



Installation Manual

Mid-Drive Motor - Conversion Kit

BAFANG

BBS01/BBS02



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1. Introduction

Congratulations on purchasing your new electric bike product.

We're certain you'll love it, and with some care and maintenance, it will last you for a long time.

Please read through this manual carefully before attempting to install your mid-drive system.

Every bike is different so its difficult to provide an exact step by step procedure for your precise configuration, however this manual is a guide which describes the basic installation steps.

If you encounter any installation difficulties, please refer to the resources provided on our website.

A general search on the internet may also find tutorial videos or instructions specific to your problem, however we don't necessarily endorse any of these methods and care should be taken that following any of these will not cause any safety issue or void your warranty.

If you still require assistance, feel free to contact us and we will assist where possible.

2. System Overview

In terms of an electric bike, mid-drive means that the 'drive' unit or motor is installed in the middle of the bike positioned directly in between the pedals at the bike's bottom bracket as opposed to a hub-drive which is positioned on the front or rear wheel, with the motor placed in the wheel hub.

2.1 Advantages of Mid-Drive Motor Systems

Major benefits:

- Can be easily installed on a standard bike frame.
- Positioned at the centre of gravity provides better control.
- Has high starting torque (Max torque $\geq 80\text{Nm}$), which provides good performance on climbing.
- Utilises a double clutch adding to a safer operation.
- Comprised of a speed sensor and torque sensor to provide the Pedal Assist feature which helps you whilst pedalling.
- Motor controller is integrated internally, which means no external wiring.
- Provides high efficiency, low consumption and longer range compared to similar output hub motors.

2.2 Standard arrangement of a Mid-Drive System



2.3 Motor Construction

The motor drive unit is made from die-cast aluminium with an electrophoresis black coating.

The working environment temperature can range between **25°C – 55°C**.

The ingress protection grade is rated at **IP65**.

This means that the unit has:

- dust protection rating of 6 (no ingress of dust)
- water protection rating of 5 (protected against water jets from all directions).

This is a high, water protection rating, but is not totally waterproof.

The motor should never be submerged in water, exposed to long periods of rain heavy enough to form puddles, or high pressure washing.

2.4 Specifications

The motor provides an identification serial number on the motor casing in the following format:

BBS01 36V 250W 15A 25km/h 13010001

This defines:

BBS01: Motor model

15A: limited current

36V: rated voltage

25 km/h: max speed

250W: rated power

13010001: Serial Number

2.5 Precautions

Our ebike conversion kits are designed to be self-installed, however it can still be a difficult process as all bikes can vary considerably.

After many years of perfecting these installations and fixing customer mistakes, we always recommend using an experienced e-bike technician to do your installation.

We have seen instances where a customer has damaged two motor controllers through poor installation resulting in repair costs exceeding \$300.

Please note that if you chose to install a kit to your bike yourself or with any other technician (not affiliated with Pirez) you do this at your own risk and any damage done to any component or bike during installation is not covered by our warranty.

For full Terms & Conditions please visit our website www.pirez.com.au. Alternately you may choose to send your bike to us to complete the installation. We offer full installation of the kit and battery for \$250. This installation is performed by our qualified technicians and ensures you full warranty terms for 12 months.

Whilst we have your bike onsite, our technicians can also recommend or offer additional servicing, repairs or upgrades of particular components such as brakes and chains.

Other required items not included in a conversion kit are freely available at retail stores or can be purchased through our website.

This includes items such as install tools, spacers, washers, cable ties, spiral wrap, etc

3.3 Battery Preparation

Prior to installation the first time, ensure your battery is fully charged. This ensures that the voltage and state of charge among all the internal cells is equalised or 'balanced'.

