EAD **060012-01-0802**

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European Assessment Document for

Kits consisting of chimney flue liners, made of glass fibres, mineral and organic substances, additional components and ancillaries

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) 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 kit according to this EAD is consisting of the hardened chimney flue liner with sootfire resistance class "O" (not sootfire resistant), made of glass fibres, mineral and organic substances, additional components (optional) and ancillaries. Hardening process of the flexible flue liner is taking place on site.

This EAD covers a kit consisting of the following components and described thereafter:

- flue liner (consisting of outer textile and basic composite)
- chimney fittings made of metal (including cleaning and inspection doors (optional) for the flue liner)
- condensate drain (optional)
- spacers (optional) made of stainless steel

Additional components to EAD 060012-00-0802:

- inner foil made of plastics (as optional part of the flue liner)
- insulation material made of mineral wool, including textile made of synthetic material on its outer surface (optional)

Chimney fittings (including cleaning and inspection doors) are made of metal and include elastomeric seals according to EN 1856-1[1] and EN 1856-2 respectively, whereas their performances are corresponding to those indicated in Table 2.1.1 (for elastomeric seals in case of classification P1 the essential characteristic gas tightness is of relevance).

For elastomeric seals EN 1856-1, clause 6.7.4 and EN 1856-2, clause 6.5.3 apply respectively.

Spacers are made of stainless-steel ring springs, whereas geometry and their grade of steel are defined in the ETA.

Condensate drains are made according to EN 1856-1 and EN 1856-2 as the metallic chimney fittings.

Note: In the ETA it shall be stated that a siphon is not subject of the assessment according to the EAD.

Insulation material, including textile at the outer surface as mentioned above, is made of mineral wool according to EN 14303.

The product is not fully covered by the following harmonized technical specifications:

- EN 14471:2013+A1:2015 due to consisting of composite materials, including mineral and organic substances and glass fibres (not dealt with in EN 14471: 2013+A1:2015), the required further processing during the installation to reach the final material properties and consequently the required detailed parameters for the production of the flue liner.
- EAD 060012-00-0802 due to the intended working life of 15 years, the chemical composition of the flue liner and related assessment of long-term resistance to thermal load in Clause 2.2.9.1, Enlargement of assessment of compound of the layer in Clause 2.2.9.4 and the optional inner foil and outer textile, applied in conjunction with thermal insulation to the composite material.

Justification for use of EN 13216-1: 2004: Assessment methods given EN 13216-1: 2004 are used throughout in this EAD in order to comply with related assessment methods in hENs, referred to in this EAD, and related classes indicated in EN 1443:2003 and implemented in the concerned hENs cited in the OJEU.

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

[1] All undated references to standards or to EADs in this EAD are to be understood as references to the dated versions listed in chapter 4.

the transport, storage, installation, 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)

Renovation or adaptation of existing chimneys for corrosion resistance classes 1 and 2 according to EN 1443, whereas for corrosion resistance class 2 natural wood is excluded. Products according to this EAD shall not be used in chimneys with sootfire resistance class "G".

The product can also be used for non-vertical installation, whereas the maximum possible inclination is 45° and depending on the relevant design. In case of inclined installation, the reduction of the inner diameter of the flue liner is related to not more than 10% of its nominal diameter in order to minimize the influence of the flow resistance and ensure proper cleanability of the flue liner.

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 kit consisting of chimney flue liner, made of glass fibres, mineral and organic substances, additional components and ancillaries for the intended use of 10 or 15 years (depending on the procedure (A or B) applied according to Clause 2.2.9.1 of this EAD) when installed in the works (provided that the kit consisting of chimney flue liner, made of glass fibres, mineral and organic substances, additional components and ancillaries 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 and the assessment of the durability of the flue liner according to this EAD.

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[2].

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

For the purposes of this EAD, the specific terms and definitions given in EN 1443, EN 1856-1 and EN 1856-2, EN 14471 and EN 15287-1 apply.

[2] 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 2.1.1 shows how the performance of the kit consisting of flue liner, made of glass fibres, mineral and organic substances, additional components and ancillaries, is assessed in relation to the essential characteristics.

Table 2.1.1 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 2: Safety in case of fire			
1	Reaction to fire (of the components)	2.2.1	Class
Basic Works Requirement 3: Hygiene, health and the environment			
2	Thermal performance	2.2.2	Level, Class
3	Gas tightness/leakage	2.2.3	Class
4	Flow resistance	2.2.4	Level
5	Thermal resistance	2.2.5	Level
6	Durability/Condensate resistance	2.2.6	Class
7	Durability against chemicals and corrosion	2.2.7	Class
8	Dangerous substances[3]	EN 14471, Clause 8	Description
Basic Works Requirement 4: Safety and accessibility in use			
9	Maximum height (including non-vertical installation)	2.2.8	Level
Aspects of durability			
10	Durability of the flue liner		
10.1	Long-term resistance to thermal load	2.2.9.1	Level
10.2	Resistance to wet/dry cycling	2.2.9.2	Level
10.3	Long-term compatibility with ancillaries	2.2.9.3	Description
10.4	Durability against Freeze-thaw	2.2.9.4	Description
10.5	Durability against UV radiation[1] [1] Relevant in case of flue liner is not covered against UV radiation, whereas applications of the flue liner equivalent as defined for plastic flue liners in Clause 6.3 of EN 14471 are excluded.	2.2.9.5	Description

3 Release of dangerous substances during the hardening process is not considered as it is not relevant for the use of the product

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

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

Testing will be limited only to the essential characteristics which the manufacturer intends to declare. If for any components covered by harmonised standards or European Technical Assessments the manufacturer of the component has included the performance regarding the relevant characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required.

The flue liners used in the assessment of the kit shall be fully hardened according the instructions provided by the manufactuerer, mentioned in Clause 1.1 of this EAD.

