MAS STANDARDS PUBLICATION

Reusable Male Absorbent Undergarment Testing Protocol

FEMTECHMAS-6514-1:2023

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HOHENSTEIN

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CONTENTS

1. SCOPE & BACKGROUND

This Standard specifies the wicking speed, maximum absorption capacity before leakage, and rewet in reusable absorbent undergarments designed for male anatomy.

The Standard can be applied on reusable undergarment solutions developed for men suffering from:

a) Post Micturition Dribble (PMD)
b) Urinary Incontinence (UI)

MAS Holdings Pvt Ltd. has partnered with Hohenstein Laboratories GmbH & Co. KG to develop a test standard that simulates urine leakages occurring from reusable male absorbent products based on 18,000+ 3D scanning data from sizing surveys (Hohenstein Digital Fitting Lab, 2023).

Based on the seating & standing position as well as action of gravity, reusable male absorbent undergarments tend to leak before reaching its total saturation capacity. As a result, wearers are left with a product that has a lower garment absorbency. This method of testing is simplified to determine valid and repeatable test data of the maximum absorbent capacity before leakage that is accurate to the male wearer.

Selected test parameters: weight, fluid amount, wait time, flow rate of urine, and male sexual anatomy is based on average data while garment leakage is representing the worst-case scenario in terms of wearer.

2. NORMATIVE REFERENCES

The following reference documents are required for the application of this standard. Latest edition of the document with amendments should be used.

- ISO 139:2005
  Standard atmospheres for conditioning and testing of textiles.

- AATCC Test Method 150-2018t,
  Dimensional Changes of Garments after Home Laundering.

- ISO 6330:2021
  Domestic washing and drying procedures for textile testing.

- AATCC Test Method 135-2018t
  Dimensional Changes of Fabrics after Home Laundering.

3. TERMS & DEFINITION

For the purposes of this document, the following terms and definitions apply.

3.1. Pouch composite

The Pouch composite located in the crotch region of the male reusable absorbent underwear. The pouch must be designed to provide support, comfort, dryness and free of leakages.

Materials and structure of the pouch composite is not limited to the basic functional requirements of wicking, absorbency & leakage resistance. It can also comprise of different materials, constructions, layers & designs based on new technologies.

3.2. Test specimen/ Sample

Samples with different silhouettes: boxers, trunks, boxer briefs & briefs, etc. can be tested using the test apparatus.
No requirement for specific size ranges of garments for testing.

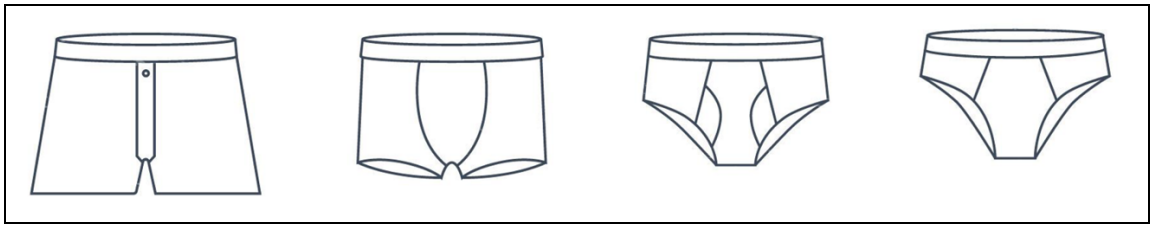

Figure 3.2.1: Samples with different silhouettes- boxers, trunks, boxer briefs & briefs)

3.3. Functional properties

The nature of having a certain function and/or performance features in products.

3.4. Reusable absorbent undergarment

Reusable absorbent underwear is an undergarment that can be worn for urinary incontinence and/or post micturition dribble. The reusable absorbent undergarment absorbs urine through a multi-layered textile material assembly that is built into the pouch composite of the undergarment. These types of undergarments can be washed & re-used multiple times.

3.5. Waiting time

Time period to settle liquid into the pouch composite between each interval of fluid addition.

3.6. Post Micturition Dribble

Involuntary loss of urine that is experienced after urination. Occurs when the bladder isn't completely emptied where drips of urine being trapped in the urethra gets released on to clothing after leaving the toilet.

3.7. Urinary Incontinence

Urinary incontinence refers to involuntary urine leakage resulting from loss of bladder control. Types of incontinence include stress, urgency, mixed & overflow incontinence.

4. PRINCIPLE

4.1. Wicking speed

A defined amount of fluid is applied to a small area of the pouch composite. Elapsed time until the fluid is completely absorbed is recorded.

