NIKKISO
Acute Blood Purification



# Aquarius™ System

## with Regional Citrate Anticoagulation

The device you expect with the support you deserve –

# Fluid balance management

## Principle

A balance alarm occurs when a +/-50 g (+/-20 g for paediatric) 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 CRRT[1].

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

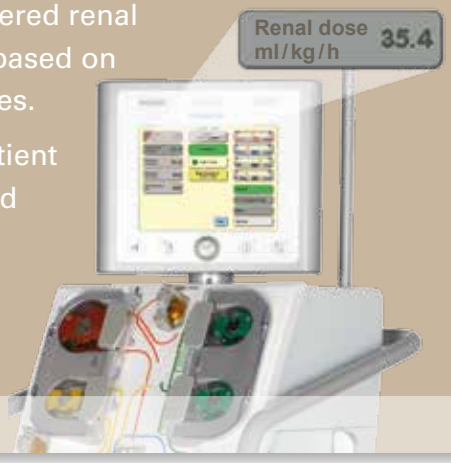
The Aquarius™ System displays on the main screen the actual delivered dose in ml/kg/h. This allows the physician to review and adjust the programmed dose to achieve the desired treatment dose. This useful tool demonstrates, rather than estimates, effective therapy delivery through proficient management. 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 modified at any time.



## Safeguarding your patients –

# Aquarius™ System with RCA

**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: patients' safeguarding features

- **Automated Total Fluid Loss Management**
- **Actual Renal Dose**
- **Integrated calcium and citrate pumps**
- **Integrated fluid warmer**
- **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
- **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 ability to download history files to an external computer or hospital data system via the optical ports located at the rear of the device.

## Naturally effective – 100% Convection

# Aquarius™ System with RCA

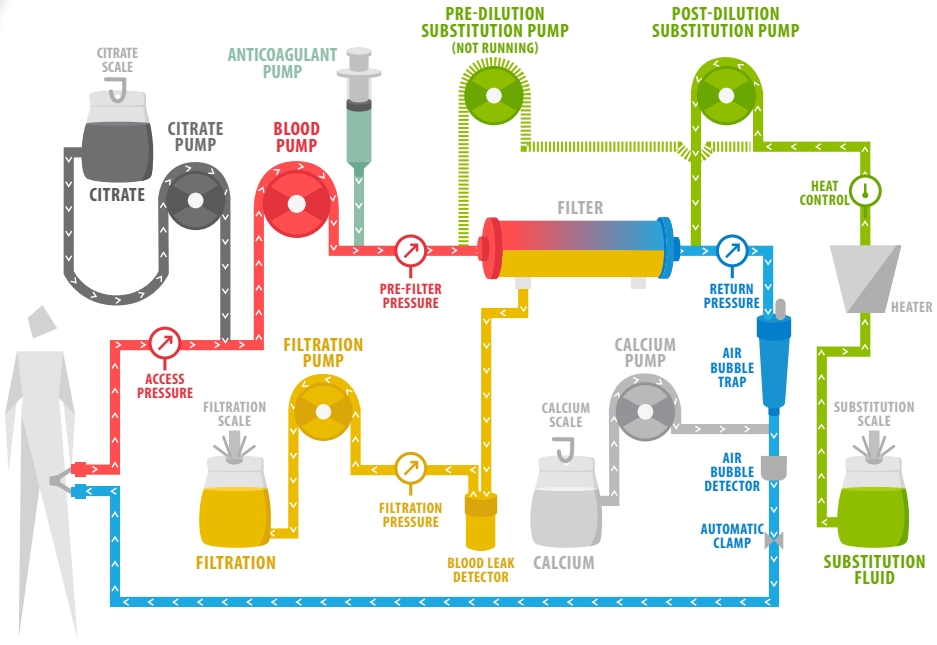
*"The ideal Continuous Renal Replacement Therapy (CRRT) protocol should provide volume control, metabolic (acid-base and electrolyte) control, and adequate solute clearance, without significant complications related to bleeding or clotting and should be versatile to allow for independent adjustment of 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 providers[3]."*

To perform an effective convective 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 will not require the use of specific replacement solutions, when combined with ACD-A.

During CVVH post-dilution using citrate anticoagulation, ACD-A is infused before the blood pump and the replacement solution is administered after the filter. Most patients may not need additional calcium supplementation when using a replacement solution containing Calcium[2]. 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 and reliability –

# Combined with therapy flexibility

**The Aquarius™ System** with RCA provides therapy 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 tubing set
- **Choice of seven filters** to use with one tubing set
- **The ACD-A infusion is proportionally linked to the chosen blood pump speed** to achieve the intermediate dose of Citrate
- **Only one type of replacement solution** is needed for regular and citrate anti-coagulation



## Cost effective treatment

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

Using only one replacement fluid helps to reduce nursing interruptions and handling requirements.

Most patients are unlikely to need additional supplementation[2] via the Aquarius™ Calcium pump.

# Advanced integrated systems –
## Tailored 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, tubing sets, 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*
- Tailored 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 support providing:

- 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 | Paediatric* |
|---|---|---|
| **Product Code GE-F095-00** (from SW 6.02.09 to 6.02.12) | | |
| **Flow Rate** | | |
| Blood pump | 30 to 450 ml/min for all therapies except:<br>TPE: 30 to 250 ml/min CVVH with RCA: 30 to 300 ml/min | 10 to 200 ml/min |
| Pre-dilution pump (Disabled 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:<br>RCA: 0 or 500 to 6,000 ml/h | 0 or 100 to 4,000 ml/h |
| The total flow rate resulting from the flow rates of pre-dilution and post-dilution pump must not exceed 10,000 ml/h. | | |
| Dialysate pump | 0 or 100 to 10,000 ml/h | CVVHD: 0 or 10 to 10,000 ml/h<br>CVVHDF: 0 or 10 to 6,000 ml/h |
| Filtrate pump | 0 or 100 to 12,000 ml/h for all therapies except:<br>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:<br>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<br>CVVH, CVVHD, CVVHDF: -100 to 2,000 ml/h | 0 or 10 to 1,000 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 | ±50 g | ±20 g |
| Substitution / Filtrate scale max. load | 20 kg | |
| Citrate / Calcium scale max. load | 2.2 kg | n/a |
| **Fluid warmer** | | |
| Adjustable substitution temperature | 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 0.1 ml / h | |
| Heparin syringe size | 50 ml | |
| 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 (in treatment mode)** | | |
| Access sensor | -250 to +350 mmHg | |
| Return sensor | +20 to +350 mmHg | |
| Pre-filter sensor | 0 to +450 mmHg | |
| Filtrate sensor | -400 to +450 mmHg | |
| **Degassing unit** | | |
| Gas removal | At least 10 ml / min | |
| **Detection parameters and monitor** | | |
| Air detector | Ultrasonic measurement: air bubbles at a volume of 1 µ 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 voltage) ±10% = 207 VAC to 253 VAC, 50 / 60 Hz | |
| Current / Power consumption | 2.2 A / 500 VA with 230 V | |
| **Dimensions 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 | |

* Paediatric therapies are currently available with anticoagulation from the integrated syringe driver or no anticoagulant.
Aquarius™ RCA with low volume capability is under development and scheduled for release in late 2017.

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[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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