Test Report 8860908 Issue 2.

Paftec Australia Pty Ltd

Introduction.

This report has been prepared by Richard Page and relates to the activity detailed below:

Job/Registration Details		Client Details
Job number:	**8860908**	Paftec Australia Pty Ltd
Job type:	Testing Samples Submitted	GF, 16-18 Carlotta Street
Start Date:	31/01/2018	Artarmon
Test type:	Type	New South Wales
Sample ID:	10174891, 10176807, 10176869, 10177538 10177635	2064 Australia
Registration:	**CE 682864**	
Scheme:	PPE CE Pt10	
Protocol:	PP123	
Scheme Mgr:	Nathan Shipley	

The report has been approved for issue by M Mayo – Testing Team Manager

Approved For Issue	
	Issue Date: 20 June 2018

Objectives.

This is an independent Certification Type Test evaluation of the product in accordance with all relevant requirements of the agreed specification to:

BS EN 12941:1998+A2:2008

AS/NZS 1716:2012, Clause 3.2.4.2 Exhalation valve

Product Scope.

BS EN 12941:1998+A2:2008. Respiratory protective devices. Powered filtering devices incorporating a full Facemask, half mask & quarter mask

AS/NZS 1716:2012. Respiratory protective devices

Issue 2 of this report supersedes all previous issues. The amendments on all pages giving rise to this issue can be ascertained by contacting the authorising signatory. This issue includes the additional of testing to AS/NZS 1716:2012 clause 3.2.4.2 Exhalation valve.

Report Summary.

The samples were received on 28 November 2017, 19 February 2018, 26 February 2018, and 9 April 2018. The testing was conducted from 31 January 2018 to 20 April 2018.

As agreed by BSI Product Certification, Clauses 6.10.2 and 6.10.3 are not applicable for this product – as the hose is short and held next to the neck. In the unlikely event of the hose becoming snagged or crushed while in use, the user would be immediately aware. The effective length of hose is less than the width of the circular moving crush test plates required by the standard; therefore the plates would not be able to load the hose. Any severe pulling or crushing of the hose would likely put a high load on the wearer's neck causing discomfort or injury.

The manufacture does not claim a specific Manufactures Minimum Design Flow or a Manufactures Minimum Design Condition, as the unit dynamically adjusts the flow as demanded by the user. As the user breaths in, the pressure within the mask drops. The unit tries to maintain a "target" positive pressure inside the mask by increasing the delivered flow. When the user is not demanding flow (pressure within the mask is at the target pressure) the flow delivered is negligible. The manufacturer has stated that they could not guarantee a minimum condition as under dynamic breathing conditions, the pressure within the mask is dependent on the breathing rate and the lung capacity (work rate) of the user, with the delivered flow continuously altering on demand. Therefore, as requested by BSI Product Certification, all tests in this report were undertaken with production blower unit samples to assess the "as used" performance of the product - Consequently the Manufactures Minimum Design Flow/Condition was not assessed.

The Total Inward Leakage tests were conducted with a walking speed of 6.5kph.

Unless otherwise stated, flowrates and pressures signs (+ and −) are corrected to the flow direction.

The samples submitted complied with the requirements of the test work conducted, subject to the implementation of any corrective actions detailed in this report.

Issue 2 of this report supersedes all previous issues. The amendments on all pages giving rise to this issue can be ascertained by contacting the authorising signatory.

Test Samples.

Sample Id	ER Number	Description
-	10174891	Particulate filters, PAF-3002, TM3
1 - 2	10174891	Half mask, Large
3 - 4	10174891	Half mask, Medium
5 - 6	10174891	Half mask, Small
7 - 8	10174891	Halo blower, Production
9 - 10	10174891	Halo blower, modified peak flow (Not tested)
11 - 14	10174891	Head harness (3D printed), (Not tested)
15 - 18	10174891	Neck support (3D printed), Medium, (Not tested)
19 - 22	10176807	Neck support (Production), Medium
23 - 26	10176869	Head harness (Production, version 1 – with blue padding)
27 - 28	10177635	Head harness (Production, version 2 – with "improved plastic straps (more flexible) with a new fire-resistant grade of elastic, cut with a hot knife and stitched with polyester thread.
29	10177635	Blower, (Production, with "new (longer) flow generator air clips")
30	10177635	Neck support (3D printed), Small

Description of Test Samples.

Sample Description
A ready to use systems consists of: Blower unit, Half mask (small, medium, large), Head harness, Filter, Neck support (optional, depended on fit) Manufacturer's claimed equipment performance:- Device classification: TM3 Minimum design flow rate/condition (MMDF/C): Not stated – Not assessed, see "Report Summary" Minimum design duration: 4.5 hours

Test Requirements.

BS EN 12942:1998+A2:2008

Respiratory protective devices. Powered filtering devices incorporating a helmet or a hood.

CLAUSE	REQUIREMENTS	ASSESSMENT
6	**Requirements**	-
6.1	**Materials**	-
6.1.1	General	Pass
6.1.2	Compatibility with skin	Pass
6.1.3	Cleaning and disinfection	Pass
6.1.4	Surface finish	Pass
6.2	**Resistance to temperature**	Pass
6.3	**Facepiece**	-
6.3.1	General	Pass
6.3.2	Full face masks (other than those complying with EN 136:1998)	N/A (1)
6.3.3	Half masks and quarter masks (other than those complying with EN 140:1998)	-
6.3.3.1	Facepiece connector	Pass
6.3.3.2	Exhalation means	-
6.3.3.2.1	Escape of exhaled air	Pass
6.3.3.2.2	Maintenance and replacements	Pass
6.3.3.2.3	Working orientation	Pass
6.3.3.2.4	Protection from damage	Pass
6.3.3.2.5	Continuous exhalation flow	Pass
6.3.3.2.6	Axially a tensile force	Pass
6.3.3.3	Head harness	Pass
6.3.3.4	Field of Vision	Pass
6.4	**Inward leakage**	-
6.4.1	Power-on	Pass (2)
6.4.2	Power-off	Pass (2)
6.5	**Breathing resistance**	-
6.5.1	General	Pass
6.5.2	Inhalation resistance	Pass (3)
6.5.3	Exhalation resistance	Pass
6.6	**Air supply**	-
6.6.1	Manufacturer's minimum design condition	(4)
6.6.2	Inadvertently switch off air supply	Pass
6.6.3	Inadvertently change air flow	N/A (1)

(1) Not applicable for this product.

