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NATIONAL TECHNICAL ASSESSMENT

ITB-KOT-2022/2086 Revision 1

This National Technical Assessment was issued in accordance with the Regulation of the Minister of Infrastructure and Construction of 17 November 2016 on national technical assessments (Dz. U. /Journal of Laws/ of 2016, item 1968) by the Building Research Institute in Warsaw, at the request of:

RAWLPLUG S.A.
ul. Kwidzyńska 6, 51-416 Wrocław

The National Technical Assessment ITB-KOT-2022/2086 Revision 1 is a positive assessment of the performance of the following construction products for their intended use:

FIX, UNO, 4ALL and UNO TIMBER plastic-metal expansion anchors

Date of expiry of the National Technical Assessment:

28 April 2027

DIRECTOR
of the Building Research Institute

Robert Geryto, Ph.D., Eng.

Warsaw, 28 April 2022

The National Technical Assessment ITB-KOT-2022/2086 Revision 1 document contains 38 pages, including 3 appendices. The text of this document may only be copied in its entirety. Publishing or distributing parts of the text of the National Technical Assessment in any form must be agreed upon with the Building Research Institute in writing. The National Technical Assessment ITB-KOT-2022/2086 Revision 1 applies to products covered by Technical Approval 1TB AT-15-8093/2016.

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0000158785

1. TECHNICAL DESCRIPTION OF THE PRODUCT

This National Technical Assessment covers UNIPFIX, UNO, 4ALL and UNO TIMBER plastic-metal expansion anchors. Products covered by this National Technical Assessment are manufactured by RAWLPLUG S.A., ul. Kwidzyńska 6, 51-416 Wrocław, in a manufacturing plant located in Poland.

This National Technical Assessment applies to product types specified by the manufacturer, which stem from the performance given in sec. 3 and the combination of utilised components.

Components of the FIX, UNO, 4ALL and UNO TIMBER expansion anchors include: a plastic sleeve (body) and a threaded steel expansion bolt screwed into the sleeve (a single- or double-threaded expansion screw). Expansion bolts of the FIX, UNO, 4ALL and UNO TIMBER anchors have countersunk heads, hexagon heads or heads in the form of a hook: a square hook, a shouldered square hook, a cup hook, a shouldered cup hook or a Q hook, as per Fig. A1 + A19.

Sleeve of the FIX anchors is made of polypropylene (PP) or polyamide (PA6). Sleeve of the UNO anchors is made of coloured polypropylene (PP) or polyamide (PA6). Sleeve of the 4ALL anchors is made of coloured polyamide (PA6). Plastics from which sleeves of the FIX, UNO and 4ALL anchors are made are virgin materials characterised by differential scanning calorimetry (DCS) curves, determined in accordance with PN-EN ISO 11357-1:2016, consistent with the model determined under the National Technical Assessment procedure.

Sleeve of the UNO TIMBER anchors is made of a plastic which constitutes a mixture of virgin materials: polypropylene (PP) and polypropylene (PP) with addition of wood chips, which has the following characteristics:

- density of $0.93 \text{ g/cm}^3 \pm 15\%$, determined in accordance with PN-EN ISO 1183-1:2019,
- IR spectrum consistent with model spectrum, determined in tests in accordance with ASTM E1421,
- differential scanning calorimetry (DCS) curve, determined in accordance with PN-EN ISO 11357-1:2016, consistent with the model determined under the National Technical Assessment procedure,
- coefficient of thermal and oxidative stability $a = 1.0$, determined in accordance with EAD 330196-01-0604.

Sleeves of the FIX, UNO, 4ALL and UNO TIMBER anchors consist of two parts: an expansion part and a guiding part. The guiding part of FIX anchors ends with a flat flange (designation FIX-K) or has no flange. The guiding part of UNO, 4ALL and UNO TIMBER anchors ends with a flat flange.

Expansion bolts of FIX, UNO, 4ALL and UNO TIMBER anchors are made of ordinary carbon steel with tensile strength R_m of 400 MPa and yield point R_e of 170 Mpa and covered with an electrolytic zinc coating with a thickness of no less than 5 μm , in accordance with PN-EN ISO 4042:2018 or PN-EN ISO 2081:2018.

The shape, dimensions and range of FIX, UNO, 4ALL and UNO TIMBER expansion anchors are shown in Figures A1 + A19 and given in Tables A1 + A9.

2. INTENDED USE OF THE PRODUCT

The FIX plastic-metal expansion anchors are intended for performance of non-structural multi-point fixings of statically loaded building components in substrates made of:

- normal weight concrete, class C20/25 + C50/60 as per PN-EN 206+A2:2021,
- solid clay bricks, as per PN-EN 771-1+A1:2015, with compressive strength of at least 20 N/mm² (at least class 20),
- solid calcium silicate bricks, as per PN-EN 771-2+A1:2015, with compressive strength of at least 20 N/mm² (at least class 20),
- autoclaved aerated concrete elements, as per PN-EN 771-4+A1:2015, with compressive strength of at least 6 N/mm² (at least class 6) and gross dry density of at least 650 kg/m³,
- TeknoAmerblok hollow lightweight concrete blocks, as per PN-EN 771-3:A1:2015, with wall thickness of at least 32 mm, compressive strength of at least 12.5 N/mm² and gross dry density of at least 1.5 kg/dm³.

The UNO plastic-metal expansion anchors are intended for performance of non-structural multi-point fixings of statically loaded building components in substrates made of:

- normal weight concrete, class C20/25 + C50/60 as per PN-EN 206+A2:2021,
- solid clay bricks, as per PN-EN 771-1+A1:2015, with compressive strength of at least 20 N/mm² (at least class 20),
- solid calcium silicate bricks, as per PN-EN 771-2+A1:2015, with compressive strength of at least 20 N/mm² (at least class 20),
- porous hollow clay bricks (Porotherm), as per PN-EN 771-1+A1:2015, with wall thickness of at least 10 mm and compressive strength of at least 15 N/mm² (at least class 15),
- cored clay bricks (cellular bricks), as per PN-EN 771-1+A1:2015, with wall thickness of at least 14 mm and compressive strength of at least 15 N/mm² (at least class 15),
- hollow calcium silicate bricks, as per PN-EN 771-2+A1:2015, with wall thickness of at least 30 mm and compressive strength of at least 20 N/mm² (at least class 20),
- gypsum plasterboards with a thickness of 12.5 mm, as per PN-EN 520+A1:2012,
- autoclaved aerated concrete elements, as per PN-EN 771-4+A1:2015, with compressive strength of at least 6 N/mm² (at least class 6) and gross dry density of at least 650 kg/m³,
- TeknoAmerblok hollow lightweight concrete blocks, as per PN-EN 771-3:A1:2015, with wall thickness of at least 32 mm, compressive strength of at least 12.5 N/mm² and gross dry density of at least 1.5 kg/dm³.

The 4ALL plastic-metal expansion anchors, except for anchors designated 4ALL-06050 and 4ALL-08065, are intended for performance of non-structural multi-point fixings of statically loaded building components in substrates made of:

- normal weight concrete, class C20/25 + C50/60 as per PN-EN 206+A2:2021,
- solid clay bricks, as per PN-EN 771-1+A1:2015, with compressive strength of at least 20 N/mm² (at least class 20),
- solid calcium silicate bricks, as per PN-EN 771-2+A1:2015, with compressive strength of at least 20 N/mm² (at least class 20),
- cored clay bricks (cellular bricks), as per PN-EN 771-2+A1:2015, with wall thickness of at least 14 mm and compressive strength of at least 5 N/mm² (at least class 5),
- porous hollow clay bricks (Porotherm), as per PN-EN 771-1+A1:2015, with wall thickness of at least 10 mm and compressive strength of at least 15 N/mm² (at least class 15),
- hollow calcium silicate bricks, as per PN-EN 771-2+A1:2015, with wall thickness of at least 30 mm and compressive strength of at least 20 N/mm² (at least class 20),
- autoclaved aerated concrete elements, as per PN-EN 771-4+A1:2015, with compressive strength of at least 6 N/mm² (at least class 6) and gross dry density of at least 650 kg/m³,
- gypsum plasterboards with a thickness of 12.5 mm and 2 x 12.5 mm, as per PN-EN 520+A1:2012,
- TeknoAmerblok hollow lightweight concrete blocks, as per PN-EN 771-3:A1:2015, with wall thickness of at least 32 mm, compressive strength of at least 12.5 N/mm² and gross dry density of at least 1.5 kg/dm³.

The 4ALL plastic-metal expansion anchors designated 4ALL-06050 and 4ALL-08065 are intended for performance of non-structural multi-point fixings of statically loaded building components in substrates made of:

- normal weight concrete, class C20/25 + C50/60 as per PN-EN 206+A2:2021,
- solid clay bricks, as per PN-EN 771-1+A1:2015, with compressive strength of at least 20 N/mm² (at least class 20),
- solid calcium silicate bricks, as per PN-EN 771-2+A1:2015, with compressive strength of at least 20 N/mm² (at least class 20),
- cored clay bricks (cellular bricks), as per PN-EN 771-2+A1:2015, with wall thickness of at least 14 mm and compressive strength of at least 5 N/mm² (at least class 5),
- hollow clay bricks, as per PN-EN 771-1+A1:2015, with wall thickness of at least 12 mm and compressive strength of at least 15 N/mm² (at least class 15),
- hollow calcium silicate bricks, as per PN-EN 771-2+A1:2015, with wall thickness of at least 20 mm and compressive strength of at least 15 N/mm² (at least class 15),
- autoclaved aerated concrete elements, as per PN-EN 771-4+A1:2015, with compressive strength of at least 6 N/mm² (at least class 6) and gross dry density of at least 650 kg/m³,

- gypsum plasterboards with a thickness of 2 x 12.5 mm, as per PN-EN 520+A1:2012,
- TeknoAmerblok hollow lightweight concrete blocks, as per PN-EN 771-3:A1:2015, with wall thickness of at least 32 mm, compressive strength of at least 12.5 N/mm² and gross dry density of at least 1.5 kg/dm³.

