

## Trial report: 06735Y-1A/2A/3A/4A/5A

### EVALUATION OF THE PERFORMANCE OF BARRIER MASKS (OR THEIR COMPONENTS) IN NEW CONDITION AND AFTER 5 AND 10 WASHING CYCLES CARRIED OUT BY ICARE, ACCORDING TO THE AFNOR SPEC S76-001 REQUIREMENT GUIDE

References

Trial request number: "Tarifs pour la réalisation des essais pour la certification des Masques Grands Public ou Barrière"  
Date of receipt of the order: 2020/06/22

Sample

Designation: Ninja PRO  
Additional informations: /  
Reference: /  
Batch: /  
Date of receipt: 2020/06/25  
Trial duration: From 2020/07/01 to 2020/07/06

### List of trials for the certification of Public or Barrier Masks (S76-001)

Test performed			Trials	Paragraphs	Pages of report*
New condition	After 5 washing	After 5 washing			
Yes			5 and 10 washing cycles carried out by ICARE	Non-applicable	Non-applicable
Yes	Yes	Yes	Visual inspection	§ 6.1.1	6 / 12 / 18
Yes	Yes	Yes	Flange clearance strength test	§ 6.1.2 / § 6.2.3	7 / 13 / 19
Yes	Yes	Yes	Testing the filtration efficiency of the material	§ 6.2.2	8 / 14 / 20
Yes	Yes	Yes	Respiratory resistance and air permeability test	§ 6.2.4	10 / 16 / 22

\* If the trial was not ordered, check "Non-applicable" on the corresponding pages.

### Trial report approval

Report approved the	2020/07/19
Name and surname	Dominique MRUGALA
Function	Responsable Unité
Signature	

The present report cannot be reproduced partially without the approval of the trials laboratory and only concerns the tested product which forms the object of the trial.  
It includes 22 pages and 0 appendix.

## GLOBAL CONCLUSION

### ➤ EVALUATION OF THE PERFORMANCE OF MASKS (OR THEIR COMPONENTS) IN NEW CONDITION

Visual inspection	<input checked="" type="checkbox"/> Conform <input type="checkbox"/> Non-conform <input type="checkbox"/> Unrealized
Flange clearance strength test	<input checked="" type="checkbox"/> Conform <input type="checkbox"/> Non-conform <input type="checkbox"/> Unrealized
Testing the filtration efficiency of the material	<input checked="" type="checkbox"/> Conform <input type="checkbox"/> Non-conform <input type="checkbox"/> Unrealized
Respiratory resistance and air permeability test	<input checked="" type="checkbox"/> Conform <input type="checkbox"/> Non-conform <input type="checkbox"/> Unrealized

**Trial results permit to conclude that tested product in accordance with the AFNOR SPEC S76-001 requirement guide is:**

- ☒ **Conform** for a **category I\*** barrier mask.
- ☐ **Conform** for a **category II\*** barrier mask.
- ☐ **Non-conform** for a **category I and II\*** barrier mask.
- ☐ **No compliance to report** as not all of the tests described in the guide were carried out.

\* Warning: Results do not permit a certification or registration to standards NF EN 149, NF EN 14683, or any other standards or regulation.

➤ **EVALUATION OF THE PERFORMANCE OF MASKS (OR THEIR COMPONENTS) AFTER 5 WASHING CYCLES CARRIED OUT BY ICARE**

Visual inspection	<input checked="" type="checkbox"/> Conform <input type="checkbox"/> Non-conform <input type="checkbox"/> Unrealized
Flange clearance strength test	<input checked="" type="checkbox"/> Conform <input type="checkbox"/> Non-conform <input type="checkbox"/> Unrealized
Testing the filtration efficiency of the material	<input checked="" type="checkbox"/> Conform <input type="checkbox"/> Non-conform <input type="checkbox"/> Unrealized
Respiratory resistance and air permeability test	<input checked="" type="checkbox"/> Conform <input type="checkbox"/> Non-conform <input type="checkbox"/> Unrealized

**Trial results permit to conclude that tested product in accordance with the AFNOR SPEC S76-001 requirement guide is:**

- ☒ **Conform** for a **category I\*** barrier mask.
- ☐ **Conform** for a **category II\*** barrier mask.
- ☐ **Non-conform** for a **category I and II\*** barrier mask.
- ☐ **No compliance to report** as not all of the tests described in the guide were carried out.

