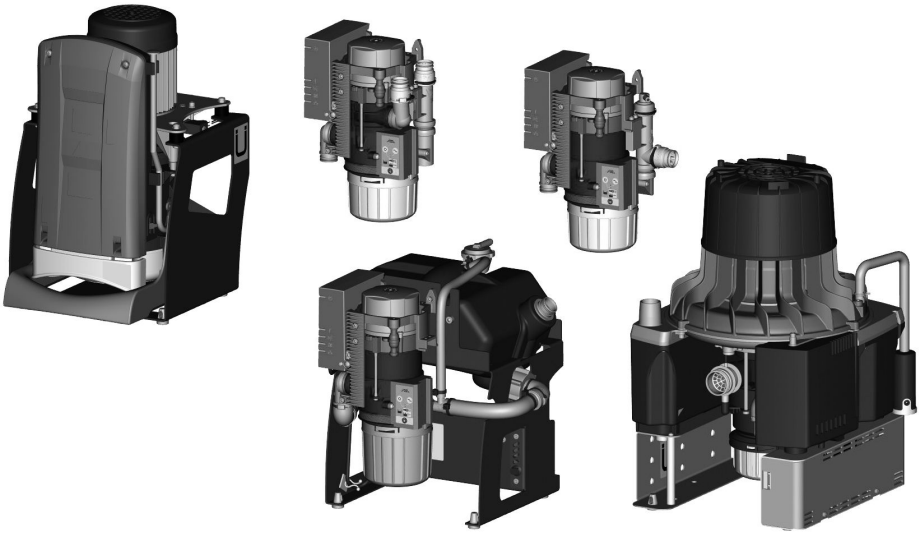
Amalgam separation



EN Tests

7805100015L40 2407V001

DÜRR DENTAL

The latest version of this document is available in the Download Center:

http://qr.duerrdental.com/7805100015

Contents

Important information

CA 4

CAS 1 / CA 1 / CA 2 Basic Unit

VSA 300 S

Important information

1 About this document

This document contains information from the installation and operating instructions that is helpful for testing the amalgam separators. Further information can be found in the installation and operating instructions for the devices listed below.

CA 4
http://qr.duerrdental.com/9000-606-44

CAS 1 / CA 1 / CA 2 Basisgerät
http://qr.duerrdental.com/9000-606-26

VSA 300 S
http://qr.duerrdental.com/9000-606-31

1.1 Warnings and symbols

Warnings

The warnings in this document are intended to draw your attention to possible injury to persons or damage to machinery.
The following warning symbols are used:


General warning symbol


Warning – dangerous high voltage


Biohazard warning

The warnings are structured as follows:

SIGNAL WORD

Description of the type and source of danger

Here you will find the possible consequences of ignoring the warning

› Follow these measures to avoid the danger.

The signal word differentiates between four levels of danger:

– **DANGER**
  Immediate danger of severe injury or death
– **WARNING**
  Possible danger of severe injury or death
– **CAUTION**
  Risk of minor injuries
– **NOTICE**
  Risk of extensive material/property damage

Other symbols

These symbols are used in the document and on or in the unit:


Note, e.g. specific instructions regarding efficient and cost-effective use of the unit.


Refer to Operating Instructions.


Disconnect all power from the unit.


Disconnect all power from the unit.


Wear protective gloves.


Wear protective goggles.


Use a face mask.


Unit in operation


Unit operation interrupted


Audible signal/melody sounds

Manufacturer

1.2 Copyright information

2 Safety

The unit has been developed and designed in such a way that dangers are effectively ruled out if used in accordance with the Intended Use. Despite this, the following residual risks can remain:

- Personal injury due to incorrect use/misuse
- Personal injury due to mechanical effects
- Personal injury due to electrical shock
- Personal injury due to radiation
- Personal injury due to fire
- Personal injury due to thermal effects on skin
- Personal injury due to lack of hygiene, e.g. infection

2.1 General safety information

- Always comply with the specifications of all guidelines, laws, and other rules and regulations applicable at the site of operation for the operation of this unit.
- Check the function and condition of the unit prior to every use.
- Do not convert or modify the unit.
- Comply with the specifications of the Installation and Operating Instructions.
- The Installation and Operating Instructions must be accessible to all operators of the unit at all times.

2.2 Electrical safety

- Comply with all the relevant electrical safety regulations when working on the unit.
- Never touch the patient and unshielded plug connections on the unit at the same time.
- Replace any damaged cables or plugs immediately.

2.3 Only use original parts

- Only use accessories and optional articles named or authorised by the manufacturer.
- Only use only original wear parts and replacement parts.

The manufacturer and distributor accept no liability for damages or injury resulting from the use of non-approved accessories, optional accessories, or from the use of non-original wear parts or replacement parts.

The use of non-approved accessories, optional accessories or non-genuine wear parts / replacement parts (e.g. mains cables) can have a negative effect in terms of electrical safety and EMC.

2.4 Disposal

The unit may be contaminated. Instruct the company disposing of the waste to take the relevant safety precautions.

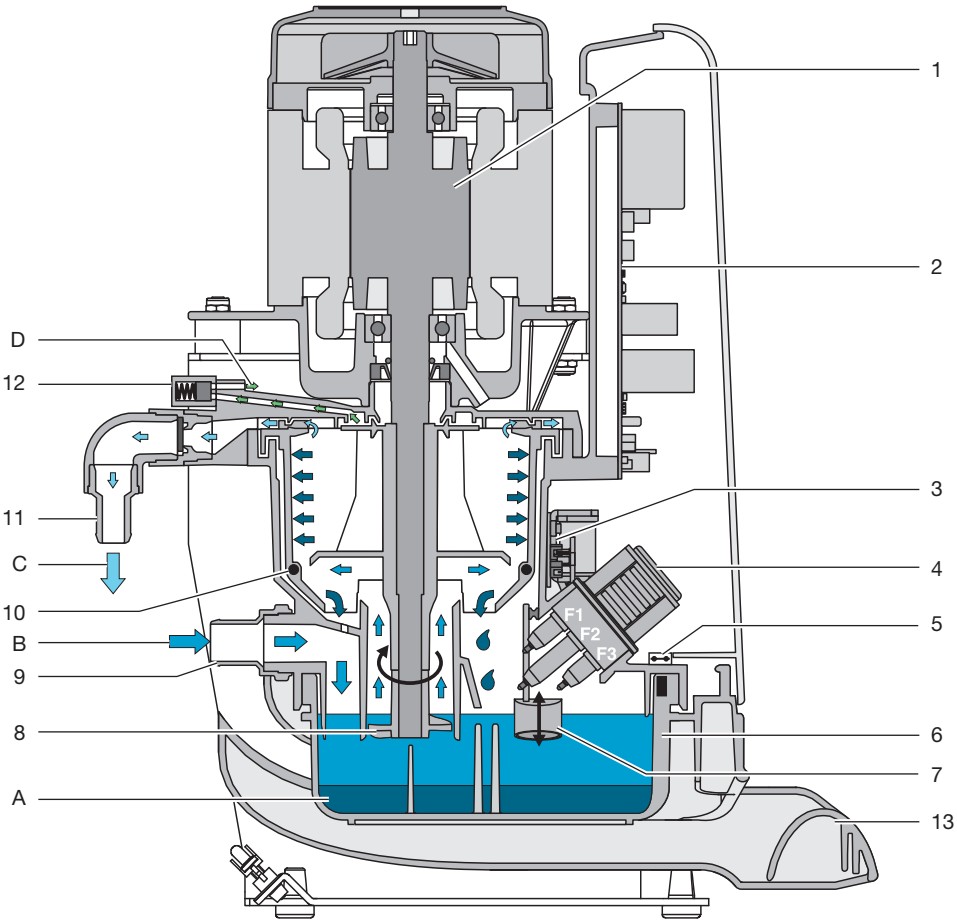
- Decontaminate potentially contaminated parts before disposing of them.
- Uncontaminated parts (e.g. electronics, plastic and metal parts etc.) should be disposed of in accordance with the local waste disposal regulations.
- If you have any questions about the correct disposal of parts, please contact your dental trade supplier.

