TECHNICAL DATA SHEET

# CHEMICAL ANCHOR ECM

## Product description

ESSVE ECM is a styrene-free polyester resin mortar delivered in a 2-component foil tube cartridge system. The product is compatible with a hand-, battery-, or pneumatic tool and a static mixer. It is designed as a cost-effective alternative for the anchoring of threaded rods and internal threaded rod sleeves for approved applications. An easy and safe application in hollow bricks is guaranteed when combined with a perforated sleeve. After full curing application in environments with base material temperature range -40°C to +80°C is possible.

## Properties and benefits

- European Technical Assessment for use in masonry: ETA-18/0638
- European Technical Assessment for use in uncracked concrete: ETA-18/0639
- Installation in water-filled bore holes (e.g. rain water)
- Overhead application
- Suitable for attachment points close to the edge, since anchoring is free of expansion forces
- Reduced chemical resistance
- High bending- and pressure strength

## Applications samples

Suitable for the fixation of facades, roofs, wood construction, metal construction; metal profile, console, railing, sanitary devices, cable trays, piping, etc.

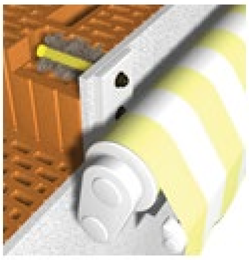
## Handling and storage

**Storage:** store in a cold and dark place, storage temperature: from +5°C up to +25 °C

**Shelf life:** Minimum 3 months for foil tubes

Cartridge can be reused up to the end of the shelf life by replacing the static mixer or resealing cartridge with the screw cap

# Applications and intended use



**Base material:**
Uncracked concrete, light-concrete, porous-concrete, solid masonry, hollow brick, natural stone (Attention! natural stone, can discolour; shall be checked in advance); hammer drilled holes

**Anchor elements:**
Threaded rods (zinc plated or hot dip, stainless steel and high corrosion resistance steel), reinforcing bars, internal threaded rods, profiled rod, steel section with undercuts (e.g. perforated section)

**Temperature range:**
Installation temperature 0°C up to +40°C , see curing time below
Cartridge temperature: +5°C to +40°C
Base material temperature after full curing: -40°C to +80°C

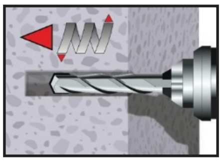
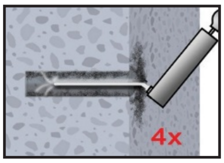
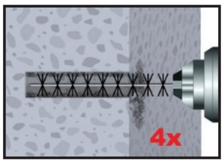
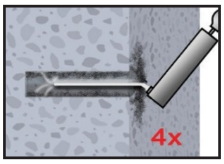
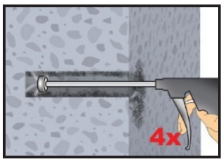
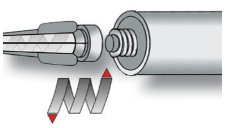
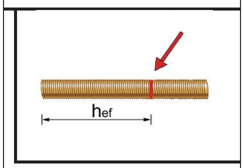
# Mortar properties

| Properties | Test Method | Result |
|---|---|---|
| UV resistance | | Pass |
| Water tightness | EN 12390-8 | 0 mm |
| Temperature stability | | 120 °C |
| pH-value | | > 12 |
| Density | | 1,79 kg / dm³ |
| Compressive strength | EN 196 -1 | 88 N / mm² |
| Flexural strength | EN 196 -1 | 31 N / mm² |
| E-modulus | EN 196 -1 | 14000 N / mm² |

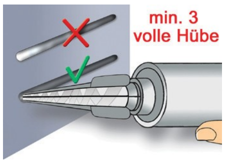
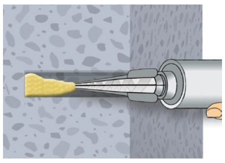
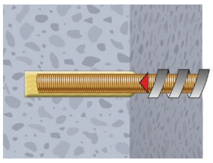
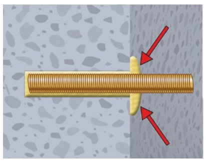
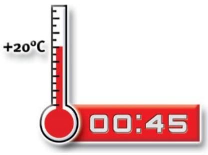
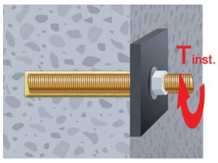
# Curing time

| Temperature of base material | Max. working time | Min. curing time |
|---|---|---|
| 0 °C to +4°C | 45 Min. | 3 h |
| +5 °C to +9°C | 25 Min. | 2 h |
| +10 °C to +14°C | 20 Min. | 100 Min. |
| +15 °C to +19°C | 15 Min. | 80 Min. |
| +20 °C to +29°C | 6 Min. | 45 Min. |
| +30 °C to +34°C | 4 Min. | 25 Min. |
| +35 °C to +39°C | 2 Min. | 20 Min. |
| Cartridge temperature | +5°C to +40°C | |