(2) All tests performed with "production" blower units, see Report Summary. All tests complied with the TH3 requirements

(3) All tests performed with "production" blower units, see Report Summary.

(4) Tested in accordance with Clause 7.7 "Manufactures minimum design duration". Due to the design of the product, a manufacturer's minimum design condition or flow could be not quoted by the manufacture (see Report Summary). Therefore, the breathing resistance was monitored continuously throughout the durations test. The pressure within the mask remained positive throughout the test, and within the limits established in Clause 6.5.

Test Requirements. (Continued)

BS EN 12942:1998+A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT
6.7	**Checking facilities**	(1)
6.8	**Resistance to clogging**	Pass (2)(3)
6.9	**Electrical components**	N/A (4)
6.10	**Breathing hose**	-
6.10.1	Free head movement	Pass
6.10.2	Resistance to collapse of breathing hose	N/T (5)
6.10.3	Strength of hoses and couplings	N/T (5)
6.11	**Filters**	**-**
6.11.1	Penetration and capacity	-
6.11.1.1	Particle filters	Pass
6.11.1.2	Gas filters	N/A (4)
6.11.1.3	Combined filters	N/A (4)
6.11.2	Filter requirements	-
6.11.2.1	Construction	Pass
6.11.2.2	Materials	Pass
6.11.2.3	Mechanical strength	Pass
6.11.2.4	Protection efficiency / capacity	-
6.11.2.4.1	Particle filters	Pass
6.11.2.4.2	Gas filters type A, B, E, K and combined filters	N/A (4)
6.11.2.4.3	Special filters	N/A (4)
6.11.2.4.4	AX filters	N/A (4)
6.11.2.4.5	SX filters	N/A (4)
6.11.2.4.6	Multiple filters	N/A (4)
6.12	**Noise level**	Pass
6.13	**Carbon dioxide content of the inhalation air (dead space)**	Pass (2)
6.14	**Resistance to flame**	Pass
6.15	**Attachments to the facepiece**	-
6.15.1	Full face mask	N/A (4)
6.15.2	Half mask and quarter mask	N/A (4)

(1) Manufacturer's minimum design condition not stated (see Report Summary). The product has a "Flow rate" check facility to insure the peak flow rate meets the designed requirements for maximum flow, and a "Calibrate" mode to re-calibrate the pressure sensor.

(2) All tests performed with "production" blower units, see Report Summary.

(3) Manufacturer's minimum design condition not stated (see Report Summary). As requested, the filters were loaded with 400mg.h/m3 of dust, and tested to TM3 penetration limits.

(4) Not applicable for this product.

(5) Not tested. As agreed with BSI Product Certification, this test is not applicable for this product.

Test Requirements. (Continued)

BS EN 12942:1998+A2:2008

CLAUSE	REQUIREMENTS (continued)	ASSESSMENT
6.16	**Total mass of device**	Pass
6.17	**Practical performance**	Pass
8	**Marking**	N/A (1)
9	**Information supplied by the manufacturer**	N/A (1)
Appendix A - Test Panel Data		
Product Photographs		

AS/NZS 1716:2012 (outside of our scope of UKAS accreditation)
Respiratory protective devices

CLAUSE	REQUIREMENTS	ASSESSMENT
3.2.4.2	Exhalation valve leakage	Pass

(1) Not requested by BSI Product Certification.

Glossary of Terms.

Pass: Complies. Tested by BSI engineers at BSI laboratories

Pass 1: Complies. Witnessed by BSI engineers in manufacturers laboratory.

Pass 2: Complies. Tests carried out by third party lab; results accepted by BSI.

Pass*: Report resulted in uncertainty and states that Compliance is more probable than non-compliance.

Fail: Non-compliance. Product does not meet the requirements of this clause.

Fail*: Report resulted in uncertainty and states that Non-compliance is more probable than compliance.

N/A: Not applicable to design under consideration.

N/T: Not tested due to similarity to previously tested item; reference earlier test report.

AR: As Received

TC: Temperature Conditioned

SW: Simulated Wear

FT: Flow Tested

MMDF: Manufactures Minimum Design Flow

MMDC: Manufactures Minimum Design Condition

Conditions of Issue.

This Test Report is issued subject to the conditions stated in current issue of 'BSI Terms of Service'. The results contained herein apply only to the particular sample(s) tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of BSI, who reserve the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.

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UKAS TESTING
0135

Opinions and Interpretations expressed herein are outside the scope of our UKAS accreditation.
Unless otherwise stated, any results not obtained from testing in a BSI laboratory are outside the scope of our UKAS accreditation.

Test Results.

