

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-20/0115
of 1 June 2022

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

MDC-7,5xL
MXC-7,5xL-A4

Product family
to which the construction product belongs

Concrete screws for fastening sandwich panels

Manufacturer

SFS Group Schweiz AG
Rosenbergsaustasse 10
CH - 9435 Heerbrugg
SCHWEIZ

Manufacturing plant

Plant 2320

This European Technical Assessment
contains

12 pages including 8 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 332700-00-0601

This version replaces

ETA-20/0115 issued on 3 May 2021

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Specific part

1 Technical description of the product

Products are SFS concrete screws MDC-7,5xL and MXC-7,5xL-A4 for fastening sandwich panels to concrete (see Annex 1).

The concrete screw MDC-7,5xL is made of galvanized steel (carbon steel 1.5523 with zinc nickel coating) and the concrete screw MXC-7,5xL-A4 is made of stainless steel (1.4401). The screws are complemented by metal washers made of stainless steel and EPDM seals.

2 Specification of the intended use in accordance with the applicable European Assessment Document 332700-00-0601 Concrete screws for fastening sandwich panels

The concrete screws are intended to be used for fastening sandwich panels to concrete structures (non-cracked and cracked concrete).

The intended use comprises connections with predominantly static load (e.g. wind loads, dead loads). Remark: In case of using the screws under wind loads (e.g. for outside walls) the cyclic pull through resistances shall be used by the designer.

The screws are intended to be used in reinforced or unreinforced normal weight concrete in accordance with EN 206 (concrete strength class in the range of C20/25 to C50/60).

The concrete screws are not intended for re-use.

The design of the anchorage is performed under the responsibility of an engineer experienced in anchorage design and concrete work. The design to determine the characteristic resistance in concrete is performed according to EN 1992-4:2018. Temperature changes of the sandwich panels causes head deflections on the screw head and has to be considered during planning and dimensioning.

The performances given in Section 3 are only valid if the concrete screws MDC-7,5xL and MXC-7,5xL-A4 are used in compliance with the specifications and conditions given in the Annexes.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the concrete screws for fastening sandwich panels MDC-7,5xL and MXC-7,5xL-A4 of at least 25 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 value of tension resistance of the connection between screw and sandwich panel and associated permissible head deflection | $N_{RK,SP,cycl}$ [kN] and u [mm] see Annexes 7 and 8 |
| Characteristic value of shear resistance of the connection between screw and sandwich panel without gap | $V_{RK,SP}$ [kN] see Annexes 7 and 8 |
| Characteristic values of resistance of the screw in concrete | $N_{RK,s}$, $N_{RK,p}$, $V_{RK,s}^0$, h_{ef} , $C_{cr,n}$, $C_{cr,sp}$, k_{crN} , $k_{u\sigma N}$, ψ_c , γ_{frst} , k_8 , d_{nom} , l_f , $M_{RK,s}^0$, k_7 , h_{min} , δ_{NO} , $\delta_{N\infty}$, δ_{V0} , $\delta_{V\infty}$ see Annex 5 and 6 |

3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|--------------------------|------------------------------------|
| Reaction to fire | Class (A1) according to EN 13501-1 |

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

In accordance with EAD No. 332700-00-0601, the applicable European legal act is: 1996/582/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 EAD

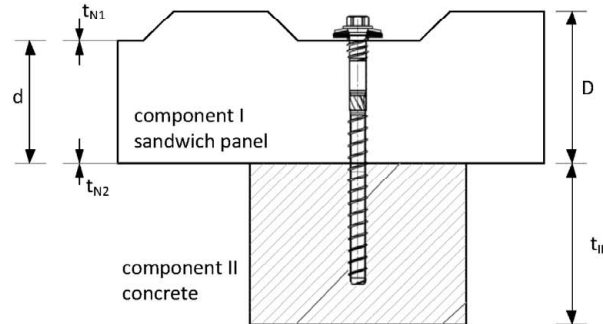
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 1 June 2022 by Deutsches Institut für Bautechnik

