

TECHNICAL INFORMATION – JULY 2022

Isokorb[®] CXT for reinforced concrete structures



Load-bearing thermal insulation elements for the effective reduction of thermal bridges on projecting structural elements such as balconies, arcades and canopies.

Planning and consulting service

The engineers of Schöck's application engineering department would be very happy to advise you on static, structural and building-physics questions and will produce for you proposals for your solution with calculations and detailed drawings. For this please send your planning documentation (general arrangements, sections, static data) with the address of the building project to:

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Downloads and requests

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www.schoeck.com

Notes | Symbols

i Technical Information

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- This technical information is valid solely for Denmark and takes into account country-specific standards and product-specific accreditations / approvals.
- If the installation takes place in another country, then the valid technical information the respective country is to be applied.
- The currently valid version of the technical information is to be applied. The current version can be found at:
www.schoeck.com/download/dk

i Combination with Schöck Isokorb® XT Types

- The Schöck Isokorb® CXT can be combined with all Schöck Isokorb® XT types. The contents of the Technical Information for the Schöck Isokorb® XT are to be noted in addition to the contents presented in this Technical Information .

i Installation instructions

Current installation instructions can be found online at:
www.schoeck.com/download/dk

Notes Symbols

⚠ Hazard note

The triangle with exclamation mark indicates a hazard warning. This means there is a danger to life and limb if compliance is not observed.

i Info

The square with an “i” indicates important information which, for example, must be read in conjunction with the design.

✓ Check list

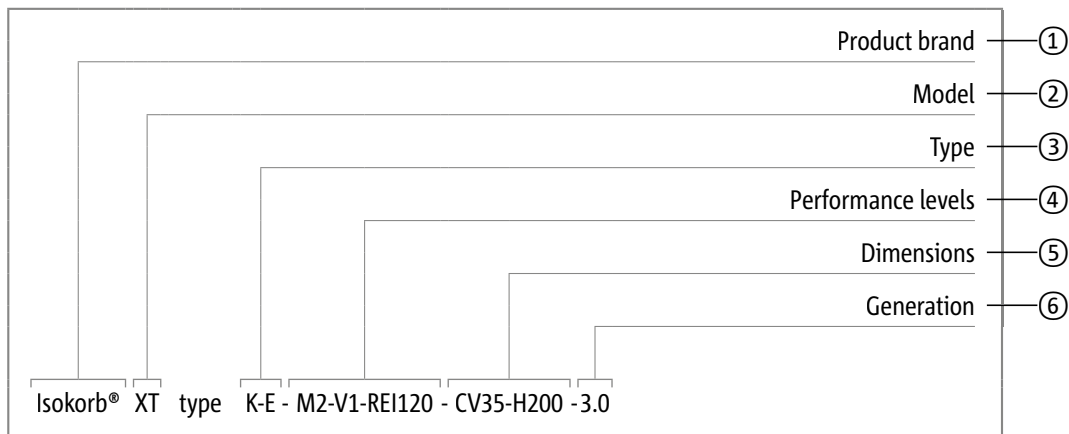
The square with a tick indicates the check list. Here, the essential points of the design are briefly summarised.

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Explanation of the naming of Schöck Isokorb® types

The naming system for the Schöck Isokorb® product group has changed. This page contains information about the name components for easier conversion.



Every Schöck Isokorb® only receives the name components that are relevant for the respective product.

① Product brand

Schöck Isokorb®

② Model

The model designation is an integral part of the name of each Isokorb®. It stands for a core characteristic of the product. The corresponding abbreviation will always be positioned before the type word.

Model	Core characteristics of the products	Connection	Components
XT	for eXtra thermal insulation	Reinforced concrete – reinforced concrete, Steel – reinforced concrete, Timber – reinforced concrete	Balcony, passageway walk, canopy, floor slab, parapet, balustrade, corbel, beam, girder, wall
CXT	with Combar® for eXtra thermal insulation	Reinforced concrete – Reinforced concrete	Balcony, passageway walk, canopy
T	for thermal break	Reinforced concrete – reinforced concrete, Steel – reinforced concrete, Timber – reinforced concrete, Steel – steel	Balcony, passageway walk, canopy, floor slab, parapet, balustrade, corbel, beam, girder, wall
RT	for reconstruction of components with a thermal break	Reinforced concrete – reinforced concrete, Steel – reinforced concrete, Timber – reinforced concrete	Balcony, passageway walk, canopy, beam, girder

③ Type

The type is a combination of the following name components:

- Basic type
- Configuration variation
- Static connection variation
- Geometric connection variation

Basic type					
K	Balcony, canopy – cantilevered	A	Parapet, balustrade	SK	Steel balcony – cantilevered
Q	Balcony, canopy – supported (shear force)	F	Parapet, balustrade – attached	SQ	Steel balcony – supported (shear force)
H	Balcony with horizontal loads	O	Corbel	S	Steel structure
Z	Balcony with intermediate insulation	B	Beam, inner slab joist		
D	Floor – continuous (indirect support)	W	Shear wall		

Configuration variant	
T	Available in lengths L1000 and L500
E	Available in lengths L1000, L500 and L250; can be used with Schöck IDock®

Static connection variation	
Z	Free of constraint forces
P	Intermittent
V	Shear force
N	Normal force

Geometric connection variation	
W	Shear force bar on floor side bent

④ Performance levels

Performance levels include load-bearing levels and fire protection. The various load-bearing levels of an Isokorb® type are numbered consecutively, beginning with 1 for the lowest load capacity. Different Isokorb® types with the same load-bearing level do not have the same load bearing capacity. The load-bearing level must always be determined via the design and calculation tables or the calculation program.

The load-bearing level has the following name components:

- Main load-bearing level: Combination of internal static force and number
- Secondary load-bearing level: Combination of internal static force and number

Internal static force of the main load capacity	
M	Moment
MM	Moment with positive or negative force
V	Shear force
VV	Shear force with positive or negative force
N	Normal force
NN	Normal force with positive or negative force

Internal static force of the secondary load-bearing level	
V	Shear force
VV	Shear force with positive or negative force
N	Normal force
NN	Normal force with positive or negative force

The name component for the fire protection contains the fire resistance class or R0 if no fire protection is required.

Fire resistance class	
REI	R – load bearing capacity, E – integrity, I – insulation under the influence of fire
R0	No fire protection

⑤ Dimensions

The following name components are part of the dimensions:

- Concrete cover CV
- Bond length LR, bond height HR
- Isokorb® height H, length L, width B (insulation element)
- Diameter of thread D

⑥ Generation

Each type designation ends with a generation number. If Schöck develops a product further and through this the characteristics of the product change, the generation number increases. With large product changes the number in front of the dot increases, with small product changes the number after the dot increases. Examples:

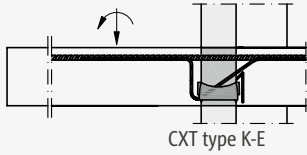
- Large product change: Generation 6.0 becomes 7.0
- Small product change: Generation 7.0 becomes 7.1

i Translation tool

- The online translation tool for the translation from old to new type designation can be found under: www.schoeck.com/da/isokorf-typebetegnelser

Summary of types

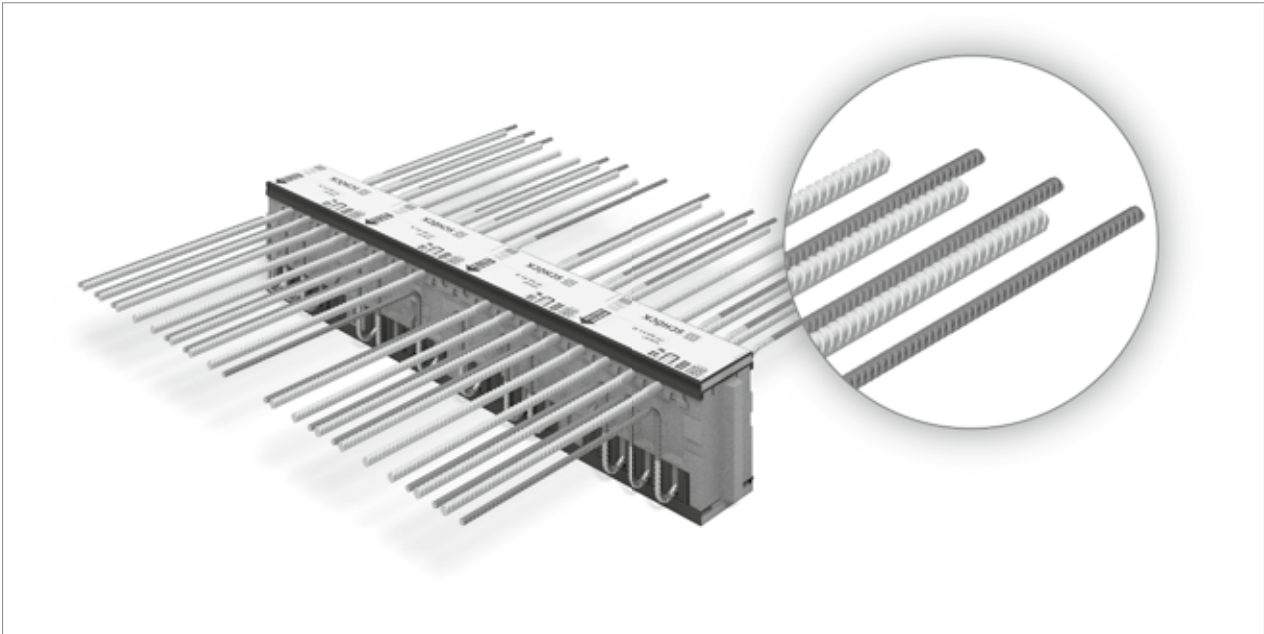
Application	Production type	Schöck Isokorb® type	
Free cantilevered balconies	In-situ concrete Completely prefabricated part Semi-finished component	CXT type K-E	Page 33



Building physics

Thermal insulation of the Schöck Isokorb® CXT

The Schöck Isokorb® thermally separates the concrete in the exterior from that in the heated interior. The individual components of the Schöck Isokorb® simultaneously provide thermal insulation and transfer internal forces: The insulating element ensures the thermal insulation. Pressure bearings, shear force bars and tension bars are available for the transfer of internal forces.



The material and the geometry of each of these components are crucial for the energy losses through the thermal bridge. Due to different thermal conductivities, each component has a different influence on the total thermal conductivity, depending on its share of the total cross-section.

Each of the components is tailored to these tasks: The pressure bearings are made from an optimised micro-steel fibre reinforced high performance fine concrete. Stainless steel with a low thermal conductivity is used for the shear force bars in the area of the penetration of the thermal insulation.

The technological innovation of the Schöck Isokorb® CXT is the use of the innovative material component Combar® for tension bars.

Tension bars of the Schöck Isokorb® CXT

The tension bars of the Schöck Isokorb® CXT type K-E are made of Combar®. Combar® is a fibre-composite material and is characterised through a very low thermal conductivity of 0.9 W/(m·K). In comparison to stainless steel with about = 15 W/(mK), the thermal conductivity of the tension bars is reduced by more than 94 %.

Due to the optimised material properties of the tension bar, the proportion of the overall heat loss is thus massively reduced through the Schöck Isokorb (see figure).

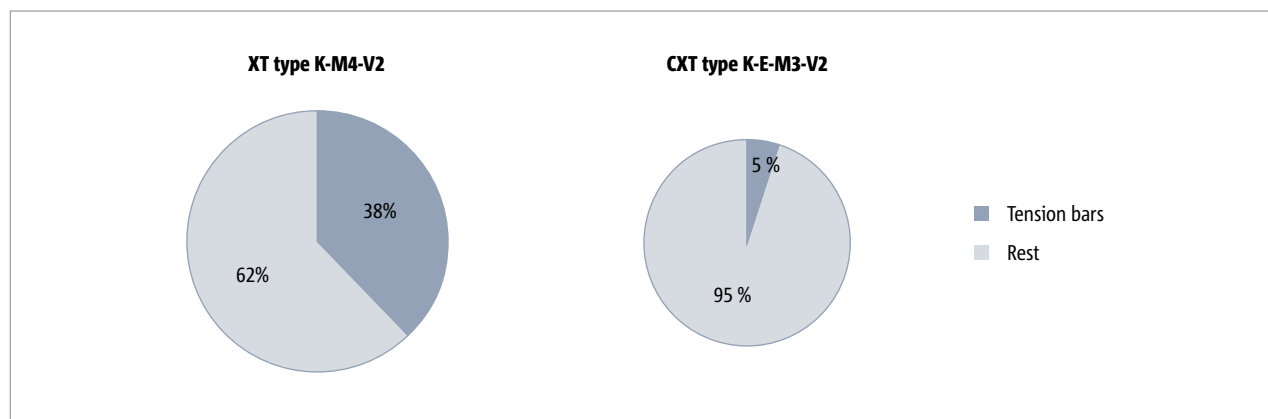


Fig. 1: Proportion of the tension bars and other components in the λ_{eq} -value of the Schöck Isokorb® XT type K-M4-V2 and CXT type K-E-M3-V2

The proportion of the tension bars in the equivalent thermal conductivity of the overall Schöck Isokorb® in this example of the Schöck Isokorb® CXT type K-E-M3-V2 in comparison with the Schöck Isokorb® XT type K-M4-V2 of 38 % falls to 5 % through the replacement of steel tension bars by Combar®.

The reduction becomes noticeable in the overall thermal conductivity of the Schöck Isokorb® CXT type K-E. As the thermal conductivity of the Schöck Isokorb® is dependent on the shape and the material of the respective component parts, one can observe a significant reduction of the thermal conductivity of the overall insulation element.

Thus the Schöck Isokorb® CXT is a highly efficient form of thermal separation and, with a high thermal insulation performance is optimally suited for installation in buildings with high energetic requirements up to the Passive House level.

Compared to stainless steel, Combar® also has a considerably lower energy requirement during production. Thanks to the improved eco-balance (+27 % less CO₂ emission) the Schöck Isokorb® CXT makes a sustained contribution to climate protection.

Detailed examination of thermal bridges

Due to its particularly high insulation performance, the Schöck Isokorb® CXT is ideal for energetically high-performance building projects. The insulation quality of the Schöck Isokorb® CXT has a great influence, in particular with detailed thermal bridge considerations. The insulation quality is described by the product-specific thermal conductivity λ_{eq} .

