Schöck Isokorb®

Technical Information

Schöck Isokorb® for steel structures

May 2021

Telephone hotline for design support services
Telephone: +47 31 30 25 00
Fax +47 31 30 25 01
post@haucon.no

Planning tools – downloads and requests
Telephone: +47 31 30 25 00
Fax +47 31 30 25 01
post@haucon.no
www.schoeck.com

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:

HauCon Norge AS
Johan Follestads vei 3
3474 Åros

Design support services at HauCon

Tel.: +47 31 30 25 00
Fax: +47 31 30 25 01
post@haucon.no

Downloads and requests

post@haucon.no
www.schoeck.com

Notes | Symbols

Technical Information

- This Technical Information on the respective product application is valid only if complete and therefore may only be reproduced as a whole. With texts and graphics published solely as extracts there is a danger of communicating insufficient or even misleading information. Therefore dissemination is the sole responsibility of the user or the person carrying out the process!
- This technical information is valid solely for Norway 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/no/home

Special constructions - bending of reinforcement

Some connection situations cannot be realised with those standard product variants presented in this Technical Information. In this case special constructions can be requested from the application engineering department (for contact see page 3.) This applies, for example, with additional requirements as a result of prefabricated component construction (limitation due to manufacturing constraints or through transport width), which can possibly be met using coupler bars. The bending of bars required for special constructions are carried out in the factory in each case on the individual steel bar. With this, it is monitored and ensured that the conditions of the general building supervisory approvals and of NS EN 1992 1-1 (EC2) and NS EN 1992-1-1/NA are observed with regard to bending of reinforcing steel.

Attention: If reinforcing steel in the Schöck Isokorb is bent or bent and bent back on-site, the observation and the monitoring o the respective conditions lie outside the ifluence of Schöck Bauteile GmbH. Therefore, in such cases, the warranty is invalidated.

Note on shortening threaded rods

The threaded rods may be shortened on site provided at least two threads remain visible after installation, levelling and final tightening of the balcony structure. Nuts must be re-checked after cutting to ensure they have remained fully tightened.

Tags

Hazard note

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

Info

The square with “i” indicates important information which must be read in conjuction with the design.

Check list

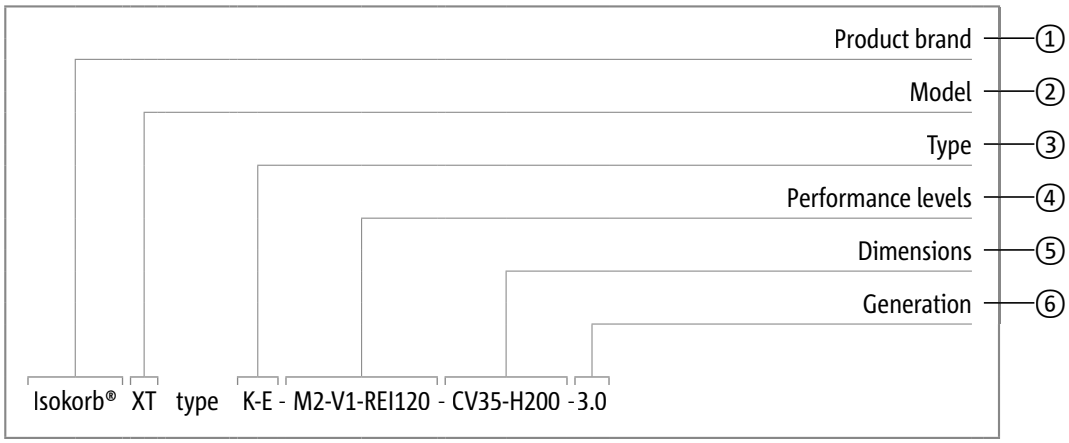
The square with tick indicates the check list. Here the essential points of the design are summarised.

Table of Contents

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.

The type designation has a strict structure. However, the order of the name components always remains the same.



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

① Product brand

Schöck Isokorb®

② Model

In the future, the model name will be an integral part of the name of every Isokorb®. It stands for a core property of the product. The corresponding abbreviation is always placed before the word type.

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

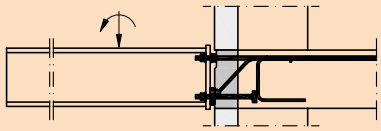
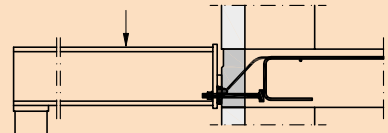
The following name components are part of the dimensions:

- Concrete cover CV
- Bond length LR, bond height HR
- Insulation element height H, length L, width B
- Diameter of thread D

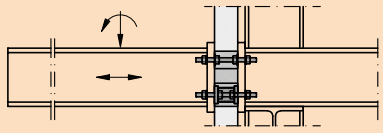
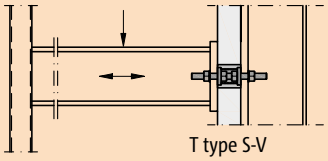
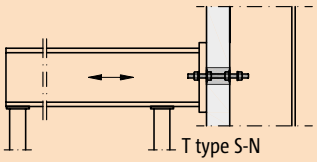
⑥ Generation

Each type designation ends with the generation number.

Type overview steel – reinforced concrete

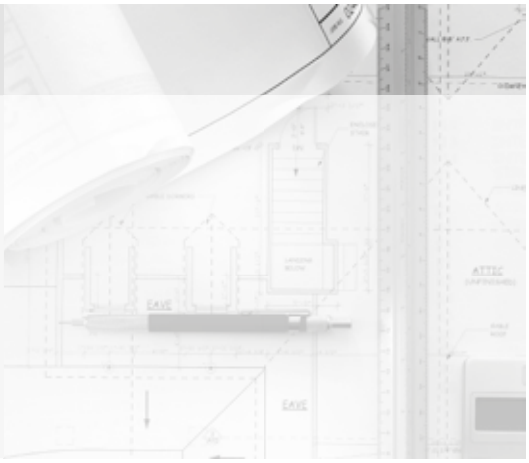
Application	Production type	Schöck Isokorb® type
Free cantilevered balconies on reinforced concrete on reinforced concrete structures		
 T type SK		**T type SK** Page 17
Supported steel balconies on reinforced concrete structures		
 T type SQ		**T type SQ** Page 51

Type overview steel – steel

Application	Production type	Schöck Isokorb® type
Free cantilevered steel structures		
 T type S		**T type S** Page 71
Supported steel structures (two supports)		
 T type S-V		**T type S-V** Page 71
Supported steel structures (four supports)		
 T type S-N		**T type S-N** Page 71

Fire protection

Steel – reinforced concrete



Fire protection

Isokorb® fire protection configuration in connection with steel structure structures

The Schöck Isokorb® for connecting steel constructions to reinforced concrete constructions or to steel constructions is delivered without fire protection, as fire protection plates that are already mounted on the product interfere with adjustability.
Fire-resistant cladding of the Schöck Isokorb® must be planned and installed on site. The same on-site fire safety measures apply as for the overall load-bearing structure.
Two design variants are possible for fire protection requirements on the steel structure:

- The entire structure can be clad on site using fire protection boards. Board thickness is dependent on the requisite fire protection class.
  The board cladding is either to be led through the insulation layer or the cladding of the steel structure is to overlap the cladding of the Schöck Isokorb® by 30 mm.
- The steel structure including the outer threaded rods is painted with a fire protection coating. In addition to this the Schöck Isokorb® is clad on site with fire protection boards of the appropriate thickness.

Requirements on the fire protection material:

- Thermal conductivity λ_p 0.11 [W/(m·K)]
- Specific thermal conductivity c_p 950 [J/kgK]
- Bulk density ρ 450 [kg/m³]

To achieve the fire resistance duration R according to BS EN 1993-2-1 the following board thicknesses t and following anchoring depths t_E are required:

On site fire protection cladding [mm]		
Fire protection class	**Board thickness t [mm]**	**Anchoring depth t_E [mm]**
R30	15	10
R60	20	15
R90	25	20
R120	30	25

Fire protection

On site fire protection implementation Schöck Isokorb® T type SK, SQ

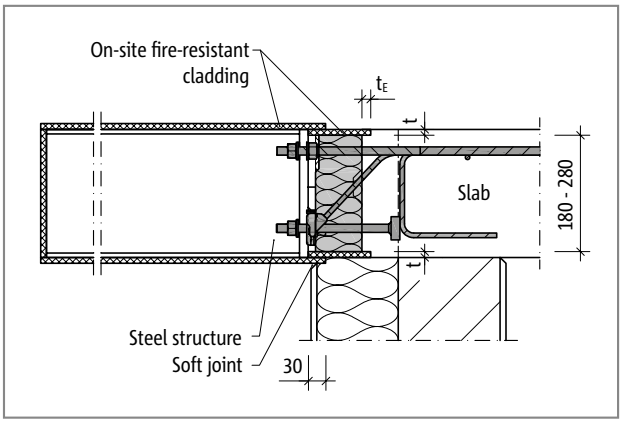


Fig. 1: Schöck Isokorb® T type SK: on site fire-resistant cladding T type SK and steel structure; cross section

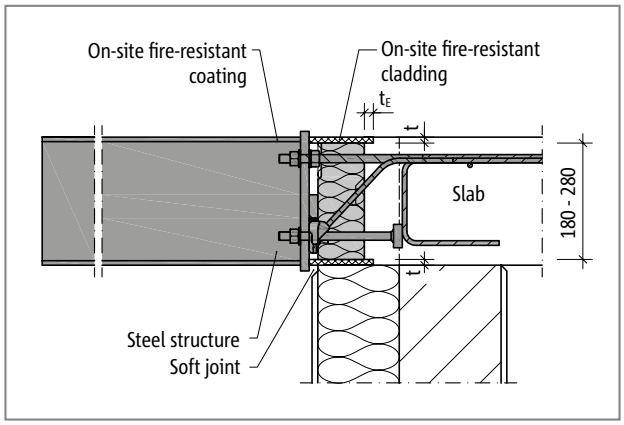


Fig. 2: Schöck Isokorb® T type SK: on site fire-resistant cladding of the connection when using steel structures with fire-resistant coating; cross-section

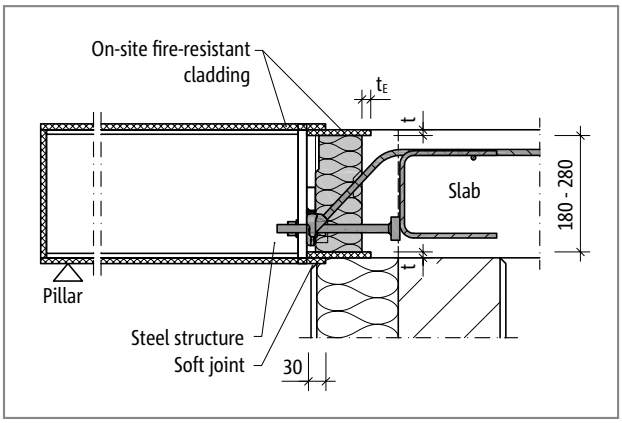


Fig. 3: Schöck Isokorb® T type SQ: on site fire-resistant cladding T type SQ and steel structure; cross-section

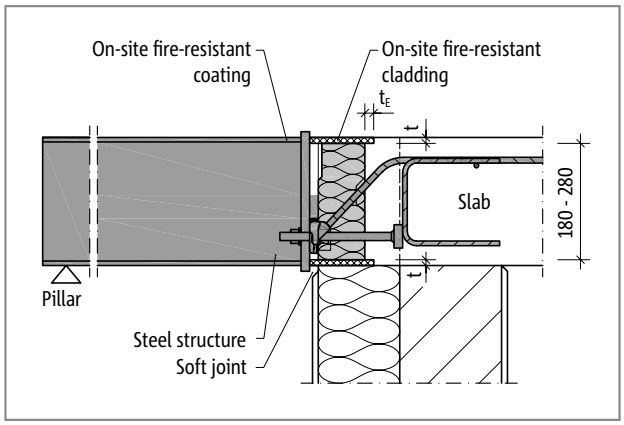


Fig. 4: Schöck Isokorb® T type SQ: on site fire-resistant cladding of the connection when using steel structures with fire-resistant coating; cross-section

Fire protection

- The selected structure is to be agreed with the project fire expert.

On-site fire resistance

On-site fire protection implementation Schöck Isokorb® T type S

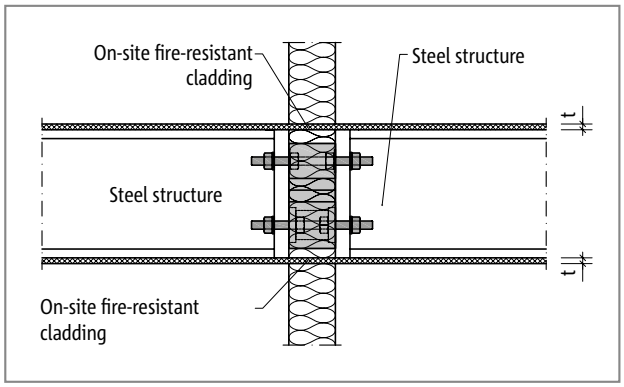


Fig. 5: Fire protection Schöck Isokorb® T type S: On-site fire protection cladding for flush front plates; section

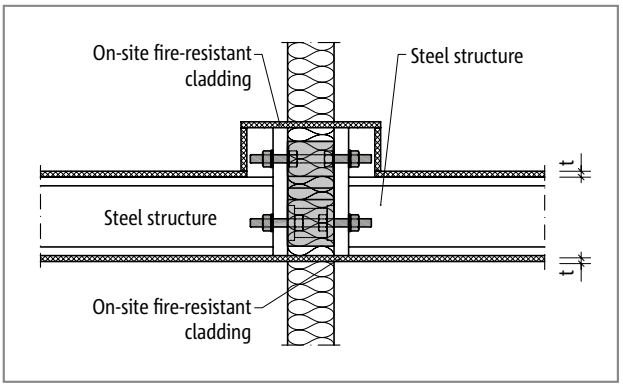


Fig. 6: Fire protection Schöck Isokorb® T type S: On-site fire protection cladding for overlaying face plates; section

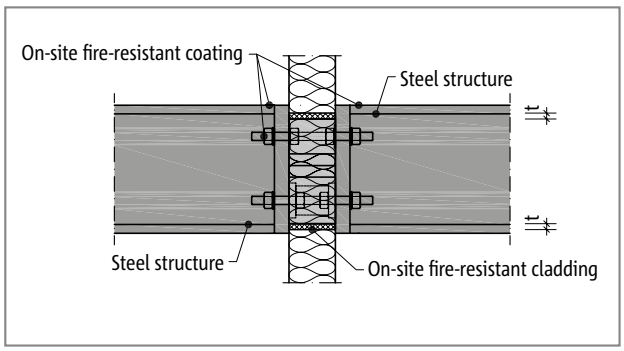


Fig. 7: Fire protection Schöck Isokorb® T type S: On-site fire protection cladding T type S, fire protection coated steel structure; section

Fire protection

- The selected structure is to be agreed with the project fire expert.

Fire protection

Steel – reinforced concrete

Construction materials | Corrosion protection

Schöck Isokorb® construction materials

Concrete steel	B500B according to BS 488-1, BSt 500 NR according to the general building supervisory approval
Thrust bearing in the concrete	S 235 JRG2 according to BS EN 10025-2 for the pressure plates
Stainless steel	Material No.: 1.4401, 1.4404, 1.4362, 1.4462 and 1.4571, according to Approval No.: Z-30.3-6 Structural components and securing means made from stainless steel or BSt 500 NR flat slab steel S690 for the tension and compression bars
Pressure plate	Grade: 1.4404, 1.4362 and 1.4571 or higher, e.g. 1.4462
Spacer shims	Grade: 1.4401 S 235, thickness: 2 mm and 3 mm, length: 180 mm, width: 15 mm
Insulating material	Neopor® - this polystyrene hard foam is a registered trademark of BASF, λ = 0.031 W/(m•K), building material classification B1 (flame retardant)

Connected components

Reinforcing steel	B500A or B500B as per BS 4449
Concrete	Minimum concrete on the internal slab side; concrete grade ≥ C 25/30
Structural steel	Minimum S 235 on the balcony side; strength class, structural design and corrosion protection as specified by the structural engineer

Anti-corrosion protection

The stainless steel used in the Schöck Isokorb® T type SK, SQ corresponds to material Nos. 1.4401, 1.4404, 1.4482 or 1.4571. The corrosion protection of these types of steel, for all uses, is specified in NS DIN EN 1993-1-4, Table A.1.
Connections of Schöck Isokorb® T type SK, SQ in conjunction with a steel end-plate that has been galvanised or coated with anti-corrosion protectionare not at risk of bimetallic corrosion. As far as connections using Schöck Isokorb® type SK, SQ are concerned,the surface area of the lower-grade material (steel end-plate) is much larger than that of the stainless steel (bolts, washers and saddle plate), failure of the connection due to bimetallic corrosion is excluded

i Note on shortening threaded rods

The threaded rods may be shortened on site provided at least two threads remain visible after installation, levelling and final tightening of the balcony structure. Nuts must be re-checked after cutting to ensure they have remained fully tightened.

Schöck Isokorb® T type SK

Schöck Isokorb® T type SK
Suitable for cantilevered steel balconies and canopies. It transfers negative moments and positive shear forces. Schöck Isokorb® T types SK-MM2 and SK-MM1 transfer positive or negative moments and shear forces.

Element arrangement | Installation cross sections

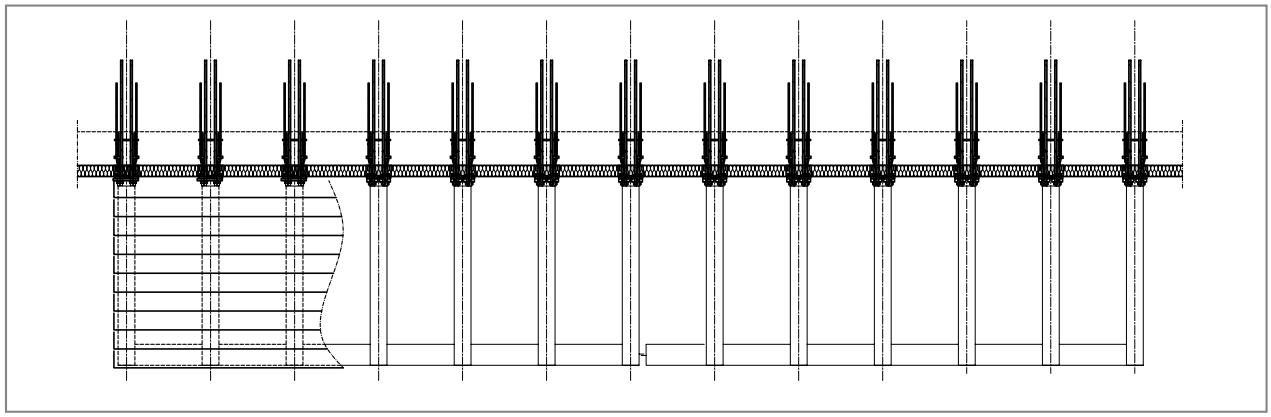


Fig. 8: Schöck Isokorb® T type SK: Balcony freely cantilevered

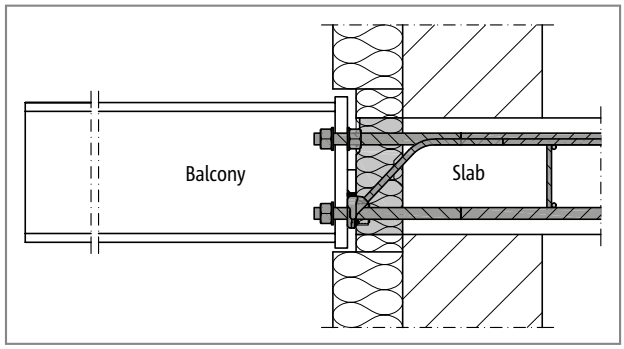


Fig. 9: Schöck Isokorb® T type SK: Connection to the reinforced concrete floor; insulating element within the outer insulation

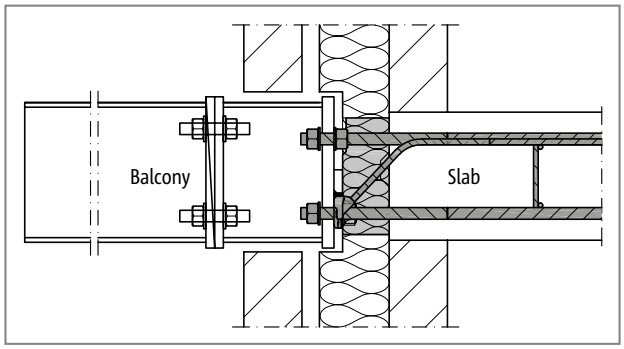


Fig. 10: Schöck Isokorb® T type SK: Insulating element within the core insulation; on-site adapter between the Isokorb® and the balconyto enable flexible installation

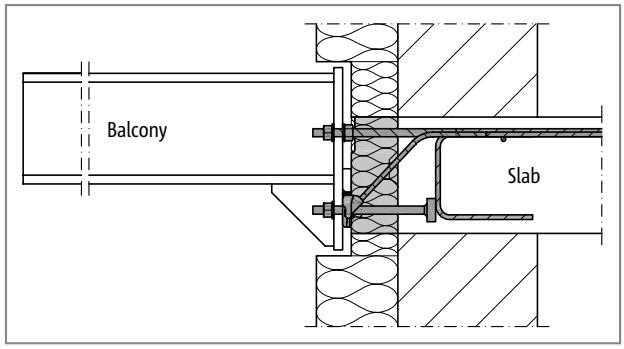


Fig. 11: Isokorb® T type SK:Barrier-free access due to height offsetoffset

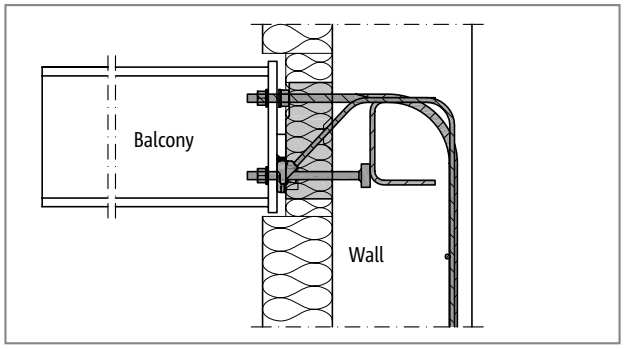


Fig. 12: Schöck Isokorb® T type SK-WU-M1: Special construction for wall connection on the basis of the shear force bearing levels M1 for wall thicknesses from 200 mm

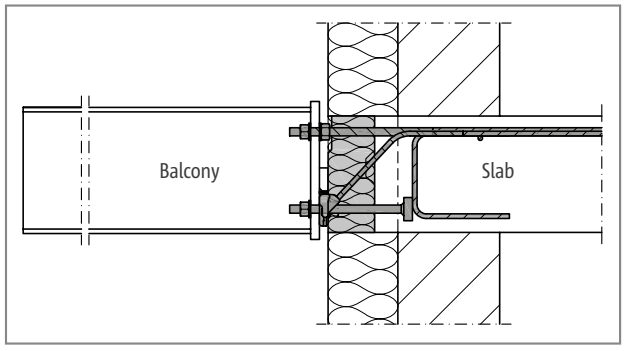


Fig. 13: Schöck Isokorb® T type SK: With the aid of the floor extension, the insulating element ends flush with the wall insulation; the spacing at the edges must be taken into consideration.

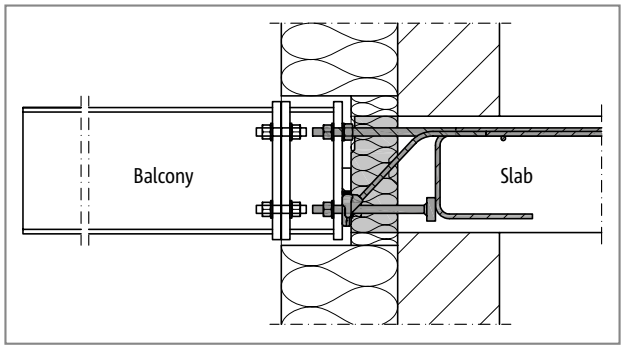


Fig. 14: Schöck Isokorb® T type SK: Connection of the steel member to an adapter that equalises the thickness of the outer insulation

Product selection | Type designations | Special designs

Schöck Isokorb® T type SK variants

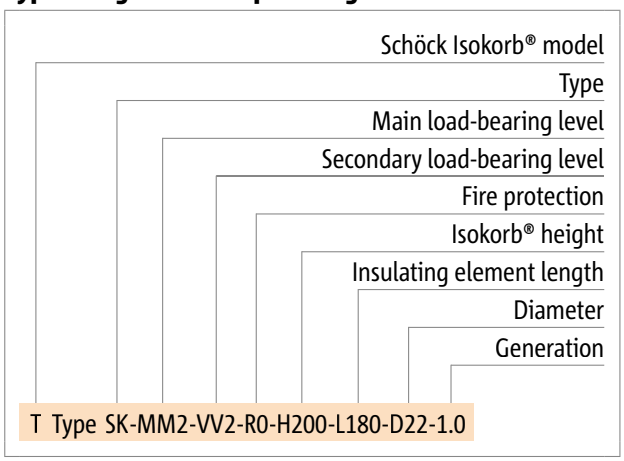
The configuration of the Schöck Isokorb® T type SK can be varied as follows:

- Main load-bearing level:
  Moment load-bearing level M1, MM1, MM2
- Secondary load-bearing level:
  for main load-bearing level M1: Shear force load-bearing level V1, V2
  for main load-bearing level MM1: Shear force load-bearing level VV1
  for main load-bearing level MM2: Shear force load-bearing level VV1, VV2
- Fire resistance class:
  R0
- Isokorb® Height:
  According to approval H = 180 mm to H = 280 mm, graduated in 10-mm steps
- Isokorb® length:
  L180 = 180 mm
- Thread diameter:
  D16 = M16 for main load-bearing level M1, MM1
  D22 = M22 for main load-bearing level MM2
- Generation:
  1.0

Installation aid T type SK variants

The configuration of the Schöck installation aid T type SK can vary as follows:
Main load-bearing level:
Moment load-bearing level T type SK-M1, T type SK-MM1
Moment load-bearing level T type SK-MM2
The installation aid T type SK-M1 H180-280 and T type SK-MM2 H180-280 respectively are only available in height h = 260 mm, depiction see page 31. With this, the Schöck Isokorb® T type SK can be installed in the H180 to H280 versions. The installation aid T type SK-M1 H180-280 is also available for moment load-bearing level MM1.

Type designations in planning documents



Special designs

Please contact the design support department if you have connections that are not possible with the standard product variants shown in this information (contact details on page 3).

Design force direction | Design

Direction of forces

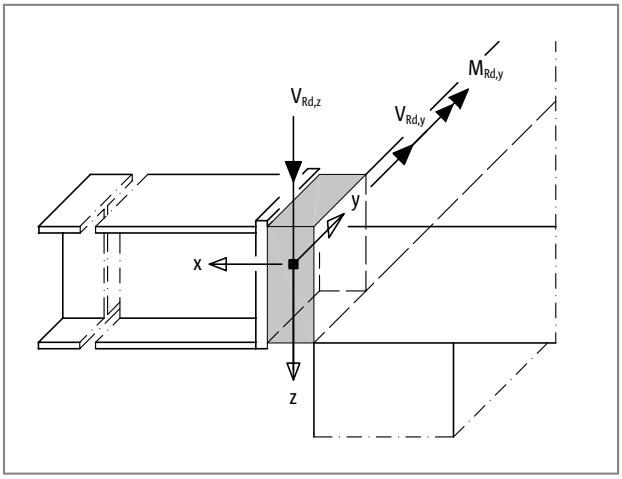


Fig. 15: Schöck Isokorb® T type SK: Direction of internal forces and moments

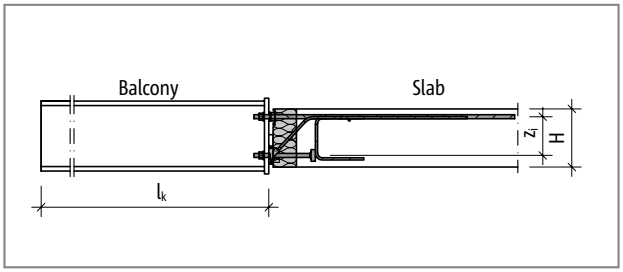


Fig. 16: Schöck Isokorb® T type SK: Structural system; Design values refer to the presented cantilever length l_k

Notes on design

- Potential applications for the Schöck Isokorb® encompass floor and balcony slab structures with predominantly static and evenly distributed live loads as per BS EN 1991-1-1/NA, Table 6.1.
- Static evidence must be furnished for the components connecting to both sides of the Isokorb®.
- A minimum of two Schöck Isokorb® T type SK must be installed per balcony structure. The balcony structure must be designed in such a way to prevent torsion being transferred into an individual Isokorb®. Schöck Isokorb® T type SK are unable to transfer any torsion (i.e. any moment $M_{Ed,x}$).
- When using an indirect bearing solution for the Schöck Isokorb® T type SK, the structural engineer must provide evidence, in particular, of the load transfer in the reinforced concrete component.
- Design values are taken in relation to the rear edge of the fixing plate
- The nominal dimension c_{nom} of the concrete cover as per BS EN 1992-1-1 (EC2), 4.4.1 and BS EN 1992-1-1/NA is 20 mm for internal areas.
- All Isokorb® T type SK variants can transfer positive shear forces. Types MM1 or MM2 must be selected for negative (uplifting) shear forces.
- When addressing the uplifting forces on steel balconies or canopies, two type SK-MM1-VV1 Isokorbs® T are often sufficient, even if the overall design requires further T type SK.

Inner lever arm

Schöck Isokorb® T type SK		M1, MM1	MM2
Inner cantilever when		z_i [mm]	
Isokorb® height H [mm]	180	113	108
	200	133	128
	220	153	148
	240	173	168
	260	193	188
	280	213	208

Design

Design with positive shear force and negative moment

Schöck Isokorb® T type SK		M1-V1, MM1-VV1			M1-V2		
Design values with		Concrete strength class ≥ C25/30					
		$V_{Rd,z}$ [kN/element]					
		10	20	30	30	40	45
		$M_{Rd,y}$ [kNm/element]					
Isokorb® height H [mm]	180	-11.0	-9.9	-8.9	-8.9	-7.8	-7.3
	200	-12.9	-11.7	-10.4	-10.4	-9.2	-8.5
	220	-14.9	-13.4	-12.0	-12.0	-10.5	-9.8
	240	-16.8	-15.2	-13.6	-13.6	-11.9	-11.1
	260	-18.7	-16.9	-15.1	-15.1	-13.3	-12.4
	280	-20.7	-18.7	-16.7	-16.7	-14.7	-13.7
		$V_{Rd,y}$ [kN/element]					
	180–280	±2.5			±4.0		

Design with negative shear force and positive moment

Schöck Isokorb® T type SK		MM1-VV1
Design values with		Concrete strength class ≥ C25/30
		$M_{Rd,y}$ [kNm/element]
Isokorb® height H [mm]	180	9.8
	200	11.5
	220	13.2
	240	14.9
	260	16.7
	280	18.4
		$V_{Rd,z}$ [kN/element]
	180–280	-12.0
		$V_{Rd,y}$ [kN/element]
	180–280	±2.5

Schöck Isokorb® T type SK	M1-V1, MM1-VV1	M1-V2
Isokorb® length [mm]	180	180
Tension bars	2 ⌀ 14	2 ⌀ 14
Shear force bars	2 ⌀ 8	2 ⌀ 10
Pressure bearing / compression bars	2 ⌀ 14	2 ⌀ 14
Thread	M16	M16

Notes on design

The applied moment capacity $M_{Rd,y}$ is dictated by the applied shear forces $V_{Rd,Z}$ and $V_{Rd,y}$. Intermediate values can be determined by linear interpolation. Extrapolation in the range of smaller shear force is not permissible.

- The maximum design values of the individual shear force load-bearing levele are to be observed:
  V1, VV1: max. $V_{Rd,z}$ = 30.9 kN
  V2: max. $V_{Rd,z}$ = 48.3 kN
- Edge and centre-to-centre distances are to be observed, see pages 27 and 28.
- See torsion spring stiffness page 25.

Design

Design with positive shear force and negative moment

Schöck Isokorb® T type SK		MM2-VV1			MM2-VV2		
Design values with		Concrete strength class ≥ C25/30					
		$V_{Rd,z}$ [kN/element]					
		25	35	45	45	55	65
		$M_{Rd,y}$ [kNm/element]					
Isokorb® height H [mm]	180	-22.6	-21.6	-20.6	-20.6	-19.6	-18.6
	200	-26.8	-25.6	-24.4	-24.4	-23.2	-22.0
	220	-31.0	-29.6	-28.2	-28.2	-26.8	-25.4
	240	-35.2	-33.6	-32.1	-32.1	-30.4	-28.9
	260	-39.4	-37.6	-35.9	-35.9	-34.1	-32.3
	280	-43.6	-41.6	-39.7	-39.7	-37.7	-35.7
		$V_{Rd,y}$ [kN/element]					
	180–280	±4.0			±6.5		

Design with negative shear force and positive moment

Schöck Isokorb® T type SK		MM2-VV1	MM2-VV2
Design values with		Concrete strength class ≥ C25/30	
		$M_{Rd,y}$ [kNm/element]	
Isokorb® height H [mm]	180	11.7	11.0
	200	13.8	13.0
	220	16.0	15.0
	240	18.1	17.0
	260	20.3	19.1
	280	22.5	21.1
		$V_{Rd,z}$ [kN/element]	
	180–280	-12.0	
		$V_{Rd,y}$ [kN/element]	
	180–280	±4.0	±6.5

Schöck Isokorb® T type SK	MM2-VV1	MM2-VV2
Isokorb® length [mm]	180	180
Tension bars	2 ⌀ 20	2 ⌀ 20
Shear force bars	2 ⌀ 10	2 ⌀ 12
Compression bars	2 ⌀ 20	2 ⌀ 20
Thread	M22	M22

Notes on design

The applied moment capacity $M_{Rd,y}$ is dictated by the applied shear forces $V_{Rd,Z}$ and $V_{Rd,y}$. Intermediate values can be determined by linear interpolation. Extrapolation in the range of smaller shear force is not permissible.

- The maximum design values of the individual shear force load-bearing levele are to be observed:
  VV1: max. $V_{Rd,z}$ = 48.3 kN
  VV2: max. $V_{Rd,z}$ = 69.5 kN
- Edge and centre-to-centre distances are to be observed, see pages 27 and 28.
- See torsion spring stiffness page 25.

Deflection/Camber | Deflection

Deflection

The torsion spring values C [kNm/rad] shown in the table result from the deformation of the Schöck Isokorb® in the ultimate limit state as a result of a moment loading of the Isokorb®. They serve for the estimation of the required camber. The calculated camber of the balcony results from the deformation of the steel construction plus the deformation of the Schöck Isokorb®. The camber of the balcony construction to be stated in the implementation plans by the engineer in charge (basis: calculated overall deformation from cantilevered slab + floor angle of rotation + Schöck Isokorb®) should be so rounded that the planned drainage direction is maintained (round up: With drainage towards the building facade, round down: With drainage towards the end of the cantilevered slab).

Deformation ($w_ü$) caused by Schöck Isokorb®

$w_ü$ = $|M_{Ed,QP}|/C \cdot l_k \cdot 10^3$ [mm]

Factors to be incorporated:

$M_{Ed,QP}$ = Bending moment [kNm] in the serviceability limit state, under quasi-permanent load, for the determination of the deformation $w_ü$ [mm] from the Schöck Isokorb®.
The structural engineer specifies the load combination to be used when calculating the deformation
(Recommendation: Quasi-permanent combination for the determination of the camber $w_ü$: $g + 0.3 \cdot q$)

C = Insert value from table [kNm/rad]

l_k = Cantilever length [m]

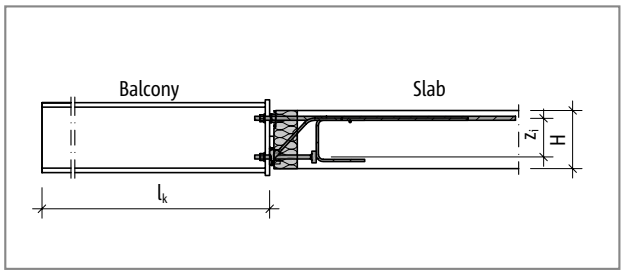


Fig. 17: Schöck Isokorb® T type SK: Structural system; Design values refer to the presented cantilever length l_k

Notes on deflection

See torsion spring stiffness page 25.

Torsional spring stiffness

Spring values

The spring values of the Schöck Isokorb® must be considered for verifications in serviceability limit state. To the extent that an examination of the vibration behaviour of the steel structure to be connected is necessary, the additional deformation resulting from the Schöck Isokorb® must be taken into consideration.

Schöck Isokorb® T type SK		M1, MM1	MM2
Torsion spring stiffness for		C [kNm/rad]	
Isokorb® height H [mm]	180	1906	3007
	200	2640	4223
	220	3494	5646
	240	4468	7275
	260	5560	9111
	280	6772	11152

Expansion joint spacing

Maximum expansion joint spacing

Expansion joints must be provided in the external component. Changes in length due to temperature deformation are determined by the maximum distance (e) from the centre of the outermost Schöck Isokorb® T type SK. The balcony structure may overhang the outermost Schöck Isokorb® element. In the case of fixed points, such as corners, half the maximum distance (e) from the fixed point applies. The calculation of the permissible expansion joint spacing is based on a reinforced concrete balcony slab that is securely connected to the steel members. If design measures have been implemented to ensure there is movement between the balcony slab and the individual steel members, then only the distances of the non-moving connections are relevant, see detail.

