
QUADROX-i Neonatal & Pediatric
Maximum safety
for the smallest patients.

MAQUET
GETINGE GROUP





Safe, high-performance oxygenators for the smallest patients

Maquet ranks as one of the world's leading suppliers of medical technology for therapies and infrastructure in operating rooms, catheterization laboratories and intensive care units. Maquet sets new standards worldwide with its innovative modern products, including those for extra-corporeal circulatory support. The therapy systems are tailored to the demands of the increasingly complex field of cardiovascular engineering. Well equipped to meet all its customers' requirements, Maquet helps to support the interests of the most vulnerable patients.

Neonates and children place the highest demands on oxygenators: A low priming volume is extremely important in order to maintain the lowest possible level of hemodilution. The special features of QUADROX-i Neonatal and Pediatric from Maquet are a wide flow range, high gas transfer rates and low blood-side flow resistance, which is typical of all QUADROX-i oxygenators.

In addition, the integrated arterial filters with their tried and tested separate pre- and postfilter de-airing system ensure still greater safety during surgery. They are easy and safe to handle and, at the same time, considerably smaller than comparable external filters.¹

Maquet has taken up this special challenge.

With the QUADROX-i Neonatal, Maquet supplies the smallest oxygenator with integrated arterial filter in the world.¹

Maquet | The Gold Standard



¹ Data on file

Highest demands on team and equipment. Low priming volume, high-performance!

Congenital heart defects are the most frequent reason* why heart-lung machines are used during operations on children. Many of these operations are highly complex, take several hours and require the very best in terms of performance from both the surgical team and their equipment.

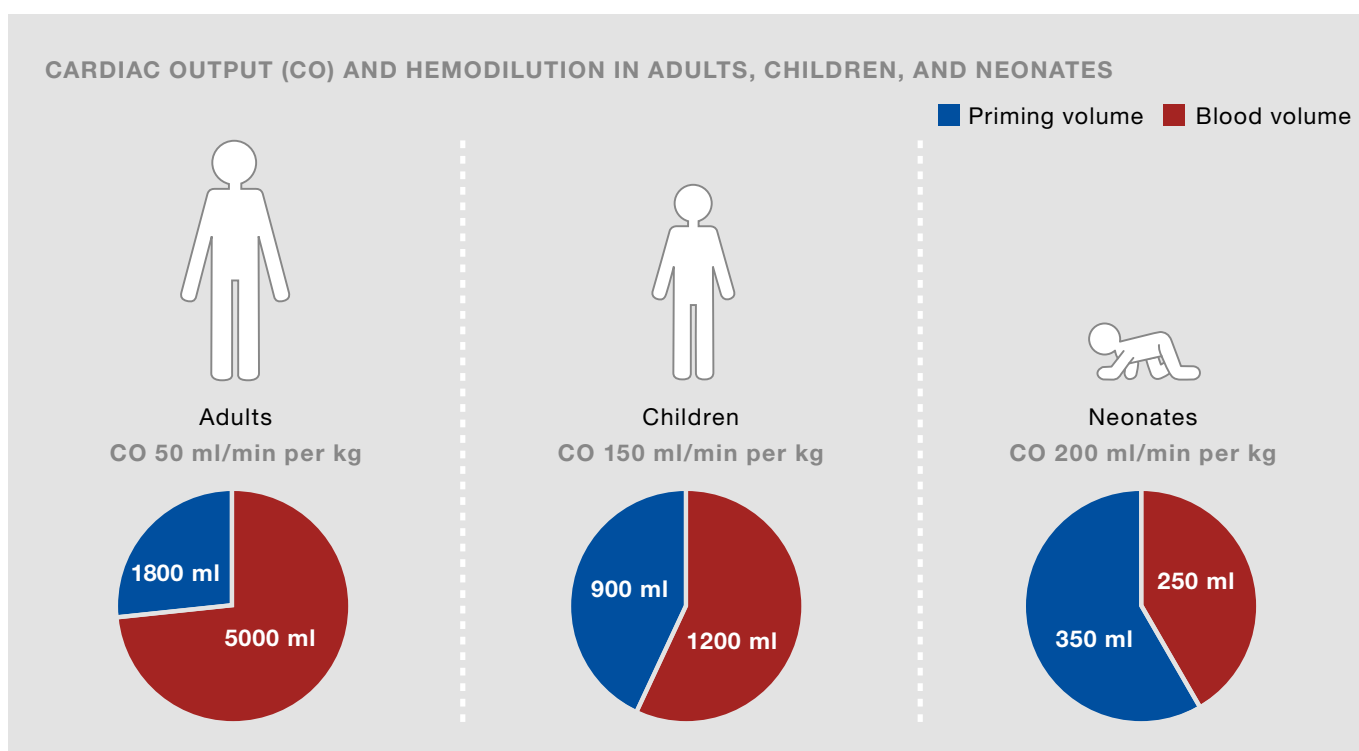
Children are not young adults: The cardiac output per kilo of bodyweight is up to four times greater in neonates than in adults. Therefore a pediatric oxygenator has to do much more in relation to its size. This is evident in hemodilution during extracorporeal circulation. Even in systems with optimized volumes, the surgical team for a neonate is faced with five times the amount of hemodilution.