BS EN 12942:1998 + A2:2008

Respiratory protective devices - Power assisted filtering devices incorporating full face masks, half masks or quarter masks

CLAUSE	REQUIREMENTS	ASSESSMENT
6.1	**Materials**	
6.1.1	General The device shall be made of suitable materials to withstand normal usage and exposure to those temperatures, humidities and corrosive environments that are likely to be encountered. Test in accordance with clause 7.2 of the standard.	Pass
6.1.2	Compatibility with Skin Materials that can come into contact with the wearer's skin shall not be known to be likely to cause skin irritation or any other adverse effect to health.	Pass
6.1.3	Cleaning and disinfection The materials used in the construction of the device shall withstand the cleaning and disinfection agents and the methods recommended by the manufacturer. Test in accordance with clauses 7.2 and 7.3.5.15 of the standard.	Pass
6.1.4	Surface finish The finish of any part of the device likely to be in contact with the user when donning, doffing or when worn shall be free from sharp edges and burrs. Test in accordance with clause 7.2 of the standard.	Pass
6.2	**Resistance to temperature** After conditioning in accordance with clause 7.1 of the Standard, the complete device excluding filters shall show no appreciable deformation of major components, nor shall these components separate in the complete device. The requirements of clauses 6.3 to 6.10 and 6.12 to 6.17 of the standard shall continue to be met. Test in accordance with clause 7.1 of the standard.	Pass

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT
6.3	**Facepiece**	
6.3.1	General Where the facepiece is fitted with the standard thread connection as defined in EN 148-1:1999 it shall comply with the requirements of EN 136:1998 or EN 140:1998 as appropriate. Additions to the equipment specified by the manufacturer shall not impair the respiratory protective performance of the equipment complying with this European Standard. Where the facepiece is designed solely for use as part of a power-assisted filtering device it shall not be fitted with the standard thread connection to EN 148-1:1999 and shall meet the requirements of clause 6.3.2 or 6.3.3 of EN 136:1998 or EN 140:1998 as appropriate.	Pass
6.3.2	Full face masks (other than those complying with EN 136:1998)	N/A (1)
6.3.3	Half masks and quarter masks (other than those complying with EN 140:1998)	-
6.3.3.1	Facepiece connector All demountable connections shall be readily connected and secured, where possible by hand. Any means of sealing used shall be retained in position when the connection is disconnected during normal maintenance. Testing shall be done in accordance with 7.2. The connection to the half mask or quarter mask shall be leaktight. It shall withstand a tensile force of (50 ± 5) N applied axially, for (10 ± 1) s whilst the facepiece shall be held by the faceblank. Testing shall be done in accordance with 7.8 of EN 140:1998.	Pass See Table A
6.3.3.2	Exhalation means	
6.3.3.2.1	A half mask or quarter mask shall have a means of allowing the escape of exhaled air and, where applicable, any excess air delivered by the air supply.	Pass
6.3.3.2.2	Any exhalation means shall be such that it can be readily maintained and correctly replaced. Testing shall be done in accordance with 7.2.	Pass
6.3.3.2.3	Exhalation means shall function correctly in orientations specified in 7.6.3. Testing shall be done in accordance with 7.6.3.	Pass
6.3.3.2.4	Exhalation means shall be protected against or be resistant to dirt and mechanical damage. It may be shrouded or include any other device that can be necessary to comply with 6.4.	Pass
6.3.3.2.5	Exhalation means shall continue to operate correctly as assessed by the procedures of 7.2, 7.3 and 7.6 after a continuous exhalation flow of (300 ± 15)l/min for a period of (60 ± 6)s	Pass
6.3.3.2.6	The housing of the exhalation means shall be attached to the facepiece such that it can withstand axially a tensile force of (50 ± 5) N for a period of (10 ±1) s.	Pass

Table A: Facepiece connector, EN130:1998 Clause 7.8 – Connector

Facepiece sample	Load applied [N]	Comments
1 AR	50	No visible effect
2 TC	50	No visible effect

(1) Not applicable for this product.

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT
6.3.3.3	Head harness The head harness shall be so designed that the half mask or quarter mask can be donned and removed easily. The head harness shall be adjustable and shall hold the half mask or quarter mask firmly and comfortably in position. Testing shall be done in accordance with 7.2 and 7.4. Each strap shall withstand a tensile force of (50 ± 5) N for (10 ± 1) s in the direction of pulling when the half mask or quarter mask is donned. **Table B:** Head harness	Pass See Table B
6.3.3.4	Field of vision The field of vision is acceptable if determined so in the practical performance test. If comparative testing of the field of vision is carried out the method described in 8.17 of EN 136:1998 shall be used with the complete device.	Pass (See Clause 6.17)

Sample	Load applied [N]	Comments
Harness 24 AR (Mask 1 AR)	50	No visible effect
Harness 26 TC (Mask 2 TC)	50	No visible effect

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT
6.4	**Inward leakage**	
6.4.1	Power-On The device shall be tested at the manufacturer's minimum design condition during which the inward leakage of the test substance for each of the exercises shall not exceed the levels given in the appropriate class from column 4 of Table 1 in the Standard, for each of the ten test subjects. Test in accordance with clause 7.3 of the standard.	Pass (1) See Table C

Table C: Clause 7.3 - Inward leakage, Power on

Test candidate	Blower(1)	Mask	Head harness	Filters	Inward Leakage [%]					
					Stage A	Stage B	Stage C	Stage D	Stage E	Average
SM1	7 AR	5 AR	23 AR	PAF-3002	0.0099	0.0093	0.0100	0.0108	0.0089	0.0098
MM2	8 TC	2 TC	25 TC	PAF-3002	0.0114	0.0123	0.0121	0.0111	0.0132	0.0120
GR1	7 AR	3 AR	27 AR	PAF-3002	0.0006	0.0007	0.0015	0.0014	0.0053	0.0019
RF1	8 TC	6 TC	25 TC	PAF-3002	0.0279	0.0251	0.0237	0.0236	0.0253	0.0251
JS2	7 AR	3 AR	23 AR	PAF-3002	0.0191	0.0187	0.0170	0.0192	0.0180	0.0184
KH1	8 TC	4 TC	25 TC	PAF-3002	0.0186	0.0180	0.0187	0.0224	0.0188	0.0193
DT1	7 AR	3 AR	23 AR	PAF-3002	0.0128	0.0123	0.0115	0.0143	0.0120	0.0126
NM1	8 TC	4 TC	25 TC	PAF-3002	0.0128	0.0123	0.0129	0.0147	0.0154	0.0136
AR1	7 AR	1 AR	23 AR	PAF-3002	0.0172	0.0158	0.0175	0.0268	0.0196	0.0194
JB1	8 TC	4 TC	25 TC	PAF-3002	0.0224	0.0232	0.0206	0.0202	0.0204	0.0214

Stage A: Walking, Stage B: Walking with head moving side to side, Stage C: Walking with head moving up and down, Stage D: Walking and talking, Stage E: Walking.

