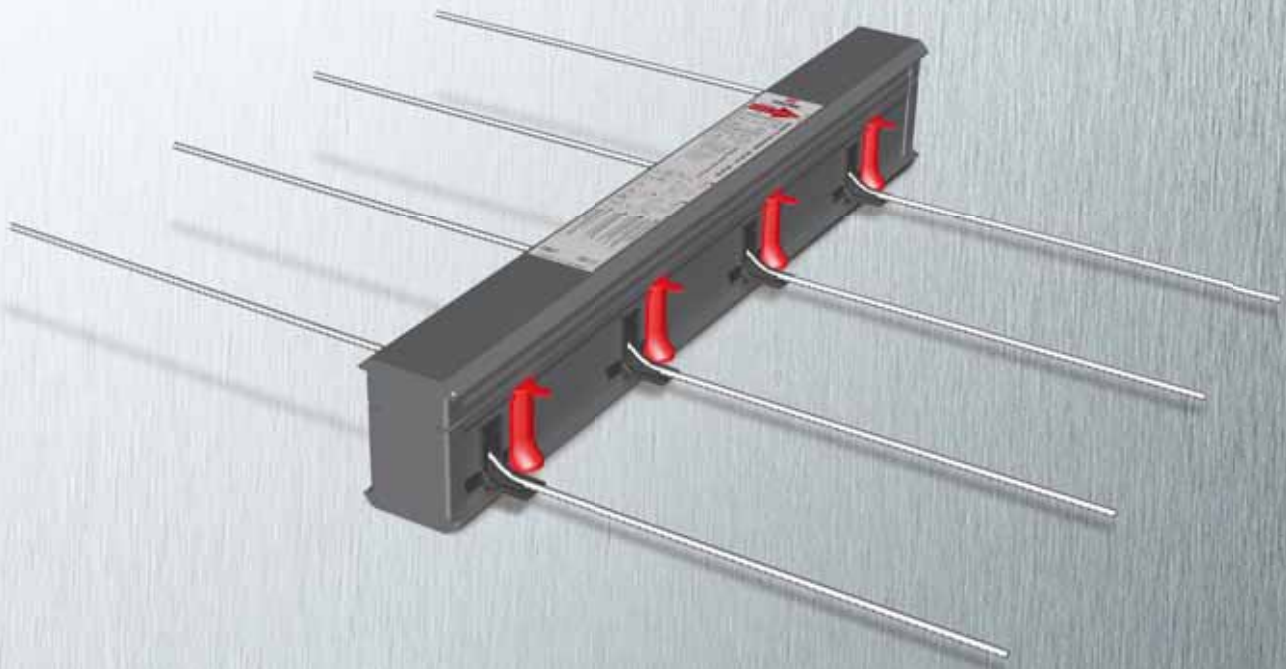


HALFEN HIT INSULATED CONNECTION

TECHNICAL PRODUCT INFORMATION



HALFEN HIT INSULATED CONNECTION

HIT 14-E

CONCRETE

NEW!

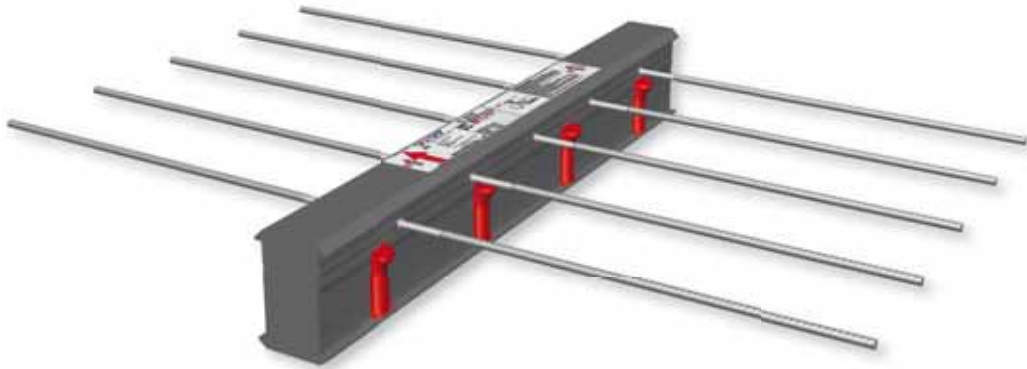
- with European Technical Approval ETA-13/0546
- with Ψ -values acc. to European Approvals
- with $\Delta L_{n,W}$ -values acc. to European Approvals
- incl. technical information according to EC2
- introducing the new solution for simply supported balcony slabs on columns
- introducing the new solution for wall connection and height offset



HALFEN
YOUR BEST CONNECTIONS

Innovation is our standard.

The new HIT by HALFEN.



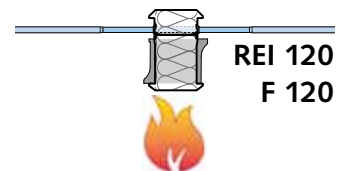
European Technical Approval ETA-13/0546.



Low heat-loss with 80 mm joint width, also available for large loads, certified by the Passive House Institute!



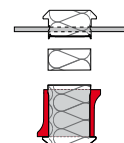
120 min fire protection on all sides, non-combustible insulation material – as standard without any extra cost.



EnEV compliant with building authority approved Ψ -values.



Flexible multi-part modular system – with quick and efficient delivery.



Mobile app available to calculate Ψ -values.



HALFEN HIT INSULATED CONNECTION

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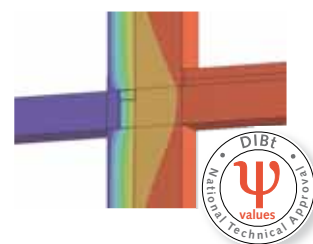
HIT-HP MV
HIT-SP MV



HIT-HP ZV
HIT-SP ZV

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	- Building authority approved thermal values: HIT-HP/SP MV	93
	- Building authority approved thermal values: HIT-HP/SP ZV	98
	- Passive House Institute certification: HIT-HP/SP MV, HIT-HP/SP ZV	100
	- Sound protection according to DIN 4109	101
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General

HALFEN HIT Insulated connection - always a good decision

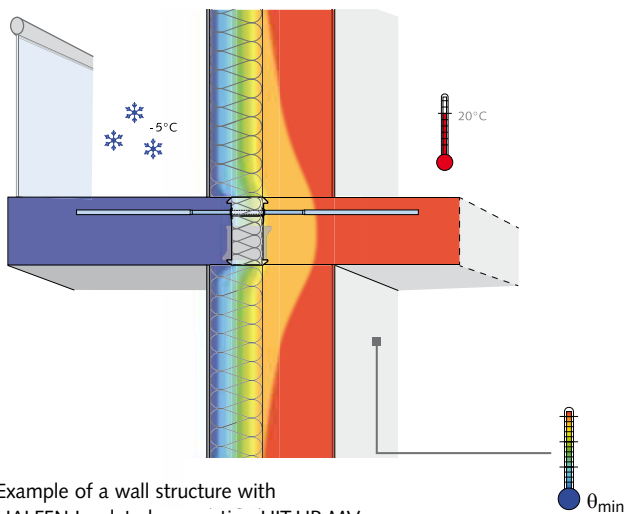
HALFEN has invested research and time to improve the successful first generation HIT.

The following is a summary of the most important benefits available to you with the HIT-HP MV and HIT-SP MV.

HP represents **High Performance** with an insulation thickness 80 mm and **SP** means **Superior Performance** with an insulation thickness of 120 mm. Convince yourself of the benefits with your next project.

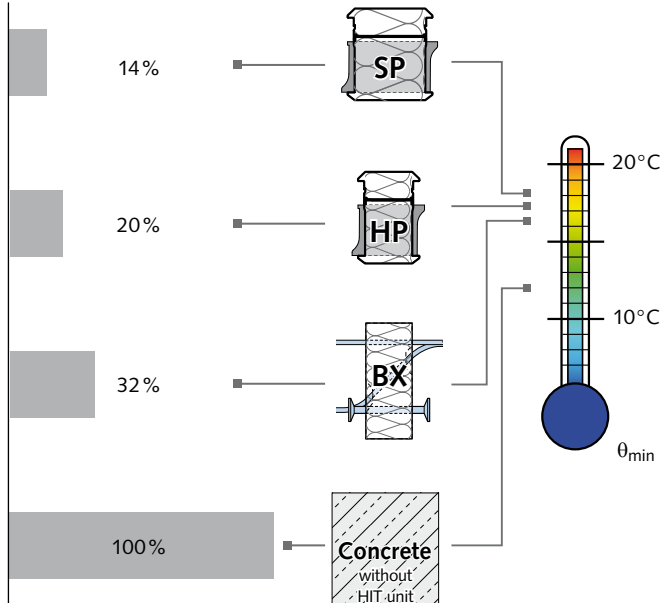
Thermal Insulation

Effective thermal separation of the balcony slab



Example of a wall structure with HALFEN Insulated connection HIT-HP MV

Compliant with requirements with HALFEN HIT Insulated connections



Δ Thermal transmission coefficient ψ

Temperature θ_{min} ; Example of a façade with ETICS (external thermal insulation composite system)

Details of the thermal conductivity → page 89 ff.

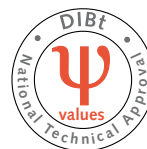
Certified by the Passive House Institute

- for HIT-HP: insulating joint from 80 mm
- also for max. load capacities with HIT-SP



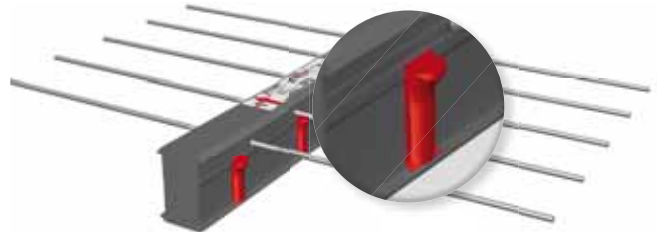
Thermal bridge reduced Construction

In accordance with EnEV with building authority approved ψ values

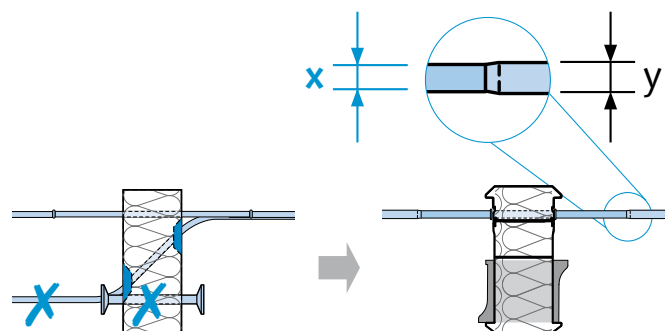


Improved thermal insulating properties with:

- innovative compression shear bearings CSB made of ultra-high strength fibre-reinforced mortar with increased thermal insulating properties and an optimized cross-section



- reduced tension bar cross-section in the insulating joint
- substantial reduction of penetration points and continuous insulating material thickness through use of mineral wool as thermally insulating fire protection material

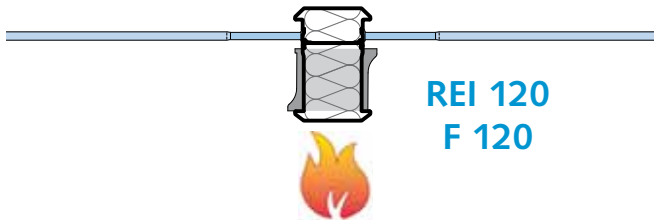


General

Further advantages at a glance

Fire protection

- REI 120 (F120) as standard for all HIT-HP MV and HIT-SP MV elements
- non-combustible insulation material of building material class A1
- no installation of lateral fire boards due to fire protection material on all sides
- no confusion of elements with and without fire protection requirement
- no additional installation time or work for REI 120 (F120)



Details of the fire protection properties → [page 102](#)

RAL quality symbol

Certified by RAL German Institute for Quality Assurance and Certification, RAL Quality Mark Anchoring- and Reinforcement technology RAL-GZ 658/2



The RAL Quality Mark guarantees compliance with the technical product requirements and the related services regarding:

- Specification, quality management, logistics, competent technical advice, high-quality technical documentation and software and fulfilment of the guaranteed benefits.

Biannual monitoring provided by German Lloyd guarantees that the recommended requirements of the quality control association for anchor and reinforcement technology (Gütegemeinschaft Verankerungs- und Bewehrungstechnik e.V) are maintained.

- CE marking
- DIBt-approved and type-tested
- user friendly software with optimized offcuts



Installation and functionality



- robust plastic casing with 3D fixing of all structural members



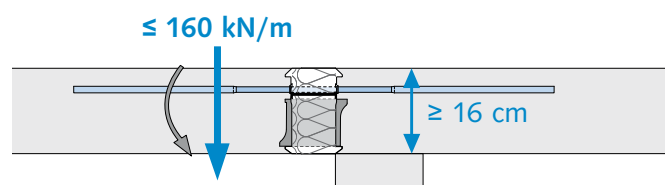
- optimal protection of the thermal insulation against mechanical loads and moisture



- simplified installation of the HIT unit even from above
- no welded assembly bars necessary

Statics

- transmissible shear forces of up to 160 kN/m with a slab thickness $h \geq 16$ cm
- HALFEN's integrated safety concept: Values given are actual design values. This means no limiting the shear capacity with additional verifications by the planner



HALFEN HIT INSULATED CONNECTION

Product Overview

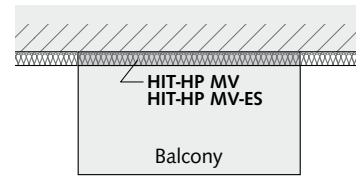
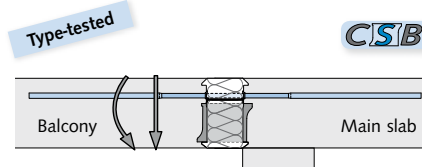
Chapter 1 – Thermally insulated connections for cantilevered balcony slabs



HIT-HP MV

- transfers bending moments and shear forces
- insulation thickness 80 mm

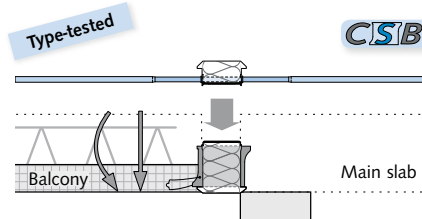
→ page 11



HIT-HP MV-...-ES

- product type for element slabs
- transfers bending moments and shear forces
- insulation thickness 80 mm

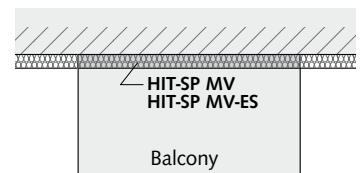
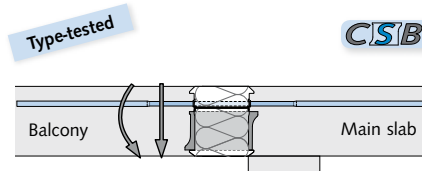
→ page 11



HIT-SP MV

- transfers bending moments and shear forces
- insulation thickness 120 mm

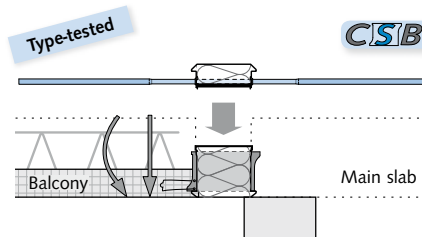
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HIT-SP MV-...-ES

- product type for element slabs
- transfers bending moments and shear forces
- insulation thickness 120 mm

→ page 11

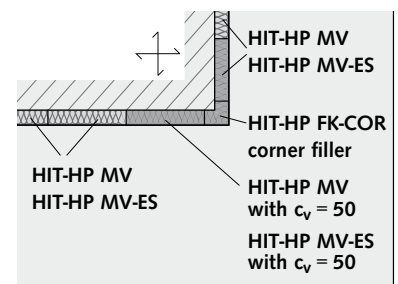
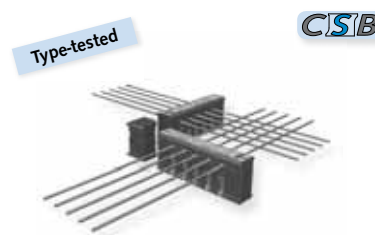


Thermally insulated connections for cantilevered corner balconies

HIT-HP MV-...-COR

- for cantilevered outside corner balconies designed with standard elements with the same load bearing capacity and a corner filler
- insulation thickness 80 mm

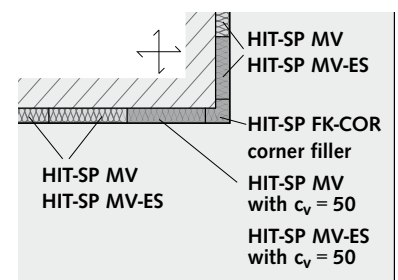
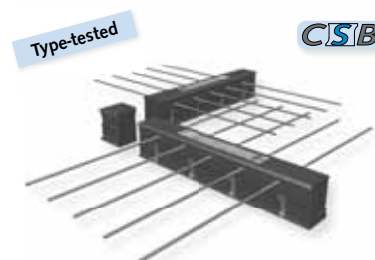
→ page 24



HIT-SP MV-...-COR

- for cantilevered outside corner balconies designed with standard elements with the same load bearing capacity and a corner filler
- insulation thickness 120 mm

→ page 24



HALFEN HIT INSULATED CONNECTION

Product Overview

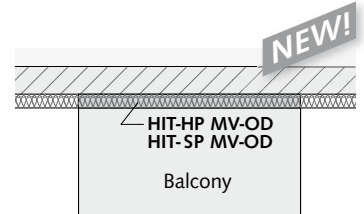
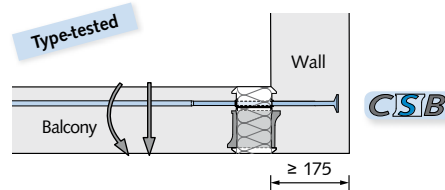
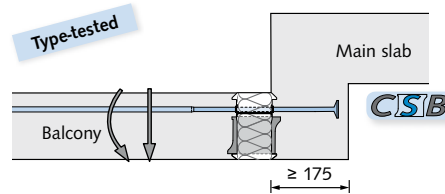
Chapter 2 Thermally insulated connections for cantilevered balcony slabs with height offset or wall connections



HIT-HP MV-OD

HIT-SP MV-OD

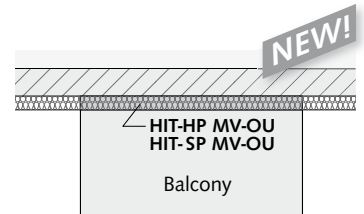
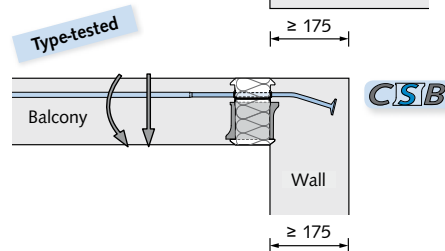
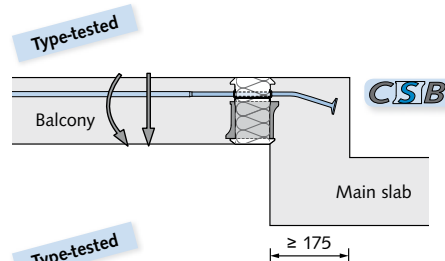
- height offset, balcony lower than main slab
 - downward wall connection
 - transfers bending moments and shear forces
 - insulation thickness 80 mm / 120 mm
- page 34



HIT-HP MV-OU

HIT-SP MV-OU

- height offset, balcony higher than main slab
 - upward wall connection
 - Transfers bending moments and shear forces
 - insulation thickness 80 mm / 120 mm
- page 34



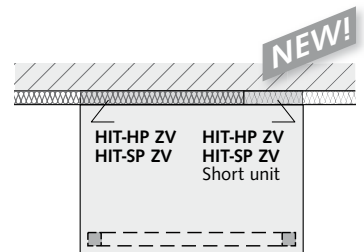
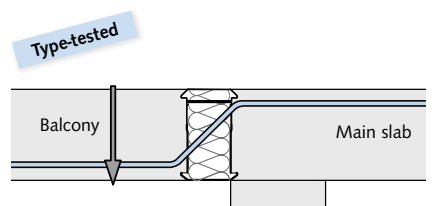
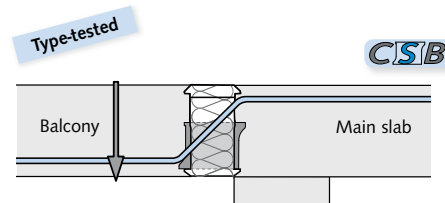
Chapter 3 Thermally insulated connections for simply-supported balcony slabs on columns



HIT-HP ZV

HIT-SP ZV

- transfer of shear forces only
 - insulation thickness 80 mm / 120 mm
- page 42



HIT-HP ZV without CSB

HIT-SP ZV without CSB

- transfer of shear forces only for unrestrained simply supported connections, e.g. for loggias
 - insulation thickness 80 mm / 120 mm
- page 42

► further types → see following pages

HALFEN HIT INSULATED CONNECTION

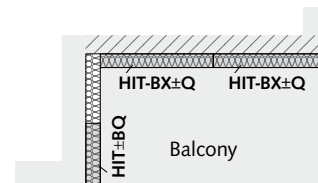
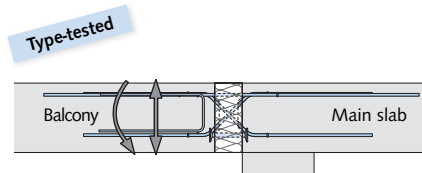
Product Overview

Chapter 4 Thermally insulated connections for cantilevered balcony slabs

HIT-BX±Q, HIT-BF±Q

- transfer of bending moments and of positive and negative shear forces

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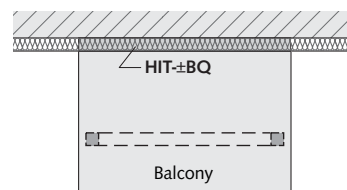
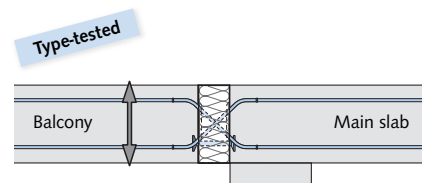


Chapter 5 Thermally insulated connections for simply-supported balcony slabs on columns

HIT±BQ

- transfer of positive and negative shear forces

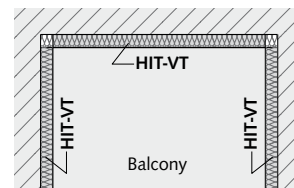
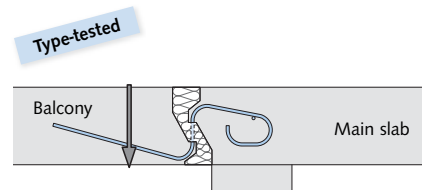
→ page 65



HIT-VT

- unrestrained connection of balcony slabs subjected only to shear loads

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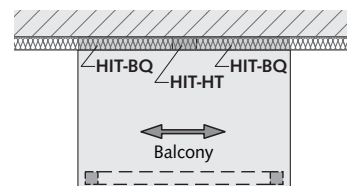
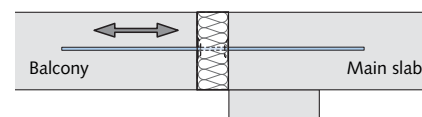


Chapter 6 Thermally insulated connections / connecting elements to absorb horizontal forces

HIT-HT

- absorbs horizontal forces parallel and/or perpendicular to the insulation line

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HIT-S-Anker

- for planned assumed horizontal loads

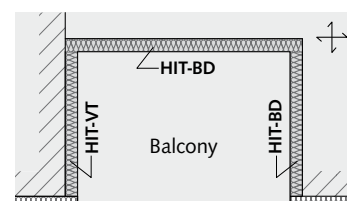
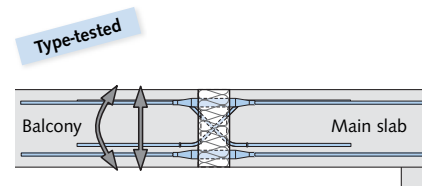
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Chapter 7 Thermally insulated connections for continuous slabs

HIT-BD

- transfer of positive and negative moments and shear forces

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HALFEN HIT INSULATED CONNECTION

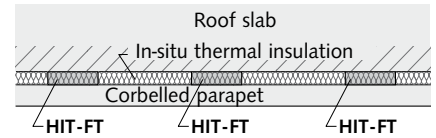
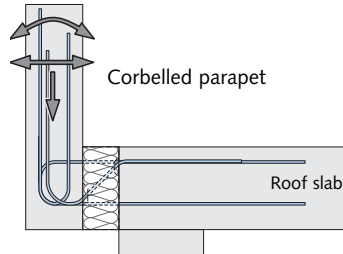
Product Overview

Chapter 8 Thermally insulated connections for parapets and corbels

HIT-FT

Forms a thermal barrier between corbelled parapet and roof slab for selective use. Unit spacing based on structural requirements.

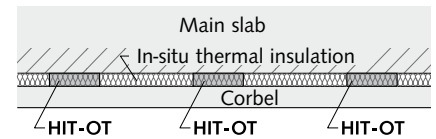
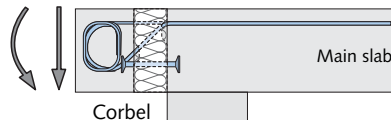
→ page 80



HIT-OT

Forms a thermal barrier between corbel and main slab for selective use. Unit spacing based on structural requirements.

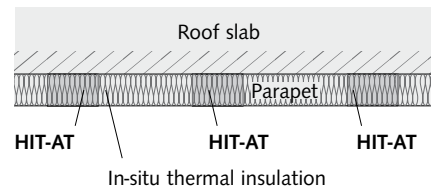
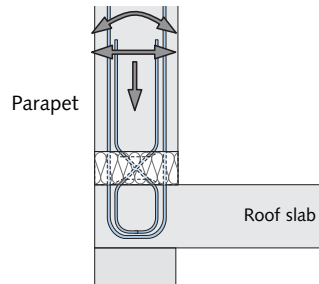
→ page 80



HIT-AT

Forms a thermal barrier between parapet and roof slab for selective use. Unit spacing based on structural requirements.

→ page 80

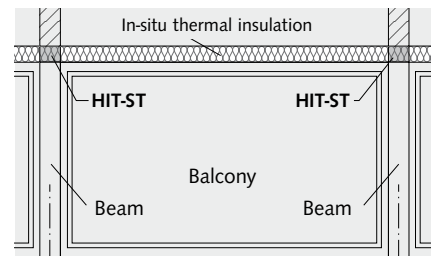
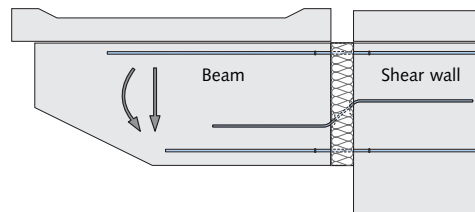


Chapter 9 Thermally insulated connections for shear walls and beams

HIT-ST

- insulates cantilevered beams
- transfers high bending moments and shear forces in selected areas

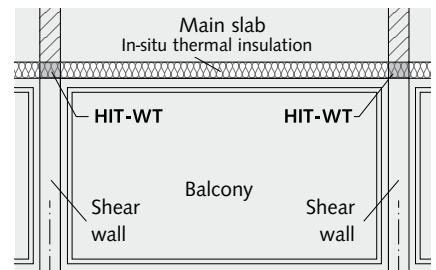
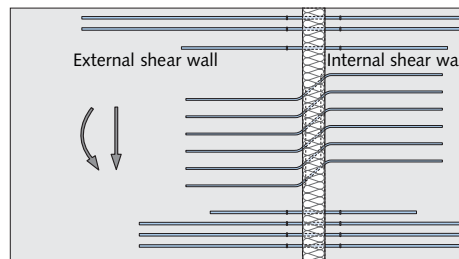
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HIT-WT

- insulates storey-high, cantilevered shear walls
- transfers bending moments and shear forces in selected areas mainly in vertical direction

→ page 84



Chapter 10 Building physics, technical information

Information on:

- thermal insulation, fire protection and noise reduction
- planning aid / HALFEN design software / tender specifications

→ page 89

Material Specification and Test Certificates

Material specification

HALFEN HIT Insulated connection

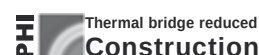
• Tension bars	Flash butt welded bar connection, consisting of a combination of two reinforcing steel bars B500B according to DIN 488 and a stainless bar steel of strength class S 690
• Compression shear bearings	High-performance mortar with increased compressive and tensile strength as well as optimized thermal conductivity
• Casings	Rigid PVC according to DIN EN ISO 1163
• Insulating material	Thermally insulating fire protection material – mineral wool (WLG 035) of Building Material Class A1, non-flammable insulation according to DIN 4102-14 or Euro Class A1 according to DIN EN 13501-1

Connecting components

• Concrete	Suited for concrete strengths $\geq$ C20/25
• On-site reinforcement	Reinforcing steel B500B

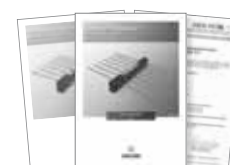
Test certificates

• Technical Approvals	EOTA: ETA-13/0546, - HALFEN HIT Insulated connection HIT-HP / HIT-SP with Compression Shear Bearings - including fire protection - including thermal values - including noise reduction - DoP No. H10-13/0546 DIBt Berlin: Approval No. Z-15.7-293
• Type statics	Type-tested by the Landesgewerbeanstalt Bayern, Test-No. S-WUE/100358 - Type test report no. 1 – 6
• Passive House Institute Certificate	Certification valid for slab thickness from 180 mm to 240 mm
• RAL Quality Mark	RAL German Institute for Quality Assurance and Certification, RAL Quality Mark Anchoring- and Reinforcement technology RAL-GZ 658/2



Approvals and type tests on the internet

The approvals and type tests can be found at www.halfen.com/downloads/brochures.
Or simply scan the code and then select the document.



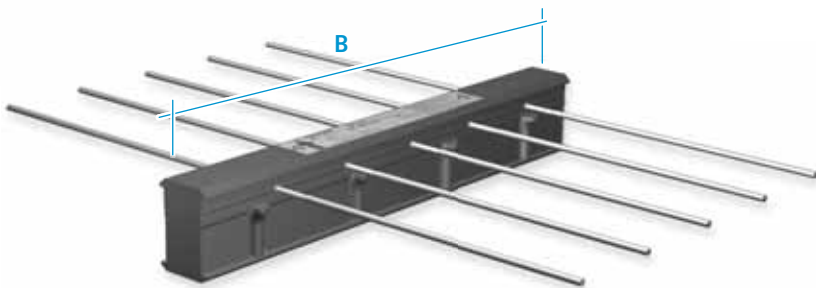
Introduction HIT-HP MV, HIT-SP MV

HIT-HP MV / HIT-SP MV:

- Balcony connection for cantilevered balcony slabs
- Transfers bending moments and shear forces

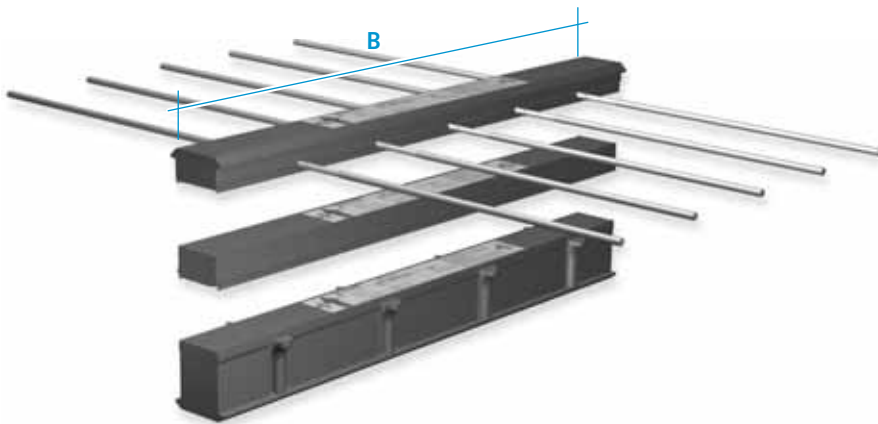
Standard design:

- HIT-HP MV** – High Performance with insulation thickness 80 mm
HIT-SP MV – Superior Performance with insulation thickness 120 mm

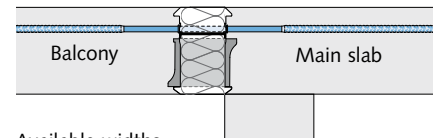


Multi-part-design:

- HIT-HP MV-ES** – High Performance for element slab
HIT-SP MV-ES – Superior Performance for element slab



HIT-HP MV / HIT-SP MV



Available widths
 $B = 1.00\text{ m} / 0.50\text{ m} / 0.25\text{ m}$

Application example HIT-HP MV / HIT-SP MV

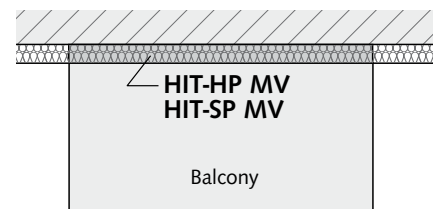
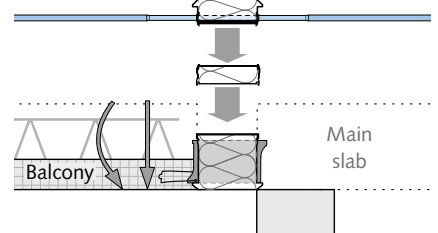


Figure: Cantilevered balcony

HIT-HP MV-...-ES / HIT-SP MV-...-ES



Available widths
 $B = 1.00\text{ m} / 0.50\text{ m} / 0.25\text{ m}$

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		Page
The basics on load bearing capacity	HIT-HP MV, HIT-SP MV	12
Product variations	HIT-HP MV, HIT-SP MV	13
Load ranges and load bearing capacity values	HIT-HP MV	17
Load ranges and load bearing capacity values	HIT-SP MV	18
Product description	HIT-HP MV, HIT-SP MV	21
Product type for element slabs	HIT-HP MV-ES, HIT-SP MV-ES	22
Elements for cantilevered corner balconies	HIT-HP MV-COR, HIT-SP MV-COR	24
Cantilever lengths, usability		26
On-site connecting reinforcement, installation diagram		27
Joint spacings and edge distances, mixed installation		31
Camber		32

Basics on Load Bearing Capacity

Load bearing behaviour of the HIT-HP MV and the HIT-SP MV

Cutting edge technology – made by HALFEN

As a world first, the HALFEN Insulated cantilever slab connections HIT-HP MV and HIT-SP MV feature the innovative and patented structural **CSB** Compression Shear Bearing system. The load bearing compression bearings and stainless steel shear bars previously used, have been replaced by the innovative technology of using compression shear bearings made of ultra-high strength fibre-reinforced mortar. The **CSB** act as a compression shear zone and transfer the compressive and shear forces in the HIT-HP MV and HIT-SP MV insulating elements.

Integrated safety concept

For the first time, the complete verification and design concept for balcony connections has been incorporated into a National Technical Approval. The ETA-13/0546 and the National Technical Approval Z-15.7-293 include verification of the moment/shear force interaction of the **CSB** as well as verification against concrete edge failure to ensure load transfer into adjacent components. This includes all respective verifications for slab connection regarding the force transmission. Consequently, time-consuming additional verifications such as the limitation of the concrete compressive strut are no longer necessary. The structural engineer is provided with maximum planning reliability.

In addition to the technical approval you will of course find the LGA Würzburg type test available for download on the HALFEN website. The type test includes the transferable bending moments M_{Rd} and shear forces V_{Rd} of normal load ranges for concrete strength classes C20/25, C25/30 and C30/37 as well as for the concrete covers for tension bars with $c_v = 30$ mm, 35 mm and 50 mm.

The load bearing capacities of selected elements are illustrated in more detail on pages 16 to 19 for HIT-HP MV and on pages 21 to 23 for HIT-SP MV. The component resistances of the elements with a width of 1.00m, 0.50m and 0.25m are each stated per running meter. This allows easy selection and planning reliability for any connector length. With different concrete strength classes on the balcony and the main slab, the lower concrete strength is decisive when selecting load range capacity level.

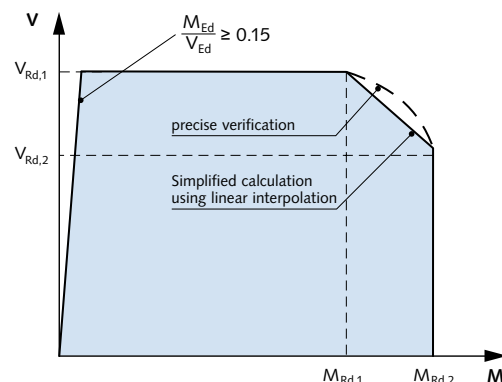
The load bearing capacity of the elements is characterized by a moment/shear force interaction curve (see diagram).

The structural behaviour of HIT Elements

If the maximum vertical force bearing capacity $V_{Rd,1}$ is not fully exploited, the **CSB** technology provides the opportunity to increase the moment bearing capacity so that it exceeds $M_{Rd,1}$. $M_{Rd,2}$ is the maximum moment bearing capacity with the corresponding vertical force bearing capacity $V_{Rd,2}$.

This load bearing behaviour is considered in the HIT software. This software selects the optimum load range of the HIT elements.

HALFEN software is available for download at www.halfen.com.



Moment/shear force interaction at the cantilever slab connection

With **CSB** technology shear forces of up to 160kN per metre can be transferred safely and in accordance with the National Technical Approval (applies to slab thickness ≥ 160 mm).

To ensure these high load bearing capacities are kept within the application range for cantilever slab connection, the following **ratio of the external force variables** must be observed:

$$\frac{M_{Ed}}{V_{Ed}} \geq 0.15$$

Load range

The respective load range results from the corresponding combination of TB- and CSB-Box.

The combinations of TB- and CSB-Box illustrated in the following table are possible and type-tested.

Load range HIT-HP/SP MV: possible combinations of upper and lower parts

Element width B = 25 cm		No. of tension bars n_{TB}											
		1	2	3									
Number of compression shear bearings n_{CSB}	1	●	●										
	2	×	●	●									
Element width B = 50 cm		No. of tension bars n_{TB}											
		2	3	4	5	6	7						
Number of compression shear bearings n_{CSB}	2	●	●	●									
	3	●	●	●	●	○							
	4	×	●	●	●	●	●						
	5		×	●	●	×	×						
Element width B = 100 cm		No. of tension bars n_{TB}											
		4	5	6	7	8	9	10	11	12	13	14	
Number of compression shear bearings n_{CSB}	4	●	●	●	●	●	×						
	5	●	●	●	●	●	●	●	×				
	6	●	●	●	●	●	●	●	●	●	×		
	7	×	×	●	●	●	●	●	●	●	●	●	
	8	×	×	●	●	●	●	●	●	●	●	●	
	9		×	×	×	●	●	●	●	●	●	×	
	10			×	×	●	●	●	×	×	×		
Values for the load bearing capacities for the elements highlighted in blue → see pages 14–20.													
● = HP and SP ○ = SP only × = HP only													

Values for the load bearing capacities for the elements highlighted in blue → see pages 14–20.

● = HP and SP

○ = SP only

× = HP only



The complete, type tested, load class range for concrete grades C20/25, C25/30 and C30/37 can be downloaded at www.halfen.com.

Information on material specifications and test certificates can be found on page 10.

Basic types

Ordering example:

HIT- HP MV - 0705 - 20 - 100 - 35 - ES

HIT- HP MV - 0404 - 18 - 050 - 50 - ES

HIT- HP MV - 0202 - 18 - 025 - 30 - ES

• Product group - Type

• Load type

• Number of tension bars

• No. of compression shear units CSB

• Element height [cm]

• Element width [cm]

• Concrete cover [mm]

• For element slab design only

Custom designs are available on request.
For further details please contact our regional sales companies
→ see inside back cover for contact details.

Available slab thickness h

Concrete cover [mm]	30	35	50
Available slab thickness h [cm]	16–30	16–30	18–30

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE



Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Element Widths B = 1.00 / 0.50 / 0.25m

Load bearing capacity values for HIT-HP MV



v_{Rd} Shear capacity in one direction

Shear capacity	B = 1.00 m	HP MV-0404	HP MV-0504	HP MV-0604	HP MV-0804	HP MV-0805
	B = 0.50 m	HP MV-0202	—	HP MV-0302	HP MV-0402	—
	B = 0.25 m	HP MV-0101	—	—	HP MV-0201	—
Design values v_{Rd} [kN/m]			64.0	64.0		80.0 80.0

Note: Concrete strength $C20/25 / \geq C25/30$

m_{Rd} Moment bearing capacity for all element widths

Moment bearing capacity	B = 1.00 m			HP MV-0404	HP MV-0504	HP MV-0604	HP MV-0804	HP MV-0805					
	B = 0.50 m			HP MV-0202	—	HP MV-0302	HP MV-0402	—					
	B = 0.25 m			HP MV-0101	—	—	HP MV-0201	—					
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 / ≥ C25/30									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		16.9	17.4	20.0	20.8	22.7	23.9	24.7	28.7	29.5	31.2
	160		180	17.9	18.4	21.3	22.1	24.2	25.4	26.4	30.6	31.5	33.2
		170		18.9	19.4	22.5	23.3	25.6	26.8	28.0	32.6	33.5	35.2
	170		190	19.9	20.4	23.7	24.5	27.1	28.3	29.7	34.6	35.4	37.1
		180		20.8	21.4	24.9	25.8	28.6	29.8	31.4	36.5	37.4	39.1
	180		200	21.8	22.4	26.2	27.0	30.1	31.3	33.1	38.5	39.4	41.1
		190		22.8	23.3	27.4	28.2	31.5	32.7	34.8	40.4	41.3	43.0
	190		210	23.8	24.3	28.6	29.5	33.0	34.2	36.5	42.4	43.3	45.0
		200		24.8	25.3	29.9	30.7	34.5	35.7	38.2	44.3	45.3	47.0
	200		220	25.8	26.3	31.1	31.9	36.0	37.2	39.9	46.3	47.3	48.9
		210		26.7	27.3	32.3	33.1	37.4	38.6	41.6	48.2	49.2	50.9
	210		230	27.7	28.3	33.6	34.4	38.9	40.1	43.3	50.2	51.2	52.9
		220		28.7	29.2	34.8	35.6	40.4	41.6	45.0	52.1	53.2	54.8
	220		240	29.7	30.2	36.0	36.8	41.9	43.1	46.7	54.1	55.1	56.8
		230		30.7	31.2	37.2	38.1	43.4	44.5	48.3	56.1	57.1	58.8
	230		250	31.7	32.2	38.5	39.3	44.8	46.0	50.0	58.0	59.1	60.7
		240		32.6	33.2	39.7	40.5	46.3	47.5	51.7	60.0	61.0	62.7
	240		260	33.6	34.2	40.9	41.8	47.8	49.0	53.4	61.9	63.0	64.7
		250		34.6	35.1	42.2	43.0	49.3	50.4	55.1	63.9	65.0	66.6
	250		270	35.6	36.1	43.4	44.2	50.7	51.9	56.8	65.8	66.9	68.6

A_s On-site reinforcement $A_{s,req}$ (→ page 27)

Edge frame	direct support	$\varnothing 6 / 25 \text{ cm}$	
Suspension reinforcement	indirect support	$\varnothing 6 / 12.5 \text{ cm}$	$\varnothing 6 / 10 \text{ cm}$



All necessary verifications including verifying concrete strut shear pressure have been already considered.

Note: HALFEN HIT software is available to calculation the connections for your balcony projects.
 Download from www.halfen.com.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE



Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Element Widths B = 1.00 / 0.50 / 0.25m

Load bearing capacity values for HIT-HP MV



V_{Rd} Shear capacity in one direction

Shear capacity	B = 1.00 m	HP MV-0506	HP MV-0606	HP MV-0806	HP MV-1006	HP MV-1106
	B = 0.50 m	—	HP MV-0303	HP MV-0403	HP MV-0503	—
	B = 0.25 m	—	—	—	—	—
Design values v_{Rd} [kN/m]		96.0 96.0				

Note: Concrete strength $C20/25 / \geq C25/30$

34.6	36.2
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m_{Rd} Moment bearing capacity for all element widths

Moment bearing capacity	B = 1.00 m			HP MV-0506	HP MV-0606		HP MV-0806		HP MV-1006		HP MV-1106		
	B = 0.50 m			—	HP MV-0303		HP MV-0403		HP MV-0503		—		
	B = 0.25 m			—	—		—		—		—		
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 / ≥ C25/30									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		21.9	22.4	25.4	26.1	31.4	32.8	34.0	38.5	36.1	41.0
	160		180	23.1	23.7	26.8	27.6	33.4	34.8	36.2	41.0	38.6	43.7
		170		24.3	24.9	28.3	29.1	35.4	36.8	38.5	43.4	41.0	46.4
	170		190	25.6	26.1	29.8	30.6	37.3	38.7	40.7	45.9	43.4	49.1
		180		26.8	27.3	31.3	32.1	39.3	40.7	42.9	48.4	45.9	51.8
	180		200	28.0	28.6	32.7	33.5	41.3	42.7	45.1	50.8	48.3	54.5
		190		29.3	29.8	34.2	35.0	43.2	44.7	47.3	53.3	50.7	57.2
	190		210	30.5	19.0	35.7	36.5	45.2	46.6	49.5	55.7	53.2	59.9
		200		31.7	32.3	37.2	38.0	47.2	48.6	51.7	58.2	55.6	62.6
	200		220	32.9	33.5	38.6	39.4	49.2	50.6	54.0	60.7	58.0	65.3
		210		34.2	34.7	40.1	40.9	51.1	52.5	56.2	63.1	60.5	68.0
	210		230	35.4	36.0	41.6	42.4	53.1	54.5	58.4	65.6	62.9	70.8
		220		36.6	37.2	43.1	43.9	55.1	56.5	60.6	68.0	65.3	73.5
	220		240	37.9	38.4	44.5	45.3	57.0	58.4	62.8	70.5	67.8	76.2
		230		39.1	39.6	46.0	46.8	59.0	60.4	65.0	73.0	70.2	78.9
	230		250	40.3	40.9	47.5	48.3	61.0	62.4	67.2	75.4	72.6	81.6
		240		41.6	42.1	49.0	49.8	62.9	64.3	69.5	77.9	75.1	84.3
	240		260	42.8	43.3	50.5	51.2	64.9	66.3	71.7	80.3	77.5	87.0
		250		44.0	44.6	51.9	52.7	66.9	68.3	73.9	82.8	80.0	89.7
	250		270	45.2	45.8	53.4	54.2	68.8	70.2	76.1	85.3	82.4	92.4



A_s On-site reinforcement $A_{s,req}$ (→ page 27)

Edge frame	direct support	Ø 6 / 25 cm
Suspension reinforcement	indirect support	Ø 8 / 15 cm



All necessary verifications including verifying concrete strut shear pressure have been already considered.

Note: HALFEN HIT software is available to calculation the connections for your balcony projects.
Download from www.halfen.com.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE



Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Element Widths B = 1.00 / 0.50 / 0.25m

Load bearing capacity values for HIT-HP MV



v_{Rd} Shear capacity in one direction

Shear capacity	B = 1.00 m	HP MV-0607	HP MV-0807	HP MV-1107	HP MV-1207	HP MV-1407
	B = 0.50 m	—	—	—	—	—
	B = 0.25 m	—	—	—	—	—
Design values v_{Rd} [kN/m]		112.0		112.0		

Note: Concrete strength $C_{20/25} / \geq C_{25/30}$

m_{Rd} Moment bearing capacity for all element widths

$C_{20/25}$	$\geq C_{25/30}$
34.6	36.2

Moment bearing capacity	B = 1.00 m			HP MV-0607		HP MV-0807		HP MV-1107		HP MV-1207		HP MV-1407	
	B = 0.50 m			—		—		—		—		—	
	B = 0.25 m			—		—		—		—		—	
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 / ≥ C25/30									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		26.1	26.8	32.8	34.0	38.2	43.2	40.4	45.8	43.2	50.2
	160		180	27.6	28.3	34.8	36.0	40.6	45.9	43.1	48.8	46.1	53.6
		170		29.1	29.8	36.7	37.9	43.1	48.6	45.7	51.7	49.1	57.0
	170		190	30.6	31.2	38.7	39.9	45.5	51.3	48.4	54.7	52.0	60.5
		180		32.0	32.7	40.7	41.9	47.9	54.0	51.1	57.6	55.0	63.9
	180		200	33.5	34.2	42.6	43.8	50.4	56.7	53.7	60.6	58.0	67.3
		190		35.0	35.7	44.6	45.8	52.8	59.4	56.4	63.5	60.9	70.7
	190		210	36.5	37.1	46.6	47.8	55.2	62.1	59.0	66.5	63.9	74.2
		200		37.9	38.6	48.5	49.7	57.7	64.8	61.7	69.4	66.8	77.6
	200		220	39.4	40.1	50.5	51.7	60.1	67.5	64.3	72.4	69.8	81.0
		210		40.9	41.6	52.5	53.7	62.5	70.2	67.0	75.3	72.8	84.4
	210		230	42.4	43.0	54.4	55.6	65.0	72.9	69.7	78.3	75.7	87.8
		220		43.8	44.5	56.4	57.6	67.4	75.6	72.3	81.2	78.7	91.3
	220		240	45.3	46.0	58.4	59.6	69.9	78.4	75.0	84.2	81.6	94.7
		230		46.8	47.5	60.3	61.6	72.3	81.1	77.6	87.1	84.6	98.1
	230		250	48.3	48.9	62.3	63.5	74.7	83.8	80.3	90.1	87.6	101.5
		240		49.7	50.4	64.3	65.5	77.2	86.5	82.9	93.0	90.5	104.9
	240		260	51.2	51.9	66.3	67.5	79.6	89.2	85.6	96.0	93.5	108.4
		250		52.7	53.4	68.2	69.4	82.0	91.9	88.3	98.9	96.4	111.8
	250		270	54.2	54.8	70.2	71.4	84.5	94.6	90.9	101.9	99.4	115.2

A_s On-site reinforcement $A_{s,req}$ (→ page 27)

Edge frame	direct support	Ø 6 / 25 cm	Ø 6 / 20 cm
Suspension reinforcement	indirect support	Ø 8 / 12.5 cm	



All necessary verifications including verifying concrete strut shear pressure have been already considered.

Note: To calculate the connections for your planned balcony designs we provide HALFEN HIT software. It can be downloaded from www.halfen.com.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE



Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Element Widths B = 1.00 / 0.50 / 0.25m

Load bearing capacity values for HIT-HP MV



V_{Rd} Shear capacity in one direction

Shear capacity	B = 1.00 m	HP MV-0408	HP MV-0808	HP MV-1208	HP MV-1010	HP MV-1210
	B = 0.50 m	HP MV-0204	HP MV-0404	HP MV-0604	HP MV-0505	HP MV-0605
	B = 0.25 m	HP MV-0102	HP MV-0202	HP MV-0302	—	—
Design values v_{Rd} [kN/m]		116.1 120.9	128.0	128.0	160.0	160.0

Note: Concrete strength $C20/25 / \geq C25/30$

34.6	36.2
-------------	-------------



m_{Rd} Moment bearing capacity for all element widths

Moment bearing capacity	B = 1.00 m			HP MV-0408	HP MV-0808	HP MV-1208	HP MV-1010	HP MV-1210					
	B = 0.50 m			HP MV-0204	HP MV-0404	HP MV-0604	HP MV-0505	HP MV-0605					
	B = 0.25 m			HP MV-0102	HP MV-0202	HP MV-0302	—	—					
Concrete cover [mm]	30	35	50	Concrete strength: <i>C20/25</i> / ≥ C25/30									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		<i>18.7</i>	18.9	<i>33.8</i>	34.9	<i>42.3</i>	47.7	<i>38.8</i>	43.6	<i>41.2</i>	47.1
	160		180	<i>19.7</i>	19.9	<i>35.8</i>	36.8	<i>44.9</i>	50.7	<i>41.1</i>	46.0	<i>43.6</i>	49.8
		170		<i>20.7</i>	20.9	<i>37.7</i>	38.8	<i>47.6</i>	53.7	<i>43.3</i>	48.5	<i>46.0</i>	52.5
	170		190	<i>21.6</i>	21.9	<i>39.7</i>	40.8	<i>50.3</i>	56.6	<i>45.5</i>	51.0	<i>48.4</i>	55.2
		180		22.6	22.9	41.7	42.7	52.9	59.6	47.7	53.4	50.7	57.9
	180		200	<i>23.6</i>	23.9	<i>43.7</i>	44.7	<i>55.6</i>	62.5	<i>49.9</i>	55.9	<i>53.1</i>	60.6
		190		<i>24.6</i>	24.9	<i>45.6</i>	46.7	<i>58.2</i>	65.5	<i>52.1</i>	58.3	<i>55.5</i>	63.3
	190		210	<i>25.6</i>	25.8	<i>47.6</i>	48.6	<i>60.9</i>	68.4	<i>54.3</i>	60.8	<i>57.9</i>	66.0
		200		26.6	26.8	49.6	50.6	63.5	71.4	56.6	63.3	60.3	68.7
	200		220	<i>27.5</i>	27.8	<i>51.5</i>	52.6	<i>66.2</i>	74.3	<i>58.8</i>	65.7	<i>62.7</i>	71.4
		210		<i>28.5</i>	28.8	<i>53.5</i>	54.5	<i>68.9</i>	77.3	<i>61.0</i>	68.2	<i>65.0</i>	74.1
	210		230	<i>29.5</i>	29.8	<i>55.5</i>	56.5	<i>71.5</i>	80.2	<i>63.2</i>	70.6	<i>67.4</i>	76.8
		220		30.5	30.8	57.4	58.5	74.2	83.2	65.4	73.1	69.8	79.5
	220		240	<i>31.5</i>	31.7	<i>59.4</i>	60.4	<i>76.8</i>	86.1	<i>67.6</i>	75.6	<i>72.2</i>	82.2
		230		<i>32.5</i>	32.7	<i>61.4</i>	62.4	<i>79.5</i>	89.1	<i>69.8</i>	78.0	<i>74.6</i>	84.9
	230		250	<i>33.4</i>	33.7	<i>63.3</i>	64.4	<i>82.1</i>	92.0	<i>72.0</i>	80.5	<i>77.0</i>	87.6
		240		34.4	34.7	65.3	66.4	84.8	95.0	74.3	82.9	79.3	90.3
	240		260	<i>35.4</i>	35.7	<i>67.3</i>	68.3	<i>87.4</i>	97.9	<i>76.5</i>	85.4	<i>81.7</i>	93.0
	250		<i>36.4</i>	36.7	<i>69.2</i>	70.3	<i>90.1</i>	100.9	<i>78.7</i>	87.9	<i>84.1</i>	95.7	
250		270	<i>37.4</i>	37.6	<i>71.2</i>	72.3	<i>92.8</i>	103.8	<i>80.9</i>	90.3	<i>86.5</i>	98.4	



$A_{s,req}$ On-site reinforcement $A_{s,req}$ (→ page 27)

Edge frame	direct support	Ø 6 / 25 cm	Ø 6 / 20 cm	Ø 6 / 15 cm
Suspension reinforcement	indirect support	Ø 8 / 12.5 cm	Ø 8 / 10 cm	Ø 8 / 9 cm



All necessary verifications including verifying concrete strut shear pressure have been already considered.

