

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-20/0768
of 25 November 2020

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

WDB-08, WDB-10, WDB-12

Product family
to which the construction product belongs

Mechanical fasteners for use in concrete

Manufacturer

Klimas Sp. z o.o.
Kuznica Kiedrzynska
ul. Wincentego Witosa 135/137
42-233 MYKANÓW
POLEN

Manufacturing plant

Plant 4

This European Technical Assessment
contains

18 pages including 3 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

EAD 330232-00-0601, Edition 10/2016

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Specific Part

1 Technical description of the product

The WDB-08, WDB-10, WDB-12 is an anchor made of galvanized or stainless steel in of sizes 8, 10 and 12. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

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

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the concrete screw of at least 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 right 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 to tension load (static and quasi-static loading) | see Annex B 3 and C 1 |
| Characteristic resistance to shear load (static and quasi-static loading) | see Annex C 2 |
| Displacements (static and quasi-static loading) | see Annex C 3 |
| Characteristic resistance and displacements for seismic performance categories C1 and C2 | No performance assessed |
| Durability | See Annex B 1 |

3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|--------------------------|-----------------------|
| Reaction to fire | Class A1 |
| Resistance to fire | See Annex C 4 and C 5 |

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

In accordance with European Assessment Documents EAD No. 330232-00-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

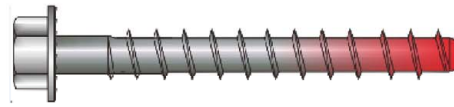
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 25 November 2020 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Baderschneider

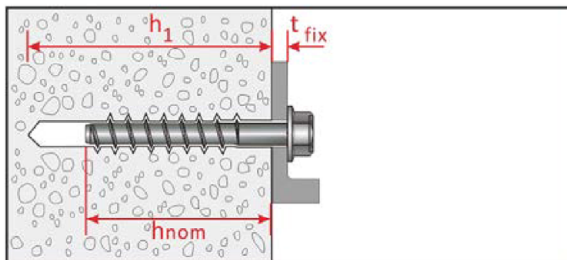
Product in the installed condition



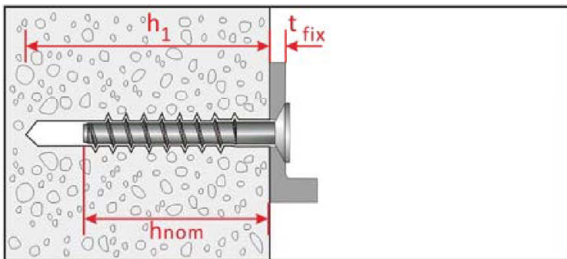
Steel 10B21



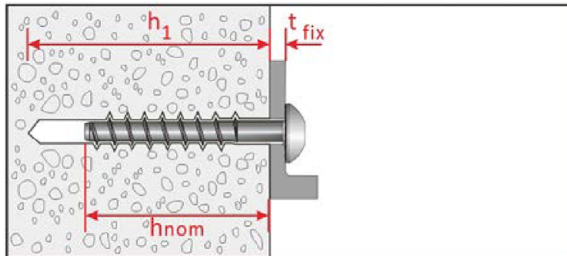
Stainless steel A4



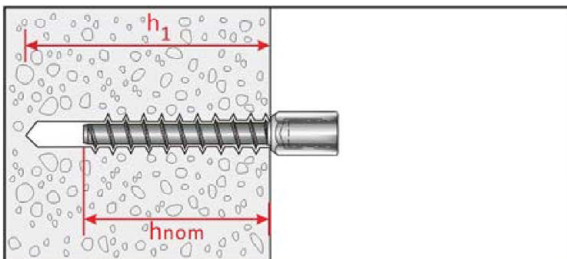
Hexagon Head : WDB-LS, WDB-LSF
10B21 (WDB8, WDB10, WDB12)
A4 (WDB8, WDB10, WDB12)



Countersunk Head : WDB-LP
10B21 (WDB8, WDB10)
A4 (WDB8, WDB10)



Pan Head : WDB-LG
10B21 (WDB8, WDB10)
A4 (WDB8, WDB10)



Hanger Bolt : WDB-GW
A4 (WDB10-M12)

