NIKKISO

Hemodialysis System

DBB-EXA ES

CE 0123

Innovations for Human Care.

DBB-EXA ES

Vision

Enhancing treatment quality with ESsential treatment modality

DBB-EXA ES is a dialysis machine dedicated to online hemodialysis (online HD). With its **online** functionality, the DBB-EXA ES is designed to enhance treatment quality with essential treatment modality, **hemodialysis**, and to perform online priming, bolus and wash back in HD.

Its high-end usability and its wide range of features are achieved by integrating decades of NIKKISO's expertise.

More time for patient care

Save running costs

Reliability in hygiene

Achieve hemodynamic stability

Optimize treatment outcomes

Innovation in consumables

DBB-EXA ES

Solutions

D-FAS

Makes workflow simple

DBB-EXA ES with its Dialysis Full Assist System (D-FAS) **reduces nurse-machine interactions** by automations in priming, blood filling, bolus and wash back.

Online

Saves saline consumption

DBB-EXA ES uses **online prepared substitution fluid in priming, bolus, and wash back** thanks to the integrated double stage endotoxin retentive filter cascade. This can save on saline consumption as well as storage costs.

Haemo-Master

Manages hemodynamic instability

Haemo-Master measures relative blood volume (dBV) and Plasma Refilling Rate (PRR) to **regulate the ultra-filtration and dialysis fluid conductivity**.
This without the need for special consumables.

iNIBP

Reduces patient stress

With its innovative inflationary Non-Invasive Blood Pressure monitor (iNIBP), the DBB-EXA ES **measures blood pressure already during inflation**. Thus target inflation pressure is lower and measurement time is shorter when compared with conventional method.

Vascular Access Recirculation Rate Measurement

Manages vascular access

With its blood volume monitoring sensor (BVM), DBB-EXA ES **measures vascular access recirculation** rate and warns at any abnormality.

Kt/V

Helps securing dialysis dose

DBB-EXA ES incorporates a Dialysis Dose Monitor (DDM) to **measure dialysis dose (Kt/V) in real time**. Periodic calibration during dialysis is not required, thus not extending treatment time.

Archloop

Reduces blood air contact

Archloop™ is designed as a simple configuration that enables **easy handling and disposal cost savings**. In addition, its airless concept may **reduce blood coagulation reaction**.

Tranfers patient data contactless

Using the contactless patient card allows **download** of prescription data from card to machine, **saving** of treatment data on the card, or **transferring treatment data** to a data monitoring system.

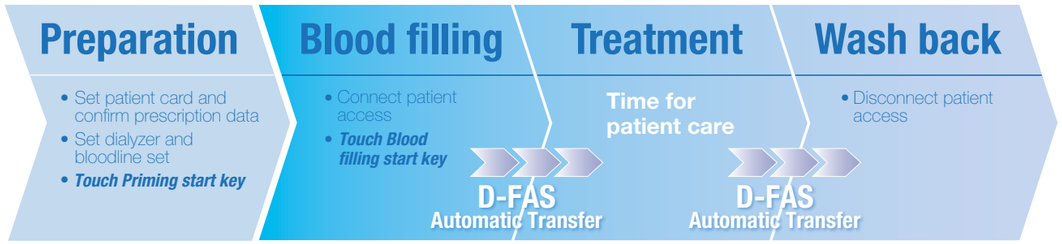
DBB-EXA ES
– More time for patient care

D-FAS

Makes workflow simple

Healthcare professionals in dialysis facilities have many tasks to complete such as entering prescribed treatment data, lining, priming, blood filling and wash back besides the primary role of patient care.

The Dialysis Full Assist System (D-FAS), which has been well-received since the DBB-EXA launch in 2015, **can simplify and automate user operations**. For example, an automatic transfer occurs from blood filling to treatment to wash back. As a result, it may be possible to significantly reduce operator errors and/or the risk of contamination.



Bringing nursing staff back to patient care.

Patient card

Patient prescription and treatment data of the last three sessions can be stored on the patient card. The operator places the patient card on the device before preparation so that the prescription data can be uploaded. After treatment completion the treatment data is automatically stored on the patient card. Patient treatment data of the last three sessions can be recalled at any time.

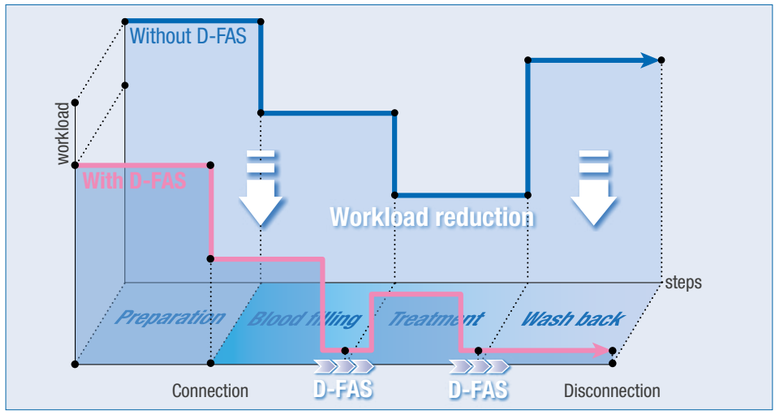
By utilizing the patient card, the prescription and treatment data recording is supported without the expense of installing a network.