An overview of the waste keys for Dürr Dental products can be found in the download area:

http://qr.duerrdental.com/P007100155

CA 4

3 Function

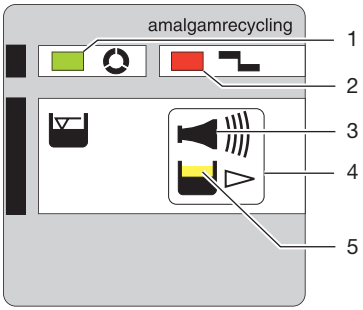


1 Motor
2 Electronics
3 Sediment PCB with sediment sensor and light barriers
4 Sensor block
F1 Emergency start sensor
F2 Reference sensor
F3 Water start sensor
5 Safety end switch on sediment PCB
6 Collecting container
7 Sediment sensor
8 Levelling pump

9 Inlet connecting piece
10 Magnets for RPM monitoring
11 Waste water outlet
12 Relief valve
13 Vessel lift
A Amalgam sludge
B Fluid with amalgam
C Waste water, cleaned
D Vent

The amalgam separator works according to the centrifugal principle and is driven by an electromotor. Each time the unit is supplied with power, the amalgam separator performs level measuring using the sediment sensor. The level detected then appears on the display panel. Where the power supply to the amalgam separator is not switched off (e.g. in hospitals), an integrated timer ensures that a sedimentation scan is carried out every 24 hours.
If the water sensor (conductivity sensor) is immersed in fluid when the amalgam separator is activated, the drive motor will start up first and the sedimentation scan will take place during the next idle phase. If the fluids in the collecting container are not recognised by the sensors, the sensitivity of the sensors can be increased via the electronics.
Fluid from the treatment unit flow through directly into the amalgam collecting container via the water inflow. A coarse filter with a mesh of max. 3 mm must be fitted upstream of the amalgam separator (e.g. in the treatment unit). Coarse particles are immediately separated out in the amalgam collecting container. When the water start sensors are bridged by fluid, the drive motor, after an initial delay, starts the centrifugal drum and the levelling pump, which is also situated on the drive shaft. The level pump pumps the fluid from the amalgam collecting container to the centrifuge drum. The amalgam floating in the fluid will then be separated using centrifugal force.
If the water start sensor is unable to detect any fluids for approx. 30 seconds, the drive motor is switched off and the brake is applied. The gravity-induced rotation of the water ring rinses the particles separated from the centrifuge drum downwards towards the amalgam collecting container.
Where there is a steady flow of fluids to the amalgam separator (e.g. if it is installed downstream of VS suction units or water ring pumps), a timer is used to briefly switch off, brake and then restart the drive motor every 15 minutes. This braking moment rinses the centrifuge drum clear. The separation rate is maintained here up to the max. nominal flow rate of 16 l/min.
If the amalgam separator is installed downstream of a VS suction unit, it can be started simultaneously with the suction unit using external start signal input.
The cover of the centrifuge housing is equipped with a solenoid valve. It remains open as long as the amalgam separator is ready for operation but closes in the event of a fault. This ensures sufficient air intake and venting of the amalgam separator during operation. If the water start sensor is defective, then the amalgam separator is monitored by a further sensor (emergency start-up sensor) and started. If the emergency start sensor is not pumped free within a set period of time, an LED will flash on the display panel. The amalgam separator is still operational. The flashing LED will switch off when the emergency start sensor is free again.
The amalgam separator is monitored and emits both an audible and an optical signal in the event of a motor breakdown, malfunction or blockage of the drainage outlet. The drive motor is switched off. It is possible to start the motor three more times using the service key. After that the motor will no longer be operational.
To restart it, the service key must be pressed for more than 2 seconds.
A hose empties the amalgam separator in the case of a malfunction, so that no water can escape when opening the amalgam collecting container.

4 Display/handling



1 GREEN LED
2 RED display
3 Audible signal/melody
4 Reset/service key
5 YELLOW LED

4.1 Ready for operation

GREEN LED lights up

4.2 Amalgam collector vessel is 95% full

Yellow LED lights up

GREEN LED lights up

Audible signal melody sounds

– At a fill level of 95%, the signal melody can be switched off by pressing the reset button. The device is then ready for operation again.
– The yellow LED comes on as a reminder that the amalgam collecting container is due to be changed. The level display is repeated every time the unit is switched on at the main power switch.

We recommend changing the amalgam collecting container when it reaches 95% full.

4.3 Amalgam collector vessel is 100% full

Yellow LED lights up

Red display flashes

Audible signal melody sounds

– At a fill level of 100% the signal melody can no longer be switched off by pressing the reset button.
– The collecting container needs to be replaced.

Wear protective equipment to avoid any risk of infection (e.g. liquid-tight protective gloves, protective goggles, face mask).

– The separator will not be ready for operation again until the amalgam collecting container has been replaced

4.4 Amalgam collector vessel not in position

Red display flashes

Audible signal

– Press the reset button briefly to switch off the audible signal.
– Switch off the device.
– Insert the collecting container.
– Switch on the unit.
– Green LED lights up – "Ready for operation“

If this error message occurs when the collecting container is correctly inserted, this indicates that there is a technical defect – inform your Service Technician.

4.5 Motor fault

Red display and

green LED flash alternately

Audible signal

Occurs during the start-up of the amalgam separator.

– Press the reset button briefly to switch off the audible signal.
– If the reset button is pressed for longer than 2 seconds the unit can be restarted.

If this problem happens again on the same day, the amalgam separator will no longer be operational - notify the service technician.

4.6 Brake monitoring

Red display and

green LED flash alternately

Audible signal

Occurs upon braking action of amalgam separator.

– Press the reset button briefly to switch off the audible signal.
– The amalgam separator is still operational.

If this problem occurs on several consecutive days, the braking must be checked by a service technician.

4.7 Emergency start sensor in overfill position

Yellow LED flashes

GREEN LED illuminates

– The yellow LED extinguishes when the emergency start sensor is free again.

If the yellow LED flashes for a prolonged period, check whether any foam is present in the collecting container.

5 Maintenance

All maintenance work must be performed by a qualified expert or by one of our Service Technicians.

WARNING

Infection due to contaminated unit

- Clean and disinfect the suction before working on the unit.
- Wear protective equipment when working (e. g. impermeable gloves, protective goggles and mouth and nose protection).

Prior to working on the unit or in case of danger, disconnect it from the mains.

