

NYTIRØ
PERFORMANCE REFINED



WHITE PAPER

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0. INTRODUCTION

Cicli Pinarello is one of the most famous and winning bike manufacturer in the world.

Founded in Treviso (Italy) in 1952 by Giovanni (Nani) Pinarello, it produces high end racing bikes.

This name, Pinarello, recalls legendary victories of the greatest cyclists of all times: since 1975, the first victory in Giro d'Italia with Fausto Bertoglio, Pinarello has won all the most important races in the world, including Olympics, World Championships and Tour de France.

All the bikes produced for the best riders in the world are also available for the amateurs, to allow everyone to perform the best possible.

The collaboration with the pro riders allow us to develop cutting edge technologies in order to win the races...those technologies are then applied on the bikes that everyone could buy and use.

1. PINARELLO NYTRO BIKE CONCEPT

a. PURPOSES OF THE PROJECT

Design a new Pinarello bike is always a challenge, there are highly performance expectations to be respected. So, designing for the first time a Pinarello's e-road bike with the clear purpose to match the unbeatable Pinarello riding feeling and provide the pedaling assistance through an electric motor, was even more an exciting challenge. It took a complicate process of engineering and testing, but the final result is the first e-road bike that guarantee the maximum riding pleasure on downhill and a not invasive but effective support during uphill.

Pinarello Nytro: riding overboost!



The main goals at the beginning of the Nytro project were:

- Provide to a e-road bike the same riding feeling as a traditional bike
- Set a new standard for e-road bike in terms of powertrain and stiffness value
- Reduce the weight of the overall system (bike + motor)
- Reduce air drag

1. PINARELLO NYTRO BIKE CONCEPT

b. HANDLING AND RIDING FEELING

The target was to optimized the handling for an all round e-bike, where riding comfort is important as well agility, precision in every corner and stability on long turns.

To reach this target it was necessary to combine the legendary Pinarello frame geometries with the integration of the Fazua Evation system.

The main areas of development were:

- Integration of the Fazua Evation system in the down tube.
This assure that the center of mass is in the lower possible position in order to assure stability on the long turns without sacrificing the agility
- Vertical tube and fork angle same as Dogma. In order to assure the agility and precision in the corner
- Wheelbase just 1% longer then existing Gan, to provide more comfort and stability.
- Head tube 10% higher for a stressless riding.
- Head Set tapered with top bearing 1" 1/8 , bottom bearing 1" 1/2 .
- Flat mount disk 160mm for secure braking in all conditions
- Thru-Axle 12mm for fork and stays.
It assures higher braking stability and higher torsional rigidity.

1. PINARELLO NYTRO BIKE CONCEPT

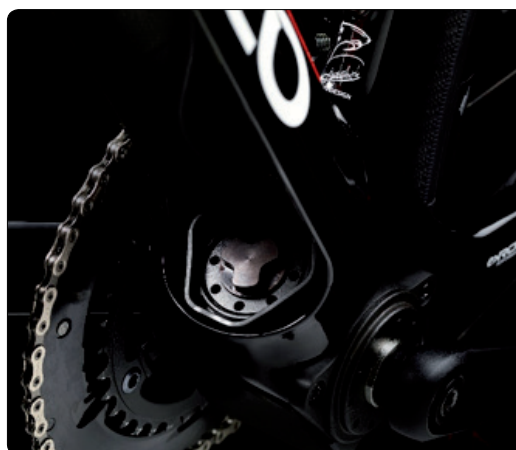
c. POWERTRAIN AND FRAME STIFFNESS

Frame stiffness is crucial to avoid any waste of energy and to have a more balanced behavior of the bike. The power transfer happens especially through the head tube, down tube, bottom bracket and chain stays. More stiffness is required in these zones to lessen energy wasting deflections and increase the power transfer between the rider and the rear wheel.

