

DK COMPOSITE

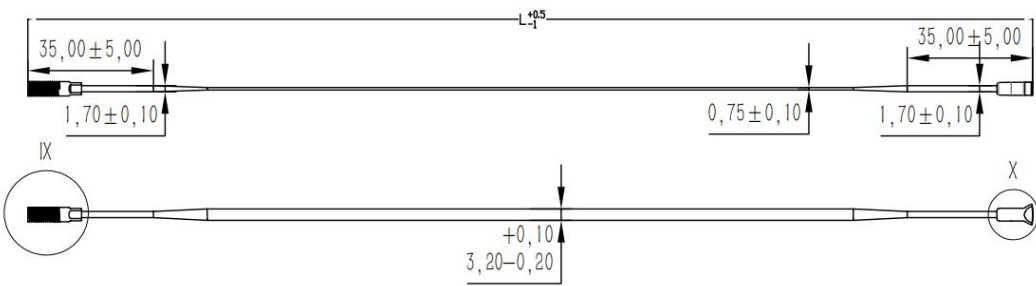
Test Report Carbon Spoke T32

DK Composite

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1 Introduction

Test Date	01.05.2025	Model	CS-T32
Doc Number	DK-TR-T32-01052025	Serial Number	DK-CS-T32-SP
Weight	2g	Version	V1
Test Status	Sample Test	Test basis	ISO 4210/DK Factory standard
Drawing	 The drawing shows a long, thin component with several dimensions and cross-sections. The top view shows a central section with a length of L_{TS}. The left end has a width of $35,00 \pm 5,00$ and a height of $1,70 \pm 0,10$. The right end has a width of $35,00 \pm 5,00$ and a height of $1,70 \pm 0,10$. The central section has a width of $0,75 \pm 0,10$. The bottom view shows a central section with a length of $3,20 - 0,20$ and a height of $+0,10$. Cross-sections IX and X are indicated at the ends of the component.		

2 Summary

Test requirements fulfilled.
All laboratory tests passed.

3 Laboratory Tests

3.1 Carbon Spoke Tensile Strength Test---120kg

A: Test Condition

1. Fix the carbon spoke T-head on a special fixture; vertically to the test machine head.
2. The machine head rises at a speed of 8mm/min, and returns to the origin after pressurizing to 120kgf;
3. Test three carbon spokes of the same specification, apply a force of 120kgf, and record the load displacement.

B: Judgement Standard

1. After the tension reaches 120kgf, the spoke elongation is $\leq 1\%$

C: Test Results

Spoke Model	120kg Load Displacement			Average Displacement	Elongation (Displacement/Total Length)
	1	2	3		
Spaim-CX-RAY Steel Spoke-268MM	0.988	0.919	0.916	0.941	0.35%
T38-281MM Carbon Spoke	0.824	0.773	0.783	0.793	0.28%
T50-281MM Carbon Spoke	0.763	0.754	0.783	0.767	0.27%
T32-253MM Carbon Spoke	1.161	1.184	1.184	1.176	0.46%
T32-258MM Carbon Spoke	1.138	1.165	/	1.152	0.45%
T32-269MM Carbon Spoke	1.207	1.172	/	1.190	0.44%
T32-270MM Carbon Spoke	1.232	1.207	/	1.220	0.45%
T32-281MM Carbon Spoke	1.196	1.196	1.208	1.200	0.43%

D: Test Pictures



3.2 Carbon Spoke Tensile Strength Test---140kg

A: Test Condition

1. Fix the carbon spoke T-head on a special fixture; vertically to the test machine head.
2. The machine head rises at a speed of 8mm/min, and returns to the origin after pressurizing to 140kgf;
3. Test three carbon spokes of the same specification, apply a force of 140kgf, and record the load displacement.

