

高剛性 V **超軽量**
 ホイール S ホイール

マジ TEST!

Educated enthusiasts understand the concept of seeking lightweight wheels in order to reduce underbody chassis weight and increase performance. But it's also important to understand the function of "Rigidity" or "Stiffness" and how the driving field affects this. Most know the importance of lightweight, but many do not realize the crucial importance of this concept of "rigidity." Is one more important than the other? The goal of this article is to compare these two factors and how they are able to affect overall performance. With the help of Enkei and MCR, we will test a high rigidity wheel versus a specially made super lightweight wheel.

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LET'S SEE
 HOW THESE
 WHEELS
 WILL DIFFER IN
 PERFORMANCE!

*Tester (Kobayashi of MCR)
 テスター
 MCR小林サン



HIGH RIGIDITY
VS.
LIGHTWEIGHT
THE TRUE TEST!

ホイールに求められる剛性の重要性を さまざまに角度から徹底的に検証!

Before observing the test results, we'll review the procedures and explain how testing was conducted to better understand the following results.

Weight and rigidity are two key factors that should be taken into consideration when seeking performance wheels. Most people understand the merits of a light-weight wheel.
But what about Rigidity?

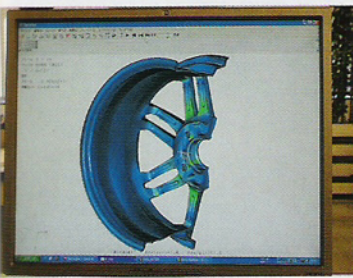
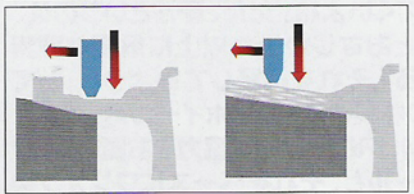
Since the majority of drivers do not often interchange wheels or purchase multiple sets, most tend to think, "As long as the wheels are rigid or strong enough not to crack or bend, it should be fine. I should look into a lighter weight wheel."

In actuality, when producing a true, race worthy wheel, reputable manufacturers take into account the degree of rigidity depending on the specifications of the particular racecar. The weight factor is taken into consideration only after the rigidity factor. Once the level of rigidity is considered sufficient, the weight factor then comes into play. Simply put, manufacturers prioritize rigidity over weight.

With the help of Enkei, we have prepared the GTC-01, a wheel capable of handling aggressive driving. In addition, a special one-off version of the GTC-01 wheel was produced for testing purposes specifically to prove this point. Using the GTC-01 wheel as the base, rigidity has been reduced to its bare, necessary minimum.



エンケイはホイールの剛性や強度をアップさせるため、独自のリム成型方法「MATH」プロセスを採用している。イラストのように、車体によって成型したリム部を鍛えながらリムを成型している。



現在のホイール開発技術は各メーカーともかなり高くなってきていて、コンピュータ上で強度や剛性を解析を徹底的に行い、デザインを決めている。レースシーンで培ったノウハウやこれまで蓄積してきた膨大なデータは、この活かされている。

SPECIFICATIONS OF THE SPECIALLY LIGHTENED GTC-01

The base of the special wheel set will be the GTC-01. It is used in Super GT and known in Japan to be the ultimate street wheel. Both sets of wheels used for the test are the same diameter, width and offset: 18x19 +22. When you first look at the specially produced lightweight wheel (gold), one may not notice any differences. Upon closer inspection, one can see that the wheels were shaved down to the bare minimum reducing the weight by 1.8 kg (3.96 lbs) compared to the market/commercial wheel. Once again, although rigidity of the special lightweight version has been reduced to its bare minimum, they are still capable enduring the driving field without fracturing.

**ENKEI GTC-01
COMMERCIAL MODEL
(10.8 KG / 23.76 LBS)**

One can easily feel the difference in weight simply by lifting and comparing the two wheels.

