

Aquarius™ System with Regional Citrate Anticoagulation

¹ Ronco, C et al. Management of fluid balance in CRRT: a technical approach. Int J Artif Organs 2005 Aug; 28(8): 765-76

² Ong et al. A continuous veno-venous hemofiltration protocol with anticoagulant citrate dextrose formula A and a calcium-containing replacement fluid. Int J Artif Organs 2014; 37

³ Tolwani, A. Speer, R. Stofan, B. Process for metabolic control and high solute clearance and solutions for use therein. 2012. US Patent 8147698 B2, 8-9.

CRRT (Continuous Renal Replacement Therapy), CVVH (Continuous Veno-Venous Hemofiltration), CVVHD (Continuous Veno-Venous Hemodialysis), CVVHDF (Continuous Veno-Venous Hemodiafiltration), TPE (Therapeutic Plasma Exchange), Hemoperfusion (Blood Detoxification).

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Nikkiso America Inc. 5910 Pacific Center Blvd. Suite 110 San Diego, CA 92121 USA
www.nikkisoabp.com

The device you expect with the support you deserve –

Fluid balance management

Principle

A balance alarm occurs when a +/- 50g (+/- 20g for pediatric) difference is detected between the target ultrafiltration volume and the actual ultrafiltration volume. The volume discrepancies are automatically compensated by the system when the pumps are reactivated by pressing the Balance Start / Stop key.



Fluid balance is a key aspect of the Continuous Renal Replacement Therapy (CRRT) prescription. The possibility of making fluid balance errors during CRRT has been identified since the beginning of CRRT¹.

With the automated Total Fluid Loss Management (TFL) feature, the Aquarius™ System with RCA provides total control over fluid balance and automatically corrects fluid balance variance back to zero, so that fluid balance discrepancies are eliminated. The TFL feature helps to reduce risks by avoiding fluid imbalance accumulation over time due to multiple balance alarms.

Renal Dose

The Aquarius™ System displays on the main screen the actual delivered dose in ml/kg/h. This allows the physician to review and adjust the programmed dose to achieve the desired treatment dose. This useful tool demonstrates, rather than estimates, effective therapy delivery through proficient management. The user is fully aware of the dose of treatment given to the patient.

Principle

At the start of treatment or after a programmed value change, the prescribed renal dose is displayed for the first 2 minutes.

After 2 minutes of uninterrupted therapy, the delivered renal dose is displayed based on the actual pump rates.

During treatment, patient weight can be entered and modified at any time.

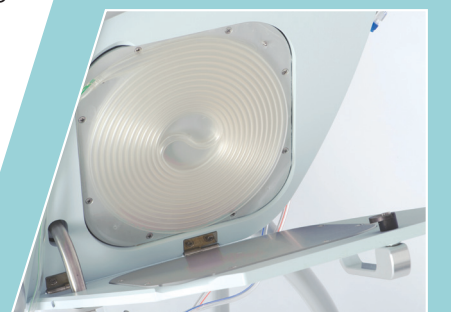
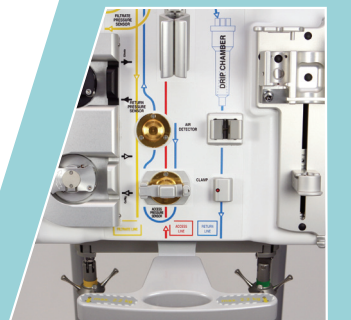


Aquarius™ System with RCA: Safe and easy to use

The Aquarius™ System integrates dual control and protection system processors that work continuously to help safeguard your patients. Alarm hierarchies alert clinicians if an out-of-range condition occurs and the Aquarius™ System responds simultaneously and automatically to help ensure patient safety.