The equivalent thermal conductivity λ_{eq} is the overall thermal conductivity of the Schöck Isokorb® determined across the various surface parts and, with the same insulation element thickness, is a measure for the thermal insulation effect of the connection. The smaller λ_{eq} , the more high-quality the insulation of the balcony connection. As the equivalent thermal conductivity takes into account the proportion of the materials used, λ_{eq} is dependent on the load-bearing level of the Schöck Isokorb®. The λ_{eq} value can then be used for the comparison of various products or for a detailed thermal bridge calculation.

When modelling a balcony connection in the conventional thermal bridge programme, the existing Schöck Isokorb® made out of several materials, can be modelled with the aid of λ_{eq} , simplified as homogenous, cuboid replacement insulation element with the same dimensions, see figure. This replacement insulation element is then assigned as the “equivalent thermal conductivity” λ_{eq} for the calculation.

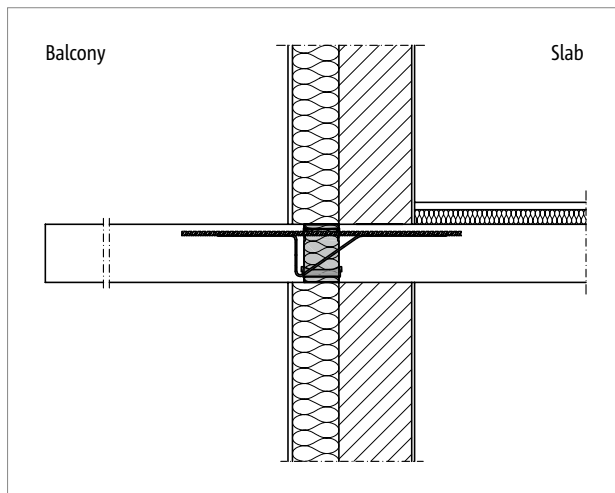


Fig. 2: Representation of a sectional drawing with detailed Schöck Isokorb® model

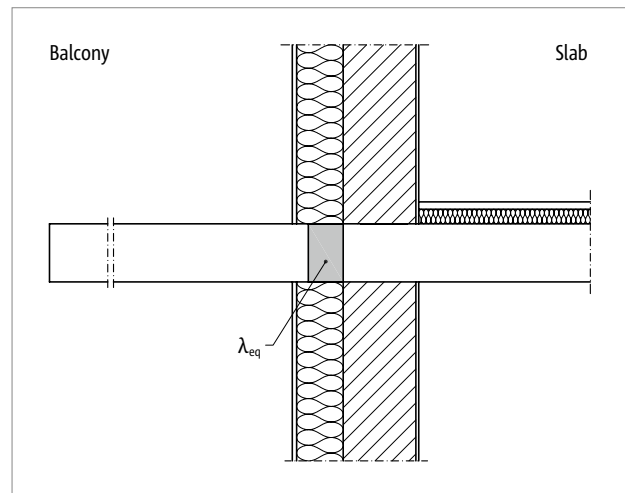


Fig. 3: Representation of a sectional drawing with substitute insulating element

The individual λ_{eq} values can be found online at:
www.schoeck.com/download/dk

Fire protection

Balconies | passageway walks

Balconies

If balconies are not part of the escape and rescue routes, no requirement is placed on the fire resistance. It must be ensured that the balconies, in case of fire, cannot fall down.

Passageway walks

The requirements on fire protection are derived from the requirements of the building regulations on passageway walks (open walkways). If the requirements in the fire protection concept are not considered separately, the requirements for floors apply for safety reasons:

Depending on the building class the following requirements apply:

- Fire resistant: R 90 without room enclosure, REI 90 with room enclosure
- Highly fire resistant R 60 without room enclosure, REI 60 with room enclosure
- Fire retardant: R 30 without room enclosure REI 30 with room enclosure

If the possibility of a fire attack is limited due to the structural situation, the fire protection concept can also only stipulate the usual requirements for fire resistance of passageway walks, like for necessary stairs. In these cases instead of “fire resistant (R 90, REI 90)” or “highly fire resistant (R 60, REI 60)” only “fire retardant (R 30, REI 30)” can be demanded.

Fire protection configuration

Fire protection configuration Schöck Isokorb® CXT

The Schöck Isokorb® CXT comes standard with a fire protection configuration (REI 120). If a configuration without fire protection is desired, then this must be explicitly indicated with (R 0).

- With fire protection e.g. CXT type K-E-M4-V1-REI120-CV26-H180-L500-1.1
- Without fire protection e.g. CXT type K-E-M4-V1-R0-CV26-H180-L500-1.1

Fire protection requirements that apply to the building component also apply to the product that is to be used. Prerequisite for the fire protection classification of the balcony connection is that the balcony slab and the floor also fulfil the requirements on the necessary fire resistance class according to DS/EN 1992-1-1 and DS/EN 1992-1-2 (EC2). If, in addition to the load-bearing capacity (R), integrity (E) and insulation (I) are also required in case of fire, then the block-outs between the Schöck Isokorb® CXT are to be closed, e.g. using the Schöck Isokorb® XT type Z with fire protection.

The Schöck Isokorb® CXT has been tested in room closure configuration in accordance with the requirements for ceilings according to DS/EN 1365-2. According to DS/EN 13501-2, only the requirement R (load-bearing capacity in the case of fire) is required. The basis for this test is DS/EN 1365-5. The fire protection of the Schöck Isokorb® is additionally further tested on the basis of ceilings according to DS/EN 1365-2. This results in the classification REI. (R - load-bearing capacity, E - integrity, I - insulation under the influence of fire.)

The requirement from the fire tests with Schöck Isokorb® with flush integrated lateral fire protection bands or 10 mm projecting fire protection boards has been implemented. The integrated fire protection bands made from material forming insulation layers or respectively the 10 mm projecting fire protection boards on the upper side of the Schöck Isokorb® CXT ensure that the joints, which have opened due to the effect of the fire, are closed. Thus the room integrity and the insulation in the case of fire are ensured (see figures below).

The fire protection configuration of the respective Schöck Isokorb® type is presented in the product chapter subject "Fire protection configuration".

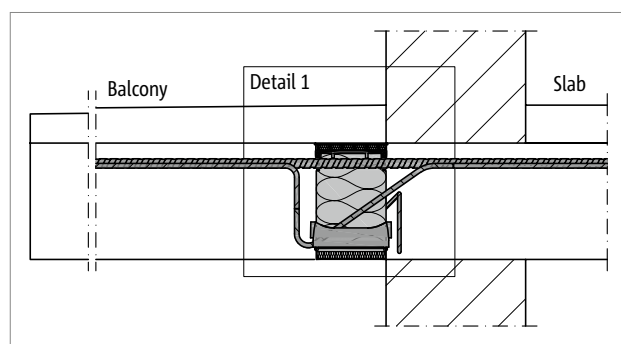


Fig. 4: Schöck Isokorb® CXT type K-E with REI120: Fire protection board top and bottom; lateral integrated fire protection bands

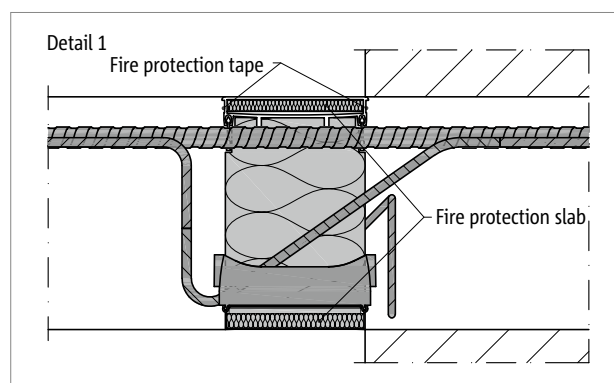


Fig. 5: Schöck Isokorb® CXT type K-E with REI120: Detail 1

Fire protection classes

Schöck Isokorb® CXT with fire protection

For the Schöck Isokorb® CXT with product-specific fire protection (-REI120), the fire protection class of the connected reinforced concrete slabs depends on the concrete cover CV and the height of mineral floor coverings

The Schöck Isokorb®CXT with fire protection (-REI120) has achieved fire protection class REI120 when exposed from below.

A reinforced concrete slab (balcony slab, floor slab) with a Schöck Isokorb® CXT type K-E-REI120-CV26 with fire effects from above achieves the fire protection class REI 30. With a Schöck Isokorb® CXT type K-E-REI120-CV46 REI 60 is achieved. See fire protection class page 25.

Basis for the fire protection classification of the Schöck Isokorb® CXT are the following documents:

- Approval Schöck Isokorb® XT-Combar Z-15.7-320
- Approval Combar® Z-1.6-238
- Expert opinion S6_1-16-056 IK Combar ETK Fire in floor superstructure, MFPA Leipzig dated 25.11.2016 DE

Prerequisite for the fire protection classification of the balcony connection is that the balcony slab and the floor slab also meet the requirements on the required fire resistance class according to DS/EN 1992-1-1 and -2 (EC2).

Schöck Isokorb® CXT type	K-E-CV26	K-E-CV46
Fire resistance class	REI 120 from below and REI 30	REI 120 from below and REI 60

Fire-resistance classes | Balcony fire protection classes

Balcony fire protection classes with Schöck Isokorb® CXT type K-E-REI120

The following applies for balconies with fire load:

Higher fire protection classes are achieved through screed or mineral flooring materials of the floor slab or balcony slab. Depending on the flooring material various different heights are required (see table). Further materials in the floor screed have a positive effect which is not taken into account (analogous to DS/EN 1992-1-2 Fig. 5.7).

Schöck Isokorb® CXT type	Reinforced concrete slab with K-E-CV26			
Flooring material height h_1 [mm]	REI 30	REI 60	REI 90	REI 120
Screed	not required	20	35	50
Anhydride screed	not required	25	45	60
Cement screed (DS/EN 1992)	not required	25	40	55
Mastic asphalt screed	not required	25	35	50
Dense bed of grit	not required	25	35	45
Bed of grit with concrete slabs	not required	25	40	55

Schöck Isokorb® CXT type	Reinforced concrete slab with K-E-CV46			
Flooring material height h_1 [mm]	REI 30	REI 60	REI 90	REI 120
Screed	not required	not required	20	30
Anhydride screed	not required	not required	20	30
Cement screed (DS/EN 1992)	not required	not required	15	30
Mastic asphalt screed	not required	not required	10	25
Dense bed of grit	not required	not required	10	20
Bed of grit with concrete slabs	not required	not required	15	30

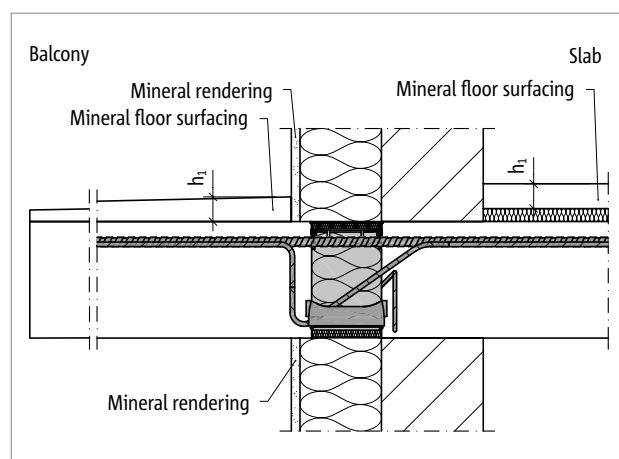


Fig. 6: Schöck Isokorb® CXT type K-E-REI120: Flooring material for higher fire protection classes

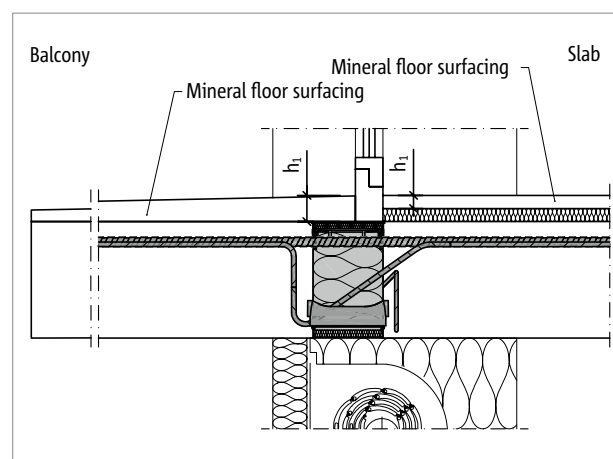


Fig. 7: Schöck Isokorb® CXT type K-E-REI120: Flooring material for higher fire protection classes

i Fire protection class

- The Schöck Isokorb® CXT comes standard with a fire protection configuration (REI120). If a configuration without fire protection is desired, then this must be explicitly indicated with (R0).
- If the fire protection designation (R0) is left out when ordering, then fire protection configuration (REI120) is delivered by default.
- REI 90 (floor building class 5) is achieved with Schöck Isokorb® CXT type K-E-REI120-CV26 and for example 40 mm cement screed flooring material on the floor.

Balcony fire protection classes

- Depending on the required fire protection, in addition to the Schöck Isokorb® CXT type K-E-REI120 the required flooring screed is to be put out to tender.

