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European Technical Assessment

ETA-12/0601
of 23.12.2025

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

Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm

Product family to which the construction product belongs

Kit for rock and soil anchors – Kit with thread bars of prestressing steel

Manufacturer

Stahlwerk Annahütte
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Germany

Manufacturing plant

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Germany

This European Technical Assessment contains

49 pages including Annexes 1 to 27, which form an integral part of this assessment.

This European Technical Assessment is issued in accordance with Regulation (EU) № 305/2011, on the basis of

European Assessment Document (EAD) 160015-00-0102 – Kits for construction of a rock and soil anchor – Kits with thread bars of steel or prestressing steel.

This European Technical Assessment replaces

European Technical Assessment ETA-12/0601 of 23.11.2023

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Specific parts

1 Technical description of the product

1.1 General

The European Technical Assessment¹ – ETA – applies to a kit, the

Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm,

comprising the following components.

– Tendon

The bar tendon of the rock and soil anchor is with one single tensile element.

– Tensile element

Tensile element is a continuously threaded steel bar of prestressing steel Y1050H according to prEN 10138-4². The continuous thread is provided by ribs, hot rolled along the entire length of the bar – thread bar. Due to the continuous thread, the individual thread bars can be anchored at any given point and to obtain the required tendon length, the thread bars can be coupled at any given point.

Nominal diameters and strength characteristics of the thread bar in prestressing steel are given in Table 1.

Table 1: Tensile elements

Nominal diameter	Nominal yield strength	Nominal tensile strength
Ø	R _{p0.1}	R _m
mm	N/mm ²	N/mm ²
17.5, 26.5, 32, 36, 40, and 47	950	1050

NOTE 1 MPa = 1 N/mm²

– Anchorage

The thread bar is anchored with a domed nut in steel and a square anchor plate in steel. Load transfer to structural concrete is without or with additional reinforcement.

– Coupler

The thread bars are jointed with steel couplers that are secured against unscrewing.

– Corrosion protection system

Temporary rock and soil anchors, temporary rock and soil anchors with extended working life, and permanent rock and soil anchors are provided with corrosion protection systems, adapted to the intended working life.

¹ ETA-12/0601 was firstly issued in 2013 as European technical approval with validity from 12.06.2013, converted and amended in 2018 to European Technical Assessment ETA-12/0601 of 21.12.2018, amended in 2023 to European Technical Assessment ETA-12/0601 of 23.11.2023, and amended in 2025 to European Technical Assessment ETA-12/0601 of 23.12.2025.

² Standards and other documents referred to in the European Technical Assessment are listed in Annex 26 and Annex 27.

- Fixed anchor length

Corrosion protection of fixed anchor length is by a cover of cement mortar on the thread bar or by encapsulation with corrugated plastic sheathing and grouting the void between thread bar and corrugated plastic sheathing.

- Free anchor length

At free anchor length the thread bar is corrosion protected by smooth sheathing, corrosion protection coating with smooth sheathing, or encapsulation with corrugated plastic sheathing and grouting the void between thread bar and corrugated plastic sheathing. For debonding, the encapsulated thread bar is provided with a smooth sheathing. At the ends, the smooth sheathing is sealed to thread bar or corrugated plastic sheathing.

- Transition anchorage to free anchor length

On the anchor plate a steel tube is tightly welded. Steel tube and sheathing of the thread bar overlap. Except for temporary rock and soil anchors, a sealing is installed between smooth or corrugated plastic sheathing and the void between steel tube and thread bar is filled with corrosion protection filling material.

- Anchorage

At the anchorage, corrosion protection is applied on thread bar and domed nut and a cap is attached to the anchor plate. For temporary rock and soil anchors, corrosion protection of anchorage is only required for corrosive environments and aesthetic reasons.

- Coupler assemblies

Corrosion protection of coupler assemblies is provided by a cover of cement mortar, heat shrinking sleeve, or combinations of coupler tube sealed to adjacent sheathings and corrosion protection filling material.

- Ancillary components

Ancillary components are spacers to provide cover of grout inside the corrugated plastic sheathing – inner grout –, to ensure the distance between thread bar or plastic sheathing and bore hole wall, and to facilitate grouting of the corrugated plastic sheathing.

Rock and soil anchor system

1.2 General

The rock and soil anchor is installed by placing the thread bar in prestressing steel, possibly jointed with couplers, and provided with corrosion protection according to the intended working life in the centre of a pre-drilled borehole. Along the fixed anchor length, the annular void between rock and soil anchor and bore hole wall is injected with cement mortar. At the protruding part of the rock and soil anchor, the anchorage is installed. After stressing the rock and soil anchor, the final corrosion protection is applied.

1.3 Designation and range of rock and soil anchors

The rock and soil anchor of the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, is designated by the nominal diameter of the thread bar in prestressing steel. The rock and soil anchor system includes rock and soil anchor with the following nominal diameters of the thread bar in prestressing steel, $\varnothing = 17.5, 26.5, 32, 36, 40,$ and 47 mm.

The characteristic values of maximum force of thread bars in prestressing steel are given in Annex 8.

1.4 Tendon

The tendon comprises one single thread bar in prestressing steel. The required length of the tendon is achieved by jointing the necessary number of thread bars in prestressing steel with couplers. To attain the intended working life, the tendon is provided with appropriate corrosion protection.

Inherent to the installation of the rock and soil anchor, the fixed anchor length provides a body of cement mortar between tendon and borehole wall with a thickness of at least 10 mm. Concentric position of tendon and minimum thickness of body of cement mortar are ensured by spacers. The cement mortar meets the requirements of EN 1537, taking into consideration the exposure classes according to EN 206.

Along the free anchor length, a smooth sheathing is slipped over the tendon.

1.5 Anchorage

The anchorage comprises a domed nut and a square anchor plate, see Annex 11. As part of the corrosion protection system, a steel tube is tightly welded on the anchor plate. Steel tube and sheathing of free anchor length overlap and a sealing between steel tube and sheathing can be installed.

Larger angular deviation may be achieved using an angle compensation tube, see Annex 13. Boreholes with large diameters are spanned with load transfer plates in steel, see Annex 12.

1.6 Coupler assemblies

Tensile elements, i.e., thread bars in prestressing steel, are jointed with couplers. The coupler is secured against unscrewing with screws. Overlap of heat shrinking sleeve and adjacent elements, i.e., thread bar in prestressing steel or corrugated plastic sheathing, is at least 75 mm. Different versions of coupler assemblies are shown in Annex 4 and the dimensions of the couplers in Annex 12.

The installed coupler does not impede the free elongation of the tendon during stressing.

1.7 Load transfer to the structure

The load is transferred from the tendon via domed nut and anchor plate to the structure.

Concrete structures directly loaded by the anchorage are executed without or with additional reinforcement.

- Centre spacing and edge distance, concrete compressive strength, and additional reinforcement are specified in Annex 6.
- Additional reinforcement is placed at the anchorage, concentric with regard to the tendon. This reinforcement confines the concrete and absorbs bursting forces due to spreading of the load from the anchorage into the concrete structure – bursting reinforcement.

For concrete structures without additional reinforcement, the area around the centric rock and soil anchor with outer dimensions corresponding to the centre distances specified in Annex 6, is reinforced as follows.

- The reinforcement is at least 50 kg/m³.
- Only the loaded depth of the concrete structure down from the anchor plate is considered.
- Reinforcement already placed in that area for other reasons may be fully taken into consideration.
- The reinforcement does not need to be detailed and placed as bursting reinforcement.

If load transfer plates, see Annex 12, are designed and installed according to Clause 2.2.3, e.g., as shown in Annex 1, Annex 2, Annex 3, and Annex 6, a minimum concrete grade of \geq C30/37 is used. However, the minimum centre and edge distances as specified in Annex 6 are not reduced.

encapsulation are sealed with an adhesive tape. The annular void between thread bar in prestressing steel and corrugated plastic sheathing is grouted according to EN 445, EN 446, and EN 447. The thickness of the cover of cement grout on the thread bar in prestressing steel inside the corrugated plastic sheathing is at least 5 mm. Concentric position of thread bar in prestressing steel and minimum thickness of cover of cement grout are ensured by a plastic cord helically wound around the thread bar in prestressing steel or by spacers. Encapsulation with grouting of the annular void is carried out at the manufacturing plant.

Body of cement mortar, thickness ≥ 10 mm, between encapsulated tendon and borehole wall along the fixed anchor length. Concentric position of thread bar in prestressing steel and minimum thickness of body of cement mortar are ensured by spacers, see Annex 3.

In the free anchor length, a smooth sheathing, thickness ≥ 1.5 mm, is slipped over the encapsulated tendon and sealed off against the corrugated plastic sheathing with an adhesive tape, see Annex 3.

Coupler in the free anchor length are placed inside a coupler tube, thickness $t \geq 2$ mm, filled with corrosion protection material and sealed at the ends with heat shrinking sleeves, see Annex 4. Alternatively, the corrosion protection filling material may also be applied as corrosion protection tape that comprises a flexible carrier, coated with corrosion protection filling material. The corrosion protection tape is wrapped wrinkle free on the coupler, overlapping the adjacent encapsulated thread bars in prestressing steel. After wrapping, the tape is smoothed to ensure a dense and continuous corrosion protection layer that fits tightly into the coupler tube.

Coupler at the transition free anchor length to fixed anchor length is protected with a double layer of heat shrinking sleeve. Overlap of heat shrinking sleeve and adjacent elements, i.e., thread bar or corrugated plastic sheathing, is at least 75 mm.

A steel tube is tightly welded onto the anchor plate.

The steel tube overlaps the corrugated plastic sheathing at the end of the free anchor length and is sealed off against the corrugated plastic sheathing with profile ring sealing. At the transition anchorage to free anchor length, the void between tendon and steel tube is filled with corrosion protection filling material, see Annex 3.

Following stressing the rock and soil anchor,

- a protective cap in steel or
- a plastic protective cap

is tightly attached to the anchor plate and filled with corrosion protection filling material, see Annex 3. If the anchorage is embedded in concrete, a cap is not required.

All exposed or outside surfaces of steel parts, e.g., steel tubes, anchor plate, anchorage components, and caps, insufficiently covered with concrete are protected against corrosion.

In general, one of the protection systems in accordance with EN ISO 12944-5 is applied. Surfaces are prepared in accordance with EN ISO 12944-4. For execution of the corrosion protection, EN ISO 12944-7 is observed.

As an alternative, anchor plates and caps exposed to corrosivity categories C1 to C3 according to EN ISO 14713-1 are hot dip galvanised according to EN ISO 1461. Mean coating thickness of hot dip galvanised coating is appropriate to the corrosivity categories and the assumed working life. In EN ISO 14713-1, guide values for coating thickness are specified.

NOTE Corrosion protection by hot dip galvanising relies on coating deterioration of the hot dip galvanised coating in the course of time. However, local corrosive exposure may cause substantially intensified coating deterioration and a clearly reduced time of protection by the hot dip galvanised coating. If such local corrosive exposure is possible, it will be considered in the corrosion protection evaluation.

Components

1.9 General

The components of the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, conform to representations and dimensions in Annex 7, Annex 11, Annex 12, Annex 13, Annex 14, Annex 15, Annex 16, Annex 17, Annex 18, and Annex 19 and material specifications in Annex 8, Annex 9, Annex 10, and Annex 20. Component specifications and tolerances of the components not given in the Annexes are specified to the technical data given in the technical file³ of the European Technical Assessment.

1.10 Tensile element, thread bar in prestressing steel

The tensile element is a hot rolled, in-line heat treated, stretched and tempered prestressing steel bar Y1050H with a continuous right-hand thread – thread bar.

The most important characteristics are, see Annex 7 and Annex 8.

- Nominal diameter 17.5, 26.5, 32, 36, 40, and 47 mm
- Characteristic yield strength $R_{p0.1} = 950 \text{ N/mm}^2$
- Characteristic tensile strength $R_m = 1\,050 \text{ N/mm}^2$
- Elongation at maximum force $A_{gt} \geq 5 \%$

The thread bar in prestressing steel is in particular suitable for geotechnical applications. Welding and bending are not intended for rock and soil anchors.

1.11 Coupler

The tensile elements, thread bars, are jointed with couplers. The coupler is secured against unscrewing with screws. Different versions of coupler assemblies are shown in Annex 4 and the dimensions of the coupler in Annex 12.

The installed coupler does not impede the free elongation of the tendon.

1.12 Anchor plate

The anchor plate is a square steel plate with a centric bore. On one side a cone is machined to accommodate the domed nut. As part of the corrosion protection system a steel tube is tightly welded on the anchor plate.

Anchor plate with welded steel tube and with dimensions are shown in Annex 11.

1.13 Domed nut

The domed nut is in steel and anchors the thread bar. The spherical shape sitting in the cone of the anchor plate permits compensation of angular deviations. It is available in two different materials.

Domed nut and dimensions are shown in Annex 11.

1.14 Corrosion protection components

Components of the corrosion protection system are corrugated and smooth plastic sheathing, heat shrinking sleeve, grout inside the corrugated plastic sheathing, sealing at the transition anchorage to free anchor length, coupler tube, corrosion protection filling material at the anchorage, and cap in steel or plastic.

Components of the corrosion protection system with specifications and dimensions are shown in Annex 9, Annex 10, Annex 11, Annex 13, Annex 14, Annex 15, Annex 16, Annex 17, Annex 18, and Annex 19.

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

1.15 Ancillary components

Spacers to provide cover of grout inside the corrugated plastic sheathing are a plastic cord or plastic mat spacers, see Annex 19. The plastic cord is helically wound around the thread bar with a pitch ≤ 0.5 m and the mat spacers are installed in a distance of ≤ 1.0 m.

In the fixed anchor length, basket spacers in plastic are fastened to thread bar or corrugated plastic sheathing in a distance of ≤ 1.5 m, see Annex 18. With the basket spacers the distance to the bore hole wall is ensured.

For grouting and to fully encase the thread bar, the corrugated plastic sheathing is completed with injection cap and end cap, see Annex 19.

Ancillary components are part of the kit, however, for them no essential characteristic is assessed.