Note: To calculate the connections for your planned balcony designs we provide HALFEN HIT software. It can be downloaded from www.halfen.com.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE



Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Element Widths B = 1.00 / 0.50 / 0.25m

Load bearing capacity values for HIT-SP MV



V_{Rd} Shear capacity in one direction

Shear capacity	B = 1.00 m	SP MV-0404	SP MV-0504	SP MV-0604	SP MV-0804	SP MV-0705
	B = 0.50 m	SP MV-0202	—	SP MV-0302	SP MV-0402	—
	B = 0.25 m	SP MV-0101	—	—	SP MV-0201	—
Design values v_{Rd} [kN/m]		61.4 64.0	62.0 64.0	56.6 64.0	27.9 48.6	74.3 80.0

Note: Concrete strength $C20/25 / \geq C25/30$

34.6	36.2
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m_{Rd} Moment bearing capacity for all element widths

Moment bearing capacity	B = 1.00 m			SP MV-0404		SP MV-0504		SP MV-0604		SP MV-0804		SP MV-0705	
	B = 0.50 m			SP MV-0202		—		SP MV-0302		SP MV-0402		—	
	B = 0.25 m			SP MV-0101		—		—		SP MV-0201		—	
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 / ≥ C25/30									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		16.9	17.4	20.0	20.8	22.7	23.9	26.7	28.8	27.1	28.4
	160		180	17.9	18.4	21.3	22.1	24.2	25.4	28.7	30.8	28.8	30.1
		170		18.9	19.4	22.5	23.3	25.6	26.8	30.6	32.7	30.5	31.8
	170		190	19.9	20.4	23.7	24.5	27.1	28.3	32.6	34.7	32.3	33.6
		180		20.8	21.4	24.9	25.8	28.6	29.8	34.6	36.7	34.0	35.3
	180		200	21.8	22.4	26.2	27.0	30.1	31.3	36.5	38.6	35.7	37.0
		190		22.8	23.3	27.4	28.2	31.5	32.7	38.5	40.6	37.4	38.7
	190		210	23.8	24.3	28.6	29.5	33.0	34.2	40.5	42.6	39.1	40.4
		200		24.8	25.3	29.9	30.7	34.5	35.7	42.4	44.5	40.9	42.2
	200		220	25.8	26.3	31.1	31.9	36.0	37.2	44.4	46.5	42.6	43.9
		210		26.7	27.3	32.3	33.1	37.4	38.6	46.4	48.5	44.3	45.6
	210		230	27.7	28.3	33.6	34.4	38.9	40.1	48.3	50.4	46.0	47.3
		220		28.7	29.2	34.8	35.6	40.4	41.6	50.3	52.4	47.8	49.0
	220		240	29.7	30.2	36.0	36.8	41.9	43.1	52.3	54.4	49.5	50.8
		230		30.7	31.2	37.2	38.1	43.4	44.5	54.2	56.4	51.2	52.5
	230		250	31.7	32.2	38.5	39.3	44.8	46.0	56.2	58.3	52.9	54.2
		240		32.6	33.2	39.7	40.5	46.3	47.5	58.2	60.3	54.6	55.9
	240		260	33.6	34.2	40.9	41.8	47.8	49.0	60.1	62.3	56.4	57.7
		250		34.6	35.1	42.2	43.0	49.3	50.4	62.1	64.2	58.1	59.4
	250		270	35.6	36.1	43.4	44.2	50.7	51.9	64.1	66.2	59.8	61.1



A_s On-site reinforcement $A_{s,req}$ (→ page 27)

Edge frame	direct support	$\varnothing 6 / 25 \text{ cm}$	
Suspension reinforcement	indirect support	$\varnothing 6 / 12.5 \text{ cm}$	$\varnothing 6 / 10 \text{ cm}$



All necessary verifications including verifying concrete strut shear pressure have been already considered.

Note: To calculate the connections for your planned balcony designs we provide HALFEN HIT software. It can be downloaded from www.halfen.com.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE



Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Element Widths B = 1.00 / 0.50 / 0.25m

Load bearing capacity values for HIT-SP MV



V_{Rd} Shear capacity in one direction



Shear capacity	B = 1.00 m	SP MV-0606	SP MV-0906	SP MV-1006	SP MV-0907	SP MV-1007
	B = 0.50 m	SP MV-0303	—	SP MV-0503	—	—
	B = 0.25 m	—	—	—	—	—
Design values v_{Rd} [kN/m]		92.1 96.0	90.8 96.0	84.8 96.0	109.3 112.0	107.7 112.0

Note: Concrete strength $C20/25 / \geq C25/30$

34.6	36.2
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m_{Rd} Moment bearing capacity for all element widths

Moment bearing capacity	B = 1.00 m			SP MV-0606	SP MV-0906		SP MV-1006		SP MV-0907		SP MV-1007		
	B = 0.50 m			SP MV-0303			SP MV-0503		—		—		
	B = 0.25 m			—	—		—		—		—		
Concrete cover [mm]	30	35	50	Concrete strength: <i>C20/25</i> / ≥ C25/30									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		<i>25.4</i>	26.1	<i>31.7</i>	35.8	<i>34.0</i>	38.5	<i>33.1</i>	37.3	<i>35.8</i>	40.3
	160		180	<i>26.8</i>	27.6	<i>33.7</i>	38.0	<i>36.2</i>	41.0	<i>35.1</i>	39.5	<i>38.0</i>	42.8
		170		<i>28.3</i>	29.1	<i>35.7</i>	40.2	<i>38.5</i>	43.4	<i>37.1</i>	41.7	<i>40.2</i>	45.3
	170		190	<i>29.8</i>	30.6	<i>37.7</i>	42.5	<i>40.7</i>	45.9	<i>39.1</i>	43.9	<i>42.4</i>	47.7
		180		<i>31.3</i>	32.1	<i>39.7</i>	44.7	<i>42.9</i>	48.4	<i>41.1</i>	46.1	<i>44.6</i>	50.2
	180		200	<i>32.7</i>	33.5	<i>41.7</i>	46.9	<i>45.1</i>	50.8	<i>43.1</i>	48.3	<i>46.8</i>	52.6
		190		<i>34.2</i>	35.0	<i>43.7</i>	49.1	<i>47.3</i>	53.3	<i>45.1</i>	50.6	<i>49.0</i>	55.1
	190		210	<i>35.7</i>	36.5	<i>45.7</i>	51.3	<i>49.5</i>	55.7	<i>47.1</i>	52.8	<i>51.2</i>	57.6
		200		<i>37.2</i>	38.0	<i>47.7</i>	53.5	<i>51.7</i>	58.2	<i>49.0</i>	55.0	<i>53.5</i>	60.0
	200		220	<i>38.6</i>	39.4	<i>49.6</i>	55.7	<i>54.0</i>	60.7	<i>51.0</i>	57.2	<i>55.7</i>	62.5
		210		<i>40.1</i>	40.9	<i>51.6</i>	58.0	<i>56.2</i>	63.1	<i>53.0</i>	59.4	<i>57.9</i>	64.9
	210		230	<i>41.6</i>	42.4	<i>53.6</i>	60.2	<i>58.4</i>	65.6	<i>55.0</i>	61.6	<i>60.1</i>	67.4
		220		<i>43.1</i>	43.9	<i>55.6</i>	62.4	<i>60.6</i>	68.0	<i>57.0</i>	63.8	<i>62.3</i>	69.9
	220		240	<i>44.5</i>	45.3	<i>57.6</i>	64.6	<i>62.8</i>	70.5	<i>59.0</i>	66.1	<i>64.5</i>	72.3
		230		<i>46.0</i>	46.8	<i>59.6</i>	66.8	<i>65.0</i>	73.0	<i>61.0</i>	68.3	<i>66.7</i>	74.8
	230		250	<i>47.5</i>	48.3	<i>61.6</i>	69.0	<i>67.2</i>	75.4	<i>63.0</i>	70.5	<i>69.0</i>	77.2
		240		<i>49.0</i>	49.8	<i>63.6</i>	71.2	<i>69.5</i>	77.9	<i>65.0</i>	72.7	<i>71.2</i>	79.7
	240		260	<i>50.5</i>	51.2	<i>65.6</i>	73.4	<i>71.7</i>	80.3	<i>67.0</i>	74.9	<i>73.4</i>	82.2
		250		<i>51.9</i>	52.7	<i>67.6</i>	75.7	<i>73.9</i>	82.8	<i>69.0</i>	77.1	<i>75.6</i>	84.6
	250		270	<i>53.4</i>	54.2	<i>69.6</i>	77.9	<i>76.1</i>	85.3	<i>71.0</i>	79.3	<i>77.8</i>	87.1



A_s On-site reinforcement $A_{s,req}$ (→ page 27)

Edge frame	direct support	$\varnothing 6 / 25 \text{ cm}$	
Suspension reinforcement	indirect support	$\varnothing 8 / 15 \text{ cm}$	$\varnothing 8 / 12.5 \text{ cm}$



All necessary verifications including verifying concrete strut shear pressure have been already considered.

Note: To calculate the connections for your planned balcony designs we provide HALFEN HIT software. It can be downloaded from www.halfen.com.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE



Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Element Widths B = 1.00 / 0.50 / 0.25m

Load bearing capacity values for HIT-SP MV



V_{Rd} Shear capacity in one direction

Shear capacity	B = 1.00 m	SP MV-1107	SP MV-1207	SP MV-1208	SP MV-1308	SP MV-1309
	B = 0.50 m	—	—	SP MV-0604	—	—
	B = 0.25 m	—	—	SP MV-0302	—	—
Design values v_{Rd} [kN/m]		103.4 112.0	96.3 109.7	120.9 120.7	109.9	108.4

Note: Concrete strength $C20/25 / \geq C25/30$



m_{Rd} Moment bearing capacity for all element widths

34.6	36.2
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Moment bearing capacity	B = 1.00 m			SP MV-1107		SP MV-1207		SP MV-1208		SP MV-1308		SP MV-1309	
	B = 0.50 m												
	B = 0.25 m			—	—	SP MV-0604	—	—					
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 / ≥ C25/30									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		38.2	43.2	40.4	45.8	42.3	47.7	43.5	50.5	46.3	52.3
	160		180	40.6	45.9	43.1	48.8	44.9	50.7	46.2	53.7	49.2	55.5
		170		43.1	48.6	45.7	51.7	47.6	53.7	49.0	56.9	52.1	58.7
	170		190	45.5	51.3	48.4	54.7	50.2	56.6	51.8	60.1	55.0	61.9
		180		47.9	54.0	51.1	57.6	52.9	59.6	54.5	63.3	57.8	65.1
	180		200	50.4	56.7	53.7	60.6	55.5	62.5	57.3	66.5	60.7	68.3
		190		52.8	59.4	56.4	63.5	58.2	65.5	60.1	69.7	63.6	71.5
	190		210	55.2	62.1	59.0	66.5	60.9	68.4	62.8	72.9	66.5	74.7
		200		57.7	64.8	61.7	69.4	63.5	71.4	65.6	76.1	69.4	77.9
	200		220	60.1	67.5	64.3	72.4	66.2	74.3	68.4	79.3	72.2	81.1
		210		62.5	70.2	67.0	75.3	68.8	77.3	71.1	82.5	75.1	84.3
	210		230	65.0	72.9	69.7	78.3	71.5	80.2	73.9	85.7	78.0	87.5
		220		67.4	75.6	72.3	81.2	74.1	83.2	76.7	88.9	80.9	90.7
	220		240	69.9	78.4	75.0	84.2	76.8	86.1	79.4	92.1	83.7	93.8
		230		72.3	81.1	77.6	87.1	79.4	89.1	82.2	95.3	86.6	97.0
	230		250	74.7	83.8	80.3	90.1	82.1	92.0	85.0	98.5	89.5	100.2
		240		77.2	86.5	82.9	93.0	84.7	95.0	87.7	101.7	92.4	103.4
	240		260	79.6	89.2	85.6	96.0	87.4	97.9	90.5	104.9	95.3	106.6
		250		82.0	91.9	88.3	98.9	90.1	100.9	93.2	108.1	98.1	109.8
	250		270	84.5	94.6	90.9	101.9	92.7	103.8	96.0	111.3	101.0	113.0



A_s On-site reinforcement $A_{s,req}$ (→ page 27)

Edge frame	direct support	$\varnothing 6 / 20$ cm		$\varnothing 6 / 15$ cm
Suspension reinforcement	indirect support	$\varnothing 8 / 12.5$ cm		$\varnothing 8 / 10$ cm

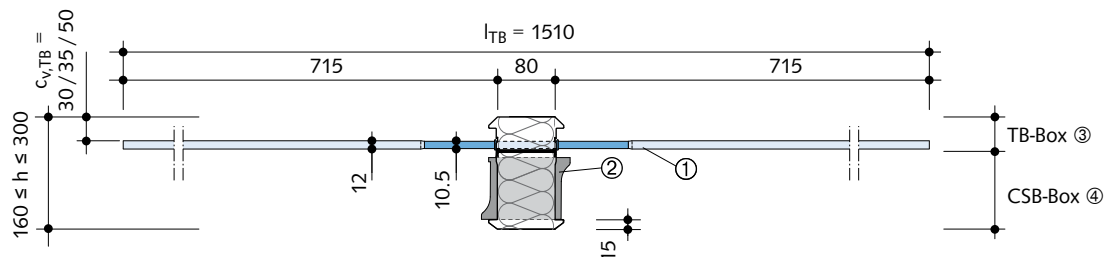


All necessary verifications including verifying concrete strut shear pressure have been already considered.

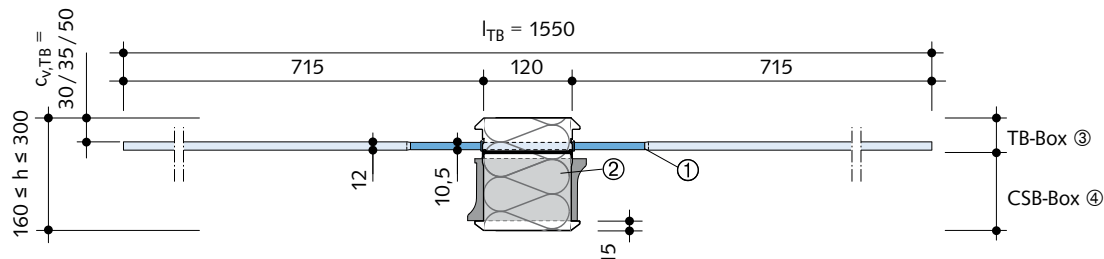
Note: To calculate the connections for your planned balcony designs we provide HALFEN HIT software. It can be downloaded from www.halfen.com.

Cross-sections

HIT-HP MV – High Performance



HIT-SP MV – Superior Performance



Dimensions in [mm]

- ① Tension bars $\varnothing$ 12 mm or 10.5 mm in the joint
- ② Compression shear bearings CSB
- ③ Tension bar box
- ④ Compression shear bearings box

For more detailed information on the element slab types see → [page 22](#)

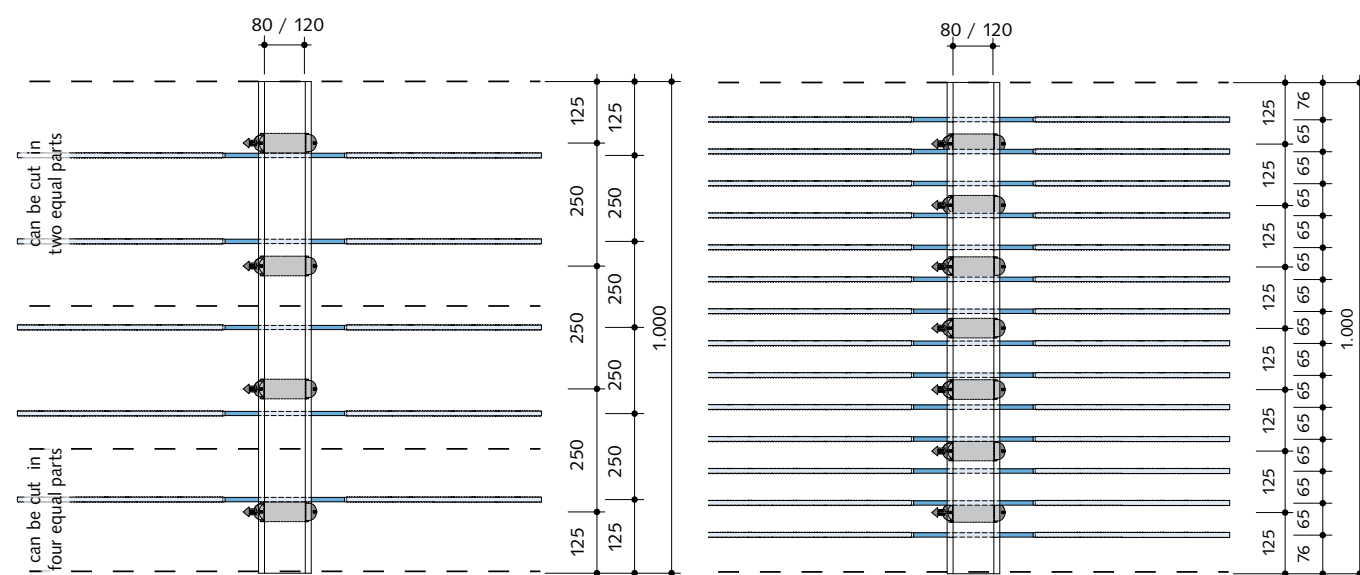
Top view (examples)

HIT-HP/SP - MV 0404 - ... - 100

HIT-HP/SP - MV 0202 - ... - 050

HIT-HP/SP - MV 0101 - ... - 025

HIT-HP/SP - MV 1407 - ... - 100



For a top view of other units with dimensions, please refer to the type statics data sheets.

Ordering example - Multi-part design

upper part	HIT-HP	M_	08	-	05	-	100	-	35	-	TB
+											
centre part	HIT-HP			-		-	04	-	100	-	DB
+											
base part	HIT-HP	_V		-	05	-	11	-	100	-	CSB
Σ	HIT-HP	MV	08	05	-	20	-	100	-	35	ES
(HIT-HP MV-ES)											

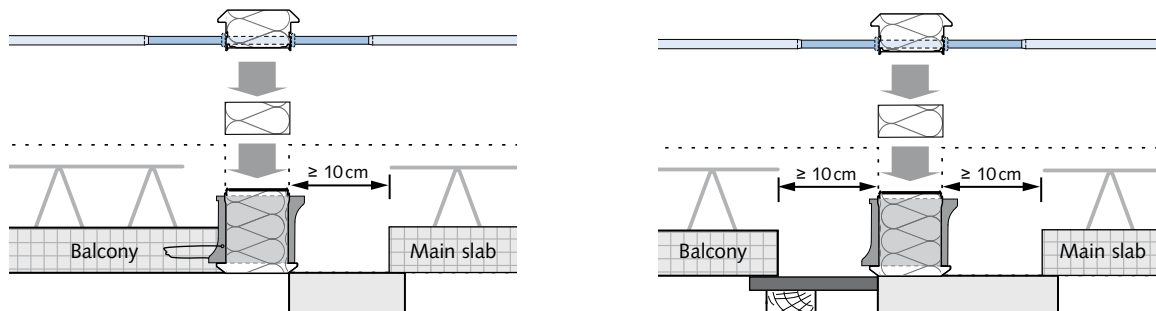
- Product group – type
- Transferable forces
- Number of tension bars
- No. of Compression shear bearings CSB
- Element height [cm]
- Element width [cm]
- Concrete cover [mm]
- For element slab version only

① Tension bar box
② Distance box
③ Compression shear bearings box

Height TB-Box [mm]		Height D-Box [mm]											Height CSB-Box [mm]					
c _v = 30/35	50	Slab height	160	170	180	190	200	210	220	230	240	250	Slab height	160	170	180	190	200 – 250
c _v = 50	70	c _v = 30/35	–	–	20	30	40	50	60	70	80	90	c _v = 30/35	110	120	110	110	110
		c _v = 50	–	–	–	–	20	30	40	50	60	70	c _v = 50	–	–	110	120	110

Pressure joints in Element slabs

Typical connections for HIT-HP/SP MV with element slabs with a structural cast-in-place concrete layer



To create a positive connection a total space of at least 10cm between insulation element and precast unit has to be maintained. Detailed information for reinforcement layout can be found in Approvals ETA-13/0546 and Z-15.7-293. The approvals are available for download at www.halfen.com.

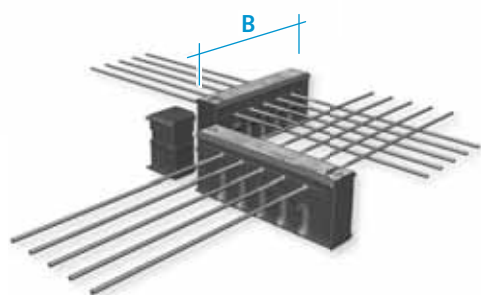
Introduction HIT-HP MV-...-COR, HIT-SP MV-...-COR

HIT-HP MV-...-COR, HIT-SP MV-...-COR:

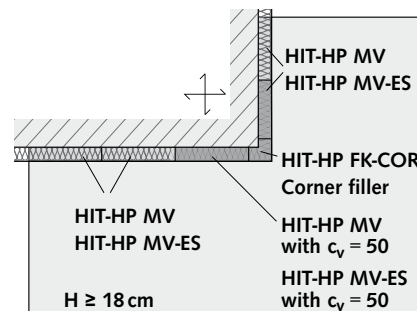
- Connection for cantilevered corner balcony slabs
- Transfer of bending moments and shear forces

HIT-HP MV-...-COR, including:

- HIT-HP MV → 1st Layer
- HIT-HP MV → 2nd Layer
- HIT-HP FK-...-COR Corner filler



Application example

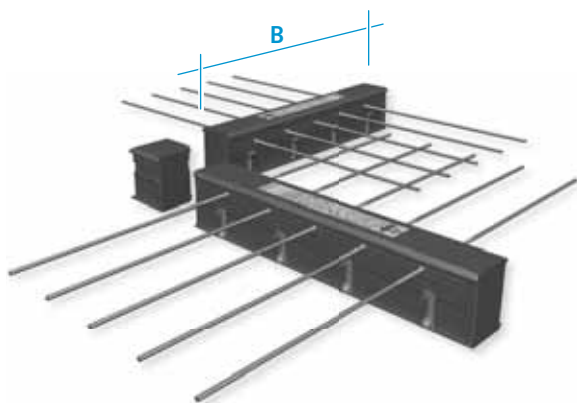


Insulation thickness 80 mm

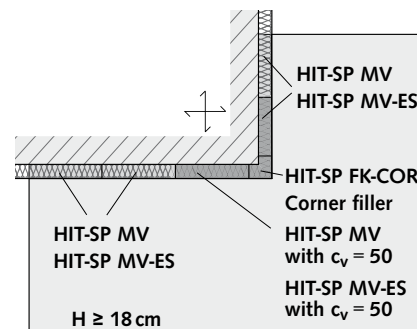
Element widths: $B = 1.00 \text{ m} / 0.50 \text{ m}$

HIT-SP MV-...-COR, including:

- HIT-SP MV → 1st Layer
- HIT-SP MV → 2nd Layer
- HIT-SP FK-...-COR Corner filler



Application example



Insulation thickness 120 mm

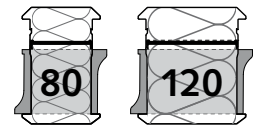
Element widths: $B = 1.00 \text{ m} / 0.50 \text{ m}$

Ordering example for corner filler

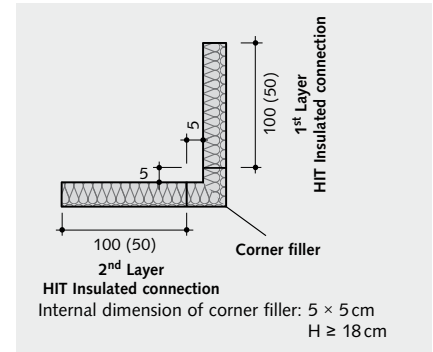
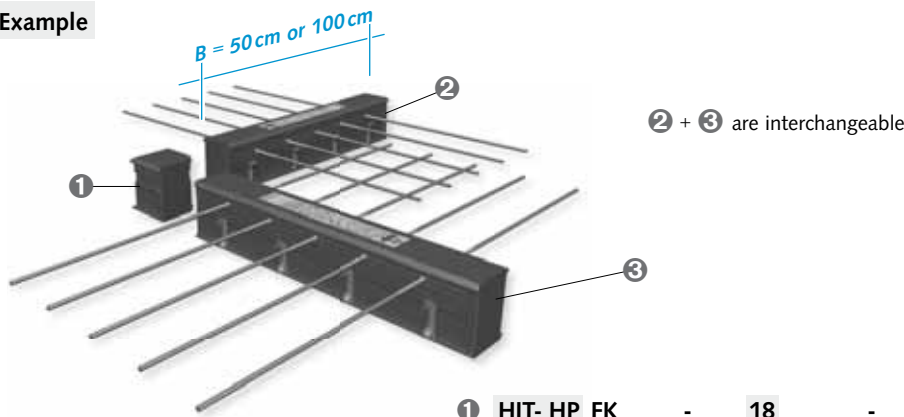
	HIT-HP	-	FK	-	18	-	COR
• Product group – type							
• Characterisation/component: <i>Corner filler</i>							
• Element height							
• Designation: <i>Corner Element</i>							

Detailed structural design for type tested connections

All standard types of HIT-HP MV and HIT-SP MV, in 0.50 m or 1.00 m lengths as well as multi-part types for filigree-elements are available for corner application.



Example



①	HIT- HP FK	-	18	-	COR	Corner filler
②	HIT- HP MV	- 05 05	- 18	- 050	- 35	1 st layer reinforcement ($c_v = 30-35$ mm)
③	HIT- HP MV	- 05 05	- 18	- 050	- 50	2 nd layer reinforcement ($c_v = 50$ mm)

- Product group - Type: ② + ③ identical
- Transferable forces: ② + ③ identical
- No. of Tension bars: ② + ③ identical
- No. of Compression shear bearings: ② + ③ identical
- Element height [cm]: ② + ③ identical
- Element width [cm]: ② + ③ identical (50/100 cm)
- Concrete cover [mm]: ② $c_v=30/35$ ③ $c_v=50$

① For corner application only
② + ③ are HIT standard elements
(see → pages 14-20)

Typical load bearing capacity values HIT-HP MV-...-COR

For load bearing capacities tables see → pages 14-20 (value $c_v = 50$ mm decisive)

Note: Concrete strength $C20/25 / \geq C25/30$
34.6 36.2



V_{Rd} Shear capacity in one direction

Shear capacity	B = 1.00 m	HP MV-0506	HP MV-0606	HP MV-0806	HP MV-1006	HP MV-1106
	B = 0.50 m	—	HP MV-0303	HP MV-0403	HP MV-0503	—
	B = 0.25 m	—	—	—	—	—
Design values V_{Rd} [kN/m]		96.0 96.0				



m_{Rd} Moment bearing capacity for all element widths

Moment bearing capacity	B = 1.00 m		HP MV-0506	HP MV-0606	HP MV-0806	HP MV-1006	HP MV-1106					
	B = 0.50 m		—	HP MV-0303	HP MV-0403	HP MV-0503	—					
	B = 0.25 m		—	—	—	—	—					
Concrete cover [mm]	30	35	Concrete strength: C20/25 / ≥ C25/30									
Design values mRd [kNm/m] for slab thickness [mm]		160	21.9	22.4	25.4	26.1	31.4	32.8	34.0	38.5	36.1	41.0
	160		23.1	23.7	26.8	27.6	33.4	34.8	36.2	41.0	38.6	43.7
		170	24.3	24.9	28.3	29.1	35.4	36.8	38.5	43.4	41.0	46.4

Connecting reinforcement see → pages 14 - 20

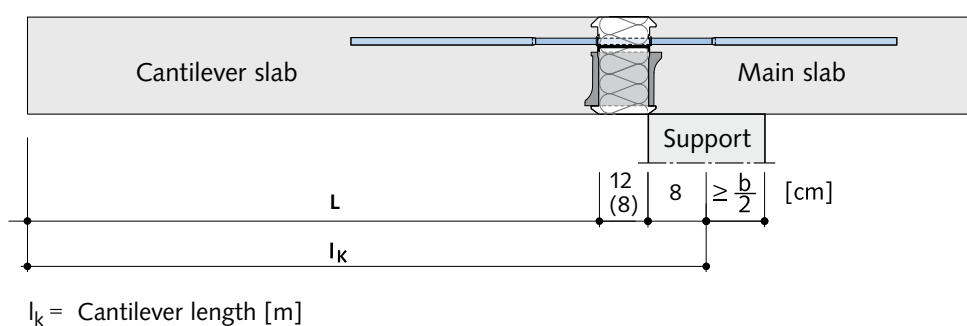
Cantilever Lengths, Usability HIT-HP MV, HIT-SP MV

Bending slenderness

The maximum cantilever lengths max. l_k [m] are shown in the table below; these are based on DIN EN 1992-1-1 (EC2) and on DIN 1045-1, chapter 11.3.2 'Deformation limits'.

The cantilever length l_k should be calculated as illustrated in the diagram below. Interim values have to be interpolated.

Maximum cantilever length l_k [m]		Thickness h [cm] of concrete slab									
		16	17	18	19	20	21	22	23	24	25
Concrete cover [cm]	$c_v = 3$	1.82	1.97	2.11	2.26	2.41	2.55	2.70	2.84	2.99	3.14
	$c_v = 4$	1.68	1.82	1.97	2.11	2.26	2.41	2.55	2.70	2.84	2.99
	$c_v = 5$	—	1.68	1.82	1.97	2.11	2.26	2.41	2.55	2.70	2.84



Connecting reinforcement

Selecting connecting reinforcement

	Element width B [cm]			Slab thickness h 160 – 300 mm		
	100	50	25	Variation A: mesh	Variation B: steel bars	Variation C: combined mesh and steel bars
	no. of tension bars n_{TB} / unit					
8	4	2	1	R424A	Ø 8 / 12 cm	Q257A + Ø 6 / 15 cm
	5	—	—	R524A	Ø 10 / 15 cm	Q188A + Ø 8 / 15 cm
	6	3	—	—	Ø 10 / 12.5 cm	Q335A + Ø 8 / 15 cm
	7	—	—		Ø 10 / 10 cm	Q424A + Ø 8 / 15 cm
	8	4	2		Ø 10 / 9 cm	Q524A + Ø 8 / 15 cm
	9	—	—		Ø 10 / 8 cm	Q424A + Ø 10 / 15 cm
	10	5	—		Ø 10 / 7.5 cm	Q524A + Ø 10 / 15 cm
	11	—	—		Ø 10 / 6.5 cm	Q636A + Ø 10 / 15 cm
	12*)	6	3		Ø 10 / 6 cm	Q636A + Ø 10 / 12.5 cm
	13*)	—	—		Ø 10 / 5.5 cm	Q636A + Ø 10 / 10 cm
	14*)	7	—		Ø 10 / 5 cm	Q636A + Ø 10 / 9 cm

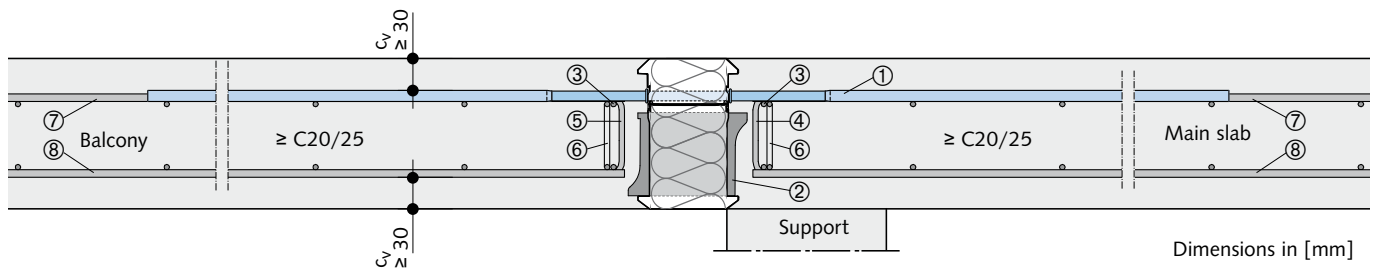
*) Because of the small clearances we recommend limiting the particle size in the concrete to 16 mm and using concrete with a plastic consistency.



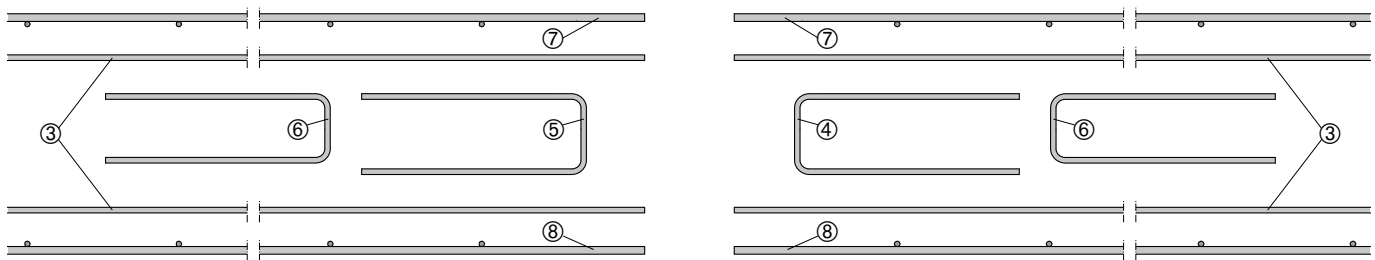
Refer to the guidelines in the type test report to calculate the overlap length l_s . Reducing the required overlap length with a ratio of $a_{s, req.} / a_{s, actual}$ is permissible.

On-site reinforcement for direct and indirect support

Longitudinal section



Reinforcement detail



Legend:

Section / Reinforcement detail

- ① HIT tension bar
- ② HIT CSB (Compression Shear Bearing)
- ③ Horizontal transverse tensile reinforcement $A_{s,h}$ min. $2 \varnothing 8$
- ④ Vertical tensile splitting reinforcement $A_{s,v}$ min. $\varnothing 6 / 25$, see also → pages 14–20
- ⑤ Vertical tensile splitting reinforcement $A_{s,v}$ min. $\varnothing 6 / 25$, see also → pages 14–20
- ⑥ Stirrups as end anchorage for the transverse tensile reinforcement → ③
- ⑦ Upper connecting reinforcement made of steel bars or mesh (→ page 26)
- ⑧ Lower connecting reinforcement made of steel bars or mesh



Stirrups as edge reinforcement

According to DIN 1045-1, section 13.3.2 / DIN EN 1992-1-1 and DIN EN 1992-1-1/NA, stirrups need to be installed in the outer edge of the balcony.

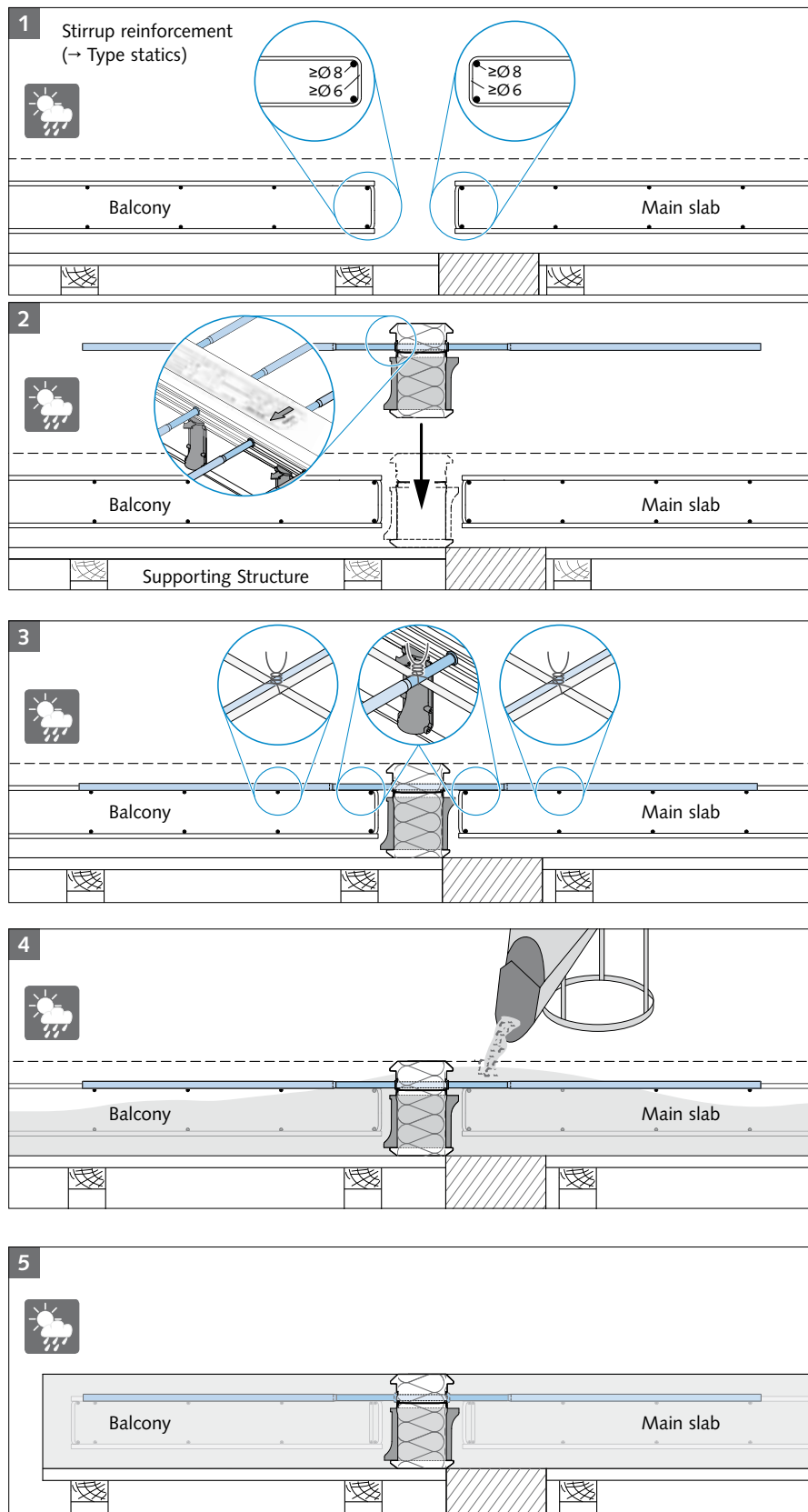


Indirect support

For indirect support a hanger-reinforcement is placed instead of the vertical tensile splitting reinforcement (Position ④). Please note the respective load bearing capacity values (→ pages 14–20).

Installation Diagram HIT-HP MV, HIT-SP MV

Installation Diagram

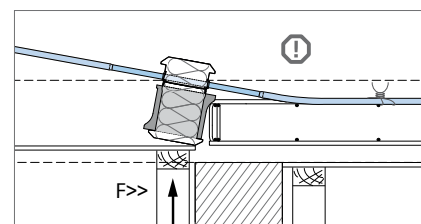


1 Installation of on-site reinforcement

⚠ The on-site reinforcement must be placed as specified by the structural engineer.

2 Installation of HIT unit from above

⚠ Check that the red arrows on the **top of the HIT unit** and on the **CSB** are pointing towards the balcony.



⚠ Ensure that the formwork is at the correct height!

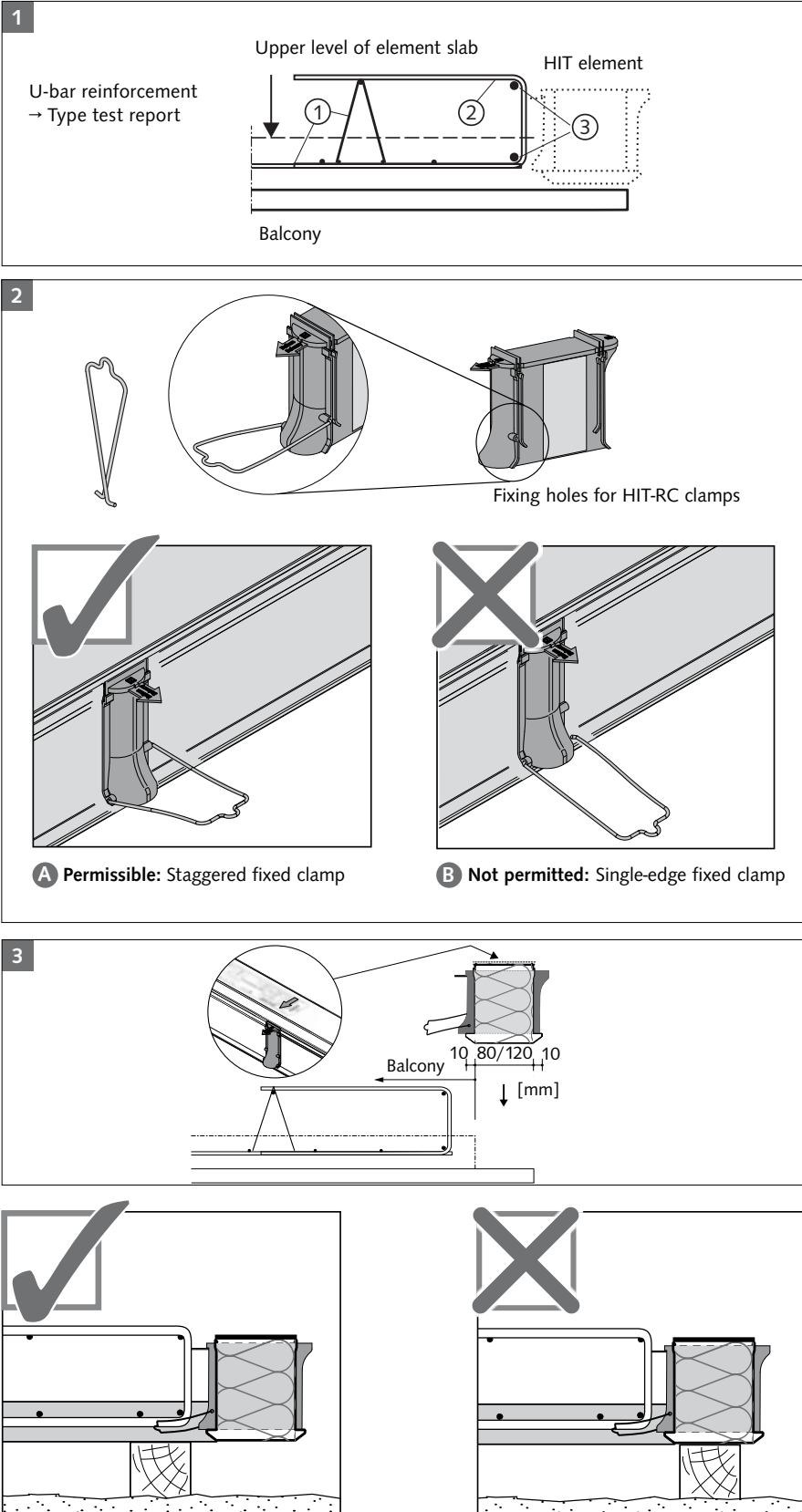
3 Fix the HIT tension bars to on-site reinforcement using tying wire

4 Pour the concrete

⚠ To ensure the HIT units are not displaced, pour and compact the concrete evenly. Secure the HIT units against movement.

5 Freshly concreted balcony slab on supporting structure

Installation Diagram for precast plant installation



1 Install the element slab reinforcement

- ① Install the lower balcony slab reinforcement including lattice girder.
- ② Install the vertical tensile splitting reinforcement $A_{s,v}$.
- ③ Install the horizontal transverse tensile reinforcement $A_{s,h}$ (min. $\varnothing 8$ mm), if required with end anchorage.

⚠ On-site reinforcement acc. to structural engineer specifications.

2 Fix the clamps

At least four CSB bearings per metre space have to be fixed with clamps to secure the position of the HALFEN elements during transport.

Permissible installation

- A One end is hooked into an upper hole and the other into a lower hole of the CSB bearing.

⚠ Not permitted installation:

- B Clamps are fixed into one hole only.

3 Install the CSB-Box

Check that the red arrows on the unit are pointing towards the balcony!
The clamps can be fixed with a nail or additionally tied to the reinforcement.

⚠ Ensure all HIT elements are securely positioned.

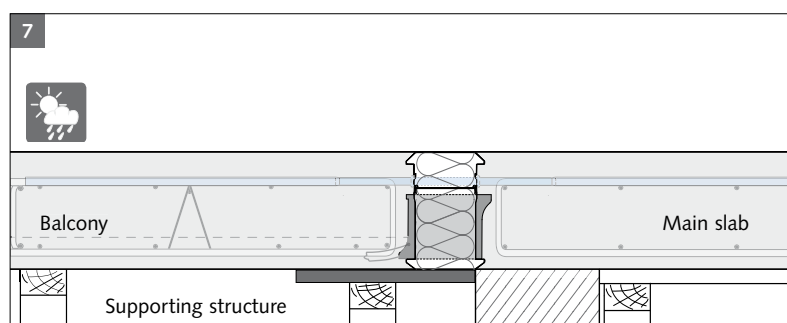
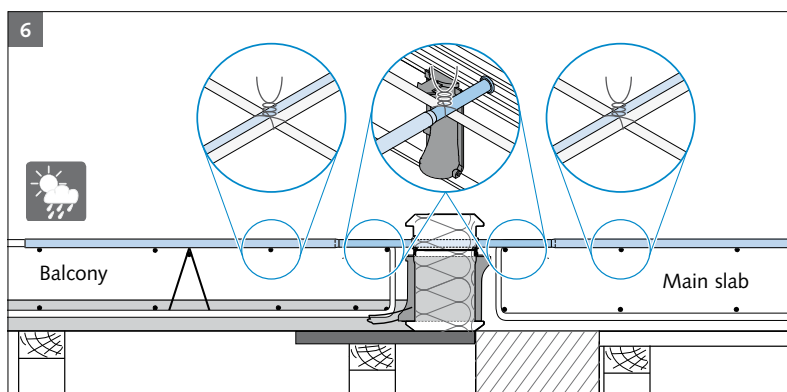
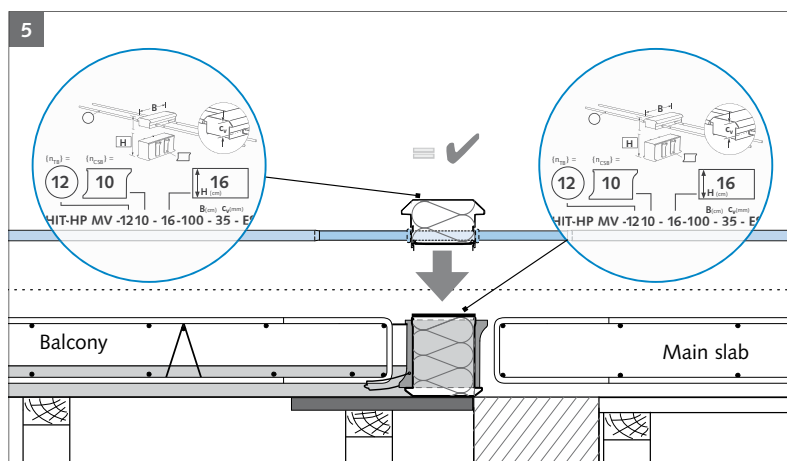
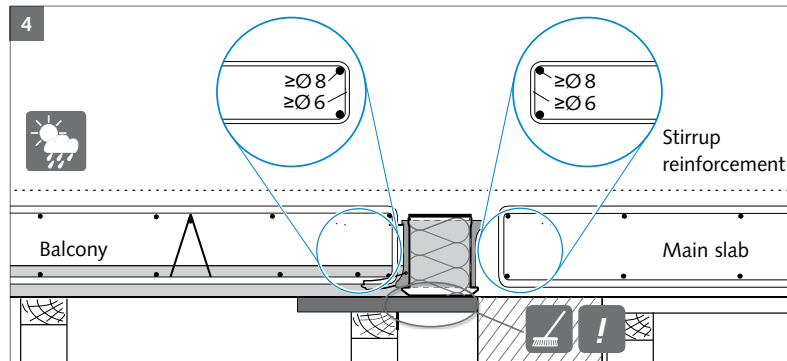
Pour the concrete for the element slab

⚠ Never place timber supports under the HIT Units!

Transport to the construction site

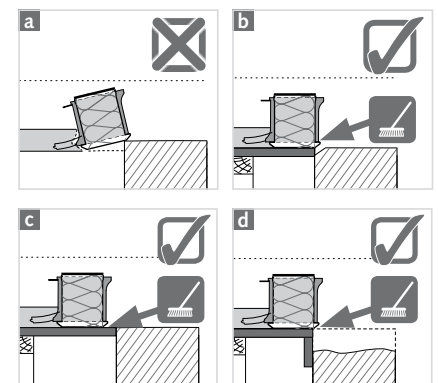
Ensure elements are properly secured during transport.
Do not rest concrete element slabs on other exposed HIT elements.

Installation Diagram for precast plant installation



4 Install the on-site element slab reinforcement

The on-site reinforcement must be placed as specified by the structural engineer.



- a) **Not permitted:** HIT Element distorted by the support
- b) **Permissible:** Support with bevelled edges
- c) **Permissible:** Installation with horizontal offset
- d) **Permissible:** Concreting top of support and main slab simultaneously

5 Install the tension bar box

CSB-Boxes and Tension bar boxes may only be connected with each other if they are **identically marked**.

Make sure the CSB-Box is supported over its whole length during installation. First the Tension bar box is fixed at one end then pressed against the CSB-Box until it snaps into place along the whole length of the element.

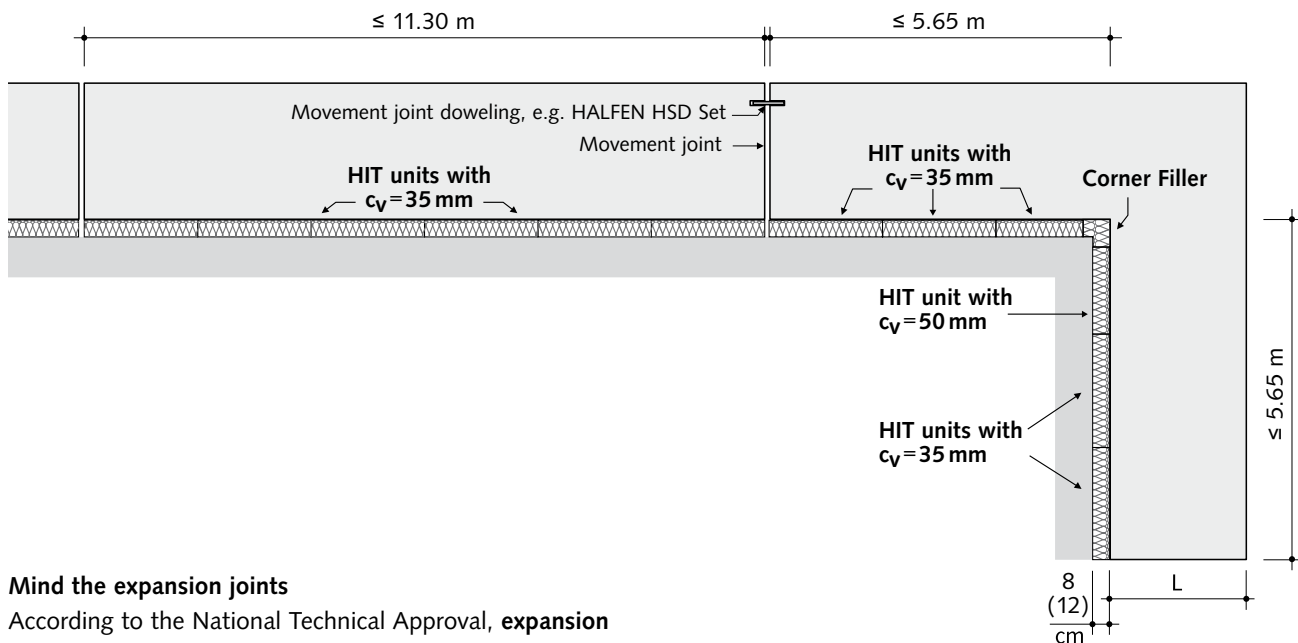


6 Fix the HIT Tension bars to on-site reinforcement using tying wire.

7 Pour the concrete

Freshly concreted balcony slab on supporting structure

Joint spacings



Mind the expansion joints

According to the National Technical Approval, **expansion joints must be provided** in the external concrete components at a right angle to the insulation line of the HIT units. In straight, cantilevered balcony slabs the distance between joints must not exceed 11.30 m.

In balcony structures extending past an outer corner a joint must be planned at least every $11.3 \text{ m} / 2 = 5.65 \text{ m}$.

For inside corners the limit is 5.65 m for each length.

Integrated safety concept

HALFEN's integrated safety concept includes **all necessary verifications** including shear force analysis for concrete compressive struts – according to DIN 1045-1 / DIN EN 1992-1-1 (EC2) – for design of HALFEN HIT Insulated connections.

The shear force verification above may become decisive, especially in minimal slab thicknesses. Consequently, the steel load bearing capacities for the proposed insulated connections can only be partially applied.

Including the shear force verification of the concrete compressive strut in the load bearing capacity allows the structural engineer to make a statically and economically reasonable selection of elements, without requiring additional verifications for the insulated connections. → This helps to ensure that HALFEN HIT Insulated connections are selected and used in compliance with the approval.

The HALFEN HIT Insulated connection integrated safety concept does not include the verification of any adjoining structural elements.

