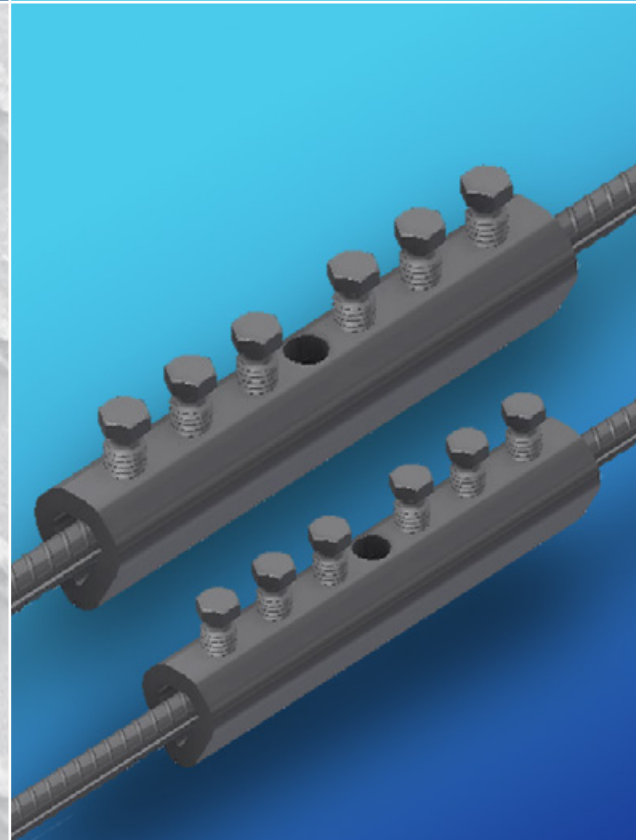


CARES Technical Approval Report TA1-B 5065

Issue 1



Terwa
Alligator (ALC)
Mechanical Coupler
Assessment of the
Terwa Alligator (ALC)
Mechanical Coupler
Product and Quality
System for Production



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Product

Terwa Alligator (ALC)
mechanical coupler
for reinforcing steel

Product approval held by

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1 Product Summary

Terwa Alligator (ALC) 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 as shown in table 1.

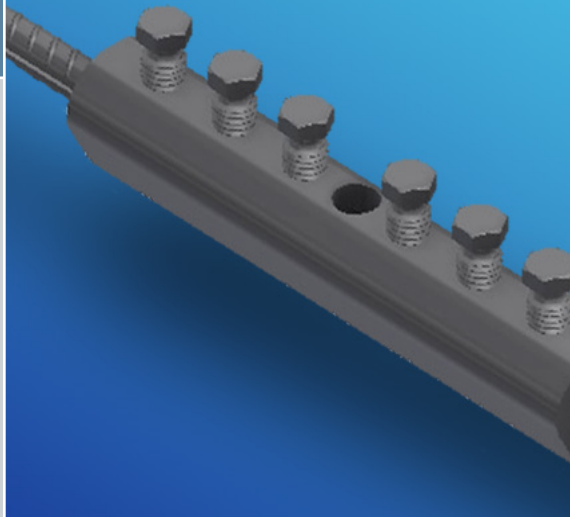
1.1 Scope of Application

Terwa Alligator (ALC) mechanical couplers in the size range 12mm - 32mm have been evaluated for use as follows:

- a) 12mm to 32mm Terwa Alligator (ALC) mechanical couplers for static Eurocode 2, EN1992 and BS 8110 applications in tension only in accordance with CARES Appendix TA1-B, using BS4449 Grade B500B 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.



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 Terwa Alligator (ALC) mechanical 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.

Lee Brankley
 L. Brankley
 Chief Executive Officer

August 2017



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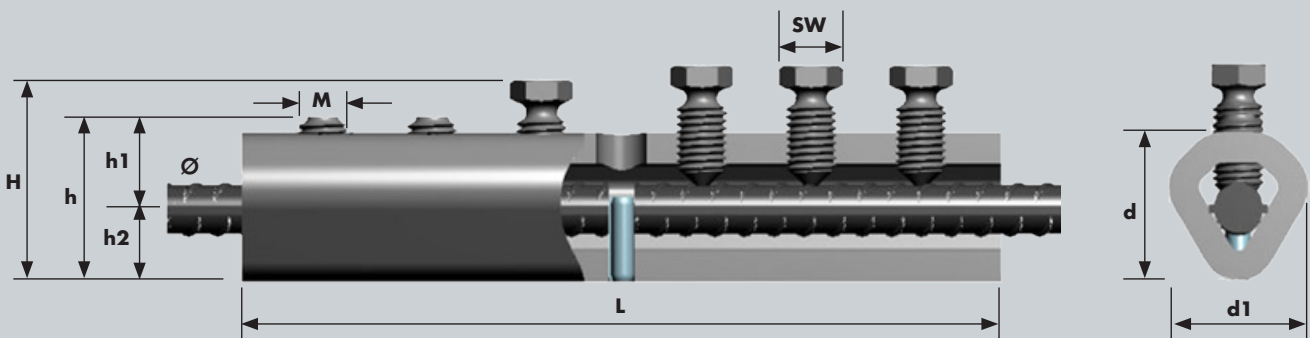
2 Technical Specification

The function of Terwa Alligator (ALC) coupler is to connect deformed straight steel reinforcing bars complying with BS4449: 2005 grade B500B and thereby create structural continuity of the reinforcing system.