デスター
MCR
小林サン

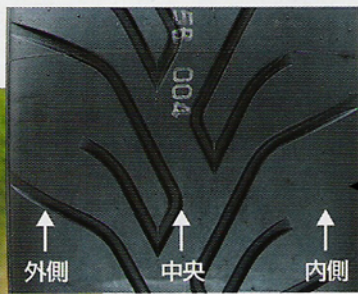


I WILL PUT THE WHEELS TO THE TEST!! YOU WATCH!!



前代未聞のテストを敢行

The tests were done on the circuit under time attack situations rather than on the street in order to bring out the maximum potential of the wheels. ADVAN A048 (M Compound) tires (265/35-18) were used during testing. The number of laps, tire pressure, and other conditions were tested under the same specs.



Side Note: GTC-01 wheels include "Anti-Slip Paint" along the inner lines of the rim of the wheel in order to prevent the running tires and wheels from shifting. Although it has little to do with our testing, we have used Anti-Slip Paint on the commercial/market wheel to compare the effects of this paint after the race.

After the runs, we observed both the front tires (in 3 sections; outside, middle, and inside section) and measured their surface temperatures, friction levels, and wear in order to better understand the effects on the tires depending on the rigidity of the wheels.

Testing at Ebisu East Circuit for First Impression and Data Analysis

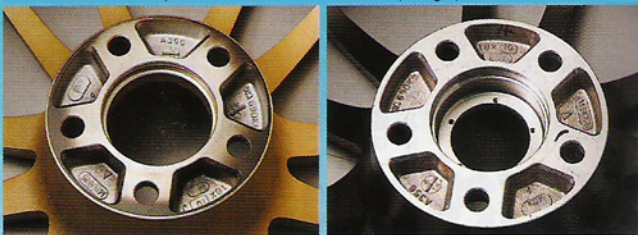
We will be using MCR's demo car, a Z33 HR Version Nismo for the test. The engine is stock. Minor upgrades include exhaust, footwork, LSD, and ROM tuning. Driver will be Kobayashi from MCR. The east side course has many ups and downs and aggressive turns making it an ideal track for testing.

Method of testing will be mainly based on Kobayashi's impression as well as measuring tire wear, data from the GPS logger (speed, lateral G, etc.), and temperature.



Diagram A: For the lightened version (Gold), the center cap area has been shaved down as you can clearly see the difference in diameter. Material has also been removed from the outer ring of the center area of the wheel increasing the diameter.

Diagram B: Look closely and you will notice that portions of the backside center have also been removed for further weight reduction. The lightened version (gold on left) has less material compared to the commercial version (on right).



EXTREME GRIP TIRES ADVAN A048



The Advan A048's are known to have the strongest grip amongst the S tires out in the market. In addition to the grip, these tires have great controllability and are widely used throughout gymkhana and grip time attack, and have earned many drivers trust and confidence. Furthermore, they come in all sorts of sizes capable of supporting most domestic sports cars.



ENKEI GTC-01
SPECIALLY LIGHTENED MODEL
(9.0 KG / 19.8 LBS)

High Rigidity is a Must for Time Attack !!!

The Effects of Wheel Rigidity is much Higher Than the Weight Factor !!!



Having a Balanced Wheel with Both Rigidity and Light Weight is Important.