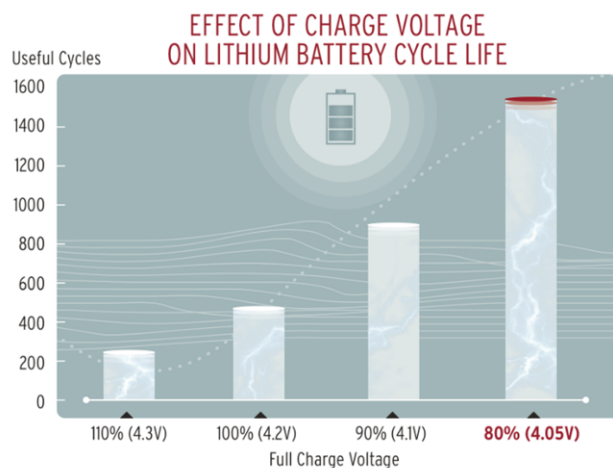
1. Plug the charger into a general power outlet.
2. Check that one of the charger indicator lights turns green.
3. Carefully connect the charger to the battery.
4. Ensure the plug is fully inserted, but do not force it if there is an obstruction.
5. The charger indicator lights should turn red whilst charging
6. Once the battery is fully charged the charger indicator light will change to green. There is no way to over-charge the battery.



Warning: Never leave a battery unattended whilst charging or left to charge overnight. Extended charging could result in overheating and cause a fire. This also reduces the longevity of your battery.

7. When it is fully charged, the charger will stop charging the battery automatically. Charging time can vary up to several hours if fully discharged.
8. The battery should be charged to 80% at least once every 3-months as a minimum to maintain healthy cells.

For a premium battery charging regime, Pirez can provide a superior '**Smart Charger**' which has some unbelievable benefits including universal compatibility, fast charging, voltage control, watertight, bike mountable and programmable to ensure battery longevity.



For frequent or long distance riders, we also highly recommend consideration of a spare or additional battery.

Pirez offer the largest range of 24V, 36V, 48V & 52V **batteries** in a range of different models.

4. Installation Procedure

The following steps are a guide to install a BBS Mid-Drive motor to most standard bikes.

Some customizations may be necessary due differences in bike models, installed accessories or even personal preference, but there are numerous resources available both online and through our website to assist you.

But the most important point is that **safety is paramount**.

Take care when installing all components, particularly once the battery is connected as the motor could engage and rotate the drivetrain which can be dangerous if its unexpected.



Warning: *The throttle can engage even if speed level is set to zero. Always ensure the display is powered off.*

4.1 Bottom bracket removal

1. Flip the bike upside down or secure on a raised **work-stand** to remove the original crankset and crank arms, front derailleur and bottom bracket from the bottom bracket shell of the bike frame.
2. Remove the crank arms using **Allen keys** or a **crank arm removal tool** depending on what sort of crank arms your bike has.
3. You can then use a **bottom bracket remover** and ratchet handle to remove the bottom bracket cups, as shown here.
4. Remove any front derailleur or front gear cables. The derailleur can usually be removed by loosening one bolt with an **Allen key** then opening a clamp.
5. You will then find that the chain is looped through the derailleur.
6. The front derailleur is not used on an e-bike so if you don't need it you can simply cut it off and discard, otherwise you will need to remove the chain via a quick link or with the aid of a **chain breaker tool**.
7. Remove all the associated cables, then reinstate the chain if you had removed it.



All tools highlighted in bold can be purchased in kits or individually through the Pirez website: pirez.com.au

4.2 Install the Mid-Drive Motor

The mid-drive motor should be installed according to the following configuration. Follow the steps underneath.



1. Affix the chainring to the motor with the concave surface facing in, using the five (5) black bolts [M5*10]. Do NOT use Loctite with these bolts.
2. Attach the chainring cover (optional) to the chainring with the five (5) silver screws [ST3.9].
3. Carefully feed the motor drive motor axle through the bottom bracket. If you encounter resistance your bottom bracket shell may need to have burrs or weld overflow smoothed with a rounded file.
4. Ensure the thread of the axle extends beyond the bottom bracket more than 10mm.



5. With the teeth on the triangular fixing plate facing inwards, fix the plate to the drive unit with two (2) black bolts [M6 x 10mm]. You may use Loctite on these two (2) bolts if you wish.
6. Ensure the triangular fixing plate is aligned straight, parallel to the same plane as the chain line or crank arms (that is perpendicular to the mid-drive axle). Use washers with the bolts or bottom bracket spacers to keep the fixing plate perfectly aligned.
7. These spacers and washers are available through our website.



8. The motor should be pressed up against the down tube of your bike frame before tightening the bolts on the motor. Make sure any cables that run along the down tube of your frame are clear from being clamped down by the motor as this could cause these brake or gear cables to fail.



