Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-13/0810 of 28 June 2018

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	BBV L1 P
Product family to which the construction product belongs	PAC 16, Post-Tensioning kits (internal unbonded for strands)
Manufacturer	BBV Systems GmbH Industriestraße 98 67240 Bobenheim-Roxheim DEUTSCHLAND
Manufacturing plant	Werk 1, D Werk 2, PL
This European Technical Assessment contains	21 pages including 15 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 160004-00-0301

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Specific Part

1 Technical description of the product

1.1 Definition of the construction product

The European Technical Assessment applies to the post-tensioning kit for prestressing of structures with the trade name:

BBV L1 P – Internal Unbonded Strand Post-Tensioning System

consisting of 1 strand with a nominal tensile strength 1770 N/mm² or 1860 N/mm² (Y1770 S7 or Y1860 S7 in according with prEN 10138-3, table 4), nominal diameter 15.3 mm (0.6" – 140 mm²) or 15.7 mm (0.62" - 150 mm²), factory-equipped with a corrosion protection system consisting of corrosion-protection grease and extruded PE-sheathing with a 1.5 mm wall thickness, which are used in normal-weight concrete with the following anchorages (stressing and fixed anchorages):

1. Stressing (active) anchor type S and fixed (passive) anchor type F in the shape of multiple plane anchorages for tendons of 1 strand,

Additional components of the present Post-tensioning system are:

2. Bursting reinforcement (stirrups),
3. Corrosion protection.

The anchorage of the strands in anchor heads is done by means of wedges.

The components and the system setup of the product are given in Annex A.

1.2 Strands

Only 7-wire strands shall be used in accordance with national provisions and with the characteristics given in Table 1:

Table 1: Dimensions and properties of 7-wire strands

Designation	Symbol	Unit	Value	
Tensile strength	Rm	MPa	1770 or 1860	
Strand				
Nominal diameter	D	mm	15.3	15.7
Nominal cross section	A_p	mm²	140	150
Nominal mass	M	g/m	1093	1172
Individual wires				
External wire diameter	d	mm	5.0 ± 0.04	5.2 ± 0.04
Core wire diameter	d'	mm	1.02 to 1.04 d	1.02 to 1.04 d

A tendon consists only of the same diameter and the same strength. Further characteristic values of the strands see Annex A7.

1.3 Wedges

To wedging the prestressing steel strands shall be used Wedges type 30, smooth or knurled, (see Annex A3). The knurled wedges shall only be used for pre-wedged (pre-locked) ones at fixed anchors. The segments of the wedges for strands Ø 15.7 mm shall be marked with "0.62".

1.4 Anchor heads (stressing- and fixed anchors)

The dimension of the anchor heads shall be in accordance with Annex A2. The conical bores of anchor heads shall be deburred. For installation, they shall be clean, free from rust and provided with corrosion protection grease.

1.5 Addinational Reinforcement (Stirrups)

The steel grades and dimensions of the stirrups shall comply with the values given in the Annexes.

1.6 Corrosion protection of the free tendon length in the anchorage zone

The strand is provided in the factory of prestressing steel with a corrosion protection consisting of corrosion protection grease and extruded HDPE sheathing.

The area of strand not protected with PE sheath shall be completely covered by PE-connection duct and PE protective cap with clamping ring, etc. according to section 3.6, Annex B2 and Annexes A5 and A6 and filled with corrosion protection mass. The transitions, which are not self-sealing, should be carefully sealed by wrapping with PE glue tape (Annexes A3 to A6).

The corrosion protection mass shall comply with EAD 160027-00-0301 and national regulations.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the PT-System is used in compliance with the specifications and conditions given in Annex B.

Specific details for installation and use are given in Annexes B1 and B2.

The test and assessment methods underlying this ETA lead to the assumption of a useful life of least 100 years. This useful life information cannot be construed as a warranty of the manufacturer, but it is an aid in selecting the right products for the expected economically reasonably life of the work.

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

No.	Essential characteristic	Performance (NPA = No Performance Assessed)
BWR 1: Mechanical restistance and stability		
1	Resistance to static load	The acceptance criterion to EAD 160004-00-0301 clause 2.2.1 is fulfilled, see Annex B
2	Resistance to fatigue	The acceptance criterion to EAD 160004-00-0301 clause 2.2.2 is fulfilled, see Annex B
3	Load transfer to structure	The acceptance criterion to EAD 160004-00-0301 clause 2.2.3 is fulfilled, see Annex B
4	Friction coefficient	The acceptance criterion to EAD 160004-00-03-01 clause 2.2.4 is fulfilled, see Annex C
5	Deviation/ deflection (limits) for internal bonded and internal unbonded tendon	The acceptance criterion to EAD 160004 00-0301 clause 2.2.5 is fulfilled, see Annex B
6	Deviation/ deflection (limits) for external tendon	NPA
7	Assessment of assembly	The acceptance criterion to EAD 160004-00-0301 clause 2.2.7 is fulfilled

8	Resistance to static load under cryogenic conditions for applications with anchorage/coupling outside the possible cryogenic zone	NPA
9	Resistance to static load under cryogenic conditions for applications with anchorage/coupling inside the possible cryogenic zone	NPA
10	Material properties, component performance, system performance of plastic duct	NPA
11	Material properties, component performance, system performance of plastic duct to provide an encapsulated tendon	NPA
12	Material properties, component performance, system performance of plastic duct to provide an electrically isolated tendon	NPA
13	Corrosion protection	NPA
Monostrand, sheathing base material		
14	Melt index	NPA
15	Density	NPA
16	Carbon black	NPA
17	Tensile strenght	NPA
18	Elongation	NPA
19	Thermal stability	NPA
Monostrand, manufactured sheathing		
20	Tensile strenght	NPA
21	Elongation	NPA
22	Surface of sheathing	NPA
23	Environtal stress cracking	NPA
24	Temperature resistance	NPA
25	Resistance to externally applied agents (mineral oil, acid, base, solvents and salt water)	NPA
26	Sheating minimum thickness	NPA

Monostrand, manufactured monostrand		
27	External diameter of sheating	NPA
28	Mass of sheating per metre	NPA
29	Mass of filling material per metre	NPA
30	Alteration of dropping point caused by monostrand manufacturing	NPA
31	Alteration of oil separation caused by monostrand facturing	NPA
32	Impact resistance	NPA
33	Reibung zwischen Ummantelung und Litze	NPA
34	Leak tightness	NPA
BWR 2: Safety in case of fire		
35	Reaction to fire	NPA
BWR 3: Hygiene, health and the environment		
36	Content, emmission and/or release of dangerous substances	NPA

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

In accordance with the European assessment document EAD 160004-00-0301 the applicable European legal act is: [98/456/EC].

