



## EUROPEAN ASSESSMENT DOCUMENT

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# HEADED REINFORCEMENT STEEL BARS

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

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## 1 SCOPE OF THE EAD

### 1.1 Description of the construction product

Headed reinforcement steel bars are steel bars for the reinforcement of concrete, which are equipped with a device for mechanical anchorage of the bar in the concrete. The anchorage device – the head - is made of steel and is attached to one or both ends of the rebar. Heads can also be integrally formed from the bar.

The product is defined by the specification of the reinforcing bar, the geometry of the anchorage device (head) and their ability to transfer loads from the rebar to the concrete.

This EAD does not cover heads or head-to-rebar connections, which consist of or include other materials than steel.

This EAD does not cover transverse steel bars or other devices, welded on-site to the reinforcing bar to provide end anchorage.

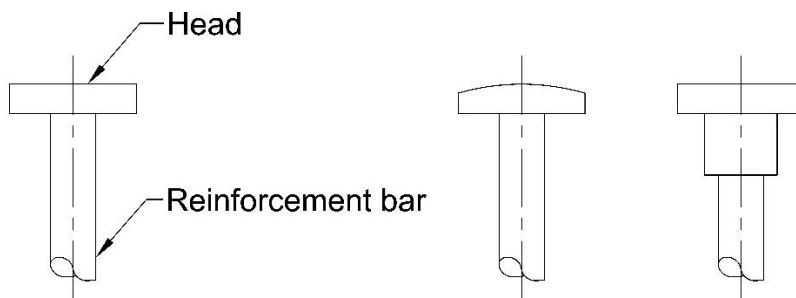


Figure 1: principle design of headed reinforcement bars, showing different head geometries

The product is not covered by a harmonised European standard (hEN).

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 the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

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.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

### 1.2 Information on the intended use(s) of the construction product

#### Intended use

Headed steel bars are used to anchor rebar in reinforced concrete structures. The head provides mechanical end anchorage or an alternative to developing reinforcement through the combination of bond and bends/hooks.

This EAD applies to the use in concrete structures with:

- Static and quasi-static loading
- Seismic loading

## **Working life/Durability**

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the headed reinforcement steel bars for the intended use of 100 years when installed in the works (provided that the headed reinforcement steel bars are subject to appropriate installation (see 1.1)). These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works<sup>1</sup>.

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 when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

## **1.3 Specific terms used in this EAD (if necessary in addition to the definitions in CPR, Art 2)**

### **General terms and definitions**

For the purpose of this EAD, the terms and definitions given in ISO 15698-1 apply.

#### **1.3.2 Parent rebar**

Reinforcing steel bar, which the head(s) are attached to or forged from.

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<sup>1</sup> The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the 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 referred to above.

## 2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

### 2.1 Essential characteristics of the product

Table 1 shows how the performance of headed reinforced steel bars is assessed in relation to the essential characteristics.

**Table 1** Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
<b>Basic Works Requirement 1: Mechanical resistance and stability</b>			
1	Nominal diameter, strength and ductility of parent rebar	2.2.1	Level
2	Geometry of anchoring head	2.2.2	Description
3	Robustness of head-to-bar connection	2.2.3	Level
4	Characteristic resistance under static and quasi-static loading	2.2.4	Level
5	Characteristic resistance under seismic loading	2.2.5	Level
<b>Basic Works Requirement 2: Safety in case of fire</b>			
6	Reaction to fire	2.2.6	Class (A1)

### 2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

Headed bars are rebar products and follow the rebar sizes. Products with variation in rebar size and head dimension only may form a series. The requirements for a series of headed bar products are given in ISO 15698-1, clause 6.2. The extent of testing may be reduced for a series of headed bar products in accordance with ISO 15698-1, clause 7.2.1.

#### 2.2.1 Nominal diameter, strength and ductility of parent rebar

Dimensions and mechanical properties of the parent reinforcement bar are determined by methods given in EN ISO 15630. The values for nominal diameter and mechanical properties shall be stated in the ETA.

#### 2.2.2 Geometry of anchoring head

The geometry of the anchoring head is determined by measurement and reference to product drawings or tabulated values.

#### 2.2.3 Robustness of head-to-bar connection

The test is performed to evaluate the robustness of the connection of the head to the rebar with regard to variations in the load situation.

The test is performed according to ISO 15698-1, clause 7.3 and ISO 15698-2, clause 6.

The assessment of the test results is described in ISO 15698-1, clause 7.3 and ISO 15698-2, clause 6.

All rebar diameters have to be tested.

#### **2.2.4 Characteristic resistance under static and quasi-static loading**

This test is performed in order to assess the suitability of the head for transfer of static loads from the rebar into the concrete. A distinction is made between tests performed with the products cast into concrete specimens and testing in air. ISO 15698-1, clause 7.2.1 contains the requirements for load transfer tests in air. If these requirements are not fulfilled, tests have to be conducted with products cast into concrete specimens.

For products, which are tested cast into concrete specimens, the concrete strength of the concrete test specimen shall be determined. The concrete strength of the test specimen shall represent the minimum concrete strength for the intended use of the product and shall be stated in the ETA. For tests in air the minimum concrete strength is set to 30MPa minimum characteristic compressive cylinder strength.

The test is performed according ISO 15698-1, clause 7.2.2 and ISO 15698-2, clause 5. The assessment of the test results is described in ISO 15698-1, clause 7.2.2 and ISO 15698-2, clause 5.7.3.

