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Introduction

A transverse joint frequently crossed by heavy goods traffic tends to form steps if it not perfectly doweled. This is associated with negative effects on ride comfort and driving safety as well as damaging after-effects to the concrete pavement.

In general, **DOWELS** are required in transverse joints to transfer load and to ensure the slabs are at the same level and **TIEBARS** are required in longitudinal joints to prevent the slabs from wandering apart. Dowels and tie bars are mandatory for concrete pavements designed to construction classes BK 3.2 to BK 100 in accordance with ZTV Beton-StB 07.

Apart from adequate dowel diameter, correct, durable dowelling requires the smallest possible pull-out resistance. Furthermore, the dowel must have effective protection against corrosion. According to TL Beton-StB 07, dowels with a diameter of 25 mm and a length of 500 mm must be used. The whole length of the dowel must be covered with a very adherent alkali resistant plastic coating, 0.2 – 0,8 mm thick. Deformation of the dowel ends on cutting to length is to be avoided to ensure free mobility of the concrete slabs.

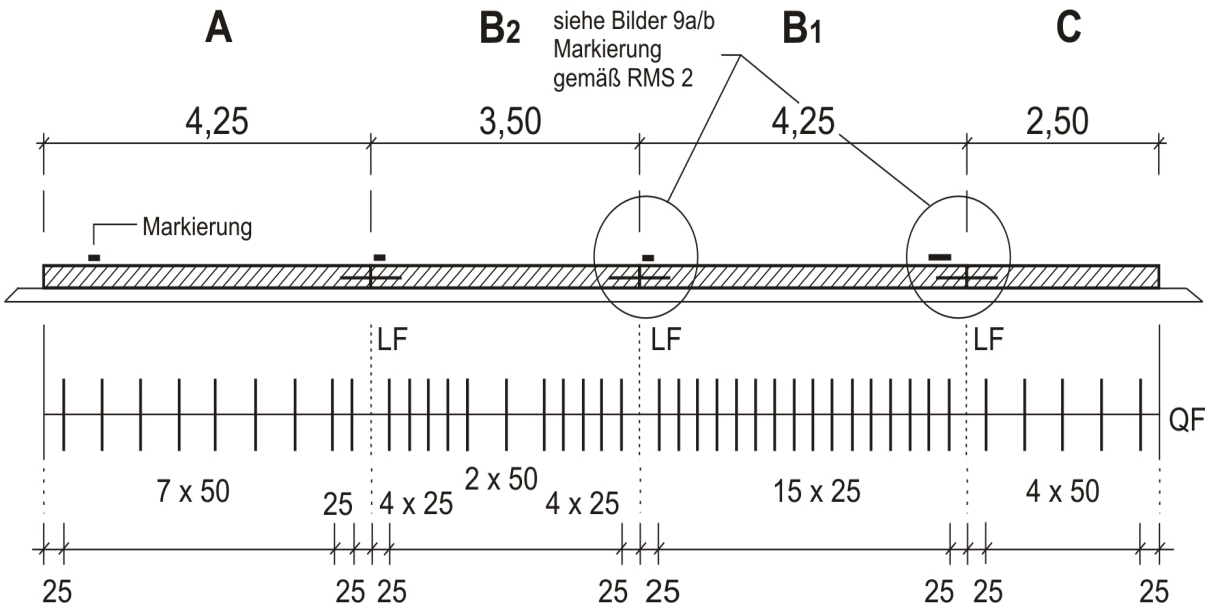
The dowels must be laid in the middle of the slab pavement so that they do not impede expansion of the slab. The dowels are usually vibrated directly into the fresh concrete by modern slipform pavers. In many cases, however, it is necessary to lay the dowels out in the correct position on an underlay before concreting. Here the problem is the additional work and maintaining the precise position of the dowels during subsequent concreting. We have developed a holder to ensure the dowels and tie bars stay in the correct position. The holder's functional performance has been appropriately verified through tests and practical trials.

The distribution of the dowels within the cross-section of the carriageway lanes is of considerable importance for the performance of the concrete pavements under use conditions. The dowel spacing for highly trafficked carriageway lanes is 25 cm.

Exemplary dowel allocation, profile in accordance with ZTV Beton-StB 07.

Performance standard A: normal trafficked lanes
Performance standard B: highly trafficked lanes
Performance standard C: Breakdown lane

In accordance with ZTV Beton-StB 07 the dowel spacing for all lanes is always 25 cm if the construction classes are BK 3,2 to BK 100. After that the performance standard is always B_1.

