

# DM03 Display

## Functionality Introduction

Product Name: Intelligent OLED Display

Product Model: DM 03





## 版本修订历史

| <b>Version No.</b> | <b>Reviser</b> | <b>Date</b> | <b>Revision content</b>            |
|--------------------|----------------|-------------|------------------------------------|
| V1.01              | Leo Liao       | 2020.06.17  | Initial version                    |
|                    | Leo Liao       | 2020.07.27  | Update display coding rules        |
| V1.02              | Leo Liao       | 2021.02.22  | Add declaration                    |
| V1.03              | Chengyou wu    | 2022.08.11  | Add Custom Requirements of Shantai |

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## Declaration

**DM03 functional definition is a function definition description of the standard-version DM03 display produced by Velofox , and is part of the technical documentation.**

**All of Velofox's display products are customized according to the electric system's requirements. While this document is a reference for complete function definitions, operation instructions, and error codes, any configuration difference between your display and the standard DM03 is possible, due to various technical requirements in different ebike applications. Please consult your drive system supplier for additional function requirements and data display.**

**If you have any questions about DM03 functional definition, please consult our sales or technical support team.**

**Our company (VeloFox ®) reserves all the rights to interpret and explain DM03 functional definitions.**

**Hangzhou Velofox Intelligent Technology Co., Ltd**



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## A Product Introduction

### 1. Product name and model

OLED display of electric power assist bikes

Product model: DM03

- DM03 includes two versions of UART communication and CAN BUS communication

DM03\_U corresponds to UART communication version;

DM03\_C corresponds to CAN BUS communication version.

### 2. Product Introduction

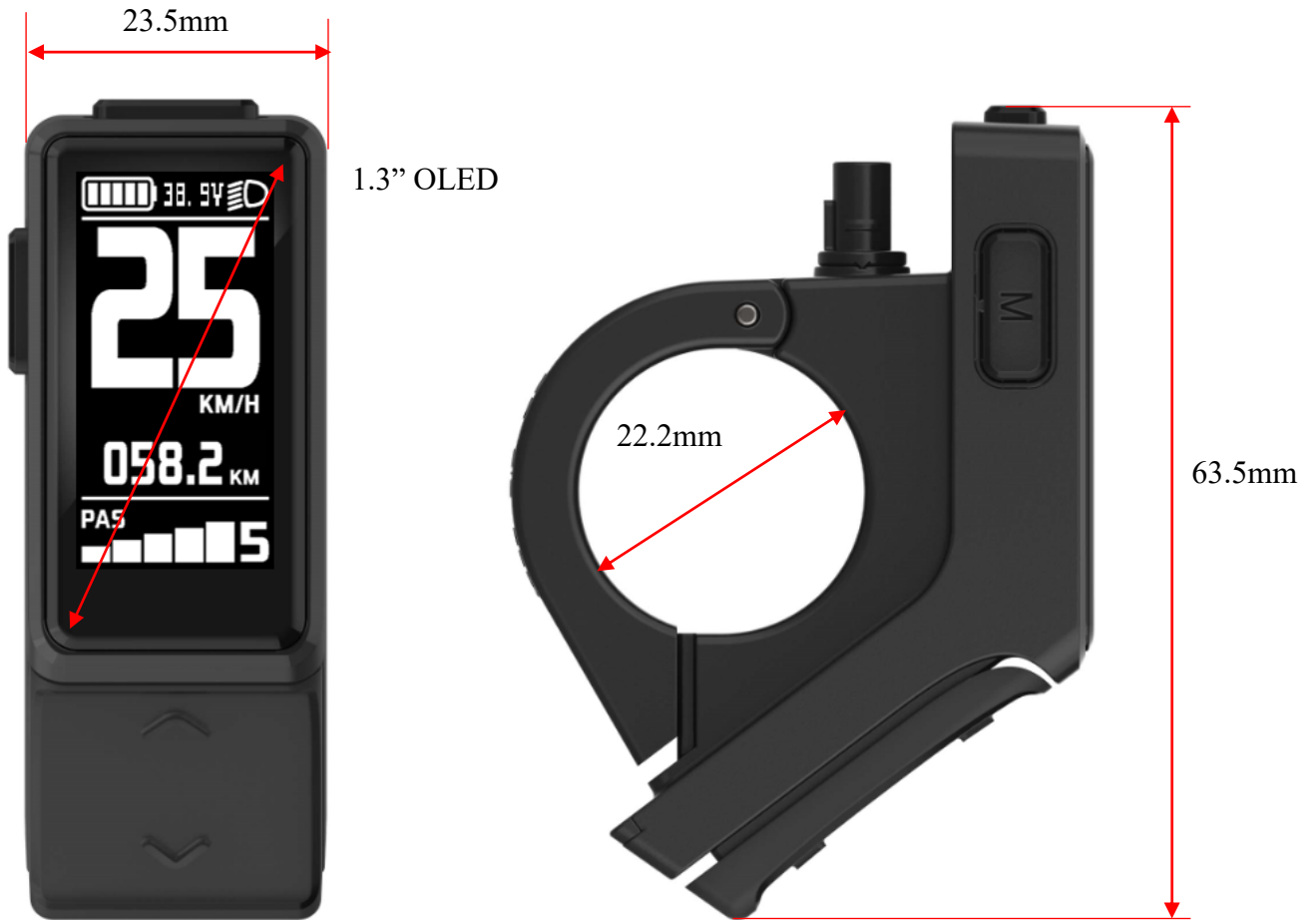
- ✧ Tempered glass screen with 2.5D chamfered edge
- ✧ 1.3 inch high brightness B/W monochrome OLED screen
- ✧ Enlarged operating space plus ergonomic button design
- ✧ IP65 waterproof level, excellent for outdoor use
- ✧ Service Tool function for fast firmware upgrade, parameter setting, and easy maintenance.

