Campagnolo®

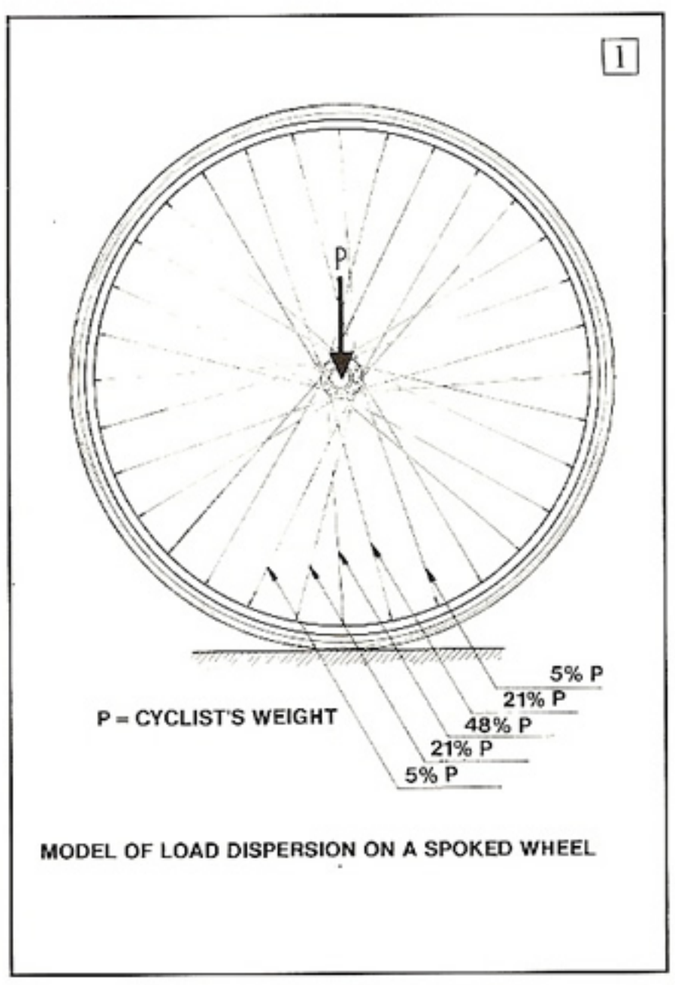
RIMS

RESISTANCE TO VERTICAL LOAD

In use, as a result of the racer's weight, the rim undergoes vertical stresses and transversal and torsional stresses due to the forces resulting from pedaling dynamics.

Campagnolo has paid particular attention to determining the resistance of the vertical load since both durability and comfort are directly related to this parameter.

The rim works like a Roman arch which supports itself by dispersing its weight along the circumference. However, in order to support loads which ouweigh it without being deformed, the radial

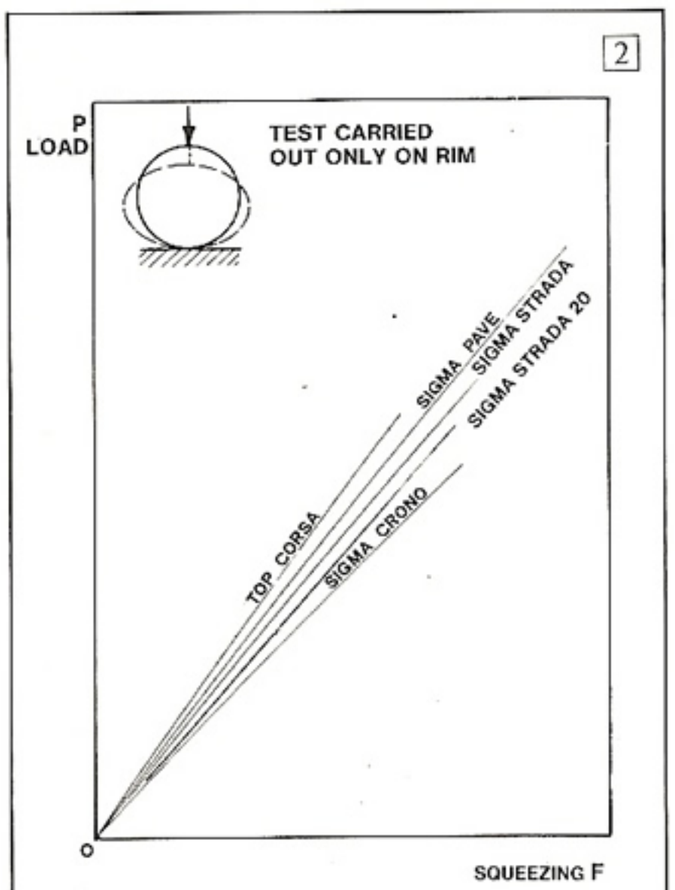


MODEL OF LOAD DISPERSION ON A SPOKED WHEEL

tension in a rim with 32 spokes must be greater than 65 Kg; on the back wheel, this tension must be greater than 110 Kg on the right and 60 Kg on the left.

The racer's weight is applied to the hub. by studying the behaviour of a spoked wheel fitted with a rim of a known profile, thickness and material, engineers have created a mathematical and physical model. This model enabled the actual stresses on the rim due to the weight to be precisely determined.

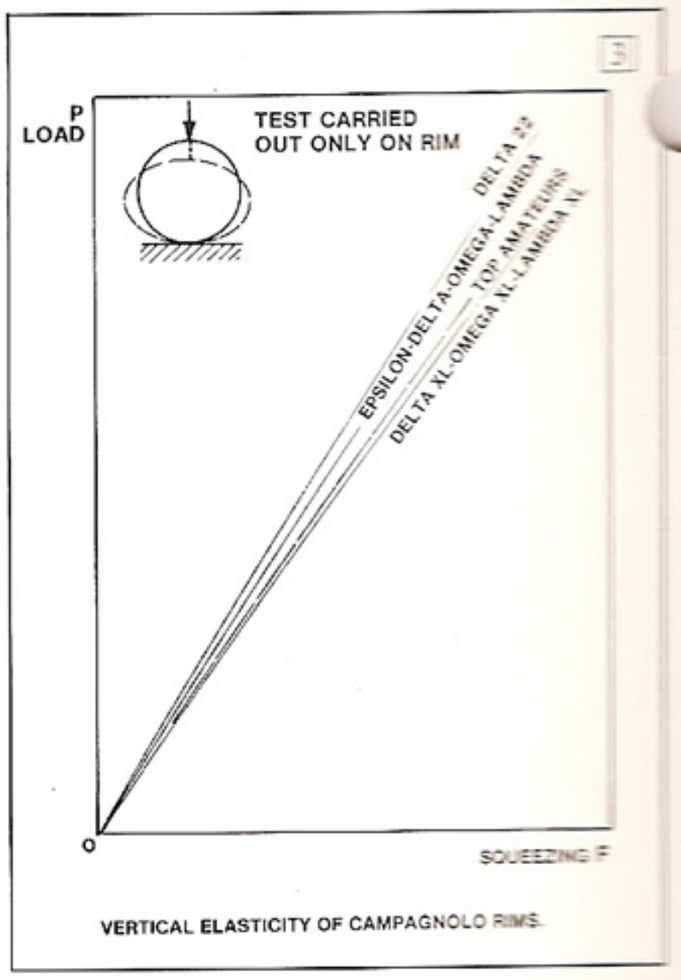
The weight applied to the hub is essentially balanced by means of 5 spokes (Fig. 1), whose



