QB60 Technical Document: UNPLASTICISED VINYL-BASED EXTRUDED PRODUCTS FOR OUTDOOR USE

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1 REQUIREMENTS CONCERNING PRODUCTS

1.1 Reference standards

The reference standards applicable to this document are defined in the QB60 Reference System, §2.2.

1.2 Specifications

The specifications for the vinyl compounds and profiles and the reference test methods for the QB mark are defined in the tables below. They are based on the above standards including any additions or amendments.

1.2.1 Compound identification characteristics

The durability requirements for compounds are specified in § 1.2.3

a) Reprocessed or recycled materials

There are no identification requirements for mono- and co-extruded materials used for internal or non-visible external layers, but the characteristics of the profile produced with this material must comply with the requirements of § 1.2.2 below.

b) Expanded PVC compounds

The formulation of the basic compound is filed with LNE at the time of the certification application.

c) Films, primer and adhesive for film coating

The film coating film must comply with the requirements below.

Characteristics and test methods	**Specifications**
Reaction of the film to radiation (Visible, UV and IR) before ageing	Producer's declared value
Reaction of the film on supports of different colours with regards to radiation in new condition Visible, UV and IR radiation	Producer's declared value
Characterisation of the IRTF micro film (optional test) before ageing	Producer's declared value
Ageing tests per colour of coated film before ageing	Delta E ≤ 5 Delta b ≤ 3 Grey scale ≥ 3

The references of the adhesive and primer are filed with LNE at the time of the certification application.

d) Paints for painting

The commercial reference of the paint and its manufacturer is filed with LNE at the time of the certification application. In addition, a technical data sheet that contains the identification characteristics of the paint must be forwarded to LNE (in particular the reference of the base, its hardener (if any) and its colour must be clearly identified).

e) PVC-U compounds for non-decorated, film-coated, painted, thermal bridge break and swimming pool cover applications.

Characteristics and test methods	Non-decorated PVC-U	Film-coated / painted	RPT	Swimming pool cover	Specifications
Density at 23°C (kg/m3) NF EN ISO 1183-1 standard	X	X	X	X	Producer's declared value ± 20
Ash content (%) (1) (3) NF EN ISO 3451-5 standard method A – appendix A (950°C) + § 1.3.	X		X	X	Producer's declared value ± 10%
Thermal stability time (DHC) (min) (3)+ § 1.3.	X		X	X	Value declared by the producer± 15 % with a minimum range of ± 7 min.
Vicat softening temperature (°C) NF EN ISO 306 Method B 50 and NF T 54-405	X		X	X	Reference value declared by the producer ± 2. The minimum value must be: - for opaque compounds: ≥ 75 - for translucent compounds: ≥ 69
		X			Level declared by the producer on the basis of the nominal reference value: - level 75: 75 ≤ T < 82 - level 82: 82 ≤ T Nominal reference value declared by the producer ± 2
Modulus of elasticity in flexure (MPa) NF EN ISO 178 standard	X	X	X	X	Nominal reference value declared by the producer ± 10% that must be ≥ 2300 N/mm²
Colour (3) NF EN ISO 18314-1 standard + § 1.3.	X	X(2)	X	X	- for opaque compounds: Producer's declared specifications (L* a* b*) - for light colours: where ± L*1 - a* ± 0.5 b* ± 0.8 ΔE* ≤ 1 - for non-light colours: ΔE* ≤ 3.5 - for translucent compounds: specifications being prepared
Translucidity (%) NF P 38-511 standard + § 1.3.	X			X	- for opaque compounds: not applicable - for translucent compounds: value declared by the producer
Reaction to contact with hydrogen sulphide(3)				X	No reaction observed[1]

(1) Illustrative figure for compounds of which L* ≤ 35

(2) If the final profile is film-coated or painted on its visible faces, the requirements do not apply.

(3) Not applicable to non-UV resistant virgin vinyl compounds

1.2.2 Physicochemical and mechanical properties of the profiles

The UV-exposed layer of co-extruded profiles must have a minimum thickness of 0.5 mm.

a) General properties of PVC-U profiles

The table below applies to mono-material PVC-U profiles or PVC-U profiles co-extruded with a PVC-U core.

Characteristics and test methods	Specifications	Non-decorated PVC-U	RPT	Film coated	Painted
Appearance NF T 54-405 standard	Clean, smooth surface with no scratches, pitting or bubbling and consistent in colour.	X	X		
	Clean surface without imperfections			X	X
Colour § 1.3.	Extruder's declared specifications (L* a* b*) - for opaque light colours: L*±1 – a* ± 0.5 b* ± 0.8 ΔE* ≤ 1 - for opaque non-light colours and translucent compounds: ΔE* ≤ 3.5	X	X		X For experimental purposes only
	- for uniform films, specifications (L* a* b*): - for light colours: where ± L*1 - a* ± 0.5 b* ± 0.8 ΔE* ≤ 1 - for non-light colours: ΔE* ≤ 3.5			X For experimental purposes only	
Decoration	- for films: Appearance conforming with a standard registered model			X	
Paint layer thickness: NF EN ISO 2808 standard	Thickness 35 µ +/- 10 µ dry per coat				X
Brilliance	Painter's declared value				X For experimental purposes only
Linear weight (g/m) - NF T 54-405 standard	Extruder's declared value (PM) P min= PM − 0.4PM $^{0.7}$	X			
- NF EN 13245-1 standard			X	X	X
Traction: NF EN ISO 527-1 & 2 + NF T 54-405					
Flow limit stress (MPa)	≥ 37				
Extension at point of failure (%)	≥ 100	X	X	X	X
Traction impact resistance at 23°C (kJ/m2) NF T 54-405 + NF EN ISO 8256 standards	Producer's declared value: ≥ 450 (for experimental purposes)	X		X	X
Thermal stability time (DHC) (min) [(3)]+ § 1.3.	- for stabilised compounds Ca/Zn or Sn ≥25min - for stabilised compounds Pb ≥50min	X	X		

Characteristics and test methods (cont.)	Specifications (cont.)	Non-decorated PVC-U (cont.)	RPT (cont.)	Film coated (cont.)	Painted (cont.)
Impact resistance at 23°C (J) -NF T 54-405 and/or NF EN ISO 6603-1+ § 1.3	Extruder's declared value with respect to the following levels: level 5: ≥ 5 level 10: ≥ 10 level 15: ≥ 15 - Energy at 50% of failure conforms to the level declared	X Special case: For roller blind slats: Tests carried out on both exposed sides unless the manufacturer declares that the slat is only intended to be rolled on one side			
- NF EN 13245-1 and/or NF EN ISO 6603-1+ § 1.3				X	X
Hot shrinkage at 100°C (%) NF EN 479 standard	Extruder's declared value with respect to the following levels: level 2: ≤ 2 level 3: ≤ 3	X	X	X(2)	X
Light transmission (opacity) §1.3	Ee/Eo ratio ≤ 120.10-7	X Only for roller blind slats and louver blinds and for the panels of leaf shutters		X Only for roller blind slats and louver blinds and for the panels of leaf shutters	X Only for roller blind slats and louver blinds and for the panels of leaf shutters
1.3	No reaction observed	X Only for swimming pool safety cover profiles			
Thermal resistance NF EN 13245-1 § 6.2	No defects coated: peeling/blistering/delamination painted: blistering/flaking			X	X
Resistance to peeling (N/mm) NF EN 13245-1 § 6.4(1)	≥2			X	
Cross-hatch test NF EN 13245-1 § 6.1	No defect: category 0				X
Scratch resistance NF EN ISO 1518 / XP CEN/TS 15186 standards	No defect				X

