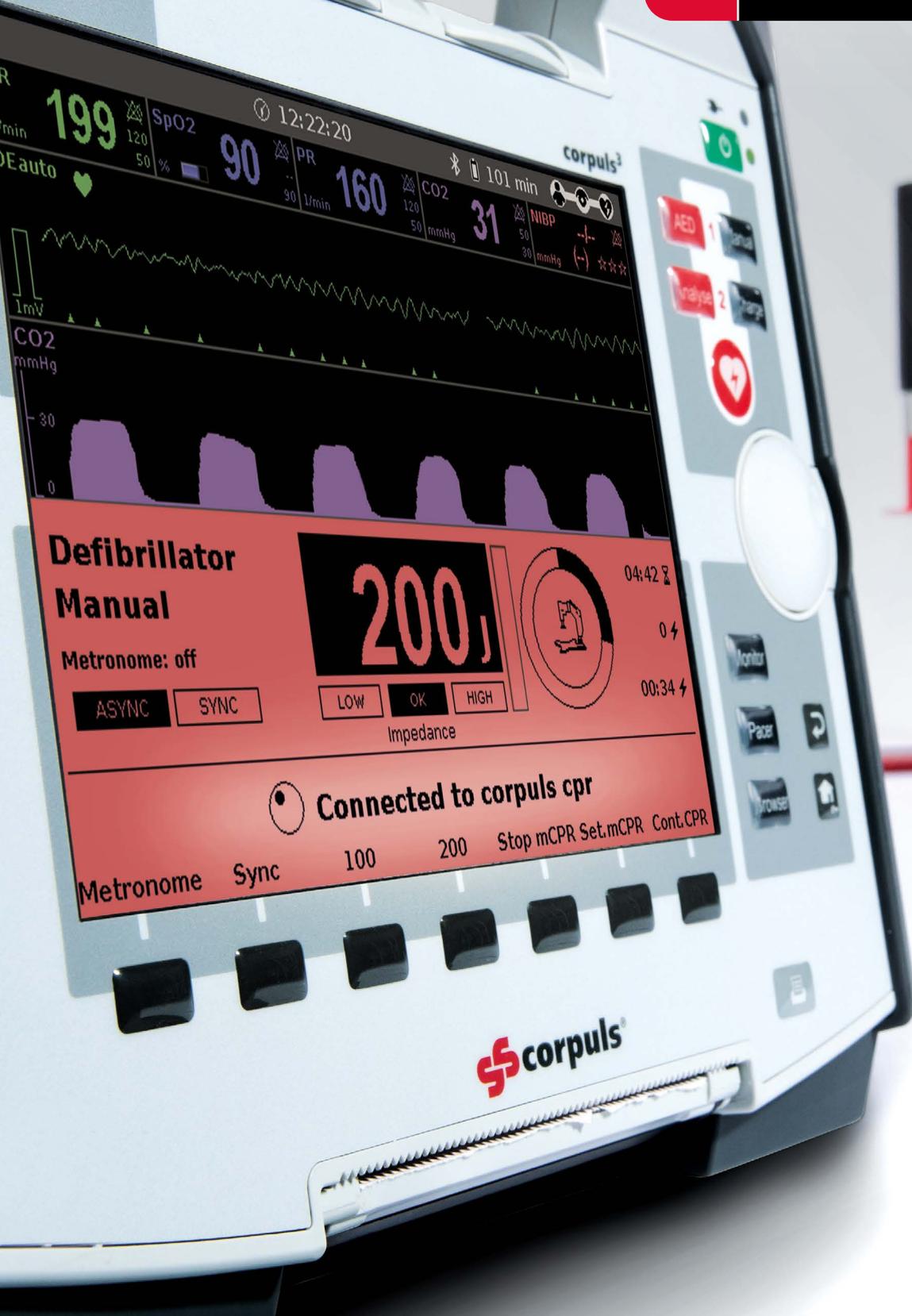




**corpuls®**

FÜR - MENSCHEN - LEBEN



# SYNCHRONISATION OF CORPULS3 AND CORPULS CPR

# TEAMWORK TO PERFECTION

## SYNCHRONISATION OF CORPULS3 AND CORPULS CPR

We have had this vision for a long time: The perfect interaction between **corpuls3** and **corpuls cpr** during resuscitation. Raising the resuscitation processes to the next level of quality was our goal.

