CARES Technical Approval Report TA1-B 5038

Issue 3

HY-TEN REINFORCEMENT

Hy-Ten
HT.S Standard, HT.P Positional and HT.LT Positional Couplers

Assessment of the Hy-Ten HT.S Standard, HT.P Positional and HT.LT Positional Coupler Product and Quality System for Production

Product

Hy-Ten HT.S Standard, HT.P Positional and HT.LT Positional Couplers for reinforcing steel

Product approval held by:

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1 Product Summary

Hy-Ten HT.S Standard, HT.P Positional and HT.LT Positional Couplers in the size range 12mm - 40mm 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 and B500C.

1.1 Scope of Application

Hy-Ten HT.S Standard, HT.P Positional and HT.LT Positional Couplers in the size range 12mm - 40mm have been evaluated for use as follows:

For static BS 8110 and EC2 applications in tension only using BS4449 grades B500B and B500C in accordance with CARES Appendix TA1-B

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 Grade B500B and B500C as detailed in the scope of application section 1.1

1.3 Conclusion

It is the opinion of CARES that HT.S Standard, HT.P Positional and HT.LT Positional Couplers in the size range 12mm - 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
January 2019

2 Technical Specification

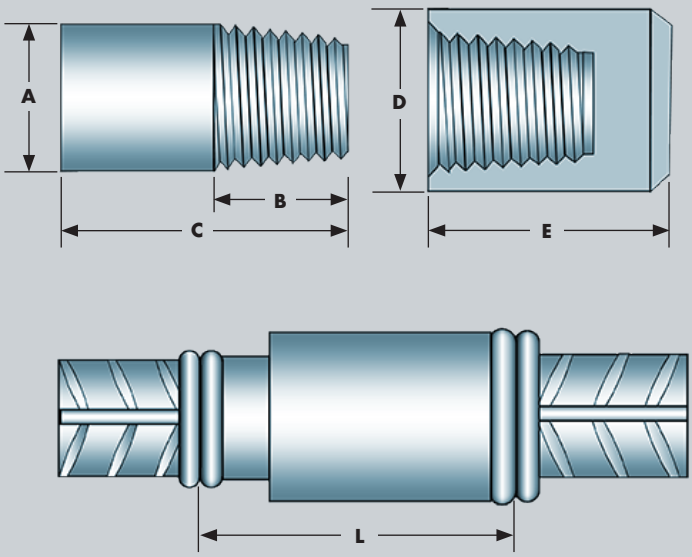
2.1 General

The function of HT.S Standard, HT.P Positional and HT.LT Positional Couplers is to connect deformed steel reinforcing bars complying with BS4449 Grade B500B and B500C and thereby create structural continuity of the reinforcing system.

2.2 HT.S Standard Coupler

The HT.S Standard Coupler is a system providing a mechanical connection of deformed Grade B500B and B500C high yield carbon steel bars for the reinforcement of concrete, complying with the tensile properties of BS4449.

HT(S) Standard Coupler



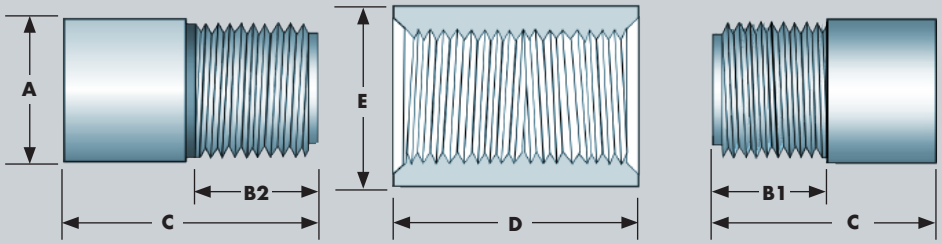
Coupler Ref	Bar Dia mm	A mm	B mm	C mm	D mm	E mm	L mm	TA1-B/ B500B	TA1-B/ B500C
HT.S12	12	14	13	38	19	29	50 ± 2	✓	✓
HT.S20	16	19	20	43	25	40	60 ± 3	✓	✓
HT.S20	20	19	20	43	25	40	60 ± 3	✓	✓
HT.S25	25	25	25	55	34	50	70 ± 4	✓	✓
HT.S32	32	32	32	63	42	63	80 ± 4	✓	✓
HT.S40	40	46	40	75	53	70	95 ± 5	✓	✓

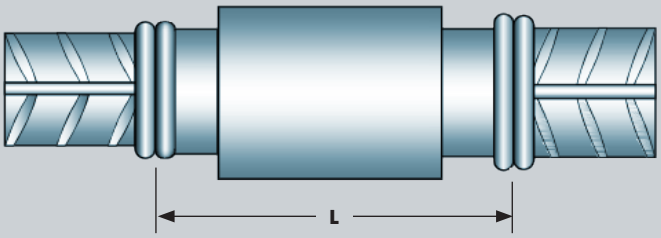
Table 1

2.3 HT(P) Positional Coupler

The HT.P Positional Coupler is a system providing a mechanical connection of deformed Grade B500B and B500C high yield carbon steel bars for the reinforcement of concrete, complying with the tensile properties of BS4449. The positional coupler is used where both bars to be joined cannot be rotated.

