bikel.pl

Phone: (+48) 732 443 033
E-mail: info@ebikecomputer.com
Website: https://ebikecomputer.com

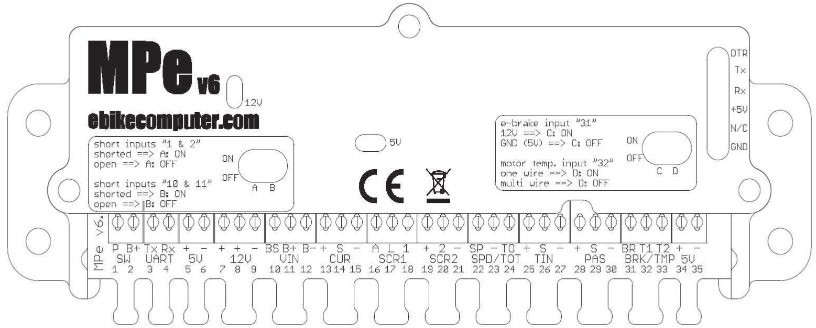
Address:
Lipowa 17A/4 street
63-000 Środa Wlkp.
Poland

Stay tuned:
Manufacturer's website: https://bikel.pl/en
Facebook: bikel.pl
Facebook group: e-BIKEL-owcy / fani pojazdów elektrycznych
(e-BIKEL'ers fans of electric vehicles)
Instagram: bikel.pl
YouTube: bikel pl

MPeV6 User manual - Release 5

MPeV6 e-bike computer

EN „Electric Vehicle's brain"
PL „Mózg Pojazdu elektrycznego"



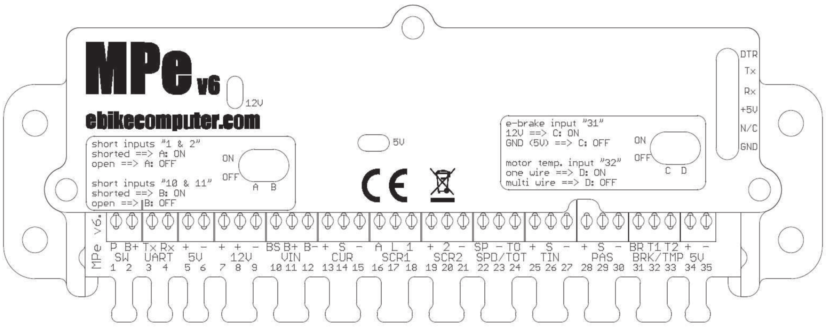
USER MANUAL

Made in Poland

MPeV6 e-bike computer

EN „Electric Vehicle's brain”

PL „Mózg Pojazdu elektrycznego”



USER MANUAL

Made in Poland

This manual is intended to familiarize the user with the operation of the product. No part of the manual may be reproduced, distributed, electronically processed or translated into another language without the prior written consent of the manufacturer.

All brand and product names are trademarks or registered trademarks of the company:

Bikel.pl

Lipowa 17A / 4 street

63-000 Środa Wielkopolska

Poland

The company is not liable for damages resulting from incorrect understanding or incorrect use of information contained in this manual.

TABLE OF CONTENTS

1. General informations

1.1. Informations about MPe system

The MPe system is designed to vehicles built from scratch, mainly electric bicycles. Its unique features and number of capabilities have already been appreciated by many users. The system itself is very successful.

1.1.1. Which vehicles are MPe computer designed to?

MPe computer is designed to electric vehicles (mainly e-bikes) built from scratch.

- it works with every motor controller that has thumb throttle input
- ideal for every powerful construction:
  - max. measured current 200 A
  - continuous power supply 30 V - 92 V (10S to 22S Li-ion) [peak max. 100 V]

1.1.2. MPe computer functions

- it works with every motor controller that has thumb throttle input
- possibility to add PAS (Pedal Assist System) to every motor controller, even those which can't support PAS by default
- possibility to add crank torque sensor (in bottom bracket) to every motor controller, even those which can't support it by default
- smooth PAS (Pedal Assist System) functionality (with and without torque sensor) and very flexible assist configuration
- PAS BOOST which allows you faster acceleration of the vehicle when starting off or accelerating after braking
- range on remaining battery (reading in km or miles)
- fully configurable 5 assist levels
- fast and simple (one click) switching between locked [<250 W, 25 km/h] and unlocked [without restrictions] mode
- very flexible configuration – above 100 settings
- main board separated from display = order in wires on handlebar
- works with every battery packs. i.a. Li-ion, Li-Po, LiFePO, Pb

Another possibilities:

- intelligent cruise control which sets throttle up and down to achieve desired speed. It works with every motor controller: square wave, sine wave and even FOC (i.a. Sabvoton, MQCON)
- temperature reading from two sensors e.g. motor, motor controller. After reaching temperature set point MPe computer automatically cuts off power from motor and protect it from overheating.
- low voltage drive cut off
- dedicated app for Android system. Possibility of reading and setting

everything also from smartphone (MPeBT module has to be purchased separately)

- speed limit can be separately set for every pedal assist level
- pedal assist can be activated or deactivated on every assist level separately (user can have only thumb throttle active)
- minimum and maximum cadence can be set for every assist level. Between minimum and maximum cadence power is delivered linearly according to cadence
- pedal assist can be activated after reaching desired minimum speed, separately to each assist level
- throttle ramp up can be set freely on every assist level / soft start
- thumb throttle can be set to not give more than e.g. 1000 W on each assist level separately
- possibility of handling the speed signal from the hall sensor at the motor or the reed switch sensor mounted at the spokes
- protection against false readings from a damaged current sensor

Additional useful indications:

- number of battery charge cycles
- the battery level indicator updates even when it is partially charged
- battery voltage
- current drawn from the battery + peak current memory (erasable)
- power consumed from the battery + peak power memory (erasable)
- amount of ampere-hours used from the battery
- amount of battery watt-hours used from the battery
- amount of watt-hours used to travel one kilometer or mile (Wh/km or Wh/mi)
- two temperature readings from sensors such as: LM35, NTC10k, KTY83
- thumb throttle input voltage reading

Indications related to movement:

- speed up to 199 km/h or 199 mph + remembering the maximum speed
- daily distance (trip)
- total distance (odo)
- riding time
- average speed
- crank speed (cadence)

1.2. Modules that make up the system

1.2.1. Basic modules

- Main board MPeV6

  (here we connect all wires and sensors)

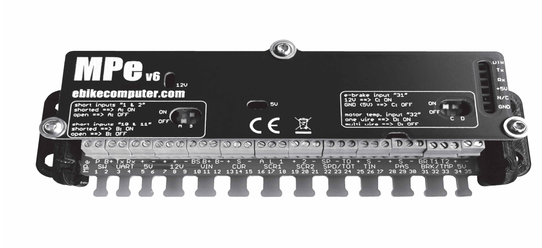


Illustration 1.2.1_1: Main board MPeV6

- Current sensor
  (this sensor provides information about the current in the wires powering the motor controller)

- Displays with control buttons

  (all vehicle indications are displayed here and the system parameters can be configured)

Illustration 1: MaxiColor 850C

Illustration 2: MiniOled

1.2.2. Optional modules

- MPeBT
  (it is used for communication with a smartphone / Android only

Illustration 1.2.2_1: MPeBT

- Universal programming tool for updating the firmware

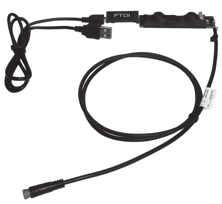


Illustration 1.2.2_2:
Universal programming tool

- MPe motherboard UART socket extension

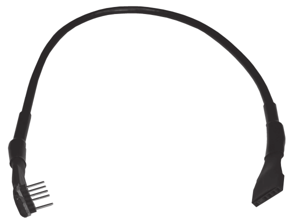


Illustration 1.2.2_3: UART
socket extension

2. Before connecting

2.1. Electrical installation in working order

Before connecting the MPe computer, the vehicle must be fully operational and tested.

In built-from-scratch vehicles, make sure that the vehicle's basic electrical system is operational before connecting the MPe computer to the vehicle. In practice, this means that before connecting the MPe computer, the vehicle must be brought to a state in which it can be driven without problems, using the thumb throttle directly connected to the motor controller. If there are any problems with the operation of the drive at this stage, they should be fixed.

Failure to comply with this recommendation may turn out to be a serious obstacle in possible diagnostics related to problems in the operation of the drive. If, after connecting the MPe computer, there are problems with the use of the vehicle, it will not be known whether this is due to incorrect configuration of the MPe system parameters or from a malfunction of the basic vehicle installation.

2.2. Safety precautions during installation and using MPe computer

By installing the MPe computer in your vehicle, you agree and accept all notices contained below.

If you disagree or do not understand any of the cautions, DO NOT install the MPe in the vehicle.

If in doubt, please contact manufacturer or distributor. The contact details are provided at the end of this manual.

2.2.1. General safety precautions

- Incorrectly set regenerative braking in the motor control unit can damage the MPe computer. The motor controller should be programmed so as not to overcharge the battery in such a way that the BMS cuts the battery off before it is overcharged. When the BMS cuts the battery to protect it, high voltage is deposited on the controller's capacitors, which may exceed the supply voltage of the motherboard and other MPe components. In other words - regenerative braking cannot be activated with a fully charged battery - regenerative braking should be set in such a way that it only switches on about 2 V below the maximum voltage of a charged battery.
- If any connection or use of the MPe device is not described in this manual, it means that it is not recommended by the manufacturer or has not been fully tested. Then, such connection or use is the sole responsibility of the installer of the MPe.
- The MPe on-board computer is not an motor controller. An external controller is required to run the motor.

- If the motor control unit is not properly set, the motor and cranks may turn in reverse. Be sure to keep the wheel in the air when first using it, and be careful of your knees and wires that can get caught in the cranks.

- When you use the virtual throttle function (you connect the MPe in place of the thumb throttle input in the motor controller), be sure to keep the wheel in the air during the first start. A not correctly set controller or MPe computer may cause the vehicle to run unintendedly.

- The vehicle should have a brake sensor installed that will disengage the drive when activated. The lack of such a sensor may be a threat to the health and life of the vehicle driver in an emergency or when maneuvering with an active PAS pedal assist system.

- Do not place MPe modules tight between other components, because vibration may rub the insulation and cause a short circuit in the installation.

- Do not bring the MPe modules, other than display, into contact with water and moisture. These modules are not waterproof and can be damaged when in contact with water.

- The maximum display cable length is 1.5 m. Above this length, the display may not function.

- The displays may have a different shade of white and colors among themselves. This can be seen when looking at two displays placed side by side at the same time.

2.2.2. Safety precautions to installation and connecting wires

- MPe motherboard cannot be powered / turned on while connecting any wires to the motherboard connectors.
- The MPe motherboard cannot be powered / turned on when connecting the display to the motherboard connectors.
- The wires in the modules and sensors can have similar color - pay special attention when making connections.
- Pay attention to the polarity (+ and -) when connecting the power. Due to improper connection, a short circuit can be made and the MPe installation or device burned.
- The negative pole of the B- battery, in connector No.12, must always be connected, the power on switch should be installed on the positive B + between connectors 1 and 2 of the main board.
- First connect the power wires to the motherboard and then to the battery. Otherwise, the wires may short-circuit and the MPe may be damaged.
- When disconnecting thepower wires from the motherboard, first disconnect both the battery and the motor controller. It should be remembered that charged capacitors in the controller are as dangerous as a charged battery and the charge accumulated in them can damage the components by short-circuiting the wires.
- Make sure that no single „hair" of the wire does not end up in the adjacent

connector. The system may short-circuit and the MPe may be damaged.

- Do not connect any other device to the MPe system than described in the manual.
- When using the internal 12 V and 5 V converter, do not power anything other than described in this manual from the MPe device.
- The supply voltage must not be exceeded - maximum 92 V DC continuous supply and 100 V DC momentary.
- Do not connect devices whose total current consumption exceeds 1 A to the switch circuit (connector No. 2).
- Before inserting the wire into the motherboard connector, make sure that the connector's „elevator" (the metal slide that presses the cable in the screw connector) is fully lowered.
- Do not over tighten the screws in the motherboard connectors as this may damage the cable or the thread in the screw.
- After inserting the wire into the motherboard connector and tightening the screw, slightly shake and pull the wire to make sure it is tight and does not slide out of the connector.
- Be sure to secure the cable with a cable tie (to the housing tab) so that it does not pull out of the motherboard connector.

2.2.3. Safety precautions to PAS pedal assist system usage

PAS stands for Pedal Assist System (pedal assist with cadence sensor or /and crank torque sensor BB)

- The manufacturer (Bikel.pl) guarantees the efficiency of the product and makes every effort to ensure that the PAS support function works properly. However, it is not possible to predict every configuration in which the PAS assist function will be used and guarantee correct operation in every configuration.

- When installing the PAS cadence sensor or crank torque sensor, be sure to install and use the brake sensor to disconnect the drive in an emergency.

- Some PAS cadence sensors on the market also work when cranking backwards. They should be avoided as they are dangerous.

    - When a PAS cadence sensor is installed, cranking the cranks backwards may also cause the engine to start. Then the motor start speed must not be set lower than 3 km/h.

    - Pulling the bike backwards causes the cranks to spin backwards. Certain PAS sensors operate in reverse and when set too low start speed and starting cadence may result in motor running forward.

- Heavy vehicles may have problems with the operation of PAS support in the 250 W mode. This is due to high power consumption and high resistance to starting and rolling.

2.2.4. Safety precautions to temperature reading

- The temperature of the overheating protection should be set carefully. It is also recommended to add a bimetallic thermostat to the controller power on circuit or to the brake circuit.
- Different temperature sensors show different accuracy of reading due to the characteristics of the sensor.
  - The reading accuracy for the KTY83 sensor is +/- 10*C.
  - Reading accuracy for LM35 sensor is +/- 5*C and positive temperatures only.
- Do not connect the MPe and the controller (eg Sabvoton) to the same temperature sensor in the motor.

  Often, separate sets of hall sensors wires do not have different temperature sensor wire, they have one and the same sensor wire, but doubled and going separately to the two sets of hall wires. Such a temperature sensor should only be connected to the MPe computer.
- By default, the T1 temperature is set for the motor and has a cutout threshold set at 140*C.
- By default, the temperature T2 is set for the controller and has a cutout threshold set at 60*C.
- In order for MPe to protect the vehicle from overheating (disconnect the drive), the thumb throttle must be connected to MPe, and MPe to the controller, in place of the thumb throttle input.
- NTC10K and KTY83 sensors are connected between + 5 V (e.g. connector no. 34) and inputs T1 and T2 (connectors 32 and 33)

2.3. Technical specifications

2.3.1. Resistance of individual modules to weather conditions

- Main board - IP30 (according to PN-EN 60529: 2003 standard) / for installation in an battery box
- Current sensor - IP31 (according to PN-EN 60529: 2003) / for installation in an battery box
- Displays - IP54 (according to PN-EN 60529: 2003) / for mounting on the handlebar
- MPeBT module - IP31 (according to PN-EN 60529: 2003) / for installation in an battery box
- Programming tool - IP30 (according to PN-EN 60529: 2003) / connected to the motherboard only for the time of programming

2.3.2. Absolute maximum ratings

2.3.2.1. Main board MPeV6

Rating	Value Min	Value Max	Unit
Supply voltage. Connectors No. 1, 2, 10	28	100	V
Measured battery voltage. Connector No. 11**	0	150	V
Total power consumption.	0.5	1.3	W
Power on switch circuit current (drawn from connector No. 2)	0	1	A
Current drawn from connectors No. 7 and 8 [+12 V supply]	0	0.3	A
Current drawn from connectors No. 13, 19, 25, 28, 34 [+5 V supply]	0	0.05	A
Input signal voltage on connectors No. 3, 4, 14, 16, 17, 18, 20, 22, 24, 26, 29, 31, 32, 33	0	5	V

*Max continous power supply 92 V, peak up to 100 V (above 92 V there will be a lot of heat to dissipate and thermal shutdown can activate).

Alternatively, you can power the MPe main board from an external 12 V converter by connecting it to connectors no. 8 and 9. Then leave the connector no. 1 unconnected, and set the A and B switches to the OFF position.

**Measured battery voltage can be greater than 100 V only, when switch "B" is disengaged (switched OFF).

2.3.2.2. Current sensor

Rating	Value Min	Value Max	Unit
Max continous measured currrent	40 A	80 A	100 A

2.3.2.3. MaxiColor 850C and 860C display

Rating	Value Min	Value Max	Unit
Supply voltage - high*	30	67	V
Supply voltage - low*	11	30	V
Total power consumption	1.2	4.5	W
Supply voltage for USB charging port to be active	30	67	V
USB charging port voltage	0	5	V
USB charging port current	0	0.5	A
Outgoing current (orange wire), for power supply i.a. MPe and motor controller, with supply voltage 30-67 V**	0	0.1	A

*In vehicles with battery voltage above 67 V display should be powered from low supply voltage +12 V.
MPeV6 main board has built in 12 V dc-dc converter for this purpose.

When supplying display with low (12 V) voltage USB charging port is not active.

Please use correct connection diagram according to the maximum battery voltage.

** When supplying display with low (12 V) voltage orange wire from display should not be connected.

2.3.2.4. MiniColor 560C display

Rating	Value Min	Value Max	Unit
Napięcie zasilania	15	67	V
Total power consumption	1.2	1.8	W
Outgoing current (orange wire), for power supply i.a. MPe and motor controller, with supply voltage 30-67 V**	0	0.1	A

*In vehicles with battery voltage above 67 V display should be powered from low supply voltage +15 V.
MPeV6 mainboard doesn't have built in dc-dc converter for this purpose.

Please use correct connection diagram according to the maximum battery voltage.

** When supplying display with low (15 V) voltage orange wire from display should not be connected.

2.4. Components that are working with MPe ebike computer

2.4.1. Motor controller

The MPe ebike computer works with motor controllers that have a 0.8 V – 4.2 V thumb throttle input. This means that it works with almost every controller available on the market..

Examples of drivers working with MPe system (selected randomly):

KT sinus, GT250, GT500, GT1500, Sabvoton / Mqcon SVMC, Sabvoton ML60, ML45,, Infineon, Kelly KLS and many more.

2.4.2. Current sensor

The MPe computer is adapted to work with current sensors which, when unloaded at the signal output, have half the supply voltage (usually approx. 2.5 V). During load, the output voltage increases or decreases as the current flows through it.

Example sensors that can be used with the MPe system:

- Winson WCS 1500
- Allegro MicroSystems ACS 758 200B - PFF
- Allegro MicroSystems ACS 770 200B - PFF

The sensors are bi-directional and can measure up to +/- 200 A.

2.4.3. Speed reading

Two types of sensor can be used to read the vehicle speed:

- a reed switch sensor, mounted near the spokes of the wheel, responding to a magnet mounted on the spoke
- signal from the hall sensor located in the engine. The same sensor and signal can be used that are connected to the motor controller (one of the three signal wires must be split into two)

Select the appropriate type of sensor in the configuration, declaring the number of magnets cooperating with the sensor. If only one magnet is entered in the configuration, the system will recognize the sensor as a reed switch. If we enter the number of magnets in the motor, the system will assume that we have chosen a hall sensor.

2.4.4. Brake sensor

For the safe and correct operation of the system, it is required to install a brake sensor, thanks to which, after its activation, the MPe system disconnects the drive (by disconnecting the signal output to the thumb throttle input in the controller).

The following brake sensors are supported:

- two-wire NO (normally open), press-switch or magnetic
- two-wire NC (normally closed), press-switch or magnetic
- three-wire with 5 V hall sensor

Two-wire NO and NC sensors can be controlled by GND or + 12 V voltage.

To use + 12 V to control the brake sensor, first set the switch „C" (on the main board) to the ON position. Failure to set this switch to the ON position and apply + 12 V voltage to the brake signal input may damage the microcontroller controlling the entire system.

The appropriate sensor type (NO / NC) should be set in the configuration (parameter No. 35).

2.4.5. Cadence sensor for PAS

The MPe computer supports three wired cadence sensors for PAS powered by 5 V, based on hall sensors and a ring with magnets.

Some cadence sensors also work when cranking backwards - this is dangerous and are not recommended. When pulling the bicycle backwards, the cranks are pulled by the chain and an unwanted motor run can occur. The appropriate PAS sensor should only function when the crank is turned forward.

It is recommended to use PAS sensors with a minimum of 12 magnets on the ring (a smaller number of magnets will result in a slower reaction of the system to turning the crank).

2.4.6. Torque sensor bottom bracket for PAS

A torque sensor can be connected to the MPe system, which, in addition to the cadence, also tests the force of pressure on the pedals / torque applied to the cranks.

At the moment, the eRider T9 bottom bracket is tested and 100% working.

It is powered from 12 V, and has an analog signal in the form of a variable voltage in the range of 1.5 V – 3.0 V at the output and supports the pedal pressure 0-60 kgF (0-600 N).

This torque sensor BB also has a built-in cadence sensor (PAS) with 18 magnets.

This bottom bracket requires additional cranks with no chainrings on the right crank. Cranks from the Tongsheng TSDZ2 drive fit very well. Cranks from Bafang drives are not so good, because they have a non-ergonomic curvature (Q factor) and the shoe hooks on the crank, near the ankle.

Ilustracja 2.4.6_1: Torque sensor – eRider T9

Other torque sensors at the moment are not tested with the MPe system, which does not mean that it will not work. It'll most likely work as well as this one. It is important that the output signal is in the form of alternating voltage, no more than 5 V.

IMPORTANT:

The eRider T9 bottom bracket contains a lot of electronics that can hang in high-power vehicles (> 2000W) due to high electro-magnetic interference with motor controller. This is manifested by skipping readings or false readings. To counteract this, a better shielded cable and an additional power filter should be used. Details available on the YouTube channel: bikel pl.

2.4.7. Temperature sensor

The MPe computer can read the temperature from two sensors T1 and T2.

The following types of temperature sensors are supported:

- LM35 sensor
- NTC10k thermistor
- KTY83-110 thermistor

Only the T1 connector can be connected to the engine temperature sensor, which has only one wire (the second wire is then shared with the ground of the hall sensors). In this case, set switch „D" (on the main board) to the ON position.

2.4.8. Thumb throttle

The MPe system works with three-wire thumb throttles, operating in the voltage standard: 0.8 V – 3.5 V or 0.8 V – 4.2 V.

This means that the thumb throttle in the rest position should send a voltage of about 0.8 V, and when twisted by 100% it should send a signal of 3.5 V – 4.2 V.

Most of the thumb throttles available on the market, dedicated to electric vehicles, operate in this standard.

2.4.9. Display

The MPe system supports two dedicated displays:

- MiniOled display
- MaxiColor 850C or 860C display
- MiniColor 560C display

Other displays will not work with the MPe system.

If the display is damaged, the display should be replaced with a new one, as the housing of these displays do not allow them to be opened and repaired without damaging the housing.

NOTE: Further in this manual there is described 850C display only. The 860C and 560C display models work on the same principle, hence they are not described in detail here. More details about other displays can be found on the blog: https://bikel.pl.

2.4.10. MPeBT module for communication with smartphone

The MPeBT module can be added to the MPe system, which will enable communication with applications on an Android smartphone.

The supported BT modules are:

- MPeBT
- HC-05

The MPeBT module works only with:

- with a smartphone
- with MiniOled display
- with MPeV6 motherboard

The MPeBT module does not work with:

- MaxiColor 850C and 860C display, MiniColor 560C
- and with the MPeV5 motherboard

2.4.11. Programming tool

- In order to be able to update the firmware on the MPe motherboard, you need the MPe „universal programming tool".
    - Details: https://bikel.pl/en/mpe-firmware-update/
- In order to be able to update the software on the MaxiColor 850C display, you need the MPe „universal programming tool".
    - Details: https://bikel.pl/en/firmware-update-maxicolor-850c/

Any other 5V USB / UART adapter can also be used to update the firmware on the MPe motherboard.

Actual firmware can be checked and downloaded at the addresses above. The entire upgrade process is described there.

3. Connecting to the vehicle

Before connecting the MPe system modules to the vehicle's installation, read the notes in the „Before connecting" section of this user manual.