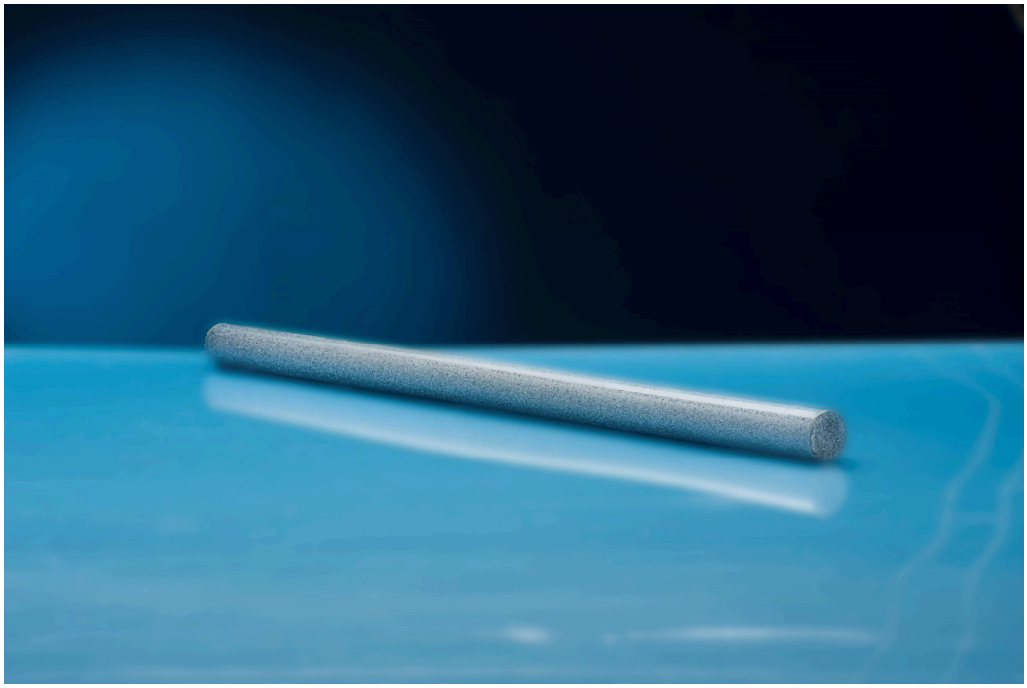


Tiebars are normally 20 mm in diameter and 800 mm long. The middle section (joint) of the tie bar is also coated with a ca. 0.3 mm thick plastic coating over a length of 200 mm to protect against corrosion.

Standard, threaded tiebars or adhesive tie bars are used for the anchorage. In the longitudinal direction, three tie bars per slab must be laid at uniform spacings on straight sections of road. The number of tie bars in longitudinal compression joints (construction joints) must be increased to five in pavements designed to construction classes BK 3.2 to BK 100. This achieves greater transfer of transverse (shear) forces. In longitudinal contraction joints the tie bars are laid in the bottom third of the pavement slab and in the middle of the pavement slab in longitudinal compression joints

1. Dowel

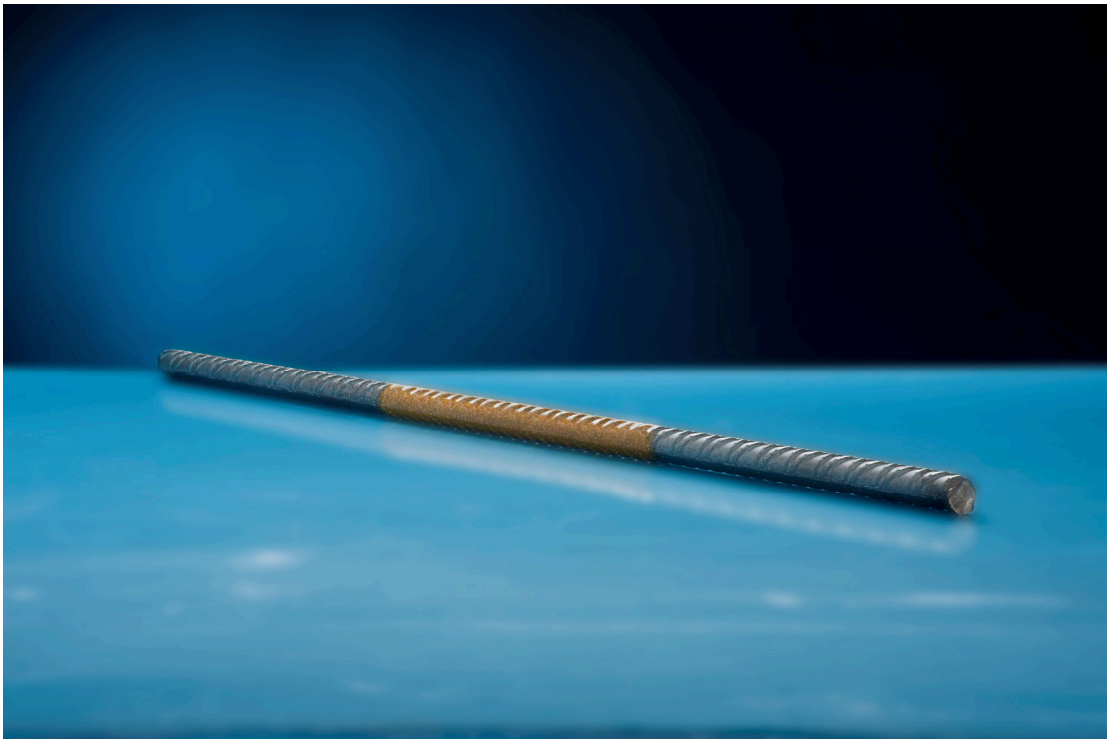
Dowels made of smooth round steel S 235 (JR or J0) or similar conform to EN 10025; diameter Ø 25 mm (Ø-tolerance +/- 0.5 mm EN 10060) + PE-coating, length 500 mm (length tolerance +/- 5 mm), both sides free of burrs, sawn without cross-sectional changes, whole length including one end face with PE plastic coating (resistant to alkalis), coat thickness at ca. 0.35 mm, one end face coated with rustproofing agent.