1.16 Cement mortar

Cement mortar is inherent in the rock and soil anchor system. Along the fixed anchor length, the body of cement mortar between thread bar or corrugated plastic sheathing and borehole wall transfers the load from thread bar to bore hole wall and takes a part of corrosion protection.

The cement mortar meets the requirements of EN 1537, taking into consideration the exposure classes according to EN 206.

Cement mortar is provided on the construction site, is not subject of ETA, and no essential characteristic is assessed for cement mortar.

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

2.1 Intended uses

The Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, is intended to stabilise the construction ground by active introduction of prestressing forces according to the principles for the execution of geotechnical works. Construction ground refers to both, rock and soil.

Rock and soil anchors are temporary, temporary with extended working life, or permanent according to Table 2.

Table 2 Intended uses of the rock and soil anchor

Line No	Intended use	Working life
1	Temporary rock and soil anchor	Up to 2 years
2	Temporary rock and soil anchor with extended working life	Up to 7 years
3	Permanent rock and soil anchor	Up to 100 years

2.2 Assumptions

2.2.1 General

Concerning product packaging, transport, storage, maintenance, replacement, and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on transport, storage, maintenance, replacement, and repair of the product as he considers necessary.

2.2.2 Packaging, transport and storage

Advice on packaging, transport, and storage includes

Temporary protection of thread bars and the other components in order to prevent damaging corrosion during transport from the production site to the job site. Light surface rust is acceptable.

Transportation, storage, and handling of the thread bars and other components in a manner as to avoid damage by mechanical or chemical impact.

Protection of thread bars and other components from moisture.

2.2.3 Design

Design is according to the Eurocodes.

For verification of rock and soil anchor applications with the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, the following items are considered.

The rock and soil anchor is only subjected to axial tensile loading.

The design value for the ultimate limit state of the rock and soil anchor is assumed according to Eurocode 2 with a partial safety factor of 1.15⁴ against attainment of the characteristic force at yield strength, $F_{p0.1}$.

The load-bearing capacity of the tendon, comprising the components thread bar, coupler, and anchorage, is 100 % relative to the characteristic maximum force, F_{pk} , of the thread bar. The values in Annex 8 are taken as a basis.

The capacity of the rock and soil anchors is determined according to Eurocode 7 and EN 1537, based on investigation, suitability and acceptance tests.

The construction works is designed as to form a redundant structure according to Eurocode 0. Structures with only one single rock and soil anchor are not executed.

The stress ranges at coupler assembly and anchorage given Table 3 were determined in fatigue tests at an upper force of $0.65 \cdot F_{pk}$ and up to $2 \cdot 10^6$ load cycles.

The parameters of the S-N curve for coupler and anchor head with anchor plate are specified in EN 1992-1-1 and given in Table 4.

Minimum centre and edge distances are given in Annex 6 without and with additional reinforcement and for a concrete cube compressive strength of $f_{cm, 0, \text{cube } 150} \geq 25 \text{ N/mm}^2$.

For load introduction from the thread bar through the anchorage into the structure Eurocode 2 applies. Minimum centre spacing and edge distance are given in Annex 6 for a concrete cube compressive strength of $\geq 25 \text{ N/mm}^2$ and with and without additional reinforcement. If centre spacing and edge distance, concrete compressive strength, and additional reinforcement are conformed to, verification of load transfer to structural concrete has been delivered. The forces outside of the bursting reinforcement or the region with outer dimensions corresponding to the centre distances require verification and, where appropriate, are covered by appropriate reinforcement.

For load transfer without additional reinforcement, the area around the rock and soil anchor is reinforced according to Clause 1.7.

Punching of the anchorage needs to be considered in any case.

⁴ Recommended partial safety factor to be applied in the absence of applicable standards and regulations in force at the place of use.

Boreholes with large diameters are spanned with load transfer plates in steel. The load transfer plates are designed according to Eurocode 3 as to permit a force of $1.1 \cdot F_{pk}$ being transferred into the substructure.

Where

F_{pk}Nominal maximum force of the thread bar, see Annex 8

Alternatively the load can be transferred from the anchorage to the structure via a steel member designed according to Eurocode 3. The steel member has dimensions as to permit a force of $1.1 \cdot F_{pk}$ being transferred into the structure.

To verify elongations during stressing, a slip value of 3 mm is assumed for the coupler and 3 mm at the anchorage for load transfer from the jack to the structure.

With a compressive strength of cement mortar of $\geq 40 \text{ N/mm}^2$, a characteristic bond strength of 6 N/mm^2 can be assumed.

Recommended proof forces and lock-off forces are listed in Annex 5.

Table 3 Stress range verified in fatigue tests

Nominal diameter \varnothing	Stress range $2 \cdot \sigma_a$	
	Coupler assembly	Anchorage with anchor plate
mm	N/mm ²	N/mm ²
17.5 to 47	80	80

Table 4 Parameter of the S-N curve for coupler and anchor head with anchor plate

Nominal diameter \varnothing	Parameter of the S-N curve
	Coupler Anchor head with anchor plate
mm	—
17.5 to 47	S-N curve with $\Delta\sigma_{Rsk} = 80 \text{ N/mm}^2$ with $N = 2 \cdot 10^6$ $k_1 = 5, k_2 = 5$ $N^* = 1 \cdot 10^n, n = 6$

Where

$\Delta\sigma_{Rsk}$ Stress range

NNumber of load cycles

k_1, k_2 Stress exponents of the S-N curve according to EN 1992-1-1, Table 6.4N

N^*Number of load cycles at the transition from k_1 to k_2

2.2.4 Installation

2.2.4.1 General

It is assumed that the product will be installed according to the manufacturer's instructions or – in absence of such instructions – according to the usual practice of the building professionals.

Assembly and installation of the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, is only carried out by appropriately qualified specialist companies with the required resources and experience in the execution of geotechnical works.

The principles for the application and installation of temporary and permanent rock and soil anchors are specified in EN 1537 that includes comprehensive information and data on site investigation, construction materials and construction products, design considerations, installation and execution as well as testing, supervision and monitoring.

Bursting out of the tendon in case of a bar failure is prevented according to local conditions.

The length of the rock and soil anchor is obtained by jointing the necessary number of thread bars with couplers. The couplers are secured against unscrewing.

The rock and soil anchor is centrally installed into a pre-drilled borehole and along the fixed anchor length injected with cement mortar. Thereby, the existing geotechnical conditions are taken into consideration. The fixed anchor length of all installed rock and soil anchors have a system inherent body of cement mortar between thread bar or corrugated plastic sheathing and borehole wall. The cement mortar conforms to EN 1537. The cement type is selected dependent on the aggressiveness of the soil according to EN 206. The water to cement ratio is appropriate for the actual conditions on the construction site. Alternatively, grout in accordance with EN 445, EN 446 and EN 447 may be used. To improve the bonding strength to the ground, post-grouting can be carried out.

Chemical agents that are aggressive to the cement mortar are considered by use of suitable cements.

NOTE 1 Aggressive chemical agents to that cement mortar cannot resist are possible.

NOTE 2 The aggressiveness of the chemical agents may be determined according to EN 206.

After the cement mortar has set and sufficiently hardened, the anchorage is installed and the rock and soil anchor is stressed. See Annex 5 for the recommended lock-off force.

2.2.4.2 Temporary rock and soil anchor

The cover of cement mortar on the thread bar along the fixed anchor length is ≥ 10 mm. The cover of cement mortar is ensured by spacers at a distance of ≤ 1.5 m. A smooth sheathing is slipped over the tendon in the free anchor length. For further details on the corrosion protection and the installation of coupler assembly and anchorage see Clause 1.8.1 and Annex 1.

2.2.4.3 Temporary rock and soil anchor with extended working life

The cover of cement mortar on the thread bar along the fixed anchor length is ≥ 10 mm. The cover of cement mortar is ensured by spacers at a distance of ≤ 1.5 m. In the free anchor length, the thread bar is coated with a corrosion protection material and a smooth sheathing is slipped over the tendon. For further details on the corrosion protection and the installation of couplers and anchorages see Clause 1.8.2 and Annex 2.

2.2.4.4 Permanent rock and soil anchor

The tendon is encapsulated with a corrugated plastic sheathing in the free and fixed anchor length. The annular void between thread bar and corrugated plastic sheathing is grouted at the manufacturing plant. Corrugated plastic sheathing with a thickness of ≥ 1.0 mm and an inner cement grout layer of at least 5 mm between thread bar and corrugated plastic sheathing are applied. The thread bar is centred in the corrugated plastic sheathing with a plastic cord or plastic spacers. Grouting of the corrugated plastic sheathing is carried out according to defined

operating procedures. The sheathed and grouted tendon is kept in place until the cement grout has sufficiently set and hardened. This is attained not before 24 hours after grouting.

Along the fixed anchor length, the cover of cement mortar on the encapsulated tendon is ≥ 10 mm. The cover of cement mortar is ensured by spacers at a distance of ≤ 1.5 m. A smooth sheathing is slipped over the encapsulated tendon in the free anchor length. For further details on the corrosion protection and the installation of couplers and anchorages see Clause 1.8.3 and Annex 3.

2.3 Assumed working life

The European Technical Assessment is based on an assumed working life of the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, of up to 2 years for temporary anchors, of up to 7 years for temporary anchors with extended working life, and of up to 100 years for permanent anchors, provided that the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, is subject to appropriate installation, use, and maintenance, see Clause 2.2. These provisions are based upon the current state of the art and the available knowledge and experience.

In normal use conditions, the real working life may be considerably longer without major degradation affecting the basic requirements for construction works⁵.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee, neither given by the product manufacturer or his representative nor by EOTA nor by the Technical Assessment Body but are regarded only as a means for expressing the expected economically reasonable working life of the product.

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

3.1 Essential characteristics

The performances of the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, for the essential characteristics are given in Table 5. In Annex 25 the combinations of essential characteristics and corresponding intended uses are listed.

Table 5 Essential characteristics and performances of the rock and soil anchor

No	Essential characteristic	Method of assessment	Product performance
Basic requirement for construction works 1: Mechanical resistance and stability			
1	Resistance to static load	EAD 160015-00-0102, Clause 2.2.1	See Clause 3.2.1.2.
2	Resistance to fatigue	EAD 160015-00-0102, Clause 2.2.2	See Clause 3.2.1.3.
3	Load transfer to the structure	EAD 160015-00-0102, Clause 2.2.3	See Clause 3.2.1.4.
4	Corrosion protection of temporary rock and soil anchor	EAD 160015-00-0102, Clause 2.2.4	See Clause 3.2.1.5.

⁵ 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.

No	Essential characteristic	Method of assessment	Product performance
5	Corrosion protection of temporary rock and soil anchor with extended working life	EAD 160015-00-0102, Clause 2.2.5	See Clause 3.2.1.6.
6	Corrosion protection of permanent rock and soil anchor	EAD 160015-00-0102, Clause 2.2.6	See Clause 3.2.1.7.
7	Transition anchorage to free length – Tightness	EAD 160015-00-0102, Clause 2.2.7	See Clause 3.2.1.8.
8	Crack width in inner grout	EAD 160015-00-0102, Clause 2.2.8	See Clause 3.2.1.9.
9	Mass per metre – Thread bar in prestressing steel	EAD 160015-00-0102, Clause 2.2.10	See Annex 7.
10	Surface geometry – Thread bar in prestressing steel	EAD 160015-00-0102, Clause 2.2.12	See Annex 7.
11	Strength characteristics – Thread bar in prestressing steel	EAD 160015-00-0102, Clause 2.2.14	See Clause 3.2.1.10.
12	Modulus of elasticity – Thread bar in prestressing steel	EAD 160015-00-0102, Clause 2.2.16	See Clause 3.2.1.11.
13	Elongation at maximum force – Thread bar in prestressing steel	EAD 160015-00-0102, Clause 2.2.18	See Annex 8.
14	Constriction at break – Thread bar in prestressing steel	EAD 160015-00-0102, Clause 2.2.19	See Clause 3.2.1.12.
15	Stress relaxation – Thread bar in prestressing steel	EAD 160015-00-0102, Clause 2.2.20	See Clause 3.2.1.13.
16	Stress corrosion resistance – Thread bar in prestressing steel	EAD 160015-00-0102, Clause 2.2.21	See Clause 3.2.1.14.
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			
—	No characteristic assessed.		—
Basic requirement for construction works 4: Safety and accessibility in use			
—	Not relevant. No characteristic assessed.		—

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No	Essential characteristic	Method of assessment	Product performance
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.		—

3.2 Product performance

3.2.1 Mechanical resistance and stability

3.2.1.1 General

The reference values of the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm are the nominal values of the thread bar in prestressing steel, see Annex 7 and Annex 8.

- Nominal diameter, \varnothing
- Nominal cross-sectional area, S_n
- Nominal mass per metre, M
- Nominal yield strength, $R_{p0.1}$
- Nominal tensile strength, R_m
- Nominal 0.1 % proof force as nominal yield force, $F_{p0.1}$
- Nominal maximum force, F_{pk}

3.2.1.2 Resistance to static load

The Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, as described in the ETA meets the acceptance criteria of EAD 160015-00-0102, Clause 2.2.1. The nominal maximum force, F_{pk} , of the thread bar in prestressing steel is given in Annex 8.

The ratio r_{ta} and r_{tn} of EAD 160015-00-0102 of the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm is given in Table 6.

Table 6 Ratios r_{ta} and r_{tn}

Item	Ratio	
	r_{ta}	r_{tn}
—	—	—
Coupling assembly	≥ 1.0	≥ 1.0
Anchorage with anchor plate	≥ 1.0	≥ 1.0

3.2.1.3 Resistance to fatigue

For resistance to fatigue of anchorages and coupling assemblies see Clause 2.2.3 and Table 3.

For resistance to fatigue of thread bar in prestressing steel see Annex 8.

The nominal cross-sectional area of the thread bar in prestressing steel is given in Annex 7.

3.2.1.4 Load transfer to the structure

The Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, as described in the ETA meets the acceptance criteria of EAD 160015-00-0102, Clause 2.2.3. The characteristic tensile strength, R_m , of the prestressing steel thread bars is given in Annex 8.