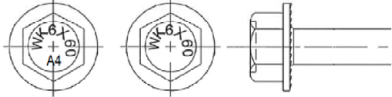

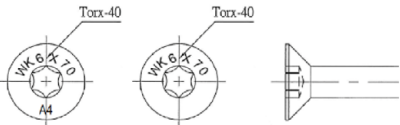
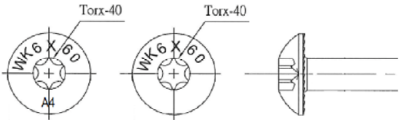
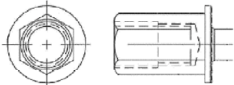
WDB-08, WDB-10, WDB-12

Product description
Installed condition

Annex A1

Table A1: Materials and screw types

| Name | Material | | | | | | | | | |
|---------------------------------|-----------------|--|-------------|------------|---------------------------|--------------------|------------|---------------------------|-----|-----|
| Screw fastener | Head marking | material | | | | | | | | |
| | WDB | Steel 10B21 acc. to SAE-J403 zinc coating: electroplated (> 5 µm) or mechanical plated (> 30 µm) (only head type –LS and –LSF) | | | | | | | | |
| | WDB A4 | Stainless steel 1.4401, 1.4404 (both A4) | | | | | | | | |
| Anchor size / head types | | WDB 8 | | | WDB 10 | | | WDB 12 | | |
| | | -LS -LSF -LP -LG | -LS -LSF | -LP -LG | -LS -LSF -LP -LG | -LS -LSF -GW | -LP -LG | -LS -LSF -LP -LG | | |
| Material | | 10B21 | A4 | | 10B21 | A4 | | 10B21 | A4 | |
| Characteristic yield strength | f _{yk} | N/mm ² | 780 | 640 | 432 | 750 | 640 | 432 | 750 | 640 |
| Characteristic tensile strength | f _{uk} | N/mm ² | 870 | 800 | 540 | 850 | 800 | 540 | 850 | 800 |
| Elongation at rupture | A _s | [%] | ≤ 8 | | | | | | | |

| | |
|---|---|
|  | <p>Hexagon washer head</p> <p>1) WDB-LS size 8,10,12 (10B21 steel) 2) WDB-LS A4 size 8,10,12 (stainless A4)</p> |
|  | <p>Hexagon washer head</p> <p>3) WDB-LSF size 8,10,12 (10B21 steel) 4) WDB-LSF A4 size 8,10,12 (stainless A4)</p> |
|  | <p>Countersunk head</p> <p>5) WDB-LP size 8,10 (10B21 steel) 6) WDB-LP A4 size 8,10 (stainless A4)</p> |
|  | <p>Pan head</p> <p>7) WDB-LG size 8,10 (10B21 steel) 8) WDB-LG A4 size 8,10 (stainless A4)</p> |
|  | <p>Hanger Bolt head</p> <p>9) WDB-GW A4 size 10 with M12 internal thread (stainless A4)</p> |

WDB-08, WDB-10, WDB-12

Product description
Materials and screw types

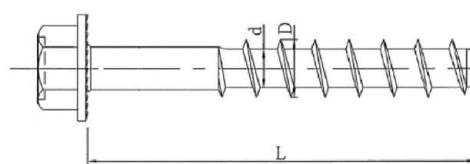
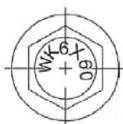
Annex A2

Table A2: Dimensions and markings

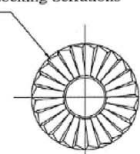
| Fastener size | | | WDB 8 | | | | WDB 10 | | | | WDB 12 | |
|--------------------|-----------|------|-------------|----|-------|----|-----------------|-----|-------|-----|---------|-----|
| Head type | | | LS, LSF, LG | | LP | | LS, LSF, LG, GW | | LP | | LS, LSF | |
| Material | | | 10B21 | A4 | 10B21 | A4 | 10B21 | A4 | 10B21 | A4 | 10B21 | A4 |
| Embedment depth | h_{nom} | [mm] | 65 | 85 | 65 | 85 | 75 | 100 | 75 | 100 | 95 | 120 |
| Length of fastener | min L | [mm] | 70 | 90 | 75 | 95 | 80 | 105 | 85 | 110 | 100 | 125 |
| | max L | [mm] | 150 | | | | 150 | | | | 150 | |
| Thread diameter | D | [mm] | 9,9 | | | | 12,5 | | | | 14,3 | |
| Shaft diameter | d | [mm] | 7,4 | | | | 9,4 | | | | 11,3 | |
| Thread pitch | p | [mm] | 5,8 | | | | 7,7 | | | | 8,1 | |

