

CARES Technical Approval Report TA1-B&C 5036



HRC **400 Series Rebar Couplers**

Assessment of the
HRC410/420
and HRC410/490
Welded Coupler and
Quality System for
Production



5036

Product

HRC410/420
and HRC410/490
Welded Couplers
for reinforcing steel.

Produced by:

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1 Product Summary

HRC410/420 and HRC410/490 welded couplers in the size range 16mm - 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 and B500C.

1.1 Scope of Application

HRC410/420 welded couplers in the size range 16mm - 32mm and 32mm HRC410/490 welded position couplers have been evaluated for use as follows:

- a) TA1-B: Eurocode 2 and BS 8110 for static applications in compression and tension with Grade B500B and B500C reinforcement.
- b) TA1-C: Sellafeld Type A couplers in tension with grade 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."

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 HRC410/420 welded couplers in the size range 16mm - 32mm and 32mm HRC410/490 welded position 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.

B. Bowsher
Executive Director

November 2011



2 Technical Specification

2.1 General

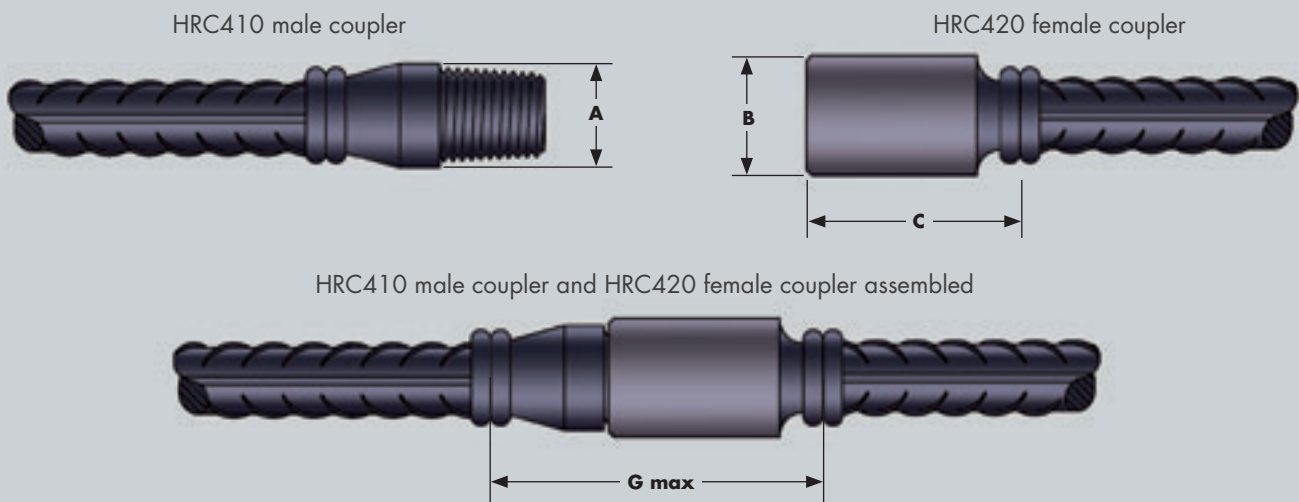
The function of HRC410/420 welded couplers and HRC410/490 welded position couplers is to connect deformed steel reinforcing bars complying with BS 4449 Grade B500B & B500C as appropriate and thereby to create structural continuity of the reinforcing system.

2.2 HRC410/420 welded standard coupler

The HRC400 rebar coupler system consists of separately machined coupler parts with self locking taper threads. The components are welded to the corresponding ends of the reinforcement bars. The complete mechanical splice is designed to have a tensile strength higher than 700 MPa, well above the actual tensile strength of most reinforcing bars. This enables the use of the full ductility of the actual reinforcing steel heat.

The system consists of the HRC410/420 standard couplers.

