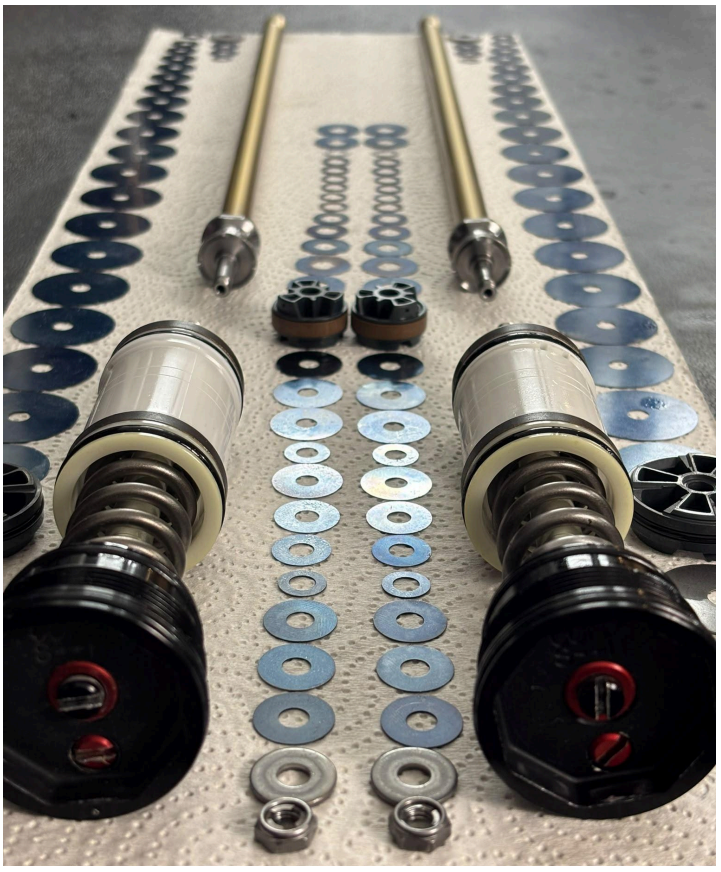
STEPS TO PODIUM

Offroad Suspension Experts

“Juggernaut” setting

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for KYB front fork with 24mm cartridge & trampoline-spring mid-speed valve



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Summary

This user guide presents the reasoning behind the Juggernaut setting for the KYB front forks, with a 24mm cartridge, and trampoline-spring design on the mid-speed valve.

It also explains the origin of this KYB technology but also the limitations for offroad.

The setting will be provided in full, with all details to take into account to make sure it is assembled properly and to keep this cartridge running in tip-top shape.

Force VS Displacement & Force VS Velocity graphs from LABA7 shock dyno software will be shown to help visualize the performance of this setting.

Lastly, I explain what R.O.T.A is all about and why it can be a new way to help future tuners or DIY guys have access to reliable tuning data.

Introduction

Like a Juggernaut, that's how I feel when riding on these.

Since coming up with this setting, I've been testing it extensively and while doing so, I've also been progressing dramatically as a rider, mainly because this setting provides a huge amount of confidence to tackle any trail, and a level of control on the front end that I haven't found with any other setting or brand cartridge.

In my opinion, it excels at pretty much anything, from wide open trails, single tracks, riverbeds and my favourite type of trails: fast rocky trails.

I truly think this setting can be a game changer for most off-road enthusiasts and will allow you to ride at your potential, naturally progress as a rider, and most important of all, have a lot of fun riding!

Just don't expect to be good for mx or sx, this is for off-road only.

Objectives

The goal is to maximize control and confidence, without wearing you out more than you need (If you don't want to get tired riding a dirt bike, I suggest other sports such as chess).

Note that I don't mention comfort, and for a reason. Most people get lost on what they should look for while riding, and in my professional opinion as a tuner, we should not look for comfort, we should always look for control and confidence.

These two aspects are what will allow you to ride in a relaxed state, which ultimately will allow you to get into the flow state.

Hopefully we'll have many more people sharing that experience!

Bike Setup

I ride a 2020 Beta 300RR mostly stock in terms of geometry, riding triangle and gearing, with KYB Factory forks (not much different from any stock KYBs for common mortals like us), MX-Tech National Shock, Scotts Steering Damper, and front and rear Michelin Tracker tires with mousses.

