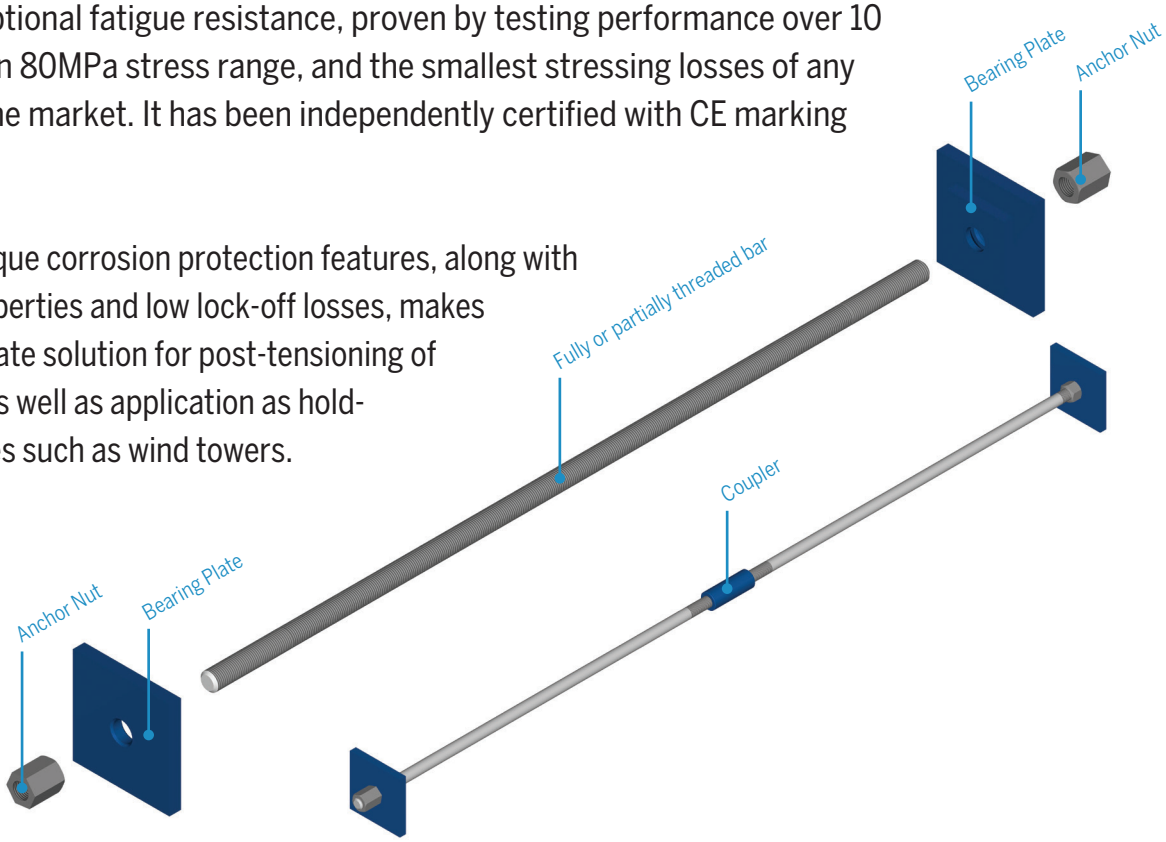
BBR C Bar System

Cold Rolled Threaded Bars for Construction, Retrofit & Hold Down Applications

The BBR C Bar is a superior cold rolled, high alloy steel bar with ISO-specified fine metric thread and increased resistance to corrosion. Its unique thread geometry facilitates a reduction of stressing losses, in particular for short length bars, making them ideal for post-tensioning applications.

BBR C Bar offers exceptional fatigue resistance, proven by testing performance over 10 million load cycles at an 80MPa stress range, and the smallest stressing losses of any product currently on the market. It has been independently certified with CE marking according to EN 1090.

The robustness and unique corrosion protection features, along with excellent relaxation properties and low lock-off losses, makes the BBR C Bar the ultimate solution for post-tensioning of bridges and buildings, as well as application as hold-down bolts for structures such as wind towers.



