

Medtronic

Extracorporeal life support (ECLS)

U.S. product catalog



Elevating ECLS every day

Innovative like no other

Extracorporeal life support (ECLS) is a rapidly growing therapy used to bridge patients experiencing acute cardiac and/or respiratory failure to recovery, or to bridge patients to a destination therapy.

Together with our partners in healthcare, we are helping shape a comprehensive ECLS solution. We provide products designed specifically for ECLS and a wide breadth of support products that can be used with patients in critical care settings.

- Catheters
- ECMO Oxygenators
- Patient Monitoring Solutions
- Blood Diagnostics
- Appendix



Catheters

● Catheters

- Crescent™* Jugular Dual Lumen
 - Crescent™*
 - Crescent™* RA
- Bio-Medicus Life Support™
 - Flex
 - Multi
 - Mini
- Opus™* Vascular Access Kit

○ ECMO Oxygenators

○ Patient Monitoring Solutions

○ Blood Diagnostics

○ Appendix

As ECLS therapy evolves and expands, so does the variety of patients you treat.

Medtronic catheters are designed for the duration and support requirements of patients on VV and/or VA ECMO.

Developed with extensive user input, the breadth of our dual lumen and single lumen catheter portfolio offers more lengths, sizes, and configurations than any other brand – giving you the choices you need to individualize your patients' ECLS care.



Crescent^{TM*} Jugular Dual Lumen Catheters

● Catheters

• Crescent^{TM*} Jugular Dual Lumen

- Crescent^{TM*}
- Crescent^{TM*} RA

• Bio-Medicus Life SupportTM

- Flex
- Multi
- Mini

• Opus^{TM*} Vascular Access Kit

○ ECMO Oxygenators

○ Patient Monitoring Solutions

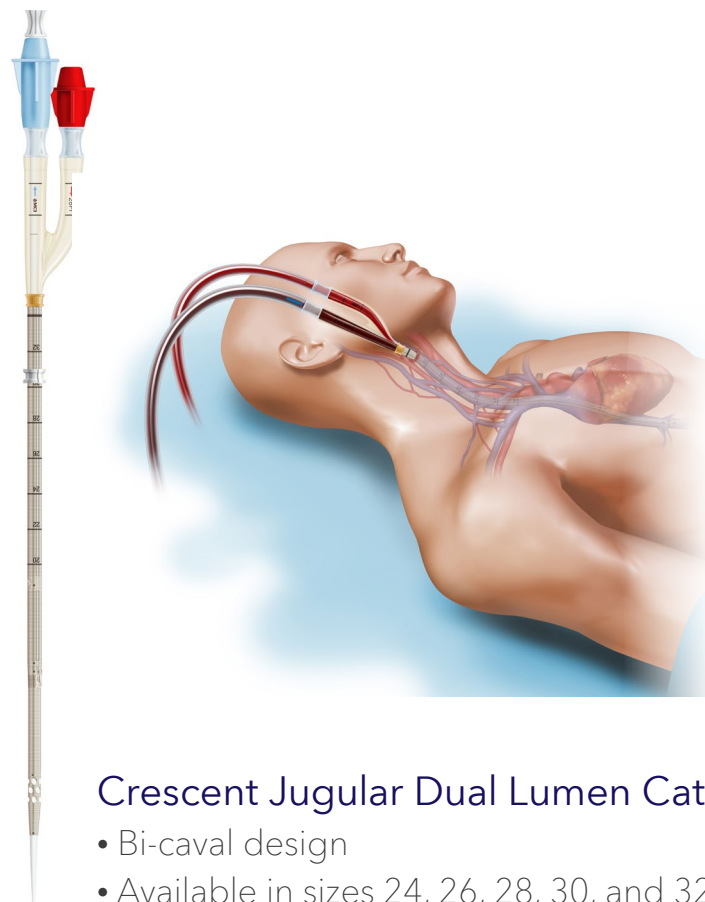
○ Blood Diagnostics

○ Appendix

Game-changing flow[†] for ECMO

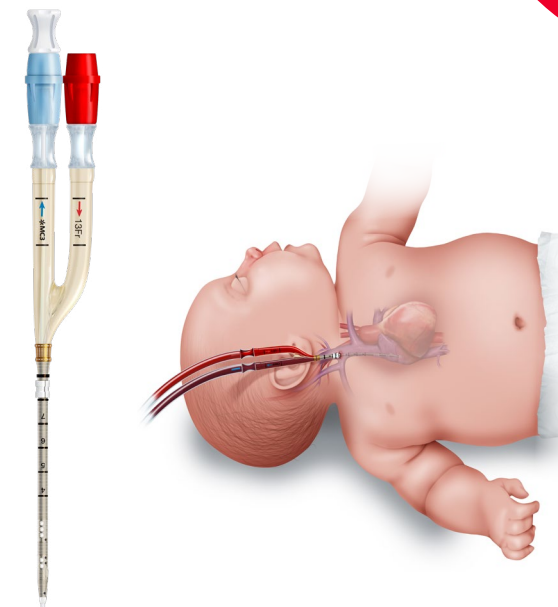
The Crescent portfolio is the first FDA-cleared, jugular dual lumen long-term ECMO line of catheters. The catheters allow for more accurate placement with just one cannulation site, deliver enhanced flow dynamics, and help maintain optimal flow once placed.

- Correct placement made easier
- Optimized flow rates[†]
- Durable securement



Crescent Jugular Dual Lumen Catheter

- Bi-caval design
- Available in sizes 24, 26, 28, 30, and 32 Fr
- Includes introducer (accommodates guidewire) for percutaneous approach



Crescent RA Jugular Dual Lumen Catheter

- Right atrial design
- Available in sizes 13, 15, and 19 Fr
- Includes obturator (short blunt tip) for an open technique and introducer (accommodates guidewire) for percutaneous technique

Only physicians with previous training and experience with venous catheterization and extracorporeal life support should use this device. Crescent^{TM*} jugular dual lumen catheter and Crescent^{TM*} RA jugular dual lumen catheter are manufactured by MC3, Inc., and exclusively distributed by Medtronic.

^{TM*}Third-party brands are trademarks of their respective owners.

[†]Bench and animal data on file at MC3. These tests may not be indicative of clinical performance.



Crescent^{TM*} Jugular Dual Lumen Catheters

● Catheters

• Crescent^{TM*} Jugular Dual Lumen

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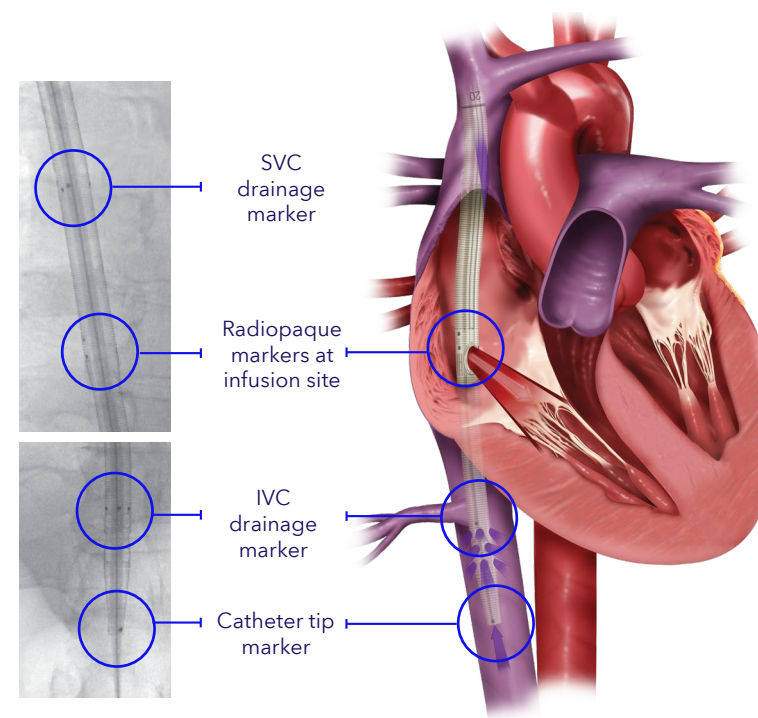
○ Blood Diagnostics

○ Appendix

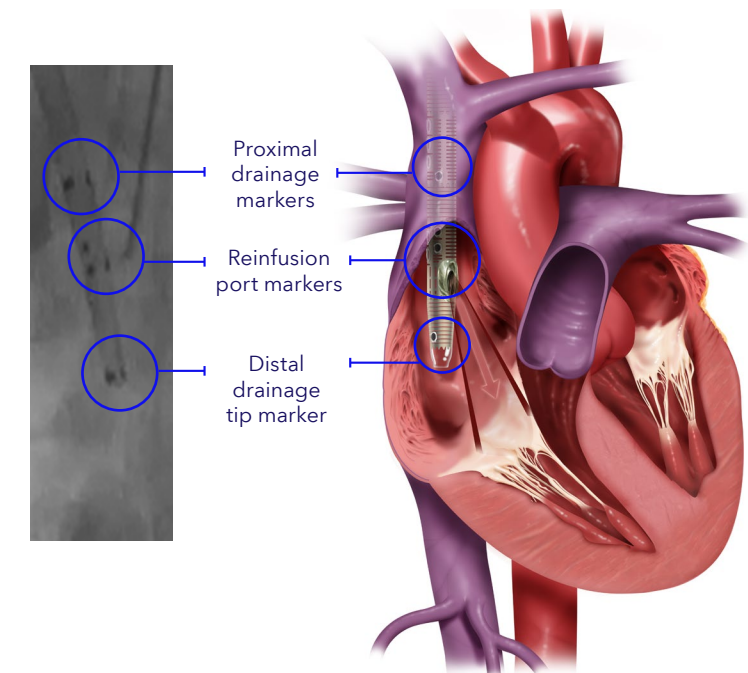
Correct placement made easier

Optimal flow begins with correct placement, and that can be challenging. The Crescent jugular dual lumen catheters were designed to address those challenges with features that make positioning and securement easier for you.

