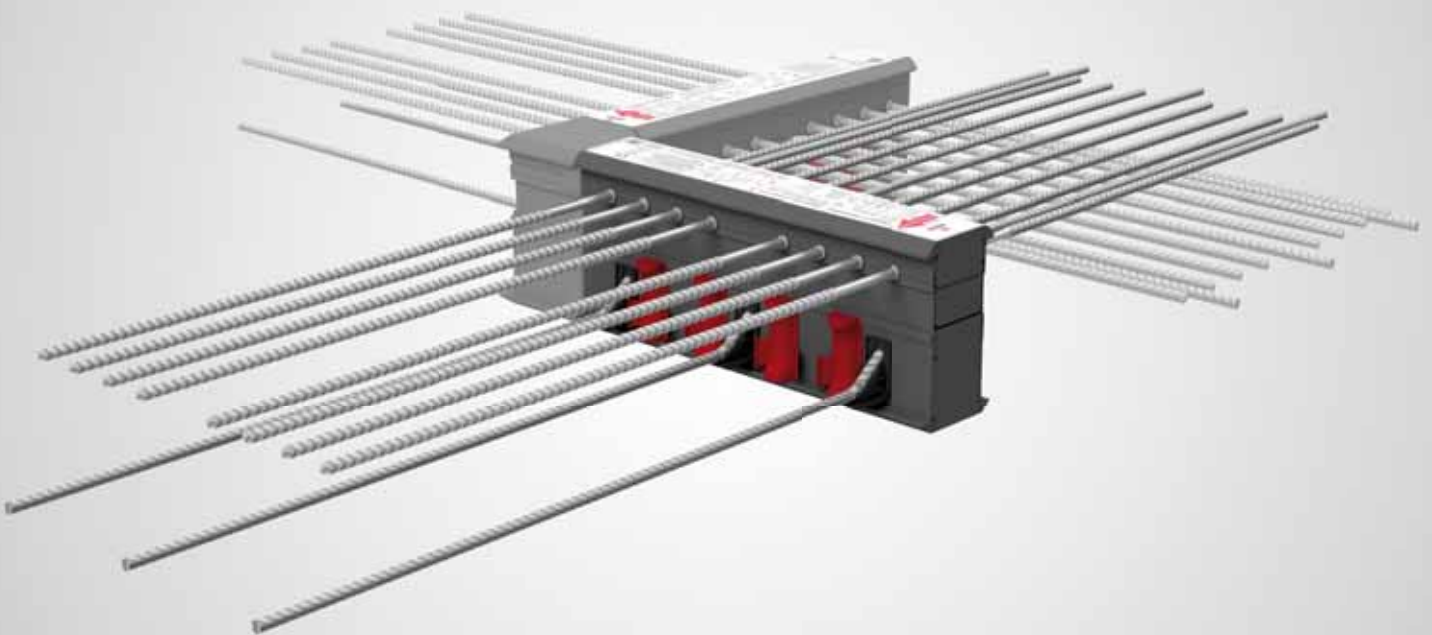


HALFEN HIT INSULATED CONNECTION

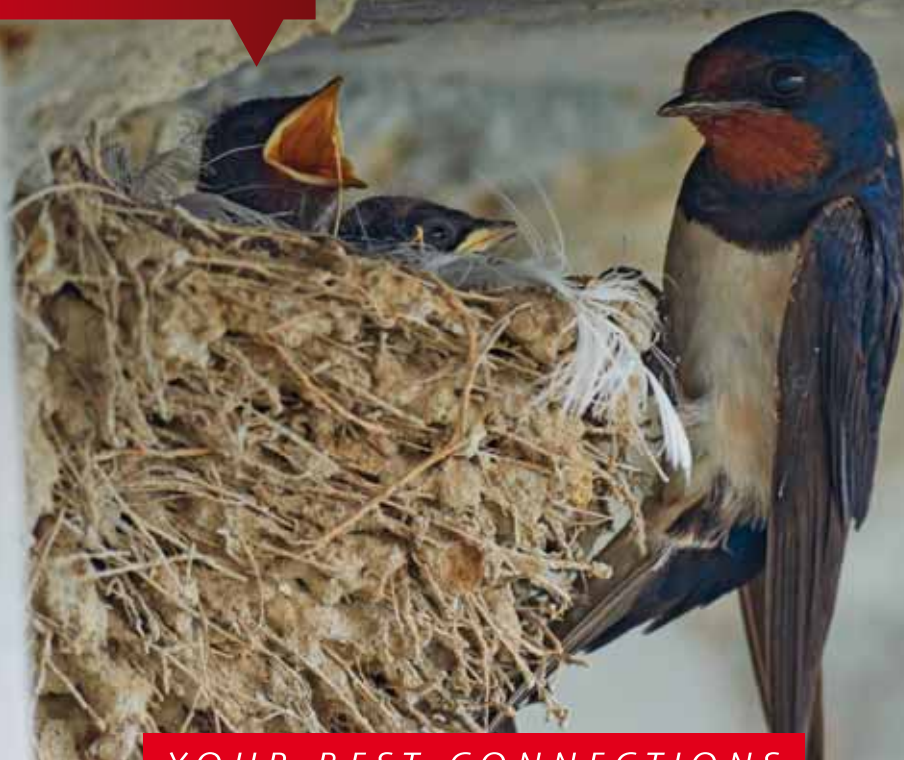
Technical Product Information

YOUR BEST CONNECTIONS



BEST VIEW

Like small balconies at a lofty height, swallows build their nests on house walls or directly under the eaves. Not only for protection – but also as a better lookout. To ensure the nests hold, the birds stick them simply but firmly to the surface. However, for larger and heavier cantilevers we recommend the new HIT-MVXL!



Find out more at
www.halfen.com

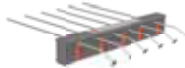
YOUR BEST CONNECTIONS

NEW: HIT-MVXL – THE CONNECTOR FOR AMBITIOUS CANTILEVER DESIGNS

Realize even the most daring balcony designs with the new HIT-MVXL! For semi-precast slabs in corner situations the connector transfers even higher shear forces with no additional recessing required in the main slab.



CONTENTS

General information and contents			
Your benefits	4–5		
Type overview	6–9		
Product description	10		
1 MVX / MVXL / -COR			
HIT-HP MVX, HIT-SP MVX	11		
HIT-HP MVXL, HIT-SP MVXL NEW	34		
HIT-HP COR, HIT-SP COR	47		
2 MVX-OU/OD			
HIT-HP MVX-OU, HIT-SP MVX-OU	57		
HIT-HP MVX-OD, HIT-SP MVX-OD	58		
3 ZVX / ZDX			
HIT-HP ZVX, HIT-SP ZVX	72		
HIT-HP ZDX, HIT-SP ZDX	73		
4 DD / DDL / DVL			
HIT-HP DD, HIT-SP DD	101		
HIT-HP DVL NEW	108		
HIT-HP DDL NEW	109		
5 HT			
HIT-HP HT1–5, HIT-SP HT1–5	116		
6 AT / FT / OTX / FK			
HIT-HP AT, HIT-SP AT	125		
HIT-HP FT, HIT-SP FT	133		
HIT-HP OTX, HIT-SP OTX	140		
HIT-HP FK, HIT-SP FK, width adjustment	148		
7 Building physics, planning			
Building physics	150		
Basics of thermal insulation	151		
HALFEN ψ calculator	154		
Building authority approved thermal values	155		
Passive House Institute certification	163		
Noise protection according to DIN 4109	165		
Fire protection according to DIN EN 13501	166		
HIT-Software	167		
Contact / Technical Support	168		

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

Benefits of Planning and Installing HIT Insulated Connections

HALFEN HIT Insulated connection – the innovative balcony connection

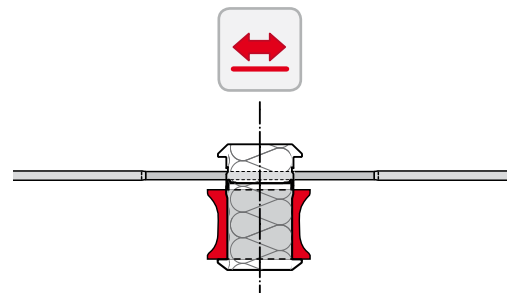
Our main focus is the development and improvement of our products. Thanks to the innovative, double-symmetrical compression shear bearings CSB, HALFEN can provide even greater reliability in planning and application as well as an

improved installation procedure – both on-site or in the precast plant. The product range includes the HIT-HP with an insulation thickness of 80 mm and the HIT-SP with 120 mm insulation thickness.

► Reliable installation

The distinct shape of the CSB-bearing means the HIT Insulated connections for balconies (HIT-HP/SP MVX, ZDX, DDL, HT) are symmetrical. Installation is therefore independent of the main slab or balcony direction.

- no confusion of installation direction

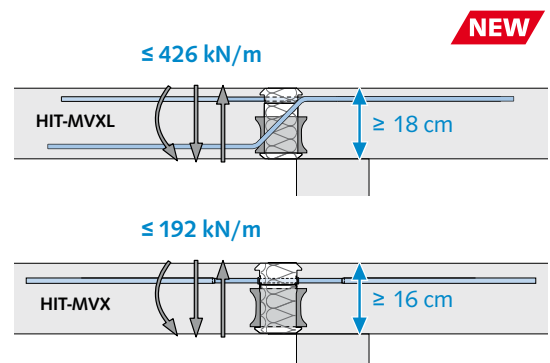


► Reliable planning with the new high load bearing capacity of the MVXL Elements

HALFEN's integrated safety concept:

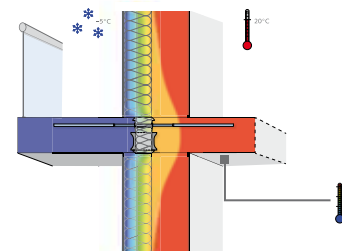
The values provided in the tables for the new HIT-MVXL-Elements are also actual design values, which means all necessary proofs for the slab connection are provided.

- shear load capability of up to 426 kN/m in corner balconies using the HIT-MVXL
- possible shear loads up to 192 kN/m for slab thickness from 16 cm
- easy load range allocation even with the individual elements in our modular system



► Up to 30% improvement on building physics key-values

A significant reduction in the number of support elements is achieved due to the further optimization of the CSB-bearings.



► Approved Environmental Performance

The Environmental Product Declaration EPD provides transparent and comparable ecological data for ecological building assessment according to EN 15978. It ensures that the high demands on the ecological performance of the building are also met.

With the EPD for the HALFEN HIT Insulated connection the necessary data for the sustainability certification of the building are available.



HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

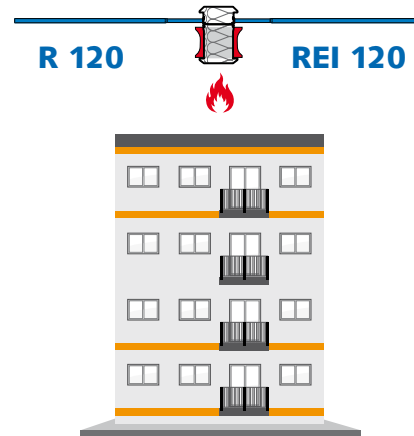
Benefits of Planning and Installing HIT Insulated Connections

Further benefits

► Fire protection

The standard HIT Elements fulfil the requirements for the highest fire protection classification REI 120

- fire resistant thermal heat insulation material; A1 building material classification – non-flammable insulation
- suitable for use as a fire-break in ETICS façades (Expanded polystyrene)
- no mix-ups of elements with or without demands on fire protection
- additional fire protection is not required due to integrated all-sided fire protection



► EnEV conformity

with building authority approved Ψ -Values

DIBt approved Ψ -values are available to calculate the total energy balance.

- HIT Calculator available on the HALFEN website: available for all platforms – no installation required!



► Passive House Institute certified

- highest category certified "Certified Passive house component" for the HIT-SP ZVX Element with up to 24 cm slab thickness
- certified as energy saving components starting with an insulation thickness of 80 mm for application in cantilevered and simply supported balcony slabs



► Certification and software

- CE marking with ETA European Technical Assessment
- approved by the German Institute of Construction Engineering (DIBt *Deutsches Institut für Bautechnik*)
- user-friendly software with integrated offcut-optimization to reduce waste



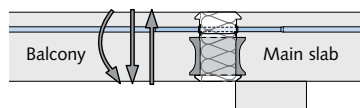
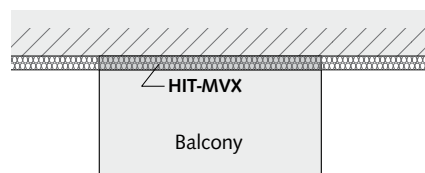
HALFEN HIT INSULATED CONNECTION

Product Overview – Thermally Insulated Connections

1 Cantilevered balcony slabs



Application for cantilevered balcony slabs

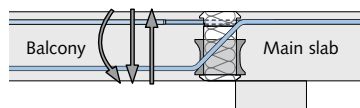
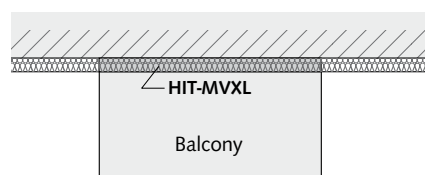


HIT-HP MVX / HIT-SP MVX



Transfers bending moments and positive and negative shear forces.

- insulation thickness 80 mm / 120 mm
- **page 11**

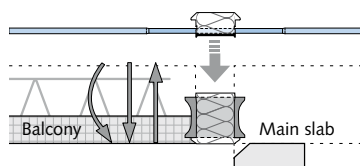
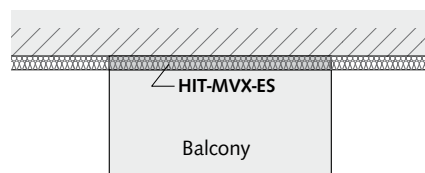


HIT-HP MVXL / HIT-SP MVXL **NEW**

Transfers higher bending moments and higher positive and negative shear forces.

- insulation thickness 80 mm / 120 mm
- **page 34**

Multi-part application for element slabs



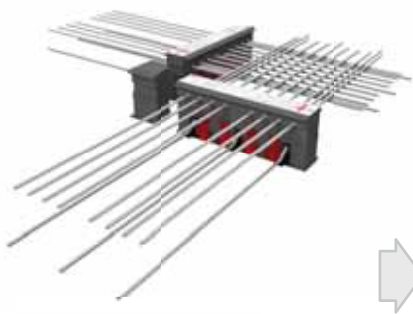
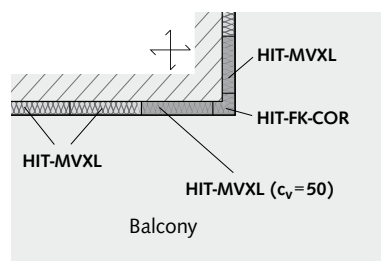
HIT-HP MVX-ES / HIT-SP MVX-ES



Product type for element slabs. Transfers bending moments and positive and negative shear forces.

- insulation thickness 80 mm / 120 mm
- **page 11**

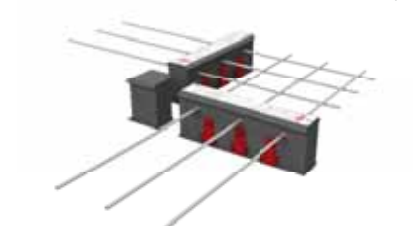
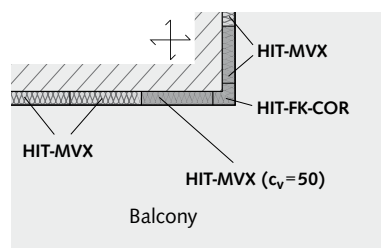
Application for cantilevered corner balcony slabs



HIT-HP COR / HIT-SP COR

For cantilevered outside corner balconies, designed with standard elements with the same load bearing capacity and a corner filler.

- application with HIT-MVXL **NEW**
 - insulation thickness 80 mm / 120 mm
- **page 47**



- application with HIT-MVX
- available as product type for element slabs (-ES)



- insulation thickness 80 mm / 120 mm
- **page 47**

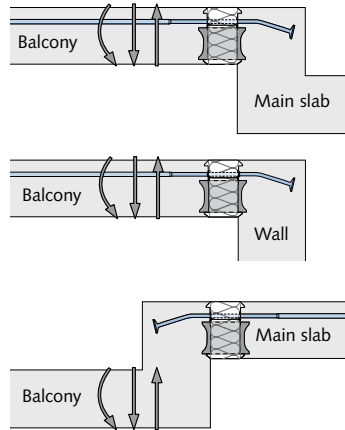
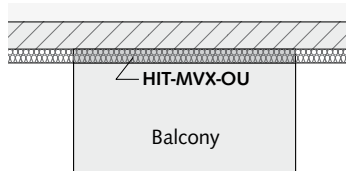
HALFEN HIT INSULATED CONNECTION

Product Overview – Thermally Insulated Connections

2 Cantilevered balcony slabs with height offset or wall connections



Application for upward height offset



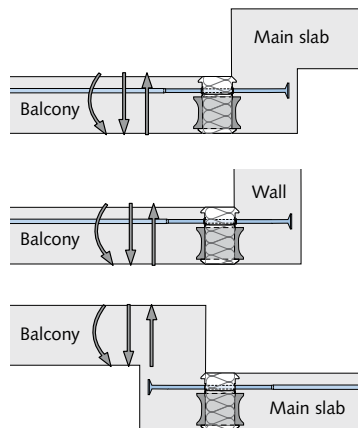
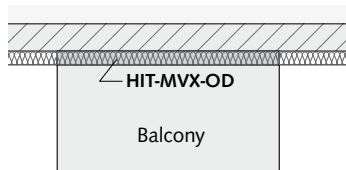
HIT-HP MVX-OU / HIT-SP MVX-OU

Height offset, balcony higher than main slab; upward wall connection.

Transfers bending moments and positive and negative shear forces.

- available as product type for element slabs (-ES)
 - available as custom design also for balcony side
 - insulation thickness 80 mm / 120 mm
- **page 57**

Application for downward height offset



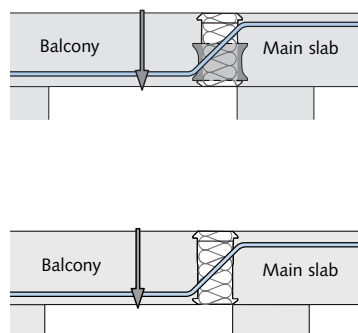
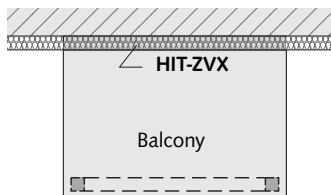
HIT-HP MVX-OD / HIT-SP MVX-OD

Height offset, balcony lower than main slab; downward wall connection.

Transfers bending moments and positive and negative shear forces.

- available as product type for element slabs (-ES)
 - available as custom design also for balcony side
 - insulation thickness 80 mm / 120 mm
- **page 58**

3 Simply-supported balcony slabs on columns



HIT-HP ZVX / HIT-SP ZVX

Transfers shear forces only

- insulation thickness 80 mm / 120 mm
- **page 72**

HIT-HP ZVX / HIT-SP ZVX without CSB

Transfers shear forces only for unrestrained simply supported connections, e.g. for loggias.

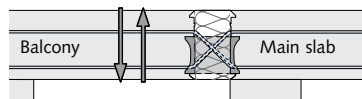
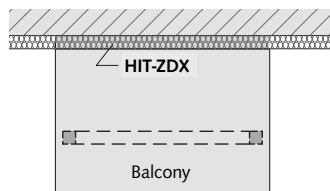
- insulation thickness 80 mm / 120 mm
- **page 72**

► further types → see following pages

HALFEN HIT INSULATED CONNECTION

Product Overview – Thermally Insulated Connections

3 Simply-supported balcony slabs on columns

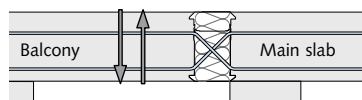
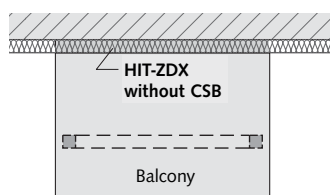


HIT-HP ZDX / HIT-SP ZDX

Transfers positive and negative shear forces.

- insulation thickness 80 mm / 120 mm

→ page 73



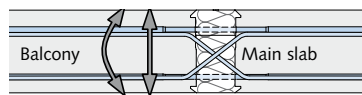
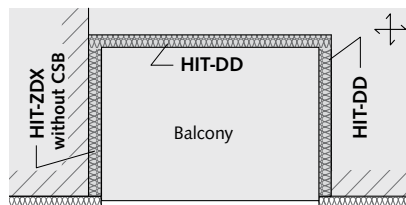
HIT-HP ZDX / HIT-SP ZDX without CSB

Transfers shear forces only for unrestrained simply supported connections.

- insulation thickness 80 mm / 120 mm

→ page 73

4 Continuous slabs

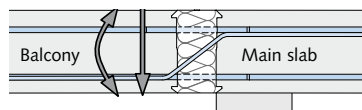
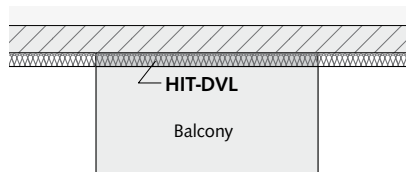


HIT-HP DD / HIT-SP DD

Transfers positive and negative bending moments and shear forces.

- insulation thickness 80 mm / 120 mm

→ page 101

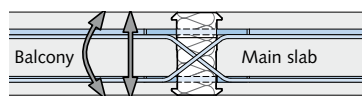
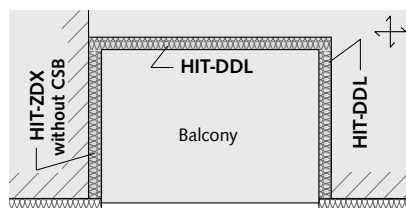


HIT-HP DVL **NEW**

Transfers high shear forces and positive and negative bending moments.

- insulation thickness 80 mm

→ page 108



HIT-HP DDL **NEW**

Transfers high positive and negative shear forces and moments.

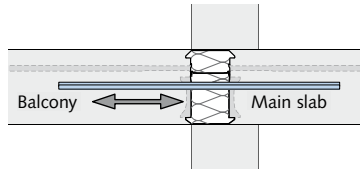
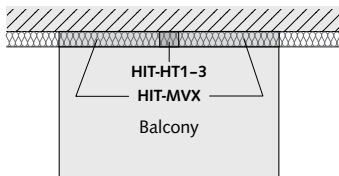
- insulation thickness 80 mm

→ page 109

HALFEN HIT INSULATED CONNECTION

Product Overview – Thermally Insulated Connections

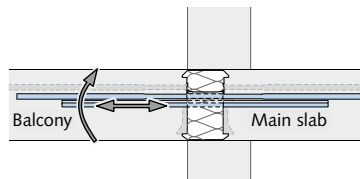
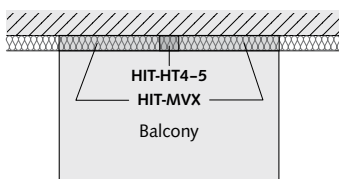
5 Transfer of horizontal forces



HIT-HP HT1-3 / HIT-SP HT1-3

For transfer of planned horizontal loads and lifting moments perpendicular to the insulation line

- insulation thickness 80 mm / 120 mm
- page 116

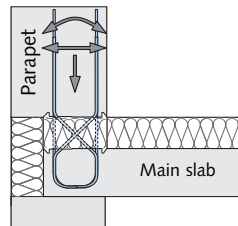
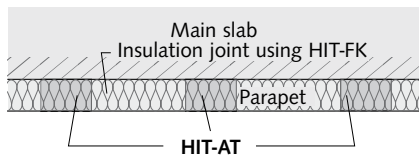


HIT-HP HT4-5 / HIT-SP HT4-5

For transfer of planned horizontal loads and lifting moments perpendicular to the insulation line and lifting moments, if applicable

- insulation thickness 80 mm / 120 mm
- page 116

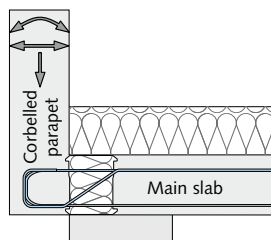
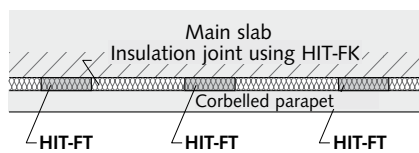
6 Parapets, corbels and fillers



HIT-HP AT / HIT-SP AT

Forms a thermal barrier between parapet and main slab for selective use.

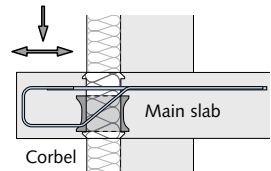
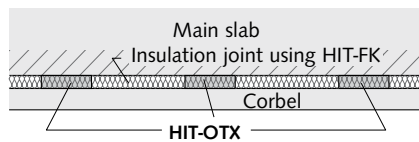
- insulation thickness 80 mm / 120 mm
- page 125



HIT-HP FT / HIT-SP FT

Forms a thermal barrier between corbelled parapet and main slab for selective use.

- insulation thickness 80 mm / 120 mm
- page 133



HIT-HP OTX / HIT-SP OTX

Forms a thermal barrier between corbel and main slab for selective use.

- insulation thickness 80 mm / 120 mm
- page 140

HIT-HP FK / HIT-SP FK: Fillers for insulation of the joint between balcony and main slab. Insulation thickness 80 mm / 120 mm

→ page 148

7 Building physics, technical information



Information on: thermal insulation, fire protection and noise reduction / planning aid / HALFEN design software

→ page 150

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

Material Specification and Test Certificates

Material specification

Tension bars	Flash butt welded bar connection, consisting of a combination of two reinforcing steel bars B500 according to DIN 488 and a stainless steel bar of strength class S 690 or stainless steel B500NR
Shear bars	Stainless bar steel of strength B500NR or flash butt welded bar connection, consisting of a combination of stainless steel bar B500NR and reinforcing steel bars B500B
Compression shear bearings	High-performance mortar with increased compressive and tensile strength as well as optimized thermal conductivity
Casings	Plastic according to EN ISO 1163
Insulating material	Mineral wool (WLG 035) of Building Material Class A1, non-flammable insulation according to DIN 4102-14 or Euro Class A1 according to EN 13501-1
Connecting components	
Concrete	Suitable for concrete strengths $\geq$ C20/25
On-site reinforcement	Reinforcement steel B500

Test certificates

Technical Approvals	
HIT-HP/SP MVX and MVXL HIT-HP/SP ZVX and ZDX HIT-HP/SP DD, DVL and DDL HIT-HP/SP AT, FT, OTX	EOTA: ETA-18/0189 including fire protection, thermal values and noise reduction DoP no. H10-18/0189
HIT-HP/SP MVX HIT-HP/SP ZVX and ZDX	DIBT Berlin: Approval no. Z-15.7-293 DIBT Berlin: Approval no. Z-15.7-312



Type Test

Type tested by the LGA Landesgewerbeamt Bayern	Test no. S-WUE/100358 (German certification institute)
---	---

Certification

Passive House Institute	Certification valid for slab thickness from 160 mm to 240 mm	
Environmental Product Declaration EPD	comparable ecological data for the ecological building assessment according to EN 15978	



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 to download the PDF file.



HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

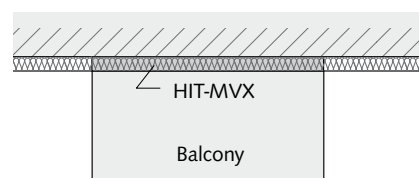
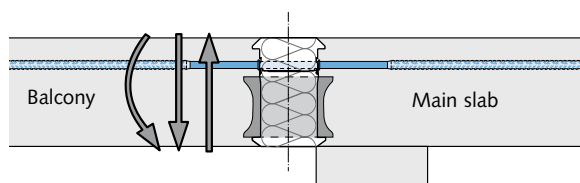
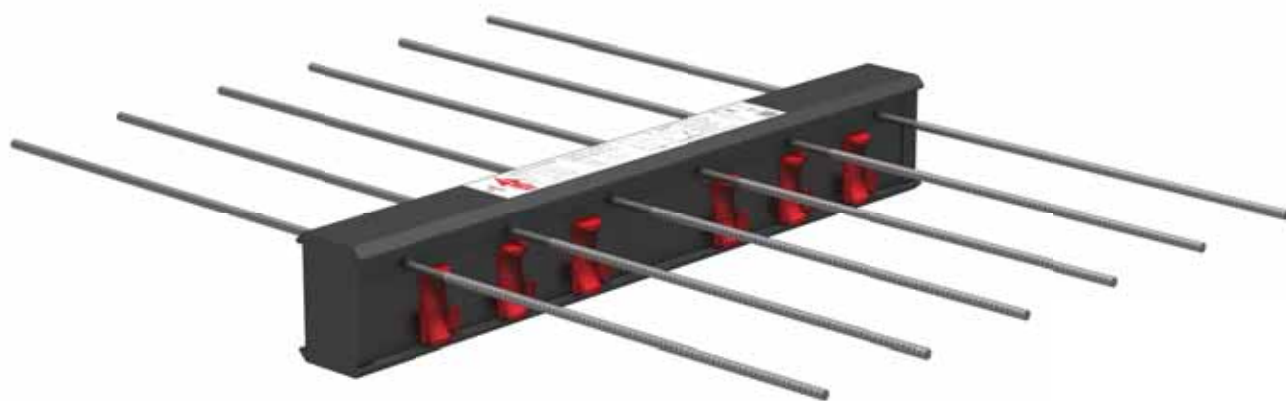
HIT-HP MVX, HIT-SP MVX

1

- > Symmetrical balcony connection for cantilevered balcony slabs
- > Transfers bending moments and positive and negative shear forces



TYPE TESTED



Application: Cantilevered balcony

HIT-HP MVX – High Performance with 80 mm insulation thickness
HIT-SP MVX – Superior Performance with 120 mm insulation thickness
 Both types are also available as multi-part design (-ES) for element slabs.

Content	Type	Page
The basics of load bearing capacity	HIT-HP MVX, HIT-SP MVX	12
Product types / Load range	HIT-HP MVX, HIT-SP MVX	13
Load bearing capacity values	HIT-HP MVX, HIT-SP MVX	14
Product type for element slabs	HIT-HP MVX-ES, HIT-SP MVX-ES	29
Elements with higher load bearing capacity NEW	HIT-HP MVXL, HIT-SP MVXL	34
Elements for cantilevered corner balconies	HIT-HP COR, HIT-SP COR	47
On-site connecting reinforcement, installation		51
HIT-MVX with prestressed concrete prefabricated slabs		53
Camber		55

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE HIT-HP MVX, HIT-SP MVX

Load bearing behaviour of the HIT-MVX

Symmetry makes life easier!

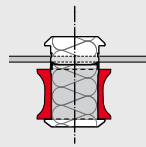
The static system of the HIT-MVX Elements is made of standard tension rods in reinforcement steel and stainless steel and the innovative CSB-bearing with high density fibre-reinforced high performance mortar. CSB is an abbreviation for Compression-Shear-Bearing and describes its unique function; the simultaneous transmission of shear and compression loads.

With our innovative double symmetrical CSB bearings, the shear forces can be applied in both directions. In combination with the tension rods these make up the symmetrical HIT-HP MVX which has 80mm insulation thickness and the HIT-SP MVX with 120mm insulation thickness.

These elements are suitable for moments as well as positive and negative shear loads.



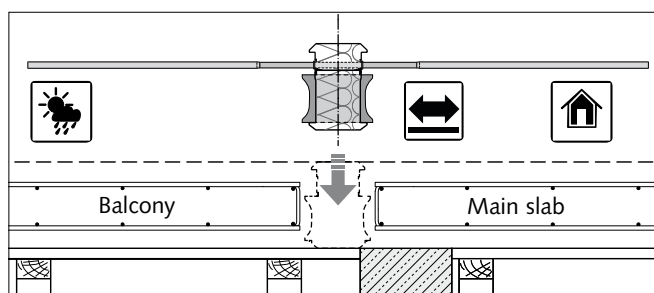
With the double-symmetrical CSB the HIT-MVX Insulated connections are symmetrical and can be installed independently of the main slab or the balcony direction.



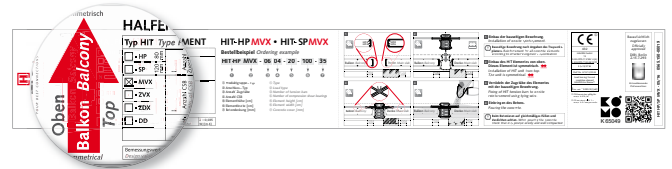
Reliable installation with symmetrical HIT-MVX Elements

The HIT Balcony connection is designed for practical building requirements. All support elements are sufficiently secured in the sturdy plastic housing to ensure safe delivery, transport and easy on-site handling. In addition, the thermal insulation is optimally protected against mechanical damage and water.

The symmetrical HIT-MVX element is easily installed from above in the prepared formwork.



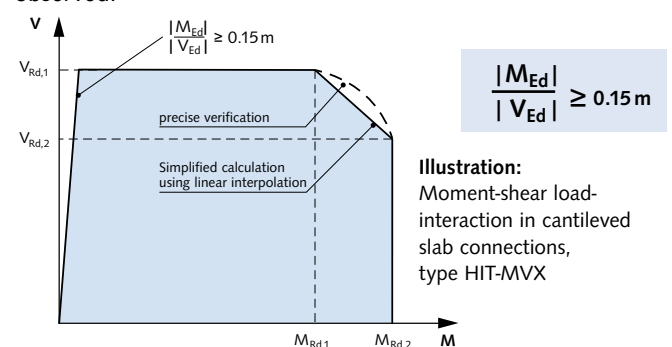
The arrow marking defining the installation direction will continue to be displayed on all HIT Elements; including the double-symmetrical HIT-MVX-Type. This is to continue to ensure an efficient installation. If when inspected, it is found that the installation direction shown on the element has been overlooked, the new symmetrical design of the HIT Elements has a distinct advantage: The HIT Element is designed for the same loads and moments in both directions – therefore the HIT Elements can stay in-situ for further installation.



Load characteristics of the HIT Elements

See the diagram below for the HIT-MVX load capacity. If it is not planned to fully exploit the maximum shear capacity $V_{Rd,1}$, the CSB technology allows the option of further increasing the moment load capacity $M_{Rd,1}$. $M_{Rd,2}$ is the maximum moment load capacity with the respective shear resistance $V_{Rd,2}$. The force couple must lie within the load-bearing capacity curve. This structural behaviour is taken into account in our HALFEN HIT Calculation software. The software selects the optimum load range for the HIT Elements for each current load-combination. The software is available in the download section on the HALFEN web page.

The CSB technology allows safe and approval conform transfer of shear loads up to 192 kN per metre in main slab thicknesses from 160 mm and larger. To ensure this high shear capacity in the planned application as a cantilevered slab connection, the following **load/moment ratio** must be observed:



HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVX, HIT-SP MVX

Product Types – Load range

The respective load range results from the corresponding combination of TB-Box (tension bar) and CSB-Box (compression shear bearings). The combinations of TB-Box and CSB-Box illustrated in the following table are available as standard.

Possible combinations of upper and lower parts (TB- and CSB Boxes)																	
Element width B = 25 cm		Number of tension bars n _{TB}															
Number of compression shear bearings n _{CSB}	1	●	●														
	2	●	●	●	●												
Element width B = 50 cm		Number of tension bars n _{TB}															
Number of compression shear bearings n _{CSB}	1	●	●														
	2	●	●	●	●												
	3		●	●	●	●	●										
	4		●	●	●	●	●	●	●	●							
	5			●	●	●	●	●	●	●							
Element width B = 100 cm		Number of tension bars n _{TB}															
Number of compression shear bearings n _{CSB}	2		●	●	●	●											
	3		●	●	●	●	●	●									
	4		●	●	●	●	●	●	●								
	5				●	●	●	●	●	●	●						
	6				●	●	●	●	●	●	●	●	●				
	7				●	●	●	●	●	●	●	●	●	●	●	●	
	8				●	●	●	●	●	●	●	●	●	●	●	●	●
	9					●	●	●	●	●	●	●	●	●	●	●	●
	10						●	●	●	●	●	●	●	●	●	●	●
	11							●	●	●	●	●	●	●	●	●	●
	12									●	●	●	●	●	●	●	●
	Values for load bearing capacities for selected elements can be found on the following pages.																
● = HP and SP																	

Values for load bearing capacities for selected elements can be found on the following pages.

• = HP and SP



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



Verifications

All necessary verifications have already been considered. Adjacent slabs must be verified by the planner.

Ordering example

HIT-HP	MVX	- 08 08	- 20	- 100	- 35				
HIT-HP	MVX	- 04 04	- 18	- 050	- 50				
HIT-SP	MVX	- 02 02	- 18	- 025	- 30	- ES			
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
①	②	③	④	⑤	⑥	⑦	⑧	⑨	

Type designation

- Product group
- Joint spacing 80 mm (HP) or 120 mm (SP)
- Connection type
- Number of tension bars
- Number of CSB compression shear bearings
- Element height [cm]
- Element width [cm]
- Concrete cover (top) [mm]
- For element slab design only



HIT Custom solutions

Our technical support team is available to provide support for your project with custom solutions using HALFEN HIT Insulated connections.

Contact: → see inside back cover

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

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVX

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	HP MVX-0202	HP MVX-0302	HP MVX-0203	HP MVX-0403	HP MVX-0603
	B = 0.50 m	HP MVX-0101	—	—	—	—
	B = 0.25 m	—	—	—	—	—
Design values	v_{Rd} [kN/m]	32.0 32.0	32.0 32.0	48.0 48.0	48.0 48.0	48.0 48.0



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVX-0202		HP MVX-0302		HP MVX-0203		HP MVX-0403		HP MVX-0603	
	B = 0.50m			HP MVX-0101		—		—		—		—	
	B = 0.25m			—		—		—		—		—	
Concrete cover [mm]	30	35	50										
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		8.5	8.7	11.3	11.9	9.0	9.2	15.7	16.4	18.5	21.5
	160		180	8.9	9.2	12.1	12.7	9.5	9.7	16.7	17.4	19.8	23.0
		170		9.4	9.7	12.8	13.4	10.0	10.2	17.7	18.4	21.0	24.4
	170		190	9.9	10.2	13.6	14.1	10.5	10.7	18.7	19.4	22.3	25.9
		180		10.4	10.7	14.3	14.9	11.0	11.2	19.6	20.3	23.6	27.4
	180		200	10.9	11.2	15.0	15.6	11.5	11.7	20.6	21.3	24.8	28.8
		190		11.4	11.7	15.8	16.4	12.0	12.2	21.6	22.3	26.1	30.3
	190		210	11.9	12.2	16.5	17.1	12.5	12.7	22.6	23.3	27.4	31.8
		200		12.4	12.6	17.2	17.8	13.0	13.2	23.6	24.3	28.6	33.2
	200		220	12.9	13.1	18.0	18.6	13.5	13.6	24.6	25.3	29.9	34.7
		210		13.4	13.6	18.7	19.3	14.0	14.1	25.5	26.2	31.2	36.2
	210		230	13.9	14.1	19.5	20.0	14.5	14.6	26.5	27.2	32.5	37.6
		220		14.4	14.6	20.2	20.8	14.9	15.1	27.5	28.2	33.7	39.1
	220		240	14.8	15.1	20.9	21.5	15.4	15.6	28.5	29.2	35.0	40.6
		230		15.3	15.6	21.7	22.3	15.9	16.1	29.5	30.2	36.3	42.0
	230		250	15.8	16.1	22.4	23.0	16.4	16.6	30.5	31.2	37.5	43.5
		240		16.3	16.6	23.1	23.7	16.9	17.1	31.5	32.1	38.8	45.0
	240		260	16.8	17.1	23.9	24.5	17.4	17.6	32.4	33.1	40.1	46.4
		250		17.3	17.6	24.6	25.2	17.9	18.1	33.4	34.1	41.3	47.9
	250		270	17.8	18.1	25.4	25.9	18.4	18.6	34.4	35.1	42.6	49.4
	> 250			Load bearing capacity values for further types (e.g. for h > 250mm, C30/37, v _{Rd,2} and m _{Rd,2}) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.									



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

$V_{Ed} \downarrow$	$\phi 6 / 25$ cm			
$V_{Ed} \uparrow$	$\phi 6 / 25$ cm	$\phi 6 / 19.5$ cm	$\phi 6 / 17.5$ cm	$\phi 6 / 17$ cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 25$ cm		
	indirect support	$\phi 6 / 25$ cm	$\phi 6 / 19.5$ cm	$\phi 6 / 17.5$ cm
$V_{Ed} \uparrow$	direct / indirect support	$\phi 6 / 25$ cm		

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVX

Load bearing capacity values $v_{Rd,1} / m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	HP MVX-0204	HP MVX-0404	HP MVX-0504	HP MVX-0604	HP MVX-0704
	B = 0.50 m	HP MVX-0102	HP MVX-0202	—	HP MVX-0302	—
	B = 0.25 m	—	HP MVX-0101	—	—	—
Design values	v_{Rd} [kN/m]	58.0 60.4		64.0 64.0		



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVX-0204	HP MVX-0404	HP MVX-0504	HP MVX-0604	HP MVX-0704
	B = 0.50 m			HP MVX-0102	HP MVX-0202	—	HP MVX-0302	—
	B = 0.25 m			—	HP MVX-0101	—	—	—
Concrete cover [mm]	30	35	50					
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		9.3 9.5	16.9 17.4	20.0 20.8	22.7 23.9	24.7 26.5
		160	180	9.8 10.0	17.9 18.4	21.2 22.1	24.2 25.3	26.3 28.2
			170	10.3 10.5	18.9 19.4	22.5 23.3	25.6 26.8	28.0 29.9
		170	190	10.8 10.9	19.9 20.4	23.7 24.5	27.1 28.3	29.7 31.7
			180	11.3 11.4	20.8 21.4	24.9 25.7	28.6 29.8	31.4 33.4
		180	200	11.8 11.9	21.8 22.3	26.2 27.0	30.1 31.2	33.1 35.1
			190	12.3 12.4	22.8 23.3	27.4 28.2	31.5 32.7	34.8 36.8
		190	210	12.8 12.9	23.8 24.3	28.6 29.4	33.0 34.2	36.5 38.6
			200	13.3 13.4	24.8 25.3	29.8 30.7	34.5 35.7	38.2 40.3
		200	220	13.8 13.9	25.8 26.3	31.1 31.9	36.0 37.1	39.9 42.0
			210	14.3 14.4	26.7 27.3	32.3 33.1	37.4 38.6	41.6 43.7
		210	230	14.7 14.9	27.7 28.2	33.5 34.4	38.9 40.1	43.3 45.4
			220	15.2 15.4	28.7 29.2	34.8 35.6	40.4 41.6	44.9 47.2
		220	240	15.7 15.9	29.7 30.2	36.0 36.8	41.9 43.0	46.6 48.9
			230	16.2 16.4	30.7 31.2	37.2 38.0	43.3 44.5	48.3 50.6
		230	250	16.7 16.8	31.7 32.2	38.5 39.3	44.8 46.0	50.0 52.3
			240	17.2 17.3	32.6 33.2	39.7 40.5	46.3 47.5	51.7 54.0
		240	260	17.7 17.8	33.6 34.1	40.9 41.7	47.8 48.9	53.4 55.8
			250	18.2 18.3	34.6 35.1	42.1 43.0	49.2 50.4	55.1 57.5
		250	270	18.7 18.8	35.6 36.1	43.4 44.2	50.7 51.9	56.8 59.2
		> 250		Load bearing capacity values for further types (e.g. for $h > 250$ mm, C30/37, $v_{Rd,2}$ and $m_{Rd,2}$) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.				



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

$V_{Ed} \downarrow$	$\phi 6 / 25$ cm			
$V_{Ed} \uparrow$	$\phi 6 / 14$ cm	$\phi 6 / 13.5$ cm	$\phi 6 / 13$ cm	$\phi 6 / 12.5$ cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 25$ cm		
	indirect support	$\phi 6 / 14$ cm	$\phi 6 / 13.5$ cm	$\phi 6 / 13$ cm
$V_{Ed} \uparrow$	direct/indirect support	$\phi 6 / 25$ cm		

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVX

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	HP MVX-0804	HP MVX-0505	HP MVX-0605	HP MVX-0705	HP MVX-0805
	B = 0.50 m	HP MVX-0402	—	—	—	—
	B = 0.25 m	HP MVX-0201	—	—	—	—
Design values	v_{Rd} [kN/m]	64.0 64.0		80.0	80.0	



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVX-0804	HP MVX-0505	HP MVX-0605	HP MVX-0705	HP MVX-0805
	B = 0.50 m			HP MVX-0402	—	—	—	—
	B = 0.25 m			HP MVX-0201	—	—	—	—
Concrete cover [mm]	30	35	50					
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		24.7 28.7	21.1 21.8	24.3 25.2	27.1 28.4	29.5 31.2
	160		180	26.4 30.6	22.4 23.0	25.8 26.7	28.8 30.1	31.5 33.2
		170		28.0 32.6	23.6 24.2	27.2 28.2	30.5 31.8	33.5 35.1
	170		190	29.7 34.5	24.8 25.5	28.7 29.6	32.2 33.5	35.4 37.1
		180		31.4 36.5	26.0 26.7	30.2 31.1	34.0 35.2	37.4 39.1
	180		200	33.1 38.4	27.3 27.9	31.7 32.6	35.7 37.0	39.4 41.0
		190		34.8 40.4	28.5 29.2	33.1 34.1	37.4 38.7	41.3 43.0
	190		210	36.5 42.4	29.7 30.4	34.6 35.5	39.1 40.4	43.3 45.0
		200		38.2 44.3	31.0 31.6	36.1 37.0	40.9 42.1	45.3 46.9
	200		220	39.9 46.3	32.2 32.8	37.6 38.5	42.6 43.9	47.2 48.9
		210		41.6 48.2	33.4 34.1	39.0 40.0	44.3 45.6	49.2 50.9
	210		230	43.3 50.2	34.6 35.3	40.5 41.4	46.0 47.3	51.2 52.8
		220		45.0 52.1	35.9 36.5	42.0 42.9	47.7 49.0	53.1 54.8
	220		240	46.7 54.1	37.1 37.8	43.5 44.4	49.5 50.7	55.1 56.8
		230		48.3 56.0	38.3 39.0	44.9 45.9	51.2 52.5	57.1 58.7
	230		250	50.0 58.0	39.6 40.2	46.4 47.4	52.9 54.2	59.0 60.7
		240		51.7 60.0	40.8 41.4	47.9 48.8	54.6 55.9	61.0 62.7
	240		260	53.4 61.9	42.0 42.7	49.4 50.3	56.3 57.6	63.0 64.6
		250		55.1 63.9	43.3 43.9	50.8 51.8	58.1 59.3	64.9 66.6
	250		270	56.8 65.8	44.5 45.1	52.3 53.3	59.8 61.1	66.9 68.6
	> 250			Load bearing capacity values for further types (e. g. for $h > 250$ mm, C30/37, $v_{Rd,2}$ and $m_{Rd,2}$) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.				



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

$V_{Ed} \downarrow$	$\phi 6 / 25$ cm			
$V_{Ed} \uparrow$	$\phi 6 / 12.5$ cm	$\phi 8 / 19.5$ cm	$\phi 8 / 19$ cm	$\phi 8 / 18.5$ cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 25$ cm		
	indirect support	$\phi 6 / 12.5$ cm	$\phi 8 / 19.5$ cm	$\phi 8 / 18.5$ cm
$V_{Ed} \uparrow$	direct / indirect support	$\phi 6 / 25$ cm		

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVX

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	HP MVX-0506	HP MVX-0606	HP MVX-0706	HP MVX-0806	HP MVX-0906
	B = 0.50 m	—	HP MVX-0303	—	HP MVX-0403	—
	B = 0.25 m	—	—	—	—	—
Design values	v_{Rd} [kN/m]	96.0 96.0				



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVX-0506		HP MVX-0606		HP MVX-0706		HP MVX-0806		HP MVX-0906	
	B = 0.50 m			—		HP MVX-0303		—		HP MVX-0403		—	
	B = 0.25 m			—		—		—		—		—	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		21.9	22.4	25.4	26.1	28.5	29.6	31.4	32.8	34.0	35.8
	160		180	23.1	23.6	26.8	27.6	30.3	31.3	33.4	34.8	36.2	38.0
		170		24.3	24.9	28.3	29.1	32.0	33.0	35.4	36.8	38.5	40.2
	170		190	25.6	26.1	29.8	30.6	33.7	34.8	37.3	38.7	40.7	42.4
		180		26.8	27.3	31.3	32.0	35.4	36.5	39.3	40.7	42.9	44.6
	180		200	28.0	28.6	32.7	33.5	37.1	38.2	41.3	42.7	45.1	46.9
		190		29.2	29.8	34.2	35.0	38.9	39.9	43.2	44.6	47.3	49.1
	190		210	30.5	31.0	35.7	36.5	40.6	41.7	45.2	46.6	49.5	51.3
		200		31.7	32.2	37.2	37.9	42.3	43.4	47.2	48.6	51.7	53.5
	200		220	32.9	33.5	38.6	39.4	44.0	45.1	49.1	50.5	53.9	55.7
		210		34.2	34.7	40.1	40.9	45.7	46.8	51.1	52.5	56.2	57.9
	210		230	35.4	35.9	41.6	42.4	47.5	48.5	53.1	54.5	58.4	60.1
		220		36.6	37.2	43.1	43.8	49.2	50.3	55.0	56.4	60.6	62.3
	220		240	37.8	38.4	44.5	45.3	50.9	52.0	57.0	58.4	62.8	64.6
		230		39.1	39.6	46.0	46.8	52.6	53.7	59.0	60.4	65.0	66.8
	230		250	40.3	40.8	47.5	48.3	54.4	55.4	60.9	62.3	67.2	69.0
		240		41.5	42.1	49.0	49.7	56.1	57.1	62.9	64.3	69.4	71.2
	240		260	42.8	43.3	50.4	51.2	57.8	58.9	64.9	66.3	71.6	73.4
		250		44.0	44.5	51.9	52.7	59.5	60.6	66.8	68.2	73.9	75.6
	250		270	45.2	45.8	53.4	54.2	61.2	62.3	68.8	70.2	76.0	77.8
	> 250			Load bearing capacity values for further types (e. g. for h > 250mm, C30/37, v _{Rd,2} and m _{Rd,2}) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.									



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

$V_{Ed} \downarrow$	$\phi 6 / 25$ cm		
$V_{Ed} \uparrow$	$\phi 8 / 16.5$ cm	$\phi 8 / 16$ cm	$\phi 8 / 15.5$ cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 25$ cm	
	indirect support	$\phi 8 / 16.5$ cm	$\phi 8 / 15.5$ cm
$V_{Ed} \uparrow$	direct/indirect support	$\phi 6 / 25$ cm	

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVX

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	HP MVX-1006	HP MVX-1106	HP MVX-0507	HP MVX-0607	HP MVX-0707
	B = 0.50 m	HP MVX-0503	—	—	—	—
	B = 0.25 m	—	—	—	—	—
Design values	v_{Rd} [kN/m]	96.0	96.0	112.0	112.0	



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVX-1006		HP MVX-1106		HP MVX-0507		HP MVX-0607		HP MVX-0707	
	B = 0.50 m			HP MVX-0503		—		—		—		—	
	B = 0.25 m			—		—		—		—		—	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		36.3	38.5	37.0	41.0	22.4	22.9	26.1	26.8	29.6	30.5
	160		180	38.8	41.0	39.5	43.7	23.6	24.1	27.6	28.3	31.3	32.2
		170		41.2	43.4	42.1	46.4	24.9	25.3	29.1	29.7	33.0	33.9
	170		190	43.7	45.9	44.6	49.1	26.1	26.5	30.5	31.2	34.7	35.7
		180		46.2	48.3	47.1	51.8	27.3	27.8	32.0	32.7	36.5	37.4
	180		200	48.6	50.8	49.7	54.5	28.5	29.0	33.5	34.2	38.2	39.1
		190		51.1	53.3	52.2	57.2	29.8	30.2	35.0	35.6	39.9	40.8
	190		210	53.5	55.7	54.8	59.9	31.0	31.5	36.4	37.1	41.6	42.5
		200		56.0	58.2	57.3	62.6	32.2	32.7	37.9	38.6	43.3	44.3
	200		220	58.5	60.6	59.8	65.3	33.5	33.9	39.4	40.1	45.1	46.0
		210		60.9	63.1	62.4	68.0	34.7	35.2	40.9	41.5	46.8	47.7
	210		230	63.4	65.5	64.9	70.7	35.9	36.4	42.3	43.0	48.5	49.4
		220		65.8	68.0	67.4	73.4	37.1	37.6	43.8	44.5	50.2	51.1
	220		240	68.3	70.5	70.0	76.1	38.4	38.8	45.3	46.0	51.9	52.9
		230		70.7	72.9	72.5	78.8	39.6	40.1	46.8	47.4	53.7	54.6
	230		250	73.2	75.4	75.1	81.5	40.8	41.3	48.2	48.9	55.4	56.3
		240		75.7	77.8	77.6	84.2	42.1	42.5	49.7	50.4	57.1	58.0
	240		260	78.1	80.3	80.1	86.9	43.3	43.8	51.2	51.9	58.8	59.7
		250		80.6	82.8	82.7	89.6	44.5	45.0	52.7	53.3	60.6	61.5
	250		270	83.0	85.2	85.2	92.3	45.8	46.2	54.1	54.8	62.3	63.2
		> 250			Load bearing capacity values for further types (e.g. for h > 250mm, C30/37, $v_{Rd,2}$ and $m_{Rd,2}$) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.								



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

$V_{Ed} \downarrow$	$\phi 6 / 25$ cm		
$V_{Ed} \uparrow$	$\phi 8 / 15$ cm	$\phi 8 / 14.5$ cm	$\phi 8 / 14$ cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 25$ cm	
	indirect support	$\phi 8 / 15$ cm	$\phi 8 / 14$ cm
$V_{Ed} \uparrow$	direct/indirect support	$\phi 6 / 25$ cm	

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVX

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	HP MVX-0807	HP MVX-0907	HP MVX-1007	HP MVX-1107	HP MVX-1407
	B = 0.50 m	—	—	—	—	—
	B = 0.25 m	—	—	—	—	—
Design values	v_{Rd} [kN/m]	112.0				



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVX-0807		HP MVX-0907		HP MVX-1007		HP MVX-1107		HP MVX-1407	
	B = 0.50 m			—		—		—		—		—	
	B = 0.25 m			—		—		—		—		—	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		32.8	34.0	35.7	37.2	38.4	40.3	40.9	43.1	43.2	50.2
	160		180	34.8	35.9	38.0	39.5	40.9	42.8	43.6	45.8	46.1	53.6
		170		36.7	37.9	40.2	41.7	43.4	45.2	46.3	48.6	49.1	57.0
	170		190	38.7	39.9	42.4	43.9	45.8	47.7	49.0	51.3	52.0	60.4
		180		40.7	41.8	44.6	46.1	48.3	50.1	51.7	54.0	55.0	63.9
	180		200	42.6	43.8	46.8	48.3	50.7	52.6	54.4	56.7	58.0	67.3
		190		44.6	45.8	49.0	50.5	53.2	55.1	57.1	59.4	60.9	70.7
	190		210	46.6	47.7	51.2	52.7	55.7	57.5	59.8	62.1	63.9	74.1
		200		48.5	49.7	53.4	55.0	58.1	60.0	62.5	64.8	66.8	77.6
	200		220	50.5	51.7	55.7	57.2	60.6	62.4	65.2	67.5	69.8	81.0
		210		52.5	53.6	57.9	59.4	63.0	64.9	67.9	70.2	72.8	84.4
	210		230	54.4	55.6	60.1	61.6	65.5	67.3	70.6	72.9	75.7	87.8
		220		56.4	57.6	62.3	63.8	67.9	69.8	73.3	75.6	78.7	91.2
	220		240	58.4	59.5	64.4	66.0	70.4	72.3	76.0	78.3	81.6	94.7
		230		60.3	61.5	66.4	68.2	72.9	74.7	78.8	81.0	84.6	98.1
	230		250	62.3	63.5	68.3	70.4	75.1	77.2	81.5	83.7	87.6	101.5
		240		64.3	65.4	70.2	72.7	77.2	79.6	84.1	86.4	90.5	104.9
	240		260	66.2	67.4	72.2	74.9	79.4	82.1	86.4	89.1	93.5	108.3
		250		68.2	69.4	74.1	77.1	81.5	84.6	88.8	91.8	96.4	111.8
	250		270	70.2	71.3	76.0	79.3	83.7	87.0	91.1	94.5	99.4	115.2
	> 250			Load bearing capacity values for further types (e.g. for h > 250 mm, C30/37, $v_{Rd,2}$ and $m_{Rd,2}$) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.									



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

$V_{Ed} \downarrow$	$\phi 6 / 25$ cm	$\phi 6 / 24.5$ cm	$\phi 6 / 23.5$ cm	$\phi 6 / 21.5$ cm
$V_{Ed} \uparrow$	$\phi 8 / 13.5$ cm		$\phi 8 / 13$ cm	$\phi 8 / 12.5$ cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 25$ cm	$\phi 6 / 24.5$ cm	$\phi 6 / 23.5$ cm	$\phi 6 / 21.5$ cm
	indirect support	$\phi 8 / 13.5$ cm		$\phi 8 / 13$ cm	$\phi 8 / 12.5$ cm
$V_{Ed} \uparrow$	direct/indirect support	$\phi 6 / 25$ cm	$\phi 6 / 24.5$ cm	$\phi 6 / 23.5$ cm	$\phi 6 / 21.5$ cm

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVX

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	HP MVX-0508	HP MVX-0608	HP MVX-0708	HP MVX-0808	HP MVX-0908
	B = 0.50 m	—	HP MVX-0304	—	HP MVX-0404	—
	B = 0.25 m	—	—	—	HP MVX-0202	—
Design values	v_{Rd} [kN/m]	128.0 128.0				



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVX-0508		HP MVX-0608		HP MVX-0708		HP MVX-0808		HP MVX-0908	
	B = 0.50 m			—		HP MVX-0304		—		HP MVX-0404		—	
	B = 0.25 m			—		—		—		HP MVX-0202		—	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		22.8	23.2	26.7	27.3	30.4	31.2	33.8	34.8	37.0	38.3
	160		180	24.0	24.4	28.2	28.7	32.1	32.9	35.8	36.8	39.2	40.6
		170		25.3	25.7	29.6	30.2	33.8	34.6	37.7	38.8	41.5	42.8
	170		190	26.5	26.9	31.1	31.7	35.5	36.3	39.7	40.7	43.7	45.0
		180		27.7	28.1	32.6	33.2	37.2	38.0	41.7	42.7	45.9	47.2
	180		200	28.9	29.3	34.1	34.6	39.0	39.8	43.6	44.7	48.1	49.4
		190		30.2	30.6	35.5	36.1	40.7	41.5	45.6	46.6	50.3	51.6
	190		210	31.4	31.8	37.0	37.6	42.4	43.2	47.6	48.6	52.5	53.8
		200		32.6	33.0	38.5	39.1	44.1	44.9	49.5	50.6	54.7	56.0
	200		220	33.9	34.3	40.0	40.5	45.8	46.6	51.5	52.5	56.7	58.3
		210		35.1	35.5	41.4	42.0	47.6	48.4	53.5	54.5	58.7	60.5
	210		230	36.3	36.7	42.9	43.5	49.3	50.1	55.4	56.5	60.6	62.7
		220		37.5	38.0	44.4	45.0	51.0	51.8	57.4	58.4	62.5	64.9
	220		240	38.8	39.2	45.9	46.4	52.7	53.5	59.4	60.4	64.4	67.1
		230		40.0	40.4	47.3	47.9	54.4	55.2	61.3	62.4	66.4	69.3
	230		250	41.2	41.6	48.8	49.4	56.2	57.0	63.3	64.3	68.3	71.5
		240		42.5	42.9	50.3	50.9	57.9	58.7	65.3	66.3	70.2	73.8
	240		260	43.7	44.1	51.8	52.3	59.6	60.4	67.2	68.3	72.2	76.0
		250		44.9	45.3	53.2	53.8	61.3	62.1	69.2	70.2	74.1	78.2
	250		270	46.1	46.6	54.7	55.3	63.1	63.9	71.2	72.2	76.0	80.4
	> 250			Load bearing capacity values for further types (e.g. for h > 250 mm, C30/37, $v_{Rd,2}$ and $m_{Rd,2}$) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.									