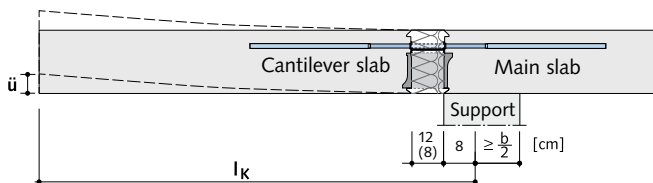
Camber HIT-HP MV, HIT-SP MV

Deflection of the balcony slab

To limit flexure we recommend under-exaggerating the planned drainage flow when casting cantilevered slabs. The calculable increase in camber results from component deformation according to DIN 1045-1 / DIN EN 1992-1-1 and DIN EN 1992-1-1/NA plus the deformation $\ddot{u}$ of the HIT Iso-Elements.

The coefficient factor for camber increase $\ddot{u}$ on page 33 refers **only to deformation** in HALFEN HIT Iso-Elements HIT-HP MV and HIT-SP MV at maximum performance in a quasi-permanent load-combination for the following boundary limits:

- $G_k = 0.6 (G_k + Q_k)$
- $Q_k = 0.4 (G_k + Q_k)$
- $\Psi_2 = 0.3$



System assumptions

Cantilever length balcony	l_k	[m]	1.9
Slab thickness	h	[cm]	18
Concrete cover	c_{nom}	[mm]	35
Concrete strength			C25/30

Load assumptions

Dead load of balcony slab	g_k	[kN/m ²]	4.5
Dead load of decking	$g_{k,Bel}$	[kN/m ²]	1.5
Traffic load on balustrade	$g_{k,Gel}$	[kN/m]	1.5
Traffic load	q_k	[kN/m ²]	4.0

Internal force variables

Bending moment dead load	$m_{G,k}$	[kNm/m]	13.68
Bending moment live load	$m_{Q,k}$	[kNm/m]	7.22
Shear force dead load	$v_{k,EG}$	[kN/m]	12.9
Shear force traffic load	$v_{k,VL}$	[kN/m]	7.6
Bending moment	m_{Ed}	[kNm/m]	29.3
Shear force	v_{Ed}	[kN/m]	28.8

When considering the partial safety factor this results in a ratio of the quasi-permanent load-combination $E_{d,perm}$ to the limit of load capacity R_d of:
 $E_{d,perm} = 0.524 R_d$.

The coefficients factor $\ddot{u}^*$ for camber increase refers to maximum moment load capacity in the HALFEN Iso-Element. It is recommended to consider each present load-combination $E_{d,perm}$ when calculating the camber increase $\ddot{u}$.

$$\ddot{u} [\text{mm}] = \ddot{u}^* \times l_k [\text{m}] \times 10 \times \frac{m_{Ed,perm}}{(0.524 \times m_{Rd})}$$

with $\ddot{u}$ Camber from HIT components deformation in [mm]
 $\ddot{u}^*$ Camber coefficient → see page 33
 l_k Span of cantilever slab in [m]
 m_{Rd} Design value of the load bearing capacity in [kNm/m]
 $m_{d,perm}$ Bending moment at maximum performance (quasi-permanent combination) in [kNm/m]

HALFEN HIT Insulated connection type HIT-HP MV-0604-18-100-35

Moment bearing capacity m_{Rd}	[kNm/m]	29.8	> 29.3
Shear capacity v_{Rd}	[kN/m]	64.0	> 28.8

Quasi-permanent load combination with $\Psi_2 = 0.3$

Bending moment

$$m_{d,perm} = (g_k + g_{k,Bel} + 0.3 \times q_k) \times l_k^2 / 2 + g_{k,Gel} \times l_k$$

$$= (4.5 + 1.5 + 0.3 \times 4.0) \times 1.9^2 / 2 + 1.5 \times 1.9$$

$$= 15.8 \text{ kNm/m}$$

Camber

$\ddot{u}^* = 0.82 \%$
 read from table for: $h = 180$ and $n_{TB} = 6$
 → $180 \text{ mm} - 35 \text{ mm} = 145 \text{ mm}$

Camber from HIT components deformation

$$\ddot{u} = \ddot{u}^* \times l_k \times 10 \times m_{Ed,perm} / (0.524 \times m_{Rd})$$

$$= 0.82 \times 1.9 \times 10 \times 15.8 / (0.524 \times 29.8)$$

$$= 15.8 \text{ mm}$$

$$= 1.6 \text{ cm}$$



Note:

Observe the deflections limits according to
 DIN 1045-1 chapter 11.3.2 /
 DIN EN 1992-1-1/NA (EC2) → page 26

Camber $\ddot{u}^*$ HIT-HP MV, HIT-SP MV

HIT-HP MV: Camber values [%] at maximum element load bearing capacity (M_{Rd})						
Slab thickness h [mm]			Number of tension bars n_{TB} per element meter			
Concrete cover [mm]			$n_{TB} \leq 8$ tension bars per metre at concrete strength		$n_{TB} > 8$ tension bars per metre at concrete strength	
30	35	50	C20/25	$\geq C25/30$	C20/25	$\geq C25/30$
	160		0.95	0.99	0.83	0.94
160		180	0.90	0.94	0.78	0.89
	170		0.86	0.89	0.74	0.85
170		190	0.82	0.85	0.71	0.81
	180		0.79	0.82	0.68	0.77
180		200	0.75	0.78	0.65	0.74
	190		0.72	0.75	0.62	0.71
190		210	0.70	0.72	0.60	0.68
	200		0.67	0.70	0.58	0.65
200		220	0.65	0.67	0.55	0.63
	210		0.63	0.65	0.53	0.61
210		230	0.60	0.63	0.52	0.59
	220		0.59	0.61	0.50	0.57
220		240	0.57	0.59	0.48	0.55
	230		0.55	0.57	0.47	0.53
230		250	0.53	0.56	0.45	0.52
	240		0.52	0.54	0.44	0.50
240		260	0.50	0.52	0.43	0.49
	250		0.49	0.51	0.42	0.47
250		270	0.48	0.50	0.41	0.46

HIT-SP MV: camber values [%] at maximum element load bearing capacity (M_{Rd})						
Slab thickness h [mm]			Number of tension bars n_{TB} per element meter			
Concrete cover [mm]			$n_{TB} \leq 8$ tension bars per metre at concrete strength		$n_{TB} > 8$ tension bars per metre at concrete strength	
30	35	50	C20/25	$\geq C25/30$	C20/25	$\geq C25/30$
	160		1.04	1.11	0.89	1.05
160		180	0.99	1.05	0.84	0.99
	170		0.95	1.00	0.80	0.95
170		190	0.90	0.96	0.76	0.90
	180		0.86	0.92	0.73	0.86
180		200	0.83	0.88	0.70	0.83
	190		0.79	0.84	0.67	0.79
190		210	0.76	0.81	0.65	0.76
	200		0.74	0.78	0.62	0.73
200		220	0.71	0.75	0.60	0.71
	210		0.69	0.73	0.58	0.68
210		230	0.66	0.70	0.56	0.66
	220		0.64	0.68	0.54	0.64
220		240	0.62	0.66	0.52	0.62
	230		0.60	0.64	0.51	0.60
230		250	0.58	0.62	0.49	0.58
	240		0.57	0.60	0.48	0.56
240		260	0.55	0.59	0.46	0.55
	250		0.54	0.57	0.45	0.53
250		270	0.52	0.56	0.44	0.52

The camber $\ddot{u}^*$ is given for each slab thickness, for ≤ 8 tension bars per metre and > 8 per metre accordingly.

Introduction HIT-HP MV-OU/-OD, HIT-SP MV-OU/-OD

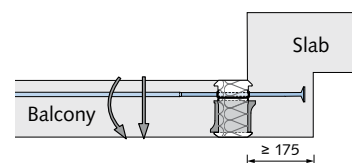
HIT-HP MV-OU/-OD, HIT-SP MV-OU/-OD

- For cantilevered balcony slabs with height offset or wall connections
- Transfer of bending moments and shear forces

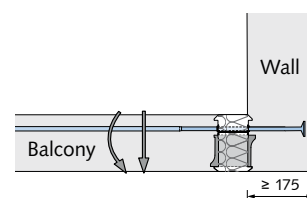
HIT-HP/SP MV-OD



HIT-HP MV-OD and HIT-SP MV-OD
Height offset,
balcony lower than main slab



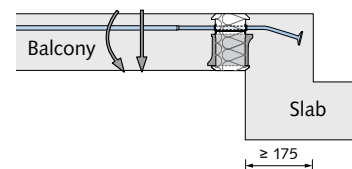
HIT-HP MV-OD and HIT-SP MV-OD
Downward wall connection



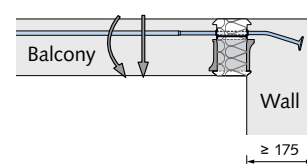
HIT-HP/SP MV-OU



HIT-HP MV-OU and HIT-SP MV-OU
Height offset,
balcony higher than main slab



HIT-HP MV-OU and HIT-SP MV-OU
Upward wall connection



Chapter 2 - Content

Page

Load ranges	HIT-HP/SP MV -OU/-OD	35
Load bearing capacity values	HIT-HP MV -OU/-OD	36
Load bearing capacity values	HIT-SP MV -OU/-OD	38
On-site reinforcement - Installation diagram	HIT-HP/SP MV -OU/-OD	40
Installation diagram	HIT-HP/SP MV -OU/-OD	41

Load range

The respective load range results from the corresponding combination of TB- and CSB-Box.
The combinations of TB- and CSB-Box illustrated in the following table are possible.

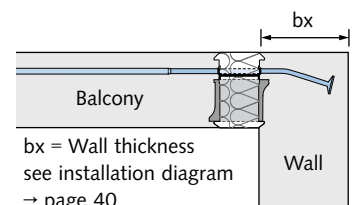
Load range: Possible combinations of TB-Boxes and CSB-Boxes											
Element width B = 25 cm		Number of tension bars n _{TB}									
		1	2	3							
Number of compression shear bearings n _{CSB}	1	●	●								
	2	×	●	●							
Element width B = 50 cm		Number of tension bars n _{TB}									
		2	3	4	5	6					
Number of compression shear bearings n _{CSB}	2	●	●	●							
	3	●	●	●	●	○					
	4	×	●	●	●	●					
	5		×	●	●	●					
Element width B = 100 cm		Number of tension bars n _{TB}									
		4	5	6	7	8	9	10	11	12	
Number of compression shear bearings n _{CSB}	4	●	●	●	●	●	×				
	5	●	●	●	●	●	●	●	×		
	6	●	●	●	●	●	●	●	●	●	
	7	×	×	●	●	●	●	●	●	●	
	8	×	×	●	●	●	●	●	●	●	
	9		×	×	●	●	●	●	●	●	
	10			×	●	●	●	●	×	×	
Information on Material Specifications and Test Certificates can be found at page 10. The load bearing capacity values for the selected elements can be found on pages 36 – 39. For further load capacity values please contact us. → see inside back cover for contact details											
● = HP and SP ○ = SP only × = HP only											

Basic types – Ordering example

	HIT-HP	MV	-0705	-20	-100	-35	-OD 175	-ES
Product group - Type								
Load type								
Number of tension bars								
Number of CSB								
Element thickness [cm]								
Element width [cm]								
Concrete cover [mm]								
Installation situation								
Wall/Beam thickness bx [mm]								
For element slab design only								

Customized designs

Please contact us for information about the feasibility of customizing HALFEN HIT Insulated connections for your project.
→ see inside back cover for contact details.



Note:

175 mm < bx < 330 mm (HP)
175 mm < bx < 290 mm (SP)

Possible slab thickness h

Concrete cover [mm]	30	35	50
Possible slab thickness h [cm]	16 – 30	16 – 30	18 – 30

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

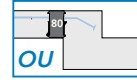
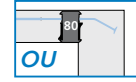


Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Element Widths B = 1.00 / 0.50 / 0.25 m

Load bearing capacity values for HIT-HP MV-OU



V_{Rd} Shear capacity in one direction



Shear capacity	B = 1.00 m	HP MV-0404-...-OU	HP MV-0504-...-OU	HP MV-0805-...-OU	HP MV-1006-...-OU	HP MV-1210-...-OU
	B = 0.50 m	HP MV-0202-...-OU	—	—	HP MV-0503-...-OU	HP MV-0605-...-OU
	B = 0.25 m	HP MV-0101-...-OU	—	—	—	—
Design values v_{Rd} [kN/m]		64.0 64.0	64.0 64.0	80.0 80.0	96.0 96.0	146.3 147.6



m_{Rd} Moment bearing capacity for all element widths

Note: Concrete strength $C20/25 / \geq C25/30$

34.6	36.2
------	------

Moment bearing capacity	B = 1.00 m			HP MV-0404-...-OU	HP MV-0504-...-OU		HP MV-0805-...-OU		HP MV-1006-...-OU		HP MV-1210-...-OU		
	B = 0.50 m			HP MV-0202-...-OU	—		—		HP MV-0503-...-OU		HP MV-0605-...-OU		
	B = 0.25 m			HP MV-0101-...-OU	—		—		—		—		
Concrete cover [mm]	30	35	50	Concrete strength: <i>C20/25</i> / ≥ C25/30									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		16.9	17.4	20.0	20.8	29.5	31.2	34.0	38.5	44.9	50.5
	160		180	17.9	18.4	21.3	22.1	31.5	33.2	36.2	41.0	47.5	53.4
		170		18.9	19.4	22.5	23.3	33.5	35.2	38.5	43.4	50.2	56.4
	170		190	19.9	20.4	23.7	24.5	35.4	37.1	40.7	45.9	52.8	59.3
		180		20.8	21.4	24.9	25.8	37.4	39.1	42.9	48.4	55.5	62.3
	180		200	21.8	22.4	26.2	27.0	39.4	41.1	45.1	50.8	58.2	65.2
		190		22.8	23.3	27.4	28.2	41.3	43.0	47.3	53.3	60.8	68.2
	190		210	23.8	24.3	28.6	29.5	43.3	45.0	49.5	55.7	63.5	71.1
		200		24.8	25.3	29.9	30.7	45.3	47.0	51.7	58.2	66.1	74.1
	200		220	25.8	26.3	31.1	31.9	47.3	48.9	54.0	60.7	68.8	77.0
		210		26.7	27.3	32.3	33.1	49.2	50.9	56.2	63.1	71.4	80.0
	210		230	27.7	28.3	33.6	34.4	51.2	52.9	58.4	65.6	74.1	82.9
		220		28.7	29.2	34.8	35.6	53.2	54.8	60.6	68.0	76.8	85.9
	220		240	29.7	30.2	36.0	36.8	55.1	56.8	62.8	70.5	79.4	88.9
		230		30.7	31.2	37.2	38.1	57.1	58.8	65.0	73.0	82.1	91.8
	230		250	31.7	32.2	38.5	39.3	59.1	60.7	67.2	75.4	84.7	94.8
		240		32.6	33.2	39.7	40.5	61.0	62.7	69.5	77.9	87.4	97.7
	240		260	33.6	34.2	40.9	41.8	63.0	64.7	71.7	80.3	90.0	100.7
	250		34.6	35.1	42.2	43.0	65.0	66.6	73.9	82.8	92.7	103.6	
250		270	35.6	36.1	43.4	44.2	66.9	68.6	76.1	85.3	95.4	106.6	



A_s On-site reinforcement $A_{s,req}$ on balcony side (→ page 40)

Edge frame	direct support	$\varnothing 6 / 25 \text{ cm}$	$\varnothing 6 / 15 \text{ cm}$
------------	----------------	---------------------------------	---------------------------------



A_s Minimum on-site stirrup reinforcement on main slab side (Stirrups are considered as single lap jointed)

Number of stirrups per metre	5	6	9	11	13
Cross section A_{SW} [cm ² /m] per leg	5.7	6.8	10.2	12.4	14.7

Minimum transverse reinforcement: At least one reinforcement bar $\varnothing 12 \text{ mm}$ must be placed next to the anchor head on the side nearest to the element edge.



All necessary verifications including concrete shear pressure have already been considered.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

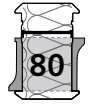
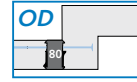
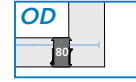


Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Element Widths B = 1.00 / 0.50 / 0.25 m

Load bearing capacity values for HIT-HP MV-OD



V_{Rd} Shear capacity in one direction



Shear capacity	B = 1.00 m	HP MV-0404-...-OD	HP MV-0504-...-OD	HP MV-0806-...-OD	HP MV-1007-...-OD	HP MV-1210-...-OD
	B = 0.50 m	HP MV-0202-...-OD	—	HP MV-0403-...-OD	—	HP MV-0605-...-OD
	B = 0.25 m	HP MV-0101-...-OD	—	—	—	—
Design values V_{Rd} [kN/m]		57.6 64.0	45.4 51.8	62.4 71.0	76.2 75.0	62.9 59.0



m_{Rd} Moment bearing capacity for all element widths

Note: Concrete strength $C20/25 / \geq C25/30$
34.6 36.2

Moment bearing capacity	B = 1.00 m			HP MV-0404-...-OD	HP MV-0504-...-OD		HP MV-0806-...-OD		HP MV-1007-...-OD		HP MV-1210-...-OD		
	B = 0.50 m			HP MV-0202-...-OD	—		HP MV-0403-...-OD		—		HP MV-0605-...-OD		
	B = 0.25 m			HP MV-0101-...-OD	—		—		—		—		
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 / ≥ C25/30									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		16.9	17.4	20.0	20.8	31.4	32.8	35.8	40.3	44.9	50.5
	160		180	17.9	18.4	21.3	22.1	33.4	34.8	38.0	42.8	47.5	53.4
		170		18.9	19.4	22.5	23.3	35.4	36.8	40.2	45.3	50.2	56.4
	170		190	19.9	20.4	23.7	24.5	37.3	38.7	42.4	47.7	52.8	59.3
		180		20.8	21.4	24.9	25.8	39.3	40.7	44.6	50.2	55.5	62.3
	180		200	21.8	22.4	26.2	27.0	41.3	42.7	46.8	52.6	58.2	65.2
		190		22.8	23.3	27.4	28.2	43.2	44.7	49.0	55.1	60.8	68.2
	190		210	23.8	24.3	28.6	29.5	45.2	46.6	51.2	57.6	63.5	71.1
		200		24.8	25.3	29.9	30.7	47.2	48.6	53.5	60.0	66.1	74.1
	200		220	25.8	26.3	31.1	31.9	49.2	50.6	55.7	62.5	68.8	77.0
		210		26.7	27.3	32.3	33.1	51.1	52.5	57.9	64.9	71.4	80.0
	210		230	27.7	28.3	33.6	34.4	53.1	54.5	60.1	67.4	74.1	82.9
		220		28.7	29.2	34.8	35.6	55.1	56.5	62.3	69.9	76.8	85.9
	220		240	29.7	30.2	36.0	36.8	57.0	58.4	64.5	72.3	79.4	88.9
		230		30.7	31.2	37.2	38.1	59.0	60.4	66.7	74.8	82.1	91.8
	230		250	31.7	32.2	38.5	39.3	61.0	62.4	69.0	77.2	84.7	94.8
		240		32.6	33.2	39.7	40.5	62.9	64.3	71.2	79.7	87.4	97.7
	240		260	33.6	34.2	40.9	41.8	64.9	66.3	73.4	82.2	90.0	100.7
		250		34.6	35.1	42.2	43.0	66.9	68.3	75.6	84.6	92.7	103.6
250		270	35.6	36.1	43.4	44.2	68.8	70.2	77.8	87.1	95.4	106.6	



A_s On-site reinforcement $A_{s,req}$ on balcony side (→ page 40)

Edge frame	direct support	Ø 6 / 25 cm	Ø 6 / 15 cm
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A_s Minimum on-site stirrup reinforcement on main slab side (Stirrups are considered as single lap jointed)

Number of stirrups per metre	5	6	9	11	13
Cross section A_{SW} [cm ² /m] per leg	5.7	6.8	10.2	12.4	14.7

Minimum transverse reinforcement: At least one reinforcement bar Ø 12 mm must be placed next to the anchor head on the side nearest to the element edge.



All necessary verifications including concrete shear pressure have already been considered.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

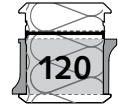
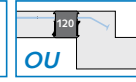
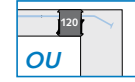


Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Element Widths B = 1.00 / 0.50 / 0.25 m

Load bearing capacity values for HIT-SP MV-OU



v_{Rd} Shear capacity in one direction



Shear capacity	B = 1.00 m	SP MV-0404-...-OU	SP MV-0504-...-OU	SP MV-0705-...-OU	SP MV-0907-...-OU	SP MV-1209-...-OU
	B = 0.50 m	SP MV-0202-...-OU	—	—	—	—
	B = 0.25 m	SP MV-0101-...-OU	—	—	—	—
Design values v_{Rd} [kN/m]		61.4 64.0	62.0 64.0	74.3 80.0	109.3 112.0	120.9 120.7

Note: Concrete strength $C_{20/25} / \geq C_{25/30}$

34.6	36.2
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m_{Rd} Moment bearing capacity for all element widths

Moment bearing capacity	B = 1.00 m			SP MV-0404-...-OU	SP MV-0504-....-OU		SP MV-0705-...-OU		SP MV-0907-...-OU		SP MV-1209-...-OU		
	B = 0.50 m			SP MV-0202-...-OU	—		—		—		—		
	B = 0.25 m			SP MV-0101-...-OU	—		—		—		—		
Concrete cover [mm]	30	35	50	Concrete strength: <i>C20/25</i> / ≥ C25/30									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		<i>16.9</i>	17.4	<i>20.0</i>	20.8	<i>27.1</i>	28.4	<i>33.1</i>	37.3	<i>43.7</i>	49.3
	160		180	<i>17.9</i>	18.4	<i>21.3</i>	22.1	<i>28.8</i>	30.1	<i>35.1</i>	39.5	<i>46.4</i>	52.2
		170		<i>18.9</i>	19.4	<i>22.5</i>	23.3	<i>30.5</i>	31.8	<i>37.1</i>	41.7	<i>49.0</i>	55.2
	170		190	<i>19.9</i>	20.4	<i>23.7</i>	24.5	<i>32.3</i>	33.6	<i>39.1</i>	43.9	<i>51.7</i>	58.1
		180		<i>20.8</i>	21.4	<i>24.9</i>	25.8	<i>34.0</i>	35.3	<i>41.1</i>	46.1	<i>54.4</i>	61.1
	180		200	<i>21.8</i>	22.4	<i>26.2</i>	27.0	<i>35.7</i>	37.0	<i>43.1</i>	48.3	<i>57.0</i>	64.0
		190		<i>22.8</i>	23.3	<i>27.4</i>	28.2	<i>37.4</i>	38.7	<i>45.1</i>	50.6	<i>59.7</i>	67.0
	190		210	<i>23.8</i>	24.3	<i>28.6</i>	29.5	<i>39.1</i>	40.4	<i>47.1</i>	52.8	<i>62.3</i>	69.9
		200		<i>24.8</i>	25.3	<i>29.9</i>	30.7	<i>40.9</i>	42.2	<i>49.0</i>	55.0	<i>65.0</i>	72.9
	200		220	<i>25.8</i>	26.3	<i>31.1</i>	31.9	<i>42.6</i>	43.9	<i>51.0</i>	57.2	<i>67.6</i>	75.8
		210		<i>26.7</i>	27.3	<i>32.3</i>	33.1	<i>44.3</i>	45.6	<i>53.0</i>	59.4	<i>70.3</i>	78.8
	210		230	<i>27.7</i>	28.3	<i>33.6</i>	34.4	<i>46.0</i>	47.3	<i>55.0</i>	61.6	<i>72.9</i>	81.7
		220		<i>28.7</i>	29.2	<i>34.8</i>	35.6	<i>47.8</i>	49.0	<i>57.0</i>	63.8	<i>75.6</i>	84.7
	220		240	<i>29.7</i>	30.2	<i>36.0</i>	36.8	<i>49.5</i>	50.8	<i>59.0</i>	66.1	<i>78.3</i>	87.6
		230		<i>30.7</i>	31.2	<i>37.2</i>	38.1	<i>51.2</i>	52.5	<i>61.0</i>	68.3	<i>80.9</i>	90.6
	230		250	<i>31.7</i>	32.2	<i>38.5</i>	39.3	<i>52.9</i>	54.2	<i>63.0</i>	70.5	<i>83.6</i>	93.5
		240		<i>32.6</i>	33.2	<i>39.7</i>	40.5	<i>54.6</i>	55.9	<i>65.0</i>	72.7	<i>86.2</i>	96.5
	240		260	<i>33.6</i>	34.2	<i>40.9</i>	41.8	<i>56.4</i>	57.7	<i>67.0</i>	74.9	<i>88.9</i>	99.4
		250		<i>34.6</i>	35.1	<i>42.2</i>	43.0	<i>58.1</i>	59.4	<i>69.0</i>	77.1	<i>91.5</i>	102.4
	250		270	<i>35.6</i>	36.1	<i>43.4</i>	44.2	<i>59.8</i>	61.1	<i>71.0</i>	79.3	<i>94.2</i>	105.4



$A_{s,req}$ On-site reinforcement $A_{s,req}$ on balcony side (→ page 40)

Edge frame	direct support	Ø 6 / 25 cm	Ø 6 / 20 cm
------------	----------------	-------------	-------------



A_s Minimum on-site stirrup reinforcement on main slab side (Stirrups are considered as single lap jointed)

Number of stirrups per metre	5	6	8	10	13
Cross section A_{SW} [cm²/m] per leg	5.7	6.8	9.0	11.3	14.7

Minimum transverse reinforcement: At least one reinforcement bar Ø 12 mm must be placed next to the anchor head on the side nearest to the element edge.



All necessary verifications including concrete shear pressure have already been considered.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

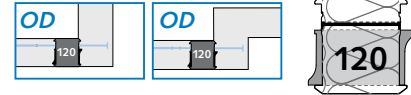


Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Element Widths B = 1.00 / 0.50 / 0.25 m

Load bearing capacity values for HIT-SP MV-OD



v_{Rd} Shear capacity in one direction



Shear capacity	B = 1.00 m	SP MV-0404-...-OD	SP MV-0504-...-OD	SP MV-0705-...-OD	SP MV-0907-...-OD	SP MV-1209-...-OD
	B = 0.50 m	SP MV-0202-...-OD	—	—	—	—
	B = 0.25 m	SP MV-0101-...-OD	—	—	—	—
Design values v_{Rd} [kN/m]		47.9 53.8	36.0 41.6	35.7 42.4	71.0 69.4	44.7 39.8



m_{Rd} Moment bearing capacity for all element widths

Note: Concrete strength $C20/25 / \geq C25/30$
34.6 36.2

Moment bearing capacity	B = 1.00 m			SP MV-0404-...-OD	SP MV-0504-....-OD		SP MV-0705-...-OD		SP MV-0907-...-OD		SP MV-1209-...-OD		
	B = 0.50 m			SP MV-0202-...-OD	—		—		—		—		
	B = 0.25 m			SP MV-0101-...-OD	—		—		—		—		
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 / ≥ C25/30									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		16.9	17.4	20.0	20.8	27.1	28.4	33.1	37.3	43.7	49.3
	160		180	17.9	18.4	21.3	22.1	28.8	30.1	35.1	39.5	46.4	52.2
		170		18.9	19.4	22.5	23.3	30.5	31.8	37.1	41.7	49.0	55.2
	170		190	19.9	20.4	23.7	24.5	32.3	33.6	39.1	43.9	51.7	58.1
		180		20.8	21.4	24.9	25.8	34.0	35.3	41.1	46.1	54.4	61.1
	180		200	21.8	22.4	26.2	27.0	35.7	37.0	43.1	48.3	57.0	64.0
		190		22.8	23.3	27.4	28.2	37.4	38.7	45.1	50.6	59.7	67.0
	190		210	23.8	24.3	28.6	29.5	39.1	40.4	47.1	52.8	62.3	69.9
		200		24.8	25.3	29.9	30.7	40.9	42.2	49.0	55.0	65.0	72.9
	200		220	25.8	26.3	31.1	31.9	42.6	43.9	51.0	57.2	67.6	75.8
		210		26.7	27.3	32.3	33.1	44.3	45.6	53.0	59.4	70.3	78.8
	210		230	27.7	28.3	33.6	34.4	46.0	47.3	55.0	61.6	72.9	81.7
		220		28.7	29.2	34.8	35.6	47.8	49.0	57.0	63.8	75.6	84.7
	220		240	29.7	30.2	36.0	36.8	49.5	50.8	59.0	66.1	78.3	87.6
		230		30.7	31.2	37.2	38.1	51.2	52.5	61.0	68.3	80.9	90.6
	230		250	31.7	32.2	38.5	39.3	52.9	54.2	63.0	70.5	83.6	93.5
		240		32.6	33.2	39.7	40.5	54.6	55.9	65.0	72.7	86.2	96.5
	240		260	33.6	34.2	40.9	41.8	56.4	57.7	67.0	74.9	88.9	99.4
		250		34.6	35.1	42.2	43.0	58.1	59.4	69.0	77.1	91.5	102.4
	250		270	35.6	36.1	43.4	44.2	59.8	61.1	71.0	79.3	94.2	105.4



A_s On-site reinforcement $A_{s,req}$ on balcony side (→ page 40)

Edge frame	direct support	Ø 6 / 25 cm	Ø 6 / 20 cm
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A_s Minimum on-site stirrup reinforcement on main slab side (Stirrups are considered as single lap jointed)

Number of stirrups per metre	5	6	8	10	13
Cross section A_{sw} [cm²/m] per leg	5.7	6.8	9.0	11.3	14.7

Minimum transverse reinforcement: At least one reinforcement bar Ø 12 mm must be placed next to the anchor head on the side nearest to the element edge.

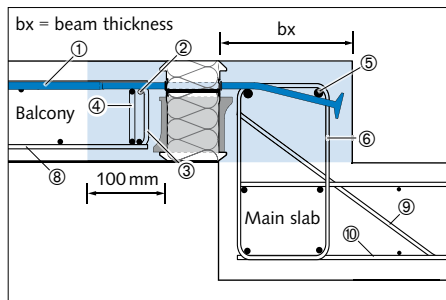


All necessary verifications including concrete shear pressure have already been considered.

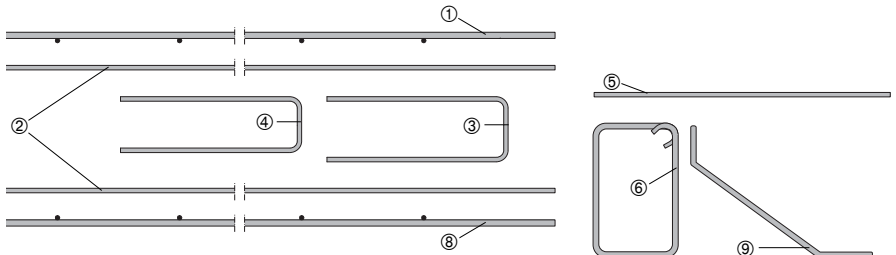
Installation diagram – On-site connecting reinforcement

HIT-HP/-SP MV-OU

Application: upward height offset

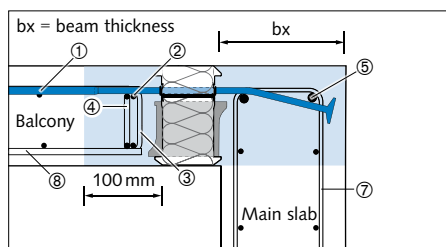


On-site reinforcement HIT-...-OU (detail view)

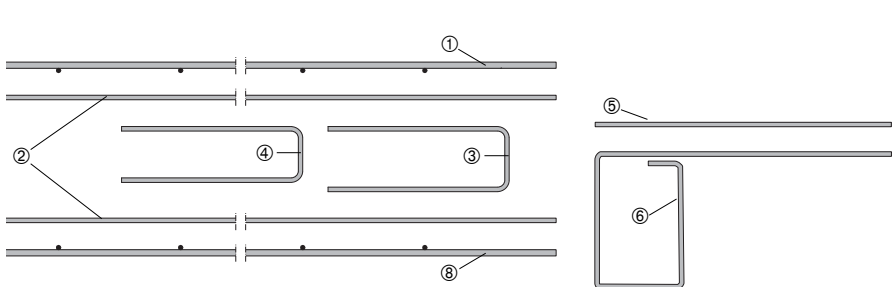


HIT-HP/-SP MV-OU

Application: upward wall connection



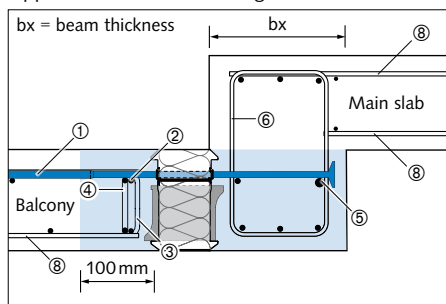
On-site reinforcement HIT-...-OD (detail view)



No construction joints permissible in this area:
On balcony side → vertical
On wall/slab side → vertical and horizontal

HIT-HP/-SP MV-OD

Application: downward height offset



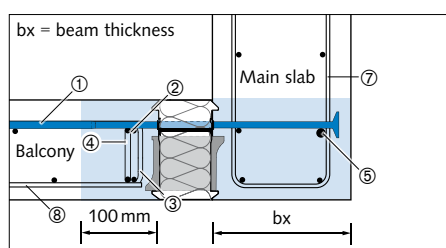
Structural design of on-site reinforcement HIT-HP/-SP MV-OU/-OD

- ① Upper connecting reinforcement made of bar steel or mesh, for reinforcement on the balcony side see also page 26.
- ② Horizontal transverse tensile reinforcement $A_{s,h}$ min. 2 Ø 8, parallel to the joint.
- ③ Vertical tensile splitting reinforcement $A_{s,v}$ min. Ø 6 / 25, see also → pages 36–39.
- ④ Stirrups at slab edge as end anchorage for the transverse tensile reinforcement ③.
- ⑤ Transverse reinforcement, min. Ø 12, adjacent to the anchor bolts.
- ⑥ Required minimum reinforcement for transmitting the loads from the HIT unit, → see pages 36–39.
- ⑦ Required minimum reinforcement as loop or mesh reinforcement with statically required edge enclosure for transmitting the loads from the HIT unit → see also pages 36–39.

Further reinforcement required due to additional load factors (e.g. beam shear reinforcement or bending reinforcement) must be verified by the structural engineer!

HIT-HP/-SP MV-OD

Application: downward wall connection



To be designed by the planner:

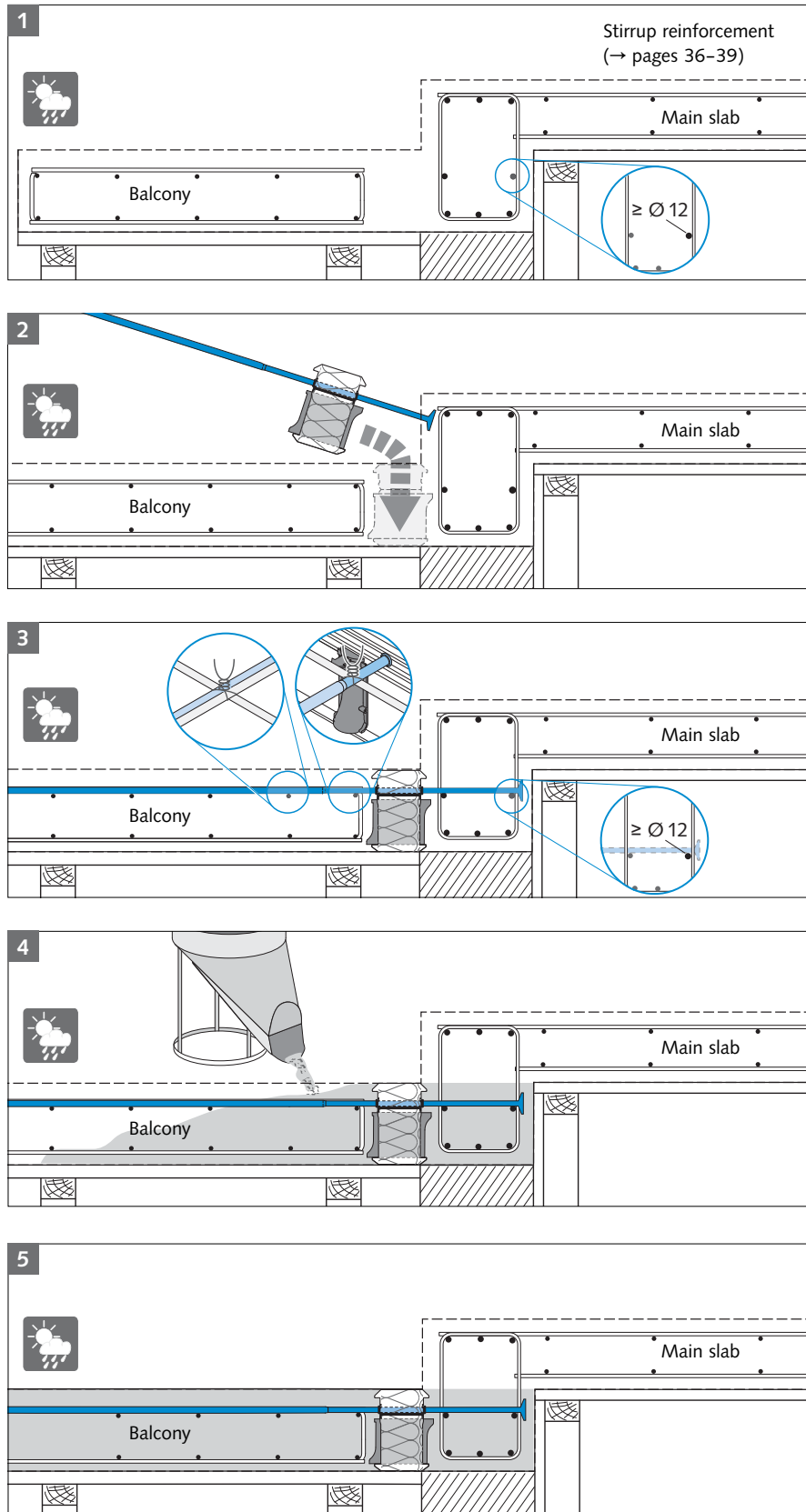
- ⑧ Connecting reinforcement made of steel-bar or mesh.
- ⑨ Diagonal structural reinforcement.
- ⑩ Upper leg of shear bar as loop or mesh reinforcement with statically required edge enclosure on main slab side (OU).

No construction joints permissible in this area:
On balcony side → vertical
On wall/slab side → vertical and horizontal

Design as frame corner!

$bx \geq$ HIT-Element height

Installation diagram



1 Installation of on-site reinforcement

See details on page 40.



Ensure that the formwork is at the correct height!



The on-site reinforcement must be placed as specified by the structural engineer.

2 Installation of HIT unit from above

Check that the red arrows on the HIT unit and the CSB are pointing towards the balcony. Ensure that the anchor bolts are placed behind the vertical structural reinforcement (e.g. stirrup). Minimum concrete cover of the anchor bolts has to be 20 mm.

3 Fixing of HIT tension bars to on-site reinforcement using tying wire

The transverse reinforcement (→ see also pages 36-39): min. Ø 12 mm, must to be placed directly under the anchor bolts.

4 Pouring the concrete

Consider the permissibility of construction joints → see figures on page 40.



To ensure the HIT units are not displaced, pour and compact the concrete evenly.

5 Freshly concreted balcony slab on supporting structure



For element slab design please consider the notes on page 23.

Introduction HIT-HP ZV, HIT-SP ZV

HIT-HP ZV, HIT-SP ZV:

- For simply supported balcony slabs on columns

- Transfer of shear forces only

HIT-HP ZV – High Performance (insulation thickness 80 mm) **with CSB**

HIT-SP ZV – Superior Performance (insulation thickness 120 mm) **with CSB**

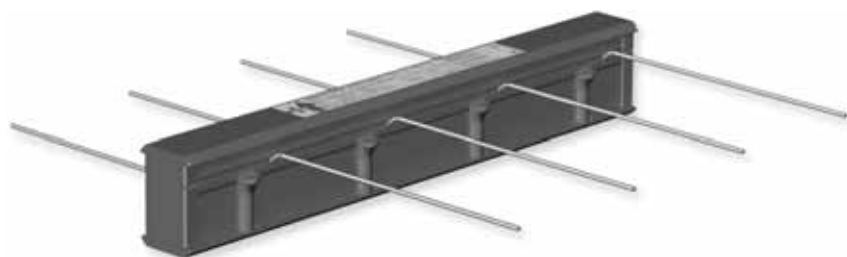
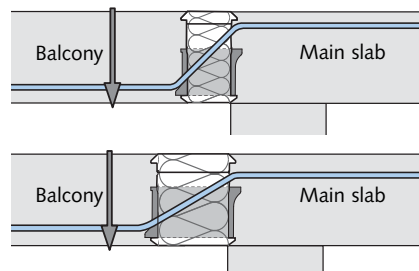


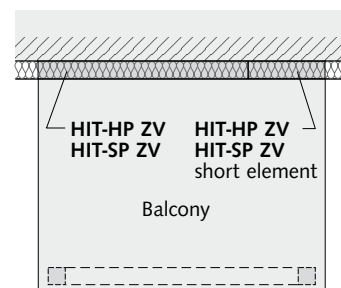
Illustration: HIT-HP ZV, design with straight shear bars, available in $\varnothing 8$, $\varnothing 10$, $\varnothing 12$

HIT-HP ZV, HIT-SP ZV with CSB



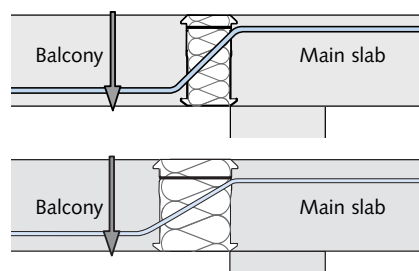
Available element widths
B = 1.00 m / 0.50 m / 0.25 m

Application example HIT-HP ZV / HIT-SP ZV



Simply supported balcony on columns

HIT-HP ZV, HIT-SP ZV without CSB



Available element widths
B = 1.00 m / 0.50 m / 0.25 m

- For unrestrained connection of balcony slabs, e.g. loggias

HIT-HP ZV – High Performance (insulation thickness 80 mm) **without CSB**

HIT-SP ZV – Superior Performance (insulation thickness 120 mm) **without CSB**

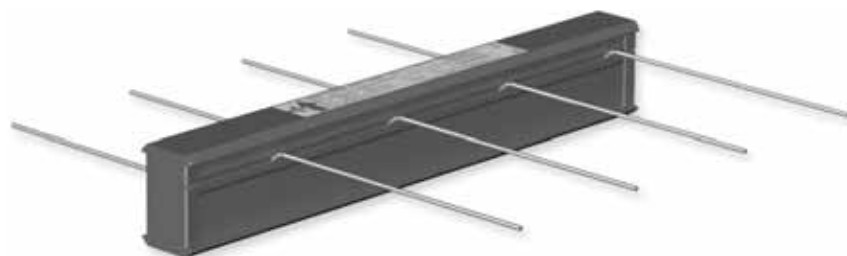


Illustration: HIT-HP ZV without CSB, design with straight shear bars, available in $\varnothing 8$, $\varnothing 10$, $\varnothing 12$

Chapter 3 – Content

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Load bearing capacity values HIT-HP ZV, HIT-SP ZV

Following combinations of SB (Shear Bars) and CSB (Compression Shear Bearings) are possible:

Possible combinations of structural elements					
Element width B = 25 cm		Diameter shear bars [mm]			
		ø 6	ø 8	ø 10	ø 12
Number of shear bars n_{SB}	1	•	•	•	•
	2	•	•	•	•
Element width B = 50 cm		Diameter shear bars [mm]			
		ø 6	ø 8	ø 10	ø 12
Number of shear bars n_{SB}	2	•	•	•	•
	3	•	•	•	•
	4	•	•	•	•
	4				•
Element width B = 100 cm		Diameter shear bars [mm]			
		ø 6	ø 8	ø 10	ø 12
Number of shear bars n_{SB}	4	•	•	•	•
	6	•	•	•	•
	8	•	•	•	•
	8				•
Information on Material Specifications and Test Certificates can be found at page 10.					• = HP and SP ○ = SP only × = HP only

Shear bars – standard design



Shear bars ø 6 mm with bent bars;
type shown: HIT-SP ZV-0404-...-06



Shear bars ø 8 mm, 10 mm and 12 mm with straight bars;
type shown: HIT-SP ZV-0404-...-08

Basic types – ordering example

	HIT-HP	ZV	-08	04	-	18	-	100	-	30	-	08
Type (HP/SP)												
Load type												
No. of shear bars												
No. of comp. shear bearings CSB												
Element height [cm]												
Element width [cm]												
Lower concrete cover [mm]												
Shear bars diameter [mm]												

Customized designs

For information about the feasibility of your custom designed HALFEN HIT Insulated connection please contact us.
For contact information:
→ see inside back cover

Possible slab thickness h

Concrete cover [mm]	bottom: 30		top: ≥ 30	
Diameter of shear bars [mm]	06	08	10	12
Possible slab thickness h [cm]	16 – 30	16 – 30	17 – 30	18 – 30

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE



Load Bearing Capacity Values According to DIN EN 1992-1-1 (EC2) – Element Widths B = 1.00 / 0.50 / 0.25 m

Load bearing capacity values HIT-HP ZV with CSB

Bar diameter $\phi 6$ mm and $\phi 8$ mm



v_{Rd} Shear capacity in one direction

Note: Concrete strength

$C20/25$	$\geq C25/30$
131.67	157.50



Shear capacity HIT-HP ZV	B = 1.00 m	ZV 0404-...-06		ZV 0604-...-06		ZV 0804-...-06		ZV 0404-...-08		ZV 0604-...-08		ZV 0804-...-08	
	B = 0.50 m	ZV 0202-...-06		ZV 0302-...-06		ZV 0402-...-06		ZV 0202-...-08		ZV 0302-...-08		ZV 0402-...-08	
	B = 0.25 m	ZV 0101-...-06		—		ZV 0201-...-06		ZV 0101-...-08		—		ZV 0201-...-08	
Lower concrete cover [mm]	30	Concrete strength: C20/25 / ≥ C25/30											
Design values v_{Rd} [kN/m] for slab thickness* [mm]	160	58.04	58.04	85.55	85.55	111.80	112.04	98.58	98.75	131.67	142.98	131.67	157.50
	170	58.04	58.04	85.55	85.55	111.80	112.04	98.58	98.75	141.78	142.98	149.42	170.43
	180	58.04	58.04	85.55	85.55	111.80	112.04	98.58	98.75	141.78	142.98	161.47	170.43
	190	58.04	58.04	85.55	85.55	111.80	112.04	98.58	98.75	141.78	142.98	170.43	170.43
	200	59.32	59.32	87.69	87.69	115.19	115.19	103.07	103.07	149.95	150.52	184.13	187.63
	210	59.32	59.32	87.69	87.69	115.19	115.19	103.07	103.07	149.95	150.52	187.63	187.63
	220	60.47	60.47	89.85	89.85	118.66	118.66	103.07	103.07	149.95	150.52	187.63	187.63
	230	60.47	60.47	89.85	89.85	118.66	118.66	103.07	103.07	149.95	150.52	187.63	187.63
	240	60.47	60.47	89.85	89.85	118.66	118.66	105.92	105.92	156.20	156.20	204.31	204.67
	250	60.47	60.47	89.85	89.85	118.66	118.66	105.92	105.92	156.20	156.20	204.31	204.67

* For information about the design values v_{Rd} when applying increased slab thickness please contact us. For contact information → see inside back cover



A_s On-site reinforcement $A_{s,req}$ (→ page 51)

Balcony	$\phi 6 / 25$ cm	
Main slab	direct support	$\phi 6 / 20$ cm
	indirect support	$0.31 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 20$ cm

Load bearing capacity values HIT-HP ZV with CSB

Bar diameter $\phi 10$ mm and $\phi 12$ mm

Shear capacity HIT-HP ZV	B = 1.00 m	ZV 0404-...-10		ZV 0604-...-10		ZV 0804-...-10		ZV 0604-...-12		ZV 0804-...-12		ZV 0806-...-12	
	B = 0.50 m	ZV 0202-...-10		ZV 0302-...-10		ZV 0402-...-10		ZV 0302-...-12		ZV 0402-...-12		ZV 0403-...-12	
	B = 0.25 m	ZV 0101-...-10		—		ZV 0201-...-10		—		—		—	
Lower concrete cover [mm]	30	Concrete strength: C20/25 / ≥ C25/30											
Design values v _{Rd} [kN/m] for slab thickness* [mm]	170	146.90	147.15	149.42	171.67	149.42	171.67	—	—	—	—	—	—
	180	146.90	147.15	161.47	185.83	161.47	185.83	161.47	185.83	161.47	185.83	174.16	215.34
	190	146.90	147.15	172.80	188.73	172.80	200.00	172.80	200.00	172.80	200.00	192.18	230.58
	200	155.57	156.26	184.13	208.88	184.13	214.17	184.13	214.17	184.13	214.17	209.74	244.75
	210	155.57	156.26	195.47	208.88	195.47	228.33	195.47	228.33	195.47	228.33	227.47	258.92
	220	155.57	156.26	206.80	208.88	206.80	242.50	206.80	242.50	206.80	242.50	226.74	273.08
	230	155.57	156.26	208.88	208.88	218.13	256.67	218.13	256.67	218.13	256.67	242.87	287.25
	240	155.57	156.26	208.88	208.88	229.47	257.17	229.47	270.83	229.47	270.83	258.77	301.42
	250	162.35	162.35	231.83	231.83	240.80	285.00	240.80	272.62	240.80	285.00	272.80	315.58

* For information about the design values v_{Rd} when applying increased slab thickness please contact us.



A_s On-site reinforcement $A_{s,req}$ (→ page 51)

Balcony	$\phi 6 / 25$ cm	
Main slab	direct support	$\phi 6 / 20$ cm
	indirect support	$0.55 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 20$ cm



All required verifications for load in the insulation including verifying the concrete compression strut have already been considered. Connecting elements must be verified by the planner.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE



Load Bearing Capacity Values According to DIN EN 1992-1-1 (EC2) – Element Widths B = 1.00 / 0.50 / 0.25 m

Load bearing capacity values HIT-HP ZV without CSB

Bar diameter $\phi 6$ mm and $\phi 8$ mm



v_{Rd} Shear capacity in one direction

Note: Concrete strength

$C20/25$	$\geq C25/30$
74.80	93.50



Shear capacity HIT-HP ZV	B = 1.00 m	ZV 0400-...-06		ZV 0600-...-06		ZV 0800-...-06		ZV 0400-...-08		ZV 0600-...-08		ZV 0800-...-08	
	B = 0.50 m	ZV 0200-...-06		ZV 0300-...-06		ZV 0400-...-06		ZV 0200-...-08		ZV 0300-...-08		ZV 0400-...-08	
	B = 0.25 m	ZV 0100-...-06		—		ZV 0200-...-06		ZV 0100-...-08		—		ZV 0200-...-08	
Lower concrete cover [mm]	30	Concrete strength: C20/25 / ≥ C25/30											
Design values v _{Rd} [kN/m] for slab thickness* [mm]	160	31.61	31.61	47.41	47.41	63.22	63.22	53.22	53.22	74.80	79.83	74.80	93.50
	170	31.61	31.61	47.41	47.41	63.22	63.22	53.22	53.22	79.83	79.83	86.13	106.43
	180	31.61	31.61	47.41	47.41	63.22	63.22	53.22	53.22	79.83	79.83	97.47	106.43
	190	31.61	31.61	47.41	47.41	63.22	63.22	53.22	53.22	79.83	79.83	106.43	106.43
	200	34.77	34.77	52.16	52.16	69.54	69.54	61.81	61.81	92.72	92.72	120.13	123.63
	210	34.77	34.77	52.16	52.16	69.54	69.54	61.81	61.81	92.72	92.72	123.63	123.63
	220	40.28	40.28	60.42	60.42	80.56	80.56	61.81	61.81	92.72	92.72	123.63	123.63
	230	40.28	40.28	60.42	60.42	80.56	80.56	61.81	61.81	92.72	92.72	123.63	123.63
	240	40.28	40.28	60.42	60.42	80.56	80.56	71.61	71.61	107.41	107.41	143.22	143.22
	250	40.28	40.28	60.42	60.42	80.56	80.56	71.61	71.61	107.41	107.41	143.22	143.22

* For information about the design values v_{Rd} when applying increased slab thickness please contact us. For contact information → see inside back cover



A_s On-site reinforcement $A_{s,req}$ (→ page 51)

Balcony	$\phi 6 / 25$ cm	
Main slab	direct support	$\phi 6 / 20$ cm
	indirect support	$V_{Ed} / f_{yd} \geq \phi 6 / 20$ cm

Load bearing capacity values HIT-HP ZV without CSB

Bar diameter $\phi 10$ mm and $\phi 12$ mm

Shear capacity HIT-HP ZV	B = 1.00 m	ZV 0400-...-10		ZV 0600-...-10		ZV 0800-...-10		ZV 0400-...-12		ZV 0600-...-12		ZV 0800-...-12	
	B = 0.50 m	ZV 0200-...-10		ZV 0300-...-10		ZV 0400-...-10		ZV 0200-...-12		ZV 0300-...-12		ZV 0400-...-12	
	B = 0.25 m	ZV 0100-...-10		—		ZV 0200-...-10		—		—		—	
Lower concrete cover [mm]	30	Concrete strength: C20/25 / ≥ C25/30											
Design values v_{Rd} [kN/m] for slab thickness* [mm]	170	83.15	83.15	86.13	107.67	86.13	107.67	—	—	—	—	—	—
	180	83.15	83.15	97.47	121.83	97.47	121.83	97.47	119.74	97.47	121.83	97.47	121.83
	190	83.15	83.15	108.80	124.73	108.80	136.00	108.80	119.74	108.80	136.00	108.80	136.00
	200	96.58	96.58	120.13	144.88	120.13	150.17	119.74	119.74	120.13	150.17	120.13	150.17
	210	96.58	96.58	131.47	144.88	131.47	164.33	119.74	119.74	131.47	164.33	131.47	164.33
	220	96.58	96.58	142.80	144.88	142.80	178.50	139.08	139.08	142.80	178.50	142.80	178.50
	230	96.58	96.58	144.88	144.88	154.13	192.67	139.08	139.08	154.13	192.67	154.13	192.67
	240	96.58	96.58	144.88	144.88	165.47	193.17	139.08	139.08	165.47	206.83	165.47	206.83
	250	111.89	111.89	167.83	167.83	176.80	221.00	139.08	139.08	176.80	208.62	176.80	221.00

* For information about the design values v_{Rd} when applying increased slab thickness please contact us.