Dr.-Ing. Ronald Schwuchow
Head of Section

beglaubigt:
Bertram

Example for the execution of a connection



Dimensions

| | |
|------------|---|
| D, d | Thickness of component I (sandwich panel) |
| t_{N1} | Thickness of the outer cover sheet of the sandwich panel |
| t_{N2} | Thickness of the inner cover sheet of the sandwich panel |
| t_{II} | thickness of the concrete substructure |
| d_0 | Nominal borehole diameter of component I and component II |
| h_{nom} | Minimum embedment depth of the fastener in the concrete (component II) |
| h_1 | Minimum depth of the drill hole in concrete (component II) |
| CL_{min} | Minimum clamping length |
| CL_{max} | Maximum clamping length |
| t_{fix} | Thickness of the sandwich panel incl. intermediate layer(s). Interlayers with a total thickness of up to 3.0 mm are possible. |

Performance characteristics

| | |
|------------------|---|
| $V_{Rk,SP}$ | Characteristic shear resistance value of the connection (see Annexes 7 and 8). |
| $N_{Rk,SP,cycl}$ | Characteristic pull through resistance value of the screw through the sandwich panel (see Annexes 7 and 8). |
| u | Maximum permissible head deflection of the screw (see Annexes 7 and 8). |

See Annexes 4-6 regarding characteristics in terms of pull-out resistance of the fasteners from the concrete substructure.

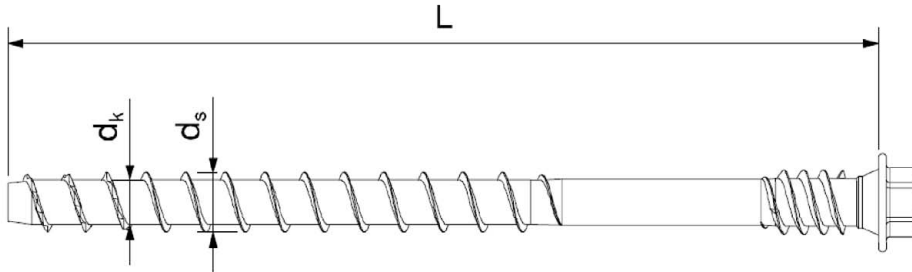
MDC-7,5xL / MXC-7,5xL-A4

Designations used in the Annexes

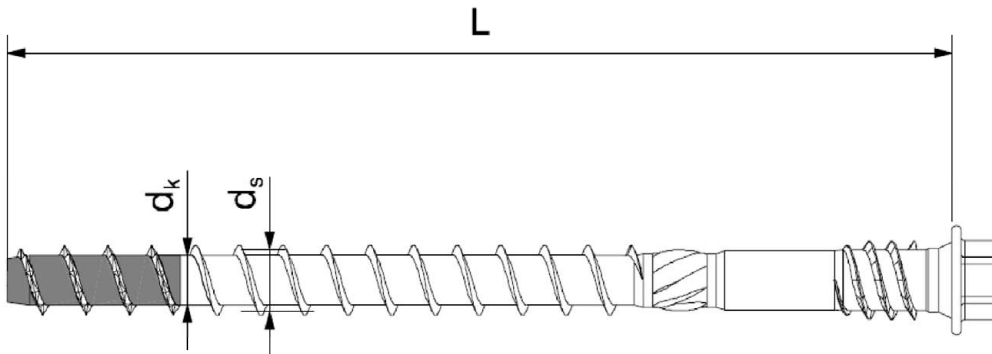
Annex 1

Dimensions and head markings

MDC-7,5xL



MXC-7,5xL-A4



| Fastener | | | MDC-7,5 x L | MXC-7,5 x L-A4 |
|--|----------|----------------------|--------------------------------|--------------------------------|
| Length | $L \geq$ | [mm] | 85 | 95 |
| | $L \leq$ | [mm] | 365 | 375 |
| Bolt diameter | d_k | [mm] | 5,45 | 5,70 |
| Thread diameter | d_s | [mm] | 7,75 | 7,50 |
| nominal value of the characteristic yield strength | f_{yk} | [N/mm ²] | 640 | 855 |
| nominal value of the characteristic tensile strength | f_{uk} | [N/mm ²] | 800 | 950 |
| elongation at rupture | A_5 | [%] | ≤ 8 | ≥ 8 |
| Material | | [-] | 1.5523 acc. EN 10263-4:2001 | 1.4401 acc. EN 10088-1:2005 |