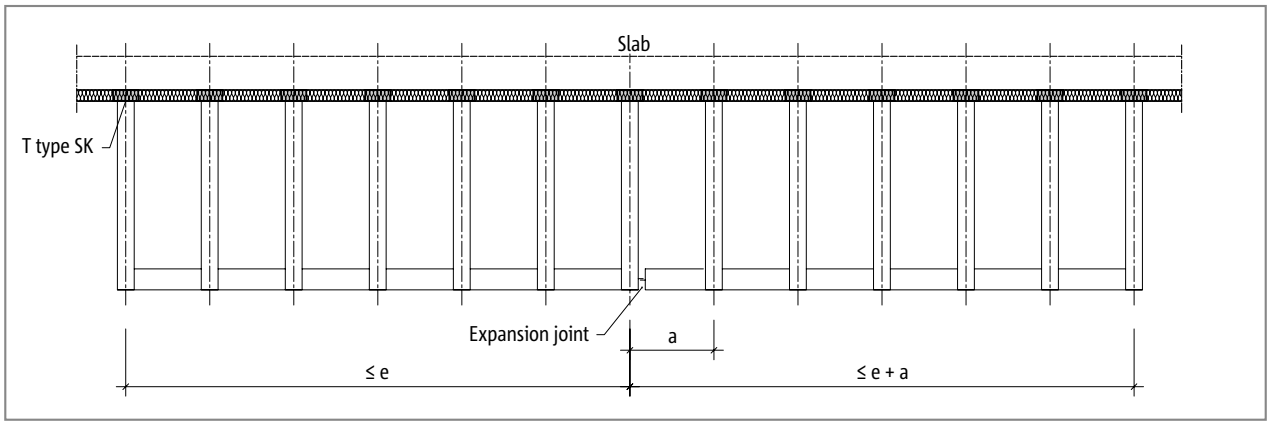


Fig. 18: Schöck Isokorb® T type SK: Maximum expansion joint spacing e

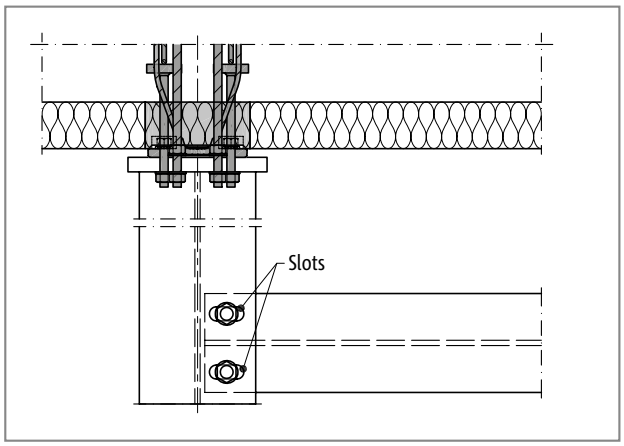


Fig. 19: Schöck Isokorb® T type SK: Expansion joint detail to ensure movement during temperature expansion

Schöck Isokorb® T type SK		M1, MM1	MM2
Maximum expansion joint spacing when		e [m]	
Insulating element thickness [mm]	80	5.7	3.5

Expansion joints

- Provided that the expansion joint detail permanently allows temperature-dependent displacements of the projecting transverse beam, the expansion joint distance may be extended to a maximum of e + a.

Edge spacing

Edge spacing

The Schöck Isokorb® T type SK must be so positioned that minimum edge distances with regard to the inner reinforced concrete structural elements are maintained:

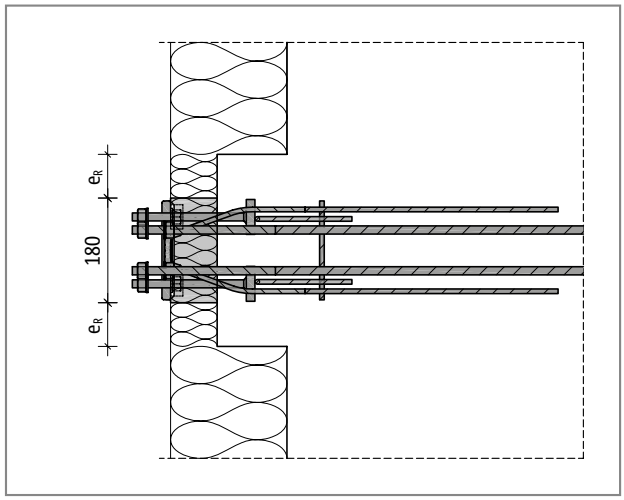


Fig. 20: Schöck Isokorb® T type SK: Edge distances

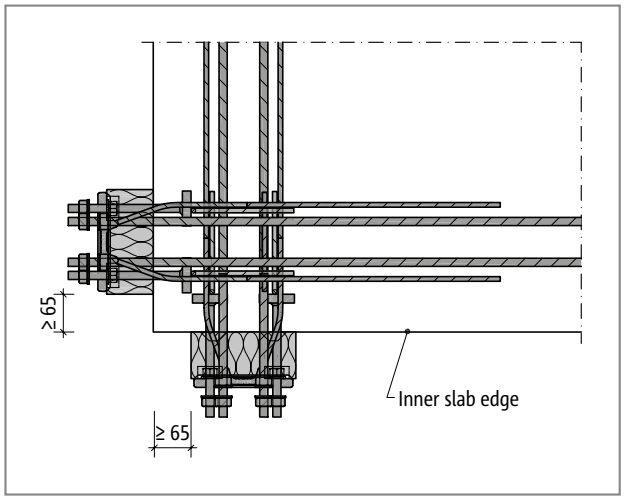


Fig. 21: Schöck Isokorb® T type SK: Edge distances at the outer corner with Isokorbs® arranged vertically to each other

Acceptable shear force $V_{Rd,z}$ depending on the edge distance

Schöck Isokorb® T type SK		M1-V1	M1-V2	MM1-VV1	MM2-VV1	MM2-VV2
Design values with		Concrete strength class ≥ C25/30				
Isokorb® height H [mm]	Edge distance e_R [mm]	$V_{Rd,z}$ [kN/element]				
180 - 190	30 ≤ e_R < 74	14.2	20.4	14.2	21.3	28.5
200 - 210	30 ≤ e_R < 81					
220 - 230	30 ≤ e_R < 88					
240 - 280	30 ≤ e_R < 95					
180 - 190	e_R ≥ 74	No reduction required				
200 - 210	e_R ≥ 81					
220 - 230	e_R ≥ 88					
240 - 280	e_R ≥ 95					

Edge distances

- Edge distances e_R < 30 mm are not permitted!
- If two Isokorb® T type SK are arranged vertically to each other at a corner. edge distances e ≥ 65 mm are required.

Centre-to-centre distances

Centre-to-centre distances

The Schöck Isokorb® T type SK must be so positioned that minimum centre-to-centre distances of Isokorb® to Isokorb® are maintained:

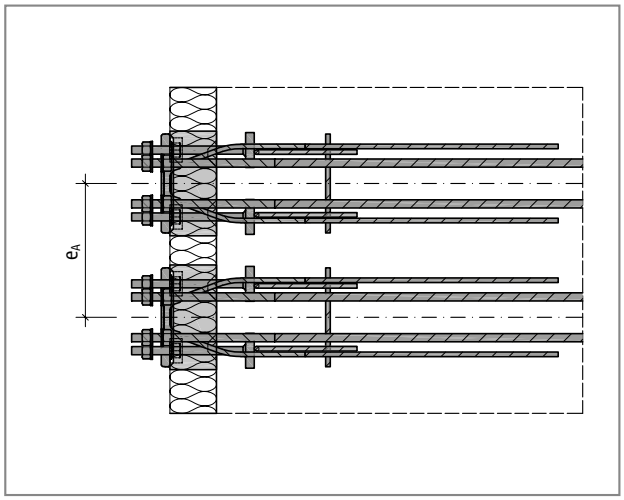


Fig. 22: Schöck Isokorb® T type SK: Centre-to-centre distance

Design internal forces depending on the centre-to-centre distance

Schöck Isokorb®		T type SK
Design values with		Concrete strength class ≥ C25/30
Isokorb® height H [mm]	Centre-to-centre distance e_A [mm]	$V_{Rd,z}$ [kN/element], $M_{Rd,y}$ [kNm/element]
180 - 190	$e_A \geq 230$	No reduction required
200 - 210	$e_A \geq 245$	
220 - 230	$e_A \geq 255$	
240 - 280	$e_A \geq 270$	

Centre-to-centre distances

- The centre-to-centre distances e_A of the Schöck Isokorb® guarantee the minimum spacing of the shear force bars of 100 mm.

Outer corner

Height offset on outer corner

On an outer corner, the Schöck Isokorbs® T type SK must be arranged at offset heights. This will allow the tension, compression and shear force rods to overlap, To help achieve this, 20 mm insulation strips can be added directly beneath and directly above the insulating element of the Schöck Isokorb® T type SK on site.

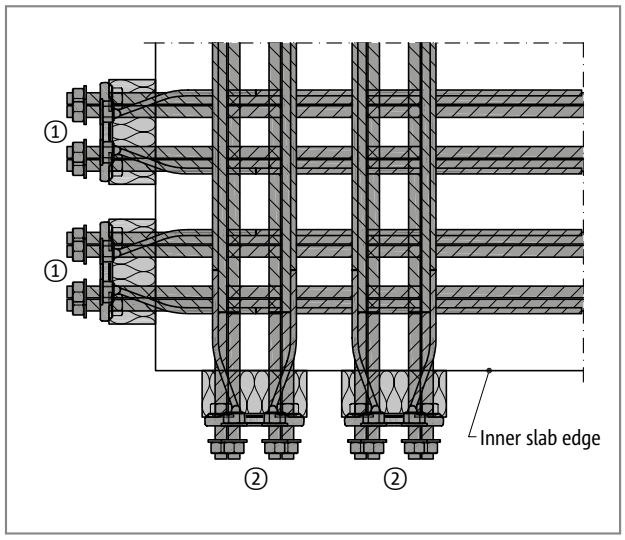


Fig. 23: Schöck Isokorb® T type SK: Outer corner

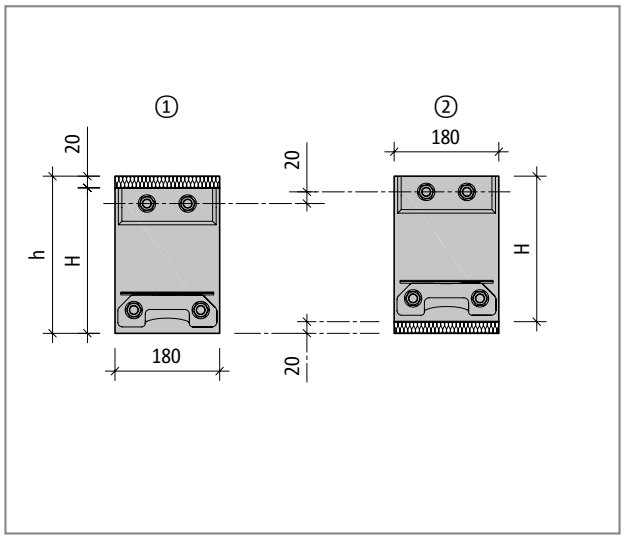


Fig. 24: Schöck Isokorb® T type SK: Layout with offset heights

Outer corner

- The corner solution using T type SK requires a slab thickness of h ≥ 200 mm!
- When building a corner balcony, care must be taken to ensure that the 20 mm height difference in the corner is also reflected in the on-site front slabs!
- The centre-to-centre, element and edge distances of the Schöck Isokorb® T type SK are to be maintained.

Installation accuracy

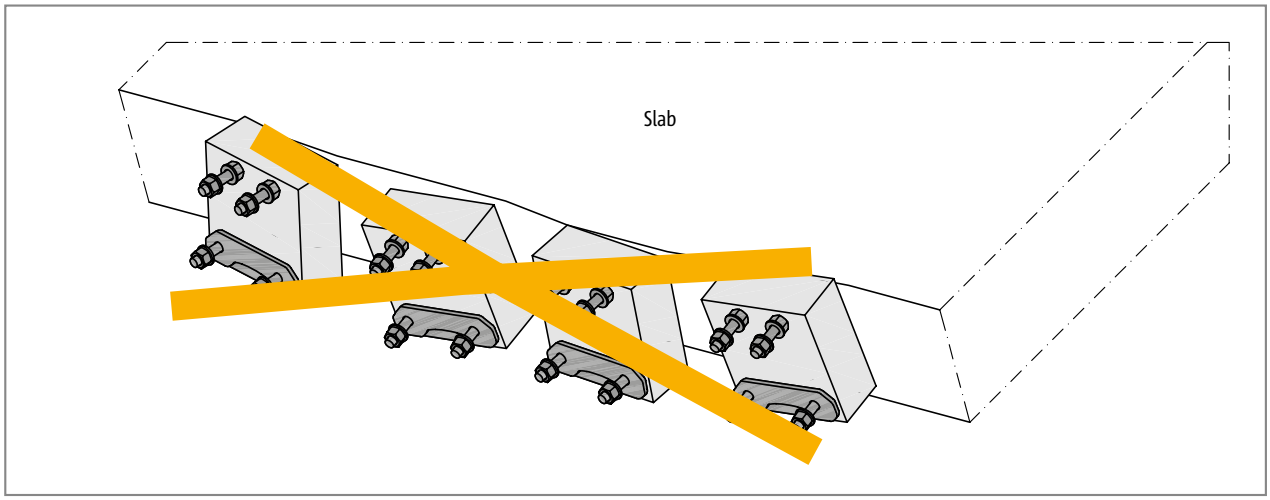


Fig. 25: Schöck Isokorb® T type SK: Twisted and displaced elements that were poorly secured while the concrete was being poured

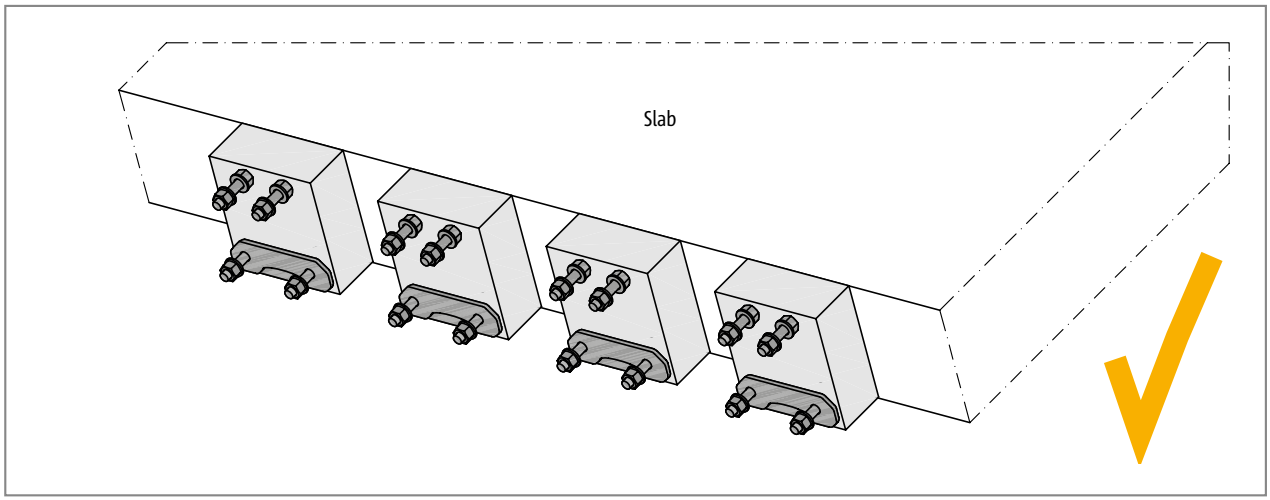


Fig. 26: Schöck Isokorb® T type SK: Reliable and correct setting while pouring the concrete ensures the tolerance accuracy is maintained.

Since the Schöck Isokorb® T type SK creates an interface between a steel component and a reinforced concrete component, the issue of tolerance is particularly important when installing T type KS. DIN 18202:2013-04 “Tolerances in building construction” must be observed in this respect! It specifies the crucial inclusion of limit deviations relating to the necessary installation position of the Schöck Isokorb® T type SK. A method of work must be agreed between project engineer, concrete contractor and steel fabricator to ensure acceptable tolerances are met. At the same time, bear in mind that steel constructors can only remedy excessive dimensional disparities with considerable extra work, if at all.

Height adjustment of the steel beam - lowest position

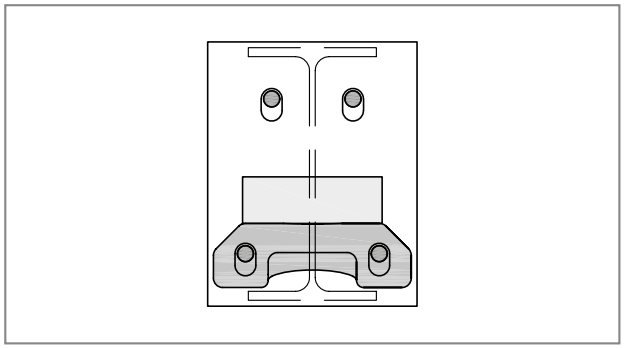


Fig. 27: Schöck Isokorb® T type SK: On-site butt stop lies directly on the load plate

Height adjustment of the steel beam - highest position

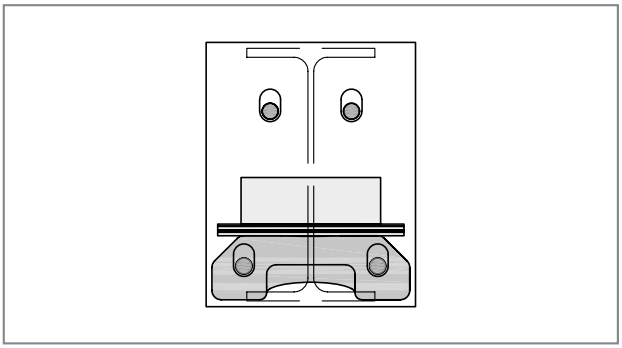


Fig. 28: Schöck Isokorb® T type SK: Adding design shims on the load plate will raise the steel beam by up to 20 mm

Installation accuracy

Information on installation accuracy

- Due to design constraints, the Schöck Isokorb® only allows dimensional deviations in the vertical direction for steel to reinforced concrete connections.
- Horizontal limit deviations for the separation of the Schöck Isokorb® axes must be specified, as must the limit deviations from the alignment. Torsional limits must also be specified.
- The use of a template developed on site is highly recommended to ensure dimensionally accurate installation and the correct sitting of the Schöck Isokorb® during the concrete pouring process.
- The construction supervisor is responsible for checking the agreed installation accuracy of the Schöck Isokorb® for steel to reinforced concrete connections in good time!

Installation aid (optional)

An installation aid is optionally available from Schöck to improve installation accuracy.

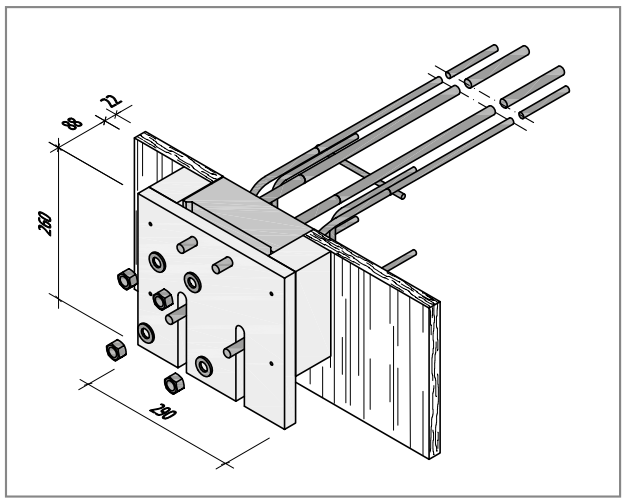


Fig. 29: Schöck Isokorb® type KS: Representation with installation aid

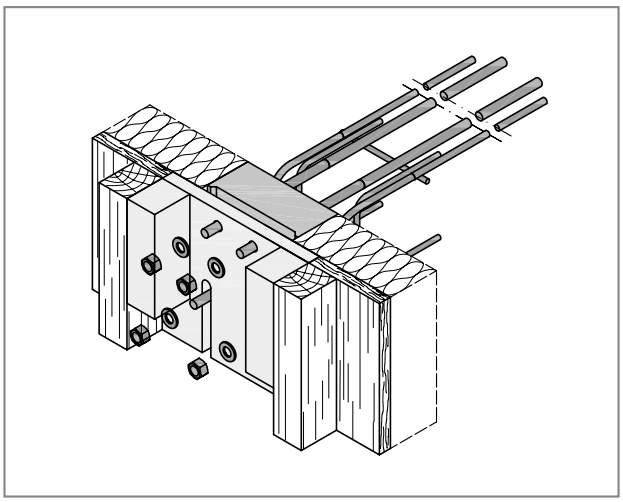


Fig. 30: Schöck Isokorb® type KS: Installation aid installed in reverse to enable gapless insulation of the slab edge on monolithic walls.

The optional installation aid for the Schöck Isokorb® type KSXT is factory assembled from a timber board and two square timbers. It holds the Isokorb® securely in place before and while pouring the concrete. When using the aid in “positive position” (see Fig. above left), it is matched to standard 22 mm formwork. If using formwork of a different thickness, the installation aid needs to be modified on site.

Notes on the installation aid

- The Schöck installation jig is available in two versions. The two versions differ for Isokorb® T type SK-M1, -MM1 and T type SK-MM2.
- The height of the Schöck installation aid is 260 mm, suitable for Isokorb® in H180 - H280.
- Please contact your regional manager if you have questions regarding the installation of the Schöck Isokorb®. They can also help directly on site if the installation conditions are difficult (contact: www.schoeck.co.uk/en_gb/regional-sales-manager).
- The Schöck installation aid is combined with the on-site formwork to form a template.

Product description

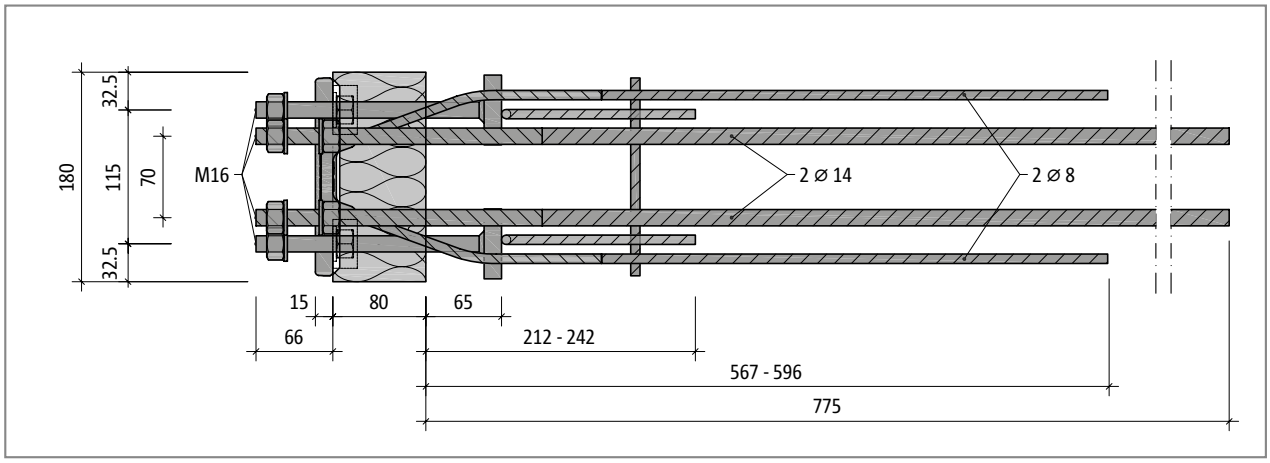


Fig. 31: Schöck Isokorb® T type SK-M1-V1: Plan view

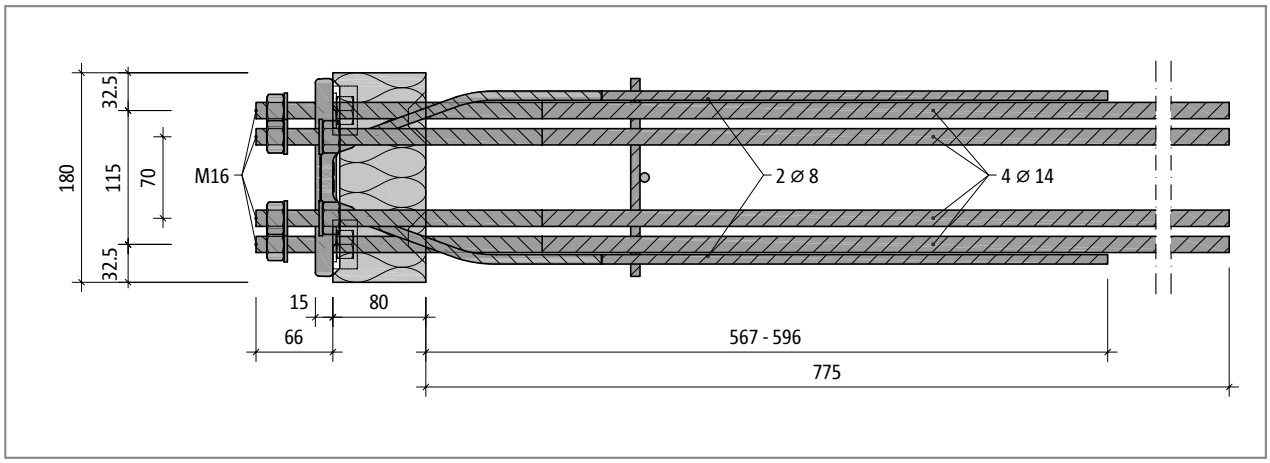


Fig. 32: Schöck Isokorb® T type SK-MM1-VV1: Plan view

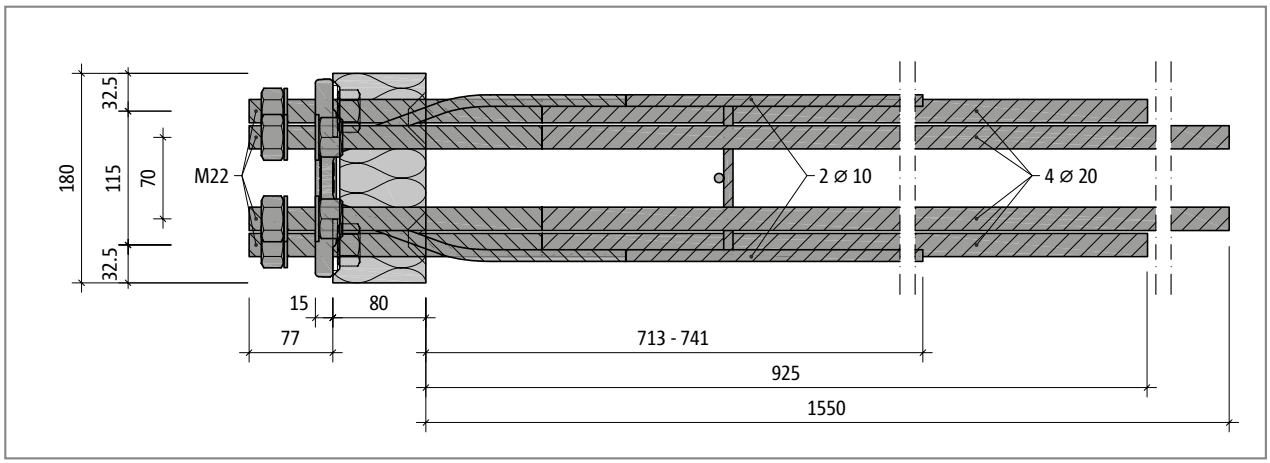


Fig. 33: Schöck Isokorb® T type SK-MM2-VV1: Plan view

Product information

- The clamping distance is 30 mm on T type SK-M1,MM1 and 35 mm on T type SK-MM2.
- Download further product plan views and cross-sections at www.schoeck.co.uk/download
- Download tender specifications under www.schock.nl/download

Product description

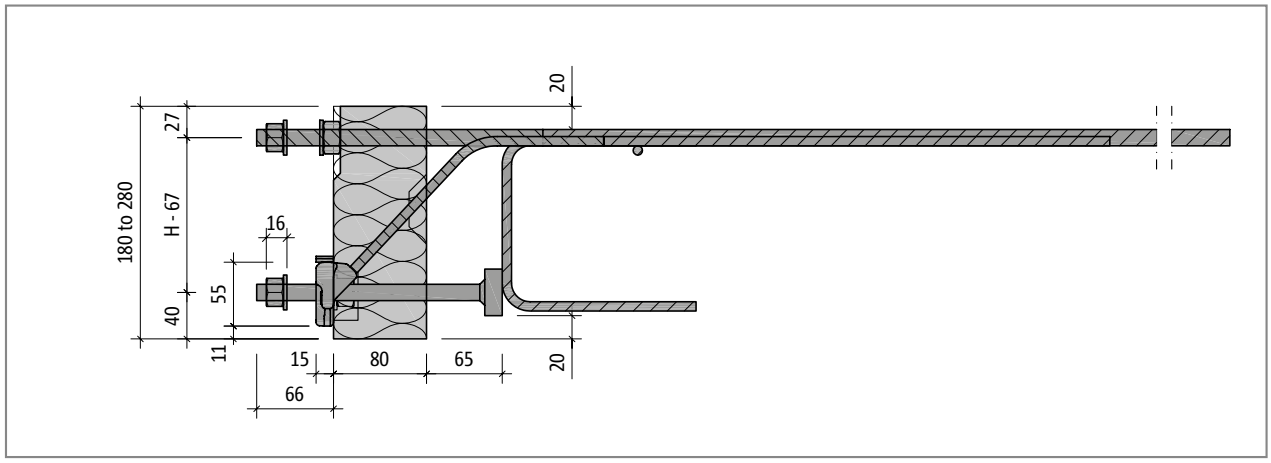


Fig. 34: Schöck Isokorb® T type SK-M1-V1: Cross section of the product

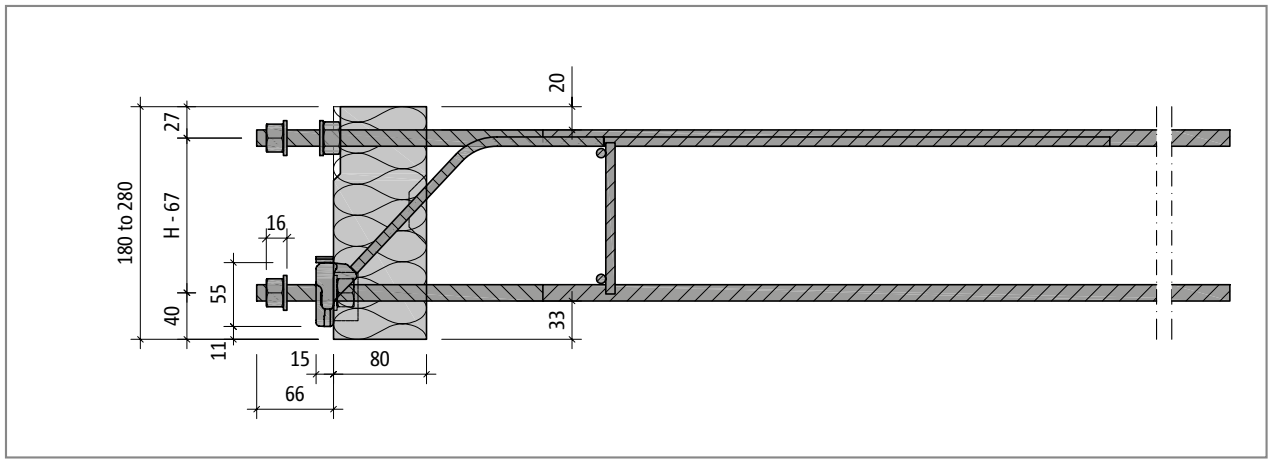


Fig. 35: Schöck Isokorb® T type SK-MM1-VV1: Cross section of the product

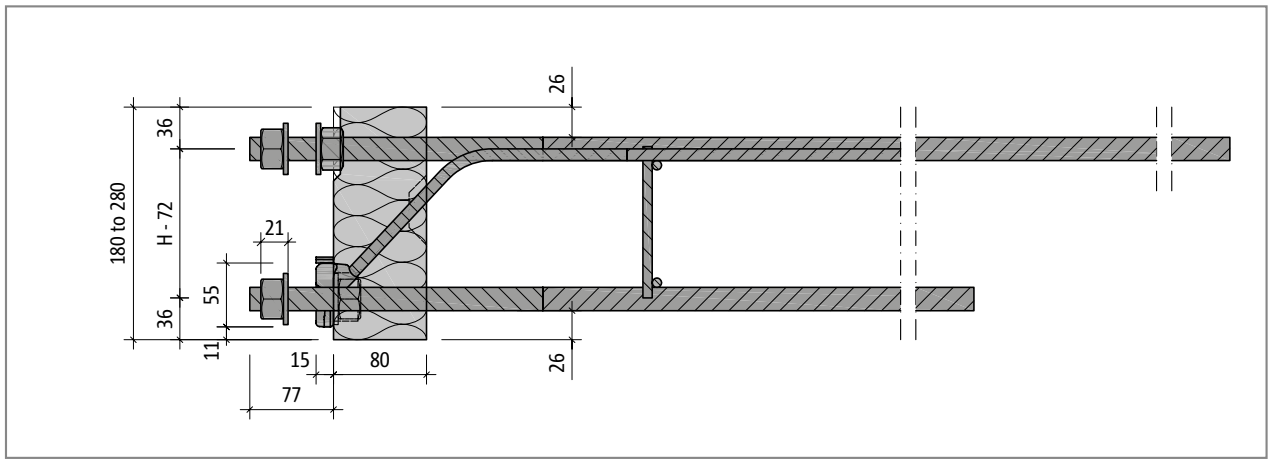


Fig. 36: Schöck Isokorb® T type SK-MM2-VV1: Cross section of the product

Product information

- The clamping distance is 30 mm on T type SK-M1,MM1 and 35 mm on T type SK-MM2.

Fire protection

Fire protection

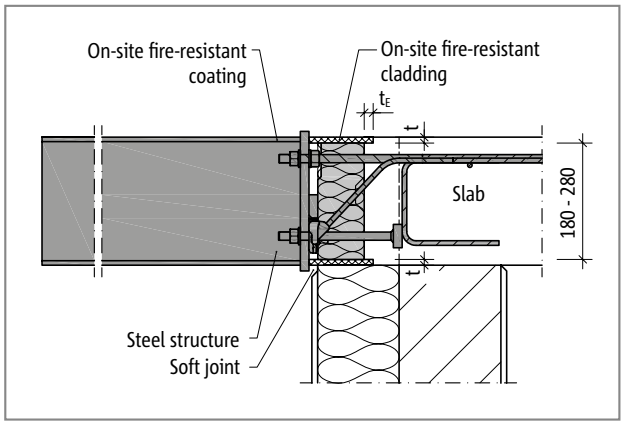


Fig. 37: Schöck Isokorb® T type SK: on site fire-resistant cladding of the connection when using steel structures with fire-resistant coating; cross-section

Fire-resistant cladding of the Schöck Isokorb® must be planned and installed on site. The same on-site fire safety measures apply as for the overall load-bearing structure.
For further information see page 12.

On-site reinforcement – In-situ concrete construction

Schöck Isokorb® T type SK-M1

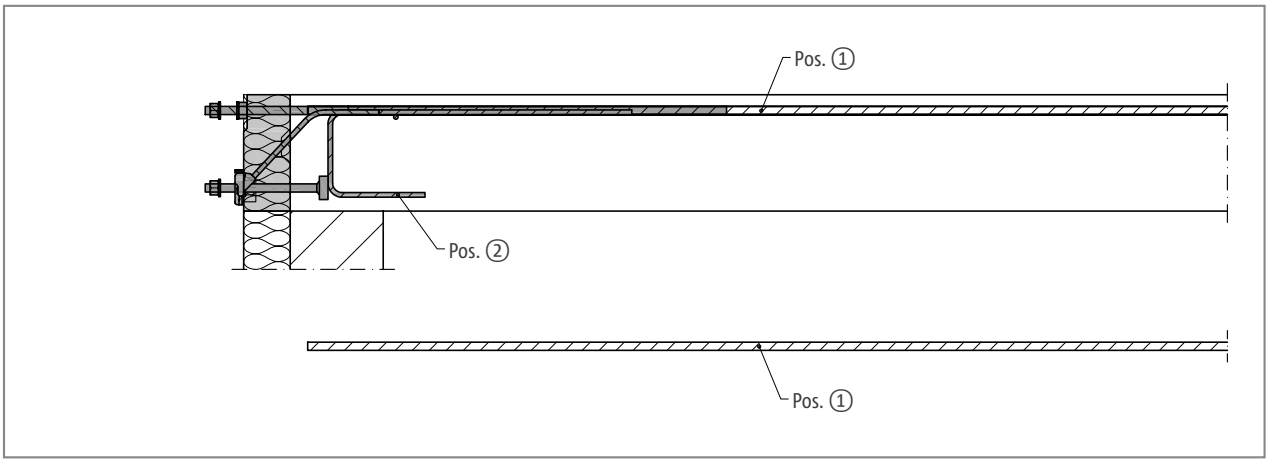


Fig. 38: Schöck Isokorb® T type SK-M1: On-site reinforcement: Cross section

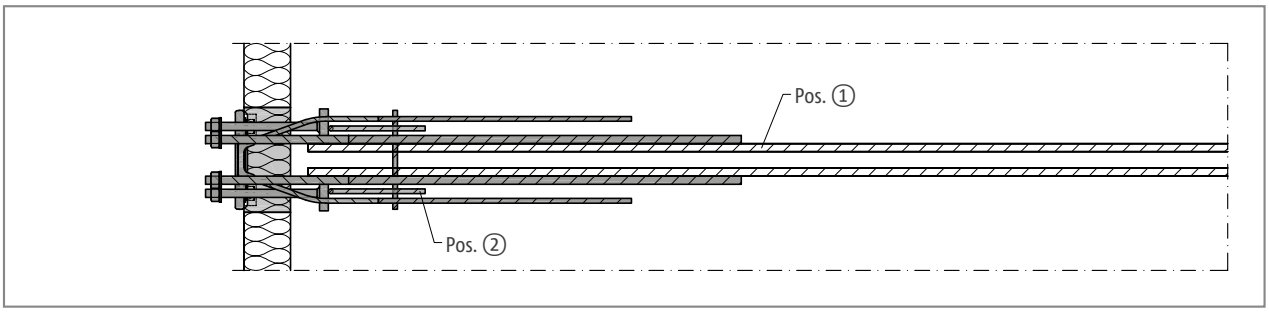


Fig. 39: Schöck Isokorb® T type SK-M1: On-site reinforcement: Plan view

Schöck Isokorb® T type SK			M1
On-site reinforcement	Type of bearing	Height H [mm]	Floor slab (XC1) concrete grade ≥ C25/30 Balcony steel structure
Pos. 1 Lapping reinforcement			
Pos. 1	direct/indirect	180–280	2 • H16
Pos. 2 Edge and splitting tension reinforcement			
Pos. 2	direct/indirect	180–280	included with the product

Information about on-site reinforcement

- Lapping of the reinforcement in the connecting reinforced concrete components must be applied as close as possible to the insulating element of the Schöck Isokorb®, the required concrete cover must be observed.
- Overlapping joints as per BS EN 1992-1-1 (EC2) and BS EN 1992-1-1/NA.
- T Type SK-M1 requires installation of transverse reinforcement as per BS EN 1992-1-1 (EC2) and BS EN 1992-1-1/NA.