### 3. Range of application

Suitable for all E-bikes that comply with EN15194 standard

### 4. Appearance and size

The shell material of DM03 is PC+ABS, the screen is made of imported tempered glass with 2.5D chamfering technology. This product is suitable to be installed on the left side of horizontal tube with a handlebar size of  $\phi$  22.2mm.



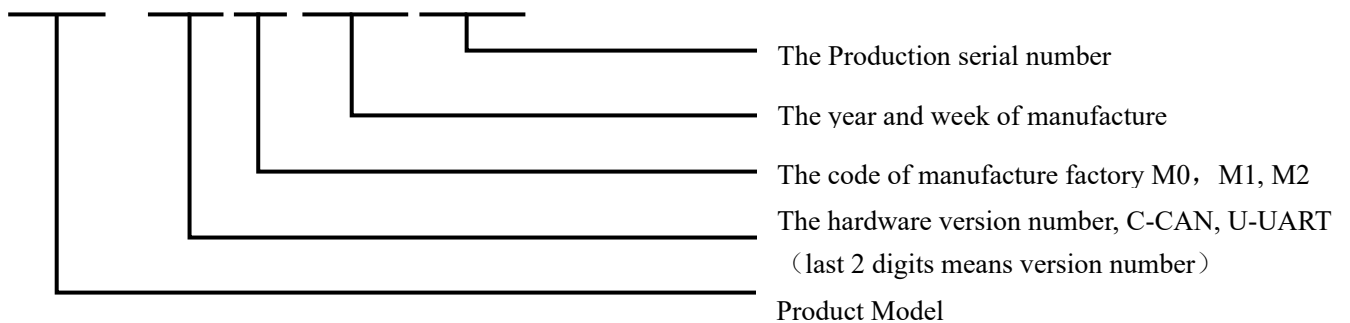
## 5. Display coding rules



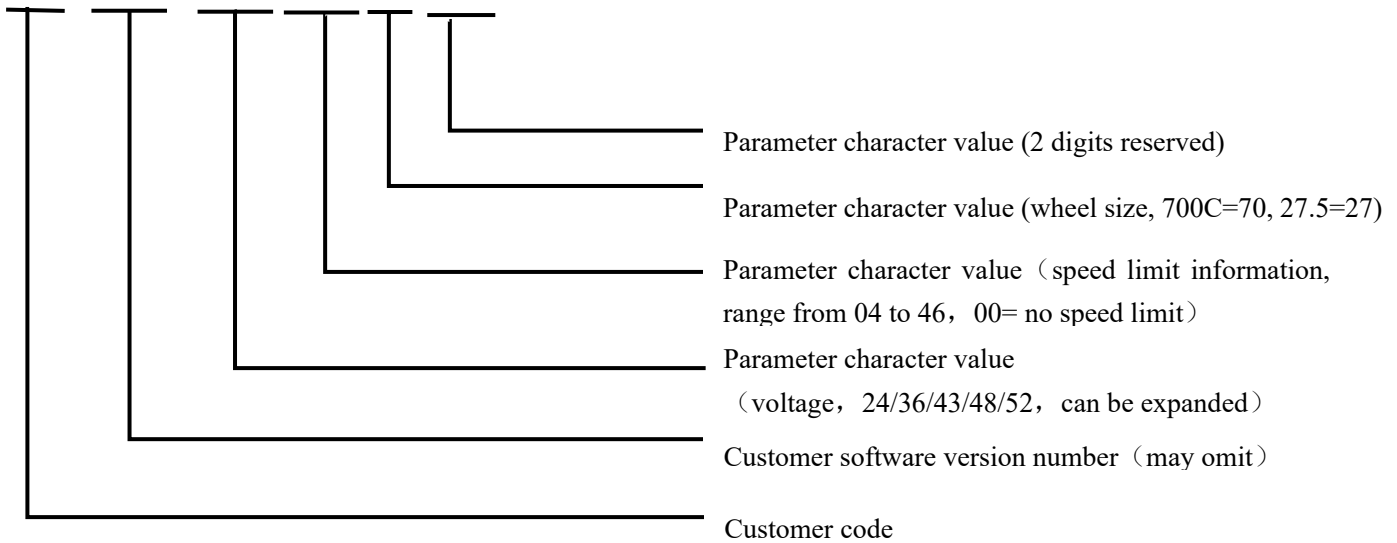
DM03-C01M020340001  
A08.01-36V2570XX

As shown as above picture:

DM03-C01M020340001.



## A08. 01-36V2570XX



## B Product manual

### 1. Specifications

- ① Power supply: DC 24V/36V/48V
- ② Rated current: 18 mA
- ③ Shutdown leakage current: <1uA
- ④ Screen specification: 1.3" OLED
- ⑤ Communication method: UART/ CAN-BUS 2 modes
- ⑥ Operating temperature: -20° C ~ 60° C
- ⑦ Storage temperature: -30° C ~ 80° C
- ⑧ Waterproof level: IP65

### 2. Function overview

- ① Four buttons, ergonomic design
- ② Selective digital and icon power assist gear for high visibility
- ③ Unit: Km / miles

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- ④ Speed: Real-time speed (SPEED)、maximum speed (MAX)、average speed (AVG)
- ⑤ Battery indicator with percentage display
- ⑥ Range: Endurance mileage (\*available if BMS provides necessary info)
- ⑦ Headlight on/off status indication and control
- ⑧ Mileage: Subtotal mileage(TRIP), total mileage (ODO)
- ⑨ Walk assist function
- ⑩ Parameters setting and advanced setting
- ⑪ Error code indication

### 3. Installation

- ① Open the display locking clip, set the display in the left handlebar (standard handlebar size:Φ22.2)  
Adjust to a position easy to operate, using M3 hex set to screws and tighten. Tightening torque: 0.8N.m.

**\*Note: Damage caused by excessive torque is not covered by the warranty.**

- ② Connect the 5 pin plug to the docking plug of the controller as marked



## 4. Interface

### 4.1 Boot interface



Boot logo interface is displayed for 3 seconds after display is turned on. When the communication connection is established, display enters the main interface which shows information obtained from the controller. ( All data displayed is following communication protocol provided by the customer)

