# Breathing Filters, HMEs and HMEFs

# Use of Breathing Filters

Breathing filters provide an effective barrier that prevent cross contamination between patients, respiratory breathing systems, equipment and the clinical environment. Their use is widely recognised as beneficial and is recommended by a number of Anaesthetic Associations[1].

## The threat to patients

Patients who require an artificial airway have their natural physiological protection bypassed. This will increase the risk of cross contamination between patients and healthcare equipment. The cross contamination of patients via an anaesthetic system has been reported, and documented areas of concern regarding infection includes *Hepatitis C*, *Mycobacterium tuberculosis*, blood in sputum and the *SARS* virus.

Critically ill patients are commonly at risk of infection and particularly from Ventilator Associated Pneumonia (V.A.P.). This nosocomial infection increases morbity and potential mortality as well as the cost of treating the patient. The strategic use of an efficient breathing filter will provide an effective barrier between patients, breathing systems and ventilatory equipment.

## Proven efficiency

The Intersurgical range of breathing filters has been designed for the protection of the patient, breathing system and equipment. They have been independently tested and proven to be highly efficient in preventing the passage of bacteria and viruses. Clinically relevant testing is carried out on all products using *Bacillus subtilis* (1.0µm x 0.7µm) and Ø174 bacteriophage, additional testing includes *Mycobacterium tuberculosis* (0.3µm x 1.0µm), *Hepatitis C* (0.03µm) and *MS-2 coliphage* (0.02µm). These tests provide you with clinically relevant information to allow evidence-based decisions to be made on the most appropriate product to meet your clinical requirements.

## Essential requirements

The Intersurgical range of breathing filters offers a choice of electrostatic and pleated mechanical filters with a range of patient connections, providing a choice of products to meet various clinical situations.

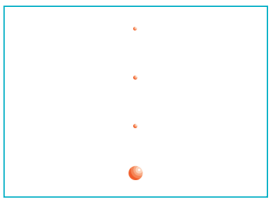
- Independently validated Filtration Efficiency[2]
- Proven filtration against *Mycobacterium tuberculosis* and *Hepatitis C*
- Proven efficiency not affected by anaesthetic agent
- Safe inert material
- Option of patient connections – conveniently packed and ready for use
- Lightweight – reducing patient trauma
- Low compressible volume – reducing rebreathing of $CO_2$
- Low resistance to flow – over 24 hours
- Safe, secure ISO connectors
- Compliance to all relevant international standards

## Filtration efficiency

Filtration performance is determined by independent microbiological testing against clinically relevant bacterial and viral challenges. The level of breakthrough of the challenge determines the efficiency. This efficiency is reported as a percentage based upon this break-through.

| Number of organisms challenging the filter | Number of organisms passing through the filter | Efficiency of the filter |
|---|---|---|
| 100,000 | 1,000 | 99% |
| | 100 | 99.9% |
| | 10 | 99.99% |
| | 1 | 99.999% |

## Potential infectious viruses [Particle sizes µ microns]

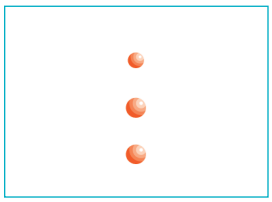


Coliphage T1 **[0.017µ]**

MS-2 coliphage **[0.02µ]**

Hepatitis C **[0.03µ]**

Adenovirus **[0.07µ]**

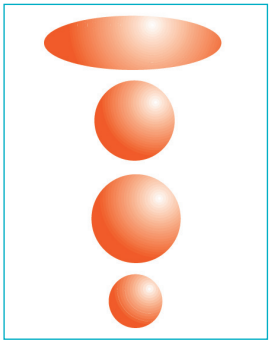


*HIV* **[0.11µ]**

*Cytomegalovirus (CMV)* **[0.1µ]**

*Orthomyxovirus* **[0.1µ]**

## Potential infectious bacteria [Particle sizes µ microns]

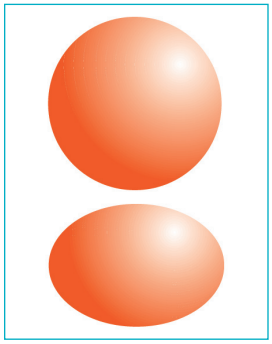


*Mycobacterium tuberculosis* **[0.3µ x 1.0µ smallest size]**

*Serratia marcescens* **[0.45µ]**

*Pseudomonas aeruginosa* **[0.5µ]**

*Brevundimonas diminuta* **[0.3µ]**



*Staphylococcus aureus* **[1.0µ]**

*Bacillus subtilis* **[1.0µ x 0.7µ]**

References

1. Association of Anaesthetists of Great Britain and Ireland 1996. Danish Society of Anaesthetists 1998. French Society of Anaesthetists 1998.

2. All filters are independently validated for filtration efficiency at the Health Protection Agency, Porton Down, Salisbury, Wiltshire, U.K and Nelson Laboratories Inc, USA.

All quoted performance figures are mean values.

