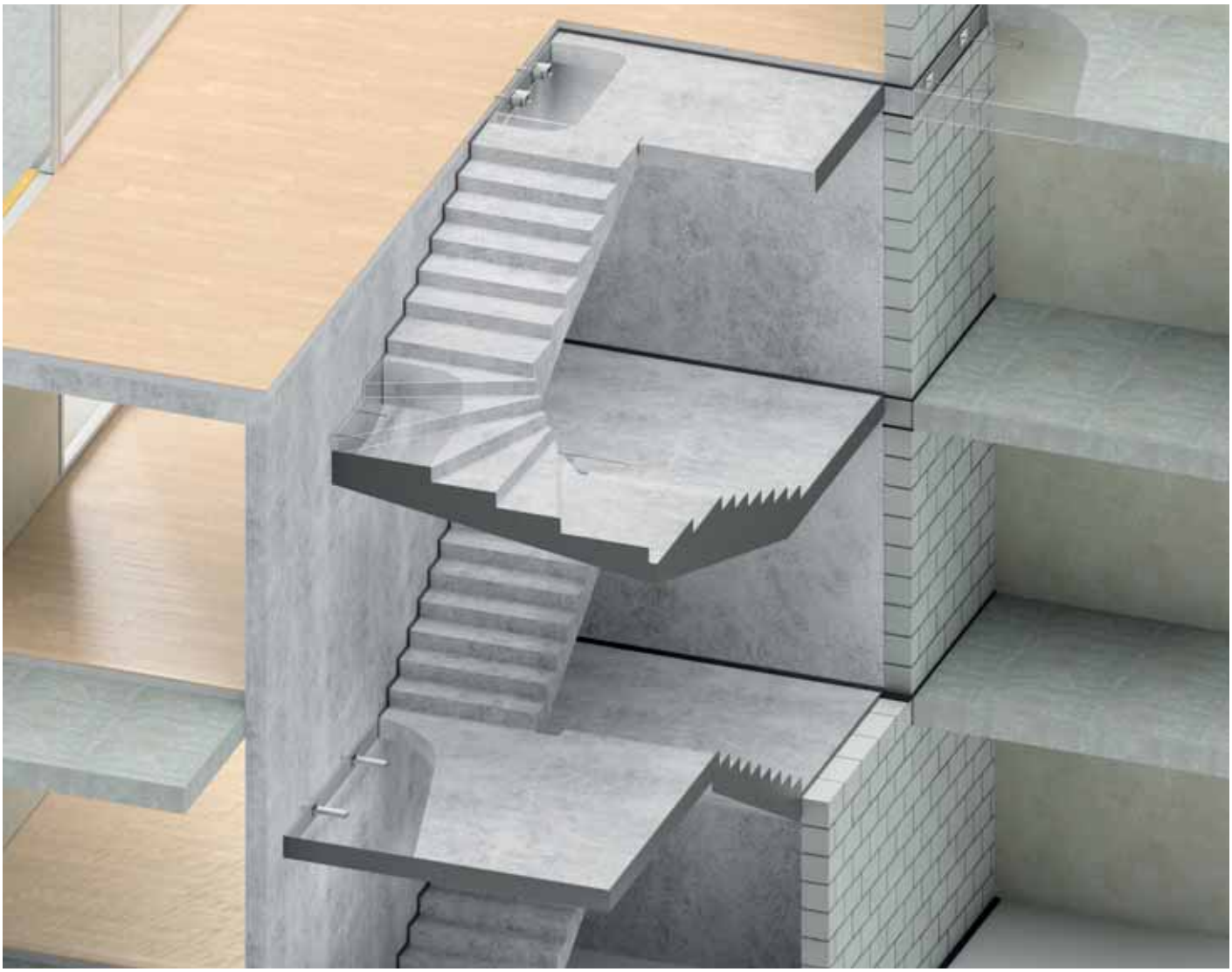
Leviat®

High Performance Sound Insulation Products

Technical Product Information



Structural Connections

Acoustic dowels and bearings

English

Imagine. Model. Make.

Leviat®

We imagine, model and make engineered products and innovative construction solutions that help turn architectural visions into reality and enable our construction partners to build better, safer, stronger and faster.

Leviat is a world leader in connecting, fixing, lifting and anchoring technology.

From the build of new schools, hospitals, homes and infrastructure, to the repair and maintenance of heritage structures, our engineering skills are making a difference around the world.

We provide technical design assistance at every stage of a project, from initial planning to installation and beyond.

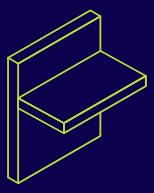
Our technical support services range from simple product selection through to the development of a fully customised project-specific design solution.

Every promise we make locally, has the commitment and dedication of our global team behind it. We employ almost 3,000 people at 60 locations across North America, Europe and Asia-Pacific, providing an agile and responsive service worldwide.

>3,000
People

60+
Locations

~20
Countries

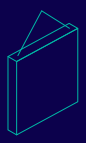


Structural Connections

Systems to form robust, efficient connections, and continuity of concrete reinforcement as necessary, between walls, slabs, columns, beams and balconies, providing structural integrity as well as enhanced thermal and acoustic performance.

- Insulated balcony connectors
- Reinforcing bar couplers
- Concrete Connections
- Reinforcement continuity systems
- Punching shear reinforcement
- Shear load connectors
- Floor Joint Systems
- Precast / Reinforced Columns
- Infrastructure Products
- Precast Connections
- Acoustic dowels and bearings
- Prestress

Other areas of expertise:

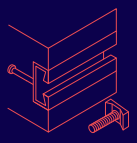


Lifting & Bracing

Systems for the safe and efficient transportation, lifting and temporary bracing of cast concrete elements and tilt-up panels before permanent structural connections are made.

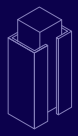
Façade Support & Restraint

Systems for the safe and thermally-efficient fixing of the external building envelope, including brick and natural stone, insulated sandwich panels, curtain walling and suspended concrete façades, and also the repair and strengthening of existing masonry installations.



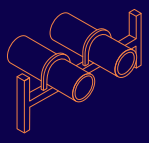
Anchoring & Fixing

Systems for fixing secondary fixtures to concrete, including anchor channels, bolts and inserts; also tension rod systems for roofs and canopies.



Formwork & Site Accessories

Non-structural accessories that complement our engineered solutions and help keep your construction environment operating safely and efficiently, including moulds for casting standard and special concrete elements and construction essentials such as reinforcing bar spacers.



Industrial Technology

Mounting channels, pipe clamps and other versatile framing systems that provide safe fixing in a wide range of industrial applications.

Leviat product ranges:

Ancon | Connolly | Halfen | Helifix | Isedio | Meadow Burke | Modersohn | Moment | | Scaldex | Thermomass

High performance impact sound insulation products

For peaceful and quiet staircases

Halfen ISI – The new generation of high performance impact sound insulation products

Noise pollution can significantly affect the quality of life in residential buildings and performance in office buildings. Noise pollution caused by impact sound in insufficiently insulated staircases is particularly unpleasant. We offer reliable solutions for staircases with our new high performance and reliable products.
HBB impact sound insulation boxes, HTF impact sound insulation elements and CRET-TS vertical impact sound insulation dowels.

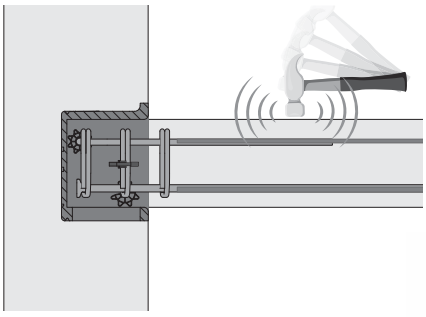
Outstanding impact sound insulation values!

- Effective and permanent decoupling of the landing slabs or the stairs
  from adjacent residential elements
- Excellent impact sound insulation values, tested in accordance with DIN 7396
- The requirements of superior acoustic comfort according to DIN 4109-5
  are far exceeded
- The highest requirements of the VDI or DEGA guidelines can be met
- High load capacity, with non-reinforced elastomeric bearings
- Concrete grey colour to match the prefabricated elements, easier processing of the finishing works

Easy and safe installation on-site / at the precast factory

Halfen HBB Impact sound insulation boxes are applied as point supports for the landing slabs, either precast or poured in-situ.

- One standard box size, suitable for all landing slab heights
- Very sturdy box
- One standard prefabricated Halfen HBB-Rebar-cage-VVH for all landing slab heights and for all HBB-boxes
- Test report S-WUE/220241, LGA Würzburg - Germany, in accordance
  with EC2, guarantees the total reliability of the solution



Impact sound insulation

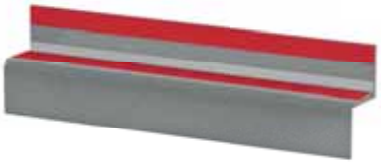
Halfen HTF Impact sound insulation elements for effective and permanent acoustic decoupling of the prefabricated staircase from the landing

- Designed with a light grey color to match the precast concrete elements
- Light and robust materials
- Fitted adhesive strips with protective foil with convenient tab to enable easy removal.
- Heavy-duty profiled, non-reinforced elastomeric bearings

Halfen HBB-SET

Halfen HTF-B

CRET-TS dowel



Halfen HTF-T

Halfen HBB-O-Box

Contents

High performance impact sound insulation products

Introduction

Scientifically verified and tested

In structural engineering, the demands on noise insulation are steadily increasing – on one hand through legislation and codes, and on the other hand from building owners themselves.

In response, our innovative and qualitatively superior load transmission elements are being consistently optimized. Consequently, in close collaboration with several institutes and based on normalised test procedures, noise insulating bearings and anchors have been developed. These products are the result of extensive studies of building acoustics.

A wide variety of insulation materials were investigated at a wide range of excitation frequencies to determine their vibration and structure-borne noise damping properties – with regard to extended service life of the materials used.

Outstanding quality

In addition to its high-level structural properties, the new Leviat acoustic product range exhibits enhanced noise reduction characteristics. Outstanding features are the use of new, select-grade materials and their completely innovative design. As a result, they enable the straightforward and efficient acoustic insulation of structural elements. Quality assurance is fundamental to safety and trust, and consequently a cornerstone of the success of any product.

The design, scheduling, procurement and quality control of our acoustic products are conducted in strict accordance with our ISO 9001 compliant internal management system.

Increased needs of modern society

Thanks to ongoing advances in technology, there are a steadily increasing number of products on offer that reduce noise emission levels. At the same time, however, people are exposed to a greater diversity of sources of noise. Moreover, our modern society longs for peace and quiet. Consequently, inhabitants are ever less willing to simply accept the intrusion of noise and are demanding better levels of protection against it. In addition, sound insulation also takes on greater importance because of high-density building. Building owners are relaying these demands to planners.

This greater need for noise reduction, reflected in the most stringent requirements of building codes, demands a continuing increase in the improvement of insulation against external noise. However, with lower external noise levels comes a heightened perception of unwelcome internal noise. For this reason, not only the transmission of airborne noise from one internal room to another, but also the transmission of structure-borne and impact noise is of considerable significance.

Impact noise is generated by people walking, whereby the floor is deformed locally. Sound waves are created that propagate through the building structure and cause other structural elements to oscillate.

From these oscillations radiate sound waves that are audible as impact noise. Hence, the vibration decoupling of building elements is extremely important. It allows the propagation of structure-borne and impact noise to be reduced and – depending on the acoustic quality of the isolation – the radiated structure-borne noise to be significantly lowered or even completely eliminated.

Efficiency and installation

In addition to the selection of high-quality products, the professional installation and application of these products are crucial. Unlike other physical processes such as heat transmission, even the smallest structure-borne sound bridge can significantly reduce the impact noise insulation effect, or at worst, cancel it entirely. This is because even a modest amount of energy is sufficient to acoustically excite building elements.

There is no need for extensive transmission points; the existence of a small, rigid bridge is enough to trigger the effect. To avoid creating structure-borne sound bridges during construction work, installation instructions are available for every type of Leviat acoustic product.

Text by: Prof. Dr. Ing. Urs Bopp SIA/VDI, FHNW School of Engineering and Prof. Dr. sc. math. Marcel Steiner, FHNW School of Engineering

The acoustic quality of homes and buildings is increasingly an important consideration in new construction and renovation projects. Meeting performance requirements is a better choice than facing failure and repair costs in the event of inadequate sound insulation. Good noise control in construction, also known as building acoustics, is based on correct detailing, reliable execution and the application of the right building materials and solutions.

This is a comprehensive and complex matter in which **Leviat** can be a specialised partner in your project. **Leviat** has extensive knowledge and solutions in the field of building acoustics.

These building acoustic solutions have already been successfully applied in a wide variety of projects.

High performance impact sound insulation products
Introduction

Measurement and evaluation procedure

In June 2016 a standardised test method for the acoustical designation of decoupling elements for heavy stairs was introduced in DIN 7396:2016 for the first time. This standard defines design variables, the measurement configuration and how the measurements are performed and evaluated.

For the acoustical characterisation of decoupling elements for heavy stairs, the standard defines two methods for decoupled landing supports and decoupled stair supports:

- the **difference** in impact sound pressure level ΔL^* and
- the **reduction** in impact sound pressure level ΔL.

To differentiate between decoupled landing support and decoupled stair support, the acoustical designation is prefixed by "landing" or "stair" suffixed at the symbol (L or ΔL).

The following description is limited to the acoustic testing of the decoupled landing support.

In both test methods (difference in impact sound pressure level of the landing and reduction in impact sound pressure level of the landing), the decoupled landing is measured in the same way: the landing is excited with a standard tapping machine and the transmitted sound pressure level in the adjacent reception area is measured for every one-third octave frequency.

The measured one-third octave level is converted to a standardised receiving room and correspondingly denoted as normalised impact sound pressure level of the landing $L_{n,landing}$.

Reference measurement

The difference between the two test methods lies in the way the reference measurement is performed.

In the test method for determining the **difference** in impact sound pressure level, the landing is rigidly installed in the reference wall, the landing is excited with the standard tapping machine and the impact sound level is then measured in the adjacent receiving room as the normalised impact sound pressure level of the reference landing $L_{n0,landing}$.

In the test method for determining the **reduction** in impact sound pressure level, no landing is installed in the reference wall for the reference measurement. The reference wall is excited directly with an electromagnetic tapping machine and the impact sound level is then measured in the adjacent receiving room as the normalised impact sound pressure level of the wall $L_{n0,wall}$.

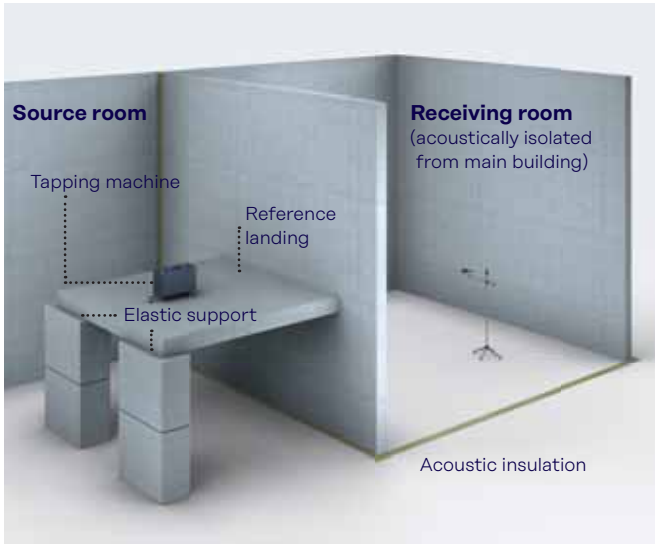
The difference between the measurement with excitation on the rigidly installed landing and on the decoupled landing (with sound-reducing measure) is calculated for every one-third octave frequency and denoted as the **difference in impact sound pressure level of the landing:**

$$\Delta L^*_{landing} = L_{n0,landing} - L_{n,landing}$$

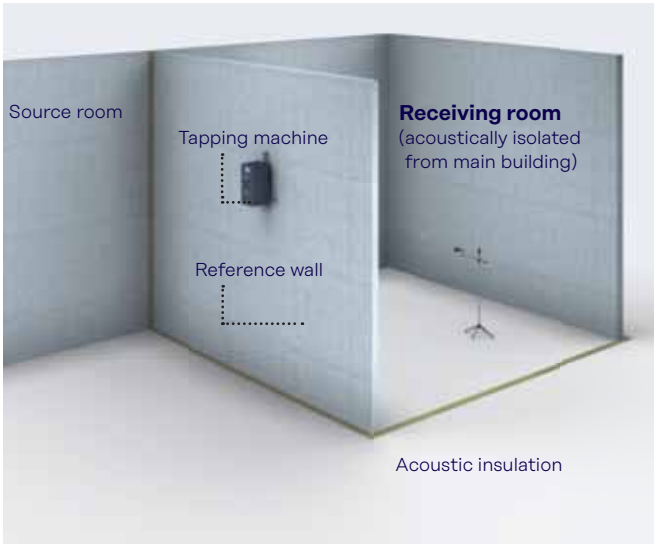
The difference between the measurement with excitation on the reference wall and on the decoupled landing (with sound-reducing measure) is calculated for every one-third octave frequency and denoted as the reduction in impact sound pressure level:

$$\Delta L_{landing} = L_{n0,wall} - L_{n,landing}$$

This leads to numerical values of the reduction in impact sound pressure level of the landing $\Delta L_{landing}$ being higher than those of the difference in impact sound pressure level of the landing $\Delta L^*_{landing}$.



Schematic diagram of the measurement of the weighted normalised impact sound pressure level of the landing where the reference stair landing is rigidly installed



Schematic diagram of the measurement of the normalised impact sound pressure level of the reference wall

High performance impact sound insulation products

Introduction

Single value

For a simpler characterisation of the acoustic effects of the decoupled support, DIN 7396:2016 requires a single value to be calculated in accordance with DIN EN ISO 717-2. The reference floor method is used for this purpose, where the values of the difference in impact sound pressure level of the landing DL*landing (or the reduction in impact sound pressure level of the landing DL landing) in the frequency range between 100 Hz and 3150 Hz are subtracted from
a curve, defined in the standard, of a "boundless" reference floor. This is used to determine the curve of a "reference floor with sound insulation measure".

This "curve of the reference floor with sound insulation measure" is compared with a reference curve (see illustration of the weighted impact sound pressure level of the landing using the reference floor method).

The reference curve is vertically offset in steps of 1 dB until the sum of the differences between the impact sound level and the reference curve in the one-third octaves in which the impact sound pressure levels are higher than the reference curve is less than 32 dB.
The level value of the offset reference curve at 500 Hz is then equivalent to the weighted normalised impact sound pressure level of the landing L n,w,landing.

The weighted difference in impact sound pressure level of the landing is then denoted by:

$$\Delta L^{*}_{w,landing} = L_{n,r,0,w} - L_{n,w,landing}$$

where Ln,r,0,w is the weighted normalised impact sound pressure level of the "boundless" reference floor. The weighted reduction in impact sound pressure level of the landing is determined analogously.

What DIN 7396:2016 denotes as the weighted reduction in impact sound pressure level of the landing DLw, landing is the new acoustic measure.
It can be used as the input variable for the theoretical forecast of impact sound transmission in accordance with DIN EN 12354-2.

To enable a comparison with earlier product parameters, it is also possible to calculate the weighted difference in impact sound pressure level DL*n,w without using the reference floor method. In this case the curve of the normalised impact sound pressure level of the reference landing (Ln0,w,landing) is used instead of the normalised curve of an "unfinished" reference floor.
As described above, the reference curve is shifted both for the curve of the measured normalised impact sound pressure level of the rigidly installed landing and for the curve of the measured normalised impact sound pressure level of the decoupled landing (Ln,w,landing).
The difference in the sound pressure levels of the two correspondingly shifted reference curves at 500 Hz is the weighted difference in impact sound pressure level DL*n,w (see illustration of the weighted difference in impact sound pressure level of the landing without applying the reference floor method):

$$\Delta L^{*}_{n,w} = L_{n0,w,landing} - L_{n,w,landing}$$

Designation	Type	$\Delta L^{*}_{w,stairs}$ / $\Delta L^{*}_{w,landing}$ [dB]	$\Delta L_{w,stairs}$ / $\Delta L_{w,landing}$ [dB]	$\Delta L^{*}_{n,w}$ [dB]	Compressive deformation [mm]
HBB-Box	V / OV	≥ 26 ①	≥ 35 ①	≥ 29 ①	2.4 ①
	VV / OVV	≥ 26 ①	≥ 35 ①	≥ 29 ①	2.4 ①
	VVH/ OVVH	≥ 26	≥ 35	≥ 29	2.4
HTF-T	T0	≥ 28	≥ 28	≥ 33	2.4
	T1	≥ 29	≥ 31	≥ 34	2.2
	T2	≥ 27	≥ 29	≥ 31	2.7
HTF-B	B0	≥ 28 ②	≥ 28 ②	≥ 33 ②	2.4 ②
	B1	≥ 28	≥ 30	≥ 33	2.1
	B2	≥ 27	≥ 28	≥ 31	2.8

① value taken from HBB-VVH ② value taken from HTF-T0

Notations

$\Delta L^{*}_{w,stairs}$	Weighted difference in impact sound pressure level of the stairs in accordance with DIN 7396:2016 applying the reference floor method
$\Delta L^{*}_{w,landing}$	Weighted difference in impact sound pressure level of the landing in accordance with DIN 7396:2016 applying the reference floor method
$\Delta L_{w,stairs}$	Weighted reduction in impact sound pressure level of the stairs in accordance with DIN 7396:2016
$\Delta L_{w,landing}$	Weighted reduction in impact sound pressure level of the landing in accordance with DIN 7396:2016
$\Delta L^{*}_{n,w}$	Weighted difference in impact sound pressure level in accordance with / based on DIN 7396:2016 without applying the reference floor method

Halfen HBB-Box – Impact sound insulation box for landing slabs

Product Overview

HBB-Box – for precast landing slabs

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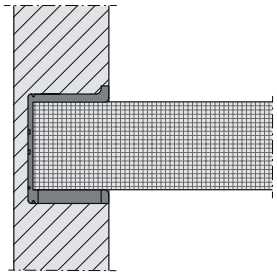

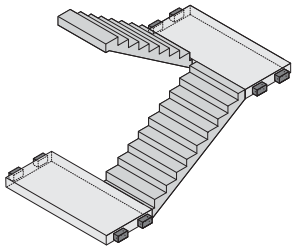

HBB-Rebar-cage-VVH

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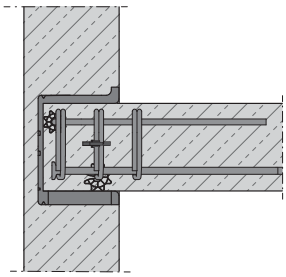

HBB-Rebar-cage-VVH reduces the complexity and the installation time of on-site production of the corbel reinforcement. A type test is available for this application.

HBB-O-Box – for in-situ landing slabs

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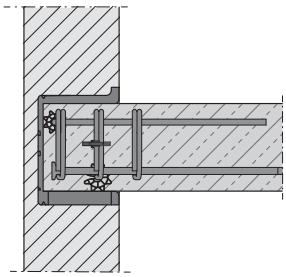

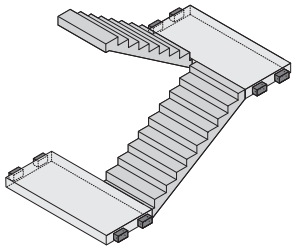

HBB-SET

HBB-Box with HBB-Rebar-cage-VVH

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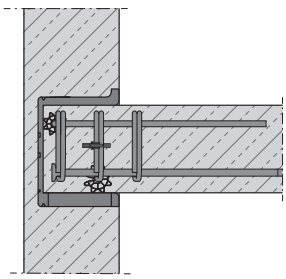
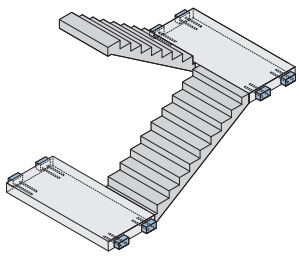
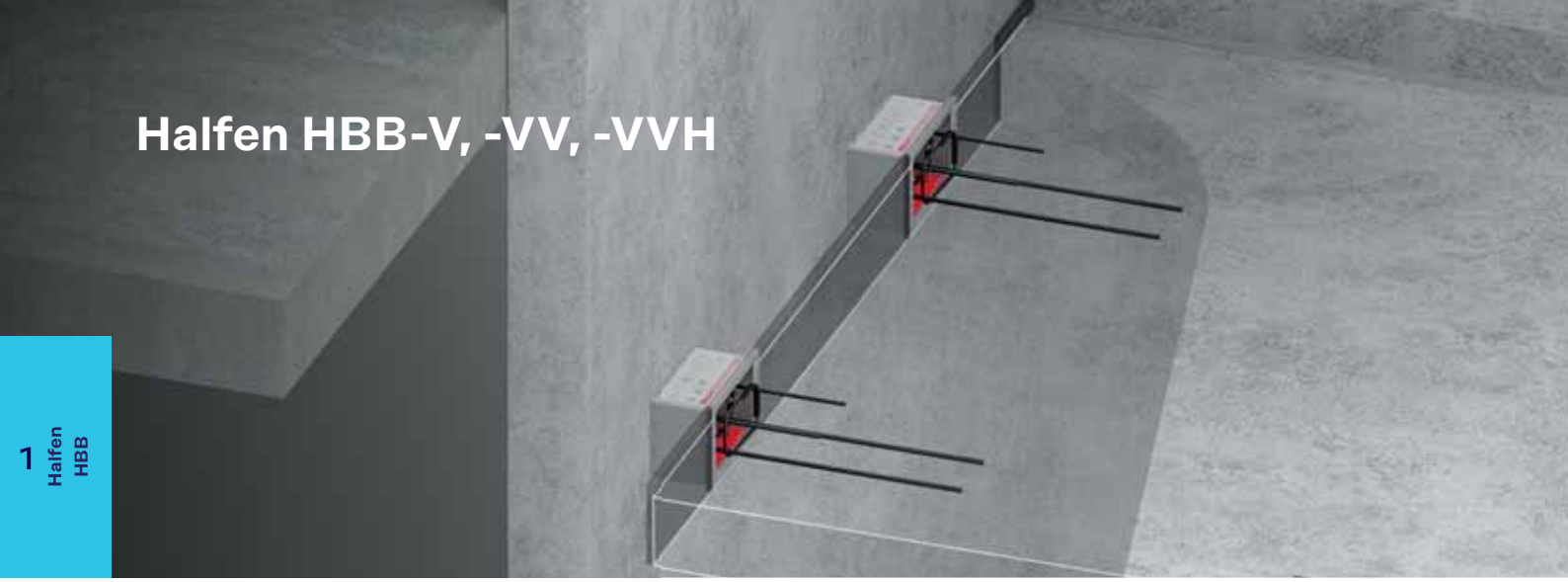






Halfen HBB-V, -VV, -VVH

Material specifications and test certificates

Stair landing	Precast concrete element
Wall	In-situ cast concrete or masonry
Available sizes	A single size for landing slabs with a minimum slab thickness of 160 mm
Available types	HBB-V / -VV / -VVH Box for loads applied in all directions

Weighted impact sound level difference, in accordance with DIN 7396.
Testing at maximum permissible dead load, Test report 91383-01

HBB-VVH	$\Delta L^*_{w,landing} \geq 26$ dB
Fire protection	Fire protection of the components up to R90 in accordance with certified fire protection properties, expert report no. GA-2022/110-Nau
Type test	Test report S-WUE/220241, LGA Würzburg - Germany
Bearing	Closed-cell, foamed polyurethane (PUR), B2 class according to EN 13501-1 / DIN 4102, microcellular closed-cell EPDM, B2 class in accordance with EN 13501 –1 / DIN 4102 Approval no. Z-16.32-519, DIBt Berlin
Materials	Plastic foam, building material class B2 in accordance with EN 13501 –1 / DIN 4102.

Halfen HBB-V Impact sound insulation box for precast landing slabs

The Halfen HBB-V / -VV / -VVH Boxes are designed for precast landing slabs. One standard size is used for all landing heights.