(1) Provision of specific test samples by the extruder (partial coating with about 100 mm with no film)
(2) Measurement on a profile sample with or without a film (as per the applicant's choice)
(3) Not applicable to non-UV resistant virgin vinyl compounds intended for the inner or outer layer of the profiles.

b) General properties of PVC-UE profiles

The table below applies to mono-material or bi-material PVC-UE profiles or to co-extruded PVC-U profiles with a PVC-UE core.

Characteristics and test methods	Specifications	Undecorated PVC-UE, TB, Painted	Film coated
Appearance	Clean, smooth surface without scratches or pitting	X	
	Clean surface without imperfections		X
Colour § 1.3.	Extruder's declared specifications (L* a* b*) - for light colours: L*±1 - a* ± 0.5 b* ± 0.8 $\Delta E^* \leq 1$ - for non-light colours: $\Delta E^* \leq 3.5$	X	
	- for uniform films, specifications (L* a* b*): - for light colours: L*±1 - a* ± 0.5 b* ± 0.8 $\Delta E^* \leq 1$ - for non-light colours: $\Delta E^* \leq 3.5$		X for experimental purposes
Decoration	- for films: Appearance conforming with a standard registered model		X
Linear weight (g/m) NF EN 13245-3 standard	Value declared by the extruder (P_M): $\pm$ 0.125 P_M	X	X
Traction: NF EN ISO 527-1 & 2 + NF T 54-405 Flow limit stress (MPa) Extension at point of failure (%)	 $\geq$ 37 $\geq$ 100	X	X
Traction impact resistance at 23°C (kJ/m2) NF T 54-405 + NF EN ISO 8256 standards	Producer's declared value: ≥ 450 (for experimental purposes)	X	X
Impact strength at 23°C (J) NF EN 13245-3 standard	Value declared by the extruder with respect to levels: level 5: ≥ 5 level 10: ≥ 10 level 15: ≥ 15 - Energy at 50% of failure complies with the level declared	X	X
Heat resistance at 75°C (%) NF EN 479 standard	≤ 3% no delamination	X	X(1)(2)
Light transmission (opacity) §1.3 Only for roller blind slats and louver blinds and for the panels of leaf shutters	$Ee/Eo \leq 120.10^{-7}$	X	X
Reaction to contact with hydrogen sulphide § 1.3	for pool safety covers only: No reaction observed	X	
Flexural strength (N) - *for pool cover applications of PVC-UE profiles* according to NF P 90-308 § 5.3.1.2	Value declared by the extruder: Lower acceptable limit: -10% of the nominal value	X	
Water absorption NF P 90-308 (§ 5.3.3.3)	for pool safety covers only: ≤ WA declared by the manufacturer	X	
Resistance to peeling (N/mm) NF EN 13245-1 § 6.4	$\geq$ 2		X(2)

(1) Measurement on a profile sample with or without a film (as per the applicant's choice)
(2) Provision of specific test samples by the extruder (partial coating with about 100 mm with no film)

1.2.3 Durability

a) Durability properties of compounds and profiles

The table below does not apply to non-UV resistant virgin vinyl compounds intended for the inner layers of the profiles.

Characteristics and test methods	Specifications
Natural ageing: NF T 54-405 over 1 and 2 years	
Surface condition after natural ageing over 1 and 2 years	no noticeable defect
Changes in the shade after 1 year of ageing:	
. Delorme rating according to NF T54-405	Rating ≥ 8
. inspection based on a grey scale(1) in accordance with NF EN ISO 20105-A02	≥ 4
. colorimetry(1) following ISO 18314-1 + § 1.3.	ΔE* ≤ 4 (compared with the representative sample) Δb* ≤ 2 (compared with the representative sample)
. brightness(2)	Value declared by the painter. Lower acceptable limit: -50% of nominal value
Changes in shade after 2 years of ageing:	
. Delorme rating according to NF T 54-405	Rating ≥ 7 for PVC-U Rating ≥ 8 for painted and coated products
- inspection based on a grey scale(1) in accordance with NF EN 20105-A02	≥ 3
. colorimetry(1) following ISO 18314-1 + § 1.3.	ΔE* ≤ 4 (compared with the representative sample) Δb* ≤ 3 (compared with the representative sample)
. brightness(2)	Value declared by the painter. Lower acceptable limit: -50% of nominal value
Impact-tensile strength after 2 years of ageing (kJ/m2) following NF EN ISO 8256 *only for PVC-U compounds and profiles*	≥ 250 with no individual value < 120
Flexural strength (MPa) after 2 years of ageing *only for pool cover applications of PVC-UE profiles* according to NF P 90-308 § 5.3.1.2	Value declared by the extruder: Lower acceptable limit: -10% of the nominal value
Resistance to peeling (N/mm) according to EN13245-1 and 3 Appendix C after 2 years *only for coated profiles*	≥ 2
Cross-hatch test NF EN ISO 2409 after 2 years *only for painted profiles*	No defect: category 0
Accelerated ageing: according to NF EN 513 after 4000 h + § 1.3.3	
Condition of surface after ageing	no noticeable defect
Change in colorimetric properties (determined 24 h after the end of the test)	ΔE* ≤ 5 (compared with the representative sample) Δb* ≤ 3 (compared with the representative sample) for experimental painted and coated products: ΔE* ≤ 4 (compared with the representative sample) Δb* ≤ 2 (compared with the representative sample)
Impact-tensile strength (kJ/m2) according to NF T 54-405 + NF EN ISO 8256 *only for PVC-U compounds and profiles*	≥ 250 with: - no fragile test pieces - no individual value < 120 after elimination of outliers
Flexural strength (MPa) - *only for pool cover applications of PVC-UE profiles* according to NF P 90-308 § 5.3.1.2	Value declared by the extruder: Lower acceptable limit: -10% of the nominal value

