Under-Screed Impact Sound Insulation

Heavy-Duty
Product Overview

**Regupol® sound** is a compound material made of rubber fibres and polyurethane, and three versions of it were developed by BSW as heavy-duty impact sound insulation to be installed under a cement screed.

**Regufoam® sound** was also developed by BSW as an impact sound insulation sheet to be installed under a cement screed. The material has the highest impact sound reduction of all materials offered by BSW for this purpose. **Regufoam® sound** is a mixed-cell polyurethane foam.

**Regupol® sound 47**
- **Material**: Polyurethane-bound rubber fibres
- **Impact noise reduction**: $\Delta_{L_w} \geq 20$ dB
- **Maximum traffic load**: 3,000 kg/m²
- **Dynamic rigidity**: $s' = 47$ MN/m³

**Regupol® sound 12**
- **Material**: Polyurethane-bound elastomers
- **Impact noise reduction**: $\Delta_{L_w} \geq 33$ dB
- **Maximum traffic load**: 3,000 kg/m²
- **Dynamic rigidity**: $s' = 12$ MN/m³

**Regupol® sound 17**
- **Material**: Polyurethane-bound rubber fibres
- **Impact noise reduction**: $\Delta_{L_w} \geq 26$ dB
- **Maximum traffic load**: 5,000 kg/m²
- **Dynamic rigidity**: $s' = 17$ MN/m³

**Regufoam® sound 10**
- **Material**: Mixed-cell polyurethane foam
- **Impact noise reduction**: $\Delta_{L_w} \geq 34$ dB
- **Maximum traffic load**: 2,500 kg/m²
- **Dynamic rigidity**: $s' = 10$ MN/m³

Detailed technical data and test documentation are available in the “Vibration Technology and Sound Insulation” technical catalogue, or at www.bsw-vibration-technology.com

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Downloads at www.bsw-vibration-technology.com
Regupol® Screed Insulation in Brief

Many floor constructions have to withstand extreme loads while at the same time providing good sound insulation. BSW has developed Regupol® and Regufoam® screed insulation for these divergent objectives. Constant area loads of 25, 30 and 50 kN/m² are possible. Regupol® and Regufoam® screed insulation have a low compressibility in accordance with DIN EN 12431, i.e. $c \leq 1.0$ mm or $\leq 2.0$ mm. Moreover, the Regupol® and Regufoam® impact sound insulation mats return to nearly their original thickness.

Regupol® and Regufoam® have remarkable stability under great static and dynamic loads. Regupol® and Regufoam® are among the products with the best performance in the area of impact sound insulation under high loads, with great dimensional stability as well as durability.

Application Areas

Over the entire heavy-duty under-screed surface, e.g. in:
- Production halls, warehouses and dispatch stations
- Supermarkets in shopping centres
- Concert halls, auditoriums, cinemas, sound studios
- Gyms
- Hospitals, care homes
- Industrial kitchens and other floors frequently exposed to moisture
- Foyers of hotels and administrative buildings
- Libraries, universities, schools
- Workshops
- Test laboratories
- Under vibration floors

The Benefits

- maximum traffic load of up to 2.5 and 5 t/m² respectively
- excellent ratio between impact sound improvement and structural height
- negligible creep behaviour, even under high static or dynamic continuous loads
- highly suitable for vibrated floor systems (no voids, etc.)
- suitable for high point loads
- unproblematic under rolling loads
- permanent elastic, rot-resistant
- high resilience level
- long service life
- quick and easy installation
- internal and external production and quality monitoring
- not harmful to health
- approved for any type of recreation room
- quality monitored by material testing agencies
Impact Noise Insulation under High Load

DIN 4109 defines the requirements for noise protection in building construction. In addition to protection against airborne noise, installation noise, noise of building service systems, noise of companies and external noise, it also provides guidelines for protection against impact noise. The standard therefore defines the minimum requirements for protecting people in common rooms from unacceptable interference.

DIN 4109 further regulates the method for proving the noise protection required. The specific noise protection level is currently not clearly regulated and must be agreed upon on a case-by-case basis. The values in the DIN 4109 Addendum 2 “Enhanced noise protection” may, for example, be used as reference values.

Addendum 2 of the standard recommends an impact noise level of at most 46 dB in the room to be protected as “enhanced noise protection”. Attempts to remain within these limit values show that quite a few noise protection measures are insufficient, particularly in rooms with a high floor load. Conventional, standard impact noise insulation materials must be very stiff to withstand high loads. Impact noise insulation therefore decreases with carrying capacity.