# Usage instructions – concrete

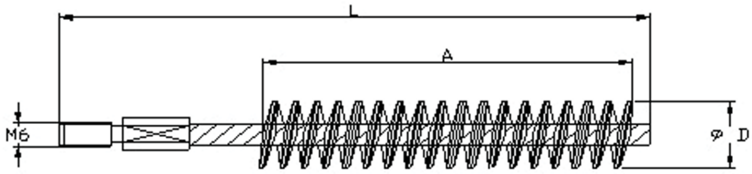
| | |
|---|---|
|  | 1. Drill with hammer drill mode a hole into the base material to the size and embedment depth required by the selected anchor (see page 6). In case of aborted drill hole: the drill hole shall be filled with mortar |
|   or | **Attention! Standing water must be removed before cleaning.**<br><br>2a. Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (min. 6 bar) or a hand pump (see page 6) 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 up to bore hole diameter 20 mm or embedment depth up to 240mm. Compressed air (min. 6 bar) can be used for all sizes. |
|   | 2b. Check brush diameter (page 6) and attach the brush to a drilling machine or a battery screwdriver. Brush the hole with an appropriate sized wire brush > $d_{b,min}$ (see page 6) a minimum of four times. If the bore hole ground is not reached with the brush, a brush extension shall be used. |
|   or   | 2c. Finally blow the hole clean again with compressed air (min. 6 bar) or a hand pump 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 up to bore hole diameter 20 mm or embedment depth up to 240mm. Compressed air (min. 6 bar) can be used for all sizes.<br><br>**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 has to be repeated directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.** |
|  | 3. Attach a supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. After every working interruption longer than the recommended working time 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. |

# Usage instructions – concrete

| | |
|---|---|
|   | 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 grey colour. |
|  | 6. Starting from the bottom resp. back of the cleaned anchor hole fill the hole up to approximately two-thirds with adhesive. Slowly withdraw of the static mixing nozzle as the hole is filled avoids creating air pockets. For embedments larger than 190mm an extension nozzle shall be used. For overhead and horizontal installation in bore holes bigger than 20mm resp. deeper than 240mm a piston plug shall be used. Observe the gel-/ working times given. |
|  | 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. |
|   | 9. Allow the adhesive to cure to the specified time prior to applying any load or torque. Do not move or load the anchor until it is fully cured. |
|   | 10. After full curing, the add-on part can be installed with the max. torque by using a calibrated torque wrench. |

# Cleaning of the drill hole – concrete

| Threaded rod | Bore hole-∅ | Brush-∅ | Min. brush-∅ |
|---|---|---|---|
| (mm) | (mm) | $d_b$ (mm) | $d_{b,min}$ (mm) |
| M 8 | 10,0 | 12,0 | 10,5 |
| M 10 | 12,0 | 14,0 | 12,5 |
| M 12 | 14,0 | 16,0 | 14,5 |
| M 16 | 18,0 | 20,0 | 18,5 |
| M 20 | 24,0 | 26,0 | 24,5 |
| M 24 | 28,0 | 30,0 | 28,5 |




Brush:
∅ 0,20 mm (A2) Steel wire
Brush length: 80 mm
M6 thread for drilling machine connection

Blower

# Setting parameter

| Anchor size (Threaded rod) | | | | M8 | M10 | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|---|---|
| Edge distance | 1,0 x $h_{ef}$ | $C_{cr,N}$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 |
| Min. edge distance | 5,0 x d | $C_{min}$ | [mm] | 40 | 50 | 60 | 80 | 100 | 120 |
| Axial distance | 2,0 x $h_{ef}$ | $S_{cr,N}$ | [mm] | 160 | 180 | 220 | 250 | 340 | 420 |
| Min. axial distance | 5,0 x d | $S_{min}$ | [mm] | 40 | 50 | 60 | 80 | 100 | 120 |
| Embedment depth | | $h_{ef}$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 |
| Min. part thickness | | $h_{min}$ | [mm] | $h_{ef}$ + 30 mm | | | $h_{ef}$ + $2d_0$ | | |
| Anchor diameter | | d | [mm] | 8 | 10 | 12 | 16 | 20 | 24 |
| Drill diameter | | $d_0$ | [mm] | 10 | 12 | 14 | 18 | 24 | 28 |
| Max. installation torque | | $T_{inst.}$ | [Nm] | 10 | 20 | 40 | 60 | 120 | 150 |

# Performance data – concrete

All data is based on Technical Assessment ETA 18/0639 (published 2018-09-24) and applies for:

- Correct installation according to ETA
- No edge distance and spacing influence. It's advised to use our calculation software ESSVE CS for more complicated design situations
- One typical embedment depth, as specified in the table. Including the minimum base material thickness dependant on this embedment depth
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Temperature range I (min. base material temp. -40°C, max. long/short term base material temp.: +24°C/40°C)
- Steel failure mode is denoted with *underline italics*
- Undersized hot dip galvanized threaded rods (e.g. 5.8U and 8.8U) have a reduced stress area in accordance with ISO 10684 Annex A. This lowers the steel capacity for M8 and M10, larger sizes are not affected
- The Design Resistance includes the partial safety factor for material $\gamma_M$ and optimal installation safety factor ($\gamma_{inst}$), (e.g. dry/wet concrete rather than water-filled hole)
- The Recommended Loads use an overall partial safety factor for action $\gamma$ = 1.4, which is an approximation of Eurocode EN 1990

# Performance data – concrete

**ESSVE ECM - Typical embedment depth**

| | | M8 | M10 | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|
| Effective embedment depth, $h_{ef}$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 |
| Minimum concrete thickness, $h_{min}$ | [mm] | 110 | 120 | 140 | 161 | 218 | 266 |

