DM02 Display
Functionality Introduction

Product Name：Colored IPS Screen Display

Product Model：DM 02-RM05

	Signature	Date
Editor	Wu chengyou	2023.10.28
Checked		
Approved		

Modification History

Version No	Reviser	Date	Revision content
V1.01	Wu chengyou	2023.10.28	Initial version
V1.02	Wu chengyou	2023.10.31	On the Settings page, the current rate limit is added and the advanced settings are deleted

Declaration

DM02 functional definition is a function definition description of the standard-version DM02 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 DM02 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 DM02 functional definition, please consult our sales or technical support team.

Our company (VeloFox ®) reserves all the rights to interpret and explain DM02 functional definitions.

Hangzhou Velofox Intelligent Technology Co., Ltd

Content

A Product Introduction

1. Product name and model

IPS display of electric power assist bikes

Product model：DM02

- DM02 includes two versions of UART communication and CAN BUS communication

  DM02_U corresponds to UART communication version；

  DM02_C corresponds to CAN BUS communication version.

- All DM02 products are available to add Bluetooth function in its hardware.

2. Product introduction

✧ Tempered glass screen with beveled edge

✧ 2.0 inch HD high brightness full viewing angles IPS LCD display

✧ Special screen fitting technology, great sunlight and outdoor readability

✧ Independent operating buttons with ergonomic design

✧ 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 DM02 is PC+ABS， the screen is made of imported tempered glass with beveled edge. This product is suitable to be installed on a horizontal handlebar tube size of Φ22.2mm， Φ25.4mm，and Φ31.8mm.

