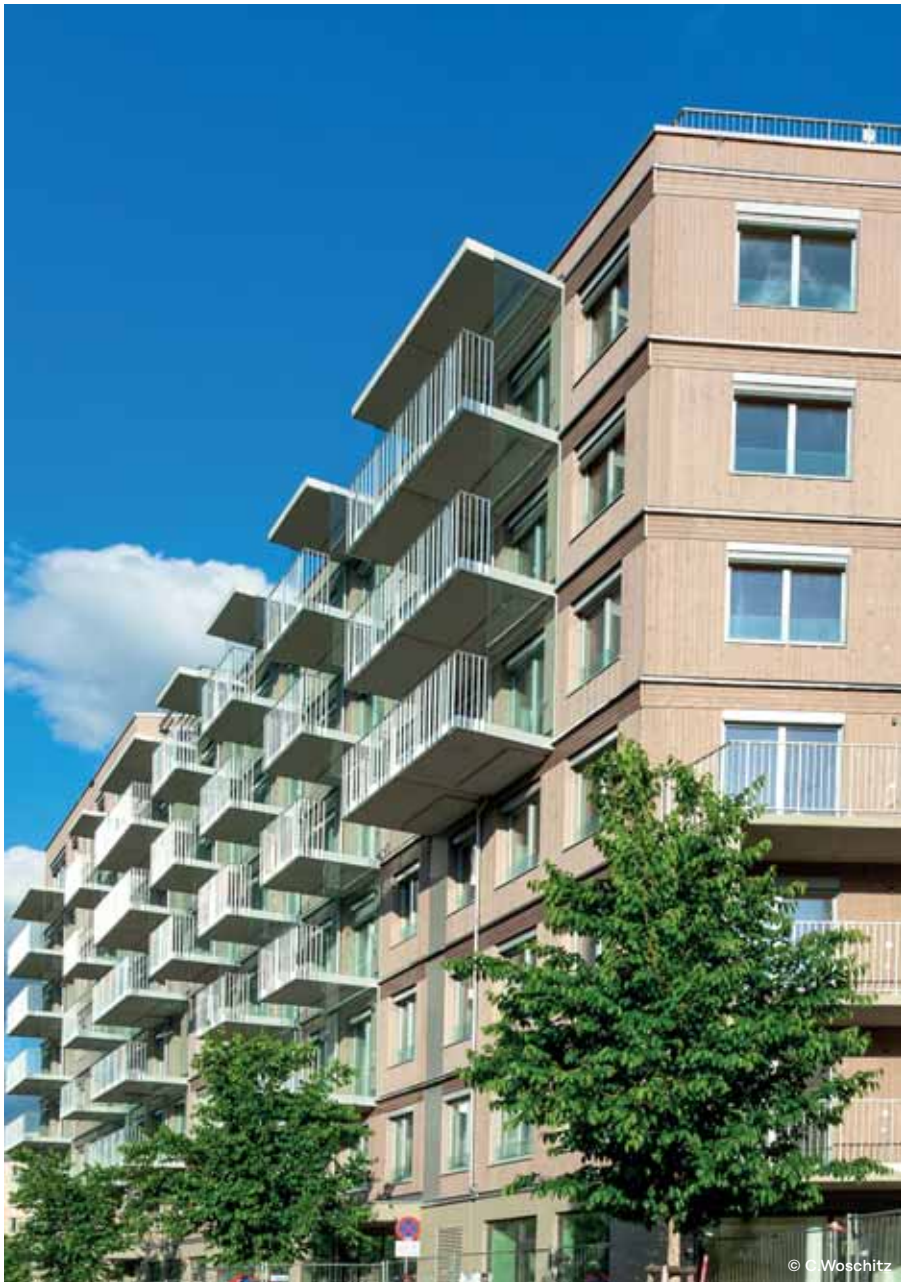
TimXtend – innovative balcony solutions for multi-storey timber construction

Wood is both a high-performance and an environmentally friendly building material. But even the best building material have limitations in certain applications. An example of this is the balcony design and balcony fastening in multi-storey wooden buildings. The project partners RWT plus, Rothoblaas and Leviat have set themselves the task of finding innovative solutions in this area.



Village im Dritten BF11B, Vienna

A specially developed connection for reinforced concrete balconies to all-timber buildings opens up new possibilities for the creation of sustainable living space in the urban environment.

With a balcony design made exclusively of wood, the legal requirements such as fire resistance cannot always be covered. Therefore, a system of innovative construction products was developed that offers standardised connection solutions for reinforced concrete balconies to solid wood ceilings. With the new system in multi-storey residential construction, there are no longer any compromises between a sustainable ceiling structure in wood construction and a cantilevered balcony – with **TimXtend** both are possible.

RWT PLUS

Leviat
A CRH COMPANY

rothoblaas
Solutions for Building Technology

TimXtend – innovative balcony solutions for multi-storey timber construction

Three strong partners for sustainable housing construction

RWT plus ZT GmbH

RWT plus ZT GmbH is a specialised civil engineering office for **structural design, building physics, fire protection planning and sustainable construction**. As part of the Woschitzgroup, the company implements national and international projects throughout Europe.