\* Warning: Results do not permit a certification or registration to standards NF EN 149, NF EN 14683, or any other standards or regulation.

➤ **EVALUATION OF THE PERFORMANCE OF MASKS (OR THEIR COMPONENTS) AFTER 10 WASHING CYCLES CARRIED OUT BY ICARE**

Visual inspection	<input checked="" type="checkbox"/> Conform <input type="checkbox"/> Non-conform <input type="checkbox"/> Unrealized
Flange clearance strength test	<input checked="" type="checkbox"/> Conform <input type="checkbox"/> Non-conform <input type="checkbox"/> Unrealized
Testing the filtration efficiency of the material	<input checked="" type="checkbox"/> Conform <input type="checkbox"/> Non-conform <input type="checkbox"/> Unrealized
Respiratory resistance and air permeability test	<input checked="" type="checkbox"/> Conform <input type="checkbox"/> Non-conform <input type="checkbox"/> Unrealized

**Trial results permit to conclude that tested product in accordance with the AFNOR SPEC S76-001 requirement guide is:**

- ☒ **Conform** for a **category I\*** barrier mask.
- ☐ **Conform** for a **category II\*** barrier mask.
- ☐ **Non-conform** for a **category I and II\*** barrier mask.
- ☐ **No compliance to report** as not all of the tests described in the guide were carried out.

\* Warning: Results do not permit a certification or registration to standards NF EN 149, NF EN 14683, or any other standards or regulation.



# **EVALUATION OF THE PERFORMANCE OF MASKS (OR THEIR COMPONENTS) IN NEW CONDITION**

## I – VISUAL INSPECTION

☐ NON-APPLICABLE

### I.1 – Trial protocol applied

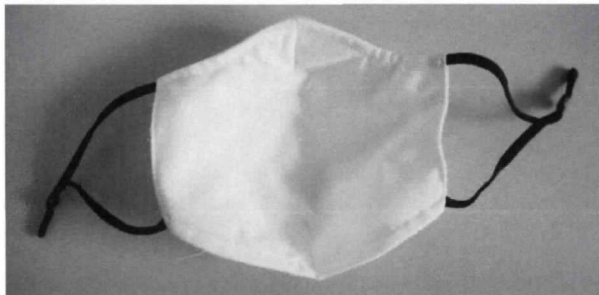

Visual inspection is carried out on a mask, inner face and outer face. On each face, detect any defects identifiable to the naked eye such as: tear, detachment of the flanges, lack of precision of adjustment, absence of flange set, etc.

A photograph of the mask, inner and outer face is carried out to illustrate this observation.

### I.2 – Acceptance criteria

Absence of visual defect identifiable to the naked eye on the inner and outer face.

### I.3 – Results

Inner face of the unfolded mask	Outer face of the unfolded mask
	
Comments: Non-applicable	

### I.4 – Conclusion

☒ The “Visual inspection” test meets the criteria in the guide S76-001 - § 6.1.1.

**Visual inspection: Conform**

☐ The “Visual inspection” test does not meet the criteria in the guide S76-001 - § 6.1.1.

**Visual inspection: Non-conform**

## II – FLANGE CLEARANCE STRENGTH TEST

☐ NON-APPLICABLE

### II.1 – Trial protocol applied

Checking the resistance of the flange set to traction is carried out by putting and removing the barrier mask 5 time by the wearer.

This protocol is applied on three mask samples and by three wearers presenting different face morphologies.

A photograph will be taken if a deterioration is observed following the simulation of 5 mask ports.

### II.2 – Acceptance criteria

No deterioration of the flange set after 5 consecutive mask ports by the three wearers.

### II.3 – Results

	Wearer 1	Wearer 2	Wearer 3
Observation of deterioration	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Comments: Non-applicable			

### II.4 – Conclusion

☒ The “Flange clearance strength test” meets the criteria in the guide S76-001 - § 6.1.2 / § 6.2.3.

**Flange clearance strength test: Conform**

☐ The “Flange clearance strength test” does not meet the criteria in the guide S76-001 - § 6.1.2 / § 6.2.3.