Maintenance interval	Maintenance work
Dependent upon the level of usage of the device	› Replace the amalgam collecting container when a fill level of 95% or 100% is indicated on the display panel **Notes concerning prophy powders:** The function of the amalgam separator is not adversely affected by conventional prophy powders. Under certain circumstances however, increased soiling of lines and hoses and a more frequent changing of the amalgam collecting container can be expected.
Annually	› Cleaning of the suction unit in accordance with the operating instructions. › Check the fluid sensors for soiling and clean if necessary. * › Check the inlet and outlet hoses for signs of deposits/blockage or cracks and replace where necessary. * › Check the pump propeller for damage and replace if necessary. * › Check the non-return valve and replace it if necessary. *
Every 3 years	› Replace the fluid sensor. *
Every 5 years	› Check that the centrifugal drum is seated tightly on the shaft, check for soiling and replace if necessary. *

* to be done by service technicians only

6 Tests

WARNING

Infection due to contaminated unit

- Clean and disinfect the suction before working on the unit.
- Wear protective equipment when working (e. g. impermeable gloves, protective goggles and mouth and nose protection).

In some countries the owner is required to keep an operating handbook. This operating handbook must document all maintenance work, service work, checks and amalgam disposal.

6.1 Device with network connection

This test should be performed as an additional test if the device is monitored with software via the network.
Requirements for the test:

✓ Device connected to the network.
✓ Monitoring software running.

Work steps to be performed:

1. Check whether any messages are displayed on the PC monitor.
2. Check the acoustic signal.

6.2 Annual inspection

This inspection should only be carried out by suitably trained staff.

Work steps to be performed:

1. General functional check (e.g. aspiration, spittoon inlet)
2. During the sediment fill level measurement, visually inspect the operability of the sediment sensor.
3. Service program

6.3 Inspection of the general operating condition every 5 years

This inspection must be carried out every 5 years (in accordance with the German Waste Water Regulations, Annex 50, Dental Treatment) by an inspector in accordance with national regulations. For inspection, the following are required:

✓ Empty collecting container
✓ Measuring beaker

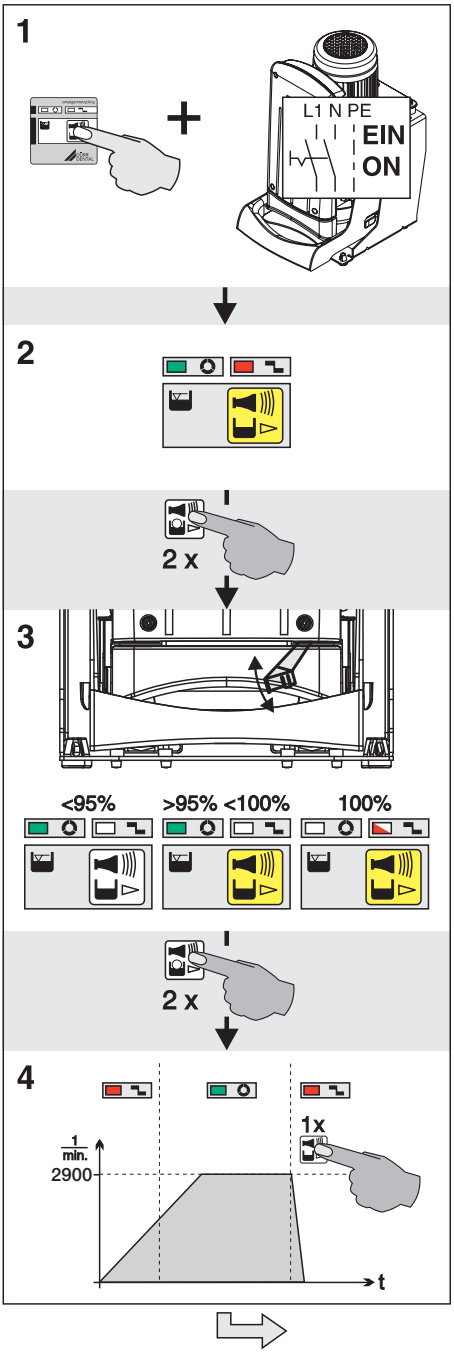
Work steps to be performed:

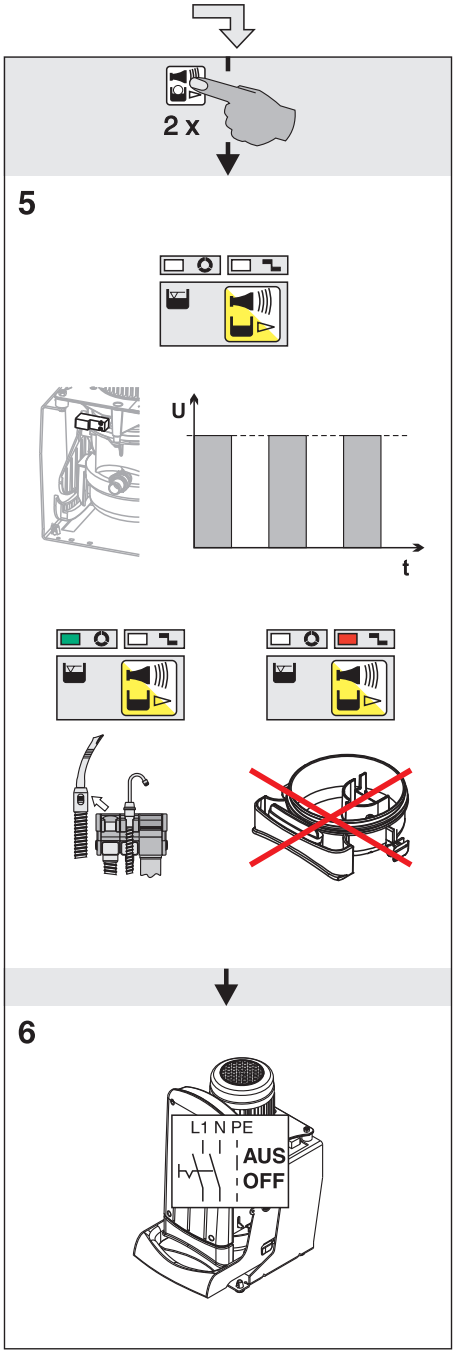
1. Fill the collecting container with water (min. 900 ml) and insert it into the unit.
2. Start the device and wait until it switches off again.
3. Once the device has switched off, remove the collector vessel and measure the remaining amount of water.

The unit is working correctly if:
– There is at least 610 ml left in the amalgam collecting container.

If there is less fluid, clean the centrifuge drum or check the operation of the unit.

7 Service program





8 Description of the service program

Wear protective equipment to avoid any risk of infection (e.g. liquid-tight protective gloves, protective goggles, face mask).

The various unit functions can be checked with the aid of the service program.
The individual program steps are:
– Display test
– Sediment level measurement
– Motor start and motor braking with rpm check
– Input and output signals

Function of the service key:
– By pressing the service key twice the next individual program step is called up.
– By pressing the service key once that program step is repeated.

A press of the service key is confirmed by an audible signal.

8.1 Service program ON/OFF

On
– Press the service key and switch on the voltage supply to the unit.
– As soon as a signal melody can be heard, release the service key.
The green, yellow and orange LEDs on the display panel light up (display test) and the service program is activated.