The range of services includes the structural design of lightweight structures and innovative supporting structures in the areas of timber construction, steel construction, solid construction and facade construction. RWT plus ZT GmbH also offers extensive construction-physical planning, supplemented by fire protection planning and sustainable construction. This comprehensive integral expertise and the experience from numerous successful projects make it possible to develop innovative solutions and to implement technically demanding construction projects.

office@rwt.at, www.woschitzgroup.com

Leviat

Leviat combines the expertise, skills and resources of many product brands such as Halfen, Ancon and Plaka and is represented in over 30 countries and at 60 locations worldwide. As one of the leading providers of fastening, connection and anchoring technology, Leviat offers an extended range of specialised products and extensive technical expertise in fastening, connection and anchoring technology.

One of the most successful product lines has been the Halfen HIT Insulated connections for more than 20 years. The balcony connections offer an effective thermal separation
of the balcony slab and the building and meet maximum fire protection requirements. The properties and load capacities of the Halfen HIT Insulated connections are regulated in a European technical assessment.

www.halfen.com

Rothoblaas

Rothoblaas is a multinational company with origins in the South Tyrolean Alps.

The Rothoblaas product range includes a complete range of products and services for the wood sector: fastening and sealing systems, solutions for sound insulation, fall protection and safety devices.

Rothoblaas is one of the world's leading companies in the development of products and services for the wood industry and, thanks to a number of subsidiaries and strategically located logistics centers, guarantees a worldwide delivery service, where the completeness of the goods and punctuality of delivery is paramount.

With a focus on innovation, Rothoblaas and its partners set new standards in all design and construction processes.

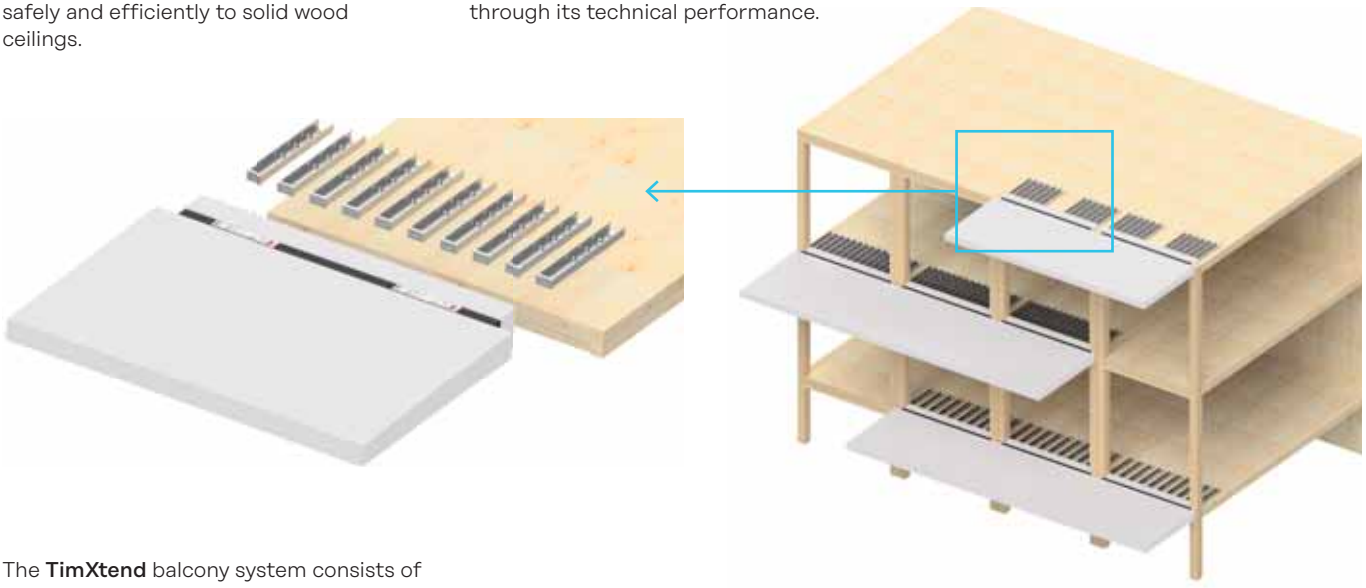
www.rothoblaas.com

TimXtend – innovative balcony solutions for multi-storey timber construction

TimXtend – pioneering solution for modern timber construction

With **TimXtend**, a pioneering solution for the modern timber construction: a standardized balcony system that connects freely cantilevered balconies safely and efficiently to solid wood ceilings.

Developed for multi-storey timber construction, **TimXtend** contributes to the spread of timber construction and thus to the greening of the construction industry through its technical performance.



The **TimXtend** balcony system consists of three main components:

① a solid wood ceiling to which the balcony is connected.

② Halfen HIT Insulated connection allows the balcony system to be supplied as a fully prefabricated unit with an integrated thermal break.

