Schöck Isokorb® T type S

Schöck Isokorb® T type S

Load-bearing thermal insulation elements for the connection of freely cantilevered steel constructions to steel structures. The element consists of the S-N and S-V modules and, depending on the module arrangement, transfers moments, shear forces and normal forces.

Installation cross sections

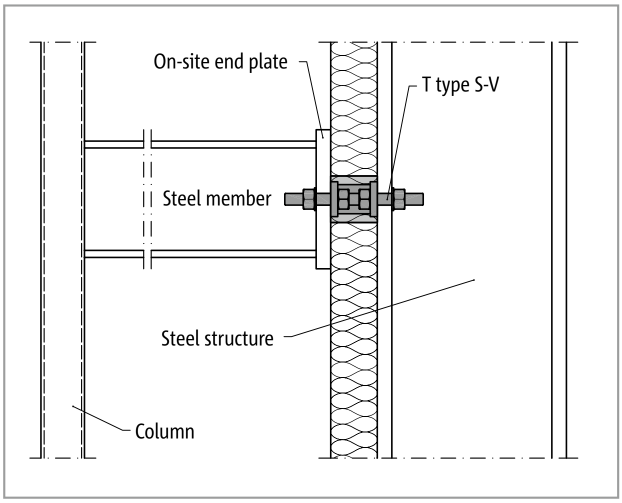


Fig. 81: Schöck Isokorb® T type S-V for supported steel structures

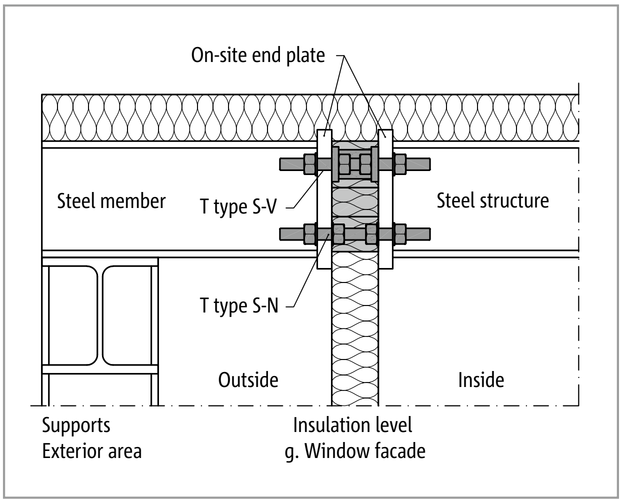


Fig. 82: Schöck Isokorb® T type S for thermal separation within the structural system

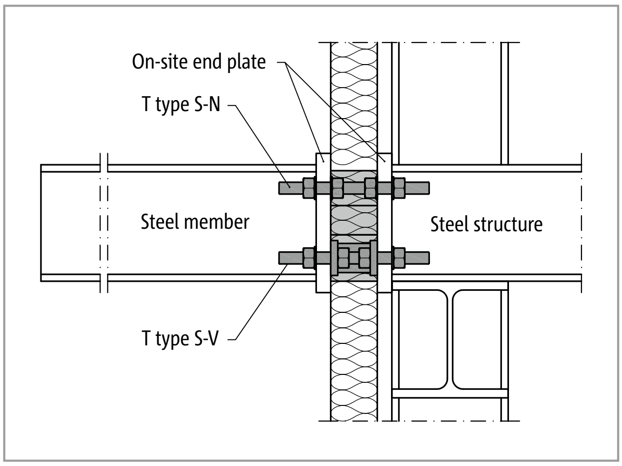


Fig. 83: Schöck Isokorb® T type S for cantilevered steel structures

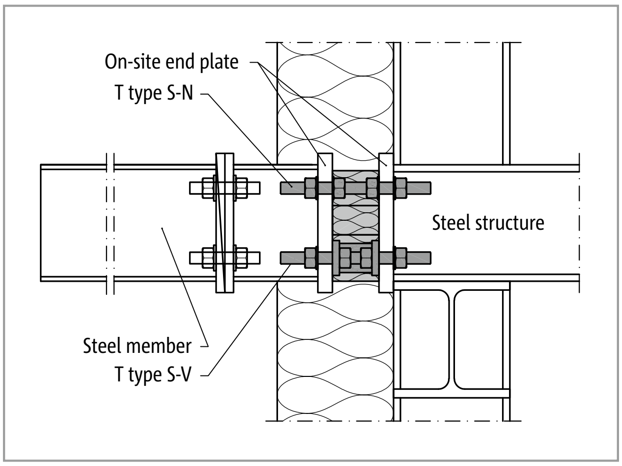


Fig. 84: Schöck Isokorb® T type S for cantilevered steel structures ; including first fix bracket

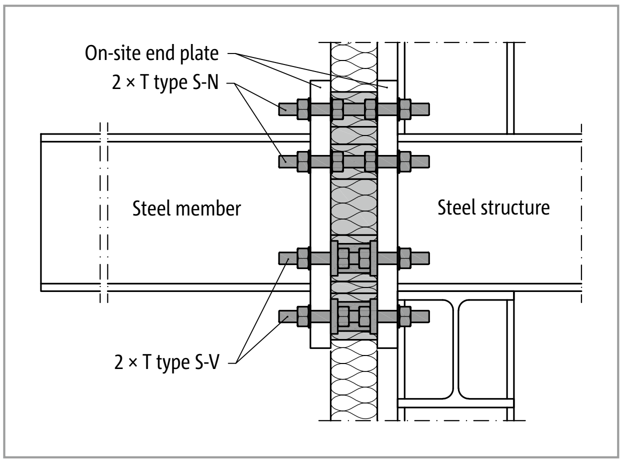


Fig. 85: Schöck Isokorb® T type S for cantilevered steel structures

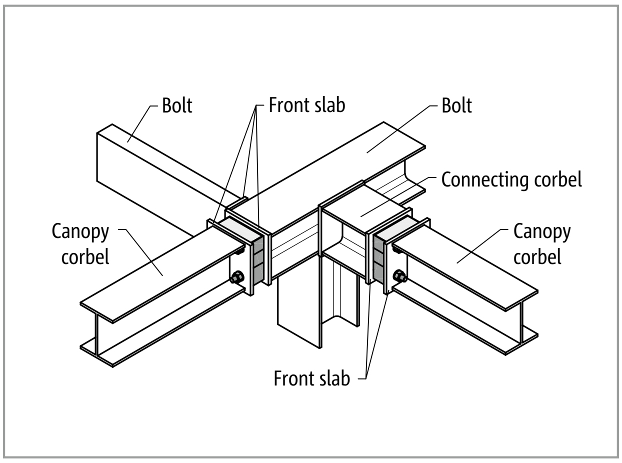


Fig. 86: Schöck Isokorb® T type S for outer corner detail

Installation cross sections

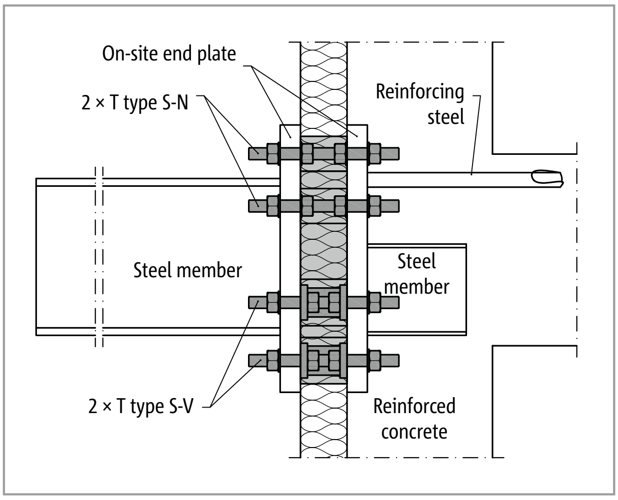


Fig. 87: Schöck Isokorb® T type S-N and T type S-V modules for connection of steel structure to reinforced concrete frame

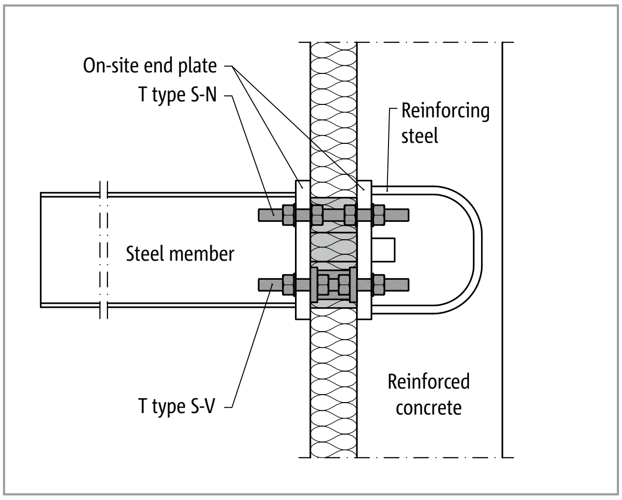


Fig. 88: Schöck Isokorb® T type S-N and T type S-V modules for connection of steel structure to reinforced concrete frame

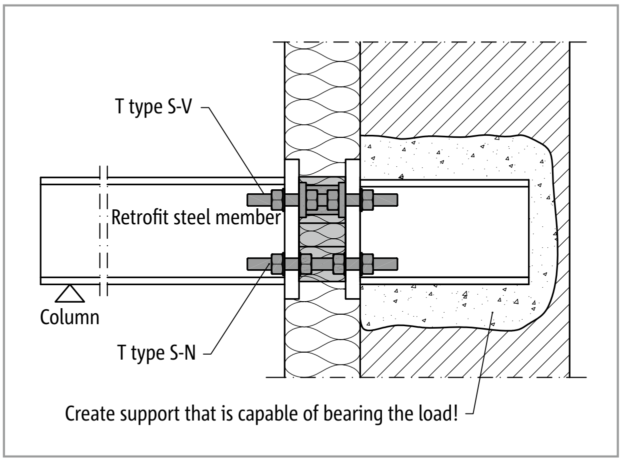


Fig. 89: Schöck Isokorb® T type S-N and T type S-V for retrofited supported steel structure; further examples of renovation see p. 90

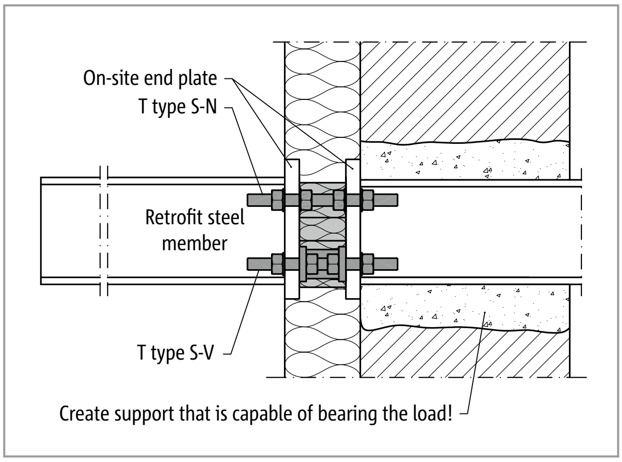


Fig. 90: Schöck Isokorb® T type S for retrofitted cantilevered steel structure; further examples of renovation see p. 90

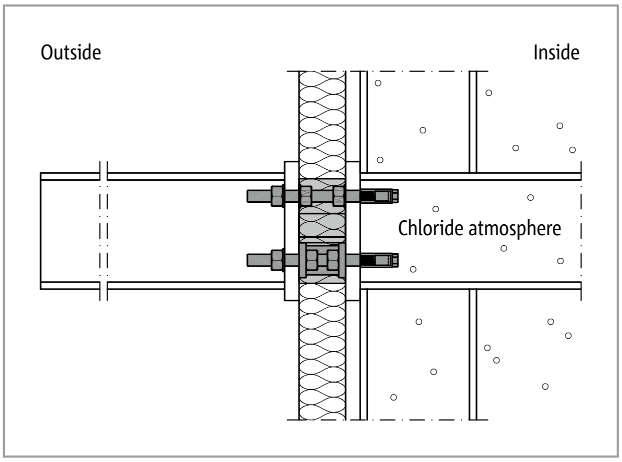


Fig. 91: Schöck Isokorb® T type S with protective caps for cantilevered steel structure in an internal atmosphere containing chloride

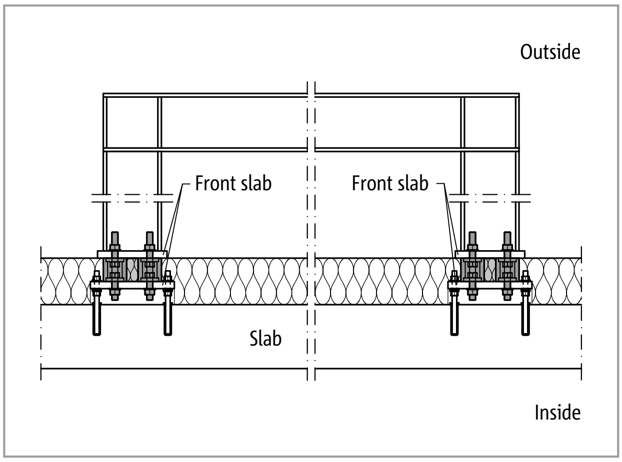


Fig. 92: Schöck Isokorb® T type S-V for rigid frame connection for secondary structures (additional moments from imperfections are to be taken into account)

Product selection

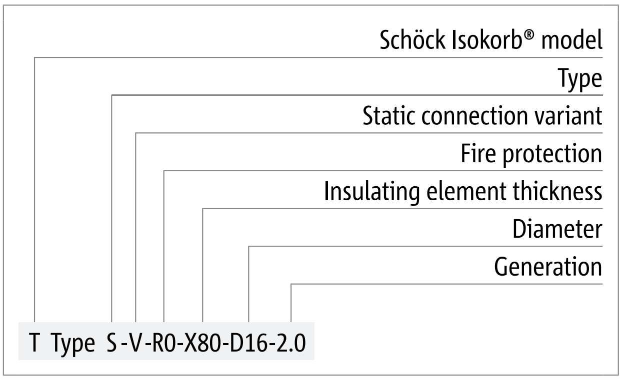
Schöck Isokorb® T type S variants

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: Absorbs compressive forces
- Fire resistance class:
  R 0
- Insulating element thickness:
  X80 = 80 mm
- Thread diameter:
  M16, M22
- Generation:
  2.0
- Height:
  T Type S-N H = 60 mm
  T Type S-V H = 80 mm
- Height with truncated insulation elements:
  T Type S-N H = 40 mm
  T Type S-V H = 60 mm
  (Insulation element cut off up to the steel plates; see p 86)
- 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 required Schöck Isokorb® T type S-N, T type S-V modules in the request for proposal and with the order.

