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European Technical Assessment

ETA-22/0573
of 22/12/2022

General Part:

Technical Assessment Body issuing the European Technical Assessment:	**SINTEF**
Trade name of the construction product:	HRC400 Series Rebar Couplers
Product family to which the construction product belongs:	Couplers for mechanical splices of reinforcing steel bars
Manufacturer:	HRC Europe Lierstranda 107 NO-3412 Lierstranda Norway
Manufacturing plants:	HRC Europe AS Lierstranda 107 N-3412 Lierstranda Norway HRC Europe NL B.V. Mortelastraat 7 NL-8211 AD Lelystad The Netherlands
This European Technical Assessment contains:	8 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	EAD 160129-00-0301, Edition 01/2020

Specific parts:

Contents

1. TECHNICAL DESCRIPTION OF THE PRODUCT

The HRC400 Rebar Couplers are used as a mechanical splice for connecting reinforcing bars in reinforced concrete structures under static or quasi-static, fatigue and low cycle loading.

The product description is given in Annex A.

The characteristic material values, dimensions and tolerances of HRC400 Rebar Couplers not indicated in Annex A shall correspond to the respective values laid down in the technical documentation[1] of this European Technical Assessment.

[1] The technical documentation of this European technical assessment is deposited at SINTEF and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

2. SPECIFICATION OF THE INTENDED USE(S) IN ACCORDANCE WITH THE APPLICABLE EUROPEAN ASSESSMENT DOCUMENT (EAD)

The performances given in Section 3 are only valid if the HRC400 Rebar Couplers are used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the HRC400 Rebar Couplers of at least 100 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3. PERFORMANCE OF THE PRODUCT AND REFERENCES TO THE METHODS USED FOR ITS ASSESSMENT

3.1 Mechanical resistance and stability (BWR 1)

No	Essential characteristic	Performance
1	Resistance to static or quasi-static loading	See Annex C
2	Slip under static or quasi-static load	See Annex C
3	Slip after static or quasi-static load	See Annex C
4	Fatigue strength for $N = 2 \cdot 10^6$ load cycles	No performance assessed
5	Fatigue strength for S-N curve with k_1 and k_2 according to *EN 1992-1-1*	No performance assessed
6	Fatigue strength for S-N curve with specific k_1 and k_2	See Annex C
7	Resistance to low cycle loading (seismic actions)	See Annex C

3.2 Safety in case of fire (BWR 2)

No	Essential characteristic	Performance
8	Reaction to fire	Class A1

4. ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE (AVCP) SYSTEM APPLIED, WITH REFERENCE TO ITS LEGAL BASE

In accordance with European Assessment Document EAD 160129-00-0301, the applicable European legal act is: 2000/206/EC.

The system to be applied is: 1+

5. TECHNICAL DETAILS NECESSARY FOR THE IMPLEMENTATION OF THE AVCP SYSTEM, AS PROVIDED FOR IN THE APPLICABLE EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at SINTEF.

Issued in Oslo on 22-12-2022

By

SINTEF

Anne-Jorunn Enstad
Certification manager

The following standards are referred to in this ETA:

– *EN 1992-1-1:2004+AC:2010+A1:2014*
Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings

– *EN 1998-1:2004+AC:2009+A1:2013*
Eurocode 8: Design of structures for earthquake resistance – Part 1: General rules, seismic actions and rules for buildings

– *NS-EN 10080:2005* Steel for the reinforcement of concrete. Weldable reinforcing steel. General

– *EN 10025-2:2004 + EN 10025-2:2019*
Hot rolled products for structural steels – Part 2: Technical delivery conditions for non-alloy structural steels

– *EN 10025-3:2019* Hot rolled products for structural steels – Part 3: Technical delivery conditions for normalized rolled weldable fine grain structural steels

ANNEX A – PRODUCT DESCRIPTION

A.1 Design variants

***Table A1**: HRC400 Series Rebar Couplers - Design variants*

Nominal rebar diameter	Standard Couplers, HRC410/420 (see Fig. A1)				Positional Couplers, HRC410/490 (see Fig. A2)				
Ø	A	B	C	G_{max}	A	D	E	F_{max}	Torque [1)]
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[Nm]
12	22	22	45	72	-	-	-	-	-
16	28	28	50	76	-	-	-	-	-
20	35	35	55	85	-	-	-	-	-
25	35	42	76	115	35	45	140	280	200
32	45	45	90	130	45	55	157	330	270
40	55	70	105	155	55	70	200	440	330