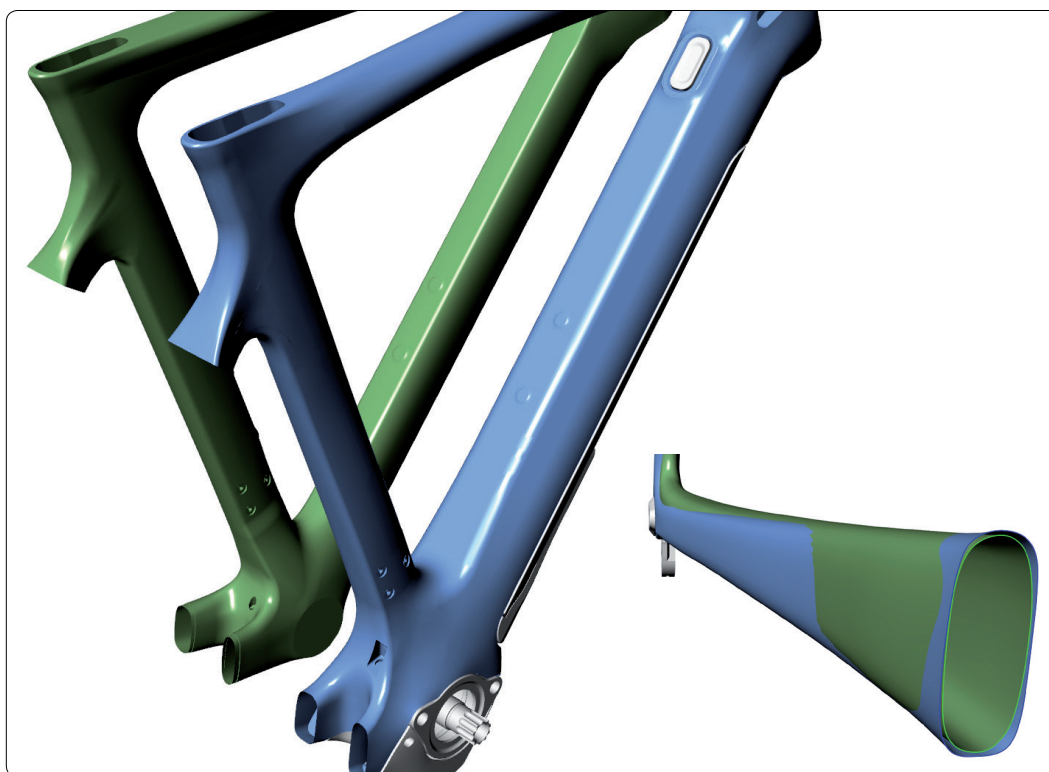
A typical problem of a e-bike is the integration of the system (motor + battery) in the frame.

This means that cuts in the traditional tube frame shape are necessary.

Therefore the sections of the down tube, bottom bracket and chain stay were increased with the double function to obtain a perfect integration and to avoid any loss of power transmission.



1. PINARELLO NYTRO BIKE CONCEPT



In these pictures is visible a comparison between the new Nytro frame (light blue) and a traditional road bike (green). Dimension of the down tube and bottom bracket are visible wider in order to provide the right frame rigidity values and integrate the Fazua Evation System.

Also the chain stays have a wider section in order to support the increase of power given by the electric motor.

The Pinarello's asymmetry concept is even more enhance in the new Nytro. We must consider that in a e-bike the frame undergoes higher stresses due to the combined action of the rider's legs plus the electric motor. The power transmitted to the frame can easily reach values around 550W (where 400W are just coming from the electric motor). In order to assure a more responsive to the stresses and provides a more balanced and symmetrical behavior the frame was designed with the following features:

- Seat tube right half section considerably wider then the left section
- Top tube right side wider as the left side.

1. PINARELLO NYTRO BIKE CONCEPT



The pictures above shows the comparison between a traditional Pinarello road bike frame (green) and the Nytro frame.

As easily visible the Nytro frame sections are even more asymmetric to bear the combined action of legs and electric motor.

To complete the frame analysis the “upper part” of the frame (seat stays and seat tube) is properly designed in order to easily absorb the terrain roughness and assure a more comfortable ride.

1. PINARELLO NYTRO BIKE CONCEPT

d. KEEP THE NYTRO AS LIGHT AS POSSIBLE

Weight is a crucial topic when it comes to talk about e-bike.

The weight of the motor + battery package is generally considerable and the modification necessary on the frame to hold the system make the overall bike pretty heavy.

Therefore a heavy bike needs more energy on uphill, it does not allow quick accelerations and braking.

This topic was clearly kept in consideration during the study of Nytro.

This was one of the reason why we choose the Fazua Evation system as propeller for our bike.

Evation is actually one of the lightest e-bike system on the market with his 4,7 kg weight.