On-site reinforcement – In-situ concrete construction

Schöck Isokorb® T type SK-MM1

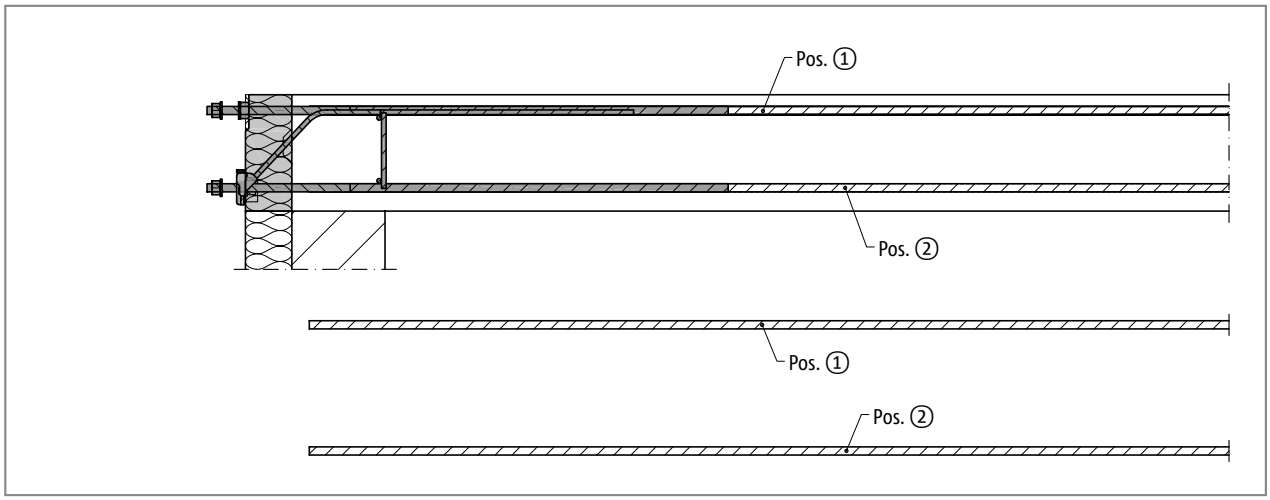


Fig. 40: Schöck Isokorb® T type SK-MM1: On-site reinforcement: Cross section

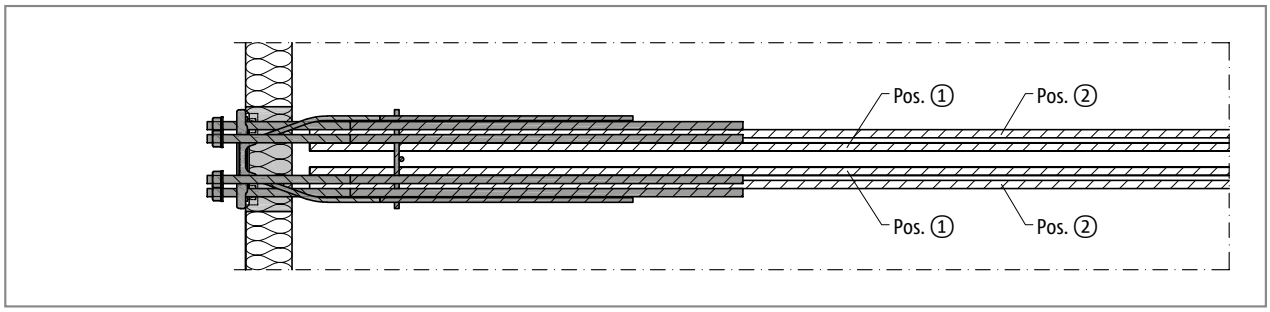


Fig. 41: Schöck Isokorb® T type SK-MM1: On-site reinforcement: Plan view

Schöck Isokorb® T type SK			MM1
On-site reinforcement	Type of bearing	Height H [mm]	Floor slab (XC1) concrete grade ≥ C25/30 Balcony steel structure
Pos. 1 Lapping reinforcement			
Pos. 1	direct/indirect	180–280	2 • H16
Pos. 2 Overlapping reinforcement			
Pos. 2	direct/indirect	180–280	necessary in the tension zone, as specified by the structural engineer

Information about on-site reinforcement

- T Type SK-MM1: In the case of exposure to uplifting loads (+M_{Ed}), as planned, an overlapping joint with the lower Isokorb® reinforcement may be necessary to cover the tensile force curve. The structural engineer must indicate whether this overlapping reinforcement is required.

On-site reinforcement – In-situ concrete construction

Schöck Isokorb® T type SK-MM2

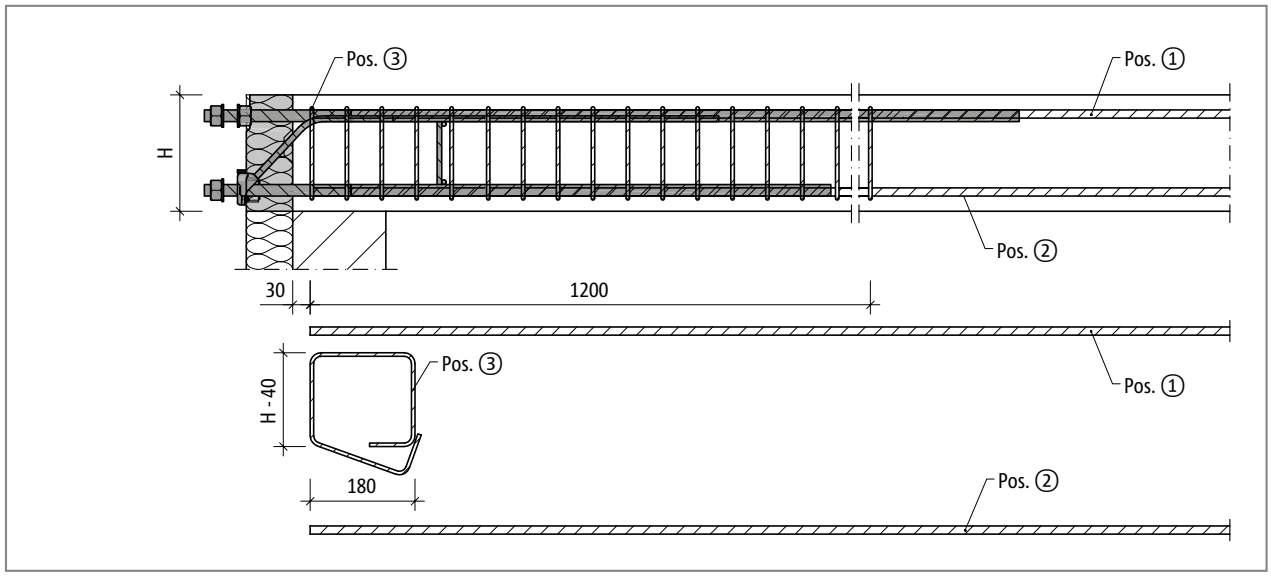


Fig. 42: Schöck Isokorb® T type SK-MM2: On-site reinforcement with stirrup ⌀ 6 mm; cross-section

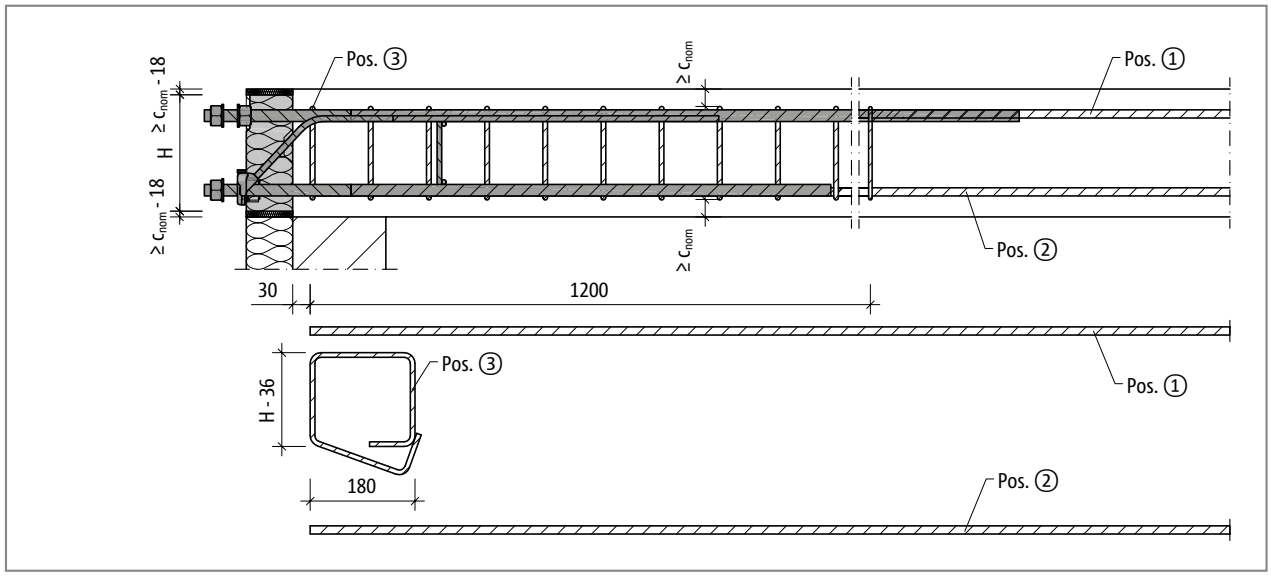


Fig. 43: Schöck Isokorb® T type SK-MM2: On-site reinforcement with stirrup ⌀ 8 mm; section

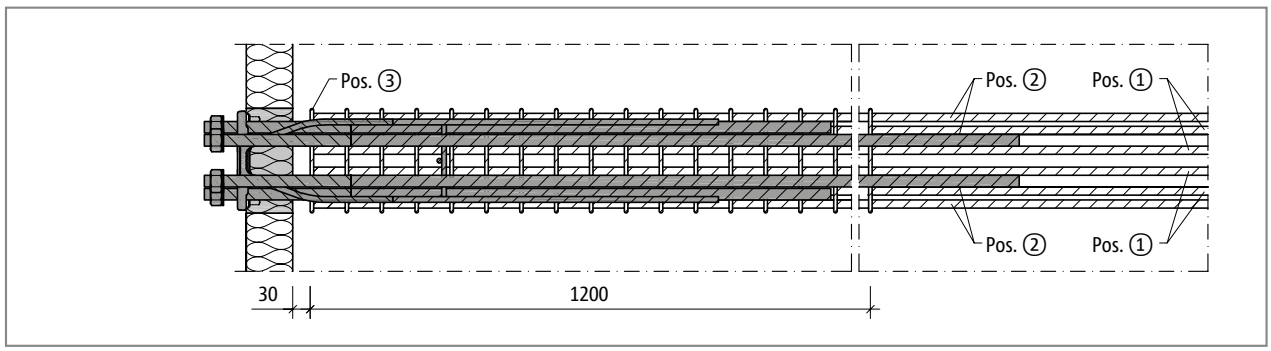


Fig. 44: Schöck Isokorb® T type SK-MM2: On-site reinforcement: Plan view

On-site reinforcement – In-situ concrete construction

Schöck Isokorb® T type SK			MM2
On-site reinforcement	Type of bearing	Height H [mm]	Floor slab (XC1) concrete grade ≥ C25/30 Balcony steel structure
Pos. 1 Lapping reinforcement			
Pos. 1	direct/indirect	180–280	4 • H16
Pos. 2 Overlapping reinforcement			
Pos. 2	direct/indirect	180–280	necessary in the tension zone, as specified by the structural engineer
Pos. 3 Stirrup			
Pos. 3	direct/indirect	180–280	13 • H8 @100 mm c/c

Information about on-site reinforcement

- T Type SK-MM2: In the case of exposure to uplifting loads (+M_{Ed}), as planned, an overlapping joint with the lower Isokorb® reinforcement may be necessary to cover the tensile force curve. The structural engineer must indicate whether this overlapping reinforcement is required.
- T Type SK-MM2: External transverse reinforcement in the form of links. When using links with a rod diameter of ⌀8 mm, check specifically that the concrete cover c_{nom} is adequate. If necessary, a thicker slab must be used.

On-site reinforcement – Precast construction

Schöck Isokorb® T type SK-M1

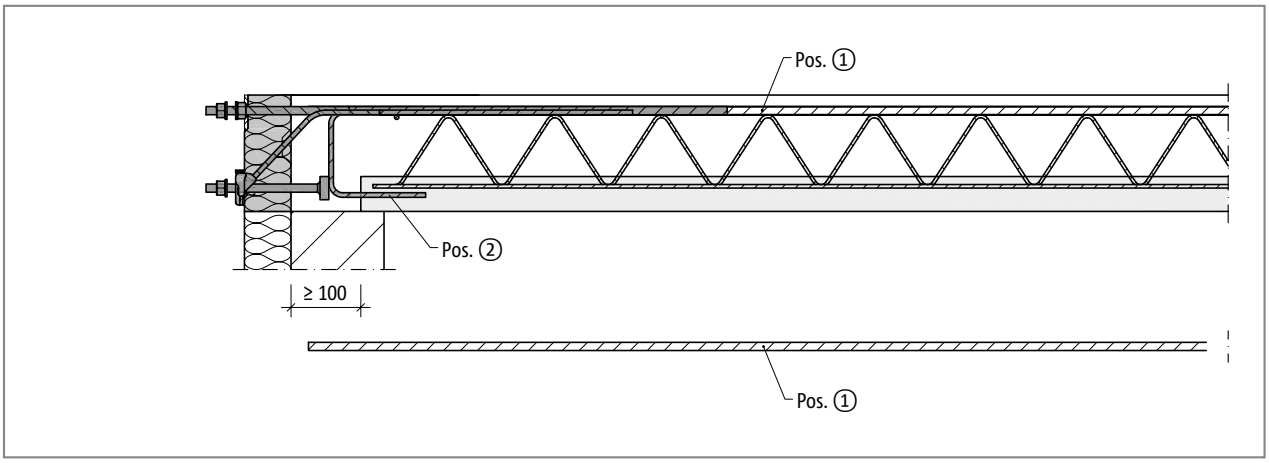


Fig. 45: Schöck Isokorb® T type SK-M1: On-site reinforcement for semi-precast construction: Cross section

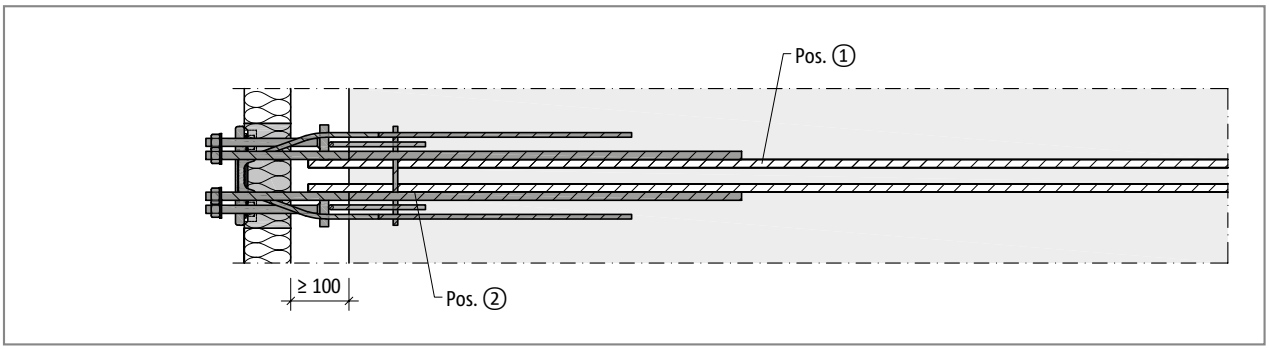


Fig. 46: Schöck Isokorb® T type SK-M1: On-site reinforcement for semi-precast construction: Plan view

Schöck Isokorb® T type SK			M1
On-site reinforcement	Type of bearing	Height H [mm]	Floor slab (XC1) concrete grade ≥ C25/30 Balcony steel structure
Pos. 1 Lapping reinforcement			
Pos. 1	direct/indirect	180–280	2 • H16
Pos. 2 Edge and splitting tension reinforcement			
Pos. 2	direct/indirect	180–280	included with the product, alternative version with on-site stirrups 2 • H8

Information about on-site reinforcement

- T Type SK-M1 requires installation of transverse reinforcement as per BS EN 1992-1-1 (EC2) and BS EN 1992-1-1/NA.
- If composite pre-cast flooring is being installed, the lower legs of the factory-supplied links can be shortened on site and replaced with two suitable ⌀8 stirrups.

On-site reinforcement – Precast construction

Schöck Isokorb® T type SK-MM2

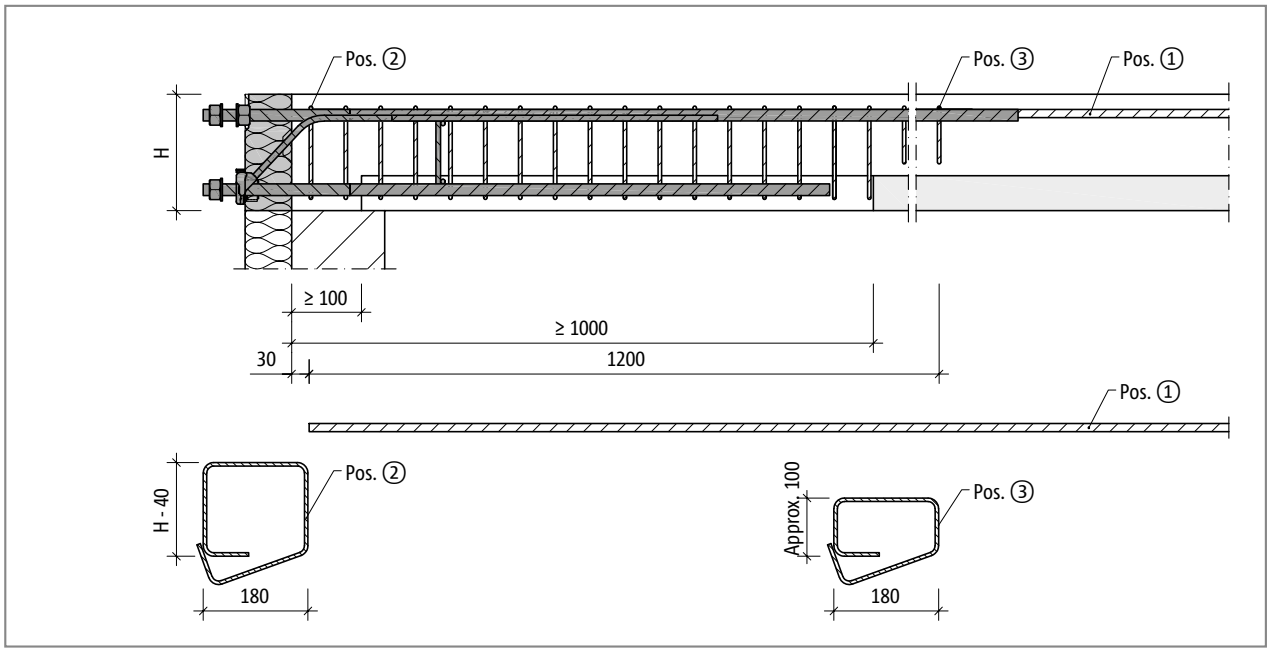


Fig. 47: Schöck Isokorb® T type SK-MM2: On-site reinforcement with stirrup ⌀ 6 mm for semi-precast construction; cross-section

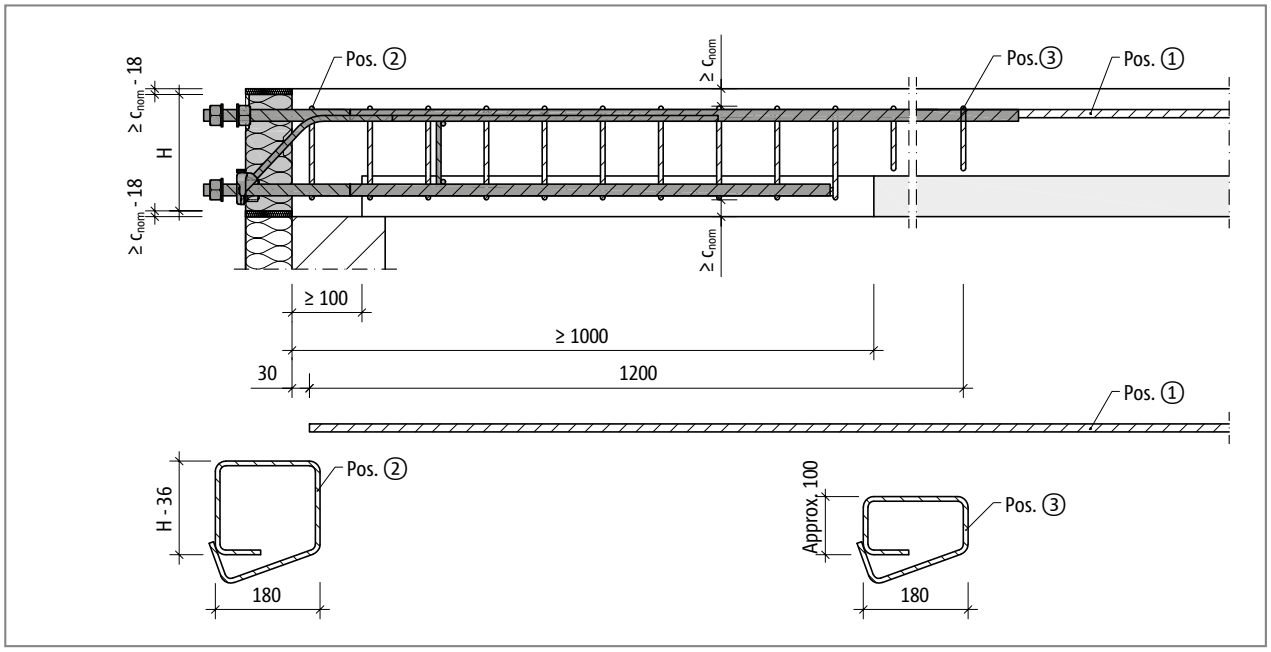


Fig. 48: Schöck Isokorb® T type SK-MM2: On-site reinforcement with stirrup ⌀ 8 mm for semi-precast construction; cross section

On-site reinforcement – Precast construction

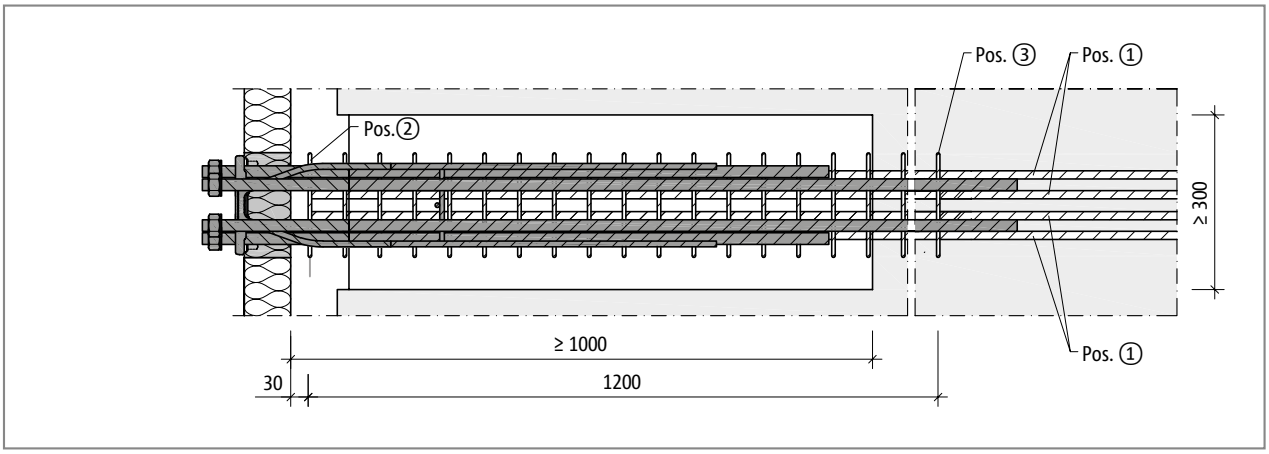


Fig. 49: Schöck Isokorb® T type SK-MM2: On-site reinforcement for semi-precast construction, plan view

Schöck Isokorb® T type SK			MM2
On-site reinforcement	**Type of bearing**	**Height H [mm]**	**Floor slab (XC1) concrete grade ≥ C25/30 Balcony steel structure**
Pos. 1 Lapping reinforcement			
Pos. 1	direct/indirect	180–280	4 ⌀ 14
Pos. 2 Stirrup			
Pos. 2	direct/indirect	180–280	10 ⌀ 8/100 mm
Pos. 3 Stirrup			
Pos. 3	direct/indirect	180–280	3 ⌀ 8/100 mm

Information about on-site reinforcement

- T Type SK-MM2: External transverse reinforcement in the form of links. When using links with a rod diameter of ⌀8 mm, check specifically that the concrete cover c_{nom} is adequate. If necessary, a thicker slab must be used.
- With thick element floors the recess in the precast element can be omitted if the Isokorb® T type SK can be installed completely in the top concrete .
- Following the installation of the Schöck Isokorb® T type SK on the formwork the concrete in the recess around the stirrup reinforcement must be properly compacted.

Fixing Plate

T type SK-M1 for transferring moment and positive shear force

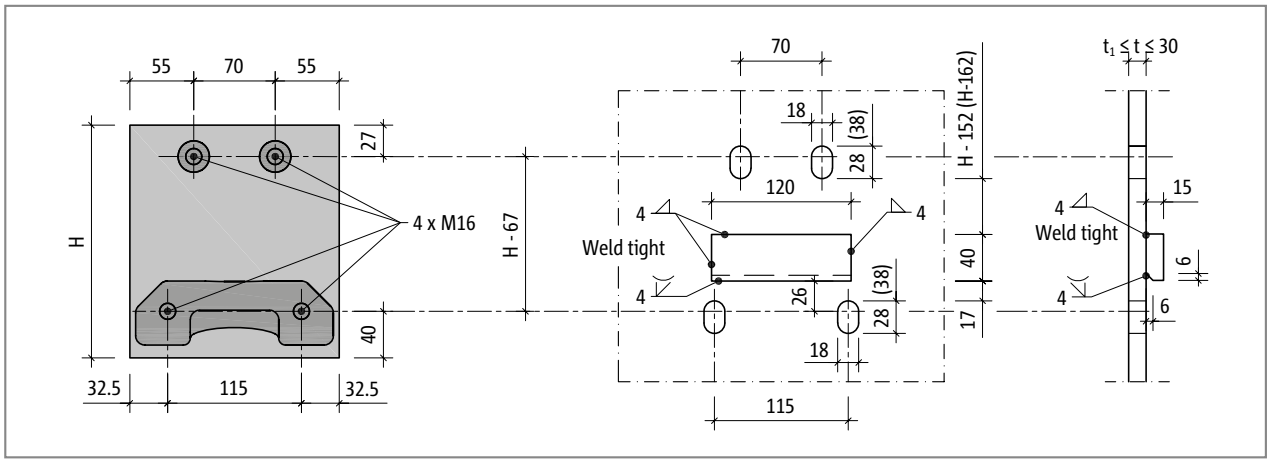


Fig. 50: Schöck Isokorb® T type SK-M1: Design of the fixing plate connection

T type SK-MM1 for transferring moment and positive or negative shear force

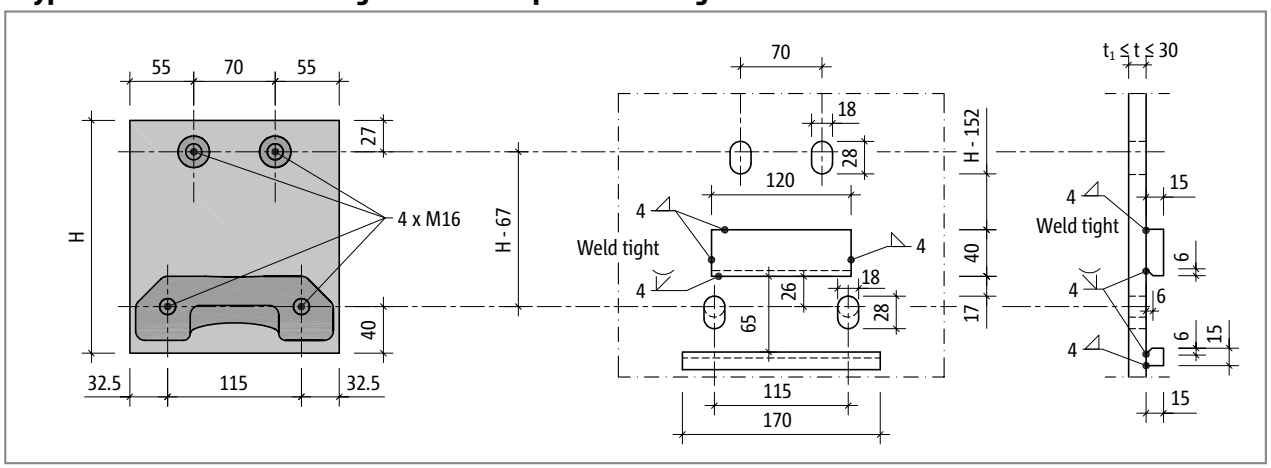


Fig. 51: Schöck Isokorb® T type SK-MM1: Design of the face plate connection; Round holes for the transfer of the negative shear force

The choice of fixing plate thickness t is determined by the minimum thickness t_1 as specified by the structural engineer. This thickness must not, however, be greater than the clamping distance of the Schöck Isokorb® T type SK.

Fixing Plate

- The illustrated elongated holes allow an uplifting of the endplate of up to 10 mm. The values shown in brackets allow for the increase of the tolerances of up to 20 mm.
- The distance of the elongated holes to the flange of the beam has to be checked.
- If uplifting loads occur as planned, a choice must be made between two design options:
  Without height adjustment: Form the end plate with round holes (rather than slots) in the lower section.
  With height adjustment: Use the additional second butt stop in combination with slots .
- If horizontal forces $V_{Ed,y} > 0.342 \cdot \min. V_{Ed,z}$ parallel to the insulation joint occur, the lower section of the fixing plate must also be modified with round holes instead of slots to ensure load transfer.
- The structural engineer must specify the overall dimensions of the fixing plate
- The construction drawing must contain the tightening torque for the nuts, which is specified as follows:
  T type SK-M1, T type SK-MM1 (threaded rod ⌀ 16): M_r = 50 Nm
- The Schöck Isokorb® embedded in concrete are to be measured in-situ before the front slabs are produced.

Fixing Plate

T type SK-MM2 for transferring moment and positive shear force

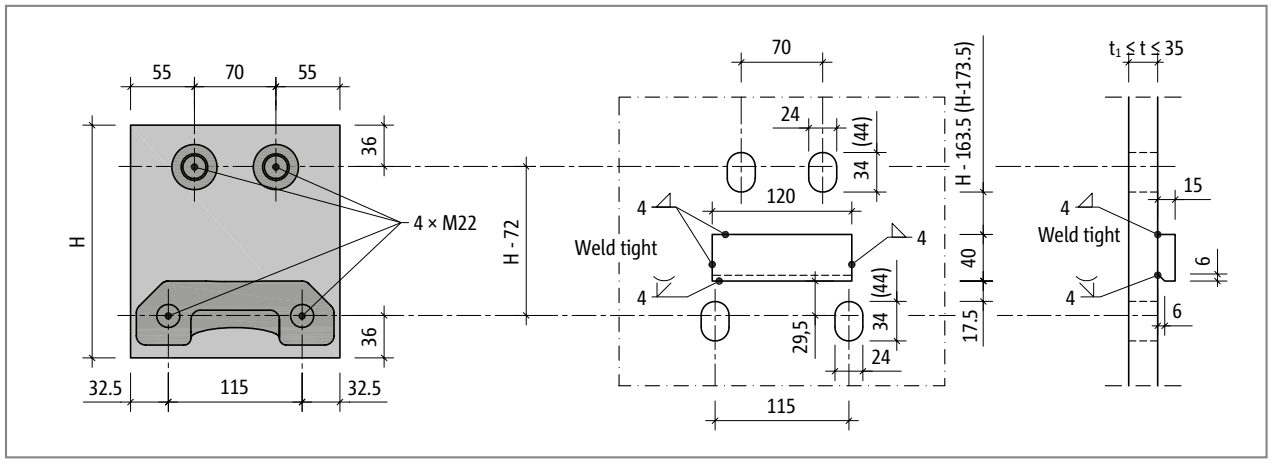


Fig. 52: Schöck Isokorb® T type SK-MM2: Design of the face plate connection

T type SK-MM2 for transferring moment and positive or negative shear force

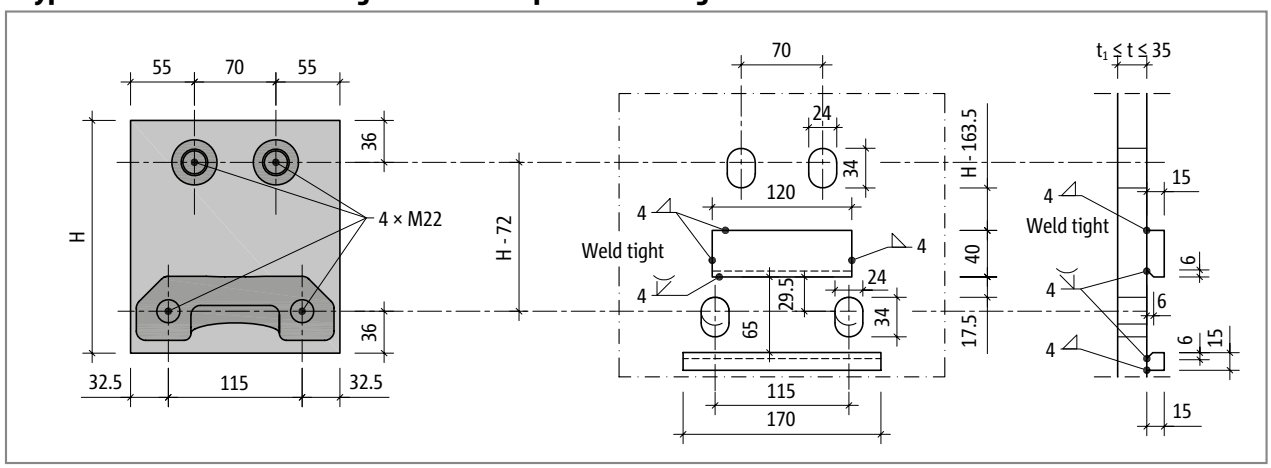


Fig. 53: Schöck Isokorb® T type SK-MM2: Design of the face plate connection; Round holes for the transfer of the negative shear force

The choice of fixing plate thickness t is determined by the minimum thickness t_1 as specified by the structural engineer. This thickness must not, however, be greater than the clamping distance of the Schöck Isokorb® T type SK.

Fixing Plate

- The illustrated elongated holes allow an uplifting of the endplate of up to 10 mm. The values shown in brackets allow for the increase of the tolerances of up to 20 mm.
- The distance of the elongated holes to the flange of the beam has to be checked.
- If uplifting loads occur as planned, a choice must be made between two design options:
  Without height adjustment: Form the end plate with round holes (rather than slots) in the lower section.
  With height adjustment: Use the additional second butt stop in combination with slots .
- If horizontal forces $V_{Ed,y}$ > 0.342 • min. $V_{Ed,z}$ parallel to the insulation joint occur, the lower section of the fixing plate must also be modified with round holes instead of slots to ensure load transfer.
- The structural engineer must specify the overall dimensions of the fixing plate
- The construction drawing must contain the tightening torque for the nuts, which is specified as follows:
  T type SK-MM2 (threaded rod ⌀ 22): M_r = 80 Nm
- The Schöck Isokorb® embedded in concrete are to be measured in-situ before the front slabs are produced.
- Schöck Isokorb® T type SK-MM2 in H180 : A maximum of 10 mm tolerance is possible for the height adjustment. Relevant is the distance of the upper elongated holes to the on-site butt stop.

Design aids – steel construction

Free clamping length

The maximum thickness of the end plate is limited by the free clamping length of the threaded rods on the Schöck Isokorb® T type SK.

Info on free clamping length

- The clamping distance is 30 mm on T type SK-M1,MM1 and 35 mm on T type SK-MM2.

Selection of the sectional beams

The minimum sizes in the table are recommended for the design of the steel setions for the connection situations presented below.

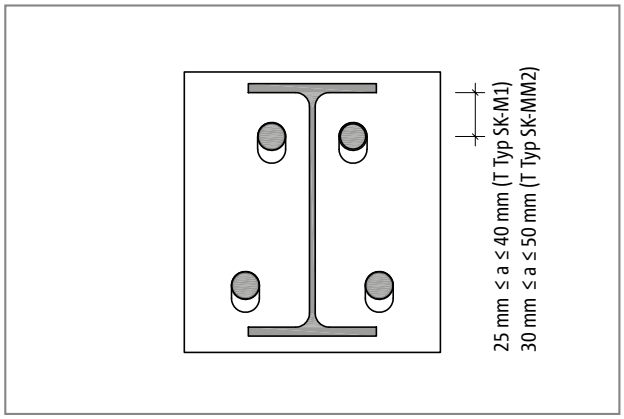


Fig. 54: Schöck Isokorb® T type SK-MM2...-H200: End plate connection to IPE220 beam.

Schöck Isokorb® T type SK		M1, MM1		MM2	
Recommended minimum beam size with		a = 25 mm		a = 30 mm	
		IPE	HEA/HEB	IPE	HEA/HEB
Isokorb® height H [mm]	180	200	200	200	200
	200	220	220	220	220
	220	240	240	240	260
	240	270	280	270	280
	260	300	300	300	300
	280	300	320	300	320

Recommended minimum beam sizes

- The presented nominal heights of the steel profiles allow end plate connection between the flanges.
- Slotted holes in the end plate allow the tolerance for height adjustment of the steel beam, see page 42, 43.
- Using the minimum recommended beam sizes, up to 20 mm tolerance is possible for the height adjustment. The information on tolerance restrictions for individual combinations of minimum beam sizes with the Schöck Isokorb® must be observed.
- Schöck Isokorb® T type SK-M1, -MM1, in height H180, H200, H220: Using the recommended minimum beam sizes for HEA/HEB 10 mm tolerance is possible. Furthermore, an increase in the size of the slotted holes requires higher beams.
- Schöck Isokorb® T type SK-MM2 in H180 : A maximum of 10 mm tolerance is possible for the height adjustment. Relevant is the distance of the upper elongated holes to the on-site butt stop.
- Schöck Isokorb® T type SK-MM2 in H200: Using the minimum recommended beam sizes for HEA/HEB 10 mm tolerance is possible. Furthermore, an increase in the size of the slotted holes requires higher beams.

On-site butt stop

On-site butt stop

The on-site butt stop is absolutely crucial for transferring shear forces from the on-site front slab to the Isokorb® T type SK! The spacer shims supplied by Schöck are used for vertical adjustment between butt stop and Schöck Isokorb®.

On-site butt stop to transfer positive shear forces.