[1)] Torque applies only to positional coupler HRC410/490

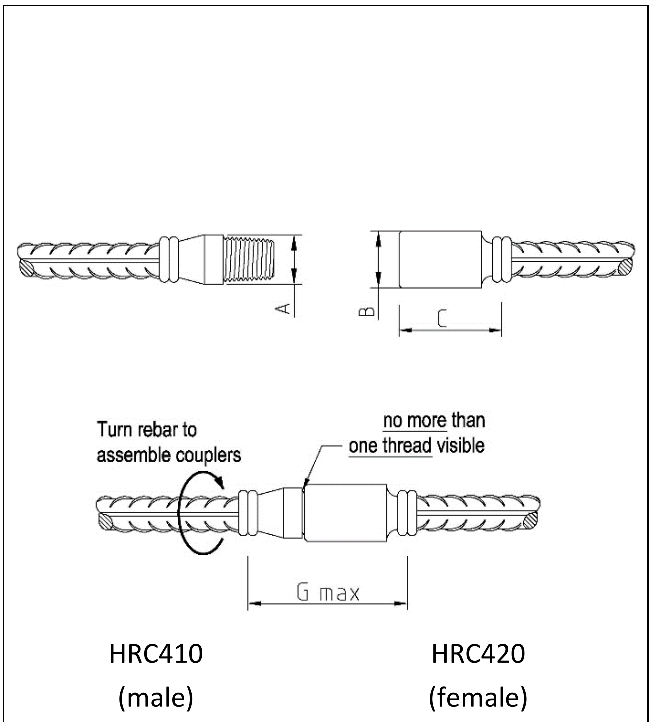

***Figure A1**: Standard Coupler, HRC410/420*

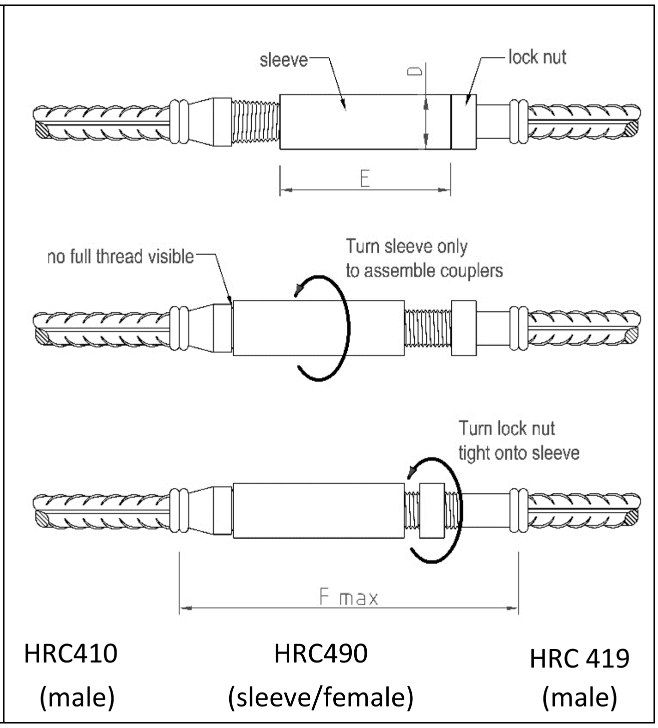

***Figure A2**: Positional Coupler, HRC410/490*

A.2 Material

Table A2*: Material*

Component	Material
Rebar steel	According to *EN 1992-1-1*, *Annex C*. - Reinforcing bars of class B500B or B500C (f_{yk} = 500 MPa)
Coupler parts	According to *EN 10025-2* and *EN 10025-3*. - Material no.: 1.0538; 1.0590; 1.8901; 1.8903 - Material: S460J0; S450J0; S460N; S460NL

ANNEX B – INTENDED USE

B.1 Application conditions

HRC400 Series Rebar Couplers are intended for us as mechanical splices of rebar of class B and C according to *EN 1992-1-1* and *Annex C.*

HRC400 Rebar Couplers can be used in design according to the same design assumptions as traditional reinforcing steel (B500B or B500C) without rebar couplers.

- Transfer of static or quasi-static tensile and compression loads according to *EN 1992-1-1*, *clause 8.7* and *8.8(4)*
- Slip limitation for control of crack width according to *EN 1992-1-1*, *clause 7.3*
- Resistance to high-cycle fatigue loading according to *EN 1992-1-1*, *clause 6.8.4*
- Resistance to low-cycle seismic loading according to *EN 1998-1*, *clause 5.6.3(2)*

B.2 Installation criteria

- The same concrete cover as for unspliced reinforcement steel bars applies also to the couplers.
- Rebar bends shall start in a distance of at least 2 x nominal rebar diameter away from the connection of the coupler part to the rebar (weld collar).
- HRC400 couplers shall be applied as delivered, without any modification or replacement of parts.
- HRC400 coupler parts are to be stored with thread protection. Couplers fixed in the reinforcing work shall have the thread protection in place until the splice is assembled.
- Installation steps have to be followed.

