

CARES Technical Approval Report TA1-A&B 5066

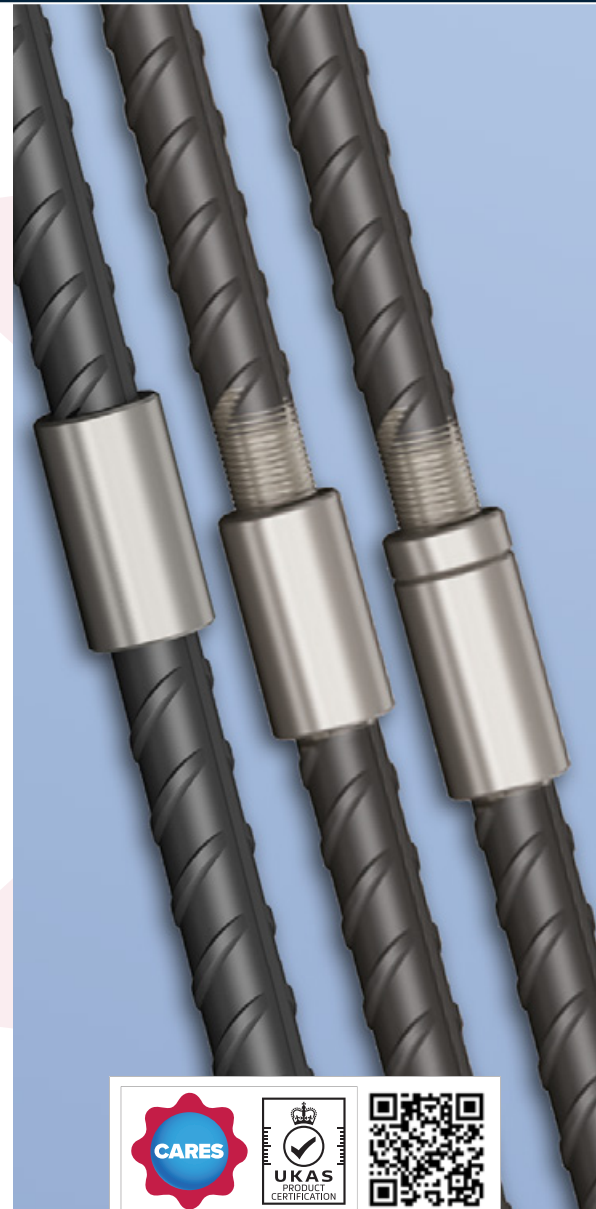


Issue 6

Leviat
A CRH COMPANY

Ancon CXL Type A, B and C Couplers

Assessment of the
Ancon CXL
Type A, B and C
Coupler Product
and Quality System
for Production



Product

Ancon CXL Type A, B and C Couplers for reinforcing steel

Product approval held by:

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1 Product Summary

Ancon CXL Type A, B and C couplers in the size range 12mm - 40mm as detailed in tables 1, 2 and 3 are for the mechanical connection of deformed high-yield carbon steel bars for the reinforcement of concrete complying with the requirements of BS4449 Grades B500B & B500C