VERTICAL ELASTICITY OF CAMPAGNOLO RIMS.

tension is reduced because of the compression. The rest of the system does not undergo important alterations. On the basis of these considerations, Campagnolo has worked out profiles and materials for its whole range of rims that solve both problems: resistance to vertical loads, and comfort for the racer.

The best level of rigidity of the various rims, as a function of their use, has been determined by means of theoretical results and road-test. Such rigidity ensures the reliability of the rim, even in case of bumps and rough roads, without reducing its elasticity and comfort (Figs. 2 and 3).



VERTICAL ELASTICITY OF CAMPAGNOLO RIMS.

RESISTANCE TO TRANSVERSAL AND TORSIONAL STRESSES

Besides the racer's weight the rim undergoes transversal and torsional stresses resulting from the push on pedals.

The ability to absorb these stresses is fundamental for the reliability and efficiency of the rim.

This feature has been optimized by Campagnolo for its whole range of performance rims

and in particular for SIGMA DELTA and OMEGA rims.

In this way the professional or amateur racer does not waste part of the energy he produces while pedaling.

Transversal loads and absorbing capacity are always checked by Campagnolo's quality control laboratory, which utilizes the most modern equipment.

The capacity to absorb transversal stresses directly affects the durability of the rim's centering hold; no longer will the cyclist's mechanics spend long work hours re-centering all the wheels at the end of the laps run on rough roads (Figs 4 and 5).

The very high elastic limit (even improved in the SIGMA range) gives Campagnolo rims a very high centering reliability during the assembly phase. Thanks to Campagnolo, building a professional wheel in a few minutes will become increasingly common.

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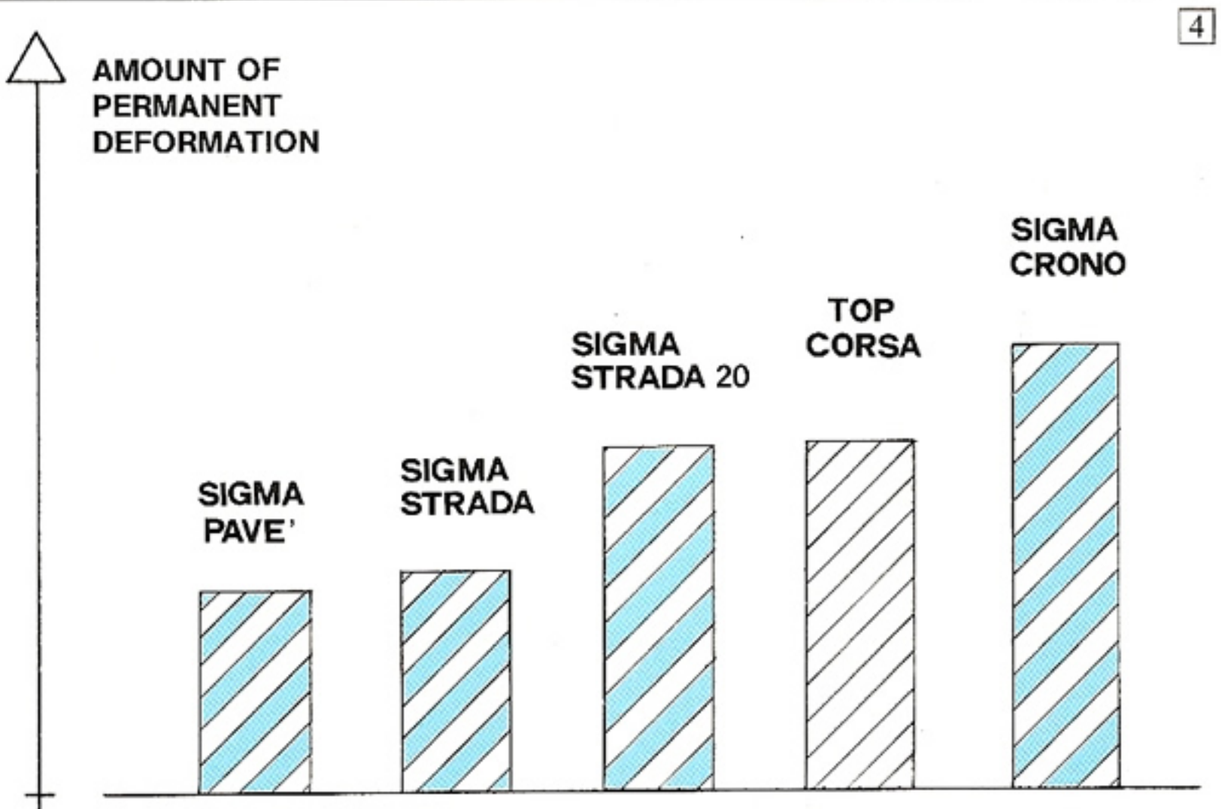