HT.P Positional Coupler





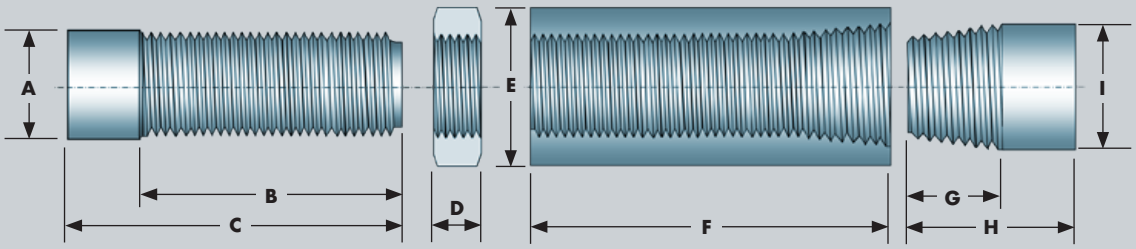
Coupler Ref	Bar Dia mm	A mm	B1 mm	B2 mm	C mm	D mm	E mm	L mm	TA1-B/ B500B	TA1-B/ B500C
HT.P20	12	22	19	22	45	39	28	75 ± 2	✓	✓
HT.P20	16	22	19	22	45	39	28	75 ± 2	✓	✓
HT.P20	20	22	19	22	45	39	28	75 ± 2	✓	✓
HT.P25	25	28	25	28	55	51	36	95 ± 3	✓	✓
HT.P32	32	36	30	33	65	60	46	115 ± 3	✓	✓
HT.P40	40	42	37	40	75	73	55	130 ± 4	✓	✓

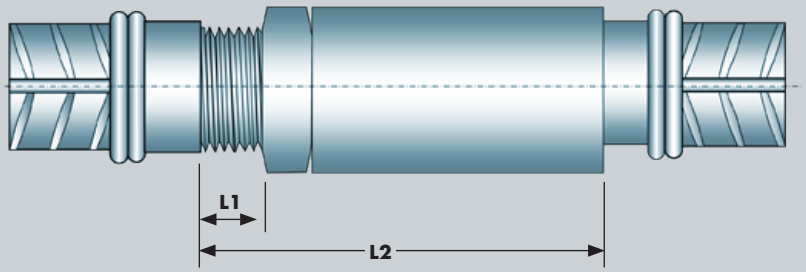
Table 2

2.4 HT.LT Positional Coupler

The HT.LT Positional Coupler is a system providing a mechanical connection of deformed Grade B500B and B500C high yield carbon steel bars for the reinforcement of concrete, complying with the tensile properties of BS4449. The positional coupler is used where both bars to be joined cannot be rotated.

HT.LT Positional Coupler





Coupler Ref	Bar Dia	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm	L1 (min)	L1 (max)	L2 (min)	L2 (max)	TA1-B/ B500B	TA1-B/ B500C
H.LT20	12	19	81	106	15	30	66	16	41	24	16	51	97	132	✓	✓
H.LT20	16	19	81	106	15	30	66	16	41	24	16	51	97	132	✓	✓
H.LT20	20	19	81	106	15	30	66	16	41	24	16	51	97	132	✓	✓
H.LT25	25	25	102	130	15	38	87	20	50	30	20	65	122	167	✓	✓
H.LT32	32	32	111	141	15	48	96	25	58	38	25	70	136	181	✓	✓
H.LT40	40	46	123	158	15	55	108	30	64	46	30	75	153	198	✓	✓

Table 3

3 Product Performance and Characteristics

3.1 Material Properties

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 and B500C for HT.S Standard, HT.P Positional and HT.LT Positional Couplers.

CARES APPENDIX TA1-B strength requirements

- Permanent deformation is less than 0.10mm after loading to 0.65 $Re_{(char)}$ in tension or compression.
- 99% characteristic tensile strength is greater than 540 MPa with grade B500B reinforcement or 575 MPa with grade B500C reinforcement.