The HBB boxes contribute to an effective acoustic decoupling of the landing from the wall. The high impact sound insulation effect has been tested in accordance with DIN 7396.

Halfen HBB-Boxes can be easily slid over the corbel before installing the precast landing slab.

The corbel is manufactured in advance in the precast concrete factory to suit the inner dimensions of the HBB-Box.

Ordering example

HBB - VVH
① ②

① Product designation
② Designation of the box type

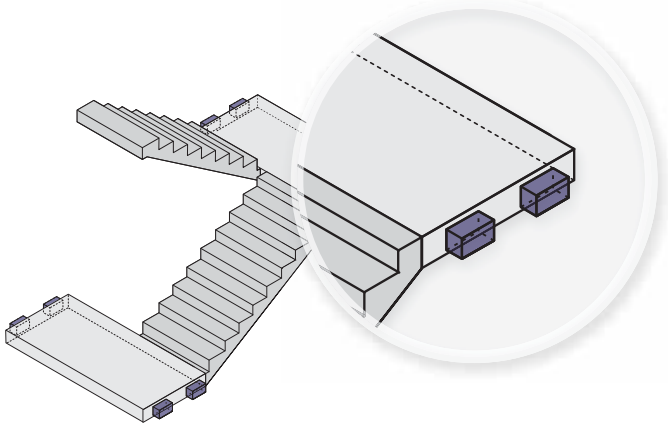
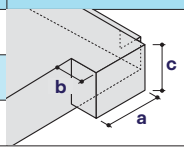


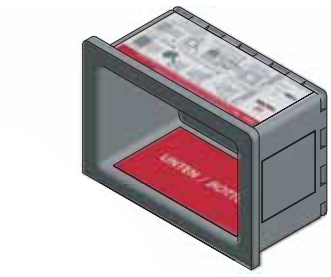
Figure: Application of the HBB-Box

HBB – Impact sound insulation box

for precast landing slabs

Halfen HBB – Product description

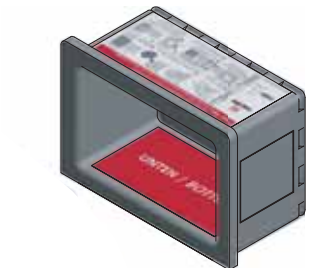
Designation	Article number	Concrete corbel dimensions a × b × c [mm]	Load direction		
			$+V_{Rd,v}$	$-V_{Rd,v}$	$\pm V_{Rd,h}$
HBB-V	1000204611	 252 × 152 × 158	●	○	○
HBB-VV	1000204612		●	●	○
HBB-VVH	1000204613		●	●	●



HBB-V

for vertical loads

incl. HBB-V Box and bottom bearing pad



HBB-VV

for additional loads in vertical upward direction

incl. HBB-VV Box; bottom and upper bearing pads

HBB-VVH

for additional loads in vertical upward direction and horizontal loads

incl. HBB-VVH Box; bottom, upper and side bearings pads

Top and side view of HBB-Box

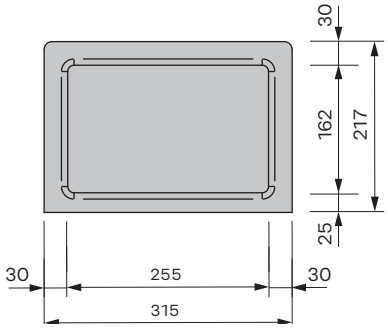


Figure: HBB-V, front view

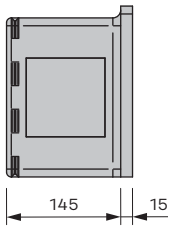


Figure: HBB-V, vertical cross section

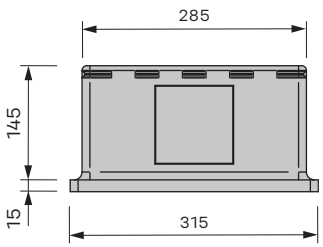
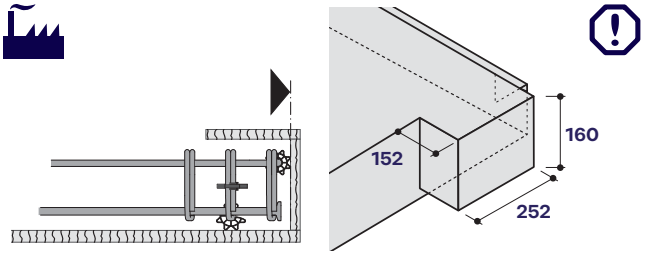


Figure: HBB-V, horizontal cross section

Halfen HBB-V / -VV / -VVH

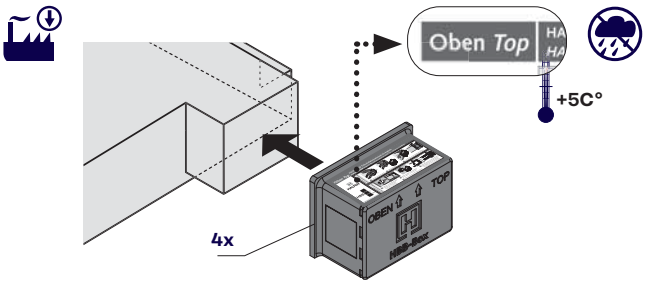
Installation instructions – Precast landing

1



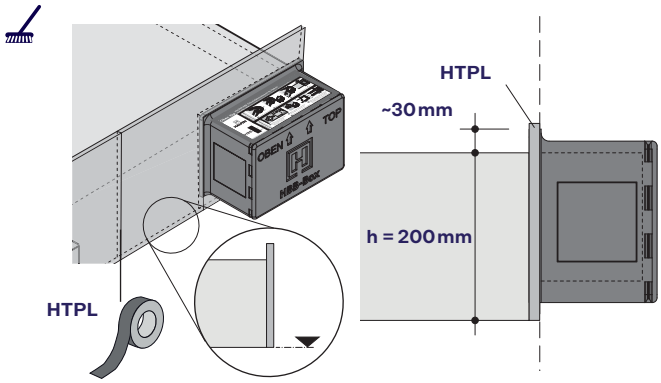
- Install the HBB-Rebar-cage-VVH and the reinforcement in the precast factory in accordance with the structural engineer's specifications.
  Pour the concrete for the landing slab.
  The dimensions of the corbels [mm] have to be observed.

2



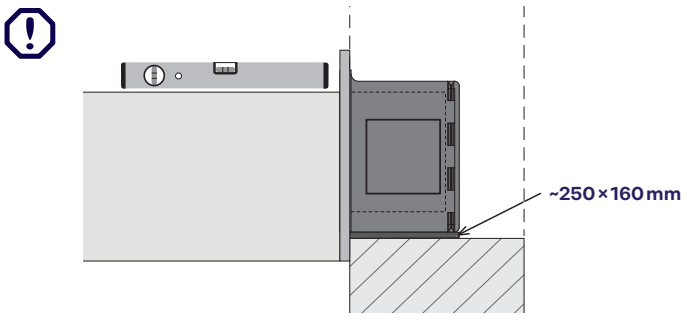
- Attach the HBB-Boxes to the corbels on the construction site. Check the correct orientation of the box!

3

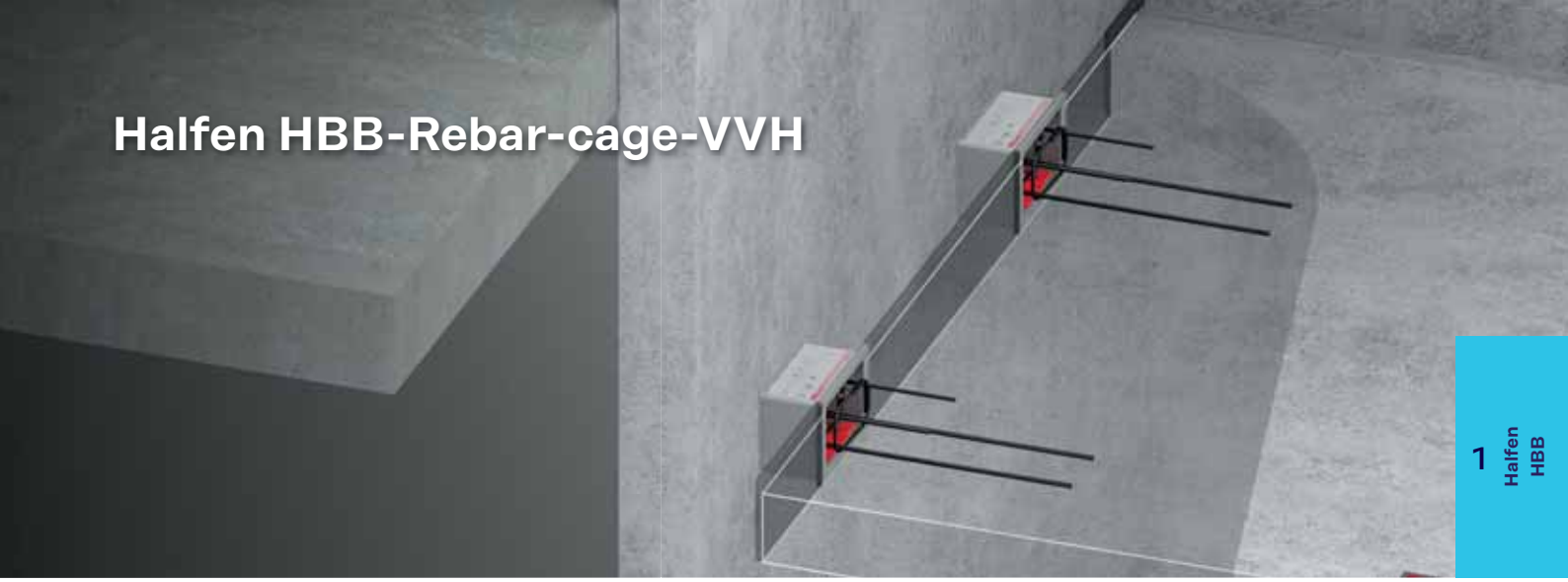


- Attach HTPL mats vertically to the sides of the landing slab. Ensure the surfaces are dust free.
  The total (required) height of the HTPL mats is the height of the landing slab plus approximately 30 mm.
  Seal the butt joints in the HTPL mats with adhesive tape.

4



- Place the landing slab on the wall.
  Ensure the slab is level.
  Use pressure plates to secure the position of the landing slab, e.g. made of steel, approximately 250 x 160 mm.
  Fix and secure the HBB-Box in the wall.



Halfen HBB-Rebar-cage-VVH

Material specifications and test certificates

Rebar cage	Reinforcement steel B500
Type test	Test report S-WUE/220241, LGA Würzburg - Germany
Available sizes	A single size for landing slabs from 160 mm thickness
Available types	A single type for all load directions
Fire protection	Fire resistance rating: R90 in accordance with EN 1992-1-2, table 5.8

Halfen HBB-Rebar-cage-VVH

The prefabricated Halfen HBB-Rebar-cage-VVH is easy to install.
This element is available for all slab thicknesses and HBB-Box types.
It transfers loads in all directions.
Because of the optimised reinforcement layout without additional, on-site stirrups, the construction process can be accelerated.

The type tested load capacities ensure planning reliability. An additional bracket design can therefore be omitted.

Ordering example

HBB - Rebar-cage - VVH

① ② ③

Type description

① Product designation
② Description
③ Designation of the type

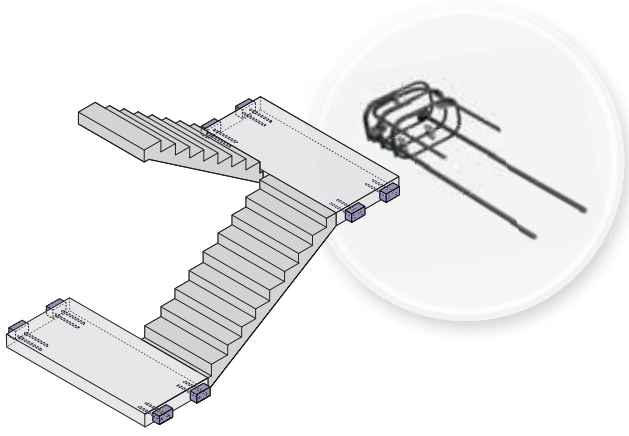


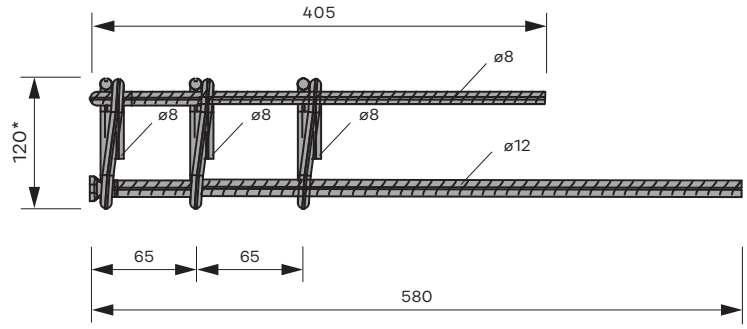
Figure: Application of the HBB-Rebar-cage

Halfen HBB-Rebar-cage-VVH

Halfen HBB-Rebar-cage-VVH – Product description

Designation	Article number	d [mm]	max. load [kN] for C ≥20/25		
			+VRd,v	−VRd,v	±VRd,h
HBB-Rebar-cage-VVH	1000204610	≥160	77.0 kN	16.0 kN	16.0 kN

Cross-section HBB-Rebar-cage-VVH



*landing slab thickness of h ≥ 160 mm

all dimensions in [mm]

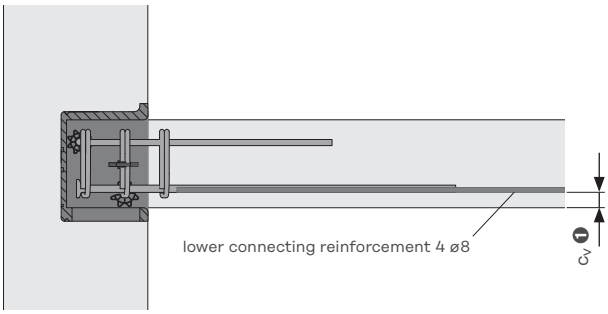
Figure: HBB-Rebar-cage-VVH, cross-section

HBB-Rebar-cage-VVH

for landing corbel

Connecting reinforcement

Cross-section – Connecting reinforcement HBB-V/OV



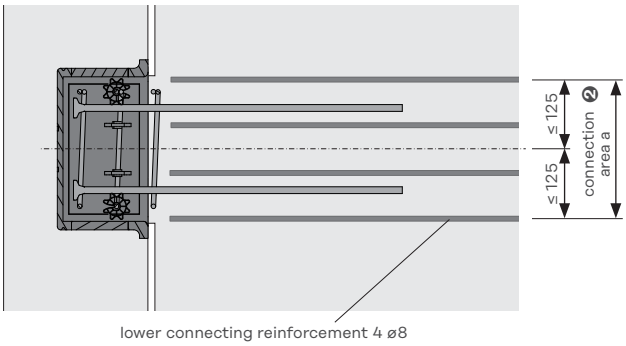


Figure: HBB-V/OV horizontal cross-section

Cross-section – Connecting reinforcement HBB-VV/OVV / HBB-VVH/OVVH

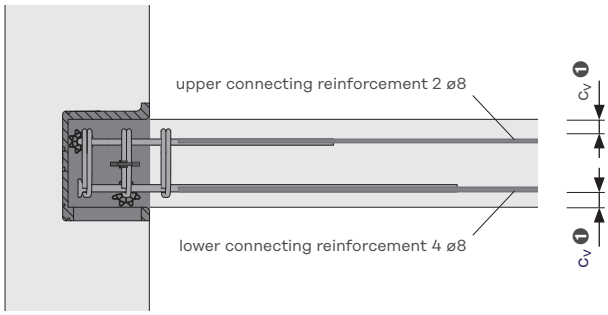


Figure: HBB-VV/OVV and HBB-VVH/OVVH vertical cross-section

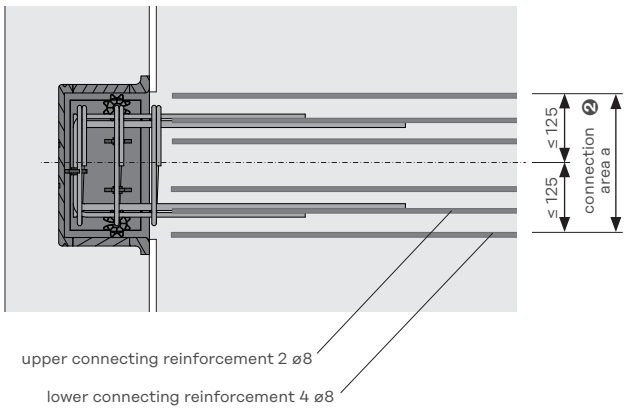
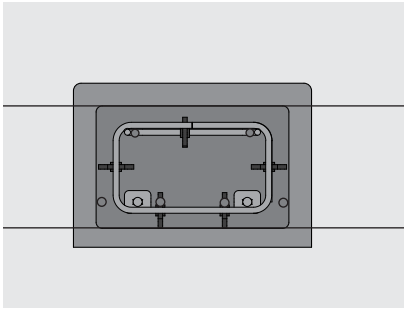


Figure: HBB-VV/OVV and HBB-VVH/OVVH horizontal cross-section

all dimensions in [mm]

Front view – Connecting reinforcement HBB-VV/OVV / HBB-VVH/OVVH



① c_v in accordance with static specifications for R90 / F90 c ≥ 30 mm

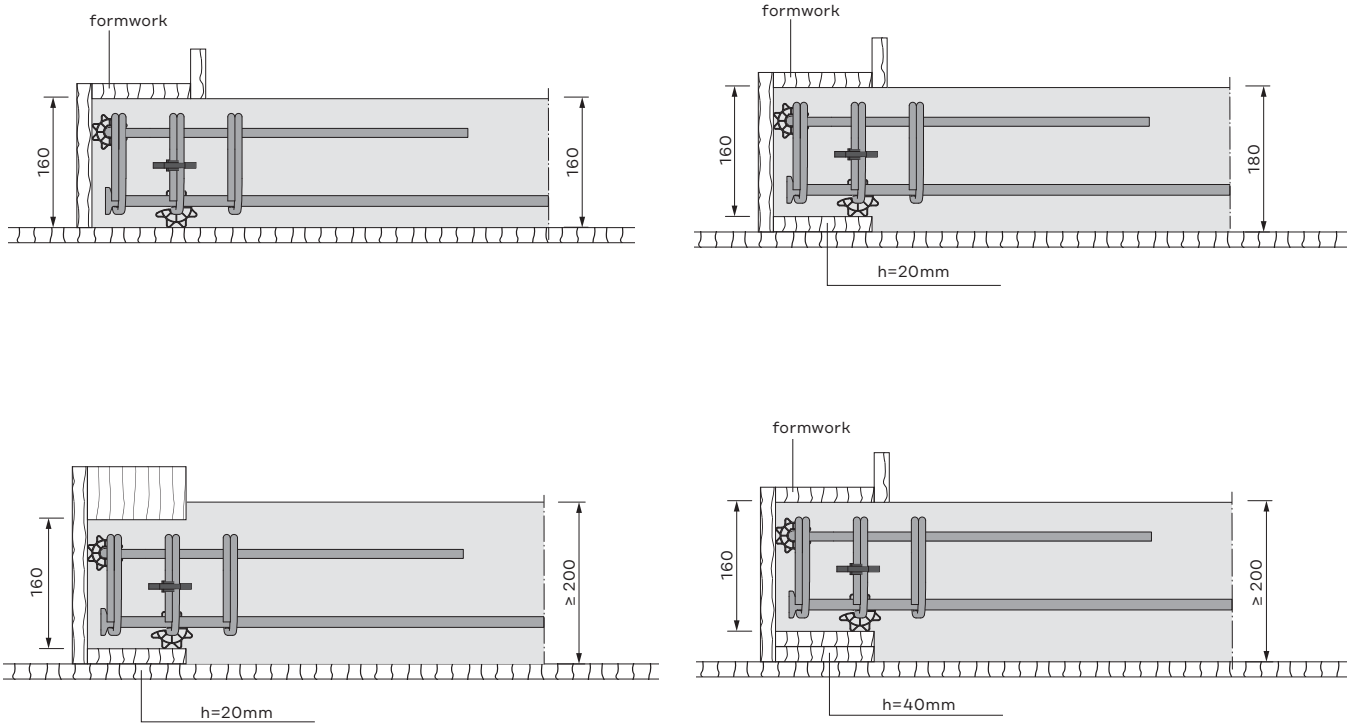
② In the connection area a, the required connection reinforcement in the lower layer is 2.01 cm².
This can be realised by 4 Ø8 mm as shown.

Alternatively, welded fabric panels or a combination of bars and welded fabric can be used. In this case, congested reinforcement is to be avoided.

Rebar cage for landing corbel

Application in precast concrete factory

Formwork for a corbel in the precast plant – variants



Halfen HBB-OV, -OVV, -OVVH

Material specifications and test certificates

Stair landing	In-situ cast concrete
Wall	In-situ cast concrete or masonry
Available sizes	A single type for landing slabs from 160 mm thickness
Available types	HBB-OV, -OVV, -OVVH Box for various load directions, all with filler

Weighted impact sound level difference, in accordance with DIN 7396.
Testing at maximum permissible dead load, Test report 91383-01

HBB-VVH	$\Delta L^*_{w,landing} \geq 26$ dB
Fire protection	Fire protection of the components up to R90 in accordance with certified fire protection properties, expert report no. GA-2022/110-Nau
Type test	Test report S-WUE/220241, LGA Würzburg - Germany
Bearing	Closed-cell, foamed polyurethane (PUR), B2 class according to EN 13501-1 / DIN 4102, microcellular closed-cell EPDM, B2 class in accordance with EN 13501 –1 / DIN 4102 Approval no. Z-16.32-519, DIBt Berlin
Materials	Plastic foam, building material class B2 in accordance with EN 13501 –1 / DIN 4102.
Filler	Polystyrene

Halfen HBB V Impact sound box for cast-in-situ landing slabs

Halfen HBB-OV, -OVV and -OVVH boxes with filler for in-situ concrete platforms are available in a single size for all slab thicknesses. The HBB boxes isolate acoustically the landing slabs from the wall. The high impact sound insulation effect has been tested in accordance with DIN 7396.

When installing HBB-boxes in masonry walls, the polystyrene filler ensures the box keeps its shape while the surrounding masonry is completed.

When installing in reinforced concrete walls, the filler is fixed to the formwork using the special nails supplied.
The HBB-box is then installed flush with the formwork over the recess filler.

Ordering example

HBB - OVVH
① ②

Type description

① Product designation
② In-situ concrete application
③ Designation of the box type

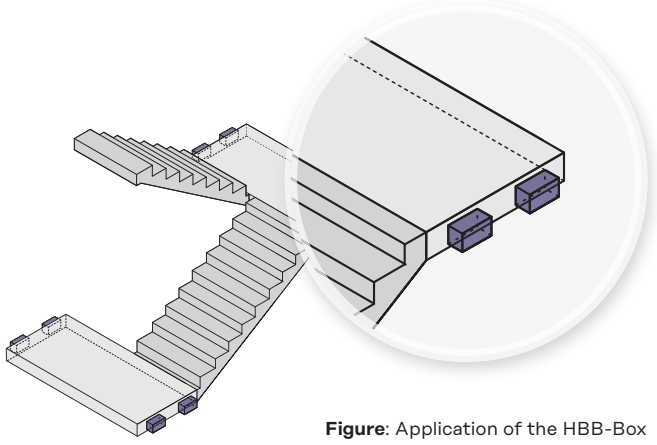
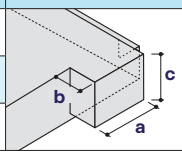
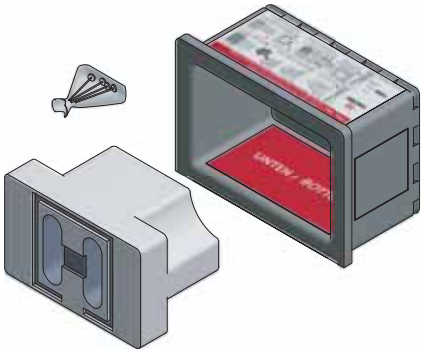


Figure: Application of the HBB-Box

Halfen HBB-OV / -OVV / -OVVH

Halfen HBB-OV – Dimensions and load bearing capacities

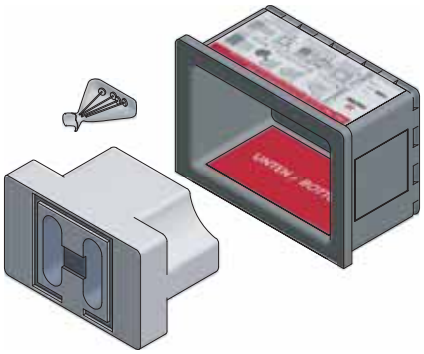
Designation	Article number	Concrete corbel dimensions a × b × c [mm]	Load direction		
			+VRd,v	–VRd,v	±VRd,h
HBB-OV	1000204607	 252 × 152 × 158	●	○	○
HBB-OVV	1000204608		●	●	○
HBB-OVVH	1000204609		●	●	●



HBB-OV

for vertical loads

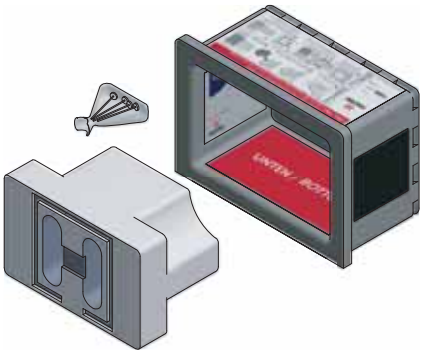
incl. HBB-V Box and bottom bearing pad; filler and four nails



HBB-OVV

for additional loads in vertical upward direction

incl. HBB-VV Box; bottom and upper bearing pads; filler and four nails



HBB-OVVH

for additional loads in vertical upward direction and horizontal loads

incl. HBB-VVH Box; bottom, upper and side bearings pads; filler and four nails

Impact sound insulation box

for in-situ landing slabs

Halfen HBB-Box as a permanent formwork variant

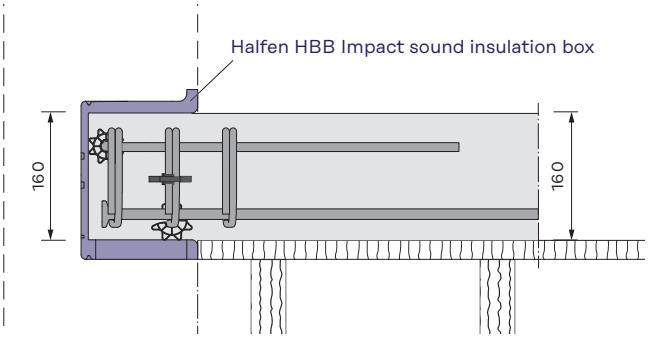


Figure: Application of HBB-box for slab thickness 160 mm

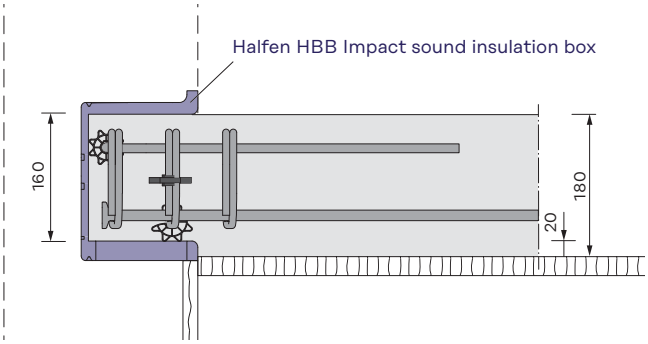


Figure: Application of HBB-box for slab thickness 180 mm with a 20 mm downward step

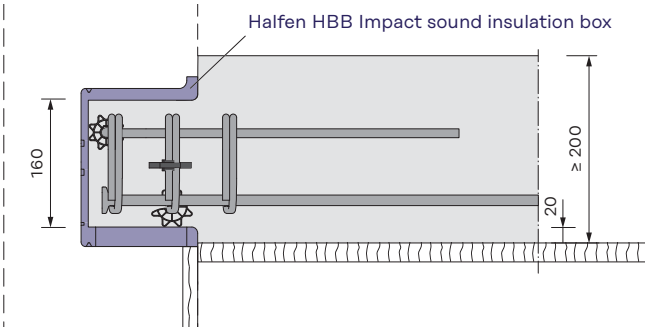


Figure: Application of HBB-box for slab thickness ≥ 200 mm with a 20 mm downward step, additional formwork on top

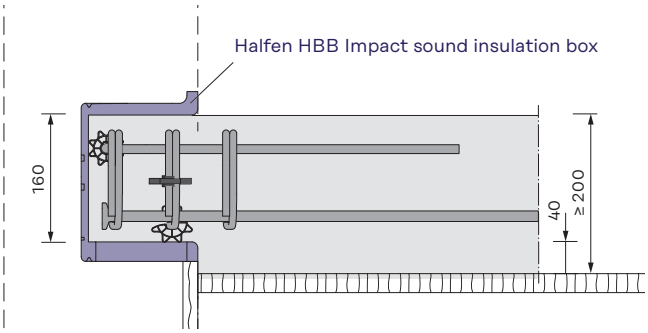


Figure: Application of HBB-box for slab thickness ≥ 200 mm with a 40mm downward step.