Off
Switch off the main supply to the unit.

8.2 Display test

The display test is activated as soon as the service program is started.
The LEDs on the display panel are checked. All three LEDs must come on. There is also an audible signal, which can be switched off by pressing the service button.

8.3 Sediment level measurement

While the service program is activated, the safety check for the collector vessel is deactivated.

The sediment level measurement can be used to check the function of the sediment sensor and the function of the LEDs.

Every time the service key is pressed, the sediment level is checked. Lifting the sediment level check wire strip allows the simulation of various sediment levels. The various fill levels are shown by LEDs H100 - H102 on the sediment measuring PCB (main board):
H100 = 100% fill level
H101 = >95% fill level
H102 = <95% fill level
Check:
– Lift the wire strap on the sediment scanner until H100 illuminates (red LED = 100% fill level). Hold onto the wire strap.
– Press the service key on the display panel.
– Wait briefly until the appropriate LED illuminates on the display panel.
– Repeat procedure with H101 and H102.

8.4 Motor start - motor braking

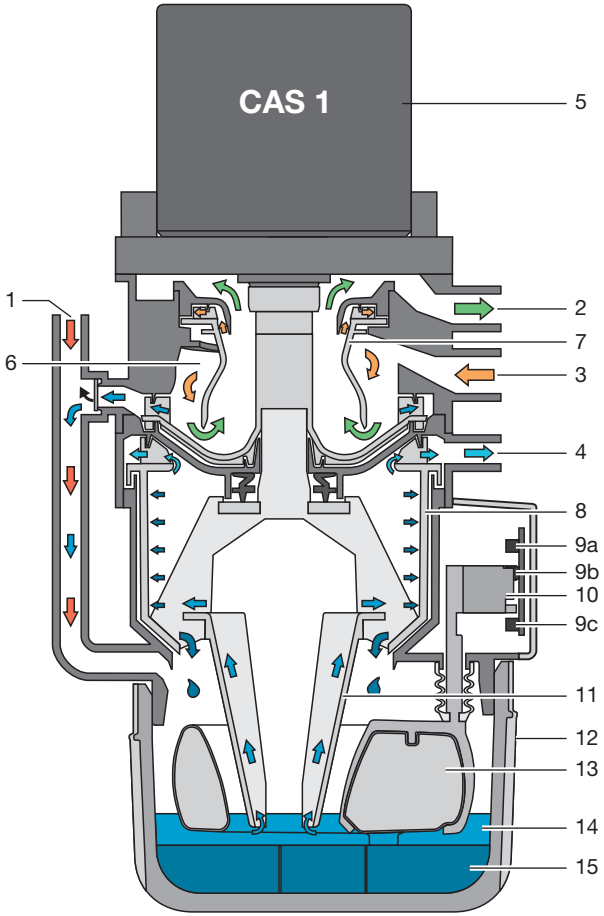
The drive motor starts and is then braked approx. 30 seconds. If the service key is pressed within this time period, the motor will be braked immediately.
This procedure can be repeated by pressing the service key 1x again.
The drive motor starts up.
As a result of the rpm monitoring, the LED will change from orange to green upon start-up and from green to orange upon braking.

8.5 Input and output signals

– After activating the program point, the yellow LED on the display panel flashes. In addition, H5 and H7 will flash on the main PCB.
– A cycled DC voltage (approx. 22-30 V) can be measured on the ventilation solenoid valve connection (X7).
– If the collecting container is opened, the red LED on the display panel lights up, as do H8 on the main board and H104 on the sedimentation scan PCB.
– If voltage is applied to connector X5 (external start), the green LED on the display panel lights up together with H4 and H6 on the main PCB.

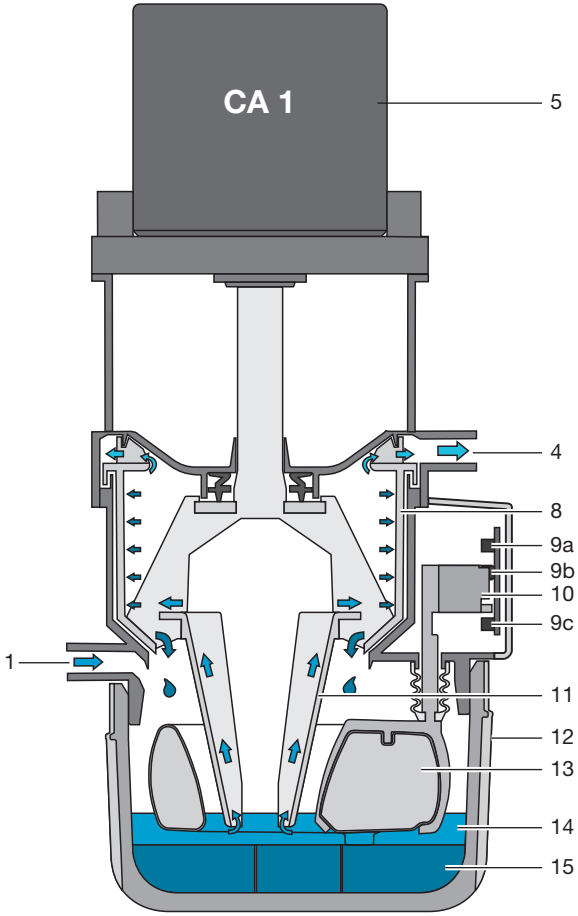
CAS 1 / CA 1 / CA 2 Basic Unit

9 Function



1 Fluid intake
2 Vacuum, to suction unit
3 Aspiration input
4 Fluid output
5 Motor
6 Separation
7 Separation rotor
8 Centrifuge
9 Light barriers (3x)
10 Sensor enclosure
11 Cone pump

12 Amalgam collector vessel
13 Float sensor
14 Fluids
15 Amalgam particles



1 Fluid intake
4 Fluid output
5 Motor
8 Centrifuge
9 Light barriers (3x)
10 Sensor enclosure
11 Cone pump
12 Amalgam collecting container
13 Float sensor
14 Fluids
15 Amalgam particles

9.1 Operation

CAS 1 Combi-Separator

The task of the CAS 1 combi-separator is to provide continuous separation of secretions and air as well as the amalgam separation of all the waste water from the treatment unit.

The waste water flows through the connection (1) from the spittoon directly into the centrifuge (8) and amalgam separation.

During the suction phase the aspirated secretions are separated from the aspirated air in the separation unit (6). The secretions accumulating in the separation unit are continuously transported to the centrifuge (8), where the amalgam particles are then separated.

Underneath the centrifuge is a replaceable amalgam collector vessel (12), into which the separated amalgam particles (15) are rinsed once the centrifuge (8) is switched off. A float sensor (13) checks the level within the collector vessel and sends a signal to the display panel when it needs replacing. In combination with a light barrier (9c), this float sensor also monitors whether a collector vessel is in use.

The compact size of the CAS 1 Combi-Separator allows it to be installed in dental treatment units. This results in short secretion carrying lines. After the centrifuge is switched off, the braking cycle triggers a self-cleaning process. This self-cleaning process also leads to smooth and silent running, as well as providing a separation efficiency of more than 95%, even under heaviest loads.

