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## European Technical Assessment

**ETA-15/0632**  
of 16.12.2015

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**

X-RAD

**Product family to which the construction  
product belongs**

Three-dimensional nailing plate

**Manufacturer**

Rotho Blaas srl  
Via Dell'Adige 2/1  
39040 Cortaccia (BZ)  
Italy

**Manufacturing plant**

Manufacturing plant X1  
Manufacturing plant X2  
Manufacturing plant X3

**This European Technical Assessment  
contains**

18 pages including 5 Annexes which form an  
integral part of this assessment.

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

Guideline for European Technical Approval  
ETAG 015 "Three-dimensional nailing plates",  
Edition November 2012, used as European  
Assessment Document

## Remarks

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

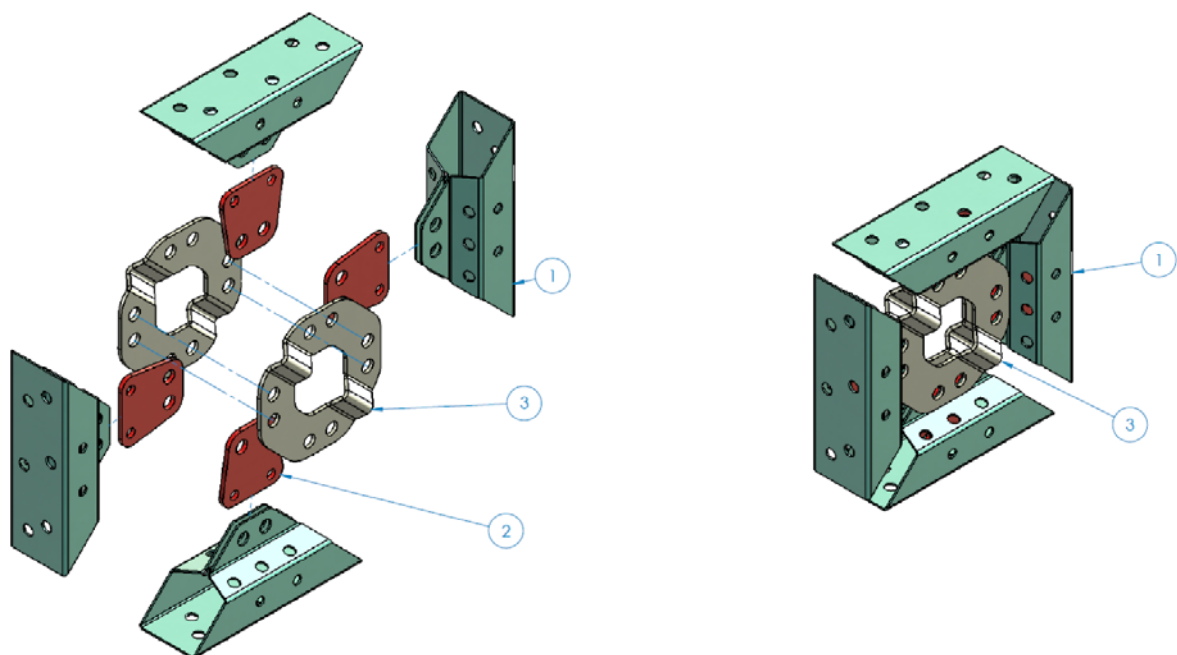
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Specific parts

## 1 Technical description of the product

### 1.1 General

This European Technical Assessment (ETA) applies to the connector X-RAD. The X-RAD connector consists of a steel element (1) filled with a hardwood core as well as a steel plate (2), both connected to the steel element by bolts and nuts. The connector is installed to the edges of cross laminated timber elements with six inclined fully threaded screws VGS of diameter 11 mm. For installation purposes, the connector is fixed to the cross laminated timber elements with two self-tapping screws via positioning holes, which will be removed later, or with special mounting templates.



### 1.2 Steel element

The steel element is made of 2.5 mm thick, curved steel. Around the holes for the fully threaded screws, 2.5 mm thick steel cover plates are mounted with rivets to the steel element for additional reinforcement. The single parts of the X-RAD connector together with their most important dimensions are shown in Annex 2.

The steel element and cover plates are produced of steel DX51D according to EN 10346<sup>1</sup> or equivalent with a minimum characteristic tensile strength of  $R_m = 270 \text{ MPa}$ .

<sup>1</sup> Reference documents are listed in Annex 5.

### 1.3 Wooden core

The steel element is provided with a predrilled inner core of laminated veneer lumber made of beech according to EN 14374 with density  $\rho_k \geq 680 \text{ kg/m}^3$  or equal or better.

### 1.4 Steel plate

The steel plate, made of 6 mm thick steel, further connects the bolts leading through the inner core with the load introduction point. The steel plate together with its most important dimensions is shown in Annex 2.

The steel plate is produced of steel DX51D according to EN 10346 or equivalent with a minimum characteristic tensile strength of  $R_m = 270 \text{ MPa}$ .