## Filta-Guard™ range

### High-efficiency

A dedicated breathing filter designed for use in breathing systems in anaesthesia and intensive care, the high-efficiency Filta-Guard protects the patient, hospital personnel and equipment from potential microbial contamination. The Flow diffuser improves performance and optimises resistance to flow.



| Code | 1944000 | 1944003 | 1944011 |
|---|---|---|---|
| Box Qty. | 70 | 70 | 20 |
| Luer lock port | | ✓ | ✓ |
| Filtration efficiency | >99.999% | >99.999% | >99.999% |
| Resistance to flow at 30L/min | 1.0cm $H_2O$ | 1.0cm $H_2O$ | 1.1cm $H_2O$ |
| Resistance to flow at 60L/min | 2.3cm $H_2O$ | 2.48cm $H_2O$ | 2.8cm $H_2O$ |
| Compressible volume | 67ml | 67ml | 67ml* |
| Weight | 40g | 41g | 54g |
| Connections | 22F-22M/15F | 22F-22M/15F | 22F-22M/15F |
| Minimum tidal volume | >200ml | >200ml | >200ml |
| Accessories | | | Superset™ catheter mount** 3504000 |

## Inter-Guard™ range

### Sterile

The Inter-Guard range of sterile breathing filters is designed for use in breathing systems in the operating theatre and the intensive care unit for the protection of the patient, breathing system and equipment. The perfect combination between size and performance.



| Code | 1344007S Ⓢ | 1344000S Ⓢ | 1344711S Ⓢ |
|---|---|---|---|
| Box Qty. | 50 | 50 | 50 |
| Luer lock port | | ✓ | |
| Filtration efficiency | >99.998% | >99.998% | >99.998% |
| Resistance to flow at 30L/min | 0.8cm $H_2O$ | 0.8cm $H_2O$ | 1.1cm $H_2O$ |
| Resistance to flow at 60L/min | 2.0cm $H_2O$ | 2.0cm $H_2O$ | 2.7cm $H_2O$ |
| Compressible volume | 41ml | 42ml | 42ml* |
| Weight | 22g | 23g | 36g |
| Connectors | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F |
| Minimum tidal volume | >150ml | >150ml | >150ml |
| Accessories | | | Superset™ catheter mount** 3504000 |

Ⓢ Sterile

* Filter only

** Refer to information on catheter mount volumes in Patient Connections.

# Clear-Guard™ range

## Medium efficiency

The Clear-Guard range of breathing filters includes a number of options, all designed for use in breathing and anaesthetic systems for the protection of the patient, hospital personnel and the equipment from potential microbial contamination. Designed with a rounded ergonomic polypropylene housing, the Clear-Guard 3 range represents our most cost-effective filter option, and is available with an integral 90° elbow, reducing the need for an additional catheter mount or separate patient elbow.

The Clear-Guard Midi low volume filter provides a further option with minimum deadspace; ideal for use in anaesthesia.

## Clear-Guard 3




| Code | 1544007 | 1544000 | 1544011 | 1544012 |
|---|---|---|---|---|
| Box Qty. | 150 | 150 | 75 | 75 |
| Luer lock port | | ✓ | ✓ | ✓ |
| Filtration efficiency | >99.99% | >99.99% | >99.99% | >99.99% |
| Resistance to flow at 30L/min | 0.9cm $H_2O$ | 0.9cm $H_2O$ | 0.9cm $H_2O$ | 1.2cm $H_2O$ |
| Resistance to flow at 60L/min | 1.9cm $H_2O$ | 1.9cm $H_2O$ | 2.5cm $H_2O$ | 3.3cm $H_2O$ |
| Compressible volume | 60ml | 60ml | 60ml* | 60ml* |
| Weight | 27g | 28g | 42g | 43g |
| Connectors | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F |
| Minimum tidal volume | >200ml | >200ml | >200ml | >200ml |
| Accessories | | | Superset™ catheter mount** 3504000 | Superset™ catheter mount with fixed elbow** 3502000 |



| Code | 1544197 *NEW* | 1544351 | 1545000 |
|---|---|---|---|
| Box Qty. | 50 | 70 | 75 |
| Luer lock port | ✓ | ✓ | ✓ |
| Filtration efficiency | >99.99% | >99.99% | >99.99% |
| Resistance to flow at 30L/min | 1.0cm $H_2O$ | 1.2cm $H_2O$ | 0.8cm $H_2O$ |
| Resistance to flow at 60L/min | 3.4cm $H_2O$ | 3.6cm $H_2O$ | 2.1cm $H_2O$ |
| Compressible volume | 60ml* | 60ml* | 75ml |
| Weight | 34g | 45g | 34g |
| Connectors | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F |
| Minimum tidal volume | >200ml | >200ml | >225ml |
| Accessories | Fixed elbow 1997000 | Flexible catheter mount with fixed elbow** 3501000 | |

* Filter only

** Refer to information on catheter mount volumes in Patient Connections.

# Clear-Guard™ range

## Clear-Guard Midi




| Code | 1644000 | 1644007 *NEW* | 1644011 | 1644012 |
|---|---|---|---|---|
| Box Qty. | 100 | 100 | 75 | 75 |
| Luer lock port | ✓ | ✓ | ✓ | ✓ |
| Filtration efficiency | >99.9% | >99.9% | >99.9% | >99.9% |
| Resistance to flow at 30L/min | 0.7cm $H_2O$ | 0.7cm $H_2O$ | 0.9cm $H_2O$ | 1.0cm $H_2O$ |
| Resistance to flow at 60L/min | 1.8cm $H_2O$ | 1.8cm $H_2O$ | 2.2cm $H_2O$ | 2.8cm $H_2O$ |
| Compressible volume | 34ml | 34ml | 34ml* | 34ml* |
| Weight | 19g | 19g | 33g | 33g |
| Connectors | 22F-22M/15F | 22F-22M/15F | 22F-22M/15F | 22F-22M/15F |
| Minimum tidal volume | >100ml | >100ml | >100ml | >100ml |
| Accessories | | | Superset™ catheter mount** 3504000 | Superset™ catheter mount with fixed elbow** 3502000 |