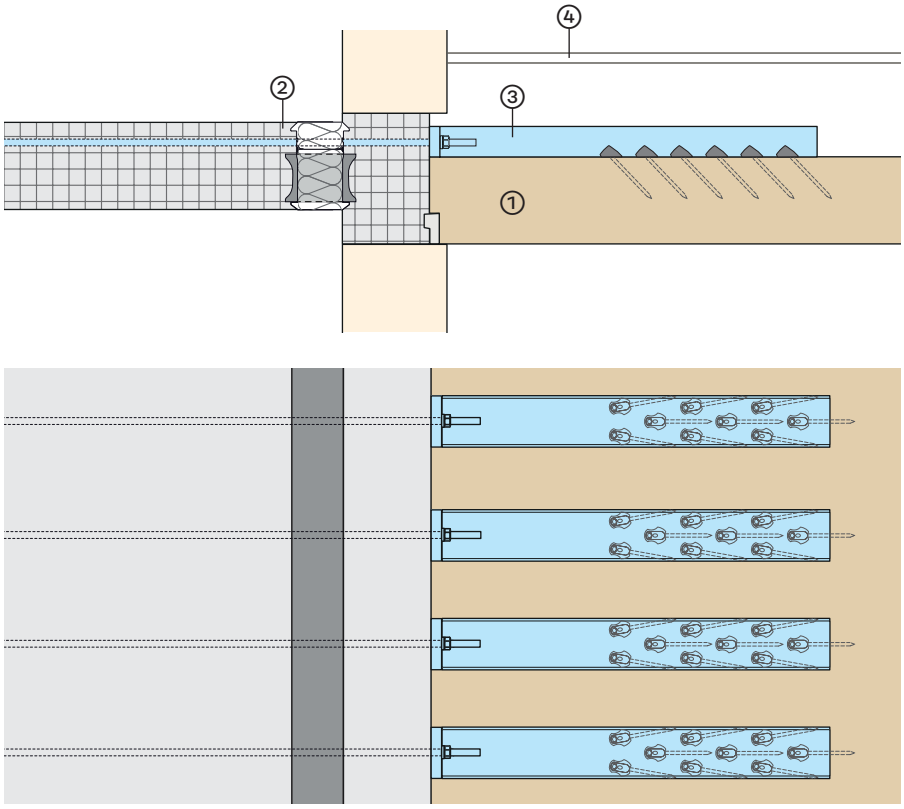
③ Steel connectors WHTVG900 for the secure connection of the complete finished part to the solid wood ceiling.

This sophisticated system solution enables simple and efficient installation and at the same time guarantees a high load-bearing capacity.

④ The floor construction is project specific and must be designed to meet building physics requirements.

A decisive advantage of the **TimXtend** system lies in its maximum flexibility. Thanks to the modular design, balcony dimensions can be individually configured and flexibly adapted to the respective structural requirements. This allows both subsequent assembly, as well as separate dismantling and reuse a central aspect for sustainable construction projects according to the principles of circular construction.

An additional layer of concrete on the solid wood ceilings is not required. This simplifies the construction process, significantly reduces the humidity in the construction and the CO_2 consumption.



Cross-section and top view: Connection of the balcony slab with HIT MVX-TS to a wooden ceiling.

TimXtend – innovative balcony solutions for multi-storey timber construction

TimXtend – Innovative standards for modern modular construction

Gesundheitsquartier, Vienna

The system has been ecologically evaluated according to the criteria of ISO 14040 and EN 15804 and sets new standards in terms of sustainability and resource conservation. Thanks to the modular design, the system can be completely disassembled after use and reused for the next project. This allows a second or even third use and significantly extends the life cycle of the system.

Only at the end of its service life will **TimXtend** be disassembled into its main materials in a single variety. The simple separation facilitates efficient recycling, so that the materials can be returned to the raw material cycle and used for new construction projects.

With the combination of re-use and recycling, **TimXtend** actively supports the principles of circular construction, minimizes construction waste and contributes to the long-term conservation of resources.

A high degree of prefabrication ensures a significant reduction in construction and assembly time. The balcony slab including the edge beam of the inner slab is supplied as a prefabricated reinforced concrete element in which the Halfen HIT Insulated connection is already mounted.

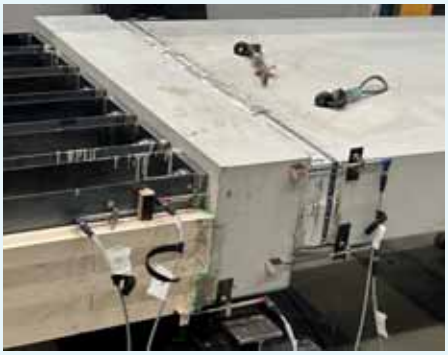
This procedure not only optimizes the construction site logistics, but also ensures a reliable and fast realization.

In addition, **TimXtend** meets the highest fire protection requirements. The overall system achieves fire protection classifications up to REI90. In addition, the system is non-combustible in the outdoor area, which means that the requirements for use in multi-storey residential construction are met. This ensures maximum safety in case of fire.

A high impact sound quality can be guaranteed by tested configurations.

TimXtend – innovative balcony solutions for multi-storey timber construction

TimXtend – Advantages at a glance



Advantages of the TimXtend system

- Innovative cantilevered balcony solution – for multi-storey timber construction
- Subsequent installation – maximum planning flexibility
- Modular disassembly & re-use – sustainable and resource-saving
- Individually configurable balcony dimensions – tailor-made adaptation
- Highest degree of prefabrication – reduced construction and assembly time
- Certified impact sound insulation – for high living comfort
- Meets fire protection requirements REI 90 & A2 – suitable for multi-storey residential buildings
- Sustainable construction method evaluated according to ISO 14040 & EN 15804

HIT MVX-TS

Advantages of Halfen HIT Insulated connections

Halfen HIT Insulated connections serve as thermally insulated connections to reduce thermal bridges in balcony slabs. The new types HIT MVX-TS (Timber Slab) are designed for connection to solid wood ceilings and combine all the advantages of the common HIT balcony connections:

- European Technical Assessment ETA-18/0189
- Highest fire resistance class REI 120 as standard
- Mineral wool as a fire protection material
- Threaded rod with nut and washer for attachment to the wooden ceiling structure

VGS LBS WHTVG900 VGU JIG VGU

Advantages of the Rothoblaas steel connector WHTVG900

Combination of special system connector WHTVG900 with proven standard components.