MDC-7,5xL / MXC-7,5xL-A4

Description

Annex 2

Assumptions for dimensioning

Determination of design values

The design values of the tensile and shear resistance of a connection may be determined as follows, unless otherwise specified in the national regulations:

$$N_{R,d} = \min \left\{ \frac{N_{Rk,SP,cycl}}{\gamma_M}; N_{R,II,d} \right\} \quad V_{R,d} = \frac{V_{Rk,SP}}{\gamma_M}$$

The characteristic values $N_{Rk,SP,cycl}$ and $V_{Rk,SP}$ are given in Annexes 4 and 5. If the component thickness t_{N1} or t_{N2} is between two given component thicknesses, the characteristic value may be calculated by linear interpolation. The recommended partial safety factor γ_M is 1.33, unless a partial safety factor is given in national regulations or national annexes to Eurocode 3.

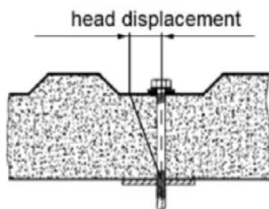
The design value $N_{R,II,d}$ is the pull-out resistance of the screw from the concrete substructure (anchoring). The design of this anchorage is carried out under the responsibility of an engineer experienced in the field of anchorages and concrete construction using the characteristic values given in Annex 4-6. Verifiable calculations and design drawings shall be prepared taking into account 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.).

The design of the anchorage under static and quasi-static load may be carried out according to EN 1992-4:2018, unless otherwise specified in the national regulations.

For the concrete the recommended partial safety factor γ_c is 1.50 according to EN 1992-4:2018, unless a partial safety factor is given in national regulations or national annexes to Eurocode 2. The installation factors γ_{inst} are given in Annex 5.

Head deflection

The head displacements resulting from the thermal expansion of the outer surface layer of the sandwich panel may not exceed the maximum allowed head displacement u according to the Annexes.



Terms of installation

The installation is done according to the manufacturer's instructions.

The load-bearing screw-in length of the screw specified by the manufacturer has to be taken into account.

The fastening screws are to be set with an electric tangential impact wrench according to the manufacturer's instructions.

The fastening screws must be fastened perpendicularly to the component surface.

The maximum distance between component I and component II is 3.0 mm.

For the MDC-7.5xL, the minimum edge distance in concrete is 30.0 mm.

For the MDC-7.5xL, the minimum axis distance in concrete is 35.0 mm.

For the MDC-7.5xL, the minimum component thickness of the concrete is $h_{min} = 100$ mm.

For the MXC-7.5xL-A4, the minimum edge distance in concrete is 40.0 mm.

For the MXC-7.5xL-A4, the minimum axis distance in concrete is 40.0 mm.

For the MXC-7.5xL-A4, the minimum component thickness of the concrete is $h_{min} = 105$ mm.

The substructure (component II) is concrete of strength class C20/25 to C50/60 according to EN 206-1:2017

MDC-7,5xL / MXC-7,5xL-A4

Design

Annex 3

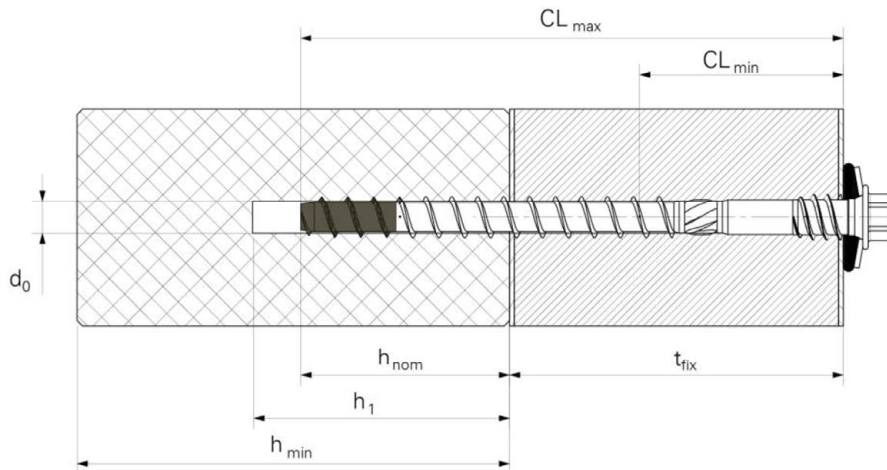
English translation prepared by DIBt

Anchoring substrate

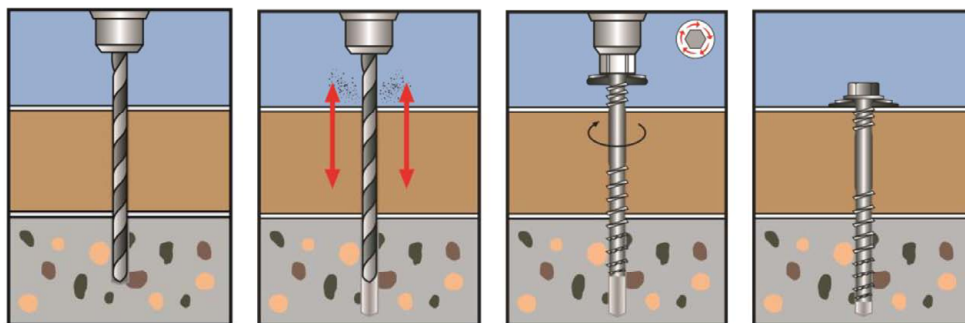
- Reinforced or non-reinforced normal weight concrete according to EN 206-1:2017
- Strength class C20/25 to C50/60 according to EN 206-1:2017
- Cracked or uncracked concrete.

Installation parameters

| Fastener | | | MDC-7,5 x L | | MXC-7,5 x L-A4 |
|--------------------------------|-----------------------|-----------|-------------|----|----------------|
| Embedment depth in concrete | $h_{nom} \geq$ | [mm] | 35 | 55 | 65 |
| nominal borehole diameter | d_0 | [mm] | 6,0 | | 6,0 |
| Drill bit cutting- \emptyset | $d_{cut} \leq$ | [mm] | 6,4 | | 6,4 |
| Borehole depth | $h_1 \geq$ | [mm] | 40 | 65 | 75 |
| Minimum component thickness | h_{min} | [mm] | 100 | | 105 |
| Cracked and uncracked concrete | Minimum axis distance | s_{min} | 35 | | 40 |
| | Minimum edge distance | c_{min} | 30 | | 40 |



Installation instructions



MDC-7,5xL / MXC-7,5xL-A4

Installation in component II

Annex 4

Performance characteristics - concrete anchoring

| Fastener | | | MDC-7,5 x L | | MXC-7,5 x L-A4 |
|--|--------------------|-------------|---|-----|----------------|
| Embedment depth in concrete | h_{nom} | [mm] | 35 ³⁾ | 55 | 65,0 |
| Min. thickness of the concrete | h_{min} | [mm] | 100 | | 105 |
| Steel failure | | | | | |
| characteristic tension resistance | $N_{Rk,s}$ | [kN] | 17,6 | | 23,0 |
| partial safety factor | γ_{Ms} | [-] | 1,5 | | 1,4 |
| characteristic shear resistance | $V_{Rk,s}^0$ | [kN] | 6,1 | | 12,3 |
| partial safety factor | γ_{Ms} | [-] | 1,25 | | 1,5 |
| k-factor | k_7 | [-] | 0,80 | | 0,80 |
| characteristic resistance | $M_{Rk,s}^0$ | [Nm] | 14,1 | | 22,0 |
| Pull out | | | | | |
| Characteristic resistance in cracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 2 | 4 | 5 |
| Characteristic resistance in uncracked concrete C20/25 | $N_{Rk,p}$ | [kN] | 4 | -2) | 7,5 |
| Increasing factor for concrete | ψ/c | C30/37 | 1,22 | | 1,22 |
| | | C40/50 | 1,41 | | 1,41 |
| | | C50/60 | 1,58 | | 1,58 |
| Installation factor | γ_{inst} | [-] | 1,0 | | 1,4 |
| Concrete cone failure and splitting failure | | | | | |
| Effective anchorage depth | h_{ef} | [mm] | 26 | 43 | 40 |
| Factor for | cracked concrete | $k_{cr,N}$ | 7,7 | | 7,7 |
| | uncracked concrete | $k_{urc,N}$ | 11,0 | | 11,0 |
| character. Resistance for splitting | $N_{Rk,sp}^0$ | [kN] | min ($N_{Rk,p}$; $N_{Rk,c}^0$ ¹⁾) | | |
| axis distance for concrete cone failure | $s_{cr,N}$ | [mm] | 3 h_{ef} | | 3 h_{ef} |
| axis distance for splitting failure | $s_{cr,sp}$ | [mm] | 3 h_{ef} | | 3 h_{ef} |
| edge distance for concrete cone failure | $c_{cr,N}$ | [mm] | 1,5 h_{ef} | | 1,5 h_{ef} |
| axis distance for splitting failure | $c_{cr,sp}$ | [mm] | 1,5 h_{ef} | | 1,5 h_{ef} |
| Installation factor | γ_{inst} | [-] | 1,0 | | 1,4 |
| Concrete pryout failure | | | | | |
| k-factor | k_8 | [-] | 1,0 | | 1,0 |
| Concrete edge failure | | | | | |
| Effective length of the anchor | $l_f = h_{ef}$ | [mm] | 26 | 43 | 40 |
| Effective diameter of the anchor | d_{nom} | [mm] | 6,0 | | 6,0 |