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

$V_{Ed} \downarrow$	$\phi 6 / 25$ cm			$\phi 6 / 23.5$ cm
$V_{Ed} \uparrow$	$\phi 8 / 13$ cm	$\phi 8 / 12.5$ cm		$\phi 8 / 12$ cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

V _{Ed} ↓	direct support	ø6/25cm			ø6/23.5cm
	indirect support	ø8/13cm	ø8/12.5cm	ø8/12cm	
V _{Ed} ↑	direct / indirect support	ø6/25cm			ø6/23.5cm

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVX

Load bearing capacity values $v_{Rd,1} / m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	HP MVX-1008	HP MVX-1108	HP MVX-1208	HP MVX-1308	HP MVX-1209
	B = 0.50 m	HP MVX-0504	—	HP MVX-0604	—	—
	B = 0.25 m	—	—	HP MVX-0302	—	—
Design values	v_{Rd} [kN/m]	128.0			144.0	



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVX-1008		HP MVX-1108		HP MVX-1208		HP MVX-1308		HP MVX-1209	
	B = 0.50 m			HP MVX-0504		—		HP MVX-0604		—		—	
	B = 0.25 m			—		—		HP MVX-0302		—		—	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		40.0	41.7	42.8	44.8	45.4	47.7	46.1	50.5	44.3	49.2
	160		180	42.5	44.1	45.5	47.5	48.3	50.7	49.1	53.7	47.0	52.2
		170		44.9	46.6	48.2	50.2	51.3	53.6	52.1	56.9	49.7	55.1
	170		190	47.4	49.0	50.9	52.9	54.2	56.6	55.1	60.0	52.4	58.1
		180		49.9	51.5	53.6	55.6	57.2	59.5	58.2	63.2	55.1	61.0
	180		200	52.3	54.0	56.3	58.3	60.1	62.5	61.2	66.4	57.8	64.0
		190		54.8	56.4	59.0	61.0	63.1	65.4	64.2	69.6	60.5	66.9
	190		210	57.2	58.9	61.7	63.7	66.0	68.4	67.2	72.8	63.2	69.9
		200		59.7	61.3	64.4	66.4	69.0	71.3	70.3	76.0	65.9	72.8
	200		220	62.2	63.8	67.1	69.1	71.9	74.3	73.3	79.2	68.6	75.8
		210		64.4	66.2	69.9	71.8	74.9	77.2	76.3	82.4	71.3	78.7
	210		230	66.5	68.7	72.3	74.5	77.8	80.2	79.3	85.6	74.0	81.7
		220		68.7	71.2	74.6	77.2	80.4	83.1	82.4	88.8	76.7	84.6
	220		240	70.8	73.6	77.0	79.9	83.0	86.1	85.4	92.0	79.4	87.6
		230		72.9	76.1	79.3	82.6	85.6	89.0	88.4	95.2	82.1	90.5
	230		250	75.1	78.5	81.7	85.3	88.2	92.0	91.4	98.4	84.8	93.5
		240		77.2	81.0	84.1	88.1	90.7	94.9	94.4	101.6	87.5	96.4
	240		260	79.4	83.5	86.4	90.8	93.3	97.9	97.5	104.8	90.2	99.4
		250		81.5	85.9	88.8	93.5	95.9	100.8	100.5	108.0	92.9	102.3
	250		270	83.7	88.4	91.1	96.2	98.4	103.8	103.5	111.2	95.6	105.3
		> 250			Load bearing capacity values for further types (e.g. for h > 250mm, C30/37, v _{Rd,2} and m _{Rd,2}) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.								



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

$V_{Ed} \downarrow$	$\phi 6 / 22.5$ cm	$\phi 6 / 21.5$ cm	$\phi 6 / 21$ cm	$\phi 6 / 20.5$ cm	$\phi 6 / 19.5$ cm
$V_{Ed} \uparrow$	$\phi 8 / 12$ cm	$\phi 8 / 11.5$ cm			$\phi 8 / 10.5$ cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 22.5$ cm	$\phi 6 / 21.5$ cm	$\phi 6 / 21$ cm	$\phi 6 / 20.5$ cm	$\phi 6 / 19.5$ cm
	indirect support	$\phi 8 / 12$ cm	$\phi 8 / 11.5$ cm			$\phi 8 / 10.5$ cm
$V_{Ed} \uparrow$	direct/indirect support	$\phi 6 / 22.5$ cm	$\phi 6 / 21.5$ cm	$\phi 6 / 21$ cm	$\phi 6 / 20.5$ cm	$\phi 6 / 19.5$ cm

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVX

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	HP MVX-1409		HP MVX-1210		HP MVX-1810*		HP MVX-1011		HP MVX-1211*	
	B = 0.50 m	—		HP MVX-0605		HP MVX-0905*		—		—	
	B = 0.25 m	—		—		—		—		—	
Design values	v_{Rd} [kN/m]	144.0	144.0	160.0	160.0	57.9	73.9	176.0	176.0	132.3	147.6



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVX-1409		HP MVX-1210		HP MVX-1810*		HP MVX-1011		HP MVX-1211*	
	B = 0.50 m			—		HP MVX-0605		HP MVX-0905*		—		—	
	B = 0.25 m			—		—		—		—		—	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		44.3	50.1	41.2	47.1	63.2	67.5	37.2	43.1	49.6	51.4
	160		180	47.0	53.2	43.6	49.8	67.7	71.9	39.3	45.5	52.1	54.4
		170		49.7	56.2	46.0	52.5	72.1	76.3	41.3	47.9	54.7	57.3
	170		190	52.4	59.2	48.4	55.2	76.5	80.8	43.4	50.2	57.3	60.3
		180		55.1	62.2	50.7	57.9	81.0	85.2	45.5	52.6	59.8	63.2
	180		200	57.8	65.3	53.1	60.6	84.9	89.6	47.5	55.0	62.4	66.2
		190		60.5	68.3	55.5	63.3	88.7	94.0	49.6	57.4	65.0	69.1
	190		210	63.2	71.3	57.9	66.0	92.6	98.5	51.7	59.8	67.6	72.1
		200		65.9	74.3	60.3	68.7	96.5	102.9	53.7	62.2	70.1	75.0
	200		220	68.6	77.3	62.7	71.4	100.3	107.3	55.8	64.5	72.7	78.0
		210		71.3	80.4	65.0	74.1	104.2	111.7	57.8	66.9	75.3	80.9
	210		230	74.0	83.4	67.4	76.8	108.0	116.2	59.9	69.3	77.9	83.9
		220		76.7	86.4	69.8	79.5	111.9	120.6	62.0	71.7	80.4	86.8
	220		240	79.4	89.4	72.2	82.2	115.7	125.0	64.0	74.1	83.0	89.8
		230		82.1	92.5	74.6	84.9	119.6	129.4	66.1	76.5	85.6	92.7
	230		250	84.8	95.5	77.0	87.6	123.5	133.9	68.2	78.8	88.2	95.7
		240		87.5	98.5	79.3	90.3	127.3	138.3	70.2	81.2	90.7	98.6
	240		260	90.2	101.5	81.7	93.0	131.2	142.7	72.3	83.6	93.3	101.6
		250		92.9	104.6	84.1	95.7	135.0	147.1	74.4	86.0	95.9	104.5
	250		270	95.6	107.6	86.5	98.4	138.9	151.6	76.4	88.4	98.4	107.5
> 250			Load bearing capacity values for further types (e.g. for h > 250mm, C30/37, v _{Rd,2} and m _{Rd,2}) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.										

* Load bearing capacity values for $v_{Rd,2}$ and $m_{Rd,2}$



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

$V_{Ed} \downarrow$		$\phi 6 / 18.5$ cm	$\phi 6 / 19$ cm	$\phi 6 / 15.5$ cm	$\phi 6 / 19$ cm	$\phi 6 / 17.5$ cm
$V_{Ed} \uparrow$		$\phi 8 / 10.5$ cm	$\phi 8 / 9$ cm	$\phi 8 / 9.5$ cm	$\phi 8 / 9$ cm	



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 18.5$ cm	$\phi 6 / 19$ cm	$\phi 6 / 15.5$ cm	$\phi 6 / 19$ cm	$\phi 6 / 17.5$ cm
	indirect support	$\phi 8 / 10.5$ cm	$\phi 8 / 9$ cm	$\phi 8 / 9.5$ cm	$\phi 8 / 9$ cm	
$V_{Ed} \uparrow$	direct / indirect support	$\phi 6 / 18.5$ cm	$\phi 6 / 19$ cm	$\phi 6 / 15.5$ cm	$\phi 6 / 19$ cm	$\phi 6 / 17.5$ cm

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVX

Load bearing capacity values $v_{Rd,2} / m_{Rd,2}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	HP MVX-1311		HP MVX-1811		HP MVX-1212		HP MVX-1312		HP MVX-1812	
	B = 0.50 m	—		—		—		—		—	
	B = 0.25 m	—		—		—		—		—	
Design values	$\pm v_{Rd}$ [kN/m]	120.1	135.3	59.5	73.9	135.8	147.6	124.4	135.3	70.0	73.9



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVX-1311		HP MVX-1811		HP MVX-1212		HP MVX-1312		HP MVX-1812	
	B = 0.50 m			—		—		—		—		—	
	B = 0.25 m			—		—		—		—		—	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		52.6	54.8	65.6	69.7	49.6	52.3	52.6	55.8	65.6	71.6
	160		180	55.4	58.0	69.4	74.1	52.1	55.2	55.4	59.0	69.4	76.0
		170		58.2	61.2	73.3	78.6	54.7	58.2	58.2	62.2	73.3	80.4
	170		190	61.0	64.4	77.2	83.0	57.3	61.1	61.0	65.4	77.2	84.8
		180		63.8	67.6	81.0	87.4	59.8	64.1	63.8	68.6	81.0	89.3
	180		200	66.6	70.8	84.9	91.8	62.4	67.0	66.6	71.8	84.9	93.7
		190		69.4	74.0	88.7	96.3	65.0	70.0	69.4	75.0	88.7	98.1
	190		210	72.1	77.2	92.6	100.7	67.6	72.9	72.1	78.2	92.6	102.6
		200		74.9	80.4	96.5	105.1	70.1	75.9	74.9	81.4	96.5	107.0
	200		220	77.7	83.6	100.3	109.5	72.7	78.8	77.7	84.6	100.3	111.4
		210		80.5	86.8	104.2	114.0	75.3	81.8	80.5	87.8	104.2	115.8
	210		230	83.3	90.0	108.0	118.4	77.9	84.7	83.3	91.0	108.0	120.3
		220		86.1	93.2	111.9	122.8	80.4	87.7	86.1	94.2	111.9	124.7
	220		240	88.9	96.4	115.7	127.2	83.0	90.6	88.9	97.4	115.7	129.1
		230		91.7	99.6	119.6	131.7	85.6	93.6	91.7	100.5	119.6	133.5
	230		250	94.4	102.8	123.5	136.1	88.2	96.5	94.4	103.7	123.5	138.0
		240		97.2	106.0	127.3	140.5	90.7	99.5	97.2	106.9	127.3	142.4
	240		260	100.0	109.2	131.2	144.9	93.3	102.4	100.0	110.1	131.2	146.8
		250		102.8	112.4	135.0	149.4	95.9	105.4	102.8	113.3	135.0	151.2
	250		270	105.6	115.6	138.9	153.8	98.4	108.3	105.6	116.5	138.9	155.7
	> 250			Load bearing capacity values for further types (e.g. for h > 250mm, C30/37, v _{Rd,1} and m _{Rd,1}) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.									



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

$V_{Ed} \downarrow$	$\phi 6 / 17$ cm	$\phi 6 / 14.5$ cm	$\phi 6 / 16.5$ cm	$\phi 6 / 16$ cm	$\phi 6 / 14$ cm
$V_{Ed} \uparrow$	$\phi 8 / 9$ cm		$\phi 8 / 8.5$ cm		



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 17$ cm	$\phi 6 / 14.5$ cm	$\phi 6 / 16.5$ cm	$\phi 6 / 16$ cm	$\phi 6 / 14$ cm
	indirect support	$\phi 8 / 9$ cm		$\phi 8 / 8.5$ cm		
$V_{Ed} \uparrow$	direct / indirect support	$\phi 6 / 17$ cm	$\phi 6 / 14.5$ cm	$\phi 6 / 16.5$ cm	$\phi 6 / 16$ cm	$\phi 6 / 14$ cm

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP MVX

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	SP MVX-0202		SP MVX-0302		SP MVX-0403		SP MVX-0603		SP MVX-0304	
	B = 0.50 m	SP MVX-0101		—		—		—		—	
	B = 0.25 m	—		—		—		—		—	
Design values	v_{Rd} [kN/m]	30.7	32.0	28.3	32.0	46.8	48.0	46.8	48.0	55.0	58.7



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			SP MVX-0202		SP MVX-0302		SP MVX-0403		SP MVX-0603		SP MVX-0304	
	B = 0.50 m			SP MVX-0101		—		—		—		—	
	B = 0.25 m			—		—		—		—		—	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		8.5	8.7	11.3	11.9	14.0	16.4	14.3	19.4	13.3	13.6
	160		180	8.9	9.2	12.1	12.7	14.8	17.4	15.2	20.7	14.1	14.4
		170		9.4	9.7	12.8	13.4	15.7	18.4	16.1	21.9	14.8	15.1
	170		190	9.9	10.2	13.6	14.1	16.5	19.4	16.9	23.2	15.6	15.8
		180		10.4	10.7	14.3	14.9	17.3	20.3	17.8	24.4	16.3	16.6
	180		200	10.9	11.2	15.0	15.6	18.2	21.3	18.7	25.6	17.0	17.3
		190		11.4	11.7	15.8	16.4	19.0	22.3	19.5	26.9	17.8	18.1
	190		210	11.9	12.2	16.5	17.1	19.9	23.3	20.4	28.1	18.5	18.8
		200		12.4	12.6	17.2	17.8	20.7	24.3	21.2	29.4	19.2	19.5
	200		220	12.9	13.1	18.0	18.6	21.5	25.3	22.1	30.6	20.0	20.3
		210		13.4	13.6	18.7	19.3	22.4	26.2	23.0	31.9	20.7	21.0
	210		230	13.9	14.1	19.5	20.0	23.2	27.2	23.8	33.1	21.5	21.7
		220		14.4	14.6	20.2	20.8	24.0	28.2	24.7	34.4	22.2	22.5
	220		240	14.8	15.1	20.9	21.5	24.9	29.2	25.6	35.6	22.9	23.2
		230		15.3	15.6	21.7	22.3	25.7	30.2	26.4	36.9	23.7	24.0
	230		250	15.8	16.1	22.4	23.0	26.6	31.2	27.3	38.1	24.4	24.7
		240		16.3	16.6	23.1	23.7	27.4	32.1	28.2	39.4	25.1	25.4
	240		260	16.8	17.1	23.9	24.5	28.2	33.1	29.0	40.6	25.9	26.2
		250		17.3	17.6	24.6	25.2	29.1	34.1	29.9	41.8	26.6	26.9
	250		270	17.8	18.1	25.4	25.9	29.9	35.1	30.8	43.1	27.4	27.6
> 250			Load bearing capacity values for further types (e.g. for h > 250mm, C30/37, $v_{Rd,2}$ and $m_{Rd,2}$) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.										



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

$V_{Ed} \downarrow$	$\phi 6 / 25$ cm			
$V_{Ed} \uparrow$	$\phi 6 / 25$ cm	$\phi 6 / 17.5$ cm	$\phi 6 / 17$ cm	$\phi 6 / 15$ cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 25$ cm		
	indirect support	$\phi 6 / 25$ cm	$\phi 6 / 17.5$ cm	$\phi 6 / 17$ cm
$V_{Ed} \uparrow$	direct/indirect support	$\phi 6 / 25$ cm		

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP MVX

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	SP MVX-0404		SP MVX-0504		SP MVX-0604		SP MVX-0704		SP MVX-0705	
	B = 0.50 m	SP MVX-0202		—		SP MVX-0302		—		—	
	B = 0.25 m	SP MVX-0101		—		—		—		—	
Design values	v_{Rd} [kN/m]	61.4	64.0			62.4	64.0			78.0	80.0



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			SP MVX-0404		SP MVX-0504		SP MVX-0604		SP MVX-0704		SP MVX-0705	
	B = 0.50 m			SP MVX-0202		—		SP MVX-0302		—		—	
	B = 0.25 m			SP MVX-0101		—		—		—		—	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		16.9	17.4	19.0	20.8	19.1	23.9	19.1	25.9	23.9	28.4
	160		180	17.9	18.4	20.2	22.1	20.3	25.3	20.3	27.6	25.3	30.1
		170		18.9	19.4	21.3	23.3	21.4	26.8	21.4	29.2	26.7	31.8
	170		190	19.9	20.4	22.5	24.5	22.6	28.3	22.6	30.9	28.2	33.5
		180		20.8	21.4	23.6	25.7	23.7	29.8	23.7	32.5	29.6	35.2
	180		200	21.8	22.3	24.8	27.0	24.9	31.2	24.9	34.2	31.1	37.0
		190		22.8	23.3	25.9	28.2	26.0	32.7	26.0	35.9	32.5	38.7
	190		210	23.8	24.3	27.1	29.4	27.2	34.2	27.2	37.5	34.0	40.4
		200		24.8	25.3	28.2	30.7	28.3	35.7	28.3	39.2	35.4	42.1
	200		220	25.8	26.3	29.4	31.9	29.5	37.1	29.5	40.8	36.8	43.9
		210		26.7	27.3	30.5	33.1	30.6	38.6	30.6	42.5	38.3	45.6
	210		230	27.7	28.2	31.7	34.4	31.8	40.1	31.8	44.2	39.7	47.3
		220		28.7	29.2	32.8	35.6	32.9	41.6	32.9	45.8	41.2	49.0
	220		240	29.7	30.2	34.0	36.8	34.1	43.0	34.1	47.5	42.6	50.7
		230		30.7	31.2	35.1	38.0	35.3	44.5	35.3	49.1	44.0	52.5
	230		250	31.7	32.2	36.3	39.3	36.4	46.0	36.4	50.8	45.5	54.2
		240		32.6	33.2	37.4	40.5	37.6	47.5	37.6	52.5	46.9	55.9
	240		260	33.6	34.1	38.6	41.7	38.7	48.9	38.7	54.1	48.4	57.6
		250		34.6	35.1	39.7	43.0	39.9	50.4	39.9	55.8	49.8	59.3
	250		270	35.6	36.1	40.9	44.2	41.0	51.9	41.0	57.5	51.2	61.1
		> 250			Load bearing capacity values for further types (e.g. for h > 250mm, C30/37, v _{Rd,2} and m _{Rd,2}) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.								



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

$V_{Ed} \downarrow$	$\phi 6 / 25$ cm		
$V_{Ed} \uparrow$	$\phi 6 / 13.5$ cm	$\phi 6 / 13$ cm	$\phi 8 / 18.5$ cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 25$ cm	
	indirect support	$\phi 6 / 13.5$ cm	$\phi 6 / 13$ cm
$V_{Ed} \uparrow$	direct/indirect support	$\phi 6 / 25$ cm	

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP MVX

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	SP MVX-0805		SP MVX-0906		SP MVX-1006		SP MVX-0907		SP MVX-1007	
	B = 0.50 m	—		—		SP MVX-0503		—		—	
	B = 0.25 m	—		—		—		—		—	
Design values	v_{Rd} [kN/m]	78.0	80.0	93.7	96.0	93.7	96.0	109.3	112.0	109.3	112.0



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			SP MVX-0805		SP MVX-0906		SP MVX-1006		SP MVX-0907		SP MVX-1007	
	B = 0.50 m			—		—		SP MVX-0503		—		—	
	B = 0.25 m			—		—		—		—		—	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		23.9	31.2	28.6	35.8	28.6	38.5	33.4	37.2	33.4	40.3
	160		180	25.3	33.2	30.4	38.0	30.4	41.0	35.4	39.5	35.4	42.8
		170		26.7	35.1	32.1	40.2	32.1	43.4	37.4	41.7	37.4	45.2
	170		190	28.2	37.1	33.8	42.4	33.8	45.9	39.4	43.9	39.4	47.7
		180		29.6	39.1	35.5	44.6	35.5	48.3	41.4	46.1	41.4	50.1
	180		200	31.1	41.0	37.3	46.9	37.3	50.8	43.4	48.3	43.4	52.6
		190		32.5	43.0	39.0	49.1	39.0	53.3	45.5	50.5	45.5	55.1
	190		210	34.0	45.0	40.7	51.3	40.7	55.7	47.5	52.7	47.5	57.5
		200		35.4	46.9	42.5	53.5	42.5	58.2	49.5	55.0	49.5	60.0
	200		220	36.8	48.9	44.2	55.7	44.2	60.6	51.5	57.2	51.5	62.4
		210		38.3	50.9	45.9	57.9	45.9	63.1	53.5	59.4	53.5	64.9
	210		230	39.7	52.8	47.6	60.1	47.6	65.5	55.5	61.6	55.5	67.3
		220		41.2	54.8	49.4	62.3	49.4	68.0	57.5	63.8	57.5	69.8
	220		240	42.6	56.8	51.1	64.6	51.1	70.5	59.6	66.0	59.6	72.3
		230		44.0	58.7	52.8	66.8	52.8	72.9	61.6	68.2	61.6	74.7
	230		250	45.5	60.7	54.6	69.0	54.6	75.4	63.6	70.4	63.6	77.2
		240		46.9	62.7	56.3	71.2	56.3	77.8	65.6	72.7	65.6	79.6
	240		260	48.4	64.6	58.0	73.4	58.0	80.3	67.6	74.9	67.6	82.1
		250		49.8	66.6	59.7	75.6	59.7	82.8	69.6	77.1	69.6	84.6
	250		270	51.2	68.6	61.5	77.8	61.5	85.2	71.6	79.3	71.6	87.0
	> 250			Load bearing capacity values for further types (e.g. for h > 250 mm, C30/37, $v_{Rd,2}$ and $m_{Rd,2}$) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.									



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

$V_{Ed} \downarrow$	$\phi 6 / 25$ cm				$\phi 6 / 24.5$ cm
$V_{Ed} \uparrow$	$\phi 8 / 18.5$ cm	$\phi 8 / 15.5$ cm	$\phi 8 / 15$ cm	$\phi 8 / 13.5$ cm	$\phi 8 / 13.5$ cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 25$ cm				$\phi 6 / 24.5$ cm
	indirect support	$\phi 8 / 18.5$ cm	$\phi 8 / 15.5$ cm	$\phi 8 / 15$ cm	$\phi 8 / 13.5$ cm	$\phi 8 / 13.5$ cm
$V_{Ed} \uparrow$	direct/indirect support	$\phi 6 / 25$ cm				$\phi 6 / 24.5$ cm

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

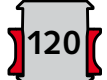
HIT-SP MVX

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	SP MVX-1107		SP MVX-1208		SP MVX-1209		SP MVX-1110		SP MVX-1112	
	B = 0.50 m	—		SP MVX-0604		—		—		—	
	B = 0.25 m	—		SP MVX-0302		—		—		—	
Design values	v_{Rd} [kN/m]	109.3	112.0	124.9	128.0	139.2	144.0	147.0	160.0	154.9	166.8



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			SP MVX-1107		SP MVX-1208		SP MVX-1209		SP MVX-1110		SP MVX-1112	
	B = 0.50 m			—		SP MVX-0604		—		—		—	
	B = 0.25 m			—		SP MVX-0302		—		—		—	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		33.4	43.1	38.2	46.0	39.1	43.1	37.7	39.2	36.3	37.9
	160		180	35.4	45.8	40.5	48.8	41.4	45.6	39.9	41.3	38.3	40.0
		170		37.4	48.6	42.8	51.6	43.7	48.1	42.0	43.5	40.3	42.0
	170		190	39.4	51.3	45.1	54.4	45.9	50.6	44.2	45.7	42.3	44.0
		180		41.4	54.0	47.4	57.2	48.2	53.0	46.3	47.8	44.2	46.0
	180		200	43.4	56.7	49.8	60.1	50.5	55.5	48.4	50.0	46.2	48.1
		190		45.5	59.4	52.1	62.9	52.8	58.0	50.6	52.2	48.2	50.1
	190		210	47.5	62.1	54.4	65.7	55.1	60.5	52.7	54.3	50.2	52.1
		200		49.5	64.8	56.7	68.5	57.4	63.0	54.8	56.5	52.1	54.2
	200		220	51.5	67.5	59.0	71.3	59.7	65.5	57.0	58.7	54.1	56.2
		210		53.5	70.2	61.3	74.1	62.0	68.0	59.1	60.8	56.1	58.2
	210		230	55.5	72.9	63.6	76.9	64.3	70.5	61.3	63.0	58.1	60.3
		220		57.5	75.6	65.9	79.7	66.6	72.9	63.4	65.2	60.1	62.3
	220		240	59.6	78.3	68.2	82.5	68.9	75.4	65.5	67.3	62.0	64.3
		230		61.6	81.0	70.5	85.3	71.1	77.9	67.7	69.5	64.0	66.3
	230		250	63.6	83.7	72.8	88.1	73.4	80.4	69.8	71.7	66.0	68.4
		240		65.6	86.4	75.1	90.9	75.7	82.9	71.9	73.8	68.0	70.4
	240		260	67.6	89.1	77.4	93.7	78.0	85.4	74.1	76.0	69.9	72.4
		250		69.6	91.8	79.8	96.5	80.3	87.9	76.2	78.2	71.9	74.5
	250		270	71.6	94.5	82.1	99.3	82.6	90.3	78.4	80.3	73.9	76.5
		> 250			Load bearing capacity values for further types (e.g. for h > 250mm, C30/37, v _{Rd,2} and m _{Rd,2}) can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.								



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

$V_{Ed} \downarrow$	$\phi 6 / 23.5$ cm	$\phi 6 / 21$ cm	$\phi 6 / 19.5$ cm	$\phi 6 / 19$ cm	$\phi 6 / 17.5$ cm
$V_{Ed} \uparrow$	$\phi 8 / 13$ cm	$\phi 8 / 11.5$ cm	$\phi 8 / 10.5$ cm	$\phi 8 / 10$ cm	$\phi 8 / 9.5$ cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	$\phi 6 / 23.5$ cm	$\phi 6 / 21$ cm	$\phi 6 / 19.5$ cm	$\phi 6 / 19$ cm	$\phi 6 / 17.5$ cm
	indirect support	$\phi 8 / 13$ cm	$\phi 8 / 11.5$ cm	$\phi 8 / 10.5$ cm	$\phi 8 / 10$ cm	$\phi 8 / 9.5$ cm
$V_{Ed} \uparrow$	direct/indirect support	$\phi 6 / 23.5$ cm	$\phi 6 / 21$ cm	$\phi 6 / 19.5$ cm	$\phi 6 / 19$ cm	$\phi 6 / 17.5$ cm

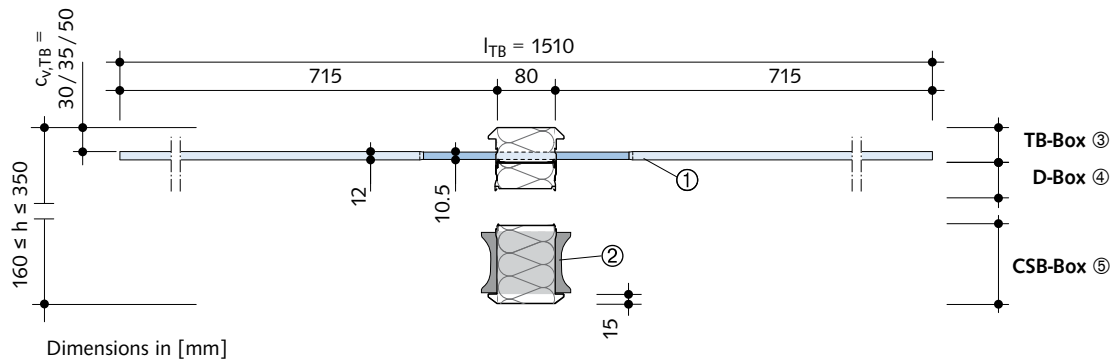
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVX, HIT-SP MVX

Application for element slabs – Cross sections

HIT-HP MVX-ES – High Performance multi-part design for element slabs

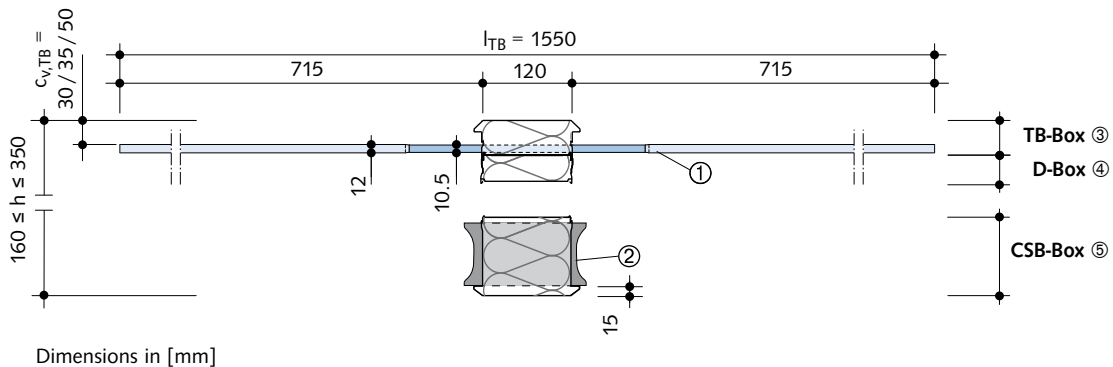
See page 14 ff. for load bearing capacity tables



- ① Tension bars $\varnothing 12 \text{ mm} / 10.5 \text{ mm}$ in the joint
- ② Double-symmetrical compression shear bearings CSB
- ③ Tension bar box
 $h = 50 \text{ mm}$ with $c_{v,TB} \text{ } 30/35 \text{ mm}$
 $h = 70 \text{ mm}$ with $c_{v,TB} \text{ } 50 \text{ mm}$
- ④ Distance box as height compensation
 $h = 20 \text{ mm}$ and higher ($\rightarrow$ see page 30)
- ⑤ Compression shear bearing box
 $h = 110 \text{ mm}$

HIT-SP MVX-ES – Superior Performance multi-part design for element slabs

See page 24 ff. for load bearing capacity tables



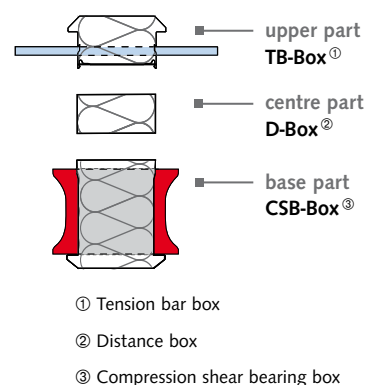
- ① Tension bars $\varnothing 12 \text{ mm} / 10.5 \text{ mm}$ in the joint
- ② Double-symmetrical compression shear bearings CSB
- ③ Tension bar box
 $h = 50 \text{ mm}$ with $c_{v,TB} \text{ } 30/35 \text{ mm}$
 $h = 70 \text{ mm}$ with $c_{v,TB} \text{ } 50 \text{ mm}$
- ④ Distance box as height compensation
 $h = 20 \text{ mm}$ and higher ($\rightarrow$ see page 30)
- ⑤ Compression shear bearing box
 $h = 110 \text{ mm}$

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVX, HIT-SP MVX

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	_ VX	- 05	- 11	- 100	-	- CSB
Σ (HIT-HP MVX-ES)	HIT-HP	MVX	- 08 05	- 20	- 100	- 35	- ES
	①	②	③	④ ⑤	⑥	⑦	⑧ ⑨



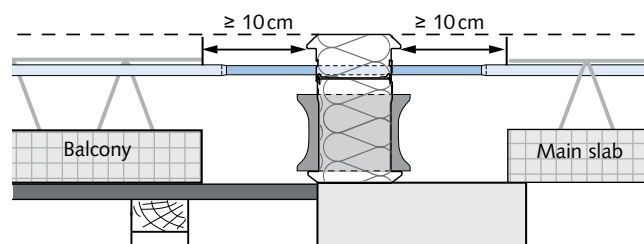
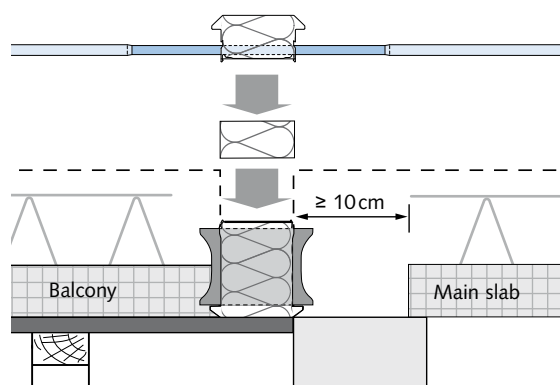
Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Number of tension bars
- ⑤ Number of compression shear bearings CSB
- ⑥ Element height [cm]
- ⑦ Element width [cm]
- ⑧ Concrete cover (top) [mm]
- ⑨ Only for semi-precast slab design

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 heigh	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 MVX with semi-precast (element) slabs with a structural cast-in-place concrete layer

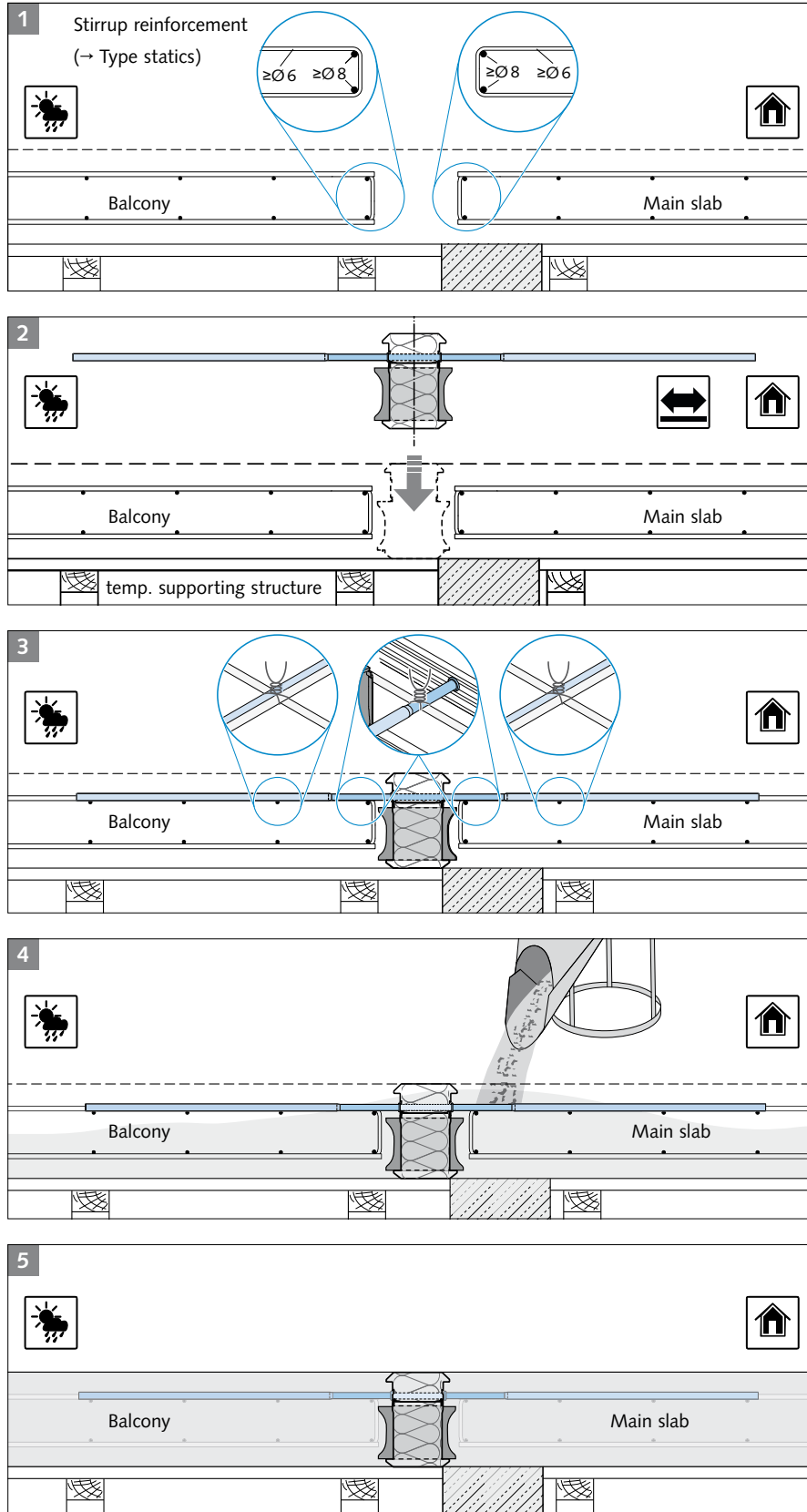


To create a positive connection a total distance of at least 10 cm between insulation element and precast unit has to be maintained. Detailed information for reinforcement layout can be found in the documents ETA-18/0189 and Z-15.7-293. The documents are available for download at www.halfen.com.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVX, HIT-SP MVX

Installation



1 Installation of on-site reinforcement

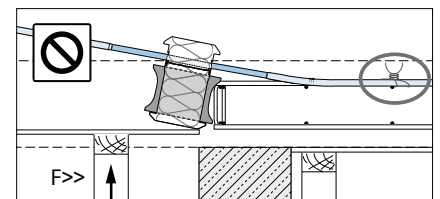
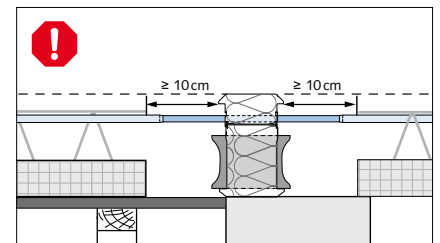


The on-site reinforcement must be placed as specified by the structural engineer.

2 Installation of the HIT Element from above



HIT-MVX Elements are symmetrical; therefore, both installation directions are correct (custom solutions can vary).



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 Elements are not displaced, pour and compact the concrete evenly. Secure the HIT Elements against movement.

5 Freshly concreted balcony slab on supporting structure

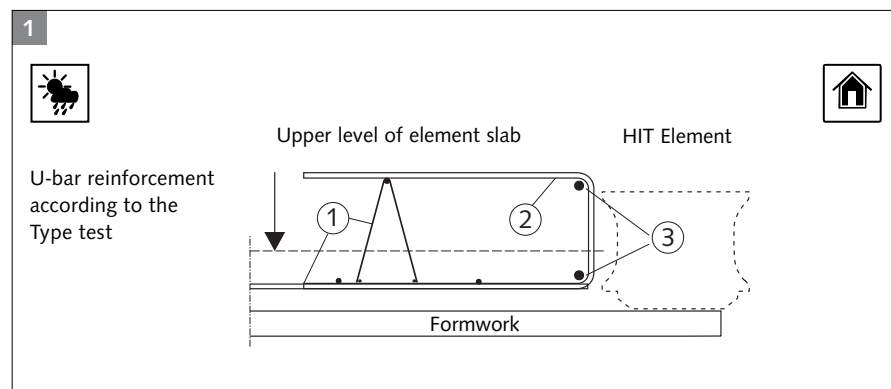


For further installation instructions please go to www.halfen.com.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVX, HIT-SP MVX

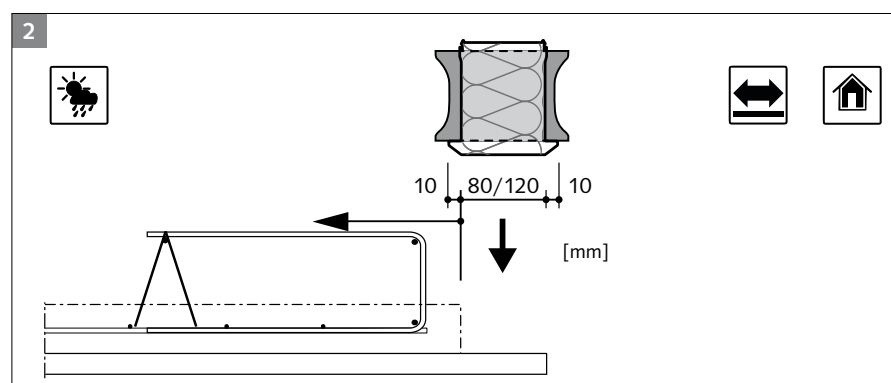
Installation; precast plant



1 Installation of 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.

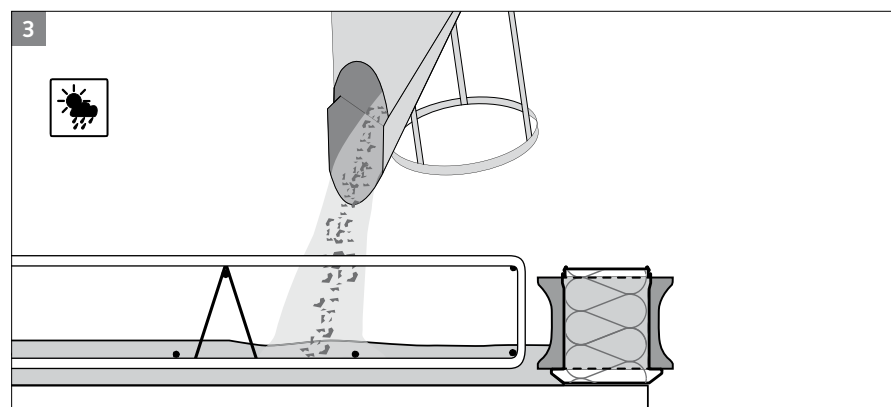
! The on-site reinforcement must be placed as specified by the structural engineer.



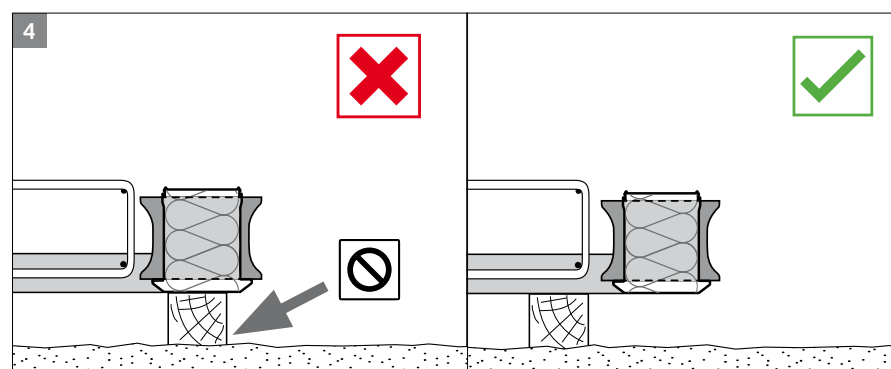
2 Installation of the CSB-Box

The HIT-MVX Element is symmetrical; therefore, both installation directions are correct (custom solutions can vary).

! Ensure all HIT Elements are securely positioned.



3 Pour the concrete for the element slab



4 Transport to the construction site

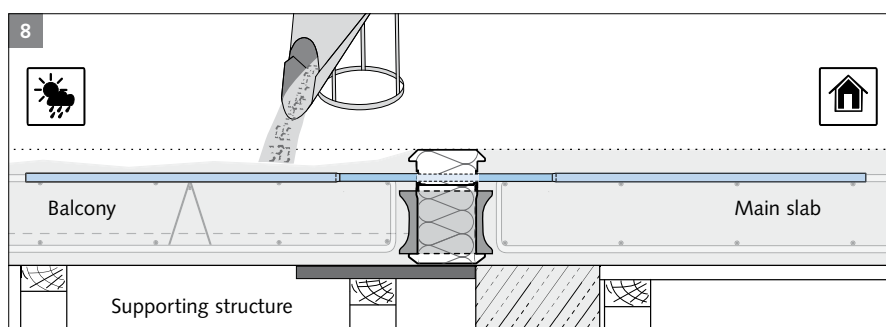
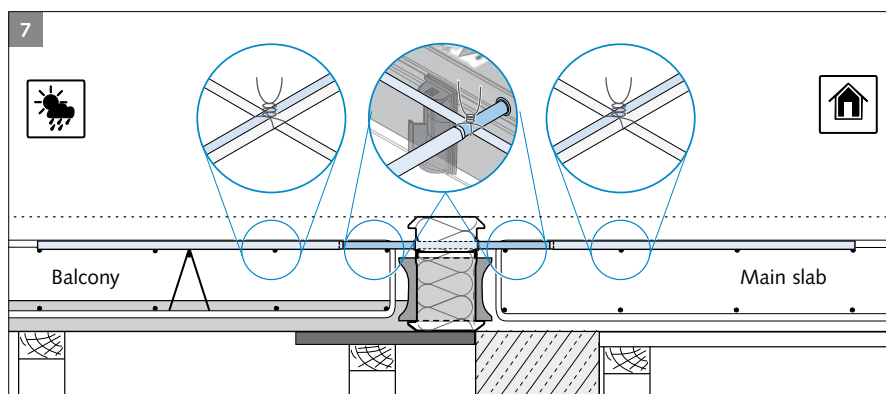
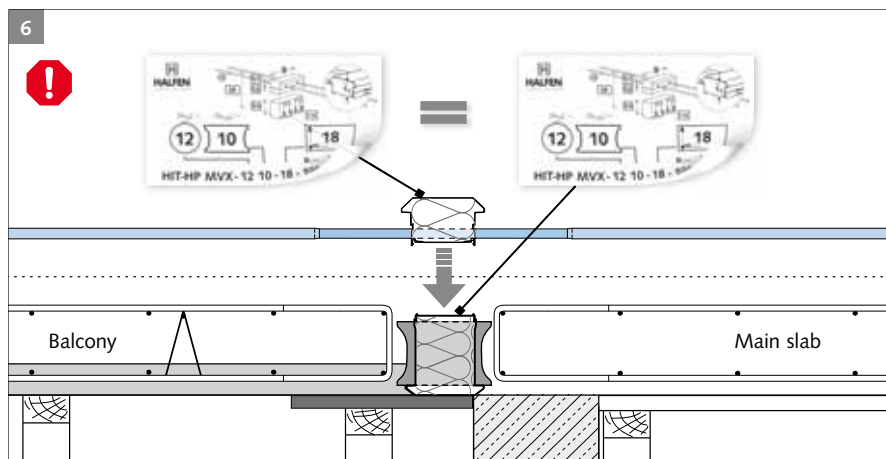
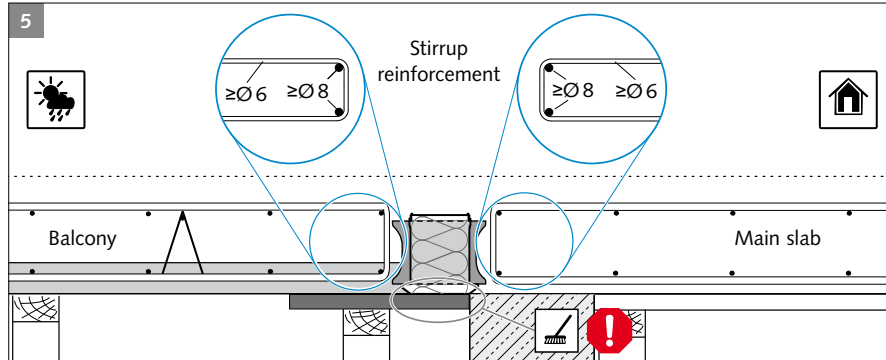
Ensure elements are properly secured during transport. Do not rest concrete element slabs on exposed HIT Elements.

! Never place temporary supports directly under the HIT Elements!

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVX, HIT-SP MVX

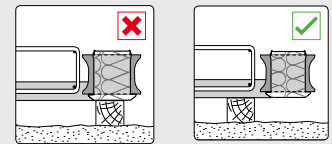
Installation; construction site



5 Install the on-site element slab reinforcement

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

! **Storage and transport**
Ensure elements are properly secured during transport. Do not rest concrete element slabs on exposed HIT Elements.



! Never place temporary supports under the HIT Elements!

6 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.

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

8 Pour the concrete

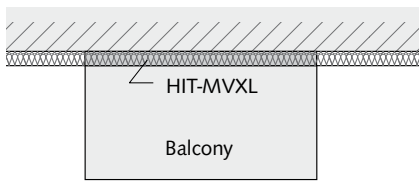
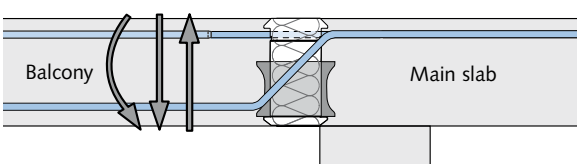
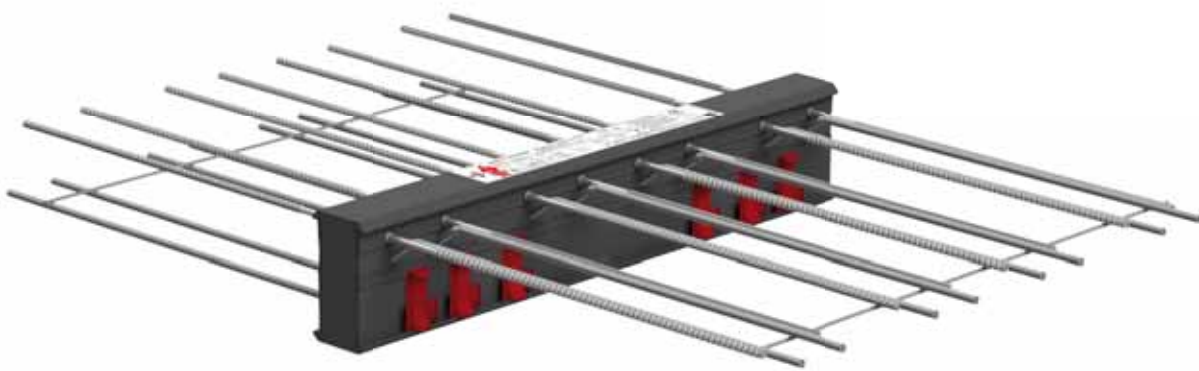
Freshly concreted balcony slab on supporting structure.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVXL, HIT-SP MVXL

- Balcony connection for high loads in a cantilevered balcony slab
- Transfers bending moments and high positive as well as negative shear forces

NEW For cantilever slabs with high loads



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

Application: Cantilevered balcony

Content	Type	Page
Product types / Load range	HIT-HP MVXL, HIT-SP MVXL	35
Load bearing capacity values	HIT-HP MVXL, HIT-SP MVXL	36
Product description	HIT-HP MVXL, HIT-SP MVXL	43
Installation	HIT-HP MVXL, HIT-SP MVXL	44

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVXL, HIT-SP MVXL

Load range

The combinations of Tension Bars TB $\varnothing 12$ mm, Compression Shear Bearings CSB and and shear bars SB $\varnothing 10$ mm and $\varnothing 12$ mm shown in the following table are possible:

Possible combinations of upper and lower parts (TB- and CSB-Boxes) MVXL									
Element width B = 50 cm		Number of shear bars n_{SB}							
Number of tension bars n_{TB}	Number of compression shear bearings n_{CSB}	$\varnothing 10$ mm			$\varnothing 12$ mm				
		3	4	5	3	4	5		
4	3		•	•		•	•		
5			•	•		•	•		
6	4	•	•	•	•	•	•		
7		•	•		•	•			
8		•	•		•	•			

Element width B = 100 cm		Number of shear bars n_{SB}							
Number of tension bars n_{TB}	Number of compression shear bearings n_{CSB}	$\varnothing 10$ mm				$\varnothing 12$ mm			
		4	6	8	10	4	6	8	10
8	6			•	•			•	•
10				•	•			•	•
12	8		•	•	•		•	•	•
14			•	•			•	•	
16			•	•			•	•	
18	9	•				•	•	•	

Values for load bearing capacities for selected elements can be found on the following pages. • = HP and SP



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



Verifications

All necessary verifications have already been considered. Adjacent slabs must be verified by the planner.

Ordering example

HIT - HP MVXL -	03	04	-	18	-	050	-	30	-	04	10
HIT - SP MVXL -	18	09	-	35	-	100	-	50	-	08	12
	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	



HIT Custom solutions

Our technical support team is available to provide support for your project with custom solutions using HALFEN HIT Insulated connections.

Contact: → see inside back cover

Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Number of tension bars
- ⑤ Number of CSB compression shear bearings
- ⑥ Element height [cm]
- ⑦ Element width [cm]
- ⑧ Concrete cover (top) [mm]
- ⑨ Number of shear bars
- ⑩ $\varnothing$ Shear bars [mm]

Possible slab thickness h						
Concrete cover [mm]	30		35		50	
Shear bar diameter [mm]	$\varnothing 10$	$\varnothing 12$	$\varnothing 10$	$\varnothing 12$	$\varnothing 10$	$\varnothing 12$
possible main slab thickness h [cm]	17-35	18-35	17-35	18-35	18-35	20-35

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVXL

Load bearing capacity values according to EN 1992-1-1 (EC2)

ø10 mm

Shear capacity $-V_{Rd}, +V_{Rd}$ Concrete strength: C20/25 $\geq$ C25/30

Type / Element width		B = 1.00 m			HP MVXL-1408-...-0610		HP MVXL-1408-...-0810		HP MVXL-1608-...-0810		HP MVXL-1809-...-0410	
		B = 0.50 m			HP MVXL-0704-...-0310		HP MVXL-0704-...-0410		HP MVXL-0804-...-0410		—	
Concrete cover [mm]		30	35	50								
Design values for slab thickness [mm]	$V_{Rd} \downarrow$ [kN/m]	170–190	170–190	180*–210	157.5	158.4	209.4	210.7	205.5	206.7	103.4	103.9
		200–240	200–240	220–260	174.1	175.1	231.7	233.1	228.2	229.5	114.6	115.1
		≥ 250	≥ 250	≥ 270	191.6	192.5	255.1	256.5	252.3	253.6	126.4	127.0
	$V_{Rd} \uparrow^{**}$ [kN/m]	≥ 170	≥ 170	≥ 180*	107.0	123.1	107.0	123.1	76.4	98.5	57.9	73.9

*effective concrete cover 47 mm, can only be used in combination with corner elements ** $|M_{Ed} / V_{Ed}| \leq 0.15$ m ($\rightarrow$ page 12) must be observedMoment bearing capacity m_{Rd}

Type / Element width		B = 1.00 m		HP MVXL-1408-...-0610		HP MVXL-1408-...-0810		HP MVXL-1608-...-0810		HP MVXL-1809-...-0410	
		B = 0.50 m		HP MVXL-0704-...-0310		HP MVXL-0704-...-0410		HP MVXL-0804-...-0410		—	
Concrete cover [mm]	30	35	50								
Design values m_{Rd} [kNm/m] for slab thickness [mm]	—		180*	56.5	59.4	56.5	59.4	61.6	65.3	69.3	73.5
		170		59.9	62.8	59.9	62.8	65.5	69.2	73.3	77.9
	170		190	63.4	66.3	63.4	66.3	69.5	73.1	77.2	82.3
		180		66.8	69.7	66.8	69.7	73.4	77.1	81.0	86.7
	180		200	70.3	73.1	70.3	73.1	77.3	81.0	84.9	91.2
		190		73.6	76.6	73.6	76.6	81.2	84.9	88.7	95.6
	190		210	76.6	80.0	76.6	80.0	84.9	88.9	92.6	100.0
		200		79.6	83.5	79.6	83.5	88.3	92.8	96.5	104.4
	200		220	82.6	86.9	82.6	86.9	91.8	96.7	100.3	108.9
		210		85.6	90.4	85.6	90.4	95.2	100.7	104.2	113.3
	210		230	88.6	93.8	88.6	93.8	98.6	104.6	108.0	117.7
		220		91.6	97.2	91.6	97.2	102.1	108.5	111.9	122.1
	220		240	94.6	100.7	94.6	100.7	105.5	112.5	115.8	126.6
		230		97.6	104.1	97.6	104.1	108.9	116.4	119.6	131.0
	230		250	100.6	107.6	100.6	107.6	112.4	120.3	123.5	135.4
		240		103.6	111.0	103.6	111.0	115.8	124.3	127.3	139.8
	240		260	106.6	114.5	106.6	114.5	119.3	128.2	131.2	144.3
		250		109.6	117.9	109.6	117.9	122.7	132.1	135.1	148.7
	250		270	112.6	121.3	112.6	121.3	126.1	136.1	138.9	153.1
> 250			Load bearing capacity values for further types can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.								

*effective concrete cover 47 mm, can only be used in combination with corner elements

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

$V_{Ed} \downarrow$	ø6 / 17.5 cm	ø6 / 17.5 cm	ø6 / 17 cm	ø6 / 15 cm
$V_{Ed} \uparrow$	ø8 / 11.5 cm	ø8 / 11.5 cm	ø8 / 11.5 cm	ø8 / 10.5 cm

On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	ø6 / 25 cm			
	indirect support	ø8 / 8 cm	ø8 / 6.5 cm	ø8 / 6.5 cm	ø8 / 10.5 cm
$V_{Ed} \uparrow$	direct / indirect support	ø6 / 19.5 cm	ø6 / 19.5 cm	ø6 / 19 cm	ø6 / 16.5 cm

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVXL

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø12 mm



Shear capacity – V_{Rd} , + V_{Rd}

Concrete strength: C20/25 ≥ C25/30



Type / Element width	B = 1.00 m			HP MVXL-0806-....-1012		HP MVXL-1208-....-1012		HP MVXL-1408-....-0612		HP MVXL-1408-....-0812	
	B = 0.50 m			HP MVXL-0403-....-0512		HP MVXL-0604-....-0512		HP MVXL-0704-....-0312		HP MVXL-0704-....-0412	
Concrete cover [mm]	30	35	50								
Design values for slab thickness [mm]	180–210	180–210	200–230	381.9	386.1	380.3	383.6	225.8	227.4	299.7	301.9
	≥220	≥220	≥240	422.6	426.8	420.6	423.9	249.9	251.7	332.1	334.3
	$V_{Rd} \uparrow^{**}$ [kN/m]	≥180	≥180	≥200	96.0	96.0	128.0	128.0	107.0	123.1	107.0
** M_{Ed} / V_{Ed} ≤ 0.15 m (→ page 12) must be observed											

** | M_{Ed} / V_{Ed} | ≤ 0.15 m (→ page 12) must be observed



Moment bearing capacity m_{Rd}

Type / Element width		B = 1.00 m		HP MVXL-0806-....-1012		HP MVXL-1208-....-1012		HP MVXL-1408-....-0612		HP MVXL-1408-....-0812	
		B = 0.50 m		HP MVXL-0403-....-0512		HP MVXL-0604-....-0512		HP MVXL-0704-....-0312		HP MVXL-0704-....-0412	
Concrete cover [mm]	30	35	50								
Design values m _{Rd} [kNm/m] for slab thickness [mm]		180		40.7	42.0	59.6	61.7	66.8	69.7	66.8	69.7
	180		200	42.7	43.9	62.4	64.6	70.3	73.1	70.3	73.1
		190		44.6	45.9	65.0	67.6	73.6	76.6	73.6	76.6
	190		210	46.6	47.9	67.6	70.5	76.6	80.0	76.6	80.0
		200		48.6	49.8	70.1	73.5	79.6	83.5	79.6	83.5
	200		220	50.5	51.8	72.7	76.4	82.6	86.9	82.6	86.9
		210		52.5	53.8	75.3	79.4	85.6	90.4	85.6	90.4
	210		230	54.5	55.7	77.9	82.3	88.6	93.8	88.6	93.8
		220		56.4	57.7	80.4	85.3	91.6	97.2	91.6	97.2
	220		240	58.4	59.7	83.0	88.2	94.6	100.7	94.6	100.7
		230		60.4	61.6	85.6	91.2	97.6	104.1	97.6	104.1
	230		250	62.3	63.6	88.2	94.1	100.6	107.6	100.6	107.6
		240		64.3	65.6	90.8	97.1	103.6	111.0	103.6	111.0
	240		260	66.3	67.5	93.3	100.1	106.6	114.5	106.6	114.5
		250		68.2	69.5	95.9	103.0	109.6	117.9	109.6	117.9
	250		270	70.2	71.5	98.5	106.0	112.6	121.3	112.6	121.3
> 250			Load bearing capacity values for further types can be found in the type tests at www.halfen.com or on request See inside back cover for contact information.								



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

V_{Ed} ↓	Ø6 / 25 cm	Ø6 / 19 cm	Ø6 / 17.5 cm	Ø6 / 17.5 cm
V_{Ed} ↑	Ø8 / 15.5 cm	Ø8 / 12 cm	Ø8 / 11.5 cm	Ø8 / 11.5 cm



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

V_{Ed} ↓	direct support	Ø6 / 25 cm			
	indirect support	Ø8 / 4.5 cm	Ø8 / 4.0 cm	Ø8 / 6.5 cm	Ø8 / 5 cm
V_{Ed} ↑	direct / indirect support	Ø6 / 25 cm	Ø6 / 21 cm	Ø6 / 19.5 cm	Ø6 / 19.5 cm

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP MVXL

Load bearing capacity values according to EN 1992-1-1 (EC2)

ø12 mm

Shear capacity $-V_{Rd}, +V_{Rd}$ Concrete strength: C20/25 $\geq$ C25/30

Type / Element width		B = 1.00 m		HP MVXL-1608-...-0812		HP MVXL-1809-...-0412		HP MVXL-1809-...-0612		HP MVXL-1809-...-0812		
		B = 0.50 m		HP MVXL-0804-...-0412		—		—		—		
Concrete cover [mm]		30	35	50								
Design values for slab thickness [mm]	$v_{Rd} \downarrow$ [kN/m]	180–210	180–210	200–230	294.5	296.5	148.5	149.3	222.0	223.4	295.0	296.9
		≥220	≥220	≥240	327.4	329.4	164.7	165.6	246.4	247.9	327.8	329.8
	$v_{Rd} \uparrow^{**}$ [kN/m]	≥180	≥180	≥200	76.4	98.5	57.9	73.9	57.9	73.9	57.9	73.9

** $|M_{Ed} / V_{Ed}| \leq 0.15$ m ($\rightarrow$ page 12) must be observedMoment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVXL-1608-...-0812		HP MVXL-1809-...-0412		HP MVXL-1809-...-0612		HP MVXL-1809-...-0812	
	B = 0.50 m			HP MVXL-0804-...-0412		—		—		—	
Concrete cover [mm]	30	35	50								
Design values m _{Rd} [kNm/m] for slab thickness [mm]		180		73.4	77.1	81.0	86.7	81.0	86.7	81.0	86.7
	180		200	77.3	81.0	84.9	91.2	84.9	91.2	84.9	91.2
		190		81.2	84.9	88.7	95.6	88.7	95.6	88.7	95.6
	190		210	84.9	88.9	92.6	100.0	92.6	100.0	92.6	100.0
		200		88.3	92.8	96.5	104.4	96.5	104.4	96.5	104.4
	200		220	91.8	96.7	100.3	108.9	100.3	108.9	100.3	108.9
		210		95.2	100.7	104.2	113.3	104.2	113.3	104.2	113.3
	210		230	98.6	104.6	108.0	117.7	108.0	117.7	108.0	117.7
		220		102.1	108.5	111.9	122.1	111.9	122.1	111.9	122.1
	220		240	105.5	112.5	115.8	126.6	115.8	126.6	115.8	126.6
		230		108.9	116.4	119.6	131.0	119.6	131.0	119.6	131.0
	230		250	112.4	120.3	123.5	135.4	123.5	135.4	123.5	135.4
		240		115.8	124.3	127.3	139.8	127.3	139.8	127.3	139.8
	240		260	119.3	128.2	131.2	144.3	131.2	144.3	131.2	144.3
		250		122.7	132.1	135.1	148.7	135.1	148.7	135.1	148.7
250		270	126.1	136.1	138.9	153.1	138.9	153.1	138.9	153.1	
> 250			Load bearing capacity values for further types can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.								