Type designations | Special designs

Type designations in planning documents



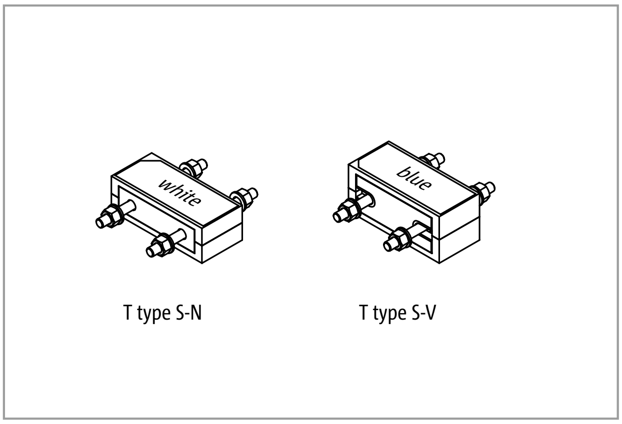


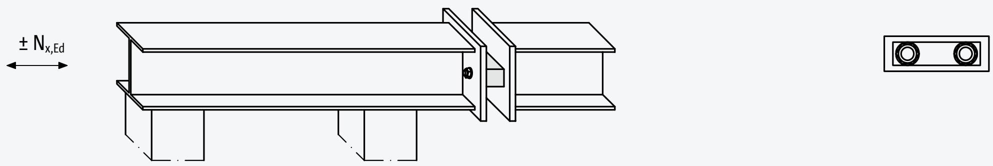
Fig. 93: Schöck Isokorb® T type S-N and T type S-V

Special designs

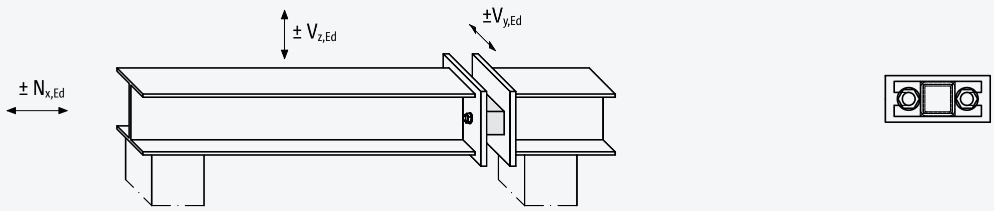
Please contact the design support department if you have connections that are not possible with the standard product variants shown in this information (contact details on page 3).

Design overview

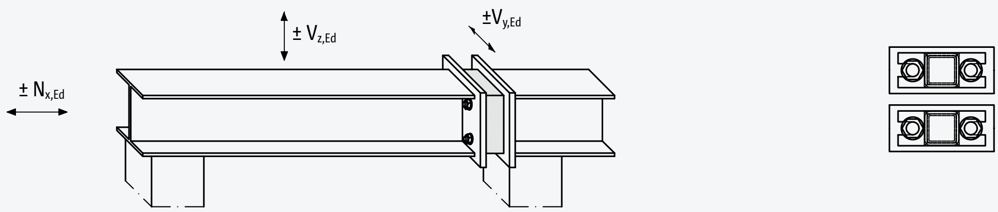
Normal force $\pm N_{x,Ed}$; 1 T type S-N Page 74



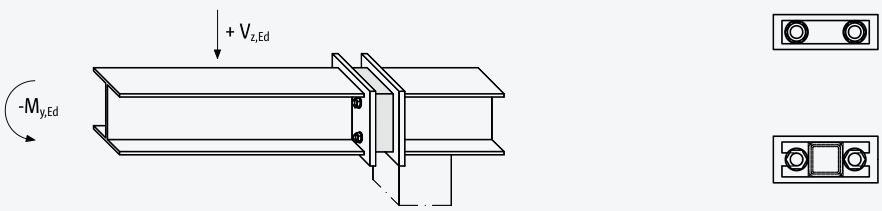
Normal force $\pm N_{x,Ed}$, shear force $\pm V_{z,Ed}$, $\pm V_{y,Ed}$; 1 T type S-V Page 74



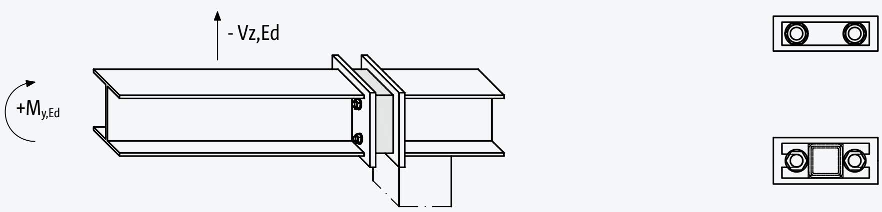
Normal force $\pm N_{x,Ed}$, shear force $\pm V_{z,Ed}$, $\pm V_{y,Ed}$; several T type S-V Page 75



Shear force $+V_{z,Ed}$, moment $-M_{y,Ed}$; 1 T type S-N + 1 T type S-V Page 76

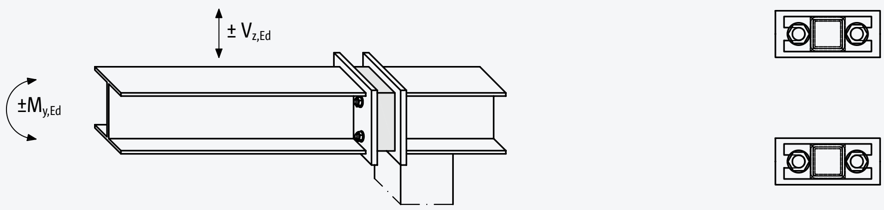


Shear force $-V_{z,Ed}$, moment $+M_{y,Ed}$; 1 T type S-N + 1 T type S-V Page 76

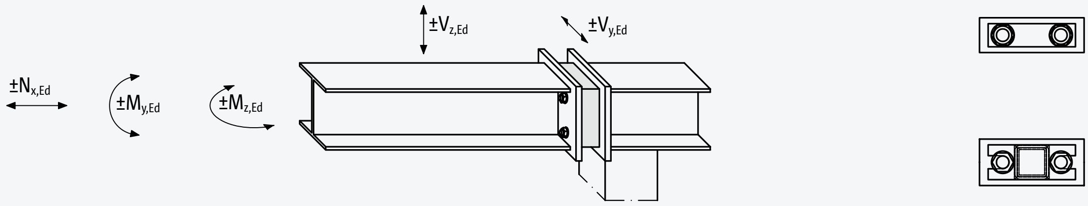


Design overview

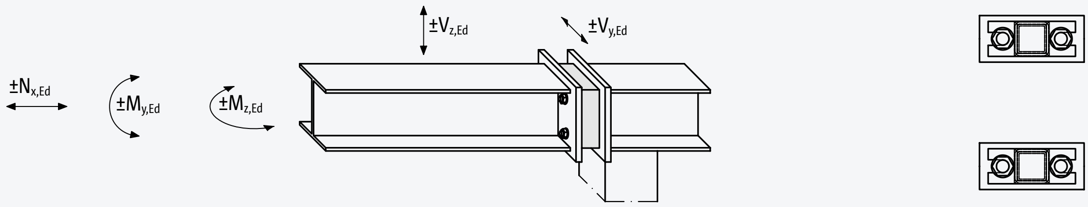
Shear force $\pm V_{z,Ed}$, moment $\pm M_{y,Ed}$; 2 × T type S-V Page 77



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 80



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 80



Design

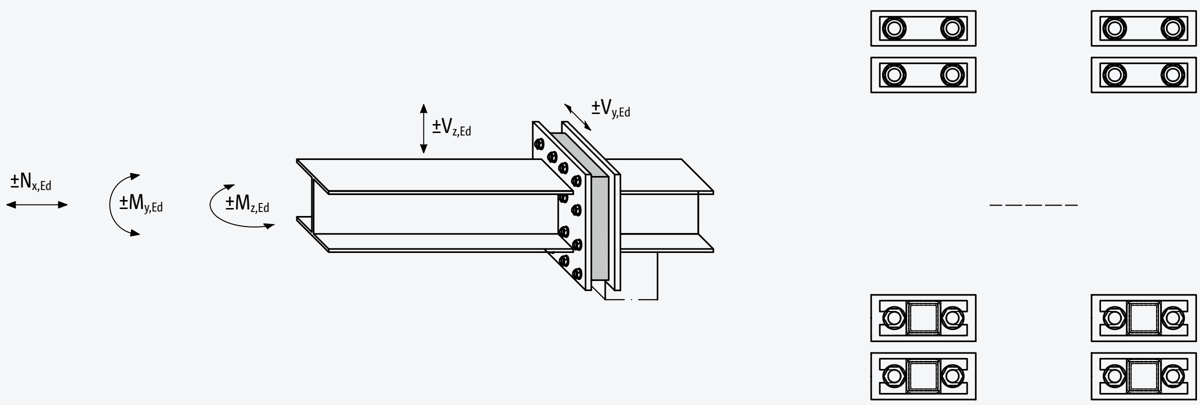
- The design software is available for a rapid and efficient design (Download under www.schoeck.com/en-gb/download).
- Further information can be requested from the design department (contact see p. 3).