Effective impact noise insulation for such applications should therefore have two characteristics that may be in conflict with each other:

- high compressive strength to ensure lasting stability
- and at the same time high impact sound improvement coefficients

The progressive spring characteristics of Regupol® sound minimize the risk of tearing joints, as the material becomes stiff under high load.

The screed or the concrete base must be appropriately reinforced to counter these high loads, in particular in the rim and corner areas. Consistent technical data, verified by continuous in-house production control, are very important for the specialist planner, as they are the basis for dimensioning. BSW provides these data and guarantees them!

Floor constructions of rooms in which forklifts and lifting carts move are usually exposed to high static and dynamic loads. Only impact insulation mats which were specifically built to handle these loads can guarantee the necessary floor stability and sound insulation.

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Downloads at www.bsw-vibration-technology.com
Regupol® and Regufoam® Screed Insulation

The maximum compressibility of Regufoam® sound and Regupol® sound in accordance with general construction guidelines is between ≤ 1.0 and ≤ 2.0 mm, depending on the type.

With a load of 30 kN/m², the deflection of the insulating material Regupol® sound 47 is only 1.6 mm.

The loads on floor surfaces which have been impact-insulated with Regufoam® sound and Regupol® sound can be accordingly high without the danger of causing damage to the screed or connection joints which have the proper dimensions. Thanks to the outstanding long-term behaviour of the material, which was demonstrated by a long-term creep test with 12 million stress cycles, among other tests, its properties, such as resilience level and impact sound improvement, remained constant over a very long time period (approx. 50 years).

Resilience is at least 95%. The measured impact sound insulation values remain permanently constant.

The elastic behaviour of Regupol® and Regufoam® screed insulation demonstrates that the material retains its properties and is not damaged by high loads. These enormously important material properties can only be achieved with comprehensive quality assurance, from incoming goods inspection of the raw materials through to the impact sound improvement tests in the laboratory of the Testing and Certification Agency. For this reason it does not make sense and is even dangerous to use products that have not been specifically developed for impact sound insulation.

In addition to outstanding physical properties, Regupol® and Regufoam®’s screed insulation also possesses highly important chemical properties. The applications of industrial floors very frequently also require resistance to moisture and hydrolysis as well as resistance to lactic and fatty acids. What is more, resistance to the standard industrial and cleaning agents is an absolute must.

Even with a heavy load, Regupol® and Regufoam® screed installation sinks in without the structure of the material being destroyed (the deflection shown here is exaggerated).

When the load is removed, the material returns almost to its original thickness. The impact sound insulation remains constant for the long term.

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Different Installations of Regupol® and Regufoam® Screed Insulation

The types of installations of screed insulation that are actually used most frequently are shown in the drawings below. Generally speaking, it has to be ensured that any acoustic bridges are avoided. If there is a conflict between heat insulation and impact sound dampening, impact sound dampening must be given preference for the sake of the immediate protection of people’s health.

a) Floating Screed:

Installation of Regupol® and Regufoam® screed insulation:
1. perimeter insulation strip with PE foil
2. floating screed
3. Regupol® or Regufoam® screed insulation with PE foil on top
4. concrete floor

b) Floating Screed with Underfloor Heating:

Installation of Regupol® and Regufoam® screed insulation with underfloor heating:
1. perimeter insulation strip with PE foil
2. floating screed
3. Regupol® or Regufoam® screed insulation with PE foil on top
4. underfloor heating pipe
5. concrete floor

Screed Insulation

Regupol® | Regufoam®

c) Black Screed with Heat Insulation and Pipe Feed-through:

Installation of Regupol® and Regufoam® under-screed impact sound insulation on heat insulation with pipelines:
1. perimeter insulation strip with PE foil
2. floating screed
3. Regupol® or Regufoam® screed insulation with PE foil on top
4. heat insulation
5. pipelines
6. concrete floor

d) Vibrated Clinker Layer:

Installation of Regupol® and Regufoam® under-screed impact sound insulation under vibrated floors:
1. perimeter insulation strip with PE foil
2. floor tiles with bonding agent
3. floating screed
4. Regupol® or Regufoam® screed insulation with PE foil on top
5. concrete floor
Planning the Screed Insulation

During the planning of the construction project, a noise protection certificate is required in addition to a statics and heating certificate. Architects usually receive the assistance of expert consultants in this who can achieve the correct relationship between the sound properties of the different elements to one another.

