DIN EN ISO 20344 Determination of Water Vapour Permeability (WVP)

Description

6.6 Determination of water vapour permeability (WVP)

6.6.1 Principle

The test piece is fixed over the opening of a jar, which contains a quantity of solid desiccant. This unit is placed in a strong current of air in a conditioned atmosphere.
The air inside the container is constantly agitated by the desiccant, which is kept in movement by the rotation of the jar.
The jar is weighed in order to determine the mass of the moisture that has passed through the test piece and has been absorbed by the desiccant.

6.6.2 Apparatus

6.6.2.1 Jars or bottles, fitted with a screw top with a circular opening whose diameter is equal to the diameter of the neck of the jar (approximately 30 mm) (see Figure 31).

Dimension in millimetres

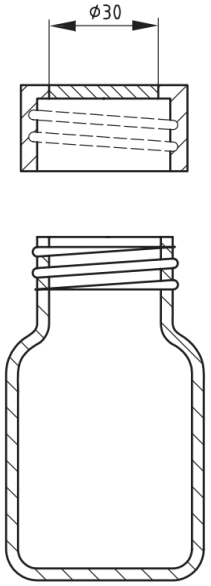


Figure 31 — Jar to be used in WVP test

Dimension in millimetres

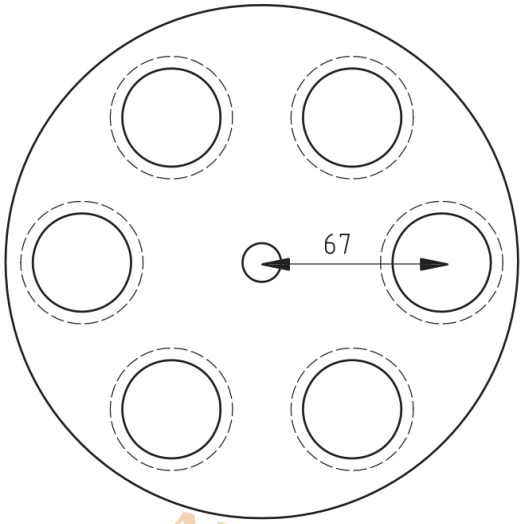


Figure 32 — Holders for jars used in WVP test

6.6.2.2 Holder, in the form of a disc which is rotated at (75 Â± 5) r/min by an electric motor. The jars are placed on this disc with their axes parallel to the axle of the disc and at a distance of 67 mm from it (see Figure 32).

6.6.2.3 Fan, mounted in front of the mouths of the jars and consisting of three flat blades in planes that are inclined at 120Â° to one another. The planes of the blades shall pass through the prolongation of the axle of the disc. The blades shall have dimensions of approximately 90 mm by 75 mm, and the 90 mm long side of each blade nearest to the mouths of the jars passes them at a distance of not greater than 15 mm (see Figure 33).
The fan shall rotate at (1 400 Â± 100) r/min. The apparatus shall be used in a conditioning atmosphere of
(23 Â± 2) Â°C, (50 Â± 5) % RH.

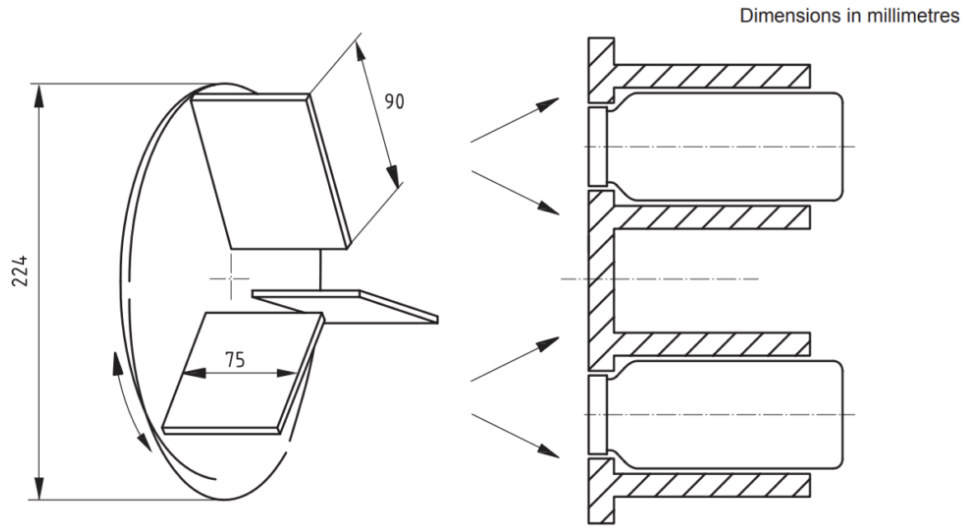


Figure 33 — Schematic diagram of apparatus to be used in water vapour permeability test

