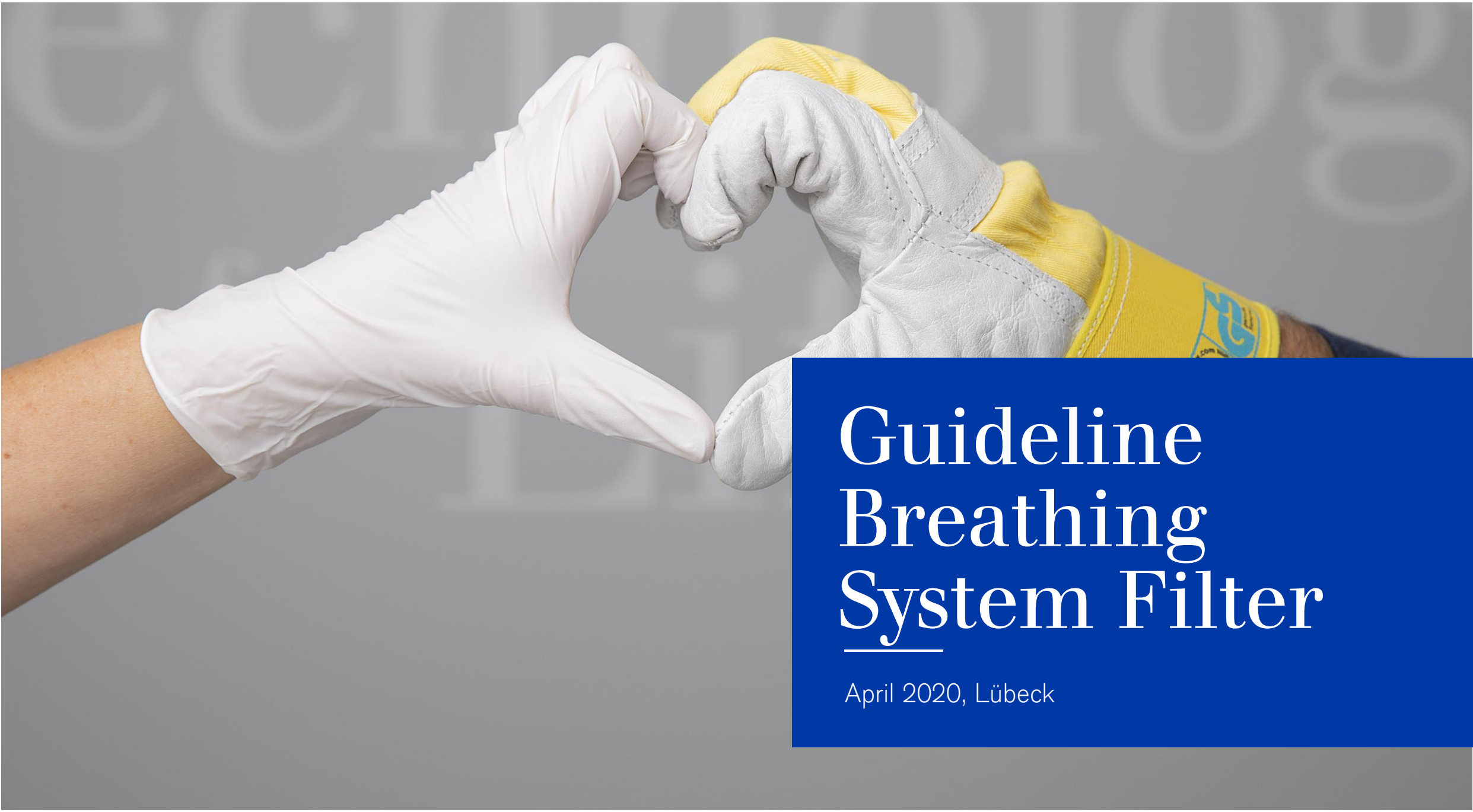


Dräger



Guideline Breathing System Filter

April 2020, Lübeck

Mechanical vs. Electrostatic Filter

Mechanical Filter

- Highly hydrophobic medium will not allow water to pass the membrane
- Optimal filtration performance due to highly efficient pleated glass fiber based filtration medium
- Higher resistance due to tightly woven filter medium
- Higher dead space due to the minimum required filtration area

