

Force Testing Comparison of Healthmark CC-230-400 New Brush Head and Olympus BW-15B Brush

**Procedure & Data**

The two brushes tested were the new CC-230-400 brush head and the equivalent Olympus brush (BW-15B).



*Figure 1 – The two brushes*

<b>Brush</b>	<b>Diameter (mm)</b>	<b>Bristle Length (mm)</b>
BW-15B	6	7
CC-230-400	4.5	43

*Table 1 – The dimensions of each brush*

Each brush was run using the standard brush testing in lumen program. The stainless steel lumens used had diameters of 2 & 3 mm. The program was set to insert and remove the brush from the lumen a total of 3 times. The program was run 5 times for each brush into each lumen. The data was analyzed and is displayed below:

<b>Brush</b>	<b>Maximum Force Inserting into Lumen (N)</b>	<b>Average Force Inserting into Lumen (N)</b>
BW-15B	2.6912	0.5471
CC-230-400	5.9339	2.9981

*Table 2 – The forces required to insert each brush into the 2 mm lumen*

<b>Brush</b>	<b>Maximum Force Inserting into Lumen (N)</b>	<b>Average Force Inserting into Lumen (N)</b>
BW-15B	0.4359	0.1646
CC-230-400	3.5185	1.8460

*Table 3 – The forces required to insert each brush into the 3 mm lumen*

<b>Brush</b>	<b>Maximum Force Pulling out of Lumen (N)</b>	<b>Average Force Pulling out of Lumen (N)</b>
BW-15B	1.3211	0.4048
CC-230-400	5.1243	1.9928

*Table 4 – The forces required to pull each brush out of the 2 mm lumen*

<b>Brush</b>	<b>Maximum Force Pulling out of Lumen (N)</b>	<b>Average Force Pulling out of Lumen (N)</b>
BW-15B	0.3025	0.1379
CC-230-400	4.9242	1.9973

*Table 5 – The forces required to pull each brush out of the 3 mm lumen*

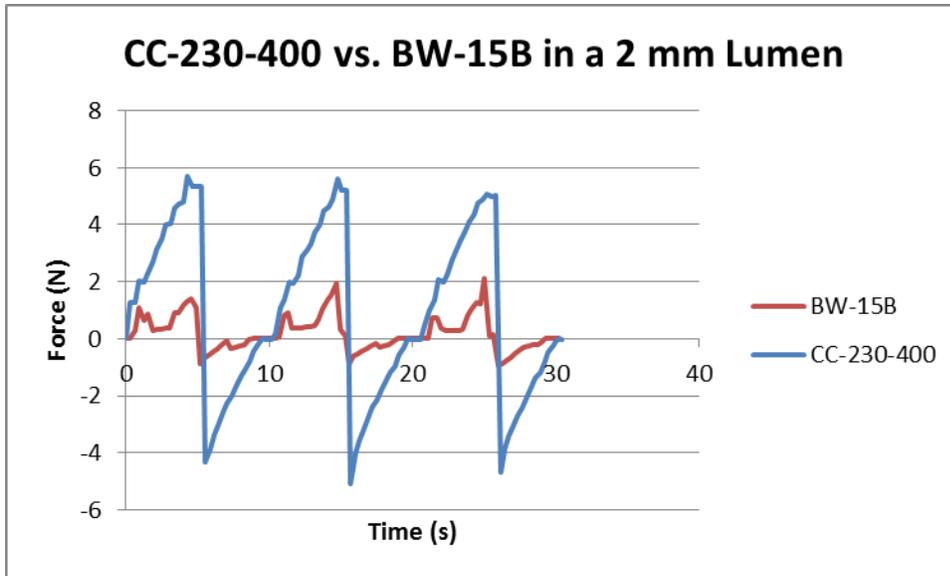


Figure 2 – One program run of each brush graphed for comparison (2 mm lumen)