Requirements

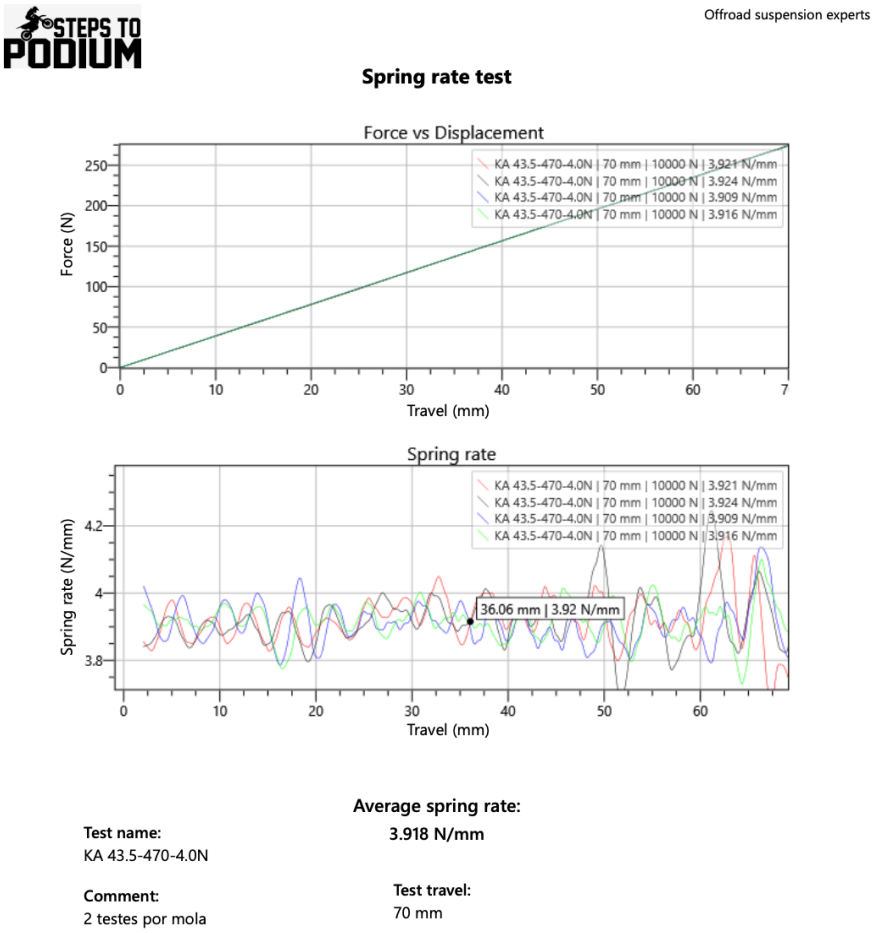
Sprung for rider weight

I can straight up tell you that revalving any kind of fork or shock without first having springs for the rider's weight is a waste of money.

You have that information on your bike's user manual and every tuner should work with that, not despite that.

I can also tell you that springs have a great amount of variability, with only a few spring manufacturers having a reliable quality control (most of them don't know they have poor quality control because very few tuners have a spring rate tester, so they won't complain about something they don't know either).

A spring rate test looks something like this report from LABA7 Spring Rate Tester:



A spring should only allow a maximum of 2% variation from the stated spring rate.

Condition

If you have the forks for a while, I strongly advise replacing all wear parts from the cartridge so that your result doesn't steer too far from the desired result.
With this I mean all o-rings, bushings, seals, piston bands and even shims if it comes to that.

The forks may feel slightly stiff in the first few hours, but that eases in and you're making sure they last.

Bike balance

This setting is meant to work with most stock shocks, so if you have your shock softened up or stiffer than stock, keep in mind that this "revalve" has to match the work done by the tuner and it isn't his fault if it does not match.

KYB forks with 24mm cartridge and trampoline-spring mid-speed valve

KYB forks are the market standard as far as how good it should be, at least in the period I'm releasing this.

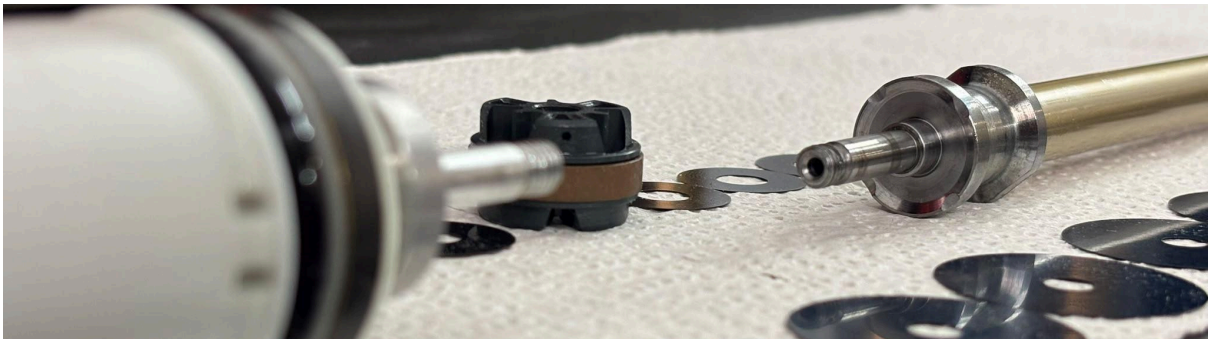
They manage to combine two things that are enormously difficult in any manufacturing process: quality and quantity.

You have many dirt bike OEMs equipping their products with KYB forks such as Yamaha, Fantic, Beta, Sherco, TM Racing, Rieju, Stark… because everyone knows they have been tried and tested for years (to a point where any new dirt bike OEM that wants to be taken seriously has to go with KYB).