2.2.1 Reaction to fire

Purpose of the assessment

This clause is referring to the assessment and classification of reaction to fire of the flue liner, including thermal insulation, if any.

Assessment method

The components shall be tested according to the method(s) referred to in EN 13501-1 and relevant for the corresponding reaction to fire class. The components shall be classified according to the Commission Delegated Regulation (EU) No 2016/364. In case of flue liner for mounting and fixing the conditions in EN 14471, Clause 7.7.8, apply.

Expression of results

Reaction to fire class of the components shall be stated in the ETA.

2.2.2 Thermal performance

Purpose of the assessment

The purpose is to assess the thermal performance of the kit, considering the distance to combustible materials. The result shall be given in the ETA.

Assessment method

For assessment of thermal performance, the non-vertical installation shall be taken into account for the installation of the test specimen according to the conditions defined in EN 14471, Clauses 6.2.2.2 and 6.2.2.3.

1st Assessment method (reference method):

Assessment shall be done according to EN 13216-1, Clause 5.7. Assessment can be done with or without outer wall. If an outer wall is used in the assessment, it shall be defined in the ETA (e.g., dimensions, material). The assessment can be done on a free standing setup according to clause 5.7.3.1.2 and Figure 9 of EN 13216-1, on a corner installation according to Clause 5.7.3.1.3 and Figure 9 and 13 of EN 13216-1 or on a corner installation fully encased in zone B according to clause 5.7.3.1.4 and Figure 9 and 14 of EN 13216-1. The encasement, if any, shall be defined in the ETA by location, dimensions and material.

2nd Assessment method:

Assessment shall be done according to EN 1856-2, Clause 6.4.1.1., with gas tightness according to clause 2.2.3 of this EAD.

For distance to combustible materials, the following applies for both assessment methods:

If not included in the assessments stated above or in case the ETA shall comprise a different outer wall than the one used in the assessment (e.g., representative outer wall for renovation), the distance to combustible materials shall be calculated according to EN 15287-1 for the respective outer wall. In the ETA, the outer wall shall be defined by thermal resistance [m²K/W] and thickness [m], including information on ventilation gap, if any.

For testing of the thermal performance of the product the following test sequence applies:

- gas tightness according to Clause 2.2.3 of this EAD
- thermal load under operating conditions according to 1st or 2nd method of this Clause
- gas tightness according to Clause 2.2.3 of this EAD
- condensate resistance according to Clause 2.2.6 of this EAD

Expression of results

The pressure class and the temperature class (Txx)[4] shall be stated in the ETA, including information on the used assessment method (1st or 2nd).

The distance to combustible materials shall be given as Oyy, whereas yy is the minimum distance to combustible material in [mm], including information on the corresponding outer wall.

2.2.3 Gas tightness/leakage

Purpose of the assessment

The gas tightness of the kit (including chimney fittings) shall be assessed and indicated in the ETA.

Assessment method

Assessment shall be done according to EN 13216-1, Clause 5.4. For the classification EN 1443 applies.

Expression of results

The pressure class shall be stated in the ETA.

2.2.4 Flow resistance

Purpose of the assessment

The flow resistance of the kit is dealt with by the assessment of the flow resistance of the flue liner and related components (chimney fittings) to be and indicated in the ETA.

Assessment method

For the assessment of flow resistance of the kit, the relevant components (flue liner, chimney fittings) shall be assessed either according to EN 13216-1, Clause 5.11, or using appropriate data according to EN 13384-1, tables B.4 and B.8.

Expression of results

The mean roughness “r” or ζ-values shall be stated in the ETA.

4 Depending on the results of long-term resistance the thermal load according to Clause 2.2.9.1 of this EAD, and, in case of condensate resistance class “W”, the results of resistance to wet/dry-cycling according to Clause 2.2.9.2 of this EAD.

2.2.5 Thermal resistance

Purpose of the assessment

The thermal resistance of the flue liner, including thermal insulation, if any, shall be assessed and indicated in the ETA.

Assessment method

Assessment of the thermal resistance of the flue liner, including thermal insulation, if any, shall be done either according to EN 13216-1, Clause 5.8 (reference method), or by calculation according to EN 13384-1, Clause 5.6.3 and where relevant for the use of thermal insulation material taking into account EN 15287-1, Clause 4.3.4.3.2 and 4.3.4.4.2.

Expression of results

The thermal resistance shall be stated in the ETA, taking into account the composition of the product (with or without thermal insulation), in the following way: Ryy (in relation to the inner diameter of the flue liner), where yy is the value in square meters Kelvin per Watt multiplied by 100, rounded to the nearest integer.

2.2.6 Durability/Condensate resistance

Purpose of the assessment

The condensate resistance of the kit shall be assessed and indicated in the ETA.

Assessment method

For the assessment of condensate resistance “W” of the kit, including thermal insulation, if part of the kit, EN 14471, Clause 6.6.3, applies.

Description that no appearance of water on the outside of the test sample of chimney fittings or flue liner occur. If met, the condensate resistance of the kit shall be assessed as condensate resistance class “W”.

Note: For classification “D” separate assessment of this essential characteristic for the kit is not relevant.

Expression of results

The condensate resistance class “D” / “W” shall be stated in the ETA.

2.2.7 Durability against chemicals and corrosion

Purpose of the assessment

Durability against chemicals and corrosion is assessed by means of the assessment of the long-term resistance to condensate exposure and resistance to wet/dry cycling.

Assessment method

For assessment of durability against chemicals and corrosion, the following applies:

Long term resistance to condensate exposure: For class 1 and class 2 assessment of durability against corrosion shall be done according to EN 14471, Clause 6.7.4, without inner foil. Assessment is to be done for the flue liner, whereas for the corrosion resistance classes according to clause 1.2.1 of this EAD Tables 11 and 12 in EN 14471 apply.

