EUROPEAN ASSESSMENT DOCUMENT

EAD 200017-00-0302

April 2015

HOT ROLLED PRODUCTS AND STRUCTURAL COMPONENTS MADE OF STEEL GRADES Q235B, Q235D, Q345B AND Q345D

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1 SCOPE OF THE EAD

1.1 Description of the construction product

The products are uncoated hot-rolled plates or profiles made of the weldable steel grades Q235B, Q235D, Q345B and Q345D. The maximum thickness for profiles is 80 mm. The maximum thickness for plates made of Q235B and Q235D is 80 mm and for plates made of Q345B and Q345D is 250 mm.

The steel grades are similar to the structural steel grades according to EN 10025-2 listed in Table 1. Due to the manufacturing process the steel grades deviate from EN 10025-2 as follows:

- The minimum yield strengths R_{eH} and the ultimate strengths R_m differ from those specified in EN 10025-2.

- The chemical analysis differs from the analysis specified in EN 10025-2.

The Product characteristics must be identified on the basis of the Inspection document “type 3.1” according to EN 10204 (to be furnished by the supplier)

This EAD comprises structural components made of the products mentioned above as well.

Table 1 – Comparison of steel grades

Steel grade according this EAD	Comparable steel grade according EN 10025-2	
	Designation according EN 10027-1	Designation according EN 10027-2
Q235B	S235JR	1.0038
Q235D	S235J2	1.0117
Q345B	S355JR	1.0045
Q345D	S355J2	1.0577

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. Thus, use, maintenance, repair is not required during the intended working life; the thermo-mechanically hot-rolled long steel products made of weldable fine grain structural steel can be dismantled and recycled, but are normally not intended for re-use.

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, notably in accordance with the provisions of EN 1090-2:2008+A1:2011.

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.

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

1.2.1 Intended use(s)

The hot-rolled products of the steel grades Q235B, Q235D, Q345B and Q345D are intended for use in welded, bolted or riveted steel or composite structures.

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 hot-rolled products of the steel grades Q235B, Q235D, Q345B and Q345D for the intended use of 100 years when installed in the works (provided that the hot-rolled products of the steel grades Q235B, Q235D, Q345B and Q345D is 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[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.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1 shows how the performance of hot-rolled products of the steel grades Q235B, Q235D, Q345B and Q345D 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
Basic Works Requirement 1: Mechanical resistance and stability			
1	Chemical composition	2.2.1	Level
2	Yield strength	2.2.2	Level(R_{eH} [MPa])
3	Tensile strength	2.2.2	Level(R_m [MPa])
4	Elongation at fracture	2.2.2	Level(L_0 [%])
5	Impact toughness value	2.2.3	Level(K_V [J])

[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 the working life referred to above.

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No	Essential characteristic	Assessment method	Type of expression of product performance
6	Weldability	2.2.4	Level(CEV [%])
7	Improved deformation properties perpendicular to the surface	2.2.5	Level
8	Formability	2.2.6	Level
9	Suitability for hot-dip zinc-coating	2.2.7	Level
10	Surface properties	2.2.8	Level
11	Internal soundness	2.2.9	Level
12	Dimensions, tolerances on dimensions and shape, mass	2.2.10	Level
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	2.2.11	Class (A1) according to EN 13501-1:2007+A1:2009
Basic Works Requirement 7: Sustainable use of natural resources			
1	Durability	2.2.13	Description

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

2.2.1 Chemical composition of the steel

The chemical analysis shall be carried out in accordance with EN 10025-2:2004, clause 8.3.3 and 9.1. The test method shall be in accordance with EN 10025-2:2004, clause 10.1.

The chemical analysis shall comply with Table 3 and Table 4.