The shape of Fazua Evation system is also really compact and allow us to design around it an optimized tubing section that assure stiffness without adding weight.

We are using carbon fiber material T700. It has high tensile strength fibers that contributes to increase the impact strength and prevent breakages. Thanks to the high grade of carbon fibers used (especially higher strength) we were able to get a lighter frame maintaining its strength unchanged.

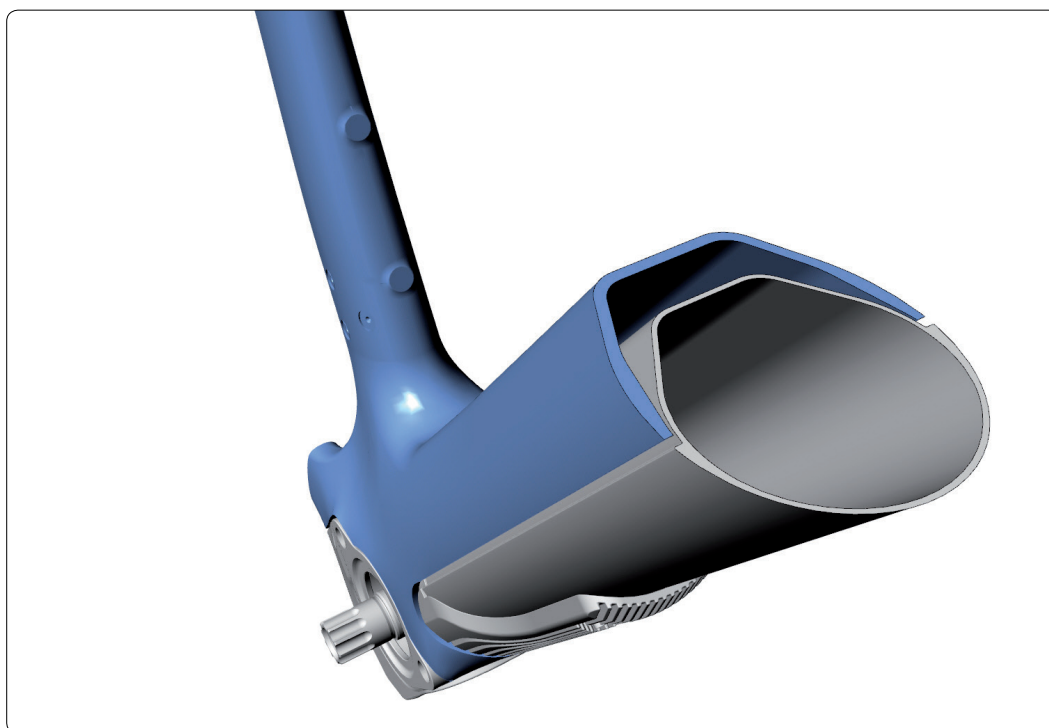
The combination of the right material for the frame, the lightest system in the market and high quality components allow to reach a bike weight 13 Kg!

1. PINARELLO NYTRO BIKE CONCEPT

e. REDUCE AIR DRAG

The target was to reduce any waste of energy due to air resistance even in a bike with an electric motor integrated. During the design phase of the new sections of the frame's tubing, it was essential to use profiles that minimize the aerodynamic drag even if they are integrating the electric motor system.

The well know Flat back profile was adapted to incorporate the Drive Pack while the design of the bottom bracket as well the chain stays are done with the clear purpose to maximize the integration between the motor components and the frame.



Following this philosophy, we were able to optimize the airflow along the complete bike.

The result is e-road frame with the lower drag coefficient possible.

1. PINARELLO NYTRO BIKE CONCEPT

f. MADE4YOU

Every rider is different and unique, because of his body: someone is taller, someone else shorter, someone has long legs, etc.

For this reason, we produce 5 different sizes, to properly accommodate every rider on his bike.

Pinarello's Nytro is the first e-road bike in the market to offer also small sizes like 46.5 and 50!

On the other hand, Pinarello wants to guarantee every rider that the bike maintains the same performances, independently from the size.

For this reason, as done also on the previous bikes, we applied the "Made4you" concept.

Every single size of the frame is designed and produced on its own: the bigger sizes are reinforced and shaped in order to bear higher stresses; the smaller sizes can be made using less material, saving weight.

This allows every rider to ride his Pinarello with same feelings and performances.

