

# National technical approval (abZ)/ General construction technique permit (aBG)

Translation version: 01 | 09.10.2024

**Number:** 

Z-1.6-308

Period of validity:

from: August 1, 2024 to: July 31, 2029

Applicant:

solidian GmbH Sigmaringer Street 150 72458 Albstadt Germany

# Subject of this approval/permit

Carbon reinforcement grid solidian GRID for the reinforcement of concrete components with nonmetallic reinforcement

The above-mentioned subject of regulation is hereby generally approved by the Deutsches Institut für Bautechnik, Berlin, for Germany and its federal states. This approval/permit comprises twelve pages and four annexes.

This document contains a translation of the original German version of the approval/permit Z-1.6-308, which has not been reviewed by Deutsches Institut für Bautechnik. Deutsches Institut für Bautechnik (DIBt) is the German technical approval body and a European Assessment Body.

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### I GENERAL PROVISIONS

- This approval/permit is proof of the usability or applicability of the subject matter of the regulation within the meaning of the Building Codes of the federal states.
- This approval/permit does not replace the permits, approvals and certificates required by law for the implementation of building projects.
- This approval/permit is issued without prejudice to the rights of third parties, in particular private property rights.
- Copies of this approval/permit must be made available to the user of the subject matter of the regulation, notwithstanding any further provisions in the "Special provisions". In addition, the user of the subject matter of the regulation must be informed that this approval/permit must be available at the place of use or application. Copies must also be made available to the authorities involved on request.
- This approval/permit may only be reproduced in full. Publication of extracts requires the approval of Deutsches Institut für Bautechnik. Texts and drawings in advertising material may not contradict this approval/permit; translations must contain the note "Translation of the original German version not approved by Deutsches Institut für Bautechnik".
- This approval/permit is issued on a revocable basis. The provisions may be supplemented and amended at a later date, in particular if new technical findings make this necessary.
- This approval/permit refers to the information and documents provided by the applicant. Any changes to this basis are not covered by this approval/permit and must be disclosed to Deutsches Institut für Bautechnik without delay.

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# II SPECIAL PROVISIONS

# 1 Subject matter and scope of use and application

#### 1.1 Subject of approval and area of usage

The subject of approval are carbon reinforcement grids solidian GRID made of epoxy resinimpregnated carbon fiber strands.

The rectangular grid structure is achieved by overlapping the warp yarns in the production direction (0°) and the weft yarns at right angles to the production direction (90°) by connecting them via stitch yarns at the intersections of the grid on a warp knitting machine with 0° and weft yarn feed.

The possible configurations for the solidian GRID carbon reinforcement grids are described in section 2.1.1.

The carbon reinforcement grid solidian GRID may be used as single or multi-layer tensile reinforcement for concrete components in compliance with the provisions in section 1.2.

The production and monitoring of factory-made precast concrete elements with solidian GRID carbon reinforcement grid is not regulated in DIN 1045-4.

# 1.2 Subject of approval and scope of application

The subject of approval is the planning, dimensioning and execution of reinforced concrete components using solidian GRID carbon reinforcement grids.

The solidian GRID carbon reinforcement grids may be used as single or multi-layer tensile reinforcement for concrete components under the following conditions:

- For load-bearing purposes (as statically effective reinforcement), a combination of solidian GRID carbon reinforcement grids with reinforcing steel and/or prestressing steel is not permitted in a component.
- A combination with steel reinforcement is possible when using solidian GRID carbon reinforcement grids exclusively for non-statically effective purposes. Direct contact between solidian GRID carbon reinforcement grid and steel reinforcement must be avoided to prevent contact corrosion.
- The DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 1, Section 5.1.1, (R15) applies to installation in an elastically bent state. The minimum permissible radius of curvature is 350 mm.
- Forming in accordance with the DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 1, Section 8.3, (R8) or Part 3, Section 6.3, (1), c) of the solidian GRID carbon reinforcement grid is not permitted.
- The DAfStb guideline "Concrete components with non-metallic reinforcement", Part 1, applies to the minimum thickness of components. However, the minimum thickness of concrete components with solidian GRID carbon reinforcement grid must not be less than 30 mm.
- Normal concrete is used in accordance with DIN EN 206-1 in conjunction with DIN 1045-2 in the concrete strength classes C30/37 to C70/85. Application for concrete strengths higher than C70/85 is possible if the values of a C70/85 are used for the compressive strength of the concrete and the bond strength.
- The diameter of the largest grain of the aggregate of the concrete used must not exceed 16 mm.
- The components are subjected to quasi-static and/or predominantly static loads.
- The specifications according to DIN EN 1992-1-1 in conjunction with DIN EN 1992-1-1/NA, Table 4.1, Sections 5 and 6 (exposure classes XF and XA) and Section 4.4.1.2 (13) (exposure classes XM) apply to the concrete attack.
- The component temperature must not fall below -20 °C and must not exceed 40 °C on an annual average. Climate-related short-term temperature increases of up to 80°C are possible.

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- This temperature range may also be briefly exceeded up to 80°C if the solidian GRID carbon reinforcement grids are still unloaded during the hardening of the concrete.

The components made of normal concrete up to strength class C 50/60 reinforced with the carbon reinforcement grids meet the requirements for the fire behavior of building materials of building material class A2 according to DIN 4102-1 if a minimum concrete cover cmin,b of the carbon reinforcement on all sides is maintained in accordance with section 3.1. The standard concrete used must meet the requirements of DIN EN 1992-1-2, section 4.5.1 in conjunction with DIN EN 1992-1-2/NA to prevent concrete spalling in the event of fire and must be manufactured using a cement without pozzolanic components and additives as well as latent hydraulic additives.

Concrete components reinforced with carbon reinforcement grids that do not comply with the above requirements meet the fire behavior requirements of building material class B2 according to DIN 4102-1 or class E according to DIN EN 13501-1.

Concrete components with carbon reinforcement grids and fire resistance requirements are not covered by this approval/permit.

# 2 Provisions for the construction product(s)

### 2.1 Properties and composition

#### 2.1.1 Grid families of solidian GRID carbon reinforcement grids

The approval/permit applies to the following grid families:

- Grid family 1 (see Appendix 1 for grids of family 1 that can be used according to the approval/permit):
  - Grid with 1-roving fiber strands (nominal fiber cross-sectional area per fiber strand 1,81 mm²) in warp and weft direction with grid widths in both directions from 21 mm to 76 mm,
- Grid family 2 (see Appendix 2 for grids of family 2 that can be used in accordance with the approval/permit):
  - Grids with 2-roving fiber strands (nominal fiber cross-sectional area per fiber strand 3,62 mm²) in warp and weft direction with grid widths in both directions from 38 mm to 76 mm,
- Grid family 3 (see Appendix 3 for grids of family 3 that can be used according to the approval/permit):
  - Grids with 1-roving fiber strands in one direction (warp or weft direction) and 2-roving fiber strands in the other direction (weft or warp direction) with grid widths for the 1-roving fiber strands of 21 mm to 76 mm and for the 2-roving fiber strands of 38 mm to 76 mm.

The carbon reinforcement grid solidian GRID is designated in accordance with the DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 2, Section 4.1.1.

The properties of the fiber strands of the individual grid families are given in Table 1 and in Appendices 1 to 3.

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**Table 1:** Properties of the fiber strands in warp and weft direction for grid families 1 to 3

Crid family			
Grid family Carbon grid	Properties	Warp thread	Weft thread
	Fiber strand type	1R	1R
	Cross-sectional area of a fiber strand $A_{fnm}$ [mm²]	1,81	1,81
	Grid width $s$ [mm]	$21 \le s \le 76$	21 ≤ <i>s</i> ≤ 76
Grid family 1	Nominal cross-sectional area $A_{nm}$ [mm²]	4,4	4,4
	Nominal diameter $\mathscr{O}_{nm}$ [mm]	2,37	2,37
	Nominal cross-sectional area per m width $a_{nm}$ [mm²/m]	$\frac{1000}{s}A_{nm}$	$\frac{1000}{s}A_{nm}$
	Fiber strand type	2R	2R
	Cross-sectional area of a fiber strand $A_{\ell,nm}$ [mm²]	3,62	3,62
	Grid width s [mm]	38 ≤ s ≤ 76	38 ≤ s ≤ 76
Grid family 2	Nominal cross-sectional area $A_{nm}$ [mm <sup>2</sup> ]	8,8	8,8
	Nominal diameter $\mathcal{O}_{nm}$ [mm]	3,35	3,35
	Nominal cross-sectional area per m width $a_{nm}$ [mm²/m]	$\frac{1000}{s}A_{nm}$	$\frac{1000}{s}A_{nm}$
	Fiber strand type	1R	2R
	Cross-sectional area of a fiber strand $A_{\rm f,nm}$ [mm <sup>2</sup> ]	1,81	3,62
Grid family 3	Grid width s [mm]	21 ≤ s ≤ 76	38 ≤ s ≤ 76
(warp and weft direction can	Nominal cross-sectional area $A_{\rm nm}$ [mm <sup>2</sup> ]	4,4	8,8
also be inter- changed)	Nominal diameter $\mathcal{O}_{nm}$ [mm]	2,37	3,35
	Nominal cross-sectional area per m width $a_{nm}$ [mm²/m]	$\frac{1000}{s}A_{nm}$	$\frac{1000}{s}A_{nm}$

The carbon grids must be impregnated with the impregnating agent (see 2.1.2) and sufficiently cross-linked so that, depending on the grid family, the characteristic values in Tables 2 and 3 are achieved.