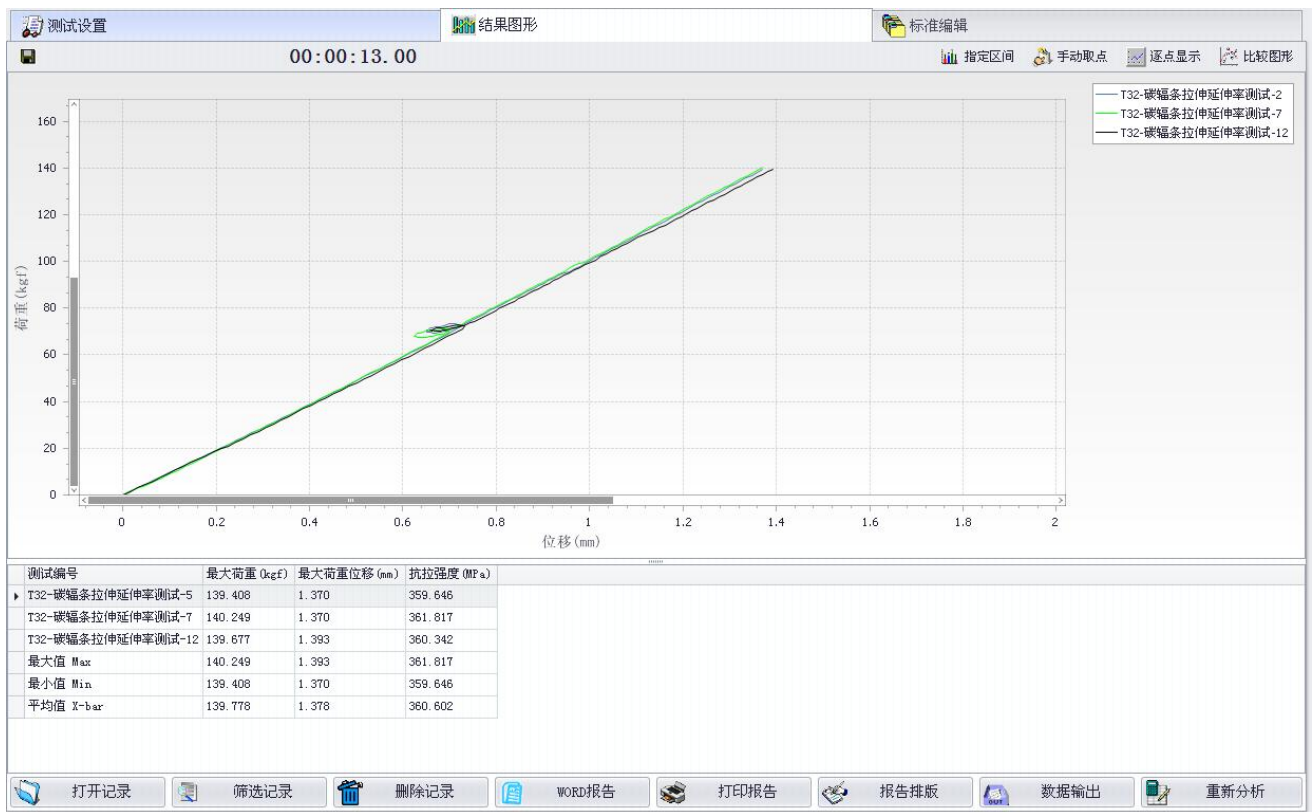
B: Judgement Standard

1. After the tension reaches 140kgf, the spoke elongation is $\leq 1\%$

C: Test Results

Spoke Model	140kg Load Displacement			Average Displacement	Elongation (Displacement/Total Length)
	1	2	3		
Spaim-CX-RAY Steel Spoke-268MM	1.1	1.123	1.055	1.093	0.41%
T38-281MM Carbon Spoke	0.922	0.889	0.9	0.904	0.32%
T50-281MM Carbon Spoke	0.889	0.878	0.889	0.885	0.32%
T32-253MM Carbon Spoke	1.312	1.312	1.289	1.304	0.52%
T32-258MM Carbon Spoke	1.289	1.338	/	1.314	0.51%
T32-269MM Carbon Spoke	1.312	1.312	/	1.312	0.49%
T32-270MM Carbon Spoke	1.348	1.289	/	1.319	0.49%
T32-281MM Carbon Spoke	1.37	1.37	1.393	1.378	0.49%