However, since they originated to keep up with the progression of Motocross and Supercross, where damping needs are immensely higher than offroad, they have some design constraints that make the job of a suspension tuner harder in providing plushness on more technical terrain such as rocky trails, but also maintain adequate bottoming resistance for faster riding, for which they are well-known.

Overview

The trampoline-spring design is incredibly simple (and why it works so well), where instead of having a helicoidal spring and shims determining how much float you have, on the KYB's there's a "cup", where a 20.20 shim sits and works as a trampoline with about 3.5mm of float available.



This cup is perfectly tailored for MX and SX (and also the highest level of offroad such as EnduroGP and Rally), where more float wouldn't be beneficial to deal with huge jumps. However, for offroad this comes as a big constraint because the amount of float you can have on the mid-speed valve correlates directly with plushness and ability of the forks to soak up rocks and roots without deflecting the front wheel.

Juggernaut setting

BASE VALVE

	Locking nut
	Check valve
	Valve
1	28.10 / 29.10
9	30.10
1	29.10
1	28.10
1	26.10
1	24.10
1	22.10
1	21.10
1	20.10
1	18.10
1	16.10
1	14.10
	Supporting washer
3	11.30

DAMPING ROD

	Locking nut
	Supporting washer
1	16.30
1	16.20
1	11.25
1	14.10
1	16.10
1	18.10
1	12.10
3	20.10
	Piston (24mm)
3	20.10
1	18.10
1	16.10
1	14.10
1	11.20
2	11.30
2	12.30
1	12.10
2	20.10

Overview

The main base-valve is a single-staged shim-stack with a bleed face shim and a single-staged mid-speed valve with float.

Bleeder shims are not a new idea in forks, with OEMs using them on some forks such as the WP AER or the Raven from MX-Tech, but usually found on the mid-speed valve, not the base-valve.

Indeed, it's not common to have the base-valve with a bleeder shim.

Note: The results shown are with KYB shims, so although I have on the setting 0.10mm thickness, they are actually 0.114mm.

Back-story

This idea only came about because, after trying out MX-Tech's Raven cartridge kit, I didn't want to believe that such amazing performance could only be achieved through a considerably different architecture/design. I had to be able to come up with something vaguely similar at least.

So, I got myself on the dyno with my KYB forks, and started testing some stuff.

It came to a point where I was having trouble finding acceptable results of any kind with a traditional setting - being one:

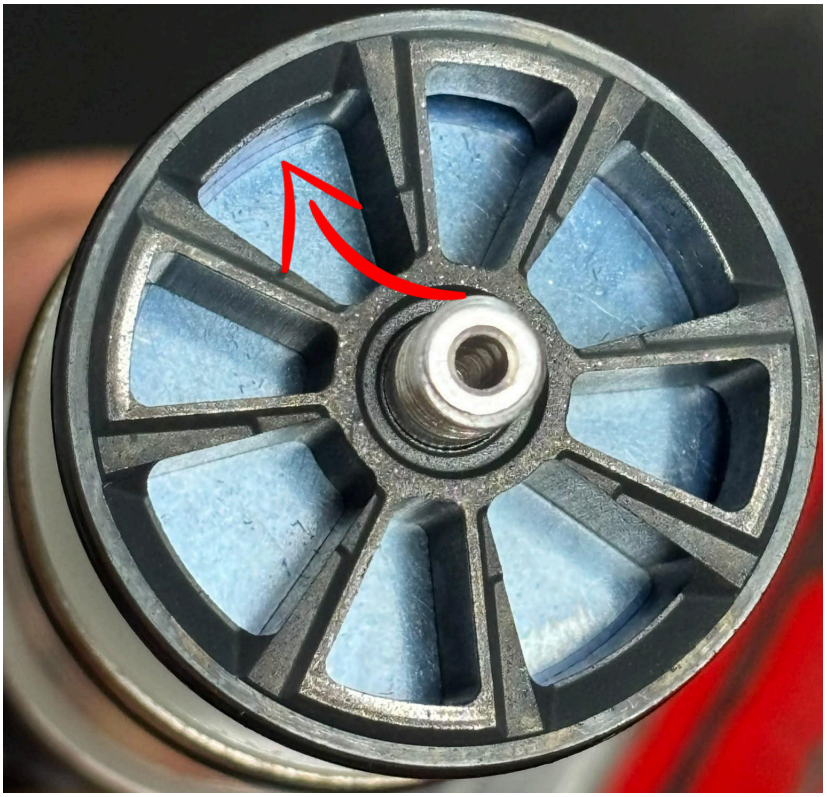
- Base-valve with double-staged shim-stack;
- Mid-speed valve with a single-staged shim-stack with float,

that would offer any similar performance to what I had in my LABA7 software library from those Raven or AER forks.