Steel
10B21

Head marking:
Identifying mark of
producer: WK
Nominal size: e.g. 8mm,
Length L: e.g. 70mm

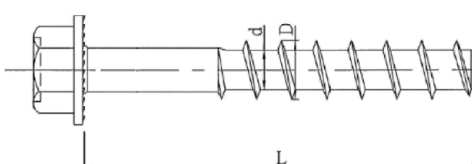
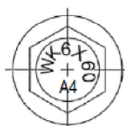


Reverse Locking Serrations

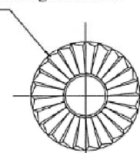


Stainless
Steel
A4

Head marking:
Identifying mark of
producer: WK
Nominal size: e.g. 8mm,
Length L: e.g. 70mm
Material: A4



Reverse Locking Serrations



WDB-08, WDB-10, WDB-12

Product description
Dimensions and markings

Annex A3

Specifications of Intended use

Anchorage subject to:

- Static and quasi-static loads: All sizes.
- Fire exposure: All sizes

Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013,
- Strength classes C20/25 to C50/60 according to EN 206:2013,
- Uncracked or cracked concrete: all sizes.

Use conditions (Environmental conditions)

- Anchorages subject to dry internal conditions. (zinc plated steel and stainless steel)
- Anchorages subject to external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions if no particular aggressive conditions exist. (Stainless steel)

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

Design:

- Anchorages are designed 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 (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages are designed in accordance with EN 1992-4:2018 and Technical Report TR 055.

Installation:

- Hammer drilling only.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of the load application.
- After installation further turning of the anchor shall not be possible.
- The head of the anchor must be fully engaged on the fixture and show no signs of damage.

WDB-08, WDB-10, WDB-12

**Intended Use
Specifications**

Annex B1

Table B1: Installation parameters (Steel 10B21)

| Fastener size | | | WDB 8 | | | WDB 10 | | | WDB 12 |
|------------------------------------|--------------------|------|--------------------|-----------------|-----------------|-----------|-----------------|-----------------|-----------|
| Head type | | | LS LSF | LP | LG | LS LSF | LP | LG | LS LSF |
| Material | | | Steel 10B21 | | | | | | |
| Diameter of drill bit | d ₀ | [mm] | 8 | | | 10 | | | 12 |
| Embedment depth | h _{nom} | [mm] | 65 | | | 75 | | | 95 |
| Min. hole depth in concrete | h ₁ ≥ | [mm] | 75 | | | 85 | | | 105 |
| Effective embedment depth | h _{ef} | [mm] | 50,6 | | | 58,1 | | | 75,4 |
| Clearance hole in the fixture | d _f | [mm] | 11 | | | 13 | | | 15 |
| Thickness of fixture | t _{fix} | [mm] | 5-85 | 10-85 | 5-85 | 5-75 | 10-75 | 5-75 | 5-55 |
| Installation torque | T _{inst} | [Nm] | 40 | - ¹⁾ | - ¹⁾ | 60 | - ¹⁾ | - ¹⁾ | 80 |
| Wrench size (types: LS, LSF) | WS | [mm] | 13 | - | - | 17 | - | - | 19 |
| Torx size (types: LP, LG) | TX | - | - | 45 | | - | 50 | | - |
| Max. power output, machine setting | T _{max} ≤ | [Nm] | 185 | 120 | 120 | 350 | 120 | 120 | 350 |

1) For the installation of the LP and LG head types only impact screw driver can be used.

Table B2: Installation parameters (Stainless Steel A4)

