DM09 Display
Functionality Introduction

Product Name：Colored IPS Screen Display

Product Model：DM09

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Revision History

Version No	Reviser	Date	Revision content
V1.1	Liu Lei	2024.8.20	Initial version

	杭州威狐智能科技有限公司 Hangzhou VeloFox Intelligent Technology Co,. Ltd.	文件编号	
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Content

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Declaration

DM09 functional definition is a function definition description of the standard-version DM09 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 DM09 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 DM09 functional definition, please consult our sales or technical support team.

Our company (VeloFox ®) reserves all the rights to interpret and explain DM09 functional definitions.

Hangzhou Velofox Intelligent Technology Co., Ltd

A.Product Introduction

1.Product name and model

IPS display of electric power assist bikes

Product model：DM09

- DM09 includes two versions of UART communication and CAN BUS communication

  DM09_U corresponds to UART communication version；

  DM09_C corresponds to CAN BUS communication version.

- All DM09 products are equipped with Bluetooth functionality in terms of hardware.

2. Product introduction

- ✧ High-brightness 1.45" IPS color LCD screen.
- ✧ Enlarged operation area with ergonomically designed buttons.
- ✧ IP65 waterproof level, excellent for outdoor use.
- ✧ Built-in Bluetooth function, compatible with CAN-BUS and UART communication.
- ✧ 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 DM09 is PC+ABS，the screen is made of high-hardness imported tempered glass, combined with 2.5D chamfering technology. This product is suitable for left-side installation on a φ22.2mm handlebar.

30.1mm

1.45" IPS
color LCD
screen

22.2mm

77.9mm

5.display coding rules

DM03-C01M120140001
V01.XXX.XX-24V2526XX

As shown in above picture：

DM03-C01M120140001

Production serial number

Manufacture year and week number

Manufacture factory code，M0, M1，M2, M3

Hardware version number，C-CAN, U-UART, last 2
numbers are version

Product model

V01. XXX. XX-24V2526XX

Parameter character value（reserved）

Parameter character value (wheel size value, 700C=70, 27.5=27)

Parameter character value（speed limit information, range from 04 to 46）

Parameter character value （voltage，24/36/43/48/52，can be expanded）)

Customer software version number （may omit）

Customer code

Main software version number (*optional)

Example：

DM09-C01M020340001

A27.01-36V2570

B. Product manual

1. Specifications

① Power supply：DC 24V/36V/48V/72V

② Rated current：40mA

③ Shutdown leakage current：<1uA

④ Screen specification：1.45" IPS color LCD screen.

⑤ Communication method：UART/ CAN-BUS

⑥ Operating temperature：-20°C～60°C

⑦ Storage temperature：-20°C～70°C

⑧ Waterproof level：IP65

⑨ Throttle signal output voltage：

　1.Initial angle output voltage: 0.8V ± 0.1V;

2.Final angle output voltage: 3.75V ± 0.1V;

3.Output voltage with the throttle negative line disconnected: Not greater than 0.5V.

2.Function overview

① 4 buttons, ergonomic design

② Selectable digital assist levels and icon-based assist levels, highly visible

③ Units: Metric/Imperial switchable

④ Speed display: Supports real-time speed/max speed/average speed display

⑤ Battery indicator with percentage display

⑥ Range indication（*available if BMS provides necessary info）

⑦ Headlight control and status indicator

⑧ Mileage display: Trip mileage (TRIP), Total mileage (ODO)

⑨ Walk assist function

⑩ Parameter setting function and advanced setting function

⑪ Fault code display function

⑫ Thumb throttle function

3. Installation

① Open the display lock clip, set the display in the left handlebar (standard handlebar

size:Φ22.2).Adjust to a position easy to operate tighten and fix the screw by M3 hexagon. Tightening torque:

0.8N.m.

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

② display connected with controller by 6 pin connector as required drawings.