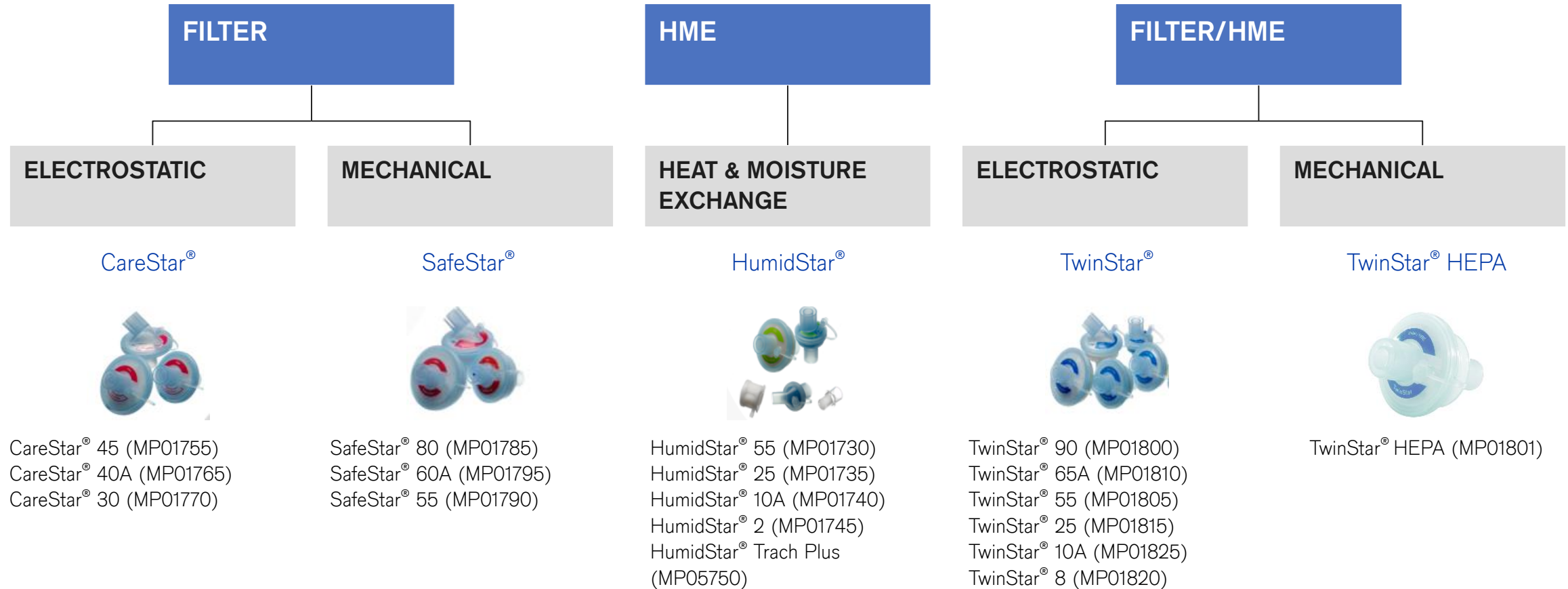
Electrostatic Filter

- Good filtration performance but only in the systems without humidification caused by a humidifier or the chemical reaction in Soda Lime during Anesthesia
- Lower resistance due to loosely woven filtration medium

Heat and Moisture Exchanger (HME)

- Available with mechanical / electrostatic filtration medium or without bacterial filtration
- Alternative for active humidification

Overview Breathing System Filter & HME



NOTE: The number indicates the dead space, DEHP & PVC free, "A" indicates Angled port, "HME" means Heat & Moisture Exchange filter, "Trach" means Tracheostomy
 Shelf life: 3 years (TwinStar®, CareStar®), 5 years (SafeStar®, HumidStar®), Maximum Duration of use = 24hrs (Single Patient Use)

