



**Technical and Test Institute
for Construction Prague**

Prosecká 811/76a
190 00 Prague
Czech Republic
eota@tzus.cz



Member of



www.eota.eu

European Technical Assessment

**ETA 16/0600
of 12/09/2016**

Technical Assessment Body issuing the ETA: Technical and Test Institute
for Construction Prague

Trade name of the construction product

G&B Fissaggi Gebofix PRO VE-SF
G&B Fissaggi Gebofix PRO VE-SF Nordic

**Product family to which the construction
product belongs**

Product area code: 33
Bonded injection type anchor for use in
cracked and non-cracked concrete

Manufacturer

G&B FISSAGGI
Corso Savona, 22
10029 Villatellone (TO)
ITALY

Manufacturing plant

G&B Fissaggi S.R.L., Plant 4

**This European Technical Assessment
contains**

20 pages including 16 Annexes which form
an integral part of this assessment.

**This European Technical Assessment is
issued in accordance with regulation
(EU) No 305/2011, on the basis of**

ETAG 001-Part 1 and Part 5, edition 2013,
used as European Assessment Document
(EAD)

This version replaces

ETA 16/0600 issued on 15/07/2016

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full (excepted the confidential Annex(es) referred to above). However, partial reproduction may be made, with the written consent of the issuing Technical Assessment Body - Technical and Test Institute for Construction Prague. Any partial reproduction has to be identified as such.

1. Technical description of the product

The G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic is a bonded anchor consisting of a cartridge with injection mortar and a steel element. The steel element consists of a commercial threaded rod with washer and hexagon nut in the range M8 to M30 or a reinforcing bar in the range of diameter 8 to 32 mm.

The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between metal part, injection mortar and concrete.

The illustration and the description of the product are given in Annex A.

2. Specification of the intended use in accordance with the applicable EAD

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the products in relation to the expected economically reasonable working life of the works.

3. Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

| Essential characteristic | Performance |
|--|-------------------|
| Characteristic resistance for tension loads - threaded rod | See Annex C 1, C2 |
| Characteristic resistance for tension loads - rebar | See Annex C 4 |
| Characteristic resistance for shear loads - threaded rod | See Annex C 3 |
| Characteristic resistance for shear loads - rebar | See Annex C 5 |
| Displacement for threaded rod | See Annex C 6 |
| Displacement for rebar | See Annex C 6 |

3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|--------------------------|---|
| Reaction to fire | Anchorage satisfy requirements for Class A1 |
| Resistance to fire | No performance assessed |

3.3 Hygiene, health and environment (BWR 3)

Regarding dangerous substances contained in this European Technical Assessment, there may be requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

For basic requirement safety in use the same criteria are valid as for Basic Requirement Mechanical resistance and stability.

3.5 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources no performance was determined for this product.

3.6 General aspects relating to fitness for use

Durability and serviceability are only ensured if the specifications of intended use according to Annex B 1 are kept.

4. Assessment and verification of constancy of performance (AVCP) system applied with reference to its legal base

According to the Decision 96/582/EC of the European Commission¹ the system of assessment verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table apply.

| Product | Intended use | Level or class | System |
|-----------------------------------|--|----------------|--------|
| Metal anchors for use in concrete | For fixing and/or supporting to concrete, structural elements (which contributes to the stability of the works) or heavy units | - | 1 |

5. Technical details necessary for the implementation of the AVCP system, as provided in the applicable EAD

5.1 Tasks of the manufacturer

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European Technical Assessment.

The manufacturer may only use raw materials stated in the technical documentation of this European Technical Assessment.

The factory production control shall be in accordance with the control plan which is a part of the technical documentation of this European Technical Assessment. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited at Technical and Test Institute for Construction Prague.² The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

The manufacturer shall, on the basis of a contract, involve a body which is notified for the tasks referred to in section 4 in the field of anchors in order to undertake the actions laid down in section 5.2. For this purpose, the control plan referred to in this section and section 5.2 shall be handed over by the manufacturer to the notified body involved.

The manufacturer shall make a declaration of performance, stating that the construction product is in conformity with the provisions of this European Technical Assessment.

¹ Official Journal of the European Communities L 254 of 08.10.1996

² The control plan is a confidential part of the documentation of the European Technical Assessment, but not published together with the ETA and only handed over to the approved body involved in the procedure of AVCP.

5.2 Tasks of the notified bodies

The notified body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The notified certification body involved by the manufacturer shall issue a certificate of constancy of performance of the product stating the conformity with the provisions of this European Technical Assessment.

In cases where the provisions of the European Technical Assessment and its control plan are no longer fulfilled the notified body shall withdraw the certificate of constancy of performance and inform Technical and Test Institute for Construction Prague without delay.