## Clear-Guard Midi

| Code | 1644137 |
|---|---|
| Box Qty. | 50 |
| Luer lock port | |
| Filtration efficiency | >99.9% |
| Resistance to flow at 30L/min | 1.0cm $H_2O$ |
| Resistance to flow at 60L/min | 3.0cm $H_2O$ |
| Compressible volume | 34ml* |
| Weight | 25g |
| Connectors | 22F - mouthpiece |
| Minimum tidal volume | >100ml |
| Accessories | mouthpiece |

* Filter only

** Refer to information on catheter mount volumes in Patient Connections.

# Hydro-Guard™ range

## Pleated membrane filter

A versatile, low-volume breathing filter with a pleated mechanical membrane for use in anaesthesia as an HMEF (moisture return: 23mg $H_2O$/L at VT 500ml), or in ITU as a filter only. Available as a sterile option if required.


| Code | 1745000 | 1745011 | 1745012 | 1745197 |
|---|---|---|---|---|
| Box Qty. | 40 | 75 | 75 | 50 |
| Luer lock port | ✓ | ✓ | ✓ | ✓ |
| Filtration efficiency | >99.999% | >99.999% | >99.999% | >99.999% |
| Resistance to flow at 30L/min | 1.3cm $H_2O$ | 1.4cm $H_2O$ | 1.7cm $H_2O$ | 1.6cm $H_2O$ |
| Resistance to flow at 60L/min | 2.9cm $H_2O$ | 3.4cm $H_2O$ | 4.4cm $H_2O$ | 3.9cm $H_2O$ |
| Compressible volume | 63ml | 63ml* | 63ml* | 63ml* |
| Weight | 30g | 44g | 45g | 37g |
| Connectors | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F |
| Minimum tidal volume | >200ml | >200ml | >200ml | >200ml |
| Accessories | | Superset™ catheter mount** 3504000 | Superset™ catheter mount with fixed elbow** 3502000 | fixed elbow** 1997000 |

| Code | 1745711 | 1745180 *NEW* | 1744000S Ⓢ | 1744011S Ⓢ | 1744580S Ⓢ |
|---|---|---|---|---|---|
| Box Qty. | 75 | 50 | 50 | 50 | 50 |
| Luer lock port | ✓ | ✓ | ✓ | ✓ | ✓ |
| Filtration efficiency | >99.999% | >99.999% | >99.999% | >99.999% | >99.999% |
| Resistance to flow at 30L/min | 1.7cm $H_2O$ | 1.5cm $H_2O$ | 1.7cm $H_2O$ | 1.6cm $H_2O$ | 1.73cm $H_2O$ |
| Resistance to flow at 60L/min | 4.4cm $H_2O$ | 3.4cm $H_2O$ | 3.6cm $H_2O$ | 3.2cm $H_2O$ | 4.0cm $H_2O$ |
| Compressible volume | 63ml* | 63ml* | 63ml | 63ml* | 63ml* |
| Weight | 50g | 59g | 36g | 50g | 62g |
| Connectors | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F |
| Minimum tidal volume | >200ml | >200ml | >200ml | >200ml | >200ml |
| Accessories | Superset™ catheter mount with detachable elbow** 3504000 1997000 | Smoothbore catheter mount** 5180000 | | Superset™ catheter mount** 3504000 | Smoothbore catheter mount with double swivel elbow and double flip top cap** 5180001S |

Ⓢ Sterile

* Filter only

** Refer to information on catheter mount volumes in Patient Connections.

# Flo-Guard

## Low-resistance breathing filter for CPAP and bilevel

Flo-Guard provides a combination of filtration performance with low-resistance, ideal for use in both the hospital and the home, where high flow rates may be used, including CPAP, bilevel and cough-assist applications.

**Electrostatic filter media**
Providing an excellent filtration efficiency

**Clear housing**
For good visibility


**Large surface area**
To reduce resistance to flow

**Conical shape**
To aid airflow

| Code | 1690000 |
|---|---|
| Box Qty. | 50 |
| Filtration efficiency | >99.99% |
| Resistance at 30L/min | 0.4 cm $H_2O$ |
| Resistance at 60L/min | 0.8cm $H_2O$ |
| Resistance at 90L/min | 1.4cm $H_2O$ |
| Resistance at 120L/min | 2.0cm $H_2O$ |
| Resistance at 150Lmin | 2.7cm $H_2O$ |
| Resistance at 180L/min | 3.4cm $H_2O$ |
| Resistance at 210L/min | 4.3cm $H_2O$ |
| Resistance at 240L/min | 5.1cm $H_2O$ |
| Compressible volume | 80ml |
| Weight | 27.8g |
| Connectors | 22F-22M |

# Air-Guard™

## For use in respiratory systems and oxygen concentrators

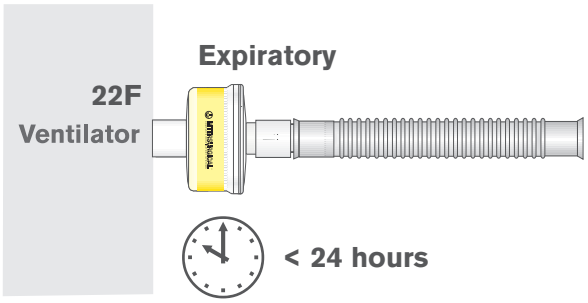
The Intersurgical Air-Guard is a hydrophobic pleated mechanical filter for the protection of oxygen concentrators and other respiratory equipment.