The UNO TIMBER plastic-metal expansion anchors are intended for performance of non-structural multi-point fixings of statically loaded building components in substrates made of:

- normal weight concrete, class C20/25 + C50/60 as per PN-EN 206+A2:2021,
- solid clay bricks, as per PN-EN 771-1+A1:2015, with compressive strength of at least 20 N/mm² (at least class 20),
- solid calcium silicate bricks, as per PN-EN 771-2+A1:2015, with compressive strength of at least 20 N/mm² (at least class 20),
- porous hollow clay bricks (Porotherm), as per PN-EN 771-1+A1:2015, with wall thickness of at least 10 mm and compressive strength of at least 15 N/mm² (at least class 15),

MAX hollow clay bricks, as per PN-EN 771-1+A1:2015, with wall thickness of at least 12 mm and compressive strength of at least 15 N/mm² (at least class 15),

- hollow calcium silicate bricks, as per PN-EN 771-2+A1:2015, with wall thickness of at least 20 mm and compressive strength of at least 15 N/mm² (at least class 15),
- gypsum plasterboards with a thickness of 12.5 mm, as per PN-EN 520+A1:2012,
- autoclaved aerated concrete elements, as per PN-EN 771-4+A1:2015, with compressive strength of at least 4 N/mm² (at least class 4) and gross dry density of at least 650 kg/m³,
- TeknoAmerblok hollow lightweight concrete blocks, as per PN-EN 771-3:A1:2015, with wall thickness of at least 32 mm, compressive strength of at least 12.5 N/mm² and gross dry density of at least 1.5 kg/dm³.

Due to corrosive aggressiveness of the environment, expansion bolts made of zinc-coated steel should be used in accordance with requirements specified in PN-EN ISO 12944-2:2018, PN-EN ISO 9223:2012 and PN-EN ISO 2081:2018.

To determine the design pull-out load-bearing capacities of fixings made using FIX, UNO, 4ALL and UNO TIMBER expansion anchors for concrete substrates, divide the characteristic pull-out load-bearing capacities given in Appendix C by a safety factor of 1.8.

To determine the design pull-out load-bearing capacities of fixings made using FIX, UNO, 4ALL and UNO TIMBER expansion anchors for clay, calcium silicate or TeknoAmerblok hollow block substrates, divide the characteristic pull-out load-bearing capacities given in Appendix C by a safety factor of 2.5.

To determine the design pull-out load-bearing capacities of fixings made using FIX, UNO, 4ALL and UNO TIMBER expansion anchors for autoclaved aerated concrete or gypsum plasterboard substrates, divide the characteristic pull-out load-bearing capacities given in Appendix C by a safety factor of 2.0.

To determine the design shear load-bearing capacities of fixings made using FIX, UNO, 4ALL and UNO TIMBER expansion anchors, divide the characteristic shear load-bearing capacities given in Appendix C by a safety factor of 1.25.

To determine the design load-bearing capacities of fixings made using FIX, UNO, 4ALL and UNO TIMBER expansion anchors related to tensile strength of hooks, divide the characteristic load-bearing capacities related to tensile strength of hooks given in Appendix C by a safety factor of 1.25.

The design pull-out load-bearing capacity of fixings made using FIX, UNO and 4ALL expansion anchors is the lower of two values: design pull-out load bearing capacity and load-bearing capacity related to tensile strength of hook.

Parameters for installation and arrangement of the FIX, UNO, 4ALL and UNO TIMBER expansion anchors in the substrate are given in Appendix B.

The hole in the substrate should be drilled perpendicular to the substrate surface using a rotary hammer drill. For substrates made of normal weight concrete, solid clay bricks, solid calcium silicate bricks and hollow calcium silicate bricks, drilling should be done with hammering, for other substrates – without hammering.

Expansion of the anchors is done by manual setting of the plastic sleeve in the hole drilled in the substrate and then screwing the expansion bolt into the sleeve. Once screwed in, the bolt expands the expansion part of the sleeve, pressing it against the sides of the hole in the substrate.

The FIX, UNO, 4ALL and UNO TIMBER expansion anchors should be used in accordance with a design prepared taking into account Polish standards and building regulations as well as provisions of this National Technical Assessment, and in accordance with the manufacturer's manual related to conditions for making fixings using the above-mentioned anchors.

3. PERFORMANCE OF THE PRODUCT AND METHODS USED TO ASSESS IT

3.1. Performance of the product

3.1.1. Characteristic pull-out and shear load-bearing capacities of fixings made using the anchors. Characteristic pull-out and shear load-bearing capacities of fixings made using the FIX, UNO, 4ALL and UNO TIMBER expansion anchors are given in Appendix C.

3.1.2. Characteristic load-bearing capacities of anchors related to tensile strength of hooks. Characteristic load-bearing capacities of anchors related to tensile strength of hooks are given in Appendix C.

3.1.3. Durability of the anchors. The zinc coating with a thickness of no less than 5 µm on the steel expansion bolts ensures durability of the anchors in the scope stemming from sec. 2.

3.2. Methods used to assess the performance

3.2.1. Characteristic pull-out and shear load-bearing capacities of fixings made using the anchors. Testing of characteristic pull-out and shear load-bearing capacities of fixings made using the anchors is performed in accordance with EAD 330284-00-0604 (previously ETAG 020:2012), with anchors set in substrates described in Appendix C.

3.2.2. Characteristic load-bearing capacities of anchors related to tensile strength of hooks.

Testing of characteristic load-bearing capacities of the anchors related to tensile strength of hooks is performed using a device with a range selected for the expected value of ultimate force, which enables constant and slow increase in force until the hook is destroyed.

3.2.3. Durability of the anchors. Testing of thickness of zinc coating on steel expansion bolts is performed in accordance with PN-EN ISO 2178:2016 or PN-EN ISO 3497:2004.

4. PACKAGING, TRANSPORT, STORAGE AND MARKING OF THE PRODUCT

The FIX, UNO, 4ALL and UNO TIMBER plastic-metal expansion anchors should be delivered in sets, in manufacturer's packaging, and stored and transported in a manner which ensures that their technical properties remain unchanged.

The manner in which the products are marked with a construction mark should be consistent with the Regulation

of the Minister of Infrastructure and Construction of 17 November 2016 on the procedure for declaring the performance of construction products and marking them with a construction mark (Dz. U. /Journal of Laws/ of 2016, item 1966, as amended).

The product's construction mark should be accompanied by the following information:

- the last two digits of the year in which the construction mark was placed on the construction product for the first time,
- the name and the address of the registered office of the manufacturer or an identification mark allowing the name and the address of the manufacturer to be clearly identified,
- the name and type designation of the construction product, the number and year of issue of the National Technical Assessment according to which performance has been declared (ITB-KOT-2022/2086 Revision 1),
- the national declaration of performance number,
- the level or class of performance declared,
- the name of the certification body that has participated in the assessment and verification of constancy of performance of the construction product,
- the address of the manufacturer's website if the national declaration of performance is available on that website.

Apart from the national declaration of performance, the material safety data sheet should be provided or made available as appropriate. The above also applies to information on hazardous substances contained in the construction product referred to in Article 31 or 33 of Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency.

In addition, the marking of a construction product constituting a hazardous mixture according to REACH should comply with the requirements of Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances

and mixtures, amending and repealing Directives 67/548/EEC and amending 1999/45/EC, and Regulation (EC) No 1907/2006.

5. ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

5.1. National system for assessment and verification of constancy of performance

In accordance with the Regulation of the Minister of Infrastructure and Construction of 17 November 2016 on the procedure for declaring the performance of construction products and marking them with a construction mark (Dz. U. /Journal of Laws/ of 2016, item 1966, as amended), System 2+ for assessment and verification of constancy of performance is applied.

5.2. Type testing

The performance assessed in sec. 3 constitutes the type examination of the product for as long as there are no changes in its raw materials, ingredients, production line or production plant.

5.3. Factory production control

A factory production control system should be implemented at the manufacturer's production plant. All components of that system, requirements, and provisions adopted by the manufacturer should be documented systematically in the form of rules and procedures, including records of the performance of tests. Factory production control should be adapted to production technology and should ensure that the declared performance of the product is maintained during batch production.

Factory production control includes the specification and verification of raw materials and ingredients, control and tests during the production process, and verification tests (acc. to sec. 5.4) carried out by the manufacturer in accordance with the specified test plan and with the rules and procedures specified in the factory production control documentation.

Production control results should be recorded systematically. The records should confirm that the products meet the criteria for assessment and verification of constancy of performance. It should be possible to fully identify and reproduce individual products or product batches and related production details.

5.4. Verification tests

5.4.1. Test programme. The test programme includes:

- a) routine testing,
- b) periodic testing.

5.4.2. Routine testing. Routine testing includes checking of:

- a) shape and dimensions,
- b) thickness of zinc coating (applies to expansion bolts),
- c) density of plastic from which sleeves of the UNO TIMBER anchors are made.

5.4.3. Periodic testing. Periodic testing includes checking of:

- a) characteristic load-bearing capacities of fixings made using the anchors,
- b) IR spectrum of plastic from which sleeves of the UNO TIMBER anchors are made.

5.5. Testing frequency

Routine testing should be carried out according to the agreed test programme, but at least for each product batch. The size of the product batch should be specified in the factory production control documentation.

Periodic testing should be carried out at least once every 3 years.

6. INSTRUCTION

6.1. The National Technical Assessment ITB-KOT-2022/2086 Revision 1 constitutes a positive assessment of performance of those essential characteristics of FIX, UNO, 4ALL and UNO TIMBER plastic-metal expansion anchors which, in accordance with the intended use stemming from provisions of this Assessment, affect the fulfilment of basic requirements by construction works in which the product is to be used.

6.2. The National Technical Assessment ITB-KOT-2022/2086 Revision 1 does not constitute an authorisation to mark the construction product with a construction mark.

According to the Act of 16 April 2004 on construction products (Dz. U. /Journal of Laws/ of 2021, item 1213), products covered by this National Technical Assessment may be placed and made available on the national market if the manufacturer has assessed and verified the constancy of their performance, prepared a national declaration of performance in accordance with the National Technical Assessment ITB-KOT-2022/2086 Revision 1 and marked the products with a construction mark in accordance with applicable regulations.

6.3. The National Technical Assessment ITB-KOT-2086/1916 Revision 1 does not infringe the rights provided for in regulations on the protection of industrial property, in particular the Act of 30 June 2000 – Industrial Property Law (Dz. U. /Journal of Laws/ of 2021, item 324). The provision of these rights is the responsibility of users of this National Technical Assessment issued by the Building Research Institute.

6.4. By issuing this National Technical Assessment, the Building Research Institute shall not become liable for any infringement of exclusive or acquired rights.

6.5. The National Technical Assessment does not release the manufacturer of the products from liability for their proper quality and contractors from liability for their proper application.