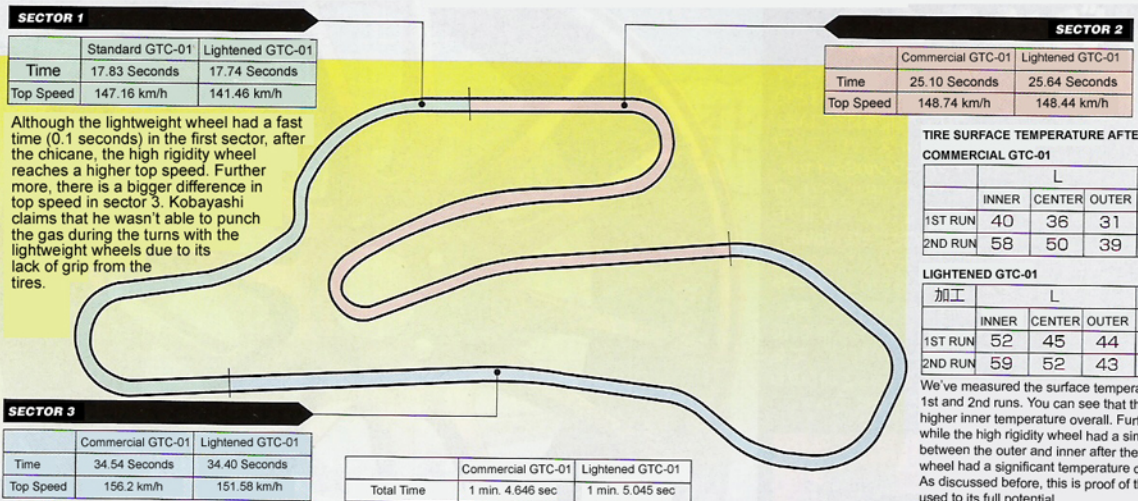


These results clearly show that although the gold wheels were super lightweight, the low rigidity became a demerit under performance where the wheels gave/bent when taking aggressive high speed turns. Due to this bending of the wheel, the height of the car was greatly affected which even leading to alignment problems. Because of this phenomenon, even on the same turns, while the high rigidity wheel showed no signs of change, the super lightweight wheel caused the bottom of the car to scrape on certain high-speed turns. In addition, due to the fact the wheels give/bend on turns, it decreases the amount of contact surface area of the tires. Thus, the tires cannot perform at their full potential. By running the low rigidity wheel, extensive side abrasion/wear occurred as well as decreasing the grip of the tires.

On the other hand, the commercial/market model GTC-01 performed throughout the entire test without encountering any of these problems due to its high rigidity. "You have to be able to attack and go into turns hard. The response you get from an aggressive turn, sharp steering, and steering formation has to be like this!" says Kobayashi.

The race time results were the following:

GTC-01 (Commercial/Market) High Rigidity Model: >Best Lap 1 min 4.646 seconds
GTC-01 (Specially Made) Super Light Weight Model: >Best Lap 1 min 5.045 seconds



Although the lightweight wheel had a fast time (0.1 seconds) in the first sector, after the chicane, the high rigidity wheel reaches a higher top speed. Further more, there is a bigger difference in top speed in sector 3. Kobayashi claims that he wasn't able to punch the gas during the turns with the lightweight wheels due to its lack of grip from the tires.

TIRE SURFACE TEMPERATURE AFTER TESTING

	L			R		
	INNER	CENTER	OUTER	INNER	CENTER	OUTER
1ST RUN	40	36	31	41	33	27
2ND RUN	58	50	39	53	46	33

加工	L			R		
	INNER	CENTER	OUTER	INNER	CENTER	OUTER
1ST RUN	52	45	44	48	35	29
2ND RUN	59	52	43	58	43	35

We've measured the surface temperature of the tires after the 1st and 2nd runs. You can see that the lightweight wheel had a higher inner temperature overall. Furthermore, you can see that while the high rigidity wheel had a similar temperature difference between the outer and inner after the 2nd run, the lightweight wheel had a significant temperature difference between the two. As discussed before, this is proof of the tires not being able to be used to its full potential.



By looking at the shoulder portions of the tires, you can clearly see the difference between the tire wear in the 2 wheels. The high rigidity wheel tire shows an even usage throughout the inner and outer parts of the tire. On the other hand, the lightweight wheel shows signs of extensive wear on the outer part while not enough contact/usage on the inner portion. This is another proof of the wheels giving/bending on the turns and the tires not being able to perform at its highest potential.

Comparing the before and after pictures of the wheels/tires. You can see how much they shifted by looking at the pink marks. The high rigidity wheel with the "anti-slip paint" shows the shift was less than half compared to the light weight wheel without the paint. Although zero shift is not possible, you can clearly see that the "anti-slip paint" does its job. When some drivers claim that their wheel balance is off after some usage, this shift is sometimes the reason.

MCR KOBAYASHI'S IMPRESSION



RIGIDITY IS A MUST WHEN CORNERING..