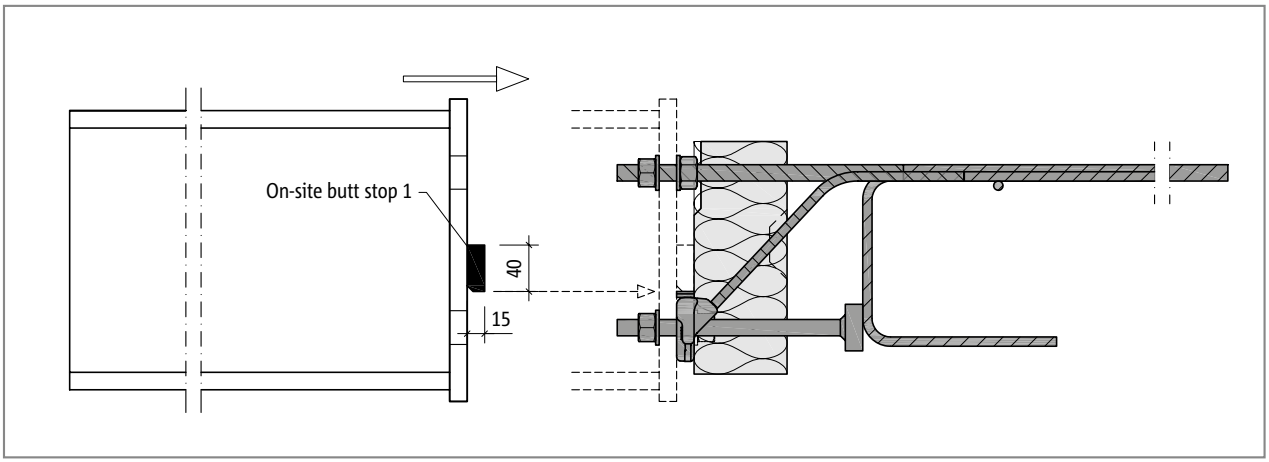


Fig. 55: Schöck Isokorb® T type SK: Mounting the steel member

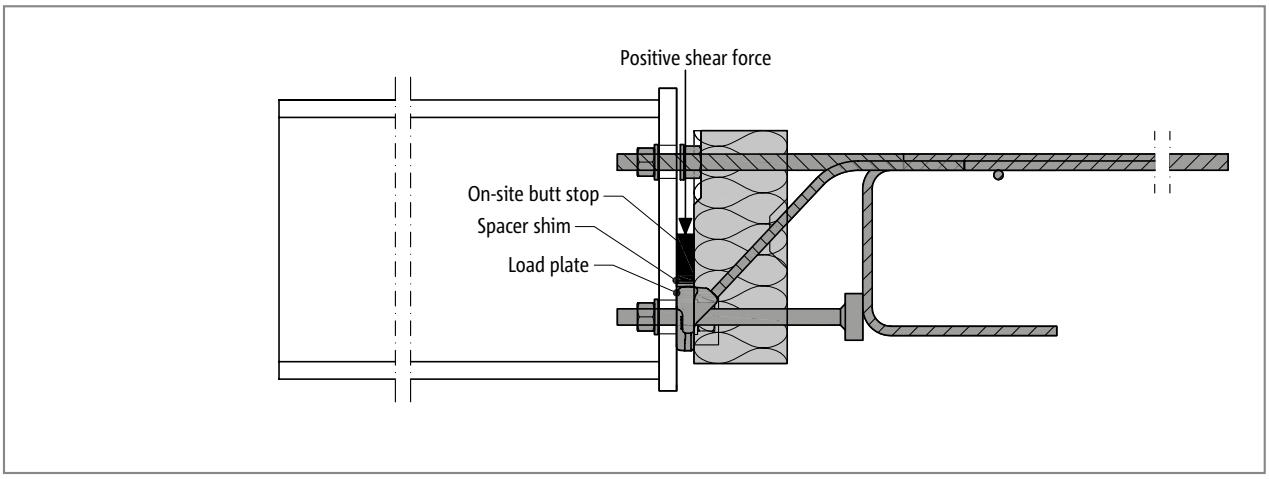


Fig. 56: Schöck Isokorb® T type SK: On-site butt stop for transferring shear forces

On-site butt stop

- Type of steel to match static requirements.
- Apply corrosion protection after welding.
- Steel construction: Checking for dimensional inaccuracy of the structure prior to fabrication is absolutely essential!

Spacer shims

- Details of dimensions and materials, see page 16
- During installation look after planeness.
- Scope of delivery: 2 • 2 mm + 1 • 3 mm thickness per Schöck Isokorb®

On-site butt stop

2 on-site butt stops for the transfer of positive or negative shear force

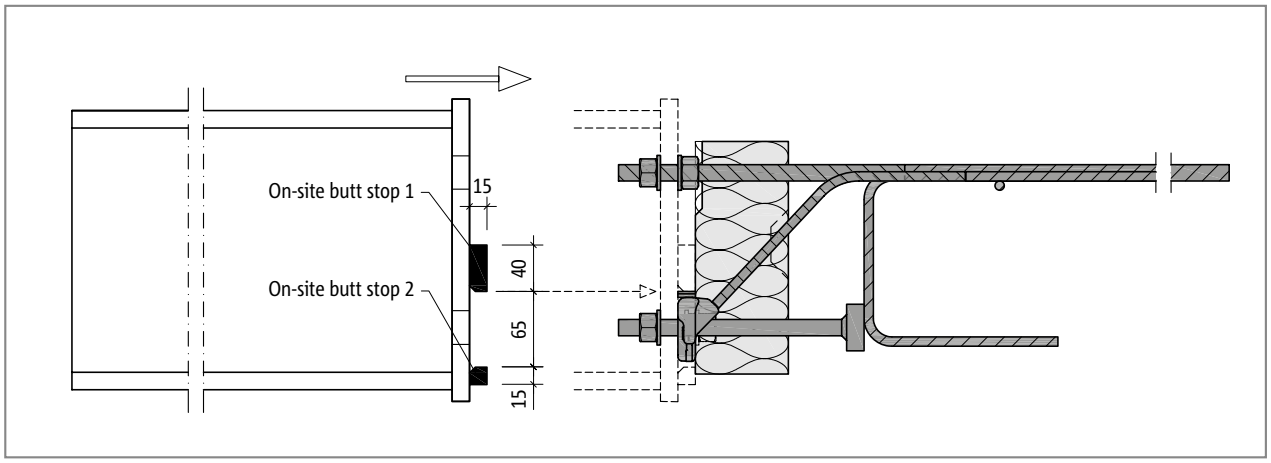


Fig. 57: Schöck Isokorb® T type SK: Mounting the steel member

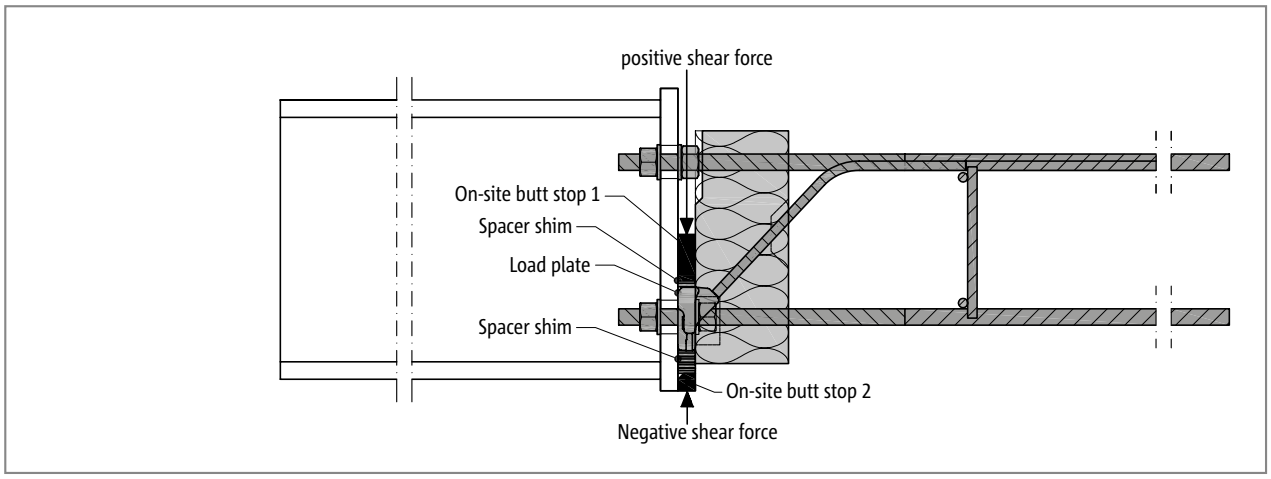


Fig. 58: Schöck Isokorb® T type SK: On-site dogs for the transfer of the shear force

On-site butt stop

- Type of steel to match static requirements.
- Apply corrosion protection after welding.
- Steel construction: Checking for dimensional inaccuracy of the structure prior to fabrication is absolutely essential!

Spacer shims

- Details of dimensions and materials, see page 16
- During installation look after planeness.
- Scope of delivery: 2 • 2 mm + 1 • 3 mm thickness per Schöck Isokorb®

Design example

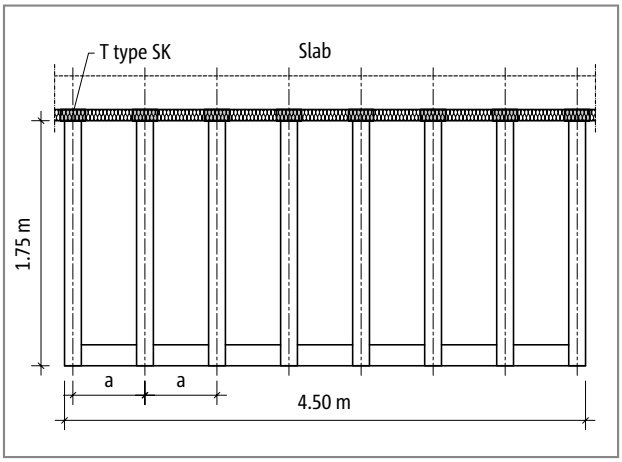


Fig. 59: Schöck Isokorb® T type SK: Plan view

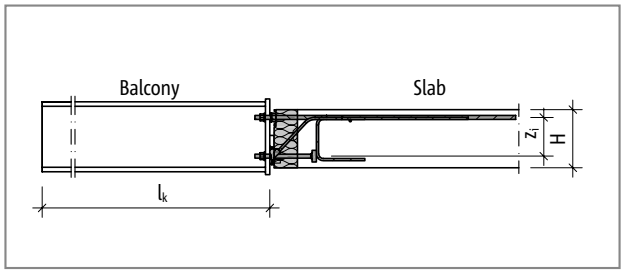


Fig. 60: Schöck Isokorb® T type SK: Structural system; Design values refer to the presented cantilever length l_k

Static system and load assumptions

Geometry:	Cantilever length	l_k = 1.75 m
	Balcony width	b = 4.50 m
Thickness of reinforced concrete inner slab		h = 200 mm
Axis spacing of the connections as chosen for the design		a = 0.7 m
Load assumptions:	Self-weight with lightweight finish	g = 0.6 kN/m²
	Live load	q = 4.0 kN/m²
	Self-weight of railing	F_G = 0.75 kN/m
Horizontal load on railing at rail height 1.0 m		H_G = 0.5 kN/m
Exposure class:	XC 1 on the inside	
chosen:	Concrete grade C25/30 for the floor slab	
	Concrete cover c_v = 20 mm for Isokorb® tension rods	
Connection geometry:	No height offset, no inner slab joist on slab edge, no balcony upstand	
Floor slab bearing:	Slab edge: directly supported	
Balcony bearing:	Cantilever fins clamped with T type SK	

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

Member forces:

M_{Ed} = $-[(\gamma_G \cdot g_B + \gamma_Q \cdot q) \cdot l_k^2/2 \cdot a + \gamma_G \cdot F_G \cdot a \cdot l_k + \gamma_Q \cdot \psi_0 \cdot H_G \cdot 1.0 \cdot a]$

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} = $(1.2 \cdot 0.6 + 1.5 \cdot 4.0) \cdot 0.7 \cdot 1.75 + 1.2 \cdot 0.75 \cdot 0.7$ = +8.9 kN

Requisite number of connections: n = (b/a) + 1 = 7.4 = 8 items

Axis separation of connections: ((4.50 - 0.18)/7) = 0.617 m, where beam width = width of Schöck Isokorb = 0.18 m

chosen: **8 items Schöck Isokorb® T type SK-M1-V1-R0-H200-L180-1.0**

M_{Rd} = -12.9 kNm > M_{Ed} = -8.7 kNm

V_{Rd} = +10.0 kN (see page 22) > V_{Ed} = +8.9 kN

Design example

Verification in the serviceability limit state (deformation/camber, torsion spring stiffness)

Torsion spring stiffness:	C	= 2640 (from table, see page 25)
chosen load combination:	g + 0,3 · q	
	(Recommendation for the determination of the camber from Schöck Isokorb®)	
	$M_{Ed,QP}$ from quasi permanent load	
	$M_{Ed,QP}$	$= -[(g_B + \psi_{2,i} \cdot q) \cdot l_k^2/2 \cdot a + F_G \cdot a \cdot l_k + \psi_{2,i} \cdot H_G \cdot 1.0 \cdot a]$
	$M_{Ed,QP}$	$= -[(0.6 + 0.3 \cdot 4.0) \cdot 1.75^2/2 \cdot 0.7 + 0.75 \cdot 0.7 \cdot 1.75 + 0.3 \cdot 0.5 \cdot 1.0 \cdot 0.7] = -3.0$ kNm
deformation:	$w_ü$	$= \lvert M_{Ed,QP} \rvert / C \cdot l_k \cdot 10^3$ [mm]
	$w_ü$	$= 3.0/2640 \cdot 1.75 \cdot 10^3 = 2$ mm
Arrangement of expansion joints		length of balcony : 4.50 m < 5.70 m
	=> no expansion joints required	

Check list

- ☐ Have the loads on the Schöck Isokorb® connection been specified at design level?
- ☐ Are the minimum concrete strength and exposure classes specified in the implementation plans?
- ☐ Is there a situation in which the construction must be designed for an emergency situation or special load during construction?
- ☐ Is the stiffness of the support taken into account with the design of statically indefinite constructions?
- ☐ Has the transfer of the forces in the reinforced concrete component been verified?
- ☐ Have the fire protection requirements for the overall load-bearing structure been clarified? Are the on-site measures included in the construction drawings?
- ☐ Is the Schöck Isokorb® connection exposed to uplifting shear forces in conjunction with positive connection moments?
- ☐ When calculating the deflection of the overall structure, has the camber caused by 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?
- ☐ Are temperature deformations directly attributed to the Isokorb® connection and has the maximum expansion joint spacing been taken into consideration in this respect?
- ☐ Is compliance with the conditions and dimensions of the on-site fixing plate assured?
- ☐ Do the construction drawings contain sufficient reference to the essential on-site butt stop?
- ☐ When using the Schöck Isokorb® T type SK-M1 in precast element slabs, has the in-situ concrete strip been taken into account in the implementation plans? Width ≥ 100 mm from rear edge Isokorb®.
- ☐ When using the Schöck Isokorb® T type SK-MM1 or T type SK-MM2 in precast element slabs, has the recess on the floor side been taken into account?
- ☐ Have the requirements for on-site reinforcement of connections been defined in each case?
- ☐ Has the required installation accuracy of the Schöck Isokorb® T type SK been clarified and shown in the implementation plans?
- ☐ Are the tightening torques for the screwed connections noted in the construction drawings?

Schöck Isokorb® T type SQ

Schöck Isokorb® T type SQ
Suitable for supported steel balconies and canopies. It transfers positive shear forces.

Element arrangement | Installation cross sections

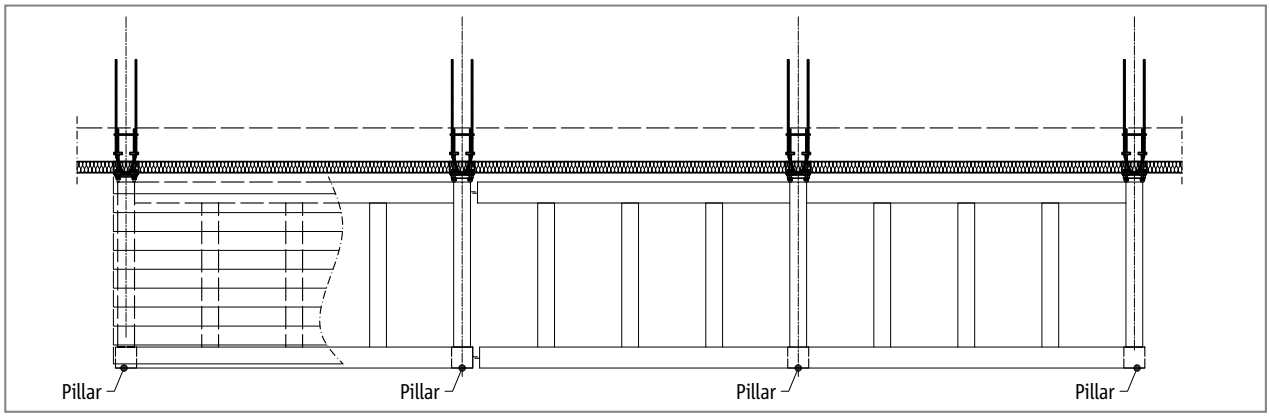


Fig. 61: Schöck Isokorb® T type SQ: Pillar supported balcony

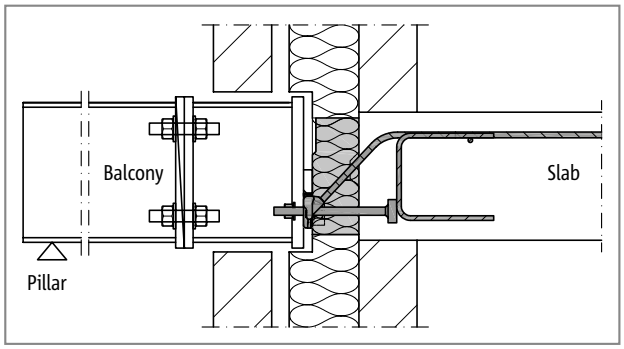


Fig. 62: Schöck Isokorb® T type SQ: insulating element within the core insulation zone; steel stub adjuster between the Isokorb® and the balconyfor flexible construction workflow

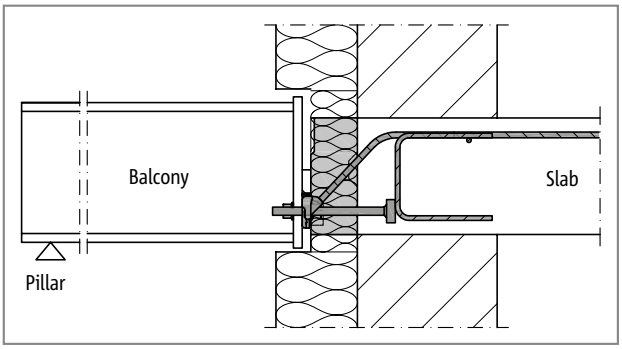


Fig. 63: Schöck Isokorb® T type SQ: Connection to reinforced concrete inner slab; insulating element within the core insulation zone.

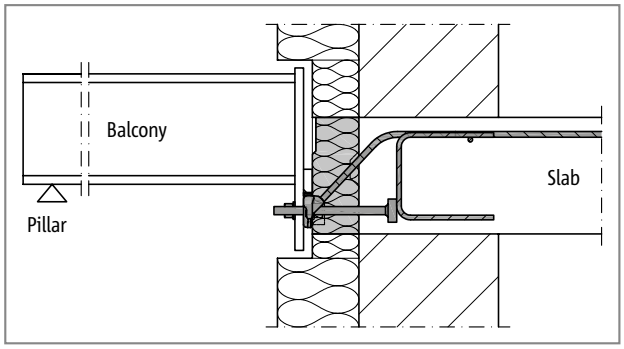


Fig. 64: Isokorb® T type SQ:Barrier-free access due to height offsetoffset

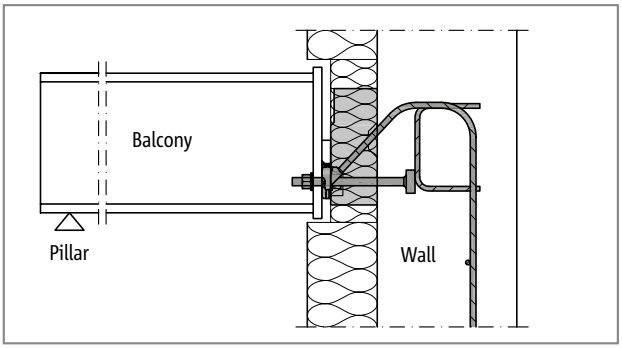


Fig. 65: Schöck Isokorb® T Type SQ-WU: Special design; required for the connection to a reinforced concrete wall

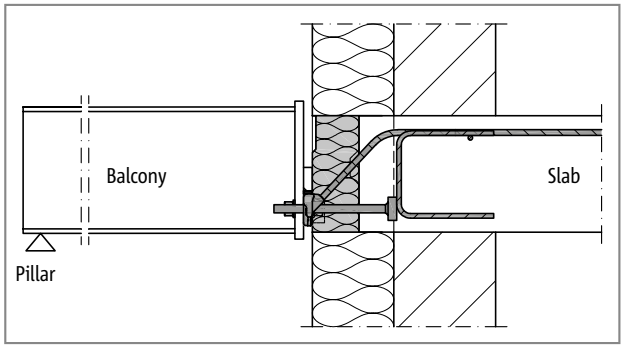


Fig. 66: sokorb® T type SQ:Using the ceiling floorion, the insulation body is flush with the insulation of the wall on the outside.outside, the lateral edge distances must be taken into account.

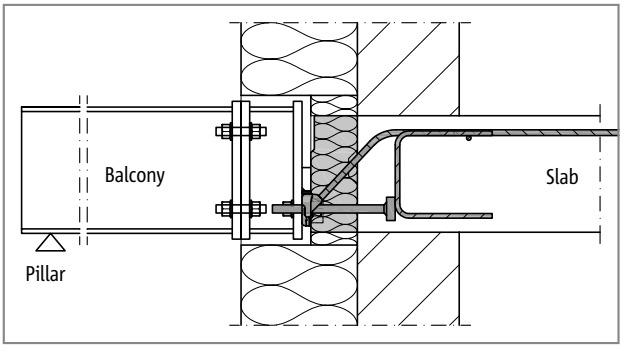


Fig. 67: Schöck Isokorb® T type SQ: Connection of the steel member to an adapter that equalises the thickness of the outer insulation

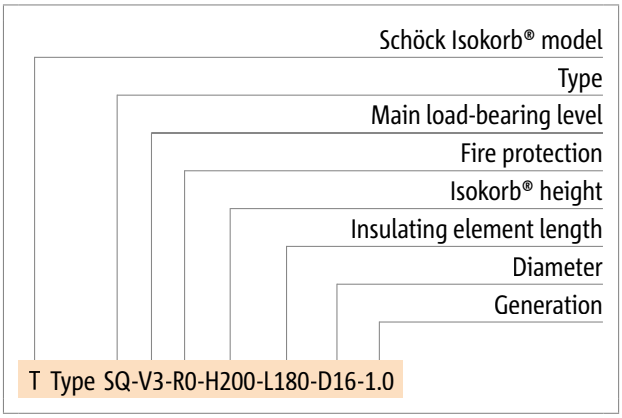
Product selection | Type designations | Special designs | Design force direction

Schöck Isokorb® T type SQ variants

The configuration of the Schöck Isokorb® T type SQ can be varied as follows:

- Main load-bearing level:
  Shear force level V1, V2, V3
- Fire resistance class:
  R0
- Isokorb® Height:
  According to approval H = 180 mm to H = 280 mm, graduated in 10-mm steps
- Isokorb® length:
  L180 = 180 mm
- Thread diameter:
  D16 = M16
- Generation:
  1.0

Type designations in planning documents



Special designs

Please contact the design support department if you have connections that are not possible with the standard product variants shown in this information (contact details on page 3).

Direction of forces

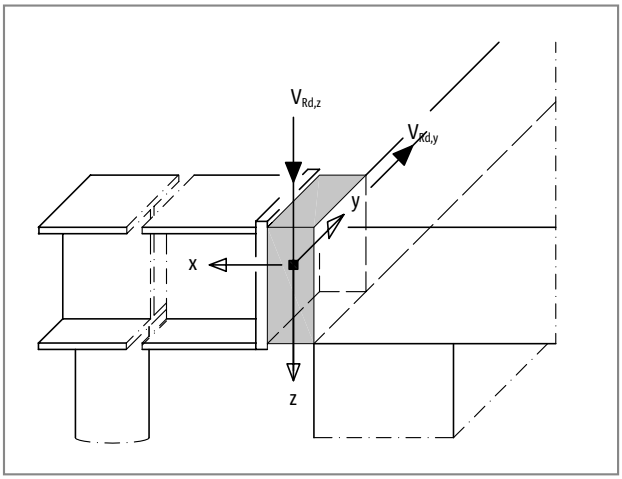


Fig. 68: Schöck Isokorb® T type SQ: Direction of internal forces and moments

Design

Schöck Isokorb® T type SQ: Design

Area of application of the Schöck Isokorb® T type SQ covers floor and balcony slab structures with predominantly static, evenly distributed live loads according to BS EN 1991-1-1/NA2 or NA 3. Static verification is to be produced for the components connecting to both sides of the Isokorb®. All Isokorb® T type SQ variants can transfer positive shear forces parallel to the z axis. The Isokorb® type SK offers solutions for negative (lifting) shear forces.

Schöck Isokorb® T type SQ	V1	V2	V3
Design values with	$V_{Rd,z}$ [kN/element]		
Concrete strength class ≥ C25/30	30.9	48.3	69.6
	$V_{Rd,y}$ [kN/element]		
	±2.5	±4.0	±6.5

Isokorb® length [mm]	180	180	180
Shear force bars	2 ⌀ 8	2 ⌀ 10	2 ⌀ 12
Pressure bearing / compression bars	2 ⌀ 14	2 ⌀ 14	2 ⌀ 14
Thread	M16	M16	M16

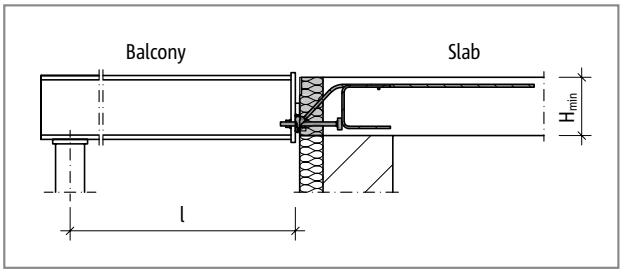


Fig. 69: Schöck Isokorb® T type SQ: Static system

Notes on design

- Design values are taken in relation to the rear edge of the fixing plate.
- When using an indirect bearing solution for the Schöck Isokorb® T type SQ, the structural engineer must provide evidence, in particular, of the load transfer in the reinforced concrete component.
- The nominal dimension c_{nom} of the concrete cover as per BS EN 1992-1-1 (EC2), 4.4.1 and BS EN 1992-1-1/NA is 20 mm for internal areas.
- Edge and centre-to-centre distances are to be taken into account, see pages 56 and 57.

Expansion joint spacing

Maximum expansion joint spacing

Expansion joints must be provided in the external component. Changes in length due to temperature deformation are determined by the maximum distance (e) from the centre of the outermost Schöck Isokorb® T type SQ. The balcony structure may overhang the outermost Schöck Isokorb® element. In the case of fixed points, such as corners, half the maximum distance (e) from the fixed point applies. The calculation of the permissible expansion joint spacing is based on a reinforced concrete balcony slab that is securely connected to the steel members. If design measures have been implemented to ensure there is movement between the balcony slab and the individual steel members, then only the distances of the non-moving connections are relevant, see detail.

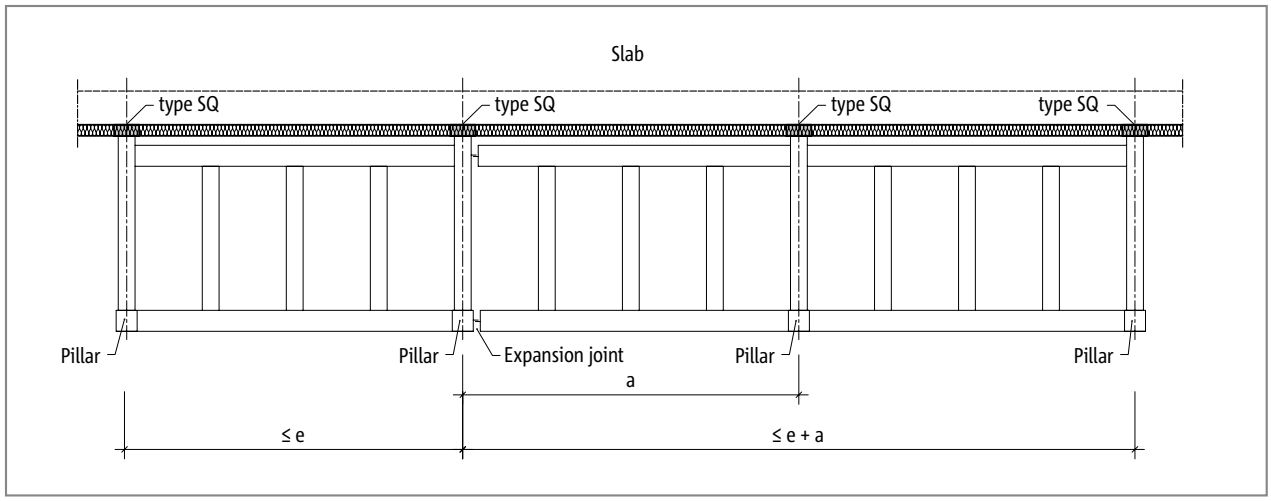


Fig. 70: Schöck Isokorb® T type SQ: Maximum expansion joint spacing e and lateral overhang a

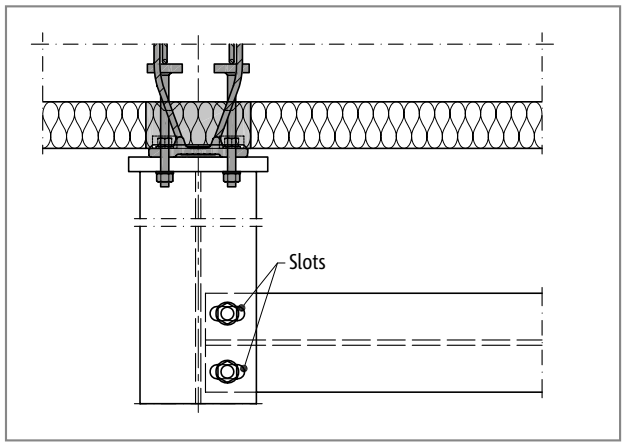


Fig. 71: Schöck Isokorb® T type SQ: Expansion joint detail to ensure movement during temperature expansion

Schöck Isokorb® T type SQ		V1 - V3
Maximum expansion joint spacing e		e [m]
Insulating element thickness [mm]	80	5.7

Expansion joints

- If the expansion joint detail permanently permits temperature conditioned displacements of the cross member of length a, the expansion joint spacing may be extended to a maximum of e + a .

Edge spacing

Edge spacing

The Schöck Isokorb® T type SQ must be so positioned that minimum edge distances related to the inner reinforced concrete structural element are maintained:

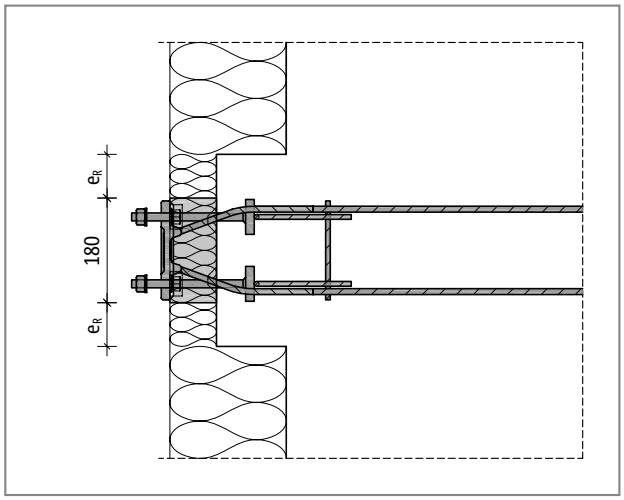


Fig. 72: Schöck Isokorb® T type SQ: Edge distances

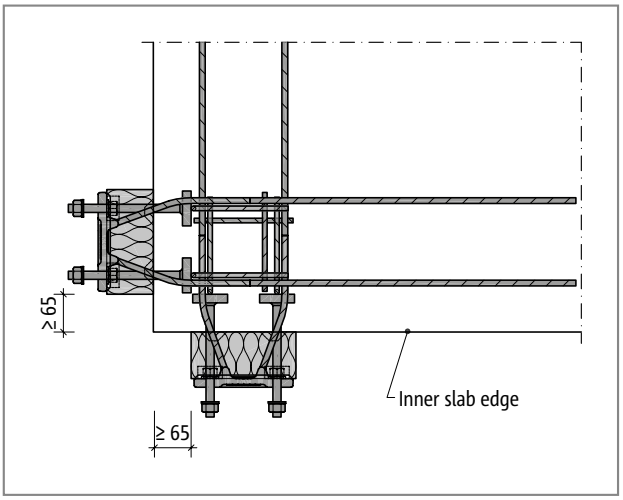


Fig. 73: Schöck Isokorb® T type SQ: Edge distances at the outer corner with Isokorbs® arranged vertically to each other

Acceptable shear force $V_{Rd,z}$ depending on the edge distance

Schöck Isokorb® T type SQ		V1	V2	V3
Design values with		Concrete strength class ≥ C25/30		
Isokorb® height H [mm]	Edge distance e_R [mm]	$V_{Rd,z}$ [kN/element]		
180 - 190	30 ≤ e_R < 74	14.2	20.4	28.5
200 - 210	30 ≤ e_R < 81			
220 - 230	30 ≤ e_R < 88			
240 - 280	30 ≤ e_R < 95			
180 - 190	e_R ≥ 74	No reduction required		
200 - 210	e_R ≥ 81			
220 - 230	e_R ≥ 88			
240 - 280	e_R ≥ 95			

Edge distances

- Edge distances e_R < 30 mm are not permitted!
- If two Isokorb® T type SQ are arranged vertically to each other at a corner. edge distances e ≥ 65 mm are required.

Centre-to-centre distances

Centre-to-centre distances

The Schöck Isokorb® T type SQ must be so positioned that minimum centre-to-centre distances of Isokorb® to Isokorb® are maintained:

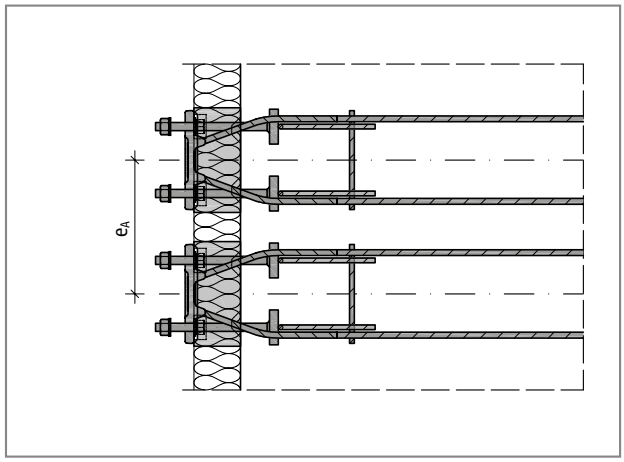


Fig. 74: Schöck Isokorb® T type SQ: Centre-to-centre distance

Design internal forces depending on the centre-to-centre distance

Schöck Isokorb® T type SQ		V1 - V3
Design values with		Concrete strength class ≥ C25/30
Isokorb® height H [mm]	Centre-to-centre distance e_A [mm]	$V_{Rd,z}$ [kN/element]
180 - 190	$e_A \geq 230$	No reduction required
200 - 210	$e_A \geq 245$	
220 - 230	$e_A \geq 255$	
240 - 280	$e_A \geq 270$	

Centre-to-centre distances

- The centre-to-centre distances e_A of the Schöck Isokorb® guarantee the minimum spacing of the shear force bars of 100 mm.

Installation accuracy

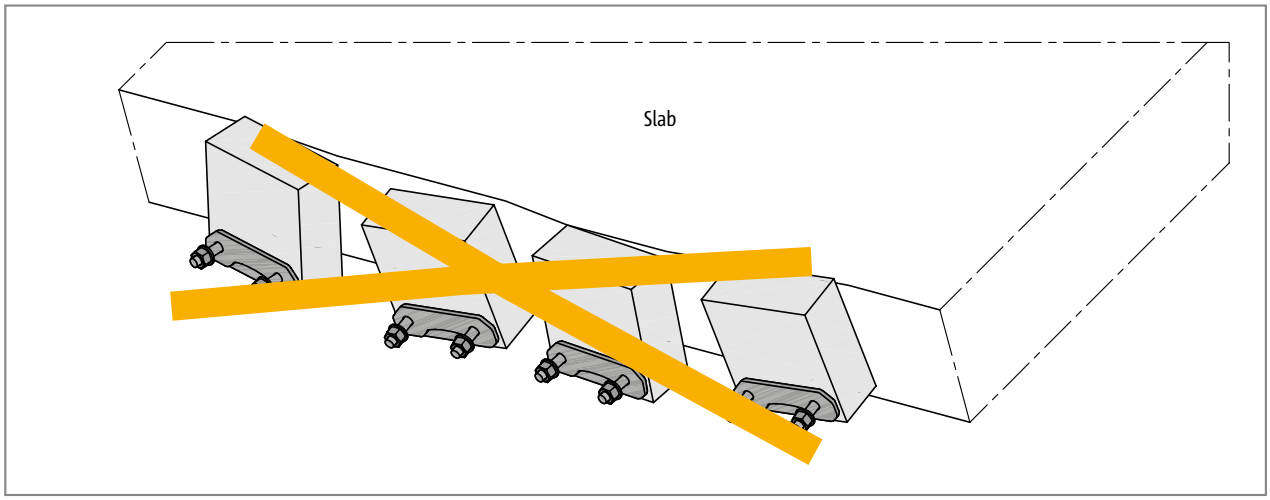


Fig. 75: Schöck Isokorb® T type SQ: Twisted and displaced elements that were poorly secured while the concrete was being poured

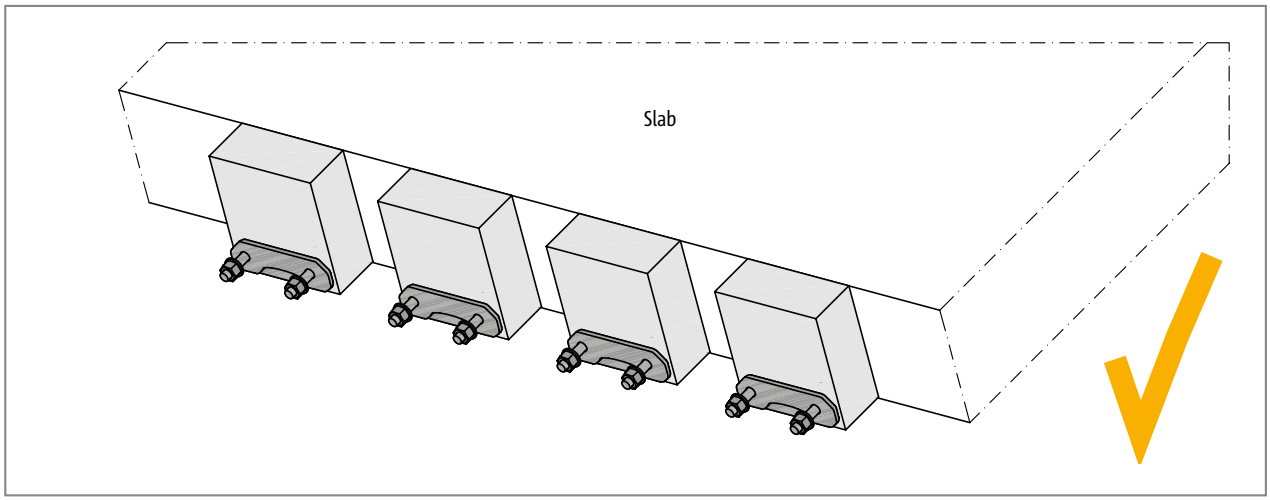


Fig. 76: Schöck Isokorb® T type SQ: Reliable and correct setting while pouring the concrete ensures the tolerance accuracy is maintained.

