Building acoustics
Impact sound insulation
www.maxfrank.com
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Impact sound insulation

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Further information can be found in our brochures for Sorp 10®, Egcovoid®, Egcodist and Stremaform® or at www.maxfrank.com.
Sound insulation requirements

The requirements for sound insulation in buildings are regulated by DIN 4109 “Sound insulation in buildings – requirements and verifications”. The aim is to enable use of the rooms for their purpose from an acoustic point of view and to protect the user against disturbances caused by sound transmission.

Accordingly, sound insulation is taken to mean measures that are aimed on the one hand at preventing the generation of sound and on the other at reducing the transmission of sound from a sound source to the hearer.

DIN 4109 specifies the minimum requirements for the impact sound insulation of stairs, while DIN 4109 supplementary sheet 2 gives suggestions for the increased sound insulation of stairs for the individual types of building as follows.

Requirements for the impact sound insulation of stairs according to DIN 4109

<table>
<thead>
<tr>
<th>Type</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-detached, terraced houses</td>
<td>$L'_{n,w} \leq 53 \text{ dB}$</td>
</tr>
<tr>
<td>Blocks of flats</td>
<td>$L'_{n,w} \leq 58 \text{ dB}$</td>
</tr>
<tr>
<td>Lodgings</td>
<td>$L'_{n,w} \leq 58 \text{ dB}$</td>
</tr>
<tr>
<td>Hospitals, sanatoriums</td>
<td>$L'_{n,w} \leq 58 \text{ dB}$</td>
</tr>
</tbody>
</table>

$L'_{n,w}$ is the evaluated standard impact sound level

Requirements for the impact sound insulation of stairs according to DIN 4109 supplementary sheet 2 (increased sound insulation)

<table>
<thead>
<tr>
<th>Type</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-detached, terraced houses</td>
<td>$L'_{n,w} \leq 46 \text{ dB}$</td>
</tr>
<tr>
<td>Blocks of flats</td>
<td>$L'_{n,w} \leq 46 \text{ dB}$</td>
</tr>
<tr>
<td>Lodgings</td>
<td>$L'_{n,w} \leq 46 \text{ dB}$</td>
</tr>
<tr>
<td>Hospitals, sanatoriums</td>
<td>$L'_{n,w} \leq 46 \text{ dB}$</td>
</tr>
</tbody>
</table>

Compliance with these requirements can be ensured among other things by means of certain types of construction (e.g. floating screed, two-shell building partition wall). In addition, there is a possibility to significantly reduce the transmission of sound through sound decoupling elements without having to restrict the choice of construction or floor covering, etc.

A reduction in the transmission of sound to a comfortable level is achieved using the impact sound products presented in this brochure.
Verification of product performances

With regard to the transmission of impact sound, it is of fundamental interest to know the extent to which the impact sound generated by the excited component (e.g. stair flight, stair landing) is transmitted into and perceived in neighbouring rooms. This is determined by means of experimental examinations on the basis of DIN EN ISO 10140, where the acoustic excitation takes place with the aid of a so-called standard hammer mill. The standard impact sound level $L_n$, as a measure of the perceivable impact sound, is determined from the signals received in the neighbouring room.

The verification of product performances takes place on the basis of an investigation into how the standard impact sound level perceivable in the neighbouring room changes as a result of the use of individual products. Initially, the standard impact sound level $L_{n,0,\text{component}}$ is measured with a rigid/monolithic connection. This level represents the initial value for assessing the effect of the sound insulation. In a second test setup, which is identical apart from the installation of the product whose sound insulating effect is to be examined, the standard impact sound level $L_{n,\text{component}}$ of the insulated system is determined. The declared impact sound reduction $\Delta L_{w}^{*}$ of a product results from the difference between these measurements and is given in dB (decibel). Since the insulation effect also depends amongst other things on the mechanical load level, the impact sound reduction is examined at several load levels and stated separately.