Crescent Jugular Dual Lumen Catheter



Crescent RA Jugular Dual Lumen Catheter



Radiopaque markers for improved visualization

Visible under radiographic imaging, radiopaque markers aid in positioning the catheter and identifying drainage sites, infusion port, catheter tip, and axial orientation of the port.

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Crescent™ Jugular Dual Lumen Catheters

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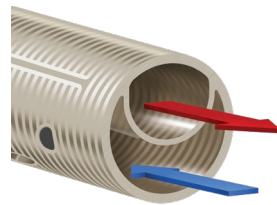
○ Patient Monitoring Solutions

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Optimized flow rates†

Enhancements in port placement, lumen design, and tip geometry give these catheters optimal flow efficiency. This enables you to realize higher flow at lower pressure, and allows for lower rates of hemolysis and recirculation.



Enhancements for optimal flow

Crescent-shaped lumen helps optimize pressure flow performance, and advanced materials make the catheter strong, flexible, and kink-resistant.

Promotes directional efficiency

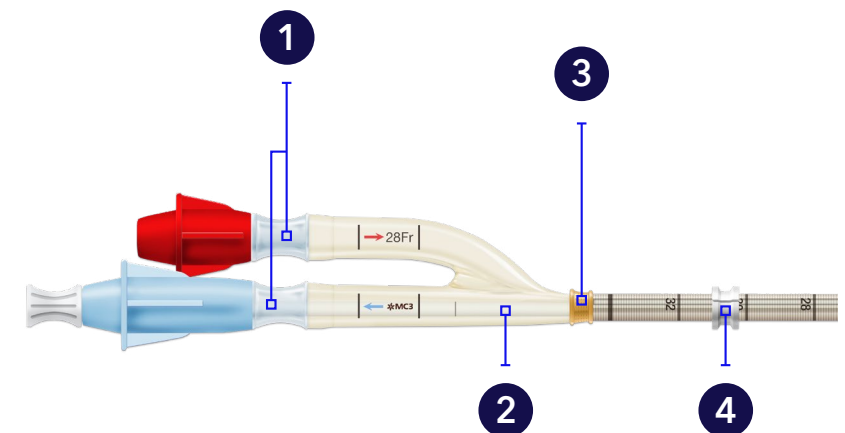
Large infusion port, combined with radiopaque markers for placement accuracy, help ensure flow is directed toward the tricuspid valve and pulmonary artery.

Helps minimize recirculation

Drainage and reinfusion ports are designed to mimic the body's natural flow ratios to minimize recirculation while maintaining flow.

Durable securement

1. In select circumstances, sutures may be placed on the connectors.
2. **Bifurcation suture site** provides security against catheter translations.
3. **Integrated suture site** contains special reinforcement to protect against catheter damage.
4. **Optional suture collar** can be placed at a desired location on the catheter body before or after catheter insertion.



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Crescent™ Jugular Dual Lumen Catheter

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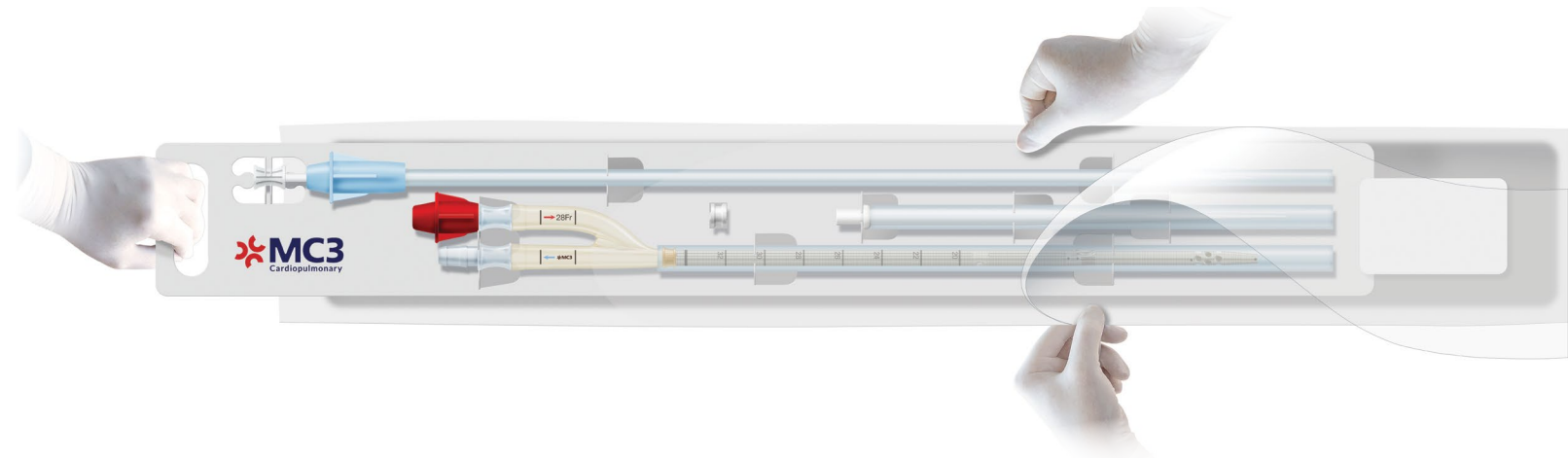
○ ECMO Oxygenators

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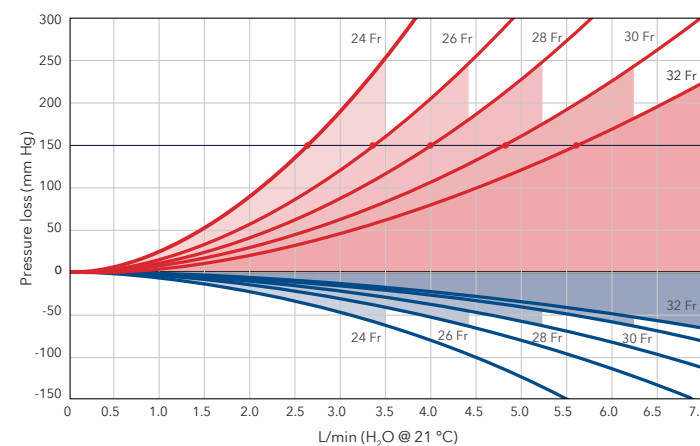
○ Appendix

The Crescent catheter is the first FDA-cleared, jugular dual lumen long-term ECMO catheter. It allows for more accurate placement with just one cannulation site, delivers enhanced flow dynamics, and helps maintain optimal flow† once placed.



The Crescent catheter, introducer with drainage cap, suture collar, and matching dilator are provided on a holding card and sealed in a sterile pouch.

Crescent flow curves



Non-vented 3/8 in (0.95 cm) connector

| | | Insertion length |
|-------|-----------------|------------------|
| 70124 | 24 Fr (8.0 mm) | 30.0 cm |
| 70126 | 26 Fr (8.7 mm) | 30.0 cm |
| 70128 | 28 Fr (9.3 mm) | 34.0 cm |
| 70130 | 30 Fr (10.0 mm) | 34.0 cm |
| 70132 | 32 Fr (10.7 mm) | 34.0 cm |

One unit per carton.

