Technical Documentation IPM

Savina 300
Intensive Care Ventilator

Warning

All servicing and/or test procedures on the device require detailed knowledge of this documentation. Use of the device requires detailed knowledge and observance of the relevant Instructions for Use.

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General

This chapter contains general notes and definitions that are important for the use of this documentation.

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1 Definition of target groups

For this product, users, service personnel, and experts are defined as target groups.

These target groups must have received instruction in the use of the product and must have the necessary training and knowledge to use, install, reprocess, maintain, or repair the product. The target groups must understand the language of the present document.

The product must be used, installed, reprocessed, maintained, or repaired exclusively by defined target groups.

1.1 Users

Users are persons who use the product in accordance with its intended use.

1.2 Service personnel

Service personnel are persons who are responsible for the maintenance of the product.

Service personnel must be trained in the maintenance of medical devices and install, reprocess, and maintain the product.

1.3 Experts

Experts are persons who perform repair or complex maintenance work on the product.

Experts must have the necessary knowledge and experience with complex maintenance work on the product.

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2 General notes

2.1 Notes on use

Read through the following notes thoroughly before applying this documentation.

The warnings set out here apply to all parts of this documentation.

Dräger reserves the right to make changes to the device and/or to this documentation without prior notice. This documentation is intended solely as an information resource for maintenance personnel or technical specialists.

2.2 Copyright and other protected rights

2.3 Definitions

WARNING

An important advisory indicating a potentially hazardous situation which may result in death or serious injury if not prevented.

CAUTION

An important advisory indicating a potentially hazardous situation which may result in minor or moderate injury to the user or patient or in damage to the medical product or other assets if not prevented.

NOTE

A NOTE provides additional information intended to avoid inconvenience during operation and/or servicing.

Term	Definition
Maintenance	Maintaining the operative condition of a medical product by suitable means
Inspection	Assessment of the actual condition of a medical product
Servicing	Maintaining the operative condition of a medical product by recurrent, specified measures
Repair	Restoring the operative condition of a medical product after failure of a device function

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2.4 General safety precautions

Read through each section thoroughly before beginning servicing.

CAUTION

Incorrect use of tools
The device's function may be impaired, or the device may be damaged.
Always use the correct tools and the specified test equipment.

WARNING

The device must be regularly inspected and serviced by maintenance personnel. Repairs and complex maintenance work on the medical product must be carried out by qualified specialists.
If you require a service contract, or for any necessary repair work, Dräger recommends DrägerService. Dräger recommends using original Dräger parts for servicing.
If the aforementioned instructions and recommendations are ignored, the correct functioning of the medical product may be put at risk. Pay attention to the "Servicing" section of the Instructions for Use.

WARNING

Non-conforming test values
If test values do not conform to specifications, the safety of the patient may be put at risk.

- **Do not put the device into operation if test values do not conform to specifications.**
- **Contact your local service organization.**

WARNING

Impermissible modifications to the device
If impermissible modifications are made to the device, the safety of the patient may be put at risk.
Do not modify the device without Dräger's permission.

WARNING

Risk of infection
The unit may transmit pathogens following use on the patient.

- **Before carrying out any servicing, ensure that the device and its components have been handed over by the user cleaned and disinfected.**
- **Service only cleaned and disinfected units and unit components.**

WARNING

Risk to patient.
Ensure that no patient is connected to the device before starting maintenance or repair work.

NOTE

Where reference is made to legislation, regulations and standards, in respect of devices used and serviced in Germany they are based on the laws of Germany. Users and technicians in other countries must comply with their national laws and/or international standards.

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3 Preamble to RoHS II and 3. Edition

3.1 Introduction

Manufacturers of electro-medical devices are required to cease using certain materials in member-states of the European Union by July 22, 2014 for reasons of environmental protection and public health.

The effects in terms of Dräger medical products are set out in the section headed ""Explanatory notes to RoHS II"".

In addition, pursuant to the amendments to the IEC 60601 **3. Edition** / ISO 80601 standards series (referred to in the following as **3. Edition**) the said devices are to be reassessed with regard to their safety and performance.

In order to comply with the standards series cited here, design modifications to the product may be required. The transitional periods for Dräger's product categories (including ventilators and anaesthesia units) are specified differently worldwide.

For more information on the **3. Edition** requirements see ""Explanatory notes to the 3. Edition"".

The new **RoHS II** and **3. Edition** requirements do not apply to products already on the market!

3.2 Explanatory notes to RoHS II

Objective

Compliance with the European Directive 2011/65/EU dated June 8, 2011 concerning restrictions on the use of certain hazardous substances in electrical and electronic equipment is the main focus of **RoHS II** (Restriction of Hazardous Substances).

This Directive sets out requirements for restrictions on the use of hazardous substances in electrical and electronic equipment in order to protect human health and the environment, including the environmentally sustainable recycling and disposal of such equipment.

The Directive also applies to medical devices under the terms of the Medical Devices Directive 93/42/EEC which depend on electric power or electromagnetic fields in order to operate properly.

The existing exemption for medicine has been restricted in terms of time by Directive 2011/65/EU. Medical devices placed on the market as from July 22, 2014, and in-vitro diagnostic medical devices placed on the market as from July 22, 2016, must now likewise comply with the **RoHS II** Directive.

From those dates on, the said medical devices may no longer contain the following substances: Lead (0.1 % by weight), mercury (0.1 % by weight), cadmium (0.01 % by weight), hexavalent chromium (0.1 % by weight), polybrominated biphenyls (PPBs) (0.1 % by weight) and polybrominated diphenyl ethers (PBDEs) (0.1 % by weight).

Manufacturers must ensure that medical devices placed on the market as from July 22, 2014 are designed and manufactured in accordance with the requirements of the Directive. Verification is provided by the EU Declaration

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of Conformity issued for each Dräger medical device also subject to the Directive. The Declaration lists the directives with which the product in question complies.

Implementation by Dräger

All the above requirements are being incorporated into the latest devices by way of modifications.

- Only **RoHS II**-compliant assemblies and replacement parts (such as PCBs) with a changed revision index or new replacement parts (such as power supply units) with a changed part number will be installed and shipped.
- Assemblies and replacement parts which are not **RoHS II**-compliant should only be used for products already on the market.

3.3 Explanatory notes to the 3. Edition

Objective

The **3. Edition** has significantly strengthened the importance of risk management. Risk management in accordance with ISO 14971 is now an essential element of the safety design of medical devices. The contents of EN 60601-1-1 and of EN 60601-1-4 are additionally incorporated into EN 60601-1.

The following requirements result from the amendment:

- Risk management as part of inspection
- Definition of key features and their retention after performing device tests
- Housing protection (higher classification against touch contact and penetration of foreign bodies as well as protection against liquids)
- Software (specification of device measured values under STPD, in the breathing system under BTPS conditions; presentation of pressure-volume / volume-volume curves; restriction of access to device settings; additions to the device test; specification of characteristic values in case of different volumetric flows)
- Alarm system, alarm tones/logs (in some cases new software required)
- Labelling of devices and of accessories
- Limit values for testing electrical safety
- Electrical insulation (creepages and clearances on PCBs/clearances from touchable housing parts, ports, grouting, insulation thickness of electrical conductors, etc.)
- Mechanical components (shearing, crushing, sill and door frame tests, tilt stability)
- Temperatures of touchable parts and applied parts
- Device performance tests (additional 100 % in case of intensive ventilators)
- Information for use
- IP21 protection for intensive ventilators

The manufacturer must specify the key features of the medical device to which any change may result in unacceptable risk for the patient. Retention of the features in question must be checked in design testing, under worst-case conditions.

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Implementation by Dräger

All the above requirements are being incorporated into the latest devices by way of modifications.

– Only **3. Edition**-compliant assemblies and replacement parts (such as PCBs) with a changed revision index or new replacement parts (such as power supply units) with a changed part number will be installed and shipped.
– Assemblies and replacement parts which are not **3. Edition**-compliant should only be used for products already on the market.
– The changes also entail new software/updates.

3.4 Effects for Service

– Only **RoHS II/3. Edition**-compliant replacement parts may be installed in **RoHS II/3. Edition**-compliant devices.
– Non-**RoHS II/3. Edition**-compliant replacement parts may be installed in any non-**RoHS II/3. Edition**-compliant devices until **EOL** (**End of Life**).
– Implementation of **RoHS II** and **3. Edition** in practice will take place in stages.
– Unambiguous indication of whether the device is **RoHS II/3. Edition**-compliant is not always possible based on the part number, as some components are installed dependent on software. Only the serial number of the device is decisive.
– It is likely that there will be some variations in the Service documents. It is also certain that not all versions will be forward and backward compatible.
– There will be different repair and maintenance instructions, parts catalogues, and possibly even test instructions, for the same device.

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Function descriptions

This chapter contains descriptions of the device's technical functions.

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1 Block diagrams and functional principle

1.1 Introduction

The following sets out the block diagrams for the LCD display with high-voltage tube and LED backlights and details the functional principle of the Savina 300.

NOTE

– With effect from January 2013 the LCD display with high-voltage tube backlight is no longer available.
– It has been replaced by the LCD display with LED backlight.

1.2 Block diagrams

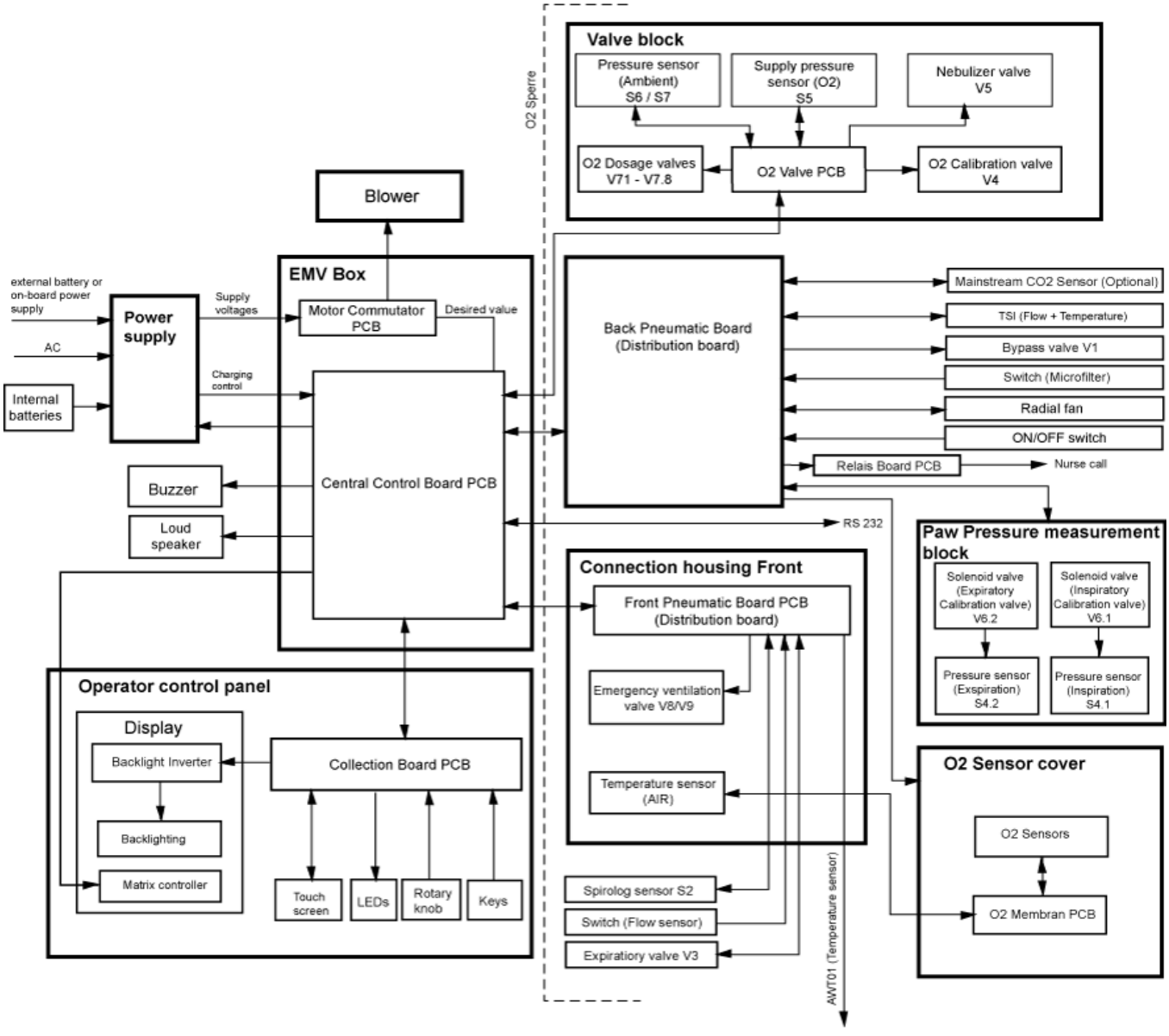

Fig. 1 Block diagram of Savina 300 with LCD display and high-voltage tube backlight

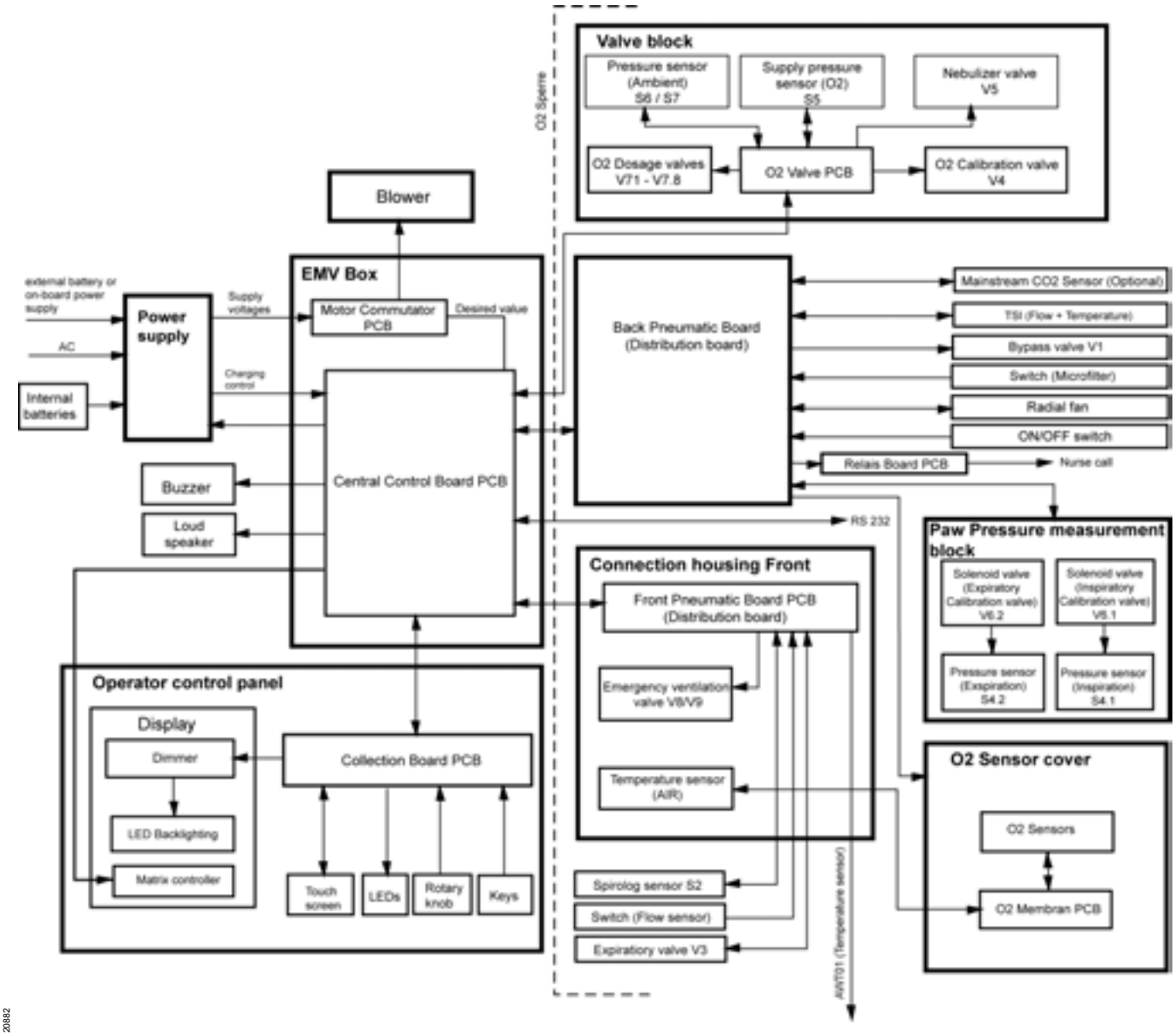

Fig. 2 Block diagram of Savina 300 with LCD display and LED backlight

1.3 Functional principle

The blower generates the necessary compressed air for ventilation. A controllable valve (non-return valve) is switched in parallel with the blower to regulate the pre-set ventilation parameter. The non-return valve opens or closes according to the pre-set ventilation parameters.

To increase the oxygen concentration in the ventilation gas, an external oxygen source can be connected to the device. Sensors, the electronics and the valve block meter the oxygen concentration.

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1.4 Main components

The device consists of the following main components:

– Electronic assembly
– Operator control
– Pneumatic assembly

2 Electronic assembly

2.1 Introduction

The electronic assembly contains the following subassemblies:

– Power supply unit
– Central Control Board
– Motor actuator
– O_2 Valve PCB
– O_2 Diaphragm PCB
– Fan

2.2 Power supply unit

The power supply unit delivers the supply voltages for the device. The input voltage range is 100 V to 240 V AC and 50 Hz to 60 Hz. The power supply unit can also be operated with an external rechargeable battery (12 V or 24 V).

The connection to the alternating voltage is made by a power cable. The connection for the external rechargeable battery is made by an encoded connector.

The power supply unit actuates the "Mains power", "External battery or on-board power supply" and "Internal battery" LEDs. The LEDs are mounted on the membrane keypad of the control panel and indicate the respective operating status.

The device includes two internal rechargeable batteries (2 x 12 V) which enable uninterrupted operation in the event of a mains power failure. The internal rechargeable batteries supply the O_2 sensors with power even when the device is switched off. When the device is switched on the valid O_2 values are present.

The power supply unit generates the following supply voltages:

– +5 V
– -15 V
– +15 V
– +24 V
– +48 V

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The output voltages are short-circuit-proof and stable at no-load.

The output voltages are generated according to the following priority, dependent on the input voltages:

Input voltage	Priority	Action
AC voltage	1	Charge external and internal batteries, and maintain the charge.
External battery/batteries	2	Charge internal batteries, and maintain the charge.
Internal batteries	3	-

The fan cools the power pack.

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2.3 Central Control Board

The Central Control Board is the device's central "control and monitoring unit". It has three separate processor systems (master processor, front processor and display processor).

Three processor systems save the changeable, non-volatile data to EEPROMs.

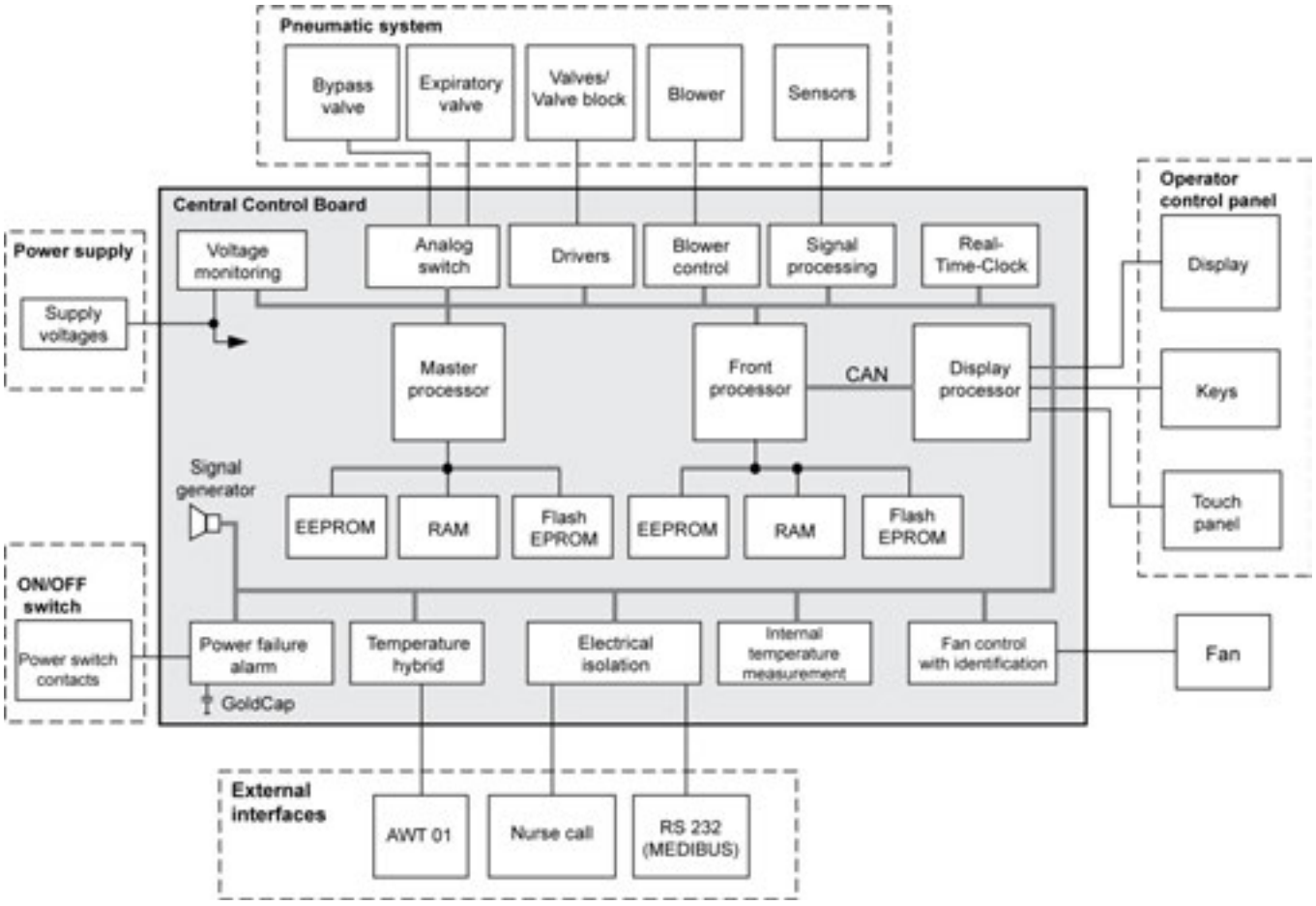

Fig. 3 Block diagram of the Central Control Board

Master processor

The master processor has the following tasks:

– Activation of the actuators (valves, valve block, blower)
– Reading of the measured values from the sensors
– Control of the ventilation
– Monitoring of the front processor

The master processor data are cached in the RAM.

The EEPROM of the master processor system stores the calibration data of the sensors and set values such as volume.

Front processor

The front processor has the following tasks:

– Interface with the display processor
– Monitoring of the master processor and display processor
– Monitoring of the input logic and the data e.g. the pixel sum

The RAM caches data from the front processor.

The EEPROM with socket of the front processor stores safety parameters, set values such as volume, software options and the operating hours.

Display processor

The display processor has the following tasks:

– Presentation of curves and parameters on the display, LEDs
– Input and operator data (keyboard, rotary encoder, touchscreen)
– Collation of data such as the pixel sum.

The EEPROM of the display processor stores user-specific display settings, such as measured value positions.

Flash EEPROMs

The device's operating system program (software) is stored in Flash EEPROMs (rewritable memory modules).

Real-time clock

The real-time clock generates the time and date information. The real-time clock has an internal battery.

The Central Control Board incorporates the following functions:

– Processing of the signals from the sensors (O_2, flow, pressure, temperature)
– Control of the blower and valves
– Monitoring of the unit functions and the supply voltages
– Actuation of the displays
– Keypad interpretation
– Provision of the internal and external interfaces
– Set values such as the volume

Mains power failure alarm

If the mains power fails, the device switches to the internal batteries which supply the device with power. If the internal batteries are discharged and the device has no external batteries, an acoustic alarm is sounded with a GoldCap and a horn.

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Temperature hybrid

The temperature hybrid reads the data of the AWT01 sensor and converts these into digital signals. An electrical isolation occurs in this process.

Internal temperature measurement

The internal temperature measurement is a safety function. In the event of overheating (if the internal temperature of the device is too high), an alarm is sounded.

Fan actuation and fans

The fan rotates quickly after the device has been switched on to remove any residual oxygen from the device. The rotation of the fan is detected and controlled in three stages (slow, medium and fast).

Three temperature sensors control the fan.

CAN

The CAN interface is a fast, serial interface. Via the CAN interface the control unit can communicate with the electronic and pneumatic assemblies. The transmission rate is 800 kbit/s.

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2.4 Motor actuator

The motor actuator controls the blower motor. The motor actuator is located in a self-contained housing. The supply voltage for the motor actuator is +48 V and is protected by a fuse (6.3AT).

The input voltage range of the motor actuator is 12 to 52.5 V. The rotation speed is set by the Central Control Board. The control voltage for the rotation speed is 0 V to +5.00 V, corresponding to a rotation speed of 0 to 12,000 rpm. The rotation speed range is 4,000 to 12,000 rpm.

The motor actuator acquires the "actual speed signal" and forwards it to the Central Control Board. The "actual value signal" is 6 pulses per rotation. In the event of discrepancies in the rotation speed the Central Control Board adjusts the speed according to the deviation.

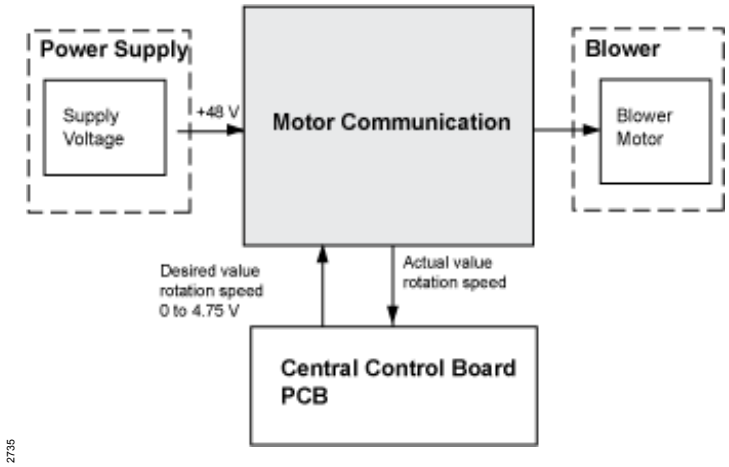

Fig. 4 Block diagram of the motor actuator

2.5 O_2 Valve PCB

The O_2 Valve PCB holds the pressure sensors (absolute pressure S6 and S7 and O_2 supply pressure S5), the actuator for the O_2 calibrating valve and the nebulizer valve and the actuator for the valve block.

The signals of the pressure sensors are amplified and routed to the Central Control Board. The supply voltage (+5 V) for the pressure sensors is generated by the O_2 Valve PCB.

The valve block valves, the O_2 calibrating valve and the nebulizer valve can be operated separately by an electronic switch. They are actuated by the Central Control Board.

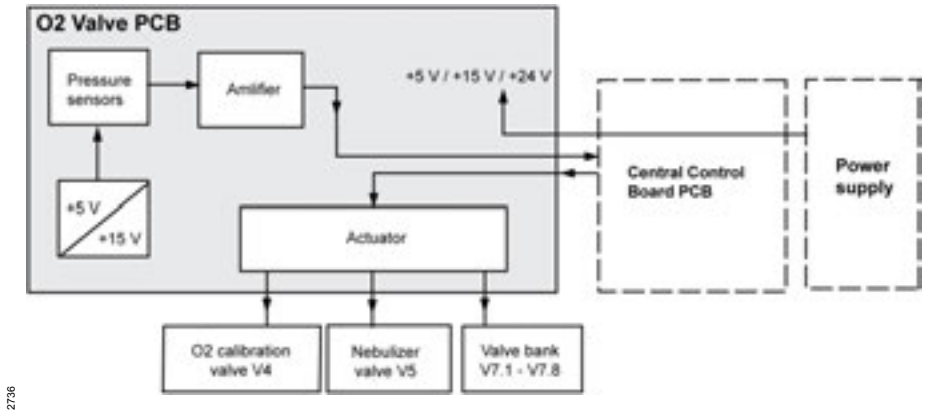

Fig. 5 Block diagram of the O_2 Valve PCB

2.6 O_2 Diaphragm PCB

The O_2 Diaphragm PCB amplifies the signals from the O_2 sensors and measures the temperature of the O_2 sensors and of the respiratory gas in the inspiration block. The temperature of the O_2 sensors is required to compensate for the temperature-sensitive O_2 measurements. The EEPROM on the Central Control Board stores the calibration data of the sensors. The reference voltage for the O_2 sensors is generated from the voltage of the rechargeable batteries.

The supply voltages for the O_2 Diaphragm PCB are +5 V and +15 V.

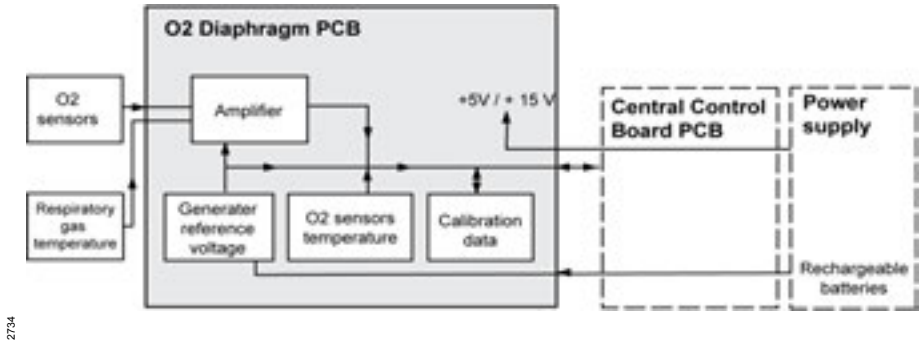

Fig. 6 O_2 Diaphragm PCB block diagram

2.7 Fan

The fan takes in ambient air through the cooler and cools the blower motor. The air flow removes excess oxygen from the device.

The supply voltage for the fan is +24 V. The Central Control Board regulates the speed of the fan.

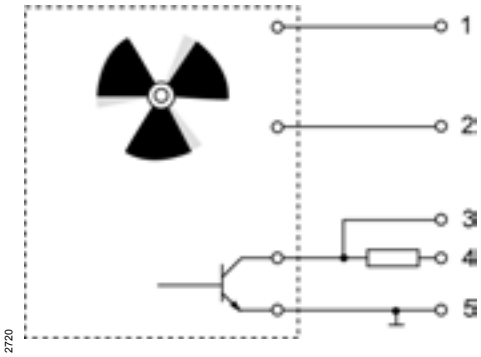

Fig. 7 Fan control

Item	Designation
1	Supply voltage
2	Target speed
3	Speed signal
4	Sensor supply voltage
5	Ground

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3 Control panel with TFT colour display

3.1 Control panel

The control panel is the interface between the unit and the user. The control panel is used to enter and display the ventilation parameters.

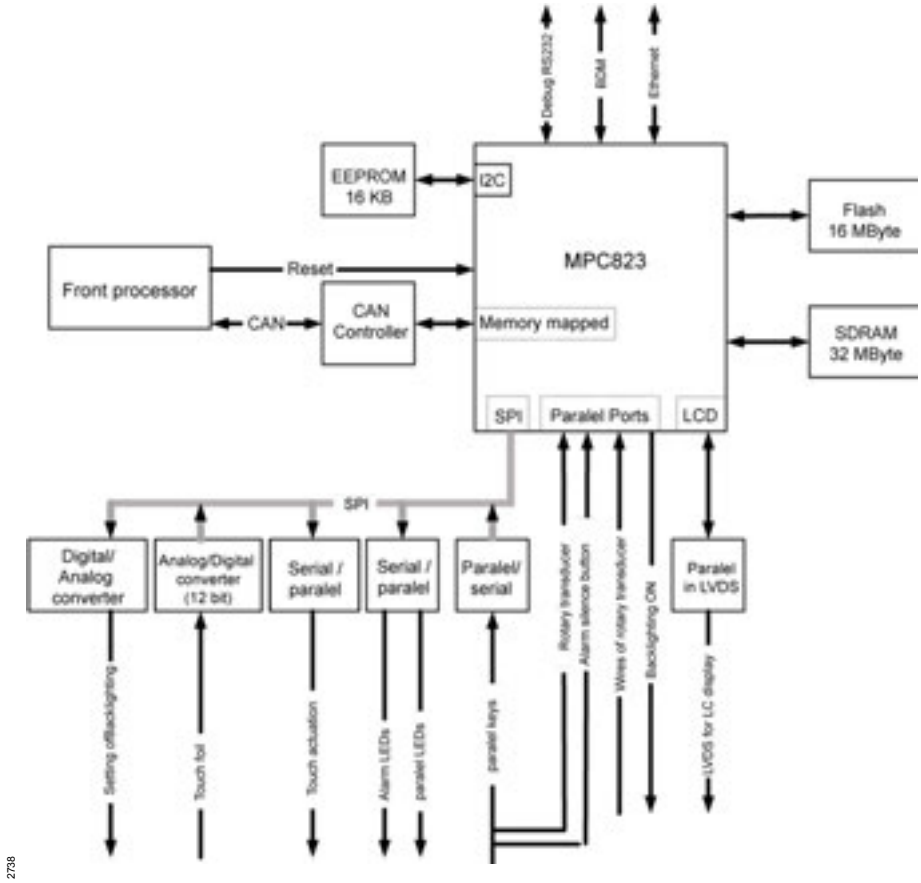

Fig. 8 Block diagram of the control panel with TFT colour display

3.2 Membrane keypad

The keypad features the control keys and the associated LEDs.

3.3 TFT colour display

NOTE

– With effect from January 2013 the LCD display with high-voltage tube backlight described is no longer available.
– It has been replaced by the LCD display with LED backlight.

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3.3.1 LCD display and high-voltage tube backlight

The 12.1” TFT colour display comprises the actual display and the 24 V backlight inverter. The TFT colour display has a resolution of 800 x 600 pixels.

The backlight inverter generates a high voltage for the display backlighting.

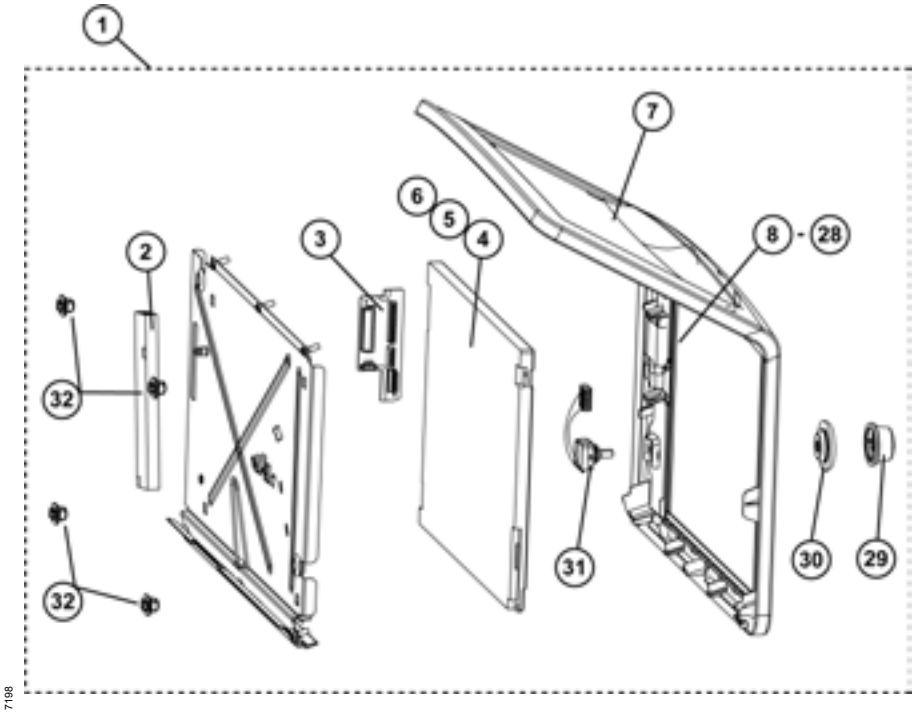

Fig. 9 Control panel

Item	Designation
1	Control panel, complete
2	Backlight inverter 24 V
3	Collection Board
4, 5, 6	Display spare parts set
7	Hood
8-28	Label strip
29	Rotary knob
30	Colour ring
31	Rotary encoder
32	Press foot

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3.3.2 LCD display and LED backlight

The 12.1” TFT colour display comprises the actual display and the Dimmer PCB for the LED backlight. The TFT colour display has a resolution of 800 x 600 pixels.

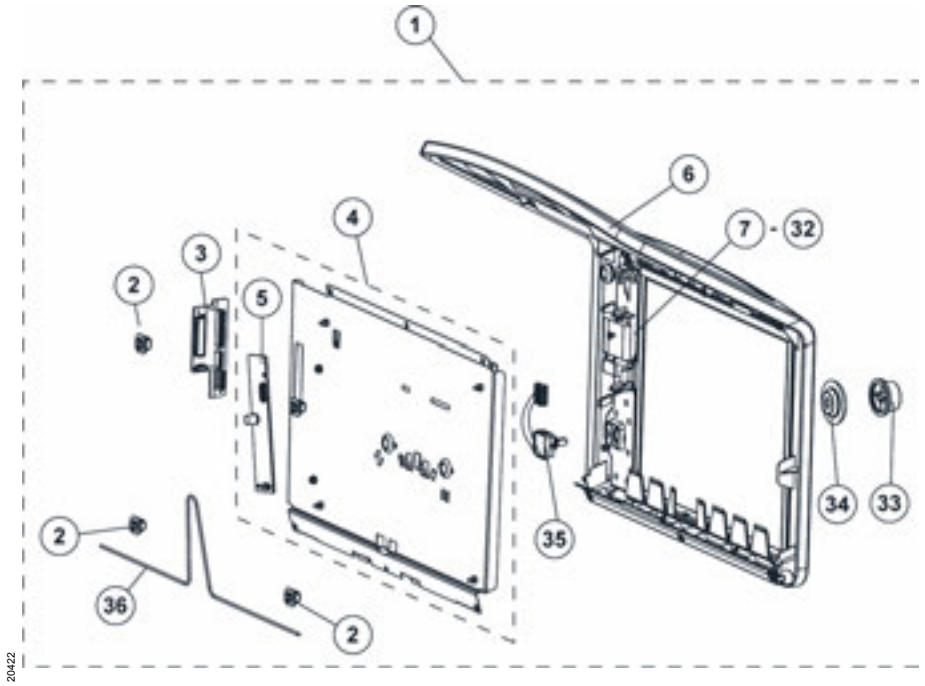

Fig. 10 Control panel

Item	Designation
1	Control panel, complete
2	Press foot
3	Collection Board
4	Display set AUO LED
5	Dimmer PCB
6	Hood
7-32	Label strip
33	Rotary knob
34	Colour ring
35	Rotary encoder
36	Hinged shaft

3.4 Rotary encoder

The rotary knob is used to set and acknowledge the ventilation parameters. The shaft encoder transmits square signals to the processor system as it rotates, and the signals are then evaluated by the Central Control Board. The voltage supply is +5 V.

3.5 Touch-panel

Analog-resistive touch-screen

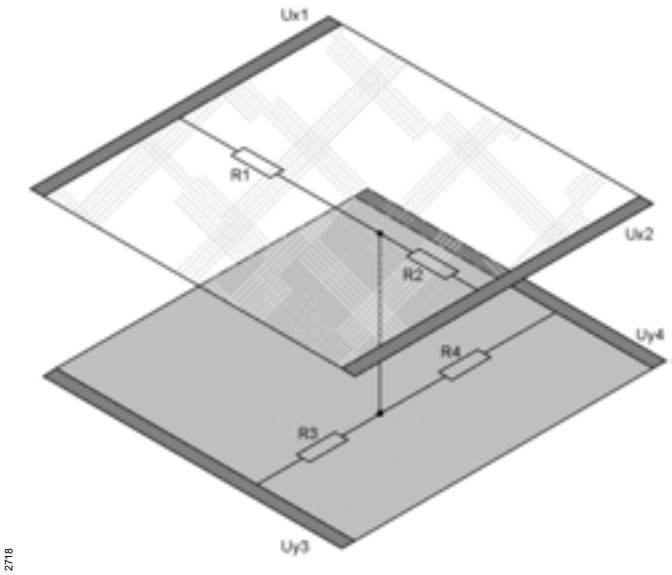

Fig. 11 Analog-resistive touch-screen

Analog systems consist of two opposing conductive indium tin oxide (ITO) layers (x and y layer) which are actuated with a constant direct voltage. Indium tin oxide is a transparent semiconducting material.

Between the two ITO layers there are a large number of small, barely visible so-called spacer dots which ensure the two layers are kept separate.

In 8-wire systems the touch-screen has eight wires routed to the controller – four for each axis.

When the touch-screen is touched at a certain point where the two ITO layers are located an electrical contact is produced. The resistance of this contact results in a different voltage at each point. The change in voltage is then used to define the x and y coordinates.

The Central Control Board controls the communication between the processor system and the touch-screen. The correct position is determined with the aid of the relevant software drivers. The analog touch-screen works very precisely, and provides a high resolution.

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4 Pneumatic assembly

4.1 Functional diagram

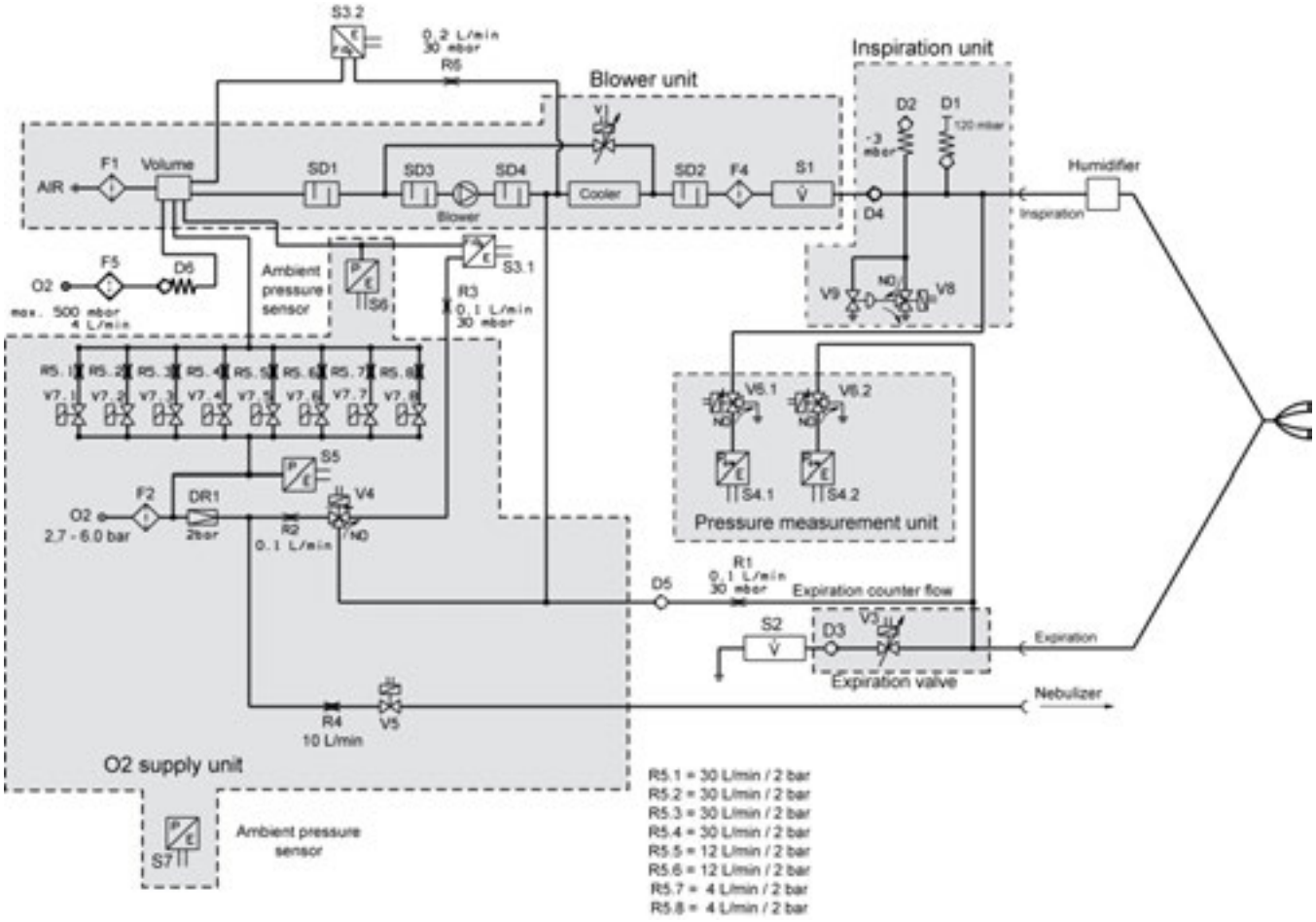

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Fig. 12 Functional diagram

Item	Designation
F1	Micro-filter (AIR)
F2	Filter (O_2)
F4	Filter (inspiratory flow sensor)
F5	Filter (Filter element)
Volume	Mixing chamber
SD1	Suction sound insulator
SD2	Sound insulator
DR1	Supply pressure regulator (Oxygen)
Gebläse	Blower
Kühler	Cooler
V1	Reduction valve
V3	Expiratory valve

Item	Designation
V4	Switching valve (oxygen compensation)
V5	Switching valve (nebulizer)
V6.1	Calibration valve (inspiratory airway pressure sensor)
V6.2	Calibration valve (expiratory airway pressure sensor)
V7.1 - V7.8	Oxygen metering valves
V8	Pilot valve for emergency vent valve
V9	Emergency vent valve
S1	Inspiratory flow sensor
S2	Expiratory flow sensor
S3.1	O_2 sensor 1 (measurement and control)
S3.2	O_2 sensor 2 (Monitoring)
S4.1	Inspiratory airway pressure sensor (located in inspiratory branch)
S4.2	Expiratory airway pressure sensor (located in expiratory branch)
S5	Supply pressure sensor (oxygen)
S6	Pressure sensor 1 (absolute pressure)
S7	Pressure sensor 2 (absolute pressure)
D1	Safety pressure-limitting valve (passive, approx. 120 mbar)
D2	Emergency air valve (-3 mbar to -6 mbar)
D3	Expiratory non-return valve
D4	Inspiratory non-return valve
D5	Flush flow non-return valve
D6	Non-return valve (LPO)
R1	Flush flow metering unit (0,1 L/min at 30 mbar)
R2	O_2 calibration metering unit for (0,1 L/min, integrated in valve block)
R3	Metering unit for O_2 measurement (0,2 L/min at 30 mbar, Sensor 3.1)
R4	Metering unit for nebulizer (10 L/min, integrated in valve block)
R5.1 - R5.8	Metering units for the oxygen metering valves
R6	Metering unit for O_2 measurement (0,2 L/min at 30 mbar, Sensor 3.2)

4.2 Main components

The pneumatic assembly consists of the following components:

– Plug-in unit
– Valve block
– Inspiratory block
– Pressure measuring block
– Patient system
– Flow sensors

4.3 Device functions

Ventilation function

When the device is switched on the power supply unit supplies the blower motor with operating voltage. The blower motor draws in ambient air through the microfilter F1, the volume and the sound insulators SD1 and SD3. The blower motor compresses the gas intake to an overpressure up to max. 140 mbar at a delivery rate of up to 180 L/min. The air compressed by the blower motor passes through the sound insulator SD4, the cooler, the sound insulator SD2, the filter F4 and the inspiratory flow sensor S1 to the inspiratory non-return valve D4. The controller operates the blower motor during a breath at a constant speed. The bypass valve regulates the inspiratory pressure. The combination of the blower motor and bypass valve V1 provides a pressure source.