The BSW specialist planning service is available to any architect who designs with Regupol® and Regufoam®.

The most important factors which must be included in the dimensioning of the screed insulation are:

- required noise protection
- necessary impact sound improvement
- static and dynamic loads to be borne

These basic parameters determine all other key values such as quality and thickness of the screed and the impact sound insulation to be applied.

**Recommendation and coordination of specialist planners for building acoustics. Learn more at www.bsw-vibration-technology.com.**

**Insulation of Adjacent Components**

Generally speaking, in concrete construction, impact sound insulation that is incorporated into the building structure is only possible under floating screeds or the installation mortar of vibrated floors. Should other floor constructions be necessary such as bonded screed or screed on a separating layer, mandatory sound-insulating measures must be taken elsewhere. Feasible alternatives are the decoupling of individual parts of the building such as wall beddings and stair flights, under-floor impact sound insulation, entire room-in-room constructions or measures to reduce the airborne sound due to structure-borne noise in the reception room. As a general rule, however, the transfer of sound should be interrupted at the place where it is generated.

The following operation applies to the determination of the impact noise level to be expected in the room that must be protected:

\[
L'_{n,w} = L'_{n,w,eq} - \Delta L_w
\]

- \(L'_{n,w}\) = weighted standard impact noise level in the reception room (calculation value)
- \(L'_{n,w,eq}\) = equivalent weighted standard impact noise level of the solid floor without floor covering (calculation value)
- \(\Delta L_w\) = impact noise level reduction (calculation value)

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Planning the Screed Insulation

When planning the screed insulation, the planner must be able to rely on the technical data supplied by the manufacturer of the impact sound insulation layer. It must therefore be checked carefully whether the specifications are feasible and whether they adhere to the applicable standards. If there are any doubts about the specifications, a test certificate should be produced on request (concerning the applicability of impact sound tests and their adherence to standards, see page 26). BSW states reliable and verifiable values as per ISO 140-8.

In actuality, even these test results only provide a benchmark, as they are based on a standardised test set-up. In real life, however, thickness and material consistency of the concrete floor and screed often deviate from them. How this impacts the impact noise level that can actually be achieved depends on the calculation performed by the expert consultant / acoustic engineer.

An essential key value for installing screed insulation is the dynamic rigidity of the impact sound insulation layer. As a rule, the following applies to conventional, standardised insulation materials:

<table>
<thead>
<tr>
<th>Dynamic rigidity</th>
<th>Sound insulation</th>
<th>Load-bearing capacity</th>
<th>Compression</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>low</td>
<td>high</td>
<td>low</td>
</tr>
<tr>
<td>low</td>
<td>high</td>
<td>low</td>
<td>high</td>
</tr>
</tbody>
</table>

By contrast, the screed insulation materials Regufoam® sound and Regupol® sound can withstand high loads and insulate impact sound very well, which distinguishes them enormously from conventional insulation materials. With a maximum traffic load of 3,000 kg/m², for instance, a maximum impact noise level reduction of 33 dB can be achieved with Regupol® sound 12.

Random layers of materials which may be similar in their physical appearance but are made of bonded rubber granulate, can cause tremendous problems regarding the required load-bearing capacity of the floor construction, as their physical behaviour may be utterly unsuitable. Impact sound insulation materials must be standardised or approved. When alternative products are used which look the same on the outside, it is doubtful if they can achieve equally good impact sound insulation.

The following sample calculation as per DIN 4109 for Regupol® sound 17 already contains the required values of the screed and the concrete floor.

