

CARES Technical Approval Report TA1-C 5067



Issue 3

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Bartec Company Pi Couplers

Assessment of the
Linxion Pi Standard (LS),
Positional (LCE), Reducing (RD)
and Bridging (LER) Coupler
Product and Quality
System for Production



TECHNICAL
APPROVAL
5067



0002



Validate with the
CARES Cloud App

Product

Linxion Pi Couplers for reinforcing steel

Product approval held by:

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1 Product Summary

Linxion Pi Standard (LS), Positional (LCE), Reducing (RD) and Bridging (LER) Couplers in the size range 16mm - 40mm are for the mechanical connection of deformed high-yield carbon steel bars for the reinforcement of concrete complying with the requirements of BS4449 Grades B500C as defined in tables 1 to 4.

1.1 Scope of Application

Linxion Pi Standard (LS), Positional (LCE), Reducing (RD) and Bridging (LER) Couplers in the size range of 16mm to 40mm have been evaluated for use as follows:

TA1-C: Sellafield Type A couplers in tension with Grade B500C reinforcement as defined in tables 1 to 4.

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 Linxion Pi Standard (LS), Positional (LCE), Reducing (RD) and Bridging (LER) Couplers 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.

L. Brankley
Chief Executive Officer
July 2022



2 Technical Specification

2.1 General

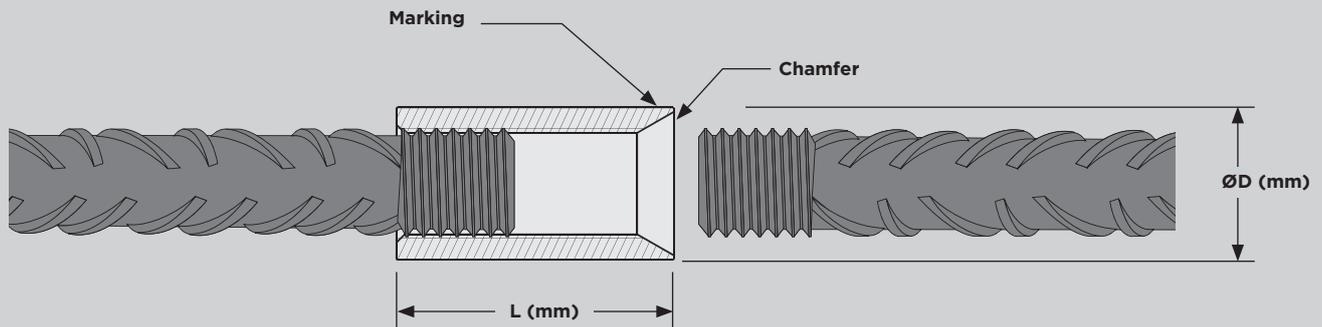
The function of Linxion Pi Couplers is to connect deformed steel reinforcing bars complying with BS 4449 Grade B500C, as appropriate (see tables 1 to 4) and thereby create structural continuity of the reinforcing system.

2.2 Pi Standard (LS) Coupler

Linxion Pi Standard (LS) parallel thread couplers are an internally threaded steel sleeve. The standard coupler is suitable for applications where one of the bars to be spliced 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.

Linxion Pi Standard (LS) Coupler



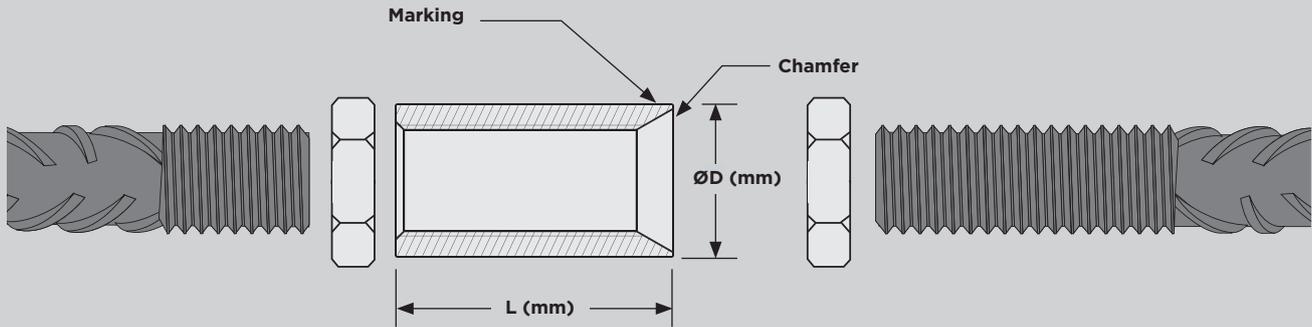
Ref	Size (mm)	External Ø D (mm)	Length L (mm)	Weight (kg)	Marking	Sealing cap colour	TA1C B500C tension only
Pi16	16	25	46	0.08	BTLX PI 16 XXX X	Blue	✓
Pi20	20	30	55	0.14	BTLX PI 20 XXX X	Red	✓
Pi26	25	40	68	0.31	BTLX PI 26 XXX X	Orange	✓
Pi32	32	50	81	0.58	BTLX PI 32 XXX X	Violet	✓
Pi40	40	62	100	1.20	BTLX PI 40 XXX X	Pink	✓