6.6. The validity of the National Technical Assessment may be renewed for further periods not exceeding 5 years.

7. LIST OF DOCUMENTS USED IN THE PROCEDURE

7.1. Reports, test reports, assessments, classifications

1. 02328/22/R 163NZZ. Technical opinion. Building Structures, Geotechnics and Concrete Department of the Building Research Institute, Katowice 2022
2. NZK.410.263.2021 07323.04.PK. Expert opinion. Building Structures, Geotechnics and Concrete Department of the Building Research Institute, Katowice 2022
3. NZK.411.259.2021 03456.20.PK. Letter on testing and assessment of suitability for application of RAWLPLUG non-structural multi-point fixings in concrete and stone substrates. Building Structures, Geotechnics and Concrete Department of the Building Research Institute, Katowice 2021
4. LZK02-02328/21/R142NZZ. Test report. Building Structures, Geotechnics and Concrete Department of the Building Research Institute, Katowice 2021
5. LZK01-02328/21/R142NZZ. Test report. Building Structures, Geotechnics and Concrete Department of the Building Research Institute, Katowice 2021
6. LZK01-02328/21/R150NZZ. Test report. Building Structures, Geotechnics and Concrete Department of the Building Research Institute, Katowice 2021
7. LZK00-02328/21/R143NZZ. Test report. Building Structures, Geotechnics and Concrete Department of the Building Research Institute, Katowice 2021
8. LZK00-02328/21/R150NZZ. Test report. Building Structures, Geotechnics and Concrete Department of the Building Research Institute, Katowice 2021
9. RB-54_09_19. Periodic testing report. RAWLPLUG S.A., 2019
10. LZK00-02328/16/R85NZZ. Test report for 4ALL plastic-metal expansion anchors. Building Structures and Geotechnics Department of the Building Research Institute, Katowice 2016
11. LOK00-02328/14/R49OSK. Test report for FIX, UNO, 4ALL general fixing anchors. Buildings and Structures Sited in Mining Areas Department of the Building Research Institute, Katowice 2014
12. LOK00-02328/14/R54OSK. Test report for hooks intended for plastic-metal anchors. Buildings and Structures Sited in Mining Areas Department of the Building Research Institute, Katowice 2014
13. Report – DSC analysis results, 13.04.2012, Wrocław University of Science and Technology, Institute of Environmental Engineering
14. LOK-1329/A/09 and LOK-1344/A/09. Test reports for FIX and UNO expansion anchors. Silesian Branch in Katowice of the Building Research Institute in Warsaw. LOK Laboratory of Fasteners and Construction Products
15. Test report for plastics (DSC thermogram) for Koelner, 17.02.2009 Wrocław University of Science and Technology, Department of Polymer Engineering and Technology

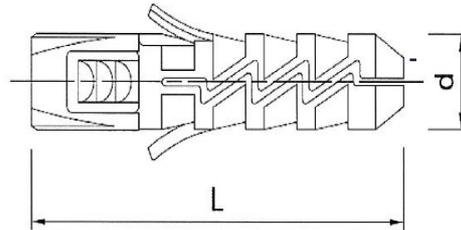
7.2. Related standards and documents

PN-EN ISO 11357-1:2016 *Plastics. Differential scanning calorimetry (DSC). Part 1: General principles*

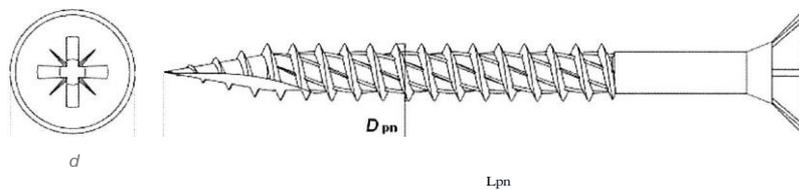
PN-EN ISO 1183-1:2019	<i>Plastics. Methods for determining the density of non-cellular plastics. Part 1: Immersion method, liquid pycnometer method and titration method</i>
PN-EN 206+A2:2021	<i>Concrete. Specification, performance, production and conformity</i>
PN-EN 771-1+A1:2015	<i>Specifications for masonry units. Part 1: Clay masonry units</i>
PN-EN 771-2+A1:2015	<i>Specifications for masonry units. Part 1: Calcium silicate masonry units</i>
PN-EN 771-3+A1:2015	<i>Specifications for masonry units. Part 3: Aggregate concrete masonry units (Dense and lightweight aggregates)</i>
PN-EN 771-4+A1:2015	<i>Specifications for masonry units. Part 4: Autoclaved aerated concrete masonry units</i>
PN-EN 520+A1:2012	<i>Gypsum plasterboards. Definitions, requirements and test methods</i>
PN-EN ISO 2081:2018	<i>Metallic and other inorganic coatings. Electroplated coatings of zinc with supplementary treatments on iron or steel</i>
PN-EN ISO 4042:2018	<i>Fasteners. Electroplated coating systems</i>
PN-EN ISO 2178:2016	<i>Non-magnetic coatings on magnetic substrates. Measurement of coating thickness. Magnetic method</i>
PN-EN ISO 3497:2004	<i>Metallic coatings. Measurements of coating thickness. X-ray spectrometric methods</i>
PN-EN ISO 12944-2:2018	<i>Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Part 2: Classification of environments</i>
PN-EN ISO 9223:2012	<i>Corrosion of metals and alloys. Corrosivity of atmospheres. Classification, determination and estimation</i>
ASTM E1421	<i>Standard Practice for Describing and Measuring Performance of Fourier Transform Mid-Infrared (FT-MIR) Spectrometers: Level Zero and Level One Tests</i>
ETAG 020:2012	<i>Plastic anchors for multiple use in concrete and masonry for non-structural applications</i>
EAD 330284-00-0604	<i>Plastic anchors for redundant non-structural systems in concrete and masonry</i>
EAD 330196-01-0604	<i>Plastic anchors made of virgin or non-virgin material for fixing of ET/CS with rendering</i>
AT-15-8093/2016	<i>FIX, UNO and 4ALL plastic-metal expansion anchors</i>

APPENDICES

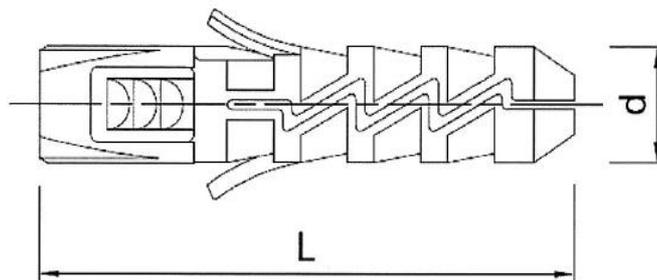
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Appendix A.


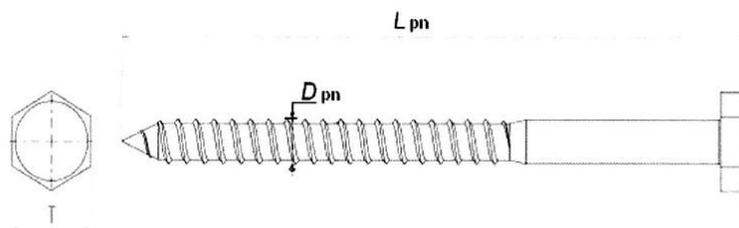
a) sleeve of the FIX anchor



b) countersunk head screw

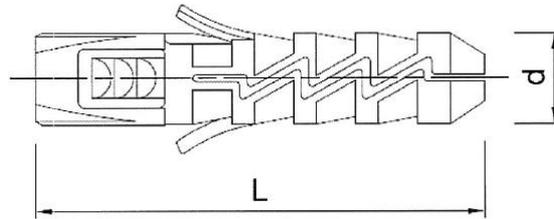
Fig. A1. Components of FIX plastic-metal expansion anchors (with a countersunk head screw)


a) sleeve of the FIX anchor

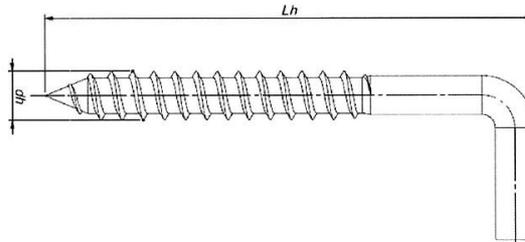


b) hexagon head screw

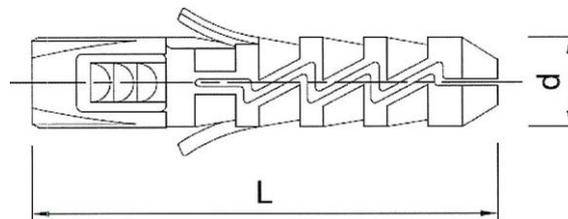
Fig. A2. Components of FIX plastic-metal expansion anchors (with a hexagon head screw)



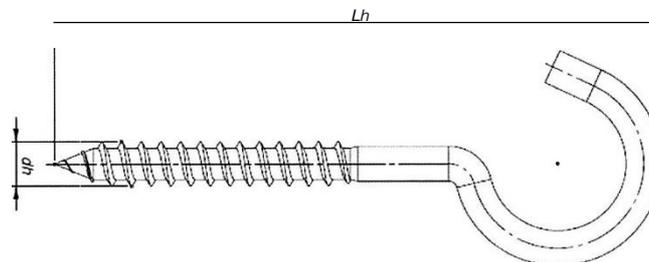
a) sleeve of the FIX anchor



b) screw with a square hook

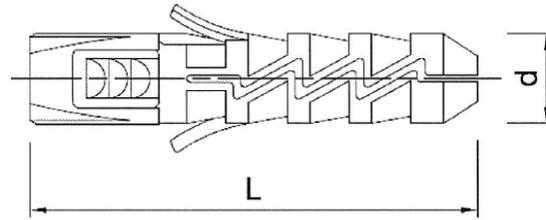
Fig. A3. Components of FIX plastic-metal expansion anchors (with a screw with a square hook)

a) sleeve of the FIX anchor

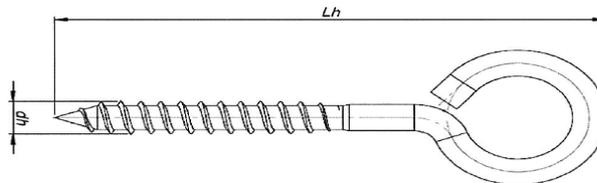


b) screw with a cup hook

Fig. A4. Components of FIX plastic-metal expansion anchors (with a screw with a cup hook)

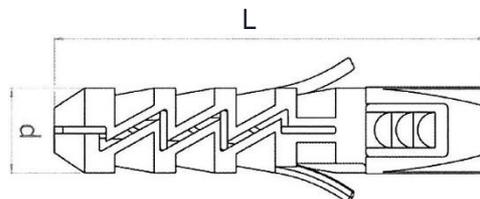


a) sleeve of the FIX anchor

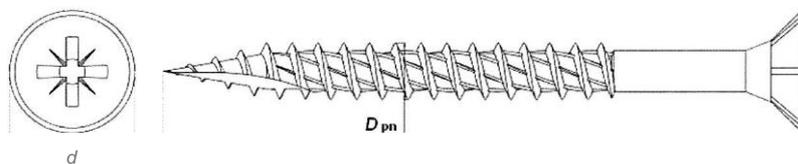


b) screw with a Q hook

Fig. A5. Components of FIX plastic-metal expansion anchors (with a screw with a Q hook)