**ESSVE ECM - Characteristic resistance, uncracked concrete, typical embedment depth**

| | | | M8 | M10 | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|---|
| Tension $N_{Rk}$ | [kN] | 5.8 | 17.1 | 22.6 | 33.2 | 50.3 | 85.5 | 126.7 |
| | | 8.8 | 17.1 | 22.6 | 33.2 | 50.3 | 85.5 | 126.7 |
| | | A4-70 | 17.1 | 22.6 | 33.2 | 50.3 | 85.5 | 126.7 |
| | | HDG 5.8U | 17.1 | 22.6 | Same as for 5.8 | | | |
| | | HDG 8.8U | 17.1 | 22.6 | Same as for 8.8 | | | |

| | | | M8 | M10 | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|---|
| Shear $V_{Rk}$ | [kN] | 5.8 | *9.0* | *15.0* | *21.0* | *39.0* | *61.0* | *88.0* |
| | | 8.8 | *15.0* | *23.0* | *34.0* | *63.0* | *98.0* | *141.0* |
| | | A4-70 | *13.0* | *20.0* | *30.0* | *55.0* | *86.0* | *124.0* |
| | | HDG 5.8U | *8.0* | *13.0* | Same as for 5.8 | | | |
| | | HDG 8.8U | *14.0* | *22.0* | Same as for 8.8 | | | |

**ESSVE ECM - Design resistance, uncracked concrete, typical embedment depth**

| | | | M8 | M10 | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|---|
| Tension $N_{Rd}$ | [kN] | 5.8 | 9.5 | 12.6 | 18.4 | 27.9 | 47.5 | 70.4 |
| | | 8.8 | 9.5 | 12.6 | 18.4 | 27.9 | 47.5 | 70.4 |
| | | A4-70 | 9.5 | 12.6 | 18.4 | 27.9 | 47.5 | 70.4 |
| | | HDG 5.8U | 9.5 | 12.6 | Same as for 5.8 | | | |
| | | HDG 8.8U | 9.5 | 12.6 | Same as for 8.8 | | | |

| | | | M8 | M10 | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|---|
| Shear $V_{Rd}$ | [kN] | 5.8 | *7.2* | *12.0* | *16.8* | *31.2* | *48.8* | *70.4* |
| | | 8.8 | *12.0* | *18.4* | *27.2* | *50.4* | *78.4* | *112.8* |
| | | A4-70 | *8.3* | *12.8* | *19.2* | *35.3* | *55.1* | *79.5* |
| | | HDG 5.8U | *6.4* | *10.4* | Same as for 5.8 | | | |
| | | HDG 8.8U | *11.2* | *17.6* | Same as for 8.8 | | | |

# Performance data – concrete

**ESSVE ECM - Typical embedment depth**

| | | M8 | M10 | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|
| Effective embedment depth, $h_{ef}$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 |
| Minimum concrete thickness, $h_{min}$ | [mm] | 110 | 120 | 140 | 161 | 218 | 266 |

**ESSVE ECM - Recommended loads, uncracked concrete, typical embedment depth**

| | | | M8 | M10 | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|---|
| Tension $N_{rec}$ | [kg] | 5.8 | 690 | 915 | 1340 | 2030 | 3455 | 5125 |
| | | 8.8 | 690 | 915 | 1340 | 2030 | 3455 | 5125 |
| | | A4-70 | 690 | 915 | 1340 | 2030 | 3455 | 5125 |
| | | HDG 5.8U | 690 | 915 | Same as for 5.8 | | | |
| | | HDG 8.8U | 690 | 915 | Same as for 8.8 | | | |

| | | | M8 | M10 | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|---|---|---|
| Shear $V_{rec}$ | [kg] | 5.8 | *520* | *870* | *1220* | *2270* | *3550* | *5125* |
| | | 8.8 | *870* | *1340* | *1980* | *3670* | *5710* | *8215* |
| | | A4-70 | *605* | *930* | *1400* | *2565* | *4015* | *5785* |
| | | HDG 5.8U | *465* | *755* | Same as for 5.8 | | | |
| | | HDG 8.8U | *815* | *1280* | Same as for 8.8 | | | |

# Setting data – masonry

ESSVE ECM can also be used for anchorages in masonry, both hollow and solid bricks. For application in hollow bricks perforated sleeves need to be used.

| **Solid bricks** | | | M8 | M10 | M12 | M16 | IG-M6 | IG-M8 | IG-M10 |
|---|---|---|---|---|---|---|---|---|---|
| nominal drill hole diameter | $d_0$ | [mm] | 10 | 12 | 14 | 18 | 10 | 12 | 16 |
| embedment depth | $h_{ef}$ | [mm] | 80 | 90 | 100 | 100 | 90 | 100 | 100 |
| bore hole depth | $h_0$ | [mm] | 80 | 90 | 100 | 100 | 90 | 100 | 100 |
| diameter of clearance hole in fixture | $d_f$ | [mm] | 9 | 12 | 14 | 18 | 7 | 9 | 12 |
| diameter of steel brush | $d_b \geq$ | [mm] | 12 | 14 | 16 | 20 | 12 | 14 | 18 |

