

# CARES Technical Approval Report TA1-B&C 5044

Issue 1



**HALFEN**

YOUR BEST CONNECTIONS

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**HBS-05 Screw Connections**

Assessment of the  
HALFEN HBS-05  
Standard Couplers  
Product and Quality  
System for Production



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# Product

HALFEN HBS-05  
Standard Couplers  
for reinforcing steel.

## Produced by:

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## 1 Product Summary

HALFEN HBS-05 Standard 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 B500C.

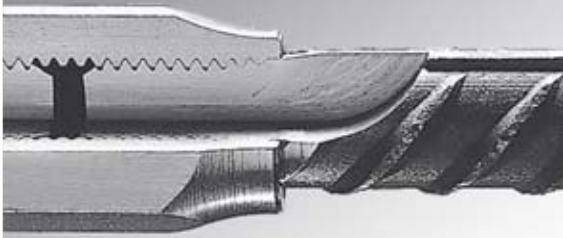
### 1.1 Scope of Application

HALFEN HBS-05 Standard Couplers in the size range 12mm - 32mm have been evaluated for use as follows:

- a) TA1-B: Eurocode 2 and BS 8110 for static applications in tension only with Grade B500C reinforcement.
- b) TA1-C: Sellafeld Type B couplers in tension only 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 HALFEN HBS-05 Standard Couplers in the size range 12mm - 32mm 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.

A handwritten signature in blue ink, appearing to read 'B. Bowsher', written over a light blue background.

B. Bowsher  
Chief Executive Officer

July 2012



## 2 Technical Specification

### 2.1 General

The function of HALFEN HBS-05 Standard Couplers is to connect deformed steel reinforcing bars complying with BS 4449 Grade B500C as appropriate and thereby create structural continuity of the reinforcing system.

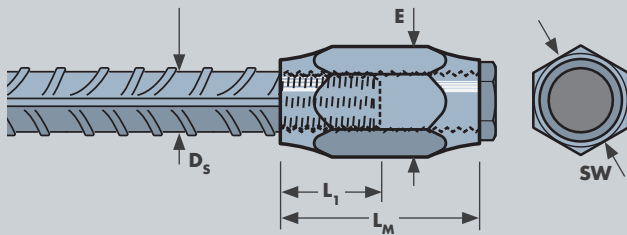
The couplers are machined from solid hexagonal bars into which an internal parallel thread is cutted. Special parallel conically extending threads are cold rolled onto the ends of the bars being coupled.

The threaded bars must be screwed into the coupler until the thread is no longer visible. The design of the mechanical splice results in a self locking mechanism when assembled correctly. There is no specific torque requirement.

### 2.2 HALFEN HBS-05 Standard Couplers

The HBS-05 Standard Coupler is used to join bars where one of the bars to be spliced can be rotated. It comprises a pre-assembled female socket bar (Table 1) and a male connector bar (Table 2).

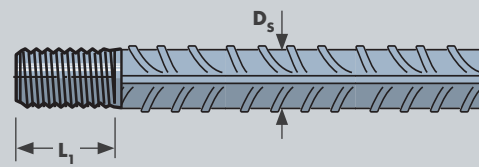
**Female socket bar**



Rebar $D_s$	Thread	$L_1$	$L_M$	SW	E
S-12	M12	16.5	36	19	21.9
S-16	M16	22.5	48	24	27.7
S-20	M20	28.5	60	30	34.6
S-25	M25 x 2.5 Special thread	36.0	75	36	41.6
S-32	M32 x 3.0 Special thread	45.5	96	50	57.5

**Table 1**

**Male connector bar**



Rebar $D_s$	Thread	$L_1$	Color Code
A-12	M12	16.5	green
A-16	M16	22.5	orange
A-20	M20	28.5	light blue
A-25	M25 x 2.5 Special thread	36.0	brown
A-32	M32 x 3.0 Special thread	45.5	blue

**Table 2**

### 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 B500C as appropriate:

#### CARES APPENDIX TA1-B strength requirements

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

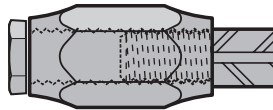
#### CARES APPENDIX TA1-C strength requirements Type B

- Permanent deformation is less than 0.1mm after loading to  $0.65f_y$  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  $-7^\circ\text{C}$  for 24 hours

## 4 Installation

HALFEN HBS-05 Standard Couplers shall be installed according to the HALFEN HBS-05 Assembly Instruction.