Table 1

2.3 Pi Positional (LCE) Coupler

Linixion Pi Positional (LCE) parallel thread couplers are an internally threaded steel sleeve. The positional coupler is suitable for applications where the bars to be spliced cannot be rotated.

Linixion Pi Positional (LCE) Coupler



Ref	Size (mm)	External Ø D (mm)	Length L (mm)	Weight (kg)	Marking	Sealing cap colour	TA1C B500C tension only
Pi16	16	25	46	0.08	BTLX PI 16 XXX X	Blue	✓
Pi20	20	30	55	0.14	BTLX PI 20 XXX X	Red	✓
Pi26	25	40	68	0.31	BTLX PI 26 XXX X	Orange	✓
Pi32	32	50	81	0.61	BTLX PI 32 XXX X	Violet	✓
Pi40	40	62	100	1.00	BTLX PI 40 XXX X	Pink	✓

Table 2

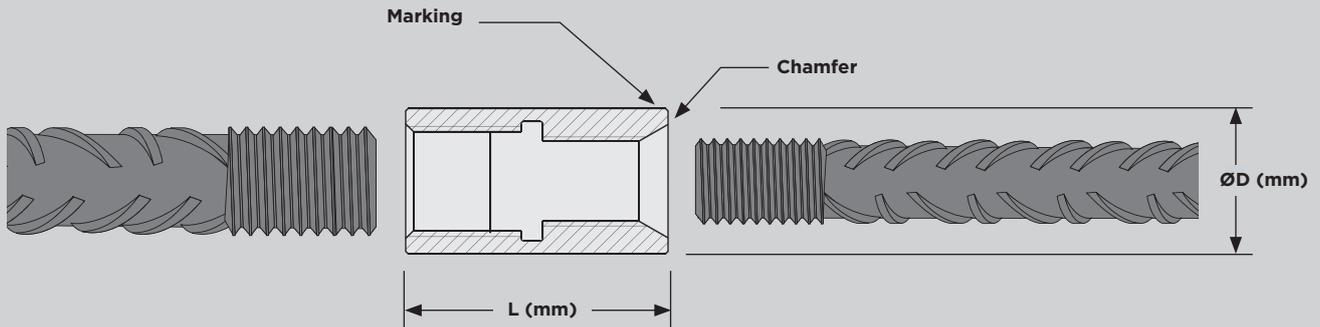
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2.4 Pi Reducing (RD) Coupler

Linixion Pi Reducing (RD) parallel thread couplers are an internally threaded steel sleeve. The Reducing coupler is suitable for applications for the connection of two dissimilar diameter bars where one of the bars to be spliced can be rotated.