9. Rotate and hold the drive unit up against the frame and tighten the [M6 x 10mm] bolts and then tighten the [M33] lock ring nut with a force of 30-40Nm. We recommend that you use the correct tools specifically designed for this purpose.

- These specialized installation tools can be purchased at Pirez via our website. An example of these tools is shown here.



- Once the lock ring nut has been tightened fit the lock ring cover over the [M33] lock ring nut.
- The new set of cranks arms can now be installed onto the motor axle. Check the markings on the back of the cranks arms to distinguish between left and right. It is particularly important you do not confuse the left and right cranks.
- Fix the left hand (LH) crank arm to the bike with the [M8] inner hex bolt using an 8mm Allen key. Use Loctite if you wish as this bolt is prone to loosening.
- Fix the right (RH) crank on the bike with the [M8] inner hex bolt using an 8mm Allen key. Again, use Loctite if you wish as this bolt is prone to loosening.
- A pair of pedals can now be installed on the crank arms. Ensure the pedal spindles are lubricated prior to installation to prevent rust oxidation. (Pedals not included in kit).
- This completes the motor installation so the bike can now be returned upright to finish the bike conversion.

4.3 Chain ring size

In the majority of cases, the standard chainring provided with your kit should be sufficient in regard to its size, however if there is a significant difference in comparison to your existing chain ring you may need to upgrade to a different size or alternatively a different sized chain.

Different sized chainrings will have the following effects:



4.4 Check the chain line

The chain line of a bicycle is determined by precise measurements between the centre of the downtube relative to the chainring and then to a direct line to the centre of the rear cassette.

This is because the chain has to move up and down the cassette as you change gears. (Down the cassette for lower gears and up the cassette for higher gears).

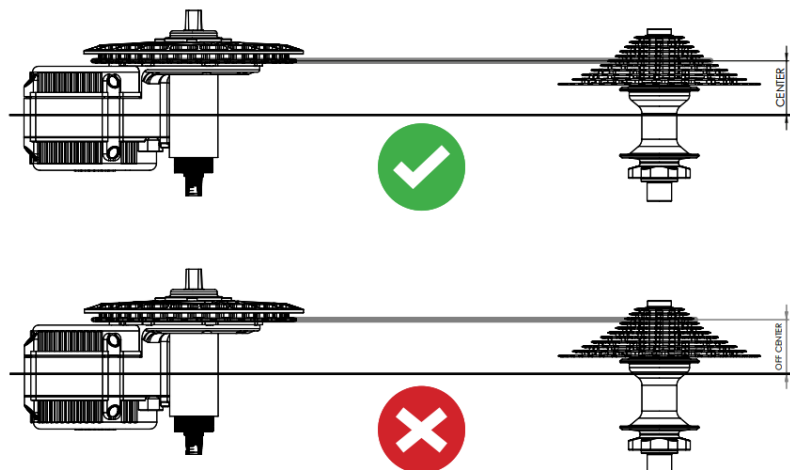
When a mid-drive motor is installed this chain line may be too far outward from the downtube and require adjustment to restore the proper chain line.

If the chain line is too far out of alignment, the chain is likely to fall off the chainring.

On many bike conversions the standard chainring will work fine. But depending on your bike frame and accessories some chain line adjustment may be recommended or even necessary.

Our conversion kits include a standard 46 tooth chainring.

This standard Bafang chainring, although extraordinarily strong, only has an offset of about 2mm to bring back the chain line into alignment. This may be insufficient to provide an acceptable chain line.

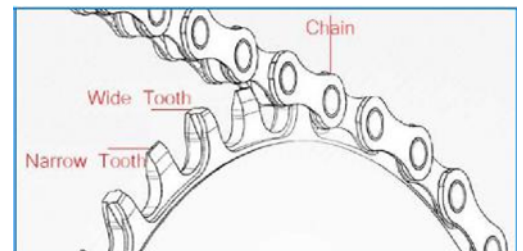


Pirez can provide other options to restore your chain line to perfect alignment.