Our range of products includes plastic coated dowels from Ø 16 mm to Ø 40 mm in lengths from 400 mm to 600 mm (special dimensions also possible). The dowels conform to EN 13877-3 and are quality monitored by Munich Technical University, Institute of Road, Railway and Airfield Construction.

2.1 Tiebar (standard)

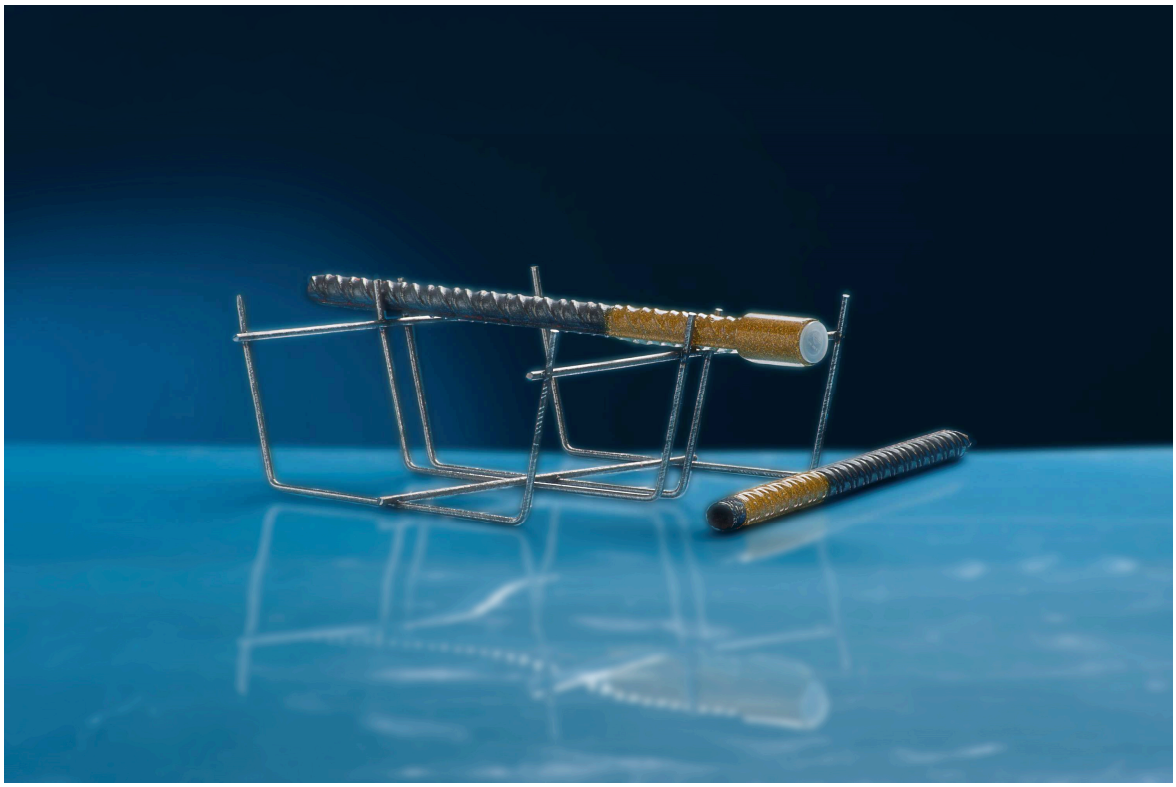
Tiebars made of B500 (structural steel); diameter Ø 20 mm, length 800 mm (length tolerance +/- 15 mm), both sides cut with reinforcing bar cutter, about 200 mm of the middle section coated with PE plastic (resistant to alkalis), coat ca. 0.3 mm thick.



Our range of products includes plastic coated tiebars Ø 14 mm to Ø 28 mm in diameter and from 700 mm to 1200 mm long. The tiebars are conform to EN 13877-1 and are quality monitored by Munich Technical University, Institute of Road, Railway and Airfield Construction.

2.2 Threaded tiebars (2-piece tie bars)

Threaded tiebars made of B500, diameter Ø 20 mm, 2-piece with threaded coupling M 20 x 50 mm, wall thickness 5 mm and plastic plugs (to protect the internal thread of the coupling), total length 800 mm (length tolerance +/- 15 mm), middle section of the tie bar plastic coated over a length about 200 mm, coat ca. 0.3 mm thick, mating component thread partly coated.



2.3 Bonded tiebars (adhesive tiebars)

Bonded tiebars for longitudinal compression joints must have a diameter of Ø 20 mm and be at least 650 mm long for all construction classes. They must have a symmetrical cut face at one end. An M 24 bonding cartridge must be used as the adhesive system when using bonded tie bars. The pull-out resistance must be verified by tensile tests with a minimum tensile force of 80 kN.

Product description:

AVA connection anchorage, consisting of M 24 bonding cartridge (drilled hole depth 250 mm, drilled hole diameter 28 mm, tie bar inserted by hammering and turning), as well as tiebars made of B500, diameter Ø 20 mm, length 700 mm, PE plastic coating off-centre over a length about 200 mm, coat ca. 0.3 mm thick; one end must have a symmetrical cut face.

