

CARES Technical Approval Report TA1-B 5061



Issue 3

Leviat
A CRH COMPANY

Ancon KSN Anchors for Reinforcing Steel

Assessment of the
Ancon KSN Anchor
Product and Quality
System for Production



Product

Ancon KSN Anchors for reinforcing steel

Product approval held by:

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1 Product Summary

Ancon's range of KSN Anchors are used for the mechanical connection of deformed high yield carbon steel bars for the reinforcement of concrete complying with the requirements of BS4449 Grade B500B & B500C to provide joints that can be subject to tensile stress.

The KSN Anchor, manufactured from Chromium-Molybdenum Alloy Steel Grade 1.7225 by the hot forging process, is a single full-length product with an internal Bartec Plus thread for use with Bartec Plus Continuation Bars which will provide a full strength connection, enabling anchorage of reinforcing steel.

1.1 Scope of Application

Ancon KSN Anchors in the size range of 12mm - 20mm as detailed in table 1 have been evaluated for use in tension in reinforced structures and have been tested to satisfy the requirements of TA1-B, reinforcement anchors for EN-1992-1-1 applications for static loading in tension only, using reinforcement grade B500 class B or C to BS4449: 2005 as appropriate.

This assessment covers the connection between the KSN Anchor and the reinforcing steel and does not cover the performance of the KSN Anchor or its connection to the structure in which it is used as these are matters for the designer and specifier.

1.2 Design Considerations

Eurocode 2, Clause 8.4 anchorage of longitudinal reinforcement requires:

8.4.1 General (1) Reinforcing bars, wires or welded mesh fabrics shall be so anchored that the bond forces are safely transmitted to the concrete avoiding longitudinal cracking or spalling. Transverse reinforcement shall be provided if necessary.



8.4.1 (5) (5) Where mechanical devices are used the test requirements should be in accordance with the relevant product standard or a European Technical Approval.

The specified cover for fire resistance and durability should be provided to the coupler sleeve. All couplers have been designed with controlled mechanical properties to be compatible with reinforcing bars complying with reinforcement of the relevant Grade in accordance with BS4449.

1.3 Conclusion

It is the opinion of CARES that Ancon KSN Anchors to reinforcing steel are satisfactory for use within the limits stated in paragraph 1.1 when applied and used in accordance with the manufacturer's instructions and the requirements of this certificate.

Lee Brankley
 L. Brankley
 Chief Executive Officer
 September 2022

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2 Technical Specification

2.1 General

The function of Ancon KSN Anchors is to provide a full strength connection to deformed reinforcing steel bars complying with BS4449 Grade B500B & C as appropriate and thereby enabling KSN anchorage of reinforcing steel.

2.2 Ancon KSN Anchor Range

Ancon KSN Anchors, in combination with Bartec Plus parallel-threaded reinforcing bars, simplify concrete slab-to-wall construction joints when compared to other continuity systems.

This quicker, easier and above all, safer system eliminates the need for on-site bar straightening.

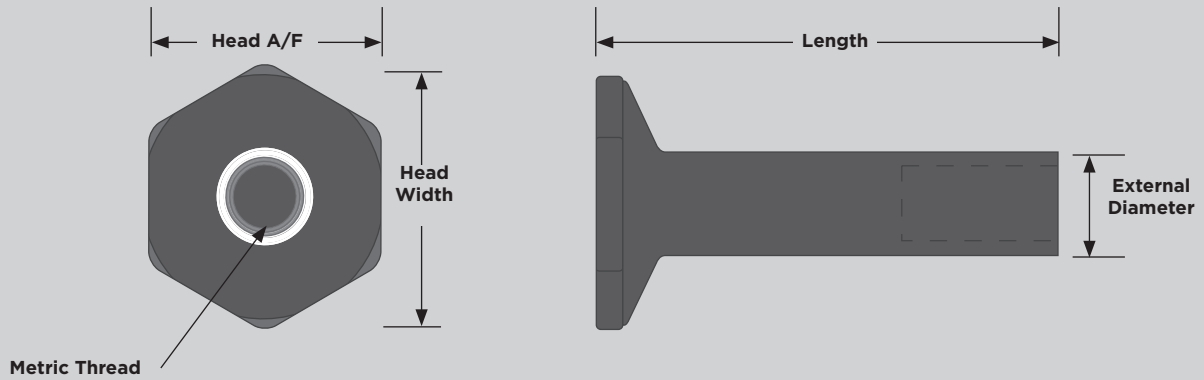
By following the key design considerations published in the Ancon KSN literature, the KSN anchorage system can be used as an alternative to hooked anchorage bars and stirrups, thereby simplifying bar scheduling and minimising congestion in the wall.