**Flange clearance strength test: Non-conform**

### III – TESTING THE FILTRATION EFFICIENCY OF THE MATERIAL

□ NON-APPLICABLE

#### III.1 – Trial protocol applied

*The following trial protocol is carried out on 2 masks.*

The mask or the component is cut using a template to make two discs of 47 mm diameter. Each of these test pieces is placed in a filter holder receiving a polydisperse aerosol composed of non-viable particles. Aerosol concentrations in the flow through the test piece outwards to inwards shall be measured.

The percentage of 3-µm diameter particles stopped by the test pieces is calculated, for each mask, using the following formula:

$$\text{Efficiency} = \frac{(STd + STf) - (SE1 + SE2)}{(STd + STf)} \times 100$$

*With: STd = Measure of the particles rate of the positive control before trial; STf = Measure of the particles rate of the positive control after trial; SE1 = Measure of the particles rate of the first test piece; SE2 = Measure of the particles rate of the second test piece.*

The final result is the average of the efficiencies obtained for the two masks, calculated using the following formula:

$$\text{Average efficiency} = \frac{\text{Efficiency mask 1} + \text{Efficiency mask 2}}{2}$$

#### III.2 – Acceptance criteria

The filtration efficiency of 3 µm non-viable particles for a **Category I barrier mask must be higher or equal than 90%.**

The filtration efficiency of 3 µm non-viable particles for a **Category II barrier mask must be higher or equal than 70%.**



### **III.3 – Results**

Average result of the filtration efficiency of 3 µm non-viable particles on two masks (in %)	99
Comments: Non-applicable	

### **III.4 – Conclusion**

☒ “Testing the filtration efficiency of the material” meets the criteria in the guide S76-001 - § 6.2.2.

**Testing the filtration efficiency of the material: Conform for a Category I barrier mask**

☐ “Testing the filtration efficiency of the material” meets the criteria in the guide S76-001 - § 6.2.2.

**Testing the filtration efficiency of the material: Conform for a Category II barrier mask**

☐ “Testing the filtration efficiency of the material” does not meet the criteria in the guide S76-001 - § 6.2.2.

**Testing the filtration efficiency of the material: Non-conform**

## IV – RESPIRATORY RESISTANCE AND AIR PERMEABILITY TEST

☐ NON-APPLICABLE

### IV.1 – Trial protocol applied

The following trial protocol is carried out on 5 measures.

A controlled vacuum pump at a speed of 8 L/min draws air through sample holder containing the mask or the material to be tested.

The differential pressure, measured in Pascal (Pa), necessary to draw air at constant flow through a surface of 4.9 cm<sup>2</sup> is measured using a manometer.

The average differential pressure ( $\Delta P$ ) is calculated using the following formula, expressed in mbar/cm<sup>2</sup>:

$$\Delta P = [(\Delta PSE1 + \Delta PSE2 + \Delta PSE3 + \Delta PSE4 + \Delta PSE5) / 5] / 4.9 / 100$$

With:  $\Delta PSE1$  = Differential pressure in Pa of the first measure;  $\Delta PSE2$  = Differential pressure in Pa of the second measure;  $\Delta PSE3$  = Differential pressure in Pa of the third measure;  $\Delta PSE4$  = Differential pressure in Pa of the fourth measure;  $\Delta PSE5$  = Differential pressure in Pa of the fifth measure; 5 = Number of measurements; 4.9 = Sample surface in cm<sup>2</sup>; 100 = conversion ratio in mbar/cm<sup>2</sup>.

### IV.2 – Acceptance criteria

The material used for the barrier mask shall have a differential pressure **lower or equal than 0,6 mbar/cm<sup>2</sup>**.

### IV.3 – Result

Differential pressure (in mbar/cm <sup>2</sup> )	0.5
Comments: Non-applicable	

### IV.4 – Conclusion

☒ The “Respiratory resistance and air permeability test” meets the criteria in the guide S76-001 - §6.2.4.

**Respiratory resistance and air permeability test: Conform**

☐ The “Respiratory resistance and air permeability test” does not meet the criteria in the guide S76-001 - §6.2.4.