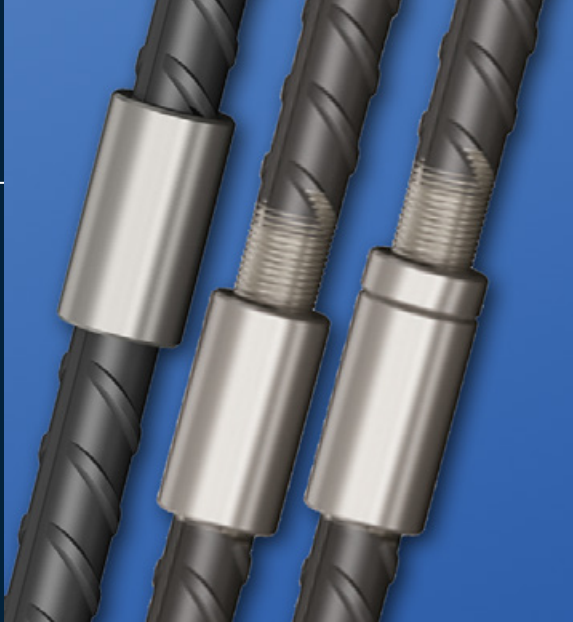
1.1 Scope of Application

Ancon CXL Type A, B and C couplers in the size range of 12mm to 40mm as detailed in tables 1, 2 and 3 have been evaluated for use as follows:

- a) In accordance with CARES Appendix TA1-A tested in tension and high cycle fatigue loads (Fatigue Class D) with BS4449 grades B500B and B500C reinforcement.
- b) In accordance with CARES Appendix TA1-B tested in tension only with BS4449 grades B500B and B500C reinforcement.
- c) BS8597:2015 for mechanical splices in reinforced concrete structures under static and high cycle fatigue loads (Fatigue class D) with BS4449 grades B500B and B500C reinforcement.

1.2 Design Considerations

BS 8110 Clause 3.12.8.9 Laps and Joints states "Connections transferring stress may be lapped, welded or joined with mechanical devices. They should be placed, if possible, away from points of high stress and should preferably be staggered". However, BS 8110 Clause 3.12.8.16.2 Bars in tension states "The only acceptable form of full-strength butt joint for a bar in tension comprises a mechanical coupler" satisfying specified slip and tensile strength criteria.



Eurocode 2, Clause 8.7 Laps and mechanical couplers 8.7.1 General (1)P “Forces are transmitted from one bar to another by:

- lapping of bars, with or without bends or hooks;
- welding;
- mechanical devices assuring load transfer in tension-compression or in compression only.”

Clause 8.8 Additional rules for large diameter bars goes on to state that “Splitting forces are higher and dowel action is greater with the use of large diameter bars. Such bars should be anchored with mechanical devices.”

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 CXL Type A, B and C couplers in the size range 12mm to 40mm 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
June 2024

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2 Technical Specification

2.1 General

The function of Ancon CXL Type A, B and C couplers is to connect deformed steel reinforcing bars complying with BS4449 Grade B500B & B500C, as appropriate, and thereby create structural continuity of the reinforcing system.

Ancon CXL Type A, B and C couplers offer a full strength connection. The ends of the rebar to be connected are cut square and enlarged using a cold forging process. This increases the core diameter of the bar end to ensure that the joint is stronger than the bar. Parallel metric threads are cut on to the enlarged ends. Each threaded end is proof tested to a force equal to the characteristic yield strength of the bar.

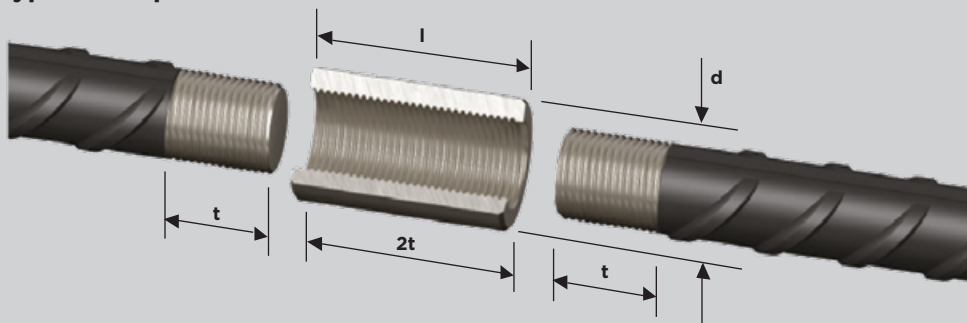
A nominal allowance of +50mm per threaded bar end should be made for cutting the bar end square and shortening during the cold forge process.