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Crescent™ RA Jugular Dual Lumen Catheter

● Catheters

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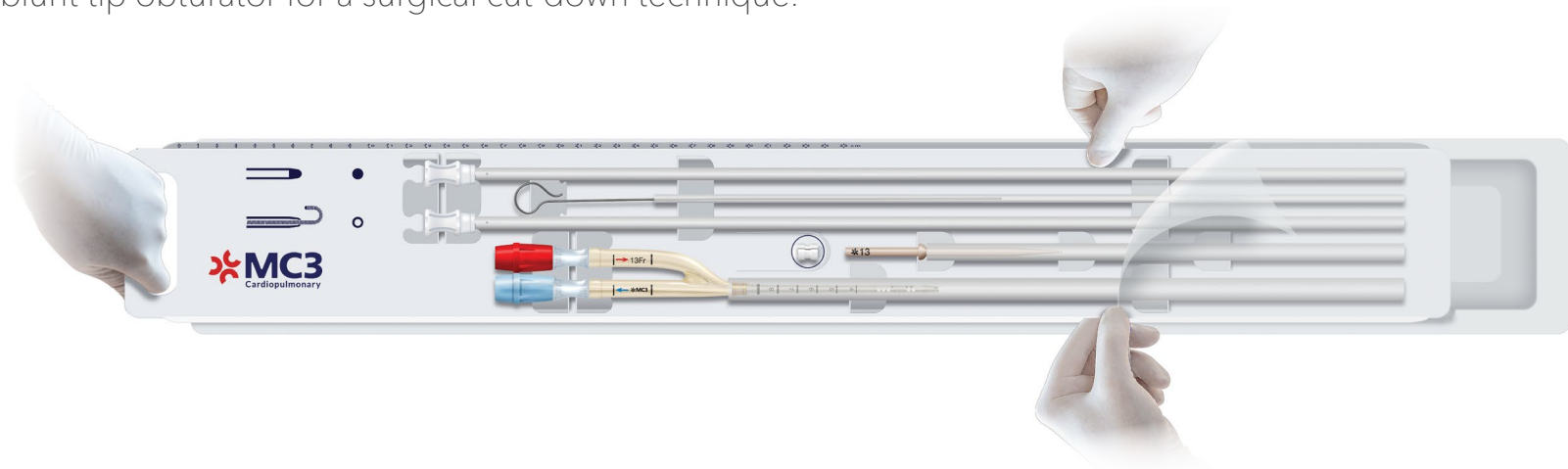
○ ECMO Oxygenators

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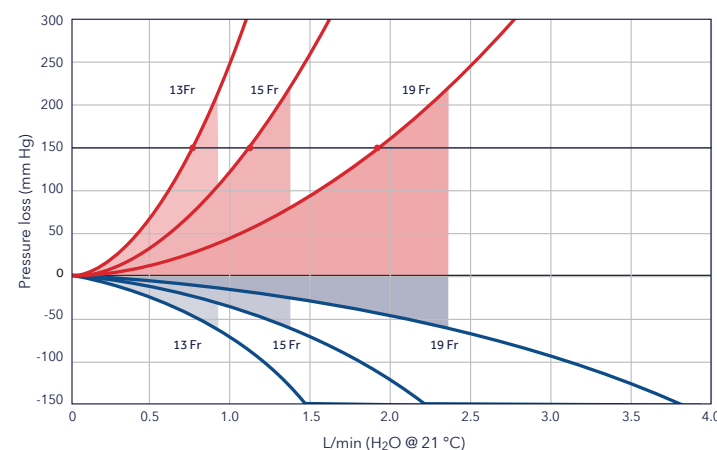
○ Appendix

We understand the value of VV ECMO therapy, and now you have the option to provide your pediatric patients with the same game-changing flow† you expect from the Crescent catheter name. The Crescent RA jugular dual lumen catheter offers a right atrial design and includes both an introducer for a percutaneous technique and a blunt tip obturator for a surgical cut-down technique.



The Crescent RA catheter, introducer (accommodates a guidewire to facilitate a percutaneous approach), obturator (short, blunt tip to facilitate an open approach), stylet, optional suture collar, and matching dilator are affixed to a holding card and sealed in a sterile pouch.

Crescent right atrial flow curves



Non-vented 1/4 in (0.64 cm) connector

| | | Insertion length |
|-------|----------------|------------------|
| 70413 | 13 Fr (3.7 mm) | 8.9 cm |
| 70415 | 15 Fr (4.3 mm) | 9.7 cm |
| 70419 | 19 Fr (5.0 mm) | 14.5 cm |

One unit per carton.

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Bio-Medicus Life Support™ Catheters

● Catheters

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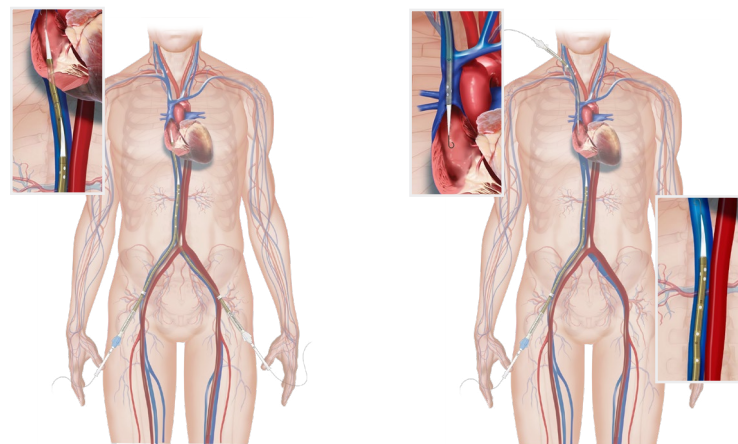
○ Blood Diagnostics

○ Appendix

Developed with extensive user input, the Bio-Medicus Life Support catheter offers more lengths, sizes, and configurations than any other brand. Life Support catheters provide clinicians with choices and options to individualize patients' ECLS care.

- French sizes 9 to 29
- Insertion lengths from 10 to 61 cm
- Configurations for VA and VV ECMO or ECLS

Veno-venous



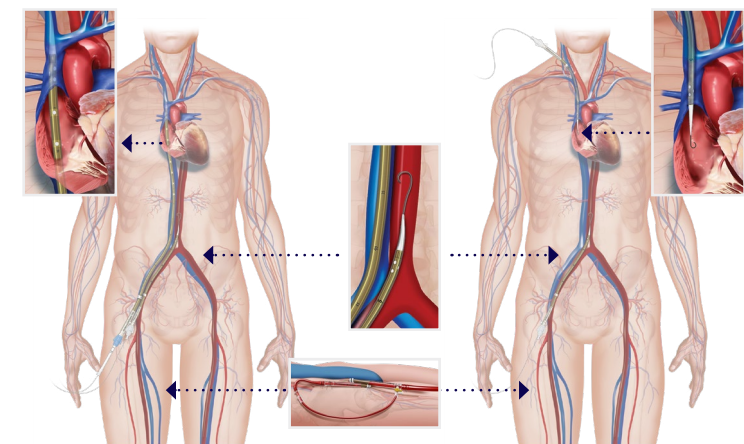
FEM-FEM VV

- Femoral-venous drainage
- Femoral-venous return

FEMORAL-JUGULAR VV

- Femoral-venous drainage
- Jugular return

Veno-arterial



FEM-FEM VA

- Femoral-venous drainage
- Femoral-arterial return

FEMORAL-JUGULAR VA

- Jugular-venous drainage
- Femoral-arterial return

Bio-Medicus Life Support cannulae are made with Elast-Eon™*, a biocompatible and biostable polyurethane/silicone copolymer.¹ Elast-Eon is commonly used in prolonged use and implantable medical devices, including ECLS dual lumen catheters. Features such as fingerlet-tip supports create a no-step transition, allowing for smooth insertion. The kink-resistant wall design promotes optimized flow rates.

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¹Elast-Eon™* is a siloxane urethane copolymer.



● Catheters

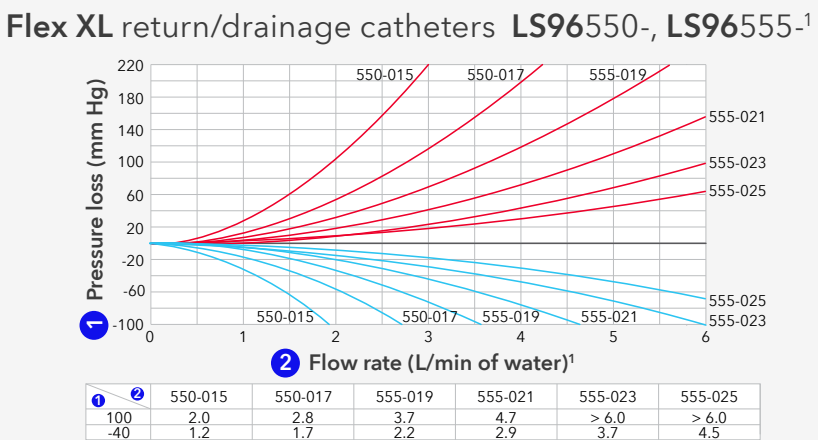
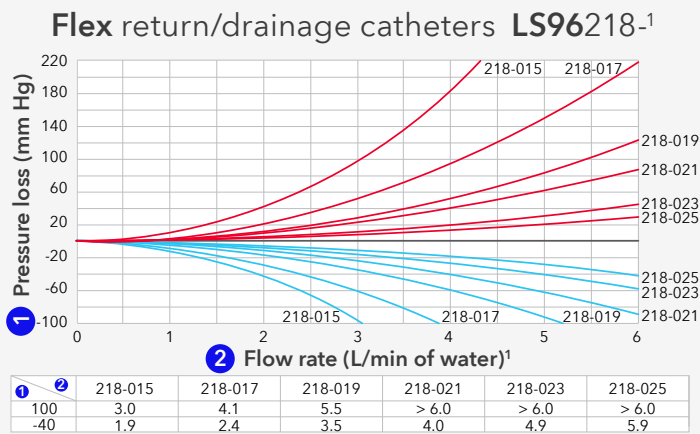
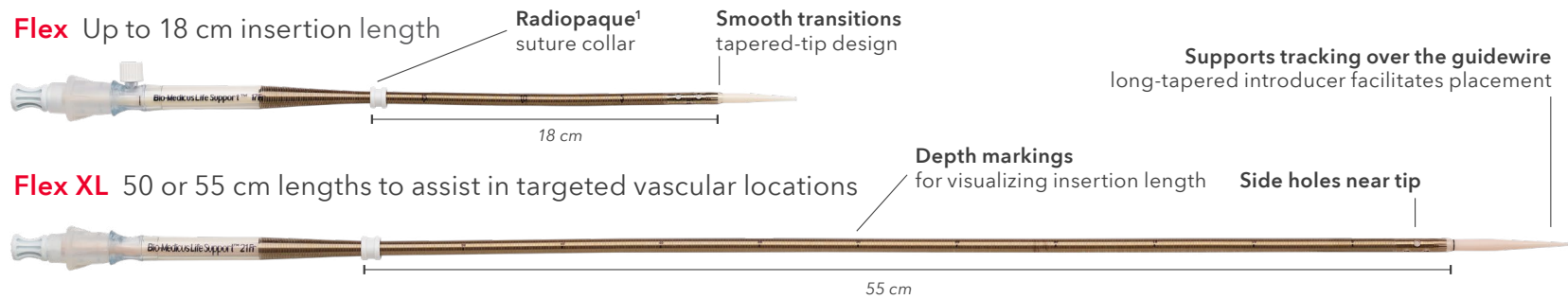
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Bio-Medicus Life Support™ Catheters