D: Test Pictures



3.3 Carbon Spoke Tensile Strength Test---160kg

A: Test Condition

1. Fix the carbon spoke T-head on a special fixture; vertically to the test machine head.
2. The machine head rises at a speed of 8mm/min, and returns to the origin after pressurizing to 160kgf;
3. Test three carbon spokes of the same specification, apply a force of 160kgf, and record the load displacement.

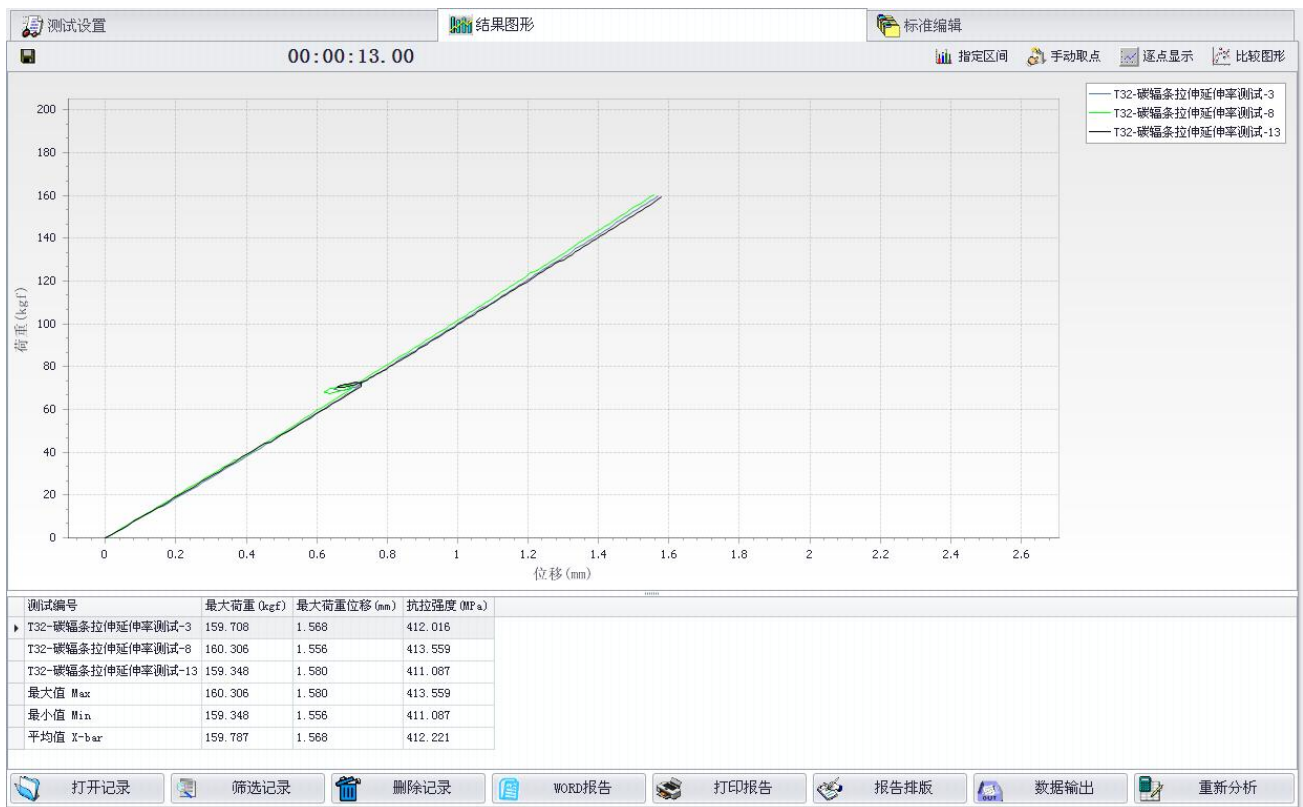
B: Judgement Standard

1. After the tension reaches 160kgf, the spoke elongation is $\leq 1\%$

C: Test Results

Spoke Model	160kg Load Displacement			Average Displacement	Elongation (Displacement/Total Length)
	1	2	3		
Spaim-CX-RAY Steel Spoke-268MM	1.242	1.181	1.206	1.210	0.45%
T38-281MM Carbon Spoke	1.035	1.032	1.012	1.026	0.37%
T50-281MM Carbon Spoke	1	0.989	1	0.996	0.35%
T32-253MM Carbon Spoke	1.486	1.486	1.463	1.478	0.58%
T32-258MM Carbon Spoke	1.451	1.513	/	1.482	0.57%
T32-269MM Carbon Spoke	1.486	1.475	/	1.481	0.55%
T32-270MM Carbon Spoke	1.536	1.451	/	1.494	0.55%
T32-281MM Carbon Spoke	1.568	1.556	1.58	1.568	0.56%

D: Test Picture:



3.4 Carbon Spoke Tensile Strength Test---300kg

A: Test Condition

1. Fix the carbon spoke T-head on a special fixture; vertically to the test machine head.
2. The machine head rises at a speed of 8mm/min, and returns to the origin after pressurizing to 300kgf;
3. Test three carbon spokes of the same specification, apply a force of 300kgf, and record the load displacement.