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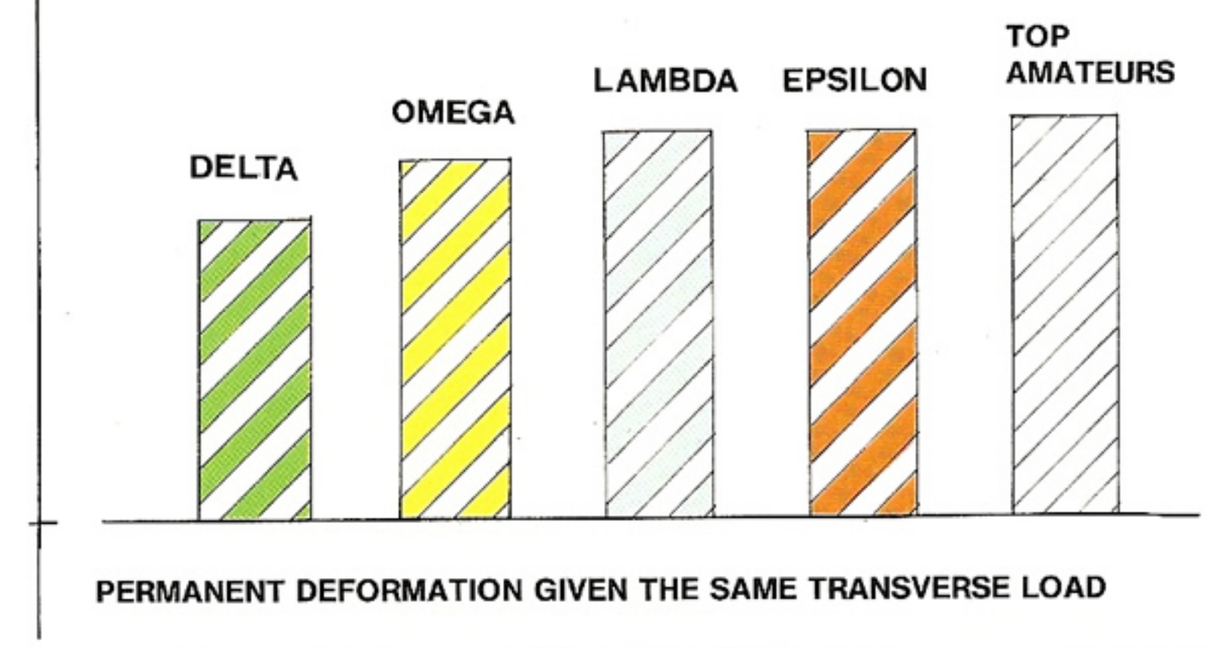

PATENTED POSITIONED EYELETS

Campagnolo rims feature an innovative, patented eyelet, which makes the assembly, centering and balancing of the wheel easier.

Campagnolo eyelets accept spoke nipples in a seat with double positioning, according to their working position: camber positioning, with an angle of 5 degrees (Fig. 7). Campagnolo uses only double eyelets coated with tropicalized zinc-plating. These enable the load to be distributed in

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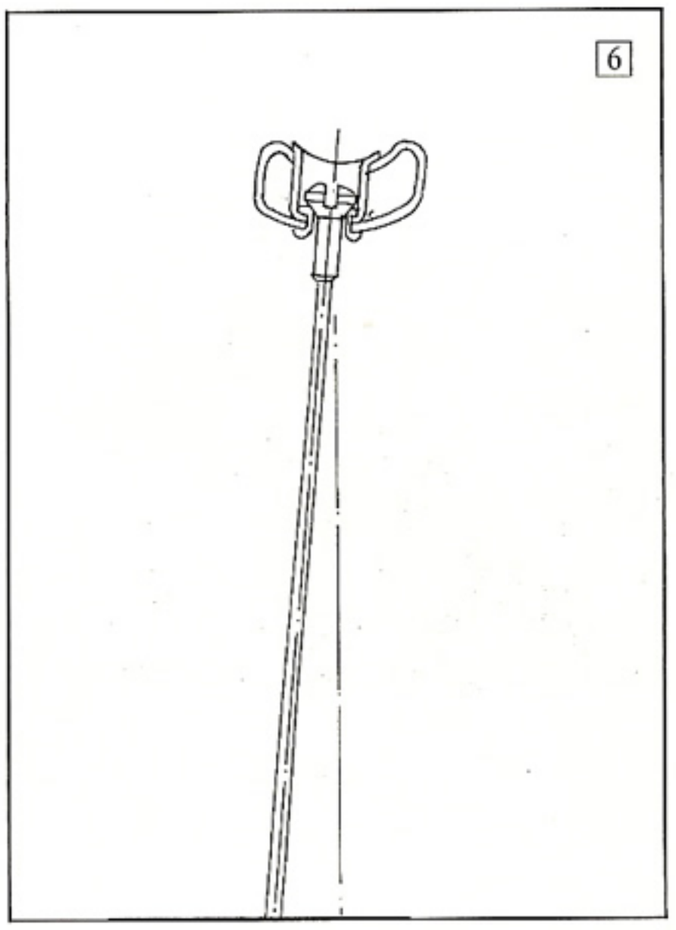
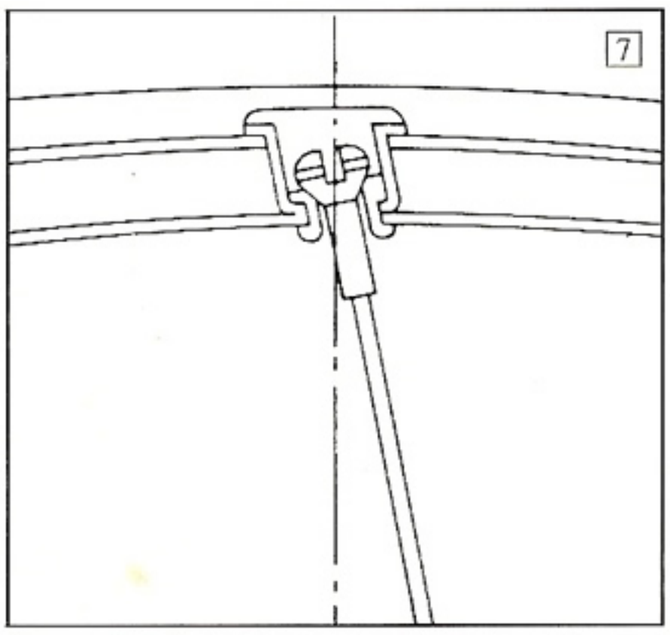


part on the tubular seat and in part on the internal cradle of the rim, according to a computer model of traction tests.

The design of this patented eyelet system reduces stress in the critical of spokes and on the hooking of the rim.