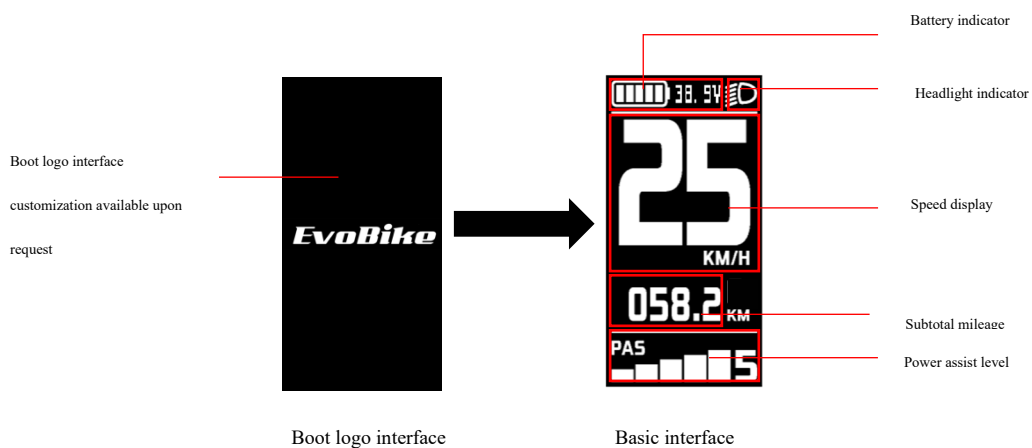
## 4.2 Basic interface and operation



- ① Display adopts 4 buttons: power button、M button、 $\wedge$  button、 $\vee$  button
- ② Standard Outlet is a board end connector, which is convenient for after-sales maintenance and replacement
- ③ 1.3 inch OLED dot matrix display meets the need for customization of the boot interface and UI interface

## 4.3 Function interface introduction

### Boot interface and basic function interface



Boot logo interface is displayed for 3 seconds after display is turned on. When the

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communication connection is established, display enters the main interface, showing real-time information stored in the controller and battery BMS according to communication protocol. (Battery indicator will not show battery percentage if BMS info is not available)

## Other function interfaces

### Function interface I

Function interface I mainly displays speed information, including average speed, maximum speed and TRIP info which is subtotal mileages as shown on basic interface. Speed display value has 3 digits, maximum value is 99.9KM/H, including one digit after the decimal point. Subtotal mileage TRIP value has 4 digits, including one digits after the decimal point. After 9999.9 KM is exceeded, the decimal point is not indicated, and a 5-digit mileage value is displayed directly, with a maximum value of 99999km. After the maximum value is exceeded, the value is shown as the actual mileage value deducted by 100,000.

Data on function interface I can be cleared by a key operation




### Function interface II

The function interface II mainly displays mileage information, including endurance mileage and total mileage information. The endurance mileage is calculated by controller based on battery BMS capacity. If the controller does not provide the endurance mileage info, it will be displayed as 000.0KM. Total mileage is usually 4 digits, including one digit after decimal point. After 9999.9KM is exceeded, the decimal point is not indicated, and a 5-digit mileage value is displayed directly, with a maximum value of 99999km. After the maximum value is exceeded, the value is shown as the actual mileage value deducted by 100,000.



### Walk assist interface

Long press  button to enter the walk assist mode, interface as shown below:









### Error code indication interface

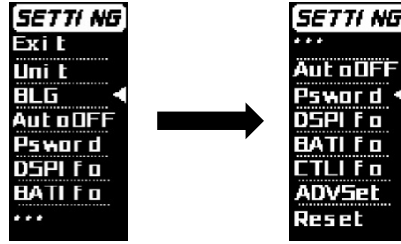
When the display receives the error info returned by controller, it will show detailed error code on interface, indicating relevant electrical system fault information. The error code will be displayed numerically in the speed display area.



### Setting interface

Within 10s after turning on display, long press M button to enter setting interface, short press ,  to switch between setting interfaces. In any setting interfaces, short press M to enter parameter editing state, which offers two modes, picking and selecting. The picking mode is indicated by triangle cursor on the right, and selecting mode is indicated by parameter shown on white background. Short press ,  to modify the parameters to edit. Long press M button to confirm and exit editing state, and long press M button again to return to previous page.

Short press ,  button to enter into each setting item accordingly.