2.2 Ancon CXL Type A Coupler

Ancon CXL parallel threaded couplers are an internally threaded steel sleeve. The Type A coupler is suitable for applications where the continuation bar can be rotated.

The threaded bar ends are either protected by the coupler or an external plastic sheath. The internal thread of the coupler is protected by an internal plastic end cap. For certain applications (such as deep concrete pours), the coupler end caps may not prevent the ingress of concrete fines. For these applications, further protection may be required.

Ancon CXL Type A Coupler



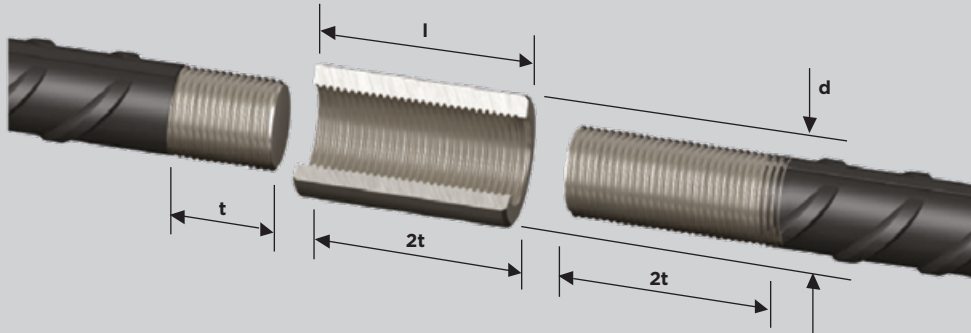
Reinforcing Bar Diameter (mm)	12	16	20	25	32	40
External diameter, d	22	30	35	42	55	65
Coupler length, l	28	40	48	60	72	90
Thread size	M14	M20	M24	M30	M36	M45
Thread pitch	2.0	2.5	3.0	3.5	4.0	4.5
Thread length, t	14	20	24	30	36	45
Weight (kg)	0.04	0.09	0.16	0.32	0.58	1.13
Rebar grade	B500B/B500C	B500B/B500C	B500B/B500C	B500B/B500C	B500B/B500C	B500B/B500C
Tension only	✓	✓	✓	✓	✓	✓
Fatigue Class D	✓	✓	✓	✓	✓	✓

Table 1

2.3 Ancon CXL Type B Coupler

The CXL Type B uses the same coupler as the Type A system, but one bar is threaded for a full coupler length. It is used for applications where it is difficult but not impossible to rotate the continuation bar.

Ancon CXL Type B Coupler



Reinforcing Bar Diameter (mm)	12	16	20	25	32	40
External diameter, d	22	30	35	42	55	65
Coupler length, l	28	40	48	60	72	90
Thread size	M14	M20	M24	M30	M36	M45
Thread pitch	2.0	2.5	3.0	3.5	4.0	4.5
Thread length, t	14	20	24	30	36	45
Weight (kg)	0.04	0.09	0.16	0.32	0.58	1.13
Rebar grade	B500B/B500C	B500B/B500C	B500B/B500C	B500B/B500C	B500B/B500C	B500B/B500C
Tension only	✓	✓	✓	✓	✓	✓
Fatigue Class D	✓	✓	✓	✓	✓	✓

Table 2

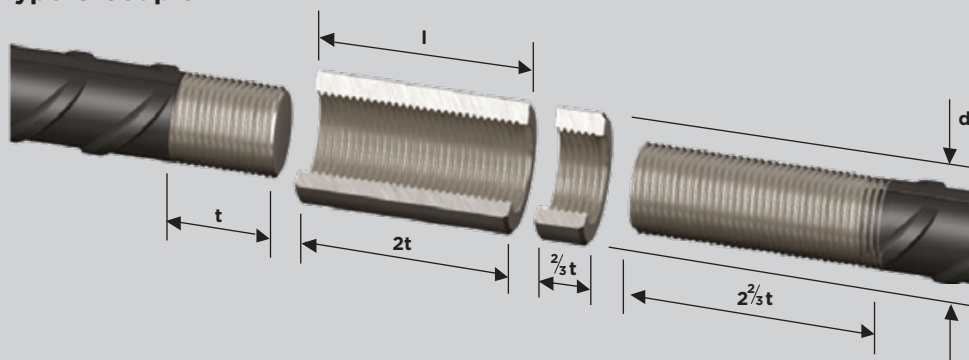
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2.4 Ancon CXL Type C Coupler