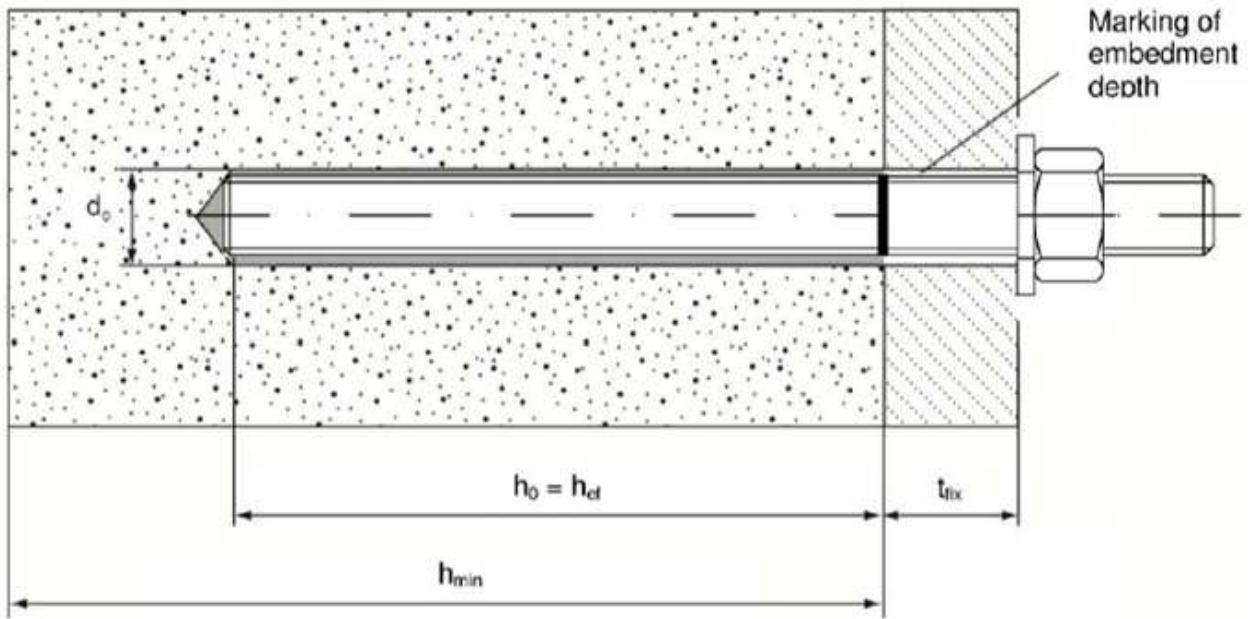
Issued in Prague on 12.09.2016

By

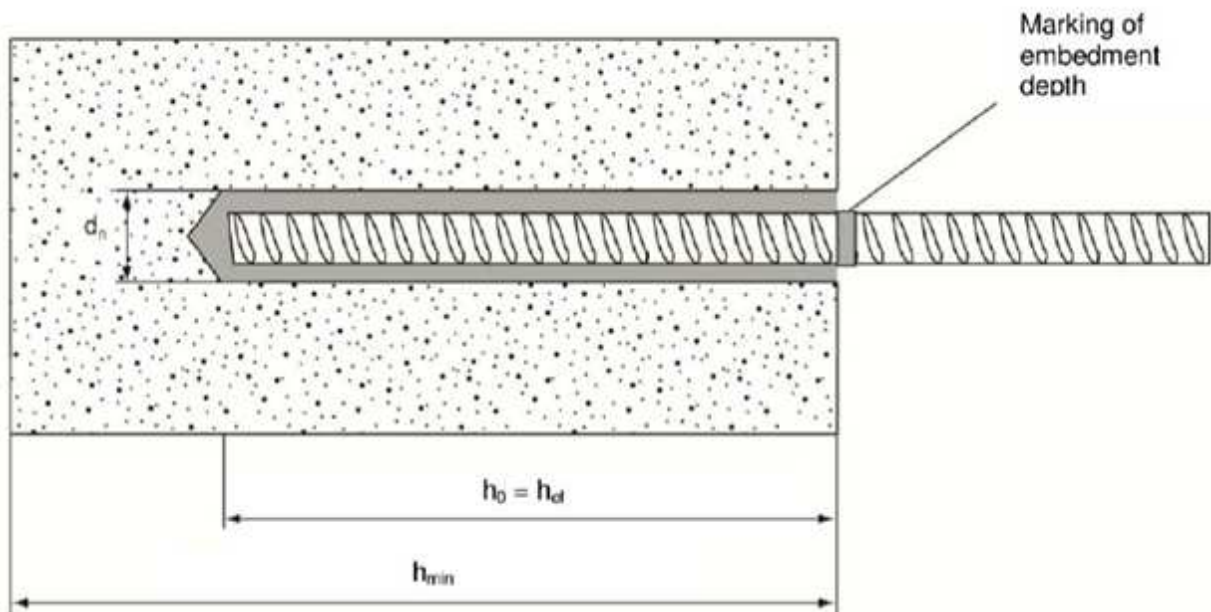
Ing. Mária Schaan

Head of the Technical Assessment Body

Installation threaded rod



Installation reinforcing bar



- d_0 = nominal drill hole diameter
- t_{fix} = thickness of fixture
- h_{ef} = effective anchorage depth
- h_0 = depth of drill hole
- h_{min} = minimum thickness of member

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

Product description
Installed conditions

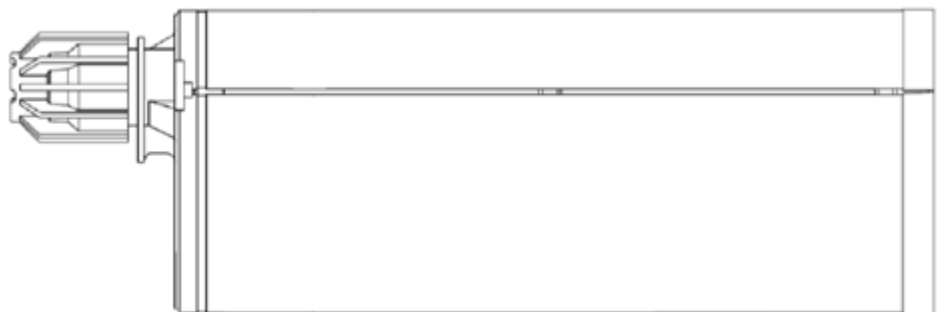
Annex A 1

Injection mortar: G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic

150 ml, 380 ml to 420 ml cartridge (Type: coaxial)



345 ml and 825 ml cartridge (Type: "side-by-side")



165 ml and 300 ml cartridge (Type: "foil tube")



