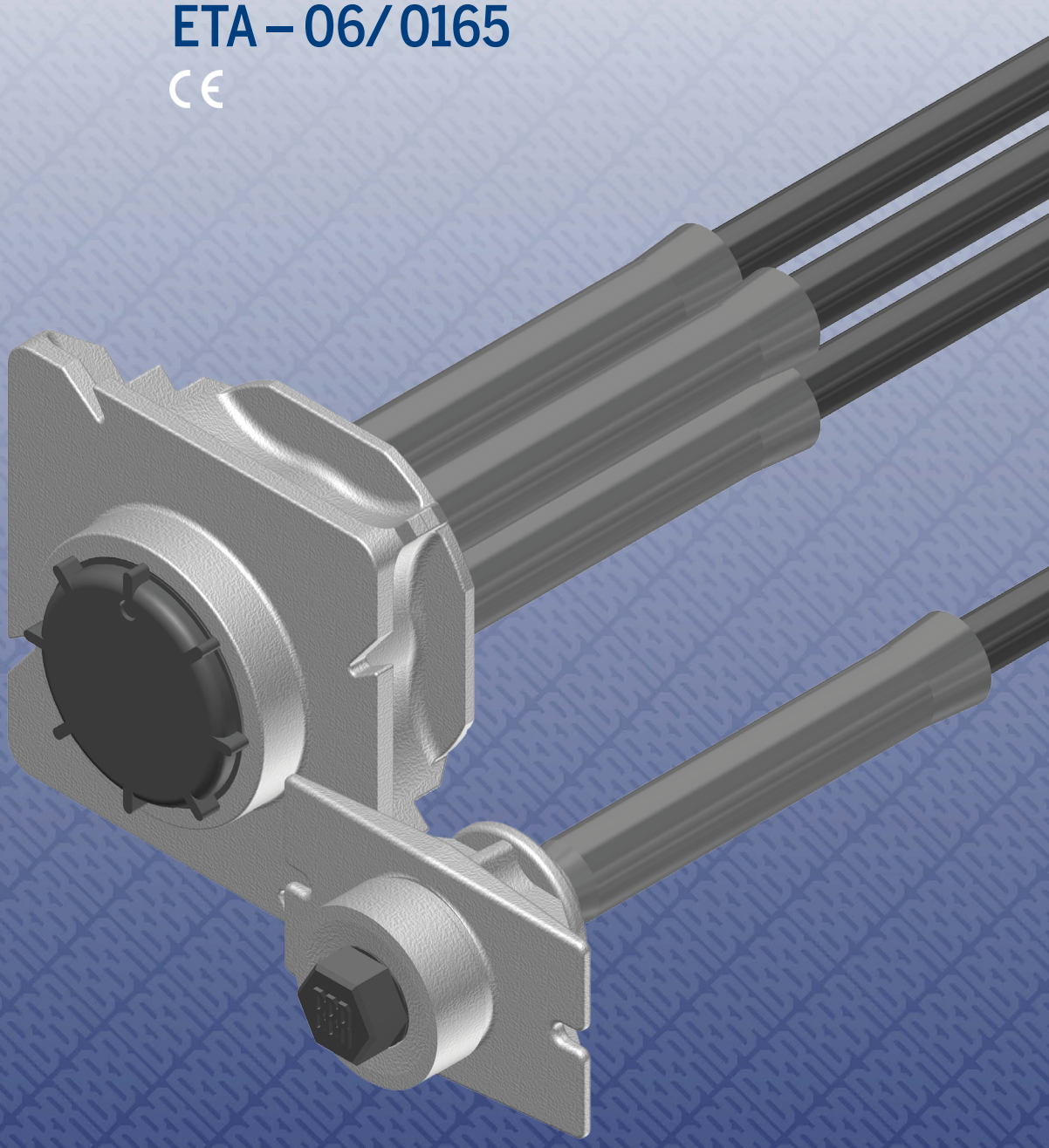
KB Vorspann-Technik

BBR VT CONA CMM

Unbonded Post-tensioning System

European Technical Assessment
ETA – 06/0165

CE



BBR A Global Network of Experts
www.bbrnetwork.com

CE
0432

ETA-06/0165
BBR VT CONA CMM
Unbonded Post-tensioning System
with 01, 02 and 04 Strands

BBR VT International Ltd
Ringstrasse 2, 8603 Schwerzenbach (Switzerland)
www.bbrnetwork.com

0432-CPD-11 9181-1.2/1
11

Responsible BBR PT Specialist Company

CE

The delivery note accompanying components of the BBR VT CONA CMM Post-tensioning System will contain the CE marking.

Company Year BBR PT Specialist Company www.bbrnetwork.com

Assembly and installation of BBR VT CONA CMM tendons must only be carried out by qualified BBR PT Specialist Companies. Find the local BBR PT Specialist Company by visiting the BBR Network website www.bbrnetwork.com.

EOTA

European Organisation for Technical Approvals
Europäische Organisation für Technische Zulassungen
Organisation Européenne pour l'Agrément technique

ETAG 013

Guideline for European Technical Approval of Post-tensioning Kits for Prestressing of Structures

CWA 14646

Requirements for the installation of post-tensioning kits for prestressing of structures and qualification of the specialist company and its personnel

BBR E-TRACE 2

BBR E-Trace is the trading and quality assurance platform of the BBR Network linking the Holder of Approval, BBR VT International Ltd, BBR PT Specialist Companies and the BBR Manufacturing Plant. Along with the established BBR Factory Production Control, BBR E-Trace provides effective supply chain management including installation, delivery notes and highest quality standards, as well as full traceability of components.

Austrian Institute of Construction Engineering
Schenkenstrasse 4 | T +43 1 533 65 50
1010 Vienna | Austria | F +43 1 533 64 23
www.oib.or.at | mail@oib.or.at

Designated according to Article 29 of Regulation (EU) No 305/2011

Member of EOTA
www.eota.eu

European Technical Assessment

ETA-06/0165 of 22.07.2016

General part

Technical Assessment Body issuing the European Technical Assessment	Österreichisches Institut für Bautechnik (OIB) Austrian Institute of Construction Engineering
Trade name of the construction product	BBR VT CONA CMM – Unbonded Post-tensioning System with 01, 02, and 04 Strands
Product family to which the construction product belongs	Post-tensioning kit for prestressing of structures with internal unbonded strands
Manufacturer	BBR VT International Ltd Ringstrasse 2 8603 Schwerzenbach (ZH) Switzerland
Manufacturing plant	BBR VT International Ltd Ringstrasse 2 8603 Schwerzenbach (ZH) Switzerland
This European Technical Assessment contains	37 pages including Annexes 1 to 17, 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	ETAG 013, Guideline for European technical approval of Post-Tensioning Kits for Prestressing of Structures, Edition June 2002, used according to Article 66 (3) of Regulation (EU) № 305/2011 as European Assessment Document.
This European Technical Assessment replaces	European technical approval ETA-06/0165 with validity from 15.11.2011 to 14.11.2016.

Table of contents

Remarks

Translations of the European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

Communication of the European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may be made with the written consent of Österreichisches Institut für Bautechnik. Any partial reproduction has to be identified as such.

Specific parts

1 Technical description of the product

1.1 General

The European Technical Assessment[1] – ETA – applies to a kit, the PT system

BBR VT CONA CMM
Unbonded Post-tensioning System with 01, 02, and 04 Strands,

comprising the following components, see Annex 1 and Annex 2.

- Tendon

  Unbonded tendons with 01, 02, or 04 tensile elements

- Tensile element

  7-wire prestressing steel strands with nominal diameters and maximum characteristic tensile strengths as given in Table 1, factory-provided with a corrosion protection system consisting of a corrosion-protective filling material and a HDPE-sheathing.

Table 1: Tensile elements

Nominal diameter	Nominal cross-sectional area	Maximum characteristic tensile strength
mm	mm^2	MPa
15.3	140	1 860
15.7	150	
15.2 [1)]	165	1 820

[1)] Compacted strand

NOTE 1 MPa = 1 N/mm^2

- Anchorage and coupler

  Anchorage of the strands with ring wedges

  End anchorage

  Fixed (passive) anchor or stressing (active) anchor as end anchorage for 01, 02, and 04 strands

  Fixed or stressing coupler

  Sleeve coupler for 01 and 04 strands

- Helix and additional reinforcement in the region of the anchorage

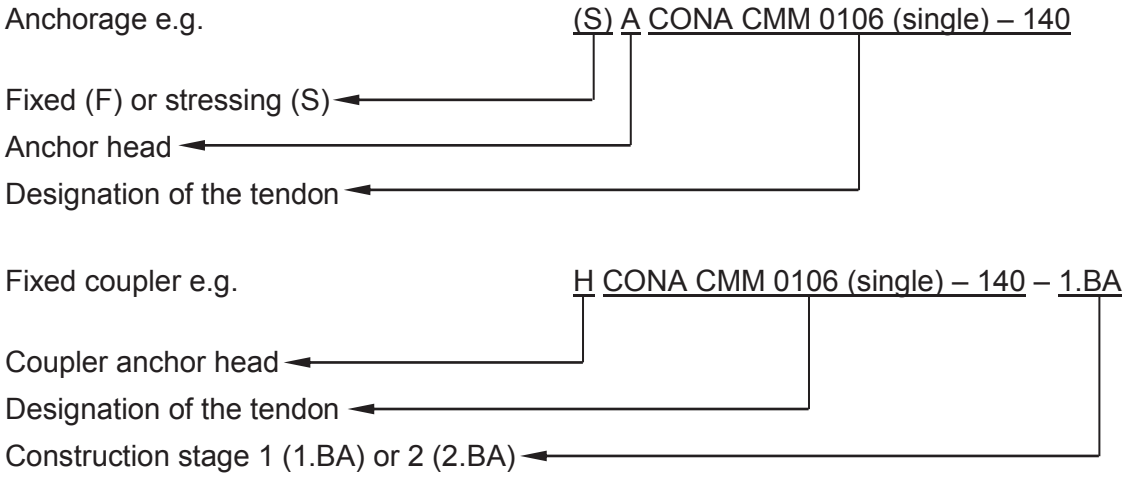
[1] ETA-06/0165 was firstly issued in 2006 as European technical approval with validity from 15.11.2006, extended in 2011 with validity from 15.11.2011 and converted in 2016 to European Technical Assessment ETA-06/0165 of 22.07.2016.

– Corrosion protection for tensile elements, couplers, and anchorages

PT system

1.2 Designation and range of anchorages and couplers

1.2.1 Designation



1.2.2 Anchorage

The anchor heads of the fixed and stressing anchorages are identical, see Annex 1. A differentiation is needed for the construction works. The principal dimensions of the anchorages are given in Annex 2 and Annex 3.

Fixed anchorages that are accessible may be prelocked. Fixed anchorages that are not accessible are prelocked with a prelocking force as specified in Table 2. The ring wedges are secured with rings between ring wedges and protection caps.

1.2.3 Fixed and stressing coupler

Couplers are intended as fixed couplers only. The principal dimensions of the couplers are given in Annex 2 and Annex 3. Fixed couplers are for tendons with 01 or 04 prestressing strands, see Annex 1.

The prestressing force at the second construction stage may not be greater than that at the first construction stage, neither during construction, nor in the final state, nor due to any load combination.

The tendon of construction stage 2 is coupled by screwing the coupler sleeve entirely on the threaded part of the coupler anchor head 1.BA (construction stage 1). The coupler anchor head 2.BA (construction stage 2) is prelocked with a prelocking force as specified in Table 2. At coupler anchor head H CONA CMM (single) – 2.BA (construction stage 2), the ring wedges are secured with wedge holding rings and at coupler anchor head H CONA CMM (four) – 2.BA (construction stage 2), the ring wedges are secured with a wedge holding plate.