4.2. Maximum Absorbent Capacity Before Leakage

The maximum absorbent capacity before leakage measures the level of liquid that can be retained by the pouch composite of the reusable absorbent undergarment right before the wearer notices wetness or liquid leakage through the undergarment.

4.3. Rewet

Rewet is the fluid retention performance of the pouch composite in a reusable male absorbent undergarment. Determination of the rewet is based on the amount of fluid that is taken up by a stack of blotting paper under defined pressure.

For the real user case, it's typically how much absorbed liquid gets resurfaced to the body touching side through the topmost layer of the absorbent pouch (usually, it is the wicking layer). Rewet measures user comfortability in terms of wet or dry feeling throughout product usage.

5. MATERIALS & APPARATUS

5.1. Absorbent paper

Use a blotting paper made from cotton sized approx.: 400 x 400 mm (100- 200 gsm). Absorbent paper not limited to above size & specifications.

5.2. Volumetric pipette

Volume: 5ml; precision 0.05ml

5.3. Stopwatch

Precision between 0.05 - 0.1 s

5.4. Weighing scale

Accuracy 0.001 g

5.5. Test fluid

Urine substitute solution: 0.9% saline solution (9g of NaCl per litre of distilled water)

5.6. Test Apparatus

Test equipment consists of specimen holder with stamp and application tube.

- **Specimen holder**
  The concave surface where the test specimen is placed flat. Specimen holder has a 3D shaped region where the pouch region of the garment must be placed.

- **Stamp**
  Component which is used to firmly hold the garment in place, simulating 3D shape of the male sexual anatomy & the gap between the male sexual organ & undergarment.

  Weight of 1kg is incorporated into the stamp to simulate the pressure exerted on the reusable male absorbent undergarment during sitting position.

- **Application tube**
  Spring loaded application tube delivers fluid on to the pouch surface.

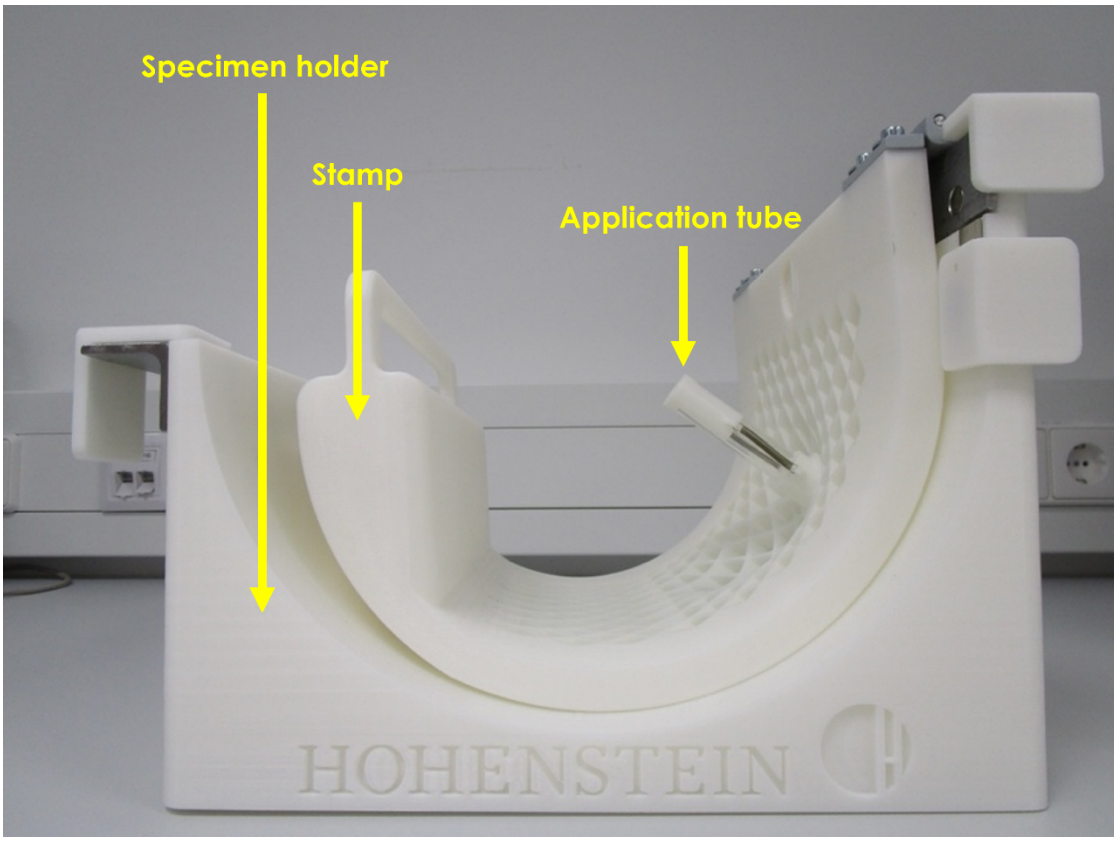

Figure 5.6.1: Side view of the test apparatus.