Providing an excellent level ( >99.9999%) of protection against bacterial and viral challenges, the Air-Guard's product performance has been tested, validated and verified at independent microbiological laboratories.

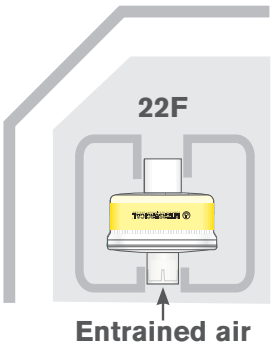
The Air Guard pleated mechanical filter is validated for 24-hours use but this can be extended when used in non-humidified gas flow. The product can be used for extended periods of time for the protection of oxygen concentrators, upon the discretion of the clinician.

**Please note:** This product is contraindicated for use at the patient connection end of the breathing system.

### Respiratory system protection




### Oxygen concentrator protection





| | Air-Guard Clear |
|---|---|
| **Code** | **1790000 (S*)** |
| Box Qty. | 50 (40*) |
| Filtration efficiency | >99.9999% |
| Resistance to flow at 30L/min | 0.9cm $H_2O$ |
| Resistance to flow at 60L/min | 1.9cm $H_2O$ |
| Compressible volume | 120ml |
| Weight | 56g |
| Connectors | 22F-22M/15F |
| Minimum Tidal Volume | >360ml |

Sterile option available

(S*) Add an S to the seven digit code number for the sterile version of this product eg. 5000000S (sterile box quantity is shown in brackets).

# Intersurgical Pulmo-Protect™ lung function filter

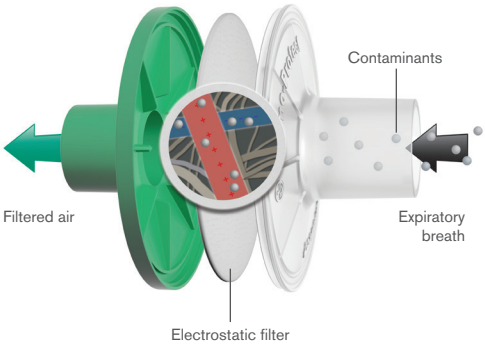
Forced expiratory and inspiratory manoeuvres are used to assess a patient's lung function. This assessment helps diagnose the extent of any disease process in the patient's lung, as a pre and postoperative assessment, during smoking cessation and occupational health programmes.

During these tests patients may generate peak flows as high as 12 L/sec (720 LPM) and expel infective droplets, which could contaminate the pulmonary function test equipment. As a result cross infection between patients is a real risk[1].

Pulmo-Protect combines low resistance with a high bacterial and viral efficiency filter designed specifically to protect the patient and equipment during lung function tests.

## Pulmo-Protect provides:

- Protection of pulmonary function test equipment
- High filtration properties reduces risk of contamination between patients
- Low resistance performance ensures efficacy of results and complies with ATS/ERS recommendations[2]
- Low functional volume
- Microbiological filtration effectiveness has been independently tested and validated to provide >99.99% efficiency against bacteria and viruses[3]
- Flexible, comfortable, disposable mouth piece helps with patient compliance and improve the effectiveness of the test
- Comfortable single patient nose clip prevents patient-to-patient touch contamination
- Device compatible range of colour coded filters available individually or as a complete pulmonary function test kit




## Pulmo-Protect options

| For use with the following test devices | Pulmo-Protect lung function filter | Filter, mouthpiece and nose clip | Filter, flexible mouthpiece and nose clip |
|---|---|---|---|
| | | 1691052 | 1691012 |
| JAEGER®, MasterScreen, SensorMedics®, Vmax™, Micro Medical®, Chest and Microgard® | 1691000 (Qty 50) | 1691050 (Qty 30) | 1691010 (Qty 30) |
| Medisoft, BodyBox, HypAir Compact + and SpiroAir | 1691001 (Qty 50) | 1691051 (Qty 30) | 1691011 (Qty 30) |
| Fukuda Denshi®, SP-350 and Fudac-77 | 1691002 (Qty 50) | 1691052 (Qty 30) | 1691012 (Qty 30) |

## Accessories

| Code | Description | Box Qty. |
|---|---|---|
| 1691020 | Flexible mouthpiece | 10 |
| 1691040 | Nose clip | 35 |

References:

References: 1. Journal of Respiratory Medicine 2005.09.015 An audit into the efficacy of single use bacterial/viral filters for the prevention of equipment contamination during lung function assessment. 2. European Respiratory Journal 2005; 26: 319–338 Standardisation of spirometry M.R. Miller, J. Hankinson, V. Brusasco, F. Burgos, et al. 3. Nelson Labs 771942B.1 4. Nelson Labs 771943B.1