Power on classification limits: TM1 <5%, TM2 <0.5%, TM3 <0.05%

Test Candidate facial dimensions in Appendix A. Tests conducted with a walking speed of 6.5kph.

6.4.2	Power-Off For three of the ten test subjects and after the power-on test, without removing the device, the inward leakage shall be tested in the power-off state during which the inward leakage shall be not greater than the levels given in the appropriate class from column 5 of Table 1 in the Standard, for each of the three test subjects. Test in accordance with clause 7.3 of the standard.	Pass (1) See Table D

Table D: Clause 7.3 - Inward leakage, Power off

Test candidate	Blower(1)	Mask	Head harness	Filters	Inward Leakage [%]					
					Stage A	Stage B	Stage C	Stage D	Stage E	Average
SM1	7 AR	5 AR	23 AR	PAF-3002	0.0065	0.0049	0.0048	0.0060	0.0049	0.0054
MM2	8 TC	2 TC	25 TC	PAF-3002	0.0181	0.0838	0.0314	0.0211	0.0218	0.0352
GR1	7 AR	3 AR	2 AR	PAF-3002	0.0650	0.0620	0.0756	0.0472	0.0944	0.0688

Stage A: Walking, Stage B: Walking with head moving side to side, Stage C: Walking with head moving up and down, Stage D: Walking and talking, Stage E: Walking.

Power off classification limits: TM1 <5%, TM2 <1%, TM3 <0.1%

Test Candidate facial dimensions in Appendix A. Tests conducted with a walking speed of 6.5kph.

(1) All tests performed with "production" blower units, see Report Summary. All tests complied with the TH3 requirements

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT
6.5	**Breathing Resistance**	
6.5.1	General The breathing resistances as specified in clauses 6.5.2 and 6.5.3 shall be met before and after the clogging test specified in clause 7.9 of the standard.	Pass
6.5.2	Inhalation resistance When tested in accordance with clause 7.6.1 of the standard, the peak inhalation resistance shall not exceed 11 mbar. When tested in accordance with clauses 7.6.2 and 7.6.4 of the standard, the peak inhalation resistance shall not exceed 3.5 mbar.	Pass (1) See Table E, F

Table E: Clause 7.6.1 - Inhalation resistance with power switched off

Blower	Mask	Filter	Flow applied	Pressure [mbar]	
				Limit	Measured
7 AR	5 AR (S)	PAF-3002	20 x 1.5 l/min	< 11.0	5.2
8 TC	2 TC (L)	PAF-3002	20 x 1.5 l/min	< 11.0	4.3

Table F: Clause 7.6.2 - Inhalation resistance with power switched on (1)

Blower (1)	Mask	Filter	Flow applied	Pressure [mbar]	
				Limit	Measured
7 AR	5 AR (S)	PAF-3002	25 x 2.0 l/min	< 3.5	−0.5
8 TC	2 TC (L)	PAF-3002	25 x 2.0 l/min	< 3.5	−0.5

6.5.3	Exhalation resistance When tested in accordance with clause 7.6.3 of the standard, the peak exhalation resistance shall not exceed 7 mbar.	Pass See Table G

Table G: Clause 7.6.3 - Exhalation resistance with power switched on, worst case reported from five orientations

Blower	Mask	Filter	Flow applied	Pressure [mbar]	
				Limit	Measured
7 AR	5 AR (S)	PAF-3002	25 x 2.0 l/min	< 7.0	3.7
8 TC	2 TC (L)	PAF-3002	25 x 2.0 l/min	< 7.0	3.5

(1) All tests performed with "production" blower units, see Report Summary.

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT
6.6	**Air Supply**	
6.6.1	The performance of the complete device shall equal or exceed the performance of the manufacturer's minimum design condition for the manufacturer's stated design duration which shall be not less than 4h. Testing shall be carried out at ambient temperature in accordance with clause 7.7 of the standard. Where the manufacturer's minimum design condition is a manufacturer's minimum design flow rate the determination of the air supply flow rate shall be as given in clause 7.8 of the standard. The flow rate and distribution of the air under the facepiece shall not cause distress to the wearer (for example by excessive local cooling of the head and face or by causing eye irritation) when assessed in accordance with clauses 7.3 and 7.4 of the standard.	(1) See Table H
6.6.2	It shall not be possible to switch off the air supply inadvertently as assessed during the practical performance test.	Pass
6.6.3	If a means is provided to adjust the air supply to give a particular classification, it shall not be possible to change the classification during use. The mechanism which adjusts the flow rate shall simultaneously indicate the appropriate reference to the selected classification (see Table 1 of the Standard) as specified in the manufacturer's information. The mechanism shall be so designed that it is not possible inadvertently to change the air flow. A means for adjusting the air flow during use within a classification may be provided. Test in accordance with clauses 7.2 and 7.4 of the standard.	N/A (2)
6.7	**Checking facilities**	
	A facility shall be provided to check directly or indirectly that the manufacturer's minimum design condition is exceeded prior to each use. The facility shall be tested to ensure that it operates at or in excess of the manufacturer's minimum design condition.	(3)

Table H: Clause 7.7 - Air supply flow rate. Peak maximum and minimum pressure within the mask for stated duration

Blower	Mask	Filters	Flow applied	Stated duration	Pressure within mask [mbar]	
					Maximum	Minimum
7 AR	1 AR	PAF-3002	20 x 1.5 l/min	4.5 hours	+2.2	+0.6
8 TC	2 TC	PAF-3002	20 x 1.5 l/min	4.5 hours	+2.0	+0.4

(1) Tested in accordance with Clause 7.7 "Manufactures minimum design duration". Due to the design of the product, a manufacturer's minimum design condition or flow could be not quoted by the manufacture (see Report Summary). Therefore, the breathing resistance was monitored continuously throughout the durations test. The pressure within the mask remained positive throughout the test, and within the limits established in Clause 6.5.