4 .Interface

4.1 Boot interface

      Boot logo interface is displayed for 3 seconds after the 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

Power button

M button

Basic display interface

Adjustment button

Thumb throttle

① 4 buttons ： the power button、M button、∧、∨ Adjustment button。

② The standard cable exit method is straight out.

③ The screen uses a 1.45-inch high-brightness, high-definition IPS LCD, meeting the customization and modification needs of the startup interface and partial UI interfaces.

④ Throttle function, providing power output by finger movement on the throttle.

4.3 Function interface introduction

Boot interface and basic function interface

Startup logo interface   Basic function interface
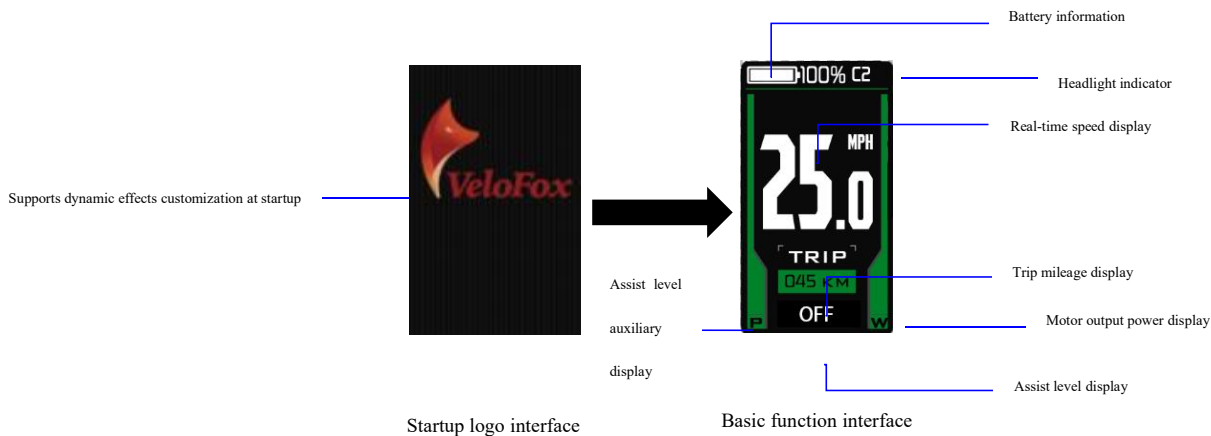
Boot logo interface is displayed for 3 seconds after display is turned on. When the communication connection is established, display enters the main interface, showing real-time information stored in the controller and battery BMS according to the communication protocol.

(Battery indicator will not show battery percentage if BMS info is not available)

Other function interfaces

Function interface I

Interface I primarily displays speed information, including trip mileage, average speed, maximum speed, and total mileage, with the trip mileage (TRIP) being the same as on the main interface. The speed display value is a 3-digit number with one decimal place, with a maximum value of 99.9 KM/H. The trip mileage value is usually a 4-digit number including one decimal place; once it exceeds 999.9 KM, the decimal point is no longer displayed, showing a direct 4-digit number with a maximum value of 9999 KM. When the maximum value is exceeded, the displayed number is the actual mileage value modulo 10000.
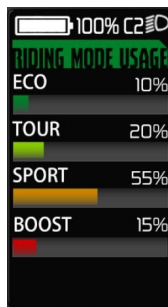
Function interface Ⅱ

Functional Interface II primarily displays battery-related information, including battery voltage, capacity percentage, total charge cycles, and remaining range. The total charge cycles are provided by the battery BMS (Battery Management System); if the BMS does not provide this information, it will display ----. The remaining range information is calculated by the controller based on the battery BMS capacity. If the controller does not provide the remaining range information, it will display ----.
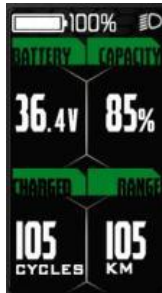
Functional Interface III

Functional Interface III primarily displays the usage time statistics for different assist modes during riding. The statistical data is calculated by the display based on the actual riding state and is shown as a percentage. The usage time statistics for assist modes can be reset to zero through a data clearing operation.
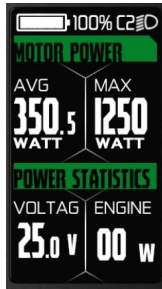

Function interface Ⅳ

Interface Ⅳ primarily displays power statistics, including the average power output of the motor, maximum power, and the ratio of rider power to motor power. The motor output power data is displayed based on the information provided by the controller. If the controller does not provide this data, the instrument calculates and displays it based on sampled voltage and current.