All this results in a significant reduction of broken spokes and, above all, in a safe and fast assembly and centering of the wheel, regardless of the system used.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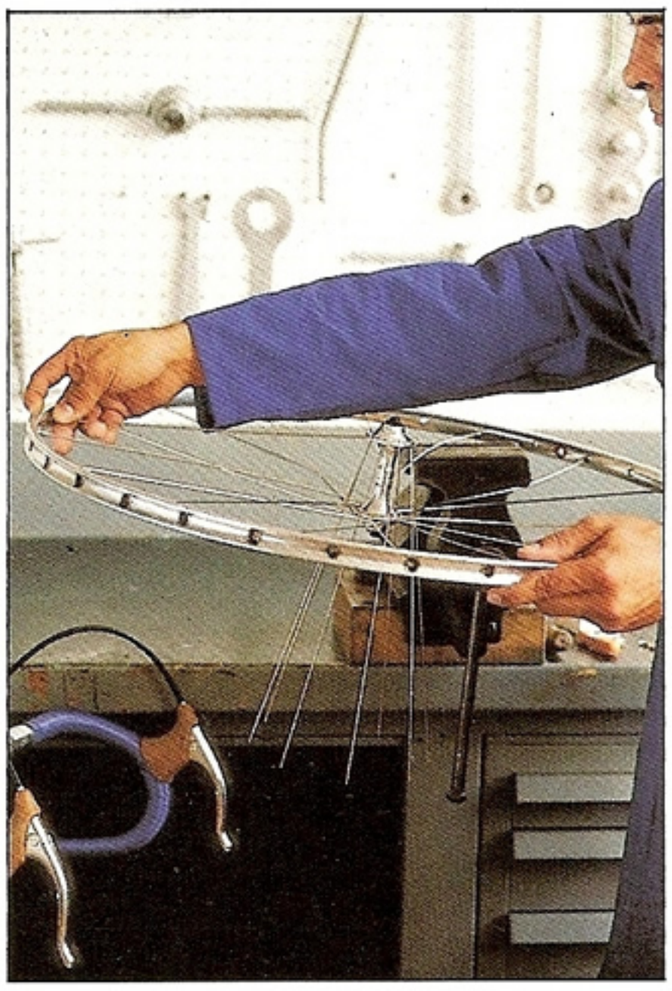
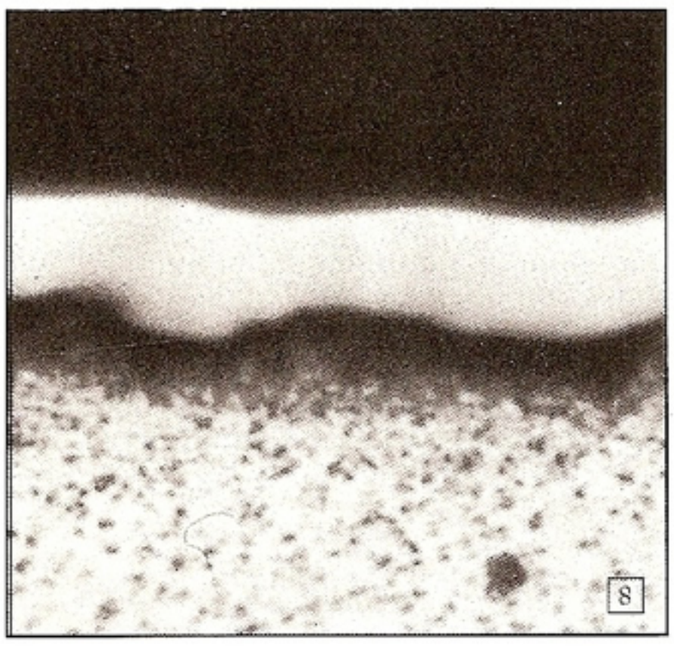


SURFACE FINISHINGS

The surface finishing plays a fundamental role in the life of the rim.

Campagnolo has introduced in this rim range a surface treatment much more resistent than all those used so far: the chrome galvanic treatment 11 micron thick, directly on aluminium (Fig. 8).

This finishing is used in car and motorcycle engines to coat the cylinders undergoing extremely high stresses due to the friction of the pistons compression rings.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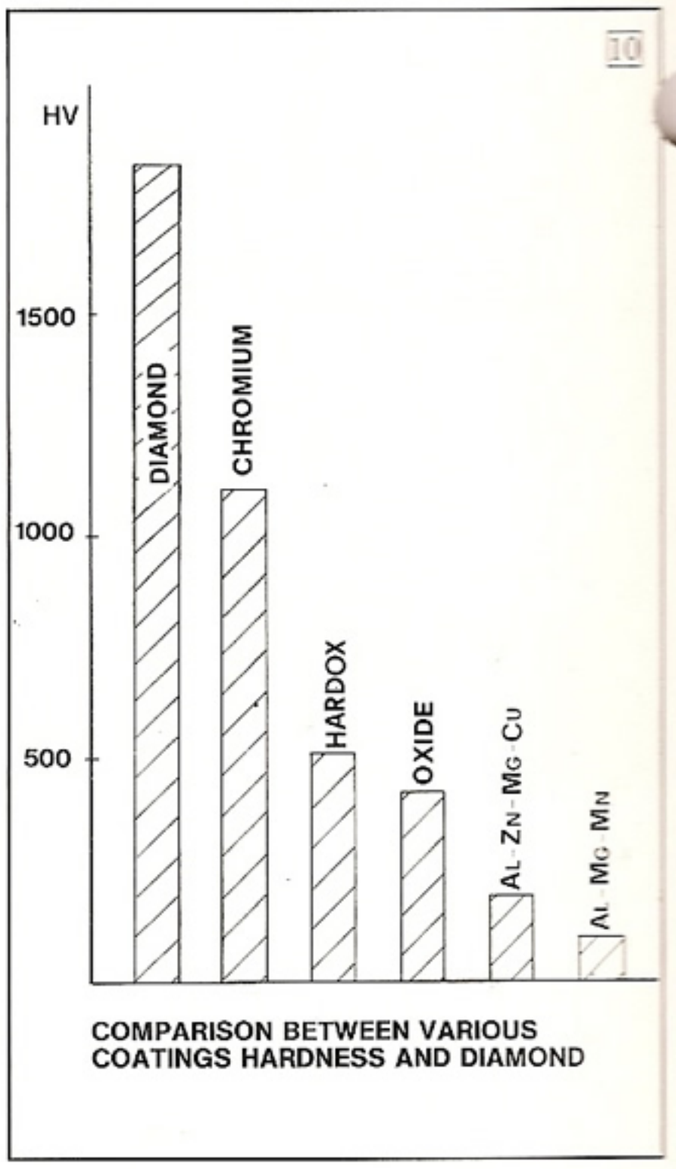
The "chromium" treatment keeps practically unchanged the characteristic metal color of the rim forever. Indeed, in wear tests carried out with machines simulating very bumpy roads in critical environmental conditions, the following results were obtained: after 30 brakings in areas with water mixed with sand, the best anodic