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

$V_{Ed} \downarrow$	ø6/17 cm	ø6/15 cm	ø6/15 cm	ø6/15 cm
$V_{Ed} \uparrow$	ø8/11.5 cm	ø8/10.5 cm	ø8/10.5 cm	ø8/10.5 cm

On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	ø6/25 cm			
	indirect support	ø8/5 cm	ø8/8.5 cm	ø8/6.5 cm	ø8/5 cm
$V_{Ed} \uparrow$	direct/indirect support	ø6/19 cm	ø6/16.5 cm	ø6/16.5 cm	ø6/16.5 cm

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP MVXL

Load bearing capacity values according to EN 1992-1-1 (EC2)

ø10 mm



Shear capacity $-V_{Rd}, +V_{Rd}$

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



Type / Element width	B = 1.00 m			SP MVXL-0806-...-0810		SP MVXL-1006-...-0810		SP MVXL-1408-...-0610		SP MVXL-1809-...-0410	
	B = 0.50 m			SP MVXL-0403-...-0410		SP MVXL-0503-...-0410		SP MVXL-0704-...-0310		—	
Concrete cover [mm]	30	35	50								
Design values for slab thickness [mm]	170-190	170-190	180*-210	177.4	177.5	172.2	172.2	129.4	129.2	85.0	84.8
	200-240	200-240	220-260	204.2	204.1	199.3	199.1	149.6	149.3	98.5	98.3
	≥ 250	≥ 250	≥ 270	227.4	227.3	223.0	222.7	167.3	166.9	110.4	110.1
$V_{Rd} \uparrow^{**}$ [kN/m]	≥ 170	≥ 170	$\geq 180^*$	91.2	96.0	74.5	96.0	81.7	96.2	32.5	47.1

*effective concrete cover 47 mm, can only be used in combination with corner elements ** $|M_{Ed} / V_{Ed}| \leq 0.15$ m ($\rightarrow$ page 12) must be observed



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			SP MVXL-0806-...-0810		SP MVXL-1006-...-0810		SP MVXL-1408-...-0610		SP MVXL-1809-...-0410	
	B = 0.50 m			SP MVXL-0403-...-0410		SP MVXL-0503-...-0410		SP MVXL-0704-...-0310		—	
Concrete cover [mm]	30	35	50								
Design values m_{Rd} [kNm/m] for slab thickness [mm]	—		180*	34.8	36.1	41.0	42.9	56.5	59.4	69.3	73.4
		170		36.8	38.0	43.5	45.4	59.9	62.8	73.3	77.9
	170		190	38.8	40.0	45.9	47.8	63.4	66.2	77.2	82.3
		180		40.7	42.0	48.4	50.3	66.8	69.7	81.0	86.7
	180		200	42.7	43.9	50.8	52.8	70.3	73.1	84.9	91.2
		190		44.7	45.9	53.3	55.2	73.6	76.6	88.8	95.6
	190		210	46.6	47.9	55.7	57.7	76.6	80.0	92.6	100.0
		200		48.6	49.8	58.2	60.1	79.6	83.5	96.5	104.4
	200		220	50.6	51.8	60.7	62.6	82.6	86.9	100.4	108.9
		210		52.5	53.8	63.1	65.0	85.6	90.3	104.2	113.3
	210		230	54.5	55.7	65.6	67.5	88.6	93.8	108.0	117.7
		220		56.5	57.7	68.0	70.0	91.6	97.2	111.9	122.1
	220		240	58.4	59.7	70.5	72.4	94.6	100.7	115.8	126.6
		230		60.4	61.6	72.9	74.9	97.6	104.1	119.6	131.0
	230		250	62.4	63.6	75.1	77.3	100.6	107.6	123.5	135.4
		240		64.3	65.6	77.2	79.8	103.6	111.0	127.3	139.8
	240		260	66.3	67.5	79.4	82.3	106.6	114.4	131.2	144.3
		250		68.3	69.5	81.5	84.7	109.6	117.9	135.1	148.7
	250		270	70.2	71.5	83.7	87.2	112.6	121.3	138.9	153.1
	> 250			Load bearing capacity values for further types can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.							

*effective concrete cover 47 mm, can only be used in combination with corner elements



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

$V_{Ed} \downarrow$	ø6 / 25 cm	ø6 / 24 cm	ø6 / 17.5 cm	ø6 / 15 cm
$V_{Ed} \uparrow$	ø8 / 15.5 cm	ø8 / 15 cm	ø8 / 11.5 cm	ø8 / 10.5



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	ø6 / 25 cm			
	indirect support	ø8 / 8 cm	ø8 / 8 cm	ø8 / 9 cm	ø8 / 11 cm
$V_{Ed} \uparrow$	direct / indirect support	ø6 / 25 cm	ø6 / 25 cm	ø6 / 19.5 cm	ø6 / 16.5 cm

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP MVXL

Load bearing capacity values according to EN 1992-1-1 (EC2)

ø12 mm

Shear capacity $-V_{Rd}, +V_{Rd}$ Concrete strength: C20/25 $\geq$ C25/30

Type / Element width		B = 1.00 m		SP MVXL-0806-...-0812		SP MVXL-0806-...-1012		SP MVXL-1006-...-0812		SP MVXL-1006-...-1012		
		B = 0.50 m		SP MVXL-0403-...-0412		SP MVXL-0403-...-0512		SP MVXL-0503-...-0412		SP MVXL-0503-...-0512		
Concrete cover [mm]		30	35	50								
Design values for slab thickness [mm]	$v_{Rd} \downarrow$ [kN/m]	180–210	180–210	200–230	252.5	253.2	312.6	313.9	245.8	246.2	305.1	305.8
		≥220	≥220	≥240	291.4	291.8	361.8	362.7	285.2	285.2	354.6	355.0
	$v_{Rd} \uparrow^{**}$ [kN/m]	≥180	≥180	≥200	91.2	96.0	91.2	96.0	74.5	96.0	74.5	96.0

** $|M_{Ed} / V_{Ed}| \leq 0.15$ m ($\rightarrow$ page 12) must be observedMoment bearing capacity m_{Rd}

Type / Element width		B = 1.00 m			SP MVXL-0806-...-0812		SP MVXL-0806-...-1012		SP MVXL-1006-...-0812		SP MVXL-1006-...-1012	
		B = 0.50 m			SP MVXL-0403-...-0412		SP MVXL-0403-...-0512		SP MVXL-0503-...-0412		SP MVXL-0503-...-0512	
Concrete cover [mm]	30	35	50									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		180		40.7	42.0	40.7	42.0	48.4	50.3	48.4	50.3	
	180		200	42.7	43.9	42.7	43.9	50.8	52.8	50.8	52.8	
		190		44.7	45.9	44.7	45.9	53.3	55.2	53.3	55.2	
	190		210	46.6	47.9	46.6	47.9	55.7	57.7	55.7	57.7	
		200		48.6	49.8	48.6	49.8	58.2	60.1	58.2	60.1	
	200		220	50.6	51.8	50.6	51.8	60.7	62.6	60.7	62.6	
		210		52.5	53.8	52.5	53.8	63.1	65.0	63.1	65.0	
	210		230	54.5	55.7	54.5	55.7	65.6	67.5	65.6	67.5	
		220		56.5	57.7	56.5	57.7	68.0	70.0	68.0	70.0	
	220		240	58.4	59.7	58.4	59.7	70.5	72.4	70.5	72.4	
		230		60.4	61.6	60.4	61.6	72.9	74.9	72.9	74.9	
	230		250	62.4	63.6	62.4	63.6	75.1	77.3	75.1	77.3	
		240		64.3	65.6	64.3	65.6	77.2	79.8	77.2	79.8	
	240		260	66.3	67.5	66.3	67.5	79.4	82.3	79.4	82.3	
		250		68.3	69.5	68.3	69.5	81.5	84.7	81.5	84.7	
	250		270	70.2	71.5	70.2	71.5	83.7	87.2	83.7	87.2	
> 250				Load bearing capacity values for further types can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.								

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

$V_{Ed} \downarrow$	ø6 / 25 cm	ø6 / 25 cm	ø6 / 24 cm	ø6 / 24 cm
$V_{Ed} \uparrow$	ø8 / 15.5 cm	ø8 / 15.5 cm	ø8 / 15 cm	ø8 / 15 cm

On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	ø6 / 25 cm			
	indirect support	ø8 / 6 cm	ø8 / 5 cm	ø8 / 6.5 cm	ø8 / 5 cm
$V_{Ed} \uparrow$	direct / indirect support	ø6 / 25 cm			

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP MVXL

Load bearing capacity values according to EN 1992-1-1 (EC2)

ø12 mm



Shear capacity $-V_{Rd}, +V_{Rd}$

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



Type / Element width		B = 1.00 m		SP MVXL-1408-...-0812		SP MVXL-1809-...-0412		SP MVXL-1809-...-0612		SP MVXL-1809-...-0812		
		B = 0.50 m		SP MVXL-0704-...-0412		—		—		—		
Concrete cover [mm]		30	35	50								
Design values for slab thickness [mm]	$v_{Rd} \downarrow$ [kN/m]	180–210	180–210	200–230	246.0	246.0	122.0	121.9	182.4	182.2	242.4	242.2
		≥ 220	≥ 220	≥ 240	285.2	285.0	141.6	141.4	211.8	211.5	281.7	281.4
	$v_{Rd} \uparrow^{**}$ [kN/m]	≥ 180	≥ 180	≥ 200	81.7	96.2	32.5	47.1	32.5	47.1	32.5	47.1
** M _{Ed} / V _{Ed} ≤ 0.15 m (→ page 12) must be observed												

** $|M_{Ed} / V_{Ed}| \leq 0.15$ m ($\rightarrow$ page 12) must be observed



Moment bearing capacity m_{Rd}

Type / Element width		B = 1.00 m		SP MVXL-1408-...-0812	SP MVXL-1809-...-0412		SP MVXL-1809-...-0612		SP MVXL-1809-...-0812		
		B = 0.50 m		SP MVXL-0704-...-0412	—		—		—		
Concrete cover [mm]	30	35	50								
Design values m_{Rd} [kNm/m] for slab thickness [mm]		180		66.8	69.7	81.0	86.7	81.0	86.7	80.5	86.7
	180		200	70.3	73.1	84.9	91.2	84.9	91.2	84.7	91.2
		190		73.6	76.6	88.8	95.6	88.8	95.6	88.8	95.6
	190		210	76.6	80.0	92.6	100.0	92.6	100.0	92.6	100.0
		200		79.6	83.5	96.5	104.4	96.5	104.4	96.5	104.4
	200		220	82.6	86.9	100.4	108.9	100.4	108.9	100.4	108.9
		210		85.6	90.3	104.2	113.3	104.2	113.3	104.2	113.3
	210		230	88.6	93.8	108.0	117.7	108.0	117.7	108.0	117.7
		220		91.6	97.2	111.9	122.1	111.9	122.1	111.9	122.1
	220		240	94.6	100.7	115.8	126.6	115.8	126.6	115.8	126.6
		230		97.6	104.1	119.6	131.0	119.6	131.0	119.6	131.0
	230		250	100.6	107.6	123.5	135.4	123.5	135.4	123.5	135.4
		240		103.6	111.0	127.3	139.8	127.3	139.8	127.3	139.8
	240		260	106.6	114.4	131.2	144.3	131.2	144.3	131.2	144.3
		250		109.6	117.9	135.1	148.7	135.1	148.7	135.1	148.7
	250		270	112.6	121.3	138.9	153.1	138.9	153.1	138.9	153.1
> 250			Load bearing capacity values for further types can be found in the type tests at www.halfen.com or on request. See inside back cover for contact information.								



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

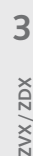
$V_{Ed} \downarrow$	ø6/17.5 cm	ø6/15 cm	ø6/15 cm	ø6/15 cm
$V_{Ed} \uparrow$	ø8/11.5 cm	ø8/10.5 cm	ø8/10.5 cm	ø8/10.5 cm



On-site stirrup reinforcement $A_{s,req}$ on main slab side ($\rightarrow$ page 51)

$V_{Ed} \downarrow$	direct support	ø6/25 cm			
	indirect support	ø8/6 cm	ø8/9.5 cm	ø8/7 cm	ø8/6 cm
$V_{Ed} \uparrow$	direct/indirect support	ø6/19.5 cm	ø6/16.5 cm		

MVX/MVXL/-COR ↗

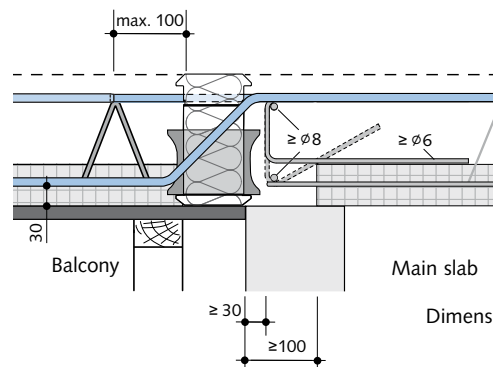
MVX-OU/OD
2

DD / DDL / DVL 4

5
H

五

AT / FT / OTX / FK 6

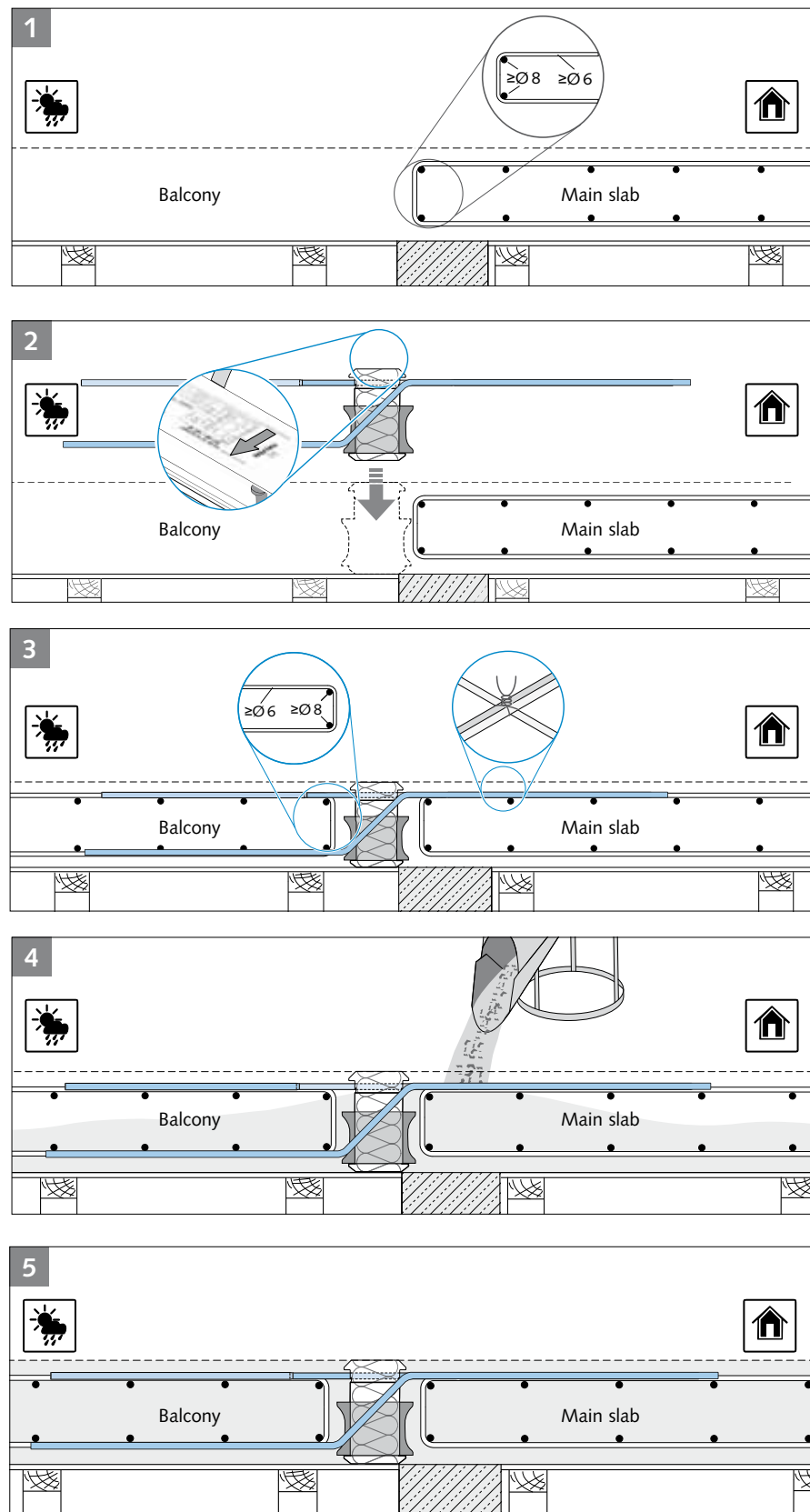
7
BUILDING PHYSICS,
PLANNING

43

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVXL, HIT-SP MVXL

Installation



1 Installing the on-site reinforcement

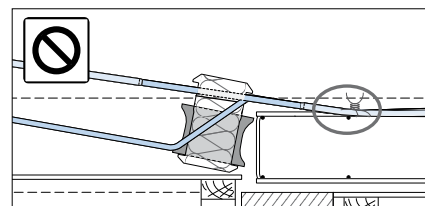
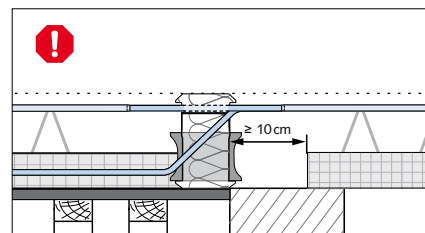


The on-site reinforcement must be placed as specified by the structural engineer.

2 Installing the HIT Elements from above



The red arrows on the label must be facing towards the balcony.



2 Installing the on-site reinforcement, balcony side

Wire-tie the on-site tensile and shear reinforcement to the HIT element.



Check the formwork is at the correct height!

4 Pouring the concrete



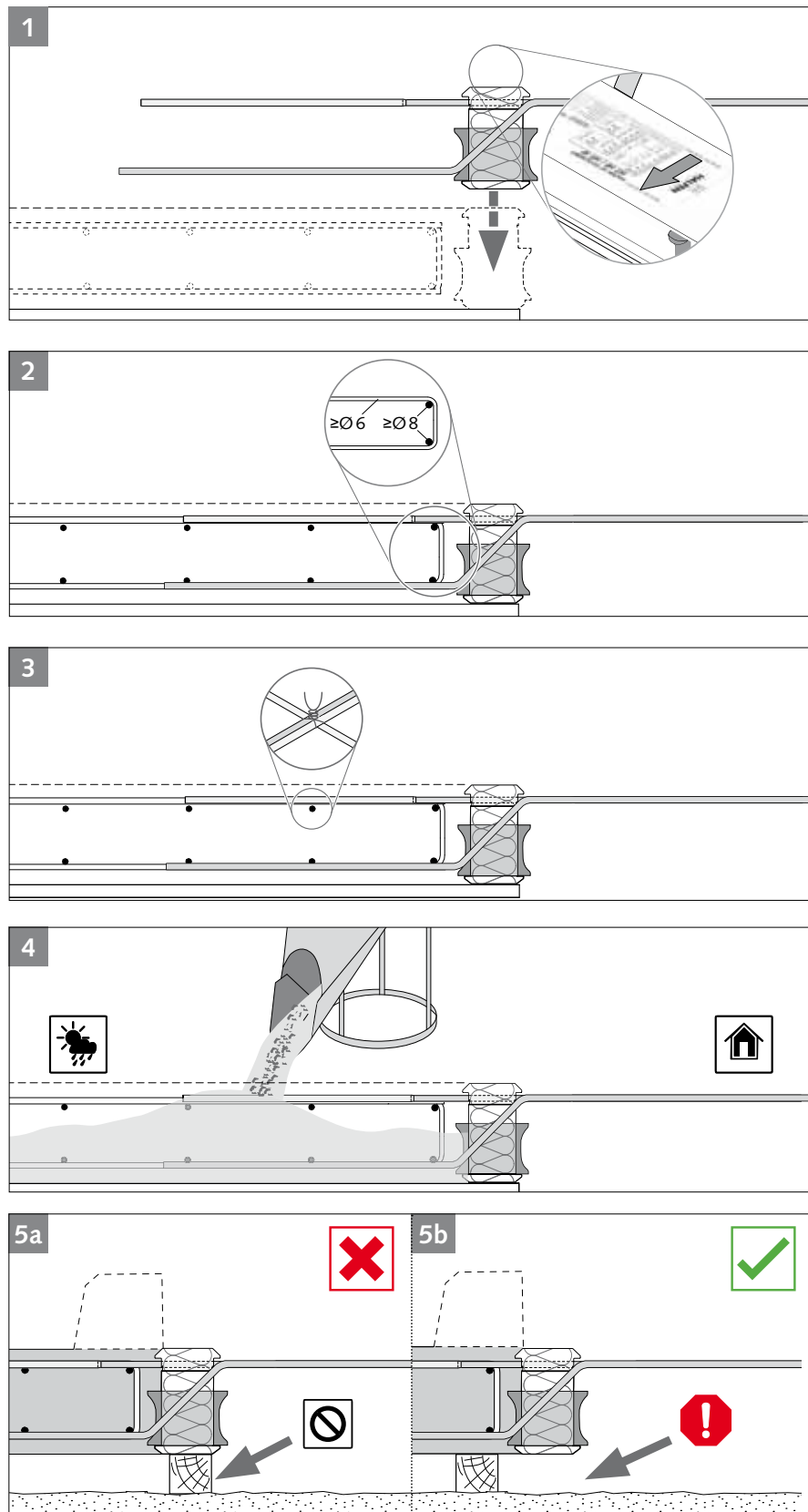
To ensure the HIT Elements are securely installed, pour and compact the concrete evenly. Ensure all HIT Elements are securely fixed.

5 Freshly concreted balcony slab on supporting structure

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVXL, HIT-SP MVXL

Installation



1 Installing the HIT-Element

2 Installing the on-site reinforcement



3 Wire-tie the on-site tensile and shear reinforcement to the HIT element.

4 Pour and compact the concrete

5 Storage and transport

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

a in-correct

b correct

1
MVX / MVXL / -COR

2
MVX-OU / OD

3
ZVX / ZDX

4
DD / DDL / DVL

5
HT

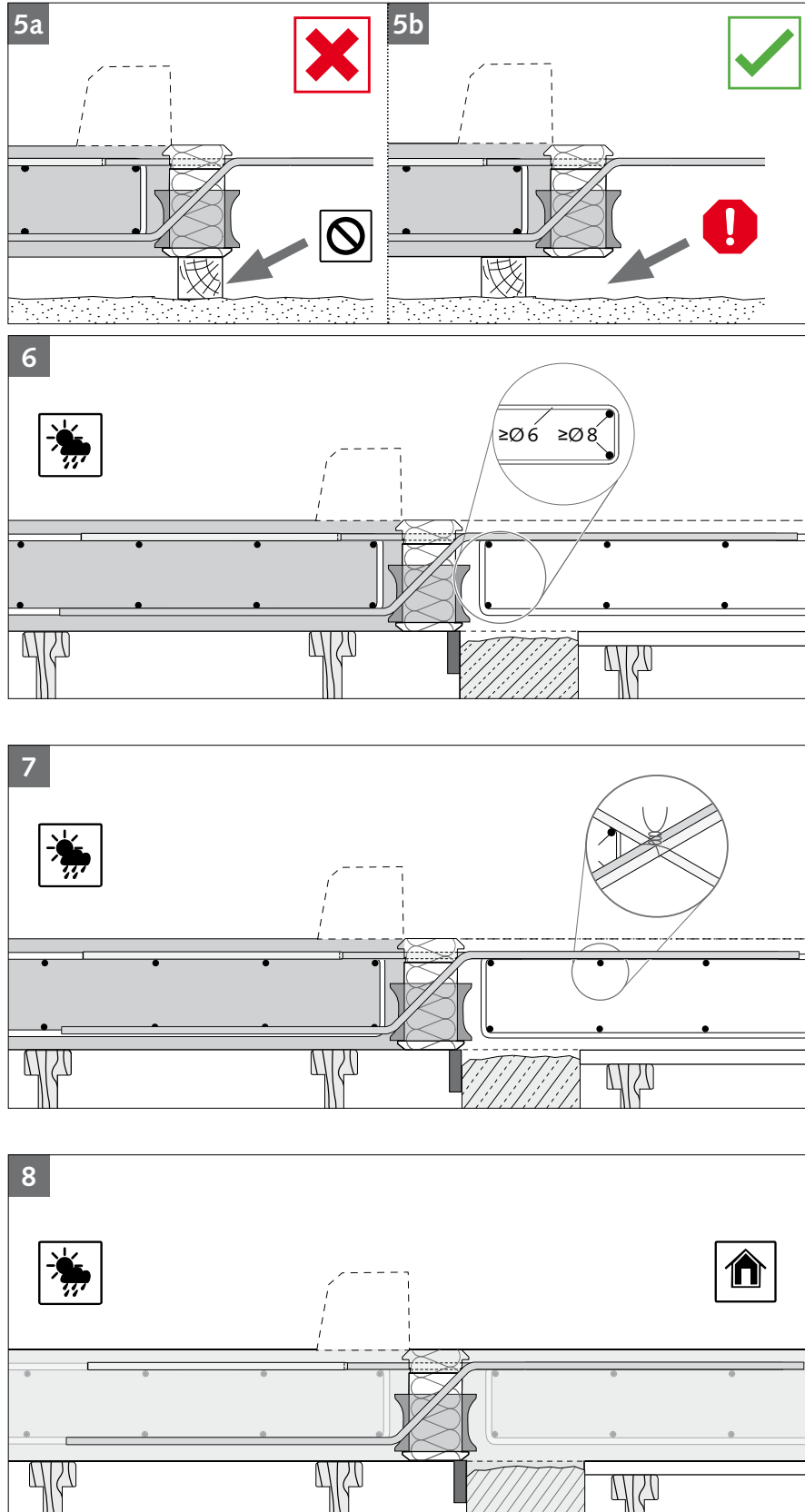
6
AT / FT / OTX / FK

7
BUILDING PHYSICS,
PLANNING

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVXL, HIT-SP MVXL

HIT On-site installation (face-up production)



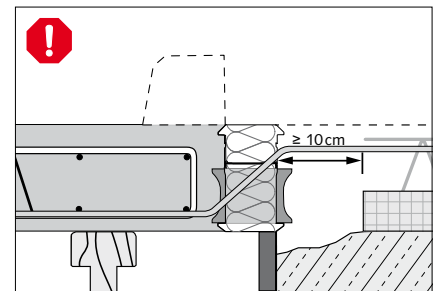
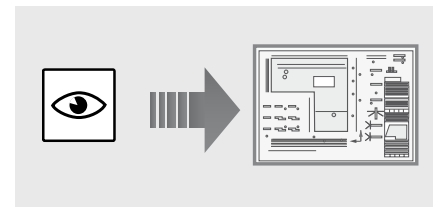
5 Storage and transport

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

a in-correct

b correct

6 Installing the on-site reinforcement



7 Wire-tie the on-site tensile and shear reinforcement to the HIT element.

8 Freshly concreted balcony slab on supporting structure

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

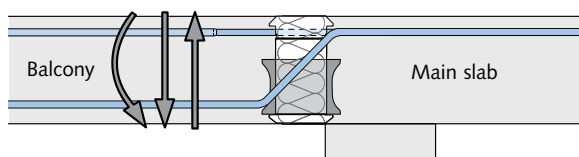
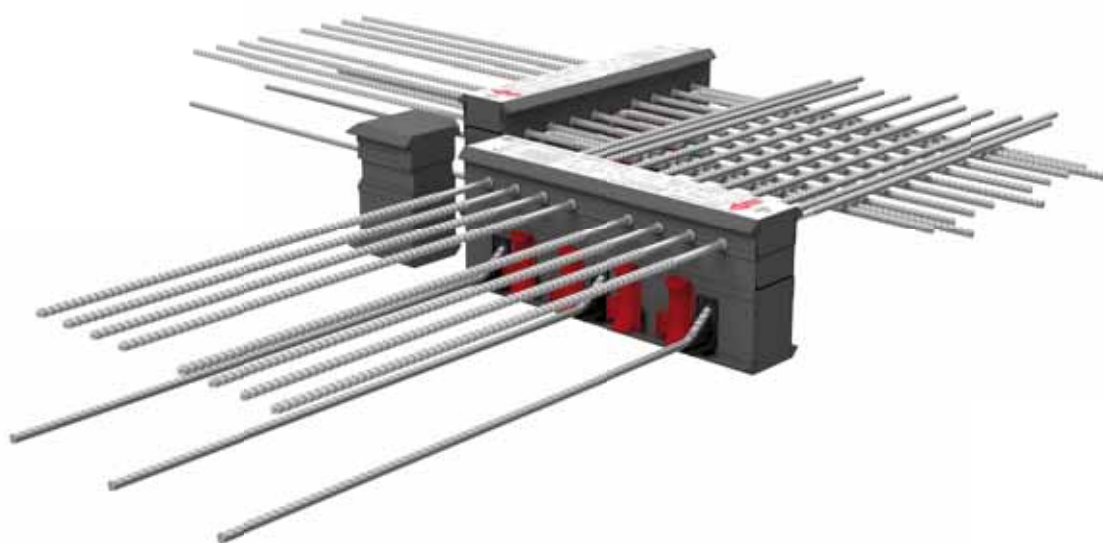
HIT-HP/SP Elements for cantilevered corner balconies

- > Connection for cantilevered corner balcony slabs for high loads
- > Transfer of bending moments as well as positive and negative shear forces

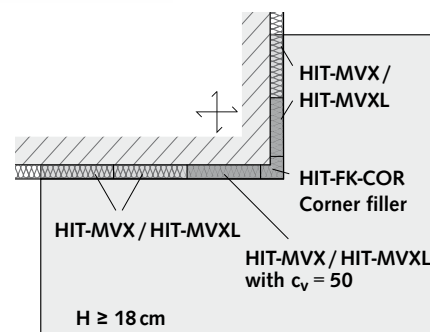
NEW System for cantilevered corner balconies with high loads



TYPE TESTED



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



Application example: outer corner

Content	Type	Page
Solutions for corner balconies	HIT-HP COR, HIT-SP COR	48
Span-to-depth ratio	HIT HP/SP MVX, HIT HP/SP MVXL	50
On-site connecting reinforcement	HIT HP/SP MVX, HIT HP/SP MVXL	51
Joint and installation spacings	HIT HP/SP MVX, HIT HP/SP MVXL	54
Camber	HIT HP/SP MVX, HIT HP/SP MVXL	55

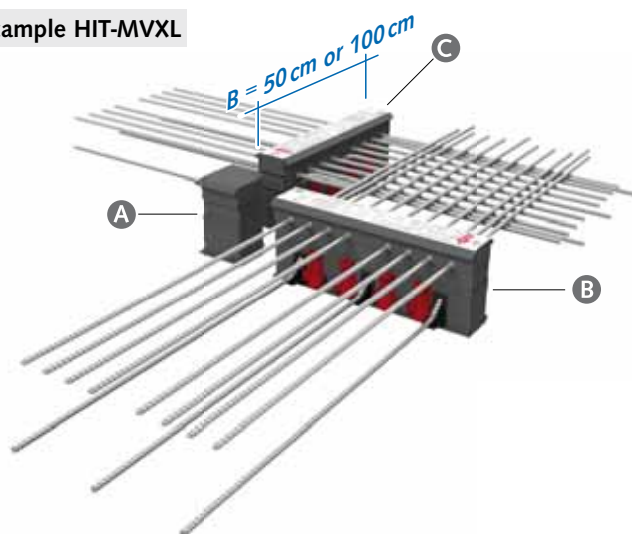
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP/SP Elements for cantilevered corner balconies

Elements for corner balconies

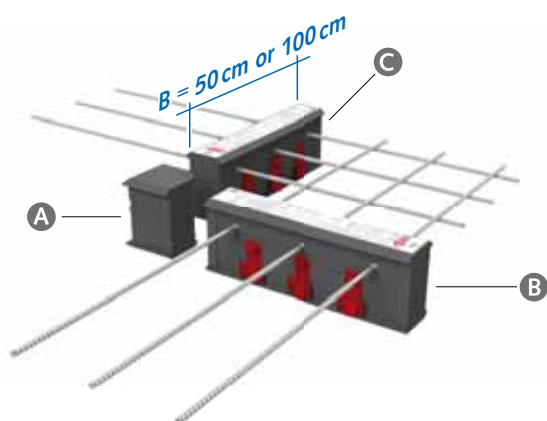
All standard types of the HIT-HP MVXL, HIT-SP MVXL as well as the HIT-HP MVX and the HIT-SP MVX are available in lengths of 0.50m or 1.00m for corner applications. HIT-HP MVX and HIT-SP MVX are also available as multi-part types for semi-precast slabs.

Example HIT-MVXL

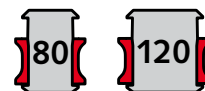
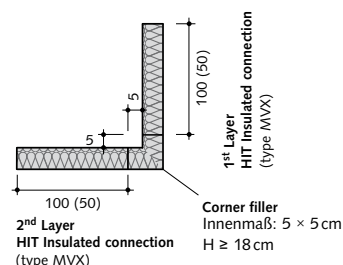


- A Corner filler
- B HIT-MVXL Standard element, 1st layer reinforcement ($c_v = 30\text{ mm} - 35\text{ mm}$)
- C HIT-MVXL Standard element, 2nd layer reinforcement ($c_v = 50\text{ mm}$)

Example HIT-MVX



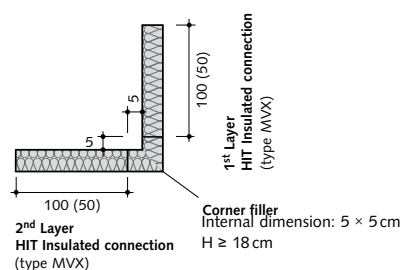
- A Corner filler
- B HIT-MVX Standard element, 1st layer reinforcement ($c_v = 30\text{ mm} - 35\text{ mm}$)
- C HIT-MVX Standard element, 2nd layer reinforcement ($c_v = 50\text{ mm}$)



A	HIT - HP	FK -	20 -									COR	
B	HIT - HP	MVXL -	07	04	-	18	-	050	-	30	-	04	10
C	HIT - HP	MVXL -	07	04	-	18	-	050	-	50	-	04	10
	1	2	3	4	5	6	7	8	9	10	11		

Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Number of tension bars
- ⑤ Number of CSB
- ⑥ Element height [cm]
- ⑦ Element width [cm]
- ⑧ Concrete cover (top) [mm]
- ⑨ Number of shear bars
- ⑩ $\varnothing$ shear load bar [mm]
- ⑪ Corner filler



A	HIT-HP	FK	-			20	-					COR		
B	HIT-HP	MVX	-	05	04	-	20	-	100	-	35	-	ES	
C	HIT-HP	MVX	-	05	04	-	20	-	100	-	50	-	ES	
	⋮	⋮		⋮	⋮		⋮		⋮		⋮			
	1	2		3	4	5	6		7		8		9	10

Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection Type
- ④ Number of tension bars
- ⑤ Number of CSB
- ⑥ Element height [cm]
- ⑦ Element width [cm]
- ⑧ Concrete cover (top) [mm]
- ⑨ For corner application only
- ⑩ For element slab design only

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP/SP Elements for cantilevered corner balconies

At the intersection of the tension bars in the HIT-HP/SP MVXL and HIT-HP/SP MVX Elements, a concrete cover c_{nom} of 50 mm must be planned to one side of the HIT Element. The other side can be configured, depending on the application, with a c_{nom} of 30 or 35 mm. The layout of the elements should be adapted to the reinforcement in the main reinforced concrete slab; how this is done depends on the layout in the slab.

The actual corner (point) is filled with a PVC filler element HIT-HP FK-...-COR or HIT-SP FK-...-COR which have mineral wool cores. When selecting the required HIT Elements, the load bearing capacities of the concrete cover c_{nom} of 50 mm are decisive regardless of installation direction.

Example: Load bearing capacity HIT-HP MVXL



Shear capacity $-V_{Rd}, +V_{Rd}$

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

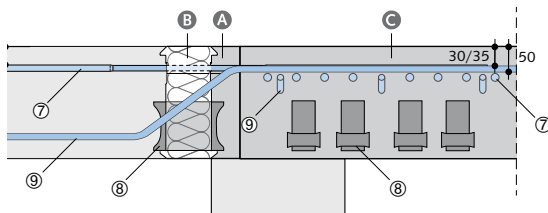
Type / Element width		B = 1.00 m			HP MVXL-1408-...-0610		HP MVXL-1408-...-0810		HP MVXL-1608-...-0810		HP MVXL-1809-...-0410	
		B = 0.50 m			HP MVXL-0704-...-0310		HP MVXL-0704-...-0410		HP MVXL-0804-...-0410		—	
Concrete cover [mm]		30	35	50								
Design values for slab thickness [mm]	$V_{Rd} \downarrow$ [kN/m]	170–190	170–190	180*–210	157.5	158.4	209.4	210.7	205.5	206.7	103.4	103.9
		200–240	200–240	220–260	174.1	175.1	231.7	233.1	228.2	229.5	114.6	115.1
		≥250	≥250	≥270	191.6	192.5	255.1	256.5	252.3	253.6	126.4	127.0
	$V_{Rd} \uparrow$ [kN/m]	≥170	≥170	≥180*	107.0	123.1	107.0	123.1	76.4	98.5	57.9	73.9

*effective concrete cover 47 mm, can only be used in combination with corner elements



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVXL-1408-...-0610		HP MVXL-1408-...-0810		HP MVXL-1608-...-0810		HP MVXL-1809-...-0410	
	B = 0.50 m			HP MVXL-0704-...-0310		HP MVXL-0704-...-0410		HP MVXL-0804-...-0410		—	
Concrete cover [mm]	30	35	50								
Design values m_{Rd} [kNm/m] for slab thickness [mm]	-		180*	56.5	59.4	56.5	59.4	61.6	65.3	69.3	73.5
		170		59.9	62.8	59.9	62.8	65.5	69.2	73.3	77.9
	170		190	63.4	66.3	63.4	66.3	69.5	73.1	77.2	82.3

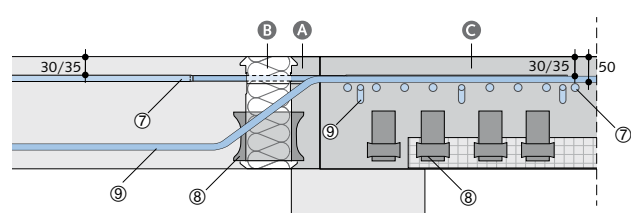


Corner situation with HIT Elements

The shear bars in the HIT-MVXL are at the same height as the tension bars. Therefore, the bars overlap in the corner without clashing. In corner balconies, the inner or outer corners define a reference point; using this reference point half the maximum joint spacing $0.5s_{joint}$ must be maintained.

See page 54 for more detailed information including maximum joint spacing in respect to minimum bar diameters.

On-site reinforcement consistent with the installed HIT Element is required for HIT Elements in corners (→ see page 51).



Corner situation with semi-precast element slabs with a HIT Element

On-site reinforcement is required for the HIT Elements used in corner applications; layout and size depends on the installed HIT Elements.

- A Corner filler element
- B HIT-MVXL Standard element, 1. layer reinforcement ($c_v = 30 \text{ mm} - 35 \text{ mm}$)
- C HIT-MVXL Standard element, 2. layer reinforcement ($c_v = 50 \text{ mm}$)

Position ⑦: Tension bar

Position ⑧: Double-symmetrical CSB

Position ⑨: Shear bar

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

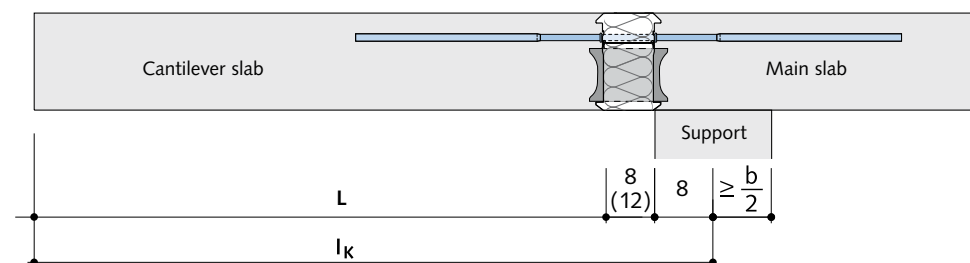
HIT-HP/SP MVX, HIT-HP/SP MVXL

Span-to-depth ratio

The maximum cantilever lengths max. l_k [m] are shown in the table below; these are based on EN 1992-1-1 (EC2). The cantilever length l_k should be calculated as shown in the diagram below. Interim values have to be interpolated.

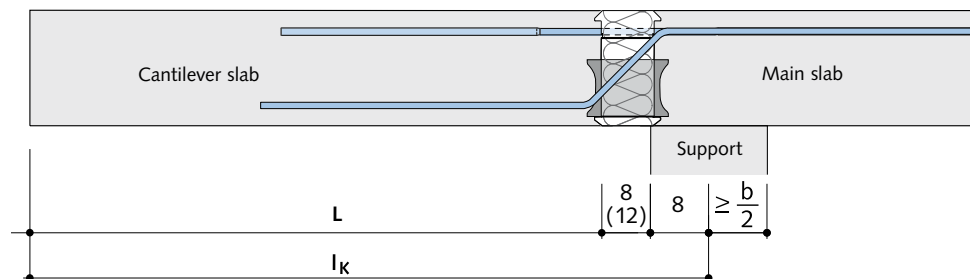
Maximum cantilever length l_k [m]		Slab thickness h [cm] of concrete slab									
		16	17	18	19	20	21	22	23	24	25
Concrete cover c_v [cm]	$c_v = 3,0$	1.74	1.88	2.02	2.16	2.30	2.44	2.58	2.72	2.86	3.00
	$c_v = 3,5$	1.67	1.81	1.95	2.09	2.23	2.37	2.51	2.65	2.79	2.93
	$c_v = 5,0$	—	—	1.74	1.88	2.02	2.16	2.30	2.44	2.58	2.72

HIT-HP/SP MVX



l_k = Cantilever length [m]
 b = Support width [cm]

HIT-HP/SP MVXL

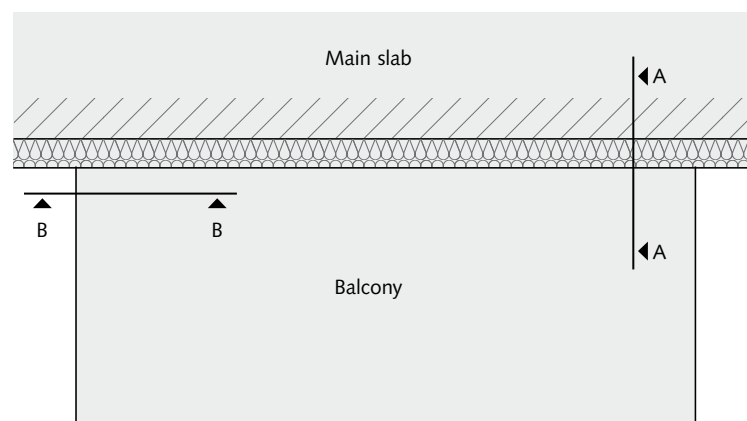


l_k = Cantilever length [m]
 b = Support width [cm]

On-site reinforcement for direct and indirect support

Section A-A

Section B-B

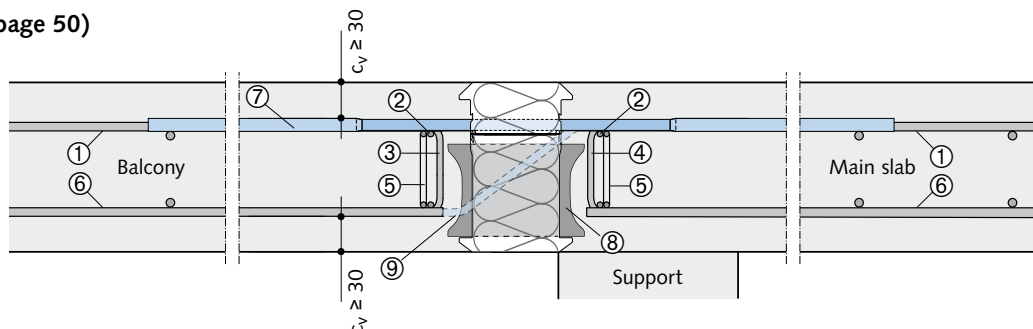


HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP/SP MVX, HIT-HP/SP MVXL

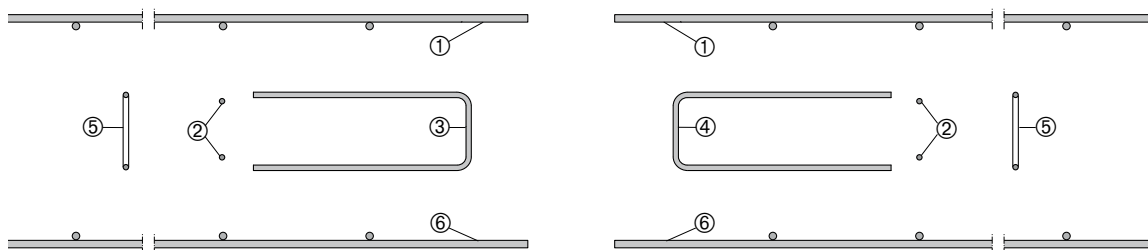
On-site reinforcement for direct and indirect support

Section A-A (see page 50)



Reinforcement detail

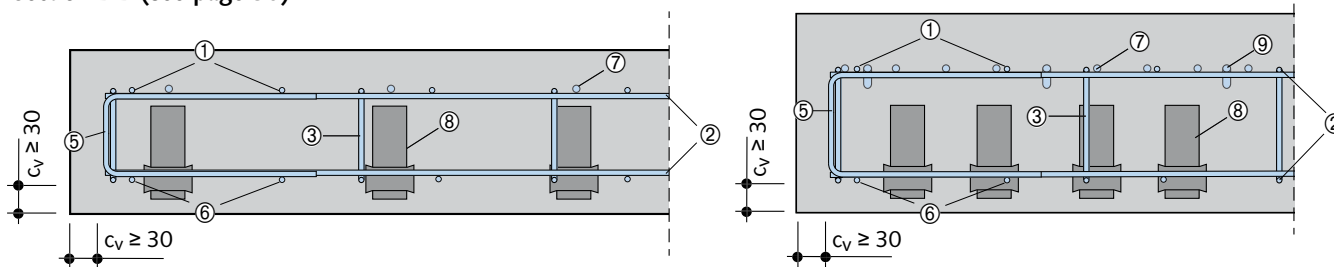
Dimensions in [mm]



Legend: see next page

On-site reinforcement for direct and indirect support

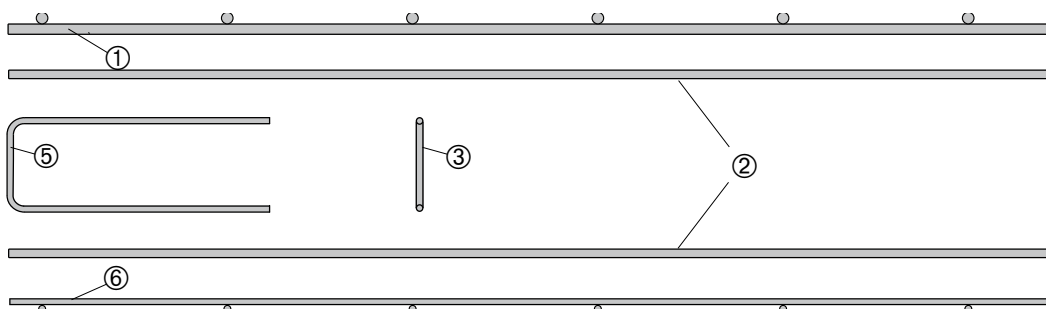
Section B-B (see page 50)



Section B-B, Example HIT-MVX

Section B-B, Example HIT-MVXL

Reinforcement detail



 → Legend: see next page

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP/SP MVX, HIT-HP/SP MVXL

Connecting reinforcement

Recommendation for on-site reinforcement (depends on construction method):

aligned butted surfaces, $a_{s,TB} \leq a_{s,overlap}$ with a load of 100% of the maximal moment M_{Rd} .

No. of tension bars n_{TB}/m	$a_{s,TB}$ [cm ² /m]	Variation A: mesh	Variation B: steel bars	Variation C: combined mesh and steel bars
2	2.26	R257 A	Ø 8 / 22 cm	—
3	3.39	R335 A	Ø10 / 23 cm	R188 A + Ø 8 / 25 cm
4	4.52	R524 A	Ø10 / 17 cm	R188 A + Ø 8 / 18 cm
5	5.65	Q636 A	Ø10 / 13.5 cm	R188 A + Ø 8 / 13 cm
6	6.79	—	Ø10 / 11.5 cm	R188 A + Ø 8 / 10 cm
7	7.92	—	Ø10 / 9.5 cm	R188 A + Ø10 / 12.5 cm
8	9.05	—	Ø12 / 12.5 cm	R257 A + Ø10 / 12 cm
9	10.18	—	Ø12 / 11 cm	R257 A + Ø10 / 10 cm
10	11.31	—	Ø12 / 10 cm	R257 A + Ø10 / 9 cm
11	12.44	—	Ø12 / 9 cm	R335 A + Ø12 / 12 cm
12	13.57	—	Ø12 / 8 cm	R335 A + Ø12 / 11 cm
13	14.70	—	Ø12 / 7.5 cm	R335 A + Ø12 / 10 cm
14	15.83	—	Ø12 / 7 cm	R524 A + Ø12 / 10 cm
16	18.10	—	Ø12 / 6 cm	Q636 A + Ø12 / 9.5 cm
18	20.36	—	Ø12 / 5.5 cm	Q636 A + Ø12 / 6.5 cm

Main slab thickness h 160 – 350 mm

Legend for page 51: on-site reinforcement

Position ①: Recommendation for upper connecting reinforcement	→ see table above
Position ②: horiz. edge reinforcement, longitudinal to the insulation joint	min. 2 × Ø8 mm
Position ③: On-site stirrup reinforcement $A_{s,req}$ balcony side	depending on the V_{Ed} load and support (direct or indirect). Exact specifications for the corresponding HIT Type see pages 14–27.
Position ④: On-site stirrup reinforcement $A_{s,req}$ slab side	
Position ⑤: Stirrups as end anchorage for position ②	
for Position ⑤: additional U-bars to secure the free edge of the balcony slab	one stirrup on each side with min. Ø8 mm
Position ⑥: Lower slab reinforcement	
Position ⑦: Tension bar with overlap length of $l_o = 685$ mm	according to DIN EN 1992-1-1 and DIN EN 1992-1-1/NA
Position ⑧: Double-symmetrical CSB	
Position ⑨: Shear bar	



Alternative connecting reinforcement as well as a reduction in the required connecting reinforcement overlap length with m_{Ed}/m_{Rd} is possible.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE HIT-HP/SP MVX, HIT-HP/SP MVXL

Using HALFEN HIT Insulated connection with pre-stressed concrete slabs

HALFEN and DW SYSTEMBAU (manufacturer of pre-stressed concrete slabs) have jointly developed constructive solutions to thermally separate cantilevered balcony slabs in compliance with fire protection regulations for use with pre-stressed concrete slabs. Also known as prestressed concrete hollow core slabs.

All these newly developed connection variants have one thing in common: The balconies are anchored to the main

slab, irrespective of the direction of tension in the slab, using thin semi-precast, pre-stressed concrete elements and a concrete topping of at least 8 cm thickness.

The balcony loads are transferred to the main slab by friction and connecting reinforcement. The bond between the concrete topping and the semi-precast, pre-stressed concrete elements must be at least category "rough" and must be verified separately taking all loads into account.

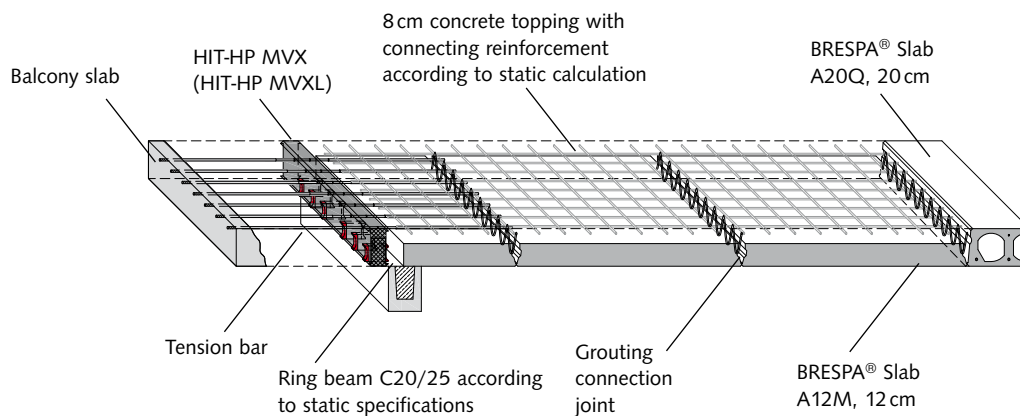


Fig.: Balcony connection using HALFEN HIT-Insulated connection and concrete topping to BRESPA® solid slab element

Constructive boundary conditions

- › the lateral edge of the slab is formed by a load-bearing beam or lintel
- › the HALFEN HIT Elements are anchored using an on-site cast concrete layer
- › for example, slab thicknesses of 20 cm are made with 12 cm BRESPA® solid slabs (A12M) and 8 cm concrete topping
- › the surface of the semi-precast, pre-stressed concrete must be at least category "rough" and must be thoroughly cleaned and moistened before the on-site concrete is poured
- › structural shear reinforcement (i.e. small filigree lattice girder) is installed in the area of the element joints

Details of balcony connections length and crosswise to the slab tensioning direction can be found in the download area at www.dw-systembau.de.

The HIT design software at www.halfen.com provides the corresponding verifiable planning for the balconies.

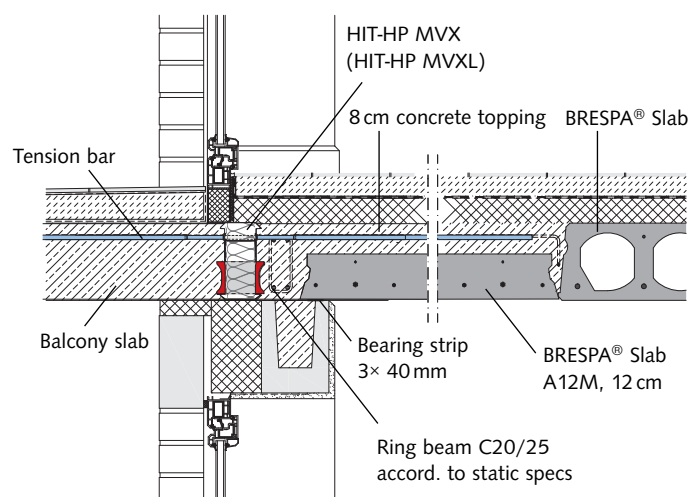
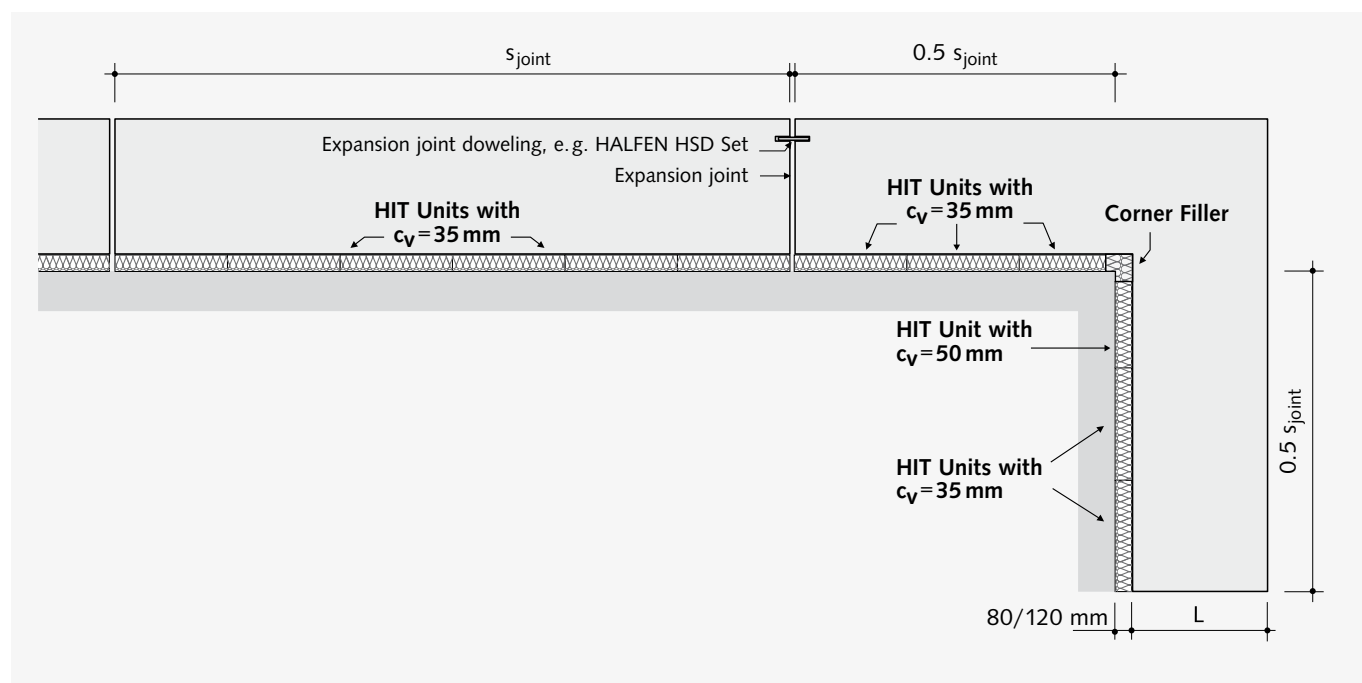


Fig: Balcony connection to BRESPA® solid slab element (example)

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP/SP MVX, HIT-HP/SP MVXL

Joint spacings



Observe the expansion joints

According to the European Technical Assessment ETA, **expansion joints must be provided** in the external concrete components at a right angle to the insulation line of the HIT Elements.

According to the assessment the spacing between joints must not exceed s_{joint} in straight, cantilevered balcony slabs. In balcony structures extending past an outer corner an expansion joint must be planned at least every $0.5 s_{\text{joint}}$. For inside corners the limit is $0.5 s_{\text{joint}}$ for each length.

Application	HALFEN HIT Type	Decisive rebar diameter ϕ	max. expansion joint spacing s_{joint} [m]	
			HP (80 mm)	SP (120 mm)
Cantilevered balconies	MVX	10.5 mm	13.5 m	23.0 m
	MVXL...-10	10.5 mm		
	MVXL...-12	12 mm	11.7 m	19.8 m
	DVL	14 mm	10.1 m	—
Offset cantilevered balconies	MVX-OD/OU	10.5 mm	13.5 m	23.0 m
Loggia/ simply-supported balcony slabs	ZVX/ZDX...-06	6 mm		
	ZVX/ZDX...-08	8 mm		
	ZVX/ZDX...-10	10 mm		
	ZVX/ZDX...-12	12 mm	11.7 m	19.8 m
Loggias/ wall penetrating concrete slabs	DD...-06/08/10	10.5 mm	13.5 m	23.0 m
	DD...-12	12 mm	11.7 m	19.8 m
	DDL	14 mm	10.1 m	—
Roof parapets	AT	8 mm	13.5 m	23.0 m
Balcony parapets	FT			
Corbels	OTX			

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

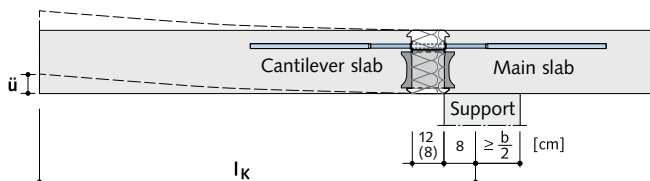
HIT-HP/SP MVX, HIT-HP/SP MVXL

Camber 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 EN 1992-1-1 and EN 1992-1-1/NA, plus the deformation $\ddot{u}$ of the HIT Elements.

The coefficient factor for camber increase $\ddot{u}^*$ on page 42 refers **only to deformation** in HALFEN HIT Elements HIT-HP/SP MVX 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 coefficient factor $\ddot{u}^*$ for camber increase refers to maximum moment load capacity in the HALFEN Insulated connection. It is recommended to consider each present load-combination $E_{d,perm}$ when calculating the camber increase $\ddot{u}$. If necessary, when selecting the drainage direction for the camber, the camber should be appropriately considered.

