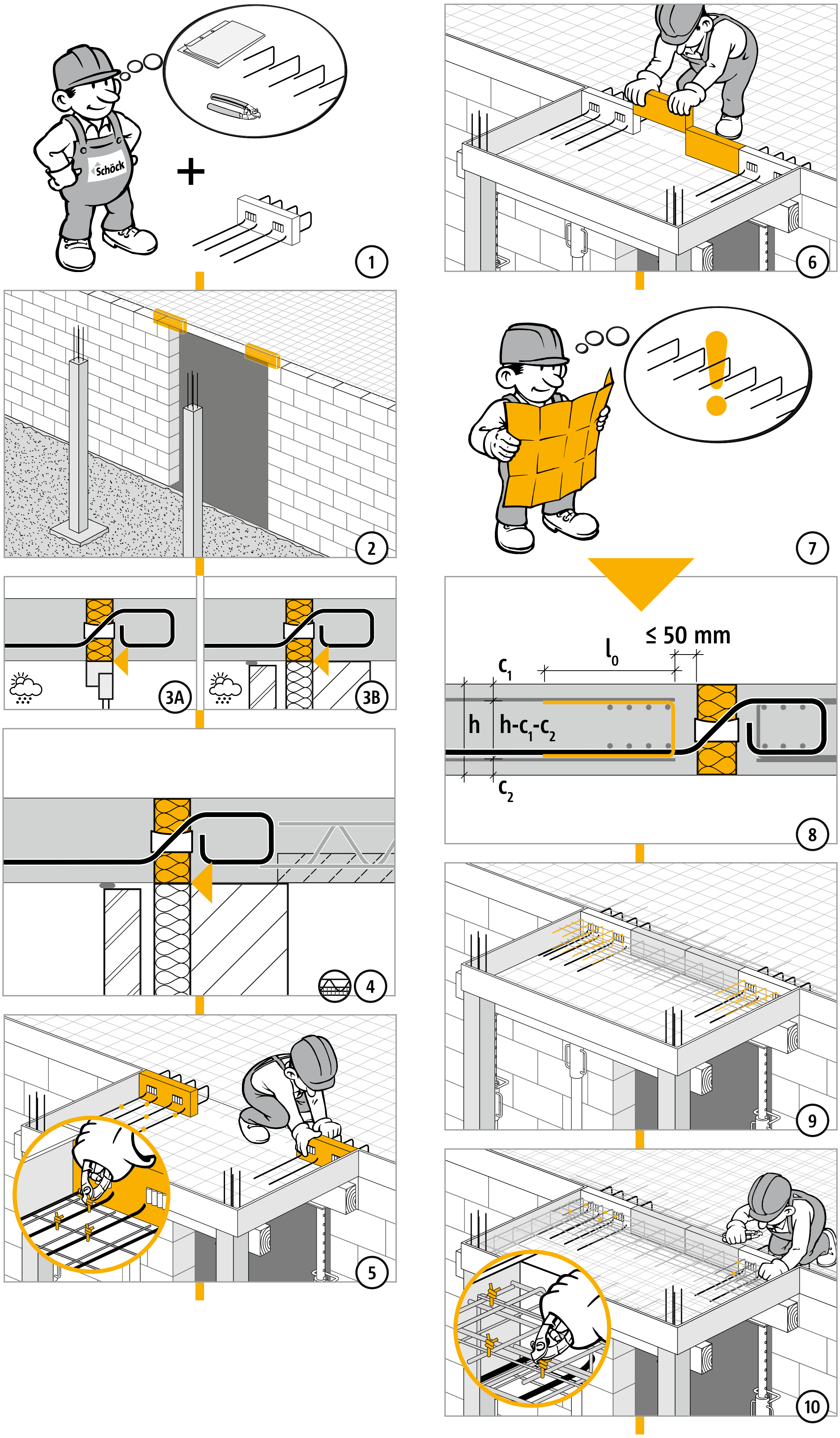
## Method statement precast



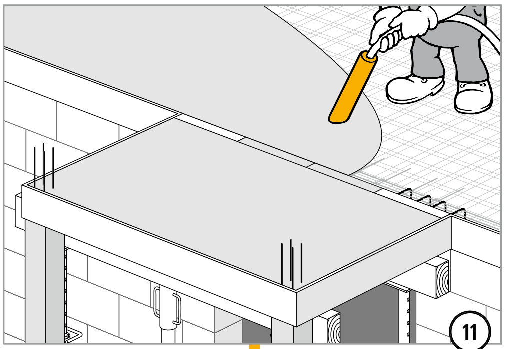



# Schöck Isokorf® type Q

## Method statement on-site

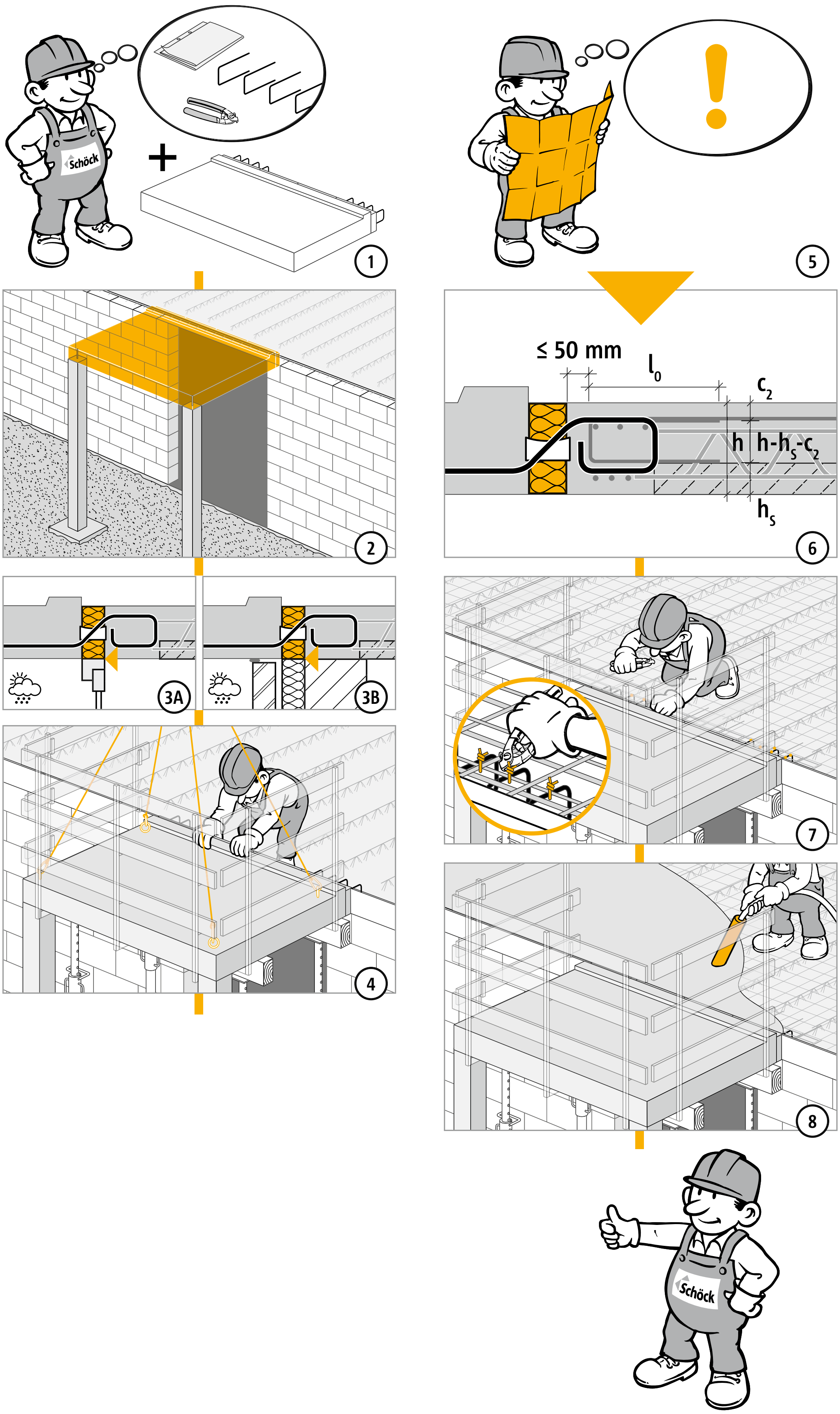


# Schöck Isokorf® type Q
Method statement on-site




# Schöck Isokorf® type Q

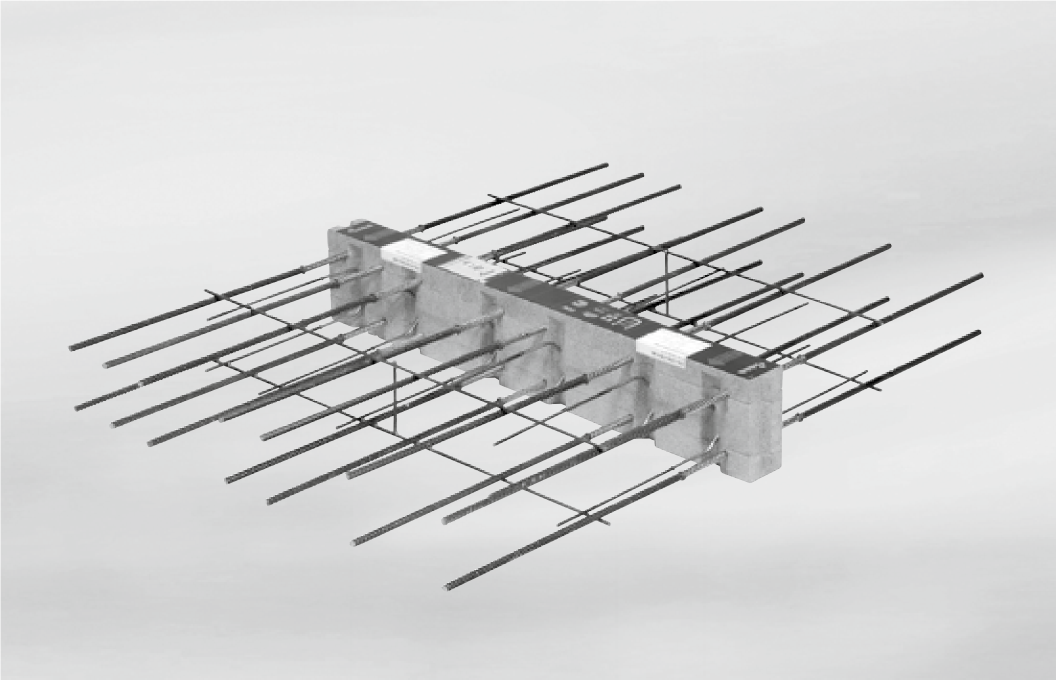
## Method statement precastelement on site



# Schöck Isokorb® type Q, Q+Q
## Checklist

- ☐ Does the design comply with the minimal requirements for the (concrete) strength class and environmental class?
- ☐ Is this a situation for which the construction must be checked as an accidental case or is there a special loading situation during the construction stage?
- ☐ Have the member forces on the Schöck Isokorb® connection been determined at the design level?
- ☐ Has the maximum allowable bar distance been taken into account (page 28)?
- ☐ Is there a difference in stiffness of the supports (statically indeterminate structure), which must be taken into account during the design of the dimensions (page 32)?
- ☐ Have the adjacent concrete components (inside and outside) of Schöck Isokorb® element been checked by the responsible structural engineer for the calculation design value of $V_{Ed}$?
- ☐ Is the required additional reinforcement determined (page 69)?
- ☐ Has the right type of Schöck Isokorb® been chosen in the case of multi-sided (2, 3, 4 sides) supports of the concrete element in order to avoid restraining effects?
- ☐ For special customised solutions have the conditions been satisfied for the Schöck Isokorb® anchor within the “shape box” and the requirements of the EN 1992 for anchorage of the Schöck Isokorb® reinforcement bars outside the “shape box” (page 21)?
- ☐ Has the required deflection for dewatering been taken into account for a proper alignment of the concrete element, next to the calculated deformation by the concrete and the Schöck Isokorb®?
- ☐ Have the fire protection requirements been clarified, and are they reflected in the chosen type designation (F 90 execution) (page 25 - 26)?
- ☐ Is the Schöck Isokorb® type clearly described on design drawings (page 129)? Example: Schöck Isokorb® type QP70+QP70-HTE-CV30-H180-D80-L500

# Schöck Isokorb® type D



*Schöck Isokorb® type D 70*



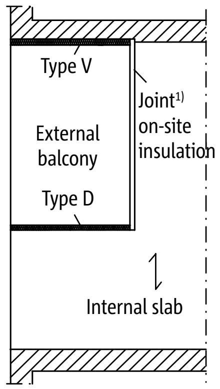
**Inhoud** **Pagina**

# Schöck Isokorb® type D

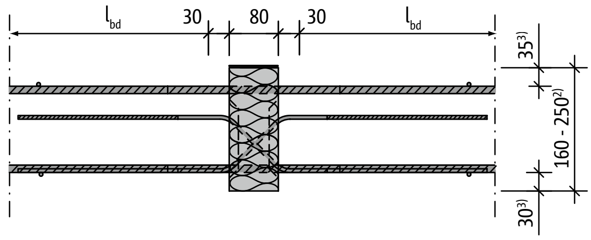
## Examples of element arrangements/Product description

Schöck Isokorb® type D is designed for situations where reinforcement is needed on top and bottom side.

In situations where reinforcement on the bottom side is under tension in the Isokorb® element, type K is not appropriate. Schöck Isokorb® type D is capable of transferring both bending moment and shear in two directions (+/-).




*One-way spanning internal slab*




*Cross-section: Schöck Isokorb® type D-CV35*

### Note

Load bearing thermal break elements (Isokorb® units), generally used as balcony connectors, can only resist uni-axial bending moments. Concrete-to-concrete thermal break connectors cannot transmit any torsional moments. For this reason the use of a type D in a RC slab supported by 4 columns is not appropriate.

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[1] A non-structural shear force connection should be provided if required, e.g. type Q+Q.
[2] Min. slab height, h ≥ 200 mm, due to this the type D-CV50 (2nd layer) has 40 mm smaller internal lever arm and therefore reduce $m_{rd}$.
[3] 50 mm for CV50 (= 2nd layer), 30 mm for CV30

# Schöck Isokorb® type D

## Examples of element arrangements/Product description

| Schöck Isokorb® type | D30-...-VV6 | D30-...-VV8 | D30-...VV10 |
|---|---|---|---|
| Isokorb® length [mm] | 1000 | 1000 | 1000 |
| Isokorb® height [mm] | 160-250 | 170-250 | 180-250 |
| Tension bars | 5 ø 12 | 5 Ø 12 | 5 Ø 12 |
| Shearforce bars V6 | 2 x 6 ø 6 | 2 x 6 Ø 8 | 2 x 6 Ø 10 |
| Compression bars | 5 ø 12 | 5 Ø 12 | 5 Ø 12 |

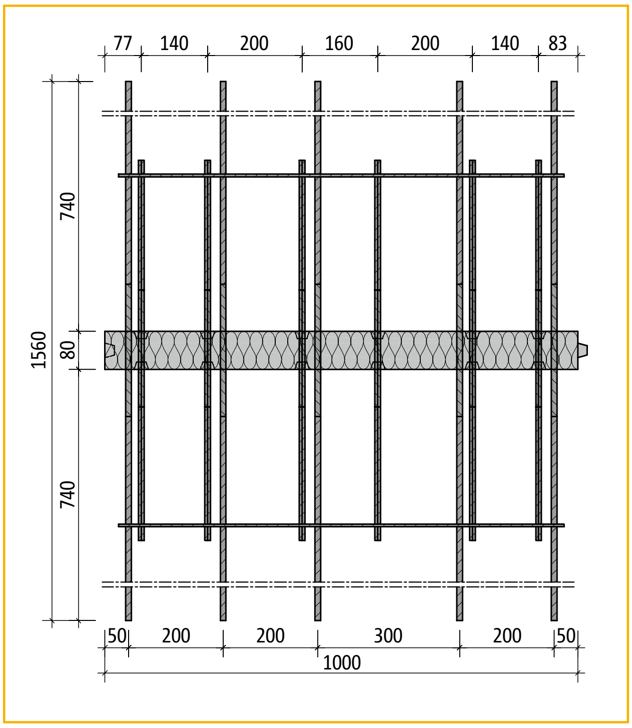
| Schöck Isokorb® type | D50-...-VV6 | D50-...-VV8 | D50-...VV10 |
|---|---|---|---|
| Isokorb® length [mm] | 1000 | 1000 | 1000 |
| Isokorb® height [mm] | 160-250 | 170-250 | 180-250 |
| Tension bars | 7 Ø 12 | 7 Ø 12 | 7 Ø 12 |
| Shearforce bars V6 | 2 x 6 Ø 6 | 2 x 6 Ø 8 | 2 x 6 Ø 10 |
| Compression bars | 7 Ø 12 | 7 Ø 12 | 7 Ø 12 |

| Schöck Isokorb® type | D70-...-VV6 | D70-...-VV8 | D70-...VV10 |
|---|---|---|---|
| Isokorb® length [mm] | 1000 | 1000 | 1000 |
| Isokorb® height [mm] | 160-250 | 170-250 | 180-250 |
| Tension bars | 10 Ø 12 | 10 Ø 12 | 10 Ø 12 |
| Shearforce bars V6 | 2 x 6 Ø 6 | 2 x 6 Ø 8 | 2 x 6 Ø 10 |
| Compression bars | 10 Ø 12 | 10 Ø 12 | 10 Ø 12 |

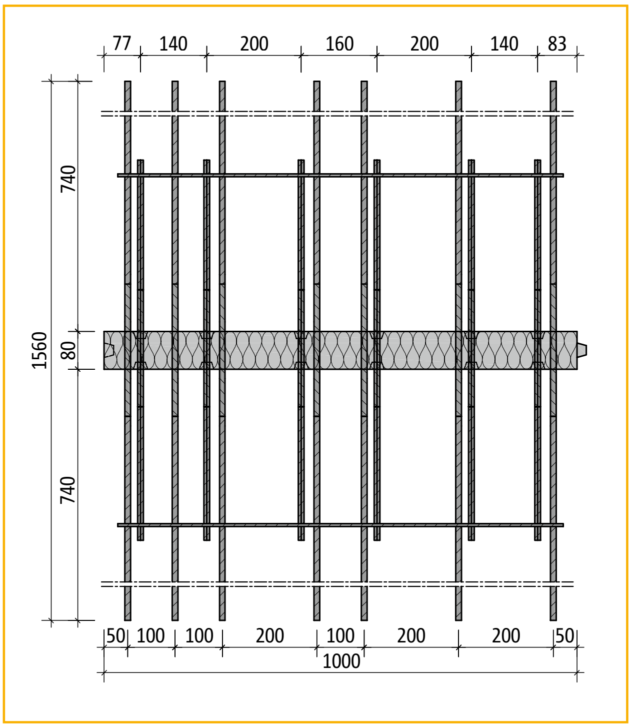
| Schöck Isokorb® type | D90-...-VV6 | D90-...-VV8 | D90-...VV10 |
|---|---|---|---|
| Isokorb® length [mm] | 1000 | 1000 | 1000 |
| Isokorb® height [mm] | 160-250 | 170-250 | 180-250 |
| Tension bars | 12 Ø 12 | 12 Ø 12 | 12 Ø 12 |
| Shearforce bars V6 | 2 x 6 Ø 6 | 2 x 6 Ø 8 | 2 x 6 Ø 10 |
| Compression bars | 12 Ø 12 | 12 Ø 12 | 12 Ø 12 |

# Schöck Isokorb® type D

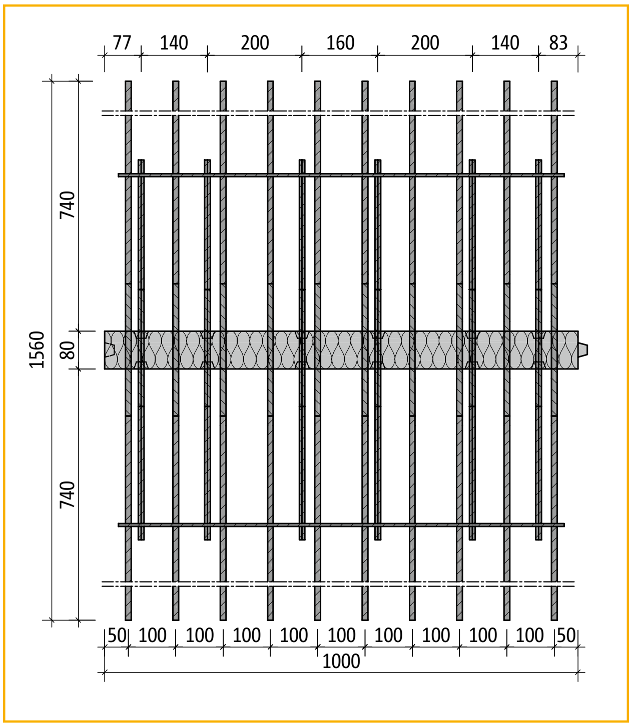
## Plan views



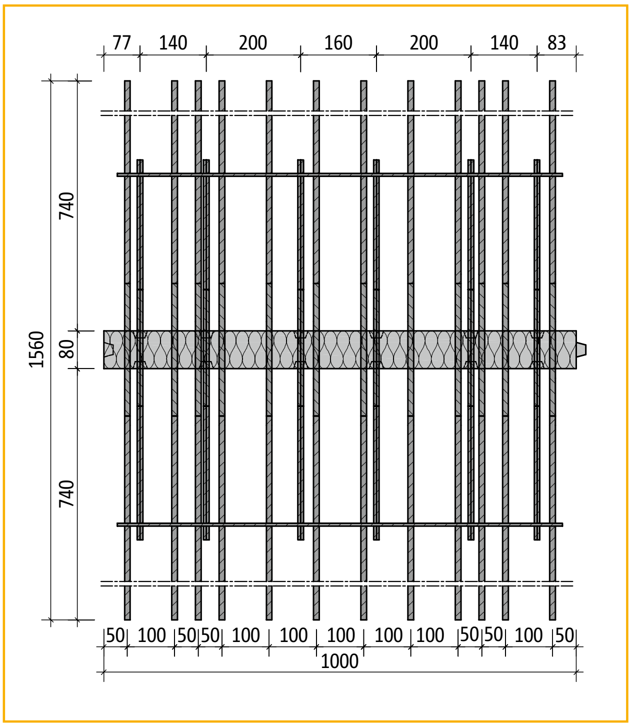

*Plan view: Schöck Isokorb® type D30-CV35*




*Plan view: Schöck Isokorb® type D50-CV35*




*Plan view: Schöck Isokorb® type D70-CV35*




*Plan view: Schöck Isokorb® type D90-CV35*

# Schöck Isokorb® type D

## Capacity tables D..-CV35

**Capacities are design values in the ultimate limit state (ULS). (Example of calculation page 89)**

| C20/25 | D30-CV35-VV6 | | | D30-CV35-VV8 | | | D30-CV35-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | 18,6 | 44,4 | 1376 | – | – | – | – | – | – |
| 170 | 20,9 | 44,4 | 1752 | 19,3 | 79,0 | 1752 | – | – | – |
| 180 | 23,1 | 44,4 | 2172 | 21,3 | 79,0 | 2172 | 19,5 | 114,5 | 2172 |
| 190 | 25,3 | 44,4 | 2638 | 23,4 | 79,0 | 2638 | 21,4 | 114,5 | 2638 |
| 200 | 27,6 | 44,4 | 3150 | 25,5 | 79,0 | 3150 | 23,3 | 114,5 | 3150 |
| 210 | 29,8 | 44,4 | 3706 | 27,5 | 79,0 | 3706 | 25,2 | 114,5 | 3706 |
| 220 | 32,1 | 44,4 | 4308 | 29,6 | 79,0 | 4308 | 27,1 | 114,5 | 4308 |
| 230 | 34,3 | 44,4 | 4955 | 31,7 | 79,0 | 4955 | 29,0 | 114,5 | 4955 |
| 240 | 36,6 | 44,4 | 5647 | 33,7 | 79,0 | 5647 | 30,9 | 114,5 | 5647 |
| 250 | 38,8 | 44,4 | 6384 | 35,8 | 79,0 | 6384 | 32,7 | 114,5 | 6384 |

| C25/30 | D30-CV35-VV6 | | | D30-CV35-VV8 | | | D30-CV35-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| h [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | 18,3 | 52,2 | 1376 | - | - | - | - | - | - |
| 170 | 20,5 | 52,2 | 1752 | 18,6 | 92,7 | 1752 | - | - | - |
| 180 | 22,7 | 52,2 | 2172 | 20,6 | 92,7 | 2172 | 18,5 | 134,4 | 2172 |
| 190 | 24,9 | 52,2 | 2638 | 22,6 | 92,7 | 2638 | 20,3 | 134,4 | 2638 |
| 200 | 27,1 | 52,2 | 3150 | 24,6 | 92,7 | 3150 | 22,1 | 134,4 | 3150 |
| 210 | 29,3 | 52,2 | 3706 | 26,6 | 92,7 | 3706 | 23,9 | 134,4 | 3706 |
| 220 | 31,5 | 52,2 | 4308 | 28,6 | 92,7 | 4308 | 25,6 | 134,4 | 4308 |
| 230 | 33,7 | 52,2 | 4955 | 30,6 | 92,7 | 4955 | 27,4 | 134,4 | 4955 |
| 240 | 35,9 | 52,2 | 5647 | 32,6 | 92,7 | 5647 | 29,2 | 134,4 | 5647 |
| 250 | 38,1 | 52,2 | 6384 | 34,6 | 92,7 | 6384 | 31,0 | 134,4 | 6384 |

| C20/25 | D50–CV35–VV6 | | | D50–CV35–VV8 | | | D50–CV35–VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | 26,8 | 44,4 | 1927 | – | – | – | – | – | – |
| 170 | 30,0 | 44,4 | 2452 | 28,4 | 79,0 | 2452 | – | – | – |
| 180 | 33,3 | 44,4 | 3041 | 31,5 | 79,0 | 3041 | 29,7 | 114,5 | 3041 |
| 190 | 36,5 | 44,4 | 3694 | 34,5 | 79,0 | 3694 | 32,5 | 114,5 | 3694 |
| 200 | 39,7 | 44,4 | 4409 | 37,6 | 79,0 | 4409 | 35,4 | 114,5 | 4409 |
| 210 | 42,9 | 44,4 | 5188 | 40,7 | 79,0 | 5188 | 38,3 | 114,5 | 5188 |
| 220 | 46,2 | 44,4 | 6031 | 43,7 | 79,0 | 6031 | 41,2 | 114,5 | 6031 |
| 230 | 49,8 | 44,4 | 6936 | 46,8 | 79,0 | 6936 | 44,0 | 114,5 | 6936 |
| 240 | 52,6 | 44,4 | 7905 | 49,8 | 79,0 | 7905 | 46,9 | 114,5 | 7905 |
| 250 | 55,9 | 44,4 | 8938 | 52,9 | 79,0 | 8938 | 49,8 | 114,5 | 8938 |

# Schöck Isokorb® type D

## Capacity tables D..-CV35



**Capacities are design values in the ultimate limit state (ULS). (Example of calculation page 89)**

| C25/30 | D50-CV35-VV6 | | | D50-CV35-VV8 | | | D50-CV35-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| **160** | 18,3 | 52,2 | 1927 | – | – | – | – | – | – |
| **170** | 20,5 | 52,2 | 2452 | 18,6 | 92,7 | 2452 | – | – | – |
| **180** | 22,7 | 52,2 | 3041 | 20,6 | 92,7 | 3041 | 18,5 | 134,4 | 3041 |
| **190** | 24,9 | 52,2 | 3694 | 22,6 | 92,7 | 3694 | 20,3 | 134,4 | 3694 |
| **200** | 27,1 | 52,2 | 4409 | 24,6 | 92,7 | 4409 | 22,1 | 134,4 | 4409 |
| **210** | 29,3 | 52,2 | 5188 | 27,6 | 92,7 | 5188 | 23,9 | 134,4 | 5188 |
| **220** | 31,5 | 52,2 | 6031 | 28,6 | 92,7 | 6031 | 25,6 | 134,4 | 6031 |
| **230** | 33,7 | 52,2 | 6936 | 30,6 | 92,7 | 6936 | 27,4 | 134,4 | 6936 |
| **240** | 35,9 | 52,2 | 7905 | 32,6 | 92,7 | 7905 | 29,2 | 134,4 | 7905 |
| **250** | 38,1 | 52,2 | 8938 | 34,6 | 92,7 | 8938 | 31,0 | 134,4 | 8938 |

| C20/25 | D70-CV35-VV6 | | | D70-CV35-VV8 | | | D70-CV35-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| **160** | 38,3 | 44,4 | 2752 | – | – | – | – | – | – |
| **170** | 42,9 | 44,4 | 3503 | 42,2 | 79,0 | 3503 | – | – | – |
| **180** | 47,6 | 44,4 | 4345 | 46,7 | 79,0 | 4345 | 44,9 | 114,5 | 4345 |
| **190** | 52,2 | 44,4 | 5277 | 51,3 | 79,0 | 5277 | 49,2 | 114,5 | 5277 |
| **200** | 56,8 | 44,4 | 6299 | 55,8 | 79,0 | 6299 | 53,6 | 114,5 | 6299 |
| **210** | 61,4 | 44,4 | 7412 | 60,3 | 79,0 | 7412 | 58,0 | 114,5 | 7412 |
| **220** | 66,0 | 44,4 | 8615 | 64,9 | 79,0 | 8615 | 62,3 | 114,5 | 8615 |
| **230** | 70,6 | 44,4 | 9909 | 69,4 | 79,0 | 9909 | 66,7 | 114,5 | 9909 |
| **240** | 75,3 | 44,4 | 11293 | 73,9 | 79,0 | 11293 | 71,0 | 114,5 | 11293 |
| **250** | 79,9 | 44,4 | 12768 | 78,5 | 79,0 | 12768 | 75,4 | 114,5 | 12768 |

| C25/30 | D70-CV35-VV6 | | | D70-CV35-VV8 | | | D70-CV35-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| **160** | 38,8 | 52,2 | 2752 | – | – | – | – | – | – |
| **170** | 43,4 | 52,2 | 3503 | 41,5 | 92,7 | 3503 | – | – | – |
| **180** | 48,1 | 52,2 | 4345 | 46,0 | 92,7 | 4345 | 43,9 | 134,4 | 4345 |
| **190** | 52,8 | 52,2 | 5277 | 50,5 | 92,7 | 5277 | 48,1 | 134,4 | 5277 |
| **200** | 57,4 | 52,2 | 6299 | 54,9 | 92,7 | 6299 | 52,4 | 134,4 | 6299 |
| **210** | 62,1 | 52,2 | 7412 | 59,4 | 92,7 | 7412 | 56,6 | 134,4 | 7412 |
| **220** | 66,8 | 52,2 | 8615 | 63,9 | 92,7 | 8615 | 60,9 | 134,4 | 8615 |
| **230** | 71,4 | 52,2 | 9909 | 68,3 | 92,7 | 9909 | 65,2 | 134,4 | 9909 |
| **240** | 76,1 | 52,2 | 11293 | 72,8 | 92,7 | 11293 | 69,4 | 134,4 | 11293 |
| **250** | 80,8 | 52,2 | 12768 | 77,3 | 92,7 | 12768 | 73,7 | 134,4 | 12768 |

# Schöck Isokorb® type D

## Capacity tables D..-CV35

**Capacities are design values in the ultimate limit state (ULS). (Example of calculation page 89)**

| C20/25 | D90-CV35-VV6 | | | D90-CV35-VV8 | | | D90-CV35-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | 45,6 | 44,4 | 3303 | – | – | – | – | – | – |
| 170 | 51,1 | 44,4 | 4204 | 51,4 | 79,0 | 4204 | – | – | – |
| 180 | 56,6 | 44,4 | 5214 | 56,9 | 79,0 | 5214 | 55,0 | 114,5 | 5214 |
| 190 | 62,1 | 44,4 | 6332 | 62,4 | 79,0 | 6332 | 60,4 | 114,5 | 6332 |
| 200 | 67,6 | 44,4 | 7559 | 67,9 | 79,0 | 7559 | 65,7 | 114,5 | 7559 |
| 210 | 73,1 | 44,4 | 8894 | 73,4 | 79,0 | 8894 | 71,1 | 114,5 | 8894 |
| 220 | 78,6 | 44,4 | 10338 | 79,0 | 79,0 | 10338 | 76,4 | 114,5 | 10338 |
| 230 | 84,1 | 44,4 | 11891 | 84,5 | 79,0 | 11891 | 81,8 | 114,5 | 11891 |
| 240 | 89,6 | 44,4 | 13552 | 90,0 | 79,0 | 13552 | 87,1 | 114,5 | 13552 |
| 250 | 95,1 | 44,4 | 15322 | 95,5 | 79,0 | 15322 | 92,5 | 114,5 | 15322 |

| C25/30 | D90-CV35-VV6 | | | D90-CV35-VV8 | | | D90-CV35-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | 46,9 | 52,2 | 3303 | – | – | – | – | – | – |
| 170 | 52,6 | 52,2 | 4204 | 50,7 | 92,7 | 4204 | – | – | – |
| 180 | 58,3 | 52,2 | 5214 | 56,2 | 92,7 | 5214 | 54,0 | 134,4 | 5214 |
| 190 | 63,9 | 52,2 | 6332 | 61,6 | 92,7 | 6332 | 59,3 | 134,4 | 6332 |
| 200 | 69,6 | 52,2 | 7559 | 67,1 | 92,7 | 7559 | 64,5 | 134,4 | 7559 |
| 210 | 75,2 | 52,2 | 8894 | 72,5 | 92,7 | 8894 | 69,8 | 134,4 | 8894 |
| 220 | 80,9 | 52,2 | 10338 | 78,0 | 92,7 | 10338 | 75,0 | 134,4 | 10338 |
| 230 | 86,5 | 52,2 | 11891 | 83,4 | 92,7 | 11891 | 80,2 | 134,4 | 11891 |
| 240 | 92,2 | 52,2 | 13552 | 88,9 | 92,7 | 13552 | 85,5 | 134,4 | 13552 |
| 250 | 97,8 | 52,2 | 15322 | 94,3 | 92,7 | 15322 | 90,7 | 134,4 | 15322 |

# Schöck Isokorb® type D

## Capacity tables D..-CV50

D

Reinforced concrete-to-reinforced concrete

**Capacities are design values in the ultimate limit state (ULS). (Example of calculation page 89)**

| C20/25 | D30-CV50-VV6 | | | D30-CV50-VV8 | | | D30-CV50-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | – | – | – | – | – | – | – | – | – |
| 170 | – | – | – | – | – | – | – | – | – |
| 180 | – | – | – | – | – | – | – | – | – |
| 190 | – | – | – | – | – | – | – | – | – |
| 200 | 19,7 | 44,4 | 2400 | – | – | – | – | – | – |
| 210 | 22,0 | 44,4 | 2888 | 20,3 | 79,0 | 2888 | – | – | – |
| 220 | 24,2 | 44,4 | 3422 | 22,4 | 79,0 | 3422 | 20,4 | 114,5 | 3422 |
| 230 | 26,5 | 44,4 | 4001 | 24,4 | 79,0 | 4001 | 22,3 | 114,5 | 4001 |
| 240 | 28,7 | 44,4 | 4625 | 26,5 | 79,0 | 4625 | 24,2 | 114,5 | 4625 |
| 250 | 31,0 | 44,4 | 5295 | 28,6 | 79,0 | 5295 | 26,1 | 114,5 | 5295 |

| C25/30 | D30-CV50-VV6 | | | D30-CV50-VV8 | | | D30-CV50-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | – | – | – | – | – | – | – | – | – |
| 170 | – | – | – | – | – | – | – | – | – |
| 180 | – | – | – | – | – | – | – | – | – |
| 190 | – | – | – | – | – | – | – | – | – |
| 200 | 19,4 | 52,2 | 2400 | – | – | – | – | – | – |
| 210 | 21,6 | 52,2 | 2888 | 19,6 | 92,7 | 2888 | – | – | – |
| 220 | 23,8 | 52,2 | 3422 | 21,6 | 92,7 | 3422 | 19,4 | 134,4 | 3422 |
| 230 | 26,0 | 52,2 | 4001 | 23,6 | 92,7 | 4001 | 21,2 | 134,4 | 4001 |
| 240 | 28,2 | 52,2 | 4625 | 25,6 | 92,7 | 4625 | 23,0 | 134,4 | 4625 |
| 250 | 30,4 | 52,2 | 5295 | 27,6 | 92,7 | 5295 | 24,8 | 134,4 | 5295 |

| C20/25 | D50-CV50-VV6 | | | D50-CV50-VV8 | | | D50-CV50-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | – | – | – | – | – | – | – | – | – |
| 170 | – | – | – | – | – | – | – | – | – |
| 180 | – | – | – | – | – | – | – | – | – |
| 190 | – | – | – | – | – | – | – | – | – |
| 200 | 28,4 | 44,4 | 3360 | – | – | – | – | – | – |
| 210 | 31,6 | 44,4 | 4044 | 30,0 | 79,0 | 4044 | – | – | – |
| 220 | 34,9 | 44,4 | 4791 | 33,0 | 79,0 | 4791 | 31,1 | 114,5 | 4791 |
| 230 | 38,1 | 44,4 | 5602 | 36,1 | 79,0 | 5602 | 34,0 | 114,5 | 5602 |
| 240 | 41,3 | 44,4 | 6476 | 39,1 | 79,0 | 6476 | 36,9 | 114,5 | 6476 |
| 250 | 44,6 | 44,4 | 7413 | 42,2 | 79,0 | 7413 | 39,7 | 114,5 | 7413 |

# Schöck Isokorb® type D

## Capacity tables D..-CV50

**Capacities are design values in the ultimate limit state (ULS). (Example of calculation page 89)**

| C25/30 | D50-CV50-VV6 | | | D50-CV50-VV8 | | | D50-CV50-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | – | – | – | – | – | – | – | – | – |
| 170 | – | – | – | – | – | – | – | – | – |
| 180 | – | – | – | – | – | – | – | – | – |
| 190 | – | – | – | – | – | – | – | – | – |
| 200 | 19,4 | 52,2 | 3360 | – | – | – | – | – | – |
| 210 | 21,6 | 52,2 | 4044 | 19,6 | 92,7 | 4044 | – | – | – |
| 220 | 23,8 | 52,2 | 4791 | 21,6 | 92,7 | 4791 | 19,4 | 134,4 | 4791 |
| 230 | 26,0 | 52,2 | 5602 | 23,6 | 92,7 | 5602 | 21,2 | 134,4 | 5602 |
| 240 | 28,2 | 52,2 | 6476 | 25,6 | 92,7 | 6476 | 23,0 | 134,4 | 6476 |
| 250 | 30,4 | 52,2 | 7413 | 27,6 | 92,7 | 7413 | 24,8 | 134,4 | 7413 |

| C20/25 | D70-CV50-VV6 | | | D70-CV50-VV8 | | | D70-CV50-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | – | – | – | – | – | – | – | – | – |
| 170 | – | – | – | – | – | – | – | – | – |
| 180 | – | – | – | – | – | – | – | – | – |
| 190 | – | – | – | – | – | – | – | – | – |
| 200 | 40,6 | 44,4 | 4799 | – | – | – | – | – | – |
| 210 | 45,3 | 44,4 | 5777 | 44,4 | 79,0 | 5777 | – | – | – |
| 220 | 49,9 | 44,4 | 6844 | 49,0 | 79,0 | 6844 | 47,1 | 114,5 | 6844 |
| 230 | 54,5 | 44,4 | 8002 | 53,3 | 79,0 | 8002 | 51,4 | 114,5 | 8002 |
| 240 | 59,1 | 44,4 | 9251 | 58,1 | 79,0 | 9251 | 55,8 | 114,5 | 9251 |
| 250 | 63,7 | 44,4 | 10590 | 62,6 | 79,0 | 10590 | 60,1 | 114,5 | 10590 |

| C25/30 | D70-CV50-VV6 | | | D70-CV50-VV8 | | | D70-CV50-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | – | – | – | – | – | – | – | – | – |
| 170 | – | – | – | – | – | – | – | – | – |
| 180 | – | – | – | – | – | – | – | – | – |
| 190 | – | – | – | – | – | – | – | – | – |
| 200 | 41,1 | 52,2 | 4799 | – | – | – | – | – | – |
| 210 | 45,8 | 52,2 | 5777 | 43,8 | 92,7 | 5777 | – | – | – |
| 220 | 50,4 | 52,2 | 6844 | 48,2 | 92,7 | 6844 | 46,0 | 134,4 | 6844 |
| 230 | 55,1 | 52,2 | 8002 | 52,7 | 92,7 | 8002 | 50,3 | 134,4 | 8002 |
| 240 | 59,8 | 52,2 | 9251 | 57,2 | 92,7 | 9251 | 54,5 | 134,4 | 9251 |
| 250 | 64,4 | 52,2 | 10590 | 61,6 | 92,7 | 10590 | 58,8 | 134,4 | 10590 |

# Schöck Isokorb® type D

## Capacity tables D..-CV50

**Capacities are design values in the ultimate limit state (ULS). (Example of calculation page 89)**

| C20/25 | D90-CV50-VV6 | | | D90-CV50-VV8 | | | D90-CV50-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | – | – | – | – | – | – | – | – | – |
| 170 | – | – | – | – | – | – | – | – | – |
| 180 | – | – | – | – | – | – | – | – | – |
| 190 | – | – | – | – | – | – | – | – | – |
| 200 | 48,4 | 44,4 | 5759 | – | – | – | – | – | – |
| 210 | 53,9 | 44,4 | 6932 | 54,1 | 79,0 | 6932 | – | – | – |
| 220 | 59,4 | 44,4 | 8213 | 59,6 | 79,0 | 8213 | 57,7 | 114,5 | 8213 |
| 230 | 64,9 | 44,4 | 9603 | 65,2 | 79,0 | 9603 | 63,1 | 114,5 | 9603 |
| 240 | 70,4 | 44,4 | 11101 | 70,7 | 79,0 | 11101 | 68,4 | 114,5 | 11101 |
| 250 | 75,9 | 44,4 | 12708 | 76,2 | 79,0 | 12708 | 73,7 | 114,5 | 12708 |

| C25/30 | D90-CV50-VV6 | | | D90-CV50-VV8 | | | D90-CV50-VV10 | | |
|---|---|---|---|---|---|---|---|---|---|
| heigth | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C | $M_{Rd}$ | $V_{Rd}$ | C |
| H [mm] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] | [kNm/m] | [kN/m] | [kNm/rad] |
| 160 | – | – | – | – | – | – | – | – | – |
| 170 | – | – | – | – | – | – | – | – | – |
| 180 | – | – | – | – | – | – | – | – | – |
| 190 | – | – | – | – | – | – | – | – | – |
| 200 | 49,8 | 52,2 | 5759 | – | – | – | – | – | – |
| 210 | 55,4 | 52,2 | 6932 | 53,4 | 92,7 | 6932 | – | – | – |
| 220 | 61,1 | 52,2 | 8213 | 58,9 | 92,7 | 8213 | 56,6 | 134,4 | 8213 |
| 230 | 66,7 | 52,2 | 9603 | 64,3 | 92,7 | 9603 | 61,9 | 134,4 | 9603 |
| 240 | 72,4 | 52,2 | 11101 | 69,8 | 92,7 | 11101 | 67,1 | 134,4 | 11101 |
| 250 | 78,0 | 52,2 | 12708 | 75,2 | 92,7 | 12708 | 72,4 | 134,4 | 12708 |

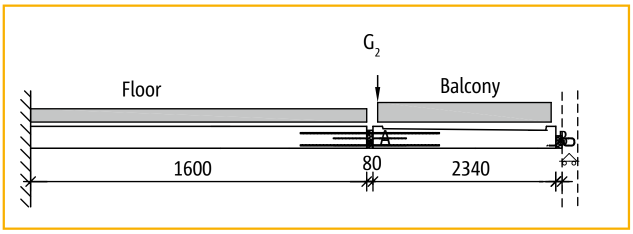
# Schöck Isokorb® type D
Calculation example



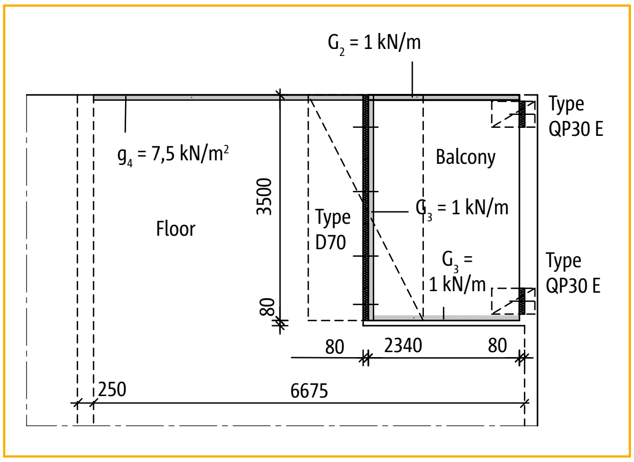
## Geometry

| | |
|---|---|
| Length | = 3500 mm |
| Width | = 2320 mm |
| Thickness balcony | = 240 mm |

## Cross-section



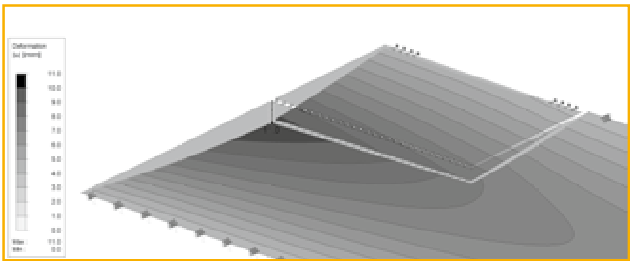

## Plan view

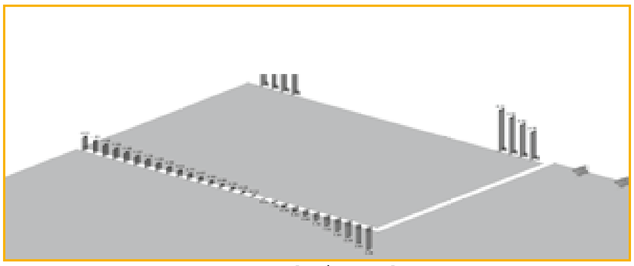


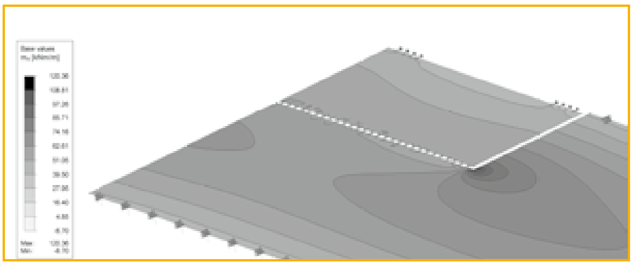

## Loads

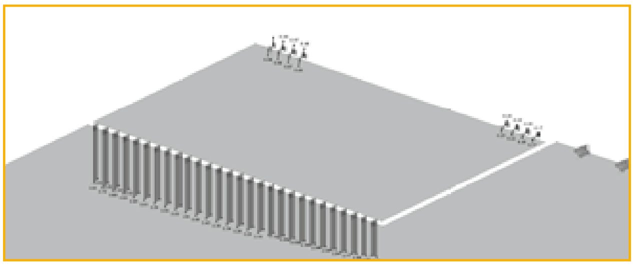
| **Permanent load** | | | | |
|---|---|---|---|---|
| Balcony slab | 0,24 ·25 kN/m³ | $p_1$ = 6,0 kN/m² | $p_{1:min}$ = 6,0 kN/m² | $p_{1:max}$ = 7,20 kN/m² |
| Railing balcony | | $G_2$ = 1,0 kN/m | $G_{2:min}$ = 1,0 kN/m | $G_{2:max}$ = 1,20 kN/m |
| Facade masonry | 20% · 2,80 · 1,8 kN/m² | $G_3$ = 1,0 kN/m | $G_{3:min}$ = 1,0 kN/m | $G_{3:max}$ = 1,20 kN/m |
| Floor | (0,26 · 25) + 1,0 kN/m² | $g_4$ = 7,5 kN/m² | $g_{4:min}$ = 7,5 kN/m² | $g_{4:max}$ = 9,0 kN/m² |
| Loads edge floor | | $g_5$ = 3,0 kN/m | $g_{5:min}$ = 3,0 kN/m | $g_{5:max}$ = 3,60 kN/m |

| **Live load** | | | |
|---|---|---|---|
| | Live load balcony $\psi_2$ = 0,3 $p_q$ = 4,0 kN/m² | $p_{q:min}$ = 4,00 kN/m² | $p_{q:max}$ = 6,00 kN/m² |
| | Live load floor $\psi_2$ = 0,3 $p_q$ = 4,0 kN/m² | $p_{q:min}$ = 4,00 kN/m² | $p_{q:max}$ = 6,00 kN/m² |


*Deformations in the serviceability state [mm]*


*$V_{Ed}$ in the Isokorb® type D-elements [kN/0,125m]*


*Bending moment $M_{Ed}$ [kNm/m] in span direction*


*$M_{Ed}$ in the Isokorb® type D-elements [kNm/0,125m]*

## Chosen Schöck Isokorb®

**Connection to the load-bearing wall: Schöck Isokorb® QP30 E h160, L 500**
**Connection floor-balcony: Schöck Isokorb® D70-VV6, h240**

(See also page 31 - 32 regarding to FEM)

$V_{Ed}$ = 61,8 kN > 25,2 kN U.C. = 41 %
$V_{Ed}$ = 52,2 kN > 8 x 3,38 = 27,0 kN U.C. = 52 %
$M_{Ed}$ = 66,6 kNm/m > 8 x 3,7 = 29,6 kNm U.C. = 44 %
(Choosing a lighter Isokorb® type D element will result in bigger deformations)

See also checklist page 93.

# Schöck Isokorb® type D
## Additional reinforcement

### Suspension reinforcement /Connection with hairpins

For a sound introduction of the shear force in the Schock Isokorb® type D it is advised to include additional reinforcement in the outside component (balcony) and in the inner component (structural floor). This reinforcement as hairpins is considered as so-called "suspension reinforcement" for the situations, where the bent-up bars ($A_{s,q}$) of the Isokorb® element are not placed at the bottom or at the top of the concrete element (see Figure 1)
The required amount of reinforcement is indicated in the table. This reinforcement may also be included as extra mm² in the already provided amount of reinforcement.

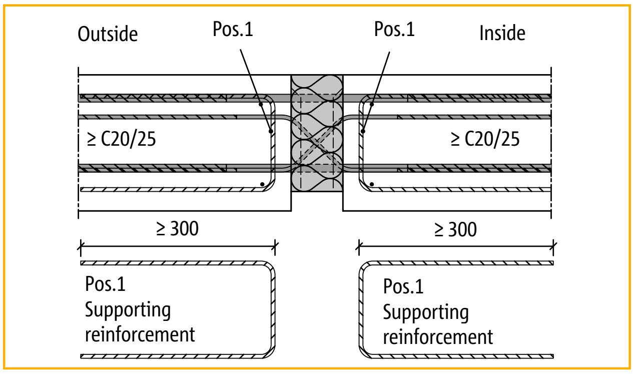
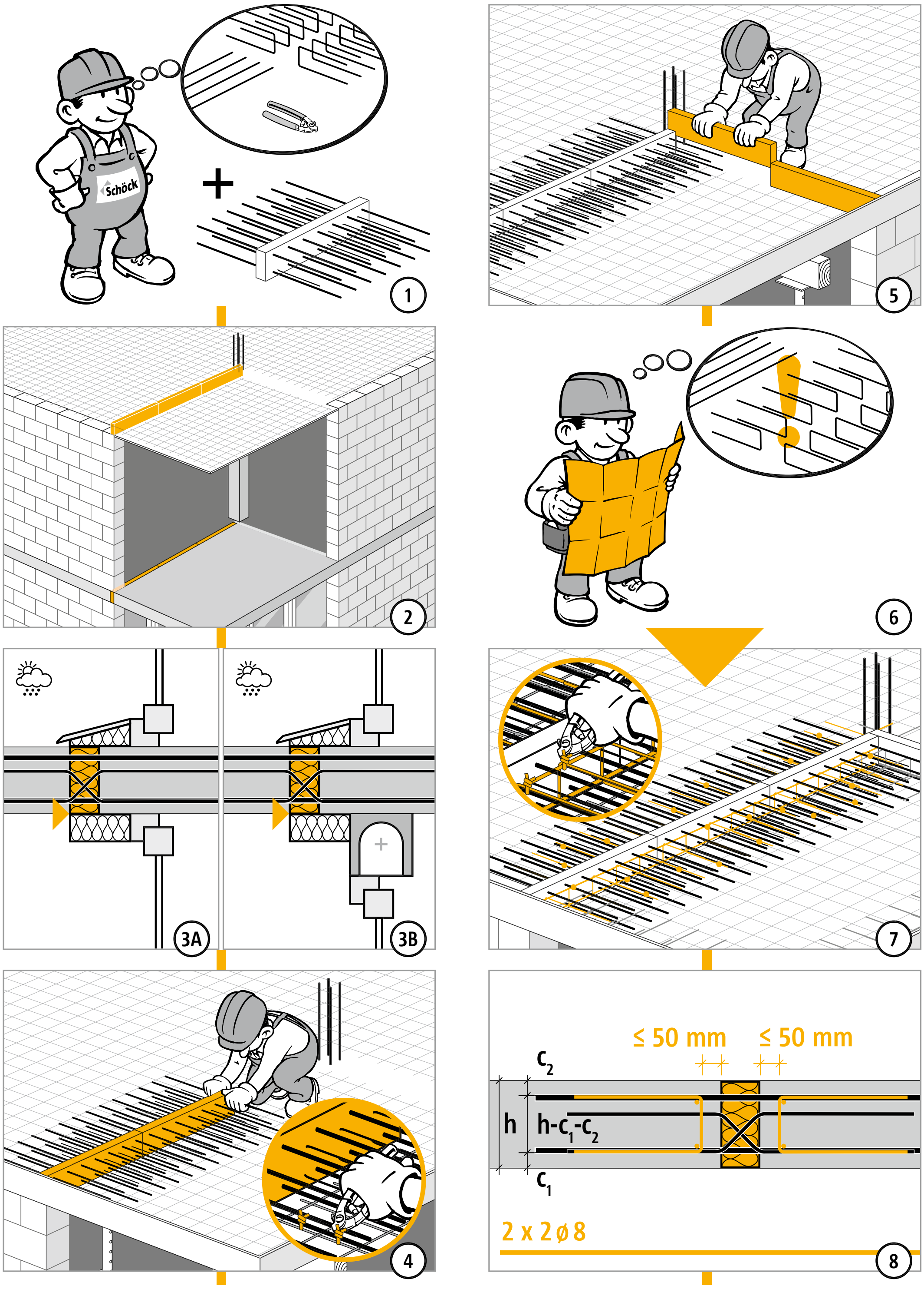



*Figure 1: Schöck Isokorb® type D.. additional reinforcement*

| Additional reinforcement (Pos.1) | | |
|---|---|---|
| Schöck Isokorb® type | $A_s$ [mm² /element] | $A_{s;selected}$ Hairpins |
| D-30-CV..-VV6 | 1,20 | ø 6-150 |
| D-30-CV..-VV8 | 2,13 | ø 8-150 |
| D-30-CV..-VV10 | 3,09 | ø 8-150 |
| D-50-CV..-VV6 | 1,20 | ø 6-150 |
| D-50-CV..-VV8 | 2,13 | ø 8-150 |
| D-50-CV..-VV10 | 3,09 | ø 8-125 |
| D-70-CV..-VV6 | 1,20 | ø 6-150 |
| D-70-CV..-VV8 | 2,13 | ø 8-150 |
| D-70-CV..-VV10 | 3,09 | ø 8-150 |
| D-90-CV..-VV6 | 1,20 | ø 6-150 |
| D-90-CV..-VV8 | 2,13 | ø 8-150 |
| D-90-CV..-VV10 | 3,09 | ø 8-150 |

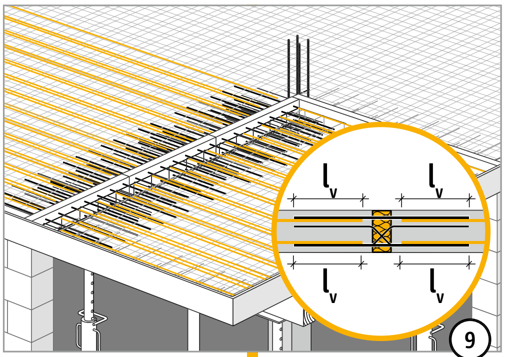
The responsible structural engineer must check/calculate if the adjacent concrete cross-section is capable of coping with the reaction forces that will develop at the location of the anchor. Depending on the design condition, like the size of the force, position in the cross-section and available concrete grades the analysis could indicate that any additional reinforcement is not required.

# Schöck Isokorb® type D
## Method statement



# Schöck Isokorb® type D
Method statement

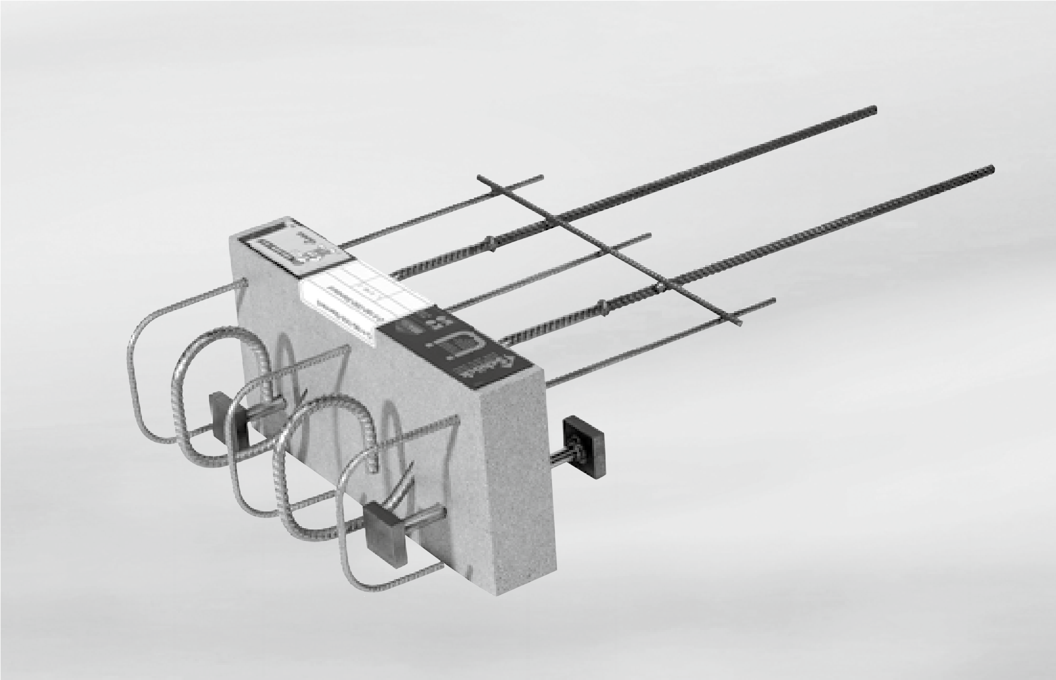





# Schöck Isokorb® type D
## Checklist

- ☐ Does the design comply with the minimal requirements for the (concrete) strength class and environmental class?
- ☐ Is this a situation for which the construction must be checked as an accidental case or is there a special loading situation during the construction stage?
- ☐ Have the member forces on the Schöck Isokorb® connection been determined at the design level?
- ☐ Has the maximum allowable bar distance been taken into account (page 28)?
- ☐ Is there a difference in stiffness of the supports (statically indeterminate structure), which must be taken into account during the design of the dimensions (page 32)?
- ☐ For the calculation of the deformation in the service limit state of the structure next to the direct deformation and concrete creep, has also the additional deformation from the Schöck Isokorb® anchor been taken into account by the responsible structural engineer (page 30, 89)?
- ☐ Have the discomforting vibrations from cantilevers been prevented in the design (page 30)?
- ☐ Have the adjacent concrete components (inside and outside) of Schöck Isokorb® element been checked by the responsible structural engineer for the calculation design values of $M_{Ed}$ and $V_{Ed}$?
- ☐ Is the required additional reinforcement determined (page 90)?
- ☐ Has the right type of Schöck Isokorb® been chosen in the case of multi-sided (2, 3, 4 sides) supports of the concrete element in order to avoid restraining effects?
- ☐ For installation of the Schöck Isokorb® type D have the bottom reinforcing bars (80 - 81) been taken into account when connecting the Schöck Isokorb® type D, for which the precast plank must have enough clearance?
- ☐ Has the required deflection for dewatering been taken into account for a proper alignment of the concrete element, next to the calculated deformation by the concrete and the Schöck Isokorb®?
- ☐ For the design of the corners zones have the minimal concrete depth (> 180 mm) and lateral reinforcement been taken into account (reinforcement in the 2nd layer)?
- ☐ For special customised solutions have the conditions been satisfied for the Schöck Isokorb® anchor within the “shape box” and the requirements of the EN 1992 for anchorage of the Schöck Isokorb® reinforcement bars outside the “shape box” (page 23)?
- ☐ Have the fire protection requirements been clarified, and are they reflected in the chosen type designation (F 90 execution) (page 25 - 26)?
- ☐ Is the Schöck Isokorb® type clearly described on structural drawings (page 129)? Example: Schöck Isokorb® type D30-CV35 -H180-D80-L1000

# Schöck Isokorb® type O



*Schöck Isokorb® type O*



**Contents** **Page**

# Schöck Isokorb® type O

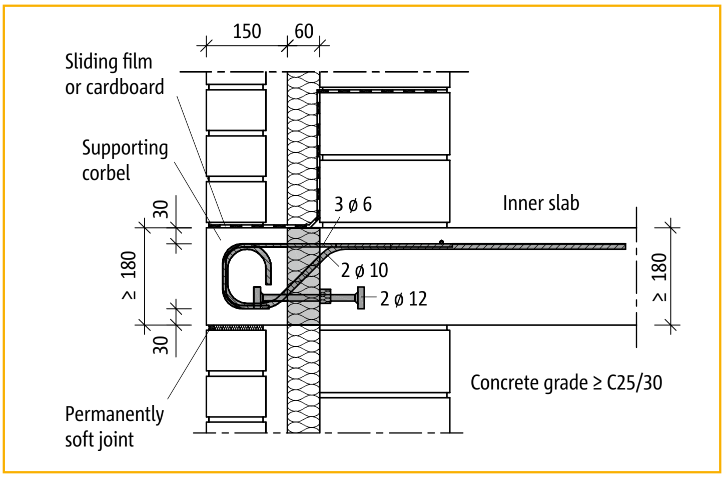
## Element arrangement/Cross-section/Design values

### Dimensions

| | |
|---|---|
| Isokorb® height | 180 - 250 mm |
| Isokorb® length | 350 mm |
| Insulating material thickness | 60 mm |

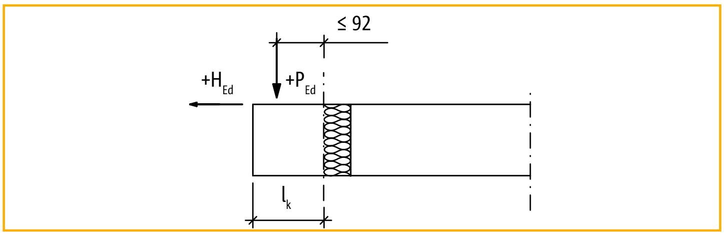
### Reinforcement

| | |
|---|---|
| Tension bars | 3 ø 6 mm |
| Pressure bearings | 2 ø 12 mm |
| Shear force bars | 2 ø 10 mm |

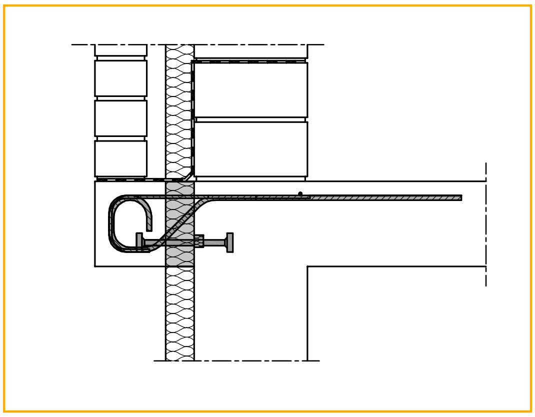



*Cross-section through inner slab console and clinker mounting*

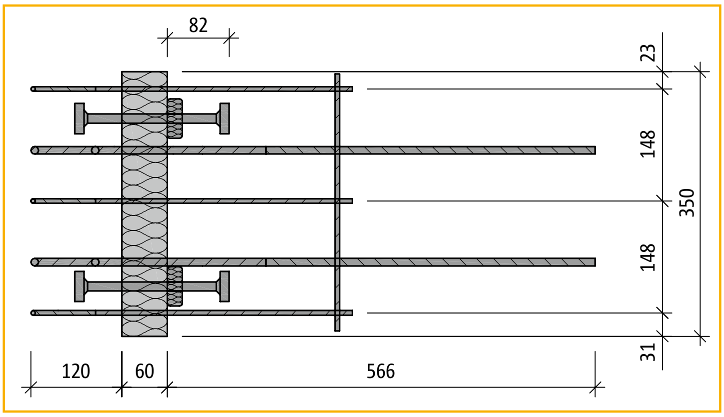
| Design values for C25/30 | | |
|---|---|---|
| **for** | **[kN/element]** | |
| **Wind-pressure** | $-3.14 \leq H_{Ed} \leq 0$ | $\mathbf{P_{Rd} = 22.56}$ at $P_{Ed} \geq +2.06 \times H_{Ed}$ |
| **Wind-suction** | $0 < H_{Ed} \leq 2.26$ | $\mathbf{P_{Rd} = 0.38 \times (59.77 - H_{Ed})}$ at $P_{Ed} \geq 10 \times H_{Ed}$ |



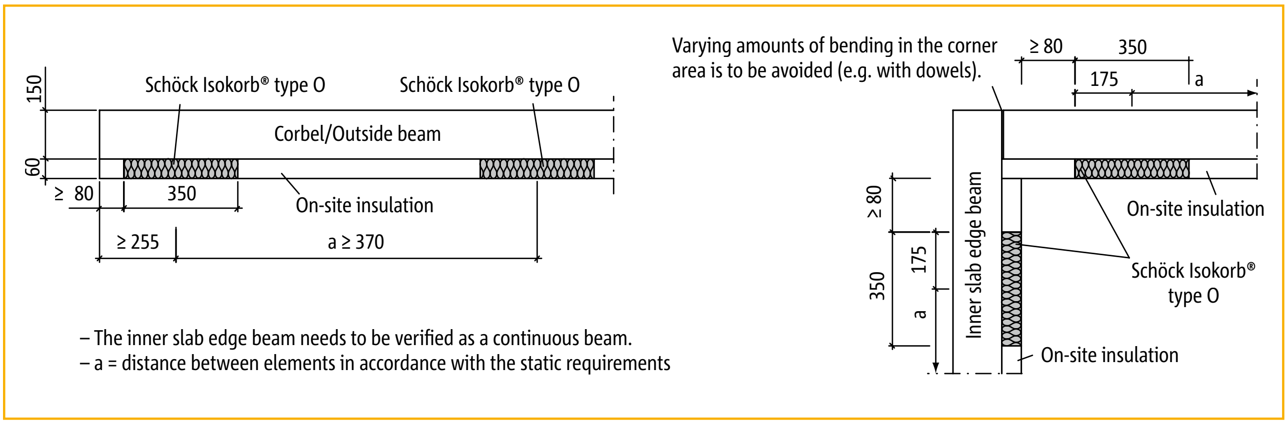

*Static system*



*Cross-section between clinker mounting and cellar wall*



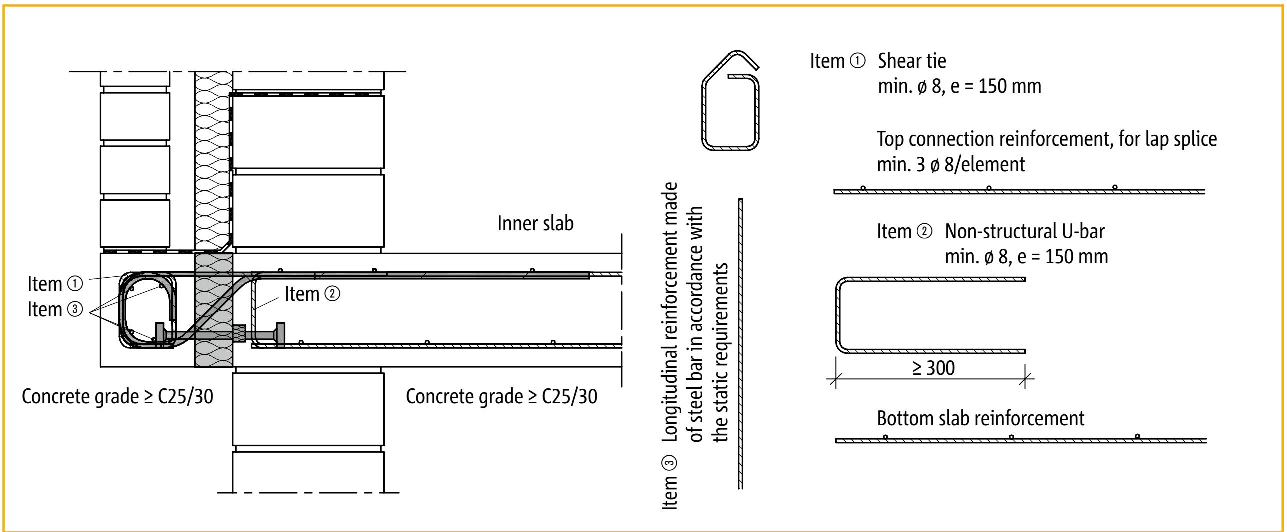

*Plan view: Schöck Isokorb® type O*




*Distance between elements*

# Schöck Isokorb® type O
## Additional reinforcement/Checklist





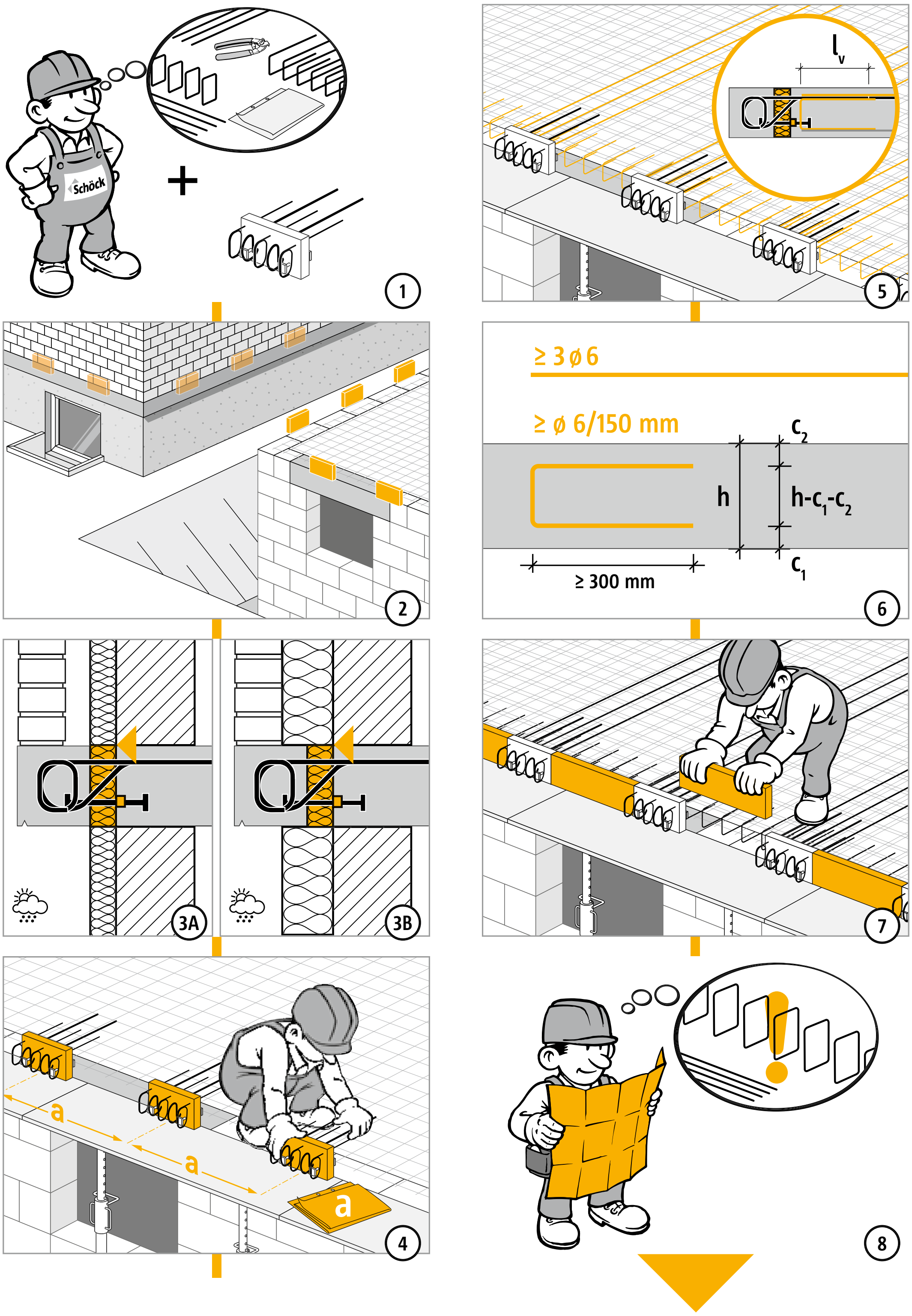

*Schöck Isokorb® type O - Additional reinforcement*

### Checklist

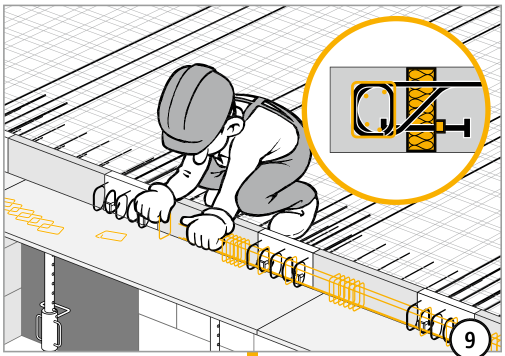
- ☐ Does the design comply with the minimal requirements for the (concrete) strength class and environmental class?
- ☐ Is this a situation for which the construction must be checked as an accidental case or is there a special loading situation during the construction stage?
- ☐ Have the member forces on the Schöck Isokorb® connection been determined at the design level?
- ☐ Has the maximum allowable bar distance been taken into account (page 28)?
- ☐ Is there a difference in stiffness of the supports (statically indeterminate structure), which must be taken into account during the design of the dimensions (page 32)?
- ☐ Have the adjacent concrete components (inside and outside) of Schöck Isokorb® element been checked by the responsible structural engineer for the calculation design values of $M_{Ed}$ and $V_{Ed}$?
- ☐ Has for the Schöck Isokorb® type O sufficient clearance been left in the structural joint behind the insulation element of the (at least 100 mm from the insulation), so that the zone around and behind the compression corbel can be properly filled and compacted to ensure proper force transfer?
- ☐ For special customised solutions have the conditions been satisfied for the Schöck Isokorb® anchor within the “shape box” and the requirements of the EN 1992 for anchorage of the Schöck Isokorb® reinforcement bars outside the “shape box” (page 21)?
- ☐ Have the fire resistant requirements been clarified, and are they reflected in the chosen type designation (F 90 execution) (25 - 26)?
- ☐ Is the Schöck Isokorb® type clearly described on structural drawings (page 129)? Example: Schöck Isokorb® type O-CV30-H160-D60-L350

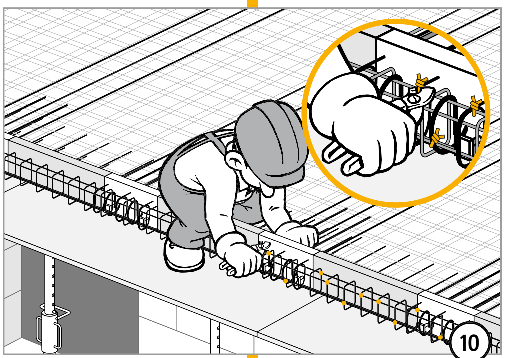
# Schöck Isokorb® type O

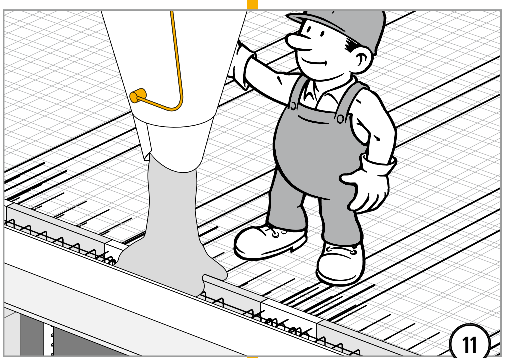
## Method statement



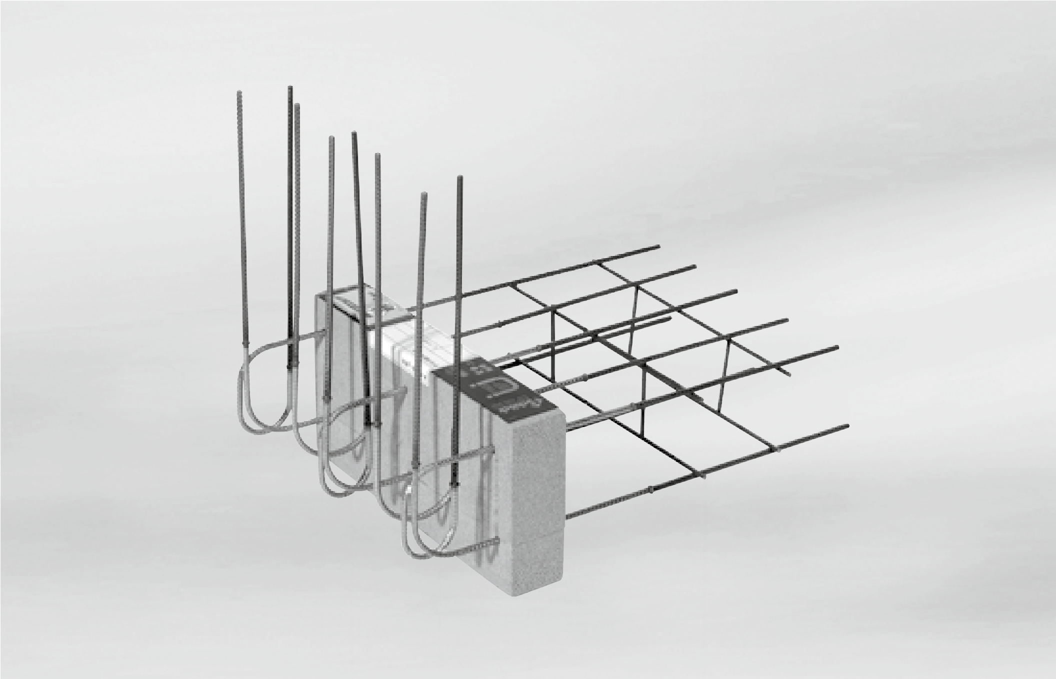
# Schöck Isokorb® type O
Method statement




# Schöck Isokorb® type F



*Schöck Isokorb® type F*

F

Reinforced concrete-to-reinforced concrete

**Contents** **Page**

# Schöck Isokorb® type F

## Element arrangement/Design values/Cross-section

### Dimensions

| | |
|---|---|
| Isokorb® height | 160 - 250 mm |
| Isokorb® length | 350 mm |
| Insulation material thickness | 60 mm |

### Reinforcement

| | |
|---|---|
| Tension bars | 3 ø 6 mm |
| Compression bars | 3 ø 6 mm |
| Shear force bars | 2 ø 6 mm |

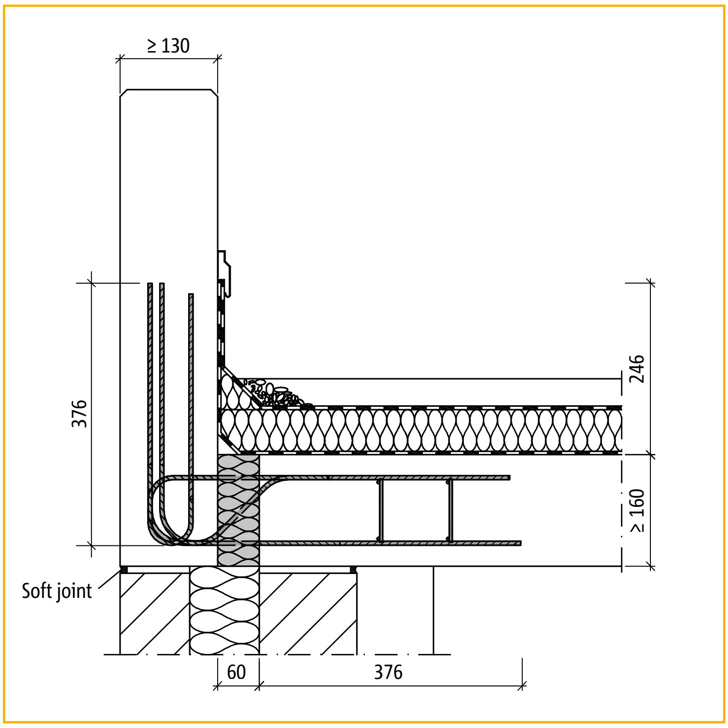
### Design values for ≥ C20/25

$V_{Rd}$ = +12.7 kN per Isokorb®
$M_{Rd}$ ≤ ±1.5 kNm per Isokorb®

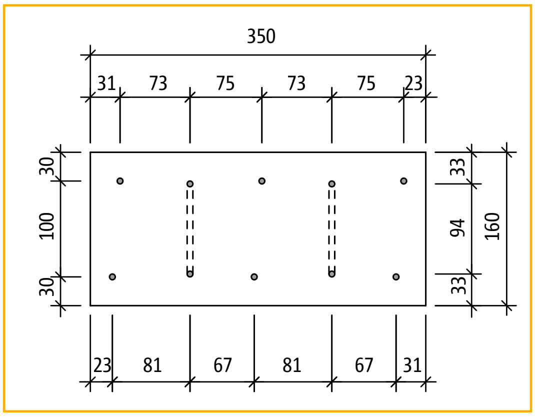
$$|N_{Ed}| + \frac{|M_{Ed}|}{0{,}047\ m} \le 30kN$$

Example
$V_{Ed}$ = 10 kN  $M_{Ed}$ = 0,8 kNm
$N_{Ed}$ = -12 kN: 10 kN ≤ 12,7 kN o.k.

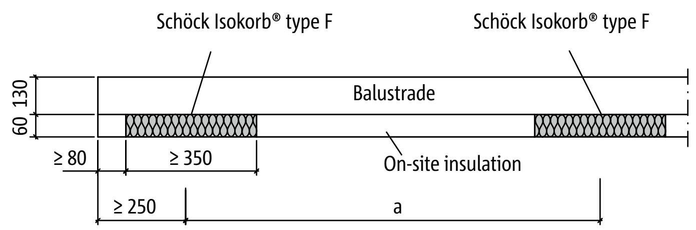
$$12kN \frac{0{,}8}{0{,}047\ m}\ 29{,}0 \le 30\ \text{o.k.}$$



*Cross-section through attic slab*

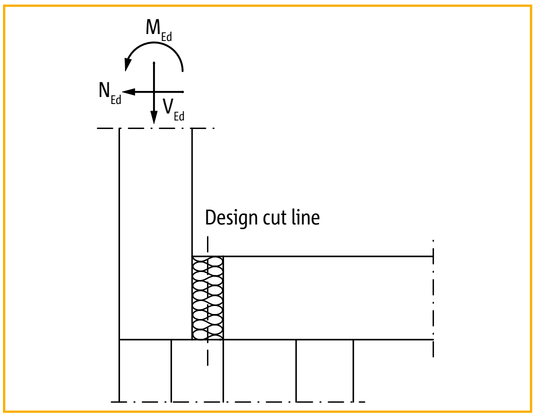


*Section A - A*




– The balustrade needs to be verified as a continuous beam.
– a = distance between elements in accordance with the static requirements

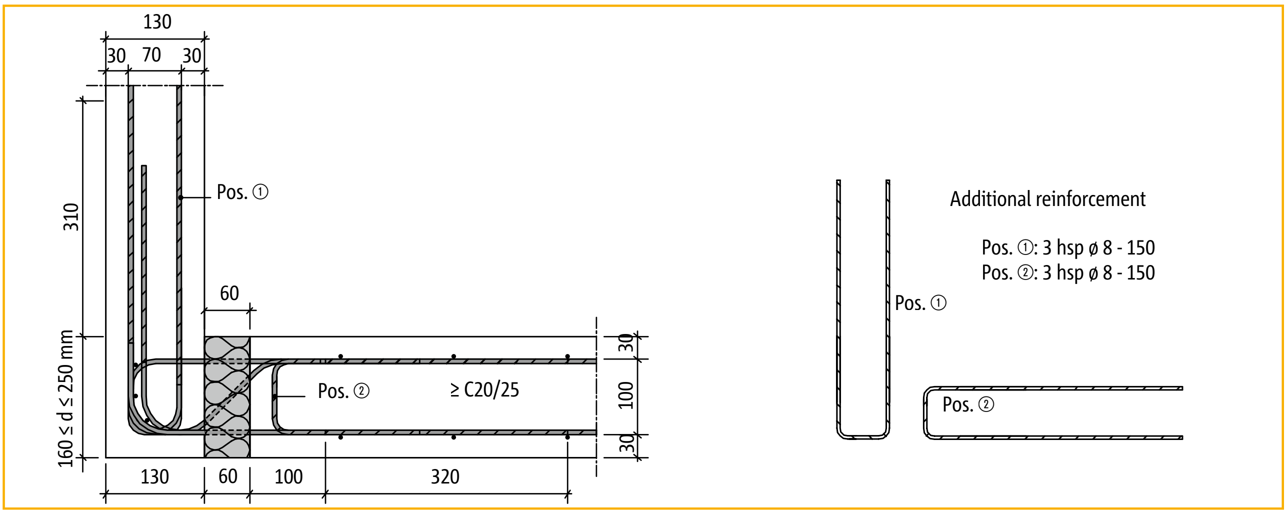
*Distance between elements*



*Structural system*

# Schöck Isokorb® type F

## Additional reinforcement/Checklist




*Schöck Isokorb® type F – Additional reinforcement*

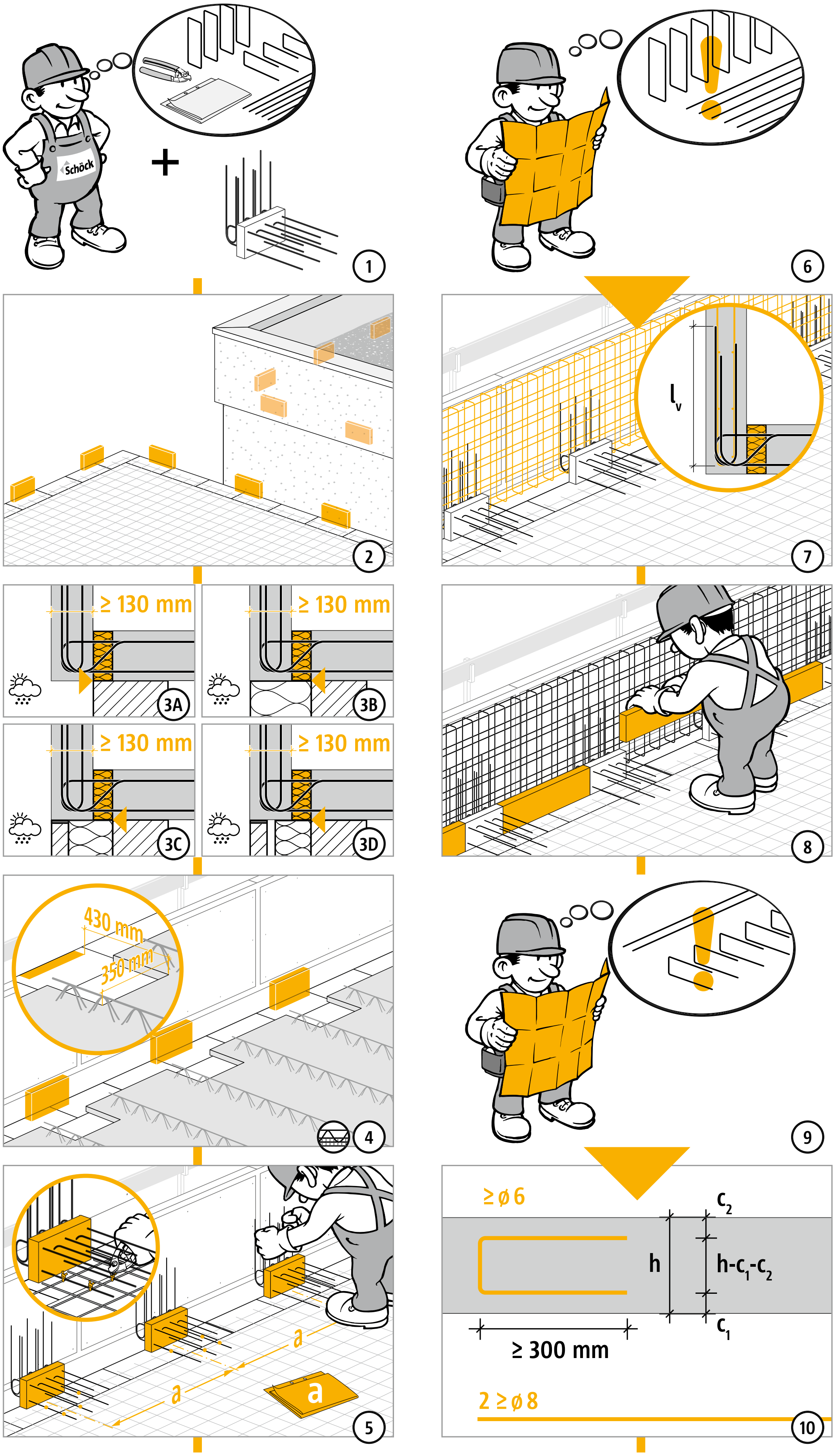
### Checklist

- ☐ Does the design comply with the minimal requirements for the (concrete) strength class and environmental class?
- ☐ Is this a situation for which the construction must be checked as an accidental case or is there a special loading situation during the construction stage?
- ☐ Have the member forces on the Schöck Isokorb® connection been determined at the design level?
- ☐ Has the maximum allowable bar distance been taken into account (page 28)?
- ☐ Is there a difference in stiffness of the supports (statically indeterminate structure), which must be taken into account during the design of the dimensions (page 32)?
- ☐ Have the adjacent concrete components (inside and outside) of Schöck Isokorb® element been checked by the responsible structural engineer for the calculation design values of $M_{Ed}$ and $V_{Ed}$?
- ☐ For special customised solutions have the conditions been satisfied for the Schöck Isokorb® anchor within the "shape box" and the requirements of the EN 1992 for anchorage of the Schöck Isokorb® reinforcement bars outside the "shape box" (page 21)?
- ☐ Have the fire resistant requirements been clarified, and are they reflected in the chosen type designation (F 90 execution) (page 25 - 26)?
- ☐ Is the Schöck Isokorb® type clearly described on structural drawings (page 129)? Example: Schöck Isokorb® type F-CV30-H160-D60-L350

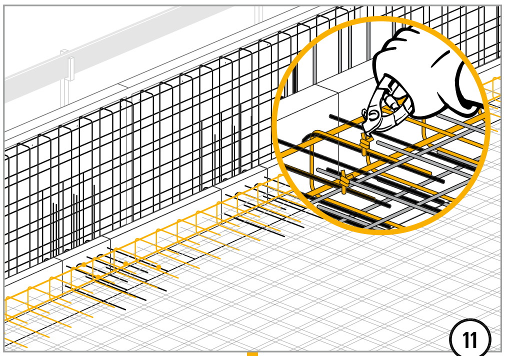
# Schöck Isokorb® type F

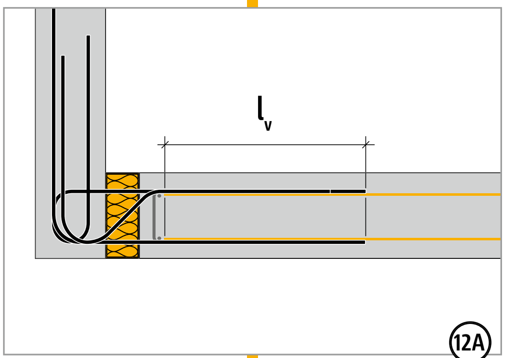
## Method statement

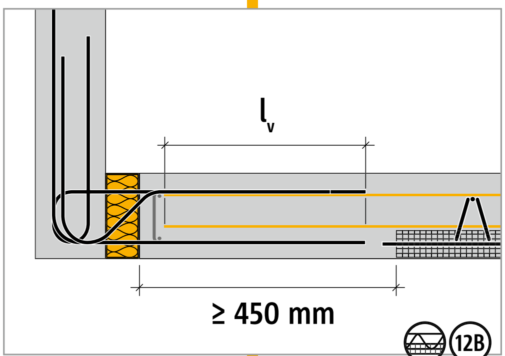




# Schöck Isokorb® type F
## Method statement

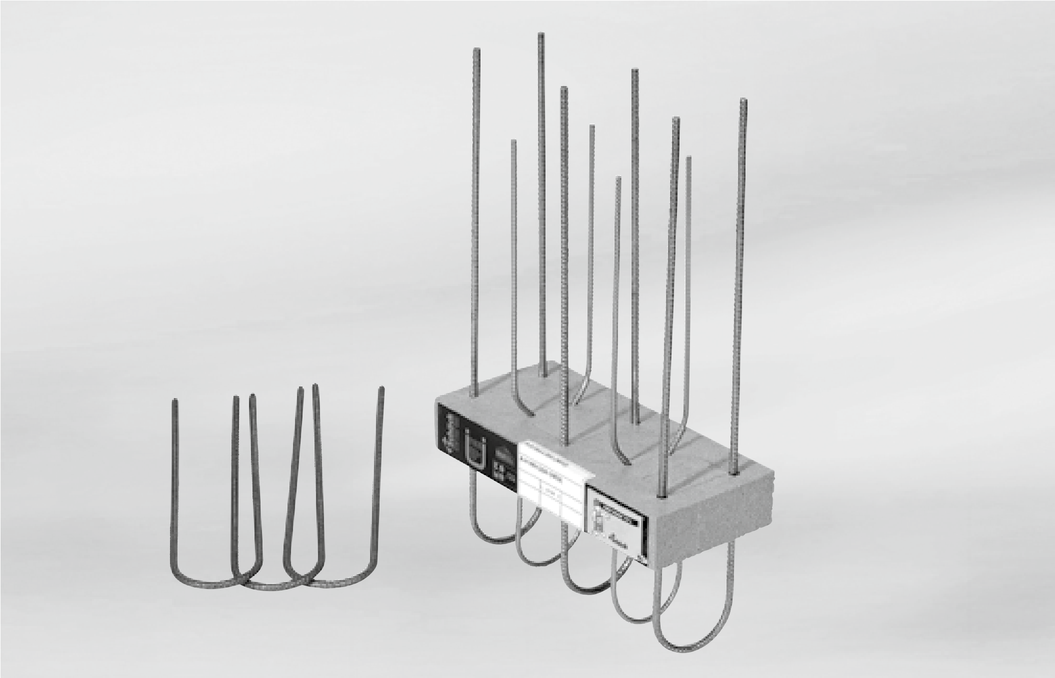





# Schöck Isokorb® type A



*Schöck Isokorb® type A*

A

Reinforced concrete-to-reinforced concrete

**Contents** **Page**

# Schöck Isokorb® type A

## Element arrangement/Design values/Cross-section

### Dimensions

| | |
|---|---|
| Isokorb® height | 160 - 250 mm |
| Isokorb® length | 350 mm |
| Insulation material thickness | 60 mm |

### Reinforcement

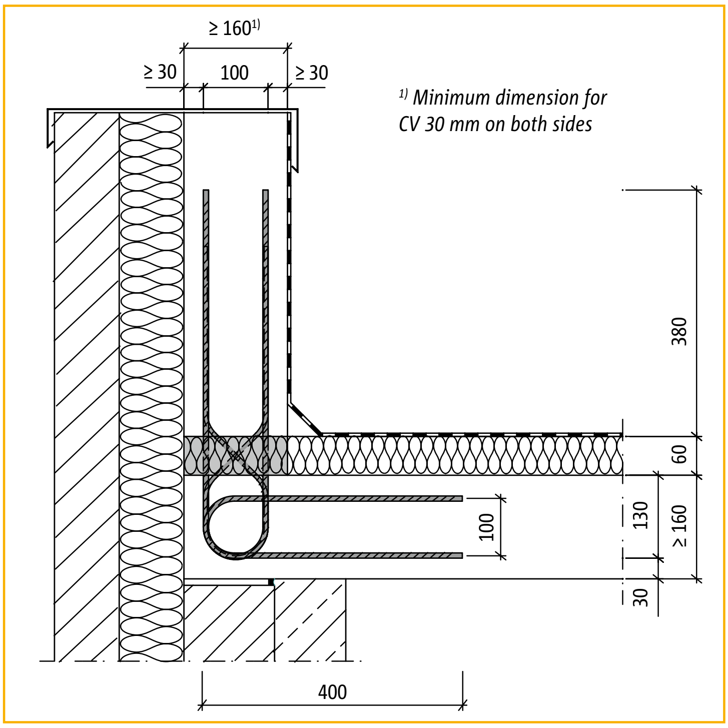
| | |
|---|---|
| Tension/Pressure bars BSt 500NR | 2 × 3 ø 8 mm |
| Shear force bars BSt 500NR | 2 × 2 ø 6 mm |

### Design values for ≥ C20/25

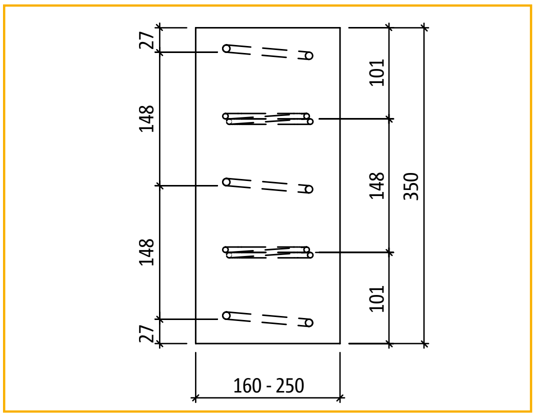
$V_{Rd}$ = ±12,7 kN per Isokorb®

$M_{Ed}$ and $N_{Ed}$ to be checked with interaction formula:

$$\frac{|M_{Ed}|}{0{,}046\ \text{m}} + 0{,}35 * |V_{Ed}| + N_{Ed} \le 63{,}5\ \text{kN}$$

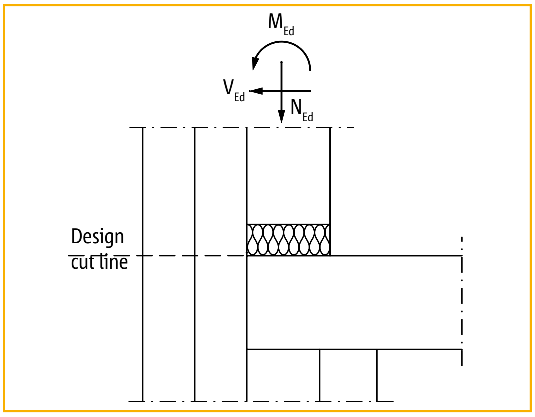


*Cross-section through RC slab with RC upstand*

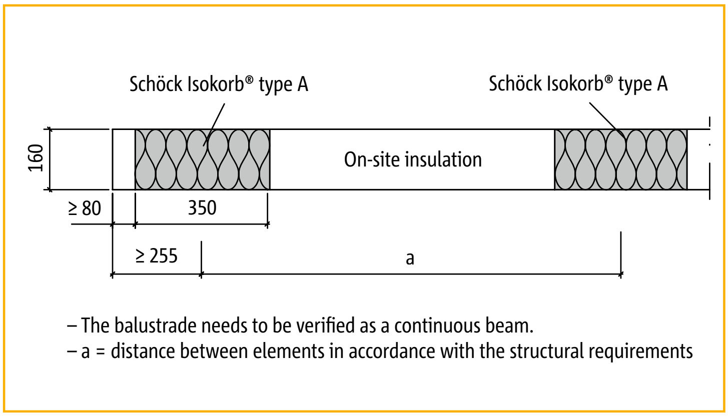


*Plan view*

Example = $M_{Ed}$ = - 1,5 kNm, $V_{Ed}$ = -6 kN, Ned = 20 kN
1,5 / 0,046 + 0,35 x 6 + 20 = 54,7 ≤ 63,5 kN o.k.

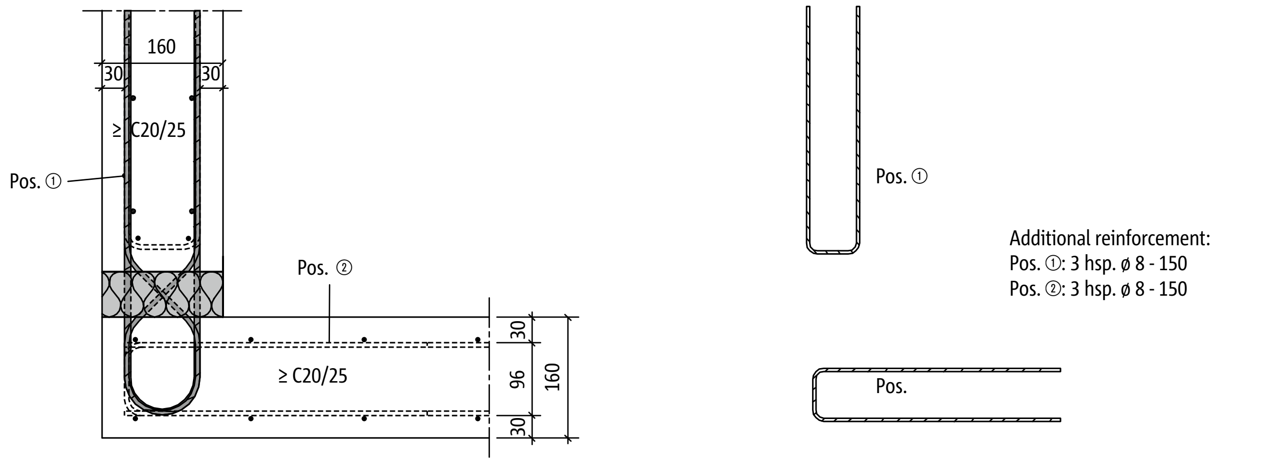


*Structural system*



*Distance between elements*

# Schöck Isokorb® type A
## Additional reinforcement/Checklist



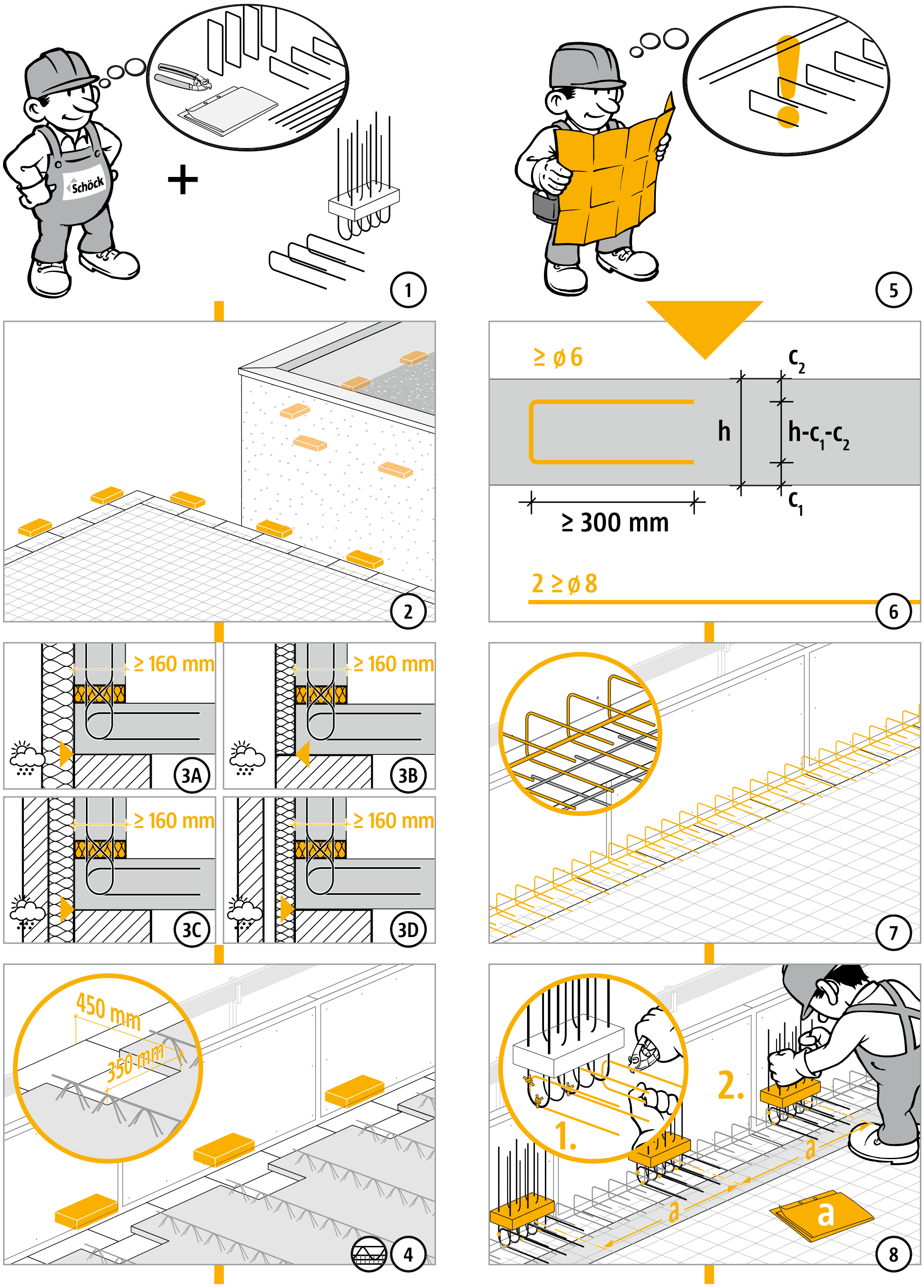

*Schöck Isokorb® type A – Additional reinforcement*



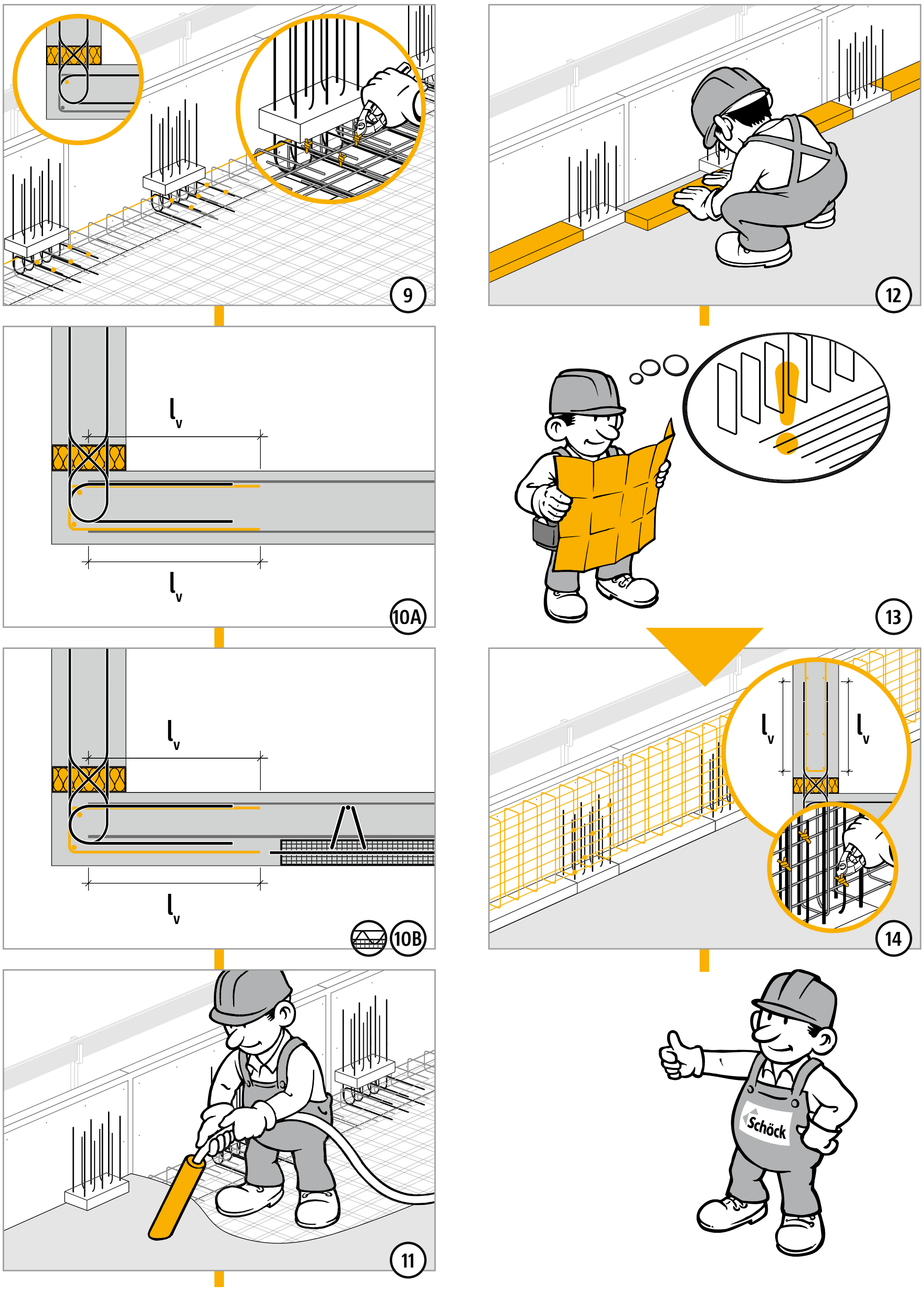
### Checklist

- ☐ Does the design comply with the minimal requirements for the (concrete) strength class and environmental class?
- ☐ Is this a situation for which the construction must be checked as an accidental case or is there a special loading situation during the construction stage?
- ☐ Have the member forces on the Schock Isokorb® connection been determined at the design level?
- ☐ Has the maximum allowable bar distance been taken into account (page 28)?
- ☐ Is there a difference in stiffness of the supports (statically indeterminate structure), which must be taken into account during the design of the dimensions (page 32)?
- ☐ Have the adjacent concrete components (inside and outside) of Schock Isokorb® element been checked by the responsible structural engineer for the calculation design values of $M_{Ed}$ and $V_{Ed}$?
- ☐ For special customised solutions have the conditions been satis ed for the Schock Isokorb® anchor within the “shape box” and the requirements of the EN 1992 for anchorage of the Schöck Isokorb® reinforcement bars outside the “shape box” (page 21)?
- ☐ Have the fire safety requirements been clarified, and are they reflected in the chosen type designation (F 90 execution) (page 25 - 26)?
- ☐ Is the Schock Isokorb® type clearly described on structural drawings (page 129)? Example: Schöck Isokorb® type A-CV30-H160-D60-L350

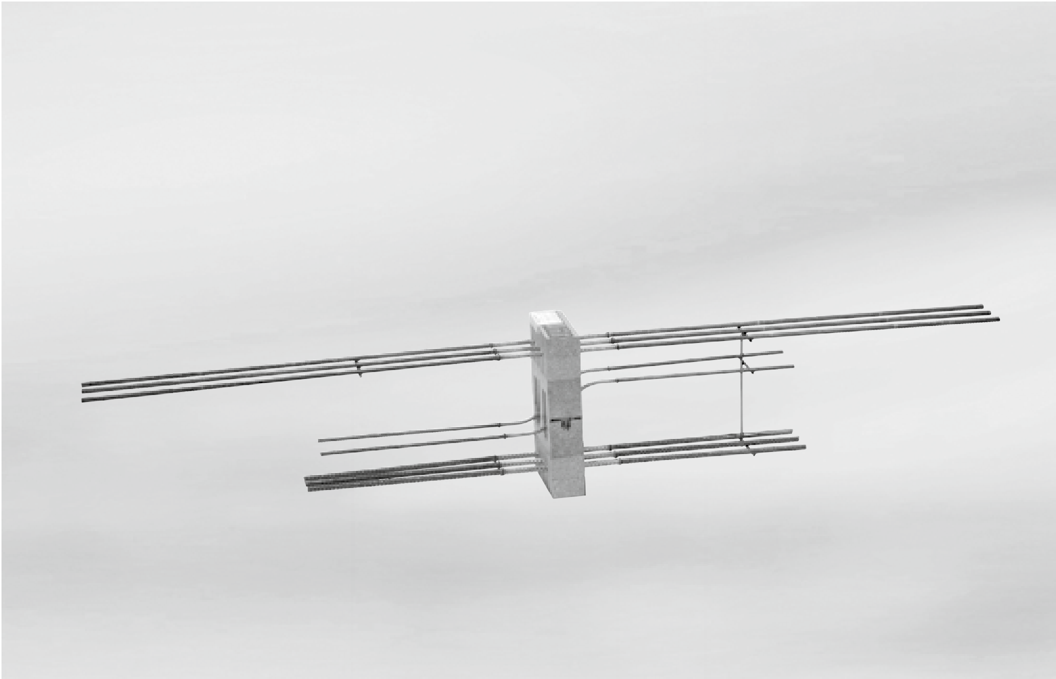
# Schöck Isokorb® type A
Method statement



# Schöck Isokorb® type A
## Method statement



# Schöck Isokorb® type S



*Schöck Isokorb® type S*

S

Reinforced concrete-to-reinforced concrete

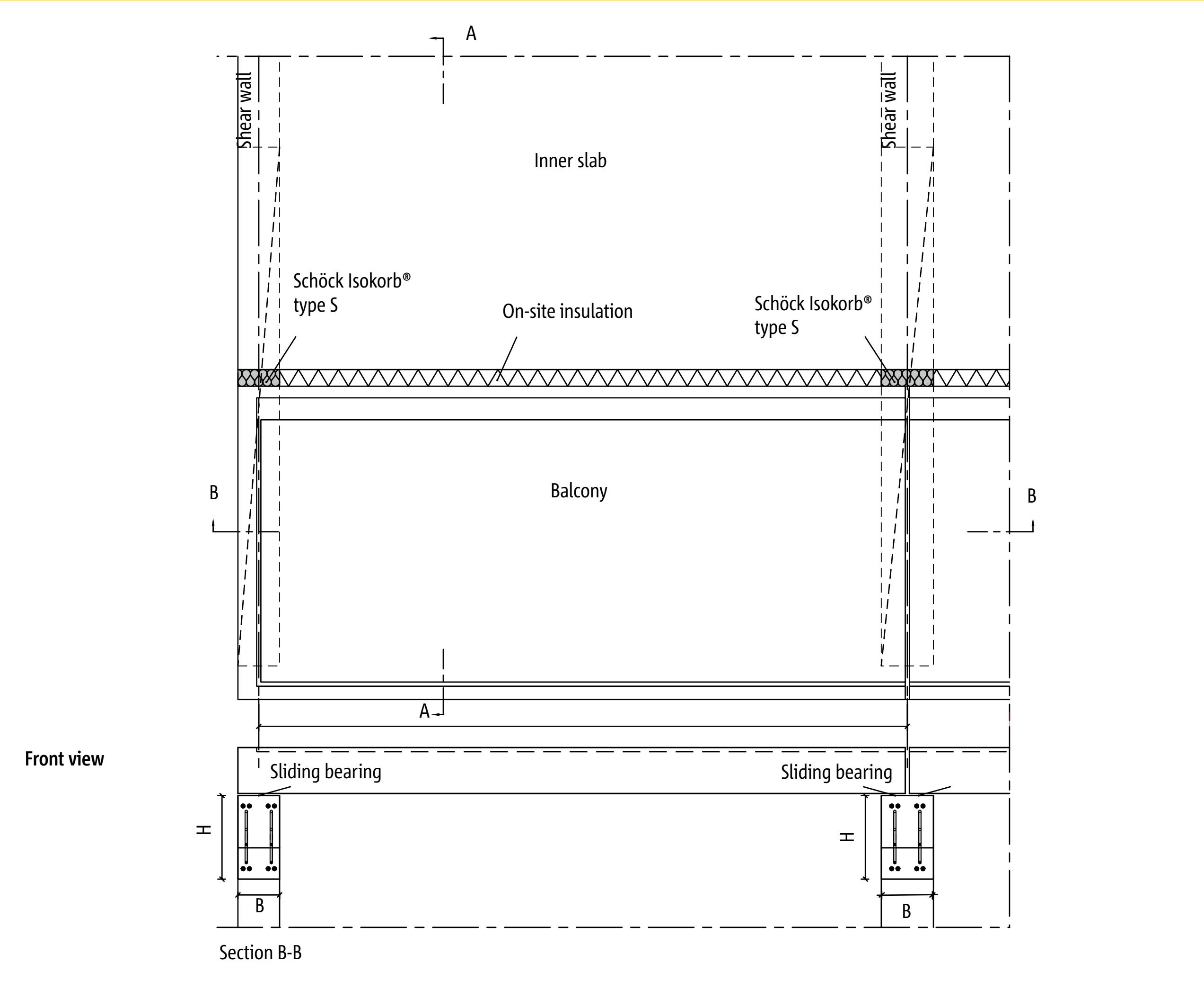
**Contents** **Page**

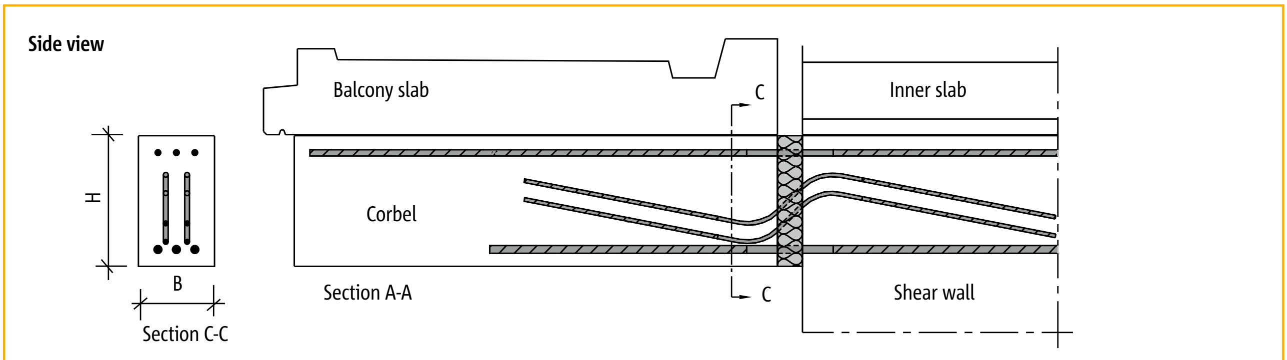
# Schöck Isokorb® type S

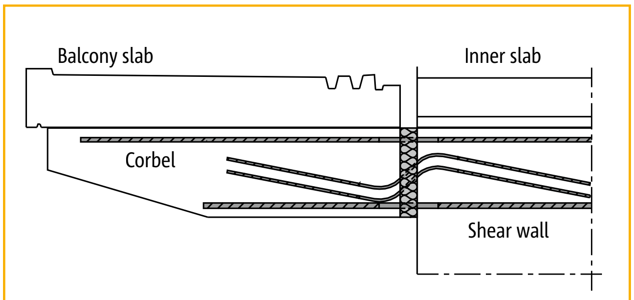
## Element arrangements/Cross-sections



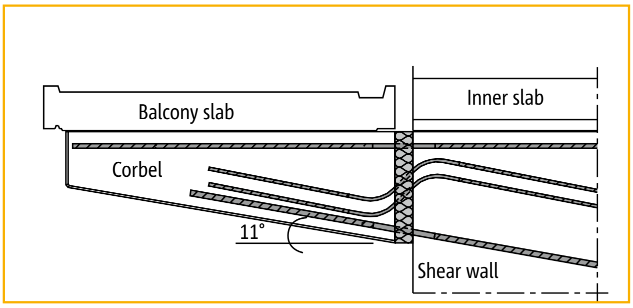
### Plan view




*Corbel variant 1 with Schöck Isokorb® type S*

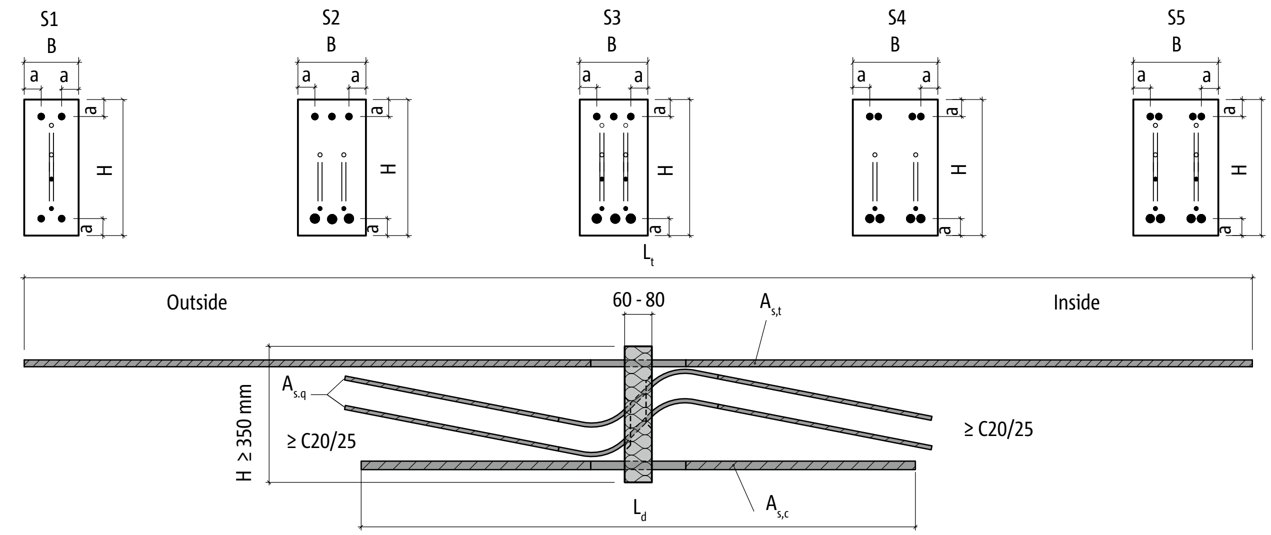



*Corbel variant 2 with Schöck Isokorb® type S*

# Schöck Isokorb® type S
## Product description/Capacity table

**Concrete grade ≥ C20/25**
**Concrete cover CV30**






| Standard length $l_t$ [mm] and $l_d$ [mm] of Schöck Isokorb® bars | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Diameter | | | | | | |
| | ø 8 | ø 10 | ø 12 | ø 14 | ø 16 | ø 20 | ø 25 |
| Tension bar $L_t$ | 880 | 1030 | 1560 | 1780 | 2620 | 3220 | – |
| Compression bar $L_d$ | 820 | 950 | 1180 | 1410 | 1350 | 1620 | 1950 |

| Minimum edge distance a [mm] of the bar in the corner | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Diameter | | | | | | |
| | ø 8 | ø 10 | ø 12 | ø 14 | ø 16 | ø 20 | ø 25 |
| Single bar | 50 | 50 | 50 | 50 | 50 | 50 | 55 |
| Bundle (2 bars) | 50 | 50 | 50 | 50 | 50 | 55 | 65 |

| Schöck Isokorb® type[1] | | | S 20/2 | S 20/3 | | S 20/4 | |
|---|---|---|---|---|---|---|---|
| Height (H) | Width (B) | | 180 mm | 220 mm | | 280 mm | |
| | | | S1 | S2 | S3 | S4 | S5 |
| H = 350 mm | Reinforcement | $A_{s,t}$ | 2 ø 20 | 3 ø 20 | | 4 ø 20 | |
| | | $A_{s,q}$ | 2 ø 12 | 2 ø 14 | | 2 ø 14 | |
| | | $A_{s,c}$ | 2 ø 25 | 3 ø 25 | | 4 ø 25 | |
| | Forces | $M_{Ed}$ in kNm | 59,7 | 108,7 | | 145,0 | |
| | | $V_{Ed}$ in kN | 58,3 | 79,3 | | 79,3 | |
| | Stiffness | C in kNm/rad | 10776 | 16163 | | 21551 | |
| H = 400 mm | Reinforcement | $A_{s,t}$ | 2 ø 20 | | 3 ø 20 | | 4 ø 20 |
| | | $A_{s,q}$ | 2 ø 12 | | 4 ø 12 | | 4 ø 14 |
| | | $A_{s,c}$ | 2 ø 25 | | 3 ø 25 | | 4 ø 25 |
| | Forces | $M_{Ed}$ in kNm | 72,0 | | 132,8 | | 177,5 |
| | | $V_{Ed}$ in kN | 58,3 | | 138,4 | | 181,6 |
| | Stiffness | C in kNm/rad | 15623 | | 23434 | | 31245 |
| H = 450 mm | Reinforcement | $A_{s,t}$ | 2 ø 20 | | 3 ø 20 | | 4 ø 20 |
| | | $A_{s,q}$ | 2 ø 14 | | 4 ø 14 | | 4 ø 16 |
| | | $A_{s,c}$ | 2 ø 25 | | 3 ø 25 | | 4 ø 25 |
| | Forces | $M_{Ed}$ in kNm | 84,7 | | 150,5 | | 209,7 |
| | | $V_{Ed}$ in kN | 79,3 | | 189,4 | | 241,8 |
| | Stiffness | C in kNm/rad | 21367 | | 32051 | | 42735 |

[1] Schöck Isokorb® type S standard is used as an example for a potential application. For other solutions please contact our Technical Design Department.

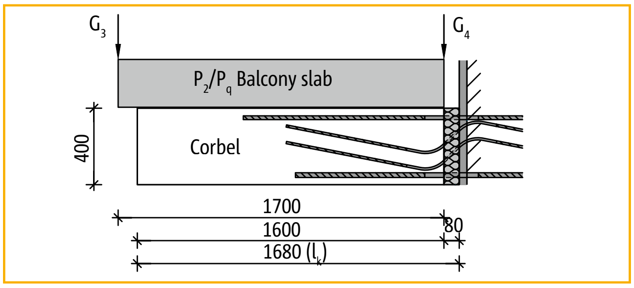
# Schöck Isokorb® type S
## Calculation example

### Geometry

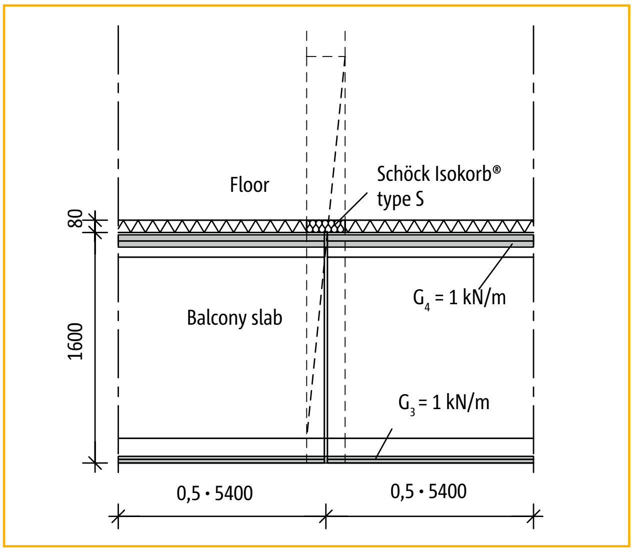
#### Corbel

| | |
|---|---|
| Width (B) | = 250 mm |
| Height (H) | = 400 mm |
| Internal arm 400-55-65 | = 290 mm |
| Cantilever ($l_k$)[1)] | = 1680 mm |

#### Cross-section




#### Plan view




### Loads

| | | | | |
|---|---|---|---|---|
| **Permanent load** | | | | |
| Corbel-shear wall | 0,4 • 0,25 • 25,0 kN/m³ = | $G_1$ = 2,50 kN/m | $G_{1:min}$ = 2,50 kN/m | $G_{1:max}$ = 3,00 kN/m |
| Balcony slab | 0,20 m • 25,0 kN/m³ = | $p_2$ = 5,00 kN/m² | $p_{2:min}$ = 5,00 kN/m² | $p_{2:max}$ = 6,00 kN/m² |
| Railing | | $G_3$ = 1,00 kN/m | $G_{3:min}$ = 1,00 kN/m | $G_{3:max}$ = 1,20 kN/m |
| Facade masonry | 20 % • 2,80 m • 1,8 kN/m² = | $G_4$ = 1,00 kN/m | $G_{4:min}$ = 1,00 kN/m | $G_{4:max}$ = 1,20 kN/m |

| | | | |
|---|---|---|---|
| **Live load** | $\psi_2$ = 0,3 $p_q$ = 4,00 kN/m² | $p_{qmin}$ = 4,00 kN/m² | $p_{qmax}$ = 6,00 kN/m² |

### Reaction forces

**Wear plate length per Isokorb® element = 5400 mm**

| | $V_{Ed}$ | | $M_{Ed}$ |
|---|---|---|---|
| **Permanent load** | [kN] | | [kNm] |
| $G_1$: 1,60 • 3,0 | = 4,8 • (0,5 • 1,60 + 0,08) | = | 4,2 |
| $p_2$: 1,70 • 5,40 • 6,0 | = 55,1 • (0,5 • 1,70 + 0,08) | = | 51,2 |
| $G_3$: 5,40 • 1,2 | = 6,5 • (1,80 + 0,08) | = | 6,4 |
| $G_4$: 5,40 • 1,2 | = 6,5 • 0,08 | = | 0,50 |
| Total permanent loads | 72,9 | | 62,3 |
| **Live load** | | | |
| $p_q$ : 1,70 • 5,4 • 6,0 | = 55,1 • (0,5 • 1,80 + 0,08) | = | 54,0 |
| **Total perm. load + live load** | **128** | | **116,3** |

### Figures element S20/4 H=400 mm

**Strength control (Ultimate Limit State (ULS))**
$M_{Ed}$ = 116,3 kNm < 177,5 kNm U.C. = 66 %
$V_{Ed}$ = 128 kN < 181,6 kN U.C. = 70 %

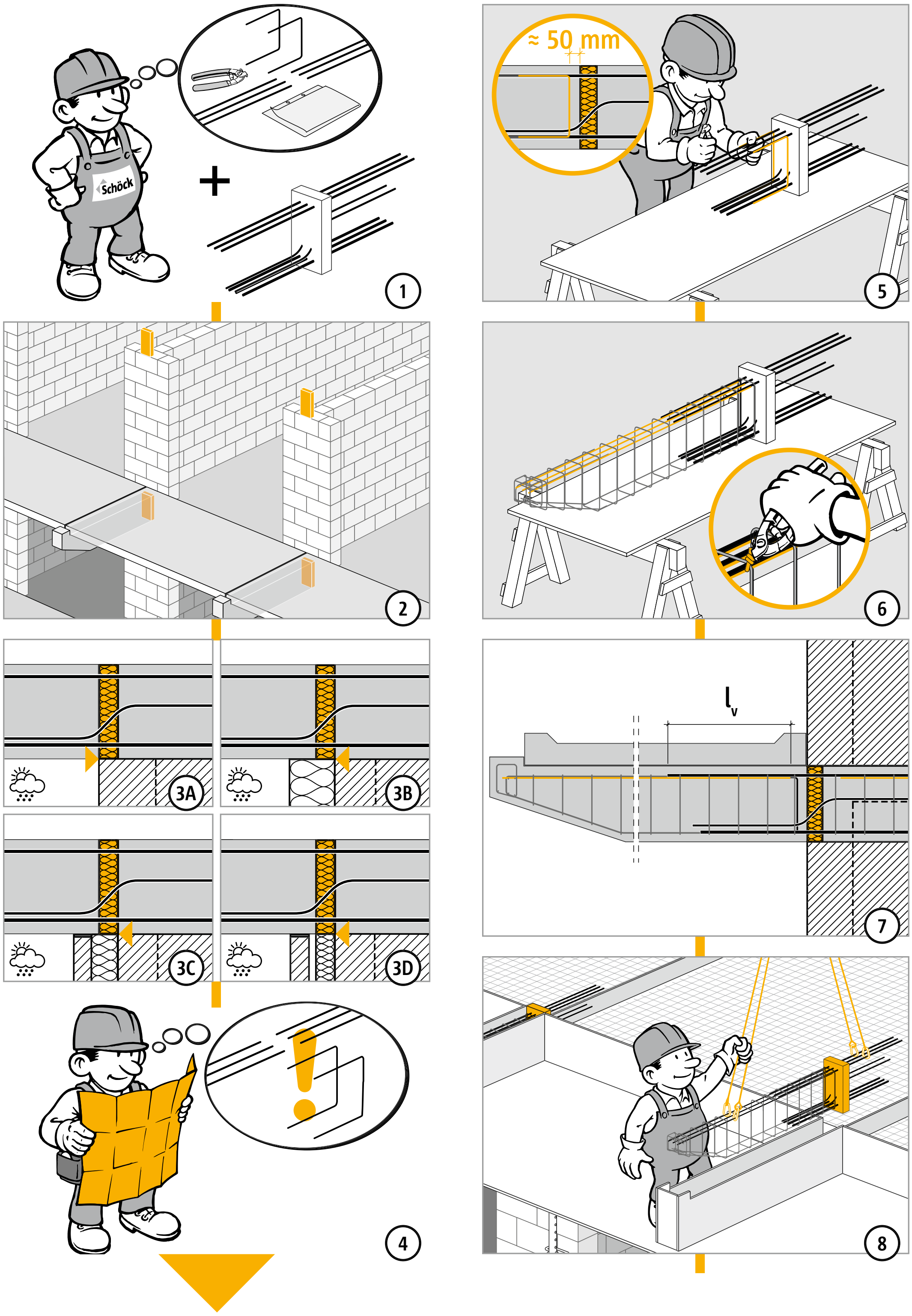
**Distortions (Service Limit State (SLS))**
Stiffness C = 31245 kNm/rad

Extra distortions (quasi-permanent):
$M_{qp}$ = 62,3/1,2 + 0,30 · 54,0/1,5 = 62,7 kNm
$f_{qp}$ = 62,7 • (1700 + 80) / 31245 = 3,6 mm
These distortions should be added to the own deformation of the console

**Look also at checklist page 119.**

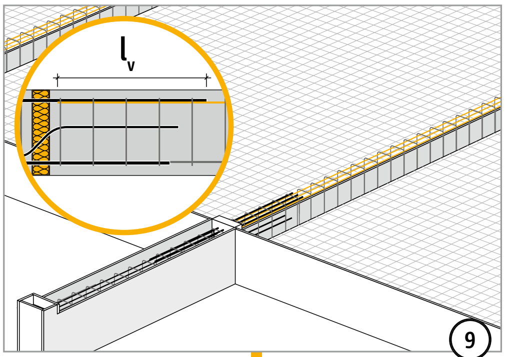
[1)] Including isolation thickness Schöck Isokorb®

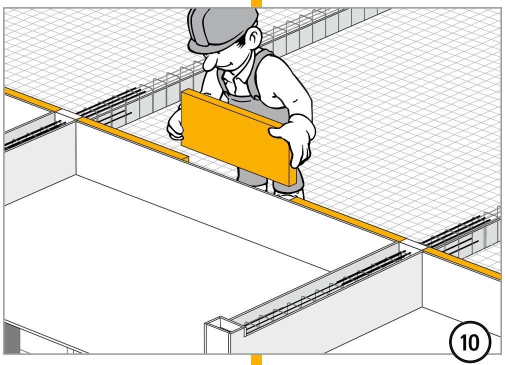
# Schöck Isokorb® type S
Method statement



# Schöck Isokorb® type S

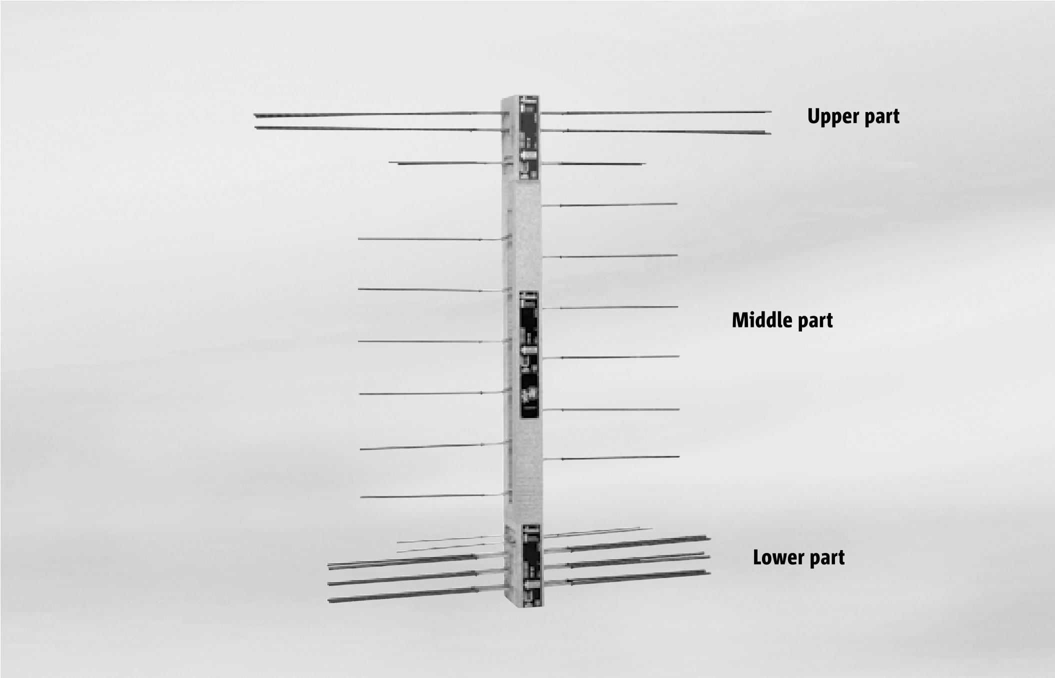
## Method statement




- ☐ Does the design comply with the minimal requirements for the (concrete) strength class and environmental class?
- ☐ Is this a situation for which the construction must be checked as an accidental case or is there a special loading situation during the construction stage?
- ☐ Have the member forces on the Schock Isokorb® connection been determined at the design level?
- ☐ For the calculation of the deformation in the service limit state of the structure next to the direct deformation and concrete creep, has also the additional deformation from the Schock Isokorb® anchor been taken into account by the responsible structural engineer (page 30, 115)?
- ☐ Have the discomforting vibrations from cantilevers been prevented in the design (page 30)?
- ☐ Have the adjacent concrete components (inside and outside) of Schöck Isokorb® element been checked by the responsible structural engineer for the calculation design values of $M_{Ed}$ and $V_{Ed}$?
- ☐ For special customised solutions have the conditions been satisfied for the Schöck Isokorb® anchor within the “shape box” and the requirements of the EN 1992 for anchorage of the Schöck Isokorb® reinforcement bars outside the “shape box” (page 21)?
- ☐ Has the required deflection for dewatering been taken into account for a proper alignment of the concrete element, next to the calculated deformation by the concrete and the Schock Isokorb®?
- ☐ Have the fire safety requirements been clarified, and are they reflected in the chosen type designation (F 90 execution) (page 25 - 26)?
- ☐ Is there between the element lying on the corbel and the corbel a sliding bearing felt applied with a “friction-coefficient” $\mu \leq 0.03$?
- ☐ Is the element lying on the corbel sufficiently anchored against horizontal move / shifting?
- ☐ Is the Schöck Isokorb® type clearly described on structural drawings (page 129)? Example: Schöck Isokorb® type S20/4-CV30-H450-D80-B250, $M_{Rd}$ = 210 kNm, $V_{Rd}$ = 242 kN

# Schöck Isokorb® type W




*Schöck Isokorb® type W*

W

Reinforced concrete-to-reinforced concrete

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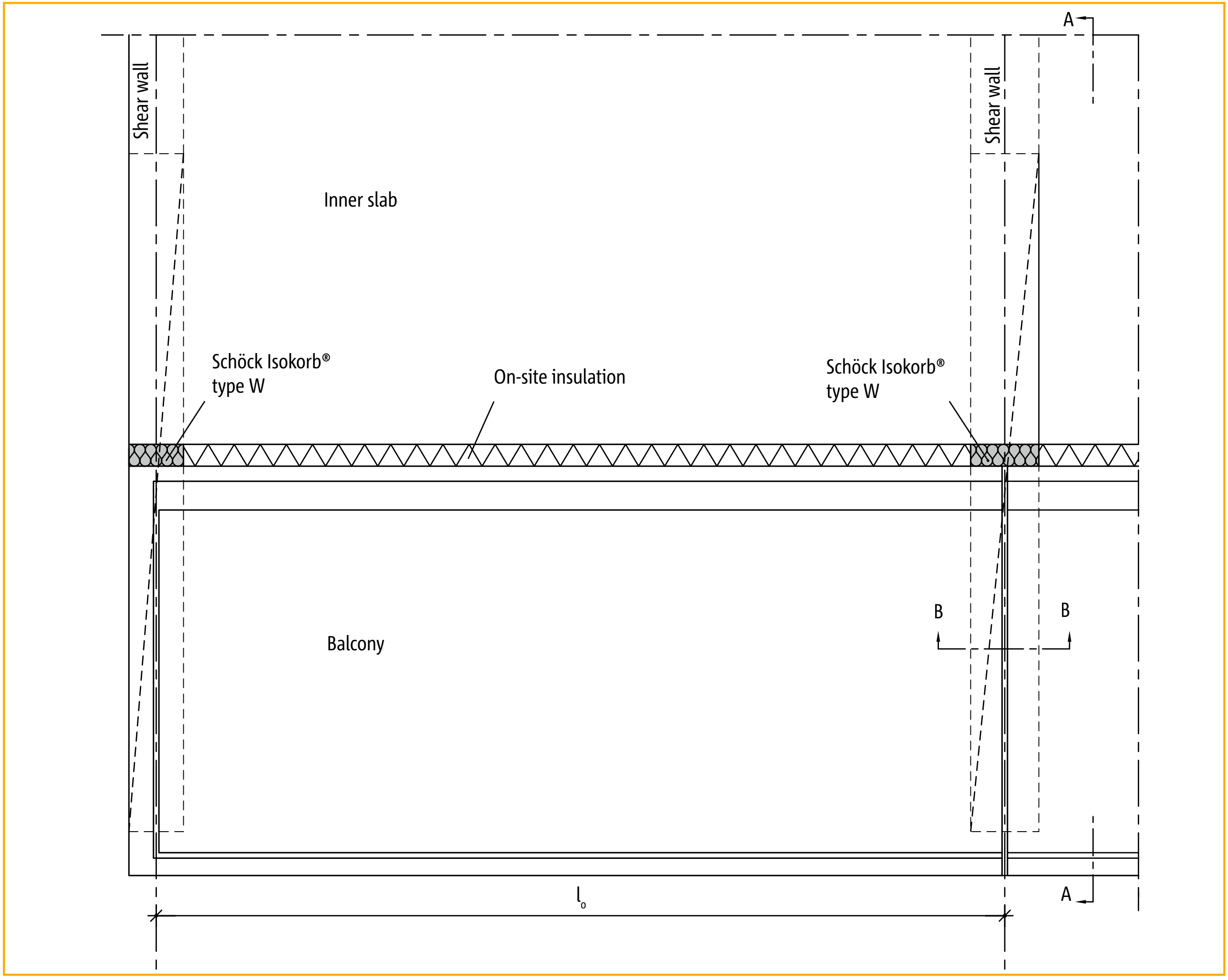
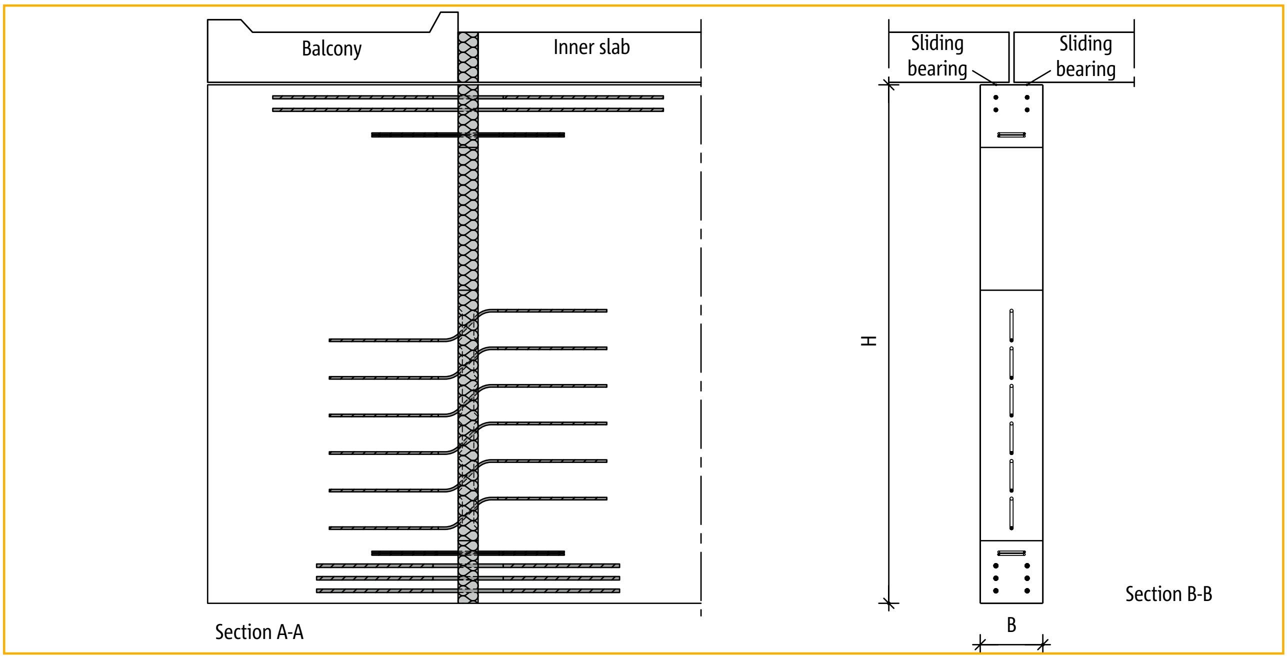
# Schöck Isokorb® type W

## Element arrangements/Cross-sections

### Plan view




### Side view




*Wall with Schöck Isokorb® type W*

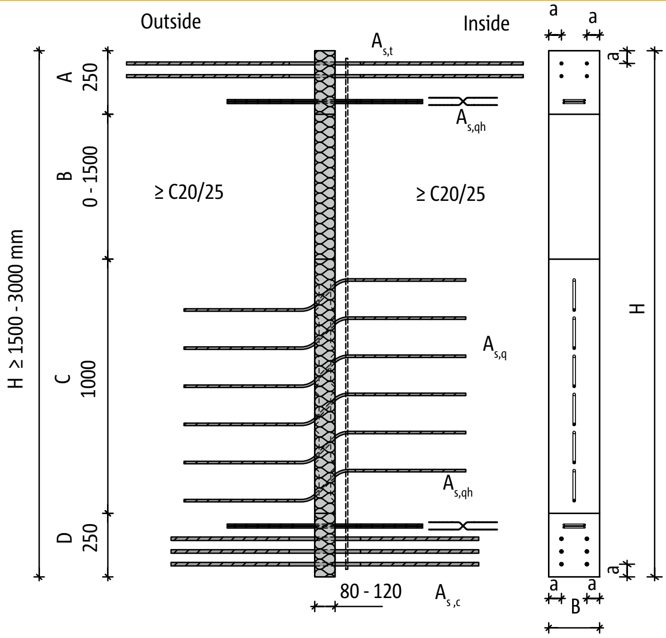
# Schöck Isokorb® type W
## Product description/Capacity tables

**Concrete grade ≥ C20/25**
**Concrete cover CV30**



- The shown composition are example, the optimal configuration in consultation with the technical department.
- Minimum bar dimensions to be determined according EN 1992-1-1

A = upper part
B = filling part
C = middle part
D = lower part




| Standard length $l_t$ [mm] and $l_d$ [mm] of schöck Isokorb® bars | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Diameter | | | | | | |
| | ø 8 | ø 10 | ø 12 | ø 14 | ø 16 | ø 20 | ø 25 |
| **Tension bar $L_t$** | 880 | 1030 | 1560 | 1780 | 2620 | 3220 | – |
| **Compression bar $L_d$** | 820 | 950 | 1180 | 1410 | 1350 | 1620 | 1950 |

| Minimum edge distance a [mm] of the bar in the corner | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Diameter | | | | | | |
| | ø 8 | ø 10 | ø 12 | ø 14 | ø 16 | ø 20 | ø 25 |
| **Single bar** | 50 | 50 | 50 | 50 | 50 | 50 | 55 |
| **Bundle (2 bars)** | 50 | 50 | 50 | 50 | 50 | 55 | 65 |

| Schöck Isokorb® type W[1)] | | | W 1 | W 2 | W 3 | W 4 |
|---|---|---|---|---|---|---|
| **Height (H)** | Width (W) | | 150 - 250 mm | 150 - 250 mm | 150 - 250 mm | 150 - 250 mm |
| | Reinforcement | $A_{s,t}$ | 4 ø 6 | 4 ø 8 | 4 ø 10 | 4 ø 12 |
| | | $A_{s,q}$ | 6 ø 6 | 6 ø 8 | 6 ø 10 | 6 ø 12 |
| | | $A_c$ | 6 ø 8 | 6 ø 10 | 6 ø 12 | 6 ø 14 |
| | | $A_{s,qh}$ | 2 x 2 ø 6 | 2 x 2 ø 6 | 2 x 2 ø 6 | 2 x 2 ø 6 |
| **H = 1500 - 2000 mm** | Forces | $M_{Ed}$ [kNm] | 106,3 | 189,7 | 260,5 | 385,9 |
| | | $V_{Ed}$ vert. [kN] | 52,2 | 92,8 | 144,9 | 208,7 |
| | Stiffness | C in [kNm/rad] | 126669 | 197041 | 273668 | 354673 |
| **H = 2000 - 2500 mm** | Forces | $M_{Ed}$ [kNm] | 131 | 233,5 | 341,7 | 468,3 |
| | | $V_{Ed}$ vert. [kN] | 52,2 | 92,8 | 144,9 | 208,7 |
| | Stiffness | C in [kNm/rad] | 233304 | 362917 | 504051 | 653250 |
| **H = 2500 - 3000 mm** | Forces | $M_{Ed}$ [kNm] | 155,5 | 277,3 | 403,8 | 550,7 |
| | | $V_{Ed}$ vert. [kN] | 52,2 | 92,8 | 144,9 | 208,7 |
| | Stiffness | C in [$kNm_{ed}$/rad] | 372252 | 579058 | 804248 | 1042305 |
| **H = > 3000 mm** | Forces | $M_{Ed}$ [kNm] | 180,0 | 321 | 465,5 | 633,1 |
| | | $V_{Ed}$ vert. [kN] | 52,2 | 92,8 | 144,9 | 208,7 |
| | Stiffness | C in [kNm/rad] | 543513 | 845465 | 1174258 | 1521838 |
| **All heightes** | Forces | $V_{Ed}$ horz. [kN] | 17,4 | 17,4 | 17,4 | 17,4 |

1) Schöck Isokorb® type W standard is used as an example for a potential application. For other solutions please contact our Technical Design Department.

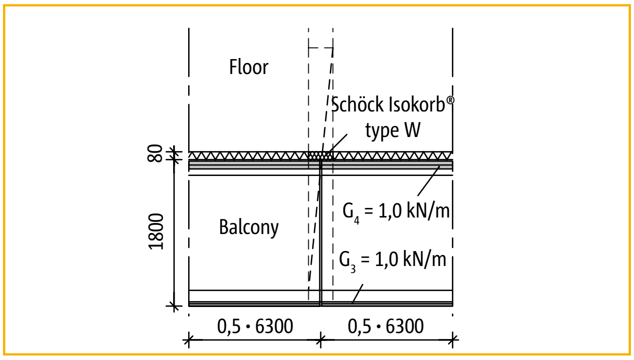
# Schöck Isokorb® type W
## Calculation example



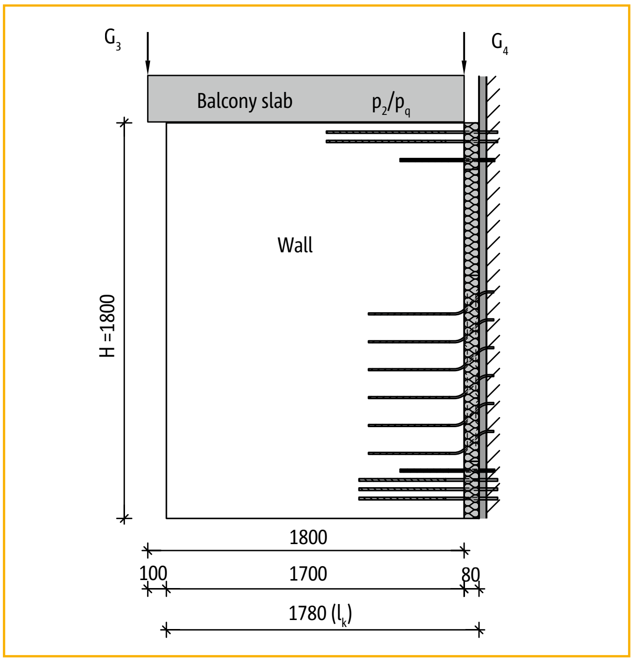
### Geometry

| | |
|---|---|
| Thickness (B) | = 250 mm |
| Height (H) | = 2800 mm |
| Cantilever ($l_k$)[1)] | = 1780 mm |

### Plan view




### Cross-section




### Loads

| Permanent load | | | | |
|---|---|---|---|---|
| Wall | 2,80 • 0,25 • 25 kN/m³ = | $g_1$ = 17,50 kN/m² | $g_{1:min}$ = 17,50 kN/m² | $g_{1:max}$ = 21,0 kN/m² |
| Balcony slab | 0,24 • 25 kN/m³ = | $p_2$ = 6,00 kN/m² | $p_{2:min}$ = 6,00 kN/m² | $p_{2:max}$ = 7,20 kN/m² |
| Railing | | $G_3$ = 1,00 kN/m | $G_{3:min}$ = 1,00 kN/m | $G_{3:max}$ = 1,20 kN/m |
| Facade masonry | 20 % • 2,80 • 1,8kN/m² = | $G_4$ = 1,00 kN/m | $G_{4:min}$ = 1,00 kN/m | $G_{4:max}$ = 1,20 kN/m |

| | | | | |
|---|---|---|---|---|
| **Live load** | | $p_q$ = 4,00 kN/m² | $p_{qmin}$ = 4,00 kN/m² | $p_{qmax}$ = 6,00 kN/m² |
| Horizontal wind load | $p_w$ = 0,65 kN/m² $c_{pe;loc}$ = 1,2 | $p_w$ = 0,78 kN/m² | $p_{wmin}$ = 1,17 kN/m² | $p_{wmax}$ = 1,17 kN/m² |

### Reaction forces

**Wear plate length per Isokorb® element = 6300 mm**

| | | $V_{Ed}$ | | $M_{Ed}$ |
|---|---|---|---|---|
| **Permanent load** | | [kN] | | [kNm] |
| $g_1$: 1,70 • 21,0 | = | 35,7 • (0,5 • 1,70 + 0,08) | = | 33,2 |
| $p_2$: 1,80 • 6,30 • 7,2 | = | 81,6 • (0,5·1,80 + 0,08) | = | 80,0 |
| $G_3$: 6,30 • 1,2 | = | 7,6 • (1,80 + 0,08) | = | 14,3 |
| $G_4$: 6,30 • 1,2 | = | 7,6 • 0,08 | = | 0,6 |
| Total permanent loads | | 132,5 | | 128,1 |
| **Live load** | | | | |
| $p_q$: 1,80 • 6,30 • 6,0 | = | 68,0 • (0,5 • 1,80 + 0,08) | = | 66,7 |
| **Total perm. load + live load** | | **200,5** | | **194,8** |

### Element W4H = 2500 – 3000mm

**Strength control vertical**

$M_{Ed}$ = 194,8 kNm < 550,7 kNm U.C. = 35 %

$V_{Ed}$ = 200,5 kN < $V_{Rd}$ = 208,7 kN U.C. = 96%

**Tensions by horizontal loads on wall**

$V_{Edh}$ = 1,78 • 2,8 • 1,17 = 5,83 kN < 17,4 kN

$M_{Edh}$ = 0,5 • 1,78 • 5,83 = 5,19 kNm

$A_{s,t}$ + $A_{s,c}$ = 4 ø 12 + 6 ø 14 = 1376 mm² z = 0,5 • 150 mm

$\sigma_s$ = 5,19 • 10⁶/(1376 • 0,5 • 100) = 75,4 N/mm²

$f_s$ = 435 N/mm² U.C. = 17 %

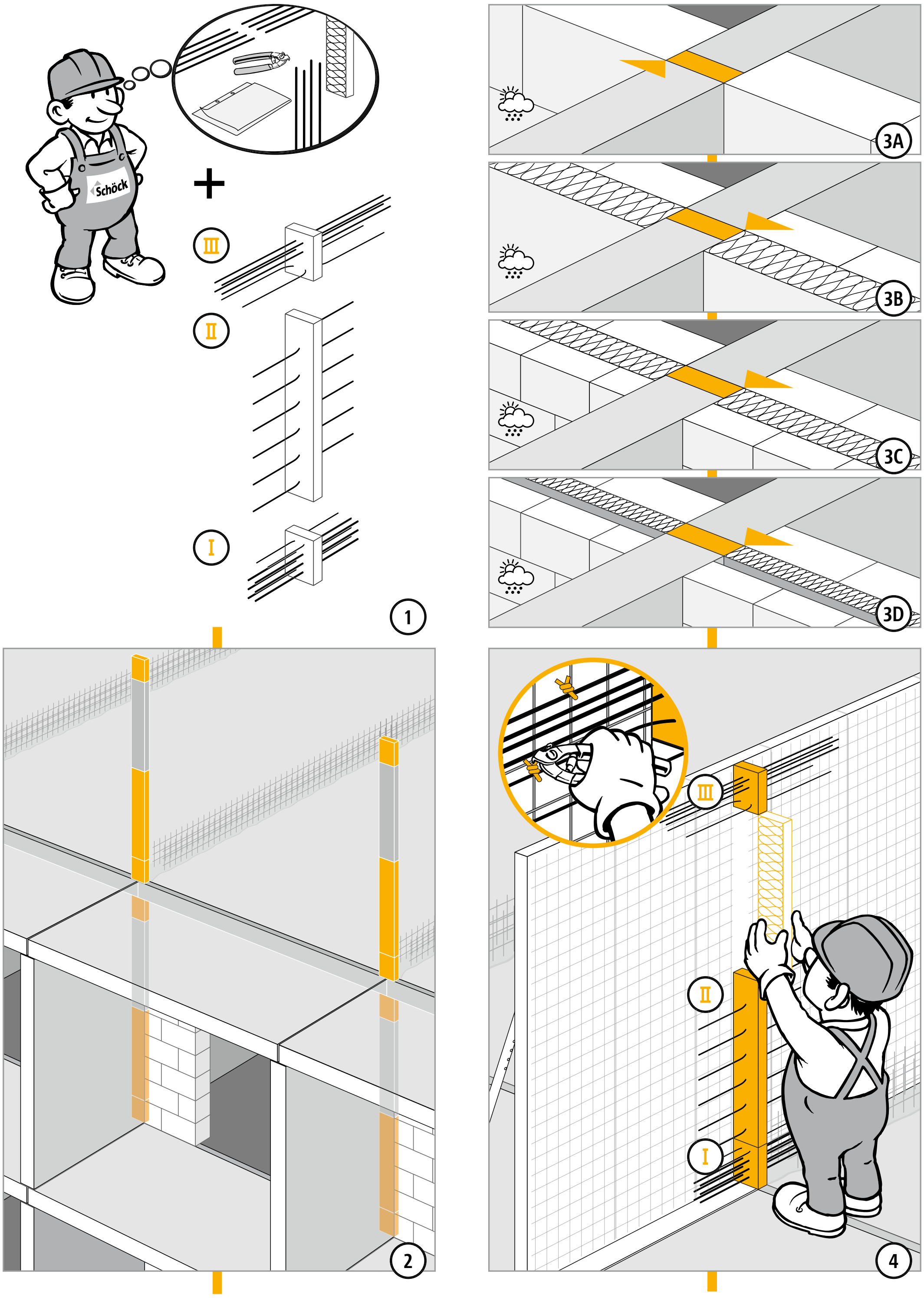
Combined vertically/horizontally:

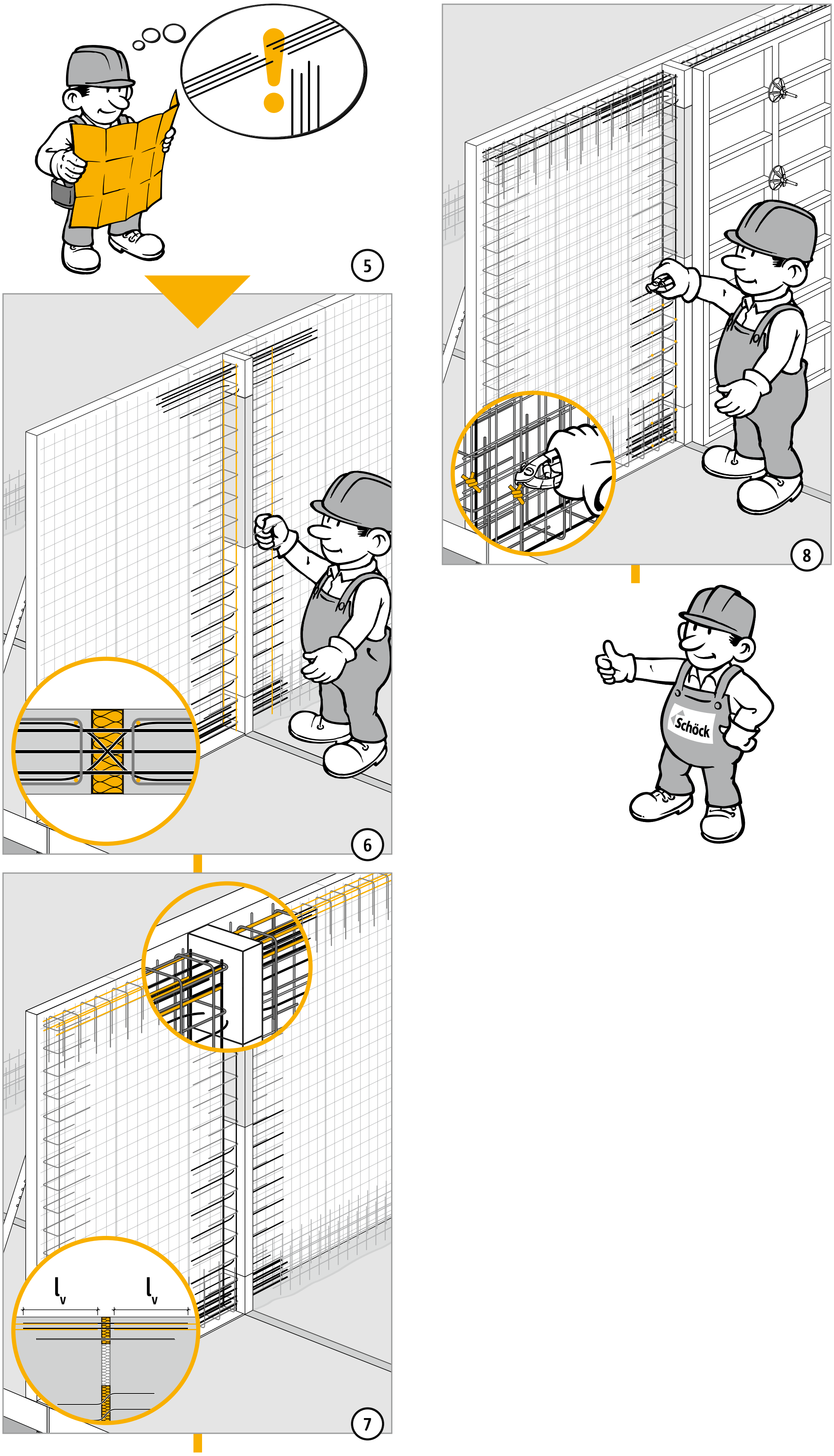
U.C. = 35 % + 17 % = 52 %

See also Checklist page 127.

[1)] Including isolation thickness of the Schöck Isokorb®

# Schöck Isokorb® type W
## Method statement





5
6
$l_v$
$l_v$
7
8
Schöck

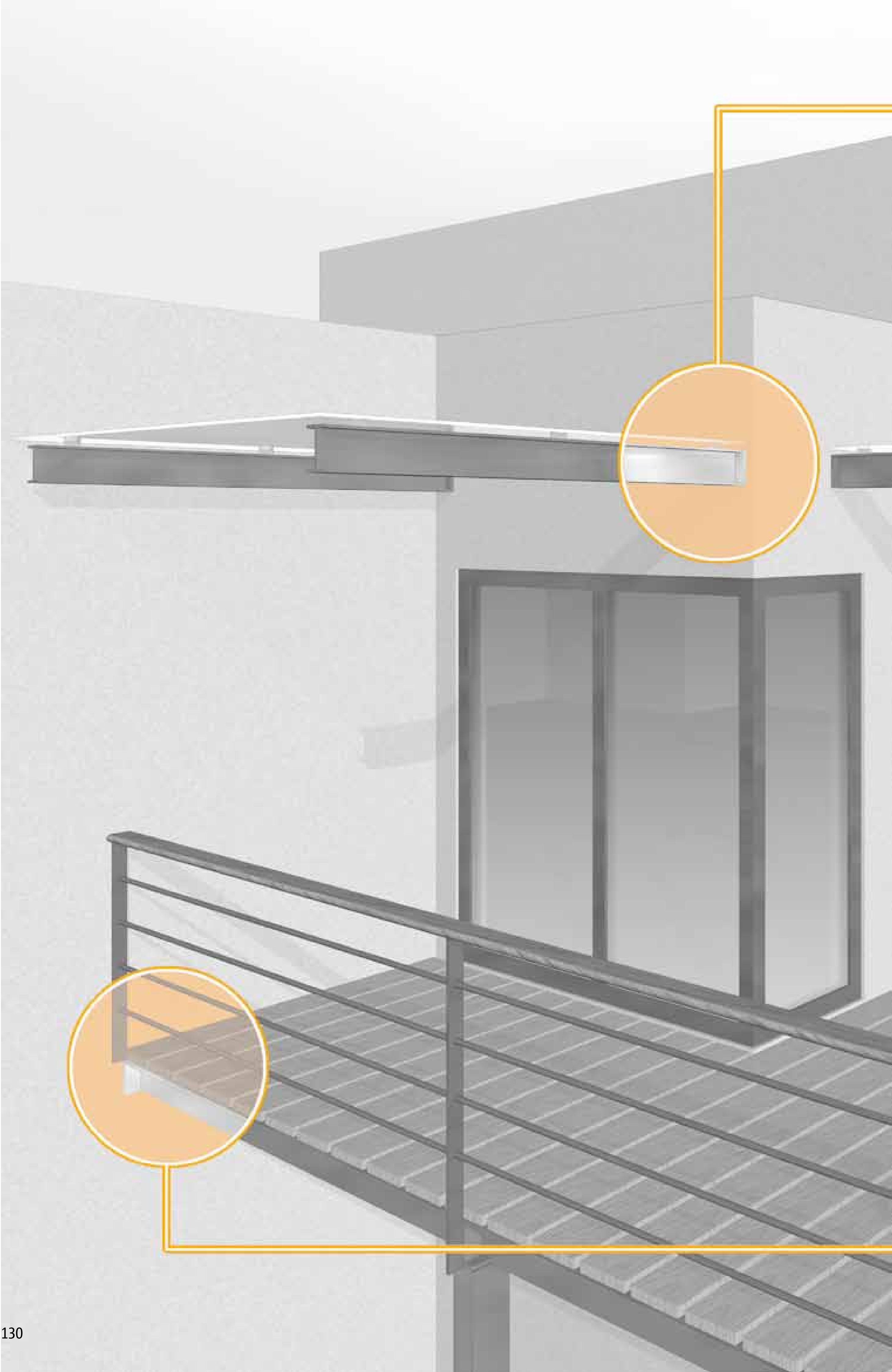
# Schöck Isokorb® type W
## Checklist

- ☐ Does the design comply with the minimal requirements for the (concrete) strength class and environmental class?
- ☐ Is this a situation for which the construction must be checked as an accidental case or is there a special loading situation during the construction stage?
- ☐ Have the member forces on the Schock Isokorb® connection been determined at the design level?
- ☐ For the calculation of the deformation in the service limit state of the structure next to the direct deformation and concrete creep, has also the additional deformation from the Schock Isokorb® anchor been taken into account by the responsible structural engineer (page 30, 124)?
- ☐ Have the discomforting vibrations from cantilevers been prevented in the design (page 30)?
- ☐ Have the adjacent concrete components (inside and outside) of Schöck Isokorb® element been checked by the responsible structural engineer for the calculation design values of $M_{Ed}$ and $V_{Ed}$?
- ☐ For special customised solutions have the conditions been satisfied for the Schöck Isokorb® anchor within the “shape box” and the requirements of the EN 1992 for anchorage of the Schöck Isokorb® reinforcement bars outside the “shape box” (page 21)?
- ☐ Has the required deflection for dewatering been taken into account for a proper alignment of the concrete element, next to the calculated deformation by the concrete and the Schock Isokorb®?
- ☐ Have the fire safety requirements been clarified, and are they reflected in the chosen type designation (F 120 execution) (page 25 - 26)?
- ☐ Is there between the element lying on the corbel and the corbel a sliding bearing felt applied with a “friction-coefficient” $\mu \leq 0.03$?
- ☐ Is the element lying on the corbel sufficiently anchored against horizontal move / shifting?
- ☐ Is the Schöck Isokorb® type clearly described on structural drawings (page 129)? Example: Schöck Isokorb® type W4-CV30-H2500-D80-B200, $M_{Rd}$ = 551 kNm, $V_{Rd}$ = 209 kN.

# Schöck Isokorb®
Specifications

## General specification Schöck Isokorb® for concrete-to-concrete connections

| Position | Quantity | Unit | Description | Price per piece | Total price |
|---|---|---|---|---|---|
| 1. | | | **Concrete work** | | |
| 1.1 | | | **Anchoring** | | |
| | | | **Schöck Isokorb® – Thermal break system for load-bearing connection between reinforced concrete-to-reinforced concrete.** | | |
| | | | Type:<br>- In line with the situation and forces. This and that according to the prescriptions of the engineer/ supplier.<br>Material:<br>- Neopor® insulation material, thickness dependent of type 60 - 80mm (standard)<br>- Stainless steel material no. 1.4362 or no. 1.4571<br>- Reinforcing steel BSt 500 S acc. to EC 2 National Annex<br>- Pressure bearings made of microfibre-reinforced high-performance fine concrete (HTE-module) in PE-HD plastic jackets<br>- Fire-resistant version 90 minutes (F90) or 120 minutes (F120)<br>Supplier:<br>- HauCon Group www.haucon.com<br>Handling:<br>- According to the plan and calculating of the engineer and instructions of the supplier | | |
| 1.1.1 | | Pieces | **Schöck Isokorb® type K..-CV..-H...-D80-L....-(F120)**<br>$\lambda_{eq}$= ...... W/mK; $M_{Rd}$ = ... kNm/elem. $V_{Rd}$ = ... kN/elem. | | |
| 1.1.2 | | Pieces | **Schöck Isokorb® type Q..E -CV.. -H... -D80-L....-(F90)**<br>$\lambda_{eq}$= ...... W/mK; $V_{Rd}$ = ... kN/elem | | |
| 1.1.3 | | Pieces | **Schöck Isokorb® type Q..+Q..E -CV.. -H... -D80-L....-(F90)**<br>$\lambda_{eq}$= ...... W/mK; $V_{Rd}$ = ... kN/elem | | |
| 1.1.4 | | Pieces | **Schöck Isokorb® type D..-CV..-H...-D80-L1000-(F90)**<br>$\lambda_{eq}$= ...... W/mK; $M_{Rd}$ = ... kNm/elem. $V_{Rd}$ = ... kN/elem. | | |
| 1.1.5 | | Pieces | **Schöck Isokorb® type O-CV30-H180-D60-L350-(F90)**<br>$\lambda_{eq}$= ...... W/mK; $M_{Rd}$ = ... kNm/elem. $V_{Rd}$ = ... kN/elem. | | |
| 1.1.6 | | Pieces | **Schöck Isokorb® type F-CV30-H160-D60-L350-(F90)**<br>$\lambda_{eq}$= ...... W/mK; $M_{Rd}$ = ... kNm/elem. $V_{Rd}$ = ... kN/elem. | | |
| 1.1.7 | | Pieces | **Schöck Isokorb® type A-CV30-H160-D60-L350-(F90)**<br>$\lambda_{eq}$= ...... W/mK; $M_{Rd}$ = ... kNm/elem. $V_{Rd}$ = ... kN/elem. | | |
| 1.1.8 | | Pieces | **Schöck Isokorb® type S ...-CV..-H...-D80-B...-(F90)**<br>$\lambda_{eq}$= ...... W/mK; $M_{Rd}$ = ... kNm/elem. $V_{Rd}$ = ... kN/elem. | | |
| 1.1.9 | | Pieces | **Schöck Isokorb® type W...-CV..-H....-D80-B...-(F90)**<br>$\lambda_{eq}$= ...... W/mK; $M_{Rd}$ = ... kNm/elem. $V_{Rd}$ = ... kN/elem. | | |



**Schöck Isokorb® type KS**

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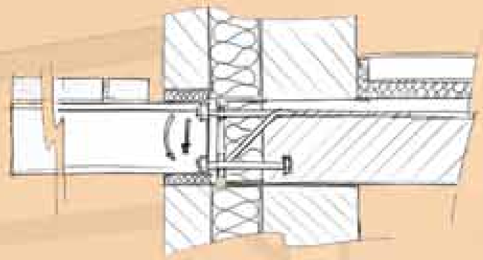

For the connection of cantilevered steel beams to reinforced concrete.

**Schöck Isokorb® type QS**

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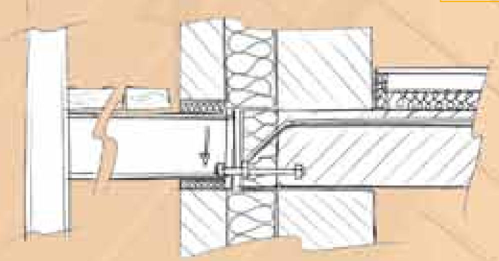


For the connection of supported steel beams to reinforced concrete.

# Schöck Isokorb® type KS
## Materials/Anti-corrosion protection/Fire protection/Designations

### Schöck Isokorb® type KS - materials

| | |
|---|---|
| **Concrete** | Minimum concrete grade C25/30 on the inner slab side |
| **Reinforcing steel** | B 500 B |
| **Pressure bearings in the concrete** | S 235 JRG 2, S 355 JO |
| **Stainless steel** | Material no.: 1.4401, 1.4404, 1.4462 or 1.4571, S460 according to approval (German Zulassung) no.: Z-30.3-6 Components and connecting devices made of stainless steels |
| **Pressure plate for external application** | Material no.: 1.4404, 1.4362 and 1.4571 or higher grade, e.g. 1.4462, S 460 |
| **Spacer shims** | Material no.: 1.4401, S 235, thickness 2 mm and 3 mm |
| **Insulating material** | Polystyrene hard foam (Neopor®[1)]), $\lambda$ = 0.031 W/(m x K) |

### Anti-corrosion protection

- The stainless steel used for Schöck Isokorb® type KS corresponds to the material no.: 1.4401, 1.4404, 1.4571 or 1.4462. So the KS unit components will have a typical corrosion resistance expected for Mo-Cr-Ni austenitic stainless steels.
- Bimetallic corrosion
  Using Schöck Isokorb® type KS in conjunction with a galvanised or paint treated end plate there is no concern regarding bimetallic corrosion. Since in this application the area of the galvanised steel is much greater than the area of the stainless steel (bolts, washer and butt stop) bimetallic corrosion that could lead to failure can be excluded as far as this relates to the Schöck products.

### Fire protection

The same on-site fire safety measures that apply to the overall load-bearing structure also apply to any freely accessible components of the Schöck Isokorb® type KS or to any components situated inside the insulating layer.
For more information please contact our design department.

**Designations used in planning documents**
(structural calculatios, specification documents, implementation, order), e.g. for H = 180 mm

Schöck Isokorb® type **KS14-H180**

Type + load range
Height of Isokorb®



1) Neopor® is a registered trademark of BASF

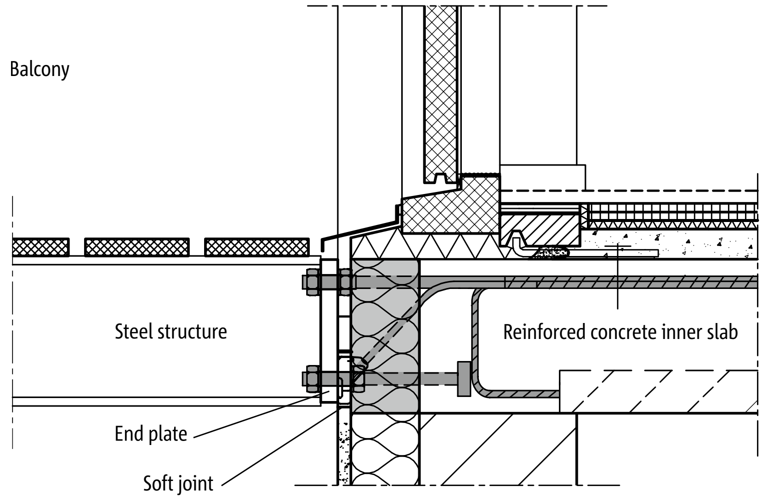
# Schöck Isokorb® type KS


*Schöck Isokorb® type KS*

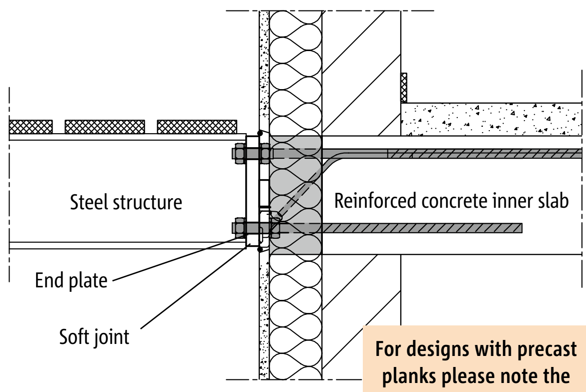


**Contents** **Page**

# Schöck Isokorb® type KS
## Connection layouts

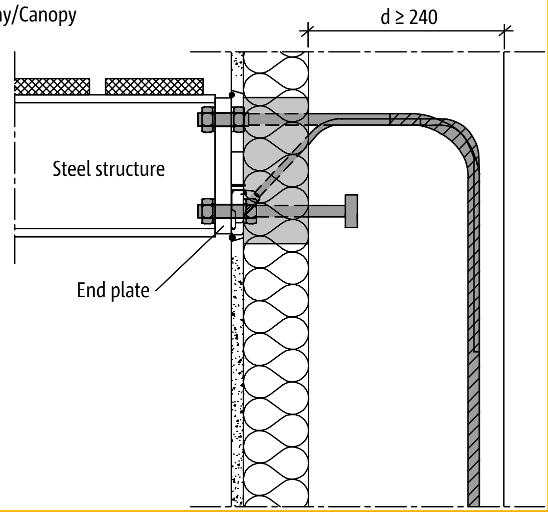



*Connection with Schöck Isokorb® type KS 14 in a door area, cavity wall*




**For designs with precast planks please note the special information on page 142**

*Connection with Schöck Isokorb® KS 20 in a wall area*



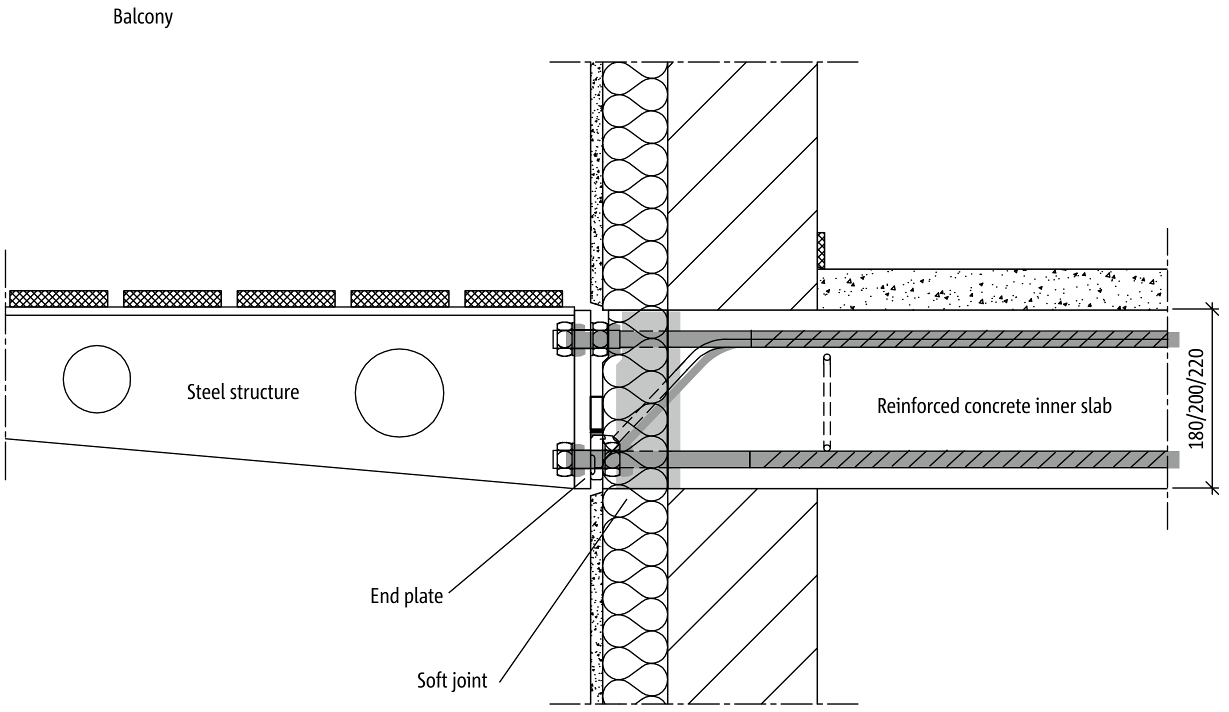

*Connection with Schöck Isokorb® KS 14 in a wall area without adjacent inner slab - special design*

Special constructions on request

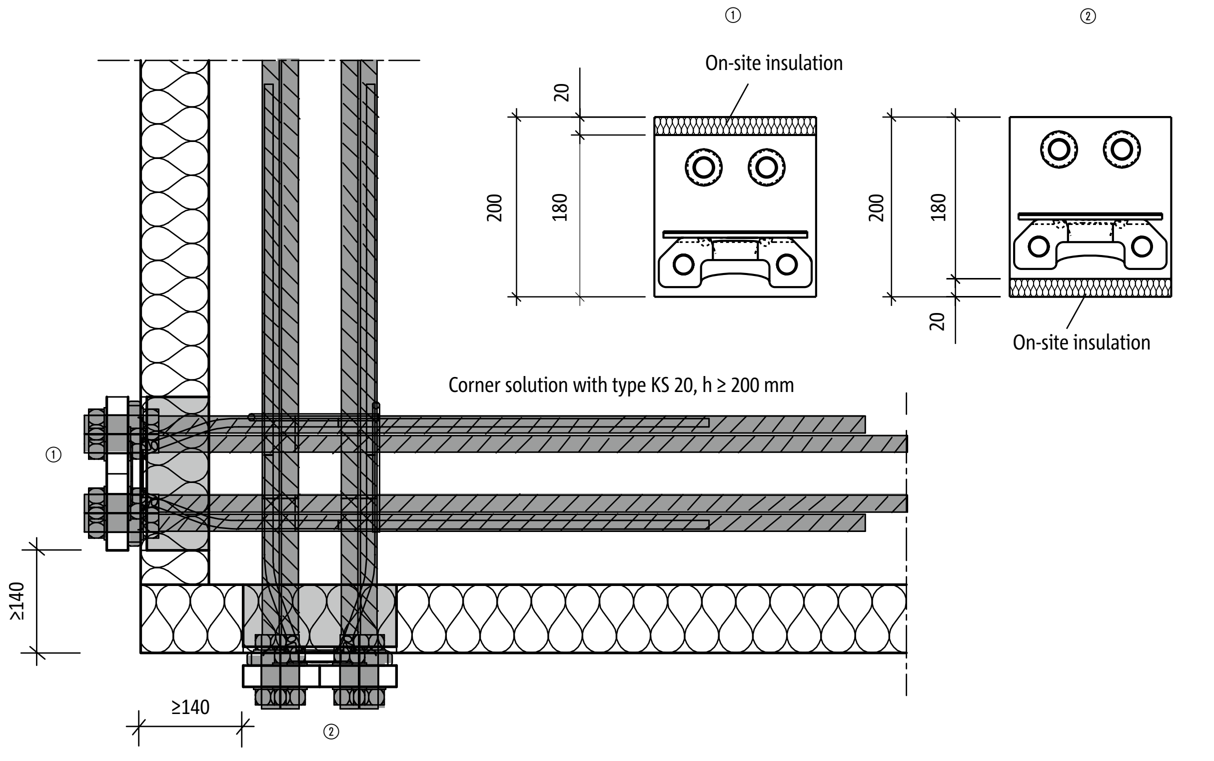
KS

Reinforced concrete-to-steel

# Schöck Isokorb® type KS
## Connection layouts




*Connection with Schöck Isokorb® type KS 20, cavity wall*




*Plan view: Connection with Schöck Isokorb® type KS 20 in a corner area*

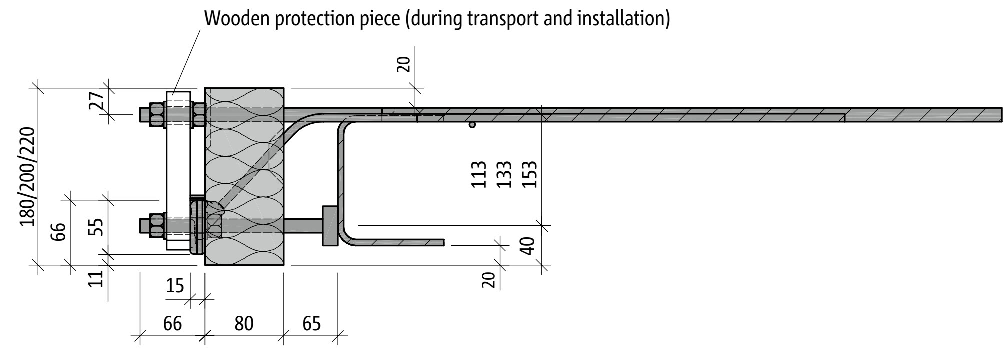
KS

Reinforced concrete-to-steel

# Schöck Isokorb® type KS

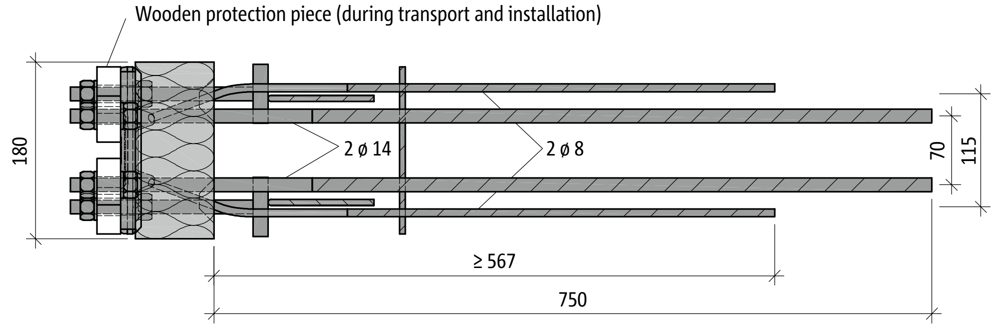
## Dimensions

**KS14**



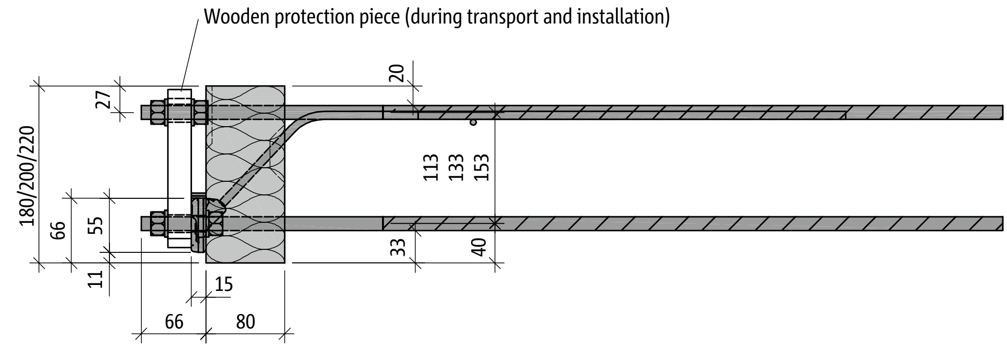

*Side view: Schöck Isokorb® type KS14*

**KS14**



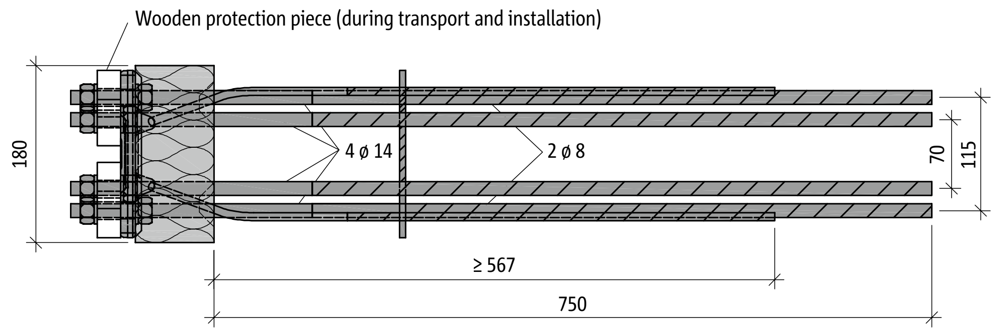

*Plan view: Schöck Isokorb® type KS14*

**KS14-VV**



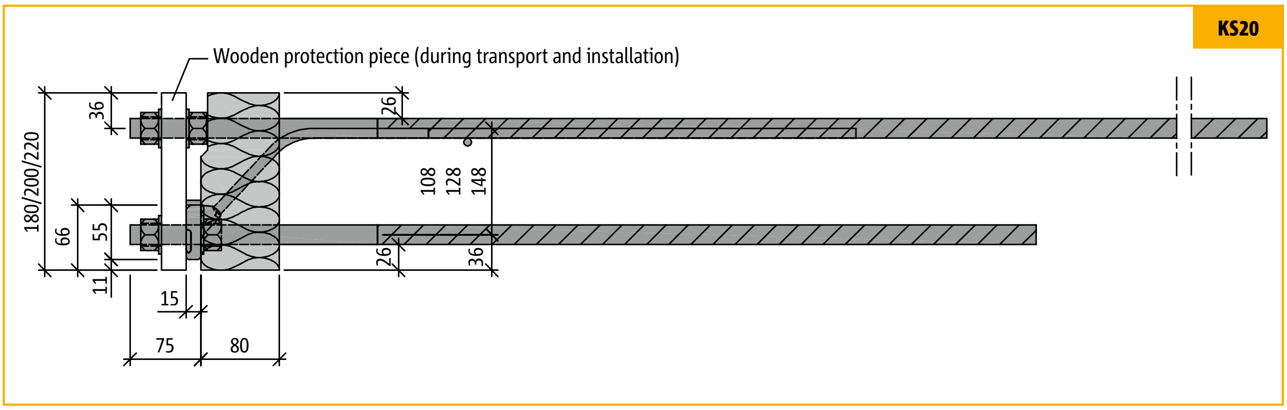

*Side view: Schöck Isokorb® type KS14-VV*

**KS14-VV**

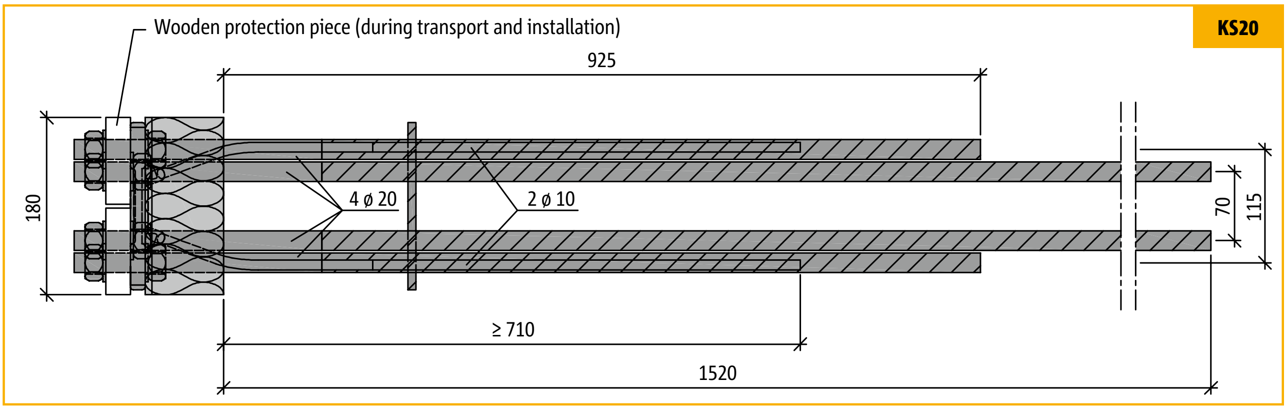



*Plan view: Schöck Isokorb® type KS14-VV*

# Schöck Isokorb® type KS
## Dimensions



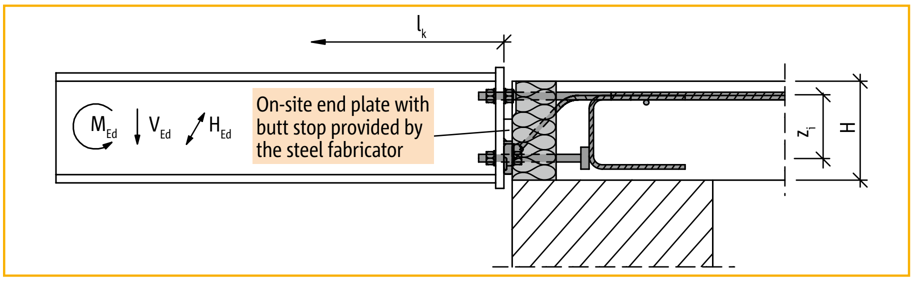

*Side view: Schöck Isokorb® type KS20*

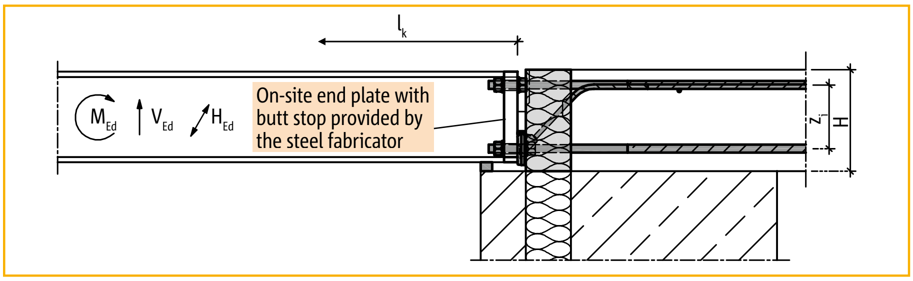



*Plan view: Schöck Isokorb® type KS20*

# Schöck Isokorb® type KS
## Capacity table

The member forces are taken in relation to the rear edge of the front plate.




▸ Checklist on page 151 is to be observed!

| Schöck Isokorb® type | | | | KS14-V8 | KS14-V10 | KS14-VV | KS20-V10 | KS20-V12 |
|---|---|---|---|---|---|---|---|---|
| Design values for concrete grade ≥ C25/30 | | | | Moment capacity $M_{Rd}$ [kNm] | | | | |
| Height of Isokorb® H [mm] | 180 | Internal lever arm $z_i$ [mm] (KS14 / KS20) | 113 / 108 | -10.1 | -8.9 | -10.3<br>+9.0 | -22.1<br>+11.2 | -20.6<br>+11.2 |
| | 200 | | 133 / 128 | -11.9 | -10.4 | -12.1<br>+10.6 | -26.2<br>+13.3 | -24.4<br>+13.3 |
| | 220 | | 153 / 148 | -13.7 | -12.0 | -14.0<br>+12.2 | -30.3<br>+15.4 | -28.2<br>+15.4 |
| Height of Isokorb® H [mm] | | | | Shear force capacity $V_{Rd}$ [kN][1)] | | | | |
| | | 180 - 220 | | +18.0 | +30.0 | +18.0<br>-12.0 | +30.0<br>-12.0 | +45.0<br>-12.0 |
| | | | | Horizontal shear force capacity $H_{Rd}$ [kN][2)] | | | | |
| | | 180 - 220 | | ±2.5 | ±4.0 | ±2.5 | ±4.0 | ±6.5 |
| | | | | Deflection factor tan $\alpha$ [%] | | | | |
| | | 180 | | 0.8 | 0.7 | 1.2 | 1.5 | 1.5 |
| | | 200 | | 0.7 | 0.6 | 1.0 | 1.3 | 1.2 |
| | | 220 | | 0.6 | 0.5 | 0.9 | 1.1 | 1.1 |
| | | | | Torsional spring strength C [kNm/rad] | | | | |
| | | 180 | | 1300 | 1300 | 800 | 1500 | 1500 |
| | | 200 | | 1700 | 1700 | 1200 | 2000 | 2000 |
| | | 220 | | 2300 | 2300 | 1500 | 2800 | 2800 |
| | | | | Max. expansion joint spacing [m] | | | | |
| | | 180 - 220 | | 5.70 | | | 3.50 | |

[1)] If absorption of a greater shear force is necessary, please contact our design department (see frontpage).
[2)] In order to absorb the present horizontal force ($H_{Ed}$) parallel to the outside wall, a minimum shear force of 2.9 × $H_{Ed}$ must be ensured.

# Schöck Isokorb® type KS
## Notes

### Notes regarding uplift loads

For uplift loads the KS14 VV and the KS20 V10/12 should be used. For the correct transfer of the shear loads (shear in the upwards direction). These shear loads are transfered through the direct contact between the bolts of the Schöck Isokorb® type KS and the end plate. There must be no play in the connection.

### Notes for the design of the construction at lifting loads.

1. The on-site end plate must have round holes (no slots) in its lower region (see page 143).
   As a consequence, vertical adjustment is no longer possible.

2. In many cases it is sufficient to assign the lifting forces to just two of several elements per connection layout.

### Deflection

The deflection values shown in the calculation tables result solely from the deformation of the Schöck Isokorb® element. The final precamber of the balcony construction results from the calculation according to EC 0, plus the precamber due to the Schöck Isokorb®.
The precamber of the balcony construction to be specified by the engineer in charge.

Deflection due to Schöck Isokorb®:
**$p$ [mm] = Table value · $l_k$ · 10 · $M_{Ed,qp}$ / $M_{Rd}$**

$l_k$ Length of projection [m]

$M_{Ed,qp}$ Bending moment for calculation of the deflection; determined by the structural engineer; according to EC 0: $M_{Ed,qp} = M_p + \psi_2 \cdot M_Q$ [kNm]

$M_{Rd}$ Maximum rated moment of the Schöck Isokorb®

**Note:**
The above values give an approximation only. Depending on the specific design layout and construction, other values may need to used.

### Expansion joint spacing

If constructive measures are implemented to allow movement between the balcony slab and the individual steel profiles, then only the distances between the fixed connections are significant.

### Installation tolerances

Due to its design, the Schöck Isokorb® type KS **only allows compensation of tolerances in a vertical direction.** The vertical tolerance is +10 mm; the horizontal tolerance is ±0 mm. We recommend the use of an on-site template to ensure the correct position. The planning engineer should inform the **concrete frame contractor** about these details in the implementation plans.

In order to ensure that the shell and the finishings join together properly without the need for modification or reworking, the **site management** must check that the tolerances are met and **take this into account in the design of the steel structure.** Dimension tolerances must be taken into account.

# Schöck Isokorb® type KS
## Calculation example/Notes

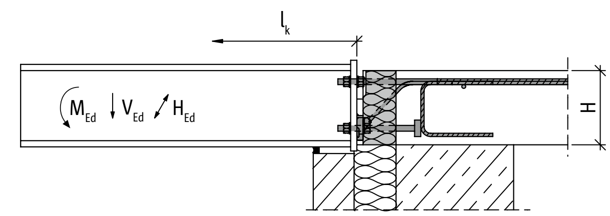


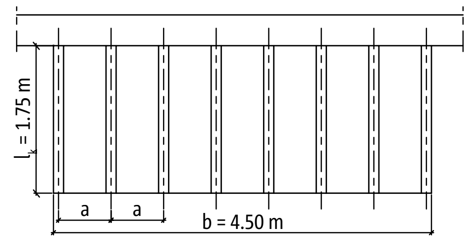
**Dimensions:**

| | |
|---|---|
| Length of projection: | $l_k$ = 1.75 m |
| Balcony width: | b = 4.50 m |
| Inner slab thickness: | h = 200 mm |
| Height of Isokorb®: | H = 200 mm |
| Chosen axis separation: | a = 0.70 m |

**Load assumptions:**

| | |
|---|---|
| Self weight with light coating: | $g_B$ = 0.6 kN/m² |
| Live load: | q = 4.0 kN/m² |
| Self weight of railing: | $F_G$ = 0.75 kN/m |
| Horizontal load on the railing at beam height 1.0 m: | $H_G$ = 0.5 kN/m |




$M_{Ed} = -[(\gamma_G \cdot g_B + \gamma_Q \cdot q) \cdot l_k^2/2 \cdot a + \gamma_G \cdot F_G \cdot a \cdot l_k + \gamma_Q \cdot \psi_0 \cdot H_G \cdot 1.0 \cdot a]$ [kNm]
$M_{Ed} = -[(1.2 \cdot 0.6 + 1.5 \cdot 4.0) \cdot 1.75^2/2 \cdot 0.7 + 1.2 \cdot 0.75 \cdot 0.7 \cdot 1.75 + 1.5 \cdot 0.7 \cdot 0.5 \cdot 1.0 \cdot 0.7] = -8.7$ kNm

$V_{Ed} = [(\gamma_G \cdot g_B + \gamma_Q \cdot q) \cdot a \cdot l_k] + \gamma_G \cdot F_G \cdot a$
$V_{Ed} = [(1.2 \cdot 0{,}6 + 1.5 \cdot 4.0) \cdot 0.70 \cdot 1.75] + 1.2 \cdot 0.75 \cdot 0.7 = 8.9$ kN

Required number of connections: n = (4.50/0.7) + 1 = 7.4 = 8 connections
Axis separation between steel members: ((4.50 - 0.18)/7) = 0.617 m

Choice: **8 × Schöck Isokorb® type KS14-V8-H200**
$M_{Rd} = -11.9$ kNm $< M_{Ed} = -8.7$ kNm
$V_{Rd} = +18.0$ kN $> V_{Ed} = +8.9$ kN

### Deflection

Prospected deformation in the serviceability limit state (SLS) according to EC 0: $M_{Ed,qp} = M_p + \psi \cdot M_Q$:

$M_{Ed,perm} = -[(g_B + \psi_{2,i} \cdot q) \cdot l^2/2 \cdot a + F_g \cdot a \cdot l_k + \psi_{2,i} \cdot H_G \cdot 1.0]$
$M_{Ed,perm} = -[(0.6 + 0.3 \cdot 4.0) \cdot 1.75^2/2 \cdot 0.7 + 0.75 \cdot 0.7 \cdot 1.75 + 0.3 \cdot 0.5 \cdot 1.0]$
$M_{Ed,perm} = -3.0$ kNm

Deflection p = 0.7 · 1.75 · 10 · -3.0/-11.9 = 3.0 mm

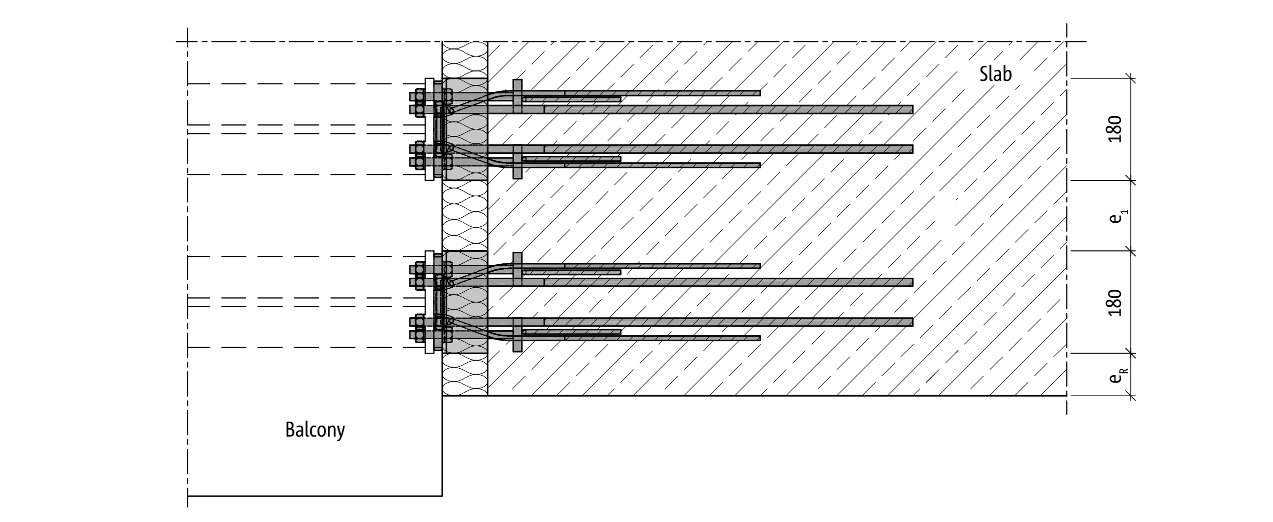
### Notes

- The range of potential applications for Schöck Isokorb® type KS elements covers inner slab and balcony structures with predominantly static and evenly distributed live loads.
- Static proof must be presented for the adjacent components on both sides of the Schöck Isokorb® type KS.
- The upper and lower reinforcement of the inner slab should be located as close as possible to the thermal insulation layer, taking into account the required concrete cover.
- The nominal dimension $c_{nom}$ for the upper concrete cover is 20 mm in the inside area.

# Schöck Isokorb® type KS

## Design considerations: Minimum distances – Steel member sizes

### Centre and edge spacing




*Schöck Isokorb® type KS centre and edge spacing*

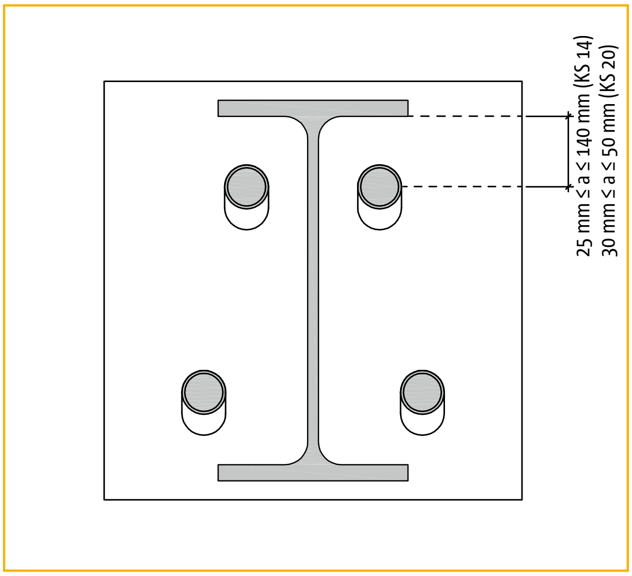
| Schöck Isokorb® type | | KS | |
|---|---|---|---|
| Element and edge distance [mm] | | $e_R$ | $e_1$ |
| Height of Isokorb® H [mm] | 180 | ≥ 75 | ≥ 55 |
| | 200 | ≥ 80 | ≥ 60 |
| | 220 | ≥ 90 | ≥ 75 |

In cases where it is not possible to respect these conditions, the load-bearing capacity of the elements must be reduced. Please contact our design department.

### Design guidelines for steel beams

For the design of the steel work, we suggest using the minimum sizes given in the table below.

| Schöck Isokorb® type | | KS14 and KS14-VV | | KS20 | |
|---|---|---|---|---|---|
| Recommended minimum section sizes | | a = 25 mm | | a = 30 mm | |
| | | IPE | HEA/HEB | IPE | HEA/HEB |
| Height of Isokorb® H [mm] | 180 | 180 | 200 | 200 | 200 |
| | 200 | 200 | 220 | 220 | 220 |
| | 220 | 240 | 240 | 240 | 260 |



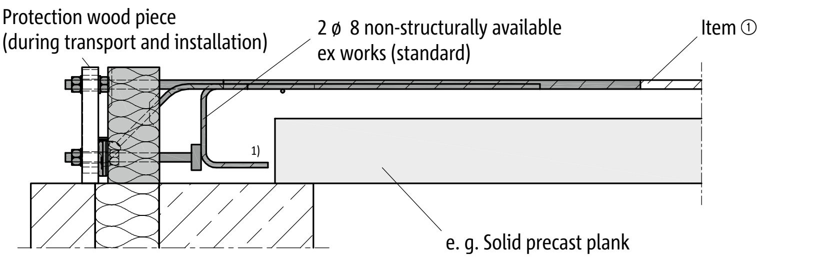

*Front view of end plate: Schöck Isokorb® type KS 20 with an IPE200*

# Schöck Isokorb® type KS
## Lap splice reinforcement

Schöck Isokorb® type KS tensile reinforcement is designed to provide sufficient length for the design of a lap splice with "on-site" reinforcement. Therefore Schöck recommends to lap 2 ø 14 with the KS 14 and 4 ø 14 with the KS 20.

### Schöck Isokorb® type KS 14

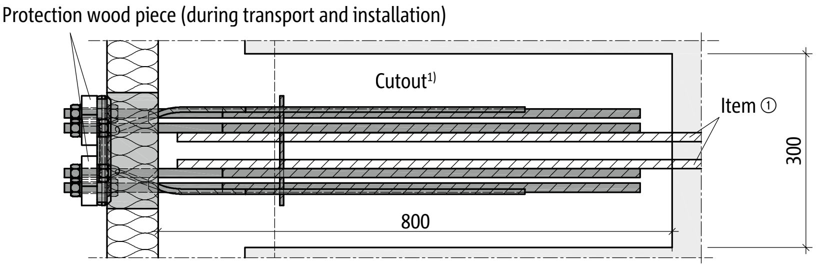
Lap splice: Design lap splice with 2 ø 16 rebars according to EN 1992, L according to structural engineer, item ① (additional on-site reinforcement)
Transverse reinforcement: Non-structural transverse reinforcement according to EN 1992




Item ①: 2 ø 14 with L according to structural engineer, at least L ≅ 1,8 × cantilever length of balcony.

[1] When using solid precast planks the lower legs of the 2 ø 8 U-bars can be shortened on-site.

*Side view: Schöck Isokorb® type KS 14 for designs with precast floor slabs*




Item ①: 2 ø 14 with L according to structural engineer, at least L ≅ 1,8 × cantilever length of balcony.

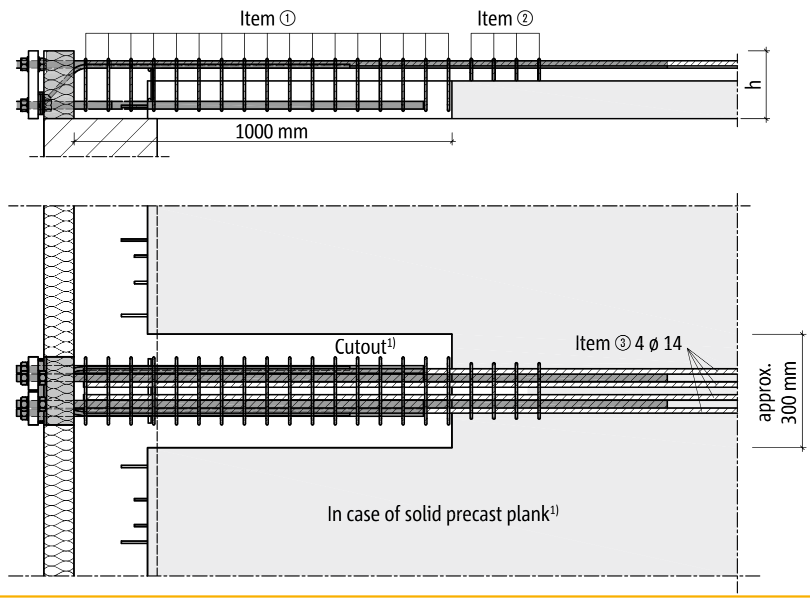
[1] **Note:**
Cutout required in solid precast planks!
(approx. 800 x 300 mm)

*Plan view: Schöck Isokorb® type KS 14-VV when used for lifting forces*

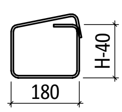
### Schöck Isokorb® type KS 20

Lap splice: Design lap splice with 4 ø 14 or with 2 ø 20 according to EN 1992 , L according to structural engineer, item ③ (additional on-site reinforcement)
Transverse reinforcement: External transverse reinforcement links (see illustration), item ① and item ②

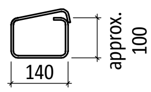
▸ Please check EC2, clause 8.7.4 "Transverse reinforcement (links) in the lap zone"




Item ①:
15 transverse links ø 6/60 mm c/c




Item ②:
6 transverse links ø 6/60 mm c/c.
For designs with cast-in-place concrete, item ② can executed the same as item ①.

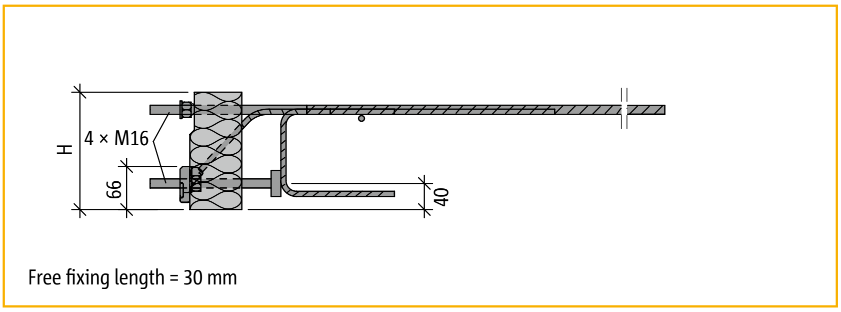



Item ③:
4 ø 14 or 2 ø 20, with L acc. to structural engineer, at least L ≅ 1,8 × cantilever length of balcony, + transverse links as noted.

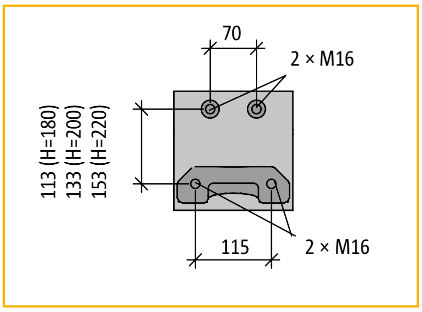
[1] **Note:**
Cutout required in solid precast planks (approx. 1000 x 300 mm). Required reinforcement due to cutout according to structural engineer.

*On-site connection reinforcement for Schöck Isokorb® type KS 20*

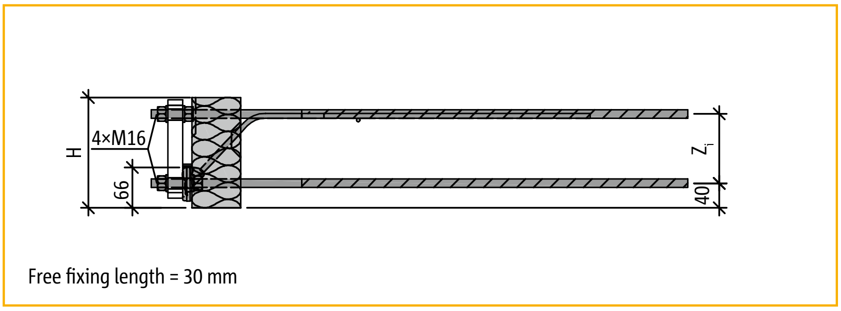
# Schöck Isokorb® type KS
## Views/On-site end plates



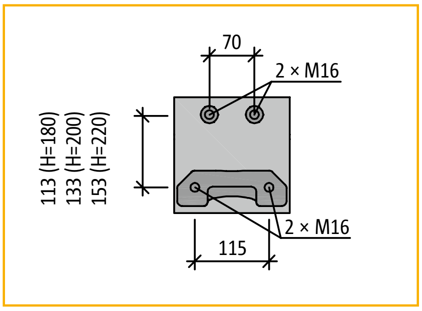

*Side view: Schöck Isokorb® type KS 14*



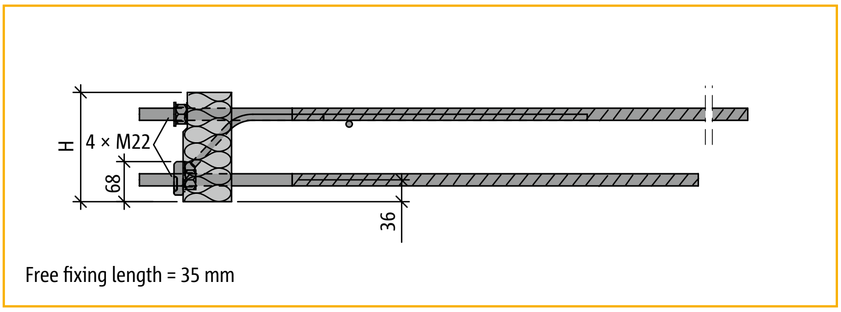

*Front view: Schöck Isokorb® type KS 14*



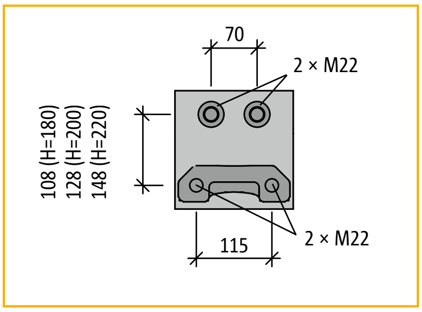

*Side view: Schöck Isokorb® type KS 14 VV*



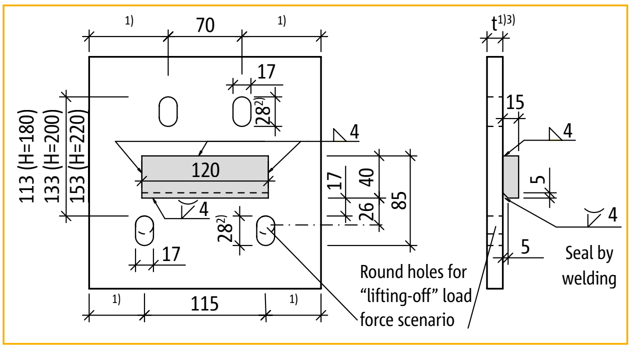

*Front view: Schöck Isokorb® type KS 14 VV*



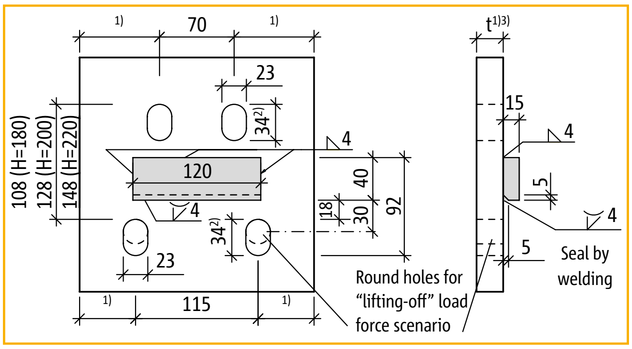

*Side view: Schöck Isokorb® type KS 20*




*Front view: Schöck Isokorb® type KS 20*




*On-site end plate for Schöck Isokorb® type KS 14*




*On-site end plate for Schöck Isokorb® type KS 20*

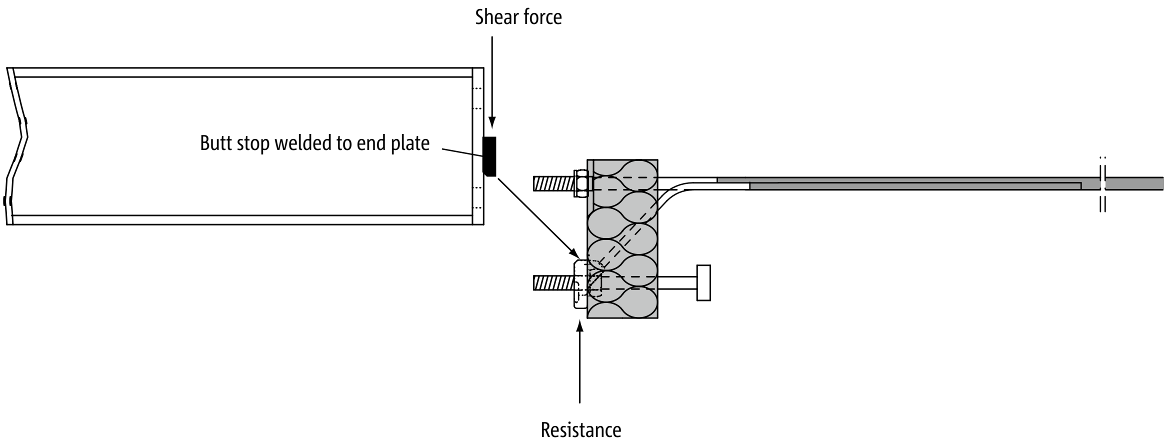
## Note

- **The butt stop is imperative in order to transfer shear forces – provided by the steel fabricator.**
- Choice of steel type according to the structural requirements. Anti-corrosion protection to be applied after welding.
- Steel construction: The tolerances of the internal structure must be checked in all cases.

[1] According to the information provided by the structural design engineer.
[2] Hole size corresponds to a height adjustment of +10 mm. The scope for height adjustment can be increased by enlarging the hole size.
[3] Note the free fixing length.

# Schöck Isokorb® type KS
## Important information

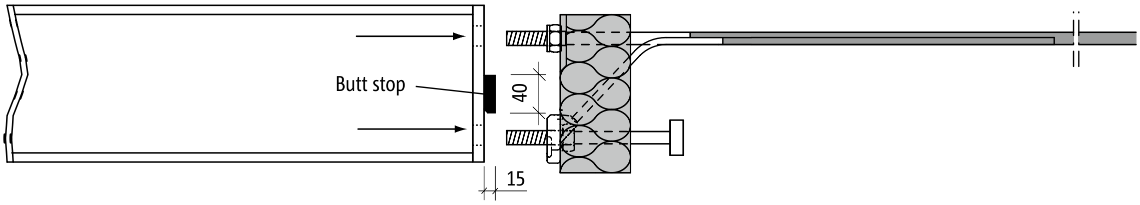
A butt stop, welded to the on-site end plate, is imperative for transfer of shear forces to the Schöck Isokorb® type KS (or QS)




*Side view: Imperative butt stop for the connection of steel fin to Schöck Isokorb®*

KS

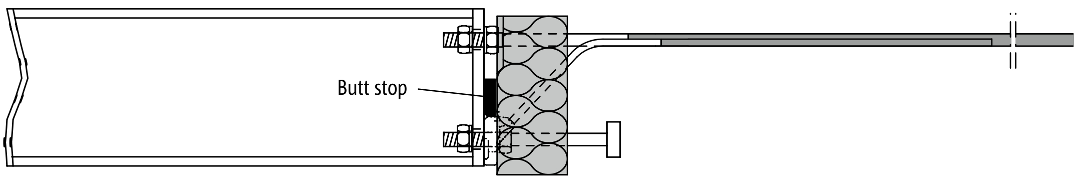
The butt stop has to be provided by the steel fabricator




*Side view: Mounting of steel beam to Schöck Isokorb®*

Reinforced concrete-to-steel

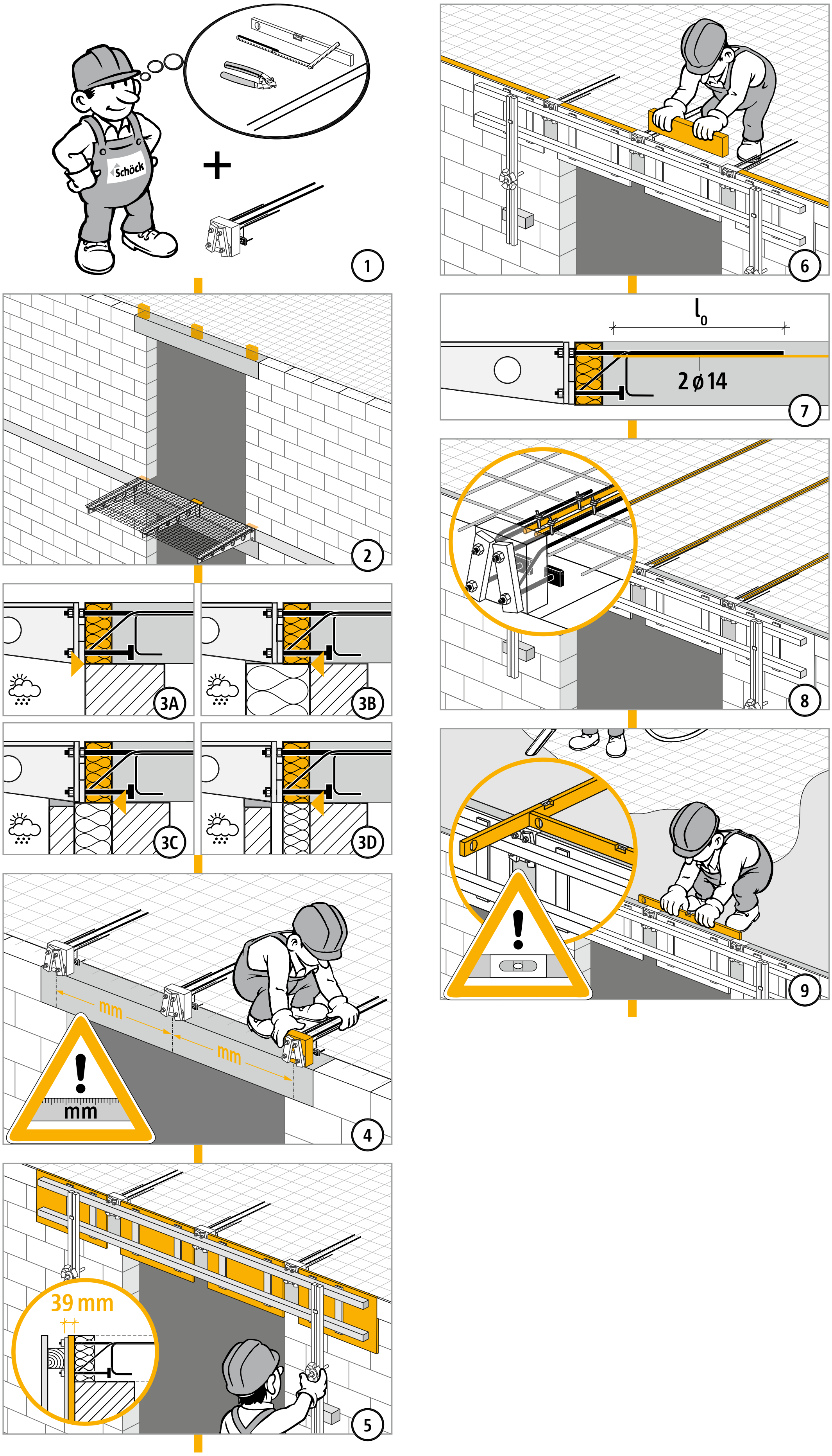
After the installation of the cantilever beam with end plate and its butt stop, the butt stop transferres the shear forces to the type KS (or QS)




*Side view: Once installed the butt stop transferres the shear forces*

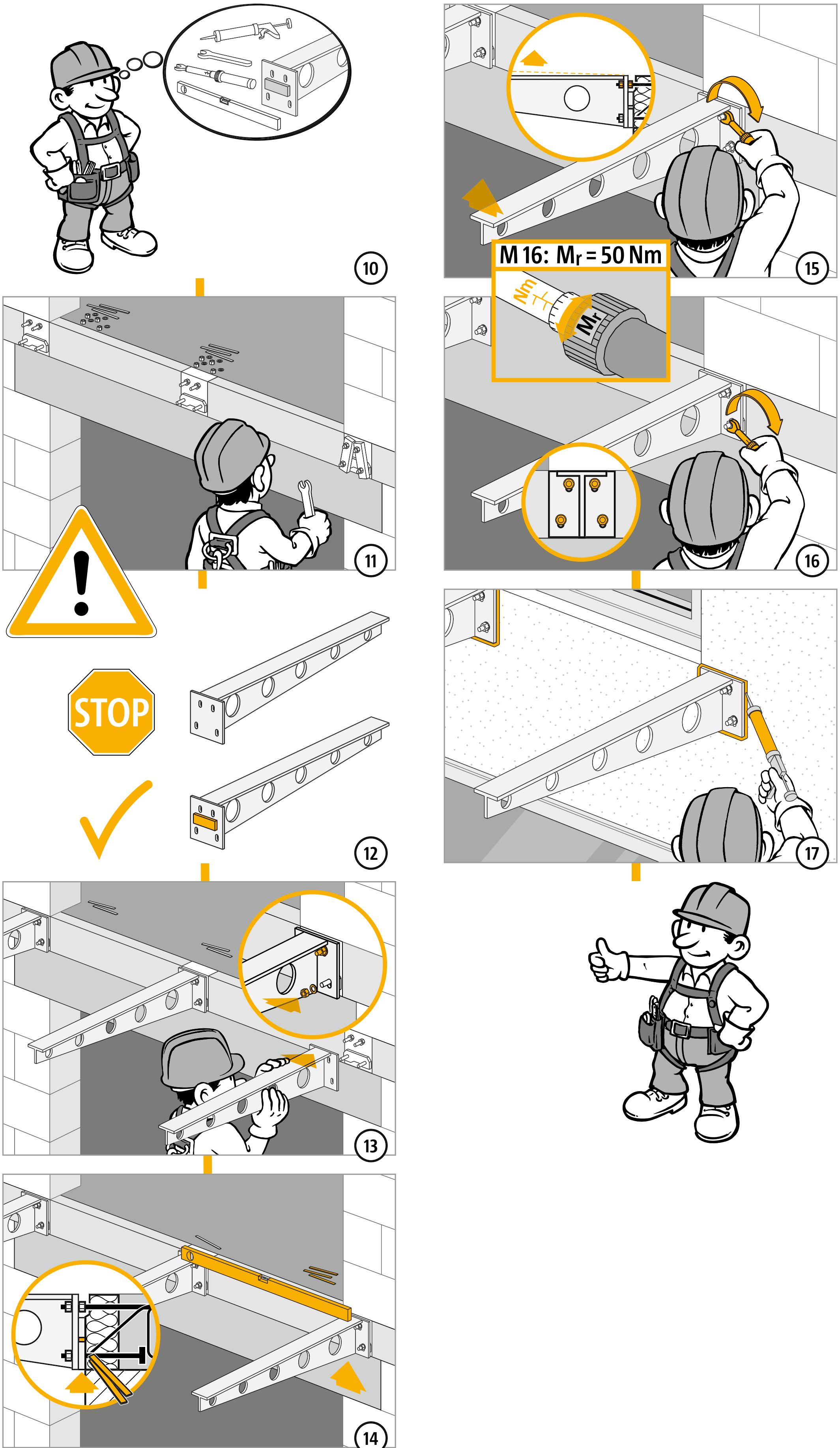
# Schöck Isokorb® type KS14

## Method statement for concrete frame constructor



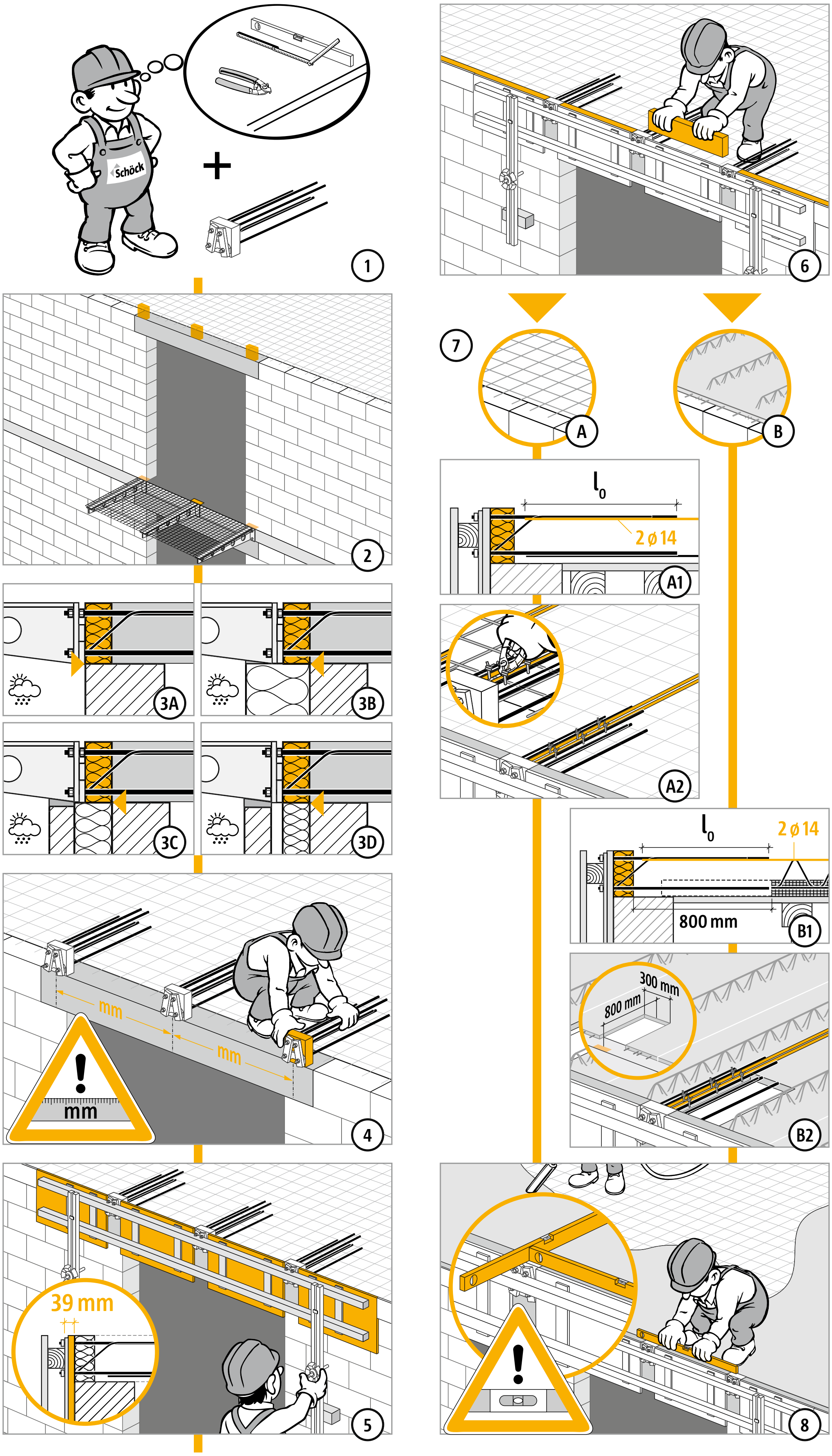
# Schöck Isokorb® type KS14

Method statement for steel fabricators



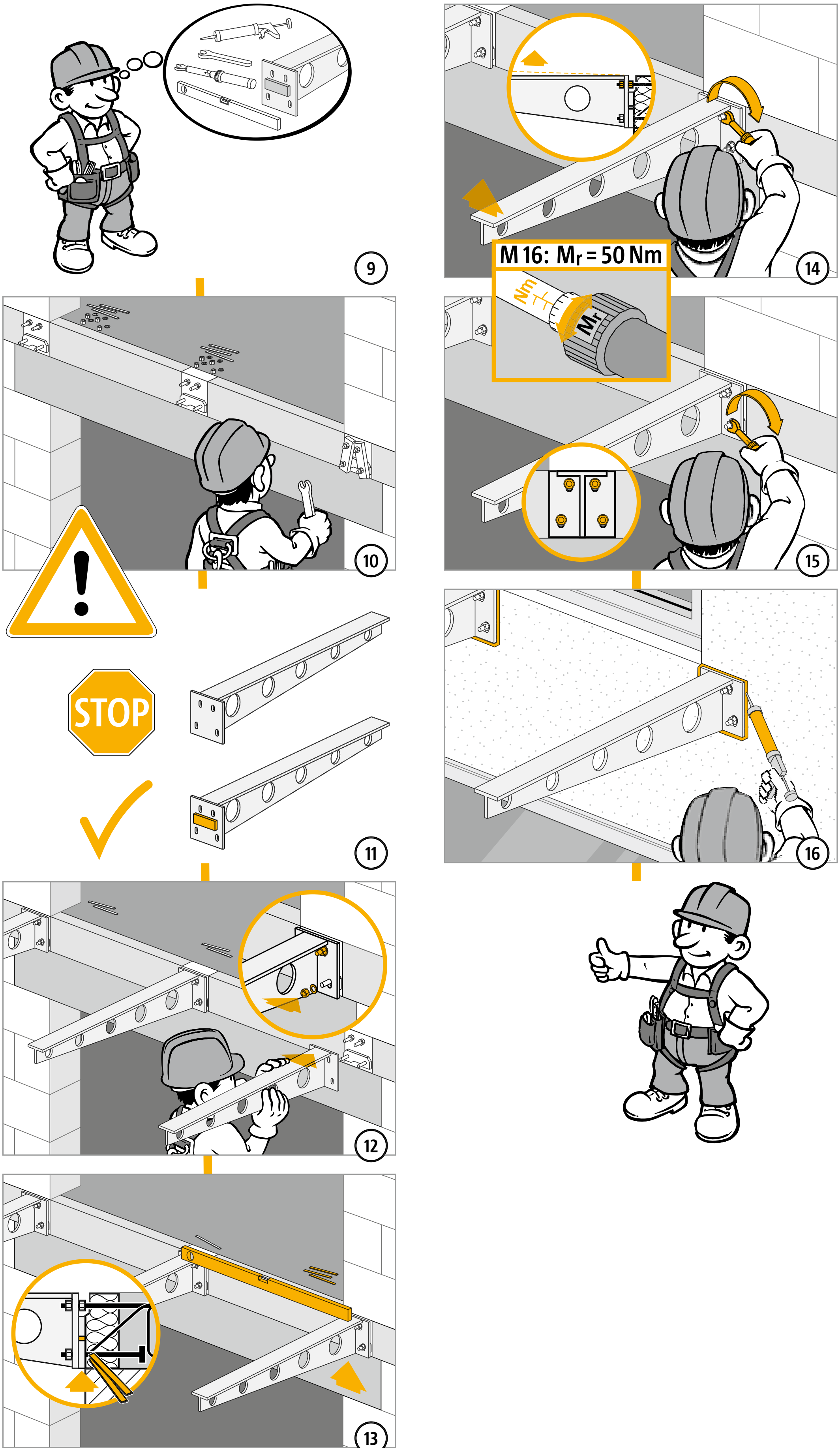
# Schöck Isokorb® type KS14-VV

## Method statement for concrete frame constructor



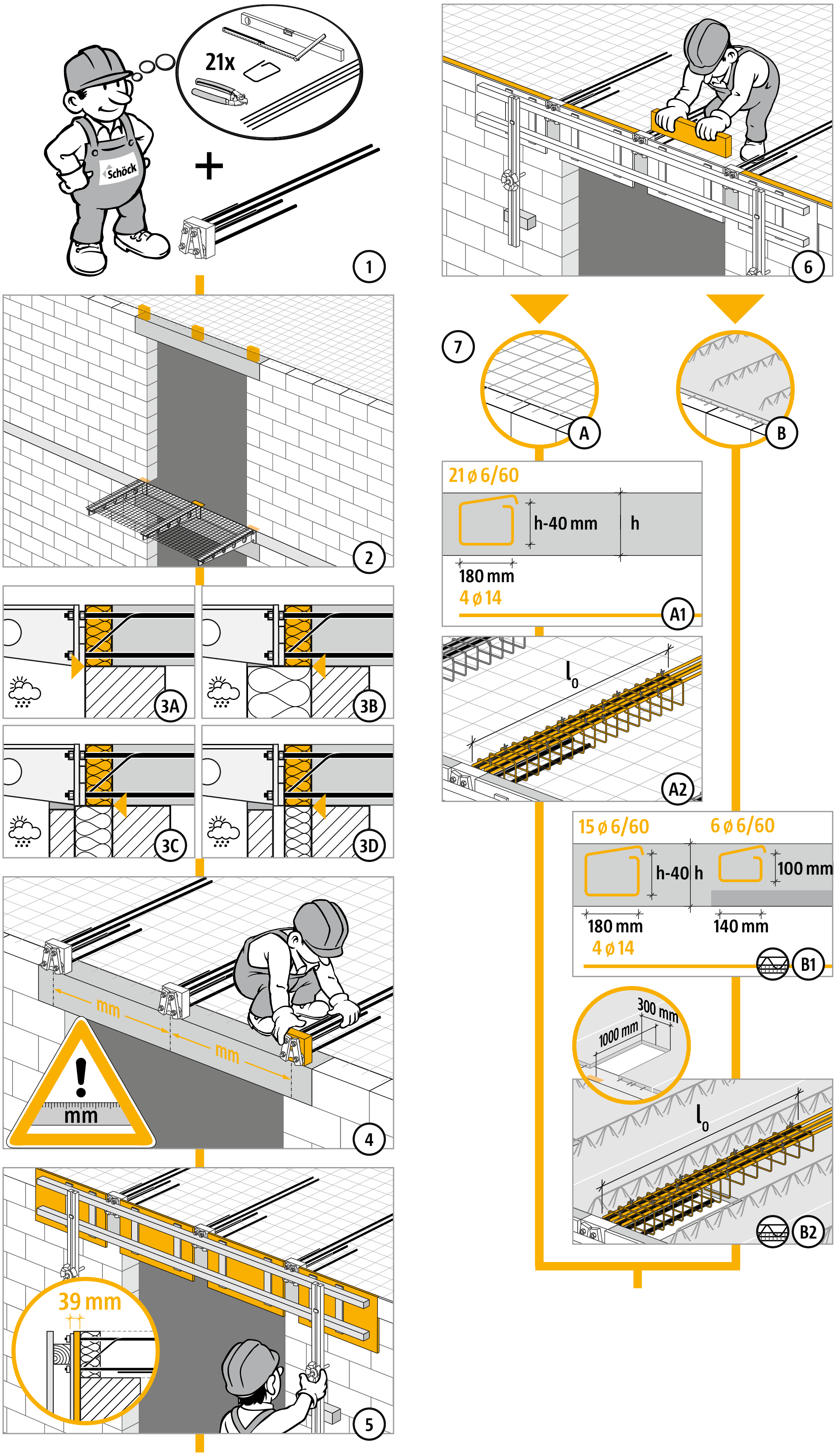
# Schöck Isokorb® type KS14-VV

## Method statement for steel fabricators



# Schöck Isokorb® type KS20

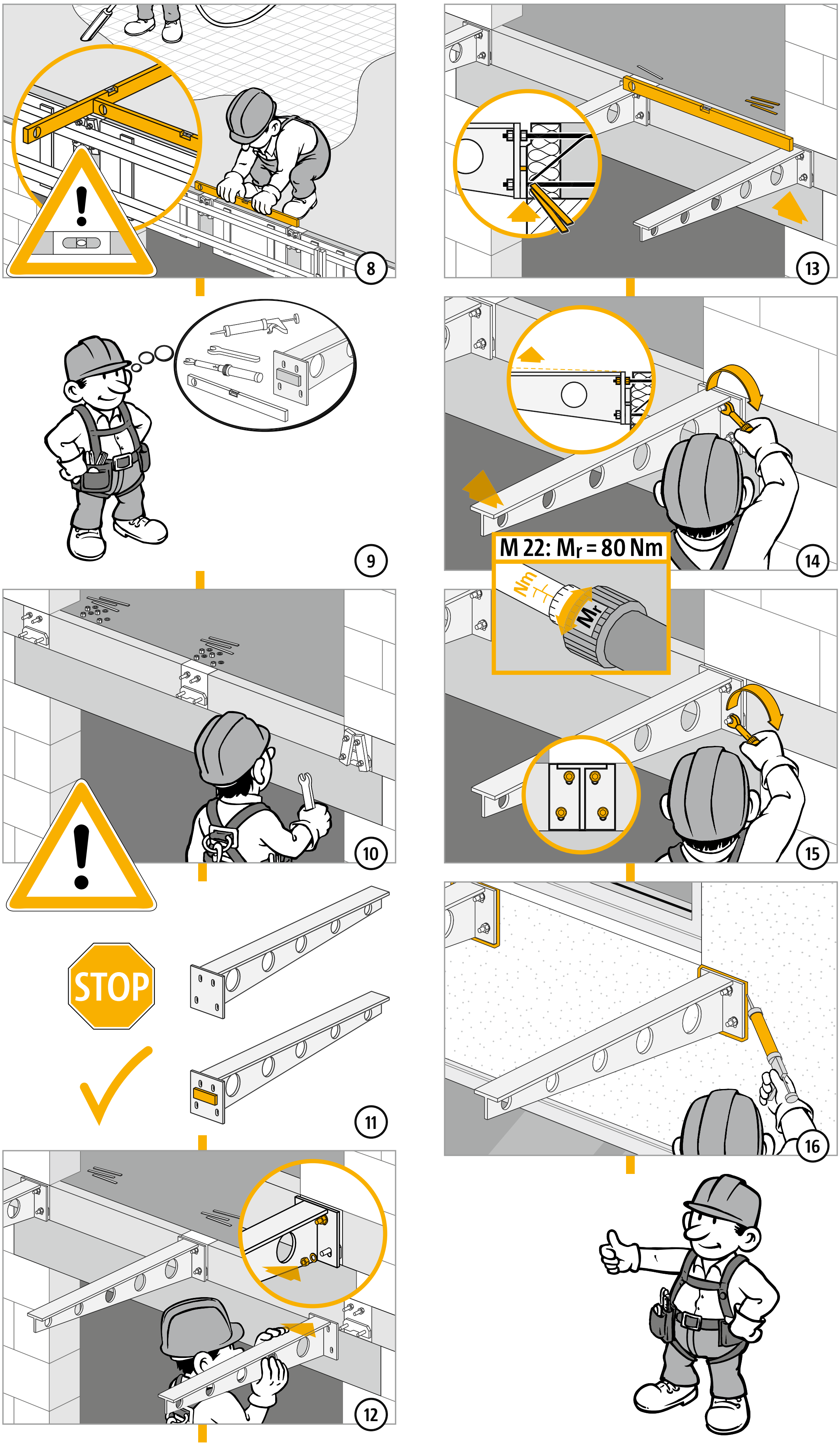
Method statement for concrete frame constructor



# Schöck Isokorb® type KS20

Method statement for steel fabricators



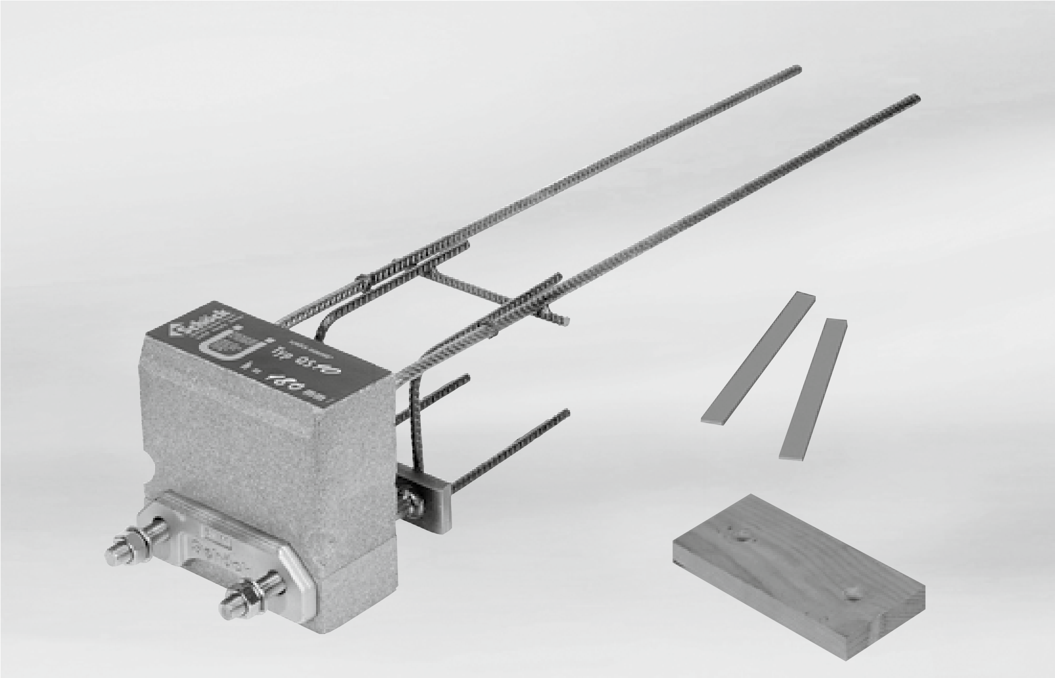


# Schöck Isokorb® type KS
## Checklist

- ☐ Have the member forces on the Isokorb® connection been determined at the design level?
- ☐ Is there a fire safety requirement for the overall load-bearing structure/Isokorb® (see page 132)?
- ☐ Are lifting-off forces active at the Isokorb® connection in conjunction with positive connection moments (see page 138 - 139)?
- ☐ Do the calculations of the deflection of the overall structure take into account the precamber due to the Schöck Isokorb® (see page 139)?
- ☐ Are temperature deformations assigned directly to the Isokorb® connection? Expansion joint spacing according to page 138.
- ☐ Have the the requirements and dimensions of the on-site end plate been met (see page 143)?
- ☐ Was sufficient reference made to the on-site end plate with butt stop which is absolutely essential?
- ☐ Has the information for the site management and/or the concrete frame contractor relating to installation tolerances been adopted in the shell plans (see pages 139 and 157)?
- ☐ If the Isokorb® type KS20 or type KS14-VV is used with precast planks, has the cutout on the inner slab side been taken into account (see page 142)?
- ☐ Have the tightening torques for the screwed connections been marked in the implementation plan (see pages 146, 148, 150)?
  The nuts should be tightened without planned preload; the following tightening torques apply:

| | |
|---|---|
| KS14 (bolt ø 16): | $M_r$ = 50 Nm |
| KS14-VV (bolt ø 16): | $M_r$ = 50 Nm |
| KS20 (bolt ø 22): | $M_r$ = 80 Nm |
| QS10 (bolt ø 16): | $M_r$ = 50 Nm |
| QS12 (bolt ø 16): | $M_r$ = 50 Nm |

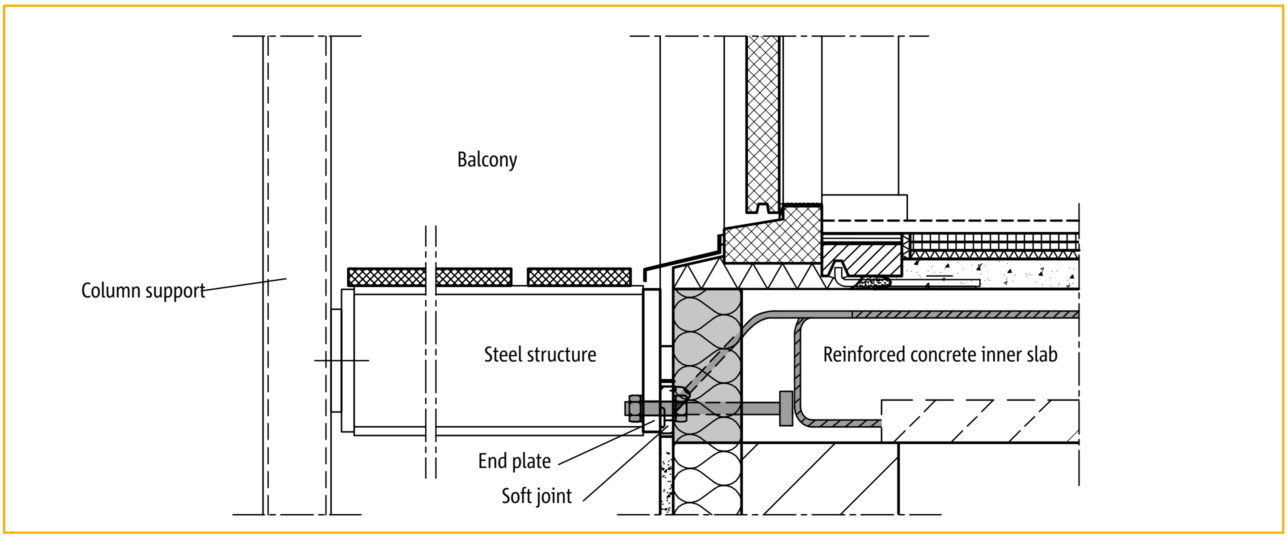
# Schöck Isokorb® type QS



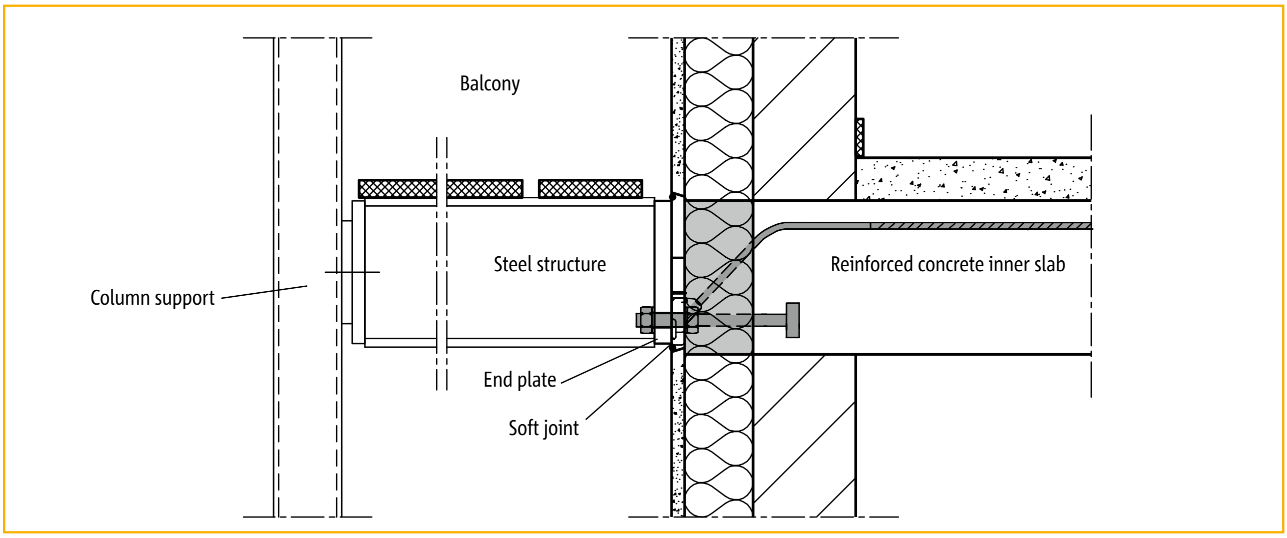
*Schöck Isokorb® type QS*

**Contents** **Page**

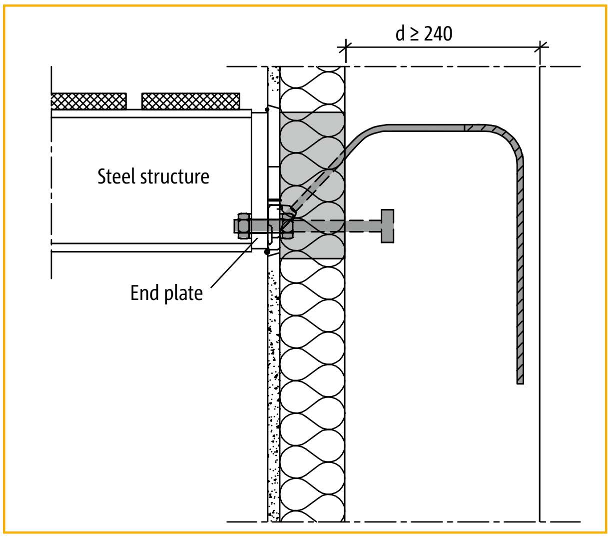
# Schöck Isokorb® type QS
## Connection layouts




*Connection with Schöck Isokorb® type QS in a door area, cavity wall*




*Connection with Schöck Isokorb® QS in a wall area*

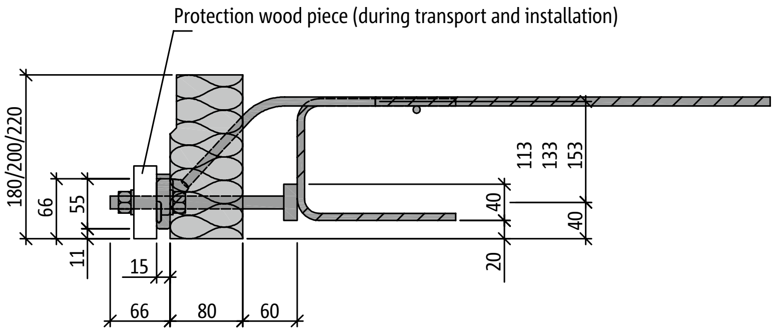



*Connection with Schöck Isokorb® QS in a wall area without adjacent inner slab - special design*

Special constructions on request

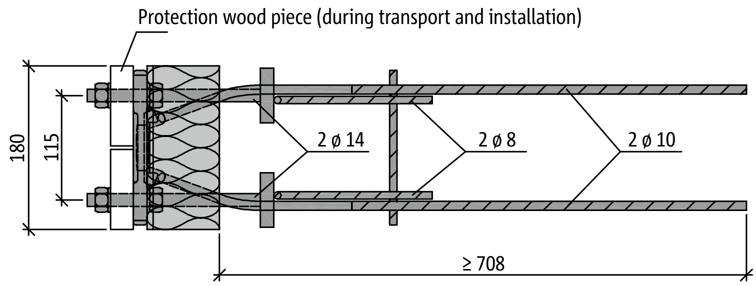
# Schöck Isokorb® type QS
## Dimensions

QS 10



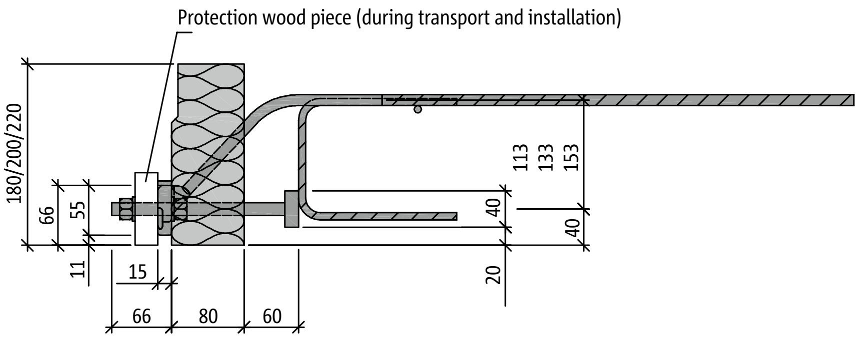

*Side view: Schöck Isokorb® type QS10*

QS 10



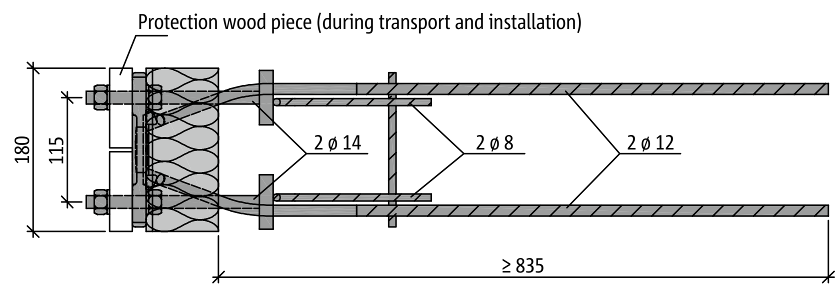

*Plan view: Schöck Isokorb® type QS10*

QS 12




*Side view: Schöck Isokorb® type QS12*

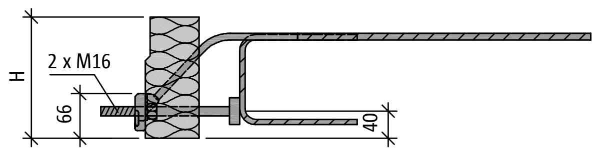
QS 12




*Plan view: Schöck Isokorb® type QS12*

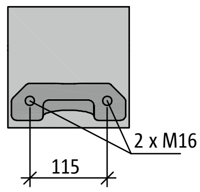
# Schöck Isokorb® type QS

## Views/On-site end plate/On-site connection reinforcement

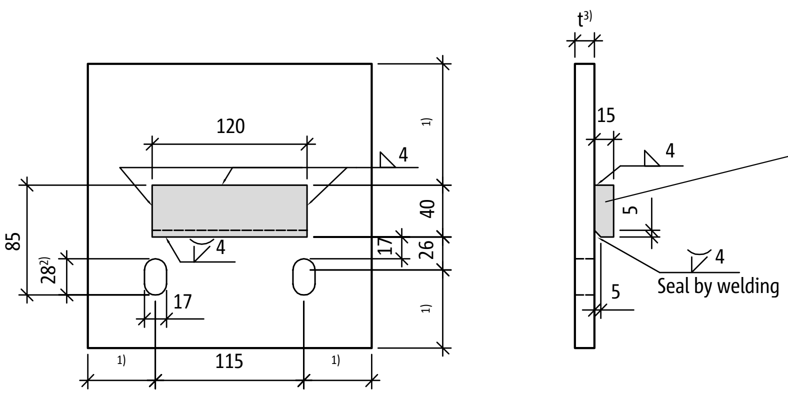



Free fixing length = 30 mm

*Side view: Schöck Isokorb® type QS10 and QS12*




*Front view: Schöck Isokorb® type QS10 and QS12*




Choice of steel type according to the structural requirements.
Anti-corrosion protection to be applied after welding.

**Important note:**
The butt stop is imperative in order to transfer shear forces – provided by the steel fabricator

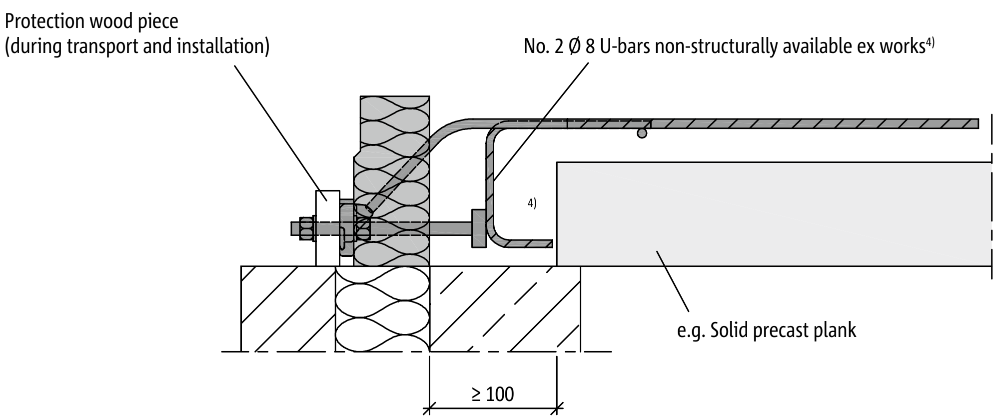
**Steel construction:** The tolerances of the internal structure must be checked in all cases.

*On-site end plate to Schöck Isokorb® type QS10 and QS12*



## On-site connection reinforcement

The 2 non-structural edge U-bars ø 8 mm, are provided as standard on every type QS element (see illustration below). Further connection reinforcement for Schöck Isokorb® type QS is not required.

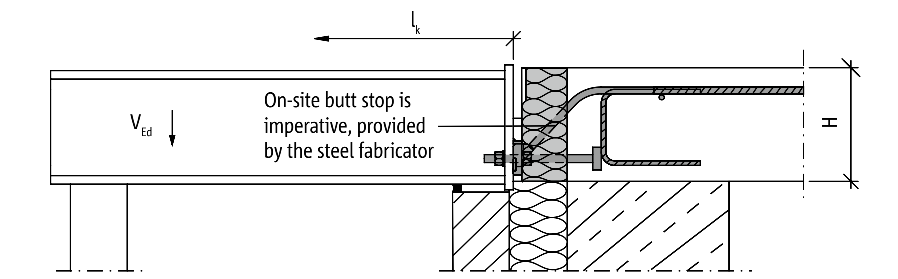



[1)] According to the information provided by the structural design engineer.
[2)] Hole size corresponds to a height adjustment of +10 mm. The scope for height adjustment can be increased by enlarging the hole size.
[3)] Note the free fixing length.
[4)] When using precast planks, the lower legs of the 2 ex works U-bars Ø 8 can be shortened on-site.

# Schöck Isokorb® type QS

## Capacity table/Expansion joint spacing/Installation tolerances/Note

The member forces are taken in relation to the rear edge of the end plate.




▸ Checklist on page 160 is to be observed!

| Schöck Isokorb® type | QS10 | QS12 |
|---|---|---|
| Design values for concrete strength ≥ C25/30 | Shear force capacity $V_{Rd}$ [kN] | |
| Height of Isokorb® H [mm] 180, 200, 220 | +48.3 | +69.6 |
| | Horizontal shear force capacity $H_{Rd}$[1] [kN] | |
| | +4.00 | +6.5 |
| | -4.00 | -6.5 |
| | Max. expansion joint spacing [m] | |
| | 5.70 | |

### Expansion joint spacing

If constructive measures are implemented to allow movement between the balcony slab and the individual steel profiles, then only the distances between the fixed connections are significant.

### Centre and edge spacing

Minimum spacing according to the table on page 141 is to be observed.

### Installation tolerances

Due to its design, the Schöck Isokorb® type QS **only allows compensation of tolerances in a vertical direction.** The tolerance is: +10 mm in a vertical direction; ±0 mm in a horizontal direction. We recommend the use of an on-site template to secure the position.The planning engineer should inform the **concrete frame contractor** about these details in the implementation plans.

In order to ensure that the shell and the finishings join together properly without the need for modification or reworking, the **site management** must check that the tolerances are met and **take this into account in the design of the steel structure.** Dimension tolerances must be taken into account.

### Note

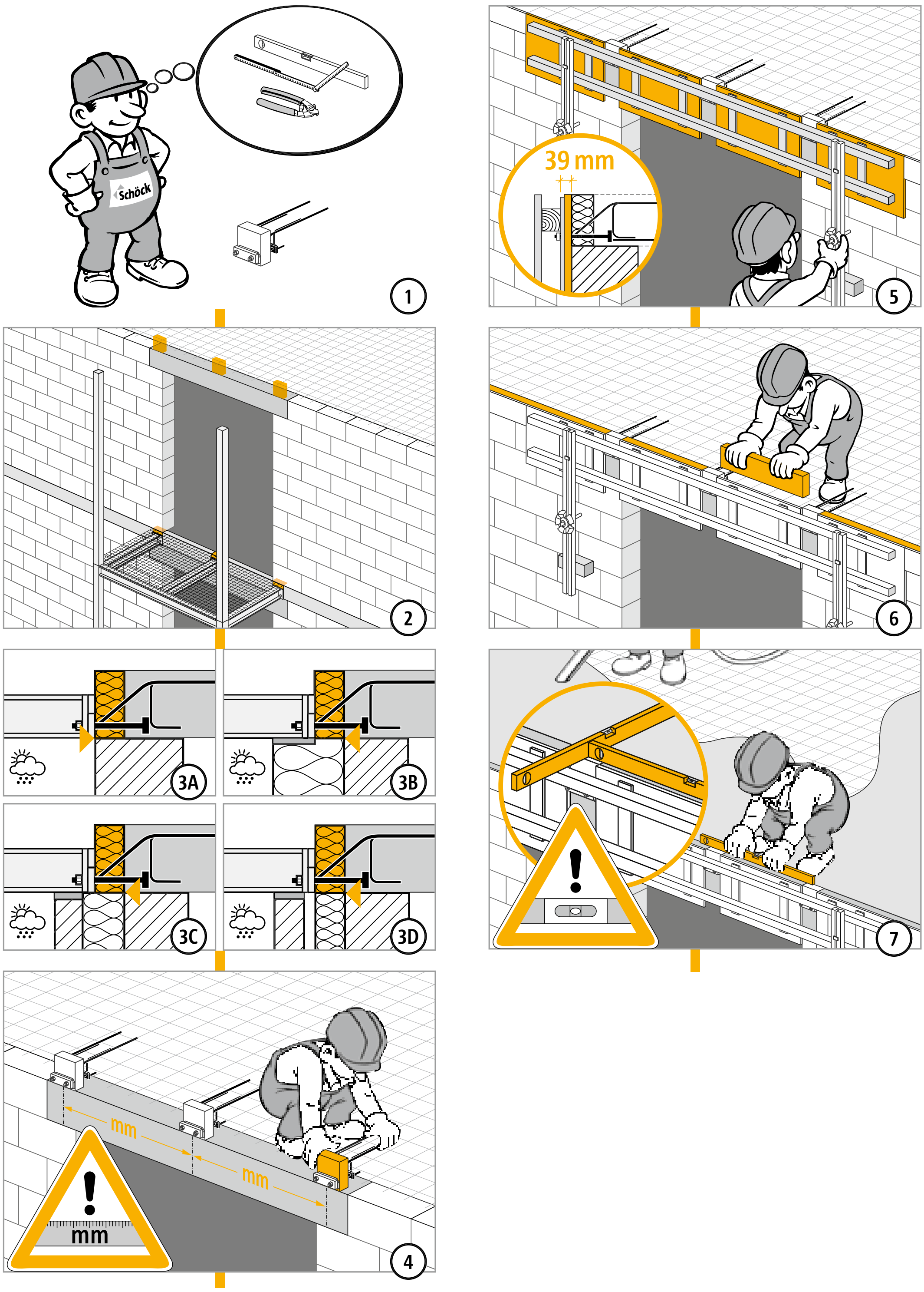
▸ The on-site end plate with butt stop has to be provided by the steel fabricator.

[1] In order to absorb the present horizontal force ($H_{Ed}$) parallel to the outside wall, a minimum shear force of 2.9 × $H_{Ed}$ must be ensured.

# Schöck Isokorb® type QS

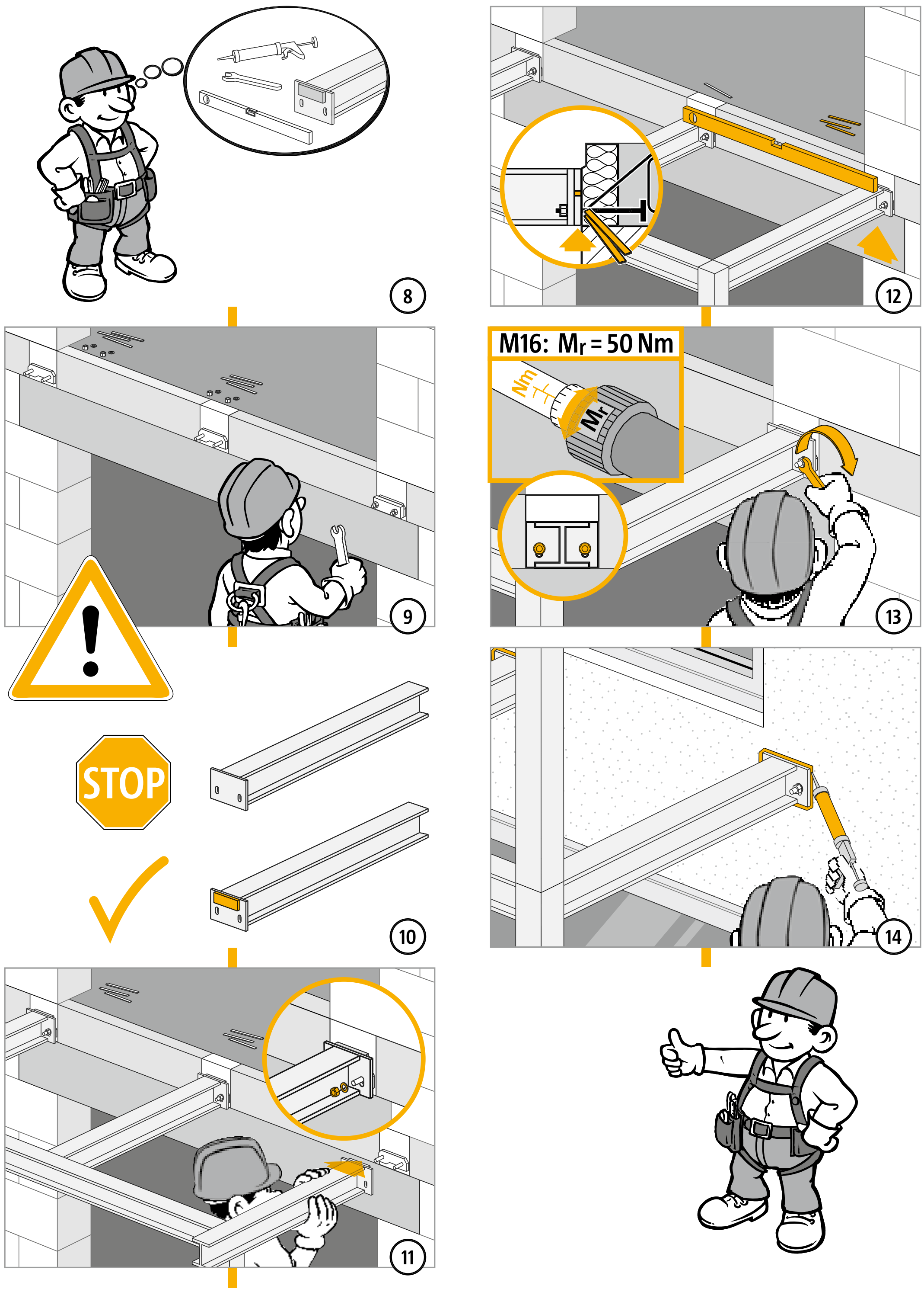
## Method statement for concrete frame contracter





# Schöck Isokorb® type QS

Method statement for steel fabricators



# Schöck Isokorb® type QS
## Checklist

☐ Have the member forces on the Isokorb® connection been determined at the design level?

☐ Is there a fire safety requirement for the overall load-bearing structure/Isokorb® (see page 132)?

☐ Do the calculations of the deflection of the overall structure take into account the precamber due to the Schöck Isokorb® (see page 157)?

☐ Are temperature deformations assigned directly to the Isokorb® connection? Expansion joint spacing according to page 157.

☐ Have the the requirements and dimensions of the on-site end plate been met (see page 156)?

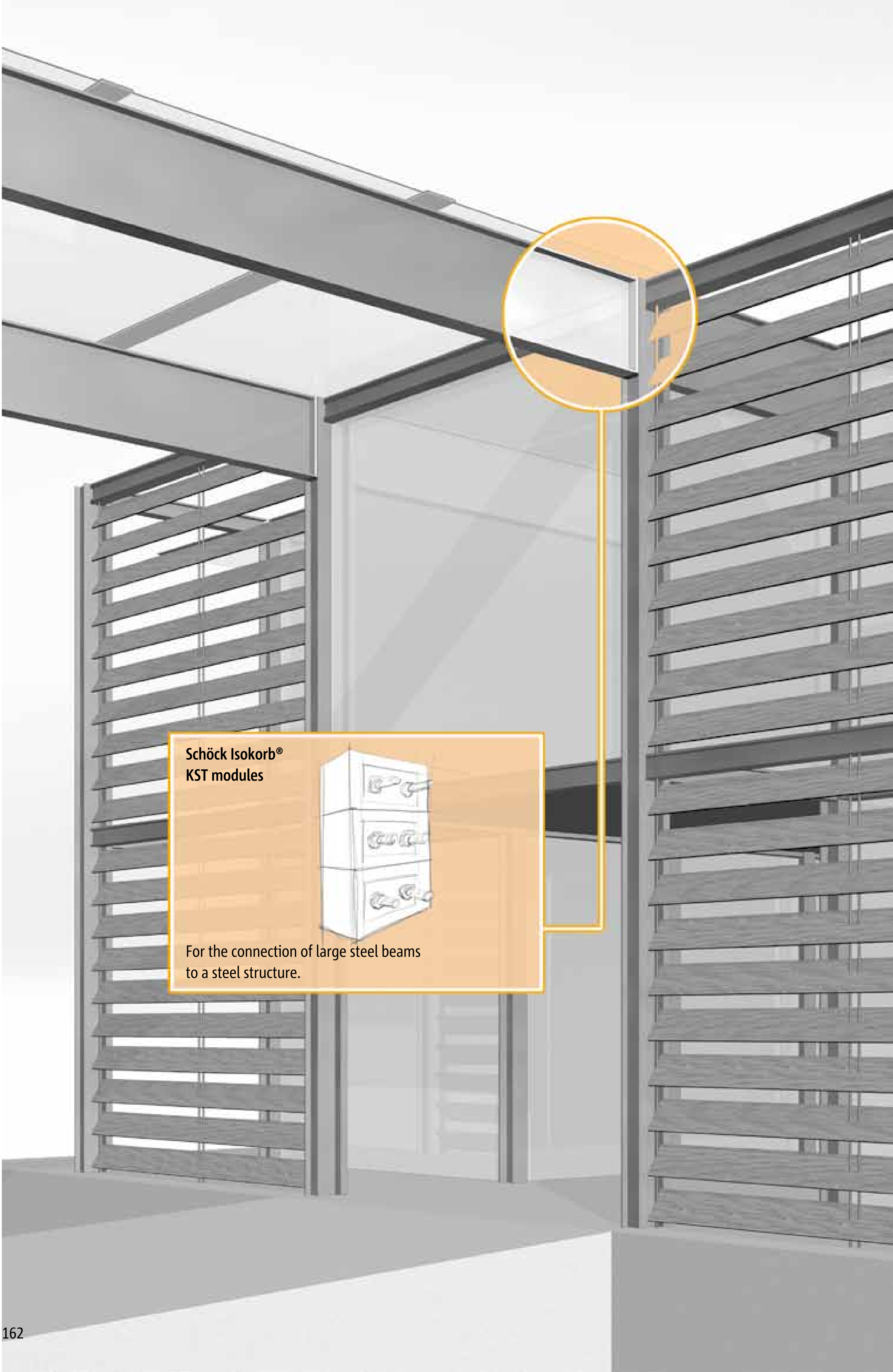
☐ Was sufficient reference made to the on-site end plate with butt stop which is absolutely essential?

☐ Has the information for the site management and/or the concrete frame contractor relating to installation tolerances been adopted in the shell plans (see pages 156 and 157)?

☐ Have the tightening torques for the screwed connections been marked in the implementation plan (see page 159)? The nuts should be tightened without planned preload; the following tightening torques apply:

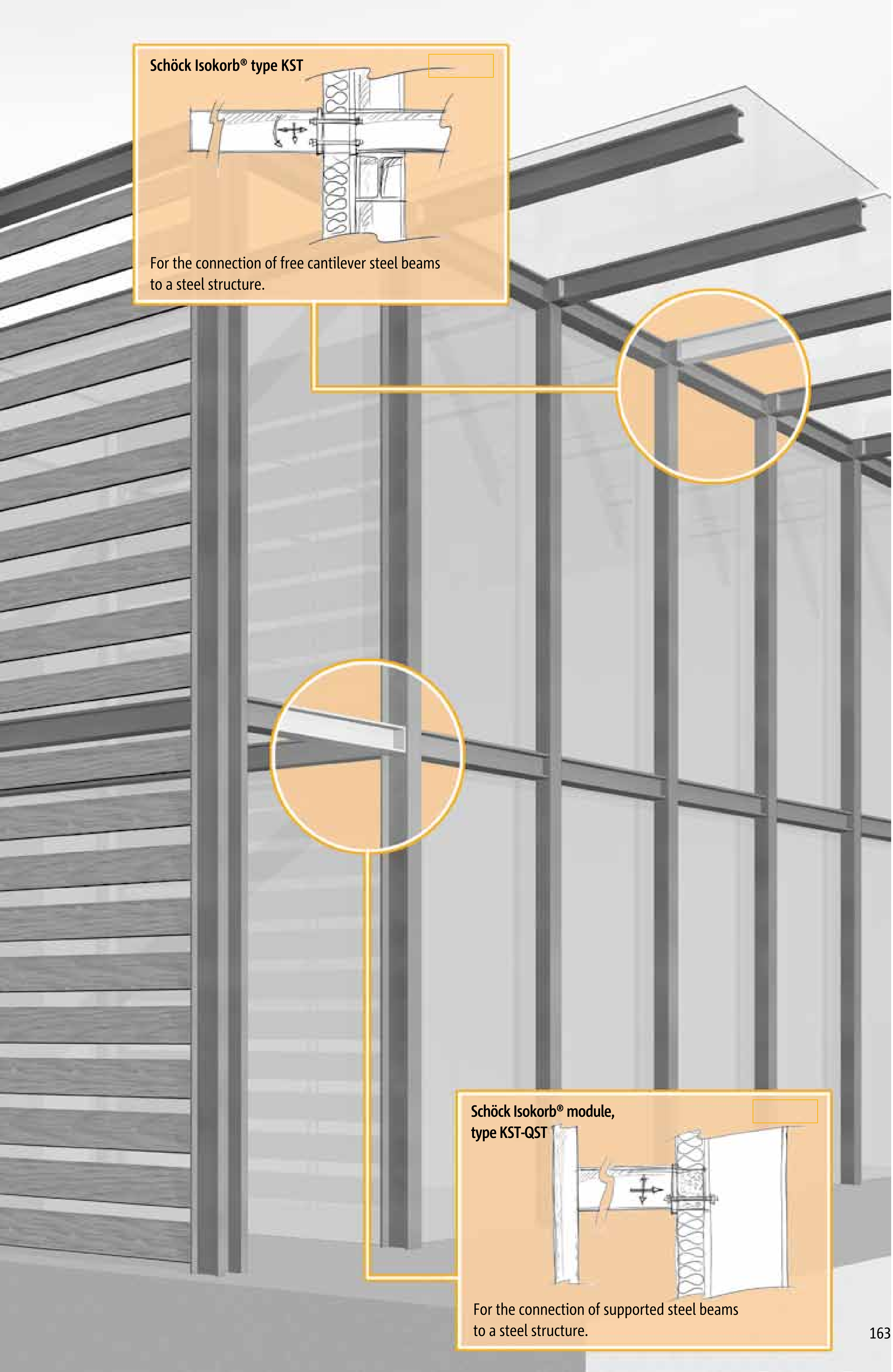
| | |
|---|---|
| KS14 (bolt ø 16): | $M_r$ = 50 Nm |
| KS14-VV (bolt ø 16): | $M_r$ = 50 Nm |
| KS20 (bolt ø 22): | $M_r$ = 80 Nm |

| | |
|---|---|
| QS10 (bolt ø 16): | $M_r$ = 50 Nm |
| QS12 (bolt ø 16): | $M_r$ = 50 Nm |



**Schöck Isokorb® KST modules**

For the connection of large steel beams to a steel structure.



**Schöck Isokorb® type KST**

For the connection of free cantilever steel beams to a steel structure.

**Schöck Isokorb® module, type KST-QST**

For the connection of supported steel beams to a steel structure.

# Schöck Isokorb® type KST
## Materials/Anti-corrosion protection/Fire protection

### Schöck Isokorb® type KST - materials

**Plates and sections**

**Chemical composition** Mo-Cr-Ni-austenitic stainless steel compliant with any of NS-EN 10088 grades 1.4401, 1.4404 and 1.4571 (Choice of Grade at Manufacturer's Discretion).

**Mechanical properties** In accordance with NS-EN 10088 – except for the following components where Schöck only accept material with mechanical properties in excess of those required for compliance with NS-EN 10088.

| Component | Required minimum 0.2 % proof stress (N/mm²) | Required ultimate tensile stress (N/mm²) | Required minimum elongation after fracture (%) |
|---|---|---|---|
| Rectangular hollow section | 355 | 600 | 30 |
| 12 mm pressure plate (QST module) | 275 | 550 | 40 |

**Threaded fasteners**

**Grade A4-70 to NS-EN ISO 3506** (corrosion resistance equivalent to NS-EN 10088 Grade 1.4401)
**Grade A5-70 to NS-EN ISO 3506** (corrosion resistance equivalent to NS-EN 10088 Grade 1.4571)

**Insulation material**

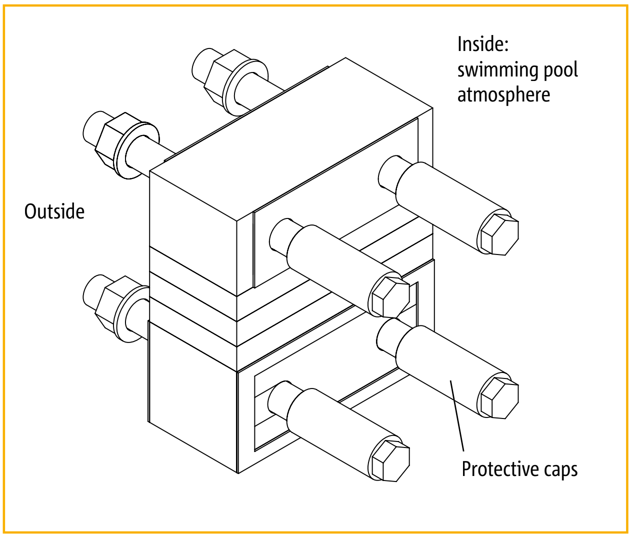
Polystyrene hard foam (Neopor®) $\lambda = 0.031$ W/(m × K)

### Anti-corrosion protection

- The stainless steel used for Schöck Isokorb® type KST corresponds to the material no.: 1.4401, 1.4404 or 1.4571. So the KST unit componenets will have a typical corrosion resistance expected for Mo-Cr-Ni austenitic stainless steels.

- Bimetallic corrosion
  Using Schöck Isokorb® type KST in conjunction with a galvanised or paint treated front plate there is no concern regarding bimetallic corrosion. Since in this application the area of the galvanised steel is greater than the area of the stainless steel (bolts, washer and butt stop) bimetallic corrosion that could lead to failure can be excluded as far as Schöck products are concerned.

- Stress corrosion cracking
  An appropriate Schöck protection system needs to be provided in environments with a high chlorine content (e.g. inside indoor swimming pools, ...). For more information please contact our design department.



*Schöck system-solution for protection in high chlorine environments*

### Fire protection

The same on-site fire safety measures that apply to the overall load-bearing structure also apply to any freely accessible components of the Schöck Isokorb® type KST or to any components situated inside the insulating layer.
For more information please contact our design department.

Steel-to-steel

# Schöck Isokorb® type KST

*Schöck Isokorb® type KST*

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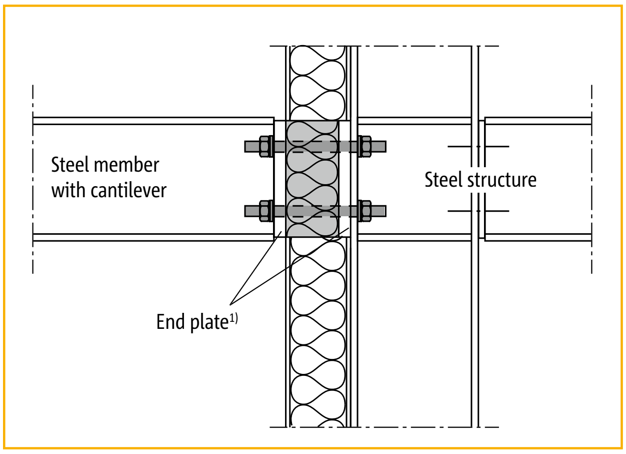
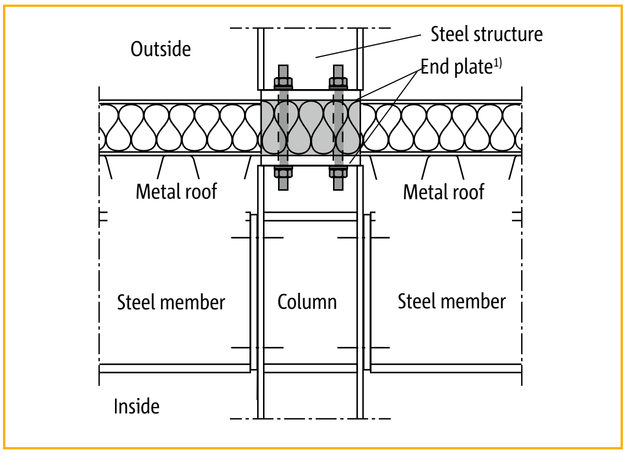
# Schöck Isokorb® type KST

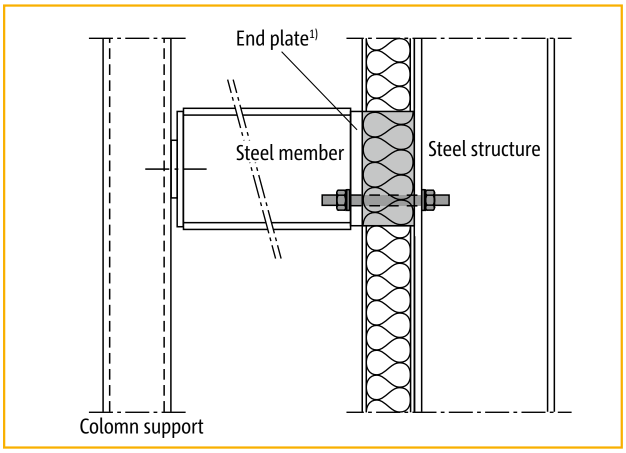
## Element arrangements/Connection layouts



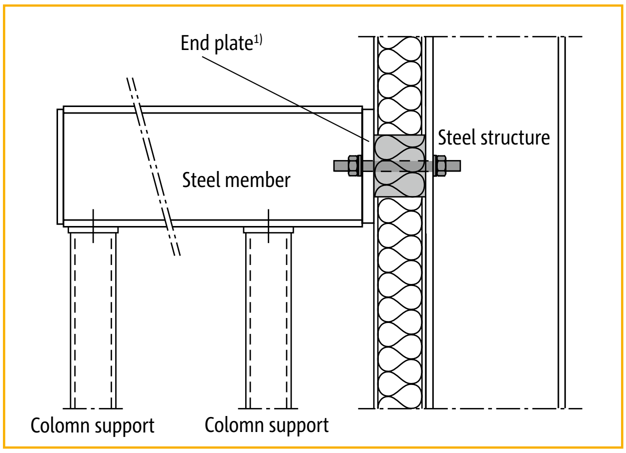

*Schöck Isokorb® type KST for steel members with cantilever*



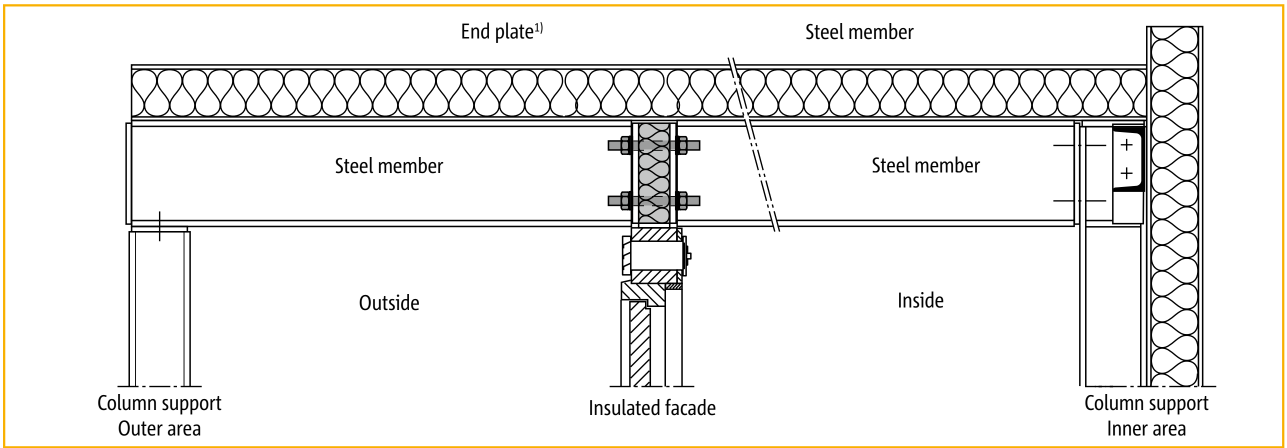

*Schöck Isokorb® type KST-QST insulating element used in steel column*




*Schöck Isokorb® type KST-QST module for a shear connection*




*Schöck Isokorb® type KST-ZST for a horizontal connection*

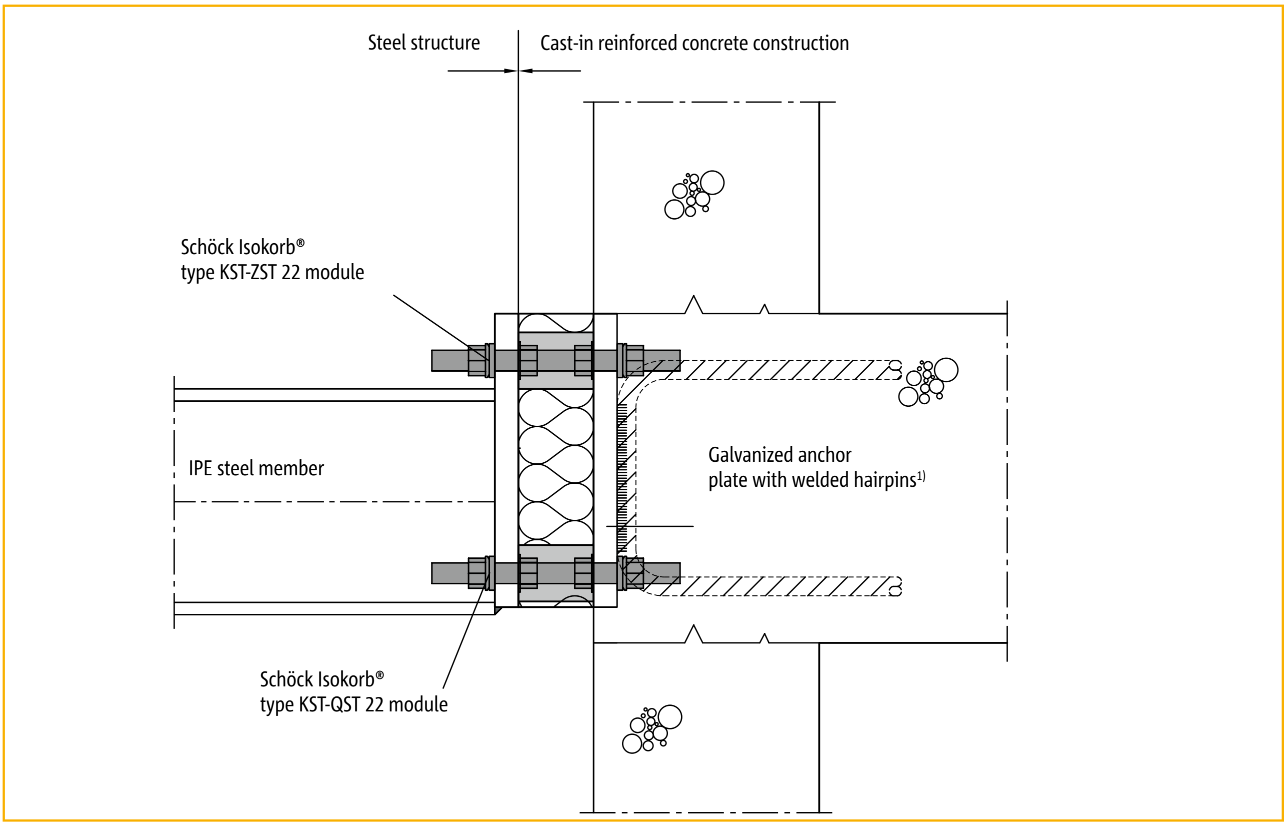



*Schöck Isokorb® type KST halfway the span of steel member*

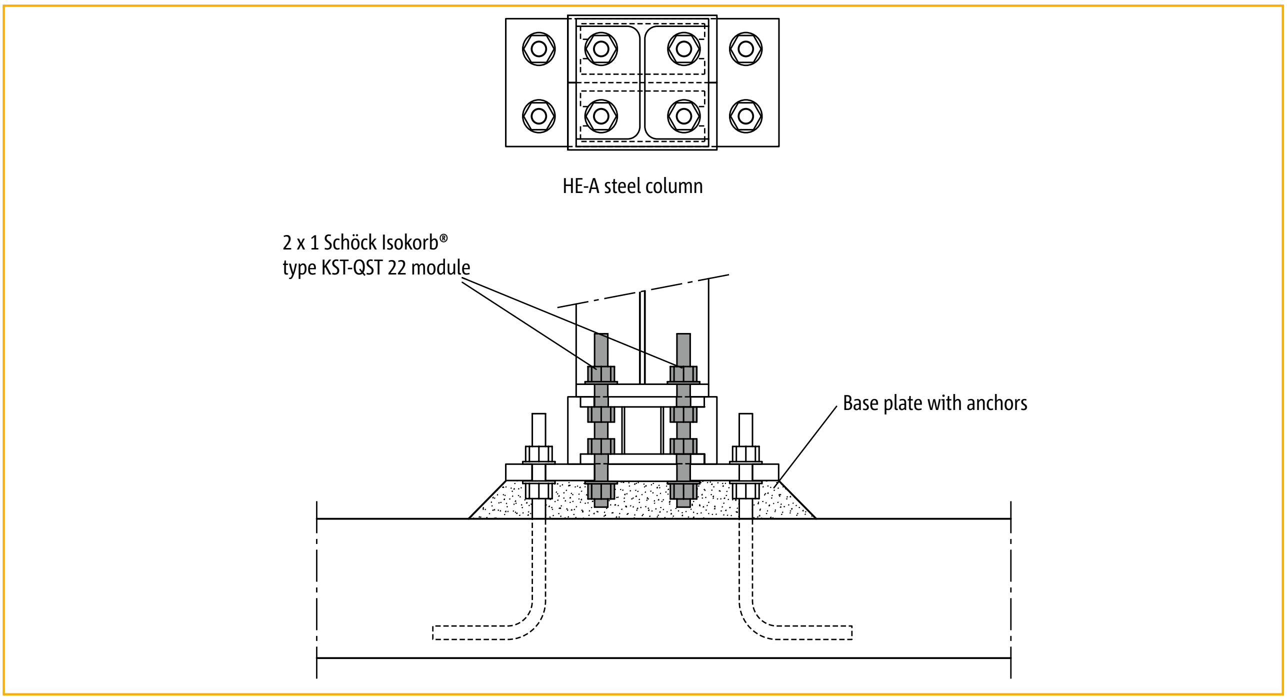
1) End plate not provided by Schöck

# Schöck Isokorb® type KST

## Element arrangements/Connection layout




*Schöck Isokorb® type KST connection to anchor plate (cast-in concrete)*




*Schöck Isokorb® type KST connection to base plate*

For the application of Schöck Isokorb® in columns please contact the hotline for design services (see front page).

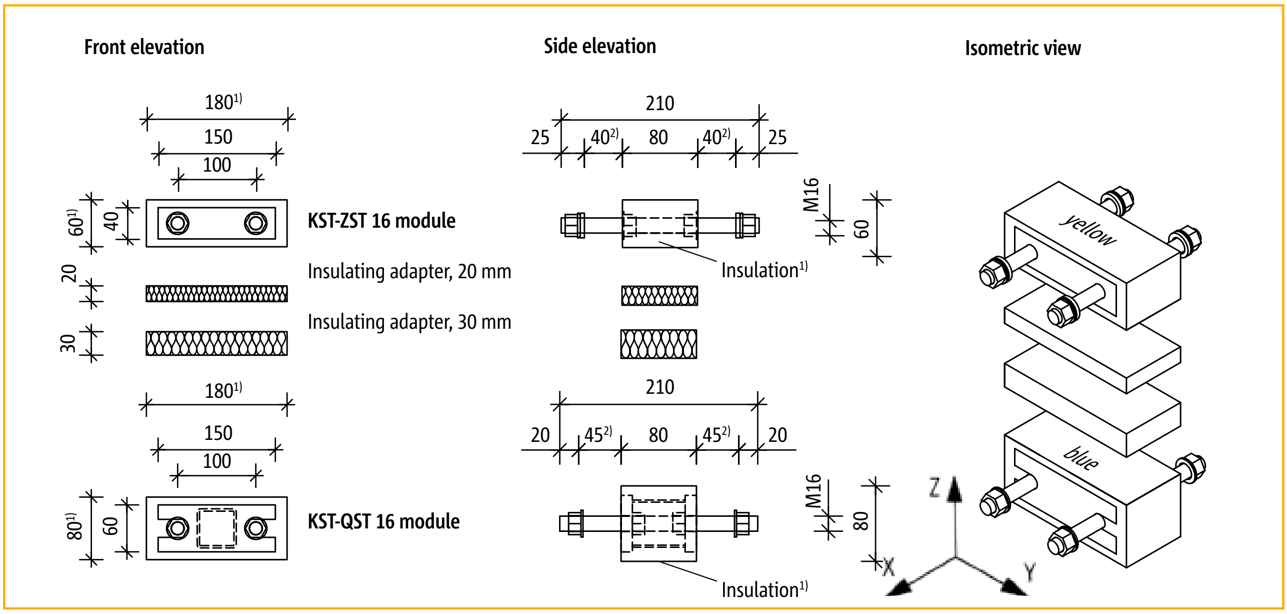
[1)] Not provided by Schöck

# Schöck Isokorb® type KST
## Views/Dimensions

### Schöck Isokorb® type KST – basic type

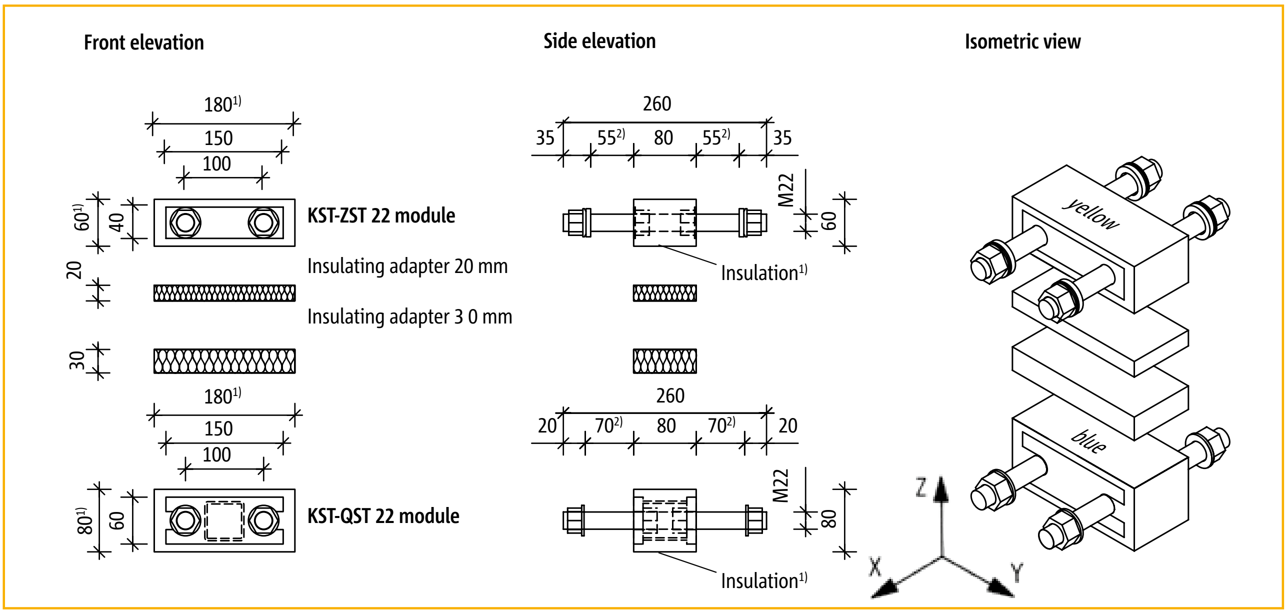
The basic KST type consists of one ZST module, one QST module, one insulating adapter with a thickness of 20 mm and one insulating adapter with a thickness of 30 mm. With these modules it is possible to achieve a vertical bolt separation of up to 120 mm (60/2 + 20 + 30 + 80/2). If your application requires a greater distance between the bolts, this can be achieved by inserting further insulating adapters or a corresponding insulating block. The main load on the basic KST type is a shear force in the z-direction and a moment around the y-axis.

### Schöck Isokorb® type KST 16




*Views - Schöck Isokorb® type KST 16*

### Schöck Isokorb® type KST 22




*Views - Schöck Isokorb® type KST 22*

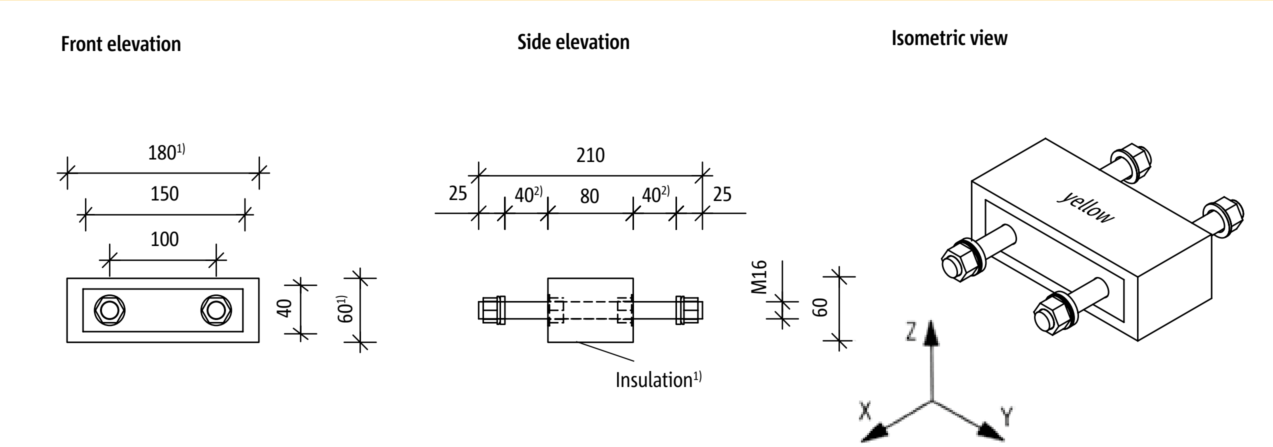
[1)] If required, the insulating element can be cut off up to the steel plates (150 × 40 for the KST-ZST module, 150 × 60 for the KST-QST module and KST-ZQST module). The minimum distance is therefore 50 mm (40/2 + 60/2).
[2)] Available fixing length.

# Schöck Isokorb® type KST
## Views/Dimensions

### Schöck Isokorb® module, type KST-ZST

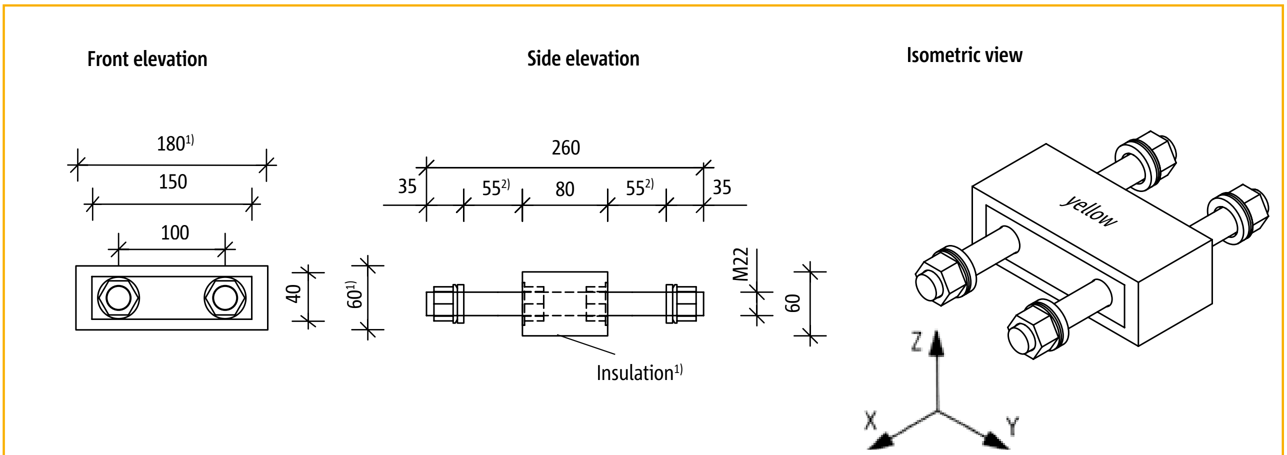
The KST-ZST module is used to absorb tensile forces. It comprises one insulating element (180/60/80 mm) and two stainless threaded bars with the corresponding nuts. The outer washers take the form of a ball socket and a conical disc. This offers advantages in terms of fatigue resistance. Refer also to the section about expansion joints on pages 174 - 175. In combination with a KST-QST module, it is also possible to absorb compressive forces, although this is limited to one third of the tensile force.

### Schöck Isokorb® module, type KST-ZST 16




*Views - Schöck Isokorb® module, type KST-ZST 16*

### Schöck Isokorb® module, type KST-ZST 22




*Views - Schöck Isokorb® module, type KST-ZST 22*



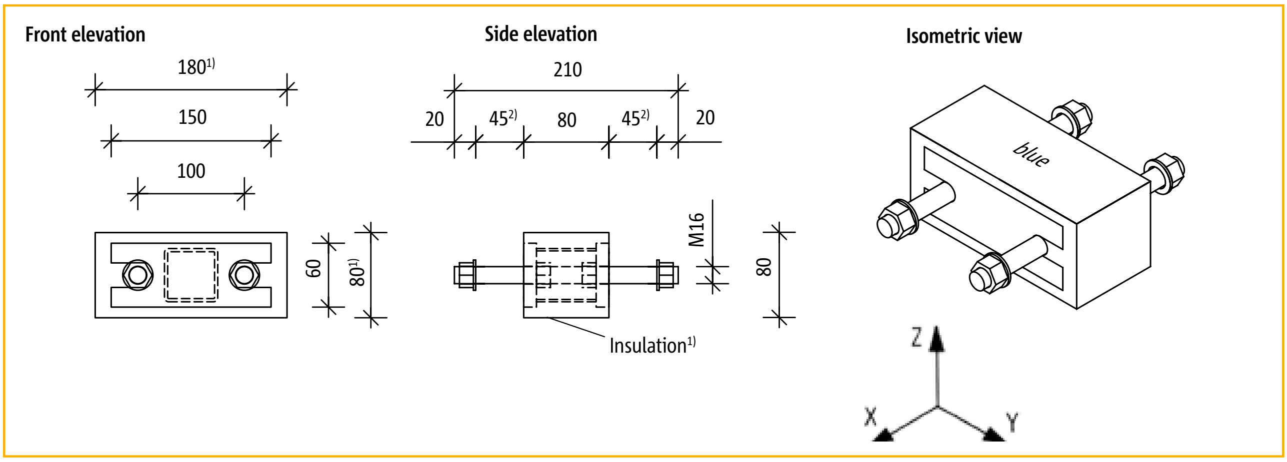
[1)] If required, the insulating element can be cut off up to the steel plates (150 × 40 for the KST-ZST module).
[2)] Available fixing length.