3. Dowel holders

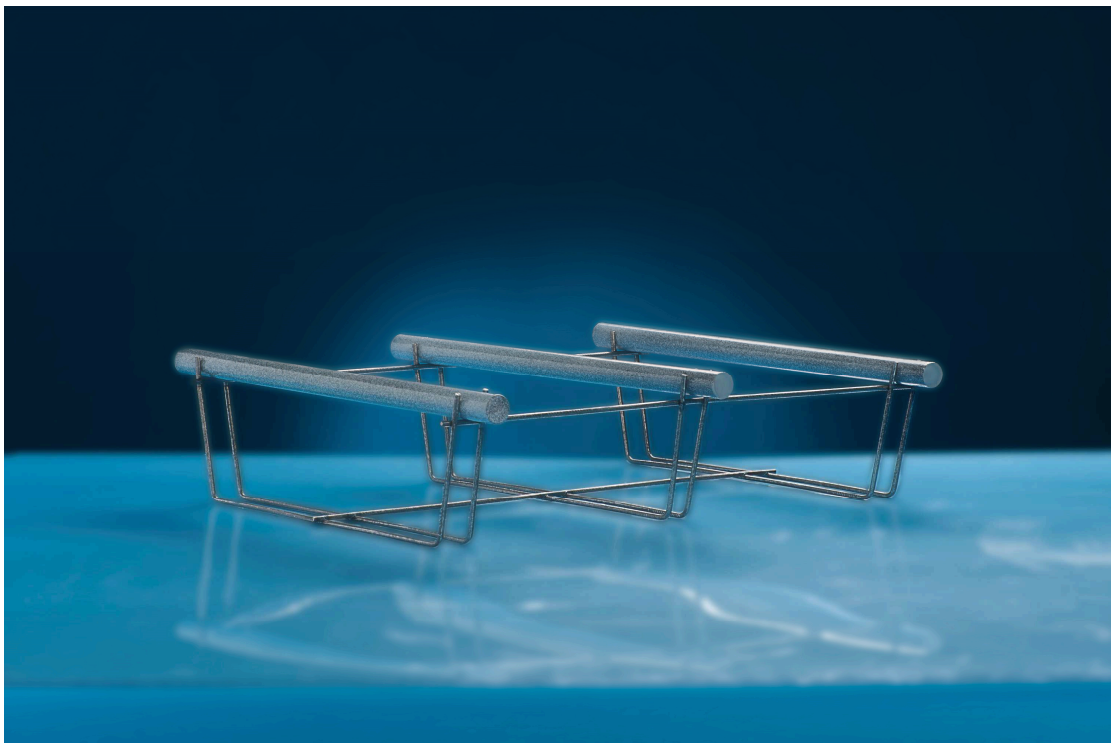
Dowel holders as welded and canted support cages made of wire rod S 235 JR (Ø 5 mm) are used to ensure dowels in a transverse joint keep their required position during construction.

The following details are needed for costing and production:

- Joint type (contraction or expansion joint)
- Pavement thickness (height of the concrete)
- Dowel spacing
- Holder length; whereby the maximum production length is 4.0 m; **2 - piece** dowel holders are made for larger working widths.

A differentiation is made between two types:

A. Wide version for providing support in contraction joints
(One continuous cage, which extends beyond the joint)



B. Narrow version for providing support on both sides in expansion joints and one-sided support in shuttered temporary joints

