EUROPEAN ASSESSMENT DOCUMENT

EAD 330155-00-0602

May 2016

SELF ADJUSTABLE CLAMP ASSESMBLIES

www.eota.eu

The reference title and language for this EAD is English. The applicable rules of copyright refer to the document elaborated in and published by EOTA.

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).

Contents

1 SCOPE OF THE EAD

1.1 Description of the construction product

The product is a range of adjustable clamp assemblies, that are self adjusting, that clamp together steel components such as flanged beams without the need to drill holes in either connected component. The components of the construction product include the adjustable clamps, a fastener assembly (bolt, nut and washer) and in some cases, a location plate. There are six types of assembly covered by this CUAP.

Type 1: A two piece self adjusting clamp.

Type 2: A one piece clamp incorporating a grade 8.8 setscrew in the tail.

Type 3: A one piece self adjusting clamp.

Type 4: A two piece self adjusting clamp incorporating a fastener assembly.

Type 5: A one piece self aligning hook clamp

Type 6: A four piece self adjusting clamp incorporating a fastener assembly.

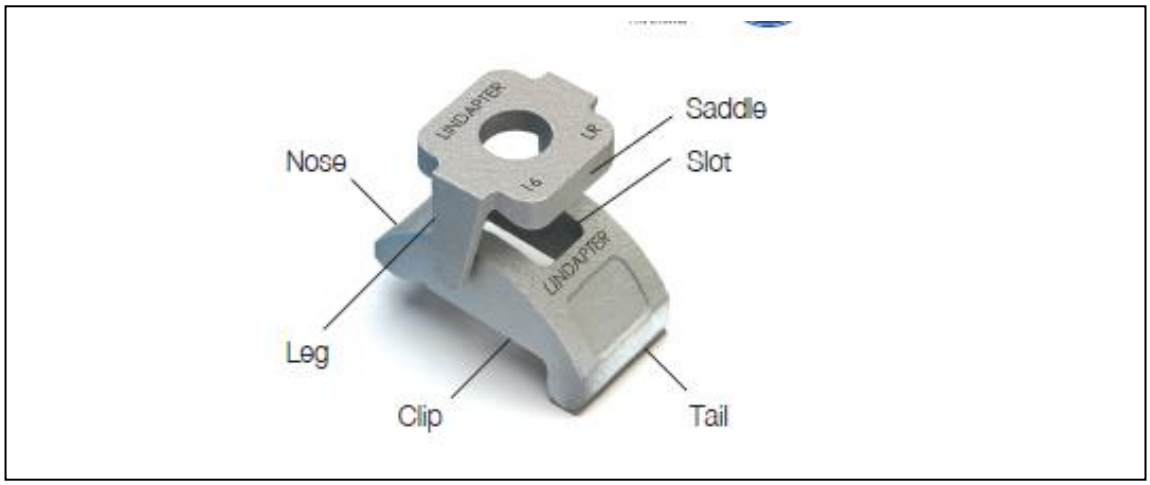
1.1.1 Type 1 Fixing

The assembly is a self adjusting clamp that comprises of a curved cast body with a central rectangular slot and a cast square top piece known as a 'saddle' that has a through hole and a cast leg either side protruding downwards. A setscrew of property Class 8.8 passes through the hole and slot of the assembly and then through a location plate and is secured to the underside by means of a hexagon nut property Class 8.

At the front of the cast body is a serrated nose which locates onto the beam flange and at the rear of the body is a tail that spans across the full width of the clamp. The tail sits on top of a location plate and can span across slotted holes. The assembly is designed to rock backwards and forwards on the tail to accommodate different flange thicknesses (3mm to 24mm) while the saddle ensures that the bolt is always at 90º to the location plate. The legs on the saddle prevent the clamp from rotating during installation.

The Type 1 assembly is manufactured from Malleable cast Iron to BS EN 1562 Grade EN-GJMB-350-10 or EN-GJMW-400-5 and has either a Zinc plated (EN ISO 2081 Fe/Zn5/A) or a Hot Dip Galvanised (EN ISO 1461) finish.