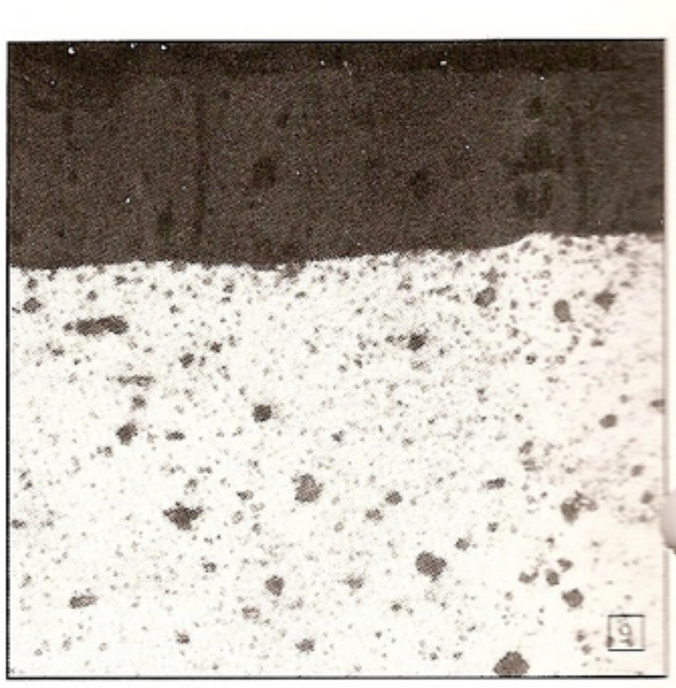


COMPARISON BETWEEN VARIOUS COATINGS HARDNESS AND DIAMOND

oxidations available today were damaged, while it took 600 brakings to start damaging chromed rims in the same enviroment.

Campagnolo Rim range also has a hard anodized finish (Fig. 9) with its characteristic dark color and a transparent anodized finish which leaves the rims its natural color.

These treatments have a high resistance in use, as shown in diagram (Fig. 10).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ASSISTENZA TECNICA

In 1986 Campagnolo was present as technical sposor at the World Championships in Colorado Springs U.S.A., and at the Asian Games of Seoul, Korea. The Campagnolo rims are used on the Campagnolo Technical Assistance Vehicles at all the world's most important cycling competitions.

SIGMA

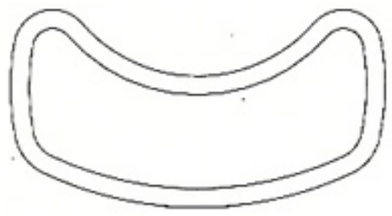
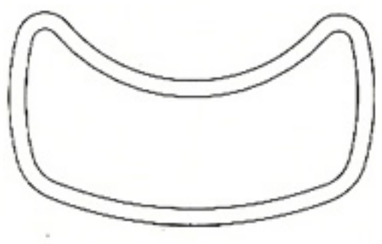
Campagnolo SIGMA rims have been created by the experience achieved through years of races on every road and track in the world, and meet all competitive requirements.

The material utilized, Ergal, an aluminium zinc alloy used in aeronautics, has a very high elastic limit (54 Kg/mm^2) and a remakable breaking load (62 Kg/mm^2).

In project design, the highest consideration was given to the rigidity/elasticity combination in order to ensure the trueness of the rim and its ability to withstand deformation under stress, including absorption of impacts.

Thanks to the technology and choice of the material, Campagnolo SIGMA rims can easily be trued, this saves mechanics hours of wheel adjustment after a race.

Patented eyelets, positioned according to the camber and the crossing, are safer with regards to the duration of spokes, remarkably reducing the possibilities of breakage in the most critical zones.

TYPE	FINISH	PROFILE	RECOMMENDED USE
SIGMA Pavè	Chromium Hardox		This is the professional rim par excellence. Designed for tough competitions, and for particularly rough roads where «pavé» makes the selection. Only those who can rely on the qualities of the strength of their rims can hope to emerge as winners. The CHROMIUM version maintains the beauty and the luster of the rim.
SIGMA Strada	Chromium Hardox		The rim for racers and competition. Resistant, and most of all, very light, it is appreciated in all conditions on sprints, uphill and flat roads. The CHROMIUM version includes a surface finishing which is resistant even in unfavorable meteorological conditions.
SIGMA 20 Strada	Chromium Hardox		The ideal complement to Compagnolo-equipped bycicles, with super-light frames and designed by name specialists. It is a rim which, thanks to Ergal, is particularly light, coupling great qualities of rigidity with high elasticity to make it particularly comfortable in use.
SIGMA Crono	Oxide		The rim for specialized uses (time trial, track, etc.). Very light, (only 330 gr.); it has a high vertical elasticity which absorbs vibrations well. The transversal rigidity is such that it does not cause deformations under the action of the racer's push.

TYPE	FINISH	DIAMETRE	DRILLING	WEIGHT ≃ gr	THICKNESS mm.	WIDTH mm.
SIGMA Pavé	Chromium	28" (700 C)	24-28-32 36-40	410	1.1	22
SIGMA Pavé	Hardox	28" (700 C)	24-28-32 36-40	410	1.1	22
SIGMA Strada	Chromium	28" (700 C)	24-28-32 36-40	380	1.0	22
SIGMA Strada	Hardox	28" (700 C)	24-28-32 36-40	380	1.0	22
SIGMA 20 Strada	Chromium	28" (700 C)	32-36	380	1.1	20
SIGMA 20 Strada	Hardox	28" (700 C)	32-36	380	1.1	20
SIGMA Crono	Oxide	28" (700 C)	24-28-32 36-40	330	0.9	20

Weights are meant for 32-eyelet rims. each eyelet weights 1.52 gr. - N.B. For thickness variations of ± 0.04 mm said weight may vary by ± 12 gr.