6.6.2.4 Silica gel desiccant, freshly regenerated by at least 16 h in a ventilated oven at (125 Â± 5) Â°C then
cooled to ambient temperature in a hermetically sealed vessel. The granular size of the crystals shall be between 2 mm to 5 mm.
NOTE Silica gel beads are preferred to granules as they generate less dust.
The silica gel should be sieved before regeneration in order to eliminate small particles and dust. At regeneration, the specified temperature 130 Â°C should not be exceeded due to the risk of reducing the absorptive capacity of the gel. The ventilation of the oven by use of a fan is not necessary but the oven should not be sealed; it should allow continuous exchange of the air inside the oven with that outside. The gel should not be used while it is warmer than the test piece and, since it cools slowly in a closed vessel, a long cooling time is needed.

6.6.2.5 Balance, capable of weighing to the nearest 0,001 g.
6.6.2.6 Stopwatch.
6.6.2.7 Instrument, capable of measuring to the nearest 0,1 mm the internal diameter of the neck of the jars.
6.6.2.8 Pre-flexing apparatus, comprising the following features.
â€” An upper clamp, consisting of a pair of flat plates. One plate has the shape of a trapezium (see Figure 34,ABCD) but with a sharp corner at D, rounded to a radius of 2 mm. It shall have a ledge, EF, on which the folded test sample rests. The other plate shall have the shape EGHCF. The two plates shall be screwed
together, so as to hold one end of the sample between them as shown in Figure 34. The screw, K, which
draws the plates together shall also act as a stop, to prevent the ends of the sample from being thrust too
far towards the back of the clamp. Between the plates near the edge, AB, shall be a stop to prevent them
from coming together near AB, and so ensuring that they clamp the sample firmly near F. The upper clamp shall be reciprocated by a motor about a horizontal axis.

Dimensions in millimetres

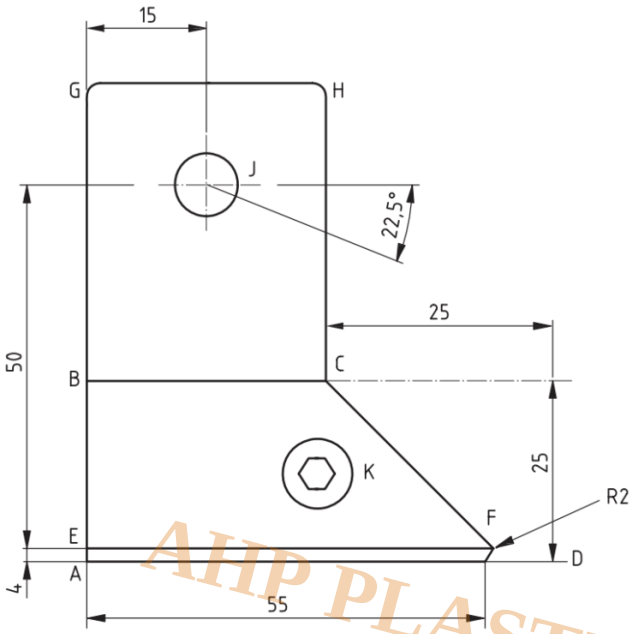
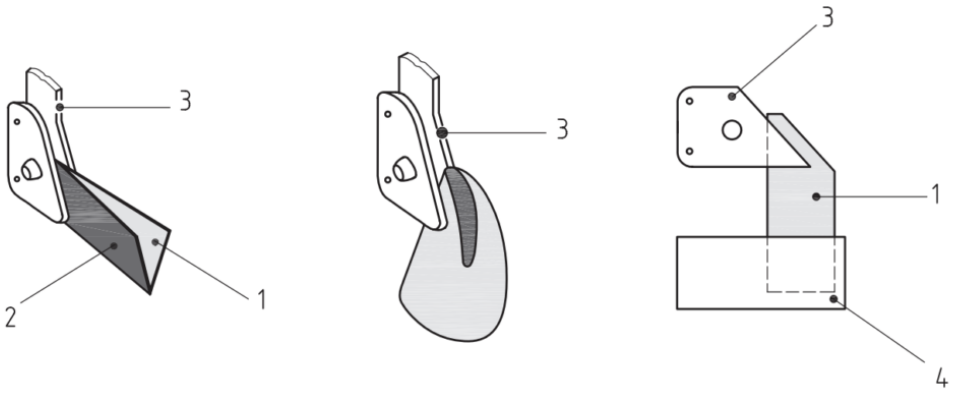


Figure 34 — Upper clamp

In the position shown in Figure 34 the ledge EF is horizontal, and the end F is its highest point. The clamp
descends through an angle of 22,5Â° and returns (100 Â± 5) times/min. The number of cycles is recorded by
a counter.