Flex and Flex XL

Designed for drainage or return at different insertion lengths, with side holes only near the tip.



Ordering information

| Bio-Medicus Life Support catheters and introducers | | Catheter code | French size | Tip length | Connector |
|--|--|---------------|----------------|------------|-----------------------------|
| Return or drainage Flex | | LS96218-015 | 15 Fr (5.0 mm) | 18 cm | 3/8 in (0.95 cm) vented |
| | | LS96218-017 | 17 Fr (5.7 mm) | 18 cm | 3/8 in (0.95 cm) vented |
| | | LS96218-019 | 19 Fr (6.3 mm) | 18 cm | 3/8 in (0.95 cm) vented |
| | | LS96218-021 | 21 Fr (7.0 mm) | 18 cm | 3/8 in (0.95 cm) vented |
| | | LS96218-023 | 23 Fr (7.7 mm) | 18 cm | 3/8 in (0.95 cm) vented |
| | | LS96218-025 | 25 Fr (8.3 mm) | 18 cm | 3/8 in (0.95 cm) vented |
| Return or drainage Flex XL | | LS96550-015 | 15 Fr (5.0 mm) | 50 cm | 3/8 in (0.95 cm) non-vented |
| | | LS96550-017 | 17 Fr (5.7 mm) | 50 cm | 3/8 in (0.95 cm) non-vented |
| | | LS96555-019 | 19 Fr (6.3 mm) | 55 cm | 3/8 in (0.95 cm) non-vented |
| | | LS96555-021 | 21 Fr (7.0 mm) | 55 cm | 3/8 in (0.95 cm) non-vented |
| | | LS96555-023 | 23 Fr (7.7 mm) | 55 cm | 3/8 in (0.95 cm) non-vented |
| | | LS96555-025 | 25 Fr (8.3 mm) | 55 cm | 3/8 in (0.95 cm) non-vented |

¹Bench data on file, may not be indicative of clinical performance.



● Catheters

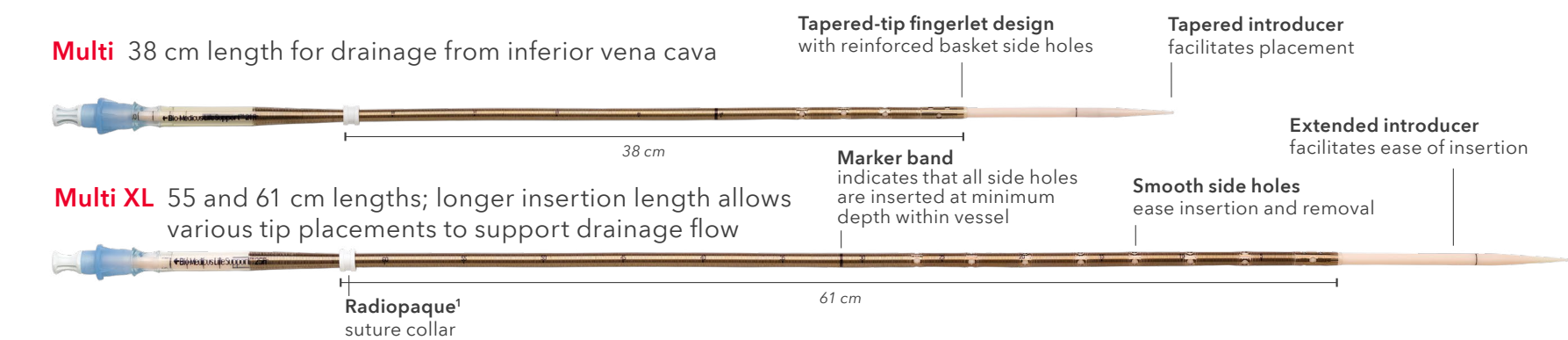
- Crescent™* Jugular Dual Lumen
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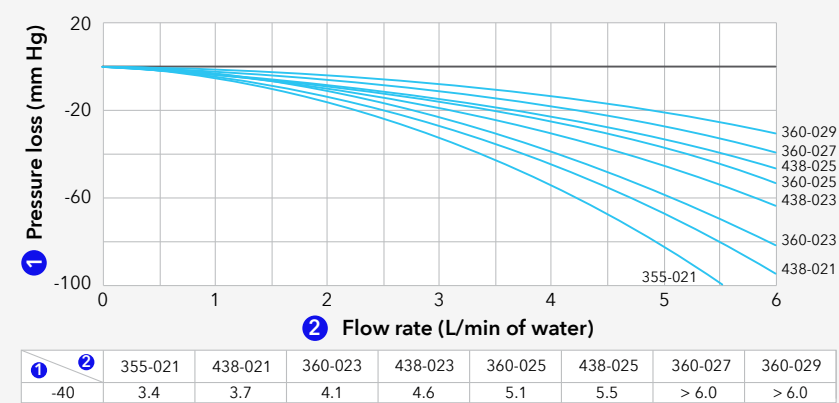
Bio-Medicus Life Support™ Catheters

Multi and Multi XL

Designed for efficient drainage and optimized flow dynamics.¹



Multi and Multi XL drainage catheters LS96438-, LS96355-, LS96360-¹



Ordering information

| Bio-Medicus Life Support catheters and introducers | | Catheter code | French size | Tip length | Connector |
|--|--|---------------|----------------|------------|-----------------------------|
| Drainage Multi | | LS96438-021 | 21 Fr (7.0 mm) | 38 cm | 3/8 in (0.95 cm) non-vented |
| | | LS96438-023 | 23 Fr (7.7 mm) | 38 cm | 3/8 in (0.95 cm) non-vented |
| | | LS96438-025 | 25 Fr (8.3 mm) | 38 cm | 3/8 in (0.95 cm) non-vented |
| Drainage Multi XL | | LS96355-021 | 21 Fr (7.0 mm) | 55 cm | 3/8 in (0.95 cm) non-vented |
| | | LS96360-023 | 23 Fr (7.7 mm) | 61 cm | 3/8 in (0.95 cm) non-vented |
| | | LS96360-025 | 25 Fr (8.3 mm) | 61 cm | 3/8 in (0.95 cm) non-vented |
| | | LS96360-027 | 27 Fr (9.0 mm) | 61 cm | 3/8 in (0.95 cm) non-vented |
| | | LS96360-029 | 29 Fr (9.7 mm) | 61 cm | 3/8 in (0.95 cm) non-vented |