Figure 1: Type 1 Fixing – Type LR

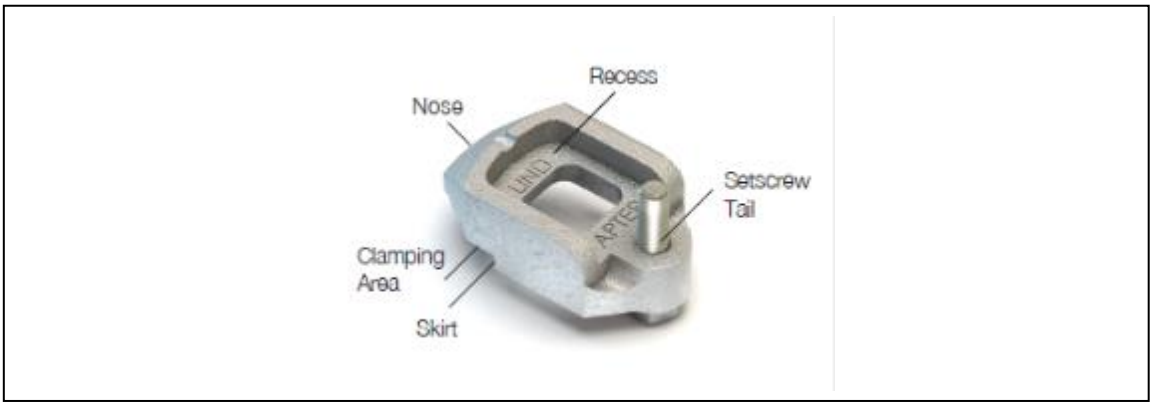


1.1.2 Type 2 Fixing

The assembly comprises of a cast body with a recess and a central through hole whereby a bolt is passed through. The recess captivates a bolt head and prevents rotation of the bolt during tightening. On the underside of the clamp is a vertical flat portion, commonly known as a skirt that butts up against the edge of the beam flange to prevent rotation of the clamp during tightening. The clamp has a profiled nose at the front to accommodate tapered beam flanges of up to 5º and teeth running from side to side. At the rear of the clamp is a setscrew of property class 8.8 that can be threaded up and down to accommodate different flange thicknesses (5 to 30mm).

The Type 2 assembly is manufactured from Malleable cast Iron to BS EN 1562 Grade EN-GJMB-350-10 or EN-GJMW-400-5 and has either a Zinc plated (EN ISO 2081 Fe/Zn5/A) or a Hot Dip Galvanised (EN ISO 1461) finish.

Figure 2: Type 2 Fixing – Type D2

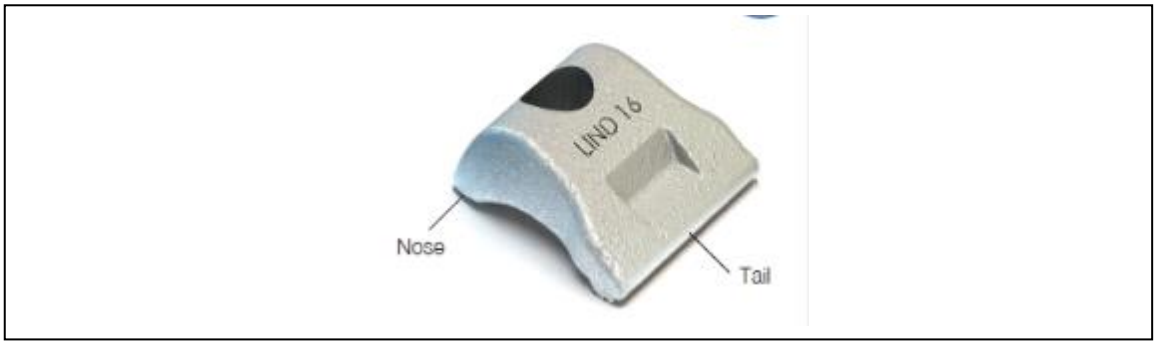


1.1.3 Type 3 Fixing

The assembly is a self adjusting clamp that comprises of a curved cast body with a through hole whereby a bolt of property Class A4-70 or 8.8 is passed through. At the rear of the clamp is a tail with special serrations along the full width to prevent rotation during tightening. The tail sits on top of the location plate and can span across slotted holes. The clamp has a thinner profiled nose at the front with teeth running front to back on the underside to resist sideways movement. The assembly is designed to rock backwards and forwards on the tail to accommodate different flange thicknesses (3mm to 30mm) and slopes up to 10º.

The Type 3 assembly is manufactured from Cast stainless steel to BS 3146 Grade ANC 4B or SG Iron to BS EN 1563 Grade EN-GJS-600-3 with a Hot Dip Galvanised (EN ISO 1461) finish.

