HALFEN HIT INSULATED CONNECTION

TECHNICAL PRODUCT INFORMATION

HALFEN HIT INSULATED CONNECTION

CONCRETE

HIT 16.1-E

NEW!

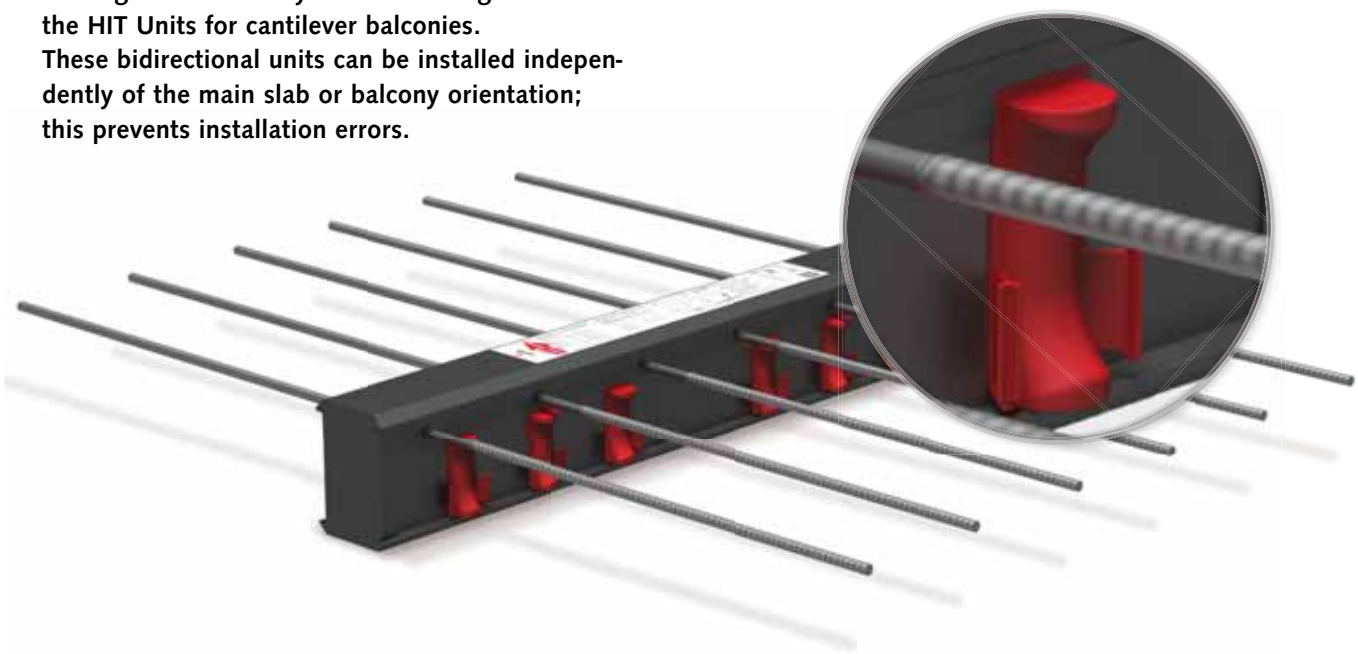
- the complete product range for balcony solutions
- with European Technical Approval
- symmetrical HIT units with optimized CSB as standard

HALFEN

YOUR BEST CONNECTIONS

Back to front or front to back: the new HIT-MVX is unique!

The mirrored-shape of the compression shear bearings results in a symmetrical design of the HIT Units for cantilever balconies. These bidirectional units can be installed independently of the main slab or balcony orientation; this prevents installation errors.



CE marking, with European Technical Approval

CSB

HIT units with symmetrical CSBs

Installation independently of the main slab or balcony orientation due to symmetrical shape

REI 120

Fire-resistance rating

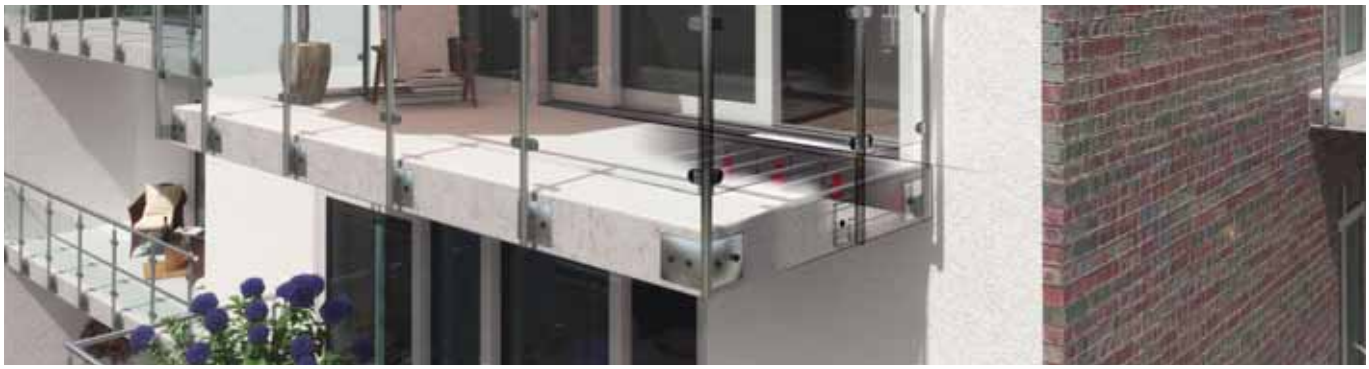
Multi-part design

Your benefits:

- Increased planning reliability; as all cantilevered balcony slab connections are suitable for positive and negative shear forces
- Increased safety during transport of precast and semi-precast balconies
- Improvement in thermal values of up to 30 %

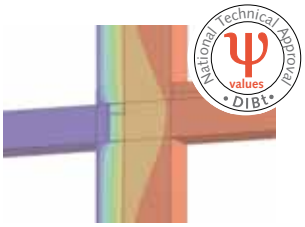
HALFEN HIT INSULATED CONNECTION

Contents



HIT-HP MVX
HIT-SP MVX

HIT-HP ZVX
HIT-SP ZVX



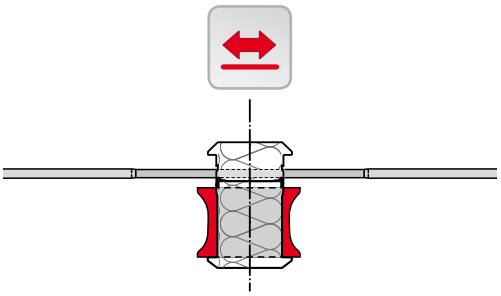
HALFEN HIT Insulated connection – the innovative balcony connection

Our main focus is the development and improvement of our products. Thanks to the innovative, double-symmetrical compression shear bearings CSB, HALFEN can now provide even greater reliability in planning and application as well as an improved installation procedure – either on-site or in the precast plant. The complete product range includes the HIT-HP with an insulation thickness of 80 mm and the HIT-SP option with 120 mm insulation thickness.

Reliable installation

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

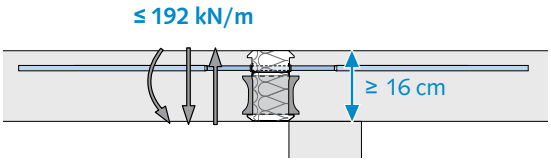
- no confusion of installation direction



Reliable planning

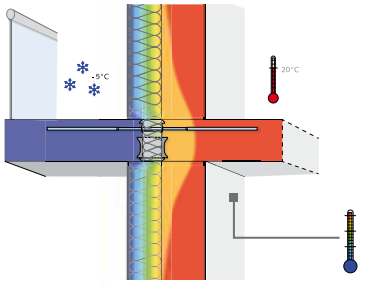
HALFEN's integrated safety concept:
The values provided in the tables are actual design values; therefore no additional verification for reduction of the shear force is required by the planner.

- 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

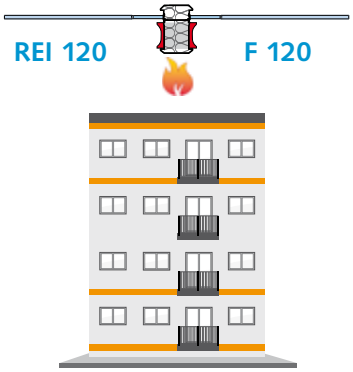
A significant reduction in the number of support elements is achieved due to the further optimization of the CSB-bearings.



Further benefits

Fire protection

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



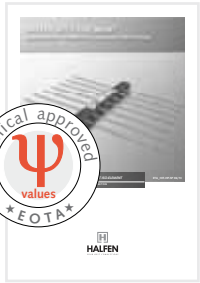
- fire resistant thermal heat insulation material; A1 building material classification – non-flammable insulation
- suitable for use as a fire-break in ETICS façades (Expanded polystyrene)
- no mix-ups of elements with or without demands on fire protection
- additional fire protection is not required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

EnEV conformity

with building authority approved Ψ-Values

DIBt and EOTA 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

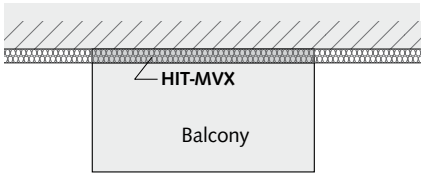
- highest category certified "Certified Passive house component" for the HIT-SP ZVX Element with up to 24 cm slab thickness
- certified as energy saving components starting with an insulation thickness of 80 mm for application in canti-levered and simply supported balcony slabs

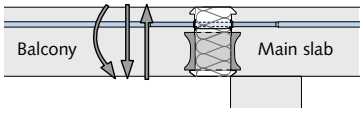
Certification and software

- CE marking with ETA European Technical Approval
- approved by the German Institute for building technology (DIBt *Deutsches Institut für Bautechnik)*
- user-friendly-software with integrated offcut-optimization to reduce waste

1 Cantilevered balcony slabs

Application for cantilevered balcony slabs

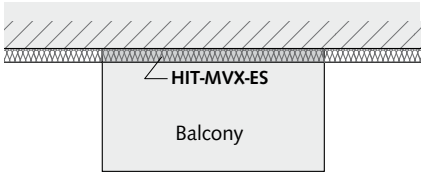


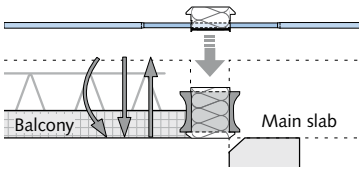


HIT-HP MVX / HIT-SP MVX NEW!
Transfers bending moments and positive and negative shear forces.
- insulation thickness 80 mm / 120 mm

→ **page 11**

Multi-part application for element slabs

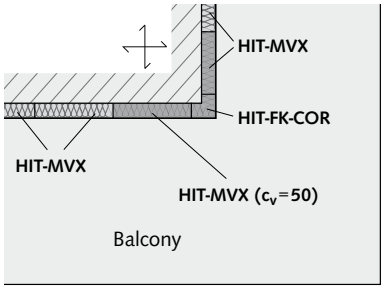


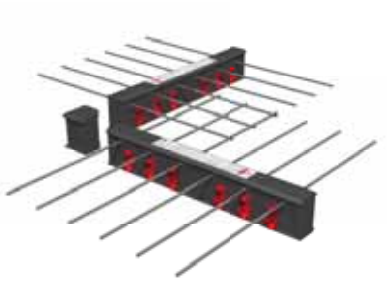


HIT-HP MVX-ES / HIT-SP MVX-ES NEW!
Product type for element slabs.
Transfers bending moments and positive and negative shear forces.
- insulation thickness 80 mm / 120 mm

→ **page 11**

Application for cantilevered corner balcony slabs





HIT-HP COR / HIT-SP COR NEW!
For cantilevered outside corner balconies, designed with standard elements with the same load bearing capacity and a corner filler.
- available as product type for element slabs (-ES)
- insulation thickness 80 mm / 120 mm

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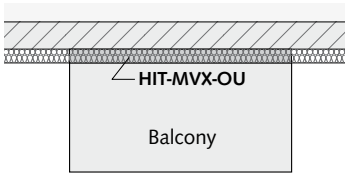
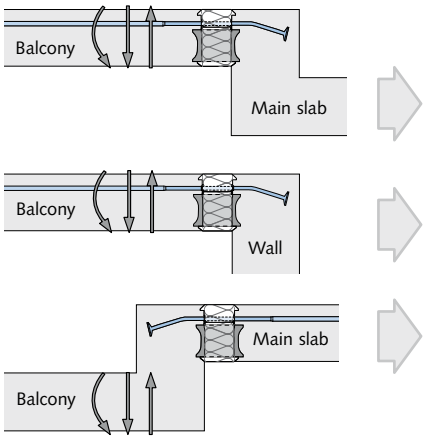
2 Cantilevered balcony slabs with height offset or wall connections

Application for upward height offset



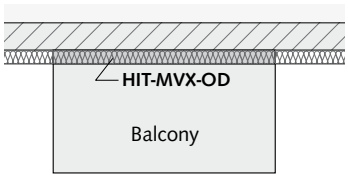


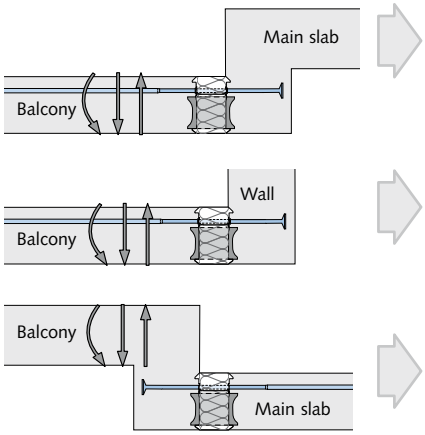
HIT-HP MVX-OU / HIT-SP MVX-OU NEW!
Height offset, balcony higher than main slab, upward wall connection. Transfers bending moments and positive and negative shear forces

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

→ **page 41**

Application for downward height offset





HIT-HP MVX-OD / HIT-SP MVX-OD NEW!
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

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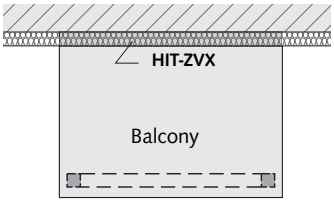
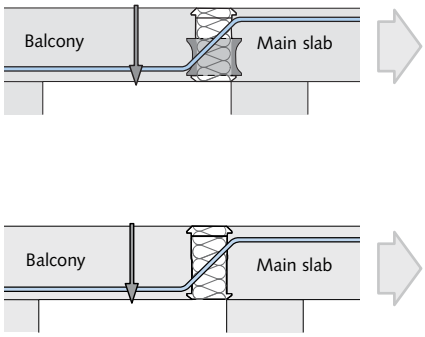
3 Simply-supported balcony slabs on columns





HIT-HP ZVX / HIT-SP ZVX NEW!
Transfers shear forces only

- insulation thickness 80 mm / 120 mm

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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

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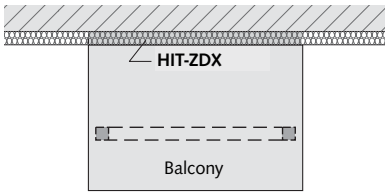
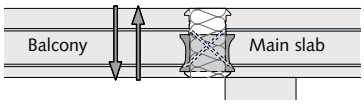
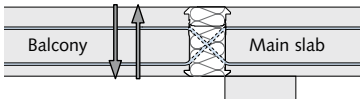
► further types → see following pages

3 Simply-supported balcony slabs on columns



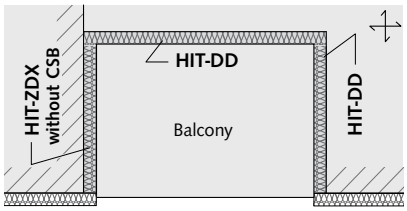


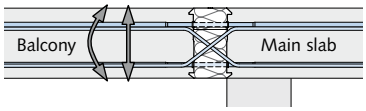
HIT-HP ZDX / HIT-SP ZDX NEW!
Transfers positive and negative shear forces
• insulation thickness 80 mm / 120 mm
→ **page 57**



HIT-HP ZDX / HIT-SP ZDX without CSB NEW!
Transfers shear forces only for unrestrained simply supported connections
• insulation thickness 80 mm / 120 mm
→ **page 57**

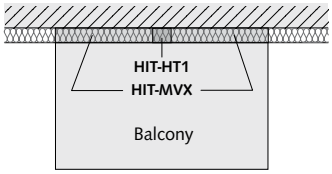
4 Continuous slabs

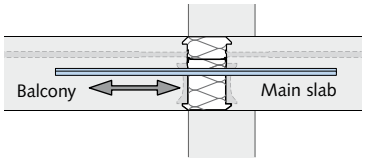




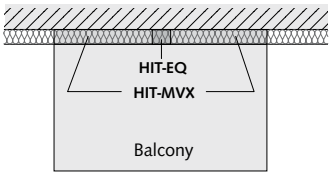
HIT-HP DD / HIT-SP DD
Transfers positive and negative bending moments and shear forces
• insulation thickness 80 mm / 120 mm
→ **page 75**

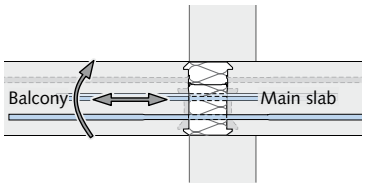
5 Absorption of horizontal forces





HIT-HP HT / HIT-SP HT
Absorbs horizontal forces parallel and/or perpendicular to the insulation line
• insulation thickness 80 mm / 120 mm
→ **page 84**

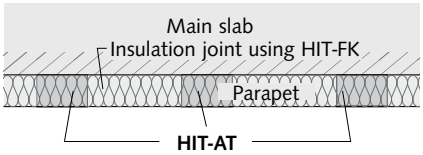


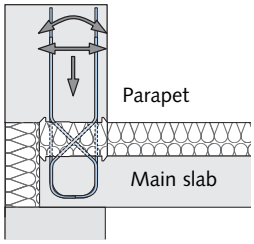


HIT-HP EQ / HIT-SP EQ NEW!
For transfer of planned horizontal loads and lifting moments perpendicular to the insulation line
• insulation thickness 80 mm / 120 mm
→ **page 89**

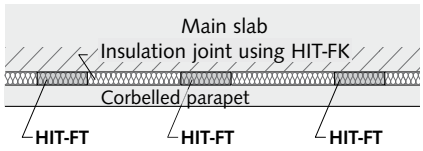
Application: Earthquake Engineering

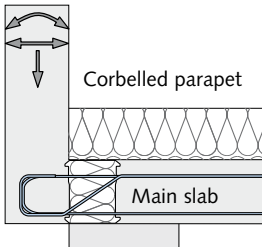
6 Parapets and corbels



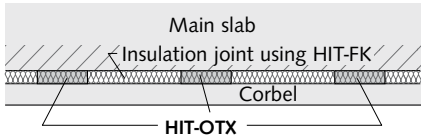


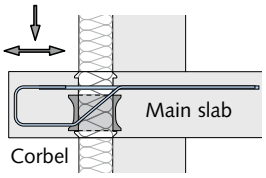
HIT-HP AT / HIT-SP AT
Forms a thermal barrier between parapet and main slab for selective use. Unit spacing based on structural requirements.
• insulation thickness 80 mm / 120 mm
→ **page 94**





HIT-HP FT / HIT-SP FT
Forms a thermal barrier between corbelled parapet and main slab for selective use. Unit spacing based on structural requirements.
• insulation thickness 80 mm / 120 mm
→ **page 102**

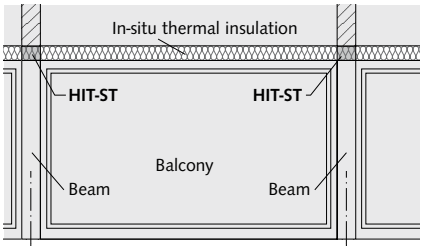


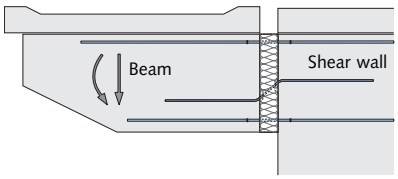


HIT-HP OTX / HIT-SP OTX
Forms a thermal barrier between corbel and main slab for selective use. Unit spacing based on structural requirements.
• insulation thickness 80 mm / 120 mm
→ **page 109**

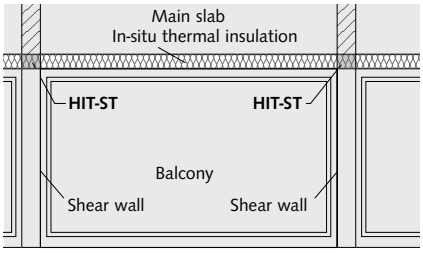
HIT-HP FK / HIT-SP FK: Fillers for insulation of the joint between balcony and main slab. Insulation thickness 80 mm / 120 mm → **page 117**

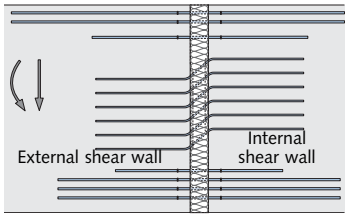
7 Shear walls and beams





HIT-ST
Insulation for cantilevered beams. Transfers high bending moments and shear forces in selected areas.
• insulation thickness 80 mm
→ **page 120**





HIT-WT
Insulation for storey-high, cantilevered shear walls. Transfers bending moments and shear forces in selected areas mainly in vertical direction
• insulation thickness 80 mm
→ **page 120**

8 Building physics, technical information

Information on: thermal insulation, fire protection and noise reduction / planning aid / HALFEN design software → **page 124**

Material Specification and Test Certificates

Material specification

Tension bars	Flash butt welded bar connection, consisting of a combination of two reinforcing steel bars B500B according to DIN 488 and a stainless bar steel of strength class S 690
Shear bars	Stainless bar steel of strength B500NR or flash butt welded bars connection, consisting of a combination of stainless bar steel 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	Rigid PVC 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	Suited for concrete strengths ≥ C20/25
On-site reinforcement	Reinforcing steel B500

Test certificates

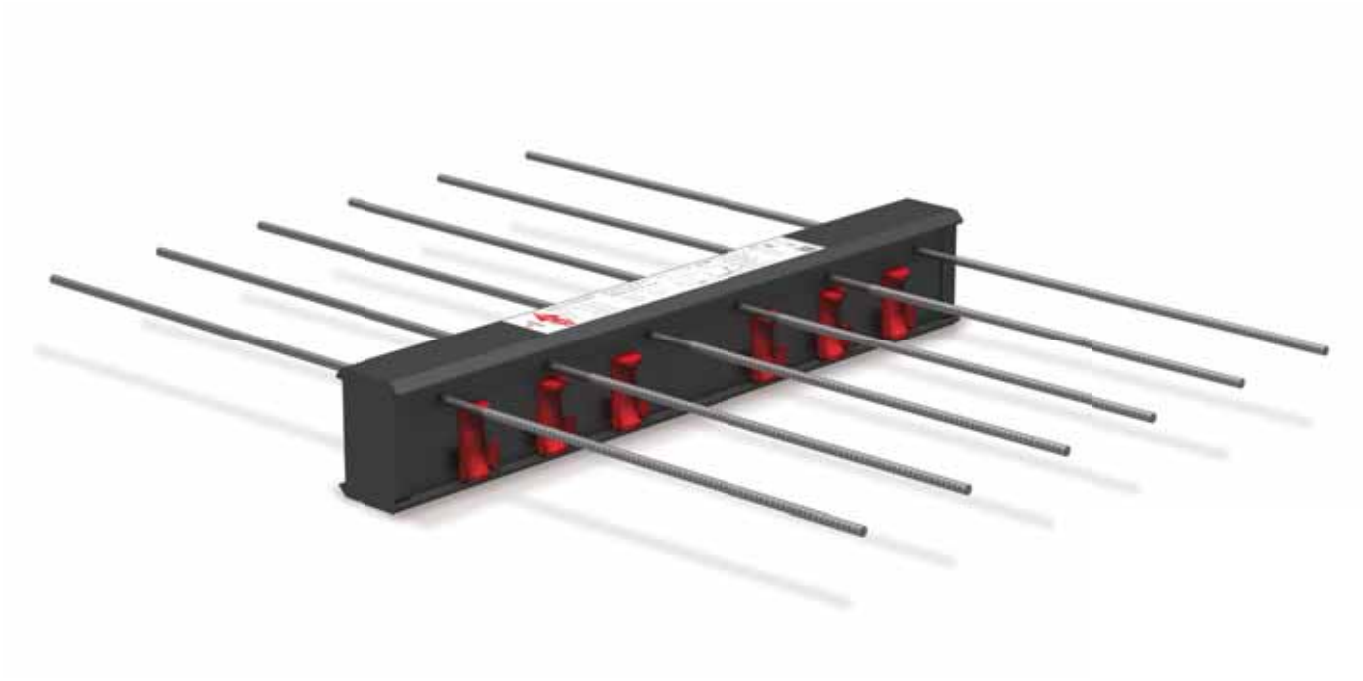
Technical Approvals	
HIT-HP/SP MVX **HIT-HP/SP ZVX and ZDX**	EOTA: ETA-13/0546 including fire protection, thermal values and noise reduction DoP no. H10-13/0546
HIT-HP/SP MVX **HIT-HP/SP ZVX and ZDX** **HIT-HP/SP DD**	DIBT Berlin: Approval no. Z-15.7-293 DIBT Berlin: Approval no. Z-15.7-312 DIBT Berlin: Approval no. Z-15.7-309
Type Test	
Type-tested by the LGA Landesgewerbeanstalt Bayern	Test-no. S-WUE/100358
Certification	
Passive House Institute	Certification valid for slab thickness from 160 mm to 240 mm

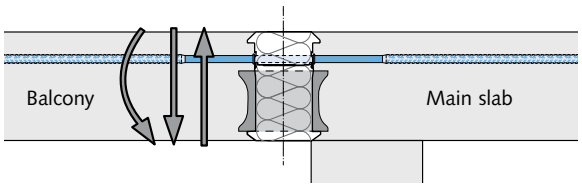
Approvals and type tests on the internet
The approvals and type tests can be found at **www.halfen.com/downloads/brochures**.
Or simply scan the code and then select the document to download a PDF file.

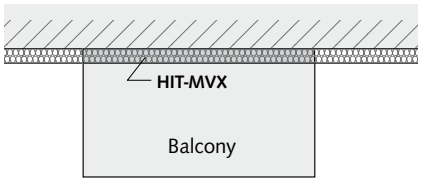
1

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

type-tested







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.

Application: Cantilevered balcony

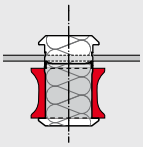
Load bearing behaviour of the HIT-MVX

Our latest development: Symmetrical HIT Elements

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 of Compression-Shear-Bearing and describes its unique function; the simultaneous transmission of shear and compression loads.

Our latest innovation is the double-symmetrical CSB for transmitting shear loads in both directions. In combination with the tension rods these make up the symmetrical HIT-HP MVX which has 80 mm insulation thickness and the HIT-SP MVX with 120 mm insulation thickness.
These elements are suitable for moments as well as positive and negative shear loads.

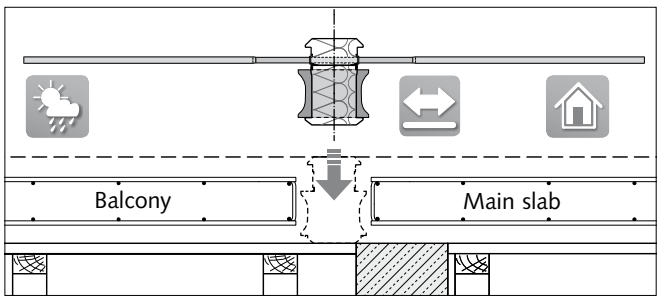
With the double-symmetrical CSB the HIT-MVX Insulated connections are symmetrical and can be installed independently of the main slab or the balcony direction.



Reliable installation with symmetrical HIT-MVX Elements

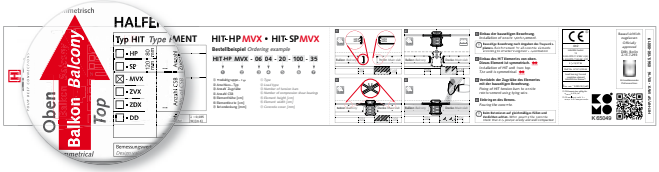
The HIT Balcony connection is designed for practical building requirements. All support elements are sufficiently secured in the sturdy plastic housing to ensure safe delivery, transport and easy on-site handling. In addition, the thermal insulation is optimally protected against mechanical damage and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

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



Reliable installation with symmetrical HIT-MVX Elements

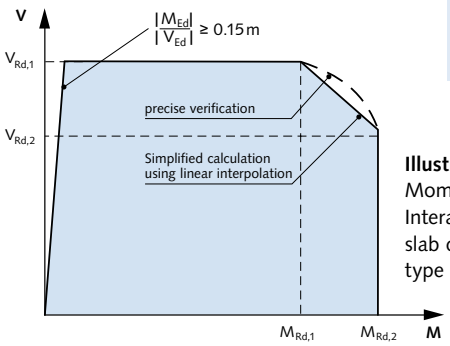
The arrow marking defining the installation direction will continue to be displayed on all HIT Elements; including the double-symmetrical HIT-MVX-Type. This is to continue to ensure an efficient installation. If on inspection, it is found that the installation direction shown on the element has been 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

If it is not planned to fully exploited the maximum shear capacity $V_{Rd,1}$, the CSB-technology allows the option of increasing the moment load capacity using $M_{Rd,1}$.
$M_{Rd,2}$ is the maximum moment load capacity with the respective shear resistance $V_{Rd,2}$. 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:



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

Illustration:
Moment-shear load-Interaction in cantileved slab connections, type HIT-MVX

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 illustrated in the following table are available as standard.

Possible combinations of upper and lower parts

Element width B = 25 cm	No. of tension bars n_{TB}			
	1	2	3	4
Number of compression shear bearings n_{CSB} 1	●	●		
2	●	●	●	●

Element width B = 50 cm	No. of tension bars n_{TB}								
	1	2	3	4	5	6	7	8	9
Number of compression shear bearings n_{CSB} 1	●	●							
2	●	●	●	●					
3		●	●	●	●	●			
4		●	●	●	●	●	●	●	●
5			●	●	●	●	●	●	●

Element width B = 100 cm	No. of tension bars n_{TB}															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	18
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 → see pages 14 – 27. ● = 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**.

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**
	↓ ↓		↓		↓ ↓		↓		↓	↓
	❶ ❷		❸		❹ ❺		❻		❼	❽	❾

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 units
⑥ Element height [cm]
⑦ Element width [cm]
⑧ Concrete cover (top) [mm]
⑨ For element slab design only

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

Available slab thickness h

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

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* ≥C25/30

Type / Element width		HP MVX-0202	HP MVX-0302	HP MVX-0203	HP MVX-0403	HP MVX-0603
	B = 1.00 m					
	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				HP MVX-0202		HP MVX-0302		HP MVX-0203		HP MVX-0403		HP MV-0603	
	B = 1.00 m												
	B = 0.50 m			HP 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	*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 > 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 reinforcement $A_{s,req}$

Edge frame	direct support	ø6 / 25 cm			
Suspension reinforcement	indirect support	ø6 / 25 cm	ø6 / 19.5 cm	ø6 / 17.5 cm	ø6 / 17 cm

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

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* ≥C25/30

Type / Element width		HP MVX-0204	HP MVX-0404	HP MVX-0504	HP MVX-0604	HP MVX-0704
	B = 1.00 m					
	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				HP MVX-0204		HP MVX-0404		HP MVX-0504		HP MVX-0604		HP MVX-0704	
	B = 1.00 m												
	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 reinforcement $A_{s,req}$

Edge frame	direct support	ø6 / 25 cm			
Suspension reinforcement	indirect support	ø6 / 14 cm	ø6 / 13.5 cm	ø6 / 13 cm	ø6 / 12.5 cm

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

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* ≥C25/30 **80**

Type / Element width		HP MVX-0804	HP MVX-0505	HP MVX-0605	HP MVX-0705	HP MVX-0805
	B = 1.00 m					
	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		HP MVX-0804	HP MVX-0505	HP MVX-0605	HP MVX-0705	HP MVX-0805
	B = 1.00 m					
	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 reinforcement $A_{s,req}$

Edge frame	direct support	ø6 / 25 cm			
Suspension reinforcement	indirect support	ø6 / 12.5 cm	ø8 / 19.5 cm	ø8 / 19 cm	ø8 / 18.5 cm

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

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* ≥C25/30

Type / Element width		HP MVX-0506	HP MVX-0606	HP MVX-0706	HP MVX-0806	HP MVX-0906
	B = 1.00 m					
	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		HP MVX-0506	HP MVX-0606	HP MVX-0706	HP MVX-0806	HP MVX-0906
	B = 1.00 m					
	B = 0.50 m	–	HP MVX-0303	–	HP MVX-0403	–
	B = 0.25 m	–	–	–	–	–

Concrete cover [mm]												
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 > 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 reinforcement $A_{s,req}$

Edge frame	direct support	ø6 / 25 cm		
Suspension reinforcement	indirect support	ø8 / 16,5 cm	ø6 / 16 cm	ø8 / 15.5 cm

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

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* ≥C25/30

Type / Element width		HP MVX-1006	HP MVX-1106	HP MVX-0507	HP MVX-0607	HP MVX-0707
	B = 1.00 m					
	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				HP MVX-1006		HP MVX-1106		HP MVX-0507		HP MVX-0607		HP MVX-0707	
	B = 1.00 m												
	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 > 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 reinforcement $A_{s,req}$

Edge frame	direct support	ø6 / 25 cm		
Suspension reinforcement	indirect support	ø8 / 15 cm	ø8 / 14.5 cm	ø8 / 14 cm

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

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* ≥C25/30

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

Moment bearing capacity m_{Rd}

Type / Element width		HP MVX-0807	HP MVX-0907	HP MVX-1007	HP MVX-1107	HP MVX-1407
	B = 1.00 m					
	B = 0.50 m	–	–	–	–	–
	B = 0.25 m	–	–	–	–	–

Concrete cover [mm]	30	35	50	HP MVX-0807		HP MVX-0907		HP MVX-1007		HP MVX-1107		HP MVX-1407	
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 reinforcement $A_{s,req}$

Edge frame	direct support	ø6 / 25 cm	ø6 / 24.5 cm	ø6 / 23.5 cm	ø6 / 21.5 cm
Suspension reinforcement	indirect support	ø8 / 13.5 cm		ø8 / 13 cm	ø8 / 12.5 cm

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

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* ≥C25/30

Type / Element width		HP MVX-0508	HP MVX-0608	HP MVX-0708	HP MVX-0808	HP MVX-0908
	B = 1.00 m					
	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		HP MVX-0508	HP MVX-0608	HP MVX-0708	HP MVX-0808	HP MVX-0908
	B = 1.00 m					
	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 reinforcement $A_{s,req}$

Edge frame	direct support	ø6 / 25 cm		ø6 / 23.5 cm
Suspension reinforcement	indirect support	ø8 / 13 cm	ø8 / 12.5 cm	ø8 / 12 cm

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

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* ≥C25/30

Type / Element width		HP MVX-1008	HP MVX-1108	HP MVX-1208	HP MVX-1308	HP MVX-1209
	B = 1.00 m					
	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* 128.0			*144.0* 144.0

Moment bearing capacity m_{Rd}

Type / Element width				HP MVX-1008		HP MVX-1108		HP MVX-1208		HP MVX-1308		HP MVX-1209	
		B = 1.00 m											
		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 > 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 reinforcement $A_{s,req}$

Edge frame	direct support	ø6 / 22.5 cm	ø6 / 21.5 cm	ø6 / 21 cm	ø6 / 20.5 cm	ø6 / 19.5 cm
Suspension reinforcement	indirect support	ø8 / 12 cm	ø8 / 11.5 cm			ø8 / 10.5 cm

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

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* ≥C25/30

Type / Element width		HP MVX-1409	HP MVX-1210	HP MVX-1810*	HP MVX-1011	HP MVX-1211*
	B = 1.00 m					
	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				HP MVX-1409		HP MVX-1210		HP MVX-1810*		HP MVX-1011		HP MVX-1211*	
	B = 1.00 m												
	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 > 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.										

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

On-site reinforcement $A_{s,req}$

		HP MVX-1409	HP MVX-1210	HP MVX-1810*	HP MVX-1011	HP MVX-1211*
Edge frame	direct support	ø6 / 18.5 cm	ø6 / 19 cm	ø6 / 15.5 cm	ø6 / 19 cm	ø6 / 17.5 cm
Suspension reinforcement	indirect support	ø8 / 10.5 cm	ø8 / 9 cm	ø8 / 9.5 cm	ø8 / 9 cm	

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

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* ≥C25/30

Type / Element width		HP MVX-1311	HP MVX-1811	HP MVX-1212	HP MVX-1312	HP MVX-1812
	B = 1.00 m					
	B = 0.50 m	–	–	–	–	–
	B = 0.25 m	–	–	–	–	–
Design values	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				HP MVX-1311		HP MVX-1811		HP MVX-1212		HP MVX-1312		HP MVX-1812	
	B = 1.00 m												
	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 > 250 mm, 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 reinforcement $A_{s,req}$

Edge frame	direct support	ø6 / 17 cm	ø6 / 14.5 cm	ø6 / 16.5 cm	ø6 / 16 cm	ø6 / 14 cm
Suspension reinforcement	indirect support	ø8 / 9 cm		ø8 / 8.5 cm		

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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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* ≥C25/30

120

Type / Element width		SP MVX-0202	SP MVX-0302	SP MVX-0403	SP MVX-0603	SP MVX-0304
	B = 1.00 m					
	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				SP MVX-0202		SP MVX-0302		SP MVX-0403		SP MVX-0603		SP MVX-0304	
	B = 1.00 m												
	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 > 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 reinforcement $A_{s,req}$

Edge frame	direct support	ø6 / 25 cm			
Suspension reinforcement	indirect support	ø6 / 25 cm	ø6 / 17.5 cm	ø6 / 17 cm	ø6 / 15 cm

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

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* ≥C25/30

120

Type / Element width	B = 1.00 m	SP MV-0404	SP MV-0504	SP MV-0604	SP MV-0704	SP MV-0705
	B = 0.50 m	SP MV-0202	–	SP MV-0302	–	–
	B = 0.25 m	SP MV-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 MV-0404	SP MV-0504	SP MV-0604	SP MV-0704	SP MV-0705
	B = 0.50 m	SP MV-0202	–	SP MV-0302	–	–
	B = 0.25 m	SP MV-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 > 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 reinforcement $A_{s,req}$

Edge frame	direct support	ø6 / 25 cm		
Suspension reinforcement	indirect support	ø6 / 13.5 cm	ø6 / 13 cm	ø6 / 18.5 cm

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

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* ≥C25/30

120

Type / Element width		SP MVX-0805	SP MVX-0906	SP MVX-1006	SP MV-0907	SP MV-1007
	B = 1.00 m					
	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				SP MVX-0805		SP MVX-0906		SP MVX-1006		SP MV-0907		SP MV-1007	
		B = 1.00 m											
		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 reinforcement $A_{s,req}$

Edge frame	direct support	ø6 / 25 cm				ø6 / 24.5 cm
Suspension reinforcement	indirect support	ø6 / 18.5 cm	ø6 / 15.5 cm	ø6 / 15 cm	ø6 / 13.5 cm	ø6 / 13.5 cm

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

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* ≥C25/30 | 120

Type / Element width		SP MVX-1107	SP MV-1208	SP MVX-1209	SP MVX-1110	SP MVX-1112
	B = 1.00 m					
	B = 0.50 m	–	SP MV-0604	–	–	–
	B = 0.25 m	–	SP MV-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				SP MVX-1107	SP MV-1208	SP MVX-1209	SP MVX-1110	SP MVX-1112
		B = 1.00 m						
		B = 0.50 m		–	SP MV-0604	–	–	–
		B = 0.25 m		–	SP MV-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 > 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 reinforcement $A_{s,req}$

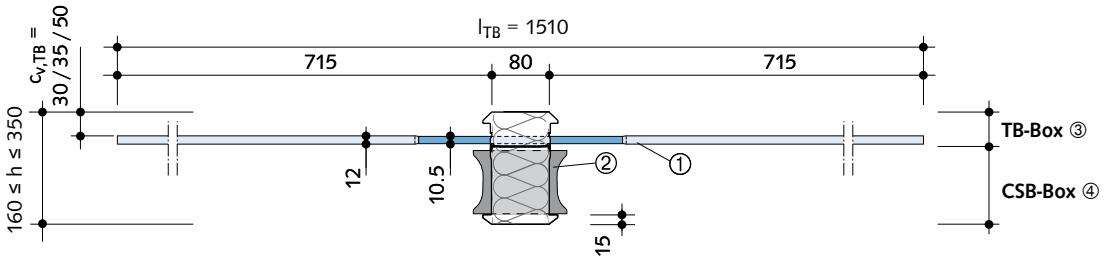
		SP MVX-1107	SP MV-1208	SP MVX-1209	SP MVX-1110	SP MVX-1112
Edge frame	direct support	ø6 / 23.5 cm	ø6 / 21 cm	ø6 / 19.5 cm	ø6 / 19 cm	ø6 / 17.5 cm
Suspension reinforcement	indirect support	ø6 / 13 cm	ø6 / 11.5 cm	ø6 / 10.5 cm	ø6 / 10 cm	ø6 / 9.5 cm

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

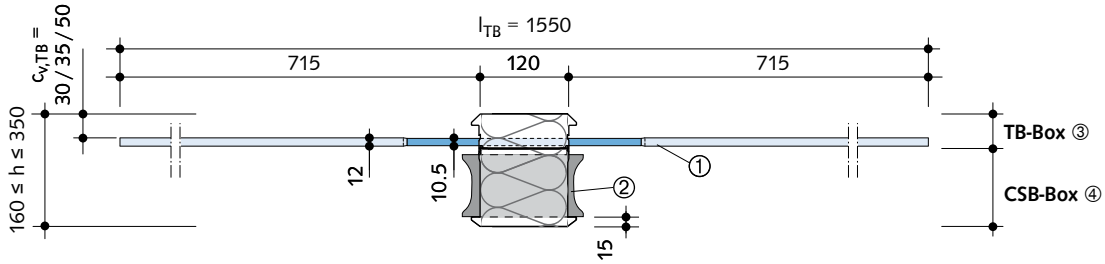
HALFEN HIT software is available at **www.halfen.com** to calculate connections for balcony projects.