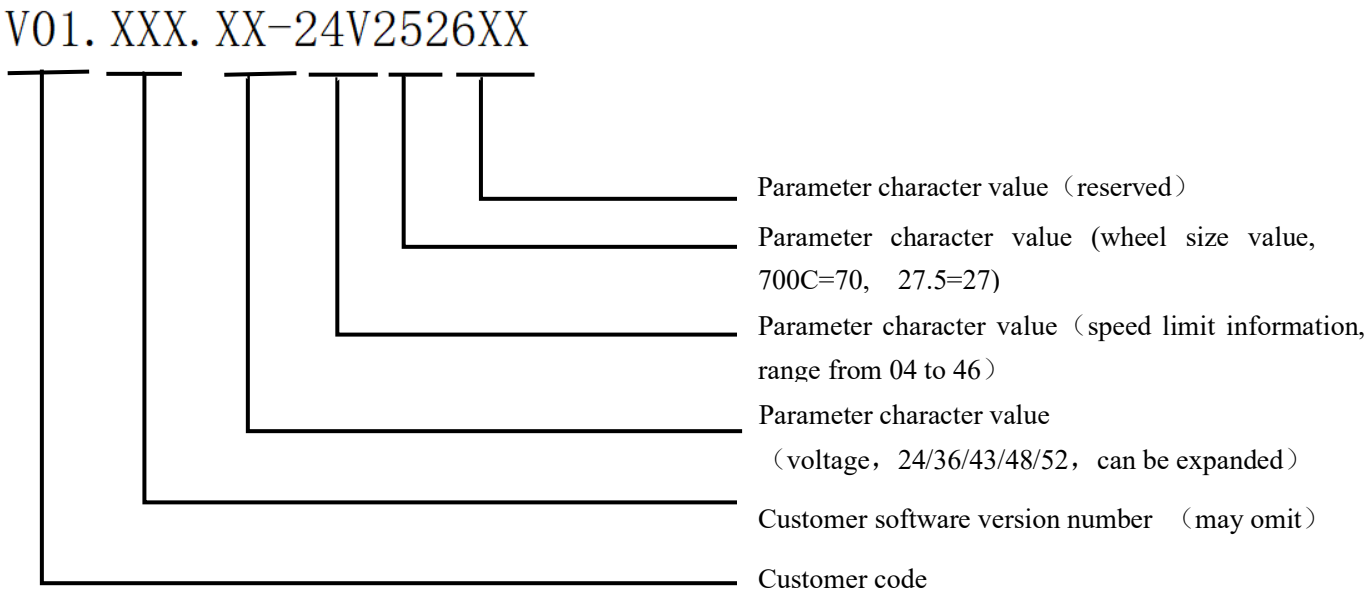
5. Display coding rules

DM02-C01M120140001
V01.XXX.XX-24V2526XX

As shown in above picture：

DM02-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



B. Product manual

1. Specifications

① Power supply：DC 24V/36V/48V

② Rated current：23 mA

③ Shutdown leakage current：<1uA

④ Screen specification：2.0 inch IPS LCD display, resolution 320*480

⑤ Communication method：UART/ CAN-BUS

⑥ Operating temperature：-10° C ~ 60° C

⑦ Storage temperature：-20° C ~ 70° C

⑧ Waterproof level：IP65

2. Function overview

① Left side independent buttons with ergonomic design

② Customization of boot interface and UI

③ Display key riding data, speed, mileage, battery info, etc.

④ Statistical function for power assist mode

⑤ Walk assist function

⑥ Auto headlight on/off function

⑦ Error code indication

⑧ Real-Time Clock for a current time indication

⑨ Range and battery indication（*available if BMS provides necessary info）

⑩ Percentage Analysis of total power output shared between engine and rider (*available if torque sensor provides necessary info)

⑪Health info statistics（*available if connected to external bluetooth device）

⑫ Include Bluetooth hardware, for wireless connection to a smartphone to achieve GPS function

⑬ Maintenance service reminder and setting

⑭Parameters setting and advanced setting

3. Installation

① Display locking clip includes two handlebar sizes, size A Φ31.8mm, and size B Φ25.4mm. Please include the requested locking clip size in the purchase order.

Installing DM02 display: Adjust display to a position easy to operate, using M3*10 hex set to screws and tighten. Tightening torque: 0.8N.m

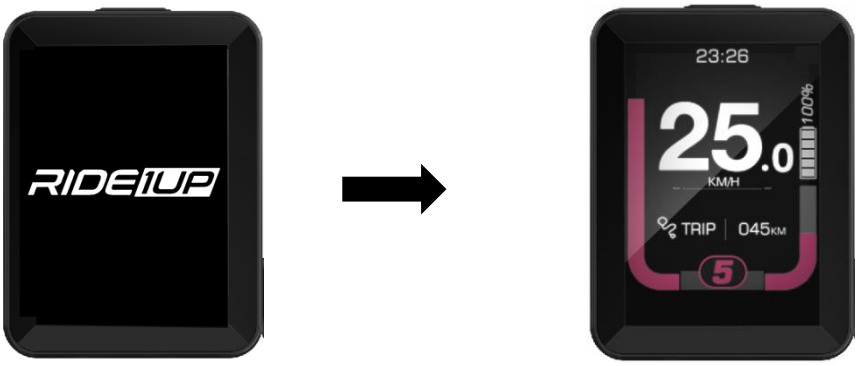
***Note:** **Damage caused by excessive torque is not covered by the warranty.**

② Place button on the left side of horizontal tube, using M3*10 hex set to screws and tighten. For more button models, please refer to Velofox product catalogue

③ Connect the 5 pin plug to the docking plug of the controller

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)

* Animated boot interface available for customization

4.2 Basic interface and operation

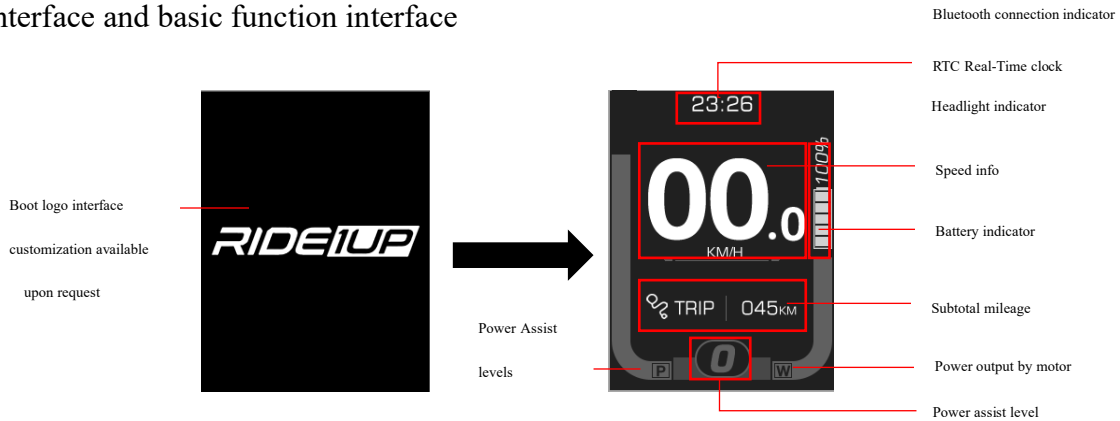
① All RM series buttons are compatible with DM02 series displays, the power-on button is located on the top side of the display.

