HALFEN HLB LOOP BOX

TECHNICAL PRODUCT INFORMATION

- with RAL Quality Mark RAL-GZ 658/2
- Approval acc. to Eurocode 2
HALFEN HLB LOOP BOX

Introduction

Economical solutions with HALFEN HLB Loop Box

- Sturdy steel case - ensures stability when nailing to the formwork and during concreting
- Solid steel cover - the HLB Loop Box element can be glued to steel formwork
- Pre-punched nail holes for easy fixing to the formwork
- The loops pop up automatically - time saving: no rebending is required
- Flexible wire loops can spring back during setting up - closing a gap can be easily carried out
- Officially approved system - guarantees reliability of the design
- Ideal product dimensions, the HLB Loop Box elements are packed in standard euro-pallet dimensions - advantageous for logistics and storage
- HLB Spacer (foam recess body) used as modules for interspaces - can be simply cut to length using a common cutter or sharp knife and allow flexible and quick assembly

The RAL Quality Mark guarantees compliance with the technical product requirements and the related services regarding:
- Specification, quality management logistics, competent technical advice, high-quality technical documentation and software, fulfillment of the guaranteed benefits and guaranteeing the neutrality of tender documents.
Biannual monitoring provided by German Lloyd guarantees that the recommended requirements of the Quality Control Association for Anchor and Reinforcement Technology (Gütegemeinschaft Verankerungs und Bewehrungstechnik e.V) are maintained.
HALFEN HLB LOOP BOX

Product overview

HLB Loop Box - The Complete Range

HLB M
Multi Loop Box
→ Pages 4-9
for load bearing
or constructive
junctions

HLB M-50

HLB M-20

HLB M-100

HLB M-50/250
→ Pages 6-7

HLB M-20/250 +
HLB M-100/250
→ Pages 8-9

HLB S
Single Loop Box
→ Page 10
for constructive
junctions

HLB Space
→ Page 11

HLB Application
→ Pages 12-15

HLB Mix
→ Page 16
HALFEN HLB LOOP BOX

Product description

HLB M Multi Loop Box
for the junction between precast concrete elements under transverse loads perpendicular and parallel to the joint

HLB M-50

HLB M-20

HLB M-100

Standard gap width: 20 mm
Installation dimensions → Pages 14-15
Directives for installation → Pages 14-15
Notes for the constructive load bearing behaviour → Pages 12-13

Materials:
Casing: steel, galvanised; profiled back, with pre-punched nail holes; cover with pre-punched opening for removing after striking the formwork
Steel wire loop: high strength, galvanised; steel ferrule

HLB M-50/250 officially approved by DIBt: → see Pages 6-7
HLB M-20/250 in combination with HLB M-100/250 officially approved by DIBt: → see Pages 8-9
HALFEN HLB LOOP BOX

Product description

HLB M Multi Loop Box

Type selection

Dimensions
HLB M-20; M-50; M-100

Order example for HALFEN Loop Box:

Product group - Type
Loop Box size
Nominal spacing of the loops [mm]

<table>
<thead>
<tr>
<th>Item name</th>
<th>Article no.</th>
<th>No. of loops</th>
<th>s [mm]</th>
<th>a₁ [mm]</th>
<th>a₂ [mm]</th>
<th>Weight [kg]</th>
<th>Packing unit [pieces]</th>
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</tbody>
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HALFEN HLB LOOP BOX

Product description

HLB M 50 Multi Loop Box

Combination of HLB M-50/250 on both sides - officially approved, approval DIBt No. Z-21.8-1869
for the junction between precast concrete elements under transverse loads perpendicular and parallel to the joint

Application examples of the combination HLB M-50/250 + HLB M-50/250:
- Butt junction wall to wall
- Junction wall to column
- Wall corner junction

Order example for HALFEN Loop Box:

Product group - Type
Loop Box size
Nominal spacing of the loops [mm]

Standard gap width: 20 mm
Installation dimensions → Page 7
Directives for installation → Pages 14-15

Joint filling with HLB Mix → Page 16,
Joint details → Page 15
Load capacity for applications according to EC 2

The official approval applies for construction elements under predominantly static loads. If imposed deformations due to e.g. temperature changes or outdoor weathering cannot be excluded, the crack width of the junction has to be restricted to \( w_k \leq 0.3 \) mm. Transverse loads do not lead to an additional crack opening. The product is not designed for regular tension loads. To include the expansion forces arising in the joint, an exterior tensile force has to be taken into consideration according to DAfStb booklet 525, which is at least 1.5 times the shear force to be transferred perpendicularly over the joint. The official approval is to be observed.