Cast-in-situ concrete landing – cross-section showing HBB-Box

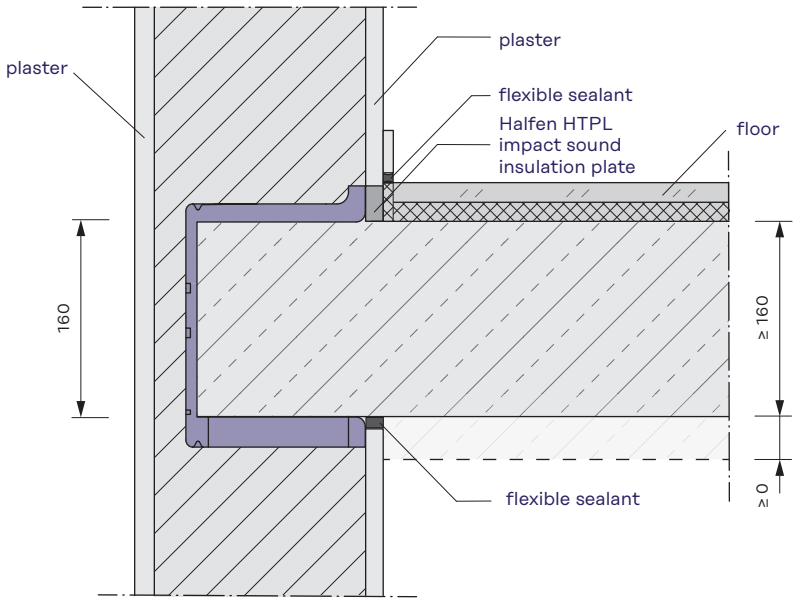


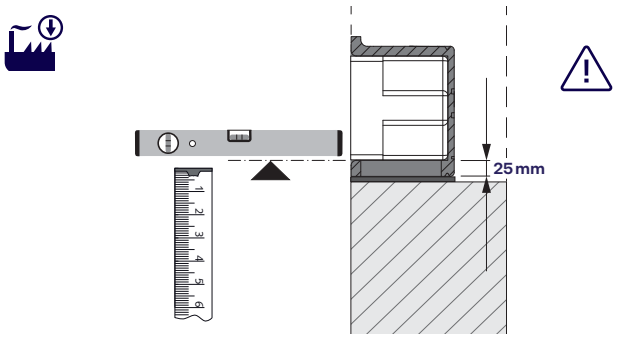
Figure: HBB-Box cross section

all dimensions in [mm]

Halfen HBB-OV / -OVV /-OVVH

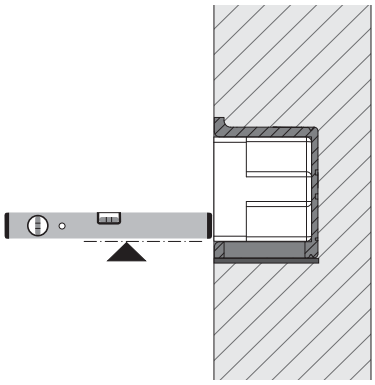
Installation steps for in-situ concrete landing slab, masonry wall

1



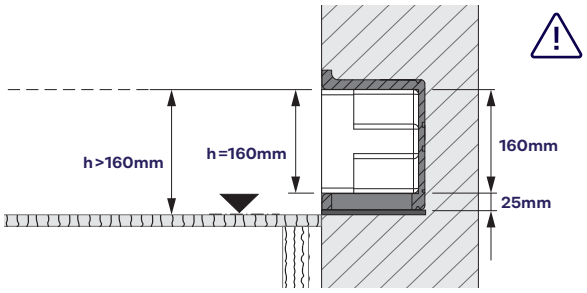
- Check the required installation height of the HBB-Box. The thickness of the HBB-Box at the bottom is 25 mm.

2



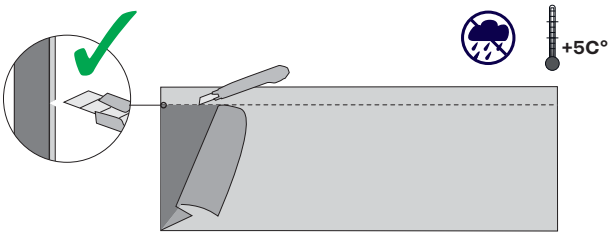
- Secure the HBB-Box to the masonry. Ensure the HBB-Box is level.

3



- Install the formwork for the landing slab. The height of the landing slab is determined in accordance with the engineer's specifications.

4



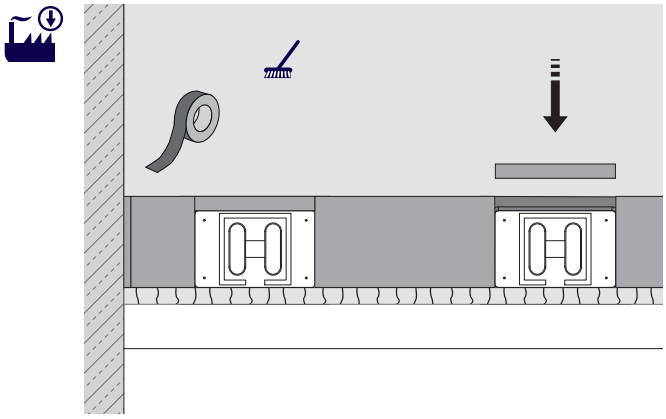
- Prepare the Halfen HTPL Impact sound insulation plates for the vertical joint between the landing slab and the wall: The total (required) height of the Halfen HTPL mat is the height of the landing slab + approximately 30 mm.

Impact sound insulation box

for in-situ landing slabs

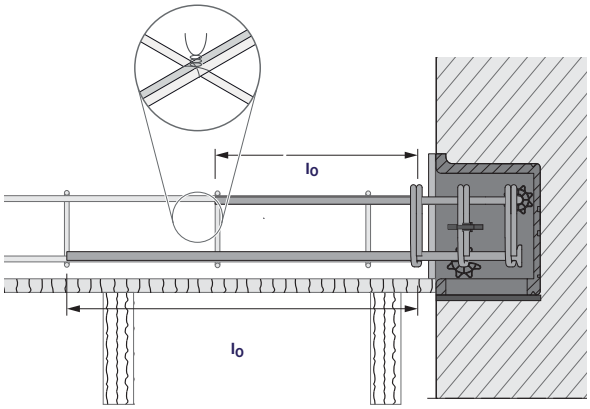
Installation steps for in-situ concrete landing slab, masonry wall

5



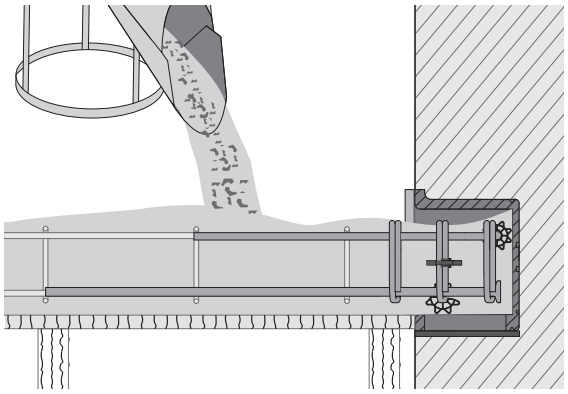
- Attach the Halfen HTPL Impact sound insulation plate to the wall.
  Ensure the wall is clean and dust-free.
  Place the Halfen HTPL mat over the box.
  Seal the butt joints in the Halfen HTPL mats with adhesive tape.

6

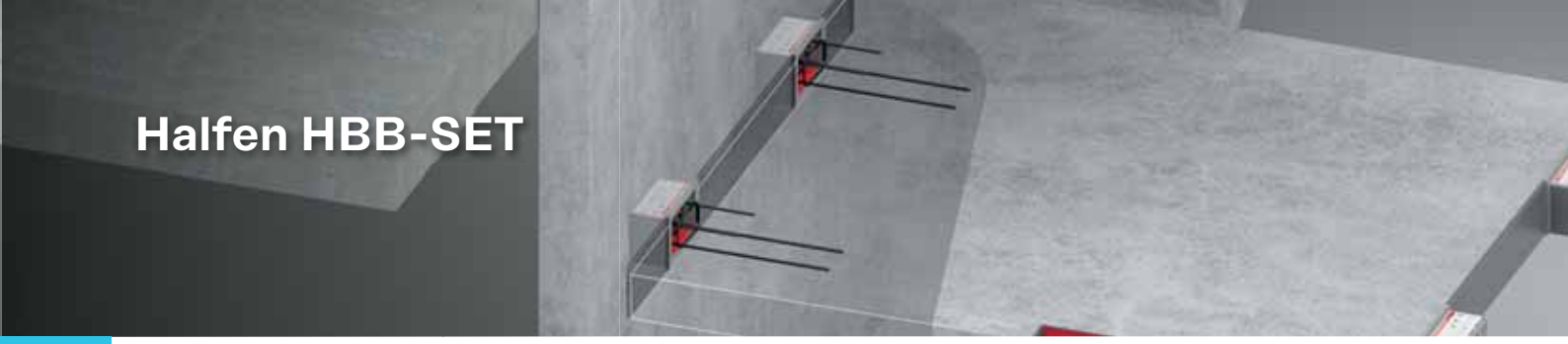


- Remove the blockout element.
  Install the HBB-Rebar-cage-VVH and the connecting reinforcement in accordance with the structural engineer's specifications.

7



- Pour the concrete for the landing slab and compact using a suitable vibrator.



Halfen HBB-SET

Material specifications and test certificates

HBB Box

Available sizes	A single size for landing slabs from 160 mm thickness
Available types	HBB-V / -VV / -VVH Box for effective load directions

Weighted impact sound level difference, in accordance with DIN 7396.
Testing at maximum permissible dead load, Test report 91383-01

HBB-VVH	$\Delta L^*_{w,landing} \geq 26$ dB
Fire protection	Fire protection of the components up to R90 in accordance with certified fire protection properties, expert report no. GA-2022/110-Nau
Bearing	Closed-cell, foamed polyurethane (PUR), B2 class in accordance with EN 13501-1 / DIN 4102, microcellular closed-cell EPDM, B2 class in accordance with EN 13501 –1 / DIN 4102 Approval no. Z-16.32-519, DIBt Berlin
Material	Plastic foam, building material class B2 in accordance with EN 13501 –1 / DIN 4102.
Rebar cage	Reinforcement steel B500
Type test	Test report S-WUE/220241, LGA Würzburg - Germany
Available sizes	A single size for landing slabs from 160 mm thickness
Available types	A single type for all load directions
Fire protection	Fire resistance rating **R90** in accordance with EN1992-1-2, table 5.8

Halfen HBB-SET Impact sound box set for landing slabs

The Halfen HBB-SET consists of an HBB box of the required type and an HBB-Rebar-cage-VVH.

It can be used for in-situ concrete and precast landings. For in-situ concrete landing slabs, the HBB-box is used as a permanent formwork.

The HBB-SET in its variants is suitable for use in both masonry and concrete walls.

Ordering example

HBB - SET - VVH
① ② ③

Type description

① Product designation
② Designation of the box type
③ Designation of the load transmission through the box

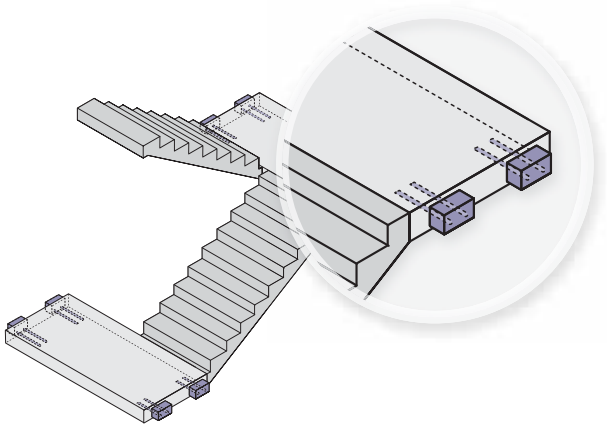
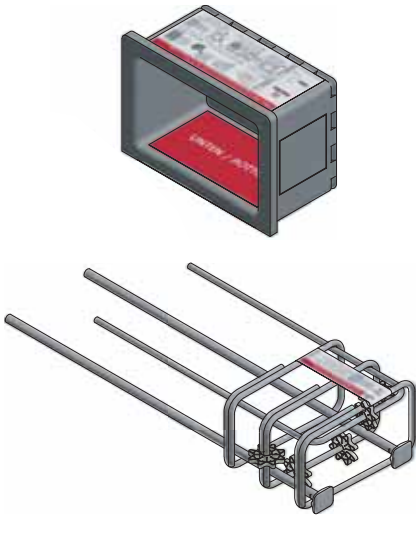


Figure: HBB-SET application

Impact sound insulation set for landing slabs

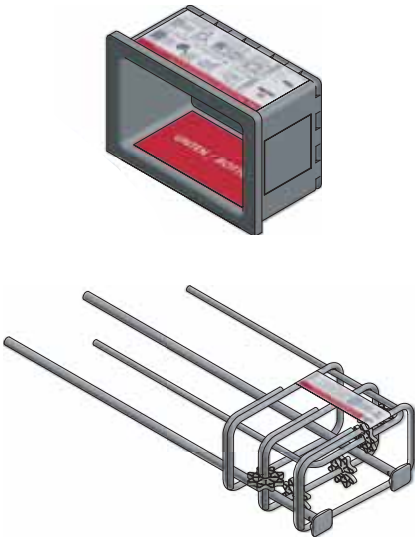
Halfen HBB-SET – dimensions and load bearing capacities

Designation	Article number	Load direction [kN]		
		$+V_{Rd,v}$	$-V_{Rd,v}$	$\pm V_{Rd,h}$
HBB-V-SET	60001566	77.0	O	O
HBB-VV-SET	60001567	77.0	16.0	O
HBB-VVH-SET	60001568	77.0	16.0	16.0



HBB-V-SET
for vertical loads:

incl. HBB-V Box, bottom bearing pad and HBB-Rebar cage-VVH



HBB-VV-SET
for additional loads in vertical upward direction:

incl. HBB-VV Box, bottom and upper bearing pad and HBB-Rebar cage-VVH

HBB-VVH-SET
for additional loads in vertical upward direction and horizontal loads:

incl. HBB-VVH Box, bottom, upper and side bearing pad and HBB-Rebar cage-VVH

Halfen HBB-SET

Curtailment of reinforcement

Cross-section showing HBB-SET reinforcement curtailment

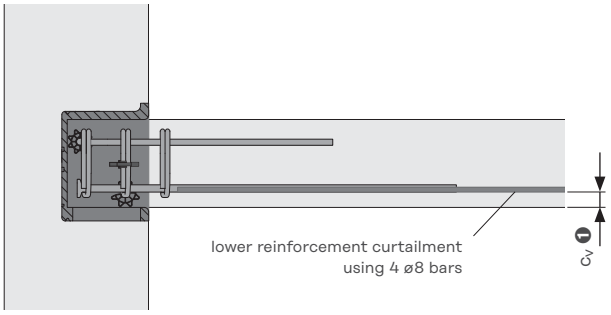


Figure: HBB-SET vertical cross-section

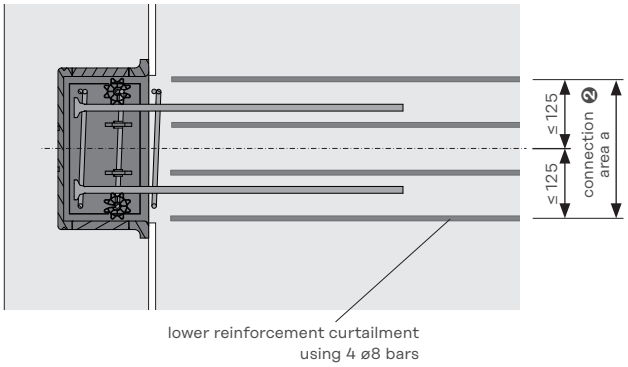


Figure: HBB-SET horizontal cross-section

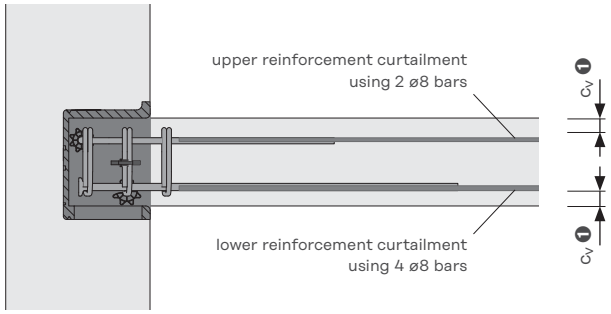


Figure: HBB-SET vertical cross-section

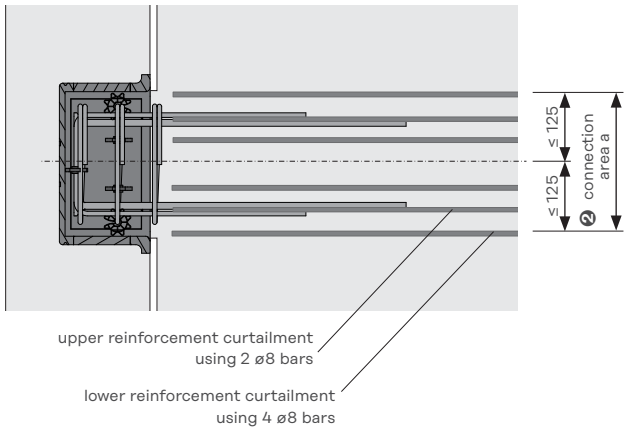
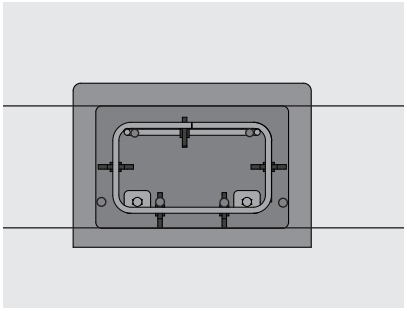


Figure: HBB-SET horizontal cross-section

all dimensions in [mm]

Front view showing HBB-SET reinforcement curtailment



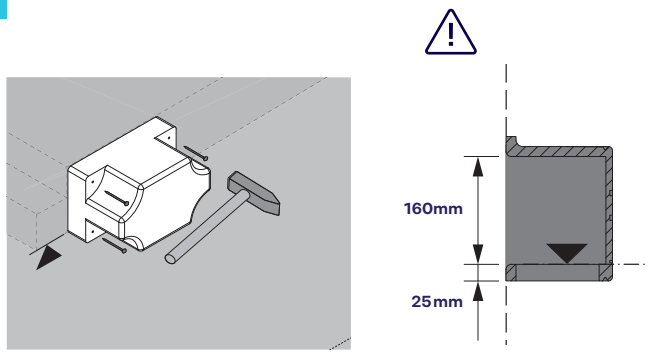
① c_v in accordance with static specifications for R90 / F90 c ≥ 30 mm

② In the curtailment area, the cross-section of curtailing reinforcement required for the lower layer is 2.01 cm².
This can be realised by using 4 Ø8 mm as shown. Alternatively, welded fabric or a combination of bars and welded fabric may be used. In this case, congestion of reinforcement must be avoided.

Impact sound insulation set for landing slabs

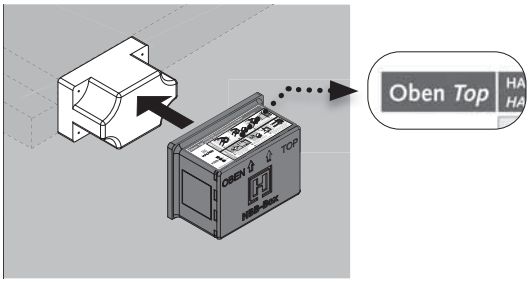
Installation instructions – cast-in-situ concrete landing slabs and walls

1



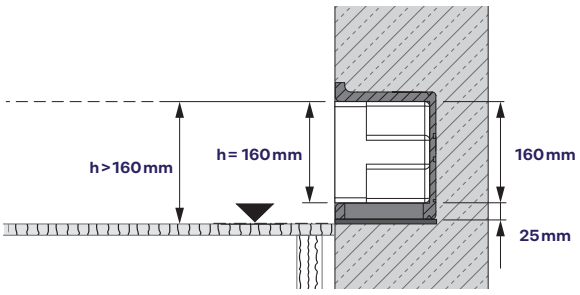
- Determine the correct installation height for the HBB-Boxes. Attach the blockout element to the formwork. Check the correct orientation of the boxes. The bottom side of the HBB-Box is thicker (25 mm).

2



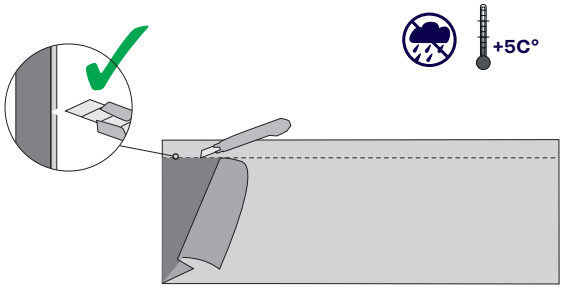
- Fix the HBB-Boxes on the blockout elements. Pour the concrete of the wall.

3



- Install the formwork for the landing slab. Please note: The height of the landing slab is determined in accordance with the engineer's specification.

4

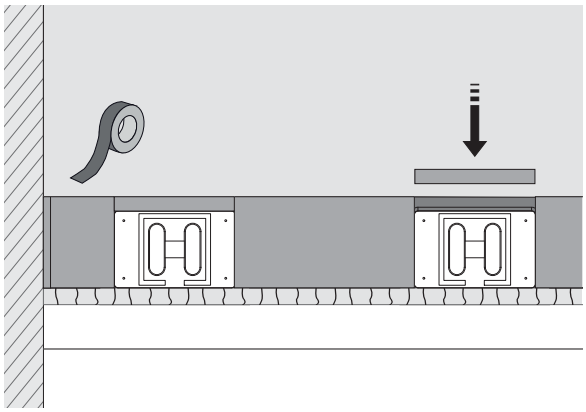


- Prepare the Halfen HTPL Impact sound insulation plates for the vertical gap between the landing and the wall. The total height of the mat is the landing height h + approximately 30 mm.

Halfen HBB-SET

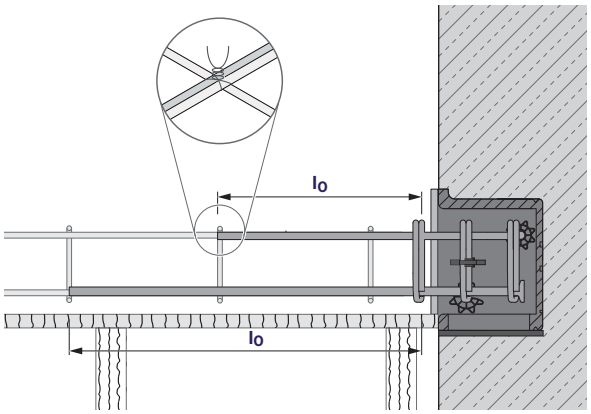
Installation instructions – cast-in-situ concrete landing slabs and walls

5



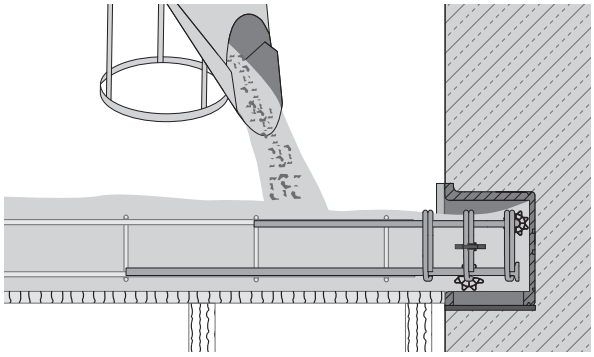
- Attach the Halfen HTPL Impact sound insulation plates to the wall. Ensure the wall is clean and dust-free. Place the HTPL mat over the box. Seal the butt joints in the HTPL mats with adhesive tape.

6



- Remove the blockout element. Install the HBB-Rebar-cage-VVH and the curtailment reinforcement in accordance with the structural engineer's specifications.

7



- Pour the concrete for the landing slab and compact using a suitable vibrator.

