# User's Guide

## Multigas Unit for DS-7000 Patient Monitor

MGU-701 $AGO_2$ Gas Unit CE 0086
MGU-702 AG Gas Unit

FUKUDA DENSHI CO.,LTD.
39-4, Hongo, 3-chome, Bunkyo-ku, Tokyo, Japan
Phone:+81-3-3815-2121 Fax:+81-3-3814-1222

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CE 0086 **This unit conforms with the provisions of Medical Device Directive 93/42/EEC in connecting with the Fukuda Denshi monitoring equipment, labeled "CE0086".**

THE PERSONS RESPONSIBLE FOR PLACING DEVICES ON THE EC MARKET UNDER MDD 93/42/EEC
NAME : FUKUDA DENSHI UK
ADDRESS : 13 WESTMINSTER COURT, HIPLEY STREET OLD WOKING, SURREY GU22 9LG, U.K.

Thank you for purchasing this product.
Before using this product, read the following precautions to make sure the product is used correctly and safely.
For procedures of sampling line connection and monitoring setup, please refer to the "DS-7000 Patient Monitor Operation Manual".

## Safety Precautions

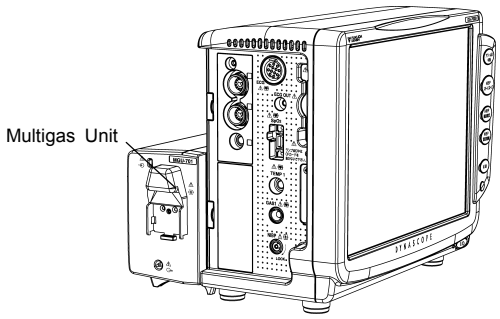
Be sure to follow the precautions given below. These are important matters related to safety. Indications and their meanings are as follows:

| | |
|---|---|
| ⚠**WARNING** | Failure to follow this message may result in death or serious injury, or complete failure of the equipment. |
| ⚠**CAUTION** | Failure to follow this message may cause injury or failure to the equipment. |
| **NOTE** | A note is not related to product safety, but provides information about the correct use and operating procedures to prevent incorrect operation and malfunction of the equipment. |

## General Description

By attaching the MGU-701/MGU-702 Multigas Unit to the DS-7000 Patient Monitor, anesthetic gas ($CO_2$, $N_2O$, $O_2$, AGT) concentration can be monitored.

The MGU-701/MGU-702 adopts Criticare Systems Inc® (CSI) gas unit (sidestream method).