There are eight standard anchors in the Ancon KSN Anchors range, designed for use with 12mm, 16mm and 20mm diameter grade B500B or B500C reinforcing bar, threaded with a Bartec Plus metric thread, supplied by Ancon. See table 1.

The Bartec Plus system produces a full strength joint. The bar end is cut square and enlarged by cold forging. This increases the core diameter of the threaded portion of the bar to ensure that the strength of the bar is maintained. A parallel metric thread is rolled onto the enlarged bar end. A 12mm bar is provided with an M16 thread, a 16mm bar with an M20 thread and a 20mm bar with an M24 thread.

The minimum KSN anchorage length required to provide the bond must be computed according to the code provisions by the structural engineer, depending on the grade of reinforcement and the class of concrete.

Ancon KSN Anchors



Anchor Ref.	Nominal External Diameter (mm)	Metric Thread (mm)	Reinforcing Bar Diameter (mm)	Nominal Head Width (mm)	Nominal Head A/F (mm)	Anchor Length (mm)	Embedment h_{eff} (mm)
KSN12S	22	M16 x 2.0	12	46	40	115	142
KSN12M						150	177
KSN16S	28	M20 x 2.5	16	61	53	130	157
KSN16M						160	187
KSN16L						190	217
KSN20S	32	M24 x 3.0	20	75	65	150	177
KSN20M						190	217
KSN20L						230	257

Table 1

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3 Product Performance and Characteristics

Full destructive tests have been carried out to demonstrate compliance with the performance requirements defined in CARES Appendix TA1-B when used with reinforcing steel BS4449 grade B500B or B500C as appropriate.

CARES APPENDIX TA1-B strength requirements

- Permanent deformation is less than 0.10mm after loading to $0.65f_y$ in tension with BS4449 grade B500B and B500C reinforcement.
- 99% characteristic tensile strength is greater than 540MPa with B500B or 575MPa with B500C reinforcement.

The evaluation considers the strength of the connection between the KSN Anchor and the reinforcing steel only and does not address aspects of KSN Anchor performance nor its connection to the structure which are matters for the designer or specifier.

4 Installation

KSN Anchors are delivered to site pre-assembled as independent rows of anchors fixed with countersunk socket head cap screws to the back of a tapered timber strip. See figure 1.

The timber provides an additional 33mm of embedment to each KSN Anchor and, after removal, provides a shear key for the joint.

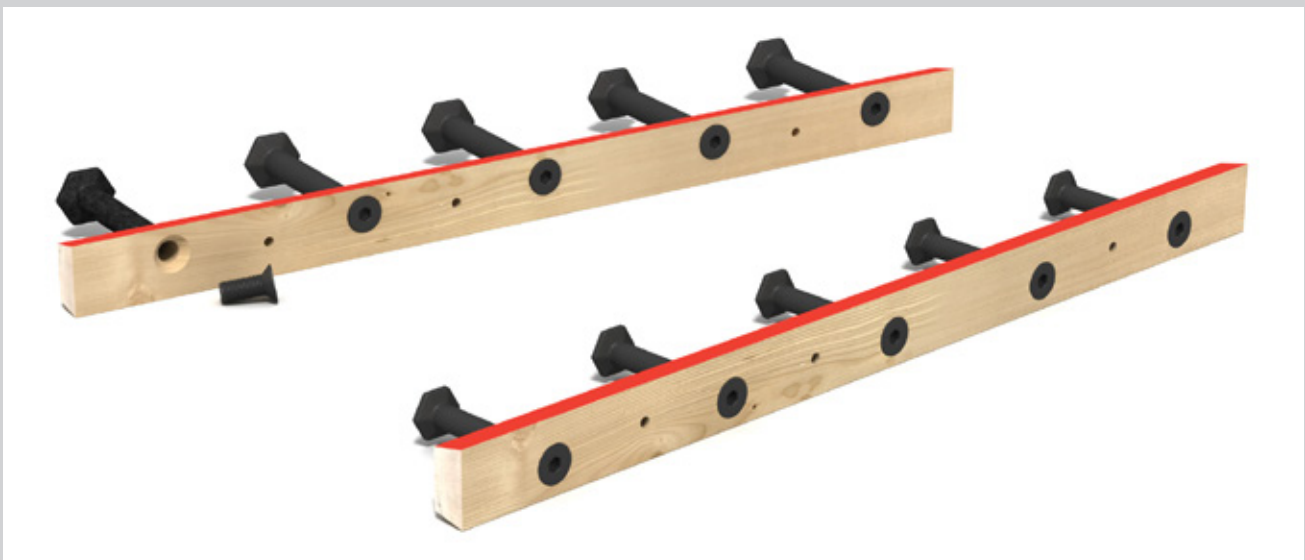


Figure 1 - Tapered timber strips simplify installation, create a shear key and increase anchor embedment