Impact sound insulation elements

Product Overview

HTF-T Impact sound insulation element

for stairway support

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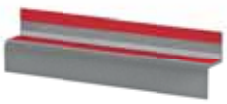
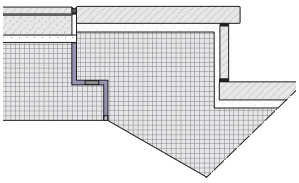
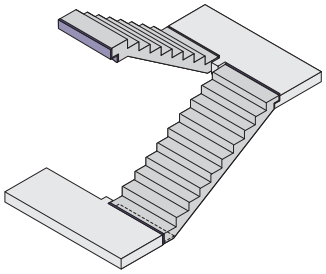


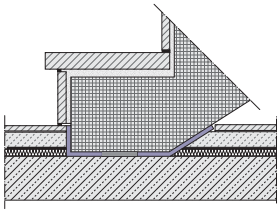


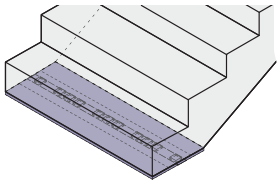


HTF-B Impact sound insulation element

for the base of staircases

Page 33

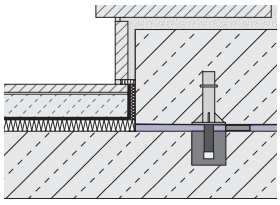


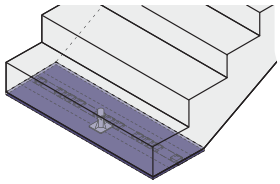


CRET-TS-SET

Vertical impact sound insulation dowel
for effective restraint of stair base

Page 37

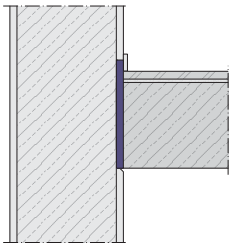


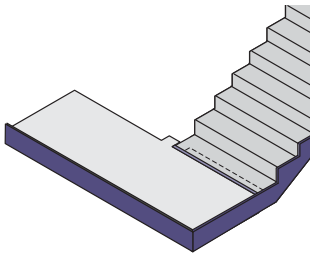


HTPL Impact sound insulation plate

between stairway and wall

Page 41

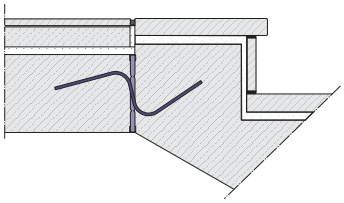


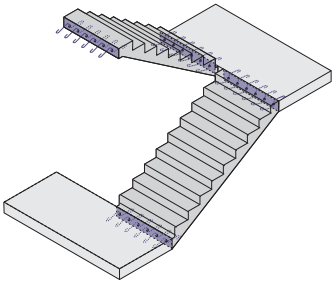


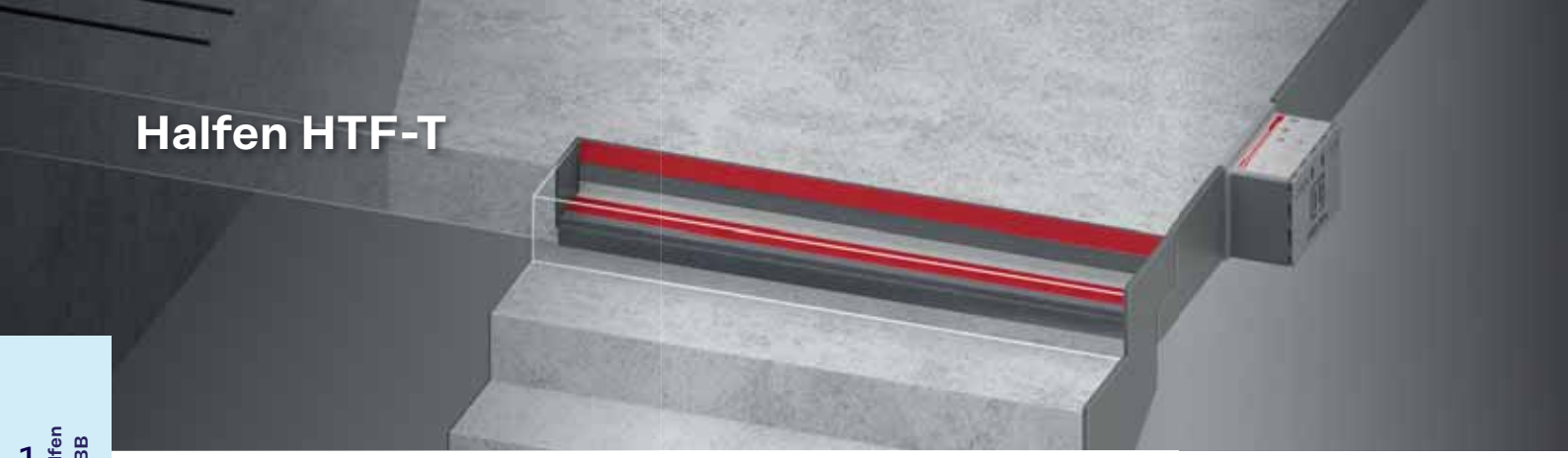
HTT Impact sound insulation element

for stairway support

Page 45



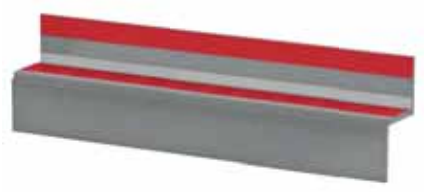




Halfen HTF-T

Material specifications and test certificates

Stair landing	Cast-in-situ or precast concrete
Stair elements	Precast element
Available sizes	**Lengths:** 1000 mm, 1200 mm, 1500 mm and special lengths available **Corbel depth:** 130–160 mm
Load range	T0, T1, T2, T3
Weighted impact sound level difference	in accordance with DIN 7396 Testing at maximum permissible dead load, Test reports 91383-14, 91383-11, 91383-10, XXXXX-xx
HTF-T0:	$\Delta L^*_{w,stairs} \geq 28$ dB
HTF-T1:	$\Delta L^*_{w,stairs} \geq 29$ dB
HTF-T2:	$\Delta L^*_{w,stairs} \geq 27$ dB
HTF-T3:	$\Delta L^*_{w,stairs} \geq$ xx dB
Fire protection	Fire protection of the components up to R90 Certified fire protection properties: Expert report no. GA-2022/110-Nau
Bearing	Heavy duty, profiled, non-reinforced elastomeric bearing; width 60 mm; Test certificate no. 853.0072 / MPA Hanover
Material	Plastic foam, building material class B2 in accordance with DIN 4102; double-sided adhesive tape for securing the position



Halfen HTF-T Impact sound insulation element

Halfen HTF-T impact sound insulation elements are used for effective, acoustic decoupling of prefabricated staircases from the landing.

High impact sound insulation values have been demonstrated by tests in accordance with DIN 7396. The built-in, heavy-duty elastomeric bearings ensure safe load transfer of the shear forces.

Adhesive strips with protective foil are pre-fitted to the element for easy mounting to the reinforced concrete substrate. The protective foil has a convenient tab to enable convenient removal.

Ordering example

HTF - T1 - 100

① ② ③

Type description

① Product designation
② Load group
③ Element length [cm]

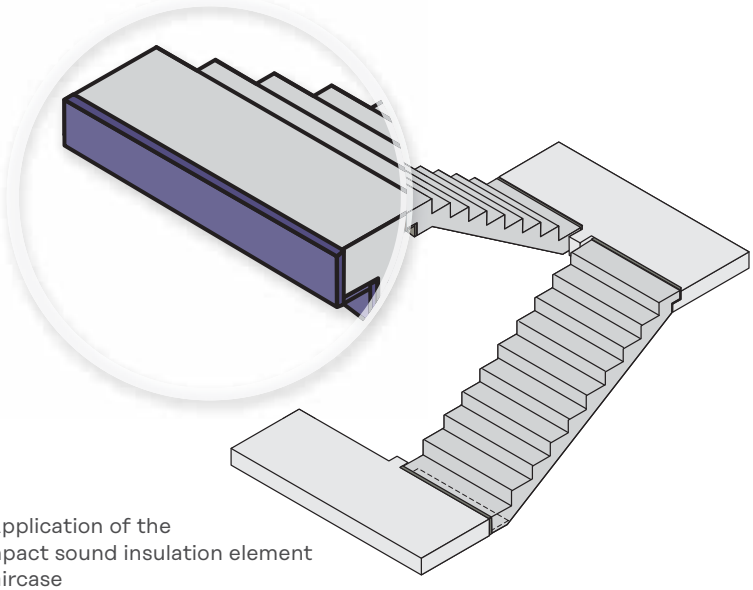


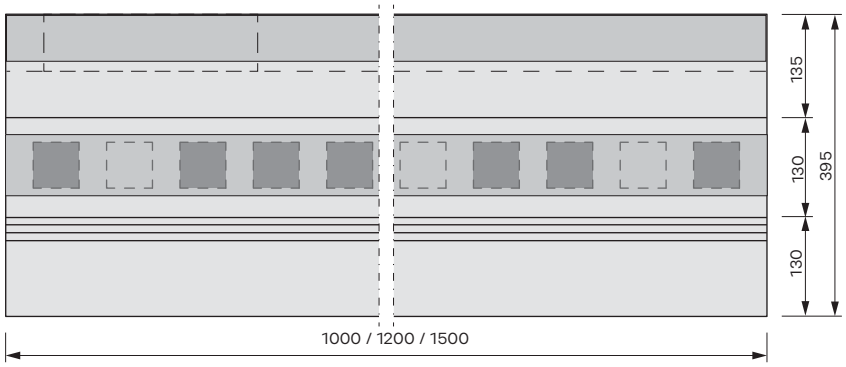
Figure: Application of the HTF-T Impact sound insulation element in the staircase

Impact sound insulation element for stairway support

Halfen HTF-T – Product description

Designation	Length [mm]	Article number	Load bearing capacity values
			V_{Rd} [kN/m]
HTF-T0-100	1000	1000211085	28.5
HTF-T0-120	1200	1000211086	28.5
HTF-T0-150	1500	1000211087	28.5
HTF-T1-100	1000	1000211088	43.1
HTF-T1-120	1200	1000211089	43.1
HTF-T1-150	1500	1000211090	43.1
HTF-T2-100	1000	1000211091	60.3
HTF-T2-120	1200	1000211092	60.3
HTF-T2-150	1500	1000211093	60.3

Top view and cross section showing HTF-T0



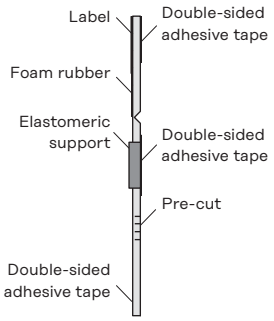


Figure: HTF-T0, top view

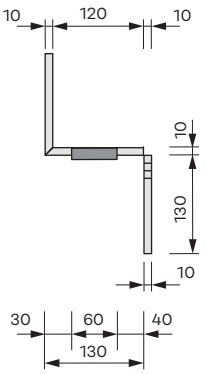


Figure: HTF-T0, cross-section. Geometry of the element with a minimum depth of the corbel of **130 mm**.

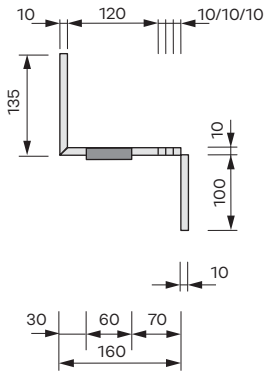


Figure: HTF-T0, cross-section. Geometry of the element with a minimum depth of the corbel of **160 mm**.

HTF custom solutions

Our technical support team is available to provide support for your project with custom solutions using Halfen HTF Impact sound insulation.

Contact: → see Address page

All dimensions in [mm]

Halfen HTF-T

Top view and cross section showing HTF-T1 and HTF-T2

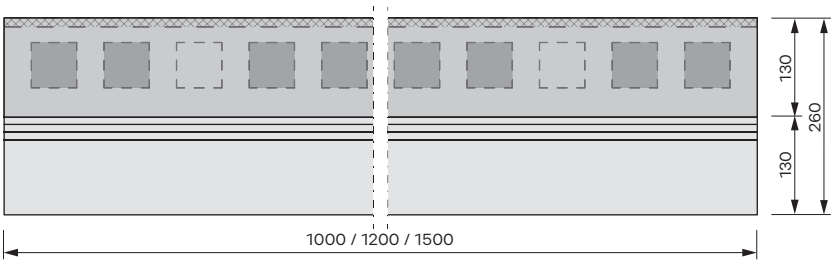


Figure: HTF-T1, top view

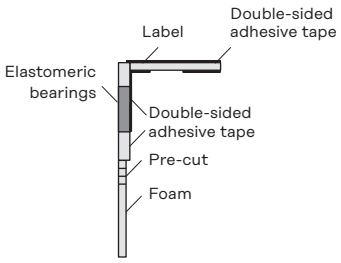


Figure: HTF-T1, section

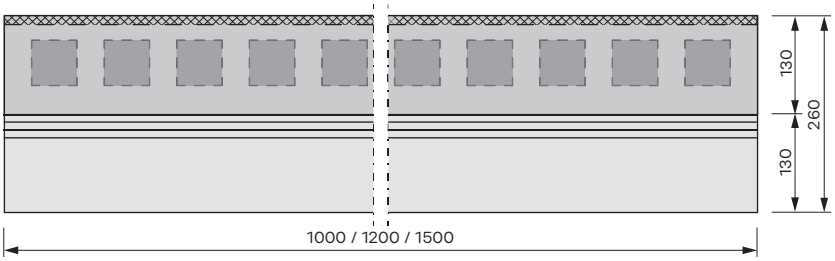


Figure: HTF-T2, HTF-T3, top view

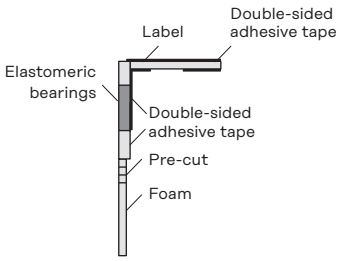


Figure: HTF-T2, HTF-T3, cross-section

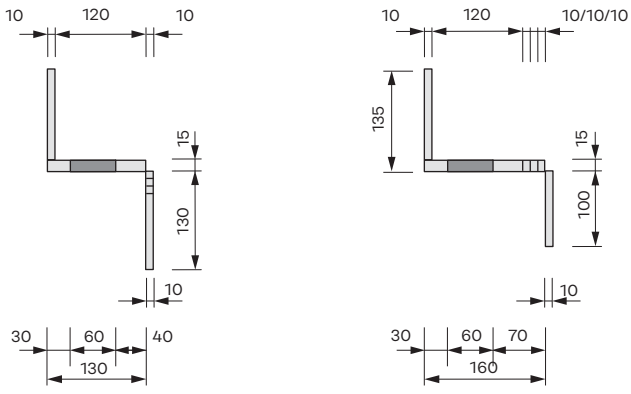


Figure: HTF-T1/HTF-T2/HTF-T3 cross-section

HTF custom solutions

Our technical support team is available to provide support for your project with custom solutions using Halfen HTF Impact sound insulation.

Contact: → see Address page

All dimensions in [mm]

Impact sound insulation element for stairway support

Application

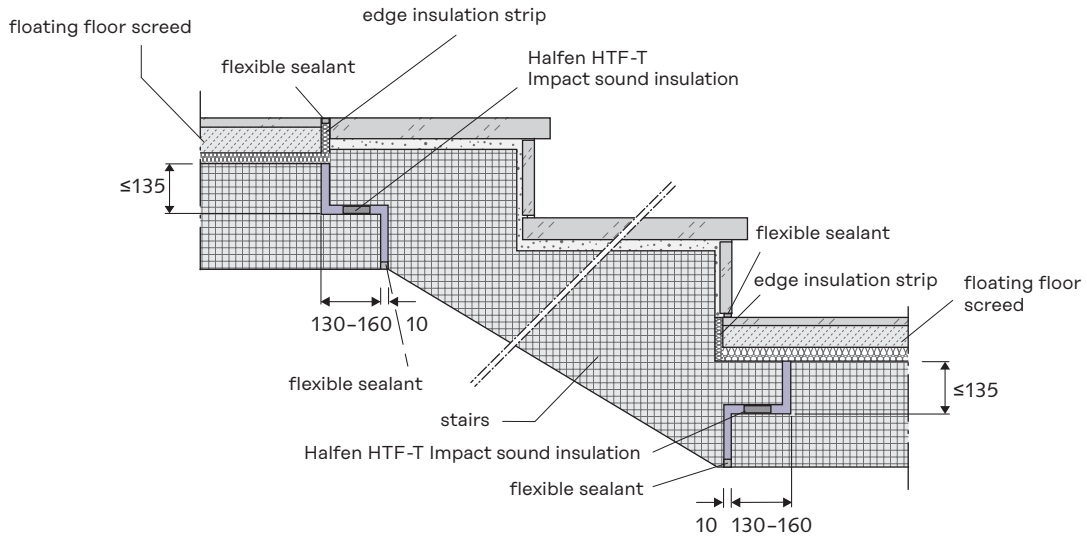


Figure: Cross-section showing the typical installation configuration for a Halfen HTF-T impact sound insulation element

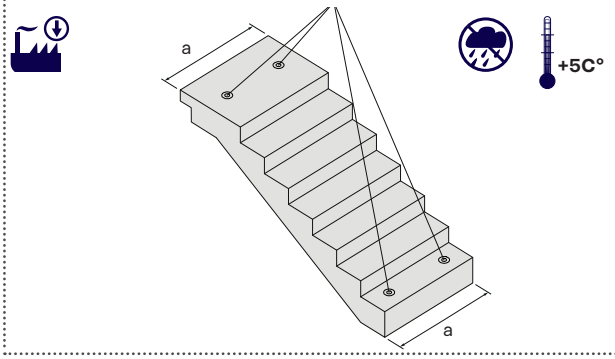
Dimensions [mm]

More detailed installation instructions can be found on the Internet at:
www.halfen.com/en ▶ Product Ranges ▶ Concrete ▶ Reinforcement systems ▶ Impact sound insulation products

Halfen HTF-T

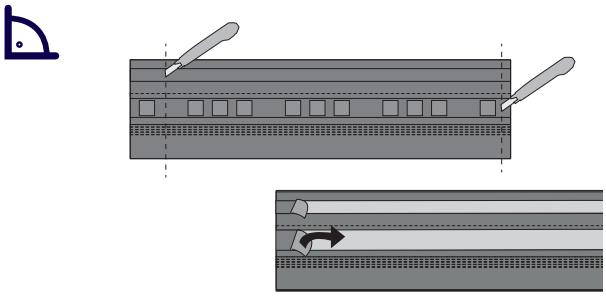
Installation instructions – Precast stairs

1



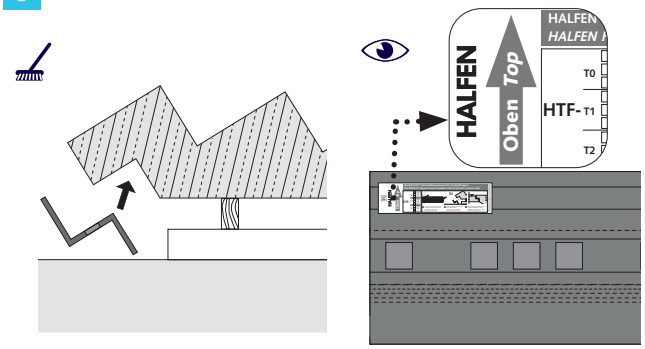
- Verify the width of the precast stair elements as delivered to the construction site

2



- Cut the HTF-T mat to the required width.
  Remove the protective foil on the adhesive strips.

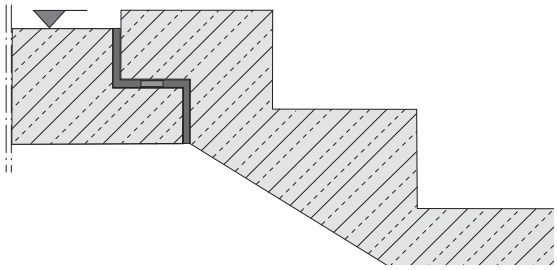
3



- Position and stick the HTF-T mat to the concrete.
  The surface must be clean and dust-free.

Ensure the mat is installed in the correct orientation.

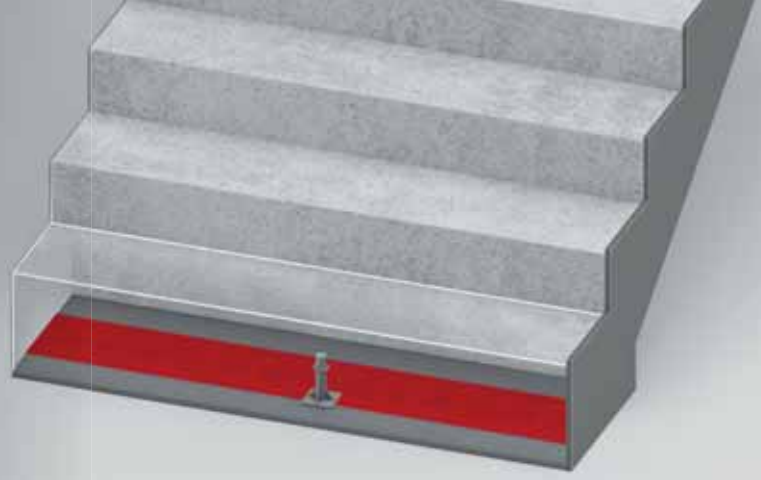
4



- Cut the mat flush with the surface of the concrete slab.

Check installation complies with the architect's specifications.

Halfen HTF-B



Material specifications and test certificates

Floor slab	Cast-in-situ or precast concrete	
Stair elements	Cast-in-situ or precast concrete	
Available sizes	**Lengths:**	1000mm, 1200mm, 1500mm and special lengths available
	Width:	600 mm
Weighted impact sound level	in accordance with DIN 7396 Testing at maximum permissible dead load, Test report 91383-14, 91383-13, 91383-12, XXXXXX-XX	
	HTF-B0:	$\Delta L^*_{w,stairs} \geq 28$ dB
	HTF-B1:	$\Delta L^*_{w,stairs} \geq 28$ dB
	HTF-B2:	$\Delta L^*_{w,stairs} \geq 27$ dB
	HTF-B3:	$\Delta L^*_{w,stairs} \geq$ XX dB
Fire protection	Fire protection of the components up to R90 Certified fire protection properties: Expert report no. GA-2022/110-Nau	
Bearing	Profiled, non-reinforced elastomeric bearing; width 60 mm	
Material	Plastic foam, building material class B2 in accordance with DIN 4102	

Halfen HTF-B Impact sound insulation element

Halfen HTF-B Impact sound insulation elements are used for the effective acoustic separation of precast or cast-in-situ concrete staircases from the base slab.

High impact sound insulation values have been demonstrated by tests in accordance with DIN 7396.
The transverse loads are transferred to the floor slabs by means of heavy-duty elastomeric bearings.

Adhesive strips with protective foil are pre-fitted to the element for easy mounting to the reinforced concrete substrate. The protective foil has a convenient tab to enable easy removal.

Ordering example

HTF - B0 - 150
① ② ③

Type description

① Product designation
② Load group
③ Element length [cm]

HTF custom solutions
Our technical support team is available to provide support for your project with custom solutions using Halfen HTF Impact sound insulation.

Contact: → see Address page

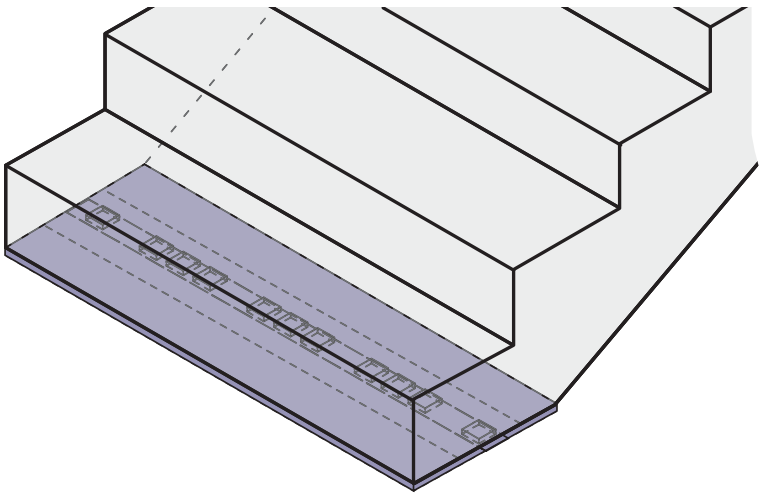


Figure: Application of the HTF-B Impact sound insulation element to the stair element

Halfen HTF-B

Halfen HTF-B – Product description

Designation	Length [mm]	Width [mm]	Article number	Load bearing capacity values V_{Rd} [kN/m]
HTF-B0-100-60	1000	600	1000211094	28.5
HTF-B0-120-60	1200	600	1000211095	28.5
HTF-B0-150-60	1500	600	1000211096	28.5
HTF-B1-100-60	1000	600	1000211097	43.1
HTF-B1-120-60	1200	600	1000211098	43.1
HTF-B1-150-60	1500	600	1000211099	43.1
HTF-B2-100-60	1000	600	1000211100	60.3
HTF-B2-120-60	1200	600	1000211101	60.3
HTF-B2-150-60	1500	600	1000211102	60.3

Special dimensions are available on request (widths larger than 1500 mm)

Top view and cross section showing HTF-B0, -B1, -B2, -B3

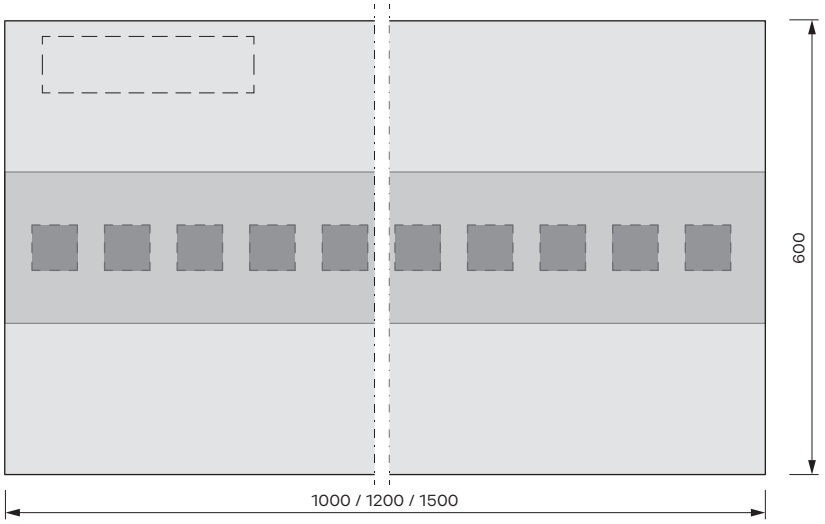


Figure: HTF-B, top view

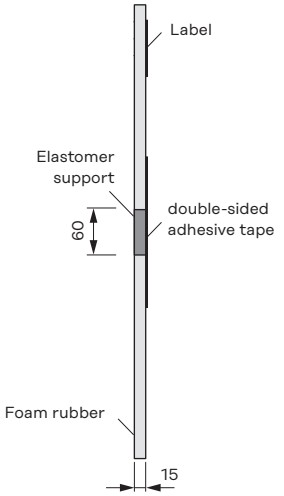


Figure: HTF-B, section

All dimensions in [mm]

Impact sound insulation element for the base of staircases

Application

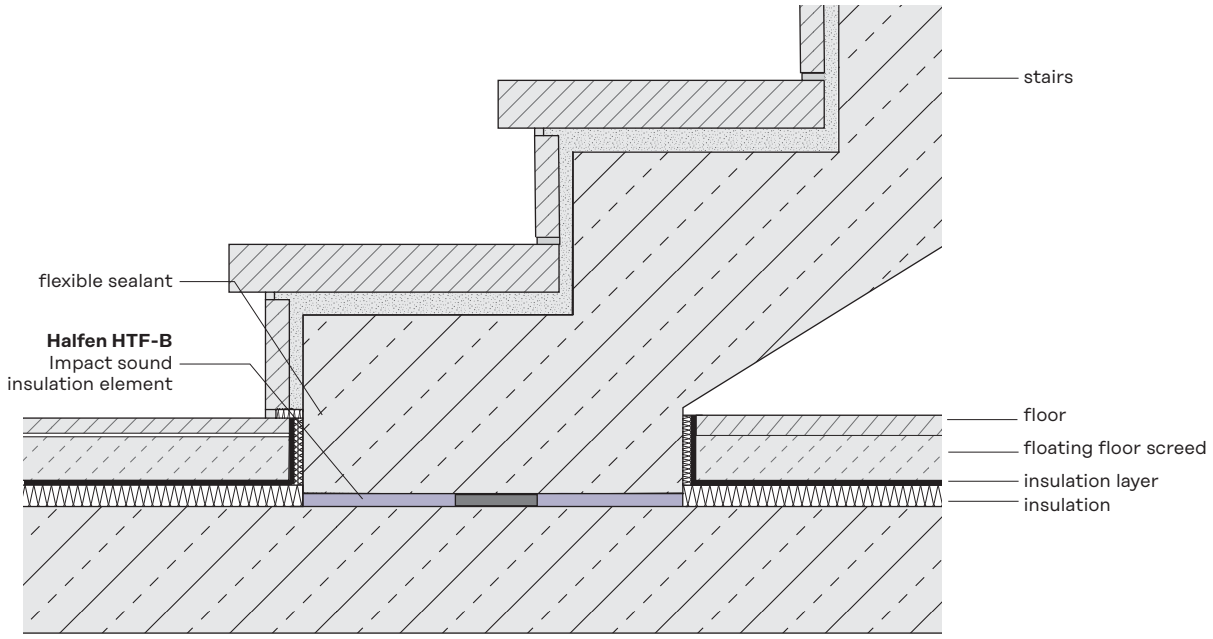
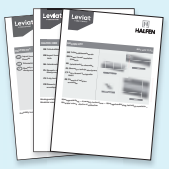


Figure: Halfen HTF-B Impact sound insulation, vertical cross-section

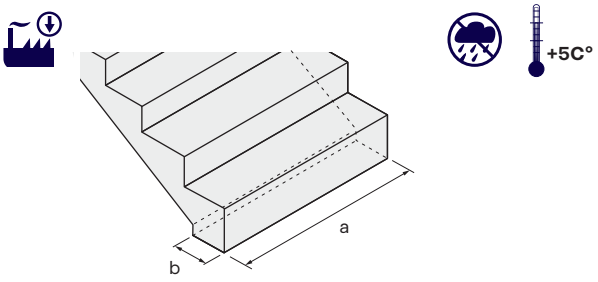
More detailed installation instructions can be found on the Internet at:
www.halfen.com/en ▶ Product Ranges ▶ Concrete ▶ Reinforcement systems ▶ Impact sound insulation products



Halfen HTF-B

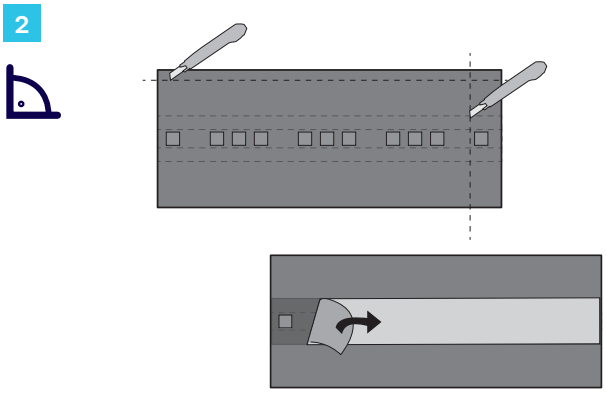
Installation instructions – Precast stairs

1



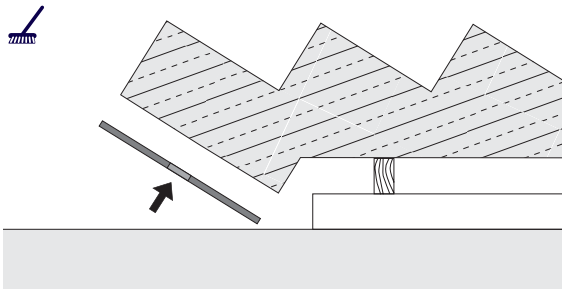
- Verify the width and depth of the precast stair elements as delivered to the construction site.