Due to the layered structure of the products covered by this EAD it is possible to protect the cut surface of the test specimen.

The change in the properties shall not affect the durability of the flue liner. This is evaluated in comparison with indicated change in properties given in EN 14471, Table 7, taking into account the composition of the flue liner.

Note: Inner foil is an optional component and is intending to improve the performance. In order to cover the most onerous situation regarding durability against corrosion, the inner foil shall not be part of the test specimen.

Resistance to wet/dry cycling: According to Clause 2.2.9.2 in this EAD, relevant for classification “W”.

Expression of results

The corrosion resistance class “1” / “2” shall be stated in the ETA.

2.2.8 Maximum height of the assembled kit (including non-vertical installation)

Purpose of the assessment

The maximum height of the kit shall be assessed for the vertical installation of the flue liner and in case of non-vertical installation of the flue liner, above the inclined part.

Assessment method

For vertical installation the maximum height of the flue liner is considered by maximum load of opening sections and shall be assessed according to EN 1856-2, Clause 6.1.1, whereas for the preparation of the test specimen as defined in EN 1859, Figure 1 (a), is taking into account the specific situation of the manufacturing process of the flue liner, taking into account boundary conditions given in EN 1856-2, Clause 6.1.1 and taking into account the most onerous situation. Most onerous situation means when installed as self-supporting structure.

The maximum load of the opening sections “F_{OP}” in [N] shall be assessed as stated in EN 1859, Clause 4.1.1.2. The applied load shall be increased until failure and the maximum load shall be recorded. “F_{OP}” is defined by the minimum resulting value of 3 tested specimens. The maximum height “Hv” in [m] for vertical installation shall be calculated as follows:

$Hv = F_{OP} / (G * g * S_v)$

where

F_{OP}	Maximum load of the opening section in [N]
G	Weight per meter [kg/m] of the flue liner
g	gravitational acceleration [m/s²]
S_v	Factor for vertical installation = 4 (most onerous situation)

Assessment for the non-vertical installation is related to an angle of 45° of the inclined part and length above of the inclined section. This is covering the most onerous situation in terms of possible allowable inclination as defined in the scope of the EAD. It is carried out as stated in EN 1856-1, Clause 6.2.1.2, with the following precisions:

- configuration of the test specimen is taking into account the maximum inclined installation situation for the concerned product, the permanent support of the flue liner by means of spacers, and referring to the minimum diameter, including the possible change of diameter according to Clause 1.2.1 in this EAD;
- the minimum distance of the inclined section shall include at least 3 spacers, whereas the positioning of the spacers shall take into account the most onerous situation within the inclined section;
- the vertical load is to be applied centrally on the top of the vertical section above;
- the possible movement of the vertical section due to the load, whereas the supportive spacers during the execution of the test stay maintained, is to be measured with a tolerance as given in EN 1859,

Clause 4.1.2.2 (deviation to Figure 2 in EN 1859 – no chimney fittings are installed in this inclined area);
- the maximum displacement of the vertical part flue liner above the inclined section is related to 5 mm, given in EN 1856-1, Clause 6.2.1.2, in case of air gap between flue liner and outer wall;
- the maximum deformation (10%, according to Clause 1.2.1 in this EAD) in the inclined section of the flue liner is defined according to Figure 2.2.8.1 and is measured by means of gauge;

The maximum Force F_I in [N], measured at the maximum allowed displacement of 5 mm (see bullet point 5 above), is to be recorded.

The resulting maximum length above the inclined section H_I [m] for the non-vertical installation of the kit is calculated as follows:

$H_I = F_I / (G * g * S_I)$

where

F_I	maximum Force in [N], resulting in maximum allowed displacement of 5 mm
G	Weight per Meter [kg/m] of the flue liner
g	gravitational acceleration [m/s²]
S_I	Factor for inclined installation = 3 (in accordance with clause 4.1.2.2 of EN 1859)