### 1.5 Bolts and nuts

The bolts used to connect the inner core and the steel plate to the steel element are described in Annex 1. Standard nuts, produced according to EN ISO 10511, or special nuts, according to Annex 1, may be used. Bolt and nut diameter is 12 mm. They are made of carbon steel.

### 1.6 Fully threaded VGS screws

The VGS screws for installation of the X-RAD connector to the cross laminated timber element are described in Annex 1. They are CE-marked according to ETA-11/0030. Screw diameter is 11 mm. They are made of carbon steel.

## 2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (thereafter EAD)

### 2.1 Intended use

The X-RAD connector is intended to be used in load bearing connections between cross laminated timber elements according to European Technical Assessments or national standards and regulations in force at the place of use.

The X-RAD connector may be subjected to static, quasi static and seismic actions.

The X-RAD connector is intended to be used in service classes 1 and 2 according to EN 1995-1-1.

### 2.2 General assumptions

The X-RAD connector is manufactured in accordance with the provisions of the European Technical Assessment using the manufacturing process as identified in the inspection of the manufacturing plant by Österreichisches Institut für Bautechnik and laid down in the technical file<sup>2</sup>.

It is the responsibility of the ETA holder to ensure that all necessary information on design and installation is submitted to those responsible for design and execution of the works constructed with X-RAD connectors.

#### Design

The European Technical Assessment only applies to the manufacture and use of the X-RAD connector. Verification of stability of the works including application of loads on the X-RAD connector is not subject of the European Technical Assessment.

The following conditions shall be observed:

- Design of connections with X-RAD connectors is carried under the responsibility of an engineer experienced in timber structures.

<sup>2</sup> The technical file of the European Technical Assessment is deposited at Österreichisches Institut für Bautechnik and, in so far as is relevant to the tasks of the notified factory production control certification body involved in the assessment and verification of constancy of performance procedure, is handed over to the notified factory production control certification body.

- Design of the works shall account for the protection of the connections to maintain service class 1 or 2 according to EN 1995-1-1.
- The X-RAD connectors are installed correctly.
- It shall be checked in accordance with EN 1995-1-1 that splitting will not occur.

Design of connections with X-RAD connectors may be according to EN 1995-1-1 taking into account the Annexes of the European Technical Assessment. Standards and regulations in force at the place of use shall be considered.

#### Packaging, transport, storage, maintenance, replacement and repair

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.

#### Installation

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.

The X-RAD connectors shall be screwed as specified in Annex 2.

For the cross laminated timber elements which are connected with the X-RAD connector the following shall be observed:

- Minimum thickness of cross laminated timber is 100 mm, minimum thickness of surface layer for three-layer panels is 30 mm;
- Minimum strength class of lamellas for cross laminated timber is C24 according to EN 338;
- The cross laminated timber elements shall have plane surfaces against the X-RAD connector;
- There is virtually no gap between the cross laminated timber elements;

### **2.3 Assumed working life**

The provisions made in the European Technical Assessment (ETA) are based on an assumed intended working life of the construction product of 50 years, when installed in the works, provided that the product 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<sup>3</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 nor by the Technical Assessment Body, but are regarded only as a means for choosing the appropriate products in relation to the expected economically reasonable working life of the works.

<sup>3</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.

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

#### 3.1 Essential characteristics of the product

**Table 1: Essential characteristics and product performance**

No	Essential characteristic	Product performance
Basic Requirement 1: Mechanical resistance and stability <sup>1)</sup>		
1	Characteristic load bearing capacity	3.1.1
2	Stiffness	3.1.2
3	Ductility in cyclic testing	3.1.3
Basic Requirement 2: Safety in case of fire		
4	Reaction to fire	3.1.4
--	Resistance to fire	No performance assessed
Basic Requirement 3: Hygiene, health and the environment		
5	Content, emission and/or release of dangerous substances	3.1.5
Basic Requirement 4: Safety and accessibility in use		
6	Same as BR 1	
Basic Requirement 5: Protection against noise		
--	No characteristic assessed	
Basic Requirement 6: Energy economy and heat retention		
--	No characteristic assessed	
Basic Requirement 7: Sustainable use of natural resources		
--	No characteristic assessed	
General aspects		
7	Resistance to corrosion and deterioration	3.1.6
8	Dimensional stability	3.1.7
<sup>1)</sup> These characteristics also relate to BR 4.		

##### 3.1.1 Characteristic load bearing capacity

The characteristic load bearing capacity of the X-RAD connectors was determined by testing. The X-RAD connectors are installed with the defined number of screws with respective nominal diameter as specified in Annex 1 and Annex 2.

The values of the characteristic load bearing capacities for the loading directions defined in Annex 3, are given in Annex 4.

### 3.1.2 Stiffness

The stiffness of the X-RAD connectors was determined by testing. The X-RAD connectors are installed with the defined number of screws with respective nominal diameter as specified in Annex 1 and Annex 2. The stiffness values are given in Annex 4.