Before installation, any loose anchors should be tightened to the timber carrier to ensure that the anchors will not move during concreting. Normal handling precautions to avoid physical injury apply and personal protection equipment should be worn.

The tape on the face of the timber strip should not be removed as it will prevent concrete ingress in the hex socket.

A formwork release agent should be applied to the timber strip and any spillage must be removed from the anchors.

The omission of the release agent will prevent the easy removal of the timber strip at a later stage and if the timber strip cannot be completely removed, the capacity of the joint may be compromised.

Tools required for installation:

KSN 12 - 10mm A/F Allen Key / Hex Head Wrench

KSN 16 - 12mm A/F Allen Key / Hex Head Wrench

KSN 20 - 14mm A/F Allen Key / Hex Head Wrench

M10 Stud/bolt to push timber away from concrete Hand Wrench to suit continuation bar diameter

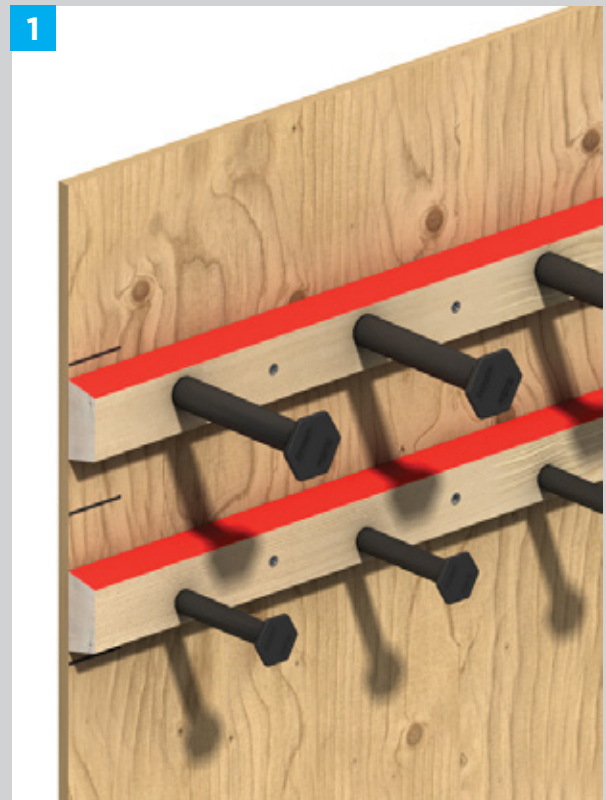
Other requirement: Formwork release agent

1. The timber carrier supporting the anchors is positioned against the formwork at the required location of the adjoining slab, orientated to the instructions on the label which indicates that the coloured side should face up. The timber is fixed to the formwork with nails.

It is important that the strip is set to the correct position, the right way up and fixed to prevent any movement during concreting to ensure adequate cover to the continuation bar and to comply with the design.

KSN Anchors for wall to slab connection:

KSN Anchors are used to provide reinforcement continuity at joints between concrete cast at different times, in particular for wall to slab connections. Reinforcement continuity systems contribute to the stability of a structure and therefore it is essential that the correct installation procedures are followed.



2. Other wall reinforcement should be installed to the Engineer's details. The concrete is then cast and once it has reached sufficient strength, the formwork is removed to reveal the face of the timber strip with the protective tape.

When installation of the continuation bars is required, the tape is removed to reveal the socket head cap screws which can be unscrewed using the corresponding Allen key (supplied with each order). We recommend keeping the screws in place until installation of the continuations bars. Three M10 tee nuts have been inserted in each timber strip in order to allow for the use of M10 studs/bolts to help push the first timber strip out.



3. The continuation bar thread should be checked to be free of any dirt and be positioned at the anchor location and rotated to fit into the anchor thread. The connection should then be tightened by using a hand wrench. No torquing is required.