4 Installation

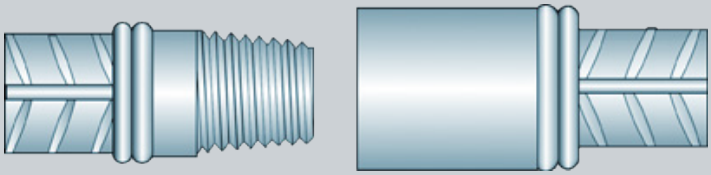
The HT.S Coupler is always delivered to site connected to the appropriate re-bar. The formation of the joint is achieved by screwing the two sections together, i.e. male and female elements.

The joint should always be tightened by the use of a wrench, until there is no further movement available between the two sections.

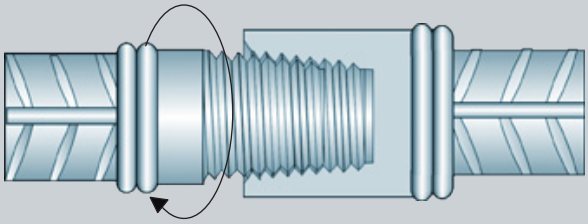
HT.50 Coupler Machine

4.1 HT.S Standard Coupler

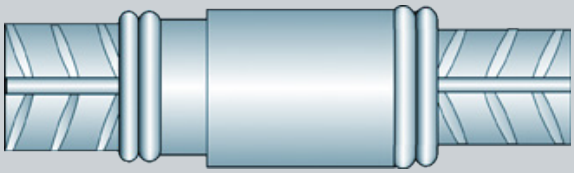
HT.S installation instructions



1 The two sections of the joint are brought together



2 The joint is then screwed together using a wrench

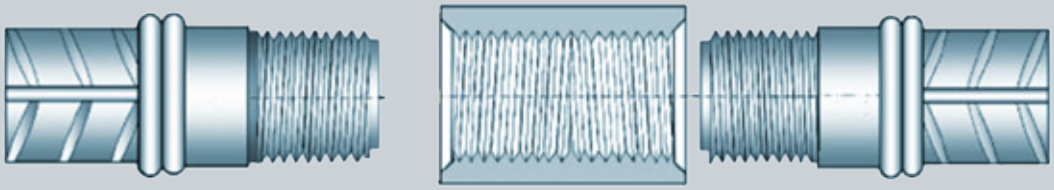


3 Finished joint tightened with a wrench until no further movement between sections

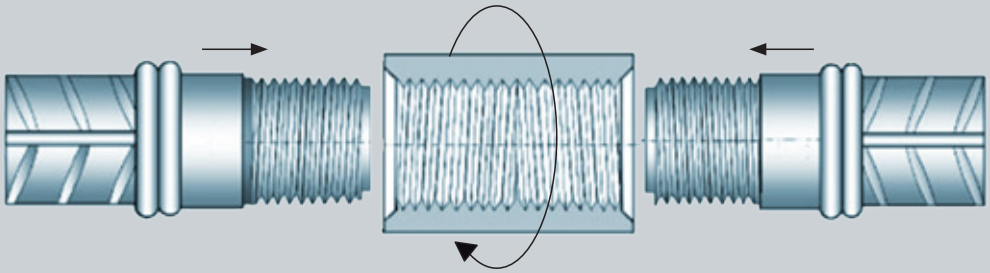
4.2 HT.P Positional Coupler

Positional Coupler type: HT.P with left and right screw for un-rotatable but moveable rebar.

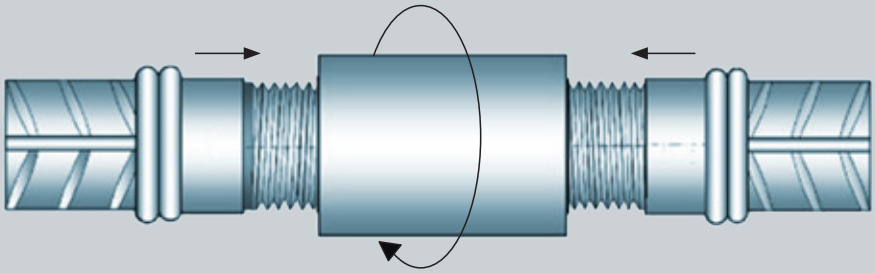
HT.P installation instructions



1 The two sections of the joint and female coupler are brought together



2 Both sections are then screwed together by turning the female coupler using a wrench



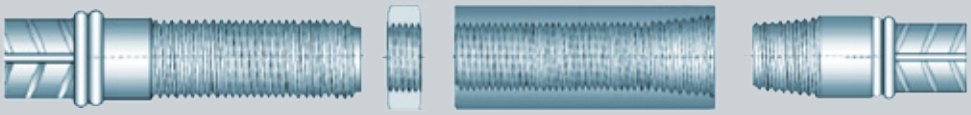
3 Finished joint tightened with a torque wrench until no further movement