### 3.1.3 Ductility in cyclic testing

The ductility in cyclic testing was determined by testing. The X-RAD connectors are installed with the defined number of screws with respective nominal diameter as specified in Annex 1 and Annex 2. The ductility in cyclic testing is given in Annex 4.

### 3.1.4 Reaction to fire

Steel element, cover plates and steel plates, are made of steel DX51D according to EN 10346 and the screws, bolts and nuts are made of carbon steel, all classified as Euroclass A1 according to Commission Decision 96/603/EC as amended.

The inner core is made of laminated veneer lumber made of beech according to EN 14374, classified as Euroclass D-s2,d0 according to Commission Decision 2005/610/EC.

### 3.1.5 Content, emission and/or release of dangerous substances

The release of dangerous substances is determined according to Guideline for European Technical Approval ETAG 015 "Three-dimensional nailing plates", Edition November 2012, used as European Assessment Document. No dangerous substances is the performance of the X-RAD in this respect. A manufacturer's declaration to this effect has been submitted.

**NOTE** In addition to the specific clauses relating to dangerous substances contained in the European Technical Assessment, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

### 3.1.6 Resistance to corrosion and deterioration

The product is intended to be used in service classes 1 and 2 according to EN 1995-1-1 and low and medium corrosive category according to EN ISO 12944-2.

In accordance with ETAG 015 and EN 1995-1-1 the steel element and the steel plate are made of steel DX51D according to EN 10346 or equivalent and coated according to EN 1995-1-1. The screws, bolts, and nuts are made of carbon steel and galvanised.

### 3.1.7 Dimensional stability

The effects of dimensional changes on the cross laminated timber elements being jointed due to varying moisture content was considered by the determination of the strength and the stiffness of the joints. The conditions of Clause 2.2 shall be observed.

## 3.2 Assessment methods

### 3.2.1 General

The assessment of the X-RAD connectors for the intended use in relation to the requirements for mechanical resistance and stability, for safety in case of fire, for hygiene, health and the environment and for safety and accessibility in use in the sense of the Basic Requirements 1, 2, 3 and 4 of Regulation (EU) № 305/2011 has been made in accordance with *Guideline for European Technical Approval ETAG № 015 "Three-dimensional nailing plates" used as European Assessment Document*.



### 3.2.2 Identification

The European Technical Assessment for the X-RAD connector is issued on the basis of agreed data, deposited with Österreichisches Institut für Bautechnik, which identifies the product that has been assessed. Changes to materials, to the composition or to characteristics of the product, or to the production process, which could result in this deposited data being incorrect, should be immediately notified to Österreichisches Institut für Bautechnik before the changes are introduced. Österreichisches Institut für Bautechnik will decide whether or not such changes affect the European Technical Assessment, and, if so, whether further assessment or alterations to the European Technical Assessment are considered necessary.

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

### 4.1 System of assessment and verification of constancy of performance

According to Commission Decision 97/638/EC the system of assessment and verification of constancy of performance to be applied to the X\_RAD connector is System 2+. As laid down in the Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014, Annex, 1.3, under System 2+ the manufacturer shall draw up the declaration of performance and determine the product-type on the basis of

(a) The manufacturer shall carry out:

- (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 that product;
- (ii) factory production control;
- (iii) testing of samples taken at the manufacturing plant by the manufacturer in accordance with a prescribed test plan<sup>4</sup>.

(b) The notified factory production control certification body shall decide on the issuing, restriction, suspension or withdrawal of the certificate of conformity of the factory production control on the basis of the outcome of the following assessments and verifications carried out by that body:

- (i) initial inspection of the manufacturing plant and of factory production control;
- (ii) continuing surveillance, assessment and evaluation of factory production control.

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

Manufacturers undertaking tasks under Systems 2+ shall consider the European Technical Assessment issued for the construction product in question as the assessment of the performance of that product. Manufacturers shall therefore not undertake the tasks referred to in point 4.1 (a)(i).

<sup>4</sup> The prescribed test plan has been deposited with Österreichisches Institut für Bautechnik and is handed over only to the notified factory production control certification body involved in the procedure for the assessment and verification of constancy of performance. The prescribed test plan is also referred to as control plan.

## **5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document**

### **5.1 Tasks for the manufacturer**

#### **5.1.1 Factory production control**

At the manufacturing plant the manufacturer has implemented and continuously maintains a factory production control system. All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written policies and procedures. The factory production control system ensures that the performance of the product is in conformity with the European Technical Assessment.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the prescribed test plan. The incoming raw materials shall be subject to controls and tests by the manufacturer before acceptance. Check of incoming materials shall include control of inspection documents (comparison with nominal values) presented by the manufacturer of the raw materials by verifying the dimensions and determining the material properties.

The frequencies of controls and tests conducted during manufacturing and on the assembled product are defined by taking account of the manufacturing process of the product and are laid down in the prescribed test plan.