The system to be applied is: 1+

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

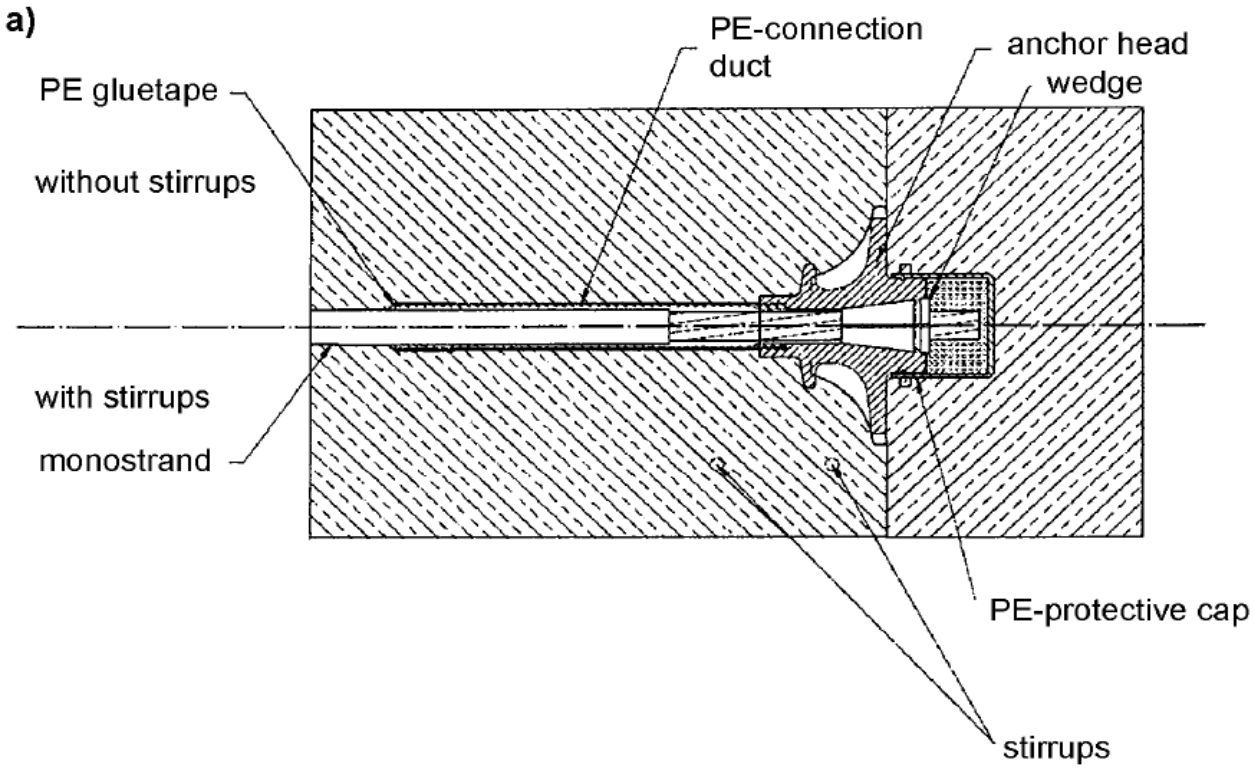
Issued in Berlin on 28 June 2018 by Deutsches Institut für Bautechnik

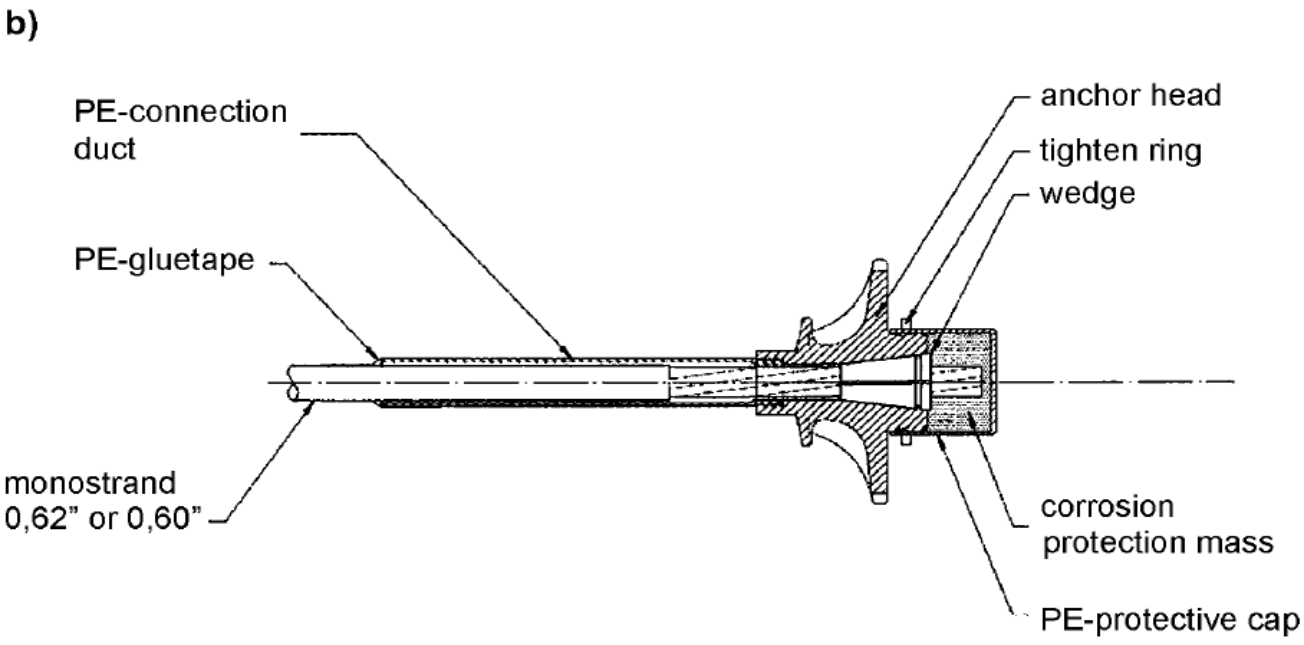
BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Sultani