1. PINARELLO NYTRO BIKE CONCEPT

g. PINARELLO NYTRO FEATURES

As explained above, the Nytro frames has all the benefit coming from the traditional Pinarello design philosophy, but several specific solutions make it the most exciting e-road bike on the market, while maintaining intact style and feeling of Pinarello bikes.



Here below the main features that make the Gan Nytro a unique bike:

- Fazua Evation system (with 250Wh battery pack)
- Asymmetric frame
- Drop In bearing system with tapered headset
- Internal cable routing
- Italian thread BB
- Frontal seat clamp, integrated and aerodynamic
- Flatback profiles
- RAD System Disk Brake
- Front Thru-Axle 100 x 12 Shimano
- Rear Thru-Axle 142 x 12 Shimano
- Disk Flat Mount max 160mm
- Max Tyre 700 x 28
- Sizes 465; 500; 530; 550; 580

2. DRIVE SYSTEM EVATION BY FAZUA

Pinarello has choose for his first e-road Pedelecs bike the drive system **EVATION** from **FAZUA**.

The reason is simple, **EVATION** is the one of the lightest and most compact drive system in his field.

The system, with just a weight of 4,7Kg (battery included) can be installed and removed on the bike's downtube with a quick click release, giving the possibility to convert the bike into a Pedelecs and back again in no time at all.

The patented **EVATION** drive system in combination with the unbeatable Pinarello frame know how make it possible to create a bicycle that feature a look and a weight profile unlike any other, all while giving to the riders dynamic rideability and superior riding pleasure.

EVATION is a drive system that assist the rider's pedaling under the EN 15194 standard. This means that the system has a maximum nominal power of 250W, provide assistance till 25 Km/h and it can't be able to travel via electric motor alone.

2. DRIVE SYSTEM EVATION BY FAZUA

GENERAL TECHNICAL INFORMATION

Max nominal Power: 250W

Max Power: 400W

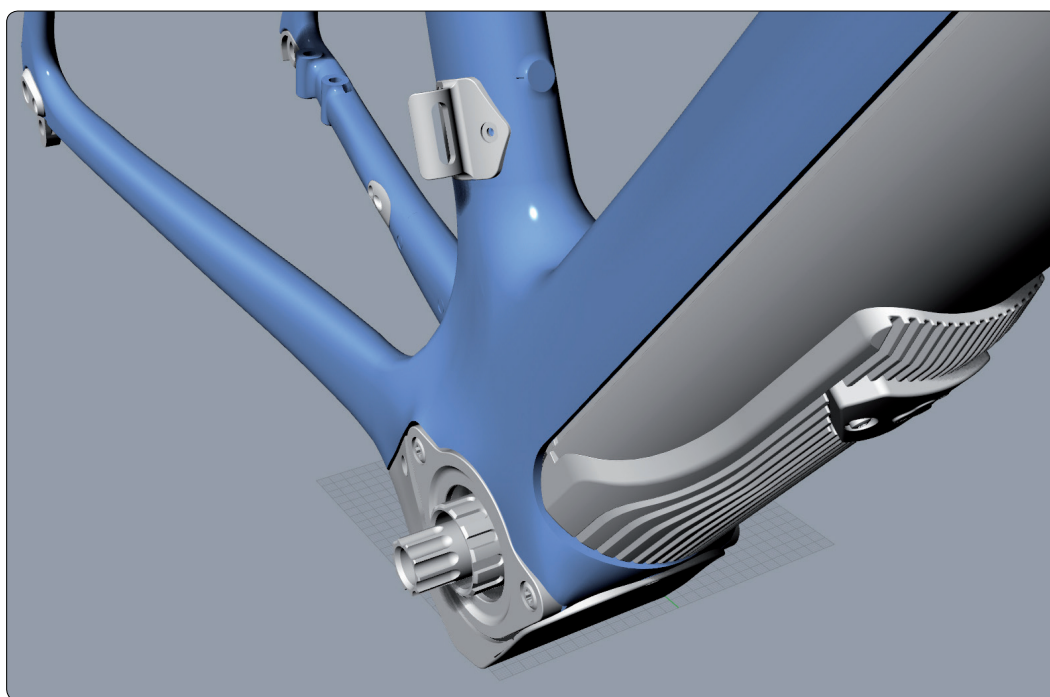
Max Torque: 60Nm

Battery energy: 252 Wh

Weight: 4,7 Kg

Max Speed with assistance: 25 Km/h

Duration: 1400m uphill in max. support level.