3.1. Switches at the top of the MPeV6 motherboard

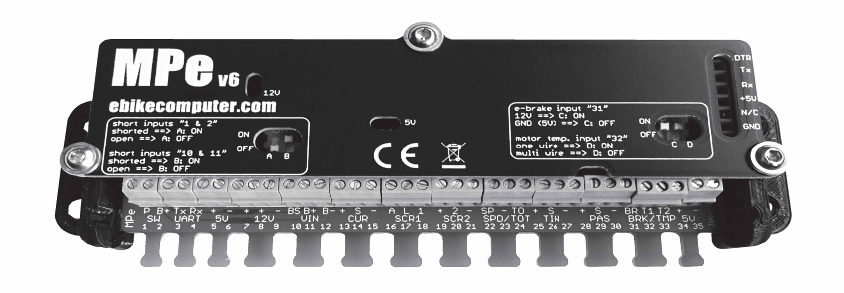


Illustration 3.1_1: View of the motherboard and switches „A, B, C, D"

There are four switches labeled „A, B, C, D" on the top of the MPeV6 motherboard that have different functions. These must be set before connecting the MPe to the power supply.

Each switch has two positions:

- ON - active
- OFF - inactive

Switches „A and B" are used to manage the power supply and battery voltage metering. The switching of these switches short / connects the screw terminals:

- setting the switch „A" to the ON position connects the screw terminals No. 1, 2 and 11

  This means that when power is applied, (+) battery positive pole to any of these pins, the MPe will turn on. This can be used instead of power-on switch when vehicle is turned on i.a from the BMS.

  (Before that, connect (-) the battery negative pole to connector B - No. 12)

- setting the switch „B" to the ON position connects the screw terminals No. 10 and 11

  This means that the measurement of the battery voltage (BS) at the screw terminal No. 10 is taken from the supply voltage MPe given to the screw terminal No. 11.

  Thanks to this, we can connect or separate the measured voltage from the supply voltage MPe.

It should be noted that when a voltage greater than 100 V is applied to the connector No. 10, when the switch „B" is in the ON position, the MPe motherboard may be damaged.

Switches „C and D" are designed to control the motor temperature reading and to control the voltage level of the brake sensor.

- by setting the „C" switch to the ON position, it is possible to send a high brake signal [+ 12 V] to the screw connection No. 31

  If this switch is in the OFF position when the high brake signal [+ 12 V] is connected, the MPe device may be damaged.

  Setting the switch „C" to the OFF position enables the use of the ground brake sensor (GND [in the 5 V voltage level])

- setting the switch „D" to the ON position allows you to connect the motor temperature sensor to the T1 connector (connector No. 32), which has only one wire from the motor, and the other wire is shared with ground from the power supply of hall sensors in the motor.

  Setting the switch „D" to the OFF position allows you to connect a temperature sensor that has all the wires led out separately.

3.2. Description of the screw terminals of the MPeV6 motherboard

The MPeV6 motherboard has 36 terminal / screw connectors and a 6-pin socket in the upper part of the housing. We connect to the motherboard: all sensors, display and motor controller. Next to each screw terminal there is a „tab" to which the connected cable should be attached with a cable tie (the ties are included in the set).

The individual outputs are described below.

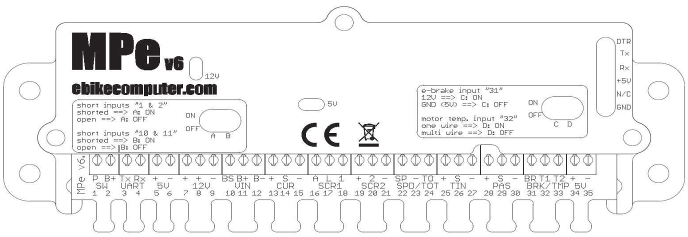


Illustration 3.2_1: View of the MPeV6 motherboard

3.2.1. 6-pin socket in the upper part of the housing:

It is the UART interface of the microcontroller.

We connect the MPeBT module or the programming tool to this socket.

Symbol	Description
DTR	Remote reset of the microcontroller during programming
Tx	UART interface outgoing signal
Rx	UART interface incoming signal
+5V	+5 V power supply input / output
N/C	Not connected
GND	Ground

3.2.2. Terminals / screw connectors

Here we connect the power supply, all sensors, the display and the motor controller.

No	Group	Symbol	Description
1	SW	P	Power on switch. After applying the battery voltage to this connector, the MPe computer turns on
2		B+	Battery voltage transferred from connector No. 11. Connectors No. 2 and No. 11 are connected to each other
3	UART	TX	UART interface outgoing signal (for communication with the display or MPeBT module)
4		RX	UART interface incoming signal (for communication with the display or MPeBT module)
5	5V	+	+ 5 V voltage output
6		-	GND ground (GND is common throughout the installation)
7	12V	+	+ 12 V voltage output
8		+	+ 12 V voltage output
9		-	GND ground (GND is common throughout the installation)
10	VIN	BS	Battery voltage measurement input
11		B+	Power supply (+) Battery voltage input
12		B-	Power supply (-) GND ground (GND is common throughout the installation)
13	CUR	+	+ 5 V voltage output
14		S	Signal input from the current sensor

15		-	GND ground (GND is common throughout the installation)
16	SCR1	A	SDA signal of the i2C protocol to the display
17		L	SCL signal of the i2C protocol to the display
18		1	Button 1 signal
19	SCR2	+	+ 5 V voltage output
20		2	Button 2 signal
21		-	GND ground (GND is common throughout the installation)
22	SPD / TOT	SP	Vehicle speed signal input
23		-	GND ground (GND is common throughout the installation)
24		TO	Throttle signal output to the motor control unit
25	TIN	+	+ 5 V voltage output
26		S	Signal input from the throttle
27		-	GND ground (GND is common throughout the installation)
28	PAS	+	+ 5 V voltage output
29		S	PAS cadence sensor signal input
30		-	GND ground (GND is common throughout the installation)
31	BRK / TMP	BR	Brake sensor signal input
32		T1	Temperature sensor signal input T1
33		T2	Temperature sensor signal input T2
34	5V / TS	+	+ 5 V voltage output
35		-	GND ground (GND is common throughout the installation)
36		TS	Torque sensor signal input

3.3. Connection diagrams

Wiring diagrams are attached to this manual on separate sheets. They present various connection variants depending on the maximum supply voltage and the options used. An appropriate schematic should be used as the primary source of information about MPe system connections.

Some displays have a different (smaller) acceptable input voltage range than the MPe motherboard, so pay special attention to the selected connection diagram in terms of the battery voltage in the vehicle where the MPe system will be installed.

In some cases, the display can act as a switch for the whole bike, and in other cases, an additional switch should be added, and the display should be powered from a lower voltage converter built into the MPe motherboard.

3.4. Sequence when connecting MPe wires to vehicle installation.

See also the tutorials on the YouTube channel: bikel pl.

WARNING! During the entire connection process, no MPe system module may be connected to the battery.

Failure to do so may result in a short-circuit of the installation, which may damage the module, cause electric shock, burns or fire.

+ 5 V voltages must not be connected between the motor controller and the MPe main board. The only allowed connection is common ground GND and brake signal.

When connecting, refer to the diagram attached to this manual. The connectors on the motherboard are numbered from No. 1 to No. 36, and in the diagram, next to each module, the wire numbering corresponds to the number of the connector to which it should be connected. Next to each screw terminal there is a „tab" to which the connected cable should be attached with a cable tie (the ties are included in the set).

1. First, connect power supply wires to the MPe motherboard to connectors No. 11 and 12.

   At the moment we do not connect this wires to the battery.

2. Next, connect the switch circuit to terminals 1 and 2.

   The switch should be left in the open / off position.

3. When the power supply wires are connected (points 1 and 2), you can proceed to connecting the current sensor and the display to the connectors according to schematics.

   The device must be turned off when connecting these wires.

4. The speed sensor should be connected to connectors No. 22 and 23 (possibly only to connector No. 22 when using the hall sensor in the motor).

   If the motor controller has a dedicated wire for the speed signal for displays, it is necessary to use it and do not get this signal from hall sensor (e.g. „hall meter" cable in MQCON controllers).

   The devices should be turned off when connecting these cables.

5. The remaining connectors are optional and do not have to be connected, however, to use all the functions of the device, it is recommended to connect them according to the diagram.

   NTC10K and KTY83 sensors are connected between + 5 V (e.g. connector no. 34) and inputs T1 and T2 (connectors 32 and 33)

6. Finally, you can now connect power supply wires to the battery. When connecting power supply wires to the battery, the MPe device should be turned off (pins 1, 2 on the motherboard are open)

3.5. Connecting torque sensor (bottom bracket)

Four wires should be connected:

- 12 V [7] - power supply [mostly red wire]
- GND [30] - ground [usually black wire]
- PAS [29] - cadence / crank speed signal [usually green wire]
- A3 [36] - pressure / torque sensor signal [usually white wire]

IMPORTANT:

The eRider T9 bottom bracket contains a lot of electronics that can hang in high-power vehicles (> 2000W) due to high electro-magnetic interference with motor controller. This is manifested by skipping readings or false readings. To counteract this, a better shielded cable and an additional power filter should be used. Details available on the YouTube channel: bikel.pl.

4. First run of the device

4.1. Configuration parameters

In order for the MPe system to function properly, individual computer parameters should be set.
Two tables with configuration parameters numbers and their description have been attached to this manual separately:

- Attachment 1: MPeV6 configuration - basic configuration parameters
- Attachment 2: MPeV6 configuration - all configuration parameters

The method of entering the values of individual parameters depends on the display used. It is described further in the manual, in the section dedicated to a given display.

4.2. Conditions that must be met for the MPe computer to allow driving and not to display a warning (!).

- correctly connected, not damaged and calibrated current sensor
- reading the current above the protection against negative current consumption (parameter No. 9). This means that e.g. the charger cannot be connected
- assist level set higher than zero (1,2,3,4,5)
- T1 and T2 temperature readings below the drive cut-off threshold set (parameter No. 43 and 44)
- battery voltage above the set drive cut-off threshold (parameter No. 3)
- calibrated and inactive brake sensor (brake must not be pressed)
- voltage coming from the thumb throttle below the safe set voltage (parameter No. 18), (by default for the MPeV5 motherboard it is set to 450 [4.5 V], and for the MPeV6 motherboard to 370 [3.7 V])
- correctly calibrated thumb throttle input and output voltages (TIN and TOT) (parameters 13, 14, 15, 16)

In order for the thumb throttle to work, the system must work in the unlocked mode (you can read more about it in the section; „Description of MPeV6 computer functions and their configuration. Locked and unlocked mode")

4.3. Description of the procedure during the first start-up

After connecting to the vehicle installation, during the first start of the MPe device, it is necessary to:

- calibrate the current sensor (procedure described later in this chapter)
- configure all parameters from the basic parameters table (Attachment 1: MPeV6 configuration - basic configuration parameters)

  Parameter numbers to be configured: 1, 2, 3, 4, 6, 26, 27, 35, 41, 42, 71, 74.

- reset present indications such as daily distance, max speed, max current, max power etc. (During connection and before calibration, these items assume random values, which should be zeroed before use). The procedure for resetting the current indications is described in the section on display operation.

After calibrating the current sensor and setting the basic parameters, the device and the vehicle should initially start working.

After correct initial setting, a test drive must be carried out. If necessary, you can fine-tune the operation of the MPe system, using the full table of configuration parameters (Attachment 2: MPeV6 configuration - all configuration parameters).

4.4. Calibration of the current sensor

4.4.1. Setting the current consumption to 0 A

When stationary, when there is no current consumption, calibrate the current sensor so that it shows the consumption of 0.0 A.

The current sensor calibration procedure is different for each display:

MiniOled:
On screen 3, press and hold the lower button.

MaxiColor 850C:

In the first screen of the configuration menu, hold down the (-) minus and (o) power_on_switch simultaneously.

MPeV6 SET (smartphone app):

After connecting to MPe, click the „Reset current sensor" button.

After correct calibration of the current sensor, the value of the indication should be 0.0 A.

More information on navigating through the screens of individual displays can be found further in the manual, in the section dedicated to a given display.

4.4.2. Setting the direction of operation of the current sensor

When we have calibrated power consumption at standstill to 0.0 A, check if the direction of the current sensor operation is correctly set. To do this, twist the thumb throttle so the motor consume power from the battery and read the actual current consumption. If, at the set power for the motor, the current indication is negative (with a minus sign in front of the digit), it means that we have to reverse the direction of the current sensor with parameter No. 6: if it is currently 0, set to 1, and if it is currently 1, set to 0. The drawn current indication must be positive.

The negative current value should only be present when the battery is charging or during regenerative braking. The negative current is subtracted from the current battery consumption and the positive current is added to the current battery consumption.

5. Operation via the MiniOled display

5.1. Description of the button actions

Later in this chapter, the following abbreviations will be used to denote and describe the button press action:

- TBSP - Top Button, Short Pressed
- TBPH - Top Button Pressed and Held
- LBSP - Lower Button, Short Pressed
- LBPH - Lower Button Pressed and Held
- 2B_SP – Two Buttons Short Pressed at the same tim
- 2B_PH – Two Buttons Pressed and Held at the same time

Each screen has different actions assigned to the button events. The description is provided below in the respective screen description.

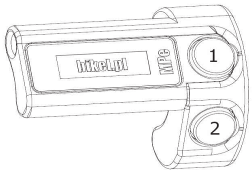
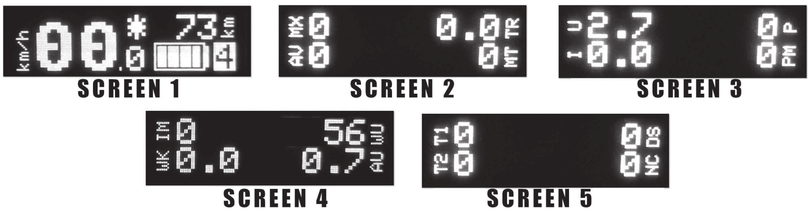


Illustration 5.1_1: MiniOled, 1: top button, 2: lower button

5.2. The display screens:



5.2.1. Screen 1

Indications on this screen:

- speed [km/h or mph]
- battery charge level (in graphic form)
- assist level
  - black digit in a white square = limit mode on (default values, 250 W and 25 km/h)
  - white digit without square = limit mode off
- distance [km/h or mph] to be traveled on the remaining battery

Information symbols:

- * use of the brake
- ^ cruise control active
- ! warning

Button actions on this screen:

TBSP – change of assist level to a higher one

LBSP – change of assist level to a lower one

TBPH – when cruise control is active - speed increase by 2 km/h [or mph]. Another holding of the top button will increase the speed by another 2 km/h. This operation can be repeated up to the limit of the MPe cruise control settings.

LBPH – activating the cruise control. When cruise control is active - speed reduction by 2 km/h. Holding the button again will decrease the speed by another 2 km/h. This operation can be repeated until the vehicle is stopped.

2B_SP – entry to screen No.2

TIP:
Brake Pressed and LBPH at the same time = shortcut to switch between locked and unlocked modes (limit on and off)

5.2.2. Screen 2

Indications on this screen:

MX: maximum recorded speed during the daily distance [km/h or mph]

TR: daily distance (trip) [km or mph]

AV: average speed during the daily distance [km/h or mph]

MT: number of minutes in motion during the daily distance [min]

Button actions on this screen:

TBPH – no action

LBPH – Reset all screen No. 2 values, PM values from screen No. 3, and IM and WK values from screen No. 4

TBSP – entry to screen No. 3

LBSP – entry to screen No. 5

2B_SP – return to screen No. 1

5.2.3. Screen 3

Indications on this screen:

U: battery voltage [V]

I: present current consumption from the battery [A]

P: present power consumption from the battery [W]

PM: maximum recorded power consumed from the battery during the daily distance [W]

Button actions on this screen:

TBPH – no action

LBPH – calibration / zeroing of the current consumption (I) (to be used only when the MPe computer is connected for the first time or when the value (I) does not show 0.0 A when parked)

TBSP – entry to screen No. 4

LBSP – entry to screen No. 2

2B_SP – return to screen No. 1

5.2.4. Screen 4

Indications on this screen:

IM: maximum recorded value of current consumed during a daily distance [A]

WK: the average amount of Wh consumed (watt-hours) per one kilometer or mile of daily distance [Wh/km or Wh/mi]

WU: the number of Wh (watt hours) consumed from the battery since the last charging [Wh]

AU: the number of Ah (ampere hours) consumed from the battery since the last charging [Ah]

Button actions on this screen:

TBPH– no action

LBPH – reset the AU and WU values, which results in resetting the battery indicator from screen 1 (if there is no clear need, do not do it - the MPe computer will take care of refreshing the battery indicator during use)

TBSP – entry to screen No. 5

LBSP – entry to screen No. 3

2B_SP – return to screen No. 1

5.2.5. Screen 5

Indications on this screen:

T1: temperature on sensor 1 [° C or ° F]

T2: temperature on sensor 2 [° C or ° F]

DS: total distance traveled [km or mi]

NC: number of battery charging cycles [pcs.]

Button actions on this screen:

TBPH – no action

LBPH – no action

TBSP – entry to screen No. 2

LBSP – entry to screen No. 4

2B_SP – return to screen No. 1

5.3. Description of the configuration screen.

CONFIGURATION SCREEN

The full list of configuration parameters can be found in the form of attachments (No. 1 and 2), attached separately to this user manual (listed in the table).

The configuration screen is divided into two areas: three-digit and five-digit. In the three-digit area, we select the number of the configuration parameter, and in the five-digit area, we change the value of the selected parameter.

We change the number and value of the parameter as each digit separately by moving the cursor (underscore „_") under the digit that we want to edit.

The parameter value is automatically saved to the device memory when it is changed.

There is no protection against entering values outside the functional range. Make sure that the entered value is within the range of the given parameter. The permissible ranges are given in the table in Attachment No. 2: MPeV6 configuration - all configuration parameters. Entering a value outside the functional range may result in incorrect operation of the device or unintended starting of the vehicle (motor rotation).

Button actions on this screen*:

2B_PH – enter the configuration screen: on any screen, press and hold two buttons simultaneously for 2 seconds

2B_SP – exit the configuration screen: briefly press two buttons simultaneously

TBSP – change the value above the underscore to one greater

TBPH– move the underscore indicating the value by one to the right

LBSP – change the value above the underscore to one lower

LBPH – move the underscore indicating the value by one to the left

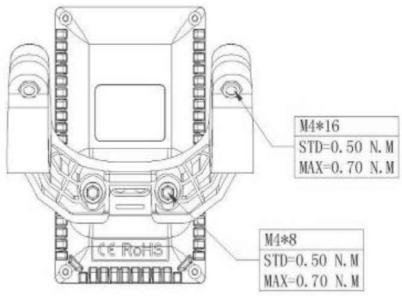
*abbreviations explained at the beginning of this chapter

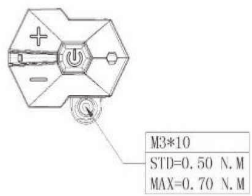
6. Operation via the MaxiColor 850C display

6.1. Installation of the display

6.1.1. Screws

Pay particular attention to the type and length of the mounting screws. Using the wrong type of screw or the wrong torque when tightening could damage the display which is not covered by the warranty.





6.1.2. Screwing the mounting clamp

The mounting clamp can be installed in two directions, but only in one direction will not pinch the USB port power cord. The clamp should be installed so that it does not crush the cable, which is as shown in the photo below.

6.1.3. Installation on the handlebar of a bicycle

The mounting clamp allows the display to be mounted on the handlebars of a bicycle. The diameter of the handlebar can be up to 31.8 mm. The set also includes rubber reductions that allow the display to be mounted on a 22.2 mm handlebar.

When installing the clamp on the handlebar, open the clamp to the diameter of the handlebar in the place where the clamp is cut. Do not open the clamp over the handlebar diameter, as this may break the clamp and is not covered by the warranty.

6.2. Description of the button actions

Later in this chapter, the following abbreviations will be used to denote and describe the action of pressing a button:

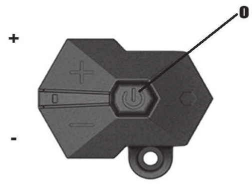


Illustration 6.2_1: Remote / buttons

+_SP : button (+) Short Pressed

-_SP : button (-) Short Pressed

O_SP : button (O) (power on switch) Short Pressed

+_PH : button (+) Pressed and Held

-_PH : button (-) Pressed and Held

O_PH : button (O) (power on switch) Pressed and Held

+-_PH : two buttons (+) and (-) Pressed and Held at the same time

+O_PH : two buttons (+) and (O) (power on switch) Pressed and Held at the same time

-O_PH : two buttons (-) and (O) (power on switch) Pressed and Held at the same time

6.3. Inversion of the (+) plus and (-) minus buttons on the remote control

You can install buttons on both the left and right side of the handlebar. Due to the fact that the remote control with buttons is asymmetrical, after putting it on the right side of the handlebar, it would be difficult to reach it with your thumb. In this case, it is possible to put it on the other way round, and from the display settings level, we will reverse the operation of the buttons. Then the „+" plus button will be at the bottom of the remote control, while the „-" minus button will be at the top.

The operation of the button remains intuitive: the top button (in this case „-") increases, for example, the value of a parameter or increases the assist level. The bottom button („+" in this case) decreases, for example, the parameter value or the assist level.

To rearrange button actions:

- on the main screen enter the configuration menu by holding the upper and lower buttons (+ -_ PH)
- then select in the configuration menu: Display settings
- here we choose: “Buttons +/- inverted” and enter value 1
- we confirm with the middle button on the remote control, thus confirming the change of buttons operation

6.4. The MaxiColor850C display screens

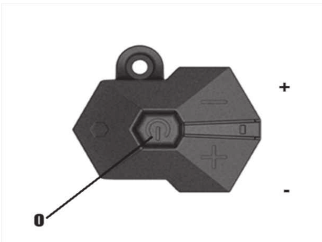


Illustration 6.4_2: Remote / buttons inverted

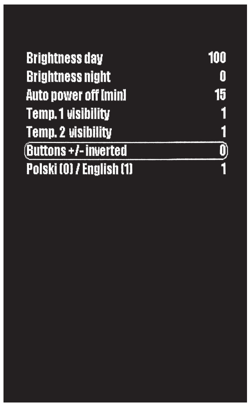


Illustration 6.4_1: Configuration menu - Buttons +/- inverted

6.4.1. Main screen No.1

Indications on this screen (reading from the top left):

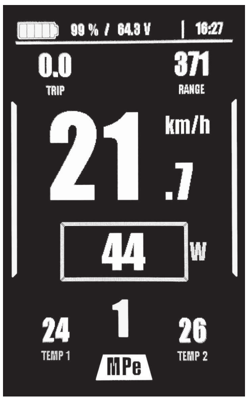


Illustration 6.4.1_1: Main screen No. 1

- battery charge level in the form of graphics, percentage and voltage [V]
- time in motion
- daily distance (trip)
- distance to run on remaining battery (range)
- speed
- power [W]
- temperature T1 and T2
- assist level
- brake usage, cruise control or warning indicator

Button actions on this screen:

+_SP : change of assist level to a higher one

-_SP : change of assist level to a lower one

-_PH : activation of cruise control

+_PH : when cruise control is active - speed increase by 2 km/h [or mph]. Another holding of the top button will increase the speed by another 2 km/h. This operation can be repeated up to the limit of the MPe cruise control settings

-_PH : activating the cruise control. When cruise control is active - speed reduction by 2 km/h. Holding the button again will decrease the speed by another 2 km/h. This operation can be repeated until the vehicle is stopped.

-O_PH : switching between locked and unlocked modes

+-_PH : entering the statistics screens

+_PH : switching between main screen No.1 and No.2

O_SP : switching the screen back-light between day and night mode

O_PH : turning display off

6.4.2. Main screen No.2

To switch between the main screen No. 1 and No. 2, on the main screen, hold the „plus" button (+ _PH).

On the main screen No. 2 there are 8 fields to which you can freely assign values (in the display configuration menu).