Setting interface level 1 menu page

**For more setting operation illustration , please refer to part 7**

## 5. Button definition

### 5.1 Button name:



Power button: Turn on/off the display

Adjust button: Adjust the assisting power level during riding and switch functions

Long press the adjust buttons to perform specific function operation



Mode button: Switch interface functions and enter into parameter setting interface

## 5.2 Definition of button operation

| Operation Type     | Description   |
|--------------------|---|
| <b>Short press</b> | Press the button and soon released, while the button is released, the function activated accordingly                              |
| <b>Long press</b>  | Press the button and hold, when the hold time exceeds the setting time (generally 2 seconds), the function activated accordingly. |

## 6. Basic function operation

### 6.1 Turn on/off the display

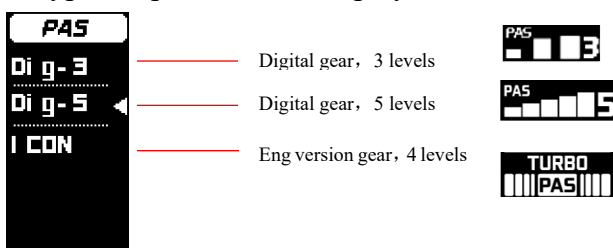
To turn on, long press  button, when the display and controller are well-connected, until boot logo interface appears and shortly enters the basic interface. To turn off, long press  button, when display is on, until display is turned off. If the rider does not perform any operation on the display within set shutdown time, while speed is 0, and current is less than 1A, then display will be turned off automatically. Set shutdown time is self-defined by user.

### 6.2 Assist level switch

During normal working state, short press 、 buttons to switch assist level, and change assist mode

**\* Power assist display can employ any of the following three modes. Please indicate your choice of mode in the order, or you can modify and choose it through advanced setting and auxiliary tool.**

Three types of power assist display modes:






Digital gear levels:



English version gear levels:



Short press 、 button to switch assist level. Switching level is not cycled, that is, after reaching 5<sup>th</sup> level, short press  button to return to off level. It's the same when adjusting up.

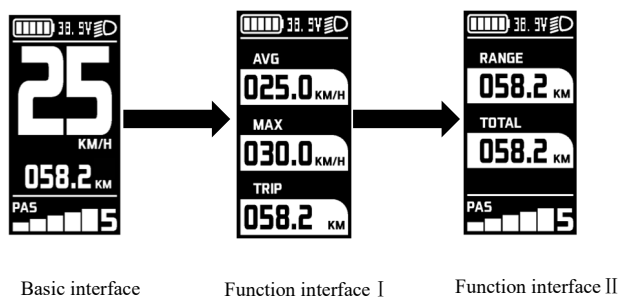
### 6.3 Information switch

In a power-on state, short press M button to switch alternately from basic interface, function interface I, and function interface II. In normal riding state, if the bike speed is greater than 0, and display is not in the basic interface, then basic interface will be automatically returned to after 5 s no operation on M button.

Function interface I displays the average speed, maximum speed and subtotal TRIP mileage;



Function interface II displays the endurance mileage and total mileage.

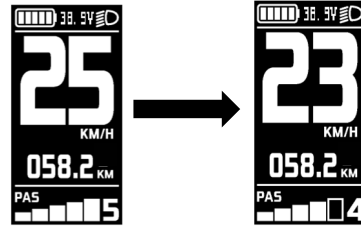
The switching process of each interface, as shown below:



**\*If BMS communication is not supported, display cannot obtain accurate RANGE information, and the value of RANGE is displayed as 000.0KM**

### 6.4 Light control function




In a power-on state, long press  button to turn on the front light, at the meantime, a light icon on top left corner of screen will appear indicating light-on status. Long press  button to turn the lights off.



### 6.5 Speed information switch

In basic function interface, display shows the real-time speed, average speed, and maximum speed. Users can switch info by short press M button. Check 6.3 for more information switch.

### 6.6 Walk assist function

When speed is 0, long press  button to enter walk assist mode, motor output according to the setting speed and control the actual walk speed, display shows the walk assist icon  and the real-time speed. Release  button or any other button to exit walk assist mode, the motor is turned off, and the display gets back to the basic interface. Walk assist interface, shown as below:



### 6.7 Battery power indicator and assist power output

Battery power information is divided into battery bar indication and remaining percentage indication. When battery power is normal, battery capacity is divided into 5 bars. Before communication is established, battery percentage is not displayed, and the power bar is full and blinks at 2Hz. After battery info is acquired, power bar will stop blinking, and displays the power percentage. If communication is not successful within 5s, it will stop blinking and no power percentage will be displayed.