(2) Not applicable for this product.

(3) Manufacturer's minimum design condition not stated (see Report Summary). The product has a "Flow rate" check facility to insure the peak flow rate meets the designed requirements for maximum flow, and a "Calibrate" mode to re-calibrate the pressure sensor.

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT

6.8 Clogging

Where particle or combined filters (including special filters) are fitted then the device shall be tested for clogging in accordance with clause 7.9 of the standard.

On completion of this test the device shall meet the breathing resistance requirements defined in clause 6.5 of the standard and the performance shall equal or exceed the manufacturer's minimum design condition, and the filter(s) shall meet the appropriate penetration requirements of columns 6 and 7 of Table 1 in the Standard, when tested in accordance with clause 7.14 of the standard at a flow rate that corresponds to the peak value of the interactive flow rate measured in clause 7.12 of the standard.

Pass (1)(2)
See Table:
I, J, K, L, M

Table I: Post clogging, Inhalation breathing resistance, to Clause 7.6.1 - Inhalation resistance with power switched off

Blower	Mask	Filter		Flow applied	Pressure [mbar]	
		Type	ID		Limit	Measured
7 AR	3 AR	PAF-3002, TM3	1	20 x 1.5 l/min	< 11.0	10.7
8 TC	4 TC	PAF-3002, TM3	2	20 x 1.5 l/min	< 11.0	10.4

Table J: Post clogging, Inhalation breathing resistance, to Clause 7.6.2 - Inhalation resistance with power switched on (1)

Blower (1)	Mask	Filter		Flow applied	Pressure [mbar]	
		Type	ID		Limit	Measured
7 AR	3 AR	PAF-3002, TM3	1	25 x 2.0 l/min	< 3.5	−0.4
8 TC	4 TC	PAF-3002, TM3	2	25 x 2.0 l/min	< 3.5	−0.1

Table K: Clause 7.6.3 - Exhalation resistance with power switched on, worst case reported from five orientations (1)

Blower (1)	Mask	Filter		Flow applied	Pressure [mbar]	
		Type	ID		Limit	Measured
7 AR	3 AR	PAF-3002, TM3	1	25 x 2.0 l/min	< 7.0	4.0
8 TC	4 TC	PAF-3002, TM3	2	25 x 2.0 l/min	< 7.0	4.0

Table L: Post clogging, Sodium chloride penetration test

Filter		Flow filter [l/min]	Penetration [%]	
Type	ID		Limit	Measured
PAF-3002, TM3	1	95 (3)	< 0.05	0.000201
PAF-3002, TM3	2	95 (3)	< 0.05	0.000695

Table M: Post clogging, Paraffin oil penetration test

Filter		Flow filter [l/min]	Penetration [%]	
Type	ID		Limit	Measured
PAF-3002, TM3	1	95 (3)	< 0.05	0.0030
PAF-3002, TM3	2	95 (3)	< 0.05	0.0030

(1) All tests performed with "production" blower units, see Report Summary.

(2) Manufacturer's minimum design condition not stated (see Report Summary). As requested, the filters were loaded with 400mg.h/m3 of dust, and tested to TM3 penetration limits

(3) Calculated Peak Interactive Flow Rate when measured in accordance with Clause 7.12 of the standard.

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT
6.9	**Electrical Components**	
	Electrical components shall be so designed that it is not possible inadvertently to reduce or reverse the air flow. Test in accordance with clause 7.4 of the standard. If the device is claimed to be intrinsically safe for use in potentially explosive atmospheres it shall comply with the appropriate requirements of EN 60079-0: 2009 and EN 60079-11: 2007. If the power supply is a battery it shall be a non-spillable type. Protection against the effects of an occurrence of a short circuit shall be provided for the battery. Test in accordance with clause 7.2 of the standard.	N/A (1)
6.10	**Breathing Hose**	
6.10.1	Any breathing hose shall permit free head movement without danger of being caught up as subjectively assessed by test subjects involved in tests in accordance with clauses 7.3 and 7.4.	Pass
6.10.2	When the breathing hose is compressed, the peak inhalation resistance shall not be changed by more than 0.5 mbar and shall not exceed 3.5 mbar. In addition, there shall be no distortion 5 min after removal of the compression load.	N/T (2)
6.10.3	Hoses and couplings shall meet the requirements given in Table 2 of the Standard and shall not become disconnected or visibly damaged. Where multiple hoses are fitted to the device each hose shall meet the requirements given in Table 2 of the Standard. Test in accordance with clause 7.11 of the standard.	N/T (2)

(1) Not applicable for this product.

(2) As agreed by BSI Product Certification, this test is not applicable for this product – as the hose short and held next to the neck, in the unlikely event of the hose becoming snagged or crushed while in use the user would be immediately aware. The effective length of hose is less than the width of the circular moving crush test plates required by the standard; therefore the plates would not be able to load the hose. Any severe pulling or crushing of the hose would likely put a high load on the wearer's neck causing discomfort or injury.

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT
6.11	**Filters**	
6.11.1	Types and classification	
6.11.1.1	Particle filters	
	Powered particle filtering devices shall be classified according to their penetration as given in columns 5 and 6 of Table 1 in the Standard.	
	Three levels are classified and shall be designated: *TMyP*	
	Where *y* is the inward leakage class 1, 2 or 3.	Pass
	The protection provided by a class 2 or a class 3 filter includes that provided by the corresponding filter of lower class or classes.	
6.11.1.2	Gas filters	N/A (1)
6.11.1.3	Combined Filters	N/A (1)
6.11.2	Design and Performance	-
6.11.2.1	Construction	
	The connection between filter(s) and the mating part of the device shall be robust and leak-tight.	
	The connection between filter and the mating part may be achieved by a special type of connection or by a screw thread connection (including threads other than the standard thread).	
	The standard thread is defined in EN 148-1.	Pass
	Filters other than pre-filters shall be designed to be irreversible and shall be readily replaceable without use of special tools.	
	The particle filter of combined filters shall be on the influent side of the gas filter.	
	Test in accordance with clause 7.2 of the standard.	
6.11.2.2	Materials	
	Internally the filter shall withstand corrosion by the filtering media.	
	Material from the filter media released by the air flow through the filter shall not constitute a hazard or nuisance for the wearer.	Pass
6.11.2.3	Mechanical Strength	
	After testing in accordance with clause 7.13 of the standard filters shall show no mechanical defects. After a visual inspection they shall meet the performance requirements given in clause 6.11.2.4 of the standard.	Pass

(1) Not applicable for this product.