DELTA

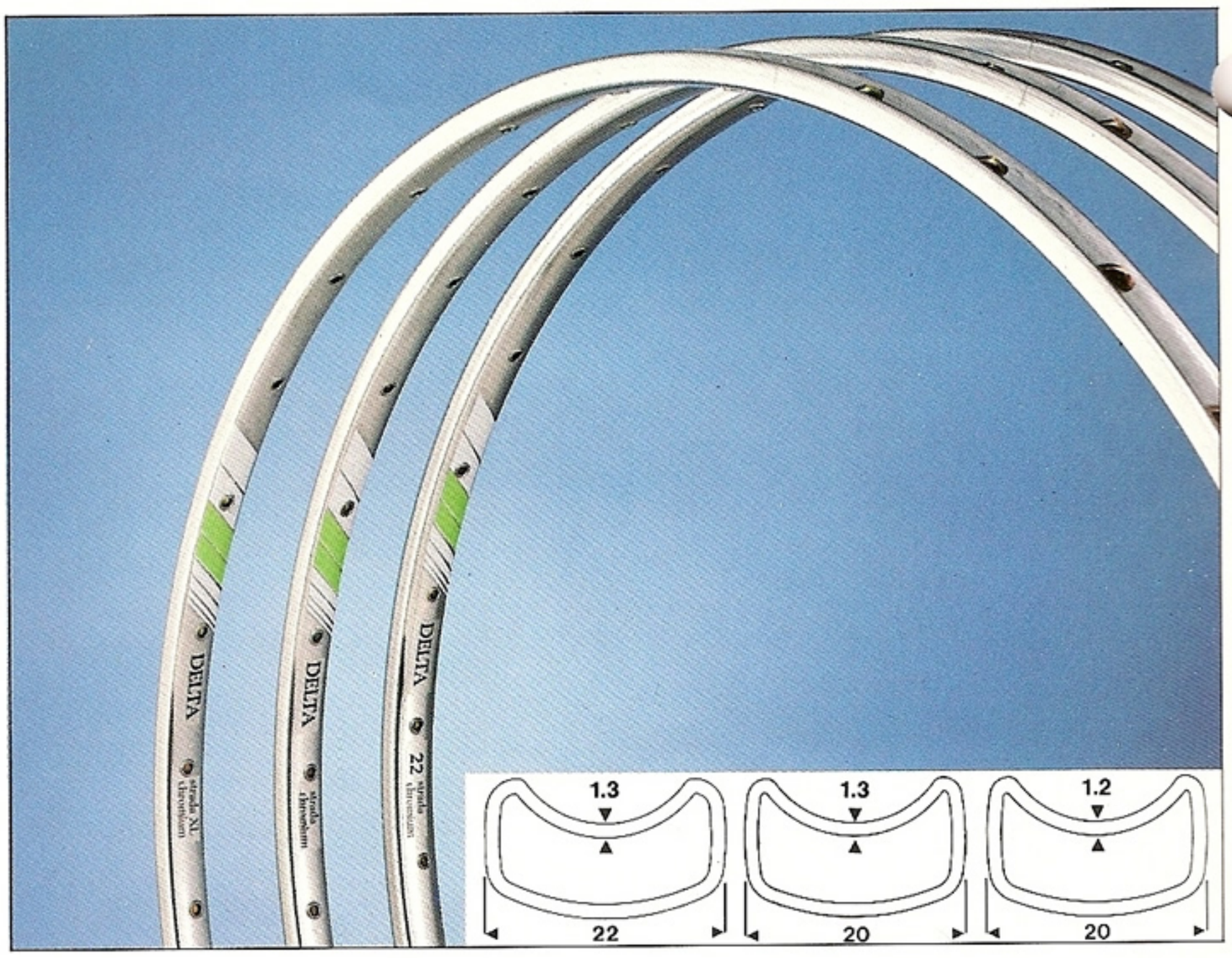
The aluminium-magnesium alloy used for the Delta rims has an elastic module and a breakage load level which ensure both maximum reliability and easy centering.

The Delta rim project has given great importance to wear resistance. Two thicknesses of 13/10 mm were chosen and the galvanic treatment of the aluminium used leaves the surface of the rim practically unaltered by time and use.

These characteristics make Delta rims particularly suited for triathlons. In fact, in triathlons the environmental factors which come into contact with the bicycle are particularly corrosive and unusual for cycling. The Delta rims are unaffected by the condition of the seawater which an athlete carries with him after the swimming event.

The street surface is often rough, or even worn away in some areas, especially in the transition area.

These are all situations where rims are vulnerable. Therefore, the particular combinations of material, profile, surface finishing of Delta rims is an ideal solution to ensure competitive performances and an extremely high wear resistance regardless of the enviroment.



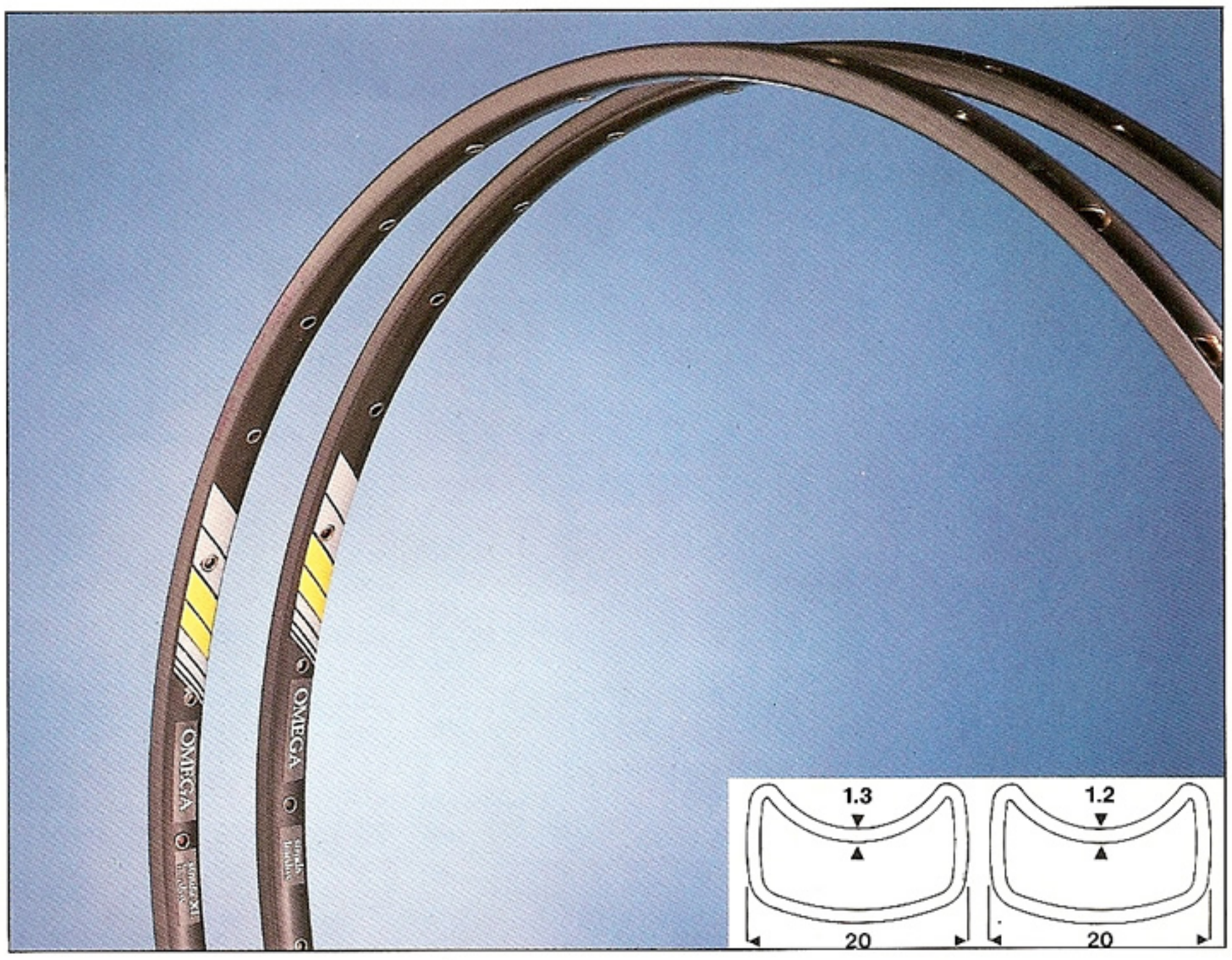
TYPE	FINISH	DRILLING	WEIGHT ≃ gr.	RECOMMENDED USE
DELTA 22	Chromium	24-28-32 36-40	465	The rim for professional racers who value versatility. For races on roads with irregular surfaces and, thanks to the chrome, for unfavorable meteorological conditions.
DELTA Strada XL DELTA Strada	Chromium	24-28-32 36-40	405 445	For those who love cycling and practice it regulary. The XL version is geared for professional cyclists, including stage races. It suitable even for triathlons and for the corrosive enviroments where this sport takes place.