We can choose all the values that are sent from the motherboard to the display, that is:

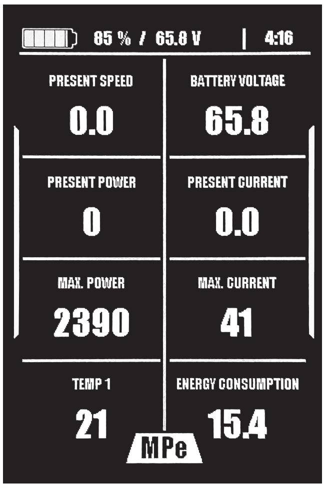


Illustration 6.4.2_1: Main screen No.2

0 - current speed
1 - distance remaining
2 - battery charge
3 - daily distance (trip)
4 - current power
5 - temp. 1
6 - assist level
7 - total distance
8 - average speed
9 - maximum speed
10 - time in motion
11 - battery voltage
12 - present current
13 - maximum current
14 - maximum power
15 - energy consumption
16 - battery capacity
17 - Ah battery used
18 - temp. 2
19 - number of charging cycles
20 - brake status
21 - cruise control status
22 - MPe version
23 - limit on/off status
24 - Wh battery used
25 - warning status
26 - cadence
27 - throttle in voltage

The above numbers from 0 - 27 are used to select the appropriate value in the display settings. To select them, go to the configuration menu: „Configuration ==> Main screen No. 2".

The button actions on the main screen 2 are the same as on the main screen 1.

6.4.3. Statistics screens

To access the statistics screens, on the main screen, press and hold both buttons (+) and (-) (+ -_ PH) at the same time.

When on the statistics screen, switch between them with the + and - buttons.

To reset the daily distance values, press and hold the two buttons (-) and (O) the (-O_PH) switch simultaneously on the statistics screen.

To refresh the battery consumption indicator, press and hold the two buttons (+) and (O) the (+ O_PH) switch simultaneously on the statistics screen. Note: do not do this unless there is a specific need. The MPe computer will take care of refreshing the battery indicator during use.

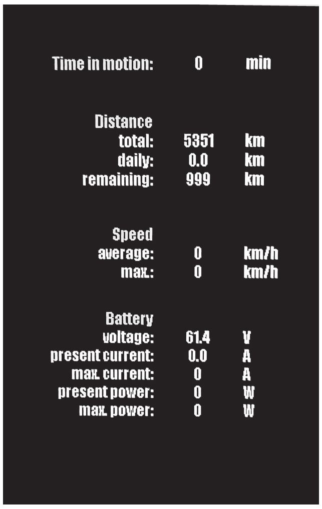


Illustration 6.4.3_1: Statistics screen No.1

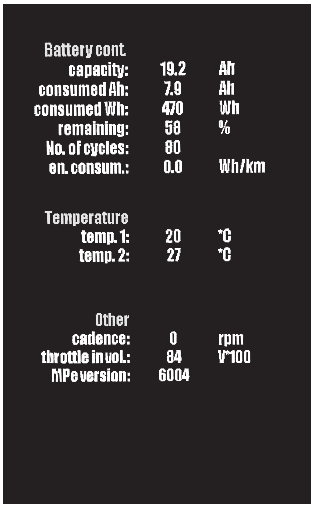


Illustration 6.4.3_2: Statistics screen No.2

6.4.4. MPe computer configuration menu

The full list of configuration parameters can be found on a separate page of this user manual (listed in the table as attachments No. 1 and No. 2)

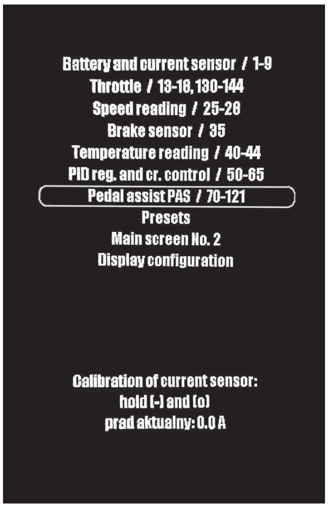


Illustration 6.4.4.1_1: Main configuration screen

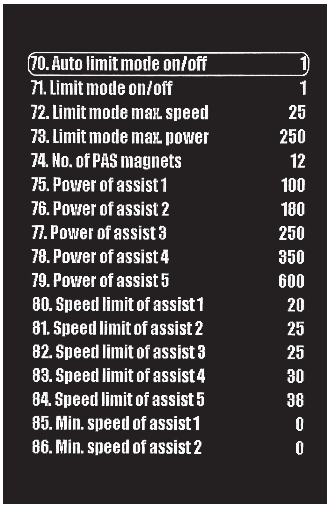


Illustration 6.4.4.1_2: Configuration menu - Pedal assist PAS configuration

6.4.4.1. Calibration of the current sensor reading

In the configuration menu, we have the option to reset the current sensor indication.

To do this, hold down the (-) and (O) (-O_PH) buttons simultaneously (on the first screen of the configuration menu).

6.4.4.2. Configuration navigation

To enter the configuration menu, first go to the statistics screens, and then press and hold the two buttons (+) and (-) (+ -_ PH) again at the same time.

So to enter the configuration menu straight from the main screen, you need to press and hold two buttons (+) and (-) (2x + -_ PH) twice in succession.

Use the (+) and (-) buttons to move the cursor up and down in the configuration menu.

With the button (O) (power on switch) pressed briefly, we enter the lower level to the configuration menu.

With the (O) button (power on switch switch) pressed and held, you go back one level higher.

6.4.4.3. Editing parameter values

1. Enter the value marked with the cursor by briefly pressing the button (O) (power on switch).
2. Use the (+) and (-) buttons to change the edited value (holding the (+) or (-) button will speed up the editing).
3. To exit the edition and save the value, click the button (O) (power on switch) on the parameter being configured.
   If, instead of clicking the button (O), we hold it longer, we will cancel the edition and go back one level in the menu. Then the edited value will not be saved.

6.5. Information icons

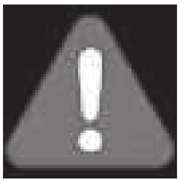


Illustration 6.5_3: Warning

Illustration 6.5_2: Brake sensor active

Illustration 6.5_1: Cruise control active

Depending on the situation, one of the above information icons may be displayed. If the warning icon is displayed, you cannot continue assisted driving for one of the following reasons:

- the assist level is set to 0
- one or two temperatures exceed the overheating threshold
- the current sensor is not calibrated, it may also be damaged or not connected
- throttle in voltage is incorrectly set or the thumb throttle is damaged or incorrectly connected
- vehicle battery is discharged

6.6. Locked and unlocked mode (limit mode on / off)

There is a shortcut to switch between Locked and Unlocked modes.

On the main screen, hold down two buttons (-) and (O) (-O_PH) at the same time.

In locked mode, you see a white frame around the assist level indicator. There is no frame in unlocked mode. Default values for locked mode: [250 W and 25 km/h].

6.7. Day and night mode

Pressing the O (O_SP) button on the main screen once will dim or brighten the screen.

The brightness of the screen can be adjusted in the configuration menu under the display setting.

6.8. Display settings (not MPe computer settings)

Configuration ==> Display Settings

In the display settings, we can:

- set the brightness levels for day and night mode
- we decide after how many minutes, the screen will turn off by itself, if the vehicle is idle and other factors will not affect it, e.g. using
- hide the temperatures on the main screen when, for example, we do not have a temperature sensor connected. We then enter the value 0
- reverse the operation of the +/- buttons on the remote control. This applies when the remote control is to be placed on the right side of the handlebar. We can then also use the left side thumb throttle (if connected)
- change the language of the configuration menu to Polish or English

6.9. Change the language

The MaxiColor 850C display offers a choice of two language versions

- Polish language (enter the value: 0)
- English language (enter the value: 1)

To change the language:

- on the main screen enter the configuration menu while holding the upper and lower buttons two times(2x + -_ PH)
- then select the field: Display settings
- here we choose the last item Polski (0) / English (1)
- Confirm with the middle button on the remote control, thus confirming the change of language

6.10. USB port for charging the phone

In the lower part of the device housing there is a USB port (eg for charging a phone) with a capacity of 2.5 W [5 V, 0.5 A].

For the charging port to be active, the display must be powered from a voltage in the range of 30 V - 67 V. The upper supply voltage of 67 V must not be exceeded, as this may damage the display. If the display is supplied with voltage in the range of 12 V – 30 V, the charging port will be inactive.

6.11. Additional protective film on the display

The MaxiColor 850C display has two protective films. The first one may peel off and have scratches. The second film is hardly noticeable. Often, users do not know about it. Of course, you can tear it off or leave it. It serve as additional protection, e.g. in the event of a scratch.

7. Operation via smartphone app

The MPe computer can also work without any permanently mounted display on the handlebar. In this case, the optional MPeBT module will be useful. With it, we can control the MPe computer and change its configuration from the level of the application on a smartphone with the Android system.

It is possible to connect two buttons to the motherboard, which can be used to switch the levels of assistance even when we do not have an active connection between the smartphone and the MPe computer. Such a connection is shown in diagram S6.01. Also, after pressing the brake and holding the „-" (minus) button, we can switch the MPe computer between locked and unlocked modes - just like in the case of the MiniOled display.

When we have a buttons connected by. of the S6.01 diagram (we do not have a display, but we only have the MPeBT module), set the parameter No. 34 (BT_BUTTONS) in the configuration to the value 1.

Two applications are dedicated to the MPe system:

- MPeBT application (serving as display)
- MPeSET application (for settings)

The application requires:

- MPeBT module for the MPe system (it is not included in the standard MPe set)
  - alternatively, the HC-05 module can be used (it is not included in the standard set)
- smartphone with Android system (it is not included in the standard set)

To obtain the correct and full compatibility of the application with the MPe device, always use the application version dedicated to the given version of the motherboard firmware.

Warning:

The MPeBT module works only with:

- with a smartphone
- with MiniOled display
- with MPeV6 motherboard

The MPeBT module does not work with:

- with MaxiColor 850C and 860C display, MiniOled 560C
- and with the MPeV5 motherboard

7.1. App installation process

The applications are available for download in * .apk format

The applications can be downloaded from the website: https://bikel.pl/en/mpebt-app-for-smartphone/

To upload such an application to the phone:

- Download it directly to the smartphone's memory or copy it from a computer using a USB cable.
- Then run the downloaded file and follow the instructions on the screen.
- By default, Android has the option of loading such applications blocked for fear of viruses. To unlock it, go to the phone's settings and activate the „Allow installation of applications from sources other than the Play Store" function in the security tab.
- Before starting the application for the first time, the MPeBT module connected to the MPe device must be paired with the phone. To do this, use the BT connectivity settings built into Android. When pairing the phone with MPeBT, we will be asked for the password. Then enter the password, which is four digits: 1234.

7.2. MPeBT application (serving as display)

7.2.1. MPeBT application appearance

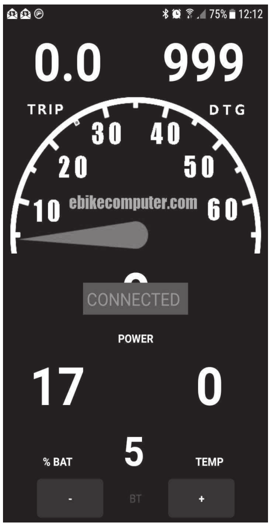


Illustration 7.2.1_1: Screen 1, main section, graphic style

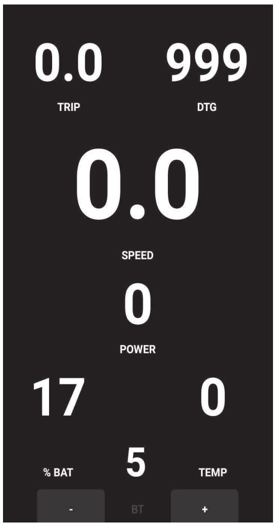


Illustration 7.2.1_3: Screen 1, main section, digital style

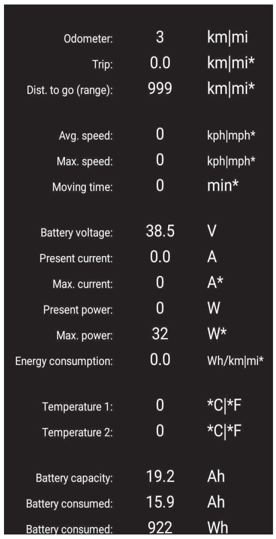


Illustration 7.2.1_2: Screen 1, middle section

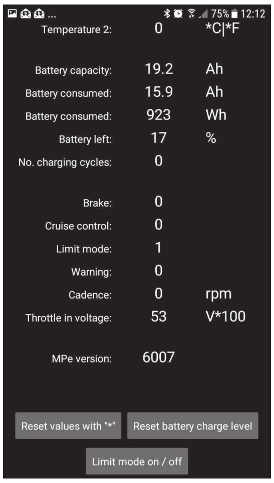


Illustration 2: Screen 1, bottom section

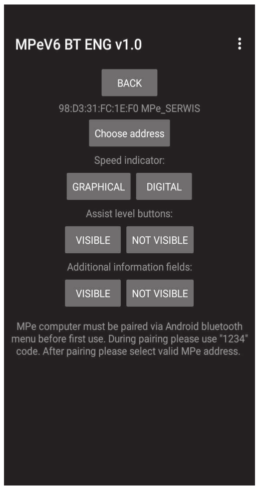


Illustration 1: Screen 2

7.2.2. Application indications and functions

The MPeBT application has two screens:

- screen 1, on which the indication fields and the MPe computer control buttons are located
- screen 2, on which we can select the address of the MPeBT device and change the appearance of screen 1. To go to screen 2, press the blue text BT on screen 1

Before starting the application for the first time, the MPeBT module connected to the MPe device and must be paired with the phone. To do this, use the BT connectivity settings built into Android.

When pairing, enter the code: 1234

After the first launch of the application, go to the second screen and select the address of the MPe device (we do this only once, at the first launch).

On screen 2, we can also decide whether we want the speed to be shown graphically or digitally. We can also decide whether to show the buttons for changing the assist levels and / or the system statistics field.

After launching, the application will connect automatically with the MPe device after about 10 seconds (after selecting the MPe address on the screen No. 2).

On screen 1, we have the following buttons:

- [Reset the value. with „*"] - pressing this button will reset all indication fields that have an asterisk „*" next to the unit

- [Reset battery charge level] - pressing this button will refresh the indication of the battery charge level. This should not be done without a clear need - the MPe computer will take care of resetting this indicator after charging the battery
- [Limit mode on / off] - pressing this button switches the MPe device operating mode between locked and unlocked mode

Minimizing the application or switching to work with another application disconnects the application's connection to the MPe computer (it will automatically resume connection after bringing app back to the top).MPeSET application (for settings)

7.3. MPeSET application appearance (for settings)

7.3.1. MPeBT application appearance

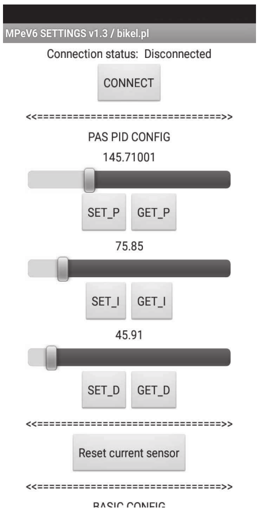


Illustration 7.3.2_1: MPeSET, PID sliders

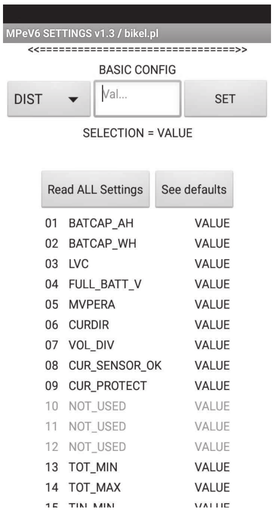


Illustration 7.3.2_2: MPeSET, buttons and values

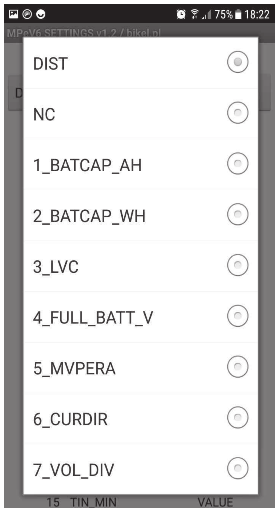


Illustration 7.3.2_3: MPeSET, drop-down list

7.3.2. Application indications and functions

Before starting the application for the first time, the MPeBT module connected to the MPe device must be paired with the phone. To do this, use the connectivity settings built into Android.

When pairing, enter the code: 1234

After starting the application, press the CONNECT button and select the address of the MPe device. Correct connection with the MPe device will be symbolized by changing the label „connection status" to the value „connected". If there is a problem with the connection, this label will change its inscription to „disconnected".

7.3.2.1. PID sliders

There are three sliders P, I, D. They are used to control the components of the PID controller (you can read more about the PID controller in the section „Description of MPeV6 computer functions and their configuration ==> PID power controller").

There are two buttons under each slider:

- GET - is used to read the current value of a given slider from the MPe device
- SET - is used to save the current value of a given slider to the MPe device

7.3.2.2. Button "Reset current sensor"

Pressing the „Reset current sensor" button will calibrate the current sensor indication to 0.0 A (use only at standstill).

7.3.2.3. BASIC CONFIG settings

In the settings section „BASIC CONFIG" you can change the values of the configuration parameters.

To change the parameter value:

1. Select a parameter from the drop-down list
2. Enter the parameter value in the text box
3. Press the SET button

In addition, there are two buttons in this section:

- Read ALL Settings - pressing this button will read the parameter values from the MPe device and put them on the list below the button
- See defaults - pressing this button will display a list where you can read the default value of the parameter and the allowed range of parameter values

8. Description of the MPeV6 computer indications

The data is saved automatically when the vehicle is stopped (speed = 0 km/h). If you turn MPe off while driving, the data may not be saved since the last stop.

8.1. Units for reading speed, distance and temperature

The MPe computer can display speeds and distances in the following units:

- kilometers per hour [km/h, kph]
- miles per hour [mile/h, mph]

The MPe computer can display the temperature in the following units:

- degrees Celsius
- degrees Fahrenheit

The appropriate unit should be set in the device configuration (parameters No. 25 and No. 40).

8.2. Time in motion

Time during which speed is greater than 0.

This time is presented in minutes [min].

This indication is reseted together with reset of the daily distance.

8.3. Total distance (odo)

Total distance (ODO) traveled since the beginning of MPe installation.

The distance is shown in kilometers or miles (parameter No. 25).

This distance can only be preset from the MaxiColor 850C display or the MPeSET application. It is not possible to set the total distance directly from the MiniOled display. Use the application (MPeBT module).

In order for the preset distance to appear in the current display, you must restart the MPe computer as soon as the counter has been set. The vehicle must be stationary and no speed may appear on the odometer as the data will not be recorded then.

8.4. Daily distance (trip)

Trip distance traveled since the last reset of this distance.

Along with reseting this distance, the values of indications related to it are also reseted, such as:

- time in motion
- maximum speed
- average speed

- maximum power
- maximum current
- Energy consumption

8.5. Remaining distance / vehicle range on remaining battery

The MPe system is able to estimate the distance to be driven by the vehicle on the remaining energy. This energy is stored in the battery until it is completely discharged. The estimated distance takes into account data from the last five kilometers / miles of driving. This means that the system analyzes our driving style on an ongoing basis and calculates the remaining distance to be traveled.

For a reliable vehicle range estimate, the battery level indicator (described later in this chapter) must first be properly set. The vehicle speed reading must also be properly calibrated.

If we spin the wheel in the air (eg during service), then due to the minimal power consumption, the range will quickly reach 999. This is normal behavior. The range will be correctly calculated only during normal driving.

8.6. Present speed

The actual speed of the vehicle is expressed in kilometers per hour or miles per hour (parameter 25).

8.7. Average speed

Average speed of the vehicle with which the daily distance (trip) was traveled. This indication is deleted together with the deletion of the daily distance.

8.8. Maximum speed

Maximum vehicle speed recorded while counting the current daily distance (trip).

This indication is deleted together with the deletion of the daily distance (trip).

8.9. Battery voltage

The voltage of the battery expressed in volts [V].

If the voltage indication differs from the real one, it can be calibrated (parameter 7).

Calibration example: The actual voltage indication by MPe is 48 V and the actual voltage is 48.5 V. The current value of the parameter No. 7 is 33058, then the target value of the parameter No. 7 is calculated from the formula:

X = (actual_voltage * current_par_value_7) / voltage_measured_by_MPe

X = (48.5 * 33058) / 48

X = 33402.35

We round the result to the nearest integer and write it to the parameter No. 7.

8.10. Current drawn from the battery

The current drawn from the battery, expressed in amperes [A].

8.11. Maximum current drawn from the battery

Maximum current drawn from the battery, registered while counting the current daily distance (trip).

This indication is reseted together with the reset of the daily distance trip.

8.12. The power drawn from the battery

The power currently drawn from the battery, expressed in watts [W].

8.13. Maximum power drawn from the battery

Maximum power drawn from the battery recorded during the daily distance (trip).

This indication is reseted together with the reset of the daily distance trip.

8.14. Ampere hours taken from the battery

Battery discharge level expressed in the number of ampere-hours [Ah] taken from the battery.

This value increases from zero until the battery is completely discharged.

This value, in relation to the battery capacity stored in parameter 1, affects the battery charge level indicator.

With this reading, we can check the actual capacity of our battery by precharging it to full, and then discharging it while driving, until the drive is cut off.

8.15. The amount of watt hours drawn from the battery

Battery discharge level expressed in watt hours [Wh] taken from the battery.

This value increases from zero until the battery is completely discharged.

This value, in relation to the battery capacity stored in parameter No. 2, affects the battery charge level indicator.

With this reading, we can check the actual capacity of our battery by precharging it to full, and then discharging it while driving, until the drive is cut off.

8.16. Battery level indicator

The MPe computer has a battery charge indicator based on energy consumption expressed in watt-hours [Wh].

8.16.1. Definition of Watt hour

A watt hour is a unit obtained by multiplying the battery voltage in volts [V] by the current drawn from the battery in amperes [A] and times the consumption time in hours [h].

Since electric vehicles require power, not only current, a watt-hour unit is the ideal unit (instead of ampere-hour) for comparing two batteries (even with different voltage) in terms of the energy stored in them .

The same unit can be used to display the current battery charge status and to estimate the remaining range of the vehicle on the remaining battery.

For example, a battery with a nominal voltage of 48 V and a capacity of 10 Ah has a capacity of 48 * 10 = 480 Wh.

If the drive of the vehicle we are moving will use 480 W from the battery for 1 hour, it will discharge the battery completely.

If the drive of the vehicle we are driving has an energy consumption of 10 Wh/km, then after driving 48 km it will discharge the battery completely.

The MPe computer has a built-in battery consumption meter in Wh (watt-hours), so we know exactly how many watt hours have already been used from the battery since the last charge. Also due to the fact that we examine the distance at which this energy has been used, we know the energy consumption per one kilometer or mile of driving. Having this data, we are able to estimate how many more kilometers / miles we will travel on the energy remaining in the battery.

8.16.2. Operation of the battery level indicator

The battery level indicator on the MPe computer consider watt hours used in relation to the amount of watt hour in a full battery. The number of watt-hours of full battery should be programmed in the MPe computer memory (parameter No. 2). How many watt hours our battery has, we can calculate or measure with the MPe computer.

Example 1: we reset the present indications measured by MPe. We charge the battery fully and then ride it to fully discharged. MPe shows the consumption of Wh when the battery is fully discharged. Write them down in memory.

Example 2: Calculated on a Li-ion battery. The average cell voltage is 3.625 V. Our battery has, for example, 16S (sections) and 19.2 Ah (ampere hours), this gives 16 * 3.625 * 19.2 = 1113.6 Wh. We enter the value 1114 into memory.

The capacity of the battery in watt hours is entered in configuration parameter No. 2 „Battery capacity Wh".

For the correct operation of the battery charge level indicator, the battery capacity in ampere-hours Ah also must be entered in the parameter No. 1 „Battery capacity Ah".