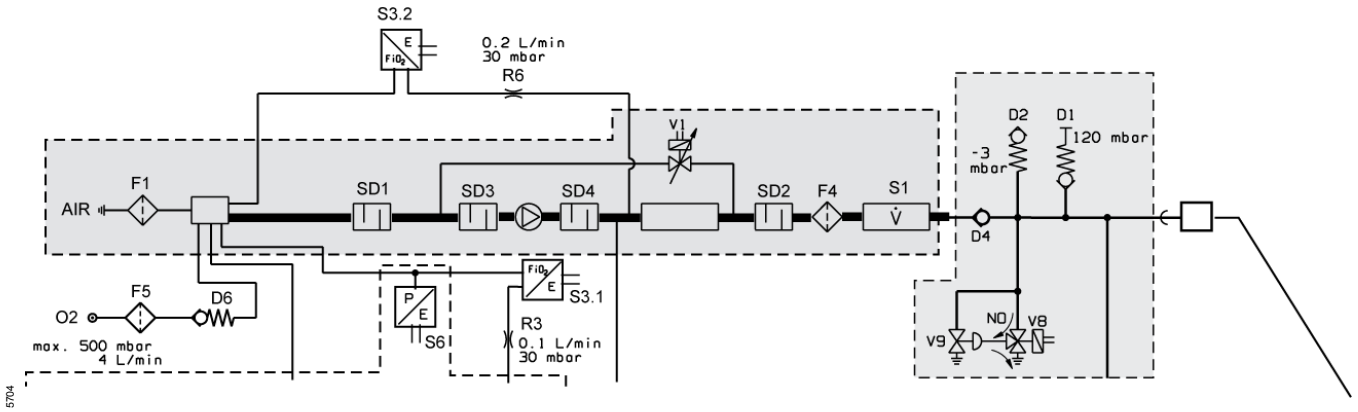

Fig. 13 Detail view of functional diagram; ventilation function

The sound insulators SD1 and SD2 on the inlet and outlet sides of the blower motor reduce the sound level.

The bypass valve V1 is operated such that the desired respiratory pressure is applied to the blower outlet, and thus to the patient. If the patient needs a high flow during the inspiratory phase, the gas flows in part or in its entirety from the blower motor outlet to the patient and the gas flow through the bypass valve V1 is reduced. During the expiratory phase all the blower gas flows through the bypass valve V1.

The cooler reduces the respiratory gas temperature down to a permissible range.

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4.4 O_2 mixture with O_2 high pressure

In order to be able to ventilate with an increased O_2 concentration, the unit must be supplied with 2.7 to 6.0 bar O_2. The oxygen is filtered by the filter F2. With the aid of the digital valve block consisting of 8 digital solenoid valves, oxygen is metered into the volume (mixing chamber). The amount of metered oxygen depends on the pre-set O_2 concentration and on the inspiratory flow rate measured by the flow sensor S1. The oxygen is metered in a closed control loop. In the process, the inspiratory O_2 concentration is measured by the O_2 sensor S 3.1.

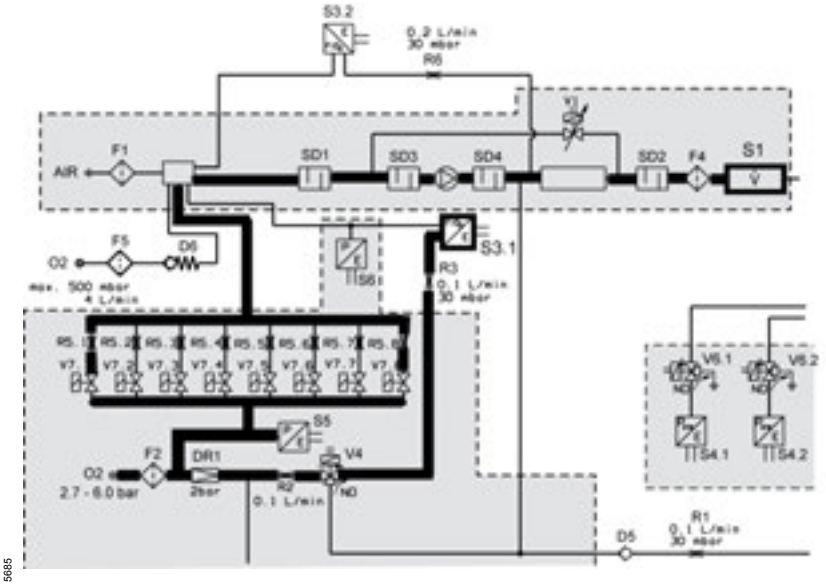

Fig. 14 Detail view of functional diagram; O_2 mixture with O_2 high pressure

4.5 O_2 mixture with O_2 low pressure ("LPO" option)

NOTE

Connect only O_2 low pressure sources without humidifier to the device!

An O_2 low pressure source without humidifier feeds the oxygen into the “LPO” connection on the back of the unit. The filter (filter element) F5 protects the non-return valve D6 from coarse particles. The oxygen flows from the non-return valve D6 into the volume (mixing chamber). In the volume (mixing chamber) it is mixed with the drawn-in and filtered fresh air.

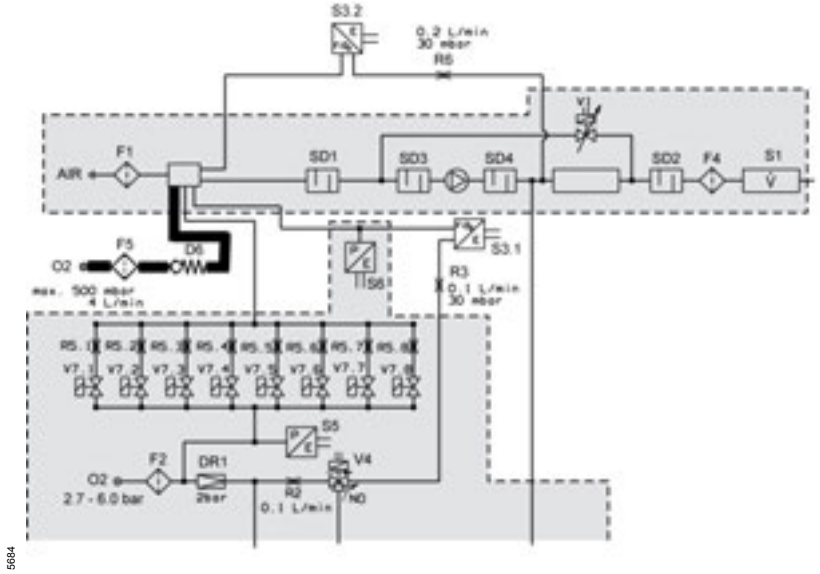

Fig. 15 Detail view of functional diagram; O_2 mixture with O_2 low pressure

When no O_2 low pressure source is connected to the unit, the non-return valve D6 prevents gas from escaping during normal operation.

NOTE

In "LPO" mode, the valve block in the O_2 supply is not actuated.

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4.6 Pneumatic safety devices

The pneumatic safety valve D1 ensures that the ventilation pressure cannot rise above 120 mbar. In the event of inspiratory stenosis the pressure is limited by opening the expiratory valve. The mechanical vacuum valve D2 ensures (except in the case of inspiratory stenosis) that the patient can breathe ambient air in case of a fault.

The pneumatic emergency vent valve V9 relieves the pressure in the breathing system in a case of expiratory stenosis if the pressure cannot be relieved through the expiratory valve. To do so, the electric emergency vent valve (pilot valve) V8 actuates the emergency vent valve V9 accordingly.

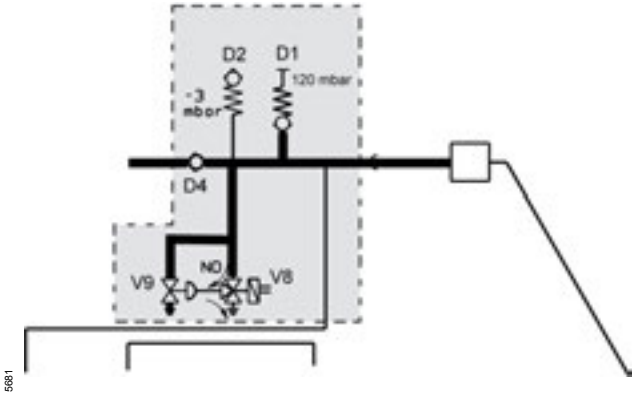

Fig. 16 Detail view of functional diagram; pneumatic safety devices

4.7 Drug nebulizer

The drug nebulizer is operated with 100% oxygen. The pressure regulator DR1 ensures in the case of widely varying supply pressure (2.7 to 6.0 bar) that the pneumatic drug nebulizer receives a constant supply pressure of 2 bar.During the nebulizing phase the solenoid valve V5 operates in an “inspiration” (open position) and “expiration” (closed position) cycle. When the nebulizer function is inactive the nebulizer switching valve V5 is closed.

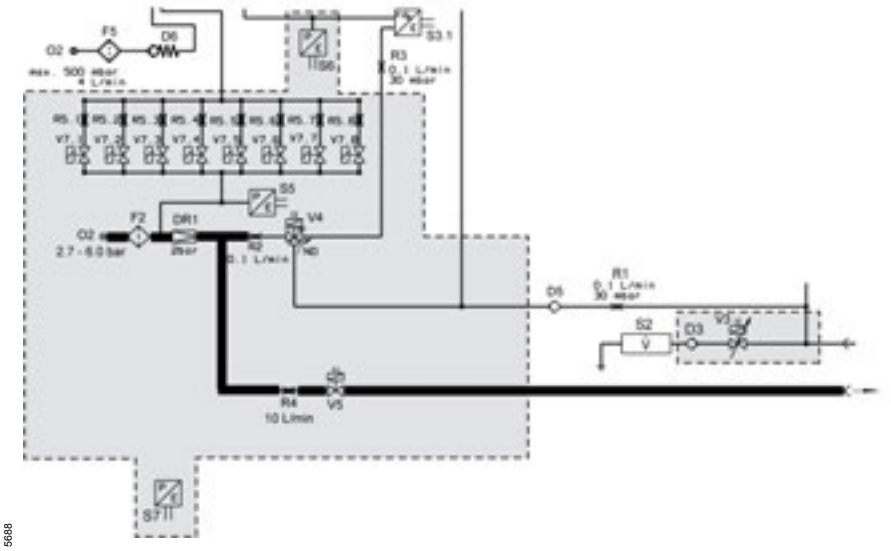

Fig. 17 Detail view of functional diagram; drug nebulier

4.8 O_2 calibration function

During operation, the switching valve (oxygen compensation) V4 is set to “measurement” – that is, the connection between the inspiratory side and the oxygen sensor is open. During oxygen sensor calibration oxygen passes to the oxygen sensor. This layout permits “online” calibration of the oxygen sensor S3.1 during ventilation. The oxygen sensor S3.2 must be calibrated manually (patient disconnected).

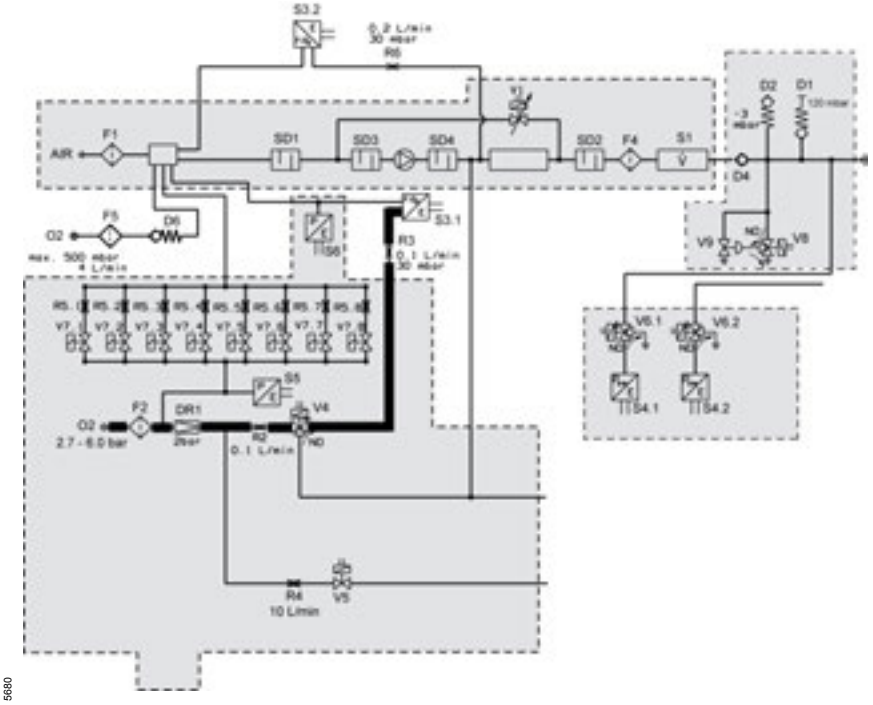

Fig. 18 Detail view of functional diagram; O_2 calibration function

4.9 O_2 sensor detection

The device has an oxygen sensor detector which is necessary for the "LPO" option.

4.10 Sensors

The pressure sensor (absolute pressure) S6 measures the atmospheric pressure necessary for oxygen measurement and for volume application. The pressure sensor (absolute pressure) S7 monitors the pressure sensor (absolute pressure) S6.The oxygen sensor S3.1 generates the signal for the displayed "FiO_2" measured value and the signal to control the inspiratory oxygen concentration. The oxygen sensor S3.2 monitors the oxygen sensor S3.1

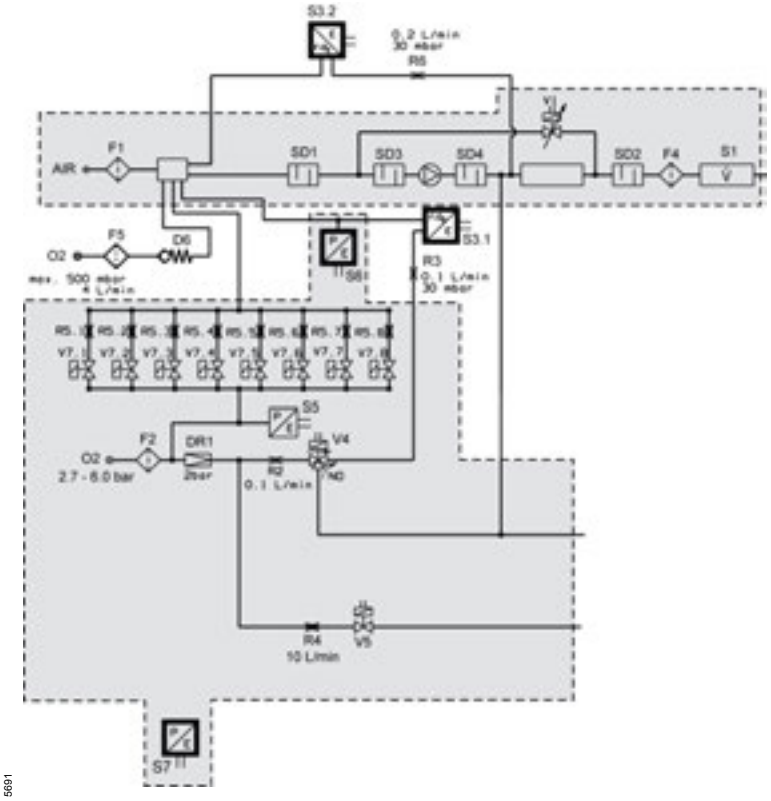

Fig. 19 Detail view of functional diagram; pressure sensors and oxygen sensor

The airway pressure sensor S4.1 measures the pressure in the inspiratory branch. The airway pressure sensor S4.2 measures the pressure in the expiratory branch. The output signals of the airway pressure sensors are needed to determine the airway pressure and for control and monitoring purposes. The airway pressure is measured on the basis of the measured value from the airway pressure sensor in the respective no-flow branch.

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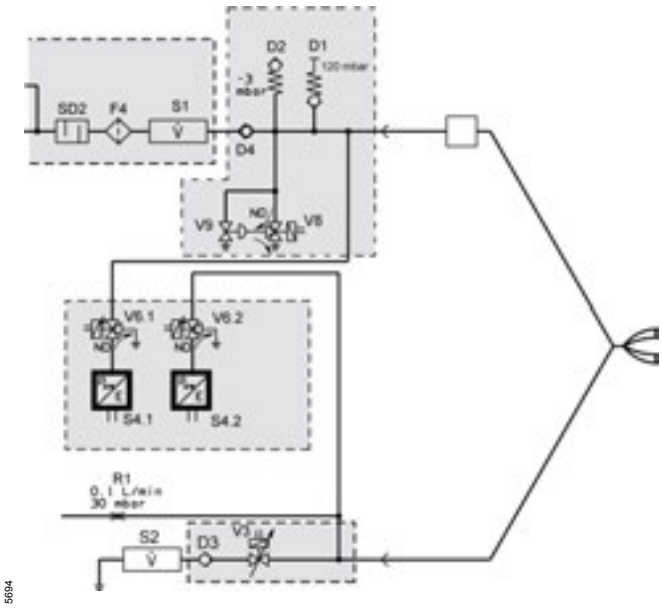

Fig. 20 Detail view of functional diagram; airway pressure sensors

The calibration valves V6.1 and V6.2 enable calibration of the inspiratory and expiratory airway pressure sensors. During calibration, the corresponding calibration valve interrupts the connection to the ventilation circuit and switches the airway pressure sensor to ambient pressure.

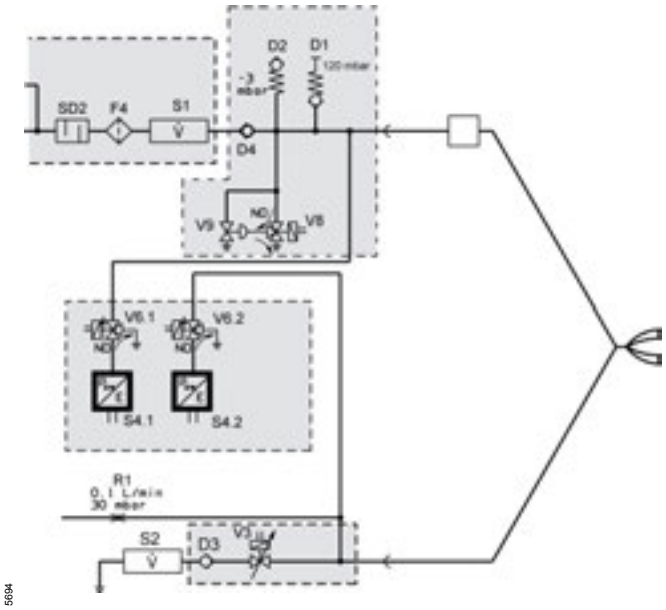

Fig. 21 Detail view of functional diagram; calibration valves

Flow sensor S1 measures the inspiratory gas flow. The measurement variable is used to calculate the necessary oxygen flow and to actuate the oxygen metering valves V7.1 to V7.8 in order to control the breaths and monitor the device functions. The flow sensor includes a temperature measurement function to measure the inspiratory gas temperature.

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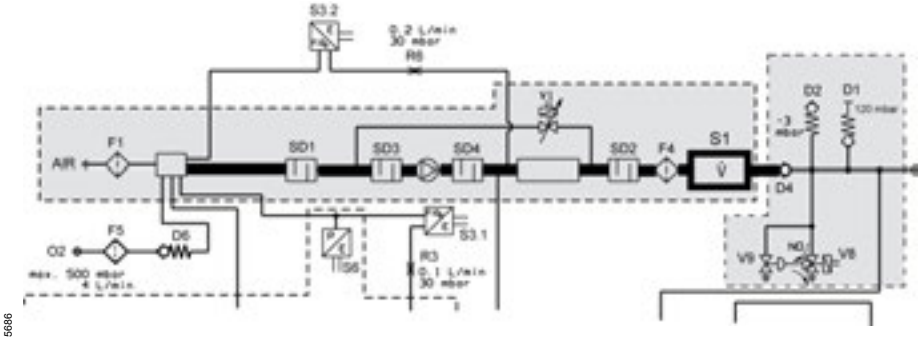

Fig. 22 Detail view of functional diagram; flow sensor

The flow sensor S2 measures the gas flow through the expiratory valve. The flow sensor is a temperature-compensated hot-wire anemometer with no flow direction detector. With this signal the patient is monitored (e.g. the minute volume).

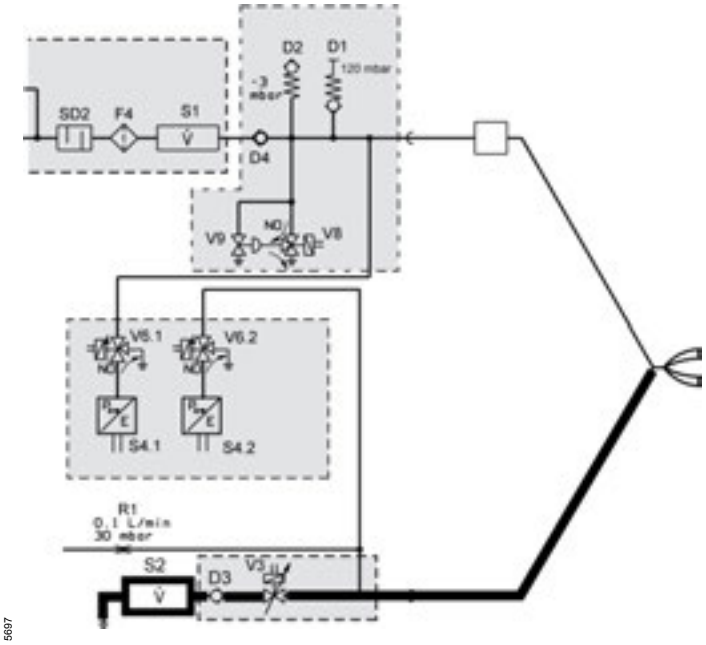

Fig. 23 Detail view of functional diagram; flow sensor

Expiration is executed with the directly actuated expiratory valve V3.

The expiratory valve has the following functions:

– PEEP control during the expiratory phase
– Close the breathing system during the inspiratory phase.

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5 Function description (Low noise)

5.1 Introduction

The low-noise variant of the Savina 300 (**Low noise**) will be introduced in April 2013.

Design modifications have reduced noise emissions by 3 dB.

5.2 Design modifications

The reduction in noise is achieved mainly by sound insulation measures in the motor blower unit:

– Sound-proof hood (Fig. 24/1) made of plastic and interior lined with foam insert
– Motor blower unit (Fig. 24/2) isolated from housing by spring suspension (three spiral springs (Fig. 24/3))
– New tubular silencers (Fig. 24/4) in the mixing chamber

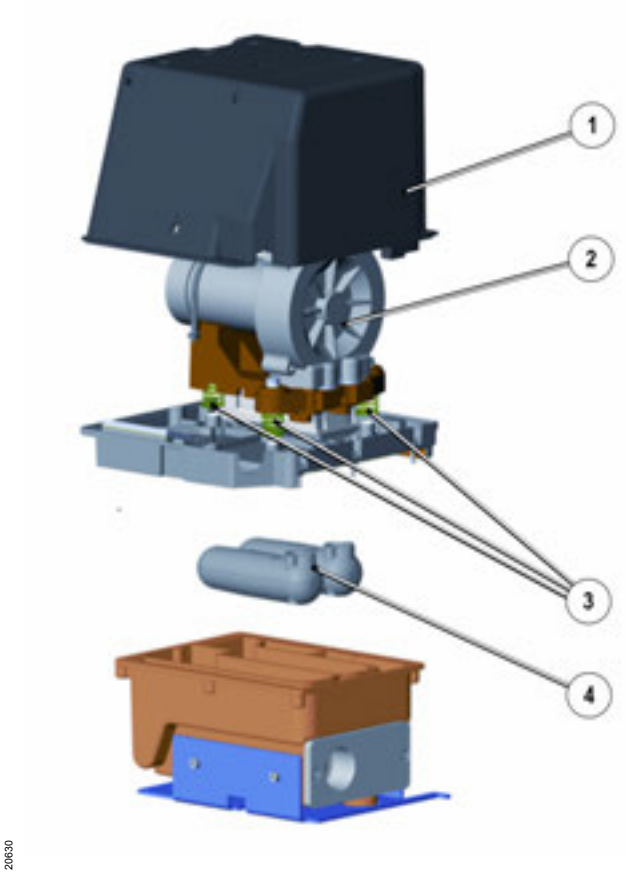

Fig. 24 Noise reduction measures

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5.3 Identification

The low-noise variant of the Savina 300 (**Low noise**) is identified by the marking **X Low noise** on the option label on the rear panel (Fig. 25/1) of the device.

The software version number differentiates between:

– Option label for SW 3.5 (Fig. 25/2)
– Option label for SW 4.n (Fig. 25/3)

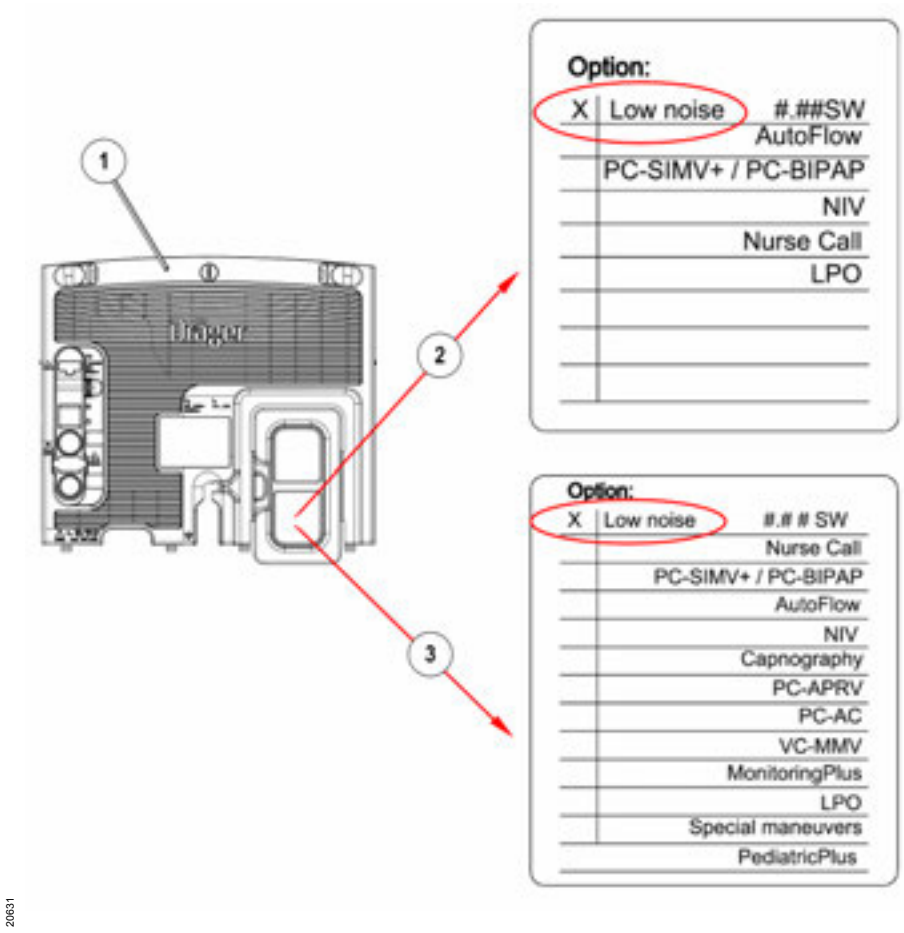

Fig. 25 Low Noise identifier

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6 Option "Mainstream CO_2 sensor Savina 300"

6.1 Introduction

The Mainstream CO_2 sensor Savina 300 measures the CO_2 content in the respiratory gas. The following section describes the design and function of the Mainstream CO_2 sensor Savina 300.

6.2 Design

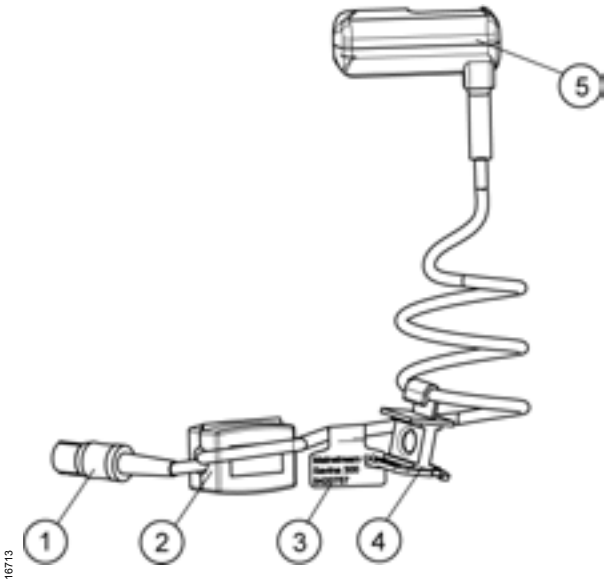

Fig. 26 Mainstream CO_2 sensor Savina 300

Item	Designation
1	Connector
2	Ferrite
3	"Mainstream CO_2 Savina 300" label
4	Test filter
5	CO_2 sensor

6.3 Principle

The CO_2 measurement is based on the principle that CO_2 molecules absorb light at a specific wavelength. Light at a wavelength of around 4.26 µm is strongly absorbed by the CO_2 molecule. Light at a wavelength of around 4.13 µm is virtually not absorbed.

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6.4 Function

Beam path

The beams emitted from the light source (9) are reflected by a parabolic reflector (8), travel through the cuvette (7), and reach a filter/reflector (5). The filter/reflector allows light at a wavelength of 4.13 µm to pass through, but reflects the other wavelengths. The light at a wavelength of 4.13 µm is bundled by a parabolic reflector (3) and sent to a detector (2).

The light reflected by the filter/reflector travels to a filter (10) which allows the light at a wavelength of 4.26 µm to pass through. This light is bundled by a parabolic reflector (11) and sent to a detector (12). The values measured by the detectors are evaluated and used to calculate the CO_2 value. The electronics required to do so is located on two printed circuit boards (1 and 13).

The optical assembly, including filters and detectors, is mounted on a metal block which is kept at a constant temperature of approx. 42 °C. The discs that face the cuvette have small heaters (6) which prevent the discs from misting up.

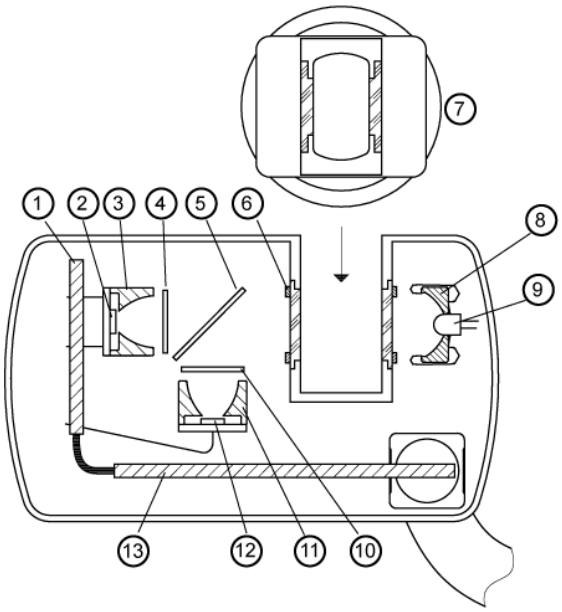

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Fig. 27 Mode of operation of the CO_2 sensor

Electronic assembly

A preamplifier and filter assembly amplifies the values measured by the detectors. The A/D converter converts these measured values into digital signals. The microcontroller then calculates the CO_2 measured values, and makes them available at the RS232 port.

The A/D converters also converts the measured values from the temperature sensors as well as the supply voltages into digital signals. With the help of the control circuit, the microcontroller uses these signals to control the heaters and to monitor the system.

The calibration data of the detectors are stored in the EEPROM.

The value of the test filter is stored in the CO_2 sensor. Depending on the cuvette used (disposable or reusable), a correction value is applied to the CO_2 measurement.

The supply voltage to the electronics is +5 V. The various internal voltages required for operation are generated on the Mainboard PCB.

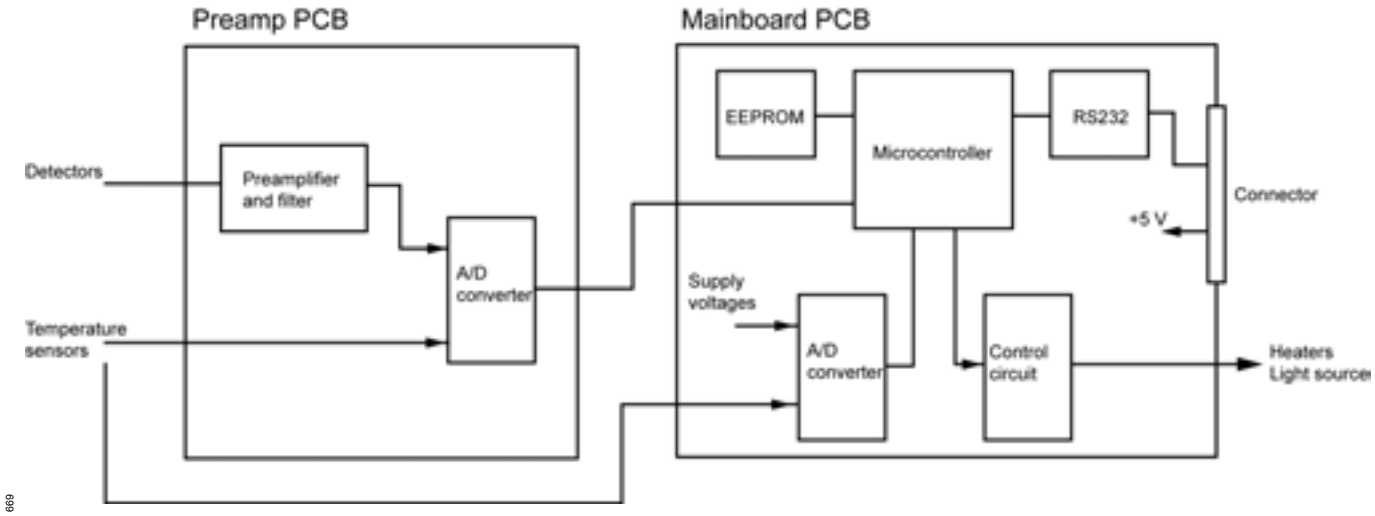

Fig. 28 Block diagram

General information

Each CO_2 sensor is fitted with a test filter. The value of the test filter is stored in the CO_2 sensor.

As from Revision 05 Defibrillator the CO_2 sensor is fixed. This is indicated on the sensor.

6.5 Connections and interfaces

The CO_2 sensor is attached by a connector to the medical product. This connector carries the voltage supply and the communication (RS232).

Pin assignment

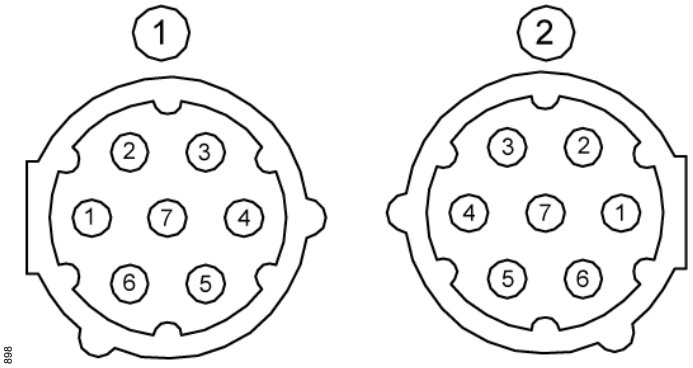

Fig. 29 Connector (1 = rear view, solder terminals, 2 = front view, pins)

Pin	Assignment
1	TXD
2	Unassigned
3	Unassigned
4	+5 V
5	GND
6	RXD
7	Cable shield

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Maintenance instructions

This chapter describes the measures required to maintain the specified condition of the device.

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1 Disassembling/assembling the device (filter cover without screw)

1.1 Introduction

This section describes how to disassemble and assemble the following assemblies:

– Removing/fitting the Savina 300 from/into the trolley
– Filter cover
– Rear panel

1.2 Removing/fitting the Savina 300 from/into the trolley

Preconditions

– The O_2 and mains power supply to the Savina 300 have been cut.
– The tubing system and fitted units have been removed.

Removal

1 Loosen the nuts (Fig. 30/1) on the left and right sides of the trolley slightly and push the two locking devices (Fig. 30/2) inwards towards **A** as far as they will go.

2 Remove the screws (Fig. 30/3).

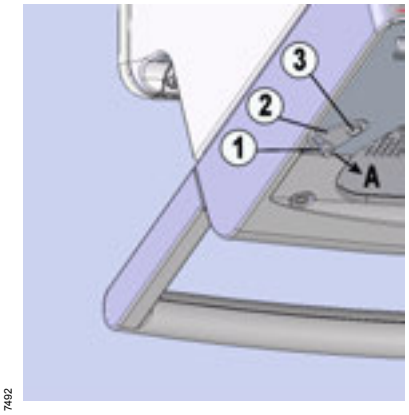

Fig. 30 View from below of trolley mount: screws

3 Lift the Savina 300 out of the trolley.

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Installation

1 Place the Savina 300 in the trolley.

2 Use the screws (Fig. 31/3) to secure the Savina 300 to the trolley.

3 Push the locking devices (Fig. 31/2) on the left and right sides of the trolley outwards towards **B** as far as they will go and tighten the nuts (Fig. 31/1).

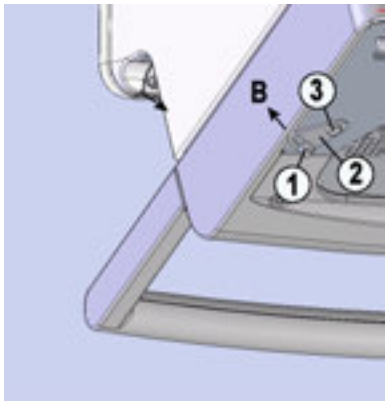

Fig. 31 View from below of trolley mount: screws

1.3 Filter cover

Removal

1 Withdraw the power cable (Fig. 32/2) from filter cover guide.

2 Reach into the openings in the filter cover on both sides, press the catches concealed behind them (Fig. 32/1) simultaneously towards **A** slightly, move the filter cover back slightly and take the filter cover out of the rear panel.

Fig. 32 View of device rear: filter cover

Removal of the filter cover is complete.

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Installation

1 Slot the tabs (Fig. 33/1) of the filter cover into the recesses (Fig. 33/2) in the rear panel, swivel the filter cover upwards and press the catches (Fig. 32/1) of the filter cover into the rear panel until they lock in place.

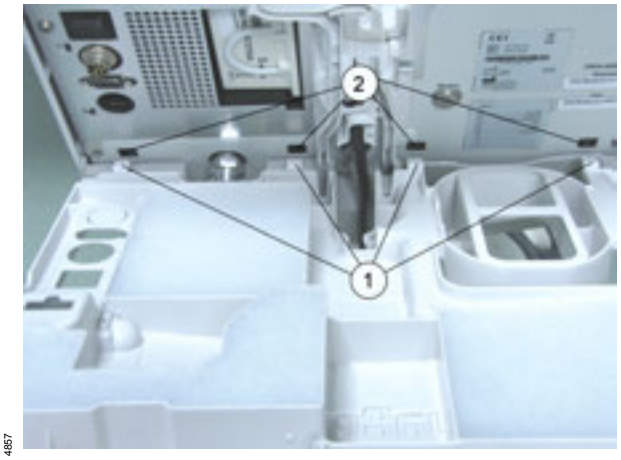

Fig. 33 Detail view of filter cover: tabs and recesses

2 Lay the power cable (Fig. 32/2) around the filter cover guide, as shown in the illustration.

Fitting of the filter cover is complete.

1.4 Rear panel

Preconditions

– Savina 300 has been disconnected from the O_2 supply and the mains power supply.
– The tubing system and units mounted on the Savina 300 have been removed.
– EGB conditions to protect against electrostatic discharge have been established.
– The filter cover has been removed, see section headed "Filter cover".

Removal

1 Pry the tab fuse (Fig. 34/2) from its holder using a small screwdriver or similar tool.

2 Remove the connectors and tubing listed below from the Savina 300, if fitted:

Fig. 34 View of device rear: connections

Item	Designation
1	Connection (external battery)
2	Tab fuse
3	Mains connection
4	Connection (nurse call)
5	Connection (RS232 port)
6	Connection for LPO (option)
7	Connection (O_2 gas supply)
	Connector for potential equalization

3 Holding the lever (Fig. 35/2) pushed back slightly, push the cable retainer (Fig. 35/1) towards **A** and take it out of the rear panel.

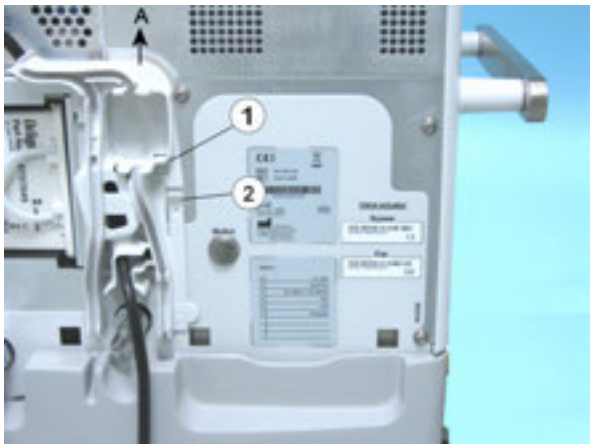

Fig. 35 View of right rear of device: cable retainer

4 **Option trolley**: Remove the Savina 300 from the trolley, see section headed "Removing/fitting the Savina 300 from/into the trolley".

5 Remove the screws (9x) (Fig. 36/1).

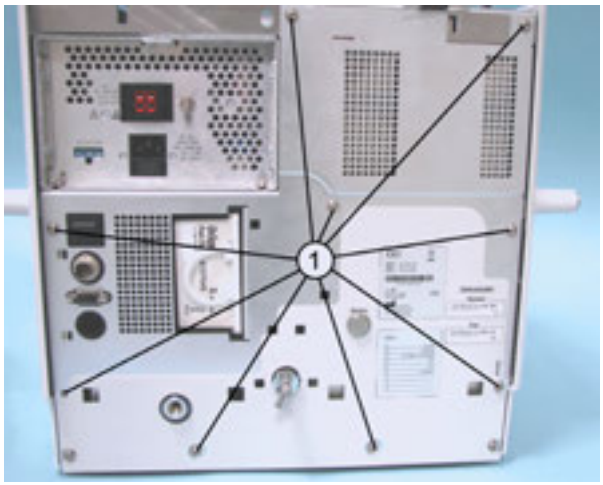

Fig. 36 View of device rear: screws

6 Remove the rear panel.

Removal of the rear panel is now complete.

Installation

1. Fit the rear panel to the Savina 300 using the screws (Fig. 36/1) tightened with a torque of 1.8 Nm +/-0.2 Nm.
2. Fit the cable retainer (Fig. 35/1) in the rear panel.
3. Fit the Savina 300 into the trolley, see section headed "Removing/fitting the Savina 300 from/into the trolley".
4. Re-attach removed connectors and tubing to the Savina 300.
5. Fit the filter cover on the Savina 300, see section headed "Filter cover".
6. Plug the tab fuse for the internal batteries into the holder on the power supply unit.
7. Perform the "electrical safety test" and "function tests" as per the test instructions.

Fitting of the rear panel is complete.

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2 Disassembling/assembling the device (filter cover with screw)

2.1 Introduction

This document describes the following:

- 2.2 Filter cover
- 2.3 Disassembling/assembling the device
- 2.4 Rear panel
- 2.5 Operator control unit
- 2.6 Standard rails
- 2.7 Side panels
- 2.8 Service flap

2.2 Filter cover

2.2.1 Removing the filter cover

1 Remove the following connectors, tab fuses and tubing:

- Tab fuse (Fig. 37/1)
- "Central alarm" port (Fig. 37/3)
- "RS232" port (Fig. 37/4)
- "Mainstream CO_2-Sensor Savina 300" port (Fig. 37/5)
- Potential equalization connector (not shown)

Fig. 37 Rear of device: Connections

2 Insert the tab fuse (Fig. 37/1) into the standby holder (Fig. 37/2) of the filter cover.

3 Fully loosen the screw (Fig. 38/1).

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4 Reach into the openings in the filter cover on both sides, press the catches concealed behind them (Fig. 38/2) simultaneously towards **A** slightly, move the filter cover back slightly and remove the tabs on the underside of the filter cover from the recesses on the rear panel.

Fig. 38 Rear of device: Filter cover

Removal of the filter cover is complete.

2.2.2 Fitting the filter cover

1 Slot the tabs (Fig. 39/1) of the filter cover into the recesses (Fig. 39/2) in the rear panel, swivel the filter cover upwards and press the catches (Fig. 38/1) of the filter cover into the rear panel until they lock in place.