- **VGS** is the timber construction screw for statically supporting connections with full thread, ideal for connections where a high tensile strength or a high connection stiffness is necessary.
  With approval for application according to ETA -11/0030 and for wood-concrete applications according to ETA-22/0806.
- **VGU** washer 45° for VGS
  The washer can be used to mount VGS full-threaded screws for use on steel plates.
  With CE marking according to ETA 11/0030
- **System connector WHTVG900** as a link between cantilevered balcony system and solid wood ceiling
- **LBS** round head screw is the wood construction screw with a cylindrical bottom head for fixing metal elements such as the WHTVG900 system connector
- **JIG VGU** is the ideal tool for precise 45° pilot holes for the washer VGU.

TimXtend – innovative balcony solutions for multi-storey timber construction

Competence in statics and building physics – RWT plus as a strong partner for your balcony system

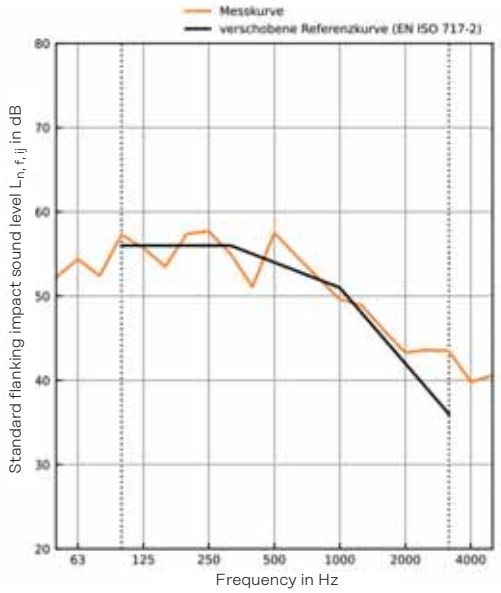
In the development and implementation of innovative balcony systems as well as entire construction projects, RWT plus is your reliable partner for all **static, building physics and fire protection requirements.**

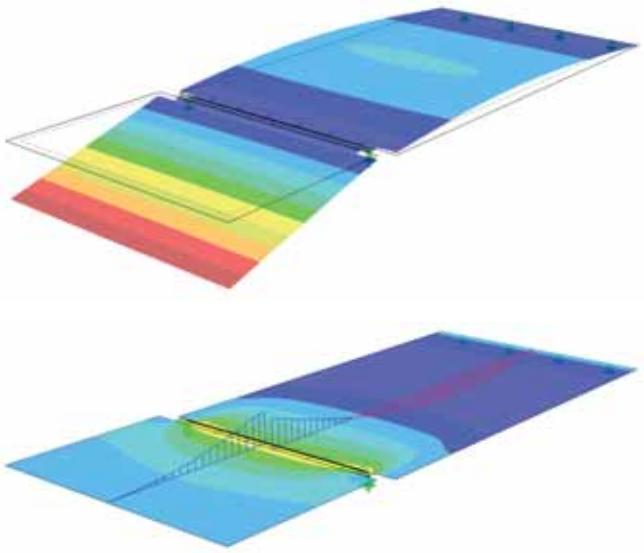
Impact sound protection

In close cooperation with our partners, we have subjected the new TimXtend balcony system to a comprehensive impact sound test in various configurations. The results confirm effective sound insulation as the basis for high living comfort, even with sophisticated building structures.

Vibration analysis

Through detailed analyses of the vibration behavior, RWT plus ensures that the TimXtend balcony system meets all the requirements for usability and comfort. Users benefit from a stable, pleasant walking behavior.





Fire protection

The balcony system has been successfully tested in terms of fire protection technology in cooperation with an accredited testing institute. In addition, RWT plus prepared the project-specific proof of the required fire resistance and, on request, develops customized fire protection concepts – both for the balcony system and for the entire construction project.

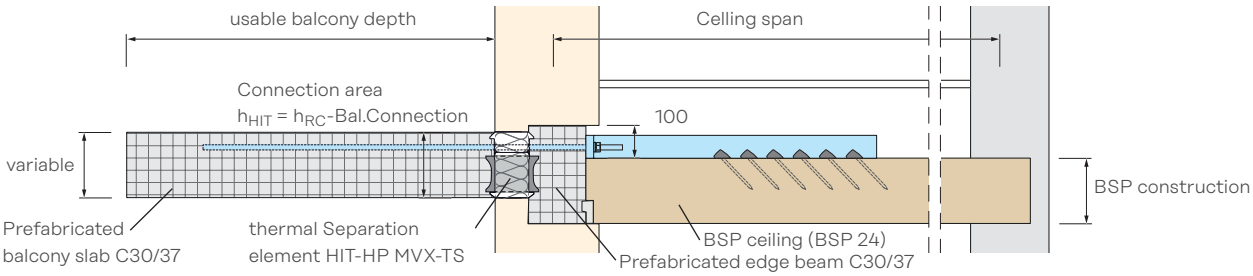
Structural design and special solutions

RWT plus offers all services of structural design, from static design to individual project adjustments to the development of custom-fit special solutions. This ensures a safe and efficient use of the TimXtend system in a wide variety of structural situations.