T
type S

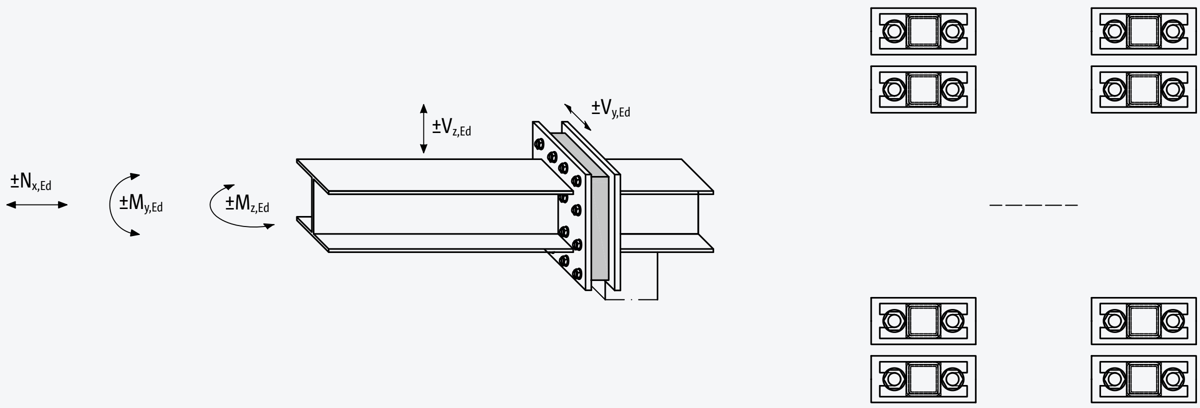
Steel – steel

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 80



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 v S-V Page 80



Design

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

Sign convention | Notes

Sign convention for the design

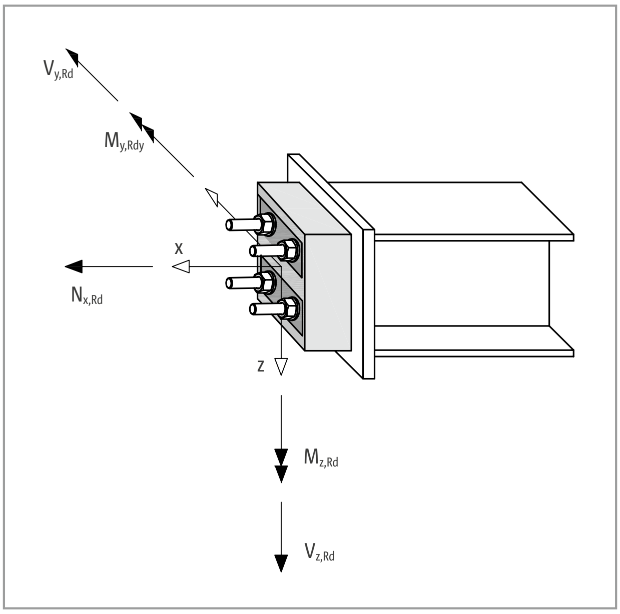


Fig. 94: Schöck Isokorb® T type S: Sign convention for the design

Notes on design

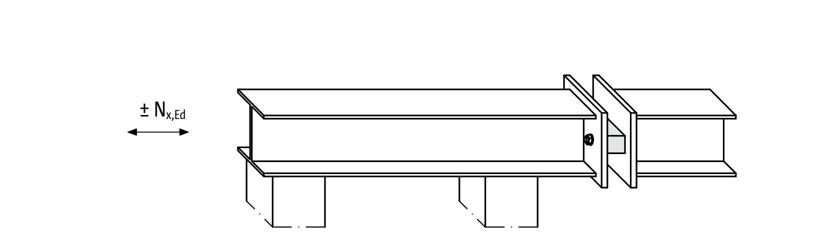
- The Schöck Isokorb® T type S is intended for use with primarily static loads.
- Design takes place in accordance with approval document No. Z-14.4-518

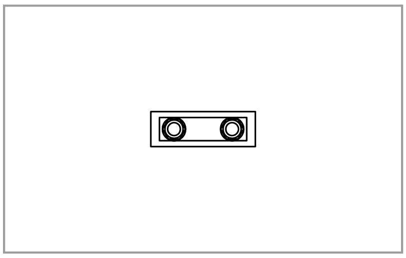
Design of the shear force

- A distinction is to be made as to which zone the Schöck Isokorb® T type S-V is to be arranged :
  Compression: Both threaded rods are pressure-loaded.
  Compression/tension: One threaded rod is compression loaded, the other threaded rod is tension-loaded, e.g. from$M_{z,Ed}$.
  tension: Both threaded rods are tension-loaded.
- Interaction for all zones:
  Allowable shear force in z-direction $V_{z,Rd}$ is dependent on the shear force in the y-direction $V_{y,Rd}$ and vice versa.
- Interaction in the ompression/tension and tension zones:
  Allowable shear force is dependent on thenormal force $N_{x,Ed}$ or the normal force from the moment $N_{x,Ed}(M_{Ed})$.

Design normal force | Design normal force and shear force

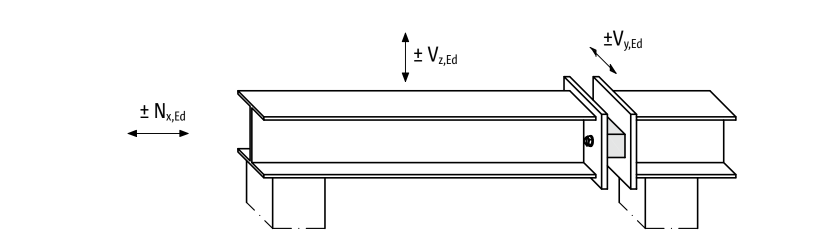
Normal force $N_{x,Rd}$ - 1 Schöck Isokorb® T type S-N module

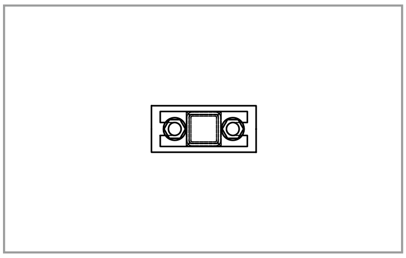




Schöck Isokorb® T type S-N	D16	D22
Design value per	$N_{x,Rd}$ [kN/module]	
Module	116.8/−63.4	225.4/−149.6

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





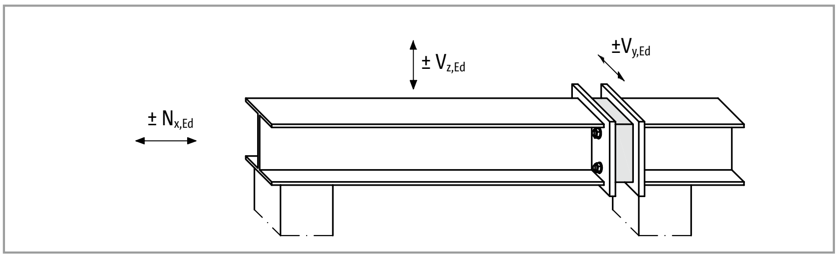
Schöck Isokorb® T type	S-V-D16			S-V-D22		
Design value per	$N_{x,Rd}$ [kN/module]					
Module	±116.8			±225.4		
Shear force compression zone						
Module	$V_{z,Rd}$ [kN/module]					
	für	$0 \leq \lvert V_{y,Ed} \rvert \leq 6$	±30	für	$0 \leq \lvert V_{y,Ed} \rvert \leq 6$	±36
	für	$6 < \lvert V_{y,Ed} \rvert \leq 15$	$\pm(30 - \lvert V_{y,Ed} \rvert)$	für	$6 < \lvert V_{y,Ed} \rvert \leq 18$	$\pm(36 - \lvert V_{y,Ed} \rvert)$
	$V_{y,Rd}$ [kN/module]					
	$\pm\min(15; 30 - \lvert V_{z,Ed} \rvert)$			$\pm\min(18; 36 - \lvert V_{z,Ed} \rvert)$		
Shear force tension zone						
Module	$V_{z,Rd}$ [kN/module]					
	für	$0 \leq N_{x,Ed} \leq 26{,}8$	$\pm(30 - \lvert V_{y,Ed} \rvert)$	für	$0 \leq N_{x,Ed} \leq 117{,}4$	$\pm(36 - \lvert V_{y,Ed} \rvert)$
	für	$26{,}8 < N_{x,Ed} \leq 116{,}8$	$\pm(1/3\ (116{,}8 - N_{x,Ed}) - \lvert V_{y,Ed} \rvert)$	für	$117{,}4 < N_{x,Ed} \leq 225{,}4$	$\pm(1/3\ (225{,}4 - N_{x,Ed}) - \lvert V_{y,Ed} \rvert)$
	$V_{y,Rd}$ [kN/module]					
	für	$0 \leq N_{x,Ed} \leq 26{,}8$	$\pm\min(15; 30 - \lvert V_{z,Ed} \rvert)$	für	$0 \leq N_{x,Ed} \leq 117{,}4$	$\pm\min(18; 36 - \lvert V_{z,Ed} \rvert)$
	für	$26{,}8 < N_{x,Ed} \leq 116{,}8$	$\pm\min\{15; 1/3\ (116{,}8 - N_{x,Ed}) - \lvert V_{z,Ed} \rvert\}$	für	$117{,}4 < N_{x,Ed} \leq 225{,}4$	$\pm\min\{18; 1/3\ (225{,}4 - N_{x,Ed}) - \lvert V_{z,Ed} \rvert\}$

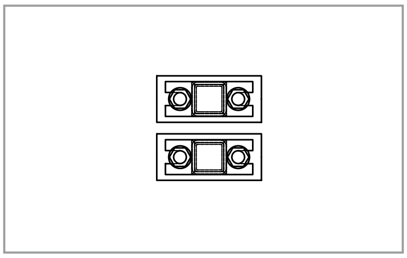
Notes on design

- The values given here apply only for a connection with precisely 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 end plates.

Design normal force and shear force

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





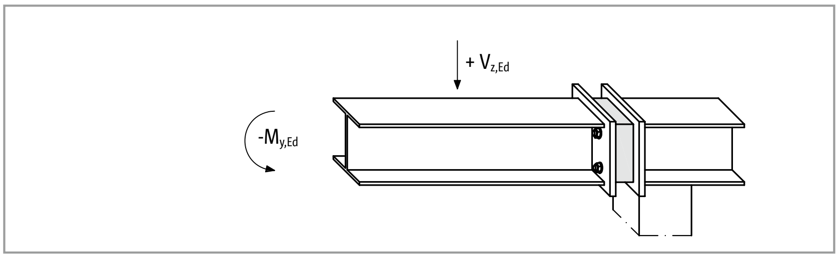
Schöck Isokorb® T type	n × S-V-D16			n × S-V-D22		
Design value per	$N_{x,Rd}$ [kN/module]					
Module	±116.8			±225.4		
Shear force compression zone						
Module	$V_{z,Rd}$ [kN/module]					
	±(46 - $\lvert V_{y,Ed} \rvert$)			±(50 - $\lvert V_{y,Ed} \rvert$)		
	$V_{y,Rd}$ [kN/module]					
	±min {23; 46 - $\lvert V_{z,Ed} \rvert$}			±min {25; 50 - $\lvert V_{z,Ed} \rvert$}		
Shear force tension zone						
Module	$V_{z,i,Rd}$ [kN/module]					
	für	$0 < N_{x,Ed} \leq 26,8$	±(30 - $\lvert V_{y,Ed} \rvert$)	für	$0 < N_{x,Ed} \leq 117,4$	±(36 - $\lvert V_{y,Ed} \rvert$)
	für	$26,8 < N_{x,Ed} \leq 116,8$	±(1/3 (116,8 - $N_{x,Ed}$) - $\lvert V_{y,Ed} \rvert$)	für	$117,4 < N_{x,Ed} \leq 225,4$	±(1/3 (225,4 - $N_{x,Ed}$) - $\lvert V_{y,Ed} \rvert$)
	$V_{y,Rd}$ [kN/module]					
	für	$0 < N_{x,Ed} \leq 26,8$	±min {23; 30 - $\lvert V_{z,Ed} \rvert$}	für	$0 < N_{x,Ed} \leq 117,4$	±min {25; 36 - $\lvert V_{z,Ed} \rvert$}
	für	$26,8 < N_{x,Ed} \leq 116,8$	±min {23; 1/3 (116,8 - $N_{x,Ed}$) - $\lvert V_{z,Ed} \rvert$}	für	$117,4 < N_{x,Ed} \leq 225,4$	±min {25; 1/3 (225,4 - $N_{x,Ed}$) - $\lvert V_{z,Ed} \rvert$}

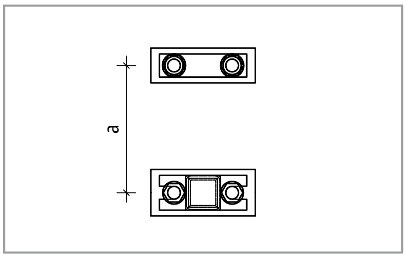
Notes on design

- In accordance with the approval a Schöck Isokorb® T type S-V module is assigned to the tension zone for $N_{x,Ed} = 0$. Additional Schöck Isokorb® T type S-V can be assigned to the compression zone.
- The design values given in this table apply for a pure supported connection. It is to be ensured that a flexible connection is also available with the arrangement of several Schöck Isokorb® T type S-V modules.
- The design values apply only for supported steel constructions and with a two-sided rigid connection of the on-site end plates.
- The 4 Teflon sheets installed for each type S-V in use add approximately 4 mm. In particular with low balcony loading and with small centre-to-centre distance between type S-N and type S-V, these additional 4 mm in the compression zone have an impact relevant to the camber of the steel beams connected with Schöck Isokorb®. Should shims be necessary for on-site levelling in the tension zone, this would be taken into account with the construction planning.