Overview Expiratory Valves & compatible Expiratory Heated Filter

	Evita® Infinity V500	Evita® V300	Savina®	Savina® 300	Babylog® VN500	Babylog® 8000 Plus
Reusable	8416750 P A Expiratory valve for Evita Infinity® V500, reusable EHF	8416750 P A Expiratory valve for Evita Infinity® V500, reusable EHF	8413660 P A Expiratory valve for Savina®, reusable EHF	8417050 P A Expiratory valve for Savina® 300, reusable EHF	8415270 N P Expiratory valve for Babylog® VN 500, reusable EHF	8408950 N P Expiratory valve for Babylog® 8000 Plus, reusable EHF
	8415270 N P Expiratory valve for Babylog® VN 500, reusable EHF	8415270 N P Expiratory valve for Babylog® VN 500, reusable EHF				
Disposable	MP01060 P A Disposable RFID expiratory valve EHF	MP01060 P A Disposable RFID expiratory valve EHF	MP01060 P A Disposable RFID expiratory valve EHF	MP01060 P A Disposable RFID expiratory valve EHF		
	MP01061 P A Expiratory valve (single use) EHF	MP01061 P A Expiratory valve (single use) EHF	MP01061 P A Expiratory valve (single use) EHF	MP01061 P A Expiratory valve (single use) EHF		

Neonatal

Pediatric

Adult

Expiratory Heated Filter

For more details see IFU or PI
 Not all articles are available worldwide



EHF = Expiratory Heated Filter
 - Infinity ID Expiratory Filter (MP01780)
 - Expiratory Filter (MP01781)
 NOTE: The Expiratory Heated Filter have a Maximum Duration of Use of 7 days.

Filtration Efficiency

	Bacterial retention*	Viral retention**	NaCl retention***
CareStar® 45 (MP01755)	≥ 99.9999%	≥ 99.9999%	≥ 98.5%
CareStar® 40A (MP01765)	≥ 99.9999%	≥ 99.9999%	≥ 98.1%
CareStar® 30 (MP01770)	≥ 99.99%	≥ 99.99%	≥ 95.3%
SafeStar® 80 (MP01785)	≥ 99.9999%	≥ 99.9999%	≥ 99.99%
SafeStar® 55 (MP01790)	≥ 99.9999%	≥ 99.9999%	≥ 99.97%
SafeStar® 60A (MP01795)	≥ 99.9999%	≥ 99.9999%	≥ 99.98%
TwinStar® 90 (MP01800)	≥ 99.999%	≥ 99.999%	≥ 97.8%
TwinStar® HEPA**** (MP01801)	≥ 99.999%	≥ 99.9999%	≥ 99.8%
TwinStar® 55 (MP01805)	≥ 99.999%	≥ 99.99%	≥ 95.1%
TwinStar® 65A (MP01810)	≥ 99.999%	≥ 99.99%	≥ 97.3%
TwinStar® 25 (MP01815)	≥ 99.999%	≥ 99.99%	≥ 98.0%
TwinStar® 8 (MP01820)	≥ 99.9%	≥ 99.9%	≥ 79.1%
TwinStar® 10A (MP01825)	≥ 99.9%	≥ 99.9%	≥ 79.1%
Infinity ID Expiratory Filter**** (MP01780)	≥ 99.9999%	≥ 99.9999%	-
Expiratory Filter**** (MP01781)	≥ 99.9999%	≥ 99.9999%	-

* BFE

According to Nelson Laboratories, Inc. Salt Lake City, USA. The mean particle size (MPS) of the challenge aerosol must be maintained at $3.0 \pm 0.3 \mu\text{m}$. The average percent bacterial filtration efficiency (%BFE) for the reference material must be within the upper and lower control limits established for the BFE test.

** VFE

According to Nelson Laboratories, Inc. Salt Lake City, USA. The mean particle size (MPS) of the challenge aerosol must be maintained at $3.0 \pm 0.3 \mu\text{m}$. The average percent virus filtration efficiency (%VFE) for the reference material must be within the upper and lower control limits established for the VFE test.

*** NaCl

According to Nelson Laboratories, Inc. Salt Lake City, USA. The filter tester produces a particle size distribution with a count median diameter of $0.075 \pm 0.02 \mu\text{m}$ and a standard geometric deviation not exceeding $1.86 \mu\text{m}$ as determined with a scanning mobility particle sizer (SMPS).

