WEAR TEST DATA for SELECTED BICYCLE ROAD TIRES

Compiled by Kerry Irons

CLINCHER TIRES

NEW TIRE DATA (all models 23 mm unless noted)

Manufacturer	Model	Mass	Thickness (in • 10^{-3})		Note
		(g)	*tread*	*sidewall*	
Continental	Grand Prix 3000	232	128-129	23	
Continental	Grand Prix	220-222	115-122	22	
Continental	Grand Sport	275	n/a	40	
IRC	PaperLite Plus	n/a	n/a	21	
IRC	Metro	540	n/a	23	
Michelin	Axial Pro	~240	n/a	31	
Michelin	Axial Pro (winter)	227	n/a	31	
Michelin	HiLite BiSynergic	260	n/a	31	
Michelin	HiLite Comp (20 mm)	260	106-112	46	
Michelin	HiLite Comp	~280	n/a	39	
Michelin	BiSynergic	~240	n/a	33	(a)
Michelin	Axial SuperComp	240	n/a	42	
Michelin	Axial Pro	225	95-99	30	
Panaracer	Pasela Comp (26" x 1.25")	240	n/a	21	
Specialized	Armadillo (26 mm)	380	n/a	40	
Vittoria	TwinTechno Green	230	80-87	30	
Vittoria	Twin Techno Orange (marked 25 mm, measured 23 mm)	270	120-127	33	
Vredestein	Fortezza TriComp	262	109-115	26	
Vredestein	Fortezza (25 mm)	280	n/a	25	

USAGE/WEAR DATA

Manufacturer	Model	Usage (mi)	Rider mass (kg)	Tire mass (g)	Tread thickness ($in \bullet 10^{-3}$)	Tread thickness (% loss)	Note
Continental	Grand Prix 3000	5050F					(e)
Continental	Grand Prix 3000	1300R	82	217	69-77	6	(e)
Continental	Grand Prix 3000	1300F					(e)
Continental	Grand Prix 3000	2950R	82	203	66-75	12	
Continental	Grand Prix 3000	4050F	82	224	105-110	3	
Continental	Grand Prix 3000	4000R	86	194	66-72	16	(f, g)
Continental	Grand Prix 3000 (20 mm)	2640R/2350F	68	178	82-88	23	(c)
Continental	Grand Prix 3000	3380R/3380F	64	192	63-70	17	(e)
Continental	Grand Prix 3000	3380R/3380F	64	191	65-73	18	(e)
Continental	Grand Prix 3000 blue	3380R/3380F	64	191	65-73	18	(f)
Continental	Grand Prix 3000 gray	3380R/3380F	64	191	65-73	18	(f)
Continental	Grand Prix 3000 blue	3380R/3380F	64	191	65-73	18	(f)
Continental	Grand Prix	9500F/4500R	56	198	70-77	10	(e)
Continental	Grand Prix	5045F/4068R	82	192	71-76	13	(d)
Continental	Grand Prix	6070R	84	199	64-78	10	(e)
Continental	Grand Prix	~9500R	57	194	63-78	12	(e)
Continental	Grand Prix	~9500F	57	222	111-120	0	(d)
Continental	Grand Prix	3170F/5045R	84	191	68-85	13	(e)
Continental	Grand Sport	~1500R	86	243	85-90	12	(h)
Continental	Grand Sport	1100R	84	235	68-75	15	(h)
IRC	Paper Lite Plus	2000R	68	175	36-51	?	(f)
IRC	Metro (26" x 1.5")	1100R	88	535	102-106	1	(c)
Michelin	Axial Pro	2100R	86	209	54-56	13	(f, g)
Michelin	Axial Pro winter	2000R	82	205	54-56	10	
Michelin	HiLite BiSynergic	~2300R	68	225	64-67	13	(e)
Michelin	HiLite Comp (20 mm)	1730R	79	250	73-80	4	(e)
Michelin	HiLite Comp	600R	88	243	70-75	13	(c)
Michelin	BiSynergic	7940F	84	232	73-81	3	(d)
Michelin	BiSynergic	7940F/2230R	84	220	52-58	8	(e)
Michelin	Axial Super Comp	2160R	79	214	59-65	11	(g)
Michelin	Axial Super Comp	3540F	79	217	71-76	10	(c, g)
Michelin	Axial Pro	0	n/a	225	95-99	6	(b)
Michelin	Axial Pro	3850F	84	221	70-72	8	(e, g)
Michelin	Axial Pro (20 mm)	3500R	84	190	52-66	21	(f, g)
Panaracer	Pasela (26" x 1.25")	1000F/300R	88	231	93-98	4	(c)
Specialized	Armadillo (26")	1100R	88	350	72-85	8	(c)
Vittoria	Twin Techno Orange (marked 25 mm, measured 23 mm)	4200R	82	245	68-75	9	(e)
Vredestein	Fortezza	~2000R	82	234	66-74	11	(c)
Vredestein	Fortezza TriComp	6420F		236			(e)
Vredestein	Fortezza TriComp	1950R	82	236	59-65	10	(e)
Vredestein	Fortezza TriComp (25 mm)	900F					(e)
Vredestein	Fortezza TriComp (25 mm)	1200R	82 - 98	255	47-62	8	
Vredestein	Fortezza	~2000R	82	234	66-74	11	(c)
Vredestein	Fortezza (25 mm)	~715R	88	265	69-74	5	(c)
Vredestein	Fortezza (25 mm)	~1940R	79	259	73-82	8	(c)
Vredestein	Fortezza	1400R	79	225	78-86	14	(c)