For anchorage without additional reinforcement and anchorage with additional reinforcement as bursting reinforcement see Annex 6.

Ratios for anchorage with anchor plate according to Annex 11 are $r_{LT, br, y} \geq 1.0$ and $r_{LT, 0, y} \geq 1.0$.

Nominal maximum force, F_{pk} , of the thread bar in prestressing steel is given in Annex 8.

3.2.1.5 Corrosion protection of temporary rock and soil anchor

Corrosion protection of the temporary rock and soil anchor is described in Clause 1.8.1.

Nominal diameter, nominal core diameter, and nominal height of ribs of the thread bar in prestressing are given in Annex 7. Nominal dimensions of coupler are given in Annex 12.

3.2.1.6 Corrosion protection of temporary anchor with extended working life

Corrosion protection of the temporary rock and soil anchor with extended working life is described in Clause 1.8.2.

Nominal diameter, nominal core diameter, and nominal height of ribs of the thread bar in prestressing are given in Annex 7. Nominal dimensions of coupler are given in Annex 12.

3.2.1.7 Corrosion protection of permanent rock and soil anchor

Corrosion protection of the permanent rock and soil anchor is described in Clause 1.8.3.

For inner grout see Annex 9 and for heat shrinking sleeve see Annex 10.

3.2.1.8 Transition anchorage to free length – Tightness

The tightness of transition anchorage to free length of the permanent rock and soil anchor is 0.3 N/mm² without leakage.

3.2.1.9 Crack width in inner grout

For crack width in inner grout see Annex 9.

3.2.1.10 Strength characteristics – Thread bar in prestressing steel

Ratios are $r_{Fp} \geq 1.0$ and $r_{Fm} \geq 1.0$.

Nominal yield force, $F_{p0.1}$, and nominal maximum force, F_{pk} , of the thread bar in prestressing steel are given in Annex 8.

3.2.1.11 Modulus of elasticity – Thread bar in prestressing steel

Nominal cross-sectional, S_n , of thread bar in prestressing steel is given in Annex 7. For the modulus of elasticity of the thread bar in prestressing steel see Annex 8.

3.2.1.12 Constriction at break – Thread bar in prestressing steel

The percentage of thread bars in prestressing steel with necking is 100 %.

3.2.1.13 Stress relaxation – Thread bar in prestressing steel

For stress relaxation after 1 000 hours of thread bar in prestressing steel see Annex 8.

3.2.1.14 Stress corrosion resistance – Thread bar in prestressing steel

For stress corrosion resistance of thread bar in prestressing steel as median and minimum time to failure see Annex 8.

3.3 Assessment methods

The assessment of the essential characteristics in Clause 3.1 of the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, for the intended uses, and in relation to the requirements for mechanical resistance and stability, in the sense of the basic requirements for construction works № 1 of Regulation (EU) № 305/2011, has been made in accordance with EAD 160015-00-0102, Kits for construction of a rock and soil anchor – Kits with thread bars of steel or prestressing steel for kits with thread bars in prestressing steel.

3.4 Identification

The European Technical Assessment for the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, is issued on the basis of agreed data that identify the assessed product⁶. 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 Commission Decision 98/456/EC the system of assessment and verification of constancy of performance to be applied to the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, is System 1+. System 1+ is detailed in Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014, Annex, point 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 plan⁷.
- (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.

⁶ The technical file of the European Technical Assessment is deposited at Österreichisches Institut für Bautechnik.

⁷ 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.

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 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 establishes and continuously maintains a factory production control. All procedures and specifications adopted by the manufacturer are documented in a systematic manner. Purpose of factory production control is to ensure the constancy of performances of the Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, with regard to the essential characteristics.

The manufacturer only uses raw materials supplied with the relevant inspection documents as laid down in the control plan. The incoming raw materials are subjected to controls by the manufacturer before acceptance. Check of incoming materials includes control of inspection documents presented by the manufacturer of the raw materials.

Testing within factory production control is in accordance with the prescribed test plan. The results of factory production control are recorded and evaluated. The records are presented to the notified product certification body involved in continuous surveillance and are kept at least for ten years after the product has been placed on the market. On request, the records are presented to Österreichisches Institut für Bautechnik.

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

At least once a year the manufacturer audits the manufacturers of nuts and couplers.

The basic elements of the prescribed test plan are given in Annex 21 and Annex 22.

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 draws up the declaration of performance. Essential characteristics to be included in the declaration of performance for the corresponding intended use are given in Clause 3.1, Table 5. In Annex 25 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 Rock and soil anchor system SAS with prestressing steel thread bars Y1050H, diameter 17.5 to 47 mm, according to the European Technical Assessment. In particular, the following items are appropriately considered.

Personnel and equipment

Suitability of the factory production control established by the manufacturer

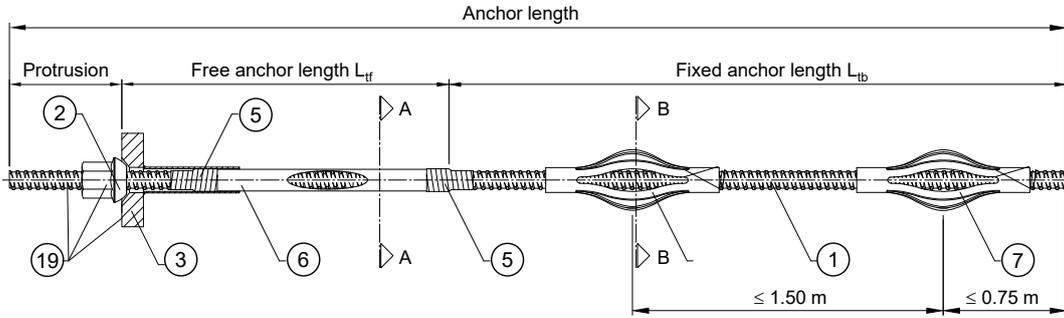
Full implementation of the prescribed test plan



Rock and soil anchor system SAS
 Prestressing steel bar Y1050H, \varnothing 17.5–47 mm
 Temporary rock and soil anchor

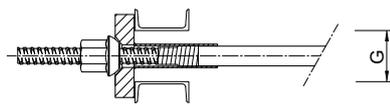
Annex 1
 of **ETA-12/0601** of 23.12.2025

Rock and soil anchor system SAS – Temporary rock and soil anchor

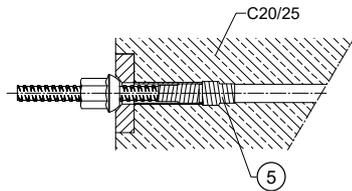


Anchor heads variants

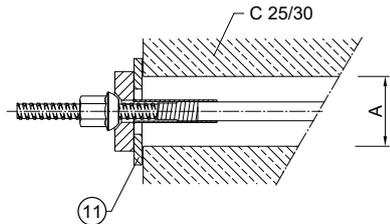
Steel bearing



Fully concreted



Bearing on larger borehole or distance

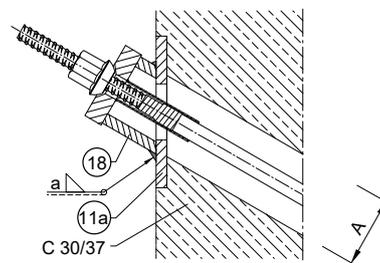


Sections

A – A, Cross section in L_{fr} B – B, Cross section in L_{fb}



Angle compensation with tube



Prestressing steel bar nominal diameter \varnothing	Maximum G for bearing on steel G	Maximum A ¹⁾ for load transfer plate A	Fillet weld minimum thickness a	Minimum borehole diameter ²⁾			
				at anchor head	without coupler	with coupler at $L_{fr} - L_{fb}$ ³⁾	with coupler in L_{fr}
mm	mm	mm	mm	mm	mm	mm	mm
17.5	80	160	3.5	55	50	60	70
26.5	90		5	65	60	75	85
32	100		6	70	65	85	95
36	130		7	70	65	90	110
40			8	90	80	95	110
47			8	100	90	110	130

- ① Prestressing steel bar
- ② Domed nut
- ③ Anchor plate with steel tube
- ⑤ Adhesive tape
- ⑥ Smooth sheathing
- ⑦ Basket spacer
- ⑪ Load transfer plate
- ⑪a Load transfer plate for angle compensation tube
- ⑱ Angle compensation tube
- ⑲ Corrosion protection coating

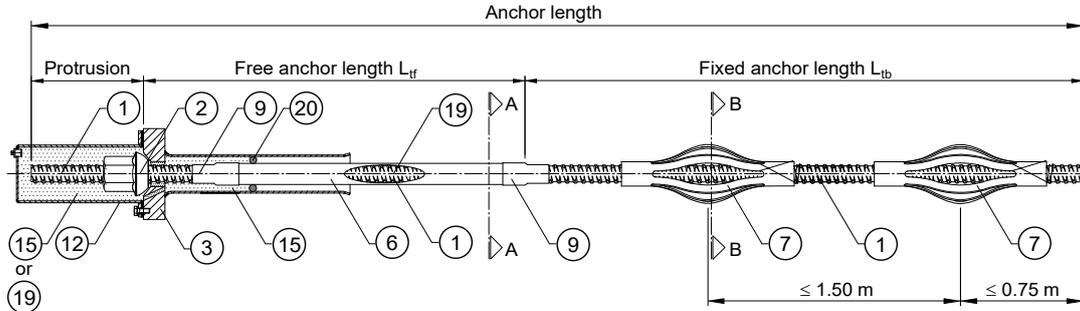
¹⁾ For load transfer plates to span larger distances, see Annex 6, a minimum concrete strength class according to EN 206 of \geq C25/30 for Pos. 11 and \geq C30/37 for Pos. 11a is required.
²⁾ The minimum borehole diameter is based on the minimum cover of grout including an injection hose \varnothing 10 mm
³⁾ Coupler at transition free anchor length, L_{fr} , to fixed anchor length, L_{fb}



Rock and soil anchor system SAS
 Prestressing steel bar Y1050H, \varnothing 17.5–47 mm
 Temporary rock and soil anchor with
 extended working life

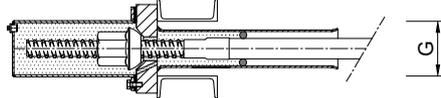
Annex 2
 of **ETA-12/0601** of 23.12.2025

Rock and soil anchor system SAS – Temporary rock and soil anchor with an extended working life

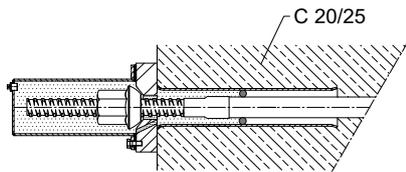


Anchor heads variants

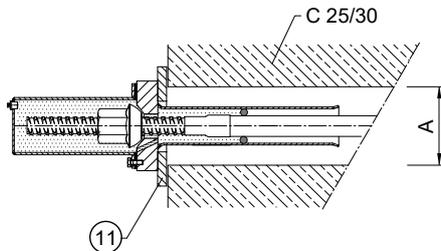
Steel bearing



Fully concreted

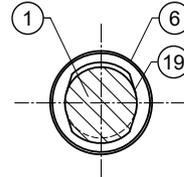


Bearing on larger borehole or distance

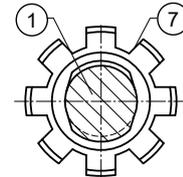


Sections

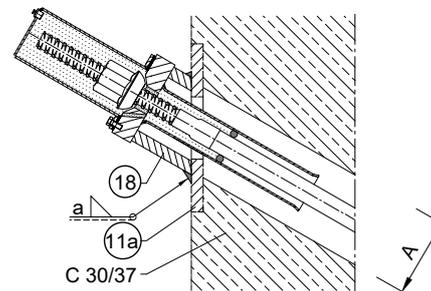
A – A, Cross section in L_{fr}



B – B, Cross section in L_{fb}



Angle compensation with tube



Prestressing steel bar nominal diameter \varnothing mm	Maximum G for bearing on steel G mm	Maximum A ¹⁾ for load transfer plate A mm	Fillet weld minimum thickness a mm	Minimum borehole diameter ²⁾			
				at anchor head mm	without coupler mm	with coupler at $L_{fr} - L_{fb}$ ³⁾ mm	with coupler in L_{fr} mm
17.5	80	160	3.5	80	50	60	70
26.5	90		5	80	60	75	85
32	100		6	85	65	85	95
36	130		7	95	65	90	110
40			8	95	80	95	110
47			8	120	90	110	130

- ① Prestressing steel bar
- ② Domed nut
- ③ Anchor plate with steel tube
- ⑥ Smooth sheathing
- ⑦ Basket spacer
- ⑨ Heat shrinking sleeve
- ⑪ Load transfer plate
- ⑪a Load transfer plate for angle compensation tube
- ⑫ Steel cap or plastic cap
- ⑮ Corrosion protection filling material
- ⑱ Angle compensation tube
- ⑲ Corrosion protection coating
- ⑳ Sealing ring

¹⁾ For load transfer plates to span larger distances, see Annex 6, a minimum concrete strength class according to EN 206 of \geq C25/30 for Pos. 11 and \geq C30/37 for Pos. 11a is required.
²⁾ The minimum borehole diameter is based on the minimum cover of grout including an injection hose \varnothing 10 mm
³⁾ Coupler at transition free anchor length, L_{fr} , to fixed anchor length, L_{fb}

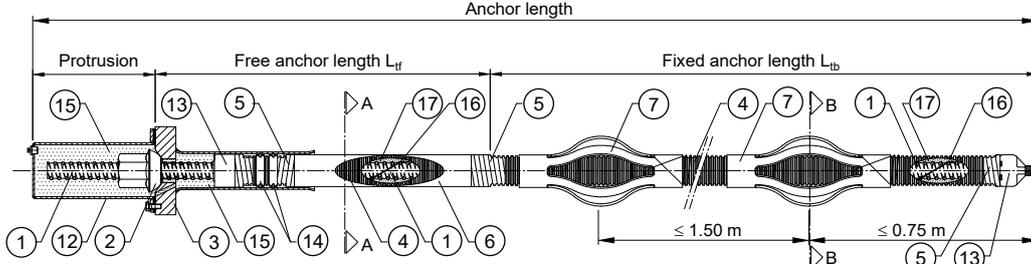
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Rock and soil anchor system SAS
 Prestressing steel bar Y1050H, \varnothing 17.5–47 mm
 Permanent rock and soil anchor