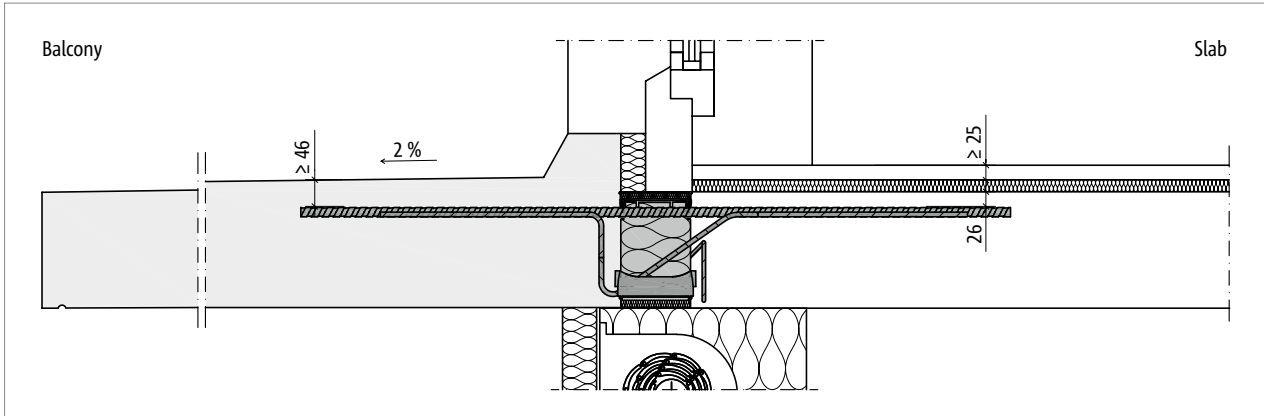


Fig. 8: Schöck Isokorb® CXT type K-E-REI120: Precast unit with higher concrete cover and flooring material inside for fire protection class REI 60

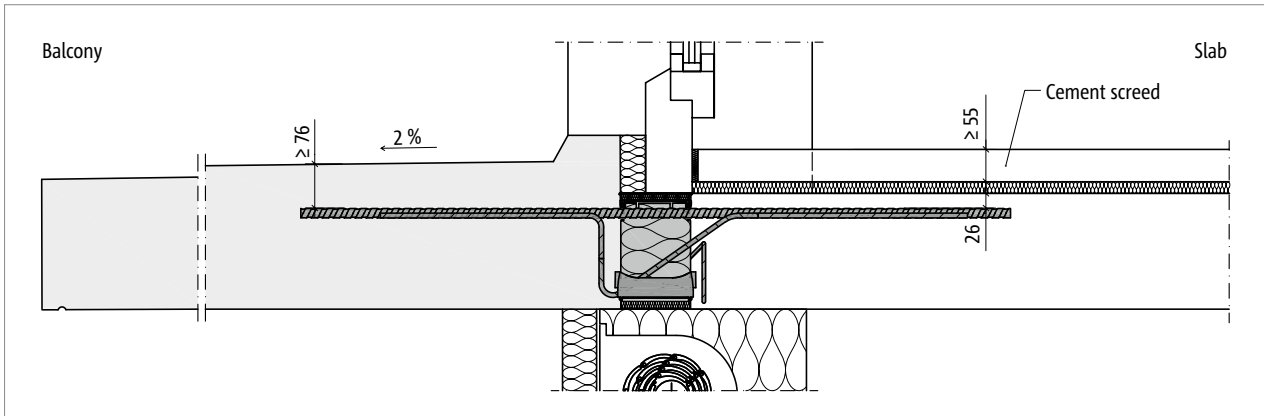


Fig. 9: Schöck Isokorb® CXT type K-E-REI120: Precast unit with higher concrete cover and flooring material inside for fire protection class REI 120

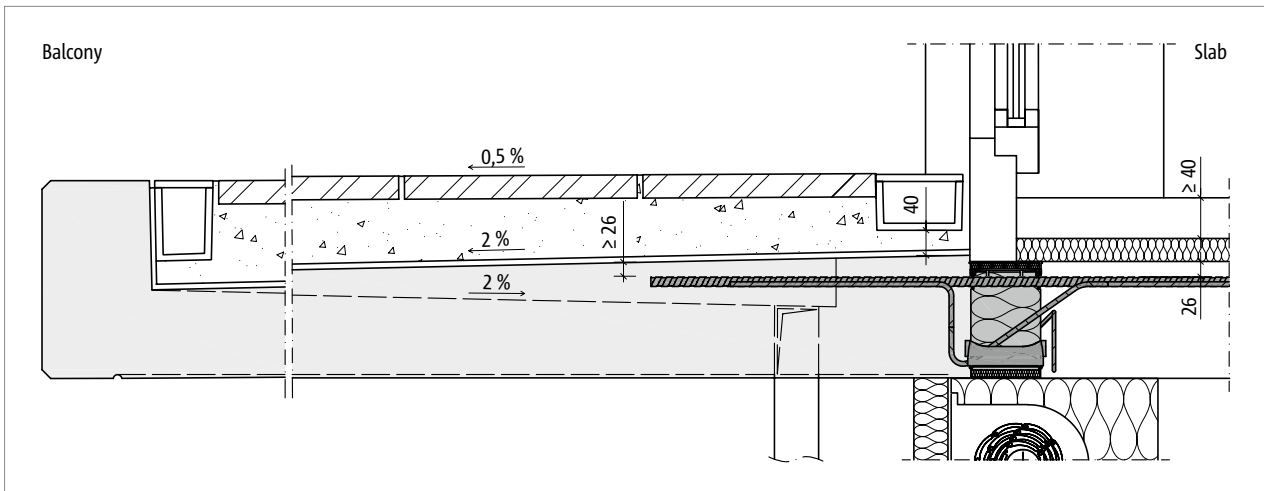


Fig. 10: Schöck Isokorb® CXT type K-E-REI120: Precast unit with flooring material and channel for fire protection class REI 90

Fire resistance classes of passageway walks

Fire protection classes for passageway walks using Schöck Isokorb® CXT type K-E-REI120

Escape route without fire load:

With the aid of numerical simulations a realistic for an enclosed room fire scenario with fire from above was investigated (Expertise BB-19-001-1, Ingenieurbüro IBB Hauswaldt, Germany).

The assumed heat release rate is 350 kW/m² (in comparison: according to DS/EN 1991-1-2: 2010-12 a heat release rate of only 250 kW/m² is to be assumed for dwellings, hospital rooms, hotel rooms, libraries, offices, classrooms, shops, shopping centres as well as for the transport branch.)

The escape route has to be free of fire load, the flames can, however, drive out of doors and windows. Rays of heat from the fire affect the passageway walk slab in front of openings in the wall.

The mean value of the investigated temperature of the reinforced concrete slab without flooring material reached the critical temperature limit only after 90 minutes fire stress. The critical temperature limit at the surface of the tension bars of the Schöck Isokorb® CXT with fire protection (-REI120) with CV26 concrete cover is achieved at isolated places only.

Normal room fires end significantly before the sixtieth minute of the fire. Therefore a compound breakdown of the slab connections in the passageway walk due to a realistic fire event in the building can be excluded. Under realistic fire conditions, passageway walks can withstand ninety minutes without floor covering.

In this sense the protective targets of fire resistance, such as load-bearing capacity, are met in the case of fire.

Within the building, depending on the required fire protection, a flooring material with a height of h_1 is required:

Schöck Isokorb® CXT type K-E	Concrete cover CV26		
Flooring material height at	Fire resistance class reinforced concrete slab access balcony		
	REI 30	REI 60	REI 120
Flooring material, floor side	h_1 [mm]		
Anhydride screed	not required	25	45
Cement screed (DS/EN 1992)	not required	25	40
Mastic asphalt screed	not required	25	35

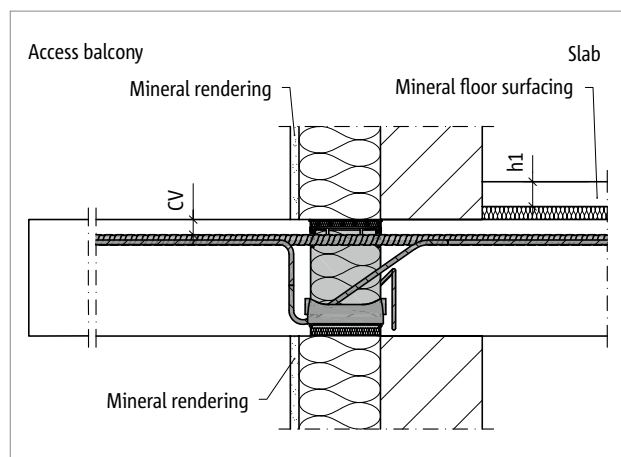


Fig. 11: Schöck Isokorb® CXT type K-E-REI120-CV26: Floor with flooring material; fire protection class of the passageway walk up to REI 90

i Fire protection class

- The Schöck Isokorb® CXT comes standard with a fire protection configuration (REI120). If a configuration without fire protection is desired, then this must be explicitly indicated with (R0).
- If the fire protection designation (R0) is left out when ordering, then fire protection configuration (REI120) is delivered by default.
- REI 90 (floor building class 5) is achieved with Schöck Isokorb® CXT type K-E-REI120-CV26 and for example 40 mm cement screed flooring material on the floor.
- Depending on the required fire protection, in addition to the Schöck Isokorb® CXT type K-E-REI120 the required flooring screed is to be put out to tender.

Fire protection configuration for passageway walks

Sound insulation

- For sound insulation, check whether a floor covering is required on the passageway walk.

Schöck Isokorb® in the escape route

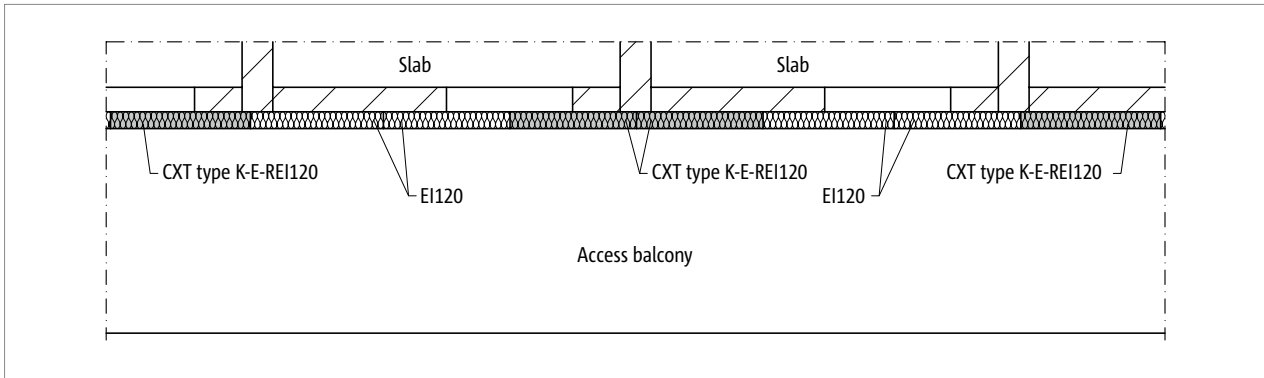


Fig. 12: Schöck Isokorb® CXT type K-E-REI120: passageway walk, room enclosing

Fire protection configuration

- Prerequisite for the fire protection classification of the escape route is that the passageway walk slab and the intermediate floor also meet the requirements on the required fire resistance class according to DS/EN 1992-1-1 and -2 (EC2).
- If, in addition to the load-bearing capacity (R), integrity (E) and insulation (I) are also required in case of fire, then the block-outs between the Schöck Isokorb® are to be closed, e.g. using the Schöck Isokorb® T type Z fire protection configuration.

Reinforced concrete – reinforced concrete

Material properties

Schöck Isokorb® CXT

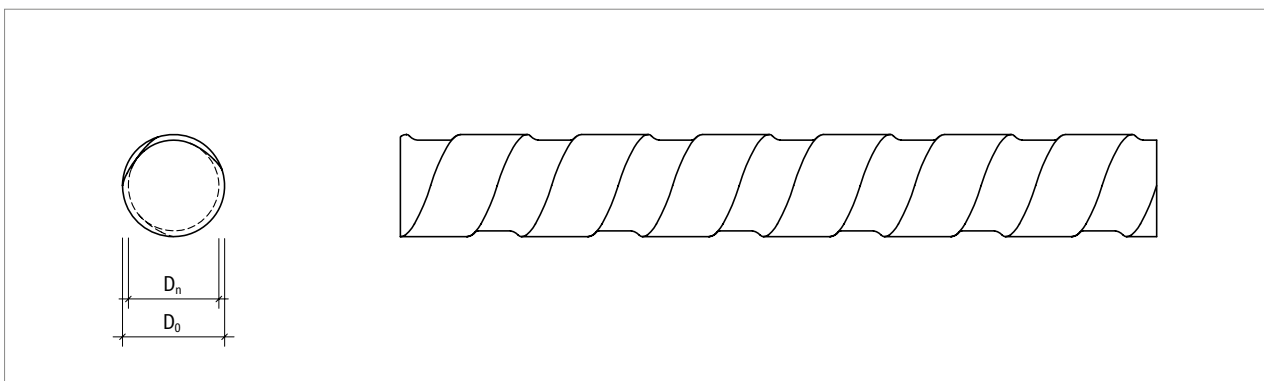
For many years Schöck has been researching the use of glass fibre reinforcement in concrete. Since 1997 the bar made from glass fibre composite material has been known under the name Combar® and has been used in various applications - the focus was always on the use in the Schöck Isokorb® due to the low thermal conductivity of the glass fibre composite material.

The development of our own glass fibre bar Combar® began with the involvement of national and international experts and approval authorities. This is particularly evident in the area of durability and quality assurance. Thus the product component Combar® has been tested, not only in the short-term but also in fatigue tests, for tension, creep, fatigue and bond under the most diverse extreme conditions.

The characteristic value of the tensile strength for 100 years in wet highly alkaline concrete has been determined as 580N/mm². The bonding behaviour has also been investigated long-term with regard to creep under increased loads and remaining load-bearing capacity. Following first applications in 2003, since 2008, the first and still only approval for Combar® was granted in 2008 with Z-1.6-238 for a glass fibre composite reinforcement in Germany. With the new building approval Z-15.7-320 now also the use of Combar® in the Schöck Isokorb® is approved in Germany.

