



Quality and Testing Specifications for Production Control for Terrace Decking made from Wood-Polymer Composites (version 2011-10-01)

1 The Quality Association for Wood-based Panels¹

The „Qualitätsgemeinschaft Holzwerkstoffe e.V.“ (Quality Association for Wood-based Panels, registered association), Giessen, Germany, awards the "Quality Mark for Wood-based Panels" to products fulfilling its quality criteria. Such products are non-hazardous to health and technically safe. Thus, industry and commerce are given an instrument which they can use as a favourable argument in view of customers who are aware of health and safety hazards.

The quality criteria fixed by the Quality Association for Wood-based Panels are compulsory for its members. It is thus being assured that the products manufactured by the members of this Association are of a high quality, durable, safe, and non-hazardous to human health and the environment.

All quality requirements are confirmed by testing at independent testing laboratories. The technical prerequisites of the materials are scrutinized and documented according to clearly defined procedures, taking account of the intended use.

Only wood-based panels having passed all the tests will be awarded the Quality Mark.

2 Scope

The Quality Association awards the Quality Mark for Wood-based Panels to producers of decking profiles made from wood-polymer composites (CEN/TS 15534, Parts 1 – 3: 2006). Such manufacturers have proven to fulfil the following quality requirements:

2.1 Decking profiles made from wood-polymer composites

In order to obtain the Quality Mark, the following properties shall be documented:

- a. The natural fibres used in the products shall consist of 100 % wood fibres coming exclusively from certified sustainably managed forests. The

¹ The „Qualitätsgemeinschaft Holzwerkstoffe e.V.“ is a recognized European Third-party Control and Certification Body for „Wood-based Panels for use in Construction according to EN 13986“ in accordance with the Construction Products Law (Notified Body, Identification-Nr. 1344).

products may not contain any other natural fibres, e.g. from annual plants. It is not permitted to use recycled wood (of the categories A I – A IV according to the “Recycled Wood Ordinance”).

- b. The polymer or polymer mixture used in the product shall consist of 100 % freshly made synthetic resin, or from a pure grade of resin originating from the residues of an earlier industrial production. Direct recycling of residues from the production of wood-polymer composites is permitted.
- c. The physical characteristics described in paragraph 3 shall be considered as minimum requirements.

2.2 Certification of Raw Material Properties

The characteristics stated under (2.1 a.) and (2.1 b.) have to be proved by third-party certification (4.2), as follows:

- a. The producer uses roundwood or chips furnished by another supplier. In this context, the following proofs have to be furnished:
 - FSC- or PEFC-certificate of the supplied roundwood by the forest authority or
 - FSC- or PEFC-certification of the chips by the chip supplier.
- b. Proof has to be furnished that the thermoplast component used are free from recycled synthetic materials. For this purpose, the components used have to be declared to the third party supervision authority. Additionally, proof of the quality and quantity of materials used has to be furnished on the basis of the purchase documents.

Furthermore, the third party supervision authority shall inspect the premises of the manufacturer, in order to check out the plausibility of the submitted documentation.

3 Supervision of physical and mechanical properties

Within the scope of third party supervision by an external authority, the physical and mechanical properties listed below are evaluated for the purpose of the initial inspection:

- bending properties (3.1)
- storage in boiling water (boil test) (3.2)
- slip resistance (3.3)
- bending performance under temperature stress (3.4)
- performance under falling ball test (3.5)
- performance under cyclic climatic stress (3.6)
- linear thermal expansion coefficient (3.7)
- weathering resistance (3.8)

The supervision authority shall draw the test pieces necessary directly at the premises of the producer. For slip resistance, one test result shall be determined, for bending properties, five test results are required and for all other properties, three test results. For the 'bending performance under temperature stress (3.4)', the 'performance under cyclic climatic stress (3.5)' and the 'performance under the falling ball test (3.6)', both individual test results and mean values shall be taken into account. The results of the 'weathering resistance test (3.8)' are merely recorded.

One year after the initial inspection, the following intervals shall be observed with respect to third-party control:

Bending properties (3.1), storage in boiling water (boil test, 3.2) and the performance under the falling ball test (3.5) shall be inspected annually.

Slip resistance (3.3), bending performance under temperature stress (3.4), performance under cyclic climatic stress (3.6), linear thermal expansion coefficient (3.7) and weathering resistance shall be tested every two years.