2



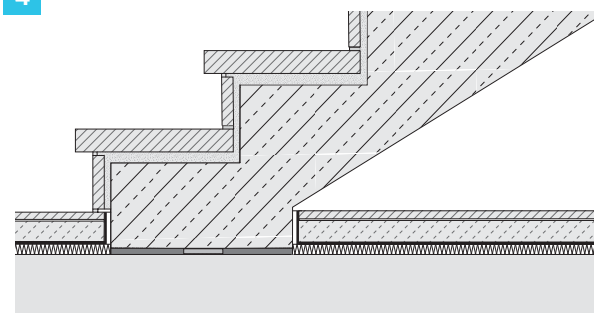
- Cut the HTF-B mat to the required width and depth. Remove the protective foil on the adhesive strips.

3

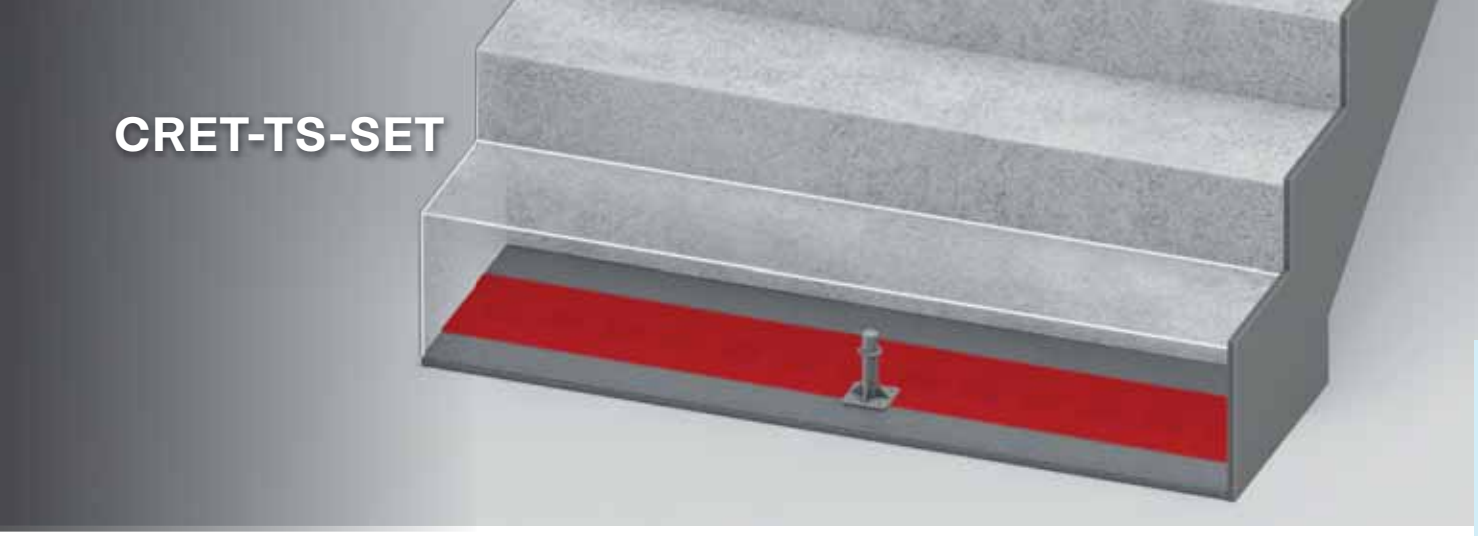


- Position and fix the HTF-B mat to the concrete. The surface must be clean and dust-free.

4



Check installation complies with the architect's specifications.



CRET-TS-SET

Material specifications and test certificates

Floor slab	Cast-in-situ concrete	
Stair elements	Cast-in-situ or precast concrete	
Available sizes	**Dowel:**	180 mm total length / 20 mm diameter
	Sleeve:	110 mm total length
Fire protection	Fire protection of the components up to R90 Certified fire protection properties: Expert report no. GA-2022/110-Nau	
Material	**Acoustic insulation:**	Elastomeric sleeve
	Dowel:	Stainless steel
	Sleeve:	Plastic

CRET-TS Dowel and CRET-TS-SET (above)

CRET-TS is a sound damping connector for precast or cast-in-situ concrete stairways.

Placed vertically across the joint between the floor slab and the first step of the stairs, CRET-TS ensures a reliable and secure positioning of the staircase, while guaranteeing an acoustic decoupling from the floor slab.

Ordering example

CRET - TS - SET

① ② ③

Type description

① Product designation
② Stair fixing element
③ CRET-TS acoustic dowel + HSD plastic sleeve

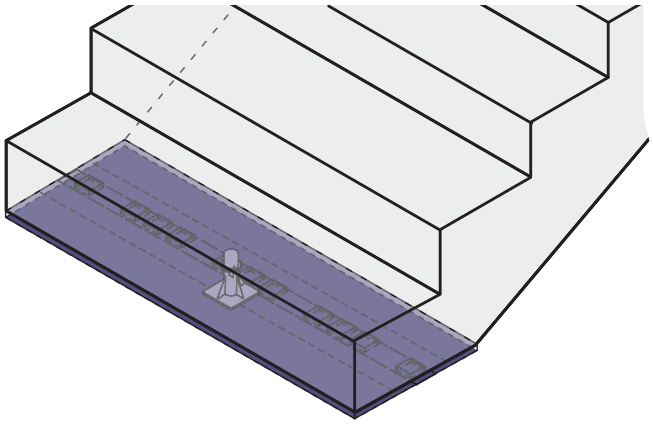


Figure: Application of CRET-TS-SET with HTF-B mat

CRET-TS-SET

CRET-TS-SET – Product description

Designation	Description	Length [mm]	Article number
CRET-TS-SET	Acoustic dowel diameter 20 mm with elastomeric sleeve + HSD plastic sleeve	205	60001571
CRET - TS ø20 × 180 - A4	Dowel diameter 20 mm in stainless steel with elastomeric acoustic sleeve	185	1000209719

Top view and cross-section CRET-TS-SET

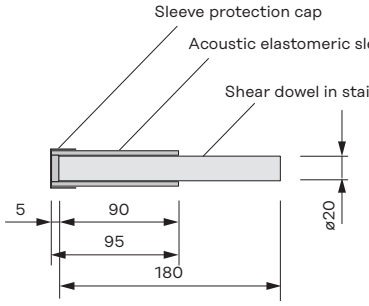


Figure: CRET-TS, cross-section

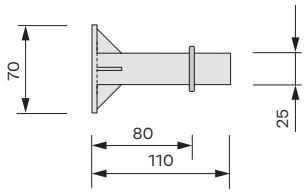


Figure: HSD plastic sleeve, cross-section

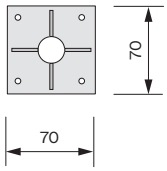


Figure: HSD plastic sleeve, front view

All dimensions in [mm]

Vertical impact sound insulation dowel for stair fixing

Application

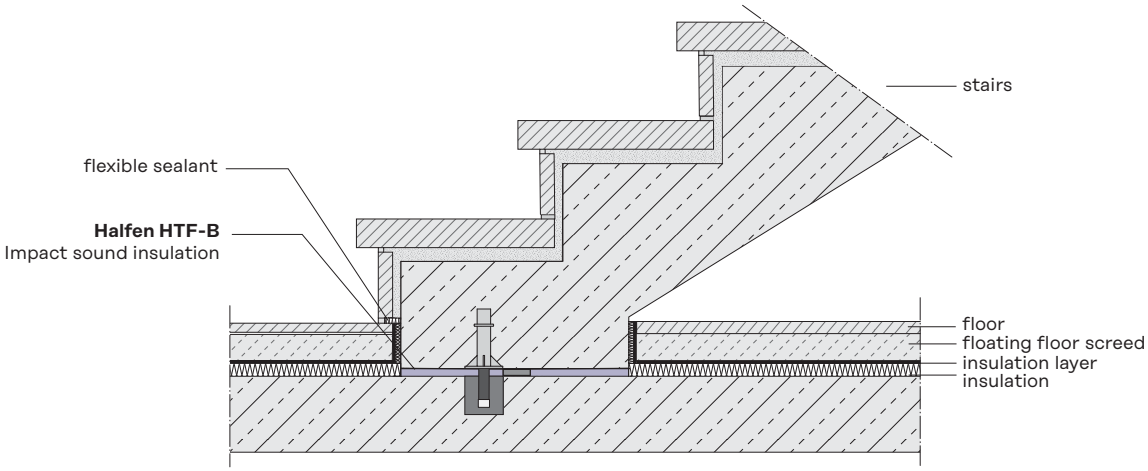


Figure: Installation cross-section – HSD plastic sleeve installed in precast stairs; CRET-TS-SET cast in floor slab, with stairs resting on HTF-B acoustic mat

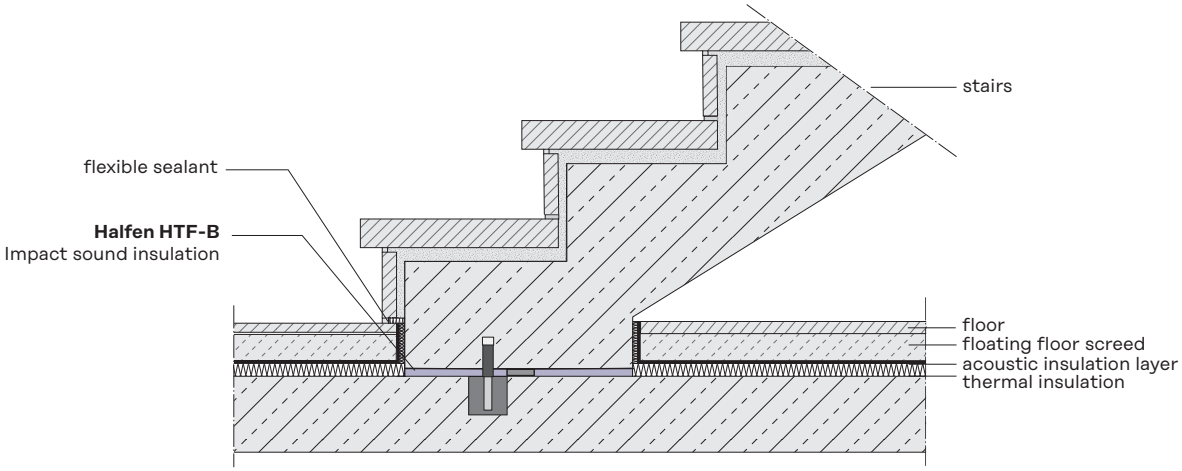
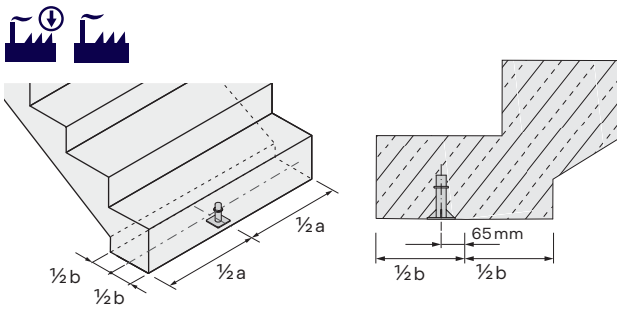


Figure: Installation cross-section – CRET-TS acoustic dowel + HTF-B acoustic mat

CRET TS-SET

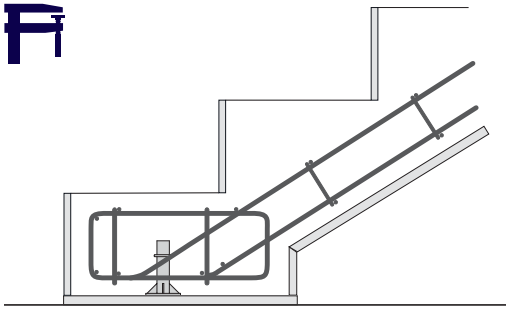
Installation instructions – Sleeve fitted in precast concrete stairs

1



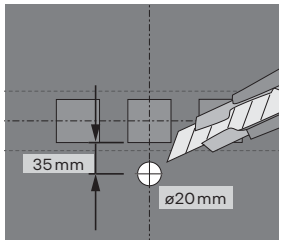
- Determine the position of the sleeve in the formwork at the precast plant.

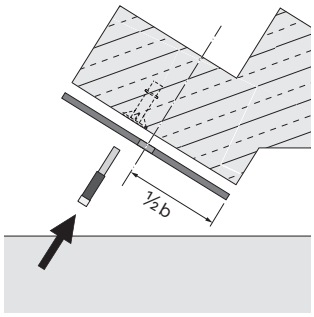
2



- Fix the HSD plastic sleeve to the formwork.
  Install the reinforcement of the stairs.
  Pour the concrete.

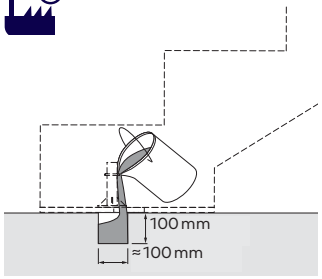
3

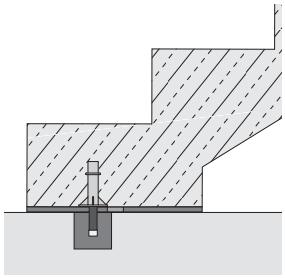




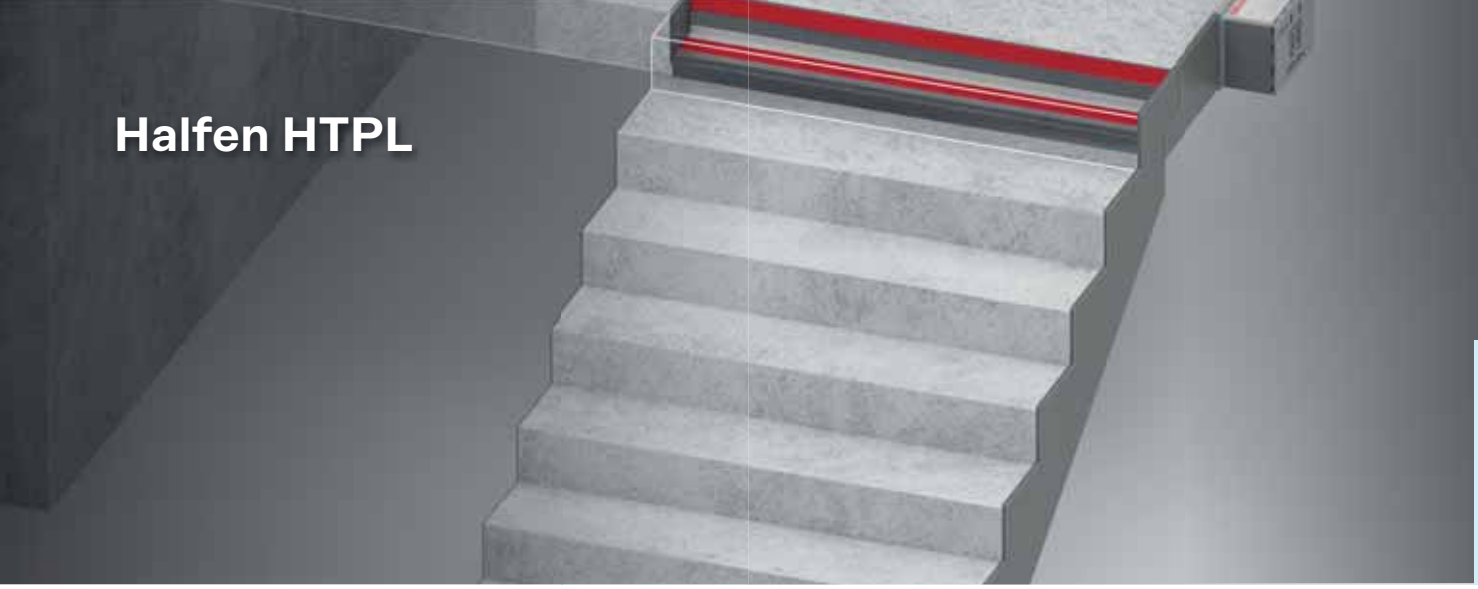
- On the construction site, cut out a hole for the dowel in the HTF-B mat. Stick the mat onto the cleaned and dust-free soffit of the precast staircase, insert the dowel in the HSD plastic sleeve.

4





- Fill the recess in the reinforced concrete slab with mortar and immediately install the precast stair element.



Halfen HTPL

Material specifications and test certificates

Stair elements	Cast-in-situ or precast concrete
Wall	Cast-in-situ concrete or masonry
Available sizes	**Length:** 1000mm **Widths:** 250 mm and 420 mm
Fire protection	Fire protection of the components up to R 90 Certified fire protection properties: Expert report no. GA-2022/110-Nau
Materials	Foam material class B2 in accordance with DIN 4102

Halfen HTPL-25-100 Joint insulation plate

The Halfen HTPL-100 Impact sound insulation plate consists of a robust PE foam.
The required cutting to size can be done easily on the construction site or at the precast concrete factory.

For easy installation, the entire surface of the plate is covered with a white, self-adhesive, double-sided film.
The plate reliably prevents the transmission of any impact sound.

The HTPL mats must be installed at the interface between the landing slab or the staircase and the adjacent wall to prevent any acoustic bridge.

Ordering example

HTPL - 25 - 100
① ② ③

Type description

① Product designation
② Element width [cm]
③ Element length [cm]

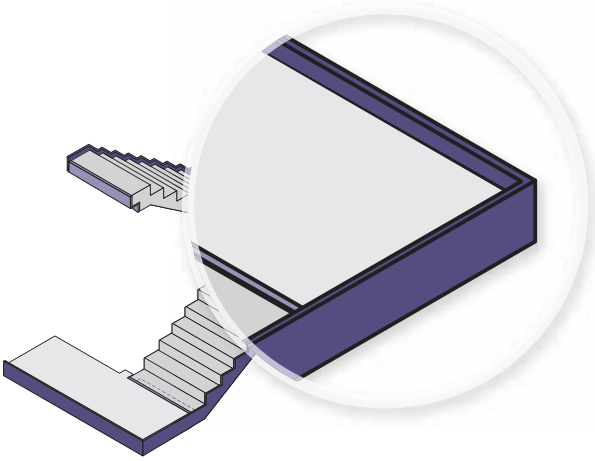


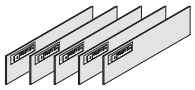
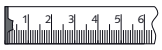
Figure: Application of the HTPL Impact sound insulation plate in a staircase

Halfen HTPL

1000211079
1000211080
1000211103
1000211104

Halfen HTPL – Product description

Designation	Width [mm]	Length [mm]	Thickness [mm]	Article number
HTPL-25-100	250	1000	15	1000211079
HTPL-42-100	420	1000	15	1000211080
HTPL-25-100-SET	250	1000	15	1000211103
HTPL-42-100-SET	420	1000	15	1000211104

HTPL SET COMPONENTS	
15 pcs. HTPL-25-100 or HTPL-42-100	
Leviat folding-ruler	
1 Roll of tape (20 m)	
Pencil	

HTPL Impact sound insulation plates are part of the Halfen sound insulation range and can be combined with other Halfen sound insulation products to prevent sound transmission resulting from rigid connections between the stairs and surrounding walls.

Top view and cross-section

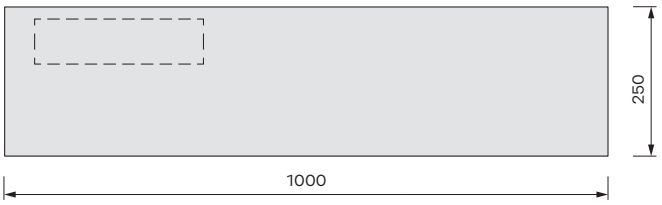


Figure: HTPL-25-100, top view

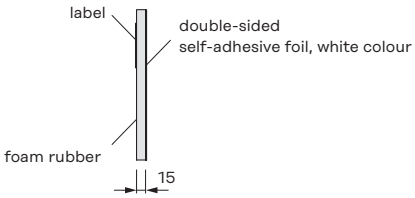


Figure: HTPL-25-100, section

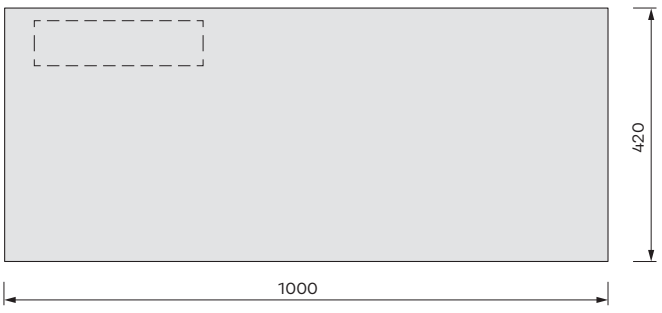


Figure: HTPL-42-100, top view

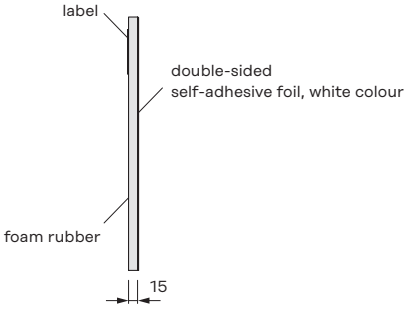


Figure: HTPL-42-100, section

All dimensions in [mm]

Impact sound insulation plate

Application

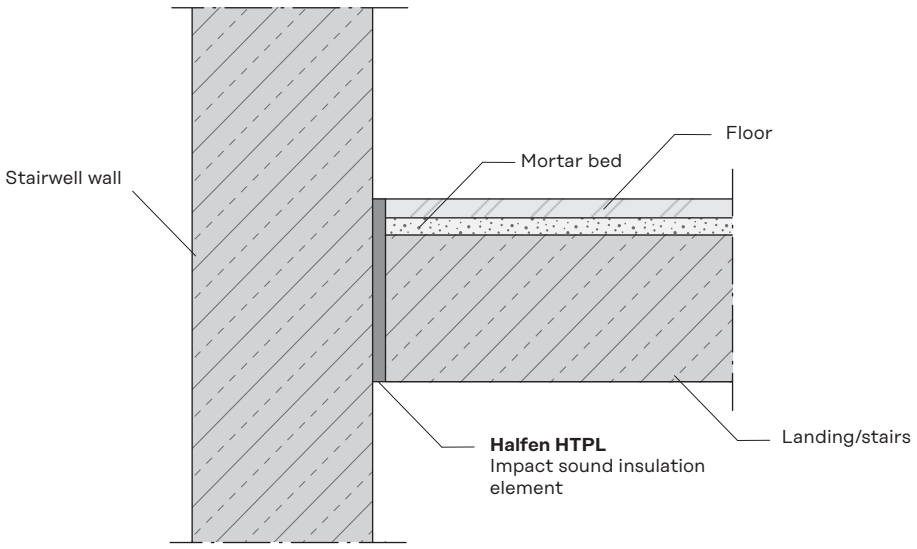


Figure: Halfen HTPL Impact sound insulation plate; cross-section 1

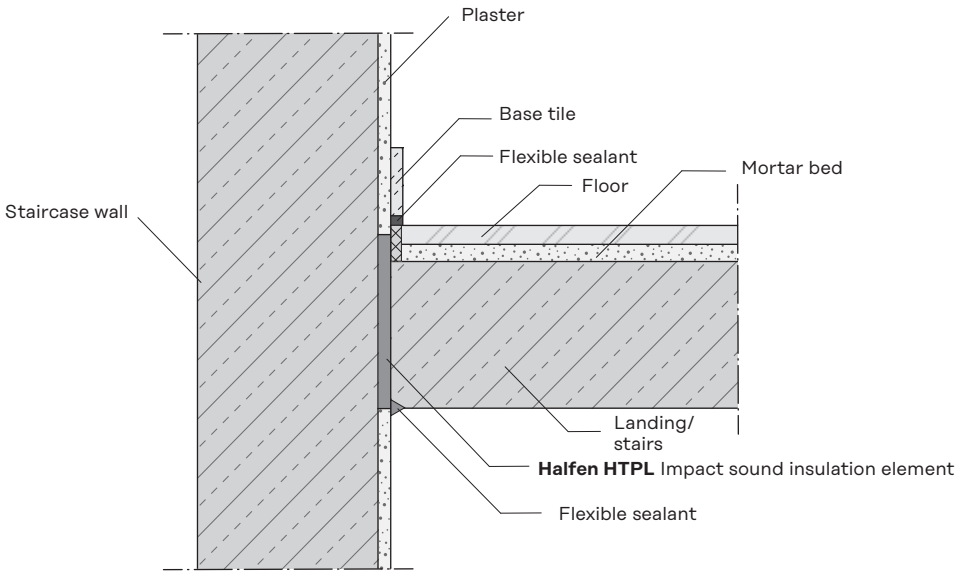


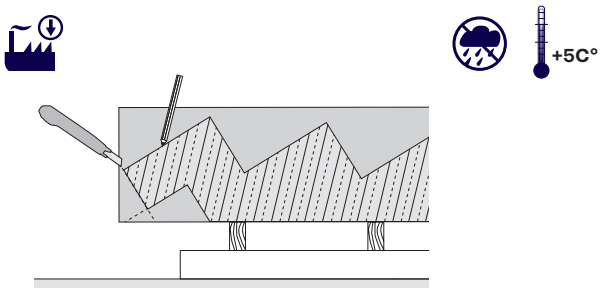
Figure: Halfen HTPL Impact sound insulation plate; cross-section 2

HTPL Impact sound insulation plates are part of the Halfen sound insulation range and can be combined with other Halfen sound insulation products to prevent sound transmission resulting from rigid connections between the stairs and surrounding walls.

Halfen HTPL

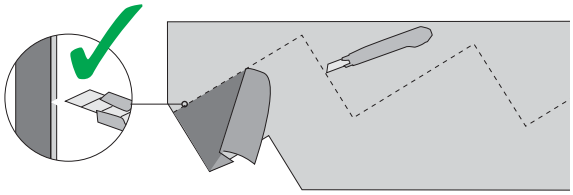
Installation instructions – Precast stairs

1



- On site, align the HTPL mats with the bottom edge of the staircase (see illustration).
  Trace the outline of the stairs with a pencil.