20 cm reinforced concrete floor

\[ L'_{n,w,eq} = 71 \text{ dB} \]

– 17 mm screed insulation mat Regupol® sound 17 under 90 mm screed plus tiles or under 120 mm screed / reinforced concrete base plate

\[ \Delta L_w = 24 \text{ dB} \]

+ 2 dB

\[ L_{n,w} = 49 \text{ dB} \]

With this impact sound insulation and proper dimensioning, the total construction would be able to bear loads of up to 5,000 kg/m². The different concrete floors have different initial sound technology values. Here is an example:

<table>
<thead>
<tr>
<th>Reinforced concrete thickness in cm</th>
<th>Mass kg/m²</th>
<th>Equivalent weighted standard impact noise level $L_{n,w,eq}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>391</td>
<td>74</td>
</tr>
<tr>
<td>18</td>
<td>414</td>
<td>73</td>
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<td>19</td>
<td>437</td>
<td>72</td>
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<td>20</td>
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<td>21</td>
<td>483</td>
<td>70</td>
</tr>
<tr>
<td>22</td>
<td>506</td>
<td>69</td>
</tr>
<tr>
<td>etc.</td>
<td>etc.</td>
<td>etc.</td>
</tr>
</tbody>
</table>

Taking Sources of Error into Account

When planning the sound technology of a floor construction, numerous sources of errors must be taken into account. These are mainly various acoustic bridges, typically other construction elements which transfer the sound without insulation to other areas of the building by avoiding or interrupting the impact sound insulation. They may considerably impair the effect of an impact sound insulation measure.

As a rule, the following applies:

The impact sound insulation must be complete. Even minute structural parts such as connection and fastening elements, but especially pipelines and constructions made of concrete or other materials which are on top or adjacent, must be excluded as transmitters of impact sound.
Planning the Screed Insulation

The most frequent mistake in the planning and installation of screed insulation is the lack of or insufficient consideration of pipelines. Pipelines are often directly on top of the concrete floor and can form acoustic bridges unless they are decoupled from the sound-emitting room.

DIN 18560-2 specifies two versions of pipelines under floating screeds and on load-bearing subfloors:

- levelling screed or another levelling layer in bonded form
- screed pipe height compensation with heat insulation boards

for achieving a level surface that can receive the insulating layer of the impact sound insulation. The pipes which are on the load-bearing concrete floor must be fixed. The construction height of the levelling layer must be determined in the plan.

Other sources of flaws are:

- stairways and landing platforms which are connected with the sound-transmitting surface must be decoupled from it
- radiator supports
- built-in components anchored in the screed and the wall
- pipelines which are fed into the walls
- joint dowels to interrupt horizontal sound waves
- support columns and partition walls

The reason is that testing according to category I is conducted on an area of, say, merely 1 x 0.4 m and is admissible for compliant covering which was installed loose or sticking to the floor covering, but not for screed insulation mats in floor coverings where at least one component is solid (e.g. screed) as described in category II.

Only testing as per DIN EN ISO 140-8, testing category II, determines practice-oriented dB values for screed insulation.

How much the impact sound insulation values of a test according to category I can deviate from those of the practice-oriented tests for screed insulation mats is demonstrated in the following example with Regupol® screed insulation.

In the benchmark test for Regupol® screed insulation as per testing category I, a sound reduction value was achieved of \( \Delta L_w = 33 \text{ dB} \).

The practice-oriented test in category II, on the other hand, showed a sound reduction value of \( \Delta L_w = 20 \text{ dB} \).

For this reason attention must be paid to the testing category when assessing the indicated impact noise reduction values. If necessary, you should request to see the test certificate.

Checking the Technical Specifications for Impact Sound Insulation Mats

A proper check of the impact noise reduction for screed insulation mats is therefore testing category II as per EN ISO 140-8. Accordingly, the tested area is at least 10 m² in size. The values measured in this test form the basis of the calculation value for impact noise reduction with screed insulation mats. It is considerably lower than the dB values measured according to testing category I.
Impact Sound Insulation Under Screed

Largely rot-, moisture-, age- and deformation-resistant, permanently elastic

**Material**
PU-bonded rubber fibres

**Standard delivery form**
in rolls of 15 m² each, 13,040 x 1,150 x 8 mm

**Temperature resistance**
from –20 °C to +80 °C

**Colour**
Anthracite

### Physical Data

<table>
<thead>
<tr>
<th>Compressive stress (N/mm²)</th>
<th>Settlement (mm)</th>
<th>Bedding modulus (MN/mm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0015</td>
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<tr>
<td>0.0059</td>
<td>0.476</td>
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<tr>
<td>0.0118</td>
<td>0.863</td>
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<td>0.0206</td>
<td>1.284</td>
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<td>0.0294</td>
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<td>11.0</td>
</tr>
<tr>
<td>0.0118</td>
<td>1.066</td>
<td></td>
</tr>
</tbody>
</table>

Weighted impact noise reduction as per ISO 717-2
\[ \Delta L_w \geq 20 \text{ dB} \]