With its revolutionary modular design, the **corpuls3** stands out from other compact devices. It can be separated into the Monitoring Unit, Patient Box and Defibrillator/Pacer.

Thanks to the synchronized therapy, stress amongst the team can be significantly reduced. **corpuls3** and **corpuls cpr** become one and when integrated into the team, this duo makes resuscitation even more efficient.

Hands-off time is significantly reduced\* and the patient's chance of survival is increased – even under the most difficult conditions where space is at a premium.



When designing the **corpuls cpr**, we focused on two things: A seamless rescue chain from pre-clinical, to air rescue to hospital, as well as the shortest possible hands-off time.

This is the reason why the **corpuls cpr** arm can be aligned and fixed over the patient with just one movement in just a few seconds. During the therapy the **corpuls cpr** checks the position of the stamp after each ventilation break or after 100 compressions when in continuous mode. If the thorax has collapsed, the **corpuls cpr** automatically corrects the distance between the stamp and the thorax. Thus ensuring that the set compression depth is always achieved. With the three different boards made of radiolucent carbon, the user is optimally equipped for every mission.

The synchronisation makes the **corpuls cpr** the fourth module of the **corpuls3** and rings us one step closer to our goal of a perfect rescue chain.



### SPECIFICATIONS CORPULS3

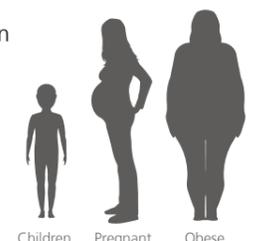
- **Weight:** only 6.5 kg (SLIM, basic configuration)
- Extremely **high dust** and **splash protection (IP55)**
- **Operation range:** -20 °C to +55 °C (basic functions: ECG monitoring, defibrillation)
- **DIN EN 1789**
- **Aviation Standard** RTCA DO 160 G
- **US Military Standard** MIL-STD-810G
- Transflective **8.4" Display**, with opt. **touch screen**
- Control of the **corpuls cpr** via Bluetooth
- Integrated **4G modem** and WLAN or LAN connection for **data transfer/telemedicine**
- **ECGmax** and **CEB®** – the 22-lead ECG solution from **corpuls**



\* Refer to the chapter "Abstract Study"

### SPECIFICATIONS corpuls cpr

- **Weight:** 5.5 kg (arm with battery and stamp)
- **Compression depth:** 2–6 cm
- **Frequency:** 80–120/ min
- **Therapy mode:** 30:2 | 15:2 | continuous
- **Bluetooth and NFC**
- **Intuitive user interface:** Therapy start/stop key with alarm and 4 softkeys
- **Customizable therapy parameters**
- **Battery running time:** up to 90 min
- **Radiolucent boards**
- **Quick & safe adjustment**
- Treatment of **children from 8 years** of age, **pregnant women** and **obese patients possible**



Children Pregnant Obese



# CONNECTION IN 3 CLICKS

During synchronized therapy, the **corpuls3** is not just the remote control for the **corpuls cpr** - although that is also possible. The **corpuls cpr** has been perfectly integrated into the AED and manual mode of the **corpuls3**. Therefore giving

the rescue team the ability to treat the patient in accordance with the current guideline recommendations. The **corpuls3** shows all the required information on its display.