The couplers comprise:

- Formed steel sleeves; manufactured from hot-rolled, seamless steel tubing. Each sleeve is formed, drilled and tapped for the appropriate number of bolts. Sleeves are also supplied with a centre stop and a viewing hole fixed in position to provide accurate location of the coupler on the reinforcing bars.
- Lock shear bolts; steel bolts, incorporating hexagonal heads and reduced diameter shank shear planes and conical heads.
- Centre pins for bar location.

Terwa Alligator (ALC) Coupler



ALC Type/ Rebar Ø (mm)	Coupler Ref	Breaking bolts number n	Breaking bolt thread M	L (mm)	d (mm)	d1 (mm)	Unruptured bolt H (mm)	h (mm)	h1 (mm)	h2 (mm)	SW (mm)	Torque moment (Nm)	Weight (kg)
12	44634	6	M12	180	35	33	Max. 48.5	40	24	16	13	100-115	0.92
14/16	43071	8	M12	230	40	36	Max. 53.5	45	27	18	13	100-115	1.37
18	43072	10	M12	280	44	42	Max. 57.5	49	29	20	13	100-115	2.05
20	43073	10	M16	260	47	44	Max. 65.5	54	33	21	17	195-215	2.23
22	43074	10	M16	330	53	50	Max. 69	58	32	26	17	195-215	3.62
25	43075	12	M16	390	56	52	Max. 74	63	33	30	17	195-215	4.51
28	43076	12	M20	420	66	62	Max. 88.5	75	45	30	22	355-405	7.37
32	43077	14	M20	480	73	68	Max. 90.5	77	46	31	22	355-405	9.40

Table 1

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 bars to BS4449 Grade B500B.

CARES APPENDIX TA1-B

- Permanent deformation is less than 0.10mm after loading to $0.65f_y$ in tension for grade B500B reinforcement
- 99% characteristic tensile strength is greater than 540 MPa for Grade B500B reinforcement

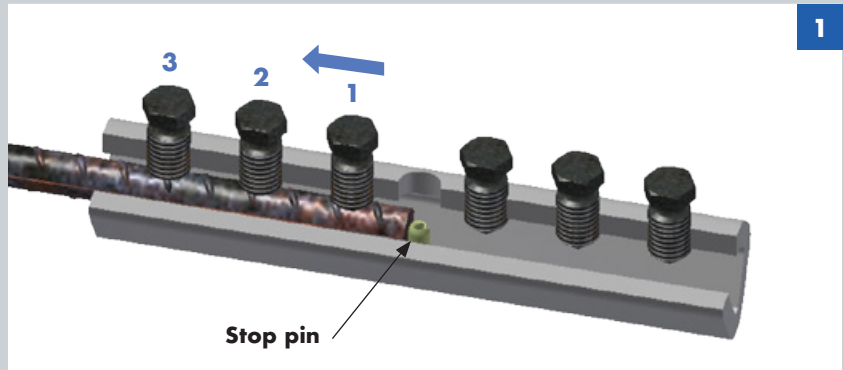
4 Installation

The Terwa Alligator (ALC) coupler is used to connect reinforcement bars of the same size. For a correct installation, the product is provided in the middle with a pin and a viewing hole.

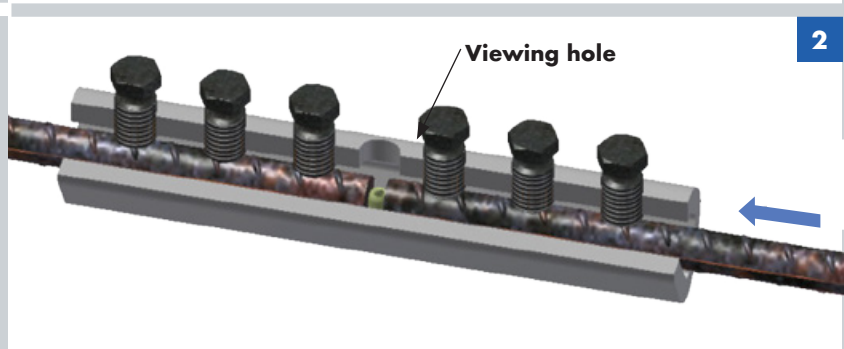
The couplers are installed with a pneumatic or electric power tool. The bolt heads will shear off when proper installation tightness has been reached. The dimensions and characteristics are in Table 1.