② Standard Outlet is a board end connector, which is convenient for after-sales maintenance and replacement.

③ 2.0 inch HD high brightness IPS LCD screen meets the need for customization of the boot interface and UI interface

4.3 Function interface introduction

Boot interface and basic function interface



Boot Interface Basic 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

Function interface Ⅰ mainly displays real-time power values：

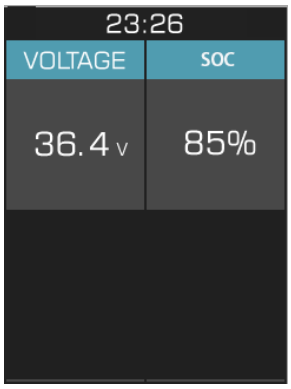
Function interface Ⅱ

Function interface Ⅱ mainly display 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 digit 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 button operation

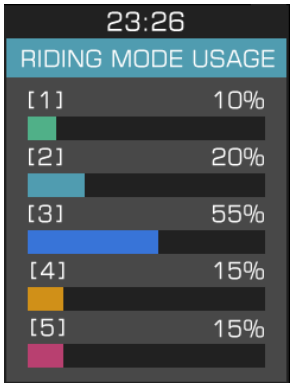
Function interface Ⅲ

The function interface Ⅲ mainly displays battery information, including voltage, capacity percentage. Accumulated charging cycles are provided by battery BMS, if it is not available from BMS, display shows ---- for charging cycles. The Range is calculated by controller using battery BMS capacity info.



Function interface Ⅳ

Function interface Ⅳ displays time usage analysis under each PAS level, data are calculated by the display according to the actual riding state, shown as a percentage. To clear the time usage data under PAS level, use button operation.

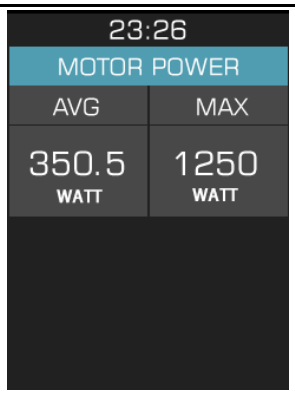


PAS Digital gears

Function interface Ⅴ

Function interface Ⅴ displays power output analysis, including average power output by motor, the maximun output by motor. Power output by motor will follow data provided by controller, if requested info is not available from controller, display will calculate using collected voltage and electric currents data.

* Power output shared between rider and motor requires controller's support



Under the basic function interface, press the "+" key and "-" key together to change function interface. If no key operation is performed within 5 seconds on any function screen, the system switches to the basic function screen.

Walk assist interface

Long press “-” button to enter walk assist mode, interface shown as below：

Maintenance reminder interface

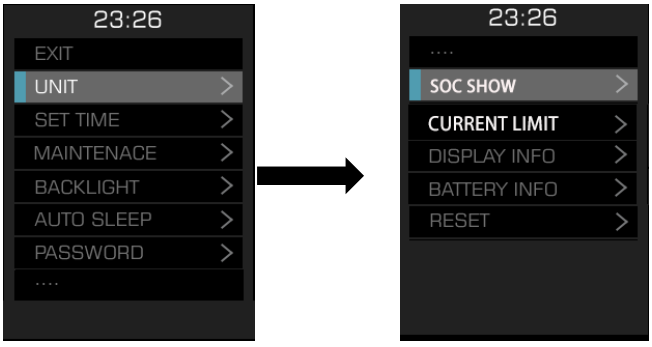
The display can be set with regular maintenance reminders, and when reaches the set mileage value, display will notify the user through the maintenance reminders. After the maintenance reminder mileage is reached, display will show a notification interface every time being turned on to prompt the user to carry out daily vehicle maintenance. Notification interface can be cancelled by short press “+”and “-” button at same time manually. After connecting to service tool box, the maintenance reminder can be reset through after-sales diagnostic tool, and meanwhile, the maintenance record will be registered.