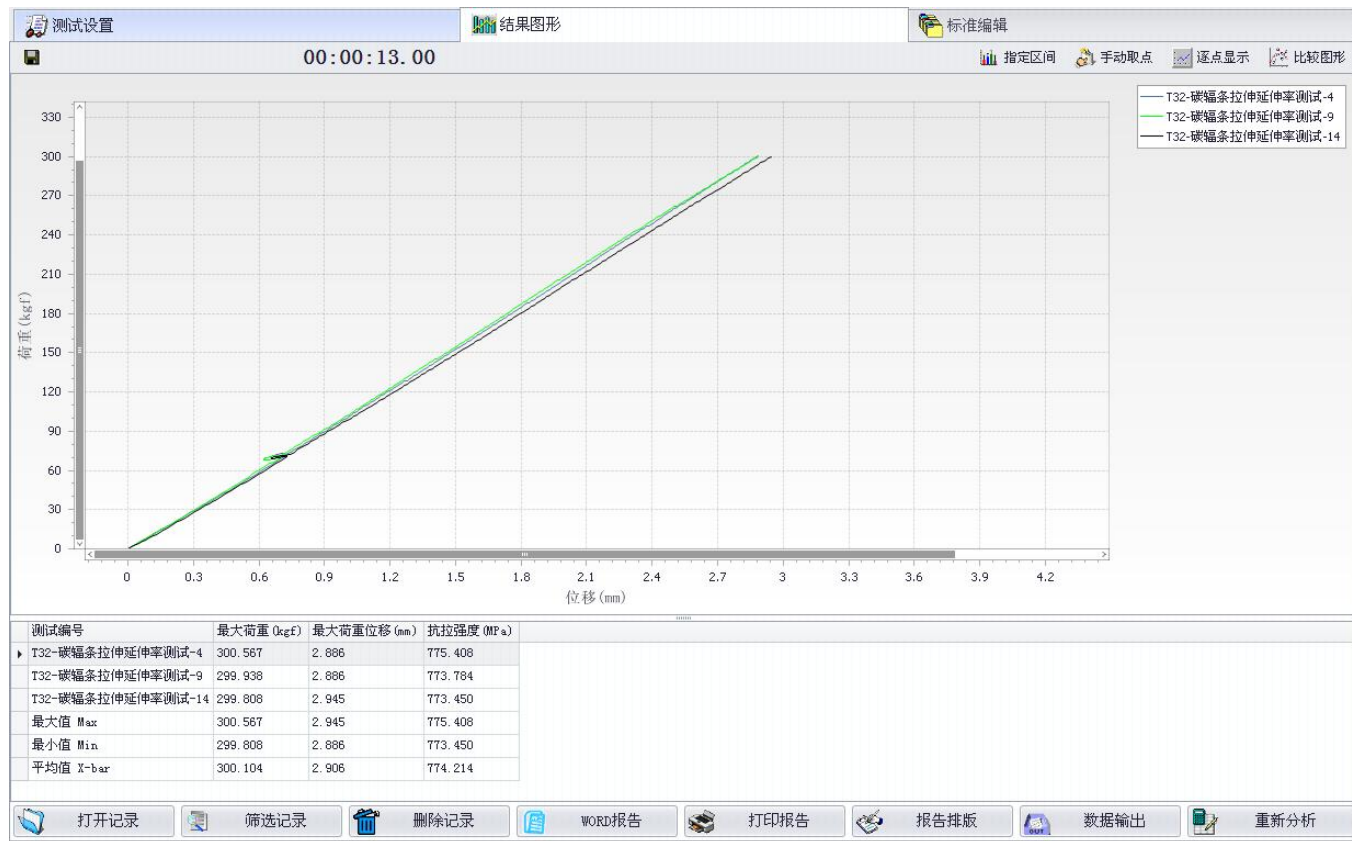
B: Judgement Standard

1. After the tension reaches 160kgf, the spoke elongation is $\leq 2\%$

C: Test Results

Spoke Model	300kg Load Displacement			Average Displacement	Elongation (Displacement/Total Length)
	1	2	3		
Spaim-CX-RAY Steel Spoke-268MM	/	/	/	Broken at 282kg average	
T38-281MM Carbon Spoke	1.906	1.895	1.883	1.895	0.67%
T50-281MM Carbon Spoke	1.895	1.883	1.883	1.887	0.67%
T32-253MM Carbon Spoke	2.688	2.653	2.641	2.661	1.05%
T32-258MM Carbon Spoke	2.606	2.7	/	2.653	1.03%
T32-269MM Carbon Spoke	2.676	2.665	/	2.671	0.99%
T32-270MM Carbon Spoke	3.108	2.665	/	2.887	1.07%
T32-281MM Carbon Spoke	2.886	2.886	2.945	2.906	1.03%

D: Test Pictures:



3.5 Ultimate Tensile Test

A: Test Condition

1. Fix the carbon spoke T-head on a special fixture; vertically to the test machine head.
2. The machine head rises at a speed of 8mm/min, pressurize until the spokes break;
3. Test three carbon spokes of the same specification by applying force until they break, and record the maximum load breaking value