Geometry

Nominal diameter D_n [mm]	Outer diameter D_o [mm]	Core cross-section area [mm ²]	Weight per metre [kg/m]
∅ 12	13,5	113	0,29
∅ 13	14,5	133	0,33
∅ 16	18,0	201	0.52



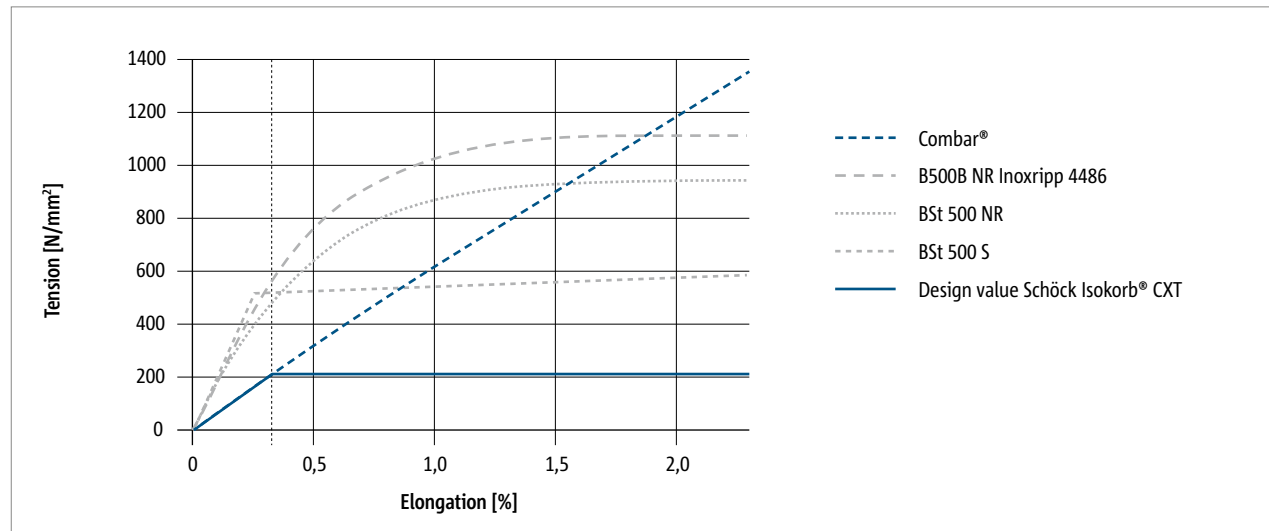
1 Geometry

- The proportion of ribs in Combar® bars is very high, about 50% of the surface. therefore, where space is limited the outer diameter should be taken into account.

Material properties

Material properties in comparison with steel

For use in the Schöck Isokorb® CXT the load-bearing capacity of the Combar® tension bars was limited, so that the extensional stiffness of the steel and Combar® used is coordinated.



Property	Reinforcing steel BSt 500 S	Reinforcing steel BSt 500 NR	Tension bars Schöck Isokorb® CXT
char. value of tensile strength f_{tk} (N/mm ²)	550	550	> 1000
char. value of the yield strength f_{yk} (N/mm ²)	500	500	no creeping
Rated value of the yield strength f_{yd} (N/mm ²)	435	435	209
Elongation at ultimate limit state	2,09 ‰	2,61 ‰	3,48 ‰
Bending value of tensile E-modulus (N/mm ²)	200.000	160.000	60.000
Design value of the bond stress f_{bd}	C20/25 (N/mm ²)	2,3	2,03
	C25/30 (N/mm ²)	2,7	2,26
Concrete cover min c_v	nach EN 1992	$d_s + 10$ mm	$d_s + 10$ mm
Density γ (g/cm ³)	7,85	7,85	2,20
Thermal conductivity λ [W/(m·K)]	50	13–15	0,7
Coefficient of thermal expansion α (1/K)	$0,8 - 1,2 \cdot 10^{-5}$	$1,2 - 1,6 \cdot 10^{-5}$	$0,6 \cdot 10^{-5}$ (axial)/ $2,2 \cdot 10^{-5}$ (radial)
Magnetism	yes	very small	no
Material classification according to DS/EN 13501	A1	A1	A2

Storage and transport

- With longer storage the Schöck Isokorb® CXT should be protected against rain and sunrays in order to prevent discolouration

Construction materials

Schöck Isokorb® construction materials

Combar®	Schöck Combar® reinforcing bar according to approval Z-1.6-238
Reinforcing steel	B500B according to DIN 488-1
Stainless steel	Ribbed reinforcing bars B500B NR, Material No. 1.4571 or 1.4482 according to ETA
Concrete pressure bearing	HTE compact pressure bearing (pressure bearing made from micro-steel fibre reinforced high performance fine concrete-HD plastic coating)
Insulation	Neopor® - this insulation material is a polystyrene hard foam and a BASF registered brand, $\lambda = 0,031 \text{ W}/(\text{m}\cdot\text{K})$, construction material classification B1 (flame resistant)
Fire protection material	Lightweight boards made of construction material A1, cement-bonded fire protection boards, and integrated fire protection tapes
Connected components	
Reinforcing steel	B500A or B500B as per DS/EN 1992-1-1 (EC2) and DS/EN 1992-1-1/NA
Concrete	Normal concrete as per DS/EN 206-1 with a dry apparent density of 2000 kg/m ³ to 2600 kg/m ³ (lightweight concrete is not permitted)

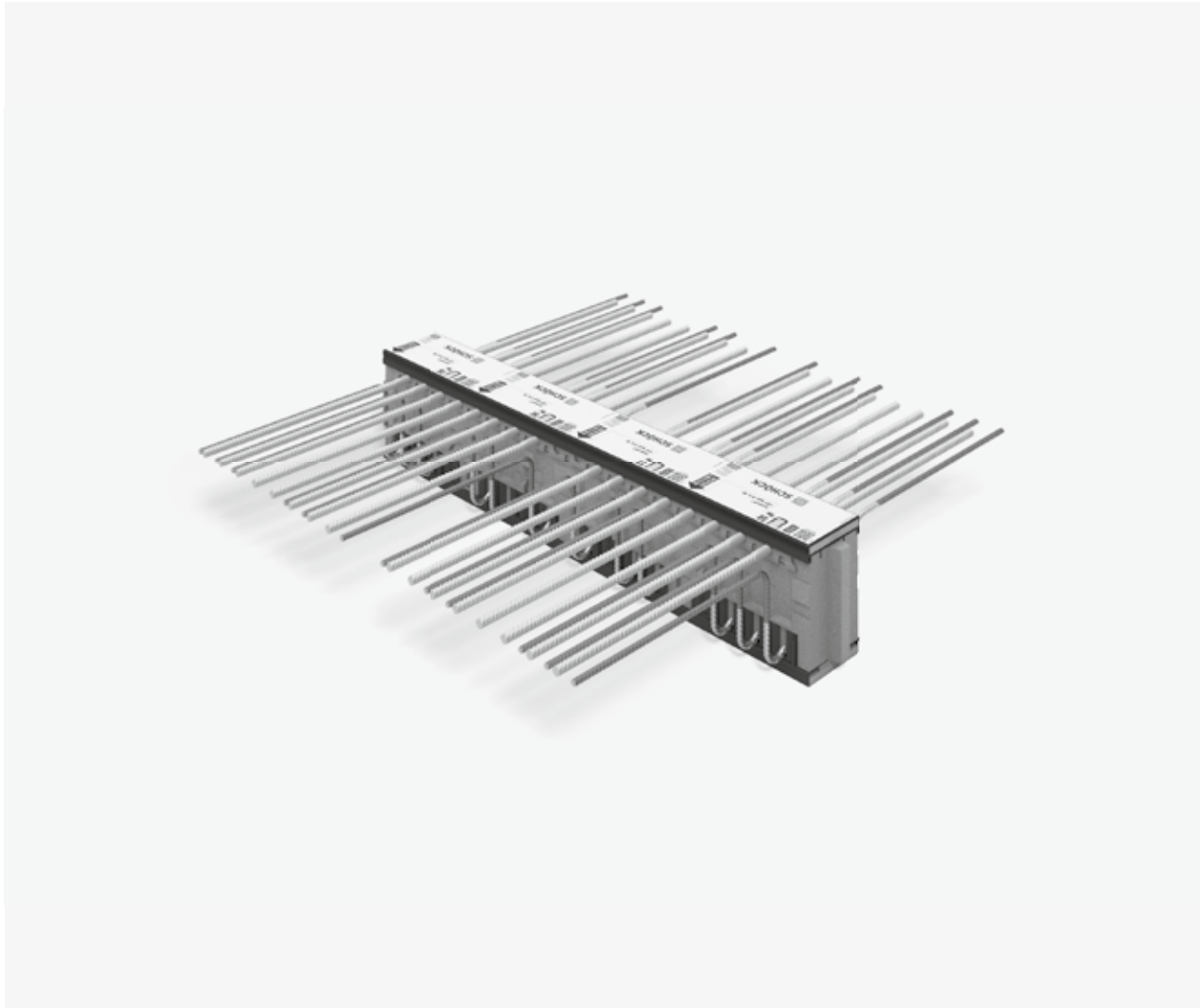
Indicative minimum strength class of the exterior structural elements:

At least C25/30 and depending on the environmental classification as per DS/EN 1992-1-1/NA, table NA.E.1

Indicative concrete strength classes of the interior structural elements:

At least C20/25 and depending on the environmental classification as per DS/EN 1992-1-1/NA, table NA.E.1

Schöck Isokorb® CXT type K-E



Schöck Isokorb® CXT type K-E

Load-bearing thermal insulation element for cantilevered balconies. The element transmits negative moments and positive shear forces. An element with the load-bearing capacity VV additionally transmits negative shear forces.

CXT
type K-E

Reinforced concrete – reinforced concrete

Element arrangement | Installation cross sections

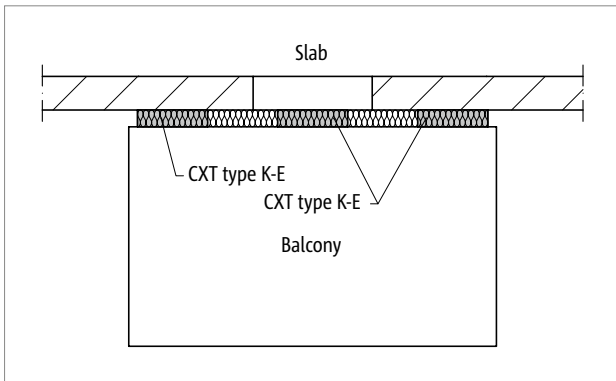


Fig. 13: Schöck Isokorb® CXT type K-E: Cantilevered balcony

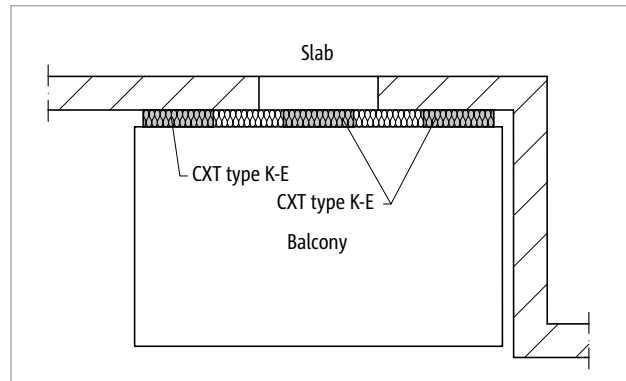


Fig. 14: Schöck Isokorb® CXT type K-E: Balcony with façade offset

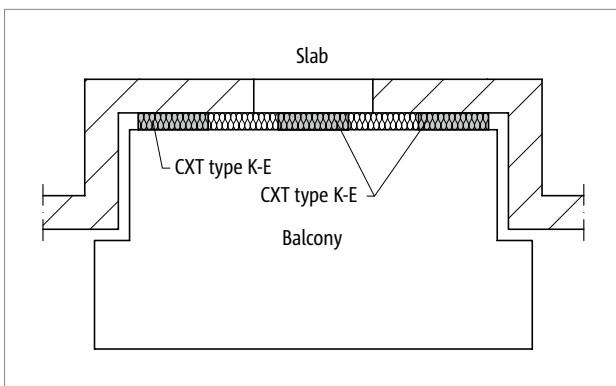


Fig. 15: Schöck Isokorb® CXT type K-E: Balcony with facade recess

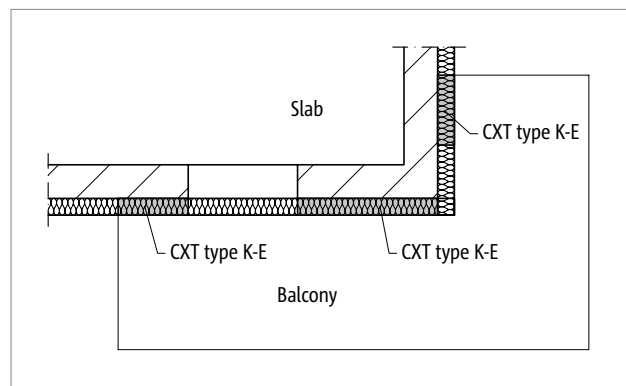


Fig. 16: Schöck Isokorb® CXT type K-E: corner balcony

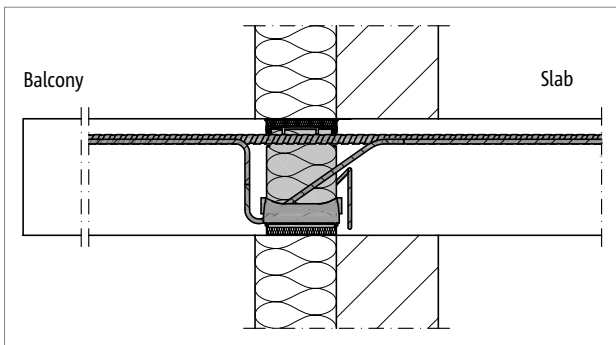


Fig. 17: Schöck Isokorb® CXT type K-E: Connection with external thermal insulation composite system ETICS