The width and length of the carbon reinforcement grids depend on the knitting machine used for production and the manufacturing process.

The composition and properties of the carbon fiber strands and the impregnation must comply with the specifications deposited with Deutsches Institut für Bautechnik.

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**Table 2:** Characteristics of the impregnated fiber strands of the solidian GRID carbon reinforcement grid

	Properties of the impregnated fiber strands (warp and weft	Values of the roving strand types in relation to nominal cross-sections and nominal diameters		
	fiber strands)	1R	2R	
1	Characteristic tensile strength of the impregnated fiber strand* [N/mm²] $f_{nm,k}$	1250 MPa	1200 MPa	
2	Modulus of elasticity of the impregnated fiber strand* [N/mm $^2$ ] $E_{\rm nm,m}$	99000 MPa	97000 MPa	
3	Characteristic value of the elongation at break of the impregnated fiber strand $\varepsilon_{nm,uk}$	12,6 ‰	12,4 ‰	
4	Characteristic value of the bond strength for anchoring $f_{bk}$	1,7 MPa	2,9 MPa	
5	Characteristic value of the applicable reinforcement stress in the anchorage check	885 MPa	1020 MPa	
6	Characteristic bond strength $\tau_{bm,k}$ for the verification of the bond in the serviceability limit state	7,1 MPa	5,9 MPa	
7	Minimum anchoring length Ib,min	42 mm <sup>a)</sup>	76 mm <sup>a)</sup>	
8	Minimum lap length Io,min	63 mm (≥ 3xgrid width s)	114 mm (≥ 3xgrid width s)	
9	Minimum lap length for transferring $f_{nm,k}$ in the lap joint	700 mm	500 mm	
10	Transferable tensile stresses $\sigma_{nm,lo,k}$ for smaller lap lengths $I_0$ (intermediate values are to be interpolated linearly):			
	<i>I<sub>0,min</sub></i> 250mm 500mm 700mm	669 N/mm² 815 N/mm² 977 N/mm² 1250 N/mm²	679 N/mm² 855 N/mm² 1200 N/mm² 	

To prevent the failure mechanism from changing to pure pull-out, it must be ensured that at least one fiber strand is located within the anchorage length in the transverse direction.

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**Table 3:** Coefficients for the properties of the impregnated fiber strands of the solidian GRID carbon reinforcement grid

	Coefficient for the properties of	Values of the roving strand types		
	the impregnated fiber strands (warp and weft fiber strands)	1R	2R	
1	Reduction factor of the tensile strength for temperature exposure $\alpha_{Tt}$	1 at -20°C ≤ T ≤ 70°C 0,95 at 70°C < T ≤ 80°C	1 at -20°C ≤ T ≤ 70°C 0,90 at 70°C < T ≤ 80°C	
2	Reduction factor $\alpha_{nmt}$ for the consideration of durability influences and long-term stresses on the tensile strength	0,83	0,83	
3	Reduction factor for the bond of the textile reinforcement in the concrete for temperature effect $\alpha_{\text{Tb}}$	1 at -20°C ≤ T ≤ 70°C 0,95 at 70°C < T ≤ 80°C	1 at -20°C ≤ T ≤ 70°C 0,90 at 70°C < T ≤ 80°C	
4	Reduction factor $\alpha_{nmb}$ for the consideration of durability influences and long-term stresses on the bond strength	0,83	0,83	

### 2.1.2 Impregnating agent

The same epoxy resin is used as the impregnating agent for all grid families in this approval/permit. The fiber strands are impregnated with this resin under defined manufacturing conditions. This coats the individual filaments of the rovings and bonds them together, creating the internal bond between the filaments in the rovings.

The composition and properties of the impregnating agents must comply with the specifications deposited with Deutsches Institut für Bautechnik.

#### 2.1.3 Fire behavior

When installed and tested in accordance with DIN EN ISO 11925-2, backed with a gypsum board in accordance with DIN EN 13238, the carbon reinforcement grids meet the fire behavior requirements for class E building materials in accordance with DIN EN 13501-1.

# 2.2 Manufacture, packaging, transport, storage, labeling

#### 2.2.1 Manufacture

# 2.2.1.1 Carbon reinforcement grid solidian GRID

The carbon grids may only be manufactured from the components deposited in accordance with sections 2.1.1 and 2.1.2 in the plants deposited with the DIBt <sup>1</sup>.

The carbon grids must be manufactured in such a way that the carbon fiber strands are aligned in the warp and weft direction without waviness, completely impregnated with the impregnating agent and sufficiently cross-linked.

The carbon grids can be supplied as flat single grids or on rolls with a minimum inner roll diameter of 70 cm.

#### 2.2.1.2 Impregnating agent

The grids may only be impregnated with the impregnating agent according to section 2.1.2 in the plants deposited with the DIBt <sup>1</sup>.

<sup>1</sup> The exact designation of the plants is deposited with the Deutsches Institut für Bautechnik.

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# 2.2.2 Packaging, transportation, storage

### 2.2.2.1 Carbon reinforcement grid solidian GRID

The DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 3, Section 6.3, (4) to (6) applies,

For the solidian GRID according to this approval/permit is  $T_{max,0} = 80 \, ^{\circ}\text{C}$ .

### 2.2.3 Labeling

#### 2.2.3.1 General information

The construction products or their packaging must be marked by the manufacturer with the conformity mark (Ü mark) in accordance with the conformity mark regulations of the federal states. The mark may only be affixed if the requirements in section 2.3 are met.

#### 2.2.3.2 Carbon reinforcement grid solidian GRID

The weatherproof instruction leaflet on the packaging of the hardened carbon grids must be clearly marked with the following information:

- Grid designation according to DAfStb guideline " Concrete components with nonmetallic reinforcement", Part 2, Section 4.1.1,
- Production batch and/or production date,
- Only for cuts for drawing parts: Confirmation of the dimensional accuracy of the grids according to the drawing,
- building authority mark of conformity stating the approval/permit number.
- manufacturing plant.

#### 2.3 Confirmation of conformity

### 2.3.1 General information

Confirmation of conformity of the construction products in accordance with sections 2.1.1 with the provisions of the general building approval covered by the approval/permit must be provided for each manufacturing plant with a declaration of conformity by the manufacturer on the basis of a factory production control and a certificate of conformity by a certification body recognized for this purpose as well as regular external surveillance by a recognized surveillance body in accordance with the following provisions.

The manufacturer of the construction product must involve a recognized certification body and a recognized inspection body for the issuing of the certificate of conformity and external monitoring, including the product tests to be carried out.

The manufacturer must submit the declaration of conformity by marking the construction products with the mark of conformity (Ü mark) with reference to the intended use.

The certification body shall provide the Deutsches Institut für Bautechnik with a copy of the certificate of conformity issued by it and a copy of the initial test report in accordance with section 2.3.3.

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#### 2.3.2 Factory production control

In each manufacturing plant of the products according to section 2.1.1 a factory production control shall be set up and carried out. Factory production control is understood to mean the continuous surveillance of production to be carried out by the manufacturer to ensure that the products manufactured by him comply with the provisions of this general building approval.

As part of the factory production control of the carbon reinforcement grid, the tests must be carried out in accordance with the test and monitoring plan provided.

The results of the factory production control in the manufacturing plants of the carbon reinforcement grid in accordance with section 2.1.1 must be recorded and evaluated. The records must contain at least the following information:

- Designation of the construction product or the basic material, the type used and the components
- Type of inspection or test
- Date of manufacture and testing of the construction product or source material or components
- Result of the checks and tests and, where applicable, comparison with the requirements
- Signature of the person responsible for factory production control

The records must be handed over to the applicant, kept by him for at least five years and, if required, submitted to the surveillance body responsible for surveillance by an approved body. They shall be submitted to Deutsches Institut für Bautechnik and the competent supreme building supervisory authority upon request.

If the test result is unsatisfactory, the manufacturer must immediately take the necessary measures to rectify the defect. Construction products that do not comply with the requirements must be handled in such a way that any confusion with compliant products is ruled out. Once the defect has been rectified, the relevant test must be repeated without delay, insofar as this is technically possible and necessary to prove that the defect has been rectified.

# 2.3.3 Surveillance by an approved body

In each manufacturing plant of the carbon reinforcement grid according to section 2.1.1, the factory production control must be checked regularly by surveillance by an approved body, but at least twice a year.

As part of the third party inspection, an initial inspection of the construction products must be carried out and samples must be taken for random testing.

For surveillance by an approved body of the carbon reinforcement grid, the tests must be carried out in accordance with the test and monitoring plan provided.

Sampling and testing are the responsibility of the approved body for surveillance.

The results of certification and surveillance must be kept for at least five years. They shall be submitted by the approved body or the surveillance body to Deutsches Institut für Bautechnik, the competent supreme building supervisory authority and the applicant upon request.

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# 3 Provisions for planning, dimensioning and execution

#### 3.1 Planning

The concrete components using the carbon reinforcement grid must be planned in compliance with the Technical Building Regulations, unless otherwise specified below.