Linixion Pi Reducing (RD) Coupler



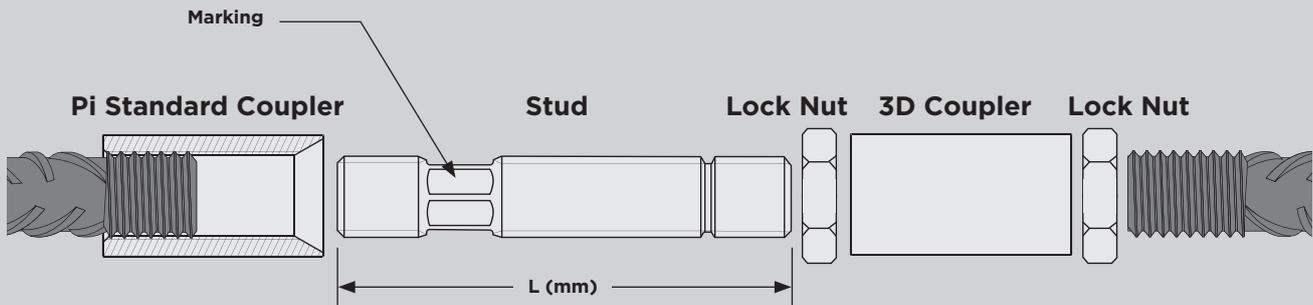
Ref	Size (mm)	External Ø D (mm)	Length L (mm)	Weight (kg)	Marking	Sealing cap colour	TA1C B500C tension only
PiR20/16	20/16	30	54	0.11	BTLX PI R 20/16 XXX X	Blue	✓
PiR26/20	25/20	40	65	0.29	BTLX PI R 26/20 XXX X	Red	✓
PiR32/26	32/25	45	78	0.52	BTLX PI R 32/26 XXX X	Orange	✓
PiR40/32	40/32	55	94	0.95	BTLX PI R 40/32 XXX X	Violet	✓

Table 3

2.5 Pi Bridging (LER) Coupler

Linixion Pi parallel thread Bridging coupler is a rebar splicing connection with adjustable spacing, designed to splice rebar systems that are not flush.

Linixion Pi Bridging (LER) Coupler



Ref	Size (mm)	Length L (mm)	Marking	TA1C B500C tension only
S16	16	115	BTLX S16 XXX X	✓
S20	20	141	BTLX S20 XXX X	✓
S26	25	185	BTLX S26 XXX X	✓
S32	32	217	BTLX S32 XXX X	✓
S40	40	265	BTLX S40 XXX X	✓

Table 4

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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-C when used with reinforcing steel BS4449 grade B500C as defined in tables 1 to 4 as appropriate.

CARES APPENDIX TA1-C strength requirements

- Permanent deformation is less than 0.10mm after loading to $0.65f_y$ in tension for grade B500C reinforcement.
- Tensile strength of $\geq 1.15, \leq 1.35 \times$ Actual yield strength ($f_{y, act}$) for B500C reinforcement steel including:
 - low cycle fatigue: 100 cycles @ 5% - 90% f_y
 - and cold soak at -7°C for 24 hours
 - and a bar break mode of failure

4 Installation

4.1 Pi Standard (LS) and Reducing (RD) Coupler Sequences



Place the 1st Phase Rebar

Screw the coupler to the end of the thread on the fixed bar and check the plastic cap is correctly fitted.

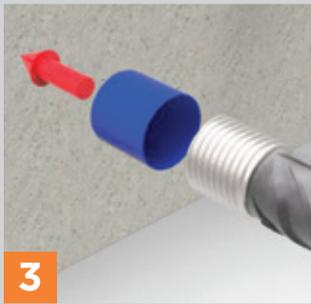
1



1st Phase Concreting

After concreting remove the plastic cap from the coupler.

2



Remove the plastic protection from the 2nd phase rebar.

3



2nd Phase Rebar and Securing the Splice

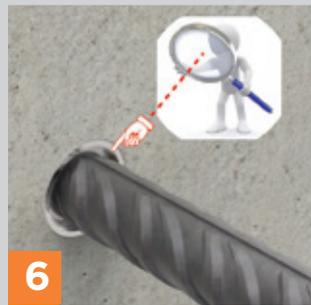
Rotate the 2nd phase rebar bar into the coupler up to the other threaded end of the fixed bar.