All test results can be found at www.maxfrank.com

An alternative measure used to state the impact sound reduction is $\Delta L_{w}^{**}$. In the case of landings this is determined firstly by direct excitation of the intermediate wall and in a second measurement the excitation takes place in a way analogous to the procedure described above behind the installed product. Due to the direct excitation of the wall, a significantly higher impact sound level is measured in the neighbouring room during the reference measurement. With one and the same product this results in a considerably higher sound level difference, which makes the product tested in this way appear to have a higher performance, even though the difference between $\Delta L_{w}^{*}$ and $\Delta L_{w}^{**}$ is attributable only to the change in the execution of the test.

The respective values specified for the impact sound reduction apply, under the underlying conditions with respect to geometry, materials used, etc., to corresponding levels of mechanical loading. The actual sound insulation effect determined in the individual structure is dictated by the individual boundary conditions. In particular the quality of the construction work can have a significant influence on the attainable sound insulation effect. Therefore, particular care should be taken when installing the product.
Egcotritt impact sound insulated shear force dowel

The impact sound insulated Egcotritt shear force dowel serves for the sound-related decoupling of components. It is used for the bedding of stair landings, arcades and cantilever balconies and transmits the shear forces acting in the connection joint. At the same time, the acoustically decoupled bedding ensures that the transmission of irritating noises into adjacent rooms is insulated – this increases the living comfort and well-being of the residents.

![Diagram of Egcotritt impact sound insulated shear force dowel](image-url)
### Egcotritt impact sound insulated shear force dowel

- National technical approval for Egcotritt and Egcotritt HL
- Fire protection rating R120
- Stainless steel version
- No restrictions of the exposure class acc. to EC2
- Load-bearing capacity up to 37 kN

#### Egcotritt
- Impact sound reduction up to 32 dB
- Joint width up to 100 mm
- $\chi = 0.085 \text{ W/K}$

#### Egcotritt HL
- Impact sound reduction up to 25 dB
- Maximum load-bearing capacity even with joint widths up to 100 mm
- $\chi_{\text{HL}} = 0.125 \text{ W/K}$

### In-situ concrete

<table>
<thead>
<tr>
<th>Type</th>
<th>Egcotritt O</th>
<th>Egcotritt O±</th>
<th>Egcotritt O HL</th>
<th>Egcotritt O HL±</th>
<th>Egcotritt O light</th>
<th>Egcotritt O-B light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction of force</td>
<td>↑</td>
<td>↓</td>
<td>↑</td>
<td>↑</td>
<td>↓</td>
<td>↓</td>
</tr>
<tr>
<td>Joint width [mm]</td>
<td>0 - 60</td>
<td>61 - 100</td>
<td>0 - 60</td>
<td>61 - 100</td>
<td>61 - 100</td>
<td>0 - 60</td>
</tr>
<tr>
<td>Dowel Ø [mm]</td>
<td>32</td>
<td>52</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact sound reduction $\Delta L_w^*$ up to [dB]</td>
<td>32</td>
<td>25</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact sound reduction $\Delta L_w^{**}$ up to [dB]</td>
<td>41</td>
<td>35</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Precast element

<table>
<thead>
<tr>
<th>Type</th>
<th>Egcotritt F</th>
<th>Egcotritt F±</th>
<th>Egcotritt F HL</th>
<th>Egcotritt F HL±</th>
<th>Egcotritt F light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction of force</td>
<td>↑</td>
<td>↓</td>
<td>↑</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>Joint width [mm]</td>
<td>0 - 60</td>
<td>61 - 100</td>
<td>0 - 60</td>
<td>61 - 100</td>
<td>61 - 100</td>
</tr>
<tr>
<td>Dowel Ø [mm]</td>
<td>32</td>
<td>52</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact sound reduction $\Delta L_w^*$ up to [dB]</td>
<td>32</td>
<td>25</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact sound reduction $\Delta L_w^{**}$ up to [dB]</td>
<td>41</td>
<td>35</td>
<td>–</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Egcotritt

The new design of the anchor body optimizes the load introduction into the component and simplifies installation capability. Excellent impact sound reduction, highest requirements on load bearing safety and corrosion resistance, different variants for the requirements of in-situ concrete and pre-cast construction, a practicability classified as fire resistance class R120 and the national technical approval of the DIBt offer a reliable system and best possible planning safety.