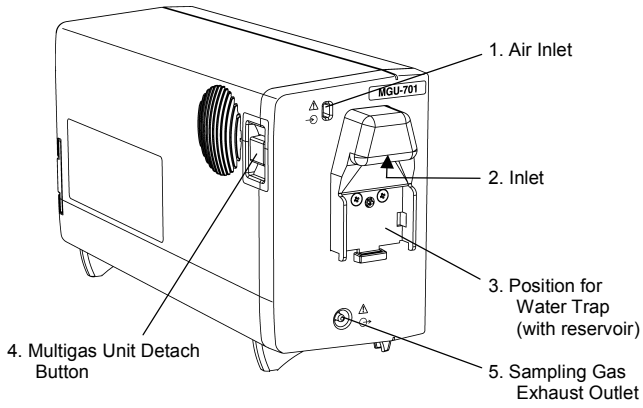


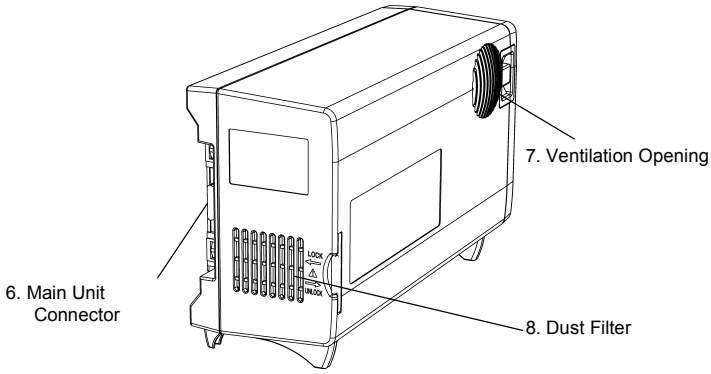

＜DS-7000 Patient Monitor＞

**Lineup of Multigas Unit**

| Model Type | Measurement Parameters | | | |
|---|---|---|---|---|
| | $CO_2$ | $O_2$ | $N_2O$ | AGT |
| MGU-701 $AGO_2$ Gas Unit | ○ | ○ | ○ | ○ |
| MGU-702 AG Gas Unit | ○ | × | ○ | ○ |

## Names of Parts and Their Functions




1. Air Inlet
Air inlet for air calibration.

2. Inlet
Connects the sampling tube and inhales the sampling gas.

3. Water Trap (with reservoir)
Removes the water inside the sampling tube connected to the patient.

4. Multigas Unit Detach Button
Press here when detaching the Multigas Unit from the DS-7000.

5. Sampling Gas Exhaust Outlet
Connect the scavenging device here.

6. Main Unit Connector
Connects to the main unit (DS-7000).

7. Ventilation Opening
Ventilation opening for cooling fan.

8. Dust Filter
Protects the Multigas Unit from suspended particles of dust.
Remove and clean the filter periodically.

## Connection to the Patient Monitor

**⚠WARNING**

The installation of this product will be performed by our service representative. The users should not attempt the procedure as electric shock or malfunction may be caused.

## Maintenance

### Cleaning the Housing

Clean the housing and cable using tightly squeezed gauze or an absorbent cotton cloth dampened with alcohol or a neutral cleanser.

**⚠CAUTION**

- Clean the equipment frequently so stains can be removed easily.
- To prevent injury, it is recommended to wear gloves when cleaning the equipment.
- Do not allow liquids or cleaning solution to enter the monitor or connectors.
- Do not use organic solvents, thinner, toluene and benzene to avoid damaging the resin case.
- Do not polish the housing with abrasive or chemical cleaner.
- When sterilizing the entire room using a spray solution, pay close attention not to have liquids get into the monitor or connectors.
- Use only neutral detergent to clean the housing. Do not use chemical cloth, scrub brush, abrasive, polishing powder, hot water, volatile solvent and chemicals (cleanser, thinner, benzine, benzol, and synthetic detergent for house and furniture), or sharp-edged tools. The surface resin coating may be damaged, resulting in discoloration, scratches, and other problems.

### Replacing the Water Trap

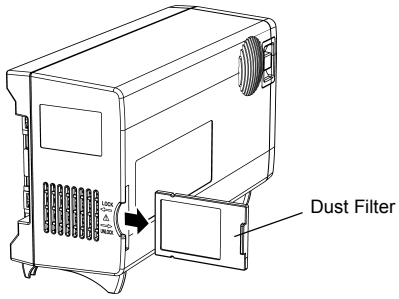
- The sampling tube connected to the patient accumulates water inside the Water Trap.
  When the water accumulated is more than half of the capacity, or when using on a different patient, make sure to replace the water trap.
- When the sampling tube or water trap is fully occluded with water, the alarm message, "Occlusion" will be displayed.
- The water trap life at 100% humidity is 8 hours.

**⚠CAUTION**

Water traps are single use only. Do not attempt to drain the water trap when full.

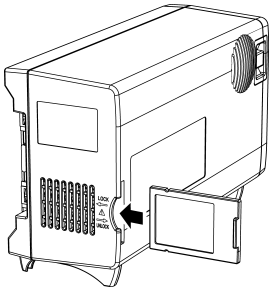
### Cleaning and Replacing the Dust Filter

1) Take off the dust filter from the MGU-701, MGU-702 Multigas Unit by sliding it to the right.