8.16.3. Reseting the battery level indicator

The battery level indicator resets automatically during charging and discharging.

When the MPe is powered on while charging, the battery level will be updated continuously based on the actually measured incoming energy.

If the MPe is turned off during charging, when it is turned on again, the values of the consumed watt hours and thus the charge level indicator will be estimated on the basis of the present battery voltage. For correct voltage estimation, set the battery voltage level in a discharged and fully charged state (parameters No. 3 „Drive cut-off voltage" and No. 4 „Full battery voltage"). In order for the voltage estimation to be activated when the MPe computer is started, the voltage must be 2 V higher than the voltage before the device was turned off.

Due to the fact that the battery charge level estimation based on voltage is only accurate to approx. +/- 15%, it is recommended to fully charge the battery, then the indicator will be reset to 100% and we are sure that it will show accurately.

We can force the refresh of the indicator and estimate the current battery charge level by pressing the appropriate key combination (do not do this if there is no specific need - the MPe computer will take care of refreshing the battery indicator during use):

- MaxiColor 850C display: on the driving statistics screen, hold both buttons (+) plus and (o) the power on switch (+ O_PH) simultaneously
- MiniOled display: on screen No. 4 hold down the bottom button (B_PH)
- MPeBT application: by pressing the „Reset charge level" button

The battery charge level will then be estimated from the battery voltage.

8.16.4. Correction of the initial settings of the battery capacity

As the battery ages, the battery capacity in Wh and Ah will decrease and these settings should be adjusted (at least once a year). This is to ensure that the battery level indicator is working properly.

8.16.5. Counting charging current and regenerative braking:

The MPe device has a bi-directional current sensor. Thanks to this, it is possible to count the charging current and regenerative braking current (current with a negative sign). This current is subtracted from the present battery consumption. This has the effect of raising the charge level indicator.

The charging current is counted by the same current sensor that measures the discharge current.

To count the charging current, the positive pole (+) cable from the charging socket must be connected through the current sensor (as shown in the wiring diagram) and the MPe computer must be turned on during charging.

If the MPe is turned off during charging, when it is turned on again, the values of the consumed watt hours and thus the charge level indicator will be estimated on the basis of the current battery voltage.

8.17. Number of battery charging cycles

The MPe system counts the number of battery charge cycles as follows:

1. The system remembers the number of ampere hours taken from the battery since the system was installed in the vehicle.
2. The system divides the stored number of ampere-hours consumed by the capacity of the battery stored in the parameter No. 1.

The calculated number of charging cycles is presented to the user on the display.

This value can be preset from the MaxiColor display or the MPeSET application. In order for the preset value to appear in the current display, the MPe must be restarted.

The value to be entered in the setting is the battery capacity in Ah multiplied by the number of cycles. For example: if we want to have 15 charging cycles, we have to enter 15 * battery capacity in Ah.

8.18. Vehicle energy consumption

The amount of energy used to travel one kilometer or one mile recorded in calculating the daily distance (trip) is expressed in watt hours per kilometer (or per mile) [Wh/km | Wh/mi].

This indication is deleted together with the deletion of the daily distance (trip).

Just as in the case of cars, we compare their energy consumption based on fuel consumption expressed in liters per 100 km or miles per gallon, in the case of light electric vehicles we compare their energy consumption based on energy consumption expressed in watt hours per kilometer or mile [Wh/km | Wh/mi].

A watt hour is a unit obtained by multiplying the battery voltage in volts [V] by the current drawn from the battery in amperes [A] and times the consumption time in hours [h].

Since electric vehicles require power, not current, a watt-hour unit is the ideal unit (instead of ampere-hour) for comparing two batteries (even with different voltage) in terms of the energy stored in them.

The same unit can be used to display the current battery charge status and to estimate the remaining range of the vehicle on the remaining battery.

For example: a battery with a nominal voltage of 48 V and a capacity of 10 Ah has a capacity of 48 * 10 = 480 Wh.

If the drive of the vehicle we are moving will use 480 W from the battery for 1 hour, it will discharge the battery completely.

If the drive of the vehicle we are driving has an energy consumption of 10 Wh/km, then after driving 48 km it will discharge the battery completely.

The MPe computer has a built-in Wh (watt-hour) meter for battery consumption. This way we know exactly how many watt hours have already been used in the battery since the last charge. Also due to the fact that we examine the distance at which this energy has been used, we know the energy consumption per one kilometer of driving. Having this data, we are able to estimate how many more kilometers we will travel on the energy remaining in the battery.

8.19. Temperature reading T1 and T2

After installing temperature sensors (max. 2 pcs.), We can read the temperature value measured by them.

The MPe computer can display the temperature in the following units:

- degrees Celsius
- degrees Fahrenheit

The appropriate unit should be set in the device configuration (parameter No. 40).

You can set the MPe computer so that after exceeding a given temperature, the drive is cut off in order to protect it against overheating (parameters No. 43 and 44).

Important: NTC10K and KTY83 sensors are connected between + 5 V (e.g. connector no. 34) and inputs T1 and T2 (connectors 32 and 33)

8.20. Cadence

The cadence is the rotational speed of the crank expressed in revolutions per minute [rpm].

Reading this value can help us diagnose the correct operation of the PAS cadence sensor. This value should increase with increasing crank rotation speed.

The reading of this value can be used when determining the minimum and maximum cadence for PAS support cadence

8.21. Thumb throttle input voltage

We can read the value of the signal coming from the thumb throttle (throttle voltage) expressed in volts multiplied by 100 [V * 100]. For example: 85 means 0.85 V input and 420 means 4.2 V input.

Reading this value can help us to diagnose the correct operation of the thumb throttle. This value should increase as twist of the throttle increases. A properly functioning thumb throttle should give voltage in the range from about 0.8 V to about 3.6 V – 4.2 V .

Using the reading of the value on the display screen, we can precisely set the input voltage parameters No. 15 TIN MIN and No. 16 TIN MAX. TIN values should be approx. 10 higher than the values indicated by the display, rounded to the nearest „ten".

For example: The value of incoming voltage of the thumb throttle in idle state, read on the display, is 83, enter 90 into the parameter No. 15 TIN MIN.

The value of the incoming voltage of the thumb throttle when set to 100% read on the display is 345, enter 350 into the parameter No. 16 TIN MAX.

Too low TIN MIN voltage value (parameter No. 15) will result in stopping the PAS pedaling system support. The MPe computer will read the throttle input at idle as the throttle twisted to ride. Such a situation will take place when the value of the TIN MIN parameter will be lower by 6 than the currently read value of the throttle input voltage.

8.22. Torque sensor - ADC

Only useful with a torque sensor BB installed and connected. Shows a digital representation of the analog signal (voltage) entering MPe from the torque sensor.

This parameter is needed to properly calibrate the pedal torque sensor. Its value changes with the change of the force of pressing the foot on the pedal.

(The calibration process is described in the description of PAS support using a torque sensor assist).

This parameter takes a value from 0 to 1023 and has no unit.

8.23. Weight on pedal

With a correctly calibrated pedal torque sensor, this parameter can be used to read the current weight on the pedal when the crank is parallel to the ground.

The parameter is given in kg * 10 and usually ranges from 0 to 600 (600 = 60 kg weight on the pedal).

9. Description of MPeV6 computer functions

9.1. Locked and unlocked mode

In the MPe system, we can work in two modes:

- locked (default <250 W, 25 km/h)
- unlocked (no limit)

The following functions are limited in locked mode:

- thumb throttle is disabled
- cruise control is disabled
- the power of the assistance of all levels of PAS pedaling assistance is limited to the one set for the locked mode (in MPe configuration No. 73 – 250 W by default)
- the speed of the assistance of all levels of the PAS pedaling assistance is limited to the one set for the locked mode (in MPe configuration No. 72 – by default 25 km/h)
- PAS BOOST option is disabled (power amplification at start of pedaling and resuming pedaling while driving)

It is possible to quickly switch between locked and unlocked modes (see chapters „Operating MPeV6 via the display")

By default, the first time you connect your MPe computer, the system is set to turn on in locked mode. To unlock it, use the button shortcuts of the given display. It is possible to set the MPe system not to always turn on in the locked mode (parameter No. 70). Then it will turn on in the mode it was in before turning off.

When the locked mode is active, the assist level is shown in a white frame on the display. The frame disappears when Locked mode is released.

9.2. Assistance levels

In the MPe system, there are five levels of assist. We can freely configure them for PAS pedaling assistance and independently of PAS for the sensitivity of the thumb throttle.

9.3. PID power regulator

9.3.1. What is this regulator for?

The PID power regulator has been implemented in MPeV6, which controls:

- PAS pedal assist power up to 3000 W
- the power of the thumb throttle up to 1000 W (only in the thumb throttle power limiting mode)
- cruise control power up to 2000 W

Due to the operating characteristics of the PID controller, the above functions will not work properly without a load (e.g. in the case of a bicycle with the wheel raised, during service).

9.3.2. What is a PID controller?

The PID controller takes its name from the English names of three parts, which consists of:

- Proportional
- Integral
- Derivative

Without going into detail, a PID controller is one that works in closed loop with feedback. This means that it is constantly examining the value it controls. If the currently measured value deviates from the set value, the controller tries to correct it.

Example: the regulator sets power of 500W to a motor by setting the throttle voltage to 30%. Then the actual power consumed by the motor is measured and it turns out that it is 600 W. At this point, the regulator decides by itself to lower the throttle voltage, e.g. to 28%. After lowering the throttle voltage to 28%, the regulator reads the correct set power at the level of 500 W.

This example describes an ideal situation. In reality, however, it is not enough to adjust the throttle voltage once to obtain the desired power. It is influenced by many factors, such as: terrain, motor power, weight and inertia of the vehicle. The throttle voltage must be adjusted several times per second. Whether or not these changes take place correctly depends on the controller settings.

It may turn out that the regulator will be overloaded and will regulate the throttle voltage too rapidly. This will be manifested by an intense „waving" of power (Illustration_1).

The opposite will be the case when the PID controller will react too slowly. This will be manifested by the sluggish reaction of the system to changes and reaching the set point (Illustration_3).

With a well-adjusted PID controller, the setpoint is obtained quickly and without wobbling (Illustration_2).

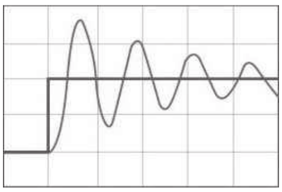


Illustration 9.3.2_3: The regulator is overloaded

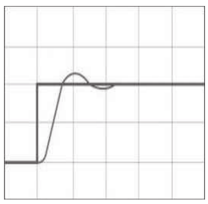


Illustration 9.3.2_1: The regulator is set correctly

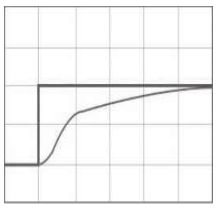


Illustration 9.3.2_2: Regulator under-controlled (sluggish)

9.3.3. PID controller settings

Three coefficients kP, kI, kD (parameters 50, 51, 52) are used to set the reaction speed of the PID controller. They affect individual parts of the regulator.

The MPeV6 computer is a universal device that can be used in an infinite number of vehicle configurations. Therefore, it may be necessary to fine-tune the PID controller for your specific application.

Increasing the values of the kP, kI, kD coefficients will direct the controller towards overload, and decreasing their values will lead to under-control.

In parallel with the PID controller, there are mechanisms that affect the controller itself, such as:

- cadence reading mechanism (crank rotational speed), which increases the set power as the cadence increases, until the power limit set for a given assist level is reached
  (in MPeV6 configuration, parameters 90 - 94: „Minimum cadence", 95 - 99: „Maximum cadence" are responsible for it)
- a mechanism that reads the speed of the vehicle, which reduces the power set with increasing speed to zero after reaching the speed limit set for a given assist level
  (in MPeV6 configuration, parameters 80 - 84: „Speed limit", 59: „Speed factor PAS min" are responsible for it)
- a mechanism that slows down / delays the ramp up speed of the power setpoint given from the above mechanisms
  (in the MPeV6 configuration, the parameters 61: „Speed factor ramp up", 64: „Cruise ctrl. power ramp up", 100 - 104: „PAS power ramp-up", 120: „PAS boost ramp up" , 140 - 144: „Throttle ramp up")

Additionally, in MPeV6 we have the possibility to set two reaction speeds of the PID controller: fast and slow.

The slow PID controller will be activated when the actual power does not differ more from setpoint than the value set in the „Slow PID threshold" parameter. Thanks to this, we can fine-tune the PID controller in the area of the setpoint limit.

By default, the slow PID controller is disabled and it should be activated only when all other control methods have failed. The slow PID controller should have settings at least half the values lower than the basic PID values. By default, only the fast PID regulator is active.

9.3.3.1. Parameter No. 60 PIDPWMMAX

This parameter directly affects the maximum throttle output voltage that the PID controller will send to the motor control unit. The parameter can assume the value 0 - 255, where 0 = 0 V and 255 = 5 V.

This parameter should be set as low as possible for the PAS pedal assist to still function properly. This should be done experimentally. By default, for the construction of approx. 3000 W, this parameter is approx. 150, and for the construction of high power (approx. 10000 W) it is 70. If this parameter is set too low, the PAS support will not reach the programmed power. If this parameter is set too high, then when driving steadily with PAS assistance, there may be a jerk, i.e. a sudden power jump for a fraction of a second. Especially in high-power constructions, it is important to set this parameter correctly, because the sudden power surge is clearly noticeable.

9.3.4. When to tune the PID controller?

The PID controller should be tuned when:

- while driving with PAS pedaling assistance, we feel the ripple of the vehicle power (especially during acceleration or near the limit speed for a given level of assistance)
- when driving with cruise control, the power waves strongly (slight waving can be felt and it is normal)
- while driving with the thumb throttle power limitation (Throttle mode = 1), we feel definitely strong waving of the vehicle's power (slight waving can be felt and it is normal)

9.3.5. PID regulator fine tuning procedure

The MPe device is delivered with the default settings of the P I D coefficients, which should be treated as a starting point (parameters No. 50, 51, 52). While driving, experimentally select new parameter values, guided by the following tips:

- first, all parameters should be changed at once by a similar amount of % of value.
  For example: if the parameters are set to P = 300, I = 200, D = 100 and we want to reduce the sensitivity of the regulator, reduce all of them, e.g. by 50%, which will give P = 150, I = 100, D = 50)
- secondly, if changing all parameters at once does not bring any more improvement, then experimentally try to change only one parameter at a time by 10% of the value, in order to look for an improvement in the regulator's operation
- if the controller is too sensitive, changing only the PID value may not be enough. Then the power set ramp up speed (output throttle voltage to the controller ramp up speed) should also be reduced (parameters No.100 - 104, 61, 64, 65, 120)

The above guidelines described reducing the sensitivity of the PID controller. If the controller is too slow-reacting, increase these values.

In case of continuous power wobble at the speed close to the limit despite of PID tuning, you can try to activate the slow PID controller. To do so set the value of the parameter No. 56 to, e.g. 100 W. The values of kP, kI, kD coefficients of a slow controller should be set at least by half of the basic PID values.

9.4. PAS Pedal Assist System (for cadence sensor only)

9.4.1. Description of the PAS function (for cadence sensor only)

Thanks to the MPe system, it is possible to add the PAS (Pedal Assist System) to the every vehicle / controller. To make it possible, the motor controller with which the MPe computer is to cooperate must have an input for the thumb throttle in the voltage standard 0.8 V – 4.2 V. Most drivers on the market have this input.

Current sensor, is connected between the battery and the motor controller, and all the necessary sensors are connected to the MPe motherboard, such as:

- cadence sensor (PAS sensor)
- thumb throttle
- speed sensor
- brake sensor

Based on the data from the above sensors, the MPe computer determines the throttle voltage level, which it sends to the motor controller to the throttle input. This way it regulates the power and speed of the motor. Power and speed control is based on the PID controller, which is described at the beginning of this chapter.

When we turn the cranks, we set to the motor (via the PID regulator) the power it should get. The power is only set when we exceed the minimum cadence (parameters 90 - 94) and exceed the minimum speed (parameters 85 - 89). Speed and power begin to increase linearly until the maximum cadence is reached (parameters 95 - 99). After exceeding the maximum cadence, the set power is fully set for the support for a given assist level.

When we approach the speed limit set for a given assist level, from 5 km/h before reaching it, the regulator reduces the power of assistance. After exceeding this speed, the MPe computer gives only the % of power, as set in the parameter No. 59 „PAS coefficient min.", by default 1%.

When we set a speed limit for a given assist level, e.g. 25 km/h, the vehicle will actually accelerate us to a speed of about 22 - 23 km/h. This is because from a speed of 20 km/h (in this case) the power is reduced in order not to exceed the speed of 25 km/h. This is to avoid a sudden cut-off of the support, to the limit that we have set for a given assist level, in this case 25 km/h. Thanks to this, we very smoothly approach the limit of the cut-off settings.

The PID controller is worse at stabilizing the power when we set the PAS support speed above what we are physically able to pedal with our legs strength.

If we set a high maximum cadence, we will receive full support only during this cadence. This means that the bike will support us weakly when we turn the cranks slowly, and it will support us strongly when we turn the cranks quickly. This setting will make the e-bike behave more like a regular unassisted bike. An additional advantage of such a setting is that the bike does not overtake our pedaling and there is no situation in which we "swing our legs in the air", feeling no resistance under our feet.

9.4.2. Pedal Assist System (PAS) configuration options (for cadence sensor only)

We can assign individual parameter values to each assist level, such as:

- speed limit (parameters 80 - 84)
- power of assist in watts [W] (parameters 75 - 79)
- minimum speed for PAS activation (parameters 85 - 89)
- minimum cadence for PAS activation (parameters 90 - 94)
- maximum cadence to which the PAS power will increase linearly (parameters 95 - 99)
- increased startup power, so-called PAS BOOST (parameters No. 105-109)
- time of increased startup power PAS BOOST (parameters No. 110 - 114)
- vehicle speed, above which PAS BOOST will not activate (parameters No. 115 - 119)
- PAS power ramp up speed (sensitivity of the assist to changes in cadence and speed) (parameters No. 100 - 104)

For all levels of assistance (all at once) you can adjust:

- Pas Boost (startup power) ramp up speed (parameter No. 120)
- cadence refresh time (parameter No. 121)

9.4.3. Reaction speed to the pedaling start and stop (for cadence sensor only)

The user has control over how quickly MPe will react to start and stop pedaling. The parameter No. 121 is used for this, which determines the refresh rate of data reading from the cadence sensor.

This parameter takes values from 150 - 750 [ms].

By setting this parameter low [150 ms], the system will react faster to the cadence sensor readings and thus start the assistance faster and end the assistance faster. However, it may turn out that parameter 121 set too low will result in „jerking" of the drive at a very low cadence. This is because the magnets on the cadence sensor ring will not have time to activate the sensor one by one before the refresh time expires.

By setting this parameter high [750 ms], the system will react more slowly to the cadence sensor readings and thus start assistance later and stop assistance later. In this case, after stopping pedaling, the system will continue to apply power to the motor for about 1 - 2 seconds.

The default value of this parameter is set to 250 ms. It is recommended to adjust this value to individual needs, the terrain on which we are riding, as well as the situations in which we are riding.

9.4.4. PAS Boost function / Increasing of the power on startup (for cadence sensor only)

The PAS Boost function allows you to increase the power of startup assist and to build up this power faster.

The PAS Boost function is activated when the following conditions are met:

- we have just started turning the crank, and the time since the start is less than the duration of the PAS Boost set in parameters No. 110 - 114
- the cadence is greater than the minimum cadence set in parameters No. 90 - 94
- the vehicle speed is lower than that set in parameters No. 115 - 119
- the vehicle speed is greater than that set in parameters No. 85 - 89

Tips:

- by setting a speed limit, e.g. to 10 km/h for the PAS Boost function, we can obtain the power amplification effect only when starting from a standing place, and not in the entire speed range (parameters No. 115 - 119). For example: driving on flat ground at a speed of 20 km/h, we suddenly stop pedaling. The vehicle begins to slow down. When starting to turn again at a speed of e.g. 15 km/h, the PAS Boost function will not be activated (this limit is set to 10 km/h). If the speed drops below 10 km/h, the PAS Boost function will be activated.
- the speed limit for the PAS Boost function (parameters 115 - 119) should be set to at least 8 km/h lower than the speed limit of the given assistance level (parameters 80 - 84). Failure to do so will result in power fluctuations and jerks at speed close to the limit for a given assist level.
- PAS Boost power ramp up speed can be reduced to make the startup smoother (parameter No. 120). By default, this parameter is set to 5000 W/s, which means that when the Pas Boost function is turned on, the power increases very quickly, which will suddenly accelerate the vehicle. If you want to move more gently, you can set this parameter to, for example, 500 W/s and then the vehicle will move more smoothly.

9.5. PAS Pedal Assist System (for cadence sensor and torque sensor)

9.5.1. Description of the PAS function (for cadence sensor and torque sensor)

Thanks to the MPe system, it is possible to add the PAS (Pedal Assist System) to the every vehicle / controller. To make it possible, the motor controller with which the MPe computer is to cooperate must have an input for the thumb throttle in the voltage standard 0.8 V – 4.2 V. Most drivers on the market have this input.

Current sensor, is connected between the battery and the motor controller, and all the necessary sensors are connected to the MPe motherboard, such as:

- torque sensor BB with integrated cadence sensor (PAS sensor)
- thumb throttle
- speed sensor
- brake sensor

Based on the data from the above sensors, the MPe computer determines the throttle voltage level, which it sends to the motor controller to the throttle input. This way it regulates the power and speed of the motor. Power and speed control is based on the PID controller, which is described at the beginning of this chapter.

When we turn the cranks, we set to the motor (through the PID regulator) the power it should get. Power starts to be set only when we exceed the minimum cadence (parameters 90 - 94) and exceed the minimum speed (parameters 85 - 89) and we put pressure on the pedals. In contrast to the pedal assist system based only on the cadence sensor, here pedal pressure is required - without this, pedaling assistance will not be activated.

Due to the fact that we have sensors for the rotational speed of the cranks and the torque applied to the cranks, we can calculate the pedaling power of a cyclist. To put it simply, the cyclist's power is the multiplication of the cadence and the torque on the crankshaft. This means that the power generated by the rider will be greater when he presses the pedals harder or increases his cadence.

By increasing the power, the rider also increases the power of the electric drive that supports him. By changing the way of pedaling, we have an impact on the way the bike's assist behaves, we can accelerate and slow down - just like riding a regular bike. When we pedal stronger and faster, the bike accelerates, and when we pedal slower and lighter, the bike slows down.

If the gear ratio on the dérailleur is too slow, it is not possible to drive faster than the current gear ratio allows. Above a certain speed, we will lose the ability to press the pedals, so the rider's and drive's power will drop to zero.

Due to the fact that we have a pedal pressure sensor (torque sensor), the bike does not overtake our pedaling. There is no situation in which we „swing our legs in the air" without feeling any resistance under our feet.

When we approach the speed limit set for a given assist level, from 5 km/h before reaching it, the regulator reduces the power of assistance. After exceeding this speed, the MPe computer gives only the % of power, as set in the parameter No. 59 „PAS coefficient min.", by default 1%.

When we set a speed limit for a given assist level, e.g. 25 km/h, the vehicle will actually accelerate us to a speed of about 22 - 23 km/h. This is because from a speed of 20 km/h (in this case) the power is reduced in order not to exceed the speed of 25 km/h. This is to avoid a sudden cut-off of the support, to the limit that we have set for a given assist level, in this case 25 km/h. Thanks to this, we very smoothly approach the limit of the cut-off settings.

9.5.2. Pedal Assist System (PAS) configuration options (for cadence sensor and torque sensor)

We can assign individual parameter values to each assist level, such as:

- speed limit (parameters No. 80 - 84)
- power multiplier* from 1 to 20 (parameters No. 75 - 79)
- minimum speed for PAS activation (parameters No. 85 - 89)
- minimum cadence for PAS activation (parameters No. 90 - 94)
- increased startup power, so-called PAS BOOST (parameters No. 105-109)
- time of increased startup power PAS BOOST (parameters No. 110 - 114)
- vehicle speed, above which PAS BOOST will not activate (parameters No. 115

- 119)
- PAS power ramp up speed (sensitivity of the assist to changes in cadence and speed) (parameters No. 100 - 104)

*the power multiplier tells the system how many times the pedaling power of the rider is to be increased. The multiplier is divided by two to allow the multiplier to be increased halfway.