| Fastener size | | | WDB 8 | | | WDB 10 | | | WDB 12 | |
|-------------------------------------|--------------------|------|---------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Head type | | | LS LSF | LP | LG | LS LSF | GW | LP | LG | LS LSF |
| Material | | | Stainless A4 | | | | | | | |
| Diameter of drill bit | d ₀ | [mm] | 8 | | | 10 | | | 12 | |
| Embedment depth | h _{nom} | [mm] | 85 | | | 100 | | | 120 | |
| Min. hole depth in concrete | h ₁ ≥ | [mm] | 95 | | | 110 | | | 130 | |
| Effective embedment depth | h _{ef} | [mm] | 51,9 | | | 58,7 | | | 75,6 | |
| Clearance hole | d _f | [mm] | 11 | | | 13 | | | 15 | |
| Thickness of fixture | t _{fix} | [mm] | 5-65 | 10-65 | 5-65 | 5-50 | 5-50 | 10-50 | 5-50 | 5-30 |
| Installation torque | T _{inst} | [Nm] | - ¹⁾ | - ¹⁾ | - ¹⁾ | - ¹⁾ | - ¹⁾ | - ¹⁾ | - ¹⁾ | - ¹⁾ |
| Wrench size (types: LS, LSF, GW) | WS | [mm] | 13 | - | - | 17 | 19 | - | - | 19 |
| Torx size (types: LP, LG) | TX | - | - | 45 | | - | - | 50 | | - |
| Max. torque moment, machine setting | T _{max} ≤ | [Nm] | 120 | 120 | 120 | 185 | 185 | 185 | 185 | 185 |

1) For the installation of the LP and LG head types only impact screw driver can be used.

WDB-08, WDB-10, WDB-12

Intended Use
Installation parameters

Annex B2

Table B3: Minimum thickness of member, Minimum spacing and edge distance

| Fastener size | | | WDB 8 | | WDB 10 | | WDB 12 | |
|--------------------------|-----------|------|-----------------|-----|------------------------|-----|--------|-----|
| Head type | | | LS, LSF, LP, LG | | LS, LSF, LP, LG, GW | | LS,LSF | |
| Material | | | 10B21 | A4 | 10B21 | A4 | 10B21 | A4 |
| Minimum member thickness | h_{min} | [mm] | 110 | 125 | 130 | 140 | 160 | 170 |
| Minimum edge distance | c_{min} | [mm] | 50 | 50 | 60 | 60 | 70 | 70 |
| Minimum spacing | s_{min} | [mm] | 50 | 50 | 60 | 60 | 70 | 70 |

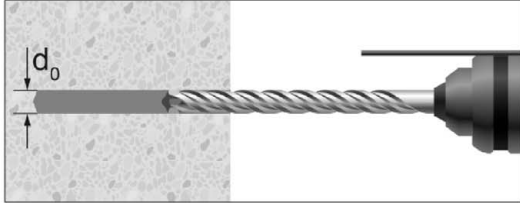
WDB-08, WDB-10, WDB-12

Intended Use

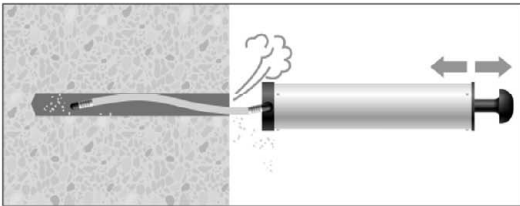
Minimum member thickness, minimum edge distance and anchor spacing

Annex B3

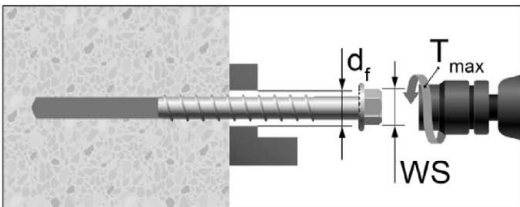
Installation instruction



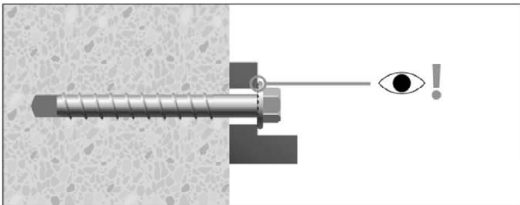
Drill the hole to the bore hole depth h_1 .



Clean the hole.



Screw in the anchor by using a torque wrench or an impact screw driver.
In case of using torque wrench: T_{inst} acc. to Table B1 and B2.
In case of using impact screw driver: T_{max} acc. to Table B1 and B2
WS= Wrench Size



Control of complete setting, full contact of screw head with fixture part.