1.2.4 Layout of the anchorage recesses

All anchor heads are placed perpendicular to the axis of the tendon, see Annex 8.

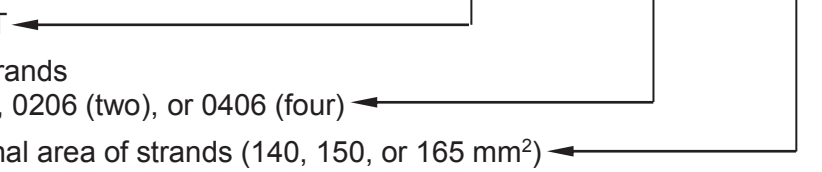
In Annex 8 and Annex 10 the minimum dimensions of the anchorage recesses are given. The dimensions of the anchorage recesses are adapted to the prestressing jacks used. The ETA holder saves for reference information on the minimum dimensions of the anchorage recesses.

The formwork for the anchorage recesses should be slightly conical for ease of removal. The anchorage recesses are designed in such a way as to permit a reinforced concrete cover with the required dimensions, and in any case with a thickness of at least 20 mm.

1.3 Designation and range of the tendons

1.3.1 Designation

Tendon e.g. CONA CMM 0106 (single) – 140



The characteristic tensile strength of the strands (1 770, 1 820, or 1 860 MPa) may be indicated optionally.

1.3.2 Range

1.3.2.1 General

Prestressing and overstressing forces are given in the corresponding standards and regulations in force at the place of use. The maximum prestressing and overstressing forces are listed in Annex 7.

The tendons consist of 01, 02, or 04 seven-wire prestressing steel strands, factory-provided with a corrosion protection system consisting of corrosion-protective filling material and an HDPE-sheathing.

1.3.2.2 CONA CMM n06 – 140

7-wire prestressing steel strand

Nominal diameter	15.3	mm
Nominal cross-sectional area	140	mm^2
Maximum characteristic tensile strength	1 770 or 1 860	MPa

Annex 6 lists the available tendon range for CONA CMM n06 – 140.

1.3.2.3 CONA CMM n06 – 150

7-wire prestressing steel strand

Nominal diameter	15.7	mm
Nominal cross-sectional area	150	mm^2
Maximum characteristic tensile strength	1 770 or 1 860	MPa

Annex 6 lists the available tendon range for CONA CMM n06 – 150.

1.3.2.4 CONA CMM n06C – 165

Compacted 7-wire prestressing steel strand

Nominal diameter	15.2	mm
Nominal cross-sectional area	165	mm^2
Maximum characteristic tensile strength	1 820	MPa

Annex 6 lists the available tendon range for CONA CMM n06C – 165.

1.4 Friction losses

For calculation of loss of prestressing force due to friction Coulomb's law applies. Due to the filling of the HDPE-sheathing of the individual monostrands or VT CMM Bands with corrosion protective material, the friction coefficient μ is very low. The calculation of the friction losses is carried out using the equation

$$F_x = F_0 \cdot e^{-\mu \cdot (\alpha + k \cdot x)}$$

Where

F_x .....kN .....Prestressing force at a distance x along the tendon

F_0 .....kN .....Prestressing force at x = 0 m

μ ..... rad^{-1} .....Friction coefficient; μ = 0.06 rad^{-1} (CONA CMM n06 – 140/150) or 0.05 rad^{-1} (CONA CMM n06C – 165)

α ..... rad .....Sum of angular displacements over distance x, irrespective of direction or sign

k ..... rad/m .....Wobble coefficient; k = 8.73 · 10^{-3} rad/m (= 0.5 °/m)

x ..... m .....Distance along the tendon from the point where the prestressing force is equal to F_0

NOTE 1 rad = 1 m/m = 1

If band-shaped tendons CONA CMM 150/165 with two or four strands are installed upright with flat-wise curvature and connected at support distances of 1.15 to 1.30 m, the wobble coefficient is k = 4.37 · 10^{-3} rad/m (= 0.25 °/m).

Friction losses in anchorages are low and do not have to be taken into consideration in design and execution.

1.5 Support of tendons

The individual monostrands or VT CMM Bands are fixed in their position. Spacing of supports is:

1 Normally

Individual monostrands (01 strand) and

VT CMM Bands with 02 and 04 strands.....1.00 to 1.30 m

2 Free tendon layout in ≤ 45 cm thick slabs

In the transition region between

a) high tendon position and anchorage (e.g. cantilever)..... 1.50 m

b) low and high tendon position or low tendon position and anchorage..... 3.00 m

In regions of high or low tendon position the tendons are connected in an appropriate way to the reinforcement mesh, at least at two points with a spacing of 0.3 to 1.3 m. The reinforcement mesh is fixed in its position. Special spacers for tendons are therefore not required. For details see Annex 11.

1.6 Slip at anchorages

Table 2 specifies the slip at anchorages that is taken into consideration in calculations of tendon elongations and tendon forces.

Table 2: Slip values

Active anchorage	(S) A	6 mm
	H 1.BA	
Not accessible passive anchorage, prelocked [1)]	(F) A	3 mm
	H 2.BA	
Accessible passive anchorage	(F) A CONA CMM 0106	6 mm
	(F) A CONA CMM 0206	8 mm [2)]
	(F) A CONA CMM 0406	

1) Prelocked with ~ 0.5 · F_{pk}
2) If a more exact evaluation is required, slip for
Y1860S7 9 mm
Y1820S7G 7 mm

1.7 Centre spacing and edge distances for anchorages

In general, spacing and distances are not be less than the values given in Table 3 and Annex 8.

However, a reduction of up to 15 % of the centre spacing of tendon anchorages in one direction is permitted, but should not be less than the outside diameter of the helix and placing of additional reinforcement still is possible, see Annex 9. In this case the spacing in the perpendicular direction is increased by the same percentage. The corresponding edge distance is calculated by

$$a_e = \frac{a_c}{2} - 10\ \text{mm} + c \qquad a_{\underline{e}} = \frac{a_{\underline{c}}}{2} - 10\ \text{mm} + c$$

$$b_e = \frac{b_c}{2} - 10\ \text{mm} + c \qquad b_{\underline{e}} = \frac{b_{\underline{c}}}{2} - 10\ \text{mm} + c$$

Where

a_c, $a_{\underline{c}}$ .....mm..... Centre spacing before and after modification

b_c, $b_{\underline{c}}$ .....mm..... Centre spacing in the direction perpendicular to a_c before and after modification

a_e, $a_{\underline{e}}$ .....mm..... Edge distance before and after modification

b_e, $b_{\underline{e}}$ .....mm..... Edge distance in the direction perpendicular to a_e before and after modification

c .....mm..... Concrete cover

Standards and regulations on concrete cover in force at the place of use are observed.

The minimum values for a_c, b_c, a_e, and b_e are given in Table 3 and in Annex 8.

Table 3: Spacing of tendon anchorages

Tendon			CONA CMM 0106	CONA CMM 0206	CONA CMM 0406
Minimum centre spacing	a_c, b_c	mm	180, 140	200, 150	300, 220
Minimum edge distance	a_e, b_e	mm	70 + c, 50 + c	90 + c, 65 + c	130 + c, 90 + c

c.....Concrete cover

Standards and regulations on concrete cover in force at the place of use are observed.

1.8 Minimum radii of curvature of internal tendons

The minimum radius of curvature R_{min} of internal tendons with strands of nominal diameter of 15.7 or 15.2 mm is 2.5 m. If this radius is adhered to, verification of prestressing steel outer fibre stresses in curved sections is not required. The minimum radius of curvature for deviation of a

tendon with multistrand anchorages in the anchorage zone outside the transition tubes up to the last reinforcement steel bar is 3.5 m.

1.9 Concrete strength at time of stressing

Concrete in conformity with EN 206[2] is used. At the time of stressing the mean concrete compressive strength, $f_{cm,\,0}$, is at least 24 MPa (cube strength, 150 mm cube) or 20 MPa (cylinder strength, 150 mm cylinder diameter). The concrete test specimen are subjected to the same curing conditions as the structure.

For partial prestressing with 30 % of the full prestressing force the actual mean value of the concrete compressive strength is at least $0.5 \cdot f_{cm,\,0,\,cube}$ or $0.5 \cdot f_{cm,\,0,\,cylinder}$. Intermediate values may be interpolated linearly according to Eurocode 2.

Helix, additional reinforcement, centre spacing and edge distance are taken from Annex 8, see also the Clauses 1.11.5 and 2.2.3.4.

Where

$f_{cm,\,0,\,cube\,150}$ .....Mean concrete compressive strength at time of stressing, determined at cubes, 150 mm

$f_{cm,\,0,\,cylinder\,\varnothing\,150}$ .....Mean concrete compressive strength at time of stressing, determined at cylinders, diameter 150 mm

Components

1.10 Strands

Only 7-wire prestressing steel strands with characteristics according to Table 4 are used, see also Annex 5.

Table 4: Prestressing steel strands

Maximum characteristic tensile strength	f_{pk}	MPa	1 860		1 820
Nominal diameter	d	mm	15.3	15.7	15.2 [1)]
Nominal cross-sectional area	A_p	mm^2	140	150	165
Mass of prestressing steel	M	kg/m	1.093	1.172	1.289
Sheathed strand filled with a corrosion protective filling material – Individual monostrands or VT CMM Bands					
Nominal mass per strand		kg/m	1.23	1.31	1.42
External diameter of HDPE-sheathing		mm	≥ 19,5	≥ 20	≥ 19,5

1) Compacted strand

The sheathed strands filled with a corrosion protective filling material may be either individual monostrands or VT CMM Bands.

In the course of preparing the European Technical Assessment, no characteristic has been assessed for prestressing steel strands. In execution, a suitable prestressing steel strand that conforms to Annex 5 and is according to the standards and regulations in force at the place of use is taken.

2 Reference documents are listed in Annex 17.

1.11 Anchorages and couplers

1.11.1 General

The components of anchorages and couplers are in conformity with the specifications given in Annex 2 and Annex 3 and the technical file[3]. Therein the component dimensions, materials, and material identification data with tolerances are given.

1.11.2 Anchor heads

The anchor heads are made of cast iron with spheroidal graphite. They provide regularly arranged conical holes to accommodate 01, 02, or 04 strands, and ring wedges. The load transfer to the concrete occurs in two planes. The anchor head has a cylindrical extension with an internal thread to screw-in a protection cap, which will be filled with corrosion protective filling material to protect the ring wedges and the strands.

The outlet end of the holes is formed in such a way as to allow the transition pipes to be inserted tension-proof. The transition pipes act as the transition from the anchor head to the sheathing of the strands.

1.11.3 Couplers

Fixed couplers are provided for tendons with 01 or 04 strands. They consist of a coupler anchor head 1.BA (construction stage 1) and a coupler anchor head 2. BA (construction stage 2).

The coupler anchor head 1. BA (construction stage 1) is the same basic body as the anchor heads of active and passive anchorages for 01 and 04 strands, but provides a cylindrical extension with an external thread to accommodate the coupler sleeve.

The connection between coupler anchor heads 1.BA (construction stage 1) and 2. BA (construction stage 2) is by means of a coupler sleeve, a steel tube featuring an internal thread, a threaded bore to accommodate the filling device and a bore for ventilation.

The coupler anchor head 2. BA (construction stage 2) for 01 strand is either a cast iron head with a conical hole or a steel body with a conical bore. The coupler anchor head 2 BA (construction stage 2) for 04 strands is a steel body with conical bores. All coupler anchor heads provide a machined external thread for the coupler sleeve.

