



Safe sedation - the systematic approach

Inhaled sedation of intensive care patients with the MIRUS™ System



**"Safety first!
By using the MIRUS™ system my patient and
I are on the safe side".**

*Steffen Brodowski,
Deputy Ward Manager,
Specialist Nurse Anaesthesia + ICU, University Hospital Magdeburg*



Workplace safety

As the MIRUS™ system operates with a closed and safe filling system and the exhaled gas is disposed of via a scavenger system or anaesthetic gas filter directly at the expiration outlet, the staff do not come into contact with the anaesthetic gas.

Due to its comprehensive safety system and the independent measurement of ventilation parameters and CO₂, the MIRUS™ only applies gas when a patient is connected.



Time saving and safety through autonomous control

The MIRUS™ system operates fully automatically with its built-in MAC pilot function. By entering the patient data, the MIRUS™ calculates the MAC-relevant value of the patient and automatically controls the amount of anaesthetic gas to be delivered. With its simple operating concept, errors in application are largely reduced.

By independently monitoring the ventilation parameters, the MIRUS™ detects every change in ventilation and can adapt accordingly. As a result, the set sedation depth is always kept constant.



"The MIRUS™ system is an autonomous application system for volatile anaesthetics."

*Dr. med. Michael Tübben D.E.S.A.
Chief Physician for Anaesthesiology, Surgical Intensive Care and
Emergency Medicine, Korbach City Hospital*



Cost savings through inhaled sedation

Inhaled sedation leads to short, predictable recovery times. This allows:

- faster transfer from the intensive care unit to step down unit
- reduced length of stay
- lower treatment costs
- additional cost savings due to lower incidence of delirium
- Optimal residual gas disposal at low cost due to residual gas elimination by an ORS system
- Due to the DOGA principle (diffusion-optimised gas application), the system offers a savings potential as it only releases gas during inspiration.