- 1) $N_{Rk,c}^0$ according EN 1992-4:2018
- 2) Pullout is not decisive
- 3) Only for statically indeterminate structures

MDC-7,5xL / MXC-7,5xL-A4

Performances for concrete anchoring

Annex 5

Performance characteristics - concrete anchoring

| Fastener | | | MDC-7,5 x L | | MXC-7,5 x L-A4 |
|---|--------------------|------|------------------|------|----------------|
| Embedment depth in concrete | h_{nom} | [mm] | 35 ¹⁾ | 55 | 65,0 |
| Displacements under tension loads | | | | | |
| Tension load uncracked concrete | N | [kN] | 1,9 | 5,3 | 2,6 |
| Displacement | δ_{N0} | [mm] | 0,06 | 0,12 | 0,1 |
| | δ_N | [mm] | 0,38 | 1,03 | 0,2 |
| Tension load cracked concrete | N | [kN] | 0,9 | 2,0 | 1,7 |
| Displacement | δ_{N0} | [mm] | 0,03 | 0,04 | 0,1 |
| | δ_N | [mm] | 0,12 | 0,11 | 0,2 |
| Displacements under shear loads | | | | | |
| Shear load cracked and uncracked concrete | V | [kN] | 4,0 | | 5,9 |
| Displacement | δ_{V0} | [mm] | 0,09 | 0,11 | 1,7 |
| | $\delta_{V\infty}$ | [mm] | 0,13 | 0,16 | 2,6 |

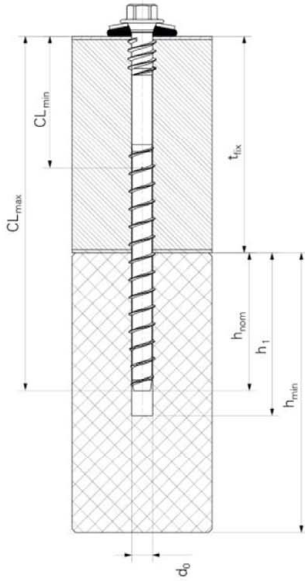
¹⁾ Only for statically indeterminate structures

MDC-7,5xL / MXC-7,5xL-A4

Performances for concrete anchoring

Annex 6

English translation prepared by DIBt



Materials

Fastener: Carbon steel 1.5523
Washer: Stainless steel A2 - EN ISO 3506-1:2020 with vulcanised EPDM

Component I: S280GD to S350GD - EN 10346:2015
Component II: Concrete - Strength class C20/C25 to C50/60

Pre-drilling diameter 6,0 mm

| | | Component II (Concrete) | | |
|--|--|-------------------------|-----------|-------|
| h _{nom} [mm] | | 35,0 or 55,0 | | |
| d ₀ [mm] | | 6,0 | | |
| h ₁ | | 40,0 or 65,0 | | |
| washer | | ≥ 16,0 mm | ≥ 19,0 mm | |
| Component I | t _{N2} [mm] V _{Rk,SP} [kN] | 0,40 | 0,84 | |
| | | 0,50 | 1,15* | |
| | | 0,55 | 1,28* | |
| | | 0,60 | 1,41* | |
| | | 0,63 | 1,48* | |
| | | 0,70 | 1,82* | |
| | | 0,75 | 2,07* | |
| | | 0,88 | 2,07* | |
| | | ≥1,00 | 2,07* | |
| | t _{N1} [mm] N _{Rk,SP,cycl} [kN] | 0,40 | 1,30 | 1,51 |
| | | 0,50 | 1,71 | 1,98 |
| | | 0,55 | 2,03 | 2,33 |
| | | 0,60 | 2,34 | 2,69 |
| | | 0,63 | 2,53* | 2,90* |
| | | 0,70 | 2,86* | 3,27* |
| | | 0,75 | 3,09* | 3,54* |
| | | 0,88 | 3,09* | 3,54* |
| | | ≥1,00 | 3,09* | 3,54* |
| D, d [mm] max. head displacement u [mm] | 40 | 3,00 | | |
| | 50 | 3,75 | | |
| | 60 | 4,50 | | |
| | 80 | 6,00 | | |
| | 100 | 7,50 | | |
| | 120 | 9,00 | | |
| | ≥ 140 | 10,50 | | |