**Respiratory resistance and air permeability test: Non-conform**

# **EVALUATION OF THE PERFORMANCE OF MASKS (OR THEIR COMPONENTS) AFTER 5 WASHING CYCLES CARRIED OUT BY ICARE**

## V – VISUAL INSPECTION

☐ NON-APPLICABLE

### V.1 – Trial protocol applied


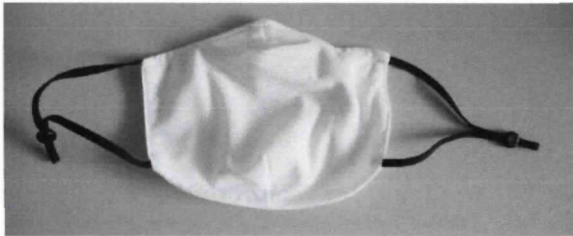
Visual inspection is carried out on a mask, inner face and outer face. On each face, detect any defects identifiable to the naked eye such as: tear, detachment of the flanges, lack of precision of adjustment, absence of flange set, etc.

A photograph of the mask, inner and outer face is carried out to illustrate this observation.

### V.2 – Acceptance criteria

Absence of visual defect identifiable to the naked eye on the inner and outer face.

### V.3 – Results

Inner face of the unfolded mask	Outer face of the unfolded mask
	
Comments: Non-applicable	

### V.4 – Conclusion

☒ The “Visual inspection” test meets the criteria in the guide S76-001 - § 6.1.1.

**Visual inspection: Conform**

☐ The “Visual inspection” test does not meet the criteria in the guide S76-001 - § 6.1.1.

**Visual inspection: Non-conform**



## VI – FLANGE CLEARANCE STRENGTH TEST

☐ **NON-APPLICABLE**

### VI.1 – Trial protocol applied

Checking the resistance of the flange set to traction is carried out by putting and removing the barrier mask 5 time by the wearer.

This protocol is applied on three mask samples and by three wearers presenting different face morphologies.

A photograph will be taken if a deterioration is observed following the simulation of 5 mask ports.

### VI.2 – Acceptance criteria

No deterioration of the flange set after the installation and removal of the mask 5 consecutive times for each of the three wearers.

### VI.3 – Results

	Wearer 1	Wearer 2	Wearer 3
Observation of deterioration	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Comments:	Non-applicable		

### VI.4 – Conclusion

☒ The “Flange clearance strength test” meets the criteria in the guide S76-001 - § 6.1.2 / § 6.2.3.

**Flange clearance strength test: Conform**

☐ The “Flange clearance strength test” does not meet the criteria in the guide S76-001 - § 6.1.2 / § 6.2.3.

**Flange clearance strength test: Non-conform**

## VII – TESTING THE FILTRATION EFFICIENCY OF THE MATERIAL

☐ NON-APPLICABLE

### *VII.1 – Trial protocol applied*

*The following trial protocol is carried out on 1 mask.*

The mask or the component is cut using a template to make two discs of 47 mm diameter. Each of these test pieces is placed in a filter holder receiving a polydisperse aerosol composed of non-viable particles. Aerosol concentrations in the flow through the test piece outwards to inwards shall be measured.

The percentage of 3-µm diameter particles stopped by the test pieces is calculated using the following formula:

$$\text{Efficiency} = \frac{(STd + STf) - (SE1 + SE2)}{(STd + STf)} \times 100$$

*With: STd = Measure of the particles rate of the positive control before trial; STf = Measure of the particles rate of the positive control after trial; SE1 = Measure of the particles rate of the first test piece; SE2 = Measure of the particles rate of the second test piece.*

### *VII.2 – Acceptance criteria*

The filtration efficiency of 3 µm non-viable particles for a **Category I barrier mask must be higher or equal than 90%.**

The filtration efficiency of 3 µm non-viable particles for a **Category II barrier mask must be higher or equal than 70%.**

### ***VII.3 – Result***

Result of the filtration efficiency of 3 µm non-viable particles on the mask (in %)	100
Comments: Non-applicable	

### ***VII.4 – Conclusion***

☒ “Testing the filtration efficiency of the material” meets the criteria in the guide S76-001 - § 6.2.2.

**Testing the filtration efficiency of the material: Conform for a Category I barrier mask**

☐ “Testing the filtration efficiency of the material” meets the criteria in the guide S76-001 - § 6.2.2.

**Testing the filtration efficiency of the material: Conform for a Category II barrier mask**

☐ “Testing the filtration efficiency of the material” does not meet the criteria in the guide S76-001 - § 6.2.2.