As the Schöck Isokorb® produces the connection between a steel component and a reinforced concrete component, the question of installation accuracy is of particular importance. DIN 18202 2013-04 “Tolerance in building construction - Buildings” must be observed in this respect! Derived therefrom, tolerances on the required installation position of the Schöck Isokorb® are without fail to be included in shell implementation plans, which are accepted by both structural engineer and steel constructor This is to be agreed in the run up to planning. At the same time, bear in mind that the construction engineer cannot or only with considerable additional expense adjust large deviations in measurement.

Height adjustment of the steel beam - lowest position

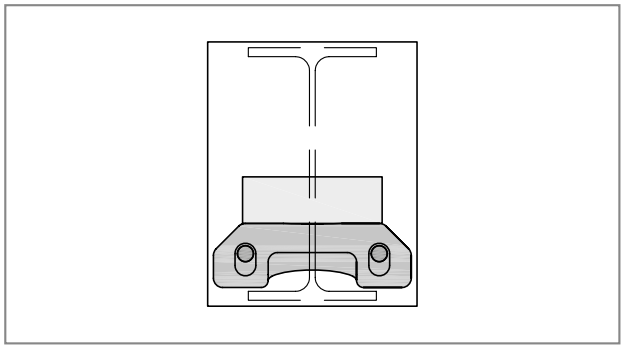


Fig. 77: Schöck Isokorb® T type SQ: on-site shim lies directly on the load plate

Height adjustment of the steel beam - highest position

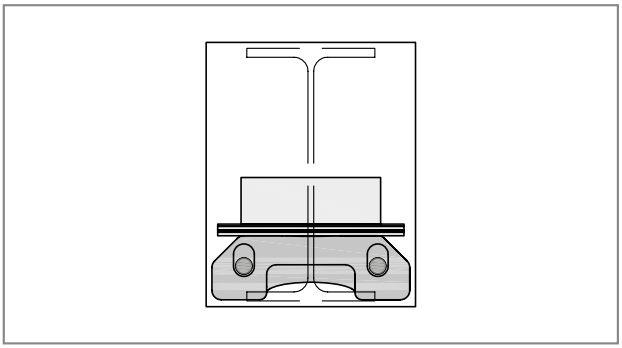


Fig. 78: Schöck Isokorb® T type SQ: Shims on the load plate raise the position of the steel beam by up to 20 mm

Installation accuracy

Information on installation accuracy

- Due to design constraints, the Schöck Isokorb® only allows dimensional deviations in the vertical direction for steel to reinforced concrete connections.
- Horizontal limit deviations for the separation of the Schöck Isokorb® axes must be specified, as must the limit deviations from the alignment. Torsional limits must also be specified.
- The use of a template developed on site is highly recommended to ensure dimensionally accurate installation and the correct sitting of the Schöck Isokorb® during the concrete pouring process.
- The construction supervisor is responsible for checking the agreed installation accuracy of the Schöck Isokorb® for steel to reinforced concrete connections in good time!

Installation aid (optional)

An installation aid is optionally available from Schöck to improve installation accuracy.

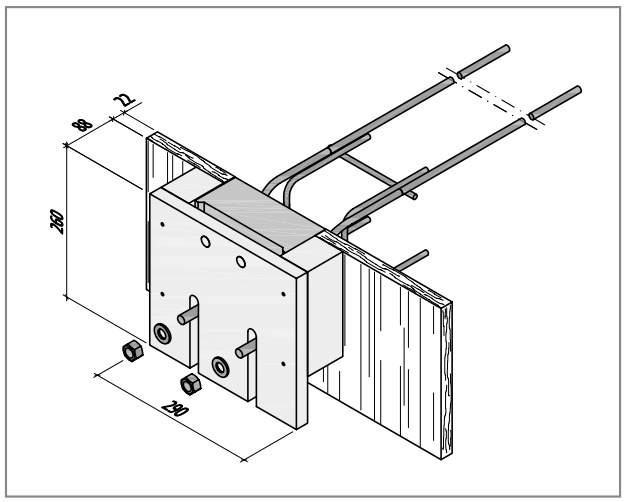


Fig. 79: Schöck Isokorb® T type SQ: Representation with installation aid

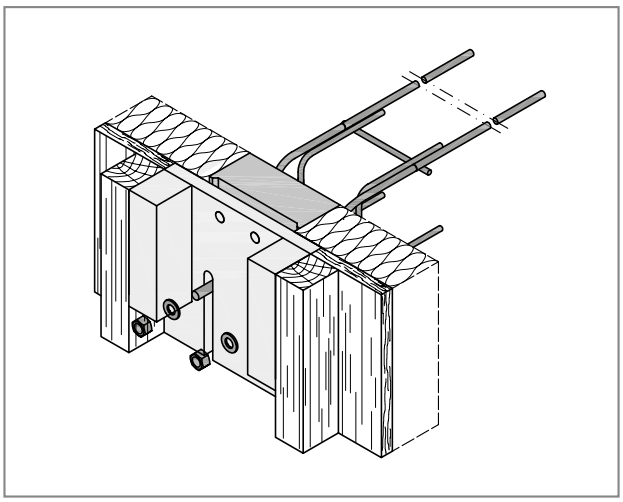


Fig. 80: Schöck Isokorb® T type SQ: Installation aid installed in reverse to enable gapless insulation of the slab edge on monolithic walls.

The optional installation aid for the Schöck Isokorb® type KSXT is factory assembled from a timber board and two square timbers. It holds the Isokorb® securely in place before and while pouring the concrete. When using the aid in “positive position” (see Fig. above left), it is matched to standard 22 mm formwork. If using formwork of a different thickness, the installation aid needs to be modified on site.

Notes on the installation aid

- Please contact your regional manager if you have questions regarding the installation of the Schöck Isokorb®. They can also help directly on site if the installation conditions are difficult (contact: www.schoeck.co.uk/en_gb/regional-sales-manager).
- The T type SK-M1 H180-280 installation aid is 260 mm high. It is suitable for versions H180 to H280 of the Schöck Isokorb® T type SQ.
- The Schöck installation aid is combined with the on-site formwork to form a template.

Product description

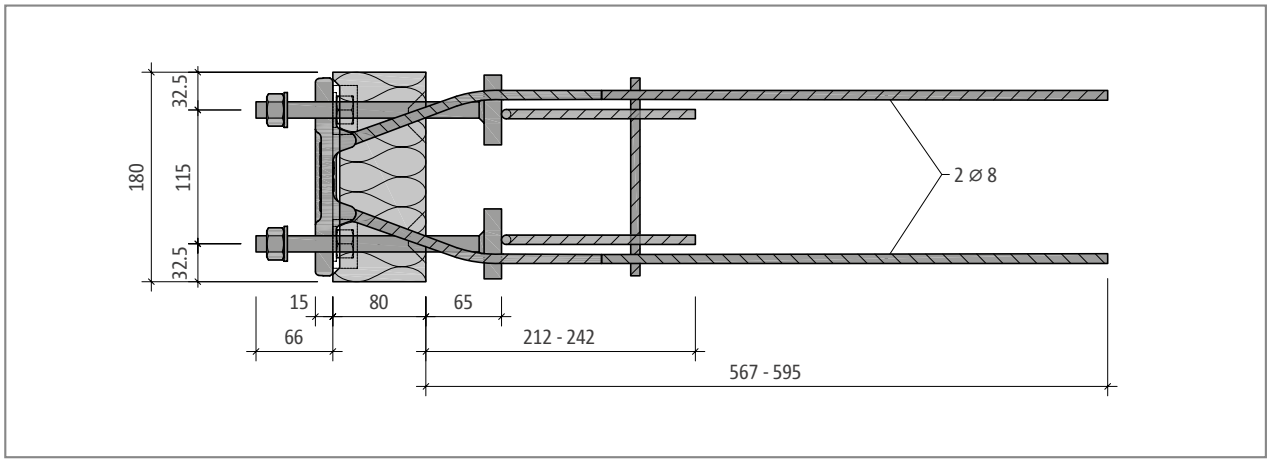


Fig. 81: Schöck Isokorb® T type SQ-V1: Plan view

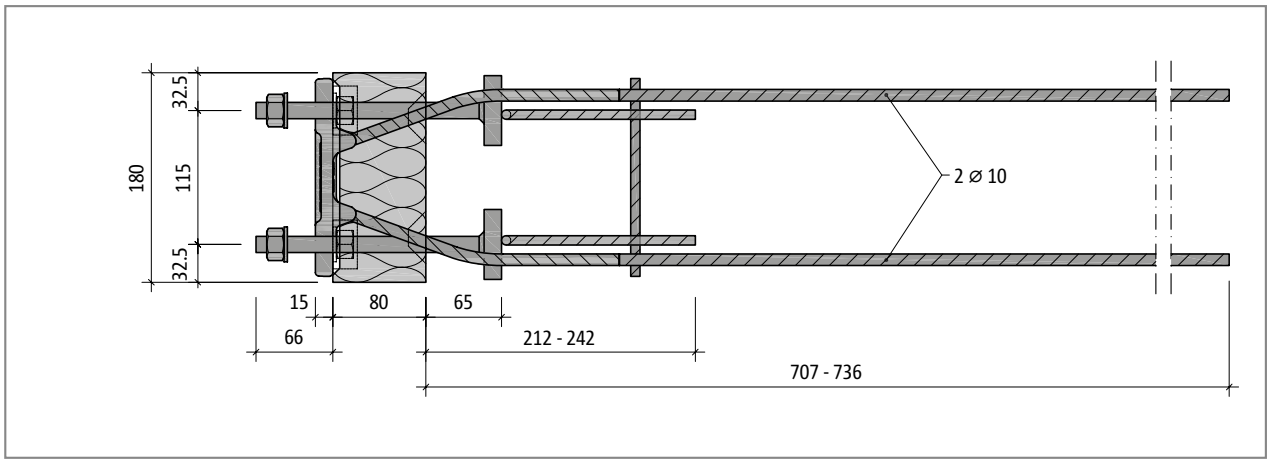


Fig. 82: Schöck Isokorb® T type SQ-V2: Plan view

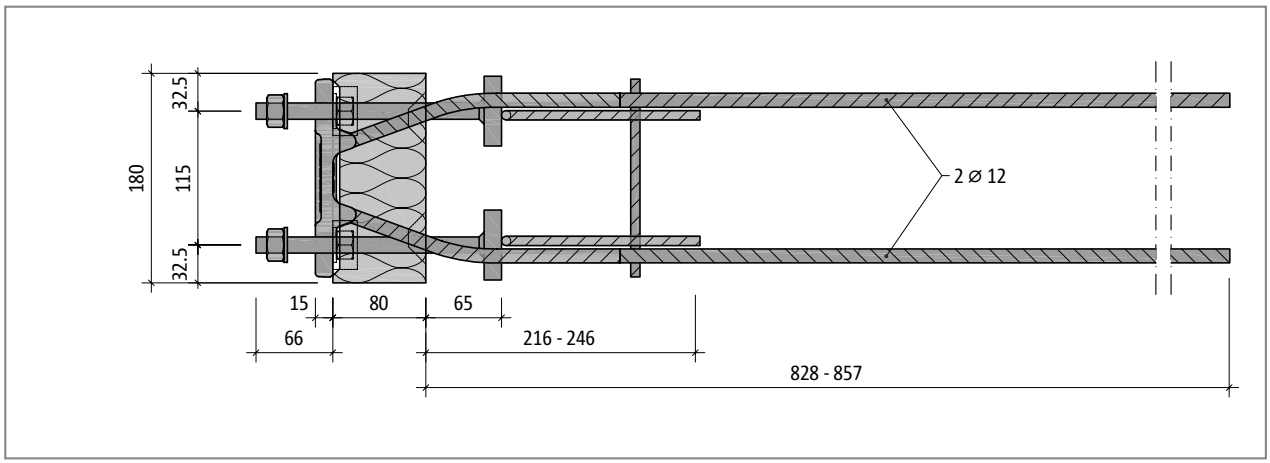


Fig. 83: Schöck Isokorb® T type SQ-V3: Plan view

Product information

- The free clamping distance on T type SQ is 30 mm.

Product description

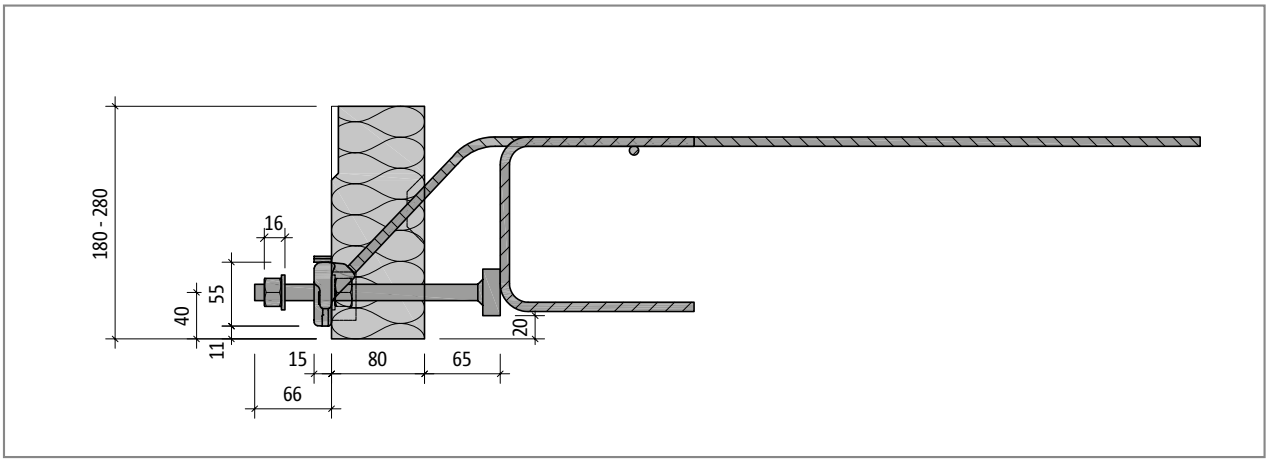


Fig. 84: Schöck Isokorb® T type SQ-V1: Cross section of the product

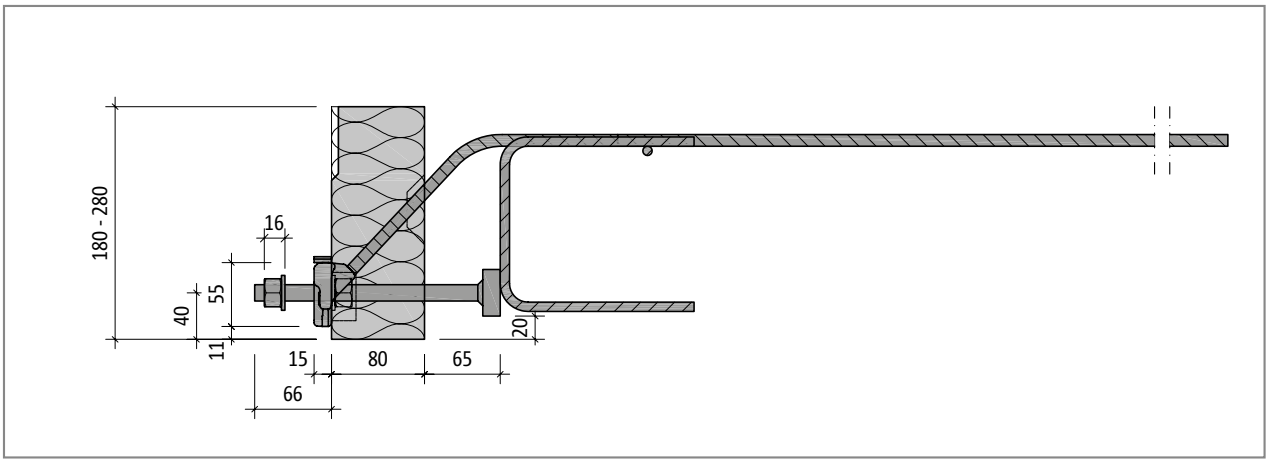


Fig. 85: Schöck Isokorb® T type SQ-V2: Cross section of the product

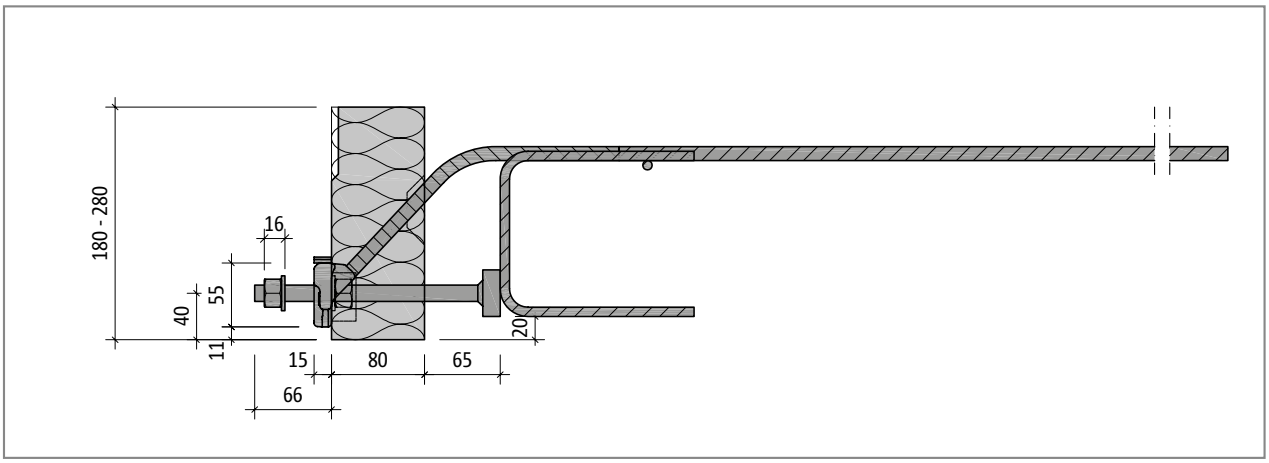


Fig. 86: Schöck Isokorb® T type SQ-V3: Cross section of the product

Product information

- The free clamping distance on T type SQ is 30 mm.

Fire protection

Fire protection

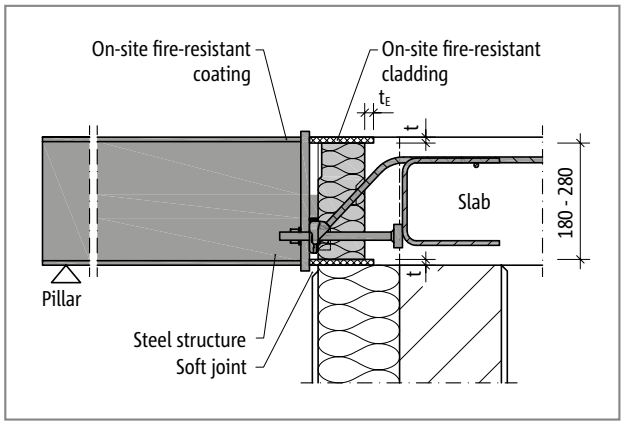


Fig. 87: Schöck Isokorb® T type SQ: on site fire-resistant cladding of the connection when using steel structures with fire-resistant coating; cross-section

Fire-resistant cladding of the Schöck Isokorb® must be planned and installed on site. The same on-site fire safety measures apply as for the overall load-bearing structure.
See explanation page 11.

On-site reinforcement – In-situ concrete construction

Schöck Isokorb® T type SQ

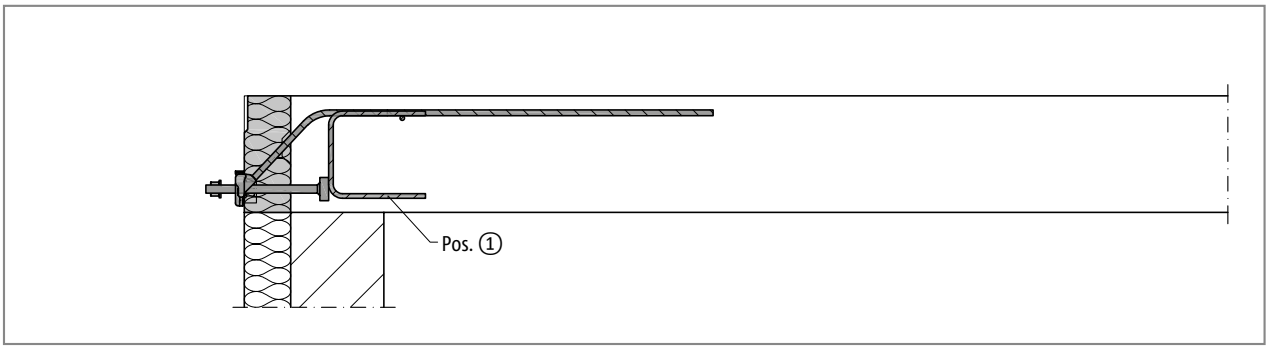


Fig. 88: Schöck Isokorb® T type SQ: On-site reinforcement: Cross section

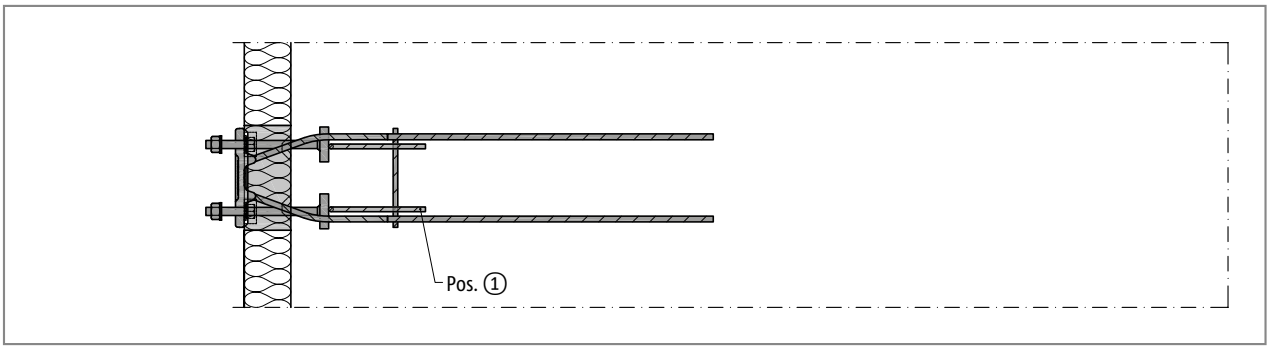


Fig. 89: Schöck Isokorb® T type SQ: On-site reinforcement: Plan view

Schöck Isokorb® T type SQ			V1 - V3
On-site reinforcement	Type of bearing	Height H [mm]	Floor slab (XC1) concrete grade ≥ C25/30 Balcony steel structure
Pos. 1 Edge and splitting tension reinforcement			
Pos. 1	direct/indirect	180–280	included with the product

Information about on-site reinforcement

- The straight legs of the shear force rods must be lapped to the reinforced concrete slab reinforcement. The lap lengths must comply with BS EN 1992-1-1 (EC2), Section 8.4.

On-site reinforcement – Precast construction

Schöck Isokorb® T type SQ

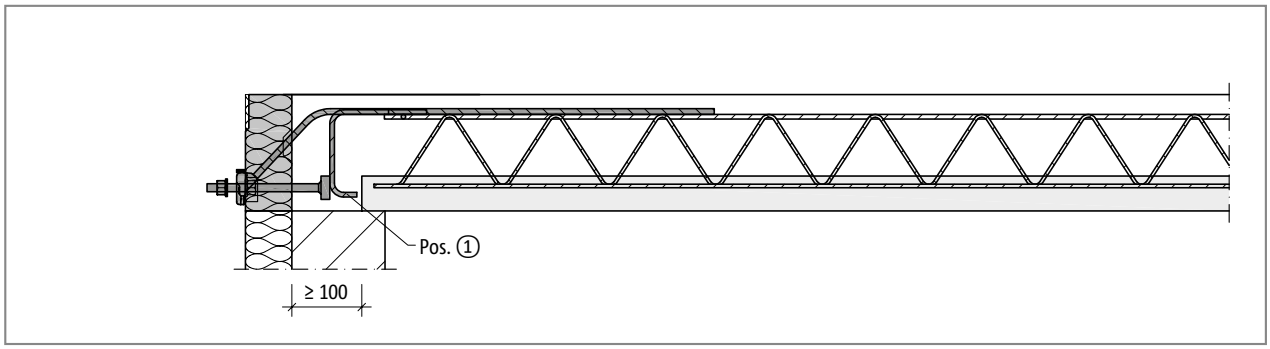


Fig. 90: Schöck Isokorb® T type SQ: On-site reinforcement for semi-precast construction: Cross section

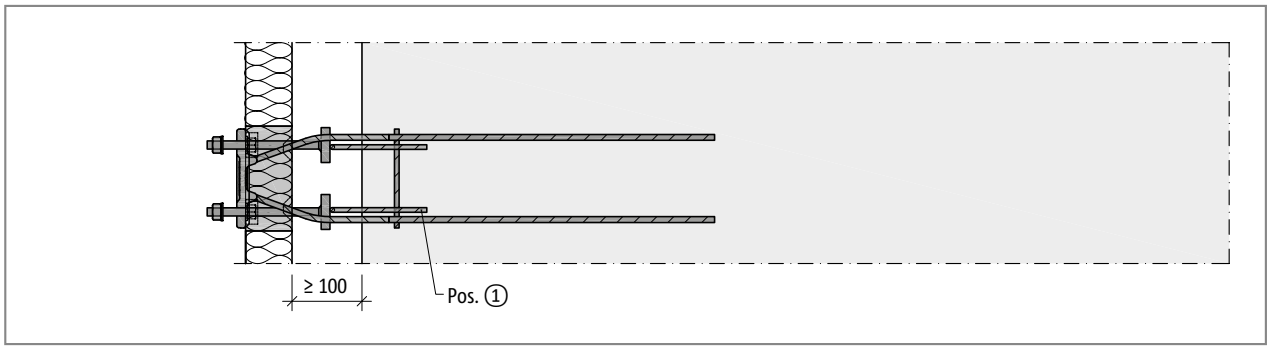


Fig. 91: Schöck Isokorb® T type SQ: On-site reinforcement for semi-precast construction: Plan view

Schöck Isokorb® T type SQ			V1 - V3
On-site reinforcement	Type of bearing	Height H [mm]	Floor slab (XC1) concrete grade ≥ C25/30 Balcony steel structure
Pos. 1 Edge and splitting tension reinforcement			
Pos. 1	direct/indirect	180–280	included with the product, alternative version with on-site stirrups 2 • H8

Information about on-site reinforcement

- The straight legs of the shear force rods must be lapped to the reinforced concrete slab reinforcement. The lap lengths must comply with BS EN 1992-1-1 (EC2), Section 8.4.
- If composite pre-cast flooring is being installed, the lower legs of the factory-supplied links can be shortened on site and replaced with two suitable ⌀8 stirrups.

Fixing Plate

T Type SQ for transferring positive shear forces

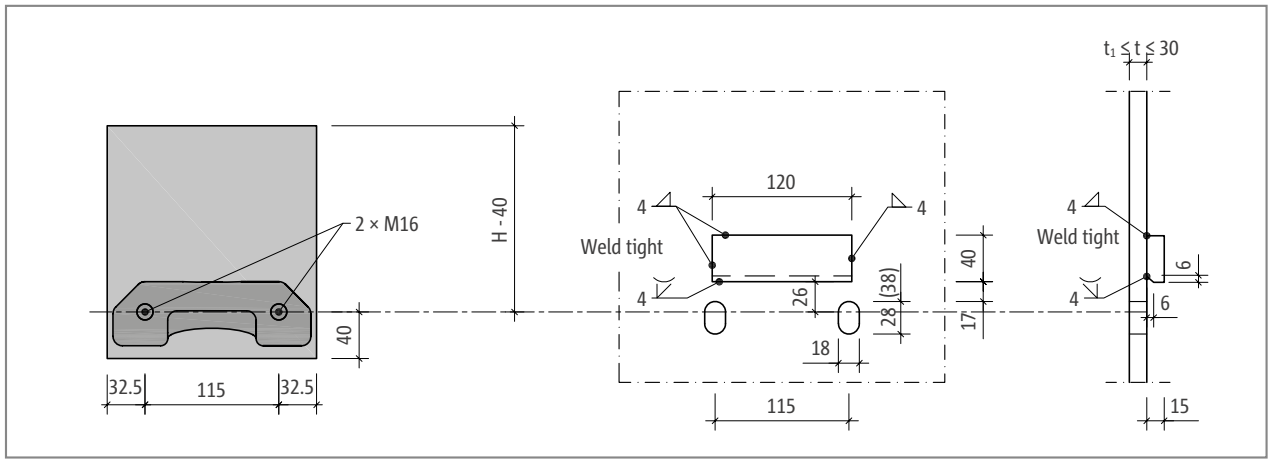


Fig. 92: Schöck Isokorb® T type SQ: Design of the fixing plate connection

The choice of fixing plate thickness t is determined by the minimum thickness t_1 as specified by the structural engineer. This thickness must not, however, be greater than the clamping distance of the Schöck Isokorb® T type SQ, which is 30 mm.

Fixing Plate

- The illustrated elongated holes allow an uplifting of the endplate of up to 10 mm. The values shown in brackets allow for the increase of the tolerances of up to 20 mm.
- If horizontal forces $V_{Ed,y} > 0.342 \cdot \text{min. } V_{Ed,z}$ parallel to the insulation joint occur, the front slab must be modified with ⌀18 mm round holes instead of slots to ensure load transfer.
- The structural engineer must specify the overall dimensions of the fixing plate
- The construction drawing must contain the tightening torque for the nuts, which is specified as follows:
  T type SQ (threaded rod ⌀ 16): M_r = 50 Nm
- The Schöck Isokorb® embedded in concrete are to be measured in-situ before the front slabs are produced.

On-site butt stop

On-site butt stop

The on-site butt stop is absolutely crucial for transferring shear forces from the on-site front slab to the Isokorb® T type SQ! The spacer shims supplied by Schöck are used for vertical adjustment between butt stop and Schöck Isokorb®.

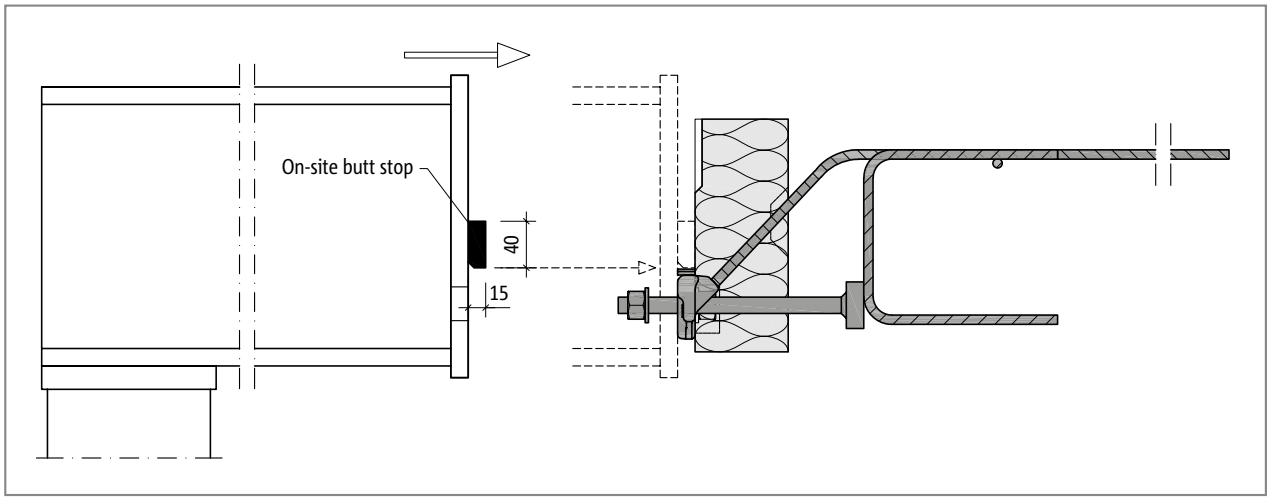


Fig. 93: Schöck Isokorb® T type SQ: Mounting the steel member

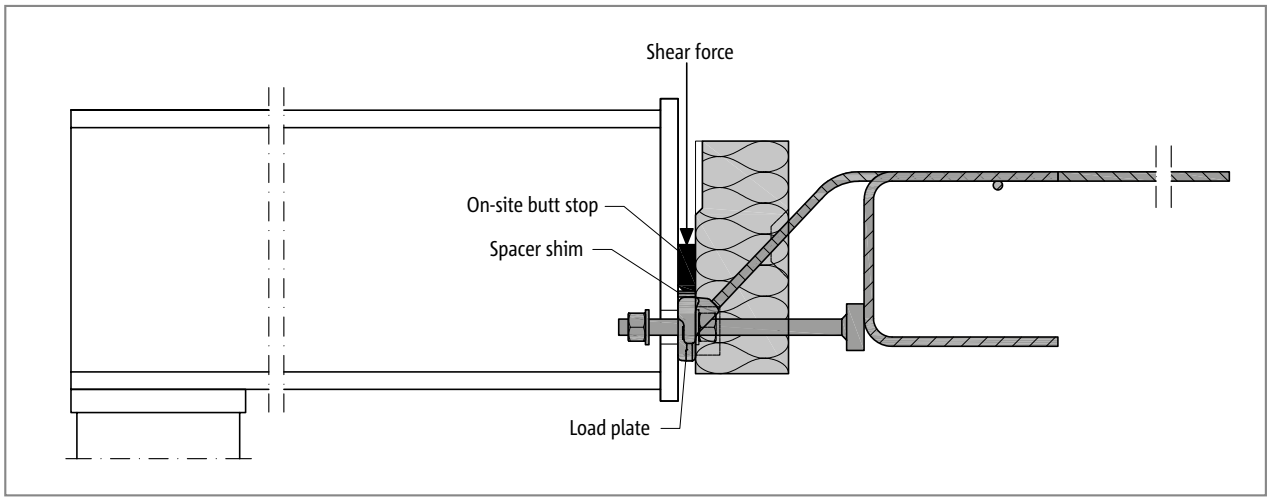


Fig. 94: Schöck Isokorb® T type SQ: On-site butt stop for transferring shear forces

On-site butt stop

- Type of steel to match static requirements.
- Apply corrosion protection after welding.
- Steel construction: Checking for dimensional inaccuracy of the structure prior to fabrication is absolutely essential!

Spacer shims

- Details of dimensions and materials, see page 16
- During installation look after planeness.
- Scope of delivery: 2 • 2 mm + 1 • 3 mm thickness per Schöck Isokorb®

Type of bearing: supported

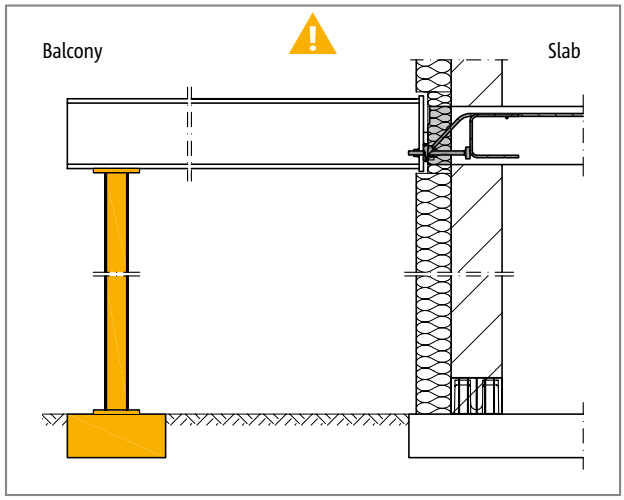


Fig. 95: Schöck Isokorb® T type SQ: Continuous support needed

Supported balcony

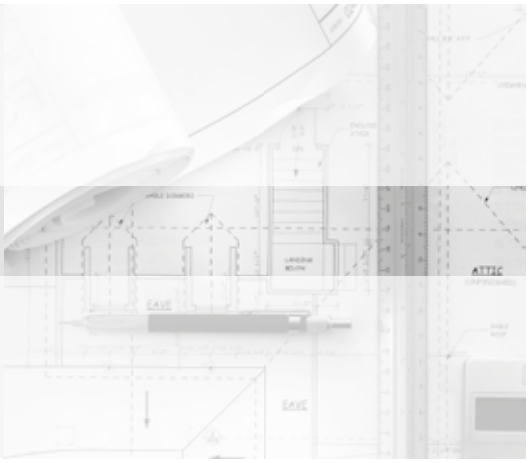
The Schöck Isokorb T Type SQ is developed for supported balconies. It transfers exclusively shear forces, no bending moments.

Hazard warning - missing supports

- The balcony will collapse if not supported.
- At all stages of construction, the balcony must be supported with statically suitable pillars or supports.
- Even when completed, the balcony must be supported with statically suitable pillars or supports.
- A removal of the temporary supports is permitted only after the installation of the final support.

Check list

- ☐ Has the right type of Schöck Isokorb® been selected for the static system? T Type SQ is a connection purely for shear forces (moment joint).
- ☐ Have the loads on the Schöck Isokorb® connection been specified at design level?
- ☐ Are the minimum concrete strength and exposure classes specified in the implementation plans?
- ☐ Is there a situation in which the construction must be designed for an emergency situation or special load during construction?
- ☐ Is the stiffness of the support taken into account with the design of statically indefinite constructions?
- ☐ Has the transfer of the forces in the reinforced concrete component been verified?
- ☐ Have the fire protection requirements for the overall load-bearing structure been clarified? Are the on-site measures included in the construction drawings?
- ☐ Does a connection to a wall or with height offset necessitate the use of Isokorb® T type SQ-WU instead of T type SQ (see page 19) or another special design?
- ☐ Are temperature deformations directly attributed to the Isokorb® connection and has the maximum expansion joint spacing been taken into consideration in this respect?
- ☐ Is compliance with the conditions and dimensions of the on-site fixing plate assured?
- ☐ Do the construction drawings contain sufficient reference to the essential on-site butt stop?
- ☐ Has the cutout on the inner slab side been taken into account if using the Isokorb® T type SQ in precast element slabs?
- ☐ Has reasonable agreement been reached between the concrete contractor and steel constructor with regard to the accuracy of installation of the Isokorb® T type SQ?
- ☐ Has the information about the required installation accuracy been incorporated into the concrete frame designs for the construction supervisor and the concrete contractor?
- ☐ Has the information about the required installation accuracy of the Schöck Isokorb® been incorporated into the implementation plans?
- ☐ Are the tightening torques of the screwed connections noted in the implementation plan?
  T type SQ (thread M16): M_r ca. 50 Nm



Construction materials

Schöck Isokorb® T type S materials

Stainless steel	Material No.: 1.4401, 1.4404, 1.4362 and 1.4571	
Threaded rods	Strength class 70	1.4404 (A4L), 1.4362 (-) and 1.4571 (A5)
Rectangular hollow section	S 355	
Pressure plate (Module S-V)	S 275	
Spacer plate (Module S-N)	S 235	
Insulation material	Neopor®- this insulation material is a polystyrene hard foam and registered trademark of BASF, λ = 0.031 W/(m•K), class B1 construction material (of low flammability)	

Anti-corrosion protection

The stainless steel used with the Schöck Isokorb® T type S corresponds to the Material No. 1.4401, 1.4404 or 1.4571. These steels are classified in the Resistance Class III/medium, according to the general technical approval (Z-30.3-6) Annex 1 “Components and connecting elements made from stainless steels”.