Cartridge label: G&B Fissaggi Gebofix PRO VE-SF or G&B Fissaggi Gebofix PRO VE-SF Nordic, processing notes, charge-code, shelf life hazard-code, curing- and processing time (depending on the temperature), with as well as without travel scale

Static mixer

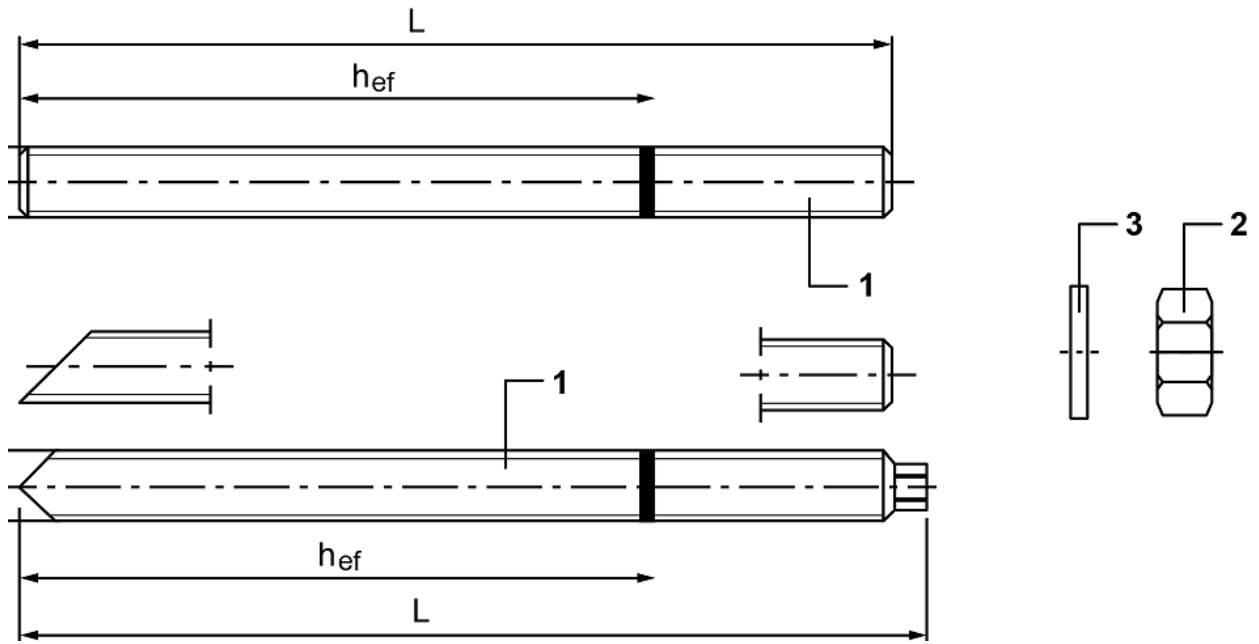


G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

Product description
Injection system

Annex A 2

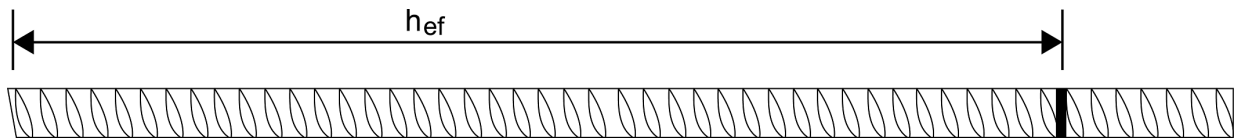
Threaded rod M8, M10, M12, M16, M20, M24, M27, M30 with washer and hexagon nut



Commercial standard rod with:

- Materials, dimensions and mechanical properties acc. Table A1
- Inspection certificate 3.1 acc. to EN 10204:2004
- Marking of embedment depth

Reinforcing bar Ø8, Ø10, Ø12, Ø14, Ø16, Ø20, Ø25, Ø32



- Minimum value of related rib area $f_{R,min}$ according to EN 1992-1-1:2004+AC:202
- Rib height of the bar shall be in the range $0,05d \leq h \leq 0,07d$
(d: Nominal diameter of the bar; h: Rib height of the bar)

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

Product description
Threaded rod and reinforcing bar

Annex A 3

Table A1: Materials

| Part | Designation | Material |
|--|---|--|
| Steel, zinc plated $\geq 5 \mu\text{m}$ acc. to EN ISO 4042:2009 or Steel, hot-dip galvanised $\geq 40 \mu\text{m}$ acc. to EN ISO 10684:2004+AC:2009 | | |
| 1 | Anchor rod | Steel, EN 10087:1998 or EN 10263:2001 Property class 4.6, 5.8, 8.8, EN 1993-1-8:2005+AC:2009 $A_5 > 8\%$ fracture elongation |
| 2 | Hexagon nut, EN ISO 4032:2012 | Steel acc. to EN 10087:1998 or EN 10263:2001 Property class 4 (for class 4.6 rod) EN ISO 898-2:2012, Property class 5 (for class 5.8 rod) EN ISO 898-2:2012, Property class 8 (for class 8.8 rod) EN ISO 898-2:2012 |
| 3 | Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000 | Steel, zinc plated or hot-dip galvanised |
| Stainless steel | | |
| 1 | Anchor rod | Material: A2-70, A4-70, A4-80, EN ISO 3506 |
| 2 | Hexagon nut EN ISO 4032 | According to threaded rod |
| 3 | Washer EN ISO 887, EN ISO 7089, EN ISO 7093 or EN ISO 7094 | According to threaded rod |
| High corrosion resistant steel | | |
| 1 | Anchor rod | Material: 1.4529, 1.4565, EN 10088-1 |
| 2 | Hexagon nut EN ISO 4032 | According to threaded rod |
| 3 | Washer EN ISO 887, EN ISO 7089, EN ISO 7093 or EN ISO 7094 | According to threaded rod |
| Reinforcing bars | | |
| 1 | Rebar according to EN 1992-1-1:2004+AC:2010, Annex C | Bars and de-coiled rods class B or C f_{yk} and k according to NDP or NCL of EN 1992-1-1/NA:2013 $f_{uk} = f_{tk} = k \cdot f_{yk}$ |

