WEINMANN
medical technology

Chest Compression Synchronized Ventilation

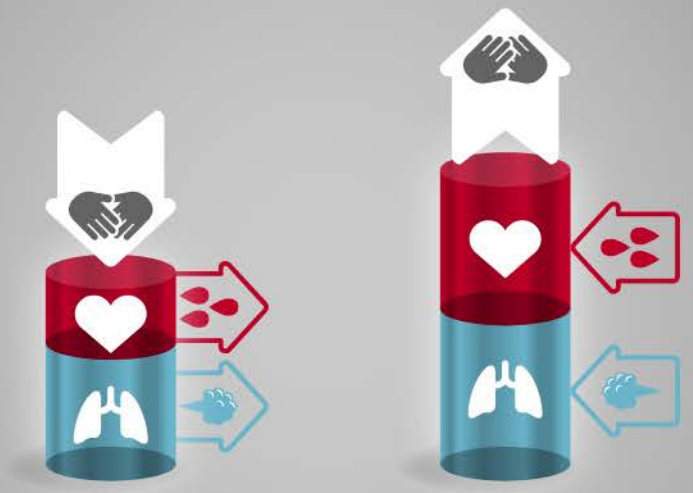
Ventilation for cardiopulmonary resuscitation

THE LUNGS SUPPORT THE HEART

The main effect of chest compressions is to increase intrathoracic pressure, which causes blood circulation to be maintained or restored. But at the same time, air does escape from the lungs, which inhibits the effect of the pressure buildup and so reduces cardiac output. This is precisely where the CCSV ventilation mode comes into play: By administering the mechanical breath in synchrony with the chest compression, it prevents any volume of gas from escaping. As a result, pressure in the lungs is increased and cardiac output rises.

CONVENTIONAL CPR AT 30:2

Compression phase Decompression phase



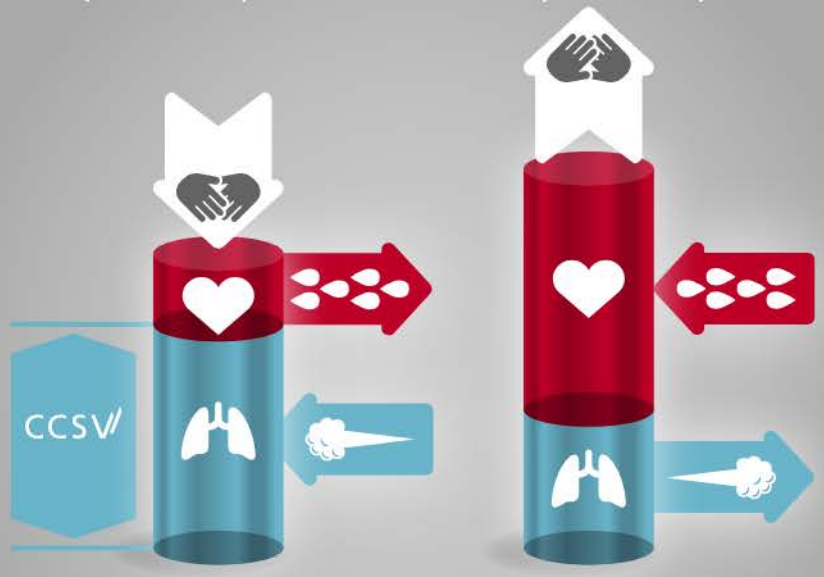
During chest compressions, the heart and the pulmonary vessels in the thorax are compressed, but air is simultaneously released from the surrounding lungs, causing a decrease in pressure.

White Paper

For an informative overview of scientific study results, please refer to our white paper on CCSV

CPR WITH CCSV

Compression phase Decompression phase



In the compression phase with CCSV, mechanical breaths are administered in synchrony with manual or mechanical chest compressions. The synchronized mechanical breath means that only a negligible volume of gas can escape from the thorax. As a result, intrathoracic pressure increases during the compression phase.