TPU hollow fibers: Operations are often carried out under deep hypothermia. An efficient heat exchanger is needed in order to reach the target temperature as quickly as possible. Thanks to their high-performance TPU hollow fibers, QUADROX-i Neonatal and Pediatric oxygenators set new standards here too.

Safety is the topmost priority in pediatric perfusion: Microbubbles and particles can be highly dangerous and cause serious complications and injury if they are not adequately eliminated. Children are particularly susceptible to microembolisms. Efficient integration of the arterial filter plus intelligent reservoir design from Maquet provide additional support for the surgical team in critical situations.

SOFTLINE Coating: Contact with foreign surfaces means blood proteins and cells can be adsorbed and the coagulation system activated. As a result, thromboses and inflammations can form, which pose a particular risk to children.* For this reason, QUADROX-i Neonatal and QUADROX-i Pediatric come with SOFTLINE Coating as standard. The polymer coating reduces cell adhesion, cell activation and activation of the coagulation and complement systems, thereby helping to enhance the hemocompatibility of the oxygenators.*

* Data on file



Gentle, safe, and efficient, the QUADROX-i design principle.

Progressive technology combined with a unique design:

The hollow fibers in the QUADROX-i oxygenators are not wound in the conventional way, but arranged in mats and accurately woven with extremely fine threads in a more complicated procedure. The fiber mats are all set at an angle of 90° to one another and stacked in a pile, reducing the amount of overlap to a minimum and thereby optimizing the use of the available fiber surface.

Gas exchange in QUADROX-i: The QUADROX-i oxygenators contain two chambers. In the first chamber, gas fiber mats made of microporous polypropylene are alternated with heat exchange mats made of polyurethane. The blood is temperature-adjusted, oxygenated and de-carboxylized. The second chamber contains only gas fiber mats which are similarly arranged at an angle of 90° to one another. The number and arrangement of the mats are determined by the blood flow widths of the particular model, so guaranteeing optimal performance, foreign surface and priming volume.

As it passes through the mats, the blood is gently circulated, using the available surface more efficiently than it does in any other oxygenator.* In this way, the QUADROX-i Neonatal and the QUADROX-i Pediatric achieve high blood flow rates of 1.5 l/min and 2.8 l/min respectively, together with low priming volumes of only 40 ml and 99 ml, including arterial filter.

Result: The unique design of the QUADROX-i oxygenator combines effective use of the transfer surface with optimum hydrodynamic properties, as indicated by the low pressure drop. This is of particular benefit to neonates and children, since low priming volume and low hemolysis alongside a high flow width are the decisive factors in pediatric perfusion. The Volume Efficiency Index¹ demonstrates these benefits clearly.