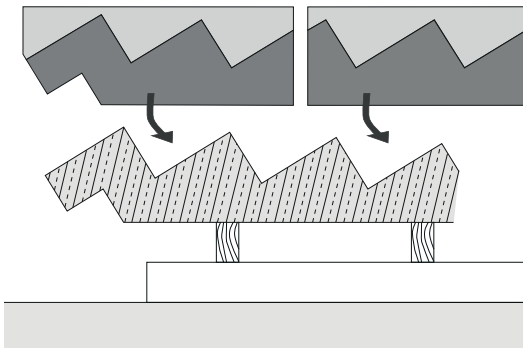
2



- Cutting

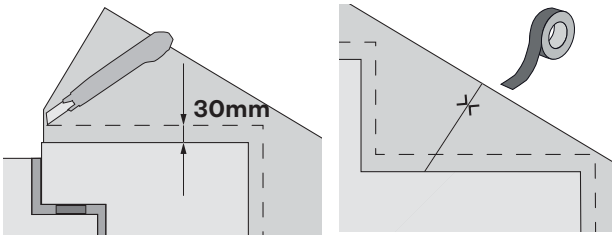
Using a very sharp blade, cut through the protective foil, taking care not to damage the sound absorbing material underneath; then remove the foil from the mats.

3



- Stick the HTPL mats onto the clean and dust-free concrete surface of the precast stairs.
  Ensure the joints between individual matts are tightly butted to each other.

4



- Cut and remove excess material leaving an exposed 30 mm edge. Seal the joints between mats with water-resistant adhesive tape.

Precise installation is required as gaps left between the elements may cause sound bridging. This would have a negative impact on the acoustic comfort in the adjacent rooms and the building.

Halfen HTT

Material specifications and test certificates

Stair landing slab	Cast-in-situ or semi-precast concrete elements
Stair elements	Cast-in-situ or precast concrete
Sound insulation	**Impact sound reduction:** ΔL = 12 dB Certified acoustic properties: test report 2027/7205-1-Re, IBMB Braunschweig
Fire protection	**Fire protection verification:** F90/F120 and R90/R120 in accordance with report GA-2017/128, IBB GmbH
Type tested	S-WUE 040519, LGA Würzburg
Product range	Available in three load sizes for staircase widths of 90 cm up to 200 cm, and landing slab thickness from 16 cm to 25 cm.
Materials	Galvanised steel sheet, mineral fibre insulation material and non-reinforced elastomeric bearings with general building authority approval, B500NR reinforcement steel.

Halfen HTT-6 Impact sound insulation

Halfen HTT impact sound insulation elements are suitable for supporting cast-in-situ and precast concrete stairs onto cast-in-situ concrete landing slabs subjected to predominantly static loads.

HTT elements are suitable for the transfer of vertical and horizontal loads. Static verification must be provided for the stair element and landing slab to confirm product suitability.

Lateral load restraint is provided on the understanding that additional reinforcement stirrups are installed, as specified on the drawing on page 46.

Subject to adequate concrete cover to the reinforcement, HTT elements will provide a high level of safety in the event of fire, allowing for a fire resistance class of R90/RF120 (F90 / F120).

Ordering example

HTT - 6 - 18 - 100

① ② ③ ④

Type description

① Product designation
② Load group
③ Landing slab height [cm]
④ Element length l / stair width [cm]

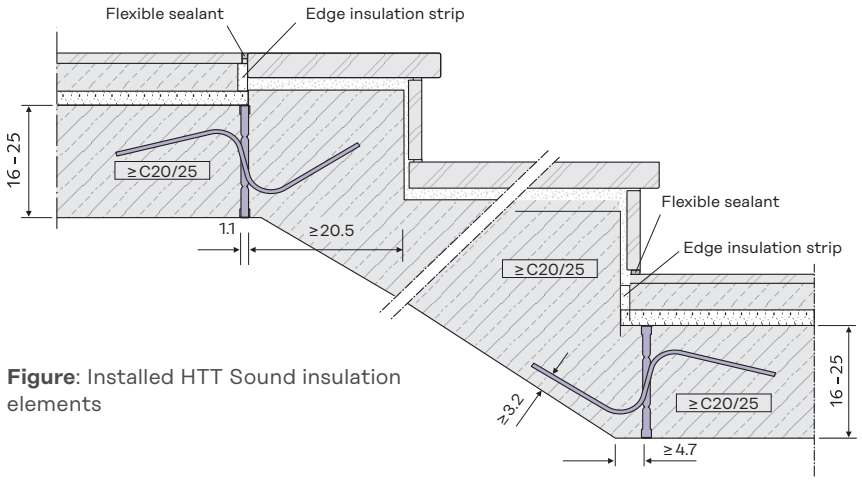


Figure: Installed HTT Sound insulation elements

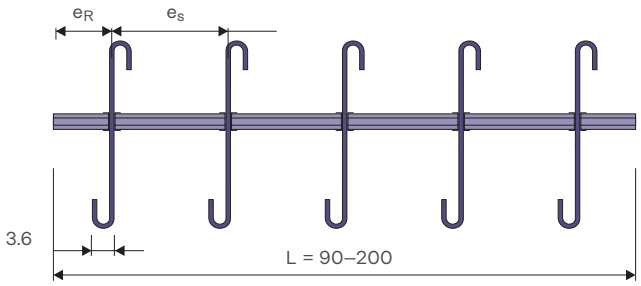
Halfen HTT

Halfen HTT – dimensions and load bearing capacities

Article name	Element height	Element length	Reinforcement	Spacings (approx.)		Values for structural design	
	h [cm]	L [cm]	number and diameter [mm]	Edge distance e_R	Spacing e_s	Lateral force V_{Rd} [kN/element]	Horizontal force H_{Rd} ❶ [kN/element]
HTT-4	16–25	90–200	3 ø6	L/6	L/3	35.9	±3.1
HTT-6			5 ø6	L/10	L/5	59.9	±4.2
HTT-8			6 ø6	L/12	L/6	71.8	±4.3

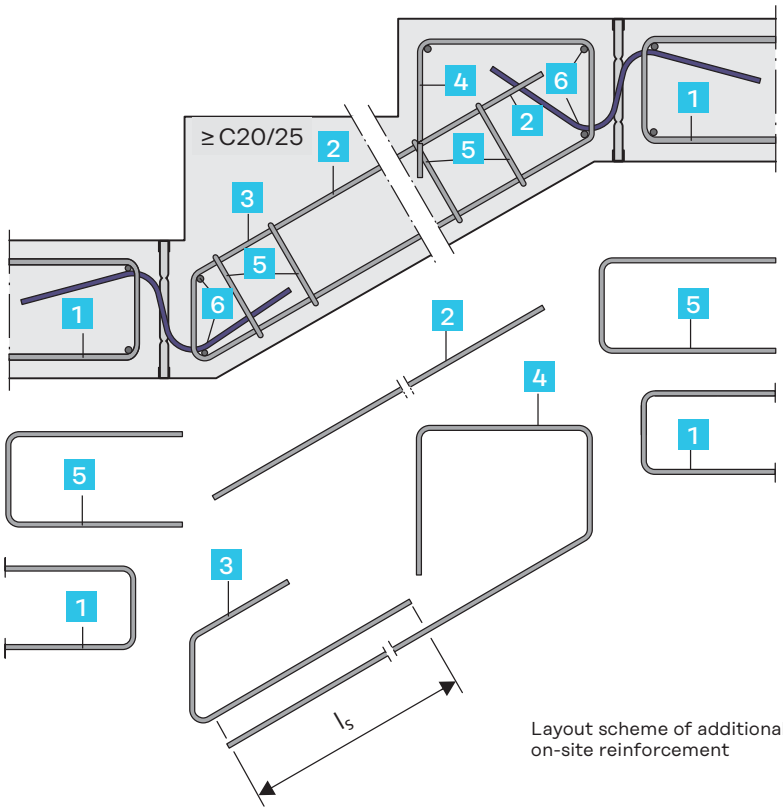
❶ max. possible horizontal load in longitudinal direction of the stairs (applies for maximum shear load)
→ see type test

Dimensions diagram



Standard lengths L = 100 / 120 cm
Custom lengths L = 90 – 200 cm

Design regulations for reinforcing and installation notes



Layout scheme of additional on-site reinforcement

Additional on-site reinforcement
(static verification required in accordance with the type test by a structural engineer):

1. End stirrups or mesh reinforcement
2. Top reinforcement layer
3. End stirrups, bent as hanger reinforcement
4. Bottom reinforcement layer, bent as hanger reinforcement
5. End stirrups, 2× ø6
6. Reinforcement bars ø8 (HTT-4, -6) or ø10 (HTT-8)

Note

Positions 1 – 4 are calculated in accordance with static requirements. Moments resulting from excentric connections have to be considered in the design calculation for the stair elements.

Impact sound insulation element for stairway support

Installation instructions – Precast stairs

1

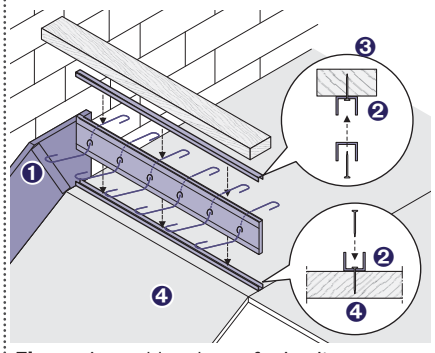


Figure: Assembly scheme for in-situ cast elements

Application with cast-in-situ concrete stairs and landings

Installation procedure for cast-in-situ stairs

- **HTPL Sound insulation plates** are fixed to the wall, following the outline of the stairs. The surface of the wall must be completely clean ensuring there are no gaps between the plates
- The bottom **HTT Nail bar** is fixed to the formwork at the specified position
- Insert the **HTT element** in the nail bar
- The top **HTT Nail bar** is fixed using an auxiliary aid (e.g. timber batten) and slotted to the top of the **HTT Impact sound insulation element**

Correctly align and fix the HTT element at the required vertical position.

2

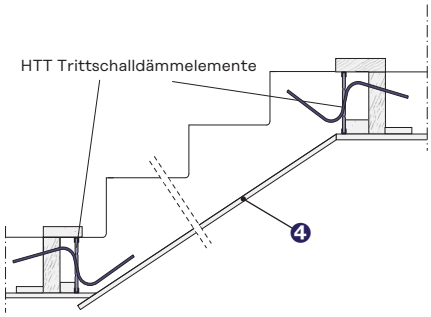


Figure: Formwork in the precast plant

Application with precast concrete stairs and cast-in-situ concrete landings

Installation in the precast plant:

- Installation of the formwork as on the picture at the left hand-side
- Fix the HTT Impact sound insulation element with the nail bars (included) as shown in figure 1
- The **HTT element** must be aligned and fixed vertically at the appropriate position

3

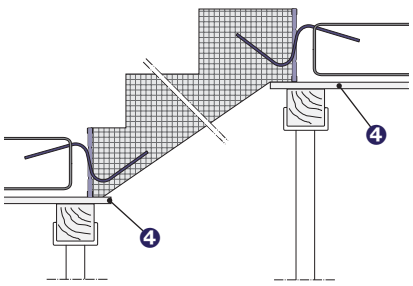


Figure: On-site installation of the precast stair element

Application with precast concrete stairs and cast-in-situ concrete or semi-precast concrete landings

Installation of precast element on-site:

- Installation as in figure 2
- Both cast-in-situ concrete and precast concrete landings are achievable.
- Place the **Halfen HTPL Sound insulation plates** in the gap between the stairs and the adjoining wall of the stairwell.

Installation note

① Halfen HTPL Impact sound insulation plate
② Nail bar (supplied)
③ Auxiliary aid
④ On-site formwork

On-site **Precast plant**

High performance impact sound insulation products

For delightful peace and quiet in new constructions

SILENT – The sound damping product range that sets high acoustic standards

We live in a loud world. Noise makes people ill, wears on their nerves, spoils their concentration. The need for greater peace and quiet in our private and professional lives is a legitimate aspiration.

With it come higher expectations on noise insulation in buildings.
The range of innovative and highly efficient Silent products already allows this factor to be considered when planning concrete structures.

In addition to their superior structural properties, the Silent load transmission elements exhibit enhanced noise reduction characteristics.

Excellent structural and enhanced sound damping properties!

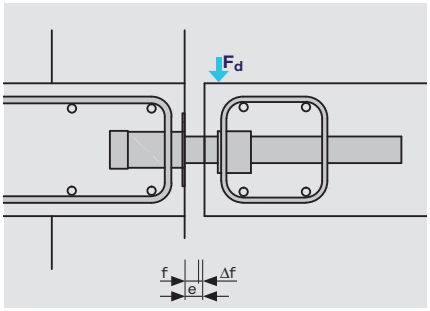
- Outstanding features based on select-grade PUR acoustic materials, allowing for very high weighted difference in impact sound pressure level (ΔL*n,w)
- Tested at the Fraunhofer Institute IBP / at the EMPA / at Schalltechnisches Entwicklungs- und Prüfinstitut (STEP) GmbH.
- Experimental verification of the strength and deflection capacity of the acoustic elements.
- Minimum time and effort in planning and construction work

Slab connected with CRET Silent shear load connectors

CRET Silent shear load connectors

Very wide range of sound damping connectors:

- Facilitate shear load transmission and deflection compatibility between adjacent building elements
- Guarantee acoustic isolation of building and/or structural elements such as stairways, landings, balconies, pathways, etc.
- CRET Silent range can be applied to in-situ poured concrete elements and to precast elements as well.

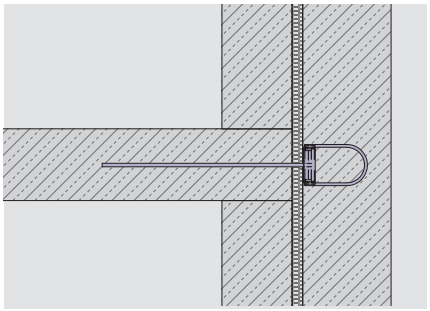


CRET Silent - general cross section

RIBA Silent tension & compression load connectors

RIBA Silent bolted tension and compression anchors with sound insulation

- Free-standing structures such as self-supporting access balconies need horizontal stabilisation.
- RIBA Silent anchors not only allow normal load transmission in movement joints, but also provide simple and acoustically efficient isolation of building elements.
- The bolted tension and compression anchors are very easy to implement on the building site.



RIBA Silent - general cross section

High performance impact sound insulation products

Overview

SILENT – Product overview

CRET Silent® – for cast in-situ concrete

Type	Joint gap [mm]	Ultimate resistance F_{Rd} [kN]	Weighted difference in impact sound pressure level ① ($\Delta L^*_{n,w}$) at maximum load [dB]	Weighted reduction in impact sound pressure level of the landing at maximum load $\Delta L_{w,landing}$ [dB]
CRET Silent-930	10 – 40	12.4 – 9.1	30	35
CRET Silent-960	10 – 60	30.9 – 24.4	23	28
CRET Silent-970	10 – 60	26.1 – 19.9	28	33
CRET Silent-992	10 – 60	43.8 – 39.9	24	29
CRET Silent-993	10 – 60	64.4 – 51.5	23	28
CRET Silent-994	10 – 60	84.6 – 69.0	25	30

① without applying the reference floor method

CRET Silent® – for prefabrications

Type	Joint gap [mm]	Ultimate resistance F_{Rd} [kN]	Weighted difference in impact sound pressure level ① ($\Delta L^*_{n,w}$) at maximum load [dB]	Weighted reduction in impact sound pressure level of the landing at maximum load $\Delta L_{w,landing}$ [dB]
CRET Silent-930 for prefabrication in combination with CRET-P	10 – 40	12.4 – 9.1	30	35
CRET Silent-960P	10 – 60	30.9 – 24.4	23	28
CRET Silent-970P	10 – 60	26.1 – 19.9	28	33
CRET Silent-945 APG	10 – 50	22.0	33	40
CRET Silent-946 APG	10 – 50	38.3 – 26.3	34	40
CRET Silent-947 APG	10 – 50	50.0 – 47.2	30	36
CRET Silent-992P	10 – 60	43.8 – 39.9	24	29
CRET Silent-993P	10 – 60	64.4 – 51.5	23	28
CRET Silent-994P	10 – 60	84.6 – 69.0	25	30

① without applying the reference floor method

RIBA Silent®

Type	Max. joint gap [mm]	Load under tension (F_{Rd}) [kN]	Load area under compression (element restrained in transverse direction) (F_{Rd}) [kN]	Load area under compression (element restrained not in transverse direction) (F_{Rd}) [kN]	Weighted difference in impact sound pressure level ① ($\Delta L^*_{n,w}$) at maximum load [dB]	Weighted reduction in impact sound pressure level of the landing at maximum load $\Delta L_{w,landing}$ [dB]
RIBA Silent-915	40 – 200	23.1	25.0 – 23.2	25.0 – 22.5	33	–
RIBA Silent-917	40 – 200	62.8	62.8	62.8 – 57.9	33	–

① without applying the reference floor method

CRET & RIBA Silent range – Sound damping shear load and tension/compression load connectors

Product Overview

CRET SILENT-930

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CRET Silent-945, 946, 947 (APG)

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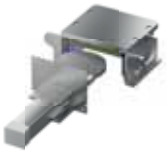
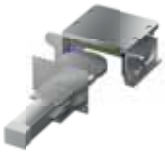
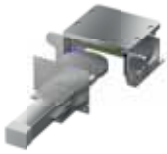


CRET Silent 945 APG



CRET Silent 946 APG



CRET Silent 947 APG

CRET Silent-960, 970 (P)

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CRET Silent 960

CRET Silent 970

CRET Silent 960P

CRET Silent 970P

CRET Silent-992, 993, 994 (P)

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CRET Silent 992

CRET Silent 992-P

CRET Silent 993

CRET Silent 993-P

CRET Silent 994

CRET Silent 994-P

RIBA Silent-915, -917

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Box

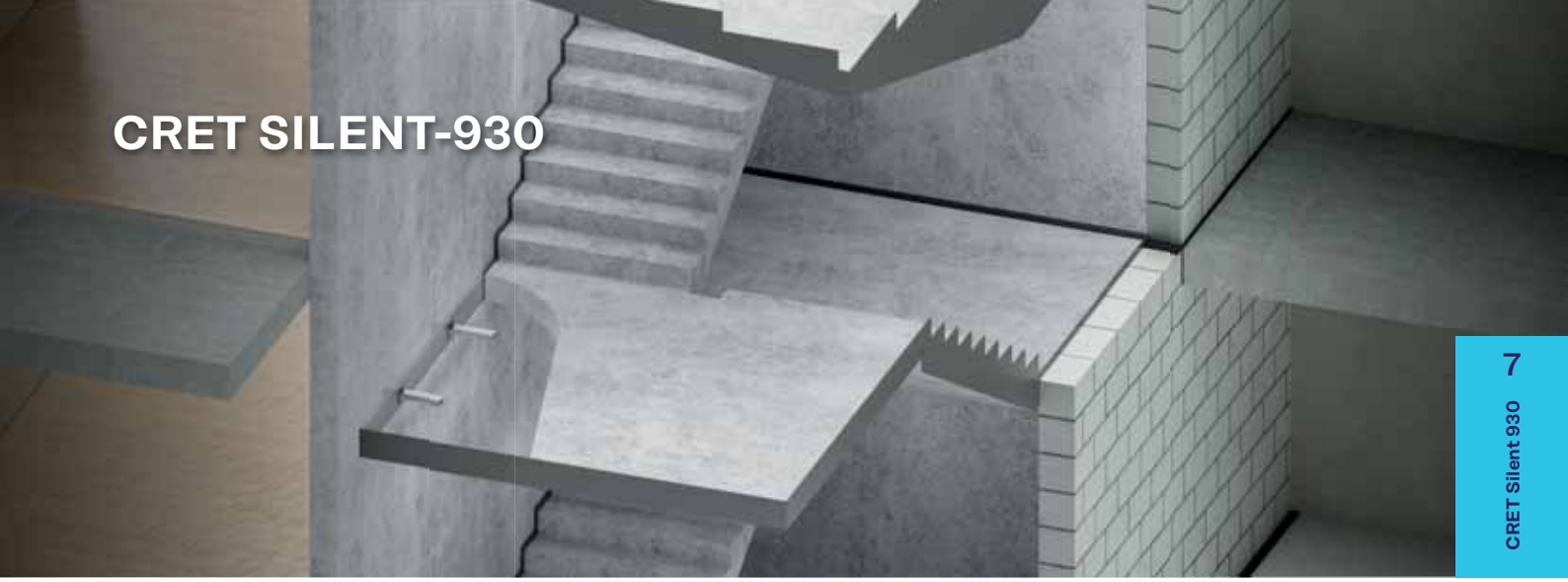
915/917

Tension and compression anchors

Model A

Model B

Model C



CRET SILENT-930

Sound damping shear load connector for winding staircases

Material specifications

Dowel:	Made of stainless steel with superior mechanical properties, corrosion resistance class III to data sheet SIA 2029.
Sound damping material:	Synthetic rubber

CRET Silent 930 CRET-P MVK

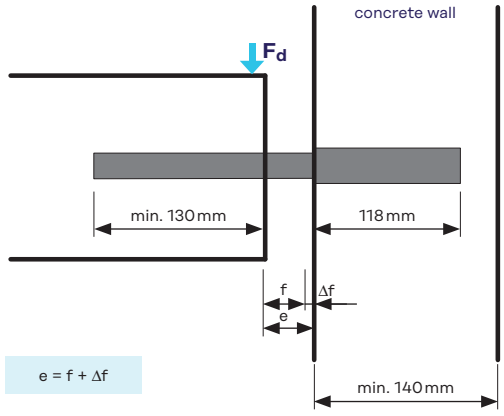
CRET Silent-930 is a sound damping shear load connector for winding staircases and the uniaxial transmission of shear loads.

It is designed to be used as a sound damping bearing for concrete staircases cast in-situ and, when combined with the "CRET-P" sleeve, of precast concrete staircases. It can be used in masonry walls when combined with the MVK load distribution frame.

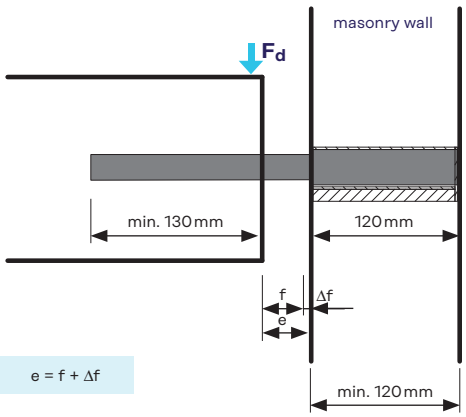
Ordering parts

CRET Silent-930	CRET-P	MVK
for application in concrete (in situ poured or precast)	optional unit for application in precast concrete	optional unit for application in a masonry wall

Installation in concrete



Masonry installation



f: Nominal joint gap
Δf: Displacement factor
e: Relevant joint gap for static design

CRET Silent-930

CRET Silent-930 – dimensions and load bearing capacities

Figure: Dimensions CRET Silent-930

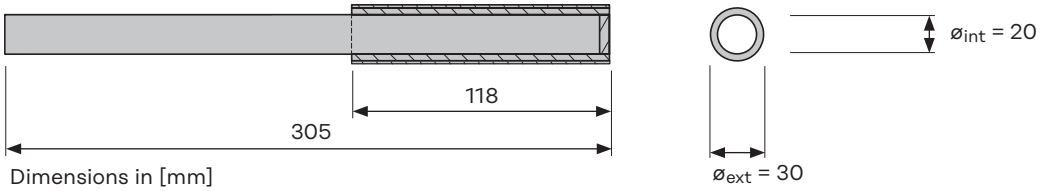
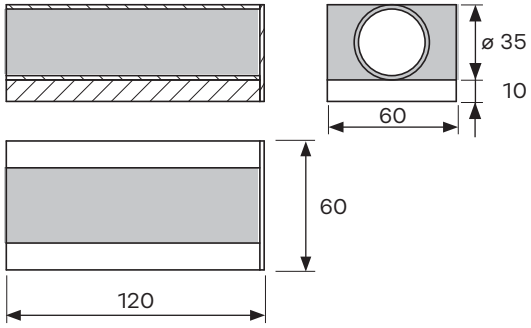
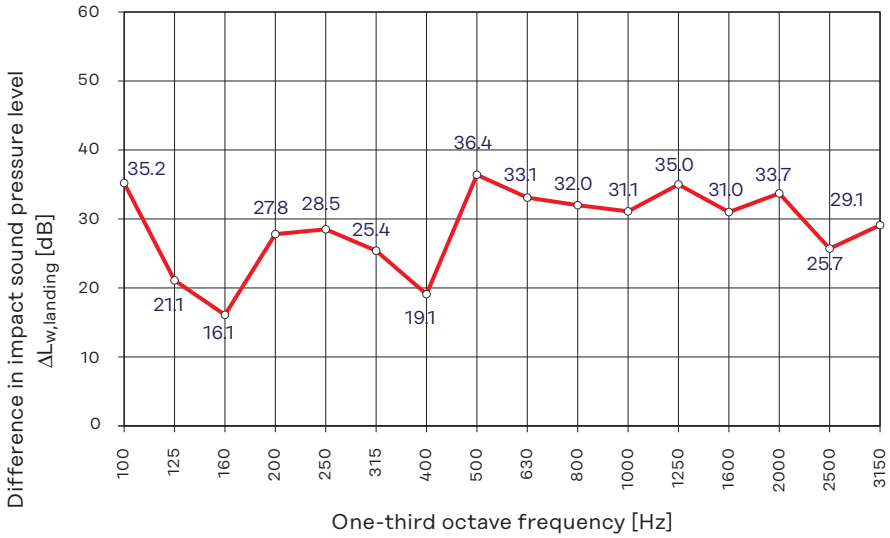


Figure: Dimensions MVK for installation in masonry



Measurement results of impact sound reduction (one-third octave bands)



Difference in impact sound pressure level of a CRET Silent-930 shear load element at maximum load. Additional spectral values for the difference in impact sound pressure level of the landing and the reduction in impact sound pressure level of the landing are presented in the measurement report.

Based on measurements for the weighted difference in impact sound pressure level[1)] $\Delta L^*_{n,w}$ and the weighted reduction in impact sound pressure level of the landing $\Delta L_{w,landing}$ in accordance with DIN 7396:2016 carried out at the Fraunhofer Institute IBP, the following values were derived for these CRET Silent-930 connectors:

$\Delta L^*_{n,w}$	= 30 dB
$\Delta L_{w,landing}$	= 35 dB

Shear load connectors of the CRET Silent-930 series are elements offering excellent strength levels and good difference in impact sound pressure level.

Sound damping shear dowels type CRET Silent

CRET Silent 930 – Product overview

Article	Article number	Difference in weighted pressure level of impact noise at maximum load $\Delta L^*_{n,w}$	Weighted improvement index of the pressure level of the impact noise at the landing under maximum load $\Delta L_{w,landing}$	Design load F_{Rd}	Joint width	In-situ poured concrete	Precast concrete	Masonry
CRET Silent®-930 	1000200107	30 dB	35 dB	12.4 – 9.1 kN	10–40 mm	●	● in combination with CRET-P	●
optional								
CRET-P 	3000021811	For use in prefabrication applications						
MVK Sleeve 	1000200108	For installation in masonry						

Benefits

- For cast in-situ concrete and for prefabrication
- Excellent structural and acoustically enhanced properties
- Very high weighted difference in impact sound pressure level ($\Delta L^*_{n,w}$)
- Experimental verification of strength and deflection capacity of the acoustic elements
- Tested at Fraunhofer Institute IBP
- Minimal effort in planning and construction

Fire protection:

- In movement joints, fire resistant collars are used for fire protection purpose
- They protect shear load connectors from the effects of exposure to fire. Fire protection collars are available on request.
- Detailed information on fire protection collars is given in the documentation "Fire protection collars CRET-BM" at page 8.