This leads to:

- Increased arterial pressure
- An increase in blood circulation
- An improvement in gas exchange (decompression phase)

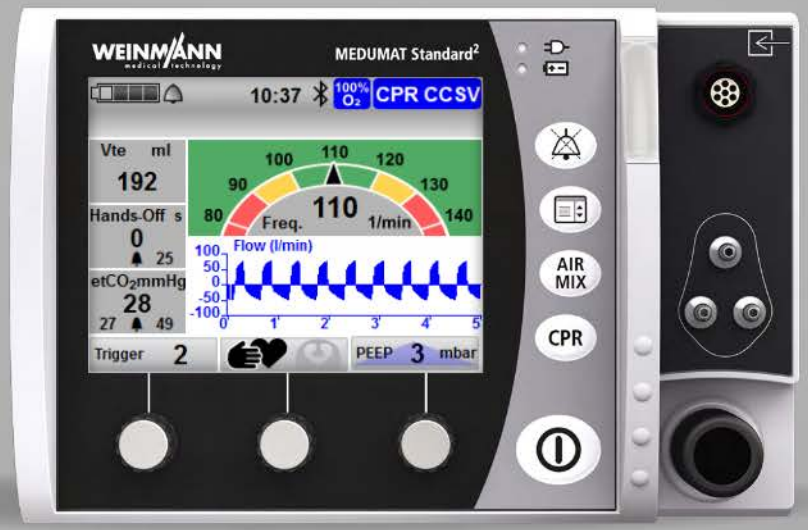
In the decompression phase, the ventilator switches to expiration, which causes air to escape from the lungs. At the same time, intrathoracic pressure decreases and the venous return to the heart can occur unhindered.

Hands-off time always in view

Added assurance during chest compression: Frequency tachometer makes CPR in line with guidelines easier

Ventilation and compression display optimized for CPR

Ventilation parameters are easy to set



Flow curve provides feedback on pressure depth and relief during chest compressions

CCSV – THE VENTILATION MODE THAT SUPPORTS THE HEART

Chest Compression Synchronized Ventilation (CCSV) is a ventilation mode developed by WEINMANN specifically for cardiopulmonary resuscitation. Integrated in MEDUMAT Standard², CCSV applies a pressure-controlled mechanical breath in synchrony with each chest compression. This revolutionary method demonstrably improves gas exchange and hemodynamics.

CCSV AS A *crucial* BRIDGE TO TREATMENT IN HOSPITAL

During cardiopulmonary resuscitation, continuous chest compressions and a reduction in hands-off time are used to establish circulation that is essential for survival and to perfuse vital organs such as the heart and brain. This is precisely where CCSV comes in: The rise in intrathoracic pressure during compression can increase arterial blood pressure. During the decompression phase, the device switches to expiration, thereby supporting the venous return flow to the heart. These two mechanisms can in turn increase perfusion. CCSV therefore not only ensures that the lungs are oxygenated and ventilated, but also improves hemodynamics. As a result, a system with CCSV provides optimal prerequisites for further treatment at the hospital (e.g. thrombolysis, catheter laboratory, ECMO or eCPR).

FROM THE EMERGENCY

CCSV IMPROVES THE PROCESS FOR USERS DURING CPR

1
START OF RESUSCITATION

At the emergency site, you start cardiopulmonary resuscitation as quickly as possible using the 30:2 method. Press the CPR button of the MEDUMAT Standard² to start ventilation during CPR. The MEDUtrigger can be used to release the mechanical breaths manually.

2
VENTILATION DURING CPR WITH CCSV

Let CCSV work automatically once you have secured the airway. MEDUMAT Standard² now ventilates in synchrony with your continuous chest compressions – fully automatically with no need to set ventilation parameters. Here, the frequency tachometer provides added assurance when monitoring the compression frequency!

3
FULLY AUTOMATED CPR

The use of CCSV with mechanical chest compression creates a fully automated system for cardiopulmonary resuscitation. This not only guarantees adequate perfusion over a longer period of time, but also ensures optimal crew resource management (CRM) by freeing up hands. The team then has time to focus on treating the cause of the cardiac arrest.

MAN OR MACHINE:
CCSV IS COMPATIBLE WITH ALL COMMON CHEST COMPRESSION DEVICES!

SITE TO THE HOSPITAL

4
SHOCK DELIVERY REQUIRED? START THE ANALYSIS!
MEDUMAT Standard² interacts perfectly with defibrillator monitoring systems like MEDUCORE Standard². If you interrupt manual or mechanical chest compressions for rhythm analysis, MEDUMAT Standard² detects this and interrupts the ventilation automatically. This enables a trouble-free ECG analysis.

5
CONTINUING THE CHEST COMPRESSIONS

Once you continue with chest compressions after delivering the shock, CCSV detects this and resumes synchronous ventilation.

6
RESUMPTION OF SPONTANEOUS CIRCULATION

If chest compressions are interrupted for a prolonged period, MEDUMAT Standard² automatically exits CCSV mode and switches to volume-controlled backup ventilation.

7
DOES CPR HAVE TO BE REPEATED?

If you start chest compressions again after ROSC has occurred, MEDUMAT Standard² will automatically resume ventilation during CPR in CCSV mode.