Example: a cyclist puts 100 W of his own strength. He wants the drive to support him with double the power, i.e. 200 W. So the assist multiplier should be set to 4 because (4/2) * 100 = 200 W.

Another example: a multiplier set to 3 will lead to a situation where a cyclist puts e.g. 150 W into the pedaling and the electric drive will give one and a half times that, which is (3/2) * 150 = 225 W.

For all levels of assistance (all at once) you can adjust:

- Pas Boost (startup power) ramp up speed (parameter No. 120)
- cadence refresh time (parameter No. 121)
- startup weight on the pedal, above which the bike will start, even if the crank has not yet started to turn (parameter No. 123)

Important: By default, the pedal assist system in MPe is set to work with the cadence sensor (PAS sensor). Connecting a torque sensored bottom bracket with integrated cadence sensor is not enough to use the torque sensor function (pedal pressure sensor). Additionally, set parameters from 75 to 79 and from 122 to 126, respectively.

It is best to copy all the settings from the table „Appendix 2: MpeV6 configuration - all configuration parameters" from the column „Default for PAS with torque sensor BB for e-bike up to 35 kg and 3000 W of power".

9.5.3. Startup weight on pedal (for cadence sensor and torque sensor)

Thanks to the torque sensor support, we have the option of electric assistance from zero speed. All you have to do is press the pedal with your foot and the electric drive will activate before the cranks start to rotate. This functionality is invaluable, especially when starting from traffic lights or when starting uphill.

The starting weight on pedal can be configured in parameter No. 123. It is expressed in kg * 10 A value of 180 means that the vehicle will start at zero speed when 18 kg is put on the pedal.

Setting the startup weight too low may cause the vehicle to move undesirably even when we only rest our foot on the pedal.

9.5.4. PAS Boost function / Increasing of the power on startup (for cadence sensor and torque sensor)

The PAS Boost function allows you to increase the power of startup assist and to build up this power faster.

The PAS Boost function is activated when the following conditions are met:

- we have just started turning the crank and we put the right pressure on the pedal, and the time from the start is less than the duration of the PAS Boost set in parameters No. 110 - 114
- we apply a pressure force of at least 5 kgF
- the cadence is greater than the minimum cadence set in parameters No. 90 - 94
- the vehicle speed is lower than that set in parameters No. 115 - 119
- the vehicle speed is greater than that set in parameters No. 85 - 89

Tips:

- by setting a speed limit, e.g. to 10 km/h for the PAS Boost function, we can obtain the power amplification effect only when starting from a standing place, and not in the entire speed range (parameters No. 115 - 119). For example: driving on flat ground at a speed of 20 km/h, we suddenly stop pedaling. The vehicle begins to slow down. When starting to turn again at a speed of e.g. 15 km/h, the PAS Boost function will not be activated (this limit is set to 10 km/h). If the speed drops below 10 km/h, the PAS Boost function will be activated.
- the speed limit for the PAS Boost function (parameters 115 - 119) should be set to at least 8 km/h lower than the speed limit of the given assistance level (parameters 80 - 84). Failure to do so will result in power fluctuations and jerks at speed close to the limit for a given assist level.
- PAS Boost power ramp up speed can be reduced to make the startup smoother (parameter No. 120). By default, this parameter is set to 5000 W/s, which means that when the Pas Boost function is turned on, the power increases very quickly, which will suddenly accelerate the vehicle. If you want to move more gently, you can set this parameter to, for example, 500 W/s and then the vehicle will move more smoothly.

9.5.5. Calibration of torque sensor bottom bracket

The eRider T9 bottom bracket should work with the default parameters. However, you may find that the default calibration needs to be adjusted if the torque sensor bottom bracket does not function properly.

In order for another model of a torque sensor bottom bracket to work properly, it must be pre-calibrated.

The following parameters are used to operate and calibrate the torque sensor:

- 122 - Activation / deactivation of the torque sensor
  - set to 0, if there is no torque sensor installed
  - set to 1 when a torque sensor is installed
- 124 - ADC min.
  - When calibration is required, read from the MPe screen the minimum ADC value for the torque sensor in an unloaded state and enter here this value increased by 10.
- 125 - ADC max.

  - When calibration is required, read from the MPe screen the maximum ADC value for the torque sensor loaded as much so that the value no longer increases. Enter this value into this parameter. The crank must be parallel to the ground when loaded. The easiest way to do this is by standing with the entire weight on the pedal (usually you need to load the pedal with a minimum weight of 60 kg).
- 126 - kgF max.
  - When calibration is required, enter here the mass with which the pedal was loaded at which the ADC of the torque sensor reached its maximum value and did not increase any more. Usually it is 60 kg. Enter the value as kg * 10, so if it is 60 kg, then enter 600 (60*10=600). This value should also be given by the manufacturer of the torque sensor bottom bracket as the maximum value measured by the BB.

9.6. Thumb throttle operation settings

In the MPe system, the thumb throttle is connected to the main board, and only the MPe output is connected to the thumb throttle input in the motor controller. Thanks to this, we can influence the signal coming from the thumb throttle.
We can limit this signal individually for each assist level. This will affect:

- vehicle power limitation
- limiting the sensitivity of the thumb throttle (slower reaction of the vehicle to twisting of the thumb throttle, the so-called SoftStart)
- limitation of the operating range of the throttle (e.g. 100% twisting of the thumb throttle will be received by the motor controller as a 50% twisting of the thumb throttle)

The method of limiting the power can be assigned individually to a given assist level (parameters 135 - 139).

In the MPe system, there are two ways to limit the thumb throttle:

- power limitation mode (parameters 135 - 139 set to 1)
- percentage limit mode (parameters 135 - 139 set to 0)

9.6.1. Adjusting the operating voltage of the thumb throttle

In the MPe system, we can regulate the thumb throttle operating voltages. It is a signal coming from the thumb throttle, which changes depending on the twist of the thumb throttle.

The parameters responsible for the operation of the thumb throttle are:

- No. 13 TOT MIN - minimum voltage at the MPe output
- No. 14 TOT MAX - maximum voltage at the MPe output
- No. 15 TIN MIN - minimum voltage at MPe input
- No.16 TIN MAX - maximum voltage at the MPe input
- (The names TIN and TOT are short for Throttle In and Throttle Out.)

By default, in the MPeV6 system, the thumb throttle connected to the screw terminal connectors No. 25, 26, 27 gives the control signal with a voltage in the range of 0.8 – 3.5 V.

The exact value of this voltage can be read on the display screen. (In the MaxiColor 850C display and MPeBT application on the statistics screen, and in the MiniOled display in configuration parameter No. 998).

The display shows this value in the V * 100 unit, i.e. for a voltage of 0.8 V it will be 80, and for a voltage of 4.3 V it will be 430 etc.

9.6.1.1. Setting the TIN thumb throttle input

Using the reading of the value on the display screen, we can accurately set the input voltage parameters No. 15 TIN MIN and No. 16 TIN MAX. TIN values should be about 10 higher than the values indicated by the display, rounded to the nearest „ten".

For example: The value of incoming voltage of the thumb throttle in idle state, read on the display, is 83, enter 90 in the parameter No. 15 TIN MIN.

The value of the incoming voltage of the thumb throttle when twisted to 100% read on the display is 345, enter 350 into the parameter No. 16 TIN MAX.

Too low TIN MIN voltage value (parameter No. 15) will result in stopping the PAS pedal assist system. The MPe computer will read the thumb throttle at idle as the thumb throttle twisted. Such a situation will take place when the value of the TIN MIN parameter will be lower by 6 than the currently read value of the thumb throttle voltage parameters at the TIN input.

9.6.1.2. TOT throttle output setting

The voltage of the thumb throttle at the output TOT to the controller (connector No. 24 on the motherboard) should be within the usable voltage range at the input of the motor controller. Most often it is 0.8 V to about 3.5 V – 4.2 V, (parameter No. 80 set to 350 - 420)

TOT output voltage notes:

- too high value of TOT MIN voltage (parameter No. 13) will result in spontaneous rotation of the motor, which may be dangerous and may lead to crash of the vehicle or uncontrolled, unintended riding of the vehicle. When adjusting this parameter, keep the drive wheel (with the motor) raised above the ground.
- too high value of TOT MAX voltage (parameter No. 14) may result in the motor being cut off by the motor controller, and the MPe display may show a warning
- too low TOT MAX voltage value (parameter No. 14) may result in a situation in which the thumb throttle turned to 100% will not lead the engine controller to deliver 100% of the set power

9.6.1.3. Thumb throttle safe voltage

Thumb throttles based on a magnet-controlled hall sensor have such a problem that when they lose connection with the ground (GND) of the vehicle, they automatically give the throttle signal at 100%. In order to counteract the situation in which the damaged connection of the thumb throttle leads to the spontaneous driving of the vehicle with full power, the MPe system is equipped with a safety mechanism. It is activated when the TIN input voltage exceeds a set value.

The value of safe voltage of the thumb throttle is set in configuration parameter No. 18 and it should be 20 higher than that set in parameter No. 16 TIN MAX.

For example: If the value of the parameter No. 16 TIN_MAX is 350, then the value by 20 greater should be entered into the parameter No. 18, i.e. 370 in this case.

When the voltage at the TIN input exceeds the value set in parameter No. 18, MPe cuts off the drive and shows a warning on the display.

9.6.2. Thumb throttle power limit mode

When we set the thumb throttle to the power limitation mode (parameters 135 - 139 set to 1), we can use the built-in PID controller (you can read more about the PID controller at the beginning of this chapter). Then, twisting of the thumb throttle from 0 - 100% results in a power set from 0W to, for example, 1000W (to be set in parameters 130 - 134). In this way, we can be sure that the vehicle will not draw more power from the battery than we set, and the power will increase linearly with the twisting of the thumb throttle.

The maximum power limitation in this mode is 1000W.

9.6.3. Thumb throttle percentage limit mode

When we set the thumb throttle to the percentage limit mode (parameters 135 - 139 set to 0), we have an influence on the range of the thumb throttle operation. This means that we can set the thumb throttle in such a way that after twisting the thumb throttle to 100%, the MPe system will send to the controller only the signal that corresponds to the percentage limit set for a given assist level (parameters 130 - 134).

For example: We have a set limitation of 70%, we twist the thumb throttle physically to 100% and MPe will send a signal to the controller of thumb throttle twisted only to 70%.

9.7. Cruise control

In MPeV6 there is an active cruise control which tries to maintain the set speed,
regulating the power set on the controller on an ongoing basis.
The maximum speed of the cruise control is 40 km/h.
The maximum power allocated to the cruise control is 2000 W.

Cruise control operation via the MaxiColor 850C display:

- switching on the cruise control: when the main screen 1 or the main screen 2 is displayed, hold the minus (-) button on the remote control
- acceleration by 2 km/h: press and hold the button plus (+) on the remote control

- deceleration by 2 km/h: press and hold the minus (-) button on the remote control
- disabling: to turn off the cruise control, click any button once, move the thumb throttle or activate the brake sensor

Cruise control operation via the MiniOled display:

- turning on: when the main screen is displayed, hold down the bottom button
- acceleration by 2 km/h: press and hold the top button
- 2 km/h slowdown: press and hold the bottom button
- turning off: to turn off the cruise control, click any button once, move the thumb throttle or activate the brake sensor

Cruise control operation via a smartphone application (MPeBT module):

- it is not possible to activate the cruise control using the smartphone application itself
- need to install additional buttons by. connection diagram No. S6.X_MPeV6 and proceed as in the case of MiniOled display buttons

9.7.1. Description of cruise control operation and settings

The configuration includes the following parameters that are responsible for the operation of the cruise control:

- minimum power (parameter No. 62)
- maximum power (parameter No. 63)
- power ramp up speed (parameter No. 64)
- maximum speed (parameter No. 65)

Cruise control works in such a way that when it is turned on, the current speed is saved, which the cruise control will try to maintain. Cruise control maintains speed by increasing or decreasing the set power (that is, adds or subtracts the throttle signal sent to the controller).

At the same time, to the cruise control will be assigned the power with which the vehicle will be ridden to maintain the given speed. As speed increases, the power required to maintain it also increases.

Cruise control power is assigned as follows:

1. MPe system compares and determines the percentage position of the current speed in relation to the zero speed and the maximum speed of the cruise control (parameter No. 65)
2. the MPe system assigns the cruise control power in the range between the minimum power (parameter No. 62) and the maximum power (parameter No. 63). With such power, it will try to run the motor to maintain the set speed

Example: The minimum power is set to 100 W, the maximum power is set to 1000 W, the maximum speed is set to 40 km/h, the desired to maintain speed is 20 km/h. With such settings, the power assigned to the cruise control is 50% of the power value between the minimum power and the maximum power, i.e. approx. 550 W.

If we set too low power values, the cruise control may not obtain set speed.

If we set too high power values, the cruise control may jerk at low speeds.

The reaction speed of the cruise control to the actual speed change is determined by the parameter No. 64, i.e. the speed of increasing the cruise control power. Light electric vehicles have high inertia, which means that they can maintain speed for a long time without the influence of external forces when they are accelerated. Therefore, the cruise control reaction cannot be too fast, because the cruise control will not be able to maintain the set speed and will often exceed it significantly. The default value of cruise control power ramp up speed is approx. 300 W/s and will be appropriate in most cases. Allowed values 50-500 W/s.

9.8. Current sensor protection

Current sensor provides the MPe computer with basic information, i.e. the present value of the current drawn from the battery. Most of the indications and functions of the MPe computer are based on this indication. Damage to the current sensor or its incorrect calibration can be dangerous in high-powered vehicles.

Due to the above, basic protections have been implemented to check the correct operation of the current sensor. It will cut-off of the motor in the case of the negative current consumption (threshold set in parameter No. 9). If there was lack of this protection, the power of the PAS pedaling assistance will be infinite in the event of a wrongly set direction of the current sensor or its failure. Too low value of this protection will delay the activation of the motor after regenerative braking.

9.9. Low battery voltage protection

The MPe computer can cut off the motor (by disabling the signal output to the throttle input in the controller), if it detects the battery voltage below the LVC (Low Voltage Cutoff) threshold set in parameter 3. This prevents excessive discharge of the battery, which could lead to it damage. However, it does not replace the operation of the BMS (Battery Management System) in the battery and its use is recommended. The BMS system can detect the voltage drop across a single section of the battery, and the MPe system only detects the voltage drop across the battery.

Also, batteries close to discharge has a higher voltage drop under load - the higher the power consumption, the greater the voltage drop. It may turn out that at high power consumption, the voltage drop is so large that the voltage drops below the LVC threshold - then the MPe computer will periodically disconnect and engage the motor (the ride will be jerky). This will be a signal that we are approaching the discharge of the battery and the power drawn from the battery should be reduced. It is then advisable, for example, to reduce the level of assistance and not to apply a lot of throttle, in order to be able to continue driving for some distance.

9.10. Thermal protection

The MPe computer can disconnect the motor (by disconnecting the signal output to the throttle input in the controller) after exceeding the set temperature threshold. This threshold can be set separately for the T1 temperature and for T2 (parameters 43 and 44).

By default, the threshold for T1 is 140, and for the temperature of T2 it is 60.

(The unit depends on the temperature reading unit set in parameter No. 40, default 0, i.e. degrees Celsius)

10. Updating the motherboard and display firmware

From time to time, firmware may be updated in the MPe motherboard or in the MaxiColor 850C display. The MiniOled display is not separately upgradeable - it is controlled by the motherboard and updated with it. The current firmware status and version can be checked at the address below. This address also describes the procedure for initializing and updating the firmware.

10.1. Web address to download the motherboard update

https://bikel.pl/en/mpe-firmware-update/

Accessory needed:

- In order to be able to update the firmware on the MPe motherboard, you need the the MPe „universal programming tool".

10.2. Web address to download the MaxiColor 850C display update

https://bikel.pl/en/firmware-update-maxicolor-850c/

Accessory needed:

- In order to be able to update the firmware on the MaxiColor 850C display, you need the MPe „universal programmer".
- Note: When updating the firmware, both USB plugs must be connected to the computer. One plug is for power delivery, the other for data transmission.

11. Handling the used equipment

Worn-out devices, i.e. MPe computer and its components, should be properly disposed of in specially designed containers for used electronic devices.

It is forbidden to put them together with other waste.

Failure to comply with this requirement may result in a potential risk to the environment or human health.

The re-use and processing of used equipment and its components is not recommended by the manufacturer. They should be disposed of in suitable containers.

12. Warranty

1. The products of the manufacturer Bikel.pl are guaranteed for proper operation for a period of 24 months from the date of purchase. We include here:

- MPe motherboard
- MiniOled display
- MaxiColor 850C display (purchased in our store)
- Current sensor
- MPeBT module
- universal programming tool
- motherboard socket extension MPe

2. The defects revealed during this time will be removed free of charge within 14 working days. The time is counted from the date of delivery to the contact address provided in this manual.
3. The condition for granting the warranty is that the user has read the manual and use the equipment in accordance with this manual.
4. The warranty does not apply in the case of:
    - tampering with the device
    - mechanical or chemical damage
    - use in a way not provided for in this manual
    - connection other than described in this manual and shown in the attached diagrams
5. The warranty repair is understood as the activities of a specialist nature performed by service, appropriate to remove the defect covered by the warranty. The warranty repair does not cover the activities provided for in the manual, which the user is obliged to perform on his own and at his own expense, e.g. installation, operation check, device configuration, etc.
6. Before sending the device for warranty repair, please contact us by phone or via the e-mail address provided in this manual and declare your willingness to send the equipment for repair.

13. FAQ - frequently asked questions and answers

13.1. Will the MPe fit my vehicle?

1. Will the MPe fit my vehicle?

   The MPe computer is designed mainly to vehicles built from scratch and fits all controllers that have a thumb throttle input, and their supply voltage is less than 100 V. If you are in doubt as to whether the MPe will fit your vehicle, you can contact us using the contact details at the end of this manual. We always try to help our clients.

2. Is it possible to put MPe on the factory e-bike and remove the 25 km/h limit?

   Unfortunately not. MPe is not designed to closed systems and central drives, which are found in factory e-bikes. MPe is not used to unlock the drive from the factory limits.

13.2. Connection to the vehicle and first run

1. I am connecting the MPe computer to the vehicle for the first time. What do i need to do first?
   Very important thing: if this is your first e-bike and you are just connecting components to the vehicle, first start and check if the vehicle is fully functional (battery, controller, motor) before connecting the MPe. Then refer to the sections of this manual, „Before Connecting", „Connecting to the Vehicle" and „First run of the device". Only in the next step, you can connect the MPe to the vehicle (then it is simply easier to eliminate the possible source of error).
2. I already have an ignition switch in the vehicle, can I connect it to the MPe so that it can run the controller and MPe together?
   Yes. You can use the ignition switch output with battery voltage and connect this battery voltage from after the ignition switch both to the controller and to MPe on connector No. 1. Then nothing is connected to connector No. 2 in MPe.
3. Which way to connect the current sensor to the battery?
   It does not matter in which direction of the current flow we connect the current sensor, as it is bidirectional. If, after connecting, it turns out that the current read from MPe has a negative sign, it is enough to reverse the direction of the current reading in the configuration (parameter 6 - measurement direction). The current indicated by MPe while driving while the battery power is being drawn must have a positive value.
4. Only 1 wire from the temperature sensor comes out of the motor. How to connect it?
   Connect the cable that comes out of the motor from the temperature sensor to connector No. 32. At the same time, we must set the „D" switch (on the main board) to the ON position, ie turned on. At this point, in the configuration, we can choose the type of sensor, depending on what is installed. The type of sensor T1 is selected in parameter No. 41.

5. Is it normal that we connect only one cable to the controller in place of the thumb throttle input?
   Yes, of course. Normally we connect three wires of the thumb throttle to the controller, because the controller supplies power to the throttle. Two of the three wires are for power and the third is for the signal. When we use MPe, the throttle is powered from the MPe motherboard, and only a signal is sent to the controller, so the power cables are not used.
6. Can I use an ordinary shunt (shunt resistor) instead of a current sensor?
   Unfortunately, this is not possible. MPe works with dedicated current sensors, operating on the Hall effect principle, where the output is by default half of the supply voltage (with increasing current consumption, the voltage increases, and with a decrease or negative value, the voltage decreases linearly with a given resolution).
7. Can I connect bicycle lighting to the 12 V output from MPe?
   Unfortunately, you cannot connect the bike's lighting, as this 12 V output is provided to power the MaxiColor 850C display. It also has a very low current efficiency, so it cannot bear the load generated by the bicycle's lighting.
8. I have just connected the MPe computer to the vehicle, after a while of assisting, warning sign „!" pops up. Motor does not work or its run is very jerky. What is the reason for this?
   Most likely, the first run procedure was not completed in accordance with the operating manual. Such symptoms occur when, for example, the current reading generates a negative current, i.e. the direction of the current sensor operation is incorrect (parameter 6). Also, similar symptoms are the result of incorrectly set throttle voltages (parameters 13-18), incorrect low voltage cut-off threshold for discharged battery (parameter # 3) or incorrect temperature reading that goes beyond the cut-off range of the motor. Follow the instructions in the „First run" section of this manual.
9. I have just connected the MPe and the battery indicator shows the charge value inaccurately. What is the reason for this?
   The Charge Indicator bases its operation on the settings we have introduced, which are the battery capacity in ampere hours [Ah] and watt hours [Wh], low voltage cut-off setting and full battery voltage setting. These are the first four configuration parameters that must be properly set. During the first installation, even after these parameters are set, there may be a discrepancy between the battery charge level indication and the actual battery charge level. This is normal and it will self-adjust when we first charge the battery to 100% and the MPe detects it.
   We can also refresh it manually.
   For the MiniOled display: on screen 4, where we have labels such as IM, WU, WK and AU, hold the bottom button for 2 seconds, then the AU and WU values will update to approximately the current battery level.
   For MaxiColor 850C display: enter the statistics screen, holding the plus and minus simultaneously, and then, when we are on this statistics screen, hold the power on switch and plus simultaneously for 2 seconds, the battery discharge values will refresh.

13.3. Pedal Assist System (PAS) operation

1. Is it possible to add a PAS also for my controller?
   Yes, the MPe computer allows you to add a PAS for all controllers available on the market that have an input for the thumb throttle. Even for those drivers that do not allow adding PAS sensors by default.
2. What is the difference between the PAS pedaling assistance based on the cadence sensor only compared to the pedaling assistance based on the torque sensor combined with the cadence sensor?
   Assistance using only the cadence sensor is less demanding for the rider. By setting a sufficiently high level of support, you can ride a bike with practically no effort. When the assist is based on the pedal pressure sensor, we always have to put even a minimal amount of force into pedaling.
   By using only the cadence sensor, the bike drive aims to achieve a specific speed and power assigned to a given assist level. When the system detects the rotation of the cranks, the drive engages and supports us even when the chain is not under tension. All we have to do is turn the crank „in the air" without any clear pressure on the pedals. When following someone, it is difficult to maintain the desired speed and either we approach the cyclist in front of us or we are left behind. There are often situations in which we have to use the brake, increase or decrease the assistance level, or we have to stop pedaling altogether. Also, the bike is often ahead of our current gear ratio and we spin our legs „in the air".
   By using a torque sensor in combination with a cadence sensor, we can measure the cyclist's power. This allows the system to better understand the rider's intentions. When the cyclist pedals harder and faster, the bicycle's drive also supports with more power. As the effort put into pedaling decreases, the drive will also reduce the power of the assist. Thanks to this, by changing the way of pedaling, we influence the behavior of the drive. Riding a bicycle becomes more natural, very similar to riding a regular, non-electric bicycle - we just get tired less. When following someone, we have no problem with adjusting the speed. If we approach the rider's in front of us wheel dangerously, we simply weaken the intensity of our pedaling and slow down. When our companion starts to accelerate and move away, it is enough that we start pedaling harder and we already have the same speed as our rider in front of us. There will never be a situation where the bike will overtake our pedaling. We always have to press the pedals even slightly. When there is no pressure on the pedals, the power of the rider and drive will drop to zero and the bike will not accelerate further.
3. What is the recommended cadence sensor (PAS sensor) and the number of magnets in the sensor?
   The cadence sensor (PAS sensor) can be any, three-wire, 5 V power supply. We recommend using a sensor with at least 12 magnets or more. Fewer magnets will result, for example, in a slower activation of the PAS or a later deactivation of the PAS when you stop pedaling.
   We recommend that you only use sensors that do not work when cranking backwards. Sensors that also work when turning the cranks backwards are dangerous (when we pull reverse the bike, the cranks turn and the MPe can detect this movement as an impulse to activate the PAS assist system and the

bike will move forward). Whether the sensor works while turning the cranks backwards depends only on the type of sensor used - please ask your dealer.