The end surface of the fixed coupler H CONA CMM 0406 (four) is provided with a BDSD-plate to permit settlement of the coupler during stressing.

1.11.4 Ring wedges

The ring wedges are in three pieces, which are held together by spring rings. Two ring wedges, i.e. H or F, are used. Within one anchorage or coupler only one of these ring wedges is used.

Wedge holding rings serve to secure the ring wedges after prelocking. The fastening of the ring wedges of the prelocked coupler anchor head CONA CMM 0406 (four) – 140/150/165 – 2.BA (construction stage 2) is made by means of a wedge holding plate.

1.11.5 Helix and additional reinforcement

The helix and the additional reinforcement are made of ribbed reinforcing steel. The end of the helix on the anchorage side is welded to the following turn. The helix is placed in the tendon axis. Dimensions of helix and additional reinforcement conforms to the values specified in Annex 8, see also Clause 2.2.3.4.

If required for a specific project design, the reinforcement given in Annex 8 may be modified in accordance with the respective regulations in force at the place of use as well as with the relevant approval of the local authorities and of the ETA holder, to provided equivalent performance.

[3] The technical file of the European Technical Assessment is deposited at Österreichisches Institut für Bautechnik.

1.11.6 Protection caps

Protection caps are made of plastic. They are screwed into the anchor head and for anchorages with two or four prestressing steel strands are provided with an air vent.

1.11.7 Pocket former set

The pocket former set is made of plastic, see Annex 3. It consists of one universal mandrel with nut and two pocket formers with different dimensions. The pocket formers are employed to form anchorage recesses for stressing anchorages (S) A CONA CMM 0106.

1.11.8 Material specifications

Annex 4 lists the material standards or specifications of the components.

1.12 Permanent corrosion protection

1.12.1 General

In the course of preparing the European Technical Assessment no characteristic has been assessed for components and materials of the corrosion protection system referred to in the Clauses 1.12.2 and 1.12.3. In execution, all components or materials have to be selected according to the standards and regulations in force at the place of use. Where no such standards or regulations are present, components and materials in accordance with ETAG 013, Annex C.1, should be deemed to be acceptable.

1.12.2 Corrosion protection of the strand

The strands are sheathed in the factory with an extruded HDPE-sheathing with a thickness of at least 1.0 mm. The actual thickness of the sheathing is in accordance with the standards and regulations in force at the place of use.

1.12.3 Corrosion protection in anchorage and coupler zones

The voids inside the HDPE-sheathing are filled with corrosion protection filling material. When mounting the anchorage, the sheathing is removed along the required length. During construction the strand excess lengths protruding from the anchorage are temporarily protected with cut-off HDPE-sheaths.

All voids of the anchorages and couplers are filled with corrosion protection filling material according to the installation instructions in Annex 12.

Anchorages that are prelocked receive their corrosion protection immediately after the prelocking operation by filling with corrosion protection filling material and screwing-on of the protection cap.

2 Specification of the intended uses in accordance with the applicable European Assessment Document (hereinafter EAD)

2.1 Intended uses

The PT system is intended to be used for the prestressing of structures. The specific intended uses are listed in Table 5.

Table 5: Intended uses

Line №	Use category
Use categories according to tendon configuration and material of structure	
1	Internal unbonded tendon for concrete and composite structures
2	For special structures according to Eurocode 2 and Eurocode 4
Optional use category	
3	Tendon for use in structural masonry construction as internal tendon

2.2 Assumptions

2.2.1 General

The manufacturer undertakes the appropriate measures and prepares advice on product packaging, transport, and storage. It is the responsibility of the manufacturer of the product to ensure that this information is given to those who are concerned.

2.2.2 Packaging, transport, and storage

Advice on packaging, transport, and storage includes.

- During transport of prefabricated tendons a minimum diameter of curvature of 1.45 to 1.75 m or as specified by the manufacturer of the strand is observed.
- Temporary protection of prestressing steel and components in order to prevent corrosion during transport from production site to job site
- Transportation, storage, and handling of the prestressing steel and other components in a manner as to avoid damage by mechanical or chemical impact
- Protection of prestressing steel and other components from moisture
- Keeping tensile elements separate from areas where welding operations are performed

2.2.3 Design

2.2.3.1 General

It is the responsibility of the ETA holder to ensure that all necessary information on design and installation is submitted to those responsible for design and execution of the structures executed with "BBR VT CONA CMM – Unbonded Post-tensioning System with 01, 02, and 04 Strands".

Design of the structure permits correct installation and stressing of the tendons. The reinforcement in the anchorage zone permits correct placing and compacting of concrete.

2.2.3.2 Anchorage Recess

The anchorage recess is designed so as to ensure a concrete cover of at least 20 mm at the protection caps in the final state.

Clearance is required for the handling of prestressing jacks. In order to allow for imperfections and to ease the cutting of the strand excess lengths it is recommended to increase the dimensions of the recesses. The forms for the recesses should be slightly conical for easy removal.

If other prestressing jacks than those shown in Annex 10 are used, the ETA holder keeps information on prestressing jacks and minimum dimensions of anchorage recesses.

In case of failure the bursting out of prestressing steels is prevented. Sufficient protection is provided by e.g. a cover of reinforced concrete.

2.2.3.3 Maximum prestressing forces

The prestressing and overstressing forces are specified in the respective standards and regulations in force at place of use. Annex 7 lists the maximum possible prestressing and overstressing forces.

2.2.3.4 Reinforcement in the anchorage zone

Verification of transfer of prestressing forces to structural concrete is not required if centre spacing and edge distance of anchorages and couplers as well as grade and dimensions of additional reinforcement, see Annex 8, are conformed to. In the case of grouped anchorages the additional reinforcement of the individual anchorages can be combined, provided appropriate anchorage is ensured. However, number, cross-sectional area, and position with respect to the anchor heads remain unchanged.

The reinforcement of the structure is not employed as additional reinforcement. Reinforcement exceeding the required reinforcement of the structure may be used as additional reinforcement, provided appropriate placing is possible.

The forces outside the area of the additional reinforcement are verified and, if necessary, dealt with by appropriate reinforcement.

If required for a specific project design, the reinforcement given in Annex 8 may be modified in accordance with the respective regulations in force at the place of use as well as with the relevant approval of the local authority and of the ETA holder to provide equivalent performance.

2.2.4 Installation

2.2.4.1 General

Assembly and installation of tendons is only carried out by qualified PT specialist companies with the required resources and experience in the use of multi strand unbonded post-tensioning systems, see ETAG 013, Annex D.1 and CWA 14646. The respective standards and regulations in force at the place of use are considered. The company's PT site manager has a certificate, stating that she or he has been trained by the ETA holder and that she or he possesses the necessary qualifications and experience with the "BBR VT CONA CMM – Unbonded Post-tensioning System with 01, 02, and 04 Strands".

Couplers are situated in a straight tendon section.

The tendons are carefully handled during production, transport, storage, and installation. The corrosion protected HDPE sheathed prestressing strands are usually delivered to site in coils with an internal diameter of 1.45 to 1.75 m.

In the anchorage zone, the webs of the VT CMM Bands are longitudinally cut over a length of 1.3 m from the end. The layout of the transition zone is shown in Annex 11.

The sequence of work steps for installation of anchorage and fixed coupler is described in Annex 12 and in Annex 13 representations of construction stages are shown.

Before placing the concrete a final check of the installed tendons is carried out. At that time, the passive anchorages mounted at the PT works are randomly checked for proper seating of the ring wedges and complete filling of the protection caps with corrosion protective filling material. In the case of minor damage of the sheathing, the damaged area is cleaned and sealed with an adhesive tape.

2.2.4.2 Stressing operation

With a mean concrete compressive strength in the anchorage zone according to the values laid down in Annex 8 full prestressing may be applied.

Stressing and, if applicable, wedging is carried out using a suitable prestressing jack. The wedging force corresponds to approximately 25 kN per wedge.

Elongations and prestressing forces are checked continuously during the stressing operation. The results of the stressing operation are recorded and the measured elongations compared with the prior calculated values.

After releasing the prestressing force from the prestressing jack, the tendon is pulled in and reduces the elongation by the amount of slip at the anchor head.

Information on the prestressing equipment has been submitted to Österreichisches Institut für Bautechnik. The ETA holder keeps available information on prestressing jacks and appropriate clearance behind the anchorage.

The safety-at-work and health protection regulations shall be complied with.

2.2.4.3 Restressing

Restressing of tendons in combination with release and reuse of wedges is permitted, whereas the wedges bite into a least 15 mm of virgin strand surface and no wedge bite remains inside the final length of the tendon between anchorages.

2.2.4.4 Welding

Welding is not intended and it is not permitted to weld on built-in components of post-tensioning systems.

In case of welding operations near tendons precautionary measures are required to avoid damage to the corrosion protection system.

2.3 Assumed working life

The European Technical Assessment is based on an assumed working life of the PT system of 100 years, provided that the PT system is subject to appropriate installation, use, and maintenance, see Clause 2.2. The indications given as to the working life of the PT system cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by the Technical Assessment Body, but are regarded only as a means for selecting the appropriate products in relation to the expected economically reasonable working life of the works[4].

3 Performances of the product and references to the methods used for its assessment

3.1 Essential characteristics

The performances of the PT system for the essential characteristics are given in Table 6 and Table 7. In Annex 16 the combinations of essential characteristics and corresponding intended uses are listed.

Table 6: Essential characteristics and performances of the product

№	Essential characteristic	Product performance
(1)	(2)	(3)
Product BBR VT CONA CMM Intended use The PT system is intended to be used for the prestressing of structures, Clause 2.1, Table 5, lines № 1 and 2.		
Basic requirement for construction works 1: Mechanical resistance and stability		
1	Resistance to static load	See Clause 3.1.1.1.
2	Resistance to fatigue	See Clause 3.1.1.2.
3	Load transfer to the structure	See Clause 3.1.1.3.
4	Friction coefficient	See Clause 3.1.1.4.
5	Deviation, deflection (limits)	See Clause 3.1.1.5.
6	Practicability, reliability of installation	See Clause 3.1.1.6.

[4] The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works are subject, as well as on the particular conditions of design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than the assumed working life.

№	Essential characteristic	Product performance
(1)	(2)	(3)
Basic requirement for construction works 2: Safety in case of fire		
—	Not relevant. No characteristic assessed.	—
Basic requirement for construction works 3: Hygiene, health, and the environment		
7	Content, emission, and/or release of dangerous substances	See Clause 3.1.2.
Basic requirement for construction works 4: Safety and accessibility in use		
—	Not relevant. No characteristic assessed.	—
Basic requirement for construction works 5: Protection against noise		
—	Not relevant. No characteristic assessed.	—
Basic requirement for construction works 6: Energy economy and heat retention		
—	Not relevant. No characteristic assessed.	—
Basic requirement for construction works 7: Sustainable use of natural resources		
—	No characteristic assessed.	—
Related aspects of serviceability		
8	Related aspects of serviceability	See Clause 3.1.3.

Table 7: Essential characteristics and performances of the product in addition to Table 6 for specific intended uses

№	Essential characteristic	Product performance
(1)	(2)	(3)
Product BBR VT CONA CMM Specific intended use Clause 2.1, Table 5, line № 3, tendon for use in structural masonry construction as internal tendon.		
Basic requirement for construction works 1: Mechanical resistance and stability		
9	Tendons in masonry structures – Load transfer to the structure	See Clause 3.1.4.1.