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

with $\ddot{u}$	Camber from HIT Components deformation in [mm]
$\ddot{u}^*$	Camber coefficient → see page 56
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 MVX-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 under quasi-permanent load combination

$$\begin{aligned} m_{Ed,perm} &= (g_k + g_{k,Bel} + \psi_2 \times q_k) \times l_k^2 / 2 + g_{k,Gel} \times l_k \\ &= (4.5 + 1.5 + 0.3 \times 4.0) \times 1.9^2 / 2 + 1.5 \times 1.9 \\ &= 15.8 \text{ kNm/m} \end{aligned}$$

Camber coefficient $\ddot{u}^* = 0.82 \%$

read from table for: $h = 180$ and $n_{TB} = 6$

Camber from HIT components deformation

$$\begin{aligned} \ddot{u} &= \ddot{u}^* \times l_k \times 10 \times m_{Ed,perm} / (0.524 \times m_{Rd}) \\ &= 0.82 \times 1.9 \times 10 \times 15.8 / (0.524 \times 29.8) \\ &= 15.8 \text{ mm} \\ &= 1.6 \text{ cm} \end{aligned}$$



Note: Observe the deflections limits according to EN 1992-1-1 and EN 1992-1-1/NA
→ page 50, Span-to-depth ratio

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP/SP MVX, HIT-HP/SP MVXL

HIT-HP: Camber coefficient $\ddot{u}^*$ [%] at maximum element load bearing capacity (M_{Rd})						
Slab thickness h [mm]			Number of tension bars n_{TB} per metre of element			
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: Camber coefficient $\ddot{u}^*$ [%] at maximum element load bearing capacity (M_{Rd})						
Slab thickness h [mm]			Number of tension bars n_{TB} per metre of element			
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.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

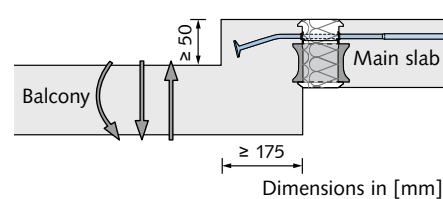
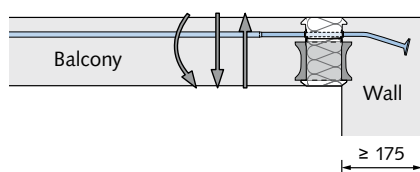
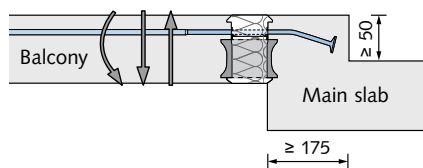
HIT-HP MVX-OU, HIT-SP MVX-OU

2

- For cantilevered balcony slabs with height offset (balcony higher than main slab) or upward wall connections
- Transfer of bending moments and bi-directional shear forces



TYPE TESTED



HIT-HP MVX-OU – High Performance 80 mm insulation thickness

HIT-SP MVX-OU – Superior Performance 120 mm insulation thickness

Both types are also available as multi-part design (-ES) for element slabs.

HIT-HP/SP MVX-OD as custom design
→ page 68

Content	Type	Page
Product types / Load range	HIT-HP/SP MVX-OU	59
Load bearing capacity values	HIT-HP/SP MVX-OU	60
Product description	HIT-HP/SP MVX-OU	68
On-site reinforcement	HIT-HP/SP MVX-OU	69
Installation	HIT-HP/SP MVX-OU	71

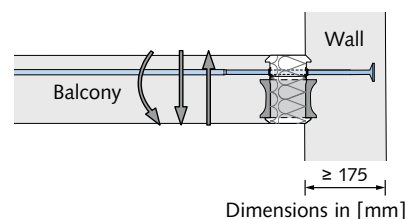
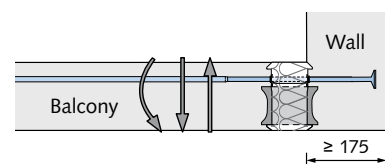
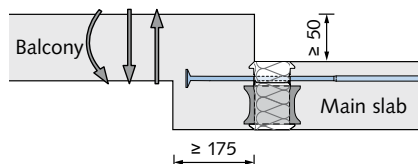
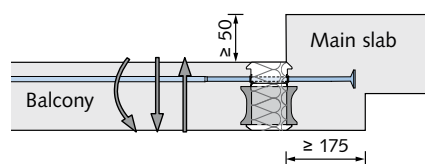
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVX-OD, HIT-SP MVX-OD

- For cantilevered balcony slabs with height offset (balcony lower than main slab) or downward wall connections
- Transfer of bending moments and bi-directional shear forces



TYPE TESTED



HIT-HP MVX-OD – High Performance 80 mm insulation thickness

HIT-SP MVX-OD – Superior Performance 120 mm insulation thickness

Both types are also available as a multi-part design (-ES) for element slabs.

HIT-HP/SP MVX-OD as custom design
→ see page 68

Content	Type	Page
Product types / Load range	HIT-HP/SP MVX-OD	59
Load bearing capacity values	HIT-HP/SP MVX-OD	64
Product description	HIT-HP/SP MVX-OD	68
On-site reinforcement	HIT-HP/SP MVX-OD	70
Installation	HIT-HP/SP MVX-OD	71

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVX-OU, HIT-SP MVX-OU

Product types – Load range

The respective load range results from the corresponding combination of TB- (tension bar) and CSB- (compression shear bearings) Box. The combinations of TB- and CSB-Box shown in the following table are possible.

Possible combinations of upper and lower element (TB- and CSB-Boxes)												
Element width B = 25 cm		Number of tension bars n_{TB}										
Number of compression shear bearings n_{CSB}	1	●	●									
	2	●	●	●								
Element width B = 50 cm		Number of tension bars n_{TB}										
Number of compression shear bearings n_{CSB}	1	●	●									
	2	●	●		●							
	3		●	●	●	●						
	4		●	●	●	●	●					
	5			●	●	●	●					
Element width B = 100 cm		Number of tension bars n_{TB}										
Number of compression shear bearings n_{CSBw}	2		●	●	●	●						
	3		●	●	●	●	●	●				
	4		●	●	●	●	●	●	●			
	5				●	●	●	●	●	●	●	●
	6				●	●	●	●	●	●	●	●
	7				●	●	●	●	●	●	●	●
	8				●	●	●	●	●	●	●	●
	9					●	●	●	●	●	●	●
	10						●	●	●	●	●	●
	11							●	●	●	●	●
	12										●	●
	The load bearing capacity values for the selected elements can be found on the following pages											

The load bearing capacity values for the selected elements can be found on the following pages

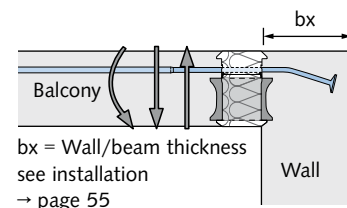
• = HP and SP

Basic types – Ordering example

HIT-SP MVX - 07 05 - 20 - 100 - 35 - OU 175 - ES

↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪



Type designation

- ① Product group
- ② Insulation thickness 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Number of tension bars
- ⑤ Number of CSB
- ⑥ Element height [cm]
- ⑦ Element width [cm]
- ⑧ Concrete cover (top) [mm]
- ⑨ Installation situation (Downward height offset)
- ⑩ Thickness of building element bx [mm]
- ⑪ Only for main element slab



bx for standard type:

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

Larger widths are available as custom solutions designs.
Our technical support team is available to assist you in realizing your projects.
Contact: → see back of catalogue

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

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

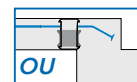
HIT-HP MVX-OU

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear load capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m B = 0.50 m	HP MVX-0403-...-OU	HP MVX-0504-...-OU	HP MVX-0805-...-OU	HP MVX-0606-...-OU	HP MVX-0806-...-OU
Design values	v_{Rd} [kN/m]	48.0 48.0	64.0 64.0	80.0 80.0	96.0 96.0	96.0 96.0



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m B = 0.50 m	HP MVX-0403-...-OU	HP MVX-0504-...-OU	HP MVX-0805-...-OU	HP MVX-0606-...-OU	HP MVX-0806-...-OU
Concrete cover [mm]	30 35 50	—	—	—	HP MVX-0303-...-OU	HP MVX-0403-...-OU
Design values m_{Rd} [kNm/m] for slab thickness [mm]	160	15.7 16.4	20.0 20.8	29.5 31.2	25.4 26.1	31.4 32.8
	170	16.7 17.4	21.2 22.1	31.5 33.2	26.8 27.6	33.4 34.8
	180	17.7 18.4	22.5 23.3	33.5 35.1	28.3 29.1	35.4 36.8
	190	18.7 19.4	23.7 24.5	35.4 37.1	29.8 30.6	37.3 38.7
	200	19.6 20.3	24.9 25.7	37.4 39.1	31.3 32.0	39.3 40.7
	210	20.6 21.3	26.2 27.0	39.4 41.0	32.7 33.5	41.3 42.7
	220	21.6 22.3	27.4 28.2	41.3 43.0	34.2 35.0	43.2 44.6
	230	22.6 23.3	28.6 29.4	43.3 45.0	35.7 36.5	45.2 46.6
	240	23.6 24.3	29.8 30.7	45.3 46.9	37.2 37.9	47.2 48.6
	250	24.6 25.3	31.1 31.9	47.2 48.9	38.6 39.4	49.1 50.5
	260	25.5 26.2	32.3 33.1	49.2 50.9	40.1 40.9	51.1 52.5
	270	26.5 27.2	33.5 34.4	51.2 52.8	41.6 42.4	53.1 54.5
	280	27.5 28.2	34.8 35.6	53.1 54.8	43.1 43.8	55.0 56.4
	290	28.5 29.2	36.0 36.8	55.1 56.8	44.5 45.3	57.0 58.4
	300	29.5 30.2	37.2 38.0	57.1 58.7	46.0 46.8	59.0 60.4
	310	30.5 31.2	38.5 39.3	59.0 60.7	47.5 48.3	60.9 62.3
	320	31.5 32.1	39.7 40.5	61.0 62.7	49.0 49.7	62.9 64.3
	330	32.4 33.1	40.9 41.7	63.0 64.6	50.4 51.2	64.9 66.3
	340	33.4 34.1	42.1 43.0	64.9 66.6	51.9 52.7	66.8 68.2
	350	34.4 35.1	43.4 44.2	66.9 68.6	53.4 54.2	68.8 70.2
	> 250	Load bearing capacity values for further elements (e.g. for $h > 250$ mm, C30/37, $v_{Rd,2}$ and $m_{Rd,2}$) are available in the type tests, at www.halfen.com and on request from our technical support team. See inside back cover for contact information.				



On-site stirrup reinforcement $A_{s,req}$ on balcony side ($\rightarrow$ page 69)

$V_{Ed} \downarrow$	$\phi 6/25$ cm				
$V_{Ed} \uparrow$	$\phi 6/17.5$ cm	$\phi 6/13.5$ cm	$\phi 8/18.5$ cm	$\phi 6/16.5$ cm	$\phi 6/15.5$ cm



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

Number of stirrups per metre	5	6	9	7	9
Cross section A_{sw} [cm ² /m] for each leg	5.7	6.8	10.2	7.9	10.2

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



All necessary verifications have already been considered. Adjacent slabs must be verified by the planner.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

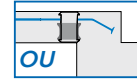
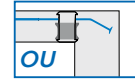
HIT-HP MVX-OU

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear load capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m B = 0.50 m	HP MVX-1106-...-OU	HP MVX-1008-...-OU	HP MVX-0610-...-OU	HP MVX-1010-...-OU	HP MVX-1012-...-OU
Design values	v_{Rd} [kN/m]	96.0 96.0	128.0 128.0	160.0 160.0	160.0 160.0	192.0 192.0



Moment bearing capacity m_{Rd}

Type / Element width		B = 1.00 m			HP MVX-1106-...-OU		HP MVX-1008-...-OU		HP MVX-0610-...-OU		HP MVX-1010-...-OU		HP MVX-1012-...-OU	
		B = 0.50 m			—		HP MVX-0504-...-OU		HP MVX-0305-...-OU		HP MVX-0505-...-OU		—	
Concrete cover [mm]	30	35	50											
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		37.0	41.0	40.0	41.7	27.5	28.0	41.2	43.6	32.5	38.5	
	160		180	39.5	43.7	42.5	44.1	29.0	29.4	43.6	46.0	34.3	40.5	
		170		42.1	46.4	44.9	46.6	30.4	30.9	46.0	48.5	36.0	42.6	
	170		190	44.6	49.1	47.4	49.0	31.9	32.4	48.4	50.9	37.8	44.7	
		180		47.1	51.8	49.9	51.5	33.4	33.9	50.7	53.4	39.5	46.7	
	180		200	49.7	54.5	52.3	54.0	34.9	35.3	53.1	55.8	41.2	48.8	
		190		52.2	57.2	54.8	56.4	36.3	36.8	55.5	58.3	43.0	50.8	
	190		210	54.8	59.9	57.2	58.9	37.8	38.3	57.9	60.8	44.7	52.9	
		200		57.3	62.6	59.7	61.3	39.3	39.8	60.1	63.2	46.5	55.0	
	200		220	59.8	65.3	62.2	63.8	40.8	41.2	62.2	65.7	48.2	57.0	
		210		62.4	68.0	64.4	66.2	42.2	42.7	64.4	68.1	50.0	59.1	
	210		230	64.9	70.7	66.5	68.7	43.7	44.2	66.5	70.6	51.7	61.2	
		220		67.4	73.4	68.7	71.2	45.2	45.7	68.7	73.1	53.4	63.2	
	220		240	70.0	76.1	70.8	73.6	46.7	47.1	70.8	75.5	55.2	65.3	
		230		72.5	78.8	72.9	76.1	48.1	48.6	72.9	78.0	56.9	67.3	
	230		250	75.1	81.5	75.1	78.5	49.6	50.1	75.1	80.4	58.7	69.4	
		240		77.6	84.2	77.2	81.0	51.1	51.6	77.2	82.9	60.4	71.5	
	240		260	80.1	86.9	79.4	83.5	52.6	53.0	79.4	85.4	62.2	73.5	
		250		82.7	89.6	81.5	85.9	54.0	54.5	81.5	87.8	63.9	75.6	
	250		270	85.2	92.3	83.7	88.4	55.5	56.0	83.7	90.3	65.6	77.7	
	> 250			Load bearing capacity values for further elements (e.g. for h > 250 mm, C30/37, v _{Rd,2} and m _{Rd,2}) are available in the type tests, at www.halfen.com and on request from our technical support team. See inside back cover for contact information.										



On-site stirrup reinforcement $A_{s,req}$ on balcony side ($\rightarrow$ page 69)

$V_{Ed} \downarrow$	$\phi 6/25$ cm	$\phi 6/22.5$ cm	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/16.5$ cm
$V_{Ed} \uparrow$	$\phi 8/15$ cm	$\phi 8/12$ cm	$\phi 8/9$ cm	$\phi 8/9$ cm	$\phi 8/8.5$ cm



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

Number of stirrups per metre	12	11	7	11	11
Cross section A_{sw} [cm ² /m] for each leg	13.6	12.4	7.9	12.4	12.4

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



All necessary verifications have already been considered. Adjacent slabs must be verified by the planner.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP MVX-OU

Load bearing capacity values $v_{Rd,2}$ / $m_{Rd,2}$ according to EN 1992-1-1 (EC2)



Shear load capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	SP MVX-0504-...-OU		SP MVX-0605-...-OU		SP MVX-0805-...-OU		SP MVX-1106-...-OU		SP MVX-1208-...-OU	
	B = 0.50 m	—		—		—		—		SP MVX-0604-...-OU	
	B = 0.25 m	—		—		—		—		SP MVX-0302-...-OU	
Design values	v_{Rd} [kN/m]	62.0	64.0	77.9	80.0	66.0	80.0	60.3	85.3	106.3	120.8



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			SP MVX-0504-...-OU		SP MVX-0605-...-OU		SP MVX-0805-...-OU		SP MVX-1106-...-OU		SP MVX-1208-...-OU	
	B = 0.50 m			—		—		—		—		SP MVX-0604-...-OU	
	B = 0.25 m			—		—		—		—		SP MVX-0302-...-OU	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		20.0	20.8	24.3	25.2	29.5	31.2	38.3	41.0	45.4	47.7
	160		180	21.2	22.1	25.8	26.7	31.5	33.2	41.0	43.7	48.3	50.7
		170		22.5	23.3	27.2	28.2	33.5	35.1	43.7	46.4	51.3	53.6
	170		190	23.7	24.5	28.7	29.6	35.4	37.1	46.4	49.1	54.2	56.6
		180		24.9	25.7	30.2	31.1	37.4	39.1	49.1	51.8	57.2	59.5
	180		200	26.2	27.0	31.7	32.6	39.4	41.0	51.8	54.5	60.1	62.5
		190		27.4	28.2	33.1	34.1	41.3	43.0	54.6	57.2	63.1	65.4
	190		210	28.6	29.4	34.6	35.5	43.3	45.0	57.3	59.9	66.0	68.4
		200		29.8	30.7	36.1	37.0	45.3	46.9	60.0	62.6	69.0	71.3
	200		220	31.1	31.9	37.6	38.5	47.2	48.9	62.7	65.3	71.9	74.3
		210		32.3	33.1	39.0	40.0	49.2	50.9	65.4	68.0	74.9	77.2
	210		230	33.5	34.4	40.5	41.4	51.2	52.8	68.1	70.7	77.8	80.2
		220		34.8	35.6	42.0	42.9	53.1	54.8	70.8	73.4	80.4	83.1
	220		240	36.0	36.8	43.5	44.4	55.1	56.8	73.5	76.1	83.0	86.1
		230		37.2	38.0	44.9	45.9	57.1	58.7	76.2	78.8	85.6	89.0
	230		250	38.5	39.3	46.4	47.4	59.0	60.7	78.9	81.5	88.2	92.0
		240		39.7	40.5	47.9	48.8	61.0	62.7	81.6	84.2	90.7	94.9
	240		260	40.9	41.7	49.4	50.3	63.0	64.6	84.3	86.9	93.3	97.9
		250		42.1	43.0	50.8	51.8	64.9	66.6	87.0	89.6	95.9	100.8
	250		270	43.4	44.2	52.3	53.3	66.9	68.6	89.7	92.3	98.4	103.8
	> 250			Load bearing capacity values for further elements (e.g. for h > 250mm, C30/37, v _{Rd,1} and m _{Rd,1}) are available in the type tests. at www.halfen.com and on request from our technical support team. See inside back cover for contact information.									



On-site stirrup reinforcement $A_{s,req}$ on balcony side ($\rightarrow$ page 69)

$V_{Ed} \downarrow$	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/21$ cm
$V_{Ed} \uparrow$	$\phi 6/13.5$ cm	$\phi 8/19$ cm	$\phi 8/18.5$ cm	$\phi 8/15$ cm	$\phi 8/11.5$ cm



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

Number of stirrups per metre	6	7	9	12	13
Cross section A_{SW} [cm ² /m] for each leg	6.8	7.9	10.2	13.6	14.7

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



All necessary verifications have already been considered. Adjacent slabs must be verified by the planner.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

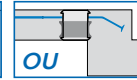
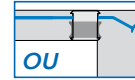
HIT-SP MVX-OU

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear load capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	SP MVX-0202-...-OU		SP MVX-0406-...-OU		SP MVX-1006-...-OU		SP MVX-1008-...-OU		SP MVX-1012-...-OU	
	B = 0.50 m	SP MVX-0101-...-OU		SP MVX-0203-...-OU		SP MVX-0503-...-OU		SP MVX-0504-...-OU		—	
Design values	v _{Rd} [kN/m]	30.7	32.0	77.2	81.7	93.7	96.0	124.9	128.0	159.4	166.8



Moment bearing capacity m_{Rd}

Type / Element width		B = 1.00 m		SP MVX-0202-...-OU		SP MVX-0406-...-OU		SP MVX-1006-...-OU		SP MVX-1008-...-OU		SP MVX-1012-...-OU	
		B = 0.50 m		SP MVX-0101-...-OU		SP MVX-0203-...-OU		SP MVX-0503-...-OU		SP MVX-0504-...-OU		—	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		8.5	8.7	18.1	18.4	28.6	38.5	38.2	41.7	36.3	37.9
	160		180	8.9	9.2	19.1	19.4	30.4	41.0	40.5	44.1	38.3	40.0
		170		9.4	9.7	20.1	20.4	32.1	43.4	42.8	46.6	40.3	42.0
	170		190	9.9	10.2	21.0	21.4	33.8	45.9	45.1	49.0	42.3	44.0
		180		10.4	10.7	22.0	22.4	35.5	48.3	47.4	51.5	44.2	46.0
	180		200	10.9	11.2	23.0	23.4	37.3	50.8	49.8	54.0	46.2	48.1
		190		11.4	11.7	24.0	24.3	39.0	53.3	52.1	56.4	48.2	50.1
	190		210	11.9	12.2	25.0	25.3	40.7	55.7	54.4	58.9	50.2	52.1
		200		12.4	12.6	26.0	26.3	42.5	58.2	56.7	61.3	52.1	54.2
	200		220	12.9	13.1	26.9	27.3	44.2	60.6	59.0	63.8	54.1	56.2
		210		13.4	13.6	27.9	28.3	45.9	63.1	61.3	66.2	56.1	58.2
	210		230	13.9	14.1	28.9	29.3	47.6	65.5	63.6	68.7	58.1	60.3
		220		14.4	14.6	29.9	30.2	49.4	68.0	65.9	71.2	60.1	62.3
	220		240	14.8	15.1	30.9	31.2	51.1	70.5	68.2	73.6	62.0	64.3
		230		15.3	15.6	31.9	32.2	52.8	72.9	70.5	76.1	64.0	66.3
	230		250	15.8	16.1	32.8	33.2	54.6	75.4	72.8	78.5	66.0	68.4
		240		16.3	16.6	33.8	34.2	56.3	77.8	75.1	81.0	68.0	70.4
	240		260	16.8	17.1	34.8	35.2	58.0	80.3	77.4	83.5	69.9	72.4
		250		17.3	17.6	35.8	36.1	59.7	82.8	79.8	85.9	71.9	74.5
	250		270	17.8	18.1	36.8	37.1	61.5	85.2	82.1	88.4	73.9	76.5
	> 250			Load bearing capacity values for further elements (e.g. for h > 250mm, C30/37, v _{Rd,2} and m _{Rd,2}) are available in the type tests, at www.halfen.com and on request from our technical support team. See inside back cover for contact information.									



On-site stirrup reinforcement $A_{s,req}$ on balcony side ($\rightarrow$ page 69)

$V_{Ed} \downarrow$	$\phi 6/25$ cm	$\phi 6/22.5$ cm	$\phi 6/25$ cm	$\phi 6/22.5$ cm	$\phi 6/18.5$ cm
$V_{Ed} \uparrow$	$\phi 6/25$ cm	$\phi 8/16$ cm	$\phi 8/15$ cm	$\phi 8/11.5$ cm	$\phi 8/9.5$ cm



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

Number of stirrups per metre	3	5	11	11	11
Cross section A_{SW} [cm ² /m] for each leg	3.4	5.7	12.4	12.4	12.4

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



All necessary verifications have already been considered. Adjacent slabs must be verified by the planner.

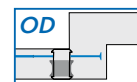
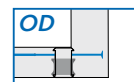
HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE HIT-HP MVX-OD

Load bearing capacity values $v_{Rd,2}$ / $m_{Rd,2}$ according to EN 1992-1-1 (EC2)



Shear load capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m B = 0.50 m	HP MVX-0505-...-OD	HP MVX-0606-...-OD	HP MVX-0807-...-OD	HP MVX-1007-...-OD	HP MVX-1009-...-OD
Design values	v_{Rd} [kN/m]	72.4 80.0	86.9 96.0	89.0 99.8	64.5 75.2	72.5 83.7



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m B = 0.50 m	HP MVX-0505-...-OD	HP MVX-0606-...-OD	HP MVX-0807-...-OD	HP MVX-1007-...-OD	HP MVX-1009-...-OD
Concrete cover [mm]	30 35 50	—	HP MVX-0303-...-OD	—	—	—
Design values m_{Rd} [kNm/m] for slab thickness [mm]	160	21.1 21.8	25.4 26.1	32.8 34.0	38.4 40.3	41.3 42.7
	160 180	22.4 23.0	26.8 27.6	34.8 35.9	40.9 42.8	43.7 45.2
	170	23.6 24.2	28.3 29.1	36.7 37.9	43.4 45.2	46.2 47.6
	170 190	24.8 25.5	29.8 30.6	38.7 39.9	45.8 47.7	48.6 50.1
	180	26.0 26.7	31.3 32.0	40.7 41.8	48.3 50.1	51.1 52.5
	180 200	27.3 27.9	32.7 33.5	42.6 43.8	50.7 52.6	53.6 55.0
	190	28.5 29.2	34.2 35.0	44.6 45.8	53.2 55.1	55.8 57.5
	190 210	29.7 30.4	35.7 36.5	46.6 47.7	55.7 57.5	57.9 59.9
	200	31.0 31.6	37.2 37.9	48.5 49.7	58.1 60.0	60.1 62.4
	200 220	32.2 32.8	38.6 39.4	50.5 51.7	60.6 62.4	62.2 64.8
	210	33.4 34.1	40.1 40.9	52.5 53.6	63.0 64.9	64.4 67.3
	210 230	34.6 35.3	41.6 42.4	54.4 55.6	65.5 67.3	66.5 69.8
	220	35.9 36.5	43.1 43.8	56.4 57.6	67.9 69.8	68.7 72.2
	220 240	37.1 37.8	44.5 45.3	58.4 59.5	70.4 72.3	70.8 74.7
	230	38.3 39.0	46.0 46.8	60.3 61.5	72.9 74.7	72.9 77.1
	230 250	39.6 40.2	47.5 48.3	62.3 63.5	75.1 77.2	75.1 79.6
	240	40.8 41.4	49.0 49.7	64.3 65.4	77.2 79.6	77.2 82.1
	240 260	42.0 42.7	50.4 51.2	66.2 67.4	79.4 82.1	79.4 84.5
	250	43.3 43.9	51.9 52.7	68.2 69.4	81.5 84.6	81.5 87.0
	250 270	44.5 45.1	53.4 54.2	70.2 71.3	83.7 87.0	83.7 89.4
	> 250	Load bearing capacity values for further elements (e.g. for $h > 250$ mm, C30/37, $v_{Rd,1}$ and $m_{Rd,1}$) are available in the type tests, at www.halfen.com and on request from our technical support team. See inside back cover for contact information.				



On-site stirrup reinforcement $A_{s,req}$ on balcony side ($\rightarrow$ page 69)

$V_{Ed} \downarrow$	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/24.5$ cm	$\phi 6/21$ cm
$V_{Ed} \uparrow$	$\phi 8/19.5$ cm	$\phi 8/16.5$ cm	$\phi 8/13.5$ cm	$\phi 8/12.5$ cm	$\phi 8/11.5$ cm



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

Number of stirrups per metre	6	7	9	11	11
Cross section A_{sw} [cm ² /m] for each leg	6.8	7.9	10.2	12.4	12.4

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



All necessary verifications have already been considered. Adjacent slabs must be verified by the planner.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

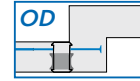
HIT-HP MVX-OD

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear load capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	HP MVX-0202-...-OD	HP MVX-0504-...-OD	HP MVX-0907-...-OD	HP MVX-0608-...-OD	HP MVX-0610-...-OD
	B = 0.50 m	HP MVX-0101-...-OD	—	—	HP MVX-0304-...-OD	HP MVX-0305-...-OD
Design values	v_{Rd} [kN/m]	32.0 32.0	64.0 64.0	112.0 112.0	128.0 128.0	137.0 147.1



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m	HP MVX-0202-...-OD	HP MVX-0504-...-OD	HP MVX-0907-...-OD	HP MVX-0608-...-OD	HP MVX-0610-...-OD
	B = 0.50 m	HP MVX-0101-...-OD	—	—	HP MVX-0304-...-OD	HP MVX-0305-...-OD
Concrete cover [mm]	30 35 50					
Design values m_{Rd} [kNm/m] for slab thickness [mm]	160	7.6 8.7	15.2 17.4	26.6 30.5	24.7 27.3	22.3 22.9
	160 180	8.0 9.2	16.1 18.4	28.1 32.2	26.0 28.7	23.4 24.1
	170	8.5 9.7	16.9 19.4	29.6 34.0	27.4 30.2	24.6 25.3
	170 190	8.9 10.2	17.8 20.4	31.1 35.7	28.7 31.7	25.8 26.5
	180	9.3 10.7	18.6 21.4	32.6 37.4	30.1 33.2	26.9 27.7
	180 200	9.8 11.2	19.5 22.4	34.1 39.1	31.4 34.6	28.1 28.9
	190	10.2 11.7	20.4 23.3	35.6 40.9	32.8 36.1	29.3 30.1
	190 210	10.6 12.2	21.2 24.3	37.1 42.6	34.1 37.6	30.4 31.3
	200	11.0 12.6	22.1 25.3	38.6 44.3	35.5 39.1	31.6 32.5
	200 220	11.5 13.1	22.9 26.3	40.2 46.0	36.8 40.5	32.8 33.6
	210	11.9 13.6	23.8 27.3	41.7 47.7	38.2 42.0	34.0 34.8
	210 230	12.3 14.1	24.7 28.3	43.2 49.5	39.5 43.5	35.1 36.0
	220	12.8 14.6	25.5 29.3	44.7 51.2	40.9 45.0	36.3 37.2
	220 240	13.2 15.1	26.4 30.2	46.2 52.9	42.2 46.4	37.5 38.4
	230	13.6 15.6	27.3 31.2	47.7 54.6	43.6 47.9	38.6 39.6
	230 250	14.1 16.1	28.1 32.2	49.2 56.4	44.9 49.4	39.8 40.8
	240	14.5 16.6	29.0 33.2	50.7 58.1	46.3 50.9	41.0 42.0
	240 260	14.9 17.1	29.8 34.2	52.2 59.8	47.6 52.3	42.1 43.1
	250	15.4 17.6	30.7 35.2	53.7 61.5	49.0 53.8	43.3 44.3
	250 270	15.8 18.1	31.6 36.1	55.2 63.2	50.3 55.3	44.5 45.5
	> 250	Load bearing capacity values for further elements (e.g. for $h > 250$ mm, C30/37, $v_{Rd,2}$ and $m_{Rd,2}$) are available in the type tests, at www.halfen.com and on request from our technical support team. See inside back cover for contact information.				



On-site stirrup reinforcement $A_{s,req}$ on balcony side ($\rightarrow$ page 69)

$V_{Ed} \downarrow$	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/25$ cm
$V_{Ed} \uparrow$	$\phi 6/25$ cm	$\phi 8/13.5$ cm	$\phi 8/13.5$ cm	$\phi 8/12.5$ cm	$\phi 8/10.5$ cm



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

Number of stirrups per metre	3	6	10	7	7
Cross section A_{sw} [cm ² /m] for each leg	3.4	6.8	11.3	7.9	7.9

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



All necessary verifications have already been considered. Adjacent slabs must be verified by the planner.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

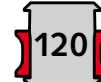
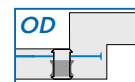
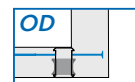
HIT-SP MVX-OD

Load bearing capacity values $v_{Rd,2}$ / $m_{Rd,2}$ according to EN 1992-1-1 (EC2)



Shear load capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m B = 0.50 m	SP MVX-0505-...-OD	SP MVX-0606-...-OD	SP MVX-0807-...-OD	SP MVX-1008-...-OD	SP MVX-1009-...-OD
Design values	v_{Rd} [kN/m]	60.2 67.2	72.3 80.6	72.0 81.8	54.7 64.9	54.7 64.9



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m B = 0.50 m	SP MVX-0505-...-OD	SP MVX-0606-...-OD	SP MVX-0807-...-OD	SP MVX-1008-...-OD	SP MVX-1009-...-OD
Concrete cover [mm]	30 35 50	—	SP MVX-0303-...-OD	—	SP MVX-0504-...-OD	—
Design values m_{Rd} [kNm/m] for slab thickness [mm]	160	21.1 21.8	25.4 26.1	32.8 34.0	40.0 41.7	41.3 42.7
	160 180	22.4 23.0	26.8 27.6	34.8 35.9	42.5 44.1	43.7 45.2
	170	23.6 24.2	28.3 29.1	36.7 37.9	44.9 46.6	46.2 47.6
	170 190	24.8 25.5	29.8 30.6	38.7 39.9	47.4 49.0	48.6 50.1
	180	26.0 26.7	31.3 32.0	40.7 41.8	49.9 51.5	51.1 52.5
	180 200	27.3 27.9	32.7 33.5	42.6 43.8	52.3 54.0	53.6 55.0
	190	28.5 29.2	34.2 35.0	44.6 45.8	54.8 56.4	55.8 57.5
	190 210	29.7 30.4	35.7 36.5	46.6 47.7	57.2 58.9	57.9 59.9
	200	31.0 31.6	37.2 37.9	48.5 49.7	59.7 61.3	60.1 62.4
	200 220	32.2 32.8	38.6 39.4	50.5 51.7	62.2 63.8	62.2 64.8
	210	33.4 34.1	40.1 40.9	52.5 53.6	64.4 66.2	64.4 67.3
	210 230	34.6 35.3	41.6 42.4	54.4 55.6	66.5 68.7	66.5 69.8
	220	35.9 36.5	43.1 43.8	56.4 57.6	68.7 71.2	68.7 72.2
	220 240	37.1 37.8	44.5 45.3	58.4 59.5	70.8 73.6	70.8 74.7
	230	38.3 39.0	46.0 46.8	60.3 61.5	72.9 76.1	72.9 77.1
	230 250	39.6 40.2	47.5 48.3	62.3 63.5	75.1 78.5	75.1 79.6
	240	40.8 41.4	49.0 49.7	64.3 65.4	77.2 81.0	77.2 82.1
	240 260	42.0 42.7	50.4 51.2	66.2 67.4	79.4 83.5	79.4 84.5
	250	43.3 43.9	51.9 52.7	68.2 69.4	81.5 85.9	81.5 87.0
	250 270	44.5 45.1	53.4 54.2	70.2 71.3	83.7 88.4	83.7 89.4
	> 250	Load bearing capacity values for further elements (e.g. for $h > 250$ mm, C30/37, $v_{Rd,1}$ and $m_{Rd,1}$) are available in the type tests, at www.halfen.com and on request from our technical support team. See inside back cover for contact information.				



On-site stirrup reinforcement $A_{s,req}$ on balcony side ($\rightarrow$ page 70)

$V_{Ed} \downarrow$	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/22.5$ cm	$\phi 6/21$ cm
$V_{Ed} \uparrow$	$\phi 8/20$ cm	$\phi 8/16.5$ cm	$\phi 8/14$ cm	$\phi 8/13$ cm	$\phi 8/13$ cm



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

Number of stirrups per metre	6	7	9	11	11
Cross section A_{SW} [cm ² /m] for each leg	6.8	7.9	10.2	12.4	12.4

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



All necessary verifications have already been considered. Adjacent slabs must be verified by the planner.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

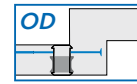
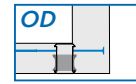
HIT-SP MVX-OD

Load bearing capacity values $v_{Rd,1}$ / $m_{Rd,1}$ according to EN 1992-1-1 (EC2)



Shear load capacity $\pm v_{Rd}$

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



Type / Element width	B = 1.00 m	SP MVX-0202-...-OD	SP MVX-0504-...-OD	SP MVX-0907-...-OD	SP MVX-0608-...-OD	SP MVX-0610-...-OD
	B = 0.50 m	SP MVX-0101-...-OD	—	—	SP MVX-0304-...-OD	SP MVX-0305-...-OD
Design values	v_{Rd} [kN/m]	28.6 31.1	57.2 62.2	100.1 108.9	107.3 115.8	111.5 119.6



Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m	SP MVX-0202-...-OD	SP MVX-0504-...-OD	SP MVX-0907-...-OD	SP MVX-0608-...-OD	SP MVX-0610-...-OD
	B = 0.50 m	SP MVX-0101-...-OD	—	—	SP MVX-0304-...-OD	SP MVX-0305-...-OD
Concrete cover [mm]	30 35 50					
Design values m_{Rd} [kNm/m] for slab thickness [mm]	160	7.2 7.4	14.3 14.9	25.0 26.0	25.7 26.7	24.8 26.1
	160 180	7.6 7.8	15.1 15.7	26.5 27.4	27.1 28.2	26.1 27.4
	170	8.0 8.2	15.9 16.5	27.9 28.8	28.5 29.6	27.4 28.8
	170 190	8.4 8.6	16.7 17.3	29.3 30.3	29.9 31.0	28.7 30.1
	180	8.8 9.1	17.5 18.1	30.7 31.7	31.3 32.5	30.0 31.5
	180 200	9.2 9.5	18.3 18.9	32.1 33.1	32.7 33.9	31.4 32.9
	190	9.6 9.9	19.1 19.7	33.5 34.5	34.1 35.4	32.7 34.2
	190 210	10.0 10.3	19.9 20.6	34.9 36.0	35.5 36.8	34.0 35.6
	200	10.4 10.7	20.7 21.4	36.3 37.4	36.9 38.2	35.3 37.0
	200 220	10.8 11.1	21.5 22.2	37.7 38.8	38.3 39.7	36.6 38.3
	210	11.2 11.5	22.3 23.0	39.1 40.2	39.7 41.1	37.9 39.7
	210 230	11.6 11.9	23.1 23.8	40.5 41.7	41.2 42.6	39.2 41.1
	220	12.0 12.3	23.9 24.6	41.9 43.1	42.6 44.0	40.6 42.4
	220 240	12.4 12.7	24.7 25.4	43.3 44.5	44.0 45.5	41.9 43.8
	230	12.8 13.1	25.5 26.3	44.7 45.9	45.4 46.9	43.2 45.2
	230 250	13.2 13.5	26.3 27.1	46.1 47.4	46.8 48.3	44.5 46.5
	240	13.6 13.9	27.1 27.9	47.5 48.8	48.2 49.8	45.8 47.9
	240 260	14.0 14.3	27.9 28.7	48.9 50.2	49.6 51.2	47.1 49.3
	250	14.4 14.8	28.7 29.5	50.3 51.6	51.0 52.7	48.4 50.6
	250 270	14.8 15.2	29.5 30.3	51.7 53.1	52.4 54.1	49.7 52.0
	> 250	Load bearing capacity values for further elements (e.g. for $h > 250$ mm, C30/37, $v_{Rd,2}$ and $m_{Rd,2}$) are available in the type tests, at www.halfen.com and on request from our technical support team. See inside back cover for contact information.				



On-site stirrup reinforcement $A_{s,req}$ on balcony side ($\rightarrow$ page 70)

$V_{Ed} \downarrow$	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/25$ cm	$\phi 6/20$ cm
$V_{Ed} \uparrow$	$\phi 6/25$ cm	$\phi 6/14$ cm	$\phi 8/14$ cm	$\phi 8/12.5$ cm	$\phi 8/12.5$ cm



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

Number of stirrups per metre	3	6	10	7	7
Cross section A_{sw} [cm ² /m] for each leg	3.4	6.8	11.3	7.9	7.9

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

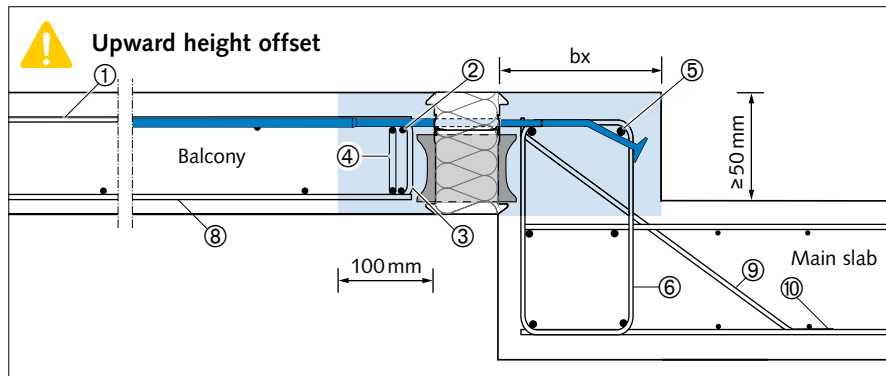


All necessary verifications have already been considered. Adjacent slabs must be verified by the planner.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVX-OU, HIT-SP MVX-OU

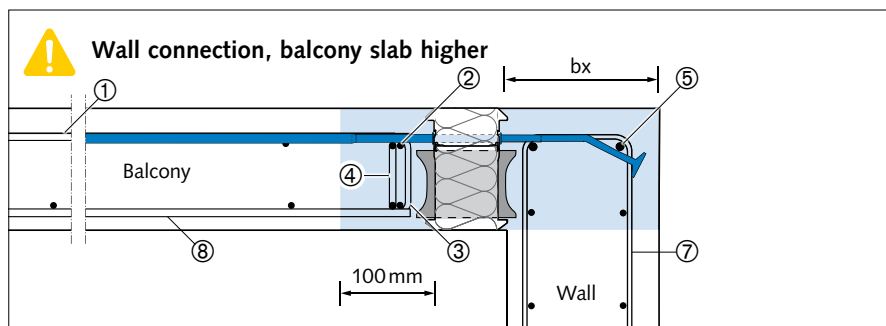
On-site reinforcement



- No construction joints**
permissible in this area:
Balcony side → vertical
Main slab → vertical and horizontal

bx = building element thickness

Design as frame corner!
Recommended:
 $bx \geq \text{height HIT Element}$

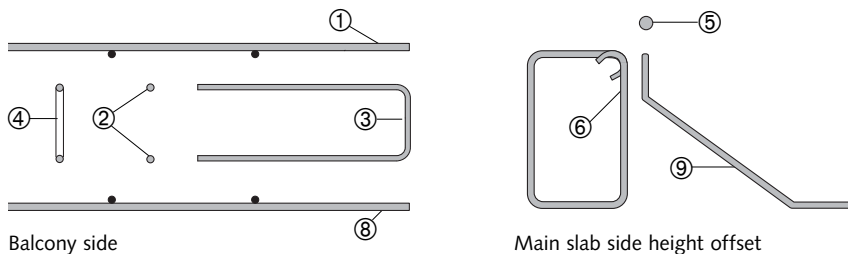


- No construction joints**
permissible in this area:
Balcony side → vertical
Wall side → vertical and horizontal

bx = building element thickness

Design as frame corner!
Recommended:
 $bx \geq \text{height HIT Element}$

On-site reinforcement HIT-...-OU (example)



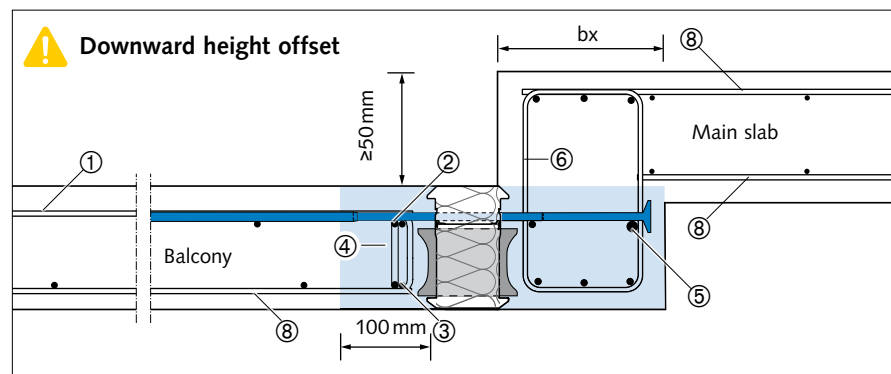
Note
Ensure that the anchor bolts are placed behind the vertical structural reinforcement (e.g. stirrup).

Position	Reinforcement details
① Upper connecting reinforcement, on balcony side	→ see also table on page 52
② Horizontal tensile edge reinforcement, lengthwise to the insulation joint	min. $2 \times \varnothing 8 \text{ mm}$
③ Onsite stirrup reinforcement $A_{s, \text{req}}$ balcony side	depending on load V_{Ed} and support type (direct or indirect), each HIT-Type → see also pages 60–63
④ Stirrups as end anchorage of the position ②	one stirrup on each side with min. $\varnothing 8 \text{ mm}$
④ Additional stirrups to secure the free edge of the balcony slab	acc. to EN 1992-1-1
⑤ Transverse reinforcement, close contact with the anchor heads	min. $\varnothing 12$
⑥ Required minimum stirrup reinforcement for load transfer from the HIT Insulated connection	→ see also pages 60–63
⑦ Required minimum reinforcement, stirrup or mesh reinforcement with statically required edge reinforcement for load transfer from the HIT Insulated connections	→ see also pages 60–63
⑧ Slab reinforcement; individual rebar or mesh reinforcement	must be specified by the structural engineer acc. to EN 1992-1-1
⑨ Constructive diagonal reinforcement	
⑩ Slab reinforcement as stirrup or mesh reinforcement with statically required edge reinforcement, upperside	

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVX-OD, HIT-SP MVX-OD

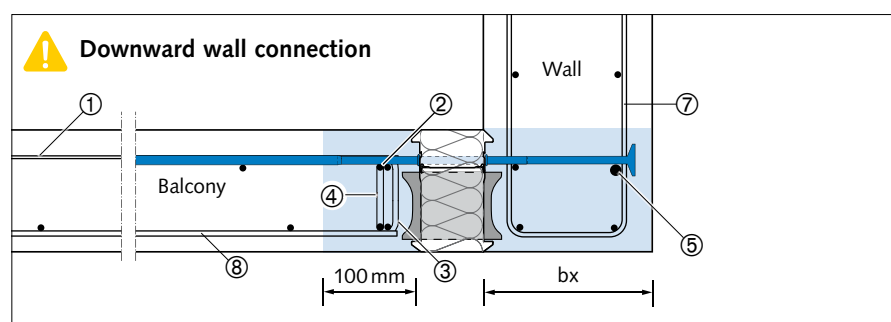
On-site reinforcement



No construction joints permissible in this area:
Balcony side → vertical
Main slab side → vert. and horizontal

bx = building element thickness

Design as frame corner!
Recommended:
 $bx \geq \text{HIT Element height}$

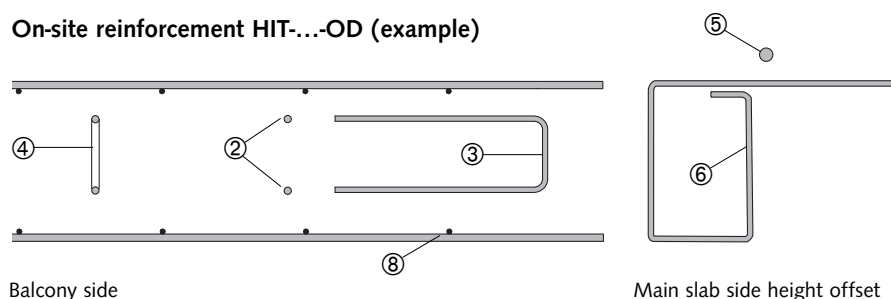


No construction joints permissible in this area:
Balcony side → vertical
Wall side → vertical and horizontal

bx = building element thickness

Design as frame corner!
Recommended:
 $bx \geq \text{HIT Element height}$

On-site reinforcement HIT-...-OD (example)



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

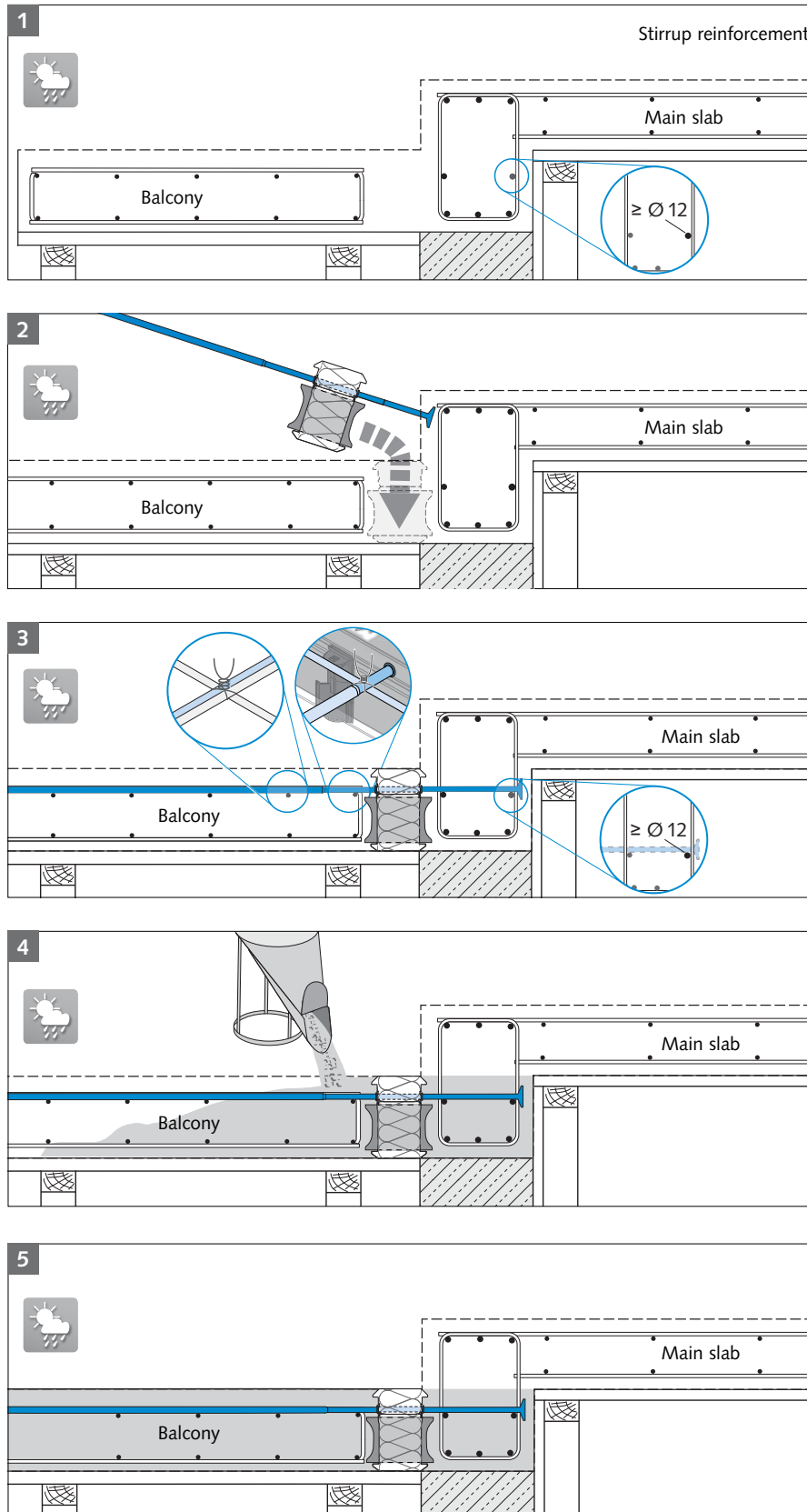
Ensure that the anchor bolts are placed behind the vertical structural reinforcement (e.g. stirrup).

Position	Reinforcement details
① Recommendation for upper connecting reinforcement, on balcony side	→ see also table on page 70
② Horizontal tensile edge reinforcement, lengthwise to the insulation joint	min. $2 \times \varnothing 8 \text{ mm}$
③ Onsite stirrup reinforcement $A_{s, \text{req}}$ balcony side	depending on load V_{Ed} and support type (direct or indirect), each HIT-Type → see also pages 64–67
④ Stirrups as end anchorage of the position ③	one stirrup on each side with min. $\varnothing 8 \text{ mm}$
④ Additional stirrups to secure the free edge of the balcony slab	acc. to EN 1992-1-1
⑤ Transverse reinforcement, close contact with the anchor heads	min. $\varnothing 12$
⑥ Required minimum stirrup reinforcement, for load transfer from the HIT Insulated connection	→ see also pages 64–67
⑦ Required minimum reinforcement- stirrup or mesh reinforcement with statically required edge reinforcement for load transfer from the HIT Insulated connections	→ see also pages 64–67
⑧ Slab reinforcement; individual rebar or mesh reinforcement	must be specified by the structural engineer acc. to EN 1992-1-1

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP MVX-OU, HIT-SP MVX-OU

Installation



1 Installation of on-site reinforcement

⚠ 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 the HIT Elements from above

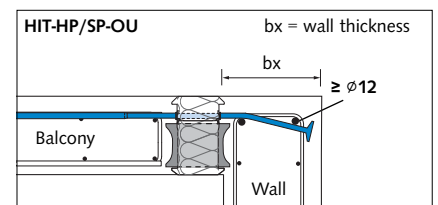
Check that the red arrows on the HIT Element and the CSB are pointing towards the balcony.

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

Transverse reinforcement: min. $\varnothing 12$ mm, must to be placed with close contact to the anchor bolts.



4 Pouring the concrete

Observe required expansion joints

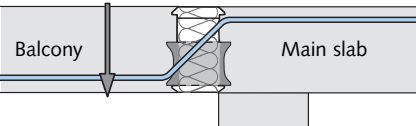
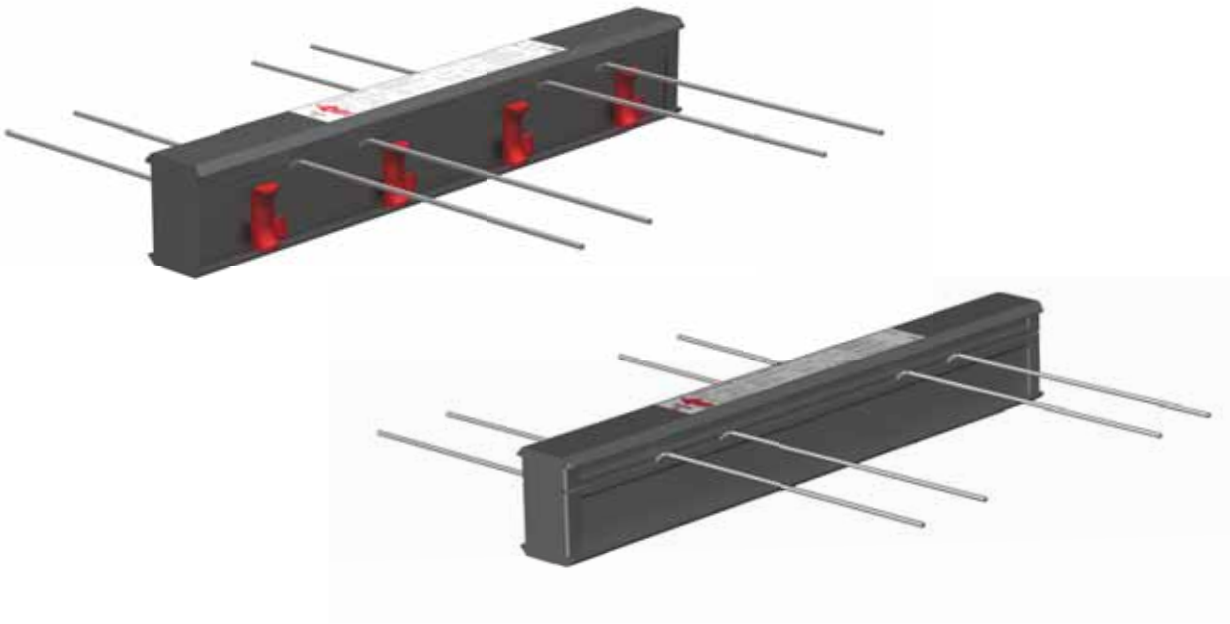
⚠ To ensure the HIT Elements are not displaced, pour and compact the concrete evenly.

5 Freshly concreted balcony slab on supporting structure

⚠ For element slab design please observe the notes on page 30.

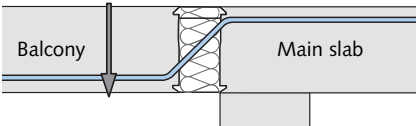
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE HIT-HP ZVX, HIT-SP ZVX

- 3
- For simply supported balcony slabs on columns
 - Transfers shear forces only



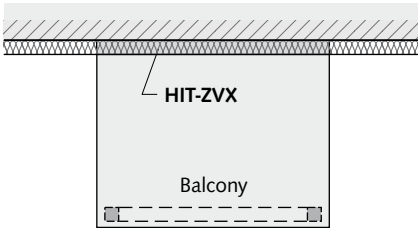
HIT-HP ZVX – High Performance
80 mm insulation thickness

HIT-SP ZVX – Superior Performance
120 mm insulation thickness



HIT-HP ZVX – High Performance
80 mm insulation thickness;
without CSB

HIT-SP ZVX – Superior Performance
120 mm insulation thickness;
without CSB



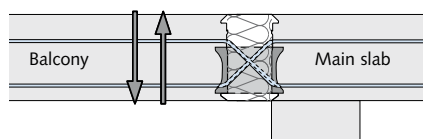
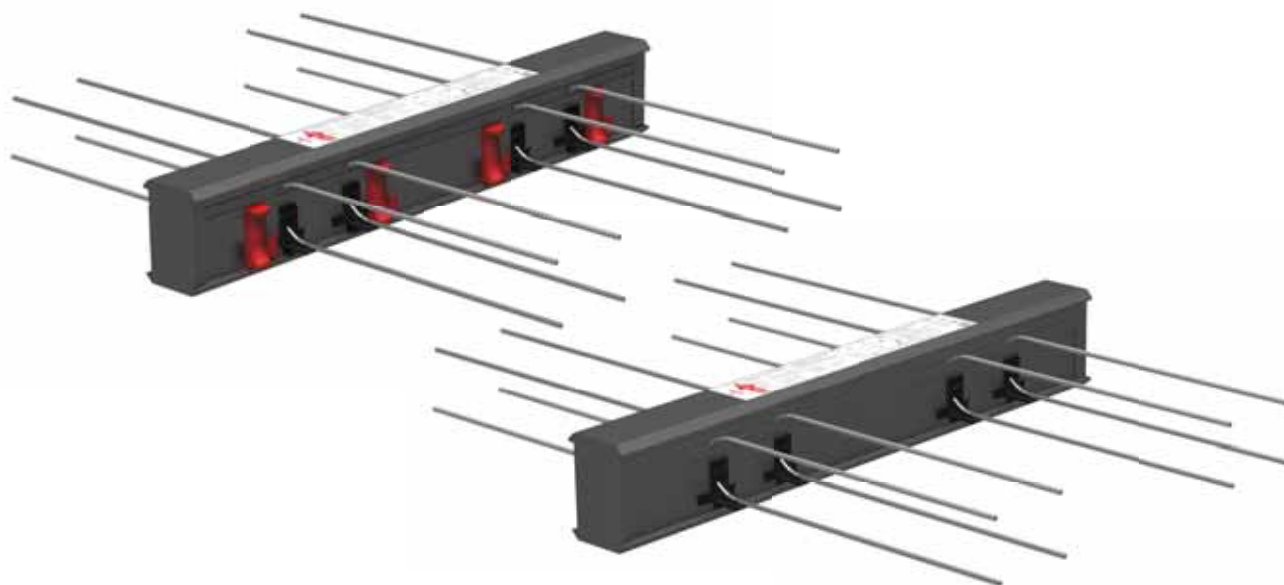
Application: Simply supported balcony on columns

Content	Type	Page
Product types / Load range	HIT-HP ZVX, HIT-SP ZVX	74
Product description	HIT-HP ZVX, HIT-SP ZVX	75
Load bearing capacity values	HIT-HP ZVX, HIT-SP ZVX	76
Application examples and joint spacings	HIT-HP ZVX, HIT-SP ZVX	97
On-site reinforcement	HIT-HP ZVX, HIT-SP ZVX	99
Installation	HIT-HP ZVX, HIT-SP ZVX	100

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

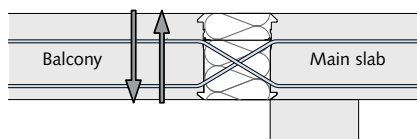
HIT-HP ZDX, HIT-SP ZDX

- For simply-supported balcony slabs on columns
- Transfers positive and negative shear forces



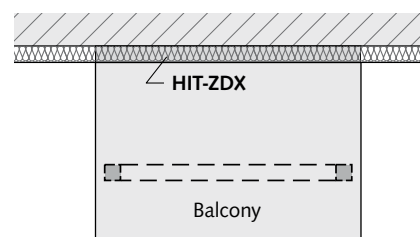
HIT-HP ZDX – High Performance
80 mm insulation thickness

HIT-SP ZDX – Superior Performance
120 mm insulation thickness



HIT-HP ZDX – High Performance
80 mm insulation thickness;
without CSB

HIT-SP ZDX – Superior Performance
120 mm insulation thickness;
without CSB



Application: Simply supported balcony on columns

Content	Type	Page
Product types / Load range	HIT-HP ZDX, HIT-SP ZDX	74
Product description	HIT-HP ZDX, HIT-SP ZDX	75
Load bearing capacity values	HIT-HP ZDX, HIT-SP ZDX	76
Application examples and joint spacings	HIT-HP ZDX, HIT-SP ZDX	97
On-site reinforcement	HIT-HP ZDX, HIT-SP ZDX	99
Installation	HIT-HP ZDX, HIT-SP ZDX	100

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP ZVX, HIT-SP ZVX / HIT-HP ZDX, HIT-SP ZDX

Product types – Load range

The load range selection table illustrates the possible combinations of support elements (shear bars and double-symmetrical CSB) depending on the element width. For HIT-ZDX Elements the number of shear bars is given for each load direction (in the following identified as "side").

Possible combinations of SB (Shear Bars) and CSB (Compression Shear Bearings)																													
Diameter of the shear bars [mm]		ø 6						ø 8						ø 10						ø 12									
Element width B = 25 cm		Number of shear bars n _{SB}																											
		1	2	3				1	2	3				2	3														
Number of compression shear bearings n _{CSB}	0	●	●	●				●	●	●				●	●														
	1	●	●					●	●					●															
Element width B = 33 cm		Number of shear bars n _{SB}																											
								2	3	4	5				2	3	4	5				2	3	4	5				
Number of compression shear bearings n _{CSB}	0								●	●	●					●	●	●				●	●	●					
	2							●	●					●	●						●	●							
Element width B = 50 cm		Number of shear bars n _{SB}																											
		1	2	3	4	5	6				1	2	3	4	5	6				2	3	4	5	6					
Number of compression shear bearings n _{CSB}	0		●	●	●	●	●					●	●	●	●	●				●	●	●	●	●					
	1	●	●	●	●						●	●	●							●									
	2		●	●	●							●	●	●						●	●	●							
	3																			●	●	●							
Element width B = 100 cm		Number of shear bars n _{SB}																											
		2	3	4	5	6	7	8	9–12	2	3	4	5	6	7	8	9–12	4	5	6	7	8	9–12	4	5	6	7	8	9–12
Number of compression shear bearings n _{CSB}	0			●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	2	●	●	●	●	●	●	●			●	●	●	●	●			●	●					●					
	3	●	●	●	●	●	●	●			●	●	●	●	●			●	●					●	●				
	4			●		●		●				●		●		●		●		●		●		●		●		●	
	6																	●		●		●		●		●		●	

Load bearing capacity values for selected elements can be found on the following pages. • = HP and SP



The complete type tested load class range for concrete grades C20/25 and ≥C25/30 can be downloaded from www.halfen.com.