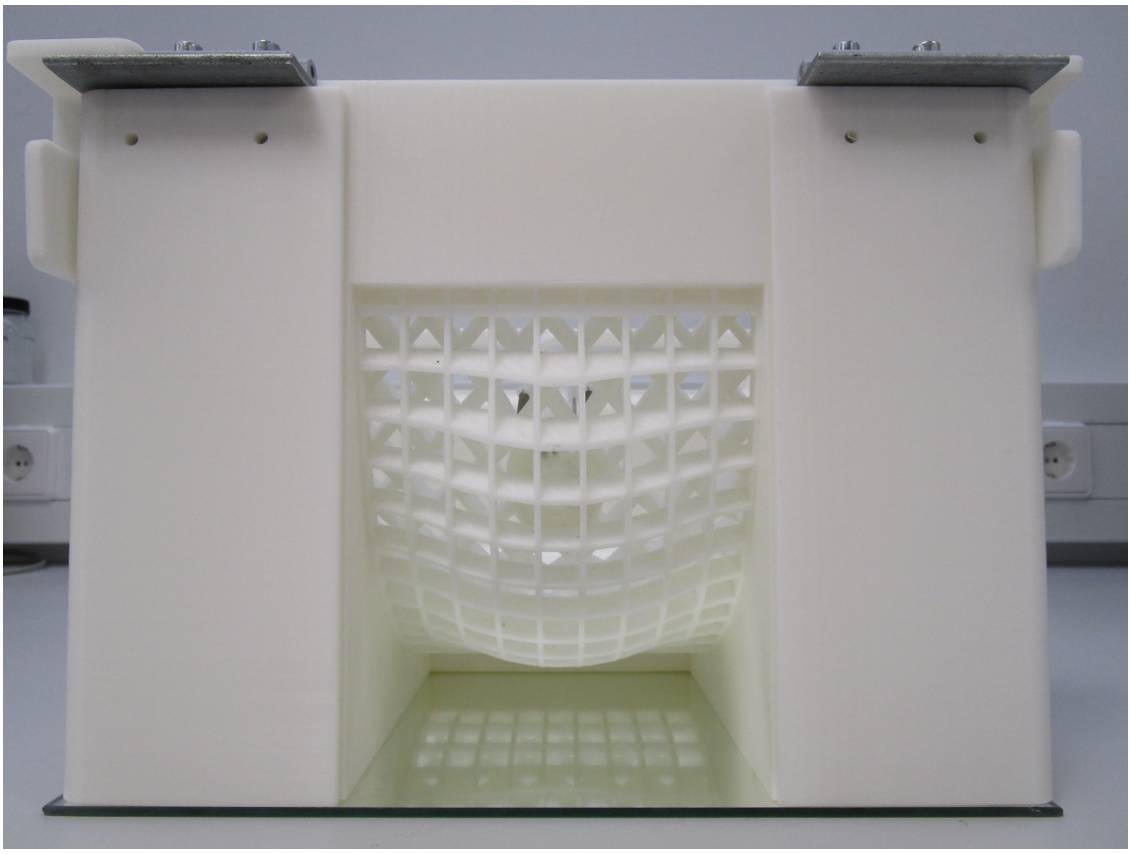

Figure 5.6.2: Mirror positioned underneath the base of the test apparatus (Front view).