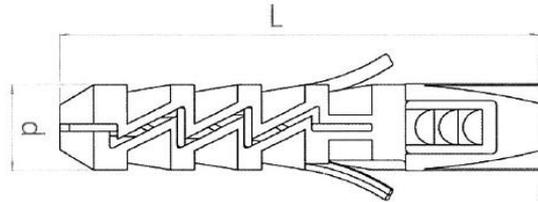


a) sleeve of the FIX-K anchor (with a flange)

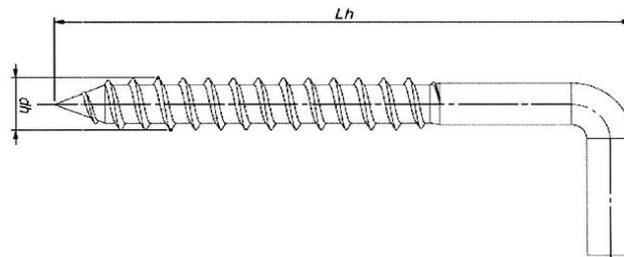


b) countersunk head screw

Fig. A6. Components of FIX-K plastic-metal expansion anchors (with a countersunk head screw)

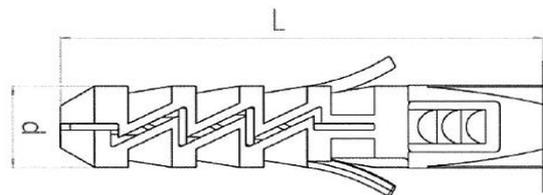


a) sleeve of the FIX-K anchor (with a flange)

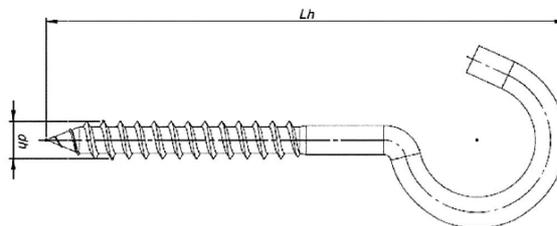


b) screw with a square hook

Fig. A7. Components of FIX-K plastic-metal expansion anchors (with a screw with a square hook)

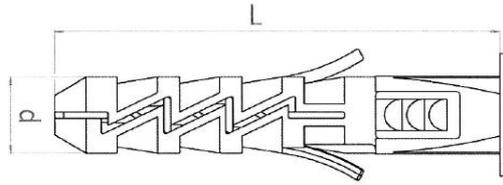


a) sleeve of the FIX-K anchor (with a flange)

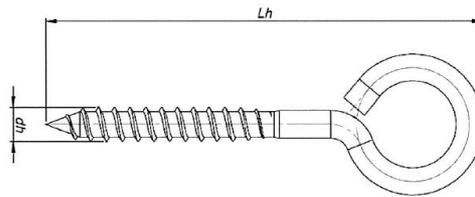


b) screw with a cup hook

Fig. A8. Components of FIX-K plastic-metal expansion anchors (with a screw with a cup hook)

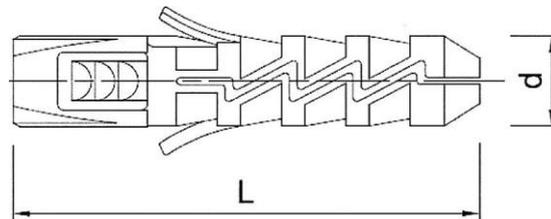


a) sleeve of the FIX-K anchor (with a flange)

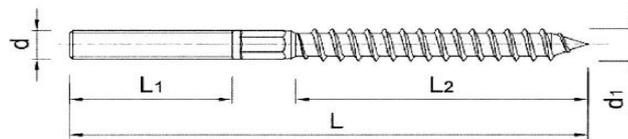


b) screw with a Q hook

Fig. A9. Components of FIX-K plastic-metal expansion anchors (with a screw with a Q hook)

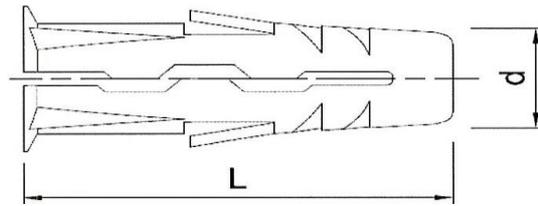


a) sleeve of the FIX anchor

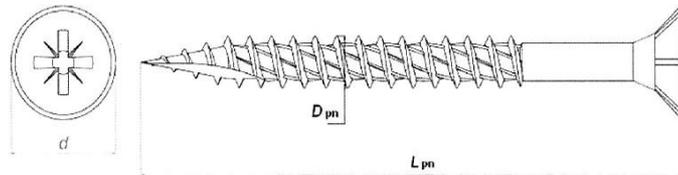


b) double-threaded screw

Fig. A10. Components of FIX plastic-metal expansion anchors (with a double-threaded screw)

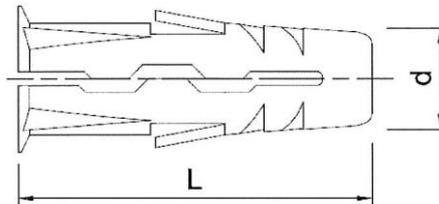


a) sleeve of UNO anchors

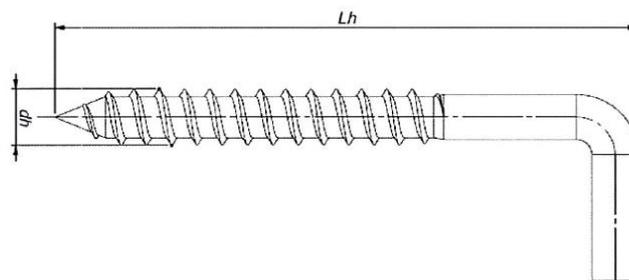


b) countersunk head screw

Fig. A11. Components of UNO plastic-metal expansion anchors (with a countersunk head screw)

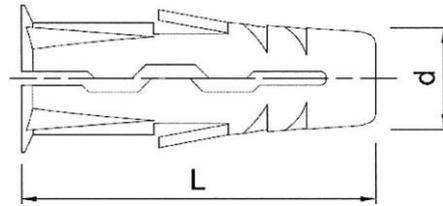


a) sleeve of UNO anchors

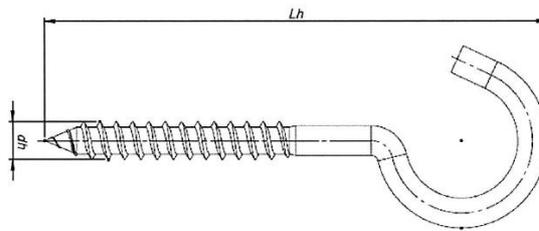


b) screw with a square hook

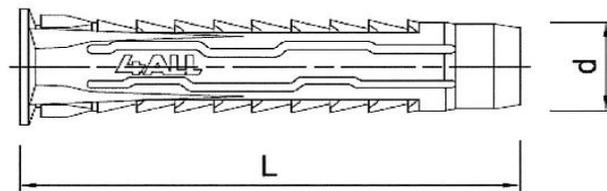
Fig. A12. Components of UNO plastic-metal expansion anchors (with a screw with a square hook)



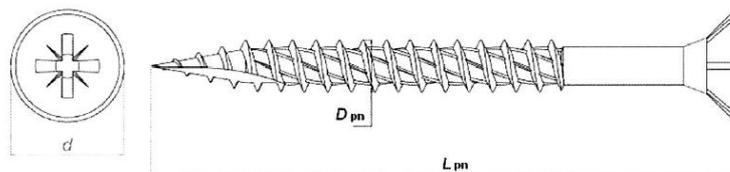
a) sleeve of UNO anchors



b) screw with a cup hook

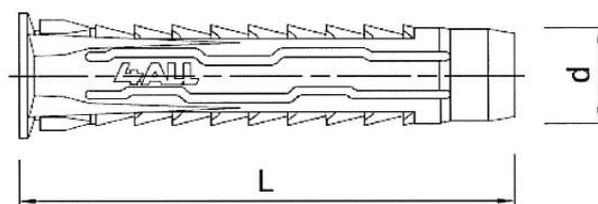
Fig. A13. Components of UNO plastic-metal expansion anchors (with a screw with a cup hook)


a) sleeve of the 4ALL anchor

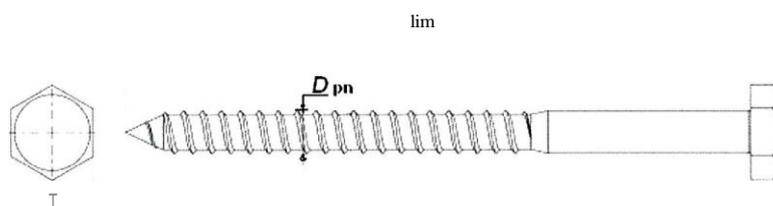


b) countersunk head screw

Fig. A14. Components of 4ALL plastic-metal expansion anchors (with a countersunk head screw)

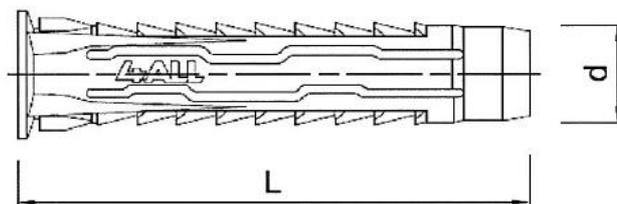


a) sleeve of the 4ALL anchor

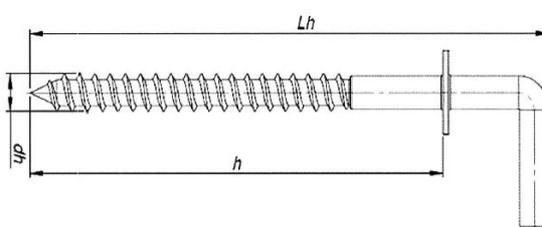


b) hexagon head screw

Fig. A15. Components of 4ALL plastic-metal expansion anchors (with a hexagon head screw)



a) sleeve of the 4ALL anchor



b) screw with a shouldered square hook

$h \geq L$, where: h – tip-shoulder length, L – sleeve length

Fig. A16. Components of 4ALL plastic-metal expansion anchors (with a screw with a shouldered square hook)