After battery capacity is lower than 5% or the voltage is lower than low voltage value, display will enter low-voltage mode. In this mode battery level showed level 0 and border blink at 1Hz, with










no power output from the motor, and disabled assist level switch. Power assist level is displayed as OFF or 0.

To get out of low-voltage mode, reset, and increase the voltage above low-voltage value and battery capacity above 5%.

Percentage of battery power (C) and power level table

(Require battery % info from BMS or controller):

| SOC                    | Battery level   | Description                   |
|------------------------|---|-------------------------------|
| $SOC \geq 38.5V$       |    | Full battery level 5          |
| $37V \leq SOC < 38.5V$ |    | Level 4                       |
| $35.5V \leq SOC < 37V$ |    | Level 3                       |
| $34V \leq SOC < 35.5V$ |  | Level 2                       |
| $32V \leq SOC < 34V$   |  | Level 1                       |
| $SOC < 32V$            |  | Level 0                       |
| $SOC < 32V$            |  | Level 0 and icon blink at 1Hz |



● Remarks about battery indicator:

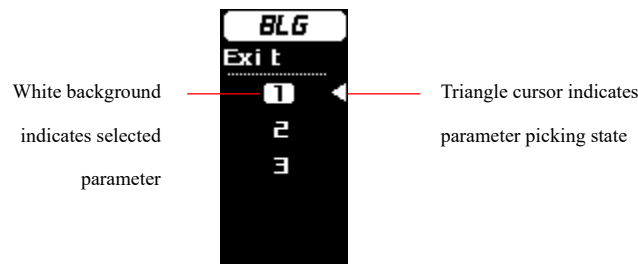
When there is a battery communication error:


1. Display will estimate the power according to the voltage and show the battery level accordingly;
2. No battery percentage information shown;
3. Range information will not be displayed;
4. If the voltage is lower than the low-voltage value, the effect of the current on voltage needs to be considered when converting to voltage at 0 current

## 7. Setting Function

Display provides specific parameter setting functions. The optional items of setting function will be deleted according to different market and product standards. The following is the complete parameter setting, information reading function description under the default state of display. Please contact our sales and technical support team for confirmation in case of any discrepancies.

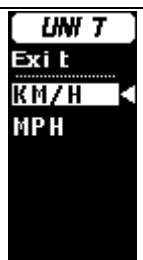
Within 10s after turning on display, long press M button to enter setting interface, short press ,  button to switch between setting interfaces. In any setting interfaces, short press M button to enter parameter editing state, the triangle cursor on the right side indicates parameter picking state. Except for the first-level, parameter setting mode is indicated by parameters shown on white background, as shown below:



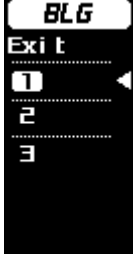



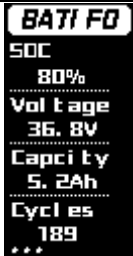

Short press ,  button to edit parameters. Long press M button to confirm parameter selection.





Long press M button again to exit and return to previous page. In any interface of the setting mode, short press M to enter next level, and long press M button to return to the previous menu.

Setting interface firstly enter the first-level parameter setting interface, description of each parameter is as follows:

| Setting items | Interface   | Description | Setting data      | Remark  |
|---------------|---|-------------|-------------------|---|
| Unit Setting  |  | UNIT=Unit   | Value=KM/H<br>MPH | Default Value=KM/H<br><br>KM/H—Metric<br>MPH—Imperial |