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.

Setting interface

Within 10s after turning on display, long press “+”and “-” button together to enter the setting interface, short press “+”button、 “-” button to switch between setting interfaces. Short press “+”button、 “-”button to enter parameter picking state.



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 “+” and “-” : Short press "+" or "-" to adjust the assit level, and long or short press “+” and “-” together to carry out the function operation (see 5.2 Definition of button operation).

5.2 Definition of button operation

Operation Type	Button / Function	on/off button	"+"button	"-"button
Basic function	on/off	Long press		
	Add assist level		Short press	
	Reduce assist level			Short press
	Switch riding info		Short press together	
	Clear trip data		Long press together	
	Turn on/off light		Long press	
	Walk			Long press
Configuration function	User Configuration		Long press together	
	The next menu		Short press together	
	Return to previous menu		Long press together	
	Switch to the previous menu		Short press	
	Switch to the previous menu			Short press
	configuration parameter +		Short press	
	configuration parameter -			Short press

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 1 seconds), the function activated accordingly.
Combination of short press	Combined short press means to press one key first for pre-trigger, press another button at the same time without releasing the current button, and release two button at the same time when the last key is pressed for the set time (usually within 1S) to trigger the corresponding function.
Combination of long press	Combined long press means that two buttons are held down at the same time. When the button is held down for longer than the set long press time (usually 1S), the corresponding function is triggered.

6. Basic function operation

6.1 Turn on/off the display

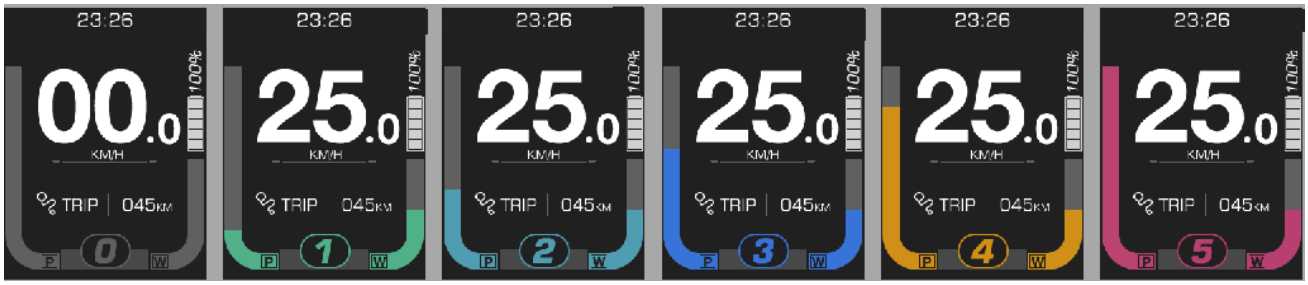
To turn on, long press  button until boot logo interface appears and shortly enters the basic interface. To turn off, long press  button until display is turned off. If the rider does not perform any operation on the display within set shutdown time, while speed is 0, and current is less than 1A, then 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 “+”、“-” buttons to switch assist level, and change assist mode

Power assist display modes as shown below：

Digital gear: 0-5 levels

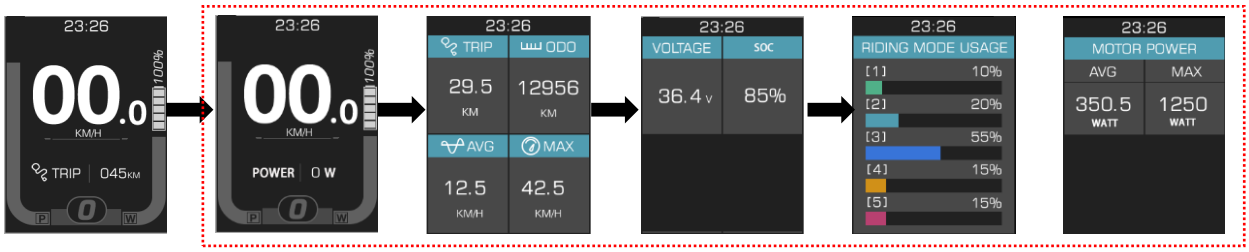


Short press “+”、“-” buttons to switch assist level. Switching level is not cycled, that is, after reaching 5th level, short press “−” button to return to off level. It’s the same when adjusting up.