Deutsches Institut für Bautechnik DIBt

BBV L1 P
Stressing- (S) and fixed anchors (F)





BBV L1 P	Annex A1
Description of the product a) Anchorage in concrete – b) complete anchorage	

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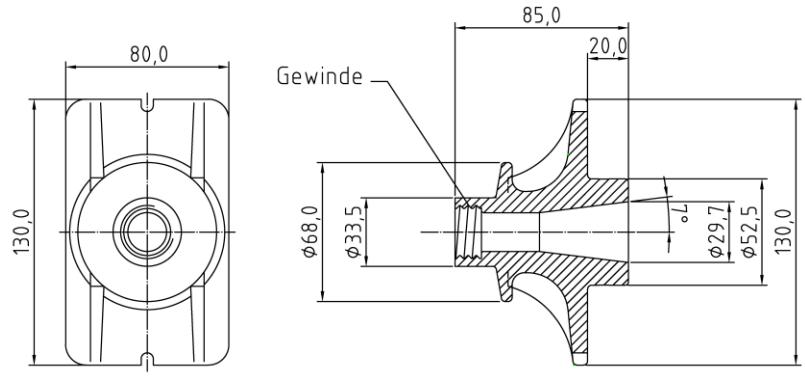
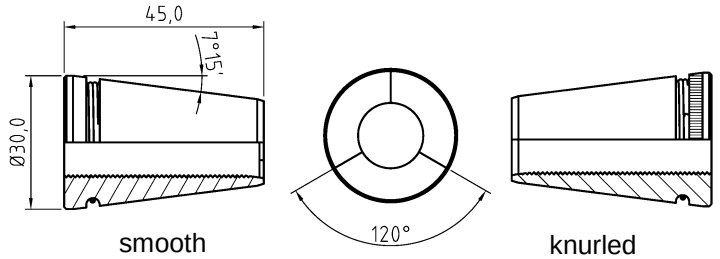
Representation of the components

Anchor Head (Stressing anchor (S), Fixed anchor (F))

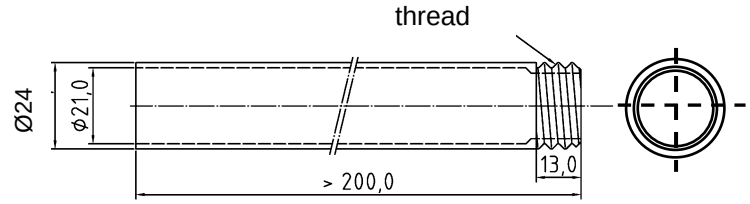


Wedges type 30

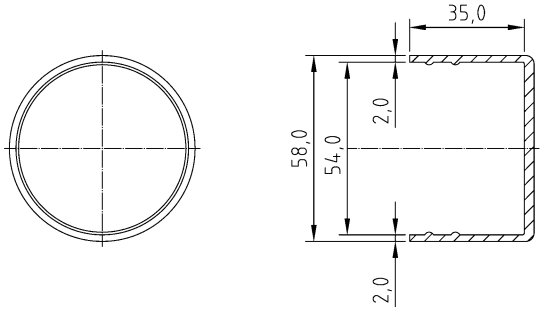


Wedges for different strand sizes have to be distinguishable. Wedges for 150 mm² strands are marked with *"0.62"* on the front face.

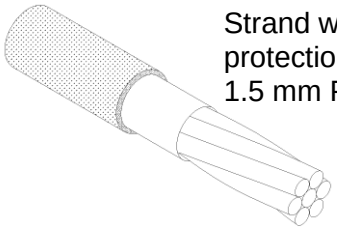
PE-connection duct



PE-protective cap with clamping ring



Monostrand



Strand with corrosion protection mass and 1.5 mm PE-sheath

BBV L1 P	
Description of the product Overview of the components	Annex A2

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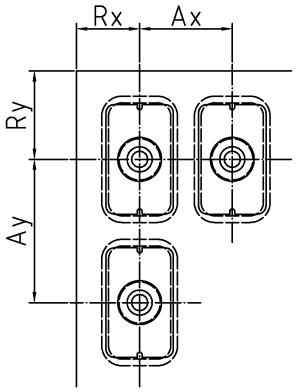
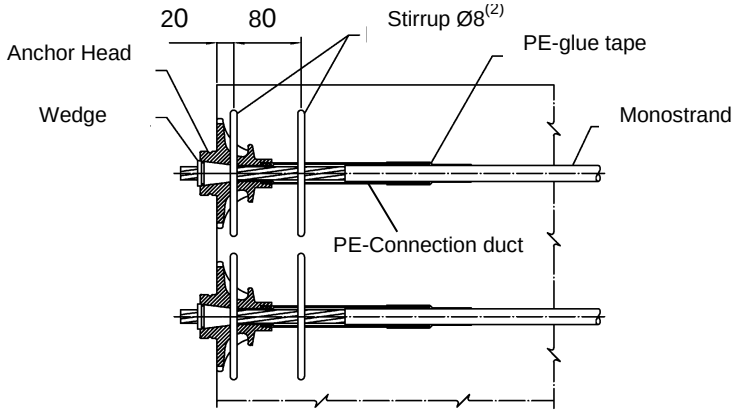
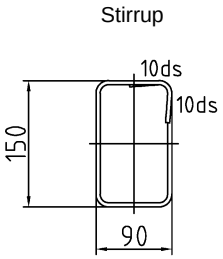
Technical details – Option with additional reinforcement