Mean value for dynamic rigidity as per DIN EN 29052-1
\[ s' = 47 \text{ MN/m}^2 \]

**Thermal conductivity**
\[ \lambda = 0.075 \text{ W/mK} \]

**Thermal resistance**
\[ R = 0.1031 \text{ m²K/W} \]

Fire classification according to DIN 4102/DIN EN 13501-1
B2 / Class E

Maximum traffic load
up to 3,000 kg/m²

Compressibility as per DIN EN 12431
\[ c \leq 1.0 \text{ mm} \]

Performance and evaluation of test as per DIN 18134, sample measurements and testing facility as per DIN EN 826. Tested by Technical University Dresden.

Regupol® sound 47, dimpled on underside

Regupol® sound 47
Regupol® sound 17
Regupol® sound 12
Regufoam® sound 10

\[ \Delta L_w = 20 \text{ dB} \]
\[ \Delta L_w = 26 \text{ dB} \]
\[ \Delta L_w = 33 \text{ dB} \]
\[ \Delta L_w = 34 \text{ dB} \]
Impact Noise Reduction **Regupol®** sound 47 as per ISO 140-8

**Description of the test object**
- 68 mm concrete screed
- 0.20 mm PE foil
- 8 mm screed insulation mat, **Regupol® sound 47** (dimpled on one side)
- mean value of dynamic rigidity as per DIN EN 29052-1, \(s' = 47 \text{ MN/m}^3\)
- 8 mm perimeter screed strip (foamed PE foil)
- 140 mm raw ceiling

**Basis weight** approx. 135 kg/m²
**Setting time** 552 h
**Air temperature in the test rooms** 21 °C
**Humidity in the test rooms** 56 %
**Volume of reception room** 54.2 m³

**Impact noise reduction improvement as per ISO 717-2**
\[ \Delta L_w \geq 20 \text{ dB} \quad C_{1w} = -12 \text{ dB} \quad C_{1r} = 1 \text{ dB} \]
The results refer only to the tested structure.

Tested by the MPA (German materials testing agency).

**Test for obtaining the national technical approval**

on 05.12.2005
MPA NRW
44285 Dortmund
Germany
Phone +49 (0)231 45020
Fax +49 (0)231 458 549

We will be pleased to send you the complete test report no. 420001705 upon request.
Impact Sound Insulation Under Screed

Largely rot-, moisture-, age- and deformation-resistant, permanently elastic

Material
PU-bonded rubber fibres

Standard delivery form
1,200 x 1,000 x 17 mm, 60 m² per pallet

Temperature resistance
from –20 °C to +80 °C

Colour
Anthracite

Upper side laminated with green aluminium foil.

Physical Data

<table>
<thead>
<tr>
<th>Compressive stress (N/mm²)</th>
<th>Settlement (mm)</th>
<th>Bedding modulus (N/mm³)</th>
</tr>
</thead>
<tbody>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.0098</td>
<td>1.4</td>
<td>7.0</td>
</tr>
<tr>
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<td>2.6</td>
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</tr>
<tr>
<td>0.0343</td>
<td>3.9</td>
<td>9.0</td>
</tr>
<tr>
<td>0.0490</td>
<td>4.7</td>
<td>10.0</td>
</tr>
<tr>
<td>0.0196</td>
<td>3.2</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Mean value for dynamic rigidity as per DIN EN 29052-1
s' = 17 MN/m

Thermal conductivity
λ = 0.08 W/mK

Thermal resistance
R = 0.2162 m²K/W

Fire classification according to DIN 4102/DIN EN 13501-1
B2 / Class E

Maximum traffic load
up to 5,000 kg/m²

Compressibility as per DIN EN 12431
c ≤ 2.0 mm

Performance and evaluation of test as per DIN 18134,
sample measurements and testing facility as per DIN EN 826.
Tested by Technical University Dresden.
Impact Noise Reduction Regupol® sound 17 as per ISO 140-8

Measurement of the impact noise reduction, provided by a floor covering on a solid standard floor under test conditions

Description of the test object

- 28 mm cast stone
- approx. 4 mm thin-set mortar
- approx. 90 mm screed
- 0.25 mm PE foil
- 17 mm screed insulation mat, Regupol® sound 17, single layer
- mean value of dynamic rigidity as per DIN EN 29052-1, $s^* = 17$ MN/m³
- length-related flow resistance as per EN 29053:
  - $r = 8088$ Pa s/m²
- 150 mm reinforced concrete
- perimeter strip made of mineral fibreboards, 15 mm thick
- mass per unit area of the floor covering 240 kg/m²