Egcotritt HL

The HL variant of the impact sound insulated shear force dowel offers the transmission capability of maximum loads, even with large joint widths of up to 100 mm. Due to the enlarged dowel diameter, high loads can be safely transmitted with minimum deformation, even with a joint width of 100 mm, thus being ideal for applications with thermal insulation. Egcotritt HL also has a national technical approval from the DIBt and offers the same benefits in terms of fire protection, corrosion resistance and planning as Egcotritt.

Egcotritt light

Egcotritt light can be used for joint widths up to 60 mm. Due to absence of the anchor body, Egcotritt light offers advantages in geometrically demanding installation situations (e.g. spiral stairs). A type static calculation can be provided for static verification. Apart from the anchorage with vertical suspended reinforcement, anchorage with loop reinforcement round the dowel is alternatively possible.
Sound insulation

The impact sound insulated shear force dowel connection Egcotritt is ideally suited to the respective field of application. If a high impact sound insulation level is required, the shear force dowel connection Egcotritt in its standard version is ideal. On account of the highly effective impact sound reduction $\Delta L_{w^*}$ of up to 32 dB, typical application areas for the Egcotritt are connections of stairs and stair landings.

The Egcotritt HL lends itself where the thermal insulation performance also has to be considered in addition to the impact sound insulation; the attainable impact sound reduction $\Delta L_{w^*}$ lies around 25 dB. Using the Egcotritt HL, insulating joints of 100 mm in width can be realised without losses in the load-bearing capacity. As a result, considerable advantages in the thermal insulation effect can be achieved when used in facades.

The application of tensile reinforcement is required for the absorption of horizontal forces, for example in arcades. Their influence on the impact sound insulation performance in connection with the Egcotritt can be reduced to a minimum and lies in the range of 3 dB. The test results can be found at www.maxfrank.com

Thermal insulation

Due to its construction, the Egcotritt shear force dowel is capable of minimising the thermal transport via the shear force connection. The thermal insulating properties of the Egcotritt and the Egcotritt HL were determined by the Institute of Thermal Insulation Research reg. assoc. Munich (Forschungsinstitut für Wärmeschutz e.V. München - FIW). The punctiform thermal transmittance coefficients achieve values of $\chi = 0.085$ W/K and $\chi_{HL} = 0.125$ W/K. Egcotritt and Egcotritt HL are thus ideally suited for arcades, loggia slabs or uninsulated staircases.
Load-bearing behaviour – lifting forces, joint width

Depending on the design and load on the components of the support structure, lifting forces may occur in individual areas that must be absorbed by Egcotritt. This is possible with the PlusMinus (PM) version, in which an impact sound decoupling separation layer is additionally installed in the upper part of the acoustic box.

While widths of up to 60 mm can be achieved with the Egcotritt light variant, Egcotritt and Egcotritt HL are suitable for joints of up to 100 mm. As the load-bearing capacity of the connection for larger joint widths is substantially limited bending moment capacity of the steel dowel, the HL variant with its enlarged dowel cross-section has the possibility of fully exploiting the maximum load capacities of the system even for large joint widths up to 100 mm. The Egcotritt HL is able to unfold its full benefits with maximum load transmission and minimum thermal bridging, particularly when installed in the insulation level.

