

National technical approval

Zulassungsstelle für Bauprodukte und Bauarten Bautechnisches Prüfamt

Eine vom Bund und den Ländern
gemeinsam getragene Anstalt des öffentlichen Rechts

Mitglied der EOTA, der UEAtc und der WFTAO

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Approval number:
Z-16.33-480

Applicant:

Calenberg Ingenieure GmbH
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Validity

from: **29 June 2020**
to: **29 June 2025**

Subject of approval:

Calenberg Sandwich Bearing Q

The subject of approval named above is herewith granted a national technical approval (*allgemeine bauaufsichtliche Zulassung*).
This decision contains seven pages.

Translation authorised by DIBt

DIBt

I GENERAL PROVISIONS

- 1 This national technical approval confirms the fitness for use of the subject of approval within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).
- 2 The national technical approval does not replace the permits, approvals and certificates prescribed by law for carrying out construction projects.
- 3 The national technical approval is granted without prejudice to the rights of third parties, in particular private property rights.
- 4 Notwithstanding further provisions in the 'Special Provisions', manufacturers and distributors of the subject of approval shall make copies of the national technical approval available to the user and point out that the national technical approval must be available at the place of use. Upon request, copies of the national technical approval shall be placed at the disposal of the authorities involved.
- 5 The national technical approval shall be reproduced in full only. Partial publication requires the consent of DIBt. Texts and drawings in promotional materials shall not contradict the national technical approval. In the event of a discrepancy between the German original of the national technical approval and this authorised translation, the German version shall prevail.
- 6 The national technical approval may be revoked. The provisions of the national technical approval can subsequently be supplemented and amended, in particular if this is required by new technical findings.
- 7 This decision is based on the information and documents provided by the applicant on the subject of approval during the approval procedure. Alterations to the information on which this national technical approval was based are not covered by this decision and shall be notified to DIBt without delay.

II SPECIAL PROVISIONS

1 Subject concerned and field of use and application

The subject of approval is the profiled reinforced elastomeric 'Sandwich Bearing Q' used to transfer forces and to compensate deformations perpendicular to the bearing plane. 'Sandwich Bearing Q' consists of a steel-reinforced elastomeric panel. The material used is chloroprene rubber (CR) with alternating layers of steel S355J2WP in accordance with DIN EN 10025-5:2019-10 (Corten steel) of a thickness of 2 mm. The inner layers of the elastomeric bearing are 8 mm thick. The top layers are 4 mm thick. The profile of the bearing consists of round studs of a diameter of 15 mm. Round and rectangular bearings may be formed in point or strip form. Circular holes may be drilled through the bearing.

The subject of the permit is the planning, design and execution of supports by means of elastomeric bearings used in buildings. The elastomeric bearings may be used at temperatures between -25 °C and 50 °C under static and quasi-static actions. The bearings may be exposed to temperatures up to +70 °C for short-term recurring periods of less than 8 hours.

Although elastomeric bearings enable shear strain, they shall not be used for the planned transfer of constant external shear forces.

Vibration insulation-related aspects and structure-borne sound insulation are not assessed in this decision.

2 Provisions for the bearings

2.1 Properties and composition

2.1.1 Dimensions

For the bearing dimensions, the following conditions shall be complied with:

Possible overall thickness of the bearing:

$t = 10 \text{ mm}$, $t = 20 \text{ mm}$, $t = 30 \text{ mm}$ and $t = 40 \text{ mm}$

Rectangular bearings: $a \geq 90 \text{ mm}$, $b \geq 90 \text{ mm}$

Round bearings: $D \geq 90 \text{ mm}$

where:

t thickness of unloaded bearing [mm]

a short side of bearing [mm]

b long side of bearing [mm]

D diameter of round bearing [mm]

Regarding the tolerances to be adhered to:

length class L3 in accordance with Table 6 of DIN ISO 3302-1:1999

width class L3 in accordance with Table 6 of DIN ISO 3302-1:1999

thickness tolerance of $\pm 2.5 \text{ mm}$

2.1.2 Materials

The physical characteristics and the chemical composition as well as the material properties of the bearings are deposited with DIBt.