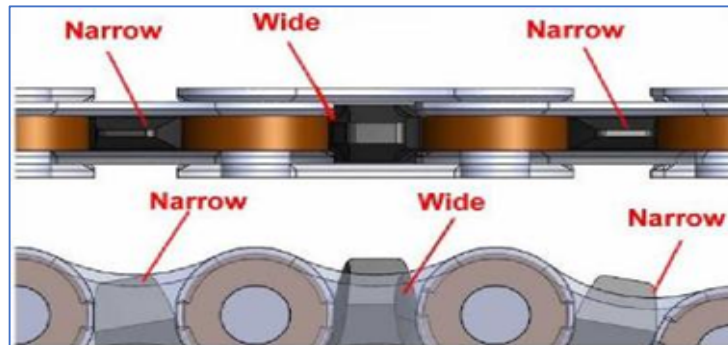
4.4.1 Narrow-wide tooth pattern

We recommend that you use narrow-wide chainrings because it provides better grip with your chain which minimizes the chance of your chain falling off.

These chainrings have a continuous, narrow tooth followed by a wide tooth pattern.



This is a benefit of Lekkie chainrings which have the narrow-wide tooth pattern.



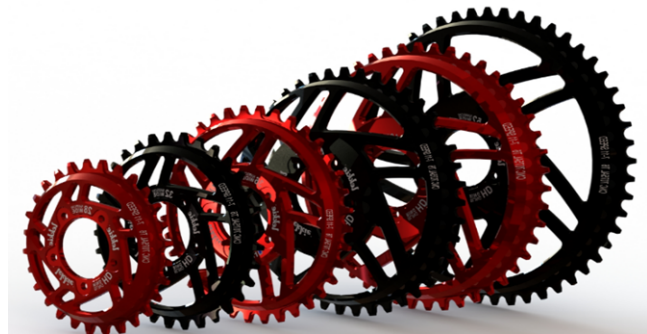
4.4.2 Chainring upgrades

Our recommendation to improve your chainline is to upgrade to a [Lekkie Bling Ring](#).

These chainrings range from size 28T to 52T.

These Lekkie chainrings have an offset which moves the chain line back into its 'perfect' position eliminating chain drop.

Also, if the chain line is in its optimum position, the drive train will last longer and run smoother.



A misaligned chain line may work, but will prematurely wear out the cassette, chain and the chainring.

Remember, e-bikes are powered and the impact of motor power on your drivetrain is much greater than human power from pedalling alone.

4.4.3 Lekkie Benefits

Besides the superior functionality, the Lekkie chainring is made of high-grade, light weight Aluminium alloy and is an attractive upgrade from the standard stamped steel Bafang chainring.



The standard Bafang chainring and cover, although strong, may detract from the desired look of your bike, particularly on more high-end bikes.

The lighter weight of a Lekkie Bling Ring is a benefit when riding the bike without pedal assist due to the overall lower weight of the bike.

4.4.4 Chaining Adapters

Chaining adapters allow you to change to any industry standard chaining allowing you to go down as small as 34T to enable insane hill climbing torque.

If you choose to use your own chaining, we offer a range of chaining adapters to enable these installations.

These chaining adapters can be installed with your chaining for both the BBS01 and BBS02 motors.



- BA104: For chainrings from 32T to 48T with a 104mm BCD
- BA110: For chainrings from 33T to 54T with a 110mm BCD
- BA130: For chainrings from 38T to 55T with a 130mm BCD

Note: BCD = bolt circle diameter



Warning: *Never install or refit a fallen chain whilst the battery is on.*

For safety reasons, we recommend disconnecting the battery to prevent the motor from engaging accidentally.

4.5 Install the Battery

Prior to installation, we recommend fully charging your battery before its first use.

Ensure your battery is compatible with your motor. Specifically, ensure that the voltage is the same. Test with a voltmeter if you are unsure.

Note: An incompatible battery could damage the motor controller and would void the warranty. In this instance, CE certifications & MSDS sheets for the applicable battery would be required to accompany a warranty claim.

1. Ensure your battery is installed securely in its position
2. Pirez supply customised securing straps with some battery types as shown here. These [Pirez Velcro Straps](#) can be purchased via our website.
3. Specific battery installation instructions are not provided here due to the large range of battery options.
4. Refer to our website or your own battery supplier for further assistance.



4.6 Install the Display Unit

The display unit included with the conversion kit is the BAFANG DP-C18.