Standard Coupler



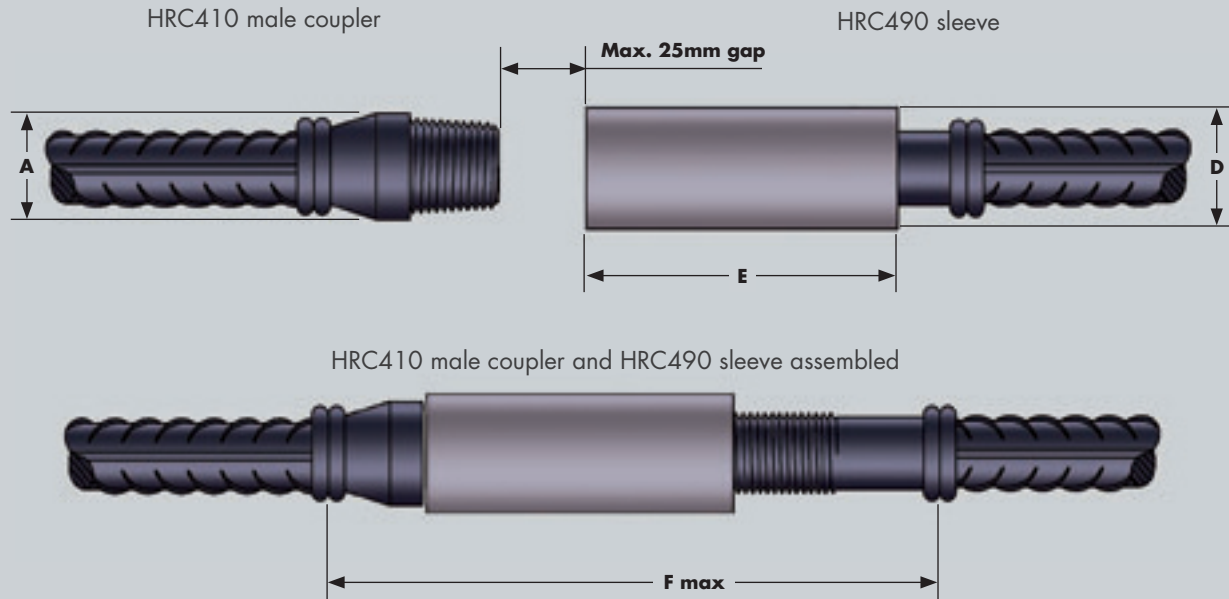
Nominal diameter of reinforcement bar	Sleeve and Thread Dimensions					Torque Nm
	Ø mm	A mm	B mm	C mm	G max mm	
16	28	28	50	76	200	
20	35	35	55	85	200	
25	35	42	76	113	270	
32	45	55	90	135	270	

Table 1

2.3 HRC410/490 welded positional coupler

The system consists of the HRC410 male coupler and HRC490 sleeve which allows the mechanical splice to be established without turning a rebar and to bridge small distances.

Positional Coupler with length adjustment



Nominal diameter of reinforcement bar	Sleeve and Thread Dimensions				
	A mm	D mm	E mm	F max mm	Torque Nm
32	45	55	157	330	270

Table 2

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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-B and TA1-C when used with reinforcing steel BS4449 Grade B500B and grade B500C as appropriate:

CARES APPENDIX TA1-B strength requirements

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

CARES APPENDIX TA1-C strength requirements

- Permanent deformation is less than 0.1 mm after loading to $0.6f_y$ in tension for grade B500C reinforcement.
- Tensile strength $\geq 1.15, \leq 1.35 \times$ 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

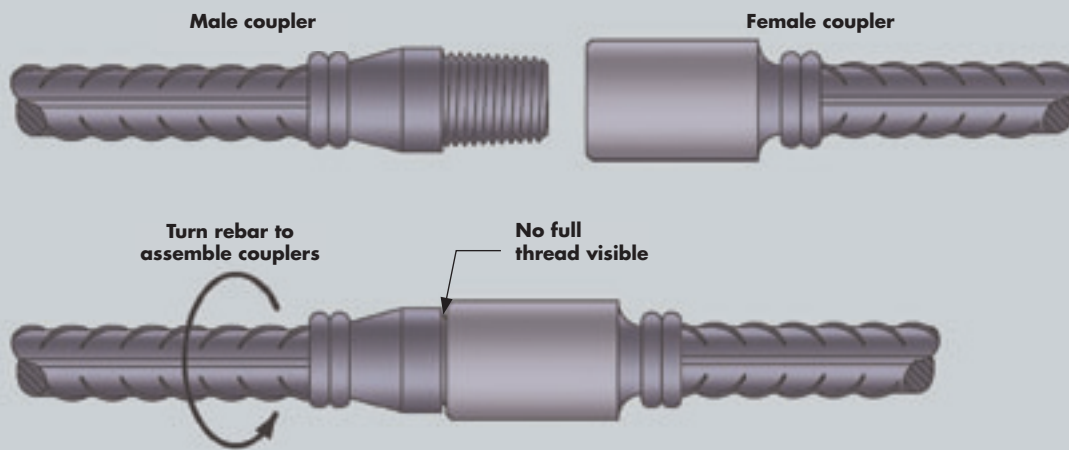
4 Installation

HRC 400 Series reinforcement couplers shall be installed according to construction drawings for the works. The couplers shall be used as supplied by the manufacturer, without any modification or exchange of components.

In the case of customer bent bars the distance between the start of the bend and the friction weld shall be no less than two times the nominal bar diameter.