These properties shall also be tested within the scope of the third party supervision, which shall be carried out annually. The testing authority shall draw the test pieces necessary at the premises of the producer.

Within the scope of the Factory Production Control (FPC) carried out by the producer at least the properties 3.1 (bending properties) and 3.2 (boil test) shall be evaluated. Each test shall be carried out at least once per shift ($\leq 12h$) and production line, respectively, in the case of multiple tools, per production string. The calculation of averages (mean values), for the purpose of detecting any exceeding of the threshold values, is performed on the basis of the individual values determined during one month. For the purposes of Factory Production Control, individual values as well as averages shall be taken into account.

Products composed of identical materials having identical dimensions, wall thicknesses and construction patterns may be certified together.

3.1 Bending properties

The profiles are subjected to a three-point-bending test according to EN 310. The distance of the supports shall be determined in accordance with the maximum distance of the support rails as recommended by the producer (clearance between the supporting rails). The length of the test piece shall be equal to the distance between the supports plus 100 mm. In the case of profiled products where forces may be transmitted between neighbouring profiles (e.g. tongue- and groove profiles), for the purposes of this test, three profiles may be jointed together as prescribed and submitted to the test. The load shall, however, only be applied to the central profile. The profiles shall not be fixed to the supports. The supports shall be rollers as specified by EN 310 and shall support all profiles submitted to the test.

The profiles shall be tested at least 24 h after production, respectively 2 weeks after production at the latest. During this time, the profiles shall be stored at room climate (18°-24°C/40-60 % r.h.).

During the tests, the modulus of rupture and the deflection at a load of 500 N shall be recorded.

If the profile may be used with both faces up (e.g. with different ribbing), the third party supervision authority shall determine during the initial type testing which face results in the lowest performances. This loading direction will be used for loading in all future tests for the purposes of factory production control and third-party supervision. If the performances are independent of the faces, the testing authority shall determine the reference loading direction for future testing.

Threshold values

- The average modulus of rupture may not be lower than 3400 N. Individual values may not be lower than 3200 N.
- The average deflection at a load of 500 N may not exceed 1,8 mm. Individual values may not exceed a deflection of 2,3 mm.

3.2 Storage in boiling water (boil test)

By analogy with EN 1087-1 profiles are stored in boiling water during 5 h. In opposition to EN 1087-1 the test pieces are submerged in the water after reaching the boiling point. After 5 h storage in boiling water, the test pieces are immediately submerged in cold water (18°-22°C) during 15 minutes. Afterwards, the test pieces are removed from the water, surplus water is taken off (e.g. by blowing off) and stored at room climate (18°-24°C/40-60 % r.h.). Within 120 minutes (latest) after removal from the water, the properties stated below shall be determined.

Thickness and width of the test pieces before testing are equal to the dimensions of the profile. The length of the test pieces (parallel to the direction of production) shall be 100 mm.

The profiles shall be tested at least 24 h after production, respectively 2 weeks after production at the latest. During this time, the profiles shall be stored at room climate (18°-24°C/40-60 % r.h.).

For the purposes of testing, the swelling in thickness, length and width of the test pieces shall be measured with a sliding calliper or an equivalent measuring instrument. These values are expressed as percentage of the initial dimensions of the test pieces. Additionally, the water uptake of the test pieces is determined as percentage of the initial mass of the test pieces.

The measuring points for the determination of swelling are shown in **Figure 1**. The measuring points shall be fixed centrally with respect to the axis of symmetry of the profile, independent of whether there is a rib or a hollow chamber below the measuring point.

Measurement of thickness shall be carried out on the cross section. The measuring instrument shall be applied at a distance of 5-15 mm from the end of the profile and shall be supported over a length of at least 10 mm (cf. **Figure 2**).