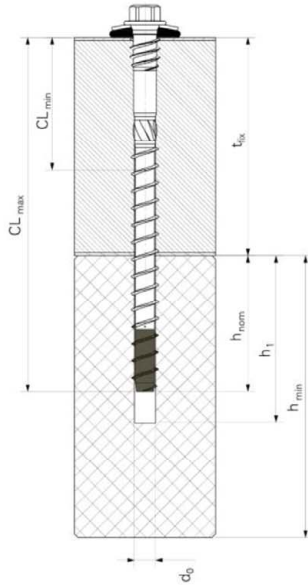
*) For sheets (t_{N1} and t_{N2}) of component I made of S320GD or S350GD the value may be increased by 8.3%

MDC-7,5xL

MDC-S16-7,5xL, MDC-S19-7,5xL, MDC-S22-7,5xL
with hexagon head and sealing washer ≥ Ø16 mm

Annex 7

English translation prepared by DIBt



Materials

Fastener: Stainless steel 1.4401 (A4)
Washer: Stainless steel A4 or A5 – EN ISO 3506-1:2020 with vulcanised EPDM

Component I: S280GD to S350GD - EN 10346:2015

Component II: Concrete - Strength class C20/C25 to C50/60

Pre-drilling diameter 6,0 mm

| | | Component II (Concrete) | | | |
|--|----------------------|------------------------------|-----------|-------|-------|
| h _{nom} [mm] | | 65,0 | | | |
| d ₀ [mm] | | 6,0 | | | |
| h ₁ | | 75,0 | | | |
| washer | | ≥ 16,0 mm | ≥ 19,0 mm | | |
| Component I | t _{N2} [mm] | V _{Rk,SP} [kN] | 0,40 | 0,84 | 0,84 |
| | | | 0,50 | 1,15* | 1,15* |
| | | | 0,55 | 1,28* | 1,28* |
| | | | 0,60 | 1,41* | 1,41* |
| | | | 0,63 | 1,48* | 1,48* |
| | | | 0,70 | 1,82* | 1,82* |
| | | | 0,75 | 2,07* | 2,07* |
| | | | 0,88 | 2,07* | 2,07* |
| | | | ≥1,00 | 2,07* | 2,07* |
| | t _{N1} [mm] | N _{Rk,SP,cycl} [kN] | 0,40 | 1,32 | 1,51 |
| | | | 0,50 | 1,74 | 1,98 |
| | | | 0,55 | 2,05 | 2,33 |
| | | | 0,60 | 2,36 | 2,69 |
| | | | 0,63 | 2,55* | 2,90* |
| | | | 0,70 | 2,88* | 3,27* |
| | | | 0,75 | 3,11* | 3,54* |
| | | | 0,88 | 3,11* | 3,54* |
| | | | ≥1,00 | 3,11* | 3,54* |
| D, d [mm] max. head displacement [mm] | | | 40 | 8,0 | |
| | | | 50 | 10,0 | |
| | | | 60 | 12,0 | |
| | | | 80 | 16,0 | |
| | | | 100 | 20,0 | |
| | | | 120 | 24,0 | |
| | | | ≥ 140 | 28,0 | |

*) For sheets (t_{N1} and t_{N2}) of component I made of S320GD or S350GD the value may be increased by 8.3%

MXC-7,5xL-A4

MXC-S16-7,5xL-A4, MXC-S19-7,5xL-A4, MXC-S22-7,5xL-A4
with hexagon head and sealing washer ≥ Ø16 mm

Annex 8