Product description – Cross-sections

HIT-HP MVX — High Performance



HIT-SP MVX — Superior Performance



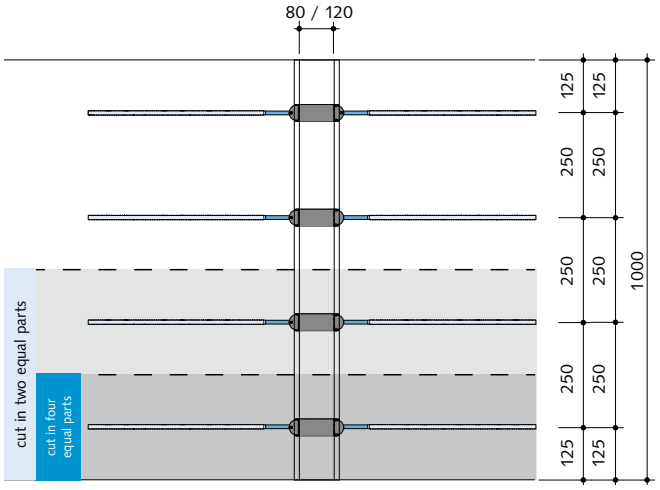
Dimensions in [mm]

① Tension bars ø12 mm / 10.5 mm in the joint
② Double-symmetrical Compression shear bearings CSB
③ Tension bar box
④ Compression shear bearings box

Product description – Top view (examples)

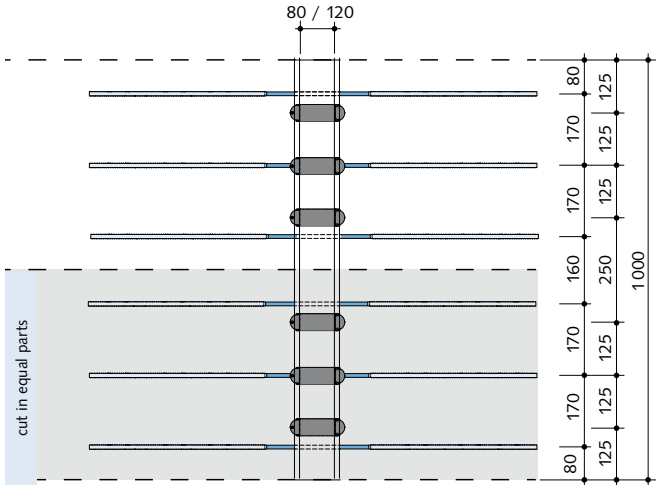
The layout of the tension bars and the CSB has been optimized when cutting the element to size is required. With an even number of support elements these are grouped in sections; this simplifies cutting the elements.

HIT-HP/SP - MVX 0404 - ... - 100
HIT-HP/SP - MVX 0202 - ... - 050
HIT-HP/SP - MVX 0101 - ... - 025



For a top view of other units with dimensions please refer to the relevant type test.

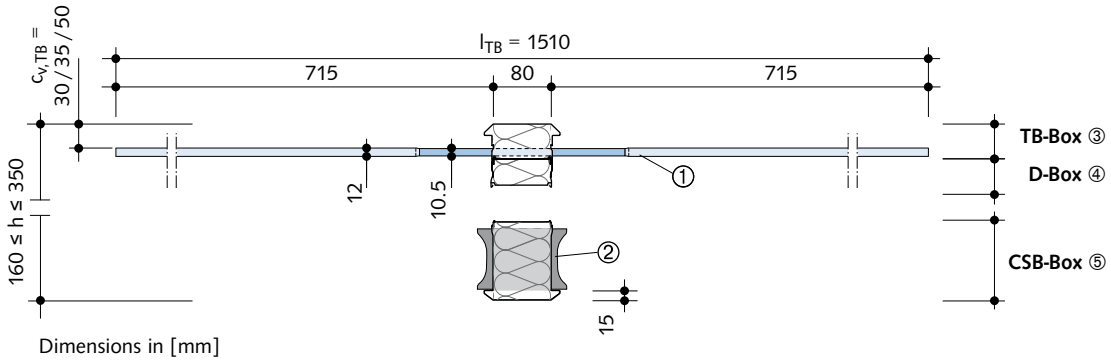
HIT-HP/SP - MVX 0606 - ... - 100
HIT-HP/SP - MVX 0303 - ... - 050



Application for element slabs – Cross sections

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

See tables on pages 14 to 27 for load bearing capacities

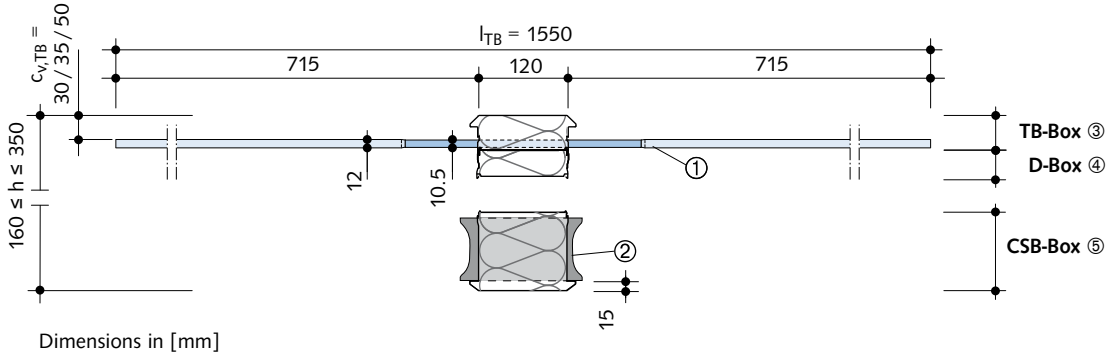


Dimensions in [mm]

① Tension bars ø12 mm / 10.5 mm in the joint
② Double-symmetrical Compression shear bearings CSB
③ Tension bar box
h = 50 mm with c_v 30/35 mm
h = 70 mm with c_v 50 mm
④ Distance box as height compensation
h = 20 mm and higher (→ see page 30)
⑤ Compression shear bearings box
h = 110 mm

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

See pages from 24 for load bearing capacities tables

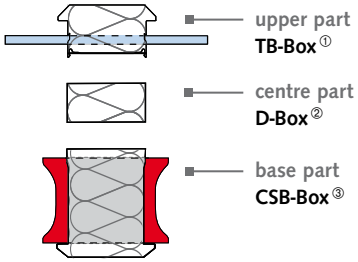


Dimensions in [mm]

① Tension bars ø12 mm / 10.5 mm in the joint
② Double-symmetrical Compression shear bearings CSB
③ Tension bar box
h = 50 mm with c_v 30/35 mm
h = 70 mm with c_v 50 mm
④ Distance box as height compensation
h = 20 mm and higher (→ see page 30)
⑤ Compression shear bearings box
h = 110 mm

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
		❶		❷ ❸		❹		❺		❻		❼



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

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 units CSB
⑥ Element height [cm]
⑦ Element width [cm]
⑧ Concrete cover (top) [mm]
⑨ For element slab design only

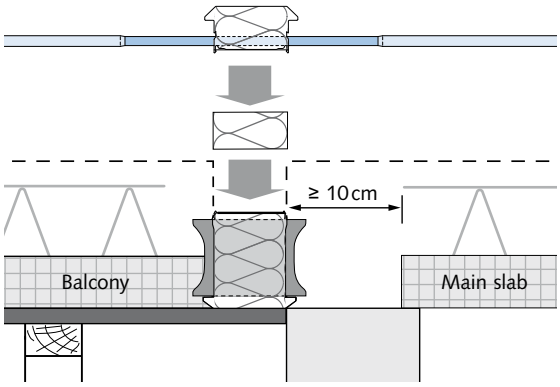
Height TB-Box [mm]	
c_v = 30/35	50
c_v = 50	70

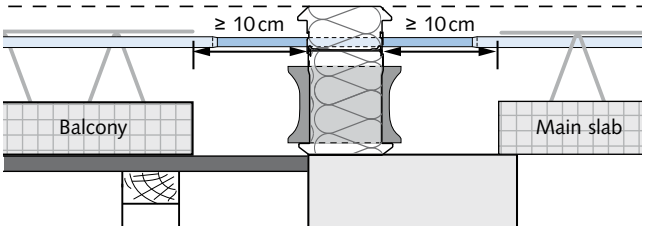
Height D-Box [mm]										
Slab height	160	170	180	190	200	210	220	230	240	250
c_v = 30/35	–	–	20	30	40	50	60	70	80	90
c_v = 50	–	–	–	–	20	30	40	50	60	70

Height CSB-Box [mm]					
Slab height	160	170	180	190	200 – 250
c_v = 30/35	110	120	110	110	110
c_v = 50	–	–	110	120	110

Pressure joints in element slabs

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

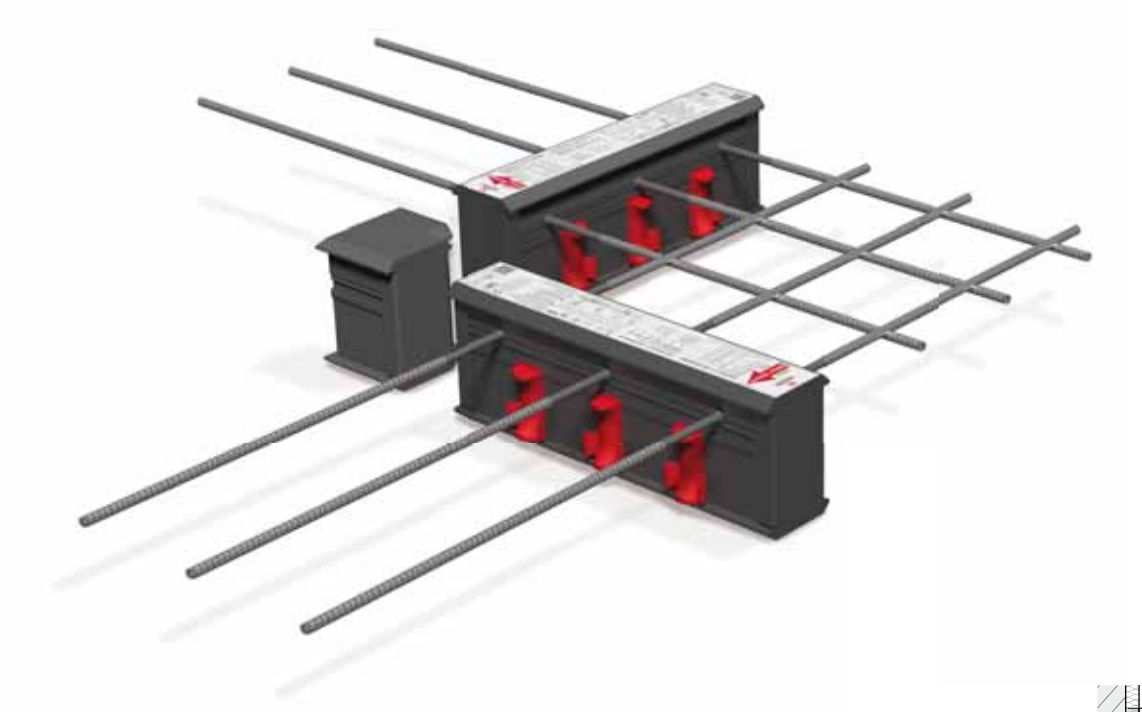


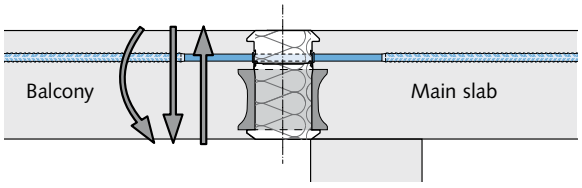


To create a positive connection a total distance of at least 10 cm between insulation element and precast unit has to be maintained. Detailed information for reinforcement layout can be found in approvals ETA-13/0546 and Z-15.7-293. The approvals are available for download at **www.halfen.com**.

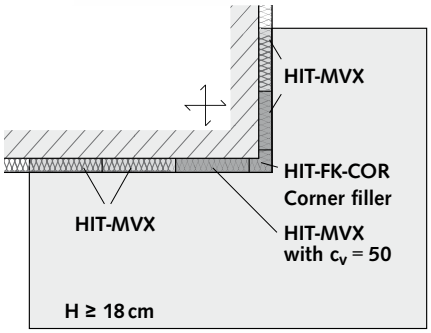
- Symmetrical connection for cantilevered corner balcony slabs
- Transfer of bending moments as well as positive and negative shear forces

type-tested





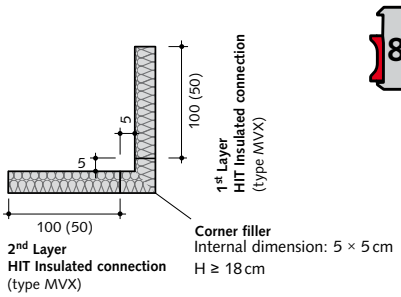
HIT-HP MVX – **High Performance** with insulation thickness 80 mm
HIT-SP MVX – **Superior Performance** with insulation thickness 120 mm
Both types are also available as multi-part types (-ES) for element slabs.



Application example: outer corner

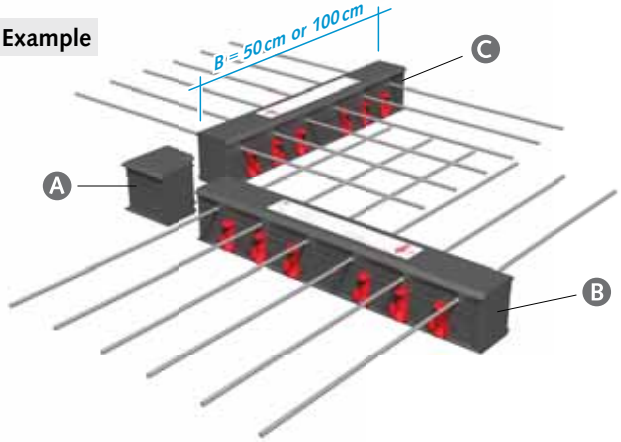
Elements for corner balconies

In addition to the type-tested connections a corner situation may be constructed (taking the occurring moments and the positive and negative shear forces into account) using HIT-HP MVX or HIT-SP MVX standard elements in 0.5 m or 1.0 m lengths.



80 120

Example



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

Ⓐ	HIT-HP	FK	-			20	-			COR - ES
Ⓑ	HIT-HP	MVX	-	05	04	- 20	-	100	- 35	
Ⓒ	HIT-HP	MVX	-	05	04	- 20	-	100	- 50	
	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 double symmetrical 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

Exemplary load bearing capacity values HIT-HP MVX COR

Shear capacity ±v_{Rd}

Concrete strength: *C20/25* ≥C25/30

80

Type / Element width		HP MVX-0506	HP MVX-0606	HP MVX-0706	HP MVX-0806	HP MVX-0906
	B = 1.00 m					
	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		HP MVX-0506	HP MVX-0606	HP MVX-0706	HP MVX-0806	HP MVX-0906
	B = 1.00 m					
	B = 0.50 m	–	HP MVX-0303	–	HP MVX-0403	–
	B = 0.25 m	–	–	–	–	–

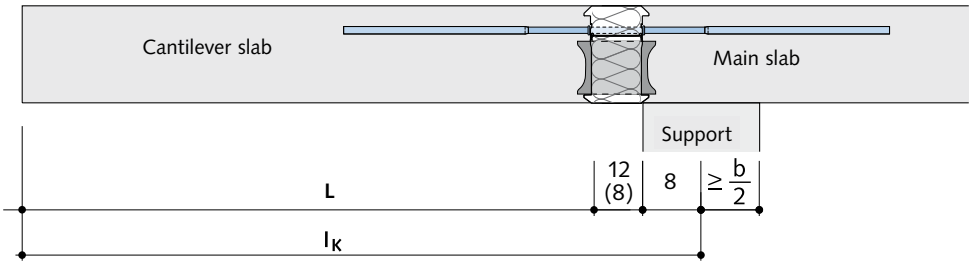
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		*21.9*	22.4	*25.4*	26.1	*28.5*	29.6	*31.4*	32.8	*34.0*	35.8
	160		180	*23.1*	23.6	*26.8*	27.6	*30.3*	31.3	*33.4*	34.8	*36.2*	38.0
		170		*24.3*	24.9	*28.3*	29.1	*32.0*	33.0	*35.4*	36.8	*38.5*	40.2

All load bearing capacity values and connecting reinforcement → pages 14–27 (value c_v = 50 mm is decisive)

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 [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	–	1.60	1.74	1.88	2.02	2.16	2.30	2.44	2.58	2.72



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

Connecting reinforcement

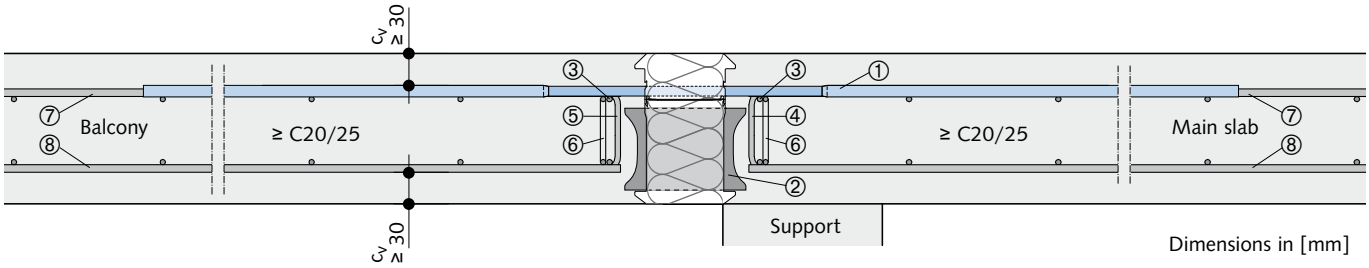
No. of tension bars n_{TB}/m	$a_{s,TB}$ [cm²]	Variation A: mesh	Variation B: steel bars	Variation C: combined mesh and steel bars
2	2,26	R257 A	ø 8 / 22 cm	–
3	3,39	R335 A	ø10 / 23 cm	R188 A + ø 8 / 25 cm
4	4,52	R524 A	ø10 / 17 cm	R188 A + ø 8 / 18 cm
5	5,65	Q636 A	ø10 / 13,5 cm	R188 A + ø 8 / 13 cm
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				

Recommendation for on-site reinforcement (constructive selected): aligned butted surfaces, $a_{s,TB} \leq a_{s,overlap}$

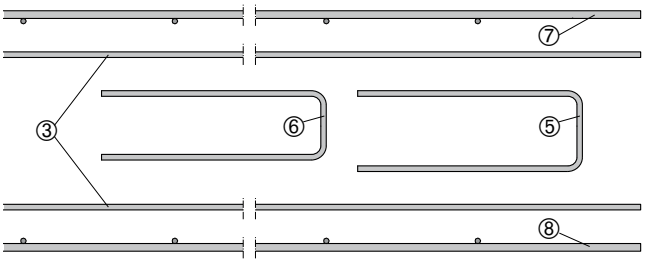
Refer to the guidelines in the type test report to calculate the overlap length l_s.
Reducing the required overlap length with a ratio of $a_{s,req.} / a_{s,actual}$ is permissable.

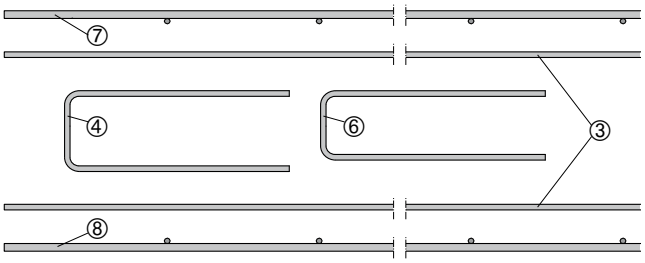
On-site reinforcement for direct and indirect support

Longitudinal section



Reinforcement detail





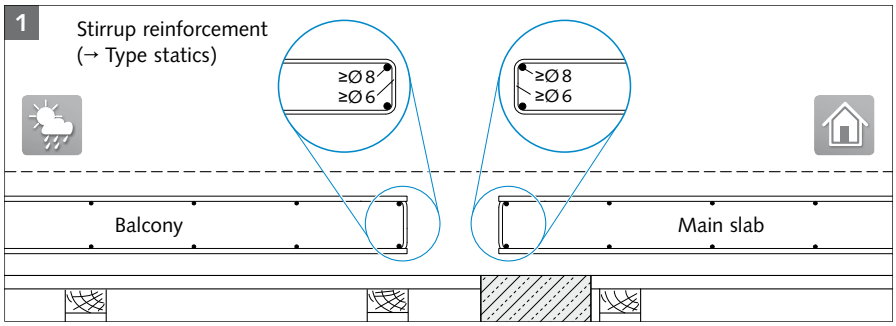
Legend: Section / Reinforcement detail

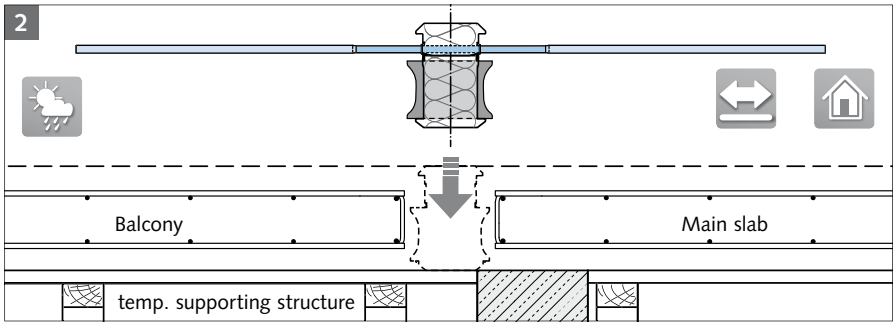
① Tension bar
② Double-symmetrical CSB
③ Horizontal transverse tensile reinforcement $A_{s,h}$ min. 2 ø8
④ Vertical tensile splitting reinforcement $A_{s,v}$ min. ø6 / 25, see also → pages 14–27
⑤ Vertical tensile splitting reinforcement $A_{s,v}$ min. ø6 / 25, see also → pages 14–27
⑥ Stirrups as end anchorage for the transverse tensile reinforcement → ③
⑦ Upper connecting reinforcement made of steel bars or mesh (→ page 33)
⑧ Lower connecting reinforcement made of steel bars or mesh

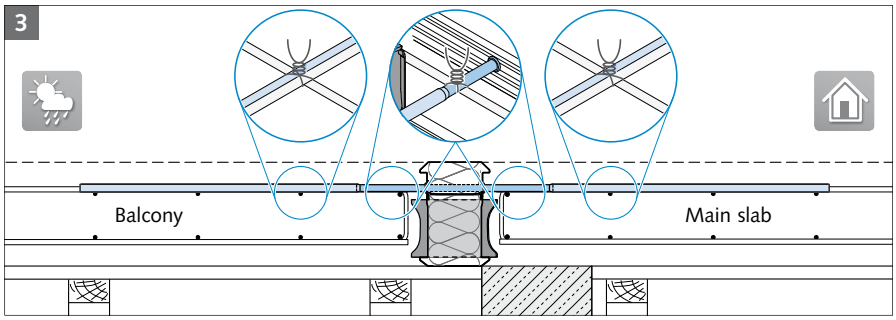
Stirrups as edge reinforcement
According to EN 1992-1-1 and EN 1992-1-1/NA stirrups need to be installed in the outer edge of the balcony.

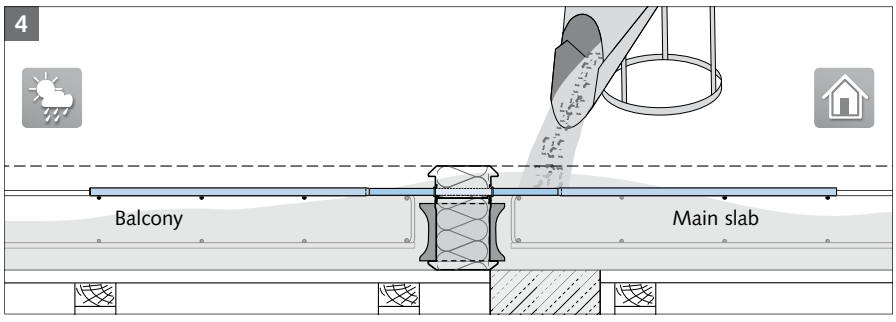
Indirect support
For indirect support a suspension reinforcement is placed in addition to the vertical tensile splitting reinforcement (Position ④).
Please note the respective load bearing capacity values (→ pages 14–27)

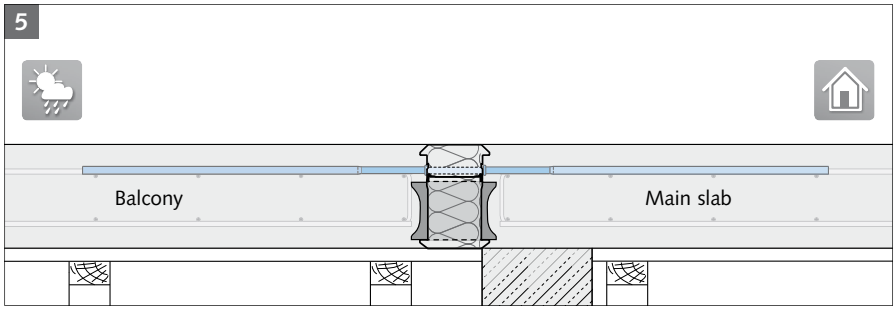
Installation diagram









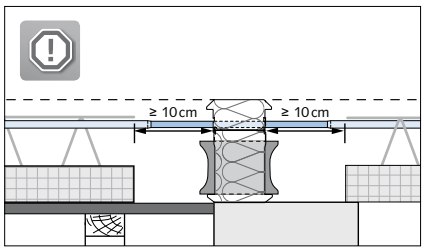


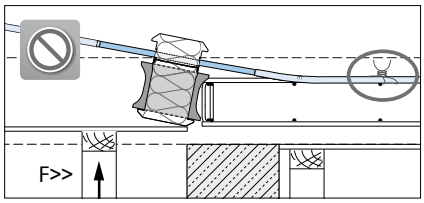
1 Installation of on-site reinforcement

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

2 Installation of the HIT Element from above

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





⚠ Ensure that the formwork is at the correct height!

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

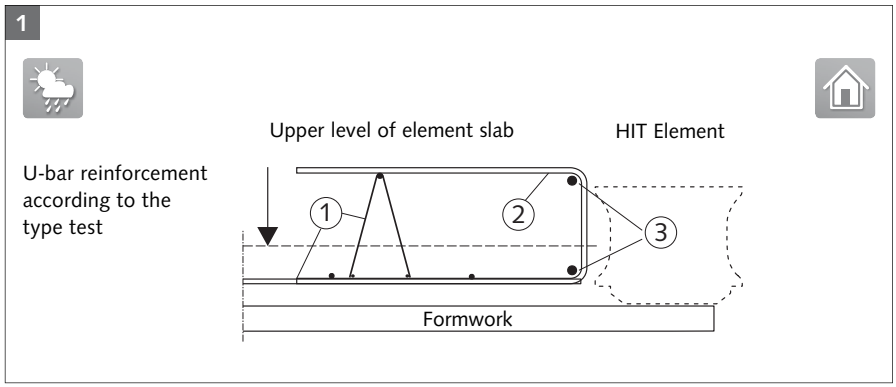
4 Pour the concrete

⚠ 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**.

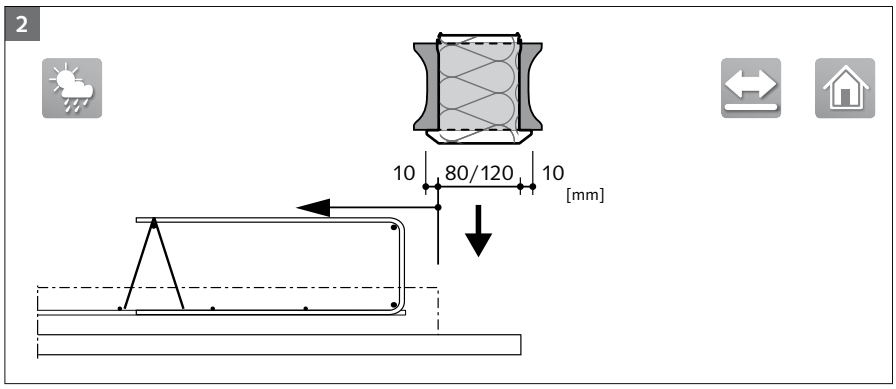
Installation diagram; precast plant



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. ⌀8 mm), if required with end anchorage.

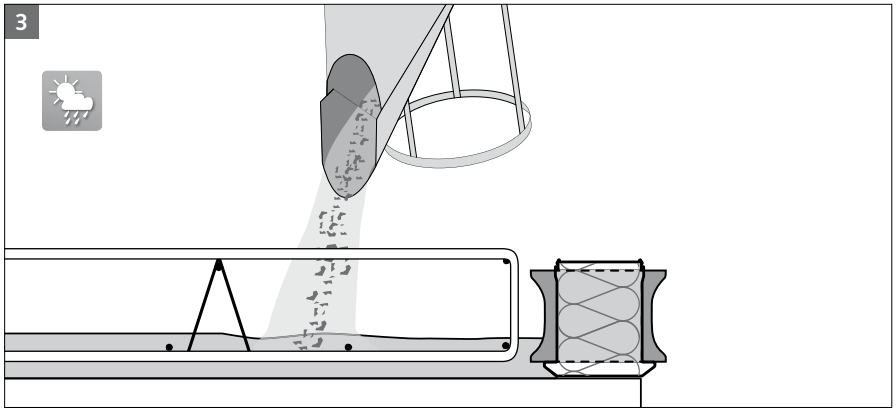
⚠ The on-site reinforcement must be placed as specified by the structural engineer.



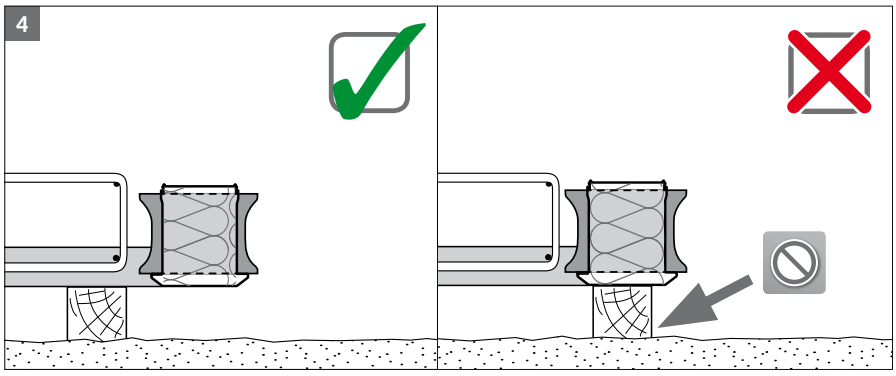
2 Installation of the CSB-Box

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

⚠ Ensure all HIT Elements are securely positioned.



3 Pour the concrete for the element slab

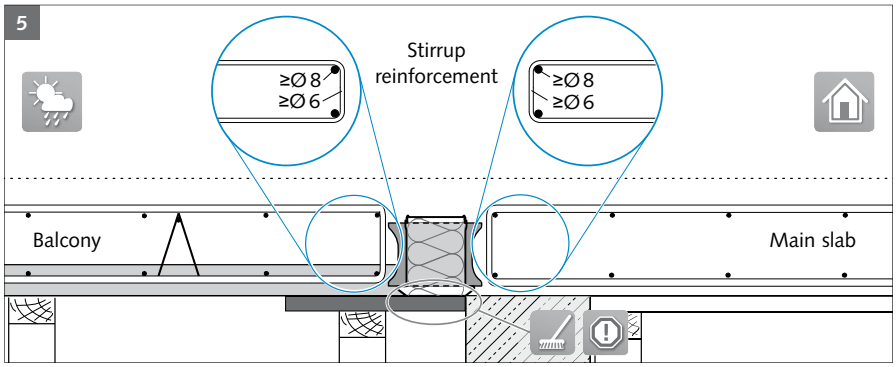


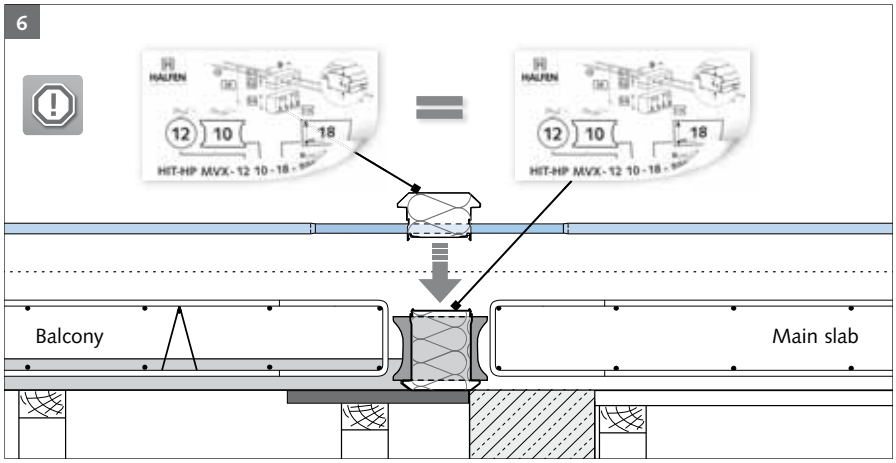
4 Transport to the construction site

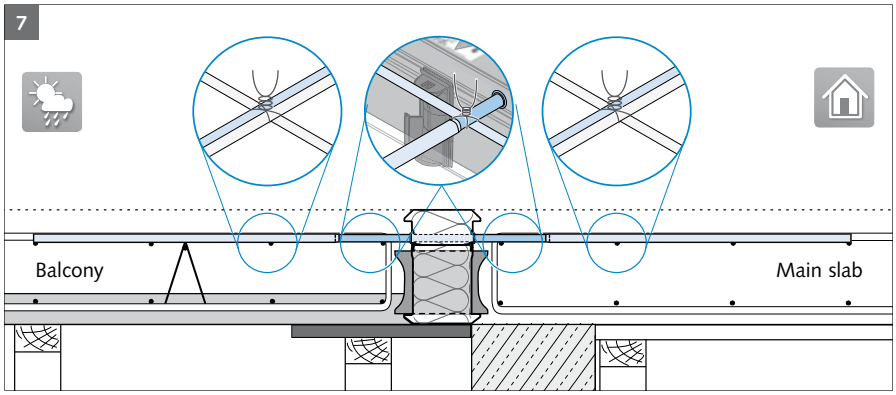
Ensure elements are properly secured during transport.
Do not rest concrete element slabs on other exposed HIT Elements.

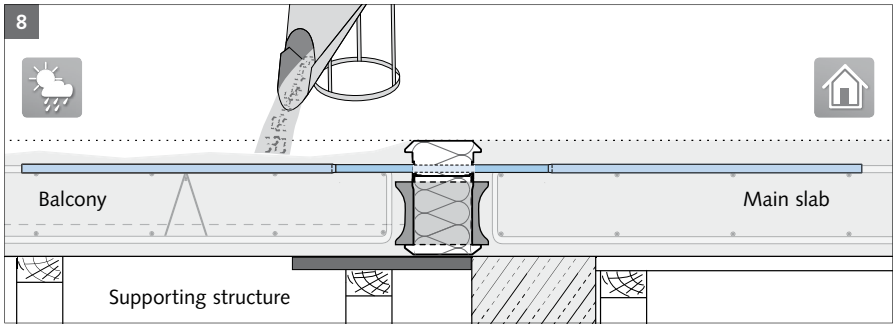
⚠ Never place temporary supports under the HIT Elements!

Installation diagram; construction site





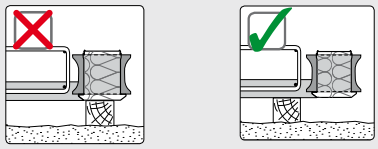




5 Install the on-site element slab reinforcement

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!

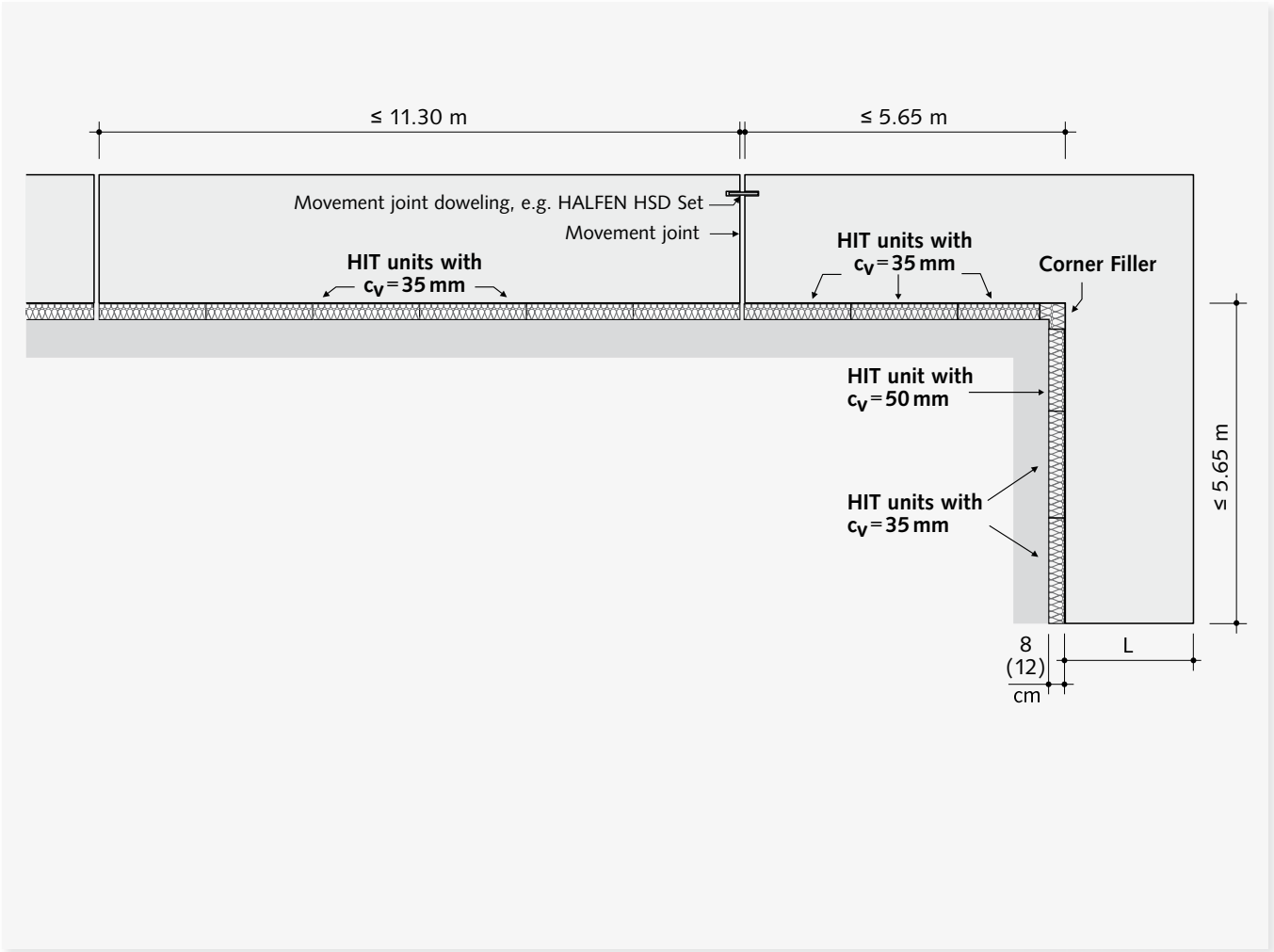
6 Install the tension bar box

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

Joint spacings



Note: Observe the expansion joints

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

In balcony structures extending past an outer corner an expansion joint must be planned at least every 11.3 m / 2 = 5.65 m.

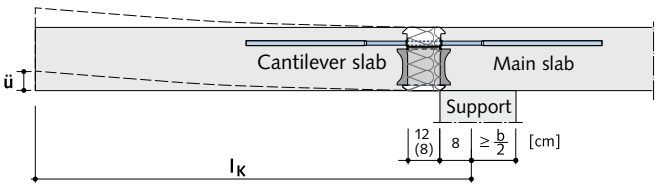
For inside corners the limit is 5.65 m for each length.

Deflection of the balcony slab

To limit flexure we recommend under-exaggerating the planned drainage flow when casting cantilevered slabs. The calculable increase in camber results from component deformation according to EN 1992-1-1 and EN 1992-1-1/NA, plus the deformation ü of the HIT Elements.

The coefficient factor for camber increase *ü** on page 40 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:

- Gk = 0.6 (G_k + Q_k)
- Qk = 0.4 (G_k + Q_k)
- Ψ_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/m²]	4.5
Dead load of decking	$g_{k,Bel}$	[kN/m²]	1.5
Traffic load on balustrade	$g_{k,Gel}$	[kN/m]	1.5
Traffic load	q_k	[kN/m²]	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 *ü** 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 *ü*.