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT
6.11.2.4	Protection efficiency / capacity	
6.11.2.4.1	Particle filters When tested in accordance with clause 7.14.1 and 7.14.2 of the standard particle filters shall comply with the requirements given in columns 6, or 6 and 7, of Table 1 in the Standard. Filters for use against solid and liquid aerosols shall be tested against sodium chloride and paraffin oil. Filters only for use against solid and water-based aerosols shall be tested against sodium chloride only. Filters not meeting the requirements after the storage test of EN 13274-7 shall be classified as single shift use only.	Pass See Table: N, O, P, Q

Table N: Maximum sodium chloride penetration

Sample	18 TC MS	12 TC MS	22 TC MS
Flow through filter [l/min]	95 (1)	95 (1)	95 (1)
Elapsed Time [Minutes]	Actual Penetration [%] (Maximum permitted penetration: TM2 <0.5%, TM3 <0.05%)		
5	0.006941 (2)	0.007031 (2)	0.024728 (2)
10	0.004784	0.004367	0.017705
15	0.003291	0.003040	0.012957
20	0.002153	0.002104	0.009328
25	0.001309	0.001304	0.006570
30	0.000918	0.000632	0.004520
Assessment	Pass	Pass	Pass

(1) Calculated Peak Interactive Flow Rate when measured in accordance with Clause 7.12 of the standard.

(2) The readings at five subsequent sampling intervals showed a decline and the testing was terminated without the 120mg exposure limit being reached, as permitted by BS EN 13274-7:2008 Clause 5.3.

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT

6.11.2.4.1 Particle filters (continued)

Table O: Maximum paraffin oil penetration

Sample	33 TC MS	42 TC MS	54 TC MS
Flow through filter [l/min]	95 (1)	95 (1)	95 (1)
Elapsed Time [Minutes]	Actual Penetration [%] (Maximum permitted penetration: TM2 <0.5%, TM3 <0.05%)		
5	0.009	0.010	0.015
10	0.012	0.011	0.015
15	0.011	0.012	0.015
20	0.011	0.010	0.013
25	0.011	0.010	0.013
30	0.011	0.010	0.013
35	0.011	0.010	0.014
40	0.010	0.011	0.016
45	0.015	0.011	0.016
50	0.015	0.011	0.016
55	0.015	0.012	0.016
60	0.015	0.012	0.016
(2)	0.015	0.012	0.016
Assessment	Pass	Pass	Pass

Table P: Sodium chloride penetration, post storage test to EN 13274-7: 2008, Clause 5.4

Samples	Flow filter [l/min]	Penetration [%]	
		Limit	Measured
18 TC MS	95 (1)	< 0.05	0.003314
12 TC MS			0.003188
22 TC MS			0.008832

Table Q: Paraffin oil penetration, post storage test to EN 13274-7: 2008, Clause 5.4

Samples	Flow filter [l/min]	Penetration [%]	
		Limit	Measured
33 TC MS	95 (1)	< 0.05	0.017
42 TC MS			0.015
54 TC MS			0.012

6.11.2.4.2 Gas filters type A, B, E, K and combined filters N/A (3)

6.11.2.4.3 Special filters N/A (3)

6.11.2.4.4 AX filters N/A (3)

6.11.2.4.5 SX filters N/A (3)

6.11.2.4.6 Multiple filters N/A (3)

(1) Calculated Peak Interactive Flow Rate when measured in accordance with Clause 7.12 of the standard.

(2) A loading of 120 mg was achieved after a period of 63 minutes 10 seconds had elapsed.

(3) Not applicable for this product.

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT

6.12 **Noise level**

The noise generated by the device shall not exceed 75 dBA. — Pass

Test in accordance with clause 7.16 of the standard. — See Table R

Table R: Clause 7.16 - Noise level, Worst case recorded

Blower	Mask	Filter	Noise level [dBA]	
			Limit	Measured
7 AR	5 AR	PAF-3002, TM3	< 75	58.0
8 TC	6 TC	PAF-3002, TM3	< 75	60.6

6.13 **Carbon dioxide content of the inhalation air**

When tested in accordance with clause 7.5 of the standard the carbon dioxide content shall not exceed: — Pass (1) See Table S, T

1) an average of 1 % by volume in the "power-on" state;
2) an average of 2 % by volume in the "power-off" state.

Table S: Clause 7.5 - Carbon dioxide content of the inhalation air (dead space), power-on (1)

Blower (1)	Mask	Filter	Flow rate	Carbon dioxide (Inhalation) [%CO_2]	
				Limit	Measured
7 AR	1 AR (L)	PAF-3002, TM3	25 x 2.0 l/min	< 1 %	0.50
	5 AR (S)	PAF-3002, TM3		< 1 %	0.35
8 TC	2 TC (L)	PAF-3002, TM3		< 1 %	0.45
	6 TC (S)	PAF-3002, TM3		< 1 %	0.30

Table T: Clause 7.5 - Carbon dioxide content of the inhalation air (dead space), power-off

Blower	Mask	Filter	Flow rate	Carbon dioxide (Inhalation) [%CO_2]	
				Limit	Measured
7 AR	1 AR (L)	PAF-3002, TM3	20 x 1.5 l/min	< 2 %	1.40
	5 AR (S)	PAF-3002, TM3		< 2 %	1.25
8 TC	2 TC (L)	PAF-3002, TM3		< 2 %	1.45
	6 TC (S)	PAF-3002, TM3		< 2 %	1.30

(1) All tests performed with "production" blower units, see Report Summary.