- Connect key** to connect with the **corpuls cpr** via Bluetooth
- Bluetooth symbol** symbolizes a Bluetooth connection to the **corpuls cpr**
- Pie chart with corpuls cpr symbol** indicates a connection with the **corpuls cpr** and shows the 2 minute resuscitation cycle
- Start/Stop mCPR key** to start and stop the mechanical chest compressions by the **corpuls cpr**
- Cont. CPR key** to reset the time in the pie chart, if not defibrillated

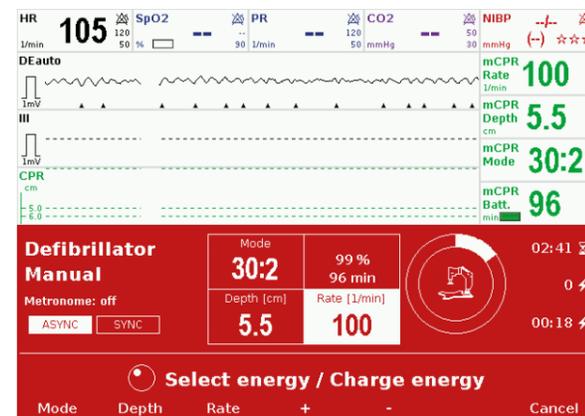


## FULL CONTROL – AT ANY TIME

Once connected to each other, it is no longer necessary to operate the **corpuls cpr** during a resuscitation. The **corpuls cpr** is completely automatically controlled by the **corpuls3**, regardless of whether it is in AED or manual

mode. All of the **corpuls cpr** therapy parameters are displayed on the monitor of the **corpuls3**.

If you would like to change the settings manually or stop or start the **corpuls cpr**, this is also possible.



# INTELLIGENT CONTROL WITH THE CORPULS3

The intelligent control of the **corpuls cpr** by the **corpuls3** during a resuscitation follows the current guideline recommendations - depending on the mode (AED, Manual-ERC, Manual-AHA). In each of the modes, the entire rhythm analysis is controlled via

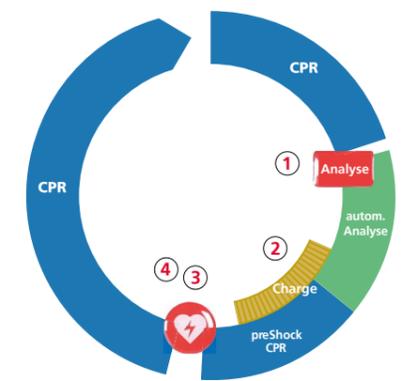
the **corpuls3** as the central operating unit. The user only needs to monitor the correct position of the stamp on the **corpuls cpr**. All control commands for the user take place wirelessly between **corpuls3** and **corpuls cpr**.

### STARTING SITUATION:

The **corpuls cpr** is positioned on the patient and is performing chest compressions. There is a Bluetooth connection to a **corpuls3**.

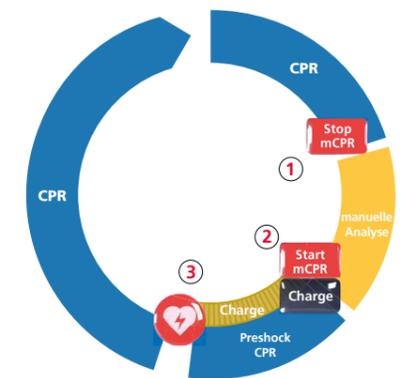
### AED MODE

- Analyse key** interrupts the **corpuls cpr** for the **AED analysis** and then automatically continues the therapy by **corpuls cpr**.
- If the **rhythm is shockable**, the defibrillator is charged and automatic preShock CPR is performed.
- The **Shock key** interrupts the **corpuls cpr** for shock delivery.
- If the **rhythm is not shockable**, the **corpuls cpr** therapy is automatically continued.