Mass per unit area: 600 kg/m²
Test surface area: 16.9 m²
Test rooms – volume of reception room: $V_e = 51.3$ m³
Condition: empty
Type: laboratory

Impact noise reduction improvement as per ISO 717-2

$\Delta L_{w} \geq 26$ dB  $C_{1a} = -13$ dB  $\Delta L_{\text{lin}} = 13$ dB

The results refer only to the tested structure.

Qualification test I for DIN 4109 on 05.05.1999

Publication of the results is authorised by the Ingenieurgesellschaft für Technische Akustik mbH
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65205 Wiesbaden
Germany
Phone +49 (0)6122 956 10
Fax +49 (0)6122 956 161

We will be pleased to send you the complete test report no. 0070.99-P 57 upon request.
Impact Sound Insulation Under Screed

Largely rot-, moisture-, age- and deformation-resistant, permanently elastic, but protect against large volumes of water.

**Material**
PU-bonded elastomers

**Standard delivery form**
1,200 x 1,000 x 17 mm, 60 m² per pallet

**Temperature resistance**
from –20 °C to +80 °C

**Colour**
brown-beige, dark particles

Upper side laminated with green aluminium foil.

**Physical Data**

<table>
<thead>
<tr>
<th></th>
<th>Weighted Impact Noise Reduction as per ISO 717-2</th>
<th>Mean Value for Dynamic Rigidity as per DIN EN 29052-1</th>
<th>Thermal Conductivity</th>
<th>Thermal Resistance</th>
<th>Fire Classification</th>
<th>Maximum Traffic Load</th>
<th>Compressibility as per DIN EN 12431</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>∆L&lt;sub&gt;w&lt;/sub&gt; ≥ 33 dB</td>
<td>s’ = 12 MN/m³</td>
<td>λ = 0.0063 W/mK</td>
<td>R = 0.289 m²K/W</td>
<td>B 2 / Class E</td>
<td>up to 3,000 kg/m²</td>
<td>c ≤ 2.0 mm</td>
</tr>
</tbody>
</table>

**Compressive stress (N/mm²)**

<table>
<thead>
<tr>
<th>Compressive stress (N/mm²)</th>
<th>Settlement (mm)</th>
<th>Bedding modulus (MN/mm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.005</td>
<td>2.1</td>
<td>2.8</td>
</tr>
<tr>
<td>0.010</td>
<td>3.2</td>
<td>3.1</td>
</tr>
<tr>
<td>0.020</td>
<td>4.5</td>
<td>4.5</td>
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<tr>
<td>0.025</td>
<td>4.9</td>
<td>5.1</td>
</tr>
<tr>
<td>0.030</td>
<td>5.3</td>
<td>5.7</td>
</tr>
<tr>
<td>0.020</td>
<td>4.7</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Performance and evaluation of test as per DIN 18134, sample measurements and testing facility as per DIN EN 826.

Regulpol® sound 12, dimpled on underside

Regulpol® sound 12

<table>
<thead>
<tr>
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<th>Regupol® sound 12</th>
<th>Regupol® sound 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔL&lt;sub&gt;w&lt;/sub&gt; = 20 dB</td>
<td>ΔL&lt;sub&gt;w&lt;/sub&gt; = 26 dB</td>
<td>ΔL&lt;sub&gt;w&lt;/sub&gt; = 33 dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ΔL&lt;sub&gt;w&lt;/sub&gt; = 34 dB</td>
</tr>
</tbody>
</table>

Regupol® sound 47
Impact Noise Reduction Regupol® sound 12 as per ISO 10140-3

Measurement of the impact noise reduction, provided by a floor covering on a solid standard floor under test conditions

Description of the test object

- 160 mm raw ceiling
- 17 mm Regupol® sound 12 screed insulation mat
- 0.25 mm PE-foil
- 80 mm screed
- total thickness 255 mm
- mean value of dynamic rigidity as per DIN EN 29052-1, $s' = 12$ MN/m$^3$

Mass per unit area: 581.6 kg/m$^2$
Test surface area: $4.0 \times 5.0 = 20.0$ m$^2$
Volume of test rooms: $V_S = 54$ m$^3$, $V_E = 62$ m$^3$
Air temperature in test rooms: 21 °C
Water curing: > 21 days

Impact noise reduction improvement as per ISO 717-2

$\Delta L_w \geq 33$ dB $C_{Lw} = -12$ dB

The results refer only to the tested structure.