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

with
- ü — Camber from HIT components deformation in [mm]
- ü* — Camber coefficient → see page 40
- 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 Ψ_2 = 0.3

Bending moment under quasi-permanent load combination

$$m_{Ed,perm} = (g_k + g_{k,Bel} + \Psi_2 \times q_k) \times l_K^2 / 2 + g_{k,Gel} \times l_K$$
$$= (4.5 + 1.5 + 0.3 \times 4.0) \times 1.9^2 / 2 + 1.5 \times 1.9$$
$$= 15.8\,kNm/m$$

Camber coefficient ü* = 0.82 %

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

Camber from HIT components deformation

$$ü = ü^* \times l_K \times 10 \times m_{Ed,perm} / (0.524 \times m_{Rd})$$
$$= 0.82 \times 1.9 \times 10 \times 15.8 / (0.524 \times 29.8)$$
$$= 15.8\,mm$$
$$= 1.6\,cm$$

Note: Observe the deflections limits according to EN 1992-1-1 and EN 1992-1-1/NA → page 33

HIT-HP: Camber coefficient ü* [%] at maximum element load bearing capacity (M_{Rd})

Slab thickness h [mm]			Number of tension bars n_{TB} per metre of element			
			n_{TB} ≤ 8 tension bars per metre at concrete strength		n_{TB} > 8 tension bars per metre at concrete strength	
Concrete cover [mm]						
30	35	50	C20/25	≥ C25/30	C20/25	≥ 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 ü* [%] at maximum element load bearing capacity (M_{Rd})

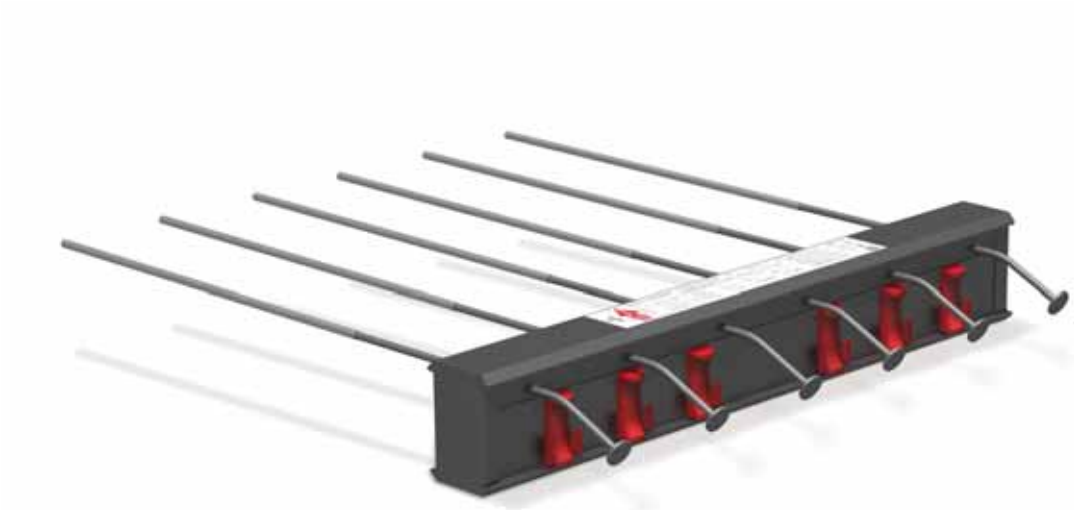
Slab thickness h [mm]			Number of tension bars n_{TB} per metre of element			
			n_{TB} ≤ 8 tension bars per metre at concrete strength		n_{TB} > 8 tension bars per metre at concrete strength	
Concrete cover [mm]						
30	35	50	C20/25	≥ C25/30	C20/25	≥ C25/30
	160		***1.04***	**1.11**	***0.89***	**1.05**
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

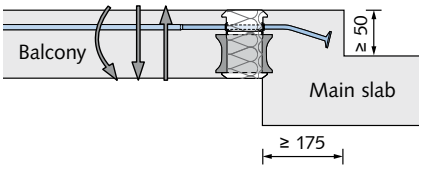
ⓘ The camber ü* is given for each slab thickness, for ≤ 8 tension bars per metre and > 8 per metre accordingly.

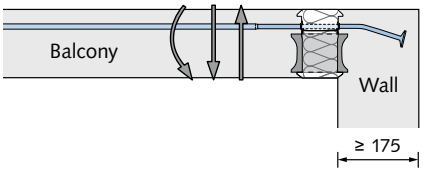
2

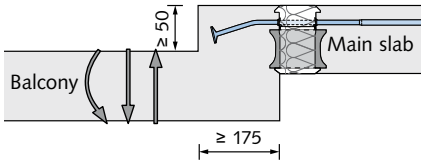
- For cantilevered balcony slabs with height offset (balcony higher than main slab) or upward wall connections
- Transfer of bending moments and bidirectional shear forces

CE CSB REI 120 type-tested









Dimensions in [mm]

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.

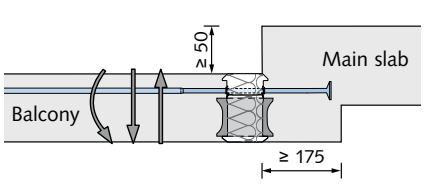
HIT-HP/SP MVX-OD as custom design
→ page 52

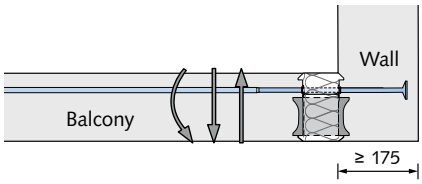
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

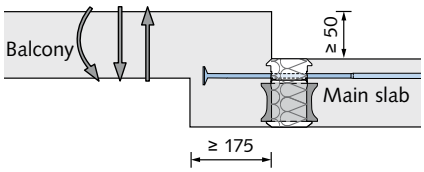
HIT-HP MVX-OD, HIT-SP MVX-OD

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

type-tested







Dimensions in [mm]

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 52

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}		
		1	2	3
Number of compression shear bearings n_{CSB}	1	●	●	
	2	●	●	●

Element width B = 50 cm		Number of tension bars n_{TB}					
		1	2	3	4	5	6
Number of compression shear bearings n_{CSB}	1	●	●				
	2	●	●	●	●		
	3		●	●	●	●	●
	4		●	●	●	●	●
	5			●	●	●	●

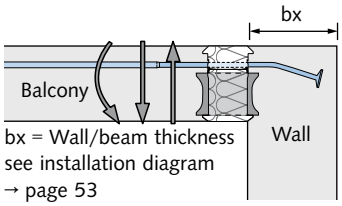
Element width B = 100 cm		Number of tension bars n_{TB}											
		1	2	3	4	5	6	7	8	9	10	11	12
Number of compression shear bearings n_{CSBw}	2		●	●	●	●							
	3		●	●	●	●	●	●					
	4		●	●	●	●	●	●	●	●			
	5				●	●	●	●	●	●	●	●	
	6				●	●	●	●	●	●	●	●	●
	7				●	●	●	●	●	●	●	●	●
	8				●	●	●	●	●	●	●	●	●
	9					●	●	●	●	●	●	●	●
	10						●	●	●	●	●	●	●
	11								●	●	●	●	●
	12										●	●	●

The load bearing capacity values for the selected elements can be found on pages 44 – 51 ● = HP and SP

Basic types – Ordering example

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

❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿ ⓫



bx = Wall/beam thickness
see installation diagram
→ page 53

Type designation

① Product group
② Insulation thickness 80 mm (HP) or 120 mm (SP)
③ Connection type
④ Number of tension rods
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

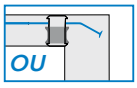
Possible slab thickness h

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

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* ≥C25/30



Type / Element width	B = 1.00 m	HP MVX-0403-…-OU		HP MVX-0504-…-OU		HP MVX-0604-…-OU		HP MVX-0805-…-OU		HP MVX-0906-…-OU	
	B = 0.50 m	–		–		HP MVX-0302-…-OU		–		–	
	B = 0.25 m	–		–		–		–		–	
Design values	v_{Rd} [kN/m]	*48.0*	**48.0**	*64.0*	**64.0**	*64.0*	**64.0**	*80.0*	**80.0**	*96.0*	**96.0**

Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVX-0403-…-OU		HP MVX-0504-…-OU		HP MVX-0604-…-OU		HP MVX-0805-…-OU		HP MVX-0906-…-OU	
	B = 0.50 m			–		–		HP MVX-0302-…-OU		–		–	
	B = 0.25 m			–		–		–		–		–	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		*15.7*	16.4	*20.0*	20.8	*22.7*	23.9	*29.5*	31.2	*34.0*	35.8
	160		180	*16.7*	17.4	*21.2*	22.1	*24.2*	25.3	*31.5*	33.2	*36.2*	38.0
		170		*17.7*	18.4	*22.5*	23.3	*25.6*	26.8	*33.5*	35.1	*38.5*	40.2
	170		190	*18.7*	19.4	*23.7*	24.5	*27.1*	28.3	*35.4*	37.1	*40.7*	42.4
		180		***19.6***	**20.3**	***24.9***	**25.7**	***28.6***	**29.8**	***37.4***	**39.1**	***42.9***	**44.6**
	180		200	*20.6*	21.3	*26.2*	27.0	*30.1*	31.2	*39.4*	41.0	*45.1*	46.9
		190		*21.6*	22.3	*27.4*	28.2	*31.5*	32.7	*41.3*	43.0	*47.3*	49.1
	190		210	*22.6*	23.3	*28.6*	29.4	*33.0*	34.2	*43.3*	45.0	*49.5*	51.3
		200		***23.6***	**24.3**	***29.8***	**30.7**	***34.5***	**35.7**	***45.3***	**46.9**	***51.7***	**53.5**
	200		220	*24.6*	25.3	*31.1*	31.9	*36.0*	37.1	*47.2*	48.9	*53.9*	55.7
		210		*25.5*	26.2	*32.3*	33.1	*37.4*	38.6	*49.2*	50.9	*56.2*	57.9
	210		230	*26.5*	27.2	*33.5*	34.4	*38.9*	40.1	*51.2*	52.8	*58.4*	60.1
		220		***27.5***	**28.2**	***34.8***	**35.6**	***40.4***	**41.6**	***53.1***	**54.8**	***60.6***	**62.3**
	220		240	*28.5*	29.2	*36.0*	36.8	*41.9*	43.0	*55.1*	56.8	*62.8*	64.6
		230		*29.5*	30.2	*37.2*	38.0	*43.3*	44.5	*57.1*	58.7	*65.0*	66.8
	230		250	*30.5*	31.2	*38.5*	39.3	*44.8*	46.0	*59.0*	60.7	*67.2*	69.0
		240		***31.5***	**32.1**	***39.7***	**40.5**	***46.3***	**47.5**	***61.0***	**62.7**	***69.4***	**71.2**
	240		260	*32.4*	33.1	*40.9*	41.7	*47.8*	48.9	*63.0*	64.6	*71.6*	73.4
		250		*33.4*	34.1	*42.1*	43.0	*49.2*	50.4	*64.9*	66.6	*73.9*	75.6
	250		270	*34.4*	35.1	*43.4*	44.2	*50.7*	51.9	*66.9*	68.6	*76.0*	77.8
	> 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 back of catalogue for contact information.										

On-site reinforcement $A_{s,req}$ (→ page 53)

Edge frame	Balcony side	ø6 / 25 cm

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

Number of stirrups per metre	5	6	7	9	10
Cross section A_{SW} [cm²/m] for each leg	5.7	6.8	7.9	10.2	11.3

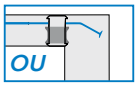
Minimum transverse reinforcement: At least one reinforcement bar ø 12 mm must be placed next to the anchor head on the side nearest to the element edge.

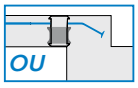
All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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* ≥C25/30





Type / Element width	B = 1.00 m	HP MVX-1006-...-OU		HP MVX-1008-...-OU		HP MVX-0610-...-OU		HP MVX-1010-...-OU		HP MVX-1012-...-OU	
	B = 0.50 m	HP MVX-0503-...-OU		HP MVX-0504-...-OU		HP MVX-0305-...-OU		HP MVX-0505-...-OU		–	
	B = 0.25 m	–		–		–		–		–	
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-1006-...-OU		HP MVX-1008-...-OU		HP MVX-0610-...-OU		HP MVX-1010-...-OU		HP MVX-1012-...-OU	
	B = 0.50 m			HP MVX-0503-...-OU		HP MVX-0504-...-OU		HP MVX-0305-...-OU		HP MVX-0505-...-OU		–	
	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	*40.0*	41.7	*27.5*	28.0	*41.2*	43.6	*32.5*	38.5
	160		180	*38.8*	41.0	*42.5*	44.1	*29.0*	29.4	*43.6*	46.0	*34.3*	40.5
		170		*41.2*	43.4	*44.9*	46.6	*30.4*	30.9	*46.0*	48.5	*36.0*	42.6
	170		190	*43.7*	45.9	*47.4*	49.0	*31.9*	32.4	*48.4*	50.9	*37.8*	44.7
		180		***46.2***	**48.3**	***49.9***	**51.5**	***33.4***	**33.9**	***50.7***	**53.4**	***39.5***	**46.7**
	180		200	*48.6*	50.8	*52.3*	54.0	*34.9*	35.3	*53.1*	55.8	*41.2*	48.8
		190		*51.1*	53.3	*54.8*	56.4	*36.3*	36.8	*55.5*	58.3	*43.0*	50.8
	190		210	*53.5*	55.7	*57.2*	58.9	*37.8*	38.3	*57.9*	60.8	*44.7*	52.9
		200		***56.0***	**58.2**	***59.7***	**61.3**	***39.3***	**39.8**	***60.1***	**63.2**	***46.5***	**55.0**
	200		220	*58.5*	60.6	*62.2*	63.8	*40.8*	41.2	*62.2*	65.7	*48.2*	57.0
		210		*60.9*	63.1	*64.4*	66.2	*42.2*	42.7	*64.4*	68.1	*50.0*	59.1
	210		230	*63.4*	65.5	*66.5*	68.7	*43.7*	44.2	*66.5*	70.6	*51.7*	61.2
		220		***65.8***	**68.0**	***68.7***	**71.2**	***45.2***	**45.7**	***68.7***	**73.1**	***53.4***	**63.2**
	220		240	*68.3*	70.5	*70.8*	73.6	*46.7*	47.1	*70.8*	75.5	*55.2*	65.3
		230		*70.7*	72.9	*72.9*	76.1	*48.1*	48.6	*72.9*	78.0	*56.9*	67.3
	230		250	*73.2*	75.4	*75.1*	78.5	*49.6*	50.1	*75.1*	80.4	*58.7*	69.4
		240		***75.7***	**77.8**	***77.2***	**81.0**	***51.1***	**51.6**	***77.2***	**82.9**	***60.4***	**71.5**
	240		260	*78.1*	80.3	*79.4*	83.5	*52.6*	53.0	*79.4*	85.4	*62.2*	73.5
		250		*80.6*	82.8	*81.5*	85.9	*54.0*	54.5	*81.5*	87.8	*63.9*	75.6
	250		270	*83.0*	85.2	*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 back of catalogue for contact information.								

On-site reinforcement $A_{s,req}$ (→ page 53)

Edge frame	Balcony side	ø6 / 25 cm	ø6 / 22.5 cm	ø6 / 25 cm	ø6 / 16.5 cm

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

Number of stirrups per metre	11	11	7	11	11
Cross section A_{SW} [cm²/m] for each leg	12.4	12.4	7.9	12.4	12.4

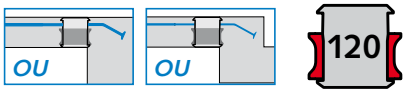
Minimum transverse reinforcement: At least one reinforcement bar ø 12 mm must be placed next to the anchor head on the side nearest to the element edge.

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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* ≥C25/30



Type / Element width		SP MVX-0403-...-OU		SP MVX-0504-...-OU		SP MVX-0705-...-OU		SP MVX-0906-...-OU		SP MVX-1208-...-OU	
	B = 1.00 m										
	B = 0.50 m	–		–		–		–		SP MVX-0604-...-OU	
	B = 0.25 m	–		–		–		–		SP MVX-0302-...-OU	
Design values	v_{Rd} [kN/m]	*45.6*	**48.0**	*62.0*	**64.0**	*74.3*	**80.0**	*84.9*	**96.0**	*106.3*	**120.8**

Moment bearing capacity m_{Rd}

Type / Element width		SP MVX-0403-...-OU		SP MVX-0504-...-OU		SP MVX-0705-...-OU		SP MVX-0906-...-OU		SP MVX-1208-...-OU	
	B = 1.00 m										
	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		*15.7*	16.4	*20.0*	20.8	*27.1*	28.4	*34.0*	35.8	*45.4*	47.7
	160		180	*16.7*	17.4	*21.2*	22.1	*28.8*	30.1	*36.2*	38.0	*48.3*	50.7
		170		*17.7*	18.4	*22.5*	23.3	*30.5*	31.8	*38.5*	40.2	*51.3*	53.6
	170		190	*18.7*	19.4	*23.7*	24.5	*32.2*	33.5	*40.7*	42.4	*54.2*	56.6
		180		***19.6***	**20.3**	***24.9***	**25.7**	***34.0***	**35.2**	***42.9***	**44.6**	***57.2***	**59.5**
	180		200	*20.6*	21.3	*26.2*	27.0	*35.7*	37.0	*45.1*	46.9	*60.1*	62.5
		190		*21.6*	22.3	*27.4*	28.2	*37.4*	38.7	*47.3*	49.1	*63.1*	65.4
	190		210	*22.6*	23.3	*28.6*	29.4	*39.1*	40.4	*49.5*	51.3	*66.0*	68.4
		200		***23.6***	**24.3**	***29.8***	**30.7**	***40.9***	**42.1**	***51.7***	**53.5**	***69.0***	**71.3**
	200		220	*24.6*	25.3	*31.1*	31.9	*42.6*	43.9	*53.9*	55.7	*71.9*	74.3
		210		*25.5*	26.2	*32.3*	33.1	*44.3*	45.6	*56.2*	57.9	*74.9*	77.2
	210		230	*26.5*	27.2	*33.5*	34.4	*46.0*	47.3	*58.4*	60.1	*77.8*	80.2
		220		***27.5***	**28.2**	***34.8***	**35.6**	***47.7***	**49.0**	***60.6***	**62.3**	***80.4***	**83.1**
	220		240	*28.5*	29.2	*36.0*	36.8	*49.5*	50.7	*62.8*	64.6	*83.0*	86.1
		230		*29.5*	30.2	*37.2*	38.0	*51.2*	52.5	*65.0*	66.8	*85.6*	89.0
	230		250	*30.5*	31.2	*38.5*	39.3	*52.9*	54.2	*67.2*	69.0	*88.2*	92.0
		240		***31.5***	**32.1**	***39.7***	**40.5**	***54.6***	**55.9**	***69.4***	**71.2**	***90.7***	**94.9**
	240		260	*32.4*	33.1	*40.9*	41.7	*56.3*	57.6	*71.6*	73.4	*93.3*	97.9
		250		*33.4*	34.1	*42.1*	43.0	*58.1*	59.3	*73.9*	75.6	*95.9*	100.8
	250		270	*34.4*	35.1	*43.4*	44.2	*59.8*	61.1	*76.0*	77.8	*98.4*	103.8
	> 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 back of catalogue for contact information.								

On-site reinforcement $A_{s,req}$ (→ page 53)

Edge frame	Balcony side	ø6 / 25 cm	ø6 / 21 cm

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

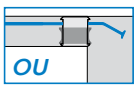
Number of stirrups per metre	5	6	8	10	13
Cross section A_{SW} [cm²/m] for each leg	5.7	6.8	9.0	11.3	14.7

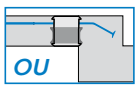
Minimum transverse reinforcement: At least one reinforcement bar ø 12 mm must be placed next to the anchor head on the side nearest to the element edge.

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

Shear load capacity ±v_{Rd} **Concrete strength:** *C20/25* ≥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		–	
	B = 0.25 m	–		–		–		–		–	
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		–	
	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	*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 > 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 back of catalogue for contact information.								

On-site reinforcement $A_{s,req}$ (→ page 53)

Edge frame	Balcony side	ø6 / 25 cm	ø6 / 22.5 cm	ø6 / 18.5 cm

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

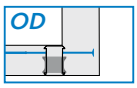
Number of stirrups per metre	3	5	11	11	11
Cross section A_{SW} [cm²/m] for each leg	3.4	5.7	12.4	12.4	12.4

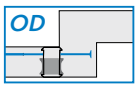
Minimum transverse reinforcement: At least one reinforcement bar ø 12 mm must be placed next to the anchor head on the side nearest to the element edge.

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

Shear load capacity ±v_{Rd} **Concrete strength:** C20/25 ≥C25/30





Type / Element width	B = 1.00 m	HP MVX-0403-...-OD		HP MVX-0504-...-OD		HP MVX-0706-...-OD		HP MVX-0806-...-OD		HP MVX-1007-...-OD	
	B = 0.50 m	–		–		–		HP MVX-0403-...-OD		–	
	B = 0.25 m	–		–		–		–		–	
Design values	v_{Rd} [kN/m]	*31.1*	**35.7**	*45.6*	**51.8**	*74.6*	**83.8**	*62.3*	**71.5**	*64.5*	**75.2**

Moment bearing capacity m_{Rd}

Type / Element width	B = 1.00 m			HP MVX-0403-...-OD		HP MVX-0504-...-OD		HP MVX-0706-...-OD		HP MVX-0806-...-OD		HP MVX-1007-...-OD	
	B = 0.50 m			–		–		–		HP MVX-0403-...-OD		–	
	B = 0.25 m			–		–		–		–		–	
Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		*15.7*	16.4	*20.0*	20.8	*28.5*	29.6	*31.4*	32.8	*38.4*	40.3
	160		180	*16.7*	17.4	*21.2*	22.1	*30.3*	31.3	*33.4*	34.8	*40.9*	42.8
		170		*17.7*	18.4	*22.5*	23.3	*32.0*	33.0	*35.4*	36.8	*43.4*	45.2
	170		190	*18.7*	19.4	*23.7*	24.5	*33.7*	34.8	*37.3*	38.7	*45.8*	47.7
		180		***19.6***	**20.3**	***24.9***	**25.7**	***35.4***	**36.5**	***39.3***	**40.7**	***48.3***	**50.1**
	180		200	*20.6*	21.3	*26.2*	27.0	*37.1*	38.2	*41.3*	42.7	*50.7*	52.6
		190		*21.6*	22.3	*27.4*	28.2	*38.9*	39.9	*43.2*	44.6	*53.2*	55.1
	190		210	*22.6*	23.3	*28.6*	29.4	*40.6*	41.7	*45.2*	46.6	*55.7*	57.5
		200		***23.6***	**24.3**	***29.8***	**30.7**	***42.3***	**43.4**	***47.2***	**48.6**	***58.1***	**60.0**
	200		220	*24.6*	25.3	*31.1*	31.9	*44.0*	45.1	*49.1*	50.5	*60.6*	62.4
		210		*25.5*	26.2	*32.3*	33.1	*45.7*	46.8	*51.1*	52.5	*63.0*	64.9
	210		230	*26.5*	27.2	*33.5*	34.4	*47.5*	48.5	*53.1*	54.5	*65.5*	67.3
		220		***27.5***	**28.2**	***34.8***	**35.6**	***49.2***	**50.3**	***55.0***	**56.4**	***67.9***	**69.8**
	220		240	*28.5*	29.2	*36.0*	36.8	*50.9*	52.0	*57.0*	58.4	*70.4*	72.3
		230		*29.5*	30.2	*37.2*	38.0	*52.6*	53.7	*59.0*	60.4	*72.9*	74.7
	230		250	*30.5*	31.2	*38.5*	39.3	*54.4*	55.4	*60.9*	62.3	*75.1*	77.2
		240		***31.5***	**32.1**	***39.7***	**40.5**	***56.1***	**57.1**	***62.9***	**64.3**	***77.2***	**79.6**
	240		260	*32.4*	33.1	*40.9*	41.7	*57.8*	58.9	*64.9*	66.3	*79.4*	82.1
		250		*33.4*	34.1	*42.1*	43.0	*59.5*	60.6	*66.8*	68.2	*81.5*	84.6
	250		270	*34.4*	35.1	*43.4*	44.2	*61.2*	62.3	*68.8*	70.2	*83.7*	87.0
	> 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 back of catalogue for contact information.								

On-site rexhement $A_{s,req}$ (→ page 54)

Edge frame	Balcony side	ø6 / 25 cm	ø6 / 24,5 cm

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

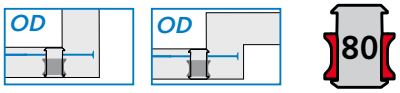
Number of stirrups per metre	5	6	8	9	11
Cross section A_{SW} [cm²/m] for each leg	5.7	6.8	9.0	10.2	12.4

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

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

Shear load capacity ±v_{Rd} **Concrete strength:** C20/25 ≥C25/30



Type / Element width		HP MVX-0202-...-OD	HP MVX-0505-...-OD	HP MVX-0606-...-OD	HP MVX-0608-...-OD	HP MVX-0610-...-OD
	B = 1.00 m					
	B = 0.50 m	HP MVX-0101-...-OD	–	HP MVX-0303-...-OD	HP MVX-0304-...-OD	HP MVX-0305-...-OD
	B = 0.25 m	–	–	–	–	–
Design values	v_{Rd} [kN/m]	*32.0* **32.0**	*80.0* **80.0**	*96.0* **96.0**	*128.0* **128.0**	*137.0* **147.1**

Moment bearing capacity m_{Rd}

Type / Element width		HP MVX-0202-...-OD	HP MVX-0505-...-OD	HP MVX-0606-...-OD	HP MVX-0608-...-OD	HP MVX-0610-...-OD
	B = 1.00 m					
	B = 0.50 m	HP MVX-0101-...-OD	–	HP MVX-0303-...-OD	HP MVX-0304-...-OD	HP MVX-0305-...-OD
	B = 0.25 m	–	–	–	–	–

Concrete cover [mm]	30	35	50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		*7.6*	8.7	*19.0*	21.8	*22.8*	26.1	*24.7*	27.3	*22.3*	22.9
	160		180	*8.0*	9.2	*20.1*	23.0	*24.1*	27.6	*26.0*	28.7	*23.4*	24.1
		170		*8.5*	9.7	*21.1*	24.2	*25.4*	29.1	*27.4*	30.2	*24.6*	25.3
	170		190	*8.9*	10.2	*22.2*	25.5	*26.7*	30.6	*28.7*	31.7	*25.8*	26.5
		180		***9.3***	**10.7**	***23.3***	**26.7**	***28.0***	**32.0**	***30.1***	**33.2**	***26.9***	**27.7**
	180		200	*9.8*	11.2	*24.4*	27.9	*29.3*	33.5	*31.4*	34.6	*28.1*	28.9
		190		*10.2*	11.7	*25.5*	29.2	*30.5*	35.0	*32.8*	36.1	*29.3*	30.1
	190		210	*10.6*	12.2	*26.5*	30.4	*31.8*	36.5	*34.1*	37.6	*30.4*	31.3
		200		***11.0***	**12.6**	***27.6***	**31.6**	***33.1***	**37.9**	***35.5***	**39.1**	***31.6***	**32.5**
	200		220	*11.5*	13.1	*28.7*	32.8	*34.4*	39.4	*36.8*	40.5	*32.8*	33.6
		210		*11.9*	13.6	*29.8*	34.1	*35.7*	40.9	*38.2*	42.0	*34.0*	34.8
	210		230	*12.3*	14.1	*30.8*	35.3	*37.0*	42.4	*39.5*	43.5	*35.1*	36.0
		220		***12.8***	**14.6**	***31.9***	**36.5**	***38.3***	**43.8**	***40.9***	**45.0**	***36.3***	**37.2**
	220		240	*13.2*	15.1	*33.0*	37.8	*39.6*	45.3	*42.2*	46.4	*37.5*	38.4
		230		*13.6*	15.6	*34.1*	39.0	*40.9*	46.8	*43.6*	47.9	*38.6*	39.6
	230		250	*14.1*	16.1	*35.1*	40.2	*42.2*	48.3	*44.9*	49.4	*39.8*	40.8
		240		***14.5***	**16.6**	***36.2***	**41.4**	***43.5***	**49.7**	***46.3***	**50.9**	***41.0***	**42.0**
	240		260	*14.9*	17.1	*37.3*	42.7	*44.8*	51.2	*47.6*	52.3	*42.1*	43.1
		250		*15.4*	17.6	*38.4*	43.9	*46.1*	52.7	*49.0*	53.8	*43.3*	44.3
	250		270	*15.8*	18.1	*39.5*	45.1	*47.3*	54.2	*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 back of catalogue for contact information.										

On-site reinforcement $A_{s,req}$ (→ page 54)

Edge frame	Balcony side	ø6 / 25 cm

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

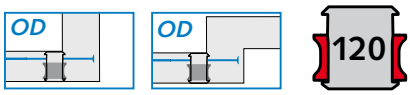
Number of stirrups per metre	3	6	7	7	7
Cross section A_{SW} [cm²/m] for each leg	3.4	6.8	7.9	7.9	7.9

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

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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

Shear load capacity ±v_{Rd} **Concrete strength:** C20/25 ≥C25/30



Type / Element width		SP MVX-0403-...-OD		SP MVX-0404-...-OD		SP MVX-0504-...-OD		SP MVX-0705-...-OD		SP MVX-0907-...-OD	
	B = 1.00 m										
	B = 0.50 m	–		SP MVX-0202-...-OD		–		–		–	
	B = 0.25 m	–		SP MVX-0101-...-OD		–		–		–	
Design values	v_{Rd} [kN/m]	*23.8*	**28.0**	*48.2*	**53.8**	*35.9*	**41.5**	*35.6*	**42.6**	*59.7*	**69.5**

Moment bearing capacity m_{Rd}

Type / Element width		SP MVX-0403-...-OD		SP MVX-0404-...-OD		SP MVX-0504-...-OD		SP MVX-0705-...-OD		SP MVX-0907-...-OD	
	B = 1.00 m										
	B = 0.50 m	–		SP MVX-0202-...-OD		–		–		–	
	B = 0.25 m	–		SP MVX-0101-...-OD		–		–		–	
Concrete cover [mm]	30 / 35 / 50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]		160		*15.7*	16.4	*16.9*	17.4	*20.0*	20.8	*27.1*	28.4	*35.7*	37.2
	160		180	*16.7*	17.4	*17.9*	18.4	*21.2*	22.1	*28.8*	30.1	*38.0*	39.5
		170		*17.7*	18.4	*18.9*	19.4	*22.5*	23.3	*30.5*	31.8	*40.2*	41.7
	170		190	*18.7*	19.4	*19.9*	20.4	*23.7*	24.5	*32.2*	33.5	*42.4*	43.9
		180		***19.6***	**20.3**	***20.8***	**21.4**	***24.9***	**25.7**	***34.0***	**35.2**	***44.6***	**46.1**
	180		200	*20.6*	21.3	*21.8*	22.3	*26.2*	27.0	*35.7*	37.0	*46.8*	48.3
		190		*21.6*	22.3	*22.8*	23.3	*27.4*	28.2	*37.4*	38.7	*49.0*	50.5
	190		210	*22.6*	23.3	*23.8*	24.3	*28.6*	29.4	*39.1*	40.4	*51.2*	52.7
		200		***23.6***	**24.3**	***24.8***	**25.3**	***29.8***	**30.7**	***40.9***	**42.1**	***53.4***	**55.0**
	200		220	*24.6*	25.3	*25.8*	26.3	*31.1*	31.9	*42.6*	43.9	*55.7*	57.2
		210		*25.5*	26.2	*26.7*	27.3	*32.3*	33.1	*44.3*	45.6	*57.9*	59.4
	210		230	*26.5*	27.2	*27.7*	28.2	*33.5*	34.4	*46.0*	47.3	*60.1*	61.6
		220		***27.5***	**28.2**	***28.7***	**29.2**	***34.8***	**35.6**	***47.7***	**49.0**	***62.3***	**63.8**
	220		240	*28.5*	29.2	*29.7*	30.2	*36.0*	36.8	*49.5*	50.7	*64.4*	66.0
		230		*29.5*	30.2	*30.7*	31.2	*37.2*	38.0	*51.2*	52.5	*66.4*	68.2
	230		250	*30.5*	31.2	*31.7*	32.2	*38.5*	39.3	*52.9*	54.2	*68.3*	70.4
		240		***31.5***	**32.1**	***32.6***	**33.2**	***39.7***	**40.5**	***54.6***	**55.9**	***70.2***	**72.7**
	240		260	*32.4*	33.1	*33.6*	34.1	*40.9*	41.7	*56.3*	57.6	*72.2*	74.9
		250		*33.4*	34.1	*34.6*	35.1	*42.1*	43.0	*58.1*	59.3	*74.1*	77.1
	250		270	*34.4*	35.1	*35.6*	36.1	*43.4*	44.2	*59.8*	61.1	*76.0*	79.3
	> 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 back of catalogue for contact information.								

On-site reinforcement $A_{s,req}$ (→ page 54)

Edge frame	Balcony side	ø6 / 25 cm

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

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

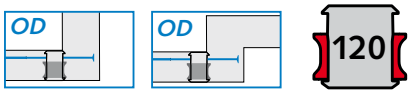
Minimum transverse reinforcement: At least one reinforcement bar ø 12 mm must be placed next to the anchor head on the side nearest to the element edge.

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

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 ≥C25/30



Type / Element width	B = 1.00 m	SP MVX-0202-...-OD		SP MVX-0505-...-OD		SP MVX-0606-...-OD		SP MVX-0608-...-OD		SP MVX-0610-...-OD	
	B = 0.50 m	SP MVX-0101-...-OD		–		SP MVX-0303-...-OD		SP MVX-0304-...-OD		SP MVX-0305-...-OD	
	B = 0.25 m	–		–		–		–		–	
Design values	v_{Rd} [kN/m]	*28.6*	**31.1**	*71.5*	**77.8**	*85.8*	**93.3**	*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-0505-...-OD		SP MVX-0606-...-OD		SP MVX-0608-...-OD		SP MVX-0610-...-OD	
	B = 0.50 m	SP MVX-0101-...-OD		–		SP MVX-0303-...-OD		SP MVX-0304-...-OD		SP MVX-0305-...-OD	
	B = 0.25 m	–		–		–		–		–	
Concrete cover [mm]	30 35 50										
Design values m_{Rd} [kNm/m] for slab thickness [mm]	160	*7.2*	7.4	*17.9*	18.6	*21.5*	22.2	*25.7*	26.7	*24.8*	26.1
	160 180	*7.6*	7.8	*18.9*	19.6	*22.7*	23.4	*27.1*	28.2	*26.1*	27.4
	170	*8.0*	8.2	*19.9*	20.6	*23.9*	24.6	*28.5*	29.6	*27.4*	28.8
	170 190	*8.4*	8.6	*20.9*	21.6	*25.1*	25.8	*29.9*	31.0	*28.7*	30.1
	180	***8.8***	**9.1**	***21.9***	**22.6**	***26.3***	**27.0**	***31.3***	**32.5**	***30.0***	**31.5**
	180 200	*9.2*	9.5	*22.9*	23.7	*27.5*	28.3	*32.7*	33.9	*31.4*	32.9
	190	*9.6*	9.9	*23.9*	24.7	*28.7*	29.5	*34.1*	35.4	*32.7*	34.2
	190 210	*10.0*	10.3	*24.9*	25.7	*29.9*	30.7	*35.5*	36.8	*34.0*	35.6
	200	***10.4***	**10.7**	***25.9***	**26.7**	***31.1***	**31.9**	***36.9***	**38.2**	***35.3***	**37.0**
	200 220	*10.8*	11.1	*26.9*	27.7	*32.3*	33.1	*38.3*	39.7	*36.6*	38.3
	210	*11.2*	11.5	*27.9*	28.7	*33.5*	34.3	*39.7*	41.1	*37.9*	39.7
	210 230	*11.6*	11.9	*28.9*	29.8	*34.7*	35.6	*41.2*	42.6	*39.2*	41.1
	220	***12.0***	**12.3**	***29.9***	**30.8**	***35.9***	**36.8**	***42.6***	**44.0**	***40.6***	**42.4**
	220 240	*12.4*	12.7	*30.9*	31.8	*37.1*	38.0	*44.0*	45.5	*41.9*	43.8
	230	*12.8*	13.1	*31.9*	32.8	*38.3*	39.2	*45.4*	46.9	*43.2*	45.2
	230 250	*13.2*	13.5	*32.9*	33.8	*39.5*	40.4	*46.8*	48.3	*44.5*	46.5
	240	***13.6***	**13.9**	***33.9***	**34.9**	***40.7***	**41.6**	***48.2***	**49.8**	***45.8***	**47.9**
	240 260	*14.0*	14.3	*34.9*	35.9	*41.9*	42.9	*49.6*	51.2	*47.1*	49.3
	250	*14.4*	14.8	*35.9*	36.9	*43.1*	44.1	*51.0*	52.7	*48.4*	50.6
	250 270	*14.8*	15.2	*36.9*	37.9	*44.3*	45.3	*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 back of catalogue for contact information.									

On-site reinforcement $A_{s,req}$ (→ page 54)

Edge frame	Balcony side	ø6 / 25 cm	ø6 / 20 cm

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

Number of stirrups per metre	3	6	7	7	7
Cross section A_{SW} [cm²/m] for each leg	3.4	6.8	7.9	7.9	7.9

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

All necessary verifications have already been considered. Connecting elements must be verified by the planner.

Product description – Cross sections

HIT-HP MVX-OU;
with bent anchor head

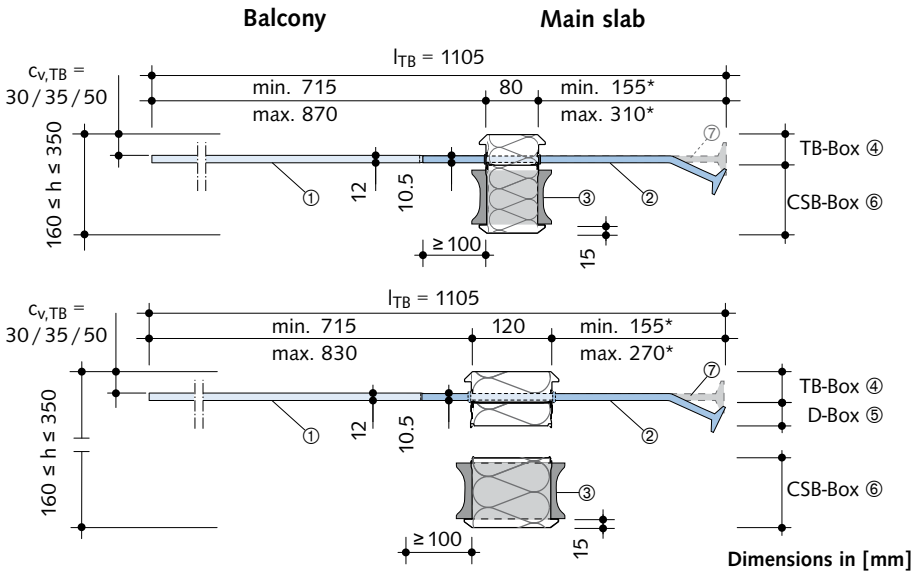
HIT-HP MVX-OD;
with straight anchor head
(dotted line)

Also available as multi part type for main slab element.

HIT-SP MVX-OU ES;
with bent anchor head

HIT-SP MVX-OD ES;
with straight anchor head
(dotted line)

① Tension section 1: ø12 mm
② Tension section 2: ø10.5 mm stainless steel
③ Double-symmetrical CSB
④ Tension bar box
⑤ Distance box as height offset h = from 20 mm (→ see page 30)
⑥ Compression shear bearing box
⑦ Tension bar with straight anchor head

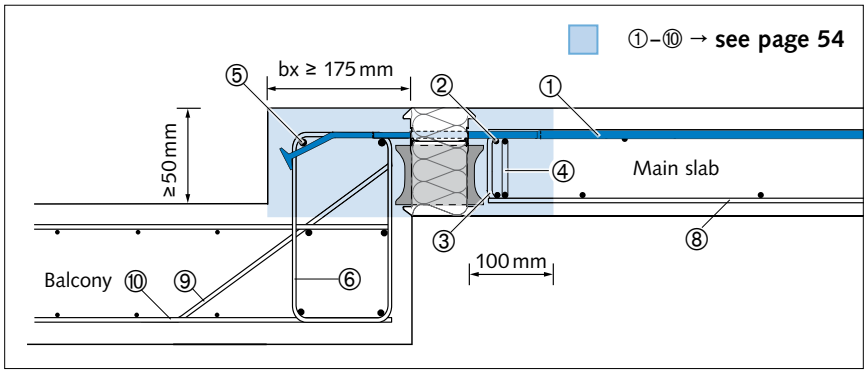


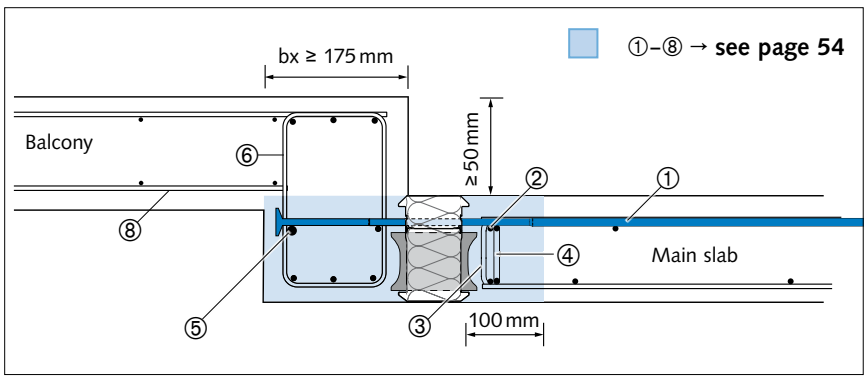
*The total length of the tension bar is pre-determined. The proportional section length for the main slab side depends on the present geometry:
Building element thickness bx – 20 mm concrete cover.
155 mm ≤ bx – 20 mm ≤ 310 mm (HIT-HP)
≤ 270 mm (HIT-SP)
Further special lengths are available on request, See contact details at the back of the catalogue.

Example: For an element thickness of bx = 175 mm the tension bar length on the main slab side is 155 mm. This leaves a length of 870 mm for HIT-HP and 830 mm with HIT-SP Elements for the balcony side.

Balcony side anchor head as custom solutions

An anchor head application in a height offset balcony side is possible if the geometric requirements are observed. (offset height x ≥ 50 mm, bx ≥ 175 mm) A beam reinforcement is required and the location of the shear reinforcement (min. ø12 mm, in close contact with the anchor heads) must be observed when designing the on-site connection reinforcement (balcony side).