* Data on file

¹ Volume Efficiency Index: Quotient of the maximum blood flow rate in ml/min and the static priming volume in ml

VOLUME EFFICIENCY INDEX

Neonatal

QUADROX-i Neonatal MAQUET	39.47
CAPIOX® RX 05 Terumo ²	34.88
Dideco D100 SORIN Group ³	22.58
HILITE® 1000 MEDOS ⁴	17.54

Pediatric

QUADROX-i Pediatric MAQUET	34.57
CAPIOX® RX 15 "R30 Reservoir" Terumo ²	29.63
Dideco D101 SORIN Group ³	28.74
HILITE® 2800 MEDOS ⁴	28.57

² Terumo product brochure reference number CV01FXFAMD-0209FKFK-I2(02.09)E | ³ SORIN product brochure reference number 09294-47 - 04/09
⁴ MEDOS product brochure online at http://www.medos-ag.de/content/download/PDF/Hilite/Oxygenatoren/HILITE_DE_A4.pdf. Accessed 04/2010

Safety in the smallest spaces. Integrated arterial filters.



Separate de-airing before and after filtering makes filling the QUADROX-i Neonatal and Pediatric oxygenators quick, simple, and safe.

Filter technology ensures safety:

The advantage of an arterial filter in terms of eliminating microbubbles and particles is undisputed. However, such filters have not been widely used until now because conventional, separate arterial filters increase the priming volume of the set, sometimes by more than ten percent. With total priming volumes of 40 ml in the QUADROX-i Neonatal and 99 ml in the QUADROX-i Pediatric, these are the two worldwide smallest combinations of oxygenator and arterial filter for their respective areas of application.

Safe de-airing: Despite the small volume, the filter design enables separate pre- and postfilter de-airing. This not

only ensures quick, easy filling, but also additional safety. If, in an extreme situation, air should indeed get into the oxygenator, it will be reliably eliminated by means of several downstream mechanisms. It can escape through the venous de-airing membrane or reach the gas side through the microporous fibers, following the drop in pressure. If air reaches as far as the arterial side of the oxygenator, it will be efficiently separated from the blood by the filter and can easily be returned to the reservoir. Moreover, the direct integration of the arterial filter is perfectly tailored to the blood flow dynamics. Additional pressure drop is minimal.





The venous cardiotomy hardshell reservoirs VHK 11000 and VHK 31000



Total flexibility: The venous inlet, the cover with the suction connections and the entire reservoir can each be rotated independently.