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

Product description
Materials

Annex A 4

Specifications of intended use

Anchorage subject to:

- Static and quasi-static loads: M8 to M30, Rebar Ø8 to Ø32.
- Seismic performance category C1: threaded rod size M12, M16, M20, M24

Base materials

- Reinforced or unreinforced normal weight concrete according to EN 206-1:2000.
- Strength classes C20/25 to C50/60 according to EN 206-1:2000.
- Non-cracked concrete M8 to M30, Rebar Ø8 to Ø32.
- Cracked concrete: M12 to M24.

Temperature range:

- I: -40°C to +40°C (max long term temperature +24°C and max short term temperature +40°C)
- II: -40°C to +80°C (max long term temperature +50°C and max short term temperature +80°C)

Use conditions (Environmental conditions)

- Structures subject to dry internal conditions (zinc coated steel, stainless steel, high corrosion resistance steel).
- Structures subject to external atmospheric exposure including industrial and marine environment, if no particular aggressive conditions exist (stainless steel A4, high corrosion resistance steel).
- Structures subject to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel A4, high corrosion resistance steel).
- Structures subject to permanently damp internal condition, with particular aggressive conditions exist (high corrosion resistance steel).

Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Design:

- The anchorages are designed in accordance with the EOTA Technical Report TR 029 "Design of bonded anchors" under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings.
- Anchorages under seismic actions (cracked concrete) have to be designed in accordance with EOTA Technical Report TR 045 "Design of Metal Anchors under Seismic Action".

Installation:

- Dry or wet concrete or flooded hole.
- Hole drilling by hammer drill mode.
- Overhead installation allowed.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

**G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic
for concrete**

**Intended use
Specifications**

Annex B 1

Table B1: Installation parameters for threaded rod

| Anchor size | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|----------------------|--|-----|-----|-----|-----------------|-----|-----|-----|
| Nominal drill hole diameter | d_0 [mm] = | 10 | 12 | 14 | 18 | 22 | 26 | 30 | 35 |
| Effective anchorage depth | $h_{ef,min}$ [mm] = | 64 | 80 | 96 | 128 | 160 | 192 | 216 | 240 |
| | $h_{ef,max}$ [mm] = | 160 | 200 | 240 | 320 | 400 | 480 | 540 | 600 |
| Diameter of clearance hole in the fixture | d_f [mm] ≤ | 9 | 12 | 14 | 18 | 22 | 26 | 30 | 33 |
| Diameter of the steel brush | d_b [mm] ≥ | 12 | 14 | 16 | 20 | 26 | 30 | 35 | 43 |
| Torque moment | T_{inst} [Nm] ≤ | 10 | 20 | 40 | 80 | 150 | 200 | 240 | 275 |
| Thickness of fixture | $t_{fix,min}$ [mm] > | 0 | | | | | | | |
| | $t_{fix,max}$ [mm] < | 1500 | | | | | | | |
| Minimum thickness of member | h_{min} [mm] | $h_{ef} + 30 \text{ mm} \geq 100 \text{ mm}$ | | | | $h_{ef} + 2d_0$ | | | |
| Minimum effective anchorage depth | | | | | | | | | |
| Minimum spacing | s_{min} [mm] | 35 | 40 | 50 | 65 | 80 | 96 | 110 | 120 |
| Minimum edge distance | c_{min} [mm] | 35 | 40 | 50 | 65 | 80 | 96 | 110 | 120 |
| Maximum effective anchorage depth | | | | | | | | | |
| Minimum spacing | s_{min} [mm] | 80 | 100 | 120 | 160 | 200 | 240 | 270 | 300 |
| Minimum edge distance | c_{min} [mm] | 80 | 100 | 120 | 160 | 200 | 240 | 270 | 300 |

Table B2: Installation parameters for rebar

| Rebar size | | Ø8 | Ø10 | Ø12 | Ø16 | Ø20 | Ø25 | Ø32 | |
|-----------------------------------|---------------------|--|-----|-----|-----|-----------------|-----|-----|--|
| Nominal drill hole diameter | d_0 [mm] = | 12 | 14 | 16 | 20 | 25 | 32 | 40 | |
| Effective anchorage depth | $h_{ef,min}$ [mm] = | 64 | 80 | 96 | 128 | 160 | 200 | 256 | |
| | $h_{ef,max}$ [mm] = | 160 | 200 | 240 | 320 | 400 | 500 | 640 | |
| Diameter of the steel brush | d_b [mm] ≥ | 14 | 16 | 18 | 22 | 31 | 35 | 43 | |
| Minimum thickness of member | h_{min} [mm] | $h_{ef} + 30 \text{ mm} \geq 100 \text{ mm}$ | | | | $h_{ef} + 2d_0$ | | | |
| Minimum effective anchorage depth | | | | | | | | | |
| Minimum spacing | s_{min} [mm] | 35 | 40 | 50 | 65 | 80 | 100 | 130 | |
| Minimum edge distance | c_{min} [mm] | 35 | 40 | 50 | 65 | 80 | 100 | 130 | |
| Maximum effective anchorage depth | | | | | | | | | |
| Minimum spacing | s_{min} [mm] | 80 | 100 | 120 | 160 | 200 | 250 | 320 | |
| Minimum edge distance | c_{min} [mm] | 80 | 100 | 120 | 160 | 200 | 250 | 320 | |