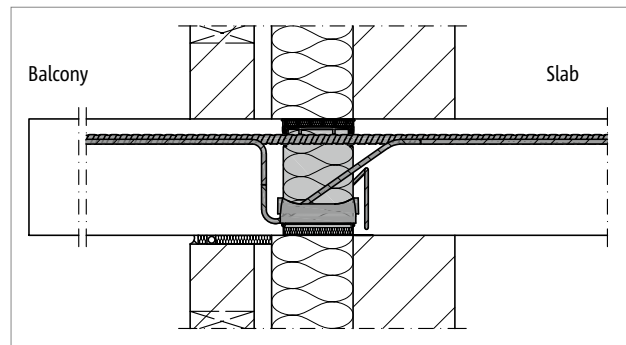


Fig. 18: Schöck Isokorb® CXT type K-E: Connection with core insulation

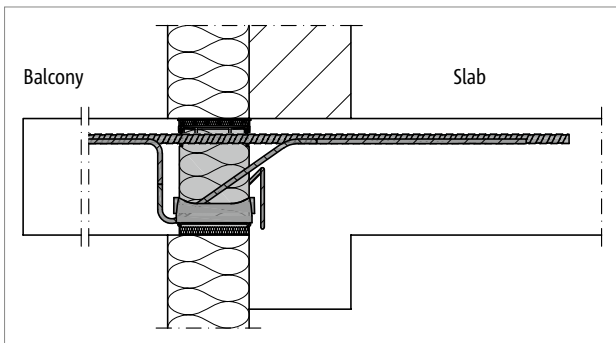


Fig. 19: Schöck Isokorb® CXT type K-E: Connection with edge beam and ET-ICS

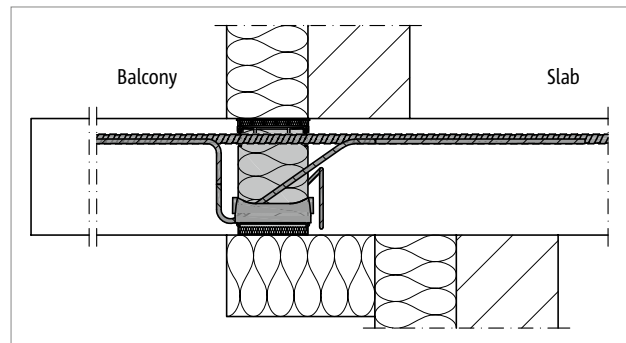


Fig. 20: Schöck Isokorb® CXT type K-E: Connection with indirectly supported floor and ETICS

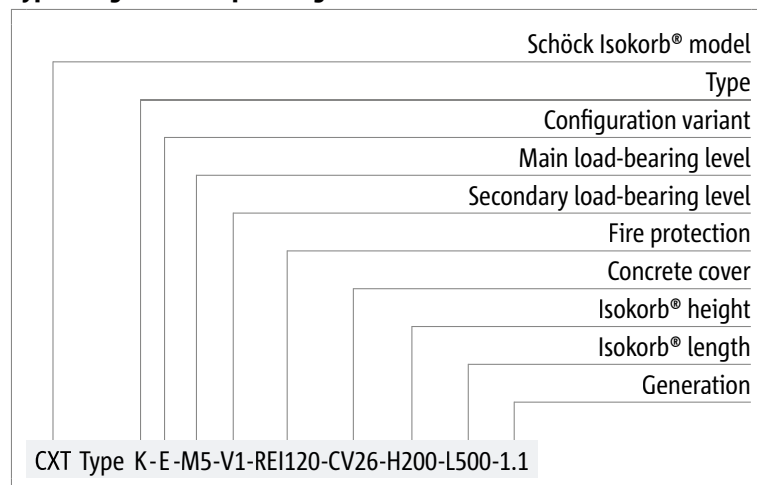
Product selection | Type designations

Schöck Isokorb® CXT type K-E variants

The configuration of the Schöck Isokorb® CXT type K-E can vary as follows:

- Configuration variants:
type K-E
- Main load-bearing level:
M1 to M7
- Secondary load-bearing level:
V1, V2, VV1
- Fire resistance class:
Fire protection as standard
CXT type K-E-REI120-CV26: REI120 from below and REI30
CXT type K-E-REI120-CV46: REI120 from below and REI60
CXT type K-E without fire protection: R0 (Option for better heat insulation and soundproofing)
- Concrete cover of the tension bars:
CV26 = 26 mm, CV46 = 46 mm
- Isokorb® height:
H = 160 – 250 mm for concrete cover CV26
H = 180 – 250 mm for concrete cover CV46
- Isokorb® length:
L = 1000 mm, for all variants;
L = 500 mm, for main load bearing levels M1 to M7 with secondary load bearing levels V1 and V2 and main load bearing levels M5 and M7 with secondary load bearing level VV1
L = 250 mm, for main load bearing levels M2 to M7 with secondary load bearing levels V1 and V2
- Generation:
1.1

Type designations in planning documents



i IDock®

The following product features of the Schöck Isokorb® CXT type K-E are required for use with Schöck IDock®:

- Main load-bearing level: M1 - M3, M5
- Secondary load-bearing level: V1, V2
- Concrete cover: CV26

C25/30 design

Schöck Isokorb® CXT type K-E			M1	M2	M3	M4	M4
Design values with	Concrete cover CV [mm]		Concrete strength class \geq C25/30				\geq C30/37
	CV26	CV46	$m_{Rd,y}$ [kNm/m]				-29.3
Isokorb® height H [mm]	160	180	-10.4	-19.9	-23.1	-29.2	-32.6
	170	190	-11.6	-22.2	-25.7	-32.3	-36.0
	180	200	-12.8	-24.5	-28.4	-35.3	-39.4
	190	210	-14.1	-26.8	-31.1	-38.4	-42.8
	200	220	-15.4	-29.2	-33.8	-41.5	-46.3
	210	230	-16.7	-31.7	-36.6	-44.6	-49.8
	220	240	-18.1	-34.1	-39.4	-47.6	-53.4
	230	250	-19.5	-36.6	-42.3	-50.7	-57.0
	240		-20.9	-39.1	-45.2	-53.8	-60.6
	250		-22.3	-41.7	-48.2	-56.9	
$v_{Rd,z}$ [kN/m]							54.1
Secondary load-bearing level	V1		27.0	54.1	54.1	54.1	96.1
	V2		48.1	96.1	96.1	96.1	
	VV1		-	96.1/-48.1	96.1/-48.1	96.1/-48.1	96.1/-48.1

Schöck Isokorb® CXT type K-E		M1	M2	M3	M4	M4
Placement with	Isokorb® length [mm]					1000
	1000	1000	1000	1000	1000	12 \emptyset 12
Tension bars V1/V2	4 \emptyset 12	8 \emptyset 12	8 \emptyset 13	12 \emptyset 12	12 \emptyset 12	
Tension bars VV1	-	8 \emptyset 12	8 \emptyset 13	12 \emptyset 12		
Shear force bars V1	4 \emptyset 6	8 \emptyset 6	8 \emptyset 6	8 \emptyset 6	8 \emptyset 6	
Shear force bars V2	4 \emptyset 8	8 \emptyset 8	8 \emptyset 8	8 \emptyset 8	8 \emptyset 8	
Shear force bars VV1	-	8 \emptyset 8 + 4 \emptyset 8	8 \emptyset 8 + 4 \emptyset 8	8 \emptyset 8 + 4 \emptyset 8	8 \emptyset 8 + 4 \emptyset 8	
Pressure bearing V1 [piece]	4	8	12	12	12	
Pressure bearing V2 [piece]	4	12	12	12	12	
Pressure bearing VV [piece]	-	12	12	12	12	
Special stirrup [piece]	-	-	-	-	-	

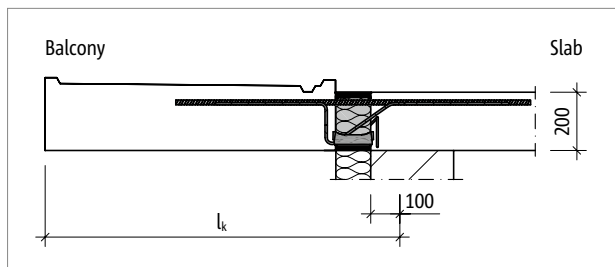


Fig. 21: Schöck Isokorb® CXT type K-E: Static system, cross-section

C25/30 design

Schöck Isokorb® CXT type K-E		M5	M6	M7	M7	
Design values with	Concrete cover CV [mm]		Concrete strength class \geq C25/30			\geq C30/37
	CV26	CV46	$m_{Rd,y}$ [kNm/m]			
Isokorb® height H [mm]	160	180	-31.9	-36.5	-44.8	-47.2
	170	190	-35.7	-40.9	-49.9	-52.8
	180	200	-39.6	-45.2	-55.0	-58.5
	190	210	-43.6	-49.6	-60.0	-64.2
	200	220	-47.5	-54.1	-65.1	-70.1
	210	230	-51.6	-58.6	-70.2	-75.9
	220	240	-55.7	-63.1	-75.3	-81.5
	230	250	-59.8	-67.7	-80.4	-87.0
	240		-64.0	-72.4	-85.5	-92.5
250		-68.2	-77.1	-90.6	-98.0	
$V_{Rd,z}$ [kN/m]						
Secondary load-bearing level	V1		96.1	96.1	96.1	96.1
	V2		144.2	144.2	144.2	144.2
	VV1		96.1/-48.1	96.1/-48.1	96.1/-48.1	96.1/-48.1

Schöck Isokorb® CXT type K-E		M5	M6	M7	M7
Placement with	Isokorb® length [mm]				
	1000	1000	1000	1000	1000
Tension bars V1/V2	8 \emptyset 16	16 \emptyset 12	12 \emptyset 16	12 \emptyset 16	12 \emptyset 16
Tension bars VV1	8 \emptyset 16	16 \emptyset 12	12 \emptyset 16	12 \emptyset 16	12 \emptyset 16
Shear force bars V1	8 \emptyset 8	8 \emptyset 8	8 \emptyset 8	8 \emptyset 8	8 \emptyset 8
Shear force bars V2	12 \emptyset 8	12 \emptyset 8	12 \emptyset 8	12 \emptyset 8	12 \emptyset 8
Shear force bars VV	8 \emptyset 8 + 4 \emptyset 8	8 \emptyset 8 + 4 \emptyset 8	8 \emptyset 8 + 4 \emptyset 8	8 \emptyset 8 + 4 \emptyset 8	8 \emptyset 8 + 4 \emptyset 8
Pressure bearing V1 [piece]	16	16	16	16	16
Pressure bearing V2 [piece]	16	16	16	16	16
Pressure bearing VV [piece]	16	16	16	16	16
Special stirrup [piece]	4	4	4	4	4

i Design

- Isokorb® length: See product variants page 35
- With CV46 $H_{\min} = 180$ mm is the lowest Isokorb® height, this requires a minimum slab thickness of $h = 180$ mm.
- Schöck Isokorb® CXT type K-E can be used with Schöck IDock® to ensure a flexible organisation of the construction process in new buildings. See page 35 and the Technical Information Schöck IDock®.
- For cantilever slab constructions without live load, stressed from moment loading without direct shear force effectiveness or lightweight constructions, contact our Design Support department.

Torsional spring stiffness | Deflection/Camber

Schöck Isokorb® CXT type K-E			M1	M2	M3	M4	M5	M6	M7
Torsion spring stiffness for	Concrete cover CV [mm]		Concrete strength class \geq C25/30						
	CV26	CV46	C [kNm/rad/m]						
Isokorb® height H [mm]	160	180	917	1835	2210	2752	2294	3281	3077
	170	190	1128	2255	2719	3383	2865	4079	3843
	180	200	1359	2719	3281	4078	3500	4963	4695
	190	210	1613	3226	3896	4839	4199	5934	5631
	200	220	1888	3777	4564	5665	4961	6992	6653
	210	230	2185	4371	5284	6556	5786	8136	7761
	220	240	2504	5008	6058	7512	6675	9367	8953
	230	250	2844	5688	6884	8533	7628	10685	10230
	240		3206	6412	7763	9618	8644	12090	11593
250		3590	7180	8694	10769	9723	13581	13041	

Deflection

The deflection calculation is used to estimate the required precamber. The arithmetic camber of the balcony slab formwork results from the calculation acc. to DS/EN 1992-1-1 (EC2) and DS/EN 1992-1-1/NA in addition to the deflection from Schöck Isokorb®. The camber of the balcony slab formwork to be given by the structural engineer/designer in the implementation plans (Basis: Calculated total deflection from cantilever slab + floor rotation angle + Schöck Isokorb®) should be so rounded that the scheduled drainage direction is maintained (round up: with drainage to the building facade, round down: with drainage towards the cantilever slab end).

Deflection (w_{ii}) as a result of the Schöck Isokorb®

$$w_{ii} = M_{Ed,GZG} / C \cdot l_k \cdot 10^3 \text{ [mm]}$$

Factors to be applied:

$M_{Ed,GZG}$ = Relevant bending moment [kNm/m] in the ultimate limit state for the determination of the deflection w_{ii} [mm] from the Schöck Isokorb®.

The load combination to applied for the deflection is determined by the structural engineer.

(Recommendation: Load combination for the determination of the camber w_{ii} : determine $g + 0,3 \cdot q$, $M_{Ed,GZG}$ in the ultimate limit state)

C = Torsion spring stiffness of the Schöck Isokorb® [kNm/rad/m], see design

l_k = cantilever length [m]

Calculation example, see page 51

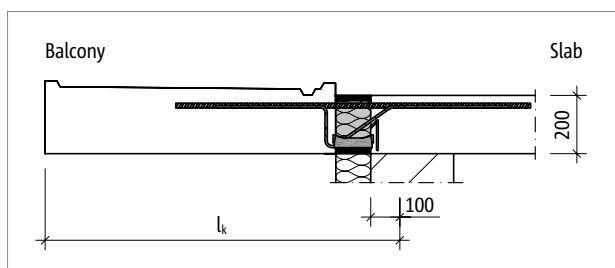


Fig. 22: Schöck Isokorb® CXT type K-E: Static system, cross-section

Vibrations | Slenderness

Vibrations

To ensure the serviceability, we recommend calculating the natural frequency of the balcony. The first natural frequency f_e is calculated simply with the deflection $w_{\ddot{u}}$ as a result of the Schöck Isokorb®. At $f_e > 6$ Hz, disruptive vibrations should be ruled out. A natural frequency $f_e > 5$ Hz is sufficient when the deflection being used takes into account the bending of the balcony slab.

Natural frequency (f_e) taking into account the torsion spring stiffness of the Schöck Isokorb®

$$f_e = \sqrt{0,384 \cdot 10^3 / w_{\ddot{u}}} > 6 \text{ Hz } (> 5 \text{ Hz})$$

Factors to be applied:

$$w_{\ddot{u}} = \text{deflection as a result of the Schöck Isokorb® [mm]}$$

Calculation example, see page 51

Slenderness

In order to safeguard the serviceability limit state we recommend the limitation of the slenderness to the following maximum cantilever lengths l_k [m]:

Schöck Isokorb® CXT type K-E		M1 – M7	
Maximum cantilever length with		CV26	CV46
		$l_{k,max}$ [m]	
Isokorb® height H [mm]	160	1.65	-
	170	1.78	-
	180	1.90	1.70
	190	2.03	1.80
	200	2.15	1.90
	210	2.28	2.00
	220	2.40	2.10
	230	2.53	2.20
	240	2.65	2.30
	250	2.78	2.40

i Maximum cantilever length

- The maximum cantilevered length for the securing of the serviceability is a benchmark. It can be limited by the load bearing capacity when using the Schöck Isokorb® CXT type K-E
- The table value for the maximum cantilevered length $l_{k,max}$ should be reduced by 10% for heavier balustrades.