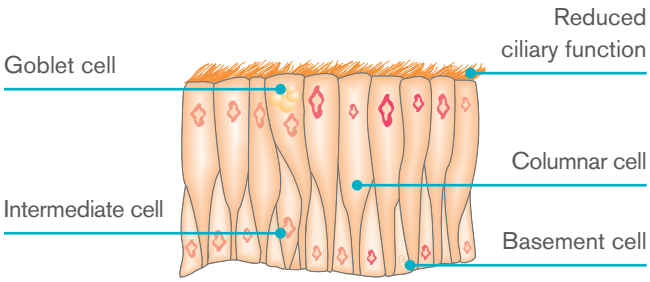
# Heat and Moisture Exchangers (HMEs)

In normal respiration the anatomy of the upper airway helps to warm and humidify inspired air, and to retain the warmth and moisture contained in expired air. During inspiration, even cold or dry air is typically heated to 37 °C and, fully saturated, contains 44mg $H_2O$ per litre. In mechanical ventilation or anaesthesia, the patient's upper airway may be bypassed by the introduction of a tracheal tube. As a result the patient's lungs may be confronted with cold dry inspired gas.

### Prolonged exposure to dry ventilatory gases can lead to:

- Localised inflammation of the trachea
- A reduction in ciliary function
- Retention and thickening of secretions
- Lowering of patient temperature
- Reduction in cardiopulmonary function
- Increased risk of tracheostomy tube occlusion
- Extended duration and cost of care

### Respiratory epithelium adversely affected by heat and moisture loss

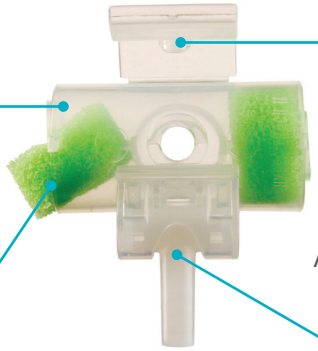



# Hydro-Trach™ T range

A heat and moisture exchanger designed for use on tracheostomised patients, the Hydro-Trach T is an ideal product for prolonged use with spontaneously breathing patients.

### Clear housing
For easy visual inspection of possible secretion build up

### Anti-occlusion mechanism
Allows the HME element to partially dislodge in the event of total occlusion or vigorous cough



### Clipped suctioning port
Allows for easier suctioning without removal of the device

### Small and lightweight
Reduces the pull on the patient connection

### An integral swivel oxygen connector
Allows for connection of the oxygen tube without the need of a separate oxygen adapter, which can be easily folded away when not in use

Video available at www.intersurgical.com

| Code | 1873000 (S*) | 1874000 (S*) |
|---|---|---|
| Box Qty. | 25 (100*) | 40 (30*) |
| Moisture loss | 13.2mg $H_2O$/L | 13.2mg $H_2O$/L |
| Calculated moisture return | 26mg $H_2O$/L | 26mg $H_2O$/L |
| Resistance at 30L/min | 0.2cm $H_2O$ | 0.2cm $H_2O$ |
| Resistance at 60L/min | 0.7cm $H_2O$ | 0.7cm $H_2O$ |
| Compressible volume | 19ml | 19ml |
| Weight | 8g | 8g |
| Connectors | 15F | 15F |
| Minimum tidal volume | >60ml | >60ml |
| Accessories | | 1.8m oxygen tube |

Sterile option available

(S*) Add an S to the seven digit code number for the sterile version of this product

### Average Fi $O_2$ at variable $O_2$ flow rates

| Oxygen (L/min) | Fi $O_2$ at 15 BPM |
|---|---|
| 1 | 26.5% |
| 2 | 32.2% |
| 3 | 35.0% |
| 4 | 38.2% |
| 5 | 41.8% |
| 6 | 44.9% |
| 7 | 47.9% |
| 8 | 50.6% |

## Hydro-Therm™ HME range

A dedicated range of Heat and Moisture Exchangers designed to replicate the functions of the body's upper airway by conserving expired heat and moisture and returning them to the patient during inhalation. The Hydro-Therm is a small volume, lightweight device which is clinically suitable over a wide range of patient sizes.

| Code | 1850000 | 1855000 |
|---|---|---|
| Box Qty. | 20 | 20 |
| Luer lock port | | ✓ |
| Moisture loss | 7.8mg $H_2O$/L | 7.8mg $H_2O$/L |
| Calculated moisture return | 30.8mg $H_2O$/L | 30.8mg $H_2O$/L |
| Resistance at 30L/min | 0.5cm $H_2O$ | 0.5cm $H_2O$ |
| Resistance at 60L/min | 1.6cm $H_2O$ | 1.6cm $H_2O$ |
| Compressible volume | 20ml | 20ml |
| Weight | 11.8g | 11.8g |
| Connectors | 15M-22M/15F | 15M-22M/15F |
| Minimum tidal volume | >60ml | >60ml |

## Hydro-Therm™ 3 HME range

A dedicated range of Heat and Moisture Exchangers designed to replicate the functions of the body's upper airway by conserving expired heat and moisture and returning them to the patient during inhalation. The Hydro-Therm 3 is a large-volume HME with rounded housing for use in anaesthesia and intensive care.