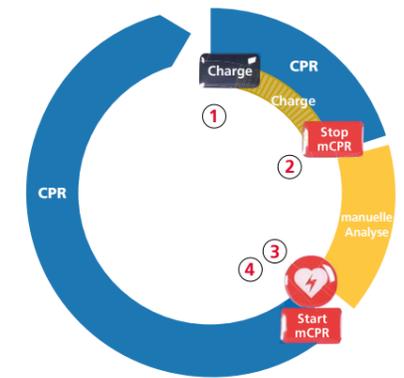
### MANUAL 1 (procedure according to ERC)

- The **stop mCPR key** on the **corpuls3** interrupts the **corpuls cpr** for manual rhythm control.
- The **Start mCPR key** resumes chest compressions/ preShock CPR.
- If the **rhythm is shockable**, the **Shock key** interrupts the **corpuls cpr** for shock delivery. If the **rhythm is not shockable**, the **Start mCPR key** continues the therapy by the **corpuls cpr**.



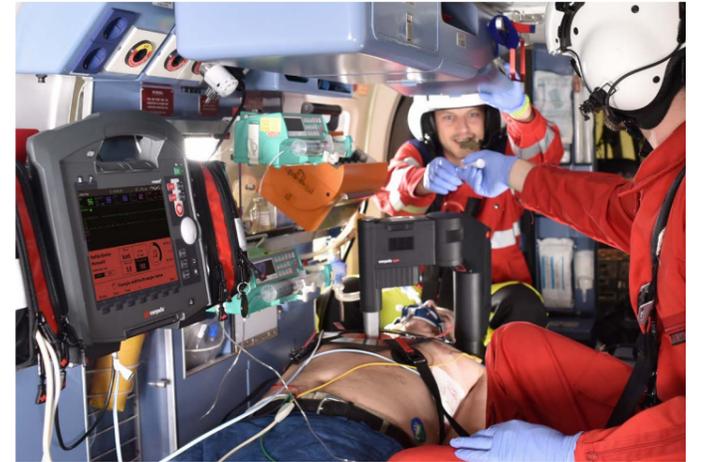
### MANUAL 2 (procedure according to AHA)

- Charge key** loads the defibrillator.
- The **Stop mCPR key** on **corpuls3** interrupts the **corpuls cpr** for manual rhythm control.
- If the **rhythm is shockable**, the **Shock key** interrupts the **corpuls cpr** for shock delivery.
- Start mCPR key** resumes the therapy by the **corpuls cpr**.





◀ Whether in a stairwell, on an aerial ladder or in alpine terrain, access to operate the **corpuls cpr** is often restricted. With the synchronized therapy, the stretcher being out of reach is no longer a problem. The user always has an overview of all values and can react immediately.



▲ In **air rescue**, patient access is extremely limited, and rescuers are belted into their seats. Thanks to the perfect interaction of the **corpuls3** with the **corpuls cpr**, movement within the cabin can be reduced. The emergency physician can now treat the patient with mechanical chest compression alone, without having to accept long hands-off times.



▲ Urgent transport always carries high risk for the patient and the rescue team – especially if the team must work while standing. Thanks to the synchronized therapy, the emergency team can remain buckled up while driving. Rhythm control and shock delivery can be performed on the **corpuls3** while the rescuer is seated.



◀ In emergency situations there are often very **few staff** available. The intuitive connection of **corpuls3** and **corpuls cpr** frees up the emergency team considerably. The physicians and nurses are available for other critical interventions, for example for airway management or medication administration.



▲ The **Emergency Room** can get hectic and overcrowded very quickly. The synchronized therapy relieves the team leaving them to concentrate on optimal treatment and therapy measures. For longer handovers, the **corpuls3** starts the rhythm control automatically in AED mode and reminds the user to perform defibrillation.



▲ In the event of a possible radiation exposure, the **corpuls cpr** can remain on site and be controlled by the **corpuls3** from a safe distance. The **corpuls cpr** radiolucent boards and the fact that the **corpuls3** can be divided into its three modules, make both devices ideal partners in the cardiac Cath Lab, for example. With the synchronized therapy, there is no need to intervene in the sterile operating room.



