Q-RINGS GENERAL INFORMATION

Stealth performance weaponary

Meet cycling's ultimate secret weapon. Q-Rings offer some of the performance advantages of the Rotor System to those with standard cranksets at no weight penalty. The ease of adaptation and performance benefits they offer make them a no-brainer upgrade for the discerning cyclist: Your "sceptical and infinitley wiser" buddies wont believe that your awesome sprints and powerful climbs come from your Q-Rings.

Q-Rings increase your power by emulating a Rotor System crankset in the power stroke and by minimizing the intensity of the “dead spot” zones. By extending the time you spend in the power stroke (where 90% of all power is produced) and smoothly accelerating the legs through the critically weak "dead spots", simultaneousley magnifying the feeble pedal imput in these zones, Q's give that extra advantage you need to get ahead.

"I have a perfect spin: I don't need help”

Not many people realize that one of the most important reasons to have a "perfect spin" is to compensate for the dead spot's inherent weakness. Having a perfect spin doesn't solve the dead spot problem: no matter how perfect your spin is, certain muscles in your legs will always far outpower others and a vertical crank will never have useful leverage on the chain. Rotor's Q-Rings are designed with smooth diameter variations, which magnify the benefits of a smooth spin by reducing variations in:

- power production,
- rotational inertia a of the cyclist legs, and
- directional inertia of the cyclists body and bike.

We agree that a smooth spin is crucial to efficient cycling. The Q-Rings' design reflects the fact that we decided to go a step further, to look at the relationship between the power curve, total inertia and the spin. The vast majority of a cyclists power is produced in the down stroke of the pedal cycle, irrespective of pedalling technique. By installing Q-Rings, the cyclists power production is smoothed out, making a fluid spin more natural. The thing that makes Q's even better, is that the bio-mechanically inspired diameter variation results in more power output and less lactates - giving a genuinely free increase in endurance and power.

Orientation and adjustability is key

Shape and ovalization of Q-Rings isn’t everything: what really sets them apart, is the basic orientation and the possibility to adjust it. The problem with normal ovalized chainrings is that they only work in one set position on a bike. As soon as the cyclist's hip moves, the angle of the crank at the minimum and maximum power points changes, which in turn changes the orientation of the chainring in regards to the cassette. The key was to make Q's compensate for the effects of varying riding positions, leg inertia and bike inertia. The basic orientation of Q-Rings, based on power and inertia studies, is one of the reasons Q-Rings feel so natural. The revolutionary narrow variance OCP (Optimum Chainring Position) system gives the cyclist the possibility to choose from an array of settings within the small, crucial range of useful orientations. Why? Because everyone has a different riding style, a different bike setup and a different pedalling style. The OCP system guarantees you personal optimization of the chainrings to make

them work best for you, with *your* riding style, *your* bike and the terrain *you're* dealing with.

OCP INFORMATION

What is the OCP system?

The Optimum Chainring Position is a system which uses a row of different fastening holes on the inner ring of the chainring, allowing the chainring to be positioned in more than one single set orientation in regards to the crank. This system was designed to allow you to orientate your Q-Rings for your own style of pedaling.

Wouldn't it be easier to have just one orientation?

It would be easier yes, but it would not be as effective! Each and every cyclist reaches his or her maximum power point at a different crank angle, and a chainring that could only be set up to one orientation would only be useful to a small percentage of cyclists.

But the orientation requirements of the chainring are not just dependent on the seated cycling position. When a cyclist stands up and sits down, the orientation of the crank when the cyclist reaches his or her maximum power point changes in regards to the ground. This is because the cyclist's hip is moving forward and backward. Because an ovalized chainring should be set up so that it's orientation is always optimal in regards to the rear cassette, the OCP system comes into use again. In short, the OCP system allows you to tune your bike for different terrain and different types of riding, simply by rotating the chainrings.

How do I set up the OCP system optimally for my pedaling style?

Those of us who have done a spinscan before will know exactly whether they have a high or low power summit, which allows you to choose the indicative basic orientation swiftly. (High spinscan: start with the Q-Rings at position 2. Middle to low spinscan: start with the Q-Rings at setting 3. Please keep in mind that you may well prefer another setting once you have got used to th4e Q-Rings, but this is the best way to start.) However, most of us have never had the chance to do a spinscan, so here are a few guidelines on how to find the perfect setting for your riding style. Read on below for tips on how to find your ideal setup.

Finding your Reference orientation for Mountain Bikes.

With Mountainbikes, there are less orientation options in setting up the Q-Rings, compared to Road versions. This is because the BCD of a mountainbike cranks is considerably smaller than the BCD of 103 and 135bcd road cranks, and as such the amount of angular space a bolt takes up, is larger. In order to provide as many setup options as possible, the bolt holes were merged to form a serrated hole with three recommended Orientation options. Seeing as the angular dispersion between settings is greater, and the variation of the angle at which the chain engages the chainrings of the crank (due to the large cassette range) setting up MTB Q-Rings is a little trickier than setting up Road Q-Rings.

All the same, there are a number of ways with which one can define the ideal settings for your riding style. After having ridden several hundred kilometers in setting 2, you

can begin to experiment with other orientations. If you have the feeling that you would like a little more power earlier on in the pedal stroke, try riding in position 1. If you would like to have the power peak later in the pedal stroke, you can try using position 3. (The vast majority of riders will find position 2 to be the best option.)