The results of factory production control are recorded and evaluated. The records include at least the following data:

- Designation of the product, basic materials and components
- Type of control or test
- Date of manufacture of the product and date of testing of the product or basic materials or components
- Results of controls and tests and, if appropriate, comparison with requirements
- Name and signature of person responsible for factory production control

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

#### **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 conformity of the factory production control issued by the notified factory production control certification body, the manufacturer shall draw up a declaration of performance.

### **5.2 Tasks for the notified factory production control certification body**

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

The notified factory production control certification body shall ascertain that, in accordance with the prescribed test plan, the factory, in particular personnel and equipment, and the factory production control, are suitable to ensure a continuously and orderly manufacturing of the X-RAD connectors with the specifications given in the specific parts as well as in the Annexes of the European Technical Assessment.



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

The notified factory production control certification body shall visit the factory at least once a year for routine inspection. It shall be verified that the system of factory production control and the specified manufacturing process are maintained, taking account of the prescribed test plan. On demand the results of continuing surveillance shall be made available by the notified factory production control certification body to Österreichisches Institut für Bautechnik. When the provisions of the European Technical Assessment and the prescribed test plan are no longer fulfilled, the certificate of conformity of the factory production control shall be withdrawn by the notified factory production control certification body.

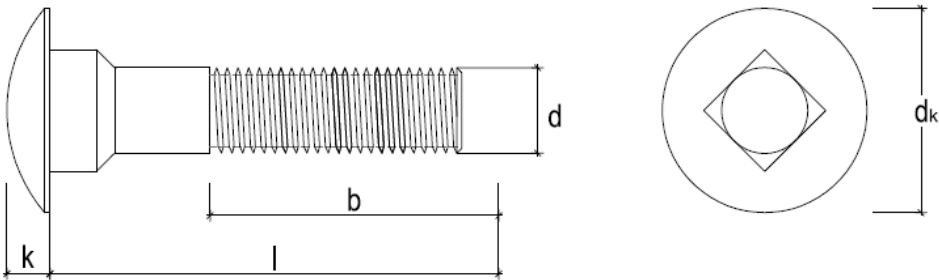
Issued in Vienna on 16.12.2015  
by Österreichisches Institut für Bautechnik

The original document is signed by:

Rainer Mikulits  
Managing Director

Bolt 8.8 M12x110 mm	
Tensile strength	≥ 600 N/mm <sup>2</sup>
E-Modulus	210 000 N/mm <sup>2</sup>
Head diameter d <sub>k</sub>	30.65 mm
Head height k	6.95 mm
Nominal diameter d	12 mm
Length l	110 mm
Threaded length b	30 mm
Pitch	1.75 mm