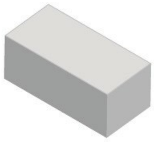
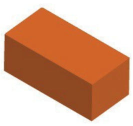
| **Hollow and solid bricks** | | | M8 | M8 | M10 | M12 | M16 | IG-M6 | IG-M8 | IG-M10 |
|---|---|---|---|---|---|---|---|---|---|---|
| perforated sleeve | | | 12x80 | 16x85<br>16x130<br>16x200 | 16x85<br>16x130<br>16x200 | 20x85<br>20x130<br>20x200 | 20x85<br>20x130<br>20x200 | 16x85<br>16x130<br>16x200 | 20x85<br>20x130<br>20x200 | 20x85<br>20x130<br>20x200 |
| nominal drill hole diameter | $d_0$ | [mm] | 12 | 16 | 16 | 20 | 20 | 16 | 20 | 20 |
| embedment depth | $h_{ef}$ | [mm] | 80 | 85<br>130<br>200 | 85<br>130<br>200 | 85<br>130<br>200 | 85<br>130<br>200 | 85<br>130<br>200 | 85<br>130<br>200 | 85<br>130<br>200 |
| bore hole depth | $h_0$ | [mm] | 85 | 90<br>135<br>205 | 90<br>135<br>205 | 90<br>135<br>205 | 90<br>135<br>205 | 90<br>135<br>205 | 90<br>135<br>205 | 90<br>135<br>205 |
| diameter of clearance hole in fixture | $d_f$ | [mm] | 9 | 9 | 12 | 14 | 18 | 7 | 9 | 12 |
| diameter of steel brush | $d_b \geq$ | [mm] | 14 | 18 | 18 | 22 | 22 | 18 | 22 | 22 |

# Performance data – masonry

The technical data sheet contains a selection of the most common masonry bricks, more bricks can be found in the masonry ETA.

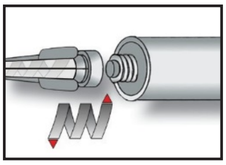
It is also possible to use the chemical anchor for stones not found in the ETA, but then construction site tests are necessary to obtain a load capacity, the results can be compared with similar bricks from the ETA, contact our technical support for assistance.

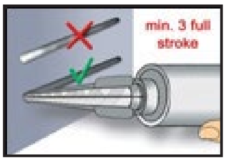
Common bricks from the masonry ETA:

| **type** | **figure** | **dimensions l x b x h [mm]** | **compressive strength [N/mm²]** | **density [kg/dm³]** | **producer** |
|---|---|---|---|---|---|
| solid calcium silica brick KS-NF |  | ≥ 240 x 115 x 71 | ≥ 10 | ≥ 2,0 | e.g. Wemding (D) |
| solid light weight con-crete brick LAC |  | ≥ 300 x 123 x 248 | ≥ 2 | ≥ 0,6 | e.g. Bisotherm (D) |
| Hollow con-crete brick Leca Lex Hark-ko RUH-200 |  | ≥ 498 x 200 x 195 | ≥ 2,7 | ≥ 0,7 | e.g. Saint Gobain Weber (FIN) |
| Solid concrete brick Leca Lex Har-kko RUH-200 Kulma |  | ≥ 498 x 200 x 195 | ≥ 3 | ≥ 0,78 | e.g. Saint Gobain Weber (FIN) |
| solid clay brick Mz-1DF |  | ≥ 240 x 115 x 55 | ≥ 10 | ≥ 1,6 | e.g. Unipor (D) |
| autoclaved ae-rated concrete AAC |  | ≥ 499 x 240 x 249 | ≥ 2 | ≥ 0,6 | e.g. Porrit (D) |

# Installation instructions – solid masonry

**Preparation of cartridge**

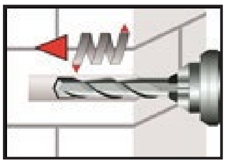




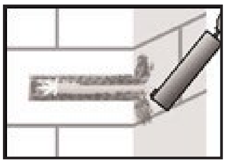

1. Remove the cap and attach the supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. In case of a foil tube cartridge, cut off the clip before use. For every working interruption longer than the recommended working time (Table B4) as well as for new cartridges, a new static-mixer shall be used.

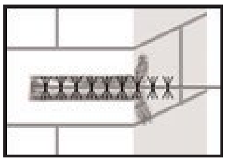
2. Initial adhesive is not suitable for fixing the anchor. Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes, for foil tube cartridges six full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey colour.

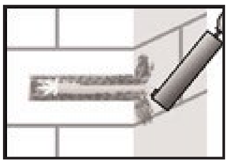
**Installation in solid masonry (without sleeve)**



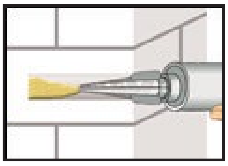
3. Holes to be drilled perpendicular to the surface of the base material by using a hard-metal tipped hammer drill bit. Drill a hole, with drilling method according to Annex C4-C45, into the base material, with nominal drill hole diameter and bore hole depth according to the size and embedment depth required by the selected anchor. In case of aborted drill hole the drill hole shall be filled with mortar.



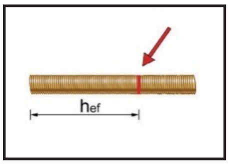




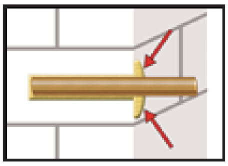
4. Blow out from the bottom of the bore hole two times. Attach the brush to a drilling machine or a battery screwdriver, brush the hole clean two times, and finally blow out the hole again two times.

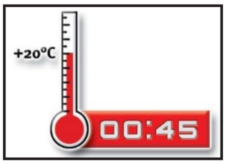


5. Starting from the bottom or back of the cleaned anchor hole, fill the hole up to min two-thirds with adhesive. Slowly withdraw the static mixing nozzle will avoid creating air pockets. Observe the gel-/ working times given in Table B4.



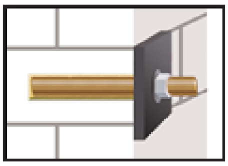

6. The position of the embedment depth shall be marked on the threaded rod. Push the threaded rod into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. The anchor shall be free of dirt, grease, oil or other foreign material.





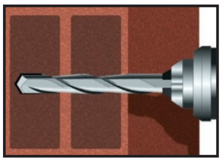
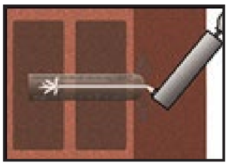
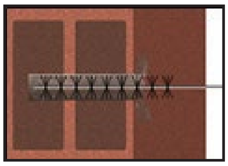
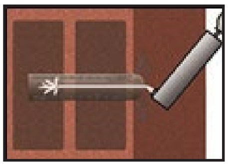
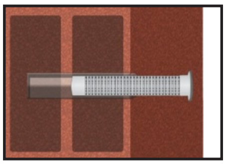
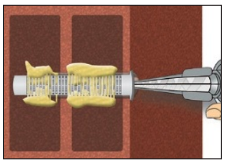
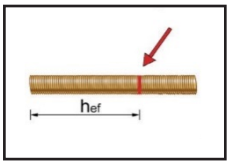
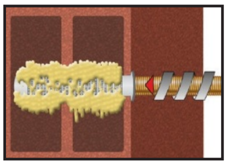
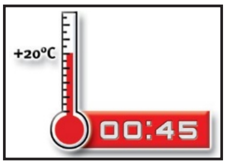
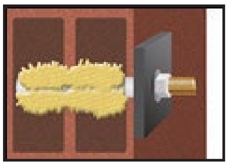

7. Be sure that the anular gap is fully filled with mortar. If no excess mortar is visible at the top of the hole, the application has to be renewed.

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

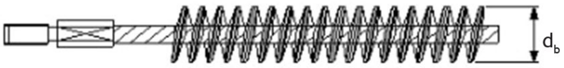


9. After full curing, the fixture can be installed with up to the max. installation torque (see parameters of brick Annex C4 to Annex C45) by using a calibrated torque wrench.

# Installation instructions – hollow masonry

| Installation in solid and hollow masonry (with sleeve) | |
|---|---|
|  | 3. Holes to be drilled perpendicular to the surface of the base material by using a hard-metal tipped hammer drill bit. Drill a hole, with drill method according to Annex C4 - C45, into the base material, with nominal drill hole diameter and bore hole depth according to the size and embedment depth required by the selected anchor. |
|    | 4. Blow out from the bottom of the bore hole two times. Attach the brush to a drilling machine or a battery screwdriver, brush the hole clean two times, and finally blow out the hole again two times. |
|  | 5. Insert the perforated sleeve flush with the surface of the masonry or plaster. Only use sleeves that have the right length. Never cut the sleeve. |
|  | 6. Starting from the bottom or back fill the sleeve with adhesive. For embedment depth equal to or larger than 130 mm an extension nozzle shall be used. For quantity of mortar attend cartridges label installation instructions.Observe the gel-/ working times given in Table B4. |
|    | 7. The position of the embedment depth shall be marked on the threaded rod. Push the threaded rod into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. The anchor shall be free of dirt, grease, oil or other foreign material. |
|   | 8. Allow the adhesive to cure to the specified curing time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (attend Table B4). |
|  | 9. After full curing, the fixture can be installed with up to the max. installation torque (See parameters of brick Annex C4 to Annex C45) by using a calibrated torque wrench. |

# Cleaning – masonry



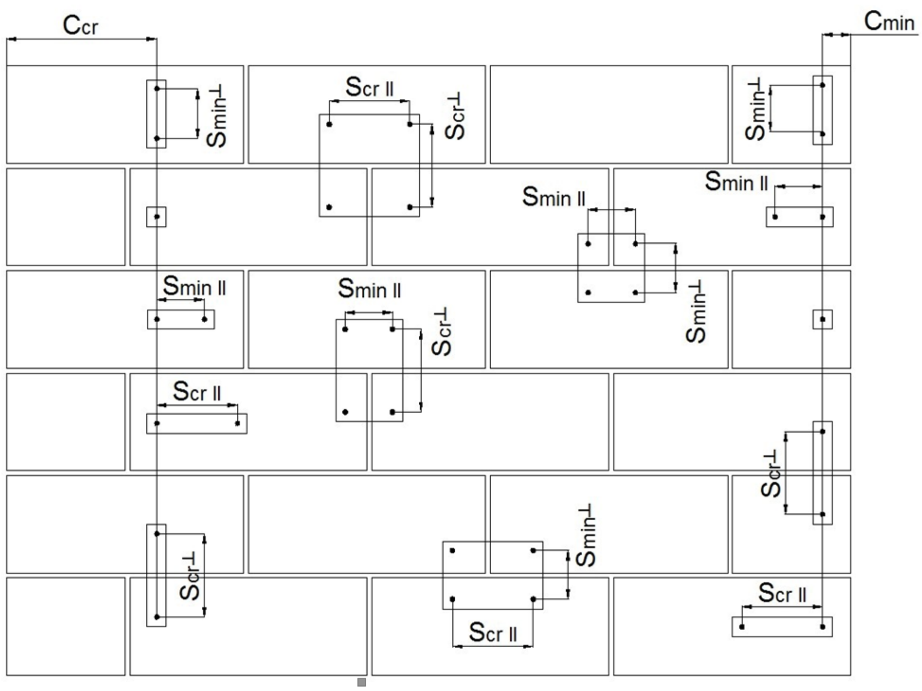

- Brush:

- Blower

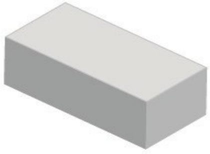
# Calculation of recommended loads

The recommended loads are only valid under the following conditions. For a more detailed design see ETA:

- dry environment
- spacing $s \geq s_{cr}$
- edge distance $c \geq c_{cr}$
- masonry mortar of strength class M2,5 to M9
- no prestressing force on the wall
- visible joints
- vertical joints are filled with mortar
- steel strength of anchor rod 5.8 or higher
- the partial safety factors for material and load are already considered
- no interaction of tension and shear loads considered



# Recommended loads in masonry

| solid calcium silica brick<br>KS-NF |  | **dimensions**<br>≥ 240 x 115 x 71 | **compressive strength**<br>≥ 10 N/mm² | **density**<br>≥ 2,0 kg/dm³ | **producer**<br>e.g. Wemding (D) |
|---|---|---|---|---|---|

| **usage without perforated sleeve** | | | M8 | M10 | M12 | M16 | IG-M6 [3] | IG-M8 [3] | IG-M10 [3] |
|---|---|---|---|---|---|---|---|---|---|
| perforated sleeve | | | - | - | - | - | - | - | - |
| anchorage depth | $h_{ef}$ | mm | 80 | 90 | 100 | 100 | 90 | 100 | 100 |
| minimum wall thickness | $h_{min}$ | mm | 115 | 240 | 240 | 240 | 240 | 240 | 240 |
| installation torque | $T_{inst}$ | Nm | 2 | | | | | | |
| drilling method | | | hammer drilling | | | | | | |
| critical edge distance | $c_{cr}$ | mm | 120 | 135 | 150 | 150 | 135 | 150 | 150 |
| critical axial distance parallel to horizontal joint | $s_{cr,II}$ | mm | 240 | 270 | 300 | 300 | 270 | 300 | 300 |
| critical axial distance perpendicular to horizontal joint | $s_{cr,T}$ | mm | 240 | 270 | 300 | 300 | 270 | 300 | 300 |
| minimal edge distance [2] | $c_{min}$ | mm | $c_{cr}$ | | | | | | |
| minimal axial distance [2] | $s_{min}$ | mm | $s_{cr}$ | | | | | | |
| recommended tension load [1] | $N_{zul}$ | kN | 0,86 | | | | | | |
| recommended vertical shear load [1] | $V_{vert.}$ | kN | 0,86 | | | | | | |
| recommended horizontal shear load [1] | $V_{hori.}$ | kN | 0,86 | | | | | | |

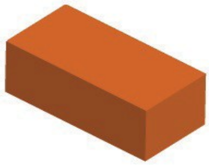
| **usage with perforated sleeve** | | | M8 | M8 | M10 | M12 | M16 | IG-M6 [3] | IG-M8 [3] | IG-M10 [3] |
|---|---|---|---|---|---|---|---|---|---|---|
| perforated sleeve | | | 12 | 16 | 16 | 20 | 20 | 16 | 20 | 20 |
| anchorage depth | $h_{ef}$ | mm | 80 | 85; 130; 200 | | | | | | |
| minimum wall thickness | $h_{min}$ | mm | 115 | $h_{ef}$ + 30mm | | | | | | |
| installation torque | $T_{inst}$ | Nm | 2 | | | | | | | |
| drilling method | | | hammer drilling | | | | | | | |
| critical edge distance | $c_{cr}$ | mm | 120 | 127,5 | | | | | | |
| critical axial distance parallel to horizontal joint | $s_{cr,II}$ | mm | 240 | 255 | | | | | | |
| critical axial distance perpendicular to horizontal joint | $s_{cr,T}$ | mm | 240 | 255 | | | | | | |
| minimal edge distance [2] | $c_{min}$ | mm | $c_{cr}$ | | | | | | | |
| minimal axial distance [2] | $s_{min}$ | mm | $s_{cr}$ | | | | | | | |
| recommended tension load [1] | $N_{zul}$ | kN | 0,71 | | | | | | | |
| recommended vertical shear load [1] | $V_{vert.}$ | kN | 0,71 | 0,86 | | | | | | |
| recommended horizontal shear load [1] | $V_{hori.}$ | kN | 0,71 | 0,86 | | | | | | |

[1] Conditions and assumptions for the recommended loads, see page 13

[2] Reduction factors, see ETA

[3] Not covered by the ETA

# Recommended loads in masonry

| solid clay brick<br>Mz-1DF |  | **dimensions**<br>≥ 240 x 115 x 55 | **compressive strength**<br>≥ 10 N/mm² | **density**<br>≥ 1,6 kg/dm³ | **producer**<br>e.g. Unipor (D) |
|---|---|---|---|---|---|

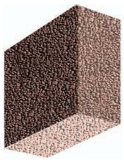
| **usage without perforated sleeve** | | | M8 | M10 | M12 | M16 | IG M6 [3] | IG M8 [3] | IG M10 [3] |
|---|---|---|---|---|---|---|---|---|---|
| perforated sleeve | | | - | - | - | - | - | - | - |
| anchorage depth | $h_{ef}$ | mm | 80 | 90 | 100 | 100 | 90 | 100 | 100 |
| minimum wall thickness | $h_{min}$ | mm | 115 | 240 | 240 | 240 | 240 | 240 | 240 |
| installation torque | $T_{inst}$ | Nm | 2 | | | | | | |
| drilling method | | | hammer drilling | | | | | | |
| critical edge distance | $c_{cr}$ | mm | 120 | 135 | 150 | 150 | 135 | 150 | 150 |
| critical axial distance parallel to horizontal joint | $s_{cr,II}$ | mm | 240 | 270 | 300 | 300 | 270 | 300 | 300 |
| critical axial distance perpendicular to horizontal joint | $s_{cr,T}$ | mm | 240 | 270 | 300 | 300 | 270 | 300 | 300 |
| minimal edge distance [2] | $c_{min}$ | mm | $c_{cr}$ | | | | | | |
| minimal axial distance [2] | $s_{min}$ | mm | $s_{cr}$ | | | | | | |
| recommended tension load [1] | $N_{zul}$ | kN | 0,43 | | | | | | |
| recommended vertical shear load [1] | $V_{vert.}$ | kN | 0,86 | 1,0 | 1,43 | 1,43 | 0,86 | 1,0 | 1,43 |
| recommended horizontal shear load [1] | $V_{hori.}$ | kN | 0,86 | 1,0 | 1,43 | 1,43 | 0,86 | 1,0 | 1,43 |