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

Intended use
Installation parameters

Annex B 2

Table B3: Parameters for cleaning and setting tools

| Anchor | Size (mm) | Nominal drill bit diameter d_o (mm) | Steel Brush d_b (mm) | Steel Brush (min brush diameter) $d_{b,min}$ (mm) |
|---|-----------|---|--|---|
| | |  |  | |
| Threaded Rod  | M8 | 10 | 12 | 10.5 |
| | M10 | 12 | 14 | 12.5 |
| | M12 | 14 | 16 | 14.5 |
| | M16 | 18 | 20 | 18.5 |
| | M20 | 22 | 26 | 22.5 |
| | M24 | 26 | 30 | 26.5 |
| | M27 | 30 | 35 | 35 |
| Rebar  | Ø8 | 12 | 14 | 12.5 |
| | Ø10 | 14 | 16 | 14.5 |
| | Ø12 | 16 | 18 | 16.5 |
| | Ø16 | 20 | 22 | 20.5 |
| | Ø20 | 25 | 31 | 25.5 |
| | Ø25 | 32 | 35 | 32.5 |
| | Ø32 | 40 | 43 | 40.5 |

Hand pump (volume 750 ml)
 Drill bit diameter (d_o): 10 mm to 20 mm



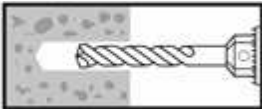
Compressed air tool (min 6 bar)
 Drill bit diameter (d_o): 10 mm to 40 mm

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

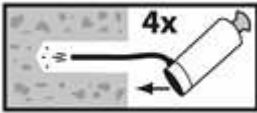
Intended use
 Cleaning and setting tools

Annex B 3

Installation instructions

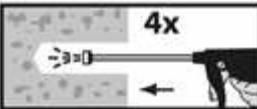


1. Drill with hammer drill a hole into the base material to the size and embedment depth required by the selected anchor (Table B1 or Table B2). In case of aborted drill hole: the drill hole shall be filled with mortar



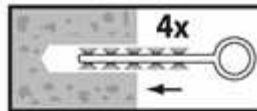
- 2a. **Attention! Standing water in the bore hole must be removed before cleaning.** Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (min. 6 bar) or a hand pump (Annex B3) a minimum of four times. If the bore hole ground is not reached an extension shall be used.

or



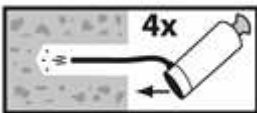
The hand pump can only be used for anchor sizes in uncracked concrete up to bore hole diameter 20mm or embedment depth up to 240mm.

Compressed air (min. 6 bar) can be used for all sizes in cracked and uncracked concrete.



- 2b. Check brush diameter (Table B3) and attach the brush to a drilling machine or battery screwdriver. Brush the hole with an appropriate sized wire brush $> d_{b,min}$ (Table B3) a minimum of four times.

If the bore hole ground is not reached with the brush, a brush extension shall be used (Table B3).

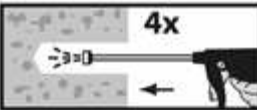


- 2c. Finally blow the hole clean again with compressed air or a hand pump (Annex B3) a minimum of four times. If the bore hole ground is not reached an extension shall be used.

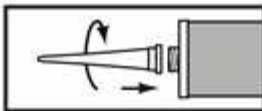
The hand pump can only be used for anchor sizes in uncracked concrete up to bore hole diameter 20mm or embedment depth up to 240mm.

Compressed air (min. 6 bar) can be used for all sizes in cracked and uncracked concrete.

or

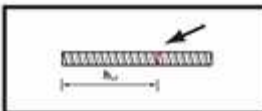


After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning repeated has to be directly before dispensing the mortar.

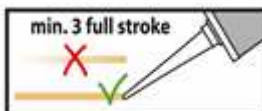


3. Attach a supplied static mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. Cut off the foil tube clip before use.

For every working interruption longer than the working time (Table B4 and B5) as well as for new cartridges, a new static-mixer shall be used.



4. Prior to inserting the anchor rod into the filled bore hole, the position of the embedment depth shall be marked on the anchor rods.



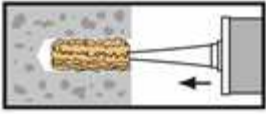
5. Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent colour. For foil tube cartridges it must be discarded a minimum of six full strokes.

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

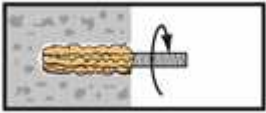
Intended use
Installation instructions

Annex B 4

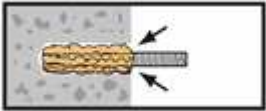
Installation instructions (continuation)



6. Starting from the bottom or back of the cleaned anchor hole fill the hole up to approximately two-thirds with adhesive. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets. For embedment depth larger than 190 mm an extension nozzle shall be used. For overhead and horizontal installation in bore holes a piston plug and extension nozzle according to Annex B3 shall be used. Observe the gel-/ Working times given in Table B4 and B5.



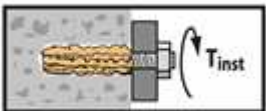
7. Push the threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. The anchor should be free of dirt, grease, oil or other foreign material.



8. Be sure that the anchor is fully seated at the bottom of the hole and that excess mortar is visible at the top of the hole. If these requirements are not maintained, the application has to be renewed. For overhead application the anchor rod should be fixed (e.g. wedges).



9. Allow the adhesive to cure to the specified time to applying any load or torque. Do not move or load the anchor until it is fully cured (attend Table B4 and B5).



10. After full curing, the add-on part can be installed with the max. torque (Table B1) by using a calibrated torque wrench.

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

Intended Use
Installation instructions

Annex B 5

Table B4: Minimum curing time – G&B Fissaggi Gebofix PRO VE-SF

| Base material temperature | Gel time (working time) | Minimum curing time in dry concrete ¹⁾ |
|---------------------------|-------------------------|---|
| +5°C to +9°C | 10 min | 145 min |
| +10°C to +19°C | 6 min | 85 min |
| +20°C to +29°C | 4 min | 50 min |
| +30°C | 4 min | 40 min |
| Cartridge temperature | +5°C to +20°C | |

¹⁾ In wet concrete the curing time **must** be doubled.

Table B5: Minimum curing time – G&B Fissaggi Gebofix PRO VE-SF Nordic

| Base material temperature | Gel time (working time) | Minimum curing time in dry concrete ¹⁾ |
|---------------------------|-------------------------|---|
| -10°C to -6°C | 35 min | 12 h |
| -5°C to -1°C | 15 min | 5 h |
| 0°C to +4°C | 10 min | 2.5 h |
| +5°C to +9°C | 6 min | 80 min |
| +10°C | 6 min | 60 min |
| Cartridge temperature | 0°C to +20°C | |

¹⁾ In wet concrete the curing time **must** be doubled.

**G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic
for concrete**

Intended Use
Curing time

Annex B 6

Table C1: Characteristic values of resistance for threaded rods under tension loads in non-cracked concrete

| Anchor size threaded rod | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 | | |
|---|--------------------------|----------------------------|----------------------|----------------------|------|-----|---------------------------|---------------------------|-----|-----|-----|
| Steel failure | | | | | | | | | | | |
| Characteristic tension resistance | | $N_{Rk,s}$ | [kN] | $A_s \times f_{uk}$ | | | | | | | |
| Combined pull-out and concrete failure | | | | | | | | | | | |
| Characteristic bond resistance in non-cracked concrete C20/25 | | | | | | | | | | | |
| Temperature range I: 40°C / 24°C | dry and wet concrete | $\tau_{Rk,ucr}$ | [N/mm ²] | 8.5 | 10.0 | 9.5 | 9.0 | 8.5 | 8.0 | 6.5 | 5.5 |
| | flooded bore hole | $\tau_{Rk,ucr}$ | [N/mm ²] | 6.0 | 7.5 | 7.5 | 7.0 | No Performance Determined | | | |
| Temperature range II: 80°C / 50°C | dry and wet concrete | $\tau_{Rk,ucr}$ | [N/mm ²] | 6.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.0 | 6.5 | 5.5 |
| | flooded bore hole | $\tau_{Rk,ucr}$ | [N/mm ²] | 4.5 | 5.5 | 5.5 | 5.5 | No Performance Determined | | | |
| Increasing factors for concrete ψ_c | | C30/37 | | 1.04 | | | | | | | |
| | | C40/50 | | 1.08 | | | | | | | |
| | | C50/60 | | 1.10 | | | | | | | |
| Factor according to CEN/TS 1992-4-5 Section 6.2.2.3 | | k_8 | [-] | 10.1 | | | | | | | |
| Concrete cone failure | | | | | | | | | | | |
| Factor according to CEN/TS 1992-4-5 Section 6.2.3.1 | | k_{ucr} | [-] | 10.1 | | | | | | | |
| Edge distance | | $c_{cr,N}$ | [mm] | 1.5 h_{ef} | | | | | | | |
| Axial distance | | $s_{cr,N}$ | [mm] | 3.0 h_{ef} | | | | | | | |
| Splitting failure | | | | | | | | | | | |
| Edge distance $c_{cr,sp}$ [mm] for | $h / h_{ef} \geq 2.0$ | | | 1.0 h_{ef} | | | | | | | |
| | $2.0 > h / h_{ef} > 1.3$ | | | 4.6 $h_{ef} - 1.8 h$ | | | | | | | |
| | $h / h_{ef} \leq 1.3$ | | | 2.26 h_{ef} | | | | | | | |
| Axial distance | | $s_{cr,sp}$ | [mm] | 2 $c_{cr,sp}$ | | | | | | | |
| Installation safety factor (dry and wet concrete) | | $\gamma_2 = \gamma_{inst}$ | | 1.2 | | | | | 1.4 | | |
| Installation safety factor (flooded bore hole) | | $\gamma_2 = \gamma_{inst}$ | | 1.4 | | | No Performance Determined | | | | |

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

Performances

Characteristic values of resistance for threaded rods under tension loads in non-cracked concrete

Annex C 1

Table C2: Characteristic values of resistance for threaded rods under tension loads in cracked concrete