Figure 3: Type 3 Fixing – Type LS



1.1.4 Type 4 Fixing

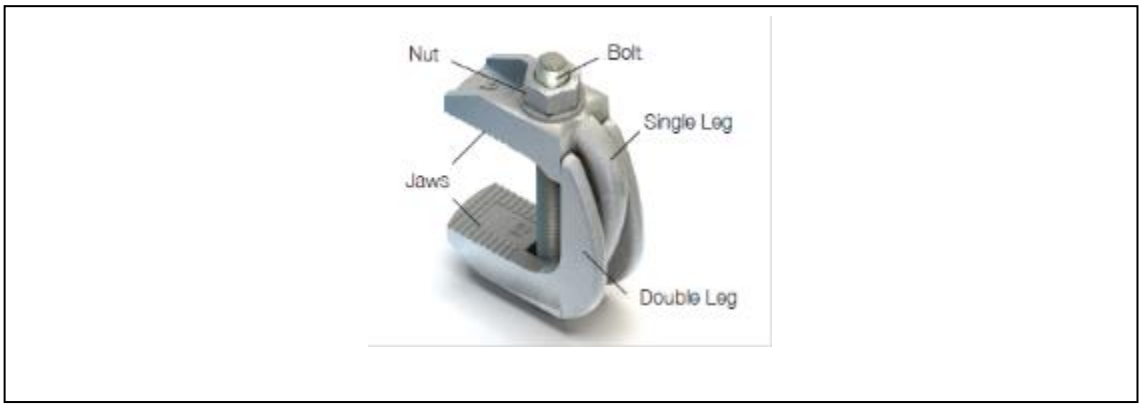
The assembly is a self adjusting clamp that comprises of a cast rectangular top part with a through hole and a cast bottom part with a through hole whereby a bolt or threaded rod of property class 8.8 can be passed through to join the two parts together to form a clamp. The top part has a profiled nose at the front with teeth on the underside running from side to side and at the rear is a centrally located single

leg. The bottom part has a profiled nose at the front with teeth on the underside running from side to side and at the rear is a ‘double’ leg. When assembled the single leg of the top part locates between the double legs of the bottom part allowing them to move up and down the bolt shank to form a clamp that will accommodate different flange thicknesses (19 to 95mm).

This assembly does not require a location plate.

The cast parts are manufactured from Malleable Cast Iron to BS EN 1562 Grade EN-GJMB-350-10 or EN-GJMW-400-5 and has either a Zinc plated (EN ISO 2081 Fe/Zn5/A) or a Hot Dip Galvanised (EN ISO 1461) finish.

Figure 4: Type 4 Fixing – Type F9

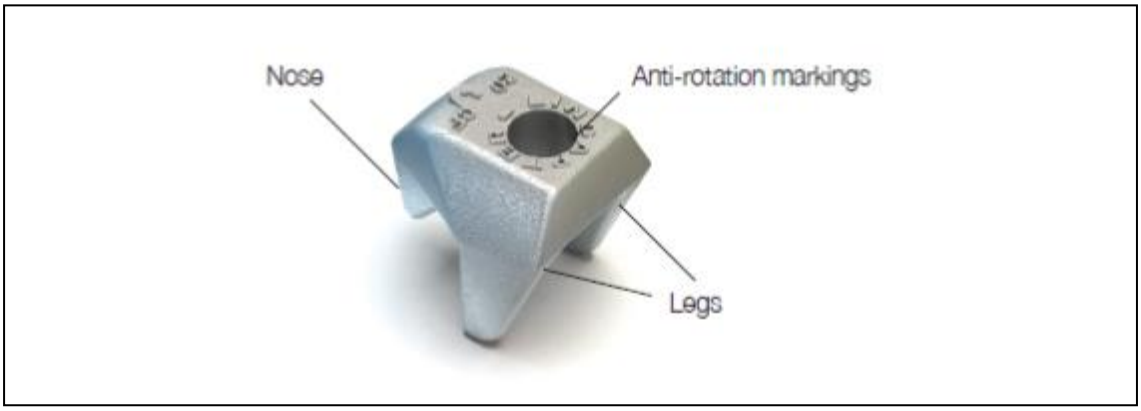


1.1.5 Type 5 Fixing

The fixing is a self aligning clamp comprising of a cast body with a through hole whereby a bolt of property class 8.8 is passed through. The clamp has a well defined profiled nose that hooks over the flanges of beams, angles and channels of various thicknesses. At the rear of the clamp are two extended legs, these prevent rotation of the clamp. On the top surface around the bolt hole are the ‘Lindapter’ markings in raised letters that act as a unique anti-rotation device for the bolt during tightening.