**** HEPA

HEPA filter class H13 according to DIN EN 1822-1:1998 / DIN EN 1822-1:2011 at $0.1 \mu\text{m}$. Our SafeStar® filter are designed with the same filtration medium as our TwinStar® HEPA.

FAQ regarding SARS COV-2

What specification is the minimum required in a breathing circuit filter (HMEF or Filter only) to prevent passage of the SARS COV-2 virus?

It always **depends on the application**. Generally, **mechanical filters** (like SafeStar® or TwinStar® HEPA) are **always safer** because they are less sensitive against humidity and they do have a really good filtration efficiency in their Most Penetrating Particle Size (MPPS). MPPS means: The filtration efficiency acts like parabola at its minimum most particles pass through.

- MPPS of **electrostatic filtration medium ~ 0.04-0.08 µm** (the filtration efficiency could be $\leq 99\%$)
- MPPS of **mechanical filtration medium ~ 0.2 µm** (the filtration efficiency should still be $\geq 99\%$)

On the other hand, the tightly woven glass fiber based filtration medium requires a minimum filtration area for optimal filtration efficiency. This leads to relatively higher resistance as well as higher dead space which is not recommended for pediatric or neonatal patients at the Y-piece.

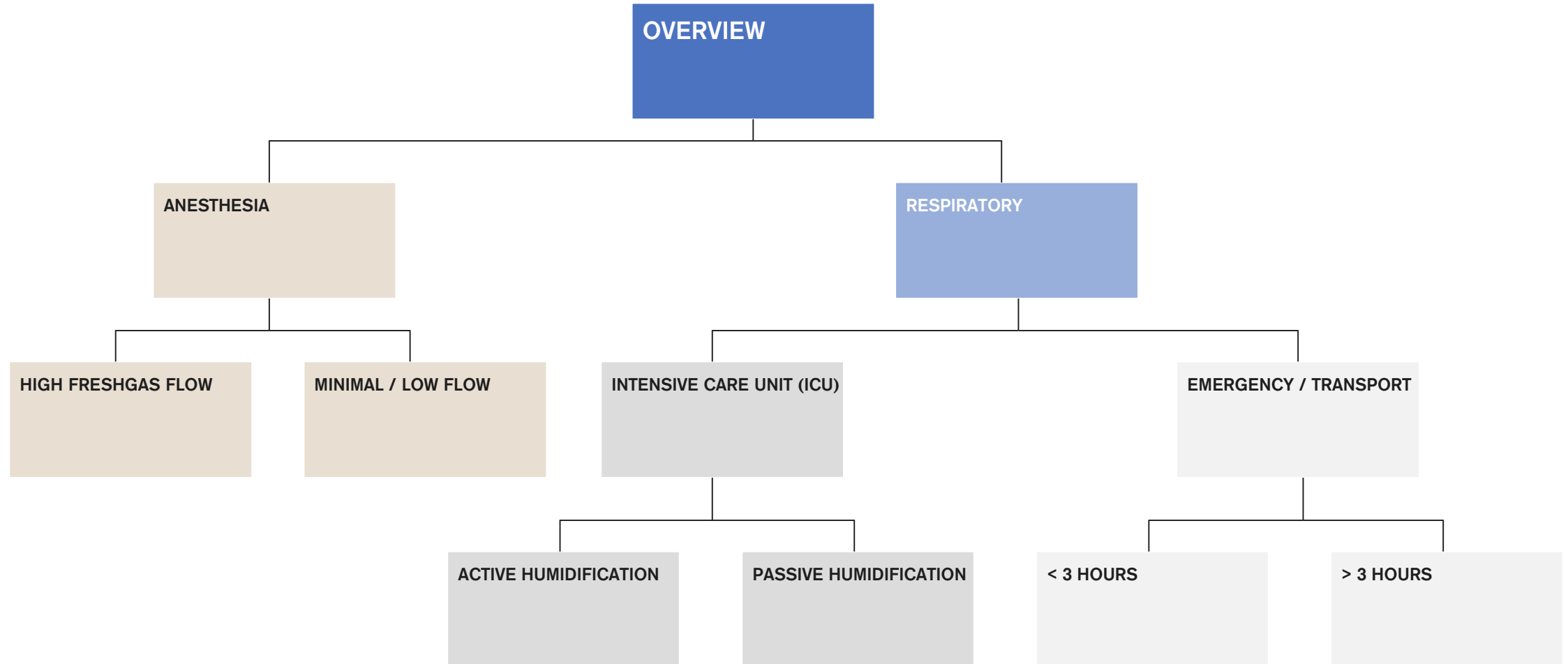
Are the differences ($\geq 99,9\%$ or $\geq 99,99\%$ or $\geq 99,999\%$) important when trying to protect patients from the SARS COV-2 virus?