Characteristics and test methods (cont.)	Specifications (cont.)
Accelerated ageing: according to NF EN 16472 over 1500 h + § 1.3.3 **- Condition of the surface after ageing**	no noticeable defect
- Changes to the colour: Every 500 h (determined 24 h after each sampling) and after 1500 h For light PVC-U colours: colorimetry following ISO 18314-1 + § 1.3. For non-light PVC-U colours: Delorme rating according to NF T 54-405 For painted and coated products (all shades), determined 24 h after the end of the test, colorimetry following ISO 18314-1 + § 1.3. measured at the same locations on the samples.	$\Delta E^* \leq 5$ (compared with the representative sample) $\Delta b^* \leq 3$ (compared with the representative sample) Rating≥ 7 $\Delta E^* \leq 3$ (compared with the representative sample)
- Impact-tensile strength (kJ/m2) according to NF T 54-405 + NF EN ISO 8256 *only for PVC-U compounds and profiles*	≥ 250 with: - no fragile test pieces - no individual value < 120 after elimination of outliers
Flexural strength (MPa) - *only for pool cover applications of PVC-UE profiles* according to NF P 90-308 § 5.3.1.2	Value declared by the extruder: Lower acceptable limit: -10% of the nominal value

(1) For painted and coated profiles, as a guide only
(2) For painted profiles, as a guide only

b) Durability properties of films for coating

Characteristics and test methods	Specifications
Reaction of the film to radiation (Visible, UV and IR) ageing according to NF EN ISO 4892-1 and 2 method A cycle 1 - over 2000 h and 4000 h	Producer's declared value
Micro-FTIR characterisation of the film (optional test)ageing according to standard NF EN ISO 4892-1 and 2 method A cycle 1 - over 4000 h	Producer's declared value

1.3 Additional test methods

1.3.1 Ash content

The test is carried out according to NF EN ISO 3451-5 (method A) with the following additional requirements:

- quantity of sample: 5 ± 0.5 g.
- operating procedure: the procedure is that of method A of NF EN ISO 3451-5-appendix A, the calcination temperature being 950 ± 50°C.

The method, in a calcination furnace, is the reference method. The use of a microwave oven is allowed; in this case, a correlation for the duration, at a defined temperature, must be established and communicated to LNE.

1.3.2 Colour checking (colorimetry)

The test is carried out according to standard ISO 18314-1 with the following additional requirements:

- colour space L* a* b* defined in EN ISO 11664-4
- standard illuminant D65, defined in EN ISO 11664-2. The measurement includes specular reflection and geometry di:8° (without light trap).
- using a visual field with an angular subtense of 2° (or 10° accepted with correlation), defined in EN ISO 11664-1;

Measure the colour differences on the sample to be tested (ΔL* Δa*Δb*) and on each side in the case of a sample with a symmetrical geometry.

Reference representative samples are kept at LNE.

LNE may need to determine "deduced LNE specifications". These are carried out on the basis of the specifications declared in the certification file, with a sample being sent by the holder for whom a colorimetric measurement of an identified area has been made, and the measurement of this same area by LNE.

In the case of translucent compounds, the verification is carried out under the following conditions:

The test is carried out on a pressed plate with a thickness of 1 mm ± 0.1 mm of surface area to sufficiently avoid light interference during the measurement (measurement zone with a diameter at least equal to three times the diameter examined by the spectrocolorimeter) .

The sample is placed on a reference and inert white plate reserved for measurements of this type of material (e.g., a ceramic calibration plate).

The measurement is carried out according to conditions identical to those of the opaque compounds: measurement of the colour differences on the sample to be tested (ΔL* Δa*Δb*ΔE).

1.3.3 Accelerated ageing

- Specimens:

Samples subjected to exposure are cut from the profiles, which must have a shape and dimension that enables the collection of impact-tensile test pieces (12 test pieces). The profile should not have a partition; otherwise, the spacing between partitions must be ≥ 25 mm:

  - Usable length by type of profile compound: 3 x 1 metre
  - Width of the profile or assembled sections: 150 mm maximum
  - Thickness of the profile: 10 mm maximum
- Tests carried out in accordance with NF EN 513: method 1 in accordance with table 1 of §9, observing the following specifications:
  - Duration of exposure: 4000 hours.

- Tests performed according to standard NF EN 16472:
  - Duration of exposure: 1500 hours.
  - Temperature of black sample: 50°C
  - Length of time protected against UV during immersion of samples: 1/3 of the cycle
  - Rotation of the sample carrier: 6 per day

1.3.4 Impact

A) Method NF EN ISO 6603-1

a) Calculation of distance between centres

- the centre-to-centre spacing of the test piece material is determined for each profile as a function of the arrow under static load under the following conditions:

Specimens/ length: 950 mm ± 10 mm.

Store three test pieces at 23°C ± 2°C for 12 h.

Equipment

- a flat surface for laying out the materials
- two parallel materials of 20 mm width, the upper end being half-cylindrical and of height greater than 200 mm
- a comparator with a precision of 1/10 mm

Operating procedure

- test temperature: 23°C ± 2°C
- centre-to-centre spacing of the materials: 800 mm
- place the test piece perpendicular to the position of the materials so that the inner side of the profile rests on the supports
- preload the profile in the middle of the supports with a mass of 100 g and adjust the comparator to 0
- add a mass of 1000 g in the middle of the supports. Allow to stabilise about 1 minute and measure arrow F_{1000}
- perform the same test on the other two test pieces

Note: the shape of the profiles may require machining in order to fit the supports or special supports may need to be used so that the profiles rest linearly on the supports.

Reporting of results

The F value of the profile arrow is the arithmetic mean of the three measured values.

Depending on this value of the arrow, the centre-to-centre spacing of the test piece material for the impact test is set according to the table below.

Arrow F (mm)	Centre-to-centre distance (mm)
$F < 10$	200
$10 \leq F < 20$	175
$20 \leq F < 40$	150
$40 \leq F < 80$	125
$80 \leq F$	100

b) Impact test

The test is carried out with a 1 or 2 kg striker.

Use the material described in standard NF T 54-405 (the supports have a radius of 5 mm) by using the centre-to-centre distance calculated above and calculate the impact energy by the so-called staircase method described in standard NF EN ISO 6603-1.

B) Constant energy level method described in NF T 54-405

The test carried out according to method NF T 54-405 and the test equipment is described in NF EN 477. The supports have a radius of 5 mm.

In the case of the method that follows standard NF T 54 405, the number of failures must not be greater than 1 in 10 for the declared energy level.

1.3.5 Light transmittance (opacity of the non-machined profile):

Diagram of the equipment used (figure below).

It consists of a parallelepiped chamber to test the specimen strips.. There should be no parasitic light transmittance between the slats and the periphery of the sample.

One end of the chamber consists of a polished aluminium plate with a 100 W bulb or a low-energy bulb in the centre.

Ground glass is positioned between the bulb and the slats to be tested.

A photoelectric cell placed on the opposite side to the light is wired to a current to voltage amplifier for measuring illuminance (detectable minimum of 10^{-3} lux with a resolution of 10^{-4} lux).

Operating procedure:

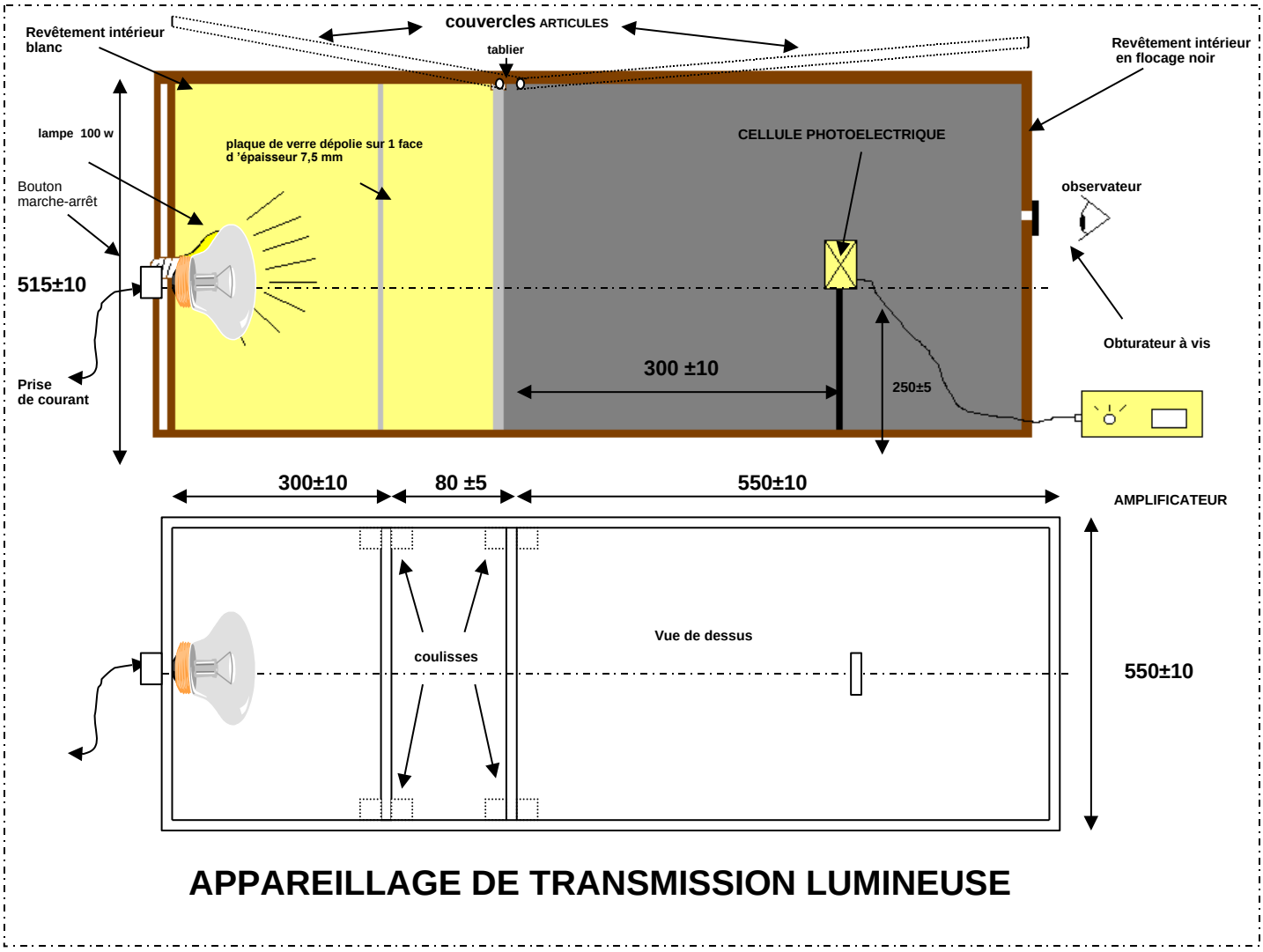
Before any operation, connect the lamp (off position) and cover the cell.

Check the illuminance of the vacuum tube lamp, the display should be 1000 ± 50 lux (Eo). (1)

Form a panel made up of 10 slats of approximately 500x500 mm and place it on the runners provided for this purpose (horizontal positioning for rolling shutters and vertical for louvered shutters). Ensure there is a good seal.

Measure the illuminance through the panel (Ee). (Wait 2 minutes for stabilisation before reading the result)

Calculate the Ee/Eo ratio.



APPAREILLAGE DE TRANSMISSION LUMINEUSE

As an exception, it is accepted that holders who do not have the appropriate equipment available may establish an internal method for verifying light transmittance that can be examined and validated during admission and follow-up audits. E.g.: visual or measurable direct method or correlated indirect method. The required verification frequency (see 2.3.2.6) remains applicable.

1.3.6 Reaction to contact with hydrogen sulphide

(Method only applicable for white or light colours).

Equipment:

- Glass stirrer
- Pipette
- Test tube 16/160
- Test tube holder
- Protective goggles
- Protective gloves
- Fume hood

Chemicals/Reagents:

- Sodium sulphide hydrate (flakes) 250 g
- Hydrochloric acid 25%
- Distilled water

Preparation of solutions

Handling and preparation of solutions is to be carried out under a fume hood while wearing personal protective equipment.

a) Solution 1:

Place 10 ± 1 ml of distilled water in a test tube and then add 1 to 2 ml of hydrochloric acid. Agitate with a glass stirrer.

Note: the order indicated (first water and then hydrochloric acid) must be adhered to; otherwise, there is a risk the acid could splatter!

b) Solution 2:

Put 2 to 3 flakes of sodium sulphide into a test tube and fill half of the test tube with distilled water (about 10 ml). Sodium sulphide should dissolve in the water (agitate lightly if necessary).

This solution should be prepared just before use.

Test procedure

The test must be carried out at a temperature of 20°C ± 5°C under a fume hood.

a) Sand the surface of the profile with sandpaper (particle size 240 μm)

b) Add 1 to 2 ml of solution 1 (hydrochloric acid solution) to solution 2 (sodium sulphide solution) using the pipette and mix with a glass stirrer.

c) Pipette 1 to 2 drops of this solution onto the sanded surface of the profile and spread lightly (with a glass stirrer or with a cotton swab, for example).

Results

No reaction should occur: there should be no discoloration of the surface of the profile after 2 minutes.

1.3.7 Thermal Stability (DHC)

Stabilised Ca/Zn compounds

The Ph-metry method according to standard NF EN ISO 182-2 at 200°C should be used. The reusable type method must be used for test cells.

Cutting of samples via the punching method is recommended.

It is acceptable to carry out the test at 190°C. Target values must then be reported to the standard's laboratory.