2) Clean or replace the dust filter.
   To clean the dust filter, beat the dust off, or wash off with neutral detergent.

3) Re-insert the dust filter.



### Periodic Replacement Parts

To ensure reliability, function, and performance of this device, the following components must be replaced periodically. When replacing, contact our service representative.

Water Trap
  Periodic Replacement Period: 6 months, or when the water is full
$CO_2$ Absorber
  Periodic Replacement Period: 1 year
$O_2$ Cell
  Periodic Replacement Period: 1 year

**⚠CAUTION**

The periodic replacement parts must be replaced at specified period.

### Periodic Maintenance

The periodic maintenance of MGU-701/MGU-702 should be performed as follows.

| | | |
|---|---|---|
| Each Patient | : | There should be no damage to the accessories and cables and should be properly connected.<br>Replace the sampling device and sampling tube. |
| Every week | : | Replace the water trap as necessary. |
| Every 2 months | : | Check the accuracy of $O_2$ sensor using the 80% $O_2$ mixture calibration gas. |
| Every 3 months | : | Clean the housing of multigas unit as necessary. |
| Every year | : | Perform the safety test. Verify the agent gas auto calibration, and calibrate as necessary. Replace the $O_2$ cell. Check the gas flow rate and adjust as necessary. Check the $CO_2$ absorber, and replace as necessary. |

**NOTE**

If any damage is found on the multigas unit, contact Fukuda Denshi service representative.

## Accessories/Optional Accessories

### 【Accessories】

To ensure product quality, use the specified accessories.

| *No.* | *Item* | *Model Type* | *Quantity* |
|---|---|---|---|
| 1 | Agent Sample Lines | 625N | 2 |
| 2 | WaterChek2 + Water Trap | 938F-NC | 2 |
| 3 | Endotracheal Adaptor, Straight | 616 | 2 |
| 4 | This Operation Manual | — | 1 |

### 【Optional Accessories】

The following products are available as optional accessories. Purchase them as required.

**Sampling Devices**

| *No.* | *Item* | *Model Type* |
|---|---|---|
| 1 | Agent Sample Lines | 625N |
| 2 | WaterChek2 + Water Trap | 938F-NC |
| 3 | Disposable Nasal Cannula | 624 |
| 4 | Divided Nasal Cannula | 628 |
| 5 | Endotracheal Adaptor, Straight | 616 |
| 6 | Endotracheal Adaptor, Elbow | 617 |
| 7 | Scavenging Kit (Exhaust Line) | 655-FD |

**Calibration Accessories**

| *No.* | *Item* | *Model Type* |
|---|---|---|
| 1 | Cal Gas Cylinder (80% $O_2$, Balance $N_2$) | 1547 |
| 2 | Hardware Regulator for Cylinder | 623 |
| 3 | Regulator Tubing | 613B |

## Specification

### Size/Weight

230(W)×820(D)×137(H) mm *not including the protrusion
1.8kg

### Environmental Condition

Operating Temperature : 15–35°C
Operating Humidity : 30–85% (non-condensing)
Transport/Storage Temperature : –5–50°C
Transport/Storage Humidity : 15–90% (at 50°C) (non-condensing)

### Power Requirement

MGU-701 : Max. 12W / Typical Operating 6W
MGU-702 : Max. 9W / Typical Operating 4W