## PRESENTATION OF THE CPR SYNCHRONISATION AT THE CIS 2020

Corpuls has been a leader in innovative medical technology for years. Even during the coronavirus pandemic, our company from southern Germany has come up with unique ideas – such as a panel discussion about new innovations, produced in-house and streamed live.

An interview by Managing Director Dr. Christian Klimmer from this discussion:

### What was the idea behind synchronized therapy?

When developing the **corpuls cpr**, we already had the vision of connecting the device to the **corpuls3** via Bluetooth. We knew from the **corpuls3** that fundamentally this would be possible and safe. The possibilities were obvious from the beginning: The top priority was an almost automated and synchronized resuscitation through the intelligent interaction of these two devices.

### The corpuls cpr has been on the market for a while. Why did it take so long to implement this new feature?

At the time of product launch, the **corpuls cpr** set new standards in mechanical resuscitation and it was extremely challenging in development. We are very proud that we mastered those various challenges. However, in order to synchronize the two devices, extensive feasibility and

usability studies were required. It just takes a little longer in this regulated field we are in.

### What do you think the five biggest advantages of synchronizing the corpuls3 with the corpuls cpr are?

It's a shame that I can only mention five advantages, because I actually see a lot more. But let me get started. First: The hands-off time during resuscitation is significantly reduced. Second: The synchronisation frees up time and resources for the rescuers, which can be used for other purposes. Third: There is only one user interface for the user. This reduces the potential for error and the user has full control over the two devices at all times. Fourth: As the **corpuls cpr** also transmits all the mission data to the **corpuls3**, a data record is created for debriefing that comprehensively shows all aspects of the mission. In turn

improving the quality of subsequent missions. Fifth: I also see an improvement in the occupational safety of the users, especially when transporting the patient in a vehicle. The removable monitor allows the **corpuls cpr** to be controlled remotely, without the user having to take off their seat belt.

### Do you think synchronized therapy will be adopted by the market?

Yes. I'm very sure of that. Ever since we first introduced the **corpuls cpr** we have been asked whether it can be connected to the **corpuls3**. We are convinced that with this new function, we can now offer all the customers who wanted this connection all the options that they had in mind.

### How have you reacted to the coronavirus pandemic?

Fortunately, we had an IT structure from the beginning that made it possible for employees to immediately start working from their homes. Our manufacturing department has achieved incredible things and built devices from early in the morning until late at night so that we could fulfill all orders asap. We also have a comprehensive hygiene concept for the employees in the office.

### How did you carry out the shock synchronisation study under these circumstances?

That was definitely a problem. Due to the social distancing restrictions and lock-down measures, we were unable to conduct the study with our partner in Munich as planned. But we are fortunate that we could fall back on the around 50 employees with (emergency) medical training within our company. The previously mentioned hygiene concept made it possible to carry out the shock synchronisation study here in house.

## WHAT IS "CIS"?

**corpuls** presents the latest developments to sales partners and the public at the **corpuls innovation summit** (CIS). This year however, due to the coronavirus pandemic, the event took place as a worldwide streaming event. Customers and those interested were able to tune in live to see the new products in action and ask the developers questions directly.

## FAQ CPR

### Which software version do I need for the synchronized therapy?

Any **corpuls3** that already has software version 4.0 has the feature on board. The **corpuls cpr** is compatible from software version 1.2. Older devices can be upgraded of course.

### Do I need training to be able to use the new functions?

As always, the operation is very intuitive, but training is mandatory. Synchronized therapy must not be used without the instruction from Application Specialists or our partners.

### Is my corpuls3/corpuls cpr Bluetooth compatible? Can my corpuls3 be retrofitted?

Yes, all our devices are compatible. The **corpuls cpr** Bluetooth function can be activated. If the **corpuls3** does not have Bluetooth, this function must be retrofitted.

### What happens if the connection is lost?

If both devices lose their connection, the **corpuls cpr** continues the current therapy and the connection can be re-established. It is also no problem to operate another **corpuls** device nearby.

### Does shock synchronisation cost anything?

No, there are no additional costs after set up.

