

Protect Your People®



Encapsulating PAPP Protection

Why Choose a PAPR Suit?

- ✔ **Superior protection compared to coveralls**
Although not gas-tight, air-fed PAPR suits maintain a positive pressure inside the suit, so any air-flow (through valves, zipper or other construction elements) is from inside to outside, making ingress of gases or vapours unlikely.
- ✔ **Superior comfort compared to coveralls and gas-tight suits**
Chemical suits are uncomfortable to wear by nature, but PAPR units provide a constant, filtered air flow into the suit, initially to the hood for breathing purposes, and then into the rest of the suit through the semi-permeable neck collar. This gentle, continuous air flow helps regulate temperature and keeps the wearer cooler and more comfortable.
- ✔ **Enhanced mobility**
Unlike suits with remote, attached airlines that limit movement to the length and flexibility of the line, PAPR suits allow greater mobility, enabling the wearer to move freely as needed. With the e-breathe unit's 8 to 10 hour battery life, the wearer has the ultimate in mobility.
- ✔ **Work for longer periods**
Compared to wearing a PAPR hood, use of a full PAPR suit allows longer working periods with greater flexibility whilst maintaining comfort.
- ✔ **Electrostatic-Discharge (ESD)-Safe**
All Lakeland PAPR suit fabrics are certified to the EN 1149 anti-static standard, to ensure the fabric will dissipate electro-static charges without causing harmful ESD*. Additionally, since the battery-operated PAPR unit is worn inside the suit instead of externally, it does not need to be anti-static.

*Note: Static dissipation requires a suitable route to earth

Protect Your People®

Industries and Applications

The combination of a fully mobile encapsulating suit with a constant, filtered air-supply creating positive pressure results in a garment that features both a high comfort level and a high level of protection. Lakeland PAPR garments can be used in a variety of industries including:



Pharmaceutical

The positive pressure created by the constant filtered air supply makes PAPR ideal for protection against the powders and components for manufacture and compounding of pharmaceuticals.

Recommended:
MicroMax® TS PAPR



Nuclear

The primary requirement in nuclear power generation is protection against radiation-contaminated dust. Because PAPR suits are ideal for dust protection they make the perfect choice - especially given the comfort benefits.

Recommended:
MicroMax® TS PAPR



Chemical

ChemMax 1 or ChemMax 3 fabric means a choice of low or high hazard chemical protection. The correct filters will remove vapours from the air supplied into the garment.

Recommended:
ChemMax® 1 PAPR
ChemMax® 3 PAPR
(Depending on chemical)



Biological

All three PAPR options are certified to the EN 14126 biological hazard standard and achieve the highest class in all tests. Full encapsulation means a safer option than a standard coverall - and a greater level of comfort.

Recommended:
MicroMax® TS PAPR
ChemMax® 1 PAPR
ChemMax® 3 PAPR
(Subject to specific hazard)



Emergency Response

All three options are suitable for protection against blood and body-fluids and bio-hazards, and ChemMax 3 features a barrier against many high hazard chemicals and is tested against multiple chemical warfare agents.

ChemMax 3 combined with Permasure® means quick calculation of Safe-Wear Times for over 2400 chemicals!

Recommended:
MicroMax® TS PAPR
ChemMax® 1 PAPR
ChemMax® 3 PAPR
(Subject to specific hazard)

Recommendations above are for guidance only. It is always the users' responsibility to ensure PPE selected will provide the appropriate level and type of protection. In the case of PAPR suits, it is vital to ensure the filter or filters selected for the PAPR unit will provide the filtration required and prevent ingress of the hazardous dust or vapour. If incorrect filters are used the PAPR suit will not protect!

Certification : EN 12941 and Chemical Protective Clothing Standards

EN 12941

Lakeland's Encapsulating PAPR suit is certified for use with the P.M. Atemschutz e-Breathe, e-Flow PAPR unit and certified to Standard EN 12941.

EN 12941 is for certification of powered air purifying filters incorporating a face mask or hood. In this case the whole garment is treated as an 'extended hood', with a key test used to measure inward leakage of particles and gases or vapours. The minimum requirement is an inward leakage of <10%, with higher classifications for inward leakages of <2% and <0.2%.