The Type 5 clamp is manufactured from Spheroidal Graphite Iron to BS EN 1563 Grade EN-GJS-600-3 and has a Hot Dip Galvanised (EN ISO 1461) finish.

Figure 5: Type 5 Fixing – Type CF

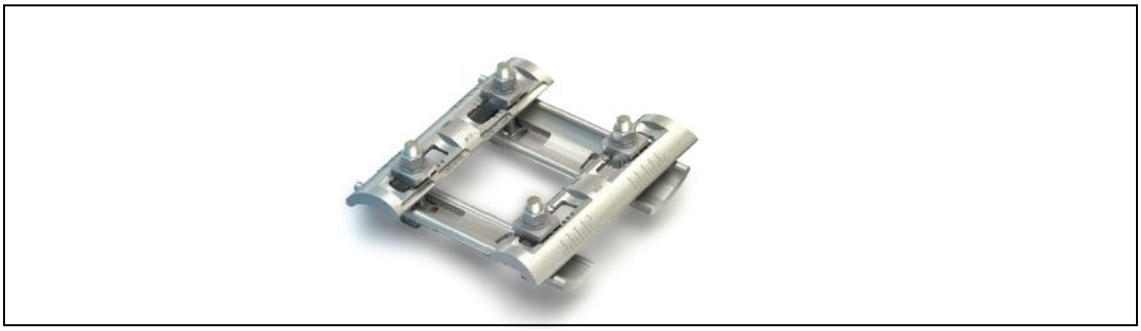


1.1.6 Type 6 Fixing

The assembly is a highly adjustable clamping system comprising of four drop forged rectangular bodies having two rectangular slots with teeth, four cast special washers with an offset ridge that engages with the teeth on the body and four special bolts of property class 8.8. The assembly clamps together two parallel beams of various thicknesses and angles without the need of a location plate.

The drop forged body is manufactured from forged carbon steel to EN 10083-2 or equivalent and the special washer is manufactured from Malleable Cast Iron to BS EN 1562 Grade EN-GJMW-400-5. All parts within the assembly have a JS500 finish, Fe/Zn8/C plus JS500.

Figure 6: Type 6 Fixing – Type Flush Clamp



1.1.7 Location Plate

The location plate is a square or rectangular piece of steel of calculated thickness, with pre-determined drilled holes. The plate is used to provide a connection between beams. The plate protrudes beyond the beam flanges with the bolt holes positioned on the overlaying edges. It is an essential part of the assembly and enables all of the components to be located in the correct position. The location plate provides support for the rear (tail) of the clamps.

1.1.8 Fastener Assembly

The carbon and alloy steel fastener assembly comprises of a hexagonal bolt and nut together with a washer. Mechanical properties of the fasteners are specified in EN ISO 898-1:2013, enabling the use of fasteners of property Class 8.8.