Weights are meant for 32 eyelet rims. each eyelet weight 1.52 gr. - N.B. For thickness variations of ± 0.04 mm sad weight may vary by ± 12 gr.

OMEGA

The Campagnolo Omega rims were designed to satisfy the needs of the most advanced cycling amateurs as well as those who race triathlons. In fact, triathlons are often held in areas away from salt water and sand so they are not subject to its corrosive effects. Even in this case, Campagnolo has applied the technology developed for its competition rims, thus giving Omega the sporting characteristic loved by bicycle fans.

The material used is the same used for Delta rims: it gives high reliability. An effective, layered hard anodization finish gives the rim its characteristic burnished color. The Omega Strada rim responds very well to short and continuous stress typical of uphill or amateur races.



TYPE	FINIH	DRILLING	WEIGHT ≃ gr	RECOMMENDED USE
OMEGA Strada XL	Hardox	24-28-32 36-40	405	It has the same use as the Delta Strada, with the traditional Hardox finish: hard anodic oxidation. The XL version is particularly suited for amateurs and racers.
OMEGA Strada	Hardox	24-28-32 36-40	445	

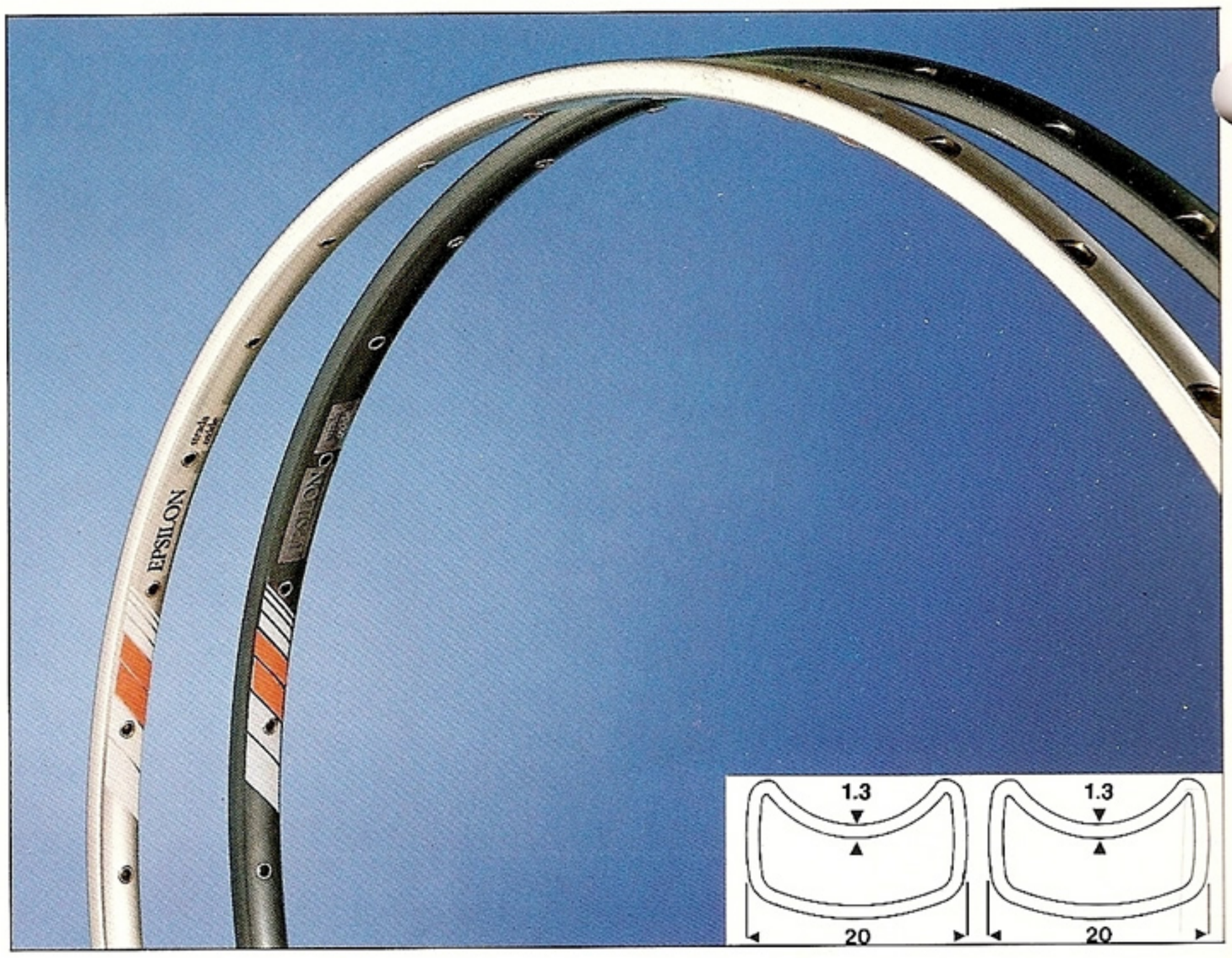
Weights are meant for 32 eyelet rims. each eyelet weights 1.52 gr. - N.B. For thickness variations of ± 0.04 mm said weight may vary by ± 12 gr.