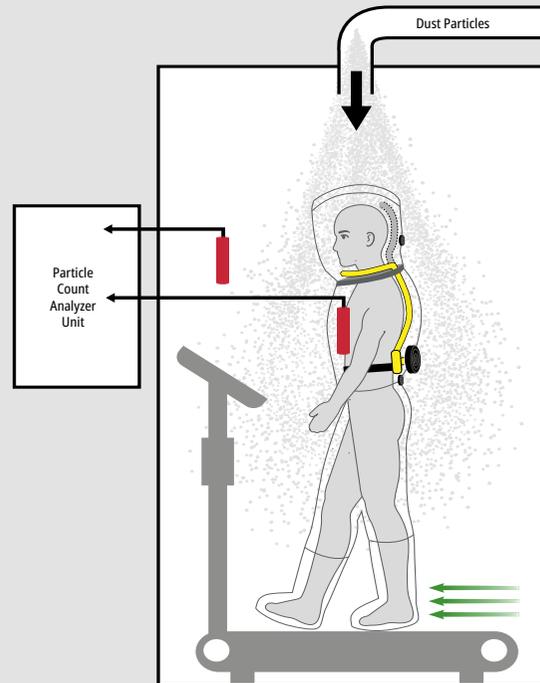
Certification of suits under this standard must be done in conjunction with the specific PAPR unit with which it is designed to be used. Certification therefor does not apply if the suit is used with a different PAPR unit.

Inward leakage tests are conducted with NaCl (Sodium chloride) dust and paraffin mist, using the range of applicable filters on the PAPR unit. Garments are classified as TH1, 2 or 3 according to three performance levels: -

Classification	Inward leakage %
TH1	<10%
TH2	<2%
TH3	0.2%

All Lakeland PAPR suits achieve the highest class TH3 with average Inward Leakage Results well below the required maximum 2%

Inward Leakage Test



How is the Inward Leakage Test Conducted?

1. A test subject wearing the suit walks on a treadmill inside a test cabin.
2. Dust particles are introduced into the cabin.
3. Probes inside and outside the suit measure the challenge particle concentration (the concentration in the cabin) and the penetration concentration (the concentration in the suit).
4. The Inward leakage is the percentage of the challenge concentration that penetrates inside the suit.

Chemical Protective Standards

In addition to EN 12941, garments are also certified to at least one of the following chemical protective clothing standards:



EN 13034: Type 6

Protection against light aerosols liquid sprays



EN 14605: Type 4

Protection against sprays of liquid chemicals



EN 14605: Type 3

Protection against jet sprays of liquid chemicals

Infectious Agent Protection Standard



EN 14126 is the standard for protection against bacteria, viruses and blood borne pathogens. It contains four tests against different forms of contamination. MicroMax® TS, ChemMax® 1 and ChemMax® 3 achieves the highest classes in all four tests.

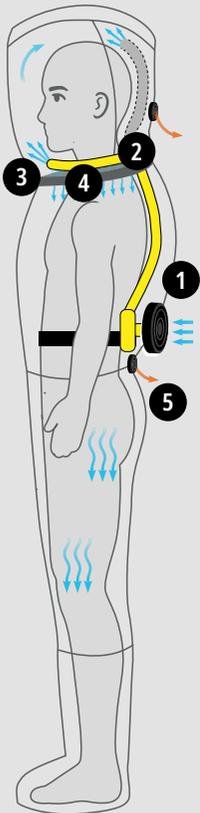
Anti-Static Standard



EN 1149 is the standard for garments that may be used in explosive atmospheres or with flammable liquids and dusts. It requires a minimum fabric surface resistance to allow dissipation of a static charge to earth, avoiding release of potentially dangerous Electrostatic Discharge (ESD). All Lakeland PAPR suits are certified to EN 1149.

How does the PAPR Suit Work?

The PAPR suit works by drawing in air from outside the suit through the correctly chosen filters in the PAPR unit, circulating it first to the hood for breathing purposes, then filtering it to the rest of the suit, creating a small positive pressure, and keeping the wearer cool and comfortable.



1. Secure Fastening

The PAPR unit is fastened to the waist with a belt, providing a secure and convenient placement.

External Filter Connection

The filters are connected through gaskets provided. The PAPR unit remains protected inside the suit, with the control screen accessible through the monitor window.

Purified Air Distribution

Drawing purified air through the filters, the PAPR unit effectively prevents entry of hazards into the suit*.

2. Primary distribution to the hood

The air is channelled first to the hood via the units hose. The hose is held in place by hook and loop straps.