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

1.2.1 Intended Use(s)

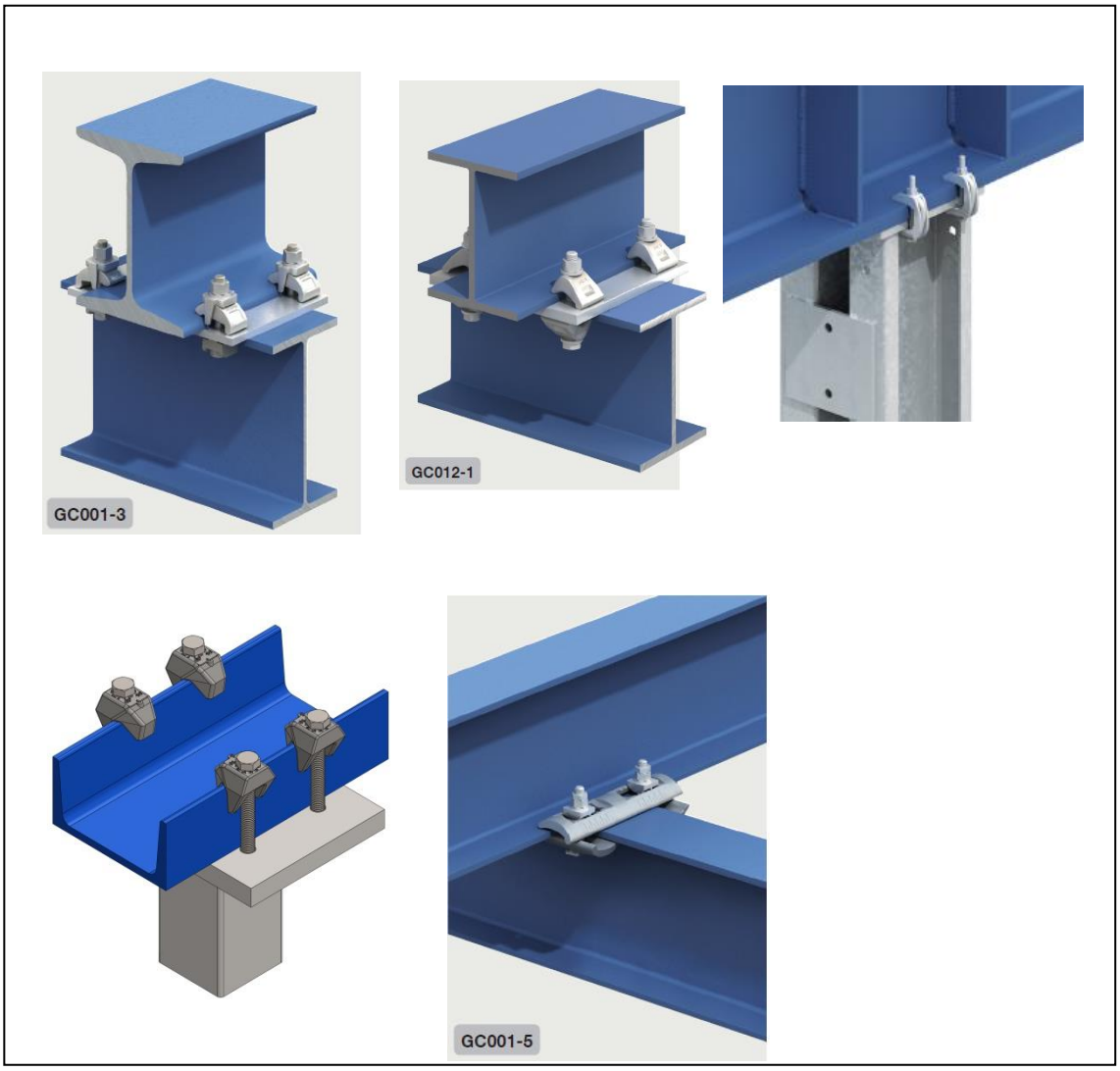
The Adjustable Clamp Assembly is intended to secure steelwork fixtures to structural members (beams, columns using I sections, channels, etc). The assembly may be required to resist tensile forces (i.e. forces tending to separate the structural components) or lateral forces, or a combination of the two.

The Adjustable Clamp Assembly is intended to be used for both temporary and permanent structures.

The location plate shown has four bolt holes on the overlaying edges. The clamps are positioned over the predrilled holes of the location plate with the nose of the clamp in contact with the beam flange and the tail in contact with the location plate. Bolts are passed through the holes in the bottom clamp (or top clamp depending on preference) and location plate ensuring that the bolt head sits in the recess of the clamp, where provided, this prevents rotation of the bolt during tightening.

Tightening each assembly to a defined procedure will achieve preload in the bolts and the connection will possess tensile resistance and slip resistance (preventing relative movement between the connected components).

Examples of adjustable clamp assemblies can be seen below.



1.2.2 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 Adjustable Clamp Assembly for the intended use of 25 years when installed in the works (provided that the Adjustable Clamp Assembly is subject to appropriate installation. 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[1].

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 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.