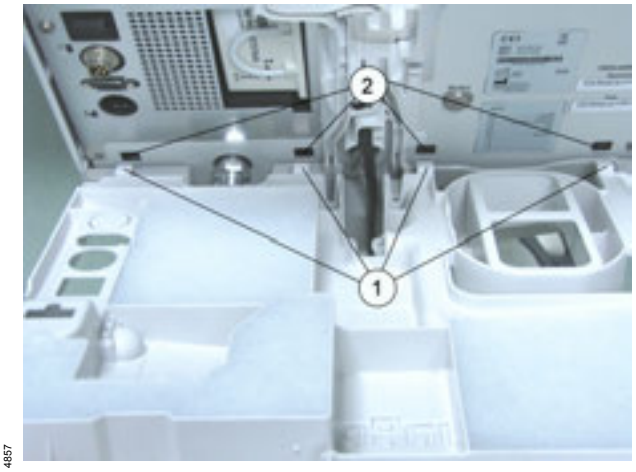

Fig. 39 Detail view of filter cover: Tabs and recesses

2 Fit the filter cover on the Savina 300 by the screw (Fig. 38/1).

Fitting of the filter cover is complete.

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2.3 Disassembling/assembling the device

2.3.1 Removing the Savina 300 from the trolley

Preconditions

- The O_2 gas supply and mains power supply to the Savina 300 have been cut.
- The tubing system and units mounted on the Savina 300 have been removed.
- The Savina 300's filter cover has been removed – see 2.2.1 Removing the filter cover.
- The power and battery cables, if connected, have been removed from the sockets on the Savina 300.

Procedure

1 Loosen the nuts (Fig. 40/1) on the left and right sides of the trolley slightly and turn the two screw locking plates fully aside.

2 Remove the screws (Fig. 40/2).

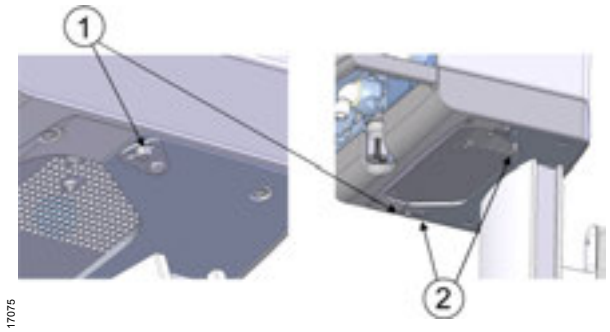

Fig. 40 View from below of trolley mount: Nuts and screws

3 Lift the Savina 300 off of the trolley and place it on a stable, scratch-resistant surface.

Removal of the Savina 300 from the trolley is complete.

2.3.2 Fitting the Savina 300 on the trolley

Procedure

1 Place the Savina 300 in the trolley.

2 Fit the Savina 300 on the trolley by the screws (Fig. 40/2), applying a tightening torque of Nm +/- Nm.

3 Push the screw locking plates on the left and right sides of the trolley all the way out and tighten the nuts (Fig. 40/1).

Fitting of the Savina 300 on the trolley is complete.

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2.4 Rear panel

2.4.1 Removing the rear panel

Preconditions

– The O_2 gas supply and mains power supply to the Savina 300 have been cut.
– The tubing system and units mounted on the Savina 300 have been removed.
– The filter cover has been removed – see 2.2.1 Removing the filter cover.
– The power and battery cables, if connected, have been removed from the sockets on the Savina 300.
– ESD conditions to protect against electrostatic discharge have been established.

Procedure

1 Holding the lever (Fig. 41/1) pulled back slightly, push the cable retainer (Fig. 41/2) towards **A** and remove the cable retainer from the rear panel.

Fig. 41 Rear of device: Cable retainer

2 Remove the Savina 300 from the trolley – see 2.3.1 Removing the Savina 300 from the trolley.

3 Remove the screws (Fig. 42/1).

Fig. 42 View of device rear: Screws

4 Remove the rear panel.

Removal of the rear panel is complete.

2.4.2 Installing the rear panel

1 Fit the rear panel to the Savina 300 by the screws (Fig. 42/1), applying a tightening torque of 1.8 Nm +/- 0.2 Nm.
2 Fit the cable retainer (Fig. 41/2) in the rear panel.
3 Mount the Savina 300 on the trolley – see 2.3.2 Fitting the Savina 300 on the trolley.
4 Connect the power and battery cables, if available, to the sockets on the Savina 300.
5 Fit the filter cover on the Savina 300 – see 2.2.2 Fitting the filter cover.
6 Re-attach removed connectors and tubing to the Savina 300.
7 Take the tab fuse (Fig. 37/1) out of the filter cover standby holder (Fig. 37/2) and push the tab fuse into the power supply unit socket.
8 Perform the "electrical safety test" and "function tests" according to the test instructions.

Fitting of the rear panel is complete.

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2.5 Operator control unit

2.5.1 Removing the operator control unit

Preconditions

– The O_2 gas supply and mains power supply to the Savina 300 have been cut.
– The tubing system and units mounted on the Savina 300 have been removed.
– The tab fuse (Fig. 37/1) has been removed from the power supply unit socket.
– ESD conditions to protect against electrostatic discharge have been established.

Procedure

1 Remove the caps (Fig. 43/1).

Fig. 43 View of device: Caps

2 Remove the screws (Fig. 44/1).

Fig. 44 View of device: Screws

3 Swivel the operator control unit (Fig. 45/1) forwards.

Fig. 45 Left side view of device: Operator control unit

4 Hold the locks of the cable connector on both sides (Fig. 46/1) to the cable connector and pull the cable connector from the plug contact of the Central Control Board, ensuring it remains straight.

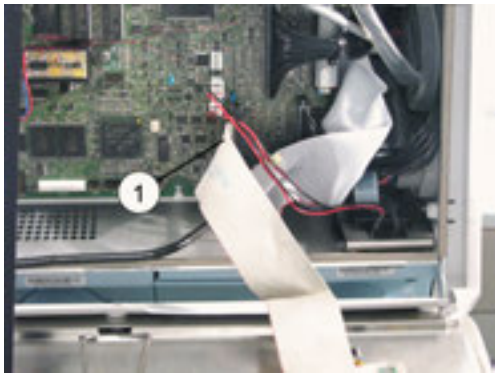

Fig. 46 Detail view of Central Control Board: Cable connector (ribbon cable)

5 Disconnect the cable socket (Fig. 47/1) from the Central Control Board.

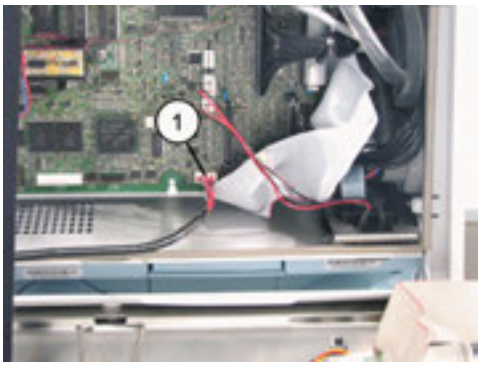

Fig. 47 Detail view of Central Control Board: Cable socket

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6 Hold the spring (Fig. 48/1) pressed down and at the same time push the metal pin and the retaining strap (Fig. 48/2) out of the lock.

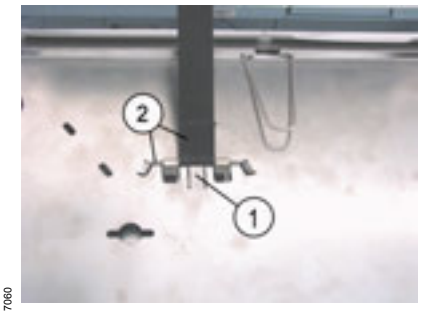

Fig. 48 Detail view of operator control unit: Metal pin and retaining strap

7 Using one hand to secure the operator control unit against falling down during removal, hold the locking spring (Fig. 49/1) pressed together towards **A** and set the locking spring to the unlock (park) position (Fig. 49/2).

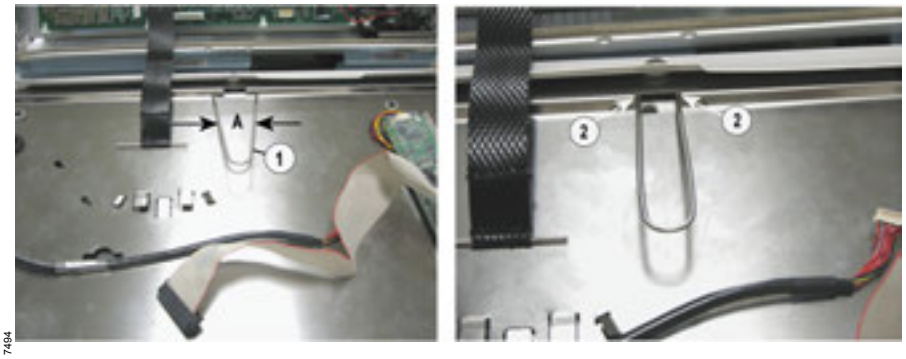

Fig. 49 Detail view of operator control unit: Locking spring (unlock position)

Removal of the operator control unit is complete.

2.5.2 Fitting the operator control unit

1 During fitting, use one hand to secure the operator control unit against falling down and fit it as follows:

– Position the operator control unit on the hinges of the side panels.

– Holding the locking spring (Fig. 50/1) of the operator control unit pressed together towards **A**, insert the locking spring pins in the locators of the left (Fig. 51/1) and right side panels respectively and set the locking spring to the lock position (Fig. 50/2).

Fig. 50 Detail view of operator control unit: Locking spring (lock position)

Fig. 51 Front left side of device: Locator on left side panel

2 Hold the spring (Fig. 52/1) of the operator control unit pressed down and at the same time push the metal pin and the retaining strap (Fig. 52/2) into the operator control unit lock.

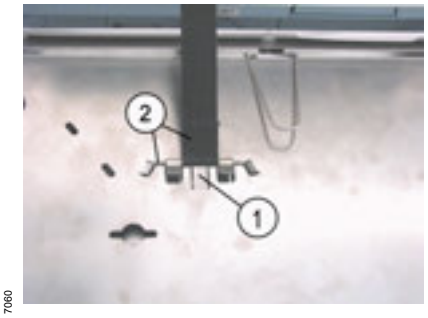

Fig. 52 Detail view of operator control unit: Metal pin and retaining strap

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3 Connect the cable socket (Fig. 53/1) to the Central Control Board.

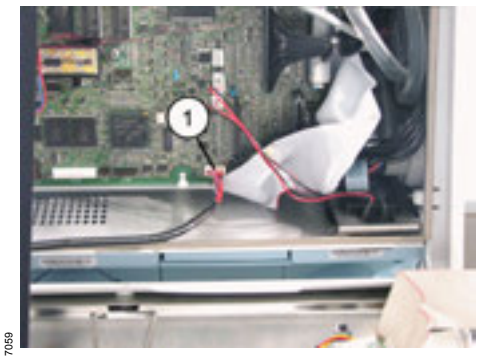

Fig. 53 Detail view of Central Control Board: Cable socket

4 Insert the cable connector (Fig. 54/1) straight into the plug contact of the Central Control Board, far enough for the locks on both sides to secure the cable connector in place.

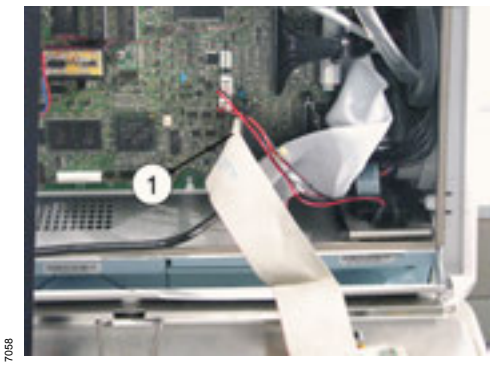

Fig. 54 Detail view of Central Control Board: Cable connector (ribbon cable)

5 Ensure that after fitting the operator control unit the two side panels are inside the operator control unit and secure the operator control unit on the Savina 300 by the screws (Fig. 55/1).

Fig. 55 View of device: Screws

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6 Fit the caps (Fig. 56/1) on the screws.

Fig. 56 View of device: Caps

7 Perform the "electrical safety test" and "function tests" according to the test instructions.

Fitting of the operator control unit is complete.

2.6 Standard rails

2.6.1 Removing the standard rails

NOTE

The next section describes how to remove and fit the right side standard rail. The left side standard rail is fitted and removed in the same way.

1 Remove the screws (Fig. 57/1) and detach the standard rail (Fig. 57/2).

Fig. 57 Right side view of device: Screws and standard rail

Removal of the standard rail is complete.

2.6.2 Fitting the standard rails

1 Use the screws (Fig. 57/1) tightened with a torque of 4.8 Nm +/-0.5 Nm to secure the standard rail (Fig. 57/2) on the Savina 300 with the recessed holes facing outwards.

Fitting of the standard rail is complete.

2.7 Side panels

2.7.1 Removing the side panels

Preconditions

NOTE

The next section describes how to remove and fit the right side panel. The left side panel is fitted and removed in the same way.

- The O_2 gas supply and mains power supply to the Savina 300 have been cut.
- The tubing system and units mounted on the Savina 300 have been removed.
- The filter cover has been removed – see 2.2.1 Removing the filter cover.
- The power and battery cables, if connected, have been removed from the sockets on the Savina 300.
- The Savina 300 has been removed from the trolley – see 2.3.1 Removing the Savina 300 from the trolley.
- ESD conditions to protect against electrostatic discharge have been established.
- The operator control unit has been removed – see 2.5.1 Removing the operator control unit.
- The standard rail of the relevant side panel has been removed – see 2.7.1 Removing the side panels.

Procedure

1 Turn the screw slot (Fig. 58/1) vertical.

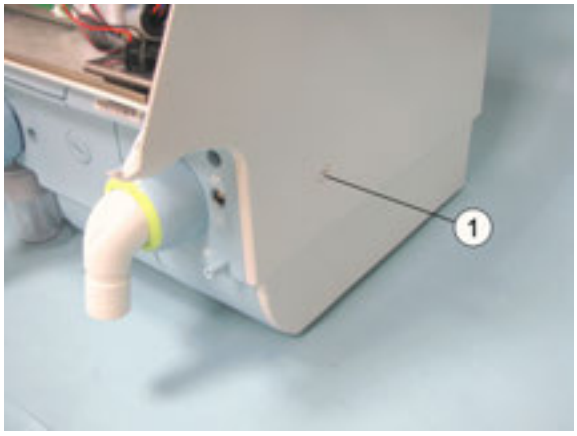

Fig. 58 Right side view of device: Screw slot

2 Press the two tabs together (Fig. 59/1) and at the same time push the tabs out of the frame.

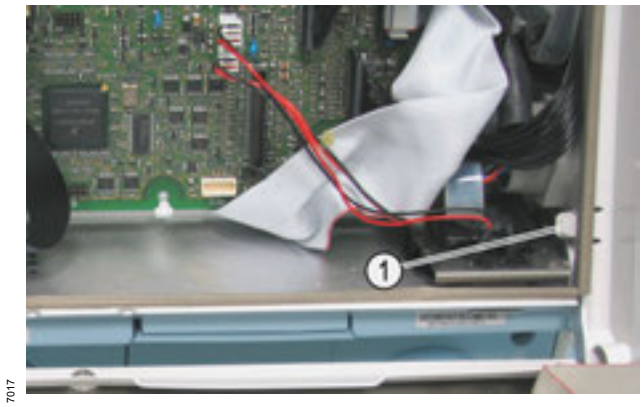

Fig. 59 Front right side view of device: Tabs

3 Raise the side panel slightly and remove the bottom tabs (Fig. 60/1) of the side panel from the recesses (Fig. 60/2) in the frame.

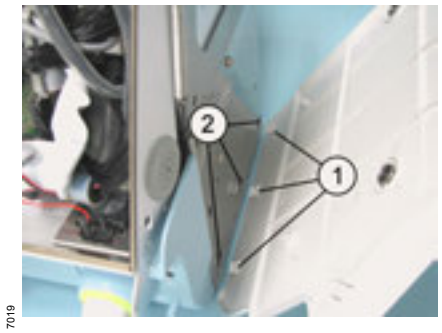

Fig. 60 Right side view of device: Tabs and recesses

Removal of the side panel is complete.

2.7.2 Fitting the side panels

1 Insert the bottom tabs (Fig. 60/1) of the side panel in the recesses (Fig. 60/2) in the frame, push the side panel down slightly and push the top tabs (Fig. 59/1) into the frame.

2 Press the screw slot into the device slightly and at the same time turn the screw slot (Fig. 58/1) horizontal.

3 Fit the standard rail on the Savina 300 – see 2.6.2 Fitting the standard rails.

4 Fit the operator control unit on the Savina 300 – see 2.5.2 Fitting the operator control unit.

5 Mount the Savina 300 on the trolley – see 2.3.2 Fitting the Savina 300 on the trolley.

6 Connect the power and battery cables, if available, to the sockets on the Savina 300.

7 Fit the filter cover on the Savina 300 – see 2.2.2 Fitting the filter cover.

8 Perform the "electrical safety test" and "function tests" according to the test instructions.

Fitting of the side panel is complete.

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2.8 Service flap

2.8.1 Removing the service flap

Preconditions

- The O_2 gas supply and mains power supply to the Savina 300 have been cut.
- The tubing system and units mounted on the Savina 300 have been removed.
- The filter cover has been removed – see 2.2.1 Removing the filter cover.
- The power and battery cables, if connected, have been removed from the sockets on the Savina 300.
- The Savina 300 has been removed from the trolley – see 2.3.1 Removing the Savina 300 from the trolley.
- ESD conditions have been established.
- The rear panel has been removed – see 2.4.1 Removing the rear panel.
- The operator control unit has been removed – see 2.5.1 Removing the operator control unit.
- The right side standard rail has been removed – see 2.6.1 Removing the standard rails.
- The right side panel has been removed – see 2.7.1 Removing the side panels.

Procedure

1 Remove the screw (Fig. 61/1).

Fig. 61 Rear of device: Screw (1)

2 Remove the screws (Fig. 62/1) and countersunk screw (Fig. 62/2) of the service flap (Fig. 62/3).

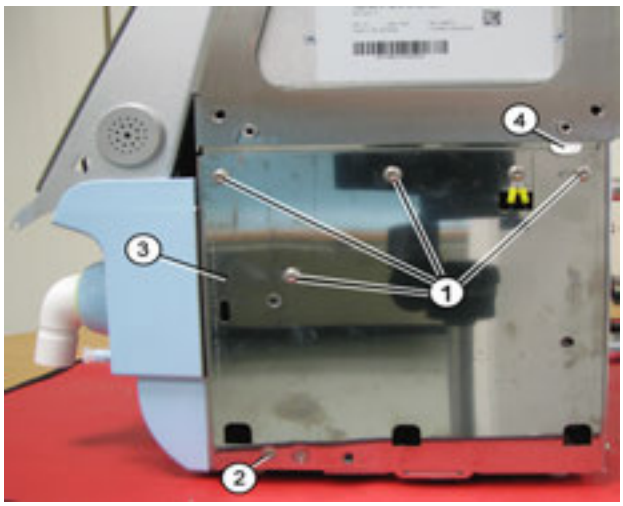

Fig. 62 Right side view of device: Screws (1)

3 Withdraw the plug (Fig. 63/1) from the connection housing (inspiration).

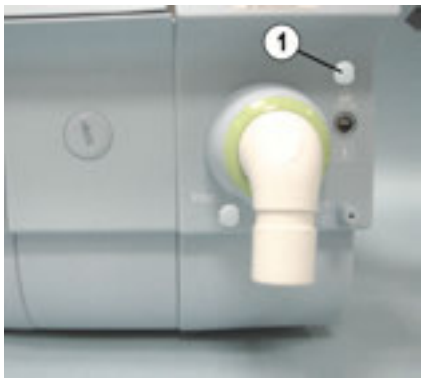

Fig. 63 View of connection housing (inspiration): 1x plug

4 Remove the screw (Fig. 64/1).

Fig. 64 View of connection housing (inspiration): Screw

5 Push out the service flap (Fig. 62/3) under the tab (Fig. 62/4) of the sheet-metal housing and remove the service flap.

Removal of the service flap is complete.

2.8.2 Fitting the service flap

1 Push the upper side of the service flap (Fig. 65/3) under the tab (Fig. 65/4) of the sheet-metal housing and, without trapping any tubing or cable, fit the service flap as follows:

- Insert the earth cables through the opening of the service flap and secure as shown in the following illustration with a screw and a torque of 1.8 Nm +/-0.2 Nm.
- Tighten the screws (Fig. 65/1) with a torque of 1.8 Nm +/-0.2 Nm.
- Hand-tighten the flat-head screw (Fig. 65/2).

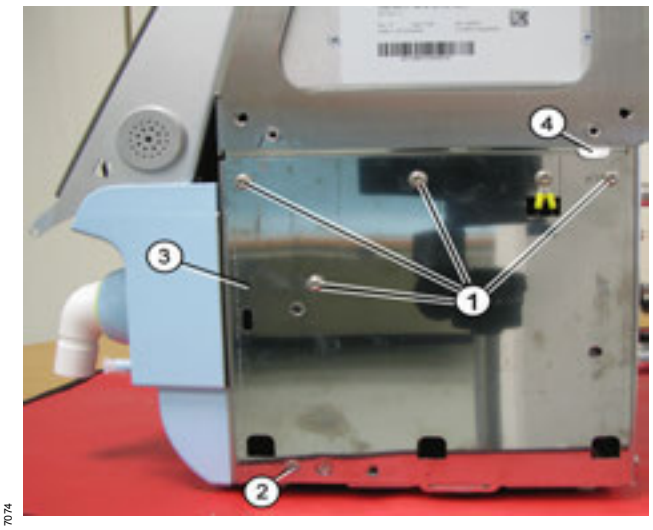

Fig. 65 Right side view of device: Screws

2 Fit the service flap to the device by the screw (Fig. 66/1) tightened with a torque of 1.8 Nm +/-0.2 Nm.

Fig. 66 Rear of device: Screw

3 Hand-tighten the connection housing (inspiration) on the Savina 300 by the screw (Fig. 67/1).

Fig. 67 View of connection housing (inspiration): Screw

4 Fit the plug (Fig. 68/1) into the opening in the connection housing (inspiration).

Fig. 68 View of connection housing (inspiration): 1x plug

5 Fit the right side panel – see 2.7.2 Fitting the side panels.
6 Fit the right side standard rail – see 2.6.2 Fitting the standard rails.
7 Fit the operator control unit – see 2.5.2 Fitting the operator control unit.
8 Fit the rear panel – see 2.4.2 Installing the rear panel.
9 Mount the Savina 300 on the trolley – see 2.3.2 Fitting the Savina 300 on the trolley.
10 Connect the power and battery cables, if available, to the sockets on the Savina 300.
11 Fit the filter cover – see 2.2.2 Fitting the filter cover.
12 Perform the "electrical safety test" and "function tests" according to the test instructions.

Fitting of the service flap is complete.

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3 Replacing the microfilter (filter cover without screw)

3.1 Introduction

The following section provides a view of the microfilter and describes how to remove and fit it.

3.2 View

The microfilter (Fig. 69/1) is located on the rear of the device.

Fig. 69 Device rear; microfilter

3.3 Removal

Preconditions

– Savina 300 is switched off.

Procedure

1 Reach into the openings in the filter cover on both sides, press the catches concealed behind them (Fig. 70/1) simultaneously towards **A** slightly, move the filter cover back slightly and take the filter cover out of the rear panel.

2 Withdraw the power cable (Fig. 70/2) from filter cover guide.

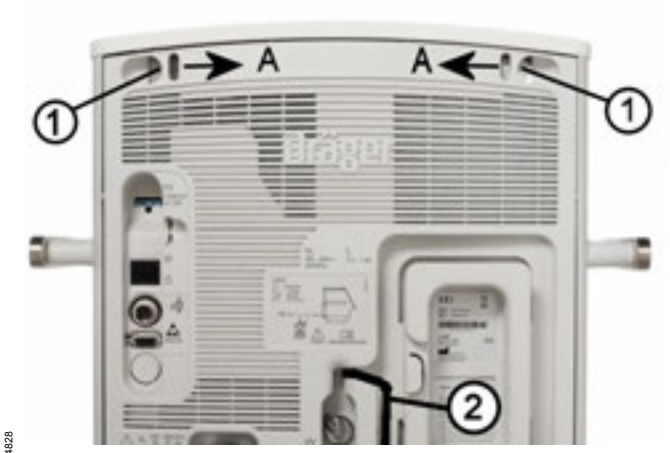

Fig. 70 Savina 300 rear; filter cover

3 Withdraw the microfilter (Fig. 71/2) by the tab (Fig. 71/1) out of its mount and dispose of it in the domestic waste bin.

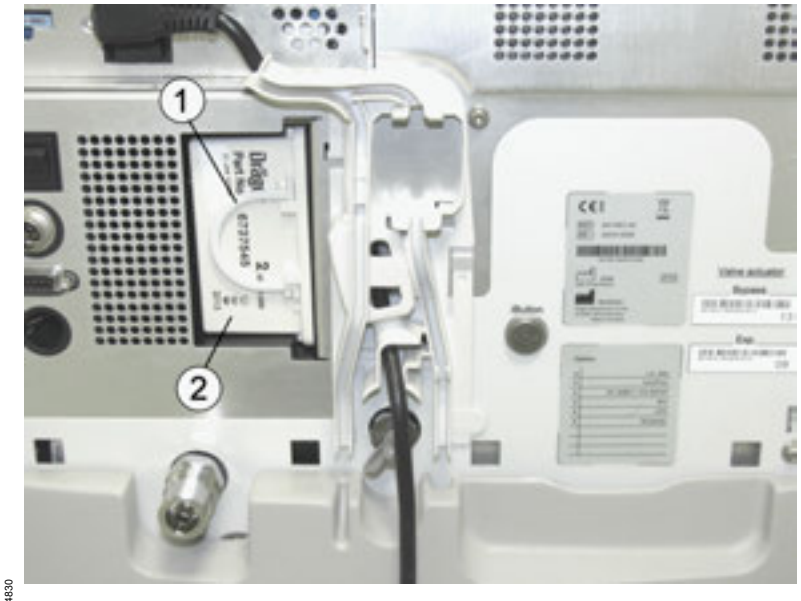

Fig. 71 Savina 300 rear; microfilter

Removal of the microfilter is complete.

3.4 Fitting

1. Insert the new microfilter (Fig. 71/2) into its mount as far as it will go.
2. Close the tab (Fig. 71/1) against the microfilter.
3. Slot the pegs on the underside of the filter cover into the recesses in the rear panel, swivel the filter cover upwards and with the catches (Fig. 70/1) press the filter cover into the rear panel until it locks in place.
4. Lay the power cable (Fig. 70/2) around the filter cover guide, as shown in the illustration.

Fitting of the microfilter is complete.

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4 Replacing the microfilter (filter cover with screw)

4.1 Introduction

The following section provides a view of the microfilter and describes how to remove and fit it.

4.2 View

The microfilter (Fig. 72/1) is located on the rear behind the device's filter cover.

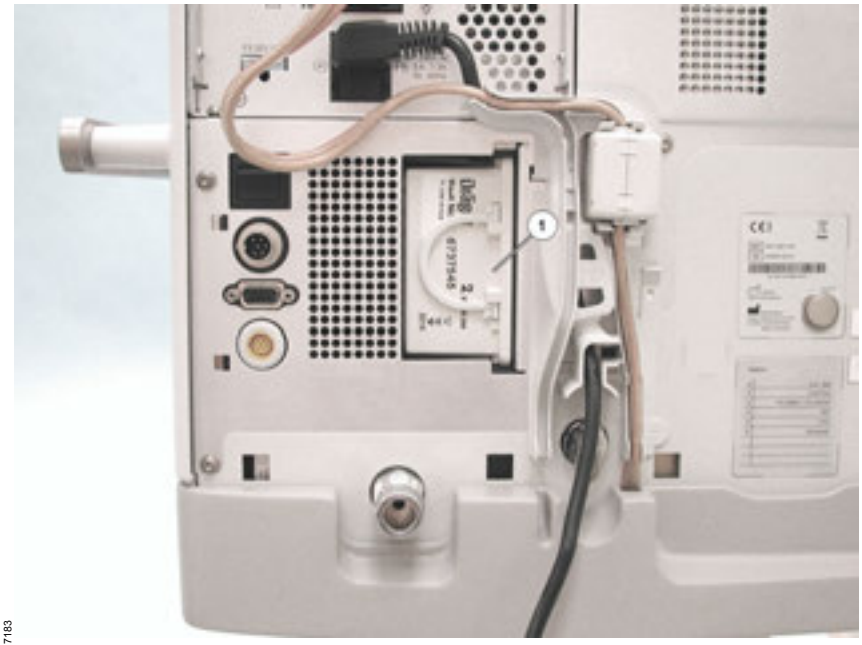

Fig. 72 Rear of device: Microfilter fitting location

4.3 Removal

Removal

1 Remove the following connectors from the Savina 300:

- "Central alarm" port (Fig. 73/1)
- "RS232" port (Fig. 73/2)
- "Mainstream CO_2-Sensor Savina 300" port (Fig. 73/3)

Fig. 73 Rear of device: Connections

2 Fully loosen the screw (Fig. 74/1).

3 Reach into the openings in the filter cover on both sides, press the catches concealed behind them (Fig. 74/2) simultaneously towards **A** slightly, move the filter cover back slightly and remove the filter cover tabs from the recesses on the rear panel.

Fig. 74 Rear of device: Filter cover

4 Grasping it by the tab (Fig. 75/1), withdraw the microfilter (Fig. 75/2) out of its mount and dispose of the microfilter as domestic waste.

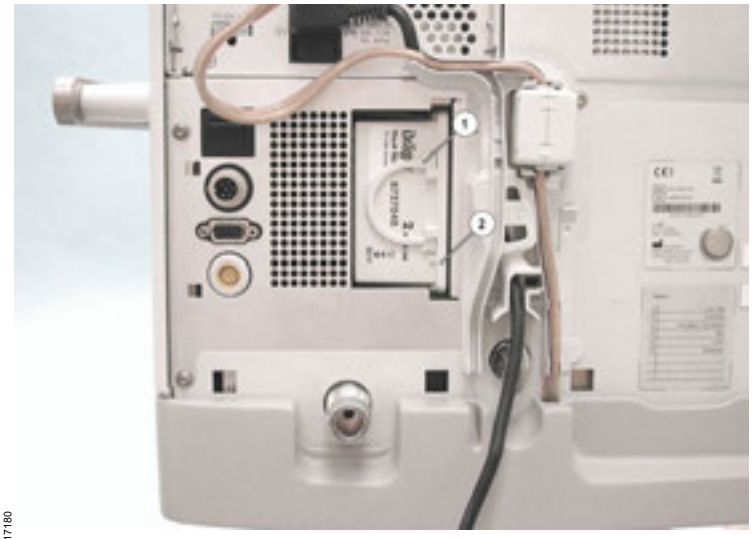

Fig. 75 Rear of device: Microfilter

Removal of the microfilter is complete.

4.4 Fitting

1. Insert the microfilter (Fig. 75/2) into its mount as far as it will go.
2. Close the tab (Fig. 75/1) against the microfilter.
3. Slot the tabs (Fig. 76/1) of the filter cover into the recesses (Fig. 76/2) in the rear panel, swivel the filter cover upwards and press the catches (Fig. 74/2) of the filter cover into the rear panel until they lock in place.

Fig. 76 Detail view of filter cover: Tabs and recesses

4. Secure the filter cover on the Savina 300 by the screw (Fig. 74/1).
5. Re-attach the removed connectors to the Savina 300.

Fitting of the microfilter is complete.

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5 Replacing the dust filters (filter cover without screw)

5.1 Introduction

The following section provides a view of the dust filter set and describes how to remove and fit it.

5.2 View

The dust filters (Fig. 77/1) are located in the device's filter cover.

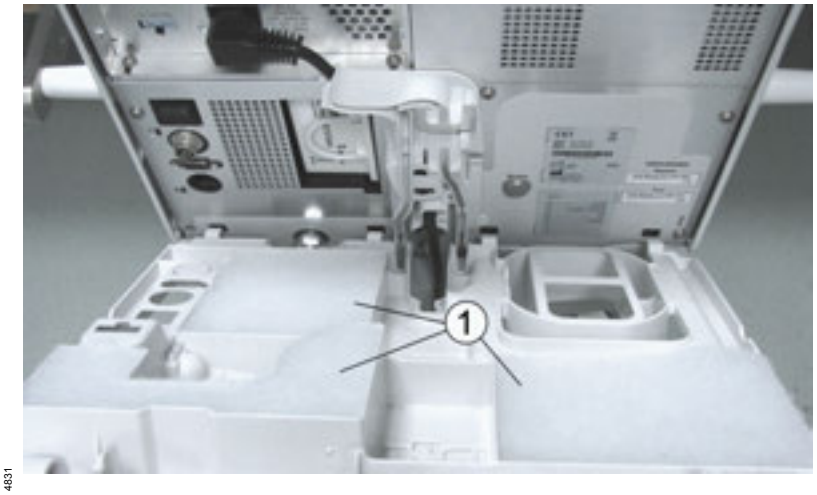

Fig. 77 Device rear; dust filters (3x)

5.3 Removal

1. Reach into the openings in the filter cover on both sides, press the catches concealed behind them (Fig. 78/1) simultaneously towards **A** slightly, move the filter cover back and take the filter cover out of the rear panel.
2. Withdraw the power cable (Fig. 78/2) from filter cover guide.

Fig. 78 Savina 300 rear; filter cover

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3 Withdraw the dust filters (Fig. 79/1) out of the filter cover and dispose of them in the domestic waste bin.

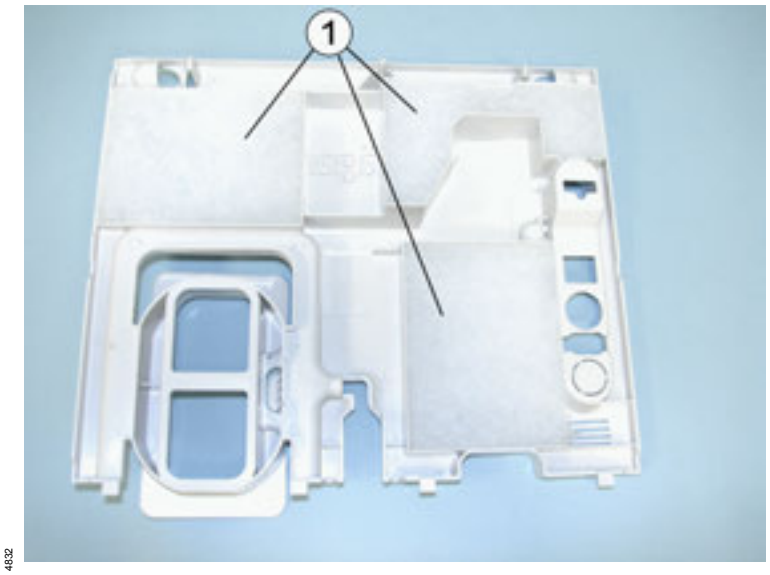

Fig. 79 Filter cover; dust filters (3x)

Removal of the dust filters is complete.

5.4 Fitting

1 Insert the new dust filters (Fig. 79/1) in the recesses in the filter cover.

2 Slot the pegs (Fig. 80/1) on the underside of the filter cover into the recesses (Fig. 80/2) in the rear panel, swivel the filter cover upwards and with the catches (Fig. 78/1) press the filter cover into the rear panel until it locks in place.

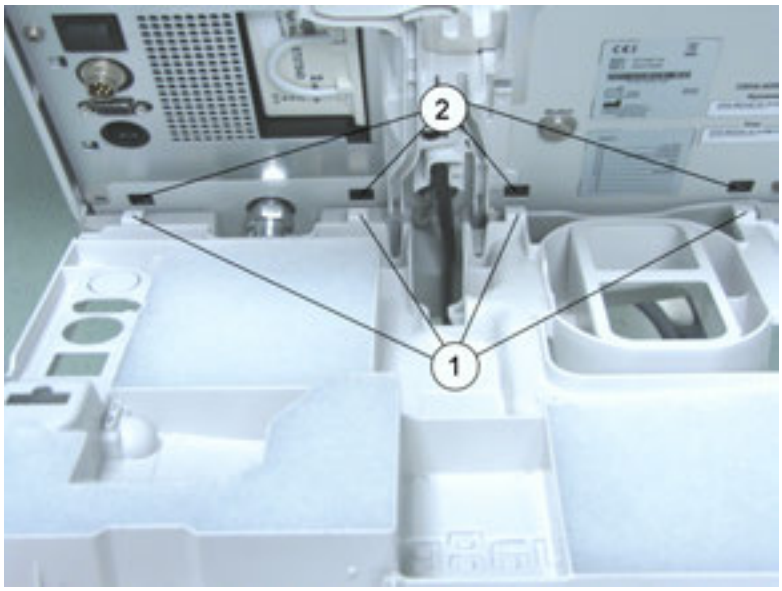

Fig. 80 Detail view of filter cover: Fitting

3 Lay the power cable (Fig. 78/2) around the filter cover guide, as shown in the illustration.

Fitting of the dust filters is complete.

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6 Replacing the dust filters (filter cover with screw)

6.1 Introduction

The following section provides a view of the dust filters and describes how to remove and fit it.

6.2 View

The dust filters (Fig. 81/1) are located in the device's filter cover.

Fig. 81 Rear view of device: Dust filters (3x)

6.3 Removal

1 Remove the following connectors, tab fuses and tubing:

- "Central alarm" port (Fig. 82/1)
- "RS232" port (Fig. 82/2)
- "Mainstream CO_2-Sensor Savina 300" port (Fig. 82/3)

Fig. 82 Rear view of Savina 300: Connections

2 Fully loosen the screw (Fig. 83/1).

3 Reach into the openings in the filter cover on both sides, press the catches concealed behind them (Fig. 83/2) simultaneously towards **A** slightly, move the filter cover back slightly and remove the filter cover tabs from the recesses on the rear panel.

Fig. 83 View of device rear: Filter cover

1 Withdraw the dust filters (Fig. 84/1) out of the filter cover and dispose of them in the domestic waste bin.

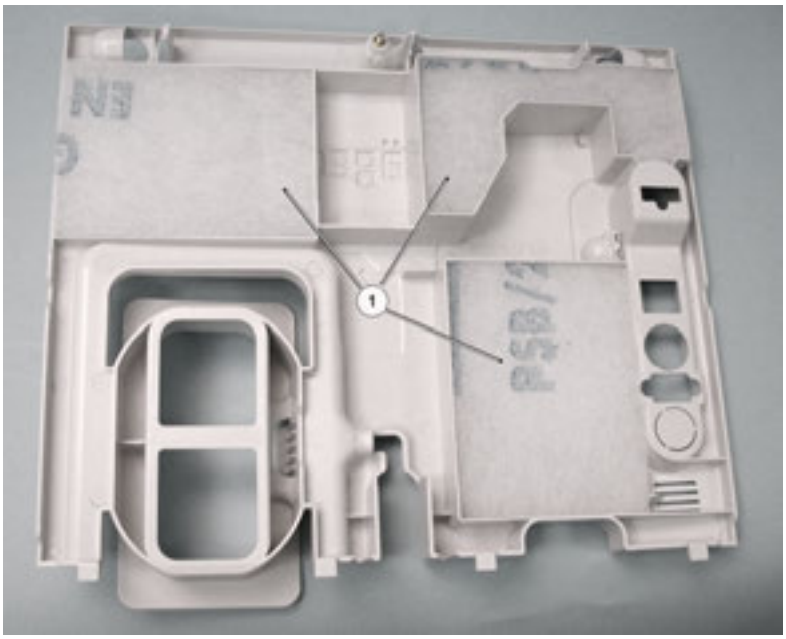

Fig. 84 Filter cover: Dust filters (3x)

Removal of the dust filters is complete.

6.4 Fitting

1 Insert the new dust filters (Fig. 84/1) in the corresponding recesses in the filter cover.

2 Slot the tabs (Fig. 85/1) of the filter cover into the recesses (Fig. 85/2) in the rear panel, swivel the filter cover upwards and press the catches (Fig. 83/2) of the filter cover into the rear panel until they lock in place.

Fig. 85 Detail view of filter cover: Tabs and recesses

3 Secure the filter cover on the Savina 300 by the screw (Fig. 83/1).

4 Re-attach the removed connectors to the Savina 300.

Fitting of the dust filters is complete.

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7 Replacing the O_2 sensors

7.1 Introduction

NOTE

Replace the O_2 sensors if calibration is no longer possible or if the alarm message "FiO_2 measurement failed" is displayed.

The following section provides a view of the O_2 sensors and describes how to remove, fit and calibrate them.

7.2 View

The O_2 sensors (Fig. 86/1) are located behind the cover plate on the front of the Savina 300.

Fig. 86 Front view of device: O_2 sensors

7.3 Removal

Preconditions
– The Savina 300 is switched off and disconnected from the mains power supply.

Required tools
– Screwdriver

Procedure

1 Swivel the inspiratory socket (Fig. 87/1) down.

2 Loosen the screw (Fig. 87/2) using a screwdriver or similar and detach the cover plate (Fig. 87/3).

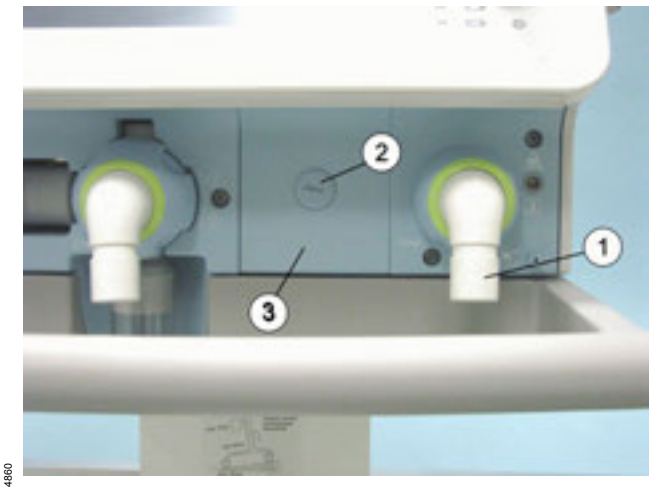

Fig. 87 Front view of device: Cover plate

3 Withdraw the O_2 sensors (Fig. 88/1) out of their mounts.

Fig. 88 Front view of device: Removing the O_2 sensors

NOTE

O_2 sensors are special waste. When disposing of them, observe local waste disposal regulations.

4 Dispose of the O_2 sensors according to local waste disposal regulations.

Removal of the O_2 sensors is complete.

7.4 Fitting

1 Push the O_2 sensors into their mounts, with the arrows imprinted on them pointing upwards, as shown in the following illustration, until you feel a resistance.

Fig. 89 Front view of device: Fitting the O_2 sensors

2 Swivel the inspiratory socket (Fig. 90/1) down.

3 Use the screw (Fig. 90/2) to fit the cover plate (Fig. 90/3) on the Savina 300.

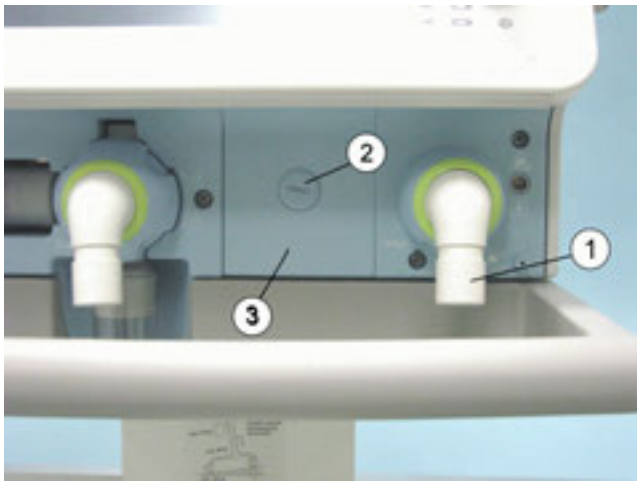

Fig. 90 Front view of device: Cover plate

Fitting of the O_2 sensors is complete.

7.5 Calibrating the O_2 sensors

Preconditions

– The Savina 300 has been connected to the mains power supply.
– The blade fuse has been has been inserted into the slot on the power supply unit.
– The Savina 300 has been connected to the O_2 supply.

Calibrating O_2 sensor 2 in "HPO" mode

NOTE

To be able to calibrate the Savina 300 correctly, you must wait for the device to warm up. If the blade fuse was removed, it may take as long as 20 minutes for the device to warm up.

CAUTION

If the quality of the oxygen from the central oxygen supply or the compressed gas oxygen cylinder is inadequate, calibrate the O_2 sensor with calibration gas (100% O_2). Otherwise miscalibration may occur.

1 Switch on the Savina 300.

2 Set "VC-CMV/VC-AC" mode.

3 Press the "Sensors/Parameters" softkey.

4 Press the O_2 calibration "Start" softkey and confirm with the rotary knob.

The message "Disconnect patient" is displayed.

5 Within the next 30 seconds detach the inspiratory tube from the inspiratory socket.

The message "O_2 calibration in progress" is displayed.

6 Detach the inspiratory tube from the inspiratory socket and, if necessary, continue ventilation with an independent ventilator.

The Savina 300 calibrates O_2 sensor 2. During calibration the alarms which would normally occur due to the disconnection and the changed O_2 concentration are disabled. After about 60 seconds the prompt "Reconnect patient" is displayed.

NOTE

If the patient has not been reconnected after 30 seconds, Savina 300 starts ventilating again in the preset ventilation mode and all alarms are enabled again.

7 Immediately fit the inspiratory tube on the inspiratory socket.

NOTE

If the message "FiO_2 measurement failed" is displayed after calibrating, the O_2 sensors must be replaced – see "Replacing the O_2 sensors".

If the display indicates "O_2 calibration OK", calibration is complete.

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Calibrating the O_2 sensors in "LPO" mode

NOTE

In "LPO" mode the O_2 sensors are calibrated with ambient air. The O_2 measurement accuracy is reduced as a result. If high O_2 measurement accuracy is required, the O_2 sensors must be calibrated in "HPO" mode.

1 In the situations listed below the O_2 sensors cannot be calibrated in "LPO" mode:

a) During the 10-minute warm-up phase after switching on the Savina 300

b) Up to one hour after the Savina 300 has been subjected to a major temperature change, such as being transported from a cold room to a heated room or due to extreme ventilation settings.