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● Catheters

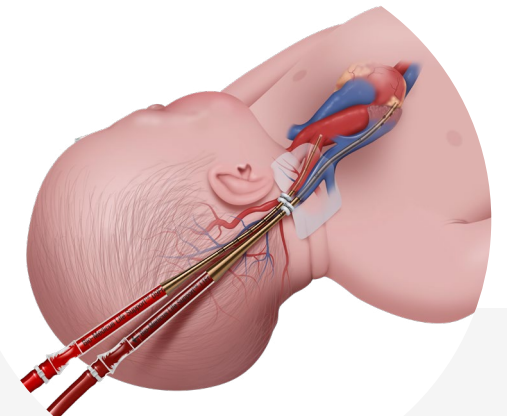
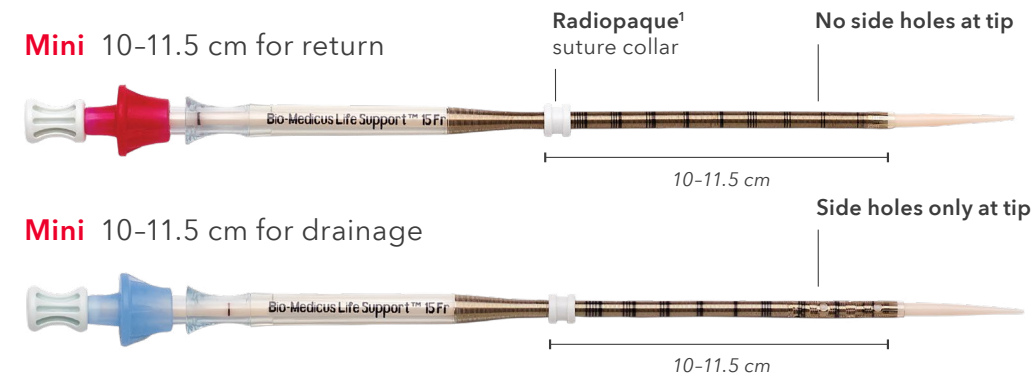
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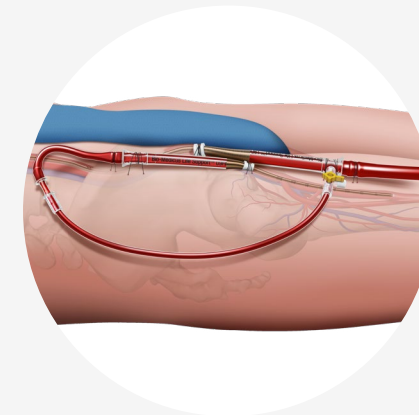
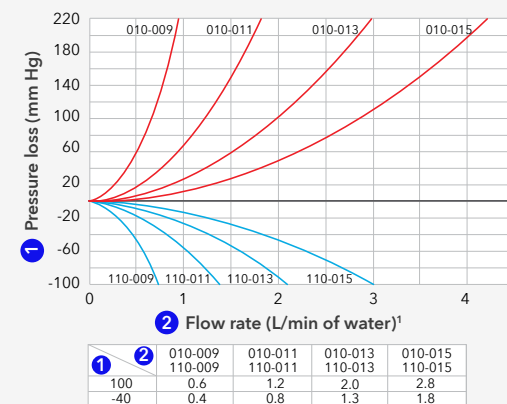
Bio-Medicus Life Support™ Catheters

Mini

Designed for catheter placement configurations that require smaller sizes and shorter insertable lengths.



Mini return/drainage catheters **LS96010-**, **LS96110-**¹



Ordering information

| Bio-Medicus Life Support catheters and introducers | | Catheter code | French size | Tip length | Connector |
|--|--|---------------|----------------|------------|-----------------------------|
| Return Mini | | LS96010-009 | 9 Fr (3.0 mm) | 10 cm | 1/4 in (0.64 cm) non-vented |
| | | LS96010-011 | 11 Fr (3.7 mm) | 10.5 cm | 1/4 in (0.64 cm) non-vented |
| | | LS96010-013 | 13 Fr (4.3 mm) | 11 cm | 1/4 in (0.64 cm) non-vented |
| | | LS96010-015 | 15 Fr (5.0 mm) | 11.5 cm | 1/4 in (0.64 cm) non-vented |
| Drainage Mini | | LS96110-009 | 9 Fr (3.0 mm) | 10 cm | 1/4 in (0.64 cm) non-vented |
| | | LS96110-011 | 11 Fr (3.7 mm) | 10.5 cm | 1/4 in (0.64 cm) non-vented |
| | | LS96110-013 | 13 Fr (4.3 mm) | 11 cm | 1/4 in (0.64 cm) non-vented |
| | | LS96110-015 | 15 Fr (5.0 mm) | 11.5 cm | 1/4 in (0.64 cm) non-vented |

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Opus™ Vascular Access Kit

● Catheters

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- **Opus™ Vascular Access Kit**

○ ECMO Oxygenators

○ Patient Monitoring Solutions

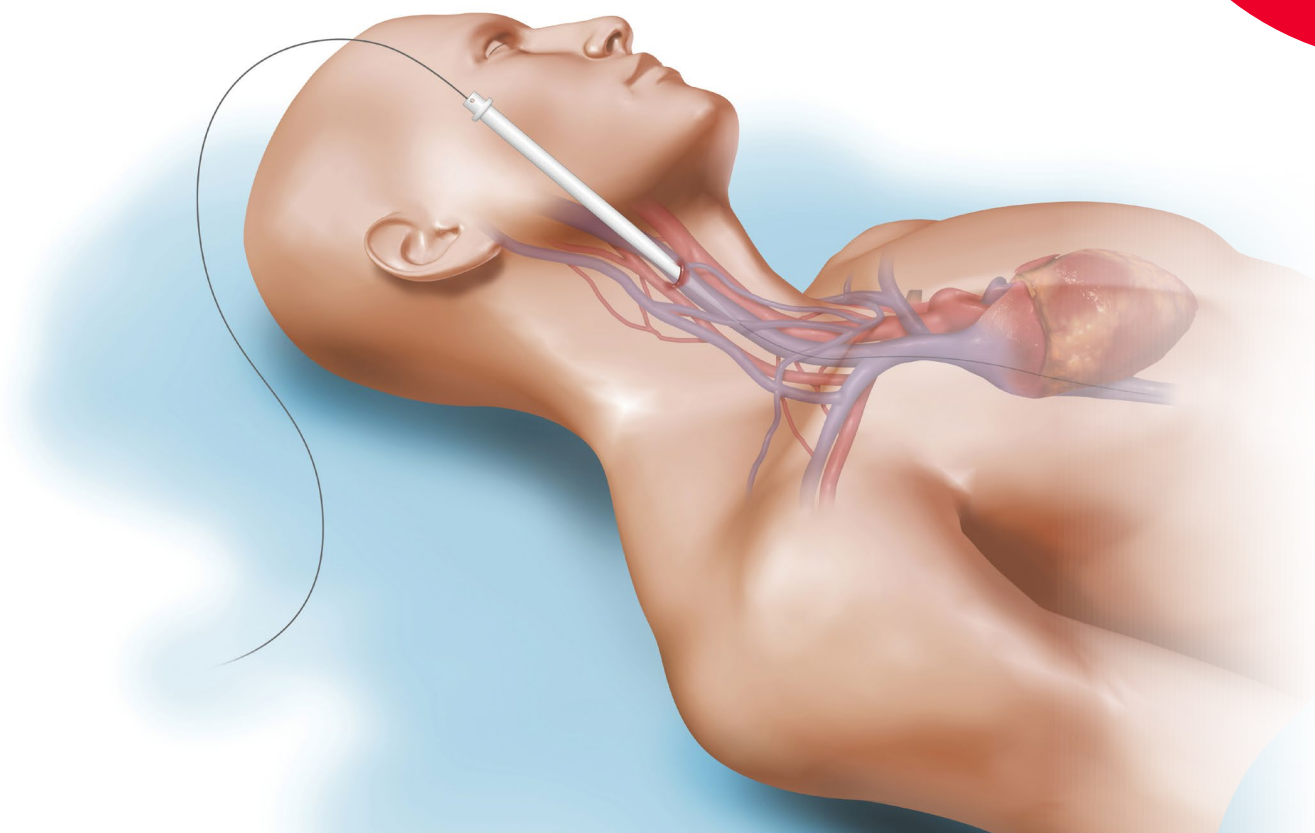
○ Blood Diagnostics

○ Appendix

Expanding options for vascular access

The Opus vascular access kit offers a convenient solution for the access you need. Our kits are thoughtfully composed to meet your preferences and techniques. Each Opus kit includes a complete set of instruments, along with dilators specifically designed to facilitate a smooth insertion – while allowing for gradual dilation of the fascia. A versatile performer, the Opus kit is compatible with single lumen arterial and venous cannulae – and Crescent™ jugular dual lumen catheters.

Experience smooth insertion and guidewire tracking with flexible, long, tapered-tip dilators.



- Selection of dilator sizes can accommodate varying patient anatomies
- Flexible-tip dilators support tracking along the guidewire¹
- Hub helps with handling during insertion and removal
- Safety scalpel features clear protective shield that locks into place with a one-handed activation

Crescent™ jugular dual lumen catheter and Opus™ vascular access kit are manufactured by MC3, Inc., and exclusively distributed by Medtronic.