In addition to the provisions in section 1.2, the following boundary conditions must be observed:

- The regulations of the DAfStb guideline "Concrete components with non-metallic reinforcement", Part 1, apply.
- The minimum concrete cover  $c_{min,b}$  required for the bond is 14 mm for all grid families.
- The minimum concrete cover is  $c_{min} = max(d_g + 5 \text{ mm}, c_{min,b} = 14 \text{ mm})$ .
- The following applies to the minimum component thickness:  $h_{min} = (2 * c_{min} + 2 * \Delta c_{dev} + n_G * h_G + (n_G 1) * s_v)$ :
  - h<sub>G</sub> the grid height of the grid used in accordance with Annexes 1 to 3,
  - s<sub>v</sub> = max {c<sub>min,b</sub>; 1,5 d<sub>g</sub>} the distance between the grid layers according to DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 1, Section 8.2, (2) and
  - Δc<sub>dev</sub> the allowance for tolerance according to DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 1, Section 4.4.1.3 (see also the last item in the list in 3.1).

A component thickness of 30 mm is permissible for components with a centrally arranged grid reinforcement layer.

- In the anchoring area of the solidian GRID carbon reinforcement grid, it must be ensured that at least one fiber strand is within the anchoring length in the transverse direction.
- A maximum of 6 grid layers ( $n_G \le 6$ ) may be arranged in a tension zone. The clear spacing between the grids must comply with the DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 1, Section 8.2 (2) and the fiber strands of the individual grid layers must lie on top of each other.
- Only components for which a calculated shear force reinforcement is not required may be reinforced with solidian GRID carbon reinforcement grids.
- The last sentence of DAfStb guideline Part 1, Section 4.4.1.3, (3), is replaced by: The reduction must not fall below the minimum dimension of the retention dimension of  $\Delta c_{\text{dev}} \ge I \, \Delta c_{\text{c}} \, I I \, \Delta c_{\text{min,b}} \, I$ . Here,  $\Delta c_{\text{c}}$  is the limit value for the deviation of the static height according to Fig. R9-1 and  $\Delta c_{\text{min,b}} = 2$  mm is the limit value for the deviation from the minimum concrete cover  $c_{\text{min,b}} = 14$  mm.

#### 3.2 Dimensioning

The concrete components using the carbon reinforcement grid must be designed in accordance with the Technical Building Regulations, unless otherwise specified below.

The DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 1, also applies to the design.

All relevant design parameters of the solidian GRID carbon reinforcement grids that can be used in accordance with this approval/permit are specified in Annexes 1 to 3 in accordance with DAfStb Guideline "Concrete components with nonmetallic reinforcement", Part 2, Section 4.1.3.

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#### 3.3 Fire behavior

The components made of normal concrete up to strength class C 50/60 produced with the carbon reinforcement grids are non-combustible building materials (building material class DIN 4102-A2) if the provisions in section 1.2 (penultimate paragraph) of this certificate are complied with and may be used in areas in which the building regulations stipulate that the building materials used must be "non-combustible", "flame-retardant" or "normally flammable".

If the requirements for the minimum concrete cover on all sides  $c_{\min,b}$  in accordance with section 3.1 or for normal concrete in accordance with section 1.2 (penultimate paragraph) are not met, the concrete components may only be installed in areas in which the building materials used are required to be "normally flammable".

#### 3.4 Execution

The concrete components using the carbon reinforcement grid must be executed in compliance with the Technical Building Regulations, unless otherwise specified below.

The DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 3, Sections 1 to 8 and 10 also applies. Forming in accordance with the DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 3, Section 6.3, (1), c) of the solidian GRID carbon reinforcement grid is not permitted.

The following furthermore applies:

- Only personnel who have been instructed by the manufacturer in the correct handling and safety instructions for using the solidian GRID carbon reinforcement grid may be used to carry out the reinforcement and concreting work.
- The solidian GRID carbon reinforcement grids must not be walked on directly, fold or subjected to sharp transverse pressures.
- The solidian GRID carbon reinforcement grids may be cut to size according to the manufacturer's instructions.
- The application of the allowance for tolerance according to 3.1, last indent or according to DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 1, Section 4.4.1.3, (3) is excluded (see also DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 1, NA.10.4).
- In-situ concrete components can be produced using the laminating process or the casting process.

# 3.4.1.1 Production of in-situ concrete components using the lamination method

This method is only suitable for horizontal components.

When concreting, the DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 3, Section R8.4.7 must be observed in particular.

The decisive factor in the laminating process is that the layers are applied in wet method and the reinforcement remains in its planned position.

#### 3.4.1.2 Production of in-situ concrete components using the casting process

This method is suitable for horizontal, inclined and vertical components and corresponds to traditional concreting.

When concreting, the DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 3, Section 8 with the exception of Section R8.4.7.

If there is little experience or uncertainty regarding the behavior of the solidian GRID carbon reinforcement grids during concreting, a test component should be concreted (see Appendix 4) to check whether the selected concreting conditions (spacing of the spacers, consistency of the concrete, concreting speed, drop height of the concrete, etc.) are suitable for complying with the tolerances specified in the project for the positional deviation of the solidian GRID carbon reinforcement grids.

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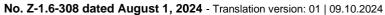
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# Normative references

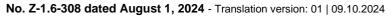
DAfStb guideline for concrete components with non-metallic reinforcement	Part 1: Design and construction; Part 2: Reinforcement products; Part 3: Notes on construction; Part 4: Recommendations for test methods; Part 5: Notes on required verifications for the usability of the construction products (non-metallic reinforcement) and the applicability of the construction type; Publisher: Beuth; 2024-01
DIN EN 206-1:2001-07	Concrete - Part 1: Specification, performance, production and conformity
DIN 1045-2:2008-08	Concrete, reinforced and prestressed concrete structures - Part 2: Concrete - Specification, performance, production and conformity - Application rules for DIN EN 206-1
DIN EN 1992-1-1:2011-01	Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings; German version EN 1992-1-1:2004 + AC:2010
DIN EN 1992-1-1/NA:2013-04	National Annex - Nationally determined parameters - Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings
DIN 4102-1:1998-05	Fire behavior of building materials and building components - Part 1: Building materials; concepts, requirements and tests
DIN EN 1992-1-2:2010-12	Eurocode 2: Design of concrete structures - Part 1-2: General rules - Structural fire design; German version EN 1992-1-2:2004 + AC:2008
DIN EN 1992-1-2/NA:2010-12	National Annex - Nationally determined parameters - Eurocode 2: Design of concrete structures - Part 1-2: General rules - Structural fire design
DIN EN ISO 11925-2:2020-07	Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2020); German version EN ISO 11925-2:2020
DIN EN 13238:2010-06	Reaction to fire tests for building products - Conditioning procedures and general rules for selection of substrates; German version EN 13238:2010
DIN EN 13501-1:2019-05	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests; German version EN 13501-1:2018





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Materi					
Fiber r	naterial	C (Carbon)			
mpreg	nating agent	EP (Epoxy resin	)		ħ A
Color		schwarz			l II
	e finish	smooth			
	g stiffness class	III, stiff			
√alidit <u>y</u>	for concrete strength classes	C30/37 to C70/8	5	и в	H E
Chemi	cal resistance of the reinforcement in relation to the	XD3	Chlorides, exc	cept seawater	
•	ure classes in accordance with DIN EN 206-1 in	XS3	Chlorides fron	n seawater	
conjun	ction with DIN 1045-2	XA3	Chemical atta	ck	
200m/	atry and structure		Unit	Value	Tolerance
اااان	etry and structure	longitudinal		value 0	± 5°
	Directions of the fiber strands	transversal	_ [°] -	90	± 5°
		longitudinal		3,5	± 10%
h	Mean value of fiber strand width	transversal	– [mm] -	4,2	± 10%
		longitudinal		1,9	± 10%
v	Mean value of fiber strand height	transversal	– [mm] -	1,8	± 10%
				2,37	± 1076
nm	Nominal diameter	longitudinal transversal	– [mm] -	2,37	<u> </u>
		longitudinal		4,4	
$\lambda_{nm}$	Nominal cross-sectional area per fiber strand	transversal	– [mm²] -	4,4	
		longitudinal		116	-
a <sub>nm</sub>	Nominal cross-sectional area per meter	transversal	[mm²/m] -	116	
		longitudinal		1,81	-
$\lambda_{f,nm}$	Fiber cross-sectional area per fiber strand	transversal	– [mm²] -	1,81	-
		longitudinal		47	-
$\mathbf{a}_{f,nm}$	Fiber cross-sectional area per meter	transversal	– [mm²/m] –	47	-
		longitudinal		38	± 3 mm
3	Grid width	transversal	– [mm] -	38	± 3 mm
		longitudinal		34,2	± 10%
Sı	Clear distance of the fiber strands	transversal	– [mm] -	34,9	± 10%
n <sub>G</sub>	Grid height (average value of the maximum height)		[mm]	2,3	± 10%
<u>.</u>	Weight per unit area of the non-metallic reinforcement		[g/m²]	309	± 10%
ς Cü	Degree of coverage of the mesh		[%]	18,9	-
min	Minimum permissible radius of curvature		[mm]	350	-
	al properties		Unit	Value	Tolerance
•	Bulk density of the fiber composite material  Coefficient of thermal expansion	along the fiber	[g/cm³]	1,30	-
Х Г.	Glass transition temperature (DMA)	along the fiber	[10 <sup>-6</sup> 1/K]	0,5 ≥ 110	-
Γ <sub>g0</sub>			[°C]	-20 bis +80	<u>-</u>
	Recommended operating temperature range		[°C]	-20 DIS +60	<del>-</del>
	Building material class reinforcement grid acc. to DIN	EN 13501-1	[-]	E, normally flamm	able -
	on reinforcement grid solidian GRID for the renonmetallic reinforcement	einforcement of	f concrete co	mponents	Annondiy 1
	amily 1: ian GRID Q47-C-EP-s38-F145				Appendix 1 Page 1 of 4