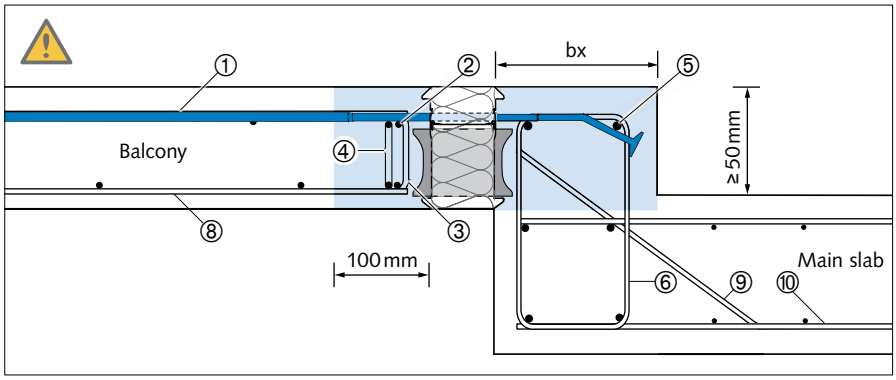
HIT Custom solutions

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

On-site reinforcement

Upward height offset

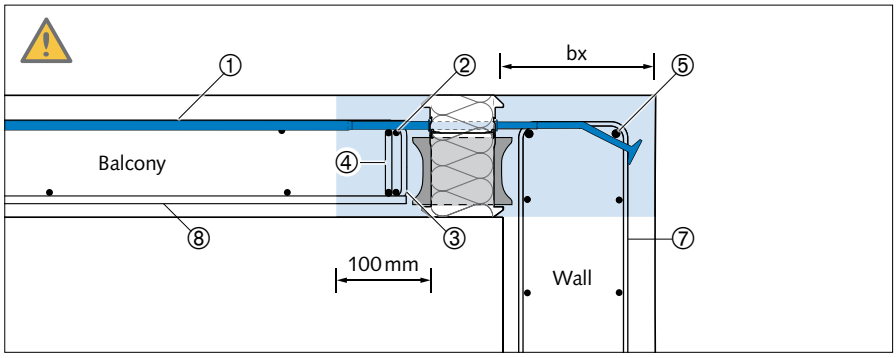


No construction joints permissable in this area:
Balcony side → vertical
Main slab → vertical and horizontal

bx = building element thickness

Design as frame corner!
Recommended:
bx ≥ height HIT Element

Wall connection, balcony slab higher

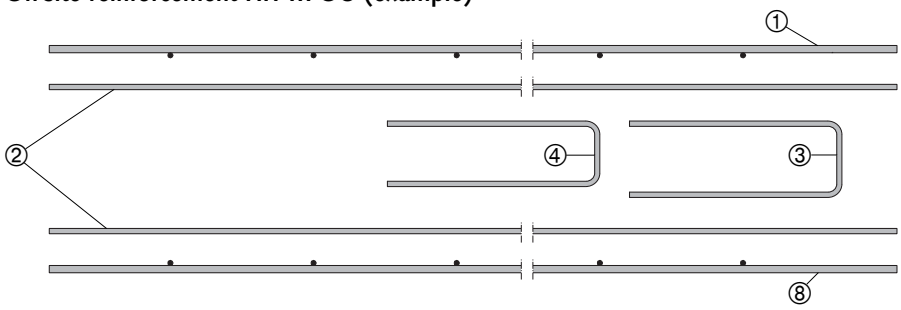


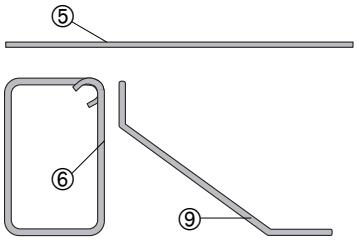
No construction joints permissable in this area:
Balcony side → vertical
Wall side → vertical and horizontal

bx = building element thickness

Design as frame corner!
Recommended:
bx ≥ height HIT Element

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





Structural design of on-site reinforcement for the HIT-HP/SP MVX-OU

① Upper connecting reinforcement made of bar steel or mesh, for reinforcement on balcony side; for more detail see also page 44

② Horizontal transverse tensile reinforcement $A_{s,h}$ min. 2 × ø8, parallel to the joint

③ Vertical tensile splitting reinforcement $A_{s,v}$ min. ø6 / 25, → see also page 44–47

④ Stirrups at slab edge as end anchorage for the transverse tensile reinforcement ③

⑤ Transverse reinforcement, min. ø12; in contact with the anchor bolts

⑥ Required minimum reinforcement for transmitting the loads from the HIT Element → see also pages 44–47

⑦ Required minimum reinforcement as loop or mesh reinforcement with statically required edge enclosure for transmitting the loads from the HIT Element → see also pages 44–47.

Specified by the structural engineer:

⑧ Connecting reinforcement of steel-bar or mesh

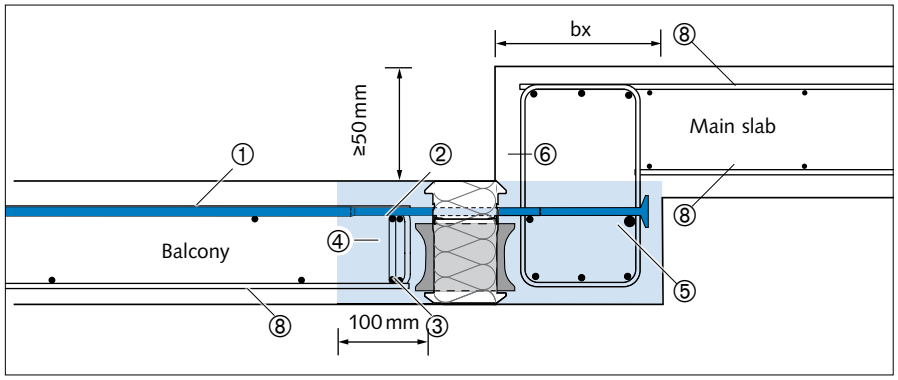
⑨ Diagonal structural reinforcement

⑩ Main slab reinforcement designed as stirrups or mesh reinforcement with statically required edge reinforcement for the main slab

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

On-site reinforcement

Downward height offset

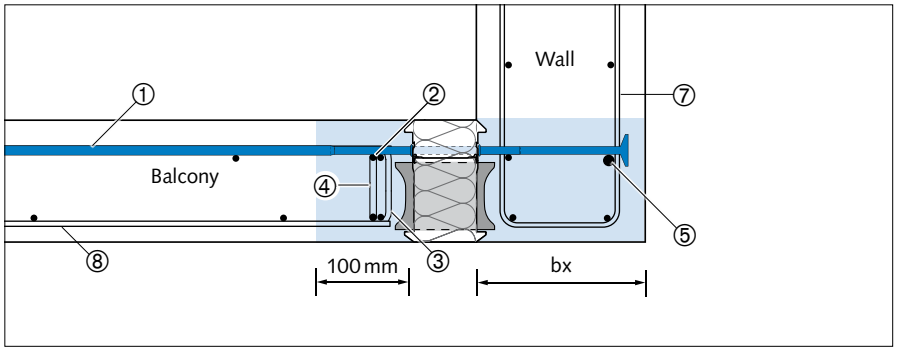


No construction joints permissable in this area:
Balcony side → vertical
Main slab side → vertical and horizontal

bx = building element thickness

Design as frame corner!
Recommended:
bx ≥ HIT Element height

Downward wall connection

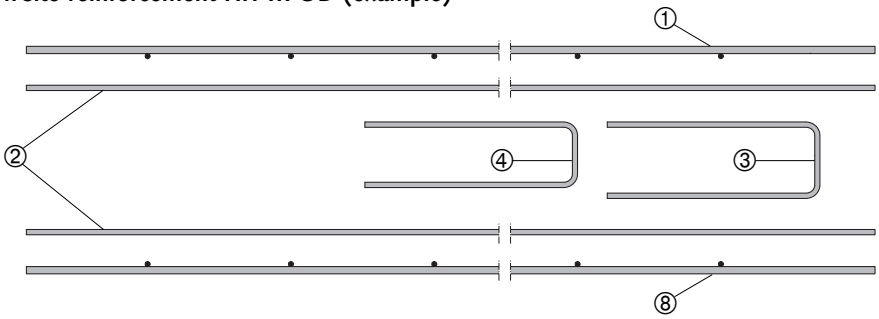


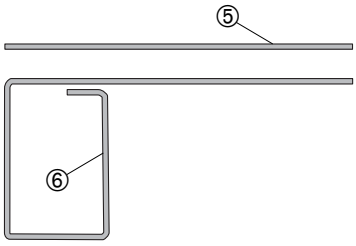
No construction joints permissable in this area:
Balcony side→ vertical
Wall side → vertical and horizontal

bx = building element thickness

HIT Element Height!
Recommended:
bx ≥ HIT Element height

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





Structural design of on-site reinforcement for HIT-HP/SP MVX-OD

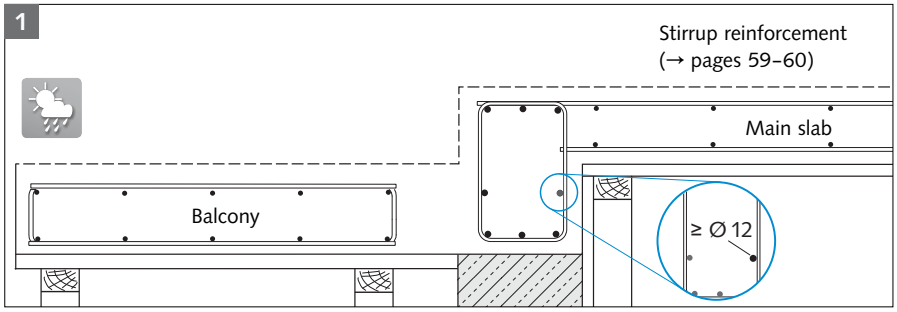
① Upper connecting reinforcement, bar steel or mesh, for reinforcement on the balcony side see also page 44
② Horizontal transverse tensile reinforcement $A_{s,h}$ min. 2 × ø8, parallel to the joint
③ Vertical tensile splitting reinforcement $A_{s,v}$ min. ø6 / 25, → see also pages 48–51
④ Stirrups at slab edge as end anchorage as transverse tensile reinforcement ③
⑤ Shear reinforcement, min. ø12; with close contact to the anchor heads
⑥ Required minimum reinforcement for transmitting the loads from the HIT Element → see also pages 48–51
⑦ Required minimum reinforcement as stirrup or mesh reinforcement with statically required edge reinforcement for transmitting the loads from the HIT Element → see also pages 48–51

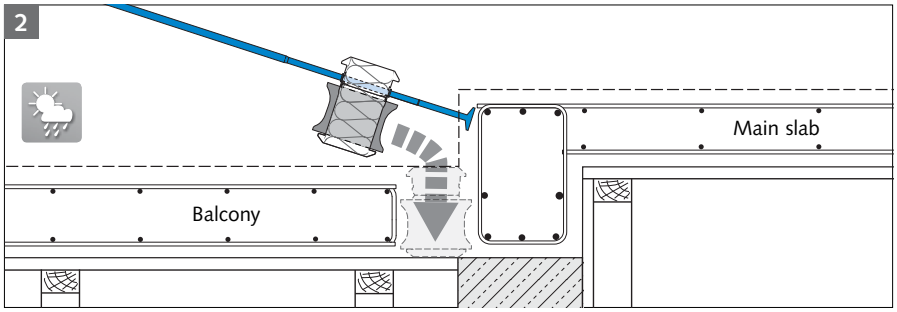
Specified by the structural engineer:

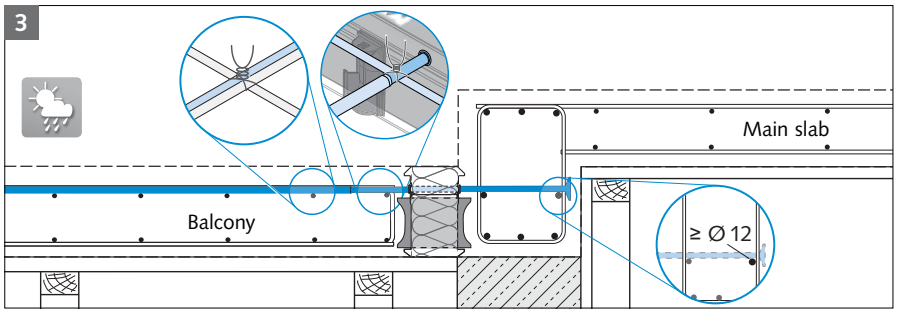
⑧ Connecting reinforcement in steel-bar or mesh

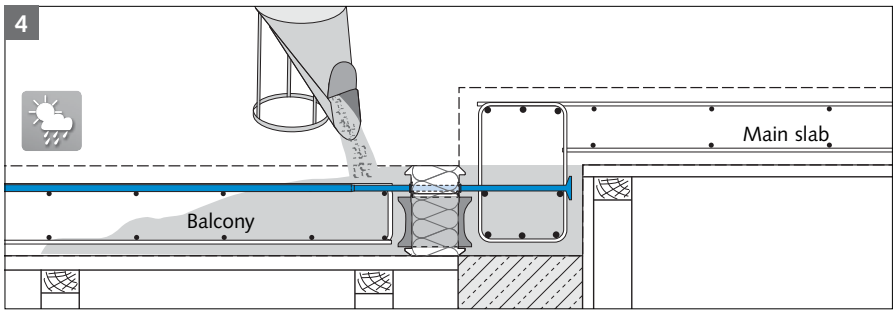
Further reinforcement required due to additional load factors (e.g. beam shear reinforcement or bending reinforcement) must be specified by the structural engineer!

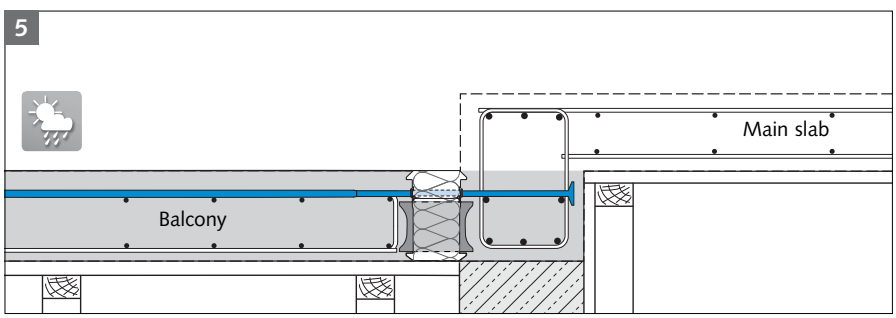
Installation diagram











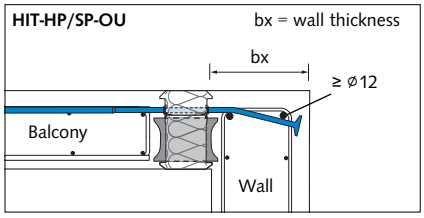
1 Installation of on-site reinforcement
See details on pages 53–54.

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 (→ see also pages 53–54): min. ø12 mm, must to be placed with close contact to the anchor bolts.



4 Pouring the concrete
Observe required expansion joints → see illustrations on pages 53–54

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

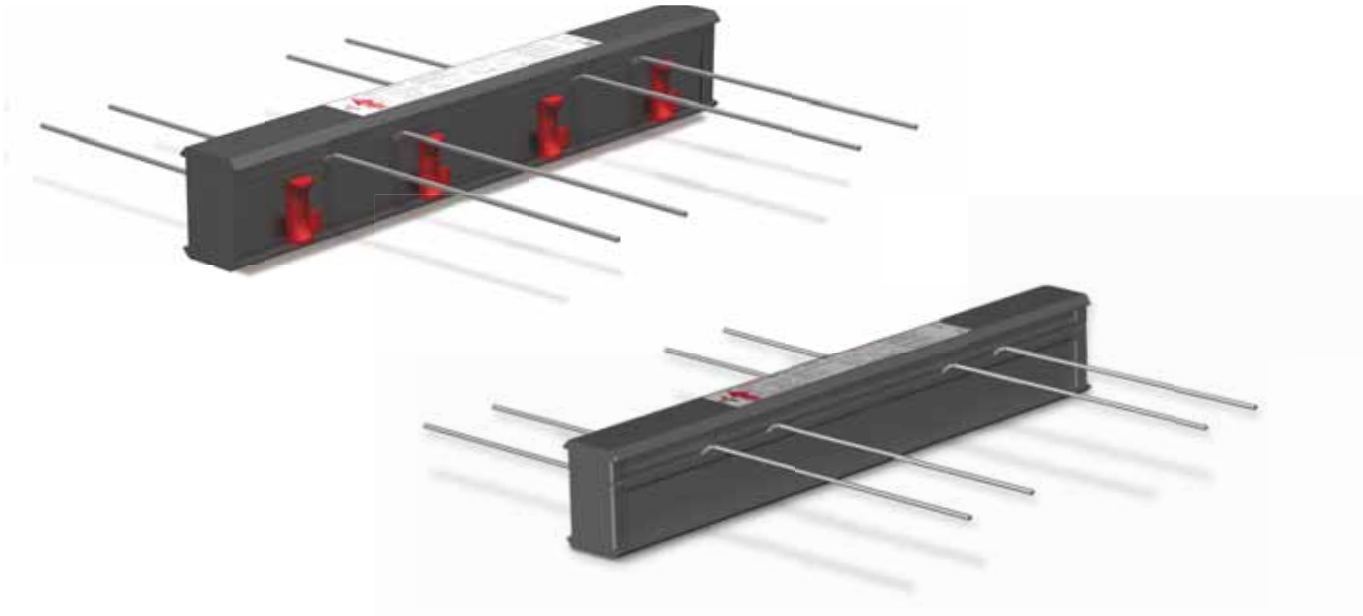
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

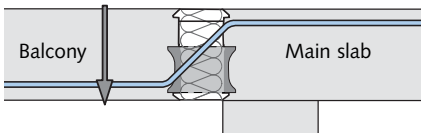
HIT-HP ZVX, HIT-SP ZVX

3

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

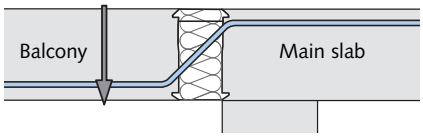
CE CSB REI 120 type-tested





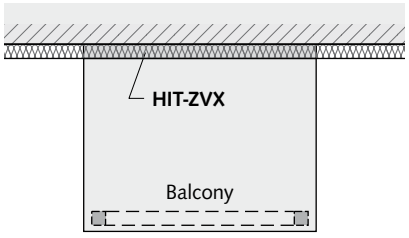
HIT-HP ZVX – High Performance
80 mm insulation thickness

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

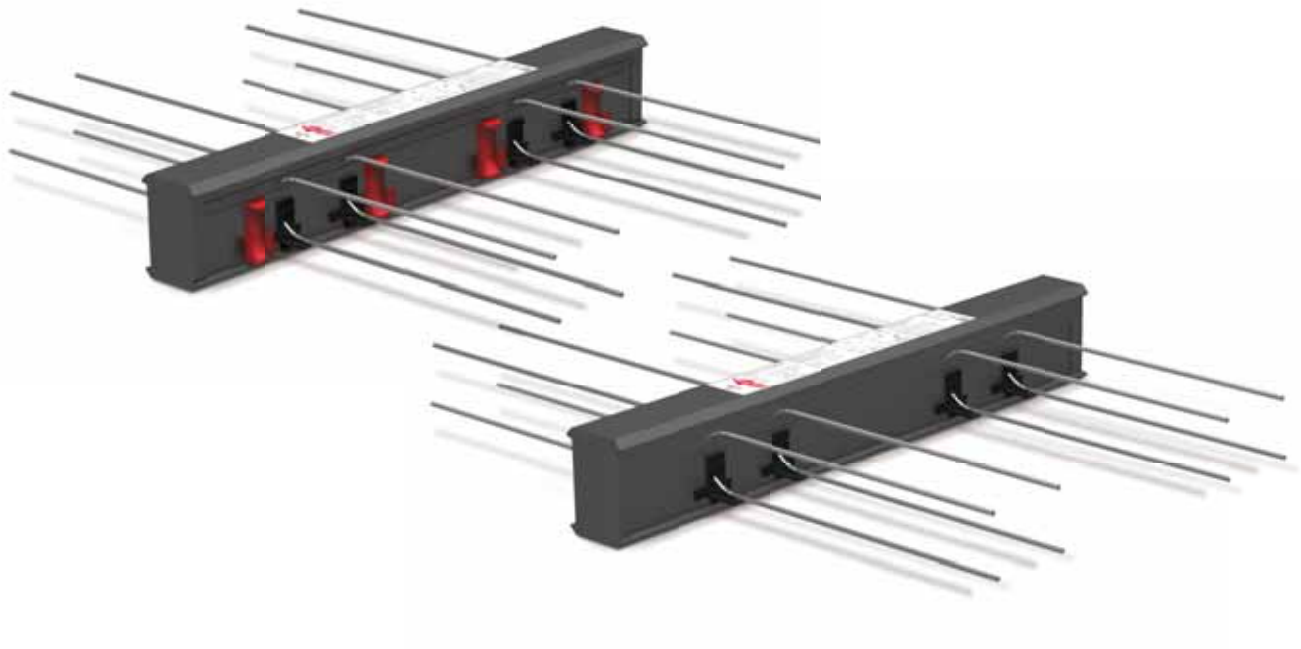


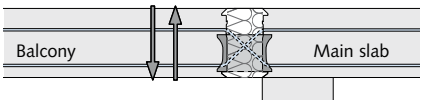
Application: Simply supported balcony on columns

HIT-HP ZDX, HIT-SP ZDX

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

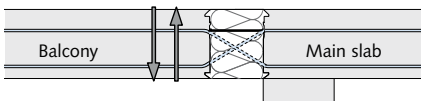
type-tested





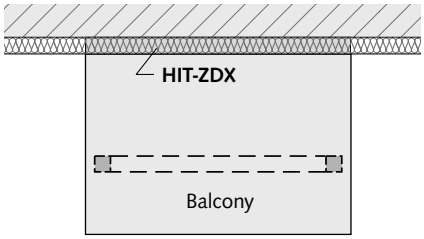
HIT-HP ZDX – High Performance
80 mm insulation thickness

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

Product types – Load range

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

Possible combinations of SB (shear load bars) and CSB (Compression Shear Bearings)

Diameter of the shear load bars [mm]		ø 6								ø 8								ø 10								ø 12							
Element width B = 25 cm		Number of shear load 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 load 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 load bars n_{SB}																															
		1	2	3	4	5	6			1	2	3	4	5	6			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 load 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 pages 60 – 65. ● = 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

❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾

Type description

① Product group
② Insulation thickness 80 mm (HP) i.e. 120 mm (SP)
③ Conection type
④ ZVX: No. of shear load bars
ZDX: No. of shear load bars on each side
⑤ Number of CSB
⑥ Element height [cm]
⑦ Element width [cm]
⑧ Concrete cover unten [mm]
⑨ Diameter shear load 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 main slab height h

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

Product description – Cross sections (Typical applications)

Figure: Type HIT-SP ZVX-0404-...-06
Bent bar type; shear load bars ø6 mm
(also available for custom designs ø8 mm)

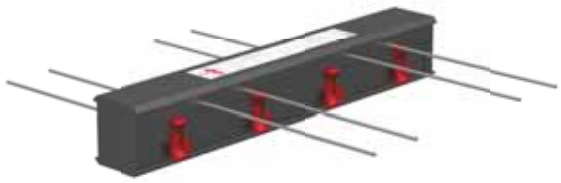
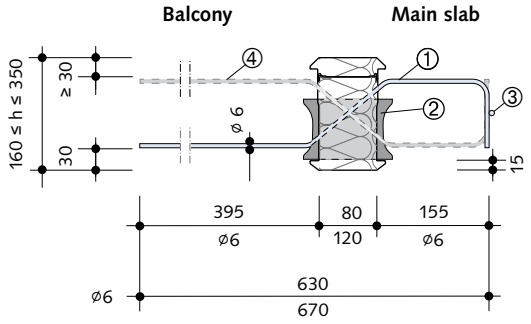
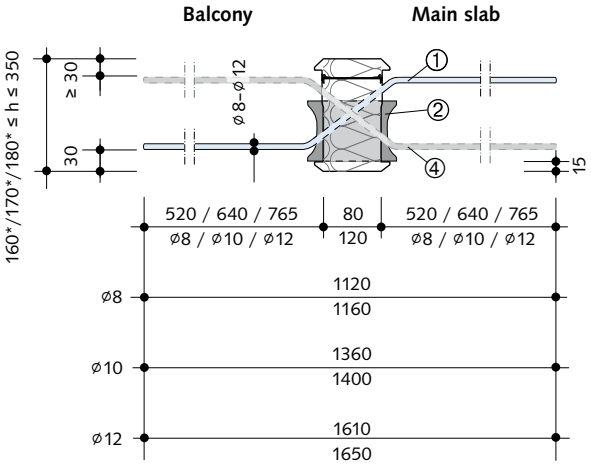


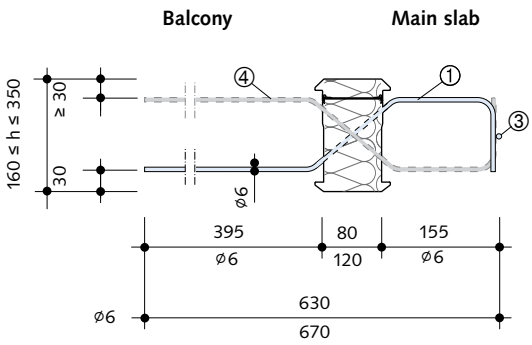
Figure: Type HIT-SP ZVX-0404-...-08
Straight bar type; shear load bars ø8, ø10, ø12 mm
(also available for custom designs in ø6 mm)



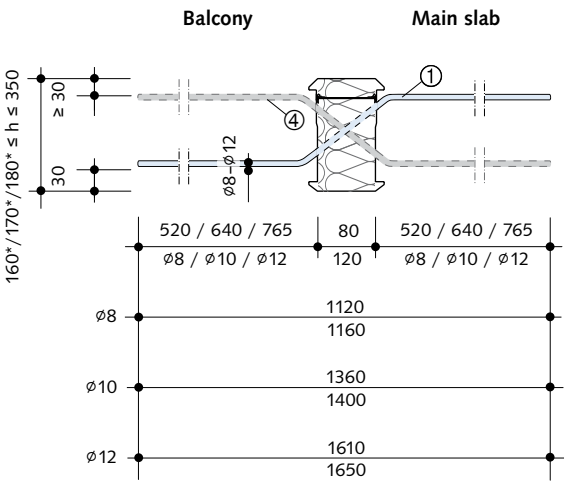


with no CSB for unrestraint connections, e.g. for loggias

Bent type; shear load bars ø6 mm



Straight type; shear load bars ø8, ø10, ø12 mm
(also available for custom designs in ø6 mm)



Dimensions in [mm]

① Shear load bars for HIT-ZVX Elements
② Double-symmetrical CSB
③ Load supporting shear bar for shear load bars ø6
④ Shear load bars for tranferring the shear loads upwards (in the opposite direction) for HIT-ZDX Elements

*smallest available element heights,
depending on the diameter of the shear load bar:
ø 6 from 160 mm
ø 8 from 160 mm
ø10 from 170 mm
ø12 from 180 mm

Load bearing capacity values according to EN 1992-1-1 (EC2) — ⌀6 mm, ⌀8 mm and ⌀10 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 ①		0302-...-06 ①		0402-...-06 ①		0502-...-06 ①		0602-...-06 ①	
	B = 0.50 m	–		–		0201-...-06		–		0301-...-06	
Lower concrete cover [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 – 250	*30.2*	30.2	*44.9*	44.9	*59.3*	59.3	*73.5*	73.5	*87.3*	87.3
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.									

① according to approval Z-15.7-312

Type / Element width	B = 1.00 m	0203-...-06		0303-...-06		0403-...-06		0603-...-06		0703-...-06	
Lower concrete cover [mm]	30	Concrete strength: *C20/25* ≥ C25/30									
Design values v_{Rd} [kN/m] for slab thickness [mm]	160 – 190	*29.4*	29.4	*43.5*	43.5	*57.4*	57.4	*83.8*	84.0	*96.4*	96.9
	200 – 210	*29.9*	29.9	*44.5*	44.5	*58.7*	58.7	*86.4*	86.4	*99.6*	99.8
	220 – 250	*30.4*	30.4	*45.3*	45.3	*60.1*	60.1	*89.0*	89.0	*103.2*	103.2
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.									

On-site reinforcement $A_{s,req}$

Balcony		⌀6 / 25 cm
Main slab	direct support	⌀6 / 20 cm
	indirect support	0,26 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 20 cm

Type / Element width	B = 1.00 m	0804-...-06		B = 1.00 m	0202-...-08		0402-...-08		0502-...-08	
	B = 0.50 m	0402-...-06		B = 0.50 m	0101-...-08		0201-...-08		–	
	B = 0.25 m	0201-...-06		B = 0.25 m	–		–		–	
Lower concrete cover [mm]	30	*C20/25* ≥ C25/30		30	Concrete strength: *C20/25* ≥ C25/30					
Design values v_{Rd} [kN/m] for slab thickness [mm]	160 – 190	*111.8*	112.0	160 – 190	*49.3*	49.4	*85.2*	85.2	*98.5*	98.5
	200 – 210	*115.2*	115.2	200 – 230	*51.5*	51.5	*93.8*	93.8	*109.3*	109.3
	220 – 250	*118.7*	118.7	240 – 250	*53.0*	53.0	*102.2*	102.3	*121.5*	121.5
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.								

On-site reinforcement $A_{s,req}$

Balcony		⌀6 / 25 cm		
Main slab	direct support	⌀6 / 25 cm		
	indirect support	0.31 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 25 cm		0.26 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 20 cm

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

Load bearing capacity values according to EN 1992-1-1 (EC2) — ⌀10 mm and ⌀12 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 ①		0403-...-10		0404-...-10		0503-...-10	
		B = 0.50 m	0201-...-10		–		0202-...-10		–	
Lower concrete cover [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	*151.9*	151.9
	200 – 240		*128.6*	128.6	*144.6*	144.6	*155.6*	156.3	*168.7*	168.7
	250		*143.9*	143.9	*159.1*	159.4	*162.4*	162.4	*187.9*	187.9
	> 250		On request, please contact our technical support team; contact information can be found at the back of the catalogue.							

① according to approval Z-15.7-312

On-site reinforcement $A_{s,req}$

Balcony		⌀6 / 25 cm	
Main slab	direct support	⌀6 / 20 cm	
	indirect support	0.35 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 25 cm	0.40 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 25cm

Type / Element width		B = 1.00 m	0804-...-08		0604-...-10		0406-...-12		0806-...-12	
		B = 0.50 m	0402-...-08		0302-...-10		0203-...-12		0403-...-12	
		B = 0.25 m	0201-...-08		–		–		–	
Lower concrete cover [mm]	30		Concrete strength: *C20/25* ≥ C25/30							
Design values v_{Rd} [kN/m] for slab thickness [mm]	160		*152.0*①	170.4	–	–	–	–	–	–
	170		*165.3*①	170.4	*165.3*①	188.7	–	–	–	–
	180		*170.4*	170.4	*178.7*①	188.7	*201.3*①	214.5	*201.3*①	239.3①
	190		*170.4*	170.4	*188.7*	188.7	*212.7*	214.5	*221.7*①	256.0①
	200		*187.6*	187.6	*205.3*①	208.9	*212.7*	214.5	*237.3*①	272.7①
	210		*187.6*	187.6	*208.9*	208.9	*212.7*	214.5	*250.7*①	289.3①
	220		*187.6*	187.6	*208.9*	208.9	*224.9*	225.8	*262.9*①	306.0①
	230		*187.6*	187.6	*208.9*	208.9	*224.9*	225.8	*277.3*①	322.7①
	240		*204.3*	204.7	*208.9*	208.9	*224.9*	225.8	*290.7*①	339.3①
	250		*204.3*	204.7	*231.8*	231.8	*224.9*	225.8	*304.0*①	356.0①
	> 250		On request, please contact our technical support team; contact information can be found at the back of the catalogue.							

① To utilize the element load capacity of the HIT Elements → see table on page 69

On-site reinforcement $A_{s,req}$

Balcony		⌀6 / 25 cm	
Main slab	direct support	⌀6 / 25 cm	
	indirect support	0.58 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 25 cm	0.86 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 25 cm

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

HALFEN HIT ISO-ELEMENT HIGH PERFORMANCE

HIT-HP ZVX, HIT-HP ZDX

Load bearing capacity values according to EN 1992-1-1 (EC2) — ⌀6 mm, ⌀8 mm and ⌀10 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		0202-...-10		0202-...-12	
Lower concrete cover [mm]	30	Concrete strength: *C20/25* ≥ C25/30 ①							
Design values v_{Rd} [kN/m] for slab thickness [mm]	160	*148.1*	148.1	*158.9* ①	198.3 ①	–	–	–	–
	170	*148.1*	148.1	*180.4* ①	214.7	*180.4* ①	220.5	–	–
	180	*148.1*	148.1	*201.3* ①	214.7	*201.3* ①	220.5	*201.3* ①	239.4 ①
	190	*148.1*	148.1	*212.9*	214.7	*220.5* ①	220.5	*221.7* ①	256.1 ①
	200	*155.0*	155.0	*225.2*	225.2	*224.6* ①	233.7	*237.4* ①	272.8 ①
	210	*155.0*	155.0	*225.2*	225.2	*233.7*	233.7	*250.8* ①	275.9
	220	*155.0*	155.0	*225.2*	225.2	*233.7*	233.7	*263.3* ①	304.9
	230	*155.0*	155.0	*225.2*	225.2	*233.7*	233.7	*277.4* ①	304.9
	240	*159.8*	159.8	*234.9*	234.9	*233.7*	233.7	*290.8* ①	304.9
	250	*159.8*	159.8	*234.9*	234.9	244.0	244.0	*304.1* ①	304.9
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.							

① To utilize the element load capacity of the HIT Elements → see table on page 69

On-site reinforcement $A_{s,req}$

Balcony		⌀6 / 25 cm		
Main slab	direct support	⌀6 / 25 cm		
	indirect support	0.44 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 25 cm	0.60 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 25 cm	0.74 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 25 cm

Load bearing capacity values according to EN 1992-1-1 (EC2) — ⌀6, ⌀8, ⌀10 and ⌀12 mm bar size

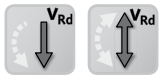
ZVX: Shear load capacity in one direction
ZDX: Shear load capacity in both directions

Type / element width	B = 1.00 m	0400-...-06		0500-...-06		0600-...-06		0800-...-06		1000-...-06	
	B = 0.50 m	0200-...-06		–		0300-...-06		0400-...-06		0500-...-06	
	B = 0.25 m	0100-...-06		–		–		0200-...-06		–	
Lower concrete cover [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	*63.2*	63.2	*79.0*	79.0
	200–210	*34.8*	34.8	*43.5*	43.5	*52.2*	52.2	*69.5*	69.5	*86.9*	86.9
	220–250	*40.3*	40.3	*50.3*	50.3	*60.4*	60.4	*80.6*	80.6	*100.7*	100.7
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.									

On-site reinforcement $A_{s,req}$

Balcony		⌀6 / 25 cm	
Main slab	direct support	⌀6 / 20 cm	
	indirect support	V_{Ed} / f_{yd} ≥ ⌀6 / 20 cm	

Load bearing capacity values according to EN 1992-1-1 (EC2) — ø6, ø8, ø10 and ø12 mm bar size



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

Type / Element width	B = 1.00 m	0600-...-08		1200-...-08		0600-...-10		1200-...-10	
	B = 0.50 m	0300-...-08		0600-...-08		0300-...-10		0600-...-10	
	B = 0.25 m	–		0300-...-08		–		0300-...-10	
Lower concrete cover [mm]	30	Concrete strength: *C20/25* ≥ C25/30							
Design values v_{Rd} [kN/m] for slab thickness [mm]	160	*79.8*	79.8	*88.0*①	110.0①	–	–	–	–
	170	*79.8*	79.8	*101.3*①	126.7①	*101.3*①	124.7	*101.3*①	126.7①
	180	*79.8*	79.8	*114.7*①	143.3①	*114.7*①	124.7	*114.7*①	143.3①
	190	*79.8*	79.8	*128.0*①	159.7	*124.7*	124.7	*128.0*①	160.0①
	200	*92.7*	92.7	*141.3*①	176.7①	*141.3*①	144.9	*141.3*①	176.7①
	210	*92.7*	92.7	*154.7*①	185.4	*144.9*	144.9	*154.7*①	193.3①
	220	*92.7*	92.7	*168.0*①	185.4	*144.9*	144.9	*168.0*①	210.0①
	230	*92.7*	92.7	*181.3*①	185.4	*144.9*	144.9	*181.3*①	226.7①
	240	*107.4*	107.4	*194.7*①	214.8	*144.9*	144.9	*194.7*①	243.3①
	250	*107.4*	107.4	*208.0*①	214.8	*167.8*	167.8	*208.0*①	260.0①
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.							

① To utilize the element load capacity of the HIT Elements → see table on page 69

On-site reinforcement $A_{s,req}$

Balcony		ø6 / 25 cm
Main slab	direct support	ø6 / 25 cm
	indirect support	V_{Ed} / f_{yd} ≥ ø6 / 25 cm

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	
Lower concrete cover [mm]	30	Concrete strength: *C20/25* ≥ C25/30							
	180	*114.7*①	143.3①	*114.7*①	143.3①	*114.7*①	143.3①	*114.7*①	143.3①
	190	*128.0*①	160.0①	*128.0*①	160.0①	*128.0*①	160.0①	*128.0*①	160.0①
	200	*141.3*①	176.7①	*141.3*①	176.7①	*141.3*①	176.7①	*141.3*①	176.7①
	210	*154.7*①	179.6	*154.7*①	193.3①	*154.7*①	193.3①	*154.7*①	193.3①
	220	*168.0*①	208.6	*168.0*①	210.0①	*168.0*①	210.0①	*168.0*①	210.0①
	230	*181.3*①	208.6	*181.3*①	226.7①	*181.3*①	226.7①	*181.3*①	226.7①
	240	*194.7*①	208.6	*194.7*①	243.3①	*194.7*①	243.3①	*194.7*①	243.3①
	250	*208.0*①	208.6	*208.0*①	243.4①	*208.0*①	260.0①	*208.0*①	260.0①
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.							

① To utilize the element load capacity of the HIT Elements → see table on page 69

On-site reinforcement $A_{s,req}$

Balcony		ø6 / 25 cm
Main slab	direct support	ø6 / 25 cm
	indirect support	V_{Ed} / f_{yd} ≥ ø6 / 25 cm

Load bearing capacity values according to EN 1992-1-1 (EC2) — ø8 mm, ø12 mm bar sizes

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

Type / Element width	B = 0.33 m	0300-…-08		0500-…-08		0500-…-10		0400-…-12	
Lower concrete cover [mm]	30	Concrete strength: *C20/25* ≥ C25/30							
Design values v_{Rd} [kN/m] for slab thickness [mm]	160	*88.0*①	110.0①	*88.0*①	110.0①	–	–	–	–
	170	*101.3*①	119.7	*101.3*①	126.7①	*101.3*①	126.7①	–	–
	180	*114.7*①	119.7	*114.7*①	143.3①	*114.7*①	143.3①	*114.7*①	143.3①
	190	*119.7*	119.7	*128.0*①	160.0①	*128.0*①	160.0①	*128.0*①	160.0①
	200	*139.1*	139.1	*141.3*①	176.7①	*141.3*①	176.7①	*141.3*①	176.7①
	210	*139.1*	139.1	*154.7*①	193.3①	*154.7*①	193.3①	*154.7*①	193.3①
	220	*139.1*	139.1	*168.0*①	210.0①	*168.0*①	210.0①	*168.0*①	210.0①
	230	*139.1*	139.1	*181.3*①	226.7①	*181.3*①	226.7①	*181.3*①	226.7①
	240	*161.1*	161.1	*194.7*①	243.3①	*194.7*①	243.3①	*194.7*①	243.3①
	250	*161.1*	161.1	*208.0*①	260.0①	*208.0*①	260.0①	*208.0*①	260.0①
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.							

① To utilize the element load capacity of the HIT Elements → see table on page 69

On-site reinforcement $A_{s,req}$

Balcony		ø6 / 25 cm
Main slab	direct support	ø6 / 25 cm
	indirect support	V_{Ed} / f_{yd} ≥ ø6 / 25 cm

Load bearing capacity values according to EN 1992-1-1 (EC2) — ø6 mm, ø8 mm, ø10 mm bar sizes

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

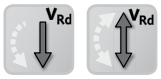
Type / Element width	B = 1.00 m	0302-…-06①		0402-…-06①		0502-…-06①		0602-…-06①		0702-…-06①	
	B = 0.50 m	–		0201-…-06		–		0301-…-06		–	
Lower concrete cover [mm]	30	Concrete strength: *C20/25* ≥ C25/30									
Design values v_{Rd} [kN/m] for slab thickness [mm]	160–190	*34.6*	34.7	*45.0*	45.4	*55.0*	55.6	*64.3*	65.4	*73.2*	74.7
	200–210	*36.7*	36.8	*48.0*	48.2	*58.8*	59.3	*69.1*	69.9	*79.0*	80.2
	220–250	*39.0*	39.0	*51.2*	51.4	*63.1*	63.4	*74.6*	75.1	*85.8*	86.6
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.									

① according to approval Z-15.7-312

On-site reinforcement $A_{s,req}$

Balcony		ø6 / 25 cm
Main slab	direct support	ø6 / 20 cm
	indirect support	0.30 cm²/m + V_{Ed} / f_{yd} ≥ ø6 / 20 cm

Load bearing capacity values according to EN 1992-1-1 (EC2) — ⌀6 mm, ⌀8 mm, ⌀10 mm bar sizes



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

Type / Element width	B = 1.00 m	0203-...-06		0303-...-06		0403-...-06		0603-...-06		0803-...-06	
Lower concrete cover [mm]	30	Concrete strength: *C20/25* ≥ C25/30									
Design values v_{Rd} [kN/m] for slab thickness [mm]	160–190	*23.9*	23.9	*35.4*	35.4	*46.5*	*46.6*	*67.6*	*68.1*	*87.2*	88.3
	200–210	*25.2*	25.2	*37.4*	37.4	*49.2*	*49.3*	*71.9*	*72.3*	*93.4*	94.3
	220–250	*26.5*	26.5	*39.5*	39.5	*52.2*	*52.2*	*76.9*	*77.0*	*100.5*	101.0
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.									

On-site reinforcement $A_{s,req}$

Balcony		⌀6 / 25 cm
Main slab	direct support	⌀6 / 20 cm
	indirect support	0,28 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 20 cm

Type / Element width	B = 1.00 m	0403-...-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	
Lower concrete cover [mm]	30	Concrete strength: *C20/25* ≥ C25/30									
Design values v_{Rd} [kN/m] for slab thickness [mm]	160 – 190	*76.5*	77.4	*92.7*	94.3	*97.1*	97.6	*113.0*	114.6	*143.6*	146.9
	200–230	*84.0*	84.7	*102.6*	103.8	*111.3*	111.8	*124.6*	125.8	*160.2*	162.7
	240–250	*90.1*	90.5	*110.7*	111.4	*123.4*	124.7	*134.0*	134.7	*174.1*	175.6
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.									