Terwa Alligator (ALC) coupler installation sequence

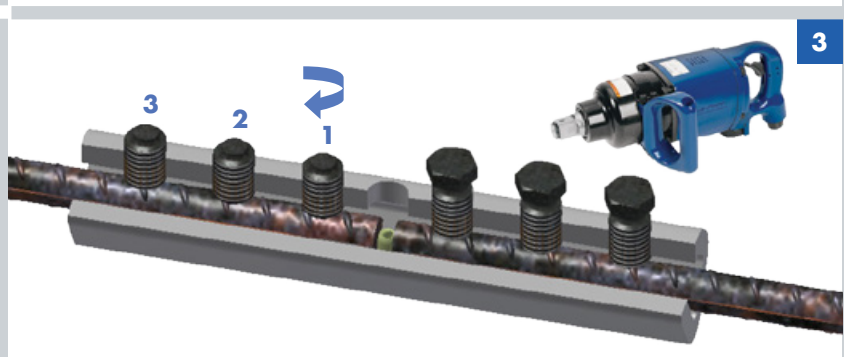
Place the Alligator (ALC) coupler over the end of the first piece reinforcement bar to be joined, ensuring the reinforcement bar meets the central stop pin, this can be verified by eye with the central viewing hole. The breaking bolts adjacent to the first bar should then be tightened by hand.



Insert the second rebar into the coupler.
Check the rebar is in contact with the stop pin by looking through the viewing hole.
Tighten the rest of the breaking bolts by hand.



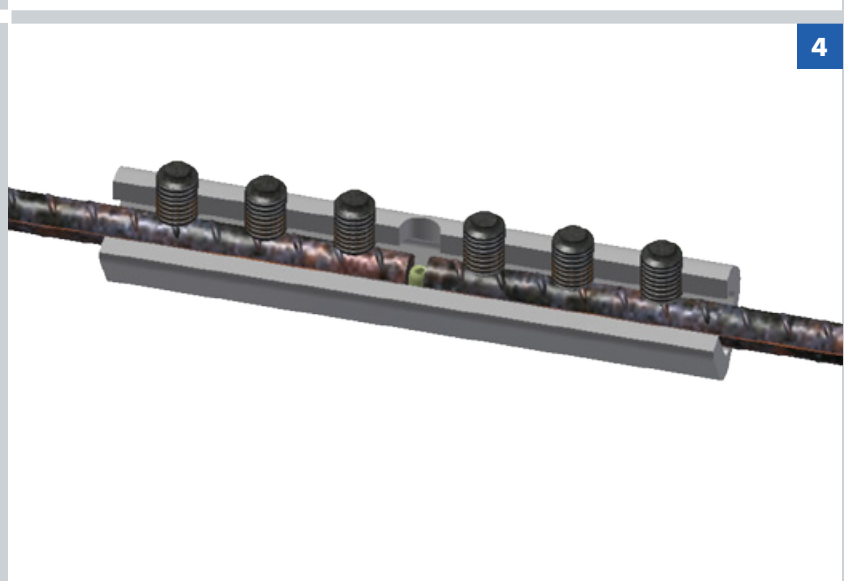
Fully tighten the breaking bolts using a pneumatic or electric wrench. The bolts must be tightened from the center to outside (1 to 3) until the heads of all the breaking bolts shear off.



Completed Alligator (ALC) coupler installation after all bolts have been sheared off.

If a bolt head is not removed/sheared off during installation, this is acceptable providing the appropriate bolt torque is achieved as detailed in table 1.

However, the installation is only considered satisfactory providing the height H in table 1 is not exceeded. This must be measured to ensure satisfactory penetration and grip of the reinforcing bar.



5 Safety Considerations

Terwa Alligator (ALC) mechanical couplers are supplied in robust Wooden Euro pallets. Euro pallets weighing up to 25kg may be handled manually 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

Terwa Alligator (ALC) mechanical couplers have been tested to satisfy the requirements of CARES Appendix TA1-B for Couplers with reinforcing bars to BS4449 Grade B500B as shown in table 1. The testing comprised the following elements

- Tensile Strength
- Permanent Deformation

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

7 Quality Assurance

Terwa Alligator (ALC) mechanical couplers are produced under an EN ISO 9001 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

Terwa Alligator (ALC) mechanical 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 Terwa Alligator (ALC) mechanical couplers comply with the material requirements of EC2.

8.2 The Building Regulations (Northern Ireland)

Materials and Workmanship

This technical approval gives assurance that Terwa Alligator (ALC) mechanical 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 Terwa Alligator (ALC) mechanical couplers comply with the material requirements of EC2 by virtue of *Clause 0.8*.

Structure

Terwa Alligator (ALC) mechanical 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.
- BS EN 1992-1-1:2004 Eurocode 2 Design of concrete structures - Part 1-1: 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 BS8110 and EN1992-1-1 Applications 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 Terwa 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 5065. Confirmation that this technical approval is current can be obtained from UK CARES.



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