
DRIVE SYSTEMS
TOUR
km/h
ODO
Km
Functionality of GSGI
Powered by gearsensor.com
made in Czech Republic
GSGI - 17.16 - 00027

1. System description - the functionality

1.1. GSGI (gearsensor with additional gear indication function)

GSGI is the main advantage of the COMP drive system, the main difference compared to other systems. GSGI is protected by patent application, here is the basic info:

- Newly assembled ebike has to be learned how many gears it has – this is done by GSGI calibration. This process takes less than one minute.
- GSGI then recognize the gear position all the time
- GSGI has automatic recalibration function, automatic recalibration is done without activation by the rider

1.2. Shifting optimization – how it works

1.2.1. Rear derailleur, or rear derailleur + front derailleur

The rider chooses time values – how long the motor power is cutted off or reduced, rider set up different time values for smallest sprocket and largest sprocket only. All the other sprockets in between – time values for these are recalculated by controller proportionally, based on data which were collected during GSGI calibration.

Also the time values for shifting from large chainwheel to small chainwheel and oppositely are setted up separately.

Generally all above mentioned time values should not bet the same (need to be each separately set up), because the time value for motor power reduction during the shifting is related to size of sprocket (number of teeth), for front derailleur this time value is related to the direction of shifting (up/down). Principle for rear derailleur: larger sprocket means need of longer time value of motor being reduced (because it takes longer to change the gear). On the other hand, smaller sprocket means need of shorter time value of motor being reduced. This differentiation is needed, because it prevents for example to this situation: If the time value of motor being reduced is too short, then it might happen that motor restarts too soon (before the chain fully seats on new position), this could even cause breaking of the chain during shifting process. Principle for front derailleur: shifting (gear change) from small to large chainwheel requires longer time value for motor being reduced, because chain is being pulled to larger chainwheel. On the other hand shifting in opposite direction is faster, so it does not require that long time value for motor being reduced. We provide default values for all shifting parameters, based on our testing – recommended values as default.

1.2.2. Internal gear hub

As the chain is not moving to another position (sprocket), time value for motor reduction remains the same for all gears and shifting directions as well.

1.2.3. Relation between time values set up and preferred/real cadence of pedaling

Time values (how long the motor is reduced) as described above are logically connected with pedaling cadence. Principle how this works is: When rider is pedaling with higher cadence, the chain is moving faster on the sprocket (or chainwheel), therefore needed time value for motor being reduced can be shorter. On the other hand when the rider is pedaling with lower cadence, the chain is moving slower, therefore needed time for motor being reduced needs to be longer. Above mentioned info is the reason, why we added preferred cadence into the shifting parameters set up. Time values set up is connected with preferred cadence. Controller is comparing the value of preferred cadence with real pedaling cadence and based on this controller recalculates the time values. Here is the example: Preferred cadence (set up by rider in display) is 60. But the real cadence is 120, this results that pre-set time values for power reduction related to preferred cadence are recalculated to half. When the real cadence is 30, time values are recalculated to double.

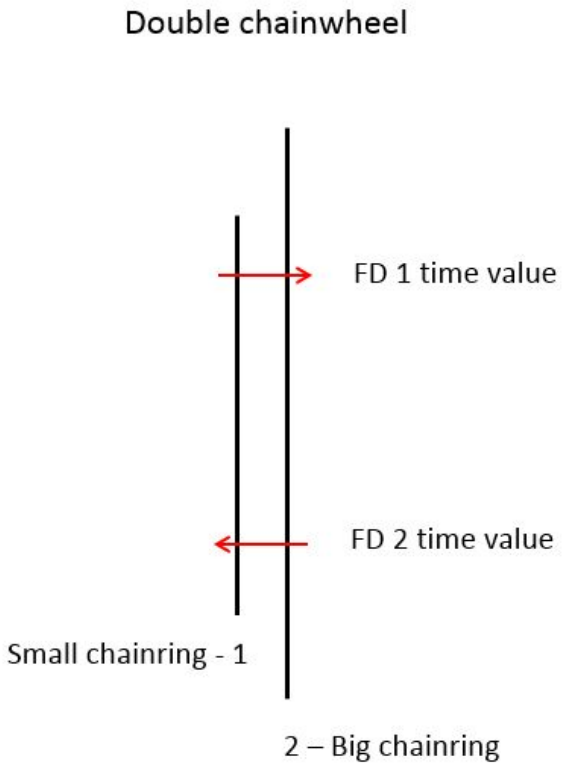
1.2.4. Motor power reduction while shifting.