Gave a shot at a mid-speed valve with a bleed face shim, but couldn't get it stiff enough at higher speeds - that gave me a sense that this mid-speed valve, although incredibly consistent, needs to be operated as the architecture mandates or it'll go over the pressure balance quickly.

Rationale

That left me in a conundrum for a while, but then I thought the bleed just needs to be somewhere else, so why not the base-valve? [Morocco 25 FTW]



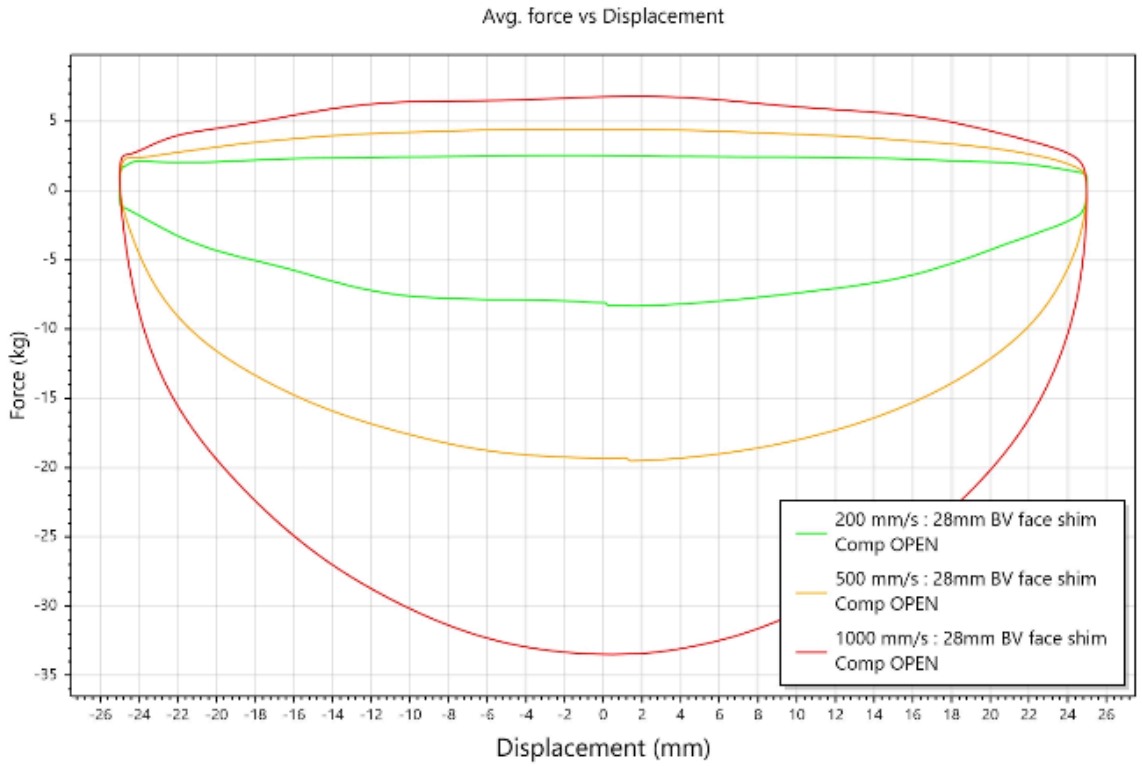
I decided to start with a single-staged shim-stack for higher bottoming resistance compared to the double-staged architecture, hoping the bleed wouldn't ruin the pressure balance of the system.

That way, on smaller compressions, the bleed would provide the plushness I was looking for, but on high-speed compressions the bleed would very quickly become neglectable and the single-staged shim-stack would kick in, providing a bottoming resistance similar to what you feel on a MX setup.

