

## Physics Lecture 12 - Data on Standard Wheel Bores

### Summary/Conclusions

Several boxes of BSA 1999 official Standard wheels show hub bore diameters that vary. Most wheels have a variance of 0.0007", commonly called "taper", between the inside and outside bores. The taper associated with a particular batch number can, however, change with time.

### Measurements

The measurements were made using a 1-inch span micrometer caliper capable of interpolation to 0.0001". The repeatability of the caliper using its constant torque clutch feature was 0.0001". The caliper was calibrated with a standard pin gauge of 0.0100 ± 0.0002". Various polished drill bit shank tips were measured with the calipers. By trial and error the shank tips that would barely penetrate the bore without excessive force were taken as the bore diameter.

BATCH NO.	OUTSIDE	INSIDE	TAPER	DATE
14	0.0938	0.0932	0.0006	6/1/04
6	0.0968	0.0958	0.0010	04/01/06
BLANK	0.0970	0.0960	0.0010	07/01/06
4	0.0973	0.0956	0.0017	07/01/06
5	0.0989	0.0973	0.0016	07/01/06
12	0.0989	0.0973	0.0016	07/01/06
11	0.0989	0.0975	0.0014	07/01/06
14	0.0989	0.0982	0.0007	07/01/06
10	0.0989	0.0982	0.0007	07/01/06
13	0.0989	0.0982	0.0007	07/01/06
1	0.0989	0.0982	0.0007	07/01/06
2	0.0989	0.0982	0.0007	07/01/06
3	0.0989	0.0982	0.0007	07/01/06
15	0.0989	0.0982	0.0007	07/01/06
17	0.0989	0.0982	0.0007	07/01/06
18	0.0989	0.0982	0.0007	07/01/06
8	0.0989	0.0982	0.0007	07/01/06
18	0.1012	0.1005	0.0007	06/01/04



**Figure 1** - Micrometer calipers with constant torque clutch next to a pin gauge of 0.0100" diameter used to calibrate the calipers for measuring bore-fitting drill bit shanks (not shown).

### Discussion

As shown by the table, measurements of batch numbers from 1 to 18 were made excepting numbers 7, 9, and 16. Batch numbers 14 and 18 had examples that had been purchased 2 years apart and showed substantial differences in bore size over this time period. The good news is 10 of the batch numbers had bores that measured 0.0989 on the outside and 0.0982 on the inside for a reasonable taper of only 0.0007". The "taper" does not appear to be uniformly sloped from outside to inside but rather concentrated closer to the inside. The 0.0982" measurement has an estimated accuracy of ± 0.0001". Occasionally a 4- flute parallel reamer would lightly touch the inside bore surface of some of the 0.0982" measurement inside bores even though the reamer was listed as 0.0980". Its accuracy is likely no better than ± 0.0001" as well. If a bore is reamed, it definitely should be polished, preferably with the technique listed under Speed Package.