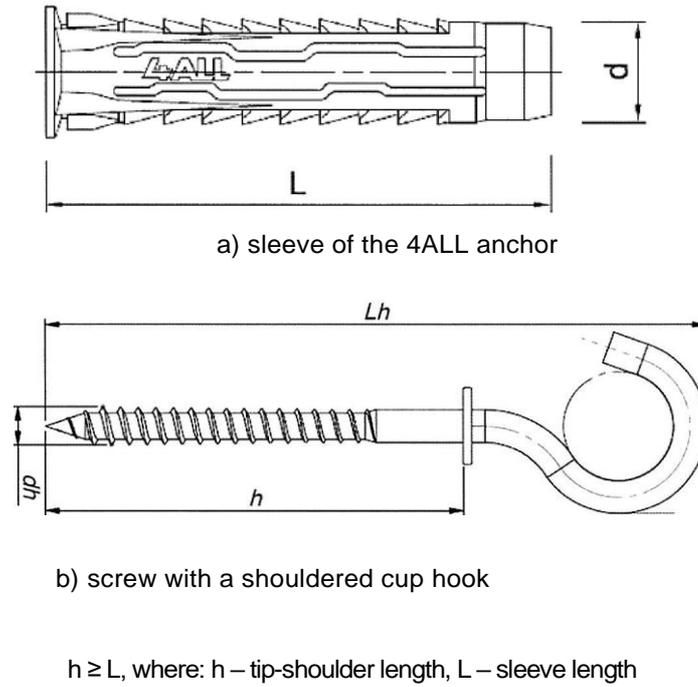


Fig. A17. Components of 4ALL plastic-metal expansion anchors (with a screw with a shouldered cup hook)

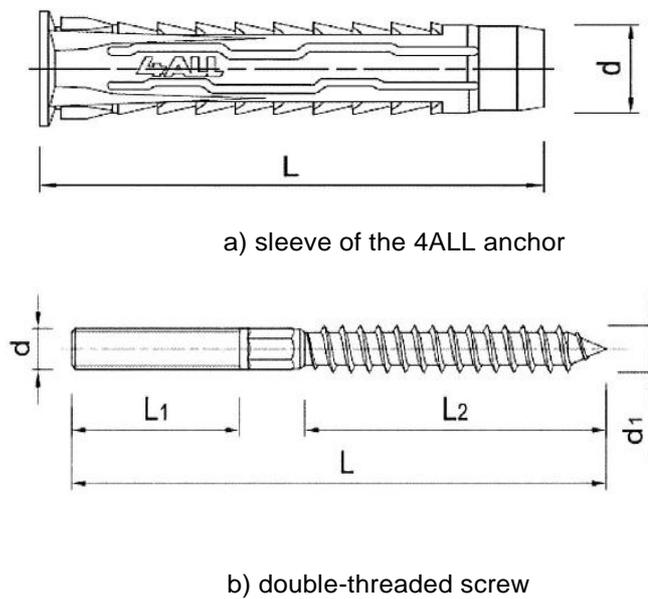
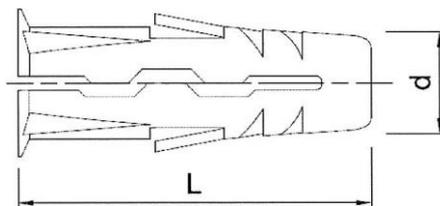
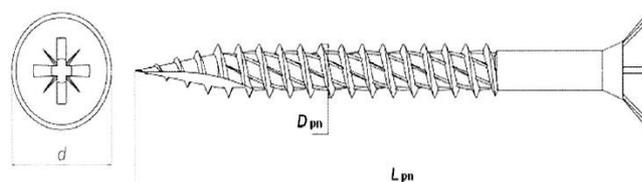


Fig. A18. Components of 4ALL plastic-metal expansion anchors (with a double-threaded screw)



a) sleeve of UNO TIMBER anchors



b) countersunk head screw

Fig. A19. Components of UNO TIMBER plastic-metal expansion anchors (with a countersunk head screw)

Table A1. Dimensions of FIX plastic-metal expansion anchors (with a countersunk head screw or with a hexagon head screw)

Size	Designation			Sleeve		Screw	
	without a flange		with a flange	Diameter	Length	Diameter	Length
	Type of screw head			d,mm	L,mm	Dpn, mm	Lpn, mm
	Countersunk head	Hexagon head	Countersunk head				
Ø5	FIX-05	-	-	5.0 ¹⁾	25	3.5 ¹⁾	30 ± 40
Ø6	FIX-06	-	FIX-K-06	6.0 ¹⁾	30	3.5 ¹⁾	35 ± 50
						4.0 ¹⁾	35 ± 50
Ø8	FIX-08	-	FIX-K-08	8.0 ¹⁾	40	4.5 ¹⁾	45 ± 60
						5.0 ¹⁾	45 ± 100
Ø10	FIX-10	FIX-10	FIX-K-10	10.0 ²⁾	50	5.0 ¹⁾	55 ± 80
						6.0 ¹⁾	55 ± 80
						6.0 ¹⁾	65 ± 120
Ø12	FIX-12	FIX-12	-	12.0 ²⁾	60	8.0 ²⁾	60 ± 180
Ø14	-	FIX-14	FIX-K-14	14.0 ²⁾	70	10.0 ²⁾	80 ± 260
Dimensional tolerances				¹⁾ ± 0.1 ²⁾ ± 0.2	± 0.5	¹⁾ ± 0.1 ²⁾ ± 0.2	± 1.0

Table A2. Dimensions of FIX plastic-metal expansion anchors (with a square hook, a cup hook or a Q hook)

Size	Designation		Sleeve		Screw	
	without a flange	with a flange	Diameter	Length	Diameter	Length
			d,mm	L,mm	dh,mm	Lh,mm
Ø6	FIX-06K	FIX-K-06K	6.0 ¹⁾	30	3.5 ¹⁾	33 + 70
					4.0 ¹⁾	33 + 70
	FIX-06S	FIX-K-06S			3.5 ¹⁾	40 + 90
					4.0 ¹⁾	40 + 90
Ø8	FIX-08K	FIX-K-08K	8.0 ²⁾	40	4.5 ¹⁾	44 + 70
					5.0 ¹⁾	44 + 70
	FIX-08S	FIX-K-08S			4.5 ¹⁾	50 + 90
					5.0 ¹⁾	50 + 90
Ø10	FIX-10K	FIX-K-10K	10.0 ²⁾	50	6.1 ¹⁾	55 + 70
	FIX-10S	FIX-K-10S			6.0 ¹⁾	65 + 90
Ø12	FIX-12K	FIX-K-12K	12.0 ²⁾	60	8.0 ²⁾	65 + 90
	FIX-12H	-			8.0 ²⁾	75 + 130
Ø14	FIX-14K	-	14.0 ²⁾	70	9.5 ²⁾	75 + 115
Dimensional tolerances			1) ± 0.1 2) ± 0.2	± 0.5	1) ± 0.1 2) ± 0.2	± 1.0
K – square hook S – cup hook H – Q hook						

Table A3. Dimensions of FIX plastic-metal expansion anchors (with a double-threaded screw)

Size	Double-threaded screw	Designation	Sleeve		Double-threaded screw			
			Diameter	Length	Diameter	Length, mm		
			d,mm	L,mm	d1, mm	L	L1	L2
Ø10	WD-08	FIX-10	10.0	50	7.3	80	30	40
Ø12	WD-10	FIX-12	12.0	60	7.3	100	40	46
		FIX-12	12.0	60	7.3	120	50	50
Dimensional tolerances			± 0.2	± 0.5	± 0.2	± 1.0		

Table A4. Dimensions of UNO expansion anchors with a countersunk head screw

Size	Designation	Sleeve		Screw	
		Diameter	Length	Diameter	Length
		d,mm	L,mm	Dpn, mm	lpn, mm
Ø5	UNO-05	5.0 ¹⁾	24	3.0 ¹⁾	30 ÷ 40
				3.5 ¹⁾	30 ÷ 50
				4.0 ¹⁾	30 ÷ 80
				4.5 ¹⁾	30 ÷ 80
Ø6	UNO-06	6.0 ¹⁾	28	3.5 ¹⁾	35 ÷ 50
				4.0 ¹⁾	35 ÷ 80
				4.5 ¹⁾	35 ÷ 80
				5.0 ¹⁾	35 ÷ 260

Table A4. Dimensions of UNO expansion anchors with a countersunk head screw, cont.

Size	Designation	Sleeve		Screw	
		Diameter	Length	Diameter	Length
		d,mm	L,mm	Dpn, mm	lpn, mm
Ø7	UNO-07	7.0 ²⁾	30	4.0 ¹⁾	35 ÷ 80
				4.5 ¹⁾	35 ÷ 80
				5.0 ¹⁾	35 ÷ 260
				6.0 ¹⁾	35 ÷ 200
Ø8	UNO-08	8.0 ²⁾	32	4.5 ¹⁾	40 ÷ 80
				5.0 ¹⁾	40 ÷ 260
				6.0 ¹⁾	40 ÷ 200
Ø10	UNO-10	10.0 ²⁾	36	5.0 ¹⁾	45 ÷ 260
				6.0 ¹⁾	45 ÷ 260
				8.0 ²⁾	45 ÷ 260
Dimensional tolerances		¹⁾ ± 0.1 ²⁾ ± 0.2	± 0.5	¹⁾ ± 0.1 ²⁾ ± 0.2	± 1.0

Table A5. Dimensions of UNO expansion anchors with a square hook or a cup hook

Size	Designation	Sleeve		Screw	
		Diameter	Length	Diameter	Length
		d,mm	L,mm	dh,mm	Lh,mm
Ø5	UNO-05K	5.0 ¹⁾	24	3.5	30 ÷ 70
	UNO-05S			3.5	40 ÷ 90
Ø6	UNO-06K	6.0 ¹⁾	28	3.5	30 ÷ 70
				4.0	30 ÷ 70
	UNO-06S			3.5	40 ÷ 90
Ø7	UNO-07S	7.0 ²⁾	30	4.0	40 ÷ 90
				4.5	40 ÷ 90
Ø8	UNO-08K	8.0 ²⁾	32	4.5	35 ÷ 70
				5.0	35 ÷ 70
	UNO-08S			4.5	40 ÷ 90
Ø10	UNO-10K	10.0 ²⁾	36	5.0	40 ÷ 90
	UNO-10S			6.0	43 ÷ 70
Dimensional tolerances		¹⁾ ± 0.1 ²⁾ ± 0.2	± 0.5	± 0.1	± 1.0
K – square hook S – cup hook					

Table A6. Dimensions of 4ALL expansion anchors with a countersunk head screw or a hexagon head screw