### Design value of the transverse load capacity parallel to the joint (plane of the wall) \( V_{rd, \parallel} \) [kN/m]

<table>
<thead>
<tr>
<th>Wall thickness [cm]</th>
<th>HLB M-50/250 C30/37</th>
<th>HLB M-50/250 C35/45</th>
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</table>

* Moreover, no further limitation of the absorbable shear stresses in the joint of diaphragms according to EC2, chapter 10.9.3 (12) is required.

### Design value of the transverse load capacity perpendicular to the joint (plane of the wall) \( V_{rd, \perp} \) [kN/m] (Table 'B')

<table>
<thead>
<tr>
<th>Wall thickness [cm]</th>
<th>HLB M-50/250 C30/37</th>
<th>HLB M-50/250 C35/45</th>
<th>HLB M-50/250 C40/50</th>
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<tr>
<td>16</td>
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<td>19</td>
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<td>29.2</td>
<td>33.3</td>
<td>35.7</td>
<td>37.5</td>
</tr>
</tbody>
</table>

* Moreover, no further limitation of the absorbable shear stresses in the joint of diaphragms according to EC2, chapter 10.9.3 (12) is required.

Equation:

\[
V_{rd, \parallel} \text{ [kN/m]} = -0.45 \cdot V_{rd, \perp} \% + 45
\]
HALFEN HLB LOOP BOX

Product description

HLB M 20 and HLB M 100 Multi Loop Box

Combination of HLB M-20/250 + HLB M-100/250 - officially approved, approval DIBt No. Z-21.8-1871
for the junction between precast concrete elements under transverse loads perpendicular and parallel to the joint

Application examples of the combination HLB M-20/250 + HLB M-100/250:

T-shaped wall junction

Wall corner junction

Butt junction wall to wall

Standard gap width: 20 mm
Installation dimensions → Page 7
Directives for installation → Pages 14-15

Order examples for HALFEN Loop Box:

<table>
<thead>
<tr>
<th>Product group - Type</th>
<th>Loop Box size</th>
<th>Nominal spacing of the loops [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLB M 20 / 250</td>
<td>HLB M-100 / 250</td>
<td></td>
</tr>
</tbody>
</table>

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**Load capacity for applications according to EC 2**

The official approval applies for construction elements under predominantly static loads. If imposed deformations due to e.g. temperature changes or outdoor weathering can not be excluded, the crack width of the junction has to be restricted to $w_k \leq 0.3$ mm. Transverse loads do not lead to an additional crack opening. The product is not designed for regular tension loads. To include the expansion forces arising in the joint, an exterior tensional force has to be taken into consideration according to DAfStb booklet 525, which is at least 1.5 times the shear force to be transferred perpendicularly over the joint. The official approval is to be observed.

<table>
<thead>
<tr>
<th>Wall thickness [cm]</th>
<th>HLB M-20/250</th>
<th>HLB M-100/250</th>
</tr>
</thead>
<tbody>
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<td>14</td>
<td>8.8</td>
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<td>15</td>
<td>10.2</td>
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<tr>
<td>25</td>
<td>27.3</td>
<td>31.1</td>
</tr>
<tr>
<td>≥ 26</td>
<td>29.2</td>
<td>33.3</td>
</tr>
</tbody>
</table>

* Moreover, no further limitation of the absorbable shear stresses in the joint of diaphragms according to EC2, chapter 10.9.3 (12) is required.

**Minimum reinforcement, alignment**

- Bar B500A, diam. 12 mm
- Bar B500A, diam. 10 mm
- Stirrup B500A, diam. 8 mm, anchoring according to EC2
- HLB M-20/250
- HLB M-100/250

**Interaction diagram of the design values of the transverse load capacities parallel and perpendicular to the joint**

Equation:

$$V_{rd,\parallel} \ [kN/m] = -0.5 \cdot V_{rd,\perp} \ [%] + 50$$
HALFEN HLB LOOP BOX

Product Description

HLB S Single Loop Box

for constructive junctions between precast concrete elements

Materials:
Casing: Steel, galvanised; profiled back, with pre-punched nail holes; lid with pre-punched opening for removing after striking the formwork
Steel wire loop: High strength, galvanised; steel ferrule