A patient card that can record prescription data and the results of three treatments.

Automating routine tasks

The DBB-EXA ES in conjunction with D-FAS can significantly **reduce the operating time** the nurse spends in front of the machine as the manual inputs needed have been limited to the absolutely necessary.

Compared to the conventional machine DBB-06, without D-FAS, the time required for handling the machine is drastically reduced through automation. This is especially true during connection and disconnection, when the patient demands more attention from the nursing staff. **Thanks to D-FAS and the automated tasks, the nurse has the time to address the patients' needs.**



Graphical representation of the workload with and without D-FAS (example)

D-FAS priming

The operator installs the bloodline set and dialyzer, and then starts **D-FAS priming**. D-FAS **automatically** primes the extracorporeal circuit without operator intervention.

D-FAS blood filling

The operator simply connects the **arterial and venous** patient access and starts **D-FAS blood filling**.

D-FAS blood filling can remove the priming solution **automatically** through the dialyzer, therefore the patients' UF removal can be minimized.

D-FAS wash back

After the completion of the treatment, **D-FAS wash back** returns the blood in the extracorporeal circuit **automatically** through the arterial and venous patient access without any operator intervention. All the operator needs to do is simply disconnect the patient.

D-FAS emergency bolus

The operator can start the emergency bolus without handling the bloodline set. **D-FAS emergency bolus** can deliver **automatically** a pre-defined volume of substitution fluid to the patient – by only pressing the Start key.

Benefit

- Reducing operational steps in treatment phases.
- Minimizing nurse-machine interactions.
- Automations reduce operator errors and risks of contamination.
- Automatic priming, bolus and closed-circuit wash back either online or with saline.
- D-FAS blood filling with or without UF.

Value

With D-FAS, DBB-EXA ES automizes treatment processes to an optimum, bringing the patient care back into focus.

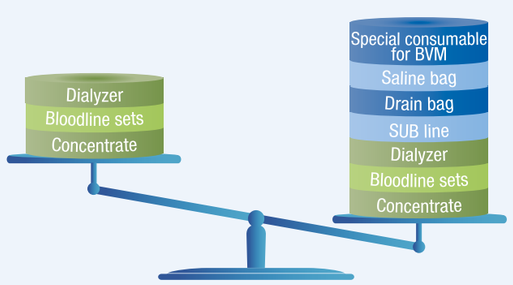
DBB-EXA ES
– Save running costs

Consumables consumption

The use of substitution fluid with DBB-EXA ES in priming, bolus and wash back **saves saline consumption**. This will eliminate the need for 156 saline and drain bags (1.000 mL) for priming, and 156 saline bags (500 mL) for bolus and wash back per patient/year*.

*The calculations were based on the assumption that 1.000 mL saline bags would be used for priming, while 500 mL bags would be used for bolus and wash back, and each patient would receive 156 treatments per year.

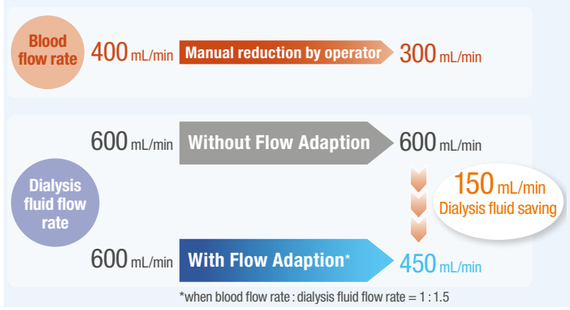
In addition, the Blood Volume Monitor (BVM) of DBB-EXA ES monitors relative blood volume change (dBV), plasma refilling rate (PRR) and vascular access recirculation **without any special consumables**. Information that is useful for dialysis treatment can be obtained without increasing running costs.



Dialysis fluid consumption

The feature **Flow Adaption** allows **automatic adjustment of dialysis fluid** flow rate if blood flow rate was changed, according to a pre-set ratio.

The Nikkiso duplex pump makes it possible to adjust dialysis fluid with 1mL/min increment to maximize dialysis fluid saving whilst maintaining the required dialysis dose.