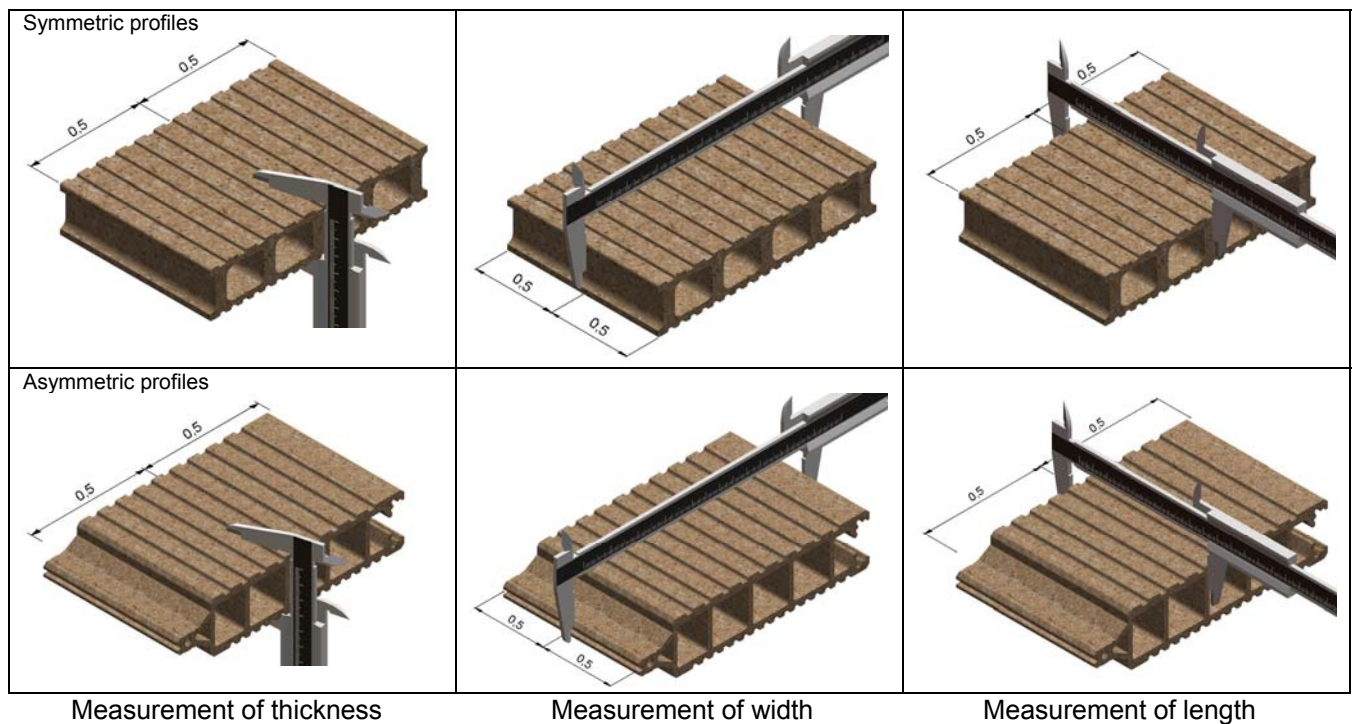


Figure 1: Measuring points for the determination of swelling characteristics.

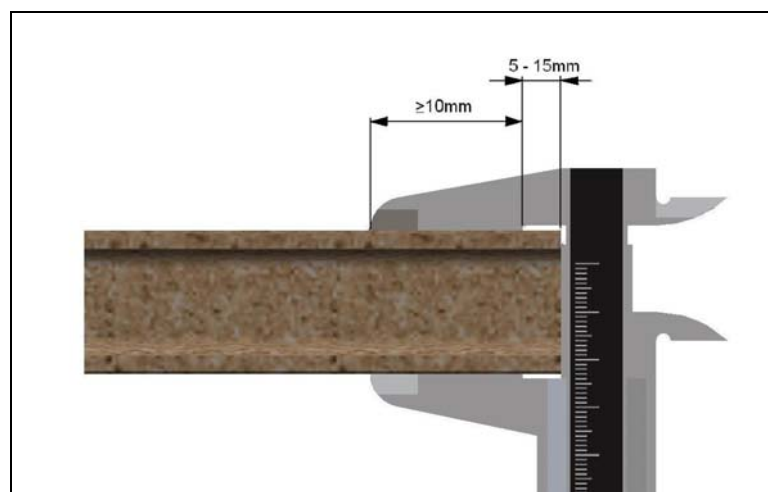


Figure 2: Detail regarding measurement of thickness

Threshold values:

- The average values of swelling may not exceed 4 % in thickness, 0,7 % in width and 0,3 % in length. Individual values may not exceed 5 % in thickness, 1,2 % in width and 0,6 % in length.
- The average value of water uptake may not exceed 7 %. Individual values may not exceed 9 %.