Size	Designation		Sleeve		Screw	
			Diameter	Length	Diameter	Length
	Countersunk head	Hexagon head	d,mm	L,mm	Dpn, mm	Lpn, mm
Ø5	4ALL-05	-	5.0 ¹⁾	25	3.0 ¹⁾	30 ÷ 40
					3.5 ¹⁾	30 ÷ 50
					4.0 ¹⁾	30 ÷ 80
Ø6	4ALL-06	-	6.0 ¹⁾	30	4.0 ¹⁾	35 ÷ 80
					4.5 ¹⁾	35 ÷ 80
					5.0 ¹⁾	35 ÷ 260
				50	4.5 ¹⁾	55 ÷ 80
					5.0 ¹⁾	55 ÷ 260
Ø8	4ALL-08	-	8.0 ²⁾	40	4.5 ¹⁾	45 ÷ 80
					5.0 ¹⁾	45 ÷ 260
					6.0 ¹⁾	45 ÷ 200
				65	5.0 ¹⁾	70 ÷ 260
					6.0 ¹⁾	70 ÷ 200
Ø10	4ALL-10	-	10.0 ²⁾	50	6.0 ¹⁾	55 ÷ 200
					8.0 ²⁾	55 ÷ 260
Ø12	-	4ALL-12	12.0 ²⁾	60	8.0 ²⁾	65 ÷ 100
					10.0 ²⁾	65 ÷ 180
Ø14	-	4ALL-14	14.0 ²⁾	70	10.0 ²⁾	75 ÷ 260
Dimensional tolerances			¹⁾ ± 0.1 ²⁾ ± 0.2	± 0.5	¹⁾ ± 0.1 ²⁾ ± 0.2	± 1.0

Table A7. Dimensions of 4ALL expansion anchors with a shouldered square hook or a shouldered cup hook

Size	Designation	Sleeve		Screw	
		Diameter	Length	Diameter	Length
		d,mm	L,mm	dh,mm	Lh,mm
Ø5	4ALL-05K	5.0 ¹⁾	25	3.5 ¹⁾	30 ÷ 70
	4ALL-05S	5.0 ¹⁾	25	3.5 ¹⁾	50 ÷ 100
Ø6	4ALL-06K	6.0 ¹⁾	30	3.5 ¹⁾	35 ÷ 70
				4.0 ¹⁾	35 ÷ 70
	4ALL-06S			3.5 ¹⁾	50 ÷ 100
Ø8	4ALL-08K	8.0 ²⁾	40	4.0 ¹⁾	50 ÷ 100
				4.5 ¹⁾	45 ÷ 90
	4ALL-08S			5.0 ¹⁾	45 ÷ 90
				4.5 ¹⁾	55 ÷ 100
Ø10	4ALL-10K	10.0 ²⁾	50	5.0 ¹⁾	55 ÷ 100
				6.1 ²⁾	55 ÷ 90
	4ALL-10S			6.1 ²⁾	65 ÷ 120
Dimensional tolerances		¹⁾ ± 0,1 ²⁾ ± 0,2	± 0.5	¹⁾ ± 0,1 ²⁾ ± 0,2	± 1.0
K – shouldered square hook S – shouldered cup hook					

Table A8. Dimensions of 4ALL plastic-metal expansion anchors (with a double-threaded screw)

Size	Double-threaded screw	Designation	Sleeve		Double-threaded screw			
			Diameter	Length	Diameter	Length, mm		
			d,mm	L,mm	d1,mm	L	L1	L2
Ø10	WD-08	4ALL-10	10.0	50	7.3	80	30	40
Ø12	WD-10	4ALL-12	12.0	60	8.9	100	30	60
Dimensional tolerances			± 0.2	± 0.5	± 0.2	± 1.0		

Table A9. Dimensions of UNO TIMBER expansion anchors with a countersunk head screw

Size	Designation	Sleeve		Screw	
		Diameter	Length	Diameter	Length
		d,mm	L,mm	Dpn, mm	Lpn, mm
Ø5	UNOT-05	5.0 ¹⁾	24	3.0 ¹⁾	30 ÷ 40
				3.5 ¹⁾	30 ÷ 50
				4.0 ¹⁾	30 ÷ 80
				4.5 ¹⁾	30 ÷ 80
Ø6	UNOT-06	6.0 ¹⁾	28	3.5 ¹⁾	35 ÷ 50
				4.0 ¹⁾	35 ÷ 80
				4.5 ¹⁾	35 ÷ 80
				5.0 ¹⁾	35 ÷ 260
Ø7	UNOT-07	7.0 ²⁾	30	4.0 ¹⁾	35 ÷ 80
				4.5 ¹⁾	35 ÷ 80
				5.0 ¹⁾	35 ÷ 260
				6.0 ¹⁾	35 ÷ 200
Ø8	UNOT-08	8.0 ²⁾	32	4.5 ¹⁾	40 ÷ 80
				5.0 ¹⁾	40 ÷ 260
				6.0 ¹⁾	40 ÷ 200
Ø10	UNOT-10	10.0 ²⁾	36	5.0 ¹⁾	45 ÷ 260
				6.0 ¹⁾	45 ÷ 260
				8.0 ²⁾	45 ÷ 260
Dimensional tolerances		¹⁾ ± 0.1 ²⁾ ± 0.2	± 0.5	¹⁾ ± 0.1 ²⁾ ± 0.2	± 1.0

Appendix B.

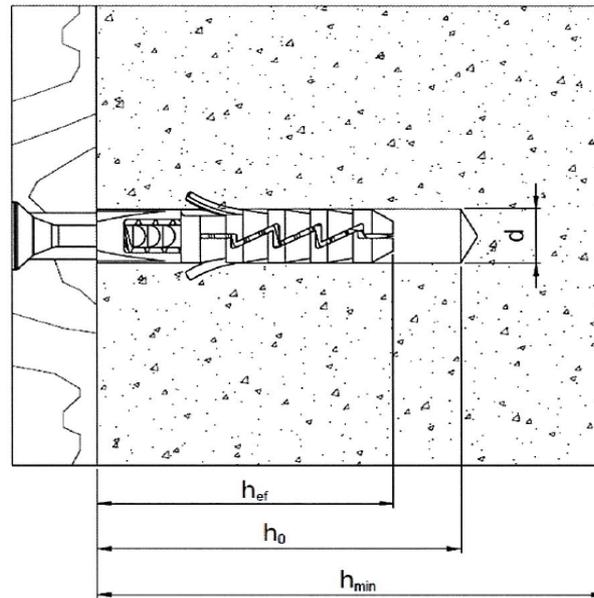


Figure 81. Parameters for installation of FIX expansion anchors in solid substrates

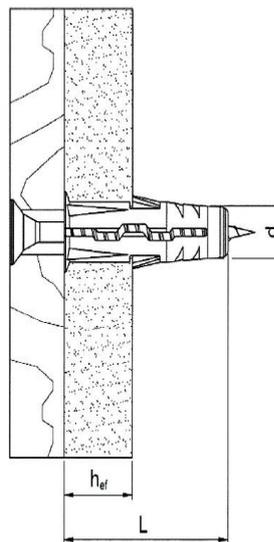


Figure 82. Parameters for installation and arrangement of UNO and UNO TIMBER expansion anchors in gypsum plasterboard substrates

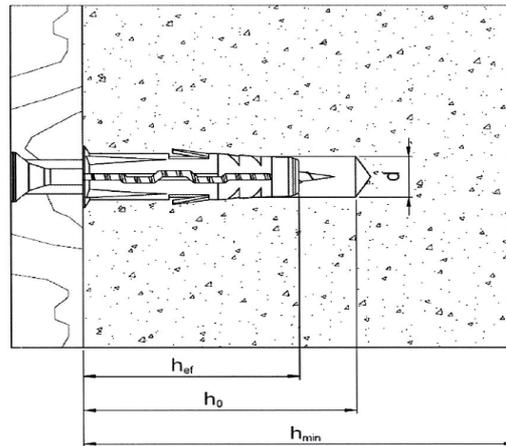


Figure B3. Parameters for installation and arrangement of UNO and UNO TIMBER expansion anchors in other substrates

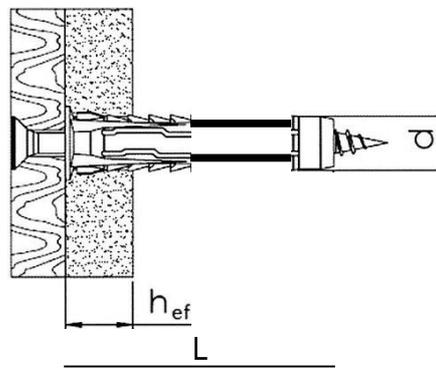


Figure B4. Parameters for installation and arrangement of 4ALL expansion anchors in gypsum plasterboard substrates

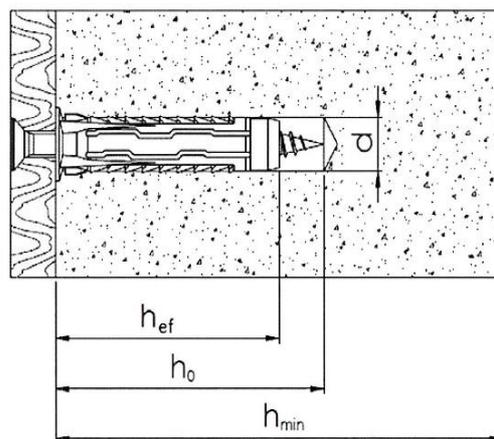


Figure B5. Parameters for installation and arrangement of 4ALL expansion anchors in other substrates

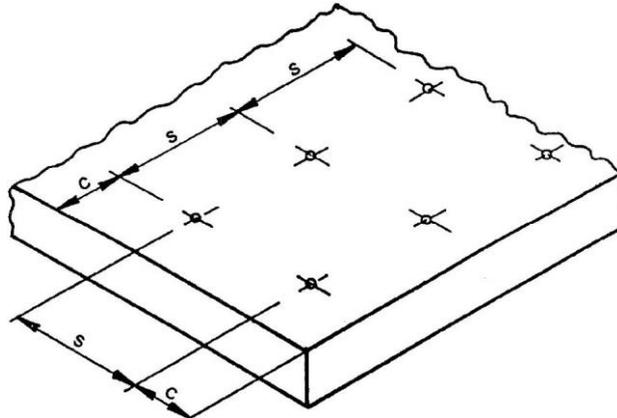


Figure B6. Parameters for arrangement of FIX, UNO, 4ALL and UNO TIMBER expansion anchors in the substrate

s – spacing between centres of anchors, c – distance between the anchor and the edge of the substrate