4. What is the recommended bottom bracket with torque sensor?
   The recommended torque sensor is eRider T9. Its advantage is to lead the cable in such a way that you do not need to drill a hole in the bicycle frame. Its second very important advantage is the fact that it measures the torque on both cranks, and not only on the left, like other BB's. The third very important feature is the fact that the bottom bracket has an integrated cadence sensor with 18 magnets - so it is very accurate.
5. I want to use both the pedal pressure sensor (torque sensor) and sometimes only ride the cadence sensor. Do I have to buy and install an additional cadence sensor?
   No, there is no such need. The eRider T9 bottom bracket has a built-in cadence sensor. In the MPe system, you can set several levels of support for the torque sensor, and leave a few using only the cadence sensor. The user has the freedom of choice and the ability to change the method of assistance while driving.
6. In unlocked mode, PAS assistance does not work, and in locked mode it works normally. In the unlocked mode, only the throttle is working. Why?
   It has to do with improperly set input voltage of the thumb throttle TIN MIN. Most likely, it is set too low and the MPe believes that the thumb throttle is minimally twisted all the time and therefore does not activate PAS assist. This is set in parameter No. 15, which defaults to 90. This value should be rounded up to the nearest ten and greater than the minimum thumb throttle incoming voltage to MPe that can be read on the display.
   For example: if the minimum thumb throttle voltage input to the MPe (read on the MPe display) is 91, then parameter No. 14 should be set to 100 (rounded up to the nearest ten).
7. When I ride steadily on the PAS pedal assist, for a long time at a speed close to the limit of the assist level, from time to time the bike gets a big boost and jerks? What is the reason for this?
   This is due to an incorrectly (too high) set speed limit option for PAS BOOST activation (pedaling assistance, parameters No. 115-119). This speed must be set so as to be below continuous speed which can be maintained in steady normal driving. Usually it is about 8-10 km/h less than the general speed limit for a given assist level (parameters 80-84).
   For example: When we have a general speed limit of 30 km/h for the assist level 4, the bike will accelerate with a steady ride to approx. 27 km/h, because from 25 km/h MPe starts to reduce the power so as not to exceed the set 30 km/h. Then we drive steadily about 27 km/h. This speed is maintained because the power-speed balance has been reached. Therefore, the speed limit of the PAS BOOST gain must be set below this value, e.g. up to 22 km/h (so 8 km/h less than the general speed limit for this assist level). The point is that this value should be below the speed that we are able to maintain during normal, steady and long driving.
8. Why do the assist levels seem to have the same amount of power in locked mode?
   In the locked mode, the power and speed of a given level of assistance does not change if is lower than that set for the locked mode (default 25 km/h 250

W). If the unlocked level of assistance is set above the locked values, then after activating the locked mode, the power and speed values of the given level of assistance will be overwritten / reduced with those for the locked mode. Therefore, if we have several levels of assistance set above the value of the locked mode, then after activating the locked mode, these levels will have the same limits (such as for the locked mode). Then, in locked mode, the change of assist level will not translate into a change in the amount of assistance power.

9. The power of assist „waves", what is the reason for this?
   The default MPe settings should fit most vehicles. There may be times that the settings will have to be tuned to your vehicle. The most common cause of power fluctuations during support are incorrectly set PID coefficients (parameters No. 50 to 61). The parameters of the speed of power ramp up (parameters No. 100 to 104) also have a large influence on the unwanted power waving.

13.4. Thumb throttle

1. I just connected the MPe to the vehicle for the first time and the thumb throttle is not working. What is wrong?
   First of all, follow all the instructions in the „First run of the device" section and configure the list of basic parameters. The MPe computer must be in unlocked mode to use the thumb throttle operation. By default, the MPe starts in locked mode, in which the thumb throttle is inoperative and power is limited to that set for locked mode.
2. Why, when I twist the thumb throttle to 100%, the vehicle cuts off the drive, and when I twist only a little, the vehicle is driving normally?
   If this happens with the wheel in the air it is normal. The current sensor protection works, which does not measure the current high enough for the currently twist of thumb throttle. This functionality can be turned off in parameter 8.
   If this situation also occurs during normal driving, most likely the thumb throttle voltage is wrongly set (configuration parameters 13 to 18). First, set the input parameters of the thumb throttle correctly (parameters 15 and 16). To do this properly, follow the recommendations in the section „Description of MPeV6 computer functions and their configuration" - „Throttle operation settings". Next, set parameters 13 and 14. Parameter No. 14 (TOT_MAX) should be set as high as possible, before the point in which controller cuts off the drive.
   For example: we set the value to 350, we twist the thumb throttle to 100% and the controller does not cut off the drive, it is ok. We give the value to 400, we twist the thumb throttle to 100% and the controller cuts it off, which means that there is too much voltage at the output to the controller. In this case, this value should be reduced.
3. Can I set the voltage of the thumb throttle output to the controller to more than 3.5 V?
   The voltage of the thumb throttle output from the MPe is set as most controllers on the market expect, ie up to 3.5 V. For some controllers, eg Sabvoton, this value can be changed, because these controllers also have their

voltage regulation in the setup program.
The reference voltage is not always equal to the actual voltage coming from MPe.
For example: not always TOT MAX voltage set to 350 will result in 3.5 V at output. It depends on the type of controller and installation. The TOT MAX parameters should be set as high as possible, just until the controller is still working normally. When we set TOT MAX too high, the controller will read it as a damaged thumb throttle and cut off the drive.

4. Is it possible to enable the thumb throttle for the locked mode?
There is no such possibility and it is a deliberate procedure. The throttle lever works only for the unlocked mode.

13.5. Regenerative braking

1. How to activate regenerative braking with MPe?
MPe does not interfere with the operation of the regenerative braking which is controlled by the controller. In order to activate regenerative braking, the controller must be informed that the brake is applied. Therefore, we connect the brake sensor located in the brake handle to both the MPe and the controller. At this point, when we press the brake handle, the controller and MPe will cut off the drive, and the controller will activate regenerative braking (if it has such a function and it is correctly set).
2. I have a regenerative braking thumb throttle, can I use it with the MPe?
Yes, the MPe computer does not interfere with the operation of regenerative braking managed by the controller. Of course, you can connect a regenerative brake thumb throttle to the controller.
There is, however, an inconvenience. Due to the fact that the brake thumb throttle is not connected to the MPe, the MPe will not see that the brake thumb throttle is applied and that we want to brake when using the regenerative brake thumb throttle.
This situation may occur: the rider pedals all the time, uses the regenerative brake thumb throttle, the controller cuts off the drive. MPe will read this as a drop in power, and because we are pedaling all the time, MPe will want to increase this power to get to what is possible and should be given. This increases the throttle signal sent to the controller. When the driver releases the regenerative brake thumb throttle, there may be a jerk (for a split second), felt by the driver. The only way to prevent this is to add a magnetic sensor that will react to the twist of the brake thumb throttle. There is a magnet in the thumb throttle, which will activate the brake sensor. The sensor should be placed near the regenerative braking throttle. When we twist the thumb throttle, the magnet will move and activate the brake sensor attached to the throttle and will give a signal to MPe that the brake is active. The position of the brake sensor glued to the brake throttle should be selected experimentally so that the sensor is activated at the minimum twist of the brake thumb throttle.

3. After using regenerative braking, the thumb throttle does not work (for 2 s). What can I do about it so that this delay is not there?
This delay is due to the fact that the current reading during regenerative

braking becomes negative. MPe has a protection against throttle output when the current is negative. This is to prevent malfunction of the PAS assist system. This value of negative current, at which the drive is cut off, can be defined with parameter No. 9. By default, it is set to -2 A. When we have a correctly configured MPe and only this functionality annoys us, we can increase the value from these -2 A, to e.g. 10 A or 15 A. Then, the thumb throttle after braking will not be delayed.

13.6. MiniOled display

1. How to reset the daily distance in the MiniOled display?
   Enter the statistics screen (by pressing two buttons at a time) and on the screen 2 (where we have the TR value - this is the parameter) hold the bottom button on the display for 2 seconds. Together with the daily distance, all other memorized values will be reset, e.g. maximum speed, average speed, running time, maximum power, maximum current.
2. Is the MiniOled display waterproof?
   Yes, both the display and the buttons on it are waterproof.

13.7. MaxiColor 850C display

1. How to reset the daily distance in the MaxiColor 850C display?
   Enter the statistics screen (on the remote control, hold 2 buttons at once plus (+) and minus (-) for one second), and then hold 2 buttons at once for 2 seconds: minus (-) and switch (o). Together with the daily distance, all other memorized values will be reset, e.g. maximum speed, average speed, running time, maximum power, maximum current.
2. Can I connect the MaxiColor 850C display so that it turns on right after turning on the ignition switch?
   Unfortunately, this is not possible. The MaxiColor 850C display turns on only with the remote control on the handlebar, which is dedicated to this display.
3. Can I use a different remote control for the MaxiColor 850C display?
   Unfortunately, this is not possible.
4. Is the MaxiColor 850C display waterproof?
   Yes, both the display and the buttons on it are waterproof. Degree of protection: IP65 - the first digit of the text means protection against access to hazardous parts by a wire and full dust-proof protection, the second digit - protection against a stream of water with an intensity of 12.5 l/min poured on the housing from each side.

13.8. Other questions

1. When during the service, with the drive wheel raised, I turn on the PAS support or cruise control, the power waves terribly. What is wrong?
   For the MPe system, the PAS assist functions and cruise control base their operation on reading the current drawn from the battery. When the wheel is raised, the power consumption is negligible compared to normal driving. Therefore, it is impossible for the PAS and cruise control to function properly in service conditions with the drive wheel raised. These functions should be

tested and fine-tuned during normal driving.

2. MPe shows me 999 travel range. What's going on?
   In order for MPe to correctly show the remaining distance to be ridden, it must have actual driving data. If it is a fresh installation or just after resetting the counter, this value is perfectly normal. It will update as the vehicle begins to move under normal road conditions.
3. Will the MPe computer handle 2 controllers? I would like a bicycle with a motor for each wheel.
   Yes you can, but in MPe there is no output for two separate controllers. This means that we will not be able to define a different power for motor 1 and a different one for motor 2. However, you can connect two motors in parallel, simultaneously controlled by one thumb throttle with one signal. This solution can be done and there will be no problem with it. You then need two motor controllers for each motor individually. Both will be connected after the MPe measuring module, and the MPe will show the total power drawn from the battery by both controllers. This solution is possible.
4. Can I use two motors with different parameters, e.g. 500 W for the front and 1000 W for the rear?
   You can use two different. Just one will take more energy than the other and give different power. Alternatively, you can use the wiring from the controllers and install various switches of their operating modes, or turn one off completely.
5. Can I connect 3 temperature sensors (engine, controller, battery)? Is the device prepared for a maximum of two sensors?
   MPe can have a maximum of 2 temperature sensors.

14. Contact

bikel.pl

Phone: (+48) 732 443 033

E-mail: info@ebikecomputer.com

Website: https://ebikecomputer.com

Address:

Lipowa 17A/4 street

63-000 Środa Wlkp.

Poland

Stay tuned:

Manufacturer's website: https://bikel.pl/en

Facebook: bikel.pl

Facebook group: e-BIKEL-owcy / fani pojazdów elektrycznych (e-BIKEL'ers fans of electric vehicles)

Instagram: bikel.pl

YouTube: bikel pl

1 2 3 4 5 6 7 8

A B C D E

BEFORE INSTALLING READ OWNER'S MANUAL

PRZED INSTALACJĄ CZYTAJ INSTRUKCJĘ OBSŁUGI

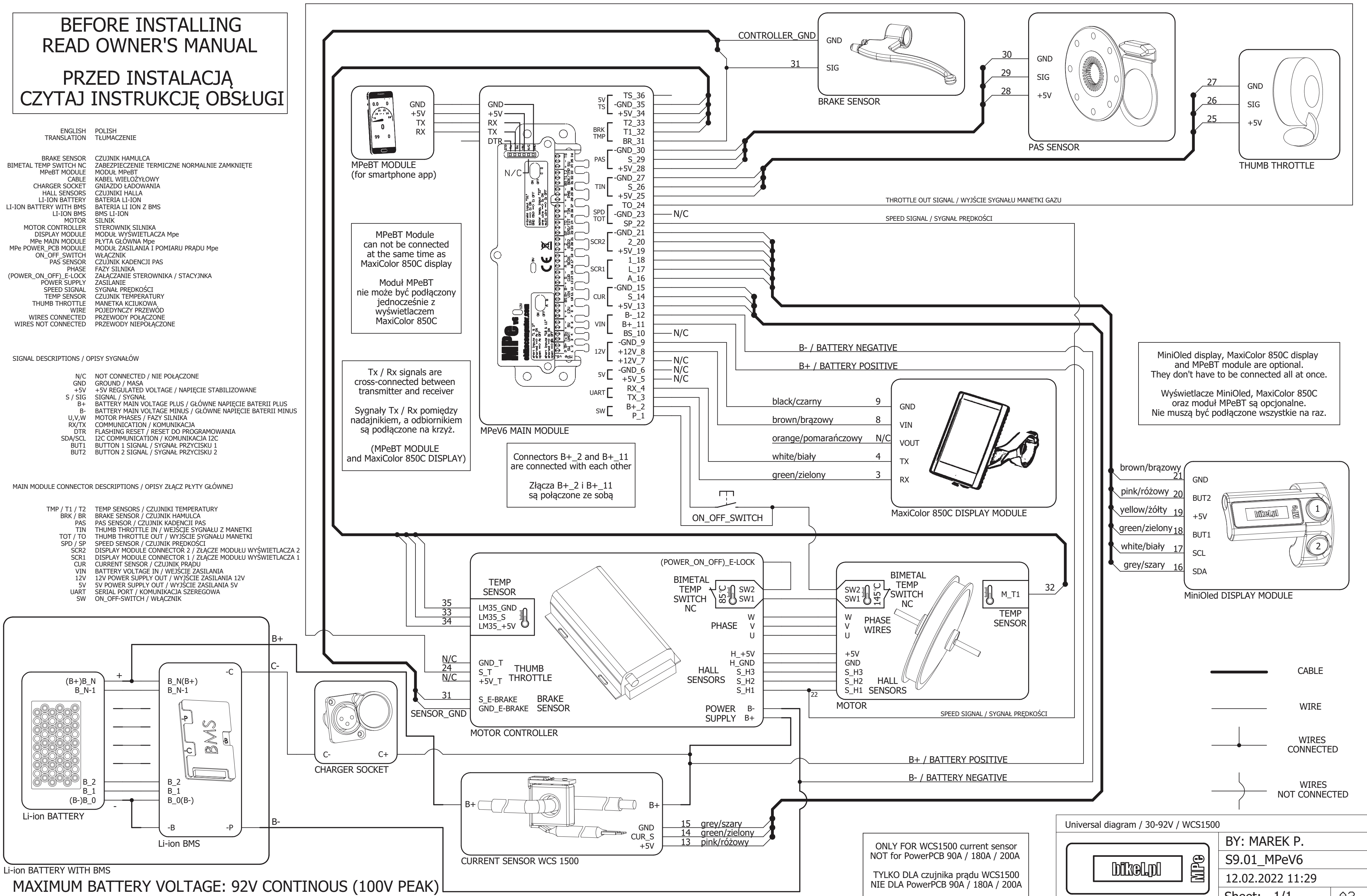
ENGLISH TRANSLATION	POLISH TŁUMACZENIE
BRAKE SENSOR	CZUJNIK HAMULCA
BIMETAL TEMP SWITCH NC	ZABEZPIECZENIE TERMICZNE NORMALNIE ZAMKNIĘTE
MPeBT MODULE	MODUŁ MPeBT
CABLE	KABEL WIELOŻYŁOWY
CHARGER SOCKET	GNIAZDO ŁADOWANIA
HALL SENSORS	CZUJNIKI HALLA
LI-ION BATTERY	BATERIA LI-ION
LI-ION BATTERY WITH BMS	BATERIA LI ION Z BMS
LI-ION BMS	BMS LI-ION
MOTOR	SILNIK
MOTOR CONTROLLER	STEROWNIK SILNIKA
DISPLAY MODULE	MODUŁ WYŚWIETLACZA Mpe
MPe MAIN MODULE	PŁYTA GŁÓWNA Mpe
MPe POWER_PCB MODULE	MODUŁ ZASILANIA I POMIARU PRĄDU Mpe
ON_OFF_SWITCH	WŁĄCZNIK
PAS SENSOR	CZUJNIK KADENCJI PAS
PHASE	FAZY SILNIKA
(POWER_ON_OFF)_E-LOCK	ZAŁĄCZANIE STEROWNIKA / STACYJNKA
POWER SUPPLY	ZASILANIE
SPEED SIGNAL	SYGNAŁ PRĘDKOŚCI
TEMP SENSOR	CZUJNIK TEMPERATURY
THUMB THROTTLE	MANETKA KCIUKOWA
WIRE	POJEDYNCZY PRZEWÓD
WIRES CONNECTED	PRZEWODY POŁĄCZONE
WIRES NOT CONNECTED	PRZEWODY NIEPOŁĄCZONE

SIGNAL DESCRIPTIONS / OPISY SYGNAŁÓW

N/C	NOT CONNECTED / NIE POŁĄCZONE
GND	GROUND / MASA
+5V	+5V REGULATED VOLTAGE / NAPIĘCIE STABILIZOWANE
S / SIG	SIGNAL / SYGNAŁ
B+	BATTERY MAIN VOLTAGE PLUS / GŁÓWNE NAPIĘCIE BATERII PLUS
B-	BATTERY MAIN VOLTAGE MINUS / GŁÓWNE NAPIĘCIE BATERII MINUS
U,V,W	MOTOR PHASES / FAZY SILNIKA
RX/TX	COMMUNICATION / KOMUNIKACJA
DTR	FLASHING RESET / RESET DO PROGRAMOWANIA
SDA/SCL	I2C COMMUNICATION / KOMUNIKACJA I2C
BUT1	BUTTON 1 SIGNAL / SYGNAŁ PRZYCISKU 1
BUT2	BUTTON 2 SIGNAL / SYGNAŁ PRZYCISKU 2

MAIN MODULE CONNECTOR DESCRIPTIONS / OPISY ZŁĄCZ PŁYTY GŁÓWNEJ

TMP / T1 / T2	TEMP SENSORS / CZUJNIKI TEMPERATURY
BRK / BR	BRAKE SENSOR / CZUJNIK HAMULCA
PAS	PAS SENSOR / CZUJNIK KADENCJI PAS
TIN	THUMB THROTTLE IN / WEJŚCIE SYGNAŁU Z MANETKI
TOT / TO	THUMB THROTTLE OUT / WYJŚCIE SYGNAŁU MANETKI
SPD / SP	SPEED SENSOR / CZUJNIK PRĘDKOŚCI
SCR2	DISPLAY MODULE CONNECTOR 2 / ZŁĄCZE MODUŁU WYŚWIETLACZA 2
SCR1	DISPLAY MODULE CONNECTOR 1 / ZŁĄCZE MODUŁU WYŚWIETLACZA 1
CUR	CURRENT SENSOR / CZUJNIK PRĄDU
VIN	BATTERY VOLTAGE IN / WEJŚCIE ZASILANIA
12V	12V POWER SUPPLY OUT / WYJŚCIE ZASILANIA 12V
5V	5V POWER SUPPLY OUT / WYJŚCIE ZASILANIA 5V
UART	SERIAL PORT / KOMUNIKACJA SZEREGOWA
SW	ON_OFF-SWITCH / WŁĄCZNIK



MAXIMUM BATTERY VOLTAGE: 92V CONTINOUS (100V PEAK)

ONLY FOR WCS1500 current sensor
NOT for PowerPCB 90A / 180A / 200A

TYLKO DLA czujnika prądu WCS1500
NIE DLA PowerPCB 90A / 180A / 200A

Universal diagram / 30-92V / WCS1500	
BY: MAREK P.	
S9.01_MPeV6	
12.02.2022 11:29	
Sheet: 1/1	A3

1 2 3 4 5 6 7 8

A B C D E

BEFORE INSTALLING READ OWNER'S MANUAL

PRZED INSTALACJĄ CZYTAJ INSTRUKCJĘ OBSŁUGI

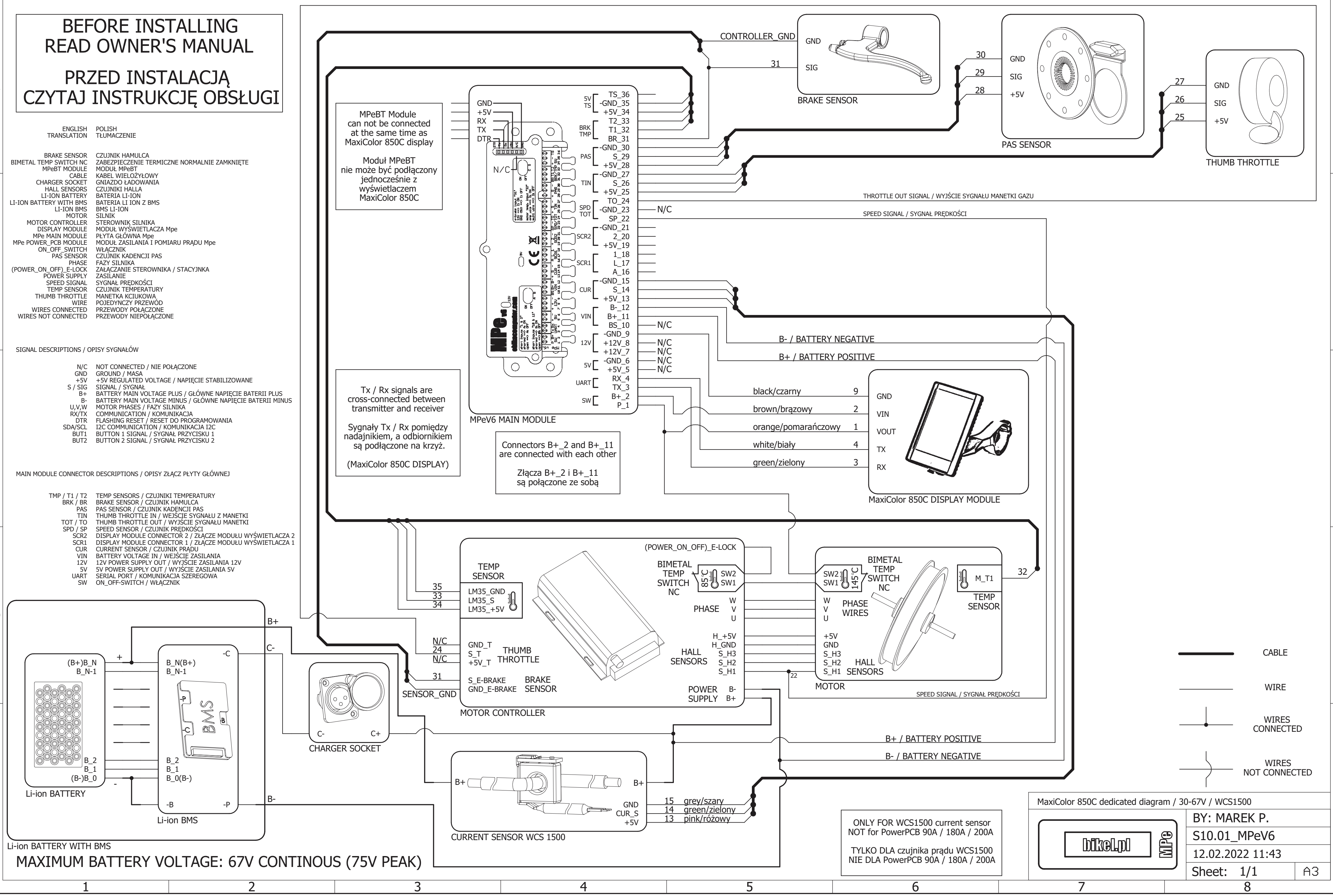
ENGLISH TRANSLATION	POLISH TŁUMACZENIE
BRAKE SENSOR	CZUJNIK HAMULCA
BIMETAL TEMP SWITCH NC	ZABEZPIECZENIE TERMICZNE NORMALNIE ZAMKNIĘTE
MPeBT MODULE	MODUŁ MPeBT
CABLE	KABEL WIELOŻYŁOWY
CHARGER SOCKET	GNIAZDO ŁADOWANIA
HALL SENSORS	CZUJNIKI HALLA
LI-ION BATTERY	BATERIA LI-ION
LI-ION BATTERY WITH BMS	BATERIA LI ION Z BMS
LI-ION BMS	BMS LI-ION
MOTOR	SILNIK
MOTOR CONTROLLER	STEROWNIK SILNIKA
DISPLAY MODULE	MODUŁ WYŚWIETLACZA Mpe
MPe MAIN MODULE	PŁYTA GŁÓWNA Mpe
MPe POWER_PCB MODULE	MODUŁ ZASILANIA I POMIARU PRĄDU Mpe
ON_OFF_SWITCH	WŁĄCZNIK
PAS SENSOR	CZUJNIK KADENCJI PAS
PHASE	FAZY SILNIKA
(POWER_ON_OFF)_E-LOCK	ZAŁĄCZANIE STEROWNIKA / STACYJNKA
POWER SUPPLY	ZASILANIE
SPEED SIGNAL	SYGNAŁ PRĘDKOŚCI
TEMP SENSOR	CZUJNIK TEMPERATURY
THUMB THROTTLE	MANETKA KCIUKOWA
WIRE	POJEDYNCZY PRZEWÓD
WIRES CONNECTED	PRZEWODY POŁĄCZONE
WIRES NOT CONNECTED	PRZEWODY NIEPOŁĄCZONE