WDB-08, WDB-10, WDB-12

Intended Use
Installation Instruction

Annex B4

Table C1: Characteristic resistance under tension loading (Steel 10B21)

| Fastener size | | WDB 8 | | | WDB 10 | | | WDB 12 | |
|--|--------------------|-------------|--------------------------|-----|-----------|------|------|-----------|------|
| Head type | | LS LSF | LP | LG | LS LSF | LP | LG | LS LSF | |
| Material | | Steel 10B21 | | | | | | | |
| Steel failure | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 35,9 | | | 57,0 | | 83,0 | |
| Partial factor | $\gamma_{Ms}^{1)}$ | [-] | 1,4 | | | 1,4 | | 1,4 | |
| Pull-out failure | | | | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 4,5 | | | 10,0 | | 12,0 | |
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 9,0 | 9,0 | 6,5 | 16,0 | 16,0 | 11 | 25,0 |
| Increasing factors for $N_{Rk,p}$ in cracked or uncracked concrete | ψ_c | C30/37 | 1,22 | | | | | | |
| | | C40/50 | 1,41 | | | | | | |
| | | C50/60 | 1,58 | | | | | | |
| Installation factor | γ_{inst} | [-] | 1,4 | | | 1,0 | | 1,2 | |
| Concrete cone failure | | | | | | | | | |
| Effective embedment depth | h_{ef} | [mm] | 50,6 | | | 58,1 | | 75,4 | |
| Characteristic edge distance | $c_{cr,N}$ | [mm] | 1,5 h_{ef} | | | | | | |
| Characteristic spacing | $s_{cr,N}$ | [mm] | 3 h_{ef} | | | | | | |
| Factor for cracked concrete | k_{cr} | [-] | 7,7 | | | | | | |
| Factor for uncracked concrete | k_{ucr} | [-] | 11,0 | | | | | | |
| Splitting failure | | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | $N^0_{Rk,sp} = N_{Rk,p}$ | | | | | | |
| Characteristic edge distance for splitting | $c_{cr,sp}$ | [mm] | 1,5 h_{ef} | | | | | | |
| Characteristic anchor spacing for splitting | $s_{cr,sp}$ | [mm] | 3 h_{ef} | | | | | | |

¹⁾ In absence of other national regulations.

WDB-08, WDB-10, WDB-12

Performance
Characteristic values under tension loading

Annex C1

**Table C2: Characteristic resistance under tension loading
(Stainless Steel A4)**

| Fastener size | | | WDB 8 | | | WDB 10 | | | | WDB 12 |
|--|--------------------|--------|--------------------------|------|------|-----------|------|------|------|-----------|
| Head type | | | LS LSF | LP | LG | LS LSF | GW | LP | LG | LS LSF |
| Material | | | Stainless steel A4 | | | | | | | |
| Steel failure | | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 33,0 | 22,3 | 22,3 | 53,7 | 53,7 | 36,2 | 36,2 | 78,1 |
| Partial factor | $\gamma_{Ms}^{1)}$ | [-] | 1,5 | | | 1,5 | | | | 1,5 |
| Pull-out failure | | | | | | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 4,5 | 4,5 | 4,0 | 7,0 | 7,0 | 7,0 | 7,0 | 12,0 |
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 9,0 | 5,5 | 4,0 | 16,0 | 16,0 | 10 | 7,0 | 25,0 |
| Increasing factors for $N_{Rk,p}$ in cracked or uncracked concrete | ψ/c | C30/37 | 1,22 | | | | | | | |
| | | C40/50 | 1,41 | | | | | | | |
| | | C50/60 | 1,58 | | | | | | | |
| Installation factor | γ_{inst} | [-] | 1,4 | | | 1,0 | | | | 1,2 |
| Concrete cone failure | | | | | | | | | | |
| Effective embedment depth | h_{ef} | [mm] | 51,9 | | | 58,7 | | | | 75,6 |
| Characteristic edge distance | $c_{cr,N}$ | [mm] | 1,5 h_{ef} | | | | | | | |
| Characteristic spacing | $s_{cr,N}$ | [mm] | 3 h_{ef} | | | | | | | |
| Factor for cracked concrete | k_{cr} | [-] | 7,7 | | | | | | | |
| Factor for uncracked concrete | k_{ucr} | [-] | 11,0 | | | | | | | |
| Splitting failure | | | | | | | | | | |
| Characteristic resistance in uncracked concrete C20/25 | $N^0_{Rk,sp}$ | [kN] | $N^0_{Rk,sp} = N_{Rk,p}$ | | | | | | | |
| Characteristic edge distance for splitting | $c_{cr,sp}$ | [mm] | 1,5 h_{ef} | | | | | | | |
| Characteristic anchor spacing for splitting | $s_{cr,sp}$ | [mm] | 3 h_{ef} | | | | | | | |

¹⁾ In absence of other national regulations.