Basic types – Ordering example

HIT-HP	ZVX	-	08 04	-	18	-	100	-	30	-	08
↓	↓		↓	↓	↓		↓	↓	↓		↓
①	②		③	④	⑤		⑥	⑦	⑧		⑨

Type description

- ① Product group
- ② Insulation thickness 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ ZVX: No. of shear bars
ZDX: No. of shear bars on each side
- ⑤ Number of CSB
- ⑥ Element height [cm]
- ⑦ Element width [cm]
- ⑧ Lower concrete cover [mm]
- ⑨ Diameter shear bars [mm]



HIT Custom solutions

Our technical support team is available to provide support for your project with custom solutions using HALFEN HIT Insulated connections

Contact: → see inside back cover

Possible main slab height h

Concrete cover [mm]	at the bottom: 30		on the top: ≥ 30	
Diameter of the shear bars [mm]	06	08	10	12
Possible main slab height h [cm]	16 – 35	16 – 35	17 – 35	18 – 35

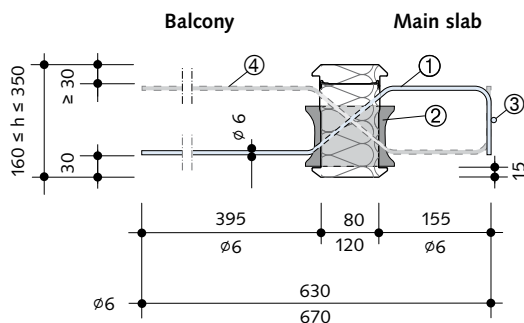
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP ZVX, HIT-SP ZVX / HIT-HP ZDX, HIT-SP ZDX

Product description – cross sections (typical applications)



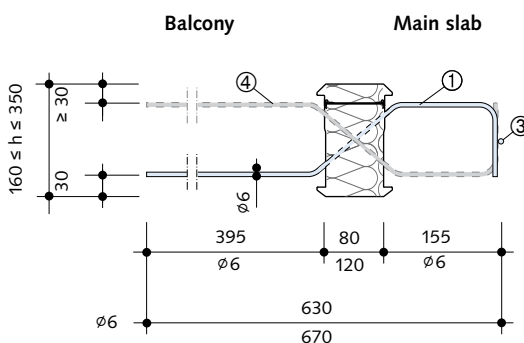
Figure: Type HIT-SP ZVX-0404-...-06
Bent bar type; shear bars $\phi 6$ mm
(also available for custom designs in $\phi 8$ mm)



Dimensions in [mm]

with no CSB for unrestraint connections, e.g. for loggias

Bent type; shear bars $\phi 6$ mm



Dimensions in [mm]

- ① Shear bars for HIT-ZVX Elements
- ② Double-symmetrical CSB
- ③ Structural transverse bar for shear bars $\phi 6$
- ④ Shear bars for transferring the shear loads upwards
(in the opposite direction) for HIT-ZDX Elements

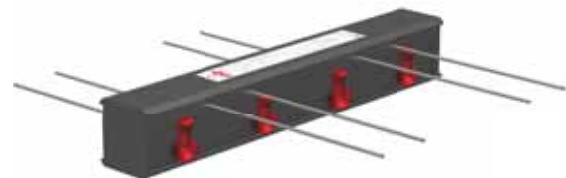
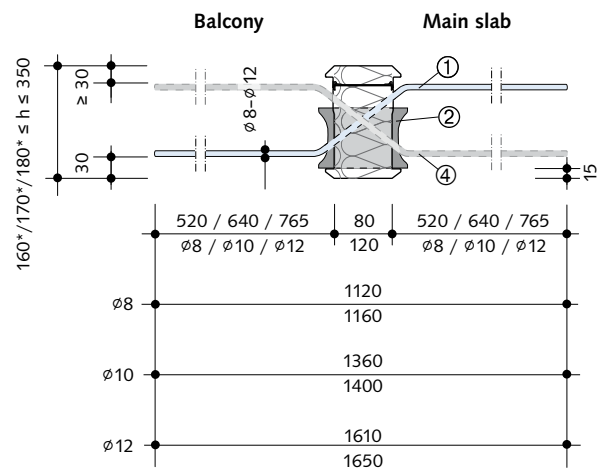
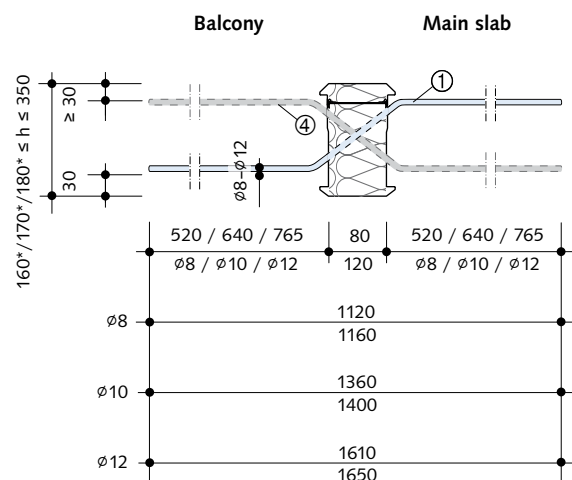


Figure: Type HIT-SP ZVX-0404-...-08
Straight bar type; shear bars $\phi 8$, $\phi 10$, $\phi 12$ mm
(also available for custom designs in $\phi 6$ mm)



Straight type; shear bars $\phi 8$, $\phi 10$, $\phi 12$ mm
(also available for custom designs in $\phi 6$ mm)



*smallest available element heights,
depending on the diameter of the shear bar:
 $\phi 6$ from 160 mm
 $\phi 8$ from 160 mm
 $\phi 10$ from 170 mm
 $\phi 12$ from 180 mm

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP ZVX, HIT-HP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø6 mm bar size



ZVX: Shear load capacity

V_{Rd}

ZDX: Shear load capacity

$\pm V_{Rd}$



Type / Element width	B = 1.00 m	0202-...-06		0302-...-06		0402-...-06		0502-...-06		0602-...-06	
	B = 0.50 m	—		—		0201-...-06		—		0301-...-06	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v _{Rd} [kN/m] for slab thickness [mm]	160 – 190	29.0	29.0	42.8	42.8	55.9	56.0	68.4	68.8	79.4	79.4
	200 – 210	29.7	29.7	43.8	43.8	57.6	57.6	70.7	70.9	83.3	83.3
	220 – 350	30.2	30.2	44.9	44.9	59.3	59.3	73.5	73.5	87.3	87.3

Type / Element width	B = 1.00 m	0403-...-06		0503-...-06		0603-...-06		0702-...-06		0703-...-06	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v _{Rd} [kN/m] for slab thickness [mm]	160 – 190	57.4	57.4	70.9	70.9	83.8	84.0	87.3	87.3	96.4	96.9
	200 – 210	58.7	58.7	72.7	72.7	86.4	86.4	92.8	92.8	99.6	99.8
	220 – 350	60.1	60.1	74.6	74.6	89.0	89.0	100.7	100.8	103.2	103.2



HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		Ø6/25 cm
Main slab	direct support	Ø6/20 cm
	indirect support	$0.26 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \text{Ø6}/20 \text{ cm}$



HIT-ZDX: On-site reinforcement $A_{s,req}$, on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct/indirect support	$0.26 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \text{Ø6}/20 \text{ cm}$
------------------------------	-------------------------	---



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP ZVX, HIT-HP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø8 mm bar size



HIT-ZVX: Shear load capacity V_{Rd}
HIT-ZDX: Shear load capacity $\pm V_{Rd}$



Type / Element width	B = 1.00 m	0202-...-08		0402-...-08		0502-...-08		0602-...-08		0804-...-08	
	B = 0.50 m	0101-...-08		0201-...-08		—		0301-...-08		0402-...-08	
	B = 0.25 m	—		—		—		—		0201-...-08	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v _{Rd} [kN/m] for slab thickness [mm]	160–190	49.3	49.4	85.2	85.2	98.5	98.5	111.8	111.8	170.4	170.4
	200–230	51.5	51.5	93.8	93.8	109.3	109.3	124.7	124.7	187.6	187.6
	240–350	53.0	53.0	102.2	102.3	121.5	121.5	139.4	139.4	204.3	204.7



HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony	Ø6/25 cm		
direct support	Ø6/25 cm		
Main slab indirect support	$0.26 \text{ cm}^2/\text{m} + V_{Ed}/f_{yd} \geq \text{Ø}6 / 25 \text{ cm}$	$0.29 \text{ cm}^2/\text{m} + V_{Ed}/f_{yd} \geq \text{Ø}6 / 25 \text{ cm}$	$0.46 \text{ cm}^2/\text{m} + V_{Ed}/f_{yd} \geq \text{Ø}6 / 25 \text{ cm}$



HIT-ZDX: On-site reinforcement $A_{s,req}$ on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct/indirect support	$0.26 \text{ cm}^2/\text{m} + V_{Ed}/f_{yd} \geq \text{Ø}6 / 25 \text{ cm}$	$0.29 \text{ cm}^2/\text{m} + V_{Ed}/f_{yd} \geq \text{Ø}6 / 25 \text{ cm}$	$0.46 \text{ cm}^2/\text{m} + V_{Ed}/f_{yd} \geq \text{Ø}6 / 25 \text{ cm}$
------------------------------	-------------------------	---	---	---



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP ZVX, HIT-HP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø10 mm bar size



ZVX: Shear load capacity

 V_{Rd}

ZDX: Shear load capacity

 $\pm V_{Rd}$ 

Type / Element width	B = 1.00 m	0402-...-10		0403-...-10		0404-...-10		0604-...-10		0804-...-10	
	B = 0.50 m	0201-...-10		—		0202-...-10		0302-...-10		0402-...-10	
	B = 0.25 m	—		—		—		—		0201-...-10	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v _{Rd} [kN/m] for slab thickness [mm]	170 – 190	115.2	115.2	131.2	131.2	146.9	147.2	188.7	188.7	230.3	230.3
	200 – 240	128.6	128.6	144.6	144.6	155.6	156.3	208.9	208.9	257.2	257.2
	250 – 350	143.9	143.9	159.1	159.4	162.4	162.4	231.8	231.8	287.8	287.9

HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		$\phi 6 / 25 \text{ cm}$		
Main slab	direct support	$\phi 6 / 25 \text{ cm}$		
	indirect support	$0.35 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$	$0.40 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$	$0.58 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$

HIT-ZDX: On-site reinforcement $A_{s,req}$ on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct/indirect support	$0.35 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$	$0.40 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$	$0.58 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$
------------------------------	-------------------------	--	--	--



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP ZVX, HIT-HP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø 12 mm bar size



ZVX: Shear load capacity

V_{Rd}

ZDX: Shear load capacity

$\pm V_{Rd}$



Type / Element width	B = 1.00 m	0503-...-12		0604-...-12		0804-...-12		0606-...-12		0806-...-12	
	B = 0.50 m	—		0302-...-12		0402-...-12		0303-...-12		0403-...-12	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v _{Rd} [kN/m] for slab thickness [mm]	180–210	188.6	191.9	243.6	243.6	251.5	255.8	275.6	275.6	335.5	335.5
	220–350	221.9	221.9	272.6	272.6	308.3	314.1	304.6	304.6	374.2	374.2



HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		Ø 6 / 25 cm		
Main slab	direct support	Ø 6 / 25 cm		
	indirect support	$0.60 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd}$ ≥ Ø 6 / 25 cm	$0.74 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd}$ ≥ Ø 6 / 25 cm	$0.86 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd}$ ≥ Ø 6 / 25 cm



HIT-ZDX: On-site reinforcement $A_{s,req}$ on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct/indirect support	$0.60 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd}$ ≥ Ø 6 / 25 cm	$0.74 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd}$ ≥ Ø 6 / 25 cm	$0.86 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd}$ ≥ Ø 6 / 25 cm
------------------------------	-------------------------	---	---	---



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP ZVX, HIT-HP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

ø8 mm and ø10 mm bar size



ZVX: Shear load capacity

 V_{Rd}

ZDX: Shear load capacity

 $\pm V_{Rd}$ 

Type / Element width	B = 0.33 m	0202-...-08		0302-...-08		B = 0.33 m	0202-...-10		0302-...-10	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30				30	Concrete strength: C20/25 ≥ C25/30			
Design values v _{Rd} [kN/m] for slab thickness [mm]	160–190	148.1	148.1	212.9	214.7	170–190	220.5	220.5	283.4	283.4
	200–230	155.0	155.0	225.2	225.2	200–240	233.7	233.7	313.6	313.6
	240–350	159.8	159.8	234.9	234.9	250–350	244.0	244.0	348.1	348.1

HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		ø6/25 cm			ø6/25 cm	
Main slab	direct support	ø6/25 cm			ø6/25 cm	
	indirect support	$0.44 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$	$0.60 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$		$0.60 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$	$0.71 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$

HIT-ZDX: On-site reinforcement $A_{s,req}$ on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct/indirect support	$0.44 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$	$0.60 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$		$0.60 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$	$0.71 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$
------------------------------	-------------------------	--	--	--	--	--



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP ZVX, HIT-HP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø12 mm bar size



ZVX: Shear load capacity
ZDX: Shear load capacity

V_{Rd}
 $\pm V_{Rd}$



Type / Element width	B = 0.33 m	0202-...-12	0302-...-12
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 $\geq$ C25/30	
Design values V_{Rd} [kN/m] for slab thickness [mm]	180–210	275.9	365.8
	220–350	304.9	409.3



HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		Ø6 / 25 cm
Main slab	direct support	Ø6 / 25 cm
	indirect support	0.74 cm ² /m + V_{Ed} / f_{yd} $\geq \text{Ø6} / 25 \text{ cm}$



HIT-ZDX: On-site reinforcement $A_{s,req}$ on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct / indirect support	0.74 cm ² /m + V_{Ed} / f_{yd} $\geq \text{Ø6} / 25 \text{ cm}$	0.86 cm ² /m + V_{Ed} / f_{yd} $\geq \text{Ø6} / 25 \text{ cm}$
------------------------------	---------------------------	---	---



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP ZVX, HIT-HP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø6 mm bar size



HIT-ZVX: Shear load capacity V_{Rd}
 HIT-ZDX: Shear load capacity $\pm V_{Rd}$



Type / Element width	B = 1.00 m	0400-...-06		0500-...-06		0600-...-06		0700-...-06	
	B = 0.50 m	0200-...-06		—		0300-...-06		—	
	B = 0.25 m	0100-...-06		—		—		—	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30							
Design values v _{Rd} [kN/m] for slab thickness [mm]	160–190	31.6	31.6	39.5	39.5	47.4	47.4	55.3	55.3
	200–210	34.8	34.8	43.5	43.5	52.2	52.2	60.8	60.8
	220–350	40.3	40.3	50.3	50.3	60.4	60.4	70.5	70.5

Type / Element width	B = 1.00 m	0800-...-06		0900-...-06		1000-...-06		1100-...-06	
	B = 0.50 m	0400-...-06		—		0500-...-06		—	
	B = 0.25 m	0200-...-06		—		—		—	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30							
Design values v _{Rd} [kN/m] for slab thickness [mm]	160–190	63.2	63.2	71.1	71.1	79.0	79.0	86.9	86.9
	200–210	69.5	69.5	78.2	78.2	86.9	86.9	95.6	95.6
	220–350	80.6	80.6	90.6	90.6	100.7	100.7	110.8	110.8

HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		Ø6/25 cm
Main slab	direct support	Ø6/20 cm
	indirect support	$V_{Ed} / f_{yd} \geq \text{Ø}6/20 \text{ cm}$

HIT-ZDX: On-site reinforcement $A_{s,req}$, on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct / indirect support	$V_{Ed} / f_{yd} \geq \text{Ø}6/20 \text{ cm}$
------------------------------	---------------------------	--



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP ZVX, HIT-HP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø8 mm bar size



HIT-ZVX: Shear load capacity V_{Rd}
HIT-ZDX: Shear load capacity $\pm V_{Rd}$



Type / Element width	B = 1.00 m	0700-...-08		0900-...-08		1000-...-08		1200-...-08	
	B = 0.50 m	—		—		0500-...-08		0600-...-08	
	B = 0.25 m	—		—		—		0300-...-08	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30							
Design values v _{Rd} [kN/m] for slab thickness [mm]	160–190	93.1	93.1	119.7	119.7	133.0	133.0	159.7	159.7
	200–230	108.2	108.2	139.1	139.1	154.5	154.5	185.4	185.4
	240–350	125.3	125.3	161.1	161.1	179.0	179.0	214.8	214.8



HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		Ø6/25 cm
Main slab	direct support	Ø6/25 cm
	indirect support	$V_{Ed} / f_{yd} \geq \text{Ø6/25 cm}$



HIT-ZDX: On-site reinforcement $A_{s,req}$ on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct/indirect support	$V_{Ed} / f_{yd} \geq \text{Ø6/25 cm}$
------------------------------	-------------------------	--



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP ZVX, HIT-HP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø10 mm and Ø12 mm bar size



HIT-ZVX: Shear load capacity V_{Rd}
 HIT-ZDX: Shear load capacity $\pm V_{Rd}$



Type / Element width	B = 1.00 m	0600-...-10		0700-...-10		1000-...-10		1200-...-10	
	B = 0.50 m	0300-...-10		—		0500-...-10		0600-...-10	
	B = 0.25 m	—		—		—		0300-...-10	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30							
Design values v _{Rd} [kN/m] for slab thickness [mm]	170–190	124.7	124.7	145.5	145.5	207.9	207.9	231.6	249.5
	200–240	144.9	144.9	169.0	169.0	241.5	241.5	269.1	289.8
	250–350	167.8	167.8	195.8	195.8	279.7	279.7	311.7	335.7

Type / Element width	B = 1.00 m	0600-...-12		0700-...-12		0800-...-12		1200-...-12	
	B = 0.50 m	0300-...-12		—		0400-...-12		0600-...-12	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30							
Design values v _{Rd} [kN/m] for slab thickness [mm]	180–210	179.6	179.6	209.5	209.5	239.5	239.5	333.6	359.2
	220–350	208.6	208.6	243.4	243.4	278.2	278.2	387.4	417.2

HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		Ø6/25 cm
Main slab	direct support	Ø6/25 cm
	indirect support	$V_{Ed} / f_{yd} \geq \text{Ø}6/25 \text{ cm}$

HIT-ZDX: On-site reinforcement $A_{s,req}$, on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct / indirect support	$V_{Ed} / f_{yd} \geq \text{Ø}6/25 \text{ cm}$
------------------------------	---------------------------	--



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP ZVX, HIT-HP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø 8 mm bar size



HIT-ZVX: Shear load capacity V_{Rd}
HIT-ZDX: Shear load capacity $\pm V_{Rd}$

Short unit

80

Type / Element width		B = 0.33 m	0300-...-08		0400-...-08		0500-...-08	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30						
Design values v _{Rd} [kN/m] for slab thickness [mm]	160–190	119.7	119.7	159.7	159.7	185.3	199.6	
	200–230	139.1	139.1	185.4	185.4	215.2	213.8	
	240–350	161.1	161.1	214.8	214.8	249.4	268.5	



HIT-ZVX: On-site reinforcement $A_{s,req}$

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



HIT-ZDX: On-site reinforcement $A_{s,req}$, on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct / indirect support	$V_{Ed} / f_{yd} \geq \text{Ø } 6 / 25 \text{ cm}$
------------------------------	---------------------------	--



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP ZVX, HIT-HP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

ø10 mm and ø12 mm bar size



HIT-ZVX: Shear load capacity V_{Rd}
HIT-ZDX: Shear load capacity $\pm V_{Rd}$



Type / Element width	B = 0.33 m	0300-...-10		0400-...-10		0500-...-10	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30					
Design values v _{Rd} [kN/m] for slab thickness [mm]	170-190	187.1	187.1	231.6	249.5	289.5	311.8
	200-240	217.3	217.3	269.1	289.8	336.3	362.2
	250-350	251.7	251.7	311.7	335.7	389.6	419.6

Type / Element width	B = 0.33 m	0200-...-12		0300-...-12		0400-...-12	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30					
Design values v _{Rd} [kN/m] for slab thickness [mm]	180-210	179.6	179.6	250.2	269.4	333.6	359.2
	220-350	208.6	208.6	290.6	312.9	387.4	417.2

HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		ø6 / 25 cm
Main slab	direct support	ø6 / 25 cm
	indirect support	$V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$

HIT-ZDX: On-site reinforcement $A_{s,req}$, on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct / indirect support	$V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$
------------------------------	---------------------------	---



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP ZVX / HIT-SP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø6 mm bar size



HIT-ZVX: Shear load capacity V_{Rd}
HIT-ZDX: Shear load capacity $\pm V_{Rd}$



Type / Element width	B = 1.00 m	0202-...-06		0302-...-06		0402-...-06		0502-...-06	
	B = 0.50 m	—		—		0201-...-06		—	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30							
Design values v _{Rd} [kN/m] for slab thickness [mm]	160–190	23.6	23.6	34.6	34.7	45.0	45.4	55.0	55.6
	200–210	24.9	24.9	36.7	36.8	48.0	48.2	58.8	59.3
	220–250	26.3	26.3	39.0	39.0	51.2	51.4	63.1	63.4

Type / Element width		B = 1.00 m		0503-...-06		0603-...-06		0702-...-06		0803-...-06	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v _{Rd} [kN/m] for slab thickness [mm]	160 – 190	57.2	57.5	67.6	68.1	73.2	74.7	87.2	88.3		
	200–210	60.7	60.9	71.9	72.3	79.0	80.2	93.4	94.3		
	220–350	64.7	64.7	76.9	77.0	85.8	86.6	100.5	101.0		



HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		Ø6 / 25 cm
Main slab	direct support	Ø6 / 20 cm
	indirect support	$0.28 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \text{Ø6} / 20 \text{ cm}$



HIT-ZDX: On-site reinforcement $A_{s,req}$ on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct / indirect support	$0.28 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \text{Ø6} / 20 \text{ cm}$
------------------------------	---------------------------	---



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP ZVX / HIT-SP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø 8 mm bar size



ZVX: Shear load capacity V_{Rd}
ZDX: Shear load capacity $\pm V_{Rd}$



Type / Element width	B = 1.00 m	0502-...-08		0503-...-08		0602-...-08		0604-...-08		0804-...-08	
	B = 0.50 m	—		—		0301-...-08		0302-...-08		0402-...-08	
	B = 0.25 m	—		—		—		—		0201-...-08	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v _{Rd} [kN/m] for slab thickness [mm]	160 – 190	85.4	86.6	92.7	94.3	97.1	97.6	113.0	114.6	143.6	146.9
	200–230	96.4	98.5	102.6	103.8	111.3	111.8	124.6	125.8	160.2	162.7
	240–350	105.8	107.3	110.7	111.4	123.4	124.7	134.0	134.7	174.1	175.6

HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		Ø 6 / 25 cm	
Main slab	direct support	Ø 6 / 25 cm	
	indirect support	$0.33 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \text{Ø} 6 / 25 \text{ cm}$	$0.49 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \text{Ø} 6 / 25 \text{ cm}$

HIT-ZDX: On-site reinforcement $A_{s,req}$, on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct / indirect support	$0.33 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \text{Ø} 6 / 25 \text{ cm}$	$0.49 \text{ cm}^2/\text{m} + V_{Ed} / f_{yd} \geq \text{Ø} 6 / 25 \text{ cm}$
------------------------------	---------------------------	--	--



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP ZVX / HIT-SP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø 10 mm bar size



ZVX: Shear load capacity V_{Rd}
ZDX: Shear load capacity $\pm V_{Rd}$



Type / Element width	B = 1.00 m	0402-...-10		0403-...-10		0604-...-10		0804-...-10		0806-...-10	
	B = 0.50 m	0201-...-10		—		0302-...-10		0402-...-10		0403-...-10	
	B = 0.25 m	—		—		—		0201-...-10		—	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v _{Rd} [kN/m] for slab thickness [mm]	170–190	99.8	100.3	111.3	114.0	162.6	166.4	199.6	200.6	222.6	227.9
	200–240	114.8	115.2	124.4	126.4	183.0	186.6	229.5	230.3	248.8	252.8
	250–350	127.6	128.6	135.3	136.7	200.1	202.6	255.3	257.2	270.6	273.4



HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony	Ø 6 / 25 cm		
direct support	Ø 6 / 25 cm		
Main slab	indirect support	0.37 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm	0.61 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm
			0.75 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm



HIT-ZDX: On-site reinforcement $A_{s,req}$, on balcony side and main slab side

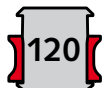
$V_{Ed} \uparrow \downarrow$	direct/indirect support	0.37 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm	0.61 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm	0.75 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm
------------------------------	----------------------------	--	--	--

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø 12 mm bar size



ZVX: Shear load capacity V_{Rd}
ZDX: Shear load capacity $\pm V_{Rd}$



Type / Element width	B = 1.00 m	0406-...-12		0804-...-12		0606-...-12		0806-...-12			
	B = 0.50 m	0203-...-12		0402-...-12		0303-...-12		0403-...-12			
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v _{Rd} [kN/m] for slab thickness [mm]	180–210	169.5	171.9	214.1	225.5	236.4	242.8	291.4	292.7		
	220–350	186.9	188.6	264.6	278.6	265.3	270.3	333.8	335.5		

– for on-site reinforcement see following page –

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP ZVX / HIT-SP ZDX

- continued from previous page -

On-site reinforcement		Ø 12 mm bar size			
Type / Element width	B = 1.00 m	0406-...-12	0804-...-12	0606-...-12	0806-...-12
	B = 0.50 m	0203-...-12	0402-...-12	0303-...-12	0403-...-12



HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		Ø 6 / 25 cm	
direct support		Ø 6 / 25 cm	
Main slab	indirect support	0.65 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm	0.90 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm



HIT-ZDX: On-site reinforcement $A_{s,req}$, on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct / indirect support	0.65 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm	0.90 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm
------------------------------	---------------------------	--	--

Load bearing capacity values according to EN 1992-1-1 (EC2) Ø 8 mm, Ø 10 mm bar size



ZVX: Shear load capacity

V_{Rd}

ZDX: Shear load capacity

± V_{Rd}

Short unit

120

Type / Element width		0202-...-08		0302-...-08		B = 0.33 m	0202-...-10		0302-...-10	
B = 0.33 m										
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30				30	Concrete strength: C20/25 ≥ C25/30			
Design values v _{Rd} [kN/m] for slab thickness [mm]	160–190	118.4	119.2	169.7	172.1	170–190	175.7	178.4	244.2	249.9
	200–230	129.1	129.8	187.1	188.8	200–240	194.0	195.9	274.7	280.1
	240–350	137.6	137.8	201.2	202.2	250–350	208.9	210.1	300.5	304.3



HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		Ø 6 / 25 cm			Ø 6 / 25 cm	
direct support		Ø 6 / 25 cm			Ø 6 / 25 cm	
Main slab	indirect support	0.47 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm	0.63 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm		0.63 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm	0.79 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm



HIT-ZDX: On-site reinforcement $A_{s,req}$, on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct / indirect support	0.47 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm	0.63 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm		0.63 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm	0.79 cm ² /m + V_{Ed} / f_{yd} ≥ Ø 6 / 25 cm
------------------------------	---------------------------	--	--	--	--	--

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP ZVX / HIT-SP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø 12 mm bar size



ZVX: Shear load capacity

V_{Rd}

ZDX: Shear load capacity

$\pm V_{Rd}$



Type / Element width	B = 0.33 m	0202-...-12	0302-...-12
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30	
Design values V_{Rd} [kN/m] for slab thickness [mm]	180-210	236.7	243.0
	220-350	265.6	270.5
		300.0	317.6
		345.0	365.8



HIT-ZVX: On-site reinforcement $A_{s,req}$

Balcony		Ø 6 / 25 cm
Main slab	direct support	Ø 6 / 25 cm
	indirect support	0.78 cm ² /m + $V_{Ed} / f_{yd} \geq \text{Ø 6} / 25 \text{ cm}$
		0.91 cm ² /m + $V_{Ed} / f_{yd} \geq \text{Ø 6} / 25 \text{ cm}$



HIT-ZDX: On-site reinforcement $A_{s,req}$ on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct / indirect support	0.78 cm ² /m + $V_{Ed} / f_{yd} \geq \text{Ø 6} / 25 \text{ cm}$	0.91 cm ² /m + $V_{Ed} / f_{yd} \geq \text{Ø 6} / 25 \text{ cm}$
------------------------------	---------------------------	---	---



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP ZVX / HIT-SP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø6 mm bar size



ZVX: Shear load capacity

 V_{Rd}

ZDX: Shear load capacity

 $\pm V_{Rd}$ Concrete strength: C20/25 $\geq$ C25/30

120

Type / Element width	B = 1.00 m	0400-...-06		0500-...-06		0600-...-06		0700-...-06	
	B = 0.50 m	—		—		0300-...-06		—	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30							
Design values v _{Rd} [kN/m] for slab thickness [mm]	160–190	26.1	26.1	32.6	32.6	39.1	39.1	45.6	45.6
	200–210	29.9	29.9	37.4	37.4	44.9	44.9	52.4	52.4
	220–350	34.8	34.8	43.5	43.5	52.2	52.2	60.8	60.8

Type / Element width	B = 1.00 m	0800-...-06		0900-...-06		1100-...-06		1200-...-06	
	B = 0.50 m	0400-...-06		—		—		0600-...-06	
	B = 0.25 m	0200-...-06		—		—		0300-...-06	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30							
Design values v _{Rd} [kN/m] for slab thickness [mm]	160–190	52.1	52.1	58.6	58.6	71.7	71.7	78.2	78.2
	200–210	59.9	59.9	67.4	67.4	82.3	82.3	89.8	89.8
	220–350	69.5	69.5	78.2	78.2	95.6	95.6	104.3	104.3

HIT-ZVX: On-site reinforcement $A_{s,req}$

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

HIT-ZDX: On-site reinforcement $A_{s,req}$ on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct / indirect support	$V_{Ed} / f_{yd} \geq \phi 6 / 20 \text{ cm}$
------------------------------	---------------------------	---



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP ZVX / HIT-SP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø 8 mm bar size



ZVX: Shear load capacity V_{Rd}
ZDX: Shear load capacity $\pm V_{Rd}$

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

120

Type / Element width	B = 1.00 m	0400-...-08		0600-...-08		0800-...-08		0900-...-08		1100-...-08	
	B = 0.50 m	0200-...-08		0300-...-08		0400-...-08		—		—	
	B = 0.25 m	0100-...-08		—		0200-...-08		—		—	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v _{Rd} [kN/m] for slab thickness [mm]	160–190	43.7	43.7	65.6	65.6	87.4	87.4	98.3	98.3	120.2	120.2
	200–230	53.2	53.2	79.8	79.8	106.4	106.4	119.7	119.7	146.3	146.3
	240–350	61.8	61.8	92.7	92.7	123.6	123.6	139.1	139.1	170.0	170.0



HIT-ZVX: On-site reinforcement $A_{s,req}$

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



HIT-ZDX: On-site reinforcement $A_{s,req}$ on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct / indirect support	$V_{Ed} / f_{yd} \geq \phi 6 / 25$ cm
------------------------------	---------------------------	---------------------------------------



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP ZVX / HIT-SP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø 10 mm bar size



ZVX: Shear load capacity
ZDX: Shear load capacity

V_{Rd}
 $\pm V_{Rd}$

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

120

Type / Element width	B = 1.00 m	0600-...-10		0700-...-10		0800-...-10		1000-...-10		1200-...-10	
	B = 0.50 m	0300-...-10		—		0400-...-10		0500-...-10		0600-...-10	
	B = 0.25 m	—		—		0200-...-10		—		0300-...-10	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v _{Rd} [kN/m] for slab thickness [mm]	170–190	102.4	102.4	119.5	119.5	136.6	136.6	170.7	170.7	190.3	204.9
	200–240	124.7	124.7	145.5	145.5	166.3	166.3	207.9	207.9	231.6	249.5
	250– 350	144.9	144.9	169.0	169.0	193.2	193.2	241.5	241.5	269.1	289.8

HIT-ZVX: On-site reinforcement $A_{s,req}$

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

HIT-ZDX: On-site reinforcement $A_{s,req}$, on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct/indirect support	$V_{Ed} / f_{yd} \geq \phi 6/25$ cm
------------------------------	-------------------------	-------------------------------------



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP ZVX / HIT-SP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

Ø12 mm bar size



ZVX: Shear load capacity

V_{Rd}

ZDX: Shear load capacity

$\pm V_{Rd}$

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

120

Type / Element width	B = 1.00 m	0600-...-12		0800-...-12		1000-...-12		1200-...-12	
	B = 0.50 m	0300-...-12		0400-...-12		0500-...-12		0600-...-12	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30							
Design values v _{Rd} [kN/m] for slab thickness [mm]	180–210	147.5	147.5	196.7	196.7	228.3	245.9	274.0	295.0
	220–350	179.6	179.6	239.5	230.5	278.0	299.3	333.6	359.2



HIT-ZVX: On-site reinforcement $A_{s,req}$

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



HIT-ZDX: On-site reinforcement $A_{s,req}$, on balcony side and main slab side

$V_{Ed} \uparrow \downarrow$	direct/indirect support	$V_{Ed} / f_{yd} \geq \phi 6 / 25 \text{ cm}$
------------------------------	----------------------------	---



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP ZVX / HIT-SP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2)

ø8 mm, ø10 mm and ø12 mm bar size

**ZVX: Shear load capacity** V_{Rd} **ZDX: Shear load capacity** $\pm V_{Rd}$ 

Type / Element width	B = 0.33 m	0300-...-08		0400-...-08		0500-...-08	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30					
Design values v _{Rd} [kN/m] for slab thickness [mm]	160–190	98.3	98.3	131.1	131.1	152.2	163.9
	200–230	119.7	119.7	159.7	159.7	185.3	199.6
	240–350	139.1	139.1	185.4	185.4	215.2	231.8

Type / Element width	B = 0.33 m	0300-...-10		0400-...-10		0500-...-10	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30					
Design values v _{Rd} [kN/m] for slab thickness [mm]	170–190	153.7	153.7	190.3	204.9	237.8	256.1
	200–240	187.1	187.1	231.6	249.5	289.5	311.8
	250–350	217.3	217.3	269.1	289.8	336.3	362.2

Type / Element width	B = 0.33 m	0200-...-12		0300-...-12		0400-...-12	
Concrete cover at the bottom [mm]	30	Concrete strength: C20/25 ≥ C25/30					
Design values v _{Rd} [kN/m] for slab thickness [mm]	180–210	147.5	147.5	205.5	221.3	274.0	295.0
	220–350	179.6	179.6	250.2	269.4	333.6	359.2

**HIT-ZVX: On-site reinforcement $A_{s,req}$**

Balcony		ø6/25 cm
Main slab	direct support	ø6/25 cm
	indirect support	$V_{Ed} / f_{yd} \geq \phi 6/25 \text{ cm}$

**HIT-ZDX: On-site reinforcement $A_{s,req}$ on balcony side and main slab side**

$V_{Ed} \uparrow \downarrow$	direct / indirect support	$V_{Ed} / f_{yd} \geq \phi 6/25 \text{ cm}$
------------------------------	---------------------------	---



All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.



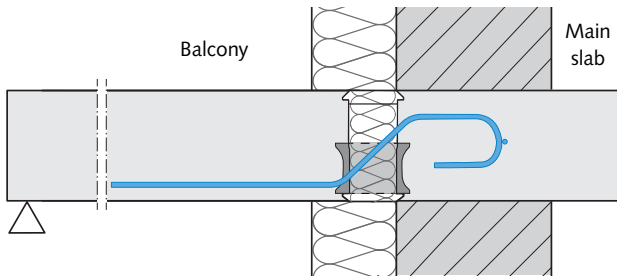
HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

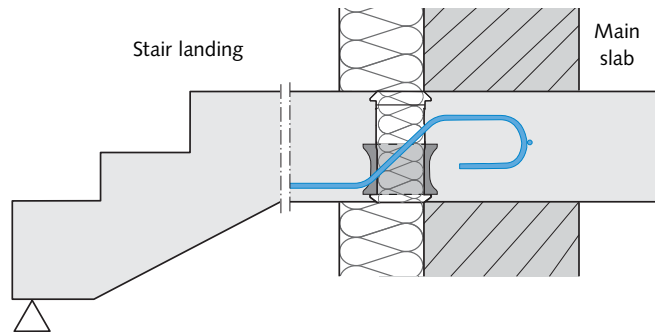
HIT-HP/SP ZVX, HIT-HP/SP ZDX

Application examples in wall cross sections

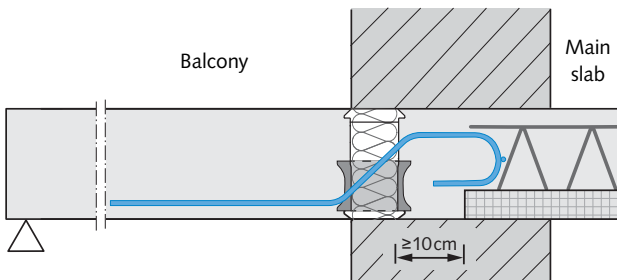
Installation diagram: Masonry cladded with ETICS (external thermal insulation composite system)



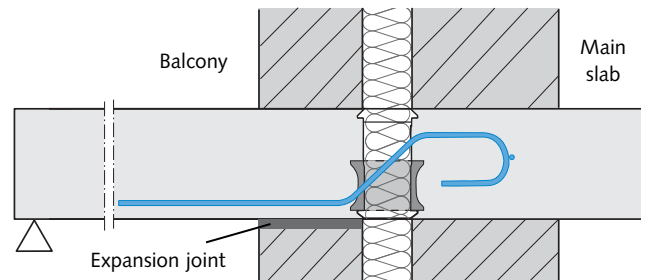
Installation diagram: Stair landing entrance to a building



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



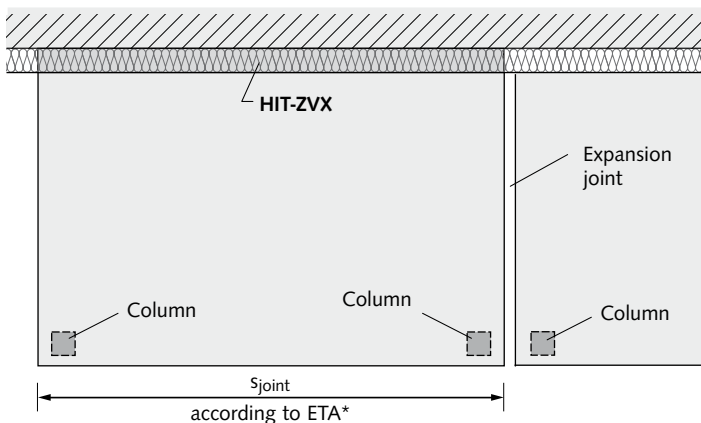
Installation diagram: Double-leaf masonry with balcony at main slab level



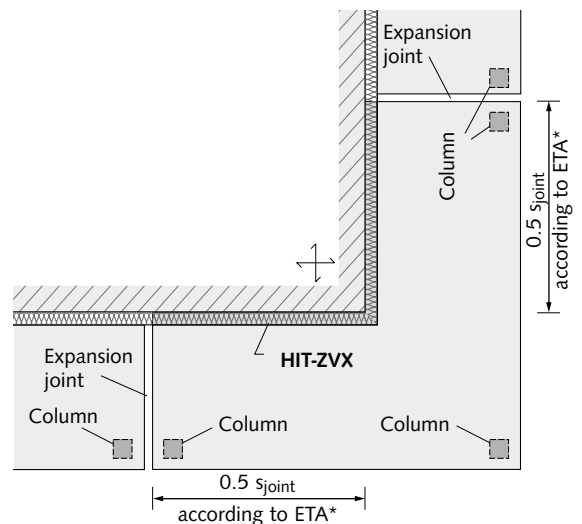
The dimension of the shear bars has been optimized.
During installation in main element slab the bars remain above the main element slab with all HIT heights.

Application examples / Expansion joint placement

Application 1: Expansion joint placement in linear balcony connections



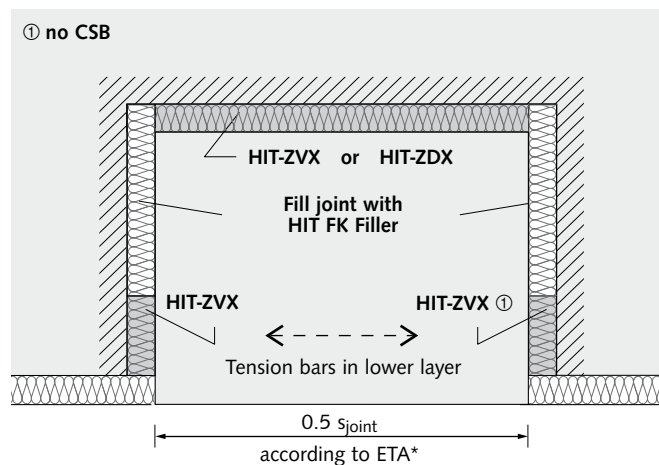
Application 2: Expansion joints in a corner balcony



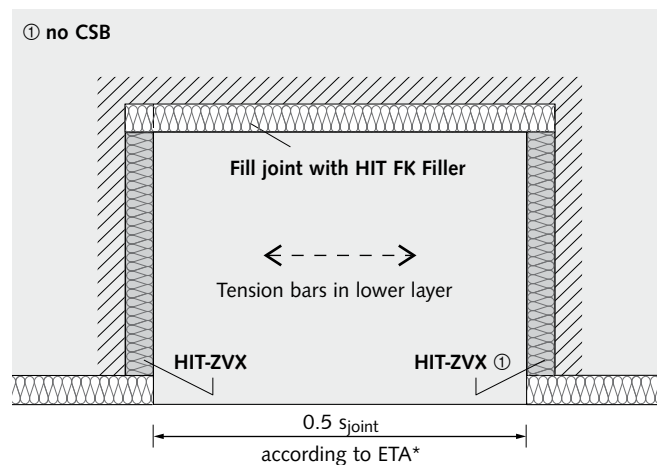
*see page 54

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE HIT-HP/SP ZVX, HIT-HP/SP ZDX

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

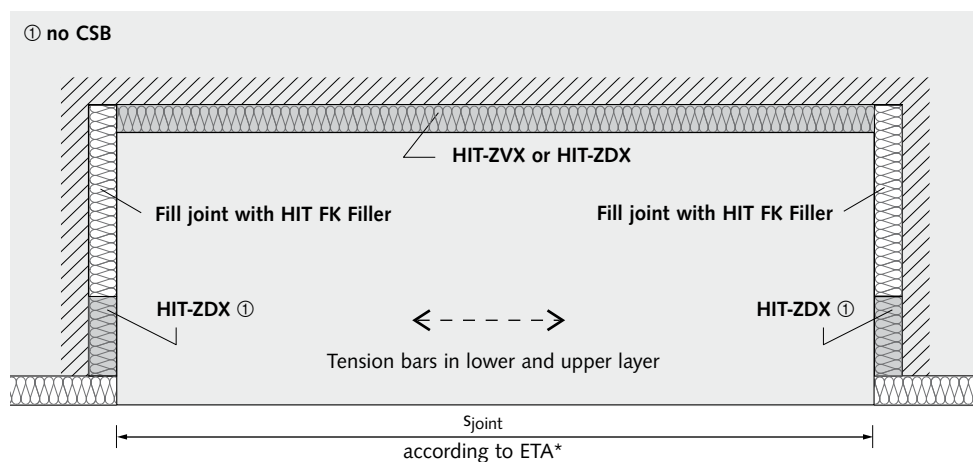


Application 4: Expansion joint location for two-side supported loggia (with CSB on the left or right)



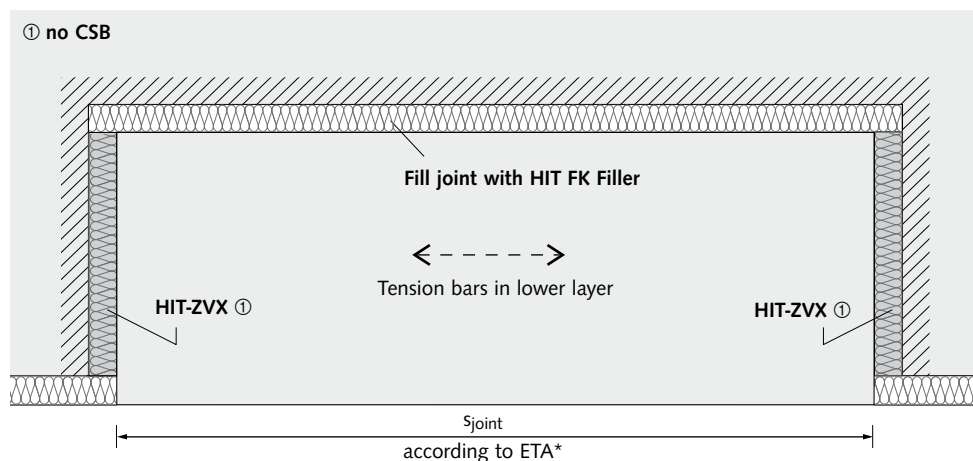
*see page 54

Application 5: Expansion joint for three-side supported loggia (left and right sides without CSB)



*see page 54

Application 6: Expansion joint for two-side supported loggia (left and right sides without CSB)

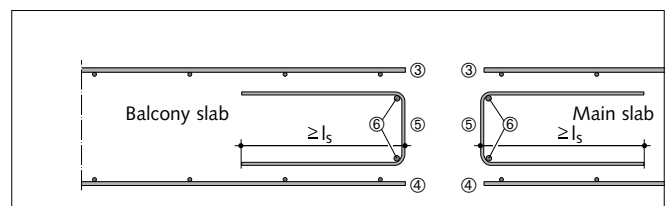
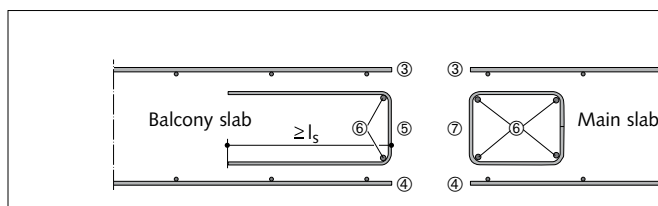
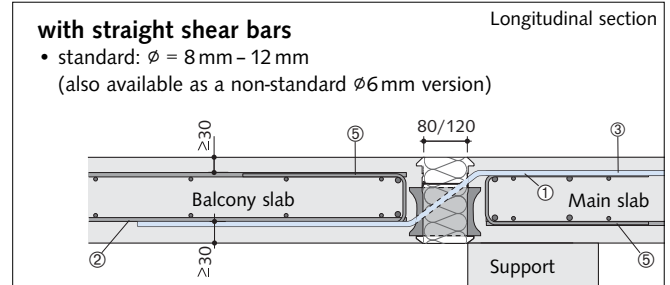
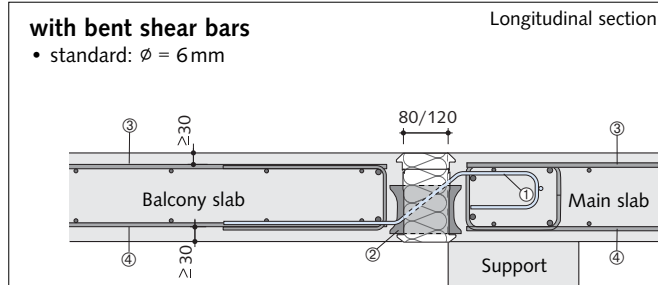


*see page 54

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP/SP ZVX, HIT-HP/SP ZDX

On-site reinforcement



Dimensions in [mm]

- ① HIT Shear bar ($\phi 6 \text{ mm}$ with load-bearing cross bar)
- ② Double-symmetrical CSB
- ③ Upper connecting reinforcement, steel bars or mesh
- ④ Lower connecting reinforcement, steel bars or mesh

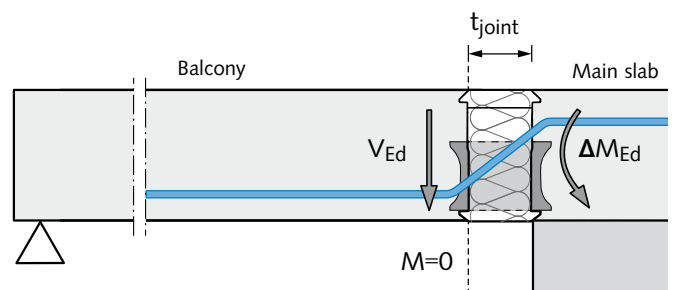
- ⑤ U-bar $\rightarrow A_{s, \text{req}}$, see pages 76–96
- ⑥ Transverse tensile reinforcement $\phi 8$
- ⑦ Edge reinforcement (min. $\phi 6/20$)

Moments from eccentric loads

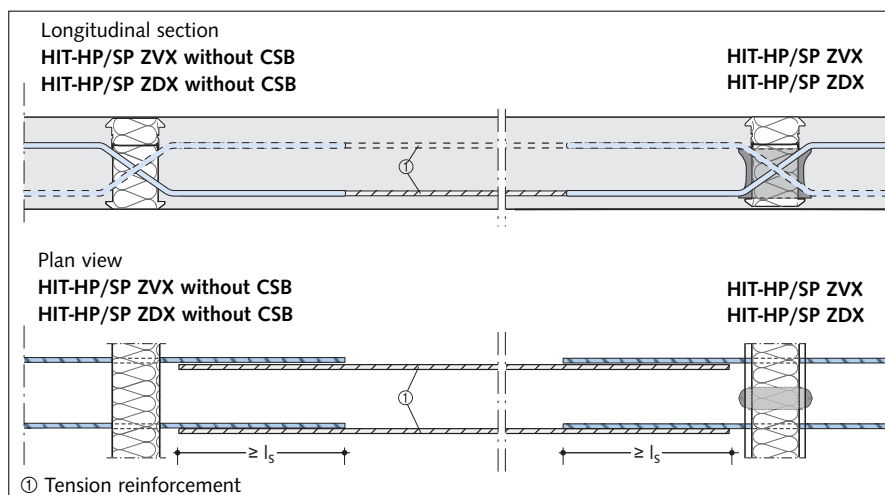
Moments resulting from an eccentric load must be considered when calculating for **HIT-HP/SP ZVX and ZDX with CSB**.
The following applies:

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

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



On-site transverse reinforcement



i Tension reinforcement

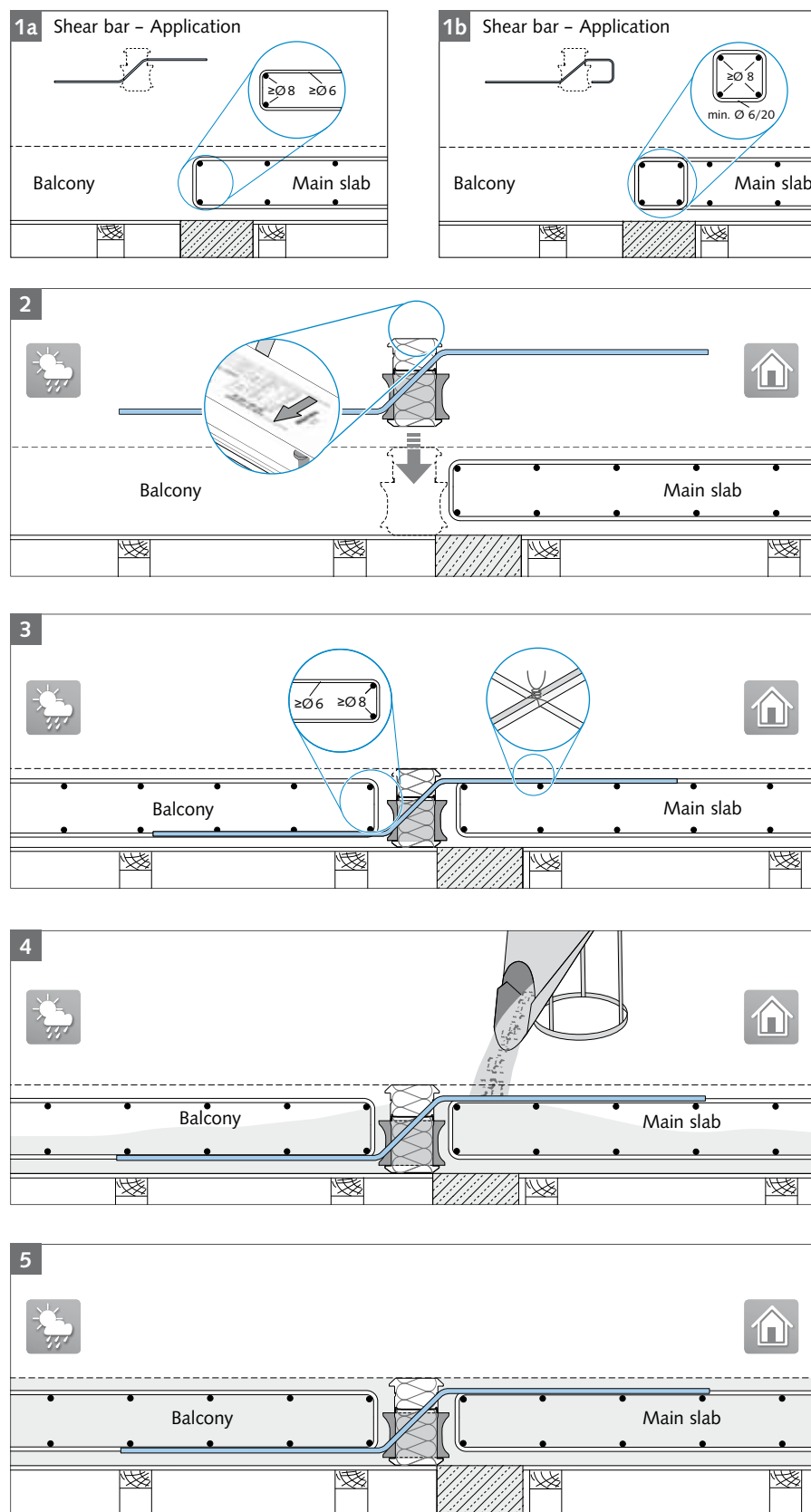
When placing the tension reinforcement in the balcony slab, each shear bar in the HIT Element (HP/SP ZVX or ZDX) must overlap with an on-site reinforcement bar of the same diameter.

The on-site bar must extend to the opposite HIT Element where it must also overlap with the shear bars.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP/SP ZVX, HIT-HP/SP ZDX

Installation

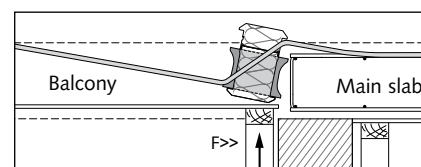


1 Installation of on-site reinforcement for the main slab

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

2 Installation of HIT Elements from above

HIT-ZDX Elements with bar diameters of $\varnothing 8$, 10 or 12 are symmetrical and do not have a dedicated installation direction.



! Ensure that the formwork is at the correct height!

3 Installation of the on-site reinforcement, balcony side

Fixing of the shear bars to on-site reinforcement using tying wire.

4 Pouring the concrete

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

5 Freshly poured concrete balcony slab on support structure

i Further installation diagrams for the types **HIT-HP/SP ZVX** and **HIT-HP/SP ZDX** can be found in the installation instructions – available for download at our website www.halfen.com.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

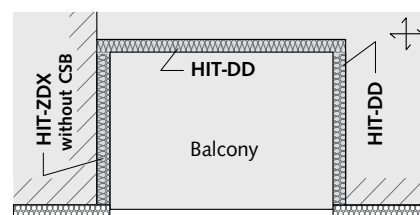
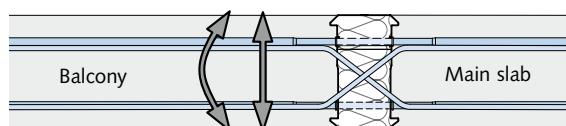
HIT-HP DD, HIT-SP DD

4

- For balcony slabs incorporated in the main slab
- Transfers positive and negative moments and shear forces



TYPE TESTED



Application: Continuous slab

HIT-HP DD – High Performance 80mm insulation thickness

HIT-SP DD – Superior Performance 120mm insulation thickness

Content	Type	Page
Product types / Load range	HIT-HP DD, HIT-SP DD	102
Load bearing capacity values	HIT-HP DD, HIT-SP DD	103
Product description	HIT-HP DD, HIT-SP DD	107
Elements with high load capacity	HIT-HP DVL/DDL	108
Installation	HIT-HP DD, HIT-HP DVL/DDL	114
Camber	HIT-HP DD, HIT-SP DD, HIT-HP DVL/DDL	115

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP DD, HIT-SP DD

Load range

All types are available with shear bar diameters 6 mm, 8 mm, 10 mm or 12 mm.

The following combinations of Shear Bar SB and Tension Bar TB are possible:

Possible combinations of support elements

Element width B = 25 cm		No. tension /compression bars n_{TB}											
		1	2										
Number of shear bars n_{SB}	1	●	●										
Element width B = 50 cm		Number of tension /compression bars n_{TB}											
			2	3	4	5	6						
Number of shear bars n_{SB}	2		●	●	●								
	3		●	●	●	●	●						
Element width B = 100 cm					Number of tension /compression bars n_{TB}								
					4	5	6	7	8	10	12	14	
Number of shear bars n_{SB}	4				●		●		●				
	6				●	●	●	●	●	●	●	●	
	7				●		●	●	●	●			
Load bearing capacity values for selected element can be found on the following pages ● = HP and SP													

Load bearing capacity values for selected element can be found on the following pages • = HP and SP



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

Basic types – Ordering example

HIT-HP	DD	-	10 07	-	18	-	100	-	35	-	06
HIT-HP	DD	-	xx yy	-	hh	-	bbb	-	cc	-	dd
↓	↓		↓	↓	↓		↓	↓	↓		↓
①	②		③	④	⑤		⑥	⑦	⑧		⑨

Type description

- ① Product group
- ② Insulation thickness 80 mm (HP)
120 mm (SP)
- ③ Connection type
- ④ No. tension/compression bars
- ⑤ No. shear bars on each side
- ⑥ Element height [cm]
- ⑦ Element width [cm]
- ⑧ Concrete cover on the top [mm]
- ⑨ Diameter shear bars [mm]



HIT Custom solutions

Our technical support team is available to provide support in your project with custom solutions using HALFEN HIT Insulated connections

Contact: → see inside back cover

Possible slab thickness h

Concrete cover, bottom: 30 mm / Concrete cover, top: 30, 35 mm				
Diameter of the shear bars [mm]	06	08	10	12
Possible main slab heights h [cm]	16–35	16–35	17–35	18–35
Concrete cover, bottom: 30 mm / Concrete cover, top: 50 mm				
Diameter of the shear bars [mm]	06	08	10	12
Possible main slab heights h [cm]	18–35	18–35	19–35	20–35

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE HIT-HP DD

Decoding the type selection: HIT-HP DD, tension/compression bars

Number of tension/compression bars xx		L = 1.00 m		05		07		10		12		14	
		L = 0.50 m		—		—		05		06		07	
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 ≥ C25/30									
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		20.4	20.4	28.6	28.6	40.8	40.8	49.0	49.0	55.5	57.2
		160	180	21.6	21.6	30.3	30.3	43.3	43.3	52.0	52.0	58.5	60.6
		170		22.9	22.9	32.0	32.0	45.8	45.8	54.6	54.9	61.5	64.1
		170	190	24.1	24.1	33.8	33.8	48.2	48.2	57.2	57.9	64.5	67.5
		180		25.3	25.3	35.5	35.5	50.7	50.7	59.8	60.8	67.5	70.9

Specifications

Main slab thickness: 18 cm Bending moment: $m_{Rd} \geq 50.7 \text{ kNm/m}$ Calculated number of tension/compression bars (xx): 10
Concrete strength: C20/25 Shear load*: $v_{Rd} \geq 55.3 \text{ kN/m}$ Calculated number of shear bars (yy)*: 07
Concrete cover: 35 mm

Compiled type description: HIT-HP DD-1007*-18-100-35-06

*Determine the shear bars for HIT-HP DD → see tables on page 104

Load bearing capacity values according to EN 1992-1-1 (EC2)



Moment bearing capacity $\pm m_{Rd}$



Number of tension/compression bars xx		L = 1.00 m		05		07		10		12		14	
		L = 0.50 m		—		—		05		06		07	
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 ≥ C25/30									
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		20.4	20.4	28.6	28.6	40.8	40.8	49.0	49.0	55.5	57.2
	160		180	21.6	21.6	30.3	30.3	43.3	43.3	52.0	52.0	58.5	60.6
		170		22.9	22.9	32.0	32.0	45.8	45.8	54.6	54.9	61.5	64.1
	170		190	24.1	24.1	33.8	33.8	48.2	48.2	57.2	57.9	64.5	67.5
		180		25.3	25.3	35.5	35.5	50.7	50.7	59.8	60.8	67.5	70.9
	180		200	26.6	26.6	37.2	37.2	53.1	53.1	62.3	63.8	70.5	74.4
		190		27.8	27.8	38.9	38.9	55.6	55.6	64.9	66.7	73.5	77.8
	190		210	29.0	29.0	40.6	40.6	57.8	58.1	67.5	69.7	76.5	81.3
		200		30.3	30.3	42.4	42.4	60.0	60.5	70.0	72.6	79.4	84.7
	200		220	31.5	31.5	44.1	44.1	62.1	63.0	72.6	75.6	82.4	88.2
		210		32.7	32.7	45.8	45.8	64.3	65.4	75.2	78.5	85.4	91.6
	210		230	33.9	33.9	47.5	47.5	66.4	67.9	77.7	81.5	88.4	95.1
		220		35.2	35.2	49.2	49.2	68.5	70.4	80.3	84.4	91.4	98.5
	220		240	36.4	36.4	51.0	51.0	70.7	72.8	82.9	87.4	94.4	101.9
		230		37.6	37.6	52.7	52.7	72.8	75.3	85.5	90.3	97.4	105.4
	230		250	38.9	38.9	54.4	54.4	75.0	77.7	88.0	93.3	100.4	108.8
		240		40.1	40.1	56.1	56.1	77.1	80.2	90.6	96.2	103.4	112.3
	240		260	41.3	41.3	57.9	57.9	79.2	82.7	93.2	99.2	106.4	115.7
		250		42.6	42.6	59.6	59.6	81.4	85.1	95.7	102.1	109.4	119.2
	250		270	43.8	43.8	61.3	61.3	83.5	87.6	98.3	105.1	112.4	122.6
	> 250		On request, please contact the HALFEN Technical Team. See inside back cover for contact information.										