National technical approval (abZ)/ General construction technique permit (aBG)





Mecha	nical properties		Unit	Value	Tolerance
nm,k	Characteristic short-term tensile strength related to	Iongitudinal	[MPa]	1.250	-
nm,ĸ	the nominal cross-sectional area	transversal	[ivii aj	1.250	-
nm	Young's modulus related to the nominal cross-section	longitudinal	[MPa]	99.000	-
-nm	roung's modulus related to the norminal cross section	transversal	[ivii aj	99.000	-
nm,k	Characteristic short-term tensile strength related to	longitudinal	[MPa]	3.039	-
r,nm,k	the fiber cross-sectional area	transversal	[ίνιι α]	3.039	-
f,nm,m	Mean modulus of elasticity related to the fiber cross-	longitudinal	[MPa]	247.000	-
— ı,nm,m	sectional area	transversal	[ivii aj	247.000	-
	Characteristic elongation at failure under tensile load	longitudinal	[‰]	12,6	-
nm,uk	of the non-metallic reinforcement	transversal	[/00]	12,6	-
	Characteristic short-term bond strength for anchoring	longitudinal	[MPa]	1,7	-
ok	for ≥ C30/37	transversal	[ivii aj	1,7	-
	Characteristic value of the mean bond stress (k <sub>t</sub> =0)	longitudinal	[MPa]	7,1	-
bm,k	for ≥ C30/37	transversal	[iviFa]	7,1	-
-	Characteristic tensile force transmission of the non-	longitudinal	[kN/m]	145	-
nm,k	metallic reinforcement per m width	transversal	[KIN/III]	145	-
Coeffic	cients		Unit	Value	Tolerance
	Coefficient for considering influences from short-terr	articularly high	n .,	1,0 at -20°C ≤ T ≤ 70°C	
( <sub>Tt</sub>	temperature stress on the tensile strength 2)	, ,	[-]	0,95 at 70°C < T ≤ 80°C	-
( <sub>Tb</sub>	Coefficient for considering influences from short-term paterness on the bond behavior 2)	articularly high	[-]	1,0 at -20°C ≤ T ≤ 70°C 0,95 at 70°C < T ≤ 80°C	-
( <sub>nmt</sub>	Coefficient for considering durability influences and long on the tensile strength	g-term stresses	[-]	0,83	-
X <sub>nmb</sub>	Coefficient for considering durability influences and long on the bond strength	g-term stresses	[-]	0,83	-
Charac	cteristic values for anchoring and lapping		Unit	Value	Tolerance
Jilala	Applicable reinforcement stress for the anchorage	longitudinal	Offic	885	- TOIGIANG
	proof	transversal	[MPa]	885	_
	F122	longitudinal		42	_
o,min	Minimum anchoring length	transversal	[mm]	42	
		longitudinal		63	<u> </u>
),min	Minimum lap length		[mm]	63	-
		transversal		700	-
	Minimum lap length for transferring f <sub>nm,k</sub> in lap joint <sup>3)</sup>	Iongitudinal	[mm]	700	-
		transversal		700	-
Turtho	r key values		Unit	Value	Tolerance
urtile	Minimum concrete cover from bond requirement 4)		[mm]	value 14	- TOIETATICE
S	iviiminam concrete cover mom bond requirement		[mm]	17	
nin,b nmin	Minimum component thickness 4)		[mm]	≥ 30	_

All values given in accordance with or based on DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 4.

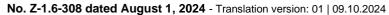
A component thickness of 30 mm is permissible for components with a single layer of centrally arranged reinforcement grid.

Carbon reinforcement grid solidian GRID for the reinforcement of concrete components with nonmetallic reinforcement	Appendix 1
Grid family 1: solidian GRID Q47-C-EP-s38-F145	Page 2 of 4

Building material class for components from a component thickness of 30 mm with a minimum concrete cover of 14 mm or for components with a component thickness of 30 mm and a single layer of centrally arranged reinforcement grid.

To use  $\alpha_{Tt}$  = 1 and  $\alpha_{Tb}$  = 1: proof required that the temperature loading does not exceed 70°C.

For smaller lap lengths, the transferable tensile stresses can be taken from the approval document Table 2, line 10.





ectional reinforcement grid (type Q) made or arbon fiber composite material for the concrete components with predominantly state with German national technical tion technique permit Z-1.6-308  Int  Int  Int  Iclass  It e strength classes  It is every constant of the properties of the reinforcement in relation to the in accordance with DIN EN 206-1 in DIN 1045-2  Incurre  In of the fiber strands  In of the fiber strand width  In of the fiber strand height		5 Chlorides, exc Chlorides fron Chemical atta Unit  [°]	value 0 90	Tolerance ± 5° ± 5°
class te strength classes ce of the reinforcement in relation to the in accordance with DIN EN 206-1 in DIN 1045-2  ucture s of the fiber strands ue of fiber strand width	EP (Epoxy resin schwarz smooth III, stiff C30/37 to C70/8 XD3 XS3 XA3 longitudinal transversal longitudinal	5 Chlorides, exc Chlorides fron Chemical atta Unit  [°]	value 0 90	± 5°
class te strength classes ce of the reinforcement in relation to the in accordance with DIN EN 206-1 in DIN 1045-2  ucture s of the fiber strands  ue of fiber strand width	EP (Epoxy resin schwarz smooth III, stiff C30/37 to C70/8 XD3 XS3 XA3 longitudinal transversal longitudinal	5 Chlorides, exc Chlorides fron Chemical atta Unit  [°]	value 0 90	± 5°
class te strength classes ce of the reinforcement in relation to the in accordance with DIN EN 206-1 in DIN 1045-2  ucture s of the fiber strands  ue of fiber strand width	EP (Epoxy resin schwarz smooth III, stiff C30/37 to C70/8 XD3 XS3 XA3 longitudinal transversal longitudinal	5 Chlorides, exc Chlorides fron Chemical atta Unit  [°]	value 0 90	± 5°
class te strength classes ce of the reinforcement in relation to the in accordance with DIN EN 206-1 in DIN 1045-2  ucture s of the fiber strands  ue of fiber strand width	schwarz smooth III, stiff C30/37 to C70/8 XD3 XS3 XA3  longitudinal transversal longitudinal	5 Chlorides, exc Chlorides fron Chemical atta  Unit  [°]	value 0 90	± 5°
te strength classes ce of the reinforcement in relation to the in accordance with DIN EN 206-1 in DIN 1045-2  ucture s of the fiber strands ue of fiber strand width	smooth III, stiff C30/37 to C70/8 XD3 XS3 XA3  longitudinal transversal longitudinal	Chlorides, exc Chlorides from Chemical atta	value 0 90	± 5°
te strength classes ce of the reinforcement in relation to the in accordance with DIN EN 206-1 in DIN 1045-2  ucture s of the fiber strands ue of fiber strand width	III, stiff C30/37 to C70/8 XD3 XS3 XA3  longitudinal transversal longitudinal	Chlorides, exc Chlorides from Chemical atta	value 0 90	± 5°
te strength classes ce of the reinforcement in relation to the in accordance with DIN EN 206-1 in DIN 1045-2  ucture s of the fiber strands ue of fiber strand width	C30/37 to C70/8 XD3 XS3 XA3  longitudinal transversal longitudinal	Chlorides, exc Chlorides from Chemical atta	value 0 90	± 5°
ce of the reinforcement in relation to the in accordance with DIN EN 206-1 in DIN 1045-2  ucture  s of the fiber strands  ue of fiber strand width	XD3 XS3 XA3  longitudinal transversal longitudinal	Chlorides, exc Chlorides from Chemical atta	value 0 90	± 5°
in accordance with DIN EN 206-1 in DIN 1045-2  ucture  s of the fiber strands  ue of fiber strand width	XS3 XA3  longitudinal transversal longitudinal	Chlorides from Chemical atta  Unit  [°]	value 0 90	± 5°
outure s of the fiber strands ue of fiber strand width	longitudinal transversal longitudinal	Chemical atta  Unit  [°]	Value 0 90	± 5°
ucture s of the fiber strands ue of fiber strand width	longitudinal transversal longitudinal	Unit — [°] -	Value 0 90	± 5°
of the fiber strands ue of fiber strand width	transversal longitudinal	- [°] -	0 90	± 5°
ue of fiber strand width	transversal longitudinal		90	
ue of fiber strand width	longitudinal			+ 5°
	transversal	– [mm] –	3,4	± 10%
ue of fiber strand beight		נווווון	4,2	± 10%
	longitudinal	_ [mm] -	1,8	± 10%
	transversal	[11111]	1,5	± 10%
liameter	longitudinal	_ [mm] -	2,37	-
	transversal	[]	2,37	-
cross-sectional area per fiber strand	longitudinal	_ [mm²] -	4,4	
	transversal	[]		
cross-sectional area per meter		[mm²/m] -	-	
	transversal	[]	-	
s-sectional area per fiber strand		_ [mm²] -	· · · · · · · · · · · · · · · · · · ·	-
<u> </u>			· · · · · · · · · · · · · · · · · · ·	-
s-sectional area per meter		– [mm²/m] –		-
·				
1		_ [mm]		± 3 mm
				± 3 mm
ance of the fiber strands		_ [mm] -		± 10%
et (average value of the maximum height)	transversar	[mm]	•	± 10%
	<u> </u>			± 10% ± 10%
	•			± 1070
			•	-
politico la diaco en cultural de la constante		[]		
S		Unit	Value	Tolerance
			1,30	-
	along the fiber		0,5	_
nsition temperature (DMA)	<u> </u>		≥ 110	
ended operating temperature range		[°C]	-20 bis +80	-
	eross-sectional area per meter ess-sectional area per fiber strand ess-sectional area per meter ess-sectional area per meter en ence of the fiber strands ent (average value of the maximum height) er unit area of the non-metallic reinforcement est coverage of the mesh epermissible radius of curvature essectional area per meter ence sectional area per meter ence sec	transversal longitudinal longitudinal transversal longitudinal longitudinal transversal longitudinal longit	transversal longitudinal transversal longitudi	transversal   longitudinal   longitudin