4



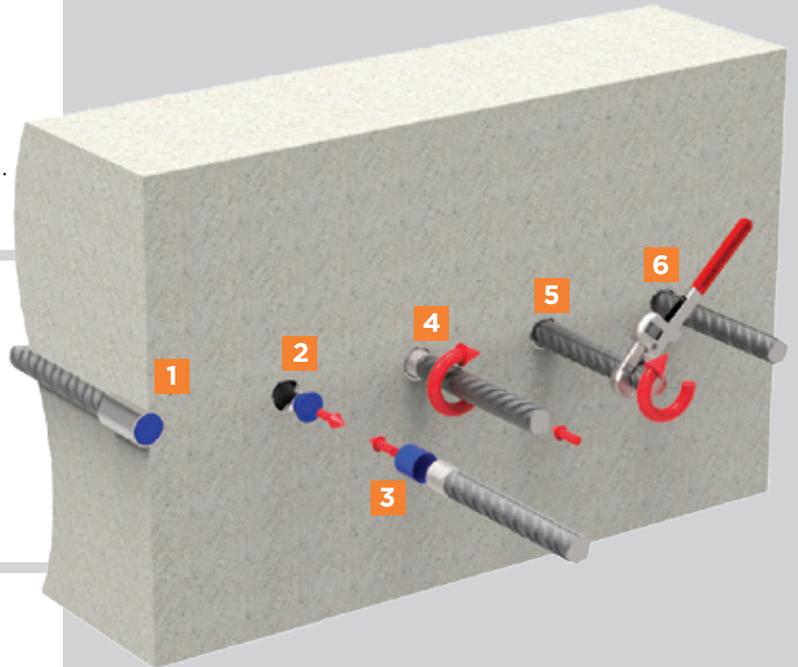
Tighten the joint using a wrench on the continuation bar.
25mm Ø rebar and above: L = 800mm minimum.

5



When installation is complete check no threaded portion of the rebar is visible outside the coupler.

6



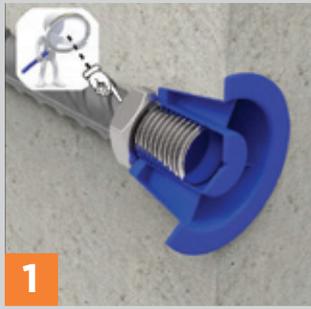
Note 1

Rebar splices reach their full resistance by hand-screwing at 80% of their total length of engagement.

Note 2

Step 5 now guarantees non slip across the rebar splices.

4.2 Pi Positional (LCE) Coupler Sequence



Place the 1st Phase Rebar

Check no threaded portion of the rebar is visible outside the lock nut and the plastic plug is correctly fitted.

1



1st Phase Concreting

After concreting remove the plastic plug from the coupler.

2



Install 2nd Phase Rebar

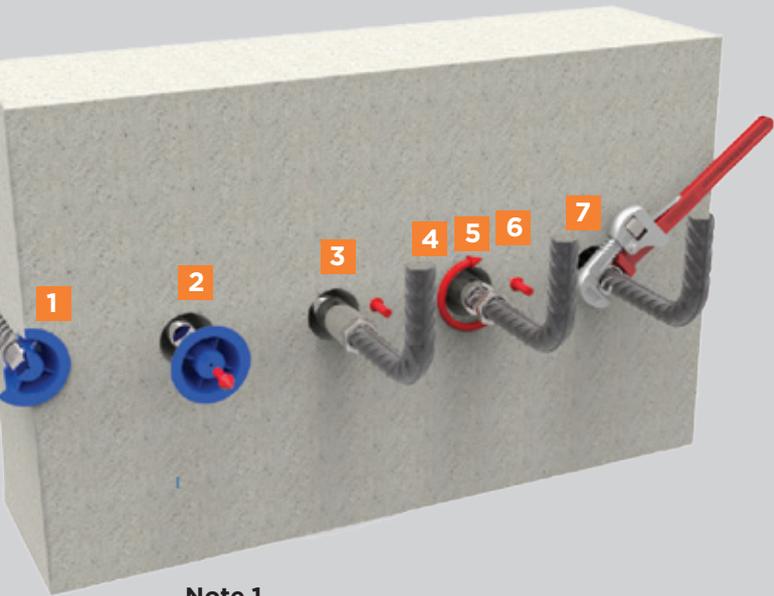
Screw the lock nut on to the 2nd phase rebar checking the coupler and lock nut are in contact.

3



Screw the coupler by hand onto the 1st phase rebar. A wrench may be used to ease operation.

4



Note 1

Rebar splices reach their full resistance by hand-screwing at 80% of their total length of engagement.

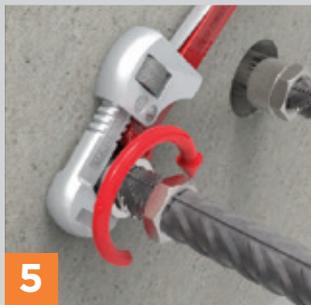
Note 2

Step 5 now guarantees non slip across the rebar splices.