Expansion joint spacing

Maximum expansion joint spacing

If the component length exceeds the maximum expansion joint spacing e , then expansion joints must be incorporated into the external concrete components at right angles to the insulating layer in order to limit the effect as a result of temperature changes. Because the layout of the Isokorb® is only possible along the side of the component due to the installation in conjunction with the external concrete precast element, corners of balconies, parapets and balustrades cannot form any fixed points.

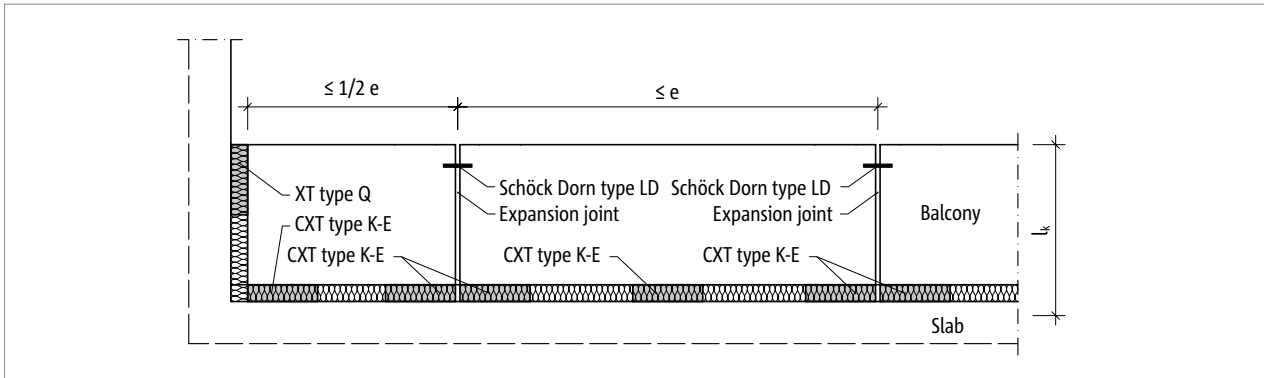


Fig. 23: Schöck Isokorb® CXT type K-E: Expansion joint spacing

Schöck Isokorb® CXT type K-E		M1 – M7
Maximum expansion joint spacing when		e [m]
Insulating element thickness [mm]	120	11.3

Edge distances

The Schöck Isokorb® must be so arranged at the expansion joint that the following conditions are met:

- For the centre distance of the tension bars from the free edge resp. from the expansion joint: $e_R \geq 50$ mm applies.
- For the centre distance of the compression bars from the free edge resp. expansion joint: $e_R \geq 100$ mm applies.

Product description

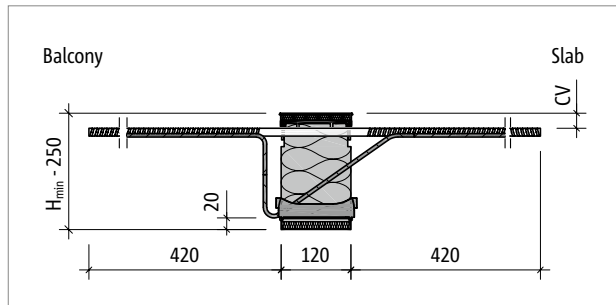


Fig. 24: Schöck Isokorb® CXT type K-E-M1-V1: Product section

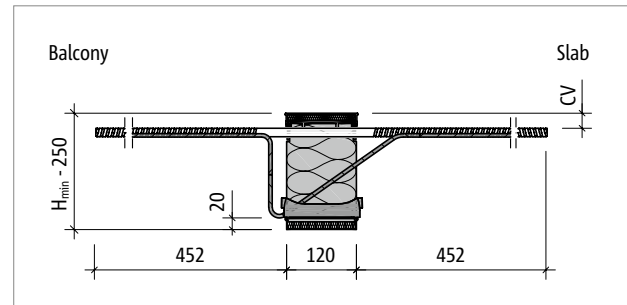


Fig. 25: Schöck Isokorb® CXT type K-E-M3-V1: Product section

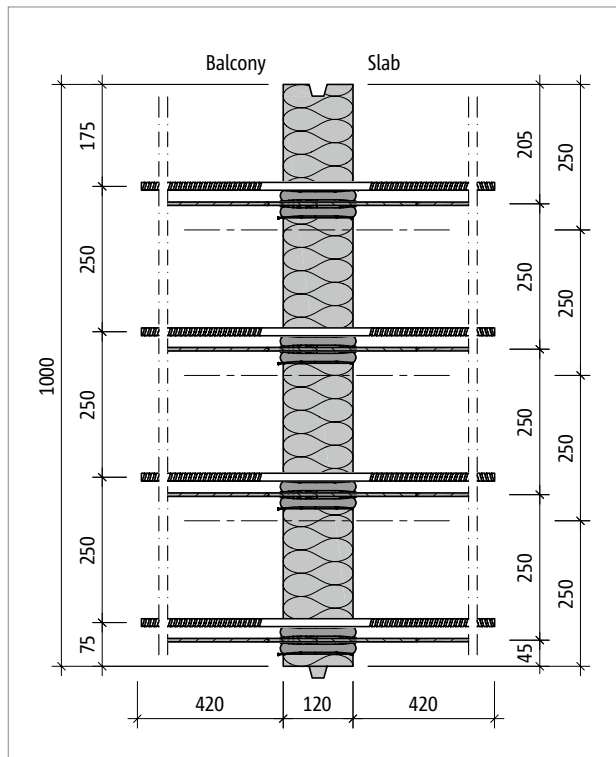


Fig. 26: Schöck Isokorb® CXT type K-E-M1-V1: Product layout

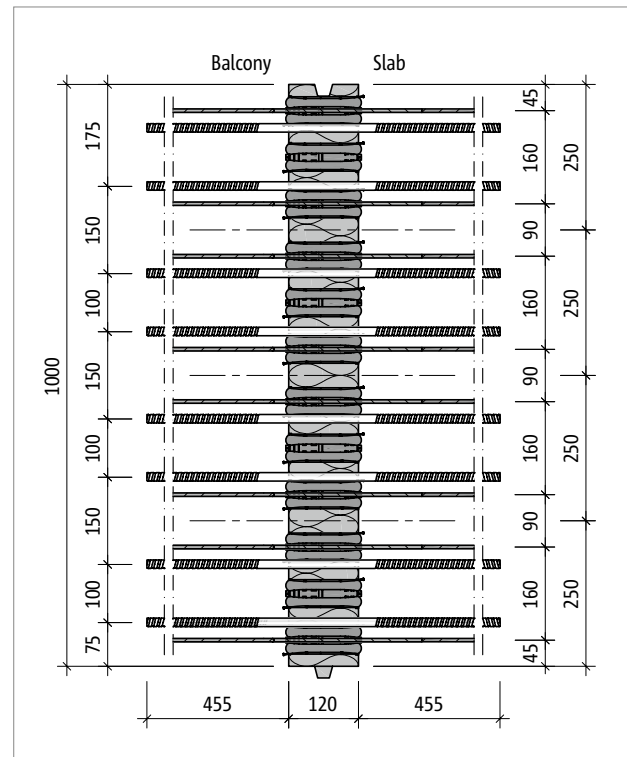


Fig. 27: Schöck Isokorb® CXT type K-E-M3-V1: Product layout

Product information

- For additional 2D and 3D product drawings contact our Design Support department.
- Concrete cover of the tension bars: CV26 = 26 mm, CV46 = 46 mm
- The Schöck Isokorb® CXT comes standard with a fire protection configuration (REI120). If a configuration without fire protection is desired, then this must be explicitly indicated with (R0).
- If the fire protection designation (R0) is left out when ordering, then fire protection configuration (REI120) is delivered by default.

Product description

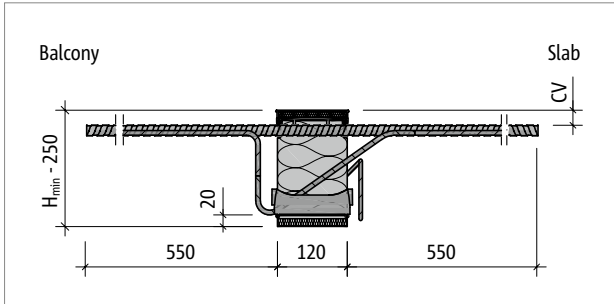


Fig. 28: Schöck Isokorb® CXT type K-E-M5-V1: Product section

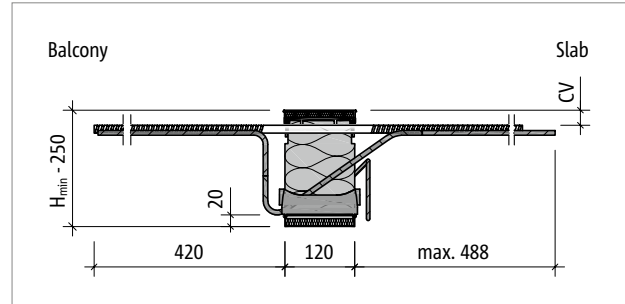


Fig. 29: Schöck Isokorb® CXT type K-E-M6-V1: Product section

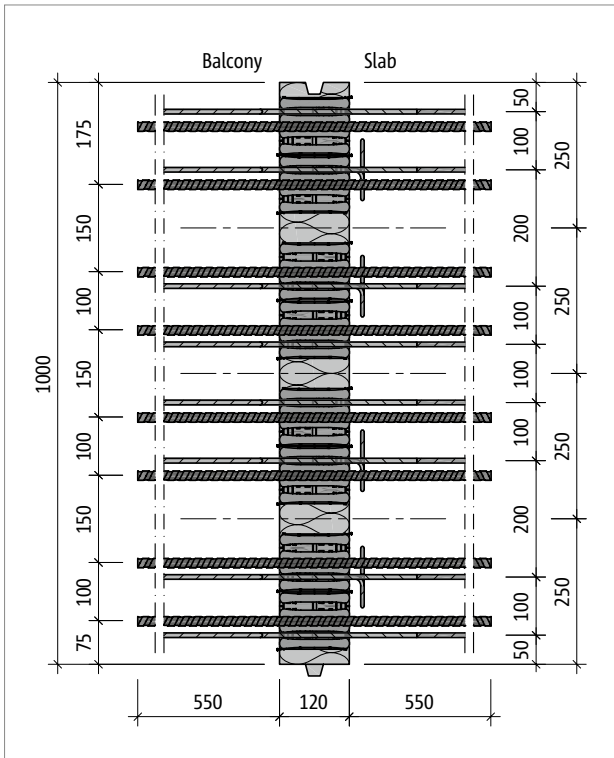


Fig. 30: Schöck Isokorb® CXT type K-E-M5-V1: Product layout

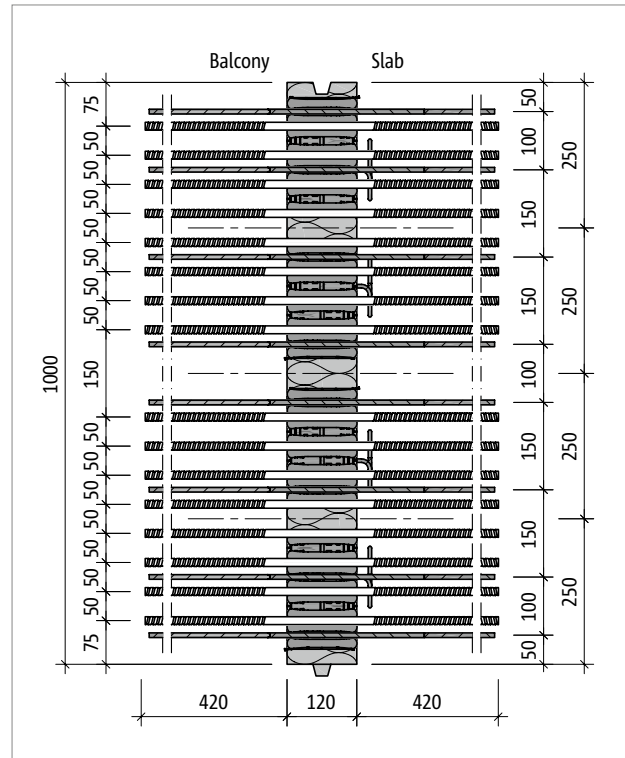


Fig. 31: Schöck Isokorb® CXT type K-E-M6-V1: Product layout

Product information

- For additional 2D and 3D product drawings contact our Design Support department.
- Concrete cover of the tension bars: CV26 = 26 mm, CV46 = 46 mm