The Aquarius™ System with RCA safety features includes the following safety features:

- **Clinician friendly** interface with on-screen illustrated set-up guides, detailed alarm messaging and help menus
- **Minimal intervention** due to self-correcting alarms, automated solution degassing unit and two rotating scales for connecting up to four substitution and filtrate bags of five liters
- **Automated Total Fluid Loss Management**
- **Actual Renal Dose**
- **Integrated calcium and citrate pumps**
- **Integrated fluid warmer** located before the treatment pumps
- **Rotating head** with status lights visible from both the front and back of the display
- **Battery backup** (for emergency blood return only) during power failure
- **Network:** the Aquarius™ System provides the possibility to download history files to an external computer or hospital data system via the optical ports located at the rear of the device.



Close to the natural way:

Convection with Aquarius™ RCA With ACD-A

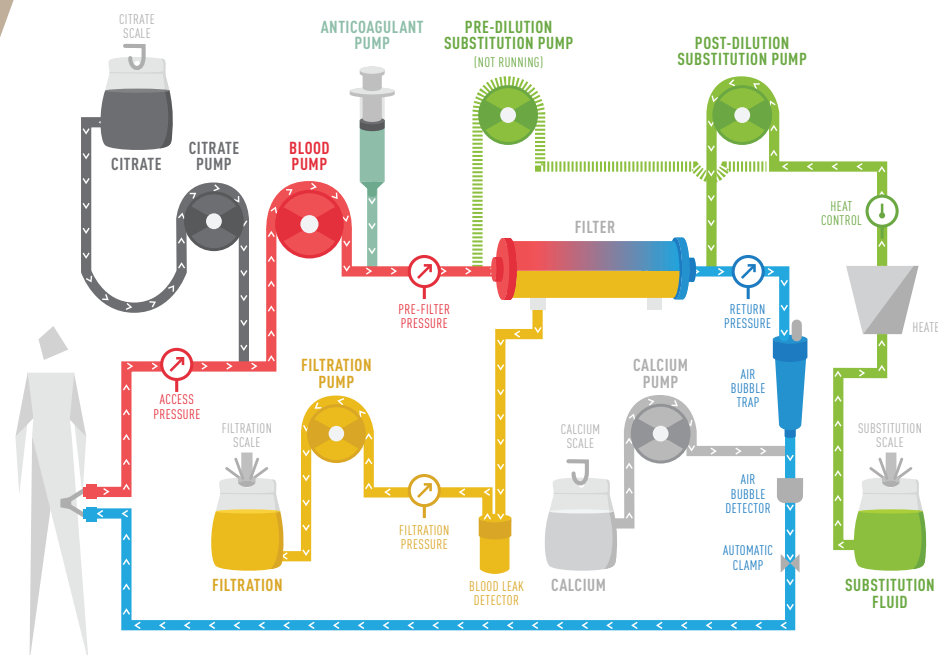
“The ideal Continuous Renal Replacement Therapy (CRRT) protocol should provide volume control, metabolic (acid-base and electrolyte) control, and adequate solute clearance, without significant complications related to bleeding or clotting and should be versatile to allow for independent adjustment of the above parameters.

Furthermore, the CRRT protocol should use standardized solutions and should not require more than two or three different types of solutions in order to minimize the strain on the compounding pharmacy and healthcare providers³.”

To perform an effective convection therapy, the Aquarius™ System with RCA has been designed to use CVVH post-dilution with citrate anticoagulation.

Convective therapy via the Aquarius™ System with integrated RCA requires the use of only two different solutions: a standard ACD-A solution and a bicarbonate and calcium containing substitution solution.

During CVVH post-dilution using citrate anticoagulation, ACD-A is infused before the blood pump and the substitution solution is administered after the filter. Most patients may not need additional calcium supplementation when using a substitution solution containing Calcium². If needed, it will be infused into the blood circuit just before the air detector system and after the drip chamber.



The selection and adjustment of therapy parameters, replacement fluids and anticoagulant fluids remains a prescription at the physician's discretion.