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

1.3.1 $F_{t,Rk}$

Characteristic value of tension resistance as defined in section 2.2.1.1

1.3.2 $F_{t,Rd}$

Design value of tension resistance as defined in section 2.2.1.1.1

1.3.3 $F_{s,Rk}$

Characteristic value of slip resistance as defined in section 2.2.1.2

1.3.4 $F_{s,Rd}$

Design value of slip resistance as defined in section 2.2.1.2.1

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1 shows how the performance of the Adjustable Clamp Assembly 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 *(level, class, description)*
Basic Works Requirement 1: Mechanical Resistance and Stability			
1	Tensile Resistance of Assembly	2.2.1.	$F_{t,Rk}$ [kN] $F_{t,Rd}$ [kN]
2	Slip Resistance of Assembly	2.2.2	$F_{s,Rk}$ [kN] $F_{s,Rd}$ [kN]
3	Design Resistance for Combined Tension and Shear Forces	2.2.3	Pass/fail
4	Mechanical Properties of the Cast Iron / Stainless Components	2.2.4	Pass/fail
5	External and Internal Soundness of the Cast Iron Components	2.2.5	Pass/fail
6	Mechanical Properties of the Carbon Steel Components	2.2.6	Pass/fail
7	Mechanical Properties of the Structural Fastener	2.2.7	Pass/fail
Basic Works Requirement 2: Safety in Case of Fire			
9	Reaction to Fire	2.2.8	Class A1
Basic Works Requirement 4: Safety and Accessibility in Use			
11	Tensile Resistance of Assembly	2.2.1	$F_{t,Rk}$ [kN] $F_{t,Rd}$ [kN]
12	Slip Resistance of Assembly	2.2.2	$F_{s,Rk}$ [kN] $F_{s,Rd}$ [kN]
13	Design Resistance for Combined Tension and Shear Forces	2.2.3	Pass/fail
14	Mechanical Properties of the Cast Iron / Stainless Components	2.2.4	Pass/fail
15	External and Internal Soundness of the Cast Iron Components	2.2.5	Pass/fail
16	Mechanical Properties of the Carbon Steel Components	2.2.6	Pass/fail
17	Mechanical Properties of the Structural Fastener	2.2.7	Pass/fail
Other characteristics			
18	Durability	2.2.10	To EN ISO 9223

2.2 Methods and Criteria for Assessing the Performance of the Product in Relation to Essential Characteristics of the Product

2.2.1 Tensile Resistance of the Assembly

For the initial type testing at least four tests shall be carried out for each nominal bolt size as described in Annex D of EN 1990:2002. The bolts shall be tightened with a torque moment specified for each bolt type and size. The test load shall be increased until failure of at least one bolt or clamp occurs. The respective failure modes for each nominal size of bolt shall be documented in the test report.

The material properties are to be documented using inspection documents 3.1, according to EN 10204:2004. The material properties shall correspond to the material specifications given by the manufacturer.

An example for the test principle is shown in Annex B.

The results of the tests, according to 1.5.1.1 (failure loads), shall be evaluated statistically (determination of the 5% fractile, confidence level 75%). Generally a normal distribution can be assumed.

The corrected and statistically evaluated test results (5% fractile) of the tests according to 1.5.1.1 are the characteristic values of the tension resistance of the assembly.

2.2.1.1 Determination of Design Tension Resistance

The design values $F_{t.Rd}$ of the tension resistance are the characteristic values of the tension resistance according to 1.5.1.1 divided by the recommended partial safety factor γ_M given in the national regulations of the member state where the adjustable clamps are to be used. In cases where no value is given then γ_M= 1.33 should be used.

2.2.2 Slip Resistance of the Assembly

For the initial type testing at least four slip tests shall be carried out for each nominal bolt size as described in Annex D of EN 1990:2002. The bolts shall be tightened with a torque moment specified for each size. The test load shall be increased until slipping of the assembly of > 0.1 mm, failure of at least one bolt or clamp occurs. The respective failure modes for each nominal size of bolt shall be documented in the test report.

The material properties should be documented by means of inspection documents 3.1 according to EN 10204:2004 and shall correspond to the material specifications given by the manufacturer.

The results of the test according to 1.5.1.2 (failure loads) shall be evaluated statistically (determination of 5% fractile, confidence level 75%). Generally, a normal distribution can be assumed.

The corrected and statistically evaluated test results (5% fractile) of the tests according to 1.5.1.2 shall be the characteristic values of slip resistance of the assembly.

2.2.2.1 Determination of Design Slip Resistance

The design values $F_{s.Rd}$ of the slip resistance are the characteristic values of the slip resistance according to 1.5.1.2 divided by the recommended partial safety factor γ_M given in the national regulations of the member state where the adjustable clamps are to be used. In cases where no value is given then γ_M= 1.33 should be used.

An example for the test principle is shown in Annex A2.

2.2.3 Design Resistance for Combined Tension and Shear Forces

The characteristic values of resistance under combined tensile and shear shall be calculated according to EN 1993-1-8. Refer to EN 1993-1-8.

2.2.4 Mechanical Properties of the Cast Iron/Stainless Steel Parts

The mechanical properties of the cast iron / stainless parts shall be proved by an inspection certificate 3.1 according to EN 10204:2004 and shall be in accordance with EN 1562:2012 for malleable cast iron and EN 1563:2011 for spheroidal graphite cast iron, or BS 3146 for cast stainless steel.