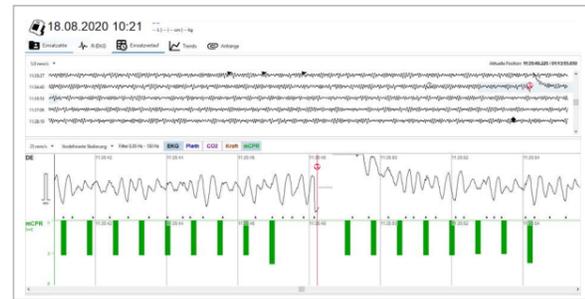
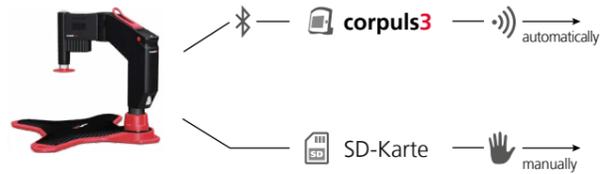
### What therapy parameters can be set by the corpuls3?

All the parameters that are adjustable on the **corpuls cpr** can be set by the **corpuls3**.



# DATA ALWAYS IN VIEW

With the combination of **corpuls.manager**, the management software solution for **corpuls** devices, follow-up becomes child's play.



## corpuls cpr

## corpuls.manager

► In **REVIEW** by **corpuls.manager** you can clearly see that when the shock key is pressed, the **corpuls cpr** automatically stops, the shock is triggered and then the CPR is automatically continued.

With just a few clicks, all curves of the **corpuls3** (e.g. ECG, CO2 or IBP) can be visually represented on a computer together with the **corpuls cpr** compression data. Thus, past missions can be analysed and future operations can be optimized. **corpuls.manager** enables an overall picture of one or more resuscitation missions in unprecedented detail, without much effort. Users who already work with **corpuls.manager** or its predecessor **corpuls.web REVIEW** will not need any adjustment period. The merging of the data from

both devices occurs completely automatically in the **corpuls3** as soon as the device connects to the **corpuls cpr**. When the **corpuls3** establishes a connection to the **corpuls.manager** server via cellular network or WLAN, the mission data is automatically uploaded.

Then, in **corpuls.manager** you can specifically filter for relevant missions and carry out statistical analysis based on your needs.

# GUIDELINE BASED

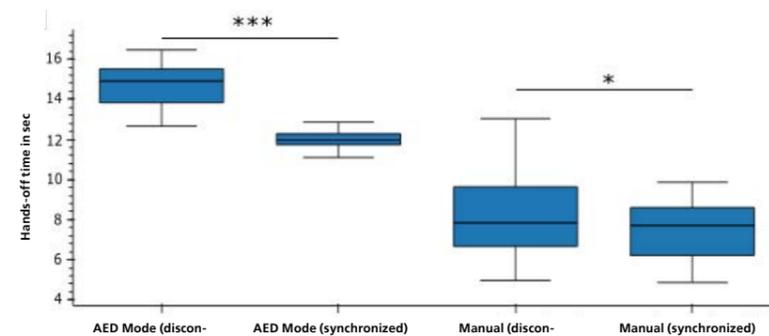
Guidelines have become an indispensable part of modern medicine. We have aligned the synchronisation between **corpuls3** and **corpuls cpr** to the basis of the current guideline recommendations according to Monsieurs et al. 2015, as high-quality chest compressions increase the patient's chance of survival:

- At least 5 cm **compression depth** (maximum 6 cm)
- Compression rate of **100-120 compressions/min**
- **Complete recoil** of the chest in between compressions
- After the application of a defibrillator, **defibrillation should not be delayed any further**
- **Chest compressions should be continued** while the defibrillator is charging
- **<10 sec interruption** before and after shock delivery
- The chest compressions should only be **minimally interrupted**, even for defibrillation attempts
- **Chest compression devices are recommended** when it is not practical to perform good manual compressions or the safety of the rescuer is compromised
- A pre-shock pause of 5–10 seconds already reduces the probability of a successful shock