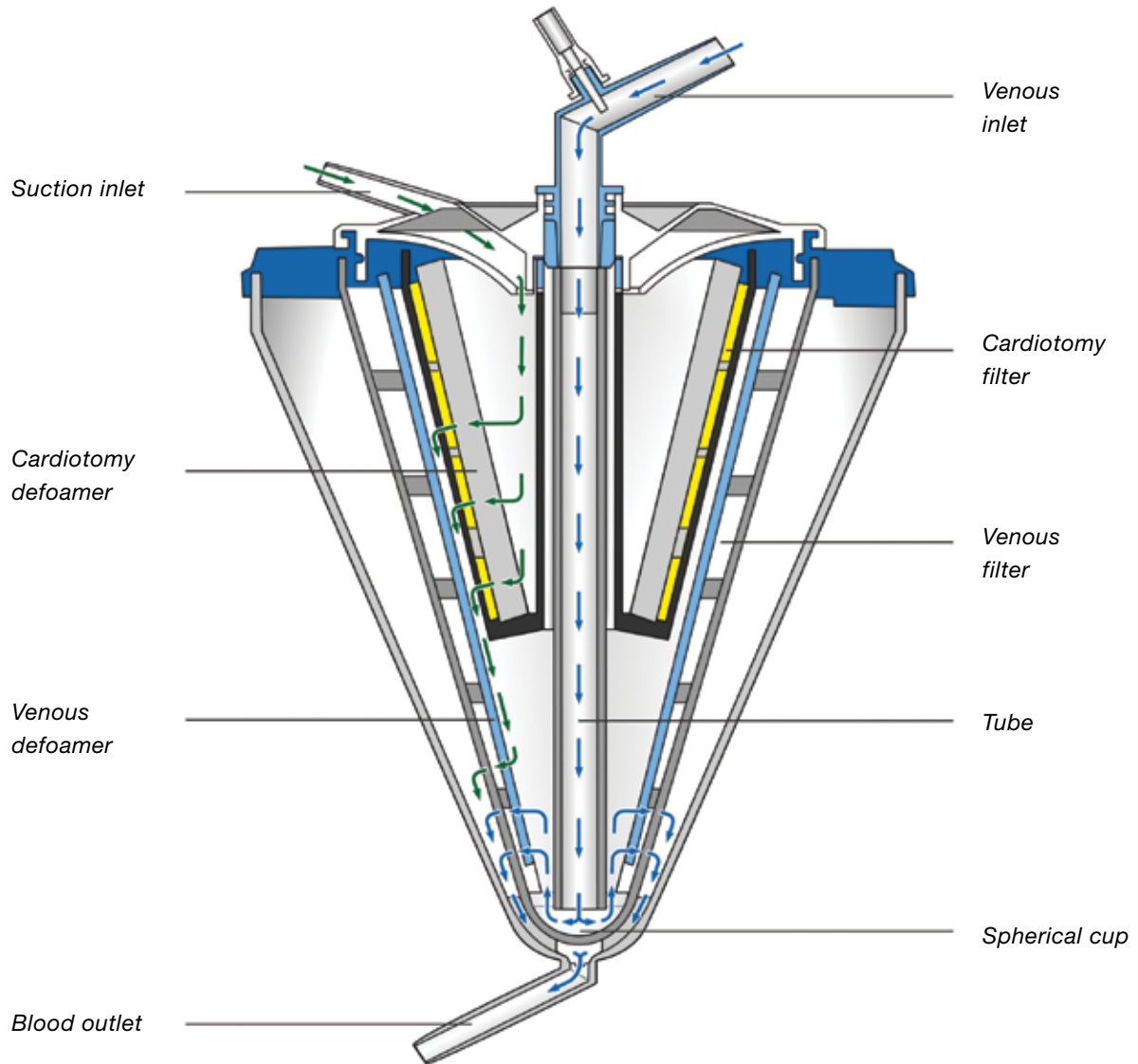
Innovative design without compromise: The unique funnel shape facilitates a high blood level at low volumes. A tube takes the venous blood down into a spherical cup. Air bubbles are efficiently removed from the venous blood at the edge of the spherical cup before the blood passes through the venous filter and reaches the outlet. This ensures the surface of the blood remains undisturbed by waves and eddies despite the high rates of flow.

The VHK 11000 and VHK 31000 reservoirs are vacuum-tight and equipped with pressure relief and negative

pressure valves. This means they can be used for vacuum-assisted venous drainage and are also suitable for use as post-operative drainage and auto-transfusion reservoirs.

Maximum compatibility: Maquet always ensures product compatibility, above all where children are concerned. This is why both QUADROX-i Neonatal and QUADROX-i Pediatric and the respective reservoirs contain no DEHP plasticizers. Both reservoirs are optionally available with SOFTLINE Coating or BIOLINE Coating.

A **cross-section** gives a clearer picture.
The venous cardiotomy hardshell reservoirs.