Tin-stabilised compounds

The referencing methods are based on conductimetry or potentiometry, in accordance with NF EN ISO 182-3 and NF EN ISO 182-4.

1.3.8 Translucency

The test is carried out according to standard NF P 38-511 with the following specifications:

- Tests on a pressed plate with a thickness of 1 mm ± 0.1 mm

1.3.9 Heat shrinkage

The test is carried out according to standard NF EN 479 with the following specifications:

- Tests on both sides of each specimen
- The outcome of this test for this property is considered to be compliant if both results (side A and side B) are less than or equal to the value declared by the extruder (for PVC-U profiles) or ≤3% (for PVC-UE profiles).
- The outcome of the test for this property is considered to be non-compliant if at least one of the 2 results (side A and/or side B) is clearly greater than the value declared by the extruder (for PVC-U profiles) or >3% (for of PVC-UE profiles).

1.3.10 Tensile strength

Standards NF EN ISO 527-1 and NF EN ISO 527-2 as well as standard NF T 54-405 apply to the tensile strength test.

However, the dimensions of the test pieces must comply with those of type 1BA given in Table A.1 of ISO 527-2.

The NOTE for this table ("The specimens of type 1BA and 1BB are proportionally scaled in relation to type 1B, respectively using a 1:2 and 1:5 reduction factor, excepting the thickness") is not applicable.

1.3.11 Flexural modulus of elasticity

The test is carried out in accordance with NF EN ISO 178, while observing the following specifications:

- Specimens:
  - The operator must stack the slats/strips and carry out the machining in the direction of extrusion.
- Method:
  - Case III of the standard is the referencing method used.

2 ACCEPTANCE TESTS PROGRAMME

2.1 Admission tests

2.1.1 Situation of a compound certification application (producer and formulator-extruder)

Certification testing of a compound includes:

a) profile tests sent by the producer during the application for certification (in particular for durability tests) according to test series A and B according to Table 1 below.
b) tests on the granules taken during the audit of the production site according to the series of tests C according to Table 1 below.

These tests are carried out by the independent laboratory and are defined in Table 1 below.

LNE will draw up and send a report containing the results of these tests by email to the correspondent(s) designated by the producer/formulator-extruder.

In case of non-compliance, the manufacturer shall inform LNE of its analysis of the causes and corrective actions taken while specifying the time taken.

Prior to the certification decision, any modification made to the material defined initially must be pointed out to LNE, which will decide whether or not additional tests need to be carried out.

A technical file supplied by the applicant can be considered and can, at the request of the applicant, be submitted to the mark committee and to a group of experts whose compound is described in part 4. A favourable opinion results in acceptance of the vinyl compound even before the ageing test results are available. However, only these results can be used as a reference for notification of acceptance.

Such a technical file contains the following:

- the results of a natural ageing test conducted at a site meeting the requirements of NF T 54-405, and the forwarding of a report setting out:
    - the details of the testing station,
    - a report of the meteorological conditions throughout the exposure
    - the results of tests conducted before and after ageing by an official laboratory in accordance with the requirements of these regulations (see table 1 to 2 below), with precise identification of the compounds to be tested in order to ensure that the file submitted corresponds fully to the compound submitted for acceptance.

Where no pre-ageing report is available, the exposed samples must be supplied to LNE to enable the latter to conduct tests to identify the compound.

TABLE 1

Acceptance tests for vinyl compounds intended for the extrusion of PVC-U profiles (Type 1, 2, 3 or 4)

TESTS (methods shown in § 1.3)		SAMPLING	Acceptance tests		
			A	**B**	**C**
Density at 23°C		Granules (1) or profiles (2) (3)	X	X	X
Ash content Illustrative figure for compounds of which L* ≤ 35			X	X	X
Thermal stability time (DHC)			X	X	X
Vicat softening temperature			X		X
Modulus of elasticity in flexure			X		X
Colour checking		Profiles	X	X	X
Tensile characteristics		Using 5 test pieces taken from the same 1-metre profile sample	X		
Traction impact resistance at 23°C		- before ageing: Using 10 test pieces taken from the same 1-metre profile sample	X		
Translucency (only for translucent compounds)		On 1 plate of thickness 1 ± 0.1 mm	X		
Reaction to contact with hydrogen sulphide (for swimming pool safety covers only)		On 1 20-cm profile sample	X		
Durability (natural ageing)	- Colour change check (grey scale, (for light colours) colorimetry, Delorme rating) after 1 and 2 years	using 1 50-cm test piece and 1 15-cm reference taken from the same sample (for each exposure duration)	X(4)	X(6)	
	- Impact resistance - traction at 23°C after 2 years	using 10 test pieces taken from the same profile sample and 1 15-cm reference taken from the same profile sample (for each exposure duration)	X(4)	X(6)	
Durability (Accelerated ageing NF EN 513)(5)	- Changes in colorimetry characteristics	using 1 exposed test piece and 1 15-cm reference taken from the same profile sample	X(4)	X(6)	
	- Impact resistance - traction at 23°C	using 10 exposed test pieces taken from the same profile sample	X(4)	X(6)	

A: Tests carried out on each reference compound submitted for certification and, in the case of shade variant, on a compound reference.

B: For shade variants, tests performed on other variants that have not been tested according to (A).

C: Sampling tests performed during the audit.

(1) Tests conducted on each compound submitted for acceptance.

(2) Tests conducted in the case of a variation in a light colour shade for applications other than swimming pools;

(3) Compound identification characteristics, tests on granules taken during the initial audit. In addition, for vinyl compounds destined for the extrusion of film-coated and painted PVC-U profiles, only these tests apply.

(4) Except for opaque compounds of the lower side of the bi-material profiles for swimming pool cover application.

(5) By the manufacturer's decision with regard to light colours; does not apply to non-light colours. However, a confirmation by natural ageing for 1 and 2 years must be carried out. Only natural ageing takes precedence.

(6) In the acceptance application, if the reference compound of a light colour is accompanied by a variation in colour (identification characteristics other than identical colours, shading colours by modifying the content and/or the nature of the shading pigments) the ageing tests to be conducted will vary according to case:

- ***1st case: the colorimetric difference of the variation compared with the reference compound complies with:***

$\Delta L^* \leq 2$ and $\Delta a^* \leq 1$ and $\Delta b^* \leq 1.6$

there is no ageing test to be carried out.

- ***2nd case: the colorimetric difference of the variation compared with the reference compound complies with:***

$2 < \Delta L^* \leq 5$ and/or $\Delta a^* \geq 1$ and/or $\Delta b^* \geq 1.6$

Change in the colour via accelerated ageing according to NF EN 513 or NF EN 16472 (comparative study with respect to the reference compound) must be carried out (as chosen by the applicant and depending on the type of application).