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT
6.14	**Resistance to flame**	
	No part of the device shall continue to burn after testing in accordance with clause 7.15 of the standard.	Pass
	The device is not required to meet other requirements of this European Standard after being tested in accordance with clause 7.15 of the standard.	See Table U

Table U: Clause 7.15 - Noise level, Worst case recorded

Area exposed	Sample	Comments
Mask: body, airclip, exhalation valve assembly	1 AR	Flame didn't catch
	2 TC	Flame didn't catch
Blower: body (top, bottom, side), breathing hose bellows, Airclip, adjustment strap and button	9 AR	Flame didn't catch
	10 TC	Flame didn't catch
Head harness	27 AR, 28 AR	Flame didn't catch
	25 TC	Flame didn't catch
Exterior of filter	AR	Flame didn't catch
	TC MS	Flame didn't catch

6.15	**Attachment to the facepiece**	
6.15.1	Full face mask	N/A (1)
6.15.2	Half mask and quarter mask	
	The total mass of all attachments (including filters) externally and directly fitted to a half mask or quarter mask and supported by the half mask or quarter mask shall not exceed 300g.	(2)
6.16	**Total mass of device**	
	The total mass of the device shall not be greater than 5 kg of which not more than 1.5kg shall be carried on the head.	Pass See Table V, W

Table V: Clause 6.16 – Total mass of the device, worst case reported

Sample	Mass [kg]	
	Limit	Measured
Mask (large), blower unit with integrated battery and breathing hose, head harness, filter	< 5	0.556

Table W: Clause 6.16 – Total mass carried on the head, worst case reported

Sample	Mass [kg]	
	Limit	Measured
Mask (large), blower unit with integrated battery and breathing hose, head harness, filter	< 1.5	0.556

(1) Not applicable for this product.

(2) As agreed with BSI Product Certification; the attachments (blower unit) are supported by the head harness, not the mask directly.

Test Results. (Continued)

BS EN 12942:1998 + A2:2008

CLAUSE	REQUIREMENTS	ASSESSMENT
6.17	**Practical performance** The device shall undergo practical performance tests under realistic conditions. These general tests serve the purpose of checking the device for imperfections that cannot be determined by the tests described elsewhere in this European Standard. Where, in the opinion of the testing authority, approval is not granted because practical performance tests show the device has imperfections related to the wearers' acceptance, the test laboratory shall describe the tests which revealed these imperfections. This will enable other test houses to duplicate the tests and assess the results thereof. Test in accordance with clause 7.4 of the standard.	Pass See Table X

Table X: Clause 7.4 - Practical performance

Test candidate	Blower	Mask	Head harness	Comments
SM1	8 TC	6 TC	27 AR	None
DK1	7 AR	5 AR	28 AR	None

Test Candidate facial dimensions in Appendix A.

Test Results.

AS/NZS 1716:2012 (outside of our scope of UKAS accreditation)
Respiratory protective devices

CLAUSE	REQUIREMENTS	ASSESSMENT
3.2.4.2	Exhalation valve leakage The exhalation valve or fitting surface of the facepiece shall be sealed to a former and, where appropriate, the inlet air opening of the facepiece sealed. When tested with air at a constant suction head of 250Pa, the leakage into the facepiece from the valve or valves and any leakage as appropriate from around the eyepiece or visor shall not exceed 30 mL/min. During the test, both valve(s) and sealing shall be free of moisture. A typical test arrangement is given in Appendix F of the standard.	Pass See Table Y

Table Y: Valve Leakage, in accordance with AS/NZS 1716:2013, Appendix F

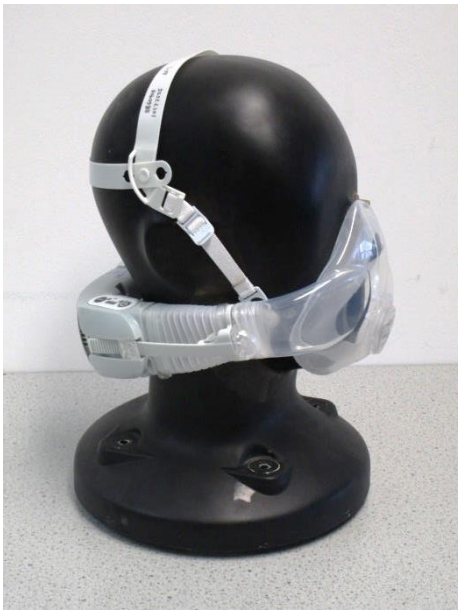
Sample	Valve leakage [ml/min]	
	Limit	Measured
1 AR (Exhalation valve only)	< 30	5
4 TC (Exhalation valve only)	< 30	0

Appendix A – Test Panel Data.

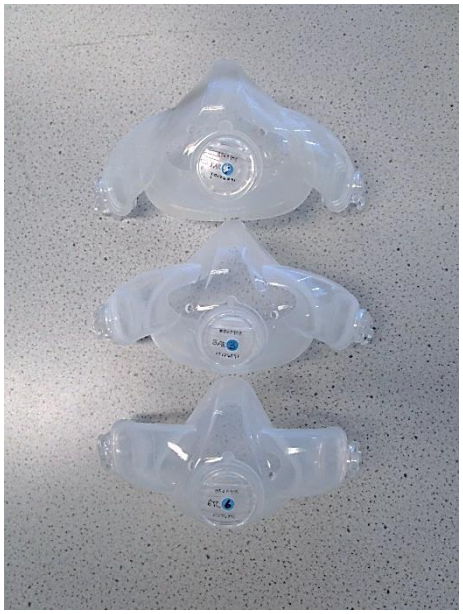
Test candidate	Facial dimensions [mm]					Sex
	Length of face	Width of face	Face depth	Width of mouth	Head Circumference	
AR1	124	154	145	60	598	Male
DK1	103	134	126	55	564	Female
DT1	120	144	130	60	560	Male
JB1	122	146	137	61	570	Male
GR1	132	147	126	48	580	Male
JS2	121	145	132	54	585	Male
KH1	112	142	115	60	585	Male
MM2	124	150	144	50	580	Male
NM1	115	138	120	53	565	Male
RF1	110	135	130	55	560	Male
SM1	110	131	120	50	550	Female

Note: All test candidates were clean shaven.