3.3 Slip resistance

The slip resistance of surfaces can be determined using the FLOOR SLIDE CONTROL 2000 testing apparatus.

A „synthetic sole“ shall be used as gliding block. The surfaces shall be wetted by means of a sponge soaked with tap water.

The profiles shall be tested at least 24 h after production, respectively 2 weeks after production at the latest. During this time, the profiles shall be stored at room climate (18°-24°C/40-60 % r.h.).

If the profiles have two faces between which the customer may choose (e.g. with different ribbings), both faces have to be tested. If the structure shows a clearly-defined direction, the direction with the lowest slip resistance values shall be decisive for the test results.

Threshold value:

- A minimum slip value μ of 0,43 (slip class "safe") shall be achieved.

Alternatively, slip resistance may also be determined according to DIN 51097 (wet barefoot area).

The profiles shall be tested at least 24 h after production, respectively 2 weeks after production at the latest. During this time, the profiles shall be stored at room climate (18°-24°C/40-60 % r.h.).

The test pieces shall be evenly wetted with the testing liquid as specified by the standard.

If the profiles have two faces between which the customer may choose (e.g. with different ribbings), both faces have to be tested. If the structure shows a clearly-defined direction, the direction with the lowest slip resistance values shall be decisive for the test results.

Threshold value:

- The tested profiles shall fulfill the requirements of the highest rating group “C” (average angle of inclination $\geq 20^\circ$) according to DIN 51097.

3.4 Bending performance under temperature stress

The profiles are submitted to three-point bending under permanent loading by analogy to EN ISO 899-2. The distance of the supports shall be determined in accordance with the maximum distance of the support rails as recommended by the producer (clearance between the supporting rails). The length of the test piece shall be equal to the distance between the supports plus 100 mm. In the case of profiled products where forces may be transmitted between neighbouring profiles (e.g. tongue- and groove profiles), for the purposes of this test, three profiles may be jointed together as prescribed and submitted to the test. The load shall, however, only be applied to the central profile. The profiles shall not be fixed to the supports. The supports shall be rollers as specified by EN 310.

The profiles shall be tested at least 24 h after production, respectively 2 weeks after production at the latest. During this time, the profiles shall be stored at room climate ($18^\circ\text{-}24^\circ\text{C}/40\text{-}60\%$ r.h.). The load applied shall be 85 kg (about 25 % of minimum modulus of rupture), the test duration shall be 168 h (7 days), and the test climate shall be $50^\circ\text{C}/50\%$ r.h.

The maximum deflection under load (at the end of the test) is determined and compared with the deflection at the beginning of the test (immediately after application of the load).

Only the direction (face) which has been determined during the bending tests (3.1) as being the relevant direction (face) shall be tested.

Threshold values:

- The mean difference between deflection at the beginning and at the end of the test may not exceed 10 mm.
Individual values shall not exceed 13 mm.

3.5 Performance under cyclic climatic stress

By analogy to EN 321, the profiles are exposed to a cyclic climatic stress.

Afterwards, modulus of rupture is determined according to 3.1. The size of the test pieces for cyclic testing is as described in 3.1.

The reference test pieces for testing without cyclic stress and the test pieces for cyclic testing shall be withdrawn from the production immediately after each other.

Only the direction (face) which has been determined during the bending tests (3.1) as being the relevant direction (face) shall be tested.

The first cycle of climatic stress shall be carried out as follows:

- 28 days storage in cold water;
- 24 h freezing;
- 72 h drying;

Two further storage cycles shall be carried out as specified below:

- 72 h cold water storage;
- 24 h freezing;
- 72 h drying;

The test pieces shall be taken from one place of storage to the next one without any delay.

After cyclic testing and before the bending tests, the test pieces shall be stored at room climate for 24-48 h.

The mean moduli of rupture before and after cyclic testing are compared with each other and the reduction of modulus of rupture is expressed in percent.

Threshold values:

- The mean reduction of modulus of rupture shall not exceed 20 %.
- Individual values may not deviate by more than 30 % from the initial values.

3.6 Performance under falling ball test

The profiles are submitted to a falling ball test according to EN 477. For this test, the profiles are impacted from a defined height with a striking pin with a mass of 1000 ± 5 g and a striking ball surface of $25 \pm 0,5$ mm radius. The profile to be tested shall have a length of 300 mm and shall be put onto two defined supports set at a centre distance of 200 mm (cf. EN 477). Thickness and width of the test pieces are equal to the dimensions of the profile.