| Code | 1560000 | 1560011 |
|---|---|---|
| Box Qty. | 150 | 100 |
| Luer lock port | ✓ | ✓ |
| Moisture loss | 6.7mg $H_2O$/L | 6.7mg $H_2O$/L |
| Calculated moisture return | 31.6mg $H_2O$/L | 31.6mg $H_2O$/L |
| Resistance at 30L/min | 0.2cm $H_2O$ | 0.3cm $H_2O$ |
| Resistance at 60L/min | 0.8cm $H_2O$ | 1.3cm $H_2O$ |
| Compressible volume | 59ml | 59ml* |
| Weight | 31g | 45g |
| Connectors | 22F/15M-22M/15F | 22F/15M-22F/15M |
| Minimum tidal volume | >200ml | >200ml |
| Accessories | | Superset™ catheter mount** 3504000 |

* HME only

** Refer to information on catheter mount volumes in Patient Connections.

# The Heat and Moisture Exchanging Filters (HMEFs)

The range of Heat and Moisture Exchanging Filters (HMEFs) combines the filtration efficiency of dedicated breathing filters with optimum moisture return provided by the addition of an HME element. Designed for use at the patient connection.

## Filta-Therm™ range

### High efficiency

A high-efficiency HMEF offered with a variety of patient connections. Filta-Therm Plus (1941001) provides the optimum solution for intensive care with improved HME performance and high filtration efficiency.




| Code | 1941001 | 1941000 | 1942000 | 1941011 |
|---|---|---|---|---|
| Box Qty. | 70 | 70 | 70 | 20 |
| Luer lock port | ✓ | ✓ | | ✓ |
| Moisture loss | 8.3mg $H_2O$/L | 9.3mg $H_2O$/L | 9.3mg $H_2O$/L | 9.3mg $H_2O$/L |
| Calculated moisture return | 30.3mg $H_2O$/L | 29.5mg $H_2O$/L | 29.5mg $H_2O$/L | 29.5mg $H_2O$/L |
| Filtration efficiency | >99.999% | >99.999% | >99.999% | >99.999% |
| Resistance at 30L/min | 1.1cm $H_2O$ | 1.0cm $H_2O$ | 1.1cm $H_2O$ | 1.1cm $H_2O$ |
| Resistance at 60L/min | 2.6cm $H_2O$ | 2.4cm $H_2O$ | 2.5cm $H_2O$ | 2.8cm $H_2O$ |
| Compressible volume | 65ml | 65ml | 66ml | 65ml* |
| Weight | 44g | 43g | 42g | 57g |
| Connectors | 22F-22M/15F | 22F-22M/15F | 22F-22M/15F | 22F-22M/15F |
| Minimum tidal volume | >200ml | >200ml | >200ml | >200ml |
| Accessories | | | | Superset™ catheter mount** 3504000 |




| Code | 1941197 | 1941351 | 1906000 | 2015000 |
|---|---|---|---|---|
| Box Qty. | 50 | 20 | 70 | 20 |
| Luer lock port | ✓ | ✓ | ✓ | ✓ |
| Moisture loss | 9.3mg $H_2O$/L | 9.3mg $H_2O$/L | 9.9mg $H_2O$/L | 9.9mg $H_2O$/L |
| Calculated moisture return | 29.5mg $H_2O$/L | 29.5mg $H_2O$/L | 28.9mg $H_2O$/L | 28.9mg $H_2O$/L |
| Filtration efficiency | >99.999% | >99.999% | >99.999% | >99.999% |
| Resistance at 30L/min | 1.4cm $H_2O$ | 1.4cm $H_2O$ | 1.2cm $H_2O$ | 1.2cm $H_2O$ (HMEF only) |
| Resistance at 60L/min | 3.8cm $H_2O$ | 4.0cm $H_2O$ | 2.4cm$H_2O$ | 2.4cm $H_2O$ (HMEF only) |
| Compressible volume | 65ml* | 65ml* | 70ml | 70ml (HMEF only) |
| Weight | 49g | 60g | 45g | 45g (HMEF only) |
| Connectors | 22F-22M/15F | 22F-22M/15F | 22M-22M-22M/15F | 22F-22F-22M/15F |
| Minimum tidal volume | >200ml | >200ml | >210ml | >210ml |
| Accessories | Fixed elbow** 1997000 | Flexible catheter mount with fixed elbow** 3501000 | | Breathing system 1.6m |

* HMEF only

** Refer to information on catheter mount volumes in Patient Connections.

# Inter-Therm™ range

## Sterile

The Inter-Therm range of sterile HMEFs is designed for use in breathing systems in the operating theatre and intensive care unit.

The Inter-Therm includes a wound paper HME media, providing excellent humidification and low resistance properties.

Inter-Therm Mini Angled offers an easy to use option with an integral 90° elbow for paediatrics, reducing the need for an additional catheter mount or separate patient elbow.

