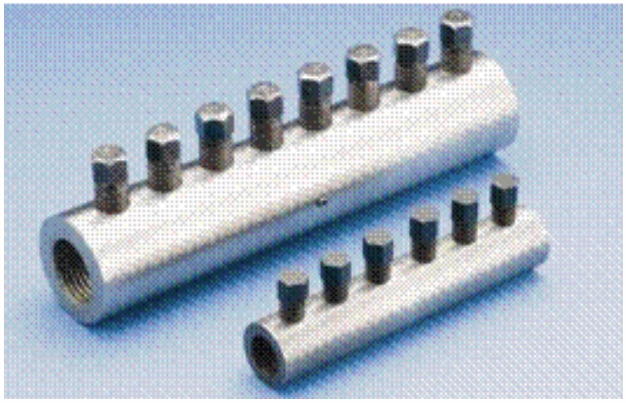
CARES Technical Approval Report TA1-A, B & C 5022

Assessment of the ERICO LENTON® LOCK Mechanical Coupler Product and the Quality System for Production

ERICO LENTON® LOCK

Mechanical Couplers



ERICO®

CARES TECHNICAL APPROVAL

UKAS PRODUCT CERTIFICATION 5022

Product

ERICO LENTON® LOCK mechanical couplers for reinforcing steel.

Produced by:

ERICO,
Jules Verneweg 75,
5015 BG,
Tilburg,
The Netherlands

1 Product Summary

ERICO LENTON® LOCK mechanical couplers in the size range 12mm - 32mm are 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.

1.1 Scope of Application

ERICO LENTON® LOCK mechanical couplers in the size range 12mm - 32mm have been evaluated for use as follows:

- 12mm to 32mm ERICO LENTON® LOCK mechanical couplers for dynamic BS5400 part 10 fatigue class D applications in accordance with CARES Appendix TA1-A using BS4449 Grade B500B and Grade B500C reinforcement only.
- 12mm to 32mm ERICO LENTON® LOCK mechanical couplers for static BS8110 applications in tension only in accordance with CARES Appendix TA1-B.
  Using BS4449 Grade B500B and Grade B500C reinforcement only.
- 12mm to 32mm ERICO LENTON® LOCK mechanical couplers for static tension in accordance with BNFL (British Nuclear Fuels) Specification for couplers Type A and CARES Appendix TA1-C using BS4449 Grade B500C reinforcement only.

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.

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 BS4449 Grade B500B and Grade B500C.

1.3 Conclusion

It is the opinion of CARES that ERICO LENTON® LOCK mechanical couplers in the size range 12mm - 32mm are satisfactory for use within the limits stated in paragraph 1.1 above when applied and used in accordance with the manufacturer's instructions and the requirements of this certificate.

B. Bowsher
Executive Director

November 2008

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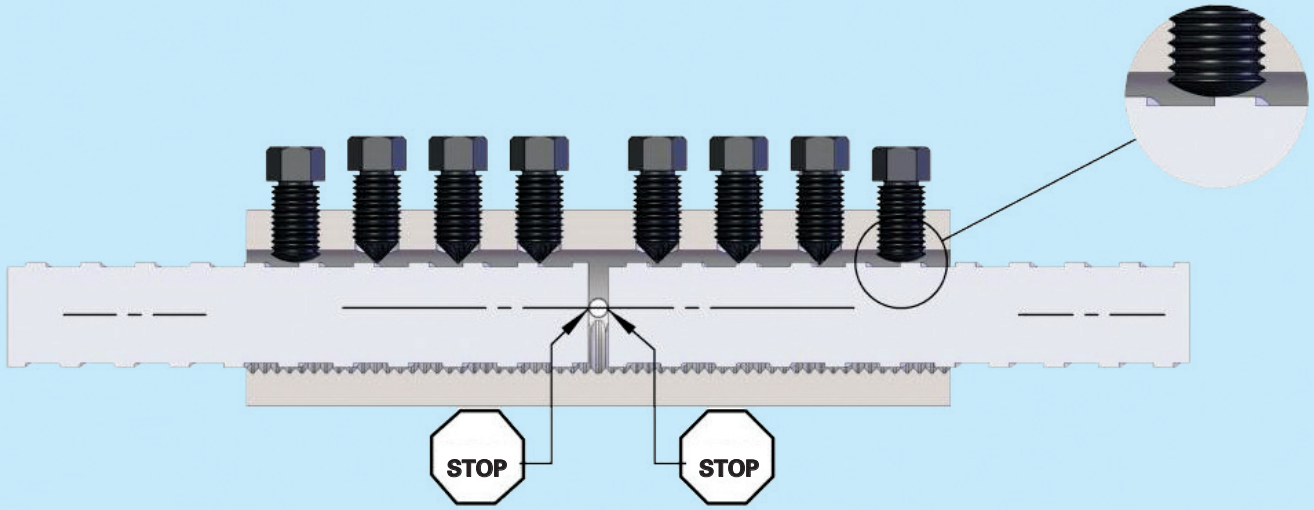
2 Technical Specification