| **usage with perforated sleeve** | | | M8 | M8 | M10 | M12 | M16 | IG M6 [3] | IG M8 [3] | IG M10 [3] |
|---|---|---|---|---|---|---|---|---|---|---|
| perforated sleeve | | | 12 | 16 | 16 | 20 | 20 | 16 | 20 | 20 |
| anchorage depth | $h_{ef}$ | mm | 80 | 85; 130; 200 | | | | | | |
| minimum wall thickness | $h_{min}$ | mm | 115 | $h_{ef}$ + 30mm | | | | | | |
| installation torque | $T_{inst}$ | Nm | 2 | | | | | | | |
| drilling method | | | hammer drilling | | | | | | | |
| critical edge distance | $c_{cr}$ | mm | 120 | 127,5 | | | | | | |
| critical axial distance parallel to horizontal joint | $s_{cr,II}$ | mm | 240 | 255 | | | | | | |
| critical axial distance perpendicular to horizontal joint | $s_{cr,T}$ | mm | 240 | 255 | | | | | | |
| minimal edge distance [2] | $c_{min}$ | mm | $c_{cr}$ | | | | | | | |
| minimal axial distance [2] | $s_{min}$ | mm | $s_{cr}$ | | | | | | | |
| recommended tension load [1] | $N_{zul}$ | kN | 0,57 | | | | | | | |
| recommended vertical shear load [1] | $V_{vert.}$ | kN | 0,86 | 0,86 | 1,0 | 1,0 | 1,0 | 0,86 | 1,0 | 1,0 |
| recommended horizontal shear load [1] | $V_{hori.}$ | kN | 0,86 | 0,86 | 1,0 | 1,0 | 1,0 | 0,86 | 1,0 | 1,0 |

[1] Conditions and assumptions for the recommended loads, see page 13

[2] Reduction factors, see ETA

# Recommended loads in masonry

| | | | | | |
|---|---|---|---|---|---|
| solid light weight concrete brick<br><br>LAC |  | **dimensions**<br>≥ 300 x 123x 248 | **compressive strength**<br>≥ 2 N/mm² | **density**<br>≥ 0,6 kg/dm³ | **producer**<br>e.g. Bisotherm (D) |

| **usage without perforated sleeve** | | | M8 | M10 | M12 | M16 | IG M6 [3] | IG M8 [3] | IG M10 [3] |
|---|---|---|---|---|---|---|---|---|---|
| perforated sleeve | | | - | - | - | - | - | - | - |
| anchorage depth | $h_{ef}$ | mm | 80 | 90 | 100 | 100 | 90 | 100 | 100 |
| minimum wall thickness | $h_{min}$ | mm | 300 | | | | | | |
| installation torque | $T_{inst}$ | Nm | 2 | | | | | | |
| drilling method | | | hammer drilling | | | | | | |
| critical edge distance | $c_{cr}$ | mm | 120 | 135 | 150 | 150 | 135 | 150 | 150 |
| critical axial distance parallel to horizontal joint | $s_{cr,II}$ | mm | 240 | 270 | 300 | 300 | 270 | 300 | 300 |
| critical axial distance perpendicular to horizontal joint | $s_{cr,T}$ | mm | 240 | 270 | 300 | 300 | 270 | 300 | 300 |
| minimal edge distance [2] | $c_{min}$ | mm | $c_{cr}$ | | | | | | |
| minimal axial distance [2] | $s_{min}$ | mm | $s_{cr}$ | | | | | | |
| recommended tension load [1] | $N_{zul}$ | kN | 0,57 | | | | | | |
| recommended vertical shear load [1] | $V_{vert.}$ | kN | 0,86 | 1,00 | 1,14 | 1,14 | 1,00 | 1,14 | 1,14 |
| recommended horizontal shear load [1] | $V_{hori.}$ | kN | 0,60 | 0,78 | 0,98 | 1,07 | 0,78 | 0,98 | 1,07 |