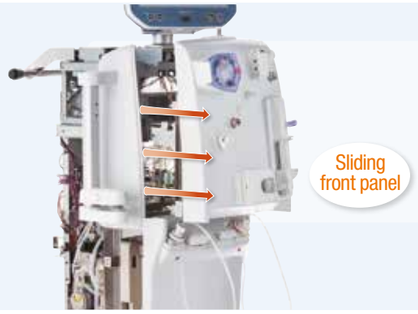


Maintenance costs

With inherited reliability and time-proven mechanical components of the DBB-series, DBB-EXA ES can **minimize maintenance costs** with simple preventive maintenance.

DBB-EXA ES incorporates on-screen technical diagnostics and easy to remove panels reducing down-time and improving serviceability.

A slide type front panel simplifies the maintenance access.



Benefit

- No need for saline and drain bag.
- Reduce logistics and disposal costs.
- Reduce dialysis fluid consumption.
- Reduce cost and space for storage.

Value

With its integrated features and its online functionality for online priming, bolus and wash back in HD, DBB-EXA ES noticeably reduces total cost of ownership.

DBB-EXA ES
– Reliability in hygiene

Online

Saves saline consumption

Online port

The shape of the online port is designed to **secure disinfection** especially for the parts that may have contact with the bloodline set. This makes it less likely for a bloodline set to come into contact with non-disinfected parts, thereby reducing the risk of contaminants entering the dialysis fluid.


Online Port

Endotoxin retentive filter

DBB-EXA ES integrates double stage endotoxin retentive filter cascade. This makes the **dialysis fluid quality** equivalent to the quality of the substitution fluid, and thus the ability to perform online priming, bolus and wash back in HD.

The filters are conveniently accessible from the front and automatically drained when replacement is required, thereby reducing disposal weight and simplifying the replacement process.


Endotoxin retentive filters

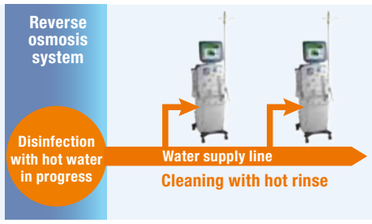
Clean coupling®

To maintain dialysis fluid purified, it is necessary to prevent contamination of dialyzer couplings. Whilst designing our latest Clean coupling®, we improved its inner structure to ensure that the dialyzer connections and the rest of its interior (even in the furthest corners) are thoroughly cleaned. **This protects dialysis fluid from being contaminated through coupling.**


Clean coupling cross-section

Hot rinse

The DBB-EXA ES can be programmed to switch on during the reverse osmosis loop heat disinfection. This facilitates the uptake of the hot feed water to **clean the inlet water supply tube** to the machine, ensuring clean feed water supply.



Drain port

The DBB-EXA ES incorporates a drain port **negating the need of a waste bag** during online or saline priming. This reduces labor and waste and is friendly on the environment.


Drain Port

Benefit

- Double stage endotoxin retention filters ensure continuous substitution fluid quality in HD treatments.
- Ensure effective disinfection of “points of contacts” between blood side and dialysis fluid side.

Value

The intelligent designs of hydraulic circuit, online port and dialyzer coupling strongly contribute to cross-contamination prevention and thus to less hospitalizations.

DBB-EXA ES
– Achieve hemodynamic stability

Haemo-Master ***Manages hemodynamic instability***

iNIBP ***Reduces patient stress***

Body water distribution in the human body

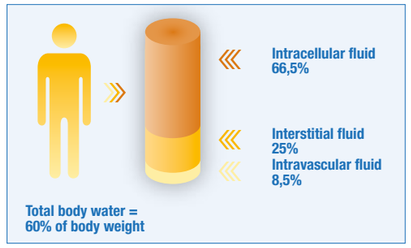
Total body water is distributed between the **intracellular** fluid compartment (66,5 %), the **interstitial** fluid compartment (25 %) and the **intravascular** fluid compartment (8,5 %).[1]

UF rate and Plasma Refilling Rate

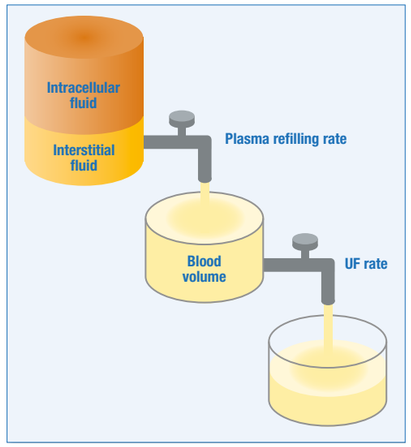
Ultrafiltration during dialysis treatment is exclusively from blood plasma. Fluid **volume reduction** of blood caused by UF **initiates plasma refilling** from other compartments to recover fluid volume.