This device will support you in configuring your wheel size and adjusting the speed limiter and power level.

1. Install the display and button control on the handlebar using the two rubber grommets and three screws supplied.
2. Adjust its location to your preference so that it will be easy to glance at whilst riding.
3. Attached to the Display Unit is the Pedal Assist Controller (PAC), which includes the ON/OFF and control buttons.
4. The PAC should be slid onto the handlebars on the side preferred by the rider. This will be affected by where you placed the Display Unit, the type of throttle you have and your brake levers.
5. Tighten the screw in the holder once the switch is in a comfortable position.
6. Plug it into the motor controller with the power off.
7. Keep the plug cap to reuse anytime the cable is disconnected. This will help protect the green plug of your display.



4.7 Install the Brake Controls

Each conversion kit includes a new set of electric brake levers.

You can choose to either install the new e-brake levers provided with your kit or purchase a set of brake sensors to use with your existing brake system.

4.7.1 E-Brakes

The standard conversion kit provides a pair of e-brake levers as shown here.

These can be installed in place of any existing brakes, then simply connected to the main cable harness using the yellow plugs.



4.7.2 Brake Sensors

Pirez offer two styles of brake sensors that can be used with your existing brake system.

Our Universal and Inline sensors are both described below.

Note: Using V-Brakes with an electric bike is not recommended.

4.7.2.1 Universal Brake Sensors

These sensors can be used for any type of brake system (including both hydraulic and disc brakes) which allows you to convert your already existing brakes into e-brakes.

This sensor is a simple piece of hardware which is basically a reed switch. When the magnet is close to the rectangle sensor (reed switch) the circuit is open, and the controller lets power pass through to the motor.

When you pull the magnet further away from the sensor, the switch closes the circuit that sends voltage to the controller which then instantly cuts the power to the motor.

1. To install, simply plug the brake sensor (yellow plug) into the main cable wiring harness.
2. Attach the rectangle reed switch and the magnet on the brake lever, as shown here.
3. There are numerous possible configurations depending on the style of the brake lever however generally speaking, the sensor should be attached to the static brake lever housing and the magnet should be attached to the movable break lever handle close to the pivot point.
4. We recommend that you use the double sided tape provided, to affix the sensor and magnet to the brake lever.
5. Once you have tested the functionality of the sensor and it is working as desired, you can more permanently fix them using either cable ties, super glue, epoxy glue, hot glue, etc.



4.7.2.2 Inline Brake Sensors

Inline brake sensors work by detecting the movement of the brake cable which is threaded through the sensor. They are compatible with all brake types that have a protruding brake cable.

Note: The inline sensors are NOT compatible with Hydraulic brakes.

1. To install, thread the brake cable through the hole in the centre of the sensor and install at the base of the brake lever housing.
2. The arrow on the sensor should point towards the brake lever.
3. When the brake cable is pulled the movement is detected and will cut off the motor power instantly.

Note: The sensor can be installed anywhere along an exposed section of the brake cable wherever there is a join between the wire cable and the protective plastic sheath.



4.8 Install the Throttle

The standard conversion kit includes a universal thumb throttle as shown here.

The most common setup for the throttle is to place it on the left hand side of the handlebar, however this depends on rider preference, and this universal device can be used on either side.

To install the thumb throttle, you will need to remove any existing hand grips and other components first.

Other types of throttle are available for purchase as shown below. These include full twist, half twist and swing throttles.



To purchase any of these throttles you must first determine whether you prefer the throttle on the left or right.

4.9 Install the Speed Sensor

The speed sensor measures the wheel revolutions and transmits to the display

unit. The speed and mileage will be shown on the display unit.

The speed sensor is comprised of the sensor, plastic holder with screw, spoke magnet with screw.



1. Assemble the speed sensor with the plastic holder and tighten the screw according to the image shown here.
2. Using the double sided tape, affix the speed sensor holder to the inside of the chainstays.
3. Affix the sensor magnet to one of the spokes on the rear wheel so that the magnet aligns with the sensor when the wheel turns.



4. The magnet must face the sensor and should be no more than 5mm apart.
5. Once you are satisfied that the sensor is aligned with the magnet, cable tie the holder to the chainstays to secure it in place.
6. Connect the speed sensor cable to the sensor and to the main cable harness.
7. Test the sensor with the Display Unit turned on.