Qualification test for DIN 4109 on 02.08.2012

Publication of the results is authorised by ift Rosenheim GmbH
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We will be pleased to send you the complete test report no. 12-001691-PR01 (PBX5.1-F03-04-de-01) upon request.
Impact Sound Insulation Under Screed

Largely rot-, moisture-, age- and deformation-resistant, permanently elastic, but protect against large volumes of water.

**Material**
Mixed-cell polyurethane foam

**Standard delivery form**
1,500 x 1,100 x 17 mm, 198 m² per pallet

**Temperature resistance**
from –20 °C to +80 °C

**Colour**
light blue

**Physical Data**

<table>
<thead>
<tr>
<th>Weighted impact noise reduction as per ISO 717-2</th>
<th>Compressive stress (N/mm²)</th>
<th>Settlement (mm)</th>
<th>Bedding modulus (MN/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta L_w \geq 34$ dB</td>
<td>0.005</td>
<td>3.4</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>0.010</td>
<td>4.9</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td>0.015</td>
<td>5.9</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>0.020</td>
<td>7.0</td>
<td>2.8</td>
</tr>
<tr>
<td></td>
<td>0.025</td>
<td>8.1</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td>0.015</td>
<td>6.2</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Mean value for dynamic rigidity as per DIN EN 29052-1
$s' = 10$ MN/m³

**Thermal conductivity**
$\lambda = 0.046$ W/mK

**Thermal resistance**
$R = 0.331$ m²K/W

**Fire classification according to DIN 4102/DIN EN 13501-1**
B 2 / Class E

**Maximum traffic load**
up to 2,500 kg/m²

**Compressibility as per DIN EN 12431**
c $\leq 2.0$ mm, deformation-resistant, compressible volume

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Performance and evaluation of test as per DIN 18134, sample measurements and testing facility as per DIN EN 826.
Impact Noise Reduction Regufoam® sound 10 as per ISO 10140-3

Measurement of the impact noise reduction, provided by a floor covering on a solid standard floor under test conditions

Description of the test object

- 160 mm raw ceiling
- 17 mm Regufoam® sound 10 screed insulation mat
- 0.25 mm PE-foil
- 80 mm screed
- total thickness 257 mm
- mean value of dynamic rigidity as per DIN EN 29052-1, $s' \approx 10$ MN/m³

Mass per unit area: 581.6 kg/m²
Test surface area $S$: $4.0 \times 5.0 = 20.0$ m²
Volume of test rooms: $V_p = 54$ m³,
$V_F = 62$ m³
Air temperature in test rooms: 21 °C
Water curing: > 21 days

Impact noise reduction improvement as per ISO 717-2

$\Delta L_w \geq 34$ dB  $C_{IA} = -13$ dB

The results refer only to the tested structure.

Impact noise reduction

$\Delta L$ in dB

<table>
<thead>
<tr>
<th>Frequency Hz</th>
<th>$L_{IA}$ raw ceiling 1/3 octave dB</th>
<th>$\Delta L$ 1/3 octave dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>66.1</td>
<td>14.3</td>
</tr>
<tr>
<td>125</td>
<td>62.8</td>
<td>13.9</td>
</tr>
<tr>
<td>160</td>
<td>68.1</td>
<td>18.6</td>
</tr>
<tr>
<td>200</td>
<td>69.0</td>
<td>21.7</td>
</tr>
<tr>
<td>250</td>
<td>70.0</td>
<td>25.7</td>
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<tr>
<td>315</td>
<td>71.4</td>
<td>29.4</td>
</tr>
<tr>
<td>400</td>
<td>70.4</td>
<td>30.5</td>
</tr>
<tr>
<td>500</td>
<td>71.4</td>
<td>32.6</td>
</tr>
<tr>
<td>630</td>
<td>71.2</td>
<td>35.6</td>
</tr>
<tr>
<td>800</td>
<td>72.4</td>
<td>39.2</td>
</tr>
<tr>
<td>1000</td>
<td>72.0</td>
<td>41.0</td>
</tr>
<tr>
<td>1250</td>
<td>72.6</td>
<td>43.9</td>
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<tr>
<td>1600</td>
<td>72.9</td>
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<tr>
<td>2000</td>
<td>72.0</td>
<td>52.4</td>
</tr>
<tr>
<td>2500</td>
<td>71.6</td>
<td>56.9</td>
</tr>
<tr>
<td>3150</td>
<td>70.9</td>
<td>60.8</td>
</tr>
</tbody>
</table>