Hypovolemia and Hypotension

If plasma refilling rate (PRR) is lower than UF rate to an inappropriate level, **hypovolemia** occurs and may result in blood pressure drop – **hypotension**[2]. Hypotension is still one of the most common complications of dialysis. It occurs in up to 30 % of dialysis sessions and is mostly followed by symptoms like cramps, nausea and vomiting[3]. Hypovolemia is the main initiator of hypotension[4]. Thus, it is essential to monitor changes in blood volume (dBV) and plasma refilling to manage hemodynamic instability.



Distribution of fluids in human body



Fluid balance between different compartments

Three approaches to manage hemodynamic instability

1 Monitoring of changes in Blood Volume (dBV) and Plasma Refilling Rate (PRR)

Monitoring of dBV and PRR is performed with the **Blood Volume Monitor (BVM)** sensor which transmits light near the infrared spectrum through the bloodline. Changes in red blood cells concentration mainly caused by UF influence the reflected light. The intensity of this light is measured and **dBV and PRR are continuously monitored**.

Monitoring of dBV and PRR mirrors the dynamic of fluid status of patient during the treatment. Both dBV and PRR are displayed graphically, allowing medical staff to timely intervene (e.g. by reducing UF rate or by triggering a blood pressure measurement) in case dBV or PRR curve strongly decreases.

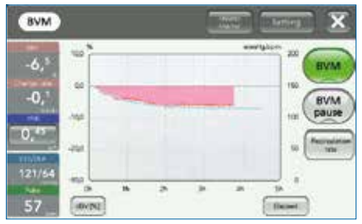
2 Haemo-Master – Automatic biofeedback system

Haemo-Master is a biofeedback system that aims at keeping patient hemodynamically stable. In the first treatments with Haemo-Master, a patient-specific ideal dBV curve is created. Afterwards, Haemo-Master controls both UF rate (BV-UFC)* and dialysis fluid conductivity (BV-COC)** to keep dBV following the ideal trajectory of dBV curve that was especially established for the patient. In contrast to BV-UFC that has a direct impact on blood volume by altering UF rate, BV-COC indirectly influences blood volume. BV-COC modifies the dialysis fluid conductivity, affecting changes in plasma sodium concentration, and thus influencing the plasma refilling capacity.

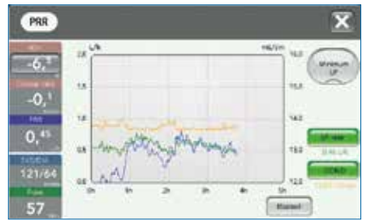
Studies performed on dBV based biofeedback system show **reduction in the incidence of hypotensive episodes** and the frequency of symptoms during the treatment.[5-7]

Depending on settings, Haemo-Master is able to use only UF control, conductivity control, or both UF and conductivity control.

A control example of Haemo-Master is depicted in the right figure below. At approximately 1h30 of treatment PRR starts to decrease (blue curve). To prevent hypovolemia and strengthen refilling capacity, Haemo-Master starts at the same time to reduce the UF rate (green curve) and to increase the conductivity (orange curve).



Patient-specific progression curves showing relative blood volume change (dBV)



Patient-specific progression curves showing Plasma Refilling Rate (PRR), UF rate (BV-UFC) and dialysis fluid conductivity (BV-COC)

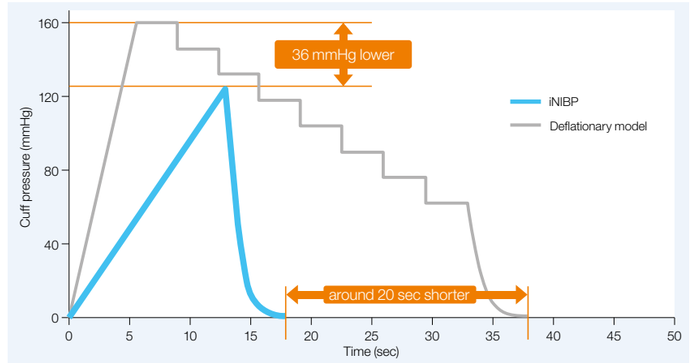
Plasma Refilling Rate (PRR)
UF rate (BV-UFC)
Dialysis fluid conductivity (BV-COC)

* BV-UFC: Blood volume ultrafiltration rate control
** BV-COC: Blood volume conductivity control

3 Intelligent Blood Pressure Monitoring

In contrast to the conventional blood pressure monitoring during deflation (BPM – grey line), the inflationary Non-Invasive Blood Pressure monitoring (iNIBP – blue line) gradually increases cuff pressure whilst simultaneously **measuring pulse oscillations during inflation**. The cuff pressure is immediately released once systolic pressure is detected. Therefore, when compared to conventional deflationary method a study including 64 cases and 323 measurements showed that the iNIBP measurement time is shorter (by ~ 20 sec.) and target inflation pressure is lower (by ~ 36 mmHg), maximizing patient comfort.[8]

Independent from the blood pressure measurement technique used (BPM or iNIBP), the DBB-EXA ES **reduces the UF rate** and blood pump speed to customizable values **if SYS blood pressure alarm setting is reached**, contributing to hemodynamic stability of patient during the treatment.