The height of fall of the pin shall be of 700 ± 5 mm above the surface of the profile to be tested. Testing temperature shall be 18° - 24° C at 40-60 % relative humidity.

The profiles shall be tested at least 24 h after production, respectively 2 weeks after production at the latest. During this time, the profiles shall be stored at room climate (18° - 24° C/40-60 % r.h.).

If both faces of the profiles may be used, both shall be tested. If not, only the useable face shall be tested.

For each useable face, tests shall be carried out on the surface of 3 profiles each as well as on the longitudinal edges of 3 profiles each (i.e. 9 tests in total per useable face).

Testing of surfaces:

The impact position of the pin on the profile shall correspond to the point with the lowest breaking strength. For cavity profiles, this is normally the central point with the highest distance between ribs.

If there are any uncertainties in this context, the correct position shall be determined by preliminary testing.

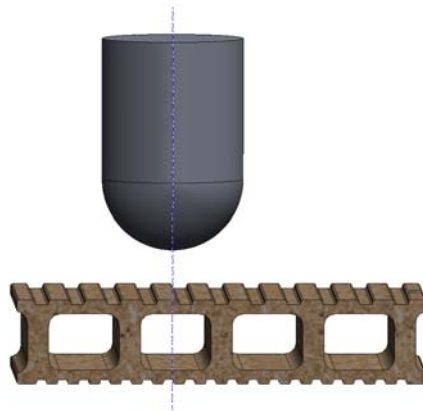


Figure 2: Example of falling ball testing on a profile surface

Testing of the longitudinal edges:

Each longitudinal edge shall be tested. The impact position shall be determined in such a way that the circumference of the pin shall be flush with the outer edge of the profile surface (useable face).

In the case of profiled products where forces may be transmitted between neighbouring profiles (e.g. tongue- and groove profiles), for the purposes of this test, two profiles shall be jointed together as prescribed and submitted to the test. The test is carried out on the joint.

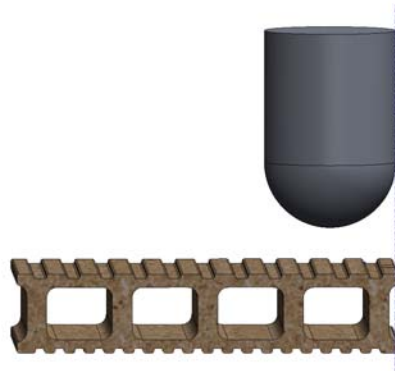


Figure 3: Example of falling ball testing on a longitudinal edge, outer surface of the pin flush with the outer edge of the profile surface

Determination of deterioration:

Measurements shall be carried out 5 ± 2 min. after impact testing.

The impact area is inspected with the aid of a magnifying glass (factor 10).

Lighting should correspond to EN 20105-A02 ('Surfaces to be compared to each other should be lighted up by daylight shining in from the North at an angle of 45° or an artificial light source with an illuminance of at least 600 lx).

The longest perceptible surface crack is measured to an accuracy of 0,5 mm (linear distance between end points of the crack). The orientation of the crack is unimportant.

The maximum depth of the residual ball impact in relation to the level of the surrounding texture which has remained intact is measured with a suitable measuring instrument (e.g. a vernier calliper) to an accuracy of 0,1 mm.

Threshold value:

Cavity profiles

- None of the test pieces shall show any surface cracks with a length exceeding 10 mm.

Solid profiles

- The maximum residual impact depth shall not exceed 0,5 mm

3.7 Linear thermal expansion coefficient

By analogy to ISO 11359-2 or DIN 53752 three profiles of 400 mm length, with the width and thickness corresponding to the dimensions of the profile, are drawn from the production. These test pieces are subsequently stored in an oven at 60 °C for at least 48 h. After storage in the oven, the dimensions of the profiles are measured with a sliding calliper; this shall be done within 15 minutes of removal of the test pieces from the oven. The dimensions are determined again after the test pieces have been stored at –20 °C for at least 48 h.

The linear thermal expansion coefficient is determined from the difference of the respective dimensions and the difference between storage temperatures according to the following equation:

$$\text{Alpha} = \text{Delta L} / (\text{Delta T} \times \text{initial length}) \text{ [K}^{-1}\text{]}$$

The profiles shall be tested at least 24 h after production, respectively 2 weeks after production at the latest. During this time, the profiles shall be stored at room climate (18°-24°C/40-60 % r.h.).