The obtained test results shall be stated in the ETA. Reference is given in ISO 15698-1, clause 7.2.2.

#### **2.2.5 Characteristic resistance under seismic loading**

The test is performed in order to assess the suitability of the head and its connection to the rebar for transfer of low-cycle elastic-plastic loads from the rebar into the concrete. The test loading is intended to model loads occurring during a seismic event.

The test is performed according to ISO 15698-1, clause 7.2.4 and ISO 15698-2, clause 5.5 and 5.9. The load transfer test for Category S (Seismic) shall be conducted with products cast into a concrete specimen.

The assessment of the test results is described in ISO 15698-1, clause 7.2.4 and ISO 15698-2, clause 5.9.3.

The obtained test results shall be stated in the ETA. Reference is given in ISO 15698-1, clause 5.4.

#### **2.2.6 Reaction to fire**

Headed reinforcement steel bars are considered to satisfy the requirements for performance class A1 of the characteristic reaction to fire in accordance with the EC Decision 96/603/EC (as amended) without the need for testing on the basis of it fulfilling the conditions set out in that Decision and its intended use being covered by that Decision.

Therefore, the performance of the product is class A1.

### 3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

#### 3.1 System of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is: 96/582/EC

The system is: 1+

#### 3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 2.

The Control Plan for the manufacturer (FPC) shall be agreed between the TAB and the manufacturer within ETA process considering the cornerstones specified in this Clause.

For raw material of the headed bars inspection certificates 3.1 according to EN 10204 may be used to verify the relevant characteristics.

**Table 2 Control plan for the manufacturer; cornerstones**

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<b>Factory production control (FPC)</b> [including testing of samples taken at the factory in accordance with a prescribed test plan]					
<b>Raw material</b>					
1	Material	Visual inspection of material and control of material certificate	Control plan	1	Each delivery
<b>Component – for separately fabricated heads, to be attached to the rebar</b>					
2	Geometry of head		Control plan	1	Each manufacturing batch
<b>Product<sup>1)</sup></b>					
3	Dimensions	Essential dimensions influencing the performance <sup>2)</sup>	Control plan	1	Each manufacturing batch
4	Strength and robustness of head-to-bar connection	Options <sup>3)</sup> : - Bend test - Wedge tensile test	Control plan	2	The least of: - Each manufacturing batch - 1000 products - Change of production parameters



No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<sup>1)</sup> Manufacturer of loose heads, have to conduct step no.3 and 4 by assembling and testing complete headed bar products. The test shall be performed with reinforcing bars of the same grade as used in load transfer tests acc. 2.2.4 and 2.2.5. <sup>2)</sup> e.g. head geometry of heads formed from the bar material, perpendicularity of head relative to the parent rebar, etc. <sup>3)</sup> Test method depending on the head-to-bar connection, see ISO 15698-1, clause 7.3.1.					

### 3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body in the procedure of assessment and verification of constancy of performance for headed reinforcement bars are laid down in Table 3.

**Table 3 Control plan for the notified body; cornerstones**

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<b>Initial inspection of the manufacturing plant and of factory production control</b>					
1	<p>The notified body shall ascertain that, in accordance with the control plan, the manufacturing plant, personnel and equipment, and the factory production control are suitable to ensure a continuous and orderly manufacturing of the head reinforcing bars.</p> <p>In particular, the following items shall be given special attention</p> <ul style="list-style-type: none"> <li>• Control of material for production</li> <li>• Strength and robustness of head-to-bar connection</li> <li>• Implementation of prescribed test plan</li> </ul>				-
<b>Continuous surveillance, assessment and evaluation of factory production control</b>					
2	It shall be verified that the system of factory production control and the specified manufacturing process are maintained in accordance with the control plan in order to ensure the constancy of product performance.				once a year
<b>Audit-testing of samples taken by the notified product certification body at the manufacturing plant or at the manufacturer's storage facilities</b>					
3	<p>Product:</p> <p>Strength and robustness of head-to-bar connection</p>	3.4.	Control Plan	3 samples of one bar diameter and manufacturing process	once a year

## **3.4**

### **3.4 Special methods of control and testing used for the verification of constancy of performance**

#### **Audit testing of samples taken by the notified product certification body**

Once a year the notified body shall take samples at the manufacturing plant or at the manufacturer's storage facility. Testing of the samples can be performed by an accredited laboratory or at manufacturers' facility.

The test is a robustness test of the head-to-bar connection according to clause 2.2.3.

At least three samples of one bar diameter of each headed bar product-type and manufacturing process have to be tested. The selection of the samples is at the convenience of the notified body.

#### 4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment, is of relevance.

EN 10080	Steel for the reinforcement of concrete – Weldable reinforcing steel, General
EN 10204:2004	Metallic products – Types of inspection documents
ISO 15698-1	Steel for the reinforcement of concrete – Headed bars – Part 1: Requirements
ISO 15698-2	Steel for the reinforcement of concrete – Headed bars – Part 2: Test methods
96/603/EC	Commission Decision 96/603/EC of 04 October 1996 establishing the list of products belonging to Class A „No contribution to fire “provided for in Decision 94/611/EC implementing Article 20 of Council Directive 89/106/EEC on construction products. Amended by Commission Decision 2000/605/EC of 26 September 2000 and Commission Decision 2003/424/EC of 06 June 2003