WDB-08, WDB-10, WDB-12

Performance
Characteristic values under tension loading

Annex C2

Table C3: Displacements under tension loads for non-cracked and cracked concrete

| Fastener size | Material | Head type | Concrete | Tension load N | Displacement | | | |
|---------------|----------------|--------------------------|-------------------|---------------------|---------------------|--------------------|-----|-----|
| | | | | | δ_{N0} | $\delta_{N\infty}$ | | |
| [-] | [-] | [-] | [-] | [kN] | [mm] | [mm] | | |
| WDB 8 | Steel 10B21 | LS/LSF | cracked C20/25 | 1,5 | 0,1 | 0,8 | | |
| | | LP | | | | | | |
| | | LG | | | | | | |
| WDB 10 | | LS/LSF | | 4,8 | 0,2 | 1,0 | | |
| | | LP | | | | | | |
| | | LG | | | | | | |
| WDB 12 | | LS/LSF | | 4,8 | 0,3 | 1,2 | | |
| WDB 8 | | Stainless steel A4 | | LS/LSF | cracked C20/25 | 1,5 | 0,1 | 0,8 |
| | | | | LP | | 1,5 | | |
| | LG | | 1,4 | | | | | |
| WDB 10 | LS/LSF/GW | | 3,3 | 0,2 | | 1,0 | | |
| | LP | | | | | | | |
| | LG | | | | | | | |
| WDB 12 | LS/LSF | | 4,8 | 0,3 | | 1,2 | | |
| WDB 8 | Steel 10B21 | | LS/LSF | uncracked C20/25 | | 3,1 | 0,1 | 0,8 |
| | | | LP | | | 2,2 | | |
| | | LG | 7,6 | | | | | |
| WDB 10 | | LS/LSF | 7,6 | | 0,1 | 1,0 | | |
| | | LP | | | | | | |
| | | LG | | | | | | |
| WDB 12 | | LS/LSF | 9,9 | | 0,3 | 1,2 | | |
| WDB 8 | | Stainless steel A4 | LS/LSF | | uncracked C20/25 | 3,1 | 0,1 | 0,8 |
| | | | LP | | | 1,8 | | |
| | LG | | 1,4 | | | | | |
| WDB 10 | LS/LSF/GW | | 7,6 | 0,1 | | 1,0 | | |
| | LP | | | | | | 4,8 | |
| | LG | | | | | | 3,3 | |
| WDB 12 | LS/LSF | | 9,9 | 0,3 | | 1,2 | | |

WDB-08, WDB-10, WDB-12

Performance
Displacements under tension loading

Annex C3

Table C4: Characteristic resistance under shear loading

| Fastener size | | | WDB 8 | | | WDB 10 | | | WDB 12 | |
|--|---------------------|------|-----------------------|-----------|----------|-----------------------|------------------|----------|-----------------------|-----------|
| Head type | | | LS LSF LP LG | LS LSF | LP LG | LS LSF LP LG | LS LSF, GW | LP LG | LS LSF LP LG | LS LSF |
| Material | | | 10B21 | A4 | | 10B21 | A4 | | 10B21 | A4 |
| Setting depth | h_{nom} | [mm] | 65 | 85 | | 75 | 100 | | 95 | 120 |
| Effective embedment depth | h_{ef} | [mm] | 50,6 | 51,9 | | 58,1 | 58,7 | | 75,4 | 75,6 |
| Steel failure without lever arm | | | | | | | | | | |
| Characteristic resistance | $V_{RK,s}^0$ | [kN] | 16,9 | 16,5 | 11,2 | 26,8 | 26,8 | 18,1 | 39,0 | 39,0 |
| Ductility factor | k_7 | [-] | 0,8 | | | | | | | |
| Partial factor | $\gamma_{Ms}^{1)}$ | [-] | 1,5 | 1,25 | | 1,5 | 1,25 | | 1,5 | 1,25 |
| Steel failure with lever arm | | | | | | | | | | |
| Characteristic resistance | $M_{RK,s}^0$ | [Nm] | 39,1 | 35,9 | 24,2 | 79,0 | 74,4 | 50,2 | 138,8 | 130,6 |
| Partial factor | $\gamma_{Ms}^{1)}$ | [-] | 1,5 | 1,25 | | 1,5 | 1,25 | | 1,5 | 1,25 |
| Concrete pryout failure | | | | | | | | | | |
| k-factor | k_8 | [-] | 1,0 | | | | | | 2,0 | |
| Partial factor | $\gamma_{Mcp}^{1)}$ | [-] | 1,5 | | | | | | | |
| Concrete edge failure | | | | | | | | | | |
| Effective length of anchor | ℓ_f | [mm] | 50,6 | 51,9 | | 58,1 | 58,7 | | 75,4 | 75,6 |
| Outside diameter of fastener | d_{nom} | [mm] | 7,25 | | | 9,24 | | | 11,15 | |
| Partial factor | $\gamma_{Mc}^{1)}$ | [-] | 1,5 | | | | | | | |