SIGNAL DESCRIPTIONS / OPISY SYGNAŁÓW

N/C	NOT CONNECTED / NIE POŁĄCZONE
GND	GROUND / MASA
+5V	+5V REGULATED VOLTAGE / NAPIĘCIE STABILIZOWANE
S / SIG	SIGNAL / SYGNAŁ
B+	BATTERY MAIN VOLTAGE PLUS / GŁÓWNE NAPIĘCIE BATERII PLUS
B-	BATTERY MAIN VOLTAGE MINUS / GŁÓWNE NAPIĘCIE BATERII MINUS
U,V,W	MOTOR PHASES / FAZY SILNIKA
RX/TX	COMMUNICATION / KOMUNIKACJA
DTR	FLASHING RESET / RESET DO PROGRAMOWANIA
SDA/SCL	I2C COMMUNICATION / KOMUNIKACJA I2C
BUT1	BUTTON 1 SIGNAL / SYGNAŁ PRZYCISKU 1
BUT2	BUTTON 2 SIGNAL / SYGNAŁ PRZYCISKU 2

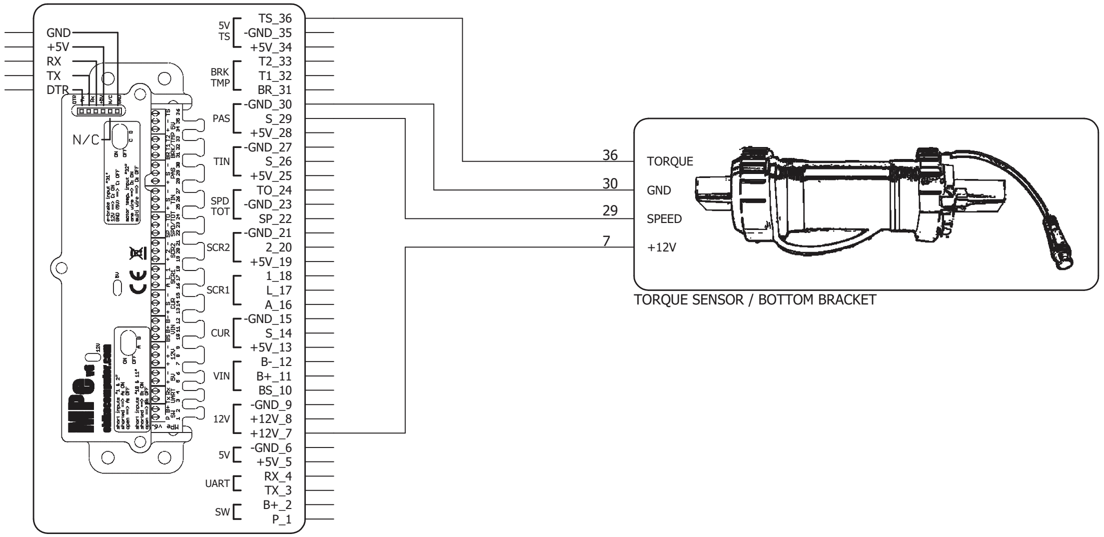
MAIN MODULE CONNECTOR DESCRIPTIONS / OPISY ZŁĄCZ PŁYTY GŁÓWNEJ

TMP / T1 / T2	TEMP SENSORS / CZUJNIKI TEMPERATURY
BRK / BR	BRAKE SENSOR / CZUJNIK HAMULCA
PAS	PAS SENSOR / CZUJNIK KADENCJI PAS
TIN	THUMB THROTTLE IN / WEJŚCIE SYGNAŁU Z MANETKI
TOT / TO	THUMB THROTTLE OUT / WYJŚCIE SYGNAŁU MANETKI
SPD / SP	SPEED SENSOR / CZUJNIK PRĘDKOŚCI
SCR2	DISPLAY MODULE CONNECTOR 2 / ZŁĄCZE MODUŁU WYŚWIETLACZA 2
SCR1	DISPLAY MODULE CONNECTOR 1 / ZŁĄCZE MODUŁU WYŚWIETLACZA 1
CUR	CURRENT SENSOR / CZUJNIK PRĄDU
VIN	BATTERY VOLTAGE IN / WEJŚCIE ZASILANIA
12V	12V POWER SUPPLY OUT / WYJŚCIE ZASILANIA 12V
5V	5V POWER SUPPLY OUT / WYJŚCIE ZASILANIA 5V
UART	SERIAL PORT / KOMUNIKACJA SZEREGOWA
SW	ON_OFF-SWITCH / WŁĄCZNIK



BEFORE INSTALLING
READ OWNER'S MANUAL

PRZED INSTALACJĄ
CZYTAJ INSTRUKCJĘ OBSŁUGI



MPeV6 MAIN MODULE

TORQUE SENSOR / BOTTOM BRACKET

WIRE

ENGLISH TRANSLATION	POLSKI TŁUMACZENIE
TORQUE SENSOR / BOTTOM BRACKET	CZUJNIK NACISKU NA PEDAŁY / CZUJNIK MOMENTU OBROTOWEGO W SUPORCIE
TORQUE	SYGNAŁ MOMENTU OBROTOWEGO
SPEED	SYGNAŁ PRĘDKOŚCI OBROTOWEJ
WIRE	PRZEWÓD

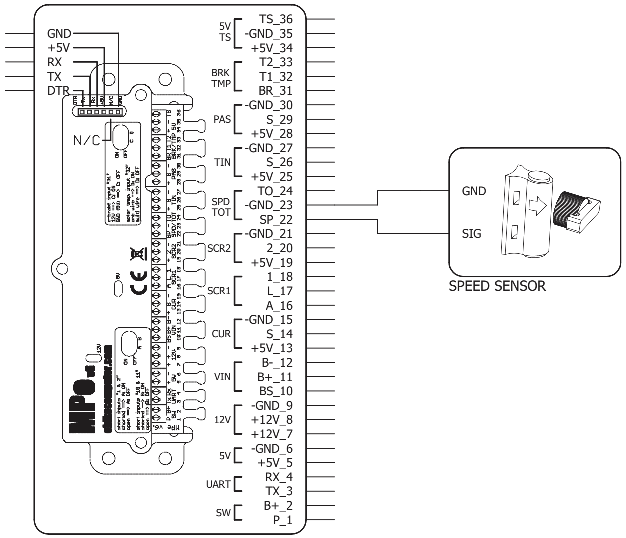
Torque sensor connection diagram

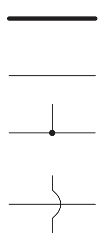
bikel.pl MPe

BY: MAREK P.
S8.01_MPeV6
2020-12-08 21:25
Sheet: 1/1 A3

BEFORE INSTALLING
READ OWNER'S MANUAL

PRZED INSTALACJĄ
CZYTAJ INSTRUKCJĘ OBSŁUGI

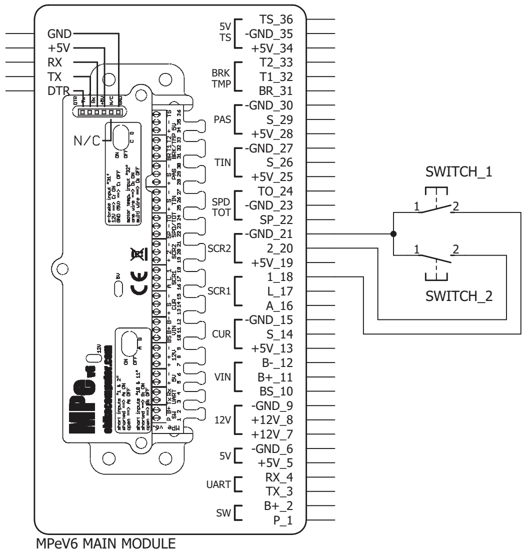


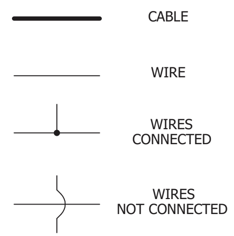


Spoke speed sensor diagram	
bikel.pl MPe	BY: MAREK P.
	S5.02_MPeV6
	2020-12-08 21:28
	Sheet: 1/1 A3

BEFORE INSTALLING
READ OWNER'S MANUAL

PRZED INSTALACJĄ
CZYTAJ INSTRUKCJĘ OBSŁUGI





External buttons diagram	
bikel.pl MPe	BY: MAREK P.
	S6.02_MPeV6
	2020-12-08 21:29
	Sheet: 1/1 A3

1. - Default for e-bike up to 35kg and 3000W of power (PAS with cadence sensor only) **Sabvoton 72045**
2. - Default for e-bike up to 35kg and 3000W of power (PAS with torque sensor BB) **Sabvoton 72045**
3. - Default for e-bike up to 35kg and 3000W of power (PAS with torque sensor BB) **Kelly KLS4812S**
4. - Default for heavy e-bikes (~70kg) and 10000W of power (PAS with cadence sensor only) **Sabvoton 72150**
5. - Default for heavy e-bikes (~55kg) and 6000W of power (PAS with torque sensor BB) **Sabvoton ML60**

No.	Name in MPeV6 SET app	Name in MaxiColor 850C display	Unit	1.	2.	3.	4.	5.	Allowable range	Description
		Battery and current sensor / 1-9								
1	1_BATCAP_AH	1. Battery capacity Ah	Ah*10	192	192	192	440	440	1-65000	Battery capacity in Ah (ampere-hours). This value can be measured with MPe or calculated. Example 1 - measured by MPe. We fully charge the battery and then ride e-bike to discharge it. MPe shows, when the battery is fully discharged, the consumption is 19.2Ah, that is 19.2 * 10 = 192. We enter the value: 192. Example 2 - Calculated. One cell has 3.5Ah, we have a battery in which there are 7 cells connected in parallel, this gives 7 * 3.5 = 24.5Ah. We assume that our battery is 85% of its nominal capacity, this gives 24.5 * 0.85 * 10 = 208.25, then we enter 208. Important: The battery in an electric vehicle will never be at 100% capacity from the cell label. Usually it is 70-95%.
2	2_BATCAP_WH	2. Battery capacity Wh	Wh	1114	1114	1114	3190	3190	1-65000	Battery capacity in Wh (watt hours). This value can be measured with MPe or calculated. Example 1 - measured by MPe. We fully charge the battery and then ride e-bike to discharge it. MPe shows consumption of 1114Wh when the battery is fully discharged. We enter the value 1114. Example 2 Calculated for a Li-ion battery. The average cell voltage is 3.625V. Our battery has a 16S (sections) and 19.2Ah (ampere hours), that is 16 * 3.625 * 19.2 = 1113.6Wh. We enter the value 1114.
3	3_LVC	3. Low voltage cutoff	V*10	480	480	480	600	600	300-999	Voltage at which MPe will cut off the drive. Most often it is the voltage of a fully discharged battery. Enter a voltage such that MPe will disconnect the drive first, before the BMS does. For example: a discharged battery is 49V, which gives 49 * 10 = 490. We enter the value 490.
4	4_FULL_BATT_V	4. Full battery voltage	V*10	665	665	665	835	835	300-999	Voltage of a fully charged battery after the balancing cycle is completed. For example: a charged battery is 66.5V, this gives 66.5 * 10 = 665, then we enter 665. It is important for correct operation of battery level indicator
6	6_CURDIR	6. Current measure direction	0/1	1	1	1	1	1	0/1	The current sensor in MPe is bidirectional and, depending on the connection, can show the current at + or -. We want the + sign to be displayed during discharge, and the - sign of the measured current during charging or regenerative braking. If the measured current is opposite to the expected value, then we enter the value opposite to the one entered now, i.e. if it is 0 then we will enter 1, and if it is 1 we will enter 0.
		Speed reading / 25-28								
26	26_PERIMETER	26. Wheel perimeter	mm	2160	2160	2160	2050	2050	1-9999	Wheel circumference expressed in millimeters [mm].
27	27_MOT_MAG	27. No. of speed sensor magnets	pcs.	46	46	46	32	32	1-999	When using a hall sensor from a motor, it is the number of magnets in the motor (not the number of pairs / poles). When using a reed switch and a magnet / sensor on the spokes, enter the value = 1.
		Brake sensor / 35								
35	35_EBRAKEHILO	35. Direction NO / NC	0/1	0	0	0	0	0	0/1	Selection of the type of brake sensor. For GND operation 0 = normally open (when we do not have the brake handle pressed the sensor is open), 1 = normally closed (when we do not have the brake handle pressed the sensor is shorted). For 12V operation values are opposite.
		Temperature reading / 40-44								
41	41_TEMPTYPE1	41. Temp. 1 type	0/1/2/3/4	0	0	0	4	4	0/1/2/3/4	Here we select the type of temperature sensor connected to the T1 port. 0 = LM35, 1 = NTC10k, 2 = KTY83, 3 = NTC10k single wire (common ground with hall, D switch ON), 4 = KTY83 single wire (common ground with hall, D switch ON).
42	42_TEMPTYPE2	42. Temp. 2 type	0/1/2/3/4	0	0	0	0	0	0/1/2/3/4	Here we select the type of temperature sensor connected to the T2 port. 0 = LM35, 1 = NTC10k, 2 = KTY83
		Pedal assist PAS / 70-126								
71	71_LIMIT_ON_OFF	71. Limit mode on/off	0/1	1	1	1	1	1	0/1	Here we set whether MPe is in the locked mode (power and speed limitation set in parameters 72_LIMIT_SPEED and 73_LIMIT_POWER). Additionally, the thumb throttle does not work in locked mode. 0 = unlocked mode, 1 = locked mode. In the MiniOled display, there is a shortcut to switch between Locked and Unlocked modes. Press the brake lever and the lower button simultaneously for one second. In the MaxiColor display, there is a shortcut to switch between locked and unlocked modes. Press the minus (-) button and the on / off switch (o) for one second.
74	74_PASMAGNETS	74. No. of PAS magnets	pcs.	12	36	36	12	36	2-50	Number of magnets in the PAS sensor.
999	n/a	n/a	rpm	0-150	0-150	0-150	0-150	0-150	present cadence	(only for MiniOled display) View the current cadence value (read only). Example: The value of 00050 is 50 crank RPM. With this parameter, we can confirm the correct connection of the PAS pedaling sensor. This parameter can help you determine the minimum and maximum cadence of PAS pedal assist (No. 85-98).
998	n/a	n/a	V*100	70-450	70-450	70-450	70-450	70-450	present thumb throttle voltage input	(only for MiniOled display) Preview of the current voltage at the input of the thumb throttle (read only) Example: the value of 00123 is 123/100, i.e. 1.23V. With this parameter, we can confirm that the thumb throttle is correctly connected to the TIN connectors. Here we can read the correct values to enter in the parameters No. 15_TIN_MIN and 16_TIN_MAX.
997	n/a	n/a	-	0-1023	0-1023	0-1023	0-1023	0-1023	torque sensor ADC	(only for MiniOled display) Preview of the current torque sensor ADC value (for torque sensor calibration and verification)
996	n/a	n/a	kgF (kg*10)	0-600	0-600	0-600	0-600	0-600	Weight on pedal	(only for MiniOled display) Preview of the current weight on pedal (for torque sensor calibration and verification)

0-PRESENT SPEED
1-DISTANCE TO GO
2-BATTERY LEVEL
3-TRIP
4-PRESENT POWER
5-TEMP 1
6-ASSIST LEVEL
7-ODOMETER
8-AVERAGE SPEED
9-MAX. SPEED
10-TIME IN MOTION
11-BATTERY VOLTAGE
12-PRESENT CURRENT
13-MAX. CURRENT
14-MAX. POWER
15-ENERGY CONSUMPTION
16-BATTERY CAPACITY
17-BATTERY USED Ah
18-TEMP 2
19-CHARGE CYCLES NO.
20-BRAKE STATUS
21-C.CONTROL STATUS
22-MPe VERSION
23-LIMIT MODE STATUS
24-BATTERY USED Wh
25-WARNING STATUS
26-CADENCE
27-THROTTLE IN VOLTAGE 28-TORQUE S. ADC 29-WEIGHT ON PEDAL

<<== **USER FIELDS OF MAINSCREEN NO. 2**
<<== **FOR MaxiColor 850C DISPLAY**

Attachment no. 2: Configurations of MPeV6 – all configuration parameters

1. - Default for e-bike up to 35kg and 3000W of power (PAS with cadence sensor only) **Sabvoton 72045**
2. - Default for e-bike up to 35kg and 3000W of power (PAS with torque sensor BB) **Sabvoton 72045**
3. - Default for e-bike up to 35kg and 3000W of power (PAS with torque sensor BB) **Kelly KLS4812S**
4. - Default for heavy e-bikes (~70kg) and 10000W of power (PAS with cadence sensor only) **Sabvoton 72150**
5. - Default for heavy e-bikes (~55kg) and 6000W of power (PAS with torque sensor BB) **Sabvoton ML60**

No.	Name in MPeV6 SET app	Name in MaxiColor 850C display	Unit	1.	2.	3.	4.	5.	Allowable range	Description
-	DIST	Odometer	km / mi	0	0	0	0	0	0-65000	Defining the current total mileage. Useful when installing MPe on a used vehicle for which we know its mileage so far.
-	NC	No. of batt. charge cycles	Ah*count	0	0	0	0	0	0-65000	Defining the current number of battery charging cycles. Useful when you install MPe to a used vehicle for which you know the number of battery charging cycles so far. For example: our battery has 20Ah and 150 charging cycles, this gives 20 * 150 = 3000. We enter the value: 3000.
		Battery and current sensor / 1-9								
1	1_BATCAP_AH	1. Battery capacity Ah	Ah*10	192	192	192	440	440	1-65000	Battery capacity in Ah (ampere-hours). This value can be measured with MPe or calculated. Example 1 - measured by MPe. We fully charge the battery and then ride e-bike to discharge it. MPe shows, when the battery is fully discharged, the consumption is 19.2Ah, that is 19.2 * 10 = 192. We enter the value: 192. Example 2 - Calculated. One cell has 3.5Ah, we have a battery in which there are 7 cells connected in parallel, this gives 7 * 3.5 = 24.5Ah. We assume that our battery is 85% of its nominal capacity, this gives 24.5 * 0.85 * 10 = 208.25, then we enter 208. Important: The battery in an electric vehicle will never be at 100% capacity from the cell label. Usually it is 70-95%.
2	2_BATCAP_WH	2. Battery capacity Wh	Wh	1114	1114	1114	3190	3190	1-65000	Battery capacity in Wh (watt hours). This value can be measured with MPe or calculated. Example 1 - measured by MPe. We fully charge the battery and then ride e-bike to discharge it. MPe shows consumption of 1114Wh when the battery is fully discharged. We enter the value 1114. Example 2 Calculated for a Li-ion battery. The average cell voltage is 3.625V. Our battery has a 16S (sections) and 19.2Ah (ampere hours), that is 16 * 3.625 * 19.2 = 1113.6Wh. We enter the value 1114.
3	3_LVC	3. Low voltage cutoff	V*10	480	480	480	600	600	300-999	Voltage at which MPe will cut off the drive. Most often it is the voltage of a fully discharged battery. Enter a voltage such that MPe will disconnect the drive first, before the BMS does. For example: a discharged battery is 49V, which gives 49 * 10 = 490. We enter the value 490.
4	4_FULL_BATT_V	4. Full battery voltage	V*10	665	665	665	835	835	300-999	Voltage of a fully charged battery after the balancing cycle is completed. For example: a charged battery is 66.5V, this gives 66.5 * 10 = 665, then we enter 665. It is important for correct operation of battery level indicator
5	5_MVPERA	5. Current resolution mV/A	mV/A	10	10	10	10	10	1-200	Resolution of operation of the installed current sensor. The standard MPe ACS758200B sensor has a resolution of 10mV / A.
6	6_CURDIR	6. Current measure direction	0/1	1	1	1	1	1	0/1	The current sensor in MPe is bidirectional and, depending on the connection, can show the current at + or -. We want the + sign to be displayed during discharge, and the - sign of the measured current during charging or regenerative braking. If the measured current is opposite to the expected value, then we enter the value opposite to the one entered now, i.e. if it is 0 then we will enter 1, and if it is 1 we will enter 0.
7	7_VOL_DIV	7. Voltage divider ratio	-	33058	33058	33058	33058	33058	1-65000	If the battery voltage value shown by MPe is not consistent with the actual state, we can correct the indication by changing this parameter. For example: MPe shows V_MPe = 66.5V and voltmeter / multimeter shows V_multimeter = 66.9V. Then we read the currently entered configuration parameter 7_VOL_DIV and substitute it into the equation: (V_multimeter * 7_VOL_DIV) / V_MPe = X, i.e. in this case (66.9 * 33058) /66.5=33256. We enter the value: 33256.
8	8_CUR_SENSOR_OK	8. Disable current sens. check	0/1	0	0	0	0	0	0/1	MPe has a built-in protection against false readings from a damaged current sensor. It is activated when: 1.The throttle signal is given, which should cause an increase in power, and the power does not increase for 1 second (it will also appear when we have the drive wheel raised), 2.The current indication will exceed 200A for 1 second (by default, the current sensor supports 200A). We can disable this protection. Then enter the value: 1. By default, the protection is enabled (value 0).
9	9_CUR_PROTECT	9. Negative current protection	A	2	2	2	20	20	1-30	MPe has a built-in protection against incorrect direction of the current sensor operation, set in parameter 6_CURDIR. This is to prevent the PAS assist power from tending to infinity. MPe will cut off the drive if the current indication is negative and lower than the value set in this parameter (-2A by default). Occasionally, on installations with regenerative braking, a value that is too low (close to zero) will result in a delayed reaction time on the thumb throttle after applying regenerative braking. Then this parameter can be increased (reasonably) to max. 20-30A.
		Throttle / 13-18, 130-144								
13	13_TOT_MIN	13. Throttle out min.	V*100	85	85	85	80	85	80-120	The minimum voltage at the output of the thumb throttle signal to the controller. Example: 1.0V * 100 = 100, then we enter 100. Too high value may cause the controller to work unintendedly and the motor to run.
14	14_TOT_MAX	14. Throttle out max.	V*100	350	350	400	420	350	300-500	Maximum voltage at the output of the thumb throttle signal to the controller. Example: 3.5V * 100 = 350, then we enter 350 Most often drivers do not increase the power above 3.5V. If we set too high a value here the controller will cut off the drive.
15	15_TIN_MIN	15. Throttle in min.	V*100	90	90	100	90	90	0-120	The minimum voltage at the signal input of the thumb throttle. We enter value rounded up to next tenth. Example: the value of the thumb throttle at rest, measured with a multimeter, is 0.9V, it gives 0.9 * 100 = 90, then we enter 100. This value can also be read directly on the MPe device. Set this parameter value too low may cause the PAS to stop working.
16	16_TIN_MAX	16. Throttle in max.	V*100	360	360	360	360	370	300-500	Maximum voltage at the signal input of the thumb throttle. We enter value rounded up to next tenth. Example: the value of the thumb throttle twisted at 100% measured with a multimeter is 4.25V, this gives 4.25 * 100 = 425, then we enter 435. This value can also be read directly on the MPe device.
17	17_THR_RESET	17. Throttle reset on/off	0/1	1	1	1	1	1	0/1	When the value of this parameter is 1, then when stationary we have set the throttle and brake at the same time, the vehicle will not start until we completely release the throttle and apply it again. It is a protection against undesirable "pulling forward" of the vehicle with high power, during eg stop at traffic lights and inadvertent operation of the thumb throttle while holding the brake.
18	18_THR_SAFE_VOL	18. Throttle safe voltage	V*100	370	370	370	370	370	300-500	The throttle voltage above which MPe will cut off the drive. It is a protection against a damaged thumb throttle or its faulty connection. For MPeV5 motherboard, the default is 450 [V * 100], and for MPeV6 motherboard, the default is 370 [V * 100]
		Speed reading / 25-28								
25	25_KPHMPH	25. Unit kph / mph	0/1	0	0	0	0	0	0/1	Speed readout in SI units (km / h) or imperial (mph). SI = 0, IMP = 1.
26	26_PERIMETER	26. Wheel perimeter	mm	2160	2160	2160	2050	2050	1-9999	Wheel circumference expressed in millimeters [mm].
27	27_MOT_MAG	27. No. of speed sensor magnets	pcs.	46	46	46	32	32	1-999	When using a hall sensor from a motor, it is the number of magnets in the motor (not the number of pairs / poles). When using a reed switch and a magnet / sensor on the spokes, enter the value = 1.
28	28_GEAR_RATIO	28. Gear ratio	n*10	10	10	10	10	10	1-999	If we have the speed taken from the hall sensor in the motor, and the ratio of the motor to the wheel is not 1: 1, then we can set the gear here. Example 1: for hub gearless motors the gear ratio is 1: 1, then 1 * 10 = 10. We enter the value: 10. Example 2: the motor has a gear ratio of 7.2: 1, this gives 7.2 * 10 = 72, then we enter 72.
34	34_BT_BUTTONS	--	0/1	0	0	0	0	0	0/1	When we use MPe only in the smartphone version (without any display), then we set this parameter to 1. Accidentally setting this parameter to 1, when using the MiniOled display, will prevent entering the statistics screens (simultaneous, momentary pressing of the upper and lower buttons at once).