Since no filter can promise 100% efficiency, there remains **always a small risk of cross contamination**. For enhanced safety, there is sometimes the opportunity **to place a mechanical filter at the y-piece as well as the expiratory valve/port**.

Exceptions:

- Mechanical filters are only allowed at the expiratory valve (never place it at the Y-piece), if the patient is a neonate or child. This is due to the dead space of the product. Smaller mechanical filters are so far not possible to produce because the area of the filtration medium is decisive for the filtration efficiency.
- No filter is allowed at the Y-piece during active humidification in the ICU because the resistance would increase and the patient would not receive enough humidity.
- More information regarding the set-up and warnings could be found in the corresponding Instruction for Use.

Overview Application Areas

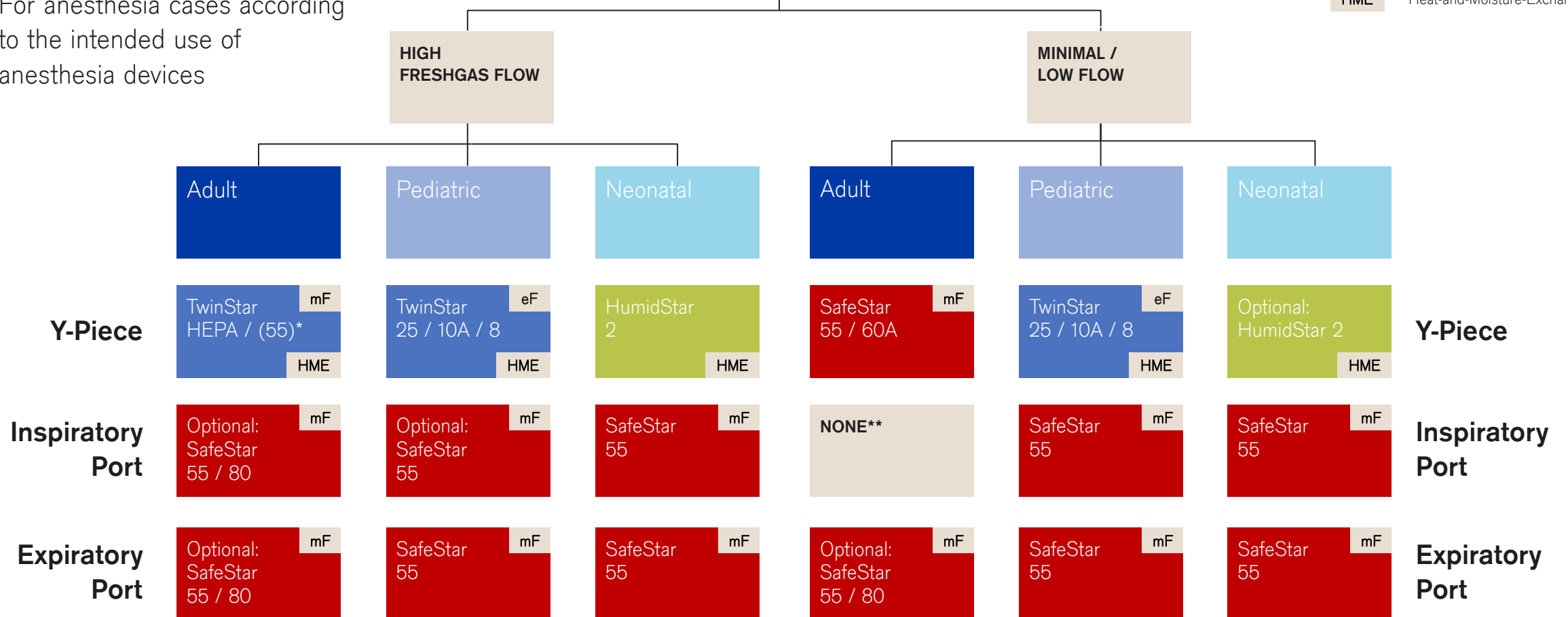


Anesthesia - enhanced safety

For anesthesia cases according to the intended use of anesthesia devices

ANESTHESIA

- eF** Electrostatic Filter
- mF** Mechanical Filter
- HME** Heat-and-Moisture-Exchanger



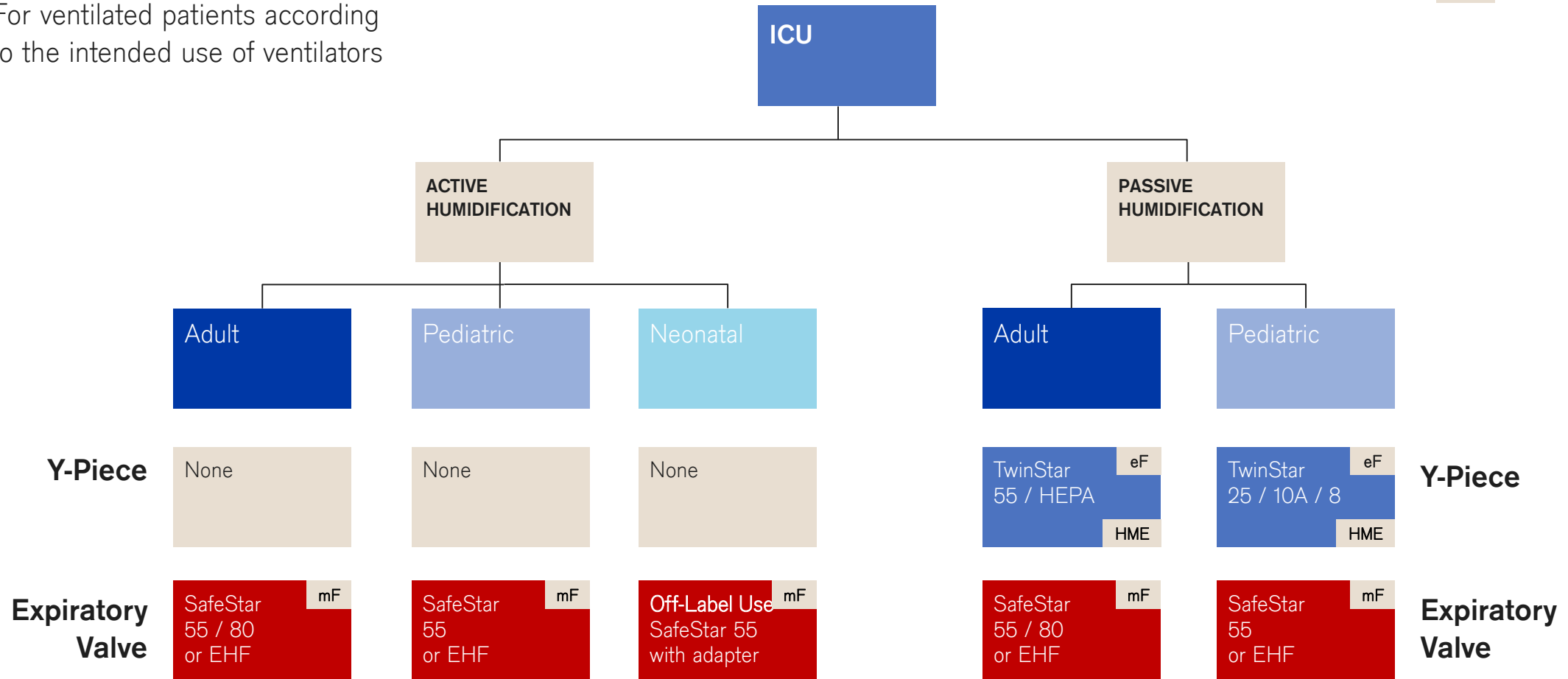
* Mechanical filters at the inspiratory as well as expiratory port are recommended and the hose system must be disposed after each patient