EPSILON

The Epsilon rims are very strong, due to the use of the tested aluminium/magnesium alloy with a breaking load of 33 Kg/sq mm, treated with a transparent anodic oxidation finish which gives the rim brilliant color.

The Epsilon rims are also available with a new exclusive anodic oxidation finish G25, thicker than the transparent one and has elegant gray color.

The Campagnolo Epsilon rims can be assembled even by machine and, thanks to its profile, and eyelet, which is positioned according to the camber and the crossing, they maintain their centering perfectly.



TYPE	FINISH	DRILLING	WEIGHT ≃ gr	RECOMMENDED USE
EPSILON Strada	G25	32-36	445	For better bicycles, made for touring and for those who love to practice a sport which is particularly good for keeping the body fit and in harmony with itself.
EPSILON Strada	Oxide	32-36	445	

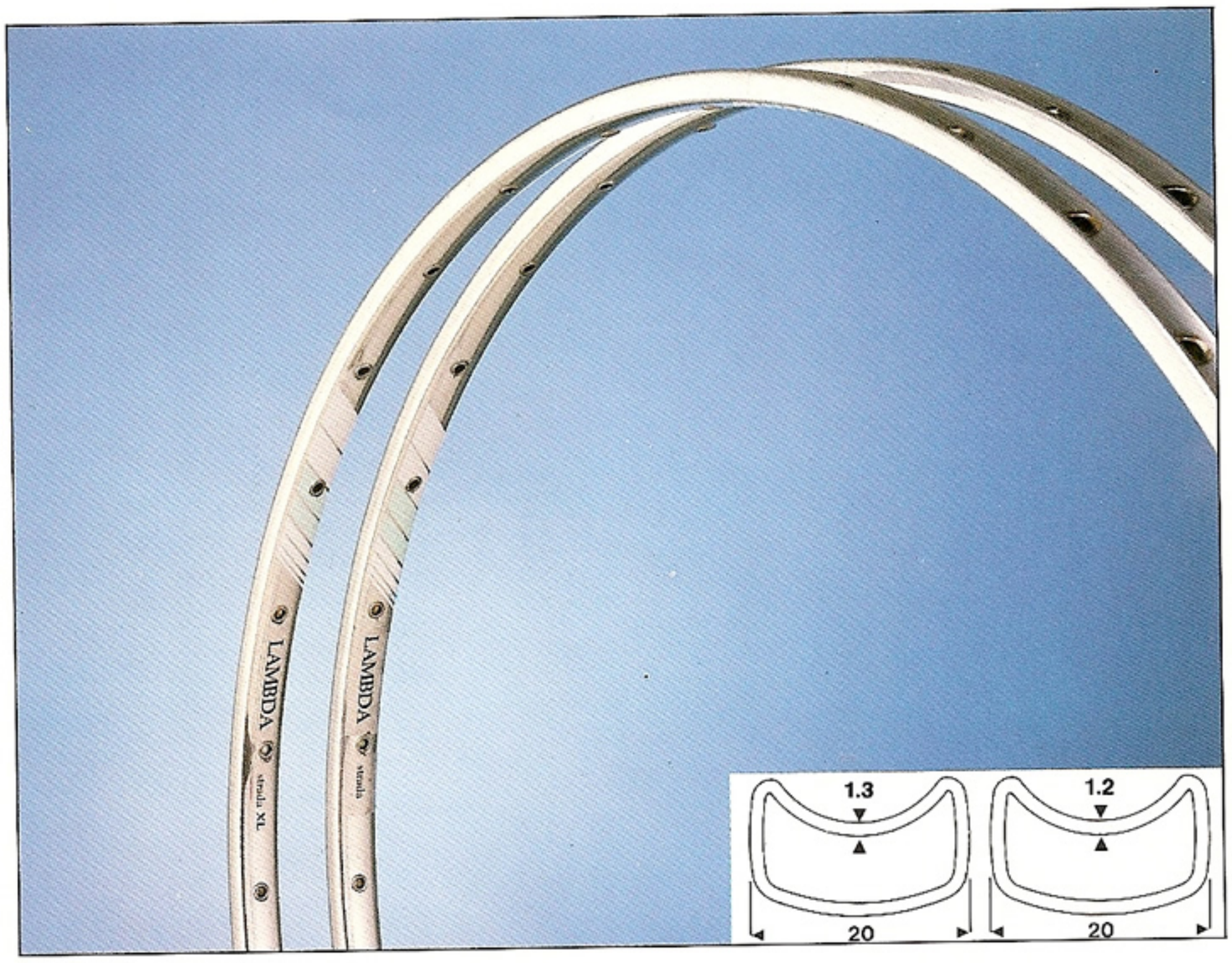
Weights are meant for 32 ferrule rims. each ferrule weights 1.52 gr. - N.B. For thickness variations of ± 0.04 mm said weight may vary by ± 12 gr.

LAMBDA

With the Lambda rims, Campagnolo has created a solution which is technologically similar to that designed for competition but which nevertheless allows an enviable quality/price advantage so its technology is affordable for a large number of bicycle lovers.

The patented Campagnolo eyelet is mounted on the Lambda rims as well.

The aluminium/magnesium alloy used has an elastic module of 7100 Kg/sq mm. This allows machine centering and balancing of the wheel without problems. The mechanical characteristics of the material and the profile projected for the Lambda rims give these products a capacity to absorb impacts which is essential for comfort. And it does this without compromising the security of the hold and the non-deformability of the rim.



TYPE	FINISH	DRILLING	WEIGHT ≃ gr	RECOMMENDED USE
LAMBDA Strada XL	Polished	32-36	405	For bicycles which last, and which address themselves to a lage number of bicycle lovers who are less interested in competition, but sensitive to the Campagnolo quality.
LAMBDA Strada	Polished	32-36	445	

Weights are meant for 32 ferrule rims. each ferrule weights 1.52 gr. - N.B. For thickness variations of ± 0.04 mm said weight may vary by ± 12 gr.

THE SAME QUALITY FOR ALL RIMS

Each series of rims, from Sigma to Lambda, even if designed to meet a particular need, has been developed using the same quality, the same engineering, the same production methods and has undergone the same rigorous quality control tests.

This industrial policy called for a long, careful examination of compatibility and optimization not only of the materials used but also of the production processes and design.

Today, thanks to our intensive research, the most technologically advanced, highest quality rims are available for all cyclists - Campagnolo Rims.

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