Bimetallic corrosion

Using Schöck Isokorb® T type S in conjunction with a galvanised or paint treate front plate there is no concern regarding bimetallic corrosion (see Approval Z-30.3-6, Section 2.1.6.4).
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 system solution (see page 98) needs to be provided in environments with a high chlorine content (e.g. inside indoor swimming pools, ...). Further details on this can be found in our application engineering department (contact see page 3).

Schöck Isokorb® T type S

Schöck Isokorb® T type S
Suitable for steel connections.
The Schöck Isokorb® T type S-N static connection variant transfers normal forces, the Schöck Isokorb® T type S-V transfers normal forces and shear forces
The static connection variants of the Schöck Isokorb® T type S are modules.
Depending on the module arrangement moments, shear forces and normal forces can be transferred.

Installation cross sections

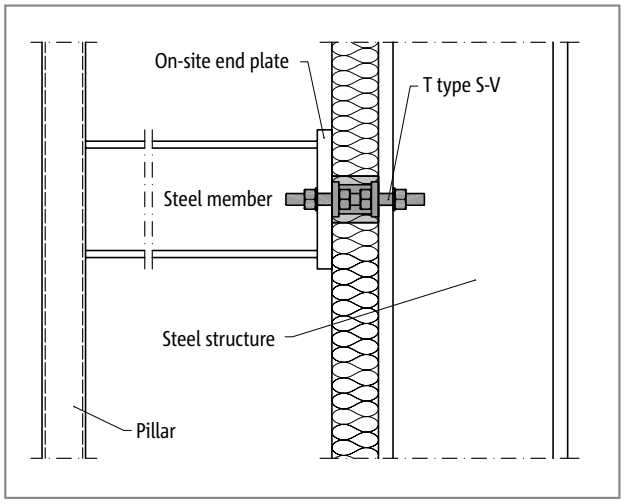


Fig. 96: Schöck Isokorb® T type S-V:for supported steel structures

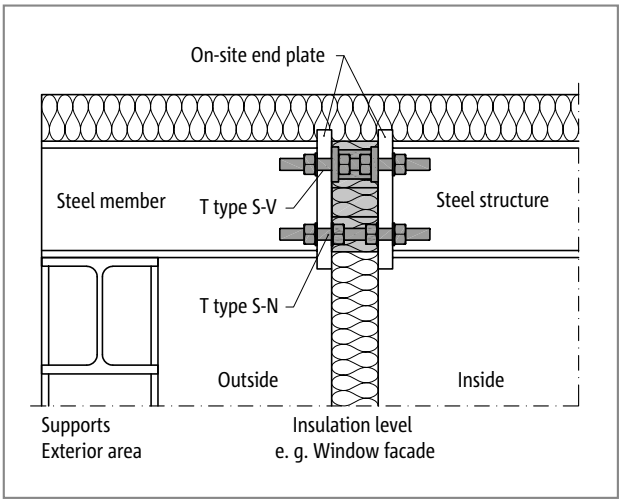


Fig. 97: Schöck Isokorb® T type S-N and T type S-V:for separation within the structural system

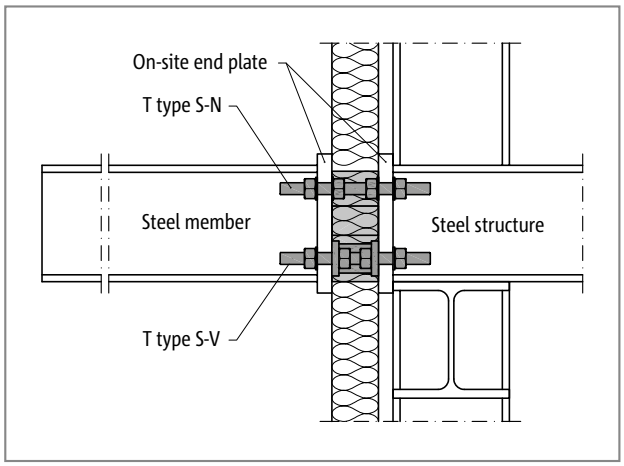


Fig. 98: Schöck Isokorb® T type S-N and T type S-V:for cantilevered steel structures

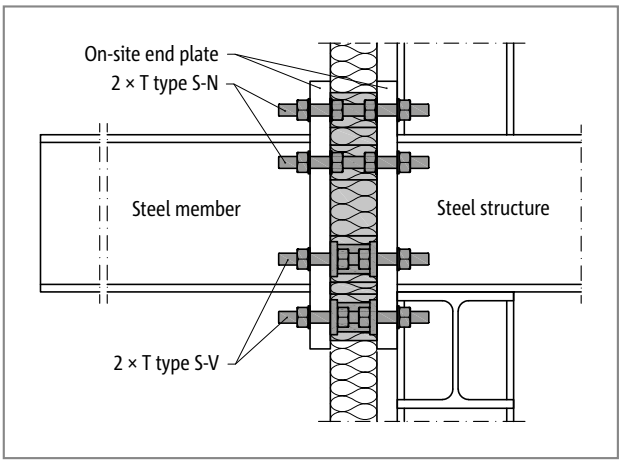


Fig. 99: Schöck Isokorb® T type S-N and T type S-V:for cantilevered steel structures

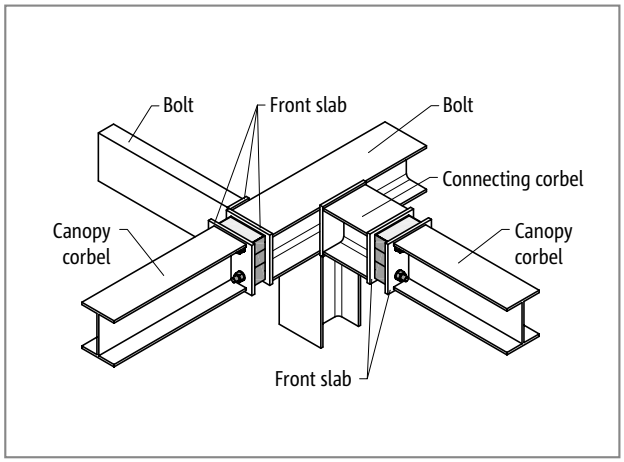


Fig. 100: Schöck Isokorb® T type S: Outer corner

Installation cross sections

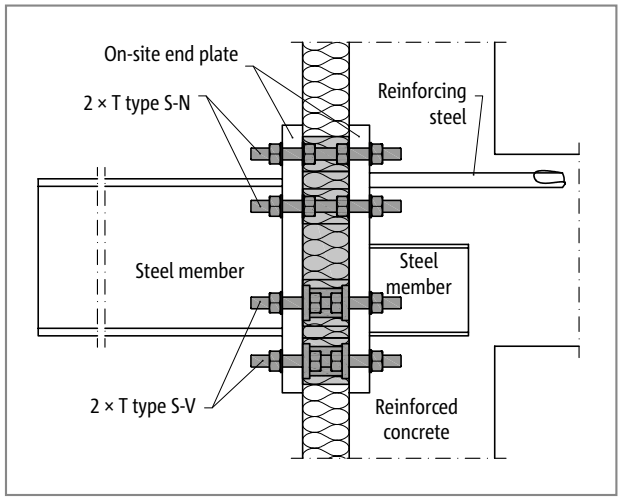


Fig. 101: Schöck Isokorb® T type S-N and T type S-V: for connection of steel structures to reinforced concrete

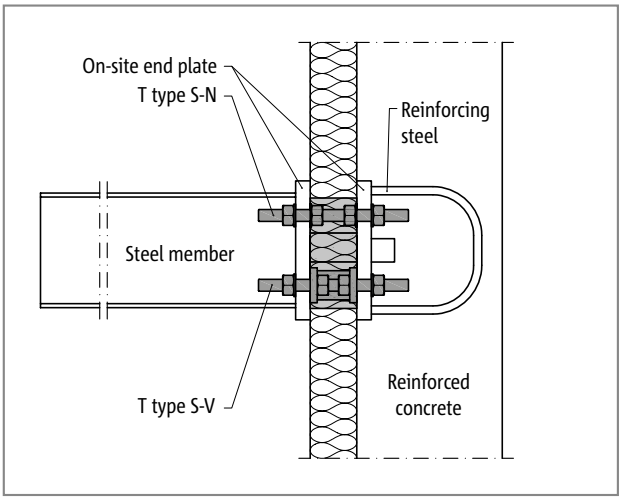


Fig. 102: Schöck Isokorb® T type S-N and T type S-V: for connection of steel structures to reinforced concrete

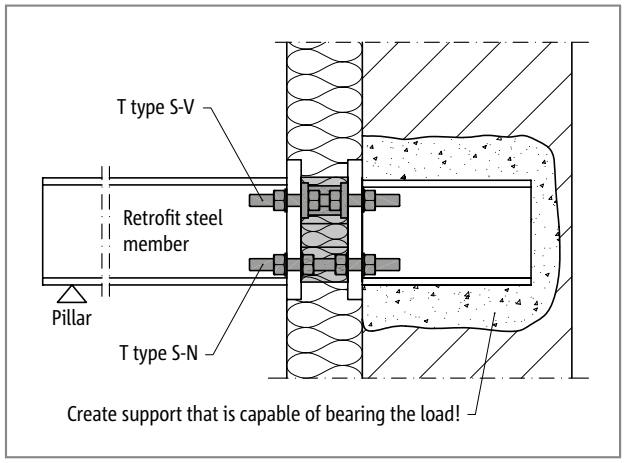


Fig. 103: Schöck Isokorb® T type S-N and T type S-V: for retrofitteds supported steel structure; for further renovation examples see p. 96

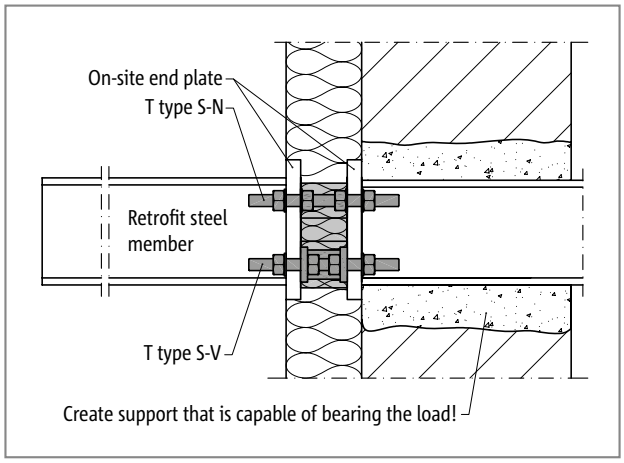


Fig. 104: Schöck Isokorb® T type S-N and T type S-V:for retrofitteds cantilevered steel structure; for further renovations examples see p. 96

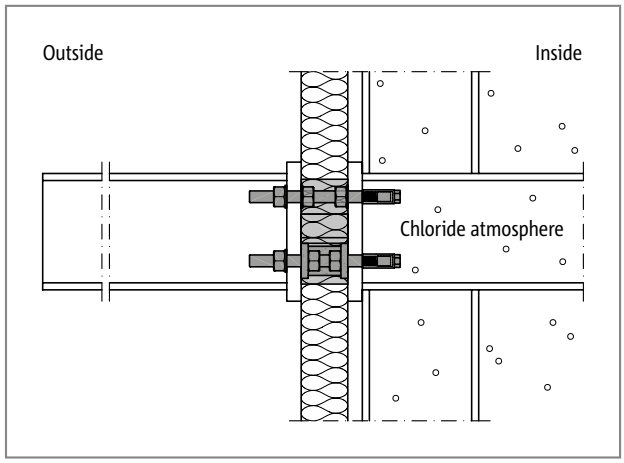


Fig. 105: Schöck Isokorb® T type S with cap nuts: for cantilevered steel structures,.chloride atmosphere inside

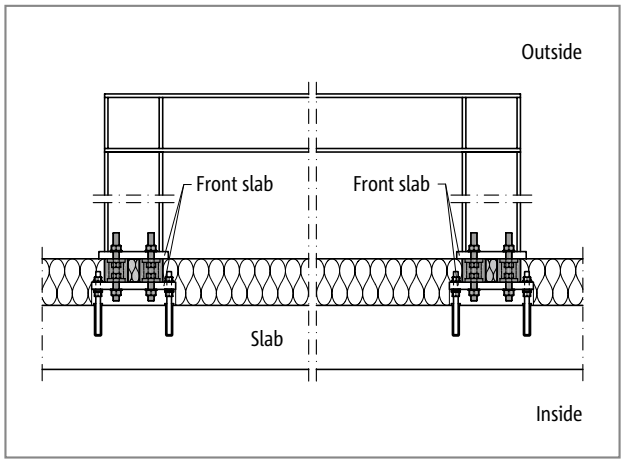


Fig. 106: Schöck Isokorb® T type S-V: Rigid frame connection for secondary structures (additional moments from imperfections must be taken into account)

Product selection

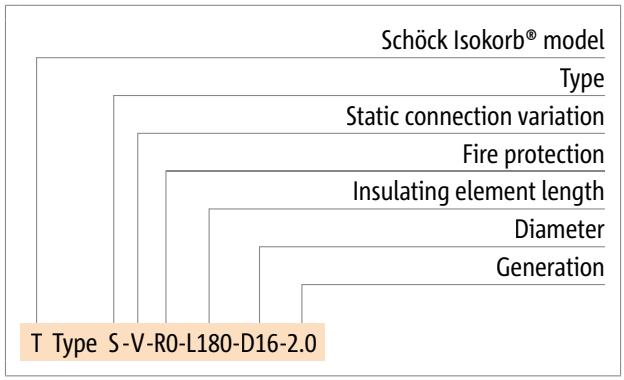
Schöck Isokorb® T type S variants

The configuration of the Schöck Isokorb® T type S can vary as follows:

- Static connection variants:
  N: Transfers normal force
  V: Transfers normal force and shear force:
- Fire resistance class:
  R0
- Thread diameter:
  M16, M22
- Generation:
  2.0
- Height:
  T Type S-N H = 60 mm
  T Type S-V H = 80 mm
- Height with trimmed-off insulation bodies:
  T Type S-N H = 40 mm
  T Type S-V H = 60 mm
  (Insulation body trimmed down to the steel plates; see p.92)
- Modular combination of Schöck Isokorb® T type S-N and T type S-V:
  Determine according to geometric and static requirements.
  Please take into account the number of Schöck Isokorb® T type S-N, T type S-V modules required in the request for quotation and when ordering.

Type designations | Special designs

Type designations in planning documents



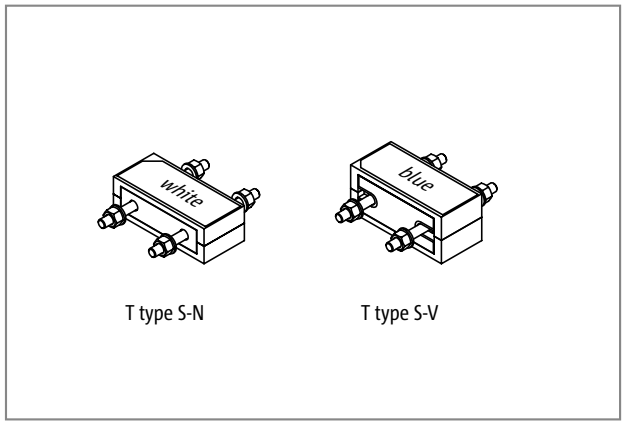


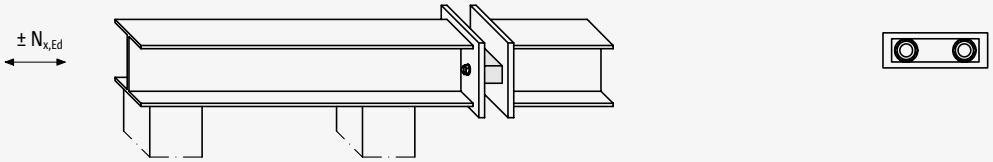
Fig. 107: Schöck Isokorb® T type S-N and T type S-V

Special designs

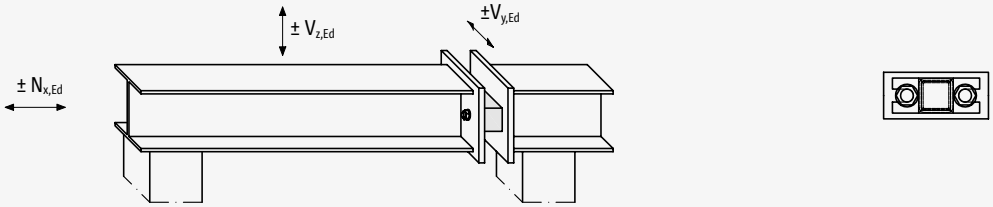
Please contact the design support department if you have connections that are not possible with the standard product variants shown in this information (contact details on page 3).

Design overview

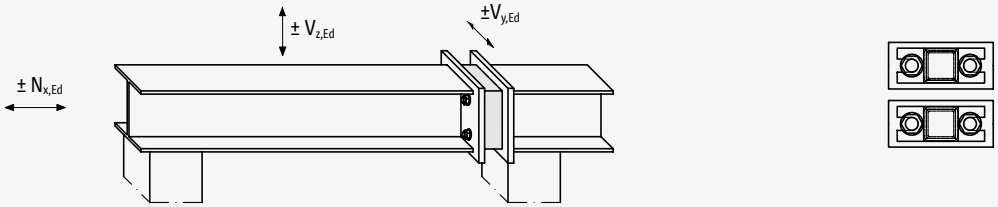
Normal force ±$N_{x,Ed}$; 1 T type S-N Page 80



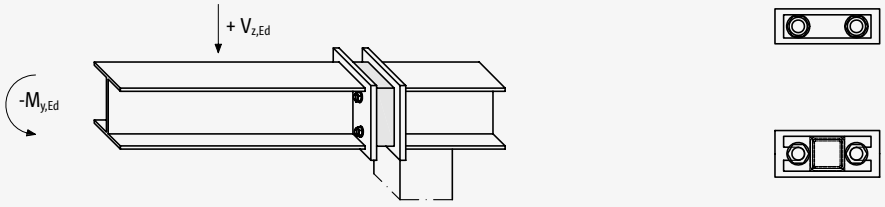
Normal force ±$N_{x,Ed}$, shear force ±$V_{z,Ed}$, ±$V_{y,Ed}$; 1 T type S-V Page 80



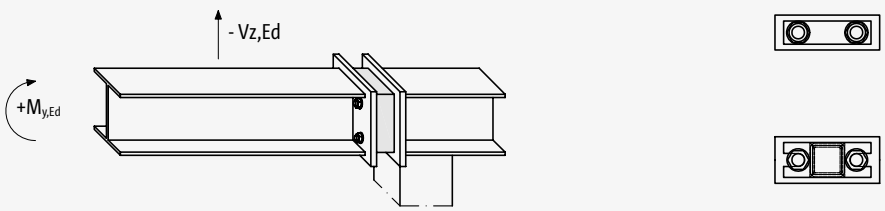
Normal force ±$N_{x,Ed}$, shear force ±$V_{z,Ed}$, ±$V_{y,Ed}$; several T type S-V Page 81



Shear force +$V_{z,Ed}$, moment -$M_{y,Ed}$; 1 T type S-N + 1 T type S-V Page 82

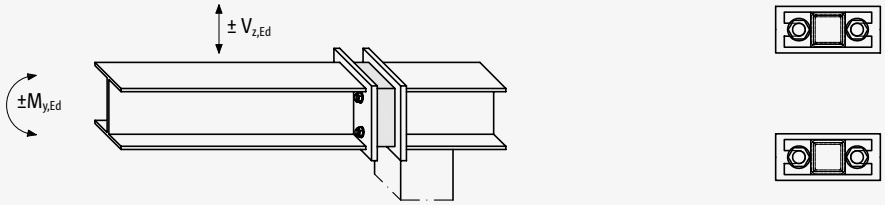


Shear force -$V_{z,Ed}$, moment +$M_{y,Ed}$; 1 T type S-N + 1 T type S-V Page 82

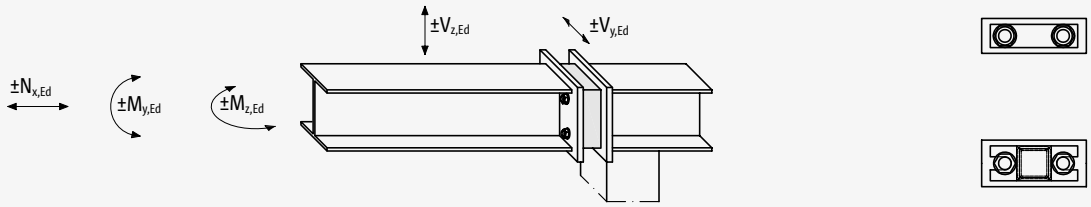


Design overview

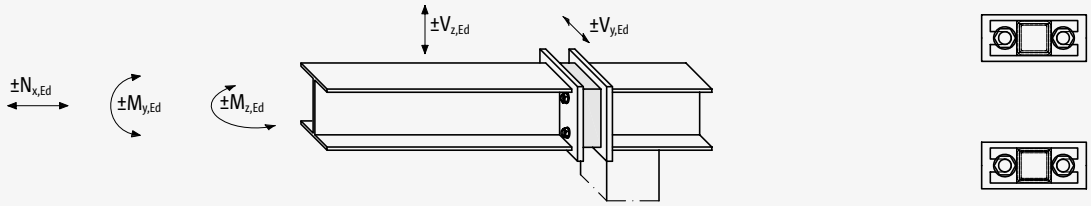
Shear force $\pm V_{z,Ed}$, moment $\pm M_{y,Ed}$; 2 × T type S-V Page 83



Normal force $\pm N_{x,Ed}$, shear force $\pm V_{z,Ed}$, $\pm V_{y,Ed}$, moment $\pm M_{y,Ed}$, $\pm M_{z,Ed}$; 1 T type S-N + 1 T type S-V Page 86



Normal force $\pm N_{x,Ed}$, shear force $\pm V_{z,Ed}$, $\pm V_{y,Ed}$, moment $\pm M_{y,Ed}$, $\pm M_{z,Ed}$; 2 × T type S-V Page 86

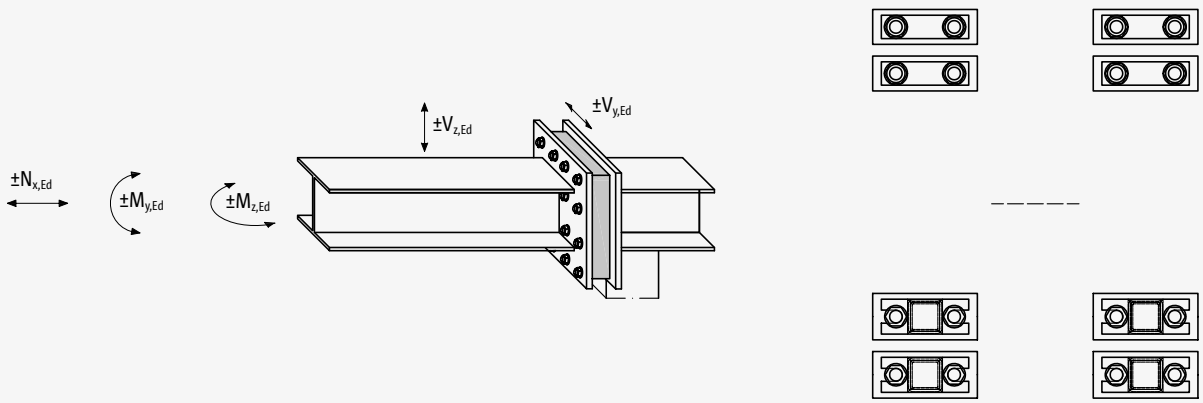


Design

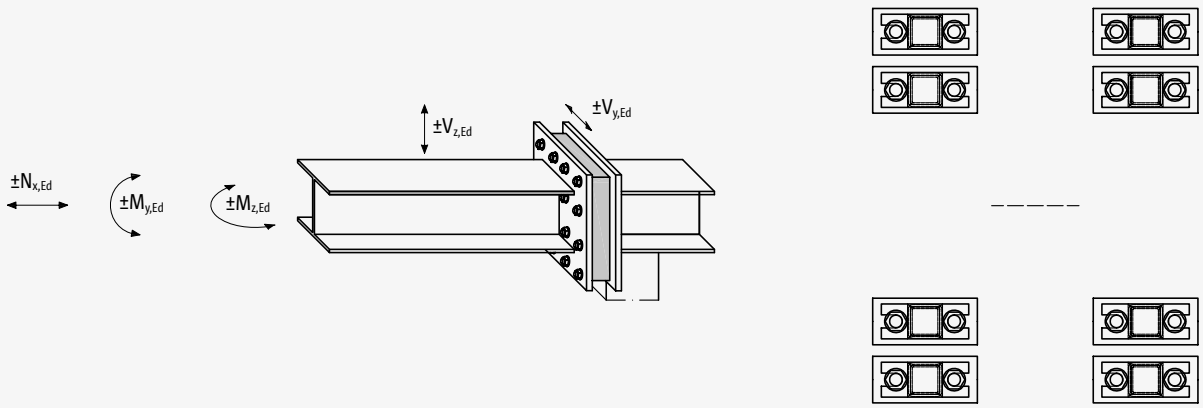
- The design software is available for a rapid and efficient design (Download under http://www.schoeck.co.uk/download).
- Further information can be requested from the design department (contact see p. 3).

Design overview

Normal force $\pm N_{x,Ed}$, shear force $\pm V_{z,Ed}$, $\pm V_{y,Ed}$, moment $\pm M_{y,Ed}$, $\pm M_{z,Ed}$; n × (T type S-N + T type S-V) Page 86



Normal force $\pm N_{x,Ed}$, shear force $\pm V_{z,Ed}$, $\pm V_{y,Ed}$, moment $\pm M_{y,Ed}$, $\pm M_{z,Ed}$; n × T type S-V Page 86



Design

- The design software is available for a rapid and efficient design (Download under http://www.schoeck.co.uk/download).
- Further information can be requested from the design department (contact see p. 3).

Design force direction | Notes

Direction of forces

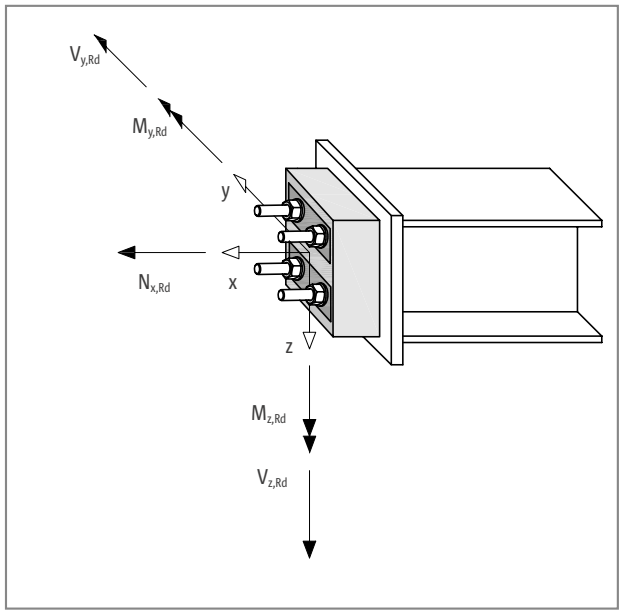


Fig. 108: Schöck Isokorb® T type S: Sign convention for design

Notes on design

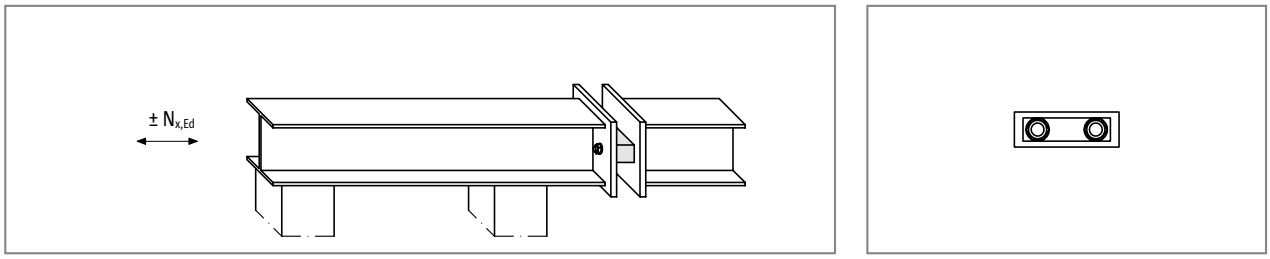
- The Schöck Isokorb® T type S is only intended for use with predominantly static loads
- Design takes place in accordance with approval document No. Z-14.4-518

Dimensioning of the shear force

- A distinction must be made between the areas in which the Schöck Isokorb® T type S-V is arranged:
  Compression: Both threaded rods are subjected to compression
  Compression/tension: one threaded rod is subjected to compression, the other threaded rod is subjected to tension, e. g. from $M_{z,Ed}$.
  Tension: Both threaded rods are subjected to tension.
- Interaction over all areas:
  Absorbable shear force in z-direction $V_{z,Rd}$ depends on the shear force acting in the y-direction $V_{y,Rd}$ and vice versa.
- Interaction in the compression/tension and tension areas:
  Absorbable shear force depends on the actinn gormal force $N_{x,Ed}$ or the normal force from the acting moment $N_{x,Ed}(M_{Ed})$.

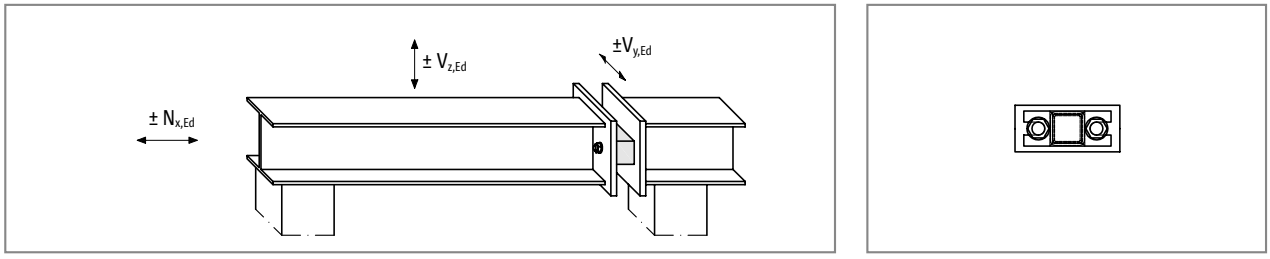
Design normal force | design normal force and shear force

Normal force $N_{x,Rd}$ - 1 Schöck Isokorb® T type S-N module



Schöck Isokorb® T type	S-N-D16	S-N-D22
Design value per	$N_{x,Rd}$ [kN/module]	
Modules	116.8/–63.4	225.4/–149.6

Normal force $N_{x,Rd}$ and shear force V_{Rd} - 1 Schöck Isokorb® T type S-V module



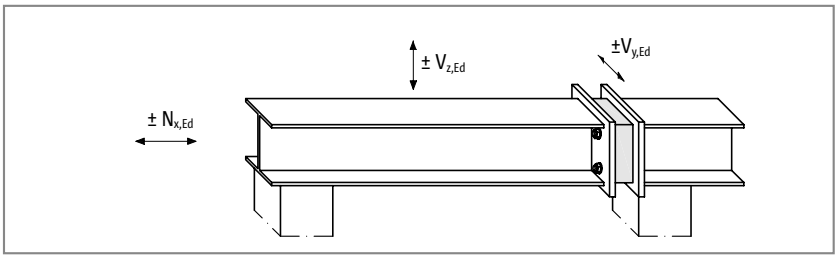
Schöck Isokorb® T type	S-V-D16			S-V-D22		
Design value per	$N_{x,Rd}$ [kN/module]					
Modules	±116.8			±225.4		
	Shear force compression zone					
Modules	$V_{z,Rd}$ [kN/module]					
	for	$0 \le \lvert V_{y,Ed} \rvert \le 6$	±30	for	$0 \le \lvert V_{y,Ed} \rvert \le 6$	±36
		$6 < \lvert V_{y,Ed} \rvert \le 15$	±(30 - $\lvert V_{y,Ed} \rvert$)		$6 < \lvert V_{y,Ed} \rvert \le 18$	±(36 - $\lvert V_{y,Ed} \rvert$)
	$V_{y,Rd}$ [kN/module]					
	±min {15; 30 - $\lvert V_{z,Ed} \rvert$}			±min {18; 36 - $\lvert V_{z,Ed} \rvert$}		
	Shear force tension zone					
Modules	$V_{z,Rd}$ [kN/module]					
	for	$0 \le N_{x,Ed} \le 26,8$	±(30 - $\lvert V_{y,Ed} \rvert$)	for	$0 \le N_{x,Ed} \le 117.4$	±(36 - $\lvert V_{y,Ed} \rvert$)
		$26.8 < N_{x,Ed} \le 116.8$	±(1/3 (116.8 - $N_{x,Ed}$) - $\lvert V_{y,Ed} \rvert$)		$117.4 < N_{x,Ed} \le 225.4$	±(1/3 (225.4 - $N_{x,Ed}$) - $\lvert V_{y,Ed} \rvert$)
	$V_{y,Rd}$ [kN/module]					
	for	$0 \le N_{x,Ed} \le 26,8$	±min {15; 30 - $\lvert V_{z,Ed} \rvert$}	for	$0 \le N_{x,Ed} \le 117.4$	±min {18; 36 - $\lvert V_{z,Ed} \rvert$}
		$26.8 < N_{x,Ed} \le 116.8$	±min{15; 1/3 (116.8 - $N_{x,Ed}$) - $\lvert V_{z,Ed} \rvert$}		$117.4 < N_{x,Ed} \le 225.4$	±min{18; 1/3 (225.4 - $N_{x,Ed}$) - $\lvert V_{z,Ed} \rvert$}

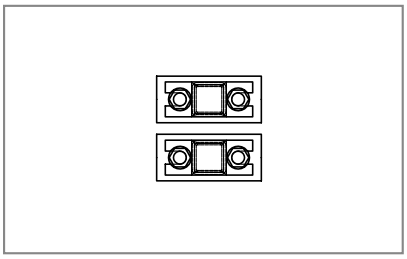
Notes on design

- The values given here apply only for a connection with exactly 1 Schöck Isokorb® T type S-V.
- The design values apply only for supported steel constructions and with a two-sided rigid connection of the on-site face plates.

design normal force and shear force

Normal force $N_{x,Rd}$ and shear force V_{Rd} - n Schöck Isokorb® T type S-V modules





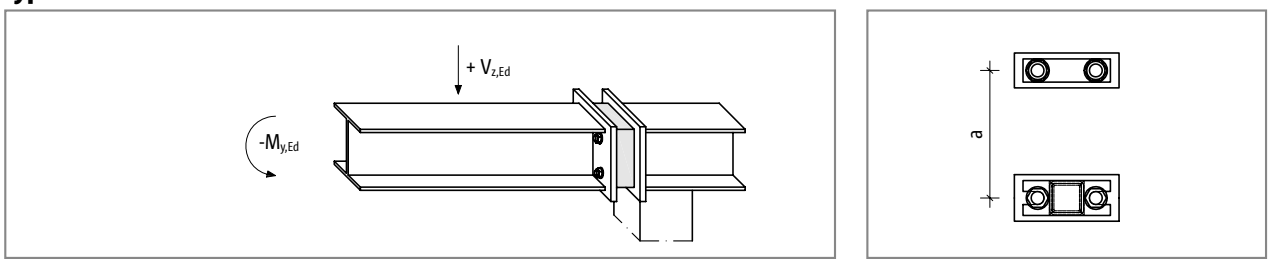
Schöck Isokorb® T type	n × S-V-D16			n × S-V-D22		
Design value per	$N_{x,Rd}$ [kN/module]					
Modules	±116.8			±225.4		
	Shear force compression zone					
Modules	$V_{z,Rd}$ [kN/module]					
	±(46 - |$V_{y,Ed}$|)			±(50 - |$V_{y,Ed}$|)		
	$V_{y,Rd}$ [kN/module]					
	±min {23; 46 - |$V_{z,Ed}$|}			±min {25; 50 - |$V_{z,Ed}$|}		
	Shear force tension zone					
Modules	$V_{z,Rd}$ [kN/module]					
	for	**0 < $N_{x,Ed}$ ≤ 26.8**	±(30 - |$V_{y,Ed}$|)	for	**0 < $N_{x,Ed}$ ≤ 117.4**	±(36 - |$V_{y,Ed}$|)
		26.8 < $N_{x,Ed}$ ≤ 116.8	±(1/3 (116.8 - $N_{x,Ed}$) - |$V_{y,Ed}$|)		**117.4 < $N_{x,Ed}$ ≤ 225.4**	±(1/3 (225.4 - $N_{x,Ed}$) - |$V_{y,Ed}$|)
	$V_{y,Rd}$ [kN/module]					
	for	**0 < $N_{x,Ed}$ ≤ 26.8**	±min {23; 30 - |$V_{z,Ed}$|}	for	**0 < $N_{x,Ed}$ ≤ 117.4**	±min {25; 36 - |$V_{z,Ed}$|}
		26.8 < $N_{x,Ed}$ ≤ 116.8	±min {23; 1/3 (116.8 - $N_{x,Ed}$) - |$V_{z,Ed}$|}		**117.4 < $N_{x,Ed}$ ≤ 225.4**	±min {25; 1/3 (225.4 - $N_{x,Ed}$) - |$V_{z,Ed}$|}

Notes on design

- For $N_{x,Ed}$ = 0, a Schöck Isokorb® T type S-V module is assigned to the tension range in accordance with the approval. Further Schöck Isokorb® T type S-V may be assigned to the compression area.
- The design values given in this table apply for supported connections only. It must be ensured that there is a hinged connection even when several Schöck Isokorb® T type S-V modules are arranged.
- The design values apply only for supported steel constructions and with a two-sided rigid connection of the on-site face plates.