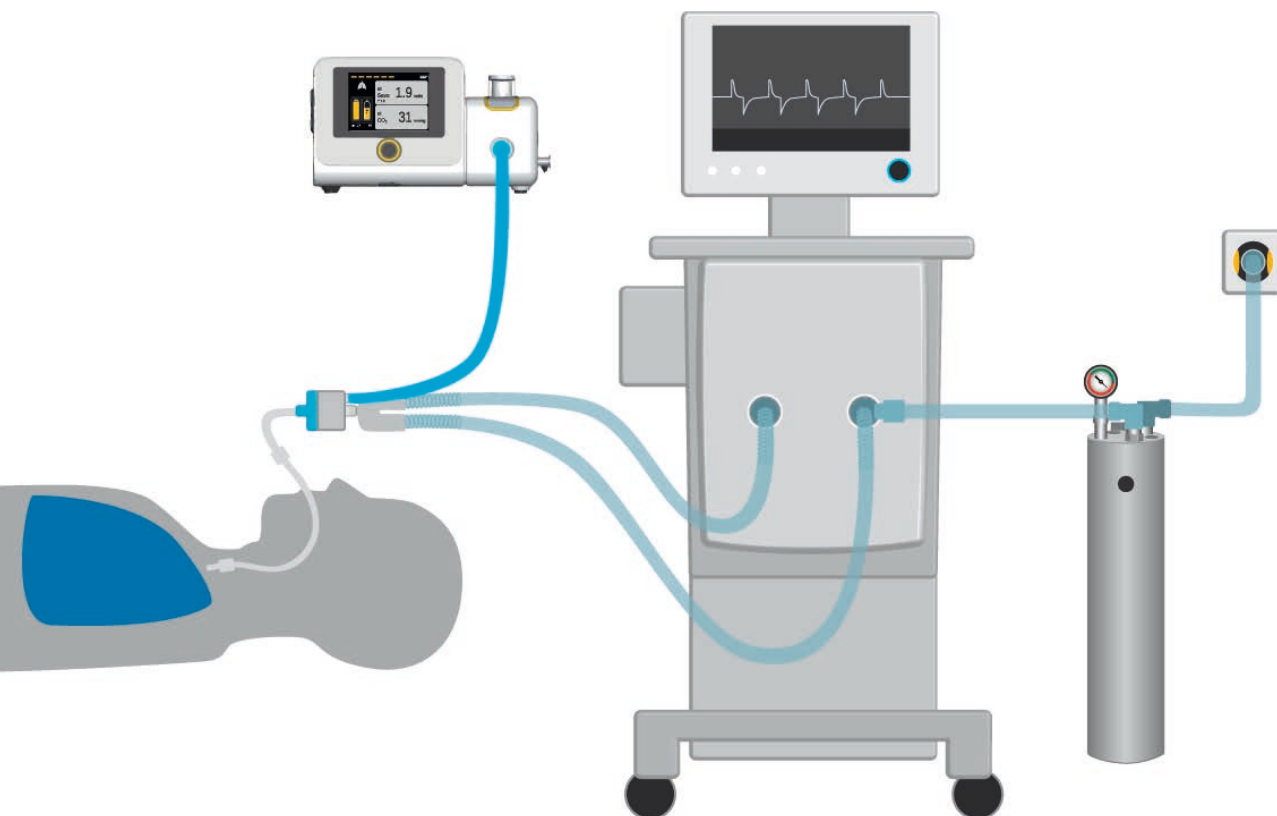


Easy integration and connectivity

The MIRUS™ system can be combined with commonly used intensive care ventilators. It operates autonomously and independently of the existing ventilation system and is therefore easy to integrate.

A universal designed interface provides connectivity to the existing patient data management system.

MIRUS™ System | Inhaled sedation



S3 Guideline:

Inhaled sedation can be applied when short recovery times, rapid recovery of cognitive functions or rapid mobilisation are desired.

The medical advantages of inhaled sedation

- Bronchodilation
- Organ protection
- Good control
- No cumulative effect
- No development of tolerance
- Low rate of metabolism
- Controllable sedation depth

Modern concepts in intensive care medicine

- Early mobilisation
- Early extubation
- Daily spontaneous breathing trials
- Daily awakening tests
- Shallow sedation (stress-free, painless, cooperative patient)
- **eCASH** (early **C**omfort using **A**nalgesia, minimal **S**edatives and maximal **H**umane care)

→ *This is only possible with well controllable sedation, for example with the MIRUS™ system.*

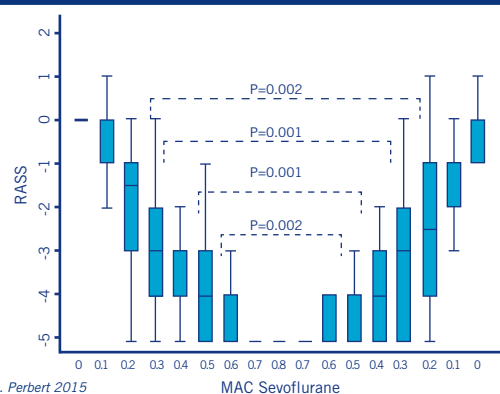
MIRUS™ System | Target value controlled and autonomous

1. MIRUS™ Controller

The MIRUS™ controller automatically controls the amount of anaesthetic gas to be delivered via the **MAC Pilot**. Due to **DOGA (Diffusion-optimised Gas Application)**, the system offers a savings potential and only releases gas during inspiration.

In addition, the device includes gas and ventilation monitoring (**etVA, etCO₂, ventilation parameters**). It is distinguished by simple operation, safe filling, an automatic stop at disconnection and an intelligent alarm management.

Sedation with volatile anaesthetics



S. Perbert 2015

Effective concentration of the sedative can be measured by the end-tidal **VA** concentration (**etVA**).

etVA/MAC correlate with **RASS**

2. MIRUS™ Reflector

The MIRUS™ Reflector is a **rebreathing system** for volatile anaesthetics, and can be used from a **tidal volume of 300 ml**. It is used to measure the ventilation parameters and delivery/storage of the volatile anaesthetic.

During exhalation, the majority of the anaesthetic gas is stored in the reflector and then used during subsequent inhalation.

The reflector can be **used across patients for 7 days** as it is additionally protected by an **HME filter**.



MIRUS™ Controller *Isoflurane*



MIRUS™ Controller *Sevoflurane*



MIRUS™ Controller *Desflurane*

There is a corresponding MIRUS™ Controller for each gas.