RWT plus - Technical competence that advances timber construction

TimXtend – innovative balcony solutions for multi-storey timber construction

TimXtend – Preliminary design



TimXtend: max. Balcony depths for example configurations ① ②

Parameters of the connected ceiling		Parameters Connecting TimXtend + balcony			
Usage category A1: Residential 2,8 kN/m² ③		RC-Balcony panel thickness in the connection area [cm]	thermal Separation element ⑨	Balcony live load: 4,0 kN/m² ④	
Floor construction: 3,5 kN/m²				Design ⑤⑥ weight-optimised	Design ⑤⑦ heavy
BSP construction [mm] ⑧	Span up to [m]			max. usable balcony depth [m]	max. usable balcony depth [m]
160 - 5s	4,0	16	HIT-HP MVX-TS-0404-16-100-35	1,60	1,40
			HIT-HP MVX-TS-0606-16-100-35	1,75	1,55
			HIT-HP MVX-TS-0808-16-100-35	1,90	1,65
180 - 5s	4,5	18	HIT-HP MVX-TS-0404-18-100-35	1,75	1,50
			HIT-HP MVX-TS-0606-18-100-35	1,90	1,65
			HIT-HP MVX-TS-0808-18-100-35	2,00	1,75
200 - 5s	5,0	20	HIT-HP MVX-TS-0404-20-100-35	1,80	1,60
			HIT-HP MVX-TS-0606-20-100-35	1,95	1,75
			HIT-HP MVX-TS-0808-20-100-35	2,05	1,80
220 - 7s	5,5	22	HIT-HP MVX-TS-0404-22-100-35	1,95	1,75
			HIT-HP MVX-TS-0606-22-100-35	2,10	1,90
			HIT-HP MVX-TS-0808-22-100-35	2,20	1,95

① Calculation of the limit spans according to Eurocode.

② Calculation of the limit spans in the event that the balcony is connected with HIT elements only over 80% of its width.

③ Live load incl. partition wall surcharge for 1.0-2.0 kN/m

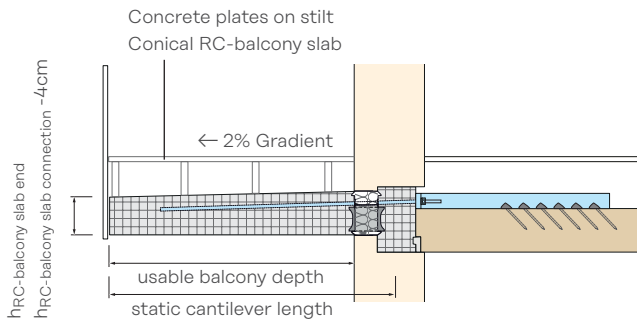
④ Snow load assumption: 1.0kN/m²

⑤ Railing load: 0.5kN/m

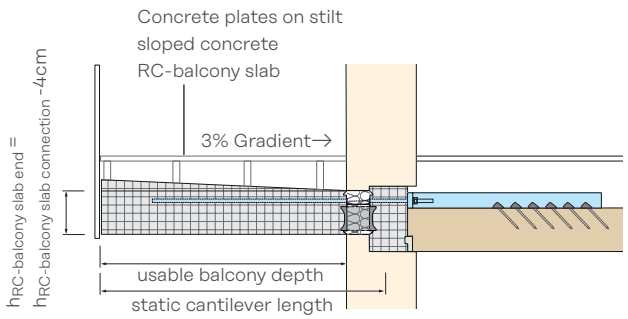
⑧ BSP superstructures with top layer thickness ≥40mm are recommended.

⑨ This table was created for HIT-HP elements. When using HIT-SP elements, the usable balcony depth is reduced and can be estimated according to the following formula: max. usable balcony depth (HIT-SP) = max. usable balcony depth (HIT-HP) x 0.98 - 0.04m.