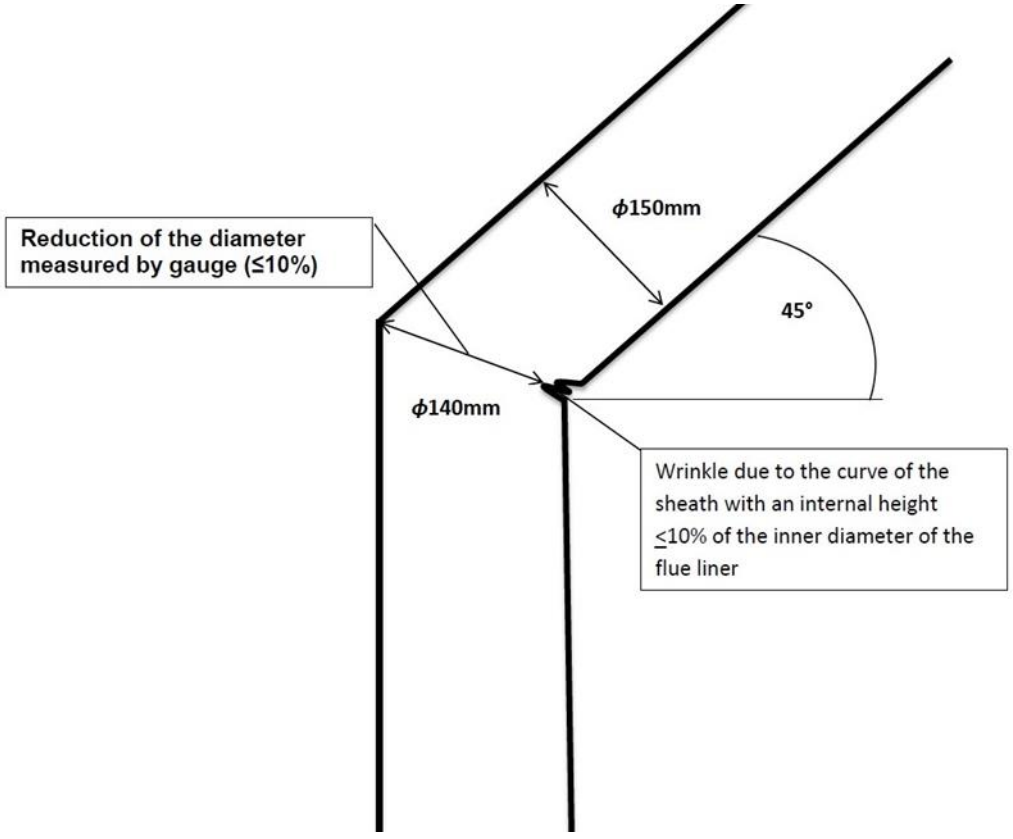

Figure 2.2.8.1: Reduction of the inner diameter of the flue liner

Expression of results

The maximum height of the assembled kit for vertical installation and, in case of non-vertical installation, for section above the inclined installation shall be stated in the ETA in [m].

2.2.9 Durability of the flue liner

2.2.9.1 Long-term resistance to thermal load

Purpose of the assessment

The long-term resistance to thermal load of the flue liner shall be assessed and indicated in the ETA.

Assessment method

For the long-term resistance to thermal load the properties stated below shall be assessed before and after exposure as defined in the respecitve procedure (A or B) and their relative change shall be calculated.

- Impact strength [*IS*] (where relevant)
- Tensile strength at break of the flue liner [σ_B] (alternatively tensile modulus [*E*])
- Ring stiffness [*S*] of the flue liner
- Density [ρ] of the flue liner
- Geometrical stability of the flue liner (inner lenght [*l*] and inner diameter [d_i])
- Tightness of the flue liner with a connected chimney fitting (see last paragraph of procedure A and B respectively)

The same assessment method for the individual property before and after exposure shall be used. The properties before exposure shall be assessed on a fully hardened flue liner prepared according to the installation manual. The relative change shall be given in [%] and shall be calculated as follows:

$C = 100*(X_a/X_b-1)$

Where

C change in properties in [%]

X_a assessed property value after exposure

X_b assessed property value before exposure

Due to the chemical composition of the liner and its sensitivity to the gas mixture used during the test procedure one of the following assessment procedures shall be applied. Therefore, Procedure A applies in case the hardening process of the flexible flue liner (see Clause 1.1 in this EAD) is depending on applying flue gas for its completion.

Procedure A

The assessment method is given in Annex A in this EAD and is covering working life of 10 years. The assessment method given in Annex A is related to simulating the specific situation of reaction of flue gas to the material of the flue liner due to its composition.

For the assessment of the tightness of the flue liner with a connected chimney fitting it is to be evaluated that the envisaged pressure class is maintained before and after exposure.

Procedure B

Assessment shall be done before and after the conditioning of the test specimens according to clause 7.7.3 of EN 14471 (exposure to thermal load). For each property at least two specimens shall be tested. The assessment of the properties listed above shall be done according to EN 14471, Annex C, and is covering working life of 15 years. Density can be checked on samples dried at a temperature of 160° C for 24 hours (preparation of the sample). Either method described in EN ISO 1183-1 is applicable. Regarding the tensile modulus, equivalently the test may be carried out according to EN 1393, method A.

Tightness of the flue liner with a connected chimney fitting is covered by assessment of long-term compatibility with ancillaries according to Clause 2.2.9.3.

Expression of results

In the ETA, the change in [%] of the material properties before and after exposure to thermal load shall be given. Depending on the test procedure used, the relevant working life shall be indicated in the ETA.

2.2.9.2 Resistance to wet/dry cycling

Purpose of the assessment

The resistance to wet/dry cycling of the flue liner is related to classification "W" for the essential characteristic condensate resistance (Line 6 in Table 2.1.1 of this EAD) and shall be assessed and indicated in the ETA.

Assessment method

For products with classification "W" the assessment of resistance to wet/dry cycling shall be done according to EN 14471 for the properties of the flue liner stated below. They shall be assessed before and after the exposure according to EN 14471, Clause 7.7.5, and their relative change shall be calculated.

- Tensile strength at break of the flue liner [σ_B] (alternatively tensile modulus [E])
- Ring stiffness [S] of the flue liner
- Density [ρ] of the flue liner

The same assessment method for the individual property before and after exposure shall be used. The properties before exposure shall be assessed on a fully hardened flue liner prepared according to the installation manual. The relative change shall be given in [%] and shall be calculated as follows:

$C = 100*(X_a/X_b-1)$

Where

C change in properties in [%]

X_a Value after exposure

X_b Value before exposure

For the respective properties to be assessed the assessment methods of procedure A and B of Clause 2.2.9.1 of this EAD apply.

The thermal insulation and the outer textile applied to the outer surface of the thermal insulation material shall be included in the test specimens as defined in Clause 7.7.5 of EN 14471.

Expression of results

In the ETA, the change in [%] of the material properties before and after exposure shall be given.

2.2.9.3 Long-term compatibility with ancillaries

Purpose of the assessment

The long-term compatibility with ancillaries of the flue liner shall be assessed and indicated in the ETA.

Assessment method

The interaction of the metal parts with the flue liner under certain conditions (hot temperature) for the operating temperature is considered as essential in respect to consequences of oxidation which may occur in the contact area. It shall be assessed by means of the change of the density and the tightness of the flue liner with a connected chimney fitting, whereas for the test specimens the length of the flue liner section is exceeding the dimension of the chimney fitting on both sides between 50 mm to 150 mm.