FiO_2 measurement is possible during this time as long as no relevant alarm is indicated.

2 Press the "Sensors/Parameters" softkey.

3 Press the O_2 calibration "Start" softkey and confirm with the rotary knob.

4 When prompted by the Savina 300, disconnect the O_2 concentrator and confirm with the rotary knob.

The message "Disconnect patient" is displayed.

5 Detach the inspiratory tube from the inspiratory socket and, if necessary, continue ventilation with an independent ventilator.

The display indicates "O_2 calibration in progress". The Savina 300 calibrates the O_2 sensors. During calibration the alarms which would normally occur due to the disconnection and the changed O_2 concentration are disabled. After about 60 seconds the prompt "Reconnect patient" is displayed.

6 Immediately fit the inspiratory tube on the inspiratory socket.

NOTE

If the patient has not been reconnected after 30 seconds, Savina 300 starts ventilating again in the preset ventilation mode and all alarms are enabled again.

NOTE

If the message "FiO_2 measurement failed" is displayed after calibrating, the O_2 sensors must be replaced – see "Replacing the O_2 sensors".

If the display indicates "O_2 calibration OK", calibration is complete.

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8 Replacing the diaphragm of the expiratory valve

8.1 Introduction

The following section provides a view of the expiratory valve diaphragm and describes how to remove and fit it.

8.2 View

The diaphragm (Fig. 91/1) is located on the expiratory valve.

Fig. 91 Detail view of expiratory valve: diaphragm

8.3 Removal

1. Swivel the flow sensor flap (Fig. 92/1) up to position **A**.
2. Push the flow sensor (Fig. 92/2) to the left as far as it will go.
3. Turn the locking ring (Fig. 92/3) of the expiratory valve to the left towards **B** as far as it will go.

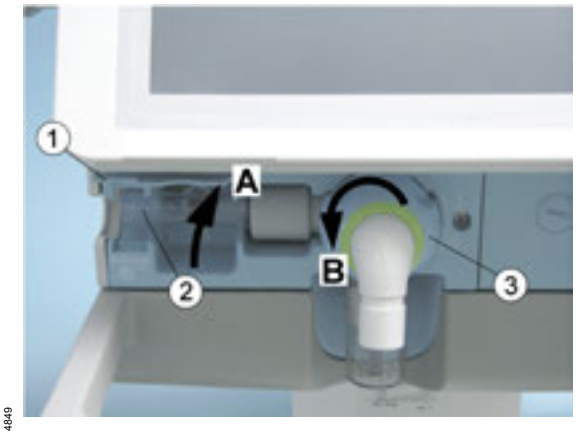

Fig. 92 Detail view of Savina 300: removing the expiratory valve

4. Take the expiratory valve out of its mount.
5. Remove the diaphragm (Fig. 93/1) from the expiratory valve.

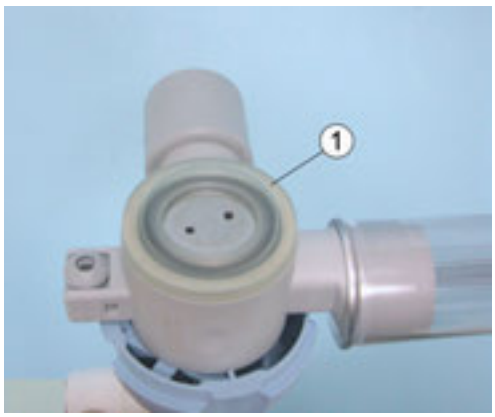

Fig. 93 Expiratory valve: diaphragm

NOTE

Diaphragms are classified as special waste. When disposing of them, observe local waste disposal regulations.

6 Dispose of the old diaphragm according to local waste disposal regulations.

Removal of the expiratory valve diaphragm is complete.

8.4 Fitting

1 Clip the new diaphragm (Fig. 94/1) onto the rim of the expiratory valve (Fig. 94/2) so that it engages on the expiratory valve rim all the way round.

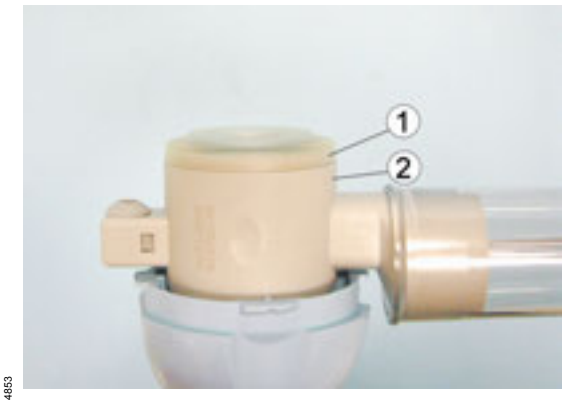

Fig. 94 Expiratory valve: fitting the diaphragm

2 Push the expiratory valve into the mount on the Savina 300 until you feel a resistance and turn the locking ring (Fig. 95/3) of the expiratory valve all the way to the right towards **B** until you feel it lock in place.

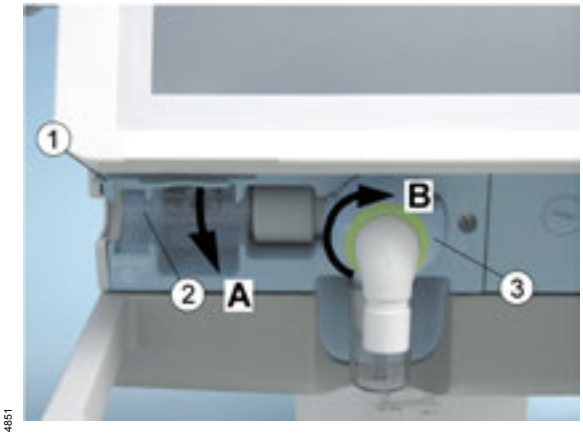

Fig. 95 Detail view of Savina 300: fitting the expiratory valve

3 Check that the expiratory valve is securely locked in place by pulling on it lightly.

4 Slide the flow sensor (Fig. 95/2) to the right into the flow sensor sleeve.

5 Swivel the flow sensor flap (Fig. 95/1) down towards **A**.

Fitting of the expiratory valve diaphragm is complete.

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9 Replacing the internal batteries

9.1 Introduction

The following section provides a view of the internal batteries and describes how to remove and fit them.

9.2 View

The internal batteries are located on the rear of the unit behind the rear panel and the cover plate (Fig. 96/1).

Fig. 96 Rear of device: Cover plate

9.3 Removal

Preconditions

- The Savina 300 has been switched off and disconnected from the mains power supply.
- The fuse link for the internal batteries has been removed from its holder on the power supply unit.
- The Savina 300 has been removed from the trolley, see "Disassembling/assembling the device" section headed "Removing/fitting the Savina 300 from/into the trolley".
- The filter cover has been removed, see "Disassembling/assembling the device" section headed "Filter cover".
- The rear panel has been removed, see "Disassembling/assembling the device" section headed "Rear panel".
- ESD precautions have been taken.

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Procedure

1 Remove the screws (Fig. 97/1).

2 Remove the cover plate (Fig. 97/2).

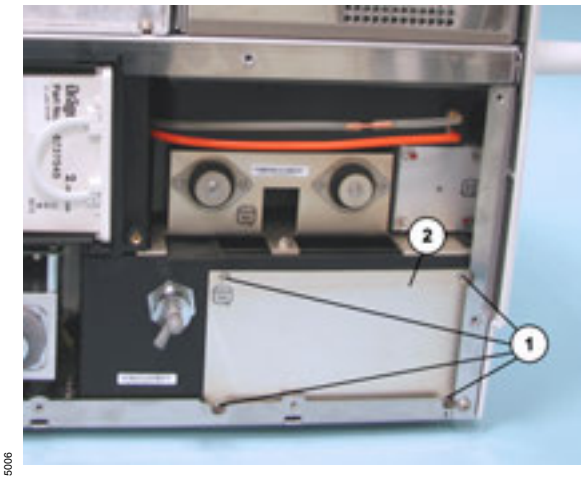

Fig. 97 Rear of device: Cover plate

3 Pull on the tab (Fig. 98/1) and withdraw the battery slightly out of the unit.

Fig. 98 Rear of device: Tab

4 Disconnect the cable connector (Fig. 99/1) from the battery lug.

Fig. 99 Rear of device: Cable connector (1x)

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5 Pull slightly on the cable link (Fig. 100/1) to bring the second battery out of the compartment.

6 Push the cable connectors (Fig. 100/1) off of the battery lugs.

7 Disconnect the cable connector (Fig. 100/2) from the battery lug.

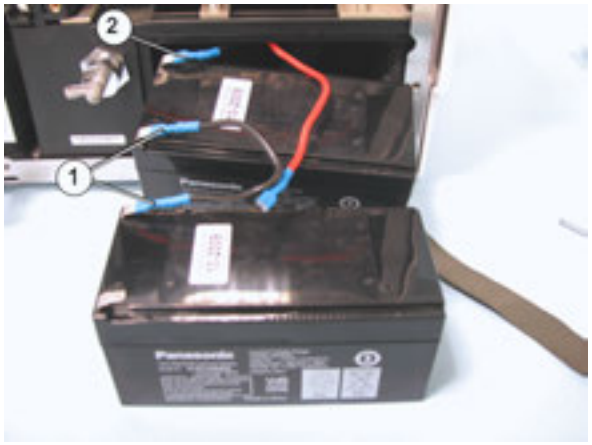

Fig. 100 Rear of device: Cable connectors (3x)

NOTE

Batteries are special waste. When disposing of them, observe local waste disposal regulations.

8 Dispose of batteries in accordance with local waste disposal regulations.

Removal of the batteries is complete.

9.4 Fitting

1. Place the new batteries in front of the Savina 300, paying attention to their orientation (the lugs of the batteries point upwards towards the O_2 supply).
2. Push the cable connectors (Fig. 100/1) firmly onto the lugs of the two batteries, as shown in Fig. 100.
3. Push the cable connector (Fig. 100/2) (--) firmly onto the battery lug.
4. Insert the first battery in the battery compartment.
5. Push the cable connector (Fig. 99/1) (+) firmly onto the battery lug.
6. Insert the second battery in the battery compartment.
7. Use the screws (Fig. 97/1) to secure the cover plate (Fig. 97/2).
8. Fit the rear panel on the Savina 300, see section headed "Disassembling/assembling the device" section headed "Rear panel".
9. Fit the filter cover on the Savina 300, see "Disassembling/assembling the device", section headed "Filter cover".
10. Fit the Savina 300 on the trolley, see "Disassembling/assembling the device", section headed "Removing/fitting the Savina 300 from/into the trolley".
11. Insert the fuse link in the holder on the power supply unit.
12. Connect the Savina 300 to the mains power supply.
13. Perform the "electrical safety test" and "function tests" according to the test instructions.

CAUTION

Batteries not fully charged! If the batteries are not fully charged, the running time of the unit in the event of a mains power failure may be reduced considerably.
Inform the user that the rechargeable batteries still need to be recharged.

14. Leave the Savina 300 connected to the mains power supply until the internal battery indicator lights up "green".

Fitting of the batteries is complete.

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10 Replacing the external batteries

10.1 Introduction

The following section provides a view of the external batteries and describes how to remove and fit them.

10.2 View

The external batteries are located behind the cover of the battery pack (Fig. 101/1).

Fig. 101 Trolley: Cover (external battery pack)

10.3 Removal

Preconditions

– The Savina 300 has been switched off and disconnected from the mains power supply.
– The connector of the DC battery cable has been disconnected from the power supply unit of the Savina 300.

Procedure

1 Actuate all locking brakes on the double-wheel castors.

2 Remove the screw (Fig. 102/1) from the cover.

Fig. 102 Cover (external battery pack): Screw

3 Lift off the cover and put it on a safe place.

4 Remove the screws and spring washers (Fig. 103/1) (2x of each) and disconnect the electrical cable with integrated tab fuse (Fig. 103/3).

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NOTE

Keep the cable with integrated tab fuse (25 A/32 V), the two screws and two spring washers for later refitting.

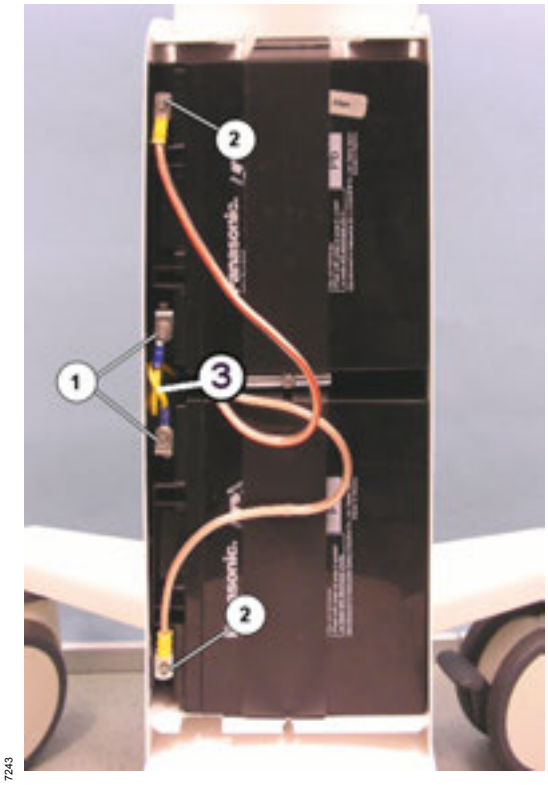

Fig. 103 External batteries: Screws, spring washers and electrical cable

5 Remove the screws and spring washers (Fig. 103/2) (2 of each).

NOTE

Keep the two screws and two spring washers for later refitting.

The batteries are fixed in the battery pack by a strap. The central screw holds the strap in place.

6 Loosen the screw (Fig. 104/1) initially just two turns.

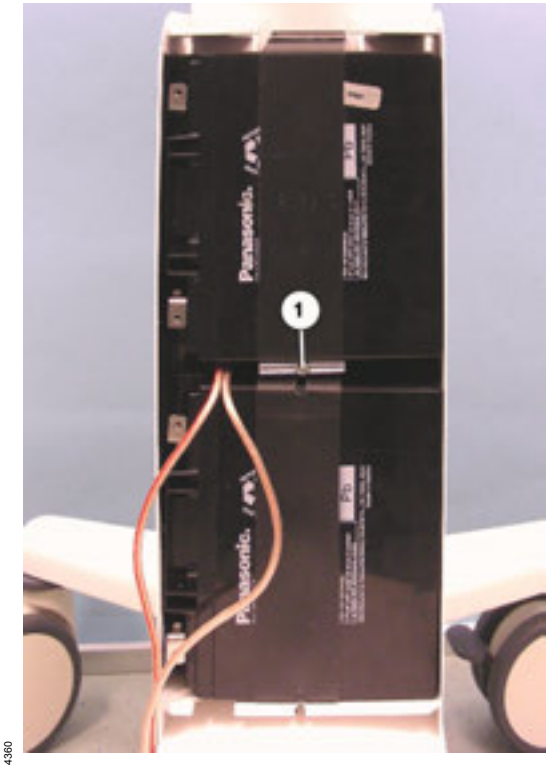

Fig. 104 External batteries: Screw (strap)

CAUTION

Danger of injury by falling battery!
When removing the batteries there is a risk that the upper battery might fall out.
Hold the top battery during removal.

7 Hold the top battery (Fig. 105/1) during removal and remove the screw with the bar (Fig. 105/2).

NOTE

Keep the central screw (with its bracket) for later refitting.

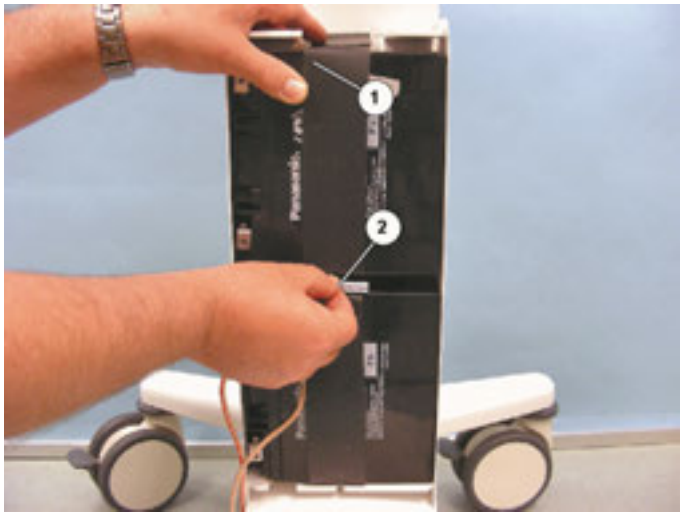

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Fig. 105 External batteries: Screw with bar

8 Take the strap out of the upper support (Fig. 106/1).

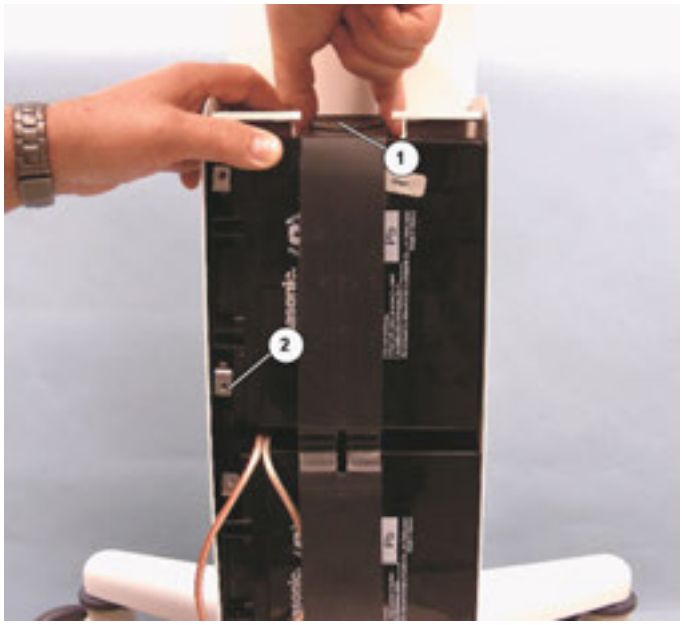

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Fig. 106 External batteries: Upper support

9 Remove used batteries and place them aside.

10 Remove the mounting brackets (Fig. 106/2) from the used batteries and fit them to the new batteries.

NOTE

Used batteries are special waste. Dispose of used batteries in accordance with local waste disposal regulations.

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11 Dispose of used batteries in accordance with local waste disposal regulations.

12 If the insulating plate (Fig. 107/1) is fitted, take it out and check that it is not damaged.

NOTE

Keep the undamaged insulating plate for later refitting.

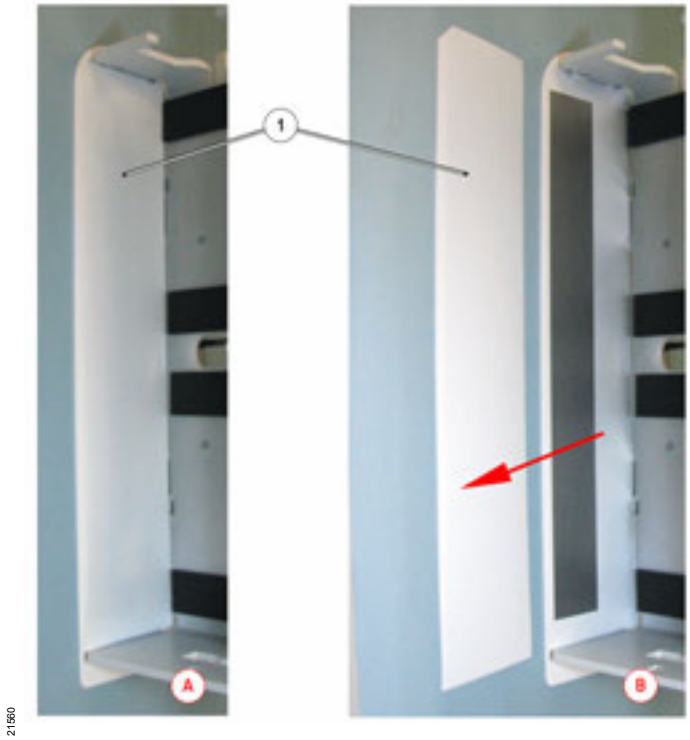

Fig. 107 Battery pack for external batteries: Insulating plate

Item	Designation
A	Position of insulating plate; before removal from battery pack
B	Position of insulating plate; after removal from battery pack

NOTE

A faulty insulating plate is classed as special waste. A faulty insulating plate must be disposed of in accordance with local waste disposal regulations.

13 Dispose of the faulty insulating plate in accordance with local waste disposal regulations.

Removal of the batteries is complete.

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10.4 Fitting

CAUTION

Risk of device failure due to damaged insulating strip!
If the insulating strip is damaged, a short-circuit may occur in the battery pack and result in device failure.
Check the condition of the insulating strip before fitting the batteries.

1 Check that the insulating strip (Fig. 108/1) is not damaged; replace it as necessary.

Fig. 108 Battery pack for external batteries: Insulating strip

2 Check that the strap is not damaged; replace it as necessary.

3 If you find during disassembly that the insulating plate (8421115) (Fig. 109/1) was not fitted, or was damaged, order a new one.

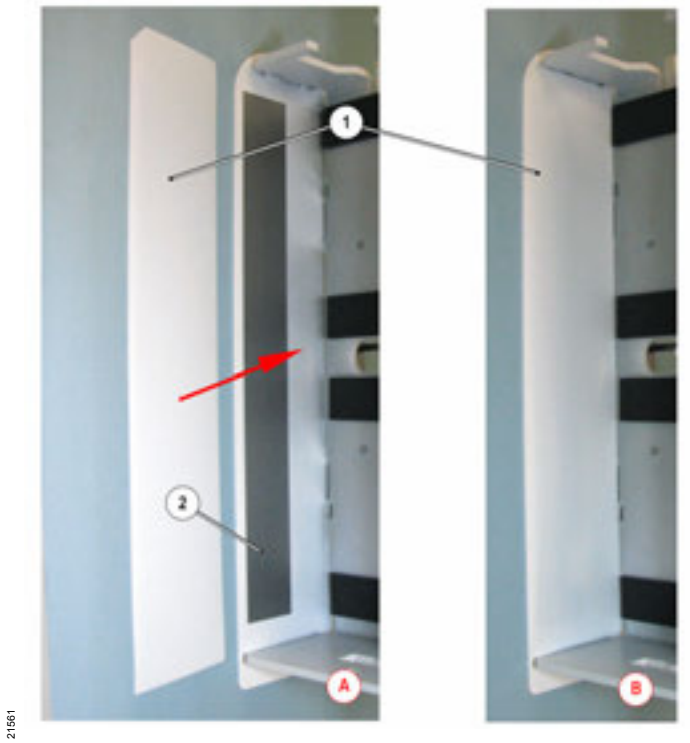

Fig. 109 Battery pack for external batteries: Insulating plate

Item	Designation
A	Position of insulating plate; before inserting battery pack
B	Position of insulating plate; after inserting battery pack

4 Insert the insulating plate (Fig. 109/1) in the battery pack, ensuring it is correctly positioned so as to sit flush on the insulating strip (Fig. 109/2).

CAUTION

Possible device failure due to short-circuit!
If the batteries are not correctly inserted, a short-circuit may occur in the battery pack and result in device failure.

– When inserting the batteries, make sure the additional insulating plate is fitted between the insulating strip and battery.
– The battery terminals must point towards the insulating strip and insulating plate!

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5 Pay attention to the polarity of the lower battery (Fig. 110/3) (the "positive" terminal is at the top). Fit the lower battery in the battery pack.

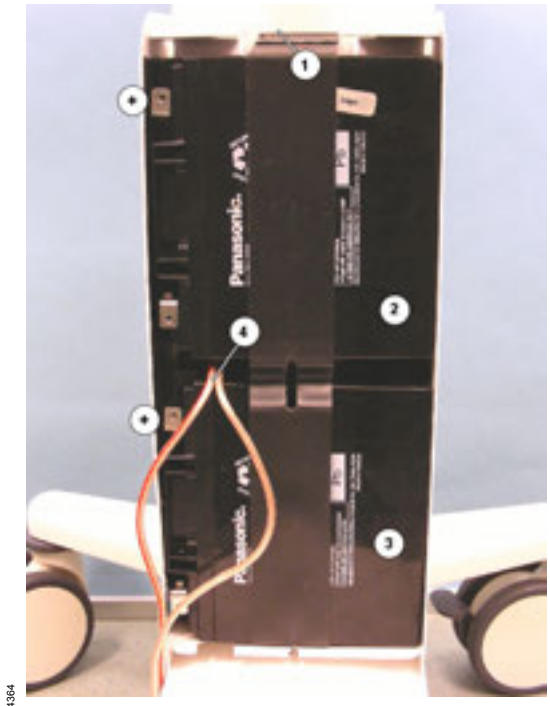

Fig. 110 External batteries: Batteries and cables

6 Place the electrical cables (Fig. 110/4) on the bottom battery so they are not trapped, as shown in the illustration.

7 Pay attention to the polarity of the upper battery (Fig. 110/2) (the "positive" terminal is at the top). Insert the battery in the battery pack and hold it firm during the further assembly procedure.

8 Insert the strap in the upper support (Fig. 110/1).

9 Check the position of the locating pin (Fig. 111/1).

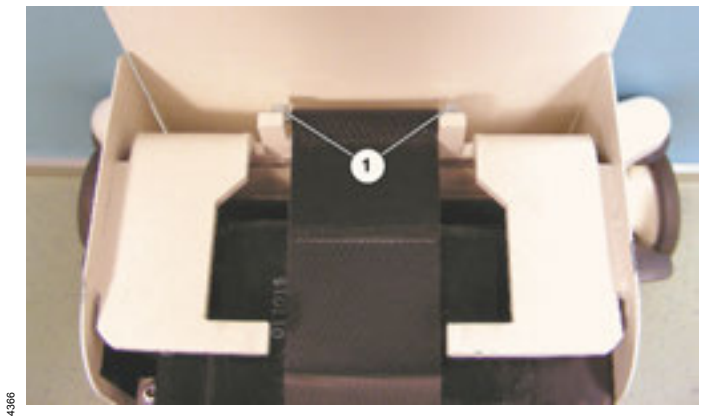

Fig. 111 Battery pack: Locating pin

10 Hold the upper battery (Fig. 112/1) and screw in the screw with bar (Fig. 112/2) a few turns.

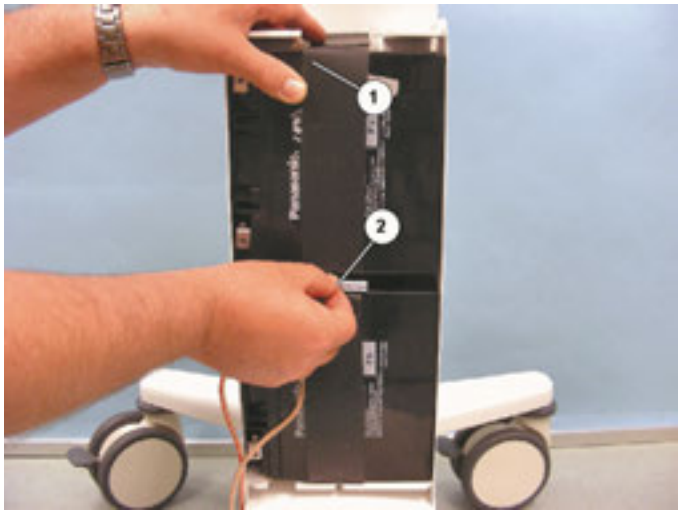

Fig. 112 External batteries: Screw with bar

11 Make sure the strap (Fig. 113/2) is contacting flush on the batteries and tighten the screw (Fig. 113/1) with a torque of 3 ±0.3 Nm.

Fig. 113 Batteries: Strap and screw

CAUTION

Risk of device failure due to electrical short-circuit!
If the electrical wires of the batteries contact the housing, an electrical short-circuit may occur and cause a device failure.

– Screw the cables onto the batteries so that no contact with the housing is possible!
– Mount the cable lugs at the maximum distance from the side panel!

12 Connect the cables by one screw and one spring washer each to the batteries as follows:

a) The cable with the red marking is connected to the positive terminal (Fig. 114/2) of the upper battery.

b) The cable with no marking is connected to the negative terminal (Fig. 114/3) of the lower battery.

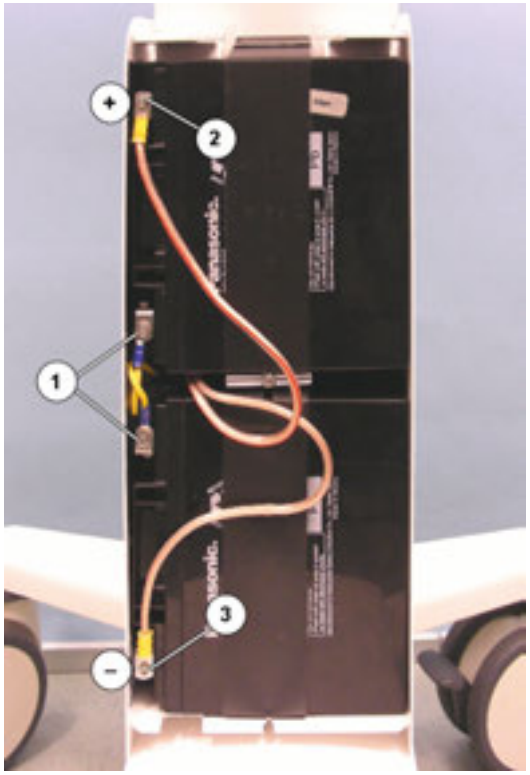

Fig. 114 External batteries: Electrical connections

13 Secure the electrical cable with integrated tab fuse (Fig. 114/1) by one screw and one spring washer to the battery mounting brackets.

14 Check the fitting position of the end profile (Fig. 115/1) of the cover. Correct the position of the end profile as necessary.

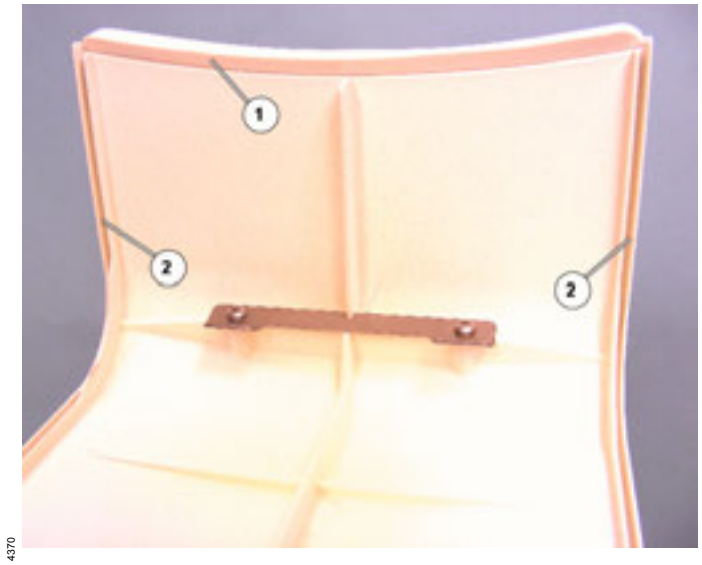

Fig. 115 Cover: End profile and groove

15 Place the cover on the battery pack so that the groove (Fig. 115/2) of the cover and the tongue engage.

16 Make sure the end profile (Fig. 116/1) is sealed off from the column.

Fig. 116 Battery pack: End profile

17 Secure the cover by the screw (Fig. 117/1).

Fig. 117 Cover (external battery pack): Screw

18 Insert the connection socket of the DS battery cable for the external batteries in the connector on the rear of the Savina 300.

Fitting of the external batteries is complete.

19 Perform the "function test" and "electrical safety test" as per the test instructions.

CAUTION

Batteries not fully charged! If the batteries are not fully charged, the running time of the unit in the event of a mains power failure may be reduced considerably.
Inform the user that the rechargeable batteries still need to be recharged.

20 Fully charge the external batteries (for time taken see instructions for use).

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Parts catalog and test instructions

Parts catalog

This chapter contains a list of the device's orderable parts.

Test Instructions

This chapter contains the measures required to determine the actual condition of the device.

No.2209_0000005623

1 Parts catalog

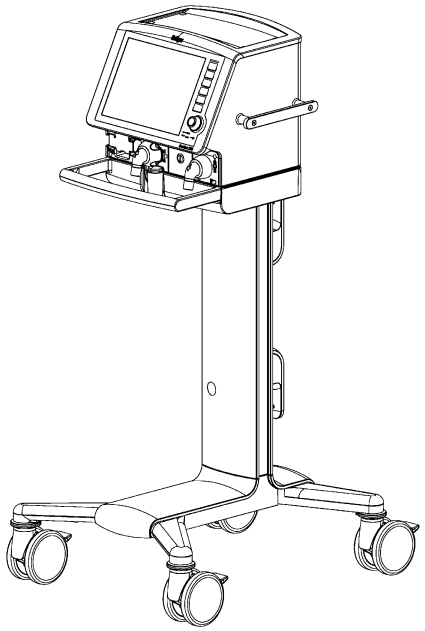
Parts catalog

Savina 300

Revision: 10
2014-11-26
5664.920

No.2209_0000005623

Parts catalog
Basic unit



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	MX44484	☐	Front connector unit	1.000	St	
2	MX44565	☐	Front panel LED	1.000	St	
3	MX44483	☐	Front panel fluorescent tubes	1.000	St	
4	MX44569	☐	Labeling	1.000	St	
5	MX44391	☐	Base group	1.000	St	
6	MX44490	☐	EMV-box	1.000	St	
7	MX44482	☐	Trolley	1.000	St	
8	MX44652	☐	Housing	1.000	St	
9	MX44656	☐	Cables	1.000	St	
10	MX44485	☐	Power supply	1.000	St	
11	MX44487	☐	O2-CS-Connectors	1.000	St	
12	MX44495	☐	Hoses	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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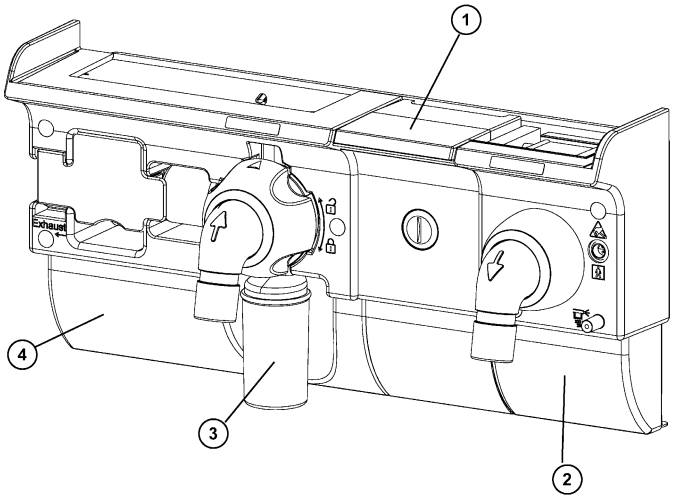
Parts catalog
Front connector unit



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	MX44567	☐	O2 sensor covering, RoHS	1.000	St	up to 11/2013
1	MX44497	☐	O2-sensor covering	1.000	St	
2	MX44496	☐	Connector housing insp.	1.000	St	
3	MX44498	☐	Expiration valve	1.000	St	
4	MX44499	☐	Connector housing exp.	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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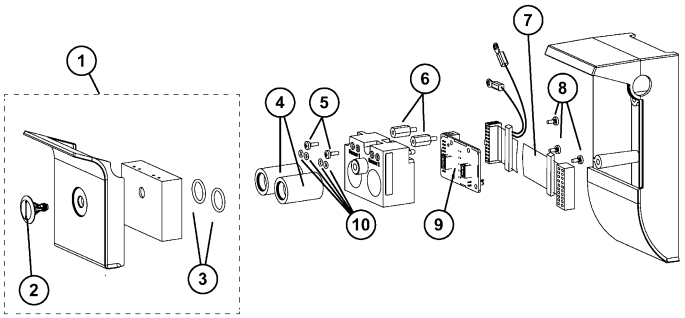
Parts catalog
O2 sensor covering, RoHS



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8417825	☑	Sensor cover, compl.	1.000	St	
2	8417828	☑	Screw	1.000	St	
3	R31296	☑	O-ring seal	1.000	St	
4	MX01049	☑	OxyTrace VE	1.000	St	
5	1343068	☑	Screw M3X8 DIN7985	1.000	St	
6	1881841	☑	PCB-Spacer 13mm RoHS	1.000	St	
7	8418922	☑	Flat cable,O2-Measuring Module	1.000	St	
8	1340727	☑	Oval head scr.DIN7985-M3X6-A2	1.000	St	
9	8420751	☑	pba O2-sensor	1.000	St	
10	8410713	☑	O-ring seal	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
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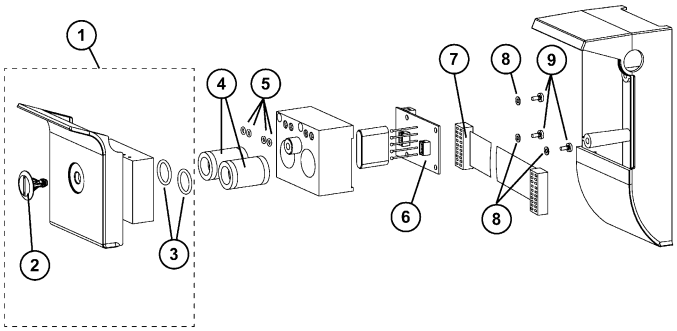
Parts catalog
O2-sensor covering



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8417825	☑	Sensor cover, compl.	1.000	St	
2	8417828	☑	Screw	1.000	St	
3	R31296	☑	O-ring seal	1.000	St	
4	MX01049	☑	OxyTrace VE	1.000	St	
5	8410713	☑	O-ring seal	1.000	St	
6	8351201	☐	PCB O2-Diaphragm	1.000	St	
7	8418922	☑	Flat cable,O2-Measuring Module	1.000	St	
8	D04766	☑	Packing ring	1.000	St	
9	1340727	☑	Oval head scr.DIN7985-M3X6-A2	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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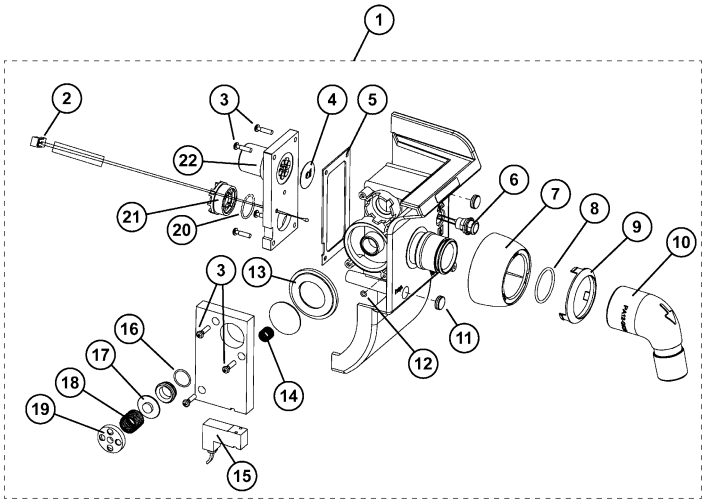
Parts catalog
Connector housing insp.



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8417840	☑	Connector housing Insp., compl.	1.000	St	
2	8417936	☑	Cable Harness Temp.Sensor	1.000	St	
3	1338986	☑	Screw f. plastics 3X12 DWN562	1.000	St	
4	8418938	☑	Diaphragm	1.000	St	only to use with plate 8420758
5	8413654	☑	Gasket	1.000	St	
6	8414519	☑	Cable harness AWT01	1.000	St	
7	8417838	☑	Inspiration cap	1.000	St	
8	M20622	☑	O-ring	1.000	St	
9	8417030	☑	Color ring	1.000	St	
10	8417077	☑	Elbow fitting 22 Insp.	1.000	St	
11	8417831	☑	Plug	1.000	St	
12	8410713	☑	O-ring seal	1.000	St	
13	8410181	☑	Diaphragm	1.000	St	
14	M06763	☑	Valve spring	1.000	St	
15	8412993	☑	Electrovalve	1.000	St	
16	R22363	☑	O-ring 12x1	1.000	St	
17	8410307	☑	Sealing washer	1.000	St	
18	2M12034	☑	Spring	1.000	St	
19	8412952	☑	Screw	1.000	St	
20	8419303	☑	O-ring 16x1.25	1.000	St	
21	8411147	☑	Non-return valve	1.000	St	
22	8420758	☑	Panel	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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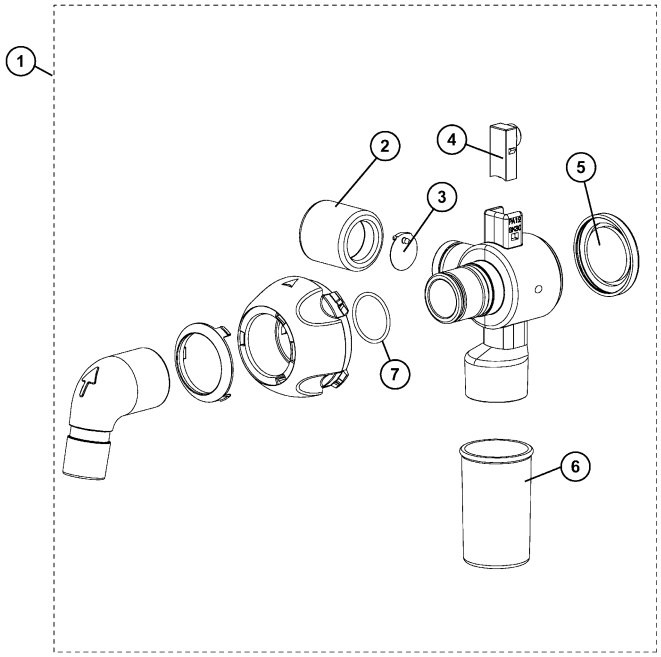
Parts catalog
Expiration valve



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	1563572	☑	Lub. Molykote 111 comp. 100g	1.000	St	
1	8417050	☑	Expiration Valve, reuse., V	1.000	St	
2	8416203	☑	Flow sensor sleeve, compl. (gray)	1.000	St	
3	8415864	☑	Expiration valve, flutter seal	1.000	St	
4	8416201	☑	Lip seal (gray)	1.000	St	
5	8413661	☑	Membrane, complete	1.000	St	
6	8416204	☑	Pot (grey)	1.000	St	
7	M20622	☑	O-ring	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
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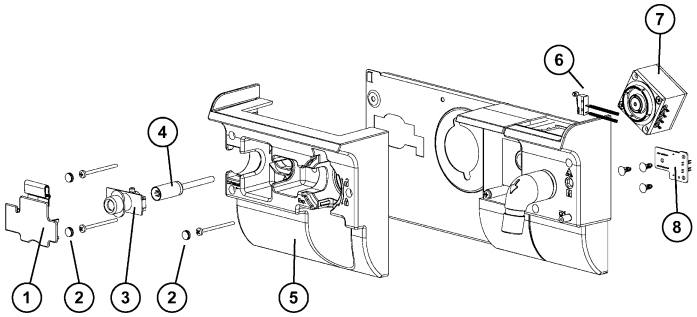
Parts catalog
Connector housing exp.