### Performance (According to CSI HIGHIQ AGENT MODULE specification)

Method : Infra-Red Solid-State Method
Parameter : End-Tidal $CO_2$ Concentration ($EtCO_2$) / Inspired $CO_2$ Concentration ($InspCO_2$) / RR
$N_2O$ Concentration
$O_2$ Concentration
Anesthetic Agent (AG) Concentration
Anesthetic Agent ID
Measurement Range :
$CO_2$ 0–12.5% (0–95mmHg)
$N_2O$ 0–99%
$O_2$ 0–100%
AG Halothane: 0–10%
Enflurane: 0–10%
Isoflurane: 0–10%
Sevoflurane: 0–10%
RR 0–60 bpm
Accuracy : $CO_2$: ±0.2% or 4% of displayed value
$N_2O$: ±(1.5% + 4% of displayed value)
$O_2$: ±3% (0–90%)
±4% (91–100%)
AG: ±(0.1% abs. 4% of displayed value)
Sampling Flow Rate :
100 mL/min ±10mL/min
150 mL/min ±10mL/min
200 mL/min ±15mL/min
Detection Threshold :
Halothane 0.2 vol. %
Enflurane 0.3 vol. %
Isoflurane 0.3 vol. %
Sevoflurane 0.3 vol. %
Mixed Gas Threshold :
0.2 vol. % + 10 % of total concentration
Gas Unit Response Time:
2.5 sec. (at 150ml/min. flow rate with 2.5m sampling line)
Warmup Time : 15min.
Operating Temperature :
15–35°C
Operating Humidity :
15%–90% non-condensing
Storage Temperature :
–5–50°C
Storage Humidity :
15%–90% non-condensing
Alltitude : –1000ft–10,000ft (–300–3000m)

### Interfering Gases for Anesthetic Agents

The monitor will report small changes in agent concentrations when anesthetic agents and other gases are used. Expected agent changes are provided here for the purpose of comparison.

For Gas Mixtures of 5% $CO_2$

| Agents | Agent Volume | Change of $CO_2$ |
|---|---|---|
| $N_2O$ | 60% | +0.2 |
| Halothane | 4% | +0.1 |
| Enflurane | 5% | +0.1 |
| Isoflurane | 5% | +0.1 |
| Sevoflurane | 5% | +0.2 |
| Desflurane* | 5% | 0.0 |
| Helium | 50% | 0.0 |
| Ethanol | 1% | +0.1 |
| Isopropanol | 1% | 0.0 |
| Acetone | 1% | +0.1 |
| Methane | 1% | 0.0 |
| Metered dose inhaler propellant | 1% | 0.0 |
| 80% Xenon | Not intended for use with Xenon | N/A |

For Gas Mixtures of 30% $O_2$

| Agents | Agent Volume | Change of $CO_2$ |
|---|---|---|
| $N_2O$ | 60% | –0.1 |
| Halothane | 4% | –0.2 |
| Enflurane | 5% | –0.2 |
| Isoflurane | 5% | –0.2 |
| Sevoflurane | 5% | –0.2 |
| Desflurane* | 5% | –0.2 |
| Helium | 50% | –0.3 |
| Ethanol | 1% | –0.2 |
| Isopropanol | 1% | +0.5 |
| Acetone | 1% | +0.1 |
| Methane | 1% | –0.1 |
| Metered dose inhaler propellant | 1% | +0.2 |
| 80% Xenon | Not intended for use with Xenon | N/A |

For Gas Mixtures of 2% Halothane

| Agents | Agent Volume | Change of $CO_2$ |
|---|---|---|
| $N_2O$ | 60% | +0.1 |
| Halothane | 4% | N/A |
| Enflurane | 5% | +0.1 |
| Isoflurane | 5% | –0.1 |
| Sevoflurane | 5% | +0.1 |
| Desflurane* | 5% | +0.1 |
| Helium | 50% | –0.1 |
| Ethanol | 1% | 0.0 |
| Isopropanol | 1% | +0.1 |
| Acetone | 1% | +0.1 |
| Methane | 1% | 0.0 |
| Metered dose inhaler propellant | 1% | 0.0 |
| 80% Xenon | Not intended for use with Xenon | N/A |