LABA7 Shock Dyno Results

Overview

For full report, please refer to Appendix #1



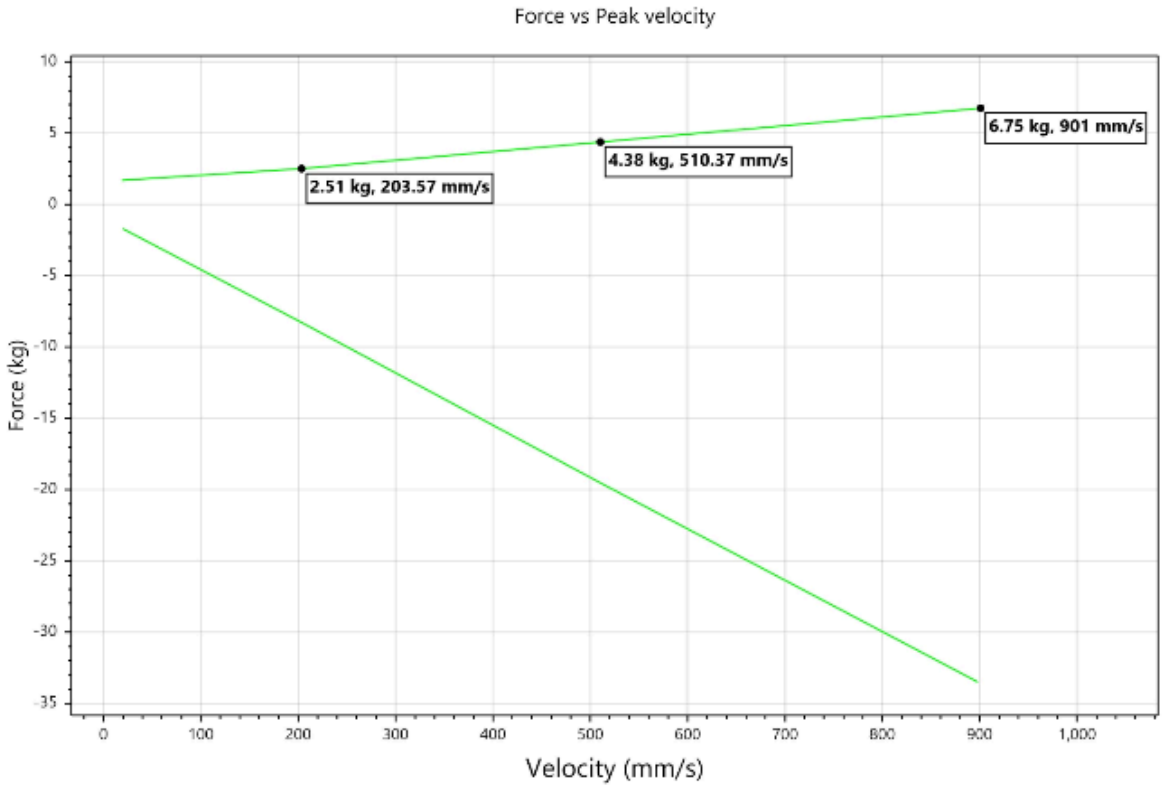
Comparison By Speed with Compression Clicker OPEN VS CLOSED

For full report, please refer to Appendix #2

This setting does have a caveat, which is a decrease in range of adjustability compared to more traditional settings.
However, taking into account its broad usability, and considering most people don't change that often their clickers (most people prefer to find a good setup and not have to change it at every ride, than to change it while riding), I believe the inherent compromise from the Juggernaut is something most people will accept.

Peak Velocity

For full report about peak velocity, please refer to Appendix #3



Conclusion

Both hard enduro and faster trails got the greenlight immediately, with the biggest results showing off on fast rocky trails - dreamy.

I also tried them on a motocross track, but despite my limited motocross skills, I realized a good rider would quickly bottom them out at any considerable jump, so I don’t recommend this for anything besides offroad.