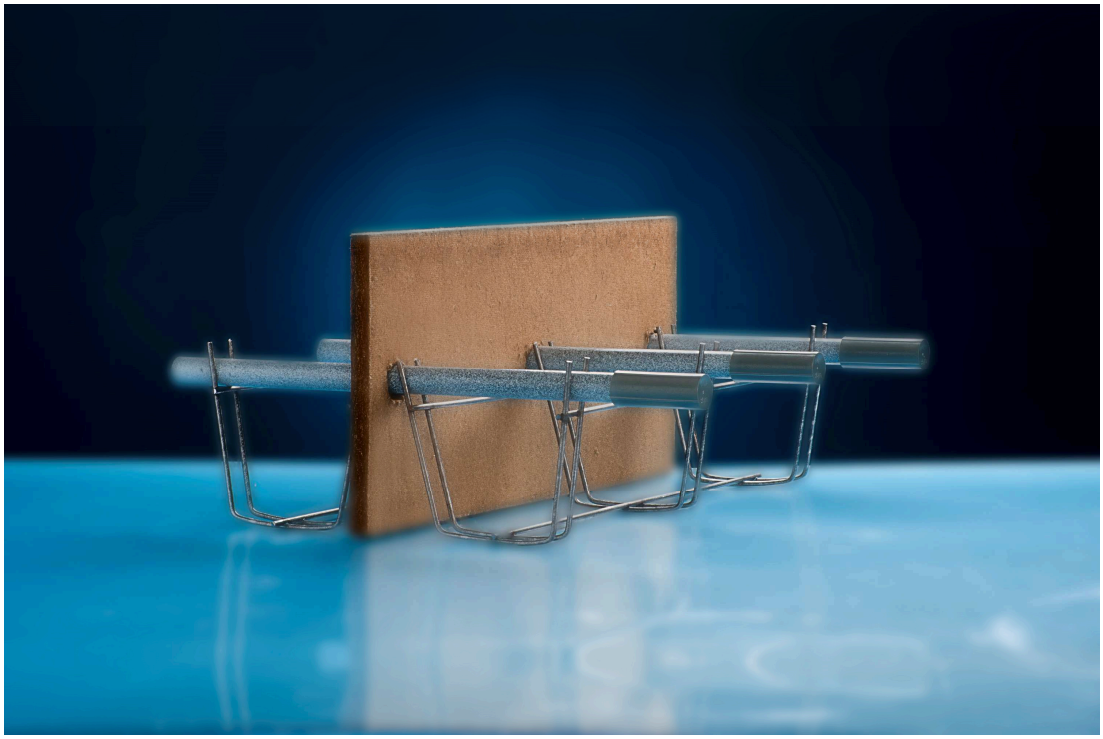


Photo: Example of support on both sides in expansion joint (expansion joint filler of drilled bituminised wood fibre soft board)

Expansion compensating sleeves (inside Ø 26 mm and 80 mm long) made of plastic which ensure an expansion space of approx. 20 mm are pushed onto alternating sides (see also Section 8).

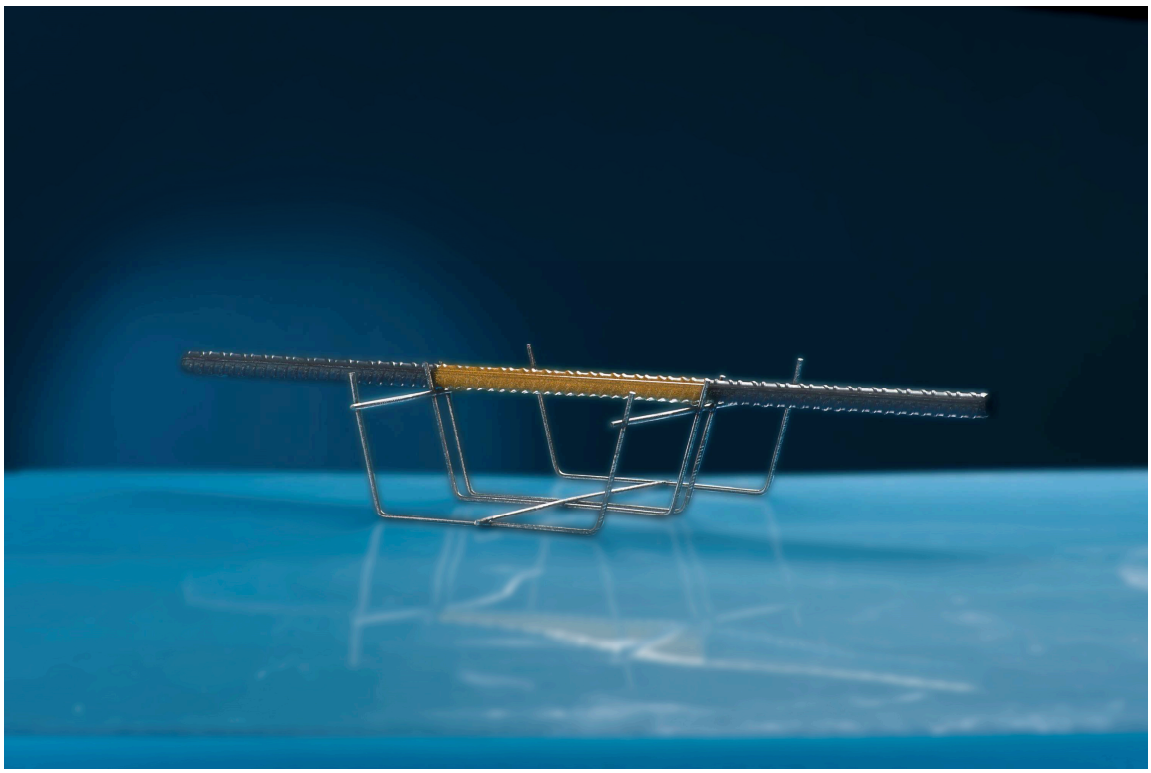
4.1 Tiebar holders (wide type)

Tiebar holders as welded and canted support cages made of wire rod S 235 JR (diameter Ø 5 mm) are used to ensure tiebars in a longitudinal contraction joint keep their required position during construction. They are produced as wide holders.

For support cage stability reasons, it is advisable to secure each tie bar with an individual support cage if the tie bar spacings are irregular or very large.

The following details are needed for costing and production:

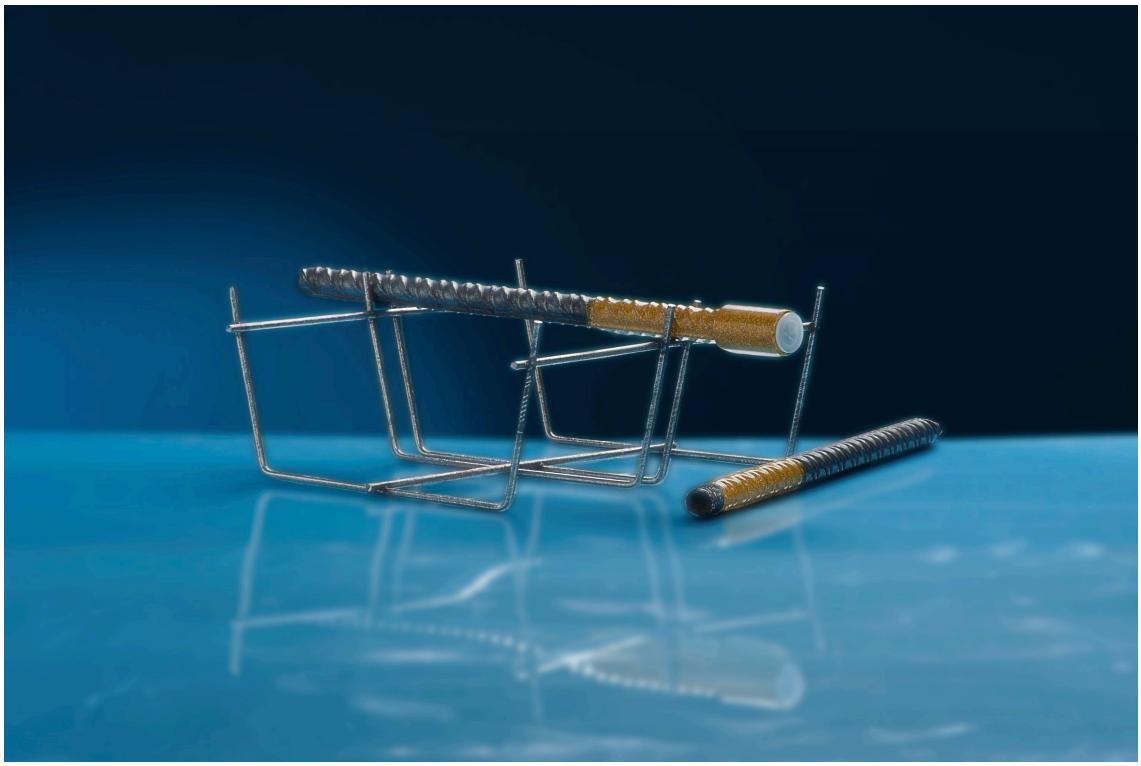
- Joint type (contraction or compression joint)
- Pavement thickness (height of the concrete)
- Tiebar spacings
- Holder length; whereby the maximum production length is 4.0 m; **2 - piece** tie bar holders are made for larger working widths.



4.2 Tiebar holders for threaded tie bars in longitudinal compression joints

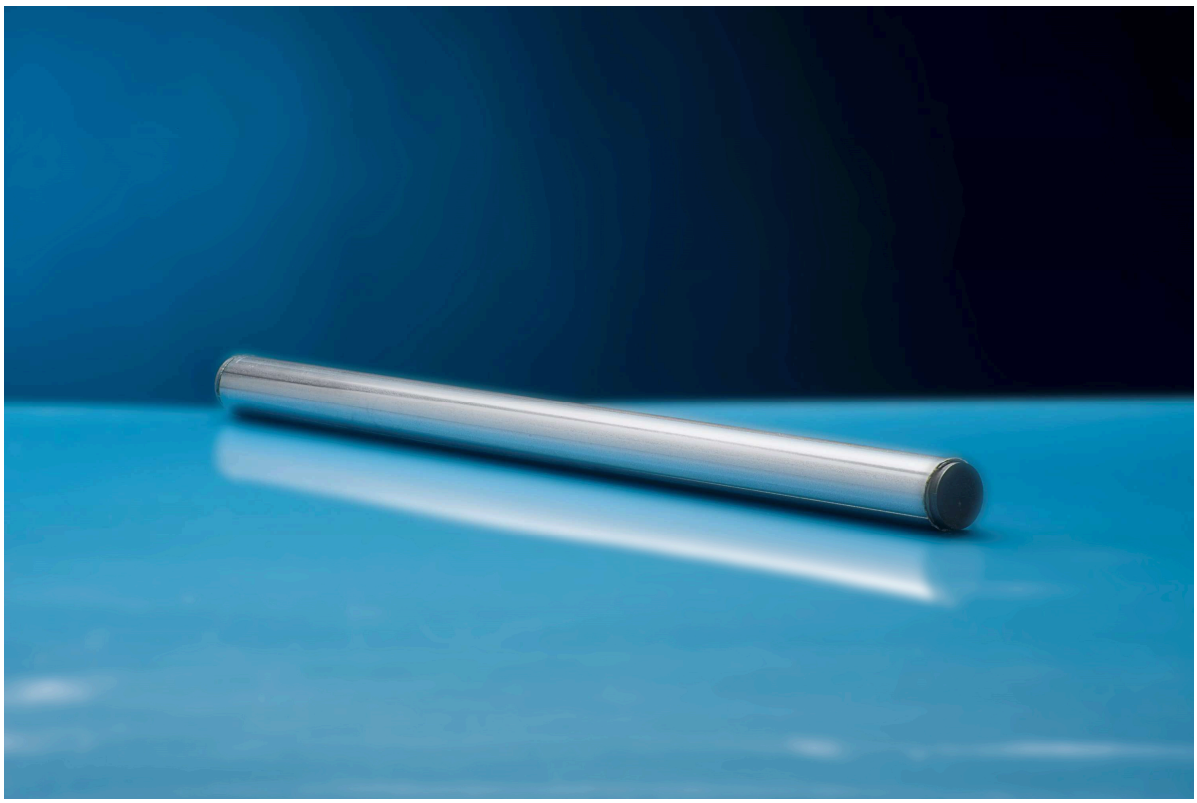
This version is used to keep the threaded tie bar coupling (half threaded tie bar) in position in a longitudinal compression joint.