The first thing I noticed is that with the super light weight wheels, there is a tendency for over steer to occur and I can't push the car to its maximum capabilities. Over steer doesn't occur abruptly or suddenly but more slowly and gradually. Think of it as an over steer situation when you have a positive camber setting.

Slow turns aren't as bad but during fast and aggressive turns when lateral G comes into play, there is a huge difference between the two wheels when coming out of the corner. I wouldn't have to apply any counter with the high rigidity wheels while I would with the lightweight wheels as well as the fact that I can't punch the gas as much during the turn.

On the other hand, the high rigidity wheel has great stability even under hard aggressive situations. I can go into the turns hard without worrying especially with the grip difference from the two wheels being quite significant. I believe any driver can tell this difference.

ACCELERATION

I WAS ABLE TO TELL THE DIFFERENCE IMMEDIATELY AFTER STARTING THE CAR

For acceleration, it would be hands down the lightweight wheel. I was able to feel the difference right when I pulled out of the pit. When each wheel weighs 1.8kg less, anyone can easily feel the difference. I initially thought that I would get better times with the lightweight wheel. However, after it reaches a certain speed, I wasn't able to tell much of a difference in the acceleration. Even being an ultra lightweight wheel, it wasn't able to perform at its highest potential due to its lack of rigidity. You can tell the difference just by starting up the car; I believe there are many other merits for a lightweight wheel under different situations but without the right amount of rigidity, there isn't much of a point in having a super lightweight wheel.



BRAKING

LONG DISTANCE BRAKING IS A PAIN ESPECIALLY WHEN THE FRONT BECOMES UNSTABLE

Since the lightweight wheels have a tendency to give/bend, the vehicle becomes really unstable in the front when you full brake on a straightaway.

However on this east circuit at Ebisu, there aren't many times when you brake fully. Instead you punch the gas right after you tap the brakes so the weight immediately shifts to the rear. Therefore, braking wasn't that big of an issue when it came to time. But, at circuits such as Fuji Speedway, there are many times when you're at high speeds, longer braking periods, and situations of fully braking. So in many cases, you would have a hard time controlling the vehicle which will ultimately lead to time loss.

I never imagined that rigidity played such a large role and the effects of it!!

At first when I was told the lightweight wheel still had the minimum amount of rigidity to withstand the test, I didn't imagine there would be much of a difference between the two wheels. In the end, I was surprised on how much of a difference there actually was. Even if the wheels are extremely lightweight, without the sufficient amount of rigidity, the tires and the vehicle will not be able to perform at their peak. Due to the fact that the wheels give/bend, it affects the geometry of the car making it impossible to have a good initial setup. This test has seriously made me realize that wheels are not all just about weight. I now understand to look out for the rigidity of the wheels as well.

Lightweight wheels have its merits as well, so ultimately it is about balance. With that said, the commercial version of the GTC-01 we used this time is a prime example of a balanced wheel which has been produced over numerous amounts of testing. It has a sufficient amount of rigidity while keeping it light weight as possible at the same time. High quality wheels are the key to faster times. I want everyone to think about this before you start shopping around for wheels!



エンケイが語る ホイールにおける剛性について



ENKEI SPEAKS: REGARDING WHEELS AND RIGIDITY

Most enthusiasts consider rigidity in terms of body and are aware of its affects on performance. Many aftermarket options are available to increase body rigidity. However, there is a lack of focus on rigidity in terms of wheels with most of the focus on weight. Hopefully, this article can change the way some view the attributes and how they affect wheels.

When it comes to wheel rigidity, many tend to assume that production method (cast vs. forged) dictates the overall rigidity. In the case of technologically advanced manufacturers, this is not the case at all. Rigidity depends on the design of the wheel. Regardless of whether the wheel is cast or forged, if the same design and raw materials are used, the rigidity factor will be equal. Furthermore, the weight will not be affected neither. The majority of Enkei wheels are cast. Although the generalized stereotype in the US seems to be that forged is superior to cast, wheels such as the GTC-01 is equal or superior in strength to many other forged wheels out on the market due to Enkei's MAT technology. This MAT technology enables Enkei to produce wheels in which both strength and lightweight attributes can coexist in a balanced manner.