4.1 HRC410/420 Standard Coupler



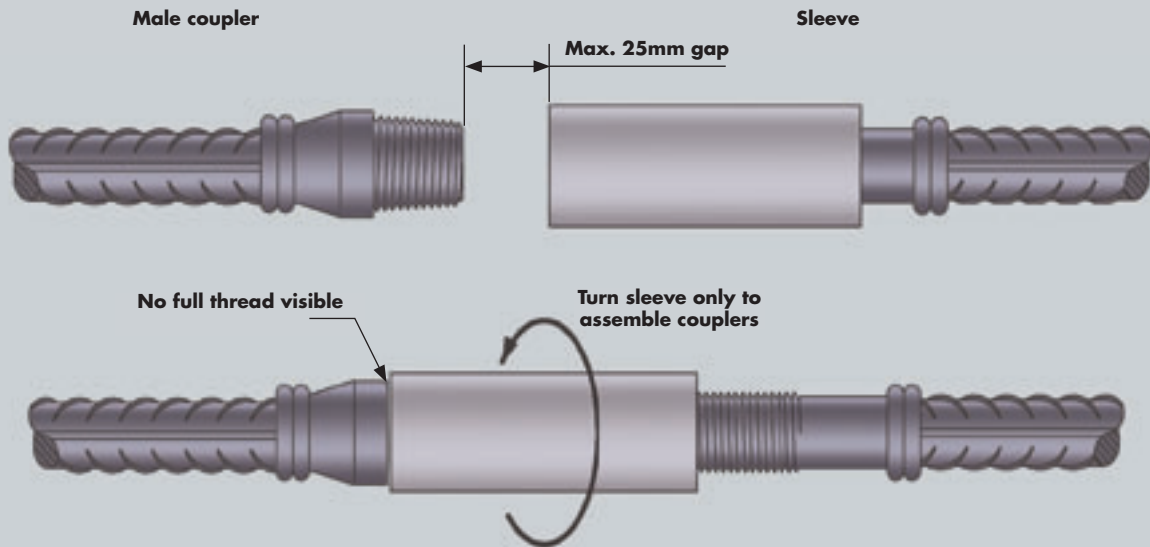
- Remove plastic-plug/cap
- Check for damage / remove dirt etc.
- Screw male and female couplers firmly together by hand
- Visual control: no full thread visible
- Apply torque as indicated in table

Nominal diameter of reinforcement bar (mm)	16	20	25	32
Torque (Nm)	200	200	270	270

Table 3



4.2 HRC 410/490 Positional Coupler



- Make sure sleeve is positioned as far back onto the straight threaded bolt as possible.
- Remove plastic-plug/cap
- Check for damage / remove dirt etc.
- Neither rebar needs to be rotated during installation
- Do not exceed maximum gap length between the sleeve and tapered thread end (see sketch above)
- Turn sleeve onto taper threaded end.
- Make sure all threads are engaged on tapered end
- Visual control: no full thread visible on tapered end
- Apply torque as indicated in table

Nominal diameter of reinforcement bar (mm)	32
Torque (Nm)	270

Table 4

5 Safety Considerations

The HRC 400 coupler system is produced by trained personnel, who have the necessary knowledge about safety procedures and – measurements.

The coupler components are delivered to the building site ready attached to the rebar. Therefore the usual safety precautions for handling reinforcing steel bars are applicable, as wearing gloves and other relevant safety equipment depending on the actual specific operation.

6 Product Testing and Evaluation

HRC410/420 welded couplers and HRC410/490 welded position couplers have been tested to satisfy the requirements of CARES Appendix 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 in tension and compression
- Low cycle fatigue

7 Quality Assurance

HRC410/420 welded couplers and HRC410/490 welded position 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.

The products are also subject to a programme of periodic testing.



8 Building Regulations

Eurocodes

BS 8110 was withdrawn in April 2010 after its coexistence period with Eurocode 2 ended. Although not yet formally endorsed by the Secretary of State it is anticipated that under building regulations Eurocode 2 when used in conjunction with the national annex will be accepted in lieu of BS8110.

8.1 The Building Regulations (England and Wales)

Structure, Approved Document A

HRC 400 Series 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 HRC 400 Series couplers 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 HRC 400 Series 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 HRC 400 Series couplers comply with the material requirements of BS8110 by virtue of *Clause B2.1*.

Part C, Structure

HRC 400 Series couplers, when used in BS8110 based designs using the data contained within this technical approval, satisfy the requirements of *The Building Standards (Scotland) Regulations 1990, 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.
- 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 - General rules for buildings.
- BS EN ISO 9001: 2008: Quality management systems - Requirements.
- 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.
- TA1-C Quality and Operations Schedule for the Technical Approval of Tension Couplers for Reinforcing Steel for Sellafield Ltd Standard Applications.
- Sellafield Ltd Technical Standard: A.0391_1: Mechanical Splices to Reinforcement for Concrete.



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 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 Metalock Industrier AS – HRC Europe 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 5036. Confirmation that this technical approval is current can be obtained from UK CARES.



Connection of prefabricated reinforcement units with HRC 400 couplers



HRC 420 used in construction joint

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