3. Over-head or over-shoulder options

The hose can be positioned either over the head or over the shoulder, depending on user preference.

4. Semi Permeable Collar

The maintenance of breathing air is crucial, and the semi-permeable collar with an adjustable drawstring is designed to keep the primary air supply in the hood before filtering it into the rest of the suit. This feature guarantees that the air supply remains pure and uncontaminated.

5. Effective Ventilation

To ensure effective ventilation, the suit features three one-way valves for exhaling air. Two valves are located at the back of the hood, while the third valve is positioned at the waist, providing efficient and safe airflow.

* Note: It is the users' responsibility to ensure that the correct filters are selected and installed to prevent ingress of the the hazard. If the wrong filters are used the PAPR suit will not protect!

PM Atemschutz e-breathe e-flow PAPR Unit

A tough, flexible, all-rounder!

Over three decades P.M. Atemschutz have become leading experts in respiratory protection and gas warning devices. Based in Mönchengladbach, product design, development and production are maintained in Germany, so users benefit from the confidence of German know-how and engineering. The partnership between Lakeland and P.M. Atemschutz for the new PAPR range of protective clothing combines the expertise of two world-leading PPE manufacturers. The modular e-breathe Powered Air Purifying Respirator is a tough yet flexible all-round option, perfect with Lakeland's PAPR coverall.

- Slim, light, ergonomic, user-friendly design.
- Filter system provides effective protection from gases, vapours and particles, with quick and easy replacement when saturated.
- Modular design with interchangeable filter boxes allows flexible configuration, whether connecting to DIN round filters, an e-breathe ecoPAD filter, or a three-filter system.
- Three-stage adjustable air-flow with 160, 180 and 200L/min settings means flexibility to adjust to working conditions.
- Smart system performs a complete check at switch-on, ongoing monitoring and audible, visual and vibration warning alarms for low volume, full filter, and low battery power.
- The quick-charge Li-ion battery (up to 80% in 1 hour & full charge in 3 hours) has a life of up to 8 to 10 hours.
- Easy-access control screen (visible through the PAPR suit viewing port) displays full range of control data.
- USB interface allows read-out and configuration on a PC or laptop.



Fully flexible modular system with comprehensive filter and accessories range

Fully encapsulating coveralls with visor for use with PAPR (Powered Air Purifying Respirator)

Certified for use with the PM Atemschutz e-breath, e-flow Powered Air Purifying Respirator. Lakeland's PAPR coveralls are available in three versions:

MicroMax® TS

MicroMax® TS fabric uses a high quality 63gsm Microporous PE film laminate providing light, soft and flexible yet highly effective protection against light splashes of hazardous liquids and vapours, infectious agents and hazardous dusts.



EN 13034:
Type 6



EN 14605:
Type 4



EN 14126:
Bio-Hazards



EN 1149:
Anti-Static



Seams:
Stitched & Taped



ChemMax® 1

ChemMax® 1 fabric uses a single layer High Density PE barrier film to offer a light and flexible permeation barrier against a broad range of lower hazard liquid chemical splash and spray along with infectious agents and hazardous dusts.



EN 13034:
Type 6



EN 14605:
Type 4



EN 14605:
Type 3



EN 14126:
Bio-Hazards



EN 1149:
Anti-Static



Seams:
Stitched & Taped



ChemMax® 3

Powered by PermaSURE®

ChemMax® 3 fabric uses a multi-layer high barrier film to offer protection against a wide range of high hazard chemical splash and spray along with infectious agents and hazardous dusts. The co-extrusion production process results in a smooth and flexible surface that allows liquids to quickly drain away.



EN 13034:
Type 6



EN 14605:
Type 4



EN 14605:
Type 3



EN 14126:
Bio-Hazards



EN 1149:
Anti-Static



Seams:
Stitched & Taped



PAPR Suit Key Features & Physical Properties

PAPR Suit Key Features

Lakeland PAPR suits all include a range of standard features that enhance effectiveness, protection and comfort.