Steel load-bearing capacity – joint width

![Steel load-bearing capacity graph](image)

Additional reinforcement

The reliable load introduction from the Egcotritt shear force bearing into the component to be connected is ensured by means of additional reinforcements that need to be inserted. This is performed in the form of bent-up suspension stirrups $A_{sx}$ running vertically next to the dowel and longitudinal bars $A_{sy}$ running orthogonally to the dowel axis. Stirrups are additionally installed in the rear part of the anchor body. Loop and hat stirrups can alternatively be used with Egcotritt light.
Fire protection
In conjunction with the fire protection collar, the impact sound insulated Egcotritt, Egcotritt HL and Egcotritt light shear force dowels can resist fires for long periods. The system has been classified by H+P Ingenieure GmbH in fire resistance class R120 for joint widths up to 70 mm.
The required fire protection collars can be ordered in addition to the shear force dowel, stating the respective joint width.

Arcade – thermally and acoustically insulated
Multi-storey residential buildings are often connected via arcades. Unlike interior staircases, the means of connection here have to meet not only the requirements for the support function and sound insulation, but also increased requirements for thermal insulation. Egcotritt HL has the solution: vertical loads from cantilever arcades are reliably introduced into the wall of the building, thermal bridges are minimised and the Egcotritt HL also provides for the necessary impact sound insulation.

In-situ concrete/
Precast element construction
All products from the Egcotritt series are available not only in an in-situ concrete design, but also as precast elements. The design of the product versions means that penetration of the formwork sheeting can be dispensed with when manufacturing both in-situ concrete and precast element landings. At the same time, this offers the advantage that no built-in components protrude from the concrete elements during mounting.
There are differences in the construction procedure. In the case of in-situ concrete landings the dowel is pushed into the acoustic box, which has been cast into the wall beforehand, and the landing is then concreted. A cut-out must be provided in the staircase wall in the case of precast element landings. The acoustic box including the dowel is pushed into the sleeve in the precast element from outside the staircase during assembly.
The detailed mounting instruction for the individual versions can be found at www.maxfrank.com

Detailed information on the product, application and static dimensioning can be found in the separate Egcotritt brochure.
Egcosono P stair landing bearing

The Egcosono P stair landing bearing effectively reduces the transmission of impact sound in the staircase through the acoustically decoupled bedding of the landing, thus consistently separating it from other components.

- Impact sound reduction $\Delta L_{w}^{*}$ of up to 32 dB
- Load bearing capacity $V_{Rd} = 75.6$ kN
- Type approval on the basis of EC2
- Fire resistance class R90

- For in-situ concrete/prefabricated landings
- Elastomer bearing with national technical approval from the DIBt
- One box height for all landing heights from 160 mm

Precast element landings

- Egcosono P Type F
- Egcosono P Type V± F
- Egcosono P Type H± F

In-situ concrete landings

- Egcosono P Type O
- Egcosono P Type V± O
- Egcosono P Type H± O
- Egcosono P Type L O
**Egcosono P**

**for in-situ concrete landings with mounting body**

Comfortable handling of the mounting body thanks to ergonomic gripping holes for simple removal.

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**Egcosono P**

**for precast landings without mounting body**

Precast element version without mounting body; no foam polystyrene to dispose of.

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**Egcosono P Reinforcement cage**

The prefabricated reinforcement cage is concreted into the landing. Shear forces and the resulting offset moments are dissipated into the walls.

The standard cage consists of 4 push-in stirrups Ø 12 mm and 5 shear force stirrups Ø 8 mm.

---

<table>
<thead>
<tr>
<th>Type</th>
<th>In-situ concrete landings</th>
<th>Precast element landings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Egcosono P O</td>
<td>Egcosono P V± O</td>
</tr>
<tr>
<td>Load direction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>max. vertical force $V_{VH}$ [kN]</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td>75.6</td>
<td>75.6/-15.3</td>
<td>151.2</td>
</tr>
<tr>
<td>max. horizontal force $H_{VH}$ [kN]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>± 15.3</td>
</tr>
<tr>
<td>stair landing thickness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 160 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Egcosono P V±**

For the case of alternating bearing forces (bearing/lifting), the element has an elastomer bearing both on top and underneath.