- ***3rd case: the colorimetric difference of the variation compared with the reference compound complies with:***

$\Delta L^* \geq 5$

Considered as a new approval.

2.1.2 Situation of a request for a PVC-U or PVC-UE profile (extruder)

The tests to be carried out by the independent laboratory on the products sampled during the audit are defined in tables 2 to 5 below.

Prior to the certification decision, any modification made to the range defined initially must be notified to LNE, which will decide whether or not additional tests need to be carried out.

TABLE 2

Acceptance tests for non-decorated PVC-U profiles and RPT (Type 1 or 2)

TESTS (methods shown in § 1.3)	**SAMPLING**	**PROFILE ACCEPTANCE TESTS**	
		A **1st reference profile**	**B** **Other reference profiles**
Density (1)	Profiles	X	
Ash content (1) (6) Illustrative figure for compounds of which L* ≤ 35		X	
Vicat softening temperature (1)		X	
Modulus of elasticity in flexure (1)		X	
Thermal stability time DHC (1) (6)		X	
Colour checking (1)		X	X
Impact resistance-traction (2)(5)	Using 10 test pieces taken from the same 1-metre profile sample	X	
Appearance	Profiles	X	X
Linear weight		X	X
Tensile characteristics	Using 5 test pieces taken from the same 1-metre profile sample	X	X
Impact resistance at 23°C(5)	Using 10 test pieces taken from the same profile sample	X	X
Shrinkage	Using 3 test pieces taken from the same profile sample	X	X
Light transmission (opacity) (3)	On test pieces 50 cm long, forming a panel of roughly 50 x 50 cm	X	X
Reaction to contact with hydrogen sulphide (4)	On a 20-cm profile sample	X	

(1) compound identification characteristics

(2) tests, conducted at the producer's expense, where the compound used has been authorised to carry the QB mark for over 5 years, but has not been used within the QB mark framework

(3) for profiles where light transmission measurement is required in connection with their intended use (profiles for roller blinds; for other types of closure profiles (e.g.,: louver blinds))

(4) for profiles for swimming pool protection (safety covers only)

(5) not applicable to profiles for thermal bridge breaks

6) if co-extrusion of PVC-U with PVC-U in an inner layer, these tests are to be performed on the profile consisting solely of the material of the visible/exposed outer layer.

TABLE 3

Acceptance tests for PVC-U solar slat profiles for swimming pool covers (Type 1 or 2)

TESTS (methods shown in § 1.3)	SAMPLING	PROFILE ACCEPTANCE TESTS	
		A 1st reference profile	B Other reference profiles
Density (1)	Measurement on both the opaque and translucent sides	X	
Ash content (1) (3) Illustrative figure for compounds of which L* ≤ 35		X	
Vicat softening temperature (1)		X	
Modulus of elasticity in flexure (1)		X	
Thermal stability time DHC (1)		X	
Colour checking (1)	Measurement on both the opaque and translucent sides	X	X
Impact resistance-traction (2)	Using 10 test pieces taken from the same 1-metre profile sample (on the translucent side)	X	
Appearance	Complete slat	X	X
Linear weight		X	X
Tensile characteristics	Using 5 test pieces taken from the same 1-metre long profile sample on the both the opaque and translucent sides	X	X
Impact resistance at 23°C	Using 10 test pieces taken from the same profile sample (complete slat)	X	X
Shrinkage	Using 3 test pieces taken from the same profile sample (complete slat)	X	X
Reaction to contact with hydrogen sulphide	On a 20-cm profile sample (translucent side)	X	

(1) compound identification characteristics

(2) tests, conducted at the producer's expense, where the compound used has been authorised to carry the QB mark for over 5 years, but has not been used within the QB mark framework

3) if co-extrusion of PVC-U with PVC-U in an inner layer, these tests are to be performed on the profile consisting solely of the material of the outer layer.

TABLE 4

Acceptance tests for film-coated PVC-U profiles (Type 3) and painted PVC-U (Type 4)

TESTS	SAMPLING	PROFILE ACCEPTANCE TESTS	
		A 1st reference profile	B Other reference profiles
Density (1)	Profiles	X	
Vicat softening temperature (1)		X	
Modulus of elasticity in flexure (1)		X	
Colour checking (1)		X	X
Impact resistance-traction (2)	Using 10 test pieces taken from the same 1-metre profile sample	X	
Appearance And decoration (only for film-coated PVC-U)	Profiles	X	X
Linear weight		X	X
Thickness of the coat of paint (only for painted PVC-U)	Using 3 test pieces taken from the same profile sample	X	X
Brilliance (only for painted PVC-U)	Using one test piece	X	X
Tensile characteristics (4)	Using 5 test pieces taken from the same 1-metre profile sample (non film-coated face)	X	
Impact resistance at 23°C	Using 10 test pieces taken from the same profile sample	X	X
Shrinkage (100°C)	Using 3 test pieces taken from the same profile sample	X	X
Thermal resistance	Using one test piece	X	X
Cross hatch test (only for painted PVC-U)	Using one test piece	X	X
Scratch resistance (only for painted PVC-U)	Using one test piece	X	X
Resistance to peeling (only for film-coated PVC-U)	Using 4 test pieces taken from the same profile sample	X	X
Light transmission (opacity) (3)	On test pieces 50 cm long, forming a panel of roughly 50 x 50 cm	X	X
Durability Natural ageing test Accelerated ageing NF EN 513 or NF EN 16472	using 1 50-cm test piece and 1 15-cm reference taken from the same profile sample (for each exposure duration)	X	

(1) compound identification characteristics

(2) tests, conducted at the producer's expense, where the compound used has been authorised to carry the QB mark for over 5 years, but has not been used within the QB mark framework

(3) for profiles where light transmission measurement is required in connection with their intended use (profiles for roller blinds; for other types of closure profiles (e.g.,: louver blinds))

(4) if the profile is film-coated on all its sides, the extruder should supply adequate samples

As a transitory measure, admission could be decided on the basis of results obtained after natural ageing for 1 year only in the case of compliant accelerated ageing.

TABLE 5

Admission tests for PVC-UE profiles

The table below applies to mono-material or bi-material PVC-UE profiles or to co-extruded PVC-U profiles with a PVC-UE core.