# ABSTRACT STUDY

The ERC guidelines recommend the shortest possible compression interruptions during cardiopulmonary resuscitation. Before and after the shock delivery, chest compressions should be interrupted for a maximum of 10 seconds. A peri-shock pause (the compression break before and after defibrillation) of a maximum of 10 seconds has been scientifically proven to be associated with a higher survival rate (Cheskes et al. 2014; Sell et al. 2010). According to the ERC guidelines, the entire

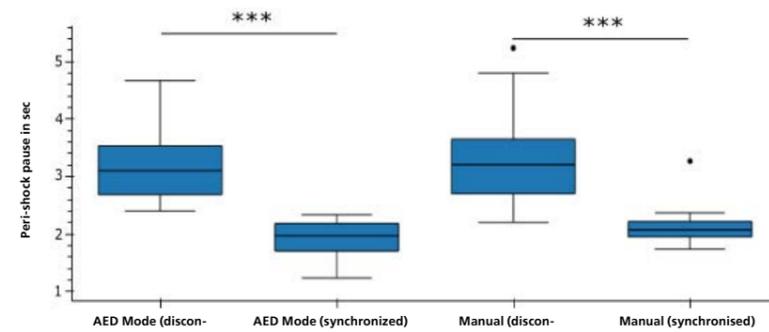
manual defibrillation process should be possible with a compression break of less than 5 seconds (Monsieurs et al. 2015). When using the **corpuls3** in combination with the **corpuls cpr** in an in-house study, these recommendations could be noticeably undercut. With the synchronisation of the **corpuls3** and the **corpuls cpr**, this endeavour could be further increased. With synchronized device operation, the hands-off time was reduced by 16.08%.



► Illustration 1: Representation of the hands-off time of our study comparing synchronized and disconnected device operation of the **corpuls3** and **corpuls cpr**. (Significance  $P < 0.001$ : \*\*\*;  $P < 0.05$ : \*)

The reduction in the compression pause is particularly evident during the perishock pause. On average, the perishock pause in synchronized mode of  $2.00 \pm 0.32$  s is 38.23% shorter than

the peri-shock pause in disconnected mode of  $3.24 \pm 0.71$  s. This saving can be a valuable gain in time with the desired break being a maximum of 5 seconds.



► Illustration 2: When comparing the peri-shock pauses, the significant minimization of the pause duration with synchronisation compared to disconnected device operation of **corpuls3** and **corpuls cpr** becomes particularly clear. (Significance  $P < 0.001$ : \*\*\*)

## References

Cheskes, Sheldon; Schmicker, Robert H.; Verbeek, P. Richard; Salcido, David D.; Brown, Siobhan P.; Brooks, Steven et al. (2014): The impact of peri-shock pause on survival from out-of-hospital shockable cardiac arrest during the Resuscitation Outcomes Consortium PRIMED trial. In: Resuscitation 85, S. 336–342. DOI: 10.1016/j.resuscitation.2013.10.014.

Kleinman, Monica E.; Brennan, Erin E.; Goldberger, Zachary D.; Swor, Robert A.; Terry, Mark; Bobrow, Bentley J. et al. (2015): Part 5. Adult Basic Life Support and Cardiopulmonary Resuscitation Quality. Circulation. 2015;132(suppl 2):S414–S435. In: Circulation 132 (18 suppl 2), S. S414–S435. DOI: 10.1161/CIR.0000000000000259.

Monsieurs, Koenraad G.; Nolan, Jerry P.; Bossaert, Leo L.; Greif, Robert; Maconochie, Ian K.; Nikolou, Nikolaos I. et al. (2015): European Resuscitation Council Guidelines for Resuscitation 2015: Section 1. Executive summary. Resuscitation 95 (2015) 1–80. In: Resuscitation 95, S. 1–80. DOI: 10.1016/j.resuscitation.2015.07.038.