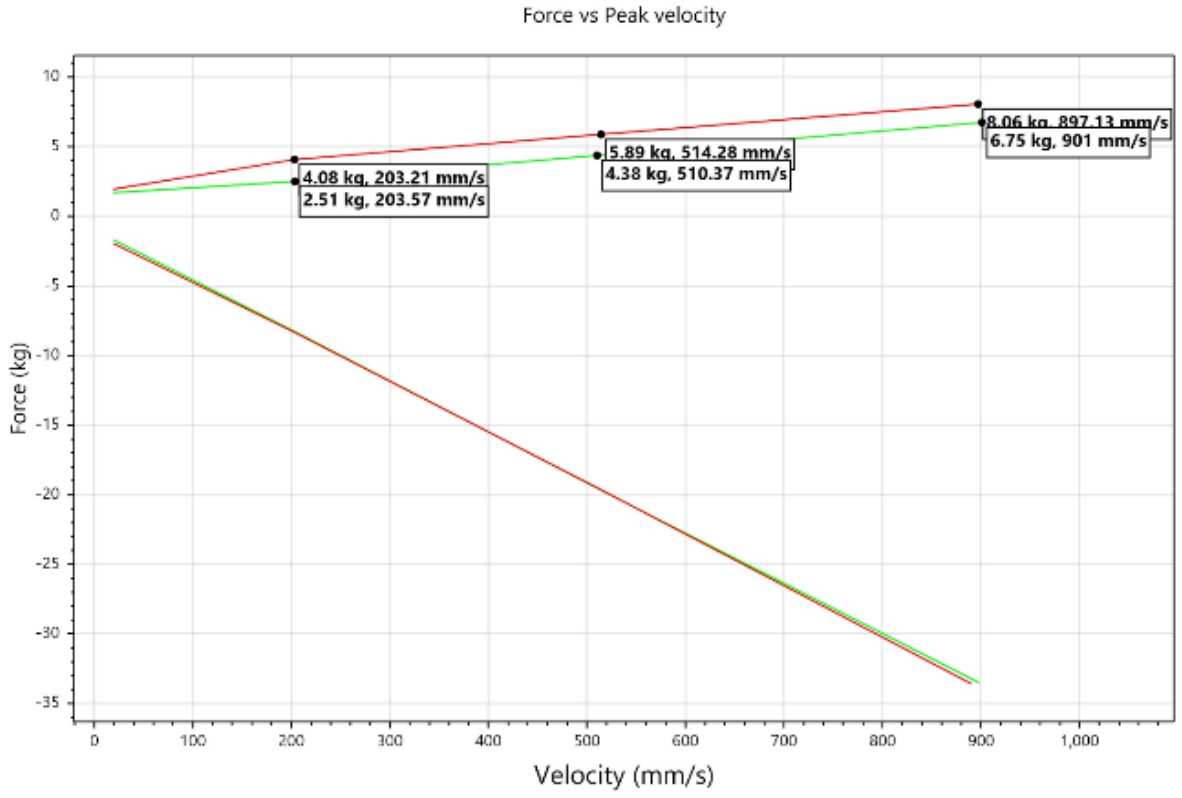
Bleed face shim from 28mm to 29mm

The reason I include this option is to consider frame variations between dirt bike manufacturers and in case you are running a 4-stroke. The setting with the 28mm face shim works fairly similarly on the frames from Beta, TM and Yamaha as opposed to Sherco's frame that require stiffer settings - much like four strokes.

The 28mm setting will suit smoother riders, while the 29mm will be better for more aggressive riders.

Peak Velocity

For full report, please refer to Appendix #4



Comparison By Speed with 28mm VS 29mm

For full report, please refer to Appendix #5

Mapping the Juggernaut Performance for Dirt Bike OEMs

Below is a table to give you an idea of which setting can be suited for what, however start with the 28mm and only then try the 29mm.

	28mm	29mm
Beta / Yamaha / TM / Fantic	✅Hard Enduro Racing ✅Fast pace riding	✅Fast pace riding ✅Enduro racing ✅ Rally riding
Sherco	✅Fast pace riding ✅Hard Enduro Racing ✅Hard Enduro	✅Hard Enduro Racing ✅Fast pace riding

Disassembly & assembly tips

Disassembly

Factory lock

The only thing you have to be careful while taking apart, is the factory lock they place on the threads on the rebound valve, which makes it hard to take it apart.
I recommend filing it a bit and steadily unthreading the nut.

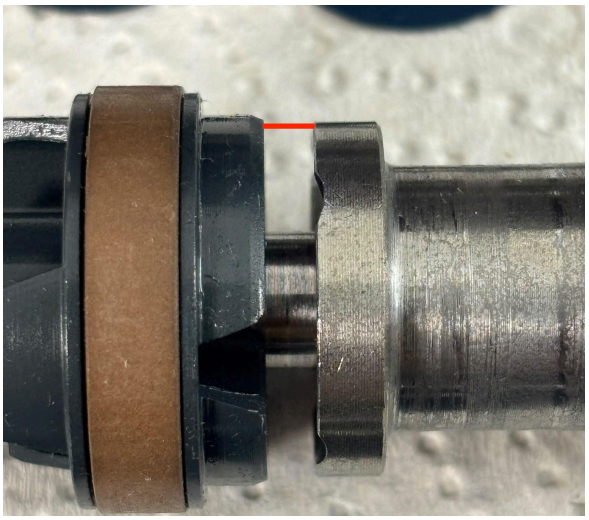
If you don’t do that, most likely you’ll damage the entire short thread and will have to replace the full steel cup from the damping rod (which is not a problem to do).

Replace steel cup

If that happens, heat it up with a blow torch and unfasten it from the damping rod with the help of a bench vice with a clamping gauge of 12.5mm (such as LABA7’s, again…)

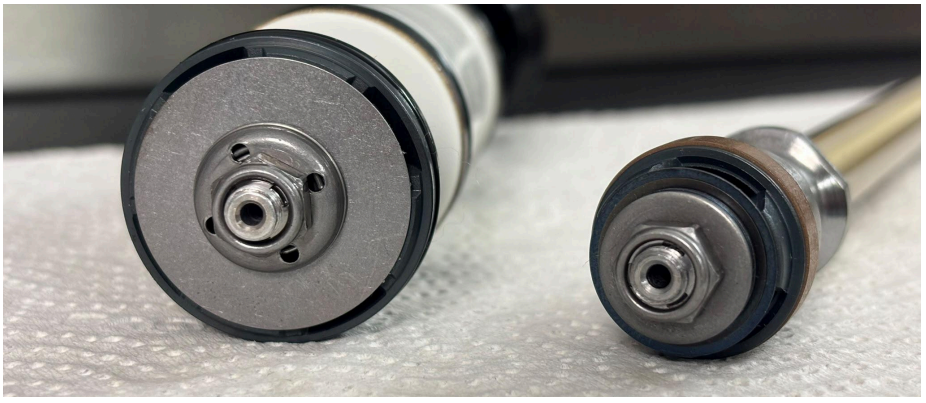
Assembly

Filler



One important aspect from this KYB mid-speed valve is that you need to place the right amount of shims as filler between the valve and base cup. Although you have my setting above, there are always some slight variations, so instead of doing a copy-paste, be critical and make sure you have the trampoline shim without preload (collapsing on the cup) and without any bleed on the valve side.