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Testing & quality assurance to international standards

At BBR, we take pride in every piece of construction technology that we supply and this is why we conduct thorough independently verified laboratory testing. We require that each product conforms to the highest applicable standards and reaches our customers in prime condition, ready for immediate use.

Independently verified testing

As a part of our testing program for technical approval, we have performed key tests to verify the major mechanical properties of the BBR C Bar System.

We have carried out demanding mechanical and material tests on the system comprising bar and anchoring accessory components. All the tests were executed in independent accredited laboratories. The testing results proved that BBR C Bars not only comply with the relevant European norms, standards and guidelines, but also fulfill additional requirements specified by international authorities

Static test on tensile bar element

A bar specimen is stressed by standard stressing equipment to the maximum force (corresponding to ultimate tensile strength) at a specified loading rate. Elongation at the maximal force (A_{gt}) of the bar is measured during the tests.

The maximum force and force at yield must meet the specified values as 5% fractiles. A_{gt} is expected to be at least 3.5%.

Static test on bar system

To verify the resistance of the BBR C Bar System against static load, a complete bar system kit — consisting of a BBR C Bar, bearing plates and anchor nuts — is assembled according to the envisaged final application.

The assembled system is stressed in equal stages up to 80% of the ultimate characteristic force using standard stressing equipment. Subsequently the load on the bar system kit is maintained for one hour (bonded application) or two hours (unbonded application) and immediately after, gradually stressed until complete failure. The measured maximum load should not be less than 95% of the actual ultimate strength and the failure of the bar system kit should not be induced by the failure of the anchorage nut or couplers. A_{gt} of the system is expected to be at least 2.0%.

During the test, the elongation of the system during loading is continuously measured as well as any relative movement between the anchor nut and the bearing plate.

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Fatigue test on bar system with subsequent static tensile test

To verify the resistance of the BBR C Bar System against fatigue, a complete bar system kit — consisting of a BBR C Bar, bearing plates and anchor nuts — is assembled according to the envisaged final application and stressed up to 65% of the nominated ultimate characteristic force.

Subsequently the bar system kit is subjected to a fatigue test with two million load cycles at an upper load of 65% of the nominated ultimate characteristic force and an axial stress of 80MPa. At the end of the fatigue test there should not be any failure due to fatigue at the free length nor at the anchor nuts.

After the fatigue test, the specimen is loaded up to failure. The load at failure must be at least 92% of the nominated ultimate characteristic force.

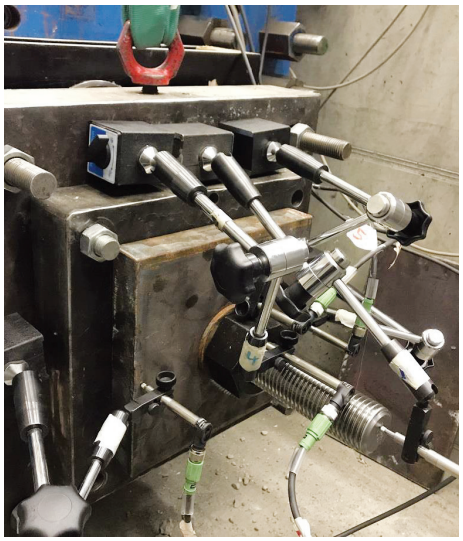
During the test, the elongation of the system during initial loading is measured as well as any correlation with the number of cycles of the relative movement between the anchor nut and the bearing plate.

Extended fatigue test on bar system

As an additional test, in excess of specified requirements, the BBR C Bar System was subjected to a fatigue test at an upper load of 65% of the nominated ultimate characteristic force and an axial stress of 80MPa up to 10 million cycles, after which the system was loaded to failure. The BBR C Bar System not only successfully withstood the fatigue impact of 10 million cycles, but also retained its functionality — the system nut was working and it was possible to unthread it from the bar. Failure load exceeded 92% of AUTS, thus complying with the other European requirements too.