Product description

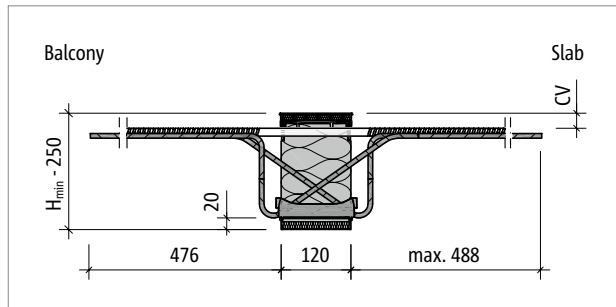


Fig. 32: Schöck Isokorb® CXT type K-E-M2-VV1: Product section

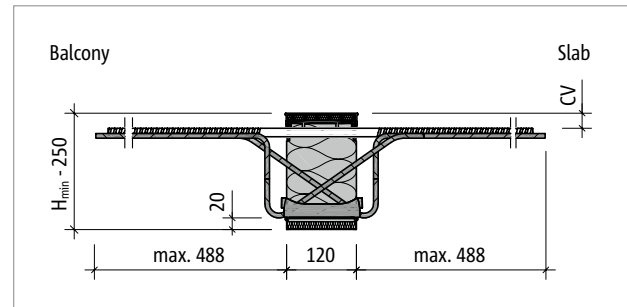


Fig. 33: Schöck Isokorb® CXT type K-E-M3-VV1: Product section

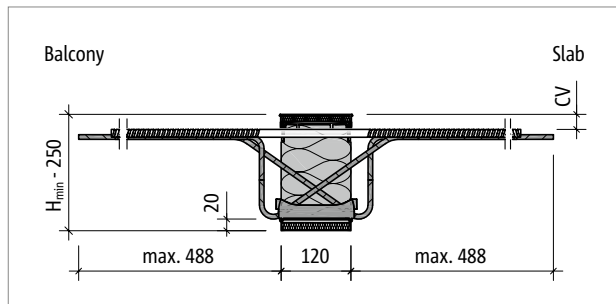


Fig. 34: Schöck Isokorb® CXT type K-E-M4-VV1: Product section

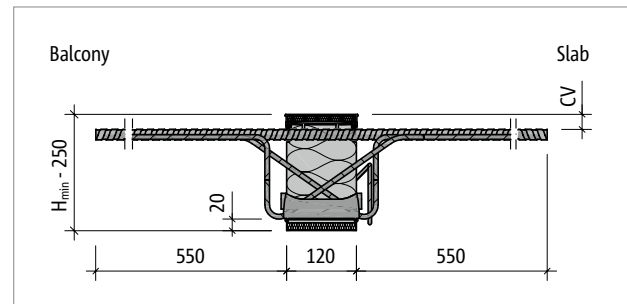


Fig. 35: Schöck Isokorb® CXT type K-E-M5-VV1: Product section

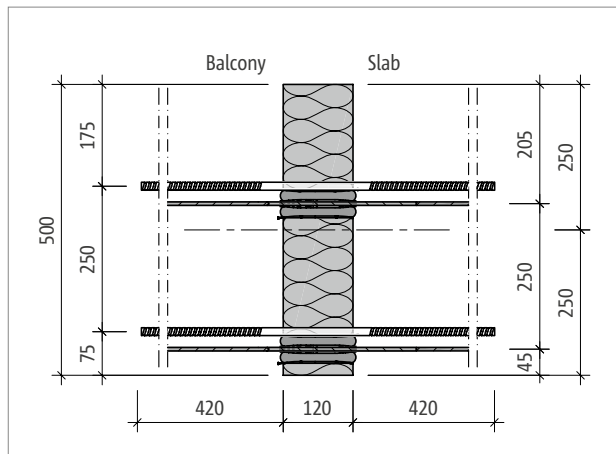


Fig. 36: Schöck Isokorb® CXT type K-E-M1-V1: Product layout of the variant length L500

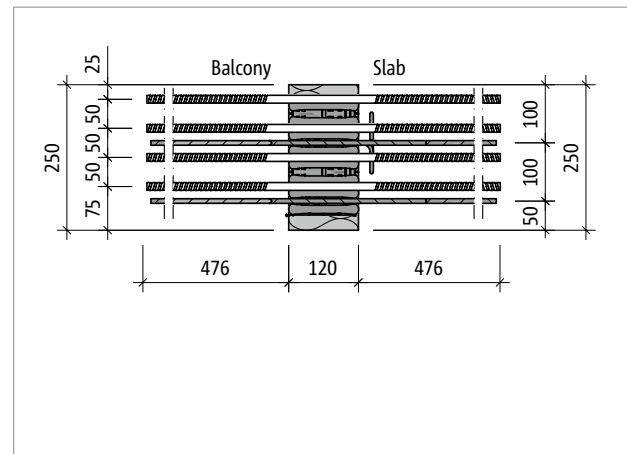


Fig. 37: Schöck Isokorb® CXT type K-E-M6-V1: Product layout of the variant L250

i Product information

- For additional 2D and 3D product drawings contact our Design Support department.
- Concrete cover of the tension bars: CV26 = 26 mm, CV46 = 46 mm
- Isokorb® length: See product variants page 35
- The Schöck Isokorb® CXT comes standard with a fire protection configuration (REI120). If a configuration without fire protection is desired, then this must be explicitly indicated with (R0).
- If the fire protection designation (R0) is left out when ordering, then fire protection configuration (REI120) is delivered by default.

Configuration without fire protection

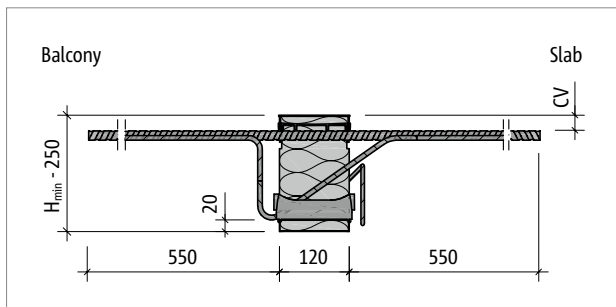


Fig. 38: Schöck Isokorb® CXT type K-E-M5-V1: Product section

i Fire protection

- The Schöck Isokorb® CXT comes standard with a fire protection configuration (REI120). If a configuration without fire protection is desired, then this must be explicitly indicated with (R0).
- If the fire protection designation (R0) is left out when ordering, then fire protection configuration (REI120) is delivered by default.

On-site reinforcement

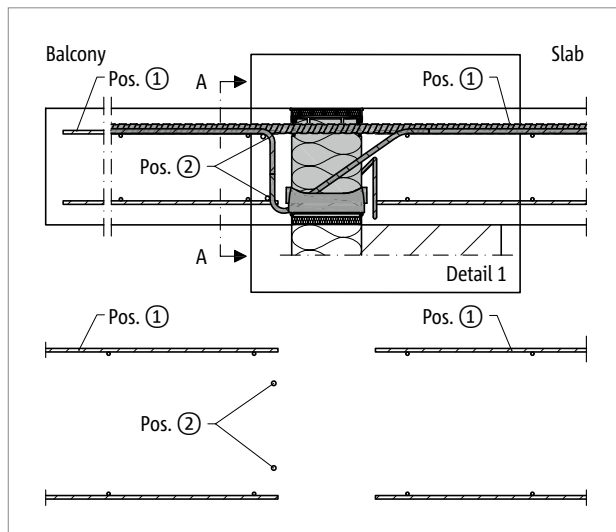


Fig. 39: Schöck Isokorb® CXT type K-E: On site reinforcement; floor edge with wall support

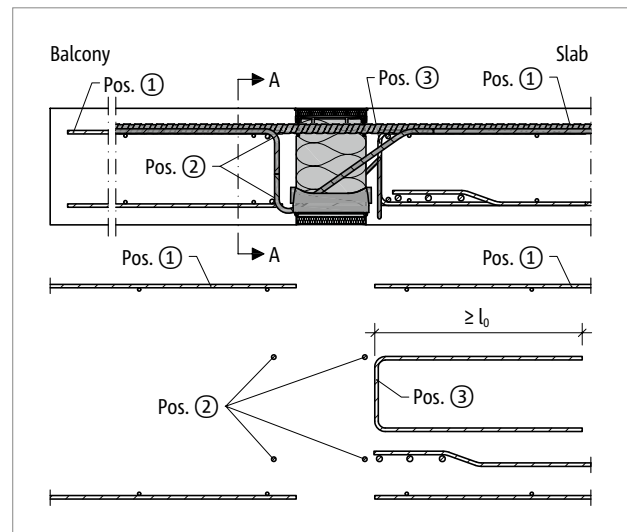


Fig. 40: Schöck Isokorb® CXT type K-E: On-site reinforcement; Floor edge with edge beam

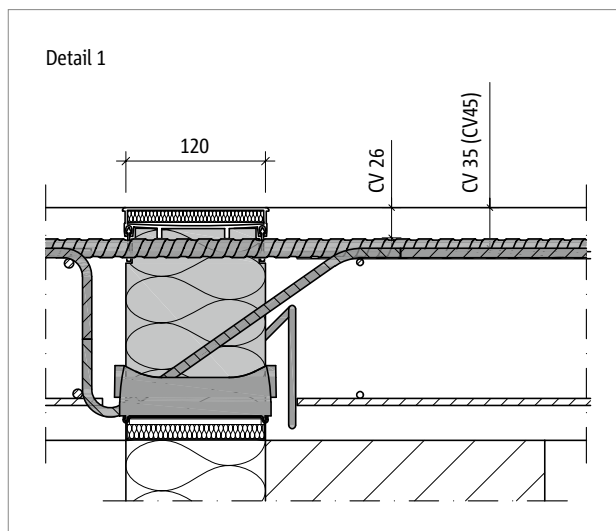


Fig. 41: Schöck Isokorb® CXT type K-E: Concrete cover CV of the tension bars in accordance with the product variants and type designation; the concrete cover CV of the shear force bars is always bigger than the concrete cover of the tension bars

On-site reinforcement

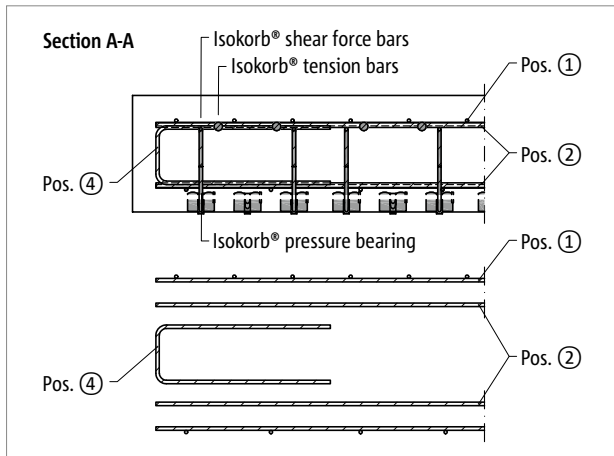


Fig. 42: Schöck Isokorb® CXT type K-E: On-site reinforcement on the balcony side in section A-A; Pos.4 = supplementary edge reinforcement on the free edge perpendicular to the Schöck Isokorb®

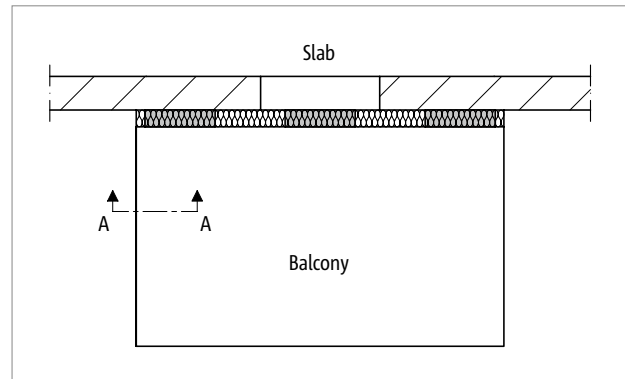


Fig. 43: Schöck Isokorb® CXT type K-E: Visualisation of section line A-A in the balcony layout

Information on side reinforcement

- The side reinforcement of the slab edge parallel to the Schöck Isokorb® is covered on-site by the integrated suspension reinforcement of the Schöck Isokorb®.

On-site reinforcement

Recommendation for the on-site connection reinforcement

Details of the lapping reinforcement for Schöck Isokorb® with a loading of 100 % of the maximum design moment with C25/30; positively selected: a_s lapping reinforcement ≥ a_s Isokorb® tension bars.

Isokorb® CXT type K-E			M1		M2			M3			M4		
			V1	V2	V1	V2	VV1	V1	V2	VV1	V1	V2	VV1
On-site reinforcement	Type of bearing	Height [mm]	Floor (XC1) Concrete strength class ≥ C25/30 Balcony (XC4) Concrete strength class ≥ C30/37										
Overlap reinforcement depending on bar diameter													
Pos. 1 with Ø8 [mm ² /m]	balcony side / floor side	160–250	283	283	522	522	522	603	603	603	685	685	737
Pos. 1 with Ø10 [mm ² /m]			359	359	661	661	661	706	706	706	867	867	933
Steel bars along the insulation joint													
Pos. 2	balcony side / floor side	160–250	According to specification of the structural engineer										
Vertical reinforcement													
Pos. 3	Floor side	160–250	According to specification of the structural engineer										
Supplementary edge reinforcement													
Pos. 4	Balkonseitig/ deckenseitig	160–250	According to BS EN 1992-1-1 (EC2), 9.3.1.4										

Isokorb® CXT type K-E			M5			M6			M7		
			V1	V2	VV1	V1	V2	VV1	V1	V2	VV1
On-site reinforcement	Type of bearing	Height [mm]	Floor (XC1) Concrete strength class ≥ C20/25 Balcony (XC4) Concrete strength class ≥ C35/45								
Overlap reinforcement depending on bar diameter											
Pos. 1 with Ø10 [mm ² /m]	balcony side / floor side	160–250	866	866	866	–	–	–	–	–	–
Pos. 1 with Ø12 [mm ² /m]			1058	1058	1058	1566	1566	1566	1363	1378	1363
Pos. 1 with Ø16 [mm ² /m]			–	–	–	2268	2268	2268	1974	1974	1974
Steel bars along the insulation joint											
Pos. 2	balcony side / floor side	160–250	According to specification of the structural engineer								
Vertical reinforcement											
Pos. 3	Floor side	160–250	According to specification of the structural engineer								
Supplementary edge reinforcement											
Pos. 4	Balkonseitig/ deckenseitig	160–250	According to BS EN 1992-1-1 (EC2), 9.3.1.4								

Information about on-site reinforcement

- Alternative connection reinforcements are possible. The rules as per DS/EN 1992-1-1 (EC2) and DS/EN 1992-1-1/NA apply for calculating the lap length. A reduction of the required lap length using m_{Ed}/m_{Rd} is permitted.
- The reinforcement at the free edges Pos. 4 of the structural component perpendicular to the Schöck Isokorb® should be selected as low as possible so that it can be arranged between the upper and lower reinforcement layer.

i IDock®

- The lateral reinforcement in the area of the overlap joints pos. 3 is not required when combining the Schöck Isokorb® CXT with Schöck IDock®.

