

# Penetration Force Comparison Study

## Safety Blood Collection Sets



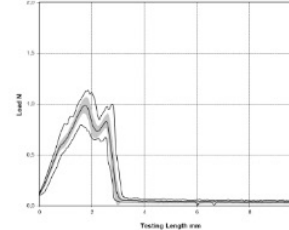
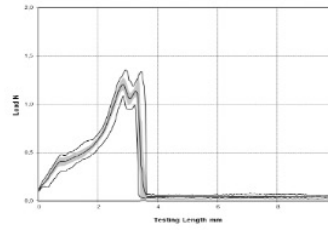
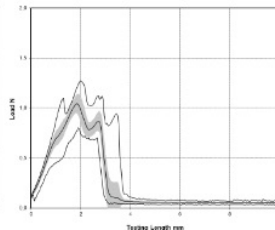
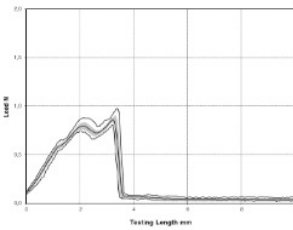
A study has been completed in accordance to DIN 13097-4 by an independent, accredited lab comparing the Greiner Bio-One VACUETTE® Safety Blood Collection Set to competitive products with respect to needle penetration force, which is directly related to patient sensation of pain.

A = Greiner SBC

B = BD Safety-Lok™

C = BD UltraTouch™

D = BD Push Button



### Penetration Force Measurement

|                              | FO<br>min-max in N       | F1<br>min-max in N       | F2<br>min-max in N       | FR min-max in N          |
|------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| A: Greiner Bio-One SBC (23G) | <b>0.60</b><br>0.55-0.65 | <b>0.80</b><br>0.75-0.85 | <b>0.85</b><br>0.80-0.98 | <b>0.04</b><br>0.03-0.06 |
| B: BD Safety-Lok™ (23G)      | <b>0.70</b><br>0.50-1.10 | <b>1.05</b><br>0.80-1.27 | <b>0.80</b><br>0.70-1.05 | <b>0.05</b><br>0.04-0.07 |
| C: BD Ultra-Touch™ (23G)     | <b>0.40</b><br>0.30-0.48 | <b>1.20</b><br>1.10-1.36 | <b>1.15</b><br>1.00-1.35 | <b>0.04</b><br>0.03-0.06 |
| D: BD Push Button (23G)      | <b>0.60</b><br>0.50-0.80 | <b>0.98</b><br>0.80-1.14 | <b>0.80</b><br>0.65-1.00 | <b>0.04</b><br>0.05-0.03 |

FO: maximum force during piercing = tip resistance/penetration  
 F1: maximum force during cutting = progression of bevel  
 F2: maximum force during dilatation = heel passing  
 FR: mean value for friction = shaft glide in tissue

The Greiner Bio-One VACUETTE® Safety Blood Collection Set (SBC) exhibited the lowest amount of force required during the cutting (F1) phase with 33% less force required than the BD UltraTouch™.

The cutting phase (F1), in combination with the piercing and dilatation phases, is the most relevant measure with regard to patient sensation of pain, depicting force of needle penetration through the skin during venipuncture.

## Needle Geometry Results:

- Large tolerance ranges for bevel angle were noted for the BD Safety-Lok™ and BD Push Button.
- The bevel geometry of BD UltraTouch™ may lead to tissue coring.
- The VACUETTE® Safety Blood Collection Set had remarkably good consistency in geometry measures with very low variation in tolerance range.

In summary, the Greiner Bio-One VACUETTE® Safety Blood Collection Set demonstrated low penetration force measurements throughout the puncture process, which directly correlates to minimal perceived pain during a venipuncture.



Complete study is available upon request. Please contact [marketing@us.gbo.com](mailto:marketing@us.gbo.com)