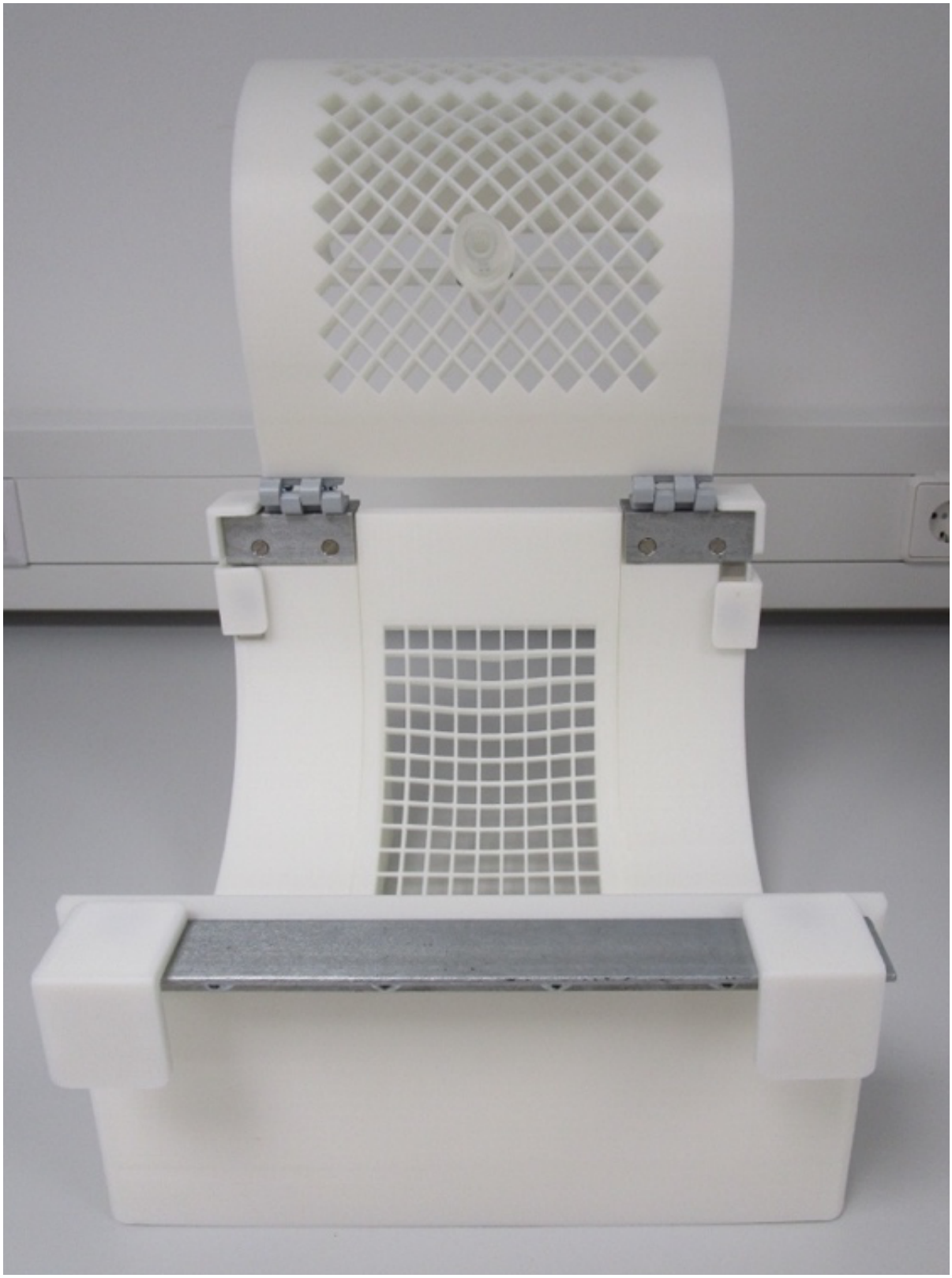

Figure 5.6.3: Open position of the stamp of test apparatus (Top view).

6. TEST PROCEDURE

Due to the nature of different fluid flow patterns & levels of urine leaked from Post Micturition Dribble (PMD) & Urinary Incontinence (UI) the following testing procedures have been developed.

6.1. Sample preparation

(a) Prior to testing, all samples must be at least washed once (1 wash cycle) according to ISO6330 / AATCC 150 (30°C gentle, line-drying) procedure 3M A or according to the labelled care instructions and conditioned at least 24h according to ISO 139.

(b) Cut open the garment on two side waists (left-side seam and right-side seam) so that the garment can lay properly on the curved bottom surface. The cut-open reusable absorbent undergarment with the pouch composite in the middle is the test specimen for all following test procedures.

(c) To ensure the garment testing surface is free of any contaminants, spray distilled water on to the garment test surface and clear / wipe away any visible foreign contaminants as deemed necessary specially after wash.

(d) If the test specimen is cleaned with water vapour, a wet wipe or any other form of water vapour or liquid prior to testing to remove solid residues from the testing area, it must be ensured that the test specimen is completely dry before the testing starts. Therefore, the test specimen shall be reconditioned / dried overnight or at least 8 hours under standard climate 20°C / 65 rh.

Figure 6.1.1: Cut open view of boxer brief underwear.

Figure 6.1.2: Demonstration of garment placement on test specimen and the use the magnetic clips to lock the garment in place (top view).