Tightening torques



Base-valve nut: 5Nmm;

Damping rod nut: 5Nmm;

Steel cup on damping rod: Until seated with light-medium thread-lock.

Cartridge bleeding

To bleed the cartridge:

1. Pour 210ml of 5W quality fork oil,
2. Cycle the damping rod until you have a smooth feel from fully compressed to fully extended (let the air come up between cycles).
3. Install the compression base-valve assembly until fully seated and give it a torque of 30N/mm.
4. Place the cartridge at a 45º angle with both top bleed holes in a vertical position, while covering the bottom bleed hole.
5. Cycle the damping rod until fully compressed to let excess oil out through the top bleed hole (It can be messy, use a rag or paper to prevent it from spewing all over the place).

How to maintain bike balance

Since this setting provides a considerably different damping character compared to stock form, it makes sense to give you some guidelines on how to keep the balance of the bike (which is always guaranteed in stock form).
(Also, the 29mm is easier to maintain balance than with the 28mm)

1. Start by placing the rebound adjusters, front and rear, at the halfway mark of the adjustments range or on the standard setting provided on the bike user manual (preferably).
2. Open completely the low-speed compression damping adjusters, front and rear.

What I feel	Problem	What to do on forks	What to do on shock
I feel the setup too soft	Setup is too soft, but you're a legend	Close 2 clicks at a time	For each 2 clicks on the forks, close 1 click on the shock
I feel the front lifting on small jumps or obstacles	Rear is not balanced	Open 2 clicks at a time and keep shock as it is until balance is reached	OR close 2 clicks at a time and keep forks as they are until balance is reached
I feel the rear kicking on small jumps or obstacles	Front is not balanced	Close 2 clicks at a time and keep shock as it is until balance is reached	OR open 2 clicks at a time and keep forks as they are until balance is reached
I feel the setup too stiff	You're a freaking dandylion	There shouldn't be no more clicks to open	There shouldn't be no more clicks to open

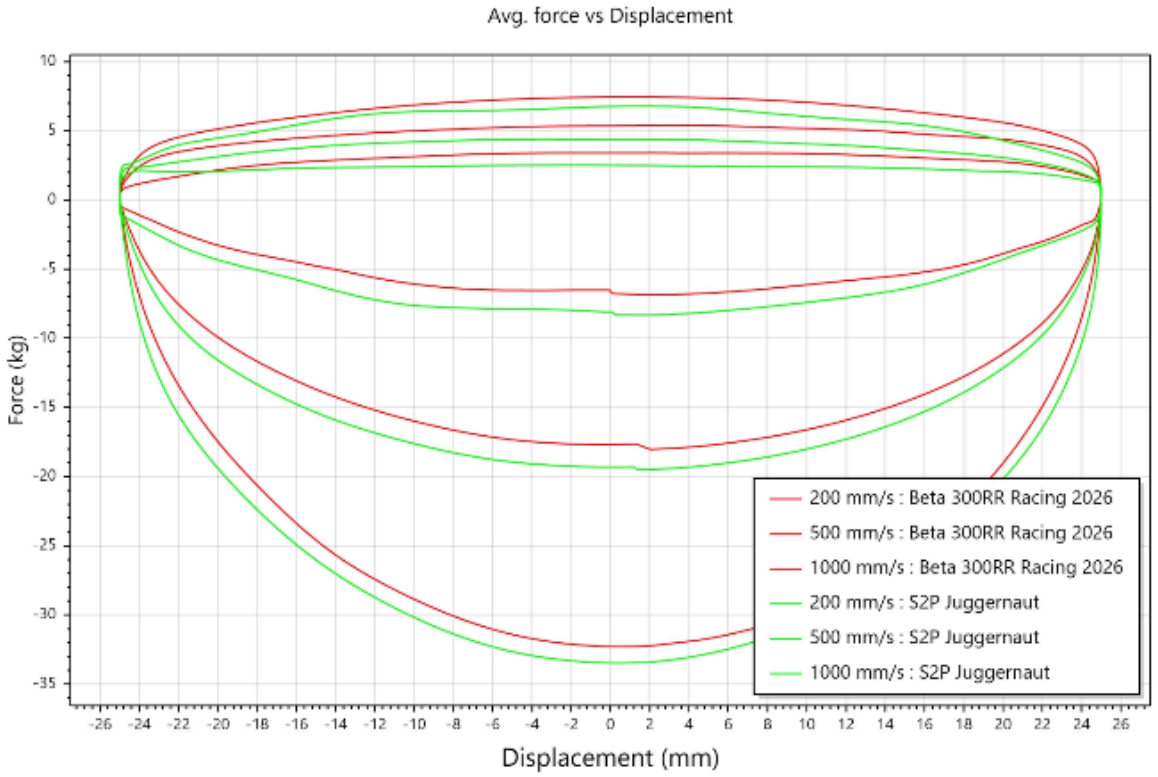
In case this table isn't clear, I have a video that goes more in depth about this topic on Steps to Podium YouTube channel.