Product range HALFEN HLB S Single Loop Box

<table>
<thead>
<tr>
<th>Item name</th>
<th>Article no.</th>
<th>No. of loops</th>
<th>Loop length ( l ) [mm]</th>
<th>Clip colour</th>
<th>Weight [kg]</th>
<th>Packing unit [pieces]</th>
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<td>blue</td>
<td>0.3</td>
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</tbody>
</table>

Application examples HLB S:

Butt junction wall to wall

Junction wall to column

Butt junction wall to wall, with filling channel only on one side of the joint

Order example for HALFEN Loop Box:

Product group - Type
Nominal loop length \( l \) [mm]

Joint filling with HLB Mix → see Page 16,
Joint details → Page 15
HALFEN HLB LOOP BOX

Application

HLB Spacer for Loop Box

Economical and time saving method for producing a continuous joint filling channel, which is requested, if HALFEN Multi Loop Box elements are applied with interspacing for length adaption.

Material: foam profile strip, dimensionally stable

Application:

- Select the HLB Spacer type suitable to the Loop Box
- Cut to the required length using a common cutter or sharp knife
- Attach the HLB Spacer to the formwork using nails, glue or adhesive tape

<table>
<thead>
<tr>
<th>Type range HALFEN HLB Spacer for Loop Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item name</td>
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<tr>
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<td>HLB Spacer-50</td>
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<tr>
<td>HLB Spacer-100</td>
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</tbody>
</table>

Order example HLB Spacer:

Product group - Type: HLB Spacer-50
fits to Loop Box HLB M size
HALFEN HLB LOOP BOX

Information on the constructive load bearing behaviour

Note: for the officially approved product combinations refer to the information given in this brochure (→ Pages 6-9) and in the official approval documents. The following notes provide a basic understanding of the load bearing behaviour for the constructive application. However they are not to be considered as normative proofs.

1. Transfer of tension loads perpendicular to the joint

The transfer of tension loads results from the overlap of the wire loops (Fig. 1). In the area of the loops the compression loads are transmitted to the grout fill. A tension load acts vertically to the plane of the loop, which must be taken up by a vertical reinforcement bar, as shown in fig. 2.

Assuming a global safety factor \( \gamma = 3.0 \) and a minimum breaking load of the cable of \( F_{\text{min}} = 22.7 \text{ kN} \) the maximum applicable tension load \( Z_{\text{max},l} \) is 15.1 kN per wire loop.

\[
Z_{\text{max},l} = \frac{F_{\text{min}} \cdot 2}{\gamma} = \frac{22.7 \cdot 2}{3.0} = 15.1 \text{ kN}
\]

Considering the serviceability limit state we recommend to specify a load not exceeding 10 kN per loop (characteristic value). Experimental tests, which have been carried out with concrete grade C30/37 and a clearance between the HLB S elements of 11 cm in the longitudinal direction of the joint, resulted in a widening of the joint of 0.4 mm at this load.

2. Transfer of shear loads parallel to the joint

Shear loads can act parallel to the joint (fig. 3). A model for the transfer of these shear loads across the joint is shown in fig. 4. Therein the shear load acting in the joint is divided into a tension and a compression strut. The values of the tension and compression loads depend on the angle \( \theta \).

HALFEN Single Loop Box: According to the model scheme shown in fig. 4 a strut is formed between the recess boxes of the precast elements facing each other. The tension load is transferred to the overlapping cable loops.
3. Transfer of shear loads perpendicular to the joint

For the transfer of shear loads perpendicular to the joint (fig. 5) the geometry of the joint is particularly important. It can be assumed, that between the concrete flanks of the opposing precast elements a strut is formed according to fig. 6. The tension load is transferred to the overlapping cable loops.

It is recommended to carry out the calculation in the same way as for unreinforced slab joints, wherein the geometry is to be considered.

Notes for fire protection

Regarding the fire protection the relevant regulations apply.

The cable loop of the HALFEN HLB Loop Box consists of a steel wire strength class 1770. It is commonly used in reinforced concrete structures. Therefore the regulations for reinforcement steel and for tensioning cables are to be observed.

In this connection the breaking stresses of the reinforcement steel and the cable loops at high temperatures have to be checked.

Furthermore, different demands are made on the centre distances for reinforcement steel and for tensioning cables. The minimum dimensions for the centre distances and further details of the constructive design depend on the required fire resistance class.
Joint for in-situ grout fill
The joint for the in-situ grout fill has to be provided throughout the entire height of the concrete element. An adequate joint depth must be provided, depending on the length of the cable loop. It must be ensured that:
- the cable loops have a sufficient overlapping and that
- popped up loops have enough space without abutting.