On-site reinforcement $A_{s,req}$

Balcony		⌀6 / 25 cm	
Main slab	direct support	⌀6 / 25 cm	
	indirect support	0.33 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 25 cm	0.49 cm²/m + V_{Ed} / f_{yd} ≥ ⌀6 / 25 cm

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

Load bearing capacity values according to EN 1992-1-1 (EC2) — ø8 mm, ø10 mm and ø12 mm bar sizes

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

Type / Element width	B = 1.00 m	0406-...-12		0604-...-10		0804-...-10		0606-...-12		0806-...-12	
	B = 0.50 m	0203-...-12		0302-...-10		0402-...-10		0303-...-12		0403-...-12	
	B = 0.25 m	–		–		0201-...-10		–		–	
Lower concrete cover [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v_{Rd} [kN/m] for slab thickness [mm]	170	–	–	160.6①	166.4	160.6①	190.7①	–	–	–	–
	180	169.5	171.9	162.6	166.4	176.1①	200.6	192.1①	238.0①	192.1①	238.0①
	190	169.5	171.9	162.6	166.4	190.4①	200.6	210.3①	242.8	210.3①	256.0①
	200	169.5	171.9	183.0	186.6	201.6①	230.3	227.6①	242.8	227.6①	272.7①
	210	169.5	171.9	183.0	186.6	216.3①	230.3	236.4	242.8	244.1①	289.3①
	220	186.9	188.6	183.0	186.6	229.5	230.3	249.8①	269.7①	249.8①	306.0①
	230	186.9	188.6	183.0	186.6	229.5	230.3	265.3	270.3	266.3①	322.7①
	240	186.9	188.6	183.0	186.6	229.5	230.3	265.3	270.3	282.3①	335.5
	250	186.9	188.6	200.1	202.6	255.3	257.2	265.3	270.3	297.8①	335.5
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.									

① To utilize the element load capacity of the HIT Elements → see table page 70

On-site reinforcement $A_{s,req}$

Balcony		ø6 / 25 cm
Main slab	direct support	ø6 / 25 cm
	indirect support	0.61 cm²/m + V_{Ed} / f_{yd} ≥ ø6 / 25 cm
		0.90 cm²/m + V_{Ed} / f_{yd} ≥ ø6 / 25 cm

Type / Element width	B = 0,33 m (Short unit)	0202-...-08		0302-...-08		0202-...-10		0302-...-10		0302-...-12	
Lower concrete cover [mm]	30	Concrete strength: C20/25 ≥ C25/30									
Design values v_{Rd} [kN/m] for slab thickness [mm]	160	118.4	119.2	153.1①	172.1	–	–	–	–	–	–
	170	118.4	119.2	169.7	172.1	175.7	178.4	173.0①	214.8①	–	–
	180	118.4	119.2	169.7	172.1	175.7	178.4	192.1①	238.0①	192.1①	238.0①
	190	118.4	119.2	169.7	172.1	175.7	178.4	210.0①	249.9	210.2①	256.1①
	200	129.1	129.8	187.1	188.8	194.0	195.9	215.3①	267.3①	227.7①	272.8①
	210	129.1	129.8	187.1	188.8	194.0	195.9	232.8①	280.1	244.2①	289.4①
	220	129.1	129.8	187.1	188.8	194.0	195.9	249.9①	280.1	249.9①	305.9①
	230	129.1	129.8	187.1	188.8	194.0	195.9	266.3①	280.1	266.3①	322.8①
	240	137.6	137.8	201.2	202.2	194.0	195.9	274.7	280.1	282.4①	339.4①
	250	137.6	137.8	201.2	202.2	208.9	210.1	287.6①	304.3	297.9①	356.1①
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.									

① To utilize the element load capacity of the HIT Elements → see table on page 70

On-site reinforcement $A_{s,req}$

Balcony		ø6 / 25 cm			
Main slab	direct support	ø6 / 25 cm			
	indirect support	0.47 cm²/m + V_{Ed} / f_{yd} ≥ ø6 / 25 cm	0.63 cm²/m + V_{Ed} / f_{yd} ≥ ø6 / 25 cm	0.79 cm²/m + V_{Ed} / f_{yd} ≥ ø6 / 25 cm	0.91 cm²/m + V_{Ed} / f_{yd} ≥ ø6 / 25 cm

Load bearing capacity values according to EN 1992-1-1 (EC2) ⌀8 mm, ⌀10 mm and ⌀12 mm bar sizes

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

Concrete strength: *C20/25* ≥C25/30

120

Type / Element width	B = 1.00 m	0500-...-06		0600-...-06		0800-...-06		0900-...-06		1200-...-06	
	B = 0.50 m	–		0300-...-06		0400-...-06		–		0600-...-06	
	B = 0.25 m	–		–		0200-...-06		–		0300-...-06	
Lower concrete cover [mm]	30	Concrete strength: *C20/25* ≥ C25/30									
Design values v_{Rd} [kN/m] for slab thickness [mm]	160–190	*32.6*	32.6	*39.1*	39.1	*52.1*	52.1	*58.6*	58.6	*78.2*	78.2
	200–210	*37.4*	37.4	*44.9*	44.9	*59.9*	59.9	*67.4*	67.4	*89.8*	89.8
	220–250	*43.5*	43.5	*52.2*	52.2	*69.5*	69.5	*78.2*	78.2	*104.3*	104.3
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.									

On-site reinforcement $A_{s,req}$

Balcony		⌀6 / 25 cm
Main slab	direct support	⌀6 / 20 cm
	indirect support	V_{Ed} / f_{yd} ≥ ⌀6 / 20 cm

Type / Element width	B = 1.00 m	0400-...-08		0600-...-08		0700-...-08		0800-...-08	
	B = 0.50 m	0200-...-08		0300-...-08		–		0400-...-08	
	B = 0.25 m	0100-...-08		–		–		0200-...-08	
Lower concrete cover [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	*76.5*	76.5	*87.4*	87.4
	200–230	*53.2*	53.2	*79.8*	79.8	*93.1*	93.1	*106.4*	106.4
	240–250	*61.8*	61.8	*92.7*	92.7	*108.2*	108.2	*123.6*	123.6
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.							

On-site reinforcement $A_{s,req}$

Balcony		⌀6 / 25 cm
Main slab	direct support	⌀6 / 25 cm
	indirect support	V_{Ed} / f_{yd} ≥ ⌀6 / 25 cm

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

Load bearing capacity values according to EN 1992-1-1 (EC2) ø6 mm, ø8 mm, ø10 mm and ø12 mm bar size

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

Concrete strength: *C20/25* ≥C25/30 **120**

Type / Element width	B = 1.00 m	0900-...-08		0600-...-10		0700-...-10		0800-...-10		1000-...-10	
	B = 0.50 m	–		0300-...-10		–		0400-...-10		0500-...-10	
	B = 0.25 m	–		–		–		0200-...-10		–	
Lower concrete cover [mm]	30	Concrete strength: *C20/25* ≥ C25/30									
Design values v_{Rd} [kN/m] for slab thickness [mm]	160	*88.0*①	98.3	–	–	–	–	–	–	–	–
	170	*98.3*	98.3	*101.3*①	102.4	*101.3*①	119.5	*101.3*①	126.7①	*101.3*①	126.7①
	180	*98.3*	98.3	*102.4*	102.4	*114.7*①	119.5	*114.7*①	136.6	*114.7*	143.3①
	190	*98.3*	98.3	*102.4*	102.4	*119.5*	119.5	*128.0*①	136.6	*128.0*①	160.0①
	200	*119.7*	119.7	*124.7*	124.7	*141.3*①	145.5	*141.3*①	166.3	*141.3*①	176.7①
	210	*119.7*	119.7	*124.7*	124.7	*145.5*	145.5	*154.7*①	166.3	*154.7*①	193.3①
	220	*119.7*	119.7	*124.7*	124.7	*145.5*	145.5	*166.3*①	166.3	*168.0*①	207.9①
	230	*119.7*	119.7	*124.7*	124.7	*145.5*	145.5	*166.3*①	166.3	*181.3*①	207.9①
	240	*139.1*	139.1	*124.7*	124.7	*145.5*	145.5	*166.3*①	166.3	*194.7*①	207.9①
	250	*139.1*	139.1	*144.9*	144.9	*169.0*	169.0	*193.2*	193.2	*208.0*①	241.5
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.									

On-site reinforcement $A_{s,req}$

Balcony		ø6 / 25 cm
Main slab	direct support	ø6 / 25 cm
	indirect support	V_{Ed} / f_{yd} ≥ ø6 / 25 cm

Type / Element width	B = 0.33 m (Short unit)	0300-...-08		0400-...-08		0300-...-10		0500-...-10		0400-...-12	
Lower concrete cover [mm]	30	Concrete strength: *C20/25* ≥ C25/30									
Design values v_{Rd} [kN/m] for slab thickness [mm]	160	*88.0*①	98.3	*88.0*①	110.0①	–	–	–	–	–	–
	170	*98.3*	98.3	*101.3*①	126.7①	*101.3*①	126.7①	*101.3*①	126.7①	–	–
	180	*98.3*	98.3	*114.7*①	131.1	*114.7*①	143.3①	*114.7*①	143.3①	*114.7*①	143.3①
	190	*98.3*	98.3	*128.0*①	131.1	*128.0*①	153.7①	*128.0*①	160.0①	*128.0*①	160.0①
	200	*119.7*	119.7	*141.3*①	159.7	*141.3*①	176.7①	*141.3*①	176.7①	*141.3*①	176.7①
	210	*119.7*	119.7	*154.7*①	159.7	*154.7*①	187.1	*154.7*①	193.3①	*154.7*①	193.3①
	220	*119.7*	119.7	*159.7*①	159.7	*168.0*①	187.1	*168.0*①	210.0①	*168.0*①	210.0①
	230	*119.7*	119.7	*159.7*①	159.7	*181.3*①	187.1	*181.3*①	226.7①	*181.3*①	226.7①
	240	*139.1*	139.1	*185.4*	185.4	*187.1*	187.1	*194.7*①	243.3①	*194.7*①	243.3①
	250	*139.1*	139.1	*185.4*	185.4	*208.0*①	217.3	*208.0*①	260.0①	*208.0*①	260.0①
	> 250	On request, please contact our technical support team; contact information can be found at the back of the catalogue.									

① To utilize the element load capacity of the HIT Elements → see table on page 70

On-site reinforcement $A_{s,req}$

Balcony		ø6 / 25 cm
Main slab	direct support	ø6 / 25 cm
	indirect support	V_{Ed} / f_{yd} ≥ ø6 / 25 cm

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

ZVX: Maximal load capacity v_{Rd}
ZDX: Maximal load capacity $\pm v_{Rd}$

Concrete strength: *C20/25* ≥C25/30

with CSB ø8 / ø10 / ø12 ①	B = 1.00 m	0804-...-08		B = 1.00 m	0604-...-10		B = 1.00 m	0406-...-12		0806-...-12	
	B = 0.50 m	0402-...-08		B = 0.50 m	0302-...-10		B = 0.50 m	0203-...-12		0403-...-12	
	B = 0.25 m	0201-...-08		–	–		–	–		–	
Design values $v_{Rd,Element}$ [kN/m] for slab thickness [mm]	160–190	*170.4*	170.4	170–190	*188.7*	188.7	180–210	*212.7*	214.5	*335.5*	335.5
	200–230	*187.6*	187.6	200–240	*208.9*	208.9	220–350	*224.9*	225.8	*374.2*	374.2
	240–350	*204.3*	204.7	250–350	*231.8*	231.8					

with CSB (Short unit) ø8 / ø12 ①	B = 0.33 m	0302-...-08		B = 0.33 m	0202-...-10		B = 0.33 m	0202-...-12	
Design values $v_{Rd,Element}$ [kN/m] for slab thickness [mm]	160–190	*212.9*	214.7	170–190	*220.5*	220.5	180–210	*275.9*	275.9
	200–230	*225.2*	225.2	200–240	*233.7*	233.7	220–350	*304.9*	304.9
	240–350	*234.9*	234.9	250–350	*244.0*	244.0			

① Bar diameter in [mm]

ZVX: Maximal load capacity in one direction
ZDX: Maximal load capacity in both directions

Concrete strength: *C20/25* ≥C25/30

no CSB ø8 / ø10 ①	B = 1.00 m	1200-...-08		B = 1.00 m	0600-...-10		1200-...-10	
	B = 0.50 m	0600-...-08		B = 0.50 m	0300-...-10		0600-...-10	
	B = 0.25 m	0300-...-08		B = 0.25 m	–		0300-...-10	
Design values $v_{Rd,Element}$ [kN/m] for slab thickness [mm]	160–190	*159.7*	159.7	170–190	*124.7*	124.7	*231.6*	249.5
	200–230	*185.4*	185.4	200–240	*144.9*	144.9	*269.1*	289.8
	240–350	*214.8*	214.8	250–350	*167.8*	167.8	*311.7*	335.7

no CSB ø12 ①	B = 1.00 m	0600-...-12		0700-...-12		0800-...-12		1200-...-12	
	B = 0.50 m	0300-...-12		–		0400-...-12		0600-...-12	
Design values $v_{Rd,Element}$ [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

no CSB (Short unit) ø8 / ø10 / ø12 ①	B = 0.33 m	0300-...-08		0500-...-08		B = 0.33 m	0500-...-10		B = 0.33 m	0400-...-12	
Design values $v_{Rd,Element}$ [kN/m] for slab thickness [mm]	160–190	*119.7*	119.7	*185.3*	199.6	170–190	*289.5*	311.8	180–210	*333.6*	359.2
	200–230	*139.1*	139.1	*215.2*	231.8	200–240	*336.3*	362.2	220–350	*387.4*	417.2
	240–350	*161.1*	161.1	*249.4*	268.5	250–350	*389.6*	419.6			

① Bar diameter in [mm]

Verifications for main slab load capacity (under consideration of concrete compression strut verification) are included in the load bearing capacity tables on pages 60 to 68. With some elements the maximum load bearing capacities of the steel load capacity of the elements can be utilized if a higher concrete strength is selected or other geometrical boundary conditions are present. The element load capacity $v_{Rd,Element}$ can be found on this page.

The concrete compression strut must be verified by the planner separately.

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

ZVX: Maximal load capacity v_{Rd}
ZDX: Maximal load capacity $\pm v_{Rd}$

Concrete strength: *C20/25* ≥C25/30

with CSB ø8 /ø10 ①	B = 1.00 m	0604-...-10		0804-...-10		B = 1.00 m	0606-...-12		0806-...-12	
	B = 0.50 m	–		0402-...-10		B = 0.50 m	0303-...-12		0403-...-12	
	B = 0.25 m	–		0201-...-10		B = 0.25 m	–		–	
Design values $v_{Rd,Element}$ [kN/m] for slab thickness [mm]	170–190	*162.6*	166.4	*199.6*	200.6	180–210	*236.4*	242.8	*291.4*	292.7
	200–240	*183.0*	186.6	*229.5*	230.3	220–350	*265.3*	270.3	*333.8*	335.5
	250–350	*200.1*	202.6	*255.3*	257.2					

with CSB ø8 /ø12① Short unit	B = 0.33 m	0302-...-08		B = 0.33 m	0202-...-10		0302-...-10		B = 0.33 m	0302-...-12	
Design values $v_{Rd,Element}$ [kN/m] for slab thickness [mm]	160–190	*169.7*	172.1	170–190	*175.7*	178.4	*244.2*	249.9	180–210	*300.0*	317.6
	200–230	*187.1*	188.8	200–240	*194.0*	195.9	*274.7*	280.1	220–350	*345.0*	365.8
	240–350	*201.2*	202.2	250–350	*208.9*	210.1	*300.5*	304.3			

① Bar diameter in [mm]

ZVX: Maximal load capacity v_{Rd}
ZDX: Maximal load capacity $\pm v_{Rd}$

No CSB ø8①	B = 1.00 m	0900-...-08	
Design values $v_{Rd,Element}$ [kN/m] for slab thickness [mm]	160–190	*98.3*	98.3
	200–240	*119.7*	119.7
	240–350	*139.1*	139.1

No CSB ø10①	B = 1.00 m	0600-...-10		0700-...-10		0800-...-10		1000-...-10	
	B = 0.50 m	0300-...-10		–		0400-...-10		0500-...-10	
	B = 0.25 m	–		–		0200-...-10		–	
Design values $v_{Rd,Element}$ [kN/m] for slab thickness [mm]	170–190	*102.4*	102.4	*119.5*	119.5	*136.6*	136.6	*170.7*	170.7
	200–240	*124.7*	124.7	*145.5*	145.5	*166.3*	166.3	*207.9*	207.9
	250–350	*144.9*	144.9	*169.0*	169.0	*193.2*	193.2	*241.5*	241.5

① Bar diameter in [mm]

No CSB ø8 /ø10 /ø12① Short unit	B = 0.33 m	0300-...-08		0400-...-08		B = 0.33 m	0300-...-10		0500-...-10		B = 0.33 m	0400-...-12	
Design values $v_{Rd,Element}$ [kN/m] for slab thickness [mm]	160–190	*98.3*	98.3	*131.1*	131.1	170–190	*153.7*	153.7	*237.8*	256.1	180–210	*274.0*	295.0
	200–230	*119.7*	119.7	*159.7*	159.7	200–240	*187.1*	187.1	*289.5*	311.8	220–350	*333.6*	359.2
	240–350	*139.1*	139.1	*185.4*	185.4	250–350	*217.3*	217.3	*336.3*	362.2			

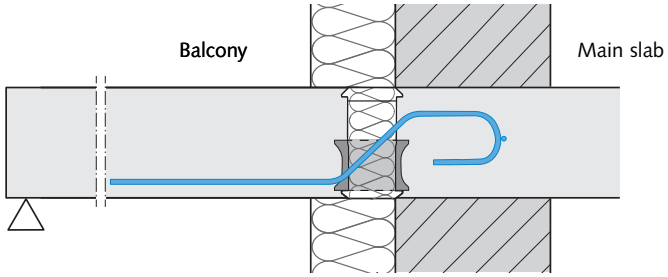
① Bar diameter in [mm]

Verifications for main slab load capacity (under consideration of concrete compression strut verification) are included in the load bearing capacity tables on pages 60–68. With some elements the maximum load bearing capacities of the steel load capacity of the elements can be utilized if a higher concrete strength is selected or other geometrical boundary conditions are present. The element load capacity $v_{Rd,Element}$ can be found on this page.

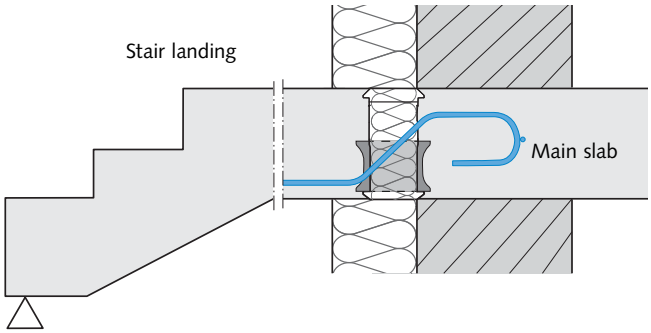
The concrete compression strut must be verified by the planner separately.

Application examples in wall cross sections

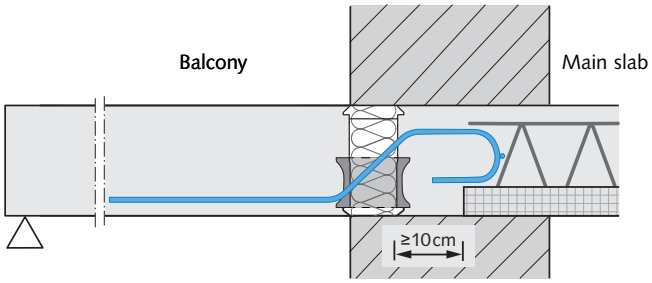
Installation diagram: Masonry cladded with ETICS (external thermal insulation composite system)



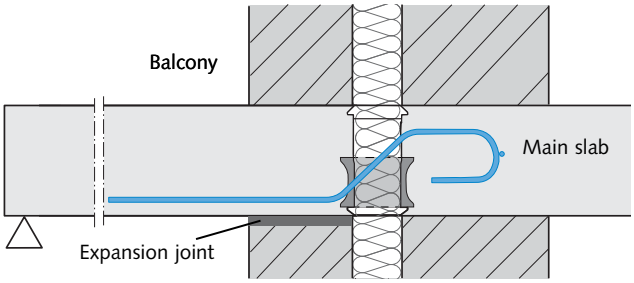
Installation diagram: Stair landing entrance to a building



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



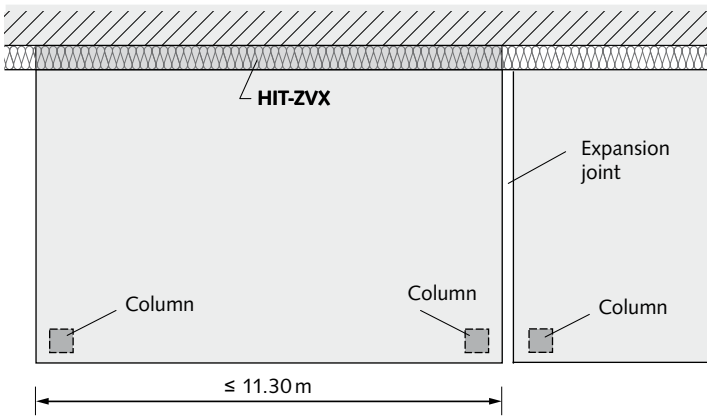
Installation diagram: Double-leaf masonry with balcony at main slab level



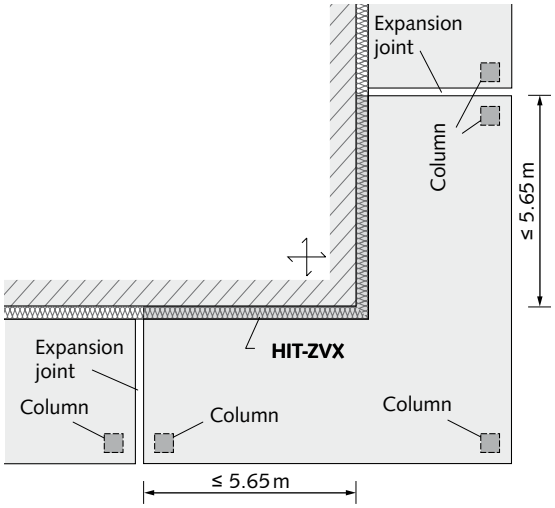
The dimension of the shear load bars has been optimized. During installation in main element slab the bars remain above the main element slab with all HIT heights.

Application examples / Expansion joint placement

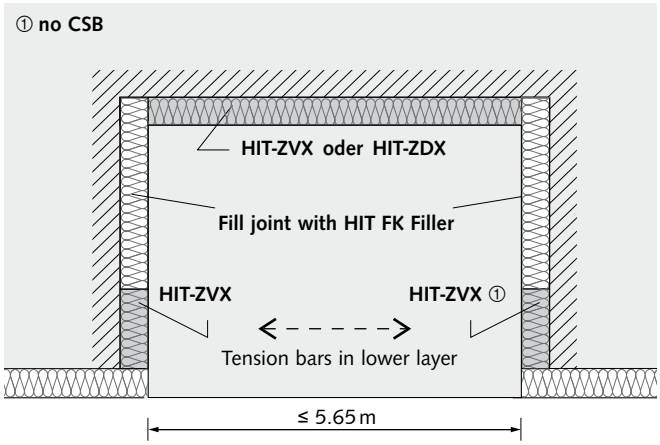
Application 1: Expansion joint placement in linear balcony connections



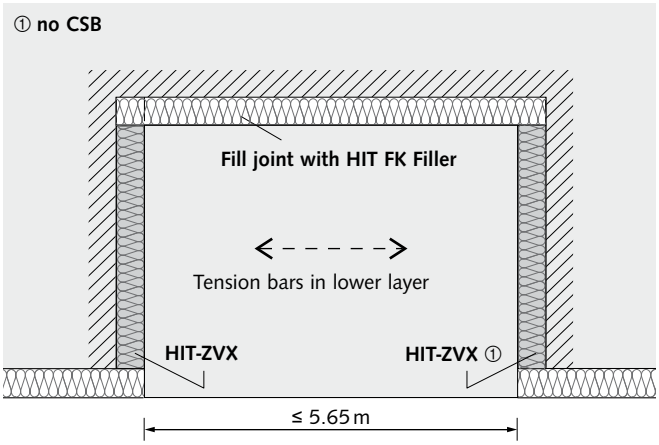
Application 2: Expansion joints in a corner balcony



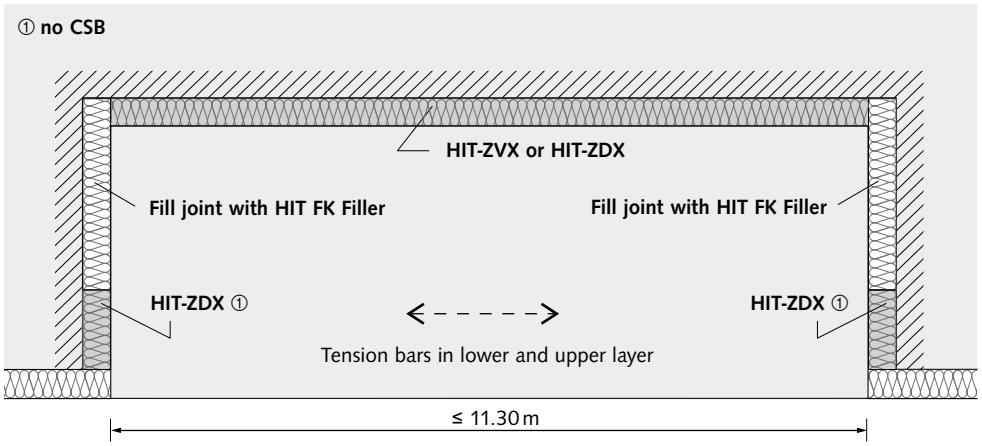
Application 3: Expansion joint location for three-side supported loggia (with CSB on the left or right)



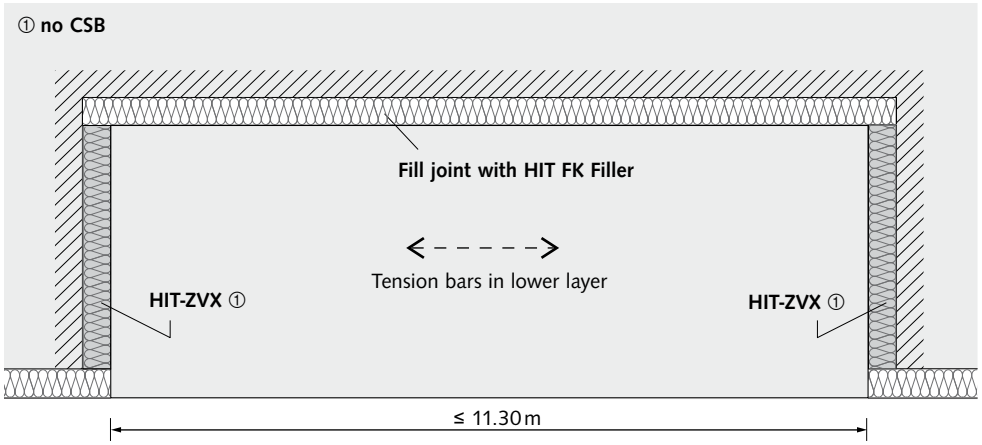
Application 4: Expansion joint location for two-side supported loggia (with CSB on the left or right)



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

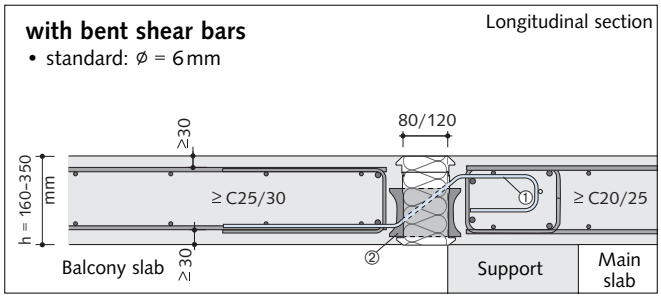


Application 6: Expansion joint for two-side supported loggia (left and right sides without CSB)

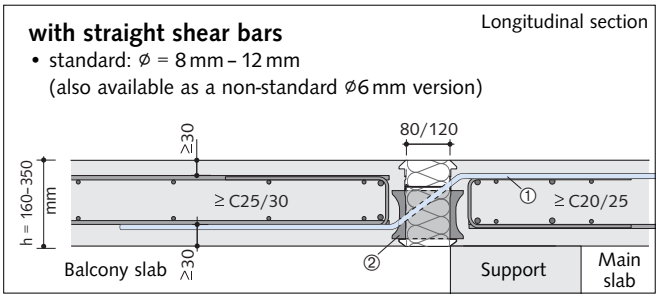


On-site reinforcement

with bent shear bars
• standard: ø = 6 mm



with straight shear bars
• standard: ø = 8 mm – 12 mm
(also available as a non-standard ø6 mm version)



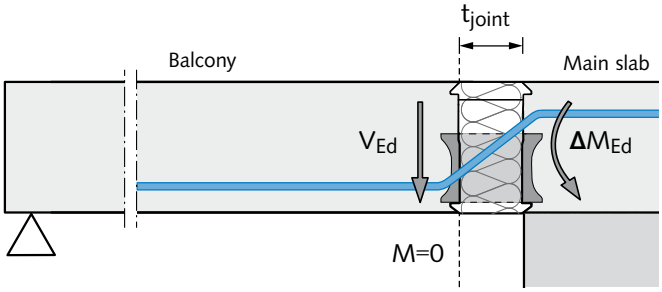
Dimensions in [mm]

① HIT-Shear load bar (bei ø6 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 → $A_{s,req}$, see pages 60–68
⑥ Transverse tensile reinforcement ø8
⑦ Edge reinforcement (min. ø6/20)

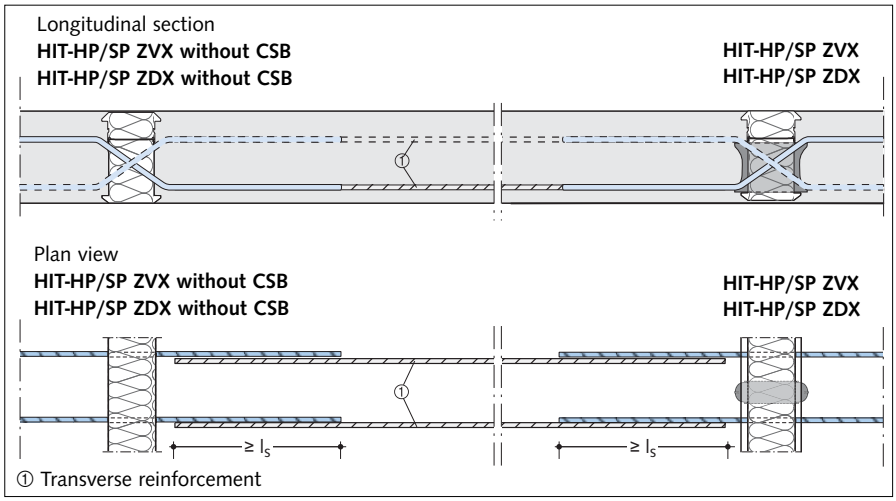
Moments from eccentric loads

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

$$\Delta M_{Ed} = V_{Ed} \cdot t_{joint}$$
with: t_{joint} = 0.08 m (HIT-HP ZVX/ZDX)
t_{joint} = 0.12 m (HIT-SP ZVX/ZDX)



On-site transverse reinforcement



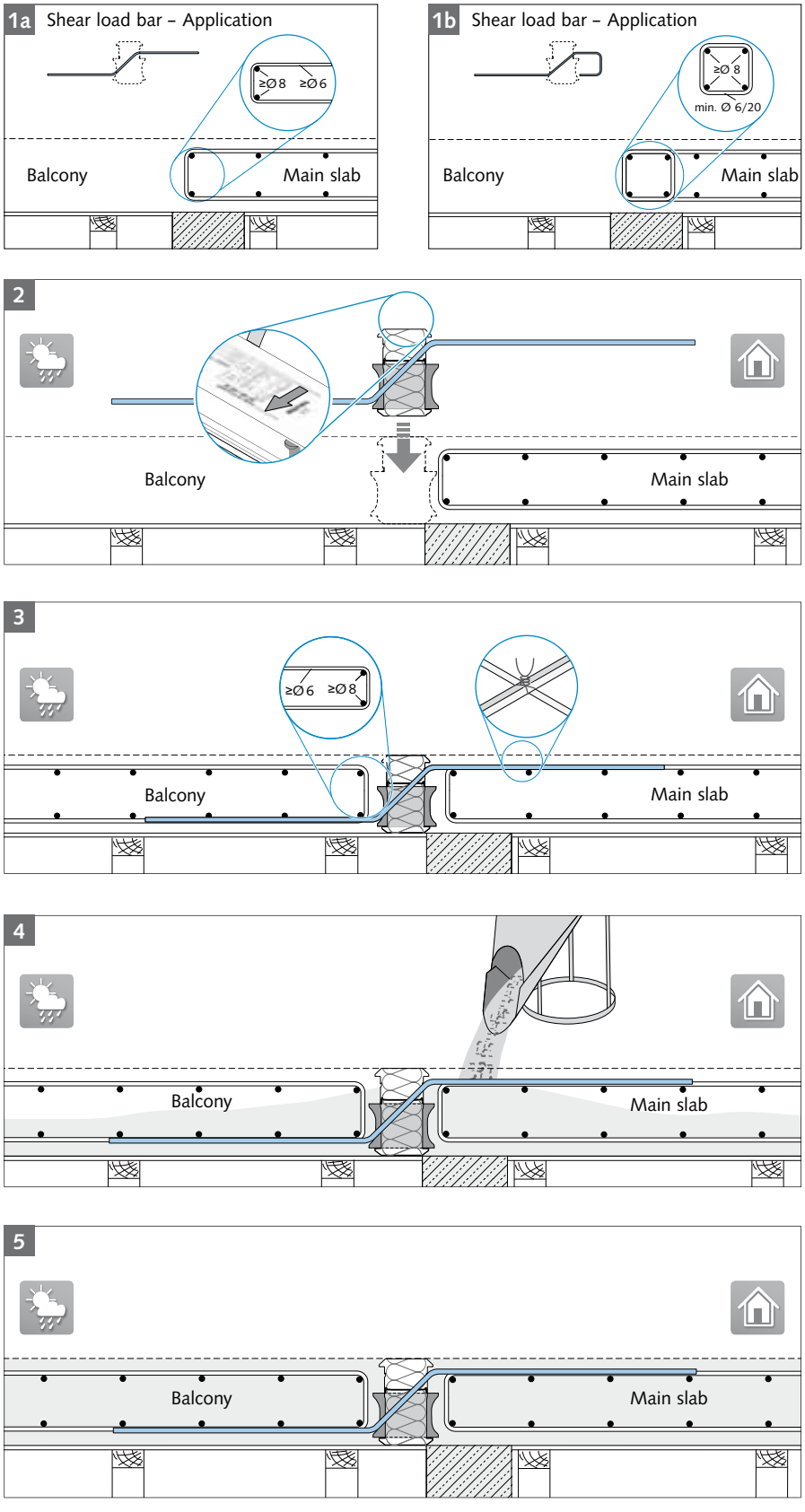
① Transverse reinforcement

Transverse reinforcement

When placing the transverse reinforcement in the balcony slab, each shear bar in the HIT Element (HP/SP ZVX or ZDX) must over-lap 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 over-lap with the shear bars.

Installation diagram

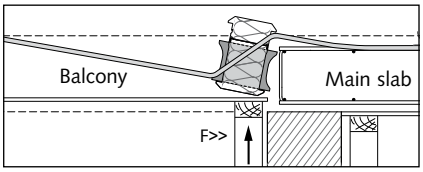


1 Installation of on-site reinforcement for the main slab

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

2 Installation of HIT Elements from above

HIT-ZDX Elements with bar diameters of ø8, 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

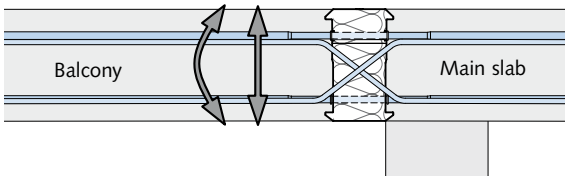
ⓘ Further installation diagrams for the types HIT-HP/SP ZVX and HIT-HP/SP ZDX can be found in the installation instructions – available for download at our website www.halfen.com.

4

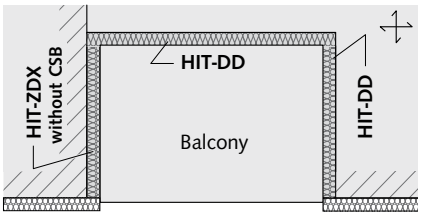
- For balcony slabs incorporated in the main slab
- Transfers positive and negative moments and shear forces

REI 120

type-tested



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



Application: Continuous slab

Load range

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

The following combinations of shear load bar SB (shear bars) and tension load 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 load bars n_{SB}	1	●	●

Element width B = 50 cm		Number of tension /compression bars n_{TB}				
		2	3	4	5	6
Number of shear load 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 load bars n_{SB}	4	●		●		●			
	6	●	●	●	●	●	●	●	
	7		●		●		●	●	●

Load bearing capacity values for selected element can be found on pages 77–80 ● = HP and SP

The complete type-tested load class range for concrete grades C20/25 and ≥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
❶ ❷	❸		❹ ❺		❻		❼		❽		❾

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 load bars on each side
⑥ Element height [cm]
⑦ Element width [cm]
⑧ Upper concrete cover [mm]
⑨ Diameter shear load 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

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

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

Number of tension/compression bars xx				05		07		10		12		14	
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: C20/25
Concrete cover: 35 mm

Bending moment: $m_{Rd} \geq 50.7$ kNm/m
Shear load*: $v_{Rd} \geq 55.3$ kN/m

Calculated number of tension/compression bars (xx): 10
Calculated number of shear load bars (yy)*: 07

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

*Determine the shear load bars for HIT-HP DD → see tables on page 78

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

Moment bearing capacity ± m_{Rd}

80

Number of tension/compression bars xx				05		07		10		12		14	
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; information can be found at the back of the catalogue.									

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

Shear load capacity ±v_{Rd} — **Concrete strength:** *C20/25* ≥C25/30 — 80

Number of shear bars yy				06		07		06		07	
Rebar diameter dd				⌀6 mm				⌀8 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				06		07		06		07	
Rebar diameter dd				⌀10 mm				⌀12 mm			
Concrete cover [mm]	30	35	50								
Design values v_{Rd} [kN/m] for slab thickness [mm]	160	160	180	–	–	–	–	–	–	–	–
		170		97.8①	122.2①	97.8①	122.2①	–	–	–	–
	170		190	104.8①	124.8	104.8①	131.0①	–	–	–	–
		180		111.9①	124.8	111.9①	139.9①	111.9①	139.9①	111.9①	139.9①
	180		200	119.0①	124.8	119.0①	145.6	119.0①	148.8①	119.0①	148.8①
		190		124.8	124.8	126.1①	145.6	126.1①	157.6①	126.1①	157.6①
	190		210	124.8	124.8	133.2①	145.6	133.2①	166.5①	133.2①	166.5①
		200		124.8	124.8	140.3①	145.6	140.3①	175.3①	140.3①	175.3①
	200		220	124.8	124.8	145.6	145.6	147.3①	179.7	147.3①	184.2①
		210		144.9	144.9	154.4①	169.1	154.4①	179.7	154.4①	193.0①
	210		230	144.9	144.9	161.5①	169.1	161.5①	179.7	161.5①	201.9①
		220		144.9	144.9	168.6①	169.1	168.6①	208.7	168.6①	210.7①
	220		240	144.9	144.9	169.1	169.1	175.7①	208.7	175.7①	219.6①
		230		144.9	144.9	169.1	169.1	182.8①	208.7	182.8①	228.4①
	230		250	144.9	144.9	169.1	169.1	189.8①	208.7	189.8①	237.3①
		240		144.9	144.9	169.1	169.1	196.9①	208.7	196.9①	243.5
	240		260	144.9	144.9	169.1	169.1	204.0①	208.7	204.0①	243.5
		250		167.9	167.9	195.9	195.9	208.7	208.7	211.1①	243.5
	250		270	167.9	167.9	195.9	195.9	208.7	208.7	218.2①	243.5
	260–350	260–350	280–350	167.9	167.9	195.9	195.9	208.7	208.7	225.3①	243.5

① To utilize the element load capacity of the HIT Elements → see table on page 81

All required verifications have already been considered. The adjacent connecting elements 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.

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

Number of tension/compression bars xx				05		07		10		12		14	
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} ≥ 50.7 kNm/m
Shear load*: v_{Rd} ≥ 45.6 kNm/m

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

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

*Determine the shear load bars for HIT-SP DD → see tables on page 80

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

Moment bearing capacity ±m_{Rd}

120

Number of tension/compression bars xx				05		07		10		12		14	
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 our technical support team; contact information can be found at the back of the catalogue.									

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

Shear load capacity in both directions — **Concrete strength:** C20/25 ≥C25/30 — **120**

Number of shear bars yy				06		07		06		07	
Rebar diameter dd				⌀6 mm				⌀8 mm			
Concrete cover [mm]	30	35	50								
Design values v_{Rd} [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				06		07		06		07	
Rebar diameter dd				⌀10 mm				⌀12 mm			
Concrete cover [mm]	30	35	50								
Design values v_{Rd} [kN/m] for slab thickness [mm]		160		–	–	–	–	–	–	–	–
	160		180	–	–	–	–	–	–	–	–
		170		97.8①	102.5	97.8①	119.6	–	–	–	–
	170		190	102.5	102.5	104.8①	119.6	–	–	–	–
		180		102.5	102.5	111.9①	119.6	111.9①	139.9①	111.9①	139.9①
	180		200	102.5	102.5	119.0①	119.6	119.0①	147.6	119.0①	148.8①
		190		102.5	102.5	119.6	119.6	126.1①	147.6	126.1①	157.6①
	190		210	102.5	102.5	119.6	119.6	133.2①	147.6	133.2①	166.5①
		200		102.5	102.5	119.6	119.6	140.3①	147.6	140.3①	172.2
	200		220	102.5	102.5	119.6	119.6	147.3①	147.6	147.3①	172.2
		210		102.5	102.5	119.6	119.6	147.6	147.6	154.4①	172.2
	210		230	102.5	102.5	119.6	119.6	147.6	147.6	161.5①	172.2
		220		124.8	124.8	145.6	145.6	168.6①	179.7	168.6①	209.6
	220		240	124.8	124.8	145.6	145.6	175.7①	179.7	175.7①	209.6
		230		124.8	124.8	145.6	145.6	179.7	179.7	182.8①	209.6
	230		250	124.8	124.8	145.6	145.6	179.7	179.7	189.8①	209.6
		240		124.8	124.8	145.6	145.6	179.7	179.7	196.9①	209.6
	240		260	124.8	124.8	145.6	145.6	179.7	179.7	204.0①	209.6
	250–350	250–350	270–350	144.9	144.9	169.1	169.1	179.7	179.7	209.6	209.6

① To utilize the element load capacity of the HIT Elements → see table on page 81

All required verifications have already been considered. The adjacent connecting elements 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.