For the assessment of the change in the density, Clause 2.2.9.1 in this EAD applies. The assessment of the tightness shall be done according to the assessment given in Clause 2.2.9.1. The tightness of the flue liner shall be maintained.

The change in the density of the flue liner in the area of the metallic chimney fitting (in comparison to virgin material) shall be equivalent to the change of the density as defined in Clause 2.2.9.1 in this EAD.

Expression of results

In the ETA shall be stated “Durable”, if the change of density of the flue liner in the area of the metallic chimney fitting is equal to the change of density as defined in Clause 2.2.9.1, otherwise it shall be stated “Not durable”.

2.2.9.4 Durability against Freeze-thaw

Purpose of the assessment

The durability against freeze-thaw of the flue liner shall be assessed and indicated in the ETA.

Assessment method

Freeze-thaw resistance of the flue liner shall be assessed according to EN 14297, whereas Table 1 of EN 14297 applies. The assessment of damages, if any, shall be done according to EN 1457-1 and EN 1457-2 respectively (depending on the classification of condensate resistance “W/D”).

Expression of results

In the ETA the following shall be stated: Resistant/ Not resistant.

Note: In case of “not resistant” relevant measures for protection of the product against freeze-thaw is necessary. This shall be stated in the ETA.

2.2.9.5 Durability against UV radiation

Purpose of the assessment

The durability against UV radiation of the flue liner shall be assessed and indicated in the ETA.

Assessment method

UV radiation resistance shall be assessed according to EN 14471.

Expression of results

In the ETA the following shall be stated: Resistant/ Not resistant.

Note: In case of “not resistant” relevant measures for protection of the product against UV radiation is necessary. This shall be stated in 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 95/467/EC of the European Commission, amended by the Commission Decision 2001/596/EC and 2002/592/EC and 2010/679/EC

The system is: 2+

In addition, with regard to reaction to fire for products covered by this EAD the applicable European legal act is: Decision 2010/679/EC (EU)

The systems are: 1-3-4 depending on the conditions defined in the said Decision.

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 Tables 3.2.1 to 3.2.4.

The manufacturer (regarding the components he buys from the market with DoP) shall take into account the Declaration of Performance issued by the manufacturer of that component. No retesting is necessary.

Table 3.2.1 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)					
1	Components produced by the manufacturer himself:				
	▪ Flue liner	See Table 3.2.2, No1	See Table 3.2.2, No1	See Table 3.2.2, No1	See Table 3.2.2, No1
	▪ Metallic components	See Table 3.2.2, No2	See Table 3.2.2, No2	See Table 3.2.2, No2	See Table 3.2.2, No2
	▪ Insulation material	See Table 3.2.2, No3	See Table 3.2.2, No3	See Table 3.2.2, No3	See Table 3.2.2, No3
	▪ Inner foiling	See Table 3.2.2, No4	See Table 3.2.2, No4	See Table 3.2.2, No4	See Table 3.2.2, No3
2	Components not produced by the manufacturer himself (*)	See Table 3.2.3	See Table 3.2.3	See Table 3.2.3	See Table 3.2.3
3	Kit	See Table 3.2.4	See Table 3.2.4	See Table 3.2.4	See Table 3.2.4
(*) Components produced by the supplier under the specifications of the manufacturer.					

Table 3.2.2 Control plan when the components are produced by the manufacturer himself; 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)					
1	Flue liner				
1.1	Incoming materials: Depending on the type (resin, additives, glass fibre, inner foiling material, outer textile), internal records and/or tests	Documentation, internal tests, visual checks; depending on the type of the material Details laid down in the control plan.	Details laid down in the control plan.	One each order, each product, each batch; depending on the type of material	Each order, each product, each batch; depending on the type of material
1.2	Composition of resin: internal records and/or tests	Composition and mixture according to working instruction	Reaction ability according to working instruction	One test per batch	Each batch
1.3	Production of basic composite for the flue liner	According to working instruction laid down in control plan	Content of components	At least one test per batch	Each unit
1.4	Processing (where relevant)	Degree of polymerisation according to working instruction	Details are laid down in control plan	1 test per unit and production day	Each unit
1.5	Manufacturing of the flue liner	Details laid down in control plan (e.g., Check of absence of defects, homogeneity, evenness, number of layers)	Details are laid down in control plan	Details laid down in control plan	Each flue liner to be manufactured
1.6	Check of compound	Clause 3.4 in this EAD (In case of applying in combination with Annex B in this EAD: Pressure for evaluation of the compound of the layer: laid down in the control plan)	Laid down in control plan	Laid down in control plan	Laid down in control plan (e.g., Minimum one per delivery of base resin and/or one per week)
1.7	Polymerisation of finished flue liner and compound of layer, including outer textile and inner foil (where relevant)	Details are laid down in control plan	Details are laid down in control plan	Each produced flue liner	Each produced flue liner
2	Metallic components				
2.1	Chimney fittings: Parameters according to EN 1856-1, Clause 10.3 and EN 1856-2, Clause 10.3	EN 1856-1 and EN 1856-2	EN 1856-1 and EN 1856-2	EN 1856-1 and EN 1856-2	EN 1856-1 and EN 1856-2
2.2	Metallic cleaning and inspection doors (optional): Parameters according to EN 1856-1, Clause 10.3 and EN 1856-2, Clause 10.3	EN 1856-1 and EN 1856-2	EN 1856-1 and EN 1856-2	EN 1856-1 and EN 1856-2	EN 1856-1 and EN 1856-2