Design shear force and moment

Positive shear forcet $V_{z,Rd}$ and negative moment $M_{y,Rd}$ - 1 Schöck Isokorb® T type S-N and 1 Schöck Isokorb® T type S-V

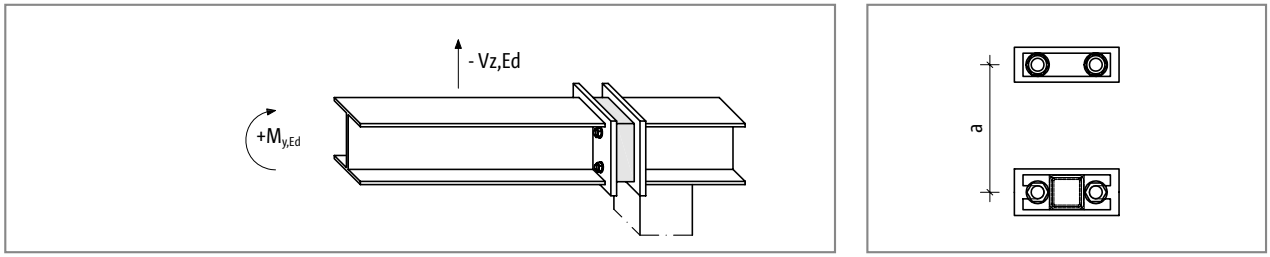


Schöck Isokorb® T type	1 × S-N-D16 + 1 × S-V-D16	1 × S-N-D22 + 1 × S-V-D22
Design value per	$M_{y,Rd}$ [kNm/connection]	
Connection	-116.8 • a	-225.4 • a
	$V_{z,Rd}$ [kN/connection]	
Connection	46	50

Notes on design

- a [m]: lever arm (separation between tension loaded and compression loaded threaded rods).
- Minimum lever arm a = 50 mm (without insulation spacers and after cutting the insulation element to size see p. 92)
- The load case presented here (positive shear force and negative moment) for the same connection can be combined with load case presented next (negative shear force and positive moment).

Negative shear force $V_{z,Rd}$ and positive moment $M_{y,Rd}$ - 1 Schöck Isokorb® T type S-N and 1 Schöck Isokorb® T type S-V



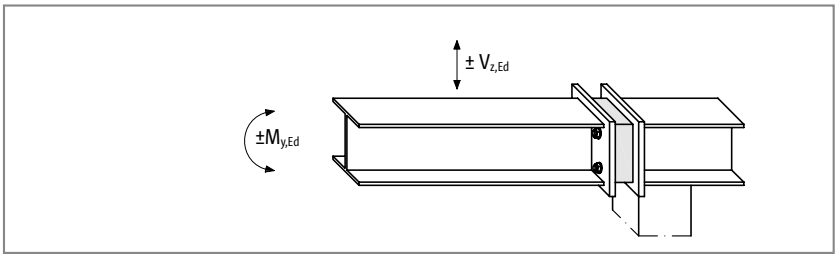
Schöck Isokorb® T type	1 × S-N-D16 + 1 × S-V-D16			1 × S-N-D22 + 1 × S-V-D22		
Design value per	$M_{y,Rd}$ [kNm/connection]					
Connection	63,4 • a			149.6 • a		
	$V_{z,Rd}$ [kN/connection]					
Connection	for	$0 < N_{x,Ed}(M_{y,Ed}) \leq 26.8$	-30	for	$0 < N_{x,Ed}(M_{y,Ed}) \leq 117.4$	-36
		$26.8 < N_{x,Ed}(M_{y,Ed}) < 63.4$	$-1/3\ (116.8 - N_{x,Ed}(M_{y,Ed}))$		$117.4 < N_{x,Ed}(M_{y,Ed}) < 149.6$	$-1/3\ (225.4 - N_{x,Ed}(M_{y,Ed}))$
		63.4	-17,8		**149.6**	-25.3

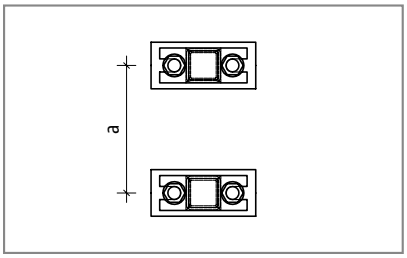
Notes on design

- $N_{x,Ed}(M_{y,Ed}) = M_{y,Ed} / a$
- a [m]: lever arm (separation between tension loaded and compression loaded threaded rods).
- Minimum lever arm a = 50 mm (without insulation spacers and after cutting the insulation element to size see p. 92)
- If the lifting loads for the Schöck Isokorb® T type are relevant then the reverse is recommended, T type S-V arranged above and T type S-N arranged below.
- The load case presented here (negative shear force and positive moment) for the same connection can be combined with load case presented previously (positive shear force and negative moment).

Design shear force and moment

Positive and negative shear force $V_{z,Rd}$ and negative and positive moment $M_{y,Rd}$ - 2 Schöck Isokorb® T type S-V modules





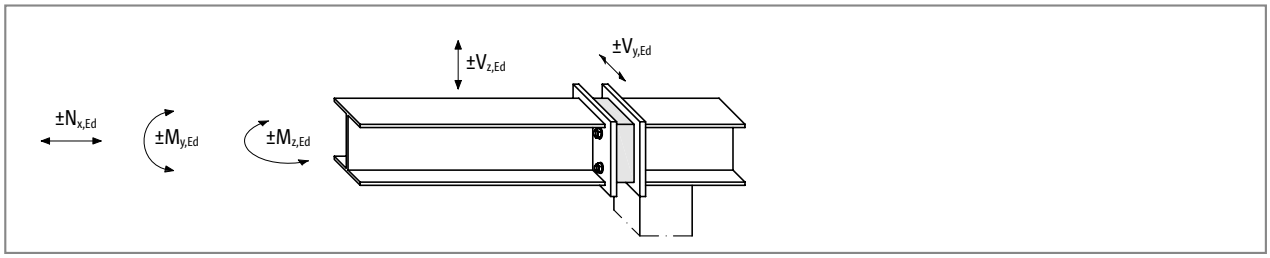
Schöck Isokorb® T type	2 × S-V-D16			2 × S-V-D22		
Design value per	$M_{y,Rd}$ [kNm/connection]					
Connection	±116.8 • a			±225.4 • a		
	Shear force compression zone					
Modules	$V_{z,Rd}$ [kN/module]					
	±46			±50		
	Shear force tension zone					
Modules	$V_{z,Rd}$ [kN/module]					
	for	$0 < N_{x,Ed}(M_{y,Ed}) \leq 26.8$	±30	for	$0 < N_{x,Ed}(M_{y,Ed}) \leq 117.4$	±36
		$26.8 < N_{x,Ed}(M_{y,Ed}) < 116.8$	±1/3 (116.8 - $N_{x,Ed}(M_{y,Ed})$)		$117.4 < \lvert N_{x,Ed}(M_{y,Ed}) \rvert \leq 225.4$	±1/3 (225.4 - $N_{x,Ed}(M_{y,Ed})$)

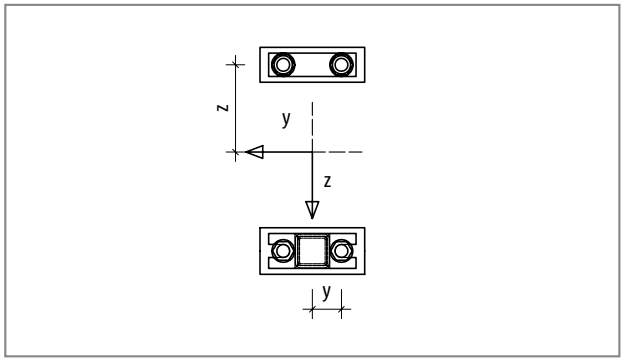
Notes on design

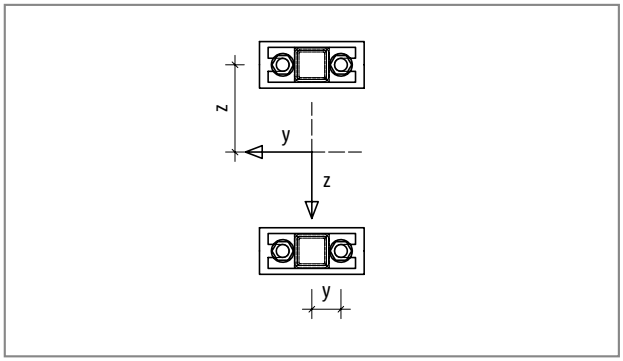
- $N_{x,Ed}(M_{y,Ed}) = M_{y,Ed} / a$
- a [m]: lever arm (separation between tension loaded and compression loaded threaded rods).
- Minimum lever arm a = 50 mm (without insulation spacers and after cutting the insulation element to size see p. 92)

Design normal force, shear force and moment

Normal force $N_{x,Rd}$ and shear force $V_{z,Rd}$, $V_{y,Rd}$ and moments $M_{y,Rd}$, $M_{z,Rd}$ - 1 T type S-N + 1 T type S-V er 2 × T type S-V







Allowable normal force $N_{x,Rd}$ per threaded rod, allowable moments $M_{y,Rd}$ $M_{z,Rd}$ per connection

Schöck Isokorb® T type	S-N-D16	S-N-D22	S-V-D16	S-V-D22
Design value per	$N_{GS,Rd}$ [kN/threaded rod]			
Threaded rod	+58,4/-31.7	+112.7/-74.8	±58,4	±112.7
	$N_{GS,Mz,Rd}$ [kN/threaded rod]			
Threaded rod	±29.2	±56.3	±29.2	±56.3

Algebraic sign definition

$+N_{GS,Rd}$: Threaded rod is in tension.
$-N_{GS,Rd}$: Threaded rod is in compression.

Each threaded rod is loaded by a normal force $N_{GS,Ed}$. This is made up of 3 subcomponents.

Subcomponents

from normal force $N_{x,Ed}$: $N_{1,GS,Ed} = N_{x,Ed} / 4$
from moment $M_{y,Ed}$: $N_{2,GS,Ed} = \pm M_{y,Ed} / (4 \cdot z)$
from moment $M_{z,Ed}$: $N_{3,GS,Ed} = \pm M_{z,Ed} / (4 \cdot y)$

Condition 1: $|N_{1,GS,Ed} + N_{2,GS,Ed} + N_{3,GS,Ed}| \leq |N_{GS,Rd}|$ [kN/threaded rod]
The maximum or minimum loaded threaded rod is critical.

Condition 2: $|N_{1,GS,Ed} + N_{3,GS,Ed}| \leq |N_{GS,Mz,Rd}|$ [kN/threaded rod]

Design normal force, shear force and moment

Allowable shear force per module and per connection

Schöck Isokorb® T type	S-V-D16			S-V-D22		
Design value per	Shear force compression zone					
	$V_{z,i,Rd}$ [kN/module]					
Modules	$\pm(46 - \lvert V_{y,i,Ed} \rvert)$			$\pm(50 - \lvert V_{y,i,Ed} \rvert)$		
	$V_{y,i,Rd}$ [kN/module]					
	$\pm\min\{23; 46 - \lvert V_{z,i,Ed} \rvert\}$			$\pm\min\{25; 50 - \lvert V_{z,i,Ed} \rvert\}$		
	Shear force tension zone/compression and tension					
Modules	$V_{z,i,Rd}$ [kN/module]					
	for	$0 < N_{GS,i,Ed} \leq 13.4$	$\pm(30 - \lvert V_{y,i,Ed} \rvert)$	for	$0 < N_{GS,i,Ed} \leq 58.7$	$\pm(36 - \lvert V_{y,i,Ed} \rvert)$
		$13.4 < N_{GS,i,Ed} \leq 58.4$	$\pm 2/3\ (58.4 - N_{GS,i,Ed}) - \lvert V_{y,i,Ed} \rvert$		$58.7 < N_{GS,i,Ed} \leq 112.7$	$\pm 2/3\ (112.7 - N_{GS,i,Ed}) - \lvert V_{y,i,Ed} \rvert$
	$V_{y,i,Rd}$ [kN/module]					
	for	$0 < N_{GS,i,Ed} \leq 13.4$	$\pm\min\{23; 30 - \lvert V_{z,i,Ed} \rvert\}$	for	$0 < N_{GS,i,Ed} \leq 58.7$	$\pm\min\{25; 36 - \lvert V_{z,i,Ed} \rvert\}$
		$13.4 < N_{GS,i,Ed} \leq 58.4$	$\pm\min\{23; 2/3\ (58.4 - N_{GS,i,Ed}) - \lvert V_{z,i,Ed} \rvert\}$		$58.7 < N_{GS,i,Ed} \leq 112.7$	$\pm\min\{25; 2/3\ (112.7 - N_{GS,i,Ed}) - \lvert V_{z,i,Ed} \rvert\}$

Determination of the effective normal force $N_{GS,i,Ed}$ per threaded rod

$N_{GS,i,Ed} = N_{x,Ed}/4 \pm \lvert M_{y,Ed} \rvert / (4 \cdot z) \pm \lvert M_{z,Ed} \rvert / (4 \cdot y)$

Determination of the allowable shear force per Schöck Isokorb® T type S-V module

The shear force that can be transferred per Schöck Isokorb® T type S-V depends on the load on the threaded rods. Zones are defined for this purpose:

Compression: Both threaded rods are subjected to compression
Compression/tension: one threaded rod is subjected to compression, the other is subjected to tension.
Tension: Both the threaded rods subjected to tension.

(In the compression/tension zone and in the tension zone the maximum positive normal force $+N_{GS,i,Ed}$ is to be applied in the design table)

$V_{z,i,Rd}$: Allowable shear force in z-direction of the individual Schöck Isokorb® T type S-V module, depending on $+N_{GS,i,Ed}$ in the respective module i.

$V_{y,i,Rd}$: Allowable shear force in y-direction of the individual Schöck Isokorb® T type S-V module, dependent on $+N_{GS,i,Ed}$ in the respective module i.

Calculate $V_{z,i,Rd}$
Calculate $V_{y,i,Rd}$

The vertical shear force $V_{z,Ed}$ and the horizontal shear force $V_{y,Ed}$ in the ratio are $V_{z,Ed}/V_{y,Ed}$ = constant distributed on the individual Schöck Isokorb® T type S.

Requirement: $V_{z,Ed}/V_{y,Ed} = V_{z,i,Rd}/V_{y,i,Rd} = V_{z,Rd}/V_{y,Rd}$

If this requirement is not met, $V_{z,i,Rd}$ or $V_{y,i,Rd}$ is reduced, so that the ratio is maintained.

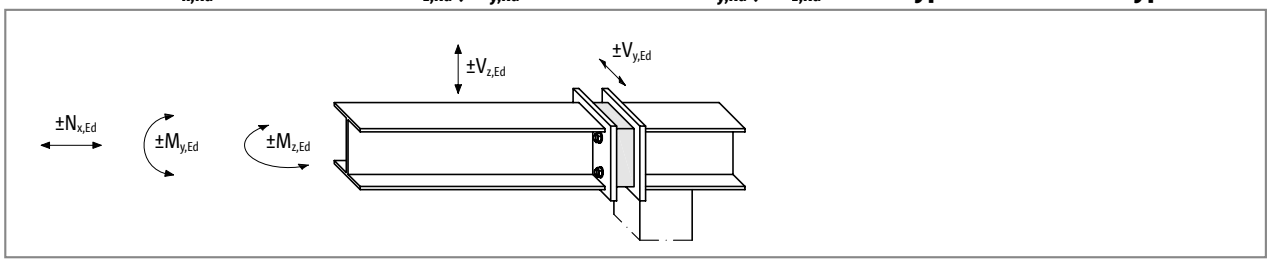
Verification: $V_{z,Ed} \leq \sum V_{z,i,Rd}$
$V_{y,Ed} \leq \sum V_{y,i,Rd}$

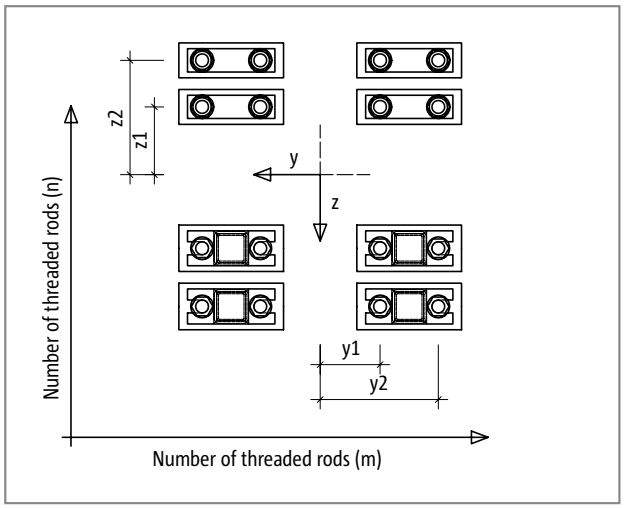
Design

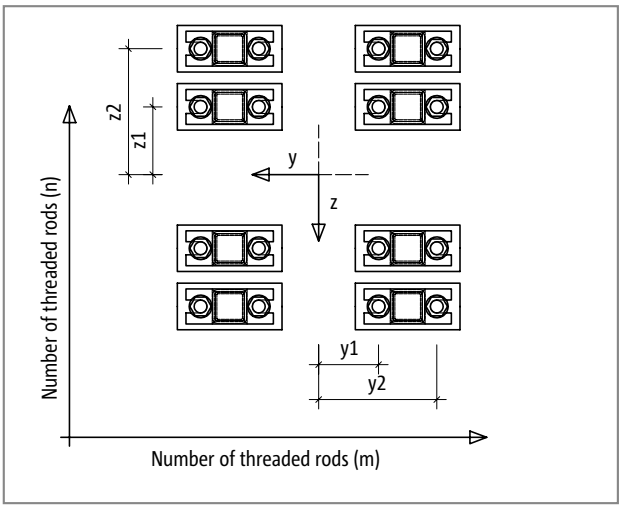
- The design software is available for a rapid and efficient design (Download under http://www.schoeck.co.uk/download).
- Further information can be requested from the design department (contact see p. 3).

Design normal force, shear force and moment

Normal force $N_{x,Rd}$ and shear force $V_{z,Rd}$, $V_{y,Rd}$ and moments $M_{y,Rd}$, $M_{z,Rd}$ - n × T type S-N and n × T type S-V







Allowable normal force $N_{x,Rd}$ per threaded rod, allowable moments $M_{y,Rd}$ $M_{z,Rd}$ per connection

Schöck Isokorb® T type	S-N-D16	S-N-D22	S-V-D16	S-V-D22
Design value per	$N_{GS,Rd}$ [kN/threaded rod]			
Threaded rod	+58,4/-31.7	+112.7/-74.8	±58,4	±112.7
	$N_{GS,Mz,Rd}$ [kN/threaded rod]			
Threaded rod	±29.2	±56.3	±29.2	±56.3

Algebraic sign definition

$+N_{GS,Rd}$: Threaded rod is in tension.
$-N_{GS,Rd}$: Threaded rod is in compression.

m: Number of threaded rods per connection in z-direction
n: Number of threaded rods per connection in y-direction

Each threaded rod is loaded by a normal force $N_{GS,Ed}$. This is made up of 3 subcomponents.

Subcomponents

from normal force $N_{x,Ed}$: $N_{1,GS,Ed} = N_{x,Ed} / m \cdot n$
from moment $M_{y,Ed}$: $N_{2,GS,Ed} = \pm M_{y,Ed} / (2 \cdot m \cdot z_2 + 2 \cdot m \cdot z_1/z_2 \cdot z_1)$
from moment $M_{z,Ed}$: $N_{3,GS,Ed} = \pm M_{z,Ed} / (2 \cdot n \cdot y_2 + 2 \cdot n \cdot y_1/y_2 \cdot y_1)$

Condition 1: $|N_{1,GS,Ed} + N_{2,GS,Ed} + N_{3,GS,Ed}| \leq |N_{GS,Rd}|$ [kN/threaded rod]
The maximum or minimum loaded threaded rod is critical.

Condition 2: $|N_{1,GS,Ed} + N_{3,GS,Ed}| \leq |N_{GS,Mz,Rd}|$ [kN/threaded rod]

Design normal force, shear force and moment

Allowable shear force per module and per connection

Schöck Isokorb® T type	S-V-D16			S-V-D22		
Design value per	Shear force compression zone					
	$V_{z,i,Rd}$ [kN/module]					
Modules	$\pm(46 - \lvert V_{y,i,Ed} \rvert)$			$\pm(50 - \lvert V_{y,i,Ed} \rvert)$		
	$V_{y,i,Rd}$ [kN/module]					
	$\pm\min\{23; 46 - \lvert V_{z,i,Ed} \rvert\}$			$\pm\min\{25; 50 - \lvert V_{z,i,Ed} \rvert\}$		
	Shear force tension zone/compression and tension					
Modules	$V_{z,i,Rd}$ [kN/module]					
	for	$0 < N_{GS,i,Ed} \leq 13.4$	$\pm(30 - \lvert V_{y,i,Ed} \rvert)$	for	$0 < N_{GS,i,Ed} \leq 58.7$	$\pm(36 - \lvert V_{y,i,Ed} \rvert)$
		$13.4 < N_{GS,i,Ed} \leq 58.4$	$\pm 2/3\ (58.4 - N_{GS,i,Ed}) - \lvert V_{y,i,Ed} \rvert$		$58.7 < N_{GS,i,Ed} \leq 112.7$	$\pm 2/3\ (112.7 - N_{GS,i,Ed}) - \lvert V_{y,i,Ed} \rvert$
	$V_{y,i,Rd}$ [kN/module]					
	for	$0 < N_{GS,i,Ed} \leq 13.4$	$\pm\min\{23; 30 - \lvert V_{z,i,Ed} \rvert\}$	for	$0 < N_{GS,i,Ed} \leq 58.7$	$\pm\min\{25; 36 - \lvert V_{z,i,Ed} \rvert\}$
		$13.4 < N_{GS,i,Ed} \leq 58.4$	$\pm\min\{23; 2/3\ (58.4 - N_{GS,i,Ed}) - \lvert V_{z,i,Ed} \rvert\}$		$58.7 < N_{GS,i,Ed} \leq 112.7$	$\pm\min\{25; 2/3\ (112.7 - N_{GS,i,Ed}) - \lvert V_{z,i,Ed} \rvert\}$

Determination of the effective normal force $N_{GS,i,Ed}$ per threaded rod

$$N_{GS,i,Ed} = N_{x,Ed} / (m \cdot n) \pm \lvert M_{y,Ed} \rvert / (2 \cdot m \cdot z_2 + 2 \cdot m \cdot z_i/z_2 \cdot z_i) \pm \lvert M_{z,Ed} \rvert / (2 \cdot n \cdot y_2 + 2 \cdot n \cdot y_i/y_2 \cdot y_i)$$

Determination of the allowable shear force per Schöck Isokorb® T type S-V module

The shear force that can be transferred per Schöck Isokorb® T type S-V depends on the load on the threaded rods. Zones are defined for this purpose:

Compression: Both threaded rods are subjected to compression
Compression/tension: one threaded rod is subjected to compression, the other is subjected to tension.
Tension: Both the threaded rods subjected to tension.

(In the compression/tension zone and in the tension zone the maximum positive normal force $+N_{GS,i,Ed}$ is to be applied in the design table)

$V_{z,i,Rd}$: Allowable shear force in z-direction of the individual Schöck Isokorb® T type S-V module, depending on $+N_{GS,i,Ed}$ in the respective module i.

$V_{y,i,Rd}$: Allowable shear force in y-direction of the individual Schöck Isokorb® T type S-V module, dependent on $+N_{GS,i,Ed}$ in the respective module i.

Calculate $V_{z,i,Rd}$
Calculate $V_{y,i,Rd}$

The vertical shear force $V_{z,Ed}$ and the horizontal shear force $V_{y,Ed}$ in the ratio are $V_{z,Ed} / V_{y,Ed}$ = constant distributed on the individual Schöck Isokorb® T type S.

Requirement: $V_{z,Ed} / V_{y,Ed} = V_{z,i,Rd} / V_{y,i,Rd} = V_{z,Rd} / V_{y,Rd}$

If this requirement is not met, $V_{z,i,Rd}$ or $V_{y,i,Rd}$ is reduced, so that the ratio is maintained.

Verification: $V_{z,Ed} \leq \sum V_{z,i,Rd}$
$V_{y,Ed} \leq \sum V_{y,i,Rd}$

Design

- The design software is available for a rapid and efficient design (Download under http://www.schoeck.co.uk/download).
- Further information can be requested from the design department (contact see p. 3).

Deflection

Deformation of Schöck Isokorb® as a result of normal force $N_{x,Ed}$

Tension zone: $\Delta l_Z = |+ N_{x,Ed}| \cdot k_z$ [cm]
Tension zone: $\Delta l_D = |- N_{x,Ed}| \cdot k_D$ [cm]
Reciprocal spring constant in tension zone: k_Z
Reciprocal spring constant in compression zone: k_D

Schöck Isokorb® T type		S-N-D16	S-N-D22	S-V-D16	S-V-D22
Reciprocal spring constant		k [cm/kN]			
per	Zone				
Modules	Tension	$2.27 \cdot 10^{-4}$	$1.37 \cdot 10^{-4}$	$1.69 \cdot 10^{-4}$	$1,15 \cdot 10^{-4}$
Modules	Compression	$1.33 \cdot 10^{-4}$	$0.69 \cdot 10^{-4}$	$0.40 \cdot 10^{-4}$	$0.29 \cdot 10^{-4}$

Torsion of Schöck Isokorb®: 1 × T type S-N + 1 × T type S-V and 2 × T type S-V as a result of moment $M_{y,Ed}$

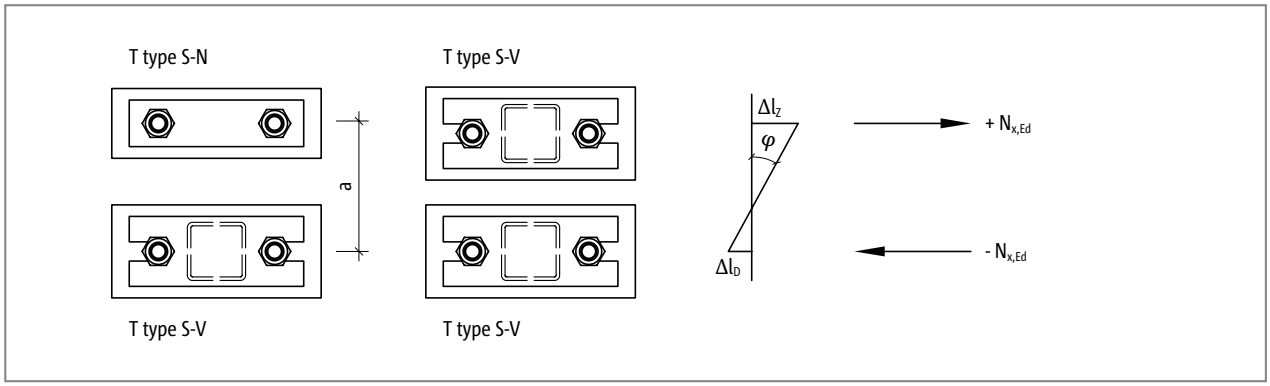


Fig. 109: Schöck Isokorb® T type S-N + T type S-V and 2 × T type S-V: Torsion angle $\varphi \approx \tan \varphi = (\Delta l_Z + \Delta l_D) / a$

A moment $M_{y,Ed}$ effects a twisting of the Schöck Isokorb®. The torsional angle of the Schöck Isokorb® type KST or a Schöck Isokorb® connection with 2 × KSTQ modules can be given approximately as follows:

$$\varphi = M_{y,Ed} / C \text{ [rad]}$$

φ	[rad]	torsional angle
$M_{y,Ed}$	[kN•cm]	characteristic moment for verification in the usability load case.
C	[kN•cm/rad]	torsion spring stiffness
a	[cm]	lever arm

Prerequisites

- Face plate is infinitely stiff
- Loading through moment M_y
- Deformation from shear force can be neglected
- In addition, deformations can result in the neighbouring structural components.

Schöck Isokorb® T type	1 × S-N-D16 + 1 × S-V-D16	1 × S-N-D22 + 1 × S-V-D22	2 × S-V-D16	2 × S-V-D22
Torsion spring stiffness per	C [kN • cm/rad]			
Connection	$3700 \cdot a^2$	$6000 \cdot a^2$	$4700 \cdot a^2$	$6900 \cdot a^2$

Expansion joint spacing

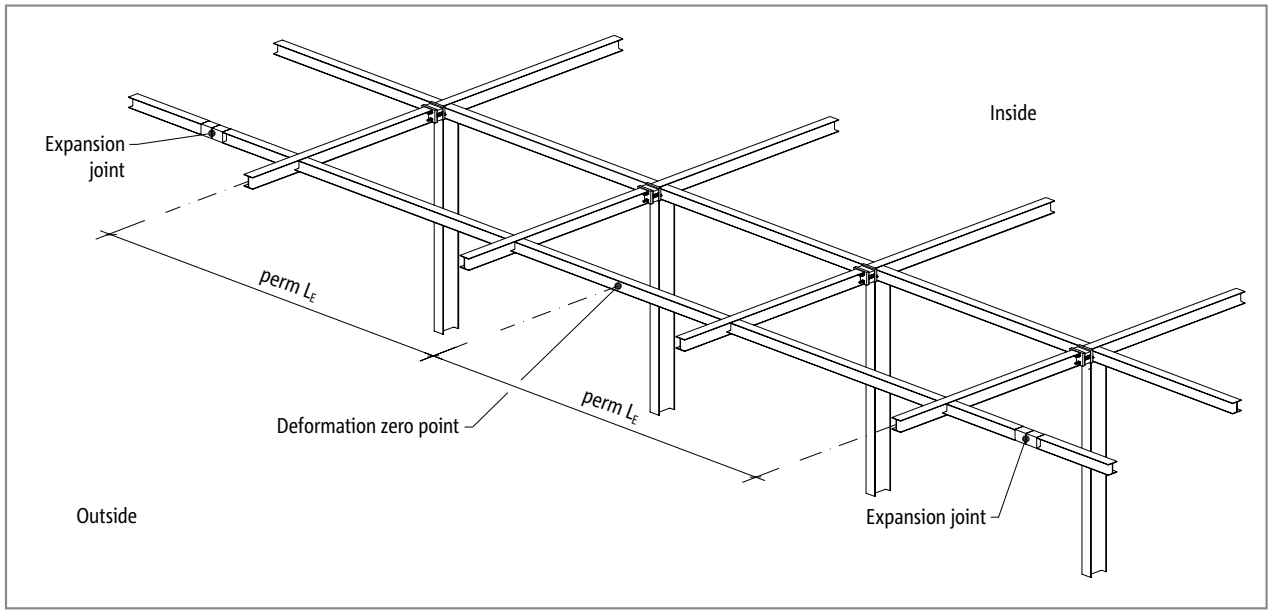


Fig. 110: Schöck Isokorb® T type S: Load influence length of the outer construction subjected to temperature expansion

Changing temperatures lead to changes in length in the steel sections and thus to constraints that can only be absorbed to a limited extent by the Schöck Isokorb® T type S modules. Stresses on the Schöck Isokorb® due to temperature deformations of the outer steel structure should therefore be avoided, e.g. through slotted holes in the secondary beams.

If temperature deformations are nevertheless assigned directly to the Schöck Isokorb®, the following permissible load impact length can be achieved
The load impact length is the length from the zero point of deformation to the last Schöck Isokorb® before an arranged expansion joint.
The zero point of the deformation is either in the axis of symmetry or is to be determined by a simulation taking into account the stiffness of the costruction.

If expansion joints are arranged in the transverse beams, these must safely and permanently allow the temperature-related displacements of the transverse beam ends without obstruction.

Schöck Isokorb® T type	S-N, S-V
Allowable load influence length with	Allowable L_E [m]
Nominal hole tolerance [mm]	
2	5.24

Product description

Schöck Isokorb® T type S-N

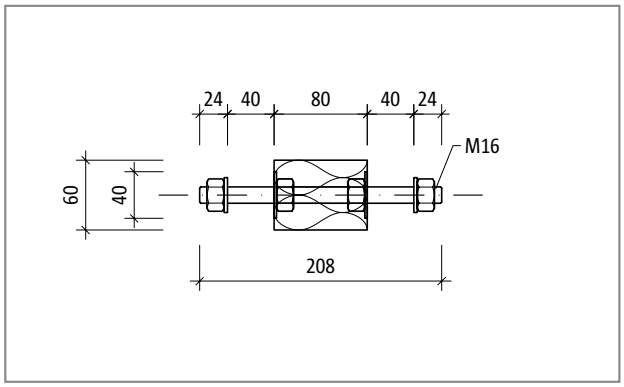


Fig. 111: Schöck Isokorb® T type S-N-D16: Cross-section

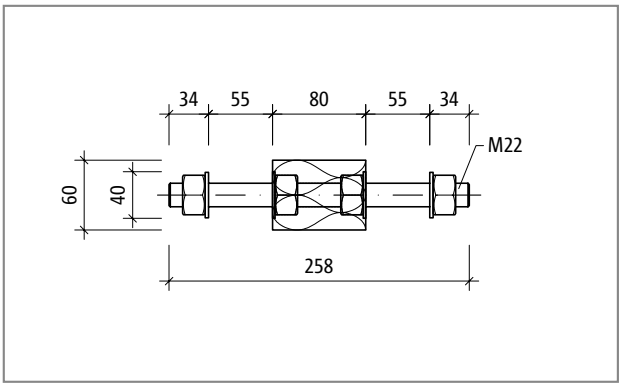


Fig. 112: Schöck Isokorb® T type S-N-D22: Cross-section

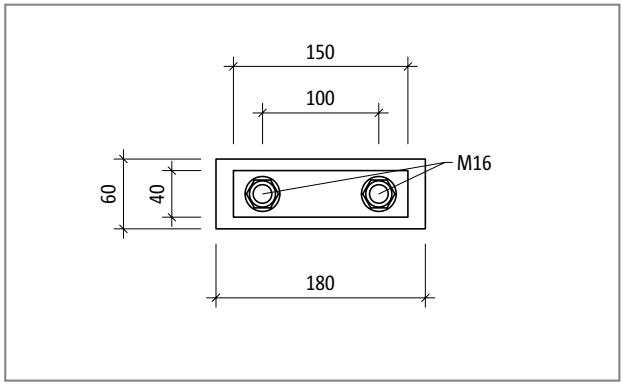


Fig. 113: Schöck Isokorb® T type S-N-D16: Product elevation

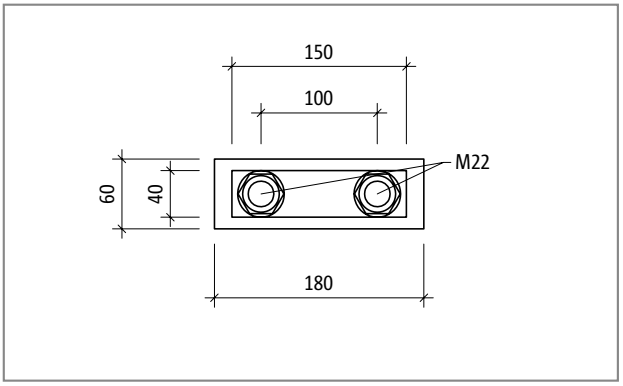


Fig. 114: Schöck Isokorb® T type S-N-D22: Product elevation

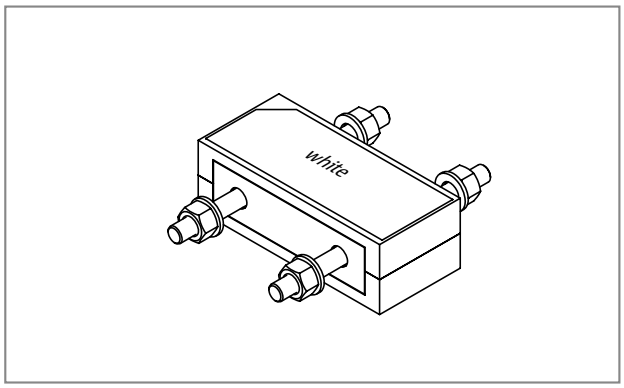


Fig. 115: Schöck Isokorb® T type S-N-D16: Isometry; colour code T type S-N: White

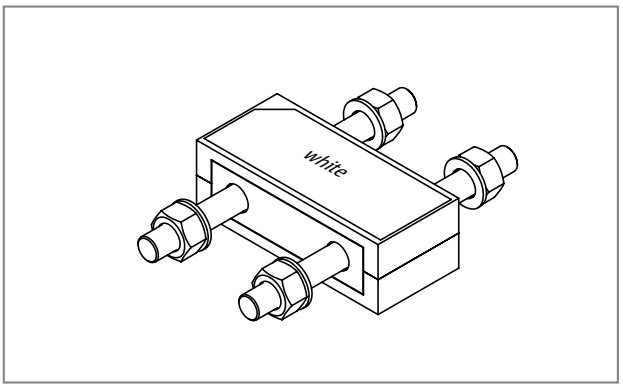


Fig. 116: Schöck Isokorb® T type S-N-D22: Isometry; colour code T type S-N: White

Product information

- The insulating element, as required, can be cut up to the steel plates.
- The free clamping length is 40 mm with threaded rods M16 and 55 mm with threaded rods M22.
- The Schöck Isokorb® and the insulation spacers can be combined according to geometric and static requirements.
  For this please take into account both the number of required Schöck Isokorb® and also the number of required insulation spacers in the request for quotation and with ordering.