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	8403735	☑	Spirolog Flow Sensor (5x)	1.000	St	
1	8417848	☑	Flow sensor cover	1.000	St	
2	8417831	☑	Plug	1.000	St	
3	8417158	☑	Connector mount-XL	1.000	St	
4	8414028	☑	Cable harness spirolog sensor	1.000	St	
5	8417845	☑	Connector housing Exp.	1.000	St	
6	8416370	☑	Cable harness flow switch	1.000	St	
7	8413610	☑	Valve actuator	1.000	St	
8	8417921	☑	pba FrontPneuBoard	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
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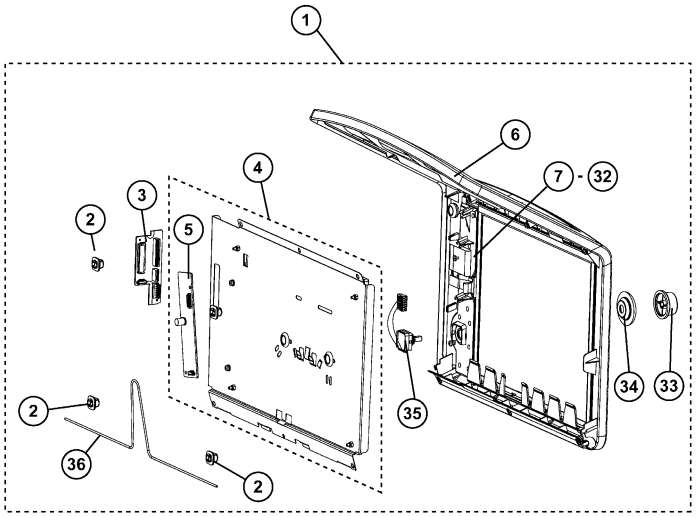
Parts catalog
Front panel LED



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	8418755	☑	Cable collection board	1.000	St	
0	8418754	☑	cable backlight	1.000	St	
1	8417806	☑	Control unit, compl.	1.000	St	
2	8417830	☑	Pressing foot	1.000	St	
3	8417931	☑	pba CollectionBoard	1.000	St	
4	8421213	☑	kit display AUO LED	1.000	St	
5	8421068	☑	progr. pba Dimmer Savina 300	1.000	St	
6	8417814	☑	Housing cover, compl.	1.000	St	
7	8417858	☑	Insertion Strip DE	1.000	St	
8	8417859	☑	Insertion Strip EN GB + US	1.000	St	
9	8417860	☑	Insertion Strip FR	1.000	St	
10	8417861	☑	Insertion Strip ZH	1.000	St	
11	8417862	☑	Insertion Strip RU	1.000	St	
12	8417863	☑	Insertion Strip JP	1.000	St	
13	8417864	☑	Insertion Strip IT	1.000	St	
14	8417865	☑	Insertion Strip ES	1.000	St	
15	8417866	☑	Insertion Strip PT	1.000	St	
16	8417867	☑	Insertion Strip RO	1.000	St	
17	8417868	☑	Insertion Strip GR	1.000	St	
18	8417869	☑	Insertion Strip PL	1.000	St	
19	8417870	☑	Insertion Strip TR	1.000	St	
20	8417871	☑	Insertion Strip NL	1.000	St	
21	8417872	☑	Insertion Strip BG	1.000	St	
22	8417873	☑	Insertion Strip SE	1.000	St	
23	8417874	☑	Insertion Strip KO	1.000	St	

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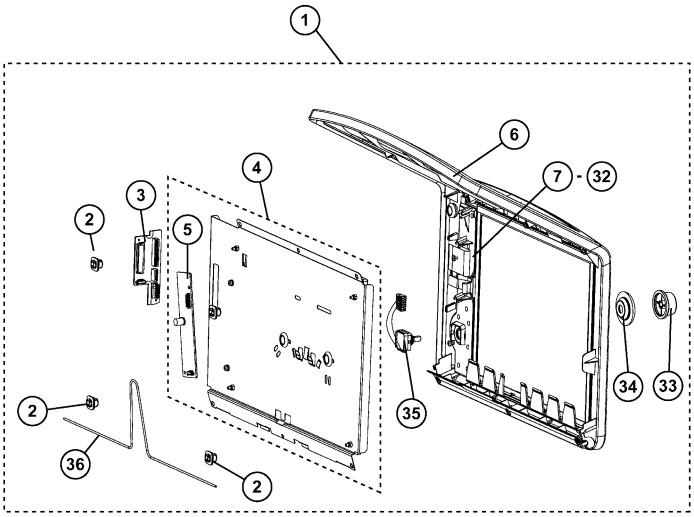
Parts catalog
Front panel LED



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
24	8417875	☑	Insertion Strip HU	1.000	St	
25	8417876	☑	Insertion Strip FI	1.000	St	
26	8417877	☑	Insertion Strip CZ	1.000	St	
27	8417878	☑	Insertion Strip SK	1.000	St	
28	8420745	☑	Insertion Strip SR	1.000	St	
29	8420746	☑	Insertion Strip LT	1.000	St	
30	8420747	☑	Insertion Strip LV	1.000	St	
31	8420748	☑	Insertion Strip HR	1.000	St	
32	8420749	☑	Insertion Strip SL	1.000	St	
33	5705304	☑	Trim Knob Cockpit	1.000	St	
34	8607479	☑	Color ring MoBi Primus IE	1.000	St	
35	8418700	☑	Rotary encoder, complete	1.000	St	
36	8417852	☑	swivel axis	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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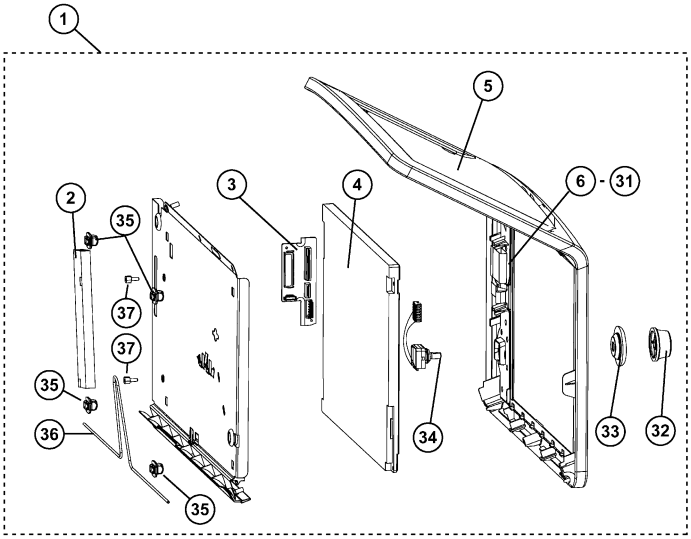
Parts catalog
Front panel fluorescent tubes



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	8418755	☑	Cable collection board	1.000	St	
0	8418754	☑	cable backlight	1.000	St	
1	8417806	☑	Control unit, compl.	1.000	St	
2	1874683	☑	BACKLIGHT INVERTER 24V RoHS	1.000	St	sale
3	8417931	☑	pba CollectionBoard	1.000	St	
4	8418829	☑	E-Set Display AUO	1.000	St	sale
5	8417814	☑	Housing cover, compl.	1.000	St	
6	8417858	☑	Insertion Strip DE	1.000	St	
7	8417859	☑	Insertion Strip EN GB + US	1.000	St	
8	8417860	☑	Insertion Strip FR	1.000	St	
9	8417861	☑	Insertion Strip ZH	1.000	St	
10	8417862	☑	Insertion Strip RU	1.000	St	
11	8417863	☑	Insertion Strip JP	1.000	St	
12	8417864	☑	Insertion Strip IT	1.000	St	
13	8417865	☑	Insertion Strip ES	1.000	St	
14	8417866	☑	Insertion Strip PT	1.000	St	
15	8417867	☑	Insertion Strip RO	1.000	St	
16	8417868	☑	Insertion Strip GR	1.000	St	
17	8417869	☑	Insertion Strip PL	1.000	St	
18	8417870	☑	Insertion Strip TR	1.000	St	
19	8417871	☑	Insertion Strip NL	1.000	St	
20	8417872	☑	Insertion Strip BG	1.000	St	
21	8417873	☑	Insertion Strip SE	1.000	St	
22	8417874	☑	Insertion Strip KO	1.000	St	
23	8417875	☑	Insertion Strip HU	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
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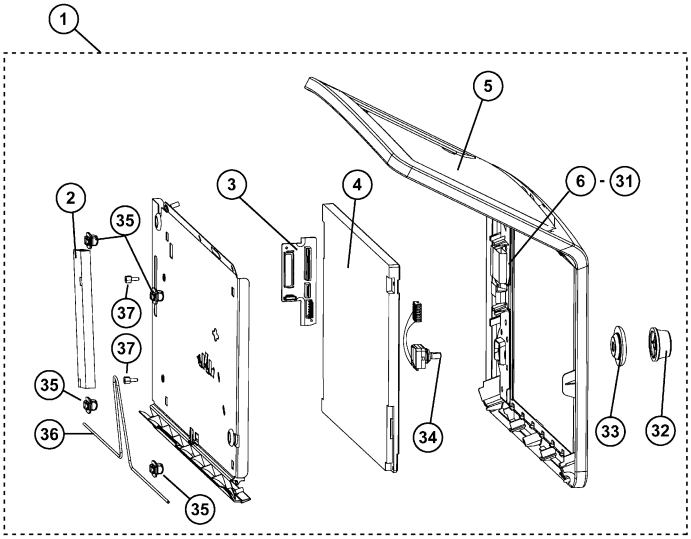
Parts catalog
Front panel fluorescent tubes



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
24	8417876	☑	Insertion Strip FI	1.000	St	
25	8417877	☑	Insertion Strip CZ	1.000	St	
26	8417878	☑	Insertion Strip SK	1.000	St	
27	8420745	☑	Insertion Strip SR	1.000	St	
28	8420746	☑	Insertion Strip LT	1.000	St	
29	8420747	☑	Insertion Strip LV	1.000	St	
30	8420748	☑	Insertion Strip HR	1.000	St	
31	8420749	☑	Insertion Strip SL	1.000	St	
32	5705304	☑	Trim Knob Cockpit	1.000	St	
33	8607479	☑	Color ring MoBi Primus IE	1.000	St	
34	8418700	☑	Rotary encoder, complete	1.000	St	
35	8417830	☑	Pressing foot	1.000	St	
36	8417852	☑	swivel axis	1.000	St	
37	8417853	☑	Spacer bolt	2.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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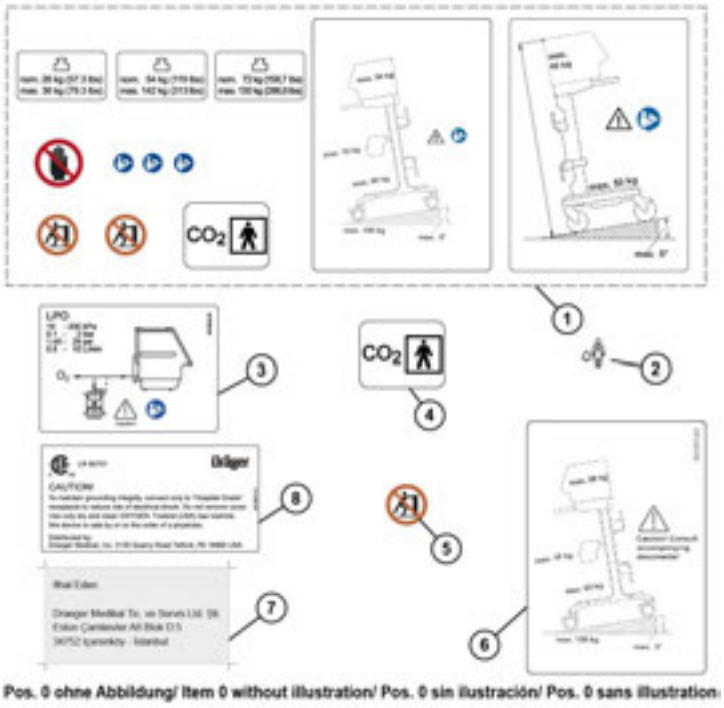
Parts catalog
Labeling



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8421441	☑	Label-Set Savina Color/300	1.000	St	3. edition
2	8418823	☑	Label nursecall	1.000	St	
3	8418824	☑	Label LPO	1.000	St	
4	8420759	☑	Label-CO2	1.000	St	
5	8416324	☑	Safety sign	1.000	St	
6	G93203	☑	Label "5 degrees"	1.000	St	
7	2M30555	☑	Importer Label TR	1.000	St	only for Turky
8	8418831	☑	Label US Caution Note	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Parts catalog
Labeling

Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
9	8419015	☑	Label set Savina, Japan	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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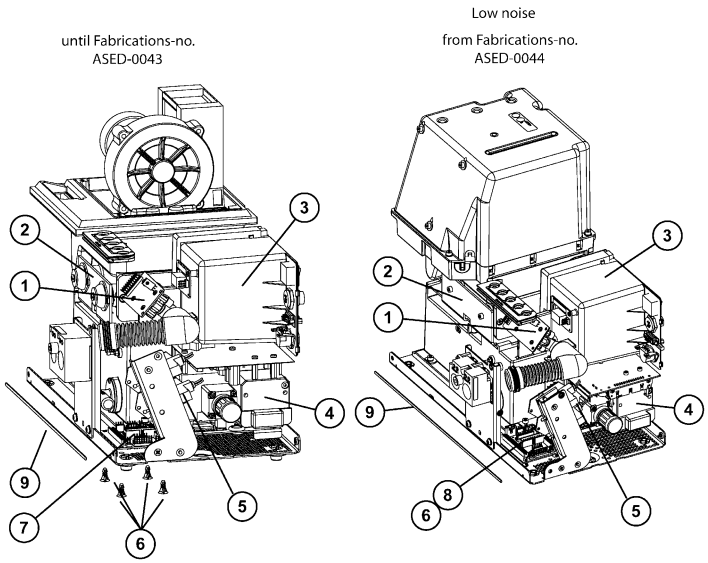
Parts catalog
Base group



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	MX44491	☐	TSI-sensor	1.000	St	
2	MX44486	☐	Plug-in unit	1.000	St	
3	MX44489	☐	Filter holder	1.000	St	
4	MX44568	☐	Valve unit, RoHS	1.000	St	up to 11/2013
4	MX44488	☐	Valve unit	1.000	St	
5	MX44492	☐	PAW-Pressure sensor unit	1.000	St	
6	8416799	☑	Spacer	1.000	St	only for "Low noise"/ up to fab.-no. ASED-0044
7	8417911	☑	Pba BackPneuBoard	1.000	St	
8	8420881	☑	Pba BackPneuBoard 2	1.000	St	only for "Low noise"/ up to fab.-no. ASED-0044
9	8418817	☑	EMC Gasket-D3	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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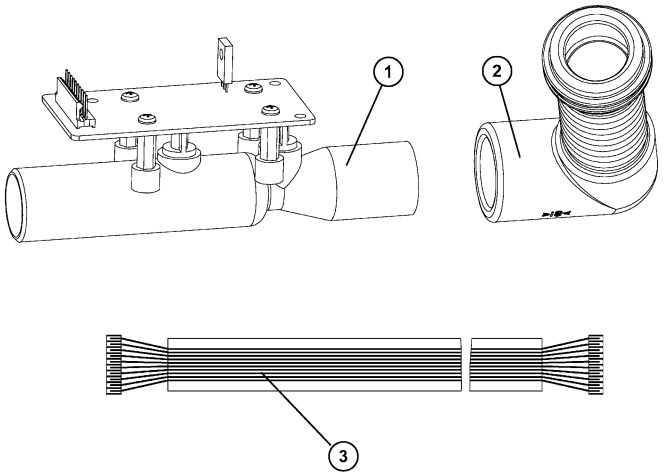
Parts catalog
TSI-sensor



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8413579	☑	TSI-sensor	1.000	St	
2	8418793	☑	TSI tube	1.000	St	
3	8413700	☑	Cable harness	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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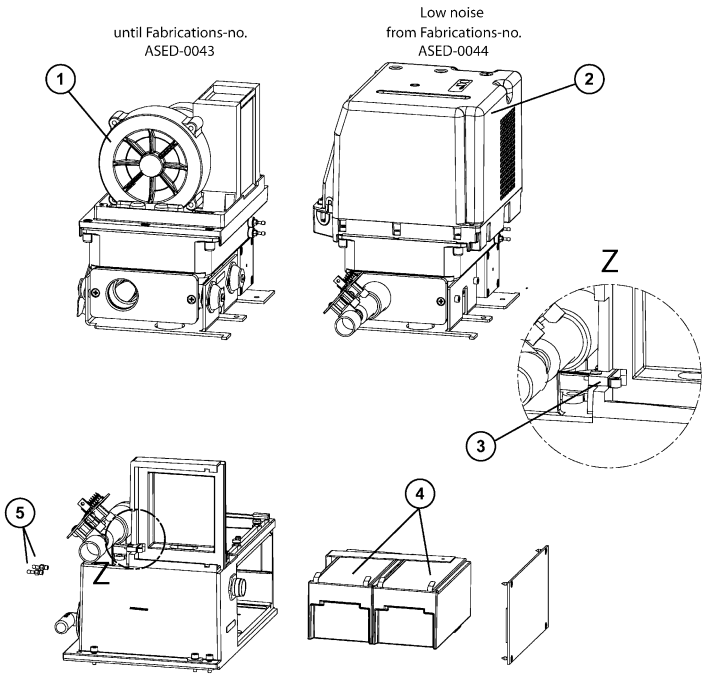
Parts catalog
Plug-in unit



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	1554123	☑	Lubricant Oxigenoex S4 RoHS	1.000	St	
1	MX44396	☐	Blower unit	1.000	St	until fabrications-no. ASED-0043
2	MX44566	☐	Blower unit "Low noise"	1.000	St	up to fabrications-no. ASED-0044
3	8416370	☑	Cable harness flow switch	1.000	St	
4	1841416	☑	Lead-acid battery 12V/3.5Ah	1.000	St	
5	8408197	☑	Socket	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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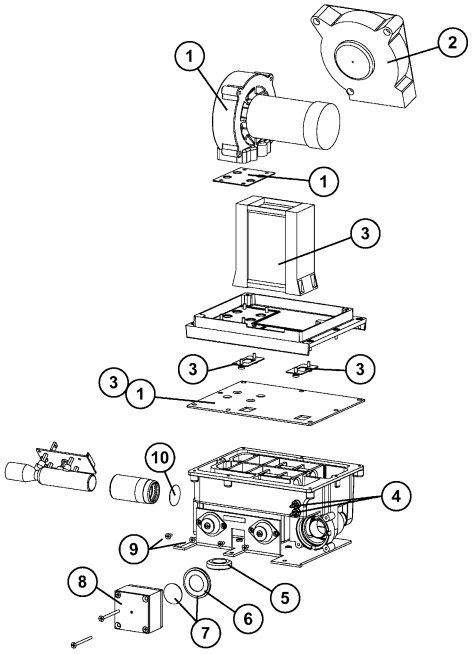
Parts catalog
Blower unit



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8413643	☑	Spare Parts (Blow.Engine Unit)	1.000	St	
2	8413625	☑	Radial fan	1.000	St	
3	8413644	☑	Rep.Set radiator	1.000	St	
4	8408197	☑	Socket	1.000	St	
5	8413710	☑	Gasket	1.000	St	
6	8410181	☑	Diaphragm	1.000	St	
7	8414081	☑	Rep.set diaphragm	1.000	St	
8	8413610	☑	Valve actuator	1.000	St	
9	1339958	☑	Counter sunk screw M4X8 DIN965	4.000	St	
10	8413748	☑	Filter TSI	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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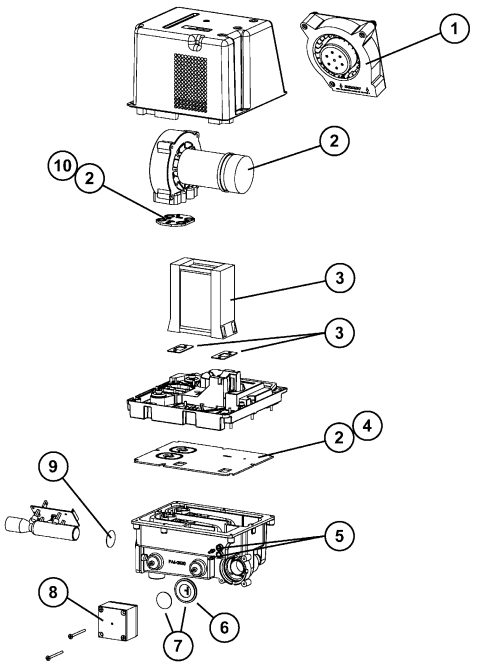
No.2209_0000005623

Parts catalog
Blower unit "Low noise"



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8421217	☑	Fan	1.000	St	
2	8413643	☑	Spare Parts (Blow.Engine Unit)	1.000	St	
3	8413644	☑	Rep.Set radiator	1.000	St	
4	8421002	☑	Seal	1.000	St	
5	8408197	☑	Socket	1.000	St	
6	8414081	☑	Rep.set diaphragm	1.000	St	
7	8410181	☑	Diaphragm	1.000	St	
8	8413610	☑	Valve actuator	1.000	St	
9	8413748	☑	Filter TSI	1.000	St	
10	8421032	☑	2C_sealing_skv	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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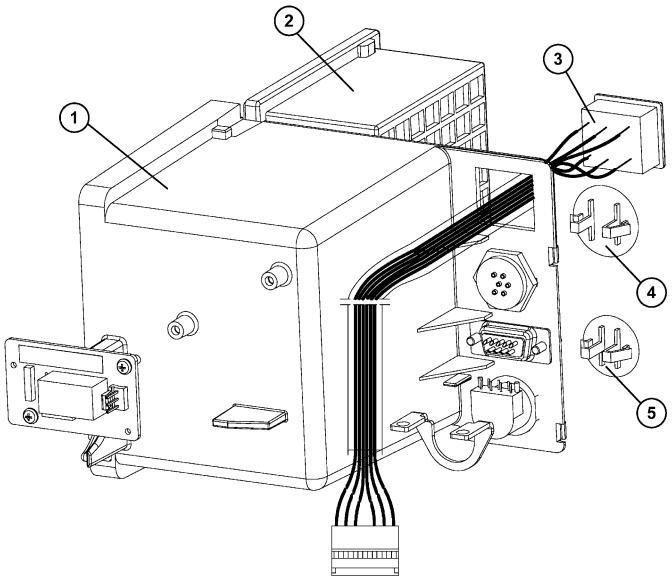
Parts catalog
Filter holder



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8417836	☑	filter holder	1.000	St	
2	6737545	☑	Microfilter	1.000	St	
3	8413609	☑	Mains switch	1.000	St	
4	8418932	☑	Cover184-206	1.000	St	
5	8418931	☑	Cover150-175	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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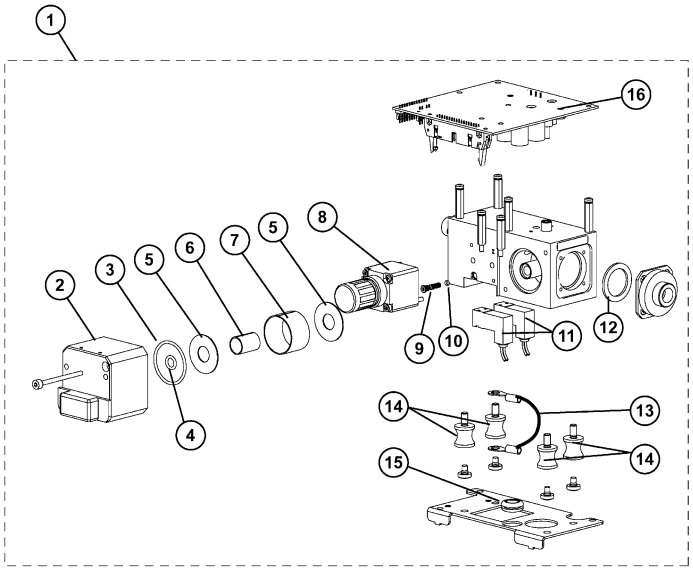
No.2209_0000005623

Parts catalog
Valve unit, RoHS



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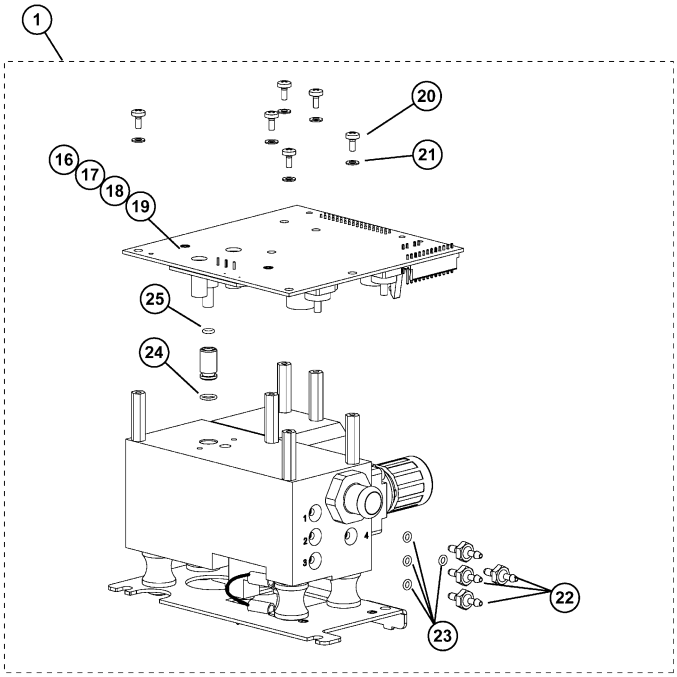
Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	1329472	☑	Washer B 5,3 DIN 9021-A4	1.000	St	
0	8420726	☑	Flat cable, Valve bench	1.000	St	
1	8417820	☑	valve unit compl.	1.000	St	
2	8413603	☑	Valve unit	1.000	St	
3	2M10633	☑	O-ring	1.000	St	
4	M11995	☑	O-Ring	1.000	St	
5	8413756	☑	Filtering plate	1.000	St	
6	8413755	☑	Filtering tube 1	1.000	St	
7	8413754	☑	Filtering tube 2	1.000	St	
8	8413666	☑	Pressure regulator	1.000	St	
9	8418792	☑	dosage insert	1.000	St	
10	8416272	☑	O-ring 2x1mm	1.000	St	
11	8412993	☑	Electrovalve	1.000	St	
12	M09257	☑	Sealing ring	1.000	St	
13	8417753	☑	Ground cable -85	1.000	St	
14	CH09932	☑	Rubber buffer	1.000	St	
15	8418789	☑	Grommet 9.5mm	1.000	St	
16	8421221	☑	pba O2-valve	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

No.2209_0000005623

Parts catalog
Valve unit, RoHS



Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8417820	☑	valve unit compl.	1.000	St	
16	8421221	☑	pba O2-valve	1.000	St	
17	8305624	☑	Admission pressure sensor	1.000	St	
18	1865862	☑	Pres. sensor 7bar absol. RoHS	1.000	St	
19	2M03646	☑	Slide washer	1.000	St	
20	1340727	☑	Oval head scr.DIN7985-M3X6-A2	1.000	St	
21	D04766	☑	Packing ring	1.000	St	
22	8418787	☑	Spout	1.000	St	
23	8418788	☑	O_Ring 2.8x1.8	1.000	St	
24	M12701	☑	O-RING	1.000	St	
25	8410713	☑	O-ring seal	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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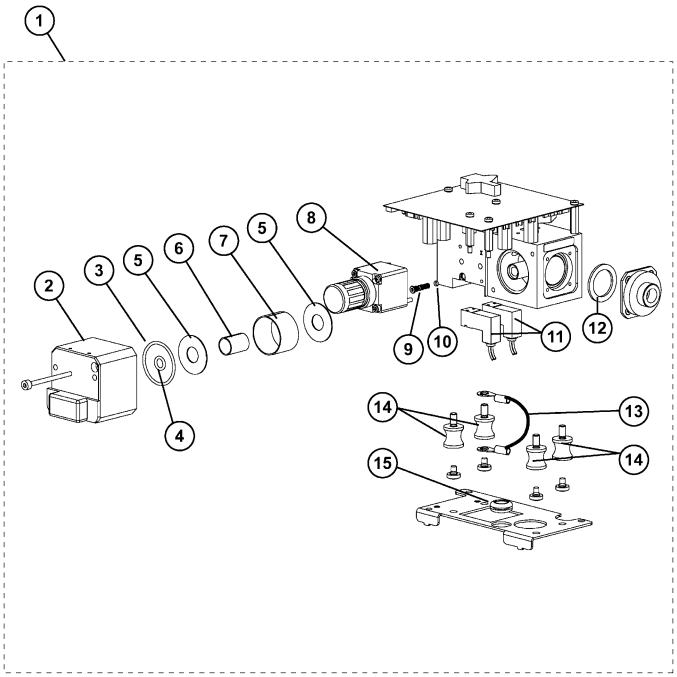
No.2209_0000005623

Parts catalog
Valve unit



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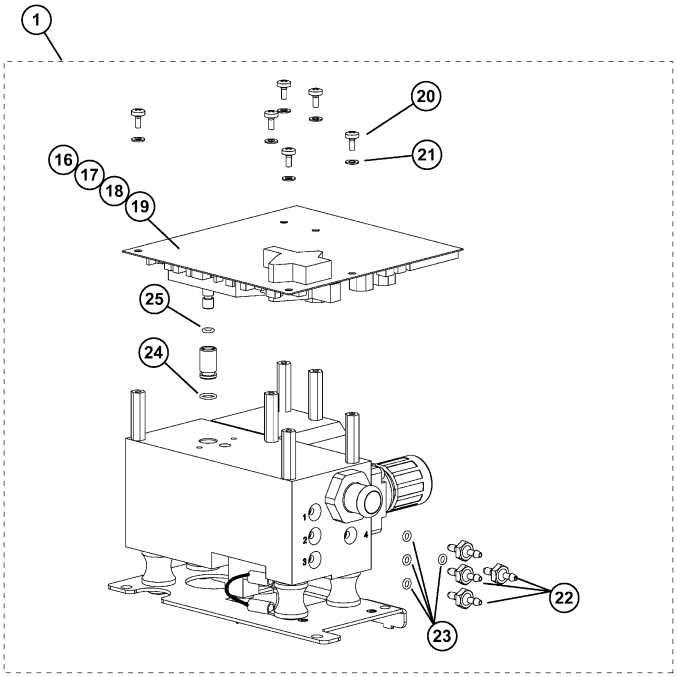
Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	1329472	☑	Washer B 5,3 DIN 9021-A4	1.000	St	
0	8420726	☑	Flat cable, Valve bench	1.000	St	
1	8417820	☑	valve unit compl.	1.000	St	
2	8413603	☑	Valve unit	1.000	St	
3	2M10633	☑	O-ring	1.000	St	
4	M11995	☑	O-Ring	1.000	St	
5	8413756	☑	Filtering plate	1.000	St	
6	8413755	☑	Filtering tube 1	1.000	St	
7	8413754	☑	Filtering tube 2	1.000	St	
8	8413666	☑	Pressure regulator	1.000	St	
9	8418792	☑	dosage insert	1.000	St	
10	8416272	☑	O-ring 2x1mm	1.000	St	
11	8412993	☑	Electrovalve	1.000	St	
12	M09257	☑	Sealing ring	1.000	St	
13	8417753	☑	Ground cable -85	1.000	St	
14	CH09932	☑	Rubber buffer	1.000	St	
15	8418789	☑	Grommet 9.5mm	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Parts catalog
Valve unit



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	1329472	☑	Washer B 5,3 DIN 9021-A4	1.000	St	
0	8420726	☑	Flat cable, Valve bench	1.000	St	
1	8417820	☑	valve unit compl.	1.000	St	
16	8350841	☑	PCB O2-Valve	1.000	St	
17	8305624	☑	Admission pressure sensor	1.000	St	
18	1865862	☑	Pres. sensor 7bar absol. RoHS	1.000	St	
19	2M03646	☑	Slide washer	1.000	St	
20	1340727	☑	Oval head scr.DIN7985-M3X6-A2	1.000	St	
21	D04766	☑	Packing ring	1.000	St	
22	8418787	☑	Spout	1.000	St	
23	8418788	☑	O_Ring 2.8x1.8	1.000	St	
24	M12701	☑	O-RING	1.000	St	
25	8410713	☑	O-ring seal	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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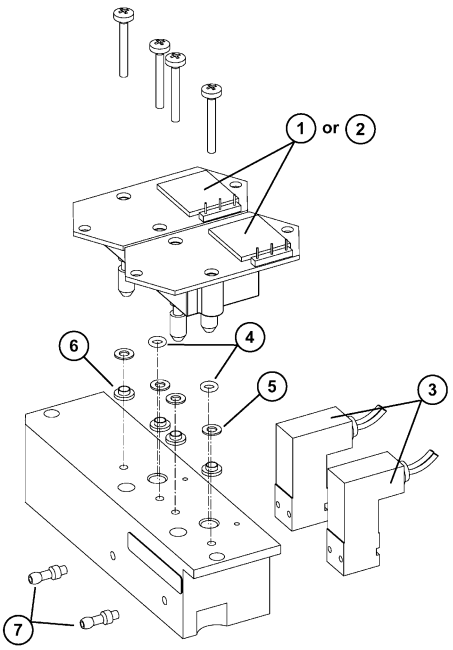
Parts catalog
PAW-Pressure sensor unit



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	8712007	☑	Cable Tie	1.000	St	
1	8415643	☑	pressure sensor 140mbar Savina	1.000	St	alternativ
2	1865889	☑	Pres.sensor 120mbar diff. RoHS	1.000	St	alternativ
3	8412993	☑	Electrovalve	1.000	St	
4	8410713	☑	O-ring seal	1.000	St	
5	D04766	☑	Packing ring	1.000	St	
6	6804141	☑	Isolate socket	1.000	St	
7	8400964	☑	Spout	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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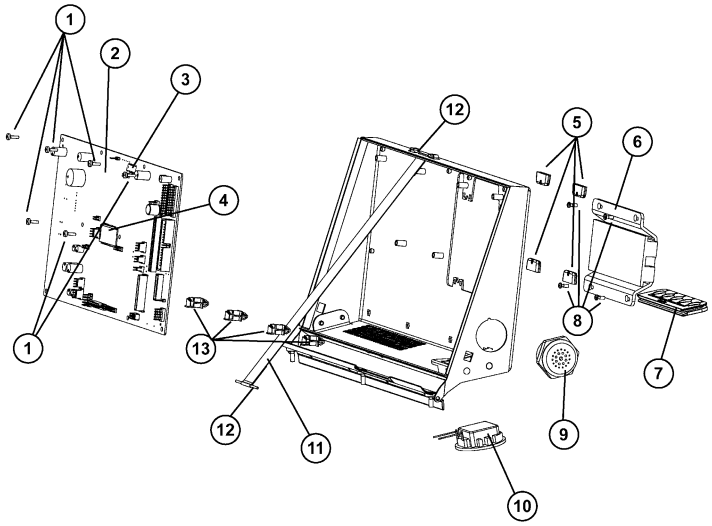
Parts catalog
EMV-box



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	8418755	☑	Cable collection board	1.000	St	
0	8417939	☑	cable harness motor electronic	1.000	St	
1	1343076	☑	Lens head screw M3x10 DIN7985	6.000	St	
2	8417905	☑	pba CCB II	1.000	St	only from SW 4.1
2	8417901	☐	pba CentralControlBoard	1.000	St	only for SW 3.5n, 4.01, 4,02 (USA, Singapore)
3	1845586	☑	Eeprom 256X8 DIP8 I2C RoHS	1.000	St	
4	1845527	☑	Real time clock DIL24 RoHS	1.000	St	alternativ 8419944
4	8419944	☑	PCB RealTimeClock RTC3287E	1.000	St	Replacement for 1845527
5	8418799	☐	Insulation holder	4.000	St	
6	8413620	☑	Enginedrive, compl.	1.000	St	
7	8417822	☑	Oxygen seal	1.000	St	
8	1338544	☑	Screw f. Plast.3X8 DWN562	4.000	St	
9	8414518	☑	Horn,cpl.	1.000	St	
10	8418763	☑	Loudspeaker, complete	1.000	St	
11	8417857	☑	Rebound strap	1.000	St	
12	8417896	☑	Rebound strap pin	2.000	St	
13	8418783	☑	PCB support hinge pivoting	4.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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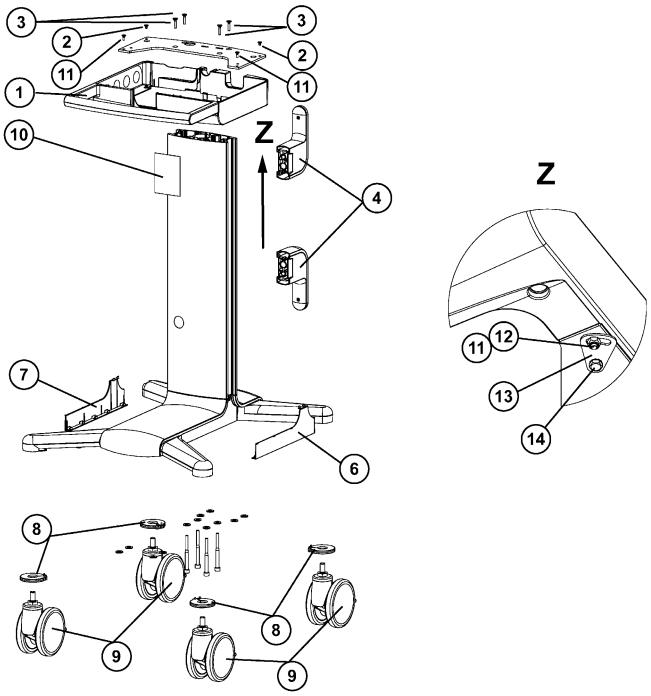
Parts catalog
Trolley



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	1843133	☐	Blade fuse 25A 32V RoHS	1.000	St	
1	8417895	☑	Eqipment holder complete	1.000	St	
2	1343335	☑	Hexagon bolt M5X8 DIN7991	1.000	St	
3	1342231	☑	Hexagon bolt M6X25 DIN7991	1.000	St	
4	G93169	☑	Set hook	1.000	St	
6	G93127	☑	Color design bottom part left	1.000	St	
7	G93128	☑	Color design bottom part right	1.000	St	
8	G93118	☑	Bumper basic complete	1.000	St	
9	G93107	☑	Castor 551-125 Steinco	1.000	St	
10	G93203	☑	Label "5 degrees"	1.000	St	
11	1346806	☑	Counters.Srew ISO10642-M5X16	2.000	St	
12	1335618	☑	hex nut M5 DIN985	2.000	St	
13	8418933	☑	Device retaining sheet	2.000	St	
14	1329235	☑	Hexagon bolt M5X12 DIN933	2.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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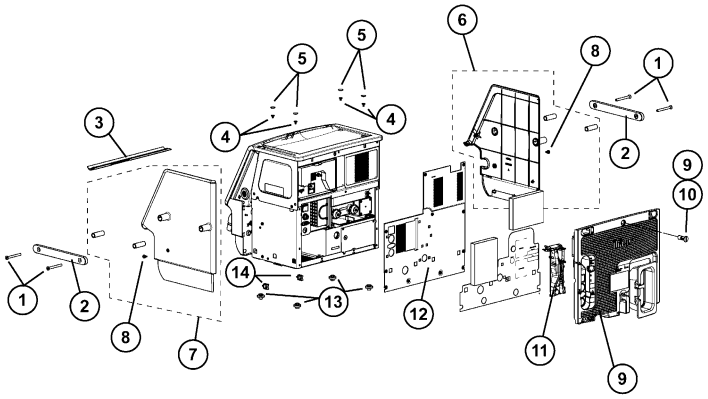
Parts catalog
Housing



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	1346849	☑	Counters. screw ISO10642-M6X60	1.000	St	
2	8417817	☑	Standard rail	1.000	St	
3	8417816	☑	Cover strip	1.000	St	
4	1343335	☑	Hexagon bolt M5X8 DIN7991	1.000	St	
5	8417832	☑	Cover cap	1.000	St	
6	8418741	☑	Left side part compl.	1.000	St	
7	8418742	☑	Right side part compl.	1.000	St	
8	8418832	☑	Toggle screw	1.000	St	
9	8421051	☑	Filter cover, compl.	1.000	St	
10	8420886	☑	Screw Filter Cover	1.000	St	
11	8418769	☑	Cable conduit	1.000	St	
12	8418818	☑	Back plane, compl.	1.000	St	
13	8417880	☑	Unit feet	1.000	St	
14	8418780	☑	cable holder	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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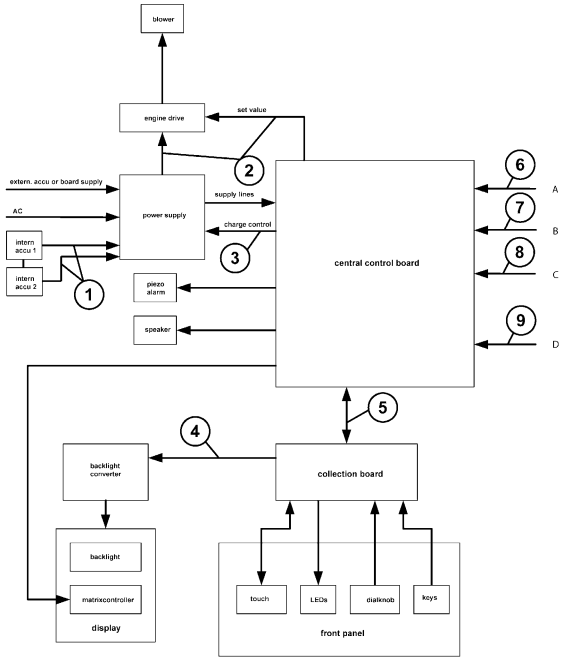
Parts catalog
Cables



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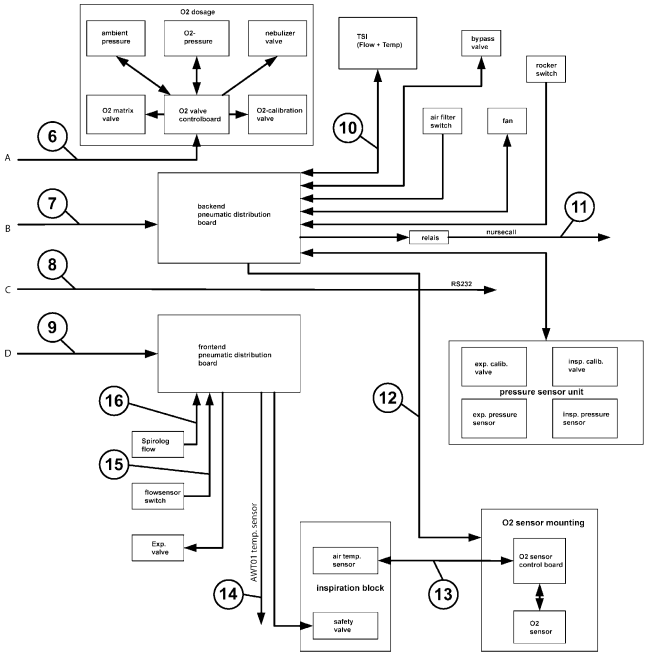
Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	8417753	☑	Ground cable -85	1.000	St	
0	8420721	☑	pba CO2-Link	1.000	St	only for Option CO2 measurement
0	8418810	☑	DC-Akku-Cable	1.000	St	
0	8418923	☑	Cable RS232 shield	1.000	St	
0	8418924	☑	Nurse call shield	1.000	St	
1	8413584	☑	Cable power supply, akku	1.000	St	
2	8417939	☑	cable harness motor electronic	1.000	St	
3	8413582	☑	Cable powerpack	1.000	St	
4	8418754	☑	cable backlight	1.000	St	
5	8418755	☑	Cable collection board	1.000	St	
6	8420726	☑	Flat cable, Valve bench	1.000	St	
7	8418757	☑	Cable backend	1.000	St	
8	8417937	☑	Interface Cable RS232	1.000	St	
9	8418758	☑	Cable frontend	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Parts catalog
Cables



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	8417753	☑	Ground cable -85	1.000	St	
0	8420721	☑	pba CO2-Link	1.000	St	only for Option CO2 measurement
0	8418810	☑	DC-Akku-Cable	1.000	St	
0	8418923	☑	Cable RS232 shield	1.000	St	
0	8418924	☑	Nurse call shield	1.000	St	
6	8420726	☑	Flat cable, Valve bench	1.000	St	
7	8418757	☑	Cable backend	1.000	St	
8	8417937	☑	Interface Cable RS232	1.000	St	
9	8418758	☑	Cable frontend	1.000	St	
10	8413700	☑	Cable harness	1.000	St	
11	8418826	☑	Option Nurcecall	1.000	St	
12	8418922	☑	Flat cable,O2-Measuring Module	1.000	St	
13	8417936	☑	Cable Harness Temp.Sensor	1.000	St	
14	8414519	☑	Cable harness AWT01	1.000	St	
15	8416370	☑	Cable harness flow switch	1.000	St	
16	8414028	☑	Cable harness spirolog sensor	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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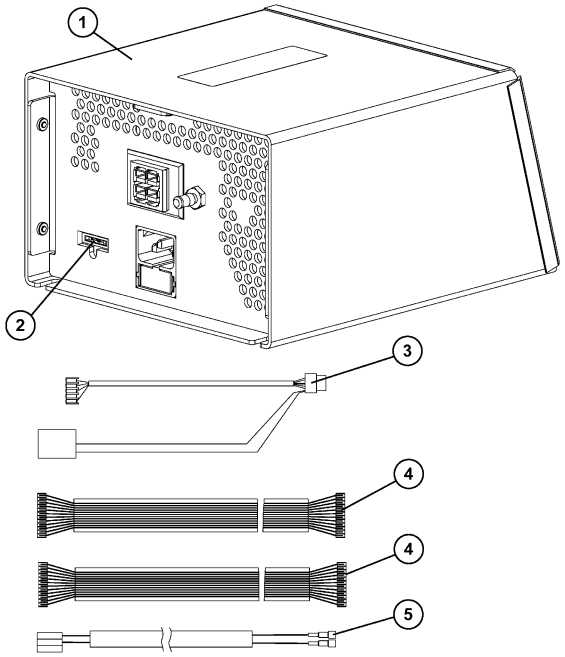
Parts catalog
Power supply



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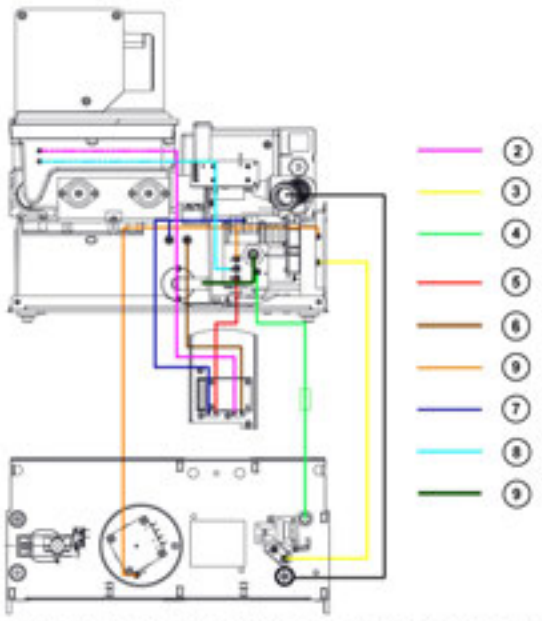
Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	1875531	☑	Mains cable BR,3m,C13W,BK RoHS	1.000	St	
0	1856553	☑	Power cord CE,3m,10A,C13W	1.000	St	
0	1856561	☑	Power cord CH,3m,10A,C13W	1.000	St	
0	1851810	☑	Cabel Australia,3m,10A,C13W	1.000	St	
0	1856596	☑	Cable Great Britian 3m,C13W	1.000	St	
0	1856626	☑	Power cord USA,3m,10A,C13W	1.000	St	
0	1875973	☑	Mains cable SA,3m,C13W,GY RoHS	1.000	St	
0	1859706	☑	Power cable 10A,3m,black,China	1.000	St	
0	1850377	☑	Fuse,5A	1.000	St	
0	1866915	☑	Power cable 10A 3m bk RoHS	1.000	St	
0	1856588	☑	PWR Cord DK,3m,10A,C13W RoHS	1.000	St	
1	8421230	☑	Netzteil	1.000	St	
2	1850369	☑	Fuse 15A	1.000	St	
3	8417939	☑	cable harness motor electronic	1.000	St	
4	8413582	☑	Cable powerpack	1.000	St	
5	8413584	☑	Cable power supply, akku	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

Parts catalog
Hoses



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	8418793	☑	TSI tube	1.000	St	
2	1180614	☑	Hose 2X1-SI NF M17749	1.000	m	
3	1204831	☑	Hose 2X1-SIGN yellow	1.000	m	
4	1204807	☑	Hose 2X1-SIGN green	1.000	m	
5	1204793	☑	Hose 2X1-SIGN red	1.000	m	
6	1204815	☑	Hose 2X1-sign brown	1.000	m	
7	1204785	☑	Hose 2X1-SIGN BL	1.000	m	
8	1204823	☑	Hose 2X1-sign orange	1.000	m	
9	1198912	☑	Hose 12X3-SI NF M29909	1.000	m	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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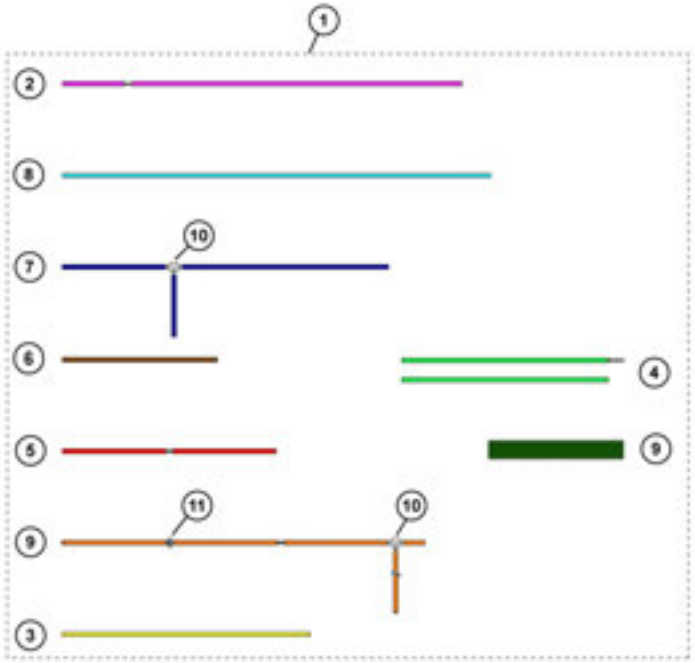
Parts catalog
Hoses



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	8418793	☑	TSI tube	1.000	St	
1	8417897	☑	tube set	1.000	St	
2	1180614	☑	Hose 2X1-SI NF M17749	1.000	m	
3	1204831	☑	Hose 2X1-SIGN yellow	1.000	m	
4	1204807	☑	Hose 2X1-SIGN green	1.000	m	
5	1204793	☑	Hose 2X1-SIGN red	1.000	m	
6	1204815	☑	Hose 2X1-sign brown	1.000	m	
7	1204785	☑	Hose 2X1-SIGN BL	1.000	m	
8	1204823	☑	Hose 2X1-sign orange	1.000	m	
9	1198912	☑	Hose 12X3-SI NF M29909	1.000	m	
10	8401083	☑	T-piece	1.000	St	
11	8406909	☑	Diode	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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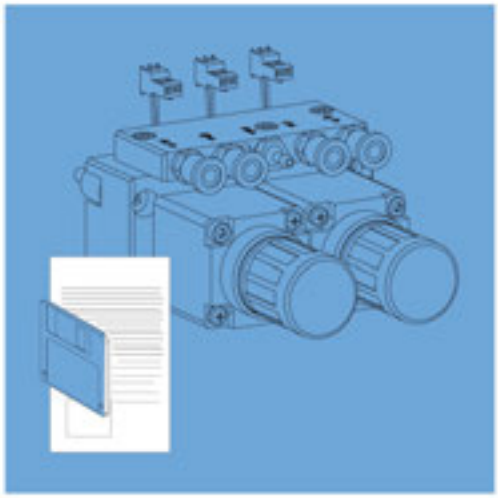
Parts catalog
Modification kits/Options



Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	MX44398	☐	CO2 measurement	1.000	St	up to SW 4.n
2	MX44393	☐	External battery	1.000	St	
3	MX44395	☐	LPO	1.000	St	
4	MX44392	☐	Monitor	1.000	St	
5	8421038	☑	Conversion kit noise reduction	1.000	St	Orderable via Confi 8414150/ up to fabricationsno. ASED-0043
6	MX44394	☐	Nurse call	1.000	St	
7	MX44654	☐	Software	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
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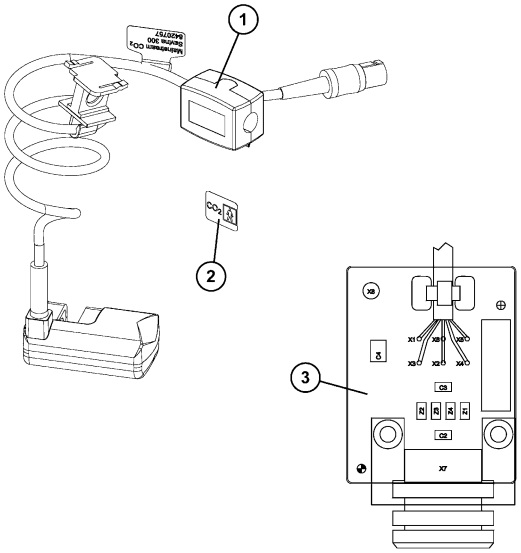
Parts catalog
CO2 measurement



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8420757	☑	CO2-Sensor Savina 300	1.000	St	
2	8420759	☑	Label-CO2	1.000	St	
3	8420721	☑	pba CO2-Link	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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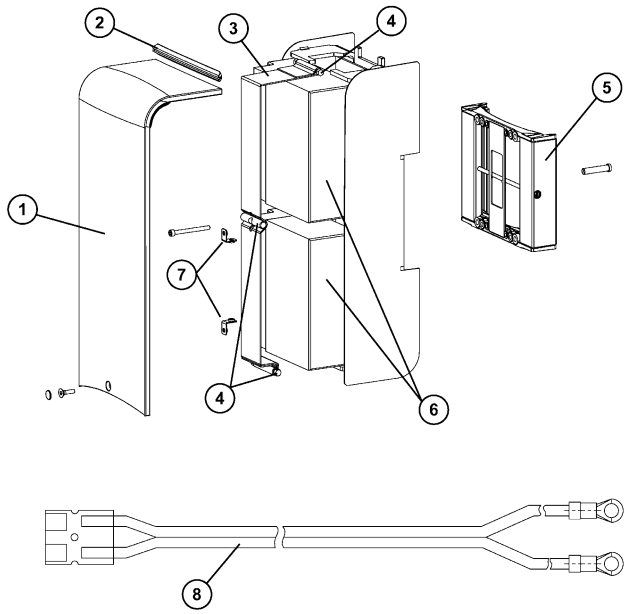
Parts catalog
External battery



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	1843133	☐	Blade fuse 25A 32V RoHS	1.000	St	
0	1857053	☑	Ferrite shell cbl harness 11mm	1.000	St	
1	8417318	☑	Accu cover, complete	1.000	St	
1-7	8417191	☑	Setting up kit Accu M25	1.000	St	
2	8416196	☑	End section	1.000	St	
3	8417300	☑	Tension belt	1.000	St	
4	8417317	☑	Set dowel pins	1.000	St	
5	8416191	☑	Claw 160	1.000	St	
6	1843303	☑	Lead-acid battery 12V/17AH	2.000	St	
7	8417321	☑	Accu mounting bracket	2.000	St	
8	8418810	☑	DC-Akku-Cable	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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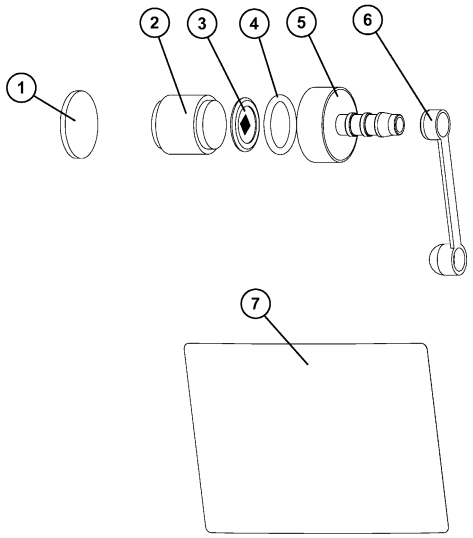
Parts catalog
LPO



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	5730293	☑	Tube extension 7.5m	1.000	St	
1	8415748	☑	Sealing Disc	1.000	St	
2	8411515	☑	Nonreturn valve (for 8411848)	1.000	St	
3	M16201	☑	Sieve	1.000	St	
4	D18400	☑	O-ring seal	1.000	St	
5	8414137	☑	Closure (LPO)	1.000	St	
6	8415745	☑	Retainer cap	1.000	St	
7	8418824	☑	Label LPO	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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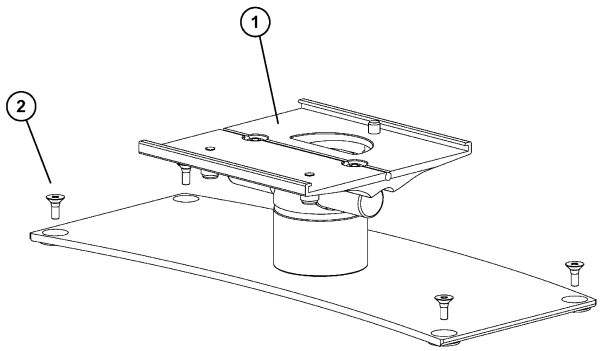
Parts catalog
Monitor



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8418819	☑	Monitor bracket Savina 300	1.000	St	
2	1343319	☑	Countersunk screw M5x12 DIN7991	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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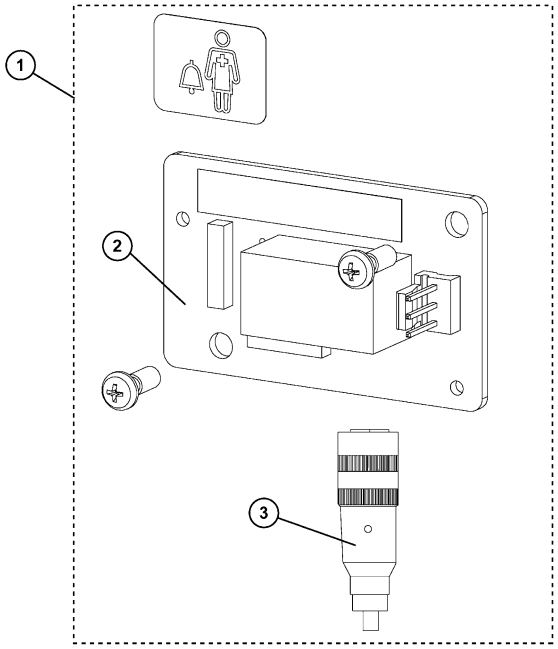
Parts catalog
Nurse call



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	8418924	☑	Nurse call shield	1.000	St	
1	8418826	☑	Option Nurcecall	1.000	St	
2	8417941	☑	pba RelaisBoard	1.000	St	
3	1846248	☑	Nurse call connector	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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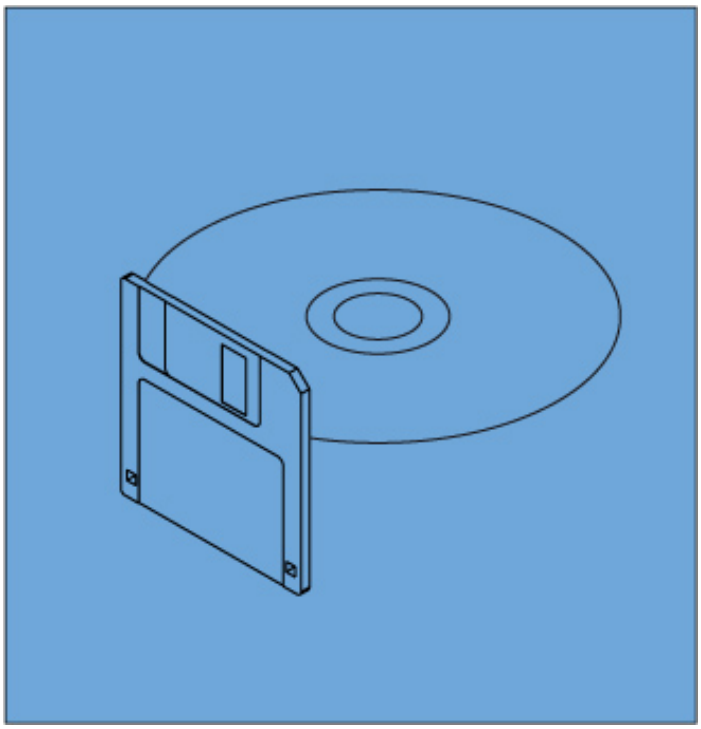
Parts catalog
Software



Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8420895	☐	CD software 4.00 Savina 300	1.000	St	
2	8421355	☐	Kit SW 4.02 Savina 300	1.000	St	Orderable via Confi 8414150
3	8421386	☑	Kit SW 4.10 Savina 300	1.000	St	Orderable via Confi 8414150
4	8421457	☑	Kit SW 4.20 Savina 300	1.000	St	Orderable via Confi 8414150

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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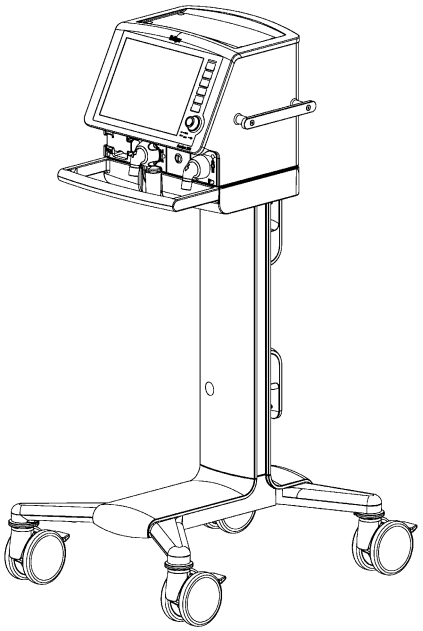
Parts catalog
Equipment affected



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
	8417800	☑	Savina 300, System	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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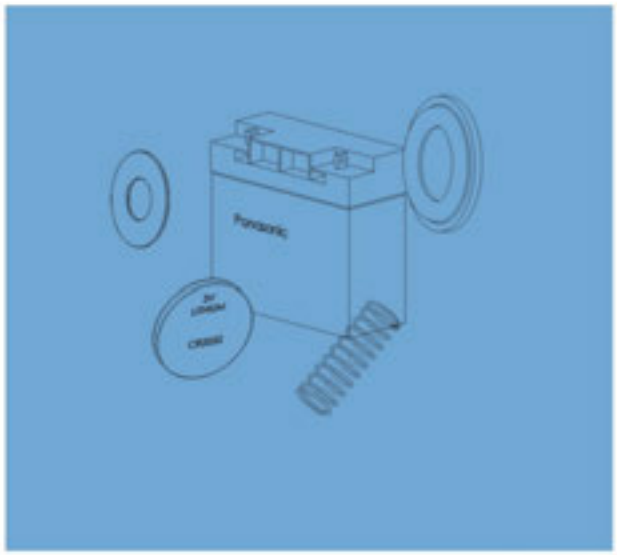
Parts catalog
Maintenance parts/Service kits



Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
	MX44387	☐	Savina 300, yearly	1.000	St	
	MX44388	☐	Savina 300, 2-yearly	1.000	St	
	MX44389	☐	Savina 300, 6-yearly	1.000	St	
	MX44481	☐	Engine-blower-unit kit	1.000	St	
	8413644	☑	Rep.Set radiator	1.000	St	
	8414081	☑	Rep.set diaphragm	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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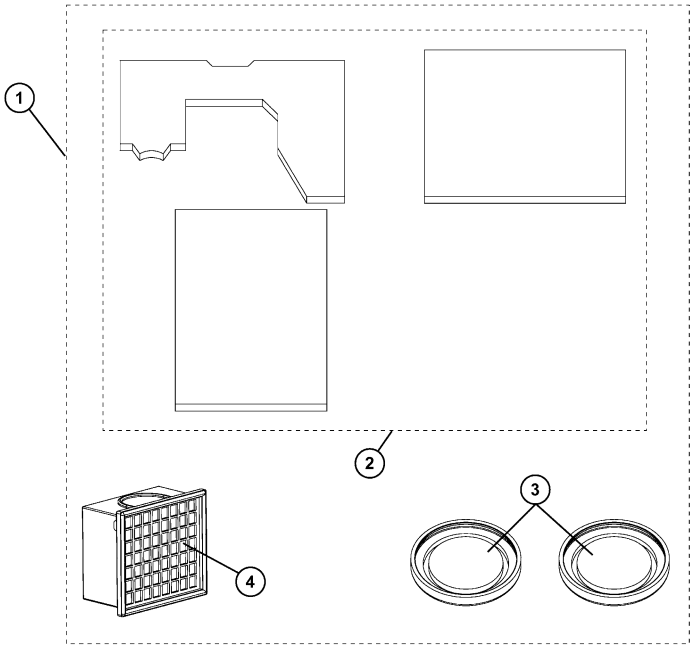
Parts catalog
Savina 300, yearly



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	MX08859	☑	Savina 300 Service Set 1y	1.000	St	
2	8417898	☑	Set dust filter	1.000	St	
3	8413661	☑	Membrane, complete	2.000	St	
4	6737545	☑	Microfilter	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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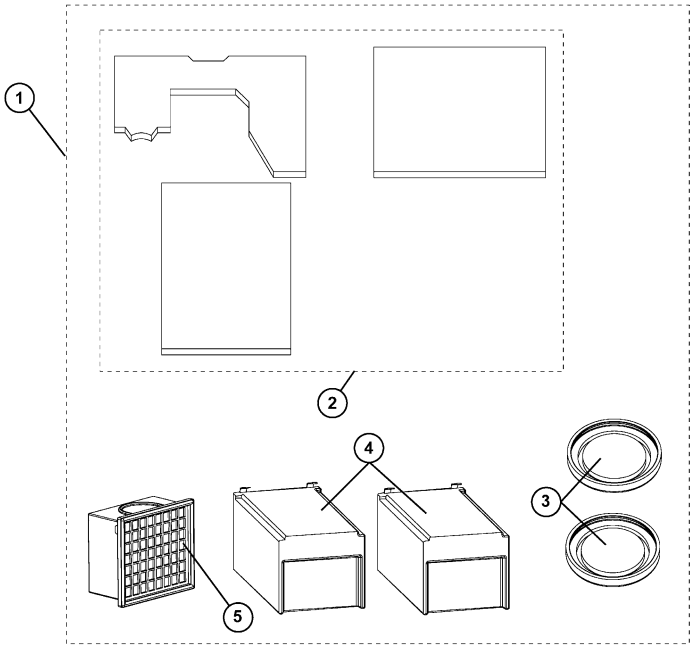
Parts catalog
Savina 300, 2-yearly



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	MX08860	☑	Savina 300 Service Set 2y	1.000	St	
2	8417898	☑	Set dust filter	1.000	St	
3	8413661	☑	Membrane, complete	2.000	St	
4	1841416	☑	Lead-acid battery 12V/3.5Ah	2.000	St	
5	6737545	☑	Microfilter	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
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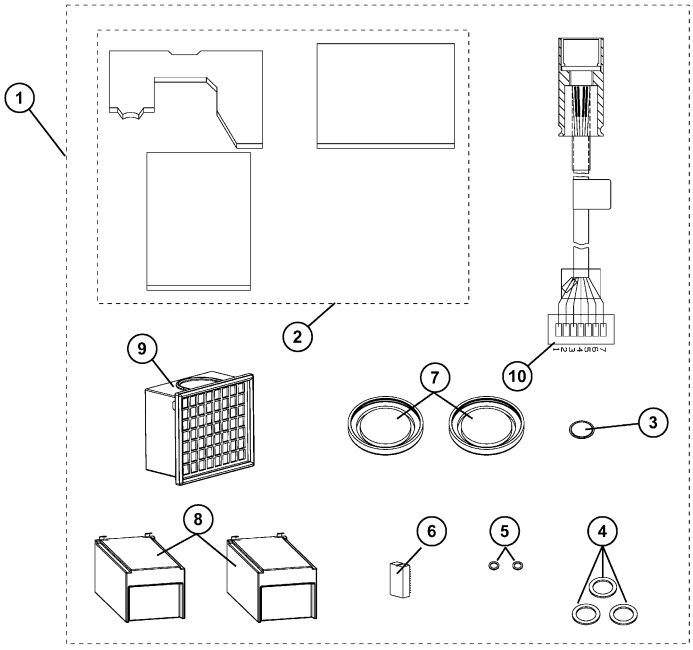
Parts catalog
Savina 300, 6-yearly



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	MX08861	☑	Savina 300 Service Set 6y	1.000	St	
2	8417898	☑	Set dust filter	1.000	St	
3	8416117	☑	Filter Gas Inlet	1.000	St	
4	M09257	☑	Sealing ring	2.000	St	
5	M19311	☑	Washer	2.000	St	
6	1845527	☑	Real time clock DIL24 RoHS	1.000	St	
6	8419944	☑	PCB RealTimeClock RTC3287E	1.000	St	Replacement for 1845527
7	8413661	☑	Membrane, complete	2.000	St	
8	1841416	☑	Lead-acid battery 12V/3.5Ah	2.000	St	
9	6737545	☑	Microfilter	1.000	St	
10	8414028	☑	Cable harness spirolog sensor	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
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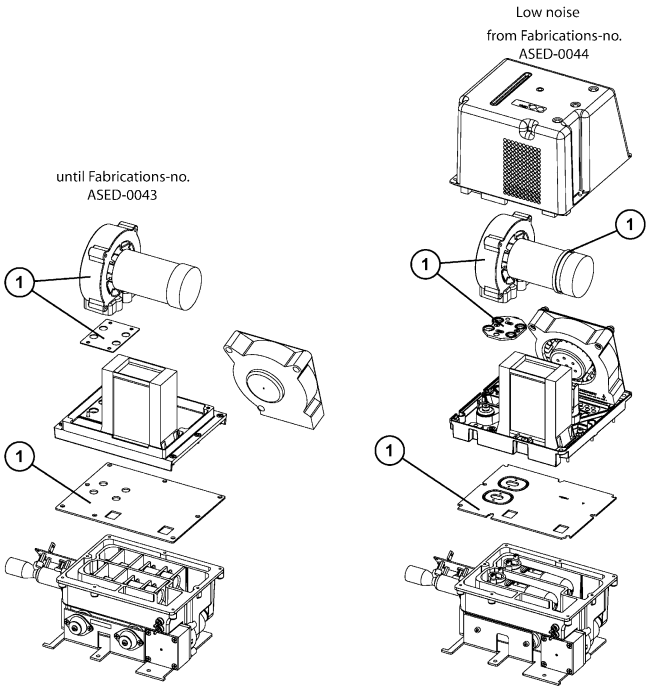
Parts catalog
Engine-blower-unit kit



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Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
1	8413643	☑	Spare Parts (Blow.Engine Unit)	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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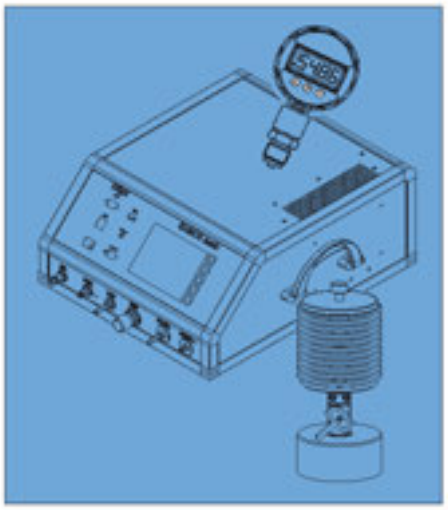
Parts catalog
Tools



Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
	8403201	☑	Test lung	1.000	St	
	8401892	☑	Test Lung	1.000	St	
	8290285	☑	Patient adaptor	1.000	St	
	8304411	☐	Oxydig complete	1.000	St	
	7910722	☑	Pres. meas. device, dig. 1bar	1.000	St	
	7910724	☑	Pres. meas. device, dig. 20bar	1.000	St	
	7910594	☑	VDE tester GMC Secutest 0751	1.000	St	
	7901022	☑	Measuring leat, red, 1M	1.000	St	
	7901023	☑	Measuring lead, black, 1m	1.000	St	
	M25647	☑	Double adapter 22/22	1.000	St	
	M13506	☑	Coupling sleeve	1.000	St	
	7901888	☑	Test cable 9-pin male	1.000	St	
	7901808	☑	Test cable RS232 extension	1.000	St	
	7901482	☑	Test pressure reducer O2	1.000	St	
	7910342	☑	Test press. red. O2, pin-INDEX	1.000	St	
	7900930	☑	Injector	1.000	St	
	1294105	☑	Plug	1.000	St	
	7901161	☑	Flowm., bl. , 0.02 - 14 L/min.	1.000	St	
	7900718	☑	Flowm. 10-120 L/min (O2. AIR)	1.000	St	
	7910385	☑	Charge tester (Evita), complete	1.000	St	
	7910387	☑	Cable for charge tester	1.000	St	
	7910426	☑	Power supply unit 3 - 18 VDC / 2 (3.5)	1.000	St	
	7900909	☑	Torque wrench, 6-50Nm	1.000	St	
	7910132	☑	Torque wrench, 20-100 NM	1.000	St	
	7901204	☑	Wrench, special open-ended, WAF 17	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

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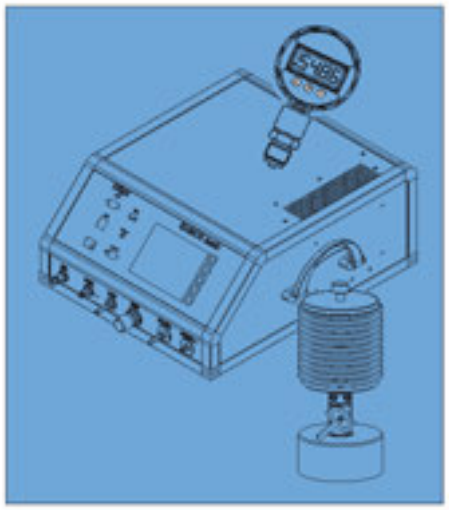
Parts catalog
Tools



Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
	7910462	☑	Special open-ended wrench, SW 41	1.000	St	
	7900484	☑	Hose clamp	1.000	St	
	2M12754	☑	Y hose connection piece	1.000	St	
	7902275	☑	Leak detection spray	1.000	St	
	1180614	☑	Hose 2X1-SI NF M17749	1.000	m	
	1198343	☑	Hose 7X2,5 SI NF M29908	1.000	m	
	1190520	☑	Hose 4X1,5-SI 50 SH A NF	1.000	m	
	1197851	☑	Silicone hose 6X2,5 NF M29907	1.000	m	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

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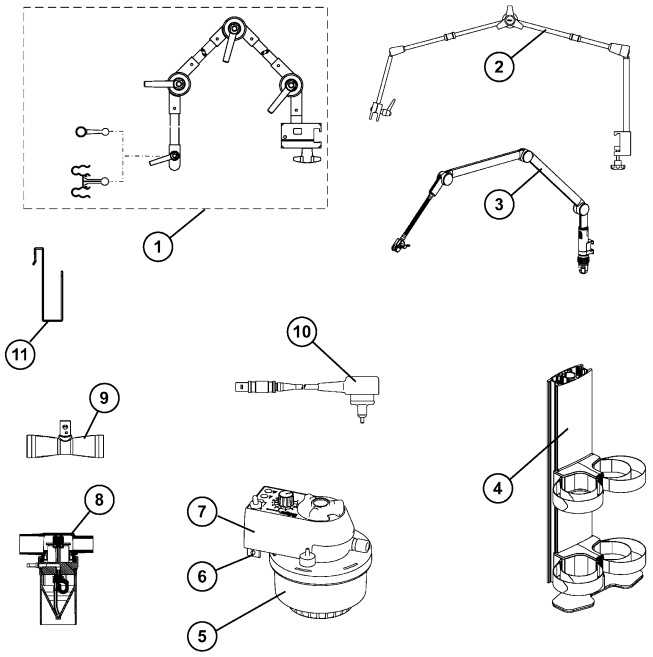
Parts catalog
Accessories/Consumables



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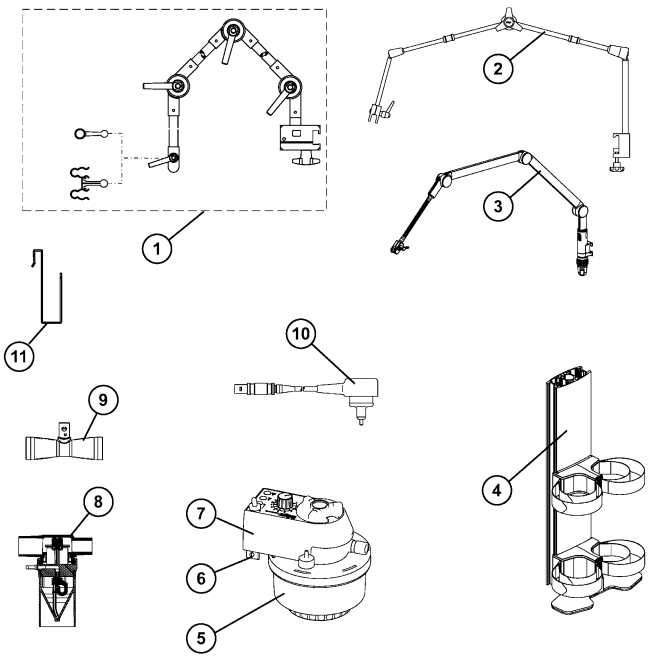
Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
0	MP01573	☑	Mask ClassicStar,NIV,SE,S	1.000	St	
0	MP01574	☑	Mask ClassicStar,NIV,SE,M	1.000	St	
0	MP01575	☑	Mask ClassicStar,NIV,SE,L	1.000	St	
0	MP01590	☑	2side pumpball f.airmanagement	1.000	St	
0	8306488	☑	Cable RS232 MEDIBUS	1.000	St	
0	MP01010	☑	Aeroneb Pro	1.000	St	
0	5702881	☑	Resuscitator adult MR_100	1.000	St	
0	8414144	☑	F&P humidifier/accessories	1.000	St	
0	5702321	☑	Resuscitator Child MR_100	1.000	St	
0	8420757	☑	CO2-Sensor Savina 300	1.000	St	only for Option CO2 measurement
0	8412344	☑	Hose kit ped., Aquapor	1.000	St	
0	8413146	☑	Hose kit E2 (blue socket)	1.000	St	
0	8412860	☑	Hose kit HME	1.000	St	
0	MP02400	☑	SelfTestLung	1.000	St	
0	8403201	☑	Test lung	1.000	St	
0	MP01579	☑	Mask NovaStarTS,NIV,w/SE,S	1.000	St	
0	MP01580	☑	Mask NovaStarTS,NIV,w/SE,M	1.000	St	
0	MP01581	☑	Mask NovaStarTS,NIV,w/SE,L	1.000	St	
1	8409609	☑	Hinged arm	1.000	St	
2	2M85706	☑	Quickstop hinged arm 2	1.000	St	
3	MP00690	☑	Infinity ACS hinged arm	1.000	St	
4	G93110	☑	Cylinder support compl	1.000	St	
5	8405029	☑	Patient part (Aquapor)	1.000	St	
6	8403345	☑	Set of spare brackets	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

No.2209_0000005623

Parts catalog
Accessories/Consumables



Pos. 0 ohne Abbildung/ Item 0 without illustration/ Pos. 0 sin ilustración/ Pos. 0 sans illustration

Item No.	Order No.	Orderable	Description	Qty.	Qty.unit	Remark
7	8414698	☐	Aquapor EL, Humidifier	1.000	St	
8	8412935	☑	Pneum. Medication Nebulizer	1.000	St	
9	MK01900	☑	SpiroLife	1.000	St	
10	8405371	☑	Temperature sensor	1.000	St	
11	2M85446	☑	Connecting hose holder	1.000	St	

Items that are shown in the illustration but are not listed below the illustration are not available as spare parts

Savina 300
Revision: 10

50/50

No.2209_0000005623

2 Test Instructions / Service Card IPM SW 3.5n

No.2209_0000005623

Test Instructions / Service Card IPM

Savina 300 SW 3.5n

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Warning

All servicing and/or test procedures on the device require detailed knowledge of this documentation. Use of the device requires detailed knowledge and observance of the relevant Instructions for Use.

Revision 9.0

No.2209_0000005623

Table of contents

Important notes

NOTE

Prior to using these test instructions, check that they are the latest revision (compare revision with latest service documentation).

All results and inputs must be documented in the "Test Report" and "Result Sheet".

NOTE

Do not use these test instructions for testing after a repair procedure.

NOTE

For the test items from **Plausibility check of internal batteries (1)** to **Plausibility check of internal batteries (2)** it is necessary for the device to be fitted with internal batteries, and that the batteries should be fully charged.

The LED for the internal rechargeable batteries on the operator control unit is lit green (rechargeable batteries are fully charged) or yellow (rechargeable batteries are charging).

These test instructions apply to devices with software version 3.5n.

For the devices listed below, use the test instructions specific to the relevant device:

– Drug nebulizer
– Humidifier
– Monitor

Conversion table: 1 bar = 14.504 PSI / 1 mbar = 1.01973 cm H_2O.

1 Device configuration

This section records the device configuration.

1.1 Savina 300

1.1.1 Serial numbers

Action • Enter the serial numbers of the component listed below:

Result **Savina 300, if not otherwise recorded**

[_____txt]

Action • Document the expiratory valve used.

Result **Document the use of a disposable expiratory valve (YES/NO) with** "Yes" **or** "NO"**.**

[_____txt]

NOTE

Disposable expiratory valves have no serial number.

Action
- Read off serial number of reusable expiratory valve(s).

Result **Expiratory valve 1 (reusable)**

[_____txt]

Result **Expiratory valve 2 (reusable)**

[_____txt]

Result **Optional respiratory gas temperature sensor AWT01**

[_____txt]

Result **Option Savina 300 trolley. The serial number is located on the rear of the trolley at the bottom. Slacken the gas cylinder holder, if fitted, and push it up a little way.**

[_____txt]

1.1.2 Device data

Action
- Enter existing option with "Yes" or "No". Note: Installed options are identifiable by the rating plate on the rear of the device.

Result **AutoFlow (YES / NO)**

[_____txt]

Result **PC-SIMV+/PC-BIPAP (YES / NO)**

[_____txt]

Result **NIV (mask breathing) (YES / NO)**

[_____txt]

Result **Option LPO (YES / NO)**

[_____txt]

Result **Option, Nurse call (Central alarm) (YES / NO)**

[_____txt]

Result **Option external battery on trolley (YES / NO)**

[_____txt]

1.1.3 Software version and operating hours

Action
- Switch on the Savina 300.
- Set the Savina 300 to "Standby" mode.
- Press the "Alarm Reset" key to reset the acoustic alarm.
- Press the "System configuration" softkey.
- Select the "Options" submenu.
- Read and record the software version.

Result **Software version**

[_____txt]

Action • Read off and note down the "Operating hours" reading.

Result **Operating hours**

[_____h]

Action • Read off and note down the "Service hours" reading.

Result **Service hours**

[_____h]

1.1.4 Recording user-specific alarm limits

Prerequisites Savina 300 is in "Standby" mode.

NOTE

The user-specific alarm limits must be re-entered after completion of the test procedure and before handing the device over to the user.

Action • Press the "Alarms" softkey.
• Read and note down the following parameters from the display:

Result **MV high**

[_____txt]

Result **MV low**

[_____txt]

Result **Paw**

[_____txt]

Result **V Ti**

[_____txt]

Result **f**

[_____txt]

Result **T apn**

[_____txt]

2 Maintenance parts

This chapter contains interval-related maintenance parts, measures, and tests that can only be performed on an open device.

2.1 Maintenance intervals, overview

2.1.1 Maintenance intervals and required sets and parts

The following table presents an overview of the required sets and maintenance parts over 12 years.

After 12 years the table is worked through again starting with the first year.

Designation (part no.)	1	2	3	4	5	6	7	8	9	10	11	12
Savina 300 service set 1 year (MX08859)	x		x		x		x		x		x	
Savina 300 service set 2 years (MX08860)		x		x				x		x		
Savina 300 service set 6 years (MX08861)						x						x
Motor-blower unit spare parts set (8413643)								x				
Optional filter for Canada and USA, filter element (MP03903)	x	x	x	x	x	x	x	x	x	x	x	x
Optional LPO, filter screen (M16201)		x		x		x		x		x		x
Optional LPO, O-ring (D18400)		x		x		x		x		x		x
Optional LPO, protective cap (8415745)		x		x		x		x		x		x

2.2 Maintenance parts by specified interval

2.2.1 Savina 300 service set 1 year

NOTE

When using disposable expiratory valves no complete diaphragms are required.

The Savina 300 service set 1 year (quantity 1) with the number MX08859 includes the following items:

Quantity	Designation	Number	Location/Remark
1	Microfilter	6737545	Filter mount / User
1	Set of dust filters S	8417898	Rear panel / User
2	Diaphragm, complete	8413661	Reusable expiratory valve (for 2 reusable expiratory valves) / User

Result **Savina 300 service set 1 year**

Next replacement: [_____dat]

2.2.2 Savina 300 service set 2 years

NOTE

When using disposable expiratory valves no complete diaphragms are required.

The Savina 300 service set 2 years (quantity 1) with the number MX08860 includes the following items:

Savina 300 SW 3.5n
Maintenance parts

Quantity	Designation	Number	Location/Remark
1	Microfilter	6737545	Filter mount / User
1	Set of dust filters S	8417898	Rear panel / User
2	Diaphragm, complete	8413661	Reusable expiratory valve (for 2 reusable expiratory valves) / User
2	Battery 12 V/3.5 Ah	1841416	Plug-in unit (internal battery) / Maintenance personnel

Result **Savina 300 service set 2 years**

Next replacement: [_____dat]

2.2.3 Savina 300 service set 6 years

NOTE

After replacing the clock module the following settings must be be made on the device:

Current date and time

User/operator ventilation settings and alarm limits.

NOTE

When using disposable expiratory valves no complete diaphragms are required.

The Savina 300 service set 6 years (quantity 1) with the number MX08861 includes the following items:

Quantity	Designation	Number	Location / Remark
1	Microfilter	6737545	Filter mount / User
1	Set of dust filters S	8417898	Rear panel / User
2	Diaphragm, complete	8413661	Reusable expiratory valve (for 2 reusable expiratory valves) / User
1	Filter Gas inlet	8416117	O_2 inlet / Maintenance personnel
2	Battery 12 V/3.5 Ah	1841416	Plug-in unit (internal battery) / Maintenance personnel
1	Sealing ring	M09257	O_2 inlet / Maintenance personnel
2	Washer	M19311	O_2 inlet / Maintenance personnel
1	Real-time clock module	1845527	Central Control Board / Specialist
1	Spirolog sensor cable harness	8414028	Connection housing (expiration) / Specialist

Result **Savina 300 service set 6 years**

Next replacement: [_____dat]

2.2.4 Motor-blower unit spare parts set

Quantity	Designation	Number	Location/Remark
1	Motor-blower unit spare parts set	8413643	Savina / Specialist

Result **Motor-blower unit spare parts set**

Next replacement: [_____dat]

2.2.5 Option for Canada and USA, filter element MP03903

Quantity	Designation	Number	Location/Remark
1	Filter element	MP03903	Gas inlet block/Replacement by specialist

Result **Filter element**

Next replacement: [_____dat]

2.2.6 LPO option

NOTE

Fit the filter screen in the device so that the side with the more pronounced curve is facing outwards.

Quantity	Designation	Number	Location/Remark
1	Filter screen	M16201	Connector-LPO / Maintenance personnel

Result **Filter screen**

Next replacement: [_____dat]

Quantity	Designation	Number	Location/Remark
1	O-ring	D18400	Connector-LPO / Maintenance personnel

Result **O-ring**

Next replacement: [_____dat]

Quantity	Designation	Number	Location/Remark
1	Protective cap	8415745	Connection socket / Maintenance personnel

Result **Protective cap**

Next replacement: [_____dat]

3 Electrical safety

This section contains tests which have to be performed in order to determine the operational readiness of the medical-electrical system.

3.1 Electrical safety to DIN EN 62353 (IEC 62353)

NOTE

The device conforms to the conditions of protection class I. When the respiratory gas temperature sensor AWT01 is connected it conforms to type BF.

The following subsections provide descriptions of device checks, recurrent testing and testing after servicing of medical electrical (ME) devices.

NOTE

The tester, e.g. SECUTEST, must be correctly configured for all measurements. If implausible measurement results are obtained, such as a leakage current of 0.0 µA, check the tester configuration in addition to the test setup!

NOTE

In testing to IEC 62353, the medical electrical device (ME device) or the medical electrical system (ME system) must be tested.

ME systems must be treated like ME devices.

An ME system is a combination of several devices, as specified by the manufacturer, of which at least one must be an ME device, which are interconnected by a functional connection or by means of a multiple socket outlet.

NOTE

In the case of devices connected to other devices by a data cable, this connection must be disconnected prior to performing the electrical safety test, in order to avoid false measurements.

3.1.1 Visual check

Prerequisites: The tester and the device under test are switched off.

Action:
- Disconnect the power plug from the mains socket.

WARNING

Hazardous voltage.

Touching live components can lead to serious injury or death.

► Disconnect the power cord from the AC outlet before checking the power fuse-links.

Test – The power fuse-links of the device under test match the specifications on the rating plate.
– The power cable and plug are not dirty or damaged.

Result **Condition checked.**

[_____OK]

3.1.2 Protective earth resistance

Test set-up

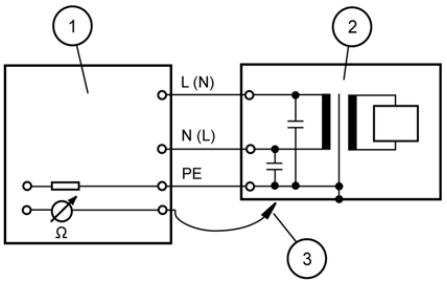

Fig. 1 Protective conductor resistance

Item	Designation
1	Tester (test device)
2	Device under test
3	Tester probe cable
L	Conductor
N	Neutral conductor
PE	Protective conductor

Action
- Create test set-up.
- Switch the tester on.
- Configure the tester appropriately and follow the instructions on the tester.
- Using the tip of the probe cable, scan each of the points on the device under test listed under Protective earth resistance measuring points one after the other, moving the mains power cable along the entire length during the measurement. The resistance must not change when you do so.

Test The protective conductor resistance of devices with detachable but connected mains power cables must not exceed **0.3** Ohm in each case.

Result **Maximum measured value of device with power cable.**

[_____Ω]

Test If other optional power cables are fitted, the respective protective conductor resistance must not exceed **0.1** Ohms. Move the power cable along the entire length during the measurement. The resistance must not change when you do so.

Result **Maximum measured value of optional power cable.**

[_____Ω]

Savina 300 SW 3.5n
Electrical safety

3.1.3 Protective earth resistance measuring points

Action
- Scan the following measuring points for protective earth conductor resistance measurement one after the other using the tip of the probe cable:
  - Power supply unit potential equalization pin
  - Gas inlet O_2
  - Option, side-mounted rails

Result **Measurement points scanned**

[_____OK]

3.1.4 Equipment leakage current

NOTE

The device leakage current can be tested by the differential measurement method or the direct measurement method.

In direct measurement, set up the device under test with insulation and scan all touchable conductive components using the probe (the protective conductor is internally interrupted in the tester).

Prerequisites The tester is switched on.

Test set-up

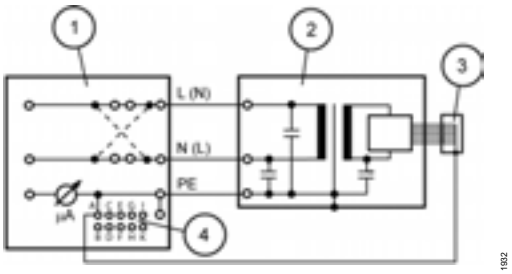

Fig. 2 Device leakage current

Item	Designation
1	Tester (test device)
2	Device under test
3	(Applied part) Device-specific test adapter for tester
4	(Applied part) Configurable sockets for applied part
L	Conductor
N	Neutral conductor
PE	Protective conductor

Action
- Create test set-up.
- (Applied part) Connect the device-specific test adapter on one end to the device under test and on the other end to the tester's configurable socket "A" for applied parts (paying attention to the configuration!).
- Follow the instructions on the tester.

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NOTE

The test must be performed twice! The second test is performed with the plug rotated 180° in the socket. In many test devices the mains plug rotation is simulated by means of a built-in selector switch. The higher measured value must be documented.

NOTE

The reference value (initial measured value) must always be transmitted!

NOTE

If the measured values are between 90% and 100% of the permissible limit value, the reference value and the previously measured values of the recurrent test should be applied to assess electrical safety!

Test The reference value must not exceed **500** µA.

Result **Reference value**

[_____µA]

Test The recurrent test value must not exceed **500** µA.

Result **Recurrent test**

[_____µA]

3.1.5 Applied parts for measurement of leakage current with respiratory gas temperature sensor AWT01, if installed

The following device-specific test adapters are required for the device under test:

– Measuring lead, 2-pin, temperature sensor, if installed

Test Measure leakage current at temperature connection.

3.1.6 Leakage current, mains on applied part with respiratory gas temperature sensor AWT01, if installed

NOTE

In the following test the leakage current is measured at the respiratory gas temperature sensor AWT01. The expected value is very low (the typical measured value is 1.5 µA to 2 µA).

Prerequisites The tester is switched on.

Action • Prepare the following test setup.

Savina 300 SW 3.5n
Electrical safety

Test set-up

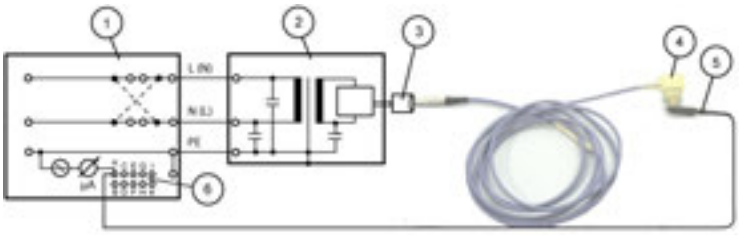

Fig. 3 Leakage current of respiratory gas temperature sensor AWT01

Item	Designation
1	Tester
2	Device under test
3	Connection port of device under test
4	Respiratory gas temperature sensor AWT01
5	Test clip with measuring lead
6	Configurable ports for applied part
L	Conductor
N	Neutral conductor
PE	Protective earth

Action
- (applied part) Connect the respiratory gas temperature sensor AWT01 on one end to the device under test and on the other end by a test clip with measuring lead and the tester, configurable port "A" for applied parts (paying attention to the configuration!).
- Follow the instructions on the tester.

NOTE

The test must be performed twice! The second test is performed with the plug rotated 180° in the socket. In many test devices the mains plug rotation is simulated by means of a built-in selector switch. The higher measured value must be documented.

NOTE

The reference value (initial measured value) must always be transmitted!

NOTE

If the measured values are between 90% and 100% of the permissible limit value, the reference value and the previously measured values of the recurrent test should be applied to assess electrical safety!

Test The reference value must not exceed **5000** µA.

Result **Reference value**

[_____µA]

Test The recurrent test value must not exceed **5000** µA.

Result **Recurrent test**

[_____µA]

3.1.7 Leakage current on applied part with test adapter (normal condition)

NOTE

The following measurement is performed under "normal condition".

Prerequisites The tester is switched on.

Test set-up

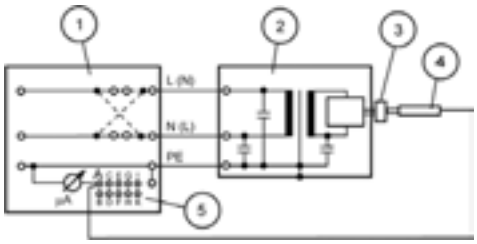

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Fig. 4 Leakage current on applied part

Item	Designation
1	Tester (test device)
2	Device under test
3	Applied part of device under test
4	Test adapter
5	Configurable sockets for application components
L	Conductor
N	Neutral conductor
PE	Protective conductor

Action
- Create test set-up.
- (Applied part) Connect the device-specific test adapter on one end to the device under test and on the other end to the tester's configurable socket "A" for applied parts (paying attention to the configuration!).
- Follow the instructions on the tester.

NOTE

The test must be performed twice! The second test is performed with the plug rotated 180° in the socket. In many test devices the mains plug rotation is simulated by means of a built-in selector switch. The higher measured value must be documented.

NOTE

The reference values (initial values measured) should always be entered in the "Test Report" or "Result Sheet" document!

NOTE

If the measured values are between 90% and 100% of the permissible limit value, the reference value and the previously measured values of the recurrent test should be applied to assess electrical safety!

Test The initial value must not exceed **100** µA "IAC".

Result **Initial value "IAC"**

[_____µA]

Test The initial value must not exceed **10** µA "IDC".

Result **Initial value "IDC"**

[_____µA]

Test The recurrent test value must not exceed **100** µA "IAC".

Result **Recurrent test "IAC"**

[_____µA]

Test The recurrent test value must not exceed **10** µA "IDC".

Result **Recurrent test "IDC"**

[_____µA]

3.2 Electrical safety according to IEC 60601-1

NOTE

The medical product to be tested conforms to the requirements of protection class I, type B with a respiratory gas temperature sensor AWT01 type BF connected.

NOTE

An optional multiple socket-outlet, if any, must be included in the individual tests (medical electrical system).

NOTE

In the case of devices connected to other devices by a data cable, this connection must be disconnected prior to performing the electrical safety test, in order to avoid false measurements.

3.2.1 Visual check

Prerequisites Savina 300 is switched off and not connected to the mains power supply.

Action
- Check the following items for damage:
  - Power supply cord of the device
  - Power switch
  - Power fuse link for mains power supply
  - Fuse link for internal battery

Test The items mentioned above are undamaged. The fitted power fuse-links match the values specified on the labels.

Result **Visual check completed.**

[_____OK]

3.2.2 Protective earth resistance

NOTE

The protective conductor resistance is measured with the power cable connected.

Test set-up

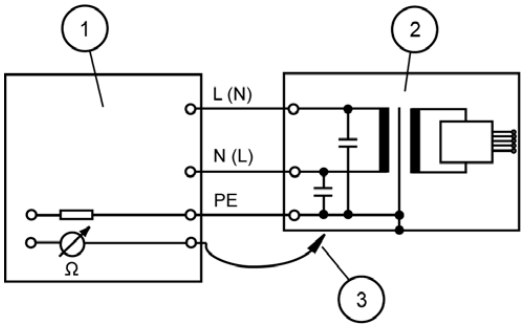

Fig. 5 Test setup for protective conductor resistance

Item	Designation
1	Tester, e.g. SECUTEST
2	Device under test
3	Test probe with tip
L	Conductor
N	Neutral conductor
PE	(Protective Earth) conductor

Action
- Prepare the test setup.
- Switch on the tester and the device under test.
- Configure the tester appropriately, and follow the instructions on the tester.
- Using the tip of the test probe, scan the following points on the device under test, move the power supply cord section-wise while doing so:
  - Power supply unit earth pin
  - Screws on the housing
  - Oxygen connection
  - Option rails (on side of Savina)

Test The protective earth resistance must not exceed **0.2** Ohm (including mains power cable) in each case.

Result **Enter the highest measured value of the protective conductor resistance.**

[_____Ω]

Savina 300 SW 3.5n
Electrical safety

3.2.3 Earth leakage current

NOTE

In order to avoid incorrect measurement, set up the device under test so that it is insulated.

Test set-up

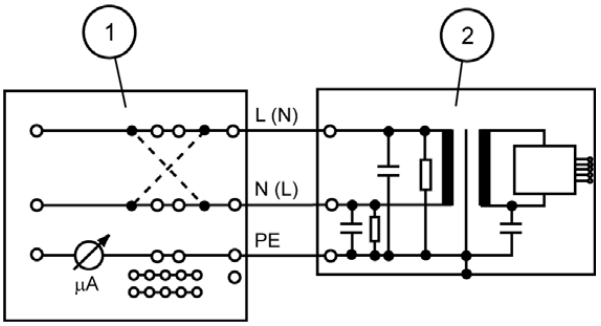

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Fig. 6 Earth leakage current test setup

Item	Designation
1	Tester, e.g. SECUTEST
2	Device under test
L	Conductor
N	Neutral conductor
PE	(Protective earth) conductor

Action
- Create test set-up.
- Switch on the tester and the device under test.
- Follow the instructions on the tester.

NOTE

For symmetrical mains plugs that have no preferential position in the socket-outlet, the earth leakage current test must be performed twice! The second test is performed with the plug rotated 180° in the socket. In many test devices the mains plug rotation is simulated by means of a built-in selector switch. The higher measured value must be documented.

Test Normal condition (N.C.): The value must not exceed **500** µA.

Result **Normal condition (N.C.)**

[_____µA]

Test Single fault condition (S.F.C.): The value must not exceed **1000** µA.

Result **Single fault condition (S.F.C.)**

[_____µA]

Action
- Plug the power supply connector (inverted, if possible) into the test socket of the test device. (In many test devices the power supply connector inversion can be simulated by means of a built-in selector switch.)

No.1408_0000007547

No.2209_0000005623

Test Normal condition (N.C.): The value must not exceed **500** µA.

Result **Normal condition (N.C.)**

[_____µA]

Test Single fault condition (S.F.C.): The value must not exceed **1000** µA.

Result **Single fault condition (S.F.C.)**

[_____µA]

3.2.4 Patient leakage current

Test set-up

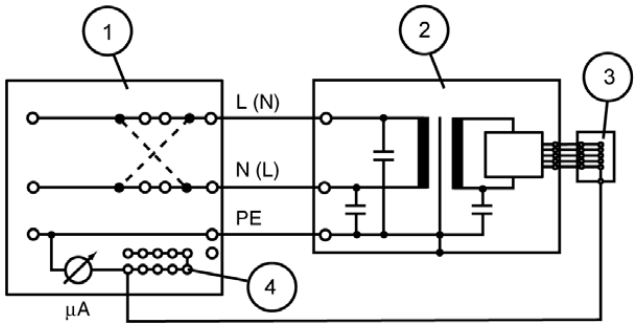


Fig. 7 Patient leakage current test setup

Item	Designation
1	Tester, e.g. SECUTEST
2	Device under test
3	Measuring line, 2-pin, temperature
4	Ports for applied parts
L	Conductor
N	Neutral conductor
PE	(Protective Earth) conductor

Action
- Prepare the test setup.
- Follow the instructions on the tester.

NOTE

For symmetrical mains plugs that have no preferential position in the socket-outlet, the patient leakage current test must be performed twice! The second test is performed with the plug rotated 180° in the socket. In many test devices the mains plug rotation is simulated by means of a built-in selector switch. The higher measured value must be documented.

Test Normal condition (N.C.) AC: The value must not exceed **100** µA.

Result **Normal condition (N.C.) AC**

[_____µA]

Test Single fault condition (S.F.C.) AC: The initial measured value must not exceed **500**.

Result **Single fault condition (S.F.C.) AC**

[_____µA]

Action • Plug the power supply connector (inverted, if possible) into the test socket of the test device. (In many test devices the power supply connector inversion can be simulated by means of a built-in selector switch.)

Test Normal condition (N.C.) AC: The value must not exceed **100** µA.

Result **Normal condition (N.C.) AC**

[_____µA]

Test Single fault condition (S.F.C.) AC: The value must not exceed **500** µA.

Result **Single fault condition (S.F.C.) AC**

[_____µA]

4 Function and condition test

This section contains tests to establish whether the device and the accessories used conform to the stipulations of the Instructions for Use in terms of condition and function.

4.1 Condition tests

4.1.1 Accompanying documents

Action • Check that the following accompanying documents are available:
– Instructions for use
– Medical Products Logbook (applicable to Germany only)

Result **All accompanying documents are available (according to user/operator).**

[_____OK]

4.1.2 Rating plates and option label

Test Check that the rating plates and the option label are complete and readable and not dirty or damaged.

Result **Rating plates and option label**

[_____OK]

4.1.3 Labels

Test Check that the country-specific adhesive labels are complete and readable and not dirty or damaged.

Result **Labels**

[_____OK]

4.1.4 General condition (Savina 300, accessories and special accessories)

Action • Check that the following device components, the accessories and the special accessories are not damaged.

Device components

– Savina 300
– Tubing system according to instructions for use/accessories list
– Expiratory valve(s) (reusable)

Accessories

– Water traps
– Tube holder
– Hinged arm

Special accessories

– Resutator 2000
– Child Resutator 2000

Result **The aforementioned device components, the accessories and the special accessories are undamaged.**

[_____OK]

4.1.5 Filter cover

Action • Check filter cover.

Test – The filter cover is not damaged (no cracks or fractures).
– The filter cover is firmly connected to the rear panel (locked in to rear panel).
– As from April 2014 the filter cover is additionally attached by a screw.

Result **Filter cover**

[_____OK]

4.1.6 O_2 gas connecting tube

Action • Check the O_2 gas connecting tube, the connector and the screw fitting.

Test The O_2 gas connecting tube conforms to the accessory list and to national regulations. The O_2 gas connecting tube, the connector and the screw fitting are undamaged.

Result **O_2 gas connecting tube**

[_____OK]

4.1.7 Option trolley (general condition)

Action • Trolley, check screw fitting of trolley and castors.

Test The trolley is not contaminated or damaged. All the trolley screw fittings are secure. The equipment mount is firmly attached to the trolley and is undamaged. The castors are undamaged. The castors are securely attached to the trolley. The locking mechanisms of the castors are working.

Result **Option trolley (general condition)**

[_____OK]

Savina 300 SW 3.5n
Function and condition test

4.1.8 Option LPO (external oxygen supply)

O_2 supply connector socket

Action • Check the O_2 supply "LPO" socket.

Test The O_2 supply "LPO" socket is undamaged.

Result **O_2 supply connector socket**

[_____OK]

Protective cap 8415745 for connector socket

Action • Check protective cap on connecting socket.

Test The protective cap on the connecting socket is undamaged.

Result **Protective cap 8415745 for connector socket**

[_____OK]

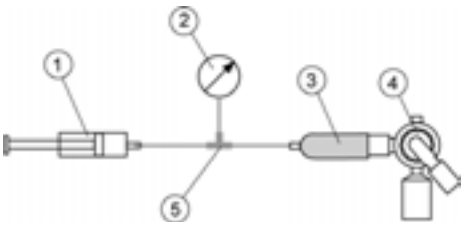
4.2 Function tests

4.2.1 Non-return valve in expiratory valve (reusable)

Prerequisites The reusable expiratory valve(s) has/have been removed.

Action • Prepare the following test setup:

Test set-up



2501

Fig. 8 Test setup: Non-return valve in expiratory valve (reusable)

Item	Designation
1	Syringe 60 mL
2	Manometer
3	Connecting sleeve
4	Expiratory valve (reusable)
5	T-piece

Action • Using the syringe, **slowly** (permissible pressure change less than 1 mbar/s) build up a pressure of 2.0 to 3 mbar at the outlet of the reusable expiratory valve.

Expiratory valve 1 (reusable)

Test The volume injected from the syringe in one minute must not exceed **35** mL/min.

Result **Expiratory valve 1 (reusable)**

[_____OK]

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Action • Repeat test for reusable expiratory valve 2.

Expiratory valve 2 (reusable)

Test The volume injected from the syringe in one minute must not exceed **35** mL/min.

Result **Expiratory valve 2 (reusable)**

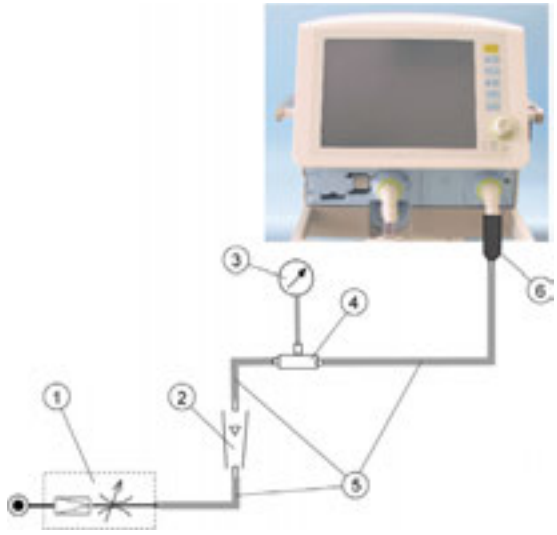
[_____OK]

4.2.2 Pneumatic safety valve (D1)

Prerequisites The Savina 300 is **not** connected to the mains power supply and **not** connected to the O_2 gas supply. Savina 300 is switched off.

Action • Prepare the following test setup:

Test set-up



3214

Fig. 9 Test setup: Pneumatic safety valve (D1)

Item	Designation
1	Test pressure regulator
2	Flowmeter
3	Manometer
4	T-piece
5	Silicone tube
6	Connecting sleeve

Action • Using the test pressure regulator, set a flow of 2 to 3 L/min.
• Read off the pressure value from the manometer.

Test The pressure is in a range of **90** mbar or higher but equal to or less than **110** mbar.

Result **Pneumatic safety valve (D1)**

[_____mbar]

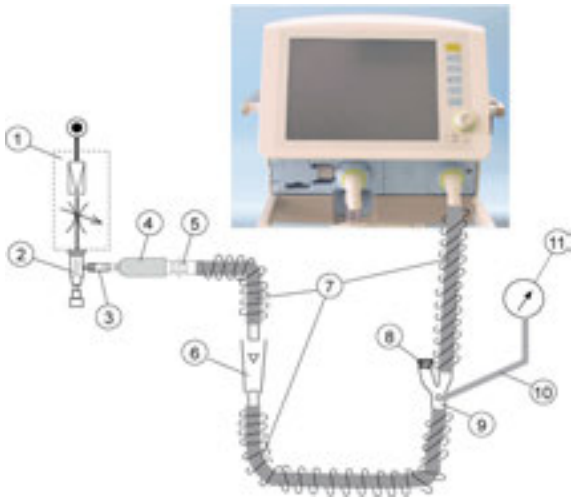
Savina 300 SW 3.5n
Function and condition test

4.2.3 Emergency respiratory valve (D2)

Prerequisites The Savina 300 is **not** connected to the mains power supply and **not** connected to the O_2 gas supply. Savina 300 is switched off.

Action
- Prepare the following test setup:

Test set-up



3194

Fig. 10 Test setup: Emergency respiratory valve (D2)

Item	Designation
1	Test pressure regulator
2	Injector
3	Silicone tube
4	Connecting sleeve
5	ISO socket
6	Flowmeter
7	Adult breathing tube (tube length 0.9 to 1.2 m)
8	Sealing plug
9	Y-piece, adult, Luer-Lock
10	Silicone tube
11	Manometer

Action
- Using the test pressure regulator, set a flow of 57 to 63 L/min.
- Read off the pressure value from the manometer.

Test The pressure is in a range from **-6.5**mbar to **-2.5**mbar.

Result **Emergency respiratory valve (D2)**

[_____OK]

4.2.4 LPO leakage test (option)

Prerequisites Savina 300 is switched off.

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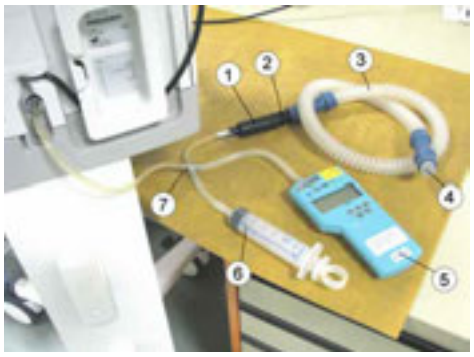
Action
- Using an approximately 40 cm silicone tube (4 x 1.5), connect the Savina 300 socket ("LPO" connection) to the cross-piece.
- Using an approximately 40 cm silicone tube (4 x 1.5), connect the manometer (Fig. 11/5) to the cross-piece (Fig. 11/7).
- Using an approximately 30 cm silicone tube (4 x 1.5), connect the syringe (Fig. 11/6) to the cross-piece.
- Using an approximately 40 cm silicone tube (4 x 1.5), connect the connecting sleeve (Fig. 11/1) to the cross-piece.
- Plug the ISO connector (Fig. 11/1) into the connecting sleeve (Fig. 11/2).
- Plug the breathing tube (1.20 m) (Fig. 11/3) onto the ISO connector (Fig. 11/2).
- Seal off the free end of the breathing tube using a rubber plug 22/25 (Fig. 11/4).



4794

Fig. 11 Test setup: LPO leakage test (option)

Action
- Using the syringe (Fig. 11/6), generate a negative pressure of -8 mbar.
- Read the pressure value off the manometer (Fig. 11/5).

Test After 5 seconds the pressure is in a range from **-8** mbar to **-6** mbar.

Result **LPO leakage test (option)**

[_____OK]

4.2.5 Power supply unit

NOTE

For the following tests do **not** connect any external batteries or DC supply to the Savina 300.

Electrical supply display

Prerequisites The Savina 300 is connected to the mains power supply.

Action
- Set the Savina 300 to "Standby" mode.

Savina 300 SW 3.5n
Function and condition test

Test	The LEDs on the front indicate the following operating states: – The mains power LED lights up green. The LED for the external batteries has gone out. – The LED for the internal batteries is lit green when the internal batteries are fully charged, or yellow when they are charging.
Result	**Electrical supply display**

[_____OK]

Internal supply voltage (internal batteries)

Prerequisites	Savina 300 is in "Standby" mode.
Action	• Disconnect the Savina 300 from the mains power supply.
Test	The acoustic alarm signal sounds. A message is displayed indicating that the internal batteries are active. The LEDs on the front of the device indicate the following operating states: – The mains power LED has gone out. The LED for the external batteries has gone out. – The LED for the internal batteries is lit green or yellow.
Action	• Press the "Start/Standby" key and switch the Savina 300 to "VC-CMV/VC-AC" mode.
Result	**The blower runs up to speed. Ignore the error messages and alarms during this test.**

[_____OK]

Action	• Connect the Savina 300 to the mains power supply.

Power failure alarm

Action	• Remove the fuse for the internal batteries. The fuse is located on the rear panel of the unit.
Test	A message is displayed indicating that the internal batteries are missing.
Action	• Press the "Alarm Reset" key. • Disconnect the Savina 300 from the mains power supply.
Test	All LEDs on the front are out. The acoustic power failure warning sounds.
Action	• Switch off Savina 300.
Test	The acoustic alarm signal stops.
Action	• Re-insert the fuse for the internal batteries. • Connect the Savina 300 to the mains power supply. • Set the Savina 300 to "Standby" mode.
Result	**Power failure alarm**

[_____OK]

4.2.6 External batteries, if present

Prerequisites	The Savina 300 is connected to the mains power supply but **not** to the external batteries. Savina 300 is in "Standby" mode.
Test	The LED for the external batteries on the front of the Savina 300 is unlit.
Action	• Connect the external batteries connector to the power supply unit of the Savina 300.

Test The LED for the external batteries on the front of the Savina 300 is lit green or yellow.

Action
- Disconnect the Savina 300 from the mains power supply.
- Switch the Savina 300 to any ventilation mode.

Test The Savina 300 is ventilating powered by the external batteries. A message is displayed indicating that the external batteries are active.

Result **External batteries, if present**

[_____OK]

Action
- Connect the Savina 300 to the mains power supply.

4.2.7 Plausibility check of internal batteries (1)

NOTE

For the following tests through to **Plausibility check of internal batteries (2)** run the device only on the internal batteries.

If the battery is not sufficient to do so, continue testing on mains power.

Action
- Disconnect the device from the mains power supply and - if present - from the external batteries.

Result **The device is powered by the internal batteries.**

[_____OK]

4.2.8 Emergency expiratory valve (V8/V9)

Prerequisites The Savina 300 is connected to the O_2 gas supply. Savina 300 is in "Standby" mode.

Action

Press "System configuration" **softkey / Select** "Ventilation" **mode tab.**
Pressure limitation: Off
Plateau: On
LPO: Off
Press "Ventilation settings" **softkey / Select** "VC-CMV/VC-AC" **mode tab.**
O_2: 21%
VT: 0.500 L
Ti : 5.0 s
f: 6 1/min
FlowAcc: 30 mbar/s (hPa/s or cmH_2O/s)
PEEP: 5 mbar
Press the "Start/Standby" **key.**
Start ventilation.
Press "Alarms" **softkey.**
Paw "high": Set 10 mbar above peak pressure.

Action
- Prepare the following test setup.

Savina 300 SW 3.5n
Function and condition test

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Fig. 12 Test setup: Emergency expiratory valve (V8/V9)

Item	Designation
1	Manometer
2	Silicone tube
3	Connecting sleeve

Action
- Read off the pressure value from the manometer.

Test
After three breathing cycles the Savina 300 builds up a pressure up to the upper airway pressure limit. Then the pressure is briefly relieved by emergency expiratory valve to **7** mbar or less.

Result
Emergency expiratory valve (V8/V9)

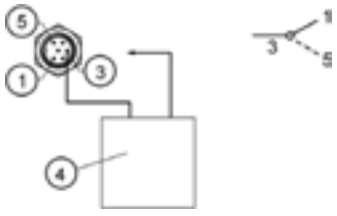
[_____OK]

4.3 Options

4.3.1 Nurse call (central alarm)

Prerequisites
The Savina 300 is connected to the O_2 gas supply. Savina 300 is in "Standby" mode.

Test set-up



2390

Fig. 13 Test setup: Nurse call (central alarm)

Item 1	Designation
1	Pin 1 (no alarm)

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Item 1	Designation
3	Pin 3
4	Multimeter (resistance measurement)
5	Pin 5 (alarm)

Action

Press "System configuration" **softkey / Select** "Ventilation" **tab.**
Pressure limitation: Off
Plateau: On
LPO: Off
Press "Ventilation settings" **softkey / Select** "VC-CMV/VC-AC" **mode tab.**
O_2: 21%
VT: 0.500 L
Ti : 2.0 s
f: 12 1/min
FlowAcc: 30 mbar/s
PEEP: 5 mbar
Press "Alarms" **softkey.**
Pressure limitation: maximum
Press the "Start/Standby" **key.**
Start ventilation.

Test No alarm:

– Pin 1 to pin 3: closed

– Pin 3 to pin 5: open

Action • Activate the alarm by disconnecting the breathing tube from the inspiratory socket. **Do not reset the acoustic alarm signal by pressing the** "Audio Paused" **key!**

Test Alarm:

– Pin 1 to pin 3: open

– Pin 3 to pin 5: closed

Result **Nurse call (central alarm)**

[_____OK]

Action • Connect the breathing tube to the inspiratory socket.

• Press the "Alarm Reset" key.

4.3.2 Respiratory gas temperature sensor AWT01

Prerequisites The Savina 300 is connected to the O_2 gas supply. The Savina 300 is set to a ventilation mode.

Action • Connect the AWT01 respiratory gas temperature sensor to the Savina 300.

• Press the "Data" softkey.

• Perform a comparative measurement with a reference thermometer at room temperature.

Test The measured value of the reference thermometer matches the Savina 300 reading and is within a tolerance of 2 °C.

Result **Respiratory gas temperature sensor AWT01**

[_____OK]

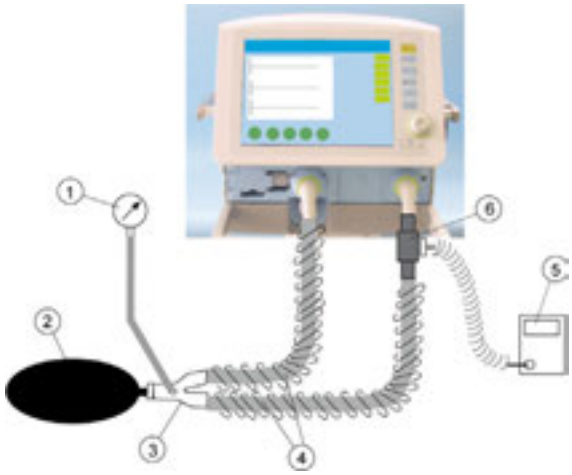
4.4 Dynamic final test in operation

4.4.1 Dynamic final test

Prerequisites The Savina 300 is connected to the O_2 gas supply. Savina 300 is in "Standby" mode.

Action
- Prepare the following test setup.

Test set-up



3234

Fig. 14 Test setup: Final test in operation

Item	Designation
1	Flowmeter (-30 mbar to 120 mbar)
2	Test lung
3	Y-piece, adult, Luer-Lock
4	Adult breathing tube
5	O_2 analyzer
6	O_2 adapter

Action

Press "System configuration" **softkey / Select** "Ventilation" **tab.**
Pressure limitation: Off
Plateau: On
LPO: Off
Press "Ventilation settings" **softkey / Select** "VC-CMV/VC-AC" **mode.**
O_2: 21%
VT: 0.500 L
Ti : 2 s

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f: 12 1/min
FlowAcc: 30 mbar/s (hPa/s or cmH_2O/s)
PEEP: 5 mbar
Select "Additional settings" **tab.**
Sigh: Off
Flow trigger: Off
AutoFlow: Off
Press "Alarms" **softkey.**
MV "high": maximum
MV "low": minimum
Paw: maximum
VTi: maximum
f: maximum
Tapn: maximum
Press "Sensors/Parameters" **softkey.**
O_2 monitoring: Off
Flow monitoring: Off
Press the "Start/Standby" **key.**
Start ventilation.
Press "Sensors/Parameters" **softkey.**

Action
- Start O_2 calibration.

Savina 300 - Display
Display messages follow until "O_2 calibration OK" appears.

Action
- Close "Sensors/Parameters" display window.
- Push the Spirolog sensor all the way to the left and then to the right.

Savina 300 - Display
An acoustic alarm signal sounds. The message "Flow sensor ?" appears. When the calibration has completed successfully the message "Flow calibration OK" is displayed.

Action
- Press the "Alarm Reset" key.
- Check the following tidal volume:

Savina 300 - Display (VTe in L)
0.421 - 0.549

Action
- Adjust and check the following oxygen concentrations:

NOTE

Perform the oxygen measurements under ventilation conditions - that is to say, with the test lung connected.

Savina 300 - SettingsO_2	**Savina 300 - Display** (FiO_2 in vol%)	**External oxygen analyzer** (O_2 in %)
21	21 - 24	21 - 24

NOTE

The following oxygen measurements can be speeded up by initially detaching the test lung from the Y-piece connection. When the preset oxygen concentration is reached, re-attach the test lung to the Y-piece connection.

Savina 300 - SettingsO_2	**Savina 300 - Display** (FiO_2 in vol%)	**External oxygen analyzer** (O_2 in %)
60	57 - 63	57 - 63

Action
- On the Savina 300 preset the specified O_2 value to 21 vol%.
- Set frequency to 6 1/min.
- Adjust and check the following PEEP values:

Savina 300 - Settings PEEP	**Savina 300 - Display** (PEEP in mbar)	**External manometer** (pressure in mbar)
5	3 - 7	3 - 7 (expiration phase)
25	23 - 27	23 - 27 (expiration phase)

Result **Dynamic final test**

[_____OK]

Action
- Set PEEP value to 0 mbar.

4.5 User-specific alarm limits

4.5.1 Input of user-specific alarm limits

Action
- Re-enter all user-specific alarm limits recorded in the "Device configuration" section into the Savina 300.

Result **The user-specific alarm limits have been re-entered into the device.**

[_____OK]

4.6 Plausibility check of internal batteries (2)

4.6.1 Plausibility test

Result **All tests could be carried out with the internal batteries.**

[_____OK]

4.7 Final action

Prerequisites
- The test instructions have been performed as specified.
- All tests performed were passed successfully.

4.7.1 Test label, notice to operator (batteries) and device handover

CAUTION

► Batteries not fully charged!

► If the batteries are not fully charged, the runtime of the ventilator in the event of a mains power failure may be reduced considerably. If applicable, inform the user that the rechargeable batteries still need to be recharged.

Action
- Attach a test label to the device.
- Advise the operator/user that the internal batteries need to be charged.
- Supply the user/owner with a fully functioning device.

Result **Test label, notice to operator (batteries) and device handover**

[_____OK]

5 Test equipment

This section sets out the test equipment required for the tests in this test procedure.

5.1 Test equipment list

NOTE

Use the following test equipment or equivalent aids.

5.1.1 Test equipment subject to mandatory calibration

Designation	Part number	Comments
Electrical safety tester, e.g. GMC Secutest	7910596	
Multimeter	7901021	

Savina 300 SW 3.5n
Test equipment

Designation	Part number	Comments
Temperature and humidity meter	7910980	
Manometer	7910722	
Test pressure regulator (tube connection) or	7901482	
Test pressure regulator (pin index)	7910342	No illustration available
Flowmeter, 3-block set	7901161	
Flowmeter	7900718	

Result **Test equipment calibrated in a valid manner used.**

[_____OK]

5.1.2 Test equipment not subject to mandatory calibration

NOTE

Use the following test equipment or equivalent aids.

Designation	Part number	Comments
Oxygen analyzer, e.g. MX 300-i	7911955	

Designation	Part number	Comments
Breathing bag with 7 mm catheter connector, set	8403201	
Measuring line, 2-pin, temperature	7910364	
Patient connection adapter	7910195	
ISO socket	M25647	
Connecting sleeve	M13506	
Injector	7900930	
O_2 adapter	8405807	
Y-piece, adult, Luer-Lock	M33278	
Insertion tool jaws, 22 mm	7911877	No illustration available
Rubber plug 18/20 DIN 12871	1294105	
Rubber plug 22/25	7901665	
Cross-piece, plastic	7901504	
T-piece, plastic	6800187	

Savina 300 SW 3.5n
Test equipment

Designation	Part number	Comments
Syringe, 60 mL	7910745	
Tube 6 x 2.5, silicone	1197851	
Tube 4 x 1.5, silicone	1190520	
Nebulizer tube	8412985	
Suction tube	M25780	
Tube 1 x 2.5, silicone	1198343	No illustration available
Tube 2 x 1, silicone	1180614	No illustration available
Tubing system	As specified in instructions for use	No illustration available
"O_2" pipeline supply connecting tube	As specified in instructions for use	No illustration available

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No.2209_0000005623

3 Result Sheet Test Instructions / Service Card IPM SW 3.5n

Result Sheet Test Instructions / Service Card IPM
Savina 300 SW 3.5n

Order number:

Location: **Serial no. (basic unit):**

Department: **Cust. invent. no.:**

Maintenance interval: **Other / Delivery date:**

Applies to Test Instructions / Service Card IPM Revision 9.0

Key

✓ / OK	= OK
+	= Spare part used
!	= Error / Report
/	= Accessory not available
-	= Not applicable

Test			Result
1 Device configuration			
1.1 Savina 300			
1.1.1 Serial numbers			
☐	1.1.1.1	Savina 300, if not otherwise recorded	txt
☐	1.1.1.2	disposable expiratory valve (YES/NO)	txt
☐	1.1.1.3	Expiratory valve 1 (reusable)	txt
☐	1.1.1.4	Expiratory valve 2 (reusable)	txt
☐	1.1.1.5	Optional respiratory gas temperature sensor AWT01	txt
☐	1.1.1.6	Option Savina 300 trolley	txt
1.1.2 Device data			
☐	1.1.2.1	AutoFlow (YES / NO)	txt
☐	1.1.2.2	PC-SIMV+/PC-BIPAP (YES / NO)	txt
☐	1.1.2.3	NIV (mask breathing) (YES / NO)	txt
☐	1.1.2.4	Option LPO (YES / NO)	txt
☐	1.1.2.5	Option, Nurse call (Central alarm) (YES / NO)	txt
☐	1.1.2.6	Option external battery on trolley (YES / NO)	txt
1.1.3 Software version and operating hours			
☐	1.1.3.1	Software version	txt
☐	1.1.3.2	Operating hours	h
☐	1.1.3.3	Service hours	h
1.1.4 Recording user-specific alarm limits			
☐	1.1.4.1	MV high	txt
☐	1.1.4.2	MV low	txt
☐	1.1.4.3	Paw	txt
☐	1.1.4.4	V Ti	txt
☐	1.1.4.5	f	txt
☐	1.1.4.6	T apn	txt
2 Maintenance parts			
2.1 Maintenance intervals, overview			
2.1.1 Maintenance intervals and required sets and parts			
2.2 Maintenance parts by specified interval			
☐	2.2.1	Savina 300 service set 1 year	dat
☐	2.2.2	Savina 300 service set 2 years	dat
☐	2.2.3	Savina 300 service set 6 years	dat
☐	2.2.4	Motor-blower unit spare parts set	dat
☐	2.2.5	Option for Canada and USA, filter element MP03903	dat
2.2.6 LPO option			
☐	2.2.6.1	Filter screen	dat
☐	2.2.6.2	O-ring	dat
☐	2.2.6.3	Protective cap	dat
3 Electrical safety			
3.1 Electrical safety to DIN EN 62353 (IEC 62353)			
☐	3.1.1	Visual check	OK

Test			Result
3.1.2 Protective earth resistance			
☐	3.1.2.1	Maximum measured value of device with power cable	Ω
☐	3.1.2.2	Maximum measured value of optional power cable	Ω
☐	3.1.3	Protective earth resistance measuring points	OK
3.1.4 Equipment leakage current			
☐	3.1.4.1	Reference value	µA
☐	3.1.4.2	Recurrent test	µA
3.1.5 Applied parts for measurement of leakage current with respiratory gas temperature sensor AWT01, if installed			
3.1.6 Leakage current, mains on applied part with respiratory gas temperature sensor AWT01, if installed			
☐	3.1.6.1	Reference value	µA
☐	3.1.6.2	Recurrent test	µA
3.1.7 Leakage current on applied part with test adapter (normal condition)			
☐	3.1.7.1	Initial value "IAC"	µA
☐	3.1.7.2	Initial value "IDC"	µA
☐	3.1.7.3	Recurrent test "IAC"	µA
☐	3.1.7.4	Recurrent test "IDC"	µA
3.2 Electrical safety according to IEC 60601-1			
☐	3.2.1	Visual check	OK
☐	3.2.2	Protective earth resistance	Ω
3.2.3 Earth leakage current			
☐	3.2.3.1	Normal condition (N.C.)	µA
☐	3.2.3.2	Single fault condition (S.F.C.)	µA
☐	3.2.3.3	Normal condition (N.C.)	µA
☐	3.2.3.4	Single fault condition (S.F.C.)	µA
3.2.4 Patient leakage current			
☐	3.2.4.1	Normal condition (N.C.) AC	µA
☐	3.2.4.2	Single fault condition (S.F.C.) AC	µA
☐	3.2.4.3	Normal condition (N.C.) AC	µA
☐	3.2.4.4	Single fault condition (S.F.C.) AC	µA
4 Function and condition test			
4.1 Condition tests			
☐	4.1.1	Accompanying documents	OK
☐	4.1.2	Rating plates and option label	OK
☐	4.1.3	Labels	OK
☐	4.1.4	General condition (Savina 300, accessories and special accessories)	OK
☐	4.1.5	Filter cover	OK
☐	4.1.6	O_2 gas connecting tube	OK
☐	4.1.7	Option trolley (general condition)	OK
4.1.8 Option LPO (external oxygen supply)			
☐	4.1.8.1	O_2 supply connector socket	OK

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Test	Result
☐ 4.1.8.2 Protective cap 8415745 for connector socket	OK
4.2 Function tests	
4.2.1 Non-return valve in expiratory valve (reusable)	
☐ 4.2.1.1 Expiratory valve 1 (reusable)	OK
☐ 4.2.1.2 Expiratory valve 2 (reusable)	OK
☐ 4.2.2 Pneumatic safety valve (D1)	mbar
☐ 4.2.3 Emergency respiratory valve (D2)	OK
☐ 4.2.4 LPO leakage test (option)	OK
4.2.5 Power supply unit	
☐ 4.2.5.1 Electrical supply display	OK
☐ 4.2.5.2 Internal supply voltage (internal batteries)	OK
☐ 4.2.5.3 Power failure alarm	OK
☐ 4.2.6 External batteries, if present	OK
☐ 4.2.7 Plausibility check of internal batteries (1)	OK
☐ 4.2.8 Emergency expiratory valve (V8/V9)	OK
4.3 Options	
☐ 4.3.1 Nurse call (central alarm)	OK
☐ 4.3.2 Respiratory gas temperature sensor AWT01	OK
4.4 Dynamic final test in operation	
☐ 4.4.1 Dynamic final test	OK
4.5 User-specific alarm limits	
☐ 4.5.1 Input of user-specific alarm limits	OK
4.6 Plausibility check of internal batteries (2)	
☐ 4.6.1 Plausibility test	OK
4.7 Final action	
☐ 4.7.1 Test label, notice to operator (batteries) and device handover	OK
5 Test equipment	
5.1 Test equipment list	
☐ 5.1.1 Test equipment subject to mandatory calibration	OK
5.1.2 Test equipment not subject to mandatory calibration	

Report:

Test has been performed according to the test instructions.

Name: ..... :_____

Date/Signature:..... :_____

4 Test Instructions / Service Card IPM SW 4.n

Test Instructions / Service Card IPM

Savina 300 SW 4.n

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Warning

All servicing and/or test procedures on the device require detailed knowledge of this documentation. Use of the device requires detailed knowledge and observance of the relevant Instructions for Use.

Revision 4.0

No.2209_0000005623

Table of contents

No.2008_0000007495

No.2209_0000005623

Important notes

NOTE

Prior to using these test instructions, check that they are the latest revision (compare revision with latest service documentation).

All results and inputs must be documented in the "Test Report" and "Result Sheet".

NOTE

Do not use these test instructions for testing after a repair procedure.

NOTE

For the test items from **Plausibility check of internal batteries (1)** to **Plausibility check of internal batteries (2)** it is necessary for the device to be fitted with internal batteries, and that the batteries should be fully charged.

The LED for the internal rechargeable batteries on the operator control unit is lit green (rechargeable batteries are fully charged) or yellow (rechargeable batteries are charging).

These test instructions apply to devices as from software version 4.n.

For the devices listed below, use the test instructions specific to the relevant device:

– Drug nebulizer
– Humidifier
– Monitor

Conversion table: 1 bar = 14.504 PSI / 1 mbar = 1.01973 cm H_2O.

1 Device configuration

This section records the device configuration.

1.1 Savina 300

1.1.1 Serial numbers

Action • Enter the serial numbers of the component listed below:

Result **Savina 300, if not otherwise recorded**

[_____txt]

Action • Document the expiratory valve used.

Result **Document the use of a disposable expiratory valve (YES/NO) with** "Yes" **or** "No"**.**

[_____txt]

NOTE

Disposable expiratory valves have no serial number.

Action • Read off serial number of reusable expiratory valve(s).

Result **Expiratory valve 1 (reusable)**

[_____txt]

Result **Expiratory valve 2 (reusable)**

[_____txt]

Result **Optional respiratory gas temperature sensor AWT01**

[_____txt]

Result **Option Mainstream CO_2 sensor Savina 300**

[_____txt]

Result **Option Savina 300 trolley. The serial number is located on the rear of the trolley at the bottom. Slacken the gas cylinder holder, if fitted, and push it up a little way.**

[_____txt]

1.1.2 Device data

Action • Enter existing option with "Yes" or "No". Note: Installed options are identifiable by the rating plate on the rear of the device.

Result **PC-SIMV+/PC-BIPAP (YES / NO)**

[_____txt]

Result **Option PC-APRV (YES / NO)**

[_____txt]

Result **Option PC-AC (YES / NO)**

[_____txt]

Result **Option VC-MMV (YES / NO)**

[_____txt]

Result **AutoFlow (YES / NO)**

[_____txt]

Result **NIV (YES / NO)**

[_____txt]

Result **Option LPO (YES / NO)**

[_____txt]

Result **Option CO_2 (YES / NO)**

[_____txt]

Result **Option MonitoringPlus (YES / NO)**

[_____txt]

Result **Option Nursecall (YES / NO)**

[_____txt]

Result **Option external battery on trolley (YES / NO)**

[_____txt]

1.1.3 Software version, operating hours and service hours

Action
- Set the Savina 300 to "Standby" mode.
- Press the "Alarm Reset" key to reset the acoustic alarm.
- Press the "System configuration" softkey.
- Select the "Options" submenu.
- Read and record the software version.

Result **Software version**

[_____txt]

Action
- Read off and note down the "Operating hours" reading.

Result **Operating hours**

[_____h]

Action
- Read off and note down the "Service hours" reading.

Result **Service hours**

[_____h]

1.1.4 Recording user-specific alarm limits

Prerequisites The device is in "Standby" mode.

NOTE

The user-specific alarm limits must be re-entered after completion of the test procedure and before handing the device over to the user.

Action
- Press the "Alarms" softkey.
- Read and note down the following parameters from the display:

Result **MV high**

[_____txt]

Result **MV low**

[_____txt]

Result **Paw**

[_____txt]

Result **VT**

[_____txt]

Result **AF**

[_____txt]

Result **Tapn**

[_____txt]

Result **$etCO_2$ high, if present**

[_____txt]

Result **$etCO_2$ low, if present**

[_____txt]

2 Maintenance parts

This chapter contains interval-related maintenance parts, measures, and tests that can only be performed on an open device.

2.1 Maintenance intervals, overview

2.1.1 Maintenance intervals and required sets and parts

The following table presents an overview of the required sets and maintenance parts over 12 years.

After 12 years the table is worked through again starting with the first year.

Designation (part no.)	1	2	3	4	5	6	7	8	9	10	11	12
Savina 300 service set 1 year (MX08859)	x		x		x		x		x		x	
Savina 300 service set 2 years (MX08860)		x		x				x		x		
Savina 300 service set 6 years (MX08861)						x						x
Motor-blower unit spare parts set (8413643)								x				
Optional filter for Canada and USA, filter element (MP03903)	x	x	x	x	x	x	x	x	x	x	x	x
Optional LPO, filter screen (M16201)		x		x		x		x		x		x
Optional LPO, O-ring (D18400)		x		x		x		x		x		x
Optional LPO, protective cap (8415745)		x		x		x		x		x		x

2.2 Maintenance parts by specified interval

2.2.1 Savina 300 service set 1 year

NOTE

When using disposable expiratory valves no complete diaphragms are required.

The Savina 300 service set 1 year (quantity 1) with the number MX08859 includes the following items:

Savina 300 SW 4.n
Maintenance parts

Quantity	Designation	Number	Location/Remark
1	Microfilter	6737545	Filter mount / User
1	Set of dust filters S	8417898	Rear panel / User
2	Diaphragm, complete	8413661	Reusable expiratory valve (for 2 reusable expiratory valves) / User

Result **Savina 300 service set 1 year**

Next replacement: [_____dat]

2.2.2 Savina 300 service set 2 years

NOTE

When using disposable expiratory valves no complete diaphragms are required.

The Savina 300 service set 2 years (quantity 1) with the number MX08860 includes the following items:

Quantity	Designation	Number	Location/Remark
1	Microfilter	6737545	Filter mount / User
1	Set of dust filters S	8417898	Rear panel / User
2	Diaphragm, complete	8413661	Reusable expiratory valve (for 2 reusable expiratory valves) / User
2	Battery 12 V/3.5 Ah	1841416	Plug-in unit (internal battery) / Maintenance personnel

Result **Savina 300 service set 2 years**

Next replacement: [_____dat]

2.2.3 Savina 300 service set 6 years

NOTE

After replacing the clock module the following settings must be be made on the device:

Current date and time

User/operator ventilation settings and alarm limits.

NOTE

When using disposable expiratory valves no complete diaphragms are required.

The Savina 300 service set 6 years (quantity 1) with the number MX08861 includes the following items:

Quantity	Designation	Number	Location / Remark
1	Microfilter	6737545	Filter mount / User
1	Set of dust filters S	8417898	Rear panel / User
2	Diaphragm, complete	8413661	Reusable expiratory valve (for 2 reusable expiratory valves) / User
1	Filter Gas inlet	8416117	O_2 inlet / Maintenance personnel
2	Battery 12 V/3.5 Ah	1841416	Plug-in unit (internal battery) / Maintenance personnel
1	Sealing ring	M09257	O_2 inlet / Maintenance personnel
2	Washer	M19311	O_2 inlet / Maintenance personnel
1	Real-time clock module	1845527	Central Control Board / Specialist
1	Spirolog sensor cable harness	8414028	Connection housing (expiration) / Specialist

Result **Savina 300 service set 6 years**

Next replacement: [_____dat]

2.2.4 Motor-blower unit spare parts set

Quantity	Designation	Number	Location/Remark
1	Motor-blower unit spare parts set	8413643	Savina / Specialist

Result **Motor-blower unit spare parts set**

Next replacement: [_____dat]

2.2.5 Optional filter for Canada and USA

Quantity	Designation	Number	Location/Remark
1	Filter element	MP03903	Gas inlet block/Replacement by specialist

Result **Filter element**

Next replacement: [_____dat]

2.2.6 LPO option

NOTE

Fit the filter screen in the device so that the side with the more pronounced curve is facing outwards.

Quantity	Designation	Number	Location/Remark
1	Filter screen	M16201	Connector-LPO / Maintenance personnel

Result **Filter screen**

Next replacement: [_____dat]

Quantity	Designation	Number	Location/Remark
1	O-ring	D18400	Connector-LPO / Maintenance personnel

Result **O-ring**

Next replacement: [_____dat]

Quantity	Designation	Number	Location/Remark
1	Protective cap	8415745	Connection socket / Maintenance personnel

Result **Protective cap**

Next replacement: [_____dat]

3 Electrical safety

This section contains tests which have to be performed in order to determine the operational readiness of the medical-electrical system.

3.1 Electrical safety to DIN EN 62353 (IEC 62353)

NOTE

The device conforms to the conditions of protection class I. When the respiratory gas temperature sensor AWT01 is connected it conforms to type BF.

Introduction The following subsections provide descriptions of device checks, recurrent testing and testing after servicing of medical electrical (ME) devices.

NOTE

The tester, e.g. SECUTEST, must be correctly configured for all measurements. If implausible measurement results are obtained, such as a leakage current of 0.0 µA, check the tester configuration in addition to the test setup!

NOTE

In testing to IEC 62353, the medical electrical device (ME device) or the medical electrical system (ME system) must be tested.

ME systems must be treated like ME devices.

An ME system is a combination of several devices, as specified by the manufacturer, of which at least one must be an ME device, which are interconnected by a functional connection or by means of a multiple socket outlet.

NOTE

In the case of devices connected to other devices by a data cable, this connection must be disconnected prior to performing the electrical safety test, in order to avoid false measurements.

3.1.1 Visual check

Prerequisites The tester and the device under test are switched off.

Action
- Disconnect the power plug from the mains socket.

WARNING

Hazardous voltage.

Touching live components can lead to serious injury or death.

► Disconnect the power cord from the AC outlet before checking the power fuse-links.

Test
– The power fuse-links of the device under test match the specifications on the rating plate.
– The power cable and plug are not dirty or damaged.

Result **Condition checked.**

[_____OK]

3.1.2 Protective earth resistance

Test set-up

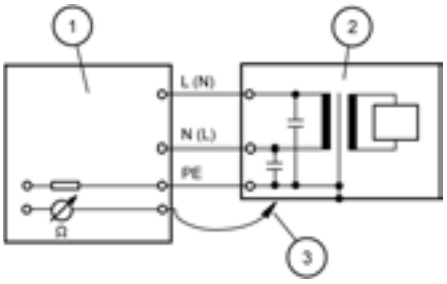

Fig. 1 Protective conductor resistance

Item	Designation
1	Tester (test device)
2	Device under test
3	Tester probe cable
L	Conductor
N	Neutral conductor
PE	Protective conductor

Action
- Create test set-up.
- Switch the tester on.
- Configure the tester appropriately and follow the instructions on the tester.
- Using the tip of the probe cable, scan each of the points on the device under test listed under Protective earth resistance measuring points one after the other, moving the mains power cable along the entire length during the measurement. The resistance must not change when you do so.

Test The protective conductor resistance of devices with detachable but connected mains power cables must not exceed **0.3** Ohm in each case.

Result **Maximum measured value of device with power cable.**

[_____Ω]

Test If other optional power cables are fitted, the respective protective conductor resistance must not exceed **0.1** Ohms. Move the power cable along the entire length during the measurement. The resistance must not change when you do so.

Result **Maximum measured value of optional power cable.**

[_____Ω]

3.1.3 Protective earth resistance measuring points

Action
- Scan the following measuring points for protective earth conductor resistance measurement one after the other using the tip of the probe cable:

– Power supply unit potential equalization pin
– Gas inlet O_2
– Option, side-mounted rails

Result **Measurement points scanned**

[_____OK]

3.1.4 Equipment leakage current

NOTE

The device leakage current can be tested by the differential measurement method or the direct measurement method.

In direct measurement, set up the device under test with insulation and scan all touchable conductive components using the probe (the protective conductor is internally interrupted in the tester).

Prerequisites The tester is switched on.

Test set-up

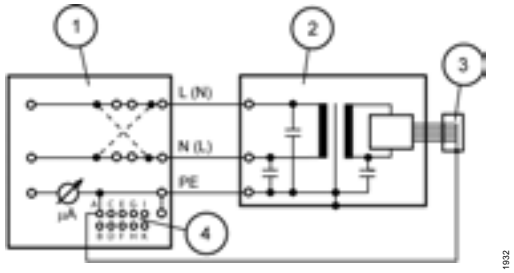

Fig. 2 Device leakage current

Item	Designation
1	Tester (test device)
2	Device under test
3	(Applied part) Device-specific test adapter for tester
4	(Applied part) Configurable sockets for applied part
L	Conductor
N	Neutral conductor
PE	Protective conductor

Action
- Create test set-up.
- (Applied part) Connect the device-specific test adapter on one end to the device under test and on the other end to the tester's configurable socket "A" for applied parts (paying attention to the configuration!).
- Follow the instructions on the tester.

NOTE

The test must be performed twice! The second test is performed with the plug rotated 180° in the socket. In many test devices the mains plug rotation is simulated by means of a built-in selector switch. The higher measured value must be documented.

NOTE

The reference value (initial measured value) must always be transmitted!

NOTE

If the measured values are between 90% and 100% of the permissible limit value, the reference value and the previously measured values of the recurrent test should be applied to assess electrical safety!

Test The reference value must not exceed **500** µA.

Result **Reference value**

[_____µA]

Test The recurrent test value must not exceed **500** µA.

Result **Recurrent test**

[_____µA]

3.1.5 Applied parts for measurement of leakage current with respiratory gas temperature sensor AWT01, if installed

The following device-specific test adapters are required for the device under test:

– Measuring lead, 2-pin, temperature sensor, if installed

Test Measure leakage current at temperature connection.

3.1.6 Leakage current, mains on applied part with respiratory gas temperature sensor AWT01, if installed

NOTE

In the following test the leakage current is measured at the respiratory gas temperature sensor AWT01. The expected value is very low (the typical measured value is 1.5 µA to 2 µA).

Prerequisites The tester is switched on.

Action • Prepare the following test setup.

Test set-up

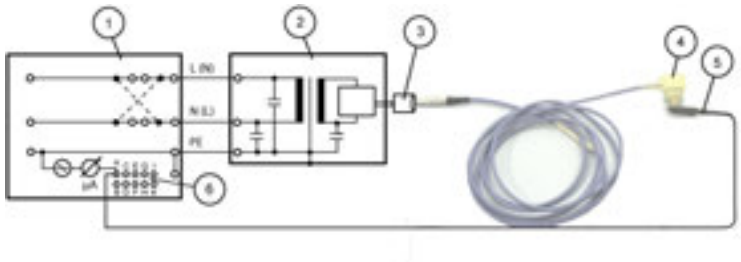

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Fig. 3 Leakage current of respiratory gas temperature sensor AWT01

Item	Designation
1	Tester
2	Device under test
3	Connection port of device under test
4	Respiratory gas temperature sensor AWT01
5	Test clip with measuring lead
6	Configurable ports for applied part
L	Conductor
N	Neutral conductor
PE	Protective earth

Action
- (applied part) Connect the respiratory gas temperature sensor AWT01 on one end to the device under test and on the other end by a test clip with measuring lead and the tester, configurable port "A" for applied parts (paying attention to the configuration!).
- Follow the instructions on the tester.

NOTE

The test must be performed twice! The second test is performed with the plug rotated 180° in the socket. In many test devices the mains plug rotation is simulated by means of a built-in selector switch. The higher measured value must be documented.

NOTE

The reference value (initial measured value) must always be transmitted!

NOTE

If the measured values are between 90% and 100% of the permissible limit value, the reference value and the previously measured values of the recurrent test should be applied to assess electrical safety!

Test The reference value must not exceed **5000** µA.

Result **Reference value**

[_____µA]

Test The recurrent test value must not exceed **5000** µA.

Result **Recurrent test**

[_____µA]

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3.1.7 Leakage current on applied part with test adapter (normal condition)

NOTE

The following measurement is performed under "normal condition".

Prerequisites The tester is switched on.

Test set-up

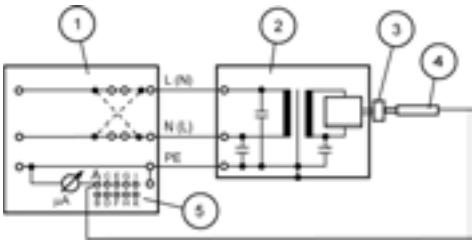

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Fig. 4 Leakage current on applied part

Item	Designation
1	Tester (test device)
2	Device under test
3	Applied part of device under test
4	Test adapter
5	Configurable sockets for application components
L	Conductor
N	Neutral conductor
PE	Protective conductor

Action
- Create test set-up.
- (Applied part) Connect the device-specific test adapter on one end to the device under test and on the other end to the tester's configurable socket "A" for applied parts (paying attention to the configuration!).
- Follow the instructions on the tester.

NOTE

The test must be performed twice! The second test is performed with the plug rotated 180° in the socket. In many test devices the mains plug rotation is simulated by means of a built-in selector switch. The higher measured value must be documented.

NOTE

The reference values (initial values measured) should always be entered in the "Test Report" or "Result Sheet" document!

NOTE

If the measured values are between 90% and 100% of the permissible limit value, the reference value and the previously measured values of the recurrent test should be applied to assess electrical safety!

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Test	The initial value must not exceed **100** µA "IAC".
Result	**Initial value "IAC"**
	[_____µA]
Test	The initial value must not exceed **10** µA "IDC".
Result	**Initial value "IDC"**
	[_____µA]
Test	The recurrent test value must not exceed **100** µA "IAC".
Result	**Recurrent test "IAC"**
	[_____µA]
Test	The recurrent test value must not exceed **10** µA "IDC".
Result	**Recurrent test "IDC"**
	[_____µA]

3.2 Electrical safety according to IEC 60601-1

NOTE

The medical product to be tested conforms to the requirements of protection class I, type B with a respiratory gas temperature sensor AWT01 type BF connected.

NOTE

An optional multiple socket-outlet, if any, must be included in the individual tests (medical electrical system).

NOTE

In the case of devices connected to other devices by a data cable, this connection must be disconnected prior to performing the electrical safety test, in order to avoid false measurements.

3.2.1 Visual check

Prerequisites	Savina 300 is switched off and not connected to the mains power supply.
Action	• Check the following items for damage: – Power supply cord of the device – Power switch – Power fuse link for mains power supply – Fuse link for internal battery
Test	The items mentioned above are undamaged. The fitted power fuse-links match the values specified on the labels.
Result	**Visual check completed.**
	[_____OK]

3.2.2 Protective earth resistance

NOTE

The protective conductor resistance is measured with the power cable connected.

Test set-up

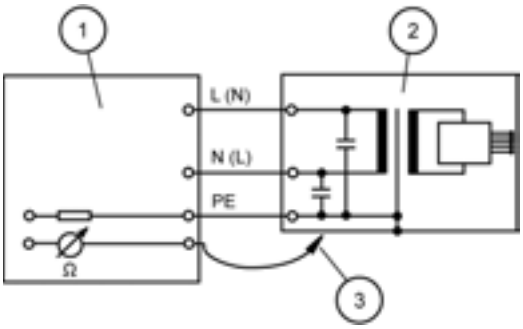

Fig. 5 Test setup for protective conductor resistance

Item	Designation
1	Tester, e.g. SECUTEST
2	Device under test
3	Test probe with tip
L	Conductor
N	Neutral conductor
PE	(Protective Earth) conductor

Action
- Prepare the test setup.
- Switch on the tester and the device under test.
- Configure the tester appropriately, and follow the instructions on the tester.
- Using the tip of the test probe, scan the following points on the device under test, move the power supply cord section-wise while doing so:
  - Power supply unit earth pin
  - Screws on the housing
  - Oxygen connection
  - Option rails (on side of Savina)

Test The protective earth resistance must not exceed **0.2** Ohm (including mains power cable) in each case.

Result **Enter the highest measured value of the protective conductor resistance.**

[_____Ω]

3.2.3 Earth leakage current

NOTE

In order to avoid incorrect measurement, set up the device under test so that it is insulated.

Test set-up

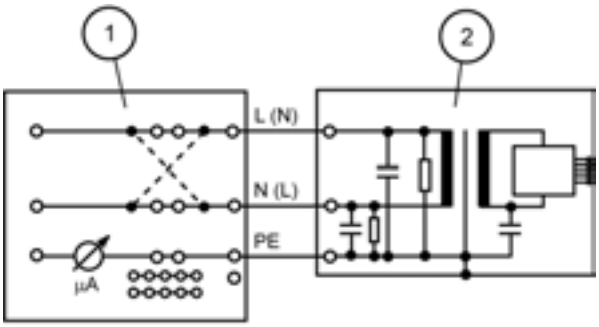

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Fig. 6 Earth leakage current test setup

Item	Designation
1	Tester, e.g. SECUTEST
2	Device under test
L	Conductor
N	Neutral conductor
PE	(Protective earth) conductor

Action
- Prepare the test setup.
- Switch on the tester and the device under test.
- Follow the instructions on the tester.

NOTE

For symmetrical mains plugs that have no preferential position in the socket-outlet, the earth leakage current test must be performed twice! The second test is performed with the plug rotated 180° in the socket. In many test devices the mains plug rotation is simulated by means of a built-in selector switch. The higher measured value must be documented.

Test Normal condition (N.C.): The value must not exceed **500** µA.

Result **Normal condition (N.C.)**

[_____µA]

Test Single fault condition (S.F.C.): The value must not exceed **1000** µA.

Result **Single fault condition (S.F.C.)**

[_____µA]

Action
- Plug the power supply connector (inverted, if possible) into the test socket of the test device. (In many test devices the power supply connector inversion can be simulated by means of a built-in selector switch.)

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Test Normal condition (N.C.): The value must not exceed **500** µA.

Result **Normal condition (N.C.)**

[_____µA]

Test Single fault condition (S.F.C.): The value must not exceed **1000** µA.

Result **Single fault condition (S.F.C.)**

[_____µA]

3.2.4 Patient leakage current

Test set-up

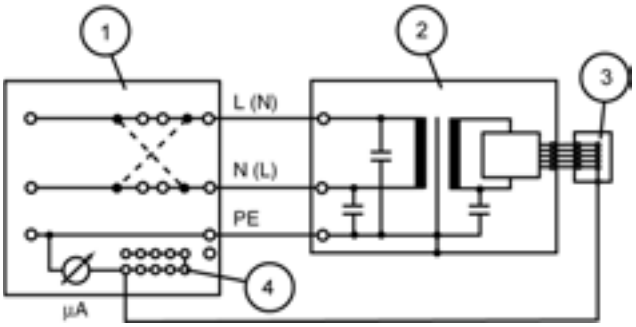

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Fig. 7 Patient leakage current test setup

Item	Designation
1	Tester, e.g. SECUTEST
2	Device under test
3	Measuring line, 2-pin, temperature
4	Ports for applied parts
L	Conductor
N	Neutral conductor
PE	(Protective Earth) conductor

Action
- Prepare the test setup.
- Follow the instructions on the tester.

NOTE

For symmetrical mains plugs that have no preferential position in the socket-outlet, the patient leakage current test must be performed twice! The second test is performed with the plug rotated 180° in the socket. In many test devices the mains plug rotation is simulated by means of a built-in selector switch. The higher measured value must be documented.

Test Normal condition (N.C.) AC: The value must not exceed **100** µA.

Result **Normal condition (N.C.) AC**

[_____µA]

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Test Single fault condition (S.F.C.) AC: The initial measured value must not exceed **500**.

Result **Single fault condition (S.F.C.) AC**

[_____µA]

Action • Plug the power supply connector (inverted, if possible) into the test socket of the test device. (In many test devices the power supply connector inversion can be simulated by means of a built-in selector switch.)

Test Normal condition (N.C.) AC: The value must not exceed **100** µA.

Result **Normal condition (N.C.) AC**

[_____µA]

Test Single fault condition (S.F.C.) AC: The value must not exceed **500** µA.

Result **Single fault condition (S.F.C.) AC**

[_____µA]

4 Function and condition test

This section contains tests to establish whether the device and the accessories used conform to the stipulations of the Instructions for Use in terms of condition and function.

4.1 Condition tests

4.1.1 Accompanying documents

Action • Check that the following accompanying documents are available:
– Instructions for use
– Medical Products Logbook (applicable to Germany only)

Result **All accompanying documents are available (according to user/operator).**

[_____OK]

4.1.2 Rating plates and option label

Test Check that the rating plates and the option label are complete and readable and not dirty or damaged.

Result **Rating plates and option label**

[_____OK]

4.1.3 Labels

Test Check that the country-specific adhesive labels are complete and readable and not dirty or damaged.

Result **Labels**

[_____OK]

Savina 300 SW 4.n
Function and condition test

4.1.4 General condition (Savina 300, accessories and special accessories)

Action • Check that the following device components, the accessories and the special accessories are not damaged.

Device components

– Savina 300
– Tubing system according to instructions for use/accessories list
– Expiratory valve (reusable)/ Expiratory valves (reusable)

Accessories

– Water traps
– Tube holder
– Hinged arm

Special accessories

– Resutator 2000
– Child Resutator 2000

Result **The aforementioned device components, the accessories and the special accessories are undamaged.**

[_____OK]

4.1.5 Filter cover

Action • Check filter cover.

Test – The filter cover is not damaged (no cracks or fractures).
– The filter cover is firmly connected to the rear panel (locked in to rear panel).
– As from April 2014 the filter cover is additionally attached by a screw.

Result **Filter cover**

[_____OK]

4.1.6 O_2 gas connecting tube

Action • Check the O_2 gas connecting tube, the connector and the screw fitting.

Result **The O_2 gas connecting tube conforms to the accessory list and to national regulations. The O_2 gas connecting tube, the connector and the screw fitting are undamaged.**

[_____OK]

4.1.7 Option trolley (general condition)

Action • Trolley, check screw fitting of trolley and castors.

Result **The trolley is not contaminated or damaged. All the trolley screw fittings are secure. The equipment mount is firmly attached to the trolley and undamaged. The castors are undamaged. The castors are securely attached to the trolley. The locking mechanisms of the castors are working.**

[_____OK]

4.1.8 Option LPO (external oxygen supply)

O_2 supply socket

Action • Check the O_2 supply "LPO" socket.

Test The O_2 supply "LPO" socket is undamaged.

Result **O_2 supply socket**

[_____OK]

Protective cap 8415745 for connector socket

Action • Check protective cap on connecting socket.

Test The protective cap on the connecting socket is undamaged.

Result **Protective cap 8415745 for connector socket**

[_____OK]

4.1.9 Option CO_2 measurement

Action • Check the following items:
– CO_2 port
– CO_2 label

Test The CO_2 port is not dirty or damaged. The CO_2 label on the rear panel is readable and undamaged.

Result **Option CO_2 measurement**

[_____OK]

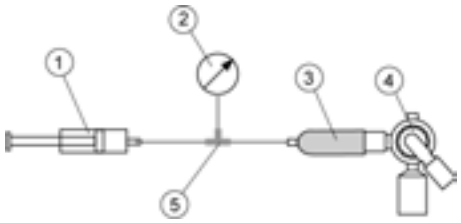
4.2 Function tests

4.2.1 Non-return valve in expiratory valve (reusable)

Prerequisites The reusable expiratory valve(s) has/have been removed.

Action • Prepare the following test setup:

Test set-up



2501

Fig. 8 Test setup: Non-return valve in expiratory valve (reusable)

Item	Designation
1	Syringe 60 mL
2	Manometer
3	Connecting sleeve

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Item	Designation
4	Expiratory valve (reusable)
5	T-piece

Action • Using the syringe, **slowly** (permissible pressure change less than 1 mbar/s) build up a pressure of 2.0 to 3 mbar at the outlet of the reusable expiratory valve.

Expiratory valve 1 (reusable)

Test The volume injected from the syringe in one minute must not exceed **35** mL/min.

Result **Expiratory valve 1 (reusable)**

[_____OK]

Action • Repeat test for reusable expiratory valve 2.

Expiratory valve 2 (reusable)

Test The volume injected from the syringe in one minute must not exceed **35** mL/min.

Result **Expiratory valve 2 (reusable)**

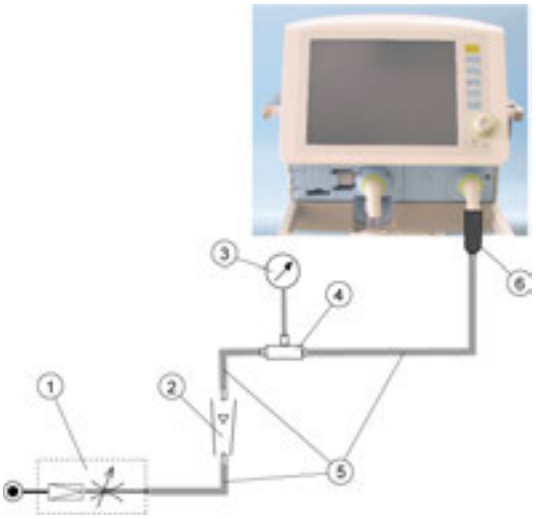
[_____OK]

4.2.2 Pneumatic safety valve (D1)

Prerequisites The Savina 300 is **not** connected to the mains power supply and **not** connected to the O_2 gas supply. Savina 300 is switched off.

Action • Prepare the following test setup:

Test set-up



3214

Fig. 9 Test setup: Pneumatic safety valve (D1)

Item	Designation
1	Test pressure regulator
2	Flowmeter

Item	Designation
3	Manometer
4	T-piece
5	Silicone tube
6	Connecting sleeve

Action
- Using the test pressure regulator, set a flow of 2 to 3 L/min.
- Read off the pressure value from the manometer.

Test The pressure is in a range of **90** mbar or higher but equal to or less than **110** mbar.

Result **Pneumatic safety valve (D1)**

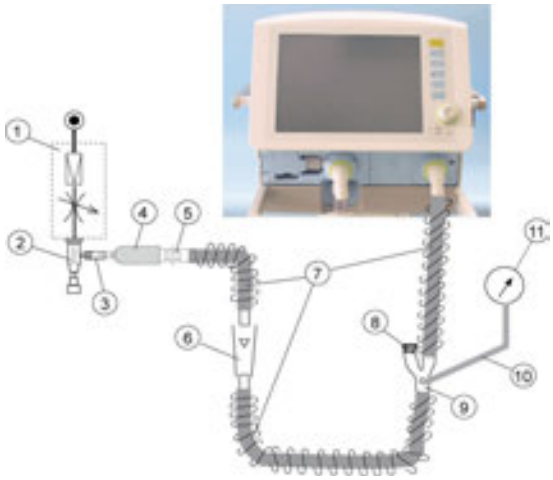
[_____OK]

4.2.3 Emergency respiratory valve (D2)

Prerequisites The Savina 300 is **not** connected to the mains power supply and **not** connected to the O_2 gas supply. Savina 300 is switched off.

Action
- Prepare the following test setup:

Test set-up



3194

Fig. 10 Test setup: Emergency respiratory valve (D2)

Item	Designation
1	Test pressure regulator
2	Injector
3	Silicone tube
4	Connecting sleeve
5	ISO socket
6	Flowmeter
7	Adult breathing tube (tube length 0.9 to 1.2 m)
8	Sealing plug
9	Y-piece, adult, Luer-Lock
10	Silicone tube
11	Manometer

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Action
- Using the test pressure regulator, set a flow of 57 to 63 L/min.
- Read off the pressure value from the manometer.

Test The pressure is in a range from **-6.5** mbar to **-2.5** mbar.

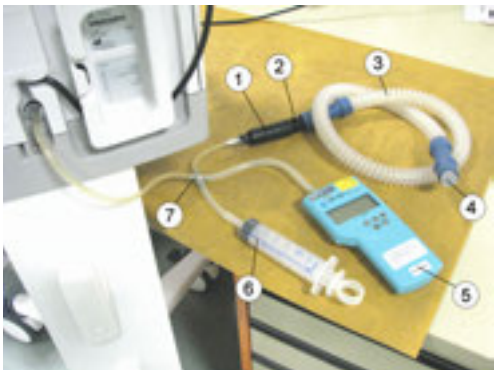
Result **Emergency respiratory valve (D2)**

[_____OK]

4.2.4 LPO leakage test (option)

Prerequisites Savina 300 is switched off.

Action
- Using an approximately 40 cm silicone tube (4 x 1.5), connect the Savina 300 socket ("LPO" connection) to the cross-piece.
- Using an approximately 40 cm silicone tube (4 x 1.5), connect the manometer (Fig. 11/5) to the cross-piece (Fig. 11/7).
- Using an approximately 30 cm silicone tube (4 x 1.5), connect the syringe (Fig. 11/6) to the cross-piece.
- Using an approximately 40 cm silicone tube (4 x 1.5), connect the connecting sleeve (Fig. 11/1) to the cross-piece.
- Plug the ISO connector (Fig. 11/1) into the connecting sleeve (Fig. 11/2).
- Plug the breathing tube (1.20 m) (Fig. 11/3) onto the ISO connector (Fig. 11/2).
- Seal off the free end of the breathing tube using a rubber plug 22/25 (Fig. 11/4).



4794

Fig. 11 Test setup: LPO leak test

Action
- Using the syringe (Fig. 11/6), generate a negative pressure of -8 mbar.
- Read the pressure value off the manometer (Fig. 11/5).

Test After 5 seconds the pressure is in a range from **-8** mbar to **-6** mbar.

Result **LPO leakage test (option)**

[_____OK]

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4.2.5 Power supply unit

NOTE

For the following tests do **not** connect any external batteries or DC supply to the Savina 300.

Electrical supply display

Prerequisites: The Savina 300 is connected to the mains power supply.

Action:
- Set the Savina 300 to "Standby" mode.

Test: The LEDs on the front indicate the following operating states:
- The mains power LED lights up green. The LED for the external batteries has gone out.
- The LED for the internal batteries is lit green when the internal batteries are fully charged, or yellow when they are charging.

Result: **Electrical supply display**

[_____OK]

Internal supply voltage (internal batteries)

Prerequisites: Savina 300 is in "Standby" mode.

Action:
- Disconnect the Savina 300 from the mains power supply.

Test: The acoustic alarm signal sounds. The message indicating that the internal batteries have been activated is displayed. The LEDs on the front of the device indicate the following operating states:
- The mains power LED has gone out. The LED for the external batteries has gone out.
- The LED for the internal batteries is lit green or yellow.

Action:
- Press the "Start/Standby" key and switch the Savina 300 to "VC-CMV/VC-AC" mode.

Result: **The blower runs up to speed. Ignore the error messages and alarms during this test.**

[_____OK]

Action:
- Connect the Savina 300 to the mains power supply.

Power failure alarm

Action:
- Remove the fuse for the internal batteries. The fuse is located on the rear panel of the unit.

Test: A message is displayed indicating that the internal batteries are missing.

Action:
- Press the "Alarm Reset" key.
- Disconnect the Savina 300 from the mains power supply.

Test: All LEDs on the front are out. The acoustic power failure warning sounds.

Action:
- Switch off Savina 300.

Test: The acoustic alarm signal stops.

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Action
- Re-insert the fuse for the internal batteries.
- Restore the mains power supply to the Savina 300.
- Set the Savina 300 to "Standby" mode.

Result **Power failure alarm**

[_____OK]

4.2.6 External batteries, if present

Prerequisites The Savina 300 is connected to the mains power supply and **not** to the external batteries. Savina 300 is in "Standby" mode.

Test The LED for the external batteries on the front of the Savina 300 is unlit.

Action
- Connect the external batteries connector to the power supply unit of the Savina 300.

Test The LED for the external batteries on the front of the Savina 300 is lit green or yellow.

Action
- Disconnect the Savina 300 from the mains power supply.
- Switch the Savina 300 to any ventilation mode.

Test The Savina 300 is ventilating powered by the external batteries. A message is displayed indicating that the external batteries are active.

Result **External batteries, if present**

[_____OK]

Action
- Restore the mains power supply to the Savina 300.

4.2.7 Plausibility check of internal batteries (1)

NOTE

For the following tests through to **Plausibility check of internal batteries (2)** run the device only on the internal batteries.

If the battery is not sufficient to do so, continue testing on mains power.

Action
- Disconnect the device from the mains power supply and - if present - from the external batteries.

Result **The device is powered by the internal batteries.**

[_____OK]

4.2.8 Emergency expiratory valve (V8/V9)

Prerequisites The Savina 300 is connected to the O_2 gas supply.

Action
- Press the "Ventilation settings" softkey and select "VC-CMV/VC-AC" mode.
- Set the following parameters:
  - O_2: 21%
  - VT: 0.500 L
  - Ti : 5.0 s
  - AF: 6 1/min
  - PEEP: 5 mbar

Action • Press the "Alarms" softkey.

– Upper airway pressure limit: Set 10 mbar above peak pressure.

Action • Prepare the following test setup.

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Fig. 12 Test setup: Emergency expiratory valve (V8/V9)

Item	Designation
1	Manometer
2	Silicone tube
3	Connecting sleeve

• Read off the pressure value from the manometer.

Test After three breathing cycles the Savina 300 builds up a pressure up to the upper airway pressure limit. Then the pressure is briefly relieved by emergency expiratory valve (V8/V9) to **7** mbar or less.

Result **Emergency expiratory valve (V8/V9)**

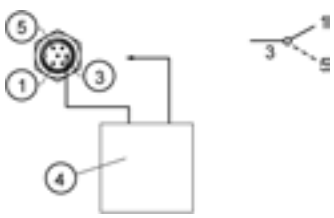
[_____OK]

4.3 Options

4.3.1 Nurse call (central alarm)

Prerequisites The Savina 300 is connected to the O_2 gas supply. Savina 300 is in "Standby" mode.

Test set-up



2380

Fig. 13 Test setup: Nurse call (central alarm)

Item 1	Designation
1	Pin 1 (no alarm)
3	Pin 3
4	Multimeter (resistance measurement)
5	Pin 5 (alarm)

Action

Press "System configuration" **softkey / Select** "Ventilation" **tab.**
Pressure limitation: Off
Plateau: On
LPO: Off
Press "Ventilation setting" **softkey / Select** "VC-CMV/VC-AC" **mode tab.**
O_2: 21%
VT: 0.500 L
Ti : 2.0 s
AF: 12 1/min
FlowAcc: 30 mbar/s
PEEP: 5 mbar
Press "Alarms" **softkey.**
Paw: 100 mbar
Press the "Start/Standby" **key.**
Start ventilation.

Test No alarm:
- Pin 1 to pin 3: closed
- Pin 3 to pin 5: open

Action
- Activate the alarm by disconnecting the breathing tube from the inspiratory socket. **Do not reset the acoustic alarm signal by pressing the** "Audio Paused" **key!**

Test Alarm:
- Pin 1 to pin 3: open
- Pin 3 to pin 5: closed

Result **Nurse call (central alarm)**

[_____OK]

4.3.2 Respiratory gas temperature sensor AWT01

Prerequisites The Savina 300 is connected to the O_2 gas supply. Savina 300 is in "Standby" mode.

Action
- Connect the AWT01 respiratory gas temperature sensor to the Savina 300.
- Press the "Data" softkey.
- Perform a comparative measurement with a reference thermometer at room temperature.

Test The measured value of the reference thermometer matches the Savina 300 reading and is within a tolerance of 2 °C.

Result **Respiratory gas temperature sensor AWT01**

[_____OK]

4.3.3 Mainstream CO_2 sensor Savina 300

Condition test

Action • Check connecting cable, test filter and Mainstream CO_2 sensor Savina 300 and cuvette.

Test The connecting cable is not porous, severely kinked or damaged. The test filter is present and undamaged. The Mainstream CO_2 sensor Savina 300 and the cuvette are undamaged.

Result **Condition test**

[_____OK]

Function test

NOTE

During the following test do **not** breathe towards the Mainstream CO_2 sensor Savina 300.

Prerequisites The Savina 300 is connected to the mains power supply. The Mainstream CO_2 sensor Savina 300 is connected to the device. Savina 300 is in "Standby" mode.

Action
- Tap the "Sensors/Parameters" softkey.
- Select the "CO_2" menu.
- Switch on CO_2 Monitoring.
- Start zero calibration and follow the menu prompts.

Action • Remove the cuvette from the Mainstream CO_2 sensor Savina 300 and press the rotary knob.

Test At the top of the display the message is displayed indicating that the zero calibration of the CO_2 sensor was successful.

Action • On the "Check sensor" submenu tap the "Filter test" softkey and follow the menu prompts.

Test At the top of the display the message is displayed indicating that the filter test of the CO_2 sensor was successful.

Result **Function test**

[_____OK]

4.4 Dynamic final test in operation

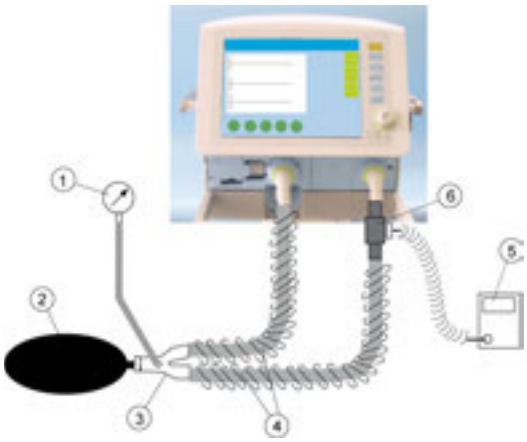
4.4.1 Dynamic final test

Prerequisites The Savina 300 is connected to the O_2 gas supply. Savina 300 is in "Standby" mode.

Action • Prepare the following test setup.

Savina 300 SW 4.n
Function and condition test

Test set-up



3234

Fig. 14 Test setup: Dynamic final test

Item	Designation
1	Manometer
2	Test lung
3	Y-piece, adult, Luer-Lock
4	Adult breathing tubes
5	O_2 analyzer
6	O_2 adapter

Action

Press the "System configuration" **softkey / Select the** "Ventilation" **tab.**
Pressure limitation: Off
Plateau: On
LPO: Off
Press "Ventilation settings" **softkey / Select** "VC-CMV/VC-AC" **mode.**
O_2: 21%
VT: 0.500 L
Ti : 2 s
AF: 12 1/min
FlowAcc: 30 mbar/s (hPa/s or cmH_2O/s)
PEEP: 5 mbar
Select "Additional settings" **tab.**
Sigh: Off
Flow trigger: Off
AutoFlow: Off
Press "Alarms" **softkey.**
MV high: maximum
MV low: minimum
Paw: maximum
VT: maximum
AF: maximum

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Tapn: maximum
Press "Sensors/Parameters" **softkey**:
FiO_2 monitoring: On
Select "Flow" **tab.**
Flow monitoring: On
Press the "Start/Standby" **key.**
Start ventilation.
Press "Sensors/Parameters" **softkey**.

Action
- Start O_2 calibration.

Savina 300 - Display
Display messages follow until "O_2 calibration OK" appears.

Action
- Close "Sensors/Parameters" display window.
- Push the Spirolog sensor all the way to the left and then to the right.

Savina 300 - Display
An acoustic alarm signal sounds. The message "Flow sensor ?" appears. When the calibration has completed successfully the message "Flow calibration OK" is displayed.

Action
- Press the "Alarm Reset" key.
- Check the following tidal volume:

Savina 300 - Display (VTe in L)
0,421 - 0,549

Action
- Adjust and check the following oxygen concentrations:

NOTE

Perform the oxygen measurements under ventilation conditions - that is to say, with the test lung connected.

Savina 300 - SettingsO_2	**Savina 300 - Display** (FiO_2 in vol%)	**External oxygen analyzer** (in vol%)
21	21 - 24	21 - 24

NOTE

The following oxygen measurements can be speeded up by initially detaching the test lung from the Y-piece connection. When the preset oxygen concentration is reached, re-attach the test lung to the Y-piece connection.

Savina 300 - SettingsO_2	**Savina 300 - Display** (FiO_2 in vol%)	**External oxygen analyzer** (in vol%)
60	57 - 63	57 - 63

Action
- On the Savina 300 preset the specified O_2 value to 21 vol%.
- Set respiratory rate to 6 1/min.
- Adjust and check the following PEEP values:

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Savina 300 - Settings PEEP	**Savina 300 - Display** (PEEP in mbar)	**External manometer** (pressure in mbar)
5	3 - 7	3 - 7 (expiration phase)
25	23 - 27	23 - 27 (expiration phase)

Result **Dynamic final test**

[_____OK]

4.5 User-specific alarm limits

4.5.1 Input of user-specific alarm limits

Action
- Re-enter all user-specific alarm limits recorded in the "Device configuration" section into the Savina 300.

Result **The user-specific alarm limits have been re-entered into the device.**

[_____OK]

4.6 Plausibility check of internal batteries (2)

4.6.1 Plausibility test

Result **All tests could be carried out with the internal batteries.**

[_____OK]

4.7 Final procedures

Prerequisites
- The test instructions have been performed as specified.
- All tests performed were passed successfully.

4.7.1 Test label and device handover

Action
- Attach a test label to the device.
- Supply the user/owner with a fully functioning device.

Result **Test label and device handover**

[_____OK]

5 Test equipment

This section sets out the test equipment required for the tests in this test procedure.

5.1 Test equipment list

NOTE

Use the following test equipment or equivalent aids.

5.1.1 Test equipment subject to mandatory calibration

Designation	Part number	Comments
Electrical safety tester, e.g. GMC Secutest	7910596	
Multimeter	7901021	
Temperature and humidity meter	7910980	
Manometer	7910722	
Test pressure regulator (tube connection) or Test pressure regulator (pin index)	7901482 7910342	 No illustration available
Flowmeter, 3-block set	7901161	

Savina 300 SW 4.n
Test equipment

Designation	Part number	Comments
Flowmeter	7900718	

Result **Test equipment calibrated in a valid manner used.**

[_____OK]

5.1.2 Test equipment not subject to mandatory calibration

NOTE

Use the following test equipment or equivalent aids.

Designation	Part number	Comments
Oxygen analyzer, e.g. MX 300-i	7911955	
Breathing bag with 7 mm catheter connector, set	8403201	
Measuring line, 2-pin, temperature	7910364	
Patient connection adapter	7910195	
ISO socket	M25647	
Connecting sleeve	M13506	
Injector	7900930	
O_2 adapter	8405807	

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Designation	Part number	Comments
Y-piece, adult, Luer-Lock	M33278	
Insertion tool jaws, 22 mm	7911877	No illustration available
Rubber plug 18/20 DIN 12871	1294105	
Rubber plug 22/25	7901665	
Cross-piece, plastic	7901504	
T-piece, plastic	6800187	
Syringe, 60 mL	7910745	
Tube 6 x 2.5, silicone	1197851	
Tube 4 x 1.5, silicone	1190520	
Nebulizer tube	8412985	
Suction tube	M25780	
Tube 1 x 2.5, silicone	1198343	No illustration available
Tube 2 x 1, silicone	1180614	No illustration available
Tubing system	As specified in instructions for use	No illustration available
"O_2" pipeline supply connecting tube	As specified in instructions for use	No illustration available

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5 Result Sheet Test Instructions / Service Card IPM SW 4.n

Result Sheet Test Instructions / Service Card IPM
Savina 300 SW 4.n

Order number:

Location: **Serial no. (basic unit):**

Department: **Cust. invent. no.:**

Maintenance interval: **Other / Delivery date:**

Applies to Test Instructions / Service Card IPM Revision 4.0

Key

✓ / OK	= OK
+	= Spare part used
!	= Error / Report
/	= Accessory not available
-	= Not applicable

Test			Result
1 Device configuration			
1.1 Savina 300			
1.1.1 Serial numbers			
☐	1.1.1.1	Savina 300, if not otherwise recorded	txt
☐	1.1.1.2	disposable expiratory valve (YES/NO)	txt
☐	1.1.1.3	Expiratory valve 1 (reusable)	txt
☐	1.1.1.4	Expiratory valve 2 (reusable)	txt
☐	1.1.1.5	Optional respiratory gas temperature sensor AWT01	txt
☐	1.1.1.6	Option Mainstream CO_2 sensor Savina 300	txt
☐	1.1.1.7	Option Savina 300 trolley	txt
1.1.2 Device data			
☐	1.1.2.1	PC-SIMV+/PC-BIPAP (YES / NO)	txt
☐	1.1.2.2	Option PC-APRV (YES / NO)	txt
☐	1.1.2.3	Option PC-AC (YES / NO)	txt
☐	1.1.2.4	Option VC-MMV (YES / NO)	txt
☐	1.1.2.5	AutoFlow (YES / NO)	txt
☐	1.1.2.6	NIV (YES / NO)	txt
☐	1.1.2.7	Option LPO (YES / NO)	txt
☐	1.1.2.8	Option CO_2 (YES / NO)	txt
☐	1.1.2.9	Option MonitoringPlus (YES / NO)	txt
☐	1.1.2.10	Option Nursecall (YES / NO)	txt
☐	1.1.2.11	Option external battery on trolley (YES / NO)	txt
1.1.3 Software version, operating hours and service hours			
☐	1.1.3.1	Software version	txt
☐	1.1.3.2	Operating hours	h
☐	1.1.3.3	Service hours	h
1.1.4 Recording user-specific alarm limits			
☐	1.1.4.1	MV high	txt
☐	1.1.4.2	MV low	txt
☐	1.1.4.3	Paw	txt
☐	1.1.4.4	VT	txt
☐	1.1.4.5	AF	txt
☐	1.1.4.6	Tapn	txt
☐	1.1.4.7	$etCO_2$ high, if present	txt
☐	1.1.4.8	$etCO_2$ low, if present	txt
2 Maintenance parts			
2.1 Maintenance intervals, overview			
2.1.1 Maintenance intervals and required sets and parts			
2.2 Maintenance parts by specified interval			
☐	2.2.1	Savina 300 service set 1 year	dat
☐	2.2.2	Savina 300 service set 2 years	dat
☐	2.2.3	Savina 300 service set 6 years	dat
☐	2.2.4	Motor-blower unit spare parts set	dat

Test			Result
☐	2.2.5	Optional filter for Canada and USA	dat
2.2.6 LPO option			
☐	2.2.6.1	Filter screen	dat
☐	2.2.6.2	O-ring	dat
☐	2.2.6.3	Protective cap	dat
3 Electrical safety			
3.1 Electrical safety to DIN EN 62353 (IEC 62353)			
☐	3.1.1	Visual check	OK
3.1.2 Protective earth resistance			
☐	3.1.2.1	Maximum measured value of device with power cable	Ω
☐	3.1.2.2	Maximum measured value of optional power cable	Ω
☐	3.1.3	Protective earth resistance measuring points	OK
3.1.4 Equipment leakage current			
☐	3.1.4.1	Reference value	µA
☐	3.1.4.2	Recurrent test	µA
3.1.5 Applied parts for measurement of leakage current with respiratory gas temperature sensor AWT01, if installed			
3.1.6 Leakage current, mains on applied part with respiratory gas temperature sensor AWT01, if installed			
☐	3.1.6.1	Reference value	µA
☐	3.1.6.2	Recurrent test	µA
3.1.7 Leakage current on applied part with test adapter (normal condition)			
☐	3.1.7.1	Initial value "IAC"	µA
☐	3.1.7.2	Initial value "IDC"	µA
☐	3.1.7.3	Recurrent test "IAC"	µA
☐	3.1.7.4	Recurrent test "IDC"	µA
3.2 Electrical safety according to IEC 60601-1			
☐	3.2.1	Visual check	OK
☐	3.2.2	Protective earth resistance	Ω
3.2.3 Earth leakage current			
☐	3.2.3.1	Normal condition (N.C.)	µA
☐	3.2.3.2	Single fault condition (S.F.C.)	µA
☐	3.2.3.3	Normal condition (N.C.)	µA
☐	3.2.3.4	Single fault condition (S.F.C.)	µA
3.2.4 Patient leakage current			
☐	3.2.4.1	Normal condition (N.C.) AC	µA
☐	3.2.4.2	Single fault condition (S.F.C.) AC	µA
☐	3.2.4.3	Normal condition (N.C.) AC	µA
☐	3.2.4.4	Single fault condition (S.F.C.) AC	µA
4 Function and condition test			
4.1 Condition tests			
☐	4.1.1	Accompanying documents	OK

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Test		Result
☐ 4.1.2	Rating plates and option label	OK
☐ 4.1.3	Labels	OK
☐ 4.1.4	General condition (Savina 300, accessories and special accessories)	OK
☐ 4.1.5	Filter cover	OK
☐ 4.1.6	O_2 gas connecting tube	OK
☐ 4.1.7	Option trolley (general condition)	OK
4.1.8	**Option LPO (external oxygen supply)**	
☐ 4.1.8.1	O_2 supply socket	OK
☐ 4.1.8.2	Protective cap 8415745 for connector socket	OK
☐ 4.1.9	Option CO_2 measurement	OK
4.2	**Function tests**	
4.2.1	**Non-return valve in expiratory valve (reusable)**	
☐ 4.2.1.1	Expiratory valve 1 (reusable)	OK
☐ 4.2.1.2	Expiratory valve 2 (reusable)	OK
☐ 4.2.2	Pneumatic safety valve (D1)	OK
☐ 4.2.3	Emergency respiratory valve (D2)	OK
☐ 4.2.4	LPO leakage test (option)	OK
4.2.5	**Power supply unit**	
☐ 4.2.5.1	Electrical supply display	OK
☐ 4.2.5.2	Internal supply voltage (internal batteries)	OK
☐ 4.2.5.3	Power failure alarm	OK
☐ 4.2.6	External batteries, if present	OK
☐ 4.2.7	Plausibility check of internal batteries (1)	OK
☐ 4.2.8	Emergency expiratory valve (V8/V9)	OK
4.3	**Options**	
☐ 4.3.1	Nurse call (central alarm)	OK
☐ 4.3.2	Respiratory gas temperature sensor AWT01	OK
4.3.3	**Mainstream CO_2 sensor Savina 300**	
☐ 4.3.3.1	Condition test	OK
☐ 4.3.3.2	Function test	OK
4.4	**Dynamic final test in operation**	
☐ 4.4.1	Dynamic final test	OK
4.5	**User-specific alarm limits**	
☐ 4.5.1	Input of user-specific alarm limits	OK
4.6	**Plausibility check of internal batteries (2)**	
☐ 4.6.1	Plausibility test	OK
4.7	**Final procedures**	
☐ 4.7.1	Test label and device handover	OK
5	**Test equipment**	
5.1	**Test equipment list**	
☐ 5.1.1	Test equipment subject to mandatory calibration	OK
5.1.2	**Test equipment not subject to mandatory calibration**	

Report:

Test has been performed according to the test instructions.

Name: ..... :_____

Date/Signature:..... :_____

No.2209_0000005623

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Directive 93/42/EEC
concerning Medical Devices

Subject to change without notice
Will not be replaced in the event of modifications.

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