Shear load capacity as maximal load capacity based on steel load capacity

Maximal load capacity ±v_{Rd}

80

Number of shear bars yy				06	07	06	07
Rebar diameter dd				ø10 mm		ø12 mm	
Concrete cover [mm]	30	35	50				
Design values $v_{Rd,Element}$ [kN/m] for slab thickness [mm]	160	160	180	–	–	–	–
	170	170	190	124.8	145.6	–	–
	180	180	200	124.8	145.6	179.7	209.6
	190	190	210	124.8	145.6	179.7	209.6
	200	200	220	124.8	145.6	179.7	209.6
	210	210	230	144.9	169.1	179.7	209.6
	220	220	240	144.9	169.1	208.7	243.5
	230	230	250	144.9	169.1	208.7	243.5
	240	240	260	144.9	169.1	208.7	243.5
	250–350	250–350	270–350	167.9	195.9	208.7	243.5

Maximal load capacity ±v_{Rd}

120

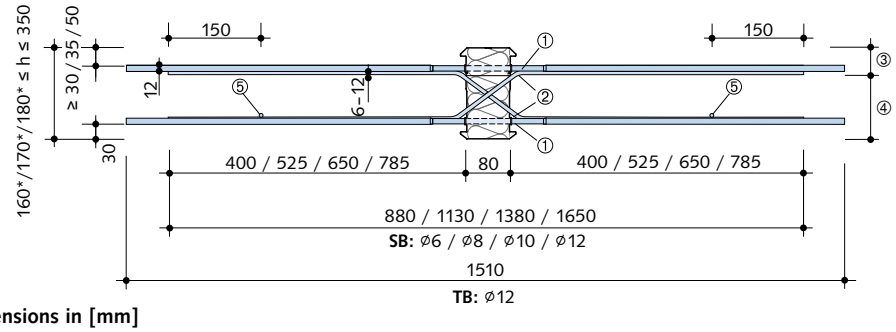
Number of shear bars yy				06	07	06	07
Rebar diameter dd				ø10 mm		ø12 mm	
Concrete cover [mm]	30	35	50				
Design values $v_{Rd,Element}$ [kN/m] for slab thickness [mm]	160	160	180	–	–	–	–
	170	170	190	102.5	119.6	–	–
	180	180	200	102.5	119.6	147.6	172.2
	190	190	210	102.5	119.6	147.6	172.2
	200	200	220	102.5	119.6	147.6	172.2
	210	210	230	102.5	119.6	147.6	172.2
	220	220	240	124.8	145.6	179.7	209.6
	230	230	250	124.8	145.6	179.7	209.6
	240	240	260	124.8	145.6	179.7	209.6
	250–350	250–350	270–350	144.9	169.1	179.7	209.6

Verifications for main slab load capacity (under consideration of concrete compression strut verification) are included in the load bearing capacity tables on pages 77–80. With some elements the maximum load bearing capacities of the steel load capacity of the elements can be utilized if a higher concrete strength is selected or other geometrical boundary conditions are present.

The concrete compression strut must be verified by the planner separately.

Product description – Cross sections (typical applications)

HIT-HP DD – High Performance

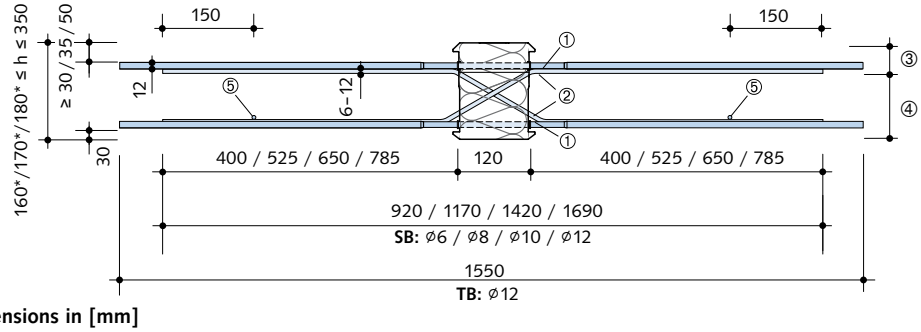


Dimensions in [mm]

① Tension-/compression bars (ø 12 mm)
② Shear bars (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 76)

HIT-SP DD – Superior Performance



Dimensions in [mm]

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

Stirrup spacing s / bar diameter [mm]	ø6	ø8	ø10
s ≤ 25 cm	49.9 kN/m	87.5 kN/m	137.0 kN/m
s ≤ 20 cm	61.5 kN/m	109.0 kN/m	171.0 kN/m
s ≤ 15 cm	82.0 kN/m	146.0 kN/m	228.0 kN/m
s ≤ 10 cm	123.0 kN/m	219.0 kN/m	342.0 kN/m

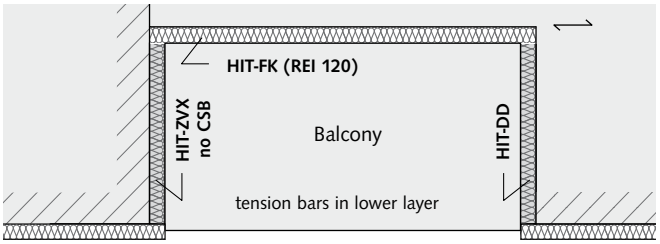
Vertical hanger reinforcement*:

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

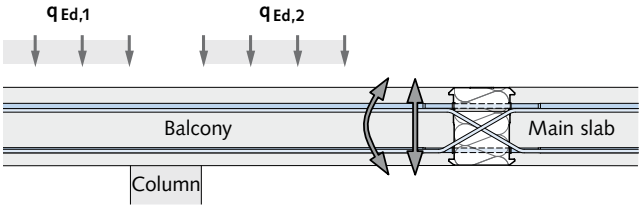
*in addition: horizontal transverse tensile reinforcement including end anchorage of at least 2 ø 8 mm

Application examples

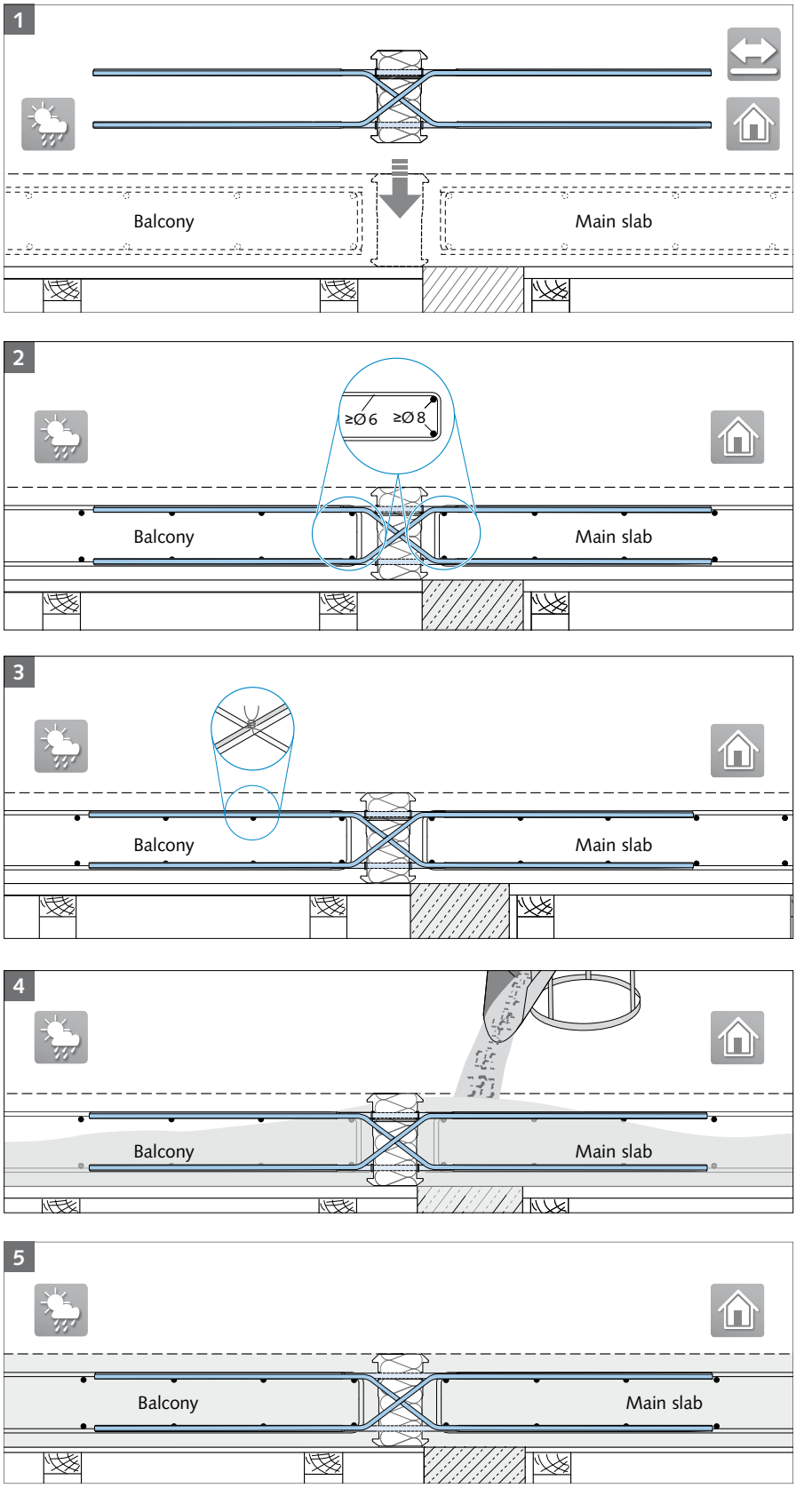
- **Single axis tensioned main slab**
  For balcony slabs incorporated within a main slab, (continuous main slab) e. g. a loggia. The insulated connection transfers positive moments, negative moments and shear forces.



- **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.



Installation diagram



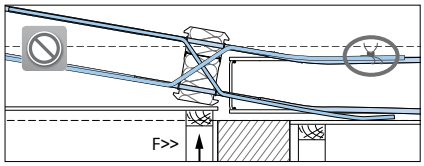
1 Positioning the HIT Element from above

The HIT-DD Element is 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 Pour the concrete

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

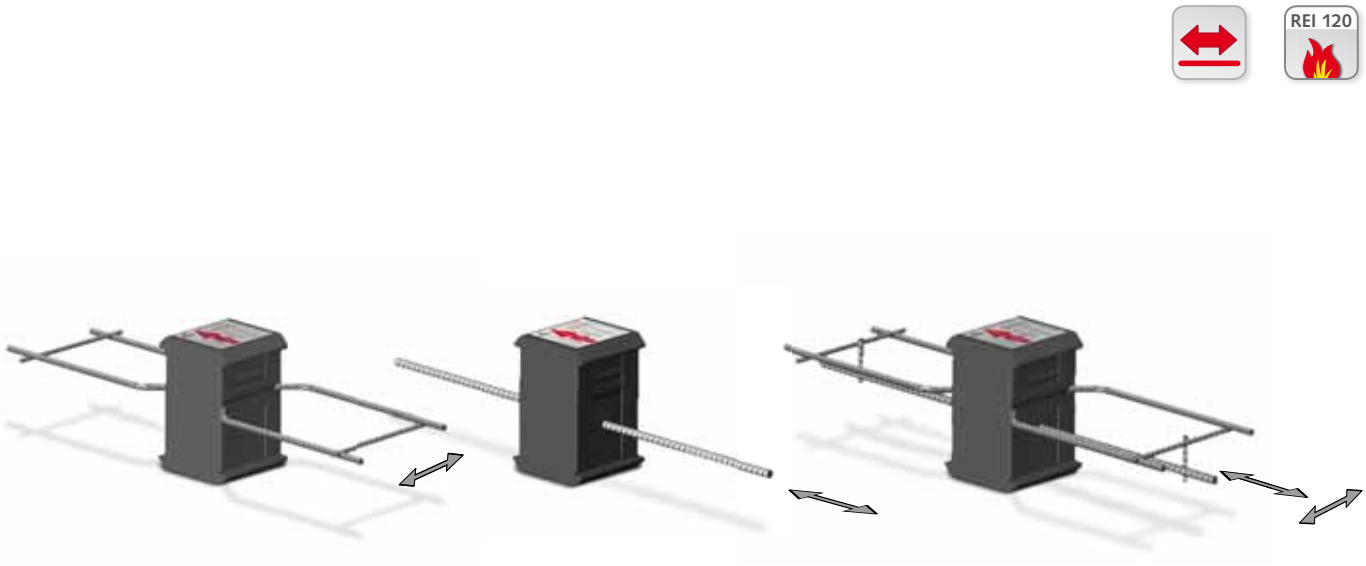
5 Freshly concreted balcony slab on supporting structure

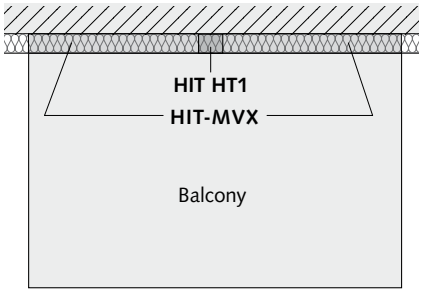
For further installation instructions please visit **www.halfen.com**.

HIT-HP HT, HIT-SP HT

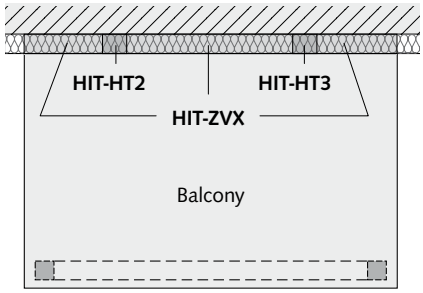
5

- Symmetrical additional elements with 80 mm and 120 mm insulation thickness
- Transfer of planned horizontal forces parallel and/or perpendicular to the insulation plane

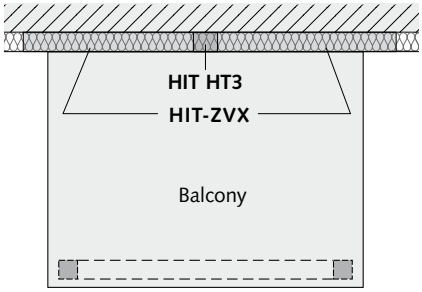




Application: Cantilevered balcony



Application: Simply supported balcony on columns

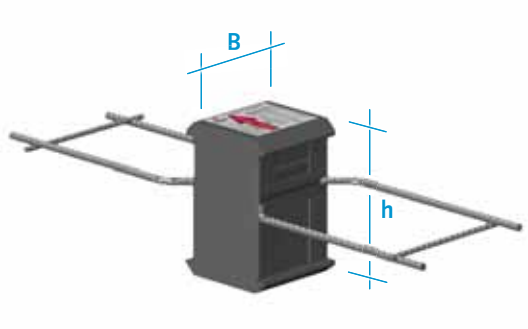


Application: Simply supported balcony on columns

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

Ordering example

HIT-HP	HT1	-	hh	-	010
HIT-SP	HT1	-	hh	-	015
❶ ❷	❸		❹		❺



Type designation

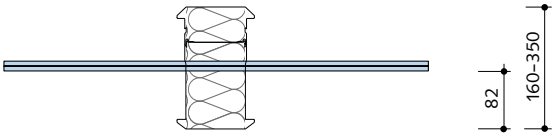
① Product group
② Joint spacing 80 mm (HP) or 120 mm (SP)
③ Connection type
④ Element height [cm]
⑤ Element width [cm]

Load bearing capacities and dimensions

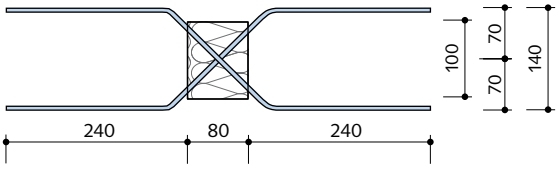
Horizontal forces parallel to the insulation plane

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} ∥ [kN/ element]*	*H_{Rd} ⊥ [kN/ element]*	H_{Rd} ∥ [kN/ element]	H_{Rd} ⊥ [kN/ element]
2 × ø8	–	100 150	*±9.9*	*0*	±11.5	0

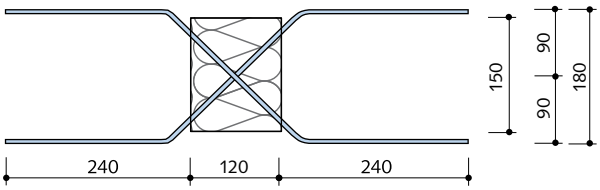
Vertical section HP/SP HT1



Top view HIT-HP HT1



Top view HIT-SP HT1

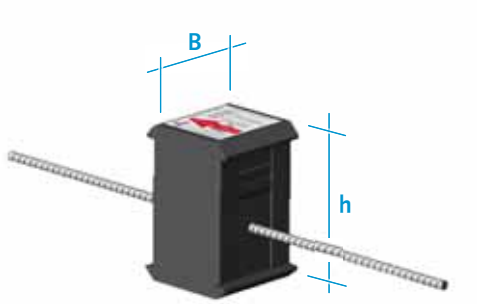


Dimensions in [mm]

HIT Type	HP	SP
Insulation thickness [mm]	80	120
Element width B [cm]	10	15
Possible HIT Element height h [cm]	16 – 35	

Ordering example

HIT-HP	HT2	-	hh	-	010
HIT-SP	HT2	-	hh	-	015
❶ ❷	❸		❹		❺



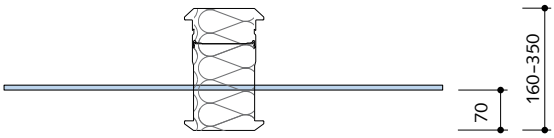
Type designation
① Product group
② Joint spacing 80 mm (HP) or 120 mm (SP)
③ Connection type
④ Element height [cm]
⑤ Element width [cm]

Load bearing capacities and dimensions

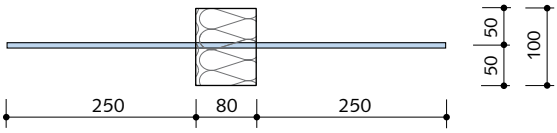
Horizontal forces perpendicular to the insulation plane

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} ∥ [kN/ element]*	*H_{Rd} ⊥ [kN/ element]*	H_{Rd} ∥ [kN/ element]	H_{Rd} ⊥ [kN/ element]
–	1 × ø10	100 150	*0*	*±18.2*	0	±21.2

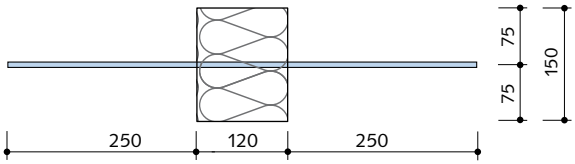
Vertical section HP/SP HT2



Top view HIT-HP HT2



Top view HIT-SP HT2

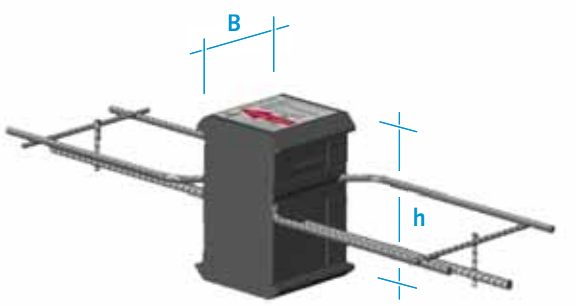


Dimensions in [mm]

HIT Type	HP	SP
Insulation thickness [mm]	80	120
Element width B [cm]	10	15
Possible slab thickness h [cm]	16 – 35	

Ordering example

HIT-HP	HT3	- hh -	010
HIT-SP	HT3	- hh -	015
❶ ❷	❸	❹	❺



Type designation

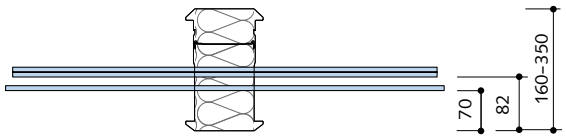
① Product group
② Joint spacing 80 mm (HP) or 120 mm (SP)
③ Connection type
④ Element height [cm]
⑤ Element width [cm]

Load bearing capacities and dimensions

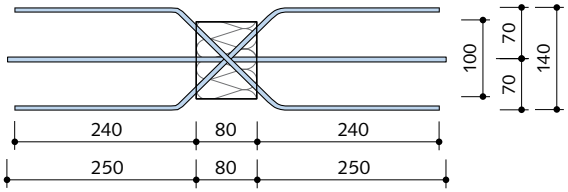
Horizontal forces parallel und perpendicular to the insulation plane

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} ∥ [kN/ element]*	*H_{Rd} ⊥ [kN/ element]*	H_{Rd} ∥ [kN/ element]	H_{Rd} ⊥ [kN/ element]
2 × ø8	1 × ø10	100 150	*±9.9*	*±18.2*	±11.5	±21.2

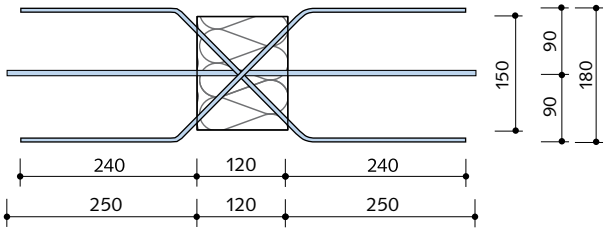
Vertical section HP/SP HT3



Top view HIT-HP HT3



Top view HIT-SP HT3



Dimensions in [mm]

Further values for load bearing capacity can be found on page 89 in the **HIT-EQ** section.

HIT Type	HP	SP
Insulation thickness [mm]	80	120
Element width B [cm]	10	15
Possible slab thickness h [cm]	16 – 35	

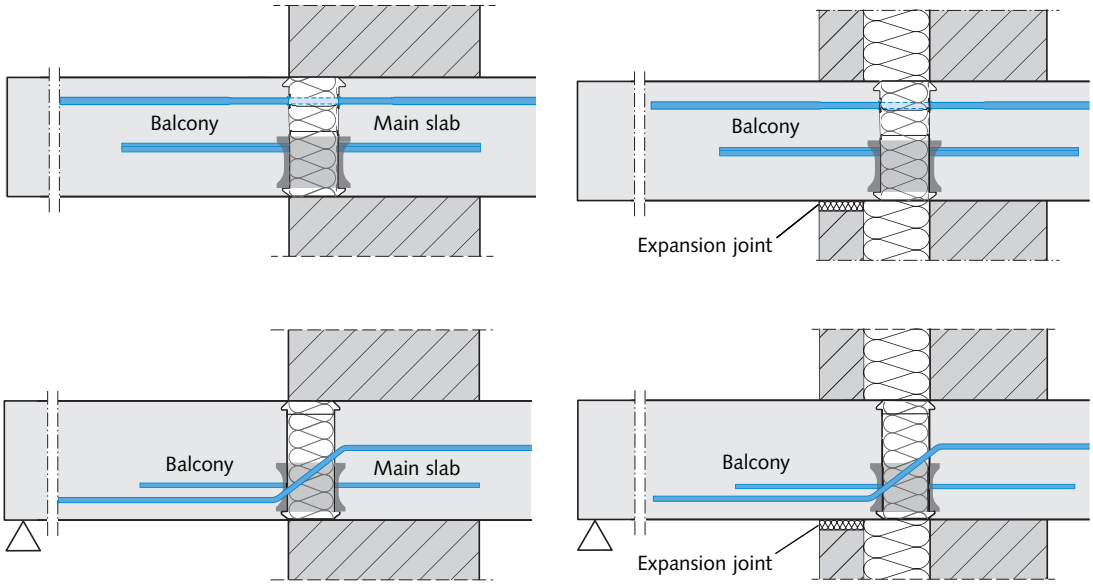
Position of the HIT-HT units in the cross-section of a wall in combination with HIT Insulated connections

HALFEN HIT-HT Elements complement the HIT Product range and are used in combination with HIT Insulated connections.

HIT-HP/SP HT1
in combination with
HIT-HP/SP MVX

HIT-HP/SP HT2
in combination with
HIT-HP/SP ZVX
or
HIT-HP/SP ZDX

Single-leaf masonry with balcony at main slab level	Double-leaf masonry with balcony at main slab level



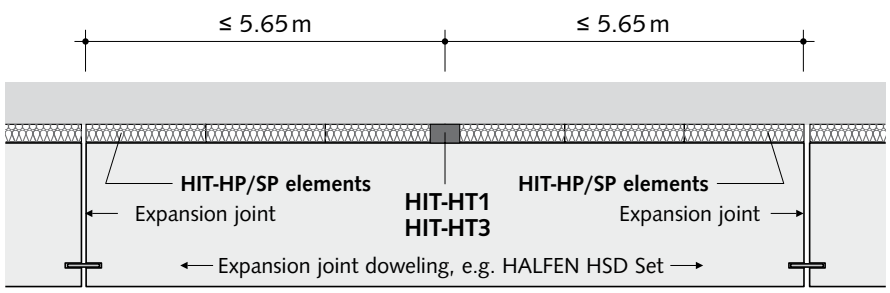
Refer to the installation instructions for installation methods, download at **www.halfen.com**.

Joint spacings

Expansion joints must be planned in external concrete components (balcony slabs) at a right angle to the insulation line of the HIT Elements to account for temperature fluctuation.

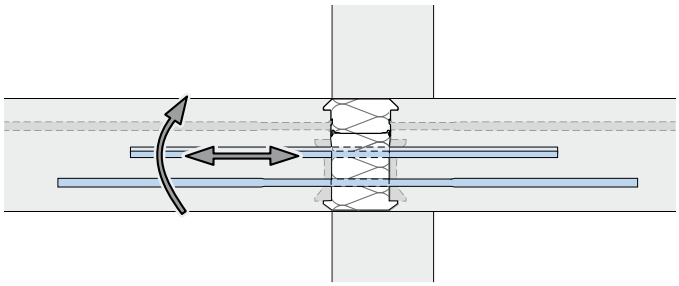
The joint spacing in straight, cantilevered balcony slabs must not exceed the maximum allowable expansion joint spacing of 11.3 m.

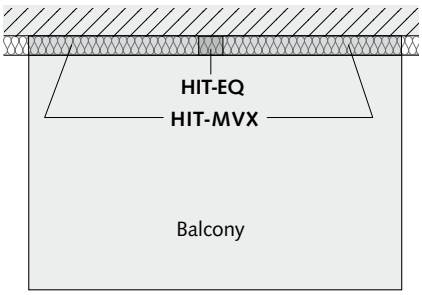
In balcony construction using HIT-HP/SP HT1 and HT3 elements the maximum spacing of HIT-HT elements must be limited to 11.3/2 m = 5.65 m.



HIT-HP EQ, HIT-SP EQ

- Symmetrical complementary elements with insulation thickness 80 mm or 120 mm for earthquake-zone application
- Transfer of planned horizontal forces parallel or perpendicular to the insulation plane
- Transfer of lifting moments



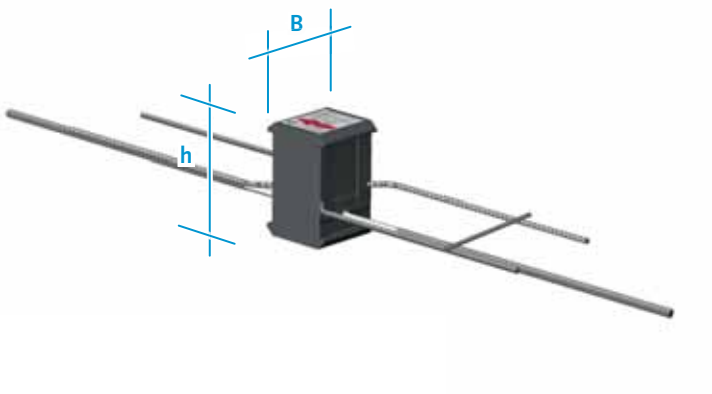


HIT-HP EQ – **High Performance** with 80 mm insulation thickness
HIT-SP EQ – **Superior Performance** with 120 mm insulation thickness

Application: Cantilevered balcony

Ordering example

HIT-HP	EQ1	-	hh	-	010
HIT-SP	EQ1	-	hh	-	015
			❶ ❷	❸	❹	❺



Type designation

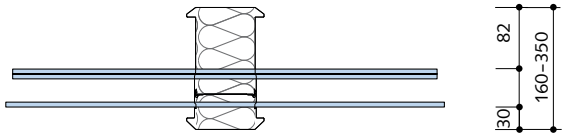
① Product group
② Joint spacing 80 mm (HP) or 120 mm (SP)
③ Connection type
④ Element height [cm]
⑤ Element width [cm]

Load bearing capacities and dimensions

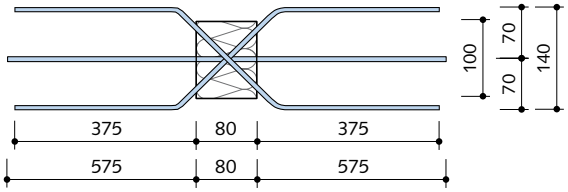
Horizontal forces parallel and perpendicular to the insulation plane

HIT-HP/SP EQ1 Components			Design values			
Reinforcement		Element width B	*C20/25*		C25/30	
Shear bars	Tension / compression bars	HIT-HP HIT-SP [mm]	*H_{Rd} ∥ [kN/ element]*	*H_{Rd} ⊥ [kN/ element]*	H_{Rd} ∥ [kN/ element]	H_{Rd} ⊥ [kN/ element]
2 × ø8	1 × ø12	100 150	*±15.5*	*±43.7*	±15.5	±49.2

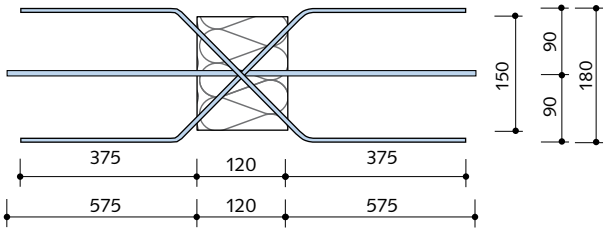
Vertical section HP/SP EQ1



Top view HIT-HP EQ1



Top view HIT-SP EQ1



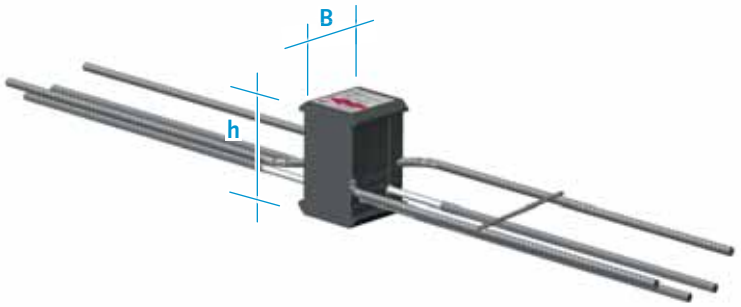
Dimensions in [mm]

M_{Rd} → page 93
Load bearing capacity values for lifting moments are on page 93 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	

Ordering example

HIT-HP	EQ2 -	hh -	010
HIT-SP	EQ2 -	hh -	015
❶ ❷	❸	❹	❺



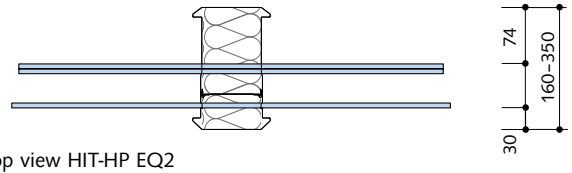
Type designation
① Product group
② Joint spacing 80 mm (HP) or 120 mm (SP)
③ Connection type
④ Element height [cm]
⑤ Element width [cm]

Load bearing capacities and dimensions

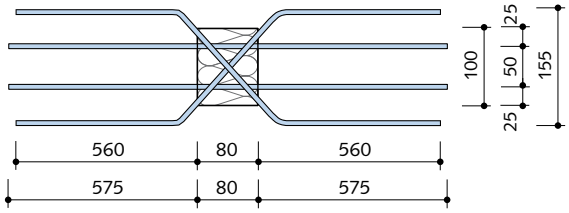
Horizontal forces parallel and perpendicular to the insulation plane

HIT-HP/SP MZ-EQ2 Components			Design values			
Reinforcement		Element width B	*C20/25*		C25/30	
Shear bars	Tension-/ compression bars	HIT-HP HIT-SP [mm]	*H_{Rd} ∥ [kN/ element]*	*H_{Rd} ⊥ [kN/ element]*	H_{Rd} ∥ [kN/ element]	H_{Rd} ⊥ [kN/ element]
2 × ø12	2 × ø12	100 150	*±34.6*	*±86.6*	±34.8	±98.4

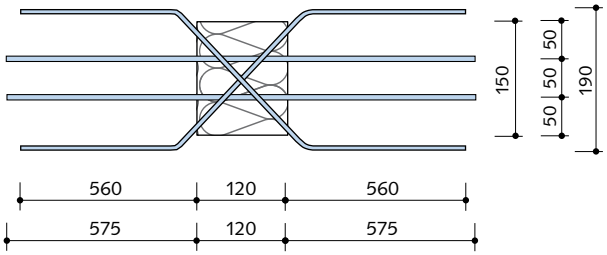
Vertical section HP/SP EQ2



Top view HIT-HP EQ2



Top view HIT-SP EQ2



Dimensions in [mm]

M_{Rd} → page 93
Load bearing capacity values for lifting moments are on page 93 of this catalogue.

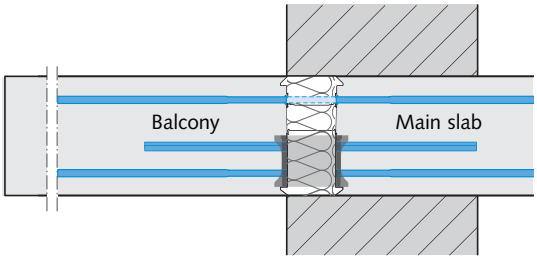
HIT Type	HP	SP
Insulation thickness [mm]	80	120
Element width B [cm]	10	15
Possible slab thickness h [cm]	16 – 35	

Position of the combined HIT-EQ elements in the cross-section of a wall

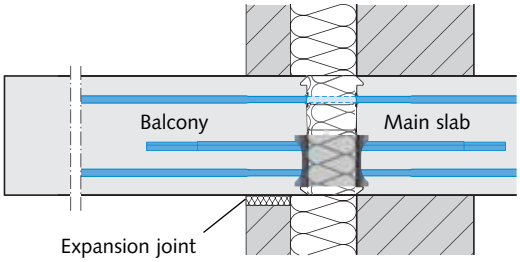
HALFEN HIT-EQ Elements complement the HIT Product range and are only to be used in combination with HIT Balcony connection elements of types HIT-MVX.

Monolithic masonry with balcony at main slab level

HIT-HP/SP EQ
in combination with
HIT-HP/SP MVX



Double-leaf masonry with balcony at main slab level

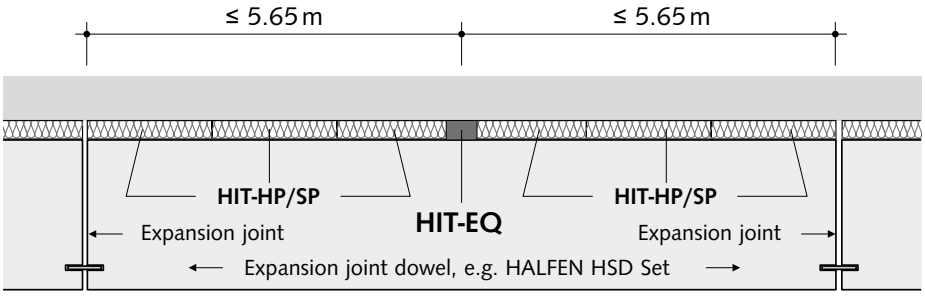


Joint spacings

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 11.3 m.

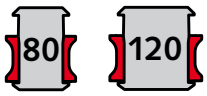
Balcony slabs designed with HIT-HP/ HIT-SP EQ1 and EQ2 elements must have a maximum edge to edge spacing of 11.3/2 = 5.65 m.



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

Lifting moment

Concrete strength: *C20/25* ≥C25/30



Type	HIT-HP EQ / HIT-SP EQ			EQ1		EQ2	
Concrete cover [mm]	30	35	50				
Design values **M_{Rd} [kNm/element]** for slab thickness [mm]		160		*3.8*	4.2	*7.5*	8.5
	160		180	*4.0*	4.5	*8.0*	9.0
		170		*4.2*	4.7	*8.4*	9.4
	170		190	*4.4*	5.0	*8.8*	9.9
		180		***4.6***	**5.2**	***9.3***	**10.4**
	180		200	*4.8*	5.5	*9.7*	10.9
		190		*5.1*	5.7	*10.1*	11.4
	190		210	*5.3*	6.0	*10.6*	11.9
		200		***5.5***	**6.2**	***11.0***	**12.4**
	200		220	*5.7*	6.4	*11.5*	12.9
		210		*5.9*	6.7	*11.9*	13.4
	210		230	*6.2*	6.9	*12.3*	13.9
		220		***6.4***	**7.2**	***12.8***	**14.4**
	220		240	*6.6*	7.4	*13.2*	14.9
		230		*6.8*	7.7	*13.6*	15.3
	230		250	*7.0*	7.9	*14.1*	15.8
		240		***7.2***	**8.2**	***14.5***	**16.3**
	240			*7.5*	8.4	*15.0*	16.8
		250		*7.7*	8.7	*15.4*	17.3
	250			*7.9*	8.9	*15.8*	17.8
	> 250			Available on request. See back of catalogue for contact information.			

Lifting moment +M_{Rd} only in combination with HIT-MVX elements

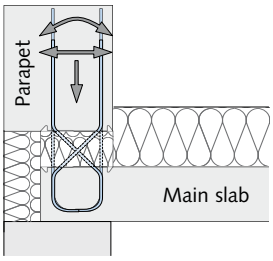
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-FT, HIT-OT, HIT-AT

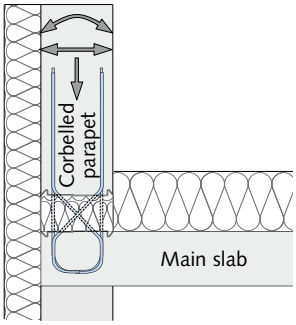
6

- 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

REI 120



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

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 ⌀8 mm	
		2	3
Number of shear bars ⌀6 in both directions	1	●	●
	2	●	●
Type		AT1	AT2
Applicable parapet heights H (without joint)		≥ 22 cm	≥ 30 cm

● = HP and SP

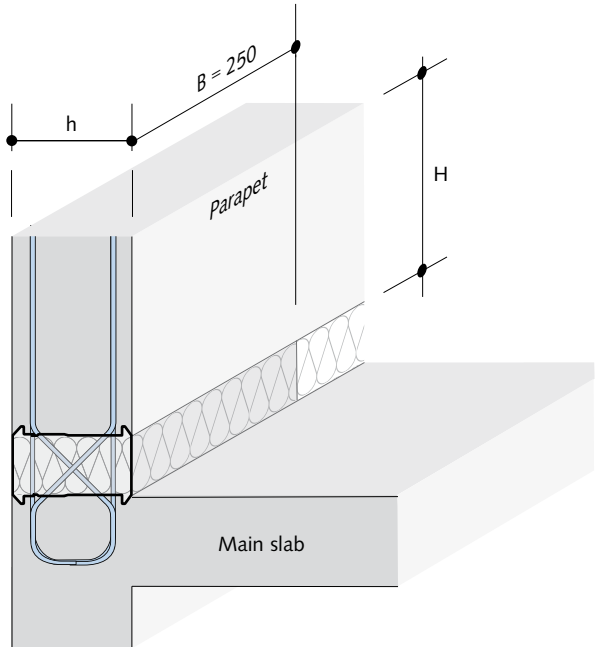
Ordering example

HIT-HP	AT 2	-	0302	- 16	-	025
HIT-SP	AT 1	-	0201	- 25	-	025
			❶ ❷ ❸ ❹ ❺ ❻ ❼			

Type designation

① Product group
② Joint spacing 80 mm (HP) or 120 mm (SP)
③ Connection type
④ Number of tension/compression loops per side
⑤ Number of shear bars
⑥ Element height h [cm]
⑦ Element width B [cm]

Possible parapet width



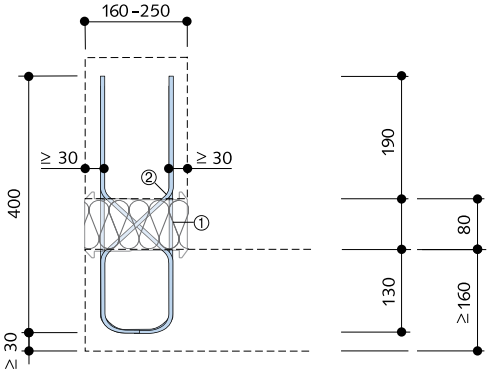
The illustration shows an application where the parapet width is identical to the height h of the HIT-AT Element.