No.	Name in MPeV6 SET app	Name in MaxiColor 850C display	Unit	1.	2.	3.	4.	5.	Allowable range	Description
		Brake sensor / 35								
35	35_EBRAKEHILO	35. Direction NO / NC	0/1	0	0	0	0	0	0/1	Selection of the type of brake sensor. For GND operation 0 = normally open (when we do not have the brake handle pressed the sensor is open), 1 = normally closed (when we do not have the brake handle pressed the sensor is shorted). For 12V operation values are opposite.
		Temperature reading / 40-44								
40	40_TEMPCTEMPF	40. Unit *C / *F	0/1	0	0	0	0	0	0/1	Temperature reading in degrees Celsius (*C = 0) or in degrees Fahrenheit (*F = 1).
41	41_TEMPTYPE1	41. Temp. 1 type	0/1/2/3/4	0	0	0	4	4	0/1/2/3/4	Here we select the type of temperature sensor connected to the T1 port. 0 = LM35, 1 = NTC10k, 2 = KTY83, 3 = NTC10k single wire (common ground with hall, D switch ON), 4 = KTY83 single wire (common ground with hall, D switch ON).
42	42_TEMPTYPE2	42. Temp. 2 type	0/1/2/3/4	0	0	0	0	0	0/1/2/3/4	Here we select the type of temperature sensor connected to the T2 port. 0 = LM35, 1 = NTC10k, 2 = KTY83
43	43_OVHT1	43. Temp. 1 overheat limit	*C / *F	140	140	140	140	140	1-150	Temperature of T1 sensor, when exceeded MPe will cut off the drive.
44	44_OVHT2	44. Temp. 2 overheat limit	*C / *F	60	60	60	60	60	1-150	Temperature of T2 sensor, when exceeded MPe will cut off the drive.
		PID reg. and cr. control / 50-65								
50	50_P_POWER	50. Coefficient P	-	150	150	350	190	200	1-999	P, I, D components of the PID controller responsible for setting power and maintaining it at the appropriate level. These apply to PAS assist, cruise control and throttle in mode 1 = power limit. Mainly these parameters, incorrectly selected, are responsible for the “waving” power setting when using the PAS, cruise control or throttle, working in mode 1 = power limit. The slow PID controller becomes active when the input power deviates from the power setpoint less than the threshold set in 56_PID_L_THR. It is worth checking the PID settings in the various suggested configurations, because the same settings work differently in different vehicles.
51	51_I_POWER	51. Coefficient I	-	80	80	180	100	70	1-999	
52	52_D_POWER	52. Coefficient D	-	50	50	150	80	140	1-999	
53	53_P_LOW	53. Coefficient slow P	-	0	0	0	0	50	1-999	
54	54_I_LOW	54. Coefficient slow I	-	0	0	0	0	30	1-999	
55	55_D_LOW	55. Coefficient slow D	-	0	0	0	0	50	1-999	
56	56_PID_L_THR	56. Slow PID threshold	W	0	0	0	0	300	0-200	Input power difference threshold to the set power, below which the Slow PID controller is activated. By default, the Slow PID controller is disabled = 0.
59	59_SPEEDFACTORMIN	59. Speed factor PAS min.	%	1	1	1	1	1	1-100	Power factor for max speed for PID controller. After reaching the maximum speed for a given PAS assist level, the PID controller reduces the power to x% of the power. For example: for the current PAS assist level, the preset power is 250W, the maximum speed is 25 km / h, and the speed factor is 1%. After exceeding the speed of 25 km / h, the PID regulator will reduce the power to 1%, which in this case to 2.5W.
60	60_PIDPWMMAX	60. PAS PID PWM out max.	-	200	200	200	70	200	150-255	Maximum PWM signal that the PID controller can accept. Responsible for the maximum voltage at the output of the throttle signal to the controller. We keep this value to a minimum so as not to give the PID controller too much food for thought.
61	61_SPD_FACTOR_RAMP_UP	61. Speed factor ramp up	W/s	50	50	40	30	50	1-300	The ramp up speed of the speed factor value for the PID controller, for PAS support and cruise control. In order to keep the speed at a given level, we have to react to the power set by the PID controller in order not to accelerate the vehicle too much. Therefore, we reduce the power from 100% to X% set in the 59_SPEEDFACTORMIN parameter. The commencement of the reduction of power begins after exceeding the speed by 5 km / h lower than the set speed for a given assist level. With the parameter 61_SPD_FACTOR_RAMP_UP we define how rapidly the power change is to take place depending on the speed close to the threshold.
62	62_CR_CTRL_PWR_MIN	62. Cruise ctrl. power min.	W	240	240	240	240	240	100-300	Cruise control minimum power.
63	63_CR_CTRL_PWR_MAX	63. Cruise ctrl. power max.	W	1300	1300	1300	2000	1300	700-2000	Cruise control maximum power.
64	64_CR_CTRL_PWR_RAMP	64. Cruise ctrl. power ramp up	W/s	300	300	300	260	300	50-500	Cruise control powerramp up speed.
65	65_CR_CTRL_MAX_SPD	65. Cruise ctrl. max. speed	kph / mph	40	40	40	40	40	30-50	Maximum cruise control speed. Default = 0, which means cruise control disabled. Do not exceed 50 km / h because above it may not run smoothly. At the moment of switching on the cruise control, MPe checks what speed has been set and linearly determines the dependence of the cruise control power on the set speed. The current speed in relation to the range from 0 km / h to the speed set in the 65_CR_CTRL_MAX_SPD parameter sets the coefficient that sets the cruise control power linearly in the power range from that set in the 62_CR_CTRL_PWR_MIN parameter to the one set in 63_CR_CTRL_PWR_MAX. If we set: power min. to 0, max power at 1000, max speed at 50 km / h and we will turn on the cruise control at 25 km / h, then MPe will set the speed coefficient for the cruise control in the middle of the set speed range. This will translate into half the power of the set values, i.e. in this case 500W (25km / h is 50% of the set speed of 50km / h and this gives 50% of the set power between 0W and 1000W).
		Pedal assist PAS / 70-126								
70	70_AUTOLIMIT	70. Auto limit mode on/off	0/1	1	1	1	1	1	0/1	When this parameter is activated, MPe will always turn on in the locked mode (power and speed limitation to those set in parameters 72_LIMIT_SPEED and 73_LIMIT_POWER). Additionally, the thumb throttle does not work in locked mode.
71	71_LIMIT_ON_OFF	71. Limit mode on/off	0/1	1	1	1	1	1	0/1	Here we set whether MPe is in the locked mode (power and speed limitation set in parameters 72_LIMIT_SPEED and 73_LIMIT_POWER). Additionally, the thumb throttle does not work in locked mode. 0 = unlocked mode, 1 = locked mode. In the MiniOled display, there is a shortcut to switch between Locked and Unlocked modes. Press the brake lever and the lower button simultaneously for one second. In the MaxiColor display, there is a shortcut to switch between locked and unlocked modes. Press the minus (-) button and the on / off switch (o) for one second.
72	72_LIMIT_SPEED	72. Limit mode max. speed	kph / mph	25	25	25	25	28	1-99	Locked mode speed limit.
73	73_LIMIT_POWER	73. Limit mode max. power	W	250	250	250	250	350	1-1000	Locked mode power limit.
74	74_PASMAGNETS	74. No. of PAS magnets	pcs.	12	36	36	12	36	2-50	Number of magnets in the PAS sensor.
75	75_PWR_LIM_PAS_1	75. Power of assist 1	W	100	5	5	500	5	1-3000	PAS assist power for a given assist level. In locked mode, this value will be limited if it is greater than the one set in 73_LIMIT_POWER. For crank torque sensor allowable values for power multiplication are from 1 to 20. Entering value above 20 will be recognized as willingness of usage of cadence sensor only. Values in range 1-20 multiplicator of human power for crank torque sensor and cadence pedal assist. Values in range 21-3500 - power limit in watts for cadence only pedal assist.
76	76_PWR_LIM_PAS_2	76. Power of assist 2		175	10	10	700	10		
77	77_PWR_LIM_PAS_3	77. Power of assist 3		250	15	15	900	15		
78	78_PWR_LIM_PAS_4	78. Power of assist 4		350	20	20	1100	20		
79	79_PWR_LIM_PAS_5	79. Power of assist 5		600	400	1000	1100	1100		
80	80_SPD_LIM_PAS_1	80. Speed limit of assist 1	kph / mph	20	41	50	20	55	10-45	PAS speed limit for a given assist level. In locked mode, this value will be limited if it is greater than the one set in 72_LIMIT_SPEED.
81	81_SPD_LIM_PAS_2	81. Speed limit of assist 2		25	41	50	25	55		
82	82_SPD_LIM_PAS_3	82. Speed limit of assist 3		25	41	50	30	55		
83	83_SPD_LIM_PAS_4	83. Speed limit of assist 4		30	41	50	35	55		
84	84_SPD_LIM_PAS_5	84. Speed limit of assist 5		38	32	35	35	37		
85	85_MIN_SPD_PAS_1	85. Min. speed of assist 1	kph / mph	0	13	0	0	0	0-10	Minimum vehicle speed above which PAS assist activates. If you want to disable PAS support for a given assist level, enter a high starting speed, e.g. 999.
86	86_MIN_SPD_PAS_2	86. Min. speed of assist 2		0	0	0	0	0		
87	87_MIN_SPD_PAS_3	87. Min. speed of assist 3		0	0	0	0	0		
88	88_MIN_SPD_PAS_4	88. Min. speed of assist 4		0	0	0	0	0		
89	89_MIN_SPD_PAS_5	89. Min. speed of assist 5		0	3	3	0	3		

No.	Name in MPeV6 SET app	Name in MaxiColor 850C display	Unit	1.	2.	3.	4.	5.	Allowable range	Description
90	90_CAD_MIN_PAS_1	90. Min. cadence of assist 1	rpm	0	0	0	0	0	2-30	The minimum cadence (crank rotation speed) above which PAS assistance activates. The power of PAS assistance increases linearly between the minimum and maximum cadence until the power set for a given assist level is reached.
91	91_CAD_MIN_PAS_2	91. Min. cadence of assist 2		0	0	0	0	0		
92	92_CAD_MIN_PAS_3	92. Min. cadence of assist 3		0	0	0	0	0		
93	93_CAD_MIN_PAS_4	93. Min. cadence of assist 4		0	0	0	0	0		
94	94_CAD_MIN_PAS_5	94. Min. cadence of assist 5		0	0	0	0	0		
95	95_CAD_MAX_PAS_1	95. Max. cadence of assist 1	rpm	10	10	10	10	10	10-120	Maximum cadence (crank speed) beyond which the power of the PAS assistance will no longer increase. The power of PAS assistance increases linearly between the minimum and maximum cadence until the power set for a given assist level is reached.
96	96_CAD_MAX_PAS_2	96. Max. cadence of assist 2		10	10	10	10	10		
97	97_CAD_MAX_PAS_3	97. Max. cadence of assist 3		10	10	10	10	10		
98	98_CAD_MAX_PAS_4	98. Max. cadence of assist 4		10	10	10	10	10		
99	99_CAD_MAX_PAS_5	99. Max. cadence of assist 5		10	10	10	10	10		
100	100_RAMP_UP_PAS_1	100. PAS power ramp up 1	W/s	300	300	300	200	350	50-500	The ramp up speed of the set power for a given assist level. Too high a value may result in a perceptible power "ripple". Too low value may result in a long, slow acceleration of the vehicle.
101	101_RAMP_UP_PAS_2	101. PAS power ramp up 2		300	300	300	200	350		
102	102_RAMP_UP_PAS_3	102. PAS power ramp up 3		300	300	300	400	350		
103	103_RAMP_UP_PAS_4	103. PAS power ramp up 4		400	300	300	500	350		
104	104_RAMP_UP_PAS_5	104. PAS power ramp up 5		500	500	500	500	350		
105	105_BOOST_PWR_PAS_1	105. PAS boost power 1	W	500	500	500	2000	500	0-2500	PAS starting power. This is the power that will only be commanded in unlocked (not locked) mode for a certain amount of time. This power should be much greater than the continuous power for the particular assist level. This power helps to speed up the bike in the early stages of pedaling.This power will also be set while driving, when the cadence (crank rotational speed) from zero increases above zero, and the vehicle speed will be lower than that set in the following parameters (BOOST_SPEED_PAS).
106	106_BOOST_PWR_PAS_2	106. PAS boost power 2		500	500	500	2000	500		
107	107_BOOST_PWR_PAS_3	107. PAS boost power 3		750	800	800	2000	800		
108	108_BOOST_PWR_PAS_4	108. PAS boost power 4		800	800	800	2000	1100		
109	109_BOOST_PWR_PAS_5	109. PAS boost power 5		1000	800	1000	2000	1000		
110	110_BOOST_TIME_PAS_1	110. PAS boost time 1	ms	3500	500	500	3500	1500	0-10000	The time for which the initial power PAS BOOST will be commanded. This time is counted from the moment when the cadence (crank rotational speed) equal to zero increases above zero, and the vehicle speed is lower than that set in the following parameters (BOOST_SPEED_PAS).
111	111_BOOST_TIME_PAS_2	111. PAS boost time 2		3500	500	700	3500	2000		
112	112_BOOST_TIME_PAS_3	112. PAS boost time 3		3500	500	700	3500	2000		
113	113_BOOST_TIME_PAS_4	113. PAS boost time 4		3500	3500	700	3500	2000		
114	114_BOOST_TIME_PAS_5	114. PAS boost time 5		3500	3500	3500	3500	1500		
115	115_BOOST_SPEED_PAS_1	115. PAS boost max. speed 1	kph / mph	10	5	4	10	5	0-99	Vehicle speed above which the start power PAS BOOST will not activate.
116	116_BOOST_SPEED_PAS_2	116. PAS boost max. speed 2		10	5	8	10	25		
117	117_BOOST_SPEED_PAS_3	117. PAS boost max. speed 3		10	5	40	20	55		
118	118_BOOST_SPEED_PAS_4	118. PAS boost max. speed 4		22	5	40	27	55		
119	119_BOOST_SPEED_PAS_5	119. PAS boost max. speed 5		30	10	30	27	29		
120	120_BOOST_RAMP_UP_PAS	120. PAS boost ramp up	W/s	5000	5000	2500	5000	5000	10-5000	Ramp up speed of the increased initial power PAS BOOST.
121	121_CADENCE_REF_TIME	121. Cadence refresh time	ms	250	250	250	250	250	150-750	Cadence refresh time. The shorter the time, the sooner PAS assistance starts and ends. Too little time will result in jerking at low cadence. Too long will be reflected in the drive giving up power after you stop pedaling, for a noticeable moment.
122	122_TORQUE_S_ENABLE	122. Enable torque sensor	0/1	0	1	1	0	1		Set to 1 to activate connected torque sensor
123	123_START_MASS_PEDAL	123. Startup mass on pedal	kg*10	180	180	180	180	100	50-600	Threshold of force applied to pedal to engage motor, even before crank start to rotate.
124	124_TORQUE_S_ADC_MIN	124. Torque sensor ADC min.	-	320	320	330	320	325	0-1023	Calibration of torque sensor zero. Enter minimum ADC value (read from MPe display) incremented by 10
125	125_TORQUE_S_ADC_MAX	125. Torque sensor ADC max.	-	620	620	620	620	620	0-1023	Calibration of maximum ADC value corresponding to maximum torque that can be read by torque sensor. Enter max. ADC value read on MPe display.
126	126_TORQUE_S_KGF_MAX	126. Torque sensor kgF max.	kg*10	600	600	850	600	750	0-1000	Enter mass*10 applied to pedal by which the ADC max. value was read. (Mass above which ADC value have not increased anymore)
		Throttle / 13-18, 130-144								
130	130_PWR_LIM_THR_1	130. Throttle limit 1	W or %	1000	1000	1000	1000	60	0-1000W 0-100%	Limiting thumb throttle power for a given assist level. The value can be expressed in watts [W] or as a percentage [%]. If in the following parameters we select the operating mode of the thumb throttle as 1 = power limitation, then this parameter will be given in watts [W]. If in the following parameters we select the operating mode of the thumb throttle as 0 = standard / voltage, then this parameter will be given in percent [%]. The limitation in watts means that when we physically apply the thumb throttle “all the way”, MPe will send a signal truncated to the given xW to the output port of the lever. The percentage reduction means that when we physically set the thumb throttle to the limit, MPe will send a signal reduced to the given x% to the output port of the thumb throttle.
131	131_PWR_LIM_THR_2	131. Throttle limit 2		70	70	70	28	100		
132	132_PWR_LIM_THR_3	132. Throttle limit 3		90	90	90	35	100		
133	133_PWR_LIM_THR_4	133. Throttle limit 4		100	100	100	35	100		
134	134_PWR_LIM_THR_5	134. Throttle limit 5		100	100	100	100	100		
135	135_MODE_THR_1	135. Throttle mode 1	0/1 (% / power)	1	1	1	1	0	0/1	Thumb throttle operating mode, standard / voltage or power limited.0 = standard / voltage (that is, just like we would connect the thumb throttle directly to the controller).1 = power limitation. The MPe computer will ensure that the throttle has linear power to the one set in the PWR_LIM_THR parameter (in the limited power mode there is a slight delay in setting the power in relation to the throttle twist).
136	136_MODE_THR_2	136. Throttle mode 2		0	0	0	0	0		
137	137_MODE_THR_3	137. Throttle mode 3		0	0	0	0	0		
138	138_MODE_THR_4	138. Throttle mode 4		0	0	0	0	0		
139	139_MODE_THR_5	139. Throttle mode 5		0	0	0	0	0		
140	140_RAMP_UP_THR_1	140. Throttle ramp up 1	W/s or mV/s	1000	1000	1000	1000	3500	10-5000	The ramp up speed of power set by thumb throttle for a given assist level. In very strong ebikes, where the delicate twist of thumb throttle pulls the vehicle onto one wheel, setting a low value of this parameter will help in controlling the vehicle - it will give the effect of the so-called Soft-Start.
141	141_RAMP_UP_THR_2	141. Throttle ramp up 2		3000	3000	3000	300	5000		
142	142_RAMP_UP_THR_3	142. Throttle ramp up 3		3000	3000	3000	200	5000		
143	143_RAMP_UP_THR_4	143. Throttle ramp up 4		3000	3000	3000	200	5000		
144	144_RAMP_UP_THR_5	144. Throttle ramp up 5		3000	3000	3000	2000	5000		
999	n/a	n/a	rpm	0-150	0-150	0-150	0-150	0-150	present cadence	(only for MiniOled display) View the current cadence value (read only). Example: The value of 00050 is 50 crank RPM. With this parameter, we can confirm the correct connection of the PAS pedaling sensor. This parameter can help you determine the minimum and maximum cadence of PAS pedal assist (No. 85-98).
998	n/a	n/a	V*100	70-450	70-450	70-450	70-450	70-450	present thumb throttle voltage input	(only for MiniOled display) Preview of the current voltage at the input of the thumb throttle (read only) Example: the value of 00123 is 123/100, i.e. 1.23V. With this parameter, we can confirm that the thumb throttle is correctly connected to the TIN connectors. Here we can read the correct values to enter in the parameters No. 15_TIN_MIN and 16_TIN_MAX.
997	n/a	n/a	-	0-1023	0-1023	0-1023	0-1023	0-1023	torque sensor ADC	(only for MiniOled display) Preview of the current torque sensor ADC value (for torque sensor calibration and verification)
996	n/a	n/a	kgF (kg*10)	0-600	0-600	0-600	0-600	0-600	Weight on pedal	(only for MiniOled display) Preview of the current weight on pedal (for torque sensor calibration and verification)

0-PRESENT SPEED
1-DISTANCE TO GO
2-BATTERY LEVEL
3-TRIP
4-PRESENT POWER
5-TEMP 1
6-ASSIST LEVEL
7-ODOMETER
8-AVERAGE SPEED
9-MAX. SPEED
10-TIME IN MOTION
11-BATTERY VOLTAGE
12-PRESENT CURRENT
13-MAX. CURRENT
14-MAX. POWER
15-ENERGY CONSUMPTION
16-BATTERY CAPACITY
17-BATTERY USED Ah
18-TEMP 2
19-CHARGE CYCLES NO.
20-BRAKE STATUS
21-C.CONTROL STATUS
22-MPe VERSION
23-LIMIT MODE STATUS
24-BATTERY USED Wh
25-WARNING STATUS
26-CADENCE
27-THROTTLE IN VOLTAGE 28-TORQUE S. ADC 29-WEIGHT ON PEDAL

<<== USER FIELDS OF MAINSCREEN NO. 2
<<== FOR MaxiColor 850C DISPLAY