* The ratio of rider power to motor power statistics requires support from the controller.
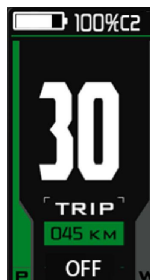

Walk assist interface

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

Error code interface

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

5.Button definition

5.1 Button name

Power button/power

Function switch key/mode

Adjust button/up

Adjust button/down

Thumb throttle

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

Thumb throttle: Provides assist output by moving the throttle

Function switch button: Switches between function display interfaces and enters the parameter setting interface

5.2 Definition of button operation

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

6. Basic function operation

6.1Turn on/off the display

To turn on, long press [⏻] button until boot logo interface appears and shortly enters the basic interface. To turn off, long press [⏻] button 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 the 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∧ 、∨，The left side (P) displays the assist progress, and the bottom shows the current gear number, allowing you to switch assist levels.

Gear display effect

Gear display
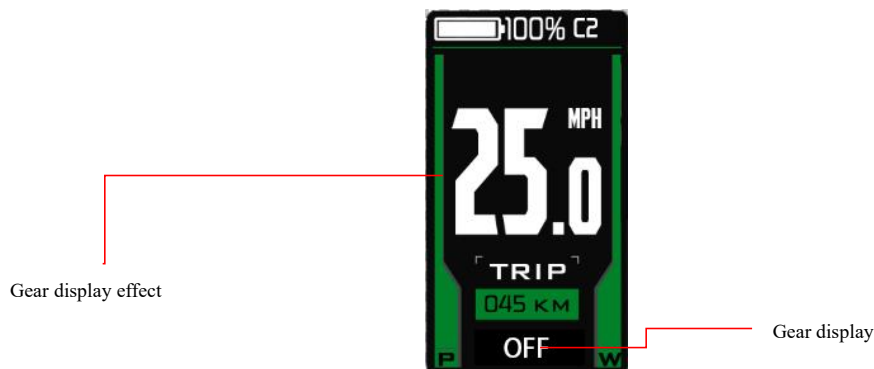
Short press∧ 、∨ button to switch assist level. Switching level is not cycled, that is, after reaching 5th level, short press ∨button to return to off level. It's the same when adjusting up.

6.3 Information switch

In a power-on state, short press M button allows sequential access to the function display screens for toggling display information. short press M button to switch alternately from the basic interface, Function Display Screen I, and Function Display Screen II.

Function Display Screen I shows average speed, maximum speed, and total mileage for a single ride.

Function Display Screen II shows remaining range, voltage, and remaining capacity.

The switching process of each interface, as shown below：
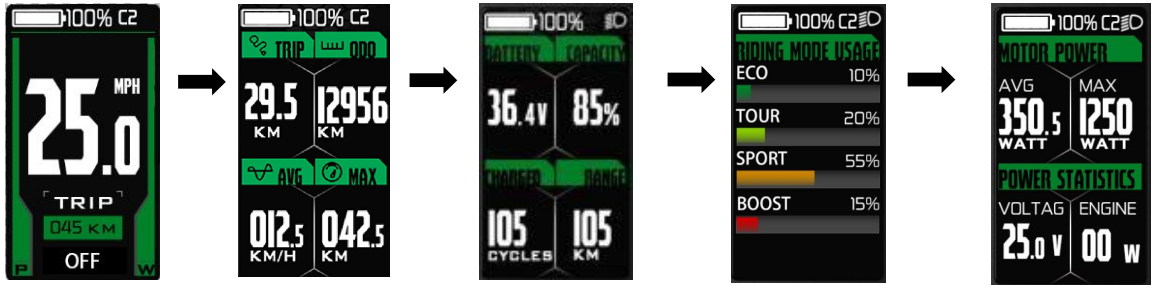
6.4 Light control function