Table B1. Parameters for installation and arrangement of FIX expansion anchors

Size		Ø 5	Ø 6	Ø 8	Ø 10	Ø 12	Ø 14
Anchor diameter, mm	d	5	6	8	10	12	14
Substrate hole diameter, mm	do	5	6	8	10	12	14
Min. substrate hole depth, mm	ho	35	40	50	60	70	80
Effective anchorage depth of the anchor in the substrate	hef	25	30	40	50	60	70
Min. substrate thickness, mm	hmin	1.5 x hef ¹⁾					
Min. spacing of anchors, mm	Smin	2 x hef ²⁾ 3 x hef ³⁾					
Min. distance from the edge, mm	Cmin	2 x hef					
1) at least 80 mm 2) for concrete substrates 3) for other substrates							

Table B2. Parameters for installation and arrangement of UNO expansion anchors

Size		Ø ₅	Ø ₆	Ø ₇	Ø ₈	Ø ₁₀
Anchor diameter, mm	d	5	6	7	8	10
substrate hole diameter, mm	do	5	6	7	8	10
Min. substrate hole depth, mm	ho	34	38	40	42	46
Effective anchorage depth of the anchor in the substrate 1), mm	hef	24	28	30	32	36
Effective anchorage depth of the anchor in the substrate for a gypsum plasterboard with a thickness of 12.5 mm – push-through installation, mm	hef	12.5				
Min. substrate thickness, mm	hmin	1.5 x hef ²⁾				
Min. spacing of anchors, mm	Smin	2 x hef ³⁾ 3 x hef ⁴⁾				
Min. distance from the edge, mm	Cmin	2 x hef				
1) does not apply to gypsum plasterboards 2) at least 80 mm; does not apply to gypsum plasterboards 3) for concrete substrates 4) for other substrates						

Table B3. Parameters for installation and arrangement of 4ALL expansion anchors (not applicable to 4ALL-06050 and 4ALL-08065)

Size		Ø ₅	Ø ₆	Ø ₈	Ø ₁₀	Ø ₁₂	Ø ₁₄
Anchor diameter, mm	d	5	6	8	10	12	14
Substrate hole diameter, mm	do	5	6	8	10	12	14
Min. substrate hole depth, mm	ho	35	40	50	60	70	80
Effective anchorage depth of the anchor in the substrate 1), mm	hef	25	30	40	50	60	70
Effective anchorage depth of the anchor in the substrate for a gypsum plasterboard with a thickness of 12.5 mm – push-through installation, mm	hef	12.5					
Effective anchorage depth of the anchor in the substrate for a gypsum plasterboard with a thickness of 2 x 12.5 mm – push-through installation, mm	hef	25					
Min. substrate thickness, mm	hmin	1.5 x hef ²⁾					
Min. spacing of anchors, mm	Smin	2x hef ³⁾ 3x hef ⁴⁾					
Min. distance from the edge, mm	Cmin	2 x hef					
1) does not apply to gypsum plasterboards 2) at least 80 mm; does not apply to gypsum plasterboards 3) for concrete substrates 4) for other substrates							

Table B4. Parameters for installation and arrangement of 4ALL-06050 and 4ALL-08065 expansion anchors

Size		Ø 6	Ø 8
anchor diameter, mm	d	6.0	8.0
substrate hole diameter, mm	do	6.0	8.0
Min. substrate hole depth, mm	ho	60	75
Effective anchorage depth of the anchor in the substrate 1), mm	hef	50	65
Effective anchorage depth of the anchor in the substrate for a gypsum plasterboard with a thickness of 2 x 12.5 mm – push-through installation, mm	hef	25	25
Min. substrate thickness, mm	hmin	1.5 x hef ²⁾	
Min. spacing of anchors, mm	Smin	2x hef ³⁾ 3x hef ⁴⁾	
Min. distance from the edge, mm	Cmin	2 x hef	
1) does not apply to gypsum plasterboards 2) at least 80 mm; does not apply to gypsum plasterboards 3) for concrete substrates 4) for other substrates			

Table B5. Parameters for installation and arrangement of UNO TIMBER expansion anchors

Size		Ø 5	Ø 6	Ø 7	Ø 8	Ø 10
Anchor diameter, mm	d	5	6	7	8	10
Substrate hole diameter, mm	do	5	6	7	8	10
Min. substrate hole depth, mm	ho	34	38	40	42	46
Effective anchorage depth in the substrate 1), mm	hef	24	28	30	32	36
Effective anchorage depth of the anchor in the substrate for a gypsum plasterboard with a thickness of 12.5 mm – push-through installation, mm	hef	12.5				
Min. substrate thickness, mm	hmin	1.5 x hef ²⁾				
Min. spacing of anchors, mm	Smin	2x hef ³⁾ 3 x hef ⁴⁾				
Min. distance from the edge, mm	Cmin	2 x hef				
1) does not apply to gypsum plasterboards 2) at least 80 mm; does not apply to gypsum plasterboards 3) for concrete substrates 4) for other substrates						

Appendix C.

Table C1. Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacities of fixings made using the FIX expansion anchors

item	Type of	Size	Effective anchorage depth h_{et} , mm	Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacity, kN
1	2	3	4	5
1	normal weight concrete ¹⁾	ø5	25	0.1
2		ø6	30	0.15
3		ø8	40	0.5
4		ø10	50	0.4
5		ø12	60	1.2
6		ø14	70	1.2
7	solid clay brick ²⁾	ø5	25	0.15
8		ø6	30	0.4
9		ø8	40	2.0
10		ø10	50	0.9
11		ø12	60	4.0
12		ø14	70	2.5
13	solid calcium silicate brick ³⁾	ø5	25	0.1
14		ø6	30	0.3
15		ø8	40	1.2
16		ø10	50	0.6
17		ø12	60	3.0
18		ø14	70	1.2
19	autoclave aerated concrete ⁴⁾	ø5	25	0.15
20		ø6	30	0.4
21		ø8	40	0.75
22		ø10	50	0.9
23		ø12	60	2.0
24		ø14	70	1.15
25	TeknoAmerblok hollow block ⁵⁾	ø5	25	0.2
26		ø6	30	0.4

1) normal weight concrete, class C20/25 + C50/60 as per PN-EN

206+A2:2021 2) solid clay brick, as per PN-EN 771-1+A1:2015, class 20

3) solid calcium silicate brick, as per PN-EN 771-2+A1:2015, class 20

4) autoclaved aerated concrete, as per PN-EN 771-4+A1:2015, class 6, gross dry density 650 kg/m³

5) TeknoAmerblok hollow block, as per PN-EN 771-3:A1:2015, wall thickness 32 mm, compressive strength 12.5 N/mm², gross dry density 1.5 kg/dm³

Table C2. Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacities of fixings made using the UNO expansion anchors

item	Type of substrate	Size	Effective anchorage depth h_{ef} , mm	Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacity, kN
1	2	3	4	5
1	normal weight concrete ¹⁾	Ø 5	24	0.6
2		Ø 6	28	1.2
3		Ø 7	30	1.2
4		Ø 8	32	1.2
5		Ø 10	36	2.5
6	solid clay brick ²⁾	Ø 5	24	1.5
7		Ø 6	28	2.5
8		Ø 7	30	3.0
9		Ø 8	32	3.0
10		Ø 10	36	3.5
11	solid calcium silicate brick ³⁾	Ø 5	24	1,5
12		Ø 6	28	2.5
13		Ø 7	30	3.0
14		Ø 8	32	2.5
15		Ø 10	36	4.0
16	porous clay hollow brick (Porotherm) ⁴⁾	Ø 5	24	0.6
17		Ø 6	28	0.75
18		Ø 7	30	0.9
19		Ø 8	32	0.9
20		Ø 10	36	0.9
21	clay brick (cellular brick) ⁵⁾	Ø 5	24	0.75
22		Ø 6	28	0.75
23		Ø 7	30	0.9
24		Ø 8	32	0.9
25		Ø 10	36	1.2
26	hollow calcium silicate brick ⁶⁾	Ø 5	24	1,5
27		Ø 6	28	1,5
28		Ø 7	30	3.5
29		Ø 8	32	1,5
30		Ø 10	36	1.2
31	gypsum plasterboard ⁷⁾ (push-through installation)	Ø 5	12.5	0.17
32		Ø 6	12.5	0.21
33		Ø 7	12.5	0.24
34		Ø 8	12.5	0.37
35		Ø 10	12.5	0.34
36	autoclaved aerated concrete ⁸⁾	Ø 5	24	0.4
37		Ø 6	28	0.5
38		Ø 7	30	0.75
39		Ø 8	32	0.75
40		Ø 10	36	0.9

Table C2 cont. Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacities of fixings made using the UNO expansion anchors

item	Type of substrate	Size	Effective anchorage depth h., mm	Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacity, kN
1	2	3	4	5
41	Tekno Amerblok hollow block ⁹⁾	Ø 5	24	1,5
42		Ø 6	28	1.2
43		Ø 7	30	1.2
44		Ø 8	32	1.2
45		Ø 10	36	1.2

1) normal weight concrete, class C20/25 + C50/60 as per PN-EN 206+A2:2021 2) solid clay brick, as per PN-EN 771-1+A1:2015, class 20 3) solid calcium silicate brick, as per PN-EN 771-2+A1:2015, class 20
4) porous hollow clay brick (Porotherm), as per PN-EN 771-1:2011, wall thickness 10 mm, class 15 5) cored clay brick (cellular brick), as per PN-EN 771-1+A1:2015, wall thickness 12 mm, class 15 6) hollow calcium silicate brick, as per PN-EN 771-2+A1:2015, wall thickness 30 mm, class 20
7) gypsum plasterboard, thickness 12.5 mm, as per PN-EN 520+A1:2012,
8) autoclaved aerated concrete, as per PN-EN 771-4+A1:2015, class 6, gross dry density 650 kg/m³
9) TeknoAmerblok hollow block, as per PN-EN 771-3:A1:2015, wall thickness 32 mm, compressive strength 12.5 N/mm², gross dry density 1.5 kg/dm³

Table C3. Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacities of fixings made using the 4ALL expansion anchors (not applicable to 4ALL-06050 and 4ALL-08065)

item	Type of substrate	Size	Effective anchorage depth hef, mm	Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacity, kN
1	2	3	4	5
1	normal weight concrete 1)	Ø 5	25	0.1
2		Ø 6	30	0.2
3		Ø 8	40	0.5
4		Ø 10	50	0.5
5		Ø 12	60	4.5
6		Ø 14	70	5.5
8	solid clay brick 2)	Ø 6	40	0.15
9		Ø 8	50	0.75
10		Ø 10	60	0.9
11		Ø 12	70	4.0
12		Ø 14	25	6.0
13	solid calcium silicate brick 3)	Ø 5	25	0.2
14		Ø 6	30	0.6
15		Ø 8	40	0.9
16		Ø 10	50	1.2
17		Ø 12	60	7.0
18		Ø 14	70	10.5
13	solid clay brick (cellular brick) 4)	Ø 5	25	0.2
14		Ø 6	30	0.3
15		Ø 8	40	0.3
16		Ø 10	50	0.6
17		Ø 12	60	0.6
18		Ø 14	70	1.2