**Testing the filtration efficiency of the material: Non-conform**

## VIII – RESPIRATORY RESISTANCE AND AIR PERMEABILITY TEST

☐ NON-APPLICABLE

### VIII.1 – Trial protocol applied

The following trial protocol is carried out on 5 measures.

A controlled vacuum pump at a speed of 8 L/min draws air through sample holder containing the mask or the material to be tested.

The differential pressure, measured in Pascal (Pa), necessary to draw air at constant flow through a surface of 4.9 cm<sup>2</sup> is measured using a manometer.

The average differential pressure ( $\Delta P$ ) is calculated using the following formula, expressed in **mbar/cm<sup>2</sup>**:

$$\Delta P = [(\Delta PSE1 + \Delta PSE2 + \Delta PSE3 + \Delta PSE4 + \Delta PSE5) / 5] / 4.9 / 100$$

With:  $\Delta PSE1$  = Differential pressure in Pa of the first measure;  $\Delta PSE2$  = Differential pressure in Pa of the second measure;  $\Delta PSE3$  = Differential pressure in Pa of the third measure;  $\Delta PSE4$  = Differential pressure in Pa of the fourth measure;  $\Delta PSE5$  = Differential pressure in Pa of the fifth measure; 5 = Number of measurements; 4.9 = Sample surface in cm<sup>2</sup>; 100 = conversion ratio in mbar/cm<sup>2</sup>.

### VIII.2 – Acceptance criteria

The material used for the barrier mask shall have a differential pressure **lower or equal than 0,6 mbar/cm<sup>2</sup>**.

### VIII.3 – Result

Differential pressure (in mbar/cm <sup>2</sup> )	0.5
Comments: Non-applicable	

### VIII.4 – Conclusion

☒ The “Respiratory resistance and air permeability test” meets the criteria in the guide S76-001 - §6.2.4.

**Respiratory resistance and air permeability test: Conform**

☐ The “Respiratory resistance and air permeability test” does not meet the criteria in the guide S76-001 - §6.2.4.

**Respiratory resistance and air permeability test: Non-conform**



# **EVALUATION OF THE PERFORMANCE OF MASKS (OR THEIR COMPONENTS) AFTER 10 WASHING CYCLES CARRIED OUT BY ICARE**

## IX – VISUAL INSPECTION

☐ NON-APPLICABLE

### *V.1 – Trial protocol applied*


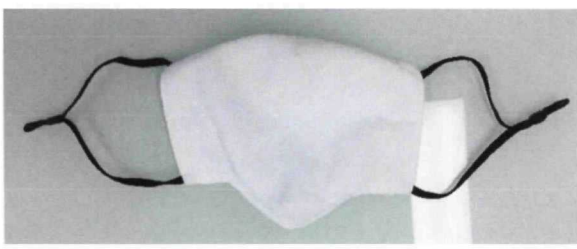
Visual inspection is carried out on a mask, inner face and outer face. On each face, detect any defects identifiable to the naked eye such as: tear, detachment of the flanges, lack of precision of adjustment, absence of flange set, etc.

A photograph of the mask, inner and outer face is carried out to illustrate this observation.

### *V.2 – Acceptance criteria*

Absence of visual defect identifiable to the naked eye on the inner and outer face.

### *V.3 – Results*

Inner face of the unfolded mask	Outer face of the unfolded mask
	
Comments: Non-applicable	

### *V.4 – Conclusion*

☒ The “Visual inspection” test meets the criteria in the guide S76-001 - § 6.1.1.

**Visual inspection: Conform**

☐ The “Visual inspection” test does not meet the criteria in the guide S76-001 - § 6.1.1.

**Visual inspection: Non-conform**

## X – FLANGE CLEARANCE STRENGTH TEST

☐ NON-APPLICABLE

### *VI.1 – Trial protocol applied*

Checking the resistance of the flange set to traction is carried out by putting and removing the barrier mask 5 time by the wearer.

This protocol is applied on three mask samples and by three wearers presenting different face morphologies.

A photograph will be taken if a deterioration is observed following the simulation of 5 mask ports.

### *VI.2 – Acceptance criteria*

No deterioration of the flange set after the installation and removal of the mask 5 consecutive times for each of the three wearers.

