mageba expansion joints – for lasting driving comfort

TENSA® FINGER Type GF
advanced, reliable, durable
Product Characteristics & Benefits

**Principle**

The mageba TENSÄ®FINGER GF sliding finger joint is suitable for use on bridges with heavy traffic loading and movements of between 4.7 inches (120 mm) and 39.3 inches (1,000 mm) or more. It contains steel edge profiles, featuring connection surfaces for deck waterproofing membranes, which are connected to the bridge deck by anchor loops. The steel finger plates which are supported by these edge profiles are prestressed downwards by springs to prevent uplift. A drainage channel, hanging beneath the joint and connected to the edge profiles, is designed to accommodate all bridge movements.

**Properties**

**Design**

The sliding finger plates, resting on the edge profiles, behave statically as simply supported beams. Traffic loading is transferred from the sliding plates to the edge profiles and into the supporting structures, with minimal moment effect compared to a cantilever finger joint. The finger plates rest on plastic bearings at the fixed side of the joint, and are held in place by high-strength friction-grip bolts. A sliding bearing pad is attached to the underside of each finger, at its outer end. These sliding pads move on stainless steel or GRP sliding sheets on the edge structure at the sliding side of the joint. At the same location, fixed fingers are securely bolted to the edge structure in the gaps between the fingers of the sliding plates.

Special stainless steel springs, which connect the sliding plates to the edge structure at the fixed side of the joint, create a constant downward prestressing and thus prevent the sliding fingers from protruding above the driving surface, even in the case of settlement or rotation of the structure. This prevents damage to the joint, e.g. from snow-clearing vehicles. The constant prestressing also prevents protrusion of the fingers above the driving surface as the joint opens and closes, where the joint is installed on a bridge deck with a high gradient and horizontal bearings.

**Noise Reduction**

The geometry of the interlocking fingers avoids a straight transverse gap in the roadway. The wheels of passing vehicles thus maintain constant contact with the expansion joint’s surface, reducing the noise caused by impacts with the gap edge. This results in low noise emissions and high driver comfort. TENSÄ®FINGER sliding finger expansion joints are thus ideal for use on bridges near residential areas or in other noise-sensitive zones.

**Surface Profiling**

To improve the ability of vehicle wheels to grip the surface of the joint’s finger plates, they can optionally be delivered with a $\frac{1}{16}$” (2 mm) deep surface pattern. This improves traffic safety, especially on joints with large movements and thus large surface areas.

**Drainage Channel**

Beneath the expansion joint, a watertight drainage channel of EPDM, soft PVC or stainless steel is attached. This features rounded end-pieces at both ends, and a flexible discharge outlet at its low point for connection to the bridge’s drainage system. The channel can be easily flushed clear of any gathered sediment during periodic bridge cleaning activities. To facilitate this, an external hose connection point can optionally be provided in the non-trafficked part of the joint. If desired, the channel can also be delivered with a dirt-repellent surface, reducing cleaning effort to an absolute minimum.

**Benefits**

- Causes less loading on the supporting structure as compared to a cantilever finger joint
- Use of steel and stainless steel ensures a long service life
- Robust, durable construction with well-proven design
- Optimized life-cycle costs due to high product quality
- Improved noise protection due to interlocking of fingers
- High driving comfort due to special fixing and bearing of sliding finger plates
Material Properties & Dimensions

Materials
The following high-quality materials in particular are used for the manufacturing of TENSA® FINGER sliding finger joints:

- Finger plates: ASTM A709 Grade 50 steel
- Support structure: ASTM A709 Grade 36 steel
- Fixed and sliding bearings of polyamide
- Sliding sheet of stainless steel
- Springs of stainless steel
- Drainage channel of EPDM, soft PVC or stainless steel, according to customer preference

Corrosion Protection
The steel edge profiles are treated with corrosion protection systems based on hot dip galvanizing ASTM A-123 / AASTHO M111, or any applicable painting systems approved by the responsible Department of Transportation (D.O.T.).