Bolt



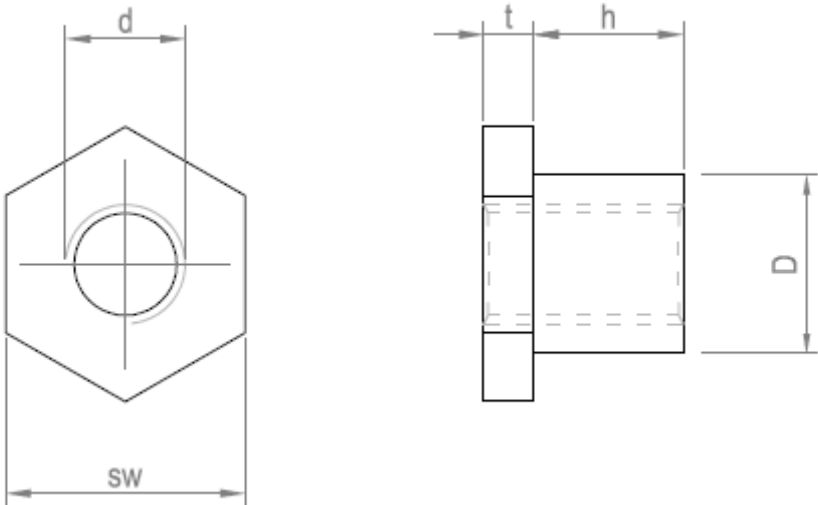
Nut

EN ISO 10511

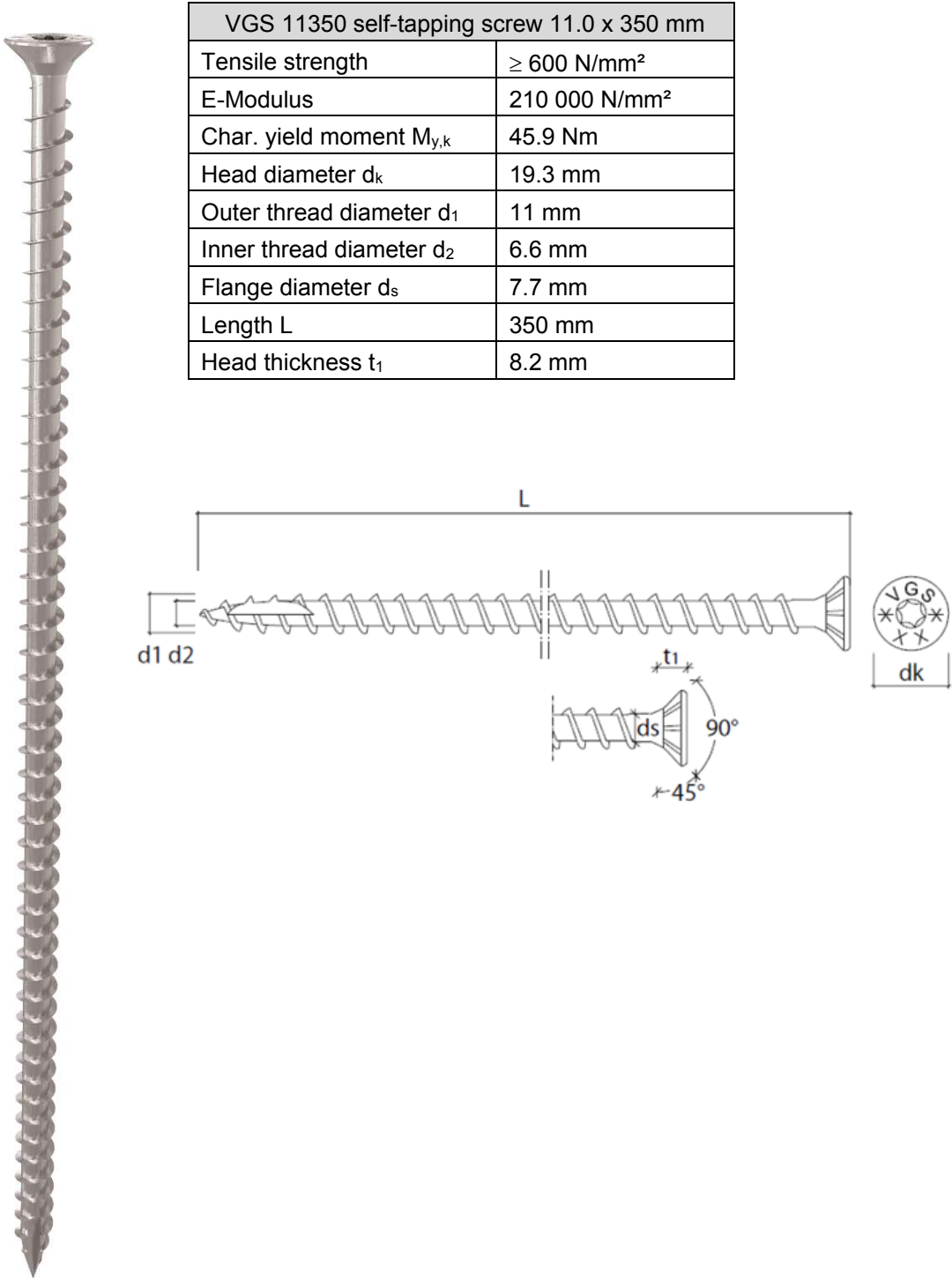


<b>X-RAD</b>	Annex 1  of European Technical Assessment ETA-15/0632 of 16.12.2015
Fastener specification – bolts and nuts	

Special nut	
Thread diameter d	M12
Head dimension sw	24 mm
Head thickness t	5 mm
Height h	15 mm
Outer diameter D	18 mm