If the sensor and magnet are not aligned or close enough to be detected the Display will indicate an Error Code 21: Speed Sensor Fault.

In this instance, adjust the sensor or magnet accordingly.

4.10 Install the cabling

All the cables must now be connected so that everything has power and will function correctly.

Most of the cables are colour coded to make it easier to identify and match the corresponding plug for each cable.

The following diagram is provided to help identify each cable and plug.

If any of these cables are too short to suit your requirements, Pirez have a range of compatible **extension cables**.

4.11 Cable Identification Chart

Connect all cables according to this diagram.



Main Cable - Wiring Harness



Display Unit

(green - male)



Left Brake Levers or Sensor

(yellow – female)



Right Brake Lever or Sensor

(yellow – female)



Throttle

(yellow – male)



Main cable to motor

(black - female)

Motor controller cables



6-Volt Light



Motor to main cable

(black - male)



Speed Sensor

(black/screw clamp)



Gear Sensor

(yellow – female)



Battery

(red/black)



Take care to not damage the pins when connecting plugs

1. The first cable to connect is the battery cable from the motor controller to your battery. Connect the red and black Anderson connectors. Red to red and black to black.
2. Connect the speed sensor cable (black) to the motor controller unit. After inserting the cable, tighten the screw clamp to ensure a tight connection.
3. Connect the main cable harness to the motor unit. (Black cable)
4. Connect the brake sensors (yellow), display unit (green) and throttle (yellow) to the main cable with the waterproof connectors.

For your convenience, there is a spare cable attached to your motor that can be used with a 6-Volt light.

4.12 Finalise & Neaten

After you have installed all of your components and accessories, it's now time to tidy up the cabling to make your converted e-bike neat. This is both for safety and aesthetic reasons.

Your kit includes several cable ties that you may use to secure any of your cables against your frame.

We can't specify exactly where to locate these ties as it depends on the style and model of your bike, your type of battery and any accessories that you may have.

However, it is important to ensure cables are secured to ensure rider safety as well as preventing damage to the cables.

Do not overtighten cable ties or they could damage the cables.

There are several other products that you can also use such as heat shrink, spiral wrap, electrical tape, etc. These are readily available online or at retail stores.

5. System Verification

1. Once you have finished the installation, double check that all cables are connected, and all parts are correctly secured.
2. Switch on the power and test all functions.
3. Once the installation has been checked, confirm the brakes are working then test ride the e-bike in a safe, traffic free area.
4. Whilst pedalling ensure the brakes work before engaging the motor.

6. Optional Extras

6.1 Bottom Bracket - Spacers & Washers

Pirez offer a range of Aluminium or alloy spacers for correct alignment and fitting of motors.

The spacers assist with odd sized bottom brackets and other alignment issues.

These spacers fit around the shaft of the motor, designed to ensure correct fitting.

If the triangle plate lines up with the two bolt attachments but is not flush against the bottom bracket of the frame, then these are the spacers you need.

The mounting plate must be totally flat against the bottom bracket side.

Pirez are also able to manufacture customised spacers to suit your specific needs.

6.2 Stabiliser Bars

Stabilizer bars are designed for those who have problems with loose Bafang motor movements.

There are two custom models of stabilizer bars, laser cut from high strength 304 stainless steel and have a mounting angle of 40 degrees.

They may also be painted or left with original stainless steel finish.

6.2.1 Non-full suspension

This fixing plate will fit most non-full suspension bikes and will attach to the chain stay on most standard frames.

An extremely secure, solid installation with either a hose clamp or suitable M6 bolt, but will require some bending or forming.



6.2.2 Full suspension

This stabilizer bar is for BBS02 and BBSHD motors that attaches to the underside of the downtube. It is targeted for stabilizing full suspension and hard tail bikes.

Note: This stabilizer bar is designed ONLY for 68mm Bottom Brackets.



6.3 Gear Sensors

E-bikes are prone to an increased rate of drivetrain wear as they typically emit torque five times higher than conventional bikes.

Our solution to this is the application of a small, low profile gear sensor module that cuts out the motor briefly during gear changing to protect your gear change shifts.

The gear sensor allows you to shift without damaging the drivetrain at any torque application.