### 1 Installation of the female socket bars



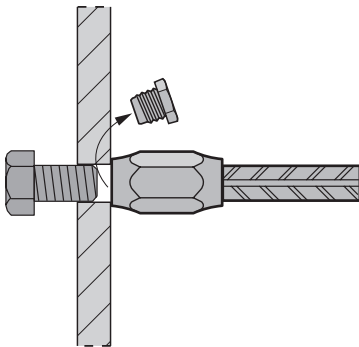
Check protection cap.

Female socket bars and male connector bars are supplied with color-coded thread protection caps.

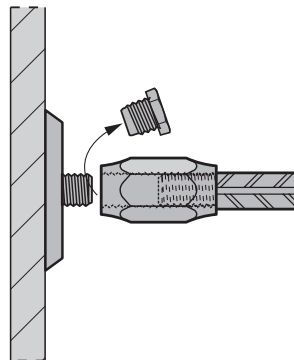
### 2 Fixing to formwork

#### Steel formwork

Fixing with hex. head bolt with standard ISO thread M12 to M20



Fixing with adhesive plate (plastic)

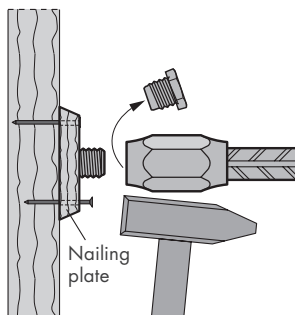


#### Timber formwork

Fixing with nailing plates

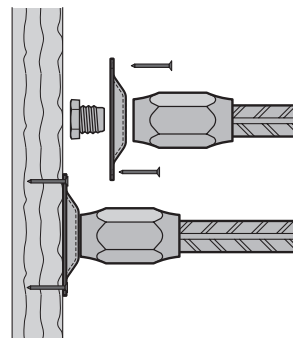
Ø D<sub>S</sub> 12 - 20mm:

→ plastic



Ø D<sub>S</sub> 25 - 32mm:

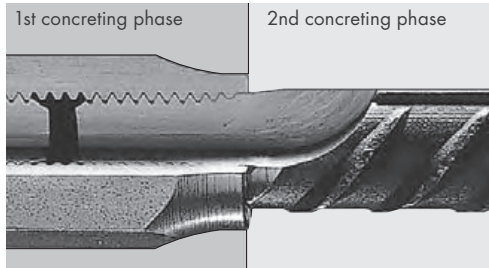
→ steel





## 4 Installation

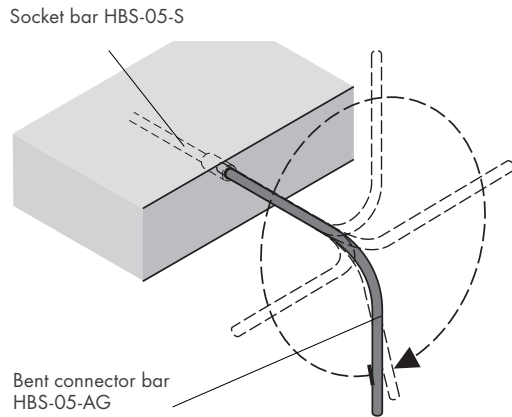
### 3 Installation of the male connector bars



After removing protection caps the male connector bar is screwed into the coupler by hand. For final tightening the connector bar must be turned by using a wrench until the thread is no longer visible.

⚠ A torque wrench is not required.

### 4 Bent connector bars



The same installation procedure also applies for bent connector bars. The splice is fully assembled when the thread of the connector bars is no longer visible. The connector bar can be rotated at least once more for adjustment.

## 5 Safety Considerations

HALFEN HBS-05 Standard Couplers are produced by trained personnel after being instructed in writing by the manufacturer. The assembly instruction is part of the delivery documents.

Female socket bars and male connector bars can be supplied in lengths up to 14 m and will be delivered in bundles or on pallets weighing up to 1 tonne, which should be lifted using appropriate equipment. It is advisable to wear suitable protective gloves when installing the couplers.

## 6 Product Testing and Evaluation

HALFEN HBS-05 Standard Couplers have been tested to satisfy the requirements of CARES Appendix TA1-B, and TA1-C for Couplers with reinforcing bars to BS4449 Grade B500C. The testing comprised the following elements:

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

## 7 Quality Assurance

HALFEN HBS-05 Standard 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.

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



## 8 Building Regulations

### Eurocodes

BS8110 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

HALFEN HBS-05 Standard 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 HALFEN HBS-05 Standard 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 HALFEN HBS-05 Standard 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 HALFEN HBS-05 Standard Couplers comply with the material requirements of BS8110 by virtue of *Clause B2.1.*

#### Part C, Structure

HALFEN HBS-05 Standard 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 HALFEN 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 5044. Confirmation that this technical approval is current can be obtained from UK CARES.





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