The drive system is composed from four main parts:

- a. Drive Pack
- b. Battery
- c. Bottom Bracket
- d. Remote

2. DRIVE SYSTEM EVATION BY FAZUA

a. DRIVE PACK

A removable motor and battery unit that flattens your way.

It is composed by:

- High Power density brushless DC motor
- Power Board highly compact with USB connection
- Exclusive Planetary Gear to reduce the motor rpm.
Assure efficiency, low dimensions and weight.
- Motion and electronic interface to transfer the power to the BB.

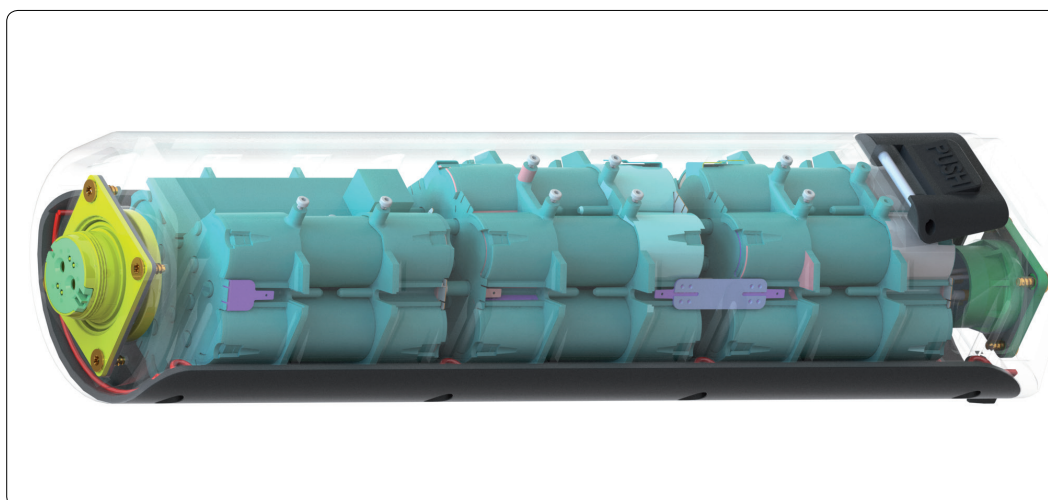


2. DRIVE SYSTEM EVATION BY FAZUA

b. BATTERY

Replaceable lithium-ion battery, offers the best ration between Energy and weight.

The battery pack can be easy remove from the Drive pack. This mean it can easily carried alone and stored away from the bike.



TECHNICAL DETAILS

Battery Energy: **252 Wh**

Rated Voltage: **36 V**

Weight: **1,4 Kg**

Number of recharges: **500 (to 100%), then 60% battery capacity is assured**

Time to recharge 0-100%: **3-4hr**

Time to recharge 0-80%: **2,5hr**

2. DRIVE SYSTEM EVATION BY FAZUA

c. BOTTOM BRACKET

It provides transmission to your chain.

In the Bottom Bracket a double-side torque measurement and cadence sensors are integrated. Thanks to that the Drive Pack can always adapt the amount of power to provide to the chain. The result is a pedal assistance really effective but not invasive.



TECHNICAL DETAILS

Max Torque: 60Nm

Weight: 1,3 kg

2. DRIVE SYSTEM EVATION BY FAZUA

d. REMOTE

Simple, easy and gives you control over everything you need.
Trough 3 buttons and a display LED bar, the remote can control the riding functions and read the riding datas.
Evation driving system has 4 level of assistance:

Support Level	Color	Max. Support factor	Max. Power
No Support		0 %	0 W
Breeze		75 %	125 W
River		150 %	250 W
Rocket		240 %	400 W

No Support (white): The motor support is switched off. The eBike can be driven as a normal bicycle.

Breeze (green): Efficient support to maximize the eBike range.

River (blue): Solid support suitable for most of scenarios.

Rocket (pink): Maximum support for the most demanding tours.

In addition to those support level, there is also a walk assistance mode that helps to carry the bike till a max speed of 6Km/h.

The visible display bar on the Remote consists of 11 LEDs.

The bottom LED is the notification indicator meant for eBike status notification.

The remaining 10 LEDs are meant for the state-of-charge and support level bar (every bar means 10%).

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