⑥ Weight-optimised design - Drainage on the railing side



⑦ Heavy design - Drainage on the building side



TimXtend – innovative balcony solutions for multi-storey timber construction

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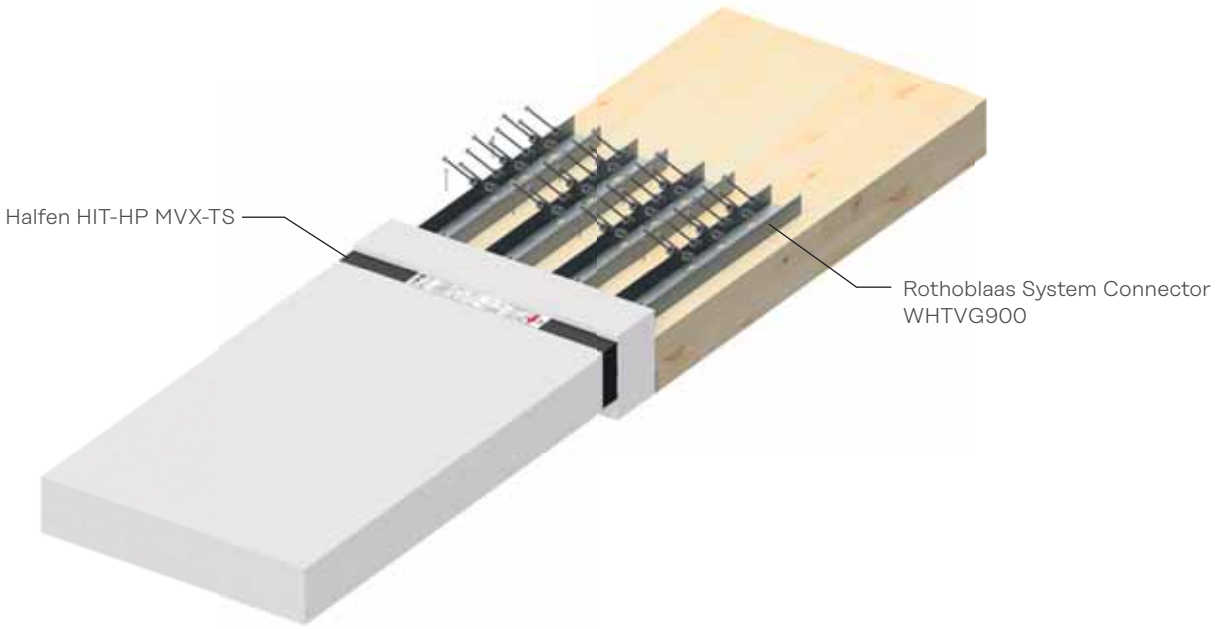
TimXtend Order Overview – Components

As part of the **TimXtend** system, the Rothoblaas WHTVG900 system connector links the cantilevered balcony to the solid wood ceiling. The number of required connectors corresponds to the number of tension rods of the HIT elements. The cantilevered balcony component is decisive for the strength and rigidity of the system.

The WHTVG900 connectors are each equipped with nine inclined countersunk head screws with full thread (VGS), with a diameter of 11mm and a length of 200mm, attached. VGU or VGU DE* washers are used for mounting the VGS countersunk head screws, which ensure correct installation with a 45° angle of inclination. The LBS Round Head screws (ø 7mm) serve as positioning screws. A JIG VGU assembly jig is also available, which can be used to easily perform pilot holes with an inclination of 45°, which means that the VGS countersunk head screws can be screwed into the washers without any problems.



Components of Rothoblaas

Product	Description	d [mm]	Reference item number
WHTVG900	System Connector		WHTVG900
VGS	Countersunk head screw with full thread	ø11	VGS11200
VGU VGU DE*	45° washer for VGS screws	VGS ø11	VGU1145 VGU1145 DE*
LBS	Round Head Screw	ø7	LBS780
JIG VGU, Reference item number JIGVGU1145			

*the VGU1145DE washer is available in Germany

Leviat components

Product	Description	d [mm]	Reference item number
HIT MVX-TS	Halfen HIT Insulated connection for wooden ceilings	ø16	6100000224

TimXtend – innovative balcony solutions for multi-storey timber construction

Halfen HIT MVX-TS – Product variants and load-bearing capasity range

The optimised product range for connection to wooden ceilings (Timber Slab) includes divisible Halfen HIT Insulated connections with four, six or eight tension bars and CSB bearings per meter. Concrete cover is available in 35 mm or 50 mm. Element height ranges from 160 mm to 220 mm in 20 mm steps; a maximum height of 250 mm is also available.

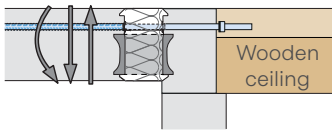
The Halfen HIT MVX-TS are available in two insulation thicknesses: 80mm (HIT-HP) and 120mm (HIT-SP) with standard lengths of 1.0m, 0.5m and 0.25m.

A very robust plastic body, adapted to the transport and installation conditions, envelops the non-combustible insulation material.

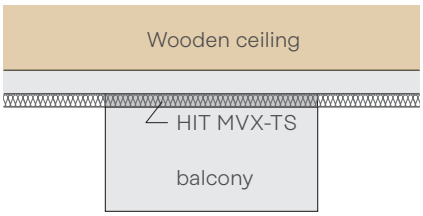
Only two different load-bearing members:

- Tension bars, diameter 16mm, for the transmission of tensile forces.
- Innovative double-symmetrical CSB bearings made of a high-performance mortar with enhanced compressive and tensile strength as well as optimised thermal conductivity for compressive and shear force transmission.

CE CSB REI 120



HIT-HP MVX-TS High Performance with 80mm insulation thickness
HIT-SP MVX-TS Superior Performance with 120mm insulation thickness



Application: cantilevered reinforced concrete balcony

Order example

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

Type designation

① Product Group
② Joint width 80 mm (HP) or 120 mm (SP)
③ Connection Type
④ Number of tension bars
⑤ Number of CSB bearings
⑥ Element height [cm]
⑦ Element width [cm]
⑧ Concrete cover on top [mm]

Available element height h		
Concrete cover, top side [mm]	35	50
Available element height h [cm]	16, 18, 20, 22, 25	18, 20, 22, 25
Element length [cm]	100, 50, 25	