| Anchor size threaded rod | | | | M12 | M16 | M20 | M24 | M27 |
|---|----------------------|-------------------------------|----------------------|---------------------|-----|---------------------------|-----|-----|
| Steel failure | | | | | | | | |
| Characteristic tension resistance | | $N_{Rk,s} = N_{Rk,s,seis,C1}$ | [kN] | $A_s \times f_{uk}$ | | | | |
| Combined pull-out and concrete failure | | | | | | | | |
| Characteristic bond resistance in cracked concrete C20/25 | | | | | | | | |
| Temperature range I: 40°C/24°C | dry and wet concrete | $\tau_{Rk,cr}$ | [N/mm ²] | 4.5 | 4.5 | 4.5 | 4.5 | NPD |
| | | $\tau_{Rk,cr,seis,C1}$ | [N/mm ²] | 3.1 | 3.1 | 3.1 | 3.1 | |
| | flooded bore hole | $\tau_{Rk,cr}$ | [N/mm ²] | 4.5 | 4.5 | No Performance Determined | | |
| | | $\tau_{Rk,cr,seis,C1}$ | [N/mm ²] | 3.1 | 3.1 | | | |
| Temperature range II: 80°C/50°C | dry and wet concrete | $\tau_{Rk,cr}$ | [N/mm ²] | 3.0 | 3.0 | 3.0 | 3.0 | NPD |
| | | $\tau_{Rk,cr,seis,C1}$ | [N/mm ²] | 2.0 | 2.0 | 2.0 | 2.1 | |
| | flooded bore hole | $\tau_{Rk,cr}$ | [N/mm ²] | 3.0 | 3.0 | No Performance Determined | | |
| | | $\tau_{Rk,cr,seis,C1}$ | [N/mm ²] | 2.0 | 2.0 | | | |
| Increasing factors for concrete ψ_c | | C30/37 | | 1.04 | | | | |
| | | C40/50 | | 1.08 | | | | |
| | | C50/60 | | 1.10 | | | | |
| Factor according to CEN/TS 1992-4-5 Section 6.2.2.3 | | k_B | [-] | 7.2 | | | | |
| Concrete cone failure | | | | | | | | |
| Factor according to CEN/TS 1992-4-5 Section 6.2.3.1 | | k_{cr} | [-] | 7.2 | | | | |
| Edge distance | | $c_{cr,N}$ | [mm] | 1.5 h_{ef} | | | | |
| Axial distance | | $s_{cr,N}$ | [mm] | 3.0 h_{ef} | | | | |
| Installation safety factor (dry and wet concrete) | | $\gamma_2 = \gamma_{inst}$ | | 1.2 | | | | |
| Installation safety factor (flooded bore hole) | | $\gamma_2 = \gamma_{inst}$ | | 1.4 | | No Performance Determined | | |

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

Performances

Characteristic values of resistance for threaded rods under tension loads in cracked concrete

Annex C 2

Table C3: Characteristic values of resistance for threaded rods under shear loads in cracked and non-cracked concrete

| Anchor size threaded rod | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 | |
|--|----------------------------|------|-----------------------------------|---------------------------------|-----|-----|-----|---------------------------|-----|----|
| Steel failure without lever arm | | | | | | | | | | |
| Characteristic shear resistance | $V_{Rk,s}$ | [kN] | $0.5 \times A_s \times f_{uk}$ | | | | | | | |
| | $V_{Rk,s,seis,C1}$ | [kN] | No Performance Determined | $0.35 \times A_s \times f_{uk}$ | | | | No Performance Determined | | |
| Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1 | k_2 | | 0.8 | | | | | | | |
| Steel failure with lever arm | | | | | | | | | | |
| Characteristic bending moment | $M_{Rk,s}^0$ | [Nm] | $1.2 \times W_{el} \times f_{uk}$ | | | | | | | |
| | $M_{Rk,s,seis,C1}^0$ | [Nm] | No Performance Determined | | | | | | | |
| Concrete pry-out failure | | | | | | | | | | |
| Factor in equation (5.7) of Technical Report TR029 Factor in equation (27) of CEN/TS 1992-4-5 Section 6.3.3 | $k_{(3)}$ | | 2.0 | | | | | | | |
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | | 1.0 | | | | | | | |
| Concrete edge failure | | | | | | | | | | |
| Effective length of anchor | l_f | [mm] | $l_f = \min(h_{ef}; 8 d_{nom})$ | | | | | | | |
| Outside diameter of anchor | d_{nom} | [mm] | 8 | 10 | 12 | 16 | 20 | 24 | 27 | 30 |
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | | 1.0 | | | | | | | |

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

Performances

Characteristic values of resistance for threaded rods under shear loads in cracked and non-cracked concrete

Annex C 3

Table C4: Characteristic values of resistance for rebar under tension loads in non-cracked concrete

| Anchor size reinforcing bar | | Ø8 | Ø10 | Ø12 | Ø16 | Ø20 | Ø25 | Ø32 | |
|---|----------------------|----------------------------|----------------------|----------------------|------|------|-----|-----|-----|
| Steel failure | | | | | | | | | |
| Characteristic tension resistance | | $N_{Rk,s}$ | [kN] | $A_s \times f_{uk}$ | | | | | |
| Combined pull-out and concrete failure | | | | | | | | | |
| Characteristic bond resistance in non-cracked concrete C20/25 | | | | | | | | | |
| Temperature range I: 40°C/24°C | Dry and wet concrete | $\tau_{Rk,ucr}$ | [N/mm ²] | 8.5 | 10.0 | 10.0 | 9.0 | 9.0 | 5.5 |
| | Flooded bore hole | $\tau_{Rk,ucr}$ | [N/mm ²] | 6.0 | 7.5 | 7.5 | 7.5 | NPD | |
| Temperature range II: 80°C/50°C | Dry and wet concrete | $\tau_{Rk,ucr}$ | [N/mm ²] | 6.5 | 7.5 | 7.5 | 7.5 | 7.0 | 5.0 |
| | Flooded bore hole | $\tau_{Rk,ucr}$ | [N/mm ²] | 4.5 | 5.5 | 5.5 | 5.5 | NPD | |
| Increasing factors for concrete ψ_c | | C30/37 | | 1.04 | | | | | |
| | | C40/50 | | 1.08 | | | | | |
| | | C50/60 | | 1.10 | | | | | |
| Factor according to CEN/TS 1992-4-5 Section 6.2.2.3 | | k_B | [-] | 10.1 | | | | | |
| Concrete cone failure | | | | | | | | | |
| Factor according to CEN/TS 1992-4-5 Section 6.2.2.1 | | k_{ucr} | [-] | 10.1 | | | | | |
| Edge distance | | $c_{cr,N}$ | [mm] | 1.5 h_{ef} | | | | | |
| Axial distance | | $s_{cr,N}$ | [mm] | 3.0 h_{ef} | | | | | |
| Splitting failure | | | | | | | | | |
| Edge distance $c_{cr,sp}$ [mm] for | | $h / h_{ef} \geq 2.0$ | | 1.0 h_{ef} | | | | | |
| | | $2.0 > h / h_{ef} > 1.3$ | | 4.6 $h_{ef} - 1.8 h$ | | | | | |
| | | $h / h_{ef} \leq 1.3$ | | 2.26 h_{ef} | | | | | |
| Axial distance | | $s_{cr,sp}$ | [mm] | 2 $c_{cr,sp}$ | | | | | |
| Partial safety factor (dry and wet concrete) | | $\gamma_2 = \gamma_{inst}$ | | 1.2 | | | | | |
| Partial safety factor (flooded bore hole) | | $\gamma_2 = \gamma_{inst}$ | | 1.4 | | | NPD | | |