Advanced Mountainbike Setup

It is also possible that you will eventually find a combination of different individual chainring orientation settings that works best for you. *(It is not necessary to go this far to benefit from your Q-Rings. We suggest that only those looking for a real specific performance boost try the following)*

As a basic guideline, use the image of the road bike above.
Visualize the red and half of the orange band as zone 1.
The zone from the centre of the orange band, through the entirety of the yellow band, is zone 2
The Green and Blue bands, are Zone 3.

These zones will vary, depending on your preference for an early power peak (in which case the zones will shift backwards slightly, or a later power peak, in which case the zones will shift forward slightly)
Now think of your riding style when using a particular chainring. If your butt is most often in zone A when using the chainring in question, we suggest you keep the chainring in setting two, or experiment with setting one. If you remain in zone B, setting two will most likely be the best orientation for you. If you tend to stand up a lot (being in zone C), and you value the standing power and sprinting performance, you can experiment with setting 3.

As an example of these combined setups: Do you tend to hammer up climbs whilst standing using the middle chainring, until it gets too hard - at which point you switch to the granny and sit? Then you may want to try the following setup combination. I:1 M:3 O:2. (I: inner, M: middle, O: outer) If you always spin seated when using both the granny gear and outer chainring and mix standing and sitting with the middle chainring, you may want to try their following setup: I:1 M:2 O:1.

Once you have come accustomed to your Q-Rings, you will be able to set them up for differing terrain if you notice your riding style is different (for example, if you go on a biking holiday or a race event in a region with very different terrain to that which you have at home.)

OVALISATION: PAST ATTEMPTS.

Ovalized chainring design

'Dumb technology is back in'...
'I hated product *X*, why would I do it again?'...
'Hopeless attempts at chainring ovalization come back every 10 years... you're right on time!'

Yeah, We've heard it all before... The problem with these statements, it that they are made by people who have never tried Q-Rings. If these guys were to get off their intelligently critical fence and onto their saddle, they would see: the thing that makes our chainrings different from all other ovalized chainrings is that Q-Rings work.

Remember how everyone “knew” that both clipless pedals and suspension were “hopeless and doomed to failure” before 1980? Just as Look proved that “dangerous and heavy” automatic pedals were the ultimate performance upgrade, and Rock Shox proved that Suspension was far more than just “heavy and no more valuable than the suspension my arms and legs give”, Rotor is here to prove that chainring ovalization works. So why do Q-Rings work where others failed? To explain this properly, we need to dive into the process of designing an ovalized chainring. There are three main defining factors for a ovoid chainring design:

The Orientation factor defines the angle between the centerline of the crank arm and the largest diameter of the chainring. This factor defines where the pedals are the hardest and the easiest to push.

The Ovalization factor is a simple ratio between the diameter of the chainring at its smallest and greatest diameters. This defines the gear range of the chainring and the amount of acceleration and deceleration it causes during the stroke.

The Form factor is the most complicated aspect of chainring design. This describes both the shape and the area of the chainring: Arcs and Ovals, Angles or flat sections.

In order to be successful, Q-Rings needed to combine the successful execution of each of these three design factors into one chainring. It's the combination that is key.

So why do Q's work, when other ovalized chainrings didn't?
Some of the most recent and infamous attempts at Ovalized Chainrings were Biopace in the 70's and 80's and O.Symetric in the 90's. These chainrings all tried to minimize the effect of the "Dead Spots" in different ways. We at ROTOR respect these designs and the pioneering spirit of their creators, but none of them attained natural market success. Why was that?

Biopace chainrings were designed to take advantage of leg inertia, but they placed the greatest effective gear at the dead spots, requiring more effort to pass the though them. The pedaling sensation was irregular and uncomfortable, and made a smooth spin impossible. Users frequently reported knee pain, which is logical given the fact that the maximum diameter was placed at the Dead Spots. The solution implemented to reduce these problems was to reduce the ovality to some degree, making it irrelevant in later versions, with the system eventually being removed from the market.

O.Symetric chainrings have a better orientation factor, giving a higher gear during pedal down stroke; but are too difficult to use for the vast majority of cyclists because they don't conserve leg inertia (the large ovalization factor and the sudden diameter ramping cause this). The O.Symetric system reduces the gear at the Dead Spots (which is good) but their shape causes sudden acceleration changes at and around the point of maximum stress for the knees, the Upper Dead Spot, where the likelihood of knee damage is already high. O.Symetric's approximate 90deg orientation is only useful for a low pealing cadence, because most cyclists generate their maximum power at a crank angle later, considering leg inertia. (look at a pair of well worn round chainrings to confirm this - they are the most worn in the area we just specified).

Q-Rings have an intelligent, sublime ovalization free of damaging 'acceleration peaks' and 'loading peaks' that allow both professional and recreational cyclists to ride faster with less lactates. Their shape ensures both faster acceleration and a smoother pedal stroke, promoting natural joint movement as well as uniform muscle and tendon loading. The ovalization of Q-Rings strikes the crucial balance between performance gain and spinning efficiency. Additionally, the orientation of Q-Rings is different from any system earlier conceived. Because the point of maximum power varies between cyclists, from when the crank is between 20 to 25º below the horizontal (as a

result of leg inertia, bike geometry, riding position and biomechanics), the necessity of a Regulation System to customize the chainring for each cyclist’s pedaling style is clearly evident. That's why Q-Rings have their unique 'OCP' (Optimum Chainring Position) chainring hole ring. The Q-Rings' shape, orientation and adjustability are what set them apart and ensures that they are here to stay.