A narrow support cage only is required here. Here too, individual support is advisable if the threaded tie bar spacings are irregular or very large.



5. Steel conduits for cut temporary joints

The conduits (pipes) are vibrated into the temporary joints and have an inner diameter of 26 mm. The length is the same as the inserted dowel. They are delivered with a plastic plug at both ends.



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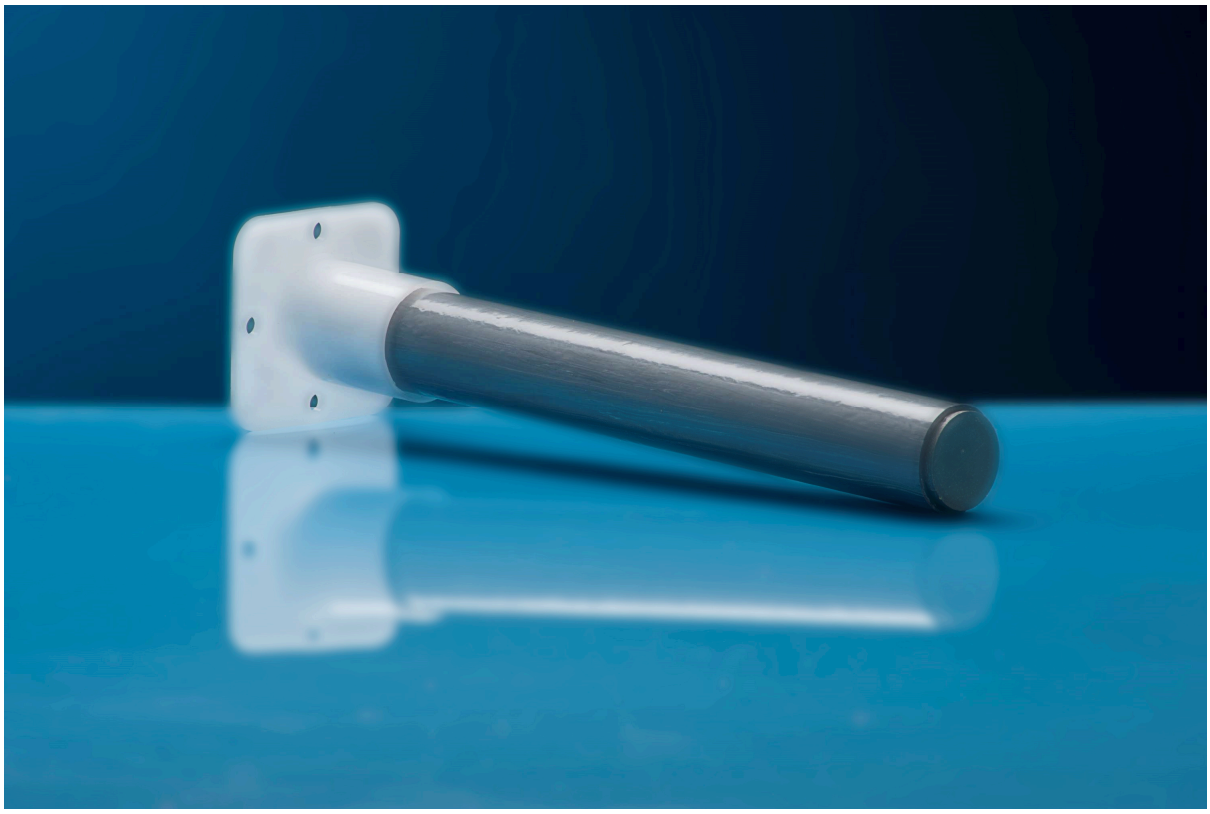
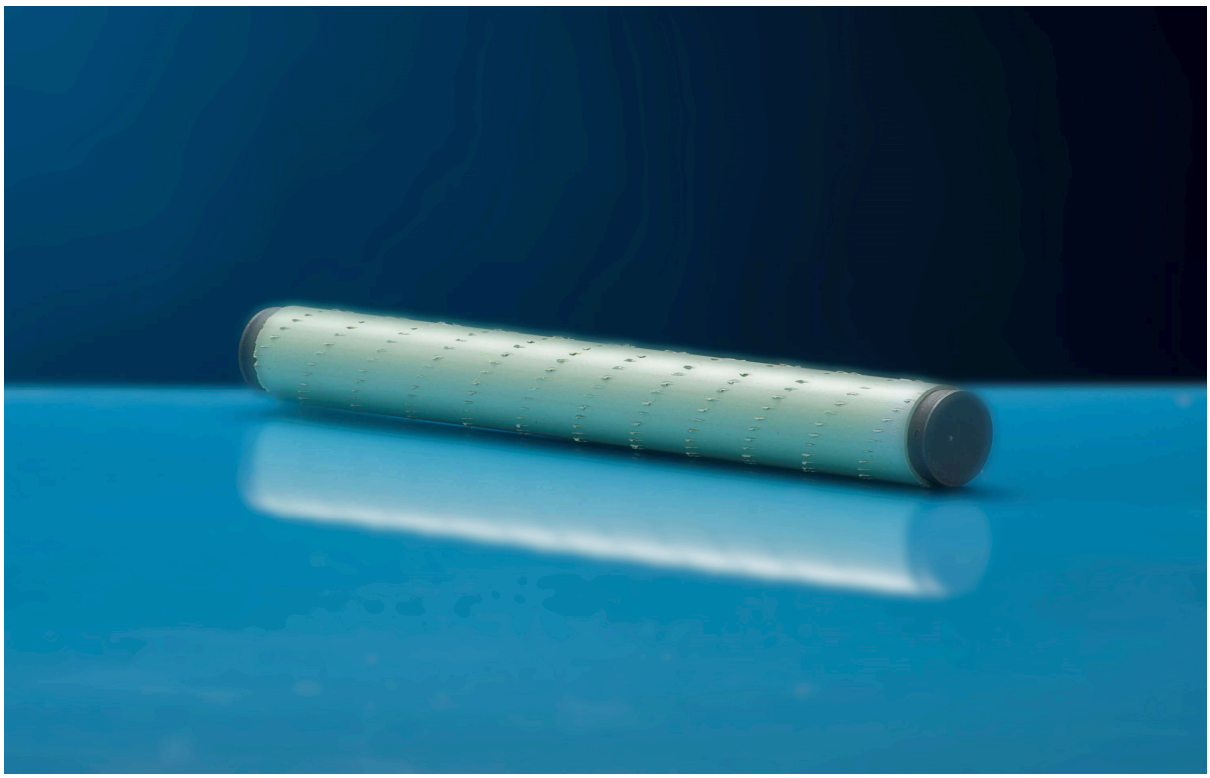
6. PVC conduits with nail holder for shuttered temporary joints