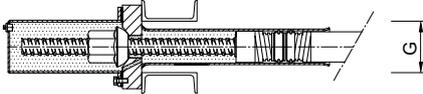
Annex 3
 of ETA-12/0601 of 23.12.2025

Rock and soil anchor system SAS – Permanent rock and soil anchor

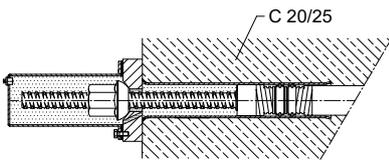


Anchor heads variants

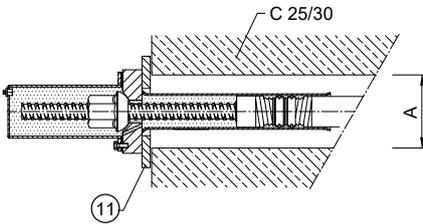
Steel bearing



Fully concreted

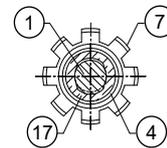
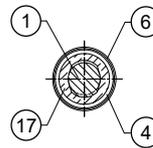


Bearing on larger borehole or distance

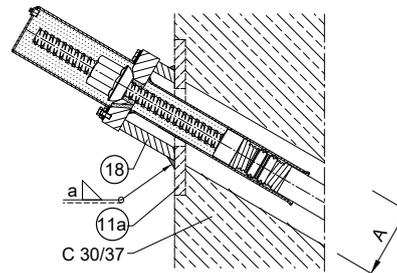


Sections

A – A, Cross section in L_{fr} B – B, Cross section in L_{fb}



Angle compensation with tube



- ① Prestressing steel bar
- ② Domed nut
- ③ Anchor plate with steel tube
- ④ Corrugated sheathing
- ⑤ Adhesive tape
- ⑥ Smooth sheathing
- ⑦ Basket spacer
- ⑪ Load transfer plate
- ⑪a Load transfer plate for angle compensation tube
- ⑫ Steel cap or plastic cap
- ⑬ Injection cap or end cap
- ⑭ Profile ring
- ⑮ Corrosion protection filling material
- ⑯ Inner spacer
- ⑰ Inner cement grout
- ⑱ Angle compensation tube

Prestressing steel bar nominal diameter \varnothing	Maximum G for bearing on steel	Maximum A ¹⁾ for load transfer plate	Fillet weld minimum thickness a	Minimum borehole diameter ²⁾			
				at anchor head	without coupler	with coupler at $L_{fr} - L_{fb}$ ³⁾	with coupler in L_{fr}
mm	mm	mm	mm	mm	mm	mm	mm
17.5	80	160	3.5	80	70	70	85
26.5	90		5	80	70	75	85
32	100		6	85	80	85	95
36	130		7	95	85	90	110
40			8	95	85	95	110
47			8	120	100	110	130

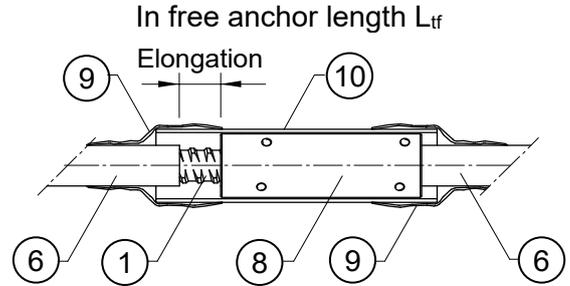
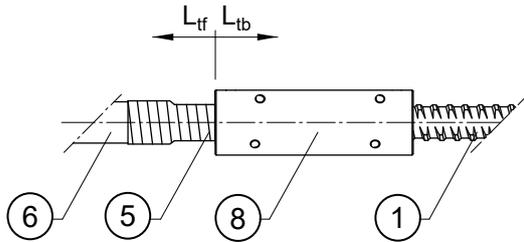
1) For load transfer plates to span larger distances, see Annex 6, a minimum concrete strength class according to EN 206 of \geq C25/30 for Pos. 11 and \geq C30/37 for Pos. 11a is required.
 2) The minimum borehole diameter is based on the minimum cover of grout including an injection hose \varnothing 10 mm
 3) Coupler at transition free anchor length, L_{fr} , to fixed anchor length, L_{fb}



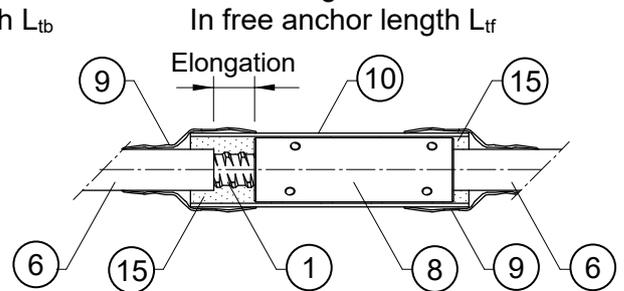
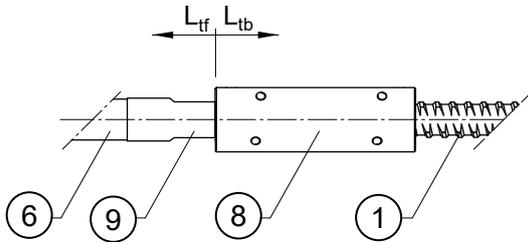
Rock and soil anchor system SAS
 Prestressing steel bar Y1050H, \varnothing 17.5–47 mm
 Coupling assemblies

Annex 4
 of ETA-12/0601 of 23.12.2025

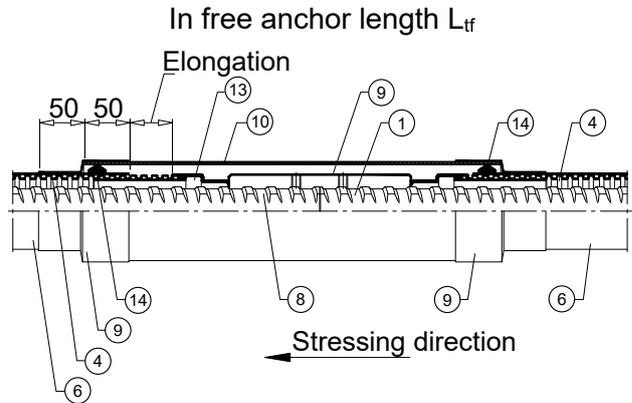
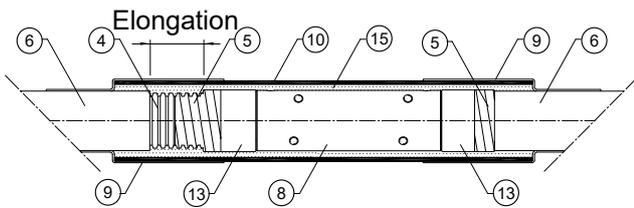
Coupling assemblies – Temporary rock and soil anchor
 Transition free anchor length L_{tf} – fixed anchor length L_{tb}



Coupling assemblies – Temporary rock and soil anchor with extended working life
 Transition free anchor length L_{tf} – fixed anchor length L_{tb}



Coupling assemblies – Permanent rock and soil anchor
 In free anchor length L_{tf}



Coupler at transition
 free anchor length, L_{tf} , to fixed anchor length, L_{tb}
 The coupler is protected with a double layer of heat shrinking sleeve. Overlap of heat shrinking sleeve and adjacent elements, i.e., prestressing steel bar or corrugated plastic sheathing, is at least 75 mm.

Coupler in fixed anchor length, L_{tb}
 In the fixed anchor length coupler are avoided. If a coupler is required in an exceptional case, the coupler is protected with a double layer of heat shrinking sleeve. Overlap of heat shrinking sleeve and adjacent elements, i.e., prestressing steel bar or corrugated plastic sheathing, is at least 75 mm.

- ① Prestressing steel bar
- ④ Corrugated sheathing
- ⑤ Adhesive tape
- ⑥ Smooth sheathing
- ⑧ Coupler with set screws
- ⑨ Heat shrinking sleeve
- ⑩ Coupler tube
- ⑬ Injection cap or end cap
- ⑭ Profile ring, optional
- ⑮ Corrosion protection filling material

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 Max Aicher GmbH & Co. KG 83404 Ainring-Hammerau	Rock and soil anchor system SAS Prestressing steel bar Y1050H, \varnothing 17.5–47 mm Proof forces and lock-off forces	Annex 5 of ETA-12/0601 of 23.12.2025
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The specified proof forces and lock-off forces of the rock and soil anchor are recommended in the absent of applicable standards and regulations in force at the place of use.

Prestressing steel bar Y1050H, $R_{p0.1} = 950 \text{ N/mm}^2$, $R_m = 1050 \text{ N/mm}^2$						
Prestressing steel bar nominal diameter	Characteristic force at yield strength	Characteristic maximum force	Maximum lock-off force ¹⁾	Investigation test maximum proof force ²⁾	Suitability test maximum proof force ²⁾	Acceptance test maximum proof force ²⁾
\varnothing	$F_{p0.1}$	F_{pk}	—	—	—	—
mm	kN	kN	kN	kN	kN	kN
17.5	230	255	191	219 or 204	219 or 204	219 or 204
26.5	525	580	435	499 or 464	499 or 464	499 or 464
32	760	845	634	722 or 676	722 or 676	722 or 676
36	960	1 070	803	912 or 856	912 or 856	912 or 856
40	1 190	1 320	990	1 131 or 1 056	1 131 or 1 056	1 131 or 1 056
47	1 650	1 820	1 365	1 568 or 1 456	1 568 or 1 456	1 568 or 1 456

1) Maximum lock-off force according to Eurocode 2 and Eurocode 7,

$$\dots\dots\dots \text{minimum} \begin{cases} 0.75 \cdot F_{pk} \\ 0.85 \cdot F_{p0.1} \end{cases}$$

2) Maximum proof force in investigation, suitability, and acceptance test according to Eurocode 2 and

$$\text{Eurocode 7} \dots\dots\dots \begin{cases} 0.95 \cdot F_{p0.1} \\ \text{or} \\ \text{minimum} \begin{cases} 0.80 \cdot F_{pk} \\ 0.90 \cdot F_{p0.1} \end{cases} \end{cases}$$

Proof force of $0.95 \cdot F_{p0.1}$ can only be applied, if the force in the prestressing jack can be measured to an accuracy of $\pm 5 \%$ of the final value of the proof force. Otherwise, minimum $\begin{cases} 0.80 \cdot F_{pk} \\ 0.90 \cdot F_{p0.1} \end{cases}$ is taken.

NOTE For crack width in inner grout see Annex 9.

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 Max Aicher GmbH & Co. KG 83404 Ainring-Hammerau	Rock and soil anchor system SAS Prestressing steel bar Y1050H, \varnothing 17.5–47 mm	Annex 6 of ETA-12/0601 of 23.12.2025
	Centre spacing and edge distance Additional reinforcement	

Mechanical anchorage without additional reinforcement

- Actual concrete compressive strength at time of stressing, $f_{cm, 0, cube 150} \geq 25 \text{ N/mm}^2$
- Minimum concrete compressive strength class according to EN 206 $\geq \text{C20/25}$
- Reinforcement in the anchorage zone according to Clause 1.7.

Prestressing steel bar nominal diameter	Centre spacing	Edge distance
\varnothing	C	E
mm	mm	mm
17.5	200	90 + c
26.5	280	130 + c
32	340	160 + c
36	380	180 + c
40	420	200 + c
47	500	240 + c

Prestressing steel bar nominal diameter	Maximum diameter ^{1), 2)}
\varnothing	\varnothing_s
mm	mm
17.5	63.5
26.5	
32	70.0
36	76.1
40	
47	101.6

c...Concrete cover of reinforcement according to standards and regulations in force at the place of use. The exposure classes according to EN 206 are considered.