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

Performances

Characteristic values of resistance for rebar under tension loads in non-cracked concrete

Annex C 4

Table C5: Characteristic values of resistance for rebar rods under shear loads in non-cracked concrete

| Anchor size reinforcing bar | | Ø8 | Ø10 | Ø12 | Ø16 | Ø20 | Ø25 | Ø32 | |
|--|----------------------------|------|-----------------------------------|-----|-----|-----|-----|-----|----|
| Steel failure without lever arm | | | | | | | | | |
| Characteristic shear resistance | $V_{Rk,s}$ | [kN] | $0.50 \times A_s \times f_{uk}$ | | | | | | |
| Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1 | k_2 | | 0.8 | | | | | | |
| Steel failure with lever arm | | | | | | | | | |
| Characteristic bending moment | $M_{Rk,s}^0$ | [Nm] | $1.2 \times W_{el} \times f_{uk}$ | | | | | | |
| Concrete pry-out failure | | | | | | | | | |
| Factor in equation (5.7) of Technical Report TR029 Factor in equation (27) of CEN/TS 1992-4-5 Section 6.3.3 | $k_{(3)}$ | | 2.0 | | | | | | |
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | | 1.0 | | | | | | |
| Concrete edge failure | | | | | | | | | |
| Effective length of anchor | l_f | [mm] | $l_f = \min(h_{ef} ; 8 d_{nom})$ | | | | | | |
| Outside diameter of anchor | d_{nom} | [mm] | 8 | 10 | 12 | 16 | 20 | 25 | 32 |
| Installation safety factor | $\gamma_2 = \gamma_{inst}$ | | 1.0 | | | | | | |

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

Performances
Characteristic values of resistance for rebar under shear loads

Annex C 5

Table C6: Displacement of threaded rod under tension and shear load

| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|----------------------|--------------------|------|-----|-----|------|------|------|------|------|------|
| Non-cracked concrete | | | | | | | | | | |
| Tension load | F | [kN] | 6,3 | 7,9 | 11,9 | 15,9 | 23,8 | 29,8 | 37,7 | 45,6 |
| Displacement | δ_{N0} | [mm] | 0,3 | 0,3 | 0,3 | 0,3 | 0,4 | 0,5 | 0,5 | 0,5 |
| | $\delta_{N\infty}$ | [mm] | 0,5 | 0,5 | 0,5 | 0,5 | 0,5 | 0,5 | 0,5 | 0,5 |
| Shear load | F | [kN] | 3,1 | 5,0 | 7,2 | 13,5 | 21,0 | 30,3 | 39,4 | 48,0 |
| Displacement | δ_{V0} | [mm] | 1,5 | 1,5 | 1,5 | 1,5 | 2,0 | 2,5 | 2,5 | 2,5 |
| | $\delta_{V\infty}$ | [mm] | 2,3 | 2,3 | 2,3 | 2,3 | 3,0 | 3,8 | 3,8 | 3,8 |
| Cracked concrete | | | | | | | | | | |
| Tension load | F | [kN] | | | 7,4 | 13,1 | 20,5 | 24,6 | | |
| Displacement | δ_{N0} | [mm] | | | 0,7 | 0,7 | 0,7 | 0,6 | | |

Table C7: Displacement of rebar rod under tension and shear load

| Rebar size | | | Ø8 | Ø10 | Ø12 | Ø16 | Ø20 | Ø25 | Ø32 | |
|----------------------|--------------------|------|-----|-----|------|------|------|------|------|--|
| Non-cracked concrete | | | | | | | | | | |
| Tension load | F | [kN] | 7,9 | 9,9 | 13,9 | 23,8 | 29,8 | 55,6 | 55,6 | |
| Displacement | δ_{N0} | [mm] | 0,3 | 0,3 | 0,3 | 0,4 | 0,4 | 0,5 | 0,5 | |
| | $\delta_{N\infty}$ | [mm] | 0,5 | 0,5 | 0,5 | 0,5 | 0,5 | 0,5 | 0,5 | |
| Shear load | F | [kN] | 5,9 | 9,3 | 13,3 | 23,7 | 37,0 | 57,9 | 94,8 | |
| Displacement | δ_{V0} | [mm] | 0,3 | 0,4 | 0,4 | 0,4 | 0,4 | 0,5 | 0,9 | |
| | $\delta_{V\infty}$ | [mm] | 0,5 | 0,6 | 0,6 | 0,6 | 0,6 | 0,8 | 1,4 | |

G&B Fissaggi Gebofix PRO VE-SF, Gebofix PRO VE-SF Nordic for concrete

**Performances
Displacements**

Annex C 6