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Opus™* Vascular Access Kit

● Catheters

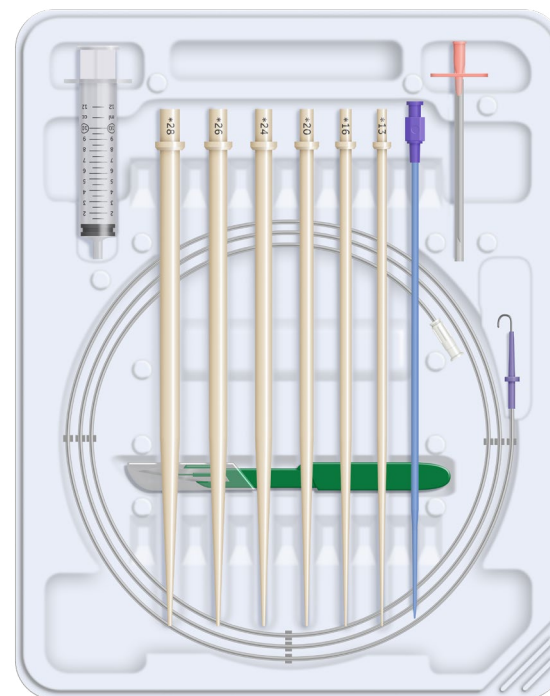
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○ Patient Monitoring Solutions

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○ Appendix



Hubs with clearly labeled sizes



Long tip gradually tapers



Ordering information

| Code | Configuration | Kit contents |
|-------|---------------|---|
| 21030 | Box of 5 | Stepped vessel dilator, 8/10 Fr, 13 Fr, 16 Fr, 20 Fr, 24 Fr, 26 Fr, 28 Fr |
| | | Guidewire, J-tip 0.038 in (0.97 mm) x 71 in (180 cm) with depth mark increments |
| | | Scalpel, #11 safety |
| | | Needle, 18 gauge |
| | | Syringe, 10 cc |



ECMO Oxygenators

○ Catheters

● **ECMO Oxygenators**

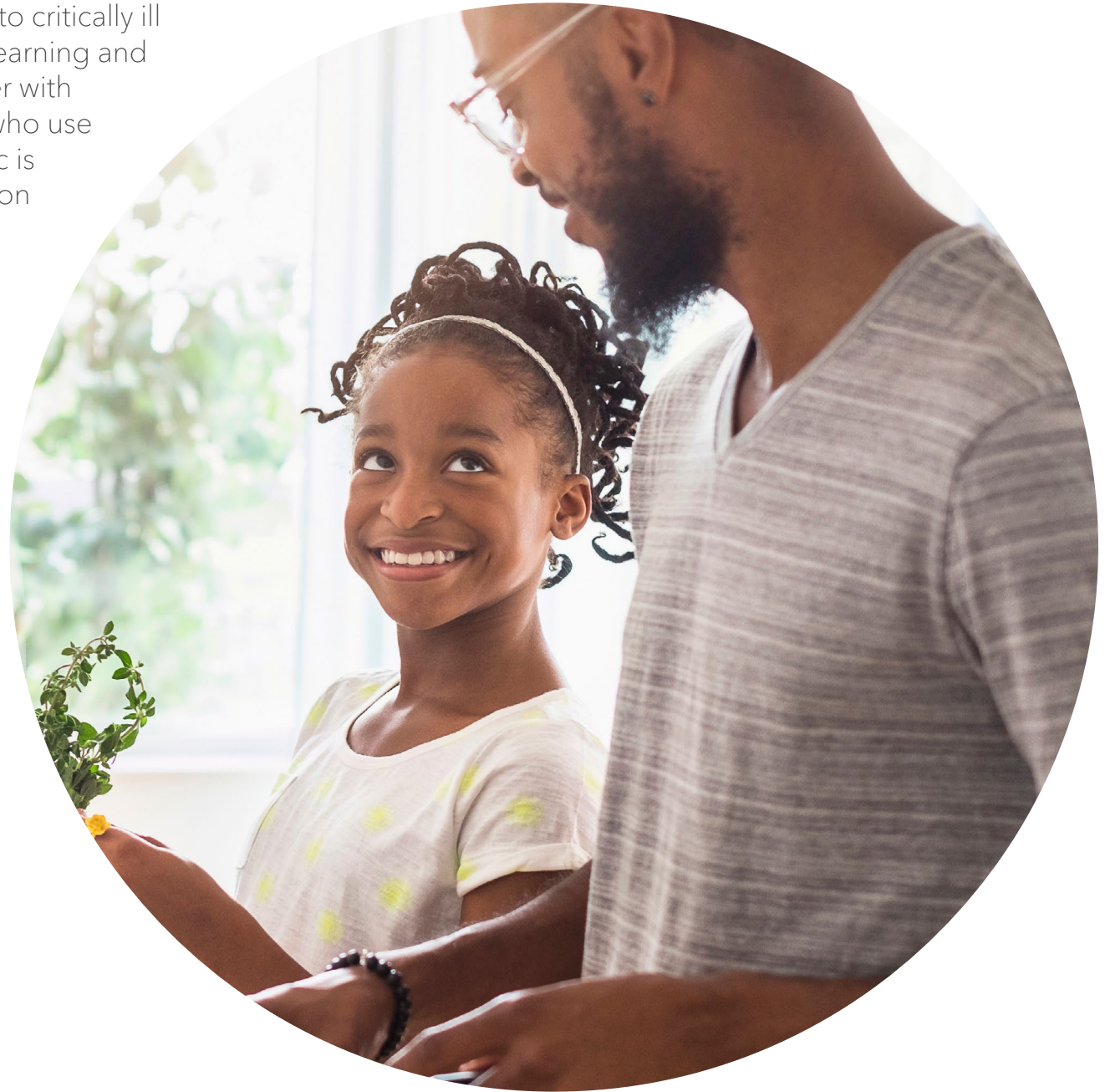
- Nautilus™* Smart ECMO Module
- Nautilus™* ECMO Oxygenator

○ Patient Monitoring Solutions

○ Blood Diagnostics

○ Appendix

Extracorporeal life support (ECLS) provides long-term heart and/or lung support to critically ill patients. We are committed to learning and developing this therapy together with those healthcare professionals who use it to save patient lives. Medtronic is shaping a comprehensive solution through standardized, easy-to-use, advanced technologies. Our Nautilus™* and Nautilus™* Smart oxygenators were designed specifically for extracorporeal membrane oxygenation (ECMO).



Nautilus™* ECMO Oxygenators

○ Catheters

● **ECMO Oxygenators**

- Nautilus™* Smart ECMO Module
- Nautilus™* ECMO Oxygenator

○ Patient Monitoring Solutions

○ Blood Diagnostics

○ Appendix

Designed for ECMO

- Long-term ECMO indication†
- PMP fiber
- Balance™ Biosurface‡
- Circular flow-path design



Nautilus™* Smart ECMO Module



Nautilus™* ECMO Oxygenator

Nautilus™* ECMO oxygenator is manufactured by MC3, Inc., and exclusively distributed by Medtronic.

™*Third-party brands are trademarks of their respective owners.

†Indicated in the United States for use up to 48 hours.

‡Technology licensed under agreement from BioInteractions, Limited, United Kingdom.



Nautilus^{TM*} Smart ECMO Module

○ Catheters

● ECMO Oxygenators

- Nautilus^{TM*} Smart ECMO Module
- Nautilus^{TM*} ECMO Oxygenator

○ Patient Monitoring Solutions

○ Blood Diagnostics

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Simplify your circuit with the first oxygenator featuring integrated monitoring. The Nautilus Smart ECMO module improves long-term gas transfer¹ while providing real-time device performance data that's accessible from an intuitive touch screen.

Performance predictability

View monitored parameters on the interactive touch screen.

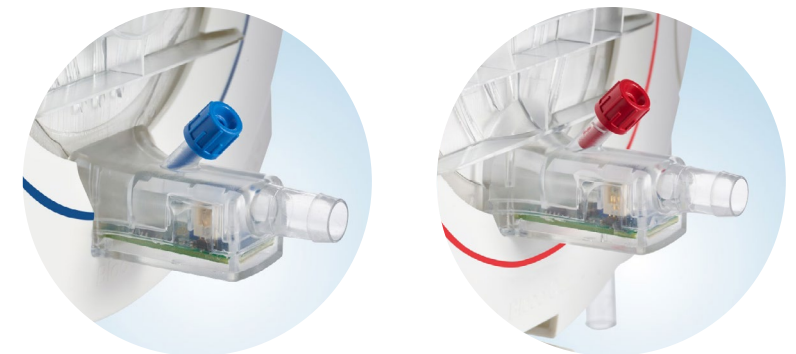
- Pressure in/pressure out/ ΔP
- O₂ saturation in/O₂ saturation out
- Temperature out
- Set alarm limits
- Receive visual and audio alert notifications

Circuit simplicity

- Integrated sensors may eliminate the need for pressure transducers and in-line blood saturation monitoring
- Simplify the circuit for patient transport, ambulation, and rehabilitation
- Fewer connections minimizes number of areas prone to blood clot formation and air entrainment

Streamlined workflow

- Light bar provides at-a-glance assessment of oxygenator performance
- Reduce need to look at multiple devices to get oxygenator-related performance data
- Visual and audio alerts when limits are exceeded
- Displayed data allows clinicians to clearly communicate oxygenator status among ECMO team members