CRET Silent-930

Design strength tables

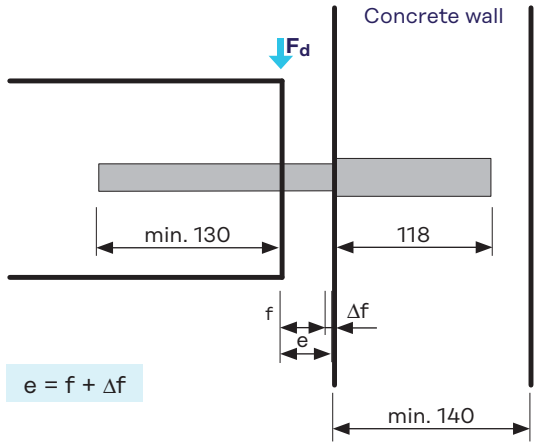
CRET Silent 930	Design strength (Concrete ≥ C25/30)	
	F_{Rd} [kN]	Δw [mm]
e ≤ 10 mm	12.4	1.0
e = 15 mm	11.8	1.1
e = 20 mm	11.1	1.2
e = 25 mm	10.6	1.4
e = 30 mm	10.1	1.5
e = 35 mm	9.6	1.7
e = 40 mm	9.1	1.8

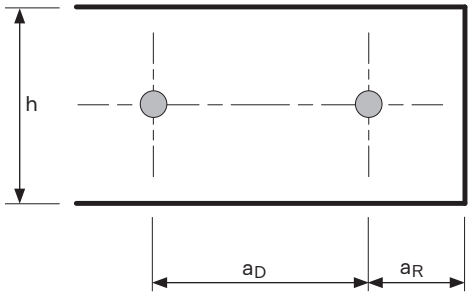
F_{Rd} = design shear resistance
Δ_w = deformation due to service load F_{Rd} / 1.4

CRET Silent 930	Minimum connector spacing $a_{D,min}$ (Concrete ≥ C25/30)			
	Slab thickness h [mm]	$a_{D,min}$ r = 0.2% [mm]	r = 0.5% [mm]	r = 1.0% [mm]
	150	180	180	180
	160	180	180	180
	180	180	180	180
	200	180	180	180
	220	180	180	180
	240	180	180	180
	≥ 260	180	180	180

r = reinforcement ratio of the slab

Installation instructions and design rules

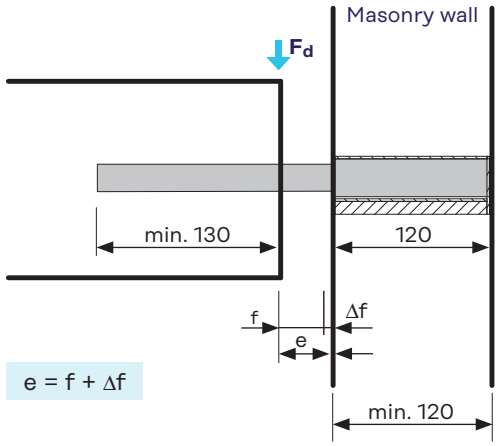


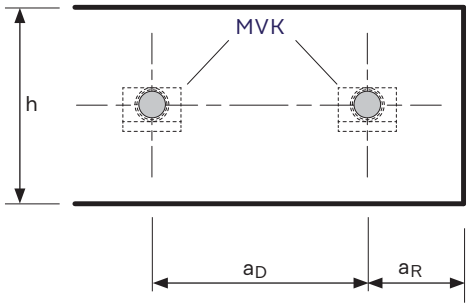


$a_{R,\,min} = \frac{a_{D,\,min}}{2}$

h_{min} = 150 mm
e = 10 to 40 mm
c_{nom} = 20 mm

Optional: Load distribution frame MVK for use in masonry wall.





$a_{R,\,min} = \frac{a_{D,\,min}}{2}$

h_{min} = 150 mm
e = 10 to 40 mm
c_{nom} = 20 mm

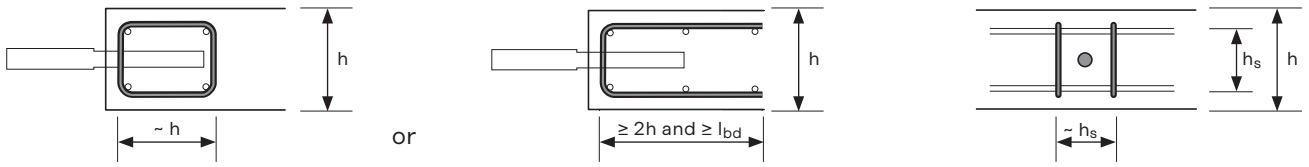
f	Nominal joint gap
Δf	Displacement factor
e	Relevant joint gap for static design
F_d	Design value acting on the shear dowel
h	Slab thickness
$a_{D,\,min}$	Minimum connector spacing. This depends on the shear resistance of the slab (with or without shear reinforcement). In any event, the minimum values given must be applied.

Sound damping shear dowels type CRET Silent

Additional stirrups

For slab edge support with shear load connectors, suspension reinforcement must always be specified (see picture below)

Figure: Stirrup reinforcement



l_{bd} Development length to Code SIA 262 5.2.5

Concrete ≥ C25/30	e = 10 to 40 mm
Stirrup reinforcement [mm]	2 Ø10

Stirrup reinforcement on slab edge

Shear load reinforcement is required in the edge zone to take up the torsional moments. Dimensioning the suspension reinforcement at the slab edge, between the connectors, is dependent on the prevailing static conditions.

Longitudinal Reinforcement at the Slab Edge

When designing longitudinal reinforcement at the slab edge:

- Consider the continuous beam behavior of the slab edge (span width = distance between connectors).
- Account for expansion forces in the slab edge direction caused by dowel shear load.
- Ensure minimum reinforcement to limit crack width.

CRET Silent-945, -946, -947 (APG)

Shear load connector with sound insulation

Material specifications

Staircase:	Precast concrete
Bearing wall:	In-situ cast concrete or masonry wall
Sound insulation:	Weighted difference in impact sound pressure level: **CRET Silent -945 APG** $\Delta L^*_{n,w}$ = 33 dB **CRET Silent -946 APG** $\Delta L^*_{n,w}$ = 34 dB **CRET Silent -947 APG** $\Delta L^*_{n,w}$ = 30 dB
Materials:	Dowel made of stainless steel with superior mechanical properties, corrosion resistance class III to data sheet SIA 2029. APG made of S235 and S355, hot-dip galvanized. Sound damping material: PUR.

CRET Silent 945 (sleeve, dowel and APG)

CRET Silent-945 APG, -946 APG and -947 APG are sound damping connectors for prefabricated building elements such as stairways , landing slabs, balconies, access pathways etc. for the uniaxial transmission of shear loads.

The dowel is height-adjustable over a range of approximately 0 to 12 mm. This allows adjustment of prefabricated elements.

Ordering parts

CRET Silent-945 APG	CRET Silent-946 APG	CRET Silent-947 APG

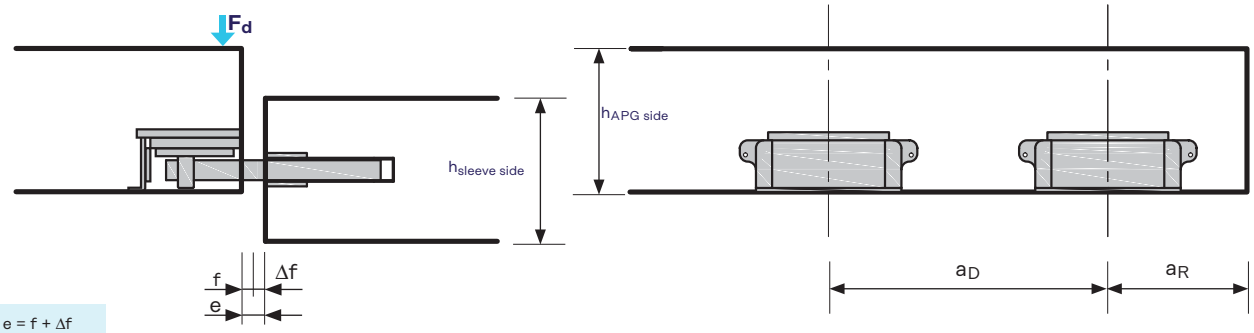
Optional: Covers with different functions

- Visual covers
- Fire-retardant covers R90
- Covers against lifting forces

f: Nominal joint gap
Δf: Displacement factor
e: Relevant joint gap for static design

$h_{APG\ side}$ = 350 mm (CRET Silent-945 APG)
430 mm (CRET Silent-946 APG)
530 mm (CRET Silent-947 APG)

$a_{R,min} = \frac{a_{D,min}}{2}$



e = f + Δf

Height adjustable shear load connector with sound insulation

Product overview and load bearing capacities

Article	Article number	Weighted difference in impact sound pressure level at maximum load $\Delta L^*_{n,w}$	Weighted reduction in impact sound pressure level of the landing at maximum load $\Delta L_{w,landing}$	Ultimate resistance F_{Rd}	Joint width
CRET Silent-945 APG 	60000062	33 dB	40 dB	22 kN	10–50 mm
CRET Silent-946 APG 	60000065	34 dB	40 dB	38.3–26.3 kN	10–50 mm
CRET Silent-947 APG 	60000066	30 dB	36 dB	50.0–47.2 kN	10–50 mm

Optional covers for CRET Silent-945/-946/-947

Article	Visual covers	Fire-retardant covers R90	Covers against lifting forces
Article number	1000200161	60000064	1000200162
CRET Silent-945	✔	✔	✔
CRET Silent-946	✔	✔	✔
CRET Silent-947	✔	✔	✔

CRET Silent 945/946/947 APG – Design strength

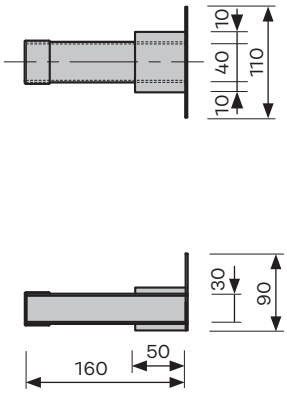
Design strength F_{Rd} [kN]	Concrete ≥ C25/30				
	Joint e [mm]				
	10	20	30	40	50
CRET Silent-945 APG	22.0	22.0	22.0	22.0	22.0
CRET Silent-946 APG	38.3	34.8	31.4	28.7	26.3
CRET Silent-947 APG	50.0	50.0	50.0	50.0	47.2

CRET Silent-945, -946, -947 (APG)

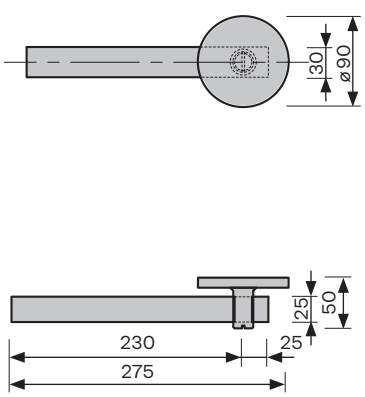
Dimensions

CRET Silent-945

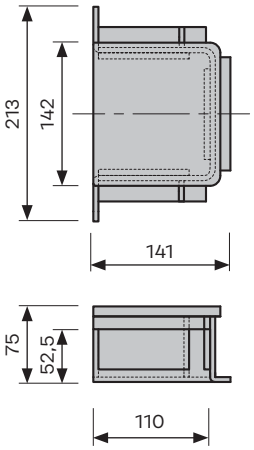
Sleeve



Dowel



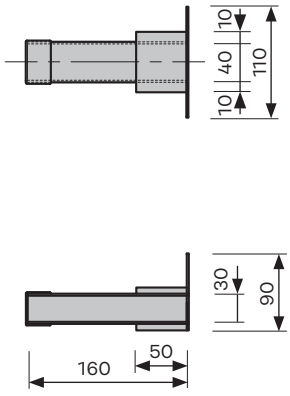
APG



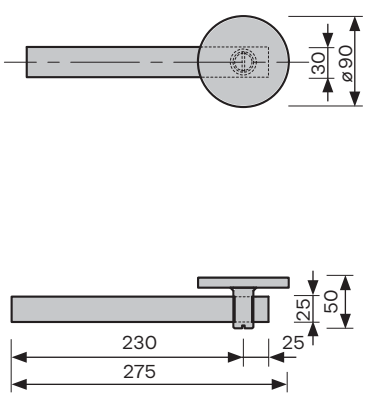
All dimensions in [mm]

CRET Silent-946

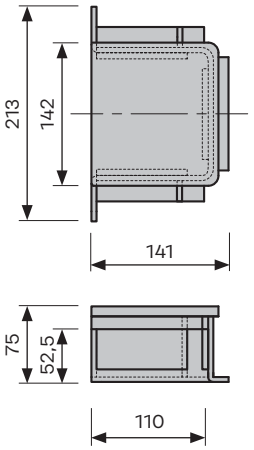
Sleeve



Dowel



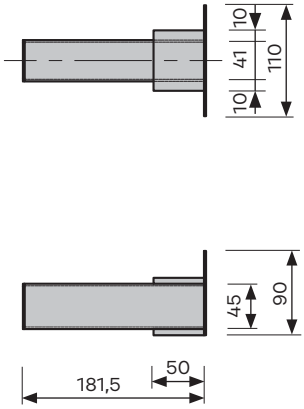
APG



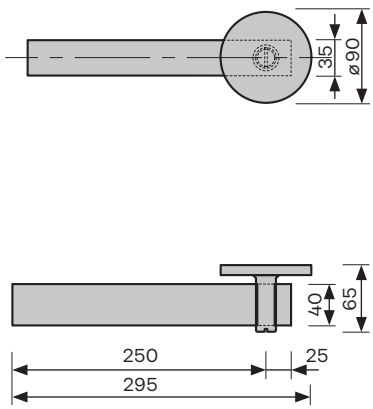
All dimensions in [mm]

CRET Silent-947

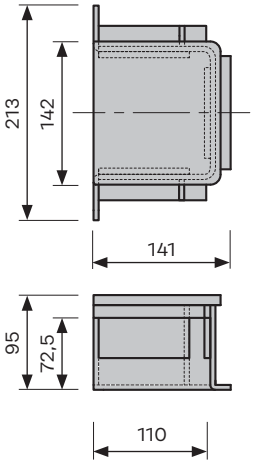
Sleeve



Dowel



APG



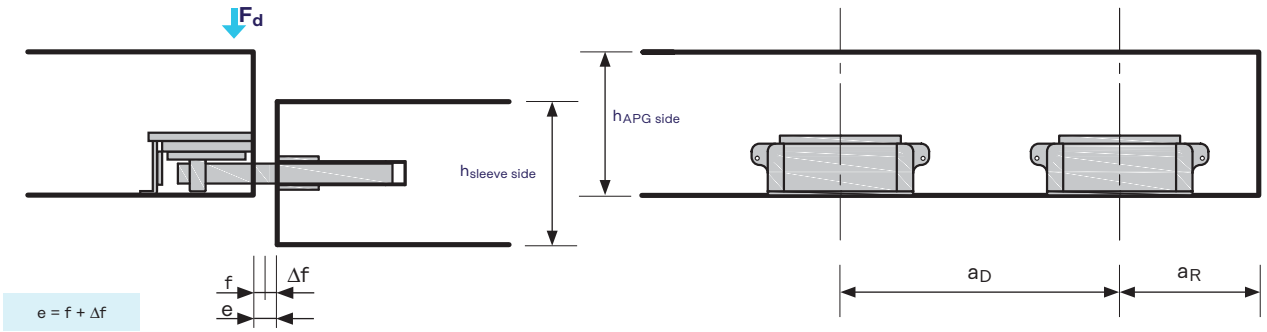
All dimensions in [mm]

Height adjustable shear load connector with sound insulation

Installation instructions and design rules

$h_{APG\ side}$ = 350 mm (CRET Silent-945 APG)
430 mm (CRET Silent-946 APG)
530 mm (CRET Silent-947 APG)

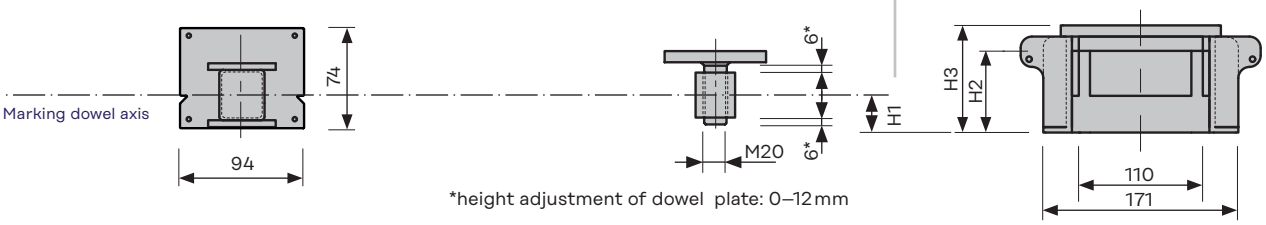
$a_{R,min} = \frac{a_{D,min}}{2}$



e = f + Δf

Height adjustment

Height offset between dowel axis marking and lower edge of the APG disregarding deformation.



*height adjustment of dowel plate: 0–12 mm

	H1 [mm]	H2 [mm]	H3 [mm]
CRET Silent-945	21.0	52.5	75.0
CRET Silent-946	21.0	52.5	75.0
CRET Silent-947	33.0	72.5	95.0

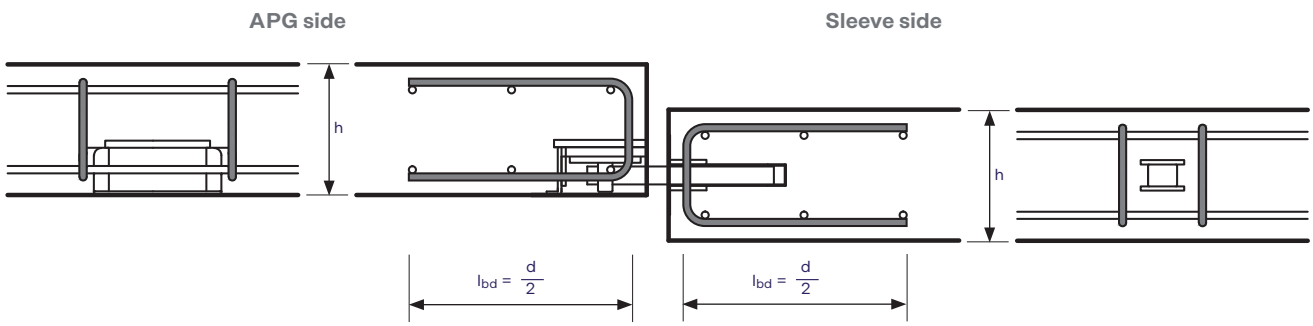
All dimensions in [mm]

Legend

f	Nominal joint gap
Δf	Displacement factor
e	Relevant joint gap for static design
$a_{D,\ min}$	Minimum connector spacing
F_e	Design value of dowel strength
h	Slab thickness

CRET Silent-945, -946, -947 (APG)

Additional reinforcement



Development length to SIA 262 5.2.5

with:

l_{bd} = anchoring length

d = diameter of the stirrups

Figure: Stirrup reinforcement

Additional stirrups

For slab edge support using shear load connectors, stirrups (see figure above) must be specified. This suspension reinforcement can be read off the following table.

This refers to the total suspension reinforcement, i.e. each side must have the same number of stirrups installed.

Stirrup reinforcement [mm]	Concrete ≥ C25/30
	Joint e ≤ 50 mm
CRET Silent®-945-APG	2 ø 10
CRET Silent®-946-APG	2 ø 12
CRET Silent®-947-APG	4 ø 12

Stirrup reinforcement on slab edge

Shear load reinforcement is required in the edge zone to take up the torsional moments. Dimensioning the suspension reinforcement at the slab edge, between the connectors, is dependent on the prevailing static conditions.

Longitudinal Reinforcement at the slab edge

When designing longitudinal reinforcement at the slab edge:

- Consider the continuous beam behavior of the slab edge (span width = distance between connectors).
- Account for expansion forces in the slab edge direction caused by dowel shear load.
- Ensure minimum reinforcement to limit crack width.

CRET Silent-960, -970 (P)

Sound damping shear load connector

Material specifications

Staircase:	**CRET Silent -960, -970:** Cast-in-situ concrete **CRET Silent -960P, -970P:** Precast concrete
Bearing wall:	In-situ cast concrete or masonry wall
Sound insulation:	Weighted difference in impact sound pressure level at maximum load up to $\Delta L^*_{n,w} = 28$ dB
Materials:	Dowel made of neoprene (synthetic rubber) with core of S235 (CRET Silent-960, -960P) or S355 tubing (CRET Silent-970, -970P); water resistant, largely resistant to waxes, greases, oils, leaching agents, diluted acids and saline solutions.


CRET Silent 960


CRET Silent 970


CRET Silent 960P


CRET Silent 970P

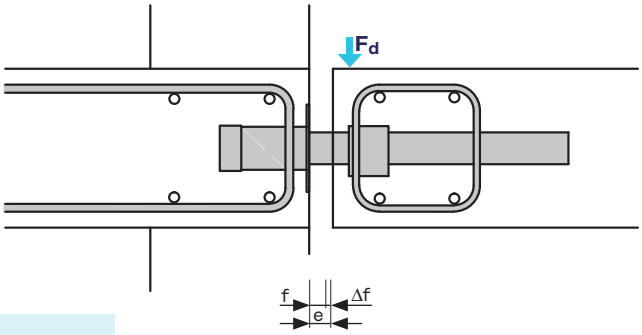
CRET Silent-960 and CRET Silent-970 are sound damping connectors for cast-in situ building elements such as stairways, landing slabs, balconies, access pathways etc. for the uniaxial transmission of shear loads.

In case of prefabricated concrete building elements, the CRET Silent-960P and -970P alternatives will be applied.

Ordering parts

CRET Silent 960	CRET Silent 970

Installation in concrete



f: Nominal joint gap
Δf: Displacement factor
e: Relevant joint gap for static design

CRET Silent-960, -970 (P)

Product overview and load bearing capacities

For in-situ cast applications

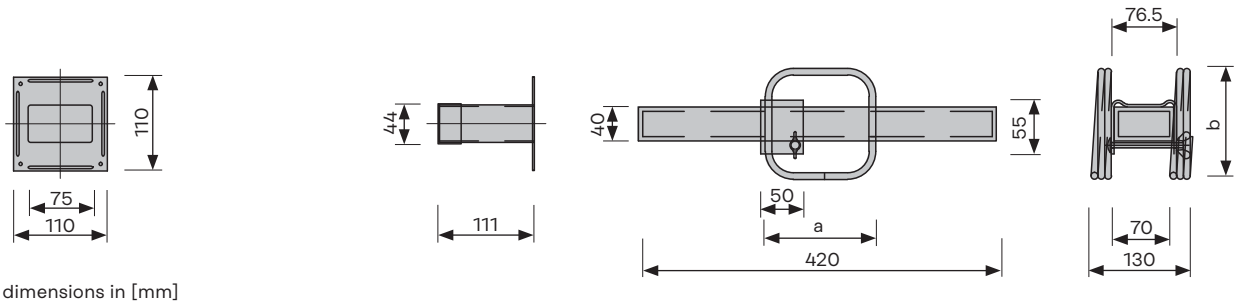
Designation	Article number	Weighted difference in impact sound pressure level at maximum load $\Delta L^*_{n,w}$	Weighted reduction in impact sound pressure level of the landing at maximum load $\Delta L_{w,landing}$	Ultimate resistance F_{Rd}	Joint width
CRET Silent® -960 	Dowel: 7000000440 Short sleeve: 1000005045 Reinforcement stirrup BD: 6100000074	23 dB	28 dB	30.9–24.4 kN	10–60 mm
CRET Silent® -970 	Dowel: 1000005047 Short sleeve: 1000005045 Reinforcement stirrup BD: 6100000074	28 dB	33 dB	26.1–19.9 kN	10–60 mm

For precast applications

Designation	Article number	Weighted difference in impact sound pressure level at maximum load $\Delta L^*_{n,w}$	Weighted reduction in impact sound pressure level of the landing at maximum load $\Delta L_{w,landing}$	Ultimate resistance F_{Rd}	Joint width
CRET Silent® -960P 	Dowel:7000000440 Long sleeve: 1000201762 (10mm gap) to 1000201767 (60mm gap) Reinforcement stirrup BHP: 6100000075	23 dB	28 dB	30.9–24.4 kN	10–60 mm
CRET Silent® -970P 	Dowel:1000005047 Long sleeve: 1000201762 (10mm gap) to 1000201767 (60mm gap) Reinforcement stirrup BHP: 6100000075	28 dB	33 dB	26.1–19.9 kN	10–60 mm

Dimensions

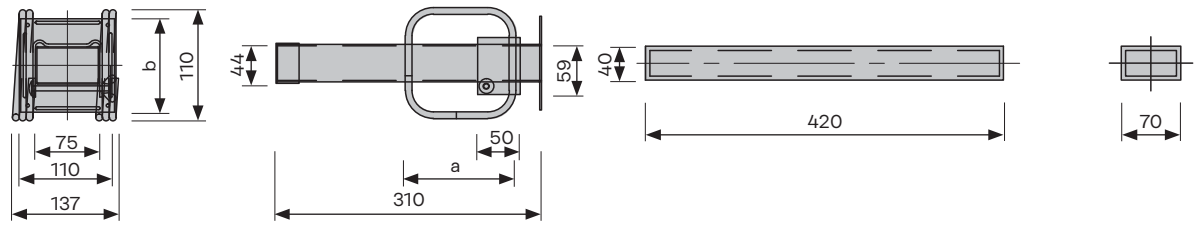
CRET Silent-960 & CRET Silent-970 for cast in-situ concrete



All dimensions in [mm]

Shear load connector with sound insulation

CRET Silent-960P & CRET Silent-970P for prefabrication



All dimensions in [mm]

Design strengths tables

CRET Silent-960, -960P

Design strengths	
Concrete ≥ C25/30	
Joint e [mm]	F_{Rd} [kN]
≤ 20	30.9
25	29.9
30	29.1
35	28.2
40	27.4
45	26.6
50	25.9
55	25.1
60	24.4

$a_{D, min}$ for slabs without shear reinforcement			
Concrete ≥ C25/30			
Slab thickness h [mm]	$a_{D,min}$ ρ = 0.2% [mm]	ρ = 0.5% [mm]	ρ = 1.0% [mm]
180	270	240	220
200	240	210	200
220	220	190	180
240	200	170	160
260	190	160	150

For CRET Silent-960 the maximum deformation factor must not exceed Δf = 45 mm.
Validity of the strength figures in accordance with GTC.

CRET Silent-970, -970P

Design strengths	
Concrete ≥ C25/30	
Joint e [mm]	F_{Rd} [kN]
20	26.1
25	25.2
30	24.3
35	23.5
40	22.7
45	22.0
50	21.3
55	20.6
60	19.9

$a_{D, min}$ for slabs without shear reinforcement			
Concrete ≥ C25/30			
Slab thickness h [mm]	$a_{D,min}$ ρ = 0.2% [mm]	ρ = 0.5% [mm]	ρ = 1.0% [mm]
180	230	200	190
200	200	180	170
220	180	160	150
240	170	150	140
260	160	140	130

For CRET Silent-970 the maximum deformation factor must not exceed Δf = 45 mm.
Validity of the strength figures in accordance with GTC.

Legend

f	Nominal joint gap	F_d	Design load value per dowel
Δf	Displacement factor	h	Slab thickness
e	Relevant joint gap for static design	F_{Rd}	Design strength per dowel
$a_{D, min}$	Minimum connector spacing		

CRET Silent-960, -970 (P)

Additional stirrups

To ensure correct load transmission, stirrups must be placed directly on each side of the connector on open and supported slab edges. To assimilate suspension load originating from the shear load connector, stirrups must be installed directly at each side of the connector dowel. Use of permanently fixed stirrups is recommended. Alternatively, 2 ø10 mm suspension stirrups may be installed loosely at each side of the shear dowel.