After tightening there should be no more than 2-4mm of thread exposed for sizes KSN12 and KSN20 and no more than 10mm for size KSN16.

The KSN anchors are to be used only with Bartec Plus continuation bars provided by Ancon.



4. Slab reinforcement should be installed to the Engineers details.

The slab is cast to complete the application.



Note:

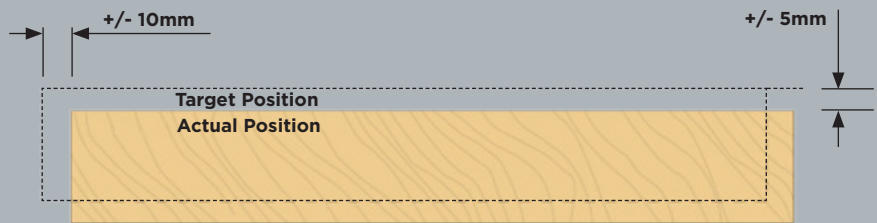
This CARES Technical report and the evaluation considers the strength of the connection between the KSN Anchor and the reinforcing steel only and does not address aspects of KSN Anchor performance with respect to its use to provide reinforcement continuity, nor its connection to the structure which are matters for the designer or specifier.

KSN Anchors for wall to slab connection:

KSN Anchors are used to provide reinforcement continuity at joints between concrete cast at different times, in particular for wall to slab connections. Reinforcement continuity systems contribute to the stability of a structure and therefore it is essential that the correct installation procedures are followed.

Installation Tolerances

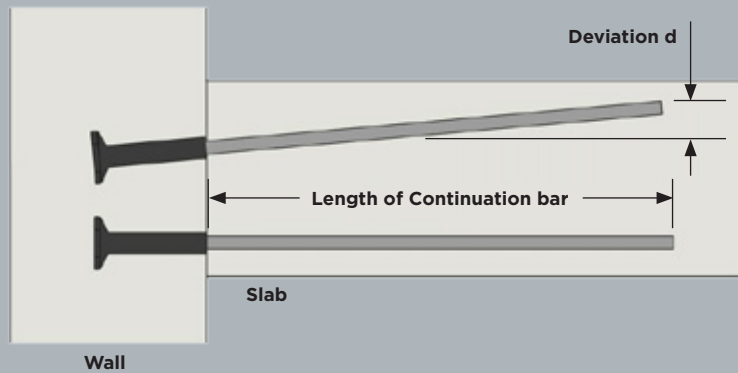
Timber anchor carrier setting out deviation allowances



Vertical transverse section alignment of anchor side view

Length of Continuation Bar (mm)	Deviation d
700	+/- 2mm
1000	+/- 3mm
1500	+/- 5mm

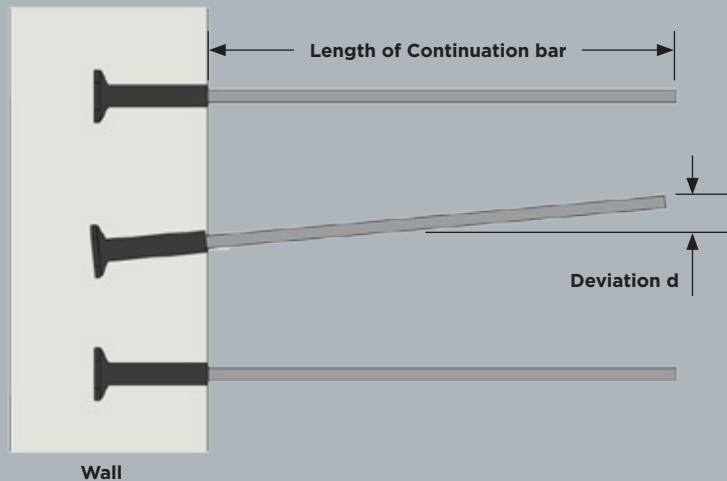
Table 2



Horizontal transverse section alignment of anchor plan view

Length of Continuation Bar (mm)	Deviation d
700	+/- 10mm
1000	+/- 12mm
1500	+/- 20mm

Table 3



Summary

KSN Anchors for wall to slab connections:

1. Apply release agent to the timber strip.
2. Position the timber strip supporting the anchors the right way up (coloured face up) as indicated on the label against the formwork according to installation tolerances to provide adequate cover to the continuation bar.
3. Fix timber strip to the formwork with nails or tie it to the reinforcement.
4. Fix the rest of the wall reinforcement to the Engineer's detail.
5. Cast the concrete wall.
6. Remove formwork when concrete has reached sufficient strength.
7. Remove tape to reveal head cap screws.
8. Remove socket head cap screws using hex key.
9. Remove timber strip.
10. Position and rotate threaded end of the continuation bar in the anchor.
11. Tighten using a hand wrench on the continuation bar.
12. Visually inspect that no more than 2-4mm of thread is exposed for KSN12 and KSN20 or 10mm for KSN16.