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Nautilus™* ECMO Oxygenator

○ Catheters

● ECMO Oxygenators

- Nautilus™* Smart ECMO Module
- **Nautilus™* ECMO Oxygenator**

○ Patient Monitoring Solutions

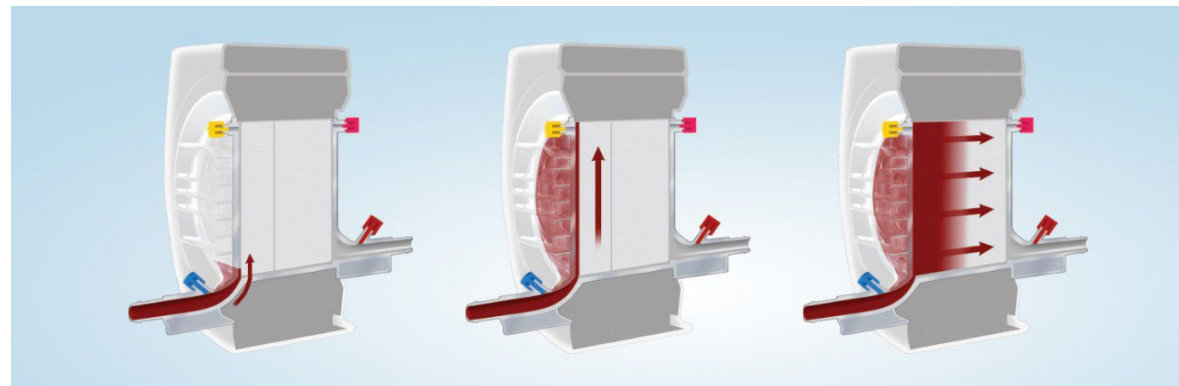
○ Blood Diagnostics

○ Appendix

Designed for ECMO

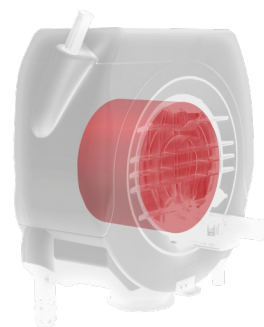
Circular flow-path technology

The Nautilus ECMO oxygenator has a transverse flow-path with a circular profile.¹ Transverse flow minimizes surface contact area while achieving a low blood-side pressure drop. The circular profile eliminates corners where low flow and stasis are known to occur.



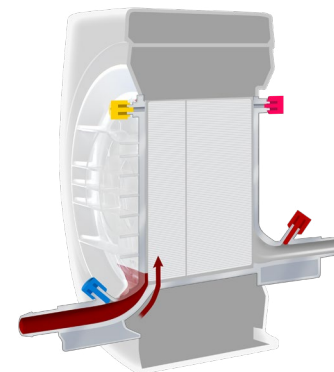
Circular shape

Eliminates corners, areas known for clotting.



Guided inlet[†]

Reduces velocity changes at the inlet where low flow and stasis may occur.



Filling vanes

Aid in even filling and even flow distribution across the membrane.



™*Third-party brands are trademarks of their respective owners.

[†]Patent pending.

¹Data on file at MC3. These tests may not be indicative of clinical performance.



Nautilus^{TM*} specifications

○ Catheters

● **ECMO Oxygenators**

- Nautilus^{TM*} Smart ECMO Module
- Nautilus^{TM*} ECMO Oxygenator

○ Patient Monitoring Solutions

○ Blood Diagnostics

○ Appendix

| | |
|---------------------------------------|----------------------------------|
| Membrane material | Polymethylpentene (PMP) |
| Membrane surface area | 1.8 m ² |
| Heat exchange material | Polyethylene terephthalate (PET) |
| Heat exchange surface area | 0.3 m ² |
| Static priming volume | 226 mL |
| Recommended blood flow rate | 0.5–7 L/min |
| Maximum blood pressure | 750 mm Hg |
| Recommended gas flow rate (gas:blood) | 0.5:1 to 3:1 |
| Maximum water side pressure | 1,125 mm Hg |
| Arterial outlet port | 3/8" |
| Venous inlet port | 3/8" |
| Delta P at 4 L/min | 38 mm Hg |
| O ₂ at 4 L/min | 266 mL/min |
| CO ₂ at 4 L/min | 186 mL/min |
| Heat exchange performance at 4 L/min | 0.77 |



Nautilus™ ordering information

○ Catheters

● ECMO Oxygenators

- Nautilus™ Smart ECMO Module
- Nautilus™ ECMO Oxygenator

○ Patient Monitoring Solutions

○ Blood Diagnostics

○ Appendix



CFN

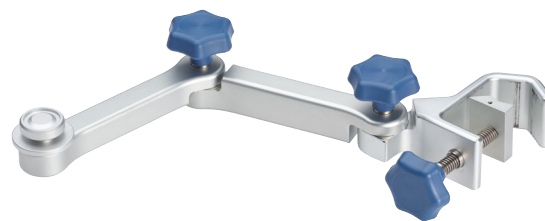
| | |
|-------|----------------------------|
| 48135 | Nautilus Smart ECMO module |
| 48160 | Nautilus oxygenator holder |
| 48150 | Power supply |
| 48155 | Power cord |



CFN

| | |
|-------|---|
| 48145 | Nautilus ECMO oxygenator with Balance™ Biosurface |
| 48160 | Nautilus ECMO oxygenator holder |

Nautilus oxygenator holder



Power cord



Power supply



Patient Monitoring Solutions

○ Catheters

○ ECMO Oxygenators

● **Patient Monitoring Solutions**

• INVOS™ Regional Oximetry System

○ Blood Diagnostics

○ Appendix

The INVOS™ system is the most widely studied regional oximeter on the market.¹ It was designed to respond quickly – so you can, too.



¹Yu Y, et al. *Cochrane Database Syst Rev*. 2018;1:CD010947.



INVOS™ Regional Oximetry System

○ Catheters

○ ECMO Oxygenators

● **Patient Monitoring Solutions**

• **INVOS™ Regional Oximetry System**

○ Blood Diagnostics

○ Appendix

INVOS regional oximetry guided management may help you detect and resolve regional tissue desaturation during ECMO that may otherwise go unrecognized in these difficult-to-treat patients.^{1,2}

The INVOS system can play an important role as a valuable "first alert"³ because it monitors for hemodynamic changes and deteriorating patient conditions. It features:

- A touch screen for easily reviewing and marking patient data
- Automatic baseline setting – ensuring a reference value is taken
- LEDs in the reusable sensor cable to enable quick identification of sensors and channel label
- Perforated sensor design to keep sensors in place
- Up to four channels to measure cerebral and somatic tissue perfusion

[See the evidence](#)



The INVOS™ regional oximetry system should not be used as the sole basis for diagnosis or therapy and is intended only as an adjunct in patient assessment.

Caution: Federal law (USA) restricts this device to sale by or on the order of a physician.

¹Wong JK, et al. *Artif Organs*. 2012;36:659-667.

²Kim DJ, et al. *ASAIO J*. 2017;63:613-617.

³Avery EG. Cerebral oximetry is frequently a "first alert" indicator of adverse outcomes [white paper]. Medtronic; 2016.



INVOS™ system ordering information

○ Catheters

○ ECMO Oxygenators

● **Patient Monitoring Solutions**

• INVOS™ Regional Oximetry System

○ Blood Diagnostics

○ Appendix

Ordering information

| SKU no. | Description | Quantity |
|---------------|--|----------|
| PM7100 | PM7100 patient monitor | 1 |
| PMPAMP71 | Preamplifier | 1 |
| PMAC71RSC | Reusable sensor cable for PM7100 | 1 |
| PMAC71DOC | Docking station | 1 |
| PMAC71STAND | Monitor stand | 1 |
| PMSENS71-A-20 | Adult rSO ₂ sensor, > 40 kg | 20/box |
| PM71IFTD | PM7100 field test device | 1 |
| PMSENS71-P-20 | Pediatric rSO ₂ sensor, 4-40 kg | 20/box |
| IS | Infant regional saturation sensor, < 40 kg | 10/box |
| PMAC71RIC | Reusable infant cable | 1 |

Technical specifications

INVOS™ 7100 monitor

| | |
|-------------|---|
| Size | 20 x 30.75 x 5.1 cm (7.87 x 12.1 x 2 in) |
| Weight | 1270g (2.8 lb) |
| Power | AC power adapter, Li-ion battery (30 minutes) |
| Screen size | 25.7 cm (10.1 in.), measured diagonally |
| Screen type | FT LCD, projected capacitive multi-touch |
| Resolution | 1280 x 800 pixels |
| Ports | USB 3.0, USB 2.0, DC In, docking port |

INVOS™ 7100 preamplifier

| | |
|-----------------|---|
| Size | 12.8 x 8.7 x 2.8cm (5.04 x 3.43 x 1.1 in) with hook folded down |
| Weight | 294 g (0.65 lb) |
| Indicator | Reusable sensor cable (RSC) connection prompt |
| Cable length | 428.4 cm (14 ft) (approximate) |
| Cable connector | Amphenol 8-pin |
| Defibrillation | Defibrillator proof |

INVOS™ 7100 adult rSO₂ and 7100 pediatric rSO₂ sensors

| | |
|-----------|--|
| Material | Medical grade acrylic adhesive, latex, DEHP & BPA free |
| Packaging | Packaged non-sterile for single use |

INVOS™ infant regional saturation sensor (OxyAlert NIRSensor)

| | |
|-----------|---|
| Material | Medical grade hydrocolloid adhesive, latex & PVC free |
| Packaging | Packaged non-sterile for single use |



Blood Diagnostics

- Catheters
- ECMO Oxygenators
- Patient Monitoring Solutions
- **Blood Diagnostics**
 - HMS Plus Hemostasis Management System
- Appendix

Medtronic Perfusion Systems remains the pioneer and leader providing both a heparin dose response test and the only point-of-care heparin assay for individualized heparin and protamine management. Our technology is guideline-recommended per the 2007 Society of Thoracic Surgeons (STS) guidelines.¹ The HMS Plus hemostasis management system is a reliable, versatile, and effective platform for improved heparin and protamine management resulting in lower associated procedural and operational costs.²



¹ Society of Thoracic Surgeons. Sts.org. Available at: <https://www.sts.org/sites/default/files/documents/BloodConservationUpdate0311.pdf>. Accessed May 12, 2022.