|                           |   |                               |  |  |
|---------------------------|---|-------------------------------|--|--|
| Backlight level setting   |    | BLG=Backlight                 | Value= 1,<br>back light level<br>60%<br>Value= 2<br>Back light level<br>80%<br>Value= 3<br>Back light<br>level100% | Default Value= 1   |
| Auto shutdown time        |    | AutoOFF= Auto sleep           | Value=OFF,5-30 min   | Default Value=5min<br>Step=5 min<br>OFF means no auto shutdown |
| Power-on password setting |   | Psword=Password               | Value= OFF and<br>ON;<br>When is ON,<br>user is allowed to<br>set 4-digit<br>password                              | Default value:<br>OFF  |
| Display info              |  | DSPIFO=display information    | Read-only  | According to communication protocol                            |
| Battery info              |  | BATIFO=battery information    | Read-only  | According to communication protocol                            |
| Controller Info           |  | CTLIFO=controller information | Read-only  | According to communication protocol                            |

|                           |   |                               |  |  |
|---------------------------|---|-------------------------------|--|--|
| BAT Info                  |    | BATIFO=battery information    | Read-only  | According to communication protocol                |
| Controller Info           |    | CTLIFO=controller information | Read-only  | According to communication protocol                |
| *Advanced setting options |    | ADVSET=Advanced setting       | Go to advanced setting secondary parameter setting interface | See advanced settings                              |
| Reset to factory setting  |  | RESET                         | Reset  | All parameters will be restored to factory setting |

## 8. Advanced setting functions

### \*Warning

The advanced setting function is based on specific protocol content, allowing to modify and set the controller and system parameter through display side. This feature is only available to specific groups of people, such as bike manufacturers, dealers and other entities with professional technical capabilities. Debugging and maintenance are allowed through advanced setting functions. In case of improper parameter setting or other setting problems, the whole system will work improperly or even have failure problems. **Please be cautious about whom to open this feature to.**

Advanced settings require a specific password, if you need to use this feature, please communicate with our company sales and technical support team to confirm compatibility with your current hardware version. At the meantime, please confirm with our sales and technical support team for adequate maintenance capacity, before obtaining the password.

### Advanced setting operation instructions

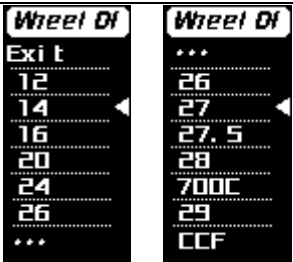

After selecting the advanced setting in the first-level menu, short press M button to enter the login password. Short press M button to select the corresponding password digit in the 4-digit password field. The selected password digits will be highlighted with a white background. Short press ^、v to edit password value, and short press M button again to confirm the input. The password input interface is as follows:




After the password is typed correctly, advanced setting is entered, divided into two-page contents. Short press ^、v to pick and select, triangle cursor on the right indicates selected object.



### Advanced setting functions descriptions:

| Setting item             | Interface   | Description             | Setting data  | Remark                      |
|--------------------------|---|-------------------------|---|-----------------------------|
| Wheel size setting       |  | WheelDI=Wheel diameter  | Value=12, 14, 16, 20, 24, 26, 27, 27.5, 700C, 28, *29, *CCF ( *value is optional) | Default value 700C          |
| Speed limitation setting |  | SpdLtd=Speed limitation | Value= 5 to 46  | Default Value= 25<br>Step=1 |

|                              |   |                           |                           |   |
|------------------------------|---|---------------------------|---------------------------|---|
| Power assist display setting |  | PAS= Pedal assistant Mode | Value= Dig-3; Dig-5; ICON | Dig-3: Digital 3 gear levels<br>Dig-5: Digital 5 gear levels<br>ICON: Eng version gears |
|------------------------------|---|---------------------------|---------------------------|---|

\* Note: The wheel diameter option CCF is the wheel diameter perimeter setting, which needs to be supported by the controller communication protocol. Parameter 29 = wheel diameter of 29 inches, which needs to be supported by a corresponding controller communication protocol. When the CCF value is selected for the wheel diameter parameter, customer is allowed to customize the wheel diameter circumference value (four-digit length value in mm).

Wheel diameter input operation: Short press ^、v button to enter the parameter value, short press M button to switch to the next number, long press M button to confirm each digit input. After confirming the wheel diameter value input, long press M button to exit the current setting and return to previous menu. The type of wheel diameter configuration will be recorded to the controller. If customer confirms wheel diameter CCF option, then CCF page will be displayed directly when entering the wheel diameter setting.