**Egcosono P H±**

With the H± version, horizontal forces of up to ± 15.3 kN can be absorbed by lateral elastomer bearings.
Sound insulation

With the Egcosono P the sound insulation effect has been significantly increased in comparison with the predecessor model. It now has an impact sound reduction $\Delta L_{w^*}$ of up to 32 dB according to DIN EN ISO 10140 and thus meets the highest requirements; test report 1482-001-14 of 10/03/2014, SG Bauakustik. The total impact sound reduction $\Delta L_{w^{**}}$ reaches 41 dB, expert’s report 1488-003-14 of 24/09/2014, SG Bauakustik. All relevant test reports can be found at www.maxfrank.com.

Load-bearing behaviour

From the point of view of static dimensioning, attention is mainly paid in the case of stair landings to the dissipation of downwardly directed shear forces; with a value of 75.6 kN, this is the strength of the Egcosono P. Depending on the prevailing conditions, lifting or even horizontal forces can occur; they can be absorbed up to 15.3 kN. In order to facilitate and secure the planning, the load-bearing capacities have already been determined within the scope of a type static calculation and tested by LBV Brandenburg, type testing report T 14/007/353 of 26/08/2014.

<table>
<thead>
<tr>
<th>Stirrups</th>
<th>Nominal value of shear force resistance $V_{Ed}$ [kN]</th>
</tr>
</thead>
<tbody>
<tr>
<td>n Ø x</td>
<td>C20/25</td>
</tr>
<tr>
<td>2 Ø 8</td>
<td>38.7</td>
</tr>
<tr>
<td>3 Ø 8</td>
<td>56.3</td>
</tr>
<tr>
<td>4 Ø 8</td>
<td>73.1</td>
</tr>
<tr>
<td>5 Ø 8</td>
<td>75.0</td>
</tr>
<tr>
<td>2 Ø 10</td>
<td>47.1</td>
</tr>
<tr>
<td>3 Ø 10</td>
<td>67.9</td>
</tr>
<tr>
<td>4 Ø 10</td>
<td>75.0</td>
</tr>
<tr>
<td>5 Ø 10</td>
<td>75.0</td>
</tr>
<tr>
<td>2 Ø 12</td>
<td>54.0</td>
</tr>
<tr>
<td>3 Ø 12</td>
<td>75.0</td>
</tr>
<tr>
<td>4 Ø 12</td>
<td>75.0</td>
</tr>
</tbody>
</table>

The table applies to shear forces directed vertically downwards with the standard box. Shear force stirrup: 5 Ø 8, $c_{nm} \geq 20$ mm. The distance between the wall and landing slab may not exceed 50 mm. The load-bearing capacity of the long box corresponds to double these values. The type approval must be observed.

Fire protection

In accordance with the fire protection test of the LBV Brandenburg, the Egcosono P can be classified according to DIN 4102 and DIN EN 1992-1-2 in the fire resistance class R90; type test report no. T16/014/353 of 26/07/2016.
Egcosono P stair landing bearing

Egcosono P versions

Standard box for landing heights from 160 mm

Long box for landing heights from 160 mm

Mounting: in-situ concrete construction method

Mounting: precast element construction method

The detailed mounting instructions can be found at www.maxfrank.com
Egcoscal NG stair bedding

The Egcoscal NG stair bedding system is for the acoustic decoupling of stair flights. The Egcoscal NG S-shape is used for the decoupling of landing and stair flight of stairs. The Egcoscal NG F-shape is used at the connection of the stair base to the floor slab. The stair base is structurally secured using the Egcoscal TD stair securing dowel. The joint with the ascending wall is protected against soiling by the FDPL distance plate.

- Impact sound reduction $\Delta L_{\text{w}}^*$ up to 36 dB
- Bearing selectable in two load levels
- Fire resistance rating F90
- Simple to cut to length
- Elastomer bearing with national technical approval no. Z-16.32-404 from the DIBt
Egcoscal NG S-shape for corbels
Flexibly formable stair bedding that can be cut to length.