Check the distance "l" between the coupler and lock nut (still engaged at the bottom of the long thread) it has to fall between the limits indicated in table 5 below.

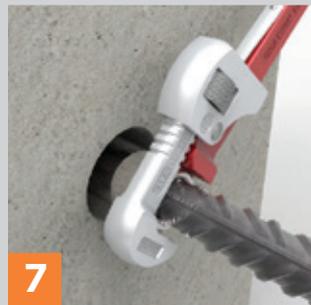
6



Fix the Coupler and Secure the Splice

Use a wrench to tighten the coupler.

5



Set the rebar in the correct position and use a wrench to tighten the lock nut.

25mm Ø rebar and above:
L = 800mm minimum.

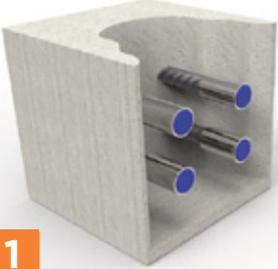
7

Rebar Diameter (mm)	Ø12	Ø14	Ø16	Ø20	Ø25	Ø32	Ø40
l min (mm)	16	18	22	27	33	39	48
l max (mm)	20	22	28	33	40	48	58

Table 5

4.3 Pi Bridging (LER) Coupler Sequence

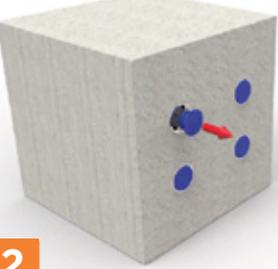
1



Place the 1st Phase Rebar

Check the couplers are fully engaged to the end of the thread on the fixed bars and the plastic caps are correctly fitted.

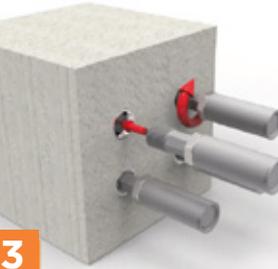
2



1st Phase Concreting

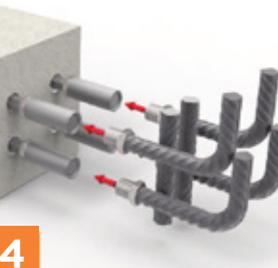
After concreting remove the plastic caps from the couplers.

3



Insert and rotate the studs. Check that the studs are screwed up to the threaded end of the 1st phase fixed rebars without being blocked.

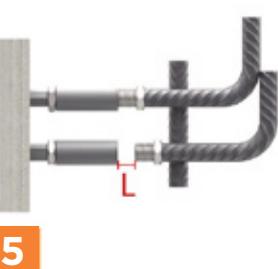
4



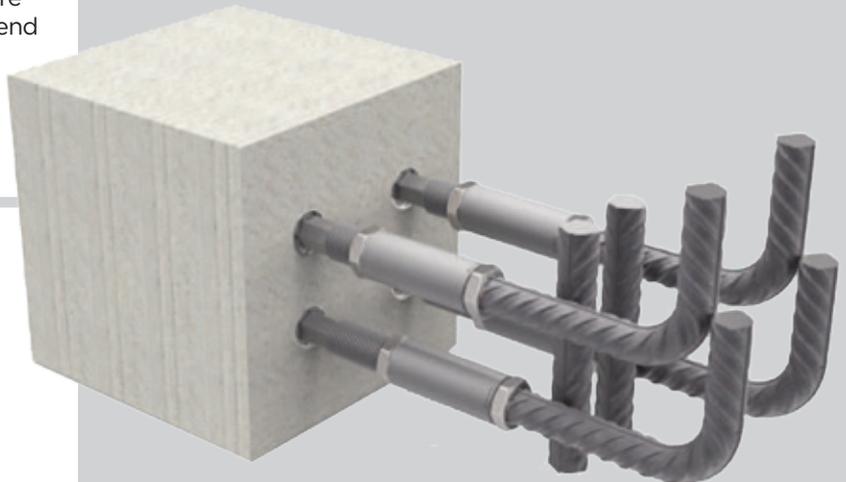
2nd Phase Rebar and Securing the Splice

Approach the rebars assembly as close as possible to the studs.

5



Check the distance "L" between the studs and 2nd phase rebars. The maximum distance allowed is indicated in table 6 below.