Design shear force and moment

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



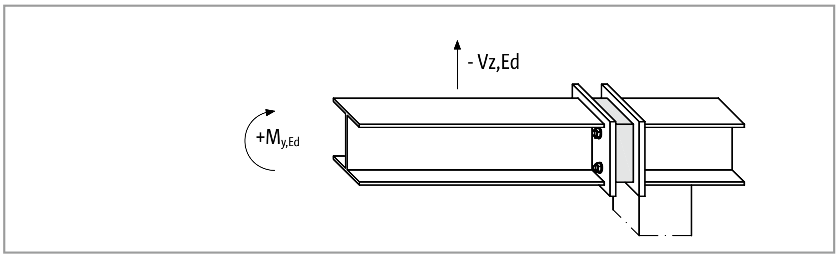


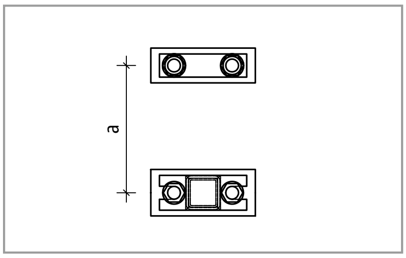
Schöck Isokorb® T type	1 × S-N-D16 + 1 × S-V-D16	1 × S-N-D22 + 1 × S-V-D22
Design value per	$M_{y,Rd}$ [kNm/connection]	
Connection	-116,8 • a	-225,4 • a
	$V_{z,Rd}$ [kN/connection]	
	46	50

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 trimming of the insulating elements, see page 86)
- 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





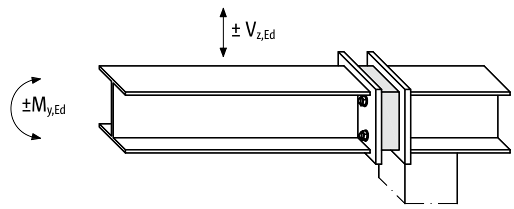
Schöck Isokorb® T type	1 × S-N-D16 + 1 × S-V-D16			1 × S-N-D22 + 1 × S-V-D22		
Design value per	$M_{y,Rd}$ [kNm/connection]					
Connection	63,4 • a			149,6 • a		
	$V_{z,Rd}$ [kN/connection]					
	für	$0 < N_{x,Ed} (M_{y,Ed}) \leq 26{,}8$	-30	für	$0 < N_{x,Ed} (M_{y,Ed}) \leq 117{,}4$	-36
	für	$26.8 < N_{x,Ed} (M_{y,Ed}) < 63.4$	$-1/3\ (116{,}8 - N_{x,Ed} (M_{y,Ed})\ )$	für	$117.4 < N_{x,Ed} (M_{y,Ed}) < 149.6$	$-1/3\ (225{,}4 - N_{x,Ed} (M_{y,Ed})\ )$
	für	63,4	-17,8	für	149,6	-25,3

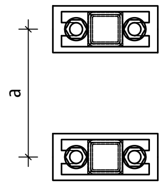
Notes on design

- $N_{x,Ed} (M_{y,Ed}) = M_{y,Ed} / a$
- a [m]: Lever arm (separation between tension loaded and compression loaded threaded rods).
- Minimum lever arm a = 50 mm (without insulation spacers and after trimming of the insulating elements, see page 86)
- 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						
Module	$V_{z,Rd}$ [kN/module]					
	±46			±50		
Shear force tension zone						
Module	$V_{z,Rd}$ [kN/module]					
	für	$0 < N_{x,Ed} (M_{y,Ed}) \leq 26{,}8$	±30	für	$0 < N_{x,Ed} (M_{y,Ed}) \leq 117{,}4$	±36
	für	$26.8 < N_{x,Ed} (M_{y,Ed}) < 116.8$	$\pm 1/3 (116{,}8 - N_{x,Ed} (M_{y,Ed}))$	für	$117.4 < \lvert N_{x,Ed} (M_{y,Ed}) \rvert \leq 225.4$	$\pm 1/3 (225{,}4 - N_{x,Ed} (M_{y,Ed}))$

Notes on design

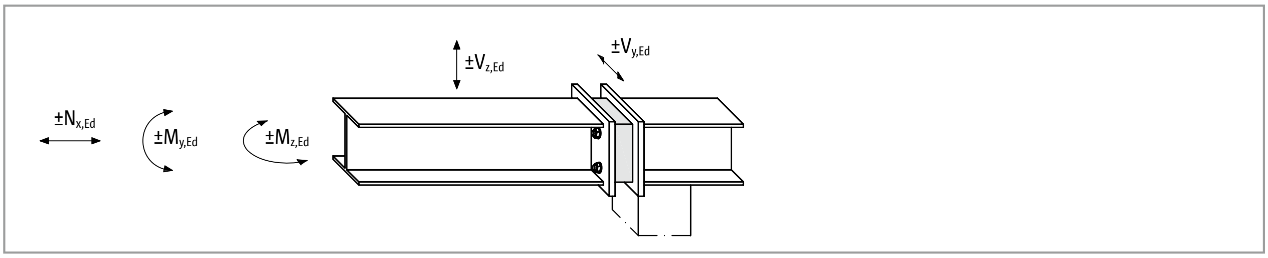
- $N_{x,Ed} (M_{y,Ed}) = M_{y,Ed} / a$
- a [m]: Lever arm (separation between tension loaded and compression loaded threaded rods).
- Minimum lever arm a = 50 mm (without insulation spacers and after trimming of the insulating elements, see page 86)

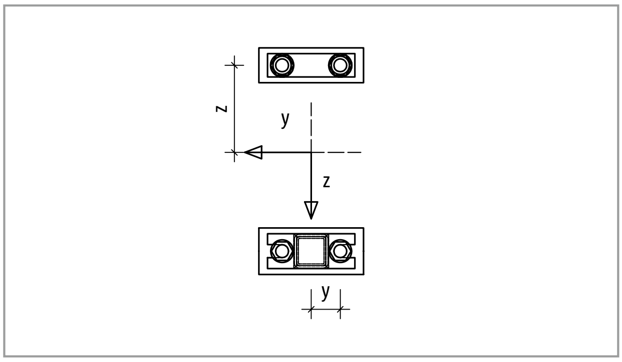
T
type S

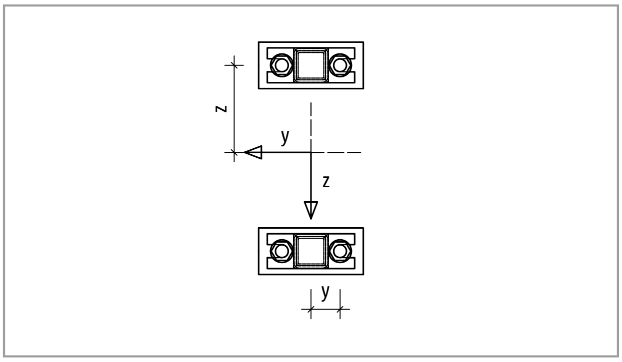
Steel – steel

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







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]			
	±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					
Module	$V_{z,i,Rd}$ [kN/module]					
	$\pm(46 - \lvert V_{y,i,Ed}\rvert)$			$\pm(50 - \lvert V_{y,i,Ed}\rvert)$		
	$V_{y,i,Rd}$ [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						
Module	$V_{z,i,Rd}$ [kN/module]					
	für	$0 < N_{GS,i,Ed} \le 13{,}4$	$\pm(30 - \lvert V_{y,i,Ed}\rvert)$	für	$0 < N_{GS,i,Ed} \le 58{,}7$	$\pm(36 - \lvert V_{y,i,Ed}\rvert)$
	für	$13{,}4 < N_{GS,i,Ed} \le 58{,}4$	$\pm 2/3\ (58{,}4 - N_{GS,i,Ed}) - \lvert V_{y,i,Ed}\rvert$	für	$58{,}7 < N_{GS,i,Ed} \le 112{,}7$	$\pm 2/3\ (112{,}7 - N_{GS,i,Ed}) - \lvert V_{y,i,Ed}\rvert$
	$V_{y,i,Rd}$ [kN/module]					
	für	$0 < N_{GS,i,Ed} \le 13{,}4$	$\pm\min\{23; 30 - \lvert V_{z,i,Ed}\rvert\}$	für	$0 < N_{GS,i,Ed} \le 58{,}7$	$\pm\min\{25; 36 - \lvert V_{z,i,Ed}\rvert\}$
	für	$13{,}4 < N_{GS,i,Ed} \le 58{,}4$	$\pm\min\{23; 2/3\ (58{,}4 - N_{GS,i,Ed}) - \lvert V_{z,i,Ed}\rvert\}$	für	$58{,}7 < N_{GS,i,Ed} \le 112{,}7$	$\pm\min\{25; 2/3\ (112{,}7 - N_{GS,i,Ed}) - \lvert V_{z,i,Ed}\rvert\}$

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 allowable shear force 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 threaded rods are tension loaded.
(In the area, compression/tension and in the tension area 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 the z-direction of the individual Schöck Isokorb® T type S-V module independent on $+N_{GS,i,Ed}$ in the respective module i.
$V_{y,i,Rd}$: Allowable shear force in the y-direction of the individual Schöck Isokorb® T type S-V module , depending on $+N_{GS,i,Ed}$ in the respective module i.

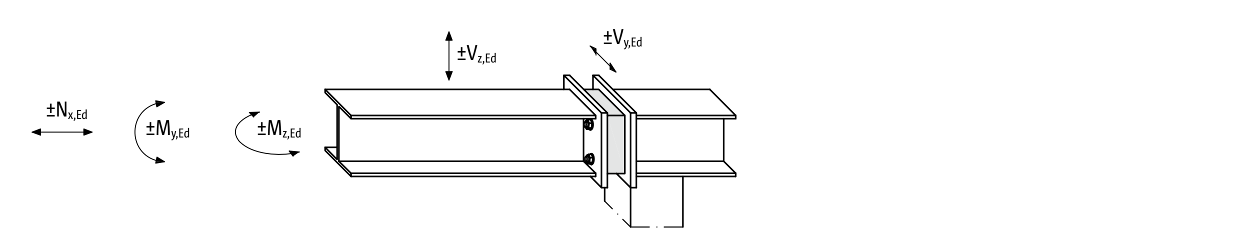
Determine $V_{z,i,Rd}$
Determine $V_{y,i,Rd}$

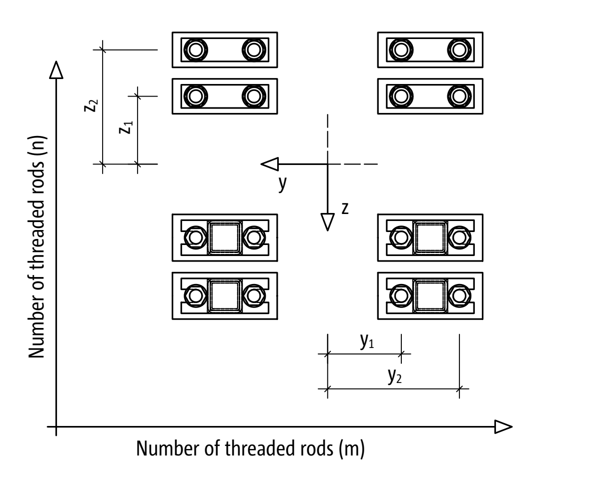
The vertical shear force $V_{z,Ed}$ and the horizontal shear force $V_{y,Ed}$ are in the ratio $V_{z,Ed}/V_{y,Ed}$ = constant distributed on the individual Schöck Isokorb® T type S-V.
Condition: $V_{z,Ed}/V_{y,Ed} = V_{z,i,Rd}/V_{y,i,Rd} = V_{z,Rd}/V_{y,Rd}$
If this condition is not met, $V_{z,i,Rd}$ or $V_{y,i,Rd}$ is reduced, so that the ratio is maintained.
Verification: $V_{z,Ed} \le \sum V_{z,i,Rd}$
$V_{y,Ed} \le \sum V_{y,i,Rd}$

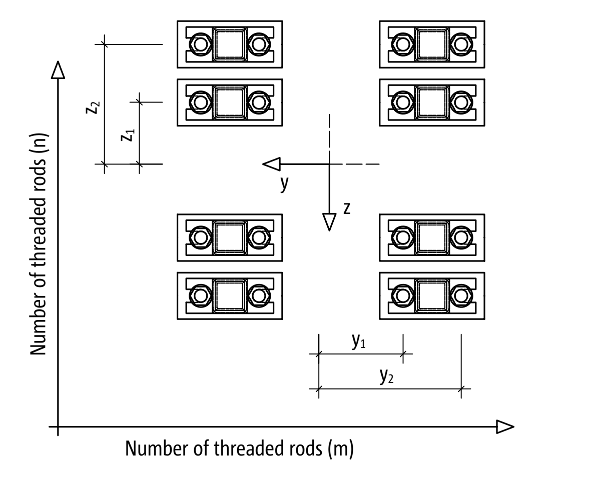
Design
- The design software is available for a rapid and efficient design (Download under www.schoeck.com/en-gb/download).
- Further information can be requested from the design department (contact see p. 3).