Product description

Schöck Isokorb® T type S-V

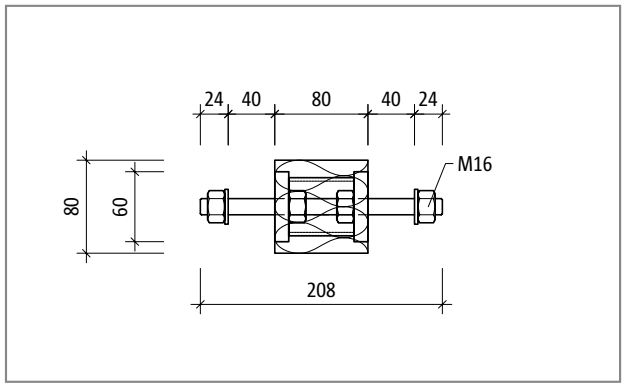


Fig. 117: Schöck Isokorb® T type S-V-D16: Cross-section

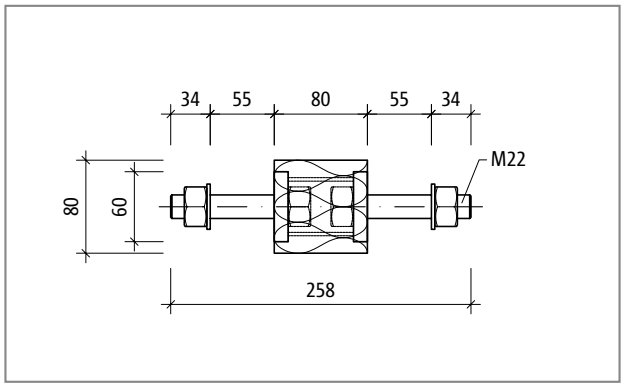


Fig. 118: Schöck Isokorb® T type S-V-D22: Cross-section

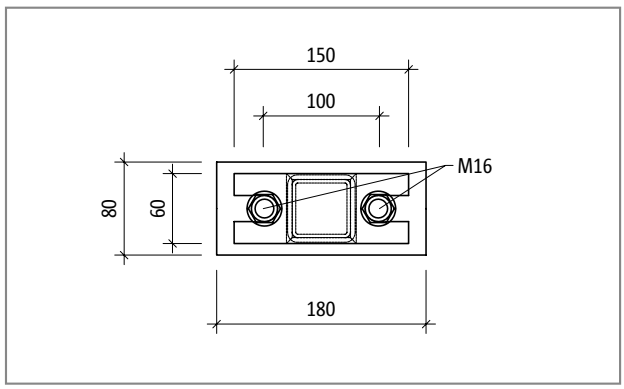


Fig. 119: Schöck Isokorb® T type S-V-D16: Product elevation

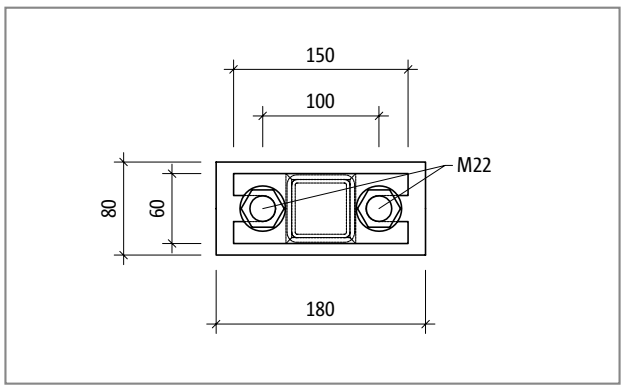


Fig. 120: Schöck Isokorb® T type S-V-D22: Product elevation

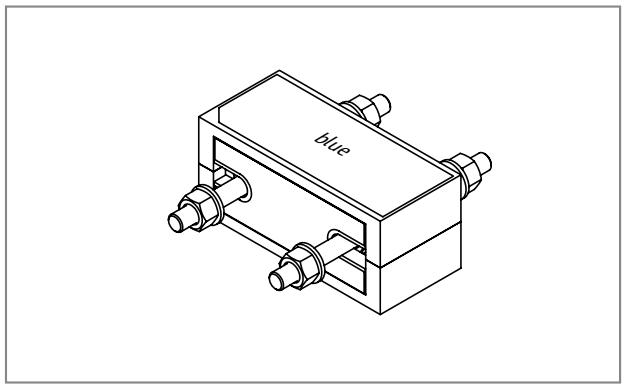


Fig. 121: Schöck Isokorb® T type S-V-D16: Isometry; colour code T type S-V: Blue

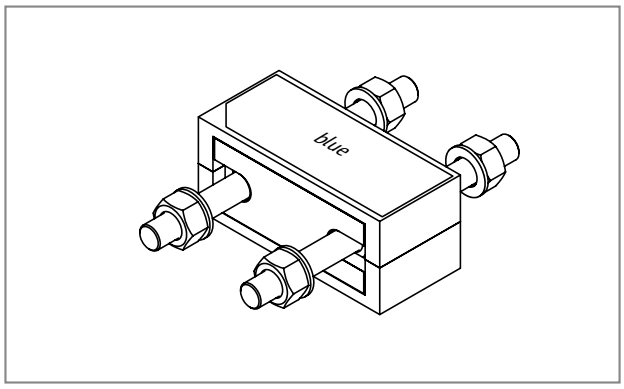


Fig. 122: Schöck Isokorb® T type S-V-D22: Isometry; colour code T type S-V: Blue

Product information

- The insulating element, as required, can be cut up to the steel plates.
- The free clamping length is 40 mm with threaded rods M16 and 55 mm with threaded rods M22.
- The Schöck Isokorb® and the insulation spacers can be combined according to geometric and static requirements.
  For this please take into account both the number of required Schöck Isokorb® and also the number of required insulation spacers in the request for quotation and with ordering.

Product description | On-site fire resistance

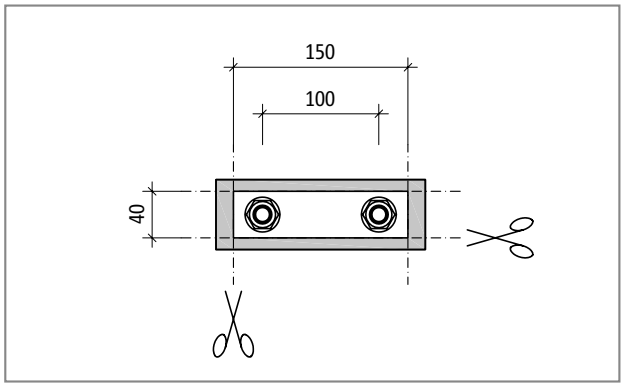


Fig. 123: Schöck Isokorb® T type S-N: Dimensions after trimming the insulation body

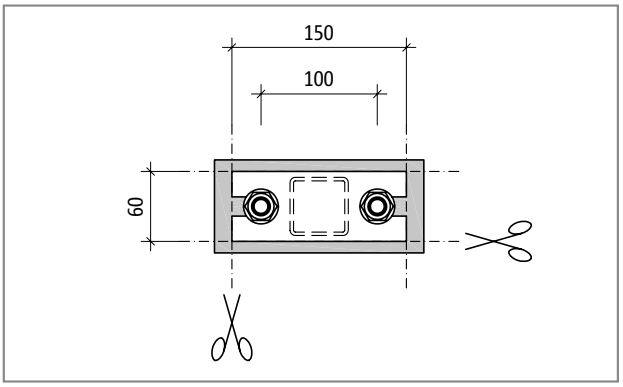


Fig. 124: Schöck Isokorb® T type S-V: Dimensions after trimming the insulation body

Product information

- The insulating element, as required, can be cut up to the steel plates.
- The following applies to the combination of 1 Schöck Isokorb® T type S-N with 1 T type S-V:
  When the insulation bodies are trimmed around the steel plates, the lowest height is 100 mm with a vertical spacing of the threaded rods of 50 mm.

Fire protection

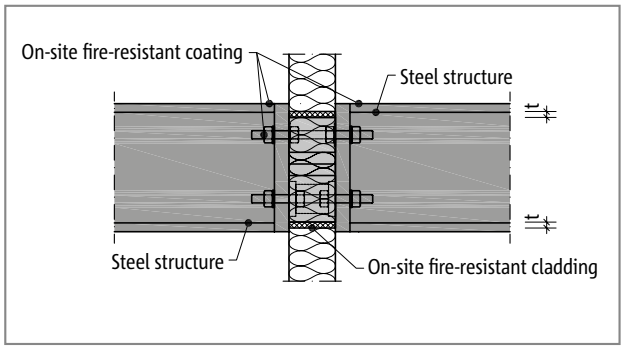


Fig. 125: Fire protection Schöck Isokorb® T type S: On-site fire protection cladding T type S, fire protection coated steel structure; section

Fire-resistant cladding of the Schöck Isokorb® must be planned and installed on site. The same on-site fire safety measures apply as for the overall load-bearing structure.
For further information see page 12.

Fixing Plate

The on site end plate can be verified as follows:

- Without more accurate verification through maintaining the minimum end plate thickness according to approval document No. Z-14.4-518 Annex 13;
- Load spread method and verification of the cantilever for a projecting end plate (approximately);
- Verification of the moment distribution for a flush end plate (approximately);
- More accurate verifications are possible with end plate programs; through this smaller end plate thicknesses can be achieved.

Maintaining the minimum end plate thickness following approval

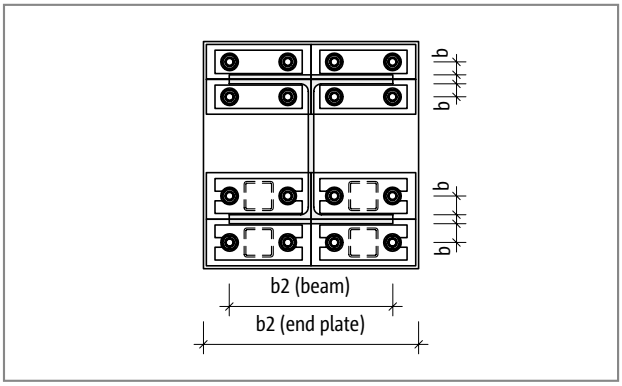


Fig. 126: End plate T type S: Geometric input values from table; view

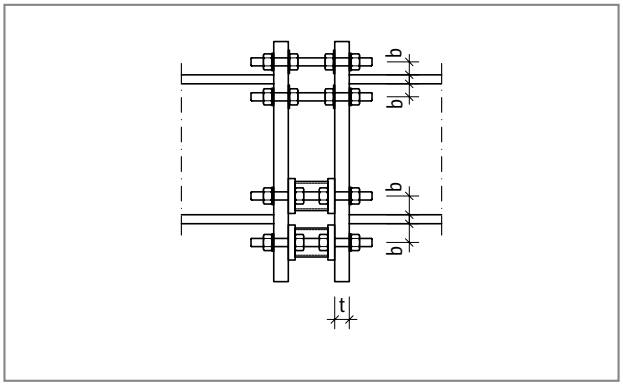


Fig. 127: End plate T type S: Geometric input values from table; cross-section

Schöck Isokorb® T type	S-N-D16, S-V-D16	S-N-D22, S-V-D22
Minimum thickness end plate with	b ≤ 35 mm b_2 ≥ 150 mm	b ≤ 50 mm b_2 ≥ 200 mm
$+N_{x,GS,Ed}/+N_{x,GS,Rd}$ ≤	t_{min} [mm]	
0.45	15	25
0.50	20	25
0.80	20	30
1.00	25	35

i Table

- $+N_{x,Gs,Ed}$: Normal force in the threaded rod most heavily tension loaded
- b: Maximum spacing of the threaded rod axis to the flange edge
- b_2: Carrier width or width of the end plate; the smaller value is relevant.

Projecting on-site end plate

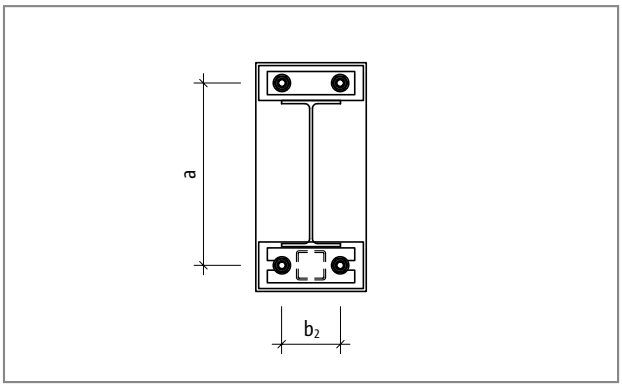


Fig. 128: Protruding end plate T type S: geometric input values from calculation; view

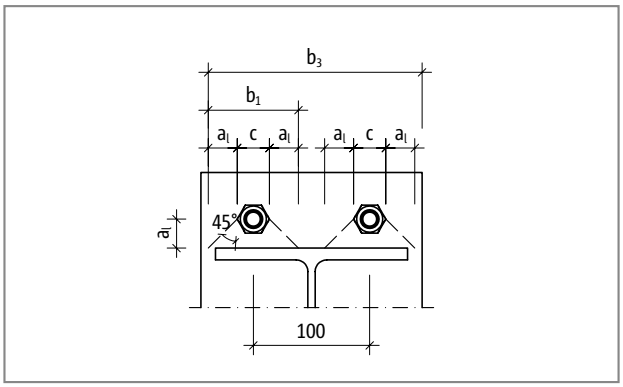


Fig. 129: Protruding end plate T type S: geometric input values from calculation; cross-section

Fixing Plate

Verification of the maximum moment in the end plate

Acting normal force
per threaded rod: $N_{GS,\,i,\,Ed}$ (See e.g. p. 85), or $N_{GS,Ed}(M_{y,Ed}) = 1/2 \cdot M_{y,Ed} / a$
Acting moment in end plate: $M_{Ed,\,STP} = N_{GS,Ed} \cdot a_l$ [kNmm]

Resistance moment in end plate: $W = t^2 \cdot b_{ef} / 6$ [mm³]

b_{ef}	= min (b_1; $b_2/2$; $b_3/2$)
t	= thickness of end plate
c	= diameter plain washer; c (M16) = 30 mm; c (M22) = 39 mm
a_l	= separation flange to centre threaded rod
b_1	= $2 \cdot a_l + c$ [mm]
b_2	= beam width or width end plate; the smaller value is relevant.
b_3	= $2 \cdot a_l + c + 100$ [mm]

Verification: $M_{Ed,\,STP} = N_{GS,Ed} \cdot a_1$ [kNmm] ≤ $M_{Rd,\,STP} = W \cdot f_{y,k} / 1.1$ [kNmm]

Flush on site end plate

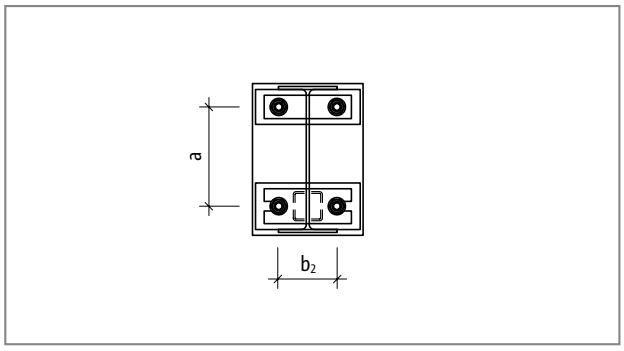


Fig. 130: Flush end plate T type S: Geometric input values from calculation; view

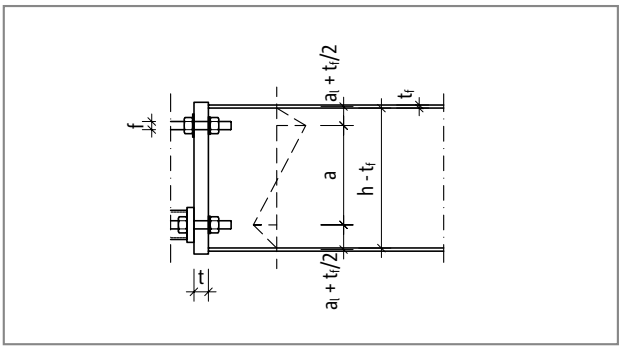


Fig. 131: Flush end plate T type S: Geometric input values from calculation; cross-section

Verification of the maximum moment in the end plate

acting normal force per module: $N_{x,\,Ed}$, or $\pm N_{x,\,Ed}$ ($M_{y,Ed}$) = $\pm M_{y,Ed} / a$
acting moment in end plate: $M_{Ed,\,STP} = \pm N_{x,\,Ed} \cdot (a_l + t_f/2)$ [kNmm]

Resistance moment in end plate: $W_{pl} = t^2 \cdot b_{ef} / 4$ [mm³]

b_{ef}	= $b_2 - 2 \cdot f$
t	= thickness of the end plate
f	= ⌀through-hole; for M16: ⌀ 18 mm, for M22: ⌀ 24 mm
a_l	= separation to centre of threaded rod
t_f	= thick flange
b_2	= beam width or width of end plate; the smaller value is relevant.

Verification: $M_{Ed,\,STP} = \pm N_{x,Ed} \cdot (a_l + t_f/2)$ [kNmm] ≤ $M_{Rd,\,STP} = W_{pl} \cdot f_{y,k} / 1.1$ [kNmm]

Fixing Plate

- The minimum thickness of the on site end plate is to be verified by the structural engineer.
- The maximum free length is:
  T type S-N-D16, T type S-V-D16 40 mm
  T type S-N-D22, T type S-V-D22 55 mm
- The end plate is to be so reinforced that the spacing of a threaded rod to the nearest reinforcement is not larger than the spacing to the nearest threaded rod.
- A certain minimum end plate thickness depending on the diameter of the threaded rods of the Schöck Isokorb® is necessary for environments containing chloride.
- The end plate is to be implemented with a nominal hole tolerance of 2 mm.

Implementation planning

Implementation planning

- In order to avoid installation errors, it is recommended that in addition to the type designation of the selected modules, their colour code is also entered in the implementation plans:
  Schöck Isokorb® T type S-N: white
  Schöck Isokorb® T type S-V: blue
- The tightening torques of the nuts must also be entered in the implementation plan; the following tightening torques apply
  T type S-N-D16, T type S-V-D16 (threaded rod M16): M_r = 50 Nm
  T type S-N-D22, T type S-V-D22 (threaded rod M22): M_r = 80 Nm
- After tightening the nuts are to be peened over.

Refurbishment/retrospective installation

The Schöck Isokorb® T type S-N, T type S-V modules can be used both in renovation and in the retrofitting of steel, in-situ concrete and prefabricated balconies to existing buildings.
Depending on the connection possibilities in the existing building, supported or cantilevered steel constructions and reinforced concrete balconies can be carried out.

Free cantilevered and reinforced concrete constructions

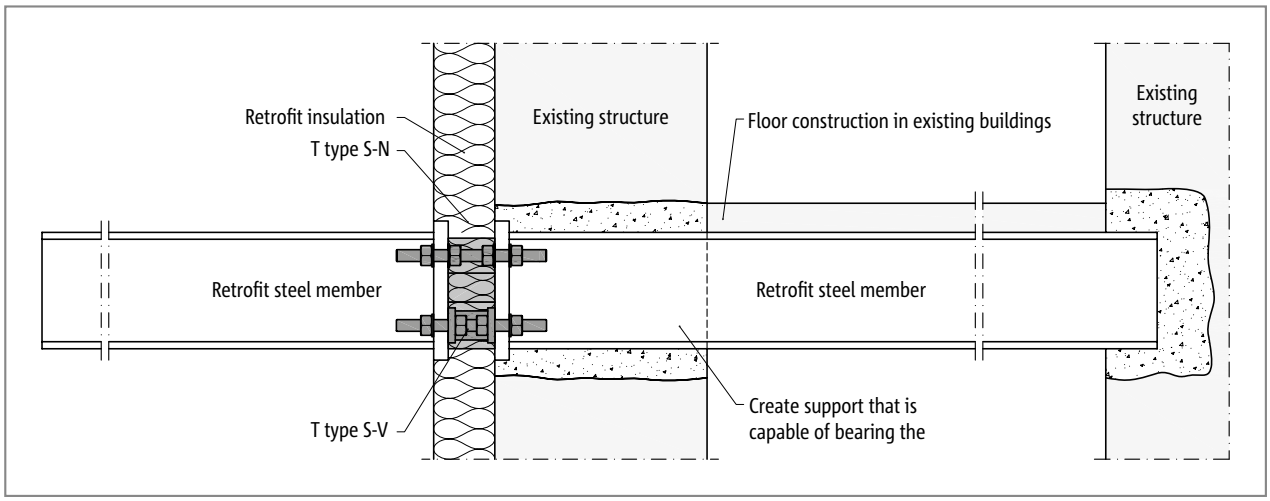


Fig. 132: Schöck Isokorb® T type S-N and T type S-V: Retrofitted cantilevered steel balcony; connected to retrofitted steel beam

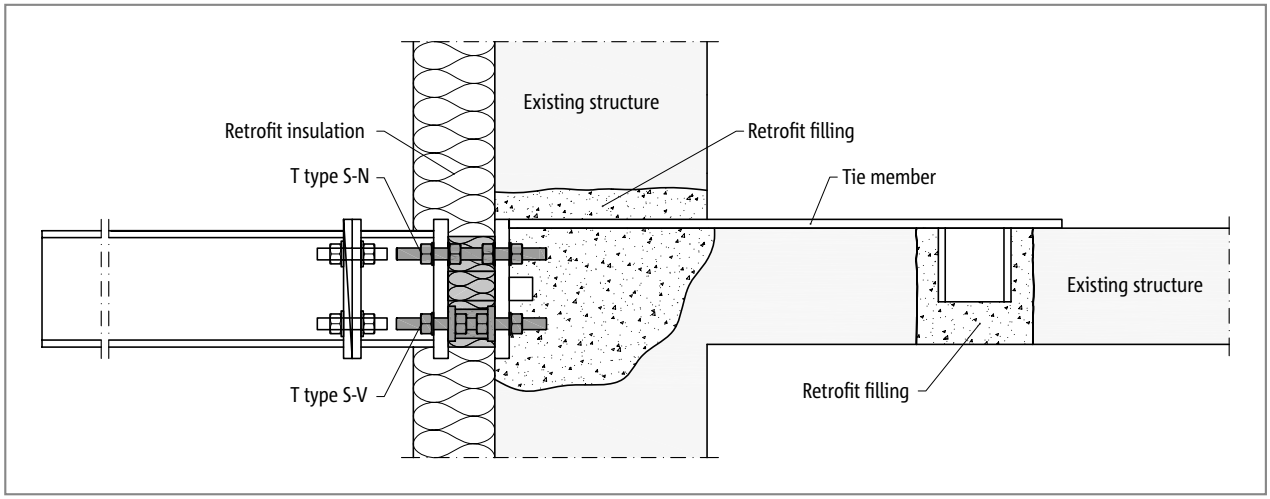


Fig. 133: Schöck Isokorb® T type S-N and T type S-V: Retrofitted cantilevered steel balcony with adapter; connected to existing reinforced concrete floor with tie member

Refurbishment/retrospective installation

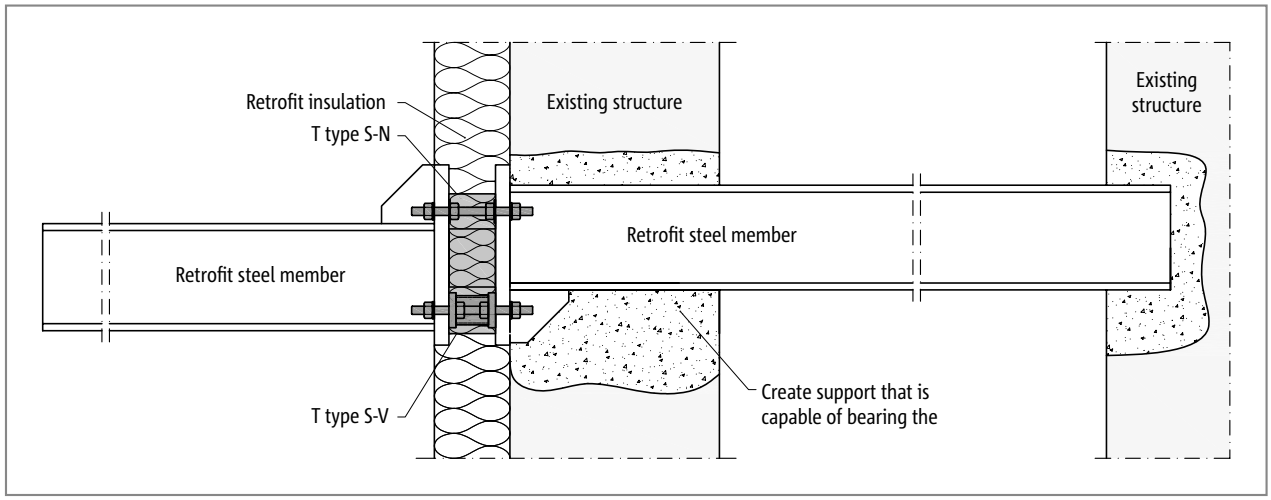


Fig. 134: Schöck Isokorb® T type S-N and T type S-V: Retrofitted cantilevered steel balcony; connected with height offset to retrofitted steel beam.

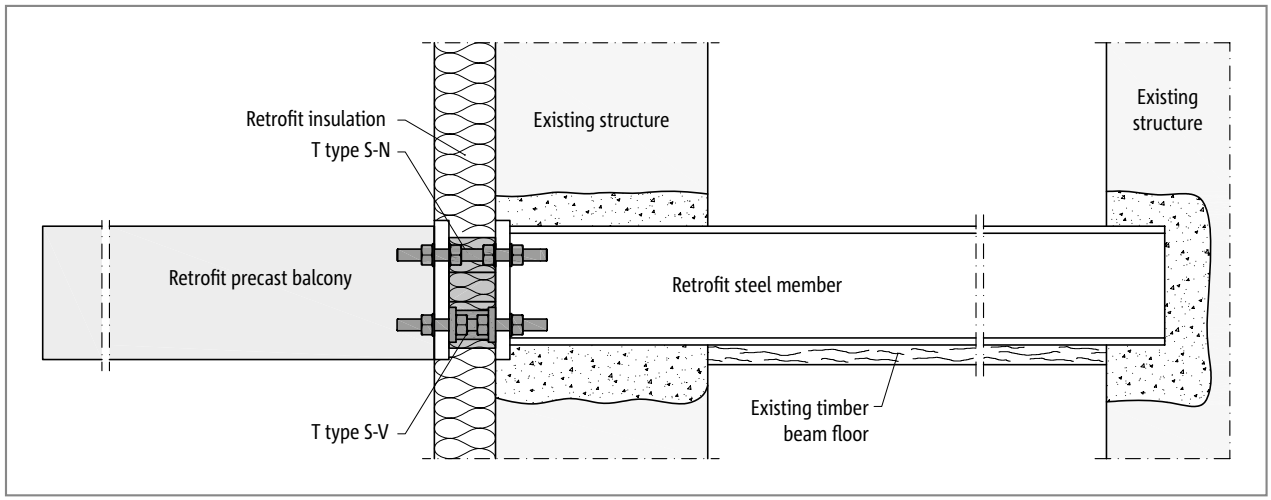


Fig. 135: Schöck Isokorb® T type S-N and T type S-V: Retrofitted cantilevered precast balcony; connected to retrofitted steel beam; internal screw connection

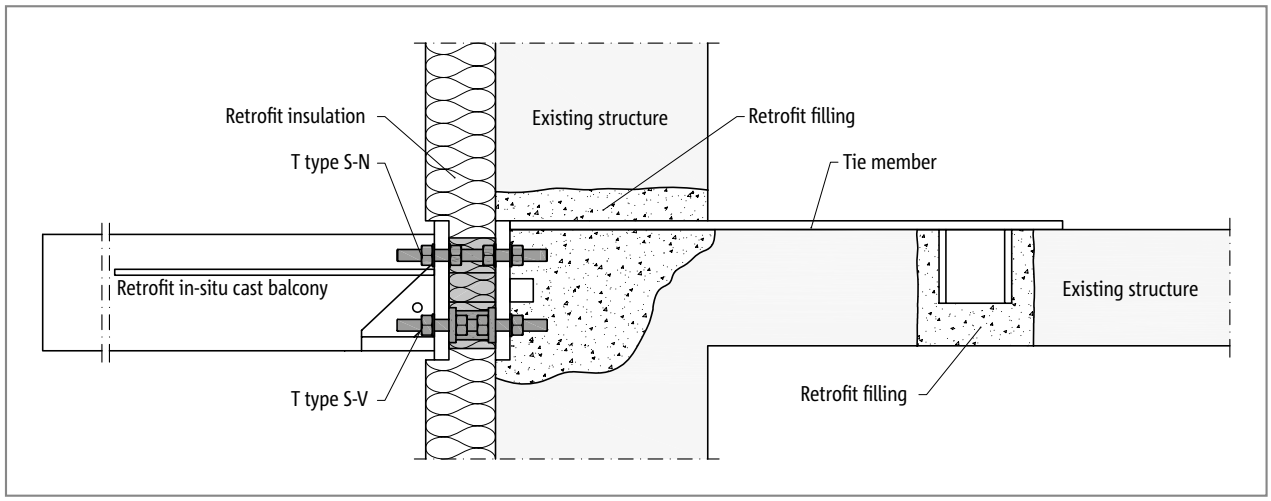


Fig. 136: Schöck Isokorb® T type S-N and T type S-V: Retrofitted cantilevered in situ concrete balcony; connected to existing reinforced concrete ceiling with tie member

Refurbishment/retrospective installation | Atmosphere containing chloride

Supported steel and reinforced concrete constructions

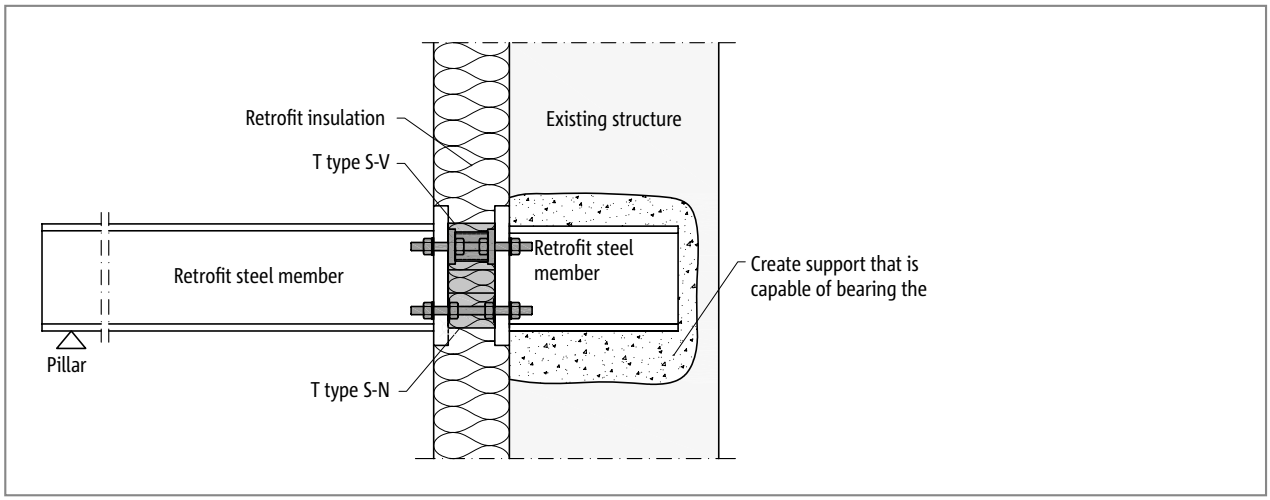


Fig. 137: Schöck Isokorb® T type S-N and T type S-V: Retrofitted supported steel balcony; connected to retrofitted wall support

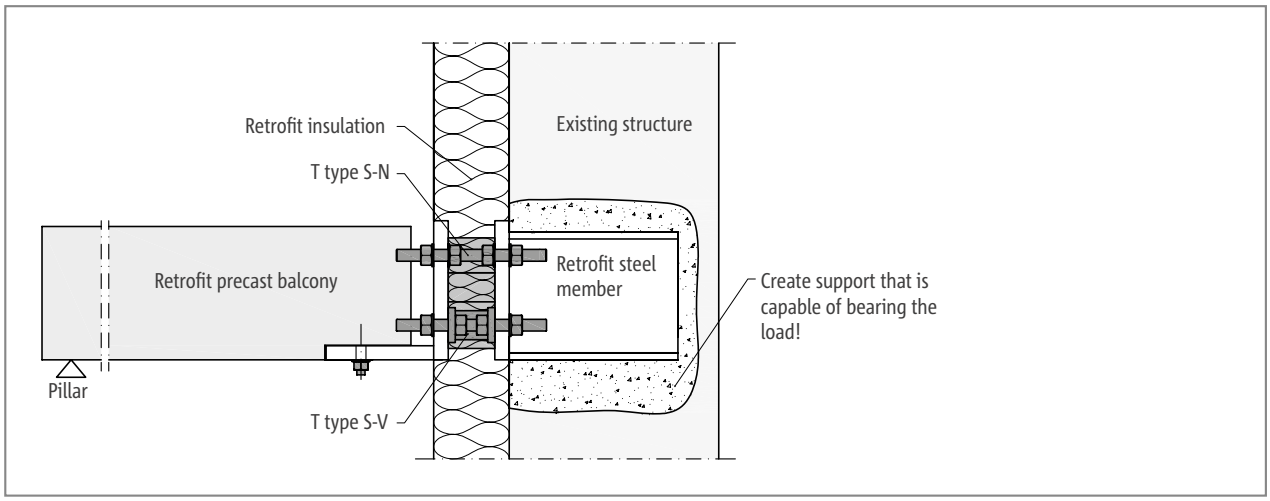


Fig. 138: Schöck Isokorb® T type S-N and T type S-V: Retrofitted supported precast balcony; connected to retrofitted steel beam

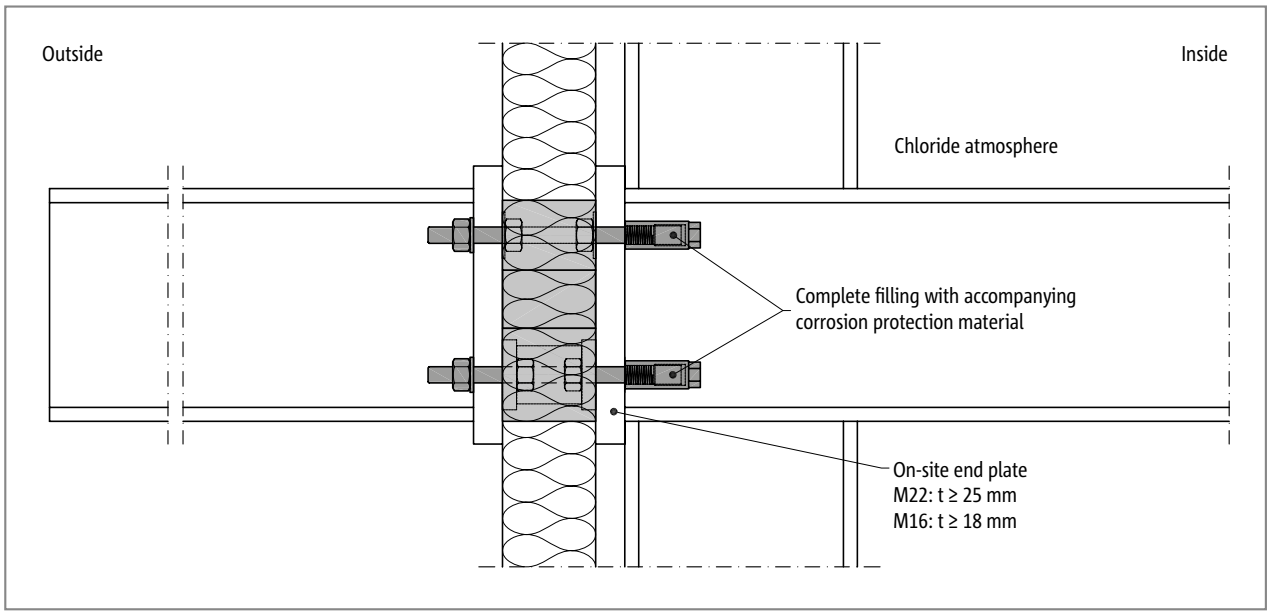


Fig. 139: Schöck Isokorb® T type S with cap nuts: Cantilevered steel construction; interior atmosphere containing chloride

Atmosphere containing chloride

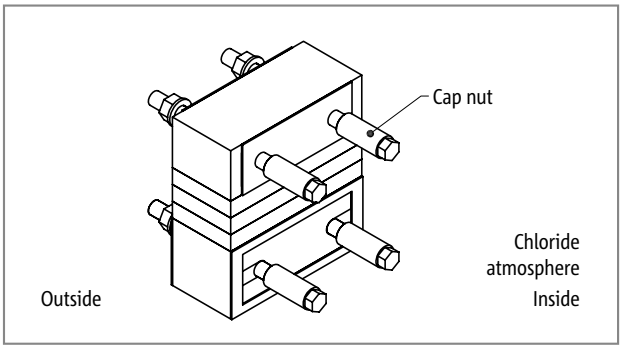


Fig. 140: Schöck Isokorb® T type S with cap nuts: Isometry; internal atmosphere containing chloride

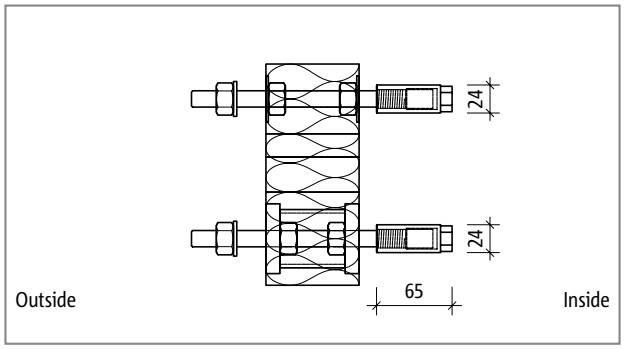


Fig. 141: Schöck Isokorb® type S with cap nuts: Cross-section

To protect against chloride-containing atmospheres, e.g. in indoor swimming pools, special cap nuts must be mounted on the threaded rods of the Schöck Isokorb® T type S on the inside of the building. The Schöck Isokorb® T type S-N and T type S-V modules are mounted according to static requirements and bolted with the cap nuts on the inside.

Chloride-containing atmosphere

- The cap nuts must be completely filled with anti-corrosion compound.
- Tighten the cap nuts hand-tight without planned pretension, this corresponds to the following tightening torque:
  T type S-N-D16, T type S-V-D16 (threaded rod M16): M_r = 50 Nm
  T type S-N-D22, T type S-V-D22 (threaded rod M22): M_r = 80 Nm
- The minimum thickness of the on site end plate is to be verified by the structural engineer.
- A certain minimum end plate thickness depending on the diameter of the threaded rods of the Schöck Isokorb® is necessary for environments containing chloride.

Check list

- ☐ Is the Schöck Isokorb® designed for primarily static loads?
- ☐ Have the member forces on the Isokorb® connection been determined at the design level?
- ☐ For the design and arrangement of the Schöck Isokorb® T type S-N and T type S-V, have the specifications from the Technical Information page 76 to page 85 been taken into account?
- ☐ Are the Schöck Isokorb® T type S-V assigned to the areas of tension or compression for the shear force design? Has the transferable shear force been taken into account accordingly? See design tables page 80 to page 85.
- ☐ Has the additional proportionate deflection resulting from the Schöck Isokorb® been taken into account?
- ☐ Are temperature deformations assigned directly to the Isokorb® connection? And is the maximum expansion joint spacing taken into account?
- ☐ Have the fire protection requirements for the overall load-bearing structure been clarified? Are the on-site measures included in the construction drawings?
- ☐ Is the minimum end plate thickness met without exact proof? Is the end plate thickness confirmed by a precise verification using an end plate program? See note page 93.
- ☐ Is the distance of the threaded rods to the beam flange taken into account when dimensioning the end plate?
- ☐ Are the Schöck Isokorb® T type S-N and T type S-V modules planned with cap nuts in chloride-containing environments (e.g. outdoor air near the sea, indoor swimming pool)?
- ☐ Are the names of the Schöck Isokorb® T type S-N and T type S-V entered in the implementation plan and in the construction drawing?
- ☐ Is the colour code of the Schöck Isokorb® modules entered in the implementation plan and the construction drawing?
- ☐ Are the tightening torques of the nuts entered into the implementation plan? The following torques apply:
  T type S-N-D16, T type S-V-D16 (threaded rod M16): M_r = 50 Nm
  T type S-N-D22, T type S-V-D22 (Threaded rod M22): M_r = 80 Nm

Imprint

Published by: HauCon Norge AS
Snarøyveien 67
Hangar 2
Koksa
1367 Snarøya
Telephone: +47 67 11 56 90
Fax: +47 67 11 56 91
post@haucon.no

Subject to technical changes
Date of publication: May 2021

Sales and technical advice
HauCon Norge AS
Johan Follestads vei 3
3474 Åros
Telephone: 31 30 25 00
Fax: 31 30 25 01
post@haucon.no
www.haucon.no

Manufacturer
Schöck Bauteile GmbH
Vimbucher Straße 2
76534 Baden-Baden
Germany
www.schoeck.com

Dependable by design

05.2021/NO/190517