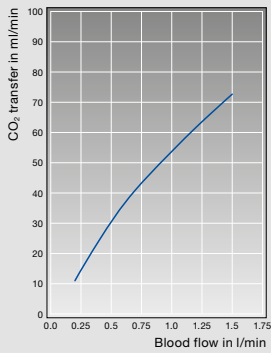


Technical data	VHK 11000	VHK 31000
Maximum priming volume	800 ml	1700 ml
Minimum operating volume	15 ml	30 ml
Pore sizes cardiotomy filters	Volume filter: 40 µm Screen filter: 33 µm	Volume filter: 40 µm Screen filter: 40 µm
Pore size venous filter	64 µm	64 µm
Venous blood inlet and outlet	1/4", reducible to 3/16"	Inlet: 3/8", Outlet: 1/4"
Suction inlets	3 x 1/4" 3 x 3/16"	4 x 1/4"
Luer lock venous	1 + 1 flexible	1 + 1 flexible

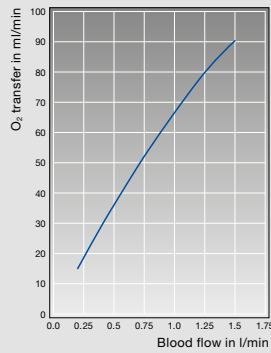
Facts and figures

Performance data at a glance

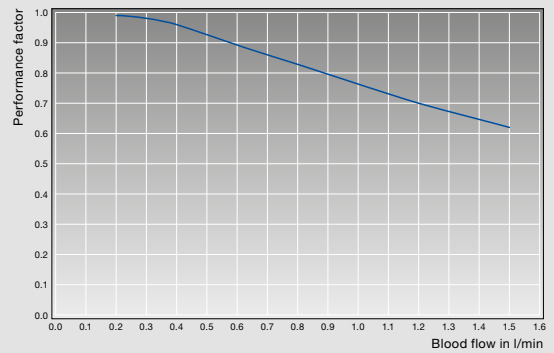
CO₂ QUADROX-i Neonatal



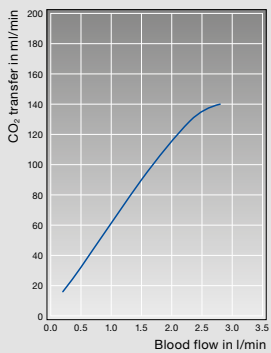
O₂ QUADROX-i Neonatal



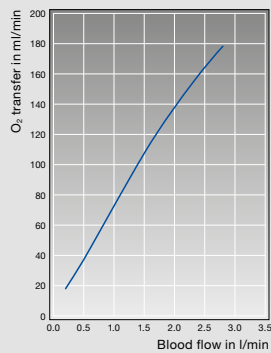
Heat exchanger efficiency QUADROX-i Neonatal (at 10 l/min water flow)