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]			
	±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 the z-direction
n: Number of threaded rods per connection in the y-direction

Each threaded rod is loaded with 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					
Module	$V_{z,i,Rd}$ [kN/module]					
	$\pm(46 - \lvert V_{y,i,Ed} \rvert)$			$\pm(50 - \lvert V_{y,i,Ed} \rvert)$		
	$V_{y,i,Rd}$ [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						
Module	$V_{z,i,Rd}$ [kN/module]					
	für	$0 < N_{GS,i,Ed} \leq 13{,}4$	$\pm(30 - \lvert V_{y,i,Ed} \rvert)$	für	$0 < N_{GS,i,Ed} \leq 58{,}7$	$\pm(36 - \lvert V_{y,i,Ed} \rvert)$
	für	$13{,}4 < N_{GS,i,Ed} \leq 58{,}4$	$\pm 2/3\,(58{,}4 - N_{GS,i,Ed}) - \lvert V_{y,i,Ed} \rvert$	für	$58{,}7 < N_{GS,i,Ed} \leq 112{,}7$	$\pm 2/3\,(112{,}7 - N_{GS,i,Ed}) - \lvert V_{y,i,Ed} \rvert$
	$V_{y,i,Rd}$ [kN/module]					
	für	$0 < N_{GS,i,Ed} \leq 13{,}4$	$\pm\min\{23; 30 - \lvert V_{z,i,Ed} \rvert\}$	für	$0 < N_{GS,i,Ed} \leq 58{,}7$	$\pm\min\{25; 36 - \lvert V_{z,i,Ed} \rvert\}$
	für	$13{,}4 < N_{GS,i,Ed} \leq 58{,}4$	$\pm\min\{23; 2/3\,(58{,}4 - N_{GS,i,Ed}) - \lvert V_{z,i,Ed} \rvert\}$	für	$58{,}7 < N_{GS,i,Ed} \leq 112{,}7$	$\pm\min\{25; 2/3\,(112{,}7 - N_{GS,i,Ed}) - \lvert V_{z,i,Ed} \rvert\}$

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 allowable shear force 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 threaded rods are tension loaded.
(In the area, compression/tension and in the tension area 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 the z-direction of the individual Schöck Isokorb® T type S-V module independent on $+N_{GS,i,Ed}$ in the respective module i.
$V_{y,i,Rd}$: Allowable shear force in the y-direction of the individual Schöck Isokorb® T type S-V module , depending on $+N_{GS,i,Ed}$ in the respective module i.

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

The vertical shear force $V_{z,Ed}$ and the horizontal shear force $V_{y,Ed}$ are in the ratio $V_{z,Ed} / V_{y,Ed}$ = constant distributed on the individual Schöck Isokorb® T type S-V.
Condition: $V_{z,Ed} / V_{y,Ed} = V_{z,i,Rd} / V_{y,i,Rd} = V_{z,Rd} / V_{y,Rd}$
If this condition is not met, $V_{z,i,Rd}$ or $V_{y,i,Rd}$ is reduced, so that the ratio is maintained.
Verification: $V_{z,Ed} \leq \sum V_{z,i,Rd}$
$V_{y,Ed} \leq \sum V_{y,i,Rd}$

i Design
- The design software is available for a rapid and efficient design (Download under www.schoeck.com/en-gb/download).
- Further information can be requested from the design department (contact see p. 3).

Deflection

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

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

Schöck Isokorb® T type		S-N		S-V	
Reciprocal spring constant		Thread diameter			
		D16	D22	D16	D22
per	Zone	k [cm/kN]			
Module	Tension	$2{,}27 \cdot 10^{-4}$	$1{,}37 \cdot 10^{-4}$	$1{,}69 \cdot 10^{-4}$	$1{,}15 \cdot 10^{-4}$
	Compression	$1{,}33 \cdot 10^{-4}$	$0{,}69 \cdot 10^{-4}$	$0{,}40 \cdot 10^{-4}$	$0{,}29 \cdot 10^{-4}$

Deflection of Schöck Isokorb®: 1 × T type S-N + 1 × T type S-V and 2 × T type S-V due to moment force $M_{y,Ed}$

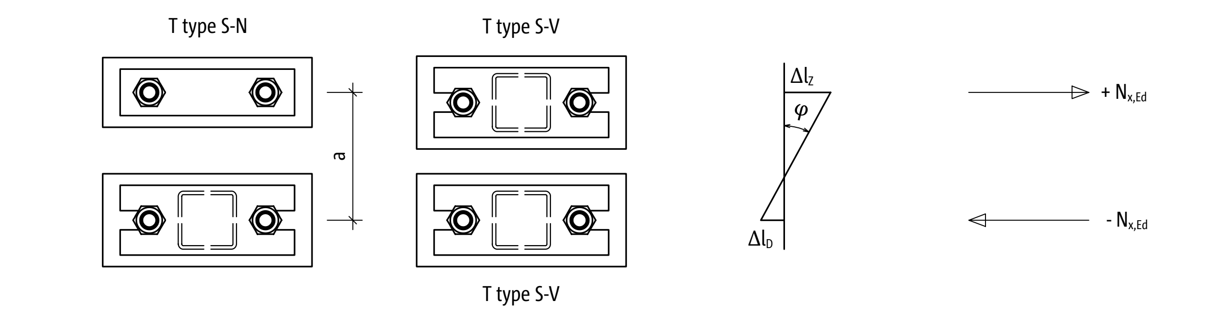


Fig. 95: Schöck Isokorb® T type S-N + T type S-V and 2 × T type S-V: Deflection angle $\varphi \approx \tan \varphi = (\Delta l_z + \Delta l_D) / a$

A moment $M_{y,Ed}$ causes rotation of the Schöck Isokorb®. The deflection angle of the Schöck Isokorb® T type S or a Schöck Isokorb® connection with 2 × T Type S-V modules can be given approximately as follows:

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

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

Conditions

- End plate is infinitely stiff
- Load due to moment M_y
- Deflection from shear force can be ignored
- In addition, deflections can result in the adjoining 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

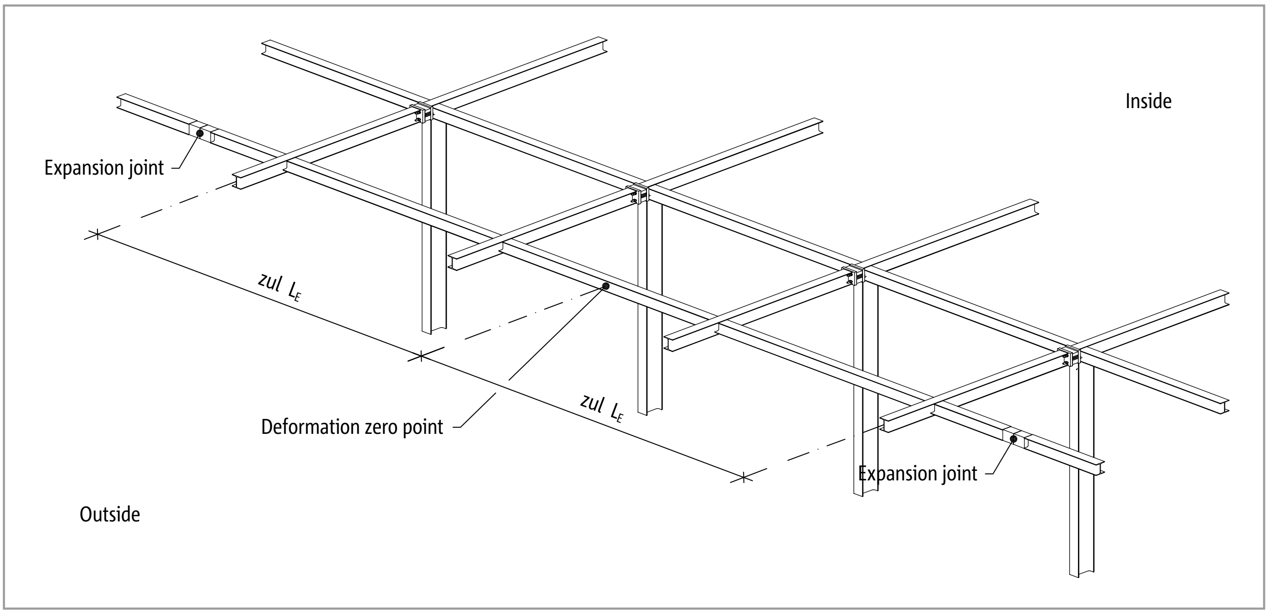


Fig. 96: Schöck Isokorb® T type S: Load influence length of the outer construction, which is loaded by temperature expansion

Changing temperatures lead to changes of length in the steel sections and thus to constraints, which can be taken up to a limited extent only by the Schöck Isokorb® T type S modules. Loading of the Schöck Isokorb® through temperature deformation of the outer steel construction should therefore generally be avoided, e.g. through slotted holes in the secondary beams.

If, nevertheless, temperature deformations are assigned directly to the Schöck Isokorb®, then the following allowable load influencing lengths can be realised.
The load influencing length is the length from the zero point of the deformation to the last Schöck Isokorb® before an arranged expansion joint.
The neutral point of the deformation lies either in the symmetry axis or is to be determined through a simulation taking into account the stiffness of the construction.

If expansion joints are arranged in the transverse beams, these must permit temperature-induced displacements of the transverse beam ends securely and safely without hindrance.

Schöck Isokorb® T type	S-N, S-V
Permissible deformation length with	Allowable L_E [m]
Nominal hole tolerance [mm]	
2	5,24

Product description

Schöck Isokorb® T type S-N

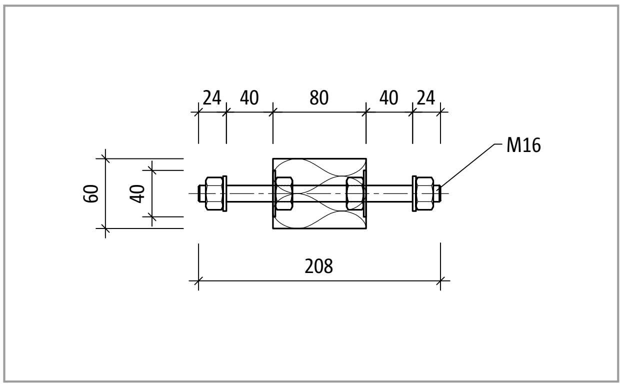


Fig. 97: Schöck Isokorb® T type S-N-D16: Cross section of the product

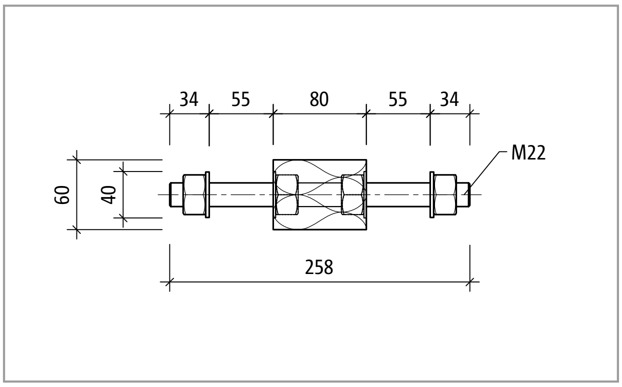


Fig. 98: Schöck Isokorb® T type S-N-D22: Cross section of the product

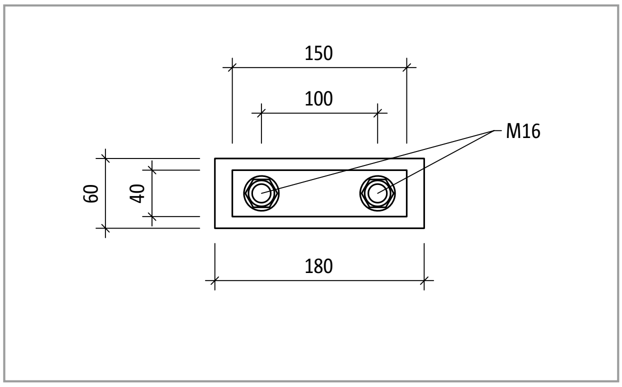


Fig. 99: Schöck Isokorb® T type S-N-D16: Elevation of the product

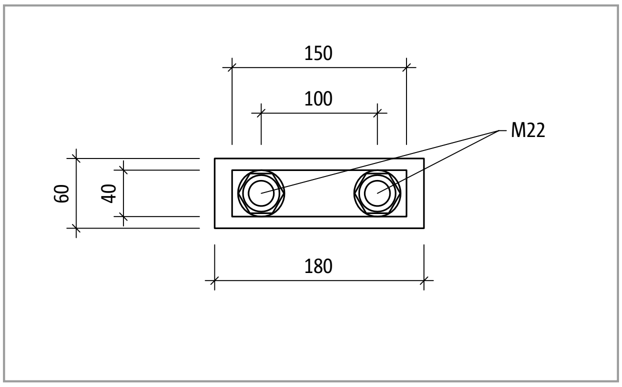


Fig. 100: Schöck Isokorb® T type S-N-D22: Elevation of the product

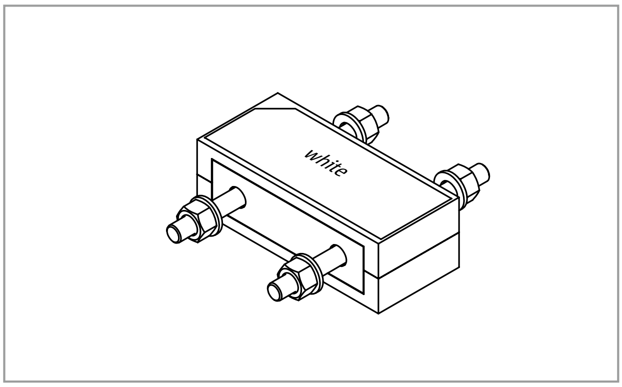


Fig. 101: Schöck Isokorb® T type S-N-D16: Isometric view; colour code T type S-N: White