Benefit

- Innovative, comfortable and quick blood pressure measurement.
- BVM provides a closed view into refilling dynamics.
- No special consumables needed.
- Haemo-Master automatically regulates refilling dynamics to prevent hypotensive episodes and hospitalizations.

Value

BVM, Haemo-Master and iNIBP support medical staff to keep patient hemodynamically stable, to reduce pain for patient, stress for medical staff and patient, and thus releasing time for emergency nursing.

DBB-EXA ES
– Optimize treatment outcomes

Helps vascular access management

The vascular access is the link between the patient and the extracorporeal blood circuit. Since the effectiveness of dialysis treatment depends, among other things, on the amount of purified blood, vascular access can be considered as the patient's lifeline, to which special attention should be paid.

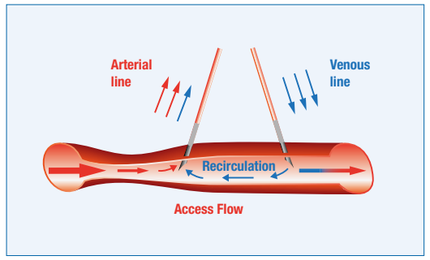
Recirculation

Blood that has already been purified can return to the extracorporeal blood circuit without having previously saturated itself with metabolic end products. **This is called recirculation.**

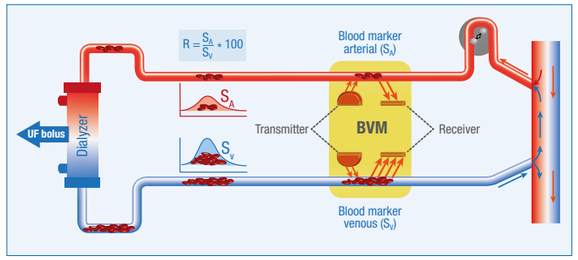
Many factors (invisible for the operator) can influence recirculation in the vascular access. Abnormalities, such as reduced arterial blood flow or obstruction in venous side can result in extracorporeal blood flow being higher than the real vascular access blood flow.

However, there are other factors that can lead to recirculation, such as inadvertent swapping of the bloodline connections, unfavorable needle positioning, or too short a distance between the needles, to name just a few.

The *vascular access recirculation rate measurement* feature for detection and monitoring of recirculation is an outstanding tool to ensure a long-term assessment of vascular access.



Example of recirculation caused by vascular access stenosis

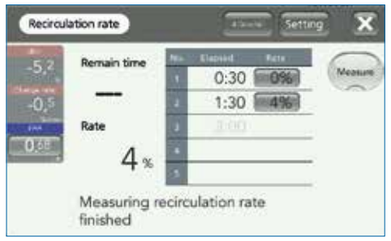


Recirculation rate – Measurement principle

Protecting vascular access

The **recirculation rate measurement system** is based on the Blood Volume Measurement (BVM) hardware that is used in the DBB-EXA ES. It is a double measuring system in the arterial and venous bloodline. If access recirculation exists, a blood marker produced by rapid ultrafiltration as a mass of concentrated blood in the extracorporeal venous line occurs in the arterial line. The rate of vascular access recirculation is calculated by the ratio of the integration of the arterial variation (Sa) to that of the venous (Sv) using the equation:

Vascular access recirculation rate (%) = Sa / Sv × 100



Recirculation rate – Schedule and results

Up to five automated measurements per treatment can be scheduled. Manual initiation of the measurement is also possible.

The special measurement method allows recirculation measurement in the treatment modalities HD and ISO-UF **without any blood dilution or infusion and without special consumables**. This also applies when using double-lumen catheters.

Helps securing dialysis dose

Positive long-term prognosis & higher quality of life

Several studies have proven that a positive long-term prognosis and improved quality of life (QOL) of patients **depend on the actual delivery of dialysis dose**.[9-11]

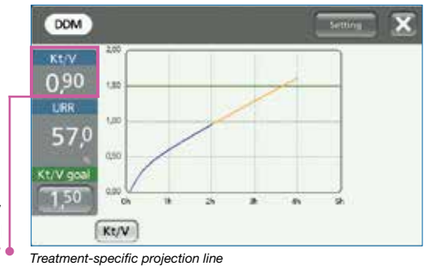
Insufficient clearance performance may have various reasons, a. o.:

- No counter flow of blood and dialysis fluid in dialyzer due to incorrect connection
- Vascular access recirculation
- Secondary membrane formation and / or dialyzer clotting
- Frequent alarms of dialysis machine which shorten effective treatment time
- Reduced effective blood flow

Reaching treatment goals

Reaching the individual treatment goals **can only be achieved by continuously monitoring the current status.** At the same time, necessary adaption of treatment parameters must be considered.