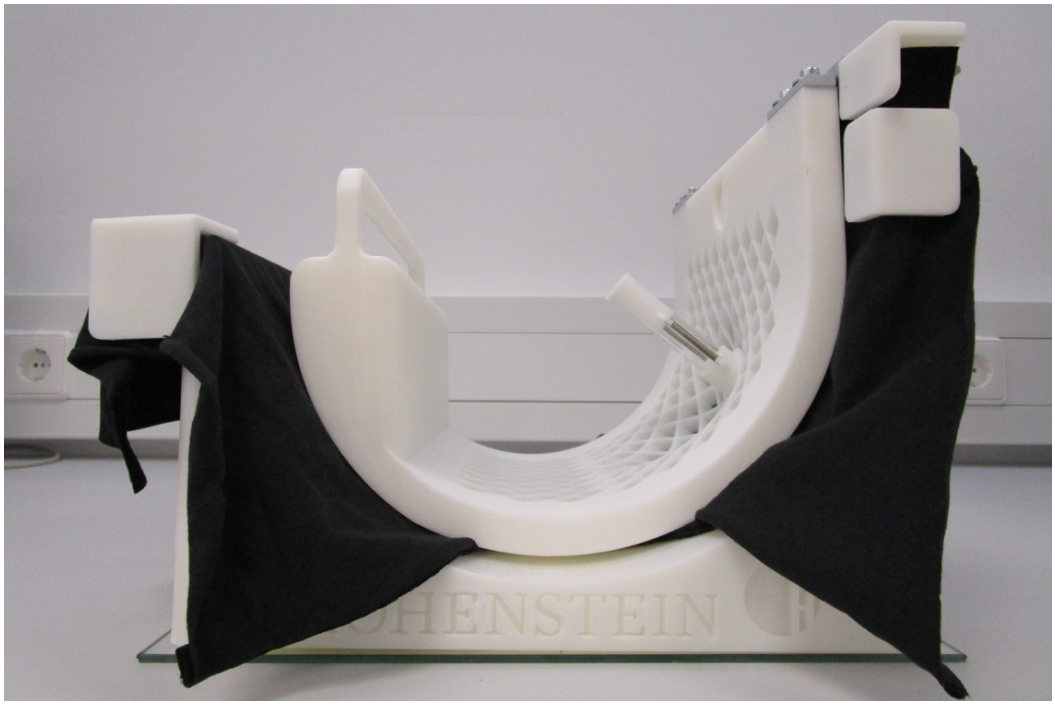

Figure 6.1.3: Side view of the garment with stamp closed.

6.2. Wicking time per ml (s/1.5ml)

(a) Take absorbent paper and note down its weight.

(b) Place the absorbent paper in specimen holder.

(c) Place the test specimen on top of absorbent paper and lower the stamp. Lift the application tube whilst placing the stamp.

(d) Add **1.5 ml** urine substitute solution within one second with a pipette into the small tube of stamp and start the stopwatch immediately (at the beginning of the application)

(e) Record the time elapsed until the test fluid is completely absorbed.
NOTE: If the process takes more than 5 min, stop the test & record the time as 300s+

(f) Continue with maximum absorbent capacity before leakage and leave the test specimen as it is in the specimen holder.

(g) Repeat the testing with 2 more specimen to obtain triple replicate readings.

6.3. Maximum absorbent capacity before leakage

The test is performed right after recording the wicking speed using the already wet test specimen.

(a) Lift the stamp for **5** seconds and then place it back again. Whilst placing the stamp lift the application tube.

(b) Add **1.5 ml** of test fluid within 1 second into the small tube of stamp.

(c) Allow the fluid to settle by waiting for **5 minutes.**

(d) Continue adding increment of 1.5ml of fluid per 5 min interval until total absorbed fluid is **15ml.**

(e) If the garment exceeds **15ml** of absorbed fluid, add increment of **3ml** of fluid per 5 min interval until the following observation listed in (f).

(f) Repeat a, b & c until

- Top surface of the absorbent paper located below the garment is wet (when observed by lifting the stamp).

  or

- Bottom surface of the absorbent paper located below the garment is wet (when observed using the mirror to detect fluid on the underside of the comb surface).

  or

- Fluid spills laterally over the absorbent area of slip.

  or

- Pooling of fluid in the combs structure of the stamp.

(g) Note down the amount of fluid added prior to observing leakage around the gusset, without considering the last released amount of fluid, as per the step (e) or (h), that resulted in leakage.

(h) Continue with rewet testing right after detecting leakage and leave the test specimen as it is in the specimen holder.

(i) Repeat the testing with 2 more specimen to obtain triple replicate readings.

6.4. Rewet

Rewet testing should be performed right after recording the maximum absorption capacity before leakage (6.3) using the already wet test specimen. This measures the rewet of the garment at the point of leakage, this can typically be considered as the worst-case scenario for the user.

Rewet test method at the point of leakage:

(a) Take absorbent paper and note down its weight in dry state.

(b) Place the paper onto the wet test specimen from maximum absorbent capacity testing.