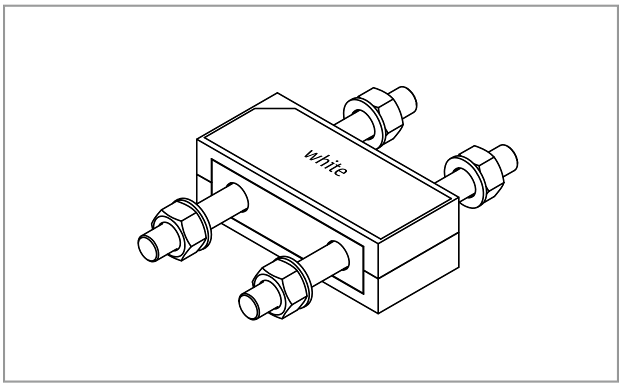


Fig. 102: Schöck Isokorb® T type S-N-D22: Isometric view; colour code T type S-N: White

Product information

- The insulating element, as required, can be cut up to the steel plates.
- The free clamp 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

Product description

Schöck Isokorb® T type S-V

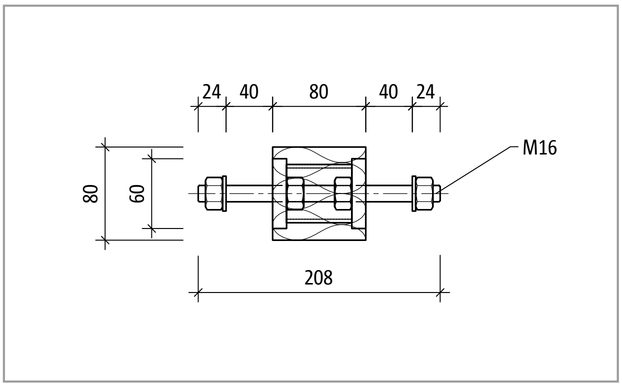


Fig. 103: Schöck Isokorb® T type S-N-D16: Cross section of the product

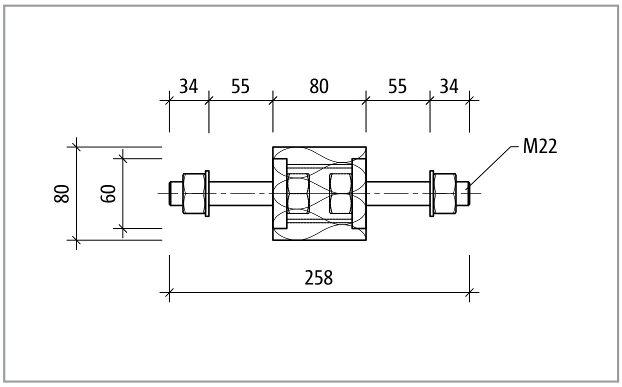


Fig. 104: Schöck Isokorb® T type S-V-D22: Cross section of the product

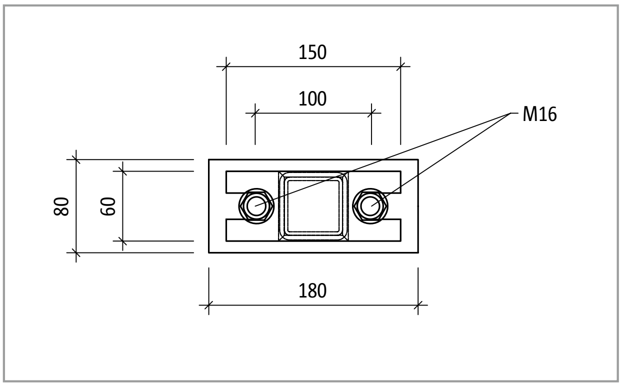


Fig. 105: Schöck Isokorb® T type S-V-D16: Elevation of the product

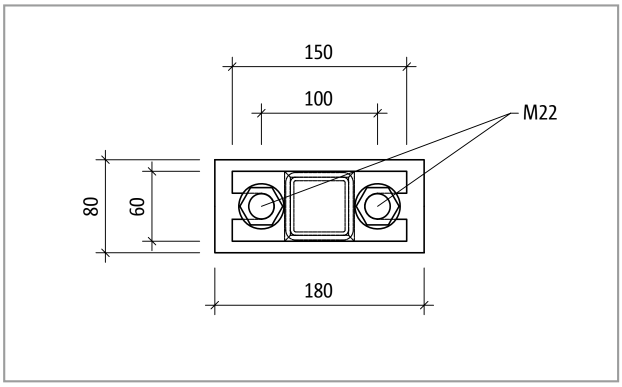


Fig. 106: Schöck Isokorb® T type S-V-D22: Elevation of the product

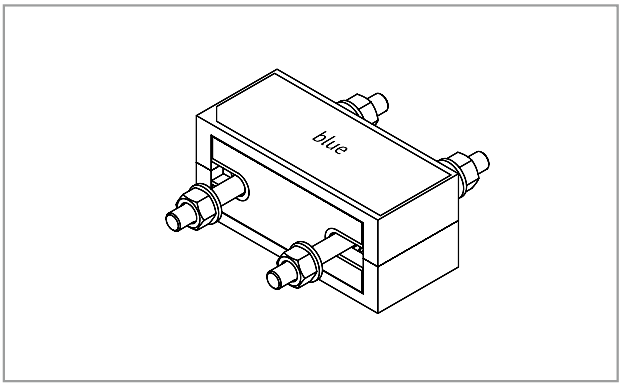


Fig. 107: Schöck Isokorb® T type S-V-D16: Isometric view; colour code T type S-V: Blue

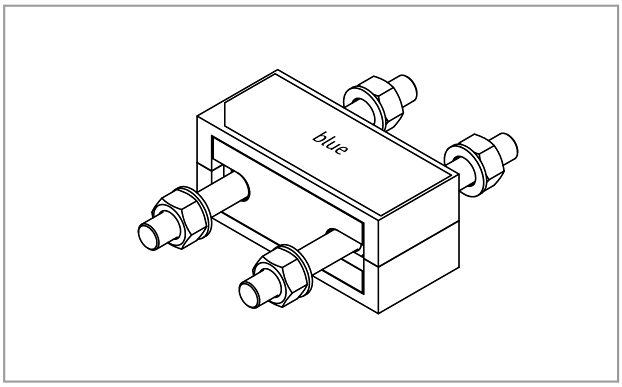


Fig. 108: Schöck Isokorb® T type S-V-D22: Isometric view; colour code T type S-V: Blue

Product information

- The insulating element, as required, can be cut up to the steel plates.
- The free clamp 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

T
type S

Steel – steel

Product description | On-site fire resistance

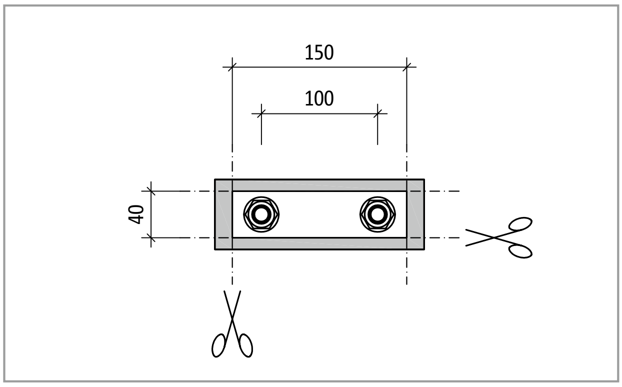


Fig. 109: Schöck Isokorb® T type S-N: Dimensions according to cutting of insulating element

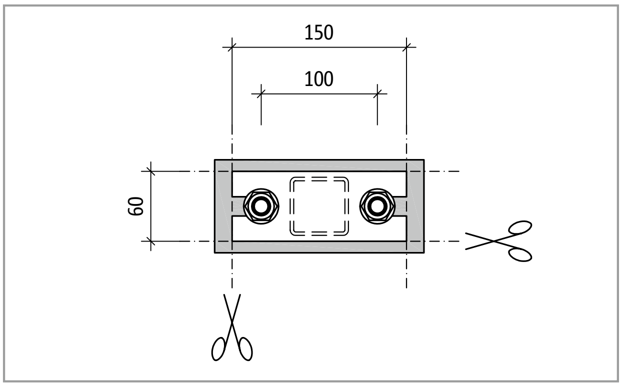


Fig. 110: Schöck Isokorb® T type S-V: Dimensions according to cutting of insulating element

Product information

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

Fire protection

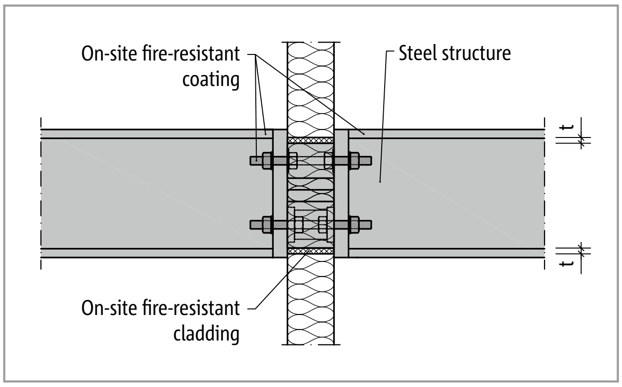


Fig. 111: Fire protection Schöck Isokorb® T type S: On-site fire protection cladding T type S, fire protection coated steel structure; section

Fire protection

- The Schöck Isokorb® is availabe only as variant without fire protection (-R0).
- 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.

End 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

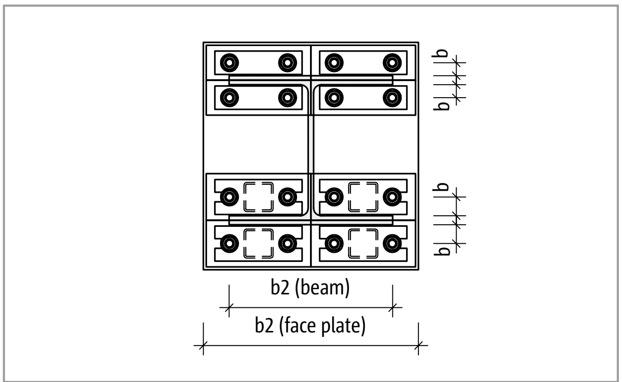


Fig. 112: End plate T type S: Geometric input values table; elevation

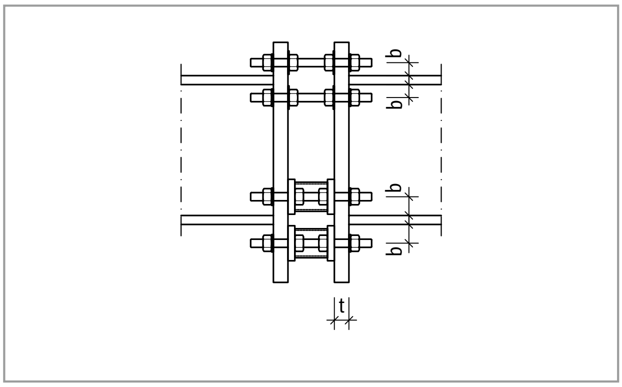


Fig. 113: End plate T type S: Geometric input values table; section

Schöck Isokorb® T type	S-N-D16, S-V-D16	S-N-D22, S-V-D22
Minimum thickness end plate with	$b \leq 35$ mm $b_2 \geq 150$ mm	$b \leq 50$ mm $b_2 \geq 200$ mm
$+N_{x,GS,Ed}/+N_{x,GS,Rd} \leq$	t_{min} [mm]	
0,45	15	25
0.50	20	25
0.80	20	30
1,00	25	35

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

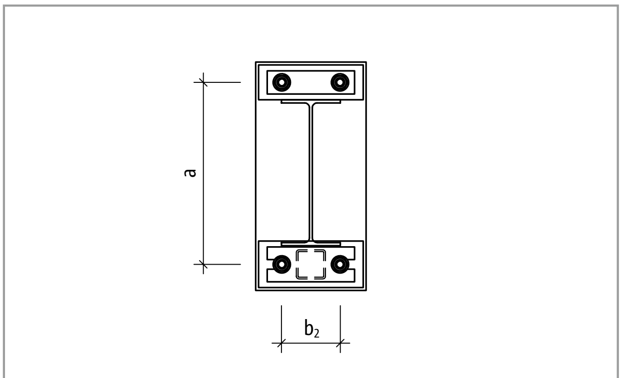


Fig. 114: Protruding end plate T type S: geometric input values from calculation; elevationt

