enFlow® IV fluid and blood warming system

The right temperature in the right place at the right time
Advantages of the enFlow IV fluid and blood warming system

The enFlow® system delivers the right temperature in the right place at the right time.

The right temperature
By consistently helping to maintain the right patient body temperature, enFlow can help provide both clinical and economic benefits for your hospital. Maintaining normothermia can help lessen complications and speed up recovery time—all while helping to shorten patient stays and reduce hospital costs.1,2

The right place
The system’s mobility and small transferable cartridge allow enFlow to help maintain normothermia in the right place—throughout all care areas. It can be used before, during and after procedures, in any orientation. And, because its cartridge is easily transported from room to room, enFlow maintains your workflow while saving steps and enabling continuous patient warming.

The right time
The enFlow system enables warmed infusate delivery at the right time across all clinical areas, right away—in less than 18 seconds. Its low priming volume reduces the time needed to reach the temperature set point, thus allowing the warming process to start quickly. Additionally, its close proximity to the patient reduces heat loss across the IV line.

Maintaining normothermia is a necessity

Keeping surgical patients at a normal body temperature is a daily struggle for clinicians caring for patients with impaired thermoregulation. Among the millions of surgeries performed annually around the world, it is estimated that 50–90% of those patients suffer from hypothermia.3 Hypothermia is defined as a core temperature below 36°C.4 A small reduction in core temperature can have a significant negative impact on postoperative outcomes, affecting patient satisfaction and recovery.5 This, in combination with the extra financial burden, is the reason more and more hospitals are taking actions to address the accidental hypothermia in the clinical and pre-hospital environment.

One of the contributing factors to accidental hypothermia is the intravenous (IV) delivery of cold fluids. One study concluded that each liter of IV fluid infused into adult patients at ambient temperature decreases the mean body temperature by approximately 0.25°C.6 A further analysis in 2010 also concluded that infusion of warm fluid is effective in keeping patients nearly normothermic and prevents postanesthetic shivering.6,7
Intuitive design
Designed for use by soldiers in extreme conditions, enFlow is very simple to operate. Simply prime, insert the cartridge, switch on and the system is ready for use.

Fast warming
The known thermal efficiency of our warmer material and the design of the disposable cartridge allow the IV fluid to reach temperature in seconds, thus minimizing prep and waiting time. Simply turn on and fluids will be warmed in seconds.

Minimized cooling
The lightweight warmer (11.6 oz) can be placed close to the patient—allowing less opportunity for fluid-cooling in the IV line.

Small, mobile, disposable cartridge
The cartridge is only 4 cm x 11 cm and has a priming volume of 4 mL. It's designed to combine great thermocoupling with the ability to transfer the cartridge from warmer to warmer. This allows you to deliver fluid warming to your patient across care areas that have the enFlow device, without having to transport the actual warming system.

Less waste
A very small, disposable cartridge, coupled with the ability to easily transfer between systems, means less waste.

Application
enFlow is simple to use and requires very little application training. Its setup is quick, application is easy and warming time to reach a target temperature of 40°C occurs in seconds. By using enFlow you will be warming fluid close to the patient with little loss of temperature as it travels to the patient through the short extension of 3”/7.5 cm (approximately 1°C for every meter).

Unlike the majority of IV fluid warmers, the enFlow disposable cartridge is designed to move easily with the patient, enabling you to warm fluids in all care areas should the need arise, using only one disposable cartridge.

Maintenance
enFlow is designed to be low maintenance. The enFlow IV fluid and blood warming system components have been designed to be durable, long lasting and water resistant. The system uses current Surface Mount Technology (SMT) and materials. CareFusion recommends a functional test every year. Additionally, we have developed the enCheck tester device to enable your biomedical engineers to check the alarm functionality of the enFlow system quickly and effectively on an annual basis, or per the protocol of individual hospitals.
Preoperative warming reduces the impact of heat redistribution caused by anesthesia, leading to a more stable core temperature when your patient reaches the postanesthesia care unit (PACU).8

ER

Each liter of intravenous fluid infused into adult patients at an ambient temperature decreases the mean body temperature by approximately 0.25°C.2

Trauma patients often arrive in a hypothermic state and continue to lose body heat during examination by healthcare providers. Warming blood and IV fluids will help maintain normothermia, which can reduce the risks associated with a core temperature below 36°C.9

Labor and delivery

Studies looking at the impact of perioperative warming on women undergoing Cesarean delivery with epidural anesthesia found that maternal and fetal hypothermia were prevented, maternal shivering was reduced and umbilical vein pH was improved.10

enFlow mobility

Combating the negative effect of hypothermia throughout the care continuum
Hypothermia reduces resistance to surgical wound infections.\textsuperscript{2,13,14}

Fluids or blood may continue to be delivered in the ICU where patients remain at risk from the effects of hypothermia.