¹⁾ In absence of other national regulations.

WDB-08, WDB-10, WDB-12

Performance
Characteristic values under shear loading

Annex C4

Table C5: Displacements under shear loads for non-cracked and cracked concrete

| Fastener size | Material | Head type | Concrete | Shear load V | Displacement | |
|---------------|--------------------------|-----------|---------------------------------------|-----------------|---------------|--------------------|
| | | | | | δ_{V0} | $\delta_{V\infty}$ |
| [-] | [-] | [-] | [-] | [kN] | [mm] | [mm] |
| WDB 8 | Steel 10B21 | LS/LSF | Cracked and uncracked C20/25 | 8,0 | 1,8 | 2,7 |
| | | LP | | | | |
| | | LG | | | | |
| WDB 10 | | LS/LSF | | 12,8 | | |
| | | LP | | | | |
| LG | | | | | | |
| WDB 12 | LS/LSF | 18,6 | | | | |
| WDB 8 | Stainless steel A4 | LS/LSF | Cracked and uncracked C20/25 | 9,4 | 1,8 | 2,7 |
| | | LP | | 6,4 | | |
| | | LG | | 15,3 | | |
| WDB 10 | | LS/LSF/GW | | 10,3 | | |
| | | LP | | | | |
| LG | | | | | | |
| WDB 12 | LS/LSF | 22,3 | | | | |

WDB-08, WDB-10, WDB-12

Performance
Displacements under shear loading

Annex C5

Table C6: Characteristic tension resistance values for resistance to fire

| Fastener size | | | | WDB 8 | | | WDB 10 | | WDB 12 | |
|--|------|-----------------|------|-----------------------|-----------------|-----|-----------------------|-----------------------------|--------|-----------------------|
| Head type | | | | LS LSF LP LG | LS LSF LP | LG | LS LSF LP LG | LS LSF GW LP LG | LG | LS LSF LP LG |
| Material | | | | 10B21 | A4 | | 10B21 | A4 | 10B21 | A4 |
| Steel failure | | | | | | | | | | |
| Characteristic resistance | R30 | $N_{Rk,s,fi}$ | [kN] | 0,41 | 0,8 | | 1,0 | 1,7 | 2,0 | 2,9 |
| | R60 | $N_{Rk,s,fi}$ | [kN] | 0,37 | 0,7 | | 0,9 | 1,3 | 1,5 | 2,4 |
| | R90 | $N_{Rk,s,fi}$ | [kN] | 0,29 | 0,5 | | 0,7 | 1,0 | 1,3 | 2,0 |
| | R120 | $N_{Rk,s,fi}$ | [kN] | 0,21 | 0,4 | | 0,5 | 0,9 | 1,0 | 1,6 |
| Pull-out failure | | | | | | | | | | |
| Characteristic resistance in concrete \geq C20/25 | R30 | $N_{Rk,p,fi}$ | [kN] | 1,1 | 1,1 | 1,0 | 2,5 | 1,8 | 3,0 | 3,0 |
| | R60 | | | | | | | | | |
| | R90 | | | | | | | | | |
| | R120 | $N_{Rk,p,fi}$ | [kN] | 0,9 | 0,9 | 0,8 | 2,0 | 1,4 | 2,4 | 2,4 |
| Concrete cone failure | | | | | | | | | | |
| Characteristic resistance in concrete \geq C20/25 | R30 | $N^0_{Rk,c,fi}$ | [kN] | 3,1 | 3,3 | | 4,4 | 4,5 | 8,5 | 8,6 |
| | R60 | | | | | | | | | |
| | R90 | | | | | | | | | |
| | R120 | $N^0_{Rk,c,fi}$ | [kN] | 2,5 | 2,7 | | 3,5 | 3,6 | 6,8 | 6,8 |
| Effective embedment depth | | h_{ef} | [mm] | 50,6 | 51,9 | | 58,1 | 58,7 | 75,4 | 75,6 |
| Minimum member thickness | | h_{min} | [mm] | 110 | 125 | | 130 | 140 | 160 | 170 |
| Spacing | | $s_{cr,N,fi}$ | [mm] | $4h_{ef}$ | | | | | | |
| | | s_{min} | [mm] | 50 | | 60 | | 70 | | |
| Edge distance | | $c_{cr,N,fi}$ | [mm] | $2h_{ef}$ | | | | | | |
| Fire exposure from one side only | | c_{min} | [mm] | 50 | | | 60 | | 70 | |
| Fire exposure from more than one side | | | | ≥ 300 mm | | | | | | |