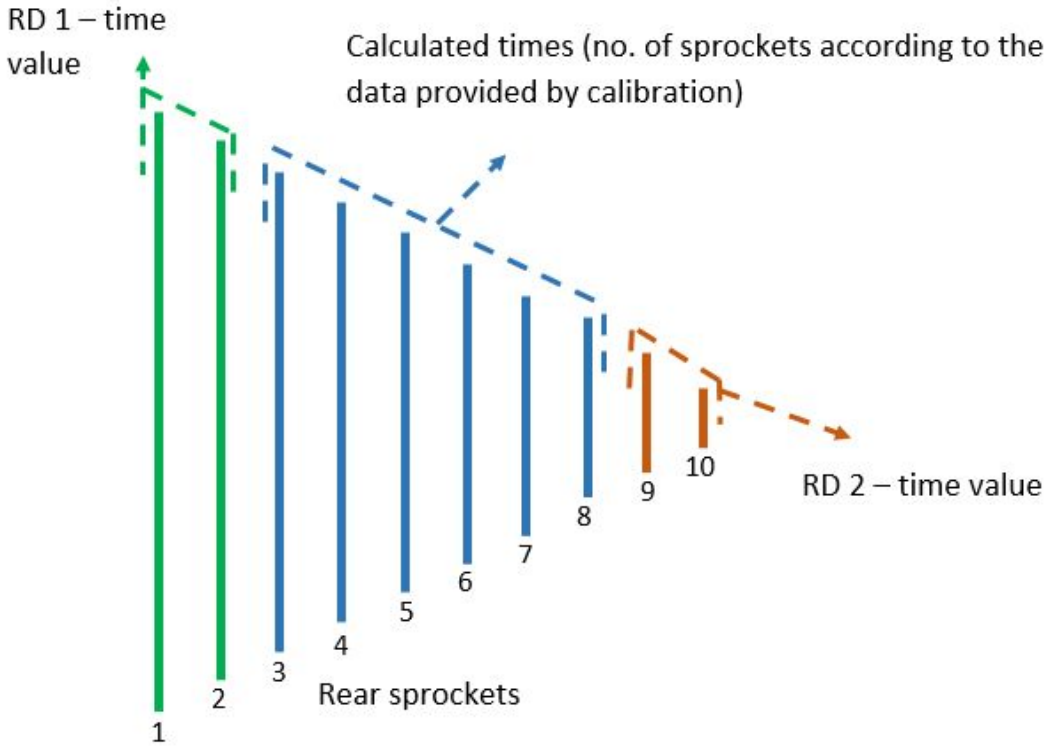
Necessary time period for smooth and correct shifting is affected by quality of the whole shifting systems and customer is able to adjust shifting timing (several time values of motor being reduced) by his own requirements and quality of his shifting mechanism. As well as quality of the shifting system affecting ability to change gear under motor load. Therefore we allow to set up required level of power reduction while shifting (gear change). Principle: smaller reduction of the motor power (smaller means higher power) while shifting means faster and more aggressive motor restart. That is because the electric motor power is not decreased to the null power while shifting, but stays in adjusted decreased motor power and when the required time value for shifting elapsed, the motor increasing its power to the standard values faster than if it would start from the null values (when the motor is fully cutted off while shifting). That is required for the sporty style of riding, for example when is necessary to shift in sharp slope (riding uphill) to eliminate significant speed reduction, otherwise can completely stop in the worst case. If you use the IGH (Internal Gear Hub), then you have to set up really high power reduction so that the IGH would be able to shift. We have all parameters for shifting optimization (mentioned above) set up as a default in our manufacturer settings, but these can be changed by the final customer with respect to his own quality of the shifting system and preferred riding style.

1.3. Results of the unique shifting optimization are:

- Elimination of possible damage caused to shifting mechanism (e.g. break the chain), extension of their lifetime.
- Decreased noise level while shifting
- Minimization of shifting time values (period of motor being reduced) required for complete and correct shifting, which is important in case of sporty riding style and hard terrain. The system calculates by itself changeable time period for motor power reduction depending on different technical requirements of each gear (sprocket diameter by cassete and gear change direction by front chainwheel) and difference between preferred and real pedalling cadence.
- System is able to prevent the situation when the motor restarts still during the gear change. That is because the system works with timing for motor power reduction and with the difference between the preferred and real pedalling cadence in the same time.
- Possibility of individual adjustment of behaviour of the drive unit while shifting (timing for motor power reduction, preferred pedalling cadence, level of power reduction). That allows adaptation behaviour for various quality of the shifting mechanism as well as for the practiced riding style – by preferred pedalling cadence.

1.4. Shifting scheme





All time values are recalculated according to the difference between preffered and real pedalling cadence