Table 3 Chemical analysis of the products of the steel grades Q235B, Q235D, Q345B and Q345D

Steel grade	Percent by weight [%]													
	C ≤	Si ≤	Mn ≤	P ≤	S ≤	Nb ≤	V ≤	Ti ≤	Cr ≤	Ni ≤	Cu ≤	N ≤	Mo ≤	Al ≥
Q235B	0,20	0,35	1,40	0,045	0,045	---	---	---	0,30	0,30	0,30	0,008	---	---
Q235D	0,17			0,035	0,035	---	---	---					---	0,015
Q345B	0,20	0,50	1,70	0,035	0,035	0,07	0,15	0,20	0,30	0,50	0,30	0,012	0,10	---
Q345D	0,18			0,030	0,025									0,015

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Table 4 Acceptable tolerances of product analyses compared to ladle analyses

Steel grade	Percent by weight [%]													
	C	Si	Mn	P	S	Nb	V	Ti	Cr	Ni	Cu	N ≤	Mo	Al
Q235B	±0,02	±0,03	≤ 0,8:±0,03 >0,8-1,7:±0,06	-0,005 +0,000	-0,005 +0,000	---	---	---	±0,05	±0,05	±0,05	±0,005	---	---
Q235D						---	---	---					---	±0,003
Q345B		≤ 0,37:±0,03 >0,37-0,50:±0,05				±0,005	-0,02 +0,01	-0,02 +0,01					±0,01	---
Q345D														±0,003

2.2.2 Yield strength, tensile strength and elongation at fracture

Location and orientation including preparation of samples and test pieces shall be in accordance with EN 10025-1 and EN 10025-2. The test method shall be in accordance with EN 10025-1, clause 10.2.1 and EN 10025-2.

The determined values of the yield strength, the ultimate strength and the elongation shall comply with Table 5.1 and 5.2.

Table 5.1 Mechanical properties of steel products of the steel grades Q235B and Q235D at ambient temperature

Steel grade	Nominal thickness t [mm]	Lower yield strength R_{eL} [MPa]	Tensile strength R_m [MPa]	Elongation at fracture $L_0 = 5,65 \cdot \sqrt{S0}$ [%]	Impact toughness value K_v [J]
Q235B	t ≤ 16	235	370 - 500	26	≥ 27 at +20 °C
	16 < t ≤ 40	225			
	40 < t ≤ 60	215		25	
	60 < t ≤ 80	215		24	
Q235D	t ≤ 16	235	370 - 500	26	≥ 27 at -20 °C
	16 < t ≤ 40	225			
	40 < t ≤ 60	215		25	
	60 < t ≤ 80	215		24	

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Table 5.2 Mechanical properties of steel products of the steel grades Q345B and Q345D at ambient temperature

Steel grade	Nominal thickness t[1)] [mm]	Lower yield strength R_{eL} [MPa]	Tensile strength R_m [MPa]	Elongation at fracture $L_0 = 5{,}65 \cdot \sqrt{S0}$ [%]	Impact toughness value K_v [J]
Q345B	t ≤ 16	345	470 - 630	20	≥ 34 at +20 °C
	16 < t ≤ 40	335			
	40 < t ≤ 63	325		19	
	63 < t ≤ 80	315			
	80 < t ≤ 100	305			
	100 < t ≤ 150	285	450 - 600	18	
	150 < t ≤ 200	275		17	≥ 27 at +20 °C
	200 < t ≤ 250	265			
Q345D	t ≤ 16	345	470 - 630	21	≥ 34 at -20 °C
	16 < t ≤ 40	335			
	40 < t ≤ 63	325		20	
	63 < t ≤ 80	315			
	80 < t ≤ 100	305			
	100 < t ≤ 150	285	450 - 600	19	
	150 < t ≤ 200	275		18	≥ 27 at -20 °C
	200 < t ≤ 250	265			

[1)] t > 80 mm for plates only

2.2.3 Impact properties of the steel

Location and orientation of samples and test specimen shall be in accordance with EN 10025-2:2004, clause 9.2.

The impact properties shall be determined according to EN 10025-2, clause 7.3.2. The determined values of the impact toughness shall be at least the values given in Table 5.1 and 5.2.

2.2.4 Weldability of the steel

The chemical analysis shall be performed in accordance with 2.2.1.1.

The carbon equivalent value CEV shall be determined according to EN 10025-1. CEV shall comply with the values specified in Table 6.