Additional testing on request

BBR has a long experience of working with international standards and laboratory test regimes, thus our engineers are able to perform any project-specific tests that may be required. For example, static and fatigue testing conforming with EN ISO 15630–1 and also with EAD 160004–00–0301 (previously ETAG013) are available. Please contact us for further details.



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Load bearing capacity of C bar system

The load bearing capacity (tension) of the BBR C Bars is calculated according to EN1993-1-1, 6.2 based on the strength and cross-section of the bar, with reference to relevant international standards.

Property	Size	Component dimensions						
		M36	M39	M42	M48	M56	M64	M68
BBR C Bar grade 8.8								
Nominal diameter	mm	36	39	42	48	56	64	68
Ultimate strength (f_k)	MPa	830	830	830	830	830	830	830
Proof load (F_p)	kN	490	585	672	882	1,218	1,605	1,833
Yield force (F_y)	kN	539	644	739	970	1,339	1,766	2,016
Ultimate force (F_k)	kN	678	810	929	1,220	1,684	2,221	2,535
Weight	kg/m	6.4	7.7	8.8	11.5	15.9	21.0	24.0
BBR C Bar grade 9.8								
Nominal diameter	mm	36	39	42	48	56	64	68
Ultimate strength (f_k)	MPa	900	900	900	900	900	900	900
Proof load (F_p)	kN	531	634	728	955	1,319	1,739	1,985
Yield force (F_y)	kN	588	702	806	1,058	1,461	1,926	2,199
Ultimate force (F_k)	kN	735	878	1,008	1,323	1,827	2,408	2,749
Weight	kg/m	6.4	7.7	8.8	11.5	15.9	21.0	24.0
BBR C Bar grade 10.9								
Nominal diameter	mm	36	39	42	48	56	64	68
Ultimate strength (f_k)	MPa	1,040	1,040	1,040	1,040	1,040	1,040	1,040
Proof load (F_p)	kN	678	810	929	1,220	1,684	2,221	2,535
Yield force (F_y)	kN	767	917	1,052	1,381	1,908	2,515	2,871
Ultimate force (F_k)	kN	849	1,015	1,164	1,528	2,111	2,783	3,177
Weight	kg/m	6.4	7.7	8.8	11.5	15.9	21.0	24.0
BBR C Bar grade 12.9								
Nominal diameter	mm	36	39	42	48	56	64	68
Ultimate strength (f_k)	MPa	1,220	1,220	1,220	1,220	1,220	1,220	1,220
Proof load (F_p)	kN	792	946	1,086	1,425	1,969	2,595	2,963
Yield force (F_y)	kN	898	1,073	1,232	1,617	2,233	2,943	3,360
Ultimate force (F_k)	kN	996	1,190	1,366	1,793	2,476	3,264	3,727
Weight	kg/m	6.4	7.7	8.8	11.5	15.9	21.0	24.0

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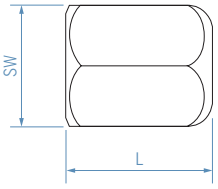
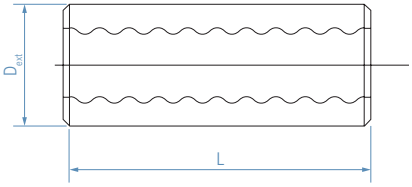
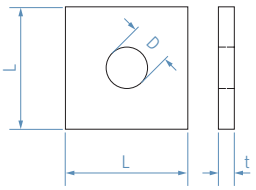
Property	Size	Component dimensions						
		M36	M39	M42	M48	M56	M64	M68
Nut and Coupler class 8								
Nominal diameter	mm	36	39	42	48	56	64	68
Ultimate strength (f_k)	MPa	830	830	830	830	830	830	830
Nut and Coupler class 9								
Nominal diameter	mm	36	39	42	48	56	64	68
Vickers hardness (HV)	-	188-302	188-302	188-302	188-302	188-302	188-302	188-302
Nut and Coupler class 10								
Nominal diameter	mm	36	39	42	48	56	64	68
Vickers hardness (HV)	-	272-353	272-353	272-353	272-353	272-353	272-353	272-353
Nut and Coupler class 12								
Nominal diameter	mm	36	39	42	48	56	64	68
Vickers hardness (HV)	-	272-353	272-353	272-353	272-353	272-353	272-353	272-353
Standard Hex Nut								
Nominal diameter	mm	36	39	42	48	56	64	68
Pitch	mm	4.0	4.0	4.5	5.0	5.5	6.0	6.0
L	mm	29	31	34	38	45	51	54
SW	mm	55	60	65	75	85	95	100
Weight	kg	0.39	0.5	0.65	0.98	1.42	1.98	2.3
Heavy Duty Hex Nut								
Nominal diameter	mm	36	39	42	48	56	64	68
Pitch	mm	4.0	-	4.5	5.0	5.5	6.0	-
L	mm	36.6	-	42	48	56	64	-
SW	mm	60	-	70	80	90	100	-
Weight	kg	0.63	-	1.06	1.64	2.38	2.74	-
Coupler								
Nominal diameter	mm	36	39	42	48	56	64	68
Pitch	mm	4.0	4.0	4.5	5.0	5.5	6.0	6.0
L	mm	75	80	85	95	115	130	140
D_{ext}	mm	55	60	65	75	85	95	100
Weight	kg	0.80	1.03	1.29	1.95	2.90	3.95	4.64



Hex anchor nut



Coupler



Bearing plate

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Production technology & quality assurance

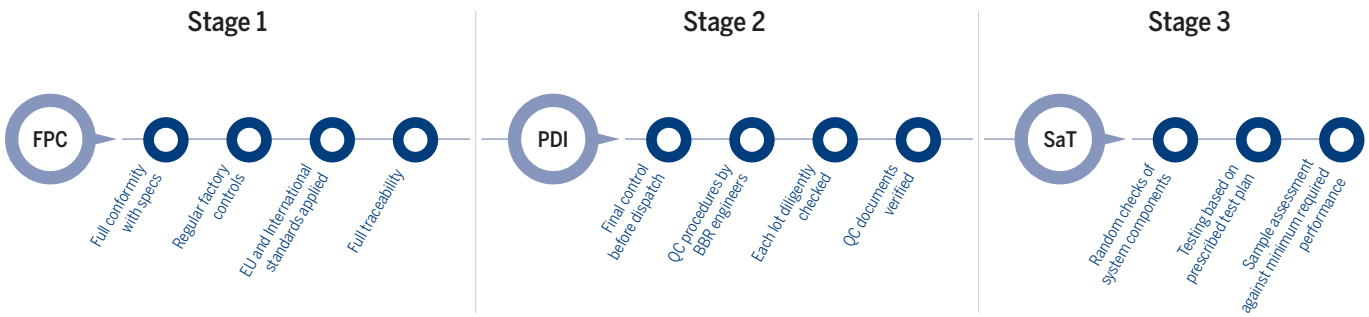
One of BBR's long-held principles is not to compromise on the quality of the delivered product. Unlike other systems on the market where solutions might be adjusted to the local demand, BBR offers only full-strength BBR solutions. This is what the BBR brand stands for and what has proven to be a sustainable approach over the past 75 years.

Uniquely in the industry, BBR has introduced Extended Triple Stage Quality Assurance procedures to ensure that only the highest quality deliveries are made to customers.

Stage 1: Factory Production Control (FPC) and continuous surveillance
BBR has implemented and continuously maintains a factory production control system ensuring that the final components are in full conformity with BBR system specifications and the applicable European and international standards. Within the framework of this factory production control, BBR, in coordination with the factory, carries out tests and controls in accordance with the prescribed test plan and commonly accepted European procedures.

Stage 2: Pre-Delivery Inspection (PDI)
The second stage of the BBR Quality Assurance process, taking inspiration from the automotive industry, is the performing of a Pre-Delivery Inspection. The PDI is carried out by BBR quality engineers just after the completion of any new production lot. PDI consists of a quality check list that includes visual inspection, geometrical control, material verification and quality documentation.

Stage 3: Sample testing (SaT)
Out of each batch, samples of the system components are randomly selected and tested in accordance with the prescribed test plan. Results of these sample tests are then assessed against the minimum performance of the system in relation to the associated required characteristics.



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Certification to international standards & unique strength

Alongside BBR's own rigorous quality assurance process, the BBR C Bar system also benefits from an international quality passport – and carries the CE mark as a sign of its conformity to latest globally recognized standards. Furthermore, the BBR C Bar system is unique in offering the lowest lock off losses of any similar product on the market.

MPA NRW.

Materialprüfungsamt Nordrhein-Westfalen

Prüfen · Überwachen · Zertifizieren

Certificate of conformity of the factory production control
0432-CPR-00637-01 (EN)

Version 01

In compliance with Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 (the Construction products Regulation or CPR), this certificate applies to the construction product

BBR C Bar System

placed on the market under the name or trade mark of

BBR VT International Ltd.

Ringstr. 2

CH-8603 Schwerzenbach / Switzerland

and produced in the manufacturing plant(s)

Code:
Component Manufacturer P31

This certificate attests that all provisions concerning the assessment and verification of constancy of performance described in Annex ZA of the standard(s)

EN 1090-1:2009+A1:2011

under **system 2+** are applied and that

the factory production control is assessed to be in conformity with the applicable requirements

This certificate was first issued on 07.10.2020 and will remain valid until 06.10.2023 as long as neither the harmonised standard, the construction product, the AVCP methods nor the manufacturing conditions in the plant are modified significantly, unless suspended or withdrawn by the notified product certification body.

Dortmund, 07.10.2020

by order

Dipl.-Ing. Hönig

Head of Certification Body (Dept. 21)

This Certificate consists of 1 page.

The original of this document was issued in German language. In case of doubt only the German version is valid.

DAkkS

Deutsche Akkreditierungsstelle D-ZE-12140-01-01

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The complete BBR C Bar System from Grades 8.8 to 12.9 with the thread range from M36 up to M68 – including bars, nuts, lock nuts, couplers and bearing plates – conforms to EN 1090- 1;2009+A1:2011 and has been tested to the requirements of EAD016, while also complying with other latest international standards. This has been independently verified and the relevant certification has been issued, thus all BBR C Bar System components bear the CE marking.

Meanwhile, testing has proven that the BBR C Bar System has the lowest lock-off losses of applied stress of any comparable product currently on the market. This great productivity enhancing performance is a result of the superior material composition and threading solution applied to the BBR C Bar itself.

When a fast construction program and high quality, high strength construction engineering solution is needed, then the BBR C Bar System is an obvious choice.

Stressing process

The usual procedure involves stressing the bar, transferring the load to the anchor nut by tightening it and then releasing the hydraulic stressing jack. Normally, part of the applied prestressing force is lost after force transfer because of the slip of the bar due to tolerance at the thread, elastic deformation of compressed components etc. Thus, a further stressing operation and retightening of the nut is usually needed to achieve the desired prestressing force. However, when using the fine-threaded BBR C Bar System with its bar slippage of only 0.1mm, this second round of stressing is not required.

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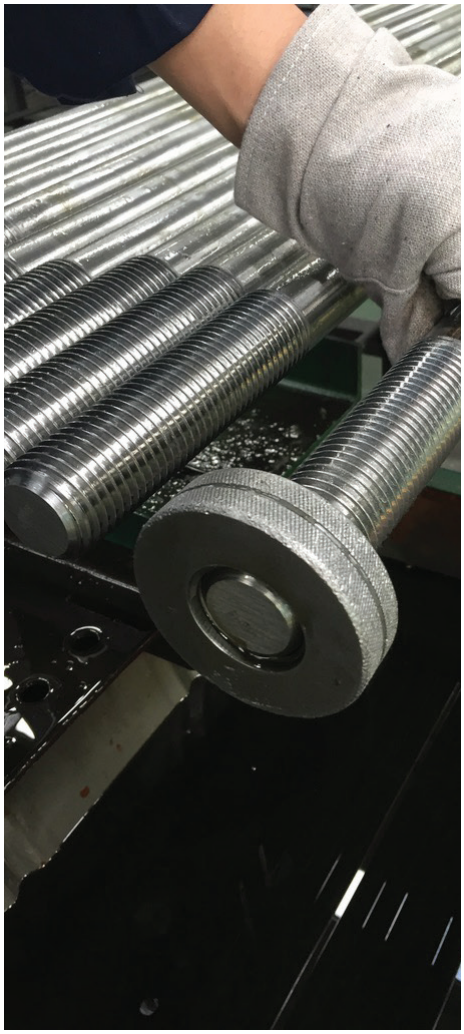
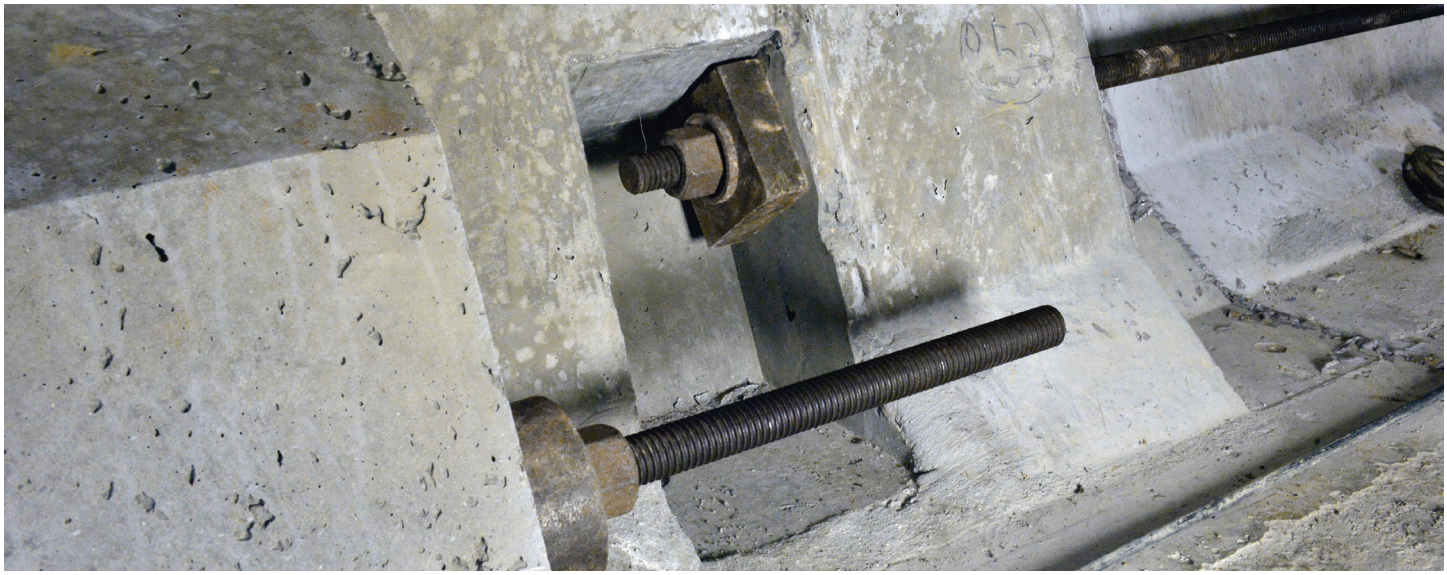
Features

- High tensile alloy steel with increased resistance to corrosion.
- Cold rolled & heat treatment process for fine structure crystallization & high load bearing capacity.
- Can be supplied with multi-layer corrosion protection according to European requirements.
- Tested & proven high fatigue performance to over 10 million load cycles at 80MPa stress range.
- Unique thread geometry reduces stressing losses - even short tendons meet required stress.
- CE Marking according to EN 1090
- Customized thread rolling & section lengths according to project requirements.
- BBR Triple Stage Quality control implemented by BBR engineers.
- Unrivalled speed of global sourcing through world class supply chain logistics.



Applications

- Post-tensioning for construction, retrofit & new build
- Post-tensioning for bridges and buildings
- High fatigue-resistant hold down bolts for wind towers & other applications with cyclic loading



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Rev 2 - 05/22