TUBULAR TIRES

Manufacturer	Model	Usage (mi)	Rider mass (kg)	Tire mass new/used (g)	Thickness (in•10^{-3}) tread	sidewall	Note
Clement	Criterium (~23 mm)	2025R	73	252/235	n/a	n/a	(c)
Clement	Criterium (~23 mm)	1310R	73	252/237	n/a	n/a	(c)
Continental	Sprinter 250 (22 mm)	2475R	73	280/262	n/a	n/a	(c, g)
Foxonall (Clement)	Criterium (~23 mm)	1690F/1135R	73	250/246	n/a	n/a	(c, g)
Vittoria	Tour TSD	~500F	84	273/273	78	25	(b, i)

INNERTUBES

Manufacturer	Model	Mass (g)	Thickness (in • 10^{-3})	Note
Michelin	Ultralight	69	38	(j)
Michelin	Airstop	43		(j, k)
Nashbar (mfd. by Kenda)	Ultralight	74	41	(j)
Vittoria	(tubular)	n/a	38	(j)

Data also posted at http://ttf.cyclingforum.com/phpBB2/viewtopic.php?p=8034

TESTING NOTES

(a) Mass of a new Michelin BiSynergic could not be determined (~240 g?). The manufacturer's listed weight for the Michelin Axial SuperComp is 240 g.

(b) New tire.

(c) Significant tread wear, but tire not worn out.

(d) Significant aging (crazing, cuts), but tire not worn out.

(e) Tire worn so that casing just showed.

(f) Tire worn so that casing showed extensively.

(g) Tread separating from casing.

(h) Rider felt tire was worn out at 1500 miles, then rode it another 1100 miles before the casing started showing through tread.

(i) The Vittoria TSD is a relatively low cost tubular tire (nominal mass = 270 g, $25) that was cut open to take the measurements. There was no visible tread wear on the ribbed center section.

(j) Innertube thickness measurement is "double" (two layers of tube).

(k) Michelin Airstop tube was patched, so no weight was taken.

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2. All tires widths were marked 23 mm unless noted.
3. F/R refers to whether and how much the tire was used on the front or rear wheel.
4. Thicknesses (tread and sidewall) are in thousandths of an inch, as measured with a micrometer accurate to 0.001". Tread thickness was measured in the center of the tread in at least 5 locations around the tire. Sidewall thickness was measured in at least two locations away from any lettering or labels. Since rubber can be compressed, an attempt was made to apply equal pressure (by feel) on each measurement. Variations in pressure could have caused thickness measurements to vary by 0.003 - 0.004". Vredesteins have softer tread than the Michelins or Contis, making it harder to get consistent readings.
5. Tire and tube weights were determined on a Mettler digital balance accurate to 1 g.