Simplicity combined with therapy flexibility

The Aquarius™ System with RCA provides prescription flexibility, simplicity and reliability for delivering your prescription:

- **Choice of different therapies:** CVVH, CVVHD, CVVHDF, TPE or Hemoperfusion
- **Choice of anticoagulant:** citrate (Therapeutic Plasma Exchange (TPE) or CVVH post-dilution) and/or heparin anticoagulation
- **Possibility of changing anticoagulation mode** from citrate to heparin during treatment, without changing the bloodline set
- **Choice of seven blood line and filter sets**
- **The ACD-A infusion is proportionally linked to the chosen blood pump speed rate** to achieve the intermediate dose of Citrate
- **Only one type of substitution solution** is needed for regular and citrate anticoagulation

Cost effective treatment

The Aquarius™ System with RCA requires the use of a standard citrate solution (ACD-A).

Using only one substitution fluid simply reduces nursing interruptions and handling requirements.

Most patients are unlikely to need additional supplementation² via the Aquarius™ Calcium pump.



Advanced integrated systems, education and support

Full range of products

Nikkiso Acute Blood Purification offers fully individualised treatment options with everything you need for a therapy. Our large portfolio is led by the Aquarius™ System with its range of catheters, solutions, bloodlines, hemofilters and plasmafilters.

World-class education

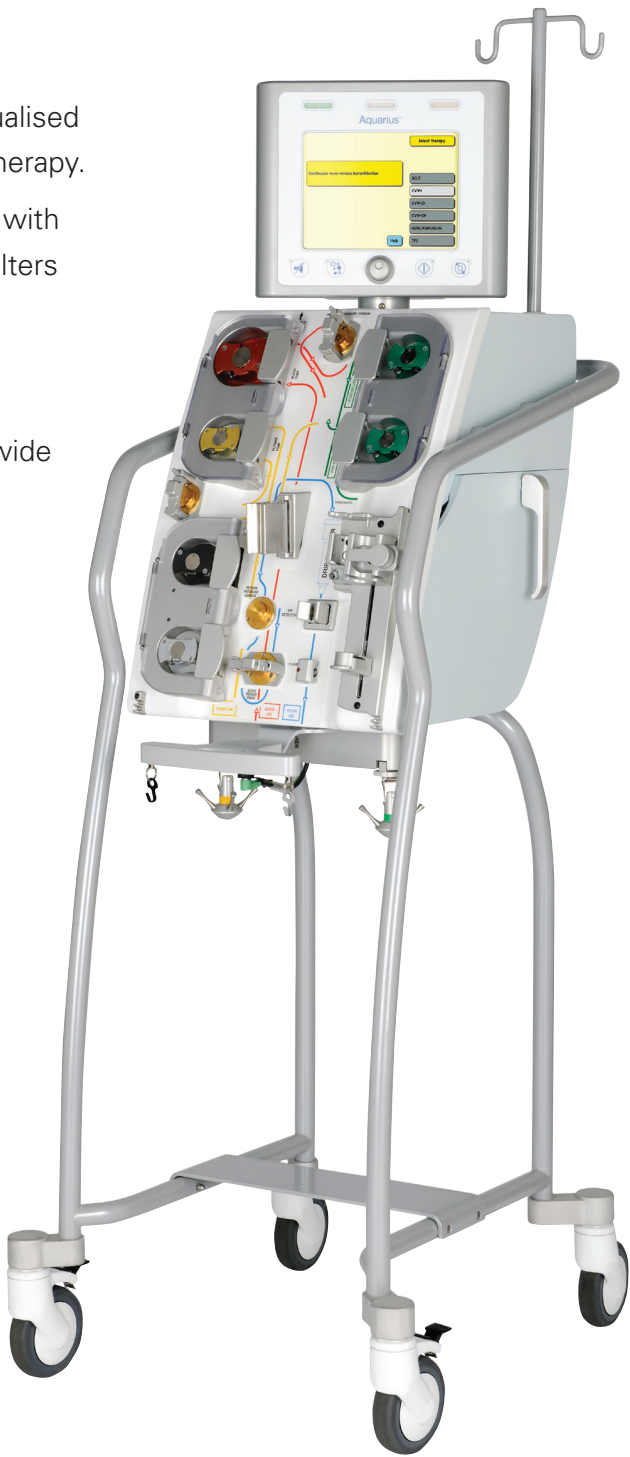
Our state-of-the-art education is well known worldwide for being tailored to each hospital's needs.