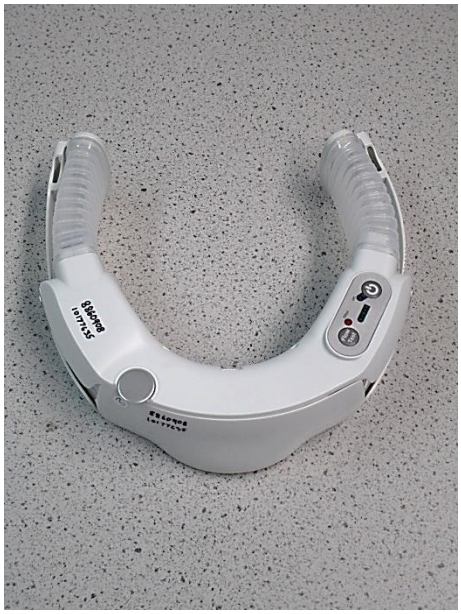
Product photographs.



Fully assembled apparatus

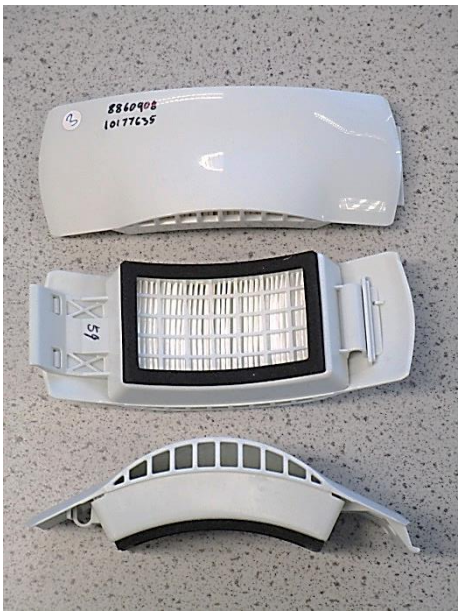
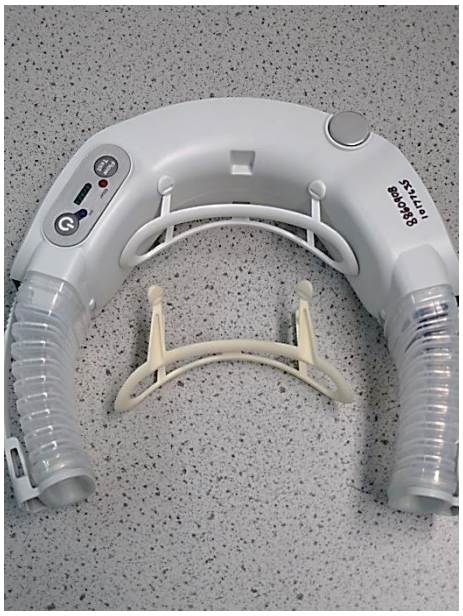
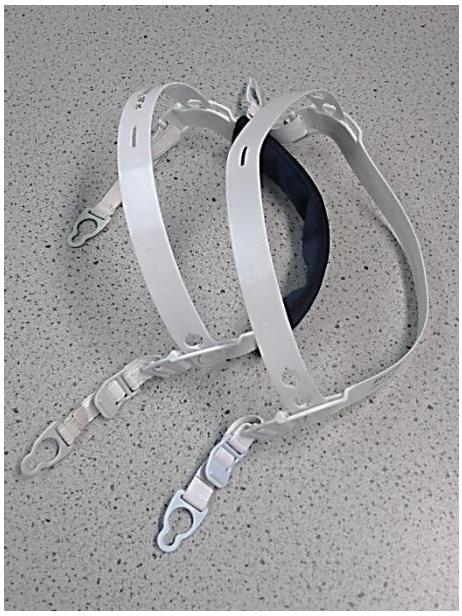
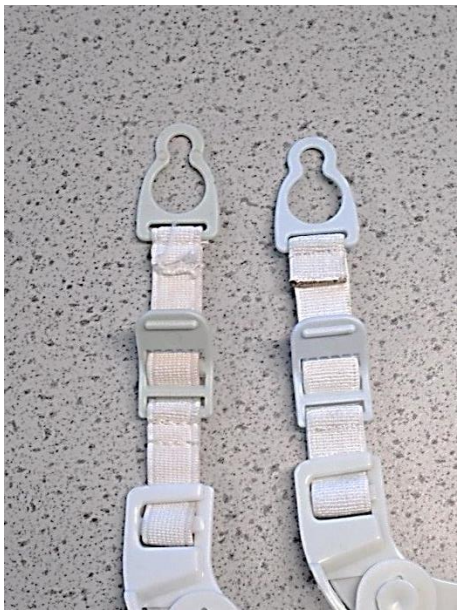


Half face masks
(From top: Large, Medium, Small)



Halo blower unit, with filter fitted

Product photographs. (Continued)

		
PAF-3002 TM3 Filter (From top: outside, inside, bottom view)	Halo blower unit with standard neck support fitted, small neck support inside	Head harness (Version 1 - with blue padding , Version 2 – with different plastic different elastic and polyester thread)
		
Head harness (Version 1 - with blue padding , Version 2 – with different plastic different elastic and polyester thread)		

End of Report