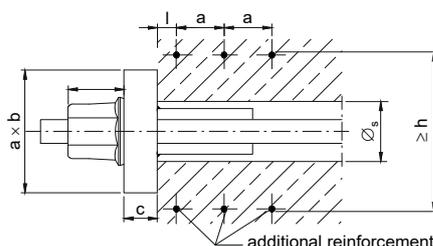
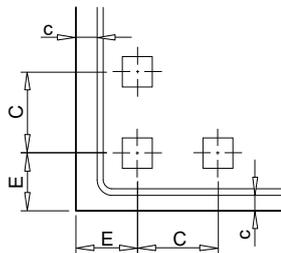
¹⁾...Maximum diameter for mechanical anchorage without and with additional reinforcement

Mechanical anchorage with additional reinforcement – bursting reinforcement

- Actual concrete compressive strength at time of stressing, $f_{cm, 0, cube 150} \geq 25 \text{ N/mm}^2$
- Minimum concrete compressive strength class according to EN 206 $\geq \text{C20/25}$

Prestressing steel bar nominal diameter	Anchor plate WR 2011- \varnothing			
	Centre spacing	Edge distance	Additional reinforcement Ribbed reinforcing steel, $R_e \geq 500 \text{ N/mm}^2$	
\varnothing	C	E	$n \times \varnothing / a / l$ ³⁾	$h \times h$ ⁴⁾
mm	mm	mm	- x mm / mm / mm	mm x mm
17.5	160	70 + c	5 x 10 / 30 / 20	140 x 140
26.5	240	110 + c	4 x 12 / 60 / 20	220 x 220
32	300	140 + c	5 x 12 / 60 / 20	280 x 280
36	340	160 + c	6 x 12 / 60 / 20	320 x 320
40	380	180 + c	6 x 12 / 60 / 20	360 x 360
47	440	210 + c	7 x 12 / 60 / 35	420 x 420

- ¹⁾ Maximum diameter for mechanical anchorage without and with additional reinforcement
- ²⁾ Larger bearing distances are spanned with load transfer plates and the minimum concrete compressive strength class according to EN 206 is $\geq \text{C25/30}$ and with angle compensation tube is $\geq \text{C30/37}$.
- c..... Concrete cover of reinforcement according to standards and regulations in force at the place of use. The exposure classes according to EN 206 are considered.
- ³⁾ n.....Number of stirrups
 \varnothingNominal diameter of additional reinforcement
 a.....Axis spacing of additional reinforcement
 l.....Distance of first stirrup to anchor plate
- ⁴⁾ h.....External dimensions of stirrups



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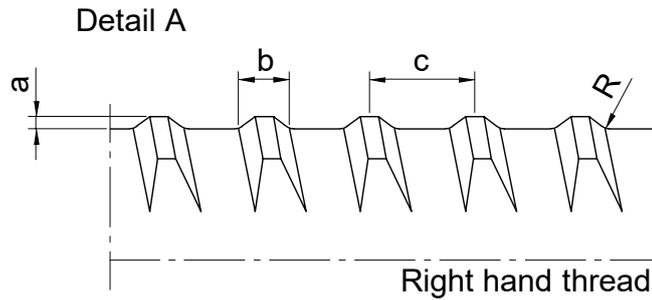
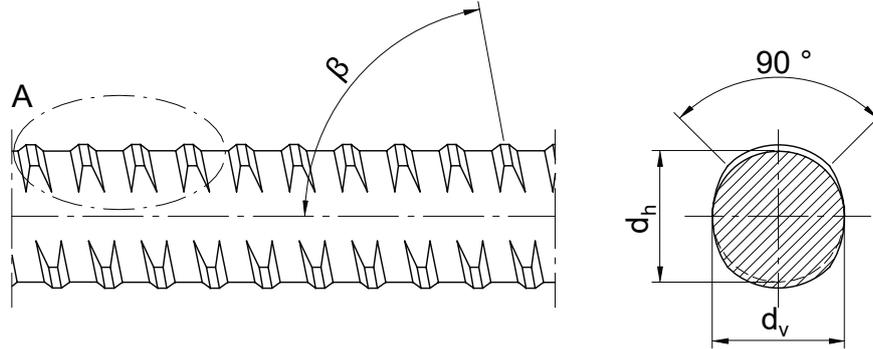


Rock and soil anchor system SAS
 Prestressing steel bar Y1050H, \varnothing 17.5–47 mm
 Prestressing steel bar – Nominal
 dimensions and mass – Rib geometry

Annex 7
 of **ETA-12/0601** of 23.12.2025

① Prestressing steel bar

Geometry



Diameter	Nominal		Core diameter		Ribs, right hand thread				
	Mass per metre ¹⁾	Cross-sectional area			Depth	Width	Pitch	Gradient	Radius
\varnothing mm	M kg/m	S_n mm ²	d_h mm	d_v mm	min a mm	b mm	c mm	β °	R mm
17.5	1.96	241	17.4	17.2	1.1	4.1	8	82.5	1.8
26.5	4.48	552	26.4	25.9	1.7	6.2	13	81.5	2.6
32	6.53	804	31.9	31.4	1.9	7.6	16	81.5	3.2
36	8.27	1 018	35.9	35.4	2.1	8.7	18	81.5	3.6
40	10.21	1 257	39.7	38.9	2.1	9.6	20	81.5	4.0
47	14.10	1 735	46.6	45.8	2.4	10.5	21	82.5	4.0

¹⁾ Nominal mass per metre, including 3.5 % of non load-bearing ribs

Tolerance to nominal mass $\begin{cases} + 6 \% \\ - 2 \% \end{cases}$



Max Aicher GmbH & Co. KG
83404 Ainring-Hammerau

Rock and soil anchor system SAS
Prestressing steel bar Y1050H, \varnothing 17.5–47 mm

Prestressing steel bar – Mechanical
technological characteristics

Annex 8

of **ETA-12/0601** of 23.12.2025

① Prestressing steel bar

Prestressing steel bar nominal diameter \varnothing mm	Nominal	
	force at yield strength ¹⁾ $F_{p0.1}$ kN	maximum force ¹⁾ F_{pk} kN
17.5	230	255
26.5	525	580
32	760	845
36	960	1 070
40	1 190	1 320
47	1 650	1 820

¹⁾ 5 % fractile

Characteristic yield strength ¹⁾	$R_{p0.1}$	N/mm ²	950
Characteristic tensile strength ¹⁾	R_m	N/mm ²	1 050
Elongation at maximum force $A_{gt} = A_g + \frac{R_m}{E} \cdot 100$ ²⁾	A_{gt}	%	≥ 3.5
Constriction at break Ductile break, reduction of area after fracture	Z	%	≥ 10
Fatigue resistance ³⁾ at an upper stress of $\sigma_{up} = 0.7 \cdot R_{m, act}$ and up to $2.0 \cdot 10^6$ load cycles. Tested stress range for \varnothing 17.5 to 32 mm \varnothing 36 and 40 mm \varnothing 47 mm	$2 \cdot \sigma_A$	N/mm ² N/mm ² N/mm ²	180 137 120
Stress relaxation With an initial stress of $0.7 \cdot R_{m, act}$	—	%	≤ 4
Stress corrosion resistance Within a test series at a stress of $0.8 \cdot R_{m, act}$ \varnothing 17.5 mm, duration to fracture { individual result median \varnothing 26.5 mm, duration to fracture { individual result median	—	h h h h	≥ 20 ≥ 250 ≥ 100 ≥ 400

¹⁾ 5 % fractile, nominal values

²⁾ Modulus of elasticity $E \approx 205\,000$ N/mm², A_g as plastic extension at maximum force

³⁾ Fatigue resistance of prestressing steel bar without anchorage and coupler



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Rock and soil anchor system SAS
Prestressing steel bar Y1050H, \varnothing 17.5–47 mm

Inner grout – Specification

Annex 9

of **ETA-12/0601** of 23.12.2025

⑰ Inner grout

Content of aggressive components	Cl ⁻ SO ₃ ²⁻ S ²⁻	%	≤ 0.1 ≤ 4.5 ≤ 0.01
Residue on sieve		—	≤ 0.01
Fluidity, cone	t ₀	s	≤ 25
	t ₃₀	s	$\left\{ \begin{array}{l} \leq 1.2 \cdot t_0 \\ \geq 0.8 \cdot t_0 \\ \leq 25 \end{array} \right.$
Fluidity, grout spread ¹⁾		—	—
Bleeding, wick-induced		%	≤ 0.3
Bleeding, inclined tube		%	≤ 0.3
Volume change		%	≥ -1 ≤ +5
Compressive strength		N/mm ²	≥ 30
Setting time		h	≥ 3 ≤ 24
Fluid density		kg/m ³	2 050
Crack width of inner grout at 60 % of R _m		mm	≤ 0.1

¹⁾ Not relevant

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 Max Aicher GmbH & Co. KG 83404 Ainring-Hammerau	Rock and soil anchor system SAS Prestressing steel bar Y1050H, \varnothing 17.5–47 mm Heat shrinking sleeve – Specification	Annex 10 of ETA-12/0601 of 23.12.2025
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⑨ Heat shrinking sleeve
P 7029

Characteristics	—	P7029-C	P7029-D	P7029-P
Thickness after shrinking	mm	≥ 1.0	≥ 1.0	≥ 1.0
Mass per unit area of adhesive	g/m^2	≥ 500	≥ 100	≥ 600
Tensile strength	N/mm	≥ 30	≥ 70	≥ 20
Elongation at break	%	≥ 500	≥ 500	≥ 600
Peel strength layer to layer	N/mm	≥ 8.0	≥ 2.0	≥ 1.5
Peel strength to steel surface	N/mm	≥ 1.0	≥ 4.0	≥ 1.0
Thermal ageing resistance	$\frac{S_{100}}{S_0}, \frac{E_{100}}{E_0}$	$\begin{cases} \leq 1.25 \\ \geq 0.75 \end{cases}$	$\begin{cases} \leq 1.25 \\ \geq 0.75 \end{cases}$	$\begin{cases} \leq 1.25 \\ \geq 0.75 \end{cases}$
	$\frac{S_{100}}{S_{70}}, \frac{E_{100}}{E_{70}}$	≥ 0.9	≥ 1.0	≥ 0.8
	$\frac{P_{100}}{P_T}, \frac{A_{100}}{A_T}$	≥ 0.75	≥ 0.75	≥ 0.75
	$\frac{P_{100}}{P_{70}}, \frac{A_{100}}{A_{70}}$	≥ 1.0	≥ 0.8	≥ 0.8
Indentation resistance	Residual thickness mm	≥ 3.7	≥ 1.0	≥ 0.6
Impact resistance ¹⁾	—	C	C	C
Saponification value	$\frac{\text{mg KOH}}{\text{g}}$	10	13	15
Microbiological resistance	$\frac{S_6}{S_0}, \frac{E_6}{E_0}$	≥ 0.9	≥ 0.8	≥ 0.8
	$\frac{A_6}{A_0}$	≥ 0.4	— ²⁾	≥ 0.8
Water absorption	%	≤ 4.65	≤ 0.45	≤ 0.05
Softening point of adhesive	$^{\circ}\text{C}$	120	120	120
Oxygen stability of adhesive	min	20	20	20
Resistance to salt spray of adhesive	—	No corrosion	No corrosion	No corrosion
Content of aggressive components of adhesive	Cl^-	≤ 50	≤ 50	≤ 50
	NO_3^-	≤ 50	≤ 50	≤ 50
	NO_2^-	≤ 10	≤ 10	≤ 10
	SO_4^{2-}	≤ 50	≤ 50	≤ 50
	S^{2-}	≤ 50	≤ 50	≤ 50

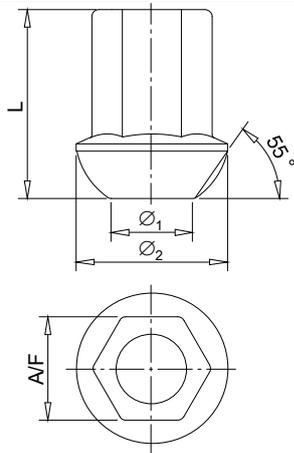
1) According to EN 12068.
2) Characteristic not assessed.



Rock and soil anchor system SAS
 Prestressing steel bar Y1050H, \varnothing 17.5–47 mm
 Components – Domed nut, square anchor plate, welded steel tube – Dimensions

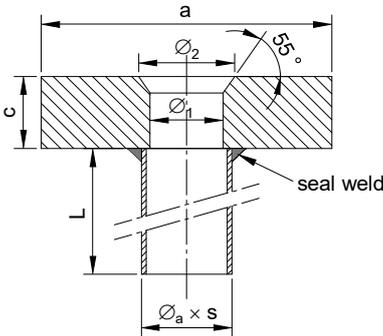
Annex 11
 of **ETA-12/0601** of 23.12.2025

② Domed nut
 WR 2001- \varnothing

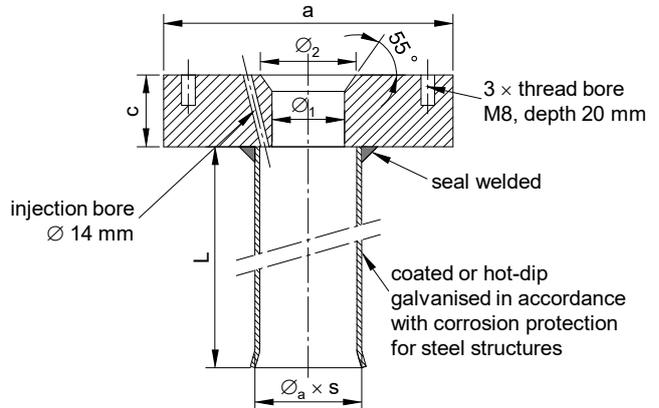


Prestressing steel bar \varnothing	A/F	L	\varnothing_1	\varnothing_2
mm	mm	mm	mm	mm
17.5	36	55	31	50
26.5	50	75	44	72
32	60	90	48	80
36	65	100	50	90
40	70	115	55	100
47	80	135	65	110

③ Square anchor plate with steel tube
 Temporary rock and soil anchor
 WR 2111- \varnothing



Temporary rock and soil anchor
 with extended working life
 Permanent rock and soil anchor
 WR 2110- \varnothing



Prestressing steel bar	Anchor plate				Steel tube				
	\varnothing	a	c	\varnothing_1	\varnothing_2	Temporary rock and soil anchor	Temporary rock and soil anchor with extended working life	Permanent rock and soil anchor ¹⁾	
mm	mm	mm	mm	mm	mm	$\varnothing_a \times s$	L	$\varnothing_a \times s$	L
17.5	110	30	28	45	44.5 × 2.3	150	300	63.5 × 2.6	300
26.5	150	35	39	72	51.0 × 2.3				
32	180	40	45	82	57.0 × 2.3				
36	200	45	49	92	60.3 × 2.3				
40	220	45	54	100	76.0 × 2.6				
47	260	50	64	110	88.9 × 2.9				
								70.0 × 2.6	
								76.1 × 2.6	
								101.6 × 2.9	

¹⁾ For permanent rock and soil anchors, the wall thickness of the steel tube is be increased by 1 mm for high corrosion load according to EN 12501-1 and EN 12501-2.