**Turbo webs**
Evenly distributes the air flow to ensure all of the filter media is utilised

**Wound paper HME element**
Providing high moisture return


**HME on the patient side**
Ensuring low resistance to flow during use

**Self retaining port cap**
Improving patient safety




| Code | 1341000S Ⓢ | 1341007S Ⓢ | 1341197S Ⓢ | 1341351S Ⓢ |
|---|---|---|---|---|
| Box Qty. | 50 | 50 | 50 | 50 |
| Luer lock port | ✓ | | ✓ | ✓ |
| Moisture loss | 6mg $H_2O$/L | 6mg $H_2O$/L | 6mg $H_2O$/L | 6mg $H_2O$/L |
| Calculated moisture return | 32.3mg $H_2O$/L | 32.3mg $H_2O$/L | 32.3mg $H_2O$/L | 32.3mg $H_2O$/L |
| Filtration efficiency | >99.998% | >99.998% | >99.998% | >99.998% |
| Resistance at 30L/min | 1.6cm $H_2O$ | 1.6cm $H_2O$ | 1.5cm $H_2O$ | 1.7cm $H_2O$ |
| Resistance at 60L/min | 2.7cm $H_2O$ | 2.7cm $H_2O$ | 4.0cm $H_2O$ | 4.6cm $H_2O$ |
| Compressible volume | 57ml | 57ml | 57ml* | 57ml* |
| Weight | 31g | 30g | 38g | 47g |
| Connectors | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F |
| Minimum tidal volume | >180ml | >180ml | >180ml | >180ml |
| Accessories | | | Elbow** 1997000 | Flexible catheter mount with fixed elbow** 3501000 |

Ⓢ Sterile

* HMEF only

** Refer to information on catheter mount volumes in Patient Connections.

## Inter-Therm™ range




| Code | 1341211S Ⓢ | 1341974S Ⓢ | 1341011S Ⓢ | 1341012S Ⓢ |
|---|---|---|---|---|
| Box Qty. | 50 | 50 | 50 | 50 |
| Luer lock port | ✓ | ✓ | ✓ | ✓ |
| Moisture loss | 6mg $H_2O$/L | 6mg $H_2O$/L | 6mg $H_2O$/L | 6mg $H_2O$/L |
| Calculated moisture return | 32.3mg $H_2O$/L | 32.3mg $H_2O$/L | 32.3mg $H_2O$/L | 32.3mg $H_2O$/L |
| Filtration efficiency | >99.998% | >99.998% | >99.998% | >99.998% |
| Resistance at 30L/min | 1.4cm $H_2O$ | 1.6cm $H_2O$ | 1.4cm $H_2O$ | 1.6cm $H_2O$ |
| Resistance at 60L/min | 3.5cm $H_2O$ | 4.4cm $H_2O$ | 3.5cm $H_2O$ | 4.4cm $H_2O$ |
| Compressible volume | 57ml* | 57ml* | 57ml* | 57ml* |
| Weight | 49g | 51g | 45g | 46g |
| Connectors | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F |
| Minimum tidal volume | >180ml | >180ml | >180ml | >180ml |
| Accessories | Superset™ catheter mount and safety cap** 3504000 | Superset™ catheter mount with detachable fixed elbow** 3504000, 1997000 | Superset™ catheter mount** 3504000 | Superset™ catheter mount with fixed elbow** 3502000 |




Inter-Therm™ Mini | Inter-Therm™ Mini | Inter-Therm™ Mini Angled

| Code | 1341580S Ⓢ | 1331000S Ⓢ | 1331197S Ⓢ *NEW* | 1332000S Ⓢ |
|---|---|---|---|---|
| Box Qty. | 50 | 50 | 50 | 50 |
| Luer lock port | ✓ | ✓ | ✓ | ✓ |
| Moisture loss | 6mg $H_2O$/L | 8.4mg $H_2O$/L | 8.4mg $H_2O$/L | 8.5mg $H_2O$/L |
| Calculated moisture return | 32.3mg $H_2O$/L | 30.2mg $H_2O$/L | 30.2mg $H_2O$/L | 30.1mg $H_2O$/L |
| Filtration efficiency | >99.998% | >99.99% | >99.99% | >99.99% |
| Resistance at 30L/min | 1.6cm $H_2O$ | 2.2cm $H_2O$ | 2.6cm $H_2O$ | 2.2cm $H_2O$ |
| Resistance at 60L/min | 3.9cm $H_2O$ | N/A | N/A | N/A |
| Compressible volume | 57ml* | 28ml | 28ml* | 29ml |
| Weight | 58g | 20g | 26g | 19g |
| Connectors | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F | 15M-22M/15F |
| Minimum tidal volume | >180ml | >90ml | >90ml | >90ml |
| Accessories | Smoothbore catheter mount with double swivel elbow and double flip top cap** 5180000 | | Elbow** 1997000 | |

Ⓢ Sterile

* HMEF only

** Refer to information on catheter mount volumes in Patient Connections.

# Clear-Therm™ range

## Clear-Therm 3 and Clear-Therm Angled

HMEF for use in anaesthesia and intensive care with the option of an integral 90° elbow, reducing the need for an additional catheter mount or separate patient elbow.