The properties of the starting materials used shall be verified through inspection certificate type 3.1 in accordance with DIN EN 10204:2005-01.

2.2 Manufacture, transport and marking

2.2.1 Manufacture and transport

The bearings shall be produced in the shape of panels and then be cut to size as needed.
Detailed information on the manufacturing process is deposited with DIBt.

2.2.2 Marking

The manufacturer shall affix the national conformity mark (*Ü-Zeichen*) to the construction product in accordance with the Conformity Marking Ordinances (*Übereinstimmungszeichen-Verordnungen*) of the federal states. The mark shall only be applied if the requirements given in Section 2.3 are met.

2.3 Confirmation of conformity

2.3.1 General

The confirmation of conformity of the bearings with the provisions of the national technical approval included in this decision shall be issued for every manufacturing plant in the form of a certificate of conformity based on factory production control and regular external surveillance including initial type-testing of the bearings in accordance with the following provisions.

To issue the certificate of conformity and for external surveillance, including the associated product testing, the manufacturer of the bearings shall use a certification body and an inspection body recognised for these purposes.

The declaration of conformity shall be submitted by the manufacturer through marking of the construction products with the national conformity mark (*Ü-Zeichen*) including statement of the intended use.

The certification body shall send a copy of the certificate of conformity issued by it to DIBt.

A copy of the initial type-testing evaluation report shall also be sent to DIBt.

2.3.2 Factory production control

A factory production control system shall be set up and implemented in each manufacturing plant. Factory production control shall be understood to be continuous surveillance of production by the manufacturer to ensure that the manufactured construction products satisfy the provisions of the national technical approval included in this decision.

Factory production control shall be carried out in accordance with the test plan deposited with DIBt.

The results of factory production control shall be recorded and evaluated. The records shall include at least the following information:

- designation of the construction product or the starting material and the components,
- type of check or test,
- date of manufacture and testing of the construction product or the starting material or the components,
- result of the checks and tests as well as, if applicable, comparison with requirements,
- signature of the person responsible for factory production control.

The records shall be kept for at least five years. They shall be submitted to DIBt and the competent supreme building authority upon request.

If the test result is unsatisfactory, the manufacturer shall immediately take the necessary measures to resolve the defect. Construction products which do not meet the requirements shall be handled in such a way that they cannot be confused with compliant products. After the defect has been remedied, the relevant test shall be repeated immediately - where technically feasible and necessary to show that the defect has been eliminated.

2.3.3 External surveillance

The plant and the factory production control system shall be inspected regularly, i.e. at least twice a year, by means of external surveillance at each manufacturing plant of the bearings.

Initial type-testing of the bearing shall be carried out within the scope of external surveillance. Samples shall also be drawn at random for testing. Sampling and testing shall be the responsibility of the recognised inspection body.

The scope and frequency of external surveillance shall be taken from the test plan deposited with DIBt.

The results of certification and external surveillance shall be kept for at least five years. They shall be presented by the certification or inspection body to DIBt and the competent supreme building authority upon request.

3 Provisions for planning, design and execution

3.1 Planning

The bearings shall be installed in one layer. The dimensions of the bearings shall be taken from the structural engineer's specifications and the installation plans.

Structural analysis shall be carried out in each individual case to verify the stability of the bearings in the ultimate limit state for all relevant design situations and load cases.

The verification concept set out in DIN EN 1990:2010-12 in conjunction with the National Annex shall apply.

The dimensions and arrangement of the bearings shall result from the structural requirements. Based on the bearing selection, an installation plan which shows the exact position of the bearings in the structural layout shall be drawn up if the installation situation so requires.

3.2 Design

The possible load case combinations shall be taken from DIN EN 1990:2010-12.

The design values of the effects of the actions (loads) E_d shall be determined from the characteristic values of the actions in consideration of the partial safety factors γ_f and the combination coefficients ψ in accordance with the Technical Building Rules.

In the ultimate limit state, the following verification shall be provided:

$$\frac{E_{\perp d}}{R_{\perp d}} \leq 1$$

where:

$E_{\perp d}$ load acting on bearing perpendicular to the bearing plane [N/mm²]

$R_{\perp d}$ design value of associated bearing resistance [N/mm²] perpendicular to bearing plane for a compressive strain of $\epsilon = 40\%$

The geometry-independent design value of the bearing resistance perpendicular to the bearing plane for a compressive strain of $\epsilon = 40\%$ shall be $R_{\perp d} = 28$ N/mm². This shall also apply to bearings with holes.