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
2.3	Condensate drain (optional): Parameters according to EN 1856-1, Clause 10.3 and EN 1856-2, Clause 10.3	EN 1856-1 and EN 1856-2	EN 1856-1 and EN 1856-2	EN 1856-1 and EN 1856-2	EN 1856-1 and EN 1856-2
2.4	Spacers				
2.4.1	Material quality	As defined in control plan	As defined in control plan	As defined in control plan	Each delivery
2.4.2	Dimensions	As defined in control plan	As defined in control plan	As defined in control plan	Each delivery
3	Insulation material				
3.1	Material (Type of material as laid down in control plan)	As defined in control plan	As defined in control plan	As defined in control plan	Each delivery
3.2	Density	As defined in control plan	As defined in control plan	As defined in control plan	Each delivery
3.3	Geometry	As defined in control plan	As defined in control plan	As defined in control plan	Each delivery
3.3	Outer textile				
3.3.1	Material quality (Type as laid down in the control plan)	As defined in control plan	As defined in control plan	As defined in control plan	Each delivery
3.3.2	Dimensions	As defined in control plan	As defined in control plan	As defined in control plan	Each delivery
4	Inner foiling				
4.1	Material characteristics	As defined in control plan	As defined in control plan	As defined in control plan	Each incoming lot
4.2	Geometry	As defined in control plan	As defined in control plan	As defined in control plan	Each incoming lot
4.3	Homogeneity	As defined in control plan	As defined in control plan	As defined in control plan	Each incoming lot

Table 3.2.3 Control plan when the components are not produced by 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)					
1	Components belonging to Case 1 (*)	(1)	Conformity with the order	Testing is not required	Each delivery
		(2)	According to Control Plan	Testing is not required	Each delivery
2	Components belonging to Case 2 (**):	(1)	Conformity with the order	Testing is not required	Each delivery
	▪ Characteristics declared in DoP for the specific use within the kit.	(2)	According to Control Plan	Testing is not required	Each delivery
	▪ Characteristics not declared in DoP for the specific use within the kit.	(3)	According to Control Plan	According to Control Plan	According to Control Plan
3	Components belonging to Case 3 (***):	(1)	Conformity with the order	Testing is not required	Each delivery
		(3)	According to Control Plan	According to Control Plan	According to Control Plan

(1) Checking of delivery ticket and/or label on the package.
(2) Checking of technical data sheet and DoP or, when relevant: supplier certificates or supplier tests or test or control according to Table 3.2.2 above.
(3) Checking of supplier documents and/or supplier tests and/or test or control according to Table 3.2.2 above.
(*) Case 1: Component covered by a hEN or its own ETA for all characteristics needed for the specific use within the kit.
(**) Case 2: If the component is a product covered by a hEN or its own ETA which, however, does not include all characteristics needed for the specific use within the kit or the characteristic is presented as NPD option for the component manufacturer.
(***) Case 3: The component is a product not (yet) covered by a hEN or its own ETA.
(****) Component characteristics are those defined in Table 3.2.2 above.

Table 3.2.4 Control plan of the complete kit; 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)					
1	Conformity to the quality conformity control e.g., correct elements, dimensions, pre assembly.	As defined in the control plan	As defined in the control plan	As defined in the control plan	Each delivery

3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.3.1

Table 3.3.1 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	Notified Body will ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing of the product	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	According to Control plan	According to Control plan	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control					
2	The Notified Body will ascertain that the system of factory production control and the specified manufacturing process are maintained taking account of the control plan.	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in Table 3.2.1	According to Control plan	According to Control plan	1/year

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire for products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).

In this case the cornerstones of the tasks to be undertaken by the notified body under AVCP system 1 are laid down in Table 3.3.2.

Table 3.3.2 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 carried out by the manufacturer regarding the constancy of performance related to reaction to fire *(for system 1 only)*					
1	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 are fulfilled for reaction to fire, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire *(for system 1 only)*					
2	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 in the Decisions regarding reaction to fire are fulfilled, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material)	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in Tables 3.2.1 to 3.2.4	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	2/year

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

Due to the chemical composition and manufacturing process (determination of the compound either on the hardened material or during the production process) of the liner, one of the following assessment procedures can be applied.

a) The assessment is done by means of carrying out the tensile strength test on five specimens of the compound according to EN 2243-4. The test specimens are defined in Clause 7 in EN 2243-4, whereas the test temperature up to 150°C as defined in Clause 7.1.1 in EN 2243-4 applies and the test specimen is prepared without foil. The procedure follows EN 2243-4 for Type A test specimen but instead of honeycomb, a layered hardened liner specimen is used. The resulting tensile strength [MPa] is defined as the maximum measured stress in the delamination test, when specimens separate between the sheet layers and not along the adhesive surface.
b) Assessment according to the Annex B. The outcome of the assessment “homogeneity given” is linked with Annex B, Clause B.4, and related indications as stated in Table 3.2.2 in this EAD.

4 REFERENCE DOCUMENTS

EAD 060012-00-0802: 2018	“Kit consisting of chimney flue liner, made of glass fibres, mineral and organic substances, and ancillaries”
EN 1228:1996	“Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of initial specific ring stiffness”
EN 1393:1996	“Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes; Determination of initial longitudinal tensile properties“
EN 1443:2003	“Chimneys - General requirements”
EN 1447: 2009+A1:2010	“Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of long-term resistance to internal pressure”
EN 1457-1:2012	“Chimneys - Clay/ceramic flue liners - Part 1: Flue liners operating under dry conditions - Requirements and test methods”
EN 1457-2:2012	“Chimneys - Clay/ceramic flue liners - Part 2: Flue liners operating under wet conditions - Requirements and test methods”
EN 1856-1:2009	“Chimneys - Requirements for metal chimneys - Part 1: System chimney products”
EN 1856-2:2009	“Chimneys - Requirements for metal chimneys - Part 2: Metal flue liners and connecting flue pipes”
EN 1859:2009+A1:2013	“Chimneys - Metal chimneys - Test methods”
EN 13216-1:2004	“Chimneys - Test methods for system chimneys - Part 1: General test methods”
EN 13384-1:2015+ A1:2019	“Chimneys - Thermal and fluid dynamic calculation methods - Part 1: Chimneys serving one combustion appliance”
EN 13501-1:2018	“Fire classification of construction products and building elements - Part 1: Classification using data from fire resistance tests“
EN 14297:2004	“Chimneys - Freeze-thaw resistance test method for chimney products”
EN 14303: 2009+A1:2013	“Thermal insulation products for building equipment and industrial installations - Factory made mineral wool (MW) products – Specification”
EN 14471: 2013+A1:2015	“Chimneys - System chimneys with plastic flue liners - Requirements and test methods”
EN 15287-1:2007+ A1:2010	“Chimneys - Design, installation and commissioning of chimneys - Part 1: Chimneys for non-roomsealed heating appliances”
EN 2243-4:2005	“Aerospace series - Non-metallic materials - Structural adhesives - Test method - Part 4: Metal-honeycomb core flatwise tensile test”
EN ISO 1183-1:2019	“Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pyknometer method and titration method (ISO 1183-1:2012)”