3-part system consisting of plug-in sleeve with nail holder, guide tube and end plug, available in Ø 20 mm, length 250 mm, or Ø 25 mm, length 250 mm. The plug-in sleeve can be fixed to all joint profiles. The PVC socket facilitates the horizontal installation of the load transfer dowels and thus ensures a trouble-free placement of concrete.



7. Plastic conduits for shuttered temporary joints

These are intended for use in compression joints and are cut to half the dowel length.



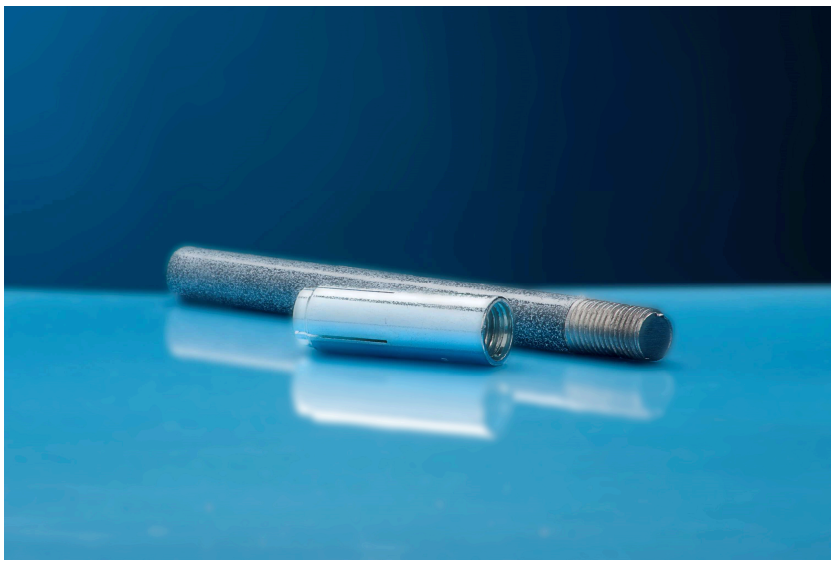
8. Dowel sleeves

Expansion compensating sleeves (80 mm long) made of plastic which ensure an expansion space of approx. 20 mm. Available for Dowels in Ø 20 mm or Ø 25 mm.

9. M 24 bonding cartridge for bonded tiebars

10. Flush anchor M 20 or M 16 (Length 80 mm)

For threaded tie bars (1-piece tie bar) or threaded dowels. This means that both screw dowels (see figure below) and screw tie bars (with a thread on one side) can be installed as connections. Available in sizes M 16 and M 20 (length 80 mm each).



Product description:

Threaded tiebar made of B500, diameter Ø 20 mm, 1-piece with threaded M 20 x 35 mm or M 16 x 35 mm, length 400 mm (length tolerance +/- 15 mm), PE plastic coating off-centre over a length about 200 mm, coating approx. 0.3 mm thick, incl. Flush anchor M 16 or M 20.

Quality control

Our products are subjected to in-house quality checks. We also work very closely together with the steel manufacturers and our suppliers to assure and guarantee the required qualities.

Furthermore, the **DOWELS and TIEBARS** produced by us are subjected to continuous quality monitoring by Munich Technical University, Institute of Road, Railway and Airfield Construction. The product is regularly checked with regard to the requirements according to TL Beton-StB 07. The required values, both with respect to the coating thickness and with respect to the pull-out resistance are achieved by our product at all times. The dowels produced by us also fulfil the requirements according to EN 13877-3 (Concrete pavements - Part 3: Specifications for dowels to be used in concrete pavements). The current test report can be made available on request.

Please contact us if you have any further questions.

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