



Quality and Testing Specifications for the Production Control of Fencing Profiles made from Wood-Polymer Composites

(Version 2016-01-01)

1 The Quality Association for Wood-based Products¹

The „Qualitätsgemeinschaft Holzwerkstoffe e. V.“ (Quality Association for Wood-based Products, registered association), Giessen, Germany, awards the "Quality Mark for Wood-based Products" to products fulfilling its quality criteria. Such products are non-hazardous to health and technically safe. Thus, industry and commerce come by 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 Products 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 Products“ to producers of fencing profiles made from wood-polymer composites (EN 15534-1 and EN 15534-6). These manufacturers have proven to fulfil the following quality requirements:

2.1 **Fencing profiles made from wood-polymer composites**

In order to obtain the Quality Mark for Wood-based Products, the following properties shall be documented:

¹ The „Qualitätsgemeinschaft Holzwerkstoffe e.V.“ carries out third-party supervision of high-quality wood-based products. It carries out selected tests and supervision on behalf of the testing laboratory EPH, which is accredited and notified according to the European Construction Products Regulation (Notified Body, N^o 0766).

- a. The content of wood of the product shall be at least 50 % by weight (dry) and shall originate exclusively from certified sustainably managed forests. Untreated recycled wood (of the category A I according to the “Recycled Wood Ordinance”) may be used, recycled wood of the categories A II to A IV is not permitted. Other natural fibres may be constituent parts of the products.
- 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. Pure grades of recycled polymers of the same polymer type, which are free of impurities, may also be added. Direct recycling of residues from the production of wood-polymer composites is permitted.
- c. WPC materials are recyclable materials which can be recovered by a recovery procedure in order to economize raw materials and to minimize emissions of dangerous substances. It is therefore additionally permitted to use recovered mill material from the manufacturers own profile systems which have been taken back from the market (cut-offs or dismantled WPC materials).
- d. The physical characteristics described in paragraph 3 shall be considered as minimum requirements.

2.2 Verification of Raw Material Properties

The characteristics stated under (2.1 a.) and (2.1 b.) have to be proved by external supervision (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.
 - Where non-ligneous natural fibres are used (e.g. rice husks, cereal hulls), proof has to be furnished of a controlled cultivation which conserves the natural resources.
- b. Proof has to be furnished that the thermoplastic components used contain only “permitted materials” according to 2.1. For this purpose, the recipe 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**:

- Immersion in boiling water (boil test) (3.1.)
- linear thermal expansion coefficient (3.2.)
- weathering resistance (3.3.)
- dimensional accuracy (3.4.)

The supervision authority shall draw the necessary test pieces directly at the premises of the producer. For all four properties, three test results are required. Individual test results are compared to the threshold values given. Additionally, the arithmetic mean of the quoted test results is determined and compared to the threshold values of the mean value in question.

The profiles shall have issued from the production line at least 24 h, maximum 4 weeks prior to testing. During this period, the profiles shall be stored at room climate (18° - 24° C/40 - 60 % relative humidity).

The tests shall be repeated two years after the initial inspection.

The testing authority shall draw the test pieces necessary at the premises of the producer once again.

A complete set of tests shall be carried out if the material composition changes significantly, i.e.:

- Change of the content of wood by more than 5 %
- Change/replacement of the natural (non-ligneous) fibres by more than 5 %
- Change of the polymer type used.

In this case, the user of the quality mark shall submit an updated data sheet to the Quality Association.

The **Factory Production Control (FPC)** carried out by the producer shall cover at least the boil test (3.1) and dimensional accuracy (3.4). Samples for each test shall be withdrawn at least once per shift (≤ 12 h) and production line, respectively, in the case of multiple tools, per production string. The individual test results are compared to the threshold values quoted.

The profiles shall have issued from the production line at least 24 h, maximum 2 weeks prior to testing. During this period, the profiles shall be stored at room climate ($18^{\circ} - 24^{\circ} \text{C}/40 - 60$ % relative humidity).

Deviations of the test results found will require an immediate validation test on the lot inspected. If the deviation is still more than 30 % of the threshold value, the lot shall be barred from being sold with the quality mark or be destroyed. For lower deviations, a special release may be carried out by an authorized person (in analogy to EN 9001). This may, however, lead to extra validation tests carried out during third-party supervision (cf. 4.3).

3.1. Immersion in boiling water (boil test)

By analogy with EN 1087-1 profiles are stored in boiling water during 5 h. In deviation from EN 1087-1 the test pieces are submerged after the water has reached the boiling point. After 5 h immersion in boiling water, the test pieces are immediately submerged in cold water ($18^{\circ} - 22^{\circ} \text{C}$) 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 ($18^{\circ} - 24^{\circ} \text{C}/40 - 60$ % 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.