TESTS		SAMPLING	PROFILE ACCEPTANCE TESTS	
			A 1st reference profile	B Other reference profiles
Density (1) (6)		Profiles	X	
Ash content (1) (6) Illustrative figure for compounds of which L* ≤ 35			X	
Vicat softening temperature (1) (6)			X	
Modulus of elasticity in flexure (1) (6)			X	
Thermal stability time DHC (1) (6)			X	
Impact resistance-traction (4)(5) (6)		Using 10 test pieces taken from the same 1-metre profile sample	X	
Tensile characteristics (6)		Using 5 test pieces taken from the same 1-metre profile sample	X	X
Colour checking (1)		Profiles	X	X
Appearance		Profiles	X	X
Linear weight			X	X
Impact resistance at 23°C(5)		Using 10 test pieces taken from the same profile sample	X	X
Shrinkage (75°C)		Using 3 test pieces taken from the same profile sample	X	X
Reaction to contact with hydrogen sulphide (2)		On a 20-cm profile sample	X	
Flexural strength(7)		Profiles	X	X
Water absorption (2)		On a 1-m profile sample	X	
Light transmission (3)		On test pieces 50 cm long, forming a panel of roughly 50 x 50 cm	X	X
Durability natural ageing (accelerated ageing NF EN 513)	Verification of appearance after 1 and 2 years: Grey scale (for light colours) Colorimetry Delorme rating	using 1 50-cm test piece and 1 15-cm reference taken from the same profile sample (for each exposure duration)	X	
	Flexural strength(7) after 2 years	Profiles		

(1) compound identification characteristics

(2) swimming pool profiles only

(3) closure profiles only

(4) tests, conducted at the producer's expense, where the compound used has been authorised to carry the QB mark for over 5 years, but has not been used within the QB mark framework

(5) not applicable to profiles for thermal bridge breaks

(6) if co-extrusion of PVC-U with a PVC-UE as an internal layer, these tests are to be carried out on the profile comprising only the material of the outer layer.

(7) pool cover application profiles only and RPT application of PVC-U co-extruded PVC-U profiles, if the PVC-UE core has a structural role

2.1.3 Situation with a film-coated profile application

The characterisation of the film coating is carried out as indicated in table 6.

TABLE 6
Tests for film-coating films

Characteristics and test methods	Samples	Tests
Reaction of the film to radiation (Visible, UV and IR) Ageing according to NF EN 4892-1.2 method A cycle 1 *Lab, Delta E, solar absorption and reflection, Solar transmission, IR emissivity* (initially, at 2000 h and at 4000 h)	1 A4 sheet per outlet and per range of colours	X only as an illustrative figure
Reaction of the film on supports of different colours with regards to radiation in new condition Visible, UV and IR radiation *Measurement of the absorption coefficient of a profile with a film on a light colour support and on a dark colour support* (initially)	1 m of profile with a film per type of support and per range of film colours	X only as an illustrative figure
Characterisation of the IRTF micro film (optional test) Ageing according to NF EN 4892-1.2 method A cycle 1 *Thickness of the various coats, Qualitative inspection, Chemical identification of the coats* (initially and at 4000 h)	1 A4 sheet per outlet and per range of colours	X only as an illustrative figure
Ageing tests per colour of coated film Ageing according to NF EN 4892-1.2 method A cycle 1 *Delta E, Delta b, Grey scale* (initially and at 4000 h)	1 per colour	X

2.2 Surveillance tests

2.2.1 Tests conducted in the mark laboratory

2.2.1.1 Tests on vinyl compounds (using samples taken on the producer's premises)

The tests carried out by the mark laboratory on the samples taken during the audits are defined in § 1.2.1.

LNE shall send the correspondent(s) designated by the holder a test report by email on sampling carried out during the audit.

The holder shall inform LNE of any corrective actions adopted following the detection of nonconformities.

2.2.1.2 Tests on profiles

The tests carried out by the mark laboratory on the samples taken during the audits and/or in the distribution circuit are defined in the tables below.

LNE shall send the correspondent(s) designated by the holder a test report by email on sampling carried out during the audit.

IMPORTANT NOTE:

If non-compliant results are detected by LNE, the manufacturer must apply the measures specified in the reference system § 2.3.2.9 (Management of non-compliant products) in order to inform its customers and call in the products.

The holder shall inform LNE of any corrective actions adopted following the detection of nonconformities. In case of material non-compliance, the holder must collect from the material producer the corrective actions adopted.

TABLE 7

Tests on non-decorated PVC-U profiles (Type 1 or 2)

TESTS **(methods shown in § 1.3)**	**SAMPLING**	**Opaque profiles All applications**	**Translucent profiles for swimming pool safety covers**	**two-colour profiles for swimming pool safety covers**
Density (1)	Profiles	X	X	On opaque and translucent sides
Ash content (1) (3) Illustrative figure for compounds of which L* ≤ 35		X	X	
Vicat softening temperature (1)		X	X	
Modulus of elasticity in flexure (1)		X	X	
Thermal stability time DHC (1) (3) (once a year)		X	X	
Colour checking (1) (3)		X	X	
Appearance		X	X	On complete slat
Linear weight		X	X	
Tensile characteristics	Using 5 test pieces taken from the same 1-metre profile sample	X	X	
Impact resistance at 23°C	Using 10 test pieces taken from the same profile sample	X	X	On complete slat
Shrinkage	Using 3 test pieces taken from the same profile sample	X	X	
Light transmission (opacity)	On test pieces 50 cm long, forming a panel of roughly 50 x 50 cm	X (2)		
Reaction to contact with hydrogen sulphide	On a 20-cm profile sample	X	X	On the translucent side
Durability (natural ageing)	using 1 50-cm test piece and 1 15-cm reference taken from the same profile sample (for each exposure duration)	X	X	Complete slat exposed on the translucent side

(1) compound identification characteristics

(2) for profiles where light transmission measurement is required in connection with their intended use (situation for roller blinds and louver blinds)

3) if co-extrusion of PVC-U with PVC-U in an inner layer, these tests are to be performed on the profile consisting solely of the material of the visible/exposed outer layer.

TABLE 8

Tests for film-coated PVC-U profiles (Type 3)

TESTS	SAMPLING
Density (1)	Profiles
Vicat softening temperature (1)	
Modulus of elasticity in flexure (1)	
Colour checking (1)	
Decoration	
Appearance	
Linear weight	
Tensile characteristics (4)	Using 5 test pieces taken from the same 1-metre profile sample (non film-coated face)
Impact resistance at 23°C	Using 10 test pieces taken from the same profile sample
Shrinkage (100°C)	Using 3 test pieces taken from the same profile sample
Thermal resistance	Using one test piece
Peeling resistance	Using 4 test pieces taken from the same profile sample
Light transmission (opacity) (3)	On test pieces 50 cm long, forming a panel of roughly 50 x 50 cm
Durability (natural ageing).	using 1 50-cm test piece and 1 15-cm reference taken from the same profile sample (for each exposure duration)

(1) compound identification characteristics

(2) tests, conducted at the producer's expense, where the compound used has been authorised to carry the QB mark for over 5 years, but has not been used within the QB mark framework

(3) for profiles where light transmission measurement is required in connection with their intended use (profiles for roller blinds and louver blinds)

(4) if the profile is film-coated on all its sides, the extruder should supply adequate samples

TABLE 9

Tests for painted PVC-U profiles (Type 4)