² Khan JH, et al. *J Extra Corpor Technol*. 2017;49:273-282.



HMS Plus Hemostasis Management System

- Catheters
- ECMO Oxygenators
- Patient Monitoring Solutions
- **Blood Diagnostics**
 - HMS Plus Hemostasis Management System
- Appendix

When measuring the ACT is not enough

The HMS Plus hemostasis management system performs multiple tests for anticoagulation management and allows user to measure actual circulating heparin concentration and assess a patient's response to heparin.¹



| Instrument | |
|------------------|--|
| Height | 40 cm (15.75") |
| Depth | 38 cm (15.0") |
| Width | 33 cm (13.0") |
| Weight | 15.47 kg (34.1 lb) |
| Serial port data | 19200 baud, 8 data bits, 1 stop bit, no parity |
| Voltage | 100-240 V ~ single phase |
| Frequency | 50-60 Hz |
| Maximum current | 1.2/0.6 A (100-120/200-240) |

| Cartridges | |
|------------|---|
| Tests | ACT, heparin dose response (HDR), heparin/protamine titration (HPT) |
| Channels | 2-channel ACT, 6-channel HDR, 4- and 6-channel HPT |
| Controls | Liquid, electronic |

Caution: Federal law (USA) restricts this device to sale by or on the order of a physician.

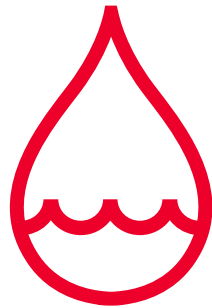
The HMS Plus instrument and cartridges must only be used in the manner and purpose for which they are intended. Instructions for proper use are included in the manual and in the cartridge package inserts. Read all warnings, precautions, and Instructions for Use carefully prior to use.

¹ Bench data on file at Medtronic.



HMS Plus Hemostasis Management System

- Catheters
- ECMO Oxygenators
- Patient Monitoring Solutions
- **Blood Diagnostics**
 - HMS Plus Hemostasis Management System
- Appendix



Benefits of improved hemostasis management

- Fewer complications associated with excessive blood loss¹
- Preservation of the coagulation system, resulting in fewer transfusions²
- Decrease in packed red blood cells, fresh frozen plasma, cryoprecipitate, and platelet usage, thus decreasing associated costs²
- Trends toward reductions in hospital length of stay and intensive care unit stay²

The following risks are known to be associated with activated clotting time and hemostatic management devices: coagulopathy, hypovolemia, infection, and ischemia.

For risks associated with the HMS Plus system, please refer to the instructions for use.

¹Despotis GJ, et al. *J Thorac Cardiovasc Surg.* 1995;110:46-54.
²Khan JH, et al. *J Extra Corpor Technol.* 2017;49:273-282.



HMS Plus Hemostasis Management System

- Catheters
- ECMO Oxygenators
- Patient Monitoring Solutions
- **Blood Diagnostics**
 - HMS Plus Hemostasis Management System
- Appendix

HMS Plus system

| CFN | Product | Units per case |
|--------|-----------------------------|----------------|
| 30514 | HMS Plus system | 1 per case |
| R30514 | Refurbished HMS Plus system | 1 per case |

HMS Plus cartridges

4-channel heparin assay includes 9 syringes and 9 blunt tip needles

| CFN | Product | Units per case |
|-----------|----------------------|----------------|
| 304-01POR | Red 0.0–0.9 mg/kg | 9 per case |
| 304-02POR | Yellow 0.0–1.5 mg/kg | 9 per case |

HMS Plus cartridges

6-channel heparin assay includes 9 syringes and 9 blunt tip needles

| CFN | Product | Units per case |
|-----------|----------------------|----------------|
| 304-07POR | Orange 0.0–2.5 mg/kg | 9 per case |
| 304-08POR | Gold 1.5–4.0 mg/kg | 9 per case |

HMS Plus accessories

| CFN | Product | Units per case |
|------------|--|------------------|
| HMSPLUSSC | Bar code scanner | 1 per case |
| 300-01 | Monoject™ syringes, 3 mL | 100 per case |
| 300-02 | Blunt needles, 1½", 19 GA | 100 per case |
| 313-51 | HEPtrac™ electronic control for HMS Plus | 1 per case |
| 300-04 | Thermal printer paper | 5 rolls per case |
| 300-10 | Temperature verification cartridge for the HMS Plus | 1 per case |
| 300-19 | HMS Plus cleaning kit | 1 per case |
| 30032 | HMS Plus cart | 1 per case |
| 31506 | HMS Plus salvage reservoir cups | 100 per case |
| 313-50 | HEPline kit | 1 per case |
| HMSPLUSEDM | HMS Plus and ACT Plus external data manager software | 1 per case |



- Catheters
- ECMO Oxygenators
- Patient Monitoring Solutions
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Important Safety Information

Nautilus Smart and Nautilus

Caution: Federal law (USA) restricts this device to sale by or on the order of a physician. For a listing of indications, contraindications, precautions, warnings, and potential adverse events, please refer to the Instructions for Use.

Only clinicians thoroughly trained in extracorporeal life support procedures should use this device.

Nautilus™ Smart ECMO Module and Nautilus are manufactured by MC3, Inc. and exclusively distributed by Medtronic.

Balance™ is a trademark of Medtronic. Technology licensed under agreement from BioInteractions, Limited, United Kingdom.

Crescent, Crescent RA, and Opus vascular access kit

Care and caution should be taken to avoid damage to vessels and cardiac tissue during cannulation or other cardiac surgery procedures. For a listing of indications, contraindications, precautions, warnings, and potential adverse events, please refer to the Instructions for Use.

Caution: Federal law (USA) restricts this device to sale by or on the order of a physician.

Crescent™ Jugular Dual Lumen Catheter, Crescent™ RA, and Opus™ vascular access kit are manufactured by MC3, Inc. and exclusively distributed by Medtronic.

Only physicians with previous training and experience with venous catheterization and extracorporeal life support should use this device.

Crescent™ Jugular Dual Lumen Catheters, Crescent™ RA, and Opus™ vascular access kit are not approved in every geography.

Bio-Medicus Life Support

- Only physicians trained and experienced in using percutaneous catheterization techniques (such as the Seldinger technique), ECMO, and ECLS should use this device.
- Note: The benefits of catheterization for extracorporeal circulation must be weighed against the risk of systemic anticoagulation and subsequent propensity for hemorrhage.
- Caution: Ensure that the catheter size selected is of adequate size for the vessel to allow distal perfusion of the limb when the catheter is in place. Improper catheter size may be difficult to advance. The vessel must be large enough to ensure perfusion and venous return.

Care and caution should be taken to avoid damage to vessels and cardiac tissue during cannulation or other cardiac surgery procedures. For a listing of indications, contraindications, precautions, warnings, and potential adverse events, please refer to the Instructions for Use.

Caution: Federal law (USA) restricts this device to sale by or on the order of a physician.

HMS Plus

Caution: Federal law (USA) restricts this device to sale by or on the order of a physician.

The HMS Plus instrument and cartridges must only be used in the manner and purpose for which they are intended. Instructions for proper use are included in the manual and in the cartridge package inserts. Read all warnings, precautions and Instructions for Use carefully prior to use.

The INVOS™

Regional Oximetry System should not be used as the sole basis for diagnosis or therapy and is intended only as an adjunct in patient assessment.

Caution: Federal law (USA) restricts this device to sale by or on the order of a physician.

For more information, contact your local Medtronic cannula products representative. U.S. Customer Service: 1-800-328-1357. Caution: Federal law (USA) restricts this device to sale by or on the order of a physician. For a listing of indications, contraindications, precautions, and warnings, please refer to the Instructions for Use.

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