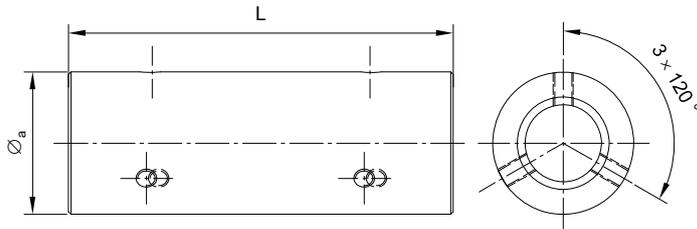


Rock and soil anchor system SAS
 Prestressing steel bar Y1050H, \varnothing 17.5–47 mm
 Components – Coupler with set screws,
 load transfer plates – Dimensions

Annex 12
 of **ETA-12/0601** of 23.12.2025

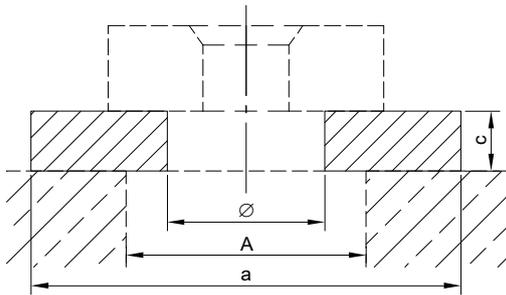
8 Coupler with set screws
 WR 3020- \varnothing

To prevent unscrewing, 3 set screws at both ends of the coupler
 Hexagon socket set screws with flat point, EN ISO 4026



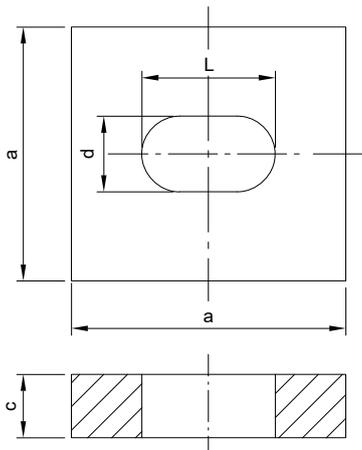
Prestressing steel bar \varnothing	\varnothing_a	L	Set screw
mm	mm	mm	mm
17.5	36	100	M 8
26.5	50	170	
32	60	200	
36	68	210	
40	70	245	M 10
47	83	270	

11 Load transfer plate ¹⁾ for large bore holes, recess tube
 WR 2149- \varnothing



Prestressing steel bar \varnothing	max. \varnothing A or borehole	a	c	\varnothing
mm	mm	mm	mm	mm
17.5	160	180	20	73
26.5		195	20	73
32		215	20	79
36		230	15	86
40		240	15	86
47		270	15	111

11a Load transfer plate ¹⁾ for angle compensation tube
 WR 2150- \varnothing



Prestressing steel bar \varnothing	a	c	d	L
mm	mm	mm	mm	mm
17.5	180	20	73	102
26.5	195	25	73	104
32	215	30	79	114
36	230	30	79	114
40	240	30	86	122
47	270	30	111	151

¹⁾ For permanent rock and soil anchors the exposed steel surfaces are coated or hot-dip galvanised as specified for corrosion protection of steel structures.



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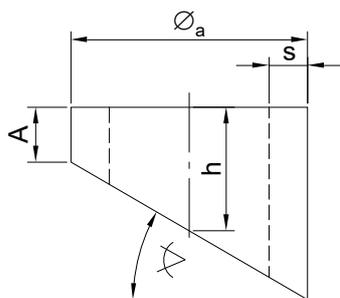
Rock and soil anchor system SAS
Prestressing steel bar Y1050H, \varnothing 17.5–47 mm

Components – Angle compensation tube,
coupler tube – Dimensions

Annex 13

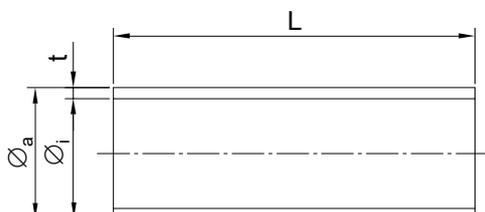
of **ETA-12/0601** of 23.12.2025

⑮ Angle compensation tube ¹⁾



Prestressing steel bar \varnothing	Steel tube $\varnothing_a \times s$	A	h for an angle of					
			5 °	10 °	15 °	20 °	25 °	30 °
mm	mm × mm	mm	mm					
17.5	101.6 × 5.0	25	30	34	39	44	49	55
26.5	133.0 × 8.0	30	36	42	48	55	62	69
32	139.7 × 12.5	30	37	43	49	56	63	71
36	139.7 × 16.0	35	42	48	54	61	68	76
40	168.3 × 16.0	35	43	50	58	66	75	84
47	219.1 × 16.0	35	45	55	65	75	87	99

⑩ Coupler tube



Prestressing steel bar \varnothing	Temporary rock and soil, Temporary rock and soil anchor with extended working life $\varnothing_a / \varnothing_i$	Permanent rock and soil anchor $\varnothing_a / \varnothing_i$	L ³⁾	min. t
mm	mm	mm	mm	mm
17.5	50 / 44	63 / 57	450	2
26.5	63 / 57	63 / 57		
32	75 / 67.8	75 / 67.8	500	
36	90 / 84.6	90 / 84.6		
40	90 / 84.6	90 / 84.6	600	
47	110 / 105	110 / 105		

³⁾ Elongation for a free anchor length of up to 18 m is considered

¹⁾ For permanent rock and soil anchors the exposed steel surfaces are coated or hot-dip galvanised as specified for corrosion protection of steel structures.



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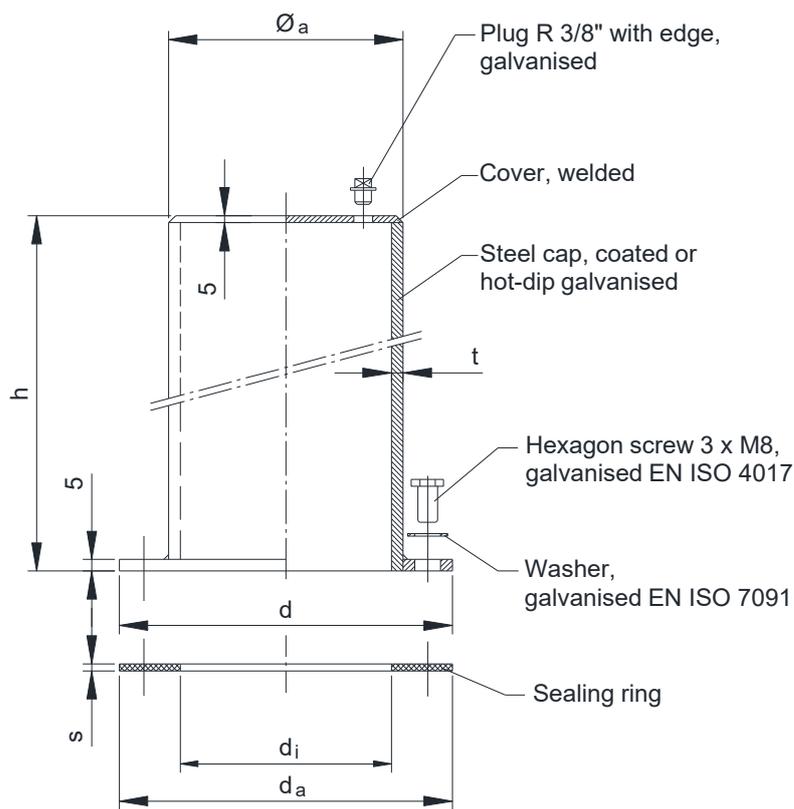
Rock and soil anchor system SAS
Prestressing steel bar Y1050H, \varnothing 17.5–47 mm

Components – Steel cap – Dimensions

Annex 14

of **ETA-12/0601** of 23.12.2025

⑫ Steel cap¹⁾
with accessories



Dimensions in mm

Prestressing steel bar \varnothing	Steel tube $\varnothing_a \times t$	Flange d	Height h	Sealing ring $d_a \times d_i \times s$
mm	mm \times mm	mm	mm	mm \times mm \times mm
17.5	63.5 \times 3.2	110	≥ 200	110 \times 57 \times 3
26.5	88.9 \times 3.2	135		135 \times 82 \times 3
32	95.0 \times 3.2	142		142 \times 88 \times 3
36	101.6 \times 3.2	148		148 \times 94 \times 3
40	114.0 \times 3.6	148		148 \times 107 \times 3
47	127.0 \times 3.6	171		171 \times 120 \times 3

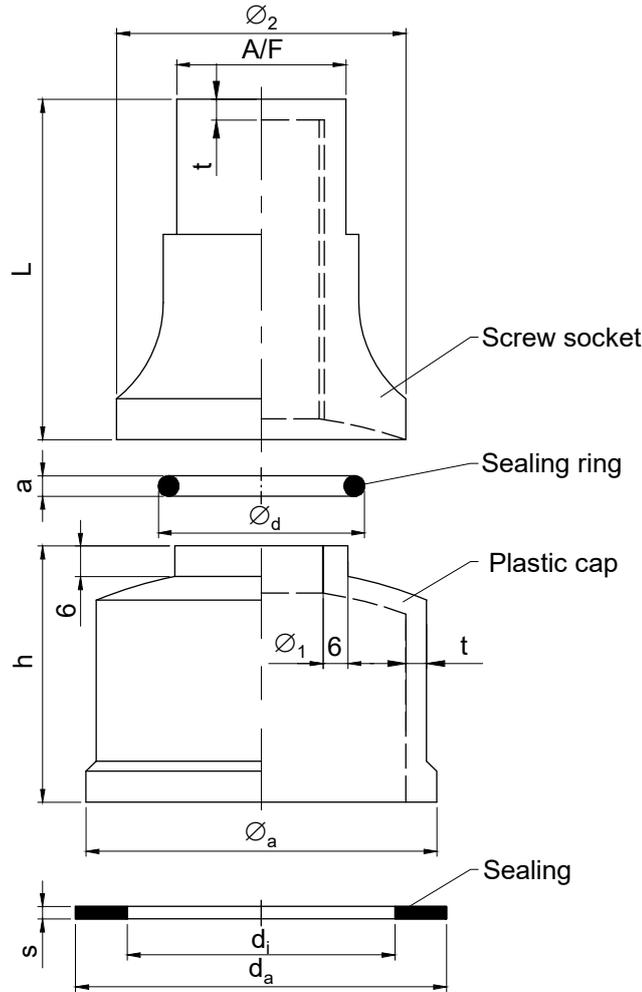
¹⁾ For permanent rock and soil anchors the exposed steel surfaces are coated or hot-dip galvanised as specified for corrosion protection of steel structures.



Rock and soil anchor system SAS
 Prestressing steel bar Y1050H, \varnothing 17.5–47 mm
 Components – Plastic cap with screw
 socket – Dimensions

Annex 15
 of **ETA-12/0601** of 23.12.2025

12 Plastic cap
 with accessories



Dimensions in mm

Prestressing steel bar \varnothing	Plastic cap			Screw socket				Sealing ring	Sealing	
	t	$\varnothing_a \times h$	\varnothing_1	t	A/F	\varnothing_2	L	$\varnothing_d \times a$	d_a / d_i	s
mm	mm	mm \times mm	mm	mm	mm	mm	mm	mm \times mm	mm / mm	mm
17.5	5	85 \times 60	30	5	41	70	107	65 \times 10	90 / 65	3
26.5–32	5	112 \times 87	42	5	50	90	115	77 \times 10	115 / 85	3
36–40	5	132 \times 105	58	5	70	110	154	84 \times 8	135 / 105	3
47	5	183 \times 125	72	5	80	130	175	98 \times 8	188 / 156	3



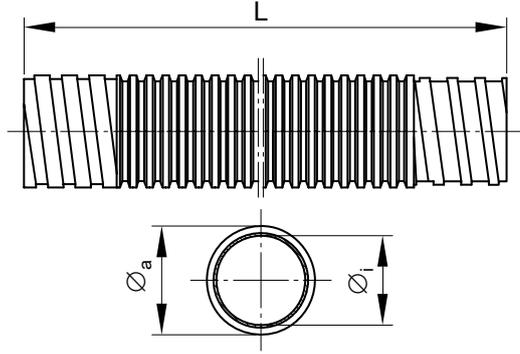
Rock and soil anchor system SAS
 Prestressing steel bar Y1050H, \varnothing 17.5–47 mm

Components – Corrugated plastic sheathing,
 heat shrinking sleeve – Dimensions

Annex 16

of **ETA-12/0601** of 23.12.2025

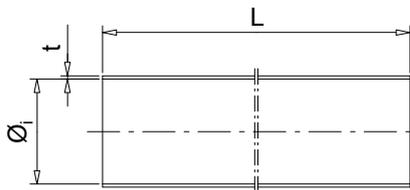
④ Corrugated sheathing



Prestressing steel bar \varnothing	Dimensions ¹⁾	
	$\varnothing_a / \varnothing_i$	min. t
mm	mm / mm	mm
17.5	50 / 43	1.0
26.5		
32	56 / 49	
36	65 / 57	
40		
47	80 / 71	

¹⁾ Length as required

⑨ Heat shrinking sleeve
 P 7029



Heat shrinking sleeve	\varnothing_i before shrinking	min t after shrinking
—	mm	mm
P7029-C50/16	50	1.0
P7029-C75/22	75	
P7029-C95/29	95	
P7029-C140/42	140	
P7029-C180/60	180	
P7029-D50/16	50	
P7029-D63/19	63	
P7029-D75/22	75	
P7029-D95/30	95	
P7029-D115/34	115	
P7029-D140/42	140	
P7029-D165/50	165	
P7029-P40/15S	40	
P7029-P50/20S	50	
P7029-P70/25S	70	
P7029-P90/30S	90	
P7029-P120/40S	120	
P7029-P170/80S	170	

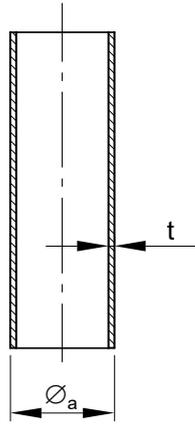
Length of heat shrinking sleeve, L, as required. Overlap of adjacent parts of the rock and soil anchor is ensured.