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE HIT-HP DD

Load bearing capacity values according to EN 1992-1-1 (EC2)

Shear load capacity $\pm V_{Rd}$

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

80

Number of shear bars yy				L = 1.00 m		06		07		06		07	
				L = 0.50 m		03		—		03		—	
Shear bar diameter dd				ø6 mm				ø8 mm					
Concrete cover [mm]	30	35	50										
Design values V_{Rd} [kN/m] for slab thickness [mm]	160–190	160–190	180–210	47.4	47.4	55.3	55.3	79.9	79.9	83.6	93.2		
	200–230	200–230	220–250	52.2	52.2	60.9	60.9	92.8	92.8	108.2	108.2		
	240–350	240–350	260–350	60.5	60.5	70.5	70.5	107.5	107.5	125.4	125.4		

Number of shear bars yy				L = 1.00 m		06		07		06		07	
				L = 0.50 m		03		—		03		—	
Shear bar diameter dd				ø10 mm						ø12 mm			
Concrete cover [mm]	30	35	50										
Design values V_{Rd} [kN/m] for slab thickness [mm]	160	160	180	—	—	—	—	—	—	—	—	—	—
	170	170	190	124.8	124.8	145.6	145.6	—	—	—	—	—	—
	180	180	200	124.8	124.8	145.6	145.6	179.7	179.7	209.6	209.6		
	190	190	210	124.8	124.8	145.6	145.6	179.7	179.7	209.6	209.6		
	200	200	220	124.8	124.8	145.6	145.6	179.7	179.7	209.6	209.6		
	210	210	230	144.9	144.9	169.1	169.1	179.7	179.7	209.6	209.6		
	220	220	240	144.9	144.9	169.1	169.1	208.7	208.7	243.5	243.5		
	230	230	250	144.9	144.9	169.1	169.1	208.7	208.7	243.5	243.5		
	240	240	260	144.9	144.9	169.1	169.1	208.7	208.7	243.5	243.5		
	250–350	250–350	270–350	167.9	167.9	195.9	195.9	208.7	208.7	243.5	243.5		

All required verifications for the insulation and for load transfer have already been considered. Adjacent slabs must be verified by the planner.

Most of the elements are also available in 25 or 50 cm lengths. For further details on load bearing capacities please contact our technical support team → see inside back cover for contact details.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP DD

Decoding the type selection: HIT-SP DD, tension/compression bars

No. of tension/compression bars xx			L = 1.00 m	05		07		10		12		14	
			L = 0.50 m	—		—		05		06		07	
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 ≥ C25/30									
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		20.4	20.4	28.6	28.6	40.8	40.8	49.0	49.0	55.5	57.2
	160		180	21.6	21.6	30.3	30.3	43.3	43.3	52.0	52.0	58.5	60.6
		170		22.9	22.9	32.0	32.0	45.8	45.8	54.6	54.9	61.5	64.1
	170		190	24.1	24.1	33.8	33.8	48.2	48.2	57.2	57.9	64.5	67.5
		180		25.3	25.3	35.5	35.5	50.7	50.7	59.8	60.8	67.5	70.9

Specifications

Main slab thickness: 18 cm
Concrete strength: C25/30
Concrete cover: 35 mm

Bending moment: $m_{Rd} \geq 50.7$ kNm/m
Shear load*: $v_{Rd} \geq 45.6$ kNm/m

Calculated no. of tension/compression bars (**xx**): 10
Calculated no. of shear bars (**yy**)*: 07

Compiled type description: HIT-SP DD-1007*-18-100-35-06

*Determine the shear bars for HIT-SP DD → see tables on page 106

Load bearing capacity values according to EN 1992-1-1 (EC2)



Moment bearing capacity $\pm m_{Rd}$

120

No. of tension/compression bars xx		L = 1.00 m		05		07		10		12		14	
		L = 0.50 m		—		—		05		06		07	
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 ≥ C25/30									
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		20.4	20.4	28.6	28.6	40.8	40.8	49.0	49.0	55.5	57.2
	160		180	21.6	21.6	30.3	30.3	43.3	43.3	52.0	52.0	58.5	60.6
		170		22.9	22.9	32.0	32.0	45.8	45.8	54.6	54.9	61.5	64.1
	170		190	24.1	24.1	33.8	33.8	48.2	48.2	57.2	57.9	64.5	67.5
		180		25.3	25.3	35.5	35.5	50.7	50.7	59.8	60.8	67.5	70.9
	180		200	26.6	26.6	37.2	37.2	53.1	53.1	62.3	63.8	70.5	74.4
		190		27.8	27.8	38.9	38.9	55.6	55.6	64.9	66.7	73.5	77.8
	190		210	29.0	29.0	40.6	40.6	57.8	58.1	67.5	69.7	76.5	81.3
		200		30.3	30.3	42.4	42.4	60.0	60.5	70.0	72.6	79.4	84.7
	200		220	31.5	31.5	44.1	44.1	62.1	63.0	72.6	75.6	82.4	88.2
		210		32.7	32.7	45.8	45.8	64.3	65.4	75.2	78.5	85.4	91.6
	210		230	33.9	33.9	47.5	47.5	66.4	67.9	77.7	81.5	88.4	95.1
		220		35.2	35.2	49.2	49.2	68.5	70.4	80.3	84.4	91.4	98.5
	220		240	36.4	36.4	51.0	51.0	70.7	72.8	82.9	87.4	94.4	101.9
		230		37.6	37.6	52.7	52.7	72.8	75.3	85.5	90.3	97.4	105.4
	230		250	38.9	38.9	54.4	54.4	75.0	77.7	88.0	93.3	100.4	108.8
		240		40.1	40.1	56.1	56.1	77.1	80.2	90.6	96.2	103.4	112.3
	240		260	41.3	41.3	57.9	57.9	79.2	82.7	93.2	99.2	106.4	115.7
		250		42.6	42.6	59.6	59.6	81.4	85.1	95.7	102.1	109.4	119.2
	250		270	43.8	43.8	61.3	61.3	83.5	87.6	98.3	105.1	112.4	122.6
		> 250		On request, please contact the HALFEN Technical Team. See inside back cover for contact information.									

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE HIT-SP DD

Load bearing capacity values according to EN 1992-1-1 (EC2)



Shear load capacity in both directions

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

120

Number of shear bars yy				L = 1.00 m		06		07		06		07	
				L = 0.50 m		03		—		03		—	
Shear bar diameter dd				Ø6 mm				Ø8 mm					
Concrete cover [mm]	30	35	50										
Design values VRd [kN/m] for slab thickness [mm]	160–190	160–190	180–210	39.1	39.1	45.6	45.6	65.5	65.5	76.5	76.5		
	200–210	200–210	220–230	44.9	44.9	52.4	52.4	65.5	65.5	76.5	76.5		
	220–230	220–230	240–250	44.9	44.9	52.4	52.4	79.9	79.9	93.2	93.2		
	240–350	240–350	260–350	52.2	52.2	60.9	60.9	92.8	92.8	108.2	108.2		

Number of shear bars yy				L = 1.00 m		06		07		06		07	
				L = 0.50 m		03		—		03		—	
Shear bar diameter dd				Ø10 mm				Ø12 mm					
Concrete cover [mm]	30	35	50										
Design values VRd [kN/m] for slab thickness [mm]	160	160	180	—	—	—	—	—	—	—	—	—	—
	170	170	190	102.5	102.5	119.6	119.6	—	—	—	—	—	—
	180	180	200	102.5	102.5	119.6	119.6	147.6	147.6	172.2	172.2		
	190	190	210	102.5	102.5	119.6	119.6	147.6	147.6	172.2	172.2		
	200	200	220	102.5	102.5	119.6	119.6	147.6	147.6	172.2	172.2		
	210	210	230	102.5	102.5	119.6	119.6	147.6	147.6	172.2	172.2		
	220	220	240	124.8	124.8	145.6	145.6	179.7	179.7	209.6	209.6		
	230	230	250	124.8	124.8	145.6	145.6	179.7	179.7	209.6	209.6		
	240	240	260	124.8	124.8	145.6	145.6	179.7	179.7	209.6	209.6		
	250–350	250–350	270–350	144.9	144.9	169.1	169.1	179.7	179.7	209.6	209.6		



All required verifications have already been considered. The adjacent slabs must be verified by the planner.



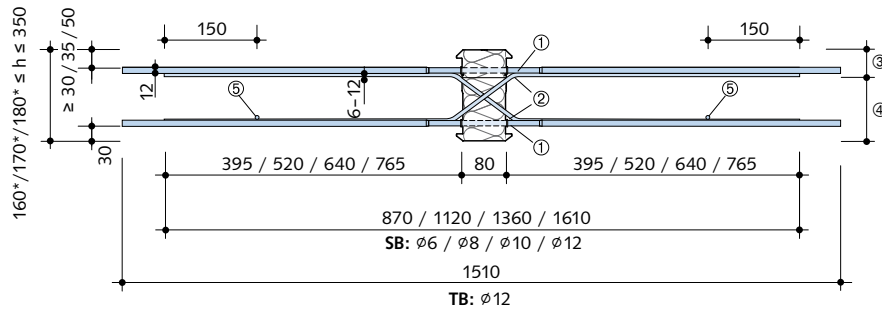
Most of the elements are also available in 25 or 50 cm lengths. For further details on load bearing capacities please contact our technical support team → see inside back cover for contact details.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP DD, HIT-SP DD

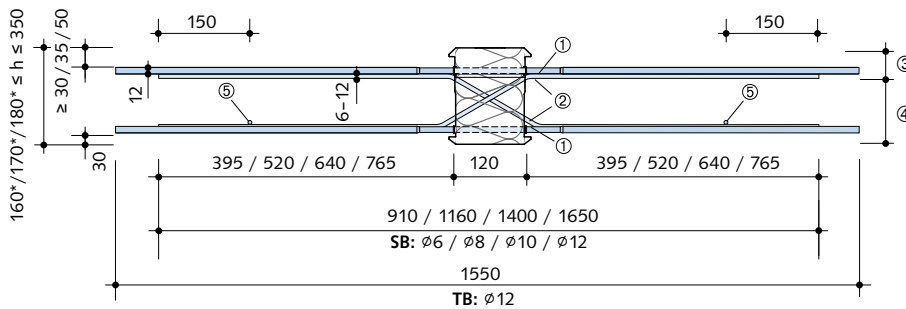
Product description – cross sections (typical applications)

HIT-HP DD – High Performance



Dimensions in [mm]

HIT-SP DD – Superior Performance



Dimensions in [mm]

- ① Tension/compression bars TB (Ø 12 mm)
- ② Shear bars SB (Ø 6 mm, Ø 8 mm, Ø 10 mm, Ø 12 mm)
- ③ Tension bar box (TB-Box)
- ④ Shear bar box
- ⑤ Installation bar, structural (Ø 6 mm)

* smallest available element height, depending on shear bar diameter: see table "Possible slab thickness h" (page 102)

On-site reinforcement: Diameter and stirrup spacing is dependent on V_{Ed} [kN/m]

Stirrup spacing s / bar diameter [mm]	Ø 6	Ø 8	Ø 10
$s \leq 25$ cm	49.2 kN/m	87.4 kN/m	136.6 kN/m
$s \leq 20$ cm	61.5 kN/m	109.3 kN/m	170.7 kN/m
$s \leq 15$ cm	82.0 kN/m	145.7 kN/m	227.7 kN/m
$s \leq 10$ cm	122.9 kN/m	218.5 kN/m	341.5 kN/m

Vertical hanger reinforcement*:

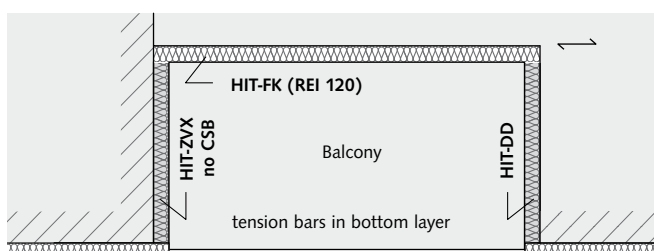
$$\min. A_{s,req} = \frac{V_{Ed}}{f_{yd}}$$

*in addition: horizontal transverse tensile reinforcement including end anchorage of at least 2 Ø 8 mm

Application examples

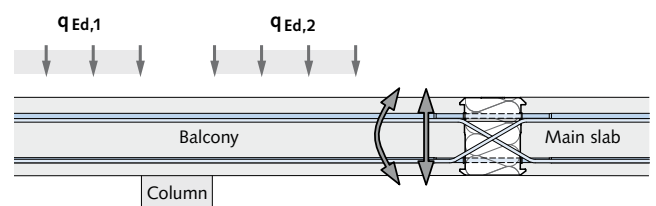
• Single axis tensioned main slab

For balcony slabs incorporated within a main slab, (continuous main slab) e.g. a loggia. The insulated connection transfers positive moments, negative moments and shear forces.



• Centrally supported cantilevered balcony

With variable load situations (see $q_{Ed,1}$ and $q_{Ed,2}$) positive and negative moments and shear forces in the balcony connection are to be expected.

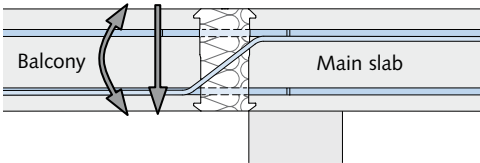


HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE HIT-HP DVL, HIT-HP DDL

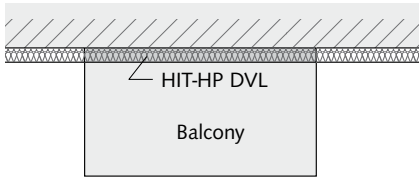
- Balcony connection with high load capacity values for cantilevered balcony slabs
- Transfers high shear forces and bi-directional moments

NEW

Higher load bearing capacity values for cantilevered slabs.



HIT-HP DVL – High Performance 80mm insulation thickness



Application: Cantilevered balcony

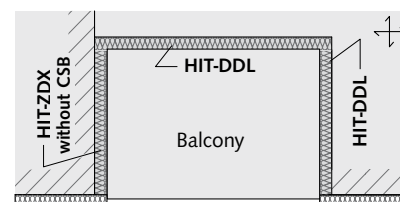
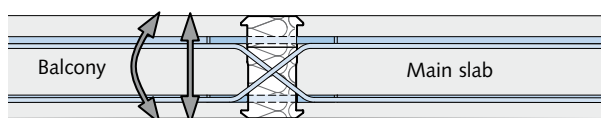
Content	Type	Page
Product types / Load range	HIT-HP DVL	110
Load bearing capacity values	HIT-HP DVL	111
Product description	HIT-HP DVL	113

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP DVL, HIT-HP DDL

- > Symmetrical connection with higher load capacity values for balcony slab incorporates in the main slab
- > Transfers bi-directional shear forces and moments

NEW Higher load bearing capacity values for **continuous** slabs.



Application: Continuous slab

HIT-HP DDL – High Performance 80 mm insulation thickness

Content	Type	Page
Product types / Load range	HIT-HP DDL	110
Load bearing capacity values	HIT-HP DDL	111
Product description	HIT-HP DDL	113

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP DVL, HIT-HP DDL

Load range

The following combinations of **shear bar SB ($\phi 8$ mm)** and **tension/compression bars TB ($\phi 14$ mm)** are possible:

Possible combinations of support elements

Element width B = 50 cm		Number of tension /compression bars n_{TB} $\phi 14$ mm	
		6	7
Number of shear bars n_{SB}	3	•	•
ϕ 8 mm, 10 mm, 12 mm	4	•	•

The following combinations of **shear bar SB ($\phi 12$ mm)** and **tension/compression bars TB ($\phi 14$ mm)** are possible:

Possible combinations of support elements

Element width B = 100 cm		Number of tension /compression bars n_{TB} $\phi 14$ mm				
		11	12	13	14	16
Number of shear bars n_{SB} ϕ 8 mm, 10 mm, 12 mm	5	•	•	•	•	•
	6	•	•	•	•	•
	7	•	•	•	•	•
	8	•	•	•	•	•
	9	•	•	•	•	•

Basic types – Ordering example

HIT-HP	DVL	- 13 08	- 18	- 100	- 35	- 12
HIT-HP	DDL	- xx yy	- hh	- bbb	- cc	- dd
↓	↓	↓	↓	↓	↓	↓
①	②	③	④ ⑤	⑥	⑦	⑧ ⑨

Type description

- ① Product group
- ② Insulation thickness 80 mm (HP)
- ③ Connection type
- ④ No. tension/compression bars
- ⑤ DVL: No. shear bars
DDL: No. shear bars on each side
- ⑥ Element height [cm]
- ⑦ Element width [cm]
- ⑧ Upper concrete cover [mm]
- ⑨ Diameter shear bars [mm]

Possible slab thickness h

Concrete cover, bottom: 30 mm / Concrete cover, top: 30, 35 mm			
Diameter of the shear bars [mm]	08	10	12
Possible main slab heights h [cm]	16–35	17–35	18–35
Concrete cover, bottom: 30 mm / Concrete cover, top: 50 mm			
Diameter of the shear bars [mm]	08	10	12
Possible main slab heights h [cm]	18–35	19–35	20–35

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE HIT-HP DVL, HIT-HP DDL

Decoding the type selection: HIT-HP DVL / HIT-HP DDL, tension/compression bars

Number of tension/compression bars xx		L = 1.00 m		11		13		16	
		L = 0.50 m		—		—		—	
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 ≥ C25/30:					
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		52.0	59.6	61.4	70.5	75.6	86.7
	160		180	55.2	63.3	65.2	74.8	80.3	92.1
		170		58.4	67.0	69.0	79.2	84.9	97.5
	170		190	61.6	70.7	72.8	83.5	89.6	102.8
		180		64.8	74.4	76.6	87.9	94.3	108.2

Specifications

Main slab thickness: 18 cm Bending moment: $m_{Rd} \geq 94.3$ kNm/m Calculated no. of tension/compression bars (**xx**): 16
Concrete strength: C25/30 Shear load*: $v_{Rd} \geq 239.5$ kN/m Calculated no. of shear bars (**yy**)*: 08
Concrete cover: 35 mm

Compiled type description HIT-HP DVL-1608*-18-100-35-12

*Determine the shear bars for HIT-HP DVL → see tables on page 112

Load bearing capacity values according to EN 1992-1-1 (EC2)



Moment bearing capacity $\pm m_{Rd}$



Number of tension/compression bars xx		L = 1.00 m		11		13		16	
		L = 0.50 m		—		—		—	
Concrete cover [mm]	30	35	50	Concrete strength: C20/25 ≥ C25/30:					
Design values m _{Rd} [kNm/m] for slab thickness [mm]		160		52.0	59.6	61.4	70.5	75.6	86.7
	160		180	55.2	63.3	65.2	74.8	80.3	92.1
		170		58.4	67.0	69.0	79.2	84.9	97.5
	170		190	61.6	70.7	72.8	83.5	89.6	102.8
		180		64.8	74.4	76.6	87.9	94.3	108.2
	180		200	68.0	78.0	80.4	92.2	98.9	113.5
		190		71.2	81.7	84.2	96.6	103.6	118.9
	190		210	74.4	85.4	88.0	100.9	108.3	124.2
		200		77.6	89.1	91.8	105.3	112.9	129.6
	200		220	80.9	92.8	95.6	109.6	117.6	134.9
		210		84.1	96.5	99.3	114.0	122.3	140.3
	210		230	87.3	100.1	103.1	118.3	126.9	145.6
		220		90.5	103.8	106.9	122.7	131.6	151.0
	220		240	93.7	107.5	110.7	127.0	136.3	156.3
		230		96.9	111.2	114.5	131.4	140.9	161.7
	230		250	100.1	114.9	118.3	135.7	145.6	167.1
		240		103.3	118.5	122.1	140.1	150.3	172.4
	240		260	106.5	122.2	125.9	144.4	154.9	177.8
		250		109.7	125.9	129.7	148.8	159.6	183.1
	250		270	112.9	129.6	133.5	153.1	164.3	188.5
> 250			On request, please contact the HALFEN Technical Team. See inside back cover for contact information.						

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP DVL, HIT-HP DDL

Load bearing capacity values according to EN 1992-1-1 (EC2)



DVL: Shear load capacity

DDL: Shear load capacity

V_{Rd}

$\pm V_{Rd}$

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



Number of shear bars yy				L = 1.00 m		06		07		08		09	
				L = 0.50 m		03		—		—		—	
Shear bar diameter dd				Ø8mm									
Concrete cover [mm]	30	35	50										
Design values V_{Rd} [kN/m] for slab thickness [mm]	160–190	160–190	180–210	79.8	79.8	93.1	93.1	106.4	106.4	119.7	119.7		
	200–230	200–230	220–250	92.7	92.7	108.2	108.2	123.6	123.6	139.1	139.1		
	240–250	240–250	—	107.4	107.4	125.3	125.3	143.2	143.2	161.1	161.1		

Number of shear bars yy				L = 1.00 m		05		06		07		08		09	
				L = 0.50 m		—		03		—		—		—	
Shear bar diameter dd				Ø12 mm											
Concrete cover [mm]	30	35	50												
Design values v_{Rd} [kN/m] for slab thickness [mm]	180–210	180–210	200–230	149.7	149.7	179.6	179.6	209.5	209.5	239.5	239.5	269.4	269.4		
	220–250	220–250	240–250	173.9	173.9	208.6	208.6	243.4	243.4	278.2	278.2	312.9	312.9		



All required verifications have already been considered. The adjacent slabs must be verified by the planner.



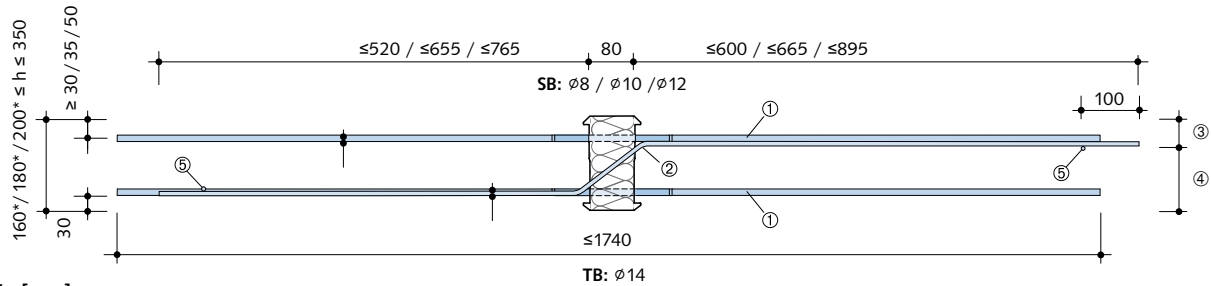
HALFEN HIT software is available at www.halfen.com to calculate connections for balcony projects.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP DVL, HIT-HP DDL

Product description – cross sections HIT-HP DVL

HIT-HP DVL – High Performance



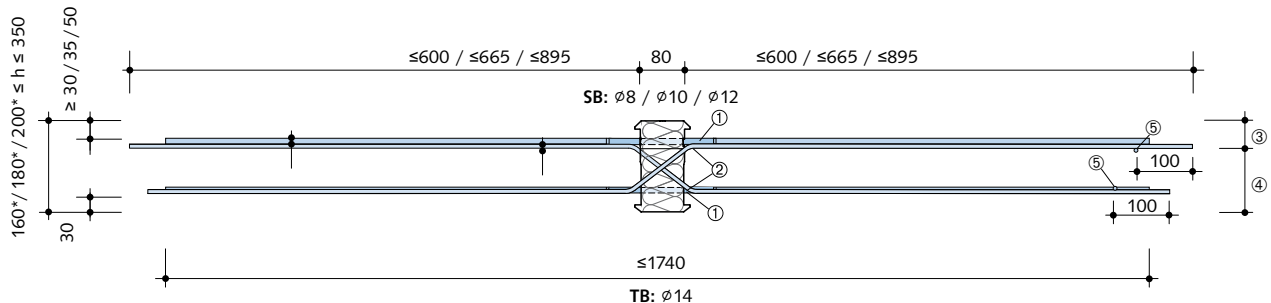
Dimensions in [mm]

- ① Tension/compression bars TB ($\varnothing$ 14 mm)
- ② Shear bars SB ($\varnothing$ 8 mm, $\varnothing$ 10 mm, $\varnothing$ 12 mm)
- ③ Tension bar box TB-Box
- ④ Shear bar box
- ⑤ Installation bar, structural ($\varnothing$ 6 mm)

* smallest available element height, depending on shear bar diameter: see table "Possible slab thickness h" (page 110)

Product description – cross sections HIT-HP DDL

HIT-HP DDL – High Performance



Dimensions in [mm]

- ① Tension/compression bars TB ($\varnothing$ 14 mm)
- ② Shear bars SB ($\varnothing$ 8 mm, $\varnothing$ 10 mm, $\varnothing$ 12 mm)
- ③ Tension bar box TB-Box
- ④ Shear bar box
- ⑤ Installation bar, structural ($\varnothing$ 6 mm)

* smallest available element height, depending on shear bar diameter: see table "Possible slab thickness h" (page 110)

On-site reinforcement, on balcony side and main slab side: Diameter and stirrup spacing is dependent on V_{Ed} [kN/m]

Stirrup spacing s / bar diameter [mm]	$\varnothing$ 8	$\varnothing$ 10
s $\leq$ 25 cm	87.4 kN/m	136.6 kN/m
s $\leq$ 20 cm	109.3 kN/m	170.7 kN/m
s $\leq$ 15 cm	145.7 kN/m	227.7 kN/m
s $\leq$ 10 cm	218.5 kN/m	341.5 kN/m

Vertical hanger reinforcement*:

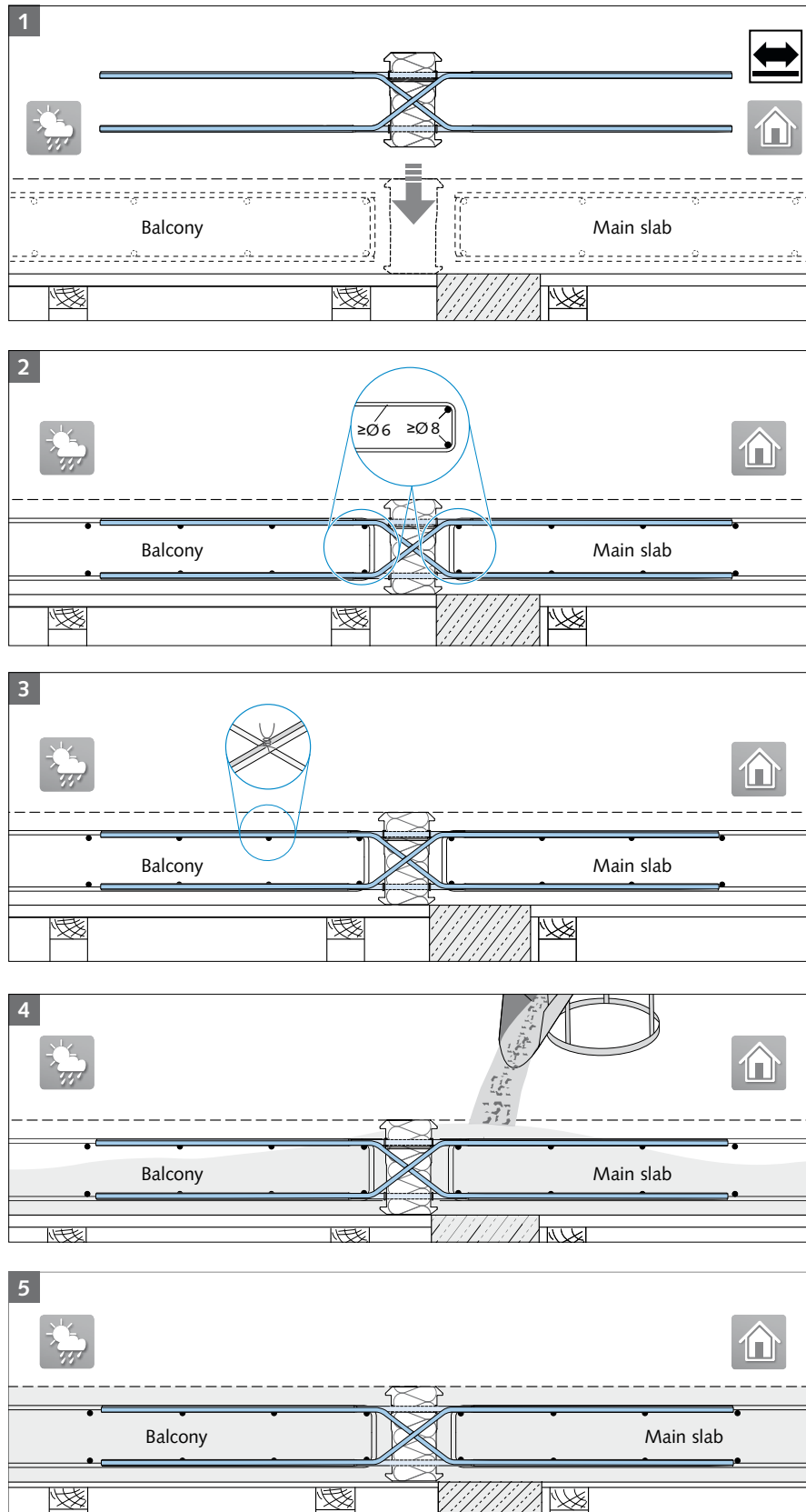
$$\min. A_{s,req} = \frac{V_{Ed}}{f_{yd}}$$

*in addition: horizontal transverse tensile reinforcement including end anchorage of at least $2 \times \varnothing$ 8 mm

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP/SP DD, HIT-HP DVL, HIT-HP DDL

Installation



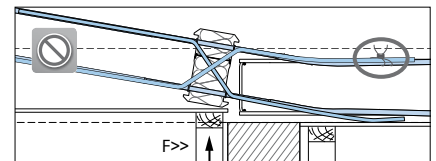
1 Positioning the HIT Element from above

i Elements HIT-HP/SP DD and HIT-HP DDL are symmetrical; therefore both installation directions are correct.

2 Installing on-site reinforcement

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

3 Fixing the tension bars and the shear bars to on-site reinforcement using tying wire



! Ensure the formwork is at the correct height!

4 Pouring the concrete

! To ensure the HIT Elements are securely installed, pour and compact the concrete evenly. Ensure all HIT Elements are securely fixed.

5 Freshly concreted balcony slab on supporting structure

i For further installation instructions please visit www.halfen.com.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP/SP DD, HIT-HP DVL, HIT-HP DDL

Camber in the balcony slab

The deformation of the slab connection and the corresponding required camber in the formwork results from the component deformation according to DIN EN 1992-1-1 plus the elevation $\ddot{u}$ from the elastic deformation of the framework in the insulation joint and load induction zone.

The deformation and camber values in the table result from the calculated torsions α_M of the HALFEN Elements HIT-HP DD and HIT-SP DD, as well as the HIT-HP DVL and HIT-HP DDL as a result of unit $M_{Ed} = 1 \text{ kNm}$. These values refer exclusively to the deformation factor of the HIT Element.

$$\ddot{u} = \ddot{u}^* / n \cdot l_k \cdot M_{Ed(GZG)} [\text{mm}]$$

with

$n = n_{TB/CB}$, no. of tension/compression bars per metre [1/m]
 l_k = Cantilever length [m]
 $M_{Ed(GZG)}$ = acting moment in load case GZG [kNm/m]
 $\ddot{u}^*$ = Camber coefficient [‰]

HIT-DD/-DVL/-DDL: Camber $\ddot{u}^*$

Slab thickness [mm]			HIT-HP DD	HIT-SP DD	HIT-HP DVL HIT-HP DDL
Concrete cover [mm]					
30	35	50	ü*[%]	ü*[%]	ü*[%]
	160		8.60	9.39	6.03
160		180	7.65	8.35	5.35
	170		6.85	7.48	4.78
170		190	6.17	6.74	4.30
	180		5.59	6.10	3.88
180		200	5.08	5.55	3.52
	190		4.64	5.07	3.21
190		210	4.26	4.65	2.94
	200		3.92	4.28	2.70
200		220	3.62	3.95	2.49
	210		3.35	3.66	2.31
210		230	3.11	3.40	2.14
	220		2.90	3.16	1.99
220		240	2.71	2.95	1.86
	230		2.53	2.76	1.74
230		250	2.37	2.59	1.63
	240		2.23	2.44	1.53
240		260	2.10	2.29	1.44
	250		1.98	2.16	1.35
250		270	1.87	2.04	1.28

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP/SP HT1-5

5

- Symmetrical additional elements with 80 mm and 120 mm insulation thickness
- Transfer of planned horizontal forces parallel and/or perpendicular to the insulation plane



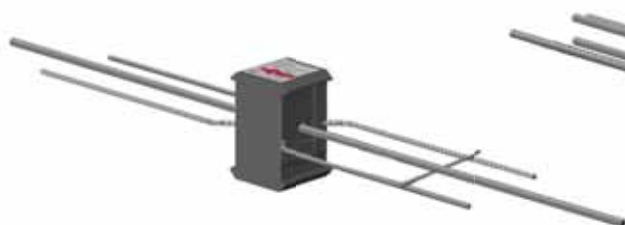
HIT-HP HT1



HIT-HP HT2



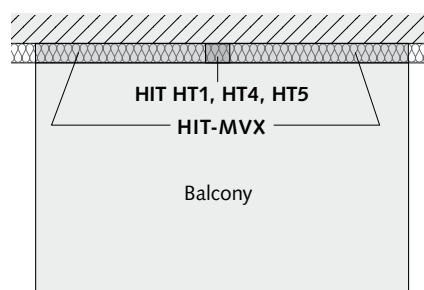
HIT-HP HT3



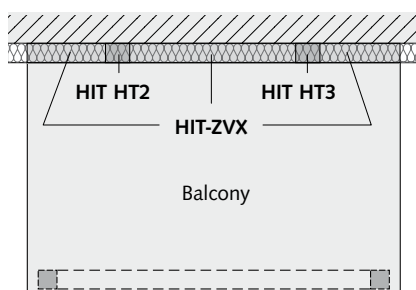
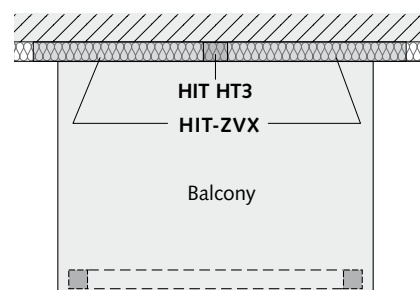
HIT-HP HT4



HIT-HP HT5



Application: Cantilevered balcony

Application: Simply supported balcony
on columnsApplication: Simply supported balcony
on columns

HIT-HP HT1-5 – High Performance with 80 mm insulation thickness
HIT-SP HT1-5 – Superior Performance with 120 mm insulation thickness

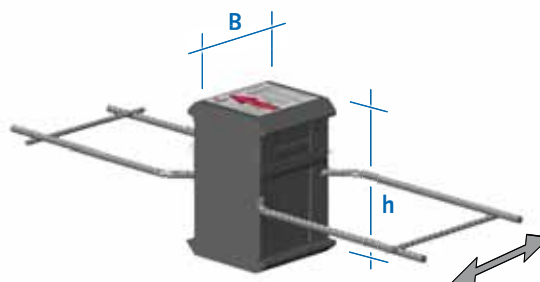
Content	Type	Page
Product variations / load bearing capacities	HIT-HP HT1, HIT-SP HT1	117
Product variations / load bearing capacities	HIT-HP HT2, HIT-SP HT2	118
Product variations / load bearing capacities	HIT-HP HT3, HIT-SP HT3	119
Positioning / joint spacings	HIT-HP HT1-3, HIT-SP HT1-3	120
Product variations / load bearing capacities	HIT-HP HT4, HIT-SP HT4	121
Product variations / load bearing capacities	HIT-HP HT5, HIT-SP HT5	122
Positioning / joint spacings	HIT-HP HT4-5, HIT-SP HT4-5	124

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP HT1, HIT-SP HT1

Ordering example

HIT-HP	HT1	-	hh	-	010
HIT-SP	HT1	-	hh	-	015
↓	↓		↓		↓
①	②		③		⑤



Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Element height [cm]
- ⑤ Element width [cm]

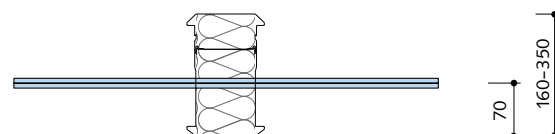
Load bearing capacities and dimensions



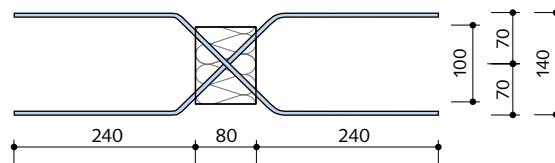
Horizontal forces
parallel to the insulation plane

HIT-HP/SP HT1 Components			Design values			
Reinforcement		Element width B	C20/25		C25/30	
Shear bars	Tension/compression bars	HIT-HP HIT-SP [mm]	$H_{Rd \parallel}$ [kN/element]	$H_{Rd \perp}$ [kN/element]	$H_{Rd \parallel}$ [kN/element]	$H_{Rd \perp}$ [kN/element]
2x $\varnothing 8$	—	100 150	±9.9	0	±11.5	0

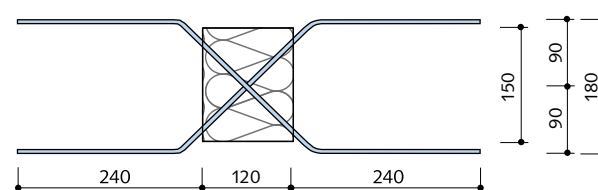
Vertical section HIT-HP/SP HT1



Top view HIT-HP HT1



Top view HIT-SP HT1



Dimensions in [mm]

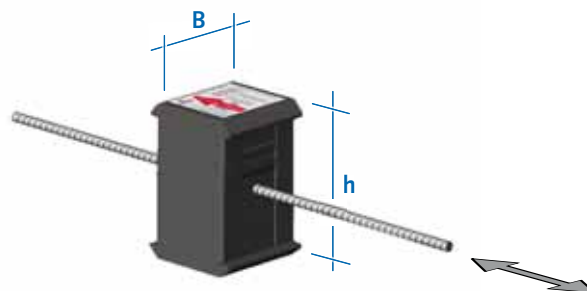
HIT Type	HP	SP
Insulation thickness [mm]	80	120
Element width B [cm]	10	15
Possible HIT Element height h [cm]	16 – 35	

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP HT2, HIT-SP HT2

Ordering example

HIT-HP	HT2	-	hh	-	010
HIT-SP	HT2	-	hh	-	015
↓	↓	↓	↓	↓	↓
①	②	③	④	⑤	



Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Element height [cm]
- ⑤ Element width [cm]

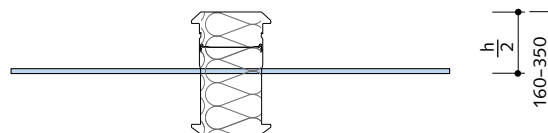
Load bearing capacities and dimensions



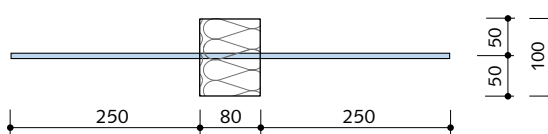
Horizontal forces
perpendicular to the insulation plane

HIT-HP/SP HT2 Components			Design values			
Reinforcement		Element width B	C20/25		C25/30	
Shear bars	Tension/compression bars	HIT-HP HIT-SP [mm]	$H_{Rd \parallel}$ [kN/element]	$H_{Rd \perp}$ [kN/element]	$H_{Rd \parallel}$ [kN/element]	$H_{Rd \perp}$ [kN/element]
—	1 × $\phi 10$	100 150	0	±18.2	0	±21.2

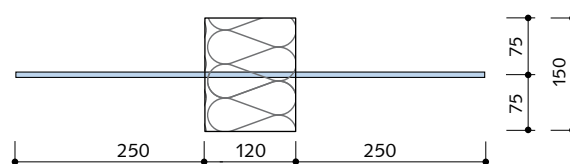
Vertical section HIT-HP/SP HT2



Top view HIT-HP HT2



Top view HIT-SP HT2



Dimensions in [mm]

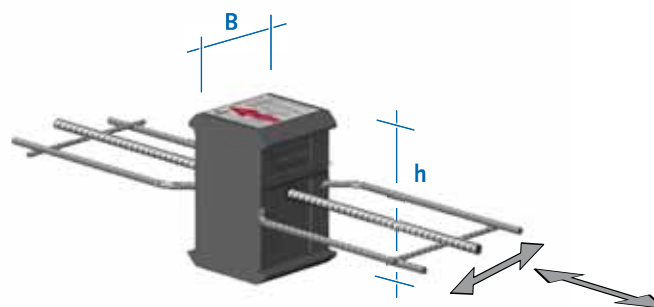
HIT Type	HP	SP
Insulation thickness [mm]	80	120
Element width B [cm]	10	15
Possible slab thickness h [cm]	16 – 35	

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP HT3, HIT-SP HT3

Ordering example

HIT-HP	HT3	-	hh	-	010
HIT-SP	HT3	-	hh	-	015
↓	↓		↓		↓
①	②		③		⑤



Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Element height [cm]
- ⑤ Element width [cm]

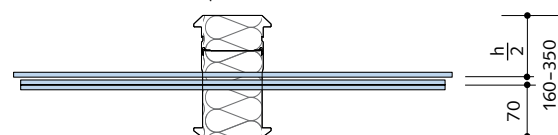
Load bearing capacities and dimensions



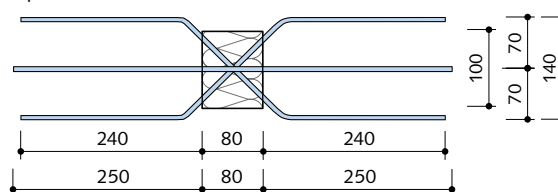
Horizontal forces
parallel and perpendicular to the insulation plane

HIT-HP/SP HT3 Components			Design values			
Reinforcement		Element width B	C20/25		C25/30	
Shear bars	Tension/compression bars	HIT-HP HIT-SP [mm]	$H_{Rd \parallel}$ [kN/element]	$H_{Rd \perp}$ [kN/element]	$H_{Rd \parallel}$ [kN/element]	$H_{Rd \perp}$ [kN/element]
2 × $\phi 8$	1 × $\phi 10$	100 150	±9.9	±18.2	±11.5	±21.2

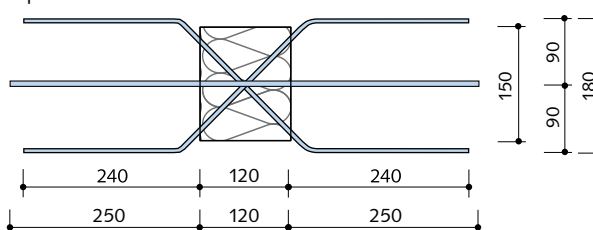
Vertical section HIT-HP/SP HT3



Top view HIT-HP HT3



Top view HIT-SP HT3



Dimensions in [mm]

HIT Type	HP	SP
Insulation thickness [mm]	80	120
Element width B [cm]	10	15
Possible slab thickness h [cm]	16 – 35	

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

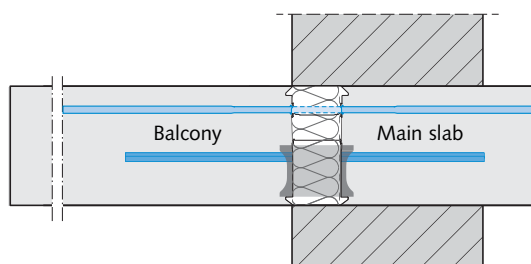
HIT-HP HT1-3, HIT-SP HT1-3

Position of the HIT-HT units in the cross section of a wall in combination with HIT Insulated connections

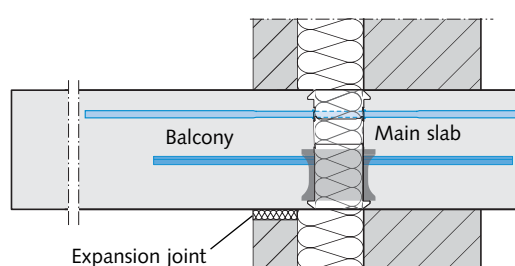


HALFEN HIT-HT Elements complement the HIT Product range and are used in combination with HIT Insulated connections.

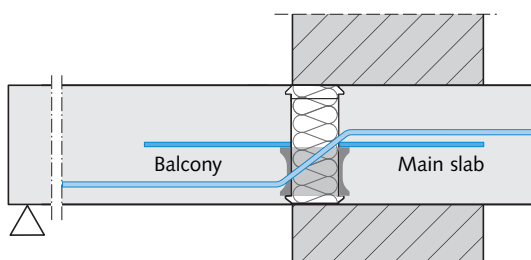
Single-leaf masonry with balcony at main slab level



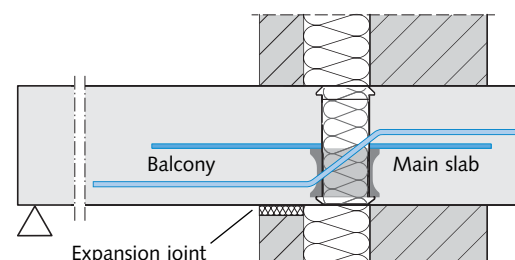
Double-leaf masonry with balcony at main slab level



Monolithic masonry with balcony at main slab level



Double-leaf masonry with balcony at main slab level



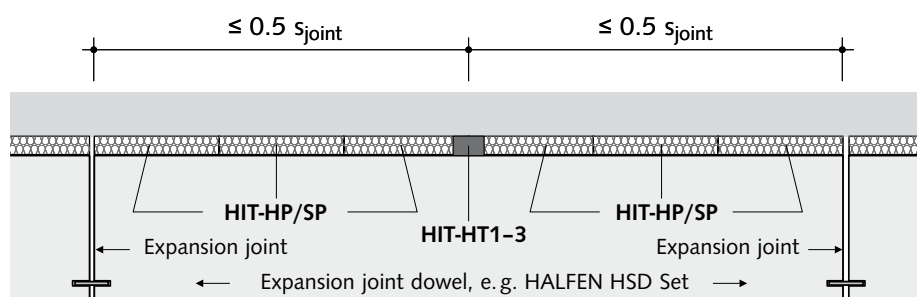
Refer to the installation instructions for installation diagrams, download at www.halfen.com.

Joint spacings

Expansion joints must be provided to limit the effect of temperature fluctuation in the external concrete components at a right angle to the insulation line of the HIT Elements.

In straight, cantilevered balcony slabs the distance between joints must not exceed the maximum expansion joint spacing of s_{joint} .

For balcony slabs using HIT-HP/HIT-SP HT1 and HT3 Elements, the maximum edge distances of the HT Elements must be limited to $0.5 s_{\text{joint}}$ of the main HIT Element. → see page 54

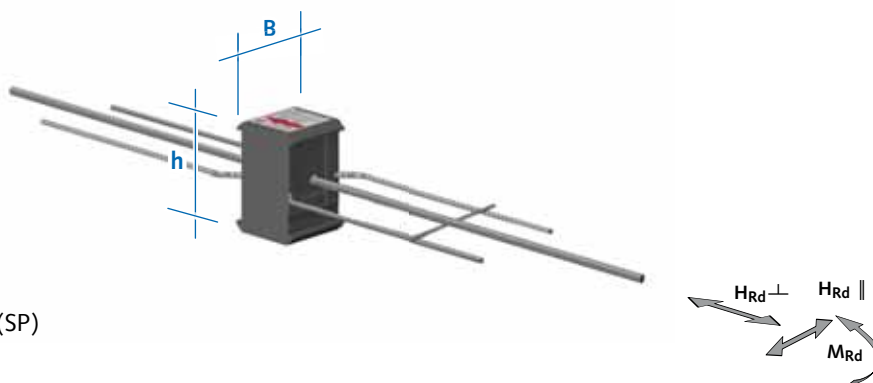


HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP HT4, HIT-SP HT4

Ordering example

HIT-HP	HT4	- hh -	010
HIT-SP	HT4	- hh -	015
↓	↓	↓	↓
①	②	③	④
⑤			



Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Element height [cm]
- ⑤ Element width [cm]

Load bearing capacities and dimensions



Horizontal forces
parallel and perpendicular to the insulation plane

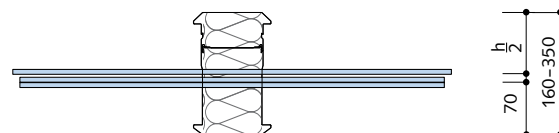
HIT-HP/SP HT4 Components			Design values			
Reinforcement		Element width B	C20/25		C25/30	
Shear bars	Tension / compression bars	HIT-HP HIT-SP [mm]	$H_{Rd \parallel}$ [kN/element]	$H_{Rd \perp}$ [kN/element]	$H_{Rd \parallel}$ [kN/element]	$H_{Rd \perp}$ [kN/element]
2x $\varnothing 8$	1x $\varnothing 12$	100 150	±15.5	±43.7	±15.5	±49.2



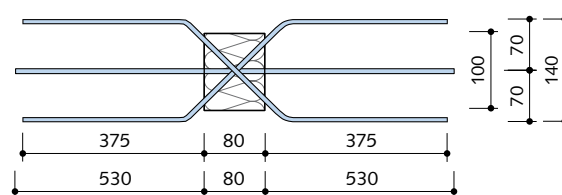
M_{Rd}

Load bearing capacity values for lifting moments are on page 123 of this catalogue.

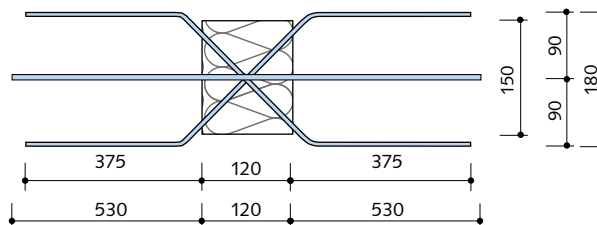
Vertical section HIT-HP/SP HT4



Top view HIT-HP HT4



Top view HIT-SP HT4



Dimensions in [mm]

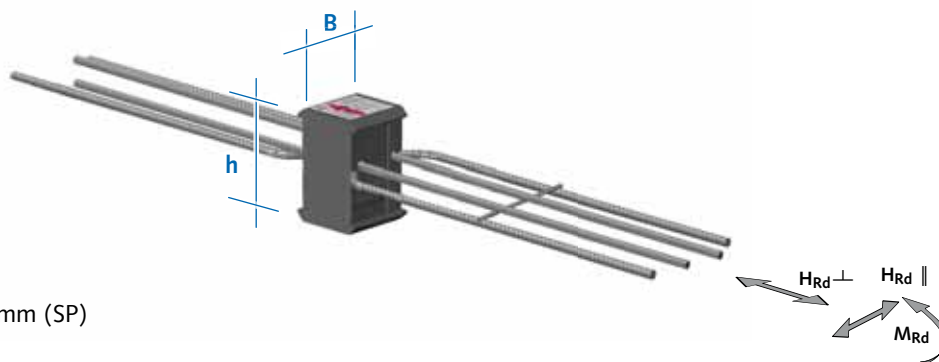
HIT Type	HP	SP
Insulation thickness [mm]	80	120
Element width B [cm]	10	15
Possible slab thickness h [cm]	16 - 35	

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP HT5, HIT-SP HT5

Ordering example

HIT-HP	HT5	- hh -	010
HIT-SP	HT5	- hh -	015
↓	↓	↓	↓
①	②	③	④
⑤			



Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Element height [cm]
- ⑤ Element width [cm]

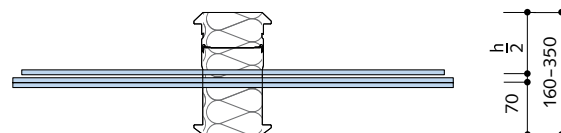
Load bearing capacities and dimensions



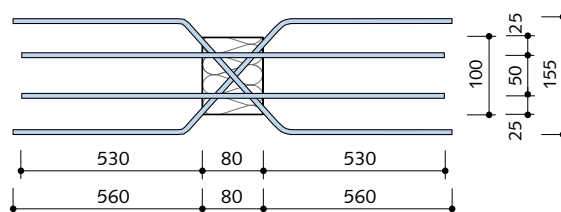
Horizontal forces
parallel and perpendicular to the insulation plane

HIT-HP/SP HT5 Components			Design values			
Reinforcement		Element width B	C20/25		C25/30	
Shear bars	Tension/compression bars	HIT-HP HIT-SP [mm]	$H_{Rd} \parallel$ [kN/element]	$H_{Rd} \perp$ [kN/element]	$H_{Rd} \parallel$ [kN/element]	$H_{Rd} \perp$ [kN/element]
2× Ø12	2× Ø12	100 150	±34.6	±87.5	±34.8	±98.4

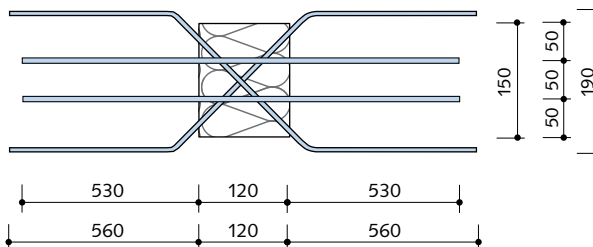
Vertical section HIT-HP/SP HT5



Top view HIT-HP HT5



Top view HIT-SP HT5



Dimensions in [mm]



M_{Rd}

Load bearing capacity values for lifting moments are on page 123 of this catalogue.

HIT Type	HP	SP
Insulation thickness [mm]	80	120
Element width B [cm]	10	15
Possible slab thickness h [cm]	16 – 35	

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

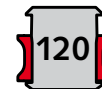
HIT-HP HT4-5, HIT-SP HT4-5

Load bearing capacity values according to EN 1992-1-1 (EC2)



Lifting moment

Concrete strength: C20/25 ≥ C25/30



Type	HIT-HP ...			HT4		HT5	
	HIT-SP ...						
Concrete cover [mm]	30	35	50				
Design values M_{Rd} [kN/element] for slab thickness [mm] and $H_{Rd} \perp \leq 0$			180	1.4	1.5	2.7	3.1
		160	190	1.6	1.8	3.2	3.5
	160	170	200	1.8	2.0	3.6	4.0
	170	180	210	2.0	2.3	4.0	4.5
	180	190	220	2.2	2.5	4.5	5.0
	190	200	230	2.5	2.8	4.9	5.5
	200	210	240	2.7	3.0	5.3	6.0
	210	220	250	2.9	3.2	5.8	6.5
	220	230	260	3.1	3.5	6.2	7.0
	230	240	270	3.3	3.7	6.7	7.5
	240	250	280	3.5	4.0	7.1	8.0
	250	260	290	3.8	4.2	7.5	8.5
	260	270	300	4.0	4.5	8.0	9.0
	270	280	310	4.2	4.7	8.4	9.4
	280	290	320	4.4	5.0	8.8	9.9
	290	300	330	4.6	5.2	9.3	10.4
	300	310	340	4.9	5.5	9.7	10.9
	310	320	350	5.1	5.7	10.2	11.4
	320	330		5.3	6.0	10.6	11.9
	330	340		5.5	6.2	11.0	12.4
	340	350		5.7	6.4	11.5	12.9
	350			6.0	6.7	11.9	13.4



Lifting moment + M_{Rd} only in combination with HIT-MVX Elements

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP HT4-5, HIT-SP HT4-5

Position of the combined HIT-HT4/-HT5 Elements in the cross section of a wall

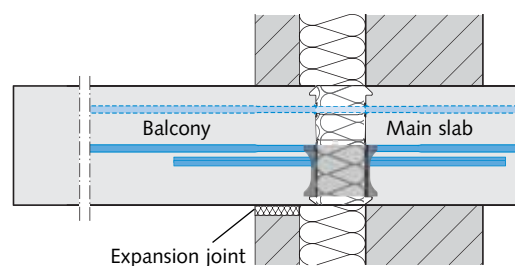
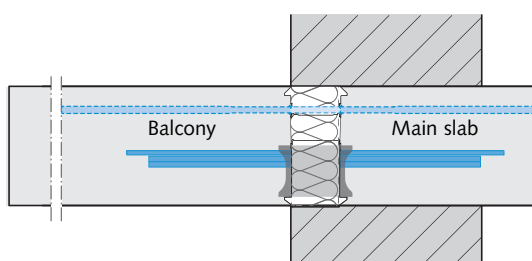


HALFEN HIT-HT4-5 Elements complement the HIT Product range and are only to be used in combination with HIT Balcony connection elements of types HIT-MVX.

Monolithic masonry with balcony at main slab level

Double-leaf masonry with balcony at main slab level

HIT-HP/SP HT4 and HIT-HP/SP HT5 in combination with HIT-HP/SP MVX

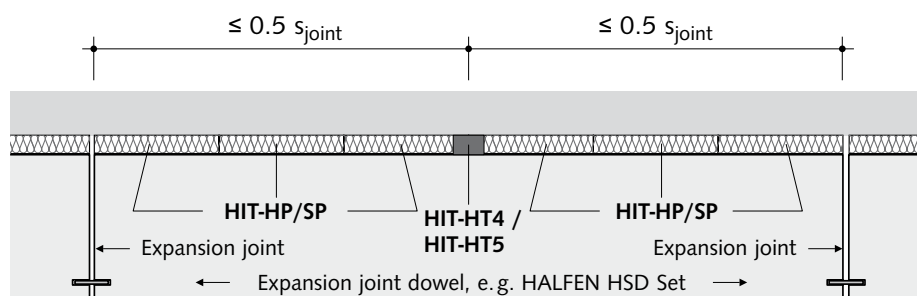


Joint spacings

Expansion joints must be provided to limit the effect of temperature fluctuation in the external concrete components at a right angle to the insulation line of the HIT Elements.

In straight, cantilevered balcony slabs the distance between joints must not exceed the maximum expansion joint spacing of s_{joint} .

For balcony slabs using HIT-HP/HIT-SP HT4 and HT5 Elements, the maximum edge distances of the HT Elements must be limited to $0.5 s_{\text{joint}}$ of the main HIT Element. → see page 54

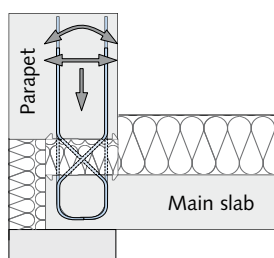


HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

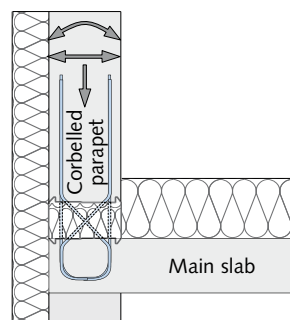
HIT-HP AT, HIT-SP AT

6

- Insulated connections to form a thermal barrier between the main slab and a parapet or a corbelled parapet
- Transfer of normal forces as well as positive and negative shear forces and bending moments



Application: Floor slab with parapet



Application: Floor slab with high parapet or corbelled parapet

HIT-HP AT – High Performance with 80 mm insulation thickness

HIT-SP AT – Superior Performance with 120 mm insulation thickness

Content	Type	Page
Product variations / Load range	HIT-HP AT, HIT-SP AT	126
Product description	HIT-HP AT, HIT-SP AT	127
Calculation tables / Load bearing capacity values	HIT-HP AT, HIT-SP AT	129
Design example	HIT-HP AT, HIT-SP AT	131
On-site reinforcement	HIT-HP AT, HIT-SP AT	132

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP AT, HIT-SP AT

Product types – Load range

Possible combinations of shear bars and tension/compression loops are shown in the table below; includes using both HP and SP types of HIT Elements.

Possible combinations of structural elements

Element width B = 25 cm		Number of tension/compression loops $\varnothing 8$ mm	
		2	3
Number of shear bars $\varnothing 6$	1	•	•
in both directions	2	•	•
Type		AT1	AT2
Applicable parapet heights H (without joint)		≥ 22 cm	≥ 30 cm

• = HP and SP

Ordering example

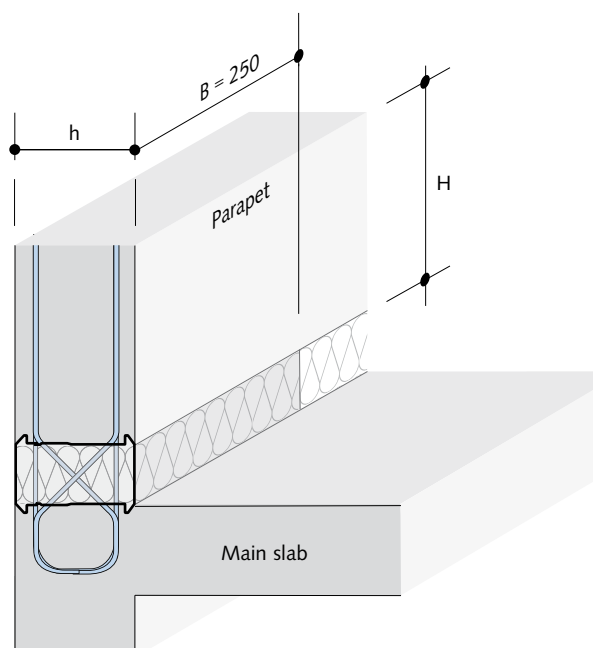
HIT-HP	AT 2	- 0302	- 16	- 025
HIT-SP	AT 1	- 0201	- 25	- 025
↓	↓	↓	↓	↓
①	②	③	④ ⑤	⑥ ⑦

Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Number of tension/compression loops
- ⑤ Number of shear bars per side
- ⑥ Element height h [cm]
- ⑦ Element width B [cm]



Possible parapet width



The illustration shows an application where the parapet width is identical to the height h of the HIT-AT Element.

