

# CARL. Controller

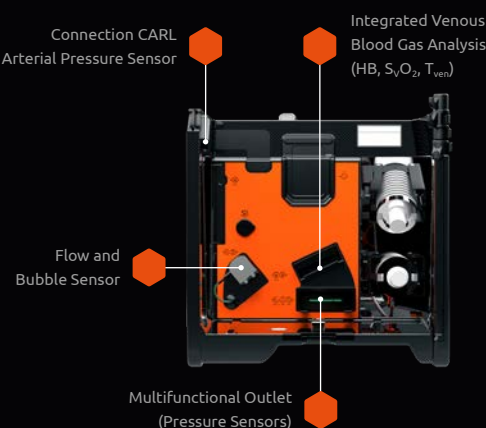
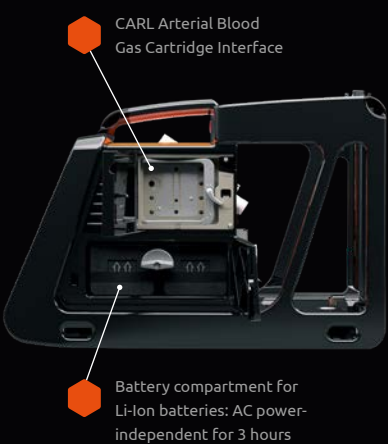
High-performance perfusion system for controlled extracorporeal cardiac and/or pulmonary support, especially for the treatment of patients requiring resuscitation.



# CARL. Controller

## KEY FEATURES:

- High-performance, automated dual pump control for high pulsatile blood flows
- Comprehensive measurement sensors with venous and arterial blood gas analysis as well as intra-aortic blood pressure monitoring through optionally integrable fiber-optic catheter
- Automated priming mode for de-airing of the CARL Reperfusion Set in a few minutes
- Intuitive and user-friendly operating interface with 8.4" touchscreen
- Emergency display



## SELECTED TECHNICAL SPECIFICATIONS:

Measurements (Length x Width x Height)	575 x 375 x 405 mm
Weight	16 kg
Blood Flow	1-8 l/min
Graphic User Interface	8.4", colour 800 x 600 pixels
Power Supply	100-240 Vac, 50 to 60 Hz
Battery Operation	Up to 4.5 hours
Interfaces	1x USB (data export via USB drive)
Sensors	<ul style="list-style-type: none"><li>• 1 Flow and bubble sensor</li><li>• 3 Pressure sensors via CARL Reperfusion Set</li><li>• Venous blood gas analysis (HB, S<sub>v</sub>O<sub>2</sub>, T<sub>ven</sub>)</li><li>• Arterial blood gas analysis via CARL Arterial Blood Gas Cartridge: pO<sub>2</sub>, pH, K, Na, Ca</li><li>• 1 Intra-aortic pressure sensor via CARL Arterial Pressure Sensor</li></ul>

## INTERFACES:

- CARL Reperfusion Set
- CARL Arterial Pressure Sensor
- CARL Arterial Blood Gas Cartridge
- CARL Cart
- CARL Rack

# CARL. Cart & CARL. Rack

## CARL Cart

Equipment trolley for intra-hospital transport and stationary use of the CARL System.

## CARL Rack

Transport bridge for the safe transport of the CARL Controller in emergency vehicles or ambulances.



# CARL. Cart

## KEY FEATURES:

- Easy intra-hospital transport of all hardware components of the CARL System
- Narrow design for efficient use in space-restricted scenarios (e.g. in hospital elevators)
- Oxygen cylinder holder (cylinder size 2-3 L)
- Medical 4-way socket strip
- Infusion Pole

## SELECTED TECHNICAL SPECIFICATIONS:

Measurements (Length x Width x Height)	74 x 61 x 95 cm
Weight	45 kg

## INTERFACES:

- CARL Controller
- CARL Cooler  
(with CARL Cooler fastening strap)
- CARL MOX via CARL MOX Wall Bracket
- Stationary hypothermia units from other manufacturers



# CARL. Rack

## KEY FEATURES:

- Ground-based transport of the CARL Controller on a patient stretcher
- Compatible with the following stretchers: Stryker M1, PowerPro XT, PowerPro TL

## SELECTED TECHNICAL SPECIFICATIONS:

Measurements (Length x Width x Height)	58 x 44 x 46.5 cm
Weight	12.9 kg

## INTERFACES:

- CARL Controller
- Stryker M1 Stretcher,  
PowerPro XT, PowerPro TL

**CARL.**  
A HEARTBEAT AHEAD

# CARL. Reperfusion Set

Compact Plug and Play tubing set for extracorporeal cardiac and/or pulmonary support with the CARL Controller, especially in resuscitation scenarios.



CARL.  
A HEARTBEAT AHEAD



# CARL. Reperfusion Set

## KEY FEATURES:

- Plug and Play for quick and easy start of therapy with the CARL Controller
- Automated de-airing via the CARL Controller with innovative priming bag in a few minutes
- Three integrated pressure sensors, no separate de-airing necessary, common connection using a multi-functional outlet plug
- Cuvette for measuring venous blood gases (temperature, hemoglobin, oxygen saturation)
- Integrated interface for intra-aortic pressure monitoring via CARL Arterial Pressure Sensor



## SELECTED TECHNICAL SPECIFICATIONS:

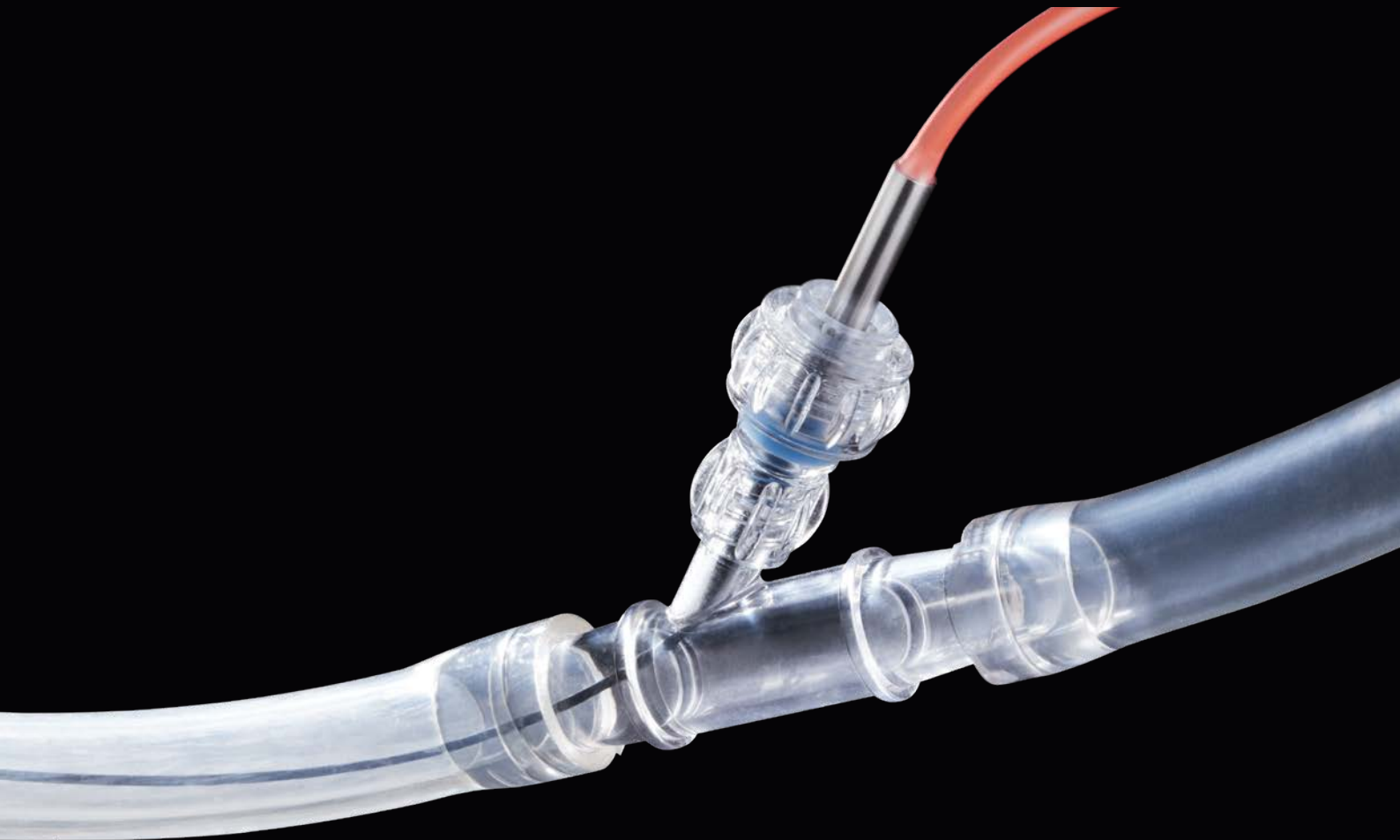
Priming Volume	890 ml
Pump Head Speed Range	0-10,000 U/min
Connection - blood	3/8"
Connection - water	3/8" Hansen coupling
Pressure Sensors' Measuring Range	-400 mmHg - 400 mmHg
Pressure Sensors' Measuring Accuracy	±1% 0-50 mmHg, ±3% 51-400 mmHg
Max. Usage Time	24 Hours

## INTERFACES:

- CARL Controller
- CARL Arterial Blood Gas Cartridge
- CARL Arterial Pressure Sensor
- CARL MOX
- CARL Cooler

# CARL. Arterial Pressure Sensor

Fiber-optic catheter for intra-aortic pressure measurement via the CARL Reperfusion Set with monitoring interface to the CARL Controller.



Position of CARL Arterial Pressure Sensor in the aorta

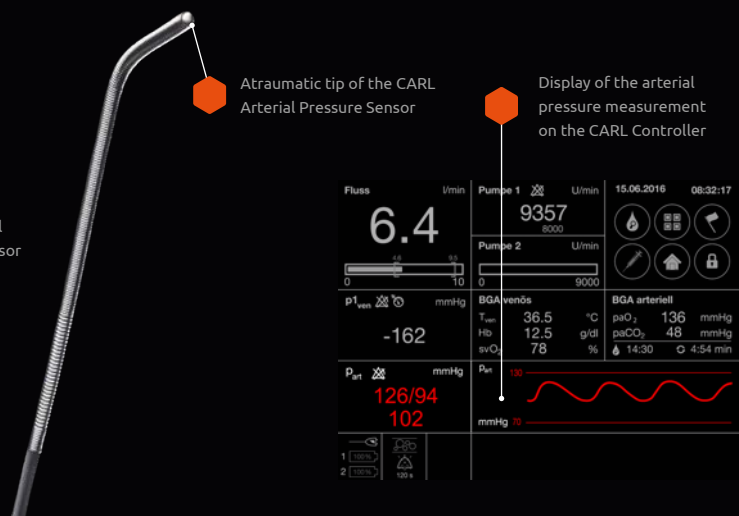
Arterial Cannula

Hemostasis Valve

CARL Arterial Pressure Sensor

The diagram illustrates the placement of the CARL Arterial Pressure Sensor. It shows a cross-section of the aorta with a cannula inserted. A hemostasis valve is positioned on the cannula. The CARL Arterial Pressure Sensor is shown as a small, curved device attached to the cannula. A callout provides a detailed view of the sensor's position within the aorta.

- Minimally invasive measurement of arterial blood pressure in the descending aorta
- Fiber-optic catheter integrated into Seldinger wire with 45° angled atraumatic tip for easy intravascular insertion
- Easy and fast implantation via the CARL Reperfusion Set using integrated 3/8-3/8" connector with a 45° Luer lock female and hemostasis valve, no separate puncture necessary
- Visualization of arterial blood pressure with the CARL Controller



Total Length	3511 mm
Insertion Length	769 mm
Diameter	1.2 mm
Measuring Range	0 mmHg to 300 mmHg
Measuring Accuracy	±7 mmHg (0 mmHg to 70 mmHg) ±10% (71 mmHg to 300 mmHg)
Max. Usage Time	6 Hours

- CARL Controller
- CARL Reperfusion Set



# CARL. Arterial Blood Gas Cartridge

Disposable cartridge for continuous measurement of arterial blood gas parameters with monitoring interface to the CARL Controller.



# CARL. Arterial Blood Gas Cartridge

## KEY FEATURES:

- Implementation of up to 25 measurements in variably selectable time intervals (1.5 min, 3 min, 5 min)
- Monitoring and display of the measured values via the CARL Controller
- Safe use due to one-way valve in the sample supply line. No transfer of air, calibration fluid or sample blood into the patient.



## SELECTED TECHNICAL SPECIFICATIONS:

Sample Volume	1-4 ml
Max. Usage Time	3 Hours
Measurement parameters	<p>Partial oxygen pressure (<math>p_aO_2</math>): 40-79mmHg <math>\pm 15</math> mmHg 80-150 mmHg <math>\pm 20</math> mmHg</p> <p>pH-value: 6.75-7.80 <math>\pm 2\%</math></p> <p>Potassium concentration (<math>K^+</math>): 1.5-10.0 mmol/L <math>\pm 10\%</math></p> <p>Sodium concentration (<math>Na^+</math>): 130-145 mmol/L <math>\pm 5\%</math></p> <p>Calcium concentration (<math>Ca^{2+}</math>): 0.5-1.4 mmol/L +0,1 mmol/L to -0,2 mmol/L</p>

## INTERFACES:

- CARL Reperfusion Set
- CARL Controller

# CARL. Cooler & CARL. Cooler Kit

## CARL Cooler

Mobile hypothermia unit for effective patient cooling in or outside of hospital.

## CARL Cooler Kit

Compact disposable initiating the endothermic cooling reaction.



# CARL. Cooler & CARL. Cooler Kit

## KEY FEATURES:

- Designed for use within and outside of hospital
- Up to 4 °C cooling capacity within a few minutes
- AC power-independent operation by means of a separate battery
- Cooling through endothermic dissolution of urea in water
- Contamination of the unit is not possible, water-bearing components are designed to be replaced after single use
- Alternating availability of the batteries in the CARL Cooler and CARL Controller for additional patient safety



CARL Cooler Kit



CARL Cooler Hardware  
in CARL Cooler Bag



CARL Cooler  
closed

## SELECTED TECHNICAL SPECIFICATIONS:

Cooling Circuit Flow Rate	0.8 l/min
Capacity	5 L
Cooling Capacity	Max. 3.8 kWh ( $\Delta T$ 4 °C < 30 min at approx. 80 kg body weight)
Measurements	630 x 375 x 405 mm
Weight	CARL Cooler Hardware: 17.8 kg CARL Cooler Kit: 6.5 kg
Connection - water	3/8"

## INTERFACES:

- CARL Reperfusion Set
- CARL Cart

# CARL. MOX & CARL. MOX Wall Bracket

## CARL MOX:

Mobile gas blender for controlled oxygenation and decarboxylation of patient blood in the extracorporeal circuit.

## CARL MOX Wall Bracket:

Holder for mounting the CARL MOX for use within or outside of hospital.



# CARL. MOX & CARL. MOX Wall Bracket

## KEY FEATURES:

- Precise control of oxygenation and decarboxylation (pO<sub>2</sub> and pCO<sub>2</sub>)
- Automated mixing of ambient air with oxygen from external oxygen source, no medical compressed air required
- Up to 4 hours of battery power for out-of-hospital use
- Variable mounting system for use in the ambulance or on the CARL Cart; compatible with standard rails measuring 25 x 10 mm according to DIN EN ISO 19054



CARL MOX in  
CARL MOX Bag



CARL MOX  
Wall Bracket

## SELECTED TECHNICAL SPECIFICATIONS:

Measurements (Length x Width x Height)	465 x 376 x 179 mm
Weight	6.8 kg
Display	7", colored   800 x 480 pixel
Power Supply	100 to 240 Vac   50 to 60 Hz
Batteries	2 of 14.4 Vdc Duration: 4 hours
Gas Flow	0-12 l/min 2-5 l/min ±250 ml/min From 5 l/min ±5%
O <sub>2</sub> Concentration	21% - 100% ±3%
Gas Connection O <sub>2</sub>	DISS

## INTERFACES:

- CARL Reperfusion Set
- CARL Cart
- Oxygen cylinder with pressure reducer (ZGA coupling according to DIN 13260)