Rock and soil anchor system SAS
 Prestressing steel bar Y1050H, \varnothing 17.5–47 mm
 Components – Smooth sheathing –
 Dimensions

Annex 17
 of **ETA-12/0601** of 23.12.2025

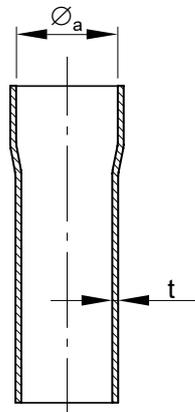
⑥ **Smooth sheathing**
 Temporary rock and soil anchor
 Temporary rock and soil anchor with extended working life



Prestressing steel bar \varnothing	Dimensions ²⁾	
	\varnothing_a	t
mm	mm	mm
17.5	35	2.0
26.5	41	
32	46	
36	50	2.0 / 3.6
40	63	
47	75	4.3

²⁾ Length as required

Permanent rock and soil anchor



Prestressing steel bar \varnothing	Dimensions ³⁾	
	\varnothing_a	min. t
mm	mm	mm
17.5	54.2	1.5
26.5		
32	60.1	
36	70.1	
40		
47	84.9	

³⁾ Length as required



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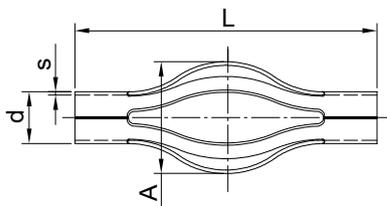
Rock and soil anchor system SAS
Prestressing steel bar Y1050H, \varnothing 17.5–47 mm

Components – Basket spacer, profile ring,
sealing ring – Dimensions

Annex 18

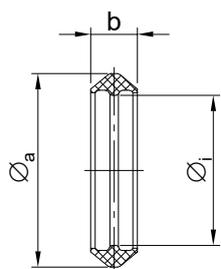
of **ETA-12/0601** of 23.12.2025

⑦ Basket spacer



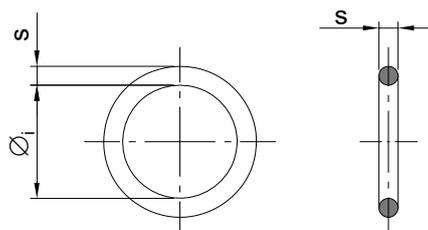
Prestressing steel bar \varnothing	Temporary rock and soil anchor, Temporary rock and soil anchor with extended working life			Permanent rock and soil anchor		
	d × s	A	L	d × s	A	L
mm	mm × mm	mm	mm	mm × mm	mm	mm
17.5	20 × 1.5	> 70	150 to 175	55 × 3.0	> 100	250 to 290
26.5	32 × 1.9			63 × 3.0		
32	40 × 3.0	> 90	250 to 290	75 × 3.6	> 115	
36				90 × 2.7	> 140	
40	50 × 3.0	> 100				
47						

⑭ Profile ring



Prestressing steel bar \varnothing	\varnothing_a	\varnothing_i	b
mm	mm	mm	mm
17.5	58.8	45.5	14
26.5			
32	65.0	49.5	20
36	71.5	58.0	20
40			
47	96.0	75.0	23

⑳ Sealing ring



Prestressing steel bar \varnothing	\varnothing_i	s
mm	mm	mm
17.5	33	15
26.5	39	12
32	44	12
36	48	15
40	61	8
47	73	15



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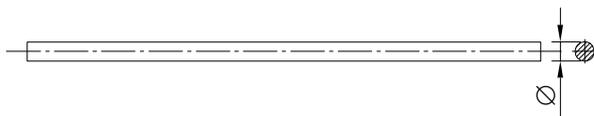
Rock and soil anchor system SAS
 Prestressing steel bar Y1050H, \varnothing 17.5–47 mm

Components – Plastic cord, mat spacer,
 injection cap and end cap – Dimensions

Annex 19

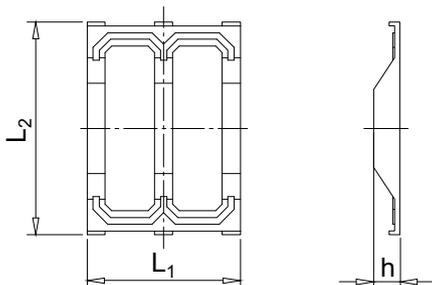
of **ETA-12/0601** of 23.12.2025

① Inner spacer
 PE cord, pitch ≤ 0.5 m



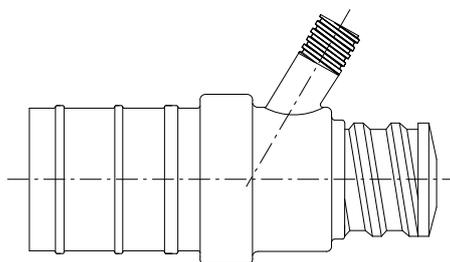
Prestressing steel bar \varnothing mm	PE cord min. \varnothing mm
17.5	6
26.5	
32	
36	
40	
47	

Mat spacer
 Distance ≤ 1.0 m

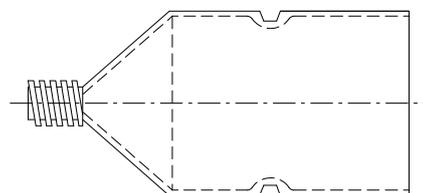


Prestressing steel bar \varnothing mm	Dimensions			Number of ribs
	h mm	L ₁ mm	L ₂ mm	
36	6	112	124	3
40	6	112	124	3
47	8	132	124	3

② Injection cap and end cap



Alternative cap





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Rock and soil anchor system SAS
Prestressing steel bar Y1050H, \varnothing 17.5–47 mm

Material specifications

Annex 20

of **ETA-12/0601** of 23.12.2025

Component	Standard / Specification
Prestressing steel bar	Annex 7 and Annex 8
Domed anchor nut, \varnothing 17.5, 26.5, 32, 36 mm	EN 10025
Domed anchor nut, \varnothing 40, 47 mm	EN 10293 EN ISO 683-2
Solid plate, square	EN 10025
Steel tube	EN 10216-1 EN 10217-1
Coupler, \varnothing 17.5, 26.5, 32, 36 mm	EN ISO 683-1
Coupler, \varnothing 40, 47 mm	Deposited at Österreichisches Institut für Bautechnik
Load transfer plate	EN 10025
Angle compensation tube	EN 10210
Coupler tube	EN ISO 17855-1 EN ISO 19069-1 EN ISO 21306-1
Steel cap	EN 10025
Corrugated sheathing Smooth sheathing Plastic cap Injection cap End cap	EN ISO 17855-1 EN ISO 19069-1 EN ISO 21306-1
PE cord Mat spacer	EN ISO 17855-1 EN ISO 19069-1
Basket spacer	EN ISO 21306-1
Sealing ring Toroidal sealing ring Profile ring	Neoprene
Sealing ring Toroidal sealing ring Profile ring	Cellular rubber
Additional reinforcement	Ribbed reinforcing steel, $R_e \geq 500 \text{ N/mm}^2$
Heat shrinking sleeve	Annex 10
Inner grout	Annex 9



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Rock and soil anchor system SAS
Prestressing steel bar Y1050H, \varnothing 17.5–47 mm

Contents of the prescribed test plan

Annex 21

of **ETA-12/0601** of 23.12.2025

Subject / type of control	Test of control method	Criteria, if any	Minimum number of samples ¹⁾	Minimum frequency of control	
Anchorage, Coupling assembly	Static load test on anchorage and coupling assembly	2)	0.2 % ^{3), 4)} ≥ 2 ⁴⁾	Per year	
	Resistance to fatigue of anchorage and coupling assembly	2)	1 ⁴⁾	Per year	
Prestressing steel bar	Mass per metre, cross-sectional area, surface geometry	2)	≥ 1 ⁵⁾ ≥ 3 ⁶⁾	Continuous	
	Strength characteristics ⁷⁾ Elongation at maximum force ⁷⁾ Constriction at break	2)	≥ 1 ⁵⁾ ≥ 3 ⁶⁾	Continuous	
	Visual inspection ⁸⁾	2)	100 %	Continuous	
	Traceability	full			
Domed anchor nut, Coupler	Dimensions	2)	5 % ^{9), 10)} ≥ 2 ^{9), 10)}	Continuous	
	Strength ¹¹⁾	2)	0.5 % ⁹⁾ ≥ 2 ⁹⁾	Continuous	
	Material	Checking ¹²⁾	2)	100 %	Continuous
	Visual inspection ⁸⁾	Checking	2)	100 %	Continuous
	Inspection of all components manufacturer by the manufacturer of the kit				1 per year
Traceability	full				
Simple square anchor plate	Dimensions	2)	3 % ^{9), 10)} ≥ 2 ^{9), 10)}	Continuous	
	Material	Checking ¹³⁾	2)	100 %	Continuous
	Visual inspection ⁸⁾	Checking	2)	100 %	Continuous
	Traceability	full			

- 1) For two specified numbers of samples, the higher number applies.
- 2) Conformity with the specifications of the item
- 3) Percentage of produced anchorages or coupling assemblies per nominal prestressing steel bar diameter. After 5 years of successful testing, the frequency may be reduced to 0.1 %.
- 4) For at least 1 nominal prestressing steel bar diameter. In case of a production of less than 20 anchorages or coupling assemblies of 1 nominal prestressing steel bar diameter per year, testing that nominal prestressing steel bar diameter is not required. However, all nominal prestressing steel bar diameters shall be tested within 5 years.
- 5) Per nominal prestressing steel bar diameter and 15 to
- 6) Per nominal prestressing steel bar diameter and heat
- 7) Assessment of long-term quality level according to prEN 10138-1, Clause 8.3.2.3.
- 8) Successful visual inspection does not need to be documented.
- 9) Percentage of produced component or minimum number of specimens per nominal prestressing steel bar diameter and batch of component
- 10) In case of a continuous manufacture without retooling of at least 1 000 parts, the frequency may be reduced to 1 % with at least 1 specimen per shift. The stability of the process of the continuous manufacture is verified.
- 11) Strength determined by means of hardness
- 12) Inspection certificate type "3.1" according to EN 10204
- 13) Test report type "2.2" according to EN 10204

Traceability full Full traceability of each component to its raw material.
 Material Defined according to technical specification deposited by the supplier
 Dimensions Measuring of all the dimensions and angles according to the specification given in the test plan
 Visual inspection Main dimensions, gauge testing, correct marking or labelling, appropriate performance, surface, corrosion, according to the component's specification



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Rock and soil anchor system SAS
Prestressing steel bar Y1050H, \varnothing 17.5–47 mm

Contents of the prescribed test plan

Annex 22
of **ETA-12/0601** of 23.12.2025

Subject / type of control		Test of control method	Criteria, if any	Minimum number of samples ¹⁾	Minimum frequency of control
Inner grout	Characteristics	EN 445	2)	EN 446	EN 446
	Traceability	full			
Heat shrinking sleeve	Dimensions	Testing	2)	0.5 % ³⁾ ≥ 1 ³⁾	Continuous
	Material	Checking ⁴⁾	2)	100 %	Continuous
	Thickness after shrinking	Testing	2)	0.5 % ³⁾ ≥ 1 ³⁾	Continuous
	Bond to steel surface	Testing ⁵⁾	6)	0.5 % ³⁾ ≥ 1 ³⁾	Continuous
	Traceability	full			
Corrugated sheathing	Dimensions	Testing	2)	0.1 % ^{7), 8)} ≥ 2 ^{7), 8)}	Continuous
	Material	Checking ⁹⁾	2)	100 %	Continuous
	Visual inspection ¹⁰⁾	Checking	2)	100 %	Continuous
	Traceability	full			

- 1) For two specified numbers of samples, the higher number applies.
- 2) Conformity with the specifications of the item
- 3) Percentage or minimum number for at least 1 size of heat shrinking sleeve per year. All sizes of heat shrinking sleeve shall be tested within 5 years.
- 4) Test report type “2.2” according to EN 10204
- 5) Detailed visual inspection of work samples regarding all-over adherence to steel surface, entrapped air, and bond defects
- 6) Applied heat shrinking sleeve with all-over adherence to steel surface, free of entrapped air, and free of bond defects
- 7) Percentage or minimum number per nominal diameter of corrugated sheathing
- 8) Per nominal diameter of corrugated sheathing. In case of less than 20 applications of a nominal diameter of corrugated sheathing per year, testing that nominal diameter of corrugated sheathing is not required. However, all nominal diameters of corrugated sheathing shall be tested within 5 years.
- 9) Inspection certificate type “3.1” according to EN 10204
- 10) Successful visual inspection does not need to be documented.

Traceability full Full traceability of each component to its raw material.
 Material Defined according to technical specification deposited by the supplier
 Dimensions Measuring of all the dimensions and angles according to the specification given in the test plan
 Visual inspection Main dimensions, correct marking or labelling, appropriate performance, surface, porosities, blisters, according to the component’s specification



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Rock and soil anchor system SAS
Prestressing steel bar Y1050H, Ø 17.5–47 mm

Audit testing

Annex 23
of **ETA-12/0601** of 23.12.2025

Subject / type of control		Test of control method	Criteria, if any	Minimum number of samples ¹⁾	Minimum frequency of control
Anchorage, Coupling assembly	Single element tensile test	EAD 160004-00-0301, Annex C.7			Once per 5 years
Prestressing steel bar	Mass per metre, Cross-sectional area, Surface geometry, Strength characteristics, Elongation at maximum force, Modulus of elasticity, Constriction at break, Visual inspection	Testing	²⁾	8 ^{3), 4)}	4 per year
	Resistance to fatigue	Testing	²⁾	1 ³⁾	4 per year
	Stress relaxation	Testing	²⁾	1 ³⁾	4 per year
	Stress corrosion resistance	Testing	²⁾	1 series ⁵⁾	4 per year
Domed anchor nut, Coupler	Dimensions	Testing	²⁾	3 ⁶⁾	Each inspection ⁷⁾
	Material	Testing / Checking	²⁾	3 ⁶⁾	Each inspection ⁷⁾
	Visual inspection	Checking	²⁾	3 ⁸⁾	Each inspection ⁷⁾
Simple square anchor plate	Dimensions	Testing	²⁾	3 ⁶⁾	Each inspection ⁷⁾
	Material	Testing / Checking	²⁾	3 ⁶⁾	Each inspection ⁷⁾
	Visual inspection	Checking	²⁾	3 ⁸⁾	Each inspection ⁷⁾
Inner grout		EN 447	²⁾	EN 447	Once per year ⁷⁾
Corrugated sheathing	Material	Testing / Checking	²⁾	1 ⁹⁾	Each inspection ⁷⁾
	Dimensions	Testing	²⁾	3 ¹⁰⁾	Each inspection ⁷⁾

1) All samples are taken at random and are clearly identified.