National technical approval (abZ)/ General construction technique permit (aBG)





Mecha	nical properties		Unit	Value	Tolerance
$f_{nm,k}$	Characteristic short-term tensile strength related to	longitudinal	[MPa]	1.250	-
nm,ĸ	the nominal cross-sectional area	transversal	[ivii aj	1.250	-
Enm	Young's modulus related to the nominal cross-section	longitudinal	[MPa]	99.000	-
-nm	Today's modulus related to the norminal cross-section	transversal	[ivii aj	99.000	-
	Characteristic short-term tensile strength related to	longitudinal	[MPa]	3.039	-
f,nm,k	the fiber cross-sectional area	transversal	[ivii aj	3.039	-
_	Mean modulus of elasticity related to the fiber cross-	longitudinal	[MPa]	247.000	-
= <sub>f,nm,m</sub>	sectional area	transversal	[iviraj	247.000	-
	Characteristic elongation at failure under tensile load	longitudinal	F0/ 1	12,6	-
Enm,uk	of the non-metallic reinforcement	transversal	[‰]	12,6	-
	Characteristic short-term bond strength for anchoring	longitudinal		1,7	-
bk	for ≥ C30/37	transversal	[MPa]	1,7	-
	Characteristic value of the mean bond stress (k <sub>t</sub> =0)	longitudinal		7,1	-
Γ <sub>bm,k</sub>	for ≥ C30/37	transversal	[MPa]	7,1	-
	Characteristic tensile force transmission of the non-	longitudinal		262	-
F <sub>nm,k</sub>	metallic reinforcement per m width	transversal	[kN/m]	262	-
	·				
Coeffic	ients		Unit	Value	Tolerance
	Coefficient for considering influences from short-term page 1	particularly high	1,0 at -20°C ≤ T ≤ 70°C		
α⊤t	temperature stress on the tensile strength 2)		[-]	0,95 at 70°C < T ≤ 80°C	-
a <sub>Tb</sub>	Coefficient for considering influences from short-term paterness on the bond behavior 2)	articularly high	[-]	1,0 at -20°C ≤ T ≤ 70°C 0,95 at 70°C < T ≤ 80°C	-
$\alpha_{nmt}$	Coefficient for considering durability influences and long on the tensile strength	g-term stresses	[-]	0,83	-
$\mathfrak{A}_{nmb}$	Coefficient for considering durability influences and long on the bond strength	g-term stresses	[-]	0,83	-
Charac	cteristic values for anchoring and lapping		Unit	Value	Tolerance
	Applicable reinforcement stress for the anchorage	longitudinal	[MPa]	885	-
	proof	transversal		885	-
b,min	Minimum anchoring length	longitudinal	[mm]	42	-
υ,ιιιιι1		transversal	r1	42	-
0,min	Minimum lap length	Iongitudinal	[mm]	63	-
o,mm		transversal	[]	63	-
	Minimum lap length for transferring f <sub>nm,k</sub> in lap joint <sup>3)</sup>	Iongitudinal	- [mm]	700	-
	willing the residence of the state of the st	transversal	[,,,,,,]	700	-
Eurtho	r key values		Unit	Value	Tolerance
	Minimum concrete cover from bond requirement 4)		[mm]	value 14	i olerance
C <sub>min,b</sub>	Minimum component thickness 4)		[mm]	≥ 30	
h <sub>min</sub> n	Proof of robustness for predominantly static loading		[-]	≥ 200.000	
'	(number of tested cycles)		נ־ז	£ 200.000	-

All values given in accordance with or based on DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 4.

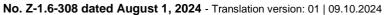
A component thickness of 30 mm is permissible for components with a single layer of centrally arranged reinforcement grid.

Carbon reinforcement grid solidian GRID for the reinforcement of concrete components with nonmetallic reinforcement	Appendix 1
Grid family 1: solidian GRID Q85-C-EP-s21-F262	Page 4 of 4

Building material class for components from a component thickness of 30 mm with a minimum concrete cover of 14 mm or for components with a component thickness of 30 mm and a single layer of centrally arranged reinforcement grid.

To use  $\alpha_{Tt}$  = 1 and  $\alpha_{Tb}$  = 1: proof required that the temperature loading does not exceed 70°C.

For smaller lap lengths, the transferable tensile stresses can be taken from the approval document Table 2, line 10.





solid	ian GRID Q71-C-EP-s51-F207				
nedia einfor oads i	etrical, bidirectional reinforcement grid (type Q) made of resistant carbon fiber composite material for the cement of concrete components with predominantly starn in accordance with German national technical ral/construction technique permit Z-1.6-308				
арргоч	a/construction technique permit 2-1.0-300			N.	
Materi	al				
iber r	naterial	C (Carbon)		e e	
mpreg	nating agent	EP (Epoxy resin	)	a V	
Color		schwarz		ř	
	e finish	smooth			ر سسسسر س
	ng stiffness class	III, stiff	.=		
	y for concrete strength classes	C30/37 to C70/8 XD3		nont conveter	E 1
	cal resistance of the reinforcement in relation to the ure classes in accordance with DIN EN 206-1 in	XS3	Chlorides, ex-	•	
	ction with DIN 1045-2	XA3	Chemical atta		
		70.00	Onemour atte	ioit	
- - -	etry and structure		Unit	Value	Tolerance
COLLI	•	longitudinal		value 0	± 5°
	Directions of the fiber strands	transversal	— [°]	90	± 5°
		longitudinal		5,0	± 10%
1	Mean value of fiber strand width	transversal	— [mm]	5,8	± 10%
	Management of Champton add a take	longitudinal	[]	2,7	± 10%
/	Mean value of fiber strand height	transversal	– [mm] -	2,6	± 10%
	Naminal diameter	longitudinal	[1	3,35	-
nm	Nominal diameter	transversal	– [mm] -	3,35	-
	Naminal areas agational area par fiber strand	longitudinal	[mm2]	8,8	-
A <sub>nm</sub>	Nominal cross-sectional area per fiber strand	transversal	— [mm²]	8,8	-
1	Nominal cross-sectional area per meter	longitudinal	[mm²/m] -	173	-
l <sub>nm</sub>	Nominal cross-sectional area per meter	transversal	[111117111]	173	-
$\lambda_{f,nm}$	Fiber cross-sectional area per fiber strand	longitudinal	— [mm²]	3,62	-
*i,nm	The order continuation per medicality	transversal	[]	3,62	-
1 <sub>f,nm</sub>	Fiber cross-sectional area per meter	longitudinal	— [mm²/m] -	71	-
		transversal		71	-
3	Grid width	longitudinal	_ [mm] -	51	± 3 mm
		transversal		51	± 3 mm
Si	Clear distance of the fiber strands	longitudinal	_ [mm] -	45,4	± 10%
	Crist be sight (or one or reduce of the or or original to be in ball	transversal	[1	46,2	± 10%
lg •	Grid height (average value of the maximum height)	<u> </u>	[mm]	3,5 454	± 10% ± 10%
<u> </u>	Weight per unit area of the non-metallic reinforcement	<u> </u>	[g/m²]		± 10%
Kü min	Degree of coverage of the mesh  Minimum permissible radius of curvature		[%] [mm]	20,1 350	<u>-</u>
min	William permissible radius of curvature		[iiiiii]	330	
/otori	al proportion		Unit	Value	Toloropo
лацеп	al properties  Bulk density of the fiber composite material		[g/cm <sup>3</sup> ]	1,30	Tolerance
1	Coefficient of thermal expansion	along the fiber	[10 <sup>-6</sup> 1/K]	0,5	-
g0	Glass transition temperature (DMA)	g	[°C]	≥ 110	-
90	Recommended operating temperature range		[°C]	-20 bis +80	-
	Building material class reinforcement grid acc. to DIN	EN 13501-1	[-]	E, normally flamm	nable -
	on reinforcement grid solidian GRID for the re	einforcement of	f concrete co	mponents	
Grid 1	ramily 2: ian GRID Q71-C-EP-s51-F207				Appendix 2 Page 1 of 4

National technical approval (abZ)/ General construction technique permit (aBG)