[Gear sensors](#) are available via the Pirez website.

6.4 Kill Switch

A **kill switch** is an important safety option for an electric bike.

Electric bikes are powerful and fast and can make some noise at speed, but they are all silent when parked whether they are on or off.

A common problem is that people intuitively grab a bike by the hand grip, and may not realize the bike is powered on. The throttle can then be easily engaged accidentally. This can be particularly problematic if you have twist throttles as it is a natural response to grab the throttle tighter which could initiate more power.

Not having an on and off switch can be a safety issue, which is not only unsafe to the user, but potentially dangerous to someone unknowingly moving the bike, or to an innocent bystander.

Implementing twist throttles with no convenient on/off switch is also potentially dangerous. A thumb throttle is a safer solution because of the problem listed above.

In addition to this, if something goes wrong in your electronics, and the bike somehow gets stuck on high throttle, there is a way you can break the power to the motor and stop quickly (most brake systems are not powerful enough to stop high-powered electric motors).

We offer a kill switch (pictured) that can be installed on your handlebar.

Some riders have these installed as a safety mechanism but also to stop the motor whilst changing gears.



7. General Care & Maintenance

To reduce strain and prolong the life of both the motor and battery, we recommend that you always pedal when riding your electric bike. Where possible, try to avoid overuse of the throttle, particularly when climbing steep hills.

When plugging your battery into the it's charger, ensure it is plugged into the wall with the power switched on first.

7.1 Installation and Maintenance Servicing

Pirez offer a range of workshop services to suit your needs.

We offer:

- **Standard - Bike Conversions**
- **Dual Suspension – Bike Conversions**

or we can offer you a quote for any bespoke or customised conversion for unusual vehicles.

In addition, we recommend servicing your mid-drive motor system every 3000-5000km.

We have a range of servicing options to meet your needs, including:

- **Regular Bike Service**
- **General E-bike Service**
- **Premium E-bike Service**
- **Comprehensive E-bike Service**

Refer to our website or contact Pirez on (03) 7035 0190 to discuss your best options.

7.2 Troubleshooting Error Codes

Error Code	Error Description	Troubleshooting Method
03	Brake signal error	Check whether a brake cable is stuck.
04	Throttle on high position	Check whether the throttle has returned home.
05	Throttle error	Check the throttle for damage or poor connection
06	Low voltage protection	Check the battery voltage. Likely an incompatible battery.
07	High voltage protection	Check the battery voltage. Likely an incompatible battery.
08	Motor hall sensor error	May be a poor connection to the motor. Unplug, check pins, reconnect.
09	Phase line of motor error	Check the motor module.
10	Controller over temperature	The controller has reached a high temperature. If riding, let the motor cool down or it will disable.
11	Motor over temperature error	The motor has reached a high temperature. If riding, let the motor cool down or it will disable.
12	Current sensor failure	Check the controller.
13	Battery temperature error	Check the battery.
21	External speed sensor fault	Check the position of the speed sensor and ensure its aligned with the magnet.
22	BMS communication failure	Replace the battery.
30	Communication failure	Check the controller connectors.

8. Warranty

A summary of the Pirez Electric Bikes warranty is provided below.

Pirez provide a warranty on all non-consumable products against manufacturing defects for a period of 12 months from the date of purchase or up to 5000km, whichever occurs first.

The warranty does not protect against wear and tear.

In general terms this warranty covers defects in materials or workmanship. It does not cover damage caused by the general use or riding of a bike.

All exclusions remain subject to inspection by the Pirez service delivery team.

It is incumbent upon the owner of the product items covered by this warranty to learn how to care for and safely operate any product item.

Inexperience or knowledge failure will not be accepted as a valid reason to afford a warranty claim.

Choosing to install conversion kits by yourself or by an unauthorised technician is done so at your own risk and any damage occurring during or as a result of the installation is not covered by warranty.

This warranty excludes products used for commercial use such as delivery or bike hire companies or any type of competition, racing or sporting event.

Should you be using your product for commercial or competitive use and any issues arise, Pirez will be more than happy to assist you to resolve any problems.

A small fee for labour and parts will likely be required as this is classified as non-warranty work.

Refer to the Pirez website for the comprehensive and current version of our:

Terms & Conditions.