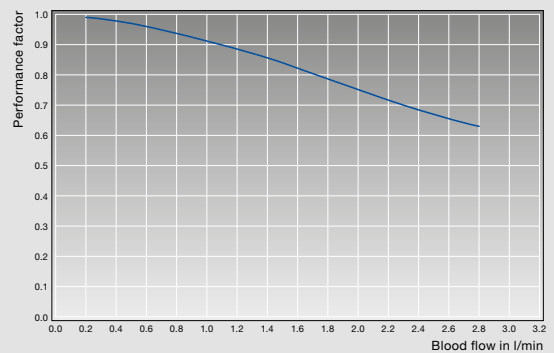
CO₂ QUADROX-i Pediatric



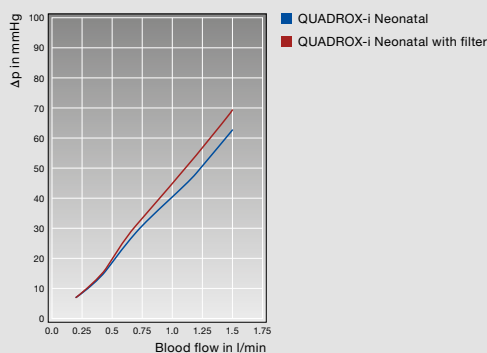
O₂ QUADROX-i Pediatric



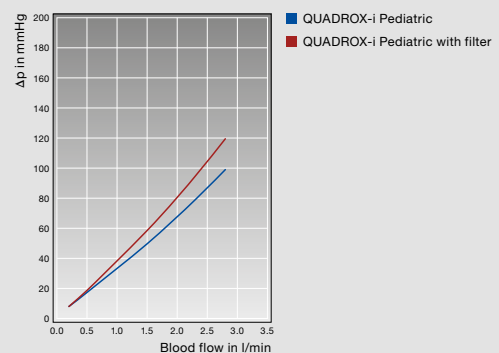
Heat exchanger efficiency QUADROX-i Pediatric (at 10 l/min water flow)



**Pressure drop
Δp QUADROX-i Neonatal**



**Pressure drop
Δp QUADROX-i Pediatric**



Full details at a glance

QUADROX-i Neonatal and Pediatric with accessories

Technical Data QUADROX-i Neonatal and Pediatric	QUADROX-i Neonatal	QUADROX-i Pediatric
Maximum blood flow rate	1.5 l/min	2.8 l/min
Static priming volume	38 ml	81 ml
Static priming volume incl. arterial filter	40 ml	99 ml
Filter medium pore size	33 µm	33 µm
Surface area of gas transfer fibers	0.38 m ²	0.8 m ²
Surface area of heat exchanger	0.07 m ²	0.15 m ²
Blood inlet and outlet size	1/4", reducible to 3/16"	1/4", reducible to 3/16"
Microporous fiber material	Polypropylene (PP)	Polypropylene (PP)
Heat exchanger fiber material	Polyurethane (TPU)	Polyurethane (TPU)

QUADROX-i Neonatal	Type	Article No.	Quantity
QUADROX-i Neonatal without integrated arterial filter*	HMO 10000	70104.6979	4 units/box
QUADROX-i Neonatal with integrated arterial filter*	HMO 11000	70104.7003	4 units/box
Neonatal venous hardshell cardiomy reservoir	VHK 11000	70104.8596	1 unit/box
QUADROX-i Neonatal without integrated arterial filter and VHK 11000*	VKMO 10000	70105.0109	1 unit/box
QUADROX-i Neonatal with integrated arterial filter and VHK 11000*	VKMO 11000	70104.9279	1 unit/box

QUADROX-i Pediatric	Type	Article No.	Quantity
QUADROX-i Pediatric without integrated arterial filter*	HMO 30000	70104.7005	4 units/box
QUADROX-i Pediatric with integrated arterial filter*	HMO 31000	70104.7006	4 units/box
Pediatric venous hardshell cardiomy reservoir	VHK 31000	70104.8595	1 unit/box
QUADROX-i Pediatric without integrated arterial filter and VHK 31000*	VKMO 30000	70105.0111	1 unit/box
QUADROX-i Pediatric with integrated arterial filter and VHK 31000*	VKMO 31000	70104.9185	1 unit/box

Accessories	Type	Article No.	Quantity
Premium holder for VKMO 10000/11000/30000/31000	HKH 6000	70104.9004	1 unit/box
Reservoir holding clamp for premium holder	HKHZ 18	70104.8997	1 unit/box
Holder for individual oxygenators HMO 10000/11000/30000/31000	016061 HKHZ 19	70104.8947 70104.7495	1 unit/box
J-mast for premium holder	HKHZ 24	70105.0007	1 unit/box

* Optionally available: QUADROX-i Neonatal and QUADROX-i Pediatric oxygenators with BIOLINE Coating.



HKH 6000



Holder 016061 and HKHZ 19



HKHZ 24



HKHZ 18



Holder 016061



HKHZ 19

This brochure contains information about products which may be pending regulatory approval to be marketed in your country.
Contact your local Maquet representative for more information.

See instructions for use for full prescribing information, including indications, contraindications, warnings, precautions and adverse events.

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