Table C3 cont. Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacities of fixings made using the 4ALL expansion anchors (not applicable to 4ALL-06050 and 4ALL-08065)

item	Type of substrate	Size	Effective anchorage depth h., mm	Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacity, kN
1	2	3	4	5
25	porous clay hollow brick (Porotherm) 5)	Ø 5	25	0.15
26		Ø 6	30	0.3
27		Ø 8	40	0.5
28		Ø 10	50	0.5
29		Ø 12	60	2.5
30		Ø 14	70	1,5
31	hollow calcium silicate brick 6)	Ø 5	25	0.5
32		Ø 6	30	0.6
33		Ø 8	40	0.75
34		Ø 10	50	0.75
35		Ø 12	60	4.5
36		Ø 14	70	5.0
37	autoclaved aerated concrete 7)	Ø 5	25	0.2
38		Ø 6	30	0.3
39		Ø 8	40	0.5
40		Ø 10	50	0.6
41		Ø 12	60	3.5
42		Ø 14	70	5.5
43	gypsum plasterboard 8) (push-through installation)	Ø 5	12.5	0.11
44		Ø 6	12.5	0.12
45		Ø 8	12.5	0.15
46		Ø 10	12.5	0.26
47	2 x gypsum plasterboard 8) (push-through installation)	Ø 12	25	0.66
48		Ø 14	25	0.74
49	TeknoAmerblok hollow block 9)	Ø 5	25	0.2
50		Ø 6	30	0.6
51		Ø 8	40	0.4
52		Ø 10	50	0.9
53		Ø 12	60	1.5
54		Ø 14	70	2,0

1) normal weight concrete, class C20/25 + C50/60 as per PN-EN 206+A2:2021
 2) solid clay brick, as per PN-EN 771-1+A1:2015, class 20 3) solid calcium silicate brick, as per PN-EN 771-2+A1:2015, class 20
 4) cored clay brick (cellular brick), as per PN-EN 771-1+A1:2015, class 5
 5) porous hollow clay brick (Porotherm), as per PN-EN 771-1+A1:2015, wall thickness 10 mm, class 15
 6) hollow calcium silicate brick, as per PN-EN 771-2+A1:2015, wall thickness 30 mm, class 20
 7) autoclaved aerated concrete, as per PN-EN 771-4+A1:2015, class 6, gross dry density 650 kg/m³
 8) gypsum plasterboard, thickness 12.5 mm, as per PN-EN 520+A1:2012,
 9) TeknoAmerblok hollow block, as per PN-EN 771-3:A1:2015, wall thickness 32 mm, compressive strength 12.5 N/mm², gross dry density 1.5 kg/dm³

Table C4. Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacities of fixings made using the 4ALL-06050 and 4ALL-08065 expansion anchors

item	Type of substrate	Size	Effective anchorage depth h_{et} , mm	Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacity, kN
1	2	3	4	5
1	normal weight concrete 1)	Ø6	50	0.3
2		Ø8	65	0.5
3	solid clay brick 2)	Ø6	50	0.6
4		Ø8	65	0.5
5	solid calcium silicate brick 3)	Ø6	50	0.9
6		Ø8	65	0.6
7	cored clay brick 4)	Ø6	50	0.5
8		Ø8	65	0.9
9	cored calcium silicate brick 5)	Ø6	50	0.9
10		Ø8	65	0.9
11	autoclaved aerated concrete 6)	Ø6	50	0.6
12		Ø8	65	0.5
13	2 x gypsum plasterboard 7) (push-through installation)	Ø6	50	0.6
14		Ø8	65	0.75
15	TeknoAmerblok hollow block 8)	Ø6	50	0.6
16		Ø8	65	0.6

1) normal weight concrete, class C20/25 + C50/60 as per PN-EN 206+A2:2021 2) solid clay brick, as per PN-EN 771-1+A1:2015, class 20 3) solid calcium silicate brick, as per PN-EN 771-2+A1:2015, class 20
4) cored clay brick (cellular brick), as per PN-EN 771-1+A1:2015, wall thickness 14 mm, class 5
5) hollow calcium silicate brick, as per PN-EN 771-2+A1:2015, wall thickness 20 mm, class 15
6) autoclaved aerated concrete, as per PN-EN 771-4+A1:2015, class 6, gross dry density 650 kg/m³
7) gypsum plasterboard, thickness 2 x 12.5 mm, as per PN-EN 520+A1:2012,
8) TeknoAmerblok hollow block, as per PN-EN 771-3:A1:2015, wall thickness 32 mm, compressive strength 12.5 N/mm², gross dry density 1.5 kg/dm³

Table C5. Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacities of fixings made using the UNO TIMBER expansion anchors

item	Type of substrate	Size	Effective anchorage depth h_{et} , mm	Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacity, kN
1	2	3	4	5
1	normal weight concrete 1)	Ø5	24	0.3
2		Ø6	28	0.5
3		Ø7	30	0.6
4		Ø8	32	0.5
5		Ø10	36	0.9
6	solid clay brick 2)	Ø5	24	1.2
7		Ø6	28	1.2
8		Ø7	30	0.9
9		Ø8	32	1,5
10		Ø10	36	1.2
11	solid calcium silicate brick 3)	Ø5	24	1.2
12		Ø6	28	0.75
13		Ø7	30	0.9
14		Ø8	32	0.6
15		Ø10	36	1.5

Table C5 cont. Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacities of fixings made using the UNO TIMBER expansion anchors

item	Type of substrate	Size	Effective anchorage depth h_{ef} , mm	Characteristic pull-out (NR,k) and shear (VR,k) load-bearing capacity, kN
1	2	3	4	5
16	porous clay hollow brick (Porotherm) 4)	Ø 5	24	0.6
17		Ø 6	28	0.6
18		Ø 7	30	0.6
19		Ø 8	32	0.9
20		Ø 10	36	1.2
21	MAX hollow clay brick 5)	Ø 5	24	0.6
22		Ø 6	28	0.75
23		Ø 7	30	0.75
24		Ø 8	32	0.75
25		Ø 10	36	0.9
26	hollow calcium silicate brick 6)	Ø 5	24	1.2
27		Ø 6	28	1,5
28		Ø 7	30	1,5
29		Ø 8	32	0.9
30		Ø 10	36	1,5
31	gypsum plasterboard 7) (push-through installation)	Ø 5	12.5	0.1
32		Ø 6	12.5	0.1
33		Ø 7	12.5	0.1
34		Ø 8	12.5	0.2
35		Ø 10	12.5	0.2
36	autoclaved aerated concrete 8)	Ø 5	24	0.2
37		Ø 6	28	0.5
38		Ø 7	30	0.75
39		Ø 8	32	0.75
40		Ø 10	36	0.9
41	TeknoAmerblok hollow block 9)	Ø 5	24	1,5
42		Ø 6	28	1,5
43		Ø 7	30	1.2
44		Ø 8	32	0.75
45		Ø 10	36	1.2

1) normal weight concrete, class C20/25 + C50/60 as per PN-EN 206+A2:2021
 2) solid clay brick, as per PN-EN 771-1+A1:2015, class 20 3) solid calcium silicate brick, as per PN-EN 771-2+A1:2015, class 20
 4) porous hollow clay brick (Porotherm), as per PN-EN 771-1:2011, wall thickness 10 mm, class 15
 5) MAX hollow clay brick, as per PN-EN 771-1+A1:2015, wall thickness 12 mm, class 15
 6) hollow calcium silicate brick, as per PN-EN 771-2+A1:2015, wall thickness 20 mm, class 20
 7) gypsum plasterboard, thickness 12.5 mm, as per PN-EN 520+A1:2012,
 8) autoclaved aerated concrete, as per PN-EN 771-4+A1:2015, class 4, gross dry density 600 kg/m³
 9) TeknoAmerblok hollow block, as per PN-EN 771-3:A1:2015, wall thickness 32 mm, compressive strength 12.5 N/mm², gross dry density 1.5 kg/dm³

Table C6. Characteristic load-bearing capacities of FIX, UNO and 4ALL expansion anchors related to tensile strength of hooks

Item	Anchor size	Anchor designation		Hook diameter	Characteristic load-bearing capacity
		without a flange	with a flange	dh,mm	kN
1	2	3	4	5	6
1	Ø5	-	UNO-05K	3.5	0.55
2	Ø6	-	UNO-06K	3.5	0.48
3				4	
4	Ø8	-	UNO-08K	4.5	0.88
5				5	
6	Ø10	-	UNO-10K	6	1.78
7	Ø6	FIX-06K	FIX-K-06K	3.5	0.48
8				4	
9	Ø8	FIX-08K	FIX-K-08K	4.5	0.88
10				5	
11	Ø10	FIX-10K	FIX-K-10K	6.1	1.78
12	Ø12	FIX-12K	FIX-K-12K	8	3.28
13	Ø14	FIX-14K	-	9.5	6.2
14	Ø5	-	4ALL-05K	3.5	1.11
15	Ø6	-	4ALL-06K	3.5	0.38
16				4	
17	Ø8	-	4ALL-08K	4.5	0.88
18				5	
19	Ø 10	-	4ALL-10K	6.1	1.78
20	Ø 5	-	UNO-05S	3.5	0.32
21	Ø 6	-	UNO-06S	3.5	0.38
22				4	0.37
23	Ø 7	-	UNO-07S	4	0.37
24				4.5	0.43
25	Ø 8	-	UNO-08S	4.5	0.43
26				5	
27	Ø 10	-	UNO-10S	6	1.10
28	Ø 6	FIX-06S	FIX-K-06S	3.5	0.38
29				4	0.37
30	Ø 8	FIX-08S	FIX-K-08S	4.5	0.43
31				5	
32	Ø 10	FIX-10S	FIX-K-10S	6	1.10
33	Ø 5	-	4ALL-05S	3.5	0.27
34	Ø 6	-	4ALL-06S	3.5	0.38
35				4.0	0.37
36	Ø 8	-	4ALL-08S	4.5	0.43
37				5.0	
38	Ø 10	-	4ALL-10S	6.1	1.10
39				6.5	
40	Ø 12	FIX12H	-	8.0	1.25

K – square hook / shouldered square hook
S – cup hook / shouldered cup hook H – Q hook