Mecha	nical properties		Unit	Value	Tolerance
$f_{nm,k}$	Characteristic short-term tensile strength related to	longitudinal	[MPa]	1.200	-
Inm,k	the nominal cross-sectional area	transversal	[ivii aj	1.200	-
Enm	Young's modulus related to the nominal cross-section	longitudinal	[MPa]	97.000	-
∟nm	roung's modulus related to the norminal cross-section	transversal	[ivir aj	97.000	-
f	Characteristic short-term tensile strength related to	longitudinal	[MPa]	2.917	-
f <sub>f,nm,k</sub>	the fiber cross-sectional area	transversal	[ivii aj	2.917	-
E.	Mean modulus of elasticity related to the fiber cross-	longitudinal	- [MPa]	243.000	-
E <sub>f,nm,m</sub>	sectional area	transversal	[ivii aj	243.000	-
<b>c</b> .	Characteristic elongation at failure under tensile load	longitudinal	[‰]	12,4	-
ε <sub>nm,uk</sub>	of the non-metallic reinforcement	transversal	[ /00 ]	12,4	-
f	Characteristic short-term bond strength for anchoring	longitudinal	[MPa]	2,9	-
f <sub>bk</sub>	for ≥ C30/37	transversal	[ivii aj	2,9	-
т	Characteristic value of the mean bond stress (k <sub>t</sub> =0)	longitudinal	[MPa]	5,9	-
T <sub>bm,k</sub>	for ≥ C30/37	transversal	[ivir aj	5,9	-
$F_{nm,k}$	Characteristic tensile force transmission of the non-	acteristic tensile force transmission of the non- longitudinal [kN/m]	- [kN/m]	207	-
I nm,k	metallic reinforcement per m width	transversal	[KIN/III]	207	-
Coeffic	sients		Unit	Value	Tolerance
~	Coefficient for considering influences from short-term p	articularly high	r 1	1,0 at -20°C ≤ T ≤ 70°C	
$\alpha_{Tt}$	temperature stress on the tensile strength 2)		[-]	0,9 at 70°C < T ≤ 80°C	-
$\alpha_{Tb}$	Coefficient for considering influences from short-term p temperature stress on the bond behavior $^{2)}$	articularly high	[-]	1,0 at -20°C ≤ T ≤ 70°C 0,9 at 70°C < T ≤ 80°C	-
$\alpha_{nmt}$	Coefficient for considering durability influences and long on the tensile strength	g-term stresses	[-]	0,83	-
$\alpha_{nmb}$	Coefficient for considering durability influences and long on the bond strength	g-term stresses	[-]	0,83	-
Charac	cteristic values for anchoring and lapping		Unit	Value	Tolerance
	Applicable reinforcement stress for the anchorage	longitudinal	[MPa]	1.020	-
	proof	transversal		1.020	-
I <sub>b,min</sub>	Minimum anchoring length	longitudinal	[mm]	76	-
-,		transversal		76	-
$I_{0,min}$	Minimum lap length	longitudinal	[mm]	117	-
-,		transversal		117	-
	Minimum lap length for transferring f <sub>nm,k</sub> in lap joint <sup>3)</sup>	longitudinal	_ [mm]	500	-
		transversal		500	-
Furtha	r key yaliyee		Unit	Volue	Toloronoo
	r key values  Minimum concrete cover from bond requirement 4)		[mm]	Value 14	Tolerance
C <sub>min,b</sub>	Minimum component thickness 4)		[mm]	≥ 30	-
h <sub>min</sub>			լոոոյ	≥ 30	-
n	Proof of robustness for predominantly static loading (number of tested cycles)		[-]	≥ 200.000	-

All values given in accordance with or based on DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 4.

A component thickness of 30 mm is permissible for components with a single layer of centrally arranged reinforcement grid.

Carbon reinforcement grid solidian GRID for the reinforcement of concrete components with nonmetallic reinforcement	Appendix 2
Grid family 2: solidian GRID Q71-C-EP-s51-F207	Page 2 of 4

Building material class for components from a component thickness of 30 mm with a minimum concrete cover of 14 mm or for components with a component thickness of 30 mm and a single layer of centrally arranged reinforcement grid.

To use  $\alpha_{Tt}$  = 1 and  $\alpha_{Tb}$  = 1: proof required that the temperature loading does not exceed 70°C.

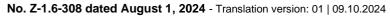
For smaller lap lengths, the transferable tensile stresses can be taken from the approval document Table 2, line 10.





media reinfor loads approv	etrical, bidirectional reinforcement grid (type Q) made of resistant carbon fiber composite material for the cement of concrete components with predominantly stat n accordance with German national technical val/construction technique permit Z-1.6-308		1	$\blacksquare$	
Materi					
	material	C (Carbon)			
	gnating agent	EP (Epoxy resin)	)		
Color		schwarz			
	e finish	smooth			
	ng stiffness class	III, stiff			
Validit	y for concrete strength classes	C30/37 to C70/8	5		и и
Chem	cal resistance of the reinforcement in relation to the	XD3	Chlorides, exce	pt seawater	
	ure classes in accordance with DIN EN 206-1 in	XS3	Chlorides from	seawater	
conjur	action with DIN 1045-2	XA3	Chemical attack	K	
Goom	etry and structure		Unit	Value	Tolerance
اااان	•	longitudinal	<del>-</del>	value	± 5°
	Directions of the fiber strands	transversal	– [°] –	90	± 5°
		longitudinal		4,8	± 10%
h	Mean value of fiber strand width	transversal	[mm]	5,5	± 10%
		longitudinal		2,6	± 10%
v	Mean value of fiber strand height	transversal	— [mm] —	2,5	± 10%
		longitudinal		3,35	± 1070
nm	Nominal diameter	transversal	– [mm] –	3,35	
				8,8	
$A_{nm}$	Nominal cross-sectional area per fiber strand	longitudinal transversal	— [mm²] —	8,8	
		longitudinal		232	
$a_{nm}$	Nominal cross-sectional area per meter	transversal	— [mm²/m] —	232	
		longitudinal		3,62	
$A_{f,nm}$	Fiber cross-sectional area per fiber strand	transversal	– [mm²] –	3,62	<u>-</u>
				95	
$a_{f,nm}$	Fiber cross-sectional area per meter	longitudinal transversal	— [mm²/m] —	95	<u> </u>
		longitudinal		38	± 3 mm
S	Grid width	transversal	– [mm] –	38	± 3 mm
				32,8	± 10%
Sı	Clear distance of the fiber strands	longitudinal	— [mm] —		
	Crid height (gyere as yell a of the mayimum height)	transversal	[mm]	33,5	± 10%
າ <sub>G</sub>	Grid height (average value of the maximum height)  Weight per unit area of the non-metallic reinforcement		[mm]	3,5 559	± 10% ± 10%
<u> </u>	Degree of coverage of the mesh		[g/m²]	25,2	± 10%
( <sub>ü</sub>	Minimum permissible radius of curvature		[%] [mm]	350	
min	Willimitum permissible radius of curvature		[iiiiii]	330	
Materi	al properties		Unit	Value	Tolerance
viateri	Bulk density of the fiber composite material		[g/cm <sup>3</sup> ]	1,30	- I DIEI ALICE
α	Coefficient of thermal expansion	along the fiber	[9/cm <sup>-</sup> ]	0,5	
Γ <sub>g0</sub>	Glass transition temperature (DMA)	along the liber	[°C]	≥ 110	-
• gu	Recommended operating temperature range		[°C]	-20 bis +80	-
			.,	- " "	
Carb	Building material class reinforcement grid acc. to DIN I		[-]	E, normally flamma	ble -
with I	nonmetallic reinforcement family 2:				Appendix 2 Page 3 of 4

### National technical approval (abZ)/ General construction technique permit (aBG)





Mecha	nical properties		Unit	Value	Tolerance
f .	Characteristic short-term tensile strength related to	longitudinal	- [MPa]	1.200	-
f <sub>nm,k</sub>	the nominal cross-sectional area	transversal	[IVIF a]	1.200	-
_	V 1 11 11 11 11 11 11 11 11	longitudinal	[MDo]	97.000	-
E <sub>nm</sub>	Young's modulus related to the nominal cross-section	transversal	– [MPa]	97.000	-
ı	Characteristic short-term tensile strength related to	longitudinal	[MPa]	2.917	-
$f_{f,nm,k}$	the fiber cross-sectional area	transversal		2.917	-
_	Mean modulus of elasticity related to the fiber cross-	longitudinal	IMP-1	243.000	-
$E_{f,nm,m}$	sectional area	transversal	- [MPa]	243.000	-
	Characteristic elongation at failure under tensile load	longitudinal	F0/ 3	12,4	-
ε <sub>nm,uk</sub>	of the non-metallic reinforcement	transversal	- [‰]	12,4	-
_	Characteristic short-term bond strength for anchoring	longitudinal		2,9	-
f <sub>bk</sub>	for ≥ C30/37	transversal	- [MPa]	2,9	-
	Characteristic value of the mean bond stress (k <sub>t</sub> =0)	longitudinal		5,9	-
T <sub>bm,k</sub>	for ≥ C30/37	transversal	- [MPa]	5,9	-
	Characteristic tensile force transmission of the non-	longitudinal		278	-
$F_{nm,k} \\$	metallic reinforcement per m width	transversal	- [kN/m]	278	_
	· · · · · · · · · · · · · · · · · · ·				
Coeffic	ients		Unit	Value	Tolerance
	Coefficient for considering influences from short-term page 1	articularly high		1,0 at -20°C ≤ T ≤ 70°C	
$\alpha_{Tt}$	temperature stress on the tensile strength <sup>2)</sup>		[-]	0,9 at 70°C < T ≤ 80°C	-
~	Coefficient for considering influences from short-term page 1	articularly high	r 1	1,0 at -20°C ≤ T ≤ 70°C	
$\alpha_{Tb}$	temperature stress on the bond behavior 2)	, -	[-]	0,9 at 70°C < T ≤ 80°C	-
$\alpha_{\text{nmt}}$	Coefficient for considering durability influences and long on the tensile strength	g-term stresses	[-]	0,83	-
$\alpha_{nmb}$	Coefficient for considering durability influences and long on the bond strength	g-term stresses	[-]	0,83	-
Charac	teristic values for anchoring and lapping		Unit	Value	Tolerance
	Applicable reinforcement stress for the anchorage	longitudinal	- [MPa]	1.020	-
	proof	transversal	[ivii aj	1.020	-
	Minimum anaharing langth	longitudinal	[mm]	76	-
I <sub>b,min</sub>	Minimum anchoring length	transversal	– [mm] ·	76	-
	Minimum Ion Ionath	Iongitudinal	[mm]	117	-
I <sub>0,min</sub>	Minimum lap length	transversal	– [mm]	117	-
	Minimum land lands for the order of the initial 3	longitudinal	f1	500	-
	Minimum lap length for transferring f <sub>nm,k</sub> in lap joint <sup>3)</sup>	transversal	– [mm] -	500	-
			11.5	N/ /	<b>-</b> .
	key values		Unit	Value	Tolerance
C <sub>min,b</sub>	Minimum concrete cover from bond requirement 4)		[mm]	14	-
h <sub>min</sub>	Minimum component thickness 4)		[mm]	≥ 30	-
n	Proof of robustness for predominantly static loading (number of tested cycles)		[-]	≥ 200.000	-