For Gas Mixtures of 2% Enflurane

| Agents | Agent Volume | Change of $CO_2$ |
|---|---|---|
| $N_2O$ | 60% | 0.0 |
| Halothane | 4% | +0.3 |
| Enflurane | 5% | N/A |
| Isoflurane | 5% | +0.1 |
| Sevoflurane | 5% | –0.2 |
| Desflurane* | 5% | +0.1 |
| Helium | 50% | +0.1 |
| Ethanol | 1% | +0.1 |
| Isopropanol | 1% | +0.1 |
| Acetone | 1% | +0.1 |
| Methane | 1% | 0.0 |
| Metered dose inhaler propellant | 1% | +0.1 |
| 80% Xenon | Not intended for use with Xenon | N/A |

For Gas Mixtures of 2% Isoflurane

| Agents | Agent Volume | Change of $CO_2$ |
|---|---|---|
| $N_2O$ | 60% | 0.0 |
| Halothane | 4% | –0.1 |
| Enflurane | 5% | +0.6 |
| Isoflurane | 5% | N/A |
| Sevoflurane | 5% | +0.2 |
| Desflurane* | 5% | –0.2 |
| Helium | 50% | 0.0 |
| Ethanol | 1% | +0.1 |
| Isopropanol | 1% | +0.1 |
| Acetone | 1% | +0.1 |
| Methane | 1% | 0.0 |
| Metered dose inhaler propellant | 1% | +0.1 |
| 80% Xenon | Not intended for use with Xenon | N/A |

For Gas Mixtures of 2% Sevoflurane

| Agents | Agent Volume | Change of $CO_2$ |
|---|---|---|
| $N_2O$ | 60% | 0.0 |
| Halothane | 4% | +0.3 |
| Enflurane | 5% | +0.6 |
| Isoflurane | 5% | +0.2 |
| Sevoflurane | 5% | N/A |
| Desflurane* | 5% | –0.2 |
| Helium | 50% | 0.0 |
| Ethanol | 1% | +0.1 |
| Isopropanol | 1% | +0.1 |
| Acetone | 1% | +0.1 |
| Methane | 1% | 0.0 |
| Metered dose inhaler propellant | 1% | +0.1 |
| 80% Xenon | Not intended for use with Xenon | N/A |

For Gas Mixtures of 2% Desflurane

| Agents | Agent Volume | Change of $CO_2$ |
|---|---|---|
| $N_2O$ | 60% | 0.0 |
| Halothane | 4% | +0.5 |
| Enflurane | 5% | +0.4 |
| Isoflurane | 5% | +0.5 |
| Sevoflurane | 5% | –0.1 |
| Desflurane* | 5% | N/A |
| Helium | 50% | –0.1 |
| Ethanol | 1% | 0.0 |
| Isopropanol | 1% | 0.0 |
| Acetone | 1% | 0.0 |
| Methane | 1% | –0.1 |
| Metered dose inhaler propellant | 1% | +0.2 |
| 80% Xenon | Not intended for use with Xenon | N/A |

For Gas Mixtures of 40% $N_2O$

| Agents | Agent Volume | Change of $CO_2$ |
|---|---|---|
| N2O | 60% | N/A |
| Halothane | 4% | +1.0 |
| Enflurane | 5% | +1.2 |
| Isoflurane | 5% | +1.3 |
| Sevoflurane | 5% | +1.0 |
| Desflurane* | 5% | +1.2 |
| Helium | 50% | +0.4 |
| Ethanol | 1% | +0.8 |
| Isopropanol | 1% | +1.5 |
| Acetone | 1% | –0.1 |
| Methane | 1% | +0.5 |
| Metered dose inhaler propellant | 1% | +0.3 |
| 80% Xenon | Not intended for use with Xenon | N/A |

* Presence of 15% Desflurane in a mixture with other halogenated gases will result in the display of 15% Desflurane readings or greater.

### Other Interference

Ether, cyclopropane and methoxyflurane are contraindicated for use with the multigas unit. The effect of ethyl alcohol and metabolic ketones and acetone are negligible.

**⚠ WARNING**

The multigas unit is not intended for monitoring gas mixtures containing methoxyflurane or halogenated hydrocarbons not specifically listed as a monitored gas.