6.3 Information switch

In a power-on state, short press “+” and “-” buttons at same time to switch alternately from basic interface, function interfaces. In a normal riding state, if the bike speed is greater than 0, and the display is not in the basic interface, then basic interface will be automatically returned, if the user don’t operate the “+” and “-” button together for more than 5s.

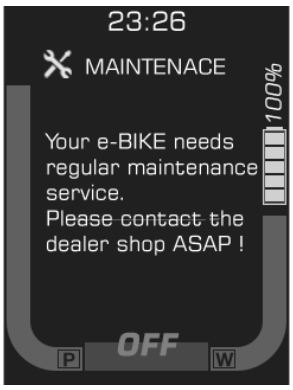
The switching process of each interface, as shown below：



Basic interface Function interface

6.4 Maintenance reminder

Display supports maintenance reminder function, when this function is enabled, the display will remind the user to give ebike a maintenance check once the total mileage reached a preset value. maintenance reminder function can be turned on/off in the setting interface and is turned on by default. The factory default reminding mileage is 5000km which is not modifiable by users, that is, display will remind the user to give a maintenance check once the total mileage reached 5000km.



6.5 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：

6.6 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, the 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 3s, 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 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.

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

（Battery % info is required from BMS or controller）：

SOC	Battery level	Description
80% ≤ SOC		Full battery level 5
60% ≤ SOC < 80%		Level 4
40% ≤ SOC < 60%		Level 3

20% ≤ SOC < 40%		Level 2
10% ≤SOC < 20%		Level 1
5% ≤ SOC < 10%		Level 0
0% ≤ SOC < 5%		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 will be 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 a voltage at 0 current

7. Setting function

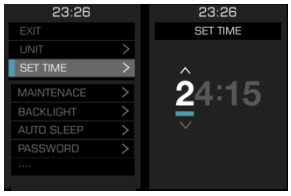
Display provides specific parameter setting functions. The optional items of setting function will be deleted according to different market and product standards. The following is the complete parameter setting, information reading function description under the default state of display. Please contact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

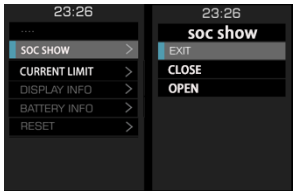
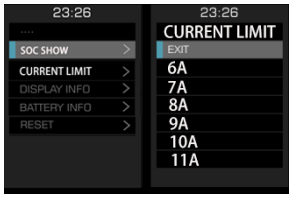
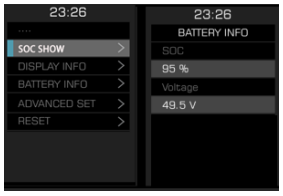
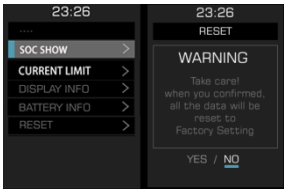
Within 10s after turning on display, long press “+” and “-” buttons at same time to enter setting interface, short press “+”、“-” buttons to switch between setting interfaces. In any setting interfaces, short press “+” and “-” buttons at same time to enter parameter editing state, the blue mark indicates chosen parameter, and selected option or value will be indicated by a white font with a grey background. Short press “+”、“-” buttons to edit parameters. Long press “+” and “-” buttons at same time to confirm parameter selection. Long press “+” and “-” buttons at same time again to exit and return to previous page

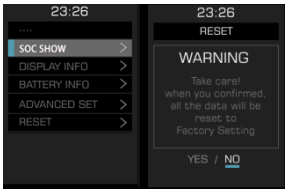
Selected option or value will be indicated by a white font with grey background，as shown below:

In any setting interfaces, short press “+” and “-” buttons at same time to enter the next level menu, and long press “+” and “-” buttons at same time to return to the previous level menu.