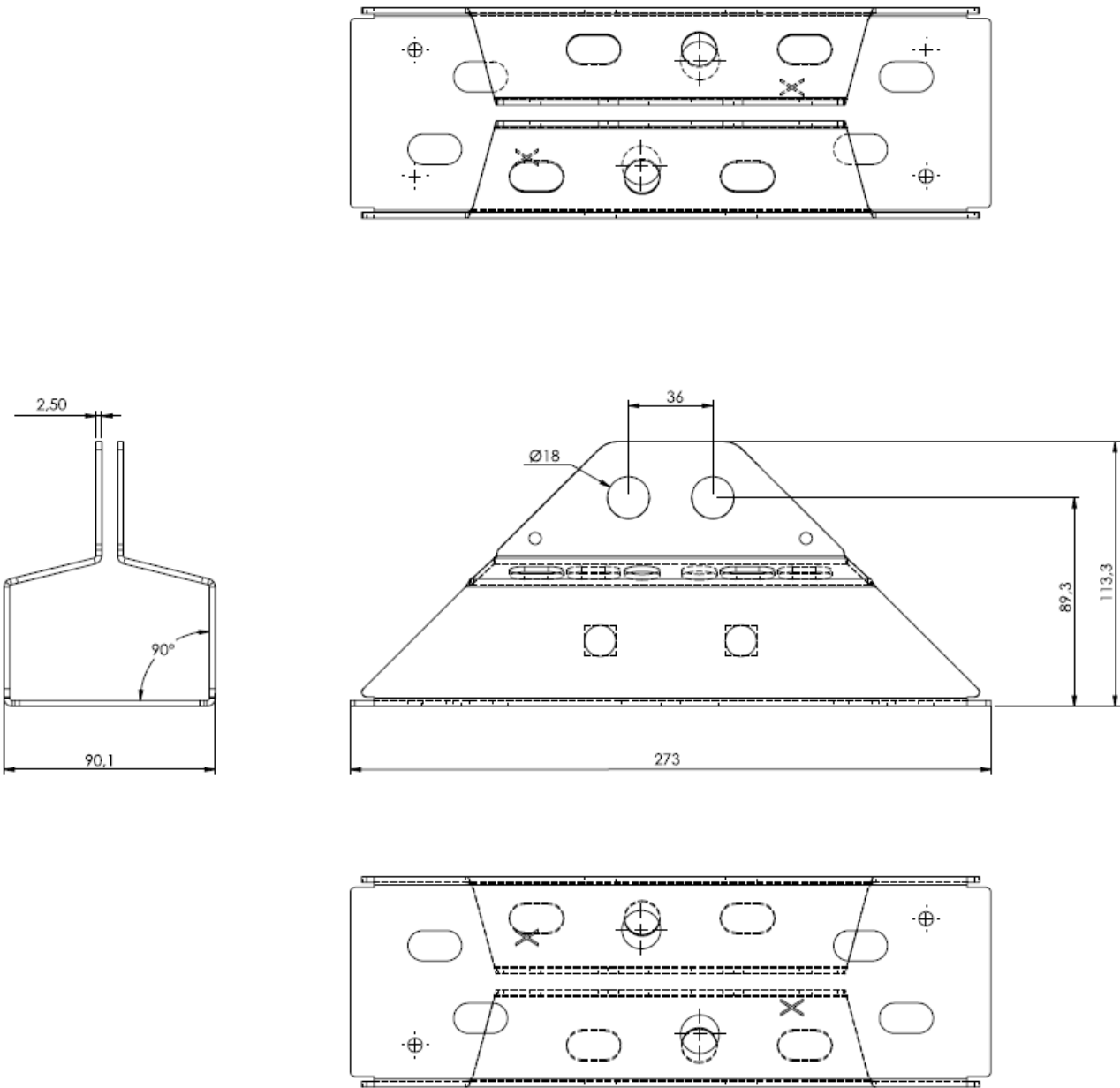


X-RAD	Annex 1 of European Technical Assessment ETA-15/0632 of 16.12.2015
Fastener specification – bolts and nuts	



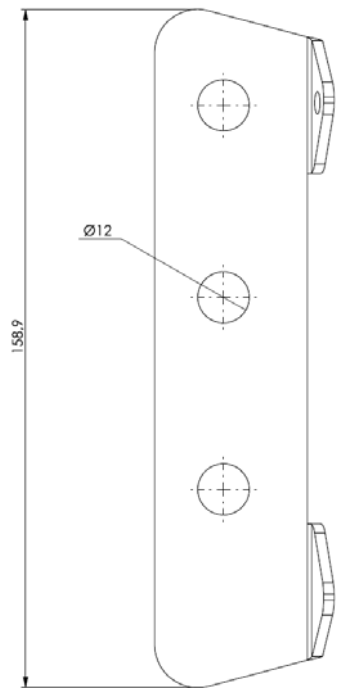
X-RAD	Annex 1 of European Technical Assessment ETA-15/0632 of 16.12.2015
Fastener specification – self-tapping screws	

**Steel element**

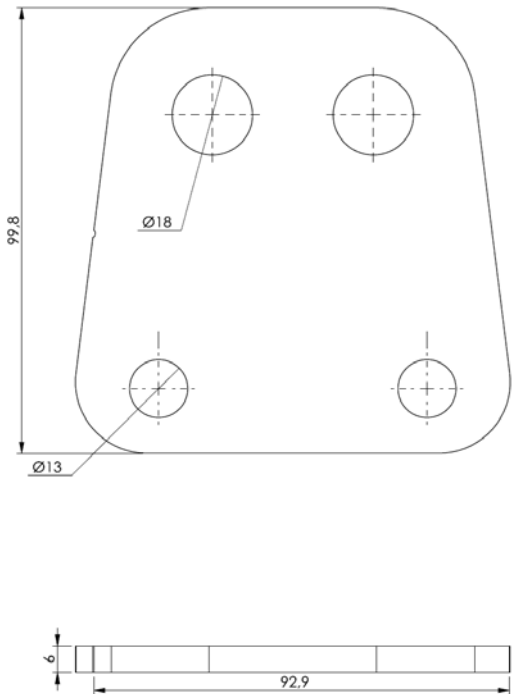


X-RAD	Annex 2 of European Technical Assessment ETA-15/0632 of 16.12.2015
Product details definitions	