The CXL Type C system has an additional locknut and is used where the continuation bar cannot be rotated. The continuation bar is threaded for the full coupler length plus the length of the locknut.

Ancon CXL Type C Coupler



Reinforcing Bar Diameter (mm)	16	20	25	32	40
External diameter, d	30	35	42	55	65
Coupler length, l	40	48	60	72	90
Thread size	M20	M24	M30	M36	M45
Thread pitch	2.5	3.0	3.5	4.0	4.5
Thread length, t	20	24	30	36	45
Weight (kg)	0.09	0.16	0.32	0.58	1.13
Rebar grade	B500B/B500C	B500B/B500C	B500B/B500C	B500B/B500C	B500B/B500C
Tension only	✓	✓	✓	✓	✓
Fatigue Class D	✓	✓	✓	✓	✓

Table 3

3 Product Performance and Characteristics

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

CARES APPENDIX TA1-A strength requirements

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

CARES APPENDIX TA1-B strength requirements

- Permanent deformation is less than 0.10mm after loading to $0.65f_y$ in tension-compression as defined in table 1 and 2 with BS4449 grade B500B and B500C reinforcement.
- 99% characteristic tensile strength is greater than 540 MPa with grade B500B reinforcement and 575 MPa with grade B500C reinforcement.

BS 8597:2015 requirements for slip, tensile strength and high cycle fatigue

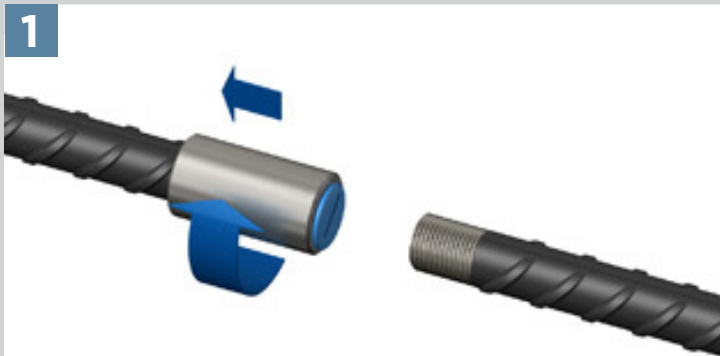
Tests verify compliance with Clause 5 of BS 8597:2015 for the following:

- slip under static forces; and
- tensile strength under static forces; and
- high cycle fatigue