# Schöck Isokorb® type KST
Views/Dimensions

### Schöck Isokorb® module, type KST-QST

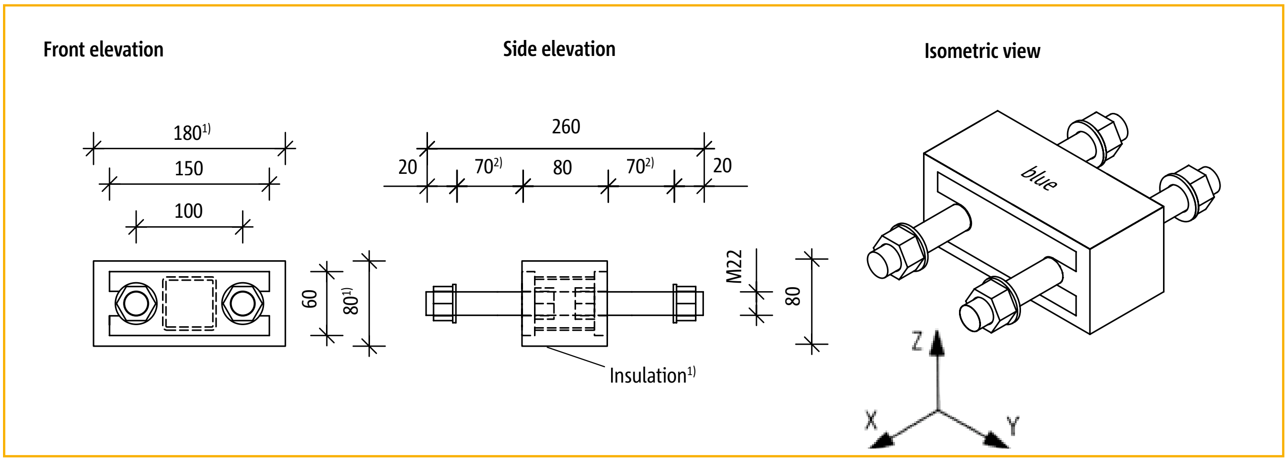
The KST-QST module is used to absorb compressive forces and shear forces. It consists of an insulating element (180/80/80 mm), two stainless threaded bars with corresponding nuts and a rectangular hollow section which is welded into the module. The rectangular hollow section transmits the shear forces. The element can transmit forces in the x, y and z-direction. Within a KST connection, the KST-QST module is located in the area in which pressure is exerted due to the self weight. Different load combinations, including tensile forces, within a KST connection, can be carried by the KST-QST module, although the interaction condition $3V_d + 2\,H_d + F_{t,d} = \max F_{t,d} \leq F_{t,Rd}$ must be satisfied.

### Schöck Isokorb® module, type KST-QST 16




*Views - Schöck Isokorb® module, type KST-QST 16*

### Schöck Isokorb® module, type KST-QST 22




*Views - Schöck Isokorb® module, type KST-QST 22*

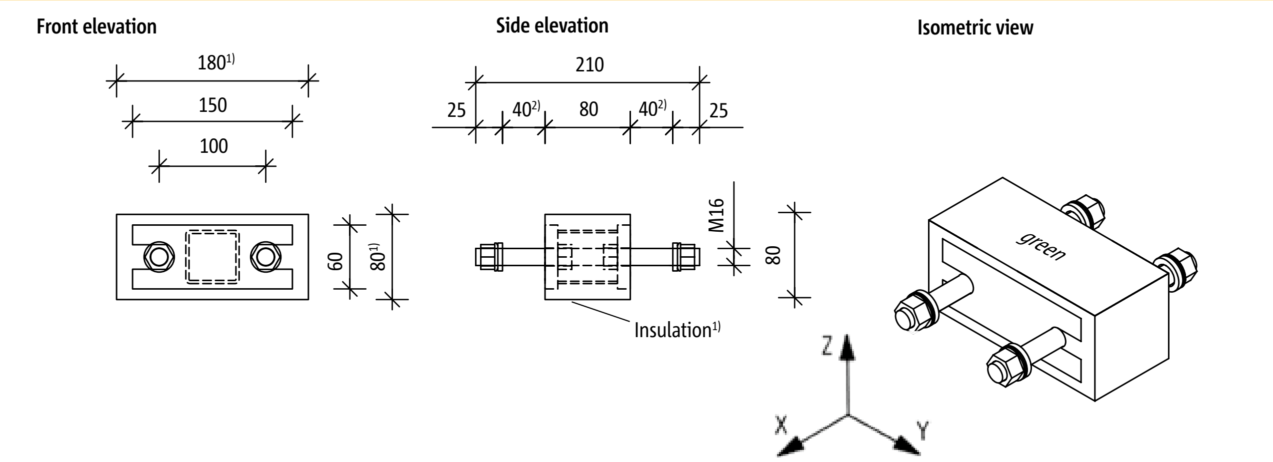
[1)] If required, the insulating element can be cut off up to the steel plates (150 × 60 for the KST-QST module and the KST-ZQST module).
[2)] Available fixing length.

# Schöck Isokorb® type KST
Views/Dimensions

### Schöck Isokorb® module, type KST-ZQST

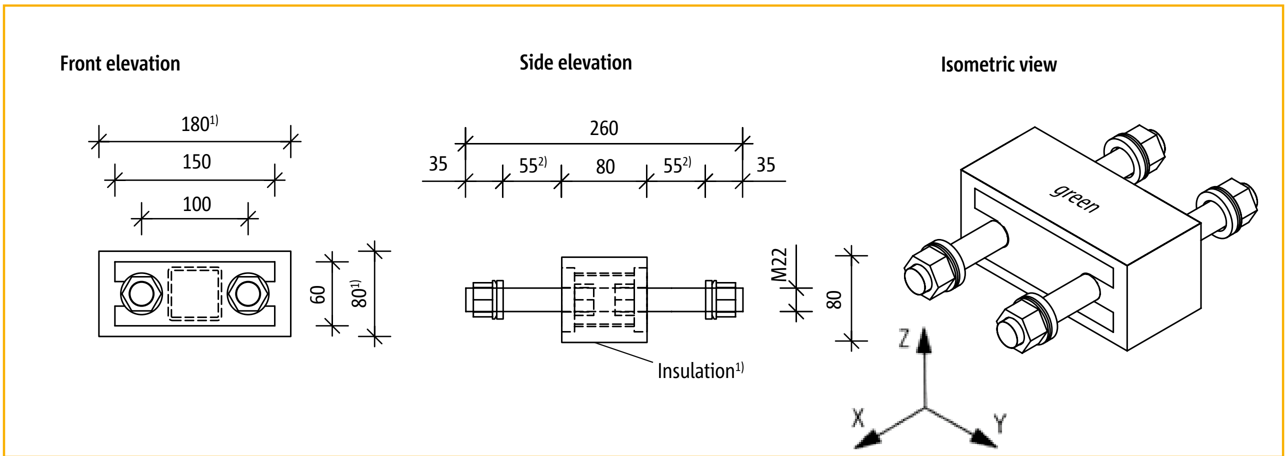
The KST-ZQST module combines the technical features of the KST-ZST module with those of the KST-QST module. It should be used for applications in which tensile forces are continuously transmitted and, at the same time, horizontal forces resulting from temperature deformations are transferred from the outer steel structure into the connection. Special two-part washers provide fatigue resistance.

### Schöck Isokorb® module, type KST-ZQST 16




*Views - Schöck Isokorb® module, type KST-ZQST 16*

### Schöck Isokorb® module, type KST-ZQST 22



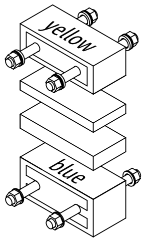
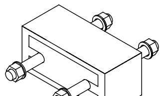
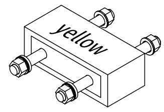

*Views - Schöck Isokorb® module, type KST-ZQST 22*

KST

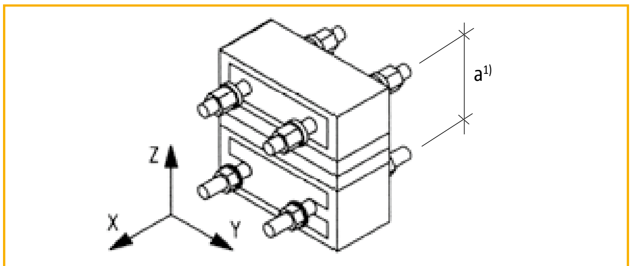
Steel-to-steel

[1] If required, the insulating element can be cut off up to the steel plates (150 × 60 for the KST-QST module and the KST-ZQST module).
[2] Available fixing length.

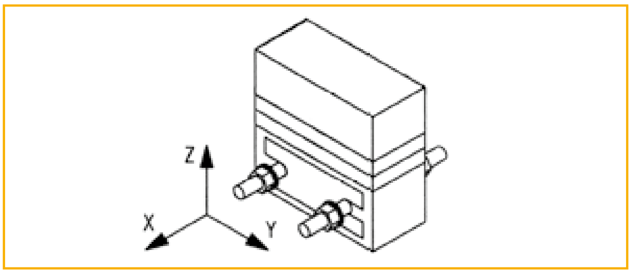
# Schöck Isokorb® type KST
## Design and capacity table

| Schöck Isokorb® type |  | | <br>KST-QST: blue<br>KST-ZQST: green | |  | |
|---|---|---|---|---|---|---|
| | **KST 16** | **KST 22** | **KST-QST 16 module<br>KST-ZQST 16 module** | **KST-QST 22 module<br>KST-ZQST 22 module** | **KST-ZST 16 module** | **KST-ZST 22 module** |
| $H_{y,Rd}$ | ±6 kN[5)] | ±6 kN[5)] | ±6 kN[3)5)] | ±6 kN[3)5)] | 0 kN | 0 kN |
| $V_{z,Rd}$ | 30 kN | 36 kN | 30 kN[3)] | 36 kN[3)] | 0 kN | 0 kN |
| $F_{x,t,Rd}$ $F_{x,c,Rd}$ | 116.8 kN[6)] | 225.4 kN[6)] | 116.8 kN[3)] | 225.4 kN[3)] | $F_t$ = 116.8 kN<br>$F_c$ = 0 kN | $F_t$ = 225.4 kN<br>$F_c$ = 0 kN |
| $M_{y,Rd}$ | $a \times F_{x,t,Rd}$ [1)] | $a \times F_{x,t,Rd}$ [1)] | 0 kNm[4)] | 0 kNm[4)] | 0 kNm | 0 kNm |
| $M_{z,Rd}$ | [2)5)] | [2)5)] | [2)5)] | [2)5)] | 0 kNm | 0 kNm |

| | |
|---|---|
| $F_{Rd}$ | resistance design [per module] |
| $F_{t,Rd}$ | for the tensile loading capacity of the bolts |
| $F_{c,Rd}$ | for the compression loading capacity of the bolts |



*Schöck Isokorb® type KST*



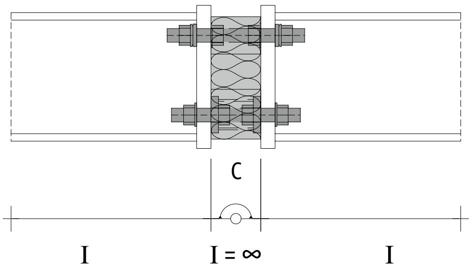
*Schöck Isokorb® module, type KST-QST/KST-ZQST*

1) a = distance between the tension bars and compression bars of the Isokorb® element (inner lever arm), minimum possible axis separation between tension bars and compression bars = 50 mm (without insulating adapters after processing of the polystyrene – see pages 168 - 171[1)]).
2) We recommend that you discuss the static system and calculations with the Schöck design department, tel. +47 67 11 56 90.
3) The interaction $3\,V_z + 2\,H_y + F_{x,t} = \max F_{x,t,d} \leq F_{x,t,Rd}$ needs to be taken into account in the event of simultaneous tensile force and shear force loads.
4) When using at least two modules arranged one above the other, it is possible to transfer both positive and negative forces (moments and shear forces) in accordance with the design variants on pages 177 - 188.
5) Please make sure that you read the notes on expansion joints/fatigue resistance on pages 174 - 175 below.
6) If the KST-ZST module is subjected to pressure loads within a KST connection (e.g. wind loads generating slight lift-off), then the KST-ZST module can absorb a maximum of 1/3 $F_{x,t,Rd}$ as a compressive force. The interaction (footnote 3) must also be noted in this load scenario.

# Schöck Isokorb® type KST

## Torsion spring strength/Notes on calculations

### Estimation of deformation variables due to $M_K$ in the Schöck Isokorb® connection

| Torsion spring strength/buckling angle resulting from bending moment | | | |
|---|---|---|---|
| **Design variants** | **Torsion spring strength c [kNcm/rad]** | **Buckling angle φ [rad]** | **Static model for the estimation of flexural stiffness** |
| No. 3 - see page 177 | $3\,700 \times a^2$ | $\varphi = \frac{M_K}{C}$ |  |
| No. 4 - see page 178 | $6\,000 \times a^2$ | | |
| No. 5 - see page 80 | $5\,200 \times a^2$ | | |
| No. 6 - see page 80 | $12\,000 \times a^2$ | | |
| No. 7 - see page 181 | $24\,000 \times a^2$ | | |
| No. 8 - see page 82 | $6\,000 \times a^2$ | | |
| No. 9 - see page 84 | $12\,000 \times a^2$ | | |
| No. 10 - see page 86 | $24\,000 \times a^2$ | | |

a [cm] = refer to the design variants on pages 177 - 188.
$M_K$ = bending moment from characteristic values for the effects around the (existing M).
Deformations resulting from normal forces and shear forces can be ignored.
Values in table above assume average secant modulus of stainless steel under working load of 17 900 kN/cm².

**Possible modular combinations of the basic types are shown on the next pages.**

### Notes on calculations

- Basis:
  Type certification (LGA Nürnberg S-N 010415)
  The Schöck Isokorb® type KST has been classified by the DIBt (German Institute for Construction Technology) as the subject of structural standards with type certification. Approval is not required as it is a modular system.

- End plate thickness:
  In the case of the connection of I-profiles in accordance with the design variants below, the indicated end plate thicknesses, using mild steel S235, can be adopted without further verification or proof. Smaller end plate thicknesses can be obtained with more accurate verification or proof.
  If the geometry is different then the end plates will need to be verified separately (e.g. connection of a U-profile, flat sheet metal, ...).

- Dynamic loads:
  The Schöck Isokorb® type KST is only intended for use with primarily static loads.

# Schöck Isokorb® type KST
## Expansion joints/Fatigue resistance

Changing temperatures cause changes in length of the steel members and thus cause fluctuating stresses to arise in the Isokorb® elements which are only passed on in part through the thermal separation.
Loads on the Isokorb® connections due to temperature deformations of the external steel construction should therefore generally be avoided.

If, nonetheless, temperature deformations are assigned directly to the Isokorb® connection, then the Isokorb® type KST construction will be fatigue-resistant up to a construction length of 6 m by virtue of its special components (KST-QST module, KST-ZQST module: sliding film on the pressure plate; KST-ZST module, KST-ZQST module: 2-part special washer). At greater lengths an expansion joint should be positioned after no more than 6 m.

Horizontal slots are needed in the on-site end plate for the KST-QST module and KST-ZQST module used in the compression zone if horizontal temperature deformations are to be introduced. These must permit horizontal movements of ±2 mm. In this case, horizontal shear forces can only be absorbed non-structurally via friction.

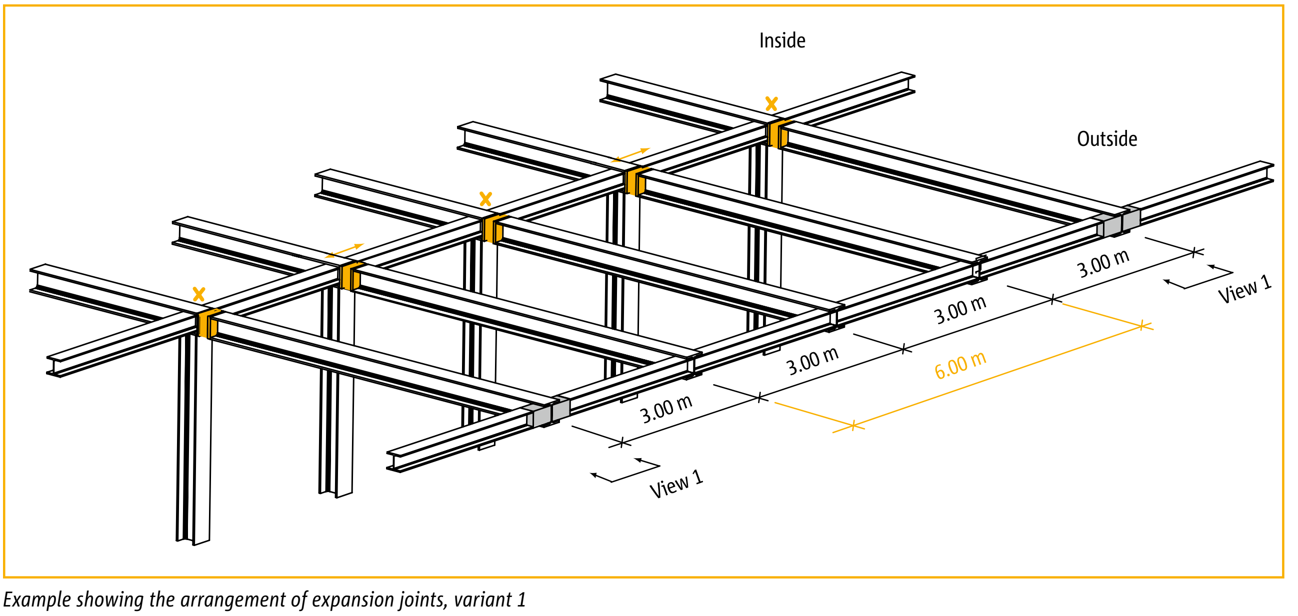
### Examples of the arrangement and design of expansion joints:

**Key:**

- Schöck Isokorb®
- Expansion joint
- x FIXED: No slots required
- ⟷ MOVEABLE: Horizontal slots in the on-site front plate for KST-QST module, KST-ZQST module (compression zone)

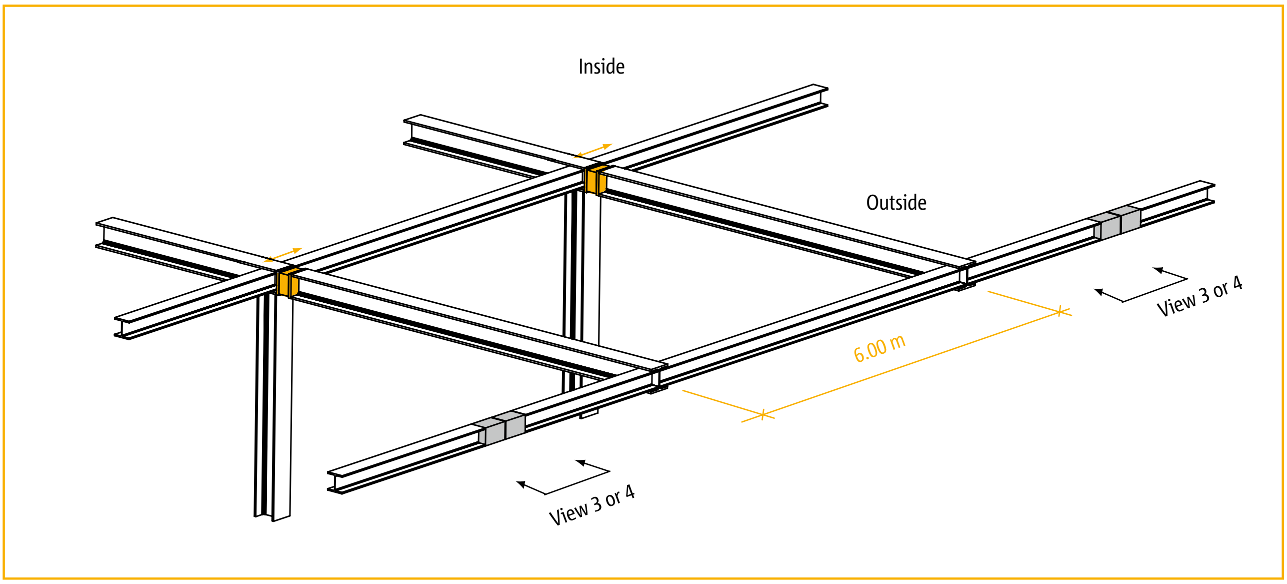




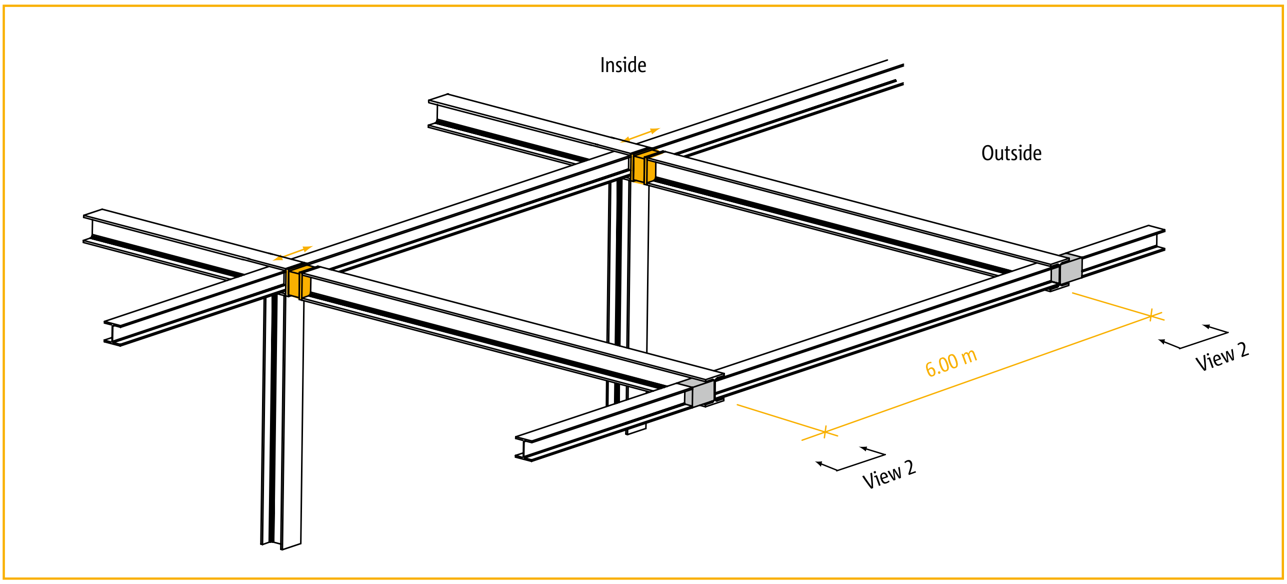



*Example showing the arrangement of expansion joints, variant 1*

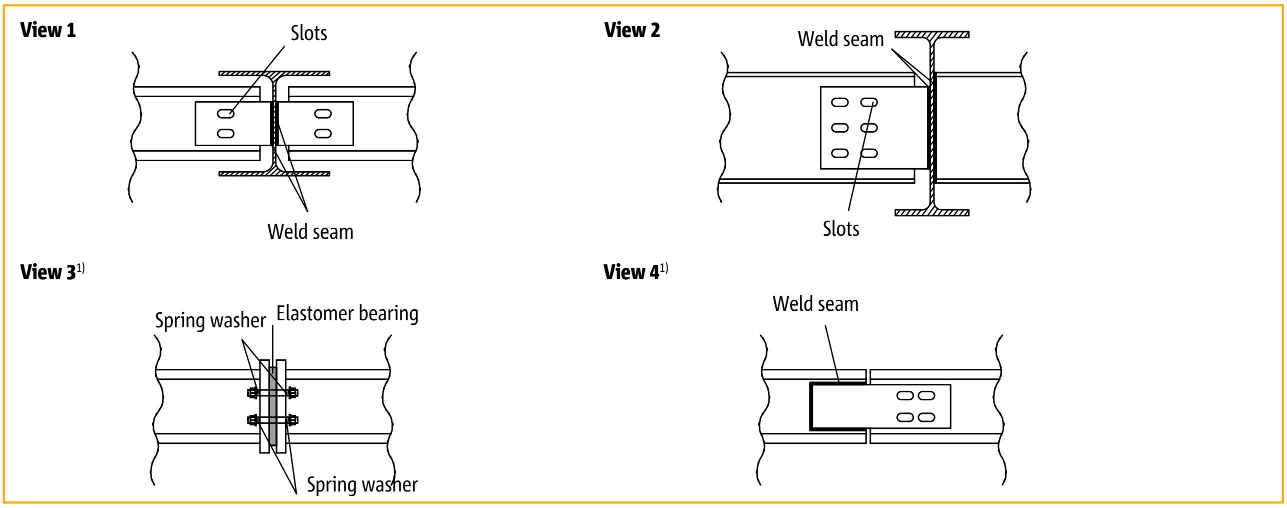
# Schöck Isokorb® type KST
## Expansion joints/Fatigue resistance




*Example showing the arrangement of expansion joints, variant 2*



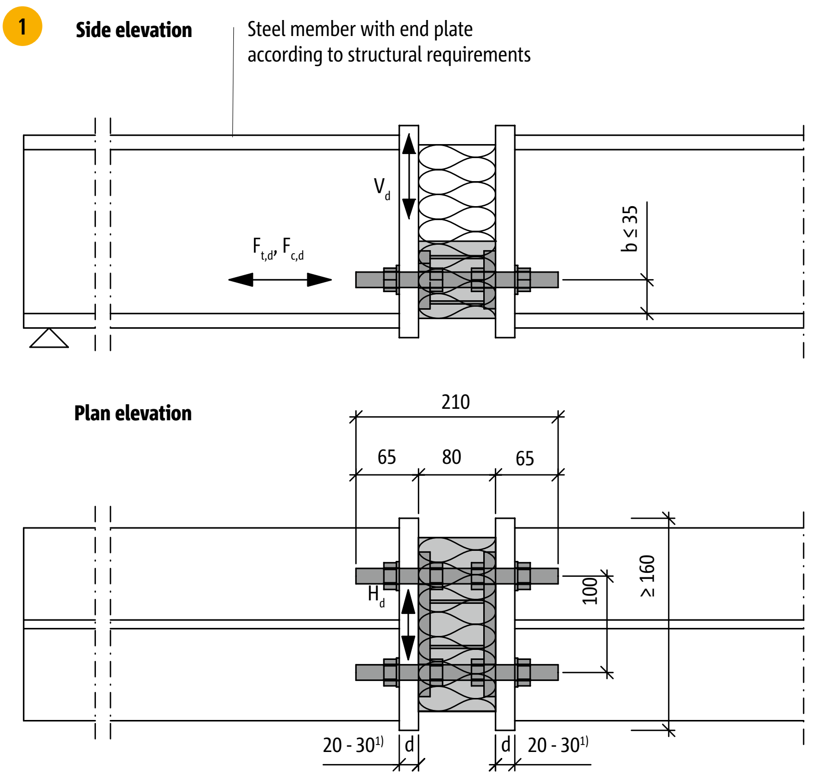

*Example showing the arrangement of expansion joints, variant 3*




[1] Only partial moment transfer possible.

# Schöck Isokorb® type KST-QST 16 module, KST-ZQST 16 module

## Design configuration and example




| KST-QST 16 module, KST-ZQST 16[2)] module | |
|---|---|
| $H_{Rd}$ | 6 kN[3)] |
| $V_{Rd}$ | 30 kN |
| $F_{t,Rd}$, $F_{c,Rd}$ | 116.8 kN |

Interaction between $V_d$, $H_d$, $F_{t,d}$:

$3\,V_d + 2\,H_d + F_{t,d} = \max F_{t,d} \leq F_{t,Rd}$

[1)] Minimum end plate thicknesses [d] without detailed verification, using mild steel S235:

$$\frac{\max F_{t,d}}{F_{t,Rd}} = \frac{F_{c,d}}{F_{c,Rd}} \quad \begin{matrix} \leq 1.0 & : 30\text{ mm} \\ \leq 0.75 & : 25\text{ mm} \\ \leq 0.5 & : 20\text{ mm} \end{matrix}$$

[2)] The Schöck Isokorb® type KST-ZQST 16 module should be used for applications in which tensile forces need to be transferred continuously into the connection and in which, at the same time, horizontal forces resulting from temperature deformation of the external steel structure are transferred into the connection. Special two-part washers provide fatigue resistance.
Refer to pages 174 - 175 for the expansion joint spacings.

[3)] Always refer to the information about expansion joints/fatigue resistance on pages 174 - 175.

*Schöck Isokorb® modules, type KST-QST 16, KST-ZQST 16[2)]*

### Example showing a supported connection of an IPE 140 with a KST-QST 16 module

KST

Loads: $V_{z,d}$ = 25 kN $\quad$ $H_d$ = ±3 kN (from wind loads) $\quad$ $F_{t,d}$ = 30 kN or $F_{c,d}$ = 80 kN

### Verifications for KST-QST 16 module

**Shear force**

$\frac{V_{z,d}}{V_{z,Rd}} < 1.0 \qquad \frac{H_d}{H_{Rd}} < 1.0$

$V_{z,d}/V_{z,Rd,QST16}$ = 25 kN/30 kN = 0.83 < 1.0

$H_d/H_{Rd,QST16}$ = 3 kN/6 kN = 0.5 < 1.0

**Compression**

$\frac{F_{c,d}}{F_{c,Rd}} < 1.0$

$F_{c,d}/F_{c,Rd,QST16}$ = 80 kN/116.8 kN = 0.68 < 1.0

**Tensile force** (see note on page 172)

Interaction condition: $3V_{z,d} + 2H_d + F_{t,d} = \max F_{t,d}$

$\frac{\max F_{t,d}}{F_{t,Rd}} < 1.0$

$\max F_{t,d} = 3V_{z,d} + 2H_d + F_{t,d}$ = 3 × 25 kN + 2 × 3 kN + 30 kN = 111 kN

$\max F_{t,d}/F_{t,Rd,QST16}$ = 111 kN/116.8 kN = 0.95 < 1.0

**Minimum end plate thickness [d] without detailed verification, using mild steel S235:** Distance b ≤ 35mm

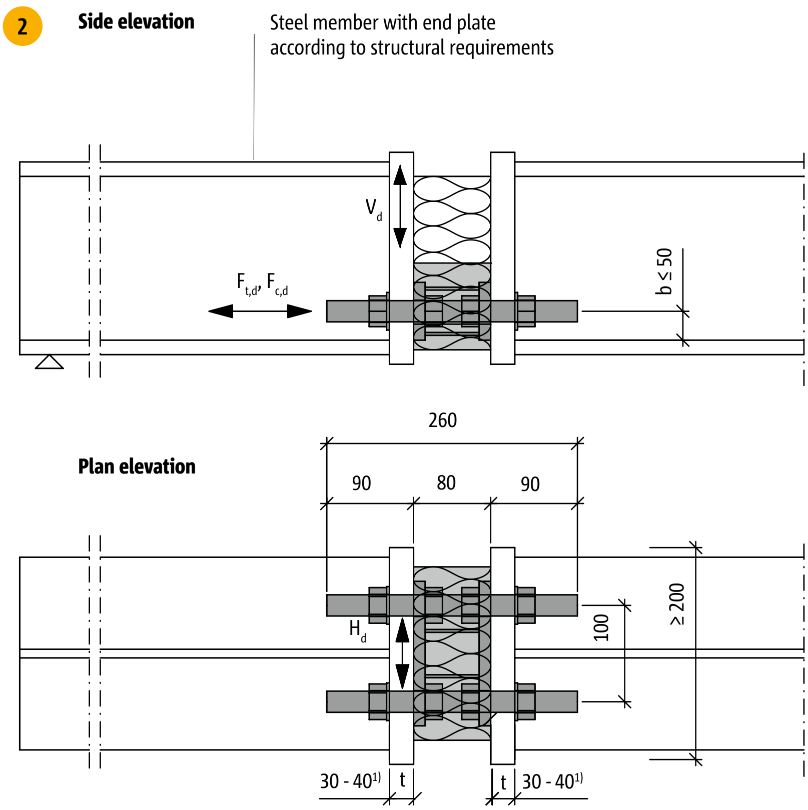
$$\frac{F_{c,d}}{F_{c,Rd,QST16}} \text{ or } \frac{\max F_{t,d}}{F_{t,Rd,QST16}} \begin{cases} \leq 1.0 & : 30\text{ mm} \\ \leq 0.75 & : 25\text{ mm} \\ \leq 0.5 & : 20\text{ mm} \end{cases}$$

$\frac{\max F_{t,d}}{F_{t,Rd,QST16}}$ = 0.95 < 1.0 → d = 25 mm

Steel-to-steel

# Design configurations, type KST-QST 22 module, KST-ZQST 22 module, KST 16

2




| KST-QST 22 module, KST-ZQST 22[2)] module | |
|---|---|
| $H_{Rd}$ | 6 kN[3)] |
| $V_{Rd}$ | 36 kN |
| $F_{t,Rd}$, $F_{c,Rd}$ | 225.4 kN |

Interaction between $V_d$, $H_d$, $F_{t,d}$:

$3\,V_d + 2\,H_d + F_{t,d} = \max F_{t,d} \leq F_{t,Rd}$

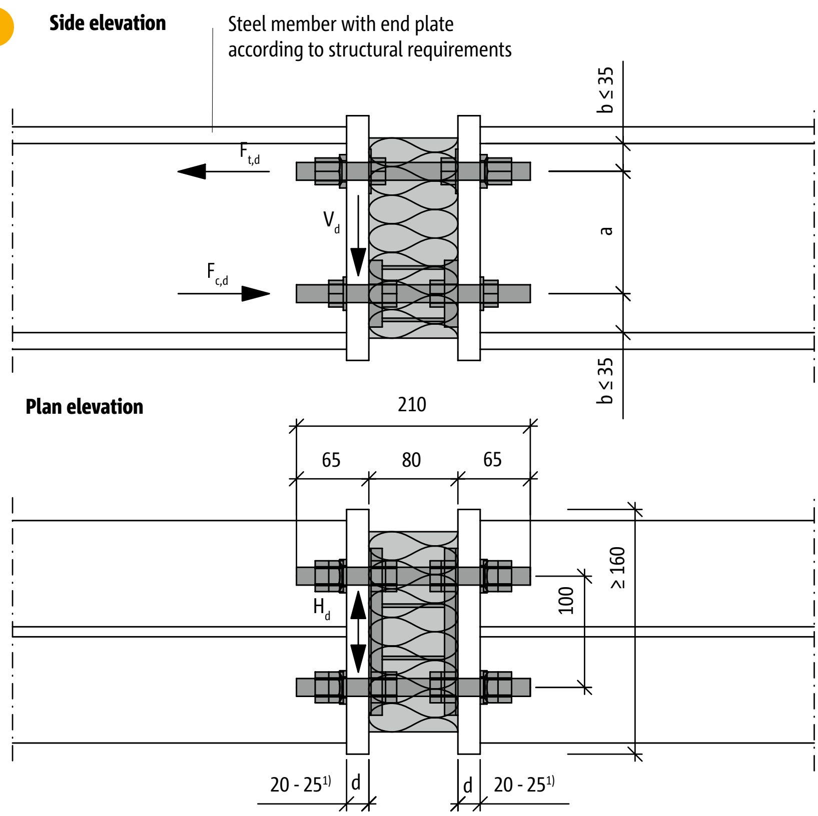
[1)] Minimum end plate thicknesses [d] without detailed verification, using mild steel S235:

$$\frac{\max F_{t,d}}{F_{t,Rd}} = \frac{F_{c,d}}{F_{c,Rd}} \quad \begin{array}{ll} \leq 1.0 & : 40\text{ mm} \\ \leq 0.75 & : 35\text{ mm} \\ \leq 0.5 & : 30\text{ mm} \end{array}$$

[2)] The Schöck Isokorb® type KST-ZQST 22 module should be used for applications in which tensile forces need to be transferred continuously into the connection and in which, at the same time, horizontal forces resulting from temperature deformation of the external steel structure are transferred into the connection. Special two-part washers provide fatigue resistance.
Refer to pages 174 - 175 for the expansion joint gaps.
[3)] Always refer to the information about expansion joints/fatigue resistance on pages 174 - 175.

*Schöck Isokorb® modules, type KST-QST 22, KST-ZQST 22[2)]*

3




| KST 16 | |
|---|---|
| $H_{Rd}$ | 6 kN[2)] |
| $V_{Rd}$ | 30 kN |
| $F_{t,Rd}$, $F_{c,Rd}$ | 116.8 kN |

[1)] Minimum end plate thicknesses [d] without more specific verification (Fkl.: S 235):

a ≤ 150: $\frac{F_{t,d}}{F_{t,Rd}}$ ≤ 1.0 : 25 mm; ≤ 0.9 : 20 mm

a < 150: 30 mm

[2)] Always refer to the information about expansion joints/fatigue resistance on pages 174 - 175.

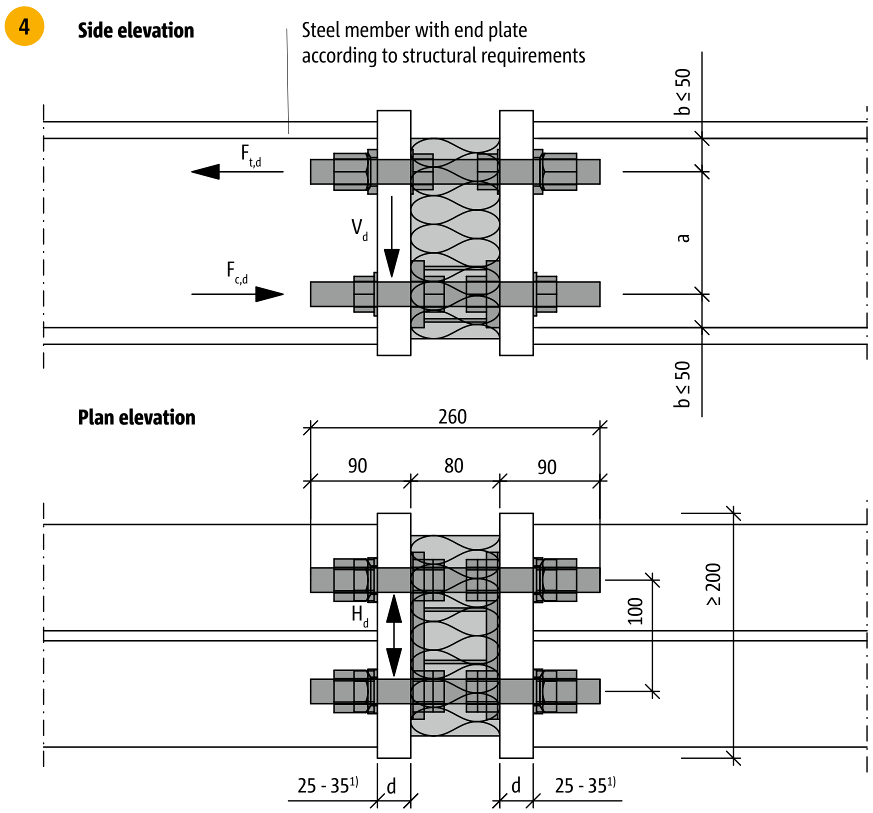
*Schöck Isokorb® type KST 16*

KST

Steel-to-steel

# Schöck Isokorb® type KST 22

## Design configuration and example




| KST 22 | |
|---|---|
| $H_{Rd}$ | 6 kN[2)] |
| $V_{Rd}$ | 36 kN |
| $Z_{Rd}$, $D_{Rd}$ | 225.4 kN |

[1)] Minimum end plate thicknesses [d] without detailed verification, using mild steel S235:

a ≤ 150: $\frac{F_{t,d}}{F_{t,Rd}}$ ≤ 1.0 : 35 mm; ≤ 0.8 : 30 mm; ≤ 0.5 : 25 mm

a < 150: 40 mm

[2)] Always refer to the information about expansion joints/fatigue resistance on pages 174 - 175.

*Schöck Isokorb® type KST 22*

KST

Steel-to-steel

### Example of moment connections for IPE 200 with KST 22

| Loads: | Load case 1: | $V_{z,d}$ = 32 kN | $H_d$ = ±4 kN | $M_{y,d}$ = −18 kNm |
|---|---|---|---|---|
| | Load case 2: | $V_{z,d}$ = −16 kN | $H_d$ = ±4 kN | $M_{y,d}$ = 5 kNm |
| | a = 0.12 m | | | |

### Verifications for KST

**Shear force and horizontal force**

$\frac{V_{z,d}}{V_{z,Rd}} < 1.0$ $\frac{H_d}{H_{Rd}} < 1.0$

$V_{z,d}/V_{z,Rd,QST22}$ = 32 kN/36 kN = 0.89 < 1.0
$H_d/H_{Rd,QST22}$ = 4 kN/6 kN = 0.67 < 1.0

**Moment at load case 1**

$\frac{N_{c,d}}{N_{c,Rd}} < 1.0$ $\frac{N_{t,d}}{N_{t,Rd}} < 1.0$

$F_{c,d} = F_{t,d} = M_{y,d}/a$ = 18 kNm/0.12 m = 150 kN
$F_{c,d}/F_{c,Rd,QST22}$ = 150 kN/225.4 kN = 0.67 < 1.0
$F_{t,d}/F_{t,Rd,ZST22}$ = 150 kN/225.4 kN = 0.67 < 1.0

**Moment at load case 2 (lifting off)**

max $N_{t,d} < N_{t,Rd}$

$F_{c,d} = F_{t,d} = M_{y,d}/a$ = 5 kNm/0.12 m = 41.67 kN
max $F_{t,d}$ = 41.67 kN < 225.4 kN = $F_{t,Rd,QST22}$

**KST-ZST module under compressive load**
(see note on page 172)

max $F_{c,d} < F_{t,Rd}/3$

max $F_{c,d} = M_{y,d}/a$ = 5 kNm/0.12 m = 41.67 kN
$F_{t,Rd,ZST22}/3$ = 225.4 kN/3 = 75.13 kN
max $F_{c,d,ZST22}$ = 41.67 kN < 75.13 kN = $F_{t,Rd,ZST22}/3$

# Schöck Isokorb® type KST 22
Example

**KST-QST module under tensile load** (see note on page 172)

Interaction condition:

$3V_{z,d} + 2H_d + F_{t,d} = \max F_{t,d}$

$\max F_{t,d} = 3V_{z,d} + 2H_d + F_{t,d} = 3 \times 16 + 2 \times 4 + 41.67 = 97.67$ kN

$\frac{\max F_{t,d}}{F_{t,Rd}} < 1.0$

$\max F_{t,d}/F_{t,Rd,ZST22} = 97.67/225.4 = 0.43 < 1.0$

**Minimum end plate thickness [d] without detailed verfification, using mild steel S235:** Distance b ≤ 50 mm

$a \le 150$: $\frac{F_{t,d}}{F_{t,Rd}} \begin{cases} \le 1.0 & : 35 \text{ mm} \\ \le 0.8 & : 30 \text{ mm} \\ \le 0.5 & : 25 \text{ mm} \end{cases}$

a > 150: 40 mm

$F_{t,d}/F_{t,Rd} = 150$ kN/225.4 kN = 0.67

$a \le 150$: $\frac{F_{t,d}}{F_{t,Rd}} = 0.67 < 0.8 \rightarrow d = 30$ mm

**Deformation due to $M_{y,d}$** (see page 173)

Buckling angle

$\varphi = \frac{M_k}{c}$ [rad]

$c = 6000 \times a^2$ [cm]

$\varphi = \frac{18/1.45^{1)} \times 100}{864000} = 1.4368 \times 10^{-3}$ [rad]

$c = 6000 \times 12^2 = 864000$ [KNcm/rad]

1) Conversion of $M_{yd}$ into $M_K$
(with global safety factor $\gamma_f = 1.45$)

KST

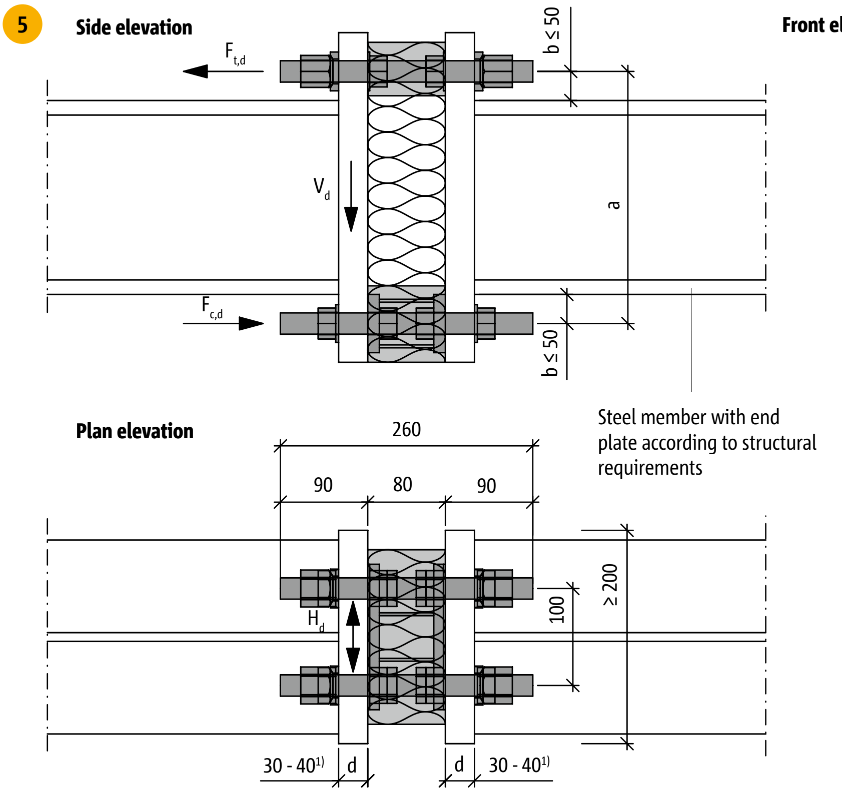
### Notes on the example

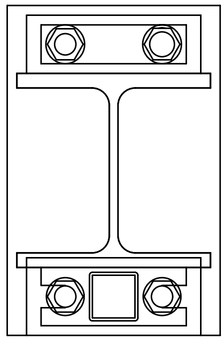
- The information relating to the fatigue resistance of expansion joints on pages 174 - 175 must be followed.
- In the event of a short-term tensile load (e.g. from wind suction) a KST-QST module can be used instead of the KST-ZQST module in the lower connection, even if horizontal forces are introduced from temperature deformation $H_d$.
- The KST-ZST module can also be subjected to compressive loads of up to 1/3 $F_{t,Rd}$ (see footnote 6 on page 172). If $F_{c,d} > 1/3\ F_{t,Rd}$ then a KST-ZQST module must be used for the KST-ZST module.
- Greater stiffness can also be achieved with the design configuration no. 5 (see page 180).

Steel-to-steel

# Schöck Isokorb® type KST 22

## Design configurations



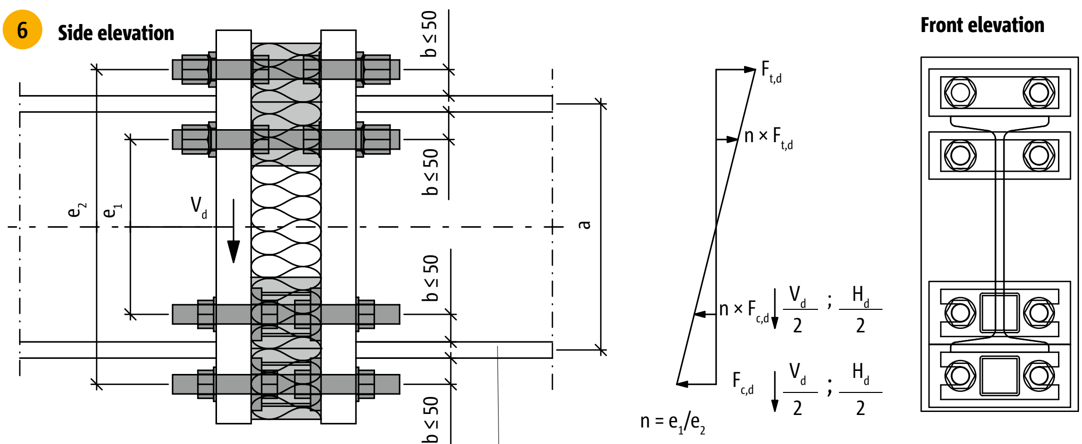

| KST 22 | |
|---|---|
| $H_{Rd}$ | 6 kN[2)] |
| $V_{Rd}$ | 36 kN |
| $F_{t,Rd}$, $F_{c,Rd}$ | 225.4 kN |

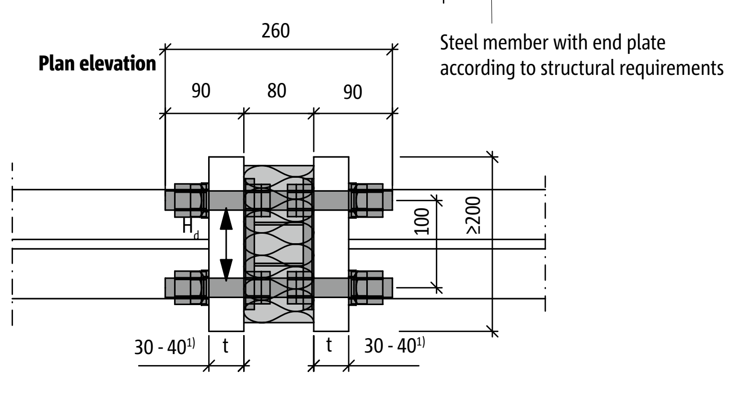
[1)] Minimum end plate thicknesses [d] without detailed verification, using mild steel S235:

$\frac{F_{t,d}}{F_{t,Rd}}$ ≤ 1.0 : 40 mm
≤ 0.75 : 35 mm
≤ 0.5 : 30 mm

[2)] Always refer to the information about expansion joints/fatigue resistance on pages 174 -175.

*Schöck Isokorb® type KST 22*




Load-bearing capacity of the individual module:

| KST 22 per module | |
|---|---|
| $H_{Rd}$ | 6 kN[2)] |
| $V_{Rd}$ | 36 kN |
| $F_{t,Rd}$, $F_{c,Rd}$ | 225.4 kN |

[1)] Minimum end plate thicknesses [d] without detailed verification, using mild steel S235:

$\frac{F_{t,d} \text{ per module}}{F_{t,Rd}}$ ≤ 1.0 : 40 mm
≤ 0.75 : 35 mm
≤ 0.5 : 30 mm

[2)] Always refer to the information about expansion joints/fatigue resistance on pages 174 - 175.