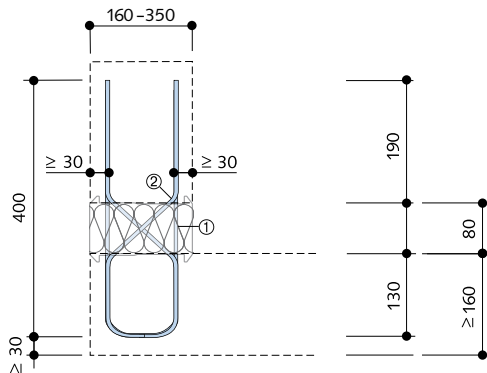
Possible slab thickness h [cm]	16 - 35*
Slab height	≥ 160 mm
*Load bearing capacity values for slab heights >25 cm available on request	

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

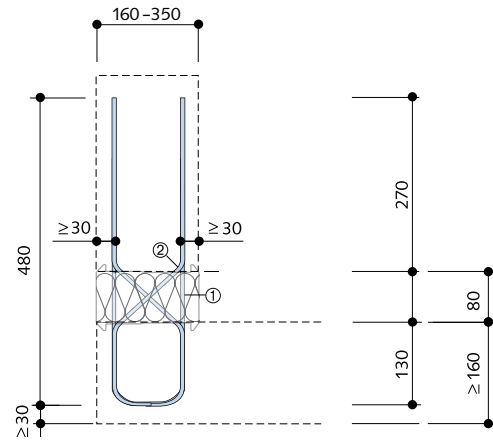
HIT-HP AT, HIT-SP AT

Product description – cross sections and top views

Cross section: HIT-HP AT1

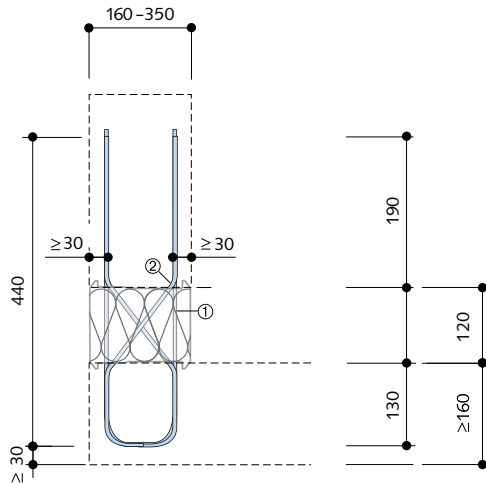


HIT-HP AT2

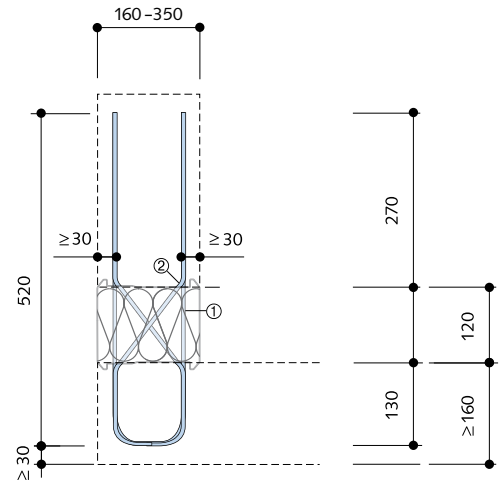


Dimensions in [mm]

Cross section: HIT-SP AT1

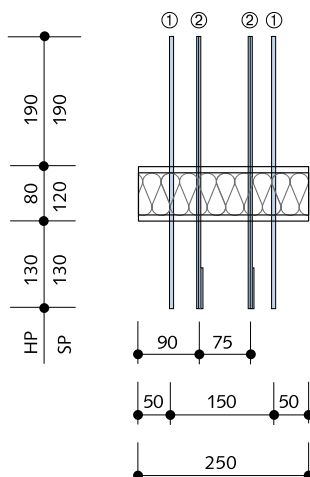


HIT-SP AT2



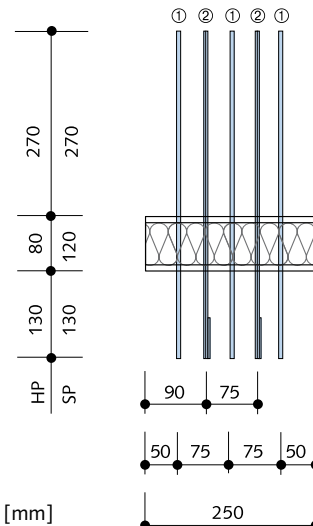
Dimensions in [mm]

Top view: HIT-HP/SP AT1 – bar spacings



- ① Tension/compression loops:
ø8 mm, B500 NR
- ② Shear bars:
ø6 mm, B500 NR

HIT-HP/SP AT2 – bar spacings



- ① Tension/compression loops:
ø8 mm, B500 NR
- ② Shear bars:
ø6 mm, B500 NR

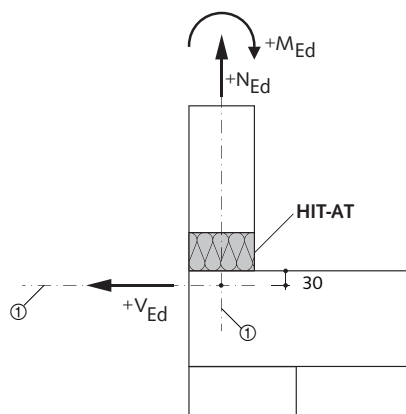
Dimensions in [mm]

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

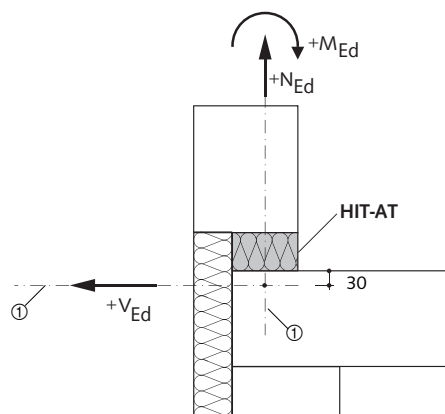
HIT-HP AT, HIT-SP AT

Structural system

Sign convention for calculation



① Design section

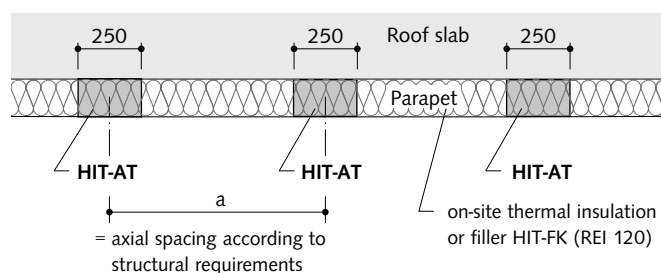


① Design section

Dimensions in [mm]

Top view:

Roof slab with connected parapet



Determining the axial spacing a

Calculation of the maximum element spacing of the HIT-AT units is dependent on the effect of moment $\pm m_{Ed}$ [kNm/m], the normal force n_{Ed} [kN/m] and the shear load $\pm v_{Ed}$ [kN/m]

⇒ see table
(page 129)



- ▶ **Step 1:** Determine the relationship (ratio) of the acting loads $|n_{Ed}/m_{Ed}|$ [1/m]
- ▶ **Step 2:** With $|n_{Ed}/m_{Ed}|$; select N_{Rd} from the “**Calculation tables**” depending on the element height h and the HIT-AT product type (AT1 or AT2). Intermediate values may be linearly interpolated.
- ▶ **Step 3:** Select the value for V_{Rd} in the table “**Load bearing capacity values**” for the respective HIT-AT variant depending on the element height h , of the selected product type, HIT-AT1 or HIT-AT2, and the shear load.
- ▶ **Step 4:** Calculate the element spacing a .

$$a_{max,1} = N_{Rd}/n_{Ed} \text{ [m]}$$

$$a_{max,2} = V_{Rd}/v_{Ed} \text{ [m]}$$

$$a = \min(a_{max,1}; a_{max,2})$$
- ▶ **Step 5: (optional)** Check the calculated load bearing capacities (per element).

$$n_{Ed} \cdot a = N_{Ed} \leq N_{Rd}$$

$$m_{Ed} \cdot a = M_{Ed} \leq M_{Rd}$$

$$v_{Ed} \cdot a = V_{Ed} \leq V_{Rd}$$



HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP AT

Calculation tables



Calculation tables

Concrete strength: Parapet $\geq C25/30$
Main slab $\geq C20/25$



HIT-HP AT1	Element height h [mm]			
	160-170	180-190	200-210	220-250
$ n_{Ed}/m_{Ed} $ [1/m]	N_{Rd} [kN/element]			
0	- 0.0	- 0.0	- 0.0	- 0.0
2	- 4.5	- 5.4	- 6.3	- 7.0
4	- 8.3	- 9.8	-11.1	-12.1
6	-11.4	-13.3	-15.0	-16.0
8	-14.2	-16.3	-18.2	-19.1
10	-16.5	-18.8	-20.9	-21.5
12	-18.5	-21.0	-23.2	-23.6
20	-24.7	-27.3	-29.5	-29.2
30	-29.5	-32.1	-34.3	-33.1
40	-32.8	-35.3	-37.2	-35.5
50	-35.1	-37.4	-39.3	-37.1
60	-36.8	-39.0	-40.8	-38.2

HIT-HP AT2	Element height h [mm]			
	160-170	180-190	200-210	220-250
$ n_{Ed}/m_{Ed} $ [1/m]	N_{Rd} [kN/element]			
0	- 0.0	- 0.0	- 0.0	- 0.0
2	- 9.6	-11.5	-13.3	-14.8
4	-17.5	-20.7	-23.6	-25.6
6	-24.3	-28.2	-31.9	-33.8
8	-30.0	-34.5	-38.6	-40.4
10	-35.0	-39.9	-44.3	-45.7
12	-39.3	-44.5	-49.1	-50.0



Load bearing capacities for slab thicknesses
> 25 cm are available on request.
See inside back cover for contact information.

Load bearing capacity values according to EN 1992-1-1 (EC2)



V_{Rd} in both directions

Concrete strength: Parapet $\geq C25/30$
Main slab $\geq C20/25$



HIT-HP AT1	V_{Rd} [kN/element] for element height h [mm]			
	160-170	180-190	200-210	220-250
HIT-HP AT1-0201-hh-025	± 6.2		± 6.8	± 7.9
HIT-HP AT1-0202-hh-025	± 12.4		± 13.6	± 15.8

HIT-HP AT2	V_{Rd} [kN/element] for element height h [mm]			
	160-170	180-190	200-210	220-250
HIT-HP AT2-0301-hh-025	± 7.9		± 8.7	± 10.1
HIT-HP AT2-0302-hh-025	± 15.8		± 17.4	± 20.1



M_{Rd} is dependent on N_{Rd}

HIT-HP AT1	M_{Rd} [kNm/element] for element height h [mm]			
	160-170	180-190	200-210	220-250
N_{Rd} [kN/element]				
0	± 2.5	± 3.0	± 3.6	± 4.1
- 5	± 2.2	± 2.7	± 3.2	± 3.7
-10	± 2.0	± 2.4	± 2.9	± 3.2
-15	± 1.7	± 2.1	± 2.5	± 2.8
-20	± 1.5	± 1.8	± 2.2	± 2.3
-25	± 1.2	± 1.5	± 1.8	± 1.8
-30	± 1.0	± 1.2	± 1.4	± 1.4

HIT-HP AT2	M_{Rd} [kNm/element] for element height h [mm]			
	160-170	180-190	200-210	220-250
N_{Rd} [kN/element]				
0	± 5.3	± 6.4	± 7.6	± 8.7
- 5	± 5.0	± 6.1	± 7.2	± 8.3
-10	± 4.8	± 5.8	± 6.9	± 7.8
-15	± 4.5	± 5.5	± 6.5	± 7.4
-20	± 4.3	± 5.2	± 6.2	± 6.9
-25	± 4.0	± 4.9	± 5.8	± 6.4
-30	± 3.7	± 4.6	± 5.4	± 6.0

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP AT

Calculation tables



Calculation tables

Concrete strength: Parapet $\geq C25/30$
Main slab $\geq C20/25$

120

HIT-SP AT1	Element height h [mm]			
	160-170	180-190	200-210	220-250
$ n_{Ed}/m_{Ed} $ [1/m]	N_{Rd} [kN/element]			
0	- 0.0	- 0.0	- 0.0	- 0.0
2	- 3.6	- 4.3	- 5.0	- 5.6
4	- 6.6	- 7.8	- 8.9	- 9.7
6	-9.2	-10.7	-12.0	-12.8
8	-11.3	-13.0	-14.6	-15.2
10	-13.2	-15.1	-16.7	-17.2
12	-14.8	-16.8	-18.5	-18.9
20	-19.7	-21.9	-23.6	-23.3
30	-23.6	-25.7	-27.4	-26.5
40	-26.2	-28.2	-29.8	-28.4
50	-28.1	-29.9	-31.4	-29.7
60	-29.4	-31.2	-32.6	-30.6

HIT-SP AT2	Element height h [mm]			
	160-170	180-190	200-210	220-250
$ n_{Ed}/m_{Ed} $ [1/m]	N_{Rd} [kN/element]			
0	- 0.0	- 0.0	- 0.0	- 0.0
2	- 8.0	- 9.6	-11.1	-12.4
4	-14.7	-17.3	-19.8	-21.5
6	-20.3	-23.7	-26.7	-28.4
8	-25.2	-29.0	-32.4	-33.9
10	-29.3	-33.5	-37.1	-38.3
12	-33.0	-37.3	-41.2	-42.0



Load bearing capacities for slab thicknesses
> 25 cm are available on request.
See inside back cover for contact information.

Load bearing capacity values according to EN 1992-1-1 (EC2)



V_{Rd} in both directions

Concrete strength: Parapet $\geq C25/30$
Main slab $\geq C20/25$

120

HIT-SP AT1	V_{Rd} [kN/element] for element height h [mm]			
	160-170	180-190	200-210	220-250
HIT-SP AT1-0201-hh-025	± 5.1		± 5.9	± 6.8
HIT-SP AT1-0202-hh-025	± 10.2		± 11.7	± 13.6

HIT-SP AT2	V_{Rd} [kN/element] for element height h [mm]			
	160-170	180-190	200-210	220-250
HIT-SP AT2-0301-hh-025	± 6.5		± 7.5	± 8.7
HIT-SP AT2-0302-hh-025	± 13.0		± 15.0	± 17.4



M_{Rd} is dependent on N_{Rd}

HIT-SP AT1	M _{Rd} [kNm/element] for element height h [mm]			
N _{Rd} [kN/element]	160–170	180–190	200–210	220–250
0	±2.0	±2.4	±2.9	±3.3
– 5	±1.7	±2.1	±2.5	±2.8
–10	±1.5	±1.8	±2.1	±2.4
–15	±1.2	±1.5	±1.8	±1.9
–20	±1.0	±1.2	±1.4	±1.5
–25	±0.7	±0.9	±1.1	±1.0
–30	±0.5	±0.6	±0.7	±0.6

HIT-SP AT2	M _{Rd} [kNm/element] for element height h [mm]			
N _{Rd} [kN/element]	160-170	180-190	200-210	220-250
0	±4.4	±5.4	±6.4	±7.3
- 5	±4.2	±5.1	±6.0	±6.9
-10	±3.9	±4.8	±5.6	±6.4
-15	±3.7	±4.5	±5.3	±5.9
-20	±3.4	±4.2	±4.9	±5.5
-25	±3.2	±3.9	±4.6	±5.0
-30	±2.9	±3.6	±4.2	±4.6

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP AT, HIT-SP AT

Design example

Planned: Joint width 12 cm

HIT-SP AT2

Required: Axial spacing a [m]

Assumed: $H = 1.40$ m

$b_A = h = 0.20$ m

$h_l = 0.12$ m

Determining the loads

$$g_d = H \cdot b_A \cdot \rho_{\text{concrete}} \cdot \gamma_G$$

$$g_d = 1.40 \text{ m} \cdot 0.20 \text{ m} \cdot 25 \text{ kN/m}^3 \cdot 1.35 = 9.45 \text{ kN/m}$$

Assumption: w_k = wind pressure + wind suction = 2.6 kN/m^2
(To simplify calculation the parapet height is assumed to be the same on both sides;
wind load / left = wind load / right)

$$w_d = w_k \cdot (H + h_l + 0.03) \cdot \gamma_Q$$

$$w_d = 2.6 \text{ kN/m}^2 \cdot 1.55 \text{ m} \cdot 1.5 = 6.05 \text{ kN/m}$$

$$k = (0.03 \text{ m} + h_l + H) \cdot 0.5$$

$$k = (0.03 \text{ m} + 0.12 \text{ m} + 1.40 \text{ m}) \cdot 0.5 = 0.78 \text{ m}$$

Determining the axial spacing

$$n_{Ed} = -9.45 \text{ kN/m}$$

$$m_{Ed} = 6.05 \text{ kN/m} \cdot 0.78 \text{ m} = 4.72 \text{ kNm/m}$$

$$v_{Ed} = -6.05 \text{ kN/m}$$

Step 1: $|n_{Ed}/m_{Ed}| = |-9.45/4.72| = 2.00 [1/\text{m}]$

Step 2: $N_{Rd} = -11.1 \text{ kN/element}$

Step 3: $V_{Rd} = \pm 7.5 \text{ kN/element}$ (for HIT-SP AT2-0301-20-025)

Step 4: $a_{\max 1} = -11.1/-9.45 = 1.17 \text{ m}$

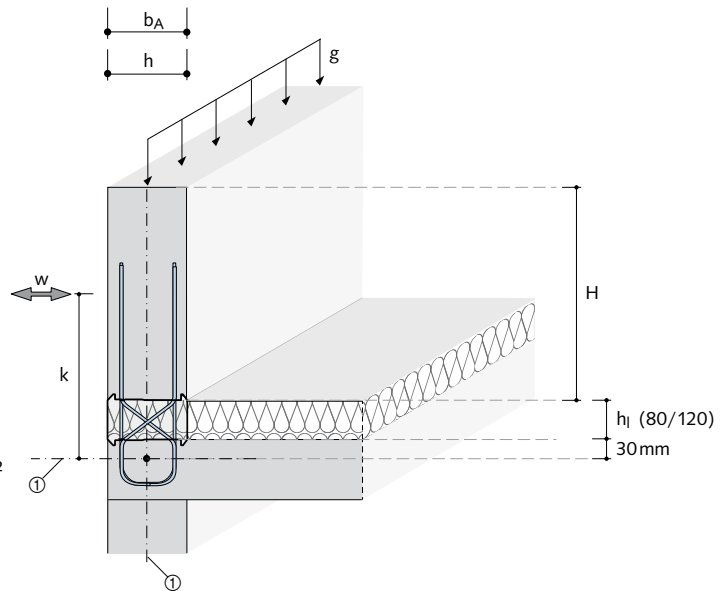
$a_{\max 2} = -7.5/-6.05 = 1.23 \text{ m}$

$\Rightarrow a = 1.17 \text{ m}$

Step 5: $N_{Ed} = -9.45 \cdot 1.17 = -11.06 \text{ kN/element}$

$M_{Ed} = 4.72 \cdot 1.17 = 5.52 \text{ kNm/element} < M_{Rd} = 5.54 \text{ kNm/element}$

$V_{Ed} = -6.05 \cdot 1.17 = -7.08 \text{ kN/element} < V_{Rd} = -7.5 \text{ kN/element}$



① Design section

Method / sign convention:
→ see page 128

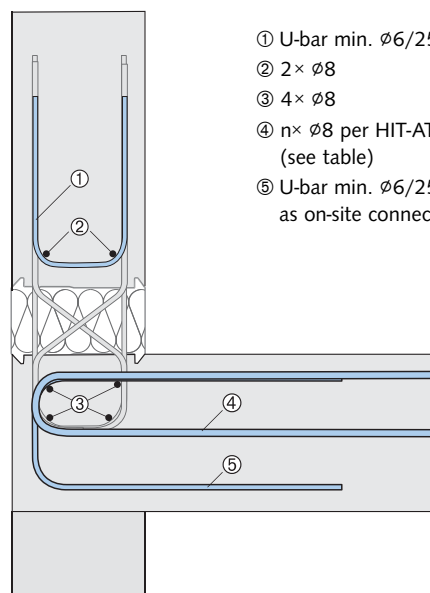


$\Rightarrow$ HIT-SP AT2-0301-20-025 with a maximum spacing of 1.17 m.

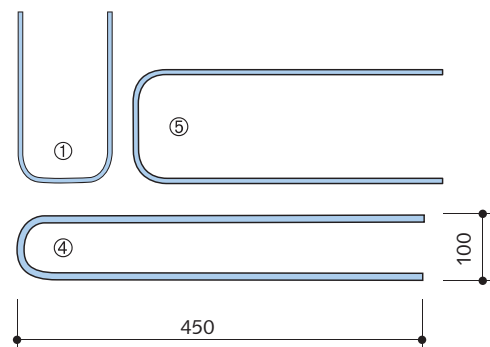
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP AT, HIT-SP AT

On-site reinforcement HIT-AT



- ① U-bar min. $\phi 6/25$ cm
- ② $2 \times \phi 8$
- ③ $4 \times \phi 8$
- ④ $n \times \phi 8$ per HIT-AT Element
(see table)
- ⑤ U-bar min. $\phi 6/25$ cm
as on-site connecting reinforcement



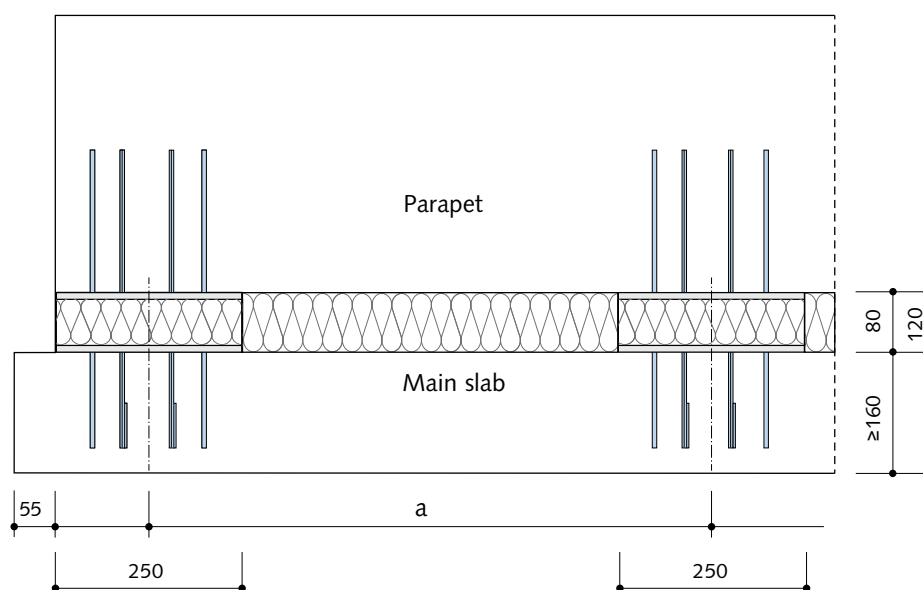
HIT-HP AT	Number n connecting bars ④
HIT-HP AT1	3
HIT-HP AT2	4
HIT-SP AT	Number n connecting bars ④
HIT-SP AT1	3
HIT-SP AT2	3

Edge distances



Edge distance

The HIT-AT Element can be installed flush with the concrete edge at the end of the parapet. The minimal distance from the side edge of the main concrete slab to the HIT-AT is 55 mm.

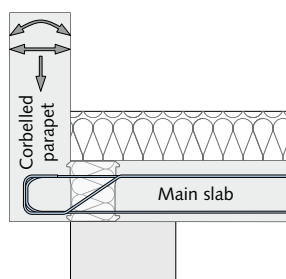
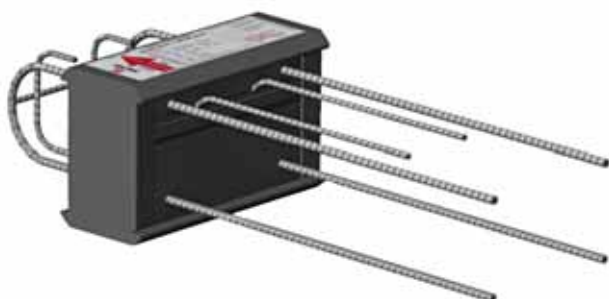


Installation instructions can be found on our website; www.halfen.com.

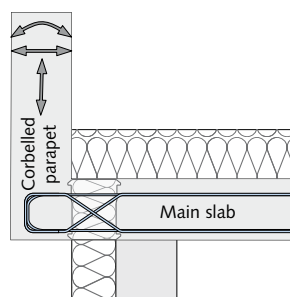
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP FT, HIT-SP FT

- Thermal insulated connections for application between the main slab and corbelled parapet
- Transfer of normal forces as well as shear forces and bending moments



Cross section:
Main slab with corbelled parapet
and thermal insulating masonry



Cross section:
Main slab with corbelled parapet
and external thermal insulation composite system

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

Content	Type	Page
Product variations / Load range	HIT-HP FT, HIT-SP FT	134
Product description	HIT-HP FT, HIT-SP FT	135
Calculation tables / Load bearing capacity values	HIT-HP FT, HIT-SP FT	137
On-site reinforcement	HIT-HP FT, HIT-SP FT	139

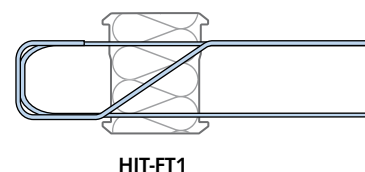
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP FT, HIT-SP FT

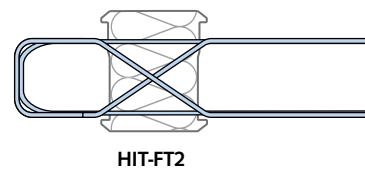
Product types – Load range

Listed in the table below are possible combinations of shear bars and tension/compression loops; this includes HIT Elements type HP and SP.

HIT-FT1: Possible combinations of structural elements		
Element width B = 25 cm		Number of tension/compression loops $\varnothing 8$
		2
Number of shear bars $\varnothing 6$ in one direction	2	•
	3	•
• = HP and SP		



HIT-FT2: Possible combinations of structural elements		
Element width B = 25 cm		Number of tension/compression loops $\varnothing 8$
		2
Number of shear bars $\varnothing 6$ in both directions	2	•
	3	•
• = HP and SP		

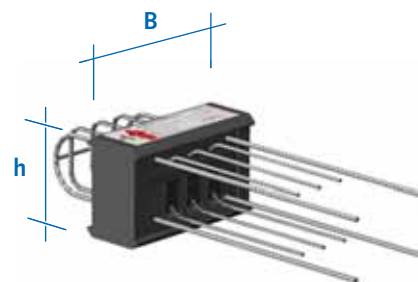


Ordering example

HIT-HP	FT1	-	0202	-	16	-	025
HIT-SP	FT2	-	0203	-	25	-	025
↓	↓		↓	↓	↓	↓	↓
1	2		3	4	5	6	7

Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Number of tension/compression loops
- ⑤ Number of shear bars per side
- ⑥ Element height h [cm]
- ⑦ Element width B [cm]



Corbelled parapets, available widths

Possible slab thickness h [cm]	16 – 35*
Corbelled parapets, width [cm]	≥ 15

*Load bearing capacities for slab thicknesses > 25 cm available on request

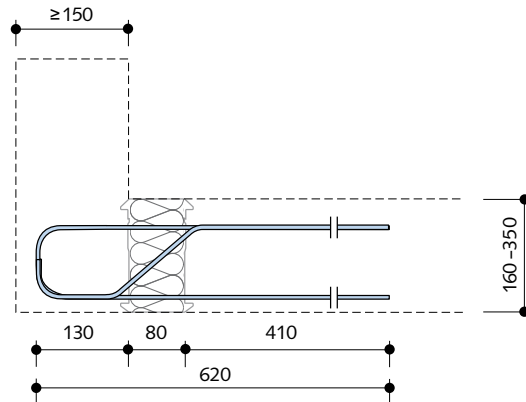
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP FT, HIT-SP FT

Product description – cross sections and top views

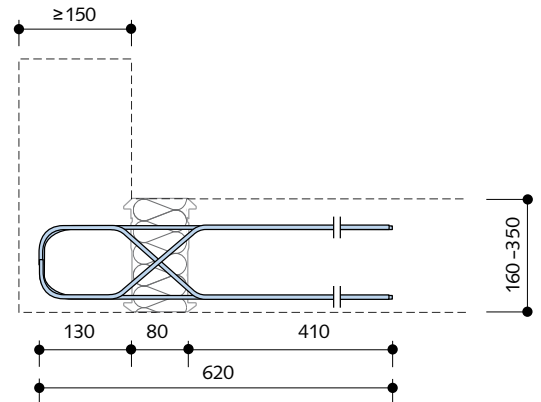
Cross section:

HIT-HP FT1



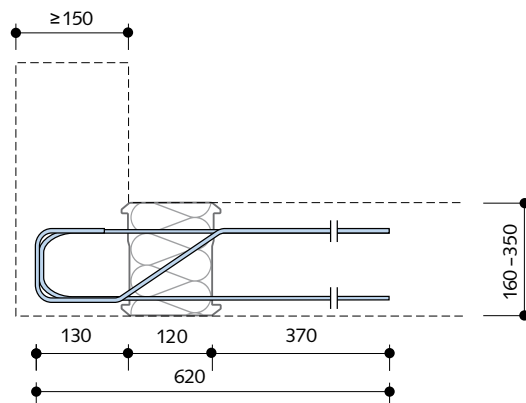
Dimensions in [mm]

HIT-HP FT2



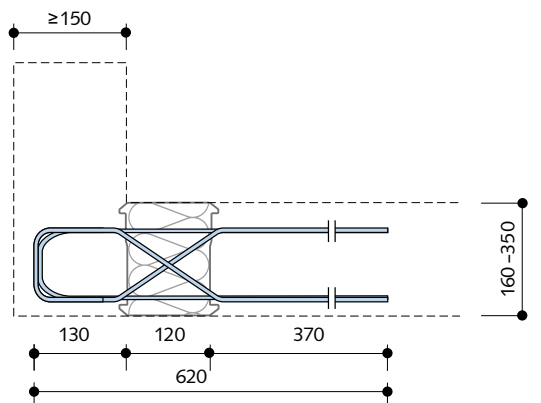
Cross section:

HIT-SP FT1



Dimensions in [mm]

HIT-SP FT2

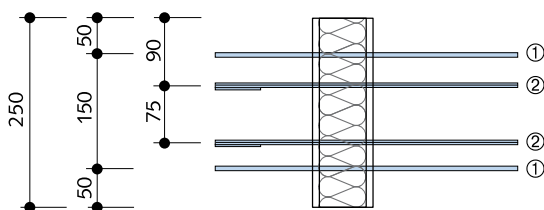


Top view:

HIT-HP/SP FT1 – Bar spacings

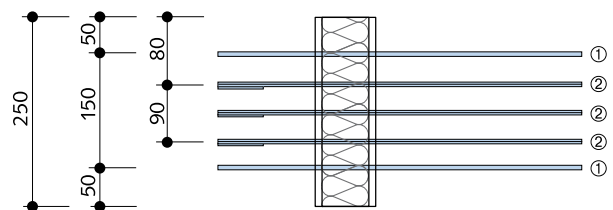
HIT-HP/SP FT2 – Bar spacings

> 2 Shear bars



Dimensions in [mm]

> 3 Shear bars



① Tension/compression loops: Ø8 mm, B500 NR

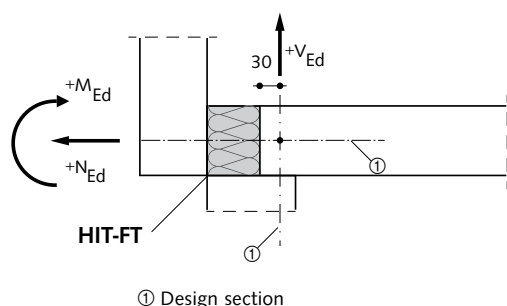
② Shear bars: Ø6 mm, B500 NR,
with type HIT-FT1 only in one direction

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP FT, HIT-SP FT

Structural system

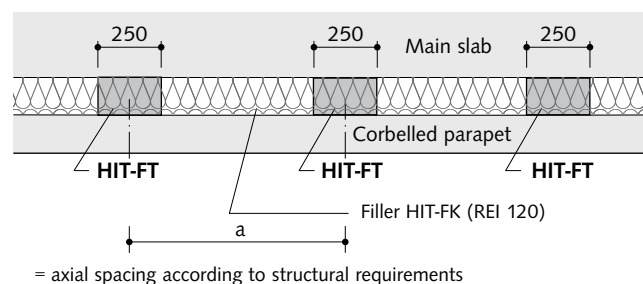
Sign convention for calculation



Dimensions in [mm]

Top view:

Main slab with attached corbelled parapet



Determining of axial spacing a

Calculation of the maximum element spacing of the HIT-FT units is dependent on the effect of moment $\pm m_{Ed}$ [kNm/m], the normal force n_{Ed} [kN/m] and the shear load $\pm v_{Ed}$ [kN/m]

⇒ see table (page 137)



- **Step 1:** Determine the relationship (ratio) of the acting loads $n_{Ed}/|m_{Ed}|$ [1/m]
- **Step 2:** With $n_{Ed}/|m_{Ed}|$ select N_{Rd} from the "Calculation tables", depending on the element height h and the HIT-AT product type (HIT-FT1 or HIT-FT2). Intermediate values may be linearly interpolated.
- **Step 3:** Select the value for V_{Rd} in the table "Load bearing capacity values" for the respective HIT-AT variant depending on the element height h , the concrete strength class and the shear load in the main slab.
- **Step 4:** Calculate the element spacing a

$$a_{max,1} = N_{Rd}/n_{Ed} \quad [m]$$

$$a_{max,2} = V_{Rd}/v_{Ed} \quad [m]$$

$$a = \min(a_{max,1}; a_{max,2})$$
- **Step 5:** Check the calculated load bearing capacities (per element).
(optional)
$$n_{Ed} \cdot a = N_{Ed} \leq N_{Rd}$$

$$m_{Ed} \cdot a = M_{Ed} \leq M_{Rd}$$

$$v_{Ed} \cdot a = V_{Ed} \leq V_{Rd}$$



HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP FT

Calculation tables



Calculation tables

Concrete strength: Parapet $\geq C25/30$
Main slab $\geq C20/25$



HIT-HP FT1 HIT-HP FT2	+N _{Rd} * [kN/element]			
	Element height h [mm]			
n _{Ed} / m _{Ed} [1/m]	160-170	180-190	200-210	220-250
+50	56.6	60.4	63.4	59.9
+40	52.9	56.9	60.1	57.3
+30	47.7	51.9	55.3	53.4
+20	39.8	44.1	47.7	47.1
+12	29.9	33.9	37.4	38.1
+10	26.6	30.4	33.7	34.8
+ 8	22.8	26.3	29.4	30.8
+ 6	18.5	21.5	24.3	25.8
+ 4	13.4	15.7	18.0	19.5
+ 2	7.3	8.7	10.1	11.2
0	0.0	0.0	0.0	0.0



Load bearing capacities for slab thicknesses > 25 cm are available on request.
See inside back cover for contact information.

HIT-HP FT1 HIT-HP FT2	-N _{Rd} * [kN/element]			
	Element height h [mm]			
n _{Ed} / m _{Ed} [1/m]	160-170	180-190	200-210	220-250
- 2	-6.4	-7.6	-8.8	-9.8
- 4	-11.7	-13.8	-15.7	-17.1
- 6	-16.2	-18.8	-21.2	-22.6
- 8	-20.0	-23.0	-25.8	-26.9
-10	-23.3	-26.6	-29.5	-30.4
-12	-26.2	-29.7	-32.7	-33.4
-20	-34.8	-38.6	-41.7	-41.2
-30	-41.7	-45.4	-48.4	-46.8
-40	-46.3	-49.8	-52.6	-50.1
-50	-49.6	-52.9	-55.5	-52.4



* Sign convention → see page 136

Load bearing capacity values according to EN 1992-1-1 (EC2)



V_{Rd} in one direction

HIT-HP FT1	V _{Rd} [kN/element] for element height h [mm]			
	160-190	200-210	220-250	
HIT-HP FT1-0202-hh-025	-13.6 -15.8	-15.0 -17.4	-17.4 -20.1	
HIT-HP FT1-0203-hh-025	-20.4 -20.4	-22.5 -26.1	-26.0 -26.0	



V_{Rd} in both directions Parapet: $\geq C25/30$
Main slab: $\geq C20/25$ $\geq C25/30$



HIT-HP FT2	V _{Rd} [kN/element] for element height h [mm]			
	160-190	200-210	220-250	
HIT-HP FT2-0202-hh-025	±13.6 ±15.8	±15.0 ±17.4	±17.4 ±20.1	
HIT-HP FT2-0203-hh-025	±20.4 ±20.4	±22.5 ±26.1	±26.0 ±26.0	



M_{Rd} is dependent on N_{Rd}

Concrete strength: Parapet $\geq C25/30$
Main slab $\geq C20/25$

HIT-HP FT1 HIT-HP FT2	M _{Rd} [kNm/element] for element height h [mm]			
	160-170	180-190	200-210	220-250
+N _{Rd} * [kN/element]				
70	±0.5	±0.6	±0.8	±0.3
60	±1.0	±1.2	±1.5	±1.2
50	±1.5	±1.8	±2.2	±2.1
40	±2.0	±2.5	±2.9	±3.0
30	±2.5	±3.1	±3.6	±3.9
25	±2.7	±3.4	±4.0	±4.4
20	±3.0	±3.7	±4.3	±4.8
15	±3.3	±4.0	±4.7	±5.3
10	±3.5	±4.3	±5.1	±5.7
5	±3.7	±4.5	±5.4	±6.1

HIT-HP FT1 HIT-HP FT2	M _{Rd} [kNm/element] for element height h [mm]			
	160-170	180-190	200-210	220-250
-N _{Rd} * [kN/element]				
0	±3.5	±4.3	±5.0	±5.8
- 5	±3.3	±4.0	±4.7	±5.4
-10	±3.0	±3.7	±4.3	±4.9
-15	±2.8	±3.4	±4.0	±4.4
-20	±2.5	±3.1	±3.6	±4.0
-25	±2.2	±2.8	±3.3	±3.5
-30	±2.0	±2.5	±2.9	±3.1
-35	±1.7	±2.1	±2.6	±2.6
-40	±1.5	±1.8	±2.2	±2.2
-45	±1.2	±1.5	±1.9	±1.7
-50	±1.0	±1.2	±1.5	±1.3

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP FT

Calculation tables



Calculation tables

Concrete strength: Parapet $\geq C25/30$
Main slab $\geq C20/25$

120

HIT-SP FT1 HIT-SP FT2	+N _{Rd} * [kN/element]			
	Element height h [mm]			
n _{Ed} / m _{Ed} [1/m]	160-170	180-190	200-210	220-250
+50	56.6	60.4	63.4	59.9
+40	52.9	56.9	60.1	57.3
+30	47.7	51.9	55.3	53.4
+20	39.8	44.1	47.7	47.1
+12	29.9	33.9	37.4	38.1
+10	26.6	30.4	33.7	34.8
+ 8	22.8	26.3	29.4	30.8
+ 6	18.5	21.5	24.3	25.8
+ 4	13.4	15.7	18.0	19.5
+ 2	6.4	8.0	9.6	11.1
0	0.0	0.0	0.0	0.0



Load bearing capacities for slab thicknesses > 25 cm are available on request.
See inside back cover for contact information.

HIT-SP FT1 HIT-SP FT2	-N _{Rd} * [kN/element]			
	Element height h [mm]			
n _{Ed} / m _{Ed} [1/m]	160-170	180-190	200-210	220-250
- 2	- 5.4	- 6.4	- 7.4	- 8.3
- 4	- 9.8	-11.6	-13.2	-14.3
- 6	-13.6	-15.8	-17.8	-18.9
- 8	-16.8	-19.3	-21.6	-22.6
-10	-19.5	-22.3	-24.8	-25.5
-12	-22.0	-24.9	-27.4	-28.0
-20	-29.2	-32.4	-35.0	-34.6
-30	-35.0	-38.1	-40.6	-39.2
-40	-38.8	-41.8	-44.1	-42.0
-50	-41.6	-44.4	-46.5	-43.9



* Sign convention → see page 136

Load bearing capacity values according to EN 1992-1-1 (EC2)



V_{Rd} in one direction

HIT-SP FT1	V _{Rd} [kN/element] for element height h [mm]			
	160-190	200-210	220-250	
HIT-SP FT1-0202-hh-025	-11.2 -13.0	-12.9 -15.0	-15.0 -17.4	
HIT-SP FT1-0203-hh-025	-16.8 -19.5	-19.3 -22.5	-22.5 -26.1	



V_{Rd} in both directions Parapet: $\geq C25/30$
Main slab: C20/25 $\geq C25/30$

120

HIT-SP FT2	V _{Rd} [kN/element] for element height h [mm]			
	160-190	200-210	220-250	
HIT-SP FT2-0202-hh-025	±11.2 ±13.0	±12.9 ±15.0	±15.0 ±17.4	
HIT-SP FT2-0203-hh-025	±16.8 ±19.5	±19.3 ±22.5	±22.5 ±26.1	



M_{Rd} is dependent on N_{Rd}

Concrete strength: Parapet $\geq C25/30$
Main slab $\geq C20/25$

HIT-SP FT1 HIT-SP FT2	M _{Rd} [kNm/element] for element height h [mm]			
+N _{Rd} * [kN/element]	160–170	180–190	200–210	220–250
70	±0.5	±0.6	±0.8	±0.3
60	±1.0	±1.2	±1.5	±1.2
50	±1.5	±1.8	±2.2	±2.1
40	±2.0	±2.5	±2.9	±3.0
30	±2.5	±3.1	±3.6	±3.9
25	±2.7	±3.4	±4.0	±4.4
20	±3.0	±3.7	±4.3	±4.8
15	±3.3	±4.0	±4.7	±5.3
10	±3.4	±4.1	±4.8	±5.5
5	±3.2	±3.8	±4.5	±5.2

HIT-SP FT1 HIT-SP FT2	M _{Rd} [kNm/element] for element height h [mm]			
−N _{Rd} * [kN/element]	160–170	180–190	200–210	220–250
0	±3.0	±3.6	±4.2	±4.9
− 5	±2.7	±3.3	±3.9	±4.4
−10	±2.4	±3.0	±3.5	±4.0
−15	±2.2	±2.7	±3.2	±3.5
−20	±1.9	±2.4	±2.8	±3.1
−25	±1.7	±2.1	±2.5	±2.6
−30	±1.4	±1.8	±2.1	±2.1
−35	±1.2	±1.5	±1.7	±1.7
−40	±0.9	±1.2	±1.4	±1.2
−45	±0.7	±0.8	±1.0	±0.8
−50	±0.4	±0.5	±0.7	±0.3

1

MVX / MVXL / -COR

2

MVX-OU/OD

3

ZVX / ZDX

4

DD / DDL / DVL

5

III

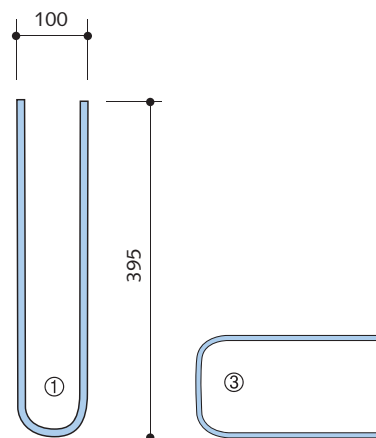
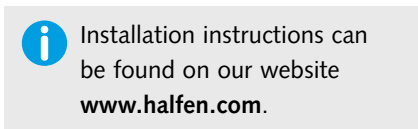
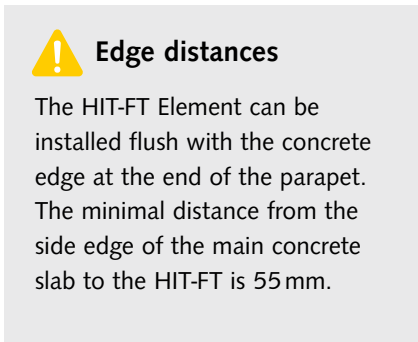
6

AT / FT / OTX / FK

7

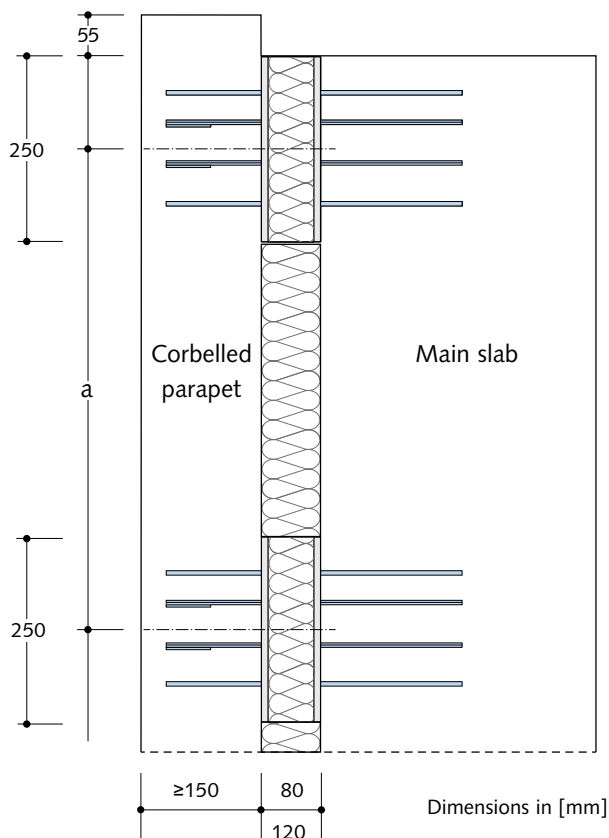
BUILDING PHYSICS, PLANNING

On-site reinforcement HIT-FT



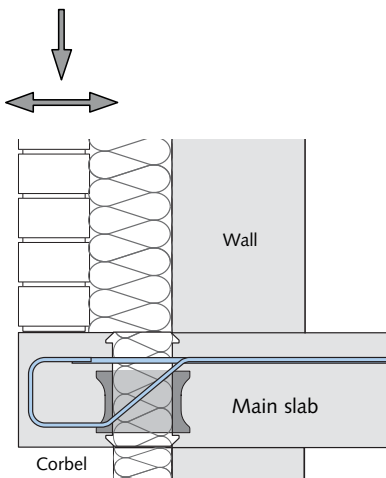
HIT Type	Number of shear bars	Number n connecting bars ①
HIT-HP FT1	2	3
HIT-HP FT2	3	4
HIT-SP FT1	2	3
HIT-SP FT2	3	4

Edge distances

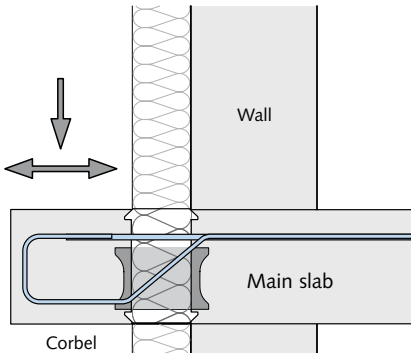


HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE HIT-HP OTX, HIT-SP OTX

- Thermal insulated connections for application between the main slab and a corbel
- Transfer of normal forces and also of shear forces



Application: Main slab supporting a brickwork façade



Application: Main slab with a continuous fascia/corbel

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

Content	Type	Page
Product variations / Load range	HIT-HP OTX, HIT-SP OTX	141
Product description	HIT-HP OTX, HIT-SP OTX	142
Load bearing capacity values	HIT-HP OTX, HIT-SP OTX	143
On-site reinforcement	HIT-HP OTX, HIT-SP OTX	146
Determining axial spacing	HIT-HP OTX, HIT-SP OTX	147

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP OTX, HIT-SP OTX

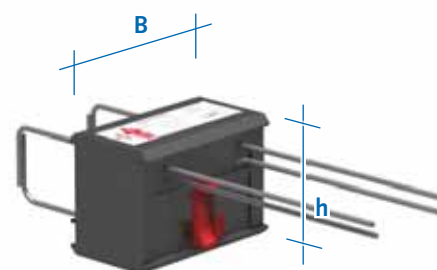
Product variations – Load range

The following table lists possible combinations of shear bars and tension bars.
All elements have a double-symmetric CSB.

Possible combinations of structural elements			
Element width B = 25 cm		Number of tension bars $\varnothing 8$	
		2	2
Number of shear bars $\varnothing 6$	2	•	•
Number of shear bars $\varnothing 8$	2	•	•
Type		OTX1	OTX2
• = HP and SP			

Ordering example

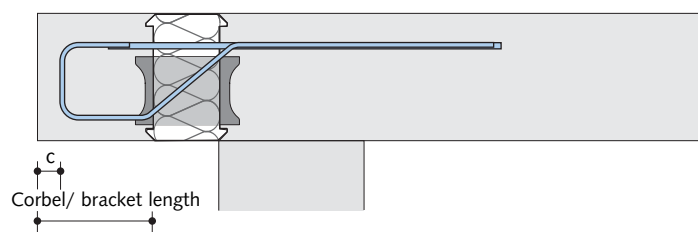
HIT-HP	OTX1	02 02	18	025	06
HIT-SP	OTX2	02 02	25	025	08
↓	↓	↓	↓	↓	↓
①	③	④ ⑤	⑥	⑦	⑧



Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Number of tension bars
- ⑤ Number of shear bars
- ⑥ Element height h [cm]
- ⑦ Element width B [cm]
- ⑧ Diameter shear bars [mm]

Possible slab thickness h



Concrete cover [mm] top and bottom	30
Possible slab thickness h [cm]	18 – 35*
Corbel/ bracket length [mm] HIT-OTX1	≥ 155 mm (c=30 mm concrete cover at front edge)
Corbel/ bracket length [mm] HIT-OTX2	≥ 195 mm (c=30 mm concrete cover at front edge)
*load bearing capacities for main slab heights > 25 cm available on request	

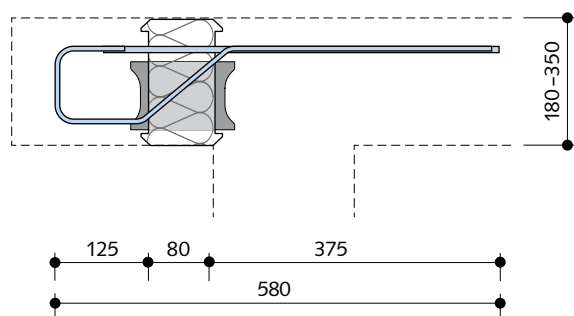
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP OTX, HIT-SP OTX

Product description – Sectional views

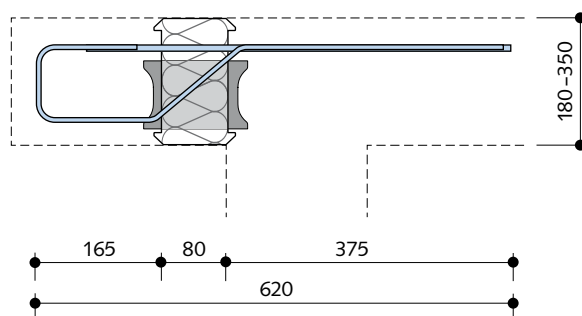
Cross section:

HIT-HP OTX1



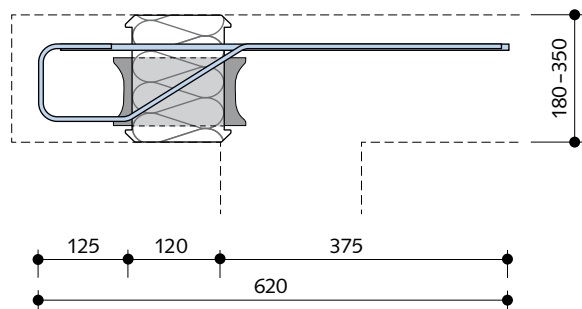
Dimensions in [mm]

HIT-HP OTX2



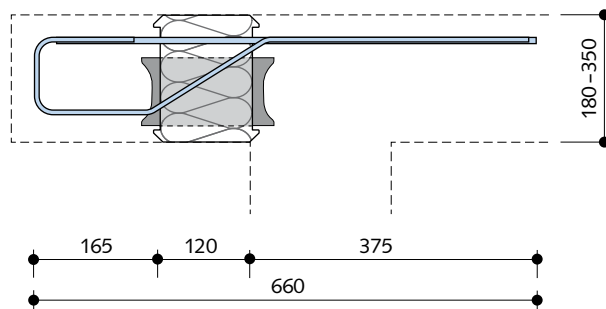
Cross section:

HIT-SP OTX1



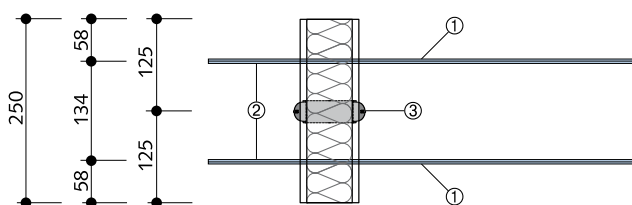
Dimensions in [mm]

HIT-SP OTX2



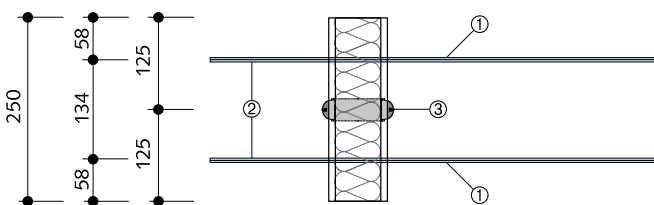
Top view:

HIT-HP/SP OTX1 – Bar spacings



Dimensions in [mm]

HIT-HP/SP OTX2 – Bar spacings

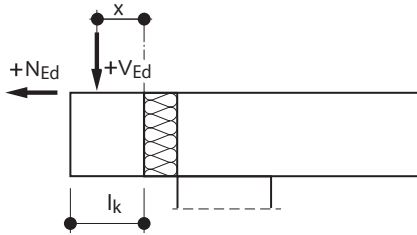


- ① Tension bars: $\varnothing 8$ mm, B500 NR
- ② Shear bars: $\varnothing 6$ mm or $\varnothing 8$ mm, B500 NR
- ③ double-symmetrical CSB

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE HIT-HP OTX

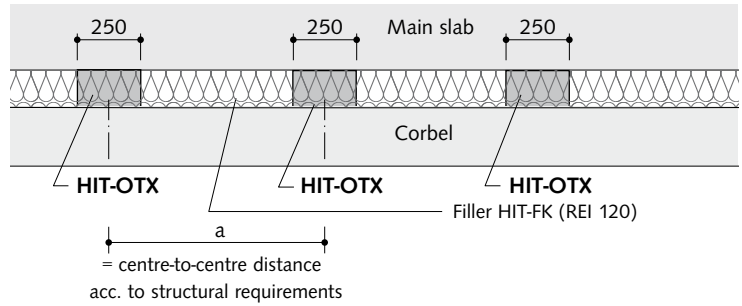
Structural system

Sign convention for calculation



l_k = cantilever length of the bracket
 x = load distance

Top view: Main slab with corbel connected



Load bearing capacity values according to EN 1992-1-1 (EC2)



V_{Rd} in one direction

Concrete strength: Corbel $\geq C25/30$
Main slab $C20/25 \geq C20/25$



HIT-HP OTX1	Element height [mm]	Shear bars $\phi 6$								Shear bars $\phi 8$							
		Load distance x [mm]								Load distance x [mm]							
		≤ 75	85	95	105	≤ 75	85	95	105	≤ 75	85	95	105	≤ 75	85	95	105
Design values V_{Rd} [kN/element]	180	27.3	28.0	25.9	26.7	24.6	25.4	23.5	24.2	27.8	28.7	26.4	27.2	25.0	25.8	23.8	24.6
	190	28.0	28.0	28.0	28.0	27.6	28.0	26.2	27.0	31.4	32.4	29.7	30.6	28.1	29.0	26.7	27.5
	200	28.8	28.8	28.8	28.8	28.8	28.8	28.1	28.8	32.8	33.7	31.1	31.9	29.5	30.3	28.1	28.8
	210	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	36.4	37.3	34.4	35.2	32.6	33.4	31.0	31.7
	220	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	40.2	41.2	37.9	38.8	35.9	36.7	34.0	34.8
	230	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	44.4	46.4	41.7	42.7	39.4	40.2	37.3	38.1
	240	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	42.8	43.7	40.5	41.3	38.5	39.2	36.6	37.3
	250	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	46.4	47.2	43.8	44.6	41.5	42.3	39.5	40.2
	>250	Available on request. See inside back cover for contact information.															

$$N_{Rd} = \pm 0.1 \times V_{Rd}$$



All necessary verifications have been already considered. Adjacent slabs must be verified by the planner.



Load bearing capacity values of further types can be found on the following page.

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

HIT-HP OTX

Load bearing capacity values according to EN 1992-1-1 (EC2)



V_{Rd} in one direction

Concrete strength: Corbel $\geq C25/30$
Main slab $C20/25 \geq C20/25$



HIT-HP OTX2	Element height [mm]	Shear bars $\phi 6$															
		Load distance x [mm]															
		≤ 75	85	95	105	115	125	135	145								
Design values V_{Rd} [kN/element]	180	27.3	28.0	25.9	26.7	24.6	25.4	23.5	24.2	22.4	23.1	21.4	22.1	20.6	21.2	19.7	20.3
	190	28.0	28.0	28.0	28.0	27.6	28.0	26.2	27.0	25.0	25.7	23.9	24.6	22.9	23.5	22.0	22.6
	200	28.8	28.8	28.8	28.8	28.8	28.8	28.1	28.8	26.8	27.5	25.6	26.3	24.5	25.2	23.6	24.1
	210	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.2	28.8	27.0	27.6	25.9	26.4
	220	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.3	28.8
	230	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8
	240	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7
	250	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.7
	>250	Available on request. See inside back cover for contact information.															

$$N_{Rd} = \pm 0.1 \times V_{Rd}$$

HIT-HP OTX2	Element height [mm]	Shear bars $\phi 8$															
		Load distance x [mm]															
		≤ 75	85	95	105	115	125	135	145								
Design values V_{Rd} [kN/element]	180	27.8	28.7	26.4	27.2	25.0	25.8	23.8	24.6	22.7	23.4	21.8	22.4	20.8	21.5	20.0	20.6
	190	31.4	32.4	29.7	30.6	28.1	29.0	26.7	27.5	25.5	26.2	24.3	25.0	23.3	23.9	22.3	22.9
	200	32.8	33.7	31.1	31.9	29.5	30.3	28.1	28.8	26.8	27.5	25.6	26.3	24.5	25.2	23.6	24.1
	210	36.4	37.3	34.4	35.2	32.6	33.4	31.0	31.7	29.5	30.2	28.2	28.8	27.0	27.6	25.9	26.4
	220	40.2	41.2	37.9	38.8	35.9	36.7	34.0	34.8	32.4	33.1	30.9	31.5	29.5	30.1	28.3	28.9
	230	44.4	46.4	41.7	42.7	39.4	40.2	37.3	38.1	35.4	36.1	33.7	34.4	32.2	32.8	30.8	31.4
	240	42.8	43.7	40.5	41.3	38.5	39.2	36.6	37.3	34.9	35.6	33.4	34.0	32.0	32.6	30.7	31.2
	250	46.4	47.2	43.8	44.6	41.5	42.3	39.5	40.2	37.6	38.3	35.9	36.6	34.4	35.0	33.0	33.5
	>250	Available on request. See inside back cover for contact information.															

$$N_{Rd} = \pm 0.1 \times V_{Rd}$$



All necessary verifications have been already considered. Adjacent slabs must be verified by the planner.



Load bearing capacity values of further types can be found on the following page.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

HIT-SP OTX

Load bearing capacity values according to EN 1992-1-1 (EC2)



V_{Rd} in one direction

Concrete strength: Corbel $\geq C25/30$
Main slab $C20/25 \geq C20/25$



HIT-SP OTX1	Element height [mm]	Shear bars $\varnothing 6$								Shear bars $\varnothing 8$							
		Load distance x [mm]								Load distance x [mm]							
		≤ 75		85		95		105		≤ 75		85		95		105	
Design values V_{Rd} [kN/element]	180	22.5	22.7	22.5	22.7	22.5	22.7	21.7	22.4	25.5	26.4	24.2	25.1	23.1	23.9	22.1	22.8
	190	22.5	22.7	22.5	22.7	22.5	22.7	22.5	22.7	29.1	30.2	27.6	28.6	26.2	27.1	25.0	25.8
	200	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	33.3	34.4	31.4	32.5	29.8	30.7	28.3	29.1
	210	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	35.9	36.7	35.8	36.7	33.8	34.8	32.0	32.8
	220	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	37.5	38.6	35.5	36.4	33.6	34.5	32.0	32.7
	230	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	40.1	40.7	39.5	40.5	37.3	38.3	35.4	36.2
	240	25.6	25.7	25.6	25.7	25.6	25.7	25.6	25.7	40.9	41.8	38.7	39.7	36.8	37.7	35.1	35.8
	250	25.6	25.7	25.6	25.7	25.6	25.7	25.6	25.7	43.5	43.9	42.4	43.3	40.2	41.1	38.2	38.9
	>250	Available on request. See inside back cover for contact information.															

$$N_{Rd} = \pm 0.1 \times V_{Rd}$$

HIT-SP OTX2	Element height [mm]	Shear bars $\varnothing 6$															
		Load distance x [mm]															
		≤ 75		85		95		105		115		125		135		145	
Design values V_{Rd} [kN/element]	180	22.5	22.7	22.5	22.7	22.5	22.7	21.7	22.4	20.8	21.5	19.9	20.6	19.2	19.8	18.5	19.1
	190	22.5	22.7	22.5	22.7	22.5	22.7	22.5	22.7	22.5	22.7	22.4	22.7	21.5	22.2	20.7	21.3
	200	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	23.8	24.1	22.9	23.5	22.0	22.7
	210	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1
	220	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1
	230	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1	24.0	24.1
	240	25.6	25.7	25.6	25.7	25.6	25.7	25.6	25.7	25.6	25.7	25.6	25.7	25.6	25.7	25.6	25.7
	250	25.6	25.7	25.6	25.7	25.6	25.7	25.6	25.7	25.6	25.7	25.6	25.7	25.6	25.7	25.6	25.7
	>250	Available on request. See inside back cover for contact information.															

$$N_{Rd} = \pm 0.1 \times V_{Rd}$$



All necessary verifications have been already considered. Adjacent slabs must be verified by the planner.