Possible slab thickness h [cm]	16 – 35*
Slab height	≥160 mm

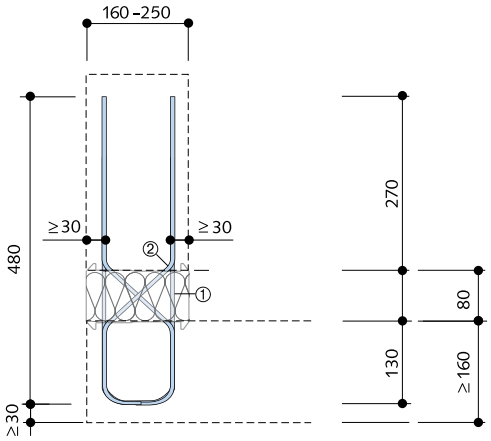
*Load bearing capacity values for slab heights >25 cm available on request

Product description – Cross sections and Top views

Cross section: HIT-HP AT1

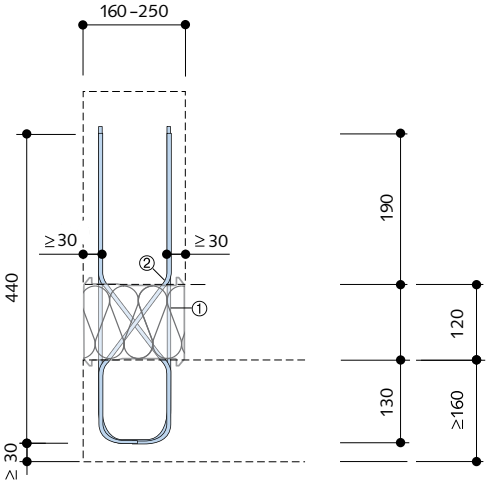


HIT-HP AT2

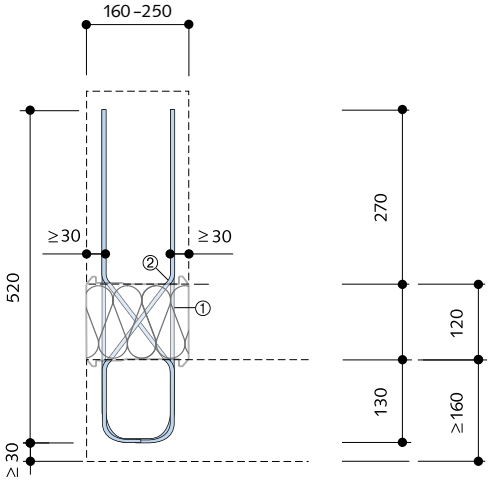


Dimensions in [mm]

Cross section: HIT-SP AT1

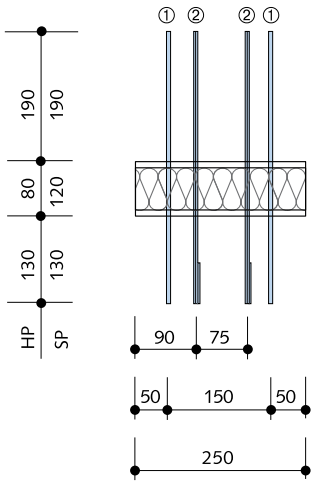


HIT-SP AT2



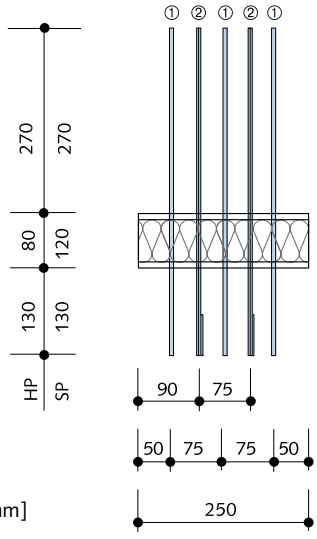
Dimensions in [mm]

Top view: HIT-HP/SP AT1 – bar spacings



① Tension/compression loops: ø8 mm, B500B NR
② Shear bars: ø6 mm, B500B NR

HIT-HP/SP AT2 – bar spacings

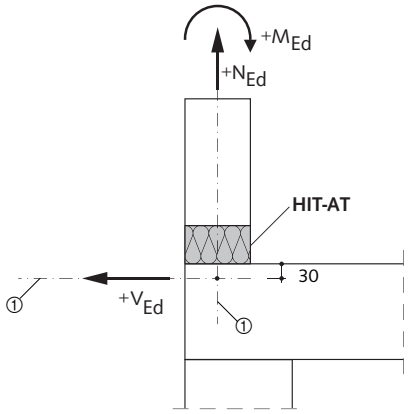


① Tension/compression loops: ø8 mm, B500B NR
② Shear bars: ø6 mm, B500B NR

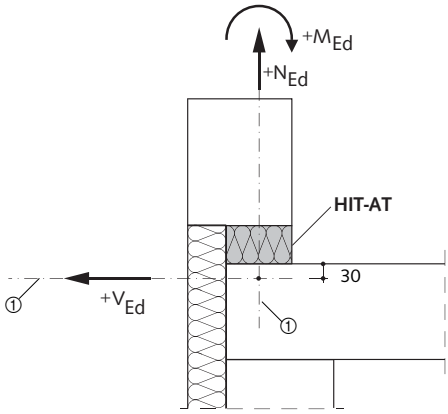
Dimensions in [mm]

Structural system

Sign convention for calculation



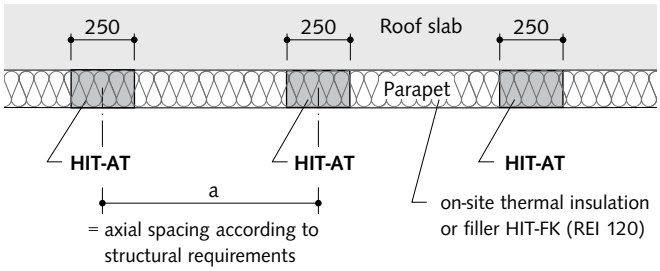
① Design section



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 98–99)**

- **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.
  $a_{max,1} = N_{Rd}/n_{Ed}$ [m]
  $a_{max,2} = V_{Rd}/v_{Ed}$ [m]
  $a = \min(a_{max,1}; a_{max,2})$
- **Step 5: (optional)** **Check** the calculated load bearing capacities (per element).
  $n_{Ed} \cdot a = N_{Ed} \le N_{Rd}$
  $m_{Ed} \cdot a = M_{Ed} \le M_{Rd}$
  $v_{Ed} \cdot a = V_{Ed} \le V_{Rd}$

Calculation tables

Calculation tables

Concrete strength: Parapet ≥C25/30
Main slab ≥C20/25

80

HIT-HP AT1	Element height h [mm]			
	160–170	180–190	200–210	220–250
$\lvert n_{Ed}/m_{Ed} \rvert$ [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
$\lvert n_{Ed}/m_{Ed} \rvert$ [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 ≥C25/30
Main slab ≥C20/25

80

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]			
N_{Rd} [kN/element]	160–170	180–190	200–210	220–250
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]			
N_{Rd} [kN/element]	160–170	180–190	200–210	220–250
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

Calculation tables

Calculation tables

Concrete strength: Parapet ≥C25/30
Main slab ≥C20/25

120

HIT-SP AT1	Element height h [mm]			
	160–170	180–190	200–210	220–250
$\lvert n_{Ed}/m_{Ed} \rvert$ [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
$\lvert n_{Ed}/m_{Ed} \rvert$ [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 ≥C25/30
Main slab ≥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

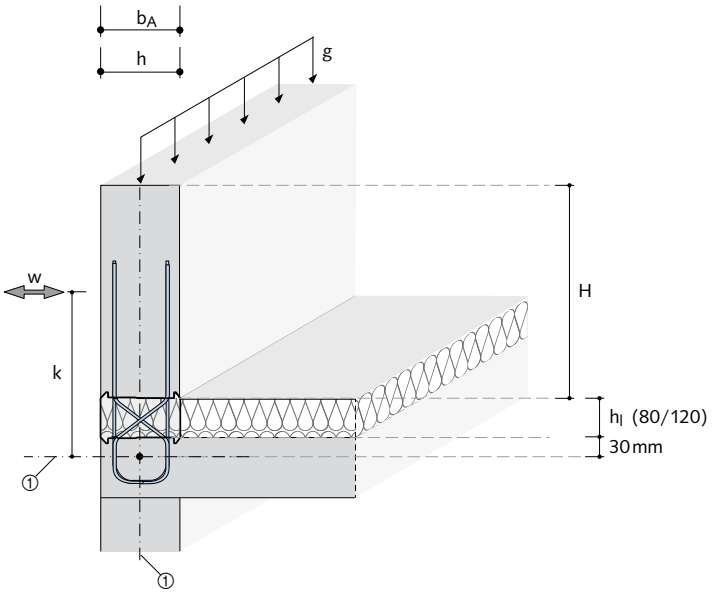
HIT-SP AT2	M_{Rd} [kNm/element] for element height h [mm]			
N_{Rd} [kN/element]	160–170	180–190	200–210	220–250
0	±4.4	±5.4	±6.4	±7.3
– 5	±4.2	±5.1	±6.0	±6.9
–10	±3.9	±4.8	±5.6	±6.4
–15	±3.7	±4.5	±5.3	±5.9
–20	±3.4	±4.2	±4.9	±5.5
–25	±3.2	±3.9	±4.6	±5.0
–30	±2.9	±3.6	±4.2	±4.6

Design example

Planned: Joint width 12 cm
HIT-SP AT2

Required: Axial spacing a [m]
of the elements (see page 97)

Assumed: H = 1.40 m
b_A = h = 0.20 m
h_l = 0.12 m



① Design section

Determining the loads

$g_d = H \cdot b_A \cdot \rho_{concrete} \cdot \gamma_G$

$g_d = 1.40\,m \cdot 0.20\,m \cdot 25\,kN/m^3 \cdot 1.35 = 9.45\,kN/m$

Assumption: w_k = wind pressure + wind suction = 2.6 kN/m²
(To simplify calculation the parapet height is assumed to be the same on both sides; wind load / left = wind load / right)

$w_d = w_k \cdot (H + h_l + 0.03) \cdot \gamma_Q$

$w_d = 2.6\,kN/m^2 \cdot 1.55\,m \cdot 1.5 = 6.05\,kN/m$

$k = (0.03\,m + h_l + H) \cdot 0.5$

$k = (0.03\,m + 0.12\,m + 1.40\,m) \cdot 0.5 = 0.78\,m$

Determining the axial spacing

$n_{Ed} = -9.45\,kN/m$

$m_{Ed} = 6.05\,kN/m \cdot 0.78\,m = 4.72\,kNm/m$

$v_{Ed} = -6.05\,kN/m$

Method / sign convention:
see → page 97

Step 1: $|n_{Ed}/m_{Ed}| = |-9.45/4.72| = 2.00\ [1/m]$

Step 2: $N_{Rd} = -11.1\,kN/element$

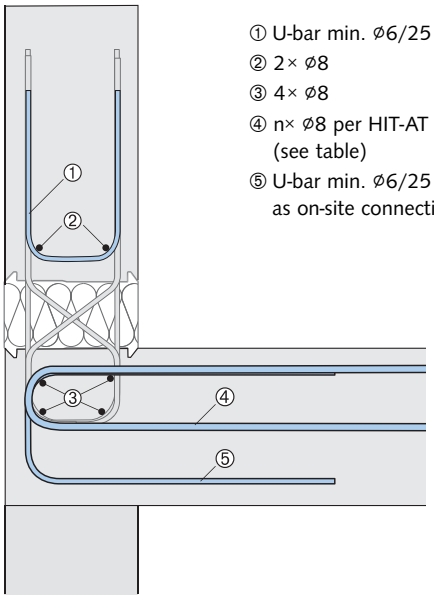
Step 3: $V_{Rd} = \pm 7.5\,kN/element$ (for HIT-SP AT2-0301-20-025)

Step 4: $a_{max1} = -11.1/-9.45 = 1.17\,m$
$a_{max2} = -7.5/-6.05 = 1.23\,m$
⇨ **a = 1.17 m**

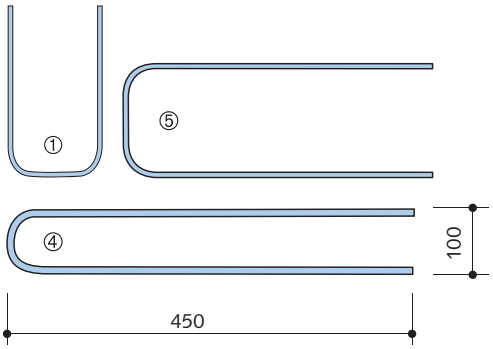
Step 5:
$N_{Ed} = -9.45 \cdot 1.17 = -11.06\,kN/element$
$M_{Ed} = 4.72 \cdot 1.17 = 5.52\,kNm/element < M_{Rd} = 5.54\,kNm/element$
$V_{Ed} = -6.05 \cdot 1.17 = -7.08\,kN/element < V_{Rd} = -7.5\,kN/element$

⇨ HIT-SP AT2-0301-20-025 with a maximum spacing of 1.17 m.

On-site reinforcement HIT-AT



① U-bar min. ø6/25 cm
② 2× ø8
③ 4× ø8
④ n× ø8 per HIT-AT Element (see table)
⑤ U-bar min. ø6/25 cm as on-site connecting reinforcement

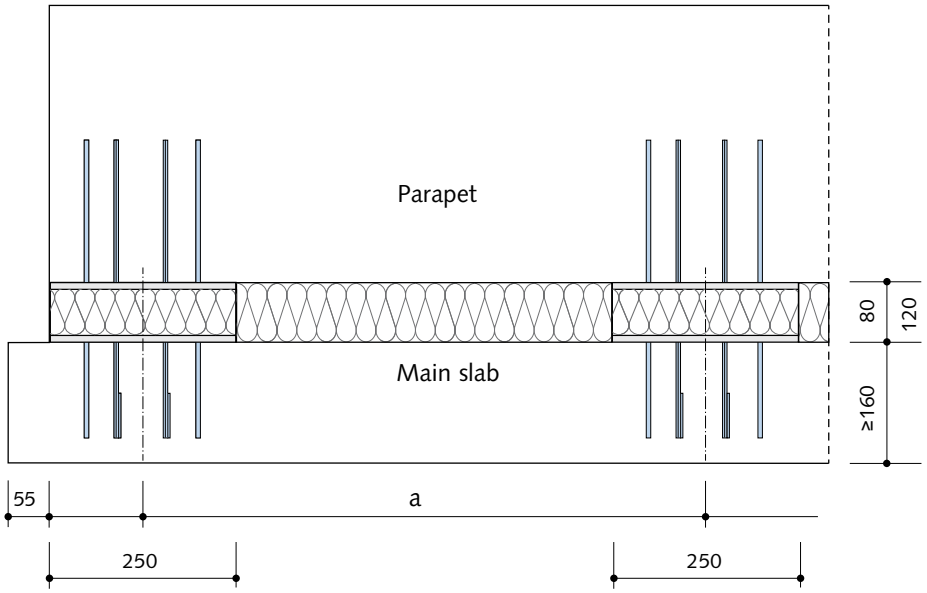


HIT-HP AT	Number **n** connecting bars ④
HIT-HP AT1	3
HIT-HP AT2	4
HIT-SP AT	Number **n** connecting bars ④
HIT-SP AT1	3
HIT-SP AT2	3

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.



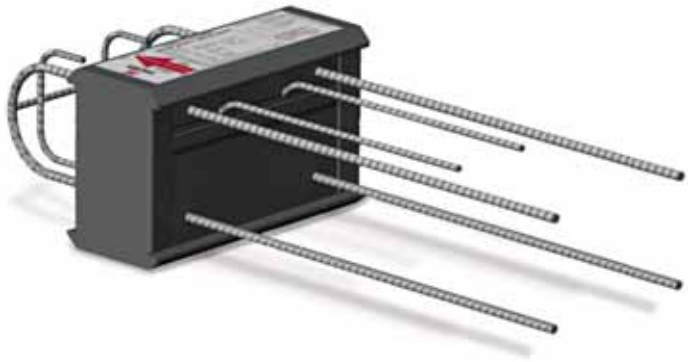
An installation diagram can be found on our website; **www.halfen.com**.

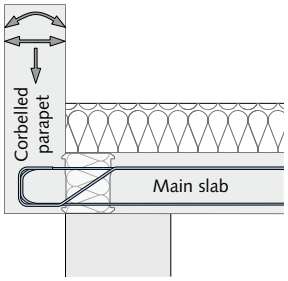
HALFEN HIT INSULATED CONNECTION HIGH & SUPERIOR PERFORMANCE

HIT-HP FT, HIT-SP FT

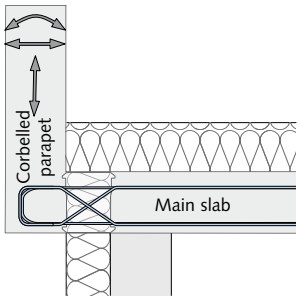
- Thermal insulated connections for application between the main slab and corbelled parapet
- Transfer of normal forces as well as shear forces and bending moments

REI 120





Cross section:
Floor slab with corbelled parapet
and thermal insulating masonry



Cross section:
Floor slab with corbelled parapet
and external thermal insulation composite system

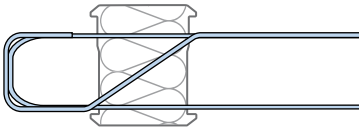
HIT-HP FT – **High Performance** with 80 mm insulation thickness
HIT-SP FT – **Superior Performance** with 120 mm insulation thickness

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

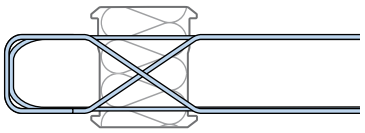
Element width B = 25 cm		Number of tension/compression loops ø8
		2
Number of shear bars ø6 in one direction	2	●
	3	●
● = HP and SP		



HIT-FT1

HIT-FT2: Possible combinations of structural elements

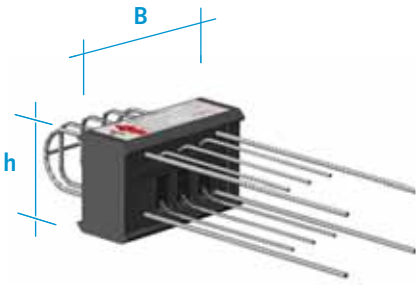
Element width B = 25 cm		Number of tension/compression loops ø8
		2
Number of shear bars ø6 in both directions	2	●
	3	●
● = HP and SP		



HIT-FT2

Ordering example

HIT-HP HIT-SP	FT1 FT2	-	02 02 02 03	-	16	-	025 025
❶	❷	❸	❹	❺	❻	❼	



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]

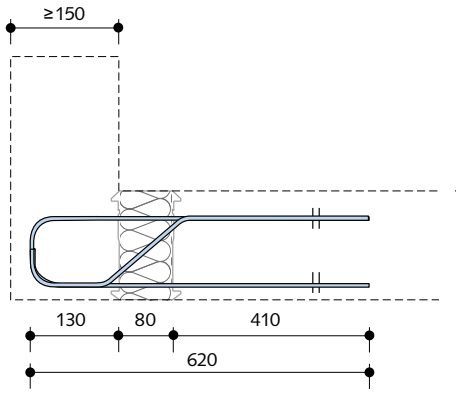
Corbelled parapets, available widths

Possible slab thickness h [cm]	16 – 35*
Corbelled parapets, width [cm]	≥ 15
*Load bearing capacities for slab thicknesses > 25 cm available on request	

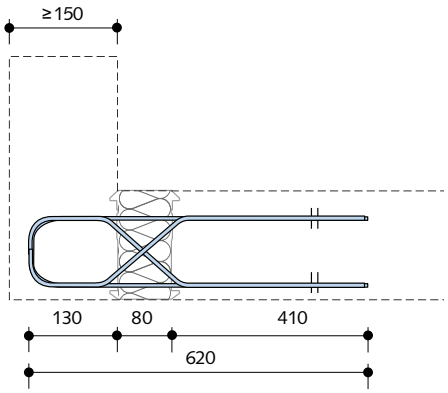
Product description – Cross sections and top views

Cross section:

HIT-HP FT1



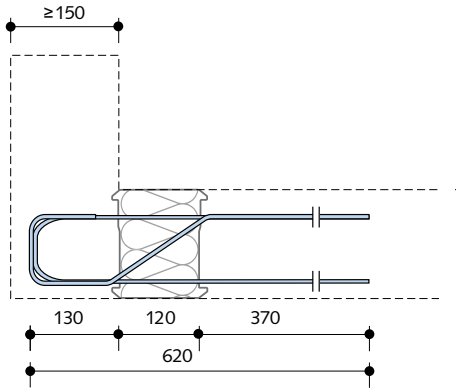
HIT-HP FT2



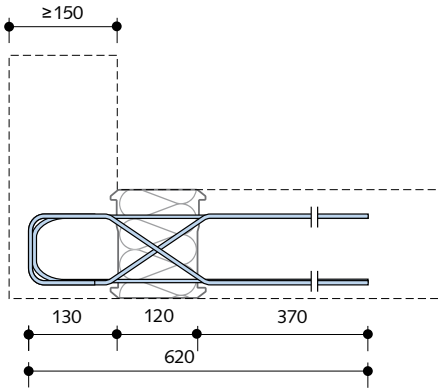
Dimensions in [mm]

Cross section:

HIT-SP FT1



HIT-SP FT2



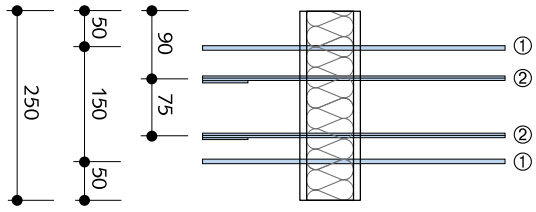
Dimensions in [mm]

Top view:

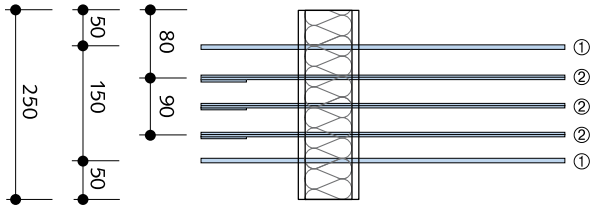
HIT-HP/SP FT1 – Bar spacings

HIT-HP/SP FT2 – Bar spacings

- 2 Shear bars



- 3 Shear bars

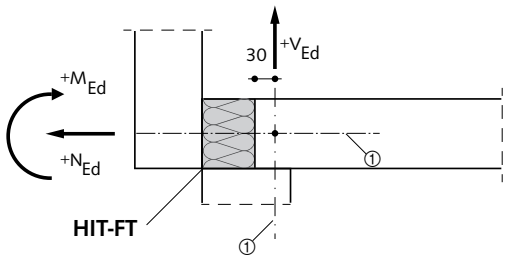


Dimensions in [mm]

① Tension/compression loops: ø8 mm, B500B NR
② Shear bars: ø6 mm, B500B NR,
with type HIT-FT1 only in one direction

Structural system

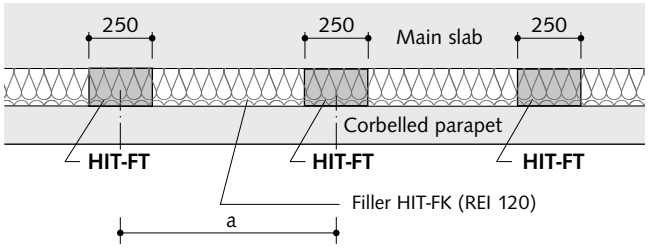
Sign convention for calculation



① Design section

Dimensions in [mm]

Top view:
Main slab with attached corbelled parapet



= axial spacing according to structural requirements

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 106 f.)**

► **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

$a_{max,1} = N_{Rd}/n_{Ed}$ [m]
$a_{max,2} = V_{Rd}/v_{Ed}$ [m]
$a = \min (a_{max,1} ; a_{max,2})$

► **Step 5: (optional)** **Check** the calculated load bearing capacities (per element).

$n_{Ed} \cdot a = N_{Ed} \le N_{Rd}$
$m_{Ed} \cdot a = M_{Ed} \le M_{Rd}$
$v_{Ed} \cdot a = V_{Ed} \le V_{Rd}$

Calculation tables

Calculation tables

Concrete strength parapet: ≥C25/30
Concrete strength, main slab: ≥C20/25

80

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

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

Load bearing capacities for slab thicknesses > 25 cm are available on request.
See inside back cover for contact information.

* Sign convention → see page 105

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: ≥C25/30
main slab: *C20/25* ≥C25/30

80

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: ≥C25/30
Concrete strength, main slab: ≥C20/25

HIT-HP FT1 HIT-HP 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	±3.5	±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]			
−N_{Rd}* [kN/element]	160–170	180–190	200–210	220–250
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

Calculation tables

Calculation tables

Concrete strength parapet: ≥C25/30
Concrete strength, main slab: ≥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

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

Load bearing capacities for slab thicknesses > 25 cm are available on request.
See inside back cover for contact information.

* Sign convention → see page 105

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: ≥C25/30
main slab: *C20/25* ≥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

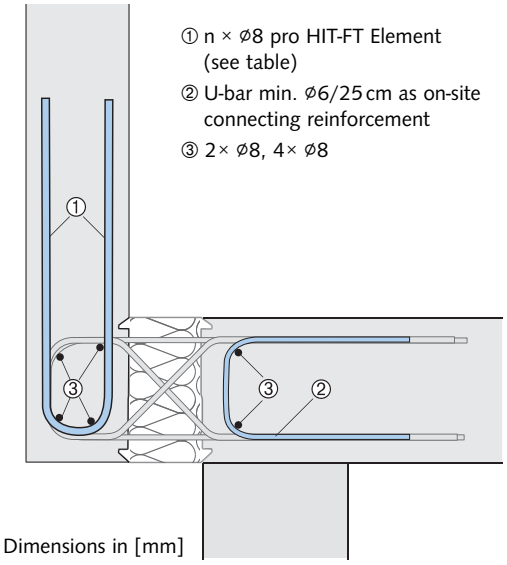
M_{Rd} is dependent on N_{Rd}

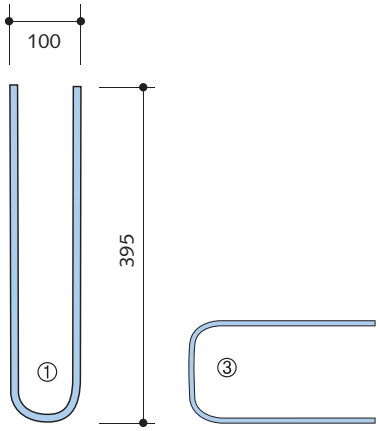
Concrete strength parapet: ≥C25/30
Concrete strength, main slab: ≥C20/25

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

On-site reinforcement HIT-FT



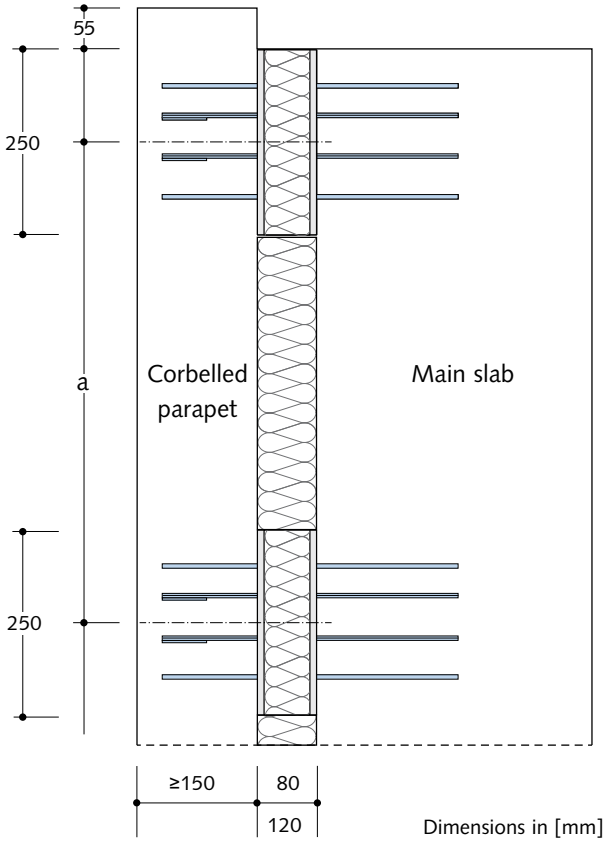


HIT Type	Number of shear bars	Number n connecting bars ①
HIT-HP FT1 HIT-HP FT2	2	3
	3	4
HIT-SP FT1 HIT-SP FT2	2	3
	3	4

Edge distances

Edge distances

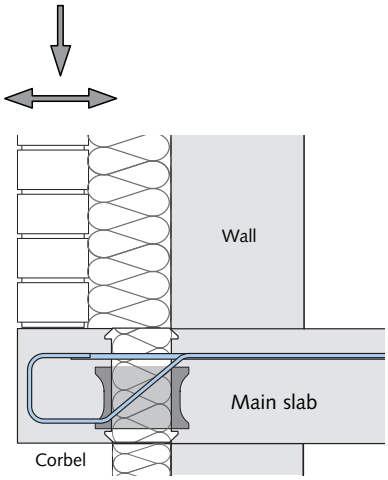
The HIT-FT Element can be installed flush with the concrete edge at the end of the parapet. The minimal distance from the side edge of the main concrete slab to the HIT-FT is 55 mm.



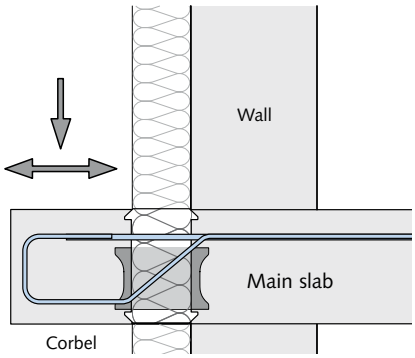
An installation diagram can be found on our website **www.halfen.com**.

HIT-HP MV-OTX, HIT-SP MV-OTX

- Thermal insulated connections for application between the main slab and a corbel
- Transfer of normal forces and also of shear forces



Application: Floor slab supporting a brickwork façade



Application: Floor 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

Product variations – Load range

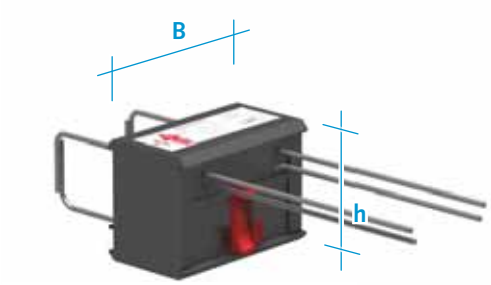
The following table lists possible combinations of shear bars and tension bars.
All elements have a double-symmetric CSB.

Possible combinations of structural elements

Element width B = 25 cm		Number of tension bars ⌀8	
		2	2
Number of shear bars ⌀6	2	●	●
Number of shear bars ⌀8	2	●	●
Type		**OTX1**	**OTX2**
● = HP and SP			

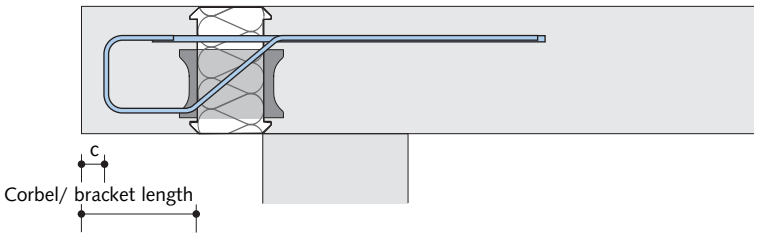
Ordering example

HIT-HP **HIT-SP**	**OTX 1** **OTX 2**	**-**	**02 02** **02 02**	**-**	**18** **25**	**-**	**025** **025**	**-**	**06** **08**
			❸		❻		❼		❽
❶ ❷			❹ ❺						



Type designation
① Product group
② Joint spacing 80 mm (HP) or 120 mm (SP)
③ Connection type
④ Number of tension/compression bars
⑤ Number of shear bars
⑥ Element height h [cm]
⑦ Element width B [cm]
⑧ Diameter shear bars [mm]

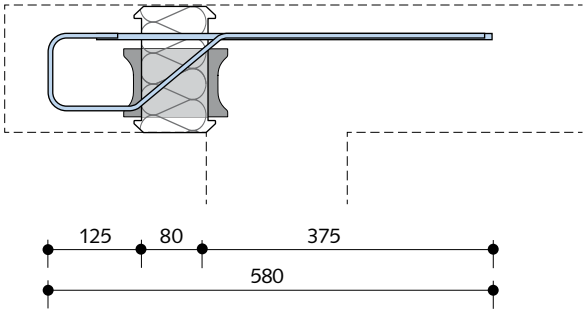
Possible slab thickness h



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	

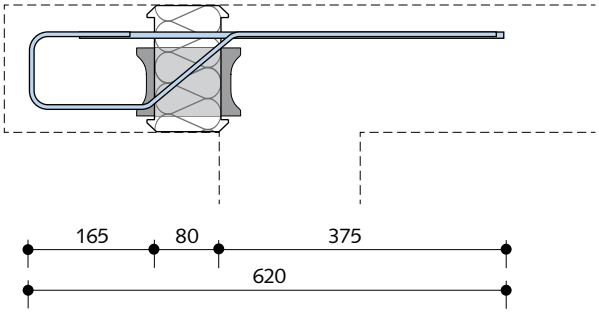
Product description – Sectional views

Cross section:
HIT-HP OTX1

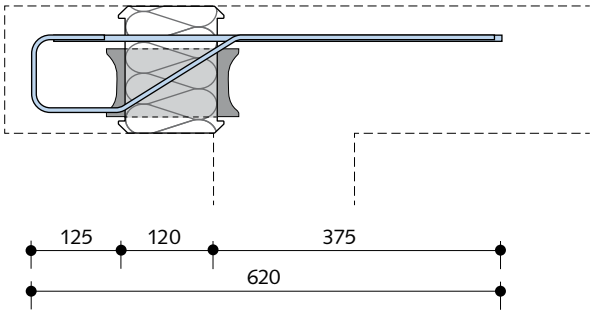


Dimensions in [mm]

HIT-HP OTX2

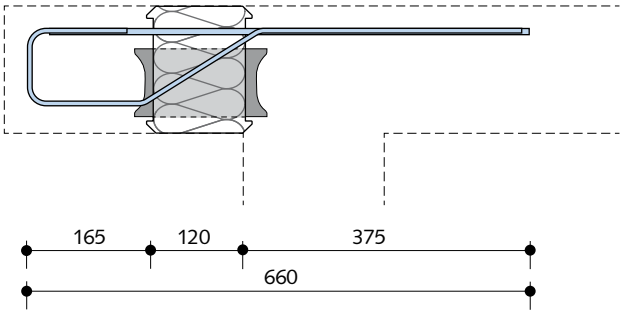


Cross section:
HIT-SP OTX1

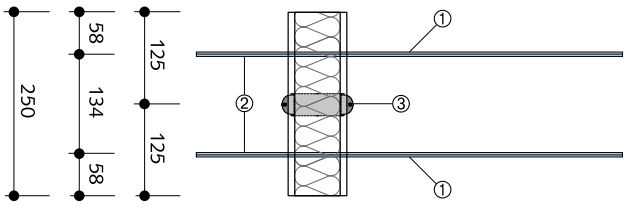


Dimensions in [mm]

HIT-SP OTX2

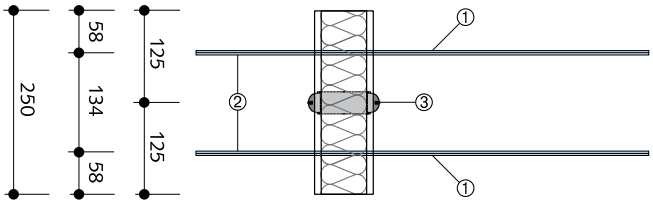


Top view:
HIT-HP/SP OTX1 – Bar spacings



Dimensions in [mm]

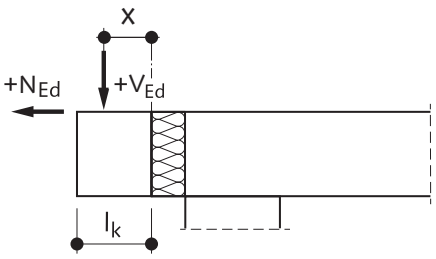
HIT-HP/SP OTX2 – Bar spacings



① Tension bars: ø8 mm, B500B NR
② Shear bars: ø6 mm oder ø8 mm, B500B NR
③ double-symmetrical CSB

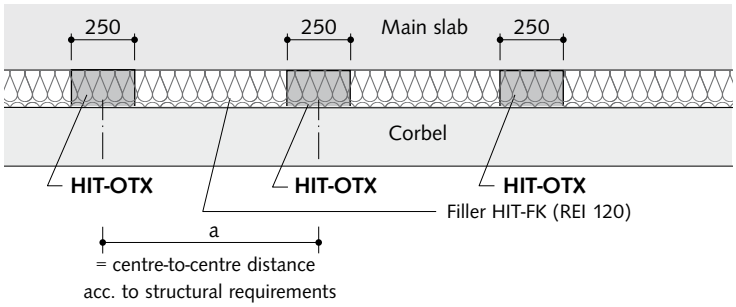
Structural system

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: ≥C25/30
Concrete strength, main slab: *C20/25* ≥C25/30

80

HIT-HP OTX1	Element height [mm]	Shear bars ⌀6								Shear bars ⌀8							
		Load distance x [mm]								Load distance x [mm]							
		≤ 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. Connecting elements must be verified by the planner.

Load bearing capacity values of further types can be found on the following page.

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

V_{Rd} in one direction

Concrete strength, corbel: ≥C25/30
Concrete strength, main slab: *C20/25* ≥C25/30

HIT-HP OTX2	Element height [mm]	Shear bars ⌀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 ⌀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. Connecting elements must be verified by the planner.

Load bearing capacity values of further types can be found on the following page.

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

V_{Rd} in one direction

Concrete strength, corbel: ≥C25/30
Concrete strength, main slab: *C20/25* ≥C25/30

HIT-SP OTX1	Element height [mm]	Shear bars ⌀6								Shear bars ⌀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 ⌀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. Connecting elements must be verified by the planner.

Load bearing capacity values of further types can be found on the following page.

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

V_{Rd} in one direction

Concrete strength, corbel: ≥C25/30
Concrete strength, main slab: *C20/25* ≥C25/30

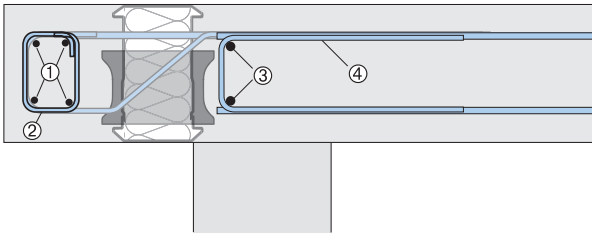
120

HIT-SP OTX2	Element height [mm]	Shear bars ⌀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.													

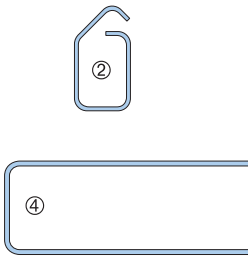
$$N_{Rd} = \pm 0.1 \times V_{Rd}$$

All necessary verifications have been already considered. Connecting elements must be verified by the planner.

On-site reinforcement HIT-OTX



① 4× ⌀8
② Stirrups 5× ⌀8 per HIT-OTX Element
③ 2× ⌀8
④ U-bar min. ⌀6 / 25 cm
as on-site connecting reinforcement



An installation diagram can be found at our website **www.halfen.com**.

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].

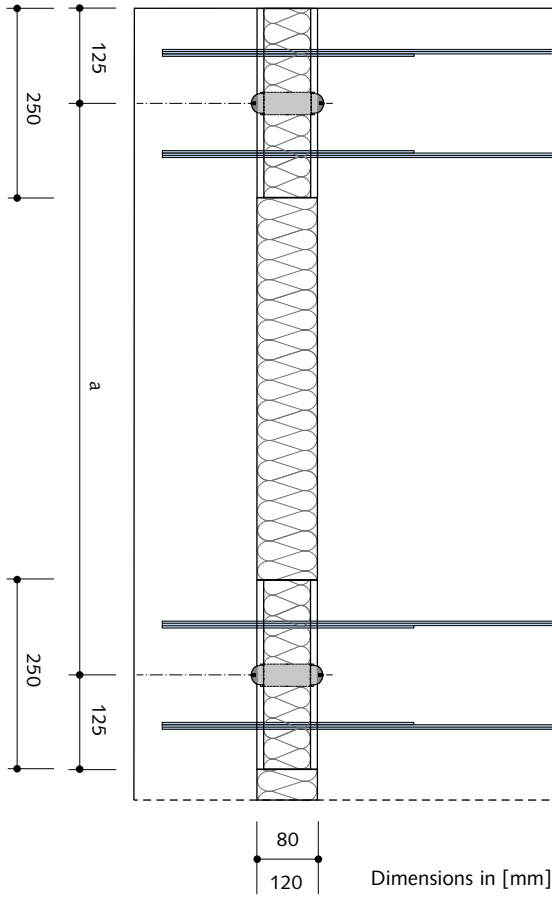
► **Step 1:** Find V_{Rd} (N_{Rd}) in the table **"Load bearing capacity values"** to select shear bars of either ø6 mm or ø8 mm this is dependent on the element height h, the concrete strength class and load distance x.

► **Step 2:** Calculate the element spacing a

$a_{max,1} = V_{Rd}/v_{Ed}$ [m]
$a_{max,2} = N_{Rd}/n_{Ed}$ [m]
$a = \min (a_{max,1} ; a_{max,2})$

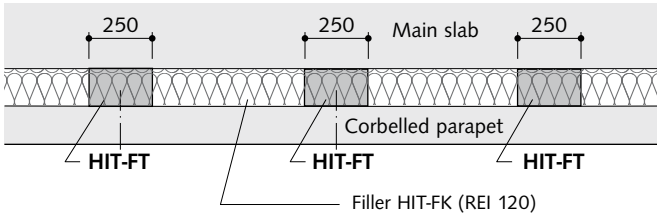
► **Step 3: (optional)** Check the calculated load bearing capacities (per element)

$v_{Ed} \cdot a = V_{Ed} \leq V_{Rd}$
$n_{Ed} \cdot a = N_{Ed} \leq N_{Rd}$



HIT-HP FK, HIT-SP FK

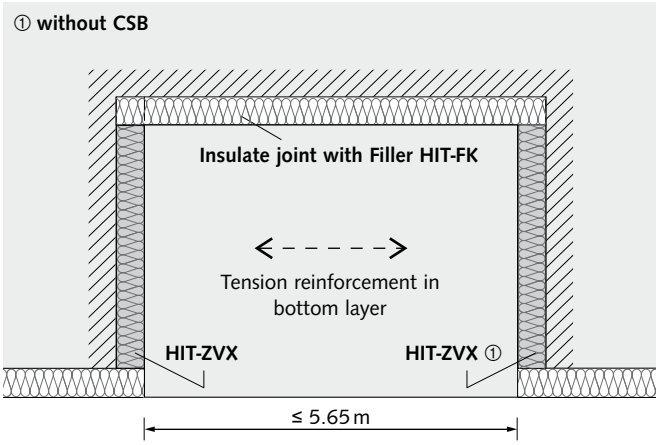
- Filler without support elements as a complementary element in all applications
- Mineral wool construction product class A1; used as an insulating material



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



Content	Type	Page
Practical width adjustment	HIT-HP FK, HIT-SP FK	118

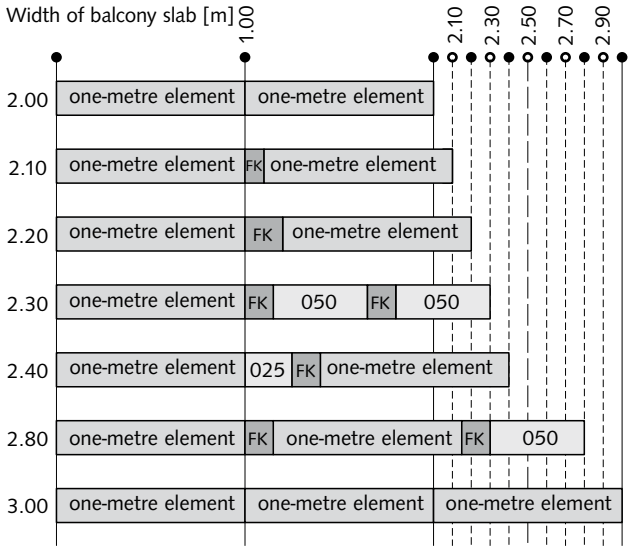
Optimized Combination

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)



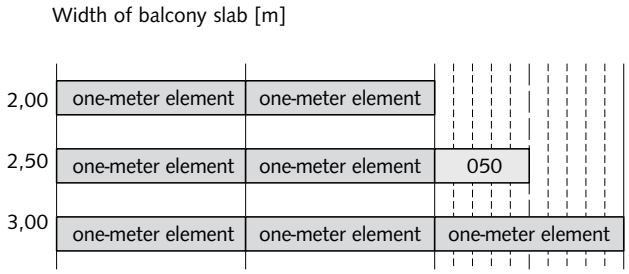
The increase of the loaded areas when HIT fillers are used is compensated by the HIT design program with the respective additions.

FK = Filler HIT-HP FK (see below)

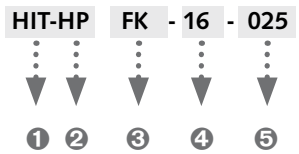
025 = Element with B = 0.25 m

050 = Element with B = 0.50 m

Use of one-metre elements and short units

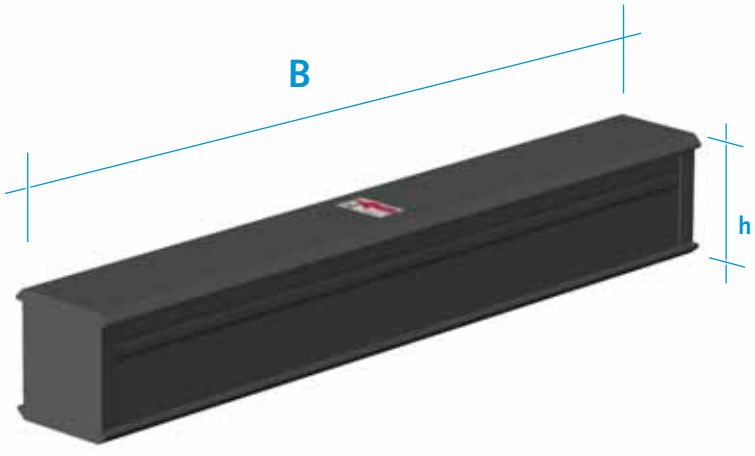


Ordering example for HIT Fillers



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]



Material specification

Tension bars	Reinforcing stainless steel type B500B NR welded to reinforcing steel B500B or alternatively: welded stainless steel rod material no. W 1.4401, W 1.4404, W 1.4571 of strength class S 460 according to National Technical Approval no. Z-30.3-6 welded to B500B reinforcing steel according to DIN 488
Compression bearings	Stainless steel material no. W 1.4404, W 1.4362 according to National Technical Approval no. Z-30.3-6
Shear bars	Reinforcing stainless steel B500B NR (if required, welded to reinforcing steel B500B)
U-bars	B500B reinforcing steel
Transport bars	B500B reinforcing steel
Insulating material	WLG 035 expanded polystyrene foam
Fire boards (F90 type)	Fibre cement board, Construction material class A1
Connecting components	
Concrete	General purpose concrete according to EN 1992-1-1 / EN 206-1 with a raw density between 2000 kg/m³ and 2600 kg/m³ (light weight concrete is not permitted). Minimum concrete strength C20/25 and depending on exposure classes according to EN 1992-1-1/NA, table NA.E.1
On-site reinforcement	B500 reinforcing steel

Test certificates

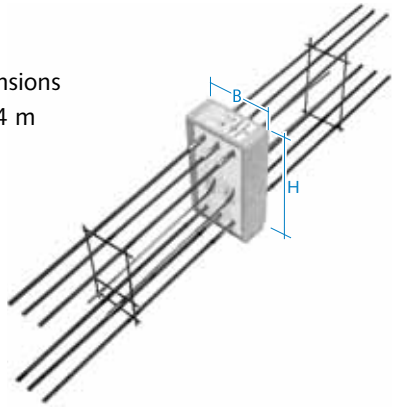
Technical Approvals	
HALFEN HIT Insulated connection	DIBt Berlin, National Technical Approval no. Z-15.7-238 Connection for reinforced concrete slabs according to EN 1992-1-1 and EN 1992-1-1/NA – including fire protection (F90 type)

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, select the document and click to download a PDF file.

7

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

HIT-ST
Standard dimensions
B / H = 0.2 / 0.4 m



Application example

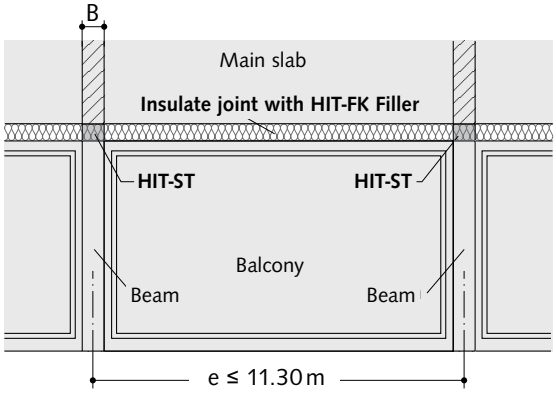
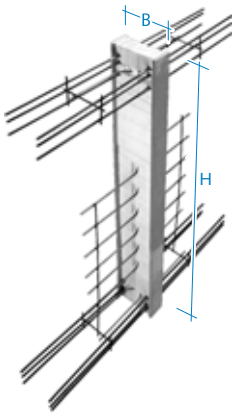


Fig. 1: Thermal insulated beam connections

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

HIT-WT
Standard dimensions
B = 0.15 – 0.25 m
H = 1.5 – 3.5 m



Application example

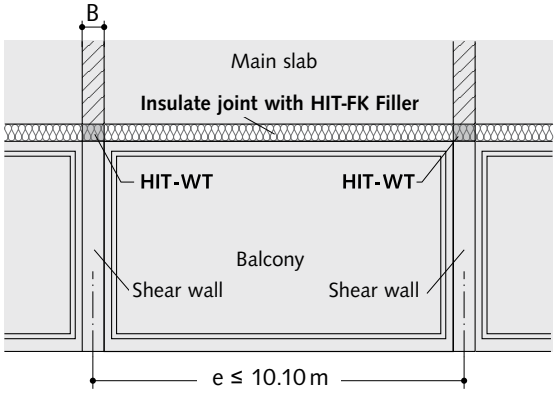
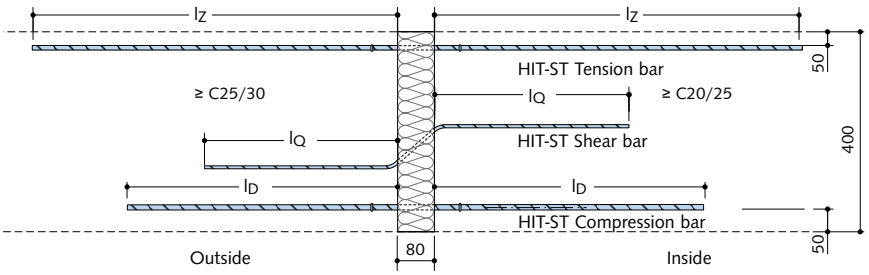


Fig. 2: Thermal insulated shear wall connections

Product description



Dimensions in [mm]

Components	Load range		HIT-ST 1	HIT-ST 2	HIT-ST 3	HIT-ST 4
	Width	B [m]	0.20	0.20	0.20	0.20
Tension bars	n · ø[mm]	n · ø[mm]	3 ø10	3 ø12	3 ø14	3 ø16
	Standard/VB2	l_Z [mm]	700 / 900	740 / 1060	850 / 1220	1270 / 1760
Compression bars	n · ø[mm]	n · ø[mm]	3 ø12	3 ø14	3 ø16	3 ø20
	Standard/VB2	l_D [mm]	550 / 900	565 / 1035	635 / 1170	770 / 1435
Shear bars	n · ø[mm]	n · ø[mm]	2 ø8	2 ø10	2 ø12	2 ø14
	Standard/VB2	l_Q [mm]	505 / 695	565 / 765	625 / 875	695 / 975
On-site stirrups	erf. A_s [cm²]		1.09	1.53	2.09	2.83
	n · ø[mm]	selected:	2 ø8	2 ø8	2 ø10	2 ø10

Load bearing capacities and product types

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

Ordering example

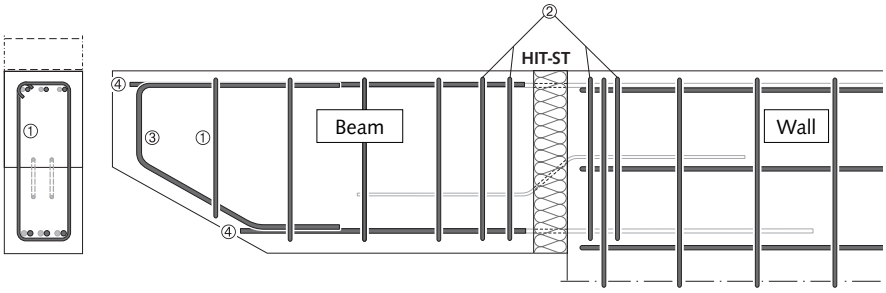
Type designation
① Product group
② Connection type
③ Bond quality*
④ Fire protection*

HIT - ST1 - VB2 * - F90 *

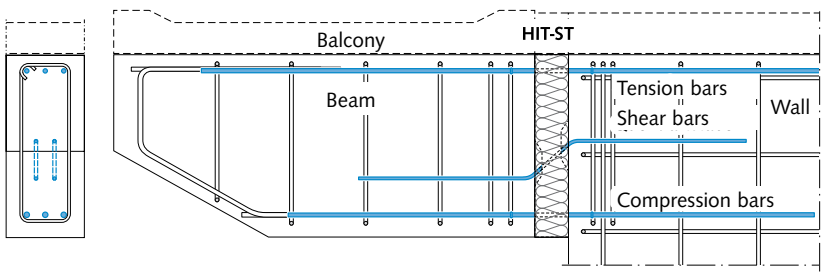
❶ ❷ ❸ ❹

*If selecting "standard" for bond or "Normal" for fire protection, the entry will be omitted in the designation.

On-site reinforcement / Installation diagram



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

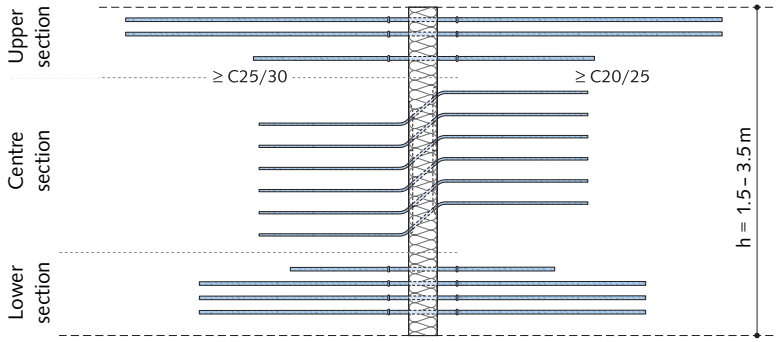


Fix the on-site connecting reinforcement in accordance with the structural engineer's drawings and specifications. Observe the required A_s values specified in the table above.

HALFEN HIT INSULATED CONNECTION

HIT-WT

Product description



Components	Load range	HIT-WT1	HIT-WT2	HIT-WT3	HIT-WT4
	for wall thickness [cm]	15–25	15–25	15–25	15–25
Tension bars	n × ø[mm]	4 ø8	4 ø8	4 ø10	4 ø12
Compression bars	n × ø[mm]	4 ø10	6 ø10	6 ø12	6 ø14
Shear bars					
- vertical	n × ø[mm]	6 ø6	6 ø8	6 ø10	6 ø12
- horizontal	n × ø[mm]	2 × 2 ø6	2 × 2 ø6	2 × 2 ø6	2 × 2 ø6

Load bearing capacities and product types

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

Basic types – Ordering example

Type designation

① Product group
② Connection type
③ Wall thickness [cm]
④ Wall height [cm]
⑤ Fire protection*

HIT - WT2 - 19 - 225 - F90 *

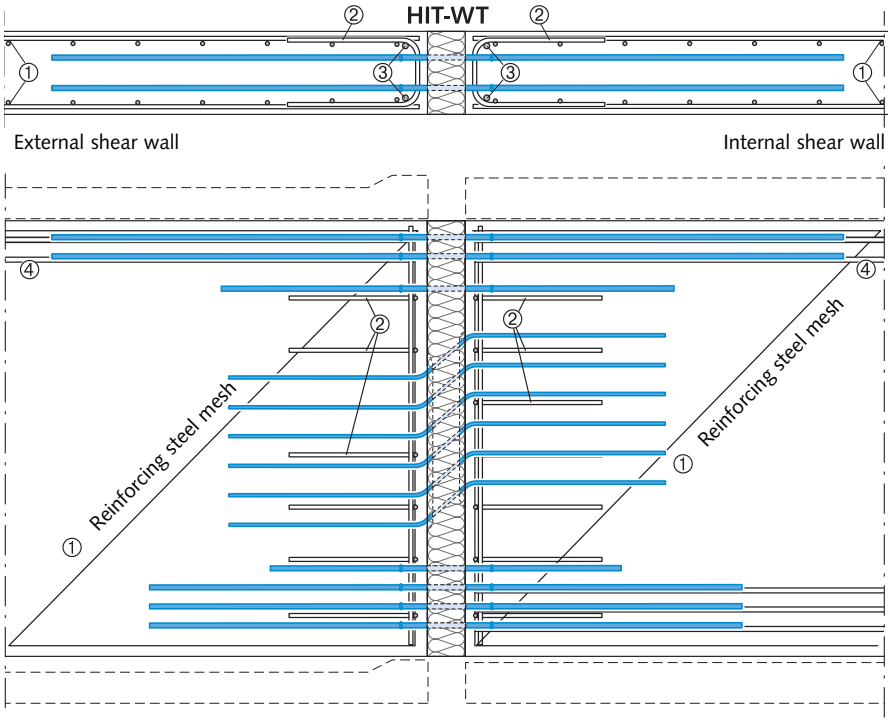
❶ ❷ ❸ ❹ ❺

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

HALFEN HIT INSULATED CONNECTION

HIT-WT

Installation diagram



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

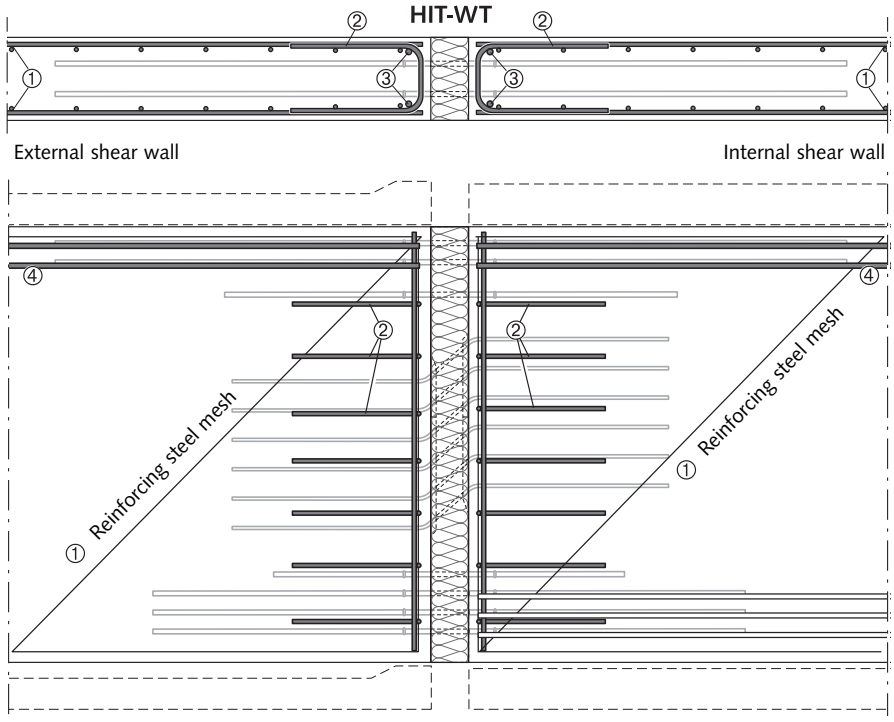
① On-site wall reinforcement as defined by the structural engineer.

② U-bars as structural edge frame.

③ Minimal two 8 mm ⌀ rebars, in the inner and outer shear wall.

④ Connecting reinforcement of the HIT tension bars depends on the structural requirements.

On-site connecting reinforcement



HIT Custom solutions

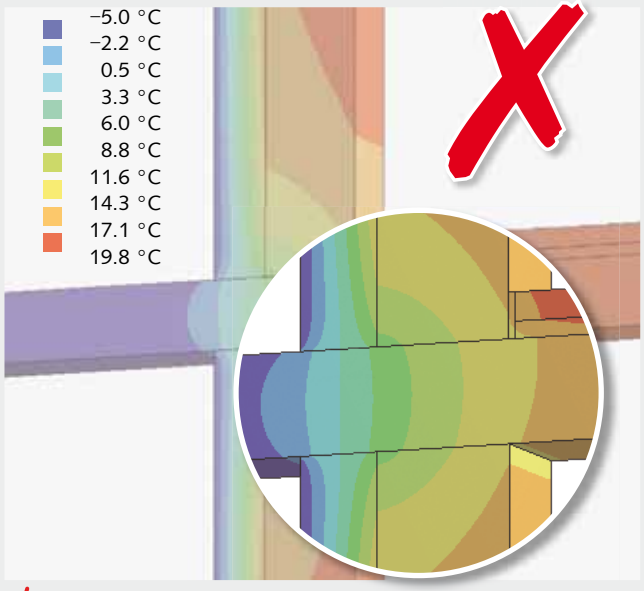
Our technical support team is available to provide support in your project with custom solutions using HALFEN HIT Insulated connections.

Contact: → see inside back cover

8

- Building physics: Basics and specific values
- Software and tender specifications

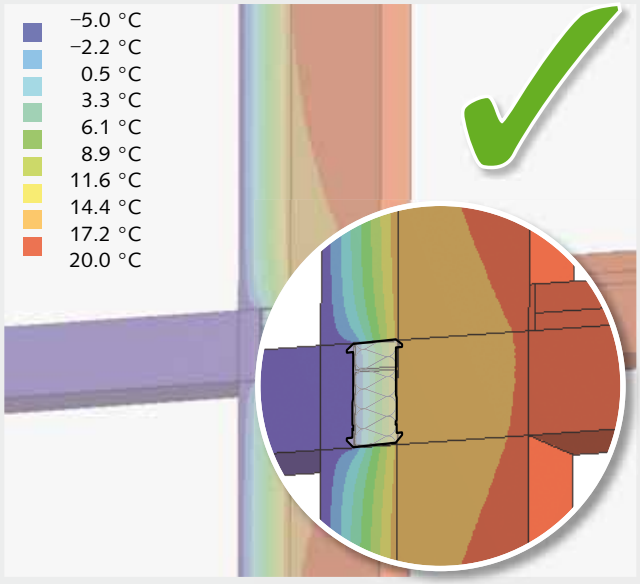
The temperature field in the cross-section (shown as isotherms) illustrates the advantages of the HALFEN HIT Insulated connection for the required minimum thermal insulation: For instance no condensation and mould growth in critical areas.



Temperature below the dew 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
- no condensation, temperature above the dew point
- perfectly designed structural physics
- prevents cracks in the concrete resulting from extrem thermal expansion in the balcony connection

Contents **Page**

Thermal insulation

Structural thermal bridges such as balconies may lead to moisture problems resulting from lower temperatures on internal surfaces. Moreover, thermal bridges normally cause additional loss of heat.
Consequently, correct planning using thermal insulated balcony slab connections:

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

Depending on the temperature, the air can retain different amounts of moisture. With a rise in air temperature, the amount of storable moisture increases. In a room the air is constantly moving (room air flow). The water content in a defined flowing air volume remains nearly constant. However, the temperature of the air changes when the air flows along colder external components.

The storage capacity of the air decreases as the air cools down, resulting in an increase in relative humidity. Condensation always occurs when the relative humidity reaches 100%. Assuming a room temperature of 20°C and a relative humidity of 50% condensation would occur when the air cools down to approx. 9°C (see dew point diagram on the right). If, under the given conditions, the temperature at the inner surface of an adjacent component, for instance the wall or the ceiling, is 9°C or colder, condensation will form on this surface.

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

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

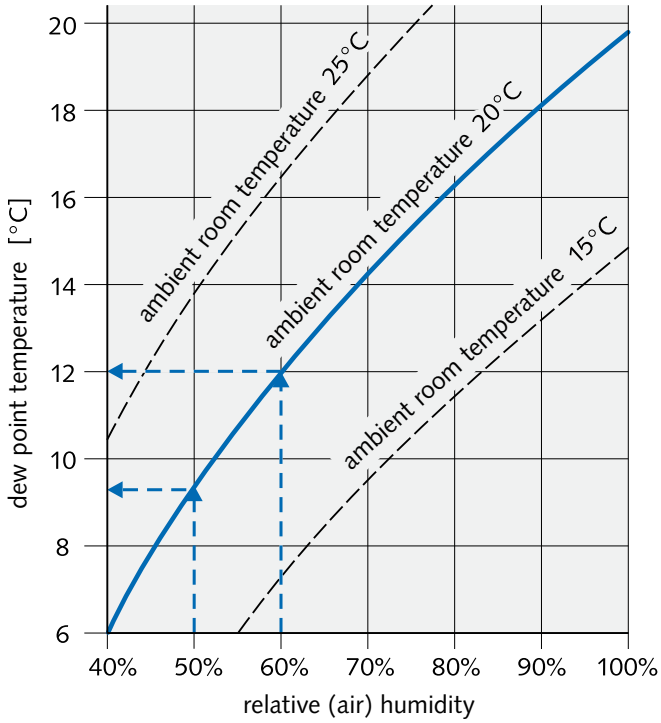


Fig.: Dew point diagram

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

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

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

According to the National Technical Approvals Z-15.7-293, Z-15.7-309 and Z-15.7-312 the minimum thermal insulation requirement in accordance with DIN 4108-2 has already been proved and applies to the complete HALFEN HIT Insulated connections load range.

Reduction of thermal transmission

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

Thermal bridges can be calculated using three different methods:

Method 1: An increase of all thermal transmission coefficients by ΔU_{WB} = 0.10 W/(m²K) 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 ΔU_{WB} = 0.05 W/(m²K).

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 ΔU_{WB} = 0.05 W/(m²K) is applied can be used because HALFEN HIT Insulated connections are classified in DIN 4108, annex 2, according to National Technical Approval Z-15.7-293, Z-15.7-309 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.

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

This method is only applicable to a limited extent for structural components with metallic-like penetrations as found in balcony slab connection.
For these cases, the basic principle and boundary conditions required to calculate a value for equivalent thermal conductivity to a uniform standard are not regulated.

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 European Technical Approval ETA-13/0546 and National Technical Approval Z-15.7-293 and Z-15.7-312.

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

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

Residential building			
Description/ basics standard	**Method 1** without verifications ΔU_{WB} = 0.10 W/(m²K)	**Method 2** specification details or equivalent details ΔU_{WB} = 0.05 W/(m²K)	**Method 3** Exact calculation of thermal bridges with linear thermal transmission coefficients (= ψ-values)
Restricting the annual primary energy demand to the permissible value required in the EnEV 2009	$\frac{Q_{P,\,act.}}{Q_{P,\,max}} < Q_{P,\,max.}$	Subject to reference building according to EnEV 2009, Annex 1 for residential buildings (or Annex 2 of EnEV 2009 for non-residential buildings)	
Actual annual primary energy demand for a residential building according to DIN V 4108-6 and DIN V 4701-10	$Q_{P,\,act.} = e_P (Q_h + Q_W)$ Q_h $Q_W = A_N \times 12.5\ kWh/(m^2a)$ e_P	Annual thermal heat demand Useful heat demand for water heating energy requirement value of a system related to primary energy	
Annual thermal heat demand Q_h according to DIN V 4108-6 (monthly balance)	$Q_h = \sum_M Q_{h,\,M/pos}$	The annual thermal heat demand is the sum of all monthly heat demands with a "positive" thermal heat demand value	
Monthly thermal heat demand $Q_{h,\,M}$	$Q_{h,\,M} = 0.024\,(H_T + H_V)\,(\theta_i - \theta_{e,M})\,t_M - \eta_M Q_{g,M}$ **Note:** the monthly thermal heat demand is positive when the losses exceed the gains		
Specific transmission heat loss H_T	$H_T = \sum U_i A_i F_{x,i} + \Delta U_{WB} \times A$		$H_T = \sum U_i A_i F_{x,i} + \sum l_j \psi_j$
Consideration of thermal bridges	ΔU_{WB} = 0.10 W/(m²K) fixed additional value	ΔU_{WB} = 0.05 W/(m²K) half the fixed additional value	Approved ψ-values for all component connections (e. g. building edges, window reveals, wall and ceiling connections, ceiling supports, thermally decoupled balcony slabs) ψ-values for different assembly situations of the HIT connections, see tables → pages 129ff.

Thermal bridge characteristic values according to National Technical Approval

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 θ_{min} and temperature factor f_{Rsi}).

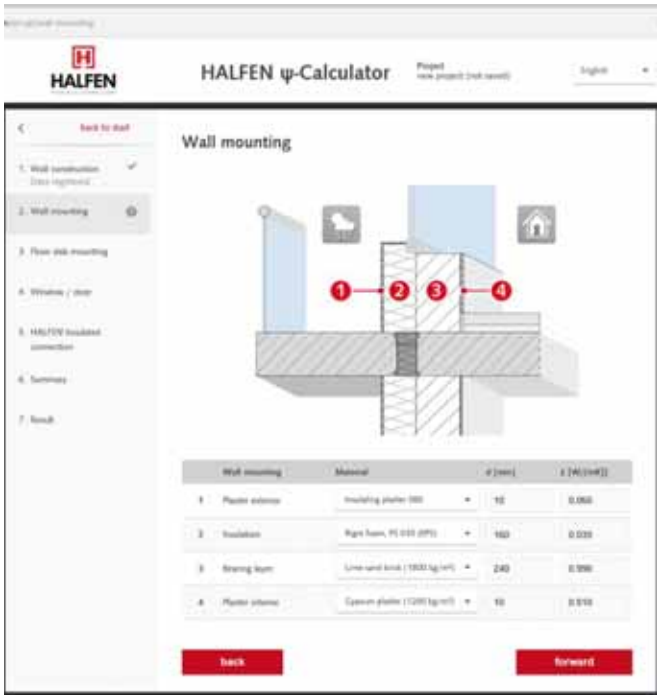
These values were officially integrated into the European Technical Approval ETA-13/0546 and the national technical approvals Z-15.7-293 and Z-15.7-312.

For the first time building authority approved ψ-values for a detailed standard-compliant thermal bridge verification for insulated balcony connections are available throughout Europe.
Compliance with the approved physical properties for HALFEN Insulated connections HIT-HP and HIT-SP is guaranteed by third party monitoring.

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

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.

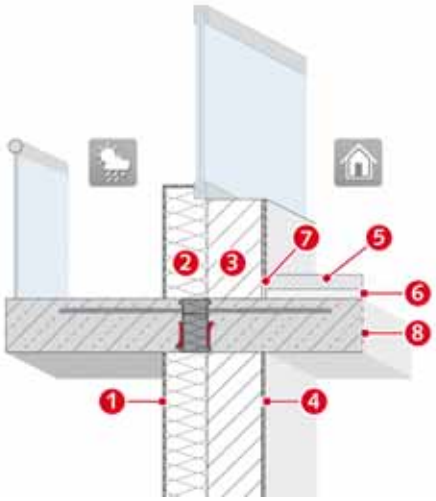


Screenshot HIT-Calculator Web App: Parameter input window

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 Insulated connection (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.



Component details

	Wall details
1	Exterior render
2	Insulation
3	load support layer
4	Interior plaster

	Slab details
5	Screed
6	Insulation
7	Edge insulation strips
8	load support layer

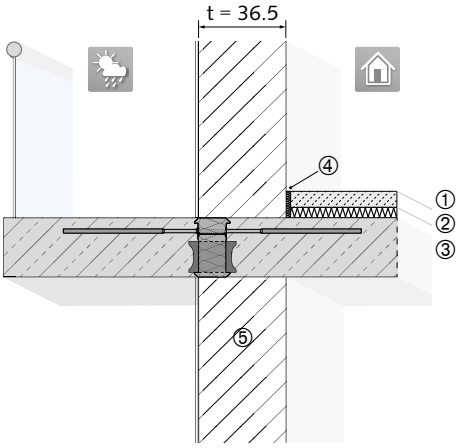
Illustration of an exterior wall: Here an example using an ETICS system with a window.

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 document with all relevant parameters, which 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.

Thermal values according to Technical Approvals



Installation diagram für monolithic masonry

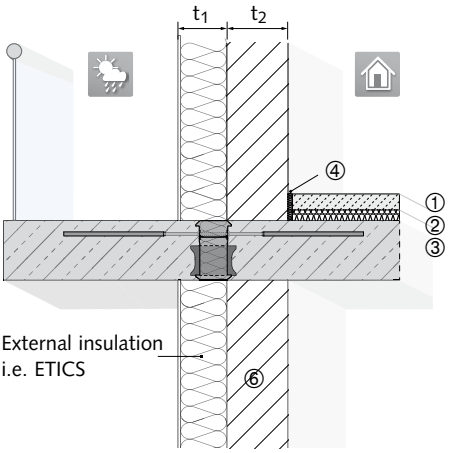
Thermal transmission coefficient, standard cross section "Exterior wall":
U = 0.311 W/(m² K)

- external wall (monolithic): width t = 36.5 cm (λ = 0.12 W/(mK))
- floor construction (indoor):

① cement screed 5 cm (λ=1.35 W/(mK))
② footfall insulation 3 cm (λ=0.035 W/(mK))
③ reinforced concrete floor 18 cm (λ=2.3 W/(mK))
④ edge insulation strips 1 cm (λ = 0.14 W/(mK))
⑤ monolithic masonry

The thermal values only apply for the specified installation applications and boundary conditions.

The values for the HIT-MVX are the same as for the HIT-MV.



Installation diagram for masonry with ETICS

Standard cross section for thermal transmission coefficient "Exterior wall":

- thermally insulation exterior wall:
  thickness t_1 = 14 cm, 22 cm or 30 cm (λ = 0.035 W/(mK))
- exterior (lime-sandstone): thickness t_2 = 24 cm (λ = 0.99 W/(mK))
- floor construction (interior):

① cement screed 5 cm (λ=1.35 W/(mK))
② footfall insulation 3 cm (λ=0.035 W/(mK))
③ reinforced concrete floor 18 cm (λ=2.3 W/(mK))
④ edge insulation strips 1 cm (λ=0.14 W/(mK))
⑥ lime-sandstone masonry

ETICS = External Thermal Insulation Composite Systems

Calculating Ψ-values with the HALFEN App

Calculations of thermal values for the HALFEN Insulated connection types HIT-HP MVX, HIT-SP MVX, HIT-HP ZVX and HIT-SP ZVX is easy with the HIT-Calculator; a mobile application for your smartphone or tablet.

▸ available at our website under Downloads/Apps/ HIT-Calculator Web App

HALFEN HIT App on the Internet
Scan the QR Code on the left to download the HALFEN app to calculate Ψ-values for your project.

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/(m²K)	0.455			0.311			0.211		
Load range	ψ ①	$\theta_{si,min}$ ②	f_{Rsi} ③	ψ ①	$\theta_{si,min}$ ②	f_{Rsi} ③	ψ ①	$\theta_{si,min}$ ②	f_{Rsi} ③
HIT-HP 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 [-]

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/(m²K)	0.455			0.311			0.211		
Load range	ψ ①	$\theta_{si,min}$ ②	f_{Rsi} ③	ψ ①	$\theta_{si,min}$ ②	f_{Rsi} ③	ψ ①	$\theta_{si,min}$ ②	f_{Rsi} ③
HIT-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 [-]

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/(m²K)	0.227			0.149			0.111		
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	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

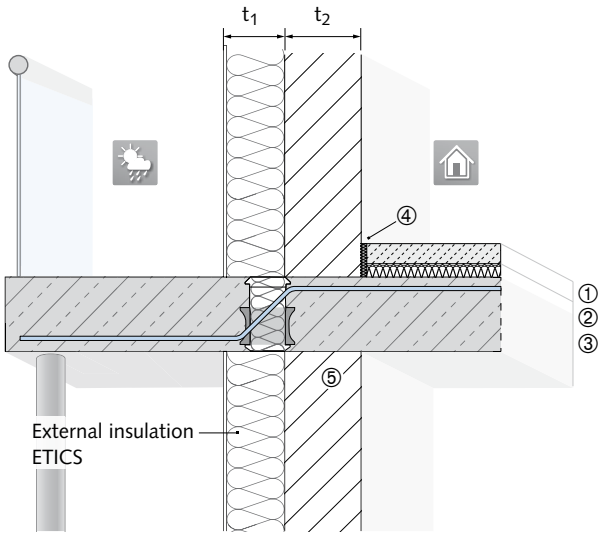
① ψ = Linear thermal transmission coefficient in W/(mK)
② $\theta_{si,min}$ = Minimum roomside surface temperature in °C
③ f_{Rsi} = Temperature factor in [-]

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/(m²K)	0.227			0.149			0.111		
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	0.115	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 $\theta_{si,min}$ = Minimum roomside surface temperature in °C
③ f_{Rsi} = Temperature factor in [-]

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 cm, 22 cm or 30 cm (λ = 0.035 W/(mK))
- exterior (lime-sandstone): thickness t_2 = 24 cm (λ = 0.99 W/(mK))
- floor construction (interior):
  ① cement screed 5 cm (λ = 1.35 W/(mK))
  ② footfall insulation 3 cm (λ = 0.035 W/(mK))
  ③ reinforced concrete floor 16 cm or 18 cm (λ = 2.3 W/(mK))
  ④ edge insulation strips 1 cm (λ = 0.14 W/(mK))
  ⑤ lime-sandstone masonry

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

The values for the HIT-ZVX are the same as for the HIT-ZV.

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 W/(m²K)	0.227			0.149			0.111		
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 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

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① ψ = Linear thermal transmission coefficient in W/(mK)
② $\theta_{si,min}$ = Minimum roomside surface temperature in °C
③ f_{Rsi} = Temperature factor in [-]

Thermal bridge characteristic values for HIT-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/(m²K)	0.227			0.149			0.111		
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 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 $\theta_{si,min}$ = 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/(m²K)	0.227			0.149			0.111		
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 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

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① ψ = Linear thermal transmission coefficient in W/(mK)
② $\theta_{si,min}$ = Minimum roomside surface temperature in °C
③ f_{Rsi} = Temperature factor in [-]

Thermal bridge characteristic values for HIT-SP 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/(m²K)	0.227			0.149			0.111		
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 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 $\theta_{si,min}$ = Minimum roomside surface temperature in °C
③ f_{Rsi} = Temperature factor in [-]

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.

Passive House Institute

Low Energy Component

The following criteria were used in awarding this certificate

- **Efficiency Criterion**
  In two typical applications (a terrace-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:

$$\theta_{i,min} > 17.00 \text{ °C}$$

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

Building Physics

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

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.

The following criteria were used in awarding this certificate

- **Efficiency Criterion**
  In two typical applications (a terrace-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:

$$\theta_{i,min} > 17.00 \text{ °C}$$

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

Soundproofing according to DIN 4109

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

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

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

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

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


Standardised tapping machine according to EN ISO 10140

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

Laboratory measurements of impact sound
In laboratory measurements, the difference in the impact sound pressure level Δ L 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 Approval, number ETA-13/0546.
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 Δ L in dB resulting from laboratory measurements	
HIT Element …MVX	**Difference in impact sound pressure leve**
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.

Fire protection according to EN 13501 and DIN 4102

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

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

The standard versions of the connecting units HIT-HP and HIT-SP are classified in class REI 120 according to EN 13501-02 as well as in class F 120-AB according to DIN 4102 in compliance with the European Technichal Approval ETA-13/0546 and the National Technical Approvals Z-15.7-293, Z-15.7-309 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.

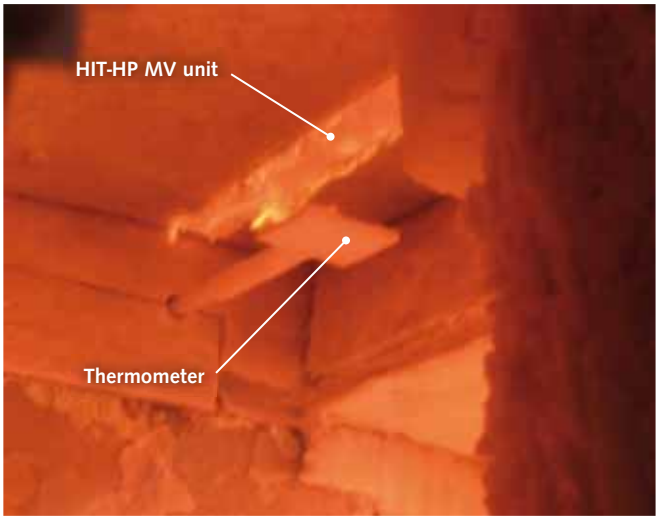
Meaning of the abbreviation REI:

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

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

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

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

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:

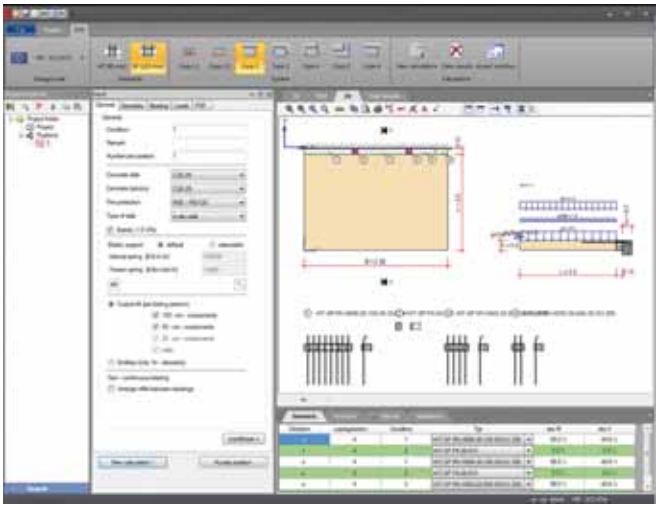
- free download available
- intuitive and easy to use
- enhanced load and support options
- verifiable static printouts
- generates .dxf-files output for input to drawing, if required
- item-list compilation to facilitate ordering
- variable GUI using the current Windows design, fully customizable to 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

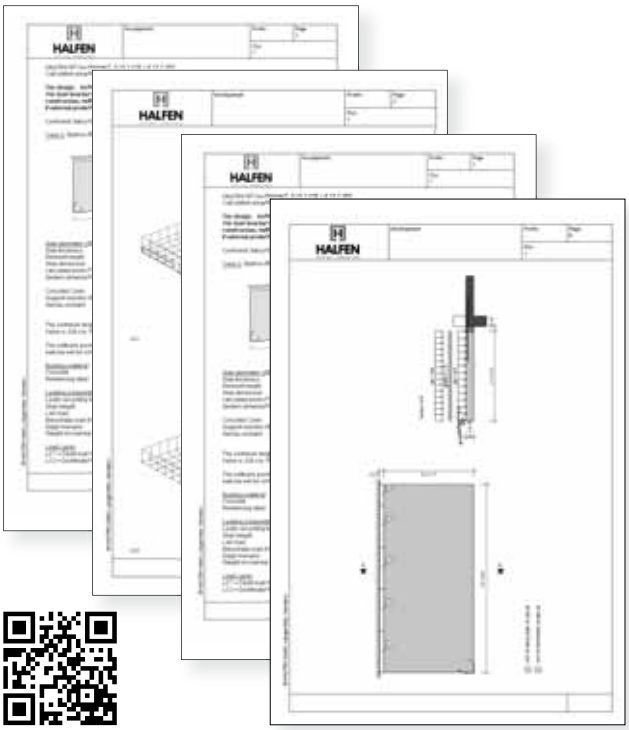


Step 2: Output of verifiable structural calculations

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 MV-0704-22-100-30		4	4
1	HIT-SP MV-0402-22-050-30		4	1
2	HIT-SP MV-0604-22-100-30		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 approvals ETA-13/0546, Z-15.7-293, Z-15.7-309 or Z-15.7-312 are also available – in keeping with HALFEN`s integral safety concept that no further approvals need to be acquired by planners when using any HALFEN HIT Insulated connections.

Micro FE by mbAEC Software

- Integration of HIT Elements into the powerful FE System especially for the building industry

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