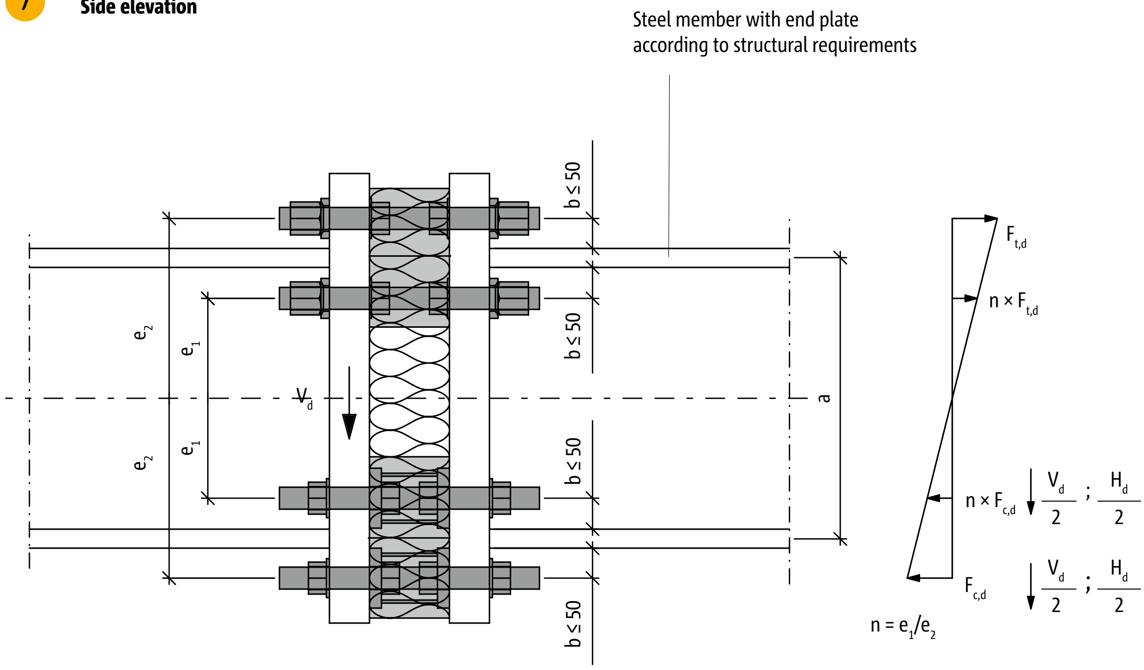
*Schöck Isokorb® for connection of members with 2 × KST 22 (2 tensile and 2 compressive shear force modules)*

KST

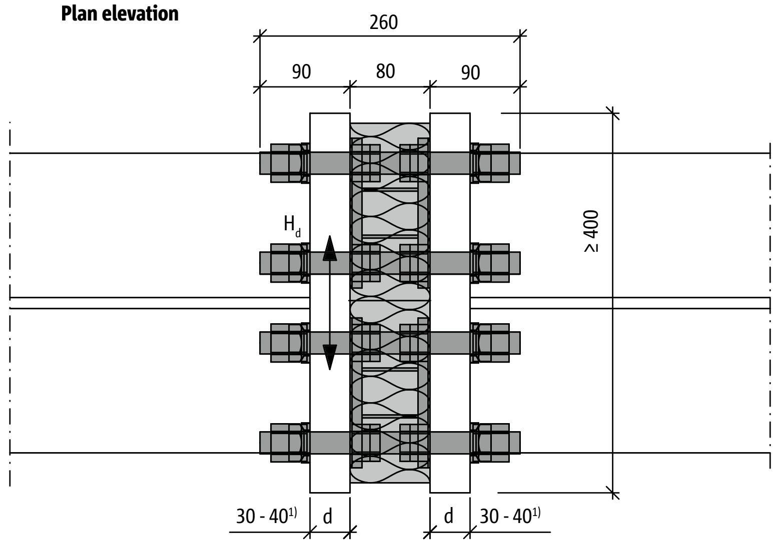
Steel-to-steel

# Schöck Isokorb® type KST 22
## Design configurations

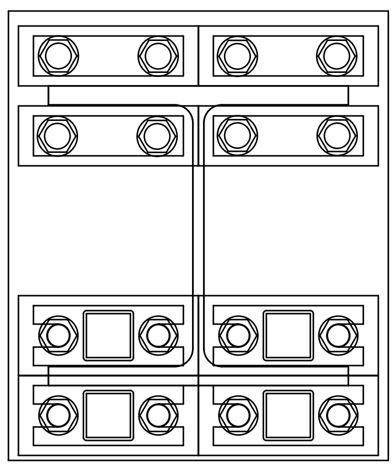
7 **Side elevation**




**Plan elevation**




**Front elevation**



[1] Minimum end plate thicknesses [d] without detailed verification, using mild steel S235:

| $\frac{F_{t,d} \text{ per module}}{F_{t,Rd}}$ | |
|---|---|
| ≤ 1.0 | : 40 mm |
| ≤ 0.75 | : 35 mm |
| ≤ 0.5 | : 30 mm |

[2] Always refer to the information about expansion joints/fatigue resistance on pages 174 -175.

Load-bearing capacity of the individual module:

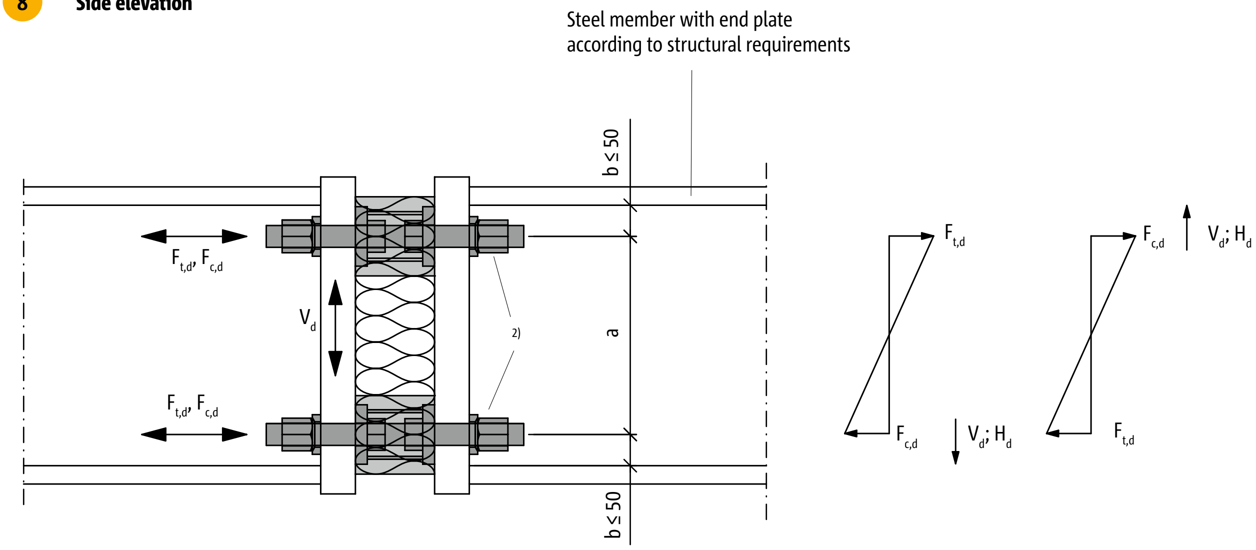
| KST 22 per module | |
|---|---|
| $H_{Rd}$ | 6 kN[2] |
| $V_{Rd}$ | 36 kN |
| $F_{t,Rd}$, $F_{c,Rd}$ | 225.4 kN |

*Schöck Isokorb® for connection of members with 4 × KST 22 (4 tensile and 4 compressive shear force modules)*

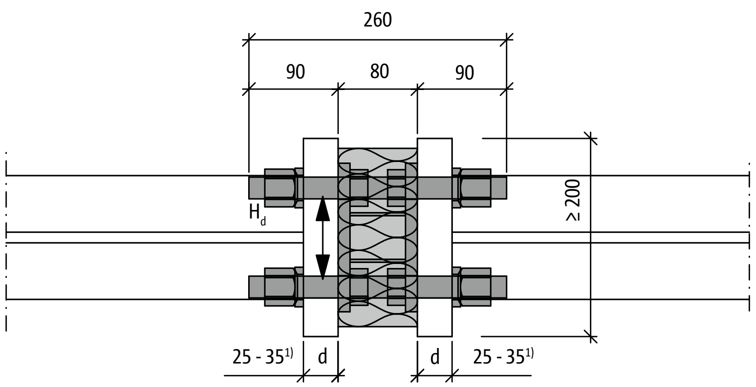
# Schöck Isokorb® type KST-QST 22 module, KST-ZQST 22 module
## Design configuration



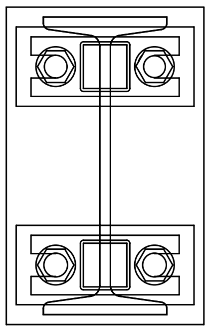
**8** **Side elevation**




**Plan elevation**




**Front elevation**



Load-bearing capacity of the individual module:

| KST-QST 22 module, KST-ZQST 22[2] module | |
|---|---|
| $H_{Rd}$ | 6 kN[3] |
| $V_{Rd}$ | 36 kN |
| $F_{t,Rd}$, $F_{c,Rd}$ | 225.4 kN |

[1] Minimum end plate thicknesses without detailed verification, using mild steel S235:

$\frac{F_{t,d} \text{ per module}}{F_{t,Rd}}$ ≤ 1.0 : 35 mm
≤ 0.8 : 30 mm
≤ 0.5 : 25 mm

[2] This variant should be used if the system needs to absorb large forces which act on alternating sides (e.g. wind loads from below onto the cantilever). The KST-ZQST module should be used in accordance with page 171 wherever primarily tensile forces (resulting from permanent loads) are transferred. The element, which is subjected only temporarily to a tensile load, can be used as a KST-QST 22 module.

[3] Always refer to the information about expansion joints/fatigue resistance on pages 174 - 175.

*Schöck Isokorb® for connection of members with 2 KST-QST 22 modules/KST-ZQST 22 modules[2]*

### Example of moment connections for IPE 200 for lifting-off forces with 2 × KST-ZQST 22 modules

| | | | | |
|---|---|---|---|---|
| Loads: | Load case 1: | $V_{z,d}$ = 32 kN | $H_d$ = ±5 kN | $M_{y,d}$ = −18 kNm |
| | Load case 2: | $V_{z,d}$ = −34 kN | $H_d$ = ±5 kN | $M_{y,d}$ = 20 kNm |
| | a = 0.12 m | | | |

### Verifications for KST-ZQST 22 module

**Shear force and horizontal force**

$$\frac{V_{z,d}}{V_{z,Rd}} < 1.0 \qquad \frac{H_d}{H_{Rd}} < 1.0$$

$V_{z,d}/V_{z,Rd,ZQST22}$ = 32 kN/36 kN = 0.89 < 1.0
$H_d/H_{Rd,ZQST22}$ = 5 kN/6 kN = 0.83 < 1.0

**Moment at load case 1**

$$\frac{F_{c,d}}{F_{c,Rd}} < 1.0 \qquad \frac{F_{t,d}}{F_{t,Rd}} < 1.0$$

$F_{c,d} = F_{t,d} = M_{y,d}/a$ = 18 kNm/0.12 m = 150 kN
$F_{c,d}/F_{c,Rd,ZQST22}$ = 150 kN/225.4 kN = 0.67 < 1.0
$F_{t,d}/F_{t,Rd,ZQST22}$ = 150 kN/225.4 kN = 0.67 < 1.0

**Shear force and moment at load case 2 (lifting off)**

$$\frac{V_{z,d}}{V_{z,Rd}} < 1.0$$

$V_{z,d}/V_{z,Rd,ZQST22}$ = 34 kN/36 kN = 0.94 < 1.0

$$\frac{F_{c,d}}{F_{c,Rd}} < 1.0 \qquad \frac{F_{t,d}}{F_{t,Rd}} < 1.0$$

$F_{c,d} = F_{t,d} = M_{y,d}/a$ = 20 kNm/0.12 m = 166.67 kN

$F_{c,d}/F_{c,Rd,ZQST22}$ = 166.67 kN/225.4 kN = 0.74 < 1.0
$F_{t,d}/F_{t,Rd,ZQST22}$ = 166.67 kN/225.4 kN = 0.74 < 1.0

**Minimum end plate thickness [d] without detailed verification, using mild steel S235:** Distance b ≤ 50 mm

$$\frac{\max F_{t,d}}{F_{t,Rd,QST22}} \begin{cases} \leq 1.0 & : 35\text{ mm} \\ \leq 0.8 & : 30\text{ mm} \\ \leq 0.5 & : 25\text{ mm} \end{cases}$$

$$\frac{F_{t,d}}{F_{t,Rd}} = 0{,}74 < 0.8 \rightarrow d = 30\text{ mm}$$

Deformation due to $M_{y,d}$ see page 173

### Notes

- As the compressive force for the KST-ZQST module will exceed 1/3 of the permitted tensile force, one KST-ZST 22 module in the upper tensile area structurally is not sufficient; furthermore, the interaction cannot be satisfied for the KST-QST module under tensile loads.

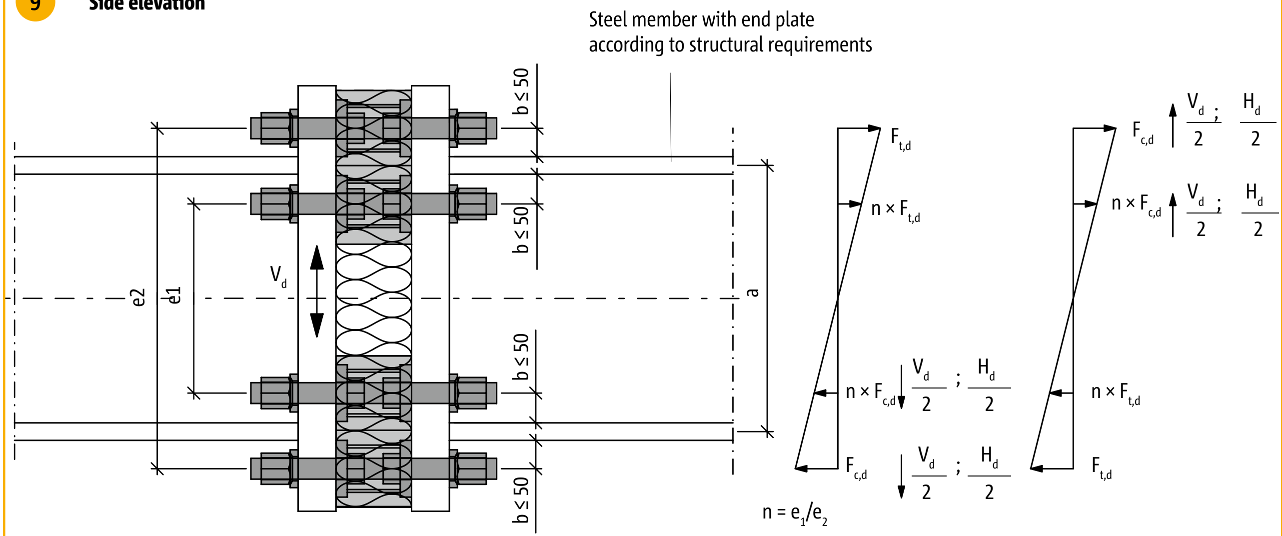
  $$(F_{c,d} = 166.67 \geq \frac{225.4}{3} = F_{t,Rd})$$

- In the lower area, tensile forces due to the wind will only occur for a limited time. Accordingly, a single KST-QST module would offer sufficient fatigue resistance. However, in order to prevent mix-ups, a symmetrical connection with 2 × KST-ZQST modules is recommended.
- As it cannot be ensured that the KST-QST modules/KST-ZQST modules establish a similarly large resistance to the dissipation of shear forces at the same time, only the module which is located in the compressive area must be used to dissipate shear forces.

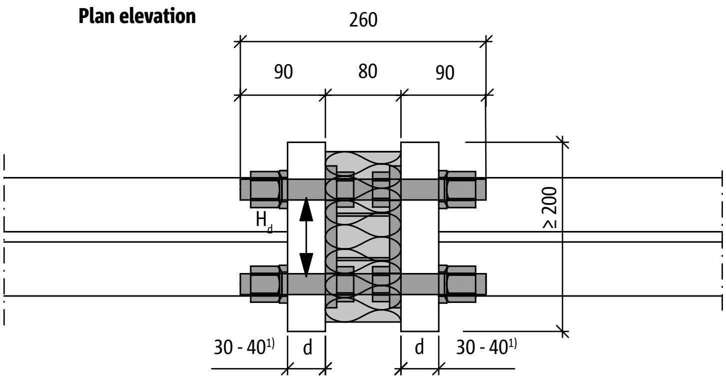
# Schöck Isokorb® type KST-QST 22 module, KST-ZQST 22 module

## Design configuration

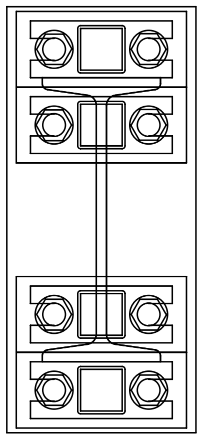
**9** **Side elevation**




**Plan elevation**




**Front elevation**



Load-bearing capacity of the individual module:

| per KST-QST 22 module, KST-ZQST 22[2)] module | |
|---|---|
| $H_{Rd}$ | 6 kN[3)] |
| $V_{Rd}$ | 36 kN |
| $F_{t,Rd}$, $F_{c,Rd}$ | 225.4 kN |

[1)] Minimum end plate thicknesses [d] without detailed verification, using mild steel S235:

| $\frac{F_{t,d} \text{ per module}}{F_{t,Rd}}$ | | |
|---|---|---|
| | ≤ 1.0 | : 40 mm |
| | ≤ 0.75 | : 35 mm |
| | ≤ 0,5 | : 30 mm |

[2)] This variant should be used if the system needs to absorb large forces which act on alternating sides (e.g. wind loads from below onto the cantilever). The KST-ZQST module should be used in accordance with page 171 wherever primarily tensile forces (resulting from permanent loads) are transferred. The element, which is subjected only temporarily to a tensile load, can be used as a KST-QST 22 module.

[3)] Always refer to the information about expansion joints/fatigue resistance on pages 174 -175.

*Schöck Isokorb® for connection of members with 4 KST-QST 22 modules/KST-ZQST 22 modules[2)]*

# Schöck Isokorb®

## Example: Type KST-QST 22 module, KST-ZQST 22 module

### Example of moment connections for HEA 360 for lifting-off forces with 4 × KST-ZQST 22 modules

| | | | | |
|---|---|---|---|---|
| Loads: | Load case 1: | $V_{z,d}$ = 55 kN | $M_{y,d}$ = –130 kNm | $e_1$ = 0.25 m |
| | Load case 2: | $V_{z,d}$ = –40 kN | $M_{y,d}$ = 80 kNm | $e_2$ = 0.45 m |

### Verifications for KST-ZQST 22 module

**Shear force**

$\frac{V_{z,d}}{V_{z,Rd}} < 1.0$

$V_{z,Rd,ZQST22}$ = 2 × 36 kN = 72 kN
$V_{z,d}/V_{z,Rd,ZQST22}$ = 55 kN/72 kN = 0.76 < 1.0

**Moment at load case 1**

$F_{c,d} = F_{t,d} = M_{y,d}/e_2 + (\frac{e_1}{e_2} \times e_1)$

$F_{c,d} = F_{t,d}$ = 130 kNm/(0.45 m + (0.25 m/0.45 m × 0.25m))
$F_{c,d} = F_{t,d}$ = 220.8 kN

$\frac{F_{c,d}}{F_{c,Rd}} < 1.0$ $\frac{F_{t,d}}{F_{t,Rd}} < 1.0$

$F_{c,d}/F_{c,Rd,ZQST22}$ = 220.8 kN/225.4 kN = 0.98 < 1.0
$F_{t,d}/F_{t,Rd,ZQST22}$ = 220.8 kN/225.4 kN = 0.98 < 1.0

**Shear force and moment at load case 2 (lifting off)**

$\frac{V_{z,d}}{V_{z,Rd}} < 1.0$

$V_{z,Rd,ZQST22}$ = 2 × 36 kN = 72 kN
$V_{z,d}/V_{z,Rd,ZQST22}$ = 40 kN/72 kN = 0.55 < 1.0

$F_{c,d} = F_{t,d} = M_{y,d}/e_2 + (\frac{e_1}{e_2} \times e_1)$

$F_{c,d} = F_{t,d}$ = 80 kNm/(0.45 m + (0.25 m/0.45 m × 0.25m))
$F_{c,d} = F_{t,d}$ = 135.8 kN

$\frac{F_{c,d}}{F_{c,Rd}} < 1.0$ $\frac{F_{t,d}}{F_{t,Rd}} < 1.0$

$F_{c,d}/F_{c,Rd,ZQST22}$ = 135.8 kN/225.4 kN = 0.6 < 1.0
$F_{t,d}/F_{t,Rd,ZQST22}$ = 135.8 kN/225.4 kN = 0.6 < 1.0

**Minimum end plate thickness [d] without detailed verification, using mild steel S235:** Distance b ≤ 50 mm

$$\frac{\max F_{t,d}}{F_{t,Rd,QST22}} \begin{cases} \leq 1.0 & : 40\text{ mm} \\ \leq 0.8 & : 35\text{ mm} \\ \leq 0.5 & : 30\text{ mm} \end{cases}$$

$\frac{F_{t,d}}{F_{t,Rd}} = 0.98 \leq 1.0 \rightarrow d = 40$ mm

Deformation due to $M_{y,d}$ see page 173

### Notes

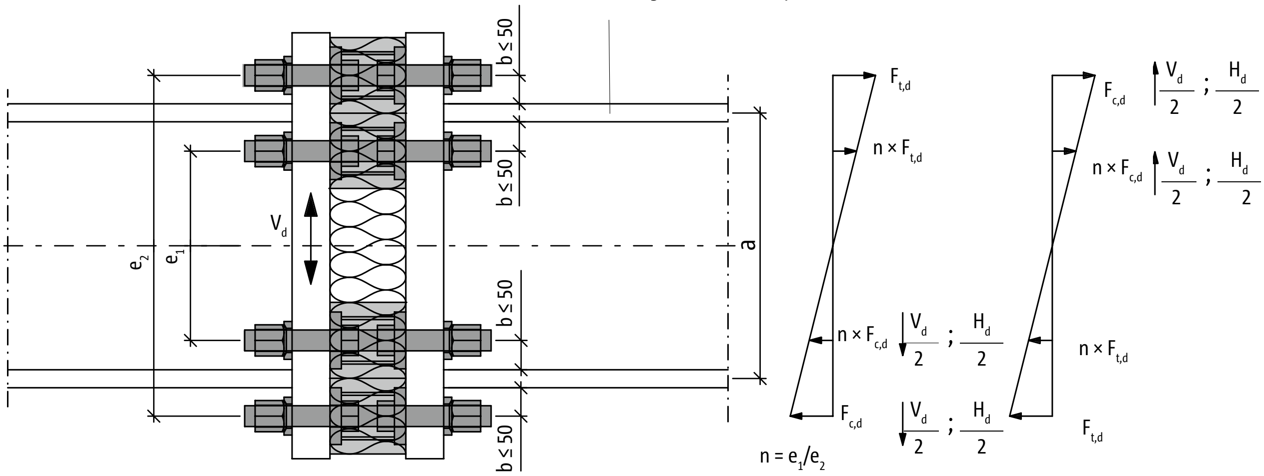
- As the compressive force for the KST-ZQST module will exceed 1/3 of the permitted tensile force, one KST-ZST 22 module in the upper tensile area structurally is not sufficient; furthermore, the interaction cannot be satisfied for the KST-QST module under tensile loads.

  $(F_{c,d} = 166.67 \geq \frac{225.4}{8} = F_{t,Rd})$

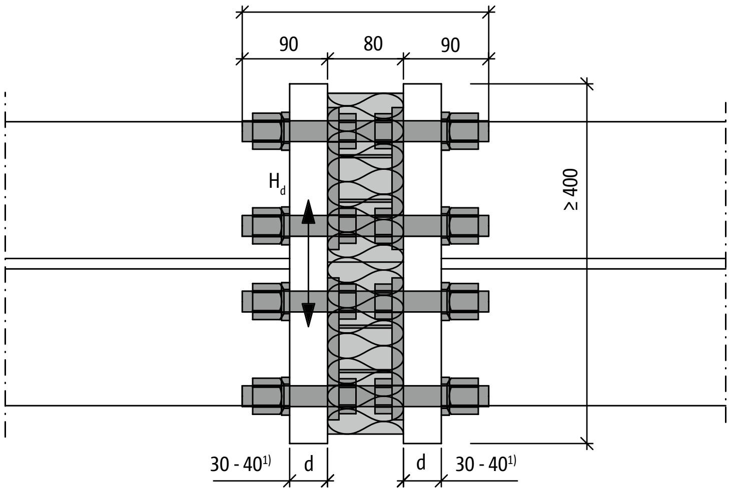
- In the lower area, tensile forces due to the wind will only occur for a limited time. Accordingly, a single KST-QST module would offer sufficient fatigue resistance. However, in order to prevent mix-ups, we recommend a symmetrical connection with 4 × KST-ZQST modules.
- As it cannot be ensured that the KST-QST modules/KST-ZQST modules establish a similarly large resistance to the dissipation of shear forces at the same time, only the module which is located in the compressive area must be used to dissipate shear forces.

# Schöck Isokorb® type KST-QST 22 module, KST-ZQST 22 module
## Design configuration

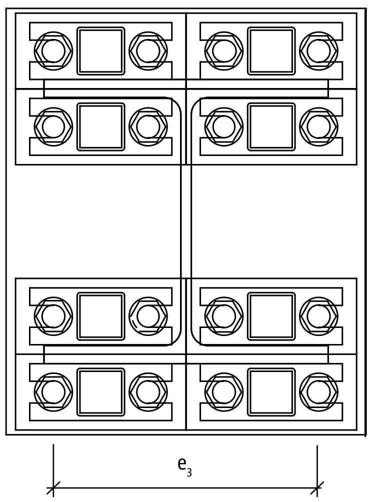
**10** **Side elevation**




**Plan elevation**




**Front elevation**




Load-bearing capacity of the individual module:

| per KST-QST 22 module, KST-ZQST 22[2] module | |
|---|---|
| $H_{Rd}$ | 6 kN[3] |
| $V_{Rd}$ | 36 kN |
| $F_{t,Rd}$, $F_{c,Rd}$ | 225.4 kN |

[1] Minimum end plate thicknesses [d] without detailed verification, using mild steel S235:

$\frac{F_{t,d} \text{ per module}}{F_{t,Rd}}$ ≤ 1.0 : 40 mm; ≤ 0.75 : 35 mm; ≤ 0.5 : 30 mm

[2] This variant should be used if the system needs to absorb large forces which act on alternating sides (e.g. wind loads from below onto the cantilever). The KST-ZQST module should be used in accordance with page 171 wherever primarily tensile forces (resulting from permanent loads) are transferred. The element, which is subjected only temporarily to a tensile load, can be used as a KST-QST 22 module.

[3] Always refer to the information about expansion joints/fatigue resistance on pages 174 -175.

*Schöck Isokorb® for connection of members with 8 KST-QST 22 modules/KST-ZQST 22 modules[2]*

### Example: Moment connection for HEA 360 with 4 × KST-ZQST 22 modules

Loads:

| | | | | | |
|---|---|---|---|---|---|
| Load case 1 (status during usage): | $V_{z,d}$ = 126 kN | $H_d$ = ±20 kN | $M_{y,d}$ = –236 kNm | | |
| Load case 2 (assembly): | $V_{z,d}$ = –96 kN | | $M_{y,d}$ = 166 kNm | $M_{z,d}$ = ±22 kNm | $F_{x,c,d}$ = 160 kNm |

$e_1$ = 0,215 m
$e_2$ = 0,450 m
$e_3$ = 0.280 m (axis separation of the outer row of bolts)

### Verification of the load case "status during usage":

**Shear force and horizontal force at load case 1**

$$\frac{V_{z,d}}{V_{z,Rd}} < 1.0$$

$V_{z,Rd,QST22}$ = 4 × 36 kN = 144 kN
$V_{z,d}/V_{z,Rd,QST22}$ = 126 kN/144 kN = 0.88 < 1.0

$H_{Rd,QST22}$ = 4 × 6 kN = 24 kN
$H_d/H_{Rd,QST22}$ = 20 kN/24 kN = 0.83 < 1.0

**Moment at load case 1**

$$M_{y,d} = 2 \times F_{t,Rd} \times e_2 + 2 \times \frac{e_1}{e_2} \times N_{t,Rd} \times e_1$$

$$F_{t,Rd,QST22} = \frac{M_{y,d}}{2 \times e_2 + 2 \times \frac{e_1}{e_2} e_1}$$

$$\frac{236\ \text{KNm}}{2 \times 0.45\ \text{m} + 2 \times \frac{0.215\ \text{m}}{0.45\ \text{m}} 0.215\ \text{m}} = 213.5\ \text{KN}$$

$$\frac{F_{c,d}}{F_{c,Rd}} < 1.0 \qquad \frac{F_{t,d}}{F_{t,Rd}} < 1.0$$

$F_{c,d}/F_{c,Rd,QST22}$ = 213.5 KN/225.4 KN = 0.95 < 1.0
$F_{t,d}/F_{t,Rd,QST22}$ = 213.5 KN/225.4 KN = 0.95 < 1.0

**Minimum end plate thickness without detailed verification, using mild steel S235:** Distance b ≤ 50mm

$$\frac{\max F_{t,d}}{F_{t,Rd,QST22}} \begin{cases} \leq 1.0 & : 40\ \text{mm} \\ \leq 0.8 & : 35\ \text{mm} \\ \leq 0.5 & : 30\ \text{mm} \end{cases}$$

$$\frac{F_{t,d}}{F_{t,Rd}} = 0.95 < 1.0 \rightarrow d = 40\ \text{mm}$$

**Deformation due to $M_{y,d}$** (see page 173)

Buckling angle

$$\varphi = \frac{M_k}{c}\ [\text{rad}]$$

$$\varphi = \frac{236/1.45 \times 100}{25.5336^{06}}\ [\text{rad}]$$

$$c = 24\,000 \times a^2$$

$$c = 24\,000 \times \left(\frac{(21.5\ \text{cm} + 45\ \text{cm})}{2}\right)^2 = 26.5335 \times 10^6\ [\text{kNcm/rad}]$$

**Loading combination during assembly:**

**Shear force at load case 2**

$$\frac{V_{z,d}}{V_{z,Rd}} < 1.0$$

$V_{z,Rd,QST22} = 4 \times 36\ \text{kN} = 144\ \text{kN}$
$V_{z,d}/V_{z,Rd,QST22} = 96\ \text{kN}/144\ \text{kN} = 0.66 < 1.0$

**Moment at load case 2 (lifting off)**

$$M_{y,d} = 2 \times D_d \times e_2 + 2 \times \frac{e_1}{e_2} \times D_d \times e_1$$

$$M_{Zd} = 2 \times D_d \times e_3$$

Verification of the bolts under the highest loads for compressive loads from bi-axial bending[1)]

$$\frac{F_{c,d}}{F_{c,Rd}} < 1.0$$

$$F_{c,d} = \frac{M_{y,d}}{2 \times e_2 + 2 \times \frac{e_1}{e_2} \times e_1} + \frac{M_{z,d}}{2^{1)} \times e_3} + \frac{F_{c,d}}{8^{2)}}$$

$$F_{c,d} = \frac{166\ \text{KNm}}{2 \times 0.45\ \text{m} + 2 \times \frac{0.215\ \text{m}}{0.450\ \text{m}} \times 0.215\ \text{m}} + \frac{22\ \text{KNm}}{2 \times 0.28\ \text{m}} + \frac{160\ \text{KNm}}{8}$$

$$F_{c,d} = 150.17\ \text{KN} + 39.29\ \text{KN} + 20\ \text{KN}$$

$$F_{c,d}/F_{c,Rd,QST22} = 209.46\ \text{KN}/225.4\ \text{KN} = 0.93 < 1.0$$

KST

Steel-to-steel

[1)] Conservatively, only the external bolts are considered as being load-bearing. The calculations are performed with just 2 bolts, as $F_{c,d}$ relates to 1 module.
[2)] Number of modules subjected to a compressive load due to normal force $F_{x,c,d}$.

# Schöck Isokorb® type KST
## End plate dimensioning

### Example - end plate protruding

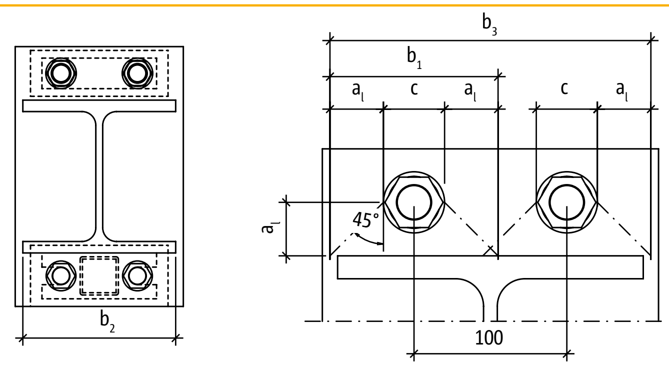
Calculation of max. bolt force: $\frac{F_{t,max,d}}{2} = F_{t,max,d}$ per bolt

Max. moment in the end plate:
$M_d = F_{t,\ max,d,bolt} \times a_l$ = [kNmm]
$W = d^2 \times b_{ef}/6$ = [mm²] with

$b_{ef}$ = min ($b_1$; $b_2/2$; $b_3/2$)
d = thickness of end plate
c = diameter of U-washer
c (KST 16) = 30 mm,
c (KST 22) = 39 mm

$b_1 = 2 \times a_l + c$ [mm]
$b_2$ = member width or width of end plate [mm]
$b_3 = 2 \times a_l + c + 100$ [mm]

$M_{R,d} = W \times f_{y,k}/1.1$ = [kNmm]
$M_d/M_{R,d}$ = ≤ 1.0




*Schöck Isokorb® type KST 22 dimensioning of the end plate*

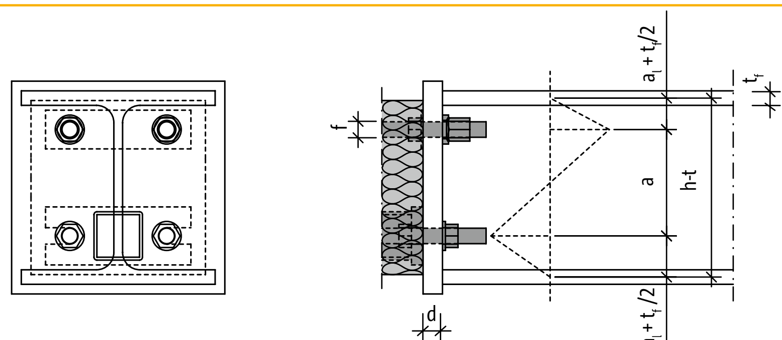
### Example - end plate flush

Max. tensile or compressive force per module: $F_{t,d} = F_{c,d}$
Max. moment in the end plate: $M_d = F_{t,d} \times (a_l + \frac{t}{2})$

$W = d^2 \times b_{ef}/6$ with

$b_{ef} = b - 2 \times f$
d = thickness of end plate
f = diameter of bore
f (KST 16) = 18 mm
f (KST 22) = 24 mm
b = width of end plate

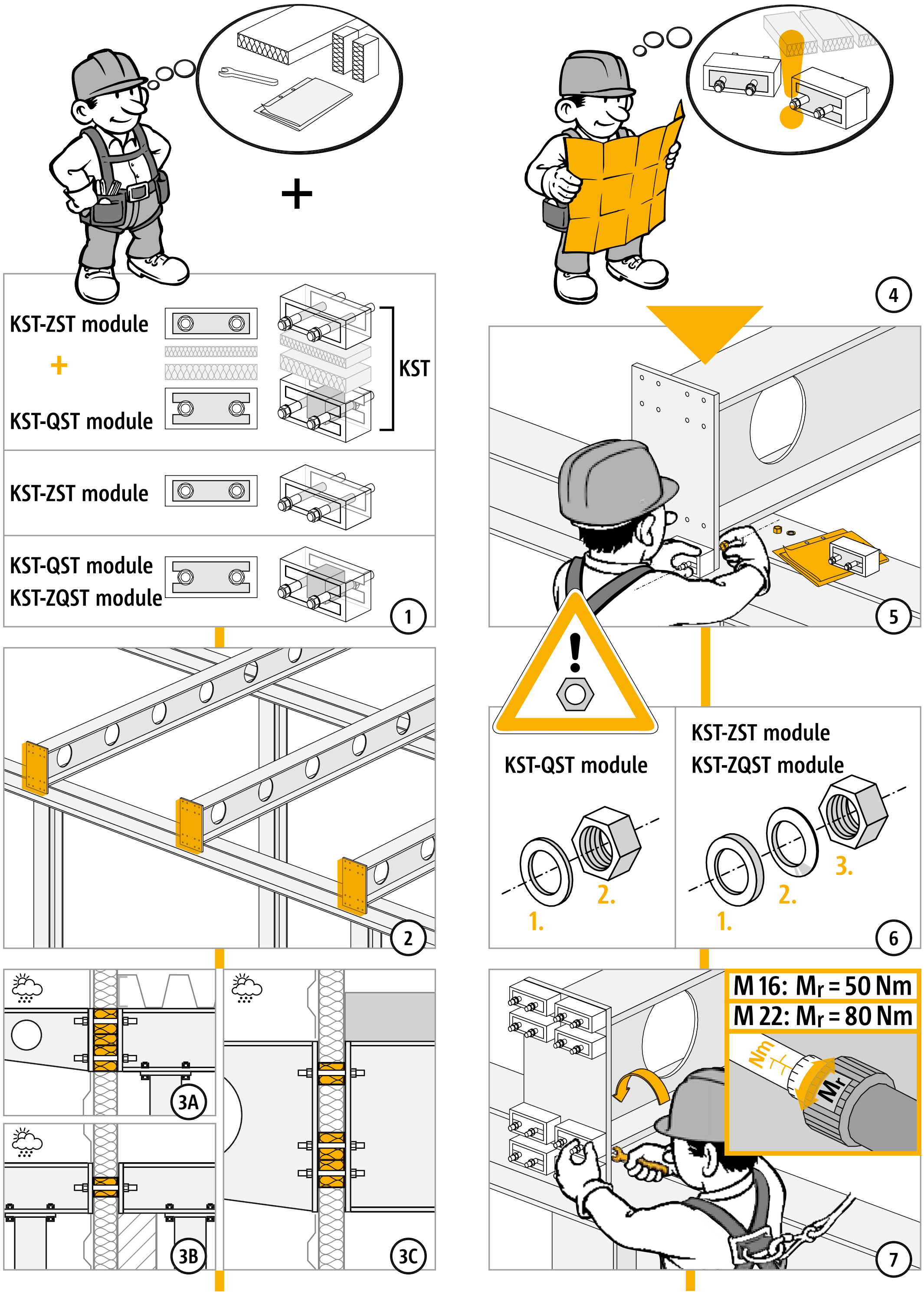
$M_{R,d} = W \times f_{y,k}/1.1$
$M_d/M_{R,d}$ = ≤ 1.0



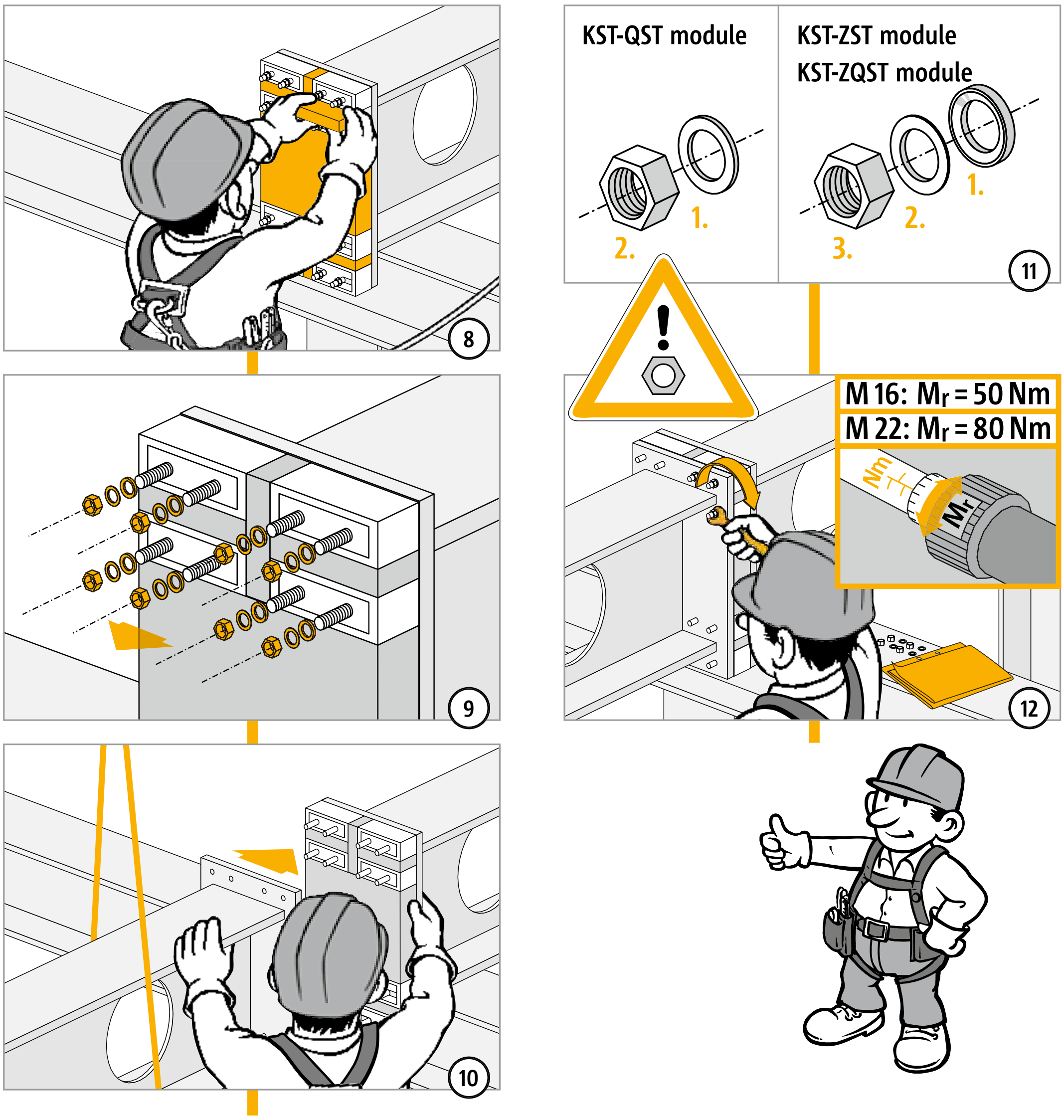

*Schöck Isokorb® type KST 16 dimensioning of the end plate*

# Schöck Isokorb® type KST

## Method statement



# Schöck Isokorb® type KST
Method statement



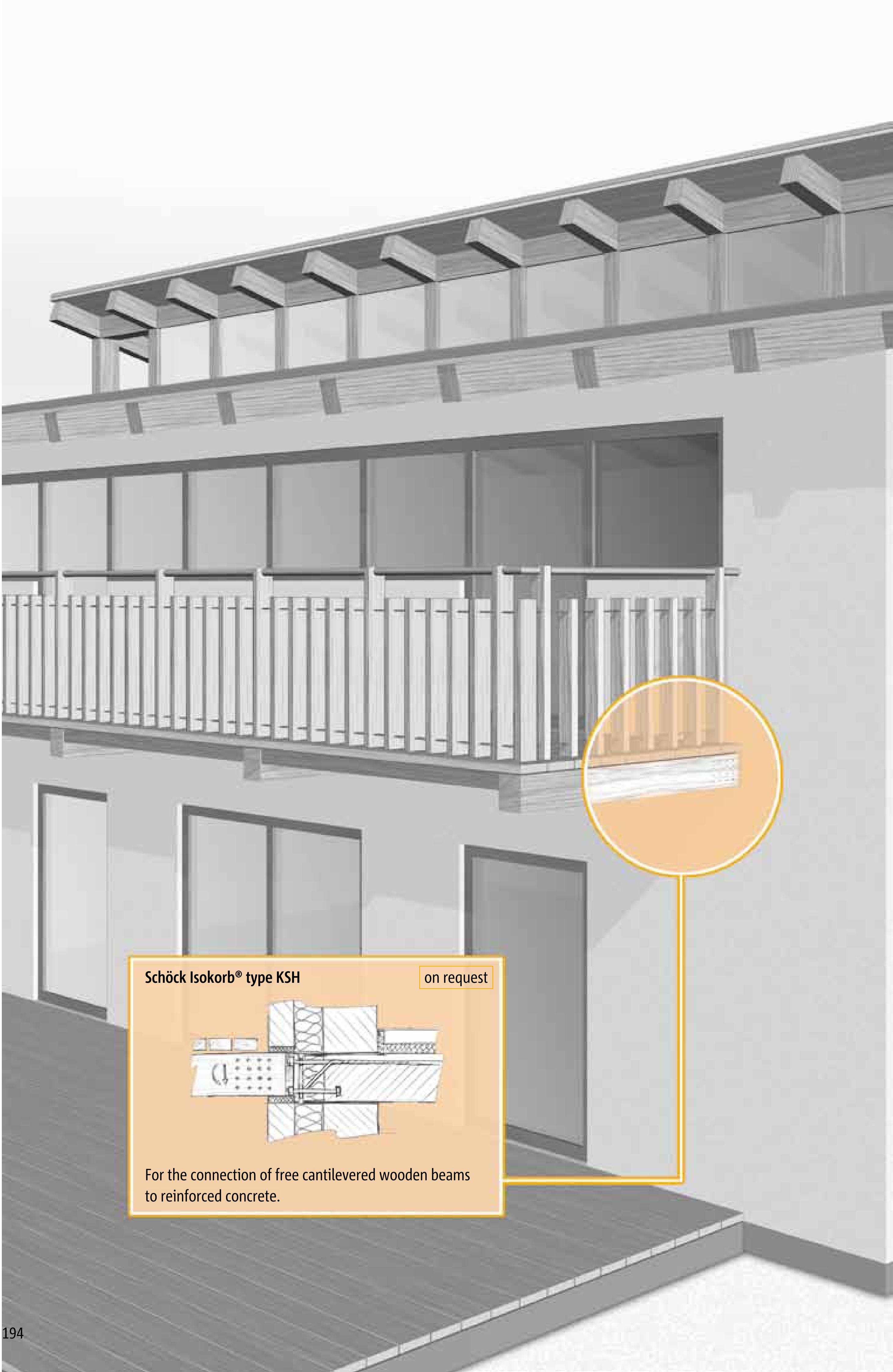

KST

Steel-to-steel

# Schöck Isokorb® KST, QST, ZST, ZQST module
## Checklist

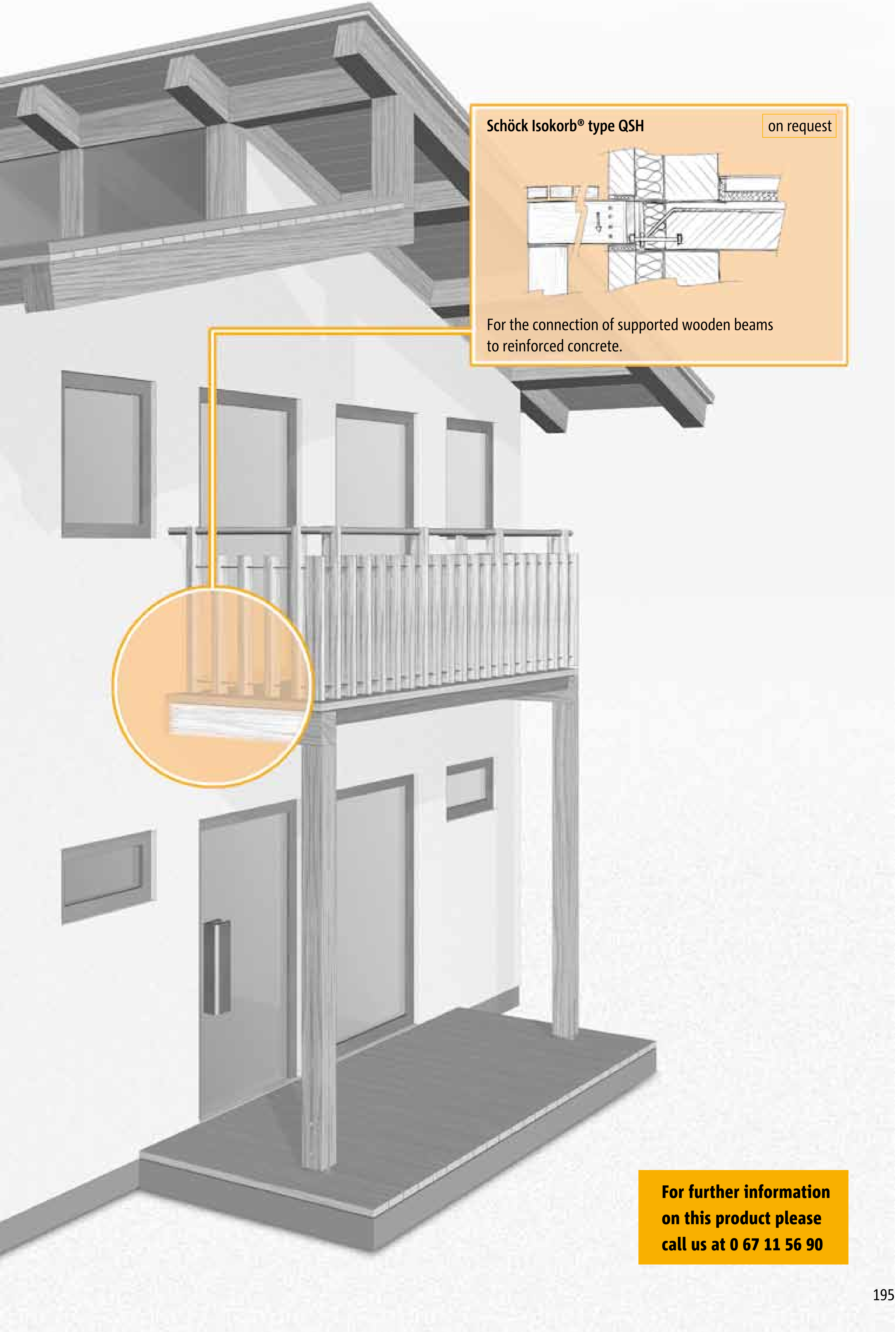
- ☐ Have the member forces on the Isokorb® connection been determined at the design level?
- ☐ Will the Isokorb® element be used under primarily static loads (see page 173)?
- ☐ Are temperature deformations assigned directly to the Isokorb® connection? Expansion joint spacing (see pages 174 - 175)?
- ☐ Will the Isokorb® connection be exposed to an environement with a high chlorine content (e.g. inside indoor swimming pools) (see page 164)?
- ☐ Is there a fire safety requirement for the overall load-bearing structure/Isokorb® (see page 164)?
- ☐ Selection and calculation of the Isokorb® elements (also see pages 168 - 171 and examples on pages 176 - 188).
  - Are the selected modules adequately dimensioned (see “Design and calculation table” on page 172)?
  - Have wind loads with a slight lift-off effect been assigned to the KST connection (see page 172, footnote [6)])?
  - Is the interaction relationship $3 \times V_z + 2 \times H_y + Z_x = \max Z_d \leq Z_{x,Rd}$ satisfied for the KST-QST module and KST-ZQST module under tensile loads with simultaneous shear loads (see page 172, footnote [3)])?
  - Have the KST-QST modules and KST-ZQST modules been located in the compression area in order to transfer shear forces (see example 8 on pages 182 - 183)?
- ☐ End plate calculation without more detailed verification (see pages 176 - 188):
  Are the requirements in terms of maximum bolt distances to the flange and minimum head plate width satisfied (see examples 1 - 10 on pages 176 - 188)?
  Front plate calculation with detailed verification: see page 189.
- ☐ Did the deformation calculations for the overall structure take into account the deformation due to $M_K$ in the Isokorb® connection (see page 173)?
- ☐ Are the individual modules clearly marked in the implementation plan and works plan so that there is no risk of their being interchanged.
- ☐ Have the tightening torques for the screwed connections been marked in the implementation plan (see page 190 - 191)?
  The nuts should be tightened spanner-tight without planned preload; the following tightening torques apply:

  KST 16 (bolt ø 16): $M_r$ = 50 Nm
  KST 22 (bolt ø 22): $M_r$ = 80 Nm



**Schöck Isokorb® type KSH** on request

For the connection of free cantilevered wooden beams to reinforced concrete.



**Schöck Isokorb® type QSH** on request

For the connection of supported wooden beams to reinforced concrete.

**For further information on this product please call us at 0 67 11 56 90**

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