On-site reinforcement $A_{s,req}$ on balcony side (→ page 51)

Balcony	$\phi 6 / 25$ cm	
Main slab	direct support	$\phi 6 / 20$ cm
	indirect support	$V_{Ed} / f_{yd} \geq \phi 6 / 20$ cm



All required verifications for load in the insulation including verifying the concrete compression strut have already been considered. Connecting elements must be verified by the planner.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE



Load Bearing Capacity Values According to DIN EN 1992-1-1 (EC2) – Element Widths B = 1.00 / 0.50 / 0.25 m

Load bearing capacity values HIT-SP ZV with CSB

Bar diameter $\phi 6$ mm and $\phi 8$ mm



V_{Rd} Shear capacity in one direction

Note: Concrete strength

$C20/25$	$\geq C25/30$
125.73	146.86



Shear capacity HIT-SP ZV	B = 1.00 m	ZV 0404-...-06		ZV 0604-...-06		ZV 0804-...-06		ZV 0404-...-08		ZV 0604-...-08		ZV 0804-...-08	
	B = 0.50 m	ZV 0202-...-06		ZV 0302-...-06		ZV 0402-...-06		ZV 0202-...-08		ZV 0302-...-08		ZV 0402-...-08	
	B = 0.25 m	ZV 0101-...-06		—		ZV 0201-...-06		ZV 0101-...-08		—		ZV 0201-...-08	
Lower concrete cover [mm]	30	Concrete strength: C20/25 / ≥ C25/30											
Design values v _{Rd} [kN/m] for slab thickness* [mm]	160	47.17	47.20	69.16	69.43	90.07	90.76	78.87	79.41	113.01	114.63	125.73	146.86
	170	47.17	47.20	69.16	69.43	90.07	90.76	78.87	79.41	113.01	114.63	141.24	146.86
	180	47.17	47.20	69.16	69.43	90.07	90.76	78.87	79.41	113.01	114.63	143.63	146.86
	190	47.17	47.20	69.16	69.43	90.07	90.76	78.87	79.41	113.01	114.63	143.63	146.86
	200	49.80	49.80	73.35	73.52	95.93	96.43	86.01	86.35	124.58	125.76	160.19	162.66
	210	49.80	49.80	73.35	73.52	95.93	96.43	86.01	86.35	124.58	125.76	160.19	162.66
	220	52.61	52.61	77.97	77.97	102.47	102.71	86.01	86.35	124.58	125.76	160.19	162.66
	230	52.61	52.61	77.97	77.97	102.47	102.71	86.01	86.35	124.58	125.76	160.19	162.66
	240	52.61	52.61	77.97	77.97	102.47	102.71	91.67	91.79	133.98	134.70	174.07	175.61
	250	52.61	52.61	77.97	77.97	102.47	102.71	91.67	91.79	133.98	134.70	174.07	175.61

* For information about the design values V_{Rd} when applying increased slab thickness please contact us. For contact information → see inside back cover



A_s On-site reinforcement $A_{s,req}$ (→ page 51)

Balcony	$\phi 6 / 25$ cm	
Main slab	direct support	$\phi 6 / 20$ cm
	indirect support	$0.33 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 20$ cm

Load bearing capacity values HIT-SP ZV with CSB

Bar diameter $\phi 10$ mm and $\phi 12$ mm

Shear capacity HIT-SP ZV	B = 1.00 m	ZV 0404-...-10		ZV 0604-...-10		ZV 0804-...-10		ZV 0604-...-12		ZV 0804-...-12		ZV 0806-...-12	
	B = 0.50 m	ZV 0202-...-10		ZV 0302-...-10		ZV 0402-...-10		ZV 0302-...-12		ZV 0402-...-12		ZV 0403-...-12	
	B = 0.25 m	ZV 0101-...-10		—		ZV 0201-...-10		—		—		—	
Lower concrete cover [mm]	30	Concrete strength: C20/25 / ≥ C25/30											
Design values VRd [kN/m] for slab thickness* [mm]	170	117.03	118.82	141.24	166.44	141.24	171.67	—	—	—	—	—	—
	180	117.03	118.82	155.81	166.44	155.81	185.83	155.81	185.83	155.81	185.83	167.30	207.79
	190	117.03	118.82	162.64	166.44	169.45	200.00	169.45	200.00	169.45	200.00	183.77	227.89
	200	129.20	130.51	176.58	186.57	176.58	214.17	182.16	211.52	182.16	214.17	199.63	246.17
	210	129.20	130.51	182.96	186.57	190.17	228.33	193.93	211.52	193.93	225.49	214.85	260.33
	220	129.20	130.51	182.96	186.57	203.24	230.30	203.24	242.50	203.24	242.50	217.22	269.70
	230	129.20	130.51	182.96	186.57	215.77	230.30	215.77	243.61	215.77	256.67	232.07	287.85
	240	129.20	130.51	182.96	186.57	227.77	230.30	227.77	243.61	227.77	270.83	246.56	302.83
	250	139.11	139.92	200.05	202.59	236.22	257.17	239.25	243.61	239.25	278.63	260.70	317.00

* For information about the design values V_{Rd} when applying increased slab thickness please contact us. For contact information → see inside back cover



A_s On-site reinforcement $A_{s,req}$ (→ page 51)

Balcony	$\phi 6 / 25$ cm	
Main slab	direct support	$\phi 6 / 20$ cm
	indirect support	$0.61 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 20$ cm



All required verifications for load in the insulation including verifying the concrete compression strut have already been considered. Connecting elements must be verified by the planner.

Load bearing capacity values HIT-SP ZV without CSB

Bar diameter $\phi 6$ mm and $\phi 8$ mm



v_{Rd} Shear capacity in one direction

Note: Concrete strength

$C20/25 \geq C25/30$
74.80 87.42



Shear capacity HIT-SP ZV	B = 1.00 m	ZV 0400-...-06		ZV 0600-...-06		ZV 0800-...-06		ZV 0400-...-08		ZV 0600-...-08		ZV 0800-...-08	
	B = 0.50 m	ZV 0200-...-06		ZV 0300-...-06		ZV 0400-...-06		ZV 0200-...-08		ZV 0300-...-08		ZV 0400-...-08	
	B = 0.25 m	ZV 0100-...-06		—		ZV 0200-...-06		ZV 0100-...-08		—		ZV 0200-...-08	
Lower concrete cover [mm]	30	Concrete strength: C20/25 / ≥ C25/30											
Design values v _{Rd} [kN/m] for slab thickness* [mm]	160	26.06	26.06	39.09	39.09	52.12	52.12	43.71	43.71	65.56	65.56	74.80	87.42
	170	26.06	26.06	39.09	39.09	52.12	52.12	43.71	43.71	65.56	65.56	86.13	87.42
	180	26.06	26.06	39.09	39.09	52.12	52.12	43.71	43.71	65.56	65.56	87.42	87.42
	190	26.06	26.06	39.09	39.09	52.12	52.12	43.71	43.71	65.56	65.56	87.42	87.42
	200	29.93	29.93	44.90	44.90	59.87	59.87	53.22	53.22	79.83	79.83	106.43	106.43
	210	29.93	29.93	44.90	44.90	59.87	59.87	53.22	53.22	79.83	79.83	106.43	106.43
	220	34.77	34.77	52.16	52.16	69.54	69.54	53.22	53.22	79.83	79.83	106.43	106.43
	230	34.77	34.77	52.16	52.16	69.54	69.54	53.22	53.22	79.83	79.83	106.43	106.43
	240	34.77	34.77	52.16	52.16	69.54	69.54	61.81	61.81	92.72	92.72	123.63	123.63
	250	34.77	34.77	52.16	52.16	69.54	69.54	61.81	61.81	92.72	92.72	123.63	123.63

* For information about the design values v_{Rd} when applying increased slab thickness please contact us. For contact information → see inside back cover



A_s On-site reinforcement $A_{s,req}$ (→ page 51)

Balcony	$\phi 6 / 25$ cm	
Main slab	direct support	$\phi 6 / 20$ cm
	indirect support	$V_{Ed} / f_{yd} \geq \phi 6 / 20$ cm

Load bearing capacity values HIT-SP ZV without CSB

Bar diameter $\phi 10$ mm and $\phi 12$ mm

Shear capacity HIT-SP ZV	B = 1.00 m	ZV 0400-...-10		ZV 0600-...-10		ZV 0800-...-10		ZV 0400-...-12		ZV 0600-...-12		ZV 0800-...-12	
	B = 0.50 m	ZV 0200-...-10		ZV 0300-...-10		ZV 0400-...-10		ZV 0200-...-12		ZV 0300-...-12		ZV 0400-...-12	
	B = 0.25 m	ZV 0100-...-10		—		ZV 0200-...-10		—		—		—	
Lower concrete cover [mm]	30	Concrete strength: C20/25 / ≥ C25/30											
Design values v _{Rd} [kN/m] for slab thickness* [mm]	170	68.30	68.30	86.13	102.44	86.13	107.67	—	—	—	—	—	—
	180	68.30	68.30	97.47	102.44	97.47	121.83	97.47	98.35	97.47	121.83	97.47	121.83
	190	68.30	68.30	102.44	102.44	108.80	136.00	98.35	98.35	108.80	136.00	108.80	136.00
	200	83.15	83.15	120.13	124.73	120.13	150.17	98.35	98.35	120.13	147.52	120.13	150.17
	210	83.15	83.15	124.73	124.73	131.47	164.33	98.35	98.35	131.47	147.52	131.47	164.33
	220	83.15	83.15	124.73	124.73	142.80	166.30	119.74	119.74	142.80	178.50	142.80	178.50
	230	83.15	83.15	124.73	124.73	154.13	166.30	119.74	119.74	154.13	179.61	154.13	192.67
	240	83.15	83.15	124.73	124.73	165.47	166.30	119.74	119.74	165.47	179.61	165.47	206.83
	250	96.58	96.58	144.88	144.88	176.80	193.17	119.74	119.74	176.80	179.61	176.80	221.00

* For information about the design values v_{Rd} when applying increased slab thickness please contact us. For contact information → see inside back cover



A_s On-site reinforcement $A_{s,req}$ on balcony side (→ page 51)

Balcony	$\phi 6 / 25$ cm	
Main slab	direct support	$\phi 6 / 20$ cm
	indirect support	$V_{Ed} / f_{yd} \geq \phi 6 / 20$ cm



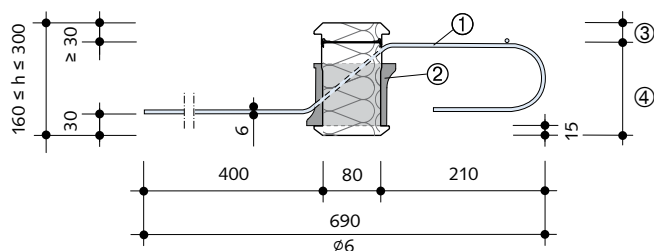
All required verifications for load in the insulation including verifying the concrete compression strut have already been considered. Connecting elements must be verified by the planner.

Product Description HIT-HP ZV, HIT-SP ZV

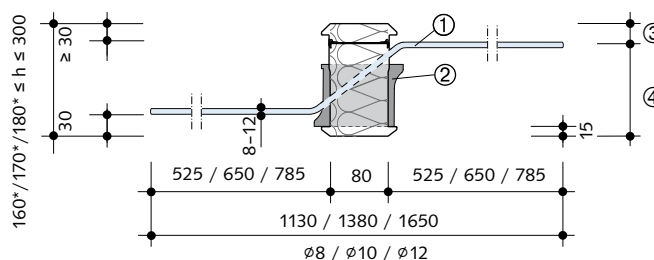
Cross-sections (design examples)

HIT-HP ZV — High Performance with CSB

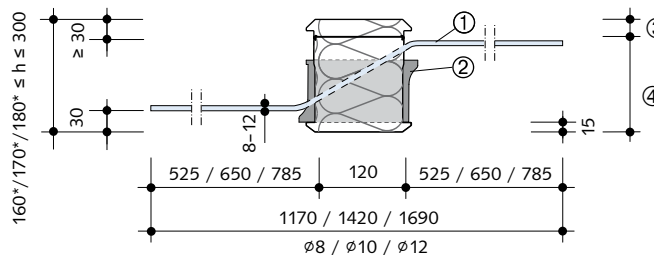
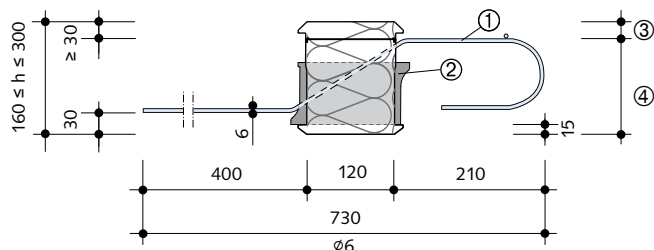
bent shear bars, Ø 6 mm



straight shear bars Ø 8, Ø 10, Ø 12 mm
(also available as a non-standard Ø 6 version)



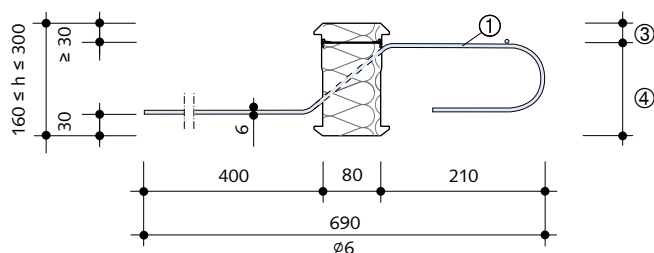
HIT-SP ZV — Superior Performance with CSB



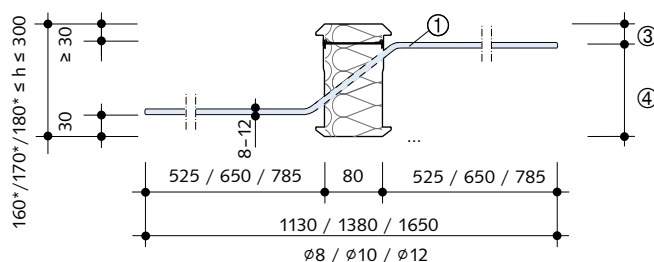
HIT-HP ZV — High Performance without CSB

for unrestrained simply supported connections, e.g. loggias

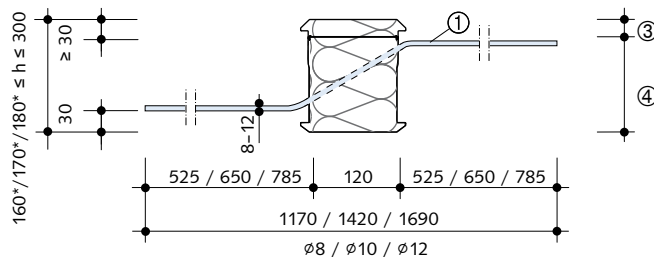
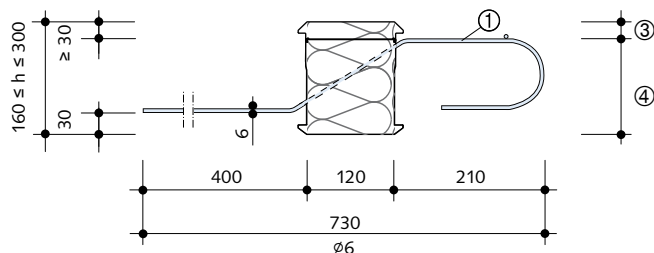
bent shear bars, Ø 6 mm



straight shear bars Ø 8, Ø 10, Ø 12 mm
(also available as a non-standard Ø 6 version)



HIT-SP ZV — Superior Performance without CSB



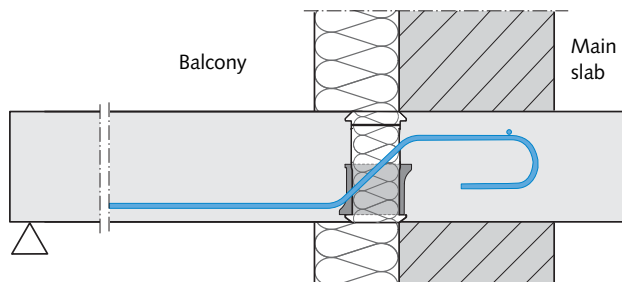
Dimensions in [mm]

- ① Shear bars
- ② Compression shear bearings (CSB)
- ③ Tension bar box
- ④ Compression shear bearings box

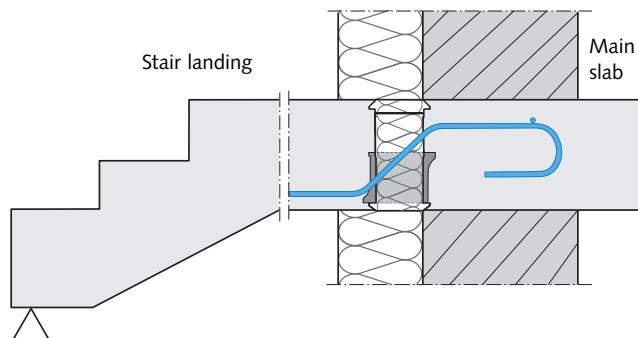
* smallest possible element thickness,
depends on the diameter of the shear bar:
Ø 6 from 160 mm
Ø 8 from 160 mm
Ø 10 from 170 mm
Ø 12 from 180 mm

Application examples in the cross-section of a wall

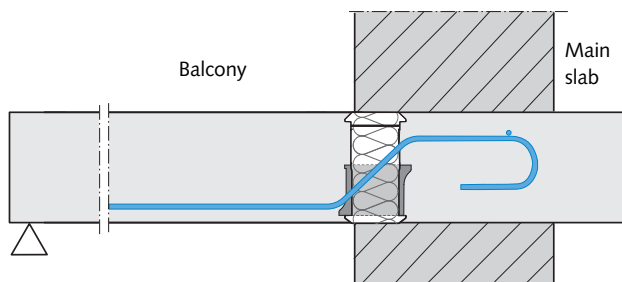
Installation diagram: Masonry cladded with ETICS (external thermal insulation composite system)



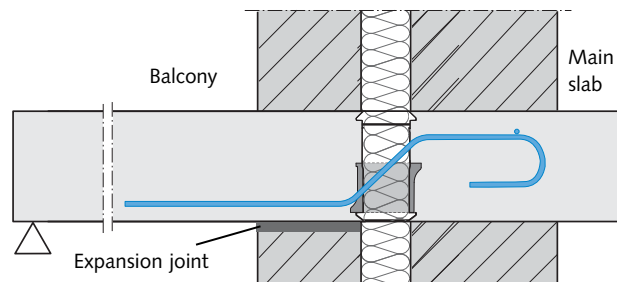
Installation diagram: Stair landing in an entrance area



Installation diagram: Single-leaf masonry with balcony at main slab level

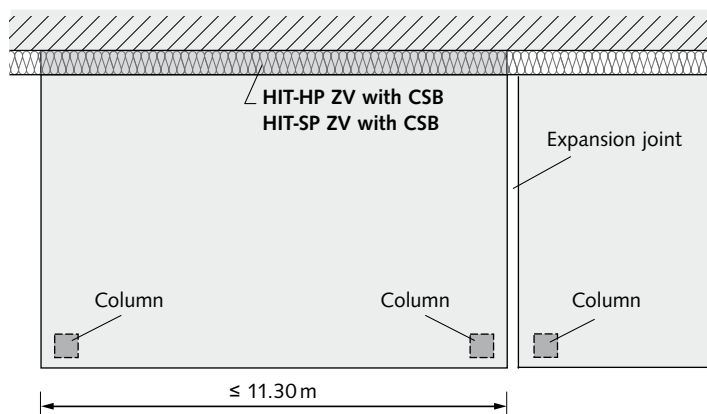


Installation diagram: Double-leaf masonry with balcony at main slab level

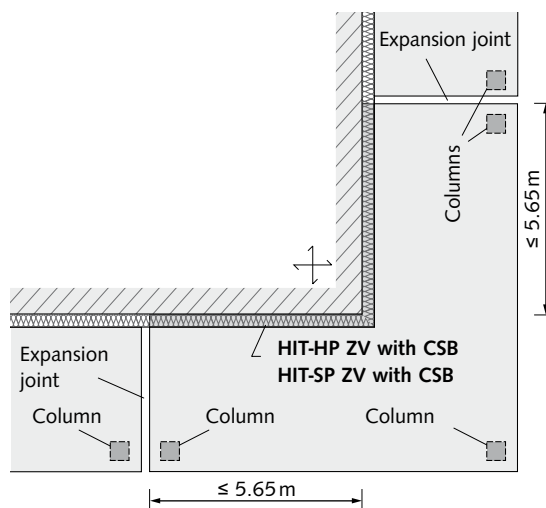


Application examples / Top view of joint spacings for HIT-HP ZV and HIT-SP ZV elements

Application 1: Expansion joint location for straight balcony connection

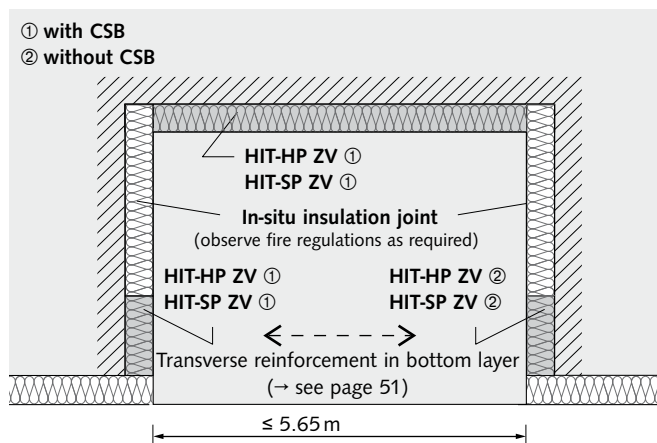


Application 2: Expansion joint location for cantilevered corner balconies

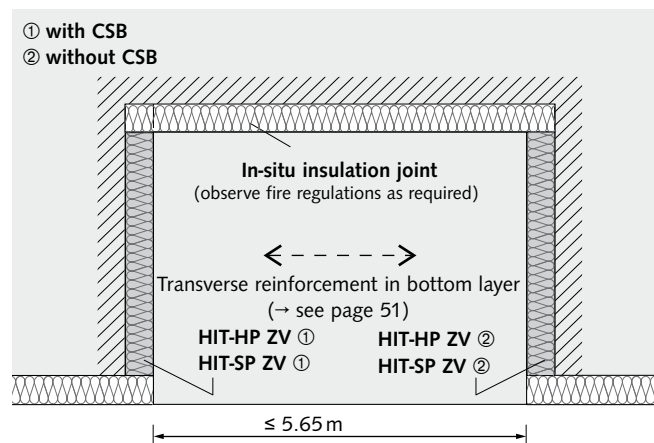


Application examples / Joint Spacings HIT-HP ZV, HIT-SP ZV

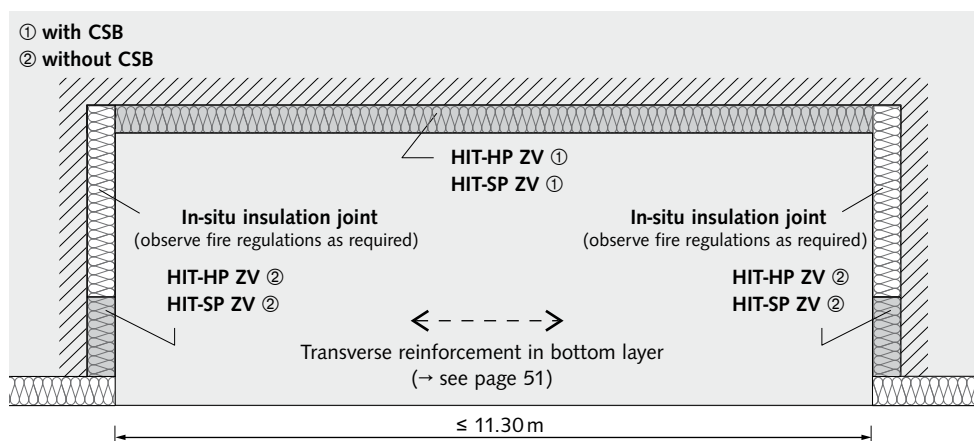
Application 3: Expansion joint location for three-side supported loggia (with CSB on the left or right)



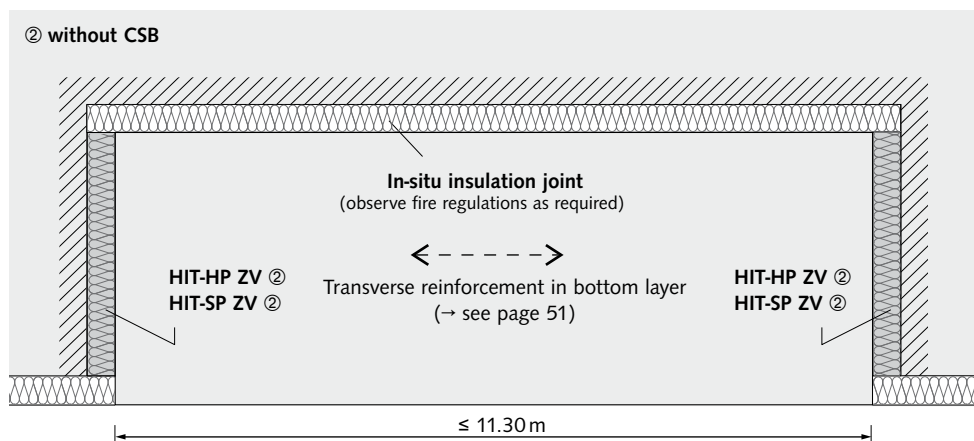
Application 4: Expansion joint location for two-side supported loggia (with CSB on the left or right)



Application 5: Expansion joint location for three-side supported loggia (both sides without CSB)



Application 6: Joint spacings two-side supported loggia (both sides without CSB)

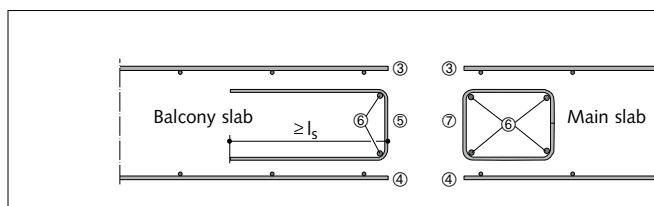
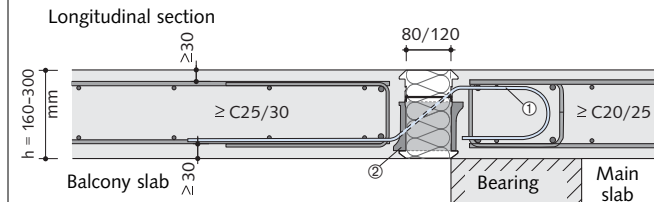


Installation Diagram HIT-HP ZV, HIT-SP ZV

On-site reinforcement for balcony connections

HIT-HP ZV / HIT-SP ZV with bent shear bars

- standard: $\varnothing = 6 \text{ mm}$

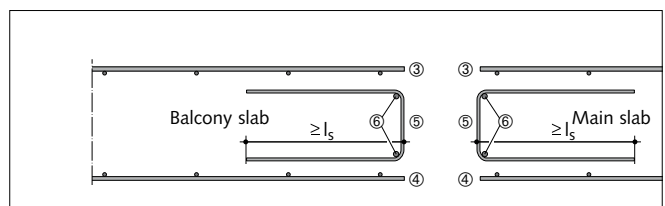
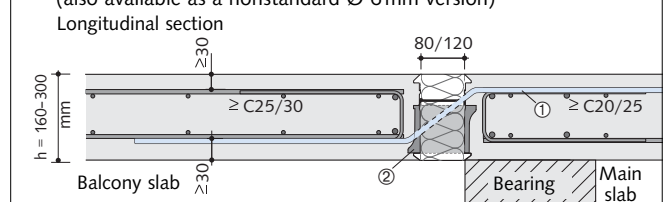


Dimensions in [mm]

- ① HIT - shear bar
- ② HIT - compression shear bearing (CSB)
- ③ Top connecting reinforcement, steel bars or mesh
- ④ Bottom connecting reinforcement, steel bars or mesh

HIT-HP ZV / HIT-SP ZV with straight shear bars

- standard: $\varnothing = 8 \text{ mm} - 12 \text{ mm}$
(also available as a nonstandard $\varnothing 6 \text{ mm}$ version)



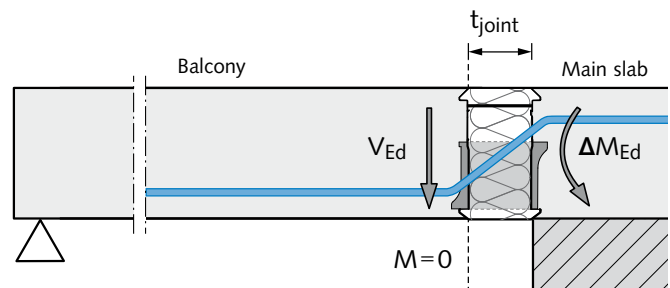
- ⑤ U-bar → $A_{s,req}$ see pages 44-47
- ⑥ Transverse tensile reinforcement $\varnothing 8$
- ⑦ Edge rebar stirrups (mind. $\varnothing 6/20$)

Moments from eccentric loads

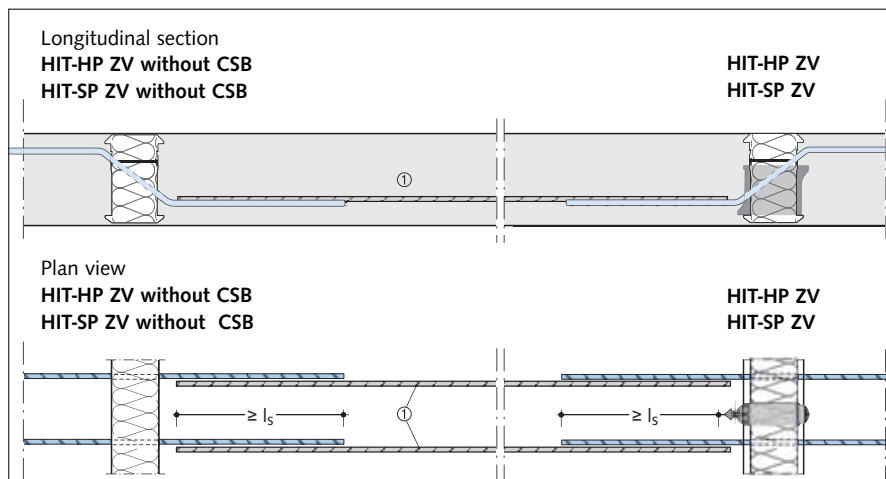
Moments resulting from an eccentric load must be considered when calculating for **HIT-HP ZV / HIT-SP ZV with CSB**; the following applies:

$$\Delta M_{Ed} = V_{Ed} \cdot t_{joint}$$

with: $t_{joint} = 0.08 \text{ m}$ (HIT-HP ZV)
 $t_{joint} = 0.12 \text{ m}$ (HIT-SP ZV)



On-site transverse reinforcement when using HIT-HP ZV / HIT-SP ZV



Transverse reinforcement

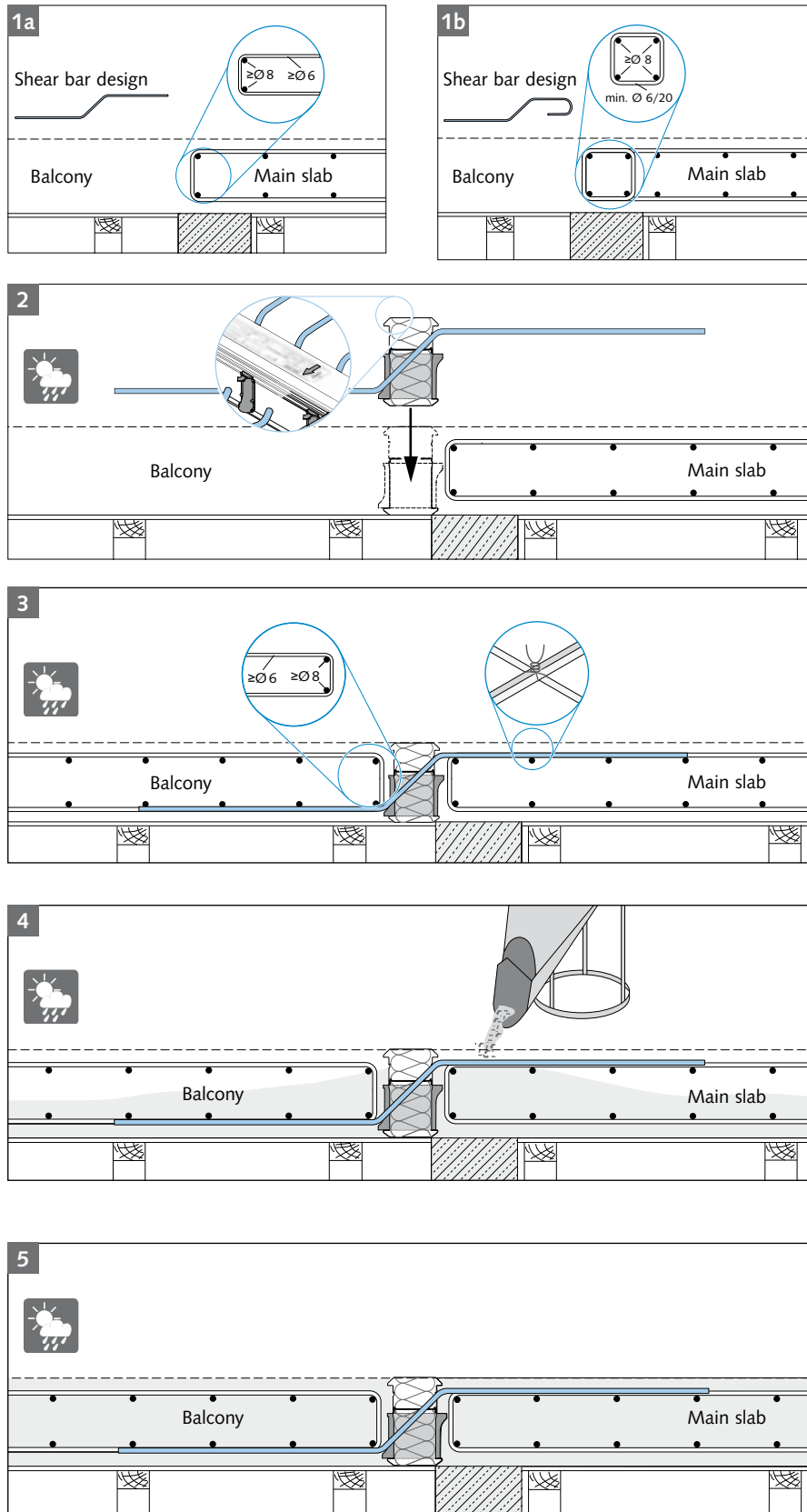
When placing the transverse reinforcement in the balcony slab, each shear bar in the HIT-HP ZV / HIT-SP ZV unit must over-lap with an on-site reinforcement bar of the same diameter.

The on-site bar must extend to the opposite HIT unit where it must also over-lap with the shear bars.

- ① Transverse reinforcement

Installation Diagram

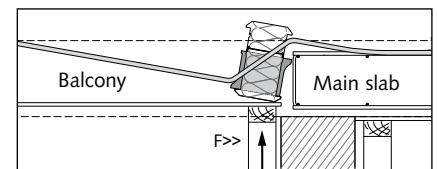
Installation Diagram HIT-HP ZV / HIT-SP ZV



- 1 Installation of on-site reinforcement for floor slab**
See page 51 for details.

⚠ On-site reinforcement as specified by the structural engineer.

- 2 Installation of HIT unit from above**
Check that the red arrows on the HIT unit and also on the CSB are pointing towards the balcony.



⚠ Ensure that the formwork is at the correct height!

- 3 Installation of balcony slab on-site reinforcement**
Fixing of the shear bars to on-site reinforcement using tying wire.
See pages 51 and 44–47 for details of transverse tensile reinforcement.

- 4 Pouring the concrete**

⚠ To ensure the HIT units are not displaced, pour and compact the concrete evenly.

- 5 Fresh-poured concreted balcony slab on supporting structure**

⚠ For application in element slabs notes on page 23 have to be considered.

HALFEN HIT INSULATED CONNECTION HIT-BX±Q, HIT-BX±Q-MOD, HIT-BF±Q, HIT-BF±Q-MOD

Introduction HIT-BX±Q, HIT-BX±Q-MOD, HIT-BF±Q, HIT-BF±Q-MOD

HIT-BX±Q Balcony connection (HIT-BF±Q as multi-part system)

- For cantilevered balcony slabs.
- Transfers bending moments as well as positive and negative shear forces.

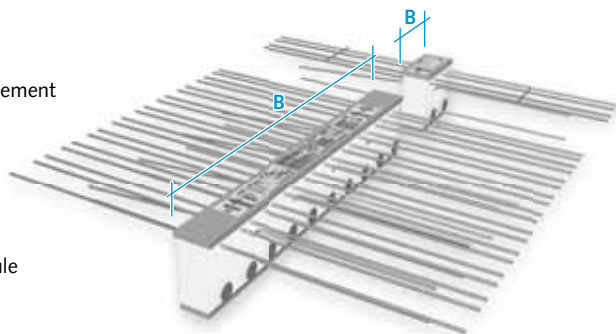
HIT-BX±Q

HIT-BX±Q one-metre element
B = 1.00 (1.05) m



HIT-BX±Q-MOD

HIT-BX±Q 20 cm module
B = 0.20 m



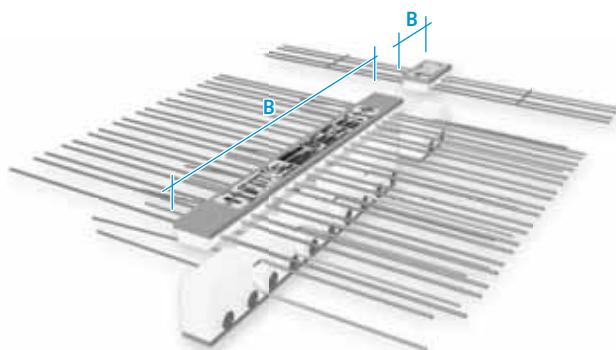
HIT-BF±Q

multi-part HIT-BF±Q ,
one-metre element
B = 1.00 (1.05) m

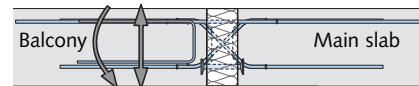


HIT-BF±Q-MOD

multi-part HIT-BF±Q
20 cm module
B = 0.20 m

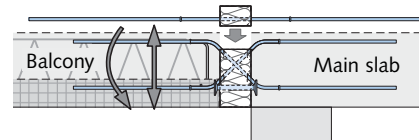


HIT-BX±Q HIT-BX±Q-MOD



Version ±Q as one-metre element or 20 cm module for bending moments as well as for positive and negative shear forces.

HIT-BF±Q HIT-BF±Q-MOD



Version ±Q for bending moments as well as for positive and negative shear forces.

Application example HIT-BX±Q

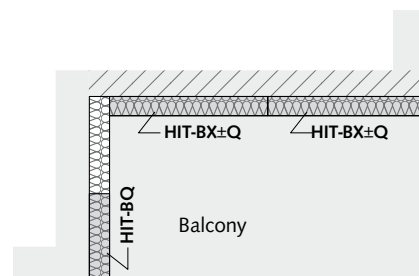


Fig. 1: Internal corner, one-way spanning slab

Chapter 4 - Content

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Product description	HIT-BX(-BF)±Q, HIT-BX(-BF)±Q-MOD	54
Product variations	HIT-BX(-BF)±Q, HIT-BX(-BF)±Q-MOD	55
Load bearing capacity values	HIT-BX(-BF)±Q	56
Load bearing capacity values	HIT-BX(-BF)±Q-MOD	59
On-site reinforcement / Connecting reinforcement		62
Installation diagram		63
Camber		64

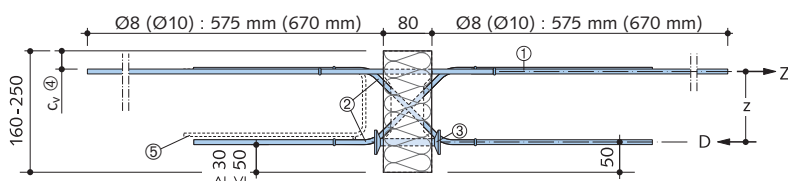
HALFEN HIT INSULATED CONNECTION HIT-BX±Q, HIT-BX±Q-MOD, HIT-BF±Q, HIT-BF±Q-MOD

Product Description HIT-BX±Q, HIT-BX±Q-MOD, HIT-BF±Q, HIT-BF±Q-MOD

HIT-BX±Q

HIT-BX±Q-MOD

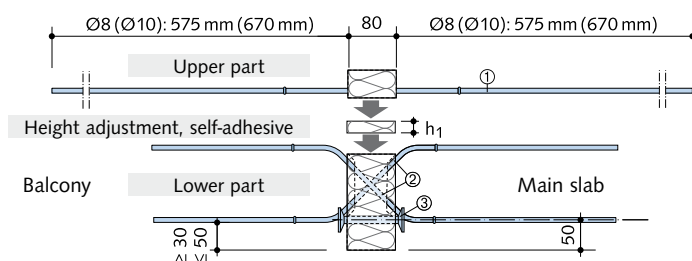
HIT-BX±Q-1L



- ① Tension bars
 - ② Shear bars
 - ③ Compression bearings
 - ④ For type HIT-BX±Q-1L it is
 - $c_v = 40$ mm,
 - for $h = 160$ mm: $c_v = 35$ mm
 - ⑤ U-bar
- Standard version **without** bar cage
 HIT-BX±Q: available with bar cage on request.
 HIT-BF±Q: **not** available with bar cage.

HIT-BF±Q

HIT-BF±Q-MOD



Dimensions in [mm]

For a top view of the units with dimensions, please see the type statics data sheets. These are available at www.halfen.com.

Required height h_1 of shim strips (available 1 – 2 – 4 cm, any combination possible) if $c_v = 40$ mm	
For slab thickness [cm]	h_1 [cm]
16	*)
17	0
18	1
19	2
20	3
21	4
22	5
23	6
24	7
25	8

*) Slab thickness 16 cm is possible as a custom design with $c_v = 35$ mm.

Information on **Material Specifications** and **Test Certificates** can be found on page 88.

Product description – one-metre elements

Components	Load range	HIT-BX±Q, HIT-BF±Q								
		8/ 5	8/10	8/14	12/ 8	12/10	12/11	12/12	14/10	14/12
	Width B [m]	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.05
Tension bars	n · Ø [mm]	5 Ø 8	10 Ø 8	14 Ø 8	16 Ø 8	19 Ø 8	14 Ø10	16 Ø10	18 Ø10	20 Ø10
	Length [mm]	1230	1230	1230	1230	1230	1420	1420	1420	1420
Compression bearings	n · Ø [mm]	4 Ø12	5 Ø12	7 Ø12	8 Ø12	10 Ø12	15 Ø12	16 Ø12	18 Ø12	20 Ø12
	Length [mm]	110	110	110	110	110	140	140	140	140
Shear bars										
• ±Q	n · Ø [mm]	4Ø6/4Ø6	4Ø6/4Ø6	4Ø8/4Ø8	4Ø8/4Ø8	4Ø8/4Ø8	4Ø8/2Ø8	4Ø8 / 2Ø8	4Ø8 / 2Ø8	5Ø8 / 3Ø8
• ±Q - QE	n · Ø [mm]	4Ø8/4Ø8	4Ø8/4Ø8	4Ø10/4Ø10	4Ø10/4Ø10	4Ø10/4Ø10	4Ø10/2Ø10	4Ø10/2Ø10	4Ø10/2Ø10	5Ø10/3Ø10
• ±Q - QEE	n · Ø [mm]	—	—	4Ø12/4Ø12	4Ø12/4Ø12	4Ø12/4Ø12	4Ø12/2Ø12	4Ø12/2Ø12	4Ø12/2Ø12	4Ø12/3Ø12

Product description – 20 cm modules

Components	Load range	HIT-BX±Q-MOD, HIT-BF±Q-MOD	
		MOD A ±Q	MOD D ±Q
Tension bars	Width B [m]	0.20	0.20
	$n \cdot \varnothing$ [mm]	4 Ø 8	4 Ø 8
	Length [mm]	1230	1230
Compression bearings	$n \cdot \varnothing$ [mm]	2 Ø 12	2 Ø 12
	Length [mm]	110	110
Shear bars	$n \cdot \varnothing$ [mm]	1 Ø 8	1 Ø 10
Used with systems		up to HIT-BX(-BF)±Q-12/10	up to HIT-BX(-BF)±Q-12/10-QE

HALFEN HIT INSULATED CONNECTION HIT-BX±Q, HIT-BX±Q-MOD, HIT-BF±Q, HIT-BF±Q-MOD

Product Variations HIT-BX±Q, HIT-BX±Q-MOD, HIT-BF±Q, HIT-BF±Q-MOD

Basic types

Ordering examples:

HIT - BX±Q - 12/10 - 20
HIT-BX±Q-MOD - A - 20
HIT - BF±Q - 12/10 - 20

- one-metre element
- 20 cm module
- multi-part, one-metre element

• Type / version

• Load range

• Slab thickness h

Fire protection

Shear capacity

Concrete cover

see → Variations

Variations

Ordering examples:

HIT - BX±Q - 8/5 - 20 - F90 - QE - 1L
HIT-BX±Q-MOD - A - 20 - F90 - 1L
HIT - BF±Q - 8/5 - 20 - F90 - QE - 1L

• Type / version

• Load range

• Slab thickness h

• Fire protection ①

standard

fire resistance F90

F90

• Shear capacity ①

standard Ø QS

increased Ø QS

increased Ø QS

QE

QEE

• Concrete cover ①

unspecified $c_v = 30$ mm

1L $c_v = 40$ mm

2L $c_v = 50$ mm

1L

2L

1L for $h \geq 16$ cm; if $h = 16$, $c_v = 35$ mm!

2L for $h \geq 18$ cm

Custom designs are available on request.
For further details, please contact us.
Contact information → see inside back cover

① When ordering the standard design, omit the reference from the specification.

Possible slab thickness h (F90 also available)		HIT-BX±Q, HIT-BF±Q - One-metre elements									HIT-BX±Q-MOD, HIT-BF±Q-MOD - 20 cm modules		
	Load range	8/ 5	8/10	8/14	12/ 8	12/10	12/11	12/12	14/10	14/12	Load range	MOD A	MOD D
	Standard	≥ 16 cm					≥ 16 cm				Standard	≥ 16 cm	≥ 18 cm
	QE	≥ 16 cm					≥ 18 cm				1L	≥ 16 cm	≥ 18 cm
	QEE	-					≥ 19 cm				2L	≥ 18 cm	≥ 20 cm
	Standard - 1L	≥ 16 cm					≥ 16 cm				3L	≥ 19 cm	≥ 21 cm
	QE -1L	≥ 17 cm					≥ 19 cm						
	QEE-1L	-					≥ 19 cm						
	Standard - 2L	≥ 18 cm					≥ 18 cm						
	QE -2L	≥ 18 cm					≥ 20 cm						
QEE-2L	-					≥ 22 cm							

HALFEN HIT INSULATED CONNECTION HIT-BX±Q, HIT-BF±Q

Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Concrete Cover $c_v = 30$ mm

Load bearing capacity values, one-metre elements, concrete cover $c_v = 30$ mm

Components	Load range	HIT-BX±Q, HIT-BF±Q								
	Width B [m]	8/5	8/10	8/14	12/8	12/10	12/11	12/12	14/10	14/12
Colour code upper/lower section -BF		Brown	Green	Blue	Purple	Red	Light blue	Black	Orange	Yellow



m_{Rd} Moment bearing capacity

Design values	Load range	8/5		8/10		8/14		12/8		12/10		12/11		12/12		14/10		14/12										
	For slab thickness [cm]	Concrete cover $c_v = 30$ mm																		Concrete strength: $C_{20/25} \geq C_{25/30}$								
m_{Rd} [kNm/m]	16	8.3	8.3	16.6	16.6	23.3	23.3	26.6	26.6	31.6	31.6	35.0	35.9	36.2	41.0	39.4	46.1	41.6	48.8									
	17	9.4	9.4	18.8	18.8	26.3	26.3	30.1	30.1	35.7	35.7	39.7	40.6	41.0	46.4	44.7	52.2	47.1	55.3									
	18	10.5	10.5	21.0	21.0	29.4	29.4	33.6	33.6	39.9	39.9	44.3	45.4	45.8	51.9	49.9	58.4	52.7	61.8									
	19	11.6	11.6	23.2	23.2	32.4	32.4	37.1	37.1	44.0	44.0	49.0	50.2	50.6	57.4	55.2	64.5	58.2	68.3									
	20	12.7	12.7	25.4	25.4	35.5	35.5	40.6	40.6	48.2	48.2	53.7	55.0	55.4	62.8	60.4	70.7	63.8	74.8									
	21	13.8	13.8	27.5	27.5	38.6	38.6	44.1	44.1	52.3	52.3	58.3	59.8	60.3	68.3	65.7	76.8	69.3	81.3									
	22	14.9	14.9	29.7	29.7	41.6	41.6	47.6	47.6	56.5	56.5	63.0	64.5	65.1	73.8	70.9	83.0	74.9	87.8									
	23	16.0	16.0	31.9	31.9	44.7	44.7	51.1	51.1	60.6	60.6	67.7	69.3	69.9	79.2	76.2	89.1	80.4	94.3									
	24	17.0	17.0	34.1	34.1	47.7	47.7	54.5	54.5	64.8	64.8	72.4	74.1	74.7	84.7	81.4	95.3	85.9	100.8									
	25	18.1	18.1	36.3	36.3	50.8	50.8	58.0	58.0	68.9	68.9	77.0	78.9	79.5	90.2	86.7	101.4	91.5	107.3									



v_{Rd} Shear capacity in both directions

Design values	Load range	8/5		8/10		8/14		12/8		12/10		12/11		12/12		14/10		14/12	
	For slab thickness [cm]	±Q		Standard positive and negative shear capacity										Concrete strength: C20/25 / ≥ C25/30					
v _{Rd} [kN/m]	16–25	30.0	34.8	30.0	34.8	44.0	51.2	44.0	51.2	44.0	51.2	44.0	51.2	44.0	51.2	44.0	51.2	52.4	61.0
		-30.0	-34.8	-30.0	-34.8	-44.0	-51.2	-44.0	-51.2	-44.0	-51.2	-22.0	-25.6	-22.0	-25.6	-22.0	-25.6	-31.5	-36.6
	For slab thickness [cm]	±Q		Increased positive and negative shear capacity										QE ② Concrete strength: C20/25 / ≥ C25/30					
	16–25	49.9	58.0	49.9	58.0	74.6	86.7	74.6	86.7	74.6	86.7	74.6	86.7	74.6	86.7	74.6	86.7	88.8	103.3
		-49.9	-58.0	-49.9	-58.0	-74.6	-86.7	-74.6	-86.7	-74.6	-86.7	-37.3	-43.4	-37.3	-43.4	-37.3	-43.4	-53.3	-62.0
	For slab thickness [cm]	±Q		Increased positive and negative shear capacity										QEE Concrete strength: C20/25 / ≥ C25/30					
	19–25	—	—	—	—	99.0	115.2	99.0	115.2	99.0	115.2	99.0	115.2	99.0	115.2	99.0	115.2	94.3	109.7
		—	—	—	—	-99.0	-115.2	-99.0	-115.2	-99.0	-115.2	-49.5	-57.6	-49.5	-57.6	-49.5	-57.6	-70.7	-82.3

② The values apply for the alternative shear bar designs as shown in the appendix to the type statics HIT-BX±Q / HIT-BF±Q.

Note: Concrete strength $C20/25 \geq C25/30$

34.6	36.2
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All necessary verifications including verifying concrete strut shear pressure have been already considered.

Custom designs are available on request. For further details, please contact us.
Contact information → see inside back cover

HALFEN HIT INSULATED CONNECTION HIT-BX±Q, HIT-BF±Q

Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Concrete Cover $c_v = 40$ mm

Load bearing capacity values, one-metre elements, concrete cover $c_v = 40$ mm

Components	Load range	HIT-BX±Q, HIT-BF±Q								
	Width B [m]	8/5	8/10	8/14	12/8	12/10	12/11	12/12	14/10	14/12
Colour code upper/lower section -BF		Brown	Green	Blue	Purple	Red	Light blue	Black	Orange	Yellow



m_{Rd} Moment bearing capacity

Design values	Load range	8/5		8/10		8/14		12/8		12/10		12/11		12/12		14/10		14/12					
	For slab thickness [cm]	Concrete cover $c_v = 40$ mm																		1L	Concrete strength: <i>C20/25</i> / $\geq$ C25/30		
m_{Rd} [kNm/m]	16 ①	7.8	7.8	15.5	15.5	21.7	21.7	24.8	24.8	29.5	29.5	32.7	33.5	33.7	38.2	36.8	43.0	38.8	45.5				
	17	8.3	8.3	16.6	16.6	23.3	23.3	26.6	26.6	31.6	31.6	35.0	35.9	36.2	41.0	39.4	46.1	41.6	48.8				
	18	9.4	9.4	18.8	18.8	26.3	26.3	30.1	30.1	35.7	35.7	39.7	40.6	41.0	46.4	44.7	52.2	47.1	55.3				
	19	10.5	10.5	21.0	21.0	29.4	29.4	33.6	33.6	39.9	39.9	44.3	45.4	45.8	51.9	49.9	58.4	52.7	61.8				
	20	11.6	11.6	23.2	23.2	32.4	32.4	37.1	37.1	44.0	44.0	49.0	50.2	50.6	57.4	55.2	64.5	58.2	68.3				
	21	12.7	12.7	25.4	25.4	35.5	35.5	40.6	40.6	48.2	48.2	53.7	55.0	55.4	62.8	60.4	70.7	63.8	74.8				
	22	13.8	13.8	27.5	27.5	38.6	38.6	44.1	44.1	52.3	52.3	58.3	59.8	60.3	68.3	65.7	76.8	69.3	81.3				
	23	14.9	14.9	29.7	29.7	41.6	41.6	47.6	47.6	56.5	56.5	63.0	64.5	65.1	73.8	70.9	83.0	74.9	87.8				
	24	16.0	16.0	31.9	31.9	44.7	44.7	51.1	51.1	60.6	60.6	67.7	69.3	69.9	79.2	76.2	89.1	80.4	94.3				
	25	17.0	17.0	34.1	34.1	47.7	47.7	54.5	54.5	64.8	64.8	72.4	74.1	74.7	84.7	81.4	95.3	85.9	100.8				

① Concrete cover $c_{nom} = 35$ mm



v_{Rd} Shear capacity in both directions

Design values	Load range	8/5		8/10		8/14		12/8		12/10		12/11		12/12		14/10		14/12					
	For slab thickness [cm]	±Q		Standard positive and negative shear capacity										Concrete strength: C20/25 / ≥ C25/30									
v _{Rd} [kN/m]	16–25	30.0	34.8	30.0	34.8	44.0	51.2	44.0	51.2	44.0	51.2	44.0	51.2	44.0	51.2	44.0	51.2	52.4	61.0				
		-30.0	-34.8	-30.0	-34.8	-44.0	-51.2	-44.0	-51.2	-44.0	-51.2	-22.0	-25.6	-22.0	-25.6	-22.0	-25.6	-31.5	-36.6				
	For slab thickness [cm]	±Q		Increased positive and negative shear capacity										QE		②		Concrete strength: C20/25 / ≥ C25/30					
	17–25	49.9	58.0	49.9	58.0	74.6	86.7	74.6	86.7	74.6	86.7	74.6	86.7	74.6	86.7	74.6	86.7	88.8	103.3				
		-49.9	-58.0	-49.9	-58.0	-74.6	-86.7	-74.6	-86.7	-74.6	-86.7	-37.3	-43.4	-37.3	-43.4	-37.3	-43.4	-53.3	-62.0				
	For slab thickness [cm]	±Q		Increased positive and negative shear capacity										QEE				Concrete strength: C20/25 / ≥ C25/30					
	19–25	—	—	—	—	99.0	115.2	99.0	115.2	99.0	115.2	99.0	115.2	99.0	115.2	99.0	115.2	94.3	109.7				
		—	—	—	—	-99.0	-115.2	-99.0	-115.2	-99.0	-115.2	-49.5	-57.6	-49.5	-57.6	-49.5	-57.6	-70.7	-82.3				

② The values apply for the alternative shear bar designs as shown in the appendix to the type statics HIT-BX±Q / HIT-BF±Q.