Tendon type	**Unit**	**BBV L1 P**			
Steel Grade	-	Y1860S7		Y1770S7	
Nominal Cross Section A_p	mm²	150	140	150	140
Nominal mass	kg/m	1.172	1.093	1.172	1.093
$P_{max} = 0{,}90 \times f_{p0,1k} \times A_p$ (1)	kN	216	202	205	192
$P_{m0}(x) = 0{,}85 \times f_{p0,1k} \times A_p$ (1)	kN	204	190	194	181
Max. Support Distance	m	1.0			
Wobble Coefficient k	°/m	0.5			
Mean Friction Coefficient μ	-	0.06			
Strand Protrusion(2)	mm	250			
Min. Strength of Concrete for Stressing					
$f_{cm0,cube150}$	N/mm²	22			
Additional Reinforcement / Stirrups (material see Annex C)					
Quantity	-	2			
Diameter	mm	8 / 10 (2)			
Min. Centre Distance and Min. Edge Distance without Stirrups					
Centre Distance(4) $f_{cmj,cube150} \geq 23$ N/mm²	mm	$A_x \times A_y$ 110 x 170			
Edge Distance (4), (5) $f_{cmj,cube150} \geq 23$ N/mm²	mm	$R_x \times R_y$ 45 + C (6) x 75 + C (6)			

(1) Based on $f_{p0,1k}$ = 1600 MPa (Y 1860S7) and 1520 MPa (Y1770S7)
(2) In case the mesh reinforcement is < 50 kg/m³, 2 x Ø10 have to be arranged
(3) distance from anchor head front face for placing of jack
(4) Concrete cover shall be taken into account additionally
(5) Min. edge distance: 0,5 x Centre distance + 20 mm (rounding up at 5 mm intervals)
(6) C: Concrete cover of stirrups







BBV L1 P

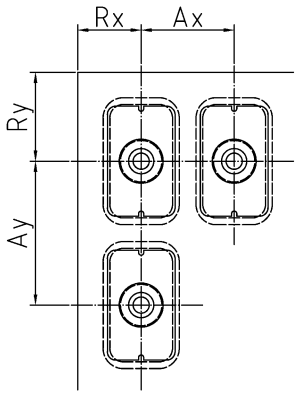
Description of the product
Technical Specification - Centre- and Edge Distance with Stirrups

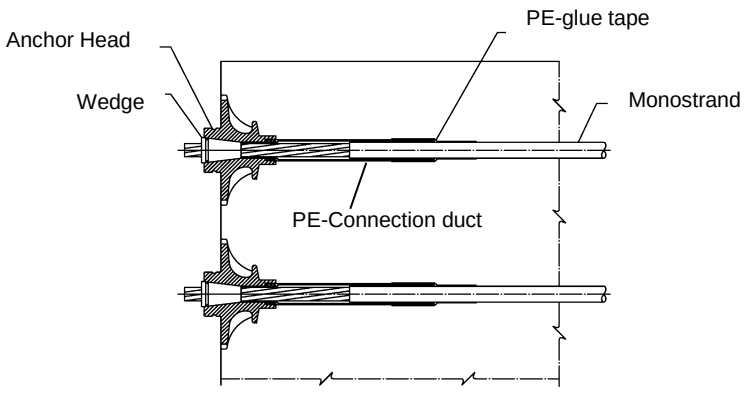
Annex A3

Technical details – Option without additional reinforcement

Tendon type	**Unit**	**BBV L1 P**			
Steel Grade	-	Y1860S7		Y1770S7	
Nominal Cross Section A_p	mm²	150	140	150	140
Nominal mass	kg/m	1.172	1.093	1.172	1.093
$P_{max} = 0{,}90 \times f_{p0,1k} \times A_p$ (1)	kN	216	202	205	192
$P_{m0}(x) = 0{,}85 \times f_{p0,1k} \times A_p$ (1)	kN	204	190	194	181
Max. Support Distance	m	1.0			
Wobble Coefficient k	°/m	0.5			
Mean Friction Coefficient μ	-	0.06			
Strand Protrusion(2)	mm	250			
Min. Strength of Concrete for Stressing					
$f_{cm0,cube150}$	N/mm²	23			
Min. Centre Distance and Min. Edge Distance without Stirrups					
Centre Distance(3) $f_{cmj,cube150} \geq 23$ N/mm²	mm	$A_x \times A_y$ 130 x 200			
Edge Distance (4) $f_{cmj,cube150} \geq 23$ N/mm²	mm	$R_x \times R_y$ 85 x 120			

(1) Based on $f_{p0,1k}$ = 1600 MPa (Y 1860S7) and 1520 MPa (Y1770S7)
(2) distance from anchor head front face for placing of jack
(3) Concrete cover shall be taken into account additionally
(4) Min. edge distance: 0,5 x Centre distance + 20 mm (rounding up at 5 mm intervals)





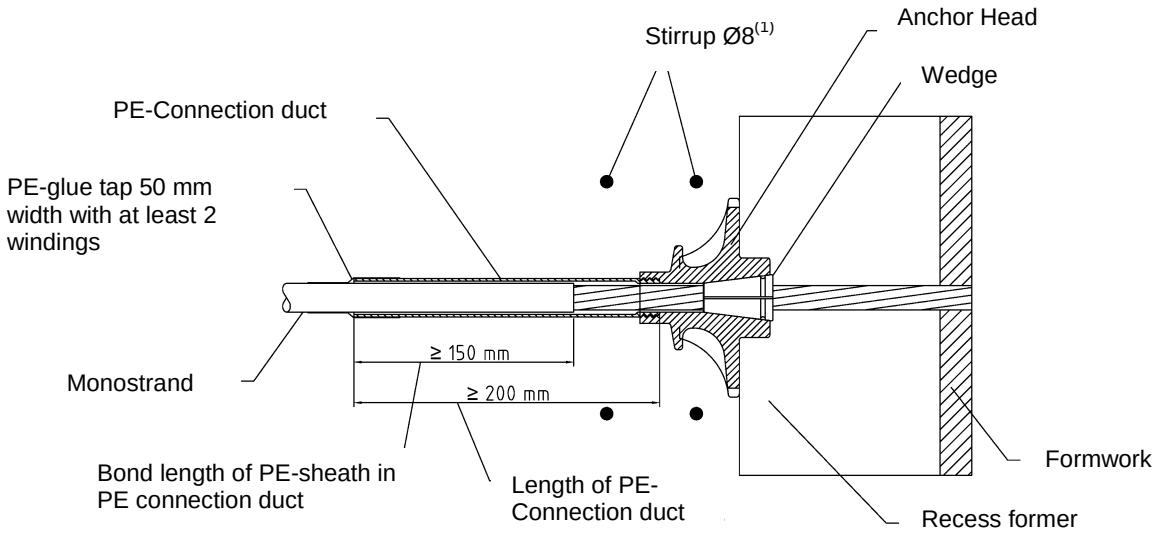
BBV L1 P

Description of the product
Technical Specification - Centre- and Edge Distance without Stirrups