3.1.1 Mechanical resistance and stability

3.1.1.1 Resistance to static load

The PT system as described in the ETA meets the acceptance criteria of ETAG 013, Clause 6.1.1-I. The characteristic values of maximum force, F_{pk}, of the tendon for prestressing steel strands according to Annex 5 are listed in Annex 6.

3.1.1.2 Resistance to fatigue

The PT system as described in the ETA meets the acceptance criteria of ETAG 013, Clause 6.1.2-I. The characteristic values of maximum force, F_{pk}, of the tendon for prestressing steel strands according to Annex 5 are listed in Annex 6.

3.1.1.3 Load transfer to the structure

The PT system as described in the ETA meets the acceptance criteria of ETAG 013, Clause 6.1.3-I. The characteristic values of maximum force, F_{pk}, of the tendon for prestressing steel strands according to Annex 5 are listed in Annex 6.

3.1.1.4 Friction coefficient

The PT system as described in the ETA meets the acceptance criteria of ETAG 013, Clause 6.1.4-I. For friction losses including friction coefficient see Clause 1.4.

3.1.1.5 Deviation, defection (limits)

The PT system as described in the ETA meets the acceptance criteria of ETAG 013, Clause 6.1.5-I. For minimum radii of curvature see Clause 1.8.

3.1.1.6 Practicability, reliability of the installation

The PT system as described in the ETA meets the acceptance criteria of ETAG 013, Clause 6.1.6-I.

3.1.2 Hygiene, health, and the environment

Content, emission, and/or release of dangerous substances is determined according to ETAG 013, Clause 5.3.1. No dangerous substances is the performance of the PT system in this respect. A manufacturer's declaration to this effect has been submitted.

NOTE In addition to specific clauses relating to dangerous substances in the European Technical Assessment, there may be other requirements applicable to the product falling within their scope, e.g. transposed European legislation and national laws, regulations, and administrative provisions. These requirements also need to be complied with, when and where they apply.

3.1.3 Related aspects of serviceability

The PT system as described in the ETA meets the acceptance criteria of ETAG 013, Clause 6.7.

3.1.4 Mechanical resistance and stability

3.1.4.1 Tendons in masonry structures – Load transfer to the structure

Load transfer of prestressing force to masonry structures is via concrete or steel members designed according to the European Technical Assessment, especially according to the Clauses 1.7, 1.9, 1.11.5, and 2.2.3.4 or to Eurocode 3 respectively.

The concrete or steel members have such dimensions as to permit a force of $1.1 \cdot F_{pk}$ being transferred into the masonry. The verification is performed according to Eurocode 6 as well as to the respective standards and regulations in force at the place of use. The characteristic values of maximum force, F_{pk}, of the tendon for prestressing steel strands according to Annex 5 are listed in Annex 6.

3.2 Assessment methods

The assessment of the essential characteristics in Clause 3.1 of the PT system for the intended uses and in relation to the requirements for mechanical resistance and stability, and for hygiene, health, and the environment in the sense of the basic requirements for construction works № 1 and

3 of Regulation (EU) № 305/2011 has been made in accordance with the Guideline for European technical approvals of "Post-Tensioning Kits for Prestressing of Structures", ETAG 013, Edition June 2002, used according to Article 66 3. of Regulation (EU) № 305/2011 as European Assessment Document, based on the assessment for internal unbonded PT systems.

3.3 Identification

The European Technical Assessment for the PT system is issued on the basis of agreed data[5] that identify the assessed product. Changes to materials, to composition, or to characteristics of the product, or to the production process could result in these deposited data being incorrect. Österreichisches Institut für Bautechnik should be notified before the changes are introduced, as an amendment of the European Technical Assessment is possibly necessary.

4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

4.1 System of assessment and verification of constancy of performance

According to the Commission Decision 98/456/EC the system of assessment and verification of constancy of performance to be applied to the PT system is System 1+. System 1+ is detailed in Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014, Annex, 1.1., and provides for the following items.

(a) The manufacturer shall carry out

  (i) factory production control;

  (ii) further testing of samples taken at the manufacturing plant by the manufacturer in accordance with the prescribed test plan[6].

(b) The notified product certification body shall decide on the issuing, restriction, suspension or withdrawal of the certificate of constancy of performance of the construction product on the basis of the outcome of the following assessments and verifications carried out by that body

  (i) an assessment of the performance of the construction product carried out on the basis of testing (including sampling), calculation, tabulated values, or descriptive documentation of the product;

  (ii) initial inspection of the manufacturing plant and of factory production control;

  (iii) continuing surveillance, assessment, and evaluation of factory production control;

  (iv) audit-testing of samples taken by the notified product certification body at the manufacturing plant or at the manufacturer's storage facilities.

4.2 AVCP for construction products for which a European Technical Assessment has been issued

Notified bodies undertaking tasks under System 1+ shall consider the European Technical Assessment issued for the construction product in question as the assessment of the performance of that product. Notified bodies shall therefore not undertake the tasks referred to in Clause 4.1, point (b) (i).

---

[5] The technical file of the European Technical Assessment is deposited at Österreichisches Institut für Bautechnik and, in so far as is relevant to the tasks of the notified product certification body involved in the assessment and verification of constancy of performance, is handed over to the notified product certification body.

[6] The prescribed test plan has been deposited with Österreichisches Institut für Bautechnik and is handed over only to the notified product certification body involved in the procedure for the assessment and verification of constancy of performance. The prescribed test plan is also referred to as control plan.

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

5.1 Tasks for the manufacturer

5.1.1 Factory production control

In the manufacturing plant the manufacturer shall establish and continuously maintain a factory production control. All procedures and specification adopted by the manufacturer shall be documented in a systematic manner. The factory production control shall ensure the constancy of performances of the PT system with regard to the essential characteristics.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the control plan. The incoming raw materials shall be subject to controls by the manufacturer before acceptance. Check of incoming materials shall include control of inspection documents presented by the manufacturer of the raw materials.

The records shall be kept at least for ten years times after the construction product has been placed on the market and shall be presented to the notified product certification body involved in continuous surveillance. On request the records shall be presented to Österreichisches Institut für Bautechnik.

If test results are unsatisfactory, the manufacturer shall immediately implement measures to eliminate the defects. Construction products or components that are not in conformity with the requirements shall be removed. After elimination of the defects, the respective test – if verification is required for technical reasons – shall be repeated immediately.

At least once a year the manufacturer shall audit the manufacturers of the components given in Annex 15.

The basic elements of the prescribed test plan are given in Annex 14, conform to ETAG 013, Annex E.1, and are specified in the quality management plan of the “BBR VT CONA CMM – Unbonded Post-tensioning System with 01, 02, and 04 Strands”.

5.1.2 Declaration of performance

The manufacturer is responsible for preparing the declaration of performance. When all the criteria of the assessment and verification of constancy of performance are met, including the certificate of constancy of performance issued by the notified product certification body, the manufacturer shall draw up the declaration of performance. Essential characteristics to be included in the declaration of performance for the corresponding intended use are given in Table 6 and Table 7. In Annex 16 the combinations of essential characteristics and corresponding intended uses are listed.

5.2 Tasks for the notified product certification body

5.2.1 Initial inspection of the manufacturing plant and of factory production control

The notified product certification body verifies the ability of the manufacturer for a continuous and orderly manufacturing of the PT system according to the European Technical Assessment. In particular the following items shall be appropriately considered.

- Personnel and equipment
- Suitability of the factory production control established by the manufacturer
- Full implementation of the prescribed test plan

5.2.2 Continuing surveillance, assessment, and evaluation of factory production control

The notified product certification body visits the factory at least once a year for routine inspection. In particular the following items are appropriately considered.

- Manufacturing process including personnel and equipment
- Factory production control

– Implementation of the prescribed test plan

Each component manufacturer of the components listed in Annex 15 shall be audited at least once in five years. It shall be verified that the system of factory production control and the specified manufacturing process are maintained taking account of the prescribed test plan.

The results of continuous surveillance are made available on demand by the notified product certification body to Österreichisches Institut für Bautechnik. When the provisions of the European Technical Assessment and the prescribed test plan are no longer fulfilled, the certificate of constancy of performance is withdrawn by the notified product certification body.

5.2.3 Audit-testing of samples taken by the notified product certification body at the manufacturing plant or at the manufacturer's storage facilities

During surveillance inspections the notified product certification body shall take samples of components of the PT system for independent testing. For the most important components Annex 15 summarises the minimum procedures that shall be performed by the notified product certification body.

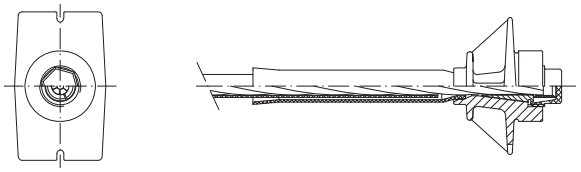
Issued in Vienna on 22 July 2016
by Österreichisches Institut für Bautechnik

The original document is signed by

Rainer Mikulits
Managing Director

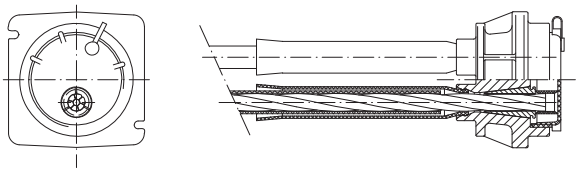
Active and passive anchorage

CONA CMM 0106
(single)



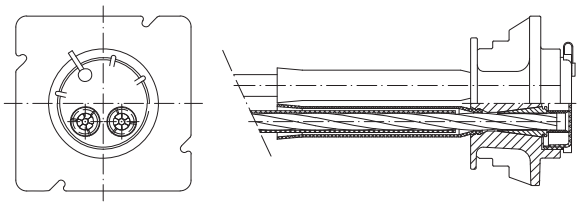
Monostrand
or VT CMM Band

CONA CMM 0206
(two)



Monostrand
or VT CMM Band

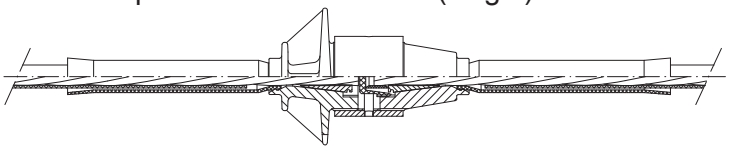
CONA CMM 0406
(four)



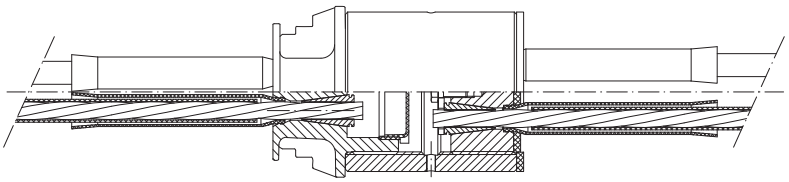
Monostrand
or VT CMM Band

Fixed couplers

Fixed coupler CONA CMM 0106 (single)



Fixed coupler CONA CMM 0406 (four)