By using the Dialysis Dose Monitor (DDM), measured Kt/V is displayed in graphic form with a projection line. **Deviations from the treatment goal may be timely recognized and treatment parameters may be adjusted.**

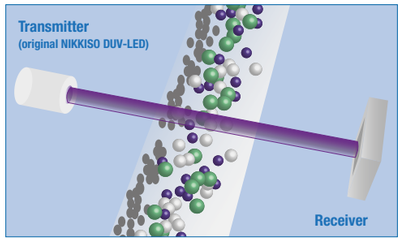


K, Kt, Kt/V and eKt/V are **numerically** displayed by pressing this **key**

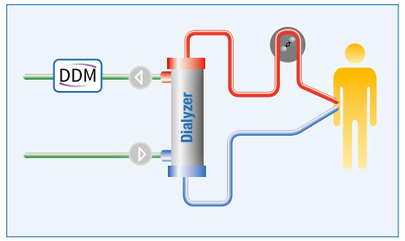
Treatment-specific projection line

Measurement principle of the DDM

A sensor located directly in the spent dialysis fluid measures the absorbance at a wavelength which directly correlates with patient blood urea nitrogen (BUN) concentration.[12] The continuously measured values are inserted in the formulas for single pool Kt/V (spKt/V) (based on Daugirdas) and for urea reduction ratio (URR). The results are **immediately** displayed.



Measurement principle with DUV-LED



Location of the module directly in the drain system

Benefit

- Timely recognition of anomalies in vascular access.
- Real-time monitoring of dialysis dose.
- Recognize treatment inconsistencies.

Value

Vascular access recirculation rate measurement and dialysis dose monitoring are indispensable components for a dialysis treatment. They assist healthcare professionals adjusting treatment parameters to achieve an optimum treatment outcome.

DBB-EXA ES
– Innovation in consumables

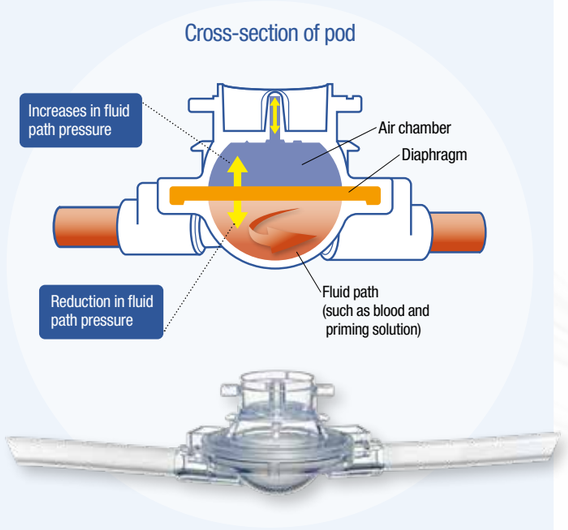
Archloop™ *Bloodline set*

Archloop™ is our novel bloodline set introducing directly mounted and easy to install Pressure Oscillating Diaphragms (PODs). Archloop™ has a small contact area between blood and air, a small priming volume and a low weight.

Archloop™ *installed on DBB-EXA ES*

Archloop™ *– A detailed closed view*

- Archloop™ measures venous pressure and arterial pressure via their respective pods.
- The pods are directly mounted onto the DBB-EXA ES and are easy to install.
- The diaphragm is a barrier between the blood path and an air chamber. If venous pressure or arterial pressure changes during dialysis treatment, the diaphragm moves, resulting in a change in the pressure applied to the air chamber.
- The DBB-EXA ES senses changes in the pressure applied to the air chamber and measures venous and arterial pressure.

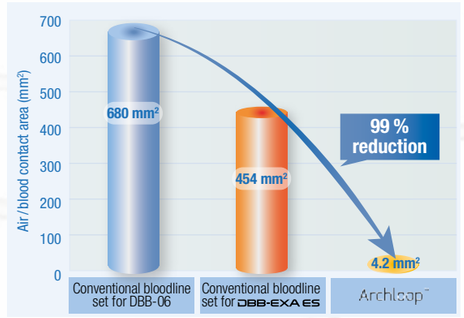


Reduction in the contact area between blood and air

Archloop™ has pods instead of pressure monitor lines on arterial and venous chambers. Archloop™ has no chamber on the arterial side, and the venous chamber is designed to be completely filled with blood without any air buffer.

This **will reduce the contact area between blood and air by 99 %** in comparison to our conventional bloodline set for DBB-06 (AV06JA-P).