2.1 General

LENTON® LOCK, an in-situ rebar splice from ERICO, requires no bar-end preparation, sawing or swaging. It can be used for new construction, repair, or retrofit applications. This mechanical rebar splice is designed for use in reinforced concrete appications such as column splicing, bridge applications, piling, splicing to protruding dowels cast in concrete and beams.

2.2 ERICO LENTON® LOCK

The couplers can be installed with a standard wrench, impact wrench or a nut runner.
The bolt heads will shear off when proper installation tightness has been reached, which allows for completely visual inspection. The dimensions are in Table 1:



Rebar Designation mm	Coupler Part Number	Length mm	Outside Diameter mm	Inside Diameter mm	Weight kg	Socket Size mm	Pre-torque All Bolts	Average Torque All Bolts Nm	Number of Bolts
12	LL12B1	127	29	15	0.6	13	-	205	6
16	LL16B1	159	35	19	0.9	13	-	205	6
20	LL20B1	191	41	24	1.4	13	-	205	8
20	LL22B1	222	48	28	2.3	16	-	475	8
25	LL25B1	254	54	30	3.4	16	-	475	8
25	LL28B1	287	60	34	4.6	16	-	475	10
32	LL32B1	323	65	38	5.9	21	545	680	8
32	LL36B1	358	72	43	7.9	21	545	750	10

Table 1

3 Product Performance and Characteristics

Full testing has been carried out to demonstrate compliance with the performance requirements defined in CARES Appendix TA1-A, TA1-B and TA1-C when used with reinforcing bars to BS4449 Grade B500B and B500C:

CARES APPENDIX TA1-A

- Permanent deformation is less than 0.1mm after loading to 0.6f_y in tension for grade B500B and B500C reinforcement.
- 99% characteristic tensile strength is greater than 540 MPa for Grade B500B material and 575 MPa for grade B500C reinforcement.
- BS5400 Part 10 fatigue class D as defined in CARES Appendix TA1-A for grade B500B and B500C reinforcement.

CARES APPENDIX TA1-B

- Permanent deformation is less than 0.1mm after loading to 0.6f_y in tension for grade B500B and B500C reinforcement.
- 99% characteristic tensile strength is greater than 540 MPa for Grade B500B material and 575 MPa for grade B500C reinforcement.

CARES APPENDIX TA1-C

- Permanent deformation is less than 0.1mm after loading to 0.6f_y in tension for grade B500C reinforcement.
- Tensile strength ≥ 1.15, ≤ 1.35 x Actual yield strength ($f_{y\,act}$) for B500C reinforcing 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

1

Ensure the rebar is free of any excessive dirt, concrete slurry, rust etc. which may affect product performance.

2

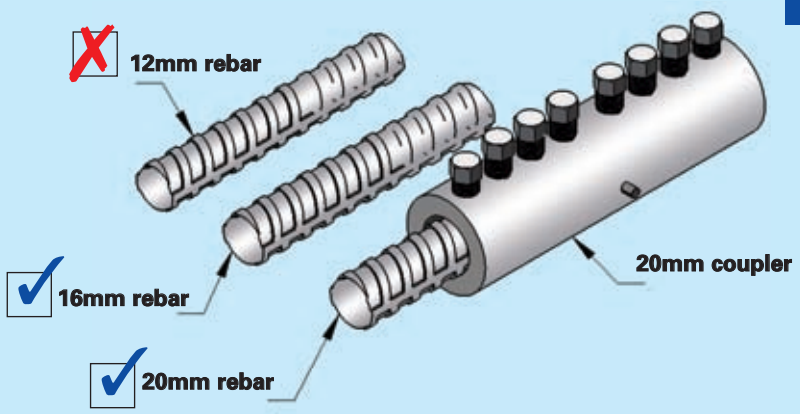
Ensure maximum rebar lip does not exceed the limits set in table 2. Excessive shear lip interferes with rebar installation.