Note: Concrete strength C20/25 / $\geq$ C25/30
34.6 36.2

All necessary verifications including verifying concrete strut shear pressure have been already considered.

Custom designs are available on request. For further details, please contact us.
Contact information → see inside back cover

HALFEN HIT INSULATED CONNECTION HIT-BX±Q, HIT-BF±Q

Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Concrete Cover $c_v = 50 / 60$ mm

Load bearing capacity values, one-metre elements, concrete cover $c_v = 50$ mm

Components	Load range	HIT-BX±Q, HIT-BF±Q								
	Width B [m]	8/5	8/10	8/14	12/8	12/10	12/11	12/12	14/10	14/12
Colour code upper/lower section -BF		Brown	Green	Blue	Purple	Red	Light blue	Black	Orange	Yellow



m_{Rd} Moment bearing capacity

Design values	Load range	8/5		8/10		8/14		12/8		12/10		12/11		12/12		14/10		14/12						
	For slab thickness [cm]	Concrete cover $c_v = 50$ mm																		2L	Concrete strength: $C20/25 / \geq C25/30$			
m_{Rd} [kNm/m]	18	8.3	8.3	16.6	16.6	23.3	23.3	26.6	26.6	31.6	31.6	35.0	35.9	36.2	41.0	39.4	46.1	41.6	48.8					
	19	9.4	9.4	18.8	18.8	26.3	26.3	30.1	30.1	35.7	35.7	39.7	40.6	41.0	46.4	44.7	52.2	47.1	55.3					
	20	10.5	10.5	21.0	21.0	29.4	29.4	33.6	33.6	39.9	39.9	44.3	45.4	45.8	51.9	49.9	58.4	52.7	61.8					
	21	11.6	11.6	23.2	23.2	32.4	32.4	37.1	37.1	44.0	44.0	49.0	50.2	50.6	57.4	55.2	64.5	58.2	68.3					
	22	12.7	12.7	25.4	25.4	35.5	35.5	40.6	40.6	48.2	48.2	53.7	55.0	55.4	62.8	60.4	70.7	63.8	74.8					
	23	13.8	13.8	27.5	27.5	38.6	38.6	44.1	44.1	52.3	52.3	58.3	59.8	60.3	68.3	65.7	76.8	69.3	81.3					
	24	14.9	14.9	29.7	29.7	41.6	41.6	47.6	47.6	56.5	56.5	63.0	64.5	65.1	73.8	70.9	83.0	74.9	87.8					
	25	16.0	16.0	31.9	31.9	44.7	44.7	51.1	51.1	60.6	60.6	67.7	69.3	69.9	79.2	76.2	89.1	80.4	94.3					



v_{Rd} Shear capacity in both directions

Design values	Load range	8/5		8/10		8/14		12/8		12/10		12/11		12/12		14/10		14/12					
	For slab thickness [cm]	±Q		Standard positive and negative shear capacity										Concrete strength: C20/25 / ≥ C25/30									
v _{Rd} [kN/m]	18 – 25	30.0	34.8	30.0	34.8	44.0	51.2	44.0	51.2	44.0	51.2	44.0	51.2	44.0	51.2	44.0	51.2	52.4	61.0				
		-30.0	-34.8	-30.0	-34.8	-44.0	-51.2	-44.0	-51.2	-44.0	-51.2	-22.0	-25.6	-22.0	-25.6	-22.0	-25.6	-31.5	-36.6				
	For slab thickness [cm]	±Q		Increased positive and negative shear capacity										QE		① Concrete strength: C20/25 / ≥ C25/30							
	18 – 25	49.9	58.0	49.9	58.0	74.6	86.7	74.6	86.7	74.6	86.7	74.6	86.7	74.6	86.7	74.6	86.7	88.8	103.3				
		-49.9	-58.0	-49.9	-58.0	-74.6	-86.7	-74.6	-86.7	-74.6	-86.7	-37.3	-43.4	-37.3	-43.4	-37.3	-43.4	-53.3	-62.0				
	For slab thickness [cm]	±Q		Increased positive and negative shear capacity										QEE		Concrete strength: C20/25 / ≥ C25/30							
	22 – 25	—	—	—	—	99.0	115.2	99.0	115.2	99.0	115.2	99.0	115.2	99.0	115.2	99.0	115.2	94.3	109.7				
		—	—	—	—	-99.0	-115.2	-99.0	-115.2	-99.0	-115.2	-49.5	-57.6	-49.5	-57.6	-49.5	-57.6	-70.7	-82.3				

① The values apply for the alternative shear bar designs as shown in the appendix to the type statics HIT-BX±Q / HIT-BF±Q.

Load bearing capacity values, one-metre elements, concrete cover $c_v = 60$ mm

Concrete cover $c_v = 60$ mm 3L										
m_{Rd} [kNm/m]	Reduced permissible load bearing capacities for the 3L version: When using m_{Rd} from the design capacities table for version $c_v = 50$ mm, reduce the slab thickness by 1 cm.									

Note: Concrete strength $C20/25 / \geq C25/30$

34.6	36.2
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All necessary verifications including verifying concrete strut shear pressure have been already considered.

Custom designs are available on request. For further details, please contact us.
Contact information → see inside back cover

HALFEN HIT INSULATED CONNECTION HIT-BX±Q-MOD, HIT-BF±Q-MOD

Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Concrete Cover $c_v = 30$ mm

Load bearing capacity values, 20 cm modules, concrete cover $c_v = 30$ mm



m_{Rd} Moment bearing capacity per metre

Design values	For slab thickness [cm]	Concrete cover $c_v = 30$ mm		Concrete strength: C20/25 / $\geq$ C25/30	
		MOD A $\pm Q$		MOD D $\pm Q$	
m_{Rd} [kNm/m]	16	33.2	33.2	—	—
	17	37.6	37.6	—	—
	18	42.0	42.0	42.0	42.0
	19	46.3	46.3	46.3	46.3
	20	50.7	50.7	50.7	50.7
	21	55.1	55.1	55.1	55.1
	22	59.4	59.4	59.4	59.4
	23	63.8	63.8	63.8	63.8
	24	68.2	68.2	68.2	68.2
	25	72.6	72.6	72.6	72.6



V_{Rd} Shear capacity per metre

Design values	For slab thickness [cm]	$\pm Q$		Concrete strength: C20/25 / $\geq$ C25/30	
V_{Rd} [kN/m]	16 *) – 25	55.1	64.0	85.9	99.9
		-55.1	-64.0	-85.9	-99.9

*) For modules MOD-D $\pm Q$ (standard version) the minimum slab thickness must be $h \geq 18$ cm



M_{Rd} Moment bearing capacity per 20 cm module

Design values	For slab thickness [cm]	Concrete cover $c_v = 30$ mm		Concrete strength: C20/25 / $\geq$ C25/30	
		MOD A $\pm Q$		MOD D $\pm Q$	
M_{Rd} [kNm/MODUL]	16	6.6	6.6	—	—
	17	7.5	7.5	—	—
	18	8.4	8.4	8.4	8.4
	19	9.3	9.3	9.3	9.3
	20	10.1	10.1	10.1	10.1
	21	11.0	11.0	11.0	11.0
	22	11.9	11.9	11.9	11.9
	23	12.8	12.8	12.8	12.8
	24	13.6	13.6	13.6	13.6
	25	14.5	14.5	14.5	14.5



V_{Rd} Shear capacity per 20 cm module

Design values	For slab thickness [cm]	$\pm Q$		Concrete strength: C20/25 / $\geq$ C25/30	
V_{Rd} [kN/MODUL]	16 *) – 25	11.0	12.8	17.2	20.0
		-11.0	-12.8	-17.2	-20.0

*) For modules MOD-D $\pm Q$ (standard version) the minimum slab thickness must be $h \geq 18$ cm

Note: Concrete strength C20/25 / $\geq$ C25/30

34.6	36.2
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All necessary verifications including verifying concrete strut shear pressure have been already considered.

HALFEN HIT INSULATED CONNECTION HIT-BX±Q-MOD, HIT-BF±Q-MOD

Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Concrete Cover $c_v = 40 \text{ mm}$

Load bearing capacity values, 20 cm modules, concrete cover $c_v = 40 \text{ mm}$



m_{Rd} Moment bearing capacity per metre

Design values	For slab thickness [cm]	Concrete cover $c_v = 40 \text{ mm}$		1L	Concrete strength: $C20/25 / \geq C25/30$
		MOD A ±Q			MOD D ±Q
m_{Rd} [kNm/m]	16 ①	31.0	31.0	—	—
	17	33.2	33.2	—	—
	18	37.6	37.6	37.6	37.6
	19	42.0	42.0	42.0	42.0
	20	46.3	46.3	46.3	46.3
	21	50.7	50.7	50.7	50.7
	22	55.1	55.1	55.1	55.1
	23	59.4	59.4	59.4	59.4
	24	63.8	63.8	63.8	63.8
	25	68.2	68.2	68.2	68.2

① Concrete cover $c_{nom} = 35 \text{ mm}$



v_{Rd} Shear capacity per metre

Design values	For slab thickness [cm]	±Q	Concrete strength: $C20/25 / \geq C25/30$	
v_{Rd} [kN/m]	16 *) – 25	55.1	64.0	85.9
		-55.1	-64.0	-85.9

*) For modules MOD-D±Q (standard version) the minimum slab thickness must be $h \geq 18 \text{ cm}$



M_{Rd} Moment bearing capacity per 20 cm module

Design values	For slab thickness [cm]	Concrete cover $c_v = 40 \text{ mm}$		1L	Concrete strength: $C20/25 / \geq C25/30$
		MOD A ±Q			MOD D ±Q
M_{Rd} [kNm/MODUL]	16 ①	6.2	6.2	—	—
	17	6.6	6.6	—	—
	18	7.5	7.5	7.5	7.5
	19	8.4	8.4	8.4	8.4
	20	9.3	9.3	9.3	9.3
	21	10.1	10.1	10.1	10.1
	22	11.0	11.0	11.0	11.0
	23	11.9	11.9	11.9	11.9
	24	12.8	12.8	12.8	12.8
	25	13.6	13.6	13.6	13.6

① Concrete cover $c_{nom} = 35 \text{ mm}$



v_{Rd} Shear capacity per 20 cm module

Design values	For slab thickness [cm]	±Q	Concrete strength: $C20/25 / \geq C25/30$	
v_{Rd} [kN/MODUL]	16 *) – 25	11.0	12.8	17.2
		-11.0	-12.8	-17.2

*) For modules MOD-D±Q (standard version) the minimum slab thickness must be $h \geq 18 \text{ cm}$

Note: Concrete strength $C20/25 / \geq C25/30$

34.6	36.2
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All necessary verifications including verifying concrete strut shear pressure have been already considered.

HALFEN HIT INSULATED CONNECTION HIT-BX±Q-MOD, HIT-BF±Q-MOD

Load Bearing Capacity Values According to DIN 1045-1 / EC2 – Concrete Cover $c_v = 50 / 60$ mm

Load bearing capacity values, 20 cm modules, concrete cover $c_v = 50$ mm



m_{Rd} Moment bearing capacity per metre

Design values	For slab thickness [cm]	Concrete cover $c_v = 50$ mm		2L	Concrete strength: $C20/25 / \geq C25/30$
		MOD A $\pm Q$			MOD D $\pm Q$
m_{Rd} [kNm/m]	18	33.2	33.2	—	—
	19	37.6	37.6	—	—
	20	42.0	42.0	42.0	42.0
	21	46.3	46.3	46.3	46.3
	22	50.7	50.7	50.7	50.7
	23	55.1	55.1	55.1	55.1
	24	59.4	59.4	59.4	59.4
	25	63.8	63.8	63.8	63.8



V_{Rd} Shear capacity per metre

Design values	For slab thickness [cm]	$\pm Q$	Concrete strength: $C20/25 / \geq C25/30$	
V_{Rd} [kN/m]	18 – 25	55.1 -55.1	64.0 -64.0	85.9 -85.9
				99.9 -99.9

All necessary verifications including verifying concrete strut shear pressure have been already considered.

Note: Concrete strength $C20/25 / \geq C25/30$
34.6 36.2



M_{Rd} Moment bearing capacity per 20 cm module

Design values	For slab thickness [cm]	Concrete cover $c_v = 50$ mm		2L	Concrete strength: $C20/25 / \geq C25/30$
		MOD A $\pm Q$			MOD D $\pm Q$
M_{Rd} [kNm/MODUL]	18	6.6	6.6	—	—
	19	7.5	7.5	—	—
	20	8.4	8.4	8.4	8.4
	21	9.3	9.3	9.3	9.3
	22	10.1	10.1	10.1	10.1
	23	11.0	11.0	11.0	11.0
	24	11.9	11.9	11.9	11.9
	25	12.8	12.8	12.8	12.8



V_{Rd} Shear capacity per 20 cm module

Design values	For slab thickness [cm]	$\pm Q$	Concrete strength: $C20/25 / \geq C25/30$	
V_{Rd} [kN/MODUL]	18 – 25	11.0 -11.0	12.8 -12.8	17.2 -17.2
				20.0 -20.0

Load bearing capacity values, 20 cm modules, concrete cover $c_v = 60$ mm

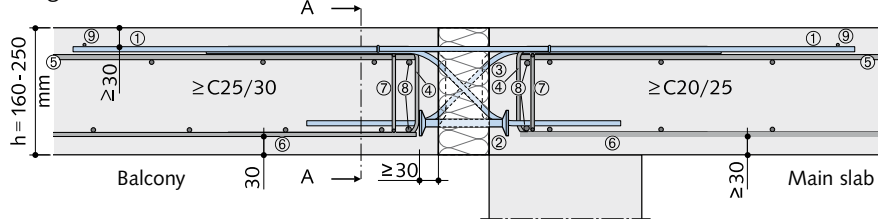
Concrete cover $c_v = 60$ mm		3L
m_{Rd} [kNm/m]	Reduced permissible load bearing capacities for the 3L version: When using m_{Rd} from the design capacities table for version $c_v = 50$ mm, reduce the slab thickness by 1 cm.	
M_{Rd} [kNm/MODUL]		

HALFEN HIT INSULATED CONNECTION HIT-BX±Q, HIT-BX±Q-MOD, HIT-BF±Q, HIT-BF±Q-MOD

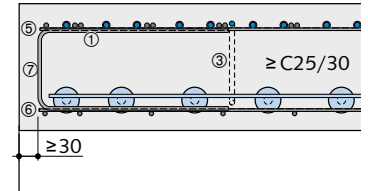
On-site Connecting Reinforcement

On-site installed reinforcement for direct support of HIT-BX±Q, HIT-BX±Q-MOD, HIT-BF±Q, HIT-BF±Q-MOD

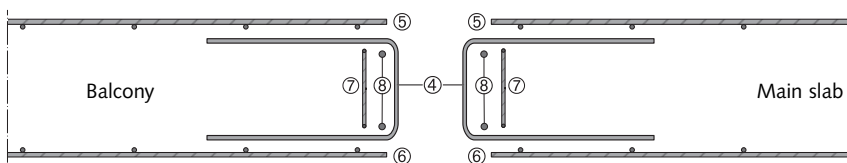
Longitudinal section



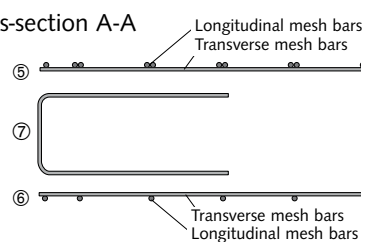
Cross-section A-A



Longitudinal section



Cross-section A-A



- ① HIT tension bar
- ② HIT compression bearing
- ③ HIT shear bar
- ④ U-bar/Edge frame
- ⑤ Top connecting reinforcement, steel bars or mesh
- ⑥ Bottom connecting reinforcement, steel bars or mesh
- ⑦ End U-bar, Ø 8 mm as end anchorage for ⑧
- ⑧ Transverse tensile reinforcement 2 Ø 8 mm
- ⑨ HIT transport bar. May be removed, not needed structurally

Dimensions in [mm]

DIN 1045-1 chapter 13.3.2 / DIN EN 1992-1-1 (EC2) 9.3.1.4 requires U-bars to be placed to secure the outer edge of the balcony slab. In addition, pos. ⑦ must be installed.

Connecting reinforcement

Types HIT-BX-±Q HIT-BF-±Q	Recommended on-site connecting reinforcement					
	Variation A Mesh only		Variation B Steel Bars		Variation C Combination of mesh and steel bars	
	Main slab thickness		Main slab thickness		Main slab thickness	
	≤ 20 cm	> 20 ≤ 25 cm	≤ 20 cm	> 20 ≤ 25 cm	≤ 20 cm	> 20 ≤ 25 cm
8/5	R188A	R188A	Ø 8/15	Ø 8/15	—	—
8/10	R 377A / R 424A	R 513A / R 524A	Ø 8/14	Ø 8/12.5	Q 188A + Ø 8/20	Q 188A + Ø 8/20
8/14	R 513A / R 524A	—	Ø 10/15	Ø 10/13	Q 188A + Ø 8/15	Q 188A + Ø 8/13
12/8	—	—	Ø 10/13	Ø 10/12	Q 188A + Ø 10/15	Q 188A + Ø 10/15
12/10 *)	—	—	Ø 10/10	Ø 10/10	Q 257A + Ø 10/15	Q 257A + Ø 10/15
12/11	—	—	Ø 12/12.5	Ø 12/12.5	Q 257A + Ø 10/12.5	Q 335A + Ø 10/12.5
12/12	—	—	Ø 12/10	Ø 12/ 9	Q 257A + Ø 10/10	Q 257A + Ø 10/10
14/10 *)	—	—	Ø 12/9	Ø 12/ 9	Q 335A + Ø 10/10	Q 513A / Q524A + Ø 10/10
14/12 *)	—	—	Ø 12/9	Ø 12/ 8	Q 377A / Q424A + Ø 10/10	Q 513A / Q524A + Ø 10/10

*) Because of the small clearances, we recommend limiting the grain size of the aggregate to 16 mm (max.) and using concrete with a plastic consistency.



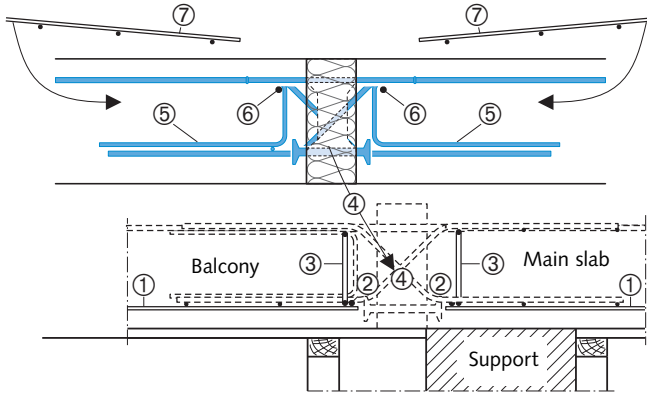
DIN1045-1 / DIN EN 1992-1-1 and DIN EN 1992-1-1/NA regulations apply when determining the overlap length l_s .
The required overlap length may be reduced at a ratio of $a_{s,req.}/a_{s,actual}$.

HALFEN HIT INSULATED CONNECTION HIT-BX±Q, HIT-BX±Q-MOD, HIT-BF±Q, HIT-BF±Q-MOD

Installation Diagram HIT-BX(±Q), HIT-BX(±Q)-MOD, HIT-BF(±Q), HIT-BF(±Q)-MOD

Installation diagram HIT-BX(±Q) and HIT-BX(±Q)-MOD

HIT-BX(±Q) or
HIT-BX(±Q)-MOD



Installation of the HIT-BX(±Q) unit

- ① Install bottom reinforcement of both main and balcony slab.
- ② Place longitudinal tensile reinforcement Ø 8mm on both sides at the bottom of the insulating joint and ③ anchor the end stirrups Ø 8mm.
- ④ Place and align the HIT unit and tie it to the top reinforcement of the floor slab. Check that the red arrow on the HIT unit is pointing towards the balcony. The bearing bars of the main and the balcony slabs are placed level with the top HIT unit bars. The HIT shear bars are positioned below.
- ⑤ Arrange edge beams as stirrups on both sides of the insulating joint.
- ⑥ Place two bars Ø 8mm on both sides of the insulating joint.
- ⑦ Install the upper reinforcement of the balcony slab and tie to the top bars of the HIT unit with wire.

To ensure the HIT units are not displaced, pour and compact the concrete evenly.



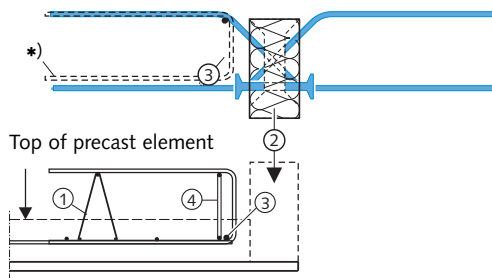
The on-site reinforcement must be placed as specified by the structural engineer.

Check the camber of the formwork for the balcony slab!

Installation diagram HIT-BF(±Q) and HIT-BF(±Q)-MOD

HIT-BF(±Q) or
HIT-BF(±Q)-MOD

- Lower part

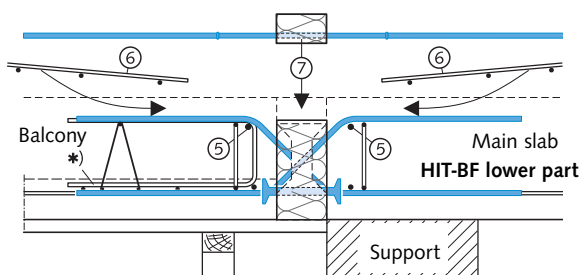


Installation of the lower part of the HIT-BF(±Q) unit at the precast plant

- ① Install lower reinforcement of the balcony slab including the lattice girder.
- ② Install lower part of the HIT unit. Check that the label on the shear bars is towards the main slab side.
- ③ Install longitudinal tensile reinforcement Ø 8mm with end anchorage stirrups Ø 8mm.
- ④ Install stirrups on-site. Pour the concrete for the balcony element.

HIT-BF(±Q) or
HIT-BF(±Q)-MOD

- Upper part



Installation of the upper part of the HIT-BF (±Q) unit on site

Install precast element with HIT unit.

- ⑤ Install required on-site reinforcement of the main and the balcony slab.
- ⑥ Place the upper reinforcement.
- ⑦ Place the upper part of the HIT element on top of the lower section and tie it to the slab reinforcement. Check that the red arrow on the HIT unit is pointing towards the balcony.

*) The standard version of the HIT element is supplied without a bar cage. Stirrups are added on site (can also be supplied by HALFEN on request).



The on-site reinforcement must be placed as specified by the structural engineer.

To ensure the HIT units are not displaced, pour and compact the concrete evenly.

Check the camber of the formwork for the balcony slab!

HALFEN HIT INSULATED CONNECTION HIT-BX±Q, HIT-BX±Q-MOD, HIT-BF±Q, HIT-BF±Q-MOD

Camber

Camber of the balcony slab

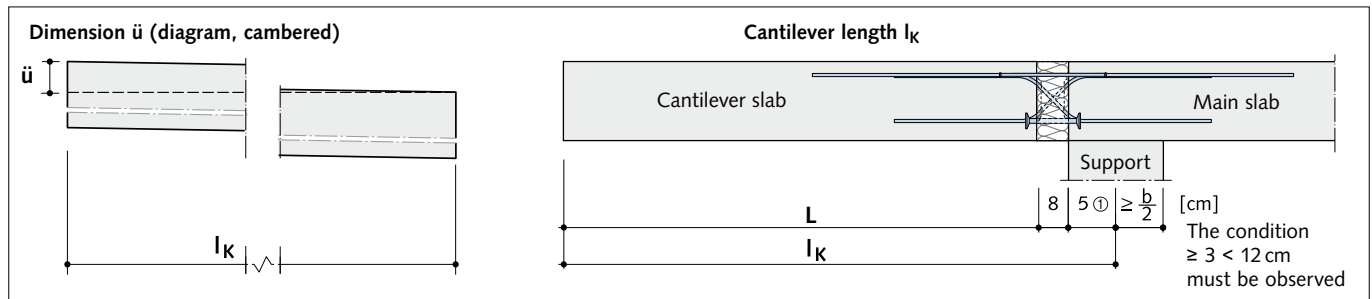
For cantilevers, the production of cambered balcony slabs is recommended. The verification of the deformation and the determination of the required camber is made under the quasi-permanent load combination according to DIN 1055-100.

$$E_d = \sum_j G_{k,j} + \sum_i \psi_{2,i} \times Q_{k,i}$$

with E_d Design value of the quasi-permanent load combination
 $G_{k,j}$ Characteristic value of the permanent actions
 $Q_{k,i}$ Characteristic value of the variable actions
 $\psi_{2,i}$ Load combination factor for the quasi-permanent value of the variable actions

The values of the deformation and camber listed in the type statics table correspond to the average twist α_M of the HALFEN HIT Insulated connections resulting from a normal action $m_{Ed} = 1 \text{ kNm/m}$ depending on the concrete cover c_{nom} . To establish the total deflection and camber of the balcony slab, the deformation $\ddot{u}$ of the HIT units must be added to the system deformation result in accordance with DIN 1045-1 / DIN EN 1992-1-1 and DIN EN 1992-1-1/NA.

Recommendation to determine the camber of the balcony slab $\ddot{u}$ [cm] due to the HIT unit



$$\ddot{u} = \alpha_M \times l_K \times m_{Ed,perm}$$

with $\ddot{u}$ Camber from HIT components deformation in [mm]
 l_K Cantilever length [m]
 m_{Ed} Design value of the bending moment for the quasi-permanent load combination [kNm/m]
 α_M Value of deformation or camber ($\rightarrow$ type statics available as pdf-file for download at www.halfen.de)

System assumptions

Cantilever length balcony	l_K	[m]	1.9
Slab thickness	h	[cm]	18
Concrete cover	c_{nom}	[mm]	35
Concrete strength			C20/25

Load assumptions

Dead load of balcony slab	g_k	[kN/m²]	4.5
Dead load of decking	$g_{k,Bel}$	[kN/m²]	1.5
Edge load of balustrade	$g_{k,Gel}$	[kN/m]	1.5
Live load	q_k	[kN/m²]	4.0

Internal force variables

Bending moment	m_{Ed}	[kNm/m]	29.3
Shear force	v_{Ed}	[kN/m]	28.8

Note: The limitation of deformations according to DIN 1045-1 Chapter 11.3.2 / DIN EN 1992-1-1 and DIN EN 1992-1-1/NA must be considered $\rightarrow$ page 26

HALFEN HIT Insulated connection type HIT-BX±Q-12/10-18-1L

Moment bearing capacity m_{Rd}	[kNm/m]	35.7	> 29.3
Shear capacity v_{Rd}	[kN/m]	44.0	> 28.8

Quasi-permanent load combination with $\psi_2 = 0.3$

Bending moment

$$\begin{aligned} m_{d,perm} &= (g_k + g_{k,Bel} + 0.3 \times q_k) \times l_K^2 / 2 + g_{k,Gel} \times l_K \\ &= (4.5 + 1.5 + 0.3 \times 4.0) \times 1.9^2 / 2 + 1.5 \times 1.9 \\ &= 15.8 \text{ kNm/m} \end{aligned}$$

Deformation value $\alpha_m = 0.248 \text{ mm/kNm}$
 read from table in the type statics

Camber

$$\begin{aligned} \ddot{u} &= \alpha_m \times l_K \times m_{Ed,perm} \\ &= 0.248 \times 1.9 \times 15.8 \\ &= 7.4 \text{ mm} \\ &= 0.7 \text{ cm} \end{aligned}$$

HALFEN INSULATED CONNECTION HIT- ±BQ

Introduction HIT- ±BQ

HIT-±BQ

- For simply supported balcony slabs.
- Transfer of positive and negative shear forces.

HIT-±BQ



One-metre element
B = 1.0m

Short units
B = 0.3 / 0.4 / 0.5m

Application examples HIT-±BQ

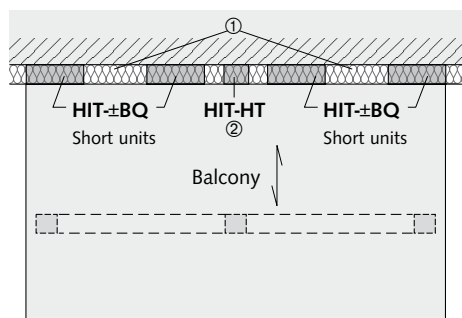


Fig. 1: Simply supported balcony on columns. Balcony slab connection with positive and negative shear forces. If necessary, combine with HALFEN HIT-HT elements to absorb horizontal loads.

- ① In-situ thermal insulation
② HALFEN HIT-HT. For more information on HIT-HT units refer to → page 75.

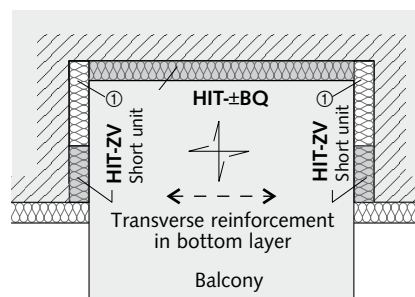


Fig. 2: Recessed balcony / loggia, supported on three sides, partly cantilevered, transverse reinforcement. Shear forces acting in upward direction. Loggia with transverse reinforcement in bottom layer.

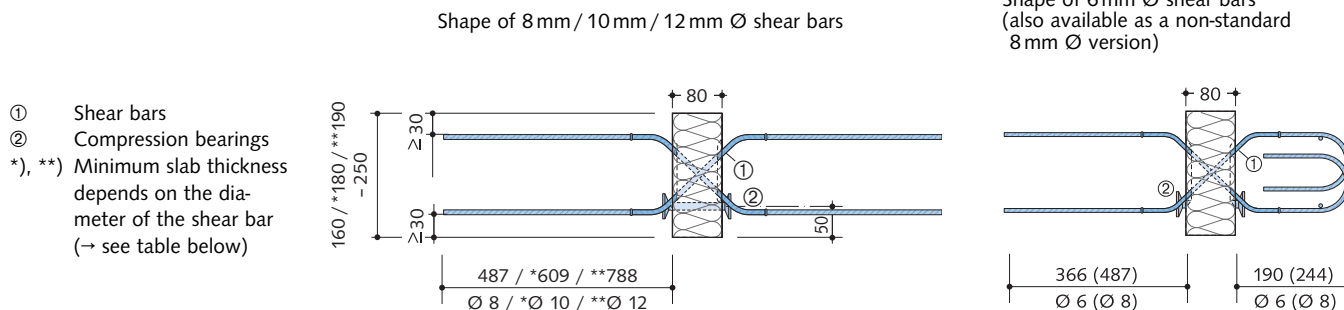
Chapter 5 – Contents

		Page
Product description	HIT-±BQ	66
Product variations	HIT-±BQ	66
Load bearing capacity values	HIT-±BQ	67
On-site reinforcement / installation diagram	HIT-±BQ	68
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On-site reinforcement / installation diagram	HIT-VT	71
Joint spacings	HIT-±BQ, HIT-VT	72
System length L_{St}		72

HALFEN INSULATED CONNECTION HIT-±BQ

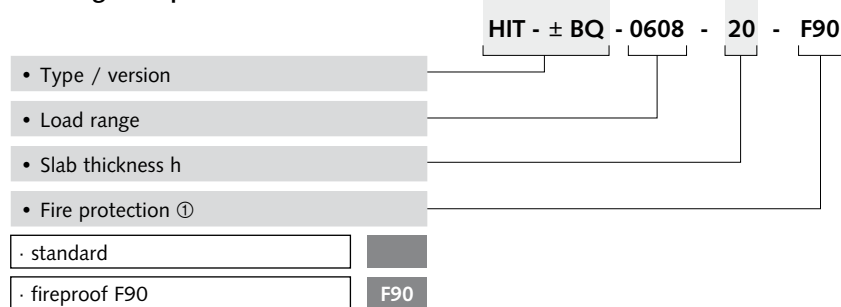
Product description, Load Bearing Capacity Values According to DIN 1045-1 / DIN EN 1992-1-1 (EC2)

HIT-±BQ



Product variations

Ordering example



① When ordering the standard version, omit F90 from the specification.

Product description HIT-±BQ one-metre elements

Components	Load range:	0406	0506	0606	0806	0408	0508
	Width B [m]	1.00	1.00	1.00	1.00	1.00	1.00
Shear bars	n × Ø [mm]	2 × 4 Ø 6*	2 × 5 Ø 6*	2 × 6 Ø 6*	2 × 8 Ø 6*	2 × 4 Ø 8	2 × 5 Ø 8
	Length [mm]	366	366	366	366	487	487
Compression bearings	n × Ø [mm]	4 Ø 12	4 Ø 12	4 Ø 12	4 Ø 12	4 Ø 12	4 Ø 12
	Length [mm]	140	140	140	140	140	140
For slab thickness	h [mm]	16–25	16–25	16–25	16–25	16–25	16–25

Components	Load range:	0608	0708	0808	0610	0810	0612
	Width B [m]	1.00	1.00	1.00	1.00	1.00	1.00
Shear bars	n × Ø [mm]	2x 6 Ø 8	2x 7 Ø 8	2x 8 Ø 8	2x 6 Ø 10	2x 8 Ø 10	2x 6 Ø 12
	Length [mm]	487	487	487	609	609	788
Compression bearings	n × Ø [mm]	4 Ø 12	4 Ø 12	4 Ø 12	4 Ø 12	4 Ø 12	5 Ø 12
	Length [mm]	140	140	140	140	140	140
For slab thickness	h [mm]	16 – 25	16 – 25	16 – 25	18 – 25	18 – 25	19 – 25

* see page 68 "Installation of on-site reinforcement for balcony connections HIT-BQ"



Information on material specifications and test certificates can be found on page 88.

HALFEN INSULATED CONNECTION HIT-±BQ

Product description, Load Bearing Capacity Values According to DIN 1045-1 / DIN EN 1992-1-1 (EC2)

Product description HIT-±BQ one-metre elements



V_{Rd} Shear capacity in both directions

Note: Concrete strength $\frac{C20/25}{34.6} \geq \frac{C25/30}{36.2}$

Design values	For slab thickness [cm]	HIT-±BQ one-metre elements										Concrete strength: $\frac{C20/25}{34.6} \geq \frac{C25/30}{36.2}$	
		0406		0506		0606		0806		0408		0508	
V_{Rd} [kN/m]	16-17	± 34.8	± 34.8	± 43.5	± 43.5	± 52.2	± 52.2	± 69.5	± 69.5	± 61.8	± 61.8	± 77.3	± 77.3
	18	± 34.8	± 34.8	± 43.5	± 43.5	± 52.2	± 52.2	± 69.5	± 69.5	± 61.8	± 61.8	± 77.3	± 77.3
	19	± 34.8	± 34.8	± 43.5	± 43.5	± 52.2	± 52.2	± 69.5	± 69.5	± 61.8	± 61.8	± 77.3	± 77.3
	20	± 34.8	± 34.8	± 43.5	± 43.5	± 52.2	± 52.2	± 69.5	± 69.5	± 61.8	± 61.8	± 77.3	± 77.3
	21	± 34.8	± 34.8	± 43.5	± 43.5	± 52.2	± 52.2	± 69.5	± 69.5	± 61.8	± 61.8	± 77.3	± 77.3
	22-25	± 34.8	± 34.8	± 43.5	± 43.5	± 52.2	± 52.2	± 69.5	± 69.5	± 61.8	± 61.8	± 77.3	± 77.3
		0608		0708		0808		0610		0810 ①		0612 ①	
V_{Rd} [kN/m]	16-17	± 92.7	± 92.7	± 108.2	± 108.2	± 123.6	± 123.6	—	—	—	—	—	—
	18	± 92.7	± 92.7	± 108.2	± 108.2	± 123.6	± 123.6	± 144.9	± 144.9	± 166.4	± 176.0	—	—
	19	± 92.7	± 92.7	± 108.2	± 108.2	± 123.6	± 123.6	± 144.9	± 144.9	± 170.9	± 176.0	± 177.9	± 208.6
	20	± 92.7	± 92.7	± 108.2	± 108.2	± 123.6	± 123.6	± 144.9	± 144.9	± 170.9	± 176.0	± 189.3	± 208.6
	21	± 92.7	± 92.7	± 108.2	± 108.2	± 123.6	± 123.6	± 144.9	± 144.9	± 170.9	± 176.0	± 200.8	± 208.6
	22-25	± 92.7	± 92.7	± 108.2	± 108.2	± 123.6	± 123.6	± 144.9	± 144.9	± 170.9	± 176.0	± 208.6	± 208.6

① For concrete cover refer to the type statics (available as a pdf download at www.halfen.com)

Product description HIT-±BQ short units

Components	Load range:	6/4K	8/2	8/3	8/4	10/2	10/3	10/4	12/2	12/3	12/4
	width B [m]	0.50	0.30	0.40	0.50	0.30	0.40	0.50	0.30	0.40	0.50
Shear bars	n · Ø [mm]	2 × 4 Ø 6*	2 × 2 Ø 8	2 × 3 Ø 8	2 × 4 Ø 8	2 × 2 Ø 10	2 × 3 Ø 10	2 × 4 Ø 10	2 × 2 Ø 12	2 × 3 Ø 12	2 × 4 Ø 12
	Length [mm]	366	487	487	487	609	609	609	788	788	788
Compression bearings	n · Ø [mm]	2 Ø 12	1 Ø 12	2 Ø 12	2 Ø 12	1 Ø 12	2 Ø 12	2 Ø 12	2 Ø 12	3 Ø 12	3 Ø 12
	Length [mm]	140	140	140	140	140	140	140	140	140	140
For slab thickness	h [mm]	16-25	16-25	16-25	16-25	18-25	18-25	18-25	19-25	19-25	19-25

*see page 68 "Installation of on-site reinforcement for balcony connections HIT-±BQ"

Product description HIT-±BQ short units

Design values	For slab thickness [cm]	HIT-±BQ short units										Concrete strength: $\frac{C20/25}{34.6} \geq \frac{C25/30}{36.2}$	
		6/4K		8/2		8/3		8/4		10/2			
V_{Rd} [kN/Elem.]	16	± 34,8	± 34,8	± 30,9	± 30,9	± 46,4	± 46,4	± 61,8	± 61,8	—	—		
	17	± 34,8	± 34,8	± 30,9	± 30,9	± 46,4	± 46,4	± 61,8	± 61,8	—	—		
	18-25	± 34,8	± 34,8	± 30,9	± 30,9	± 46,4	± 46,4	± 61,8	± 61,8	± 42,7	± 44,0		
		10/3		10/4		12/2		12/3		12/4			
V_{Rd} [kN/Elem.]	16	—	—	—	—	—	—	—	—	—	—		
	17	—	—	—	—	—	—	—	—	—	—		
	18	± 66,6	± 72,4	± 83,2	± 88,0	—	—	—	—	—	—		
	19	± 71,1	± 72,4	± 85,5	± 88,0	± 53,4	± 62,6	± 71,1	± 83,5	± 88,9	± 104,4		
	20	± 72,4	± 72,4	± 85,5	± 88,0	± 56,8	± 66,7	± 75,7	± 88,9	± 94,7	± 111,1		
	21	± 72,4	± 72,4	± 85,5	± 88,0	± 60,2	± 69,5	± 80,3	± 94,3	± 100,4	± 117,8		
	22	± 72,4	± 72,4	± 85,5	± 88,0	± 63,7	± 69,5	± 84,9	± 99,7	± 106,1	± 124,6		
	23	± 72,4	± 72,4	± 85,5	± 88,0	± 67,1	± 69,5	± 89,5	± 104,3	± 111,9	± 131,3		
	24	± 72,4	± 72,4	± 85,5	± 88,0	± 69,5	± 69,5	± 94,1	± 104,3	± 117,6	± 132,0		
	25	± 72,4	± 72,4	± 85,5	± 88,0	± 69,5	± 69,5	± 98,7	± 104,3	± 120,5	± 132,0		

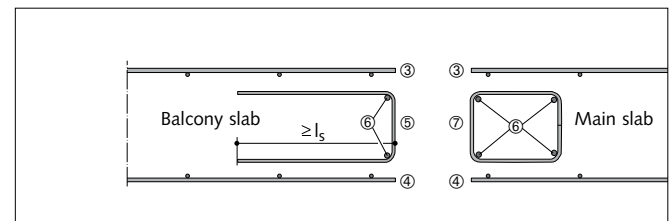
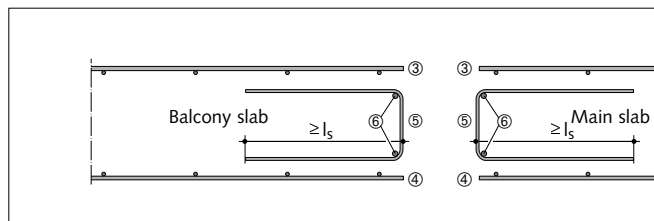
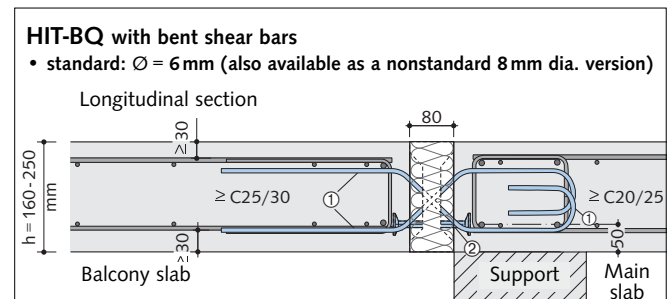
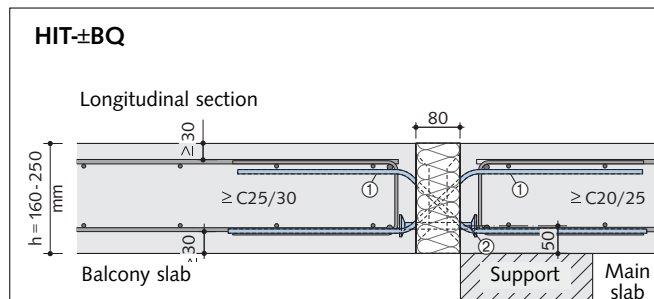


All necessary verifications including verifying concrete strut shear pressure have been already considered.

HALFEN INSULATED CONNECTION HIT- ±BQ

Installation Diagram HIT- ±BQ

Installation of on-site reinforcement for balcony connections HIT-BQ



Dimensions in [mm]

To calculate the on-site reinforcement on both sides of the HIT-BQ unit, moments resulting from an eccentric connection must be considered: refer to → Appendix 1 of the type statics (available as a pdf download at www.halfen.com).

- ① HIT shear bar
- ② HIT compression bearing
- ③ Top reinforcement with bars or mesh
- ④ Bottom reinforcement with bars or mesh
- ⑤ U-bar, $\varnothing 8$ mm → required a_s see type statics data sheets
- ⑥ Transverse tensile reinforcement
- ⑦ Edge rebar stirrups (min. $\varnothing 6/20$)

HALFEN INSULATED CONNECTION HIT-VT

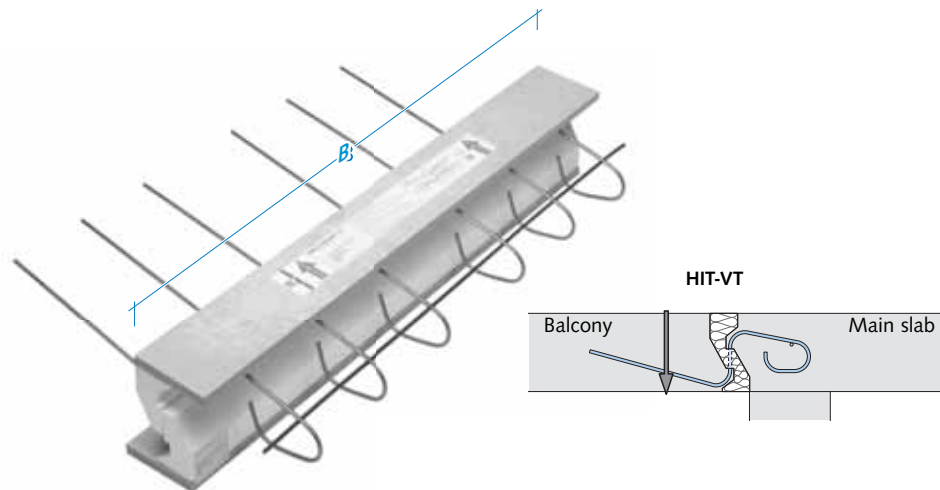
Introduction HIT-VT

HIT-VT

- Used for simply supported balconies or loggias
- For unrestrained connection and for shear capacity only

HIT-VT

One-metre element
B = 1.0 m



Application examples HIT-VT

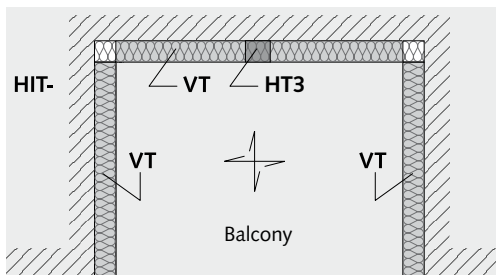


Fig. 1: Balcony / loggia, simply supported on three sides, two direction spanning slab.
HIT-HT units are used to absorb the expected horizontal loads.

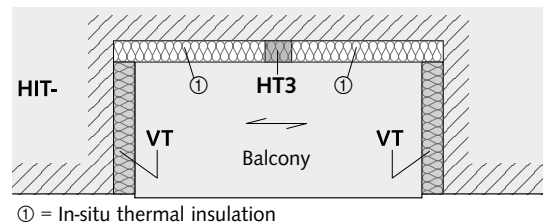


Fig. 2: Balcony / loggia, simply supported on two sides, one direction spanning slab.
HIT-HT units are used to absorb the expected horizontal loads.

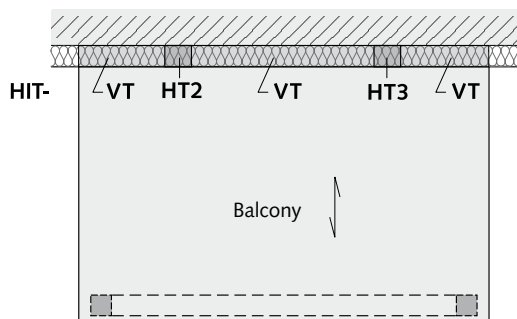


Fig. 3: Simply supported balcony on columns.
HIT-HT units are used to absorb the expected horizontal loads.

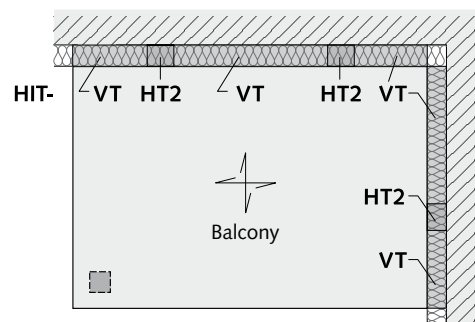


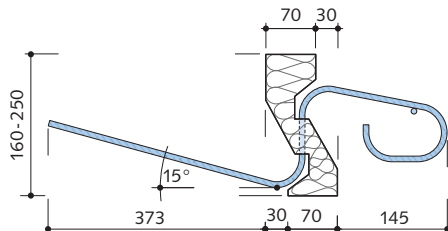
Fig. 4: Balcony simply supported on two sides on a column.
HIT-HT units are used to absorb the expected horizontal loads.

Note: HIT-HT units to absorb horizontal forces, see → page 73

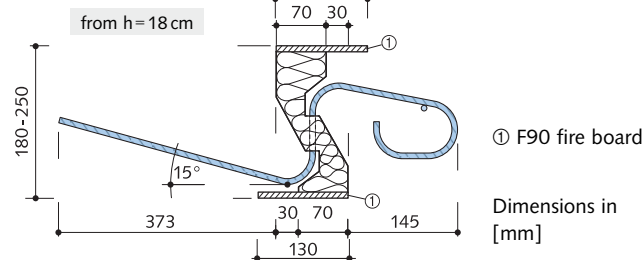
HALFEN INSULATED CONNECTION HIT-VT

Product Variations, Load Bearing Capacity Values According to DIN 1045-1 / EN 1992-1-1 (EC2)

HIT-VT



HIT-VT - F90



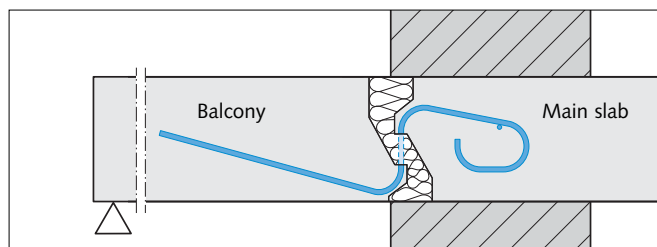
① F90 fire board

Dimensions in [mm]

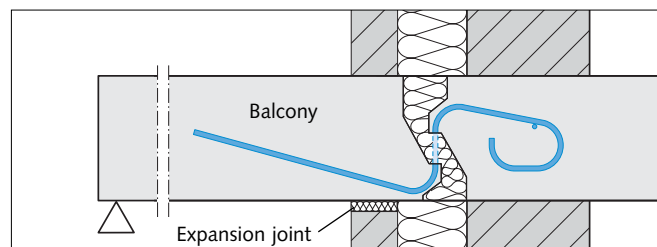
Note: For a top view of the units with dimensions, please refer to the diagrams included in the HIT-VT type statics.

Position of the HIT-VT units in the cross-section of a wall

Single-leaf masonry with balcony at main slab level



Double-leaf masonry with balcony at main slab level



Product description one-metre elements

Components	Load range:	0406	0506	0606	0806	1006
	Width B [m]	1.00	1.00	1.00	1.00	1.00
Shear bars	n × Ø [mm]	4 Ø 6	5 Ø 6	6 Ø 6	8 Ø 6	10 Ø 6
	Length* [mm]	316	316	316	316	316

* Note: The length of the shear bars refers exclusively to the effective bond length.



Information on material specifications and test certificates can be found on page 88.

Product variations

Ordering example:

HIT - VT - 0506 - 18 - F90

• Type / version

• Load range

• Slab thickness h

• Fire protection ①

• standard

• fireproof F90

① When ordering the standard version, omit the reference from the specification. F90 version available from h = 18 cm.

Custom designs are available on request. For further details, please consult us. → see inside back cover for contact details

Load bearing capacity values HIT-VT one-metre elements



Shear capacity in one direction

Design values	For slab thickness [cm]	HIT-VT one-metre elements						Concrete strength: C20/25 / ≥ C25/30			
		0406		0506		0606		0806		1006	
V_{Rd} [kN/m]	16	40.4	47.0	50.5	58.7	60.6	70.5	80.8	94.0	101.0	117.4
	17 – 25	42.5	49.2	53.2	61.5	63.8	73.8	85.1	98.3	106.4	122.9

Note: Concrete strength C20/25 / ≥ C25/30

34.6	36.2
------	------

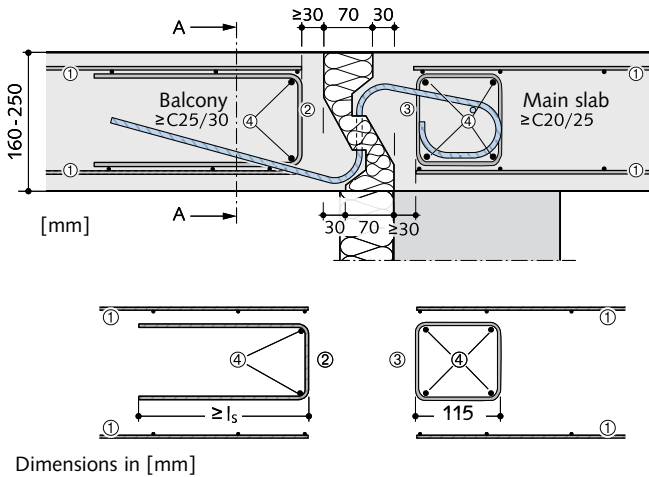
All necessary verifications including verifying concrete strut shear pressure have been already considered.

HALFEN INSULATED CONNECTION HIT-VT

Installation Diagram HIT-VT

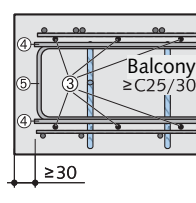
Installation of on-site reinforcement for balcony connections HIT-VT

HIT-VT

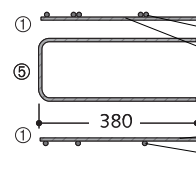


- ① On-site connecting reinforcement, see table A
- ② Required hanger reinforcement on balcony side, see table B
- ③ Structural hanger reinforcement on main slab side
- ④ Additional rebars $2 \times \varnothing 8$ mm
- ⑤ End U-bars $\varnothing 8$ mm

DIN 1045-1 chapter 13.3.2 / DIN EN 1992-1-1 (EC2) 9.3.1.4 requires U-bars to be placed around the outer edge of the balcony slab as edge frame. In addition, item ⑤ must be installed.