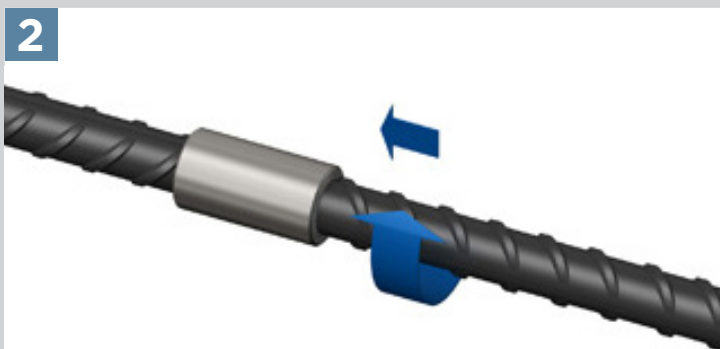


4 Installation

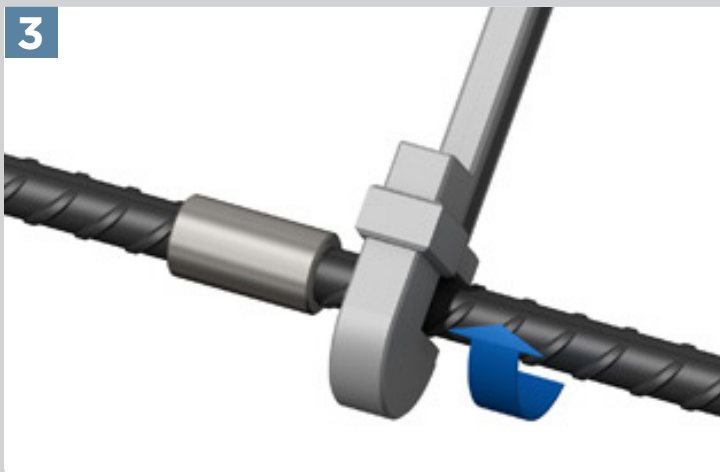
CXL Type A Coupler Sequence



The CXL Type A system coupler is rotated to the rear of the thread on the fixed bar, then locked tight. The bar end should be central within the coupler.

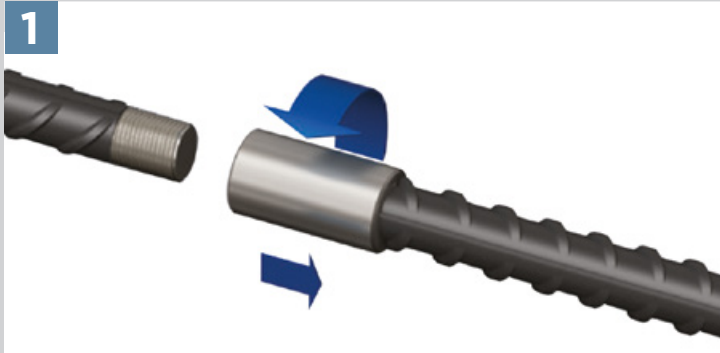


Remove the thread protector from the end of the coupler. Position and rotate the continuation bar such that the thread fully engages within the coupler.



Tighten the joint using a wrench on the continuation bar. After tightening there should be no more than 2-4mm of exposed thread, depending on the diameter of the rebar.

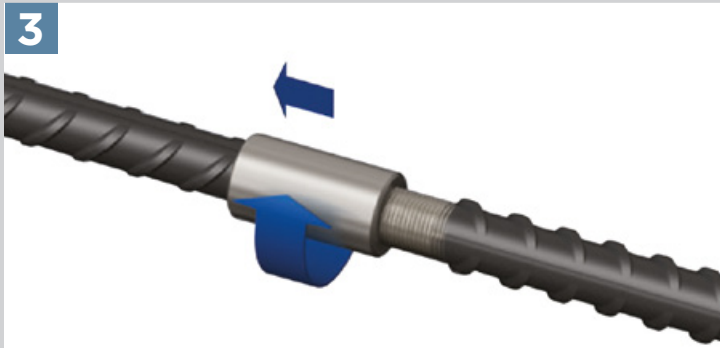
CXL Type B Coupler Sequence



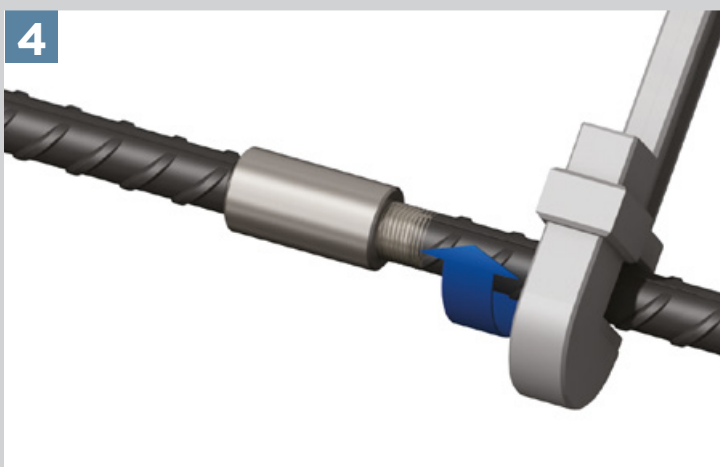
Screw the CXL Type B system coupler to the rear of the thread on the continuation bar.