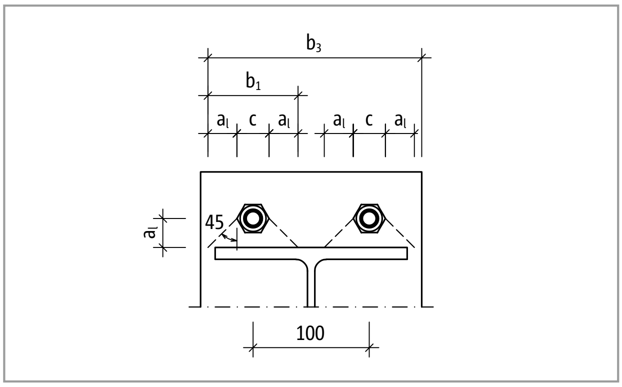


Fig. 115: Protruding end plate T type S: geometric input values from calculation; elevation

End Plate

Verification of the maximum moment in the end plate

Acting normal force
per threaded rod: $N_{GS,\,i,\,Ed}$ (See e.g. p. 79), or $N_{GS,Ed}(M_{y,Ed}) = 1/2 \cdot M_{y,Ed} / a$
Acting moment end plate: $M_{Ed,\,STP} = N_{GS,Ed} \cdot a_l$ [kNmm]

Resistance moment end plate: $W = t^2 \cdot b_{ef} / 6$ [mm^3]

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] $\leq M_{Rd,\,STP} = W \cdot f_{y,k} / 1.1$ [kNmm]

Flush on site end plate

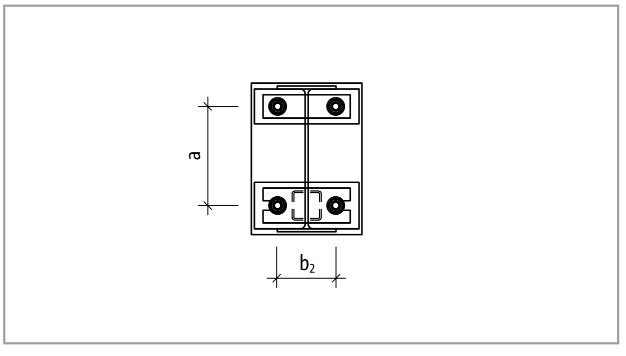


Fig. 116: Flush end plate T type S: Geometric input values calculation; elevation

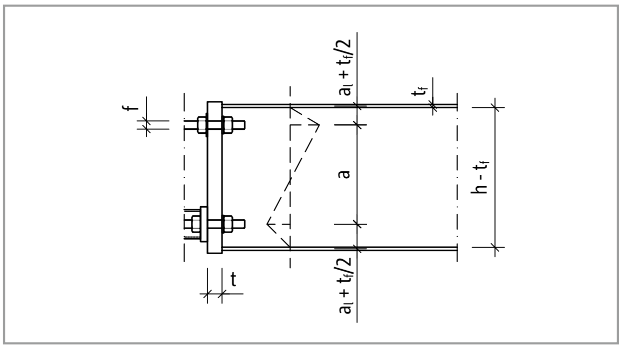


Fig. 117: Flush end plate T type S: Geometric input values calculation; section

Verification of the maximum moment in the end plate

Acting normal force per threaded rod: $N_{GS,\,i,\,Ed}$ (See e.g. p. 79), or $N_{GS,Ed}(M_{y,Ed}) = 1/2 \cdot M_{y,Ed} / a$
Acting moment in end plate: $M_{Ed,\,STP} = \pm N_{x,\,Ed} \cdot (a_l + t_f /2)$ [kNmm]

Resistance moment end plate: $W_{pl} = t^2 \cdot b_{ef} / 4$ [mm^3]

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] $\leq M_{Rd,\,STP} = W_{pl} \cdot f_{y,k} / 1.1$ [kNmm]

ℹ End 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

- To avoid installation errors it is recommended, besides the type designation of the selected modules, their colour code is also to be entered in the implementation plans:
  Schöck Isokorb® T type S-N: white
  Schöck Isokorb® T type S-V: blue
- The tightening torque of the nuts are also to be entered in the implementation plan; the following tightening torques apply:
  T type S-N-D16, T type S-V-D16 (threaded rod M16 - wrench width s = 24 mm): M_r = 50 Nm
  T type S-N-D22, T type S-V-D22 (threaded rod M22 - wrench width s = 32 mm): M_r = 80 Nm
- After tightening the nuts are to be peened over.
- The 4 Teflon sheets installed for each type S-V in use add approximately 4 mm. In particular with low balcony loading and with small centre-to-centre distance between type S-N and type S-V, these additional 4 mm in the compression zone have an impact relevant to the camber of the steel beams connected with Schöck Isokorb®. Should shims be necessary for on-site levelling in the tension zone, this would be taken into account with the construction planning.

Renovation/retrofitting

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

Free cantilevered and reinforced concrete constructions

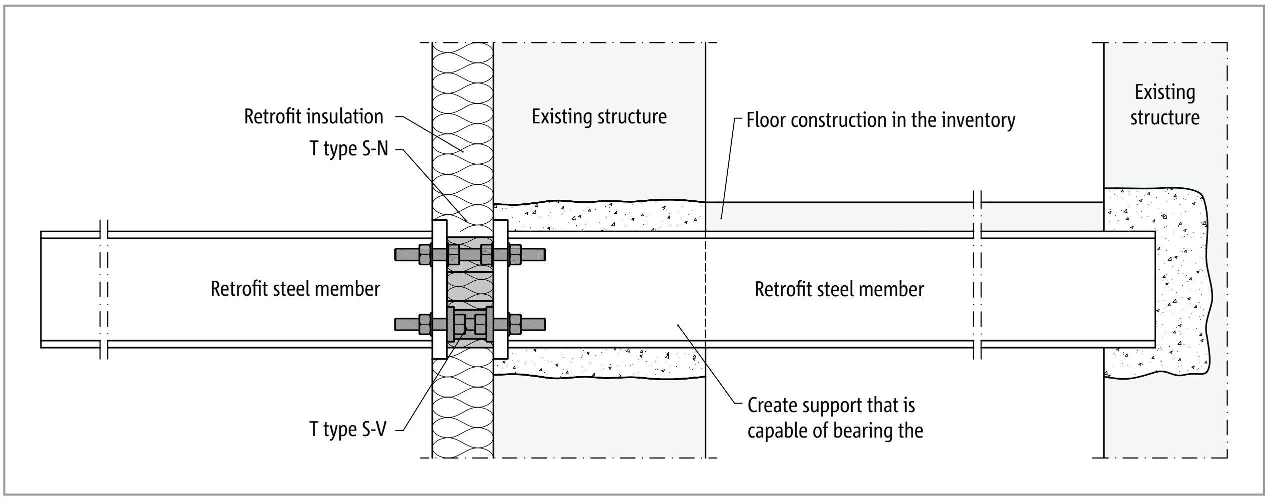


Fig. 118: Schöck Isokorb® T type S-N and T type S-V: Retrofitted cantilevered steel balcony, connected to retrofitted steel beam

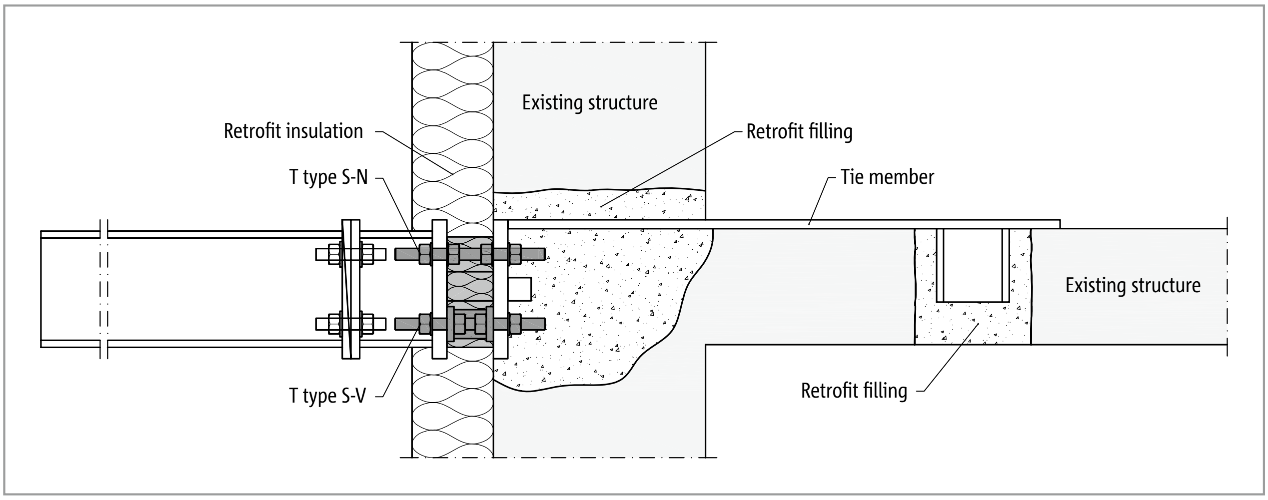


Fig. 119: Schöck Isokorb® T type S-N and T type S-V: Retrofitted cantilevered steel balcony with adapter, with support bracket connected to existing reinforced concrete slab

Renovation/retrofitting

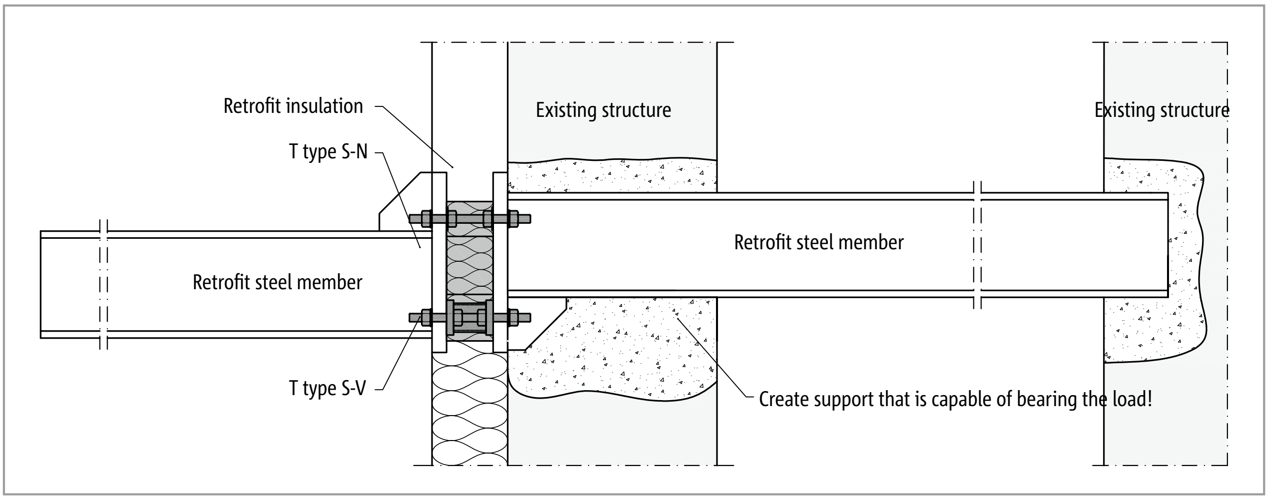


Fig. 120: Schöck Isokorb® T type S-N and T type S-V: Retrofitted cantilevered steel balcony connected with height offset retrofitted steel beam

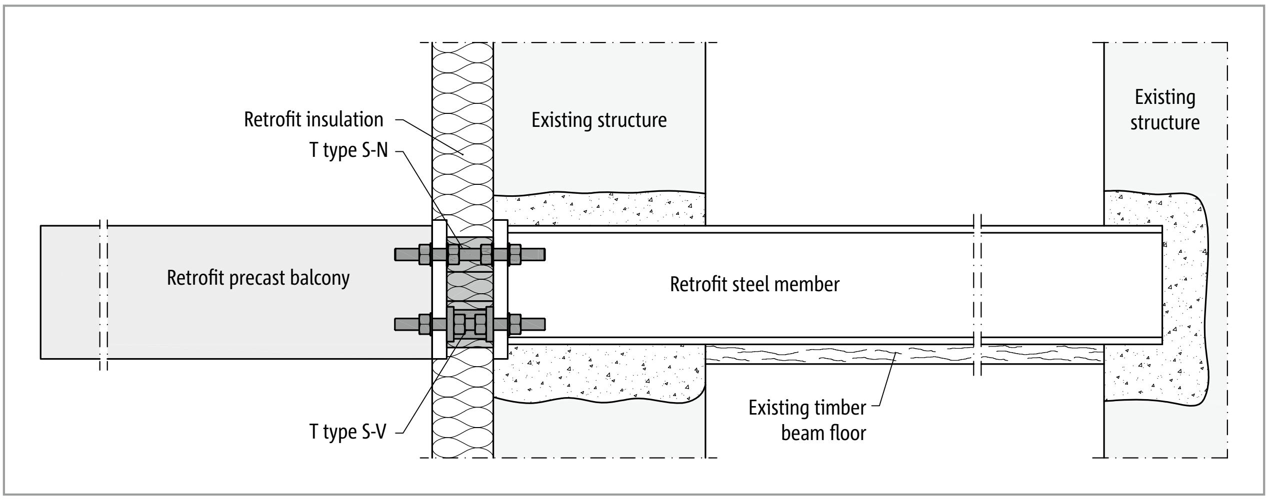


Fig. 121: Schöck Isokorb® T type S-N and T type S-V: Retrofitted cantilevered precast balcony connected to retrofitted steel beam