VT CMM Band

VT CMM Band 01-140
VT CMM Band 01-150

VT CMM Band 02-140
VT CMM Band 02-150

VT CMM Band 04-140
VT CMM Band 04-150

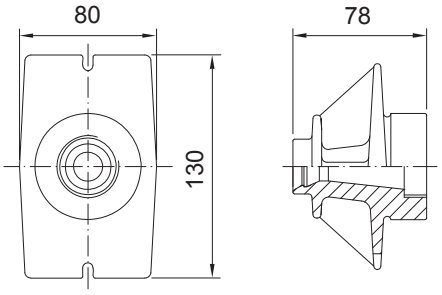
VT CMM Band 01-165

VT CMM Band 02-165

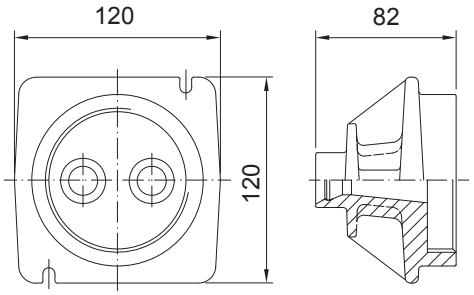
VT CMM Band 04-165

Stressing and fixed anchorage

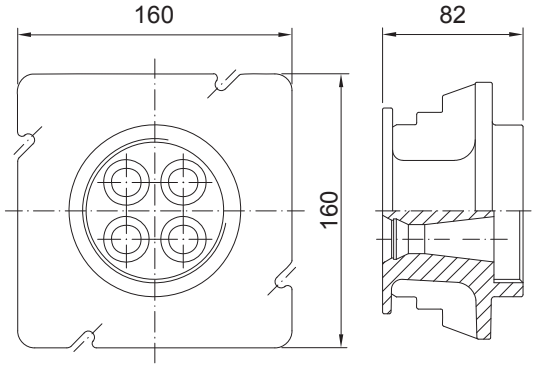
(S/F) A CONA CMM 0106 (single)



(S/F) A CONA CMM 0206 (two)



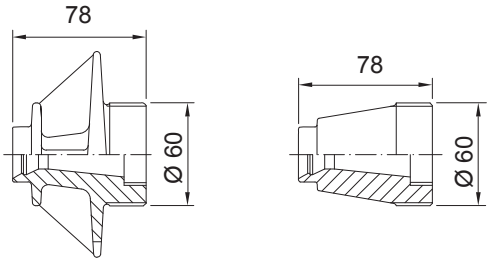
(S/F) A CONA CMM 0406 (four)



Fixed coupler

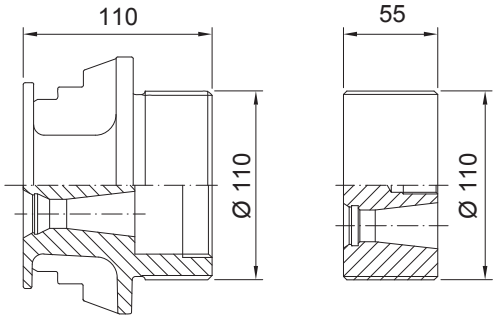
H CONA CMM 0106 (single)

1. BA 2. BA



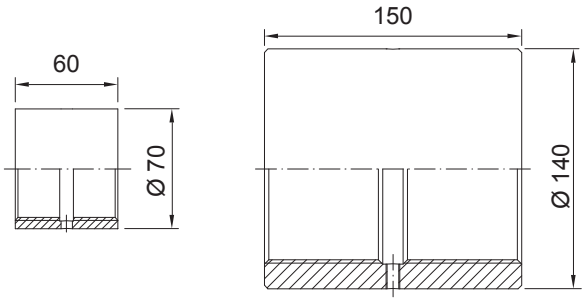
H CONA CMM 0406 (four)

1. BA 2. BA

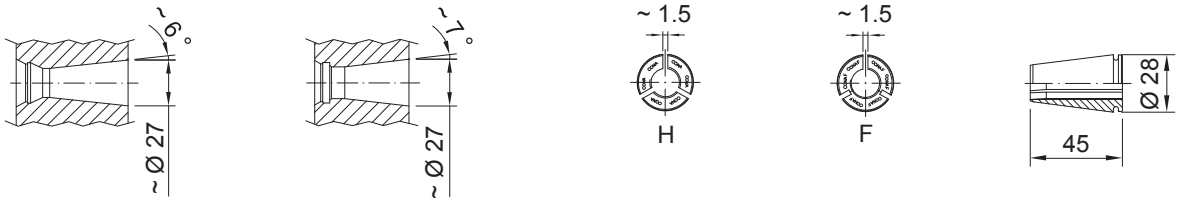


Threaded coupler sleeve

H CONA CMM 0106 (single) H CONA CMM 0406 (four)



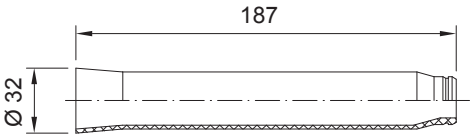
Cast iron cone Machined cone Ring wedge



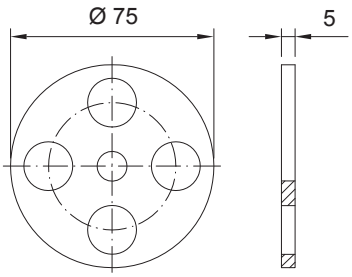
Dimensions in mm

CONA CMM	**Unbonded Post-tensioning System** Components – Anchorages and fixed couplers	**Annex 2** of European Technical Assessment **ETA-06/0165** of 22.07.2016

Transition pipe

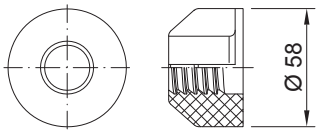


Wedge holding plate
H CONA CMM 0406 (four), 2. BA

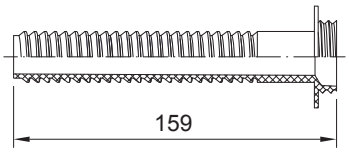


Pocket former set

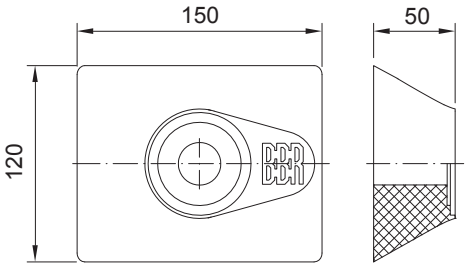
Nut



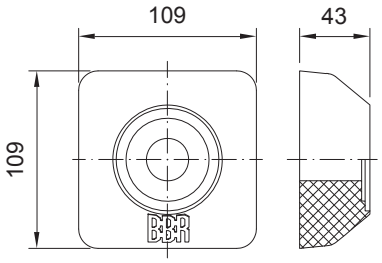
Mandrel



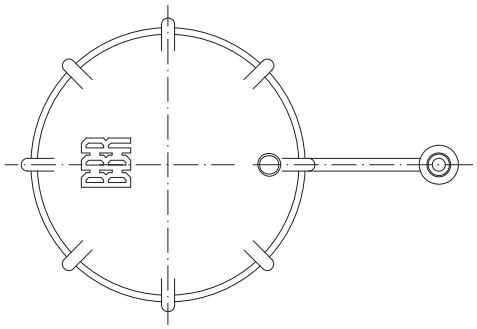
Pocket former R



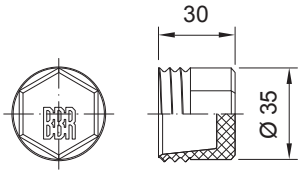
Pocket former C



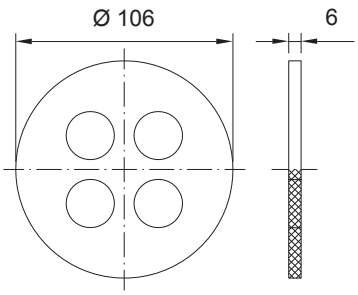
Protection caps
CONA CMM 0206 (two)
CONA CMM 0406 (four)



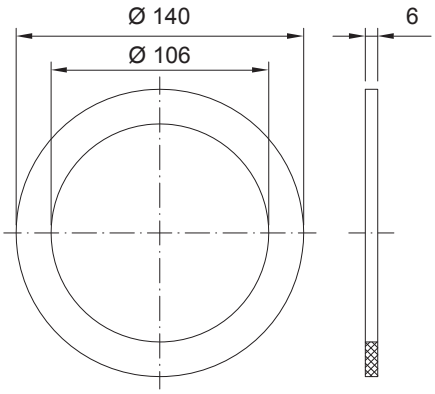
CONA CMM 0106 (single)



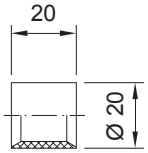
BDSD-plate
Version A



Version DF



Wedge holding ring



Dimensions in mm

CONA CMM	**Unbonded Post-tensioning System** Components – Accessory	**Annex 3** of European Technical Assessment **ETA-06/0165** of 22.07.2016

Material specifications

Component	Standard / Specification
Anchor head 0106, 0206, 0406	EN 1563
Coupler anchor head 0106, 0406 – 1. BA	EN 1563
Coupler anchor head 0106 – 2. BA	EN 1563 EN 10083-1 EN 10083-2
Coupler anchor head 0406 – 2. BA	EN 10083-1 EN 10083-2
Coupler sleeve 0106, 0406	EN 10210-1
Ring wedge H F	 EN 10277-2 EN 10084
Wedge holding plate	EN 10025-2
Helix	Ribbed reinforcing steel, $R_e \geq 500$ MPa
Additional reinforcement (stirrups)	Ribbed reinforcing steel, $R_e \geq 500$ Mpa
Corrosion protection filling material	ETAG 013, Annex C
Strand sheathing	ETAG 013, Annex C
Transition pipe	EN ISO 16396-1 EN ISO 17855-1
Wedge holding ring, protection cap, pocket former set	EN ISO 17855-1
BDSD-plate	—

7-wire strands according to prEN 10138-3 [1)]

Steel designation			Y1770S7	Y1860S7	Y1770S7	Y1860S7	Y1820S7G
Tensile strength	R_m	MPa	1 770	1 860	1 770	1 860	1 820
Diameter	d	mm	15.3	15.3	15.7	15.7	15.2 [2)]
Nominal cross-sectional area	A_p	mm^2	140	140	150	150	165
Nominal mass per metre	M	kg/m	1.093		1.172		1.289
Permitted deviation from nominal mass		%	± 2				
Characteristic value of maximum force	F_{pk}	kN	248	260	266	279	300
Maximum value of maximum force	$F_{m,\,max}$	kN	285	299	306	321	345
Characteristic value of 0.1 % proof force [3)]	$F_{p0.1}$	kN	218	229	234	246	264
Minimum elongation at maximum force, $L_0 \geq 500$ mm	A_{gt}	%	3.5				
Modulus of elasticity	E_p	MPa	195 000 [4)]				

1) Suitable strands according to standards and regulations valid at the place of use may also be used.
2) Compacted strand
3) For strands according to prEN 10138-3, 09.2000, the value shall be multiplied by 0.98.
4) Standard value

CONA CMM n06-140

Number of strands	Nominal cross-sectional area of prestressing steel	Nominal mass of prestressing steel	Nominal mass of tendon	Characteristic value of maximum force of tendon	
				f_{pk} = 1 770 MPa	f_{pk} = 1 860 MPa
n	A_p	M	M	F_{pk}	F_{pk}
—	mm^2	kg/m	kg/m	kN	kN
01	140	1.09	1.23	248	260
02	280	2.19	2.46	496	520
04	560	4.37	4.92	992	1 040

CONA CMM n06-150

Number of strands	Nominal cross-sectional area of prestressing steel	Nominal mass of prestressing steel	Nominal mass of tendon	Characteristic value of maximum force of tendon	
				f_{pk} = 1 770 MPa	f_{pk} = 1 860 MPa
n	A_p	M	M	F_{pk}	F_{pk}
—	mm^2	kg/m	kg/m	kN	kN
01	150	1.17	1.31	266	279
02	300	2.34	2.62	532	558
04	600	4.69	5.24	1 064	1 116