â€” A lower clamp, fixed and lying in the same vertical plane as the upper clamp. It shall consist of a pair of
plates, which can be screwed together to hold the other end of the sample between them. If the upper clamp has been turned to the position where the ledge EF is horizontal (see Figure 34) the upper edges of
the plates of the lower clamp shall be 25 mm below the ledge of EF.



a) Sample in upper clamp b) Sample folded back c) Sample clamped in upper and lower clamps

Key
1 outer side
2 inner side
3 upper clamp (see Figure 34)
4 lower clamp

Figure 35 — Insertion of the test sample in the clamps

6.6.3 Preparation of the test piece

6.6.3.1 Preflexing

Cut a test sample of dimensions 70 mm Ã— 45 mm.

Turn the motor until the ledge EF is horizontal. Fold the test sample in two, with the grain side inwards, and clamp it to the upper clamp as shown in Figure 35 a), with one end of the sample against the stop and the folded edge against the ledge.

Draw the free corners of the sample outwards and downwards as shown in Figure 35 b) so that the surface which is turned inwards in the clamp is turned outwards below it. Draw the sample down, bringing together its two corners which have not been clamped. Clamp it in the lower clamp [as shown in Figure 35 c)] with the part of the fold between the clamps vertical, using no more force than is needed to make the sample just taut.

Switch on the machine and carry out 20 000 flexing cycles.

Switch off the machine and remove the test sample from the clamps.

6.6.3.2 Cutting the test piece

Cut a circular test piece of 34 mm diameter from the preflexed sample centrally about the point at which the flexing creases meet.

6.6.4 Test procedure

Measure the internal diameter of the neck of a jar (to the nearest 0,1 mm) in two directions perpendicular to each other and calculate the average diameter in mm.

Add regenerated silica gel to the jar until it is approximately half full. Fix the test piece over the neck of the jar by means of the screw top with the side facing the foot pointing outwards.

If it is necessary to seal the junction between the test piece and the neck of the jar, warm the bottle and apply a thin layer of wax to the flat end surface of the neck.

If the opening of the jar has been coated with wax, warm to around (50 Â± 5) Â°C before introducing the silica gel and fixing the test piece.

Place the jar in the holder of the apparatus and switch on the machine, noting the time.

After it has run for 1 h, stop the machine and weigh the jar, m1.
Place the jar in the apparatus and switch on the machine, noting the time.
After â‰¥ 7 h and â‰¤ 16 h stop the machine and reweigh the jar, m2, noting once again the time.

6.6.5 Calculation and expression of results

Calculate the water vapour permeability using the equation:

$$W_3 = \frac{m}{At} = \frac{m}{\pi r^2 t}$$

where

W_3 is the water vapour permeability, in mg/(cm^2·h);

m is $m_2 - m_1$, in mg;

m_1 is the initial mass of the jar with test piece and silica gel, in mg;

m_2 is the final mass of the jar with test piece and silica gel, in mg;

A is πr^2 = the test surface area, in cm^2;

r is the radius of the test surface, in cm;

t is the time between the first and second weighing, in h.

Water Vapour Permeability Tester

Leather water vapor permeability tester is for measuring the water vapor permeability of leather or synthetic materials for shoes or personal protective equipment. The tester provides certain rotary speed for holder and timer for counting the rotating number. The operator can calculate the water vapor permeability by weight changes of desiccants. It is widely used to determine the wearing comfort performance for shoes or personal protective equipment.

Standards

SATRA TM172, EN ISO 20344: 6.6, BS 3144 Method 24, SLP 25ï¼ŒDIN 53333, ISO 17699, DIN 53 429, METODO â€“ 309 WI 009, UNI EN IUP/15, UNI EN 13515

Diameter of jar	Î¦30mm
Jar number	6
Rotational Speed	75Â±5rpm
Rotary speed of fan	1400Â±100rpm
Power supply	220V 50Hz
Dimension	670mmÃ—440mmÃ—550mm
Net weight	80kg

Category

1. Equipment for Standards
2. Standards