2.2.5 External Soundness of the Cast Iron Parts

The external and internal soundness of the cast iron parts shall be verified by visual inspection.

2.2.6 Mechanical Properties of the Carbon Steel Parts

The mechanical properties of the carbon steel parts shall be proved by an inspection certificate 3.1 according to EN 10204:2004 and shall be in accordance with EN 10025-1:2004 or EN 10083-2 for forged carbon steel.

2.2.7 Mechanical Properties of the Structural Fasteners

The mechanical properties of the structural fasteners shall be proved by an inspection certificate 3.1 according to EN 10204:2004 and shall be in accordance with EN 15048-1 and EN ISO 898.

2.2.8 Reaction to Fire

The product shall be classified according to Commission Delegated Regulation (EU) 2016/364. The Adjustable Clamp Assembly is considered to satisfy the requirements for performance Class A1 of the characteristic reaction to fire, in accordance with the EC decision 1996/603/EC (as amended) without the need for further testing on the basis of its conformity with the specification of the product detailed in that Decision and its intended end use application being covered by that Decision.

2.2.9 Safety and Accessibility in Use

The verification and assessment methods are the same as for BWR1.

2.2.10 Durability

The product shall have a verified durability expressed as a Corrosivity Classification (C1 to C5) in accordance with EN ISO 9223. The durability of the product in relevant environmental conditions shall be declared in the ETA. Where a protective coating is provided, its product specification and application shall be in accordance with the requirements of the ETA.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of Assessment and Verification of Constancy of Performance to be Applied

For the products covered by this EAD the applicable European Legal Act is: Decision 1997/176/EC

The System is: **2+**

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.

Table 2: Control Plan for the Manufacturer; Cornerstones

No.	Subject/Type of Control *(product, raw/constituent material, component - indicating characteristic concerned)*	Test or Control Method *(refer to 2.2 or 3.4)*	Criteria, if any	Minimum Number of Samples	Minimum Frequency of Control
Factory Production Control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]*					
1	Check of material properties stated in the ETA.	Inspection document 3.1 according to EN 10204 (to be - furnished by the supplier)	Results have to fulfil requirements stated in the ETA	-	Inspection level criteria in accordance with EN ISO 2859-1
2	Geometry and dimensions	Check of geometry, dimensions and tolerances	Results have to fulfil requirements stated in the ETA	As per QMS	Inspection level criteria in accordance with EN ISO 2859-1
3	External and internal soundness of cast iron parts	Check according to test plan	Results have to fulfil requirements stated in the ETA	As per QMS	Inspection level criteria in accordance with EN ISO 2859-1
Initial Type Testing (ITT)					
4	Check of material properties stated in the ETA	Inspection document 3.1 according to EN 10204 (to be - furnished by the supplier)	Results have to fulfil requirements stated in the ETA	-	When starting the production or a new production line
5	Geometry and dimensions	Check of geometry, dimensions and tolerances	Results have to fulfil requirements stated in the ETA	4	When starting the production or a new production line
6	External and internal soundness of cast iron parts	Check according to test plan	Results have to fulfil requirements stated in the ETA	4	When starting the production or a new production line

3.4 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 the Adjustable Clamp Assembly is laid down in Table 3.

Table 3: Control Plan for the Notified Body; Cornerstones

No.	Subject/Type of Control *(product, raw/constituent material, component - indicating characteristic concerned)*	Test or Control Method *(refer to 2.2 or 3.4)*	Criteria, if any	Minimum Number of Samples	Minimum Frequency of Control
Initial Inspection of the Manufacturing Plant and of Factory Production Control ***(for Systems 1+, 1 and 2+ only)***					
1.	Inspection of Factory and Factory Production Control	-	-	-	Before Certification
2.	Inspection of Manufacturers Test Facility	-	-	-	Before Certification
Continuous Surveillance, Assessment and Evaluation of Factory Production Control *(for systems 1+, 1 and 2+ only)*					
1.	Surveillance of Factory and Factory Production Control	-	-	-	2/Year
2.	Surveillance of Manufacturers Test Facility	-	-	-	2/Year

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.