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

Shear load capacity ±v_{Rd}

Concrete strength: C30/37 ≥C35/45

Shear load capacity ±v_{Rd}				
Type / Element Width	B = 1,00 m	HP MVX-TS-0404	HP MVX-TS-0606	HP MVX-TS-0808
	B = 0,50 m	HP MVX-TS-0202	HP MVX-TS-0303	HP MVX-TS-0404
	B = 0,25 m	HP MVX-TS-0101	—	HP MVX-TS-0202
Design values	v_{Rd} [kN/m]	72,8 72,8	109,2 109,2	145,6 145,6

Moment bearing capacity m_{Rd}

Concrete strength: C30/37 ≥C35/45

Moment bearing capacity m_{Rd}								
Type / Element Width	B = 1,00 m		HP MVX-TS-0404		HP MVX-TS-0606		HP MVX-TS-0808	
	B = 0,50 m		HP MVX-TS-0202		HP MVX-TS-0303		HP MVX-TS-0404	
	B = 0,25 m		HP MVX-TS-0101		—		HP MVX-TS-0202	
Concrete cover [mm]	35	50	Concrete strength: C30/37 ≥C35/45					
Design values m_{Rd} [kNm/m] for slab thickness [mm]	160		-27,2	-27,2	-40,8	-40,8	-54,4	-54,4
		180	-28,9	-28,9	-43,4	-43,4	-57,5	-57,8
	180		-34,0	-34,0	-51,1	-51,1	-65,4	-68,0
		200	-35,7	-35,7	-53,6	-53,6	-68,0	-71,5
	200		-40,9	-40,9	-61,3	-61,3	-76,6	-81,7
		220	-42,6	-42,6	-63,9	-63,9	-79,3	-85,2
	220		-47,7	-47,7	-71,6	-71,6	-87,4	-95,4
		250	-52,9	-52,9	-79,3	-79,3	-95,6	-105,7
	250		-58,0	-58,0	-87,0	-87,0	-103,7	-115,4

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

On-site bracket reinforcement $A_{s,req}$ edge beams*				
V_{Ed}↓	direct support	ø6 / 25cm	ø6 / 24cm	ø6 / 18cm
	indirect support	ø8 / 20cm	ø8 / 13cm	ø8 / 10cm
V_{Ed}↑	direct/indirect support	ø6 / 25cm	ø6 / 24cm	ø6 / 18cm

* Provide this reinforcement in addition to the edge beam stirrup reinforcement; the two reinforcement layers may be combined so that a uniform bar diameter and spacing can be used.

On-site stirrup reinforcement $A_{s,req}$ on the balcony side			
V_{Ed}↓	ø6 / 25cm	ø6 / 24cm	ø6 / 18cm
V_{Ed}↑	ø8 / 20cm	ø8 / 13cm	ø8/10cm

Camber of the balcony slab

To limit deflection we recommend under-exaggerating the planned drainage flow when casting cantilevered slabs. The required camber is the sum of the slab deformation calculated in accordance with EN 1992-1-1 and EN 1992-1-1/NA, and the deformation component *ü* contributed by the Halfen HIT Insulated connections. The coefficient factor for camber increase *ü** refers **only to deformation** in Halfen HIT Insulated connection HIT-HP/SP MVX-TS 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

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: $\mathbf{E_{d,perm} = 0{,}524\ R_d}$

The camber coefficients *ü** refer to the full utilisation of the bending moment capacity m_{Rd} of the Halfen HIT Insulated connection. It is recommended to take the actual permanent action $E_{d,perm}$ into account when determining the formwork camber *ü*. When selecting the camber, the drainage direction should, if necessary, be considered by applying a safety margin (positive or negative).

$$ü\ [mm] = ü^* \times l_k\ [m] \times 10 \times \frac{m_{Ed,perm}}{(0{,}524 \times m_{Rd})}$$

with ü Camber from HIT Components deformation in [mm]
ü* Camber coefficient
l_k Span of cantilever slab in [m]
m_{Rd} Design value of the load bearing capacity in [kNm/m]
$m_{Ed,perm}$ Bending moment at serviceability limit states (quasi-permanent combination) in [kNm/m]

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

Type / Element Width	B = 1,00 m		HP MVX-TS-0404		HP MVX-TS-0606		HP MVX-TS-0808	
	B = 0,50 m		HP MVX-TS-0202		HP MVX-TS-0303		HP MVX-TS-0404	
	B = 0,25 m		HP MVX-TS-0101		—		HP MVX-TS-0202	
Concrete cover [mm]	35	50	Concrete strength: C30/37 ≥C35/45					
Camber ü* [%]	160		1,00	1,00	1,00	1,00	1,00	1,00
		180	0,95	0,95	0,95	0,95	0,95	0,95
	180		0,84	0,84	0,84	0,84	0,81	0,84
		200	0,81	0,81	0,81	0,81	0,77	0,81
	200		0,73	0,73	0,73	0,73	0,68	0,73
		220	0,70	0,70	0,70	0,70	0,66	0,70
	220		0,64	0,64	0,64	0,64	0,59	0,64
		250	0,58	0,58	0,58	0,58	0,53	0,58
	250		0,54	0,54	0,54	0,54	0,49	0,54

Torsion spring [kNm/rad/m]

Type / Element Width	B = 1,00 m		HP MVX-TS-0404	HP MVX-TS-0606	HP MVX-TS-0808
	B = 0,50 m		HP MVX-TS-0202	HP MVX-TS-0303	HP MVX-TS-0404
	B = 0,25 m		HP MVX-TS-0101	—	HP MVX-TS-0202
Concrete cover [mm]	35	50			
Torsion spring [kNm/rad/m] for slab thickness [mm]	160		1400	2100	2900
		180	1600	2400	3200
	180		2100	3200	4200
		200	2300	3500	4600
	200		3000	4400	5900
		220	3200	4800	6300
	220		3900	5900	7800
		250	4700	7100	9400
	250		5600	8500	11200

TimXtend – innovative balcony solutions for multi-storey timber construction

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

Shear load capacity ±v_{Rd}

Concrete strength: C30/37 ≥C35/45

120

Shear load capacity ±v_{Rd}				
Type / Element Width	B = 1,00 m	SP MVX-TS-0404	SP MVX-TS-0606	SP MVX-TS-0808
	B = 0,50 m	SP MVX-TS-0202	SP MVX-TS-0303	SP MVX-TS-0404
	B = 0,25 m	SP MVX-TS-0101	—	SP MVX-TS-0202
Design values	v_{Rd} [kN/m]	70,8 72,8	106,2 109,2	114,4 125,6

Moment bearing capacity m_{Rd}

Concrete strength: C30/37 ≥C35/45

Moment bearing capacity m_{Rd}								
Type / Element Width	B = 1,00 m		SP MVX-TS-0404		SP MVX-TS-0606		SP MVX-TS-0808	
	B = 0,50 m		SP MVX-TS-0202		SP MVX-TS-0303		SP MVX-TS-0404	
	B = 0,25 m		SP MVX-TS-0101		—		SP MVX-TS-0202	
Concrete cover [mm]	35	50	Concrete strength: C30/37 ≥C35/45					
Design values m_{Rd} [kNm/m] slab thickness [mm]	160		-27,2	-27,2	-40,8	-40,8	-54,4	-54,4
		180	-28,9	-28,9	-43,4	-43,4	-57,5	-57,8
	180		-34,0	-34,0	-51,1	-51,1	-65,4	-68,0
		200	-35,7	-35,7	-53,6	-53,6	-68,0	-71,5
	200		-40,9	-40,9	-61,3	-61,3	-76,6	-81,7
		220	-42,6	-42,6	-63,9	-63,9	-79,3	-85,2
	220		-47,7	-47,7	-71,6	-71,6	-87,4	-95,4
		250	-52,9	-52,9	-79,3	-79,3	-95,6	-105,7
	250		-58,0	-58,0	-87,0	-87,0	-103,7	-115,4

On-site stirrup reinforcement $A_{s,req}$ on the balcony side

On-site stirrup reinforcement $A_{s,req}$ edge beams*				
V_{Ed}↓	direct support	ø6 / 25cm	ø6 / 24cm	ø6 / 18cm
	indirect support	ø8 / 20cm	ø8 / 13cm	ø8 / 10cm
V_{Ed}↑	direct/indirect support	ø6 / 25cm	ø6 / 24cm	ø6 / 18cm

* This reinforcement must be inserted in addition to the stirrup reinforcement of the edge beam, whereby both types of reinforcement can be combined and a uniform diameter and spacing can be selected.

On-site stirrup reinforcement $A_{s,req}$ on the balcony side			
V_{Ed}↓	ø6 / 25cm	ø6 / 24cm	ø6 / 18cm
V_{Ed}↑	ø8 / 20cm	ø8 / 13cm	ø8/10cm

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Camber coefficients

HIT-SP: Camber coefficients ü* [%] at maximum element load capacity (m_{Rd})								
Type / Element Width	B = 1,00 m		SP MVX-TS-0404		SP MVX-TS-0606		SP MVX-TS-0808	
	B = 0,50 m		SP MVX-TS-0202		SP MVX-TS-0303		SP MVX-TS-0404	
	B = 0,25 m		SP MVX-TS-0101		—		SP MVX-TS-0202	
Concrete cover [mm]	35	50	Concrete strength: C30/37 ≥C35/45					
Camber ü* [%]	160		1,13	1,13	1,13	1,13	1,13	1,13
		180	1,08	1,08	1,08	1,08	1,08	1,08
	180		0,96	0,95	0,96	0,95	0,92	0,95
		200	0,92	0,92	0,92	0,92	0,88	0,92
	200		0,82	0,82	0,82	0,82	0,78	0,82
		220	0,80	0,80	0,80	0,80	0,75	0,80
	220		0,72	0,72	0,72	0,72	0,67	0,72
		250	0,66	0,66	0,66	0,66	0,61	0,66
	250		0,61	0,61	0,61	0,61	0,55	0,61

Torsion spring [kNm/rad/m]					
Type / Element Width	B = 1,00 m		SP MVX-TS-0404	SP MVX-TS-0606	SP MVX-TS-0808
	B = 0,50 m		SP MVX-TS-0202	SP MVX-TS-0303	SP MVX-TS-0404
	B = 0,25 m		SP MVX-TS-0101	—	SP MVX-TS-0202
Concrete cover [mm]	35	50			
Torsion spring [kNm/rad/m] for slab thickness [mm]	160		1300	1900	2500
		180	1400	2100	2800
	180		1900	2800	3700
		200	2000	3100	4100
	200		2600	3900	5200
		220	2800	4200	5600
	220		3500	5200	6900
		250	4200	6300	8300
	250		5000	7500	9800

R-224 – 09/25-EN PDF 09/25

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