Rebar Designation mm	Maximum Rebar Shear Lip Daimeter (A) mm
12	14.5
16	18.5
20	23.5
25	29.4
32	37.5

Table 2

3

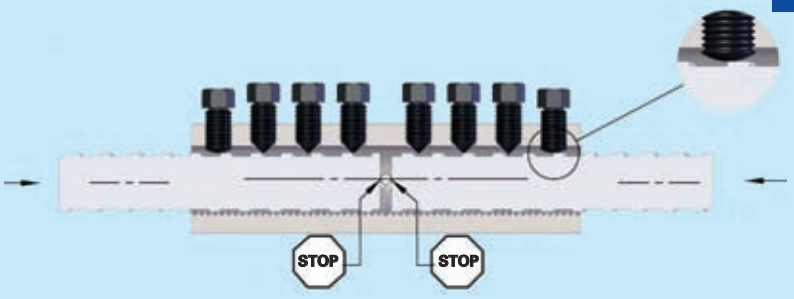
Ensure the LENTON® LOCK coupler is sized properly for the bars being spliced. See product data sheet enclosed with product.



4

Product should arrive with bolts configured as shown in the figure right. (Round point bolts should be on the ends)

Insert rebar into LENTON® LOCK coupler until contact is made with the centre stop pin as shown in figure 4. Rebar must be flush against centre stop pin.

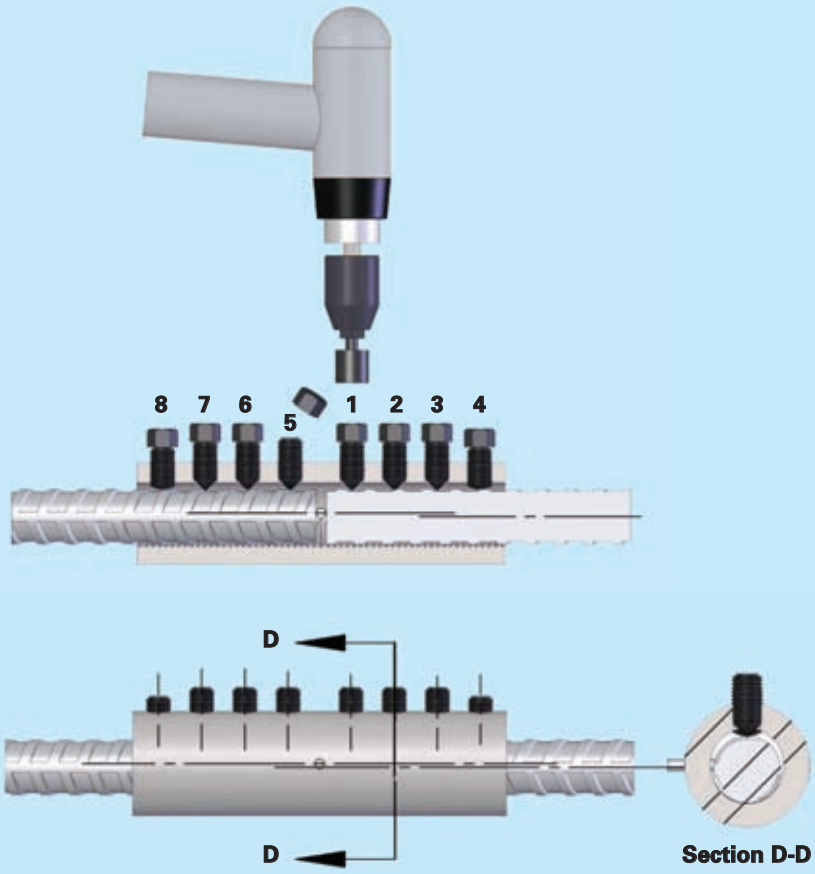


Procedures for rebar sizes 12mm to 25mm.