** Mechanical filter at the inspiratory port would lead to condensation issues. Still enhanced safety level due to mechanical filter at the Y piece

Intensive Care Unit – enhanced safety

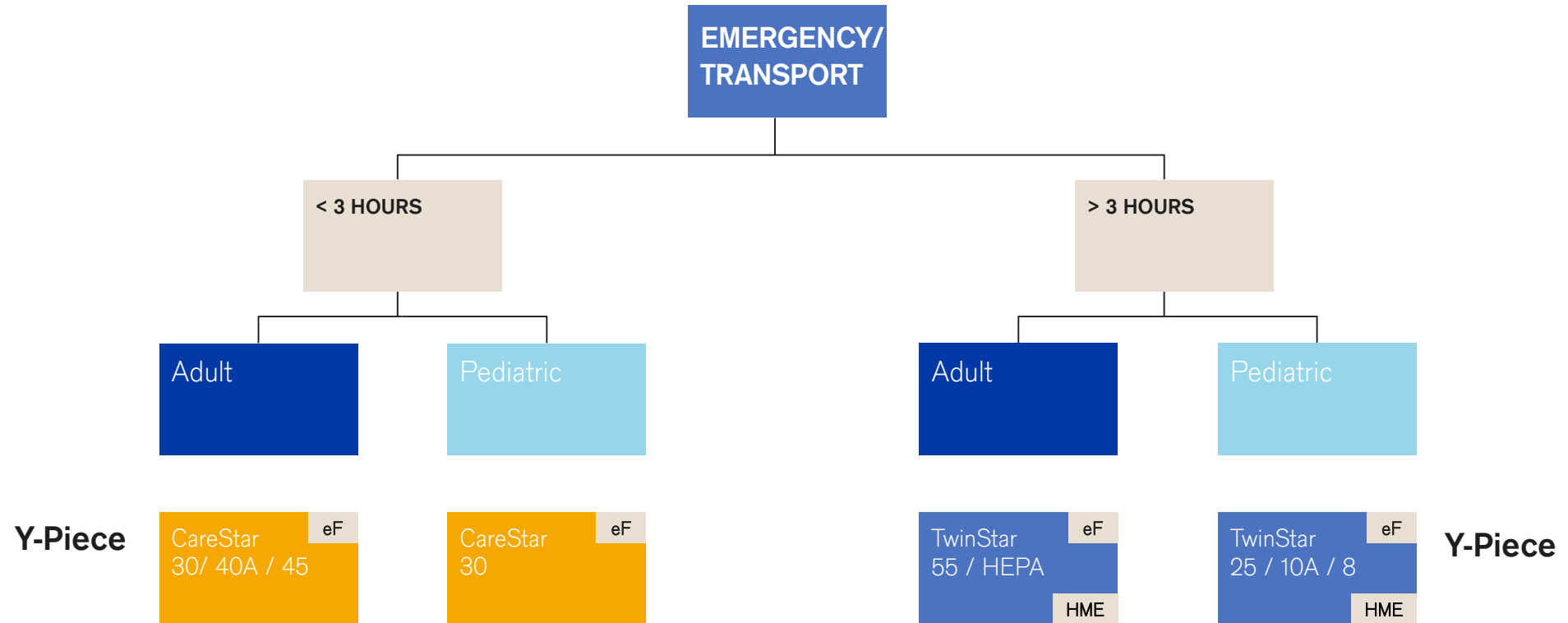
For ventilated patients according to the intended use of ventilators

- eF Electrostatic Filter
- mF Mechanical Filter
- HME Heat-and-Moisture-Exchanger



Emergency Care

- eF Electrostatic Filter
- HME Heat-and-Moisture-Exchanger



Many thanks

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