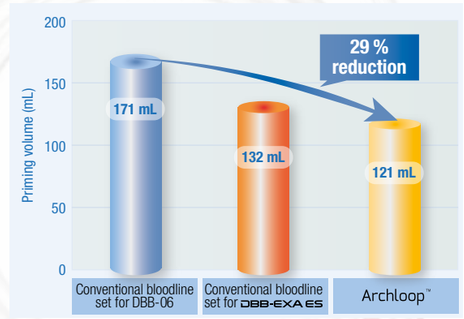
Reduction of contact between blood and air is reported to lead to less coagulation[13].



Reduction in priming volume

Using a simpler configuration without the chamber on the arterial side as well as a smaller venous chamber reduce the priming volume significantly.

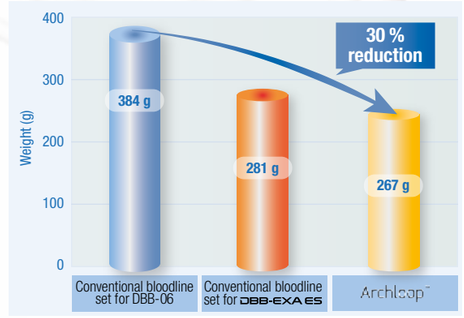
The priming volume is 29 % smaller compared to our conventional bloodline set for DBB-06 (AV06JA-P).



Reduction in weight

- A simple configuration design has made the Archloop™ **30 % lighter in weight** than our conventional bloodline set (AV06JA-P). If transportation and disposal costs are determined on a weight basis, significant savings can be achieved.
- The simple configuration design of Archloop™ has **increased the number of units per box by 17 %*** compared to conventional bloodline set models.

*This is based on the comparison of AV06JA-P (24 sets) with Archloop™ (AL-ADC-P) (28 sets).



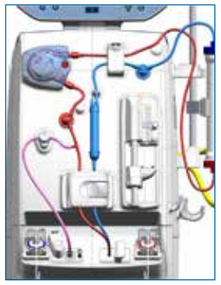
Benefit

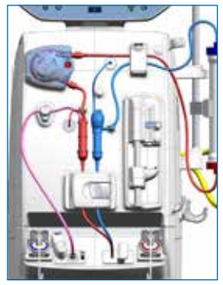
- Reduction in blood-air contact area by 99 %.
- Reduction in priming volume by 29 %.
- Reduction in weight by 30 %.
- Increase in package content by 17 %.

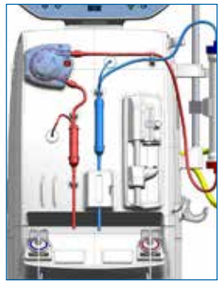
Value

Archloop™ is designed to help preventing extracorporeal coagulation and thus to help reduction in heparinization. With its low weight and compact design, Archloop™ is eco-friendly and strongly contributes to reduction in total cost of ownership.

DBB-EXA ES
– A rich line-up of options







- ● standard feature
- ○ option
- – not available

Features	DBB-EXA ES with Archloop and D-FAS	DBB-EXA ES with D-FAS	DBB-EXA ES Basic
D-FAS	●	●	–
Bloodline set	Archloop™	ES-series	open
Pressure Transducer Connection	POD	Luer-Lock	Luer-Lock
Saline empty detector	●	●	–
Blood Volume Monitor*	○	○	–
Endotoxin retentive filter (ETRF)	double	double	single
Drain port	●	●	–
Online port	●	●	–
Central Concentrate Supply	○	○	○
Dialysis Dose Monitor	○	○	○
Water leak detector	○	○	○
Blood Pressure Monitor (conventional)	○	○	○
Blood Pressure Monitor (inflationary Non-Invasive Blood Pressure Management – iNIBP)	○	○	○
NFC (Patient card incl. connector plate)	○	○	○
Disinfectant canister holder	○	○	○
Rear handle	○	○	○
Tray	○	○	○
Concentrate canister holder	○	○	○

* incl. Vascular Access Recirculation Rate Measurement

Specifications*

General data

Dimensions	150 x 43 x 50 (H x W x D in cm) Base: 45 x 61 (W x D in cm)
Weight	Approx. 80 kg (incl. all options)
Water supply	Pressure: 1 to 7 bar
Drain	Minimum drain capacity: 800 mL/min average Height: 92 cm maximum Temp.: 90 °C maximum
Concentrate supply	Pressure: 0 to 0.5 bar
Power supply	220 to 240 VAC ±10 %, 50 to 60 Hz ±1 Hz
Battery	Ni-MH battery 24 V / 3200 mAh
External connection port	External output (Staff call) External input 1, External input 2 Network BPM start switch USB 2.0 or 3.0
Monitor	15 inch LCD