Standard Coupler, HRC 410/420, see Fig. A1

1. Remove plastic-plug/cap
2. Check for damage/remove dirt etc.
3. Screw couplers firmly together by hand (possible to tighten, e.g. by pipe wrench)
4. Visual control: → no full thread visible

Positional Coupler, HRC 410/490, see Fig. A2

1. Make sure sleeve is positioned as far back onto the straight threaded bolt as possible.
2. Remove plastic-plug/cap
3. Check for damage/remove dirt etc.
4. Position sleeve at male coupler end
5. Turn sleeve onto taper threaded end by hand
6. Make sure all threads are engaged on tapered end
7. Visual control: → no full thread visible on tapered end
8. Apply torque, see table B1
9. Turn lock nut firm onto sleeve, apply torque, see table B1

Table B1*: Positional Coupler – recommended torque during installation*

Nominal rebar diameter, Ø	[mm]	25	32	40
Recommended torque	[Nm]	200	270	330

ANNEX C – ESSENTIAL CHARACTERISTICS

***Table C1**: HRC400 Series Rebar Couplers (B500B and B500C) – essential characteristics*

Copupler type	Nominal Rebar diameter	**Resistance to static or quasi static loading**		**Slip**		**Fatigue strength** 5)			**Resistance to low cycle loading (seismic action)**			
		Failure of rebar	Failure of coupler	under loading	after loading	(S-N-curve with specific defined k_1 and k_2)				Ultimate tensile load, $F_{u,min}$ 7)		Failure mode 8)
	Ø	$f_{u,min,bar,outside}$ 1)	$f_{u,min,coupler}$ 2)	S_1 3)	S_2 4)	$\Delta\sigma_{Rsk}$	k_1	k_2	u_{20} 6)	B500B	B500C	
	[mm]	[MPa]	[MPa]	[mm]	[mm]	[MPa]			[mm]	[kN]	[kN]	
Standard Coupler HRC 410/420	12	B500B: 540 B500C: 575	> 850	< 0,10	< 0,10	49 (N = 10^7) 69 (N = $2 \cdot 10^6$)	4,6	8,3	0,2	61,1	65,0	Ductile rupture of the rebar outside splice
	16		> 850							108,6	115,6	
	20		> 850							169,6	180,6	
	25		> 850							265,1	282,3	
	32		> 740							434,3	462,4	
	40		> 850							678,6	722,6	
Positional Coupler HRC 410/490	25	B500B: 540 B500C: 575	> 670	< 0,10	< 0,10	49 (N = 10^7) 69 (N = $2 \cdot 10^6$)	4,6	8,3	0,2	265,1	282,3	
	32									434,3	462,4	
	40									678,6	722,6	

1) $f_{u,min,bar,outside}$ according to *EN 1992-1-1*, *Annex C.1*:
For B500B: $f_{u,min,bar,outside} = k_{B500B} \cdot f_{yk} = 1{,}08 \cdot 500$ MPa = 540 MPa
For B500C: $f_{u,min,bar,outside} = k_{B500C} \cdot f_{yk} = 1{,}15 \cdot 500$ MPa = 575 MPa
Failure loads are determined by the strength of the parent rebar, not the HRC400 mechanical coupler.
The full specified elongation A_{gt} of the rebar can be developed, according to *EN 1992-1-1*, *Annex C.1*.

2) $f_{u,min,coupler}$ = minimum rebar stress equivalent to failure of the coupler. Values from test results with larger rebar than the coupler are intended for ("oversized rebar"). The full actual elongation $A_{gt,act}$ of the intended rebar size will be developed.

3) Slip across the mechanical splice under loading at $0{,}6 \cdot f_{yk} = 0{,}6 \cdot 500$ MPa = 300 MPa

4) Slip across the mechanical splice after unloading from $0{,}6 \cdot f_{yk}$ to a load level of $0{,}02 \cdot f_{yk} = 0{,}02 \cdot 500$ MPa = 10 MPa

5) Fatigue strength $\Delta\sigma_{Rsk}$ for S-N-curve with specific defined stress exponents k_1 and k_2

6) u_{20} = Residual max deformation

7) $F_{u,min} = A_{s,nom,bar,outside} \cdot f_{u,min,bar,outside} = \pi/4 \cdot Ø^2 \cdot f_{u,min,bar,outside}$

8) The actual failure loads are determined by the strength of the parent rebar, not the HRC400 couplers. Splices of rebar with lower/higher actual tensile strength will therefore achieve lower/higher actual capacities than given in the table. The failure mode remains unchanged: ductile rupture of the parent rebar.