### *VI.3 – Results*

	Wearer 1	Wearer 2	Wearer 3
Observation of deterioration	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Comments:	Non-applicable		

### *VI.4 – Conclusion*

☒ The “Flange clearance strength test” meets the criteria in the guide S76-001 - § 6.1.2 / § 6.2.3.

**Flange clearance strength test: Conform**

☐ The “Flange clearance strength test” does not meet the criteria in the guide S76-001 - § 6.1.2 / § 6.2.3.

**Flange clearance strength test: Non-conform**

## XI – TESTING THE FILTRATION EFFICIENCY OF THE MATERIAL

□ NON-APPLICABLE

### VII.1 – Trial protocol applied

*The following trial protocol is carried out on 1 mask.*

The mask or the component is cut using a template to make two discs of 47 mm diameter. Each of these test pieces is placed in a filter holder receiving a polydisperse aerosol composed of non-viable particles. Aerosol concentrations in the flow through the test piece outwards to inwards shall be measured.

The percentage of 3-µm diameter particles stopped by the test pieces is calculated using the following formula:

$$\text{Efficiency} = \frac{(STd + STf) - (SE1 + SE2)}{(STd + STf)} \times 100$$

*With: STd = Measure of the particles rate of the positive control before trial; STf = Measure of the particles rate of the positive control after trial; SE1 = Measure of the particles rate of the first test piece; SE2 = Measure of the particles rate of the second test piece.*

### VII.2 – Acceptance criteria

The filtration efficiency of 3 µm non-viable particles for a **Category I barrier mask must be higher or equal than 90%.**

The filtration efficiency of 3 µm non-viable particles for a **Category II barrier mask must be higher or equal than 70%.**



### ***VII.3 – Result***

Result of the filtration efficiency of 3 µm non-viable particles on the mask (in %)	100
Comments: Non-applicable	

### ***VII.4 – Conclusion***

☒ “Testing the filtration efficiency of the material” meets the criteria in the guide S76-001 - § 6.2.2.

**Testing the filtration efficiency of the material: Conform for a Category I barrier mask**

☐ “Testing the filtration efficiency of the material” meets the criteria in the guide S76-001 - § 6.2.2.

**Testing the filtration efficiency of the material: Conform for a Category II barrier mask**

☐ “Testing the filtration efficiency of the material” does not meet the criteria in the guide S76-001 - § 6.2.2.

**Testing the filtration efficiency of the material: Non-conform**

## XII – RESPIRATORY RESISTANCE AND AIR PERMEABILITY TEST

☐ NON-APPLICABLE

### VIII.1 – Trial protocol applied

The following trial protocol is carried out on 5 measures.

A controlled vacuum pump at a speed of 8 L/min draws air through sample holder containing the mask or the material to be tested.

The differential pressure, measured in Pascal (Pa), necessary to draw air at constant flow through a surface of 4.9 cm<sup>2</sup> is measured using a manometer.

The average differential pressure ( $\Delta P$ ) is calculated using the following formula, expressed in mbar/cm<sup>2</sup>:

$$\Delta P = [(\Delta PSE1 + \Delta PSE2 + \Delta PSE3 + \Delta PSE4 + \Delta PSE5) / 5] / 4.9] / 100$$

With:  $\Delta PSE1$  = Differential pressure in Pa of the first measure;  $\Delta PSE2$  = Differential pressure in Pa of the second measure;  $\Delta PSE3$  = Differential pressure in Pa of the third measure;  $\Delta PSE4$  = Differential pressure in Pa of the fourth measure;  $\Delta PSE5$  = Differential pressure in Pa of the fifth measure; 5 = Number of measurements; 4.9 = Sample surface in cm<sup>2</sup>; 100 = conversion ratio in mbar/cm<sup>2</sup>.

### VIII.2 – Acceptance criteria

The material used for the barrier mask shall have a differential pressure **lower or equal than 0,6 mbar/cm<sup>2</sup>**.

### VIII.3 – Result

Differential pressure (in mbar/cm <sup>2</sup> )	0.5
Comments: Non-applicable	

### VIII.4 – Conclusion

☒ The “Respiratory resistance and air permeability test” meets the criteria in the guide S76-001 - §6.2.4.

**Respiratory resistance and air permeability test: Conform**

☐ The “Respiratory resistance and air permeability test” does not meet the criteria in the guide S76-001 - §6.2.4.

**Respiratory resistance and air permeability test: Non-conform**