BS 3146-2	Investment Castings in Metals
EN 1090-2	Execution of steel structures and aluminium structures - Part 2: Technical requirements for steel structures
EN 1562	Founding - Malleable cast iron
EN 1563	Founding - Spheroidal graphite cast iron
EN 1993-1-8	Eurocode 3: Design of steel structures- Part 1-8: Design of Joints
EN 10025-1	Hot rolled products of structural steels - Part 1: General technical delivery conditions
EN 10083-2	Steels for quenching and tempering
EN 10204	Metallic products - Types of inspection documents
EN 15048-1	Non preloaded structural bolting assemblies
EN ISO 898-1	Mechanical properties of fasteners made of carbon and alloy steel
EN ISO 1461	Hot Dip Galvanising and Chromate Passivate
EN ISO 2081	Electroplated Coatings of zinc on iron and steel
EN ISO 2859-1	Part Sampling schemes indexed by AQL for Lot-by- Lot inspection
EN ISO 9223	Corrosion of metals and alloys
EN 1990	Basis of structural design

ANNEX A – TENSILE TEST FOR THE ADJUSTABLE CLAMP ASSEMBLY

The intention of the design of the assembly is to provide a connection that would, after installation in accordance with a defined procedure, resist a tensile load that is at least equal to the characteristic tensile resistance of the adjustable clamp determined in accordance with 2.2.1.1.

During initial type testing, the suitability test shall be carried out on the standard two bolt assembly, (with the result multiplied by two in order to simulate a four bolt assembly) and installed in accordance with the installation procedure that is to be specified in the ETA. At least four tests shall be carried out for each nominal size.

The results of the initial type testing shall be evaluated to demonstrate that the minimum tensile failure load of the installed assembly (the maximum load sustained during a test to failure) is at least the value specified in the ETA. The ETA shall specify the minimum information to be included in the test documentation.

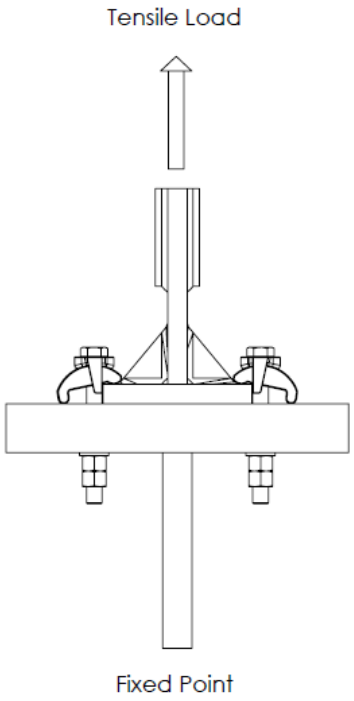


Figure1: Test Rig showing the Arrangement for a Two Bolt Assembly

ANNEX B – SLIP TEST FOR THE ADJUSTABLE CLAMP ASSEMBLY

The intention of the design of the assembly is to provide a connection that would, after installation in accordance with a defined procedure, resist a load that is at least equal to the characteristic slip resistance of the adjustable clamp, determined in accordance with 2.2.1.2.

During initial type testing, the suitability test shall be carried out on a standard four bolt assembly and installed in accordance with the installation procedure that is to be specified in the ETA. A minimum of four tests should be carried out for each nominal size.

The results of the initial type test shall be evaluated to demonstrate that the minimum slip resistance load of the installed assembly is at least the value specified in the ETA.

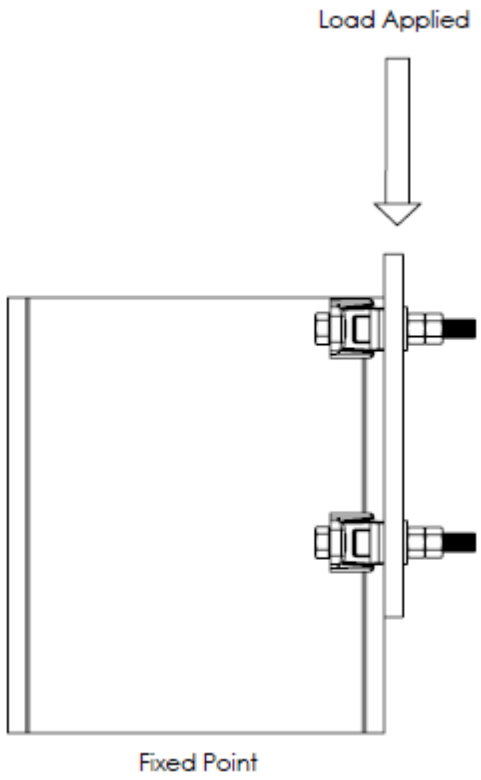


Figure2: Slip Test Arrangement