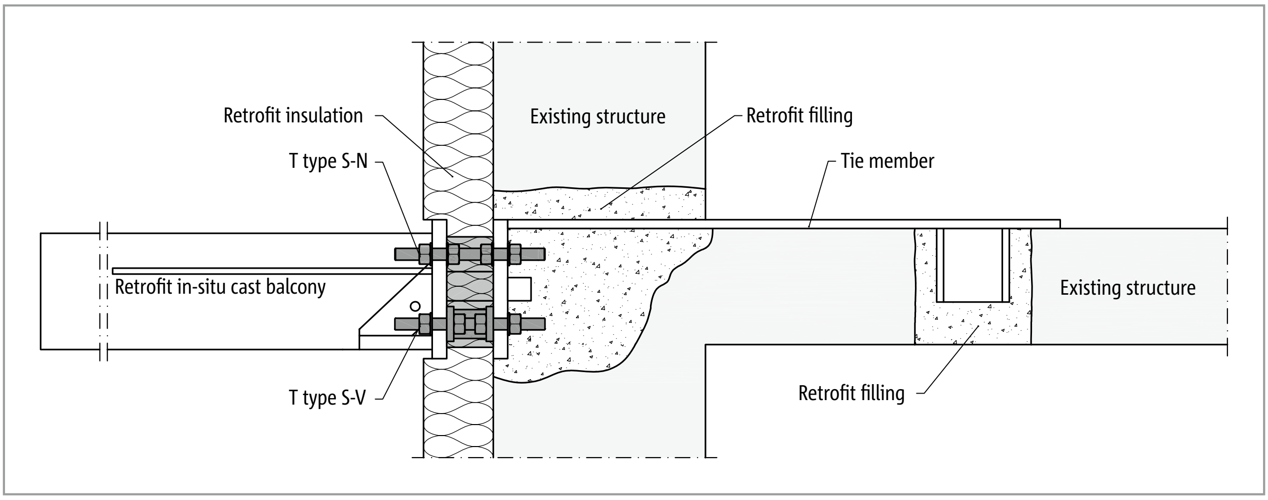


Fig. 122: Schöck Isokorb® T type S-N and T type S-V: Retrofitted cantilevered in situ concrete balcony, with support connected to existing reinforced concrete slab

T
type S

Steel – steel

Renovation/retrofitting | Atmosphere containing chloride

Supported steel and reinforced concrete constructions

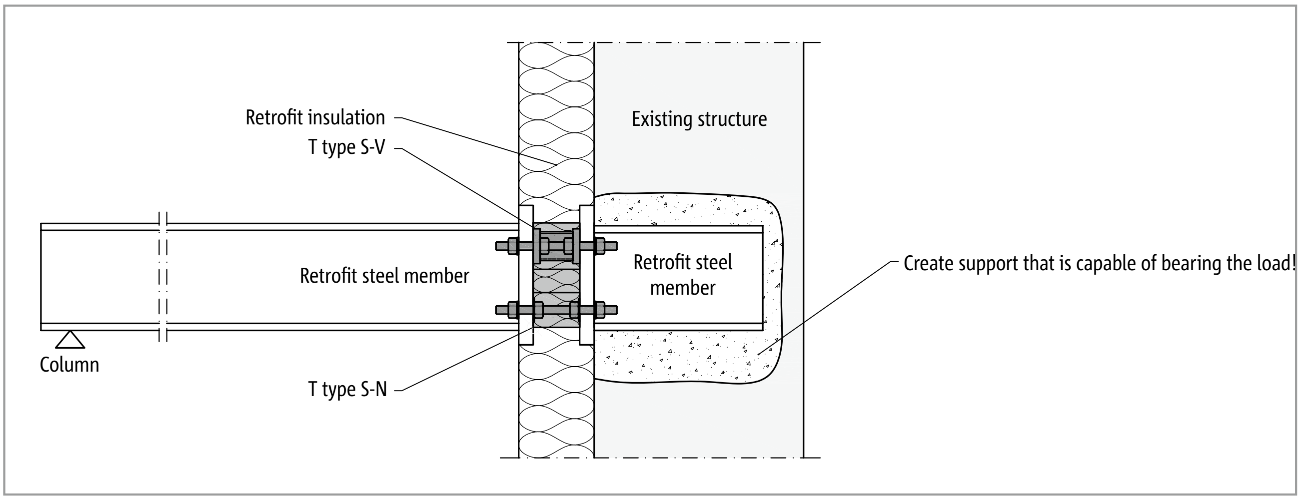


Fig. 123: Schöck Isokorb® T type S-N and T type S-V: Retrofitted supported steel balcony connected to retrofitted wall support

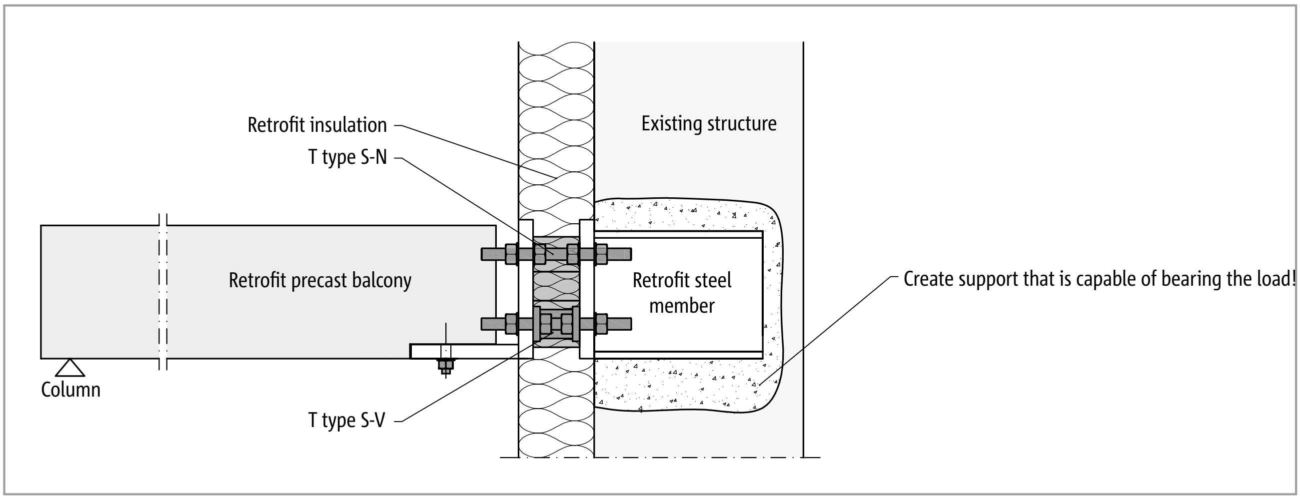


Fig. 124: Schöck Isokorb® T type S-N and T type S-V: Retrofitted supported precast balcony connected to retrofitted wall support

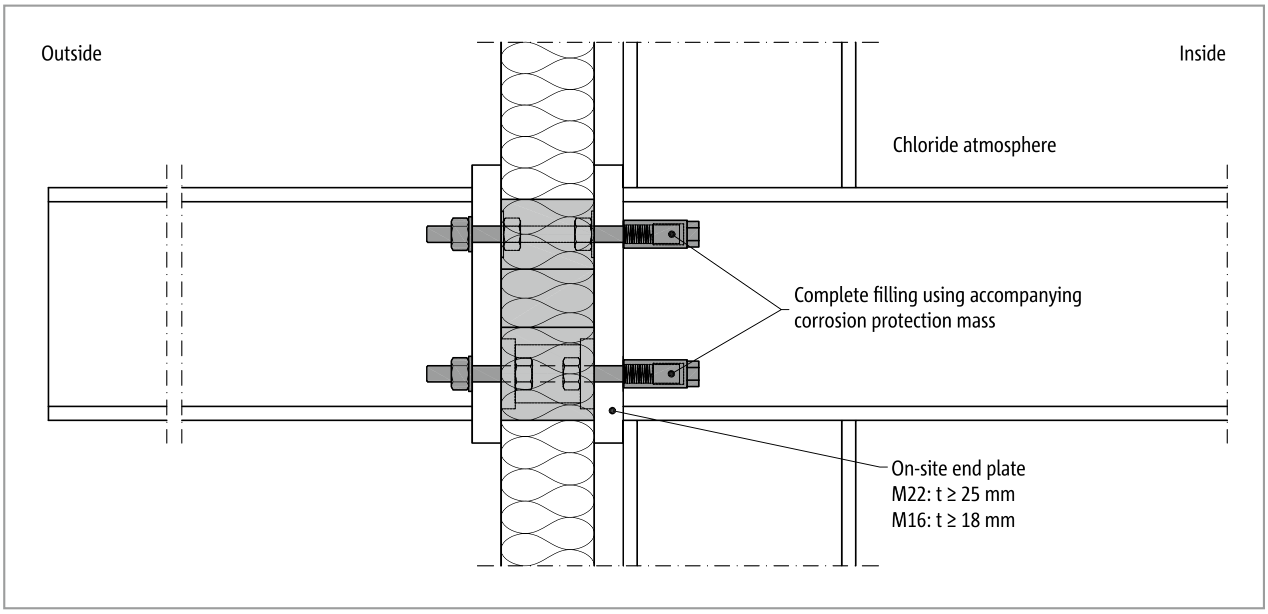


Fig. 125: Schöck Isokorb® T type S with cap nuts: Cantilevered steel structure; internal atmosphere containing chloride

Atmosphere containing chloride | Installation instructions

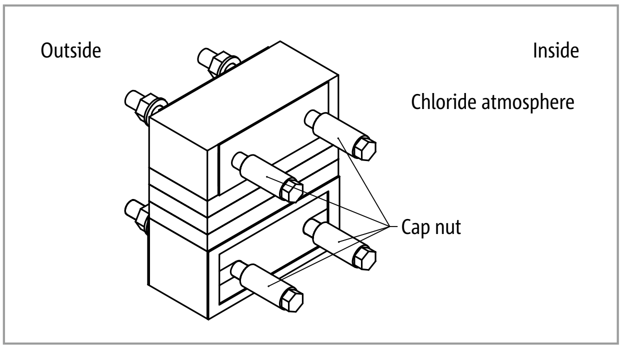


Fig. 126: Schöck Isokorb® T type S with cap nuts: Isometric; internal atmosphere containing chloride

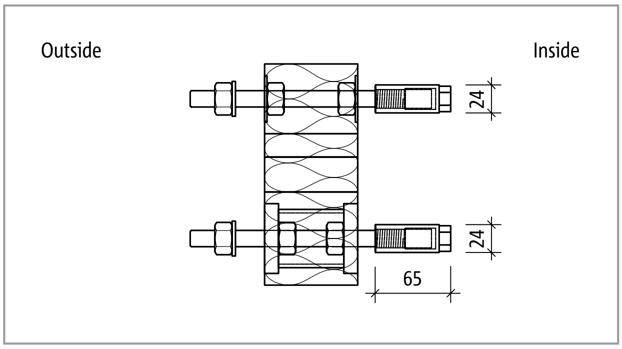


Fig. 127: Schöck Isokorb® type S with cap nuts: Product section

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

Atmosphere containing chloride

- The protective caps must be completely filled with anti-corrosion sealant.
- Tighten protective caps hand tight without planned preloading, this corresponds with the following tightening torques
  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.

Installation instructions

The current installation instruction can be found online under:
www.schoeck.com/view/2741

☑ Check list

- ☐ Is the Schöck Isokorb® element to be used under primarily static loads?
- ☐ Have the member forces on the Isokorb connection been determined at the design level?
- ☐ Has the additional deformation due to the Schöck Isokorb® been taken into account?
- ☐ Are temperature deformations assigned directly to the Schöck Isokorb® and with this 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?
- ☐ Are the Schöck Isokorb® T type S-N and T type S-V planned with protective caps in environments containing chloride (e.g. outside air near the sea, indoor swimming pools)?
- ☐ Are the names of the Schöck Isokorb® T type S-N and T type S-V entered in the implementation plan and in the working drawing?
- ☐ Is the colour code of the Schöck Isokorb® modules entered in the implementation plan and the construction drawing?
- ☐ Are the tightening torques for the screwed connections noted in the construction drawings?