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 cavity 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. The measuring instrument shall

be selected in such a way that swelling of the edges is not taken into account. (cf. Figure 2).

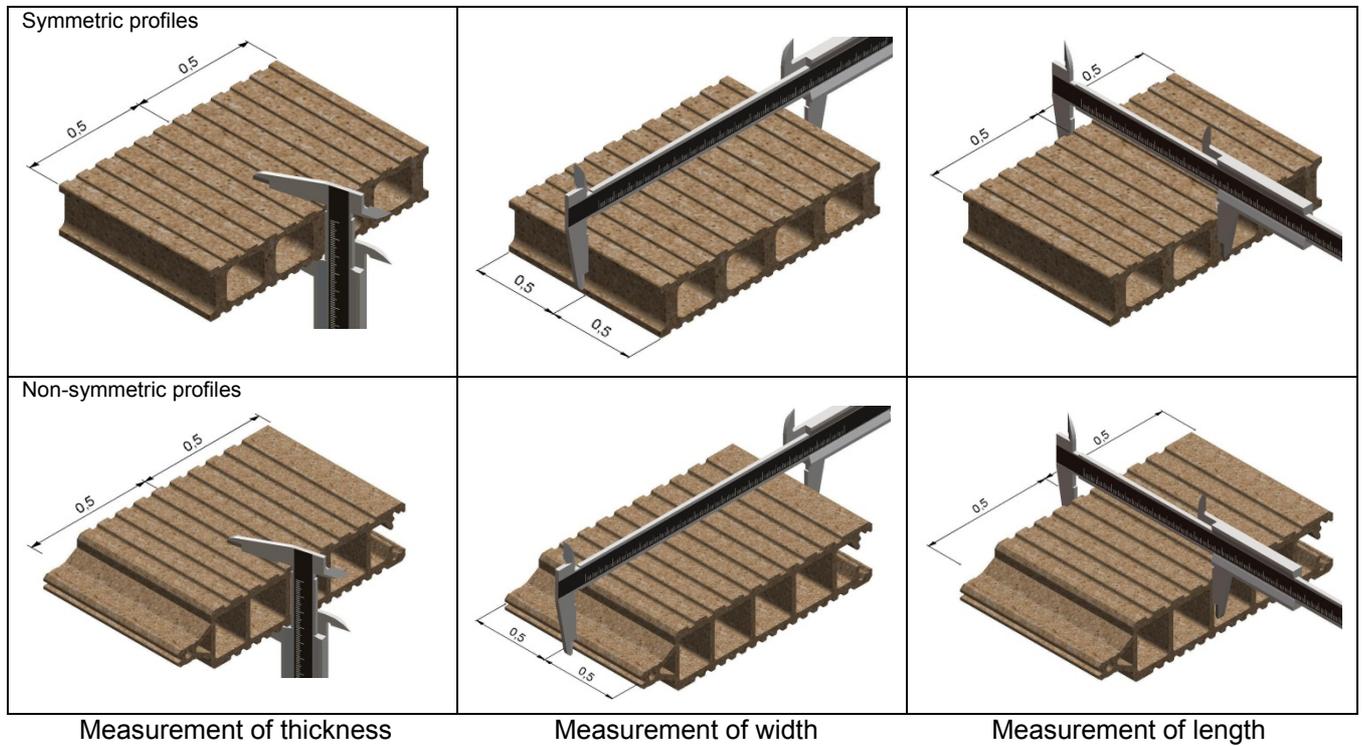


Figure 1: Measuring points for determination of swelling properties

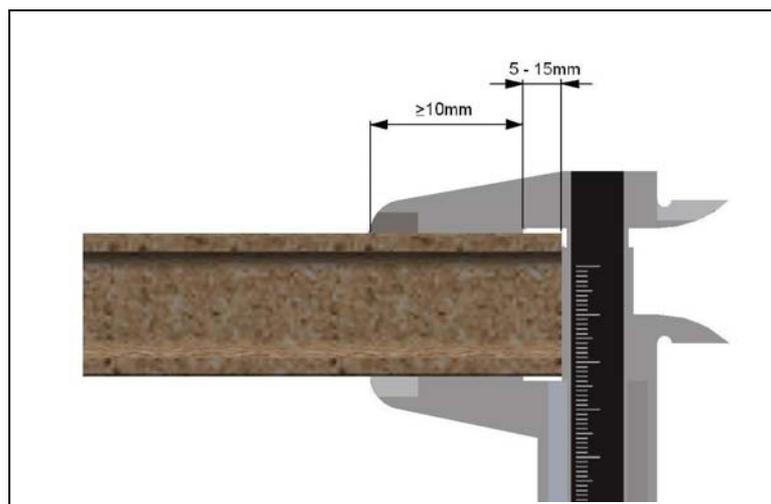


Figure 2: Detail of thickness measurement

Threshold values:

- The average values of swelling may not exceed 4,5 % in thickness, 0,8 % in width and 0,5 % in length.
- The average value of water uptake may not exceed 7 %, individual values may not exceed 8 %.