- Troubleshooting help available 24/7
- Bespoke training packages according to your team's experience and need
- Hands-on demonstration and practice with the Aquarius™ System

Exclusive technical support

The Aquarius™ System is paired with Nikkiso's exclusive technical assistance intended to treat patients quickly.

- 24/7 phone-based technical assistance*
- Dedicated Nikkiso field service engineers with ICU experience
- On-site diagnostic and repair services within 48 hours*
- Multiple service contract options



*in selected countries

Technical data

	Adult	Pediatric
Flow rate		
Blood pump	30 to 450 ml/min for all therapies except: TPE: 30 to 250 ml/min CVVH with RCA: 30 to 300 ml/min	10 to 200 ml/min
Pre-dilution pump (Disable with RCA)	0 or 100 to 10,000 ml/h	0 or 100 to 6,000 ml/h
Post-dilution pump	0 or 100 to 10,000 ml/h for all therapies except: RCA: 0 or 500 to 6,000 ml/h	0 or 100 to 4,000 ml/h
Dialysate pump	0 or 100 to 10,000 ml/h	CVVHD: 0 or 10 to 10,000 ml/h CVVHDF: 0 or 10 to 6,000 ml/h
Filtrate pump	0 or 100 to 12,000 ml/h for all therapies except: RCA: 0 or 100 to 8,800 ml/h	0 or 100 to 11,000 ml/h
Plasma	0 or 10 to 3,000 ml/h for all therapies except: RCA: 0 or 500 to 3,000 ml/h	0 or 10 to 1,200 ml/h
Patient fluid loss	SCUF: 0 to 2,000 ml/h CVVH, CVVHD, CVVHDF: -100 to 2,000 ml/h	0 or 10 to 1,200 ml/h
Citrate pump	0 or 20 to 500 ml/h	n/a
Calcium pump	0 or 2 to 300 ml/h	n/a
Scales		
Fluid balance alarm	±50g	±20g
Substitution / Filtrate scale max. Load	20kg	
Citrate scale max. Load	2.2kg	n/a
Fluid warmer		
Adjustable substitution temperture	0 (off) or 35°C to 39°C by 0.5°C	
Capacity	5 l/h	
Anticoagulant settings and intended use		
Heparin pump settings	0 or 0.5 to 15 ml/h, by 0.5 ml/h	
Heparin pump size	50ml	
Bolus function	0 or 0.5 to 2.5 ml by 0.5 ml	
Concentration of citrate	Between 136 and 148 mmol/l	
Concentration of calcium supplementation	Approx. 10 mmol/l to 20 mmol/l	
Pressure monitoring		
Access sensor	-250 to +200 mmHg	
Return sensor	-80 to +300 mmHg	
Pre-filter sensor	-500 to +800 mmHg	
Filtrate sensor	-400 to +800 mmHg	
Degassing unit		
Working range	-300 to +30mmHg	
Gas removal	At least 10 ml/min	
Dimenstions and weight		
H x W x D	175 cm (without I.V. pole) x 65 cm x 75 cm	
Floor space	55 cm x 65 cm	
Weight	Approx. 90 kg	
Detection parameters and monitor		
Air detector	Ultrasonic measurement: air bubbles at a volume of 1µ at a blood flow rate of 200 ml/h	
Blood leak detector	Measurement of clouding; 2 ml blood/1,000 ml filtrate at HCT 32%	
Display monitor	10.4" TFT color	
Processors	2 x CPU 80517 and 1 x Intel	
Electrical power supply voltage / current		
Voltage	230 V ~ (Alternating volatage) ±10% = 207 VAC to 253 VAC, 50/60 Hz	
Current / Power consumption	2.2 A / 500 VA with 230 V	