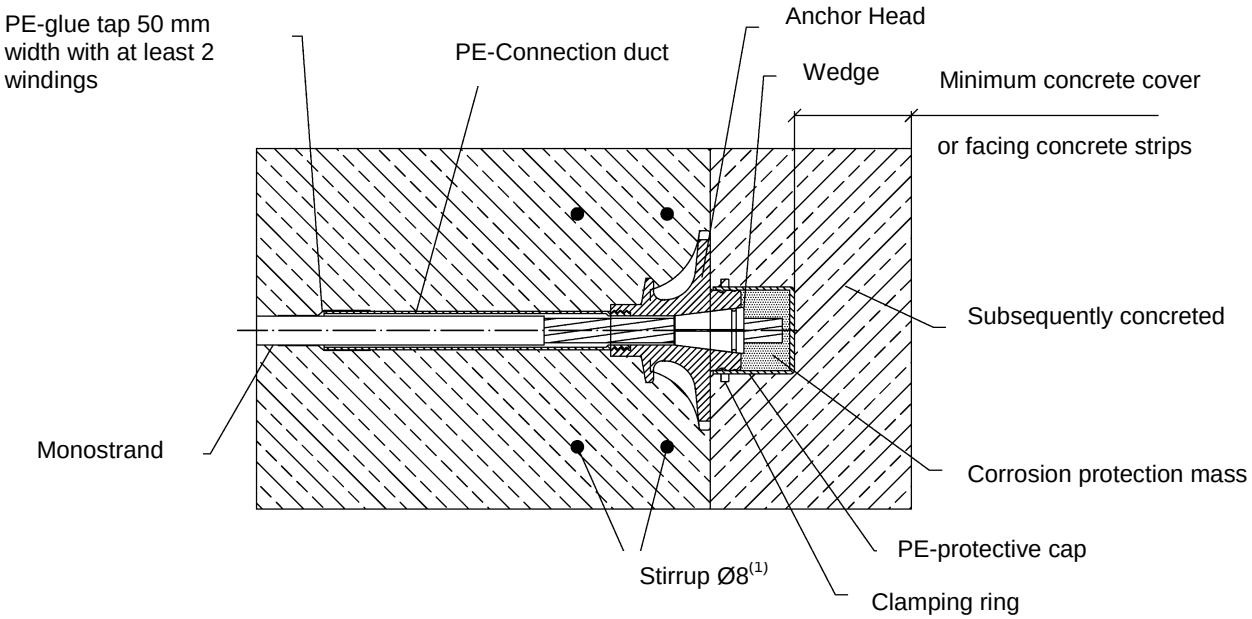
Annex A4

Structural design of the anchorage of single strands with additional reinforcement

Active Anchor (S) and passive Anchor (F) - Montage state



Active Anchor (S) and passive Anchor (F) - final state



(1) In case the mesh reinforcement is < 50 kg/m³, 2 x Ø10 have to be arranged

BBV L1 P	Annex A5
Description of the product Structural design of the anchorage of single strands with additional reinforcement	

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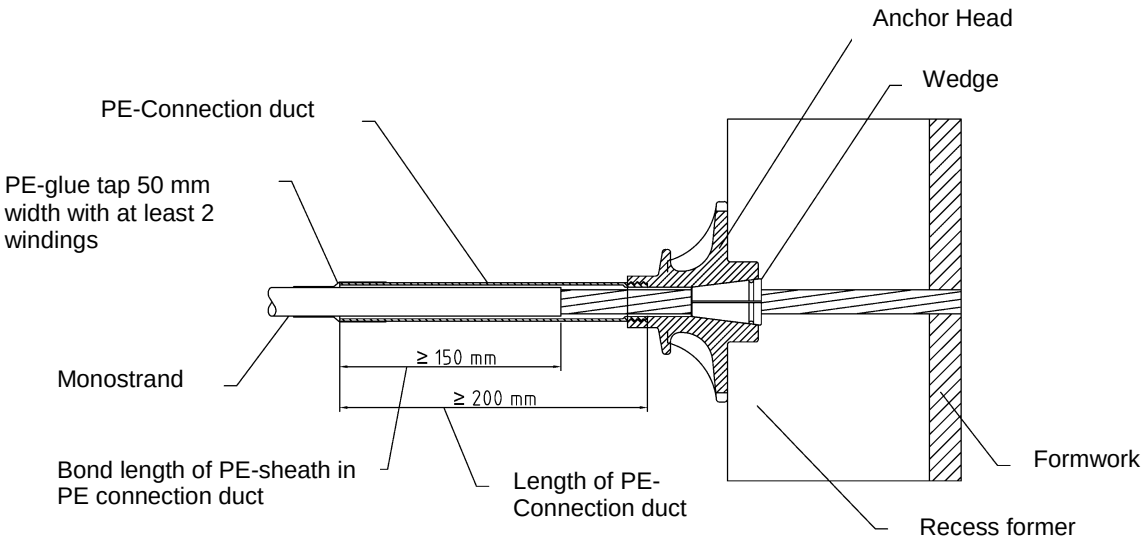
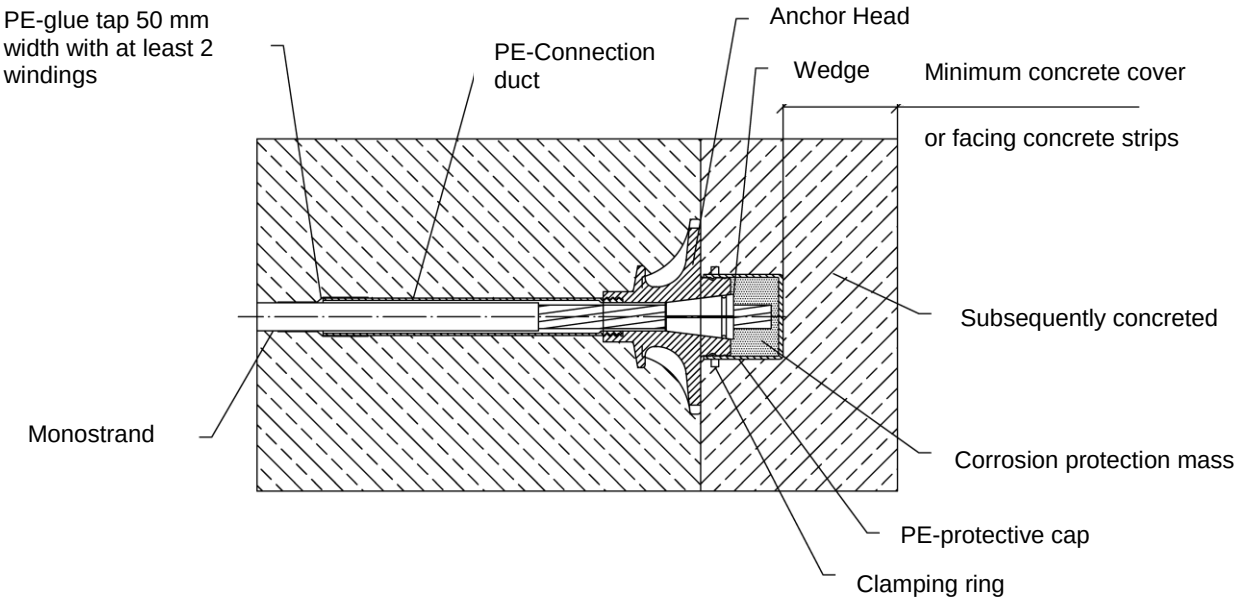
Structural design of the anchorage of single strands without additional reinforcement