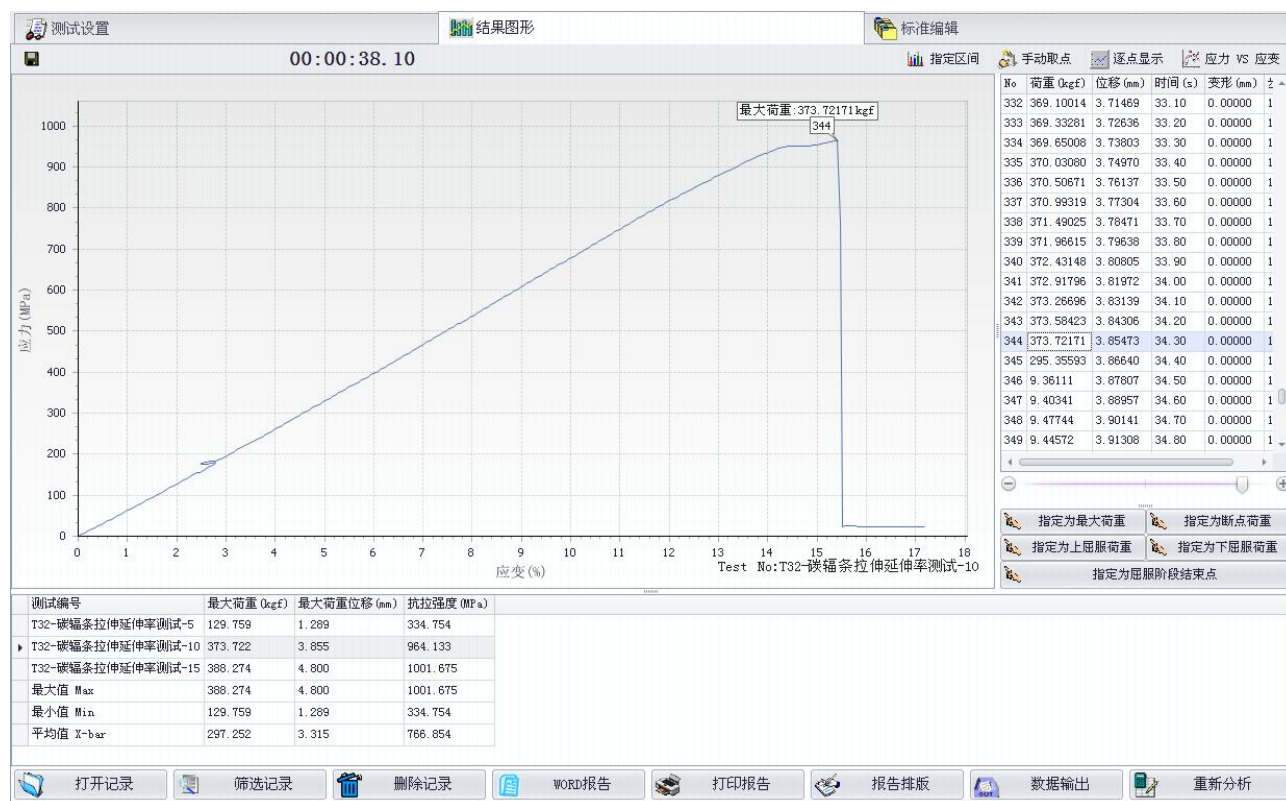
B: Judgement Standard

1. maximum load breaking value of the spokes shall be $\geq 300\text{kgf}$.

C: Test Results

Spoke Model	Maximum Load Breaking Value(kgf)			Average Displacement	Maximum Load Breaking Average(kgf)
	1	2	3		
Spaim-CX-RAY Steel Spoke-268MM	291.167	273.857	282.384		282.469
T38-281MM Carbon Spoke	468.499	482.718	473.692		474.970
T50-281MM Carbon Spoke	438.497	459.679	490.586		462.921
T32-253MM Carbon Spoke	390.857	368.127	372.271		377.085
T32-258MM Carbon Spoke	441.462	404.79	/		423.126
T32-269MM Carbon Spoke	415.271	460.516	/		437.894
T32-270MM Carbon Spoke	404.574	381.339	/		392.957
T32-281MM Carbon Spoke	326.578	373.722	388.274		362.858

D: Test Pictures:



3.6 Spoke & Wheel Running Test

A: Test Condition

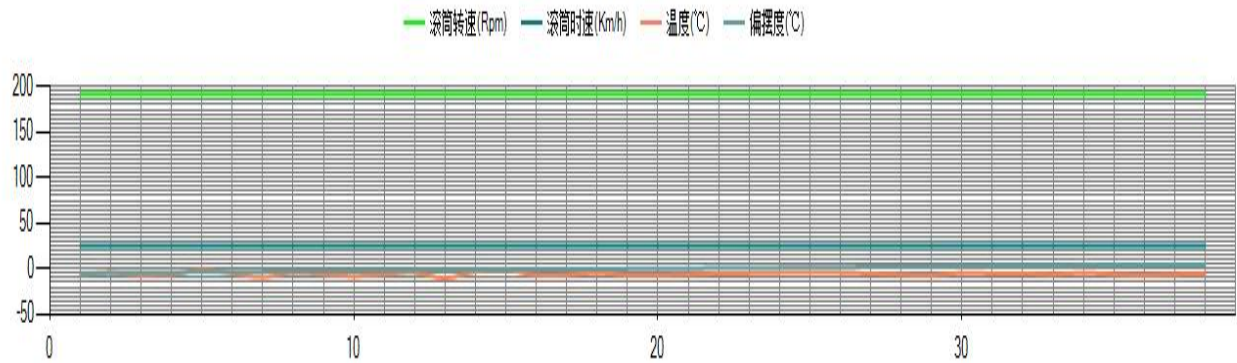
1. Wheelset: Load 65kg, speed 25km/h, Tire Pressure 110psi.
2. Assemble the wheel, tire and inner tube and inflate the tire to 90% of the maximum inflation pressure.
3. The diameter of the drum should be in the range of 500mm to 1000mm, the width of the slats should be $50\text{mm} \pm 2.5\text{mm}$, thickness $10\text{mm} \pm 0.25\text{mm}$, and the edges should be half of their thickness with a 45° chamfer.
4. The circumferential spacing between the center lines of two consecutive slats shall not be less than 400mm. Rotate the drum to a linear speed of 25km/h ($\pm 10\%$) for a period of time to provide 750,000 impacts between the tire and the slats.

B: Judgment Standard

1. For road running, the difference in front and rear wheel rim runout is $\leq 0.2\text{mm}$, the average difference in carbon spoke tension is $\pm 0.1\text{mm}$, and the average difference in wheel rim outer width is $\pm 0.1\text{mm}$.

C: Test Results

Test Data 1			
Rim Model	D50TL-28		
Conditions	Road Running 1370km (1.2 million times + Impact)		
	Before Running	After Running	Difference
Flatness	0.26/0.28	0.18/0.22	
Measured Value(the outer width of brake edge)	28.14	28.11	-0.03
	28.18	28.14	-0.04
	28.26	28.23	-0.03
	28.24	28.10	-0.03
	28.20	28.19	-0.14
	28.24	28.19	-0.01
	28.28	28.25	-0.05
	28.24	28.24	-0.03
Average	28.2225	28.18125	-0.04125



Test Data 2						
Spoke No.	Wheel Without Tire			Wheel with 108 psi tire pressure		
	After Running	Before Running	Difference	After Running	Before Running	Difference
1	1.75	1.7	-0.05	1.6	1.7	0.1
2	1.2	1.15	-0.05	1.2	1.1	-0.1
3	1.65	1.9	0.25	1.6	1.8	0.2
4	1.15	1.1	-0.05	1	1.1	0.1
5	1.6	1.6	0	1.5	1.55	0.05
6	1.2	1.2	0	1.15	1.1	-0.05
7	1.7	1.85	0.15	1.55	1.7	0.15
8	1.1	1.1	0	1	1.1	0.1
9	1.65	1.65	0	1.55	1.6	0.05
10	1.25	1.2	-0.05	1.2	1.1	-0.1
11	1.65	1.75	0.1	1.55	1.6	0.05
12	1.1	1.1	0	1	1	0
13	1.6	1.6	0	1.5	1.55	0.05
14	1.25	1.15	-0.1	1.1	1.05	-0.05
15	1.6	1.7	0.1	1.5	1.55	0.05
16	1.2	1.2	0	1.15	1.1	-0.05
17	1.65	1.7	0.05	1.6	1.6	0
18	1.1	1.1	0	1.1	1	-0.1
19	1.55	1.7	0.15	1.5	1.55	0.05
20	1.15	1.2	0.05	1.1	1.15	0.05
Average	1.3625	1.425	0.0625	1.325	1.325	0.0275

D: Test Pictures: