



# Needle-Free Connectors

## Making an informed, educated decision

Not all healthcare professionals have the same clinical requirements when it comes to needle-free connectors. BD offers a comprehensive range of different proven technologies and enables you to make an informed decision, so that you can choose the right connector for your specific needs.



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## Our Solutions

SmartSite®



NeutraClear®

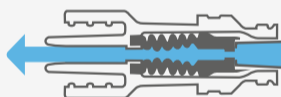

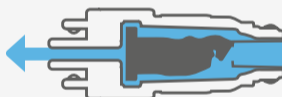



MaxZero™



BD Q-Syte™



	SmartSite®	NeutraClear®	MaxZero™	BD Q-Syte™
Short disinfection scrub time	1 to 2 seconds	15 seconds	3 seconds <sup>10,11</sup>	According to hospital policy*
Clear fluid pathway <sup>2</sup>		●	●	●
Fluid displacement	Neutral** <sup>4</sup>	Neutral <sup>4</sup>	Positive <sup>3,4</sup>	Neutral** <sup>4</sup>
Split septum <sup>5</sup>	●	●		●
Solid surface septum <sup>1</sup>			●	
Mechanical valve <sup>6,7,8,9</sup>	●		●	
Internal blunt cannula <sup>6</sup>		●		
Open fluid path				●
Fluid pathway <sup>13</sup>	 Laminar	 Laminar	 Non Laminar	 Laminar
Size & weight	3 cm length 1.54 g	2.7 cm length 1 g	3 cm length 1.75 g	2 cm length 1 g
Priming volume <sup>12</sup>	0.10 mL	0.05 mL	0.19 mL	0.16 mL
Gravity flow rate	8100 mL/hr (8,1 L/hr) 135 mL/min	8400 mL/hr (8,4 L/hr) 140 mL/min	8500 mL/hr (8,5 L/hr) 142 mL/min	32000 mL/hr (32 L/hr) 533 mL/min
Compatible with power injector (Maximum rated pressure)	● (325 PSI @ 10 mL/sec)	● (325 PSI @ 10 mL/sec)	● (325 PSI @ 10 mL/sec)	
Compatible with CT Scan / MRI	●	●	●	●
Compatible with emergency drug glass syringes	●		●	●
Change interval	7 days or 200 activations	7 days or 400 activations	7 days or 200 activations	6 days or 100 activations

Your Choices

\*\*Perform a vigorous mechanical scrub for manual disinfection of the needleless connector prior to each VAD access and allow it to dry." Infusion Therapy Standards of Practice. Journal of Infusion Nursing. 2016.

\*\*Utilising an appropriate clamping sequence for SmartSite / BD Q-Syte™ is described as equivalent to a neutral needle-free connector.

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# References/Notes/Comments

## NC : Needleless connectors

1. Not all NCs have the same design problems, and some have design features that are desirable from an infection-control standpoint. Septum surface. Many current NCs have complex external septum surfaces that include gaps and openings. These gaps and openings create spaces that may not be reached by the clinician's disinfection routine. If the septum is not completely disinfected, then connecting a syringe or IV tubing to the NC can result in infusion of potentially contaminating pathogens into the patient's bloodstream.

**Preferable:** A NC with a smooth external septum surface with few if any gaps that can be more thoroughly disinfected.

Jarvis W. Choosing the Best Design for Intravenous Needleless Connectors to Prevent Healthcare-Associated Bloodstream Infections. *Infection Control Today*. August 2010, Vol. 14, No. 8.

2. Clear connectors allow healthcare professionals to more adequately assess if any residual blood or other infusates, such as blood, total parenteral nutrition or lipid emulsion, remains in the connector. A clearly visible fluid path encourages proper flushing of connectors, which, in turn, clears the catheter and helps maintain catheter patency.

Jarvis W. Needleless Connectors and the Improvement of Patient and Healthcare Professional Safety. *Infection Control Today*. Dec 2013, Vol. 17, No. 12.

3. Royer T. Implementing a Better Bundle to Achieve and Sustain a Zero Central Line-Associated Bloodstream Infection Rate. *Journal of Infusion Nursing*. 2010;33:398-406.
4. Blood reflux. If a connector creates no reflux, such as in the case of a theoretically "truly neutral" displacement connector or a "positive" displacement connector, the reflux does not occur.

Jarvis W. Needleless Connectors and the Improvement of Patient and Healthcare Professional Safety. *Infection Control Today*. Dec 2013, Vol. 17, No. 12.

5. When needleless systems are used, a split septum valve may be preferred over some mechanical valves due to increased risk of infection with the mechanical valves [197–200]. Category II.

Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011. O'Grady N, Alexander M, Burns L et al.

**Note:** there are a variety of needle-free connectors available, some are described as split septum.

This category II recommendation from CDC is based on studies involving the interlink split septum/ blunt cannula device circa 1990.



6.  **Mechanical valve**  
 **Internal blunt cannula**

7. Hadaway L, Richardson D. Needleless Connectors: A Primer on Terminology. *Journal of Infusion Nursing*. Jan/Feb 2010, Vol 33, No.1

8. Jarvis W, Murphy C, Hall K et al. Health Care-Associated Bloodstream Infections Associated with Negative- or Positive-Pressure or Displacement Mechanical Valve Needleless Connectors. *Clinical Infectious Diseases*. 2009;49 (15 December).

9. Stoker R. Advances in Needleless Connectors, Technologies assist in prevention of bloodstream infections. *Managing Infection Control*. May 2009.

10. An extended microbial challenge study comparing two needleless connectors. The purpose of this study was to compare the ability of two designs of needleless connectors to form an effective physical barrier to microbial contamination when microbiologically challenged, subjected to a three second disinfection protocol and simulated clinical use. Data on file at BD.

11. Extended microbial challenge - MaxZero™ needleless connector.

The purpose of this study was to ascertain whether the MaxZero™ needleless connector, when microbially challenged over an extended period of time, can maintain an effective physical barrier to microbial contamination. Data on file at BD.

12. **Priming Volume:** We consider priming volume to be the amount of fluid required to completely fill the NC and purge it of air.

**Dead Volume / Dead space:** Dead volume, also referred to as dead space, is the amount of fluid that remains in the NC after post access disconnection. Our measurements show that in practice, there is no significant difference between the priming and dead volume of an NC.

Note that different manufacturers may define dead volume differently and may use different terms—such as residual volume or dead space—to refer to it.

**Positive displacement:** By convention, positive displacement or reflux refers to the fluid flow toward the patient when the syringe is disconnected.

Needleless Connectors. ECRI Institute. [www.ecri.org](http://www.ecri.org). Health Devices. September 2008.

13. Fluid pathway. Some NCs have a fluid pathway that is complex and indirect. If the pathway is indirect, flushing is less likely to remove blood or other nutrient fluids. When blood or other nutrient materials settle on a NC internal surface, they can serve as the nidus for biofilm development. **Preferable:** A NC with a direct – that is, straight - fluid pathway that facilitates adequate flushing and reduces the internal surface for biofilm development

Jarvis W. Choosing the Best Design for Intravenous Needleless Connectors to Prevent Healthcare-Associated Bloodstream Infections. *Infection Control Today*. August 2010, Vol. 14, No. 8.

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