Active Anchor (S) and passive Anchor (F) - Montage state



Active Anchor (S) and passive Anchor (F) - final state



BBV L1 P	Annex A6
Description of the product Structural design of the anchorage of single strands without additional reinforcement	

Dimensions and Properties of 7-wire Strands

Designation	Symbol	Unit	Value	
Tensile strength	R_m/f_{pk}	MPa	1770 or 1860	
Strand				
Nominal diameter	D	mm	15.3	15.7
Nominal cross section	A_p	mm²	140	150
Nominal mass	M	g/m	1093	1172
Surface configuration	-	-	plain	
Strength at 0,1%	$f_{p0.1k}$	MPa	1520 or 1600*	
Strength at 0,2%	$f_{p0.2}$	MPa	1570 or 1660	
Modulus of elasticity	E	MPa	≈ 195,000	
Individual wires				
External wire diameter	d	mm	5.0 ± 0.04	5.2 ± 0.04
Core wire diameter	d'	mm	1.02 to 1.04 d	1.02 to 1.04 d

* If admissible in the place of use, strands with higher characteristic yield stresses might be used, but not more than $f_{p0,1k} \geq 1560$ MPa (Y1770S7) or 1640 MPa (Y1860S7).

As long as prEN 10138-3:2009-08 has not been adopted 7-wire strands in accordance with national provisions and with the characteristics given in the table above shall be used.

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1 Intended use

The Post-Tensioning System is intended to be used for the prestressing of structures of normal-weight concrete with internal unbonded tendons.

The structural members are to be designed in accordance with national regulations.

To avoid confusions only strands with one nominal diameter shall be used on one site. If the use of the strands with R_m = 1860 MPa is intended on site, these shall solely be used there.

2 Methods of verification

2.1 General

The structural members prestressed by means the BBV L1 P-Internal Unbonded Strand Post-Tensioning System have to be designed in accordance with national regulations.

2.2 Tendons

Prestressing and overtensioning forces are specified in the respective national provisions.

The maximum force P_{max} applied to a tendon shall not exceed the force $P_{max} = 0.9\ A_p\ f_{p0,1k}$ accordance Table B1 (140 mm² or 150 mm²). The value of the prestressing initial prestress force $P_{m0}(x)$ applied to the concrete after tensioning and anchoring shall not exceed the force $P_{m0}(x) = 0.85\ A_p\ f_{p0,1k}$ accordance Table B1 (140 mm² or 150 mm²).

Table B1: Maximum prestressing forces[1] for tendons with A_p = 140 mm² and 150 mm²

Tendon Designation	Number of strands	Cross section A_p [mm²]	Prestressing force Y1770 S7 $f_{p0,1k}$ = 1520 N/mm²		Prestressing force Y1860 S7 $f_{p0,1k}$ = 1600 N/mm²	
			$P_{m0}(x)$ [kN]	P_{max} [kN]	$P_{m0}(x)$ [kN]	P_{max} [kN]
BBV L1 P	1	140	181	192	190	202
BBV L1 P	1	150	194	205	204	216

[1] The forces stated in Tables B 1 to B 3 are maximum values referring on $f_{p0,1k}$ = 1520 N/mm² or 1600 N/mm². The actual prestressing forces are to be found in national regulations valid in the place of use. If admissible in the place of use, strands with higher characteristic yield stresses might be used, but not more than $f_{p0,1k}$ = 1560 N/mm² (Y1770S7) or 1640 N/mm² (Y1860S7). In this case the prestressing forces of Tables B 1 to B 3 can be linearly increased by multiplying them with the factor ($f_{p0,1k}$/ 1520) or ($f_{p0,1k}$ /1600).
Compliance with the stabilisation and crack width criteria in the load transfer test was verified to a load level of 0,80*F_{pk}.