ANNEX A – ASSESSMENT OF THE LONG-TERM RESISTANCE TO THERMAL LOAD OF THE FLUE LINER WITH CONNECTED CHIMNEY FITTINGS

This Annex describes the method of assessment of long-term resistance to thermal load by testing of properties of the flue liner with connected chimney fittings and their change after exposure to thermal load. The test execution is related to the specific composition of the flue liner covered by this EAD.

The principle of this test procedure is to assess the tensile strength at break, ring stiffness, density, geometrical stability, tightness of the flue liner with a connected chimney fitting and reaction of metal parts when coming in contact with the flue liner according to the assessment method stated below before and after exposure of the hardened flue liner to thermal load as defined in Clause A.4 in this annex.

A.1 Samples and preparation of test specimens

The test samples for assessment of the properties of the flue liner before exposure to thermal load according to Clause A.2 shall correspond to the test pieces as defined in the test method in Clause A.2 for the individual property.

Equivalent test sample from the same production shall be prepared in order to assess the properties after exposure.

As an alternative, single test pieces can be taken from different productions and shall be separated for the tests of the properties before and after exposure.

The test pieces shall be arranged in a way to ensure that all of them are subjected to the testing atmosphere.

In order to assess the compatibility with metallic parts the arrangement should include such elements in a proper way.

At least 3 test specimens shall be assessed.

A.2. Testing execution for assessment of the properties before exposure to thermal load

Assessment of tensile strength at break (alternatively tensile modulus) shall be done according to EN 1393, Method A.

Assessment of ring stiffness shall be done according to EN 1228, method A, with condition A, whereas the diameter of the tube shall be at least 150 mm and its length at least 300 mm.

Assessment of density shall be done according to EN ISO 1183-1. The density shall be checked on samples dried at a temperature of 160° C for 24 hours (for eliminating process water etc.). Either method described in EN ISO 1183-1 is applicable.

Assessment of geometrical stability shall be done by measurement of change of internal diameter and length of the flue liner.

Assessment of tightness of a test sample with a connected chimney fitting (without sealant) with the following conditions:

- testing pressure is depending on the envisaged pressure class;
- the length of the flue liner section is exceeding the dimension of the chimney fitting on both sides between 50 mm to 150 mm;
- the opening of the chimney fitting is connected to the pressure equipment.

Assessment of the reaction of metal parts when coming in contact with the flue liner: measurement of change of density.

A.3 Test equipment for exposure to thermal load

The test equipment shall simulate the assessed maximum temperature class Txxx situation for connections of flue pipes and chimney fittings. It consists of an oven chamber with ventilation and control device for keeping constant the temperature of the surrounding air in the chamber and the test gas in the flue liner. Example is given in Figure A.1.