**Steel cover**



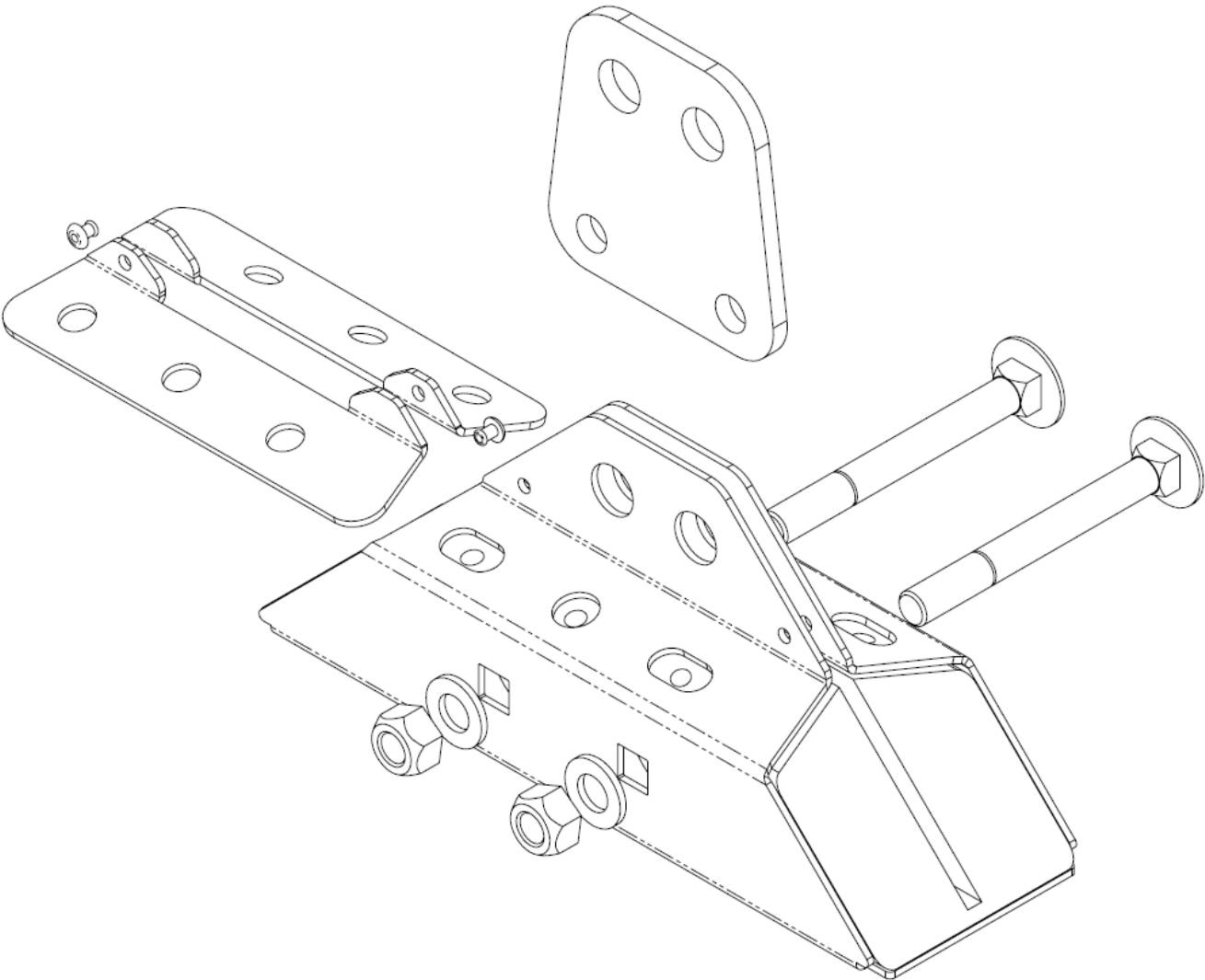
**Steel plate**



X-RAD	Annex 2 of European Technical Assessment ETA-15/0632 of 16.12.2015
Product details definitions	