OBSERVATIONS

1. Tire wear is roughly linear with the total mass it supports.
2. Location (i.e., front or rear) is THE major factor in tire wear. Identical tires show significantly different wear depending on where they are mounted, far more than can be explained by F/R weight distribution. Even after thousands of miles, front tires show little tread thinning and essentially no loss of mass due to wear, although they do thin a little due to “cold flow” of the rubber on the casing, and their sidewalls may become cracked, crazed, scuffed, and cut. Accumulating significant mileage on the front and then switching to the rear reduces rear mileage somewhat compared to mounting a new tire on the rear. The front tire ages due to environmental exposure, resulting in about 1/3 faster wear once mounted on the rear (see for instance the Continental GP with 5,000 miles front/4,000 miles rear vs. 6,000 miles rear for a new Conti GP on the rear, same rider).
3. The reason rear tires wear out so much faster is power transmission through the tire. If there is significant hard braking (lots of steep downhills) then front tires can wear due to power dissipation. Riders who stand, sprint frequently, corner hard, etc. will likely significantly accelerate rear tire wear. Presumably hard cornering would wear front and rear tires roughly equally (affected by F/R weight distribution). It is even likely that riders who “stomp” rather than “spin” will wear rear tires faster.
4. Tires are worn out when they have lost roughly 10% of their weight. Obviously, there are wide variations in tire construction which can shift rubber (and weight) to the tread or away from it, but for the lightweight road tire this general rule applies.
5. From personal experience (my body mass = 82 kg and my wife = 57 kg), I have found no correlation between mileage and flats, but any given tire flats so infrequently that the resulting statistics are fairly sketchy. For roughly 100,000 miles, my wife and I have found that flats spread uniformly over the tire life.
6. There is a significant difference in construction philosophy for different tires. The Continental Grand Prix and GP 3000 sidewalls are ~0.020 inches thick, while the Conti Gran Sport are 0.040". The Michelin Axial Pro sidewalls are 0.030-0.033", while the Axial Super Comp’s are 0.042". Some would argue that these differences explain the “fragile sidewall” reputation that Contis have, though my wife and I have experienced no Conti side wall failures in over 100,000 “tire miles”.

   Michelins have significantly thicker sidewalls than Continentals or Vredesteins, while the Contis have significantly more tread rubber than the Michelins. The tread of a new Axial Pro is not much thicker than a worn-out Conti Grand Prix. The weight of the Michelins is in the casing rather than the tread.

   A Conti GP has 0.045-0.055 inches of tread, while a Michelin Axial Pro has 0.030-0.040". The extra tread thickness, rather than rubber compound differences, explains the greater mileage with the Conti. Within a brand, tread compound does affect durability; a Conti GP 3000 has about the same tread thickness as a Conti Grand Prix, but wears significantly faster, presumably due to much lower carbon black content in its tread compound.

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About the author:

Kerry Irons is a recently retired chemical engineer who has been an active cyclist since the mid-1960s. Irons began self-supported touring with high school friends in 1965, which led to a Michigan- Seattle-San Francisco solo ride in 1970, and a ride around Lake Huron in 1971. Since that time, Irons’ annual riding has averaged 7,000-12,000 miles, including commuting to work year-round and many roller miles in the darkness of Michigan winters. From 1980 to 1985, Irons operated Cyclo-Pedia, a mail order bicycle parts business. Irons rode tubular tires for nearly 30 years, but converted (along with his wife) to clinchers in 1998. This stimulated him to record tire wear data as a way to find better tires and to understand the issues of tire wear. Discussions with members of CyclingForum.com resulted in several riders sending worn out (and not so worn out) tires to Irons for measurement, the result of which is the information presented here.