CA 1 Amalgam Separator / CA 2 Basic Unit

The task of the CA 1 Amalgam Separator / CA 2 Basic Unit is to separate amalgam from all of the waste water of the treatment unit.

During the aspiration process, the aspirated secretions are separated from the aspirated air in the separation chamber of the upstream separation unit. The secretions accumulating in the separation chamber are continuously fed via the connection (1) to the centrifuge (8), where the amalgam particles are then separated out.

Underneath the centrifuge is a replaceable amalgam collector vessel (12), into which the separated amalgam particles (15) are rinsed once the centrifuge is switched off. A float sensor (13) checks the level within the collector vessel and sends a signal to the display panel when it needs replacing. In combination with a light barrier (9c), this float sensor also monitors whether a collector vessel is in use.

Once the centrifuge is switched off, a self-cleaning process is triggered by the braking cycle. This self-cleaning process also leads to smooth and silent running, as well as providing a separation efficiency of more than 95%, even under heaviest loads.

9.2 Separation

At the inlet connection (3) of the CAS 1, the aspirated fluid/air mix is accelerated and set into a spiral motion in the separation unit (6). The resulting centrifugal forces sling the aspirated particles against the outer wall. The air is continuously separated from the fluid and escapes via the spinning separation rotor (7) to the suction unit. The aspirated air is subject to high centrifugal forces by the separation rotor (7), which is driven by the motor (1), which ensures that no fluid or blood foam can be carried into the suction unit. The spiral motion feeds the separated fluid continuously to the pump wheel, which transports the fluid into the collector vessel. The fluid is transported to the centrifuge (8) via a pump cone (11).

An external station selection valve connects the CAS 1 with the suction unit via the vacuum connection (2).

9.3 Spittoon connections

The waste water from the spittoon flows through a protective strainer on the fluid inlet (1) and into the collector vessel (12). Once sufficient fluid has been collected, the float sensor (13) activates a light barrier (9a) and (9b) via a sensor housing (10) and switches on the motor (1). The fluid is transported to the centrifuge (8) via a pump cone (11).

9.4 Station selection valve / safety valve

The station selection valve has 2 tasks:
1st task:
The station selection valve interrupts the suction flow between the hose manifold and the suction unit. As soon as a suction hose is removed from the hose manifold, a solenoid valve opens the station selection valve and suction flow is enabled.
2nd task:
The station selection valve also acts as a safety valve. If the CAS 1 is over-full or not functioning properly, the system will perform a safety shutdown. This safety shutdown prevents fluids from being drawn into the dry suction pipe.

For single station suction systems, the station selection valve takes over the function of the safety valve.

In various types, a station selection valve is already integrated in the CAS 1. The station selection valve is on the connection (2) of the CAS 1.

9.5 Amalgam separation

The switches in the hose manifold or the light barrier of the sensor system switch on the motor and the associated centrifuge (8).
The fluid containing amalgam particles flows continuously to the collector vessel (12). The fluids ejected by the centrifuge are pumped through the fluid output (4) to the central waste water system.
As soon as no further fluid is fed to the amalgam separator, e.g. when the suction hose is placed back in the hose manifold, the centrifuge drum is switched off after a short delay time. This switch-off brakes the motor, as a result of which the ring of water, which continues to rotate due to inertia, rinses the separated particles out of the centrifuge (8) downwards into the collector vessel.
The separated amalgam particles form a sediment in the replaceable collector vessel. The level of fluid in the collector is regulated by the pump cone so that the risk of fluid escaping when the collector vessel is changed can be avoided.

9.6 Sediment level measurement

The fill level in the collector vessel (12) is checked by a float sensor (13) every time the main power switch is switched on.

The centrifuge motor starts, fluid is transported via the pump cone to the centrifuge drum (8) and provides a constant level of fluid (underside of the cone pump) in the collector vessel. The float sensor sinks. Two light barriers (9a) and (9b) measure the fluid level. Once the level reaches 95% in the collector vessel, this is displayed on the display panel.

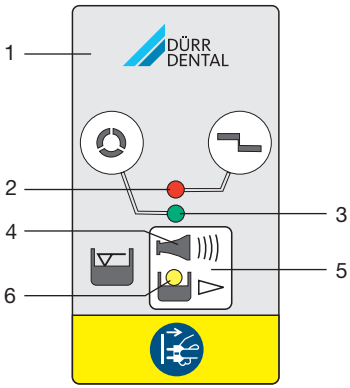
9.7 Operating problems

If the unit is not ready for operation due to a fault, this will be indicated on the display panel via illuminated LEDs and an audible signal.

9.8 Service key

On the display panel there is a service key that can be used to switch off the audible signal in the event of a fill level warning or if a fault message is indicated. This button can also be used to start the device manually. To do this, press the button for longer than 2 seconds until the drive motor starts up.

10 Display/handling



1 Display panel
2 RED display
3 GREEN LED
4 Audible signal/melody
5 Reset/service key
6 YELLOW LED

10.1 Ready for operation

Green LED is on

10.2 Amalgam collector vessel is 95% full

Yellow LED is on

Green LED is on

Audible signal melody sounds

– At a fill level of 95%, the signal melody can be switched off by pressing the reset button. The device is then ready for operation again.
– The yellow LED comes on as a reminder that the amalgam collector vessel is due to be changed. The level display is repeated every time the unit is switched on at the main power switch.

We recommend changing the amalgam collector vessel when it reaches 95% full.

10.3 Amalgam collector vessel is 100% full

Yellow LED is on

Red display flashes

Audible signal melody sounds

– At a fill level of 100% the signal melody can no longer be switched off by pressing the reset button.
– The collecting container needs to be replaced.

Wear protective equipment to avoid any risk of infection (e.g. liquid-tight protective gloves, protective goggles, face mask).

– The separator will not be ready for operation again until the amalgam collecting container has been replaced

10.4 Amalgam collector vessel not in position

Red display flashes

Audible signal

– Press the reset button briefly to switch off the audible signal.
– Switch off the device.
– Insert the collecting container.
– Switch on the unit.
– Green LED lights up – "Ready for operation“

If this error message occurs when the collecting container is correctly inserted, this indicates that there is a technical defect – inform your Service Technician.

10.5 Motor fault

Red display and

green LED flash alternately

Audible signal

– Press the reset button briefly to switch off the audible signal.
– If the reset button is pressed for longer than 2 seconds the unit can be restarted.
– Green LED lights up – "Ready for operation“

If, after pressing the reset button repeatedly, the fault report reappears again each time, this indicates a technical defect – inform your Service Technician.

11 Maintenance

All maintenance work must be performed by a qualified expert or by one of our Service Technicians.

WARNING

Infection due to contaminated unit

- Clean and disinfect the suction before working on the unit.
- Wear protective equipment when working (e. g. impermeable gloves, protective goggles and mouth and nose protection).

Prior to working on the unit or in case of danger, disconnect it from the mains.

Maintenance interval	Maintenance work
Dependent upon the level of usage of the device	› Replace the amalgam collecting container when a fill level of 95% or 100% is indicated on the display panel › Clean or replace protective sieves during replacement of the amalgam collecting container. At the latest, do this when the suction or draining power of the device decreases.
Annually	› Cleaning of the suction unit in accordance with the operating instructions. › Clean the float. * › Replace the bellows. *
Every 3 years	› Replace the rubber grommets on the connections. * › Replace the float. *
Every 5 years	› Replace the centrifuge drum and seal. * › Replace all O-rings (from the replacement parts kit) in the device. * › Replace the rubber grommets on the connections. * › Replace the float. *

* to be done by service technicians only

11.1 Additional maintenance work for CA 2

Maintenance interval	Maintenance work
Monthly	› Check the yellow filter at the inlet of the buffer vessel and clean if necessary.
Annually	› Check the throttle at the inlet of the CA 2 basic unit for contamination and clean if necessary. *
Every 3 years	› Replace the throttle with ventilation. * › Replace the ventilation valve. * › Replace the nonreturn valve. *

* to be done by service technicians only

12 Tests

WARNING

Infection due to contaminated unit

› Clean and disinfect the suction before working on the unit.
› Wear protective equipment when working (e. g. impermeable gloves, protective goggles and mouth and nose protection).

In some countries the owner is required to keep an operating handbook. This operating handbook must document all maintenance work, service work, checks and amalgam disposal.

12.1 Device with network connection

This test should be performed as an additional test if the device is monitored with software via the network.
Requirements for the test:

✓ Device connected to the network.
✓ Monitoring software running.

Work steps to be performed:

1. Check whether any messages are displayed on the PC monitor.
2. Check the acoustic signal.

12.2 Annual inspection

This inspection should only be carried out by suitably trained staff.
For inspection, the following are required:

✓ Test vessel

Work steps to be performed:

1. General functional check (e.g. aspiration, spittoon inlet)
2. Service program

The following measurement times apply to fill level measurements with a test vessel:

– For a fill level of 95%, the measurement result is displayed after approx. 30 sec, whereby the drive motor is briefly switched off during the measurement.
– At a fill level of 100% the measurement result is displayed after approx. 90 sec continuous running.

12.3 Inspection of the general operating condition every 5 years

This inspection must be carried out every 5 years (in accordance with the German Waste Water Regulations, Annex 50, Dental Treatment) by an inspector in accordance with national regulations. For inspection, the following are required:

✓ Test vessel
✓ Measuring beaker

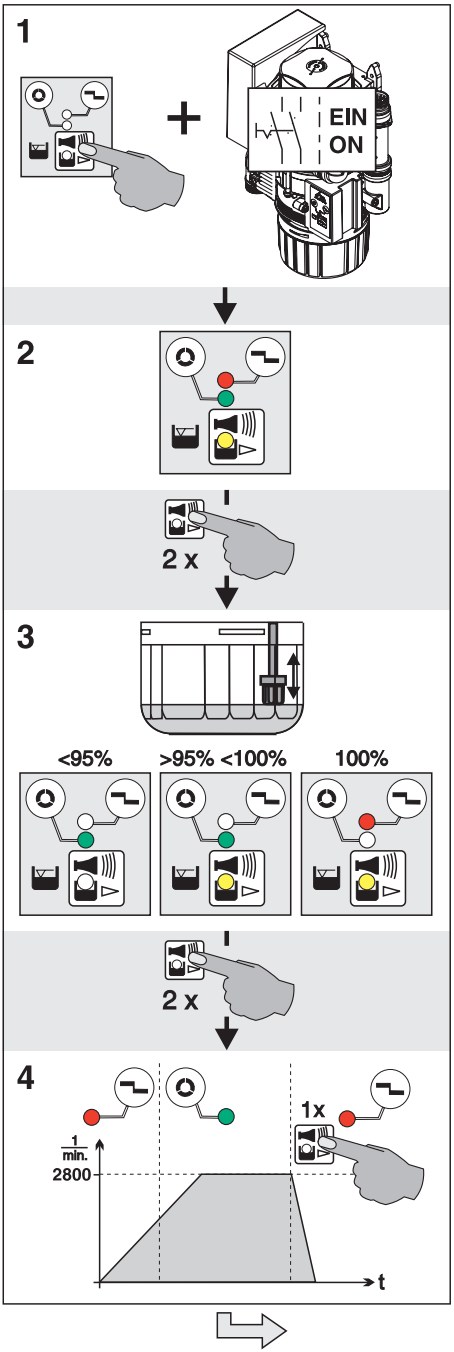
Work steps to be performed:

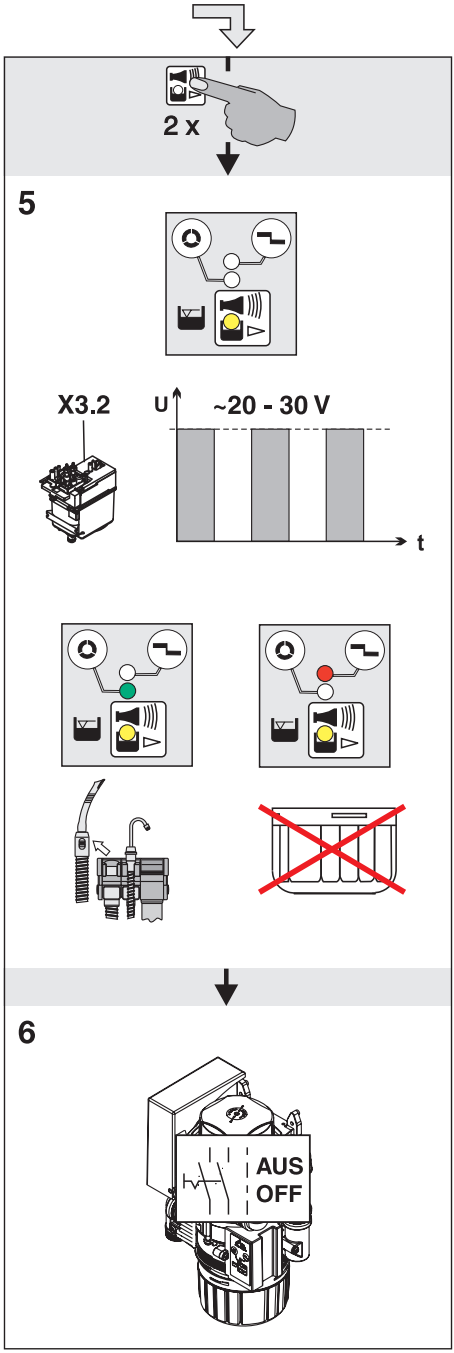
1. Fill the test vessel with water and insert it into the unit.
2. Start the device and wait until it switches off again.
3. Once the device has switched off, remove the test vessel and measure the remaining amount of water.

The unit is working correctly if:
– there is at minimum content of 140 ml in the **test vessel**.

If there is less fluid, clean the centrifuge drum or check the operation of the unit.

13 Service program





14 Description of the service program

Wear protective equipment to avoid any risk of infection (e.g. liquid-tight protective gloves, protective goggles, face mask).

The various unit functions can be checked with the aid of the service program.
The individual program steps are:
- Display test
- Sediment level measurement
- Motor start and motor braking with rpm check
- Input and output signals

Function of the service key:
- By pressing the service key twice the next individual program step is called up.
- By pressing the service key once that program step is repeated.

A press of the service key is confirmed by an audible signal.

14.1 Service program ON/OFF

On
- Press the service key and switch on the voltage supply to the unit.
- As soon as a signal melody can be heard, release the service key.
  The green, yellow and orange LEDs on the display panel light up (display test) and the service program is activated.

Off
Switch off the main supply to the unit.

14.2 Display test

The display test is activated as soon as the service program is started.
The LEDs on the display panel are checked. All three LEDs must come on. There is also an audible signal, which can be switched off by pressing the service button.

14.3 Sediment level measurement

While the service program is activated, the safety check for the collector vessel is deactivated.

The sediment level measurement can be used to check the function of the sediment sensor and the function of the LEDs.

Every time the service key is pressed, the sediment level is checked. If a test collector vessel is used for this, the different levels can be scanned and made visible on the display panel.
While changing the collectors (collector vessel - test collector vessel) in the service program the unit remains in the ON state.

14.4 Motor start - motor braking

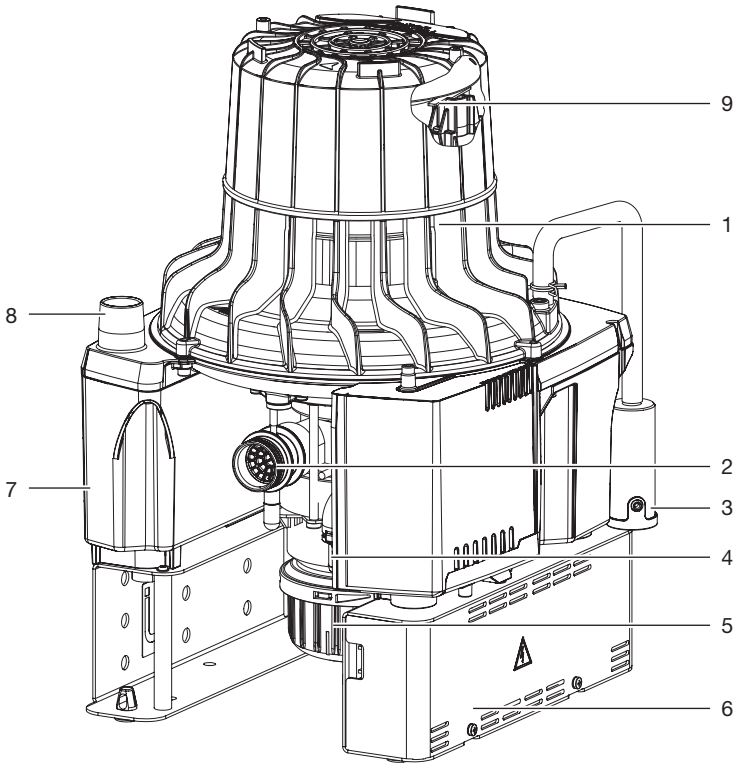
The drive motor starts and, after approx. 5 seconds, braking is applied. If the service key is pressed during these 5 seconds, the motor will immediately be braked.
This procedure can be repeated by pressing the service key 1x again.
The drive motor starts up.
As a result of the rpm monitoring, the LED will change from orange to green upon start-up and from green to orange upon braking.

14.5 Input and output signals

- After this program item is activated, the yellow LED flashes and a cycled DC voltage (approx. 22-30 V) can be measured at the terminal for the rinsing unit.
- If the suction hose is lifted off the hose manifold the green LED will also come on.
- Removal of the collecting container causes the red LED to illuminate.

VSA 300 S

15 Function

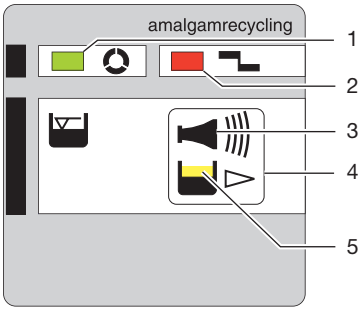


1 Motor
2 Inlet connection with protective coarse filter
3 Auxiliary air nozzle
4 Waste water connection
5 Amalgam collecting container
6 Control electronics
7 Exhaust air muffler
8 Exhaust air connection
9 Rotational speed sensor

The mixture of liquids, solid particles and air drawn in passes through the inlet connection and into the suction unit. The coarse filter holds back the solid particles.
Inside the separation unit, the aspirated fluids and solid particles pass through a two-stage separation system and are separated from the suction air. This separation system consists of a cyclone separator and a separation turbine.

The aspirated mixture flows into the cyclonic separator, where it is set into a spiral motion. In this first stage, the resulting centrifugal forces force the fluid constituents and any remaining solid particles against the outside wall of the separation chamber of the cyclone separator. This initially only effects a "coarse separation" of the fluid.
In the subsequent second stage, the separation turbine effects "fine separation" of the remaining liquid from the air flow that has carried it to this point.
The fluid and solids accreting in the separation chamber are continuously fed to the amalgam centrifuge, where the amalgam particles are removed. The fluid extracted via the centrifuge is fed through the waste water valve and the outlet connection into the central waste-water system.
Under the centrifuge there is an interchangeable collecting container into which the separated amalgam particles fall once the motor is switched off.
A sensor checks the fill level in the collecting container, and when it is full, an LED on the display panel indicate that the collecting container needs to be replaced. Depending on the type of work carried out and the amount of amalgam arising, the collector vessel should be changed approx. every 6-9 months.
A secure twist cap makes the replacement and closing of the collector vessel easier.
A pump connected to the centrifuge keeps the fluid level constant in the collecting container. This prevents accidental overflow when replacing the collecting container.
The air separated from the liquid is sucked off by the vacuum pressure generated by the turbine wheel. The air is then blown through the noise reduction hood and over the exhaust air connection and out of the machine.
The turbine wheel, separation turbine and amalgam centrifuge are driven by the motor.
An auxiliary air nozzle is connected to the turbine housing. The auxiliary air nozzle limits the vacuum in the system. In certain working situations it also sucks additional cooling air into the machine.

16 Display/handling



1 GREEN LED
2 RED display
3 Audible signal/melody
4 Reset/service key
5 YELLOW LED

16.1 Ready for operation

GREEN LED lights up

16.2 Amalgam collector vessel is 95% full

Yellow LED lights up

GREEN LED lights up

Audible signal melody sounds

– At a fill level of 95%, the signal melody can be switched off by pressing the reset button. The device is then ready for operation again.
– The yellow LED comes on as a reminder that the amalgam collecting container is due to be changed. The level display is repeated every time the unit is switched on at the main power switch.

We recommend changing the amalgam collecting container when it reaches 95% full.

16.3 Amalgam collector vessel is 100% full

Yellow LED lights up

Red display flashes

Audible signal melody sounds

– At a fill level of 100% the signal melody can no longer be switched off by pressing the reset button.
– The collecting container needs to be replaced.

Wear protective equipment to avoid any risk of infection (e.g. liquid-tight protective gloves, protective goggles, face mask).

– The separator will not be ready for operation again until the amalgam collecting container has been replaced

16.4 Amalgam collector vessel not in position

Red display flashes

Audible signal

– Press the reset button briefly to switch off the audible signal.
– Switch off the device.
– Insert the collecting container.
– Switch on the unit.
– Green LED lights up – "Ready for operation“

If this error message occurs when the collecting container is correctly inserted, this indicates that there is a technical defect – inform your Service Technician.