Unintentional filling with the wrong anaesthetic is impossible due to coding of the filling adapter.



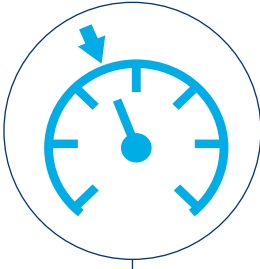
3. MIRUS™ Filter

The MIRUS™ Filter is a **high-performance HME filter**. Like any HME, it stores the heat and moisture from the patient's exhaled air and releases it again during inspiration. This prevents moisture and heat loss. This in turn prevents the patient's airways from dehydrating.

Simultaneously, the MIRUS™ Filter reliably **filters all germs from the respiratory air**.

The filter has a **service life of up to 48 hours**.

MIRUS™-System | Benefits at a glance



MAC pilot function

Reach your goal under control.
Target value controlled sedation through automatic control of the volume of anaesthetic gas to be delivered

Control:

Easy, via integrated MAC pilot function

Operability:

Easy, via a touchscreen



Gas monitor on board

Gas delivery under control.
Built-in gas monitor for CO₂ and VA measurement with CO₂ curves visualised on the display

Volatile anaesthetics:

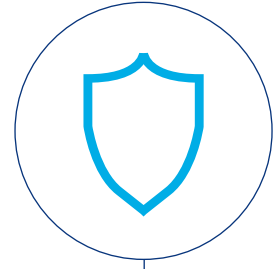
Isoflurane, Sevoflurane und Desflurane

Gas delivery:

The gas is introduced during inspiration.

End-tidal gas concentration:

etCO₂ and etVA are measured correctly.



Safety

Lean back and relax.
With its simple operating concept, errors in application are reduced.

Workplace safety:

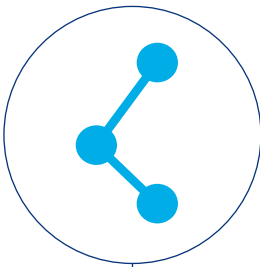
In case of disconnection immediate stop of gas supply and alarm information

Personnel safety:

Owing to a closed system there is no contact with the liquid gas. Filling of the system is safe and without loss of gas.

Patient safety:

Safety through integrated alarm system (medical device Class 2b)

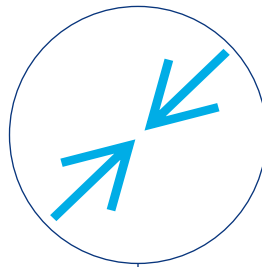


Connectivity

Remain dedicated to your system.
The MIRUS™ system can be combined with commonly used intensive care ventilators. It operates autonomously and independently of the existing ventilation system and is therefore easy to integrate.

Integration:

A universally designed interface provides connectivity to the existing patient data management system.



Low space requirements

Leave everything in place.
With its well thought-out dimensions, the MIRUS™ Controller can be integrated effortlessly almost anywhere.



Integrated savings potential

Keep an eye on costs.
Due to the DOGA principle (diffusion-optimised gas application), the system offers a savings potential as it only releases gas during inspiration.

Cost-savings:

Cost savings due to reduced incidence of delirium, optimal residual gas disposal (ORS system) and 7-day cross-patient use of the reflector, as this is additionally protected by an HME filter.

MIRUS™ System | Accessories



MIRUS™ Filling adapter

Adapter for the safe filling of the controller with desflurane, isoflurane or sevoflurane



Device connections

Connection between expiration outlet of the respirator and the Clean-Air reservoir for residual gas extraction - including compatibility declaration



Clean-Air vacuum connection DE

Connecting tube for connection between Clean-Air reservoir and vacuum system



Clean-Air

An ORS residual gas elimination system is available as optional accessory for residual gas elimination. The Clean-Air is a so-called Open Reservoir Scavenger for the disposal of exhaled patient gas via the vacuum system, if this complies with the EN ISO 9170-1 standard "Tapping points for medical gas line systems".

The ORS Clean-Air is available in several installation variants to fit almost all common ventilators with the appropriate adapter.

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