Tighten the bolts, beginning in the centre of the coupler and working to the outside (1 to 8). A standard wrench, impact wrench or nut runner may be used to tighten the bolts.

If bolt head does not shear, the installer should verify the appropriate torque was met (table 3)

If a minimum cover must be maintained, the head can be cut off after the proper torque has been applied.



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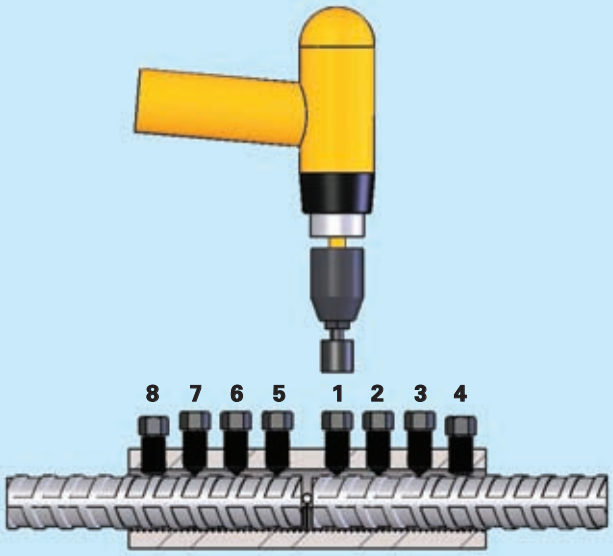
25	LL25B1	254	54	30	3.4	16	475	8
25	LL28B1	287	60	34	4.6	16	475	10

Table 3

Procedure for rebar size 32mm

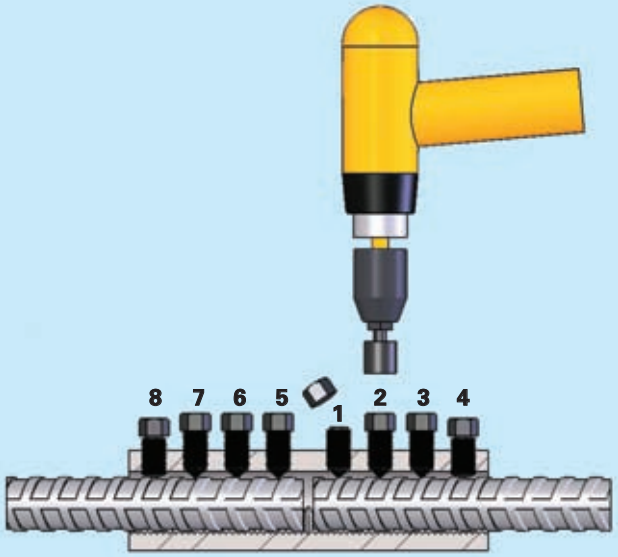
6

Pre-Torque the bolts beginning in the centre of the coupler and working to the outside (1 to 8).



7

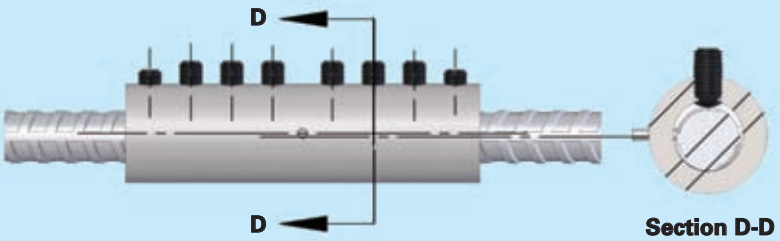
Then go back to bolt 1 and finish tightening the bolts, once again beginning in the centre of the coupler and working to the outside (1 to 8). A standard wrench, impact wrench or nut runner may be used for the final tightening of the bolts.



8

If the bolt head does not shear, the installer should verify the appropriate torque was met. (Table 4)

If a minimum cover must be maintained, the head can be cut off after the proper torque has been applied.