Section A-A



- Longitudinal mesh bars
- Transverse mesh bars
- Transverse mesh bars
- Longitudinal mesh bars

The **overlap joints** between the shear bars of the HALFEN Insulated connection HIT-VT and the shear reinforcement of the adjacent slabs must be made according to DIN 1045-1, chapter 12.8 / DIN EN 1992-1-1 (EC2) and the National Technical Approval no. Z-15.7-238.

The calculation for on-site connecting reinforcement overlap length is for full load capacity of element if a connecting reinforcement of 6 mm diameter is placed for each shear bar.

The same applies when the connecting reinforcement is calculated applying the effective reinforcement cross-section according to table A: Recommended on-site connecting reinforcement.

An overlap of 316 mm with the HALFEN Insulated connection HIT-VT can be applied when 6 mm diameter shear bars are used.

Connecting reinforcement

Table A: Recommended on-site connecting reinforcement

Variation	Connecting Reinforcement	Effective reinforcement cross-section for $\geq C25/30$: calculated as follows
A) On-site connecting reinforcement using only mesh B500A/B (BSt 500 M)	Q188A and R188A	$a_s = 1.0 \times a_{s, \text{Mesh}}$
	Q257A to Q513A/Q524A and R257A to R524A	$a_s = 0.75 \times a_{s, \text{Mesh}}$
B) On-site connecting reinforcement using only bar steel B500B (BSt 500 S)	$\varnothing 6$ mm	$a_s = 1.0 \times a_{s, \varnothing 6}$
	$\varnothing 8$ mm	$a_s = 0.75 \times a_{s, \varnothing 8}$
	$\varnothing 10$ mm	$a_s = 0.60 \times a_{s, \varnothing 10}$
C) On-site connecting reinforcement using a combination of mesh and bar	Reinforcing-steel mesh B500A/B (BSt 500 M) to Q 335 A and R 335 A	$a_s = 0.75 \times a_{s, \text{Mesh}}$
	Bar steel B500B (BSt 500 S), 6 mm $\varnothing$	$a_s = 1.0 \times a_{s, \varnothing 6}$
	Bar steel B500B (BSt 500 S), 8 mm $\varnothing$	$a_s = 0.75 \times a_{s, \varnothing 8}$
	Bar steel B500B (BSt 500 S), 10 mm $\varnothing$	$a_s = 0.60 \times a_{s, \varnothing 10}$

Table B: Required suspension reinforcement

Type HIT-VT	For slab thickness [cm]	Concrete strength: $C20/25 / \geq C25/30$							
		0406		0506		0606		0806	
a_s	16	0.93	1.08	1.16	1.35	1.39	1.62	1.86	2.16
[cm ² /m]	17 - 25	0.98	1.13	1.22	1.41	1.47	1.70	1.96	2.26

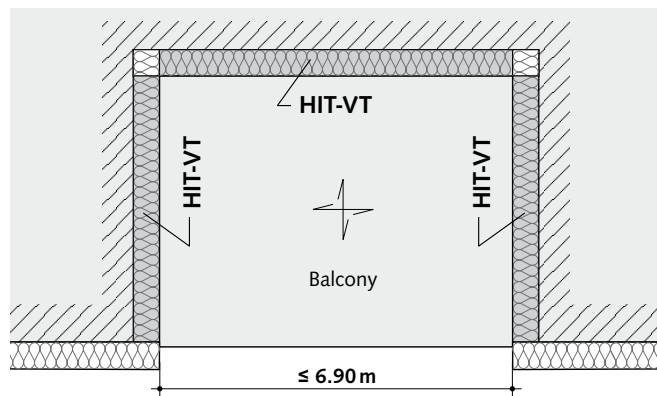
Note: Concrete strength $C20/25 / \geq C25/30$

34.6 36.2

HALFEN INSULATED CONNECTION HIT-±BQ, HIT-VT

Joint Spacings, System Length

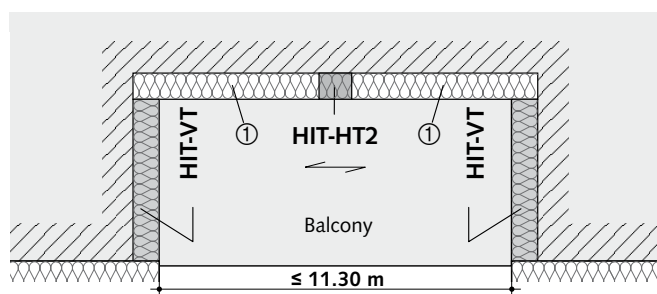
Design for maximum slab width 6.90 m



The National Technical Approval Z-15.7-238 section 4.1. limits the width of the loggia slab in this design variation to a **maximum of 6.90 m**.

Recessed balcony / loggia, supported on 3 sides.

Design at maximum slab width 11.30 m

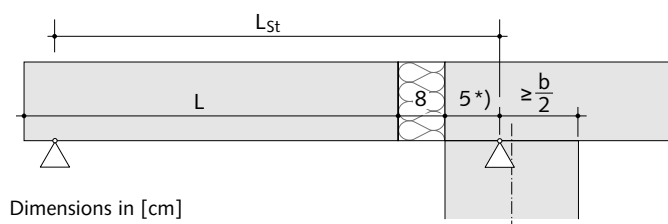


The National Technical Approval Z-15.7-238 section 4.1. limits the width of the loggia slab in this design variation to a **maximum of 11.30 m**.

Recessed balcony / loggia, supported on 2 sides.
HALFEN Insulated connections **HIT-HT** are used to absorb expected horizontal loads.

① In-situ thermal insulation or HIT-BQ, HIT-BD

Calculating the system length L_{St}



Dimensions in [cm]

To calculate the system length L_{St} please refer to the diagram on the left.

*) The condition $\geq 3 < 12$ cm must be met.

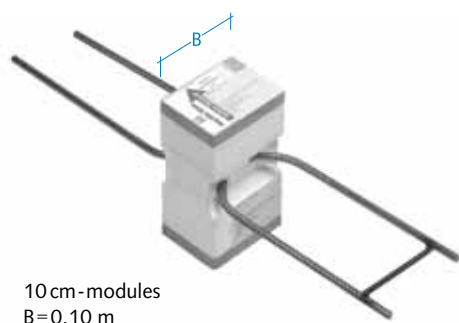
HALFEN INSULATED CONNECTION HIT-HT, HIT-S ANCHOR

Introduction HIT-HT

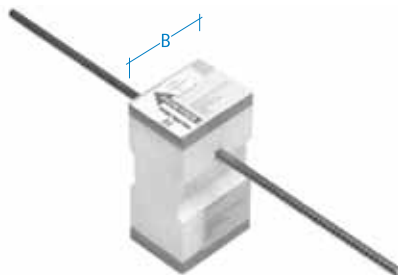
HIT-HT

- To absorb expected horizontal forces.
- HIT-HT1: Transfers horizontal forces parallel to the insulation plane.
- HIT-HT2: Transfers horizontal forces perpendicular to the insulation plane.
- HIT-HT3: Transfers horizontal forces parallel and perpendicular to the insulation plane.

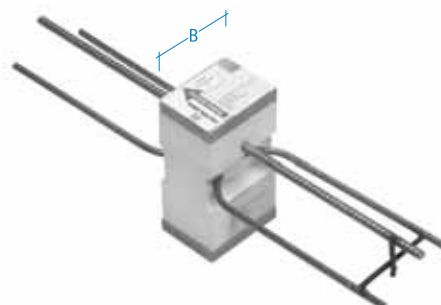
HIT-HT1



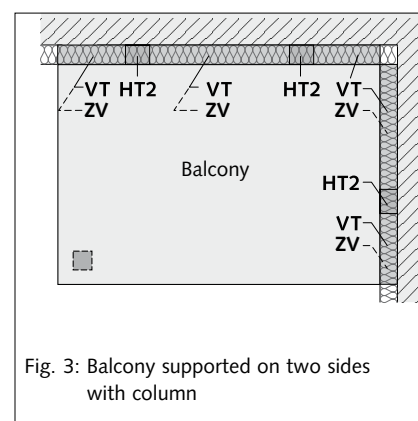
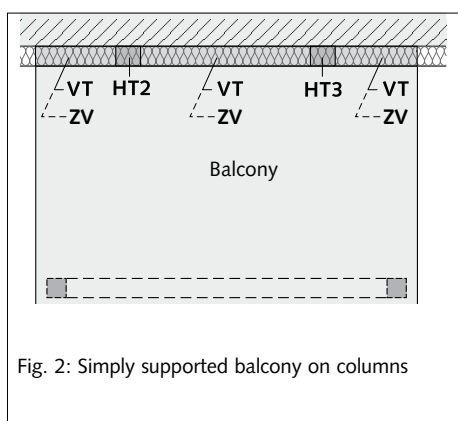
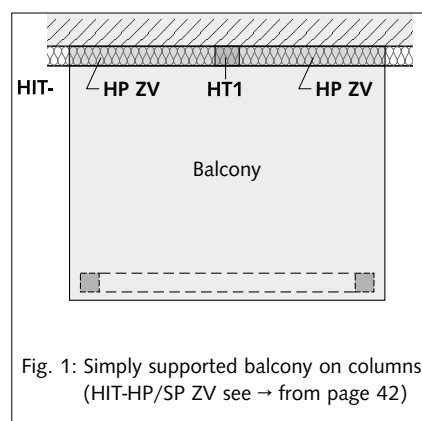
HIT-HT2



HIT-HT3



Application examples HIT-HT1 / -HT2 / -HT3



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Load bearing capacity values	HIT-HT	74
Installation diagram		75
Product description	HIT-S-Anchor	75

HALFEN INSULATED CONNECTION HIT-HT

Product Description, Product Variations HIT-HT

Product variations

Ordering example:

HIT - HT3 - 18 - F90 ①

• Type / version

• Slab thickness h

• Fire protection ①

• standard

• fireproof F90

F90



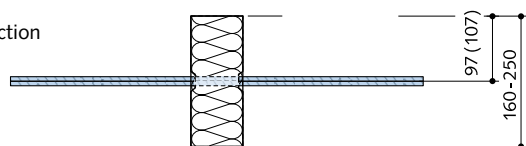
Information on material specifications and test certificates can be found on page 88.

① When ordering the standard version, omit the reference from the specification.

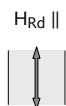
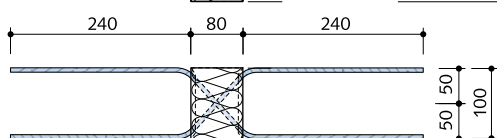
Horizontal forces parallel to the insulation plane

HIT-HT1

Vertical section



Top view



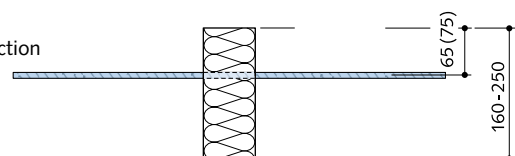
HIT-HT1 Components		Design values			
Reinforcement		Element length	C20/25		C25/30
Shear force	Horizontal force		$H_{Rd \parallel}$	$H_{Rd \perp}$	$H_{Rd \parallel}$
		[mm]	[kN]	[kN]	[kN]
2 × Ø 8	—	100	±7.4	0	±8.6

Dimensions in [mm]

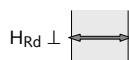
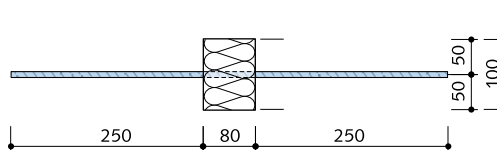
Horizontal forces perpendicular to the insulation plane

HIT-HT2

Vertical section



Top view



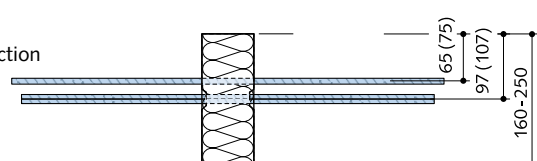
HIT-HT2 Components		Design values			
Reinforcement		Element length	C20/25		C25/30
Shear force	Horizontal force		$H_{Rd \parallel}$	$H_{Rd \perp}$	$H_{Rd \parallel}$
		[mm]	[kN]	[kN]	[kN]
—	1 × Ø 10	100	0	±18.2	0

Dimensions in [mm]

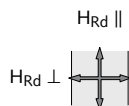
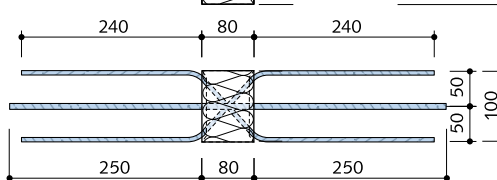
Horizontal forces parallel and perpendicular to the insulation plane

HIT-HT3

Vertical section



Top view



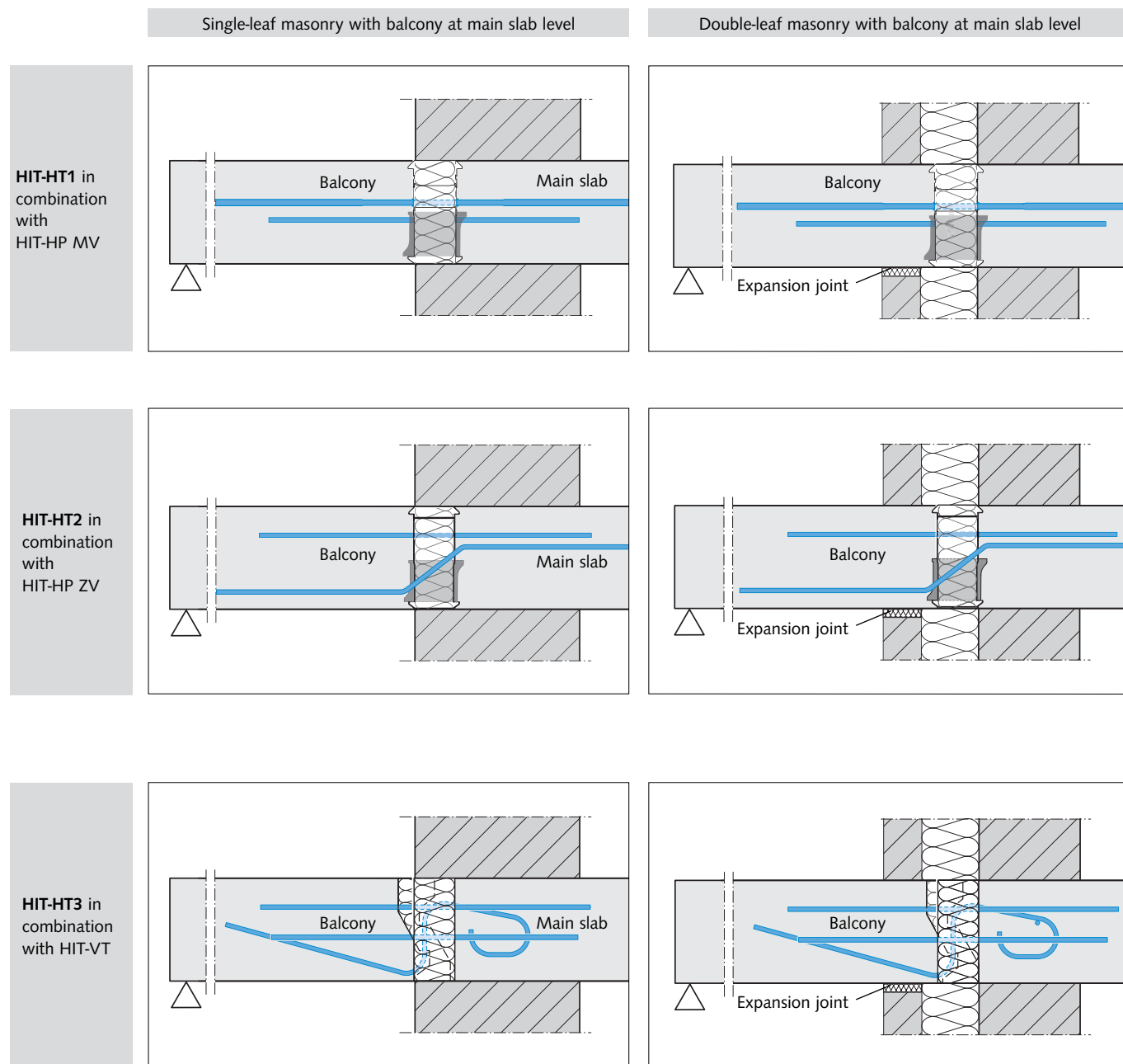
HIT-HT3 Components		Design values			
Reinforcement		Element length	C20/25		C25/30
Shear force	Horizontal force		$H_{Rd \parallel}$	$H_{Rd \perp}$	$H_{Rd \parallel}$
		[mm]	[kN]	[kN]	[kN]
2 × Ø 8	1 × Ø 10	100	±7.4	±18.2	±8.6

Dimensions in [mm]

HALFEN INSULATED CONNECTION HIT-HT

Installation Diagram HIT-HT, Product Variations HIT-S-Anchor

Position of the HIT-HT units in the cross-section of a wall in combination: Examples



HIT-S-Anchors

If expected horizontal forces are to be transferred through the connection, additional horizontal anchors must be installed.

Insert HIT-S-Anchors through the insulation of the HIT unit.

HIT-S-Anchors (B500 NR) are available as individual bars; see table on the right.

Available HIT-S-Anchors	
Specification	Bar length [mm]
HIT-S-Anchor-8	820
HIT-S-Anchor-10	1150
HIT-S-Anchor-12	1180

HALFEN INSULATED CONNECTION HIT-BD

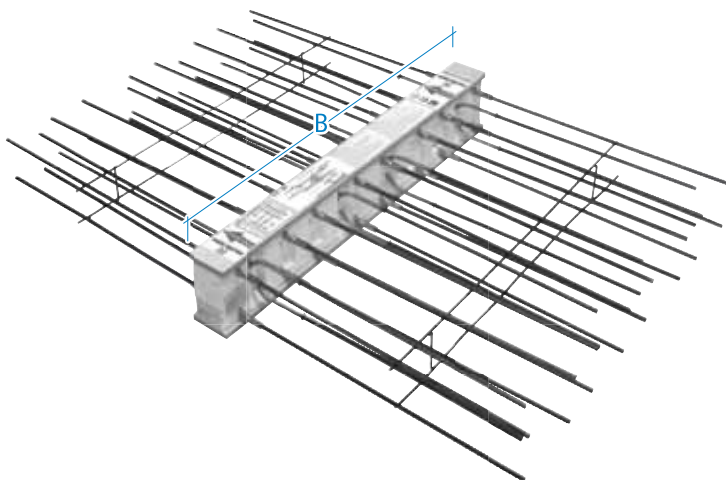
Introduction HIT-BD

HIT-BD

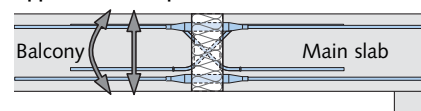
- Used for balcony slabs incorporated within the main slab, e.g. a loggia.
- Transfers positive and negative moments and shear forces.

HIT-BD

One-metre element
B = 1.0 m



Application example HIT-BD



Standard one-metre element version for negative and positive bending moments and shear forces.

Application examples HIT-BD

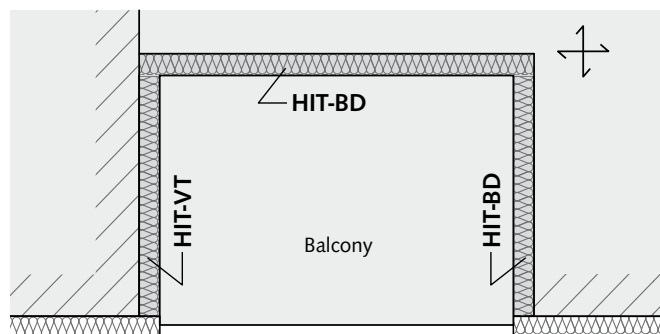


Figure 1: Balcony slabs cut into a floor slab (continuous slab); one example is a loggia. The balcony slab transfers positive and negative directed moments and shear forces.

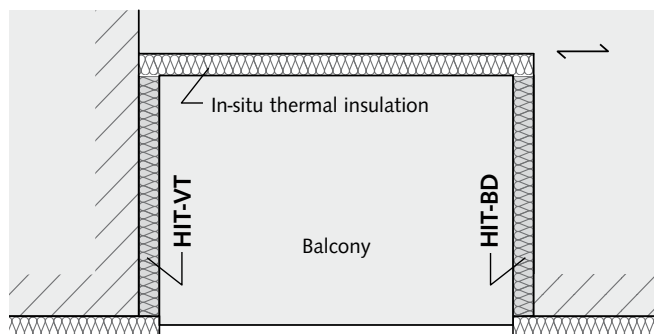


Figure 2: Balcony slabs cut into a floor slab (continuous slab); one example is a loggia. The balcony slab transfers positive and negative directed moments and shear forces.

Chapter 7 – Contents

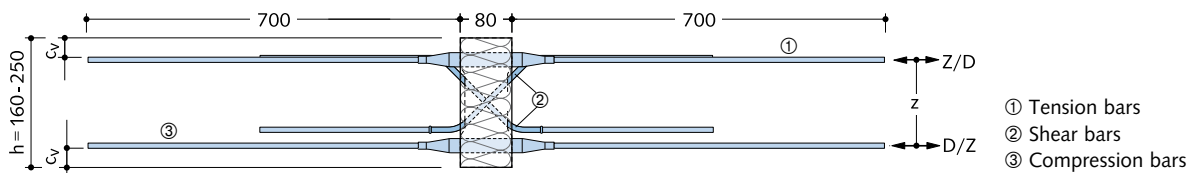
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Product variations	HIT-BD	77
Load bearing capacity values	HIT-BD	78
Installation diagram		79

HALFEN INSULATED CONNECTION HIT-BD

Product Description, Product Variations HIT-BD

HIT-BD

Dimensions
in [mm]



Product description HIT-BD

Components	Load range	12/7	12/10	14/10	12/7-QE	12/10-QE	14/10-QE	12/7-QEE	12/10-QEE	14/10-QEE
Width B [m]		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Tension bars/ Compression bars	n × Ø [mm]	2 × 8 Ø 10	2 × 12 Ø 10	2 × 16 Ø 10	2 × 8 Ø 10	2 × 12 Ø 10	2 × 16 Ø 10	2 × 8 Ø 10	2 × 12 Ø 10	2 × 16 Ø 10
	Length [mm]	1480	1480	1480	1480	1480	1480	1480	1480	1480
Shear bars										
• Standard	n × Ø [mm]	2 × 4 Ø 8	2 × 4 Ø 8	2 × 4 Ø 8	—	—	—	—	—	—
• QE	n × Ø [mm]	—	—	—	2 × 4 Ø 10	2 × 4 Ø 10	2 × 4 Ø 10	—	—	—
• QEE	n × Ø [mm]	—	—	—	—	—	—	2 × 4 Ø 12	2 × 4 Ø 12	2 × 4 Ø 12



Information on material specifications and test certificates can be found on page 88.

Product variations

Ordering example:

HIT - BD - 12/7 - 20 - F90 - QE - 1L

• Type / version

• Load range

• Slab thickness h

• Fire protection ①

• standard

• fireproof F90

• Shear capacity ①

• standard Ø QS → table above

• increased Ø QS → table above

• increased Ø QS → table above

• Concrete cover ①

• unspecified $c_v = 30$ mm

• 1L $c_v = 40$ mm

• 2L $c_v = 50$ mm

Standard for $h \geq 16$ cm

1L for $h \geq 18$ cm

2L for $h \geq 20$ cm

3L for $h \geq 22$ cm

Custom designs are available on request.
For further details, please contact us:
→ see inside back cover for contact details

① When ordering the standard design, omit the reference from the specification.

Camber of the balcony slab → see type statics, Appendix 1

Joint spacings, installation clearances, maximum cantilever length acc. to DIN 1045-1 / DIN EN 1992-1-1 (EC2) → page 31

HALFEN INSULATED CONNECTION HIT-BD

Load Bearing Capacity Values Acc. to DIN 1045-1 / DIN EN 1992-1-1 (EC2) – Concrete Cover $c_v = 30, 40$ and 50 mm

Load bearing capacity values HIT-BD one-metre elements



m_{Rd} Moment bearing capacity

Design values	Load range	12/7	12/10	14/10	12/7-QE	12/10-QE	14/10-QE	12/7-QEE	12/10-QEE	14/10-QEE
	For slab thickness [cm]	concrete cover $c_v = 30$ mm						Concrete strength: $C20/25 / \geq C25/30$		
m_{Rd} [kNm/m]	16	$\pm 24.4 \pm 24.4$	$\pm 36.5 \pm 36.5$	$\pm 48.7 \pm 48.7$	—	—	—	—	—	—
	17	$\pm 27.1 \pm 27.1$	$\pm 40.6 \pm 40.6$	$\pm 54.1 \pm 54.1$	—	—	—	—	—	—
	18	$\pm 29.8 \pm 29.8$	$\pm 44.7 \pm 44.7$	$\pm 59.6 \pm 59.6$	$\pm 29.8 \pm 29.8$	$\pm 44.7 \pm 44.7$	$\pm 59.6 \pm 59.6$	—	—	—
	19	$\pm 32.5 \pm 32.5$	$\pm 48.7 \pm 48.7$	$\pm 65.0 \pm 65.0$	$\pm 32.5 \pm 32.5$	$\pm 48.7 \pm 48.7$	$\pm 65.0 \pm 65.0$	$\pm 32.5 \pm 32.5$	$\pm 48.7 \pm 48.7$	$\pm 65.0 \pm 65.0$
	20	$\pm 35.2 \pm 35.2$	$\pm 52.8 \pm 52.8$	$\pm 70.4 \pm 70.4$	$\pm 35.2 \pm 35.2$	$\pm 52.8 \pm 52.8$	$\pm 70.4 \pm 70.4$	$\pm 35.2 \pm 35.2$	$\pm 52.8 \pm 52.8$	$\pm 70.4 \pm 70.4$
	21	$\pm 37.9 \pm 37.9$	$\pm 56.9 \pm 56.9$	$\pm 75.8 \pm 75.8$	$\pm 37.9 \pm 37.9$	$\pm 56.9 \pm 56.9$	$\pm 75.8 \pm 75.8$	$\pm 37.9 \pm 37.9$	$\pm 56.9 \pm 56.9$	$\pm 75.8 \pm 75.8$
	22	$\pm 40.6 \pm 40.6$	$\pm 60.9 \pm 60.9$	$\pm 81.2 \pm 81.2$	$\pm 40.6 \pm 40.6$	$\pm 60.9 \pm 60.9$	$\pm 81.2 \pm 81.2$	$\pm 40.6 \pm 40.6$	$\pm 60.9 \pm 60.9$	$\pm 81.2 \pm 81.2$
	23	$\pm 43.3 \pm 43.3$	$\pm 65.0 \pm 65.0$	$\pm 86.6 \pm 86.6$	$\pm 43.3 \pm 43.3$	$\pm 65.0 \pm 65.0$	$\pm 86.6 \pm 86.6$	$\pm 43.3 \pm 43.3$	$\pm 65.0 \pm 65.0$	$\pm 86.6 \pm 86.6$
	24	$\pm 46.0 \pm 46.0$	$\pm 69.0 \pm 69.0$	$\pm 92.0 \pm 92.0$	$\pm 46.0 \pm 46.0$	$\pm 69.0 \pm 69.0$	$\pm 92.0 \pm 92.0$	$\pm 46.0 \pm 46.0$	$\pm 69.0 \pm 69.0$	$\pm 92.0 \pm 92.0$
	25	$\pm 48.7 \pm 48.7$	$\pm 73.1 \pm 73.1$	$\pm 97.5 \pm 97.5$	$\pm 48.7 \pm 48.7$	$\pm 73.1 \pm 73.1$	$\pm 97.5 \pm 97.5$	$\pm 48.7 \pm 48.7$	$\pm 73.1 \pm 73.1$	$\pm 97.5 \pm 97.5$

Design values	Load range	12/7	12/10	14/10	12/7-QE	12/10-QE	14/10-QE	12/7-QEE	12/10-QEE	14/10-QEE
	For slab thickness [cm]	concrete cover $c_v = 40$ mm						Concrete strength: $C20/25 / \geq C25/30$		
m_{Rd} [kNm/m]	18	$\pm 24.4 \pm 24.4$	$\pm 36.5 \pm 36.5$	$\pm 48.7 \pm 48.7$	$\pm 24.4 \pm 24.4$	$\pm 36.5 \pm 36.5$	$\pm 48.7 \pm 48.7$	—	—	—
	19	$\pm 27.1 \pm 27.1$	$\pm 40.6 \pm 40.6$	$\pm 54.1 \pm 54.1$	$\pm 27.1 \pm 27.1$	$\pm 40.6 \pm 40.6$	$\pm 54.1 \pm 54.1$	$\pm 27.1 \pm 27.1$	$\pm 40.6 \pm 40.6$	$\pm 54.1 \pm 54.1$
	20	$\pm 29.8 \pm 29.8$	$\pm 44.7 \pm 44.7$	$\pm 59.6 \pm 59.6$	$\pm 29.8 \pm 29.8$	$\pm 44.7 \pm 44.7$	$\pm 59.6 \pm 59.6$	$\pm 29.8 \pm 29.8$	$\pm 44.7 \pm 44.7$	$\pm 59.6 \pm 59.6$
	21	$\pm 32.5 \pm 32.5$	$\pm 48.7 \pm 48.7$	$\pm 65.0 \pm 65.0$	$\pm 32.5 \pm 32.5$	$\pm 48.7 \pm 48.7$	$\pm 65.0 \pm 65.0$	$\pm 32.5 \pm 32.5$	$\pm 48.7 \pm 48.7$	$\pm 65.0 \pm 65.0$
	22	$\pm 35.2 \pm 35.2$	$\pm 52.8 \pm 52.8$	$\pm 70.4 \pm 70.4$	$\pm 35.2 \pm 35.2$	$\pm 52.8 \pm 52.8$	$\pm 70.4 \pm 70.4$	$\pm 35.2 \pm 35.2$	$\pm 52.8 \pm 52.8$	$\pm 70.4 \pm 70.4$
	23	$\pm 37.9 \pm 37.9$	$\pm 56.9 \pm 56.9$	$\pm 75.8 \pm 75.8$	$\pm 37.9 \pm 37.9$	$\pm 56.9 \pm 56.9$	$\pm 75.8 \pm 75.8$	$\pm 37.9 \pm 37.9$	$\pm 56.9 \pm 56.9$	$\pm 75.8 \pm 75.8$
	24	$\pm 40.6 \pm 40.6$	$\pm 60.9 \pm 60.9$	$\pm 81.2 \pm 81.2$	$\pm 40.6 \pm 40.6$	$\pm 60.9 \pm 60.9$	$\pm 81.2 \pm 81.2$	$\pm 40.6 \pm 40.6$	$\pm 60.9 \pm 60.9$	$\pm 81.2 \pm 81.2$
	25	$\pm 43.3 \pm 43.3$	$\pm 65.0 \pm 65.0$	$\pm 86.6 \pm 86.6$	$\pm 43.3 \pm 43.3$	$\pm 65.0 \pm 65.0$	$\pm 86.6 \pm 86.6$	$\pm 43.3 \pm 43.3$	$\pm 65.0 \pm 65.0$	$\pm 86.6 \pm 86.6$

Design values	Load range	12/7	12/10	14/10	12/7-QE	12/10-QE	14/10-QE	12/7-QEE	12/10-QEE	14/10-QEE
	For slab thickness [cm]	concrete cover $c_v = 50$ mm						Concrete strength: $C20/25 / \geq C25/30$		
m_{Rd} [kNm/m]	20	$\pm 24.4 \pm 24.4$	$\pm 36.5 \pm 36.5$	$\pm 48.7 \pm 48.7$	$\pm 24.4 \pm 24.4$	$\pm 36.5 \pm 36.5$	$\pm 48.7 \pm 48.7$	—	—	—
	21	$\pm 27.1 \pm 27.1$	$\pm 40.6 \pm 40.6$	$\pm 54.1 \pm 54.1$	$\pm 27.1 \pm 27.1$	$\pm 40.6 \pm 40.6$	$\pm 54.1 \pm 54.1$	$\pm 27.1 \pm 27.1$	$\pm 40.6 \pm 40.6$	$\pm 54.1 \pm 54.1$
	22	$\pm 29.8 \pm 29.8$	$\pm 44.7 \pm 44.7$	$\pm 59.6 \pm 59.6$	$\pm 29.8 \pm 29.8$	$\pm 44.7 \pm 44.7$	$\pm 59.6 \pm 59.6$	$\pm 29.8 \pm 29.8$	$\pm 44.7 \pm 44.7$	$\pm 59.6 \pm 59.6$
	23	$\pm 32.5 \pm 32.5$	$\pm 48.7 \pm 48.7$	$\pm 65.0 \pm 65.0$	$\pm 32.5 \pm 32.5$	$\pm 48.7 \pm 48.7$	$\pm 65.0 \pm 65.0$	$\pm 32.5 \pm 32.5$	$\pm 48.7 \pm 48.7$	$\pm 65.0 \pm 65.0$
	24	$\pm 35.2 \pm 35.2$	$\pm 52.8 \pm 52.8$	$\pm 70.4 \pm 70.4$	$\pm 35.2 \pm 35.2$	$\pm 52.8 \pm 52.8$	$\pm 70.4 \pm 70.4$	$\pm 35.2 \pm 35.2$	$\pm 52.8 \pm 52.8$	$\pm 70.4 \pm 70.4$
	25	$\pm 37.9 \pm 37.9$	$\pm 56.9 \pm 56.9$	$\pm 75.8 \pm 75.8$	$\pm 37.9 \pm 37.9$	$\pm 56.9 \pm 56.9$	$\pm 75.8 \pm 75.8$	$\pm 37.9 \pm 37.9$	$\pm 56.9 \pm 56.9$	$\pm 75.8 \pm 75.8$



v_{Rd} Shear capacity in both directions

Design values	Load range	12/7	12/10	14/10	12/7-QE	12/10-QE	14/10-QE	12/7-QEE	12/10-QEE	14/10-QEE
	For slab thickness [cm]	Concrete strength: $C20/25 / \geq C25/30$								
		Standard			Increased shear capacity		QE	Increased shear capacity		
v_{Rd} [kN/m]	16 – 25	$\pm 44.0 \pm 51.2$	$\pm 44.0 \pm 51.2$	$\pm 44.0 \pm 51.2$	—	—	—	—	—	—
	18 – 25	—	—	—	$\pm 73.3 \pm 85.3$	$\pm 73.3 \pm 85.3$	$\pm 73.3 \pm 85.3$	—	—	—
	19	—	—	—	—	—	—	$\pm 95.6 \pm 119.5$	$\pm 95.6 \pm 119.5$	$\pm 95.6 \pm 119.5$
	20 – 25	—	—	—	—	—	—	$\pm 105.7 \pm 122.9$	$\pm 105.7 \pm 122.9$	$\pm 105.7 \pm 122.9$

Note: Concrete strength $C20/25 / \geq C25/30$

34.6	36.2
------	------

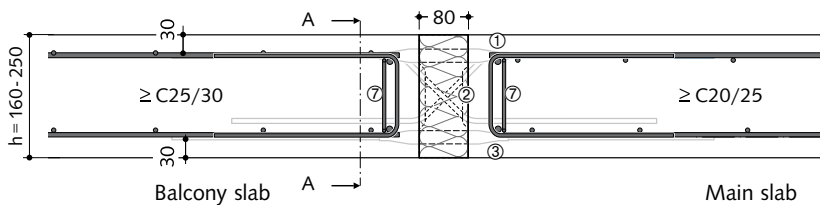
All necessary verifications including verifying concrete strut shear pressure have been already considered

HALFEN INSULATED CONNECTION HIT-BD

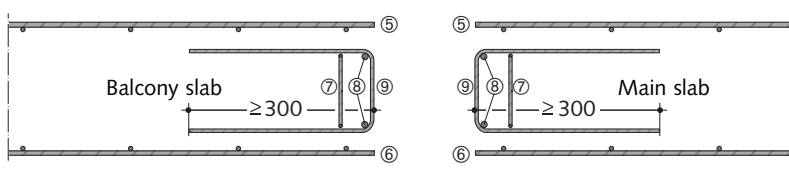
On-site Reinforcement, Installation Diagram

On-site reinforcement for balcony connections HIT-BD

Longitudinal section



Longitudinal section

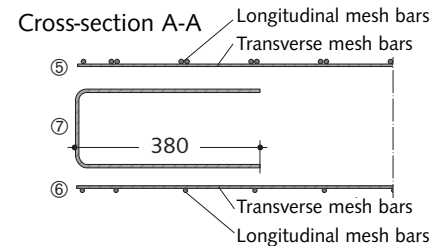
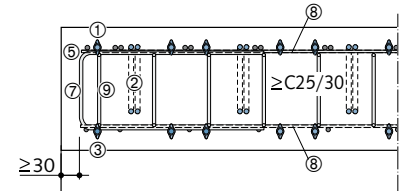


Dimensions in [mm]

- ① HIT tension/compression bar
- ② HIT shear bars
- ③ HIT tension/compression bar
- ⑤ Top connecting reinforcement, steel bars or mesh
- ⑥ Bottom connecting reinforcement, steel bars or mesh
- ⑦ End U-bar Ø 8 mm as end anchorage for ⑧
- ⑧ Transverse tensile reinforcement 2 Ø 8 mm
- ⑨ U-bar Ø 6 mm, e = 10 cm

On-site connecting reinforcement:
see → Type statics, appendix 1

Cross-section A-A



DIN 1045-1 chapter 13.3.2 / DIN EN 1992-1-1 (EC2) 9.3.1.4 requires stirrups to be placed in the outer edge of the balcony slab as an edge frame. Additionally, item ⑦ must be installed.

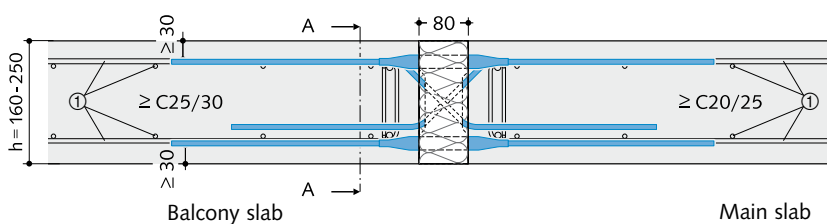
Connecting reinforcement

Type HIT-BD	Recommended on-site connecting reinforcement					
	Variation A = B500A/B mesh only		Variation B Bar steel B500B		Variation C = Combined mesh B500A/B + steel bars B500B	
	Main slab thickness		Main slab thickness		Main slab thickness	
	≤ 20cm	> 20 ≤ 25cm	≤ 20cm	> 20 ≤ 25cm	≤ 20cm	> 20 ≤ 25cm
12/7	R 513A	—	Ø 10/15	Ø 10/12,5	Q 188A + Ø 8/15	Q 257A + Ø 8/15
12/10	—	—	Ø 10/9	Ø 10/7,5	Q 335A + Ø 8/10	Q 377A + Ø 8/10
14/10 *)	—	—	Ø 12/7,5	Ø 12/7,5	Q 377A + Ø 10/10	Q 513A + Ø 10/10

*) Due to the small clearances, we recommend limiting the maximum grain size of the aggregate to 16 mm and using concrete with a plastic consistency.

Installation diagram HIT-BD

Longitudinal section



Dimensions in [mm]

① On-site reinforcement

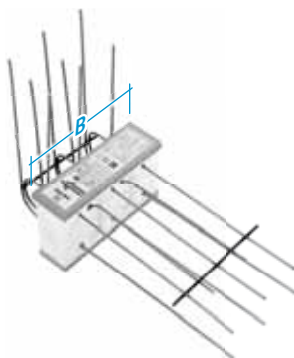
HALFEN INSULATED CONNECTION HIT-FT, HIT-OT, HIT-AT

Introduction HIT-FT, HIT-OT, HIT-AT

HALFEN HIT Insulated connections to form a thermal barrier between main slab and:

- a corbelled parapet → HIT-FT
- a corbel → HIT-OT
- a parapet → HIT-AT
- Select the unit spacing based on structural requirements.

Element width
B=0.30m



Application examples Dimensions in [mm]

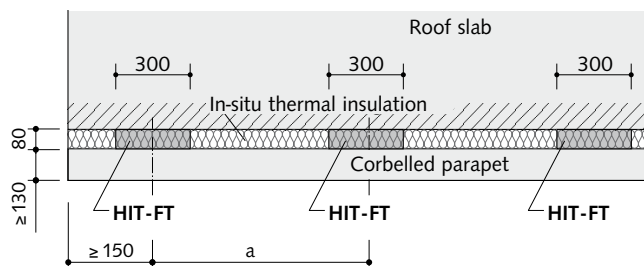


Fig. 1: Roof slab with a corbelled parapet connected.
The corbel is designed as a continuous beam.

Element width
B=0.30m

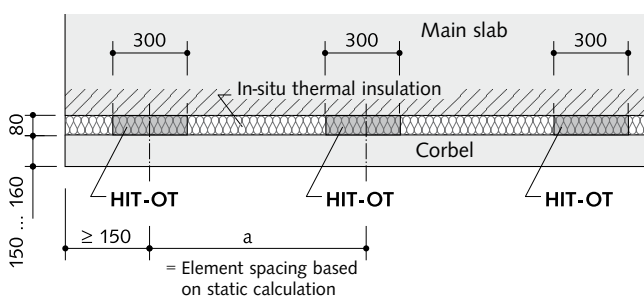
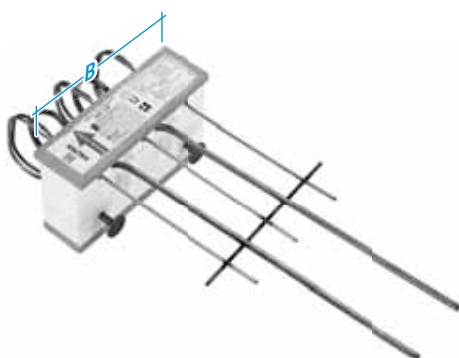


Fig. 2: Main slab with a corbel connected.
The corbel is designed as a continuous beam.

Element width
B=0.30m

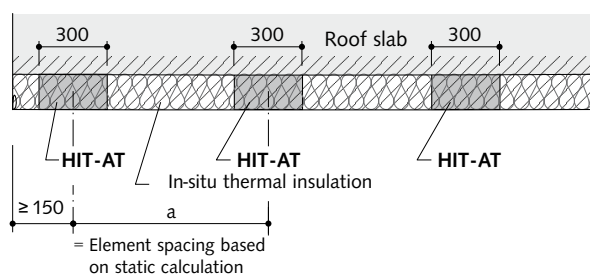
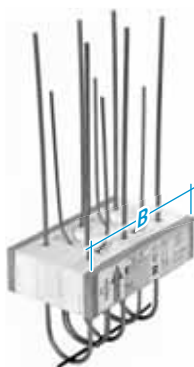


Fig. 3: Roof slab with a parapet connected.
The corbel is designed as a continuous beam.

Chapter 8 – Contents

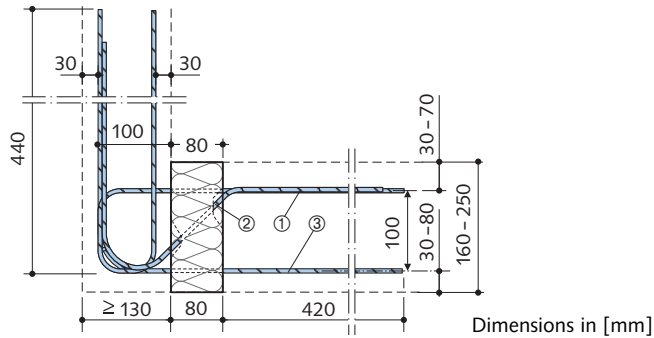
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Product information	HIT-FT	81
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Product information	HIT-AT	83

HALFEN INSULATED CONNECTION HIT-FT, HIT-OT, HIT-AT

Product Information HIT-FT

Product description

- ① Tension / compression bars 3 x Ø 6 mm, B500 NR
- ② Shear bars 2 x Ø 6 mm, B500 NR
- ③ Tension / compression bars 3 x Ø 6 mm, B500 NR



Ordering example

- Product group / type
- Slab thickness h [cm]
- Fire protection ①

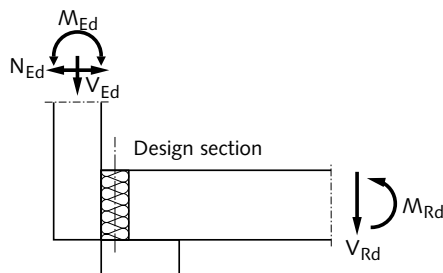
HIT - FT - 20 - F90

- ① When ordering the standard version, omit the reference from the specification.

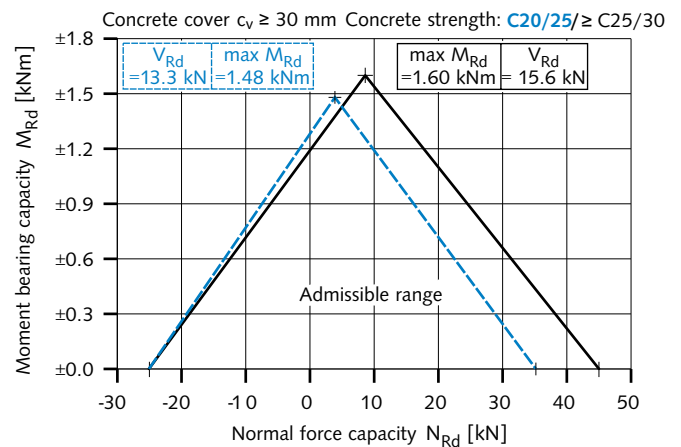


Information on material specifications and test certificates can be found on page 88.

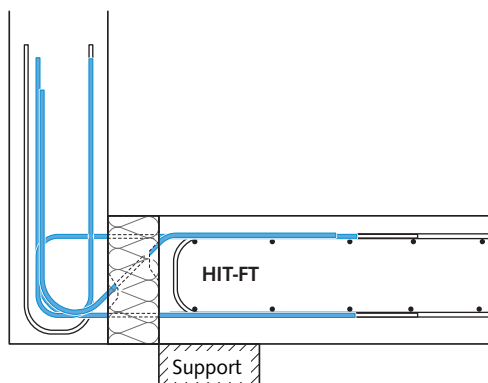
Static system



Load bearing capacity

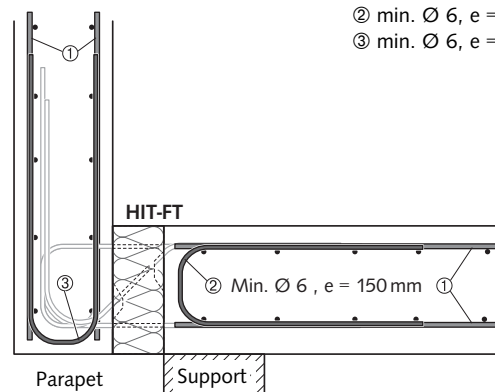


Installation diagram HIT-FT



On-site reinforcement HIT-FT

- ① On-site reinforcement
- ② min. Ø 6, e = 150 mm
- ③ min. Ø 6, e = 150 mm

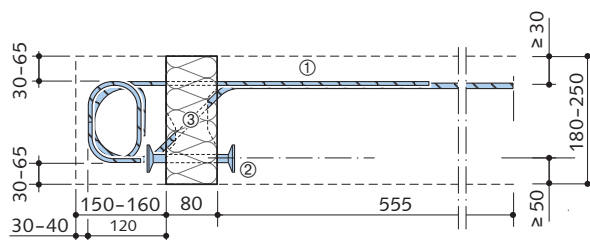


HALFEN INSULATED CONNECTION HIT-FT, HIT-OT, HIT-AT

Product Information HIT-OT

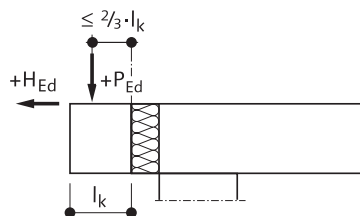
Product description

- ① Tension bars 3 x Ø 6 mm, B 500 NR
- ② Shear bars 2 x Ø 10 mm, B 500 NR
- ③ Compression bearings 2 x Ø 12 mm, stainless steel



Dimensions in [mm]

Static system



l_k = cantilever length of the bracket

Ordering example

HIT - OT - 20 - F90

• Product group / type

• Corbel thickness h [cm]

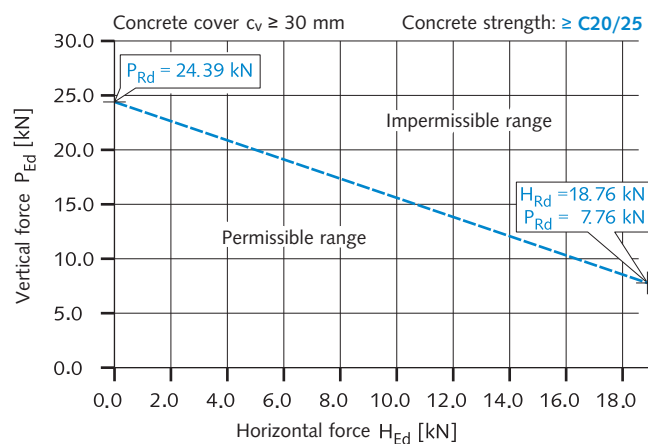
• Fire protection ①

- ① When ordering the standard version, omit the reference from the specification.

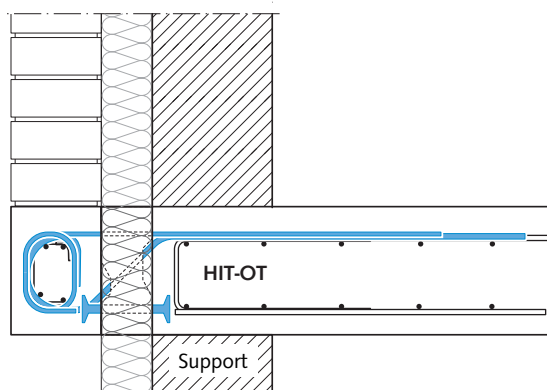


Information on material specifications and test certificates can be found on page 88.

Load bearing capacity

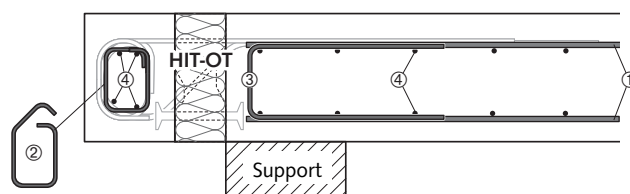


Installation diagram HIT-OT



On-site reinforcement HIT-OT

- ① On-site connecting reinforcement
- ② 2 x closed stirrup
- ③ 2 x U-bar
- ④ Additional rebars ≥ 8 mm Ø

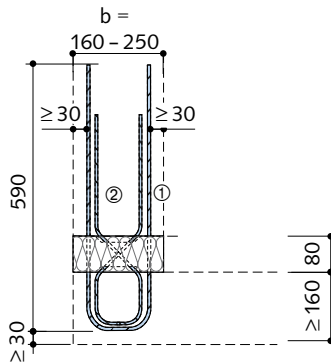


HALFEN INSULATED CONNECTION HIT-FT, HIT-OT, HIT-AT

Product Information HIT-AT

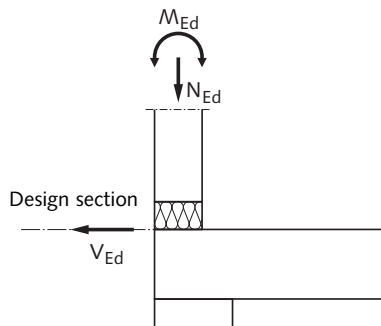
Product description

- ① Tension / compression bars $2 \times 3 \text{ } \varnothing 8 \text{ mm}$, B500 NR
- ② Shear bars $2 \times 2 \text{ } \varnothing 6 \text{ mm}$, B500 NR

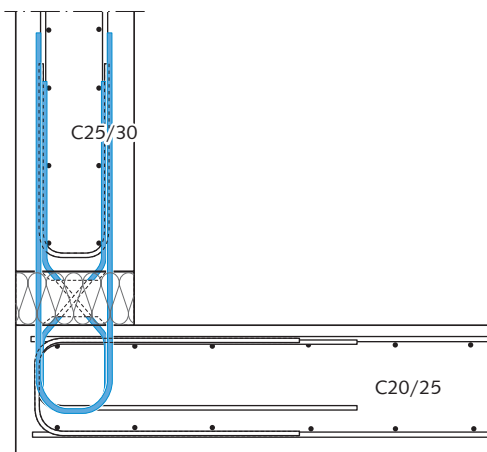


Dimensions in [mm]

Static system



Installation diagram HIT-AT



Ordering example

Ordering example:

- Product group / type
- Parapet width b [cm]
- Fire protection ①

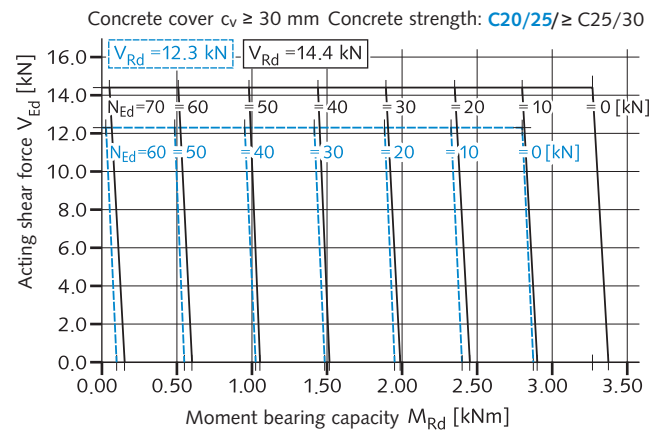
HIT - AT - 20 - F90

- ① When ordering the standard version, omit the reference from the specification.



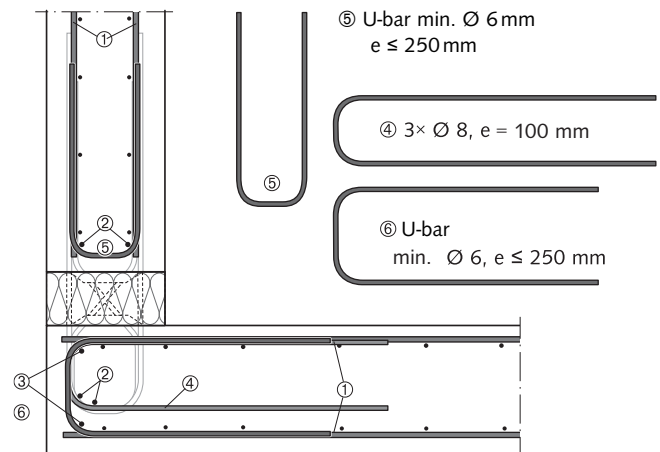
Information on material specifications and test certificates can be found on page 88.