16.5 Motor fault

Red display and

green LED flash alternately

Audible signal

Occurs during the start-up of the amalgam separator.

– Press the reset button briefly to switch off the audible signal.
– If the reset button is pressed for longer than 2 seconds the unit can be restarted.

If this problem happens again on the same day, the amalgam separator will no longer be operational - notify the service technician.

16.6 Brake monitoring

Red display and

green LED flash alternately

Audible signal

Occurs upon braking action of amalgam separator.

– Press the reset button briefly to switch off the audible signal.
– The amalgam separator is still operational.

If this problem occurs on several consecutive days, the braking must be checked by a service technician.

17 Maintenance

All maintenance work must be performed by a qualified expert or by one of our Service Technicians.

WARNING

Infection due to contaminated unit

- Clean and disinfect the suction before working on the unit.
- Wear protective equipment when working (e. g. impermeable gloves, protective goggles and mouth and nose protection).

Prior to working on the unit or in case of danger, disconnect it from the mains.

Maintenance interval	Maintenance work
Dependent upon the level of usage of the device	› Replace the amalgam collecting container when a fill level of 95% or 100% is indicated on the display panel **Notes concerning prophy powders:** The function of the amalgam separator is not adversely affected by conventional prophy powders. Under certain circumstances however, increased soiling of lines and hoses and a more frequent changing of the amalgam collecting container can be expected.
Annually	› Cleaning of the suction unit in accordance with the operating instructions. › Check the inlet and outlet hoses for signs of deposits/blockage or cracks and replace as required. * › Check the outflow valve and replace as required. * › Replace the exhaust air filter (depending on the installation conditions). *

* to be done by service technicians only

18 Tests

WARNING

Infection due to contaminated unit

- Clean and disinfect the suction before working on the unit.
- Wear protective equipment when working (e. g. impermeable gloves, protective goggles and mouth and nose protection).

In some countries the owner is required to keep an operating handbook. This operating handbook must document all maintenance work, service work, checks and amalgam disposal.

18.1 Device with network connection

This test should be performed as an additional test if the device is monitored with software via the network.
Requirements for the test:

✓ Device connected to the network.
✓ Monitoring software running.

Work steps to be performed:

1. Check whether any messages are displayed on the PC monitor.
2. Check the acoustic signal.

18.2 Annual inspection

This inspection should only be carried out by suitably trained staff.

Work steps to be performed:

1. General functional check (e.g. aspiration, spittoon inlet)
2. During the sediment fill level measurement, visually inspect the operability of the sediment sensor.
3. Service program

18.3 Inspection of the general operating condition every 5 years

This inspection must be carried out every 5 years (in accordance with the German Waste Water Regulations, Annex 50, Dental Treatment) by an inspector in accordance with national regulations. For inspection, the following are required:

✓ Test vessel
✓ Measuring beaker

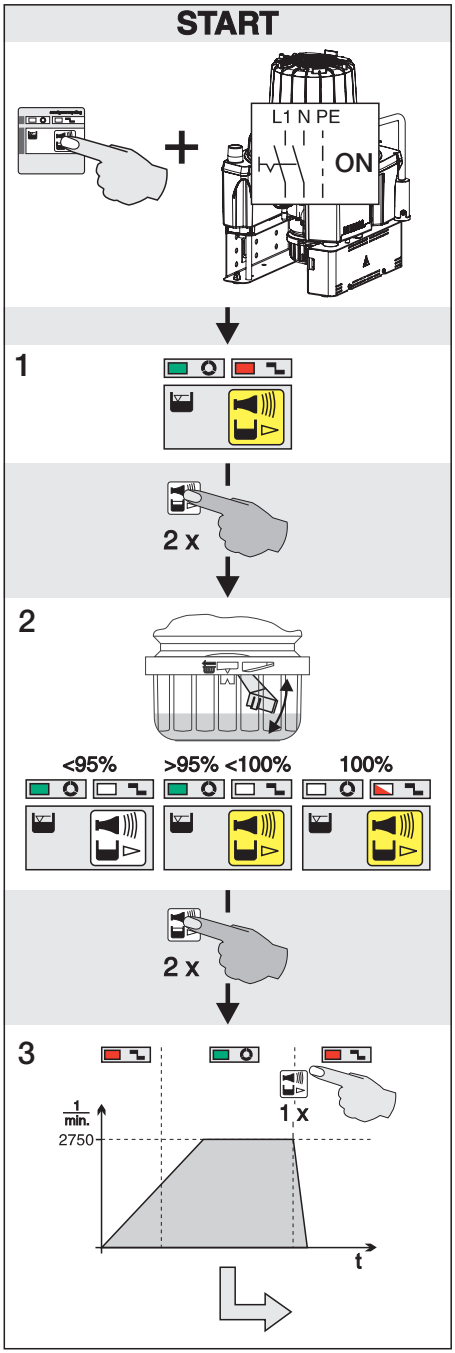
Work steps to be performed:

1. Remove the collector vessel. Here, the red LED on the display panel must flash and an audible signal must sound.
2. Insert the test collector vessel.
3. Press the service key on the display panel.
4. Suck up c. 1 L water.
5. Once the device has switched off, remove the test vessel and measure the remaining amount of water.

The unit is working correctly if:
– there is at minimum content of 70 ml in the test vessel.

If there is less fluid, clean the centrifuge drum or check the operation of the unit.

19 Service program



20 Description of the service program

Wear protective equipment to avoid any risk of infection (e.g. liquid-tight protective gloves, protective goggles, face mask).

The various unit functions can be checked with the aid of the service program.
The individual program steps are:
- Display test
- Sediment level measurement
- Motor start and motor braking with rpm check
- Input and output signals

Function of the service key:
- By pressing the service key twice the next individual program step is called up.
- By pressing the service key once that program step is repeated.

A press of the service key is confirmed by an audible signal.

20.1 Service program ON/OFF

On
- Press the service key and switch on the voltage supply to the unit.
- As soon as a signal melody can be heard, release the service key.
  The green, yellow and orange LEDs on the display panel light up (display test) and the service program is activated.

Off
Switch off the main supply to the unit.

20.2 Display test

The display test is activated as soon as the service program is started.
The LEDs on the display panel are checked. All three LEDs must come on. There is also an audible signal, which can be switched off by pressing the service button.

20.3 Sediment level measurement

While the service program is activated, the safety check for the collector vessel is deactivated.

The sediment level measurement can be used to check the function of the sediment sensor and the function of the LEDs.

Every time the service key is pressed, the sediment level is checked. If a test container is used, the different 95% and 100% filling level on the display panel can be revealed.

20.4 Motor start - motor braking

The drive motor starts up and is automatically braked after the delay time. If the service key is pressed before the end of the delay time, the motor will immediately be braked.
This procedure can be repeated by pressing the service key 1x again.
As a result of the rpm monitoring, the LED will go from orange to green on start-up and from green to orange during braking.

20.5 Input and output signals

- After activating the program point, the yellow LED on the display panel flashes.
- A cycled DC voltage (c. 22-30 V) can be measured on the rinsing unit connection (X1).
- Opening the collecting container causes the orange display to illuminate on the display panel.
- If a start signal is applied to socket X2 (lift out the suction hose on the hose manifold) the green LED illuminates on the display panel.

Hersteller / Manufacturer:

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