TESTS	SAMPLING
Density (1)	Profiles
Vicat softening temperature (1)	
Modulus of elasticity in flexure (1)	
Colour checking (1)	
Appearance	
Linear weight	
Paint layer thickness	Using 3 test pieces taken from the same profile sample
Brilliance	Using one test piece
Tensile characteristics	Using 5 test pieces taken from the same 1-metre profile sample (non-painted face)
Impact resistance at 23°C	Using 10 test pieces taken from the same profile sample
Shrinkage (100°C)	Using 3 test pieces taken from the same profile sample
Thermal resistance	Using one test piece
Cross hatch test	Using one test piece
Scratch resistance	Using one test piece
Light transmission (opacity) (3)	On test pieces 50 cm long, forming a panel of roughly 50 x 50 cm
Durability (natural ageing)	using 1 50-cm test piece and 1 15-cm reference taken from the same profile sample (for each exposure duration)

(1) compound identification characteristics

(2) tests, conducted at the producer's expense, where the compound used has been authorised to carry the QB mark for over 5 years, but has not been used within the QB mark framework

(3) for profiles where light transmission measurement is required in connection with their intended use (profiles for roller blinds and louver blinds)

TABLE 10

Tests for PVC-UE profiles

The table below applies to mono-material or bi-material PVC-UE profiles or to co-extruded PVC-U profiles with a PVC-UE core.

TESTS	SAMPLING
Colour checking (1)	Profiles
Appearance	Profiles
Linear weight	
Impact resistance at 23°C	Using 10 test pieces taken from the same profile sample
Shrinkage (75°C)	Using 3 test pieces taken from the same profile sample
Reaction to contact with hydrogen sulphide (2)	On a 20-cm profile sample
Water absorption (2)	On a 1-m profile sample
Bending strength	Profiles
Light transmission (3)	On test pieces 50 cm long, forming a panel of roughly 50 x 50 cm
Durability (natural ageing)	using 1 50-cm test piece and 1 15-cm reference taken from the same profile sample (for each exposure duration)

(1) compound identification characteristics

(2) swimming pool profiles only

(3) closure profiles only

(4) only if external PVC-U coat

TABLE 11

Tests for PVC-U profiles for thermal bridge breaks (Type 1 or 2)

TESTS (methods shown in § 1.3)	SAMPLING
Density (1)	Profiles
Ash content (1) (2) Illustrative figure for compounds of which L* ≤ 35	
Vicat softening temperature (1)	
Modulus of elasticity in flexure (1)	
Thermal stability time DHC (1) (2)	
Colour checking (1) (2)	
Appearance	
Linear weight	
Tensile characteristics	Using 5 test pieces taken from the same 1-metre profile sample
Shrinkage	Using 3 test pieces taken from the same profile sample
Durability (natural ageing)	using 1 50-cm test piece and 1 15-cm reference taken from the same profile sample (for each exposure duration)

(1) compound identification characteristics

(2) if co-extrusion of PVC-U with PVC-U in an inner layer, these tests are to be performed on the profile consisting solely of the material of the visible/exposed outer layer.

2.2.2 Tests on the holder's manufacturing premises

2.2.2.1 Tests on vinyl compounds (using samples taken on the producer's premises)

During the audit, the auditor has conformity tests carried out in their presence on accepted compounds, in order to verify the conditions under which inspections are carried out by the manufacturer. As a minimum, these are the tests of the control plan referred to in paragraph 2.3.2.7 of the reference system. These tests are carried out on the same batch as that sampled for tests in the mark laboratory.

NOTE: test results obtained during the audit do not prejudge results obtained by the mark laboratory.

2.2.2.2 Tests on profiles

During the audit, the auditor has conformity tests carried out in their presence on accepted profiles, in order to verify the conditions under which inspections are carried out by the manufacturer. As a minimum, these are the tests of the control plan referred to in paragraph 2.3.2.7 of the reference system. It is preferable to carry out these tests on the type sampled for tests in the mark laboratory.

In case of the use of dies with multiple outlets, compliance testing must be conducted on each outlet in the presence of the auditor.For tests conducted at the mark laboratory, sampling will be done on only one of the outlets.

NOTE: test results obtained during the audit do not prejudge results obtained by the mark laboratory.

2.3 Requirements concerning profile modifications

Any change, whether or not resulting in a change to the certified characteristics of the profile with respect to those set out in the technical file submitted during acceptance, will require a request for modification. This application must be sent to LNE (cf. the administrative appendix) and may give rise to the performance of verification tests.

The modifications are processed as indicated in table 12 below.

Table 12 –
Acceptance extension procedure for profiles

Type of change	Application to be sent to LNE	Examination of the application	Extension notification conditions
① New geometry(ies) of profiles extruded from a vinyl compound already carrying the QB mark and used by the holder	Application for extension (forms in the administrative appendix)	- If the linear weight of the new profiles means they can be incorporated into an existing range: No test	without consulting the mark committee
		Where this is not the case: - Creation of one or more additional profile ranges - Tests conducted in the mark laboratory: test series B according to tables 2 to 5 on the reference profiles of these ranges	without consulting the mark committee, if there are no particular problems
②. New geometry(-ies) for profiles, extruded using a vinyl compound already carrying the QB mark, but not used by the holder	Application for extension (forms in the administrative appendix)	- Creation of one or more ranges - Tests conducted in the mark laboratory: test series A according to tables 2 to 5 on the 1st reference profile and test series B according to tables 2 to 5 on the other reference profiles.	without consulting the mark committee, if there are no particular problems
③. Profiles extruded using a vinyl compound already carrying the QB mark, but not yet used by the holder (these profiles have been previously approved using a different material)	Application for extension (forms in the administrative appendix)	- Tests conducted in the mark laboratory on the reference profiles: test series A according to tables 2 to 5 - Submission of a file containing the results obtained by the manufacturer on the other reference profiles: test series B according to tables 2 to 5	without consulting the mark committee, if there are no particular problems
④. Profiles extruded using a vinyl compound not yet approved for the QB mark (variation in colour shade or not). These profiles have been previously approved using a different material.	Application for extension made jointly with compound acceptance (forms in the administrative appendix)	Tests conducted in the mark laboratory: - on one of the reference profiles: test series A according to tables 2 to 5 made jointly with the compound acceptance tests - on the other reference profiles: test series B according to tables 2 to 5	after acceptance of the compound. Without consulting the mark committee, if there are no particular problems
⑤. Extruded profiles with a vinyl compound already carrying the QB mark having undergone a modification in the colour by the producer	Extension request + identification sheet + one 1 m sample with the manufacturer's measurement area (forms in the administrative appendix)	- Tests conducted in the mark laboratory: determination of the new colorimetric target values on the 1st reference profile. - Submission of a file containing the results obtained by the manufacturer on the other colour reference profiles	without consultation the mark committee, No change to the certificate.