Physical Properties

Property	EN Standard	MicroMax® TS PAPR	ChemMax® 1	ChemMax® 3
		CE Class	CE Class	CE Class
Abrasion Resistance	EN 530	2	2	6
Flex Cracking	ISO 7854	6	2	1
Trapezoidal Tear	ISO 9073	2	3	4
Tensile Strength	EN 13934	1	2	3
Puncture Resistance	EN 863	1	2	2
Surface Resistance	EN 1149-1	Pass* ($<2.5 \times 10^9 \Omega$)	Pass* ($<2.5 \times 10^9 \Omega$)	Pass* ($<2.5 \times 10^9 \Omega$)
Seam Strength	EN 13935-2	2	3	4

Inward leakage according to EN 12941 (Clause 7.3)

In this test, a subject walks on a treadmill inside a spray cabin. The cabin is filled with sodium chloride or sodium hexafluoride dust whilst probes inside the suit count the particles in the cabin (the "challenge count") and the particles that penetrate inside the suit. A Total Inward Leakage percentage, the percentage of particles that penetrate inside the garment, is calculated. Three Classifications are defined.

EN 12941 Inward leakage classifications		CE Class	CE Class	CE Class
Classification	Inward Leakage %	MicroMax® TS PAPR	ChemMax® 1	ChemMax® 3
TH1	<10%			
TH2	<2%			
TH3	<0.2%	✓	✓	✓
Actual Inward Leakage Results*		0.05%	0.04%	0.03%

* Average results over all tests conducted on each suit

Infectious Agent / Biological Hazard Protection

Tested according to EN14126. This consists of 4 tests assessing resistance against different forms of pathogen contamination of the fabric only. Protective properties of the whole garment are defined by the chemical protective clothing type. We would always recommend a garment with sealed seams such as MicroMax® TS for protection against infectious agent hazards.

Test Description	Test No.	MicroMax® TS PAPR	ChemMax® 1	ChemMax® 3
Synthetic blood test*	ISO 16603 -class	6 (max is 6)	6 (max is 6)	6 (max is 6)
Protection against blood and body fluids	ISO 16604:2004	6 (max is 6)	6 (max is 6)	6 (max is 6)
Protection against biologically contaminated aerosols	ISO 22611:2003	3 (max is 3)	3 (max is 3)	3 (max is 3)
Protection against dry microbial contact	ISO 22612:2005	3 (max is 3)	3 (max is 3)	3 (max is 3)
Protection against mechanical contact with substances containing contaminated liquids	ISO 22610:2007	6 (max is 6)	6 (max is 6)	6 (max is 6)

The synthetic blood test ISO 16603 is a screening test for ISO 16604, does not carry a classification and should not be used as an indication of protection. The information is included here purely for comparison purposes only.

Choose your combination of e-breathe PAPR Unit Filter and Lakeland PAPR encapsulating suit

Choosing your PAPR + Suit Selection

Combining a Powered Air Purifying Respirator (PAPR) with a fully encapsulating chemical protective coverall results in both more effective protection in areas where hazardous gases, vapours or particulates may be present and in a far more comfortable experience for the wearer.

1

Step 1: Choose your PAPR filters

Select the right combination of filters for the e-breathe PAPR Unit depending on the present hazards.

The e-breathe PAPR unit supports a full range of filters to protect against gases, vapours and particulates. Choice of filter is guided by colour coding, as defined in EN 14387 and according to the hazard, as shown in the table below. Combinations of filters feature multi-colour coding, as in the example shown below:

A - Brown	Organic gases & vapours. Boiling point >65 °C
B - Grey	Inorganic gases & vapours. Chlorine, Hydrogen Sulphide, Hydrogen Cyanide
C - Yellow	Sulphur Dioxide, Hydrogen Chloride
K - Green	Ammonia & organic ammonia derivatives
CP - White	Dry particles

Example: ecoPad Gas Filter
GF-ABEL (Part no 32202143)

Selection of the correct filters is important in ensuring workers are protected. For a full list of filter options see separate datasheet



2

Step 1: Choose your PAPR encapsulating suit



EN 13034:
Type 6



EN 14605:
Type 4



EN 14126:
Bio-Hazards



EN 1149:
Anti-Static



EN 13034:
Type 6



EN 14605:
Type 4



EN 14605:
Type 3



EN 14126:
Bio-Hazards



EN 1149:
Anti-Static



EN 13034:
Type 6



EN 14605:
Type 4



EN 14605:
Type 3



EN 14126:
Bio-Hazards



EN 1149:
Anti-Static



MicroMax .75

Suitable for dry particulate, infectious agents, pharmaceutical, blood and body protection

ChemMax .1

Suitable for lower hazard or lower toxicity chemicals

ChemMax .3
Powered by PermaSURE®

Suitable for high-hazard, highly toxic chemicals and warfare agents

Refer to Permeation Test Data for comparative effectiveness against different specified chemicals. For ChemMax® 3 use PermaSURE to calculate Safe-Wear Times.