Reference table for the circumference value corresponding to common wheel diameters

| C ETRTO       |                |            | ETRTO         |                |            |
|---------------|----------------|------------|---------------|----------------|------------|
| 16 x 1.75 x 2 |                |            | 16 x 1.75 x 2 |                |            |
|               |                | kmh<br>mph |               |                | kmh<br>mph |
| 47-305        | 16x1.75x2      | 1272       | 32-630        | 27x1 1/4       | 2199       |
| 47-406        | 20x1.75x2      | 1590       | 28-630        | 27x1 1/4 Fifty | 2174       |
| 37-540        | 24x1 3/8 A     | 1948       | 40-622        | 28x1.5         | 2224       |
| 47-507        | 24x1.75x2      | 1907       | 47-622        | 28x1.75        | 2268       |
| 23-571        | 26x1           | 1973       | 40-635        | 28x1 1/2       | 2265       |
| 40-559        | 26x1.5         | 2026       | 37-622        | 28x1 3/8x1 5/8 | 2205       |
| 44-559        | 26x1.6         | 2051       | 18-622        | 700x18C        | 2102       |
| 47-559        | 26x1.75x2      | 2070       | 20-622        | 700x20C        | 2114       |
| 50-559        | 26x1.9         | 2089       | 23-622        | 700x23C        | 2133       |
| 54-559        | 26x2.00        | 2114       | 25-622        | 700x25C        | 2146       |
| 57-559        | 26x2.125       | 2133       | 28-622        | 700x28C        | 2149       |
| 37-590        | 26x1 3/8       | 2105       | 32-622        | 700x32C        | 2174       |
| 37-584        | 26x1 3/8x1 1/2 | 2086       | 37-622        | 700x35C        | 2205       |
| 20-571        | 26x3/4         | 1954       | 40-622        | 700x40C        | 2224       |
|               | 14x1.75        | 1046       |               | 12x1.75        | 957        |

## 9. Data clearance

Data clearance is aimed at the removal of data information such as subtotal mileage TRIP, average speed, and maximum speed. 10s after display is turned on when display is at function interface I, long press M button to show data clearance window, short press  $\wedge$ 、 $\vee$  button to select accordingly. To remove the pop-up clearance window, long press M button or remain no operation for 30s.



After clearance, the subtotal mileage TRIP is 0, average speed and max speed is 0. ODO information can't be cleaned manually on the display, professional service tools are required.

## 10. Error information

Display can warn bike faults. When faults are detected, error code will be shown on interface and blink at 1Hz. When error code is shown, button functions will not be affected, meaning interfaces can be shown normally by pressing buttons. If no button operation after 5s, the display will returns to the error code interface.

Error code interface as shown below:



Bafang protocol's error code information table:

| Error code          | Error description   | Suggest operation                              |
|---------------------|---|--|
| "04" shown at speed | throttle doesn't turn back to zero position (stay on the high position) | Check if the throttle turned back              |
| "05" shown at speed | throttle failure  | Check throttle                                 |
| "07" shown at speed | overvoltage protection  | Check battery voltage                          |
| "08" shown at speed | failure of motor's hall signal wire                                     | Check motor                                    |
| "09" shown at speed | failure of motor's phase wire   | Check motor                                    |
| "11" shown at speed | failure of the motor's temperature sensor                               | Check controller                               |
| "12" shown at speed | failure of the current sensor   | Check controller                               |
| "13" shown at speed | failure of the temperature of the battery                               | Check battery                                  |
| "14" shown at speed | Controller temperature is too high, and reaches the protection point    | Check motor                                    |
| "21" shown at speed | failure of the speed sensor   | Check the install position of the speed sensor |
| "22" shown at speed | Failure of BMS communication  | Change battery                                 |
| "30" shown at speed | communication failure   | Check connector to controller                  |



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## C Note

- ✧ In the use of the display, pay attention to the security, do not plug the display in and out the when the power is on;
- ✧ Try to avoid exposure in harsh environments like heavy rain, heavy snow, and strong sunlight
- ✧ When the display can't be used normally, it should be sent to repair as soon as possible