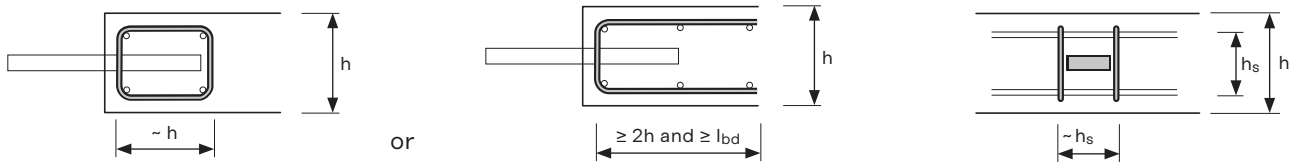


Figure: Stirrup reinforcement Development length to SIA 262 5.2.5

Concrete ≥ C25/30	joint width e = 10 to 60 mm	2 ø10 mm	loose suspension stirrups

Stirrup reinforcement on slab edge

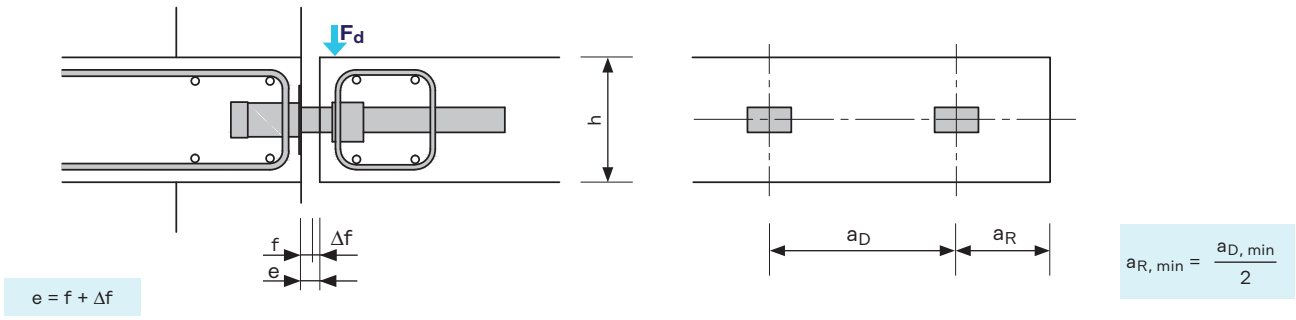
Shear load reinforcement is required in the edge zone to take up the torsional moments. Dimensioning the suspension reinforcement at the slab edge, between the connectors, is dependent on the prevailing static conditions.

Longitudinal Reinforcement at the slab edge

When designing longitudinal reinforcement at the slab edge:

- Consider the continuous beam behavior of the slab edge (span width = distance between connectors).
- Account for expansion forces in the slab edge direction caused by dowel shear load.
- Ensure minimum reinforcement to limit crack width.

Installation instructions and design rules



Legend

f	Nominal joint gap	F_d	Design value of dowel strength
Δf	Displacement factor	h	Slab thickness
e	Relevant joint gap for static design	F_{Rd}	Design strength per dowel
$a_{D, min}$	Minimum connector spacing		

CRET Silent-992, -993, -994 (P)

Sound damping shear load connector

Material specifications

Staircase:	**CRET Silent-992, -993, -994:**	Cast-in-situ concrete
	CRET Silent-992P, -993P, -994P:	Precast concrete
Bearing wall:	In-situ cast concrete or masonry wall	
Sound insulation:	Weighted difference in impact sound pressure level at maximum load up to $\Delta L^*_{n,w}$ = 25 dB	
Materials:	Dowel made of composite construction of steel and concrete, corrosion resistance class II to data sheet SIA 2029. Sound damping material: PUR	

CRET Silent 992

CRET Silent 992-P

CRET Silent 993

CRET Silent 993-P

CRET Silent 994

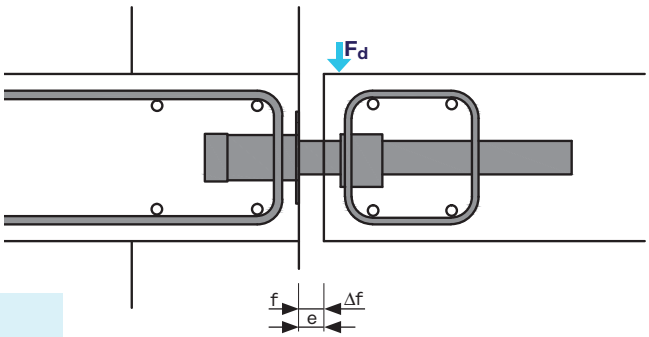
CRET Silent 994-P

CRET Silent-992, -993 and -994 are sound damping connectors for cast-in situ building elements such as stairways, landing slabs, balconies, access pathways etc. for the uniaxial transmission of shear loads.

In case of prefabricated concrete building elements, the CRET Silent-992P, -993P and -994P alternatives will be applied.

Ordering parts

CRET Silent 992	**CRET Silent 993**	**CRET Silent 994**
CRET Silent 992-P	**CRET Silent 993-P**	**CRET Silent 994-P**



f: Nominal joint gap
Δf: Displacement factor
e: Relevant joint gap for static design

CRET Silent-992, -993, -994 (P)

Product overview and load bearing capacities

For in-situ cast applications

Designation	Article number	Weighted difference in impact sound pressure level at maximum load $\Delta L^*_{n,w}$	Weighted reduction in impact sound pressure level of the landing at maximum load $\Delta L_{w,Podest/landing}$	Ultimate resistance F_{Rd}	Joint width
CRET Silent®-992 	Dowel: 1000200147 Short sleeve: 1000200148	24 dB	29 dB	43.8–39.9 kN	10–60 mm
CRET Silent®-993 	Dowel: 1000200151 Short sleeve: 1000200152	23 dB	28 dB	64.4–51.5 kN	10–60 mm
CRET Silent®-994 	Dowel: 1000200155 Short sleeve: 1000200156	25 dB	30 dB	84.6–69.0 kN	10–60 mm

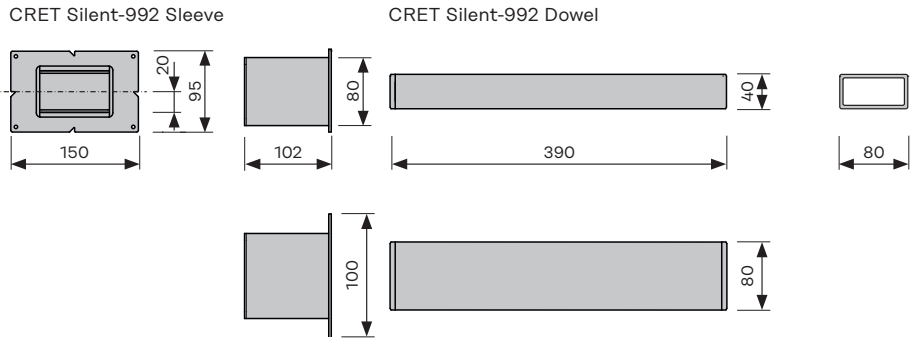
For precast applications

Designation	Article number	Weighted difference in impact sound pressure level at maximum load $\Delta L^*_{n,w}$	Weighted reduction in impact sound pressure level of the landing at maximum load $\Delta L_{w,Podest/landing}$	Ultimate resistance F_{Rd}	Joint width
CRET Silent®-992P 	Dowel: 1000200147 Short sleeve: 1000200148 Long sleeve for following joint gaps: 10 mm: 1000200150 20 mm: 1000201647 to 60 mm: 1000201651	24 dB	29 dB	43.8–39.9 kN	10–60 mm
CRET Silent®-993P 	Dowel: 1000200151 Short sleeve: 1000200152 Long sleeve for following joint gaps: 10 mm: 1000200154 20 mm: 1000201652 to 60 mm: 1000201656	23 dB	28 dB	64.4–51.5 kN	10–60 mm
CRET Silent®-994P 	Dowel: 1000200155 Short sleeve: 1000200156 Long sleeve for following joint gaps: 10 mm: 1000200158 20 mm: 1000201657 to 60 mm: 1000201661	25 dB	30 dB	84.6–69.0 kN	10–60 mm

Shear load connector with sound insulation

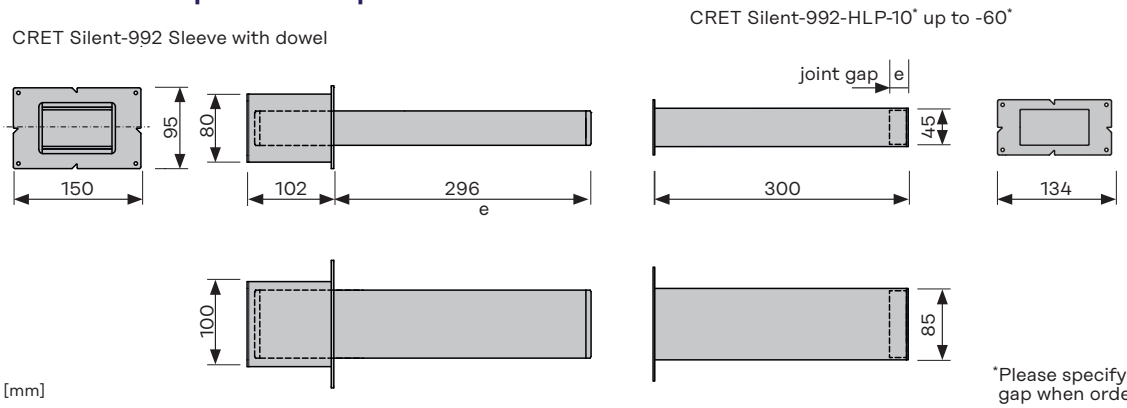
Dimensions

CRET Silent 992 for in-situ concrete



Dimensions in [mm]

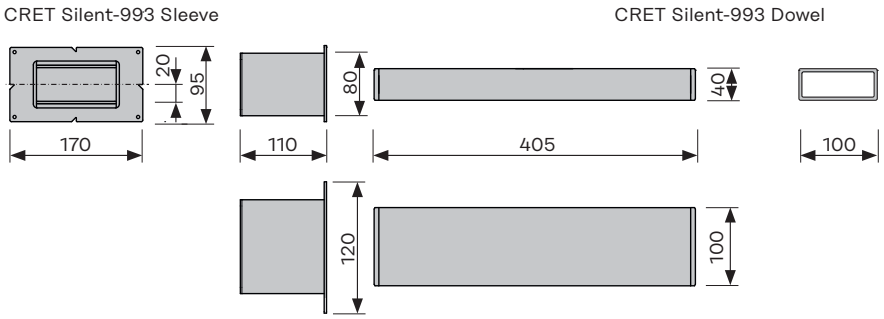
CRET Silent-992P-10* up to -60* for prefabrication



Dimensions in [mm]

*Please specify joint gap when ordering.

CRET Silent 993 for in-situ concrete

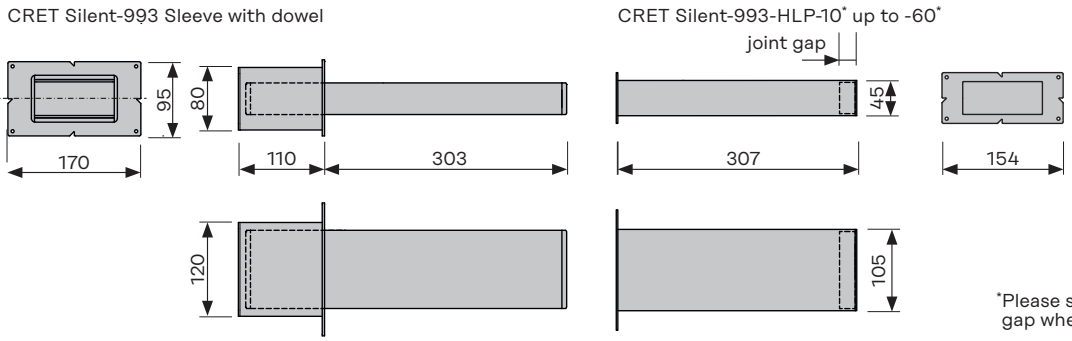


Dimensions in mm

CRET Silent-992, -993, -994 (P)

Dimensions

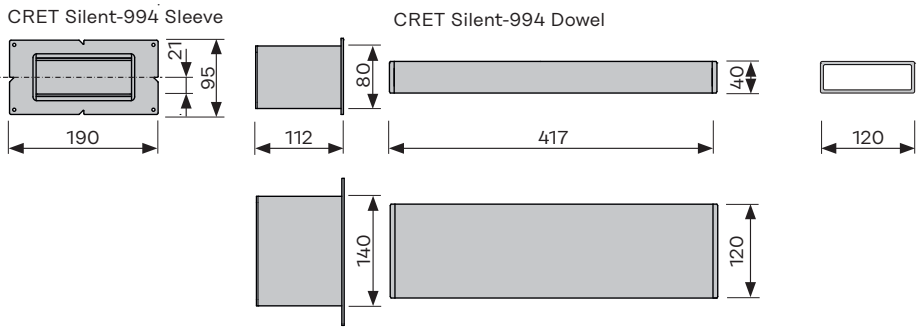
CRET Silent-993P-10* up to -60* for prefabrication



*Please specify joint gap when ordering.

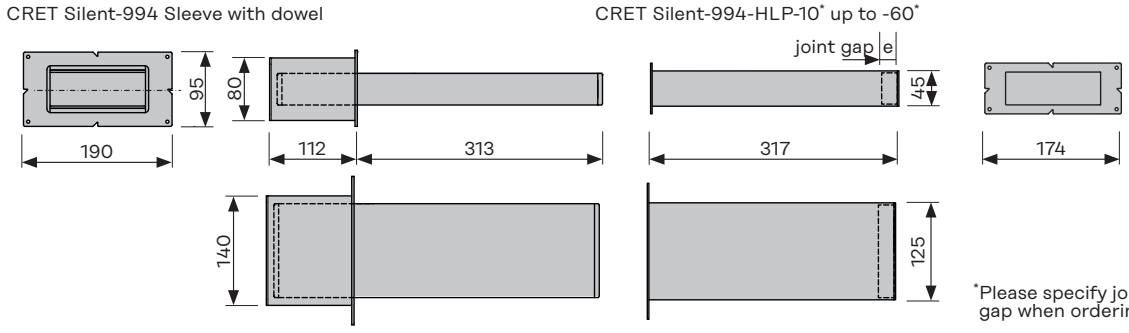
Dimensions in mm

CRET Silent-994 for cast in-situ concrete



Dimensions in mm

CRET Silent-994P-10* up to -60* for prefabrication



*Please specify joint gap when ordering.

Dimensions in mm

Shear load connector with sound insulation

Design strengths tables

CRET Silent-992, -992P

Design strengths	
Concrete ≥ C25/30	
Joint e [mm]	F_{Rd} [kN]
10	43.8
20	43.8
30	43.8
40	43.8
50	41.8
60	39.9

$a_{D, min}$ for slabs without shear reinforcement			
Concrete ≥ C25/30			
Slab thickness h [mm]	$a_{D,min}$ ρ = 0.2% [mm]	ρ = 0.5% [mm]	ρ = 1.0% [mm]
180	372	330	313
200	335	294	278
220	305	266	251
240	281	243	228
260	261	224	210
280	244	208	194
350	200	190	190
400	190	190	190

CRET Silent-993, -993P

Design strengths	
Concrete ≥ C25/30	
Joint e [mm]	F_{Rd} [kN]
10	64.4
20	61.8
30	59.2
40	56.6
50	54.1
60	51.5

$a_{D, min}$ for slabs without shear reinforcement			
Concrete ≥ C25/30			
Slab thickness h [mm]	$a_{D,min}$ ρ = 0.2% [mm]	ρ = 0.5% [mm]	ρ = 1.0% [mm]
180	547	485	460
200	492	432	409
220	448	391	368
240	413	358	336
260	383	330	308
280	358	306	286
350	295	250	250
400	263	250	250

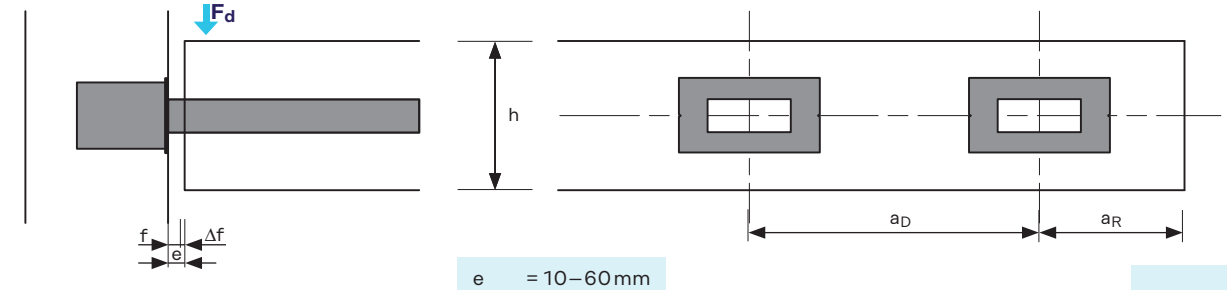
CRET Silent-994, -994P

Design strengths	
Concrete ≥ C25/30	
Joint e [mm]	F_{Rd} [kN]
10	84.6
20	81.5
30	78.3
40	75.2
50	72.1
60	69.0

$a_{D, min}$ for slabs without shear reinforcement			
Concrete ≥ C25/30			
Slab thickness h [mm]	$a_{D,min}$ ρ = 0.2% [mm]	ρ = 0.5% [mm]	ρ = 1.0% [mm]
200	646	568	537
220	589	514	484
240	542	470	441
260	503	433	405
280	471	403	375
350	387	325	299
400	346	287	270

CRET Silent-992, -993, -994 (P)

Installation instructions



$e = f + \Delta f$

e = 10–60 mm
h_{min} = 180 mm
c_{nom} = 20 mm

$a_{R,\,min} = \frac{a_{D,\,min}}{2}$

Legend

f	Nominal joint gap	$a_{D,\,min}$	Minimum connector spacing
Δf	Displacement factor	F_d	Design value of dowel strength
e	Relevant joint gap for static design	h	Slab thickness

Design rules – Design parameters

Additional stirrups

For slab edge support with shear load connectors, suspension reinforcement must always be specified.

Slab suspension reinforcement is shown in the following table.

It relates to the entire suspension reinforcement, i.e. one-half is to be specified for each side.

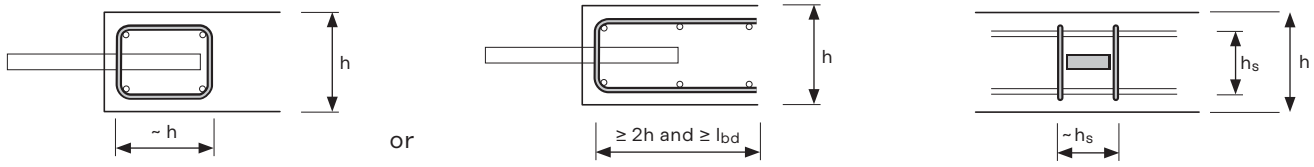


Figure: Stirrup reinforcement

l_{bd}: Development length to Code SIA 262 5.2.5

Additional reinforcement	
Concrete ≥ C25/30 (e = 10 to 60 mm*)	
CRET Silent	Stirrup reinforcement [mm]
-992, -992P	4 ø 10
-993, -993P	4 ø 12
-994, -994P	4 ø 14
*e: Relevant joint gap for static design	

Stirrup reinforcement on slab edge

Shear load reinforcement is required in the edge zone to take up the torsional moments. Dimensioning the suspension reinforcement at the slab edge, between the connectors, is dependent on the prevailing static conditions.

Longitudinal Reinforcement at the slab edge

When designing longitudinal reinforcement at the slab edge:

- Consider the continuous beam behavior of the slab edge (span width = distance between connectors).
- Account for expansion forces in the slab edge direction caused by dowel shear load.
- Ensure minimum reinforcement to limit crack width.

RIBA Silent-915, -917

Bolted tension and compression anchors with sound insulation

Material specifications

Function: Uniaxial transmission of tension and compression.
Sound reduced anchorage of building elements such as parapets, double walls, stabilisation of free-standing balconies and access pathways, etc.

Sound insulation: Weighted difference in impact sound pressure level at maximum load up to $\Delta L^*_{n,w} = 33\,dB$

Materials: Standard versions made of rebar,
corrosion resistance class III to data sheet SIA 2029.
Insulation material: PUR
Anchorage bars made of corrosion resistance class IV to data sheet SIA 2029 are available to order. Length and geometry can be adapted to the specific application requirements.

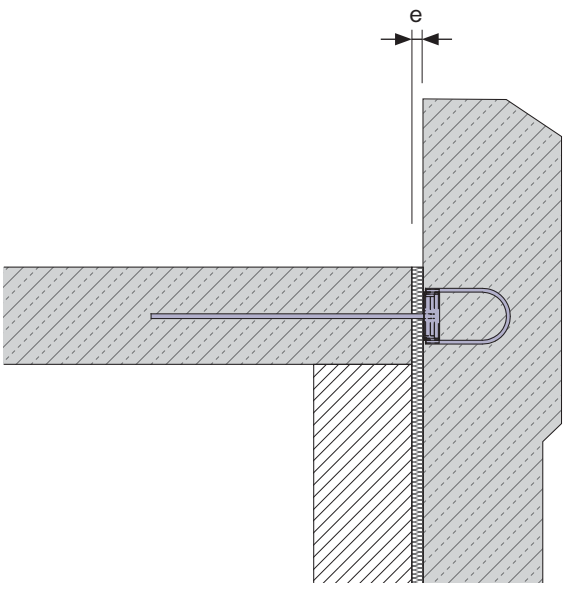
Box **Tension and compression anchors**

915/917 Model A Model B Model C

Ordering parts

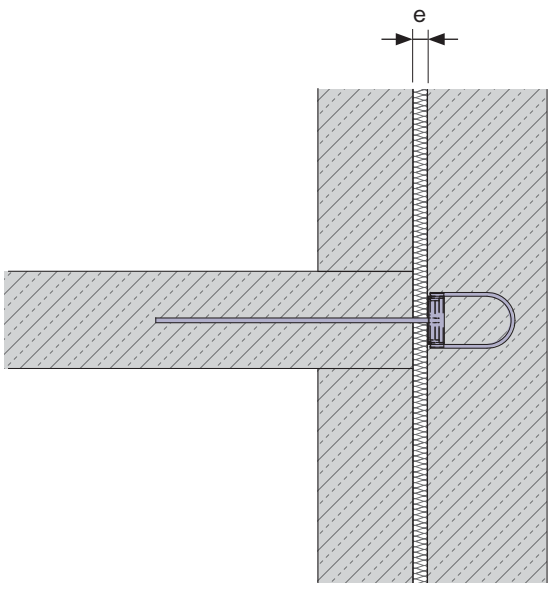
RIBA Silent-915

-10 -12 -14 -16



RIBA Silent-917

-16 -20



Joint e = free bar length: relevant for load under compression

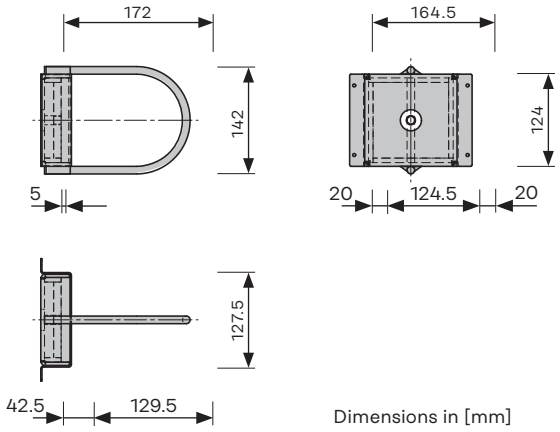
RIBA Silent-915, -917

RIBA Silent-915, -917 – dimensions and load bearing capacities

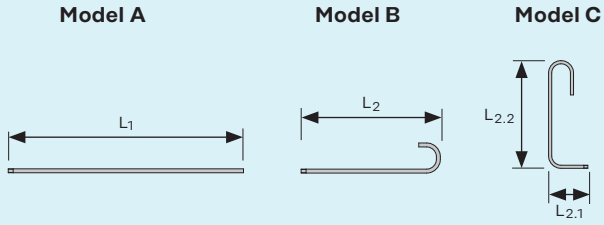
Production overview

Designation	Types	Article number	Box 	Tension and compression anchors diameter ø 	Weighted **difference** in impact sound pressure level at maximum load $\Delta L^{*}_{n,w}$	Weighted **reduction** in impact sound pressure level of the landing at maximum load $\Delta L_{w,\,landing}$
RIBA Silent®	-915-10	6100000010	RIBA Silent-915	10 mm	33 dB	–
RIBA Silent®	-915-12	6100000010	RIBA Silent-915	12 mm	33 dB	–
RIBA Silent®	-915-14	6100000010	RIBA Silent-915	14 mm	33 dB	–
RIBA Silent®	-915-16	6100000010	RIBA Silent-915	16 mm	33 dB	–
RIBA Silent®	-917-16	6100000010	RIBA Silent-917	16 mm	33 dB	–
RIBA Silent®	-917-20	6100000010	RIBA Silent-917	20 mm	33 dB	–

RIBA Silent-915

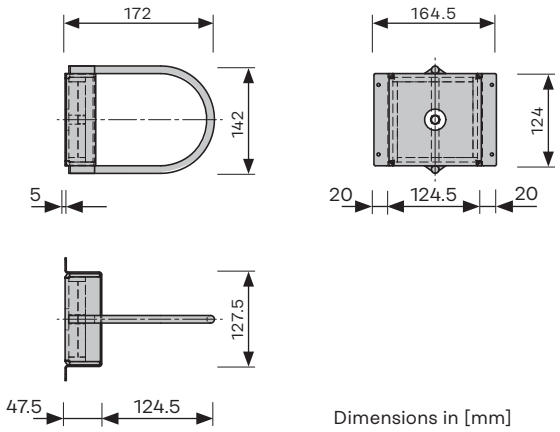


Dimensions in [mm]

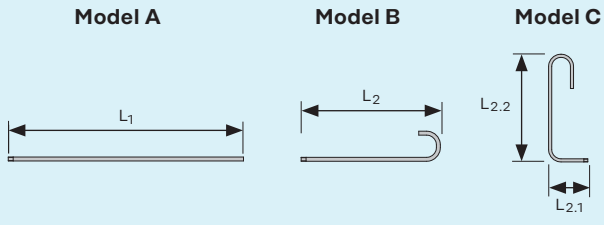


ø [mm]	Model A L1 [mm]	Model B L2 [mm]	Model C L2.1 [mm]	L2.2 [mm]
10	500	400	130	295
12	600	480	144	366
14	700	560	158	436
16	800	640	182	499

RIBA Silent-917



Dimensions in [mm]



ø [mm]	Model A L1 [mm]	Model B L2 [mm]	Model C L2.1 [mm]	Model C L2.2 [mm]
16	800	640	182	499
20	1000	800	210	640

Bolted tension and compression anchors with sound insulation

Design strengths tables

RIBA Silent-915	Tension and compression anchors ø [mm]	max. joint gap [mm]	Tensile force (F_{Rd}) [kN]	Compression force (building element restrained in the transverse direction) (F_{Rd}) [kN]	Compression force (building element not restrained in the transverse direction) (F_{Rd}) [kN]
RIBA Silent-915-10	10	40	23.1	23.2	23.2
RIBA Silent-915-12	12	80	23.1	25.0	25.0
RIBA Silent-915-12	12	120	23.1	25.0	22.5
RIBA Silent-915-14	14	160	23.1	25.0	25.0
RIBA Silent-915-16	16	200	23.1	25.0	25.0

RIBA Silent-917	Tension and compression anchors ø [mm]	max. joint gap [mm]	Tensile force (F_{Rd}) [kN]	Compression force (building element restrained in the transverse direction) (F_{Rd}) [kN]	Compression force (building element not restrained in the transverse direction) (F_{Rd}) [kN]
RIBA Silent-917-16	16	40	62.8	62.8	62.8
RIBA Silent-917-16	16	80	62.8	62.8	62.8
RIBA Silent-917-16	16	120	62.8	62.8	57.9
RIBA Silent-917-20	20	160	62.8	62.8	62.8
RIBA Silent-917-20	20	200	62.8	62.8	62.4

Validity of strength figures in accordance with GTC.

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