Rebar Designation mm	Coupler Part Number	Length mm	Outside Diameter mm	Inside Diameter mm	Weight kg	Socket Size mm	Pre-torque All Bolts	Average Torque All Bolts Nm	Number of Bolts
32	LL32B1	323	65	38	5.9	21	545	680	8

Table 4

5 Safety Considerations

LENTON® LOCK shall be installed and used only as indicated in ERICO product instruction sheets and training materials. Instruction sheets are available at www.erico.com and from your ERICO customer service representative.

LENTON® LOCK couplers may only be used for the purpose for which they were designed.

- All ERICO instructions must be followed to ensure proper and safe installation and performance.
- Improper installation, misuse, misapplication or other failure to completely follow ERICO's instructions and warnings may cause product malfunction, property damage, serious bodily injury and death.
- The customer is responsible for:
  - Conformance to all governing codes.
  - The integrity of structures to which the products are attached including their capability of safely accepting the loads imposed, as evaluated by a qualified engineer.
  - Using appropriate industry standard hardware as noted above.
- All governing codes and regulations and those required by the job site must be observed. Always use appropriate safety equipment such as eye protection, hard hat, and gloves as appropriate to the application.

6 Product Testing and Evaluation

LENTON® LOCK mechanical couplers have been tested to satisfy the requirements of CARES Appendix TA1-A, TA1-B, and TA1-C for Couplers with reinforcing bars to BS4449 Grade B500B and B500C. The testing comprised the following elements:

- Tensile Strength
- Permanent Deformation
- Low cycle fatigue
- High cycle fatigue

The products are subject to a programme of periodic testing to ensure that they remain within the performance limits of this technical approval.

7 Quality Assurance

LENTON® LOCK mechanical couplers are produced under an ISO9001 quality management system certified by CARES. The quality management system scheme monitors the production of the couplers and ensures that materials and geometry remain within the limits of this technical approval.

8 Building Regulations

8.1 The Building Regulations (England and Wales)

Structure, Approved Document A
ERICO LENTON® LOCK mechanical couplers, when used in BS8110 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, to support regulation 7
This technical approval gives assurance that the ERICO LENTON® LOCK comply with the material requirements of BS8110.

8.2 The Building Regulations (Northern Ireland)

Part B, Materials and Workmanship
This technical approval gives assurance that ERICO LENTON® LOCK mechanical couplers comply with the material requirements of BS8110 by virtue of regulation *B3, Deemed to satisfy provisions regarding the fitness of materials and workmanship.*

8.3 The Building Standards (Scotland) Regulations

Part B, Fitness of Materials
This technical approval gives assurance that ERICO LENTON® LOCK mechanical couplers comply with the material requirements of BS8110 by virtue of *Clause B2.1*

Part C, Structure
ERICO LENTON® LOCK mechanical couplers, when used in BS8110 based designs using the data contained within this technical approval, satisfy the requirements of *The Building Standards (Scotland) Regulations, Part C, C2.1 clause b. construction,ii.*

9 References

- BS 4449: 2005: Steel for the reinforcement of concrete - Weldable reinforcing steel - Bar, coil and decoiled product - Specification.
- BS 5400 Part 10: 1980 - Code of Practice for Fatigue [Incorporating Amendment No.1 dated November 1983]
- BS8110: Part 1: 1997: Structural Use of Concrete, Code of Practice for Design and Construction.
- BS EN ISO 9001: 2000: Quality management systems - Requirements.
- BNFL technical standard Std. A. 0391
- CARES Appendix TA1-A; Quality and Operations Schedule for the Technical Approval of Couplers for Reinforcing Steel for use in Structures Designed in accordance with the Fatigue Requirements BS5400 Part 10.
- CARES Appendix TA1-B; Quality and Operations Schedule for the Technical Approval of Couplers for Reinforcing Steel For BS8110 Applications for Static Tension or Static Compression.
- CARES Appendix TA1-C; Quality and Operations Schedule for the Technical Approval of Tension Couplers for Reinforcing Steel for BNFL Standard Applications

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 is unchanged.
   b. The materials and method of manufacture 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 ERICO 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 5022. Confirmation that this technical approval is current can be obtained from UK CARES.

UK CARES

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Independent Product Assessments for the Construction Industry