Threshold values:

- The maximum linear thermal expansion coefficient shall not exceed a value of $5 \times 10^{-5} \text{ [K}^{-1}\text{]}$

3.8 Weathering resistance

According to EN ISO 4892-2 the profiles are exposed to artificial weathering in a Xenon testing apparatus. The testing cycle shall correspond to method A, testing cycle 1 (not protected by glass, 102 min. radiation, 18 min. spraying).

One test each shall be carried out per useable face and colour.

Total weathering time in the testing apparatus shall be 300 h.

The test pieces shall be removed from the apparatus during a drying cycle.

The determination of brightness and hue is carried out with colorimeters using the gray scale and halftones (EN 20105-A2). The colour differences ΔE , ΔL , Δa and Δb are determined according to ISO 7724 Part 1-3 as the difference between the measurements taken prior to and after 300 h of artificial weathering.

When using colorimeters for colorimetry, the following points should be taken into account: The measuring geometry of the colorimeter used should be of 45°/0° or of 8°/d, including a gloss trap. The measuring orifice shall have a diameter of at

least 6 mm. Five measuring points shall be distributed evenly over the surface exposed to weathering, and the average shall be calculated from the measurements taken.

The measuring geometry and the measuring orifice of the colorimeter used shall be recorded.

Threshold value:

For the time being, the database is inadequate for the fixing of threshold values. The colorimetry measurements (ΔE , ΔL , Δa und Δb) and the measurement of the gray scale shall therefore only be recorded.

4 Third-party supervision

4.1 Initial inspection / FPC

Each factory applying to the Quality Association for the Quality Mark is subject to an initial inspection. During the initial inspection, the Quality Association for Wood-based Panels will check out the personal and technical circumstances of the applicant. The manufacturer must be able to produce wood-polymer decking profiles according to the present Quality and Testing Requirements of the Quality Association for Wood-based Panels. Furthermore, the applicant must prove that he is able to carry out the required Factory Production Control (FPC).

4.2 Third-party supervision

Regular third-party supervision by the quality association is carried out once per year. For all products bearing the quality mark, sampling of test pieces and an inspection of the production premises is carried out annually respectively, every two years (as defined in Clause 3) for the purpose of an independent (neutral) evaluation of the wood-polymer products.

Supervision is carried out by the Quality Association. The Association may entrust suitable neutral experts or testing authorities with the supervision. Strict confidentiality of the information gathered shall be ensured by the Quality Association.

The costs shall be borne by the user of the Quality Mark.

4.3 Repeated inspection

Should the supervisor detect any shortcomings regarding the quality control carried out by the user of the Quality Mark during his inspection visit, the Quality Committee of the Quality Association may order a repeated inspection. The scope, contents and date of the repeated inspection shall be determined by the Quality Committee.

If the manufacturer fails to pass the repeated inspection, it shall be considered that he no longer fulfills the quality requirements. The Quality Committee shall then schedule the further proceedings for the withdrawal of the Quality Mark.

The costs of the repeated inspection shall be borne by the user of the Quality Mark.

5 Marking

5.1 Obligation of Marking

Technical Data Sheets shall be provided for each decking profile made from wood polymer composites subject to these quality requirements and for which the manufacturer has been awarded the Quality Mark. Such technical data sheets shall contain the following, unmistakable information:

Producer, "Product name (brand)", registration number, type of synthetic polymer used, wood fibre content

Example: Hansen, "Novo-Deck", PP-WF 60

5.2 Quality Mark

Decking profiles made from wood polymer composites which have proven to fulfil the requirements set out in paragraphs 2 and 3 may be marked with the Quality Mark represented hereinafter, if the producer has been awarded the Mark by the Quality Association on the basis of a valid licence agreement.

Sample:



Wood-polymer composite made from:

- **Wood** from sustainably managed forests
- **Industrial polymer** (pure grades)

The proportions as well as the defined colours of the logo as well as of the wording shall remain unchanged. Further information is given in the licence agreement.



6 Amendments

Amendments of these Quality and Testing Specifications shall receive written approval by at least $\frac{3}{4}$ of the members of the Quality Association. The Managing Board of the Association will fix an adequate deadline for the implementation of such amendments after the members of the Association have been notified thereof.