3.2. Linear thermal expansion coefficient

By analogy to ISO 11359-2 or DIN 53752 three profiles of 400 mm length are drawn from the production. These test pieces are subsequently stored in an oven at 80° C for at least 48 h. After storage in the oven, the length of the profiles is 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 length expansion coefficient is determined from the difference of the respective length of the profile and the difference between storage temperatures according to the following equation:

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

Threshold value:

- The maximum linear thermal length expansion coefficient shall not exceed a value of $4,5 \times 10^{-5} [\text{K}^{-1}]$

3.3. Weathering resistance

According to EN ISO 4892-2 the profiles are exposed to artificial weathering in a Xenon arc 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 service face and colour.

Total weathering time in the testing apparatus shall be 1000 h.

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

The determination of brightness and hue is carried out with colorimeters. 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 1000 h of artificial weathering.

When using colorimeters for colorimetry, the following points shall be taken into account: The measuring geometry of the colorimeter used should be of $45^{\circ}/0^{\circ}$ or of $8^{\circ}/d$, including a gloss trap. The measuring orifice shall have a diameter of at least 6 mm. Five measuring points shall be evenly distributed 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:

- The total deviation ΔE may not exceed a value of 10.

3.4. Dimensional accuracy

Measurements regarding longitudinal dimensions, profile width and thickness, deviation from straightness and warp are taken on the test pieces according to EN 15534-1.

Threshold value:

- The tolerances specified by the manufacturer shall be adhered to.

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 Products will check out the personal and technical circumstances of the applicant. The manufacturer must be able to produce wood-polymer fencing profiles according to the present Quality and Testing Requirements of the Quality Association for Wood-based Products. 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 every two years at the production site(s) of the user of the quality mark. For all products bearing the quality mark, sampling of test pieces and an inspection of the production premises is carried out every two years for the purpose of an independent (neutral) evaluation of the wood-polymer products.



Third-party supervision will also include an inspection of the complete execution of the manufacturer's factory production control and compliance with the threshold values. Upon request, all measured values, test results and proofs shall be made available to the Quality Association.

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 any shortcomings according to the following list be detected by the third-party supervision authority during third-party supervision regarding the quality assurance of the user of the quality mark and/or the results of the third-party supervision, the user of the quality mark shall apply for a repeated inspection within the period fixed in the list.

If the manufacturer fails to pass the repeated inspection, it shall be considered that he no longer fulfils the quality requirements. This will normally result in the revocation of the quality mark. For justified exceptions, the Quality Supervision Committee may suspend the revocation for ½ year.

Possible shortcomings of the factory production control or detected by the third-party supervision:

- a. The procedures applied and testing apparatus used are not suitable for carrying out an adequate factory production control. In this case, the proof of suitability shall be submitted within eight weeks.
- b. One or several results of the immersion in boiling water test do not comply with the requirements of the quality mark. Exception: The user of the quality mark is able to prove that the products deviating from the quality mark were not sold in the market. In this case, proof of compliance shall be furnished latest after three months.
- c. In case of a deviation of the measuring results achieved during third-party supervision, the repeated inspection including a new withdrawal of test specimens shall be carried out by the third-party control authority within a period of eight weeks.

The costs of the repeated inspection shall be borne by the user of the quality mark.



In case of revocation of the quality mark, all references to the mark, which is no longer valid, shall be removed from the electronic publications of the producer within a period of four weeks. For printed media, a period of six months applies.

5 **Marking**

5.1. **Obligation of Marking**

For the end users, Technical Data Sheets shall be provided for each product made from wood-polymer composites subject to the relevant version of these quality requirements for fencing profiles and for which certificates have been issued. Such technical data sheets shall contain the following, unmistakable information:

Producer, Product name (brand), registration number, type of synthetic polymer used, type and content of cellulose-based materials used according to EN 15534-6, table 12, profile thickness and width.

Example: Hansen, Novofence, QG/2016/ZP054, PP, W60/R10, 20 x 60 mm

The products shall also be marked with this description.

5.2. **Quality Mark**

Fences made from wood polymer composites which have proven to fulfil the requirements set out above 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.

Pattern I: WPC-products using 100 % wood fibres



Wood-polymer fencing profile from certified production

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



Pattern II: WPC-products using wood and other natural fibres (e.g. rice husks)



Wood-polymer fencing profile from certified production

- **Wood** from sustainably managed forests
- **Rice husks** from controlled cultivation
- **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.

For products having identical material compositions, dimensions, wall thicknesses and structures, a common certificate may be issued.

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.