CONA CMM n06C-165, Compacted strand

Number of strands	Nominal cross-sectional area of prestressing steel	Nominal mass of prestressing steel	Nominal mass of tendon	Characteristic value of maximum force of tendon
				f_{pk} = 1 820 MPa
n	A_p	M	M	F_{pk}
—	mm^2	kg/m	kg/m	kN
01	165	1.29	1.42	300
02	300	2.58	2.84	600
04	660	5.16	5.68	1 200

Maximum prestressing and overstressing forces

CONA CMM 0106 (single)

Strands		A_P	mm²	140		150		165 [1]
Characteristic tensile strength		f_{pk}	MPa	1 770	1 860	1 770	1 860	1 820
Characteristic value of maximum force of tendon		F_{pk}	kN	248	260	266	279	300
Maximum prestressing force [2]	$0.90 \cdot F_{p0.1}$		kN	196	206	211	221	238
Maximum overstressing force [2), 3)]	$0.95 \cdot F_{p0.1}$		kN	207	218	222	234	251

CONA CMM 0206 (two)

Strands		A_P	mm²	140		150		165 [1]
Characteristic tensile strength		f_{pk}	MPa	1 770	1 860	1 770	1 860	1 820
Characteristic value of maximum force of tendon		F_{pk}	kN	496	520	532	558	600
Maximum prestressing force [2]	$0.90 \cdot F_{p0.1}$		kN	392	412	421	443	475
Maximum overstressing force [2), 3)]	$0.95 \cdot F_{p0.1}$		kN	414	435	445	467	502

CONA CMM 0406 (four)

Strands		A_P	mm²	140		150		165 [1]
Characteristic tensile strength		f_{pk}	MPa	1 770	1 860	1 770	1 860	1 820
Characteristic value of maximum force of tendon		F_{pk}	kN	992	1 040	1 064	1 116	1 200
Maximum prestressing force [2]	$0.90 \cdot F_{p0.1}$		kN	785	824	842	886	950
Maximum overstressing force [2), 3)]	$0.95 \cdot F_{p0.1}$		kN	828	870	889	935	1 003

1) Compacted strand

2) The given value are maximum values according to Eurocode 2. The actual values are to be taken from the standards and regulations in force at the place of use. Conformity with the stabilisation and crack width criteria in the load transfer test has been verified to a level of $0.80 \cdot F_{pk}$.

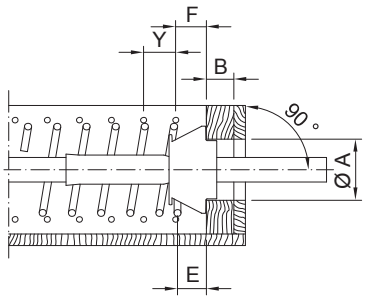
Where F_{pk} ..... Characteristic value of maximum force of tendon

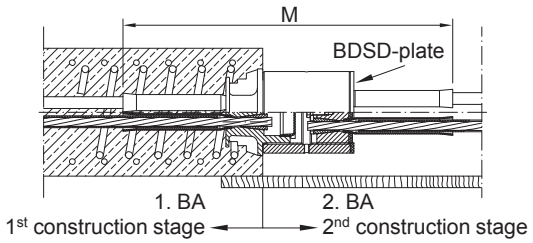
$F_{p0.1}$ ..... Characteristic value of 0.1 % proof force of tendon

For strands according to prEN 10138-3, 09.2000, the value shall be multiplied by 0.98.

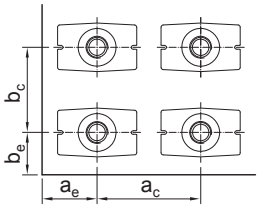
3) Overstressing is permitted if the force in the prestressing jack can be measured to an accurancy of ± 5 % of the final value of the prestressing force.

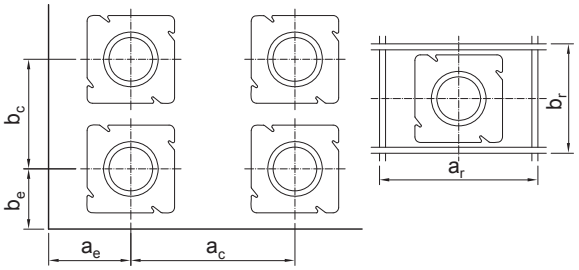
Stressing and fixed anchorage / coupler





Centre and edge distance



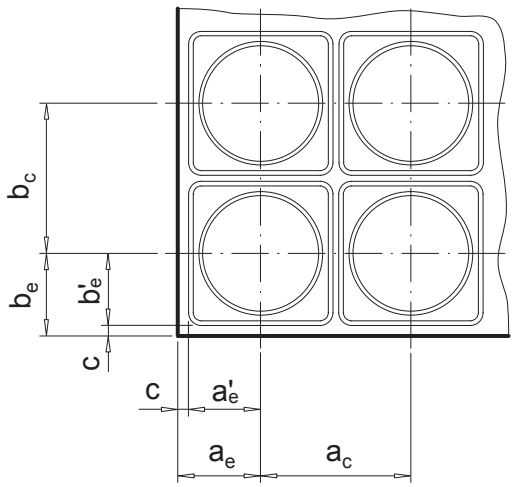


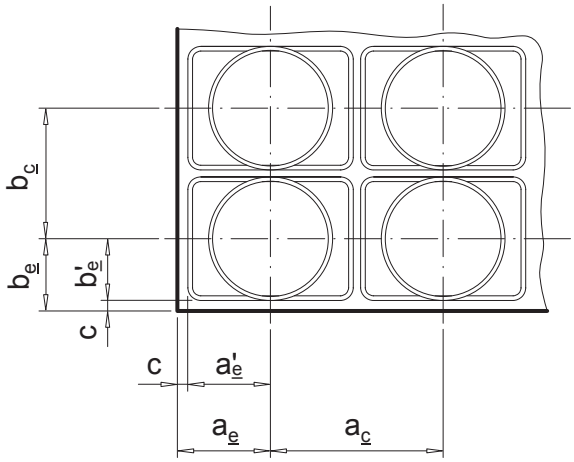
Technical data of the BBR VT CONA CMM anchorage system

CONA CMM [1]			**0106 (single)**					**0206 (two)**					**0406 (four)**				
Strands	A_P	mm²	**140**		**150**		**165**	**140**		**150**		**165**	**140**		**150**		**165**
Char. tensile strength	f_{pk}	MPa	1 770	1 860	1 770	1 860	1 820	1 770	1 860	1 770	1 860	1 820	1 770	1 860	1 770	1 860	1 820
Char. value of maximum force	F_{pk}	kN	248	260	266	279	300	496	520	532	558	600	992	1040	1064	1116	1200
0.90 · $F_{p0.1k}$ [2]		kN	196	206	211	221	238	392	412	421	443	475	785	824	842	886	950
0.95 · $F_{p0.1k}$ [2]		kN	207	218	222	234	251	414	435	445	467	502	828	870	889	935	1003
Dimensions of strands / band		mm	Ø 20					2 × ∅20 / 44 × 20					4 × ∅20 / 90 × 20				
Minimum concrete strength																	
Cube	$f_{cm,0}$	MPa	≥ 24														
Cylinder	$f_{cm,0}$	MPa	≥ 20														
Helix - The anchorage sided end is welded								Ribbed reinforcing steel, R_e ≥ 500 MPa									
Outer diameter		mm						100					160				
Bar diameter		mm						10					12				
Length, approx.		mm						180					275				
Pitch		mm						40					50				
Number of pitches		—						4+1					5+1				
Distance	E	mm						50					45				
Additional reinforcement			Ribbed reinforcing steel, R_e ≥ 500 MPa														
Number of stirrups		—	2					4					6				
Bar diameter		mm	8					10					10				
Spacing	Y	mm	50					50					55				
Distance from anchor plate	F	mm	55					25					53				
Outside dimensions	a_r	mm	140					180					260				
	b_r	mm	100					130					180				
Centre and edge spacing																	
Minimum centre spacing	a_c	mm	180					200					300				
	b_c	mm	140					150					220				
Minimum edge distance	a_e	mm	70 + c					90 + c					130 + c				
	b_e	mm	50 + c					65 + c					90 + c				
Bore in forms	ØA	mm	65					103					103				
Bore in forms for coupler 1. BA	ØA	mm	62					—					113				
Depth	B	mm	50					50					50				
Coupler	M	mm	~ 545					—					~ 565				

[1] For strand pattern see Annex 2.
[2] For strands according to prEN 10138-3, 09.2000, the values shall be multiplied by 0.98.
[3] c .....Concrete cover

Centre spacing and edge distance





a_c, b_c $\quad a_c \geq b_c$

a_e, b_e $\quad a_e \geq b_e$

Modification of centre spacing and edge distance in accordance with the Clauses 1.7 and 2.2.3.4.

$$b_c \geq \begin{cases} 0.85 \cdot b_c \\ \text{and} \\ \geq \text{Helix, outside diameter } ^{1)} \end{cases}$$

$$a_c \geq \frac{A_c}{b_c}$$

$$A_c = a_c \cdot b_c \leq a_c \cdot b_c$$

Corresponding edge distances

$$a_e = \frac{a_c}{2} - 10\ \text{mm} + c$$

and

$$b_e = \frac{b_c}{2} - 10\ \text{mm} + c$$

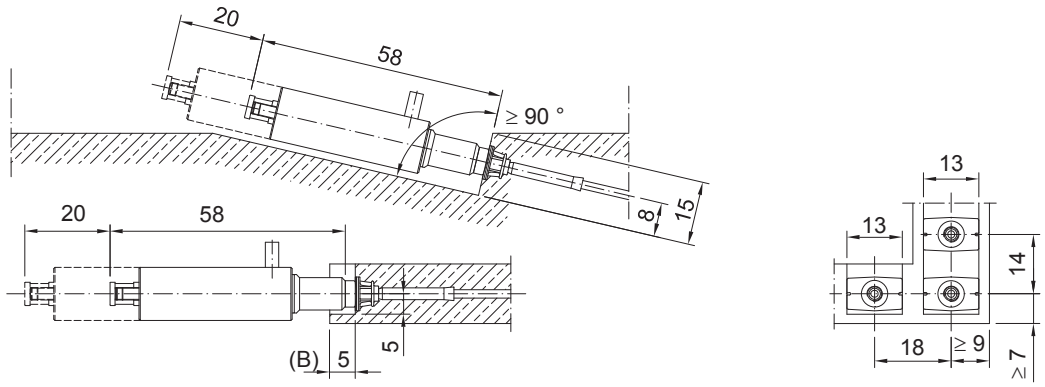
c ..... Concrete cover

[1)] ..... The outer dimensions of the additional reinforcement are adjusted accordingly. Further modifications of reinforcement have to be in accordance with Clause 2.2.3.4.

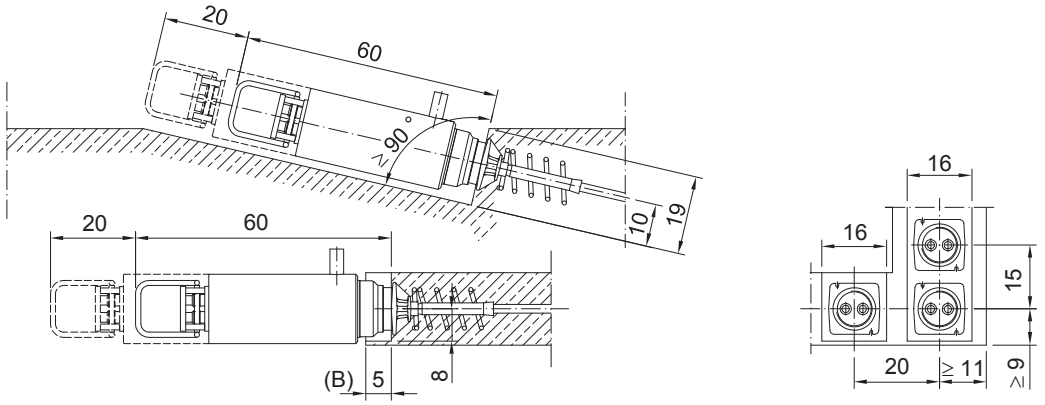
Construction examples, minimised anchorage recess dimensions

Tendon CONA CMM 0106 (single)
Strand excess length 70 cm

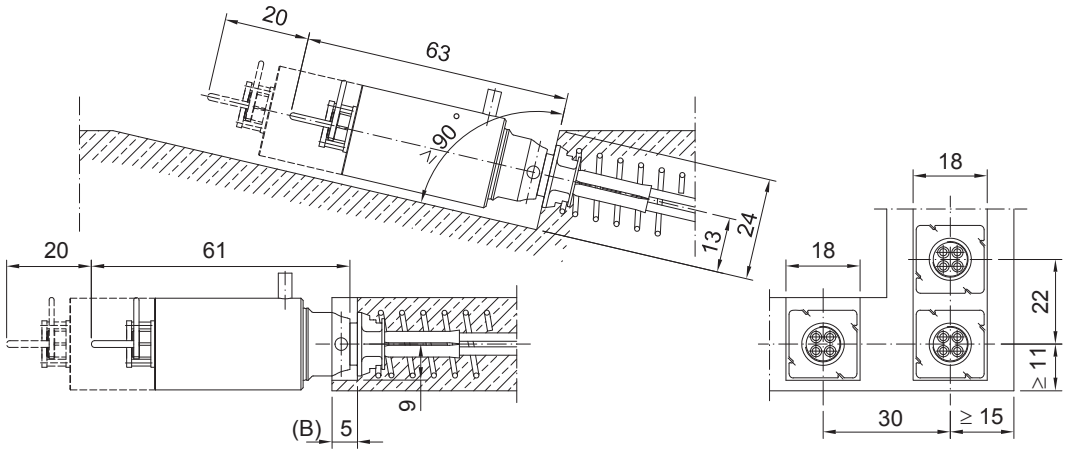
supposed 2 cm concrete cover



Tendon CONA CMM 0206 (two)
Strand excess length 40 cm



Tendon CONA CMM 0406 (four)
Strand excess length 40 cm

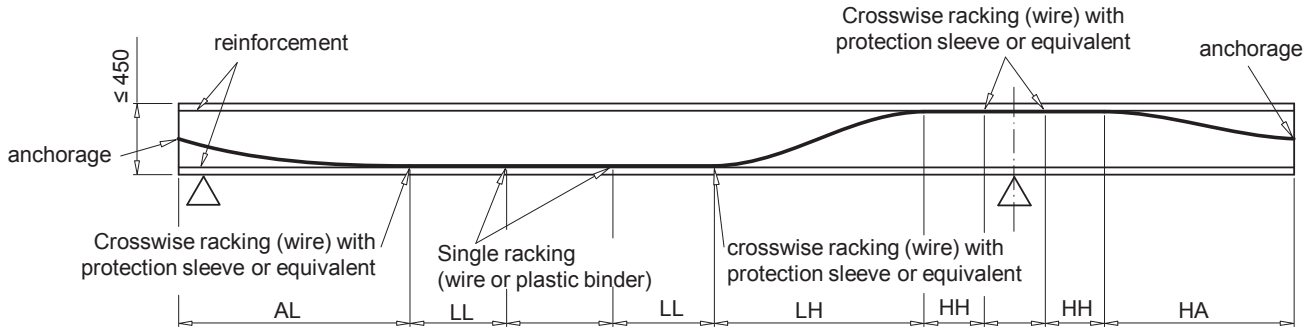


If other prestressing jacks will be used, different minimum dimensions may apply. Ask ETA holder for advice.

Dimensions in cm

BBR CONA CMM	**Unbonded Post-tensioning System** Dimensions of anchorage recesses	**Annex 10** of European Technical Assessment **ETA-06/0165** of 22.07.2016

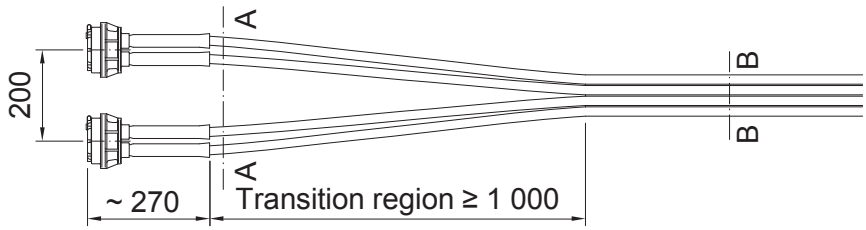
Free tendon layout



Typical zones		max. distances	min. number	Racking
AL	Anchorage – Low point	3 m	—	Crosswise
LL	Low point – Low point	1.0–1.3 m	2	Single wire
LH	Low point – High point	3 m	—	Crosswise
HH	High point – High point	0.3–1.0 m	2	Crosswise
HA	High point – Anchorage	1.5 m	—	Crosswise

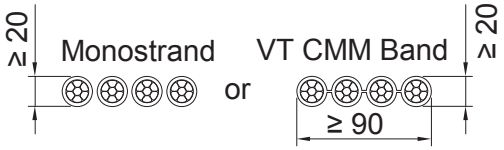
Transition regions

Tendon CONA CMM 0206 (two)

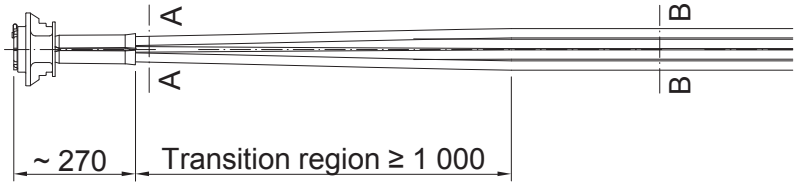


Section A-A

Section B-B

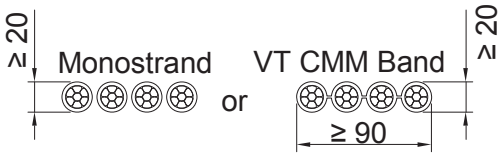


Tendon CONA CMM 0406 (four)



Section A-A

Section B-B



Dimensions in mm

CONA CMM	**Unbonded Post-tensioning System** Free tendon layout – Transition regions	**Annex 11** of European Technical Assessment **ETA-06/0165** of 22.07.2016

Member of EOTA

PT Works	A) Manufacturing of the tendon	Construction Works

1) Longitudinal cutting of the VT CMM Band [1]
2) Removing the PE-sheathing at the end
3) Wrapping the single strands with bandage filled with corrosion protective filling material in the region of the transition pipe
4) Mounting the anchor block on the strands
5) Prelocking the anchor block
6) Securing wedges with wedge holding rings or holding plate [2]
7) Filling protection cap with corrosion protective filling material and screwing it onto the anchor block
8) Coiling according to the tendon list and fixing the tendon for transport / Transport [3]

B) Preliminary site works

1) Erection of the formwork

Fastening the active anchor block (SA, H 1. BA) on the formwork

2) Placing reinforcement bottom layer and supporting stirrups

C) Tendon installation

1) Placing the tendon
2) Fastening the tendon with wire or plastic binder at the bottom layer and supporting stirrups

Coupling [4]: The coupler anchor block 2. BA is mounted and prelocked on the prefabricated tendon
3) Placing the coupler anchor block (construction stage 2)
4) Screwing-on the coupler sleeve on the coupler anchor 1. BA, meanwhile or afterwards filling of the space inside the coupler sleeve and both coupler anchor blocks with corrosion protective filling material.

Connecting tendon with the active anchor block (SA, H 1.BA)
5) Longitudinal cutting of the VT CMM Band [1]
6) Removing the PE-sheathing at the end
7) Wrapping the single strands with bandage filled with corrosion protective filling material in the region of the transition pipe
8) Inserting the strands into the anchor block
9) Putting on removed PE-sheathing to protect excess strand length

10) Placing reinforcement top layer

11) Fastening tendon with wire or plastic binder on the reinforcement top layer

D) Concreting of the structure

1) Concreting the structure, recommended to make testing cubes
2) Determining concrete strength
3) Dismantling the formwork at the active anchorage side

E) Stressing and finishing work

1) Removal of protecting PE-sheaths and check whether cones are clean
2) Inserting ring wedges
3) Stressing the tendon according to stressing order
4) Cutting excess strand lengths
5) Filling protection cap with corrosion protective filling material and screwing it onto the anchor block

6) Filling of the anchorage recess with concrete [5]

[1] not applicable when assembling a tendon VT CMM 106 or monostrand
[2] applicable case of using an anchor body K VT CMM 406 – 2. BA
[3] not applicable in case of manufacturing on the site
[4] only applicable when using a coupler
[5] not applicable when assembling a coupler construction stage 1

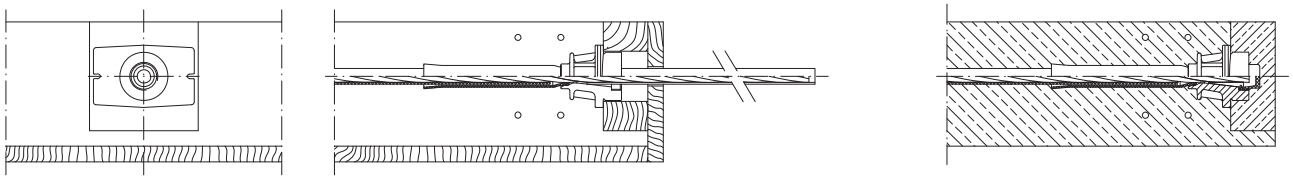
CONA CMM

Unbonded Post-tensioning System
Description of worksteps – Anchorage
Fixed coupler construction stages 1 and 2

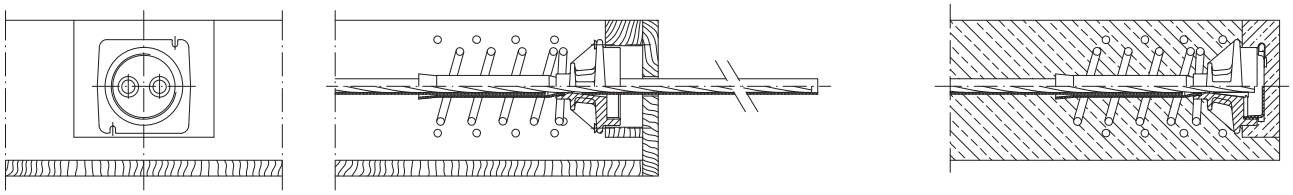
Annex 12
of European Technical Assessment
ETA-06/0165 of 22.07.2016

Construction stages

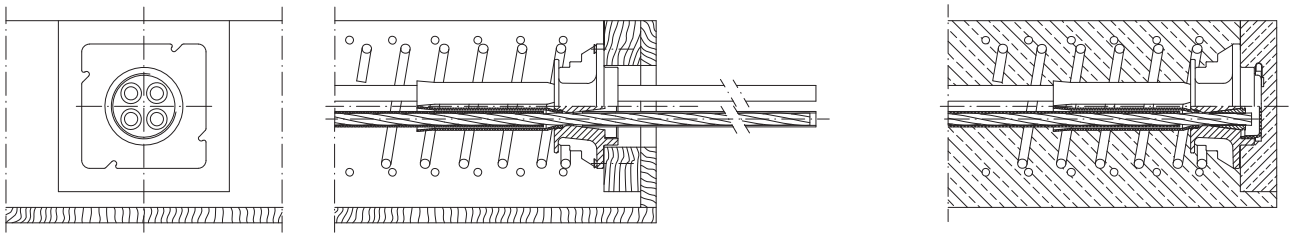
Tendon CONA CMM 0106 (single)



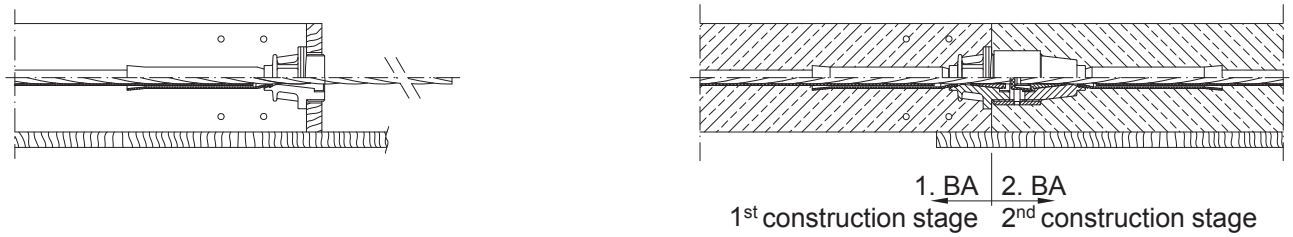
Tendon CONA CMM 0206 (two)



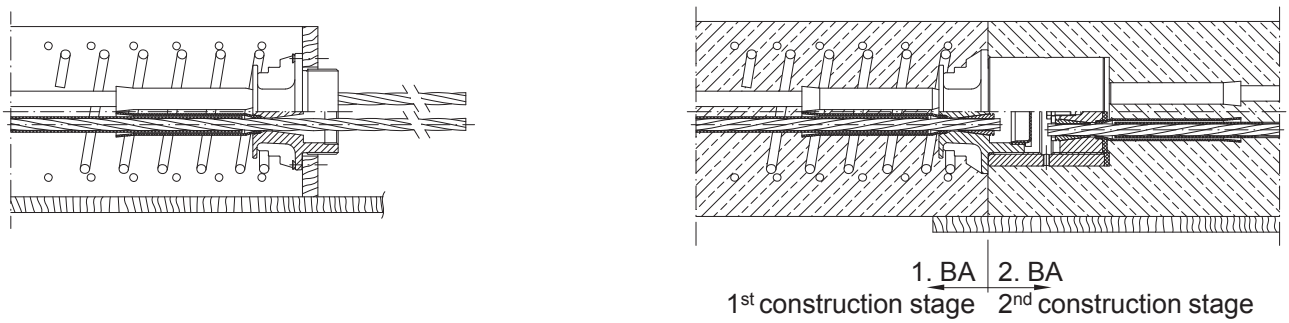
Tendon CONA CMM 0406 (four)



Fixed coupler CONA CMM 0106 (single)



Fixed coupler CONA CMM 0406 (four)



CONA CMM	**Unbonded Post-tensioning System** Construction stages – Anchorages and fixed couplers	**Annex 13** of European Technical Assessment **ETA-06/0165** of 22.07.2016

Contents of the prescribed test plan

Component	Item	Test / Check	Trace-ability	Minimum frequency	Documentation
Anchor head, Coupler anchor head	Material	Check	Full	100 %	"3.1" [1)]
	Detailed dimensions [2)]	Test		5 % ≥ 2 specimens	Yes
	Visual inspection [3), 4)]	Check		100 %	No
Ring wedge	Material	Check	Full	100 %	"3.1" [1)]
	Treatment, hardness [5), 6)]	Test		0.5 % ≥ 2 specimens	Yes
	Detailed dimensions [7)]	Test		5 % ≥ 2 specimens	Yes
	Visual inspection [3)]	Check		100 %	No
Coupler sleeve	Material	Check	Full	100 %	"3.1" [1)]
	Detailed dimensions [2)]	Test		5 % ≥ 2 specimens	Yes
	Visual inspection [3)]	Check		100 %	No
VT CMM Band	Material of strand	Check	Full	100 %	"CE" [1)]
	Diameter of strand	Test		Each coil	N0
	Visual inspection of strand [3)]	Check		Each coil	No
	HDPE-sheath [6)]	Check		100 % ETAG 013, Annex C.1	Yes
	Corrosion protective filling material [6)]	Check		100 % ETAG 013, Annex C.1	Yes
	Material of VT CMM Band [8)]	Test		ETAG 013, Annex C.1	Yes
	Visual inspection of VT CMM Band [3)]	Check		100 %	No
Individual monostrand	Material of strand	Check	Full	100 %	"CE" [1)]
	Diameter of strand	Test		Each coil	No
	Visual inspection of strand [3)]	Check		Each coil	No
	Material of individual monostrand [6), 8)]	Check		100 % ETAG 013, Annex C.1	Yes
	Visual inspection of individual monostrand [3)]	Check		100 %	No

1) "3.1": Inspection certificate type "3.1" according to EN 10204
2) Other dimensions than [4)]
3) Visual inspections includes e.g. main dimensions, gauge testing, correct marking or labelling, appropriate performance, surface, fins, kinks, smoothness, corrosion, coating etc., as detailed in the prescribed test plan.
4) Dimensions: All conical bores of the anchor heads and coupler anchor heads regarding angle, diameter and surface condition, thread dimensions of all anchor heads and coupler anchor heads
5) Surface hardness
6) Suppliers certificate
7) Geometrical properties
8) According to ETAG 013, Annex C.1.4

Full..... Full traceability of each component to its raw materials.
Bulk .... Traceability of each delivery of components to a defined point.

Audit testing

Component	Item	Test / Check	Sampling [2] – Number of components per visit
Anchor head, Coupler anchor head	Material according to specification	Test / Check	1
	Detailed dimensions	Test	
	Visual inspection [1]	Check	
Coupler sleeve	Material according to specification	Test / Check	1
	Detailed dimensions	Test	
	Visual inspection [1]	Check	
Ring wedge	Material according to specification	Test / Check	2
	Treatment	Test	2
	Detailed dimensions	Test	1
	Main dimensions, surface hardness	Test	5
	Visual inspection [1]	Check	5
Individual monostrands or VT CMM Bands	Material according to specification	Test / Check	1
	Diameter	Test	
	Visual inspection [1]	Check	
Strand	Material according to specification	Test / Check	1
Single tensile element test	Single tensile element test according to ETAG 013, Annex E.3	Test	1 series

[1] Visual inspections means e.g. main dimensions, gauge testing, correct marking or labelling, appropriate performance, surface, fins, kinks, smoothness, corrosion protection, corrosion, coating etc., as given in the prescribed test plan.

[2] All samples shall be randomly selected and clearly identified.

№	Essential Characteristic	Clause	Intended use Line № according to Clause 2.1, Table 6 and Table 7		
			1	2	3
1	Resistance to static load	3.1.1.1	+	+	+
2	Resistance to fatigue	3.1.1.2	+	+	+
3	Load transfer to the structure	3.1.1.3	+	+	—
4	Friction coefficient	3.1.1.4	+	+	+
5	Deviation, deflection (limits)	3.1.1.5	+	+	+
6	Practicability, reliability of the installation	3.1.1.6	+	+	+
7	Content, emission and/or release of dangerous substances	3.1.2	+	+	+
8	Related aspects of serviceability	3.1.3	+	+	+
9	Tendons in masonry structures – Load transfer to the structure	3.1.4.1	—	—	+

Key
+……..Essential characteristic relevant for the intended use
—…… Essential characteristic not relevant for the intended use
For combinations of intended uses the essential characteristics of all intended uses composing the combination are relevant.

Reference documents

Guideline for European Technical Approval

ETAG 013, 06.2002	Guideline for European Technical Approval of Post-Tensioning Kits for Prestressing of Structures

Standards

EN 206, 12.2013	Concrete: Specification, performance, production and conformity
EN 1563, 12.2011	Founding – Spheroidal graphite cast irons
Eurocode 2	Eurocode 2: Design of concrete structures
Eurocode 3	Eurocode 3: Design of steel structures
Eurocode 4	Eurocode 4: Design of composite steel and concrete structures
Eurocode 6	Eurocode 6: Design of masonry structures
EN 10025-2, 11.2004 EN 10025-2/AC, 06.2005	Hot rolled products of structural steels – Part 2: Technical delivery conditions for non-alloy structural steels
EN 10083-1, 08.2006	Steels for quenching and tempering – Part 1: General technical delivery conditions
EN 10083-2, 08.2006	Steels for quenching and tempering – Part 2: Technical delivery conditions for non alloy steels
EN 10084, 04.2008	Case hardening steels – Technical delivery conditions
EN 10204, 10.2004	Metallic products – Types of inspection documents
EN 10210-1, 04.2006	Hot finished structural hollow sections of non-alloy and fine grain steels – Part 1: Technical delivery conditions
EN 10277-2, 03.2008	Bright steel products – Technical delivery conditions – Part 2: Steels for general engineering purposes
EN ISO 16396-1, 02.2015	Plastics – Polyamide (PA) moulding and extrusion materials – Part 1: Designation system, marking of products and basis for specifications
EN ISO 17855-1, 10.2014	Plastics – Polyethylene (PE) moulding and extrusion materials – Part 1: Designation system and basis for specifications
prEN 10138-3, 09.2000	Prestressing steels – Part 3: Strand
prEN 10138-3, 08.2009	Prestressing steels – Part 3: Strand
CWA 14646, 01.2003	Requirements for the installation of post-tensioning kits for prestressing of structures and qualification of the specialist company and its personnel

Certificate of constancy of performance
0432-CPR-00299-1.2

Version 02

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 VT CONA CMM – Unbonded Post-tensioning System with 01, 02 and 04 Strands

(Post-tensioning kit for prestressing of structures with internal unbonded strands)

placed on the market under the name or trade mark of

BBR VT International Ltd

Ringstr. 2
8603 Schwerzenbach (ZH) / Switzerland

and produced in the manufacturing plant(s)

BBR VT International Ltd

Ringstr. 2
8603 Schwerzenbach (ZH) / Switzerland

This certificate attests that all provisions concerning the assessment and verification of constancy of performance described in the

ETA-06/0165, issued on 22.07.2016

and

ETAG 013 - Post Tensioning Kits for prestressing of Structures

under **system 1+** for the performance set out in the ETA are applied and that the factory production control conducted by the manufacturer is assessed to ensure the

constancy of performance of the construction product.

This certificate was first issued on 07.09.2016 and will remain valid until 06.09.2021 as long as neither the ETA, the EAD, 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, 07.09.2016

Dipl.-Ing. Opitz
Head of Certification Body

Materialprüfungsamt MPA NRW 10 Nordrhein-Westfalen

This Certificate consists of 1 page.

This Certificate replaces the Certificate no. 0432-CPR-00299-1.2 dated 07.09.2016, Version 01.

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-11142-01-01

KB Vorspann-Technik GmbH
Weitwörth 25
5151 Nussdorf a. H.
Austria

Tel +43 6272 40790
Fax +43 6272 40790 11

www.kb-vt.com
office@kb-vt.com

KB Vorspann-Technik GmbH
Bahnhofstrasse 108
82166 Gräfelfing
Germany

Tel +49 89 724 49 69 0
Fax +49 89 724 49 69 12

www.kb-vt.com
office@kb-vt.com

BBR VT International Ltd
Technical Headquarters and Business Development Centre
Switzerland

BBR A Global Network of Experts
www.bbrnetwork.com