When the vehicle is equipped with a battery and powered on,long press ∧ button can turn on the headlight,a headlight icon ▣D on the top right corner of screen will appear indicating light-on status.The screen will display the normal function status, and the screen brightness will decrease.Long press ∧ button to manually turn the headlight off.

6.5 Speed Display Switching

Display provides a speed display function. In normal mode,the interface displays real-time speed and trip mileage. The user can switch the display using the M button. refer to section 6.3Display Information Switching.
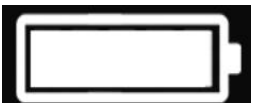
6.6 Walk assist function

When speed is 0, long press ﹀ button to enter walk assist mode, motor outputs power according to the set 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 the battery power is normal, the screen will show the battery capacity changes accordingly. Before communication is established, the battery percentage is not displayed, and the power bar is full and blinks at 2Hz.After battery info is acquired, it will display the battery percentage (a white bar will represent 100%, and the segments will not display 100%).

After battery capacity is lower than 5% or the voltage is lower than low voltage value, display will enter the 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.

SOC	Battery level	Description
90% ≤ SOC		Full battery level 5

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70% ≤ SOC		Level 4
50% ≤ SOC		Level 3
30% ≤ SOC		Level 2
20% ≤SOC		Level 1
5% ≤ SOC		Level 0
0% ≤ SOC < 5%		Level 0 and icon blink at 1Hz

6.8 Maintenance Reminder Function

The display supports a maintenance reminder function. When this function is activated, the display will remind the user to perform maintenance when the accumulated mileage reaches the preset maintenance mileage.

The maintenance reminder can be enabled or disabled in the menu settings, with the default setting being off. The maintenance mileage is preset at 5000 km from the factory and cannot be changed by the user. Therefore, every 5000 km, the system will remind the user to perform a full vehicle maintenance.

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.
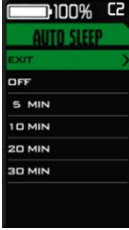
long press M button to enter setting interface, short press︿ 、﹀button to switch between setting interfaces. In any setting interfaces, short press M button to enter parameter editing state, the blue mark indicates chosen parameter, and selected option or value will be indicated by a black font with a green background. 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.

Selected option or value will be indicated by a black font with green background，as shown below:
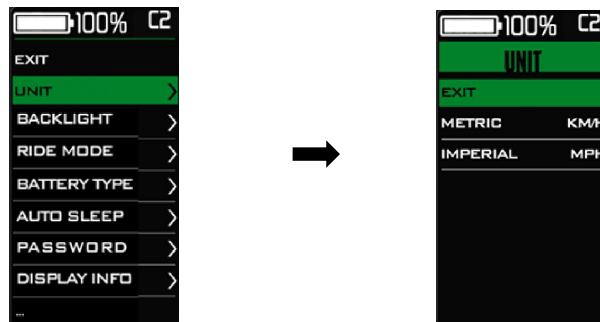
First level parameter setting interface, and the description of each parameter interface is as follow:

Setting items	Interface	Description	Setting data	Remark
Unit setting		UNIT=Unit	Value=KM/H MPH	Default Value=KM/H KM/H—Metric MPH—Imperial

Backlight level setting		BACKLIGHT= Back light grade	Value= LEVEL1 Back light level 60% Value= LEVEL 2 Back light level 80% Value= LEVEL 3 Back light level 100%	Default Value= 3
Auto shutdown time		AUTO SLEEP	Value=OFF,5-30 min	Default Value=5min OFF means no auto shutdown
Power on Passward setting		Psword=Password	Value= OFF and ON； When is ON, user is allowed to set 4-digit password	Default value：OFF
Display info		DSPIFO=display information	read only	According to Communication protocol
Battery info		BATTERY INFO	read only	According to Communication protocol

Controller info		CTLIFO=controller information	read only	read only According to communication protocol
*Advanced setting functions		ADVSET=Advanced setting	Entering Advanced Settings Secondary Parameter Configuration Interface	Refer to the advanced settings instructions for details.
Reset to Factory settings		RESET	factory data reset	All parameters will be restored to factory settings values.