Tight fit/Concreting section | Precast/Compression joints

Tight fit/Concreting section

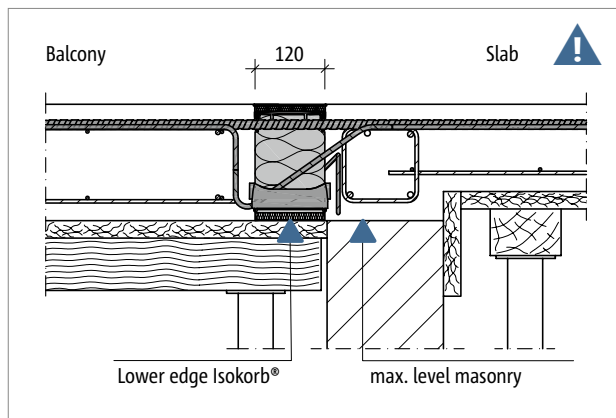


Fig. 44: Schöck Isokorb® CXT type K-E: In-situ concrete construction with height offset floor on masonry wall

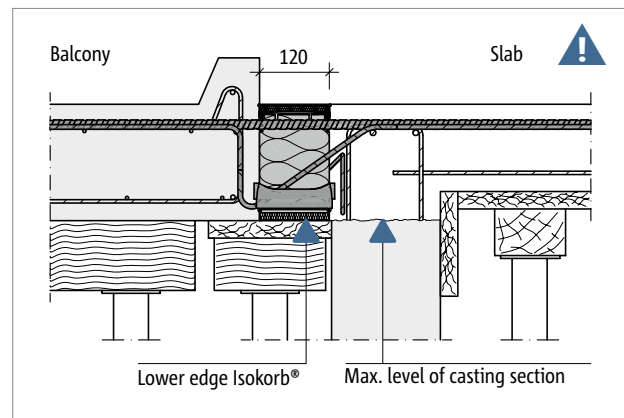


Fig. 45: Schöck Isokorb® CXT type K-E: Fully-finished balcony with height offset floor on reinforced concrete wall

⚠ Hazard note: Tight fit with different height levels

The tight fit of the pressure bearings to the freshly poured concrete is to be ensured, therefore the upper edge of the masonry respectively of the concreting section is to be arranged below the lower edge of the Schöck Isokorb®. This is to be taken into account above all with a different height level between inner slab and balcony.

- The concreting joint and the upper edge of the masonry are to be arranged below the lower edge of the Schöck Isokorb®.
- The position of the concreting section is to be indicated in the formwork and reinforcement drawing.
- The joint planning is to be coordinated between precast concrete plant and construction site.

Precast/Compression joints

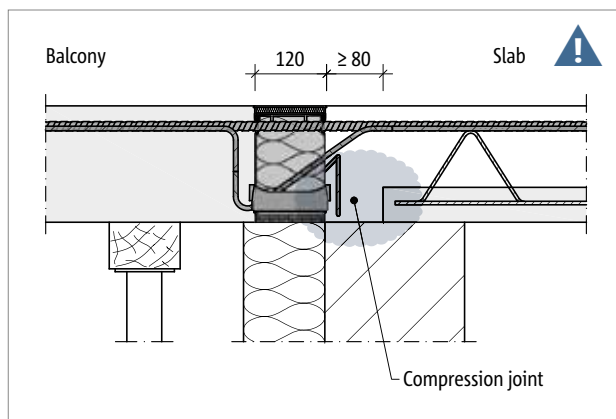


Fig. 46: Schöck Isokorb® CXT type K-E: Installation in conjunction with pre-fabricated slab with wall support, compression joint on the floor side

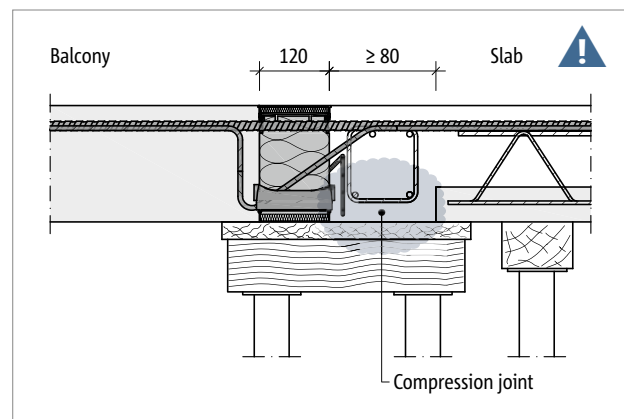


Fig. 47: Schöck Isokorb® CXT type K-E: Installation in conjunction with pre-fabricated slab with edge beams, compression joint on the floor side

⚠ Hazard note: Compression joints

Compression joints are joints which, with unfavourable loading combination, remain always in compression (DS/EN 1992-1-1/NA, NCI to 10.9.4.3(1)). The underside of a cantilever balcony is always a compression zone. If the cantilever balcony is a complete precast part or an element slab, and/or the floor is an element slab, then the definition of the standard is effective.

- Compression joints are to be indicated in the formwork and reinforcement drawing!
- Compression joints between precast parts are always to be grouted using in-situ concrete. This also applies for compression joints with the Schöck Isokorb®!
- With compression joints between precast parts (on the inner slab or balcony side) and the Schöck Isokorb®, a in-situ concrete resp. pour of ≥ 80 mm width is to be cast. This is to be entered in the working drawings.
- We recommend the installation of the Schöck Isokorb® and/or the pouring of the balcony-side compression joint already in the precast concrete plant.

Installation cross sections | Precast construction

Precast part construction - Fully precast balcony IDock1 without edge beams

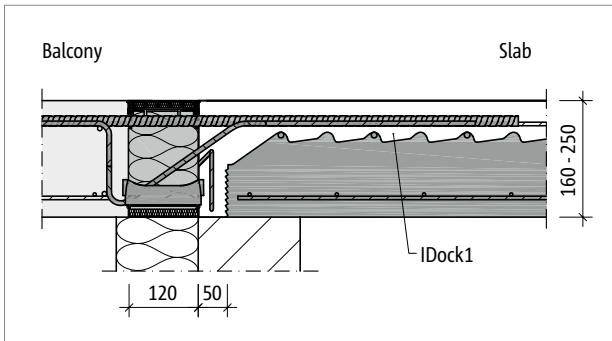


Fig. 48: Schöck Isokorb® CXT type K-E: Connection of balconies with slab thicknesses of 160 mm to 250 mm with IDock1

IDock2 with edge beams

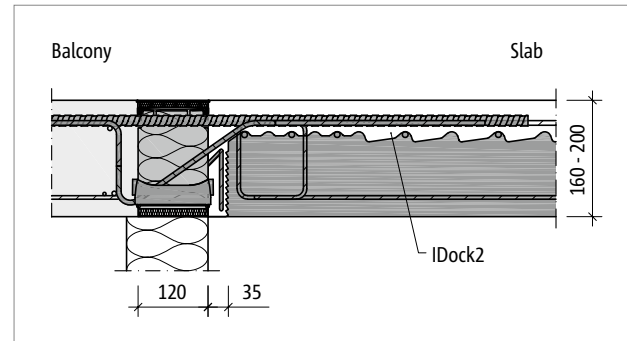


Fig. 49: Schöck Isokorb® CXT type K-E: Connection of balconies with slab thicknesses of 160 mm to 200 mm with IDock2

i Precast part construction

- Schöck Isokorb® CXT type K-E can be used with Schöck IDock® to ensure a flexible organisation of the construction process in new buildings. See page 35 and the Technical Information Schöck IDock®.

Design example

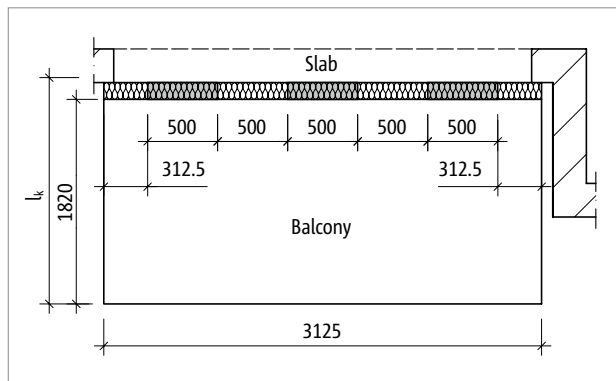


Fig. 50: Schöck Isokorb® CXT type K-E: Static system, layout

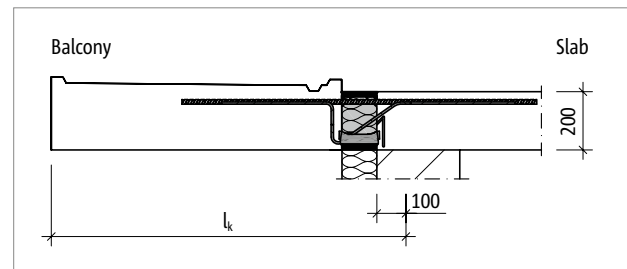


Fig. 51: Schöck Isokorb® CXT type K-E: Static system, cross-section

Static system and load assumptions

Geometry:	Schöck Isokorb® height	$h = 200 \text{ mm}$
	cantilever length	$l_k = 2.04 \text{ m}$
	Average balcony slab thickness	$h = 230 \text{ mm}$
Load assumptions:	balcony slab	$g = 5.75 \text{ kN/m}^2$
	live load	$q = 2.5 \text{ kN/m}^2$
	edge load (balustrade)	$g_R = 1.0 \text{ kN/m}$
Exposure classes:	external	XC 4
	internal	XC 1
chosen:	Concrete strength class	C25/30 for floor
	Concrete strength class	C45/55 for balcony
	Concrete cover c_v	$c_v = 26 \text{ mm}$ for Schöck Isokorb® tension bars
Connection geometry:	no height offset, no floor downstand beam, no balcony upstand	
Support floor:	floor edge directly supported	
Support balcony:	restraint of cantilever slab using CXT type K-E	

Proof of limits of load-bearing capacity (moment stress and shear force)

The calculation takes into account the gaps shown in the above drawing with the proportion of the balcony length to the length of the connection with Isokorb® (= 3.125 m / 1.50 m).

Internal forces:

$$m_{Ed} = -(0.5 \cdot [3.125 \cdot (\gamma_G \cdot g + \gamma_Q \cdot q) + 2 \cdot \gamma_G \cdot g_R] \cdot l_k^2 + 3.125 \cdot \gamma_G \cdot g_R \cdot l_k) / 1.50$$

$$m_{Ed} = -(0.5 \cdot [3.125 \cdot (1.0 \cdot 5.75 + 1.5 \cdot 2.5) + 2 \cdot 1.0 \cdot 1.0] \cdot 2.04^2 + 3.125 \cdot 1.0 \cdot 1.0 \cdot 2.04) / 1.50$$

$$= -48.2 \text{ kNm/m}$$

$$V_{Ed} = +([3.125 \cdot [(\gamma_G \cdot g + \gamma_Q \cdot q) + 2 \cdot \gamma_G \cdot g_R] \cdot l_k + 3.125 \cdot \gamma_G \cdot g_R]) / 1.50$$

$$V_{Ed} = +([3.125 \cdot [(1.2 \cdot 5.75 + 1.5 \cdot 4.0) + 2 \cdot 1.2 \cdot 1.0] \cdot 2.04 + 3.125 \cdot 1.2 \cdot 1.0]) / 1.50$$

$$= +45.2 \text{ kN/m}$$

Selected: **3 pieces of Schöck Isokorb® CXT type K-E-M6-V1-REI120-CV26-H200-L500**

$$m_{Rd} = -54.1 \text{ kNm/m (see page 37)} > m_{Ed}$$

$$V_{Rd} = +96.1 \text{ kN/m (see page 37)} > V_{Ed}$$

Design example

Proof of ultimate limit state (deflection/precamber, vibrations)

The calculation takes into account the gaps shown in the above drawing with the proportion of the balcony length to the length of the connection with Isokorb® (= 3.125 m / 1.50 m).

Torsion spring stiffness: $C = 6992 \text{ kNm/rad/m}$ (from table, see page 38)

Quasi-state load combination: $g + 0.3 \cdot q$

(Recommendation for the calculation of the precamber from Schöck Isokorb®)

$M_{Ed,GZG}$ Determine in ultimate limit state

$$M_{Ed,GZG} = -(0.5 \cdot [3.125 \cdot (g + \psi_{2,i} \cdot q) + 2 \cdot g_R] \cdot l_k^2 + 3.125 \cdot g_R \cdot l_k) / 1.50$$

$$M_{Ed,GZG} = -(0.5 \cdot [3.125 \cdot (5.75 + 0.3 \cdot 2.5) + 2 \cdot 1.0] \cdot 2.04^2 + 3.125 \cdot 1.0 \cdot 2.04) / 1.50$$

$$= -35.2 \text{ kNm/m}$$

Deflection $w_{ii} = |M_{Ed,GZG}| / C \cdot l_k \cdot 10^3 \text{ [mm]}$

$$w_{ii} = 35.2 / 6992 \cdot 2.04 \cdot 10^3 = 10.3 \text{ mm}$$

Natural frequency $f_e = \sqrt{(0.384 \cdot 10^3 / 10.3)} = 6.1 \text{ Hz} > 6 \text{ Hz}$

=> no disruptive vibrations

Layout of expansion joints Length of balcony: $3.125 \text{ m} < 11.30 \text{ m}$

=> no expansion joints required

✓ Check list

- Is the same height level planned for the balcony and floor in relation to the upper edges of the shell?
- For fully precast balconies, are any necessary gaps for the frontal transport anchors and rainwater downpipes for internal drainage taken into account?
- Have the loads on the Schöck Isokorb® connection been specified at design level?
- Has the cantilevered system length or the system support width been taken as a basis?
- Has the additional proportionate deflection resulting from the Schöck Isokorb® been taken into account?
- Is the drainage direction taken into account with the resulting camber information? Is the degree of camber entered in the working drawings?
- Is the minimum slab thickness H_{\min} for the respective Schöck Isokorb® type taken into account?
- Are the recommendations for the limitation of the slenderness observed?
- Are the maximum allowable expansion joint spacings taken into account?
- Are the Schöck FEM guidelines taken into account with the calculation using FEM?
- Is the relevant concrete strength class taken into account when selecting the design and calculation table?
- Are the requirements with regard to fire protection explained and is the appropriate addendum entered in the Isokorb® type description in the implementation plans?
- Have the requirements for on-site reinforcement of connections been defined in each case?
- Has a soft elastic joint been taken into account between the upper edge of the facing shell and the balcony?
- Is the type designation of the Schöck Isokorb® explicit in the plans? - Example: Schöck Isokorb® CXT type K-E-M6-V1-REI120-CV26-H200-L1000

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