Load bearing capacity values of further types can be found on the following page.

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE HIT-SP OTX

Load bearing capacity values according to EN 1992-1-1 (EC2)



V_{Rd} in one direction

Concrete strength: Corbel $\geq C25/30$
Main slab $C20/25 \geq C20/25$



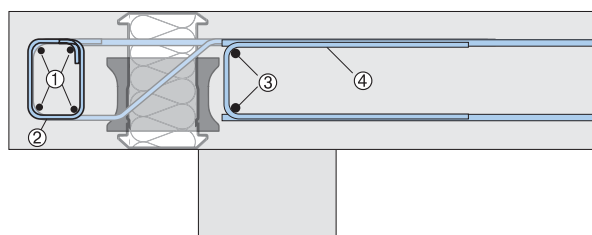
HIT-SP OTX2	Element height [mm]	Shear bars $\phi 8$															
		Load distance x [mm]															
		≤ 75		85		95		105		115		125		135		145	
Design values V_{Rd} [kN/element]	180	25.4	26.4	24.2	25.1	23.0	23.9	22.0	22.8	21.1	21.8	20.2	20.9	19.4	20.1	18.7	19.3
	190	29.0	30.1	27.5	28.5	26.2	27.1	25.0	25.8	23.8	24.6	22.8	23.6	21.9	22.6	21.0	21.7
	200	33.2	34.3	31.3	32.4	29.7	30.7	28.2	29.1	26.9	27.7	25.7	26.5	24.6	25.3	23.6	24.3
	210	35.9	36.7	35.7	36.7	33.7	34.7	31.9	32.8	30.3	31.2	28.8	29.7	27.5	28.3	26.3	27.1
	220	37.4	38.5	35.4	36.4	33.6	34.5	31.9	32.8	30.5	31.3	29.1	29.9	27.9	28.6	26.8	27.4
	230	40.1	40.7	39.4	40.4	37.3	38.2	35.4	36.2	33.6	34.5	32.1	32.9	30.7	31.4	29.4	30.1
	240	40.5	41.8	38.7	39.6	36.8	37.6	35.0	35.8	33.5	34.2	32.0	32.8	30.7	31.4	29.5	30.2
	250	42.5	43.9	42.3	43.2	40.1	41.0	38.2	39.0	36.4	37.2	34.8	35.5	33.3	34.0	32.0	32.6
	>250	Available on request. See inside back cover for contact information.															

$$N_{Rd} = \pm 0.1 \times V_{Rd}$$



All necessary verifications have been already considered. Adjacent slabs must be verified by the planner.

On-site reinforcement HIT-OTX



- ① 4× $\phi 8$
- ② Stirrups 5× $\phi 8$ per HIT-OTX Element
- ③ 2× $\phi 8$
- ④ U-bar min. $\phi 6 / 25$ cm as on-site connecting reinforcement



Installation instructions can be found on our website www.halfen.com.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE HIT-HP OTX, HIT-SP OTX

Determining the axial spacing a

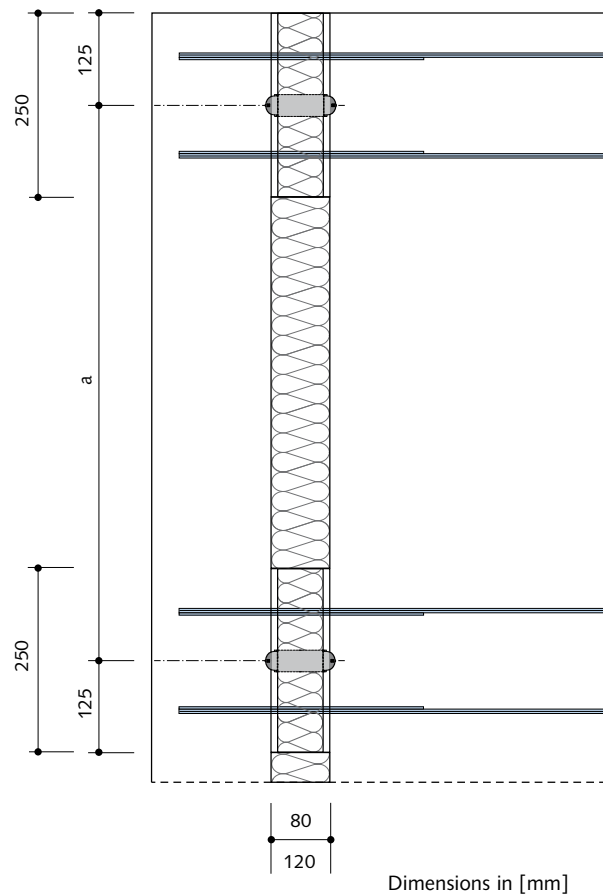
Calculation of the maximum element spacing of the HIT-OTX Elements is dependent on the acting shear forces $+v_{Ed}$ [kN/m] and the axial forces $\pm n_{Ed}$ [kN/m].

- **Step 1:** Find V_{Rd} (N_{Rd}) in the table “Load bearing capacity values” to select shear bars of either $\varnothing 6$ mm or $\varnothing 8$ mm this is dependent on the element height h , the concrete strength class and load distance x .
- **Step 2:** Calculate the element spacing a

$$a_{max,1} = V_{Rd} / v_{Ed} \quad [m]$$

$$a_{max,2} = N_{Rd} / n_{Ed} \quad [m]$$

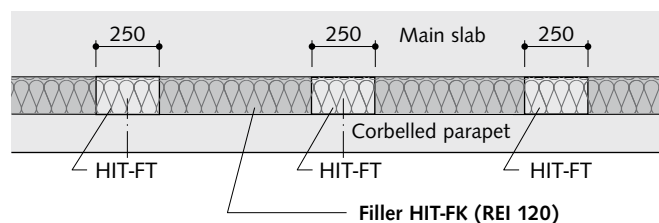
$$a = \min(a_{max,1}; a_{max,2})$$
- **Step 3:** Check the calculated load bearing capacities (per element)
(optional) $v_{Ed} \cdot a = V_{Ed} \leq V_{Rd}$
 $n_{Ed} \cdot a = N_{Ed} \leq N_{Rd}$



HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP FK, HIT-SP FK

- Filler element without support elements for use in all applications
- Mineral wool construction product class A1; used as an insulating material



Top view:

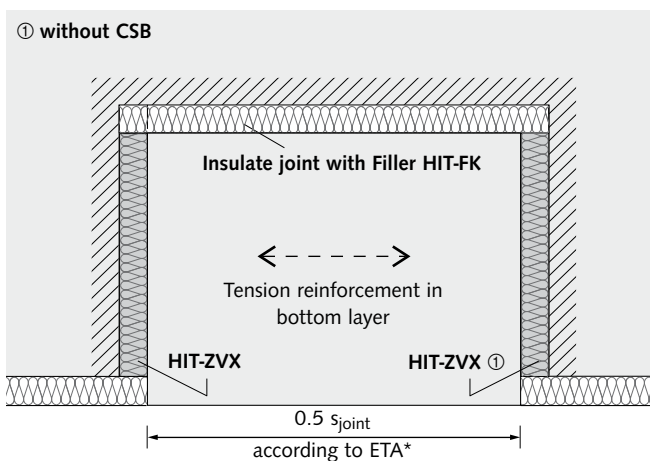
Main slab with attached corbelled parapet

HIT-HP FK – High Performance

with 80 mm insulation thickness

HIT-SP FK – Superior Performance

with 120 mm insulation thickness



*see page 54

Content	Type	Page
Practical width adjustment	HIT-HP FK, HIT-SP FK	149

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP FK, HIT-SP FK

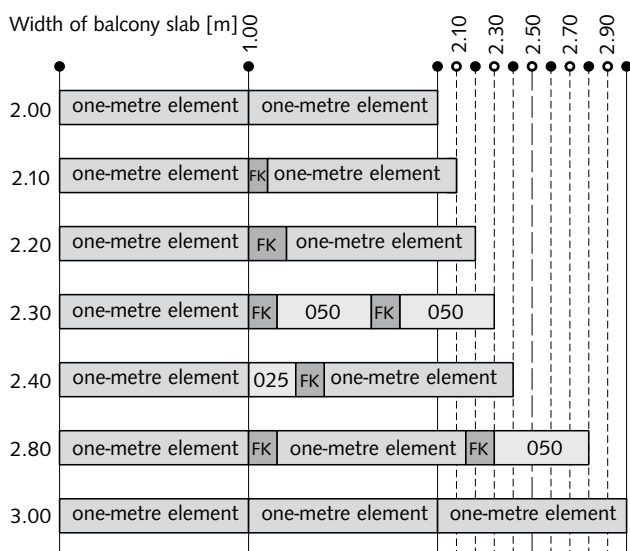
Optimized Combination

HIT Fillers ease the installation of HIT Elements as 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: 16–35 cm

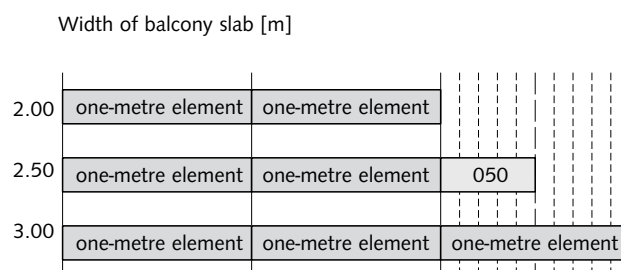
Combination of HIT-HP / HIT-SP Elements (B = 0.25/0.50/1.00 m) and fillers (examples)



The increase of the loaded areas when HIT Fillers are used is compensated by the HIT Design program with the respective additions.

FK = Filler HIT-HP FK (see below) 025 = Element with B = 0.25 m
 050 = Element with B = 0.50 m

Use of one-metre elements and short units



Ordering example for HIT Fillers

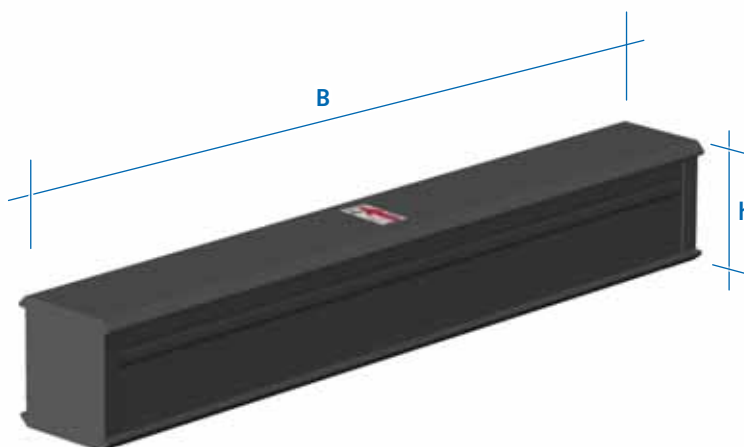
HIT-SP FK - 16 - 025

↓ ↓ ↓ ↓

① ② ③ ④ ⑤

Type designation

- ① Product group
- ② Joint spacing 80 mm (HP) or 120 mm (SP)
- ③ Connection type
- ④ Element height h [cm]
- ⑤ Element width B [cm]



HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

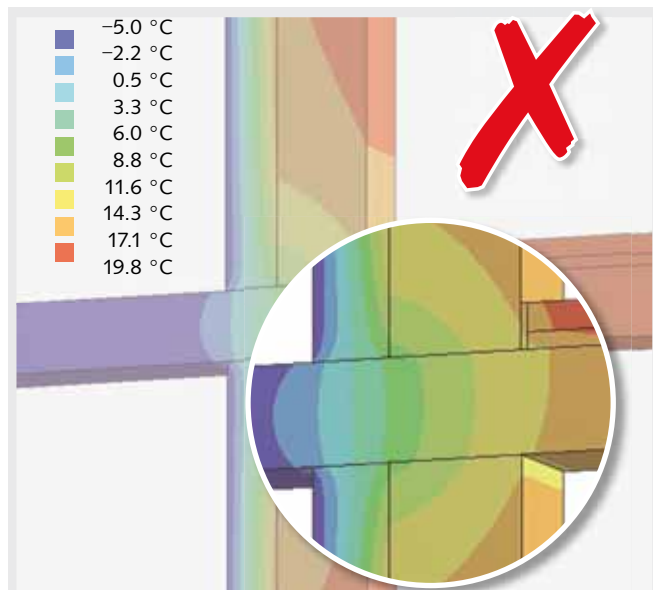
Building Physics, Planning

7

- › Building physics: Basics and specific values
- › Software and tender specifications

The temperature field in the cross section (shown as isotherms) illustrates the advantages of the HALFEN HIT Insulated connection for the required

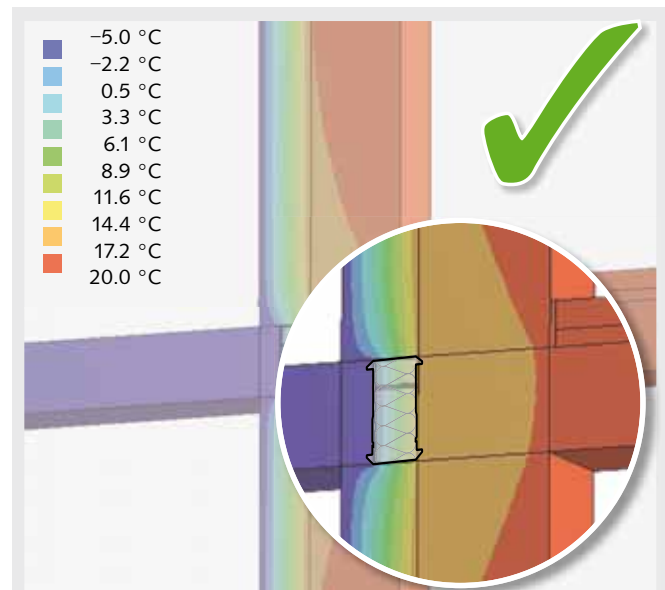
minimum thermal insulation: For instance no condensation and mould growth in critical areas.



⚡ **Temperature below condensation point – negative effects**

Balcony slab – installed without insulation:

- thermal bridge
- condensation
- moisture penetration
- mould formation on ceiling and wall
- cracks in the concrete slabs



✓ **Temperature OK – positive effects**

Balcony slab – with HALFEN Insulated connection HIT-HP and HIT-SP:

- effective thermal insulation of the balcony slab
- temperature above the condensation point
- perfectly designed structural physics
- prevents cracks in the concrete resulting from extreme thermal expansion in the balcony connection

Content	Page
Thermal insulation basics	151
HALFEN ψ Calculator	154
Building authority approved thermal values HIT-HP MVX, HIT-SP MVX	155
Building authority approved thermal values HIT-HP ZVX, HIT-SP ZVX	160
Passive House Institute certificates	163
Sound proofing according to DIN 4109	165
Fire protection according to EN 13501	166
HIT Software	167

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

Building Physics

Thermal insulation

Definition of thermal bridging

A thermal bridge is an area in buildings through which the transmission heat loss (heat loss) is increased.

Heat is conveyed to the outside of the building faster than through adjacent components. The following are types of thermal bridges are common to buildings:

- Material-related thermal bridges caused by materials or components with increased thermal conductivity, which are installed in specific areas, for example; steel support and beams.
- Geometric thermal bridges are created solely by geometric shapes, e.g. by an outer corner of a wall.
- Constructive thermal bridges such as non-insulated cantilever balcony slabs.

With regard to type, we need to distinguish between linear and point thermal bridges. In the case of a linear thermal bridge, the additional heat loss is determined by the linear heat transfer coefficient Ψ in $W/(mK)$, for point type thermal bridge with the point thermal heat transfer coefficient χ in W/K .

Consequences of thermal bridges

Thermal bridges result in higher primary energy consumption, as the additional heat loss requires a higher heating output at low outside temperatures. The surface temperature in the area of thermal bridges can be significantly lower than in other areas. If the temperature falls below the critical limit, mould spores can form at humidity as low as 80%. Behind cupboards and under carpets, mould usually remains undetected for a longer period of time and can cause health problems such as allergies.

If the surface temperature of a component falls below the condensation point, the water in the room air will condensate in these areas. This will moisten the structure of the building. This can impair the load-bearing capacity and serviceability of the building.

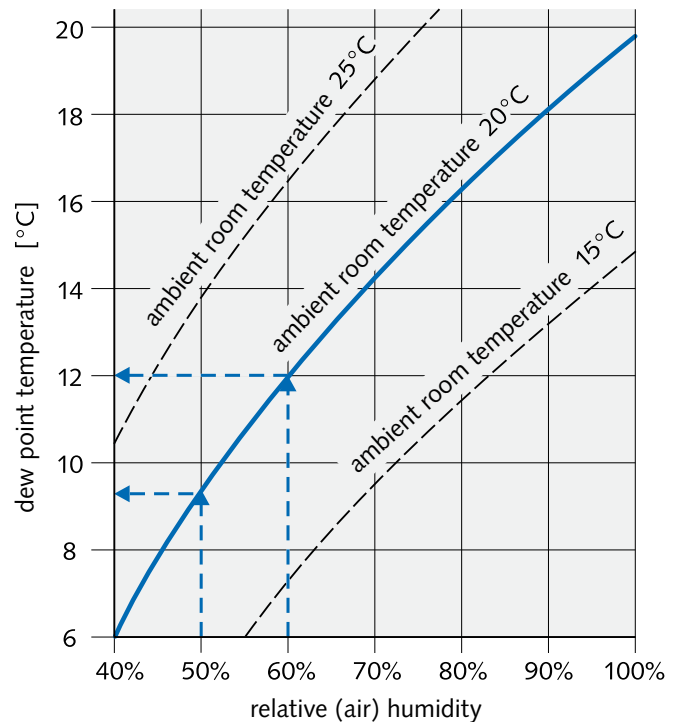


Fig.: Condensation diagram

Properties of air

Depending on the temperature, the air can retain different amounts of moisture. The capacity of the air to store water 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 condensation 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, condensation will form on this surface.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

Building Physics

Amendments to DIN 4108-2

Temperature factor f_{Rsi}

The temperature factor f_{Rsi} is calculated using the minimum surface temperature Θ_{si} , of the interior air temperature Θ_i and the exterior air temperature Θ_e . According to the requirements in DIN 4108-2 concerning the minimum surface temperature and boundary conditions, the following criterion apply to prevent mould forming:

$$f_{Rsi} = \frac{\Theta_{si} - \Theta_e}{\Theta_i - \Theta_e} \geq 0.7$$

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

Linear thermal heat coefficient Ψ

Heat losses caused by a linear thermal bridge, for example a continuous balcony, are taken into account using the length-related heat transfer coefficient (unit $W/(mK)$). The length-related heat transfer coefficient is a parameter that describes the influence of this thermal bridge on the total heat flow and is characteristic for the relevant component.

The Ψ value depends on the insulation performance of the slab connection element (HIT Element) and on the structural design of the wall. With increased insulation performance of the wall, the length-related heat transfer coefficient Ψ increases even if the HALFEN Insulated connection remains unchanged.

Equivalent thermal heat conductivity λ_{eq}

Complex building elements like the HALFEN Insulated connection consist of various base materials with different thermal conductivities. To consider this type of configuration in detail can be very complex. To simplify, a homogeneous, cube-shaped substitute with the same dimensions can be used in the insulation joint. An equivalent thermal conductivity λ_{eq} is assigned to the substitute body so that the total heat flow of both systems is identical. The determination of the λ_{eq} value is based on an detailed three-dimensional thermal bridge calculation.

The calculation of the equivalent thermal conductivity is defined in the European Assessment Document (EAD) for load-bearing thermal insulation elements and the European Technical Assessment (ETA) for HALFEN Insulated connections.

The λ_{eq} values cannot be used directly to calculate the primary energy demand of a building. With the help of a thermal bridge software, length-related heat transfer coefficients can be determined and the transmission losses calculated. To achieve this, the thermal boundary conditions according to EN ISO 6946 and DIN 4108 part 2 must be observed. Because of simplified modelling an exact calculation of the minimum surface temperature resp. the temperature factor is not possible. However, the results are sufficiently accurate and can be used to evaluate for mould formation.

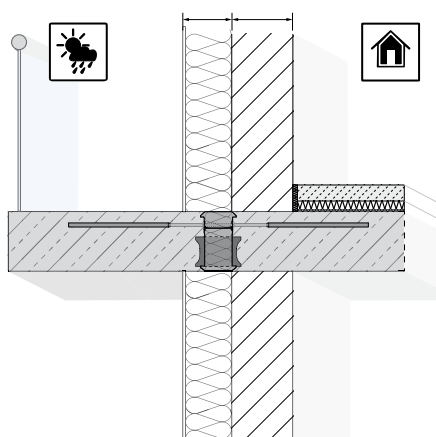


Fig. 1: Cross section through a balcony slab with a HALFEN HIT Insulated connection, connected to the main (inner) slab.

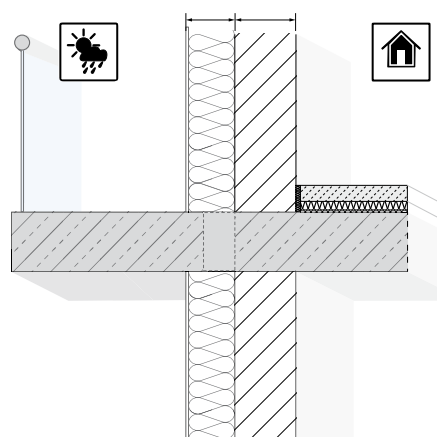


Fig. 2: Cross section through a balcony slab with homogeneous inset, connected to the main (inner) slab.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

Building Physics

EnEV - The Energy Saving Directive

EnEV requirements

The European Buildings Directive of 2010 requires:

- that by 31st December 2020, all new buildings are low-energy buildings
- after 31st December all new buildings used by public authorities as owners are low-energy buildings

The amended EnEV 2014, which came into force on the 1st May 2014, implements this EU building directive.

The EnEV 2014 includes an improvement in the energy standard for new buildings, both residential and non-residential, from the 1st January 2016.

According to the 2016 EnEV, for new residential buildings the maximum value of the calculated annual primary energy demand is to be reduced by 25% compared to the 2009 EnEV, i.e. the result of the calculation of the annual primary energy demand of the reference house from 2009 EnEV is multiplied by the factor 0.75. In addition, the thermal insulation of the envelope in new buildings must exhibit an improvement of approx. 20%. The thermal heat loss (H_T in (W/m²K)) of the building envelope must not exceed the corresponding maximum value of the reference house.

Calculation of thermal bridges

The energy related effect of thermal bridges is taken into account in the calculations for the EnEV verification. Thermal bridges can be calculated using three different methods:

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: With a detailed verification of the specific transmission loss of the thermal bridges according to DIN V 4108-6 or DIN V 18599 or by determination 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 methods 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, annex 2, according to National Technical Approvals Z-15.7-293 and Z-15.7-312. 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.

The thermal values for HALFEN Insulated connection types HIT-HP MVX / HIT-SP MVX and HIT-HP ZVX / HIT-SP ZVX are included in the National Technical Approvals Z-15.7-293 and Z-15.7-312.

Calculation of thermal bridges in residential buildings

Description/ basics standard	Method 1 without verifications	Method 2 specification details or equivalent details	Method 3 Exact calculation of thermal bridges with linear thermal transmission coefficients (= ψ -values)
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 slab connections, slab supports, thermally separated balcony slabs)

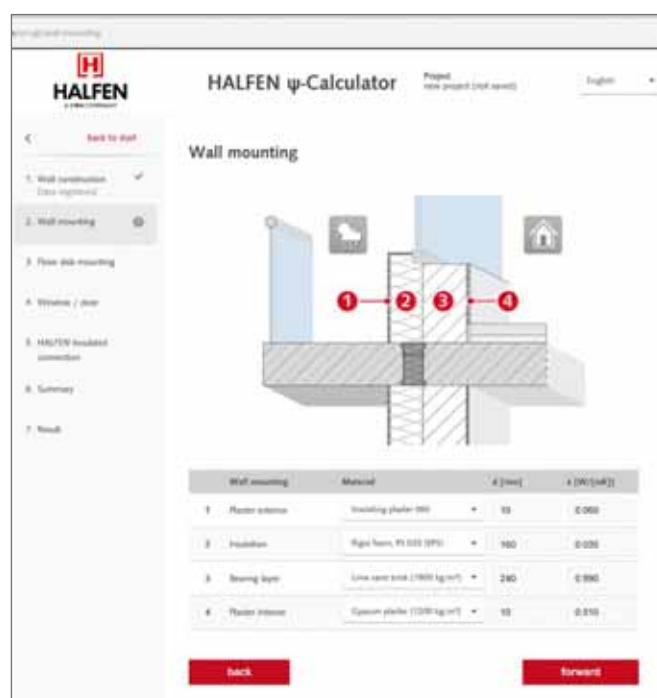
* ψ -values for various installation situations → see tables on page 156ff.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE Building Physics

HALFEN ψ -Calculator – Thermal bridge tool for HALFEN Insulated connections



To obtain an Energy Performance Certification (EPC) according to the German Energy Saving Ordinance (EnEV Energieeinsparverordnung) verification of thermal bridges are required. To calculate the thermal bridges in balcony connections ψ -values are required to model the structure. The essential key values for this are provided by HALFEN.



Screenshot HIT-Calculator Web App: Parameter input window

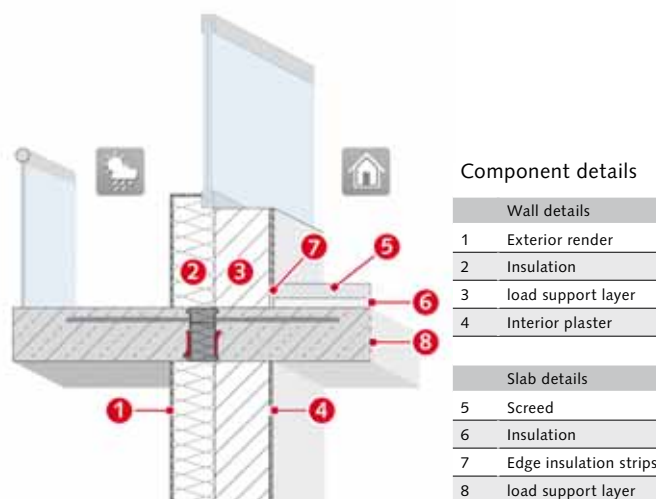


Illustration of an exterior wall: Here an example using an ETICS system with a window.

User-friendly selection of standard materials and their properties are available to ensure efficiency. This tool also provides the option of selecting windows and doors above a balcony.

The results of the ψ -value calculation can be output as a concise PDF file with all relevant parameters. This can be printed and included in your planning and project documentation. Individual project details can also be included in the PDF output.

Using a link, previous defined installation situations can be reused; these can be edited or adapted with new specifications.

Five easy stages are required to enter the necessary parameters:

- > selection of wall design
- > selection of wall construction
- > selection of slab details
- > option to select windows/doors
- > output of selected HALFEN HIT (type)

Select between an External Thermal Insulation Composite System (ETICS), a monolithic or double-leaf and a sandwich wall construction for calculation. All wall constructions consist of different layers, for example, an exterior render, insulation or the load-bearing layer. The thermal conductivity, materials and the dimensions of the various layers can be defined in further stages.



HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

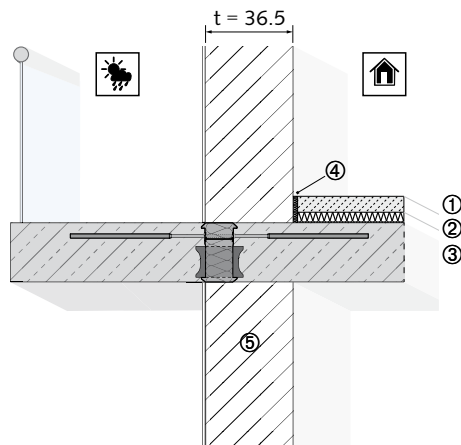
Building Physics

Thermal values according to Technical Approvals



The physical properties for HALFEN Insulated connections HIT-HP MVX/HIT-SP MVX and HIT-HP ZVX/HIT-SP ZVX 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 EN ISO 10211 (linear coefficient of thermal transmission ψ , minimal surface temperature $\theta_{\min}$ and temperature factor f_{Rsi}).

These values were officially integrated into the national technical approvals Z-15.7-293 and Z-15.7-312.



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 MVX/HIT-SP MVX and HIT-HP ZVX/HIT-SP ZVX are listed in the tables on the following pages.

Installation diagram for monolithic masonry

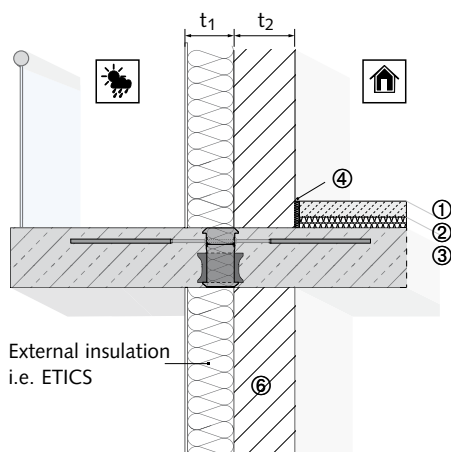
Thermal transmission coefficient, standard cross section "Exterior wall": $U = 0.311 \text{ W}/(\text{m}^2 \text{ K})$

- external wall (monolithic):
width $t = 36.5 \text{ cm}$ ($\lambda = 0.12 \text{ W}/(\text{mK})$)
- floor construction (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 ($\lambda = 0.14 \text{ W}/(\text{mK})$)
- ⑤ monolithic masonry



The thermal values only apply for the specified installation applications and boundary conditions.



External insulation
i.e. ETICS

Installation diagram for masonry with ETICS

Standard cross section

for thermal transmission coefficient "Exterior wall":

- thermally 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

ETICS = External Thermal Insulation Composite Systems

HALFEN HIT INSULATED CONNECTION HIGH PERFORMANCE

Building Physics

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

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

Building Physics

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

Building Physics

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

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

Building Physics

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

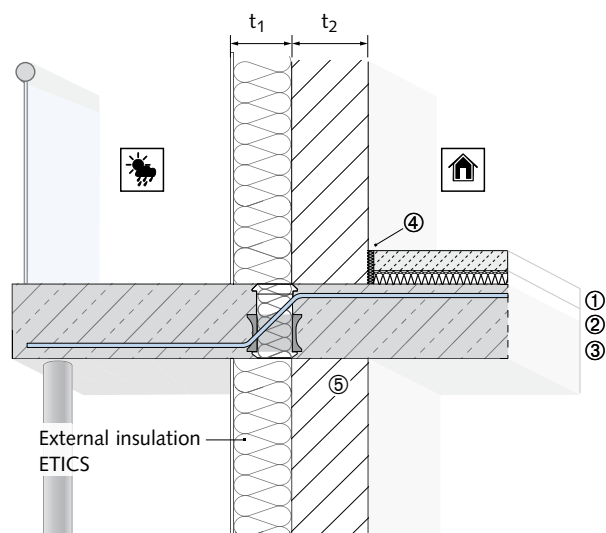
② θ_{si,min} = Minimum roomside surface temperature in °C

③ f_{Rsi} = Temperature factor in [-]

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

Building Physics

Thermal values according to Technical Approvals



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 bridge characteristic values for HIT-HP ZVX for masonry with ETICS

Thermal insulation exterior wall / ETICS thickness [mm]	140			220			300		
Thermal transmission coefficient of standard cross section "External wall" U in $\text{W/(m}^2\text{K)}$	0.227			0.149			0.111		
Load range	ψ ①	$\theta_{\text{si,min}}$ ②	f_{Rsi} ③	ψ ①	$\theta_{\text{si,min}}$ ②	f_{Rsi} ③	ψ ①	$\theta_{\text{si,min}}$ ②	f_{Rsi} ③
HIT-HP ZVX-0404-16-100-30-06	0.148	17.91	0.916	0.161	18.22	0.929	0.168	18.38	0.935
HIT-HP ZVX-0604-16-100-30-06	0.152	17.85	0.914	0.172	18.09	0.924	0.185	18.19	0.927
HIT-HP ZVX-0804-16-100-30-06	0.157	17.85	0.914	0.183	18.09	0.924	0.201	18.19	0.927
HIT-HP ZVX-0404-16-100-30-08	0.155	17.86	0.914	0.168	18.18	0.927	0.174	18.35	0.934
HIT-HP ZVX-0604-16-100-30-08	0.163	17.76	0.910	0.182	18.01	0.920	0.195	18.10	0.924
HIT-HP ZVX-0804-16-100-30-08	0.171	17.76	0.910	0.197	18.01	0.920	0.215	18.10	0.924
HIT-HP ZVX-0404-18-100-30-10	0.161	17.82	0.913	0.180	18.11	0.924	0.187	18.27	0.931
HIT-HP ZVX-0604-18-100-30-10	0.175	17.65	0.906	0.201	17.86	0.914	0.211	17.99	0.920
HIT-HP ZVX-0804-18-100-30-10	0.190	17.65	0.906	0.222	17.86	0.914	0.235	17.99	0.920
HIT-HP ZVX-0404-18-100-30-12	0.171	17.77	0.911	0.189	18.06	0.922	0.196	18.23	0.929
HIT-HP ZVX-0604-18-100-30-12	0.190	17.56	0.902	0.215	17.78	0.911	0.224	17.91	0.916
HIT-HP ZVX-0804-18-100-30-12	0.209	17.56	0.902	0.240	17.78	0.911	0.253	17.91	0.916
HIT-HP ZVX-0202-16-100-30-06	0.098	18.21	0.928	0.120	18.48	0.939	0.130	18.62	0.945
HIT-HP ZVX-0402-16-100-30-06	0.103	18.17	0.927	0.124	18.45	0.938	0.135	18.59	0.944
HIT-HP ZVX-0602-16-100-30-06	0.108	18.14	0.926	0.129	18.42	0.937	0.139	18.56	0.942
HIT-HP ZVX-0802-16-100-30-06	0.113	18.11	0.925	0.134	18.39	0.936	0.143	18.54	0.941
HIT-HP ZVX-0603-16-100-30-06	0.128	18.02	0.921	0.147	18.30	0.932	0.156	18.46	0.938
HIT-HP ZVX-0803-16-100-30-06	0.133	18.00	0.920	0.152	18.28	0.931	0.160	18.44	0.937

- continue on next page -

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

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

③ f_{Rsi} = Temperature factor in [-]

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

Building Physics

Thermal bridge characteristic values for HIT-HP ZVX for masonry with ETICS – continued from previous page									
Thermal insulation exterior wall / ETICS thickness [mm]	140			220			300		
Thermal transmission coefficient of standard cross section "External wall" U in W/(m ² K)	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 ZVX-0202-16-100-30-08	0.102	18.18	0.927	0.123	18.45	0.938	0.133	18.60	0.944
HIT-HP ZVX-0402-16-100-30-08	0.111	18.13	0.925	0.131	18.40	0.936	0.141	18.55	0.942
HIT-HP ZVX-0602-16-100-30-08	0.119	18.07	0.923	0.139	18.35	0.934	0.148	18.50	0.940
HIT-HP ZVX-0802-16-100-30-08	0.128	18.02	0.921	0.147	18.31	0.932	0.156	18.46	0.938
HIT-HP ZVX-0603-16-100-30-08	0.139	17.96	0.918	0.158	18.24	0.930	0.165	18.40	0.936
HIT-HP ZVX-0803-16-100-30-08	0.147	17.91	0.916	0.165	18.20	0.928	0.172	18.36	0.934
HIT-HP ZVX-0402-18-100-30-10	0.123	18.05	0.922	0.145	18.32	0.933	0.155	18.47	0.939
HIT-HP ZVX-0602-18-100-30-10	0.136	17.97	0.919	0.156	18.25	0.930	0.166	18.40	0.936
HIT-HP ZVX-0802-18-100-30-10	0.148	17.90	0.916	0.169	18.18	0.927	0.177	18.34	0.933
HIT-HP ZVX-0603-18-100-30-10	0.155	17.86	0.914	0.174	18.14	0.926	0.182	18.30	0.932
HIT-HP ZVX-0803-18-100-30-10	0.167	17.79	0.912	0.186	18.08	0.923	0.193	18.24	0.930
HIT-HP ZVX-0402-18-100-30-12	0.133	18.01	0.920	0.154	18.28	0.931	0.164	18.43	0.937
HIT-HP ZVX-0602-18-100-30-12	0.151	17.90	0.916	0.170	18.17	0.927	0.179	18.33	0.933
HIT-HP ZVX-0802-18-100-30-12	0.168	17.81	0.912	0.186	18.09	0.924	0.193	18.26	0.930
HIT-HP ZVX-0603-18-100-30-12	0.169	17.80	0.912	0.187	18.08	0.923	0.194	18.25	0.930
HIT-HP ZVX-0803-18-100-30-12	0.185	17.70	0.908	0.203	18.00	0.920	0.208	18.17	0.927

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 ZVX for masonry with ETICS									
Thermal insulation exterior wall / ETICS thickness [mm]	140			220			300		
Thermal transmission coefficient of standard cross section "External wall" U in W/(m ² K)	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 ZVX-0404-16-100-30-06	0.095	18.23	0.929	0.120	18.47	0.939	0.137	18.58	0.943
HIT-SP ZVX-0604-16-100-30-06	0.099	18.18	0.927	0.124	18.42	0.937	0.143	18.51	0.940
HIT-SP ZVX-0804-16-100-30-06	0.103	18.18	0.927	0.128	18.42	0.937	0.149	18.51	0.940
HIT-SP ZVX-0404-16-100-30-08	0.101	18.19	0.928	0.127	18.43	0.937	0.144	18.54	0.941
HIT-SP ZVX-0604-16-100-30-08	0.108	18.11	0.924	0.134	18.35	0.934	0.153	18.43	0.937
HIT-SP ZVX-0804-16-100-30-08	0.115	18.11	0.924	0.141	18.35	0.934	0.162	18.43	0.937

– continue on next page –

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 [-]

HALFEN HIT INSULATED CONNECTION SUPERIOR PERFORMANCE

Building Physics

Thermal bridge characteristic values for HIT-SP ZVX for masonry using ETICS – continued from previous page									
Thermal insulation exterior wall / ETICS thickness [mm]	140			220			300		
Thermal transmission coefficient of standard cross section "External wall" U in W/(m ² K)	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 ZVX-0404-18-100-30-10	0.109	18.14	0.926	0.136	18.38	0.935	0.153	18.48	0.939
HIT-SP ZVX-0604-18-100-30-10	0.119	18.02	0.921	0.142	18.31	0.932	0.165	18.34	0.934
HIT-SP ZVX-0804-18-100-30-10	0.129	18.02	0.921	0.148	18.31	0.932	0.177	18.34	0.934
HIT-SP ZVX-0404-18-100-30-12	0.117	18.10	0.924	0.145	18.33	0.933	0.163	18.43	0.937
HIT-SP ZVX-0604-18-100-30-12	0.132	17.94	0.918	0.155	18.23	0.929	0.180	18.25	0.930
HIT-SP ZVX-0804-18-100-30-12	0.147	17.94	0.918	0.165	18.23	0.929	0.196	18.25	0.930
HIT-SP ZVX-0202-16-100-30-06	0.058	18.45	0.938	0.079	18.73	0.949	0.091	18.86	0.954
HIT-SP ZVX-0402-16-100-30-06	0.063	18.43	0.937	0.083	18.70	0.948	0.095	18.84	0.953
HIT-SP ZVX-0602-16-100-30-06	0.067	18.40	0.936	0.087	18.68	0.947	0.099	18.81	0.952
HIT-SP ZVX-0802-16-100-30-06	0.071	18.38	0.935	0.091	18.65	0.946	0.103	18.79	0.952
HIT-SP ZVX-0603-16-100-30-06	0.084	18.30	0.932	0.103	18.58	0.943	0.114	18.72	0.949
HIT-SP ZVX-0803-16-100-30-06	0.088	18.28	0.931	0.107	18.56	0.942	0.117	18.70	0.948
HIT-SP ZVX-0202-16-100-30-08	0.062	18.43	0.937	0.082	18.71	0.948	0.094	18.84	0.954
HIT-SP ZVX-0402-16-100-30-08	0.069	18.39	0.936	0.089	18.67	0.947	0.101	18.80	0.952
HIT-SP ZVX-0602-16-100-30-08	0.076	18.34	0.934	0.096	18.62	0.945	0.107	18.76	0.950
HIT-SP ZVX-0802-16-100-30-08	0.084	18.30	0.932	0.103	18.58	0.943	0.114	18.72	0.949
HIT-SP ZVX-0603-16-100-30-08	0.093	18.24	0.930	0.112	18.53	0.941	0.122	18.67	0.947
HIT-SP ZVX-0803-16-100-30-08	0.100	18.20	0.928	0.118	18.49	0.940	0.128	18.63	0.945
HIT-SP ZVX-0402-18-100-30-10	0.078	18.33	0.933	0.099	18.61	0.944	0.111	18.74	0.949
HIT-SP ZVX-0602-18-100-30-10	0.088	18.26	0.930	0.109	18.54	0.941	0.121	18.67	0.947
HIT-SP ZVX-0802-18-100-30-10	0.099	18.20	0.928	0.120	18.48	0.939	0.131	18.62	0.945
HIT-SP ZVX-0603-18-100-30-10	0.105	18.17	0.927	0.125	18.45	0.938	0.135	18.59	0.943
HIT-SP ZVX-0803-18-100-30-10	0.115	18.11	0.924	0.135	18.39	0.935	0.145	18.53	0.941
HIT-SP ZVX-0402-18-100-30-12	0.087	18.29	0.931	0.108	18.56	0.942	0.119	18.69	0.948
HIT-SP ZVX-0602-18-100-30-12	0.101	18.20	0.928	0.122	18.47	0.939	0.133	18.61	0.944
HIT-SP ZVX-0802-18-100-30-12	0.117	18.12	0.925	0.136	18.40	0.936	0.146	18.54	0.942
HIT-SP ZVX-0603-18-100-30-12	0.118	18.11	0.924	0.137	18.38	0.935	0.147	18.53	0.941
HIT-SP ZVX-0803-18-100-30-12	0.132	18.02	0.921	0.151	18.31	0.932	0.160	18.46	0.938

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 [-]

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

Building Physics

Certificates by the Passive House Institute – Low Energy Component

The Passive House Standard sets very high standards – on the thermal insulation of the building envelope as well as on the individual components.

HALFEN HIT Insulated connections with an insulation thickness from 80 mm are certified by the Passive House Institute as a “Low Energy Component” in the category balcony connection.



The following criteria were used in awarding this certificate

• Efficiency Criterion

In two typical applications (a terraced house and an apartment) the construction fulfills the requirement of:

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

• Comfort Criterion

The inner surface must be warm enough to prevent mould and uncomfortable down-draught and radiation losses:

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



HALFEN HIT certificates on the Internet: If you require HALFEN certificates use the QR code or the hyperlink.



Low Energy Component HIT-HP MVX

Insulation thickness 80 mm for cantilevered balcony slabs	Slab thickness [mm]	Thermal transmission coefficient ψ [W/(mK)]
HIT-HP MVX-0404-18-100-35	180	0.20
HIT-HP MVX-0504-18-100-35	180	0.21
HIT-HP MVX-0506-18-100-35	180	0.25
HIT-HP MVX-0804-18-100-35	180	0.23
HIT-HP MVX-0404-24-100-35	240	0.22
HIT-HP MVX-0504-24-100-35	240	0.23

Low Energy Component HIT-SP MVX

Insulation thickness 120 mm for cantilevered balcony slabs	Slab thickness [mm]	Thermal transmission coefficient ψ [W/(mK)]
HIT-SP MVX-0202-18-100-35	180	0.109
HIT-SP MVX-0404-18-100-35	180	0.167
HIT-SP MVX-0504-18-100-35	180	0.16
HIT-SP MVX-0705-18-100-35	180	0.19
HIT-SP MVX-0804-18-100-35	180	0.17
HIT-SP MVX-0907-18-100-35	180	0.22
HIT-SP MVX-1006-18-100-35	180	0.21
HIT-SP MVX-1008-18-100-35	180	0.24
HIT-SP MVX-1107-18-100-35	180	0.24
HIT-SP MVX-1208-18-100-35	180	0.25
HIT-SP MVX-0202-22-100-35	220	0.113
HIT-SP MVX-0404-22-100-35	220	0.173
HIT-SP MVX-0504-22-100-35	220	0.17
HIT-SP MVX-0705-22-100-35	220	0.20
HIT-SP MVX-0804-22-100-35	220	0.18
HIT-SP MVX-0202-24-100-35	240	0.115
HIT-SP MVX-0404-24-100-35	240	0.175
HIT-SP MVX-0504-24-100-35	240	0.17
HIT-SP MVX-0705-24-100-35	240	0.20
HIT-SP MVX-0804-24-100-35	240	0.18
HIT-SP MVX-0907-24-100-35	240	0.24
HIT-SP MVX-1006-24-100-35	240	0.23
HIT-SP MVX-1008-24-100-35	240	0.25
HIT-SP MVX-1107-24-100-35	240	0.25

Low Energy Component HIT-SP MVX-OD

Insulation thickness 120 mm for cantilevered balcony slabs with downward height offset	Slab thickness [mm]	Thermal transmission coefficient ψ [W/(mK)]
HIT-SP MVX-0504-18-100-35-OD	180	0.175
HIT-SP MVX-0504-22-100-35-OD	220	0.179
HIT-SP MVX-0504-24-100-35-OD	240	0.182

Low Energy Component HIT-SP MVX-OU

Insulation thickness 120 mm for cantilevered balcony slabs with upward height offset	Slab thickness [mm]	Thermal transmission coefficient ψ [W/(mK)]
HIT-SP MVX-0504-18-100-35-OU	180	0.170
HIT-SP MVX-0504-22-100-35-OU	220	0.178
HIT-SP MVX-0504-24-100-35-OU	240	0.180

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

Building Physics

Certificates by the Passive House Institute – Low Energy Component

Low Energy Component HIT-HP ZVX		
Insulation thickness 80 mm for simply-supported balcony slabs on columns	Slab thickness [mm]	Thermal transmission coefficient ψ [W/(mK)]
HIT-HP ZVX-0404-18-100-30-06	180	0.18
HIT-HP ZVX-0804-18-100-30-08	180	0.20
HIT-HP ZVX-0404-24-100-30-06	240	0.20
HIT-HP ZVX-0804-24-100-30-08	240	0.21



more information can be found at:
passivehouse.com ► certification

Low Energy Component HIT-SP ZVX		
Insulation thickness 120 mm for simply-supported balcony slabs on columns	Slab thickness [mm]	Thermal transmission coefficient ψ [W/(mK)]
HIT-SP ZVX-0302-18-100-30-08	180	0.11
HIT-SP ZVX-0404-18-100-30-06	180	0.14
HIT-SP ZVX-0804-18-100-30-08	180	0.15
HIT-SP ZVX-0502-22-100-30-06	220	0.109
HIT-SP ZVX-0202-24-100-30-08	240	0.109
HIT-SP ZVX-0302-24-100-30-06	240	0.108
HIT-SP ZVX-0302-24-100-30-08	240	0.11
HIT-SP ZVX-0502-24-100-30-06	240	0.109
HIT-SP ZVX-0404-24-100-30-06	240	0.14
HIT-SP ZVX-0804-24-100-30-08	240	0.16

Certificates by the Passive House Institute – Certified Passive House Component

In the higher category "Certified Passive House Component" which applies for cool, temperate climate HALFEN Balcony connections are certified for slab thicknesses from 160 mm.



passivehouse.com

The following criteria were used in awarding this certificate

- Efficiency Criterion**

In two typical applications (a terraced house and an apartment) the construction fulfills the requirement of:

$$\Delta U_{WB} < 0.01 \text{ W/(m}^2\text{K)}$$

- Comfort Criterion**

The inner surface must be warm enough to prevent mould and uncomfortable down-draught and radiation losses:

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

Certified Passive House Component / HIT-SP ZVX		
Insulation thickness 120 mm for simply-supported balcony slabs on columns	Slab thickness [mm]	Thermal transmission coefficient ψ [W/(mK)]
HIT-SP ZVX-0202-16-100-30-06	160	0.096
HIT-SP ZVX-0202-16-100-30-08	160	0.099
HIT-SP ZVX-0302-16-100-30-06	160	0.098
HIT-SP ZVX-0502-16-100-30-06	160	0.102
HIT-SP ZVX-0202-18-100-30-06	180	0.096
HIT-SP ZVX-0202-18-100-30-08	180	0.101
HIT-SP ZVX-0302-18-100-30-06	180	0.102
HIT-SP ZVX-0502-18-100-30-06	180	0.107
HIT-SP ZVX-0202-22-100-30-06	220	0.104
HIT-SP ZVX-0202-22-100-30-08	220	0.105
HIT-SP ZVX-0302-22-100-30-06	220	0.106
HIT-SP ZVX-0202-24-100-30-06	240	0.104

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

Building Physics

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 distracting noise. The airborne sound pressure level $L'_{n,w}$ [dB] indicates the noise level between the adjacent units of the building.

DIN 4109 specifies the minimum requirements as follows:

req $L'_{n,w}$	DIN 4109-1; 1989-11	DIN 4109-1; 2016-07	DIN 4109-1; 2018-01
Floor slabs under terraces and loggias above lounges	≤ 53 dB	≤ 50 dB	≤ 50 dB
Floor slabs above access balconies	≤ 53 dB	≤ 53 dB	≤ 53 dB
Balconies	–	–	≤ 58 dB

req. $L'_{n,w} = 53$ 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 (→ HALFEN HIT Insulated connections).

The sound insulation properties of different HIT Elements were examined in independent on-site measurement and in measurements done in the MFPA Braunschweig laboratory.



Standardised tapping machine according to EN ISO 10140



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

Laboratory measurements of impact sound

In laboratory measurements, the valued difference in the impact sound pressure level $\Delta L_{n,w}$ was examined on a balcony slab made with HIT Elements in comparison to a continuous floor slab. The table shows the detected values for different load ranges.

For the first time, the difference in sound impact levels in slab connections are included in a building authority approval; they are included in the European Technical Assessment, number ETA-18/0189.

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

Differences in impact sound pressure level $\Delta L_{n,w}$ in dB resulting from laboratory measurements	
HIT Element ...MVX	Difference in impact sound pressure level
HIT-HP MVX-0504-18-100-35	12 dB
HIT-HP MVX-0705-18-100-35	11 dB
HIT-HP MVX-1207-18-100-35	11 dB
HIT-SP MVX-0504-18-100-35	14 dB
HIT-SP MVX-0705-18-100-35	15 dB
HIT-SP MVX-1208-18-100-35	10 dB
HIT Element ...ZVX*	Difference in impact sound pressure level
HIT-HP ZVX-0504-18-100-30-12	12 dB
HIT-HP ZVX-0705-18-100-30-12	11 dB
HIT-HP ZVX-1207-18-100-30-12	11 dB
HIT-SP ZVX-0504-18-100-30-12	14 dB
HIT-SP ZVX-0705-18-100-30-12	15 dB
HIT-SP ZVX-1208-18-100-30-12	10 dB

* Values from HIT MVX are transferred for HIT ZVX. This is a very conservative assumption.

HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE Building Physics

Fire protection according to EN 13501

Fire Protection Requirements

All significant requirements concerning fire protection are documented 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 EN 13501-02 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 EN 13501-02 in compliance with European Technical Assessment ETA-18/0189 and the National Technical Approvals Z-15.7-293 and Z-15.7-312.

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.

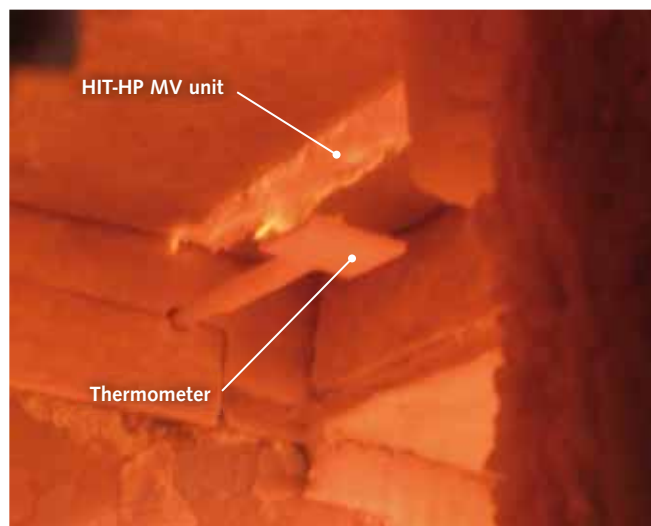
The structure prevents flashover on the element sides as the insulating wool encloses the load bearing elements (CSB, shear bars and tension bars) from all sides.

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

Meaning of the abbreviation REI:

- R** The structural safety of the connection is ensured for the specified duration.
- E** The room separation effect for the connection is ensured for the specified period.
- I** The thermal insulating property 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

Advantages

The advantages of the 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 R 120 versions
- selecting a fire-resistant element doesn't compromise heat insulation efficiency
- more robust construction as the easy damageable fire protection pads on the top and bottom of the connecting elements have been removed
- 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 HIGH & SUPERIOR PERFORMANCE HIT Software

Innovations and advantages

The up-dated version of the HIT-Software for calculation of HIT Insulated connections is a development of previous versions, which has been optimized and enhanced with essential functions.

The HIT design software allows you to plan verifiable balconies with these ten key advantages:

- free download available
- intuitive and easy to use
- enhanced load and support options
- verifiable static printouts
- generates .dxf-files output for input to construction plans, if required
- item-list compilation to facilitate ordering
- variable GUI using the current Windows design, fully customizable to your needs
- output of internal force progression for each load case
- option to select a variety of international standard
- numerous different language options available

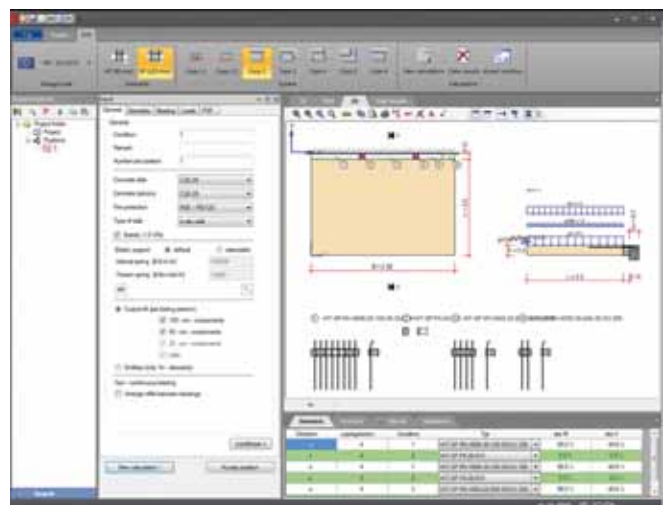


Only three steps required to complete a parts list for enquiries and orders

Step 1: Easy and intuitive input of the initial parameters

HALFEN offers a wide selection of balcony types:

- cantilever balcony (see example on the right)
- cantilever balcony with column
- loggia
- outside corner balcony
- outside corner balcony with column
- inside corner balcony
- inside corner balcony with column
- height offset balcony



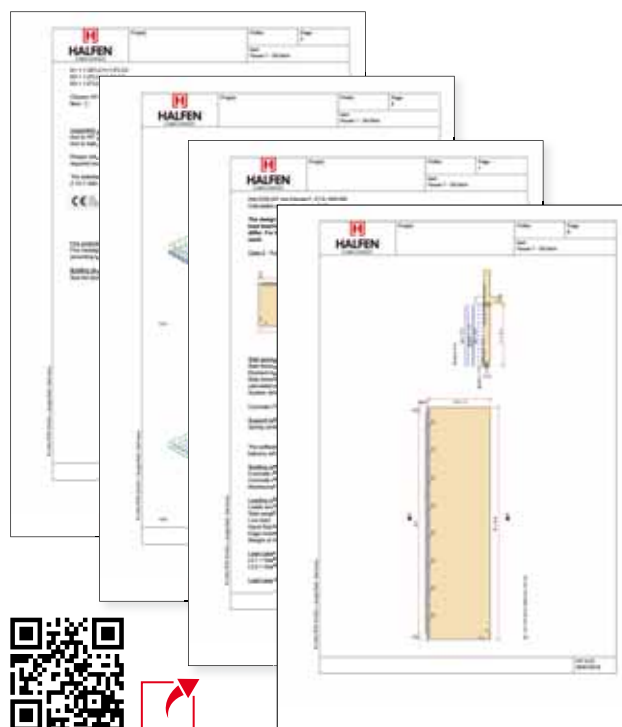
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE HIT Software

Step 2: Output of verifiable structural calculations

The HIT design program uses the geometry of the balcony and the constraints for concrete cover and concrete strength to select the appropriate HIT Elements.

If required, the results can be printed out as a verifiable structural calculation. Printouts can be a compact version or in greater detail including all analysed load cases and combinations, the distortion results, as well as graphic illustrations.

The significantly improved graphic output capabilities of the new HIT Software can include 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 MVX-0704-22-100-30		4	4
1	HIT-SP MVX-0403-22-050-30		4	1
2	HIT-SP MVX-0804-22-100-30		2	6

Conclusion

The user-friendly, tried and tested HALFEN Software is now available in a new design. The program allows intuitive operation and easy input of parameter for numerous balcony support application. HALFEN provides the planner with a software with absolute reliability in designing and dimensioning balcony connections.

The software calculates building authority approved HIT Elements. All verifications required in accordance with the documents ETA-18/0189, Z-15.7-293 or Z-15.7-312 are also available — following HALFEN's integral safety concept that no further approvals need to be acquired by planners when using any HALFEN HIT Insulated connections.

BauStatik (static calculation software) from mb AEC Software

- Integration of HIT Elements into the powerful, document-based structural analysis software for structural engineers.



CONTACT HALFEN WORLDWIDE

HALFEN is represented by subsidiaries in the following countries, please contact us!

Austria	HALFEN Gesellschaft m.b.H. Leonard-Bernstein-Str. 10 1220 Wien	Phone: +43-1-259 6770 E-Mail: office@halfen.at Internet: www.halfen.at	
Belgium / Luxembourg	HALFEN N.V. Borkelstraat 131 2900 Schoten	Phone: +32-3-658 07 20 E-Mail: info@halfen.be Internet: www.halfen.be	Fax: +32-3-658 15 33
China	HALFEN Construction Accessories Distribution Co.Ltd. Room 601 Tower D, Vantone Centre No. A6 Chao Yang Men Wai Street Chaoyang District Beijing · P.R. China 100020	Phone: +86-10 5907 3200 E-Mail: info@halfen.cn Internet: www.halfen.cn	Fax: +86-10 5907 3218
Czech Republic	HALFEN s.r.o. Business Center Šafránkova Šafránkova 1238/1 155 00 Praha 5	Phone: +420-311-690 060 E-Mail: info@halfen.cz Internet: www.halfen.cz	Fax: +420-235-314 308
France	HALFEN S.A.S. 18, rue Goubet 75019 Paris	Phone: +33-1-445231 00 E-Mail: halfen@halfen.fr Internet: www.halfen.fr	Fax: +33-1-445231 52
Germany	HALFEN Vertriebsgesellschaft mbH Liebigstr. 14 40764 Langenfeld	Phone: +49-2173-970-0 E-Mail: info@halfen.de Internet: www.halfen.de	Fax: +49-2173-970 225
Italy	HALFEN S.r.l. Soc. Unipersonale Via F.lli Bronzetti N° 28 24124 Bergamo	Phone: +39-035-0760711 E-Mail: tecnico@halfen.it Internet: www.halfen.it	Fax: +39-035-0760799
Netherlands	HALFEN b.v. Oostermaat 3 7623 CS Borne	Phone: +31-74-267 14 49 E-Mail: info@halfen.nl Internet: www.halfen.nl	Fax: +31-74-267 26 59
Norway	HALFEN AS Postboks 2080 4095 Stavanger	Phone: +47-51 82 34 00 E-Mail: post@halfen.no Internet: www.halfen.no	
Poland	HALFEN Sp. z o.o. Ul. Obornicka 287 60-691 Poznan	Phone: +48-61-622 14 14 E-Mail: info@halfen.pl Internet: www.halfen.pl	Fax: +48-61-622 14 15
Spain	HALFEN IBERICA, S.L. Polígono Industrial Santa Ana c/ Ignacio Zuloaga 20 28522 Rivas-Vaciamadrid	Phone: +34-91 632 18 40 E-Mail: info@halfen.es Internet: www.halfen.es	Fax: +34-91 633 42 57
Sweden	Halfen AB Vädersgatan 5 412 50 Göteborg	Phone: +46-31-98 58 00 E-Mail: info@halfen.se Internet: www.halfen.se	Fax: +46-31-98 58 01
Switzerland	HALFEN Swiss AG Hertistrasse 25 8304 Wallisellen	Phone: +41-44-849 78 78 E-Mail: info@halfen.ch Internet: www.halfen.ch	Fax: +41-44-849 78 79
United Kingdom/ Ireland	HALFEN Ltd. A1/A2 Portland Close Houghton Regis LU5 5AW	Phone: +44-1582-47 03 00 E-Mail: info@halfen.co.uk Internet: www.halfen.co.uk	Fax: +44-1582-47 03 04
United States of America	HALFEN USA Inc. PO Box 18687 San Antonio TX 78218	Phone: +1 800.423.91 40 E-Mail: info@halfenusa.com Internet: www.halfenusa.com	Fax: +1 877.683.4910
For countries not listed HALFEN International	HALFEN International GmbH Liebigstr. 14 40764 Langenfeld / Germany	Phone: +49-2173-970-0 E-Mail: info@halfen.com Internet: www.halfen.com	Fax: +49-2173-970-849

NOTES REGARDING THIS CATALOGUE

Technical and design changes reserved. The information in this publication is based on state-of-the-art technology at the time of publication. We reserve the right to make technical and design changes at any time. HALFEN GmbH shall not accept liability for the accuracy of the information in this publication or for any printing errors.

The HALFEN GmbH subsidiaries in Germany, France, the Netherlands, Austria, Poland, Switzerland and the Czech Republic are Quality Management certified according to **ISO 9001:2015**, Certificate no. 202384-2016-AQ-GER-DAKKS.





YOUR BEST CONNECTIONS

For further information please contact: www.halfen.com