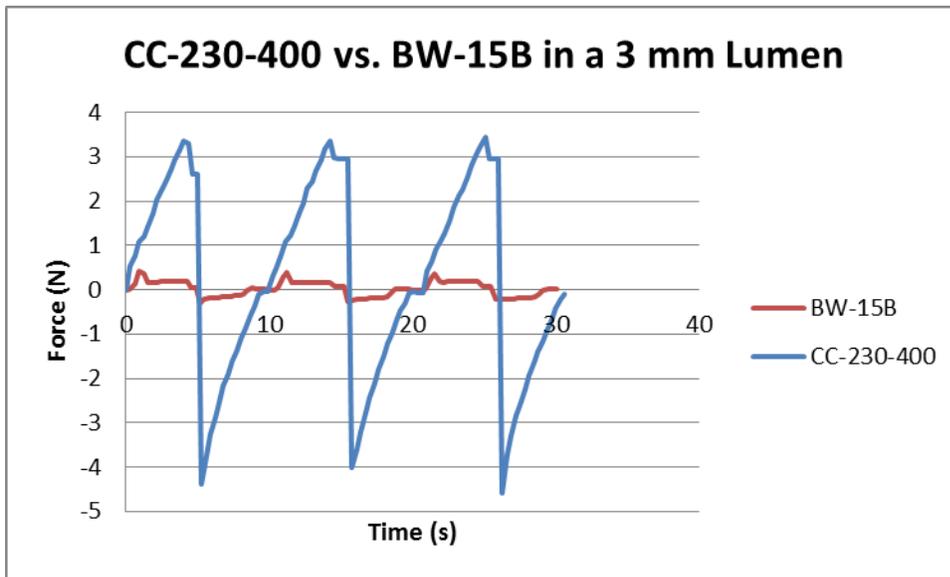


Figure 3 – One program run of each brush graphed for comparison (3 mm lumen)

The ability of each brush to remove soil was tested by soiling 2 mm and 3.175 mm Teflon tubes and running the standard brush testing in lumen program. The weights were taken at each step to determine soil added and removed. After the brushing program was run, the lumens were flushed with water and air to simulate a real world cleaning scenario.

<b>Brush</b>	<b>Average % of Soil Removed From Brushing</b>	<b>Average % of Soil Removed From Brushing &amp; Flushing</b>
BW-15B	6	99
CC-230-400	5	99

*Table 6 – Amount of soil removed with a dry brush (2 mm lumen)*

<b>Brush</b>	<b>Average % of Soil Removed From Brushing</b>	<b>Average % of Soil Removed From Brushing &amp; Flushing</b>
BW-15B	46	98
CC-230-400	52	99

*Table 7 – Amount of soil removed with a dry brush (3 mm lumen)*

## **Discussion**

The force required to insert or remove a brush from the lumen is associated with the friction of the bristles contacting the surface of the lumen. Therefore, a higher force can be related to more bristle contact with the lumen. More bristle contact and friction can be related to cleaning power, because the bristles would have more opportunities to loosen and remove soil. Comparing the two brushes, the new CC-230-400 brush head required more force to be inserted and removed, with higher peak forces, and higher average forces (Tables 2 - 5 and Figures 2 & 3). This is likely due to the greater length of bristles along the shaft of the new CC-230-400 brush head compared to the BW-15B, which have more contact with the lumen and create more friction. Even though the BW-15B is wider in diameter, there is more bristle contact with the new CC-230-400 brush head due to the much greater length along the shaft. Overall, more force is required to insert and remove the new CC-230-400 brush head compared to the Olympus's BW-15B. As stated, this greater overall force can be related to more friction and bristle contact. When testing actual soil removal (Tables 6 & 7), both brushes performed similarly, each having about 5-6% removal from the brushing alone, and then about 99% removal with flushing the lumen. Due to limitations in the available length of each brush's shaft when testing the 2 mm lumen, the brushes weren't able to be inserted the entire length of the soiled lumen. This explains the low percent of soil removed from brushing alone in the 2 mm soiled lumen, but since both brushes were inserted the same distance, the data is comparable. With the 3.175 mm soiled lumen, the brushes were able to be inserted further, resulted in higher soil removal. The differences in soil removal between the 2 & 3 mm lumens from brushing has more to do with the distances the brushes were inserted, and not the performance of

the brushes. With the force and soil removal data previously detailed, it is demonstrated that the new CC-230-400 brush head would perform similarly to Olympus's BW-15B.