(c) Lower the stamp on the wet test specimen and wait for 5 min.

(d) Weigh the absorbent paper on top of wet test specimen.

(e) Weigh the absorbent paper underneath the test specimen.

(f) Repeat the testing with 2 more specimen to obtain triple replicate readings.

7. CALCULATION & EXPRESSION OF RESULTS

7.1. Wicking time per ml (s/1.5ml)

Wicking time is defined as the time taken to wick 1.5ml of fluid into the pouch composite of the undergarment, with 't' being the average value of the elapsed time in seconds.

Specimen	Specimen 01	Specimen 01	Specimen 03
Time (s)			
Average time (s)			

7.2. Maximum Absorption Capacity Before Leakage

The result is the average of the three replicates of the test fluid amount until leakage.

Specimen	Absorbed Volume (mL)
Specimen 01	
Specimen 02	
Specimen 03	
Average	
Standard Deviation	

7.3. Rewet

The result is the sum of test fluid rewet weight of the 2 blotting papers (Δ1, Δ2).

$m = \Delta 1 + \Delta 2$

The fluid rewet is determined as follows:

$\Delta 1 = m_{wet1} - m_{dry1}$

(Difference of the wet weight and dry weight of bottom layer of blotting paper)

$\Delta 2 = m_{wet2} - m_{dry2}$

(Difference of the wet weight and dry weight of top 4 layers of blotting paper)

with Δ1 being the 1 layer of blotting paper under the test specimen and Δ2 being the average value of the 4-layered blotting paper stack on top of the test specimen.

The rewet in % (percent) is determined as follows:

$$\% \ Rewet = \frac{m}{Total\ amount\ of\ added\ fluid} \ x\ 100$$

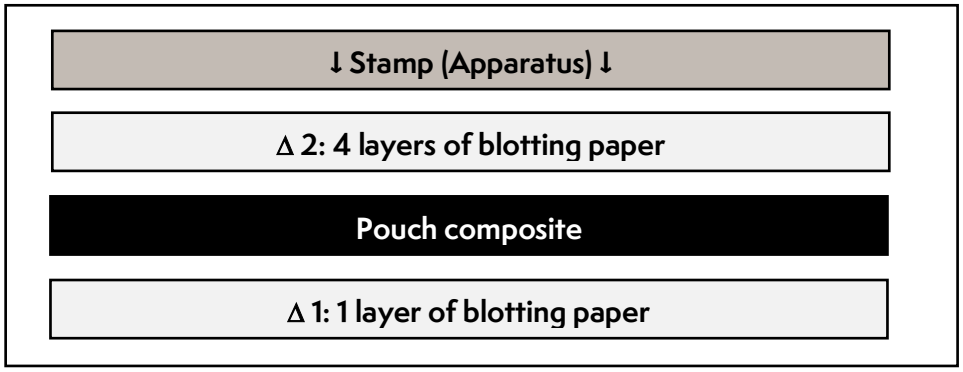

Figure 7.3.1: Cross section illustrating layout of rewet test.

Specimen	Bottom Blotting paper			Top Blotting papers			Total Rewet Weight (g)	Added Total Volume of Fluid (mL)	Rewet Percentage (%)
	Dry weight (g)	Wet weight (g)	Rewet weight (g)	Dry weight (g)	Wet weight (g)	Rewet weight (g)			
Specimen 01									
Specimen 02									
Specimen 03									
Average									
Std Deviation									

7.4. Testing Codes

Use the following codes in the Test Request Form.

Code	Test
FEMTECHMAS-6514-1:2023-6.2	Wicking time per ml
FEMTECHMAS-6514-1:2023-6.3	Maximum Absorption Capacity Before Leakage
FEMTECHMAS-6514-1:2023-6.4	Rewet

7.5. Additional records in test report

When recoding results in 6.3, measure & record the following in the test report:

a) Leakage points on the absorbent pouch.
b) Dimensions of the absorbent pouch (length & width from the fluid dispersing point.

Identifying the fluid dispersion point:

- Place the pouch composite in the 3D pouch holder.
- Close the stamp.
- Identify the point where the spring-loaded glass tube sits over the absorbent pouch composite. Consider the selected point as the fluid dispersion point.
- Now measure the length & width of the absorbent pouch composite crossing the fluid dispersion point.