All values given in accordance with or based on DAfStb guideline "Concrete components with nonmetallic reinforcement", Part 4.

A component thickness of 30 mm is permissible for components with a single layer of centrally arranged reinforcement grid.

Carbon reinforcement grid solidian GRID for the reinforcement of concrete components with nonmetallic reinforcement	Appendix 2
Grid family 2: solidian GRID Q95-C-EP-s38-F278	Page 4 of 4

Building material class for components from a component thickness of 30 mm with a minimum concrete cover of 14 mm or for components with a component thickness of 30 mm and a single layer of centrally arranged reinforcement grid.

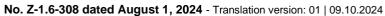
To use  $\alpha_{Tt}$  = 1 and  $\alpha_{Tb}$  = 1: proof required that the temperature loading does not exceed 70°C.

For smaller lap lengths, the transferable tensile stresses can be taken from the approval document Table 2, line 10.





media reinfor loads i	etrical, bidirectional reinforcement grid (type Q) made of resistant carbon fiber composite material for the cement of concrete components with predominantly stat n accordance with German national technical ral/construction technique permit Z-1.6-308				
Materi		2 (2 1 )			
	naterial	C (Carbon)	<u> </u>		
mpreç Color	gnating agent	EP (Epoxy resin	)		
	e finish	smooth			
	ng stiffness class	longitudinal	II, mid		
	•	transversal	III, stiff		
/alidit	y for concrete strength classes	C30/37 to C70/8	5		
Chemi	cal resistance of the reinforcement in relation to the	XD3	Chlorides, exc	cept seawater	
	ure classes in accordance with DIN EN 206-1 in	XS3	Chlorides from		
conjur	ction with DIN 1045-2	XA3	Chemical atta	ck	
Geom	etry and structure		Unit	Value	Tolerance
	Directions of the fiber strands	longitudinal	_ [°] -	0	± 5°
		transversal		90	± 5°
h	Mean value of fiber strand width	longitudinal	_ [mm] -	3,1	± 10%
		transversal longitudinal		5,5 1,8	± 10% ± 10%
v	Mean value of fiber strand height	transversal	— [mm] -	3,1	± 10% ± 10%
		longitudinal		2,37	- 1070
nm	Nominal diameter	transversal	– [mm] -	3,35	
		longitudinal		4,4	-
A <sub>nm</sub>	Nominal cross-sectional area per fiber strand	transversal	— [mm²] -	8,8	-
	Naminal areas agational area per meter	longitudinal	[mm²/m] -	58	-
a <sub>nm</sub>	Nominal cross-sectional area per meter	transversal	[[[[[]]	232	-
$\Delta_{f,nm}$	Fiber cross-sectional area per fiber strand	longitudinal	– [mm²] -	1,81	-
*i,nm	Tibol order decidental area per liber estana	transversal	[]	3,62	
a <sub>f,nm</sub>	Fiber cross-sectional area per meter	longitudinal	[mm²/m] -	24	-
	·	transversal		95	
3	Grid width	longitudinal	[mm] -	76	± 3 mm
		transversal longitudinal		38 72,8	± 3 mm
Sı .	Clear distance of the fiber strands	transversal	– [mm] -	32,5	± 10%
ι <sub>G</sub>	Grid height (average value of the maximum height)	transversar	[mm]	3,0	± 10%
)	Weight per unit area of the non-metallic reinforcement		[g/m²]	381	± 10%
ς <sub>ü</sub>	Degree of coverage of the mesh		[%]	18,0	-
min	Minimum permissible radius of curvature		[mm]	350	-
Materi	al properties		Unit	Value	Tolerance
	Bulk density of the fiber composite material		[g/cm³]	1,30	-
X -	Coefficient of thermal expansion	along the fiber	[10 <sup>-6</sup> 1/K]	0,5	-
Γ <sub>g0</sub>	Glass transition temperature (DMA)		[°C]	≥ 110	-
	Recommended operating temperature range		[°C]	-20 bis +80	-
	Building material class reinforcement grid acc. to DIN I	EN 13501-1	[-]	E, normally flammable	-
	on reinforcement grid solidian GRID for the renonmetallic reinforcement	einforcement of	f concrete co	·	pendix 3



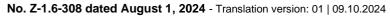


Macha	nical properties		Unit	Value	Tolerance
iviecna	• •	longitudinal	Offic	1.250	Tolerance
n <sub>m,k</sub>	Characteristic short-term tensile strength related to the nominal cross-sectional area	transversal	- [MPa]	1.200	<del>-</del>
	the Hommar oross sectional area				-
nm	Young's modulus related to the nominal cross-section	longitudinal	- [MPa]	99.000	-
		transversal		97.000	-
f,nm,k	Characteristic short-term tensile strength related to	longitudinal	- [MPa]	3.039	-
.,,,,,,	the fiber cross-sectional area	transversal		2.917	-
f,nm,m	Mean modulus of elasticity related to the fiber cross-	longitudinal	- [MPa]	247.000	-
,,,,,,,,,	sectional area	transversal	[]	243.000	-
nm,uk	Characteristic elongation at failure under tensile load	longitudinal	<b>[</b> ‰]	12,6	-
·nm,uk	of the non-metallic reinforcement	transversal	[700]	12,4	-
	Characteristic short-term bond strength for anchoring	longitudinal	- [MPa]	1,7	-
bk	for ≥ C30/37	transversal	[ivir aj	2,9	-
	Characteristic value of the mean bond stress (k <sub>t</sub> =0)	longitudinal	[MDa]	7,1	-
bm,k	for ≥ C30/37	transversal	- [MPa]	5,9	-
	Characteristic tensile force transmission of the non-	longitudinal		72	-
F <sub>nm,k</sub>	metallic reinforcement per m width	transversal	- [kN/m]	278	-
	·			<u>-</u>	
Coeffic	sients		Unit	Value	Tolerance
~	Coefficient for considering influences from short-term particularly high temperature stress on the tensile	longitudinal	[-]	1,0 at -20°C ≤ T ≤ 70°C 0,95 at 70°C < T ≤ 80°C	-
ı⊤t	strength <sup>2)</sup>	transversal	f 1	1,0 at -20°C ≤ T ≤ 70°C	
	on ong an	transversal	[-]	0,9 at 70°C < T ≤ 80°C	
	Coefficient for considering influences from short-term	longitudinal	[-]	1,0 at -20°C ≤ T ≤ 70°C 0,95 at 70°C < T ≤ 80°C	-
<b>I</b> Tb	particularly high temperature stress on the bond behavior <sup>2)</sup>			1,0 at -20°C ≤ T ≤ 70°C	
	benavior -/	transversal	[-]	0,9 at 70°C < T ≤ 80°C	
I <sub>nmt</sub>	Coefficient for considering durability influences and long on the tensile strength	g-term stresses	[-]	0,83	-
a <sub>nmb</sub>	Coefficient for considering durability influences and long on the bond strength	g-term stresses	[-]	0,83	-
Charac	cteristic values for anchoring and lapping		Unit	Value	Tolerance
	Applicable reinforcement stress for the anchorage	longitudinal		885	-
	proof	transversal	- [MPa]	1.020	-
		longitudinal		42	
b,min	Minimum anchoring length	transversal	– [mm]	76	
					-
0,min	Minimum lap length	longitudinal	- [mm]	228	-
		transversal		117	-
	Minimum lap length for transferring f <sub>nm,k</sub> in lap joint <sup>3)</sup>	longitudinal	_ [mm]	700	-
		transversal	[]	500	-
- باغیری"	* key yelve		1.160	Value	T-1
	Minimum concrete cover from band requirement 4)		Unit	Value 14	Tolerance
min,b	Minimum concrete cover from bond requirement 4)		[mm]		-
1 <sub>min</sub>	Minimum component thickness <sup>4)</sup> Proof of robustness for predominantly static loading		[mm]	≥ 30	-
1	(number of tested cycles)		[-]	≥ 200.000	<u>-</u>
Bu cor To	les given in accordance with or based on DAfStb guidelir ilding material class for components from a component the mponents with a component thickness of 30 mm and a si use $\alpha_{Tt} = 1$ and $\alpha_{Tb} = 1$ : proof required that the temperatur smaller lap lengths, the transferable tensile stresses can component thickness of 30 mm is permissible for component	hickness of 30 mm ingle layer of centr ure loading does n n be taken from th	with a minimulally arranged root exceed 70° approval doc	um concrete cover of 14 mm or reinforcement grid. C. cument Table 2, line 10.	or for
	on reinforcement grid solidian GRID for the re				
with r Grid f	vith nonmetallic reinforcement  Grid family 3:				pendix 3 ge 2 of 4
solid	ian GRID R24/95-C-C-EP-s76/38-F72/278			1 4	,- <del></del> : -