PAPR Suit Certification and Applications Guide

EN Certification		MicroMax® TS PAPR	ChemMax® 1 PAPR	ChemMax® 3 PAPR
Chemical Clothing Protection Types	EN 12941 - Hoods with powered air filter respirators	✓	✓	✓
	EN 12941 - Inward Leakage Class for protection against infectious agents, particles & liquid chemicals	TH3 (Inward leakage <0.2%)	TH3 (Inward leakage <0.2%)	TH3 (Inward leakage <0.2%)
	Type 6 - EN 13034 - Light aerosol protection	✓	✓	✓
	Type 5 - EN 13982 - Dry particle protection	✓	✓	✓
	Type 4 - EN 14605 - Liquid Spray Protection	✓	✓	✓
	Type 3 - EN 14605 - Jet Spray Protection		✓	✓
	1. Protection against low hazard liquid and dust penetration	✓	✓	✓
	2. Protection against dusts and liquid chemical permeation	✓	✓	✓
	3. Protection against dusts and high hazard liquid chemical permeation	✓	✓	✓
	Works with PermaSURE® app. * refer to permeation test data or PermaSURE®			✓
Infectious Agent Protection	EN 14126 Certification - EN 14126 Test Classifications:	✓	✓	✓
	ISO 16604 - Resistance to blood borne pathogens (BBP's) (1 to 6 - 6 highest)	Class 6 of 6	Class 6 of 6	Class 6 of 6
	ISO 22610 - Resistance to mechanical contact with liquid (1 to 6 - 6 highest)	Class 6 of 6	Class 6 of 6	Class 6 of 6
	ISO 22611 - Resistance to contaminated aerosols (1 to 3 - 3 highest)	Class 3 of 3	Class 3 of 3	Class 3 of 3
	ISO 22612 - Resistance to Contaminated Particles (1 to 3 - 3 highest)	Class 3 of 3	Class 3 of 3	Class 3 of 3
EN 1149-5 - Surface Resistance < 2.5 x 10 ⁹ according to EN 1149-3	✓	✓	✓	

Applications	MicroMax® TS PAPR	ChemMax® 1 PAPR	ChemMax® 3 PAPR
Protection against hazardous dry particulates	✓ S	✓ O	✓ O
Protection against infectious agents, bacteria, viruses, blood & body fluids	✓ S	✓ O	✓ O
Emergency response to incidents involving medical emergencies	✓ S	✓ O	✓ O
Pharmaceutical manufacture	✓ S	✓ O	✓ O
Protection against liquids under pressure		✓ S	✓ S
Protection against light liquid sprays and splashes	✓ S	✓ O	✓ O
Protection against inorganic, low toxicity chemicals or chemicals at low concentrations *		✓ S	✓ S
Protection against organic chemicals, inorganic chemicals at high concentrations and high toxicity chemicals *			✓ S
Protection against chemical Warfare Agents *			✓ S
Hazardous waste management and handling *		✓ O	✓ S
Hazardous chemical management and handling*		✓ S	✓ S
Emergency Response involving hazardous chemicals *		✓ O	✓ S

S = Suggested / O = Optional

* Where applications involve hazardous chemicals or chemical warfare agents, selection of garment should be subject to permeation resistance data and consideration of toxicity data and level.

Recommendations and suggestions are made as general guidance only and do not imply a guarantee of protection in any specific application or circumstances.

Selection of any protective clothing or PPE should only be made following a comprehensive risk assessment conducted by qualified safety personnel, and considering all the issues and factors that may affect the outcome, including the relative toxicity and nature of any chemical or hazardous substance involved. High hazard chemicals may require a fully gas-tight suit.

Lakeland PAPR suits are not Type 1 gastight and may not provide complete protection against gases and vapours. Gas and vapour protection relies on maintenance of positive pressure inside the suit, so these suits may not be suitable for highly toxic gases and vapours.

PAPR suits rely on breathing air supplied by the PAPR unit, drawing in filtered air from outside the suit. Selection of the correct filters for the hazard is therefore vital in ensuring protection. The suit will not protect if incorrect filters are used.



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