Position the continuation bar with the coupler against the end of the first bar.

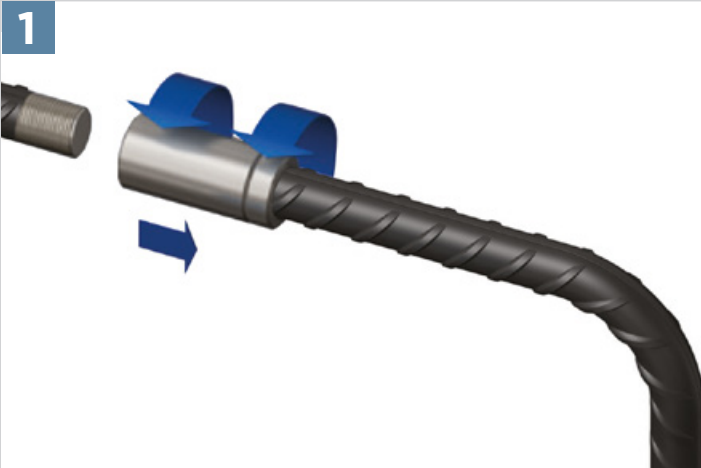


Rotate the coupler from the continuation bar to engage against the rear of the thread on the opposing bar and lock tight.

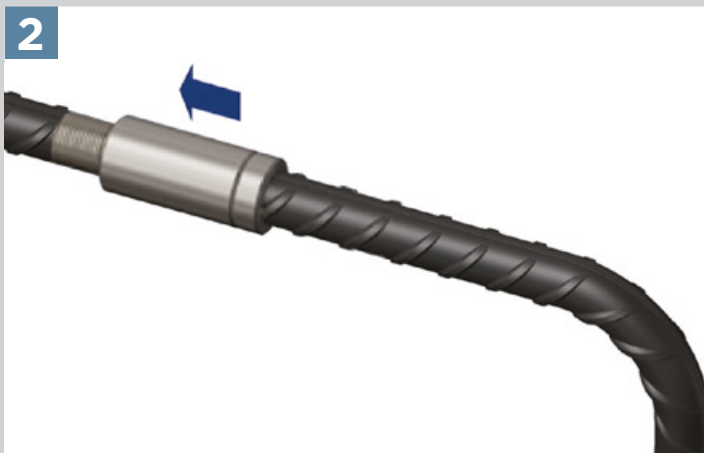


Using a wrench, rotate the continuation bar to lock the two bar ends against each other within the coupler. After tightening, the length of exposed thread should be no more than half of the coupler length plus 2-4mm depending on the diameter of the rebar.