2) Conformity with the specifications of the item

3) One nominal prestressing steel bar diameter. The nominal prestressing steel bar diameter alternates from sampling to sampling. All nominal prestressing steel bar diameters shall be sampled within 5 years.

4) After 5 years of successful testing, the number of samples may be reduced to 5.

5) Small nominal prestressing steel bar diameter

6) Per kind of component. One nominal prestressing steel bar diameter is sampled. All nominal diameters shall be sampled within 5 years.

7) Inspection of kit manufacturer

8) Each kind of component for all nominal prestressing steel bar diameters

9) 1 nominal diameter of corrugated sheathing, all nominal diameters of corrugated sheathing shall be tested within 5 years.

10) All nominal diameters of corrugated sheathing. Number per nominal diameter of corrugated sheathing

Material Defined according to technical specification deposited by the ETA holder at the Notified body

Dimension Measuring of all the dimensions and angles according to the specification given in the test plan

Visual inspection Main dimensions, gauge testing, correct marking or labelling, appropriate performance, surface, corrosion according to the component's specification



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Rock and soil anchor system SAS
Prestressing steel bar Y1050H, \varnothing 17.5–47 mm

Audit testing

Annex 24

of **ETA-12/0601** of 23.12.2025

Subject / type of control		Test of control method	Criteria, if any	Minimum number of samples ¹⁾	Minimum frequency of control
Heat shrinking sleeve	Dimensions (thickness, diameter or size)	Testing	2)	1 ³⁾	Once per year ⁵⁾
	Thickness after shrinking	Testing ⁴⁾	2)	1 ³⁾	
	Mass per unit area of adhesive	Testing ⁴⁾	2)	1 ³⁾	
	Tensile strength	Testing ⁴⁾	2)	1 ³⁾	
	Elongation at break	Testing ⁴⁾	2)	1 ³⁾	
	Peel strength to steel surface	Testing ⁴⁾	2)	1 ³⁾	
	Bond to steel surface	Testing	6)	2 ⁷⁾	
	Conformity to relevant standard	Checking	2), 8)	1 ³⁾	Once every 5 years ⁵⁾
	Peel strength layer to layer	Testing ⁴⁾	2)	2 ⁷⁾	
	Thermal aging resistance	Testing ⁴⁾	2)	2 ⁷⁾	
	Indentation resistance	Testing ⁴⁾	2)	2 ⁷⁾	
	Impact resistance	Testing ⁴⁾	2)	2 ⁷⁾	
	Saponification value	Testing ⁴⁾	2)	2 ⁷⁾	Once per year ⁵⁾
	Chemical signature of the adhesive	Testing ⁹⁾	2)	1 ³⁾	

- 1) All samples are taken at random and are clearly identified.
- 2) According to the specification of the heat shrinking sleeve or adhesive
- 3) 1 size of heat shrinking sleeve, all sizes of heat shrinking sleeve shall be tested within 5 years. Sampling for peel strength is appropriate to the test procedure.
- 4) Testing according to EAD 160015-00-0102, clause 2.2.6.3.
- 5) Inspection of kit manufacturer
- 6) Visual inspection of applied heat shrinking sleeve regarding all-over adherence to steel surface, free of entrapped air and bond defects
- 7) Samples from 2 sizes of heat shrinking sleeve
- 8) Test report type "2.2" according to EN 10204
- 9) Determination of infra-red spectrum according to DIN 51451.
This method is applied to identify that the product is the same as the one tested during the assessment of the essential characteristics of the product by the TAB

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Rock and soil anchor system SAS
Prestressing steel bar Y1050H, \varnothing 17.5–47 mm

Essential characteristics for the intended uses

Annex 25

of **ETA-12/0601** of 23.12.2025

No ¹⁾	Essential characteristic ¹⁾	Product and intended use Line No according to Clause 2.1, Table 2		
		1	2	3
Basic requirement for construction works 1: Mechanical resistance and stability				
1	Resistance to static load	+	+	+
2	Resistance to fatigue	+	+	+
3	Load transfer to the structure	+	+	+
4	Corrosion protection of temporary rock and soil anchor	+	—	—
5	Corrosion protection of temporary rock and soil anchor with extended working life	—	+	—
6	Corrosion protection of permanent rock and soil anchor	—	—	+
7	Transition anchorage to free length – Tightness	—	—	+
8	Crack width in inner grout	—	—	+
9	Mass per metre – Thread bar in prestressing steel	+	+	+
10	Surface geometry – Thread bar in prestressing steel	+	+	+
11	Strength characteristics – Thread bar in prestressing steel	+	+	+
12	Modulus of elasticity – Thread bar in prestressing steel	+	+	+
13	Elongation at maximum force – Thread bar in prestressing steel	+	+	+
14	Constriction at break – Thread bar in prestressing steel	+	+	+
15	Stress relaxation – Thread bar in prestressing steel	+	+	+
16	Stress corrosion resistance – Thread bar in prestressing steel	+	+	+

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.

¹⁾ Line numbers and essential characteristics correspond to Clause 3.1, Table 5.

 <p>Max Aicher GmbH & Co. KG 83404 Ainring-Hammerau</p>	<p>Rock and soil anchor system SAS Prestressing steel bar Y1050H, \varnothing 17.5–47 mm</p> <p>Reference documents</p>	<p>Annex 26 of ETA-12/0601 of 23.12.2025</p>
<p>EAD 160004-00-0301 EAD 160015-00-0102 EN 206+A2, 03.2021 EN 445, 10.2007 EN 446, 10.2007 EN 447, 10.2007 EN 1537, 07.2013 EN 1992-1-1, 2004 EN 1992-1-1/AC, 2008 EN 1992-1-1/AC, 2010 EN 1992-1-1/A1, 2014 Eurocode 0 Eurocode 2 Eurocode 3 Eurocode 7 EN 10025-series, 08.2019 EN 10204, 10.2004 EN 10210-series, 04.2006 EN 10216-1, 12.2013 EN 10217-1, 04.2019 EN 10293, 01.2015 EN 12068, 08.1998 EN 12501-1, 04.2003 EN 12501-2, 04.2003 EN ISO 683-1, 06.2018 EN ISO 683-2, 06.2018 EN ISO 1461, 09.2022 EN ISO 4017, 07.2022</p>	<p>Post-Tensioning Kits for Prestressing of Structures Kits for construction of a rock and soil anchor – Kits with thread bars of steel or prestressing steel Concrete – Specification, performance, production and conformity Grout for prestressing tendons – Test methods Grout for prestressing tendons – Grouting procedures Grout for prestressing tendons – Basic requirements Execution of special geotechnical works – Ground anchors Eurocode 2 – Design of concrete structures – Part 1-1: General rules and rules for buildings Eurocode 0 – Basis of structural design Eurocode 2 – Design of concrete structures Eurocode 3 – Design of steel structures Eurocode 7 – Geotechnical design Hot rolled products of structural steels – Series Metallic products – Types of inspection documents Hot finished structural hollow sections of non-alloy and fine grain steels – Series Seamless steel tubes for pressure purposes – Technical delivery conditions – Part 1: Non-alloy steel tubes with specified room temperature properties Welded steel tubes for pressure purposes – Technical delivery conditions – Part 1: Electric welded and submerged arc welded non-alloy steel tubes with specified room temperature properties Steel castings – Steel castings for general engineering uses Cathodic protection – External organic coatings for the corrosion protection of buried or immersed steel pipelines used in conjunction with cathodic protection – Tapes and shrinkable materials Protection of metallic materials against corrosion – Corrosion likelihood in soil – Part 1: General Protection of metallic materials against corrosion – Corrosion likelihood in soil – Part 2: Low alloyed and non alloyed ferrous materials Heat-treatable steels, alloy steels and free-cutting steels – Part 1: Non-alloy steels for quenching and tempering Heat-treatable steels, alloy steels and free-cutting steels – Part 2: Alloy steels for quenching and tempering Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods Fasteners – Hexagon head screws – Product grades A and B</p>	

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 <p>Max Aicher GmbH & Co. KG 83404 Ainring-Hammerau</p>	<p>Rock and soil anchor system SAS Prestressing steel bar Y1050H, Ø 17.5–47 mm</p> <p>Reference documents</p>	<p>Annex 27 of ETA-12/0601 of 23.12.2025</p>																														
<table border="0"> <tr> <td data-bbox="130 465 475 499">EN ISO 4026, 12.2003</td> <td data-bbox="496 465 1034 499">Hexagon socket set screws with flat point</td> </tr> <tr> <td data-bbox="130 506 475 539">EN ISO 7091, 06.2000</td> <td data-bbox="496 506 1142 539">Plain washers – Normal series – Product grade C</td> </tr> <tr> <td data-bbox="130 546 475 647">EN ISO 12944-4, 12.2017</td> <td data-bbox="496 546 1461 647">Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 4: Types of surface and surface preparation</td> </tr> <tr> <td data-bbox="130 654 475 721">EN ISO 12944-5, 10.2019</td> <td data-bbox="496 654 1461 721">Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 5: Protective paint systems</td> </tr> <tr> <td data-bbox="130 728 475 795">EN ISO 12944-7, 12.2017</td> <td data-bbox="496 728 1461 795">Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 7: Execution and supervision of paint work</td> </tr> <tr> <td data-bbox="130 801 475 902">EN ISO 14713-1, 05.2017</td> <td data-bbox="496 801 1461 902">Zinc coatings – Guidelines and recommendations for the protection against corrosion of iron and steel in structures – Part 1: General principles of design and corrosion resistance</td> </tr> <tr> <td data-bbox="130 909 475 976">EN ISO 17855-1, 11.2014</td> <td data-bbox="496 909 1461 976">Plastics – Polyethylene (PE) moulding and extrusion materials – Part 1: Designation system and basis for specifications</td> </tr> <tr> <td data-bbox="130 983 475 1050">EN ISO 19069-1, 03.2015</td> <td data-bbox="496 983 1461 1050">Plastics – Polypropylene (PP) moulding and extrusion materials – Part 1: Designation system and basis for specifications</td> </tr> <tr> <td data-bbox="130 1057 475 1158">EN ISO 21306-1, 04.2019</td> <td data-bbox="496 1057 1461 1158">Plastics – Unplasticized poly(vinyl chloride) (PVC-U) moulding and extrusion materials – Part 1: Designation system and basis for specifications</td> </tr> <tr> <td data-bbox="130 1164 475 1198">prEN 10138-1, 08.2009</td> <td data-bbox="496 1164 1158 1198">Prestressing steels – Part 1: General requirements</td> </tr> <tr> <td data-bbox="130 1205 475 1238">prEN 10138-4, 08.2009</td> <td data-bbox="496 1205 919 1238">Prestressing steels – Part 4: Bar</td> </tr> <tr> <td data-bbox="130 1245 475 1312">DIN 51451, 02.2020</td> <td data-bbox="496 1245 1461 1312">Testing of petroleum products and related products – Analysis by infrared spectrometry – General working principles</td> </tr> <tr> <td data-bbox="130 1319 272 1352">98/456/EC</td> <td data-bbox="496 1319 1461 1487">Commission Decision 98/456/EC of 3 July 1998 on the procedure for attesting the conformity of construction products pursuant to Article 20(2) of Council Directive 89/106/EEC as regards post-tensioning kits for the prestressing of structures, Official Journal L 201 of 17 July 1998, page 112</td> </tr> <tr> <td data-bbox="130 1494 252 1527">305/2011</td> <td data-bbox="496 1494 1461 1863">Regulation (EU) № 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC, OJ L 88 of 4 April 2011, p. 5, amended by Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014, OJ L 157 of 27.05.2014, p. 76, Commission Delegated Regulation (EU) № 574/2014 of 21 February 2014, OJ L 159 of 28.05.2014, p. 41, Regulation (EU) 2019/1020 of the European Parliament and of the Council of 20 June 2019, OJ L 169 of 15.06.2019, p. 1, and Commission Delegated Regulation (EU) 2024/2769 of 30 May 2024, OJ L 2769 of 28.10.2024, p. 1</td> </tr> <tr> <td data-bbox="130 1870 252 1904">568/2014</td> <td data-bbox="496 1870 1461 2051">Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014 amending Annex V to Regulation (EU) № 305/2011 of the European Parliament and of the Council as regards the assessment and verification of constancy of performance of construction products, OJ L 157 of 27 May 2014, page 76</td> </tr> </table>			EN ISO 4026, 12.2003	Hexagon socket set screws with flat point	EN ISO 7091, 06.2000	Plain washers – Normal series – Product grade C	EN ISO 12944-4, 12.2017	Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 4: Types of surface and surface preparation	EN ISO 12944-5, 10.2019	Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 5: Protective paint systems	EN ISO 12944-7, 12.2017	Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 7: Execution and supervision of paint work	EN ISO 14713-1, 05.2017	Zinc coatings – Guidelines and recommendations for the protection against corrosion of iron and steel in structures – Part 1: General principles of design and corrosion 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Journal L 201 of 17 July 1998, page 112	305/2011	Regulation (EU) № 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC, OJ L 88 of 4 April 2011, p. 5, amended by Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014, OJ L 157 of 27.05.2014, p. 76, Commission Delegated Regulation (EU) № 574/2014 of 21 February 2014, OJ L 159 of 28.05.2014, p. 41, Regulation (EU) 2019/1020 of the European Parliament and of the Council of 20 June 2019, OJ L 169 of 15.06.2019, p. 1, and Commission Delegated Regulation (EU) 2024/2769 of 30 May 2024, OJ L 2769 of 28.10.2024, p. 1	568/2014	Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014 amending Annex V to Regulation (EU) № 305/2011 of the European Parliament and of the Council as regards the assessment and verification of constancy of performance of construction products, OJ L 157 of 27 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EN ISO 4026, 12.2003	Hexagon socket set screws with flat point																															
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