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2.3 Radius of curvature of the tendons in the structure

The smallest admissible radius of curvature of the tendons is

For strands Y1770S7:

- 2.5 m for nominal diameter 15.3 m (A_p = 140 mm²)
- 2.6 m for nominal diameter 15.7 m (A_p = 150 mm²)

For strands Y1860S7:

- 2.7 m for nominal diameter 15.3 m (A_p = 140 mm²)
- 2.8 m for nominal diameter 15.7 m (A_p = 150 mm²)

If this radius is adhered to, verification of prestressing steel outer fibre stresses in curvatures is not required.

2.4 Losses due to friction and wobble effects

The losses of the prestressing force due to friction and wobble effects may normally be determined in the calculation by using the friction coefficients μ = 0.06 and the unintentional angular displacement k = 0.5°/m (wobble coefficient).

2.5 Concrete strength

Concrete complying with EN 206-1:2000, EN 206-1/A1:2004 and EN 206-1/A2:2005 shall be used.
At the time of transmission of the full prestressing force the mean concrete strength of the normal weight concrete in the anchor zone shall be at least $f_{cmj,cube}$ or $f_{cmj,cyl}$ according to Table B 2. The mean concrete strength shall be verified by means of tests at least three specimens (cylinder or cube with the edge length of 150 mm or cylinder with diameter of 15 mm and height of 300 mm), which shall to be stored under the same conditions as the concrete member, with the individual values of specimen not differ more than 5 %.

Table B2: Necessary mean concrete strength f_{cmj} of the specimens at time of prestressing

$f_{cmj,cube}$ [N/mm²]	$f_{cmj,cyl}$ [N/mm²]
23(1)	19(1)
22(2)	18(2)
(1) without additional reinforcement (Annex A4)	
(2) with additional reinforcement (Annex A3)	

For partial prestressing with 30 % of the full prestressing the minimum value of the concrete compressive strength to be proven is 0.5 $f_{cmj,cube}$ or 0.5 $f_{cmj,cyl}$; intermediate values can be interpolated lineally.

2.6 Centre and edge distances of the tendon anchorages, concrete cover

The centre and edge distances of the tendon anchorages shall not be less than the values given in the Annexes A3 and A4 depending on the actual mean concrete strength.

All centre and edge distances have only been specified in conjunction with load transfer to the structure; therefore, the concrete cover given in national standards and provisions shall be taken into account additionally. Standards and regulations on concrete cover valid in place of use shall be considered.

2.7 Reinforcement in the anchorage zone

The anchorages (including reinforcement) for the transfer of the prestressing forces to the structural concrete are verified by means of tests. The resistance to the forces occurring in the structural concrete in the anchorage zone outside the helix and the additional reinforcement shall be verified. An adequate transverse reinforcement shall be provided here in particular for the occurring transverse tension forces (not shown in the attached drawings).
In the post-tensioning system without stirrups (Annex A4) the additional reinforcement in the anchorage zone of at least 50 kg/m3 is realized by using the mesh reinforcement.

In the post-tensioning system with stirrups (Annex A3) the additional reinforcement in the anchorage zone, besides of the mentioned above mesh reinforcement (at least 50 kg/m3), consist also of the stirrups closed by means of bends or hooks or an equivalent method. The stirrups locks (bend or hooks) shall be placed mutually offset. The steel grades and dimensions of the stirrups shall follow the values given in the Annex A3.

The additional reinforcement must not be taken into account as part of the statically required reinforcement. However, existing reinforcement in a corresponding position exceeding the given reinforcement may be taken into account for the additional reinforcement.

In the anchorage zone vertically led gaps for concreting shall be provided for concreting properly.

2.8 Slip at the anchorages

The slip at the anchorages (see Annex B3, section 4.2.4) shall be taken into account in the static calculation and the determination of the tendon elongation.

2.9 Fatigue resistance

With the fatigue tests for the anchors and couplers carried out in accordance with EAD 160004-00-0301, the stress range of 80 N/mm² of the stands at the maximum stress of 0.65 f_{pk} at 2 x 10^6 load cycles was verified.

Deutsches Institut für Bautechnik DIBt

3. Installation

3.1 General

Assembly and installation of the tendons shall only be performed by qualified post-tensioning specialist companies which have the required technical skills and experiences with the BBV L1 P Post-tensioning System. The company's site manager shall have a certificate of the manufacturer certifying that he is instructed by the manufacturer and has the required knowledge and experience with this post-tensioning system. Standards and regulations valid on site and CWA 14646:2003 shall be considered.

The manufacturer is responsible for informing all parties involved about the use of the BBV L1 P Post-tensioning system. Supplementary technical documents are issued by the manufacturer if required.

The tendons and the components shall be handled carefully.

3.2 Welding

Welding at the anchorages is not permitted.

After mounting the tendons no more welding shall be performed at the anchorages and in the immediate vicinity of the tendons.

3.3 Installation of the anchorages and the addational einforcement (Stirrups)

The conical boreholes of the anchor head shall be clean, free from rust and provided with protection grease. The central position of additional reinforcement shall be ensured by means of mounting brackets.

In the area (behind) the anchorage, the tendon shall be positioned perpendicularly to the axis of the tendon.

3.4 Wedging force and slip at anchorage

Without pre-wedging the slip within the anchorage to be taken into account for the determination of the elongations is 6.5 mm at the fixed anchorages. In the case of hydraulic pre-wedging with 1.1 $P_{m0}(x)$ no slip shall be taken into account for the determination of the elongations.

The wedges of stressing anchors shall be pre-wedged after tensioning with the minimum force of 0.1 $P_{m0}(x)$. In this case the slip is 4.5 mm.

3.5 Tensioning

Before tensioning the minimum mean concrete strength shall comply with the values given in Annex B1, section 2.4.

Taking into account the constraints is possible to restress the tendons by releasing and re-using the wedges. After restressing and anchoring, wedge marks on the strands resulting from first stressing shall be moved to the outside by at least 15 mm.

The minimum straight length for tensioning behind the anchorages (strand protrusion) is given in Annexes A3 and A4.