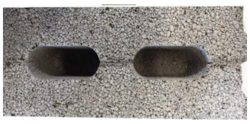
| | | | | | |
|---|---|---|---|---|---|
| solid light weight concrete brick<br>Leca Lex Harkko<br>RUH-200 kulma |  | **dimensions**<br>≥ 498 x 200 x 195 | **compressive strength**<br>≥ 3 N/mm² | **density**<br>≥ 0,78 kg/dm³ | **producer**<br>e.g. Saint Gobain Weber (FIN) |

| **usage without perforated sleeve** | | | M8 | M10 | M12 | M16 | IG M6 [3] | IG M8 [3] | IG M10 [3] |
|---|---|---|---|---|---|---|---|---|---|
| perforated sleeve | | | - | - | - | - | - | - | - |
| anchorage depth | $h_{ef}$ | mm | 80 | 90 | 100 | 100 | 90 | 100 | 100 |
| minimum wall thickness | $h_{min}$ | mm | 300 | | | | | | |
| installation torque | $T_{inst}$ | Nm | 2 | | | | | | |
| drilling method | | | hammer drilling | | | | | | |
| critical edge distance | $c_{cr}$ | mm | 120 | 135 | 150 | 150 | 135 | 150 | 150 |
| critical axial distance parallel to horizontal joint | $s_{cr,II}$ | mm | 240 | 270 | 300 | 300 | 270 | 300 | 300 |
| critical axial distance perpendicular to horizontal joint | $s_{cr,T}$ | mm | 240 | 270 | 300 | 300 | 270 | 300 | 300 |
| minimal edge distance [2] | $c_{min}$ | mm | $c_{cr}$ | | | | | | |
| minimal axial distance [2] | $s_{min}$ | mm | $s_{cr}$ | | | | | | |
| recommended tension load [1] | $N_{zul}$ | kN | 0,57 | 0,86 | | | | | |
| recommended vertical shear load [1] | $V_{vert.}$ | kN | 0,86 | 1,14 | | | | | |
| recommended horizontal shear load [1] | $V_{hori.}$ | kN | 0,73 | 0,95 | 1,14 | 1,14 | 0,95 | 1,14 | 1,14 |

[1] Conditions and assumptions for the recommended loads, see page 13

[2] Reduction factors, see ETA

# Recommended loads in masonry

| | | | | | |
|---|---|---|---|---|---|
| hollow concrete brick<br>Leca Lex Harkko<br>RUH-200 |  | **dimensions**<br>≥ 498 x 200 x 195 mm | **compressive strength**<br>≥ 2,7 N/mm² | **density**<br>≥ 0,7 kg/dm³ | **producer**<br>e.g. Saint Gobain Weber (FIN) |

| | | | M8 | M8 | M10 | M12 | M16 | IG M6 [3] | IG M8 [3] | IG M10 [3] |
|---|---|---|---|---|---|---|---|---|---|---|
| perforated sleeve | | | 12 | 16 | 16 | 20 | 20 | 16 | 20 | 20 |
| anchorage depth | $h_{ef}$ | mm | 80 | 85; 130 | | | | | | |
| minimum wall thickness | $h_{min}$ | mm | 200 | | | | | | | |
| installation torque | $T_{inst}$ | Nm | 2 | | | | | | | |
| drilling method | | | rotation drilling | | | | | | | |
| critical edge distance | $c_{cr}$ | mm | 100 | 100 | 100 | 120 | 120 | 100 | 120 | 120 |
| critical axial distance parallel to horizontal joint | $s_{cr,II}$ | mm | 498 | | | | | | | |
| critical axial distance perpendicular to horizontal joint | $s_{cr,T}$ | mm | 195 | | | | | | | |
| minimal edge distance [2] | $c_{min}$ | mm | $c_{cr}$ | | | | | | | |
| minimal axial distance [2] | $s_{min}$ | mm | $s_{cr}$ | | | | | | | |
| recommended tension load [1] | $N_{zul}$ | kN | 0,57 | | | 0,71 | 0,71 | 0,57 | 0,71 | 0,71 |
| recommended vertical shear load [1] | $V_{vert.}$ | kN | 0,71 | 1,00 | | | | | | |
| recommended horizontal shear load [1] | $V_{hori.}$ | kN | 0,26 | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| autocalved aerated concrete<br><br>AAC |  | **dimensions**<br>≥ 499 x 249 x 240 mm | **compressive strength**<br>≥ 2 N/mm² | **density**<br>≥ 0,2 kg/dm³ | **producer**<br>e.g. Porit (D) |

| | | | M8 | M10 | M12 | M16 | IG M6 [3] | IG M8 [3] | IG M10 [3] |
|---|---|---|---|---|---|---|---|---|---|
| perforated sleeve | | | - | - | - | - | - | - | - |
| anchorage depth | $h_{ef}$ | mm | 80 | 90 | 100 | 100 | 90 | 100 | 100 |
| minimum wall thickness | $h_{min}$ | mm | 240 | | | | | | |
| installation torque | $T_{inst}$ | Nm | 2 | | | | | | |
| drilling method | | | hammer drilling | | | | | | |
| critical edge distance | $c_{cr}$ | mm | 120 | 135 | 150 | 150 | 135 | 150 | 150 |
| critical axial distance parallel to horizontal joint | $s_{cr,II}$ | mm | 240 | 270 | 300 | 300 | 270 | 300 | 300 |
| critical axial distance perpendicular to horizontal joint | $s_{cr,T}$ | mm | 240 | 270 | 300 | 300 | 270 | 300 | 300 |
| minimal edge distance [2] | $c_{min}$ | mm | 75 | | | | | | |
| minimal axial distance [2] | $s_{min}$ | mm | 100 | | | | | | |
| recommended tension load [1] | $N_{zul}$ | kN | 0,89 | 1,43 | 1,79 | 2,32 | 1,43 | 1,79 | 2,32 |
| recommended vertical shear load [1] | $V_{vert.}$ | kN | 2,14 | 3,03 | 3,57 | 3,57 | 1,79 | 3,21 | 3,57 |
| recommended horizontal shear load [1] | $V_{hori.}$ | kN | 1,29 | 1,68 | 2,13 | 2,32 | 1,44 | 1,88 | 2,01 |

[1] Conditions and assumptions for the recommended loads, see page 13

[2] Reduction factors, see ETA