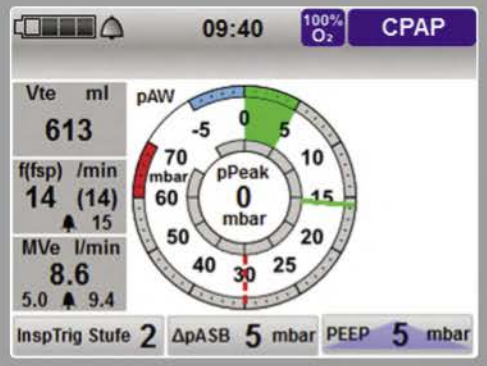
INTEGRATING THE SOFTWARE OPTION IS SO EASY

The option is activated using an enable code. CCSV ventilation mode is available exclusively from WEINMANN as a software option for the MEDUMAT Standard² emergency ventilator. It can be activated either during initial commissioning or at a later stage.

THE "FLOW MEASUREMENT + ASB" AND "CCSV" SOFTWARE OPTIONS

In order for you to use CCSV, the "Flow measurement + ASB" software option must be activated. Why? CCSV adjusts the ventilation to the chest compressions and requires a trigger to initiate a mechanical breath. This trigger is provided by the "Flow measurement + ASB" function. In addition, the compression frequency and applied tidal volume can be monitored with this option.

Software option:
Flow measurement + ASB



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Accessories:
FlowCheck sensor

Available in disposable or reusable versions.
Disposable breathing circuits with flow measurement are equipped with disposable FlowCheck sensors.

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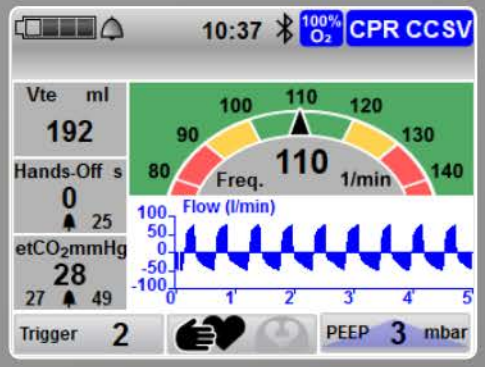
Software option:
CCSV



= *A strong team*

Experts tell us from practice

"CCSV does what it's supposed to do. There is no disruptive factor. It not only ventilates the patient, but also has a positive effect on circulation."

Dr. Birgit Plöger

Senior Consultant at the Center for Emergency Medicine of the University Hospital Giessen/Marburg and Medical Director of the DRK-Rettungsdienst Central Hesse emergency medical services

"Fully automated CPR not only allows us to focus on diagnosing and treating the cause of the cardiac arrest, it also allows us to transport a patient in cardiac arrest to a definitive intervention. For me, CCSV is the ultimate bridge to the cath lab or ECMO."

Dr. Jason van der Velde

Senior Emergency Physician and Senior Consultant Cork University Hospital and West Cork Rapid Response

FIVE *remarkable* FACTS ABOUT CCSV

CCSV is a hit!
90% of users would recommend CCSV to others.
93% of users rate CCSV as helpful in the field.[1]

The maximum CCSV ventilation time of a patient requiring CPR and able to leave the hospital was over 3 hours.[2]

Initial publications are promising: In one study, ROSC was achieved on hospital admission in 21 out of 34 (61.8%) CCSV patients.[3]
For comparison: According to the annual report of the German Resuscitation Registry, a total of 30% of all patients reached the hospital with restored spontaneous circulation in 2022.

Equally promising:
5 out of 34 of these patients (14.7%) were discharged from hospital alive.[3]
For comparison: According to the annual report of the German Resuscitation Registry, a total of 10.7% of all patients were able to leave the hospital alive in 2022.

Since the introduction of CCSV, the mode has already been used in over 150 EMS organizations and clinics – and the trend is rising![4]

Source references:
1 WEINMANN Emergency GmbH+Co. KG: Results of a survey as part of the post-market clinical follow-up of CCSV, 10/2019.
2 van der Velde J, et al. Fully Automated Cardiopulmonary Resuscitation - a Bridge to ECMO. In: Resuscitation 192, SUPPLEMENT 1, p52-p53, Nov 2023. https://doi.org/10.1016/S0300-9572(23)00467-7
3 Kill C, et al: Mechanical positive pressure ventilation during resuscitation in out-of-hospital cardiac arrest with chest compression synchronized ventilation (CCSV). In: Resuscitation 142, e42, https://doi.org/10.1016/j.resuscitation.2019.06.102.
4 WEINMANN Emergency GmbH+Co. KG: Evaluation of the internal customer database, 11/2023.

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We Simplify Saving Lives

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