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. In 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∧ 、∨ to edit password value, and short press M button again to confirm the input. The password input interface is as follows:
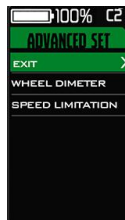
After the password is typed correctly, advanced setting is entered, divided into two-page contents. Short press∧ 、∨ to pick and select.The triangular cursor on the right indicates the selected item.

Advanced setting functions descriptions：

Setting item	Interface	Description	Setting data	Remark
Wheel size setting		Wheel diameter	Value=16、18、20、22、24、26、27.5、700C、28、29	Default value：26
Speed limitation setting		Speed limitation	Value= 5 to 46	Default Value= 25 Step=1

9．**Data clearance**

Data clearance is aimed at the removal of data information such as subtotal mileage TRIP, average speed, and maximum speed.

In the Display interface,long press M button to show data clearance window, and short press∧ 、∨ button to select accordingly. To remove the pop-up clearance window, long press M button.


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 the 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 return to the error code interface.

Error code interface as shown below:
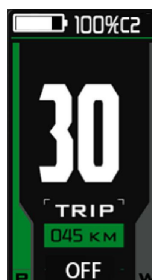
error code information table:

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

（*** Different communication protocols are different in error code system. If an error code appears, please communicate with our sales and technical support team to verify and confirm!**）

11. Wire definition

11.1Display wires definition

The standard output of the display is in the form of a board-end plug, and it requires a matching conversion cable. Our company has specific standards for the length and interface of the conversion cable. If these standard settings cannot be met, a custom adapter cable will be necessary.

The DM09 product offers two output modes: board-end plug and non-board-end plug mode. The non-board-end plug mode refers to the conventional method of connecting cables directly to the product.

Table 1 Standard wire definition

No.	Color	Function
1	Orange(KP)	Power lock control wire
2	White(TX)	Data transmission wire of display
3	Brown(VCC)	Power wire of display
4	Green(RX)	Data receiving wire of display
5	Black(GND)	GND of display
6	....	......

C.Package specifications

Standard delivery, in double corrugated box packaging. The inner layer is a double corrugated septum plus EPE foam product bag.

 Outer box size：580*390*168mm　(L*W*H)
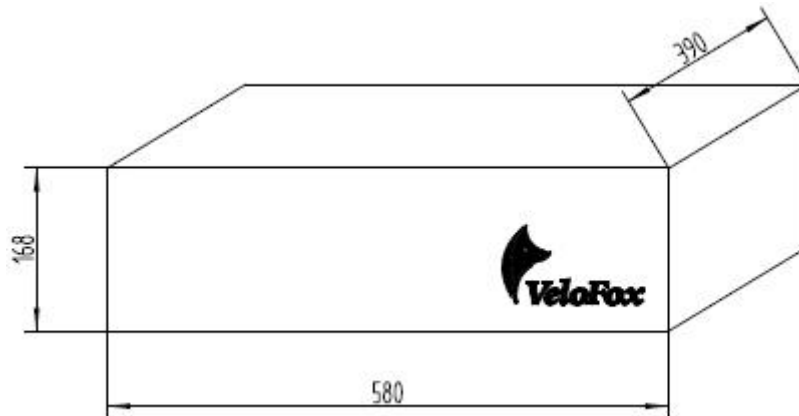
D.Note

✧ In the use of the display, pay attention to the security, do not plug the display in and out 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.