After setting up the precast elements, a reinforcement bar (reinforcing steel B 500 A) diam. 12 mm must be inserted into the joint through the overlapping cable loops. For applications designed as constructive junction it is recommended to provide U-shaped stirrups (reinforcing steel grade B 500 A) diam. 8 mm, so that an overlap junction between the tail of the cable loops and the U-shaped stirrup is created as with the officially approved HLB Loop Boxes.

Reinforcement
- Examples for HLB Loop Box applications designed as constructive junction:
  - surface area reinforcement
  - centric area reinforcement
  - without area reinforcement
**HALFEN HLB LOOP BOX**

Installation instructions

**Installation tolerances**

According to the official approvals, recommended also for applications designed as constructive junctions.

- **horizontal**
  - Regular joint: 20 mm
  - Minimum joint: 10 mm
  - Maximum joint: 40 mm

- **vertical**
  - Regular arrangement: loops at the same level
  - Maximum tolerance: maximum 20 mm

**Dry grout per meter joint length [kg/m]: joint : 2 cm**

<table>
<thead>
<tr>
<th>Wall thickness [cm]</th>
<th>HLB M-50 + HLB M-50</th>
<th>HLB M-20+ HLB M-100</th>
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</tr>
<tr>
<td>26</td>
<td>21.5</td>
<td>26.9</td>
</tr>
</tbody>
</table>

**On the construction site:**

1. State of delivery with closed HLB Loop Box

2. Remove the HLB Loop Box cover: strike-in the pre-punched hole and pull out the steel cover, using an appropriate tool, e.g., a carpenters hammer. Remove end covers (adhesive tape).

   If HLB Spacers are incorporated, they must be removed, using an appropriate tool.

3. Setting up the precast element. The wire loops must stick out perpendicular to the joint, and after deflection during the setting up they should spring back into this position.

4. Insert the reinforcement bar diam. 12 mm and encase the joint with appropriate formwork. Prepare the HLB Mix joint grout according to the manufacturers instructions. The maximum grouting height is 3.5 m. HLB Mix joint grout is capable of flowing, no additional compaction is required.

**Note:** Welding on HLB Loop Box elements is not permitted.
HALFEN HLB MIX joint grout for producing a load bearing joint fill without further compaction

According to the official approval HLB Mix grout must be used for filling the joint. Mixing and applying the grout should be carried out with reasonable care, the manufacturers instructions are to be observed.

Properties of the HLB Mix joint grout:
- Graining 0…5 mm
- Consistency: capable of flowing, subsequent compaction is not necessary
- Maximum workability time at 20°C: 90 min, pumpable
- Guide value for the cube compression strength (150 mm), tested at 20°C:
  - after 24 hours: minimum 40 N/mm²
  - after 28 days: compression strength grade C60/75
- shrinkage class SKVB II
- resistant to frost and de-icing salt

Mixing:
Mix the HLB Mix joint grout with approx. 2.5 l to 3.0 l of water. Pour the water into the compulsory Mixer, leaving a remaining quantity, add the grout, and after a short period of mixing pour in the remaining quantity of water and mix for at least 5 minutes.

Substrate:
The substrate must be well cleaned. Loose particles which prevent adhesion, i.e. cement sludge, moulding grease etc. must be completely removed by air blasting or similar treatment. It must have a minimum breakaway resistance of ≥1.5N/mm² and sufficient bearing strength. The substrate must be sufficiently pre-watered!

Joint moulding, additional reinforcement bar:
Usually a spacing is left between the edges of the abutting precast elements. After connecting the loops of the HLB Loop Boxes with a reinforcement bar, the joints between the 2 elements are encased with formwork. For high elements or if the formwork allows no high pressure, the grout casting should be carried out in 2 steps.

Filling the joint:
The grout is poured in continuously up to the required filling height. Observe the height limit: the maximum height for pouring the HLB grout mix is limited to a maximum of 3.50 m, if necessary the grout must be filled in using a hose, or the height of the casting channel must be limited accordingly. The compaction may be facilitated using an internal spud vibrator or by poking. The temperatures of the environment and the building structure should be not below +5°C during the preparation of the grout and until 36 hours after pouring.
### HALFEN HLB LOOP BOX

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**Sum:**

plus packing and shipping costs [EUR]

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