Main Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Movement capacity</th>
<th>Smin</th>
<th>Smax</th>
<th>A</th>
<th>B</th>
<th>T</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>inches mm</td>
<td>inches mm</td>
<td>inches mm</td>
<td>inches mm</td>
<td>inches mm</td>
<td>inches mm</td>
<td>lb/ft kg/m</td>
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<tr>
<td>GF 120</td>
<td>4.7 120</td>
<td>6.2 157</td>
<td>10.9 277</td>
<td>13.8 350</td>
<td>13.8 350</td>
<td>13 330</td>
<td>215 320</td>
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<tr>
<td>GF 240</td>
<td>9.5 240</td>
<td>8.1 207</td>
<td>17.6 447</td>
<td>13.8 350</td>
<td>18.5 470</td>
<td>13.8 350</td>
<td>329 490</td>
</tr>
<tr>
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<td>14.2 360</td>
<td>10.3 262</td>
<td>24.5 622</td>
<td>13.8 350</td>
<td>26 660</td>
<td>14.2 360</td>
<td>440 655</td>
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<tr>
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<td>18.9 480</td>
<td>12.3 312</td>
<td>31.2 792</td>
<td>13.8 350</td>
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<td>14.6 370</td>
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<tr>
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<td>23.6 600</td>
<td>13.8 352</td>
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<td>35 890</td>
<td>15 380</td>
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<td>48.9 1,242</td>
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<tr>
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<td>39.4 1,000</td>
<td>20.7 525</td>
<td>60.3 1,532</td>
<td>13.8 350</td>
<td>50.8 1,290</td>
<td>15.7 400</td>
<td>1129 1,680</td>
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</tbody>
</table>

(Dimensions for larger movements on request)

Shuttering Plates
Steel shuttering plates not only provide support to the fresh concrete during pouring, considerably reducing construction effort, but also serve as a connection surface for the drainage channel. They can alternatively be made from stainless steel to enhance their durability.

Replacement of Individual Sliding Plates
Due to the modular design of the system, with individual elements of 19.7 inches (0.5 m) length bolted in place, single sliding plates can be easily replaced at any time.
Quality & Support

Quality
For five decades, mageba expansion joints have proven their worth in thousands of structures under the most demanding conditions. In addition to the product properties, the extensive experience of our well-qualified manufacturing and installation staff also contributes to the high quality and durability of the products.

mageba has a process-orientated quality system. In addition, its quality is regularly inspected by independent testing institutes. mageba factories are AISC certified for Major Bridges (CPT, STD, SPE) and also maintain AWS certifications for D1.1 and D1.5.

Tests and National Approvals
TENSA®FINGER sliding finger joints have been subjected to extensive testing and analysis to confirm their properties and performance. For example, the joint was tested with $2 \times 10^6$ load cycles at a frequency of 3.2 Hz and loads of up to 35.9 kips (160 kN). Under this loading, the system fulfilled the demanding requirements of the AASHTO CRFD standard. The system has also been awarded with national approvals in numerous countries around the world.

Installation
The expansion joint is pre-assembled in the factory and fixed at the desired pre-setting value (gap width) by cross-beams. mageba installation technicians precisely position the joint on the main structure, and fix its anchorages to the structure’s reinforcement. The concrete is then poured, fully securing the joint to the bridge. The stainless steel springs are not prestressed until the concrete has achieved sufficient strength.

Customer Support
Our product specialists will be pleased to advise you in the selection of the optimal solution for your project, and to provide you with a quotation.

On our website, mageba-group.com, you will find further product information, including reference lists and tender documentation.

Related Products
The following mageba products can be used in combination with TENSA®FINGER sliding finger joints:

- **ROBO®DUR**: Strengthening ribs of special mortar, which reinforce the asphalt adjacent to the joint. These reduce rutting while increasing driver comfort and the durability of the joint
- **ROBO®STATIFLEX**: Strengthening strip of quick-hardening polymer concrete along the side of an expansion joint, which reduces rutting while increasing driver comfort and joint durability
- **ROBO®MUTE**: Noise-protection system, consisting of mats placed beneath the joint to reduce noise emissions

Reference Projects with mageba Expansion Joints

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Project Name</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>Sliding Finger Joints</td>
<td>Audubon Bridge, LA (US)</td>
<td></td>
</tr>
<tr>
<td>Single Gap Joints</td>
<td>Route 9G Bridge, NY (US)</td>
<td></td>
</tr>
<tr>
<td>Modular Expansion Joints</td>
<td>Port Mann Bridge (CA)</td>
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<td>Deh Cho Bridge (CA)</td>
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<tr>
<td>Sliding Finger Joints</td>
<td>Pont de Beauharnois (CA)</td>
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</tbody>
</table>

mageba Expansion Joint Types

- Single Gap Joints
- Cantilever Finger Joint
- Sliding Finger Joints
- Modular Expansion Joints

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