4 Finished Installation

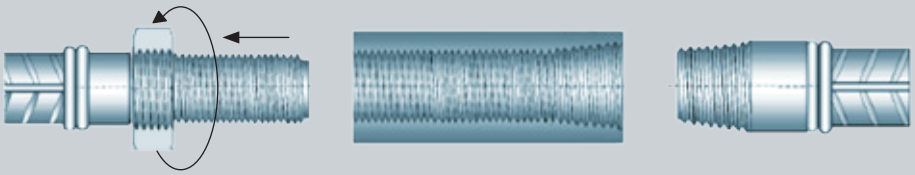
4.3 HT.LT Positional Coupler

Positional coupler type: HT.LT is suitable for connecting two bars where neither bar is rotatable, at least one bar is movable and extended length adjustment of the coupler is required.

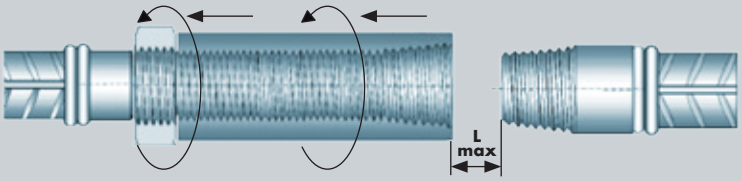
HT.LT installation instructions



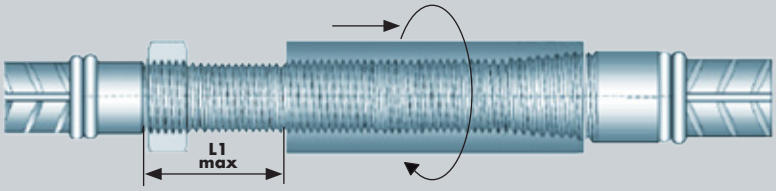
1 Both the sections, female coupler and lock nut are brought together



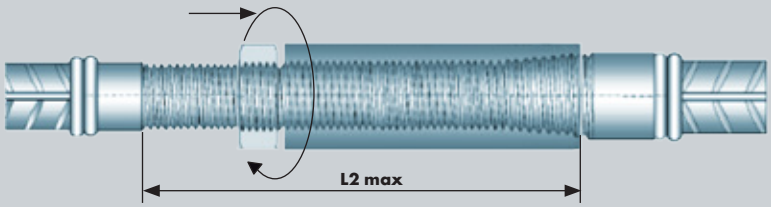
2-1 Spin the lock nut up the parallel thread as far as it will go



2-2 Spin the female coupler up the parallel threaded male section as far as it will go. Bring the tapered thread male section close to the female coupler. The gap between the two components should be less than the maximum extension limit as shown above



3 Turn the female coupler off the parallel threaded section and onto the tapered thread of the male coupler, tighten it with a wrench until there is no further movement



4 Spin the lock nut down the parallel thread and tighten the lock nut with a wrench behind the female coupler

5 Finished Installation

5 Safety Considerations

The friction welding of the couplers is done at the Hy-Ten factory in Newark. The couplers are delivered to the factory, packaged in 20kg boxes. A full risk assessment has been undertaken by Hy-Ten for this manufacturing process.

On site, the usual safety precautions should be followed when handling re-bar and the use of gloves and other relevant PPE is always advised.

6 Product Testing and Evaluation

HT.S Standard, HT.P Positional and HT.LT Positional Couplers have been tested to satisfy the requirements of CARES Appendix TA1-B for Couplers with reinforcing bars to BS4449 Grade B500B and B500C. The testing comprised the following elements:

- Tensile Strength
- Permanent Deformation

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

HT.S Standard, HT.P Positional and HT.LT Positional 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

HT.S Standard, HT.P Positional and HT.LT Positional 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 HT.S Standard, HT.P Positional and HT.LT Positional Couplers comply with the material requirements of EC2.

8.2 The Building Regulations (Northern Ireland)

Materials and Workmanship

This technical approval gives assurance that HT.S Standard, HT.P Positional and HT.LT Positional 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 HT.S Standard, HT.P Positional and HT.LT Positional Couplers comply with the material requirements of EC2 by virtue of *Clause 0.8.*

Structure

HT.S Standard, HT.P Positional and HT.LT Positional 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.
- BS 8110: Part 1: 1997 (Revised 2005): Structural Use of Concrete, Code of Practice for Design and Construction.
- 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 For BS 8110 Applications for Static Tension or Static Compression.
- BS EN 1992-1-1:2004 Eurocode 2 Design of concrete structures - General rules for buildings.

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 Hy-Ten 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 5038. Confirmation that this technical approval is current can be obtained from UK CARES.

TECHNICAL APPROVAL 5038

UKAS PRODUCT CERTIFICATION 0002

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Independent Product Assessments for the Construction Industry

7.1.22