Load bearing capacity



On-site reinforcement HIT-AT

- ① On-site connecting reinforcement
- ② $\varnothing 6 \text{ mm}$
- ③ $\varnothing 8 \text{ mm}$
- ⑤ U-bar min. $\varnothing 6 \text{ mm}$
 $e \leq 250 \text{ mm}$



HALFEN INSULATED CONNECTION HIT-ST, HIT-WT

Introduction HIT-ST, HIT-WT

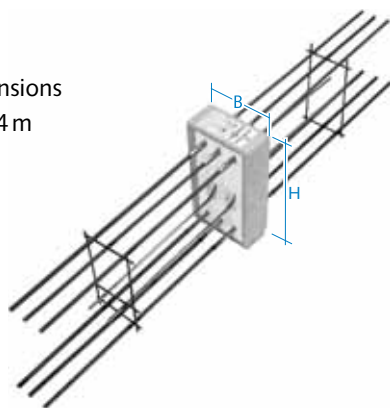
HIT-ST:

- Cantilever connection for thermal separation of cantilevered reinforced concrete beams.
- Transfers high bending moments and shear forces.

HIT-ST

Standard dimensions

$B/H = 0.2/0.4\text{ m}$



Application example

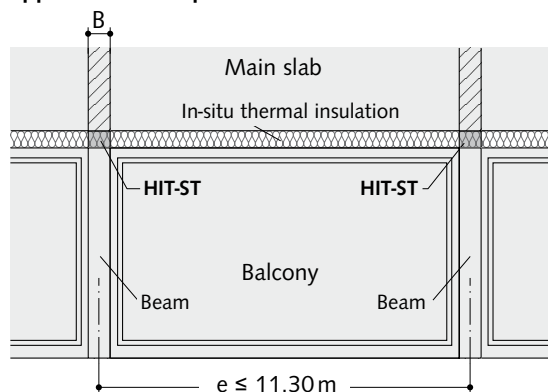


Fig. 1: Thermally insulated beam connections

HIT-WT:

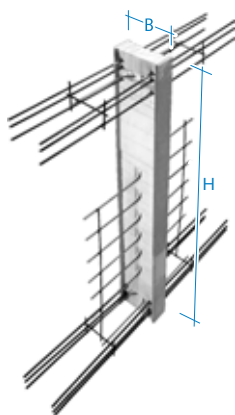
- Wall connection for thermal separation of a cantilevered shear wall from the building.
- Transfers bending moments as well as vertical and horizontal shear forces.

HIT-WT

Element dimensions

$B = 0.15 - 0.25\text{ m}$

$H = 1.5 - 3.5\text{ m}$



Application example

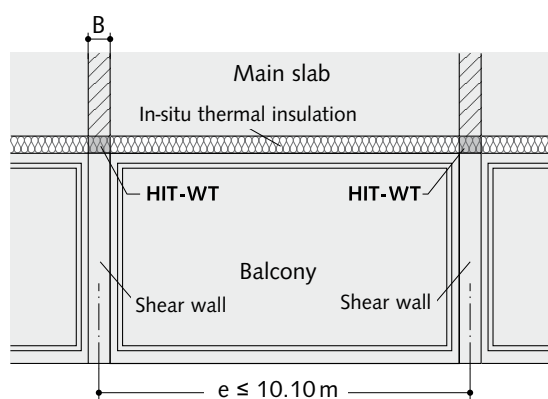


Fig. 2: Thermally insulated shear wall connections

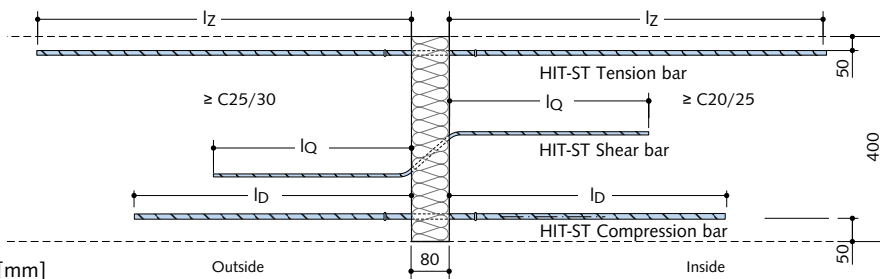
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Product information	HIT-WT	86
Installation diagram	HIT-WT	87

HALFEN INSULATED CONNECTION HIT-ST, HIT-WT

Product description HIT-ST

HIT-ST



Dimensions in [mm]



Information on material specifications and test certificates can be found on page 88.

Product description

Components	Load range:		HIT-ST 1	HIT-ST 2	HIT-ST 3	HIT-ST 4
	Width B	B [m]	0.20	0.20	0.20	0.20
Tension bars	n × Ø [mm]	n × Ø [mm]	3 Ø 10	3 Ø 12	3 Ø 14	3 Ø 16
	Standard/VB2	l _z [mm]	700 / 900	740 / 1060	850 / 1220	1270 / 1760
Compression bars	n × Ø [mm]	n × Ø [mm]	3 Ø 12	3 Ø 14	3 Ø 16	3 Ø 20
	Standard/VB2	l _D [mm]	550 / 900	565 / 1035	635 / 1170	770 / 1435
Shear bars	n × Ø [mm]	n × Ø [mm]	2 Ø 8	2 Ø 10	2 Ø 12	2 Ø 14
	Standard/VB2	l _Q [mm]	505 / 695	565 / 765	625 / 875	695 / 975
On-site stirrups	req. A _s [cm ²]		1.09	1.53	2.09	2.83
	n × Ø [mm]	selected:	2 Ø 8	2 Ø 8	2 Ø 10	2 Ø 10

Load bearing capacities and product variations

Load bearing capacity of the element		Concrete strength: C20/25			
Bending moment	M _{Rd} [kNm]	24.1	33.3	43.6	60.8
Shear force	V _{Rd} [kN]	25.3	36.1	50.2	66.3
Expansion joint spacing	e [m]	11.3	10.1	9.2	8.0

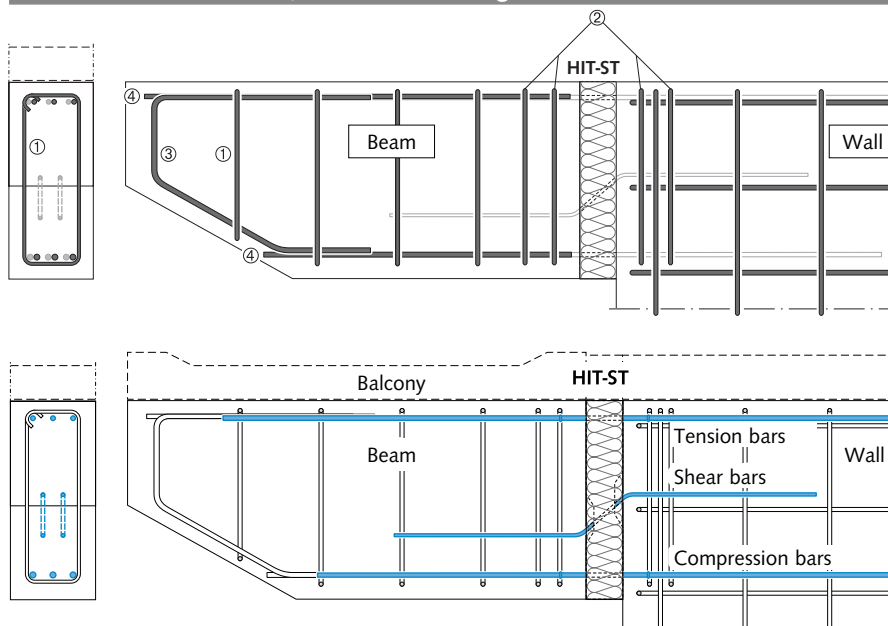
Ordering example:

- Product group
- Beam type
- Bond quality ①
- Fire protection ①

HIT - ST1 - VB2 - F90

① When ordering the standard version, omit VB2 and F90 from the specification.

On-site reinforcement / Installation diagram



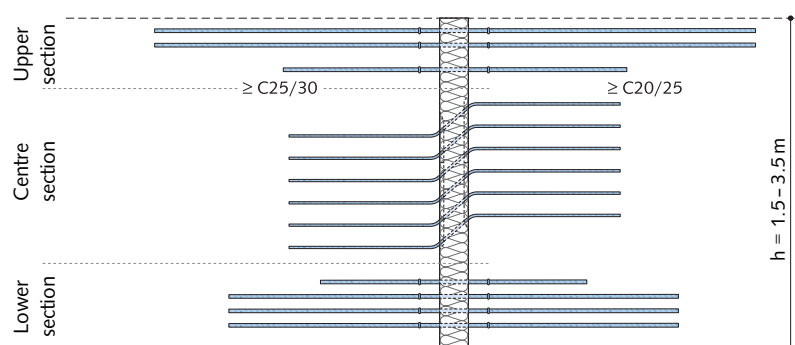
- ① U-bar reinforcement according to the structural engineer's specifications
- ② Suspension and tensile splitting reinforcement in accordance with the above table "Product description"
- ③ On-site edge frame
- ④ Connecting reinforcement of the tension and compression bars

Fix the on-site connecting reinforcement in accordance with the structural engineer's drawings and specifications. Observe the required A_s values specified in the table above.

HALFEN INSULATED CONNECTION HIT-ST, HIT-WT

Product description HIT-WT

HIT-WT



Information on material specifications and test certificates can be found on page 88.

Product description

Components	Load range:	HIT-WT1	HIT-WT2	HIT-WT3	HIT-WT4
	for wall thickness [cm]	15 – 25	15 – 25	15 – 25	15 – 25
Tension bars	$n \times \varnothing$ [mm]	4 $\varnothing$ 8	4 $\varnothing$ 8	4 $\varnothing$ 10	4 $\varnothing$ 12
Compression bars	$n \times \varnothing$ [mm]	4 $\varnothing$ 10	6 $\varnothing$ 10	6 $\varnothing$ 12	6 $\varnothing$ 14
Shear bars					
- vertical	$n \times \varnothing$ [mm]	6 $\varnothing$ 6	6 $\varnothing$ 8	6 $\varnothing$ 10	6 $\varnothing$ 12
- horizontal	$n \times \varnothing$ [mm]	2 x 2 $\varnothing$ 6	2 x 2 $\varnothing$ 6	2 x 2 $\varnothing$ 6	2 x 2 $\varnothing$ 6

Load bearing capacities and product variations

Load bearing capacity of the element		Concrete strength: C20/25			
Bending moment	M_{Rd} [kNm]				
for wall height h [cm]	150 – 200	63.4	81.9	120.1	158.7
	200 – 250	87.0	113.4	166.4	219.9
	> 250	110.7	144.9	212.7	281.2
Shear capacity	V_{Rd} [kN]	33.9	68.1	116.0	146.3
Expansion joint spacing	e [m]	11.3	11.3	11.3	10.1

Ordering example:

HIT - WT2 - 19 - 225 - F90

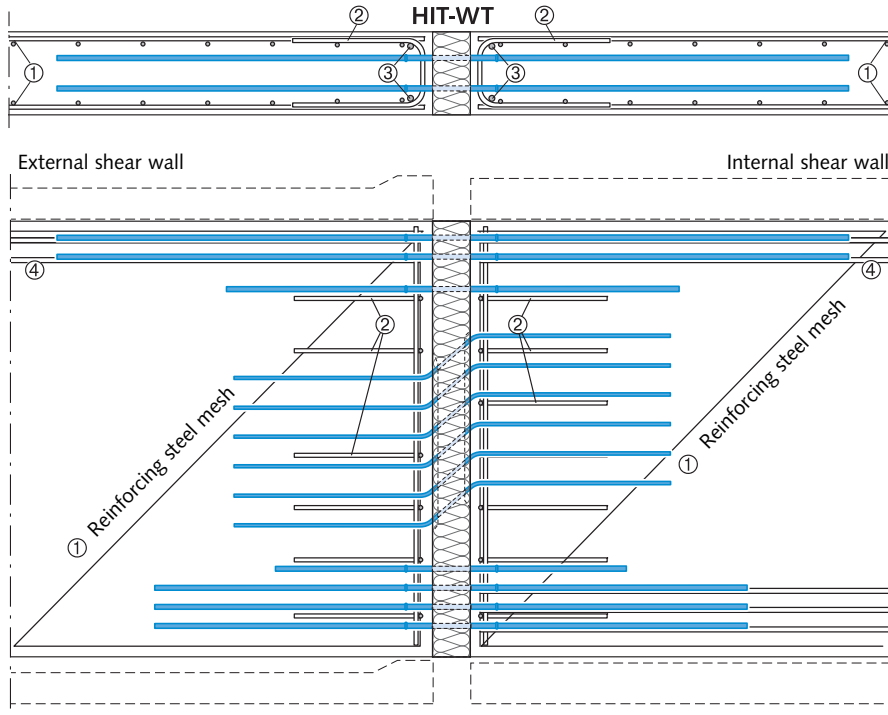
- Product group
- Wall type
- Wall thickness [cm]
- Wall height [cm]
- Fire protection ①

① When ordering the standard version, omit the reference from the specification.

HALFEN INSULATED CONNECTION HIT-WT

Installation Diagram, On-site Connecting Reinforcement

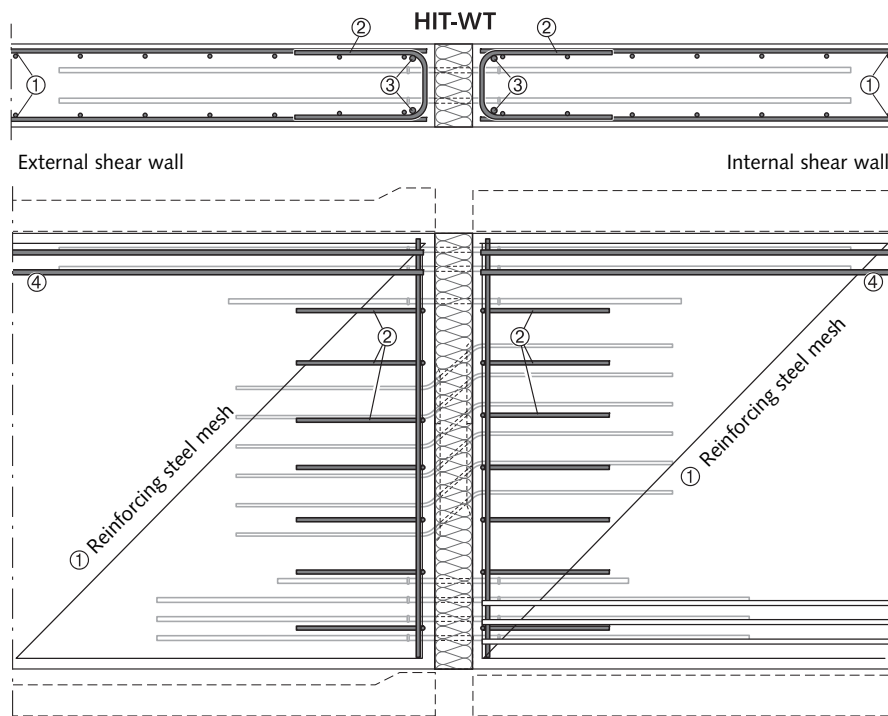
Installation diagram



The thermally insulated HIT-WT wall connection is available for wall heights $h = 1.5$ to 3.5 m. For easy transportation and handling, the HIT-WT units are shipped in **multiple units, minimum of at least three separate component groups** (upper, centre and lower section).

- ① On-site wall reinforcement as defined by the structural engineer.
- ② U-bars as structural edge frame.
- ③ Minimal two 8 mm $\varnothing$, rebar, in the inner and outer shear wall.
- ④ Connecting reinforcement of the HIT tension bars depends on the structural requirements.

On-site connecting reinforcement



Custom designs are available on request.
For further details, please contact us: → see inside back cover for contact details

Material Specification and Test Certificates

HALFEN HIT Insulated Connection

- Tension bars

- Compression bearings

- Shear bars

- U-bars

- Transport bars

- Insulating material

- Fire boards (for F90 version)

Fibre cement board, Construction material class A1

- Concrete

General purpose concrete according to DIN 1045-2 / DIN EN 206-1 with a raw density between 2000 kg/m³ and 2600 kg/m³ (light weight concrete is not permitted). Minimum concrete strength C20/25 and depending on exposure classes according to DIN 1045-1, table 3 / DIN EN 1992-1-1/NA, table NA.E.1

- On-site reinforcement

B500B reinforcing steel

- National Technical Approval

DIBt Berlin, National Technical
Approval no. Z-15.7-238
- Connection for reinforced concrete slabs
according to DIN 1045-1 / DIN EN
1992-1-1 and DIN EN 1992-1-1/NA
- Including Fire protection (Design F90)

- Type statics

German Institute Landesgewerbeanstalt Bayern:
Test Report No. 1c / Test Report No. 2c /
Test Report No. 3a / Test Report No. 4 /
Test Report No. 5a / Test Report No. 6

- RAL Quality Mark

RAL German Institut for Quality Assurance and Certification,
RAL Quality Mark Anchoring- and Reinforcement technology RAL-GZ 658/2



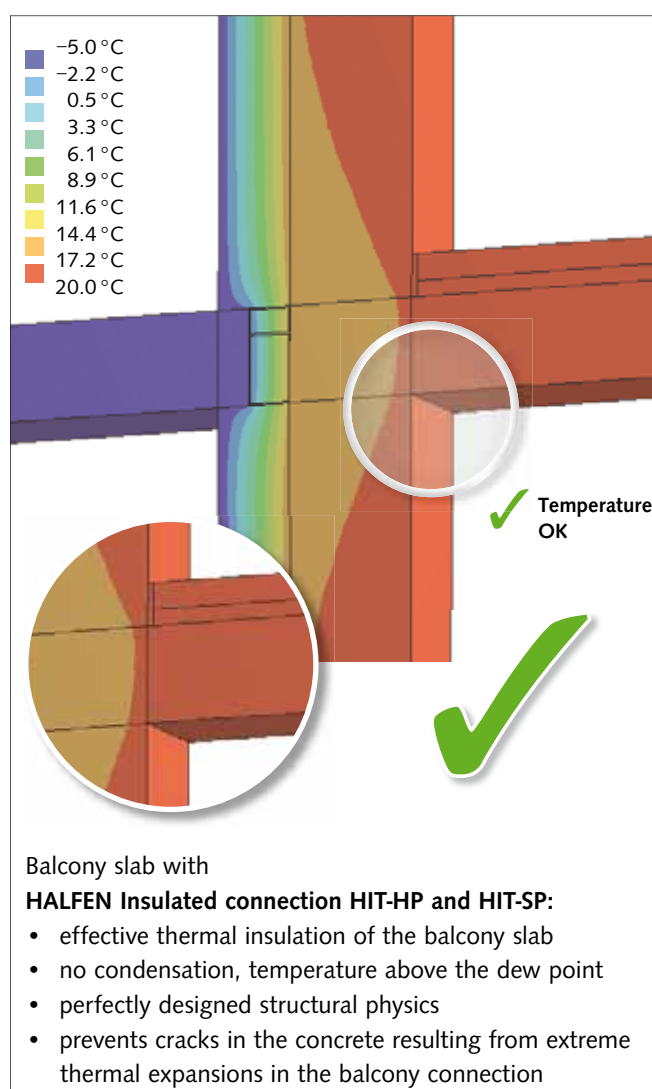
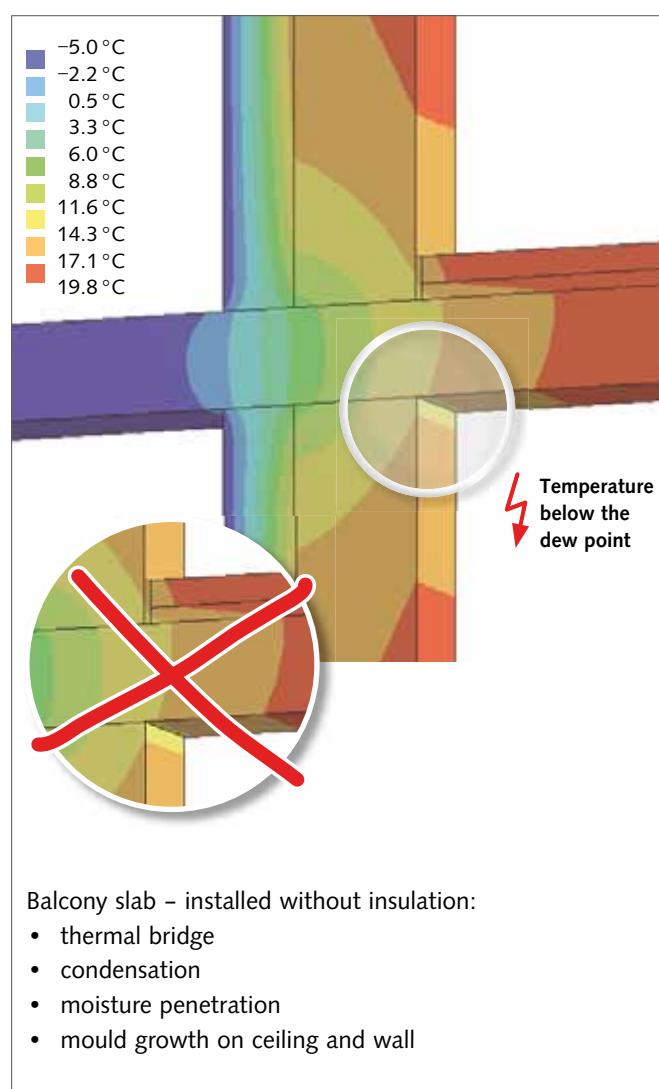
The approvals and type tests can be found at our website or simply scan the code and then select the document.

HALFEN HIT INSULATED CONNECTION

Building Physics, Technical Information

Building Physics and Technical Information

- The temperature field in the cross-section (shown as isotherms) illustrates the advantages of the HALFEN HIT Insulated connection for the required minimum thermal insulation:
For instance no condensation and mould growth in critical areas.



Chapter 10 – Contents

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HALFEN HIT INSULATED CONNECTION

Thermal Insulation

Thermal insulation

Structural thermal bridges such as balconies may lead to moisture problems resulting from lower temperatures on internal surfaces. Moreover, thermal bridges normally cause additional loss of heat.

Consequently, correct planning using thermally insulated balcony slab connections:

- prevent condensation and mould growth by fulfilling the minimum thermal insulation requirements according to DIN 4108-2
- reduce the transmission heat losses in the area of the connections

Prevention of condensation and mould growth by fulfilling the minimum thermal insulation requirements according to DIN 4108-2

Depending on the temperature, the air can retain different amounts of moisture. With a rise in air temperature, the amount of storable moisture increases. In a room, the air is constantly moving (room air flow). The water content in a defined flowing air volume remains nearly constant. However, the temperature of the air changes when the air flows along colder external components. The storage capacity of the air decreases as the air cools down, resulting in an increase in relative humidity. Condensation always occurs when the relative humidity reaches 100%. Assuming a room temperature of 20°C and a relative humidity of 50% condensation would occur when the air cools down to approx. 9°C (see dew point diagram on the right). If, under the given conditions, the temperature at the inner surface of an adjacent component, for instance the wall or the ceiling, is 9°C or colder, then condensation will form on this surface.

Correct application of HALFEN HIT Insulated connections prevents the surface of the wall/ceiling from falling below the dew point and therefore prevents condensation. An increased relative humidity of approx. 80% above the surface of the component promotes mould growth.

In a standard scenario with an indoor temperature of 20°C and a relative humidity of 50%, cooling down the air to approximately 13°C raises the relative humidity to 80%.

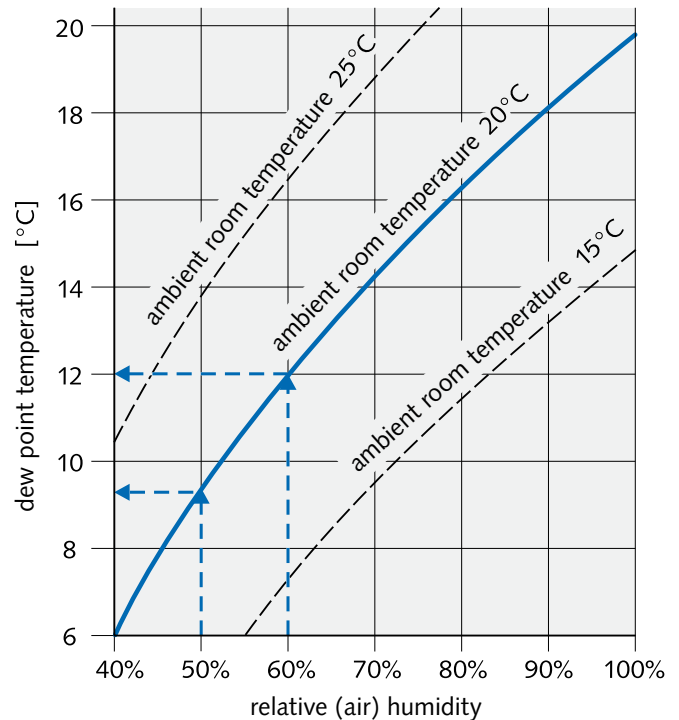


Fig.: Dew point diagram

HALFEN HIT Insulated connections prevent cooling of the adjacent components at the inside of the balcony below the critical temperatures for condensation and mould growth. The criterion to prevent mould growth is the temperature factor f_{Rsi} . It is defined as the ratio of the *lowest surface temperature minus outside temperature* to the total temperature difference (*inside temperature minus outside temperature*).

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

DIN 4108-2 stipulates that the temperature factor f_{Rsi} must be higher than 0.7 for all component connections.

According to the National Technical Approvals Z-15.7-293 and Z-15.7-238 the minimum thermal insulation requirement in accordance with DIN 4108-2 has already been proved and applies to the complete HALFEN HIT Insulated connections load range.

HALFEN HIT INSULATED CONNECTION

Thermal Insulation

Reduction of transmission losses

The Energy Saving Regulation (EnEV) specifies that the primary energy demand required to heat a building must be limited. To calculate this energy demand, thermal bridges through concrete balcony slabs must also be taken into account. Monolithic balcony systems without thermal separation have the same effect as cooling fins due to their geometry and therefore they cause substantial heat losses.

Thermal bridges can be calculated in three different ways:

Method 1: An increase of all thermal transmission coefficients by $\Delta U_{WB} = 0.10 \text{ W}/(\text{m}^2\text{K})$ for the entire heat transmitting outer surface without any further analysis of the thermal bridges

Method 2: When consistently adhering to the regulations for energetically efficient component connections according to DIN 4108, supplementary sheet 2, the effect of the thermal bridge is taken into account with the increase of the thermal transmission coefficient for the total heat transmitting surface area by $\Delta U_{WB} = 0.05 \text{ W}/(\text{m}^2\text{K})$

Method 3: By a detailed verification of the specific transmission loss of the thermal bridges according to DIN V 4108-6 or DIN V 18599 or by the determination of an individual additional value for thermal bridges

HALFEN HIT Insulated connections provide the engineer with every opportunity to determine the effect of thermal bridges by using all verification options mentioned above.

Method 1 is used to calculate the highest transmission losses. Engineers who don't consider the structural design of thermal bridges are "disciplined" by the regulations of the Energy Saving Regulation (EnEV) with high additional transmission losses.

The simplified verification method (**Method 2**) where $\Delta U_{WB} = 0.05 \text{ W}/(\text{m}^2\text{K})$ is applied can be used because HALFEN HIT Insulated connections are classified in DIN 4108, supplementary sheet 2, according to National Technical Approval Z15.7-238. The respective verification has also been proven for the HALFEN HIT Insulated connections with the highest reinforcement content.

Method 3: In most cases even when conforming to the specifications stipulated in DIN 4108, the calculated specific transmission loss H_T (resulting from standard cross-sections and thermal bridges) is still so high that the max. thermal ceiling set by the EnEV is not easy to maintain. Planners have to deal with this problem when they have to meet predefined criteria.

In these cases it is necessary to determine the exact transmission losses of all thermal bridges in a detailed analysis. For structural component linear connections the linear thermal transmission coefficients (ψ -value) are defined by set standards.

Some building products manufacturers specify a λ_{eq} -value for the insulation capacity of thermal separation elements. λ_{eq} is the equivalent thermal conductivity of a replacement cross-section of inhomogeneous building products without any metallic penetration such as for a special insulation element at the base of the masonry. In this case, the ψ -value for the detailed analysis of the thermal bridges can be determined with the λ_{eq} -value by a two-dimensional calculation of the thermal bridges by the engineer without having to model a geometrically complex insulation element at the base of masonry.

This method is only applicable to a limited extent for structural components with metallic like penetrations as found in balcony slab connection as uniform standards for basic or boundary conditions calculation for equivalent thermal conductivity value have not been defined.

The thermal values for HALFEN Iso-Element types HIT-HP MV / HIT-SP MV and HIT-HP ZV / HIT-SP ZV are included in the European Technical Approval ETA-13/0546 and National Technical Approval Z-15.7-293.

Standard specification for non-residential buildings

The DIN V 18599 specifications regulates the calculation of annual primary energy demand of non-residential buildings, thermal bridges are calculated analogously, i.e. they can also be alternatively calculated using method 1, 2 or 3 to determine specific heat transmission loss H_T and the annual energy demand.

Thermal Insulation

Standard specification for the calculation of thermal bridges to determine the annual primary energy demand according to the Energy Saving Regulation EnEV 2009

Residential building			
Description/ basics standard	Method 1 without verifications $\Delta U_{WB} = 0.10 \text{ W}/(\text{m}^2\text{K})$	Method 2 specification details or equivalent details $\Delta U_{WB} = 0.05 \text{ W}/(\text{m}^2\text{K})$	Method 3 Exact calculation of thermal bridges with linear thermal transmission coefficients (= ψ -values)
Restricting the annual primary energy demand to the permissible value required in the EnEV 2009	$Q_{P, \text{ act. }} < Q_{P, \text{ max. }}$ $Q_{P, \text{ max. }}$ Subject to reference building according to EnEV 2009, Annex 1 for residential buildings (or Annex 2 of EnEV 2009 for non-residential buildings)		
Actual annual primary energy demand for a residential building according to DIN V 4108-6 and DIN V 4701-10	$Q_{P, \text{ act. }} = e_P (Q_h + Q_W)$ Q_h $Q_W = A_N \times 12.5 \text{ kWh} / (\text{m}^2\text{a})$ e_P	Annual thermal heat demand Useful heat demand for water heating energy requirement value of a system related to primary energy	
Annual thermal heat demand Q_h according to DIN V 4108-6 (monthly balance)	$Q_h = \sum_M Q_{h, \text{ M/pos }}$ The annual thermal heat demand is the sum of all monthly heat demands with a "positive" thermal heat demand value		
Monthly thermal heat demand $Q_{h, \text{ M }}$	$Q_{h, \text{ M }} = 0.024 (H_T + H_V) (\theta_i - \theta_{e, \text{ M }}) t_M - \eta_M Q_{g, \text{ M }}$ Note: the monthly thermal heat demand is positive when the losses exceed the gains		
Specific transmission heat loss H_T	$H_T = \sum U_i A_i F_{x, i} + \Delta U_{WB} \times A$		$H_T = \sum U_i A_i F_{x, i} + \sum l_j \psi_j$
Consideration of thermal bridges	$\Delta U_{WB} = 0.10 \text{ W}/(\text{m}^2\text{K})$ fixed additional value	$\Delta U_{WB} = 0.05 \text{ W}/(\text{m}^2\text{K})$ half the fixed additional value	Approved ψ -values for all component connections (e. g. building edges, window reveals, wall and ceiling connections, ceiling supports, thermally decoupled balcony slabs) ψ -values for different assembly situations of the HIT connections, see tables → pages 94 ff.

Thermal bridge characteristic values according to National Technical Approval

The physical properties for HALFEN Iso-Elements HIT-HP MV / HIT-SP MV and HIT-HP ZV / HIT-SP ZV in various type of applications (based on a three-dimensional FEM calculation) were determined in tests by the Institute for Materials Research and Testing at the Bauhaus University MFPA in Weimar in accordance with DIN EN ISO 10211 (linear coefficient of thermal transmission ψ , minimal surface temperature min and temperature factor f_{Rsi}).

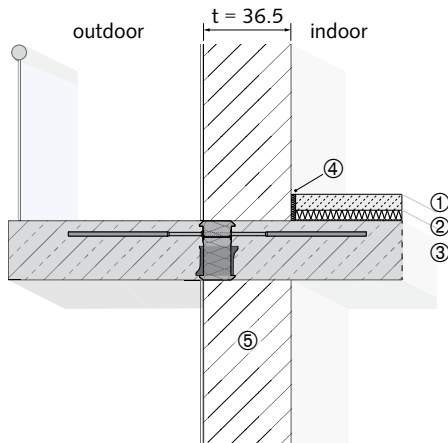
These values were officially integrated into the European Technical Approval ETA-13/0546 and the national technical approval Z-15.7-293.

For the first time building authority approved ψ -values for a detailed standard-compliant thermal bridge verification for insulated balcony connections are available throughout Europe.

Compliance with the approved physical properties for HALFEN Insulated connections HIT-HP and HIT-SP is guaranteed by third party monitoring.

The approved physical property values for HALFEN Insulated connections HIT-HP MV / HIT-SP MV and HIT-HP ZV / HIT-SP ZV are listed in the tables on the following pages.

Standard cross section for monolithic masonry



Installation diagram für monolithic masonry

Thermal transmission coefficient, standard cross section "Exterior wall": $U = 0.311 \text{ W}/(\text{m}^2 \text{K})$

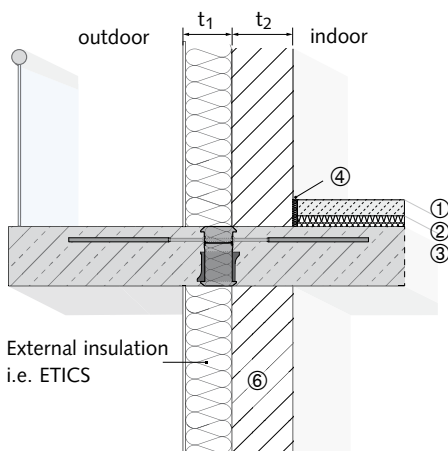
- external wall (monolithic): width $t = 36.5 \text{ cm}$ ($\lambda = 0.12 \text{ W}/(\text{mK})$)
- floor construction (indoor):

- ① cement screed 5 cm ($\lambda = 1.35 \text{ W}/(\text{mK})$)
- ② footfall insulation 3 cm ($\lambda = 0.035 \text{ W}/(\text{mK})$)
- ③ reinforced concrete floor 18 cm ($\lambda = 2.3 \text{ W}/(\text{mK})$)
- ④ edge insulation strips 1 cm ($\lambda = 0.14 \text{ W}/(\text{mK})$)
- ⑤ monolithic masonry



Thermal values see pages 94–95

Standard cross section for masonry with ETICS



Installation diagram for masonry with ETICS

Standard cross section for thermal transmission coefficient "Exterior wall"

- thermal insulation exterior wall:
thickness $t_1 = 14 \text{ cm}, 22 \text{ cm}$ or 30 cm ($\lambda = 0.035 \text{ W}/(\text{mK})$)
 - exterior (lime-sandstone): Thickness $t_2 = 24 \text{ cm}$ ($\lambda = 0.99 \text{ W}/(\text{mK})$)
 - floor construction (interior):
- ① cement screed 5 cm ($\lambda = 1.35 \text{ W}/(\text{mK})$)
 - ② footfall insulation 3 cm ($\lambda = 0.035 \text{ W}/(\text{mK})$)
 - ③ reinforced concrete floor 18 cm ($\lambda = 2.3 \text{ W}/(\text{mK})$)
 - ④ edge insulation strips 1 cm ($\lambda = 0.14 \text{ W}/(\text{mK})$)
 - ⑥ lime-sandstone masonry



Thermal values see pages 96–97

ETICS = External Thermal Insulation Composite Systems

Calculating Ψ -values with the HALFEN App

Calculations of thermal values for the HALFEN Insulated connections types HIT-HP MV, HIT-SP MV, HIT-HP ZV and HIT-SP ZV can be done quite simply by using the HIT-Calculator, a mobile application for your smartphone, iPhone or tablet. The HIT Calculator App can be used to calculate HIT-HP MV and HIT-SP MV or alternatively the calculation can be done online at the HALFEN website without any download required.



HALFEN HIT App im Internet

Just scan the QR Code on the left, if you would like to use the HALFEN App to calculate Ψ -values for your project.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE



Thermal Values According to National Technical Approval HIT-HP MV – monolithic masonry

Thermal bridge characteristic values for HIT-HP MV (High Performance) for monolithic masonry									
Thermal conductivity ψ in [W/(mK)]	0.18			0.12			0.08		
Thermal transmission coefficient of standard cross section "External wall" U in W/(m²K)	0.455			0.311			0.211		
Load range	ψ ①	$\theta_{si,min}$ ②	f_{Rsi} ③	ψ ①	$\theta_{si,min}$ ②	f_{Rsi} ③	ψ ①	$\theta_{si,min}$ ②	f_{Rsi} ③
HIT-HP MV- 0404-18-100-35	0.168	15.49	0.819	0.180	15.91	0.836	0.186	16.21	0.848
HIT-HP MV- 0504-18-100-35	0.173	15.45	0.818	0.185	15.86	0.834	0.192	16.15	0.846
HIT-HP MV- 0604-18-100-35	0.178	15.41	0.817	0.190	15.82	0.833	0.197	16.10	0.844
HIT-HP MV- 0804-18-100-35	0.188	15.35	0.814	0.200	15.74	0.829	0.207	16.01	0.840
HIT-HP MV- 0505-18-100-35	0.186	15.31	0.813	0.199	15.70	0.828	0.207	15.97	0.839
HIT-HP MV- 0705-18-100-35	0.196	15.25	0.810	0.209	15.62	0.825	0.217	15.88	0.835
HIT-HP MV- 0805-18-100-35	0.201	15.21	0.809	0.214	15.58	0.823	0.222	15.83	0.833
HIT-HP MV- 0506-18-100-35	0.198	15.19	0.807	0.212	15.55	0.822	0.220	15.80	0.832
HIT-HP MV- 0606-18-100-35	0.203	15.15	0.806	0.217	15.50	0.820	0.226	15.75	0.830
HIT-HP MV- 0706-18-100-35	0.208	15.12	0.805	0.222	15.46	0.819	0.231	15.70	0.828
HIT-HP MV- 0906-18-100-35	0.217	15.06	0.802	0.232	15.39	0.816	0.241	15.62	0.825
HIT-HP MV- 1006-18-100-35	0.222	15.03	0.801	0.236	15.35	0.814	0.246	15.58	0.823
HIT-HP MV- 1106-18-100-35	0.226	15.00	0.800	0.241	15.32	0.813	0.251	15.54	0.821
HIT-HP MV- 0607-18-100-35	0.214	15.03	0.801	0.229	15.36	0.814	0.239	15.59	0.824
HIT-HP MV- 0707-18-100-35	0.219	15.00	0.800	0.234	15.33	0.813	0.244	15.55	0.822
HIT-HP MV- 0907-18-100-35	0.228	14.94	0.797	0.244	15.25	0.810	0.254	15.46	0.818
HIT-HP MV- 1007-18-100-35	0.233	14.91	0.796	0.249	15.22	0.809	0.259	15.42	0.817
HIT-HP MV- 1107-18-100-35	0.237	14.88	0.795	0.253	15.18	0.807	0.263	15.38	0.815
HIT-HP MV- 1207-18-100-35	0.242	14.85	0.794	0.258	15.15	0.806	0.268	15.35	0.814
HIT-HP MV- 1407-18-100-35	0.250	14.80	0.792	0.266	15.09	0.803	0.277	15.27	0.811
HIT-HP MV- 0408-18-100-35	0.215	14.99	0.799	0.230	15.31	0.812	0.240	15.53	0.821
HIT-HP MV- 0708-18-100-35	0.230	14.89	0.795	0.246	15.19	0.808	0.256	15.40	0.816
HIT-HP MV- 0808-18-100-35	0.234	14.85	0.794	0.251	15.16	0.806	0.261	15.35	0.814
HIT-HP MV- 1008-18-100-35	0.243	14.80	0.792	0.260	15.09	0.803	0.271	15.28	0.811
HIT-HP MV- 1208-18-100-35	0.252	14.74	0.790	0.269	15.02	0.801	0.280	15.20	0.808
HIT-HP MV- 1308-18-100-35	0.256	14.72	0.789	0.273	14.99	0.800	0.284	15.17	0.807
HIT-HP MV- 1309-18-100-35	0.266	14.61	0.784	0.284	14.87	0.795	0.295	15.04	0.801
HIT-HP MV- 0610-18-100-35	0.245	14.71	0.788	0.262	14.98	0.799	0.273	15.16	0.807
HIT-HP MV- 0910-18-100-35	0.259	14.62	0.785	0.276	14.88	0.795	0.288	15.05	0.802
HIT-HP MV- 1010-18-100-35	0.263	14.59	0.784	0.281	14.85	0.794	0.292	15.01	0.801
HIT-HP MV- 1210-18-100-35	0.272	14.54	0.782	0.290	14.79	0.792	0.301	14.94	0.798
HIT-HP MV- 1412-18-100-35	0.297	14.32	0.773	0.316	14.53	0.781	0.329	14.66	0.786

① ψ = Linear thermal transmission coefficient in W/(mK)

② $\theta_{si,min}$ = Minimum roomside surface temperature in °C

③ f_{Rsi} = Temperature factor in [-]

Thermal bridge characteristic values for HIT-SP MV (Superior Performance) for monolithic masonry									
Thermal conductivity ψ in [W/(mK)]	0.18			0.12			0.08		
Thermal transmission coefficient of standard cross section "External wall" U in W/(m ² K)	0.455			0.311			0.211		
Bezeichnung der Tragstufe	ψ ①	$\theta_{si,min}$ ②	f_{Rsi} ③	ψ ①	$\theta_{si,min}$ ②	f_{Rsi} ③	ψ ①	$\theta_{si,min}$ ②	f_{Rsi} ③
HIT-SP MV- 0404-18-100-35	0.132	15.86	0.835	0.142	16.33	0.853	0.147	16.69	0.868
HIT-SP MV- 0504-18-100-35	0.136	15.83	0.833	0.147	16.30	0.852	0.152	16.64	0.866
HIT-SP MV- 0604-18-100-35	0.141	15.80	0.832	0.151	16.26	0.850	0.157	16.60	0.864
HIT-SP MV- 0804-18-100-35	0.149	15.74	0.830	0.160	16.18	0.847	0.166	16.51	0.860
HIT-SP MV- 0505-18-100-35	0.148	15.71	0.828	0.159	16.15	0.846	0.165	16.48	0.859
HIT-SP MV- 0705-18-100-35	0.156	15.65	0.826	0.168	16.08	0.843	0.175	16.39	0.856
HIT-SP MV- 0805-18-100-35	0.161	15.62	0.825	0.172	16.04	0.842	0.179	16.35	0.854
HIT-SP MV- 0506-18-100-35	0.158	15.59	0.824	0.170	16.02	0.841	0.178	16.32	0.853
HIT-SP MV- 0606-18-100-35	0.163	15.56	0.823	0.175	15.98	0.839	0.182	16.28	0.851
HIT-SP MV- 0706-18-100-35	0.167	15.53	0.821	0.180	15.94	0.838	0.187	16.24	0.849
HIT-SP MV- 0906-18-100-35	0.175	15.48	0.819	0.188	15.87	0.835	0.196	16.16	0.846
HIT-SP MV- 1006-18-100-35	0.180	15.45	0.818	0.193	15.84	0.834	0.201	16.12	0.845
HIT-SP MV- 1106-18-100-35	0.184	15.42	0.817	0.197	15.81	0.832	0.205	16.08	0.843
HIT-SP MV- 0607-18-100-35	0.173	15.45	0.818	0.186	15.85	0.834	0.194	16.13	0.845
HIT-SP MV- 0707-18-100-35	0.177	15.42	0.817	0.191	15.81	0.833	0.199	16.09	0.844
HIT-SP MV- 0907-18-100-35	0.186	15.37	0.815	0.199	15.75	0.830	0.208	16.01	0.841
HIT-SP MV- 1007-18-100-35	0.190	15.34	0.814	0.204	15.71	0.829	0.212	15.98	0.839
HIT-SP MV- 1107-18-100-35	0.194	15.32	0.813	0.208	15.68	0.827	0.216	15.94	0.838
HIT-SP MV- 1207-18-100-35	0.198	15.29	0.812	0.212	15.65	0.826	0.221	15.90	0.836
HIT-SP MV- 1407-18-100-35	0.206	15.24	0.810	0.220	15.59	0.824	0.229	15.84	0.833
HIT-SP MV- 0408-18-100-35	0.174	15.41	0.816	0.187	15.80	0.832	0.196	16.08	0.843
HIT-SP MV- 0708-18-100-35	0.187	15.32	0.813	0.201	15.69	0.828	0.210	15.96	0.838
HIT-SP MV- 0808-18-100-35	0.191	15.29	0.812	0.206	15.66	0.826	0.214	15.92	0.837
HIT-SP MV- 1008-18-100-35	0.200	15.24	0.810	0.214	15.60	0.824	0.223	15.84	0.834
HIT-SP MV- 1208-18-100-35	0.208	15.19	0.807	0.222	15.53	0.821	0.232	15.77	0.831
HIT-SP MV- 1308-18-100-35	0.212	15.16	0.807	0.226	15.50	0.820	0.236	15.74	0.830
HIT-SP MV- 1309-18-100-35	0.221	15.07	0.803	0.236	15.39	0.816	0.246	15.61	0.825
HIT-SP MV- 0610-18-100-35	0.201	15.15	0.806	0.216	15.50	0.820	0.226	15.73	0.829
HIT-SP MV- 0910-18-100-35	0.214	15.07	0.803	0.229	15.40	0.816	0.239	15.63	0.825
HIT-SP MV- 1010-18-100-35	0.218	15.05	0.802	0.234	15.37	0.815	0.244	15.59	0.824
HIT-SP MV- 1210-18-100-35	0.226	15.00	0.800	0.242	15.31	0.813	0.252	15.53	0.821
HIT-SP MV- 1412-18-100-35	0.250	14.78	0.791	0.267	15.06	0.802	0.279	15.24	0.810

① ψ = Linear thermal transmission coefficient in W/(mK)

② $\theta_{si,min}$ = Minimum roomside surface temperature in °C

③ f_{Rsi} = Temperature factor in [-]

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE



Thermal Values According to National Technical Approval HIT-HP MV – Masonry with ETICS

Thermal bridge characteristic values for HIT-HP MV (High Performance) for masonry with ETICS									
Insulating material thickness in mm (ETICS)	140			220			300		
Thermal transmission coefficient of standard cross section "External wall" U in W/(m²K)	0.227			0.149			0.111		
Load range	ψ ①	θ _{si,min} ②	f _{Rsi} ③	ψ ①	θ _{si,min} ②	f _{Rsi} ③	ψ ①	θ _{si,min} ②	f _{Rsi} ③
HIT-HP MV- 0404-18-100-35	0.168	17.80	0.912	0.187	18.08	0.923	0.194	18.25	0.930
HIT-HP MV- 0504-18-100-35	0.175	17.76	0.910	0.193	18.05	0.922	0.200	18.21	0.929
HIT-HP MV- 0604-18-100-35	0.181	17.73	0.909	0.199	18.02	0.921	0.206	18.18	0.927
HIT-HP MV- 0804-18-100-35	0.194	17.66	0.906	0.211	17.95	0.918	0.217	18.12	0.925
HIT-HP MV- 0505-18-100-35	0.194	17.64	0.906	0.211	17.94	0.918	0.216	18.11	0.924
HIT-HP MV- 0705-18-100-35	0.207	17.57	0.903	0.223	17.87	0.915	0.228	18.05	0.922
HIT-HP MV- 0805-18-100-35	0.213	17.54	0.902	0.229	17.84	0.914	0.233	18.02	0.921
HIT-HP MV- 0506-18-100-35	0.212	17.53	0.901	0.228	17.83	0.913	0.231	18.02	0.921
HIT-HP MV- 0606-18-100-35	0.219	17.49	0.900	0.234	17.80	0.912	0.237	17.99	0.919
HIT-HP MV- 0706-18-100-35	0.225	17.46	0.898	0.240	17.77	0.911	0.243	17.96	0.918
HIT-HP MV- 0906-18-100-35	0.238	17.39	0.896	0.251	17.71	0.908	0.253	17.90	0.916
HIT-HP MV- 1006-18-100-35	0.244	17.36	0.894	0.257	17.68	0.907	0.258	17.87	0.915
HIT-HP MV- 1106-18-100-35	0.249	17.33	0.893	0.262	17.65	0.906	0.263	17.85	0.914
HIT-HP MV- 0607-18-100-35	0.236	17.38	0.895	0.249	17.70	0.908	0.251	17.90	0.916
HIT-HP MV- 0707-18-100-35	0.243	17.35	0.894	0.255	17.67	0.907	0.257	17.87	0.915
HIT-HP MV- 0907-18-100-35	0.255	17.29	0.891	0.267	17.61	0.904	0.267	17.81	0.912
HIT-HP MV- 1007-18-100-35	0.261	17.26	0.890	0.272	17.58	0.903	0.272	17.79	0.911
HIT-HP MV- 1107-18-100-35	0.267	17.23	0.889	0.278	17.56	0.902	0.277	17.76	0.910
HIT-HP MV- 1207-18-100-35	0.272	17.20	0.888	0.283	17.53	0.901	0.282	17.73	0.909
HIT-HP MV- 1407-18-100-35	0.283	17.14	0.886	0.293	17.48	0.899	0.292	17.68	0.907
HIT-HP MV- 0408-18-100-35	0.239	17.35	0.894	0.252	17.68	0.907	0.253	17.87	0.915
HIT-HP MV- 0708-18-100-35	0.259	17.25	0.890	0.270	17.58	0.903	0.270	17.79	0.911
HIT-HP MV- 0808-18-100-35	0.265	17.22	0.889	0.276	17.55	0.902	0.275	17.76	0.910
HIT-HP MV- 1008-18-100-35	0.277	17.16	0.886	0.287	17.49	0.900	0.285	17.70	0.908
HIT-HP MV- 1208-18-100-35	0.289	17.10	0.884	0.297	17.44	0.898	0.295	17.65	0.906
HIT-HP MV- 1308-18-100-35	0.294	17.07	0.883	0.302	17.41	0.897	0.300	17.63	0.905
HIT-HP MV- 1309-18-100-35	0.309	16.98	0.879	0.316	17.33	0.893	0.312	17.55	0.902
HIT-HP MV- 0610-18-100-35	0.283	17.09	0.884	0.292	17.44	0.898	0.289	17.66	0.906
HIT-HP MV- 0910-18-100-35	0.301	17.00	0.880	0.308	17.35	0.894	0.304	17.58	0.903
HIT-HP MV- 1010-18-100-35	0.307	16.97	0.879	0.314	17.33	0.893	0.309	17.56	0.902
HIT-HP MV- 1210-18-100-35	0.318	16.92	0.877	0.324	17.28	0.891	0.319	17.51	0.900
HIT-HP MV- 1412-18-100-35	0.356	16.70	0.868	0.357	17.08	0.883	0.349	17.33	0.893

① ψ = Linear thermal transmission coefficient in W/(mK)

② θ_{si,min} = Minimum roomside surface temperature in °C

③ f_{Rsi} = Temperature factor in [-]

Thermal bridge characteristic values for HIT-SP MV (Superior Performance) for masonry with ETICS									
Insulating material thickness in mm (ETICS)	140			220			300		
Thermal transmission coefficient of standard cross section "External wall" U in W/(m²K)	0.227			0.149			0.111		
Load range	ψ ①	θ _{si,min} ②	f _{Rsi} ③	ψ ①	θ _{si,min} ②	f _{Rsi} ③	ψ ①	θ _{si,min} ②	f _{Rsi} ③
HIT-SP MV- 0404-18-100-35	0.115	18.12	0.925	0.134	18.40	0.936	0.145	18.54	0.942
HIT-SP MV- 0504-18-100-35	0.121	18.09	0.924	0.140	18.37	0.935	0.150	18.51	0.941
HIT-SP MV- 0604-18-100-35	0.126	18.06	0.922	0.145	18.34	0.934	0.155	18.48	0.939
HIT-SP MV- 0804-18-100-35	0.137	18.00	0.920	0.156	18.28	0.931	0.165	18.43	0.937
HIT-SP MV- 0505-18-100-35	0.137	17.99	0.919	0.155	18.27	0.931	0.164	18.42	0.937
HIT-SP MV- 0705-18-100-35	0.148	17.92	0.917	0.166	18.21	0.929	0.175	18.37	0.935
HIT-SP MV- 0805-18-100-35	0.154	17.89	0.916	0.171	18.19	0.927	0.179	18.34	0.934
HIT-SP MV- 0506-18-100-35	0.153	17.89	0.916	0.170	18.18	0.927	0.178	18.34	0.933
HIT-SP MV- 0606-18-100-35	0.158	17.86	0.914	0.176	18.15	0.926	0.183	18.31	0.932
HIT-SP MV- 0706-18-100-35	0.164	17.83	0.913	0.181	18.12	0.925	0.188	18.28	0.931
HIT-SP MV- 0906-18-100-35	0.175	17.77	0.911	0.191	18.07	0.923	0.198	18.23	0.929
HIT-SP MV- 1006-18-100-35	0.180	17.74	0.910	0.196	18.04	0.922	0.203	18.20	0.928
HIT-SP MV- 1106-18-100-35	0.186	17.71	0.908	0.201	18.01	0.921	0.207	18.18	0.927
HIT-SP MV- 0607-18-100-35	0.174	17.76	0.910	0.190	18.06	0.922	0.196	18.23	0.929
HIT-SP MV- 0707-18-100-35	0.179	17.73	0.909	0.195	18.03	0.921	0.201	18.20	0.928
HIT-SP MV- 0907-18-100-35	0.190	17.67	0.907	0.205	17.98	0.919	0.211	18.15	0.926
HIT-SP MV- 1007-18-100-35	0.196	17.65	0.906	0.210	17.95	0.918	0.215	18.12	0.925
HIT-SP MV- 1107-18-100-35	0.201	17.62	0.905	0.215	17.93	0.917	0.220	18.10	0.924
HIT-SP MV- 1207-18-100-35	0.206	17.59	0.904	0.220	17.90	0.916	0.225	18.08	0.923
HIT-SP MV- 1407-18-100-35	0.216	17.54	0.902	0.229	17.85	0.914	0.233	18.03	0.921
HIT-SP MV- 0408-18-100-35	0.177	17.73	0.909	0.192	18.04	0.921	0.198	18.21	0.928
HIT-SP MV- 0708-18-100-35	0.194	17.64	0.906	0.208	17.95	0.918	0.213	18.12	0.925
HIT-SP MV- 0808-18-100-35	0.199	17.61	0.905	0.214	17.92	0.917	0.218	18.10	0.924
HIT-SP MV- 1008-18-100-35	0.210	17.56	0.902	0.224	17.87	0.915	0.228	18.05	0.922
HIT-SP MV- 1208-18-100-35	0.220	17.50	0.900	0.233	17.82	0.913	0.237	18.00	0.920
HIT-SP MV- 1308-18-100-35	0.226	17.48	0.899	0.238	17.79	0.912	0.241	17.98	0.919
HIT-SP MV- 1309-18-100-35	0.239	17.39	0.896	0.251	17.72	0.909	0.253	17.90	0.916
HIT-SP MV- 0610-18-100-35	0.216	17.50	0.900	0.229	17.82	0.913	0.232	18.00	0.920
HIT-SP MV- 0910-18-100-35	0.232	17.42	0.897	0.244	17.74	0.910	0.246	17.93	0.917
HIT-SP MV- 1010-18-100-35	0.237	17.39	0.896	0.249	17.71	0.909	0.250	17.91	0.916
HIT-SP MV- 1210-18-100-35	0.248	17.34	0.893	0.258	17.67	0.907	0.259	17.86	0.914
HIT-SP MV- 1412-18-100-35	0.283	17.13	0.885	0.290	17.48	0.899	0.288	17.69	0.908

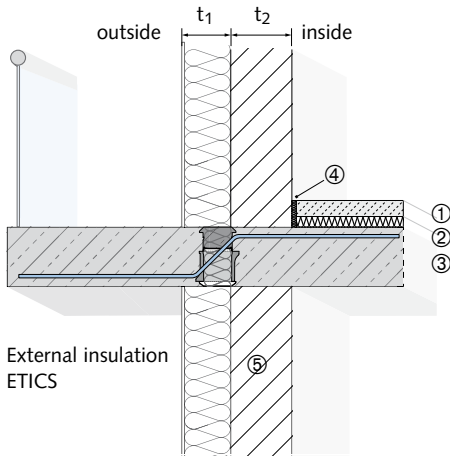
① ψ = Linear thermal transmission coefficient in W/(mK)

② θ_{si,min} = Minimum roomside surface temperature in °C

③ f_{Rsi} = Temperature factor in [-]

Thermal Values According to National Technical Approval for HIT-HP ZV and HIT-SP ZV

Standard cross section for masonry with ETICS



Installation diagram for masonry with ETICS

Standard cross section for thermal transmission coefficient "Exterior wall"

- thermal insulation exterior wall:
thickness $t_1 = 14 \text{ cm}$, 22 cm or 30 cm ($\lambda = 0.035 \text{ W/(mK)}$)
- exterior (lime-sandstone):
thickness $t_2 = 24 \text{ cm}$ ($\lambda = 0.99 \text{ W/(mK)}$)
- floor construction (interior):
 - ① cement screed 5 cm ($\lambda = 1.35 \text{ W/(mK)}$)
 - ② footfall insulation 3 cm ($\lambda = 0.035 \text{ W/(mK)}$)
 - ③ reinforced concrete floor 16 cm or 18 cm ($\lambda = 2.3 \text{ W/(mK)}$)
 - ④ edge insulation strips 1 cm ($\lambda = 0.14 \text{ W/(mK)}$)
 - ⑤ lime-sandstone masonry



Thermal values are valid for the given configuration and boundary conditions.