5 Safety Considerations

Handling: KSN Anchors for wall to slab connections are delivered to site pre-assembled with a tapered timber strip. The anchors are held in position by countersunk socket head cap screws. Tape is provided on the front part of the strip to protect the socket head from concrete ingress.

The product should be handled with gloves by the timber strip.

Corresponding Bartec Plus threaded continuation bars should be handled with the same handling precaution as standard reinforcement bars, with additional care taken not to damage the threaded end.

Due to the weight of some of the products, they may require two men handling depending on installation position.

Storage: The timber strip is treated with a sealer to protect it from water; however the product should be protected from frost while stored and from water when possible.

6 Product Testing and Evaluation

Ancon KSN Anchors for reinforcing steel have been subject to mechanical testing to satisfy the requirements of CARES Appendix TA1-B for anchors with BS4449 Grade B500B and B500C reinforcing steel.

7 Quality Assurance

Ancon KSN Anchors for reinforcing steel are produced under an EN ISO 9001 quality management system certified by CARES at locations agreed with CARES.

The quality management system scheme monitors the production of the KSN Anchors and ensures that materials and geometry remain within the limits of this technical approval.

The products are subject to a programme of periodic testing to ensure continued compliance.



8 Building Regulations

8.1 The Building Regulations (England and Wales)

Structure, Approved Document A

Ancon KSN Anchors to reinforcing steel, when used in EC2 based designs using the data contained within this technical approval, satisfy the relevant requirements of The Building Regulations (England and Wales), Approved Document A.

Materials and Workmanship, Approved Document

This technical approval gives assurance that the Ancon KSN Anchors to reinforcing steel comply with the material requirements of EC2.

8.2 The Building Regulations (Northern Ireland)

Materials and Workmanship

This technical approval gives assurance that Ancon KSN Anchors to reinforcing steel comply with the material requirements of EC2 by virtue of regulation 23, *Deemed to satisfy provisions regarding the fitness of materials and workmanship*.

8.3 The Building Standards (Scotland)

Fitness of Materials

This technical approval gives assurance that Ancon KSN Anchors to reinforcing steel comply with the material requirements of EC2 by virtue of *Clause 0.8*.

Structure

Ancon KSN Anchors to reinforcing steels, when used in EC2 based designs using the data contained within this technical approval, satisfy the requirements of *The Building Standards (Scotland) clause 1*.

9 References

- BS4449: 2005 Steel bars for the reinforcement of and use in concrete - Requirements and test methods.
- BS EN 1992-1-1:2004 Eurocode 2 Design of concrete structures - General rules for buildings.
- BS EN ISO 9001: Quality management systems - Requirements.
- CARES Appendix TA1-B: Quality and Operations Schedule for the Technical Approval of Couplers for Reinforcing Steel and Reinforcement Anchors for Static Loading in Tension or Tension and Compression.



10 Conditions

1. The quality of the materials and method of manufacture have been examined by CARES and found to be satisfactory. This technical approval will remain valid providing that:
 - a. The product design and specification are unchanged.
 - b. The materials, method of manufacture and location are unchanged.
 - c. The manufacturer complies with CARES regulations for technical approvals.
 - d. The manufacturer holds a valid CARES Certificate of Product Assessment.
 - e. The product is installed and used as described in this report.
2. CARES make no representation as to the presence or absence of patent rights subsisting in the product and/or the legal right of Leviat to market the product.
3. Any references to standards, codes or legislation are those which are in force at the date of this certificate.
4. Any recommendations relating to the safe use of this product are the minimum standards required when the product is used. These requirements do not purport to satisfy the requirements of the Health and Safety at Work act 1974 or any other relevant safety legislation.
5. CARES does not accept any responsibility for any loss or injury arising as a direct or indirect result of the use of this product.
6. This Technical Approval Report should be read in conjunction with CARES Certificate of Product Assessment No 5061. Confirmation that this technical approval is current can be obtained from UK CARES.



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