¹⁾ In absence of other national regulations.

WDB-08, WDB-10, WDB-12

Performance
Characteristic values for resistance to fire (tension)

Annex C6

Table C7: Characteristic shear resistance values for resistance to fire

| Fastener size | | | | WDB 8 | | WDB 10 | | WDB 12 | |
|--|-------|-----------------|------|--|------|--------|-----|--------|------|
| Head type | | | | all | all | all | all | all | all |
| Material | | | | 10B21 | A4 | 10B21 | A4 | 10B21 | A4 |
| Steel failure without level arm | | | | | | | | | |
| Characteristic resistance | R30 | $V_{Rk,s,fi}$ | [kN] | 0,41 | 0,8 | 1,0 | 1,7 | 2,0 | 2,9 |
| | R60 | $V_{Rk,s,fi}$ | [kN] | 0,37 | 0,7 | 0,9 | 1,3 | 1,5 | 2,4 |
| | R90 | $V_{Rk,s,fi}$ | [kN] | 0,29 | 0,5 | 0,7 | 1,0 | 1,3 | 2,0 |
| | R120 | $V_{Rk,s,fi}$ | [kN] | 0,21 | 0,4 | 0,5 | 0,9 | 1,0 | 1,6 |
| Steel failure with level arm | | | | | | | | | |
| Characteristic resistance | R30 | $M^0_{Rk,p,fi}$ | [Nm] | 0,45 | 0,9 | 1,4 | 2,3 | 3,4 | 4,9 |
| | R60 | $M^0_{Rk,p,fi}$ | [Nm] | 0,40 | 0,7 | 1,2 | 1,9 | 2,5 | 4,0 |
| | R90 | $M^0_{Rk,p,fi}$ | [Nm] | 0,31 | 0,5 | 0,9 | 1,5 | 2,1 | 3,3 |
| | R120 | $M^0_{Rk,p,fi}$ | [Nm] | 0,22 | 0,45 | 0,7 | 1,3 | 1,6 | 2,6 |
| Pry-out failure | | | | | | | | | |
| k_8 | | | | [-] | 1 | 1 | 2 | | |
| Characteristic resistance | R30 | $V_{Rk,cp,fi}$ | [kN] | 3,1 | 3,3 | 4,4 | 4,5 | 17,0 | 17,1 |
| | R60 | | | | | | | | |
| | R90 | | | | | | | | |
| | R120 | $V_{Rk,cp,fi}$ | [kN] | 2,5 | 2,7 | 3,5 | 3,6 | 13,6 | 13,7 |
| Concrete edge failure | | | | | | | | | |
| Characteristic resistance | ≤ R90 | $V_{Rk,c,fi}$ | [kN] | $V^0_{Rk,c,fi} = 0.25 * V^0_{Rk,c}^{2)}$ | | | | | |
| | R120 | $V_{Rk,c,fi}$ | [kN] | $V^0_{Rk,c,fi} = 0.20 * V^0_{Rk,c}^{2)}$ | | | | | |

1) In absence of other national regulations.

2) $V^0_{Rk,c}$ = characteristic resistance for concrete edge failure in cracked concrete C20/C25 under normal temperature calculated acc. to EN 1992-4:2018.

WDB-08, WDB-10, WDB-12

Performance
Characteristic values for resistance to fire (shear)

Annex C7