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Table 6 Maximum for Carbon Equivalent Value (CEV)

Steel grade	Nominal thickness t [mm]	
	t ≤ 63	63 < t ≤ 250
Q235B, Q235D	0,37	0,40
Q345B, Q345D	0,44	0,48

2.2.5 Improved deformation properties perpendicular to the surface

If agreed at the time of the order the products made of the steel grades Q235D and Q345D shall comply with one of the improved deformation properties perpendicular to the surface of the product as specified in EN 10164.

2.2.6 Formability

The formability of the products shall be in accordance with EN 10025-2:2004, clause 7.4.2 for the steel grades S235 and S355.

2.2.7 Suitability for hot-dip zinc-coating

For the suitability for hot-dip zinc-coating EN 10025-2:2004, clause 7.4.3 applies.

2.2.8 Surface properties

The surface condition of the products shall be in accordance with EN 10025-2:2004, clause 7.5.

2.2.9 Internal soundness

The inside condition of the products shall be in accordance with EN 10025-2:2004, clause 7.6.

2.2.10 Dimensions, tolerances on dimensions and shape, mass

The dimensions, the tolerances on dimensions and shape as well as the mass of the products shall be in accordance with EN 10025-2:2004, clause 7.7.

2.2.11 Reaction to fire

The hot-rolled steel products made of the steel grades Q235B, Q235D, Q345B and Q345D are considered to satisfy the requirements for performance class A1 of the characteristic reaction to fire, in accordance with the provisions of 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.

2.2.12 Durability

Durability of the structure made of hot-rolled steel products made of the steel grades Q235B, Q235D, Q345B and Q345D is assessed and expressed as a corrosivity classification (C1 to C5) in accordance with EN ISO 9223:2012. If required, the corrosion protection shall be carried out according to EN 1090-2:2008+A1:2011 and the appropriate part of EN ISO 12944:1998.

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3 ASSESSMENT AND VERFIFICATION 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 1998/214/EC

The system is: **2+**

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the hot rolled products and structural components made of steel grades Q235B, Q235D, Q345B and Q345D structural steel in the procedure of assessment and verification of constancy of performance are laid down in Table 6.

Table 7 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
Factory production control (FPC) including testing of samples taken at the factory in accordance with a prescribed test plan					
1	Chemical composition (Weldability)	2.2.1	Results have to be assessed by TAB	1	Every cast
2	Yield strength Tensile strength Elongation at fracture	2.2.2	Results have to be assessed by TAB	3[1]	
3	Impact strength	2.2.3	Results have to be assessed by TAB	3[1]	Every cast
4	Visual surface inspection	2.2.8	Results have to be assessed by TAB	-	
5	Tolerances on dimensions and shape	2.2.10	Results have to be assessed by TAB	-	

1) A supplementary testing of the product shall be carried out on every range and every grade and quality being placed on the market taken from any of the 3 casts used for the other tests.

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3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body in the procedure of verification of constancy of performance for hot rolled products and structural components made of steel grades Q235B, Q235D, Q345B and Q345D are laid down in Table 8.

Table 8 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
Initial inspection of the manufacturing plant and of factory production control					
1	Inspection of factory and factory production control				Before certification
2	Inspection of the testing facilities of the manufacturer				
Continuous surveillance, assessment and evaluation of factory production control					
3	Surveillance and assessment of factory production control				Once a year
4	Surveillance of the testing facilities of the manufacturer				

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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 1090-2:2008+A1:2011	Execution of steel structures and aluminium structures – Part 2: Technical requirements for the execution of steel structures
EN 10025-1:2004	Hot rolled products of structural steels – Part 1: General technical delivery conditions
EN 10025-2:2004	Hot rolled products of structural steels – Part 2: Technical delivery conditions for non-alloy structural steels
EN 10164:2004	Steel products with improved deformation properties perpendicular to the surface of the product - Technical delivery conditions
EN 10204:2004	Metallic products – Types of inspection documents
EN 13501-1:2007+A1:2009	Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests
EN ISO 9223:2012	Corrosion of metals and alloys - Corrosivity of atmospheres - Classification, determination and estimation
EN ISO 12944:1998	Paints and varnishes – Corrosion protection of steel structures by protective paint systems

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