Nolan, Jerry P.; Soar, Jasmeel; Zidean, David A.; Biarent, Dominique; Bossaert, Leo L.; Deakin, Charles D. et al. (2010): European Resuscitation Council Guidelines for Resuscitation 2010. Section 1. Executive Summary. In: Resuscitation 81 (10), S. 1219–1276. DOI: 10.1016/j.resuscitation.2010.08.021.

Perkins, Gavin D.; Olasveengen, Theresa M.; Maconochie, Ian; Soar, Jasmeel; Wyllie, Jonathan; Lockey, Robert Greif Andrew et al. (2017): ERC 2017 Guidelines Update. In: Resuscitation. DOI: 10.1016/j.resuscitation.2017.12.007.

Sell, Rebecca E.; Sarno, Renee; Lawrence, Brenna; Castillo, Edward M.; Fisher, Roger; Brainard, Criss et al. (2010): Minimizing pre- and post-defibrillation pauses increases the likelihood of return of spontaneous circulation (ROSC). In: Resuscitation 81 (7), S. 822–825. DOI: 10.1016/j.resuscitation.2010.03.013.



# corpuls simulation

## TRAIN BEFORE YOU FIGHT

There is often a big difference between theoretical scenarios and actual missions. With **corpuls simulation** we bring completely realistic scenarios to your training. Just as pilots training in a flight simulator are thrown surprise complications, rescuers

training with **corpuls simulation** have to overcome unforeseen situations. The result is a team that is optimally prepared for every scenario and therefore, a significantly better quality of care for the patient.

## SYNCHRONISATION THERAPY

Training not only means using existing knowledge, but also learning new techniques – that includes synchronized therapy with **corpuls3** and **corpuls cpr**. Thanks to the Bluetooth connection from **corpuls simulation**, this feature can now be trained realistically at any time. All usage scenarios and benefits can be optimally taught for use in the field: simply connect **corpuls simulation** with the **corpuls cpr** (from software version 1.2) and take your training to a whole new level.



*\* Using the combination of corpuls simulation and corpuls cpr only on training manikins*

### THE FACTS

- All the functions of the original device
- Realistic parameters and curves
- Status changes through events
- Scenario editor
- Simulation consumables
- Original accessories
- The latest device software for the respective medical products
- Multiple languages available
- Safe training
- corpuls simulation community
- Bluetooth connection to corpuls cpr

### THE ECONOMICAL SOLUTION

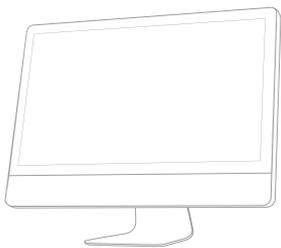
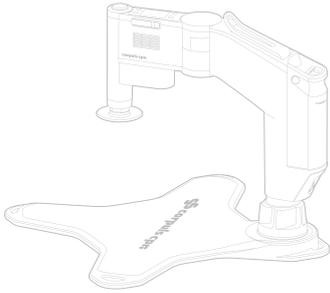
Training as with a high-end simulation manikin – but for a fraction of the price.

#### Display of:

- Different ECG rhythms
- Perfusion dependent SpO<sub>2</sub> curve
- NIBP parameters or IBP with curve
- etCO<sub>2</sub> parameters and waveforms
- CPR Feedback display

corpuls simulation in action – Find the video here.





For over 35 years, **corpuls®** has developed and produced innovative high-end equipment for emergency and intensive care medicine. Today, in our headquarters in Kaufering, over 300 hearts each beat around 60,000 times every work day while aspiring to meet the high standards of rescue workers from over 70 countries around the world.

**corpuls** defibrillators, patient monitoring systems and chest compression devices have set the standard since day one in the realisation of the most advanced insights in medical science, as well as in terms of innovation and ergonomics. Thus guaranteeing reliable and trusted aid in the fight for human lives.



Manufacturer:

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