Thermal values of HIT-HP ZV and HIT-SP ZV for masonry with ETICS ($t_1 = 140 \text{ mm}$)

Thermal transmission coefficient of standard cross section "Exterior wall" U in $\text{W/(m}^2\text{K)}$		$U = 0.227 [\text{W/m}^2\text{K}]$	
Load range	Linear thermal transmission coefficient ψ in W/(mK)	Minimum roomside surface temperature $\theta_{si, \min}$ in $^{\circ}\text{C}$	Temperature factor f_{Rsi} in $[-]$
HIT-HP ZV			
HIT-HP ZV- 0404-16-100-30-06	0.148	17.91	0.916
HIT-HP ZV- 0604-16-100-30-06	0.152	17.85	0.914
HIT-HP ZV- 0804-16-100-30-06	0.157	17.85	0.914
HIT-HP ZV- 0404-16-100-30-08	0.155	17.86	0.914
HIT-HP ZV- 0604-16-100-30-08	0.163	17.76	0.910
HIT-HP ZV- 0804-16-100-30-08	0.171	17.76	0.910
HIT-HP ZV- 0404-18-100-30-10	0.161	17.82	0.913
HIT-HP ZV- 0604-18-100-30-10	0.175	17.65	0.906
HIT-HP ZV- 0804-18-100-30-10	0.190	17.65	0.906
HIT-HP ZV- 0404-18-100-30-12	0.171	17.77	0.911
HIT-HP ZV- 0604-18-100-30-12	0.190	17.56	0.902
HIT-HP ZV- 0804-18-100-30-12	0.209	17.56	0.902
HIT-SP ZV			
	$\psi [\text{W/(mK)}]$	$\theta_{si, \min} [^{\circ}\text{C}]$	$f_{Rsi} [-]$
HIT-SP ZV- 0404-16-100-30-06	0.095	18.23	0.929
HIT-SP ZV- 0604-16-100-30-06	0.099	18.18	0.927
HIT-SP ZV- 0804-16-100-30-06	0.103	18.18	0.927
HIT-SP ZV- 0404-16-100-30-08	0.101	18.19	0.928
HIT-SP ZV- 0604-16-100-30-08	0.108	18.11	0.924
HIT-SP ZV- 0804-16-100-30-08	0.115	18.11	0.924
HIT-SP ZV- 0404-18-100-30-10	0.109	18.14	0.926
HIT-SP ZV- 0604-18-100-30-10	0.119	18.02	0.921
HIT-SP ZV- 0804-18-100-30-10	0.129	18.02	0.921
HIT-SP ZV- 0404-18-100-30-12	0.117	18.10	0.924
HIT-SP ZV- 0604-18-100-30-12	0.132	17.94	0.918
HIT-SP ZV- 0804-18-100-30-12	0.147	17.94	0.918

Thermal Values According to National Technical Approval for HIT-HP ZV and HIT-SP ZV

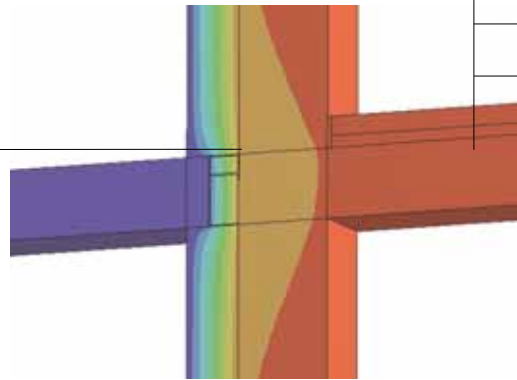
Thermal values of HIT-HP ZV and HIT-SP ZV for masonry with ETICS (t ₁ = 220 mm)			
Load range	U = 0.149 [W/m ² K]		
HIT-HP ZV	ψ in W/(mK)	θ _{si,min} in °C	f _{Rsi} in [-]
HIT-HP ZV- 0404-16-100-30-06	0.161	18.22	0.929
HIT-HP ZV- 0604-16-100-30-06	0.172	18.09	0.924
HIT-HP ZV- 0804-16-100-30-06	0.183	18.09	0.924
HIT-HP ZV- 0404-16-100-30-08	0.168	18.18	0.927
HIT-HP ZV- 0604-16-100-30-08	0.182	18.01	0.920
HIT-HP ZV- 0804-16-100-30-08	0.197	18.01	0.920
HIT-HP ZV- 0404-18-100-30-10	0.180	18.11	0.924
HIT-HP ZV- 0604-18-100-30-10	0.201	17.86	0.914
HIT-HP ZV- 0804-18-100-30-10	0.222	17.86	0.914
HIT-HP ZV- 0404-18-100-30-12	0.189	18.06	0.922
HIT-HP ZV- 0604-18-100-30-12	0.215	17.78	0.911
HIT-HP ZV- 0804-18-100-30-12	0.240	17.78	0.911
HIT-SP ZV	ψ [W/(mK)]	θ _{si,min} [°C]	f _{Rsi} [-]
HIT-SP ZV- 0404-16-100-30-06	0.120	18.47	0.939
HIT-SP ZV- 0604-16-100-30-06	0.124	18.42	0.937
HIT-SP ZV- 0804-16-100-30-06	0.128	18.42	0.937
HIT-SP ZV- 0404-16-100-30-08	0.127	18.43	0.937
HIT-SP ZV- 0604-16-100-30-08	0.134	18.35	0.934
HIT-SP ZV- 0804-16-100-30-08	0.141	18.35	0.934
HIT-SP ZV- 0404-18-100-30-10	0.136	18.38	0.935
HIT-SP ZV- 0604-18-100-30-10	0.142	18.31	0.932
HIT-SP ZV- 0804-18-100-30-10	0.148	18.31	0.932
HIT-SP ZV- 0404-18-100-30-12	0.145	18.33	0.933
HIT-SP ZV- 0604-18-100-30-12	0.155	18.23	0.929
HIT-SP ZV- 0804-18-100-30-12	0.165	18.23	0.929

Thermal values of HIT-HP ZV and HIT-SP ZV for masonry with ETICS (t ₁ = 300 mm)			
Load range	U = 0.111 [W/m ² K]		
HIT-HP ZV	ψ in W/(mK)	θ _{si,min} in °C	f _{Rsi} in [-]
HIT-HP ZV- 0404-16-100-30-06	0.168	18.38	0.935
HIT-HP ZV- 0604-16-100-30-06	0.185	18.19	0.927
HIT-HP ZV- 0804-16-100-30-06	0.201	18.19	0.927
HIT-HP ZV- 0404-16-100-30-08	0.174	18.35	0.934
HIT-HP ZV- 0604-16-100-30-08	0.195	18.10	0.924
HIT-HP ZV- 0804-16-100-30-08	0.215	18.10	0.924
HIT-HP ZV- 0404-18-100-30-10	0.187	18.27	0.931
HIT-HP ZV- 0604-18-100-30-10	0.211	17.99	0.920
HIT-HP ZV- 0804-18-100-30-10	0.235	17.99	0.920
HIT-HP ZV- 0404-18-100-30-12	0.196	18.23	0.929
HIT-HP ZV- 0604-18-100-30-12	0.224	17.91	0.916
HIT-HP ZV- 0804-18-100-30-12	0.253	17.91	0.916
HIT-SP ZV	ψ [W/(mK)]	θ _{si,min} [°C]	f _{Rsi} [-]
HIT-SP ZV- 0404-16-100-30-06	0.137	18.58	0.943
HIT-SP ZV- 0604-16-100-30-06	0.143	18.51	0.940
HIT-SP ZV- 0804-16-100-30-06	0.149	18.51	0.940
HIT-SP ZV- 0404-16-100-30-08	0.144	18.54	0.941
HIT-SP ZV- 0604-16-100-30-08	0.153	18.43	0.937
HIT-SP ZV- 0804-16-100-30-08	0.162	18.43	0.937
HIT-SP ZV- 0404-18-100-30-10	0.153	18.48	0.939
HIT-SP ZV- 0604-18-100-30-10	0.165	18.34	0.934
HIT-SP ZV- 0804-18-100-30-10	0.177	18.34	0.934
HIT-SP ZV- 0404-18-100-30-12	0.163	18.43	0.937
HIT-SP ZV- 0604-18-100-30-12	0.180	18.25	0.930
HIT-SP ZV- 0804-18-100-30-12	0.196	18.25	0.930

General wall construction type

$U = 0.127 \text{ W/(m}^2\text{K)}$

External render 10mm
Insulation 300mm
Brickwork 175mm
Internal plaster 10mm



Floor screed 50mm
Impact sound insulation 30mm
Concrete (180 – 240mm)



PHI Thermal bridge reduced
Construction

Approved criteria to achieve certifications

Reduced thermal bridges

The requirements on the elements must be satisfied in two typical applications*)

*) Criteria has been proved by monitoring a terrasse house and a block of flats in which HIT Insulated connection were installed

$$\Delta U_{WB} < 0.025 \text{ W/(m}^2\text{K)}$$

No mould growth

Minimum surface temperature must be high enough to prevent mould formation at standard edge conditions.

$$\theta_{i,min} > 17.00 \text{ }^{\circ}\text{C}$$

HIT-ZV – Thermal values certified by the Passive House Institute

HALFEN Insulated connection HIT-HP ZV / HIT-SP ZV	Minimum roomside surface temperature $\theta_{i,min}$ [°C]	Thermal transmission coefficient ψ [W/(m K)]
HIT-HP ZV- 0404-18-100-35-06	18.45	0.18
HIT-HP ZV- 0804-18-100-35-08	18.34	0.20
HIT-SP ZV- 0302-18-100-35-08	18.87	0.11
HIT-SP ZV- 0404-18-100-35-06	18.71	0.14
HIT-SP ZV- 0804-18-100-35-08	18.62	0.15
HIT-HP ZV- 0404-24-100-35-06	18.37	0.20
HIT-HP ZV- 0804-24-100-35-08	18.29	0.21
HIT-SP ZV- 0302-24-100-35-08	18.85	0.11
HIT-SP ZV- 0404-24-100-35-06	18.68	0.14
HIT-SP ZV- 0804-24-100-35-08	18.62	0.16

HIT-MV – Thermal values certified by the Passive House Institute

HALFEN Insulated connection HIT-HP MV / HIT-SP MV	Minimum roomside surface temperature $\theta_{i,min}$ [°C]	Thermal transmission coefficient ψ [W/(m K)]
HIT-HP MV- 0404-18-100-35	18.33	0.20
HIT-HP MV- 0504-18-100-35	18.26	0.21
HIT-HP MV- 0506-18-100-35	18.03	0.25
HIT-HP MV- 0804-18-100-35	18.18	0.23
HIT-SP MV- 0504-18-100-35	18.58	0.16
HIT-SP MV- 0705-18-100-35	18.41	0.19
HIT-SP MV- 0804-18-100-35	18.50	0.17
HIT-SP MV- 0907-18-100-35	18.15	0.22
HIT-SP MV- 1006-18-100-35	18.26	0.21
HIT-SP MV- 1008-18-100-35	18.40	0.24
HIT-SP MV- 1107-18-100-35	18.11	0.24
HIT-SP MV- 1208-18-100-35	18.00	0.25
HIT-SP MV- 0504-22-100-35	18.53	0.17
HIT-SP MV- 0705-22-100-35	18.36	0.20
HIT-SP MV- 0804-22-100-35	18.47	0.18
HIT-HP MV- 0404-24-100-35	18.25	0.22
HIT-HP MV- 0504-24-100-35	18.18	0.23
HIT-SP MV- 0504-24-100-35	18.45	0.17
HIT-SP MV- 0705-24-100-35	18.36	0.20
HIT-SP MV- 0804-24-100-35	18.48	0.18
HIT-SP MV- 0907-24-100-35	18.10	0.24
HIT-SP MV- 1006-24-100-35	18.21	0.23
HIT-SP MV- 1008-24-100-35	18.00	0.25
HIT-SP MV- 1107-24-100-35	18.05	0.25

Soundproofing According to DIN 4109

Soundproofing Requirements

With balconies and access balconies, vibration is transferred into the main structure of the building and distributed into adjacent rooms as airborne sound. DIN 4109 specifies the maximum level of the airborne sound pressure level $L'_{n,w}$ which penetrates the adjacent units of the building and which is measured with a standardised tapping machine. For access balconies in multi-storey buildings with residential and business units, the current version of DIN 4109 published in 1989 specifies as follows:

req. $L'_{n,w} = 53 \text{ dB}$ (req. TSM = 10 dB)

The impact sound transmission from the balcony into the adjacent units can be significantly reduced by using thermally separated balcony connections.

In DIN 4109 there is no requirement defining the necessary sound-proofing insulation for balconies. This more than 20 year old norm is out of date and does not represent current technology.

Under special boundary conditions the standard versions of HALFEN HIT Insulated connections can fulfil the sound insulation requirements for access balconies. The sound insulation properties of different elements were examined in independent on-site measurement and in measurements done in the MFPA Braunschweig laboratory.



Standardised tapping machine according to DIN EN ISO 10140



Test setup according to DIN EN ISO 10140 with built-in element

Laboratory measurements of impact sound

In laboratory measurements, the difference in the impact sound pressure level ΔL was examined on a balcony slab made with HIT units in comparison to a continuous floor slab. The table shows the detected values for different load ranges.

These differences in impact sound pressure level for slab connections are approved by building authorities for the first time. They are now part of the European Technical Approval ETA-13/0546.

The HALFEN Insulated connections HIT-HP and HIT-SP have the advantage that with the required design-inherent fire protection sound insulation is also ensured.

Differences in impact sound pressure level ΔL in dB resulting from laboratory measurements

HIT unit ...MV	Difference in impact sound pressure level
HIT-HP MV-0504-18-100-35	12 dB
HIT-HP MV-0705-18-100-35	11 dB
HIT-HP MV-1207-18-100-35	11 dB
HIT-SP MV-0504-18-100-35	14 dB
HIT-SP MV-0705-18-100-35	15 dB
HIT-SP MV-1208-18-100-35	10 dB
HIT unit ...ZV*	Difference in impact sound pressure level
HIT-HPZV-0504-18-100-30-12	12 dB
HIT-HPZV-0705-18-100-30-12	11 dB
HIT-HPZV-1207-18-100-30-12	11 dB
HIT-SP ZV-0504-18-100-30-12	14 dB
HIT-SP ZV-0705-18-100-30-12	15 dB
HIT-SP ZV-1208-18-100-30-12	10 dB

*) Values from HIT MV are transferred for HIT ZV. This is a very conservative assumption.

Fire Protection According to DIN EN 13501 and DIN 4102

All significant requirements concerning fire protection are laid down in the respective Building Regulations of the Federal States or in the relevant Master Building Regulations.

The components in close contact to the HALFEN Insulated connections HIT-HP or HIT-SP must also meet the requirements of the respective fire resistance class according to DIN EN 13501-02 or DIN 4102-2 including DIN 4102-22 in order to fully exploit the fire protection classification of the connection.

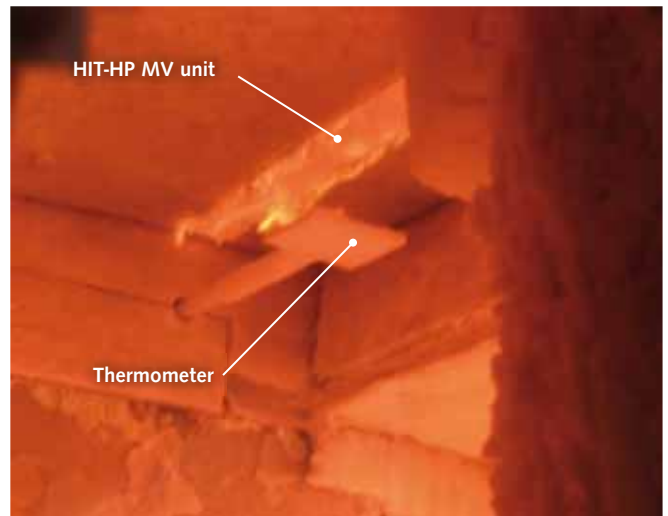
The standard versions of the connecting units HIT-HP and HIT-SP are classified in class REI 120 according to DIN EN 13501-02 as well as in class F 120-AB according to DIN 4102 in compliance with the European Technical Approval ETA-13/0546 and the National Technical Approval Z-15.7-293.

This is possible due to the special shape of the insulating body in combination with the use of high-quality non-flammable mineral wool, Building Material Class A1 and Euro Class A1, respectively.

The structure prevents flashover on the element sides as the insulating wool encloses the load bearing elements CSB, shear bars and tension bars from all sides.

Meaning of the abbreviation REI:

- R** The structural safety of the connection is ensured for the specified duration.
 - E** The projective effect of the connection is ensured for the specified duration.
 - I** The thermal insulating properties of the connection is ensured for the specified duration.
- 120** The functions above mentioned are ensured for 120 minutes of fire exposure in compliance with the standard time/temperature curve.



View into the fire test chamber during the HIT-HP MV fire-test after 120 minutes of exposure

The compliance with requirements concerning fire protection of any adjoining structural elements must be verified by the engineer.

Advantages

The advantages of the new connection element in comparison to the elements used in conventional construction methods with polystyrene and fire boards are obvious:

- no confusion of the standard and F 90 versions
- selecting a fire resistant element doesn't compromise heat insulation efficiency.
- no damage to the load bearing elements caused by flashover on the sides as the fire resistant insulating wool encloses the load bearing elements from all sides
- protection against weathering

HALFEN HIT INSULATED CONNECTION

Fire Protection According to DIN 4102

HALFEN Insulated connections **HIT-BX**, **HIT-BQ**, **HIT-VT**, **HIT-BD**, **HIT-ST** and **HIT-WT** are available as standard versions or, if there are any special fire protection requirements regarding the fire resistance classification of balconies, they are also available as F90 version.

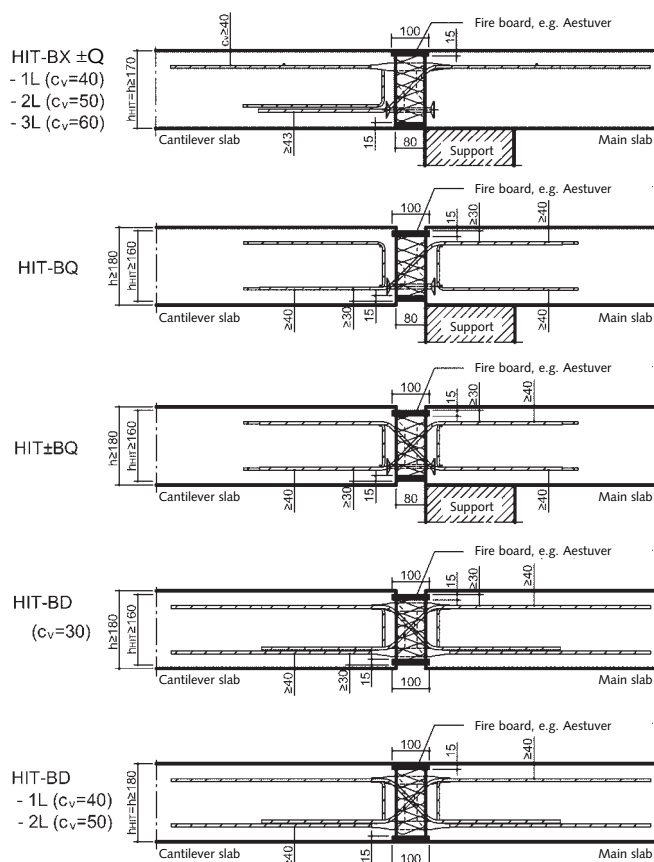
According to the National Technical Approval Annex Z-15.7-238, the F90 version fulfils the fire protection requirements for F90. It even fulfils the F120 requirements when the specified installation boundary conditions in compliance with the guidelines issued by the materials testing institute MPA Braunschweig are observed.

If a standard version without fire protection requirements complies with the structural boundary conditions (installation of a HALFEN HIT Insulated connection within a wall = "recessed installation", see figure 2), the F30 requirement can also be met.

It must be observed that, besides the fire protection version of the balcony connection, the balcony itself also fulfils the fire protection requirements.

If you have any question concerning fire protection of balcony slabs please contact us.

→ see inside back cover for contact details



Fire protection F120 according to MPA Braunschweig guidelines

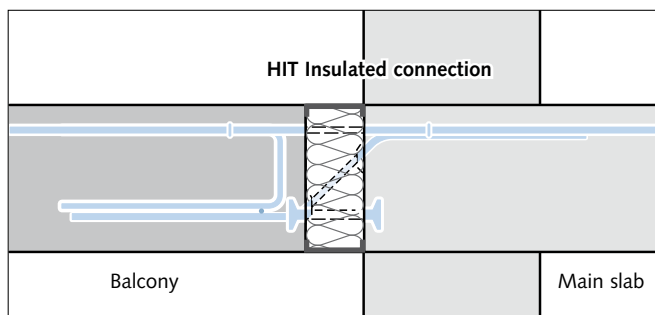


Fig. 1: Design without fire boards

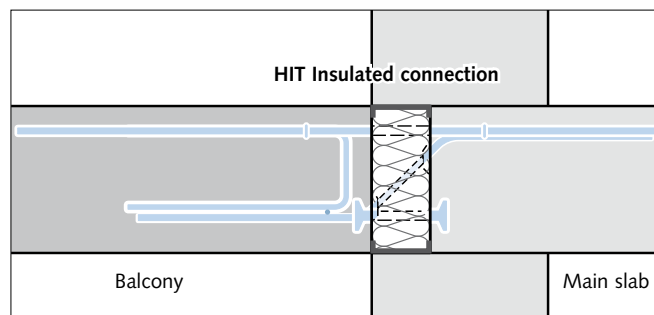


Fig. 2: Design F30 — recessed installation

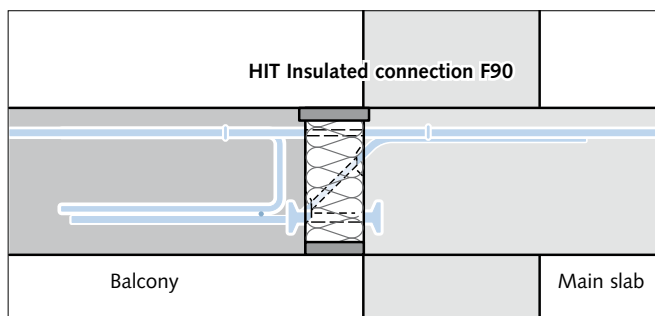


Fig. 3: Design F90 with fire boards

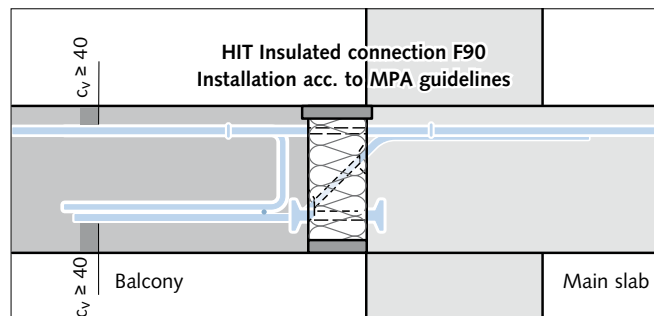


Fig. 4: Design F120 — Element F90 + Install. acc. to MPA guidelines

HALFEN HIT INSULATED CONNECTION

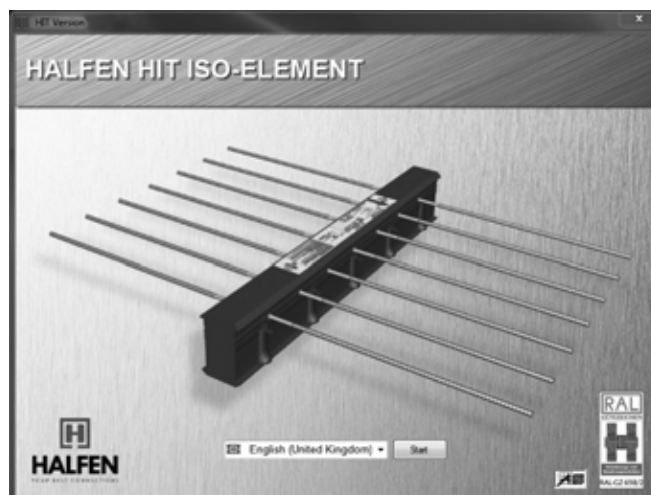
HIT Software

Innovations and advantages

The current version of the HIT balcony connections dimensioning software is based on the well proven previous versions; it has been improved and enhanced with significant additional functions.

The HIT software provides verifiable calculations for your balconies and offers these 6 key advantages:

- free download available
- simple, intuitive user interface
- increased load and support options
- provides verifiable structural calculations
- generates DXF drawings to import into your construction drawings
- generates parts lists for easy ordering



Only 3 steps required to a complete parts list for enquiries and orders

Step 1:

Simple and intuitive data input

HALFEN features a large selection of balcony types:

- cantilevered balcony
- cantilevered balcony with column
- recessed balcony
- external corner balcony
- external corner balcony with column
- corner, recessed balcony
- corner, recessed balcony with column



HALFEN HIT INSULATED CONNECTION

HIT Software

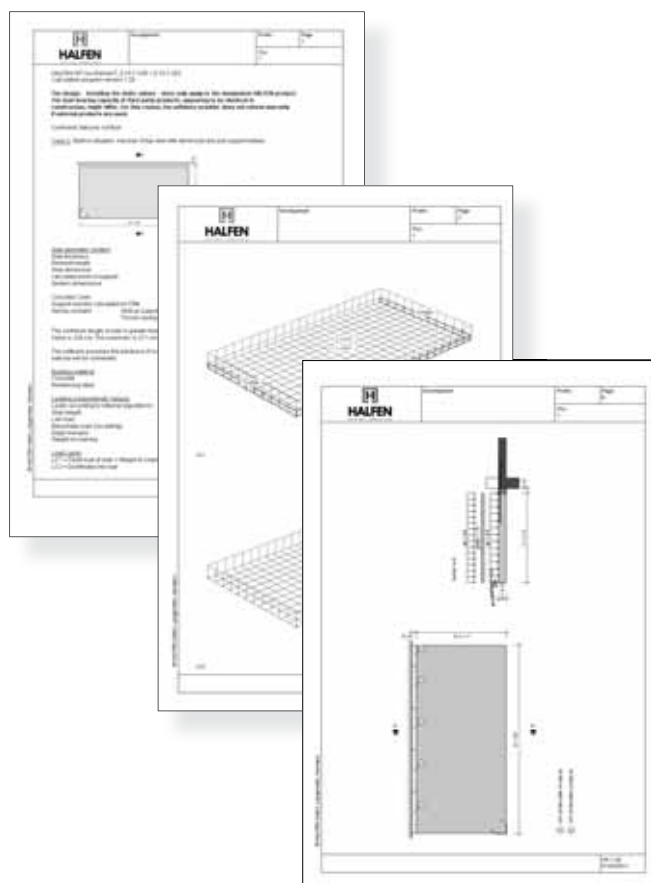
Step 2:

Generation of verifiable structural calculations

The HIT design programme uses the geometry of the balcony and the constraints regarding concrete cover and fire protection to select the appropriate HIT units.

If desired, the results can be printed as a verifiable structural calculation. Printouts can be generated in compact version or in greater detail including all investigated load cases and combinations, the distortion results, as well as graphical illustrations.

The graphical output capabilities of the significantly improved new HIT software can produce not only the basic geometry of the balcony but also a detailed top view and diagram illustrating the HALFEN HIT Insulated connections, the loads and the necessary connecting reinforcement.



Step 3:

Parts lists printout

To simplify enquiry and the order process the HIT software can generate the following parts lists:

- parts list showing all individual balcony units (example on the right)
- parts listed as HIT types

HALFEN HIT Insulated connection Parts List				
HIT Design Software				
Project: Multifamily Building, Central Street				
Created by: Mr. Builder				
Company: ABC				
Position	Article number	Catalogue No.	Number of balconies	per item
1	HIT-SP MV-0704-22-100-10		4	4
1	HIT-SP MV-0402-22-050-10		4	1
2	HIT-SP MV-0604-22-100-10		2	6

Conclusion

The user-friendly, tried and tested HALFEN software is now available in a new design. The program allows intuitive operation and simple entry of numerous balcony support situations. HALFEN offers the planner a software for absolute reliability when planning and dimensioning balcony connections.

The software calculates HIT units which have been building authority approved. Furthermore, all verifications required in accordance with approvals ETA-13/0546, Z-15.7-238 or Z-15.7-293 can be provided.

This is an integral part of HALFEN's integrated safety concept that no further approvals need to be separately acquired by planners when using HALFEN HIT Insulated connections.

Tender Specifications

Example 1: HALFEN HIT Insulated connection High Performance type HIT-HP MV-0504-hh-100-cc

HALFEN HIT Insulated connection High Performance type HIT-HP MV for thermal separation of a free cantilevered, steel reinforced balcony slab from a steel reinforced main slab, according to European Technical Approval ETA-13/0546, with RAL Anchoring- and Reinforcement technology Quality Mark GZ 658/2, including compression shear bearings CSB made of ultra-high performance fibre-reinforced mortar, with an insulation joint (width 8 cm) made of fire-resistant mineral wool. Building Material Class A1 according to DIN 4102-1 or to Euro Class A1 according to DIN EN 13501-1 with a thermal conductivity of 0.035 W/m²K (thermal conductivity 035), fire-resistant class REI 120 according to DIN EN 13501-2 or F 120-AB according to DIN 4102-2 AB.



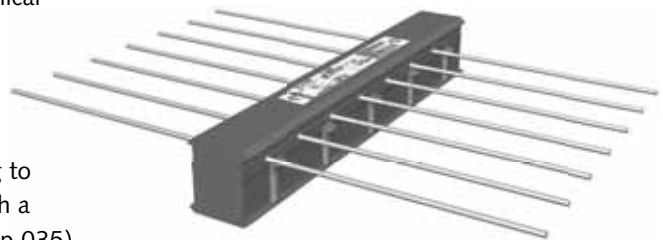
Type HIT-HP MV-0504-hh-100-cc with

HP = designation, thermal insulation thickness; 80 mm
 0504 = load range with 5 tension bars and 4 compression shear bearings CSB
 hh = balcony slab thickness (16 – 25) [cm]
 100 = element width b [cm]
 cc = upper concrete cover (30/35/50) [mm]
 up to height h = 24 cm certificated by the Passive House Institute

or equivalent and install according to the manufacturer's installation instructions.

Example 2: HALFEN HIT Insulated connection Superior Performance type HIT-SP MV-0705-hh-100-cc

HALFEN HIT Insulated connection Superior Performance type HIT-SP MV for thermal separation of a free cantilevered, steel reinforced balcony slab from a steel reinforced main slab, according to the National Technical Approval Z-15.7-293, with the RAL Quality Mark Anchoring- and Reinforcement technology RAL-GZ 658/2, including compression shear bearings CSB made of ultra-high performance fibre-reinforced mortar, with a insulating joint (width 12 cm) made of fire-resistant mineral wool of Building Material Class A1 according to DIN 4102-1 or to Euro Class A1 according to DIN EN 13501-1 with a thermal conductivity of 0.035 W/m²K (thermal conductivity group 035), fire-resistance class REI 120 according to DIN EN 13501-2 or F 120-AB according to DIN 4102-2 AB.



Type HIT-SP MV-0705-hh-100-cc with

SP = designation, thermal insulation thickness; 120 mm
 0705 = load range with 7 tension bars and 5 compression shear bearings CSB
 hh = balcony slab thickness (16 – 25) [cm]
 100 = element width b [cm]
 cc = upper concrete cover (30/35/50) [mm]
 up to height h = 24 cm certificated by the Passive House Institute

or equivalent and install according to the manufacturer's installation instructions.

Further tender specifications are available at www.halfen.com

Tender Specifications

Example 3: HALFEN HIT Insulated connection High Performance type HIT-HP MV-0605-hh-100-cc-OU

HALFEN HIT Insulated connection High Performance type HIT-HP MV-...-OU for thermal separation of a free cantilevered, steel reinforced balcony slab from a steel reinforced main slab, with any height offset (balcony higher than main slab) or upward wall connections according to European Technical Approval ETA-13/0546, with RAL Anchoring- and Reinforcement technology Quality Mark GZ 658/2, including compression shear bearings CSB made of ultra-high performance fibre-reinforced mortar, with a insulation joint (width 8 cm) made of fire-resistant mineral wool. Building Material Class A1 according to DIN 4102-1 or to Euro Class A1 according to DIN EN 13501-1 with a thermal conductivity of 0.035 W/m²K (thermal conductivity 035), fire-resistant class REI 120 according to DIN EN 13501-2 or F 120-AB according to DIN 4102-2 AB.



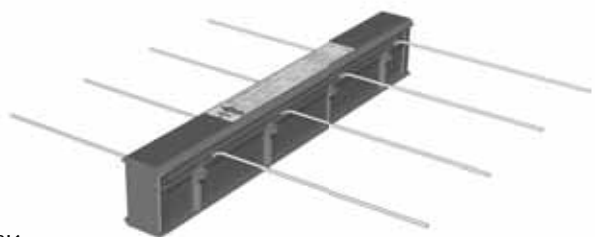
Type HIT-HP MV-0605-hh-100-cc-OU xxx with

- HP = designation, thermal insulation thickness; 80 mm
- 0605 = load range with 6 tension bars and 5 compression shear bearings CSB
- hh = balcony slab thickness (16 – 30) [cm]
- 100 = element width b [cm]
- cc = upper concrete cover (30 / 35 / 50) [mm]
- xxx = wall/beam thickness (175 – 330) [mm]

or equivalent and install according to the manufacturer's installation instructions.

Example 4: HALFEN HIT Insulated connection High Performance type HIT-HP ZV-0404-hh-100-30-dd

HALFEN HIT Insulated connection High Performance type HIT-HP ZV for thermal separation of a simply supported balcony slab on columns from a steel reinforced main slab, according to European Technical Approval ETA-13/0546, with RAL Anchoring- and Reinforcement technology Quality Mark GZ 658/2, including compression shear bearings CSB made of ultra-high performance fibre-reinforced mortar, with a insulation joint (width 8 cm) made of fire-resistant mineral wool. Building Material Class A1 according to DIN 4102-1 or to Euro Class A1 according to DIN EN 13501-1 with a thermal conductivity of 0.035 W/m²K (thermal conductivity 035), fire-resistant class REI 120 according to DIN EN 13501-2 or F 120-AB according to DIN 4102-2 AB.



Type HIT-HP ZV-0404-hh-100-30-dd with

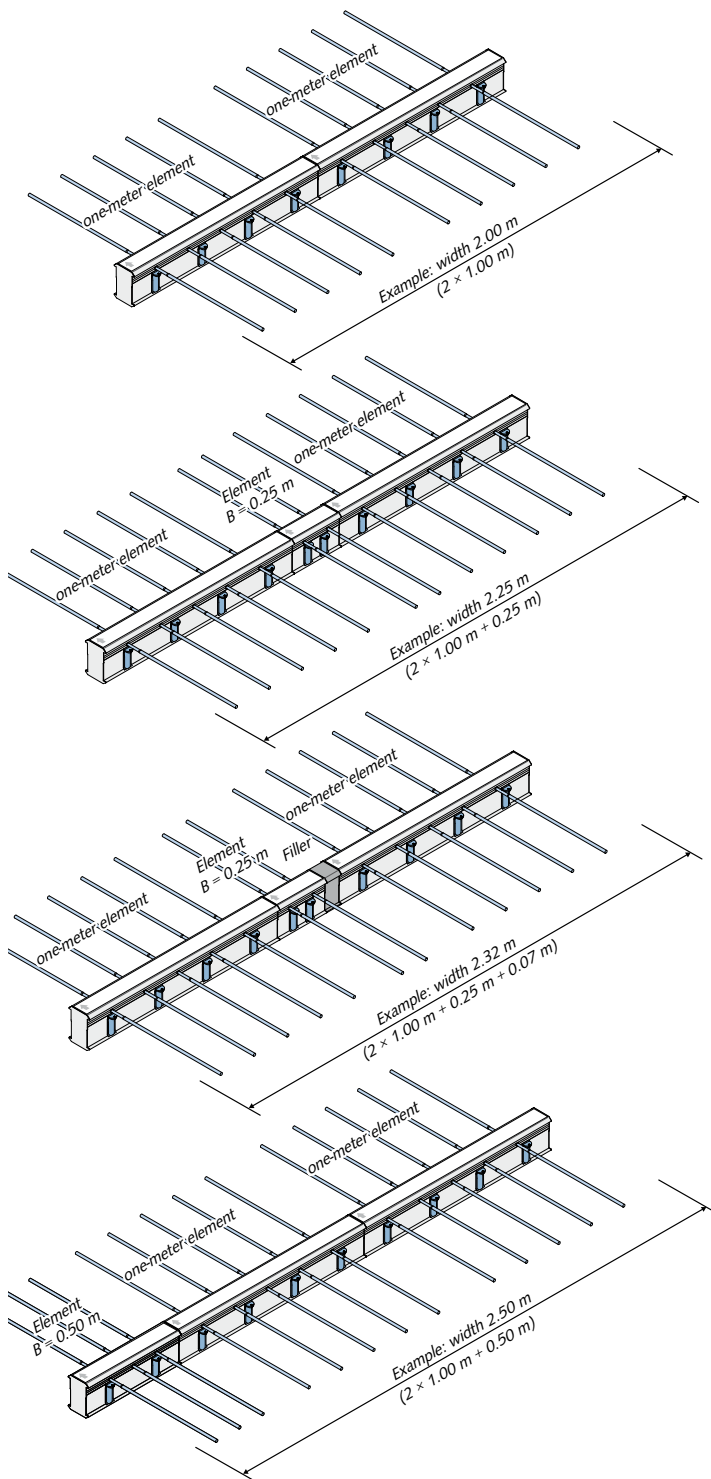
- HP = designation, thermal insulation thickness; 80 mm
- 0404 = load range with 4 shear bars and 4 compression shear bearings CSB
- hh = balcony slab thickness (16 – 30) [cm]
- 100 = element width b [cm]
- dd = shear bars diameter (6 / 8 / 10 / 12) [mm]
- up to height h = 24 cm certificated by the Passive House Institute

or equivalent and install according to the manufacturer's installation instructions.

Further tender specifications are available at www.halfen.com

Optimized Combination of HIT Units to Reduce Material Waste; HALFEN HIT-HP, HIT-SP

Combinable: HIT-HP MV and HIT-SP MV elements with widths of 0.25 m, 0.50 m or 1.00 m can be combined to fit any width. Fillers can be used to ensure a precise fit.



Combination of HIT-HP / HIT-SP elements (B = 0.25/0.50/1.00 m) and fillers (examples)

Width of balcony slab [m]	1.00	2.10	2.30	2.50	2.70	2.90
2.00	one-metre element	one-metre element				
2.10	one-metre element	FK	one-metre element			
2.20	one-metre element	FK	one-metre element			
2.30	one-metre element	FK	050	FK	050	
2.40	one-metre element	025	FK	one-metre element		
2.80	one-metre element	FK	one-metre element	FK	050	
3.00	one-metre element	one-metre element	one-metre element			

The increase of the loaded areas when HIT fillers are used is compensated by the HIT design programme with the respective additions. See Note ① (→see below).

FK = Filler HIT-HP FK (see below) 025 = Element with B = 0.25 m
 050 = Element with B = 0.50 m

HIT fillers ease the installation of HIT elements because planned spacings can be filled with HIT-FK. No need to cut insulation to size on site.

The HIT-HP FK and HIT-SP FK fillers are available in the following sizes:

- width b = 6 – 100 cm
- height h = 16 – 30 cm
- thickness HIT-HP FK-SK = 8 cm
 HIT-SP FK-SK = 12 cm

Ordering examples: Type Dimensions in [cm]
 HIT-HP FK-20-006 High Performance b = 6, h = 20
 HIT-SP FK-16-020 Superior Performance b = 20, h = 16

Use of one-metre elements and short units

Width of balcony slab [m]	1.00	2.10	2.30	2.50	2.70	2.90
2.00	one-metre element	one-metre element				
2.50	one-metre element	one-metre element	050			
3.00	one-metre element	one-metre element	one-metre element			

① Note:

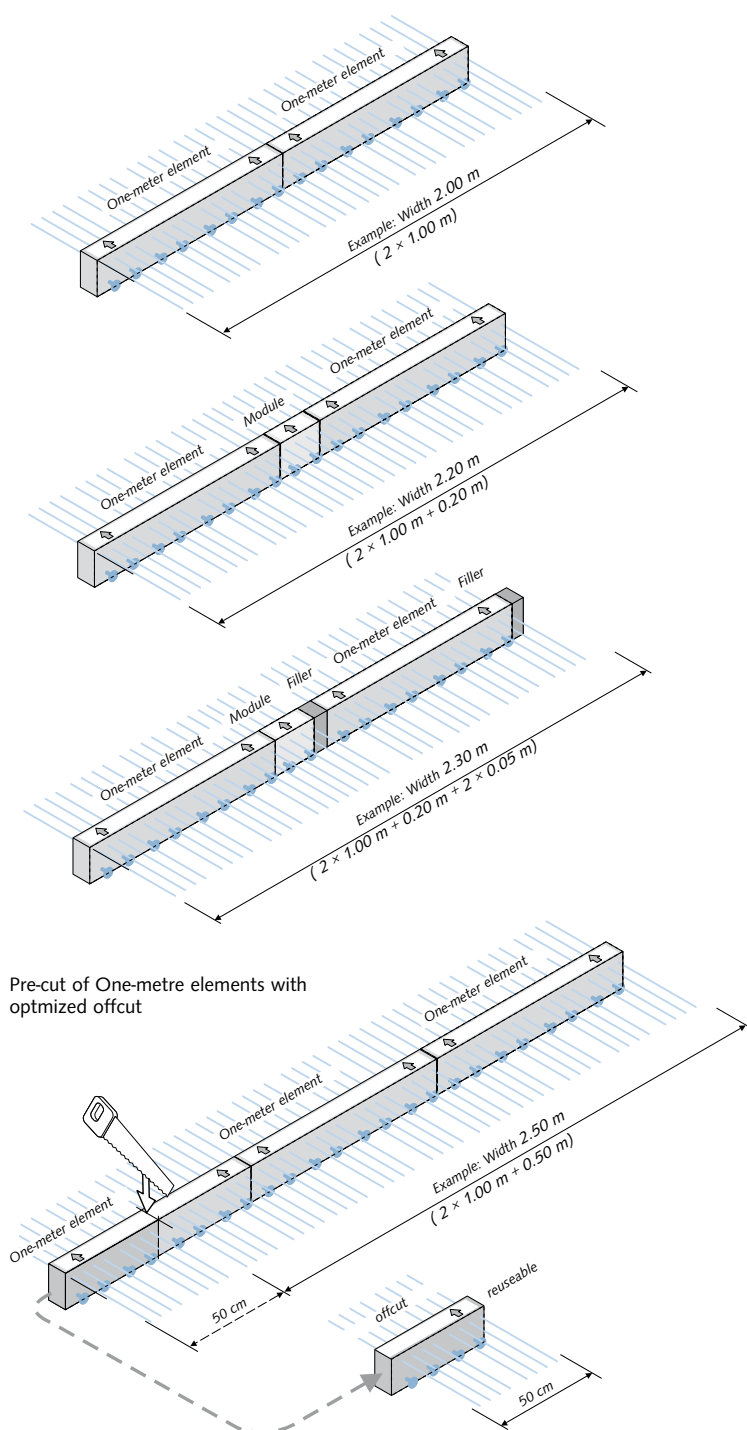
Installation distances according to ETA-13/0546 and National Technical Approval Z-15.7-293 must be observed:

- maximum centre distance of the tension bars and CSB: 30 cm; but not less than 4 bars/CSB per metre
- minimum distance to the free edge or joint: tension bar: 5 cm; CSB: 8 cm

HALFEN HIT INSULATED CONNECTION

Practice-Oriented Offcut: Combining HIT Units to Optimize Material Use, HALFEN HIT-FK Filler Elements

Combinable: Standard one-metre elements and 20cm modules can be combined to fit any width. Fillers can be used to ensure a precise fit.



Combination of one-metre elements and modules (examples)

Width of balcony slab [m]	1.00	2.10	2.30	2.50	2.70	2.90
2.00	one-metre element	one-metre element				
2.10	one-metre element	F	one-metre element	F		
2.20	one-metre element	Mo	one-metre element			
2.30	one-metre element	Mo	F	one-metre element	F	
2.50	one-metre element	Mo	Mo	one-metre element	F	
2.80	one-metre element	one-metre element	one-metre element	one-metre element	one-metre element	①
3.00	one-metre element	one-metre element	one-metre element	one-metre element	one-metre element	one-metre element

When using HIT fillers the programme compensates for the increased spacing between HIT bars by a corresponding reduction in the load capacity. See Note ②

① Shorten the HIT element but observe the approval specifications.

Mo = 20-cm module

F = Filler HIT-FK (see below)

HIT fillers facilitate the installation of HIT elements as planned spacings can be filled with HIT-FK. No need to cut the insulation to size on site.

HIT fillers are available in the following sizes:

- width $b = 5\text{--}200\text{ cm}$
- height $h = 15\text{--}30\text{ cm}$
- thickness the same as all HIT units = 8 cm.
- Select from two versions:** Standard version with plastic cover, F90 variation with fire boards.

Ordering examples:

	Version	Dimensions [cm]
HIT-FK-5-20-SK	Standard	$b = 5$, $h = 20$
HIT-FK-9-24-F90-SK	F90	$b = 9$, $h = 24$

Reference no. for all HIT-FK: 0909.009-00001

Use of one-metre elements plus pre-cut and the effective use of remaining offcuts

Width of balcony slab [m]	2.00	2.50	3.00
one-metre element	one-metre element	one-metre element	one-metre element
one-metre element	one-metre element	0.5 El.	one-metre element
one-metre element	one-metre element	one-metre element	one-metre element

① Note:

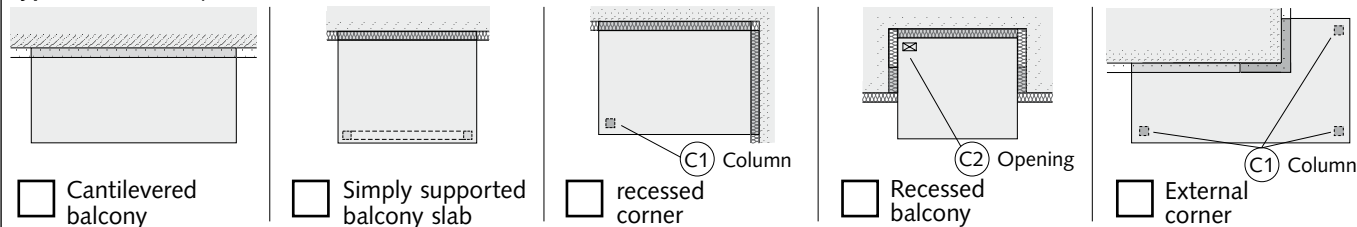
Installation distances according to National Technical Approval Z-15.7-293 must be observed:

- maximum centre distance of the tension / compression bars and shear bars: 30 cm; but not less than 4 bars/bearings per metre
- minimum distance to the free edge or joint: tension / compression bar: 5 cm; shear bars: 10 cm

HALFEN HIT INSULATED CONNECTION

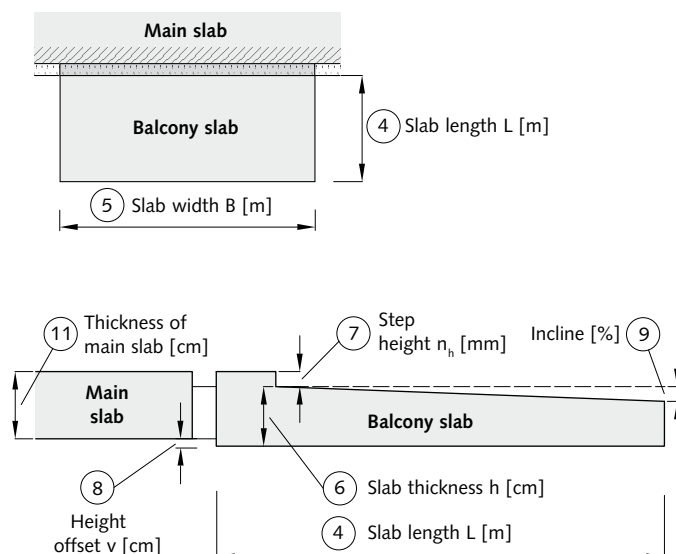
Project check list

Type overview (top views)



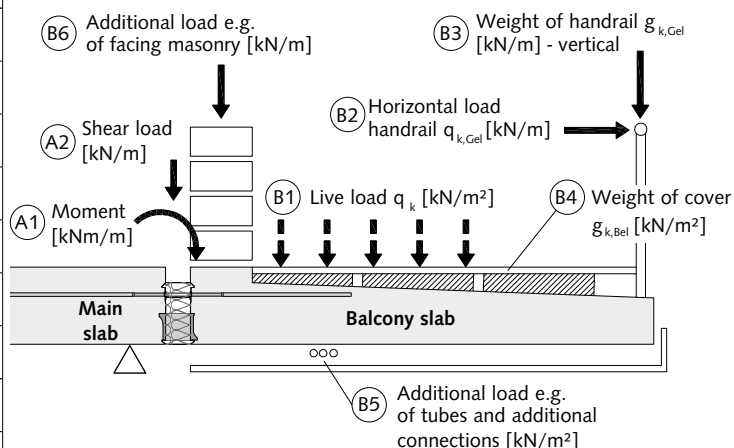
Basics / Dimensions

1	Concrete strength	C ... / ...	
2	Concrete cover c_{nom} [mm]		
3	Fire protection class	☐ not required	☐ F90
4	Slab length L [m]		
5	Slab width B [m]		
6	Slab thickness h [cm]		
7	Step height n_h [mm]		
8	Height offset v [cm]		
9	Incline [%]		
10	Construction of main slab	☐ Filigree slab	☐ On-site concrete
11	Thickness of main slab [cm]		
12	Number of balconies		



Loads (please fill in A or B only)

A1	Design value of the acting moment M_{Ed} [kNm/m]	
A2	Design value of the acting shear force V_{Ed} [kN/m]	
Characteristic load		
B1	Live load q_k [kN/m ²]	
B2	Horizontal load handrail $q_{k,Gel}$ [kN/m]	
B3	Weight of handrail $g_{k,Gel}$ [kN/m] - vertical	
B4	Weight of flooring $g_{k,Bel}$ [kN/m ²]	
B5	Additional load e.g. of railing and additional connections [kN/m ²]	
B6	Additional load e.g. of facing masonry [kN/m]	
Other details (e.g. additional loads, columns etc.)		
C1		
C2		



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Furthermore HALFEN is represented with sales offices and distributors worldwide. Please contact us: www.halfen.com

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