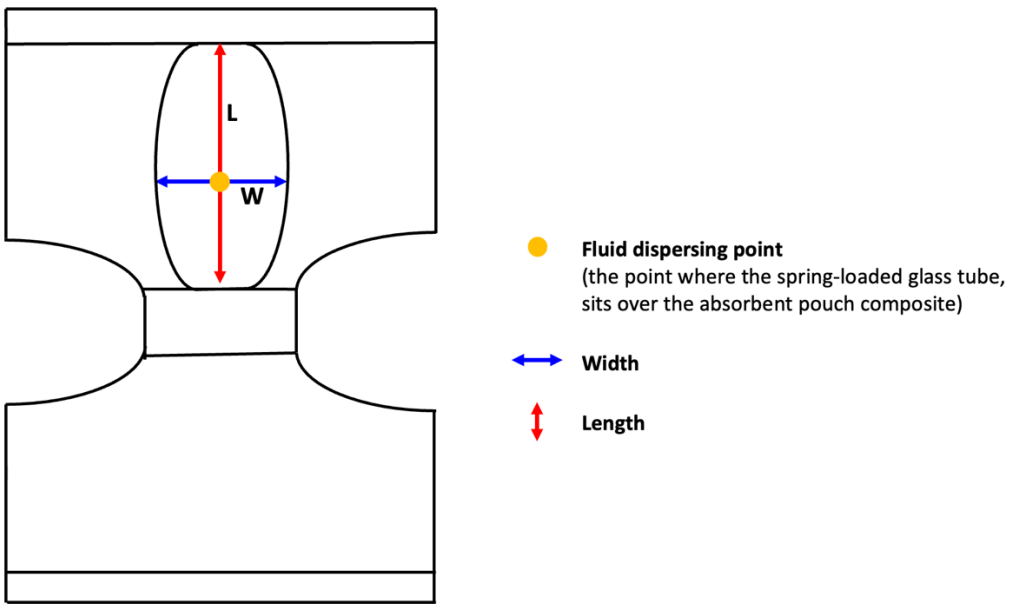

Figure 7.5.1: Identifying the fluid dispersing point in male reusable absorbent underwear.

8. BIBLIOGRAPHY

- ISO 139, Textiles — Standard atmospheres for conditioning and testing
- AATCC 150-2018 — Dimensional Changes of Garments after Home Laundering
- ISO 6330:2021 -Textiles — Domestic washing and drying procedures for textile testing.
- Test method No. 12/2015 MDS-Hi (German Healthcare Medical Service)

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ANNEX A: INFORMATIVE

Test Protocol Part 2 - Additional Garment Form Testing
This part of the Standard specifies the functional properties other than described in Part 1. This Includes:

- Water Vapor Resistance Ret (Breathability) of the undergarment
- Microbiological Testing
- Odour testing-GC and Sensory evaluation
- Dimensional stability after repeated home laundering.
- Appearance after repeated home laundering.
- Biological evaluation of garments -Cytotoxicity, Skin irritation, and Skin
- Sensitization
- Drying rate and time of undergarments
- Sensations of skin touch material of the reusable absorbent
- undergarment.
- pH-value of the undergarment crotch.

ANNEX B: DIMENSIONS OF THE TEST APPARATUS

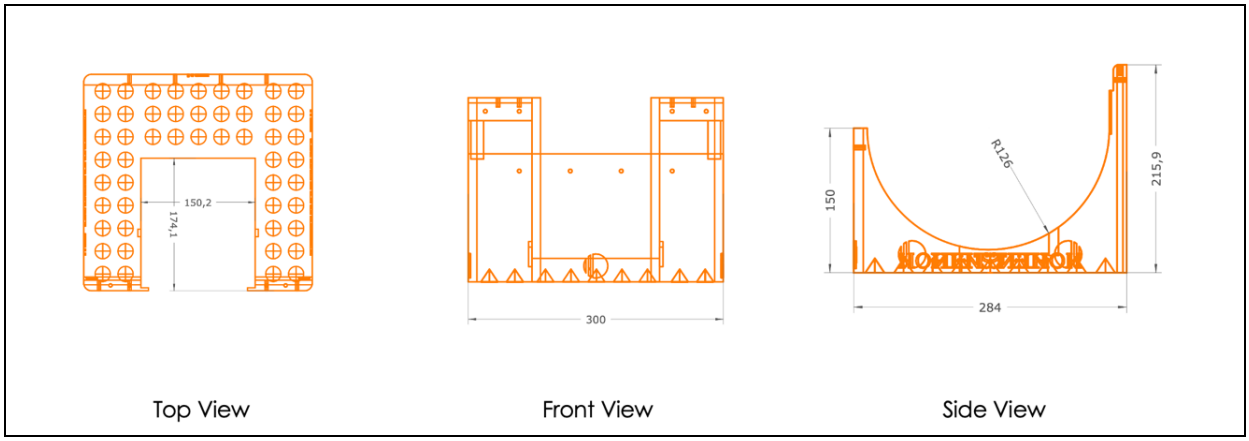

Figure B1: Dimensions of base of the device.