Hydraulic circuit

Dialysis fluid flow rate	Setting range: Single ETRF 300 to 800 mL/min Double ETRF 300 to 700 mL/min
Dialysis fluid temperature	Setting range: 33.0 to 40.0 °C
Dialysis fluid conductivity	Bicarbonate dialysis Bicarbonate conductivity setting range: 2.3 to 7.0 mS/cm Accuracy: ±0.1 mS/cm Total conductivity setting range: 12.7 to 15.2 mS/cm Accuracy: ±0.2 mS/cm Acetate dialysis Total conductivity setting range: 12.7 to 15.2 mS/cm Accuracy: ±0.2 mS/cm
Blood leak detector	Method: Optical Sensitivity: 0.3 mL Blood / 1 L Dialysis fluid (Blood: Hematocrit 32 ± 2 %; Dialysis fluid temperature: 37 °C)
Ultrafiltration	UF rate: 0.00; 0.10 to 4.00 L/h UF accuracy (Balance): ±30 mL/h (at dialysis fluid flow rate 300 to 500 mL/min) ±0.1 % of the dialysis fluid flow rate (at dialysis fluid flow rate 501 to 800 mL/min)
Dialysis Dose Monitor	Measurement principle: Absorptiometry Applicable treatment mode: HD Applicable Kt/V range: 0 to 3.0 Kt/V monitoring accuracy: ±0.1 (Kt/V 0 to 1) ±10 % (Kt/V 1 to 3) eKt/V: 0 to 30 Applicable URR range: 0 % to 100 % URR monitoring accuracy: ±5 %
Endotoxin retentive filter (ETRF)	EF-02D

Treatment options

Single needle treatment	Single needle single pump treatment SN control pressure: Upper limit: +200 mmHg Lower limit: +50 mmHg
UF profiles	9 programmable profiles available
Conductivity profiles	9 programmable profiles available

* Those specifications may differ depending on the ordered configuration.

Extracorporeal circuit

Arterial pressure monitoring	Measurement range: -300 to +500 mmHg Measurement accuracy: ±10 mmHg or ±5% ±15mmHg or ±5% (-300 to +200mmHg, atmospheric pressure: 78 to 106kPa)
	With Archloop: Measurement range: -200 to +500 mmHg Measurement accuracy: ±10mmHg or ±5% ±15mmHg or ±5% (-200 to +50mmHg, atmospheric pressure: 70 to 106kPa) ±30% or ±5% (+50 to +200mmHg, atmospheric pressure: 70 to 106kPa)
Venous pressure monitoring	Measurement range: -300 to +500 mmHg Measurement accuracy: ±10 mmHg or ±5%
	With Archloop: Measurement range: -200 to +500 mmHg Measurement accuracy: ±15mmHg or ±5% (-200 to +500mmHg)
Single needle pressure	Measurement range: -200 to +600 mmHg Measurement accuracy: ±10 mmHg
Air detector	Method: ultrasonic waves Sensitivity: 0.02 mL (normal air bubbles) (at blood flow rate: 250 mL/min) 0.0003 mL (microbubbles: blood/air mixture) (at blood flow rate: 250 mL/min)
Arterial blood pump	Setting range: 40 to 600 mL/min Flow rate accuracy: set value ±10 % (inlet Pressure -150 mmHg ≦ P ≦ +150 mmHg) Set value -20 to 0 % (inlet Pressure -200 mmHg ≦ P < -150 mmHg)
Heparin pump	Setting range: 0.0 to 9.9 mL/h Output rate accuracy: set value ±10 % Syringe type: 30 mL or 20 mL Bolus volume: 0.0 to 9.9 mL
Blood Pressure Monitor (BPM)	*For standard BPM:* Pressure display range: 10 to 300 mmHg Pressure display accuracy: less than ±3 mmHg Measurement range: Adult systolic blood pressure (SYS): 60 to 250 mmHg Mean arterial pressure (MAP): 45 to 235 mmHg Diastolic blood pressure (DIA): 40 to 200 mmHg Pulse rate: 40 to 200 beats per minute
	For iNIBP: Pressure display range: 0 to 300 mmHg Pressure display accuracy: Less than ±3 mmHg Measurement range: Adult systolic blood pressure (SYS): 40 to 280 mmHg Mean arterial pressure (MAP): 10 to 280 mmHg Diastolic blood pressure (DIA): 10 to 235 mmHg Pulse rate: 30 to 200 beats per minute
Blood Volume Monitor (BVM)	Measurement principle : near-infrared reflection method Applicable blood flow rate range: 40 to 600 mL/min Applicable hematocrit range: 15 to 50 % Accuracy: ±2.3 dBV % (double needle)

Cleaning program

Disinfection and decalcification	50 % citric acid DIALOX (peracetic acid)
Disinfection and degreasing	Sodium hypochlorite solution (maximum 10 %)
Decalcification	30 % acetic acid

Configurations

Patient card	MIFARE Classic 4K Capacity: 4096 byte

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Inherited reliability

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