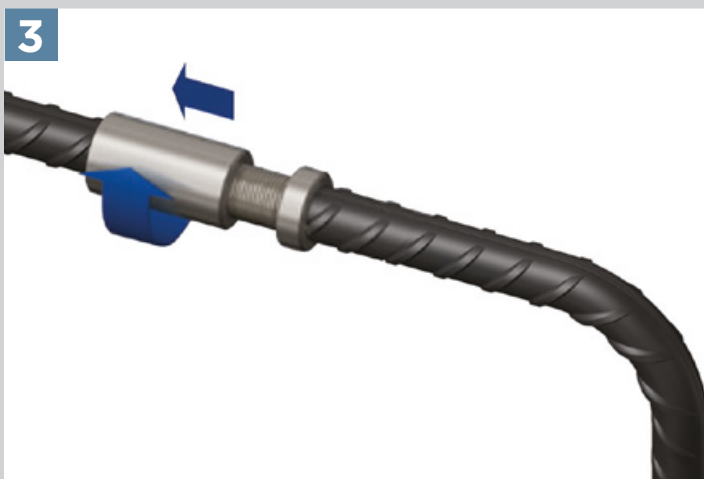
CXL Type C Coupler Sequence



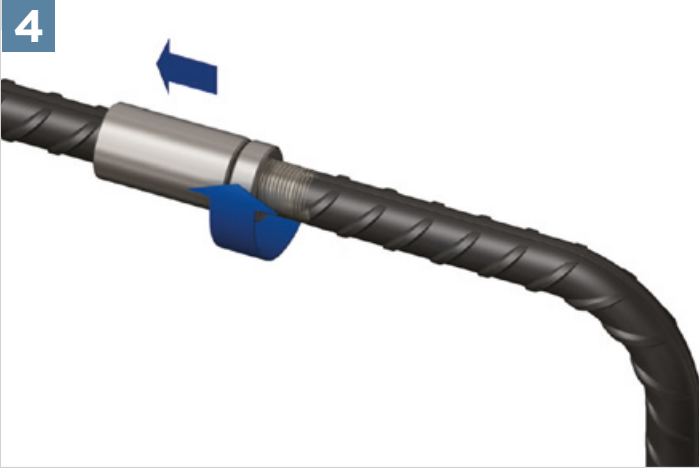
Screw the locknut followed by the CXL Type C system coupler to the rear of the thread on the continuation bar.



Position the continuation bar with the coupler against the end of the first bar.



Rotate the coupler from the continuation bar to engage against the rear of the thread on the opposing bar and lock tight.



Rotate the locknut along the continuation bar to abut the coupler.



Hold the rebar in its required orientation and using a wrench tighten the locknut against the coupler.

5 Safety Considerations

Ancon CXL Type A, B and C couplers are generally supplied in robust cardboard cartons. Cartons/containers weighing up to 25kg are to be handled with care. Heavier cases require the use of mechanical handling equipment. Protective gloves should be worn when installing the couplers.

6 Product Testing and Evaluation

Ancon CXL Type A, B and C couplers have been tested to satisfy the requirements of CARES Appendices TA1-A and TA1-B for couplers with reinforcing bars to BS4449 Grade B500B or C as defined in table 1. The testing comprised the following elements:

- Tensile Strength
- Permanent deformation in tension
- High cycle fatigue (Class D)

Tests verify compliance with Clause 5 of BS 8597:2015 for slip under static forces, tensile strength under static forces, and high cycle fatigue.

7 Quality Assurance

Ancon CXL Type A, B and C couplers 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 CXL Couplers 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 CXL Type A, B and C couplers, 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 CXL Type A, B and C couplers comply with the material requirements of EC2.

8.2 The Building Regulations (Northern Ireland)

Materials and Workmanship

This technical approval gives assurance that Ancon CXL Type A, B and C couplers 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 CXL Type A, B and C couplers comply with the material requirements of EC2 by virtue of *Clause 0.8*.

Structure

Ancon CXL Type A, B and C couplers, 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.
- BS8110: Part 1: 1997: Structural Use of Concrete, Code of Practice for Design & Construction
- BS 8597:2015 Steels for the reinforcement of concrete – Reinforcement couplers – 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 TA1-A: CARES Appendix TA1-A: Quality and Operations Schedule for the Technical Approval of Couplers for Reinforcing Steel for use in Structures and Structural Elements designed in accordance with the Fatigue Requirements of Structural Eurocodes.
- CARES Appendix TA1-B: Quality and Operations Schedule for the Technical Approval of Couplers for Reinforcing Steel and Reinforcement Anchors For BS8110 and EN1992-1-1 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 provided 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 etc 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 5066. Confirmation that this technical approval is current can be obtained from UK CARES.

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