If holes are planned for the bearing, the following conditions shall be adhered to:

Smallest bearing geometry with holes:	$a \geq 90$ mm, $b \geq 90$ mm $D \geq 120$ mm
Maximum percentage of holes:	10 %
Maximum diameter of hole:	47.4 mm with $n = 1$
Maximum number of holes:	$n = 4$
Minimum edge distance:	20 mm
Minimum hole spacing:	20 mm
Type of hole:	round hole
Drilling of holes:	waterjet cutting

If the bearing shows holes, it shall be ensured in the design that the base area of the bearing is reduced by the base area of the holes.

The material partial safety factor for a compressive strain of $\epsilon = 40\%$ is $\gamma_{m,40\%} = 1.25$.

The structural members adjacent to the bearing shall be designed such that the interaction with the structural behaviour of the bearing is taken into account. It shall be observed that loading of an elastomeric bearing leads to a load concentration. Rotation of the elastomeric bearings leads to eccentricities in the load concentration and hence to a restoring moment.

The compressive strain of the bearing shall be taken into account as a product-specific value in the determination of the actions on the overall structure. If the contact surfaces of the adjacent structural members deviate from planar parallelism, e.g. as a result of manufacturing and installation tolerances, these deviations shall be taken into account in the design of the bearing. If more detailed verification is not provided, the angle of rotation of the adjacent structural members shall be determined through adding of the following factors:

- obliqueness with 10 ‰
- unevenness with 625/a ‰.

If the adjacent structural members are made of steel or in-situ concrete, the unevenness may be halved.

For rotations on both perpendicular sides of the bearing, amounts for angular displacement shall be proportionally added to the respective design values.

The positional stability shall be verified.

For bearings having a rectangular or round base area, the maximum twist for rotation about an axis shall be determined as follows depending on the bearing thickness t:

$$\alpha_{t=10,b,max} = 200 \cdot \frac{t}{a} \leq 40 \text{ ‰}$$

$$\alpha_{t>10,b,max} = 350 \cdot \frac{t}{a} \leq 43 \text{ ‰}$$

where:

$\alpha_{b,max}$ maximum angle of twist for rotation about the central axis parallel to side b

The formula shall be used analogously for determination of the maximum angle of twist about the central axis parallel to side a. Verification that edge contact with the adjacent structural members is avoided at simultaneous occurrence of the maximum compression and the maximum twist shall be provided during the structural design.

For biaxial torsional stress, the following boundary condition shall be adhered to depending on the bearing thickness t:

$$\alpha_{resultant, t=10} = \sqrt{\alpha_{a,max}^2 + \alpha_{b,max}^2} \leq 40 \text{ ‰}$$

$$\alpha_{resultant, t>10} = \sqrt{\alpha_{a,max}^2 + \alpha_{b,max}^2} \leq 43 \text{ ‰}$$

3.3 Execution

Regarding the transport of the bearings the manufacturer's specifications shall be observed.

The bearings shall be stored and installed in a dry condition. The bearings shall be protected from direct sunlight. The substrate shall be smooth and level. The support surfaces shall be carefully deburred for protecting the bearing. Voids in the adjacent concrete surfaces shall be avoided. If necessary, height compensation may be carried out by means of a suitable mortar bed. The adjacent structural members shall be compatible with the bearing material. It shall be ensured that the bearing and the adjacent structural members are kept free of damaging chemical and physical effects as well as contaminants. The surfaces of the adjacent structural members shall be swept clean and free of snow, ice, grease and bond breakers. Stagnant water shall be avoided.

The manufacturer's specifications regarding installation shall be observed.

The executing company shall provide a declaration of conformity in accordance with Sections 16a(5) and 21(2) of the Model Building Code to confirm the conformity of the installed bearing with the general construction technique permit included in this decision.

4 Provisions for use, maintenance and repair

The bearings shall be installed such that they are maintenance-free.

Andreas Schult
Head of Section

Drawn up by