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	Value=KM/H MPH	Default Value=KM/H KM/H— Metric MPH— Imperial
Clock setting		SET TIME	Customization	Default= 12：00
Maintenance reminder		MAINTENACE	Fixed value	Default= 5000km
Backlight level setting		BACK LIGHT	Value= LEVEL1,backlight level 60% Value= LEVEL 2 backlight level 80% Value= LEVEL 3 backlight level 100%	Default Value= LEVEL 3

Auto shutdown time		Auto sleep	Value=OFF, 5-30 min	Default Value=5min OFF means no auto shutdown
Power on Password setting		Password	Value= OFF and ON; When is ON, user is allowed to set 4-digit password	Default value：OFF
SOC SHOW		SOC SHOW	Value=CLOSE OPEN	Default value ：=CLOSE
Rate limiting		CURRENT LIMIT	Value=6A, 7A, 8A, 9A, 10A, 11A	Default value：=11A
Display info		Display information	read only	According to communication protocol
Battery info		Battery information	read only	According to communication protocol
Reset to factory setting		RESET	Reset	All parameters will be restored to the factory setting

8. 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, long press “+” and “-” buttons at same time to show data clearance window, and short press “+”、“-” buttons to select accordingly. To remove the pop-up clearance window, long press “+” and “-” buttons at same time 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.

9. 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:

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

（* 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!）

10. Wire definition

10.1 Standard wires definition:

The standard outlet of the display is defined by Velofox according to the conventional application,

and the standard outlet needs to match the corresponding conversion harness. Our company has corresponding standard settings for the conversion line length and interface standards. If the standard settings cannot meet your requirement, a customized conversion harness is required.

Standard outlet in a sample is shown in the figure below:

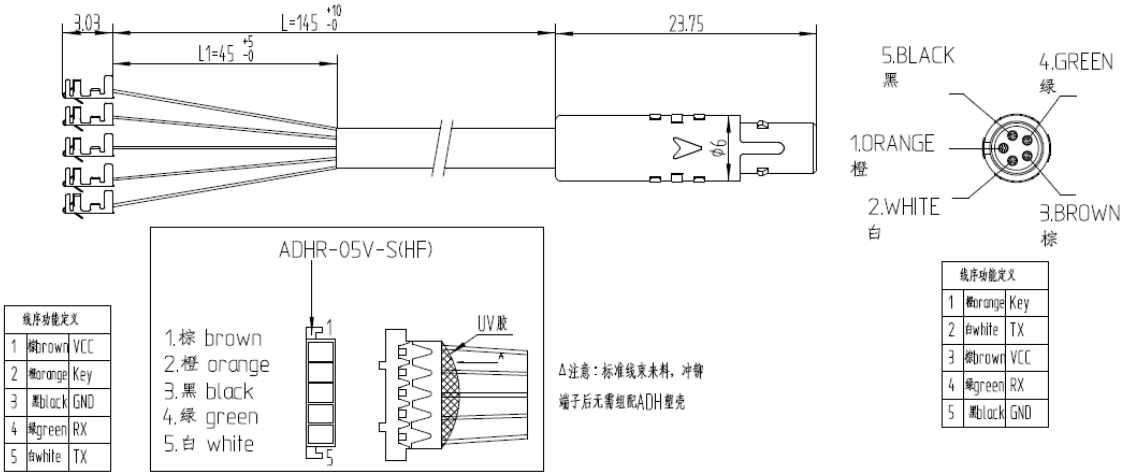


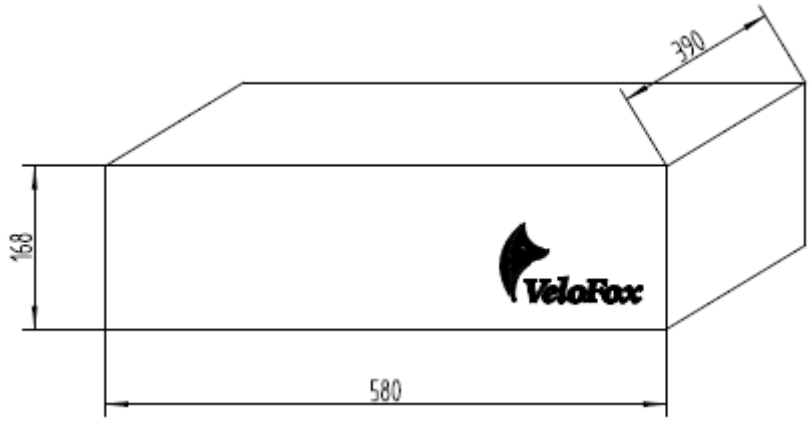
Table 1 Standard wire definition

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	reserve	reserve

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