<table>
<thead>
<tr>
<th>Load-bearing capacity $V_{m, \text{gr}}$ [kN/m]</th>
<th>43</th>
<th>61</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length $l$ [mm]</td>
<td>1000</td>
<td>1100</td>
</tr>
<tr>
<td>Number of beddings [-]</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Thickness [mm]</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

Other dimensions on enquiry.

Egcoscal NG F-shape for floor
Bedding of the stair base.

<table>
<thead>
<tr>
<th>Load-bearing capacity $V_{m, \text{gr}}$ [kN/m]</th>
<th>43</th>
<th>61</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length $l$ [mm]</td>
<td>1000</td>
<td>1100</td>
</tr>
<tr>
<td>Width $w$ [mm]</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Number of beddings [-]</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Thickness [mm]</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

Other dimensions on enquiry.

Egcoscal stair securing dowel for floor
Acoustically decoupled structural securing of the position.
- Stainless steel version
- Dimensions of the dowel Ø 22/300 mm
Sound insulation

The Egcoscal NG meets the highest requirements with regard to sound insulation. The impact sound reduction \( \Delta L_{w}^* \) according to DIN EN ISO 10140 is up to 36 dB; test report 1515-001-14 of 23/09/2014, SG Bauakustik. The total impact sound reduction \( \Delta L_{w}^{**} \) reaches 47 dB, expert’s report 1488-002-14 of 24/09/2014, SG Bauakustik. All relevant test reports can be found at www.maxfrank.com

Load-bearing behaviour

The load induction is secured by EPDM bearings with building authority approval – DIBt approval no. Z-16.32-404.

Fire protection

According to the expert’s report GA-2016/029-Nau of 04/04/2016, the Egcoscal NG can be classified in fire resistance class F90 according to DIN 4102.

Mounting

The detailed mounting instructions can be found at www.maxfrank.com

Egcoscal T for precast element stairs

- Strip bearing made of an elastomer that is specially adapted to the application
- High impact sound reduction \( \Delta L_{w}^* \) up to 32 dB
- Dimensions: Thickness 10 mm, width 100 mm, as rolled goods or ready made up
FDPL distance plate

Optimum decoupling of structure-borne sound is only achieved when no sound bridges are created. With the FDPL distance plate you secure the joints and prevent soiling, e.g. with stair landings and stair flights.

- Density: approx. 30 kg/m³
- Length: 1000 mm
- Thickness: 15 mm
- Widths: 250 mm, 355 mm, 420 mm
- Fire protection: Class E according to DIN EN 13501-1/building material class B2 according to DIN 4102-01
- Available individually or as a set
- Simple to cut with a cutter
- Adhesive tape for mounting is already applied

Mounting

The detailed mounting instructions can be found at www.maxfrank.com
Egcostep NG stair flight decoupling

Egcostep NG acoustically isolates the stair flight from the stair landing and reduces impact sound transmissions in the staircase.

- Impact sound reduction $\Delta L_{eq}$ up to 35 dB
- Fire resistance rating R90
- Type approval on the basis of EC2

- For in-situ concrete/precast element execution
- Standard elements up to 1.60 m long, 25 cm ceiling height and 60 kN load-bearing capacity per element
### Sound insulation

The new generation Egcostep NG achieves an impact sound reduction $\Delta L_{w^*}$ of up to 35 dB according to DIN EN ISO 10140 and a total impact sound reduction $\Delta L_{w^{**}}$ of up to 44 dB. The values for the individual types can be found in test report 1551-001-15 of 21/05/2015 at www.maxfrank.com

### Load-bearing behaviour

The load transfer is verified by the type approval T 16/007/353 of 24/02/2016 on the basis of EC2. A load of vertically 7.5 kN and horizontally 1.0 kN can be absorbed per bearing. The type and thus the number of bearings can be chosen according to the individual needs.
Additional reinforcement