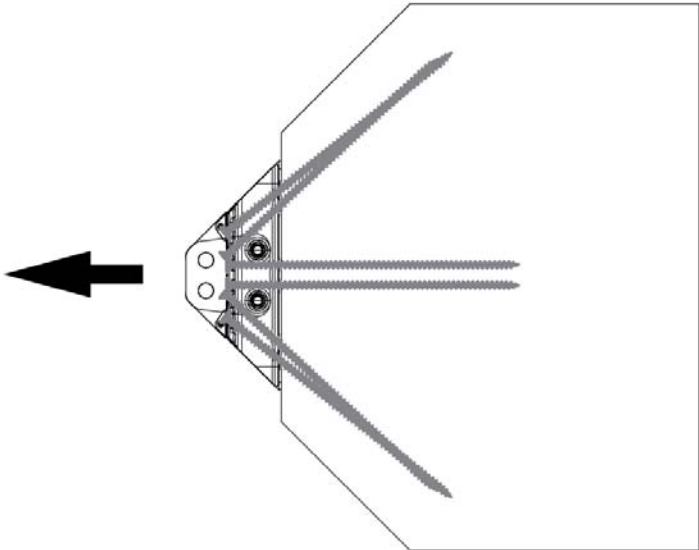


**Assembling of connector**

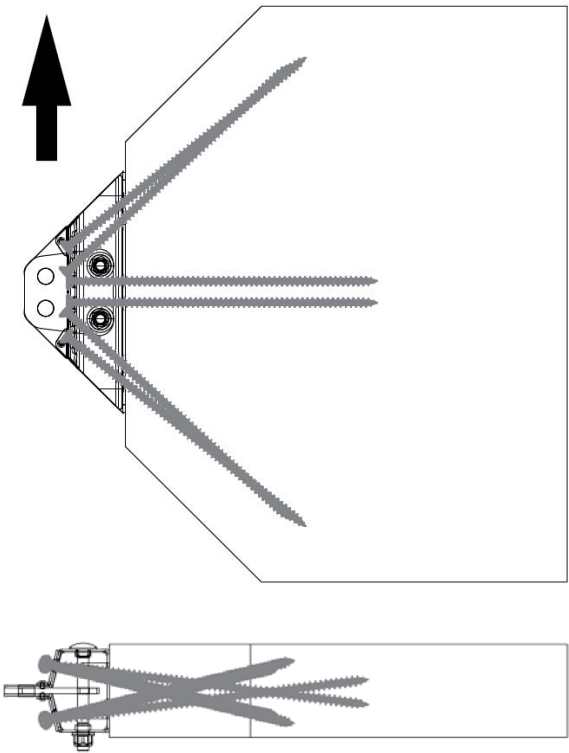


<b>X-RAD</b>	Annex 2 of European Technical Assessment ETA-15/0632 of 16.12.2015
Product details definitions	

Tension load  $R_T$



Shear load  $R_s$



X-RAD	Annex 3 of European Technical Assessment ETA-15/0632 of 16.12.2015
Definition of forces and their directions	

BR	Essential characteristic	Method of assessment	Level / Class / Description
1	<b>Mechanical resistance and stability</b>		
	<b>Characteristic load bearing capacity</b>		
	Tension perpendicular to the joint	ETAG 015	$R_{T,k} = 141 \text{ kN}$
	Shear in joint direction	ETAG 015	$R_{S,k} = 97 \text{ kN}$
	<b>Stiffness</b>		
	Connection stiffness for tension perpendicular to the joint	ETAG 015	$k_S = 21 \text{ kN/mm}$
	Connection stiffness for shear in joint direction	ETAG 015	$k_S = 33 \text{ kN/mm}$
	Rotational stiffness for shear in joint direction	ETAG 015	$M_{\phi,S} = 2\,990 \text{ kNm/rad}$
	<b>Ductility in cyclic testing</b>		
	Tension configuration	EN 12512	Medium capacity to dissipate energy
	Shear configuration	EN 12512	Low capacity to dissipate energy
2	<b>Safety in case of fire</b>		
	Reaction to fire	Commission Decision 96/603/EC and Commission Decision 2005/610/EC.	Steel element, steel plate, screws, bolts and nuts: Euroclass A1  Inner core of LVL of beech: Euroclass D-s2,d0
3	<b>Hygiene, health and the environment</b>		
	Content, emission and/or release of dangerous substances	ETAG 015	No dangerous substances
-	<b>General aspects</b>		
	Resistance to corrosion and deterioration	EN 1995-1-1	Service class 1 and 2
	Dimensional stability	Moisture content during service shall not change to such an extent that adverse deformation will occur.	
<b>X-RAD</b>		Annex 4	
Characteristic load bearing capacities and stiffness		of European Technical Assessment ETA-15/0632 of 16.12.2015	

Guideline for European Technical Approval ETAG 015 “Three-dimensional nailing plates”, Edition November 2012, used as European Assessment Document

EN 338 (10.2009) Structural timber – Strength classes

EN 10346 (03.2009), Continuously hot-dip coated steel flat products – Technical delivery conditions

EN 1995-1-1 (11.2004) +AC (06.2006) +A1 (06.2008), Eurocode 5 – Design of timber structures – Part 1-1: General – Common rules and rules for buildings

EN 14374 (11.2004), Timber structures – Structural laminated veneer lumber – Requirements

EN ISO 10511 (12.2012), Prevailing torque type hexagon thin nuts

Commission Decision 96/603/EC of 4 October 1996 establishing the list of products belonging to Classes A ‘No contribution to fire’ provided for in Decision 94/611/EC implementing Article 20 of Council Directive 89/106/EEC on construction products, Official Journal L 267 from 19.10.1996, page 23, amended by Commission Decision 2000/605/EC of 26 September 2000, Official Journal L 258 from 12.10.2000 and Commission Decision 2003/424/EC of 6 June 2003, Official Journal L 144 from 12.6.2003

Commission Decision 2005/610/EC of 9 August 2005 establishing the classes of reaction-to-fire performance for certain construction products, Official Journal L 208 from 11.08.2005, page 21.

<b>X-RAD</b>	Annex 5  of European Technical Assessment ETA-15/0632 of 16.12.2015
Reference documents	