Qualification test for DIN 4109 on 01.08.2012

Publication of the results is authorised by ift Rosenheim GmbH
Theodor-Gietl-Str. 7-9
83026 Rosenheim
Germany
Phone +49 (0)8031 261-0
Fax +49 (0)8031 261-290

We will be pleased to send you the complete test report no. 12-001691-PR01 (PBX3.1-F03-04-de-01) upon request.
Installation Guidelines

Concrete Floor

Before the Regupol® and Regufoam® screed insulation is installed, make sure the concrete floor is swept clean and dry. Protruding pieces, stones and chunks of concrete must be removed. Any slight unevenness may be ignored, as it will be levelled by Regupol® and Regufoam® screed insulation.

Perimeter Insulation

Prior to the installation of the Regupol® and Regufoam® Perimeter Insulation Strips, Regupol® and Regufoam® Perimeter Insulation Strips must be installed in all adjoining vertical structural elements such as walls, columns, pipes, etc. Their width equals approximately the entire structural height of the floor construction from the top edge of the concrete floor including the floor covering with possible additional impact sound insulation.

Unrolling the Screed Insulation Mats

The Regupol® and Regufoam® Screed Insulation Mats are unrolled parallel to one another, butt to butt, on the concrete floor with the dimpled side down.

Coil tension may cause the material to shrink slightly in the direction in which it was rolled. We therefore recommend that you pull up the insulation mat a few centimetres lengthwise in front of the perimeter insulation strip. After a few hours the roll can be cut to the exact required length.

The material is butt-joined and taped down on the top side with a suitable adhesive tape in order to avoid acoustic bridges.
Installation Guidelines

Covering with PE Foil

Once the Regupol® and Regufoam® Screed Insulation Mats have been installed and cut to the required length, they are covered with PE foil which has a minimum thickness of 0.2 mm, and the perimeter insulation strips are pulled up on the outer sides. The butts and overlaps of the foil strips are taped together with a suitable adhesive tape. The foil should cover the entire screed insulation in order to avoid acoustic bridges.
References

These references constitute only a small selection of all buildings which have been equipped with Regupol® under-screed impact sound insulation.

ADAC Headquarters
Place: Munich, Germany
Screed insulation with Regupol® BA
Insulated building part: print shop

Elbphilharmonie
Place: Hamburg, Germany
Screed insulation with Regupol® BA, Regupol® E48
Insulated building part: concert halls and studios

Cinemagnum
Place: Nuremberg, Germany
Screed insulation with Regupol® BA
Insulated building part: underground car park

Other buildings insulated with Regupol® are:

RTL Studios, Cologne, Germany
Hesse State Parliament, Wiesbaden, Germany
Frankfurt Airport, Frankfurt, Germany
Nuremberg Trade Fair Centre, Nuremberg, Germany
Scandic Hotel, Berlin, Germany
University Clinic, Regensburg, Germany
Clinical Centre, Minden, Germany
Deutsche Bank Building, Frankfurt, Germany
Commercial Park Laim, Munich, Germany
Commerzbank Tower, Frankfurt, Germany
Musiktheater, Linz, Austria
References

These references constitute only a small selection of all buildings which have been equipped with Regupol® under-screed impact sound insulation.

The Shard
Place: London, United Kingdom
Screed insulation with Regupol® E48
Insulated building part: 42 floors of Shangri-La Hotel

Central Bus Terminal
Place: Munich, Germany
Screed insulation with Regupol® E48
Insulated building part: floor plates in the service and trade areas

Audi plant
Place: Győr, Hungary
Screed insulation with Regupol® BA
Insulated building part: plant

Other buildings insulated with Regupol® are:

Opera House, Frankfurt, Germany
Doha Exhibition and Convention Centre, Doha, Qatar
One Hyde Park, London, United Kingdom
DFS Deutsche Flugsicherung GmbH, Langen, Germany
Wisseloord Studios, Hilversum, Netherlands