media reinfor loads i	etrical, bidirectional reinforcement grid (type Q) made of resistant carbon fiber composite material for the cement of concrete components with predominantly stat n accordance with German national technical ral/construction technique permit Z-1.6-308		-		
Materi					
	naterial	C (Carbon)			
mpreç Color	nating agent	EP (Epoxy resin)	)		
	e finish	smooth		-\\-\\\	
	ng stiffness class	longitudinal	III, stiff		ľ
	<u> </u>	transversal	II, mid		
/alidit	for concrete strength classes	C30/37 to C70/8	5		1
Chemi	cal resistance of the reinforcement in relation to the	XD3	Chlorides, exc	cept seawater	
	ure classes in accordance with DIN EN 206-1 in	XS3	Chlorides fron		
conjur	ction with DIN 1045-2	XA3	Chemical atta	ck	
3eom	etry and structure	longitudinal	Unit	Value	Tolerance
	Directions of the fiber strands	longitudinal transversal	- [°] -	0 90	± 5° ± 5°
		longitudinal		5,5	± 10%
h	Mean value of fiber strand width	transversal	– [mm] –	3,8	± 10%
		longitudinal		3,1	± 10%
v	Mean value of fiber strand height	transversal	– [mm] –	1,8	± 10%
nm	Nominal diameter	longitudinal	– [mm] -	3,35	-
nm	Nominal diameter	transversal	[IIIIII]	2,37	-
$\lambda_{nm}$	Nominal cross-sectional area per fiber strand	longitudinal	– [mm²] –	8,8	-
		transversal	1	4,4	-
a <sub>nm</sub>	Nominal cross-sectional area per meter	longitudinal	_ [mm²/m] -	58 	
		transversal longitudinal		3,62	<u>-</u>
$A_{f,nm}$	Fiber cross-sectional area per fiber strand	transversal	[mm²] -	1,81	
		longitudinal		95	-
a <sub>f,nm</sub>	Fiber cross-sectional area per meter	transversal	– [mm²/m] –	24	-
_	مادا المادات ا	longitudinal	[1	38	± 3 mm
3	Grid width	transversal	– [mm] –	76	± 3 mm
Sı	Clear distance of the fiber strands	longitudinal	– [mm] -	33,4	± 10%
<b>2</b> 1		transversal	[]	72,8	± 10%
1 <sub>G</sub>	Grid height (average value of the maximum height)		[mm]	3,3	± 10%
<u> </u>	Weight per unit area of the non-metallic reinforcement		[g/m²]	350	± 10%
Cü	Degree of coverage of the mesh  Minimum permissible radius of curvature		[%]	17,4 350	<u>-</u>
min	Millimum permissible radius of culvature		[mm]	330	-
//ateri	al properties		Unit	Value	Tolerance
viateri	Bulk density of the fiber composite material		[g/cm³]	1,30	-
χ	Coefficient of thermal expansion	along the fiber	[10 <sup>-6</sup> 1/K]	0,5	-
Γ <sub>g0</sub>	Glass transition temperature (DMA)		[°C]	≥ 110	-
	Recommended operating temperature range		[°C]	-20 bis +80	-
	Building material class reinforcement grid acc. to DIN	EN 13501-1	[-]	E, normally flammable	-
vith r	on reinforcement grid solidian GRID for the renonmetallic reinforcement ramily 3:	einforcement of	f concrete co		pendix 3 ge 3 of 4





Mecha	nical properties		Unit	Value	Tolerand
nm,k	Characteristic short-term tensile strength related to	longitudinal	- [MPa]	1.200	-
,.	the nominal cross-sectional area	transversal	[]	1.250	-
nm	Young's modulus related to the nominal cross-section	longitudinal	[MPa]	97.000	-
		transversal	[,	99.000	-
nm,k	Characteristic short-term tensile strength related to	longitudinal	[MPa]	2.917	-
IIIII,K	the fiber cross-sectional area	transversal	[ ~]	3.039	-
f,nm,m	Mean modulus of elasticity related to the fiber cross-	longitudinal	- [MPa]	243.000	-
1,1111,111	sectional area	transversal	[ ~]	247.000	-
nm,uk	Characteristic elongation at failure under tensile load	longitudinal	[‰]	12,4	-
iii,uk	of the non-metallic reinforcement	transversal	[]	12,6	-
ık	Characteristic short-term bond strength for anchoring	longitudinal	[MPa]	2,9	-
	for ≥ C30/37	transversal		1,7	-
bm,k	Characteristic value of the mean bond stress ( $k_t$ =0) for $\geq$ C30/37	longitudinal	[MPa]	5,9	-
		transversal		7,1	-
nm,k	Characteristic tensile force transmission of the non-	longitudinal	[kN/m]	278	-
1111,10	metallic reinforcement per m width	transversal	[	72	-
Coeffic	ients		Unit	Value	Tolerand
I <sub>Tt</sub>	Coefficient for considering influences from short-term particularly high temperature stress on the tensile	longitudinal	[-]	1,0 at -20°C ≤ T ≤ 7 0,9 at 70°C < T ≤ 8	
•11	strength <sup>2)</sup>	transversal	[-]	1,0 at -20°C ≤ T ≤ 7 0,95 at 70°C < T ≤ 8	
	Coefficient for considering influences from short-term	longitudinal	[-]	1,0 at -20°C ≤ T ≤ 7 0,9 at 70°C < T ≤ 8	_
Тъ	particularly high temperature stress on the bond behavior <sup>2)</sup>	transversal	[-]	1,0 at -20°C ≤ T ≤ 7 0,95 at 70°C < T ≤ 8	
I <sub>nmt</sub>	Coefficient for considering durability influences and long on the tensile strength	-term stresses	[-]	0,83	-
X <sub>nmb</sub>	Coefficient for considering durability influences and long on the bond strength	-term stresses	[-]	0,83	-
Charac	cteristic values for anchoring and lapping		Unit	Value	Tolerand
	Applicable reinforcement stress for the anchorage	longitudinal	[MPa]	1.020	-
	proof	transversal	[IVIF a]	885	-
	Minimum anaharing langth	longitudinal	[mm]	76	-
o,min	Minimum anchoring length	transversal	- [mm]	42	-
	Minimum landament	longitudinal	[1	117	-
),min	Minimum lap length	transversal	- [mm]	228	-
	Minimum land landth fautana familia ( in landinia ( 3)	longitudinal	f1	500	-
	Minimum lap length for transferring f <sub>nm,k</sub> in lap joint <sup>3)</sup>	transversal	- [mm]	700	-
urther	r key values		Unit	Value	Tolerand
min,b	Minimum concrete cover from bond requirement 4)		[mm]	14	<u> </u>
l <sub>min</sub>	Minimum component thickness 4)		[mm]	≥ 30	-
	Proof of robustness for predominantly static loading (number of tested cycles)		[-]	≥ 200.000	-
<sup>1)</sup> Bui		nickness of 30 mm	ponents with no	nmetallic reinforcemen	
To Fo	use $\alpha_{Tt} = 1$ and $\alpha_{Tb} = 1$ : proof required that the temperatures smaller lap lengths, the transferable tensile stresses car component thickness of 30 mm is permissible for component	ire loading does not be taken from the	ot exceed 70°C e approval doc	). ument Table 2, line 10.	
	on reinforcement grid solidian GRID for the rei			· -	
vith n	nonmetallic reinforcement amily 3:				Appendix 3
	ian GRID R95/24-C-C-EP-s38/76-F278/72				Page 4 of 4

Translation of:
National technical approval (abZ)/
General construction technique permit (aBG)



No. Z-1.6-308 dated August 1, 2024 - Translation version: 01 | 09.10.2024

# Notes on the manufacture and testing of test components when using the casting process

- The dimensions of the test component must be selected so that the stress on the solidian GRID during concreting corresponds to what is to be expected in the real component.
- The concreting conditions (spacing of the spacers, consistency of the concrete, concreting speed, drop height of the concrete, etc.) must correspond to the concreting conditions of the actual component.
- After the concrete has hardened, at least the concrete cover for all layers of the solidian GRID must be determined using non-destructive or destructive testing methods.
- If it is also considered necessary to determine ultimate loads, at least three separate test specimens (preferably cylinders with a diameter of 150 mm and a height of 300 mm) must be produced in addition to the test component, stored under the conditions of the test specimen and tested at the time of the ultimate load determination.
- In this case, the concrete cover can only be determined using destructive testing methods after the ultimate load has been determined.
- The results of the tests must be recorded (e.g. as an appendix to the construction log book)

Carbon reinforcement grid solidian GRID for the reinforcement of concrete components with nonmetallic reinforcement

Instructions for manufacturing and testing the test component when using the casting process

Appendix 4