Outpatient procedures

Hypothermic patients, on average, take 40 minutes longer to recover.\textsuperscript{5}

Hypothermia can occur in up to 90\% of all surgeries.\textsuperscript{3} Now, with millions of day surgeries being performed every year (\textit{nearly half of which take place in the outpatient setting}), it is imperative that patients recover safely and quickly to streamline the demand on surgical services.

PACU

Normothermic patients are less prone to postoperative cardiac events and leave the PACU earlier than those suffering from hypothermia.\textsuperscript{11,12}

ICU

Hypothermia reduces resistance to surgical wound infections.\textsuperscript{2,13,14}

Fluids or blood may continue to be delivered in the ICU where patients remain at risk from the effects of hypothermia.
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### Warmer

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<td>12.7 cm x 6.6 cm x 3.0 cm (5.0” x 2.6” x 1.75”)</td>
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**Controller**

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<td>23.6 cm x 16.8 cm x 9.7 cm (9.3” x 6.6” x 3.8”)</td>
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**Disposable cartridge**

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<td>11 cm x 4 cm x 1 cm (4.5” x 1.5” x 0.4”)</td>
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**Weight**

- **Warmer:** (w/o disposable cartridge): 330 g (11.6 oz.)
- **Controller:** 1.9 kg (4.2 lb)
- **Disposable cartridge:** 33 g (1.2 oz.)

### Performance detail

#### Disposable cartridge

- **priming volume:** 4 mL

#### Disposable cartridge sterility

- **Gamma sterilized**

#### Fluid temperature output

- **40°C ± 2°C**

#### Flow rate range

- **KVO to 200 mL/min**

#### Input voltage

- **Warmer:** 28.5 VDC at a maximum of 350 watts
- **Controller:** 100-240 VAC

#### Temperature set point

- **40°C**

#### Input current

- **5 A**

### Environmental/Physical requirements

#### Operating temperature

- **-5°C to 50°C**

#### Storage temperature

- **-30°C to 70°C**

#### Operating and storage relative humidity

- **Warmer:** 10–90%
- **Controller:** 10–90%
- **Disposable cartridge:** 10–90%

#### Operating and storage altitude

- **Up to 4,572 m (15,000')**

#### Operating and storage air pressure

- **570 hPa, (17 inHg) to 1,060 hPa (31 inHg)**

### Compliance with standards

#### Biocompatibility

- **disposable cartridge:** ISO 10993

#### Infusion set compatible

- **disposable cartridge:** ISO 8536-4

#### Over-temperature set point

- **ASTM F-2172-02**

#### Alarms

- **IEC60601-1-8**

#### Water resistance

- **Warmer:** IEC 529 IP67 30 min immersion at a depth of 91.4 cm (36”)
- **Controller:** IEC 529 IP31 dripping water
- **Disposable cartridge:** IEC 529 IP68 continuous immersion

#### Penetration

- **Warmer:** IEC 529 IP67 dust tight
- **Controller:** IEC 529 IP31 ≥ 2.5 mm diameter against ingress of solid foreign bodies
- **Disposable cartridge:** IEC 529 IP68 dust tight

#### Electrical safety


### Safety classifications

#### Type of protection against electrical shock

- **Class I or internally powered**

#### Degree of protection against electric shock

- **Type BF, defibrillation-proof**

#### Mode of operation

- **Continuous**

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**enFlow IV fluid/blood warmer system**

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  - The front panel includes a temperature display and keypad.

- **Warmer holder, PN 980305VS, box of 20**
  - The warmer holder affixes to the side of the controller to allow clinicians a place to hang the warmer when it is not in use.

- **Warmer, PN 980105VS**
  - The warmer is designed to work in conjunction with the disposable cartridge to warm IV fluids. The innovative design of the enFlow warmer allows it to be placed within inches of the IV site, reducing the potential for fluid cooling within the IV line.

- **enCheck testing tool, PN 980400**
  - The enCheck tester was developed to quickly and reliably trigger the over-temperature alarm condition on the enFlow warmer. Within seconds, the enCheck unit will heat the warmer to an over-temperature scenario, causing the alarm to sound. enCheck is also designed to verify the warmer operation at the installation site.

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For more information or to order an enFlow IV fluid and blood warming system, please call 800.323.9088 or visit carefusion.com/enFlow

References