Note 1

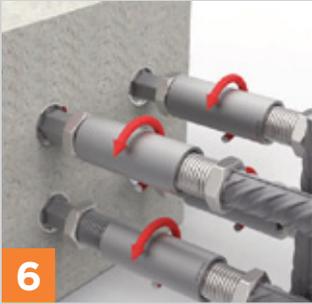
Rebar splices reach their full resistance by hand-screwing at 80% of their total length of engagement.

Note 2

When using both lock nuts non slip across the rebar splice is guaranteed.

Rebar Diameter (mm)	Ø16	Ø20	Ø25	Ø32	Ø40
L max (mm)	24	28	32	42	52

Table 6



Rotate the couplers towards the assembly rebar until they start engaging.

6



Rotate the lock nuts towards the fixed couplers.

11



Rotate each stud with a wrench to find the correct engagement position.

7



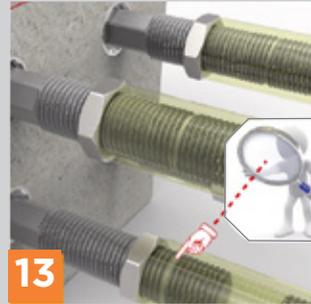
Tighten the lock nuts with a wrench.

12



Rotate the couplers until they have reached the end of the threaded rebar.

8



When the installation is completed check the mark on the studs as they must be inside the splicing (not visible outside the couplers).

13

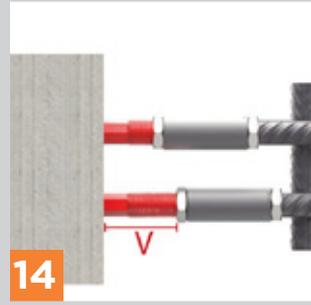


Use a wrench to tighten the couplers onto their matching rebar.



25mm Ø rebar and above:
L = 800mm minimum.

9



Check the distance "V". The maximum distance allowed is indicated in table 7 below.

14



Lock each stud using a wrench.

10

Rebar Diameter (mm)	Ø16	Ø20	Ø25	Ø32	Ø40
V max (mm)	64	77	99	120	145

Table 7

5 Safety Considerations

Couplers are supplied in metal containers weighting up to 25kg, which may be handled manually with care. Heavier cases require the use of mechanical handling equipment. It is advisable to wear suitable protective gloves during handling the containers, couplers and implementation, as well as during the cutting, upsetting and threading process.

6 Product Testing and Evaluation

Linxion Pi Couplers have been tested to satisfy the requirements of CARES Appendix TA1-C for Couplers with reinforcing bars to BS4449 Grade B500C as defined in tables 1 to 4 as appropriate. The testing comprised the following elements:

- Tensile strength
- Permanent deformation in tension
- Low cycle fatigue

7 Quality Assurance

Linxion Pi 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 Standard 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

Linxion Pi Standard (LS), Positional (LCE), Reducing (RD) and Bridging (LER) 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 Linxion Pi Standard (LS), Positional (LCE), Reducing (RD) and Bridging (LER) Couplers comply with the material requirements of EC2.

8.2 The Building Regulations (Northern Ireland)

Materials and Workmanship

This technical approval gives assurance that Linxion Pi Standard (LS), Positional (LCE), Reducing (RD) and Bridging (LER) 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 Linxion Pi Standard (LS), Positional (LCE), Reducing (RD) and Bridging (LER) Couplers comply with the material requirements of EC2 by virtue of *Clause 0.8*.

Structure

Linxion Pi Standard (LS), Positional (LCE), Reducing (RD) and Bridging (LER) 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

- BS 4449: 2005: Steel for the reinforcement of concrete - Weldable reinforcing steel - Bar, coil and decoiled product - Specification.
- BS8110: Part 1: 1997: Structural Use of Concrete, Code of Practice for Design and Construction (now withdrawn).
- 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-C: Quality and Operations Schedule for the Technical Approval of Tension or Tension- compression Couplers for Reinforcing Steel and Reinforcement Anchors based on Sellafield Engineering Standard.
- Sellafield Engineering Standard ES_O_3110_2: Mechanical Splices to Reinforcement for Concrete Part 2 - Manufacturing, Installation and Construction Requirements.



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 Bartec Company 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 5067. Confirmation that this technical approval is current can be obtained from CARES.



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