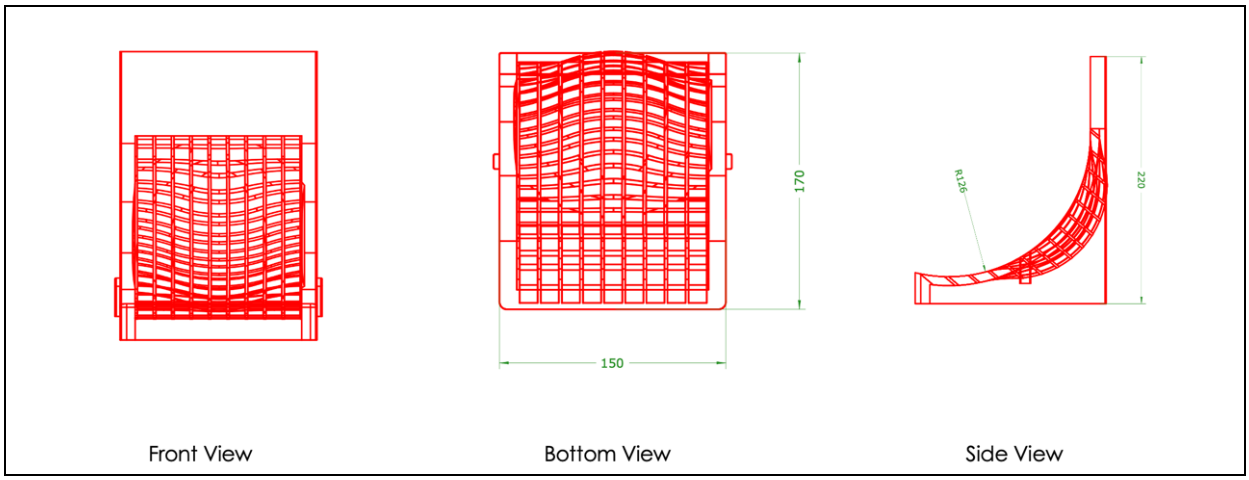

Figure B2: Dimensions of pouch holder.

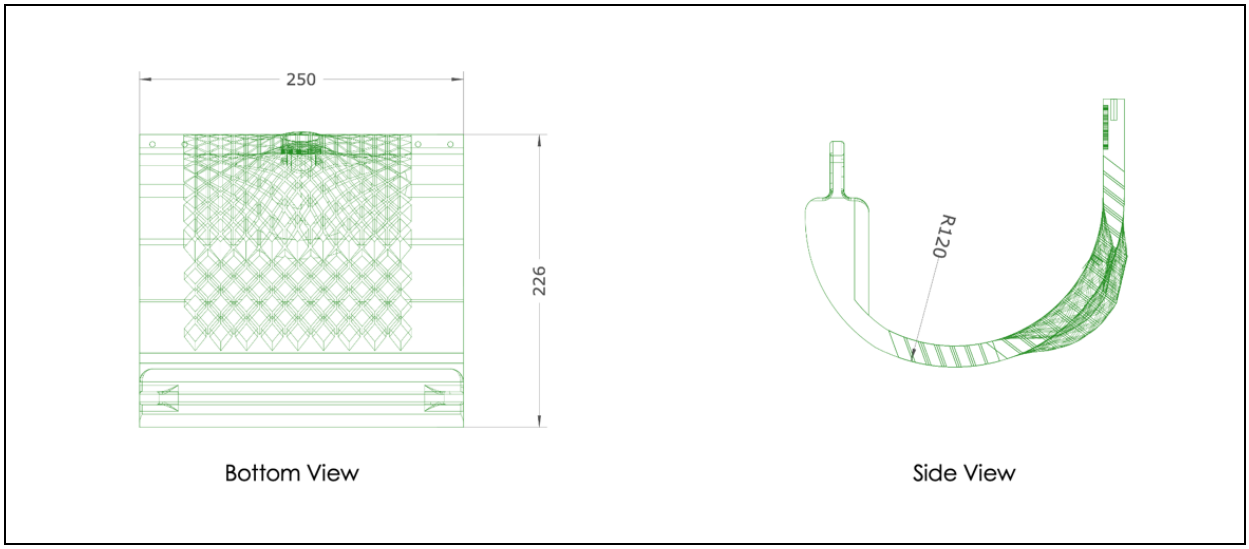

Figure B3: Dimensions of device- stamp & application tube.

ABOUT US

MAS Holdings is a pioneer in innovation in apparel solutions in the hygiene space.

Our purpose is to bring normalcy to men suffering from urinary incontinence, supporting them throughout their daily lives. The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through processes.

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