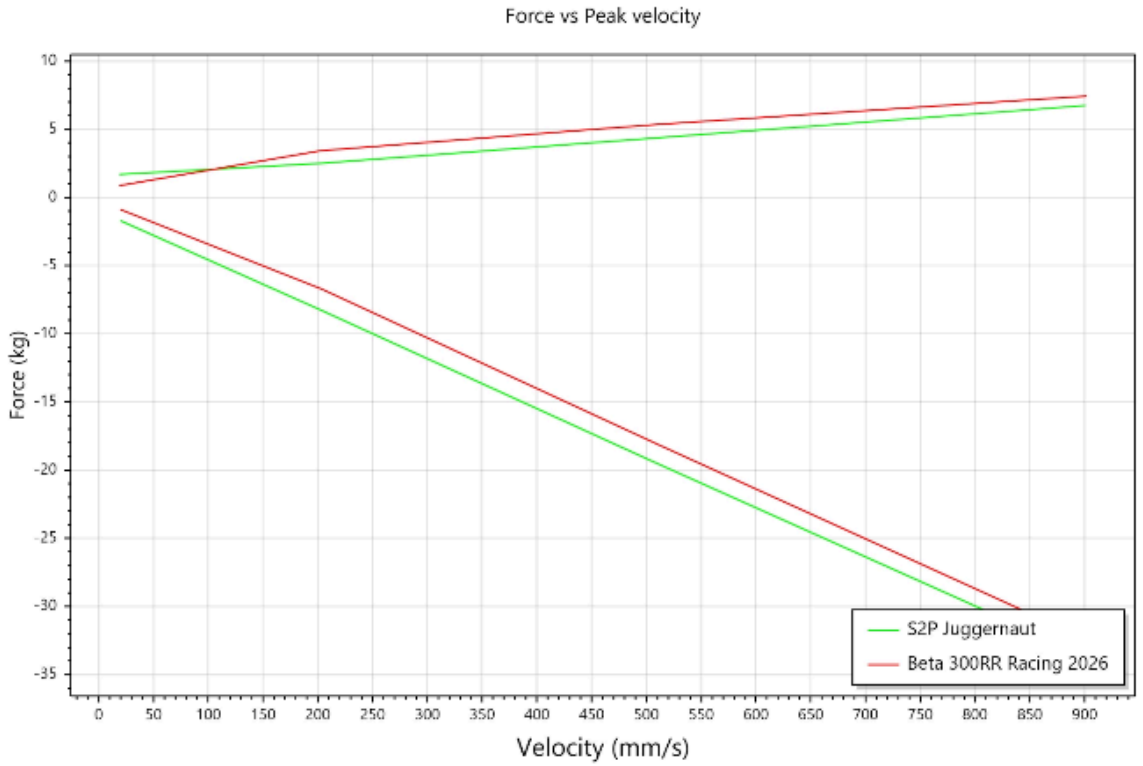
R.O.T.A - Revalve Over the Air

Let's say you tried this setting and you liked it a lot, but you'd like to know how it compares with your previous setting, or any other?

Introducing R.O.T.A, where you can request the comparison of different shim-stack settings!

You pick any two settings (or more) and have them compared side-by-side, with possible notes and insights from our part, to help you make sense of the results, and possible suggestions on where you want to go next.





Check our website for more information!

Final notes

Future of the industry

Giving this setting for free is a great way to start changing the way the community looks at revalves, right now it’s seen as some kind of magic, but it’s only so because of lack of clarity on the very closed-guarded industry of suspension tuning.

Let 's change that :)

Hopefully this will inspire other tuners to make their settings open-sourced and give the deserved recognition to great tuners, to their creativity and their desire to improve the offroad community and sport.

I also hope some very good tuners out there will pick up this setting and find some amazing improvements on it.

R.O.T.A is also a way to promote and facilitate the access to reliable data instead of relying on the cumbersome process of trial and error.

Next User Guide

And if one setting wasn’t enough, the next user guide will be the hard enduro setting for the KTM EXC 300 24-27 front forks AND rear shock!

Word of appreciation

I cannot thank the guys at LABA7 enough for their incredible work on their shock dynos. It has become a must-have tool for my progress as a suspension tuner. Andrius Liskus has a vision of changing the suspension world (which by now is just part of his goal) and I feel grateful in helping showcase the value of their efforts. Su didžiausia meile!

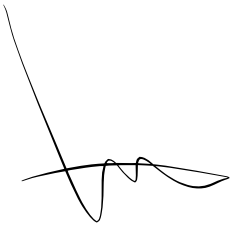
And also Jeremy Wilkey from MX-Tech for giving me a reason to think outside the box! Their products are incredibly good.

Much of me is part of this “silly” report.
Hope you like it!

If you did, you’re gonna love what’s coming!
If you don't, you’ll end up hearing about me somewhere anyways eheh

I’m having so much fun doing this stuff, thank you for following this helluva ride :)

Much love,
Luis
Steps to Podium



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