3.6 Corrosion protection of the anchorage zone

During installation of the wedges into the cones all relevant surfaces and gaps shall be injected with hot corrosion protection mass with a maximum temperature of 100 °C. The area of the pre-stressing steel strand not protected with PE-sheath shall be completely covered with PE-connection duct and PE protective cap with clamping ring, etc. as described (see Annex B3) filed with completely with corrosion protection mass. The transitions, which are not self-sealing, shall be carefully sealed with wrapping with PE glue tape (see Annexes A3 to A6).

In the final state, the minimum lap length specified in Annexes A5 and A6 between the PE connection and the monostrand sheath complied and the cavities shall be completely filed with corrosion protection mass, PE cap covered.

The corrosion protection masses are deposited by the manufacturers at the Deutsches Institut für Bautechnik.

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3.7 Packing, transport and storage

The components and the tendons shall be protected against moisture and staining.

The tendons shall be kept away from areas where welding procedures are performed.

For transport and handling of the tendon the provisions of the tendon manufacturer shall be observed.

The tendons shall be transport in such a way that any damaging on the plastic sheath is avoided.

4 Description of the Post-Tensining System BBV L1 P

4.1 Prestressing steel

The prestressing steel of the tendons consists of 7-wire prestressing steel strands with a nominal diameter of 15.3 mm (nominal cross-section 140 mm²) or with a nominal diameter of 15.7 mm (nominal cross-section 150 mm²) are used. Steel grades Y1770S7 or Y1860S7 are allowed. These are factory provided with a corrosion protection system consisting of corrosion protective grease and extruded PE – sheathing with a 1.5 mm wall thickness.
The tendons may be re-stressed since the ducts are filed with non-setting corrosion protection mass. No duct is necessary in the free length of the post-tensioning kit.

4.2 Anchorages

The components for the stressing anchor (active) and the fixed anchor (passive) are identical.
For anchorage with nominal cross-section of 150 mm² strands wedges with marking "0.62" on the front shall be used (see Annex A2).
The slip at the anchorages is assumed as follows:

- slip at the stressing anchor (S): 4.5 mm
- slip at the fixed anchor (F), without pre-wedging 6.5 mm

The additional reinforcement, the required center and edge distances and the minimum required concrete strength at time of prestressing can be found in Annex A3 or A4. A mesh like minimum reinforcement of 50 kg/m³ is also required in any case (see Annexes A5 and A6).

4.3 Strand Protrusion

The minimum straight length for tensioning behind the anchorages (strand protrusion) is given in Annexes A3 and A4. The required strand protrusion and the required space for the prestressing jack might be adapted to specific project requirements after consulting BBV Systems.

4.4 Stressing

A hydraulic pump unit and a special jack are used for the stressing of the tendon. Stressing in load steps and resetting of the jak is easily done. A single-strand stressing jack be used. After stressing, the wedges will be pressed into the wedge seating device.

4.5 Corrosion Protection of the Anchor

The corrosion protection system of the anchorage is shown in Annexes A5 and A6. Before threading the strand into the Anchor head, corrosion protection mass is applied to the strand (from the over thrust area of the PE connection duct to the end of the anchor head). The lap length of monostrand sheath and PE connection duct shall be at least 150 mm. After threading monostrand and installing the anchoring wedge, the cavity between the strand and anchorages is filed with corrosion protection mass. The transition between the factory corrosion-protected monostrand and the PE connection duct is wrapped with a 50 mm wide PE glue tape with at least two layers.

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Material of Components

Designation	Material	Standard
Components of the Anchorages		
Wedge	deposited at Deutsches Institut für Bautechnik	
Anchor Head	deposited at Deutsches Institut für Bautechnik	DIN EN 1563:2011-12
Additional reinforcement	R_e=500 MPa $f_{yk} \geq 500$ MPa, $\varepsilon_{uk} \geq 50$ ‰	valid provisions at the place of use
PE-Connection Ductr	PE	EN ISO 17855-1: 2014-10
Protective Cap	PE	DIN EN ISO 17855-1: 2014-10
clamping ring	deposited at Deutsches Institut für Bautechnik	
Corrosion Protection Mass oft he Anchor		
Corrosion Protection Mass Nontribus MP-2 [1] (grease)	deposited at Deutsches Institut für Bautechnik	
Corrosion Protection Mass Vaseline FC 284 [1] (wax)	deposited at Deutsches Institut für Bautechnik	
Corrosion Protection Mass Denso - Jet [1] (wax)	deposited at Deutsches Institut für Bautechnik	

The technical documentation of the components of this European Technical Approval is deposited at the Deutsches Institut für Bautechnik

[1] Korrosionsschutzmassen (Wachs oder Fett) gemäß den Zusammensetzungen des Herstellers, die er beim Deutschen Institut für Bautechnik hinterlegt hat. Die charakteristischen Materialeigenschaften müssen EAD 160027-00-0301 entsprechen.

Deutsches Institut für Bautechnik DIBt

Codes and References

prEN 10138-3:2009-08	Prestressing Steels – Part 3: Strand
EAD 160004-00-0301:2016-09	European Assessment Document - Post-Tensioning Kits for Prestressing of Structures
EAD 160027-00-0301:2016-09	Special filling products for post-tensioning kits
EN 206-1:2001-07	Concrete – Part 1: Specification, Performance, Production an Conformity
EN 206-1/A1:2004-10	Concrete – Part 1: Specification, Performance, Production an Conformity; German Version EN 206-1:200/A1:2004
EN 206-1/A2:2005-09	Concrete – Part 1: Specification, Performance, Production an Conformity; German Version EN 206-1:200/A2:2005
CWA 14646:2003-01	Requirements for the installation of post-tensioning kits for prestressing of structures and qualification of the specialist company and its personnel
EN 1563:2011-12	Founding – Spheroidal graphite cast irons; German version EN 1563:2011
EN ISO 17855-1:2014-10	Plastics – Polyethylene (PE) moulding and extrusion materials – Part 1: Designation system and basis for specifications (ISO 17855-1:2014); German version EN 17885-1:2014
EN ISO 17855-2:2016-06	Plastics – Polyethylene (PE) moulding and extrusion materials – Part 2: Preparation of test specimens and determination of properties (ISO 17855-2:2016); German version EN ISO 17855-2:2016