| Code | 1541000 | 1541011 | 1541012 | 1541197 |
|---|---|---|---|---|
| Box Qty. | 150 | 75 | 75 | 50 |
| Luer lock port | ✓ | ✓ | ✓ | ✓ |
| Moisture loss | 7.8mg $H_2O$/L | 7.8mg $H_2O$/L | 7.8mg $H_2O$/L | 7.8mg $H_2O$/L |
| Calculated moisture return | 30.8mg $H_2O$/L | 30.8mg $H_2O$/L | 30.8mg $H_2O$/L | 30.8mg $H_2O$/L |
| Filtration efficiency | >99.99% | >99.99% | >99.99% | >99.99% |
| Resistance at 30L/min | 0.8cm $H_2O$ | 1.0cm $H_2O$ | 1.2cm $H_2O$ | 1.2cm $H_2O$ |
| Resistance at 60L/min | 2.1cm $H_2O$ | 2.6cm $H_2O$ | 3.4cm $H_2O$ | 3.3cm $H_2O$ |
| Compressible volume | 60ml | 60ml* | 60ml* | 60ml* |
| Weight | 29g | 44g | 45g | 36g |
| Connectors | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F |
| Minimum tidal volume | >200ml | >200ml | >200ml | >200ml |
| Accessories | | Superset™ catheter mount** 3504000 | Superset™ catheter mount with fixed elbow** 3502000 | Fixed elbow** 1997000 |



| Code | 1541351 | 1541974 | 1542000 |
|---|---|---|---|
| Box Qty. | 70 | 40 | 75 |
| Luer lock port | ✓ | ✓ | ✓ |
| Moisture loss | 7.8mg $H_2O$/L | 7.8mg $H_2O$/L | 7.4mg $H_2O$/L |
| Calculated moisture return | 30.8mg $H_2O$/L | 30.8mg $H_2O$/L | 31.1mg $H_2O$/L |
| Filtration efficiency | >99.99% | >99.99% | >99.99% |
| Resistance at 30L/min | 1.3cm $H_2O$ | 1.2cm $H_2O$ | 0.9cm $H_2O$ |
| Resistance at 60L/min | 3.7cm $H_2O$ | 3.5cm $H_2O$ | 2.3cm $H_2O$ |
| Compressible volume | 60ml* | 60ml* | 74ml |
| Weight | 47g | 50g | 38g |
| Connectors | 22F/15M-22M/15F | 22F/15M-22M/15F | 22F/15M-22M/15F |
| Minimum tidal volume | >200ml | >200ml | >225ml |
| Accessories | Flexible catheter mount with fixed elbow** 3501000 | Superset™ catheter mount with detachable fixed elbow** 3504000 + 1997000 | |

* HMEF only

** Refer to information on catheter mount volumes in Patient Connections.

# Clear-Therm™ range

## Clear-Therm Midi

A low volume option for minimising dead space in anaesthesia.



| Code | 1641000 | 1641197 | 1641012 |
|---|---|---|---|
| Box Qty. | 100 | 50 | 75 |
| Luer lock port | ✓ | ✓ | ✓ |
| Moisture loss | 13.3mg $H_2O$/L | 13.3mg $H_2O$/L | 13.3mg $H_2O$/L |
| Calculated moisture return | 25.9mg $H_2O$/L | 25.9mg $H_2O$/L | 25.9mg $H_2O$/L |
| Filtration efficiency | >99.9% | >99.9% | >99.9% |
| Resistance at 30L/min | 0.9cm $H_2O$ | 1.2cm $H_2O$ | 1.2cm $H_2O$ |
| Resistance at 60L/min | 2.1cm $H_2O$ | 3.1cm $H_2O$ | 3.2cm $H_2O$ |
| Compressible volume | 34ml | 34ml* | 34ml* |
| Weight | 19g | 26g | 35g |
| Connectors | 22F-22M/15F | 22F-22M/15F | 22F-22M/15F |
| Minimum tidal volume | >100ml | >100ml | >100ml |
| Accessories | | Fixed elbow** 1997000 | Superset™ catheter mount with fixed elbow** 3504000 + 1997000 |

## Clear-Therm Mini and Micro

For paediatrics and neonates.




| Code | 1831000 | 1831197 | 1441000 | 1441197 |
|---|---|---|---|---|
| | Clear-Therm Mini | Clear-Therm Mini | Clear-Therm Micro | Clear-Therm Micro |
| Box Qty. | 40 | 40 | 20 | 40 |
| Luer lock port | ✓ | ✓ | ✓ | ✓ |
| Moisture loss | 6.8mg $H_2O$/L | 6.8mg $H_2O$/L | 12.3mg $H_2O$/L | 12.3mg $H_2O$/L |
| Calculated moisture return | 31.7mg $H_2O$/L | 31.7mg $H_2O$/L | 26.8mg $H_2O$/L | 26.8mg $H_2O$/L |
| Filtration efficiency | >99.99% | >99.99% | >99.99% | >99.99% |
| Resistance at 30L/min | 1.5cm $H_2O$ | 2.0cm $H_2O$ | N/A | N/A |
| Resistance at 10L/min | N/A | N/A | 1.0cm $H_2O$ | 0.9cm $H_2O$ |
| Compressible volume | 26ml | 26ml* | 11ml | 11ml* |
| Weight | 22g | 29g | 11g | 19g |
| Connectors | 22F/15M-22M/15F | 22F/15M-22M/15F | 15M-15F | 15M -22m/15F |
| Minimum tidal volume | >90ml | >90ml | >35ml | >35ml |
| Accessories | | Fixed elbow** 1997000 | | Fixed elbow** 1997000 |

* HMEF only

** Refer to information on catheter mount volumes in Patient Connections.