For safe load transfer, reinforcement must be provided in the adjacent structural elements according to the static requirements. The illustration below shows a suggestion for the principle reinforcement layout. The suspension reinforcement (items 2 and 3) is dimensioned as follows:

\[ A_v = \frac{V_{rd}}{T_{yd}} \]

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lower reinforcement layer of stair landing</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Upper reinforcement layer of stair landing</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Stirrup as suspension reinforcement</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Stirrups each 2 Ø 6</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Steel bar Ø 8</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Lower reinforcement layer of flight of stairs</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Upper reinforcement layer of flight of stairs</td>
<td></td>
</tr>
</tbody>
</table>

1) according to static requirements
Connection of precast floor slab

When connecting precast floor slabs, a sufficiently wide joint must be provided in order to avoid reinforcement conflicts and to ensure adequate concrete coverage; see suggestion in the illustration.

Fire protection

According to the expert’s report TP14-041 of 04/03/2016, the Egcostep NG can be classified in fire resistance class R90 according to DIN 4102.

Mounting

Depending on the type, the elements can be shortened by up to 150 mm per side; see table at top of page 23. Mounting can also be done upside down if necessary. The detailed mounting instructions can be found at www.maxfrank.com
You might also be interested in this...

**Sorp 10® sound absorber for thermally activated structural elements**

Sorp 10® - the acoustic strip absorbers for the regulation of reverberation times for thermally activated ceilings. The basic damping, e.g. of office and administration buildings can be achieved with Sorp 10® by means of a stripe-like arrangement in the bare ceiling; at the same time the influence on the thermal efficiency of the activated ceiling is minimised. The coating with an acoustically open plaster system allows for a jointless, smooth ceiling.

- Evaluated sound absorption level \( \alpha_w \) up to 0.45 (M)
- Influence on the thermal efficiency between 3 % and 8 %
- Classified as A1 material; no additional fire load in the ceiling
- Reduced increase in temperature at the reinforcing steel behind absorber in case of fire
- Verification of load-bearing capacity and suitability for use

More information can be found in the Sorp 10® brochure.

**Egcovoid® void former for planned voids**

The Egcovoid® void former forms voids that are planned as horizontal or vertical separating layers. Voids are necessary, for example, where vibration decoupling or statically specific load situations are desired. The void is formed by applying water to the Egcovoid® void former at a clearly defined time. The panel, which was developed as permanent formwork, thus creates the desired void in the following applications, among others:

- Decoupling of floor slabs and machine foundations
- Expansion space for swelling, cohesive soils
- Targeted load introduction for pile foundations
- Load release of underground structures
- Permanent, smooth formwork of building pit foundation walls
- Vertical separating layer to existing foundations

More information can be found in the Egcovoid® brochure.
Further products from the building acoustics sector

**Egcodist wall and ceiling bearings**

Improper ceiling bedding can lead to considerable damage, whose rectification is then complex and expensive. To avoid this, the planned use of Egcodist ceiling bearings is recommended. There is a suitable Egcodist ceiling bearing available for many applications. The following properties can be combined according to the requirements:

- Load centring
- Enabling length changes
- Compensation of unevenness
- Reduction of secondary sound paths
- Fire protection

More information can be found in the Egcodist brochure.

**Stremaform® sound joint for the acoustic isolation of concrete structural elements**

Stremaform® sound joints create an acoustic separation between concrete components. The ready-to-install formwork element is predominantly installed between the individual units in semi-detached and terraced houses for sound. Since the Stremaform® sound joints make subsequent demoulding work unnecessary, the reinforcement work can continue without having to take the concreting work into consideration. The Stremaform® sound joint can be used as a formwork element for concrete elements in floor slabs/walls/element walls without standing water. The joint insert of the Stremaform® sound joint consists of a sound insulating mineral fibre board in various joint widths.

- Prevents transmission of sound from neighbouring apartments
- One-piece construction – for simple and rapid assembly
- Ready-to-install element – tailored to the requirements specific to the construction site

More on the subject of formwork elements can be found in the Stremaform® brochure.