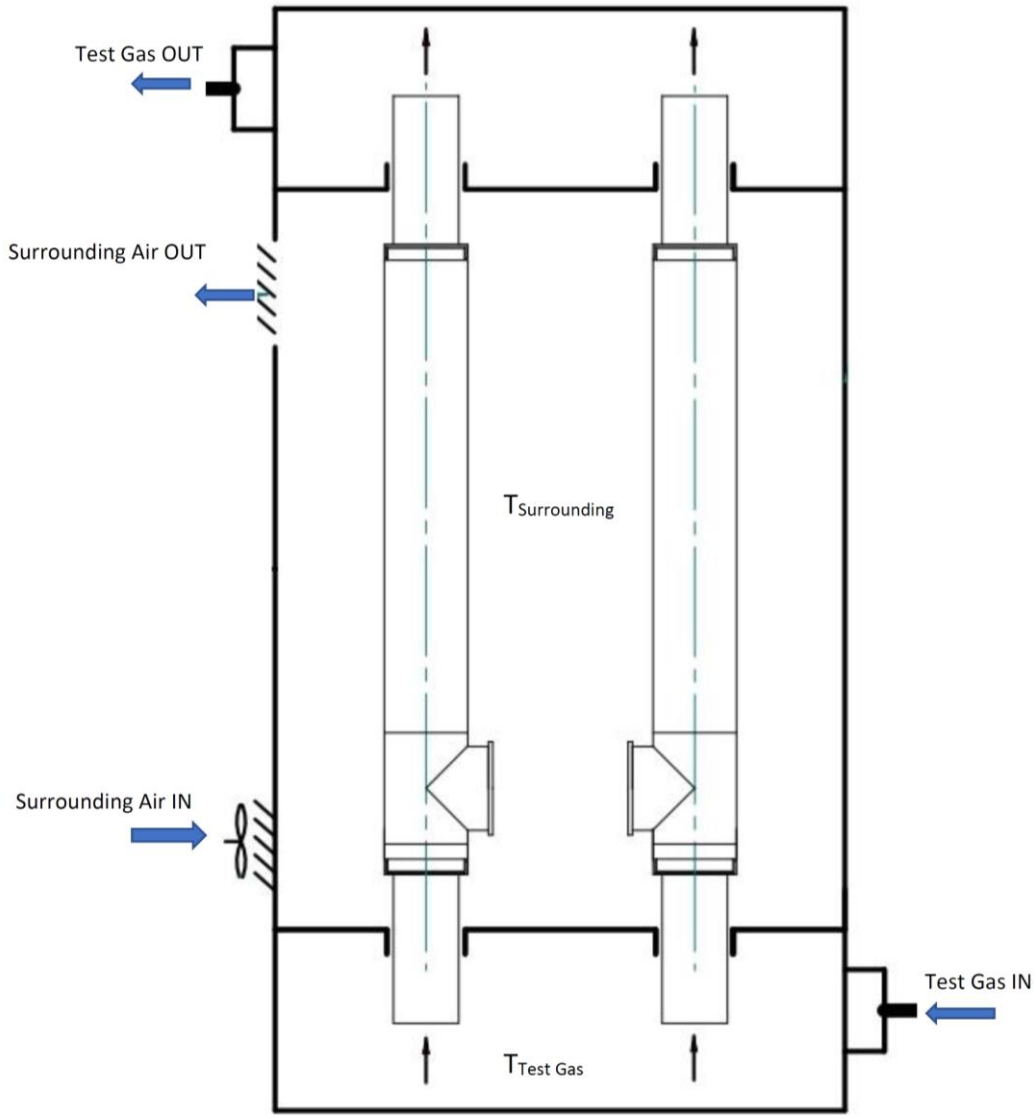

Figure A.1: Testing arrangement

The test gas consists of nitrogen, CO_2 and oxygen, whereas an oxygen content of 13% is to be achieved.

The requested temperature for the test gas and surrounding air are ensured by electrical equipment.

The temperature of the surrounding air and the test gas is kept constant with a tolerance of ± 2°C.

The exchange rate shall be maintained as to ensure constant condition of the surrounding air in the test chamber.

A.4 Execution of exposure to thermal load

For T200, the test specimens shall be exposed continuously for 70 days to 140°C surrounding air temperature and 200°C test gas temperature.

Note: Specific exposure conditions (differences in temperature, use of flue gas, temperature class) are related to the composition of the product to be tested.

A.5 Testing execution for assessment of the properties after exposure to thermal load

Assessment of impact strength (were relevant) shall be done according to ANNEX C of EN 14471.

Assessment of tensile strength (alternatively tensile modulus) at break shall be done according to EN 1393, Method A.

Assessment of ring stiffness shall be done according to EN 1228, Method A, with condition A, whereas the diameter of the tube shall be at least 150 mm.

Assessment of density shall be done according to EN ISO 1183-1.

Assessment of geometrical stability shall be done by measurement of change of internal diameter and length of the flue liner, change in dimensions of openings in case of chimney fittings (one or more).

Assessment of the tightness of a test sample with a connected chimney fitting (testing conditions see Clause A.2 in this annex).

Assessment of the reaction of metal parts when coming in contact with the flue liner.

A.6 Expression of the results in the test report

For all parameters given in Clause 2.2.9.1 in the EAD the values shall be stated and extraordinary occurrences (damages, debonding, etc.) shall be recorded.

ANNEX B – ASSESSMENT OF THE DURABILITY OF THE FLUE LINER - COMPOUND OF THE LAYER

Due to the composition of the basic composite of the flue liner by means of several layers, the assessment of sufficient compound of the layer shall be done by means of X-ray test method. The assessment is carried out on the test specimens of the flue liner with the pressure to compound the layer in order to assess that no in-homogeneity which indicates a not allowable degree of delamination is occurring.

Sequence of test:

B.1 Preparation of sheath samples in production area

4 samples of the complete sheath of the flue liner with a length of 600 mm and a diameter of d = 160 mm (width of the pressed specimen: π*d/2) have to be taken directly from the production area. The samples must be flattened manually to obtain pieces of flat sheath. The outer fabric is not to be curled or crooked.

The pressing of the samples must be performed with the rollers of the impregnation machine according to the following parameters:

- Sample 1: not pressed.
- Sample 2: pressed with pressure switch set at 2 bar equivalent to a pressing load of 6 kN
- Sample 3: pressed with pressure switch set at 3 bar equivalent to a pressing load of 9 kN
- Sample 4: pressed with pressure switch set at 4 bar equivalent to a pressing load of 12 kN

B.2 Test execution

Radiographs have to be performed on each prepared sample of the flattened sheath. Digital radiographs must be converted into a photographic format (e.g., TIF). The photographic files of the radiographs have to be analysed through a specific software for the analysis of technical photographs (e.g., “IMAGEJ”).

The photographic files of the radiographs of the specimens will have exactly the same conditions in both dimensional and pixel terms.

B.3 Test evaluation and analysis of radiographs

The photographic files of the radiographs have to be analysed by creating histogram images of the radiographs by the appropriate software (e.g., “IMAGEJ”) that give an indication of the amount of pixels in the range from white/grey to black.

To compare the results of each sample, the mean value of white/grey pixels has to be obtained.

A higher quantity of grey or bright pixels indicates a worse compound of the layers and a displacement of the resin in respect to the glass fibre. A higher quantity of black pixels indicates a compound of the layers with less displacement of the resin in respect to the glass fibre.

B.4 Development of the reference value for a correct compaction of the composite material layers

The sample with the minimum value of white/grey pixels corresponding to the greatest quantity of black pixels shows the maximum reference of the radiographs for the correct compound of the layers.

The compound of the layer is assessed by applying the appropriate pressure assuring the least amount of delamination of the layers of the flue liner.