

Controllers Mini-e, Max-e Instruction manual

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Chapter 1

Quick Start

Warning!

- Braking a motor can not be used as the main braking method. Mandatory installation of brakes, ensure Chiva emergency braking.
- The controller can not be operated without connecting the pre-custodian or circuit breaker. Fuse or circuit breaker must operate at exceeding the peak current of 250 amperes for mini-e and 400 amps for max-e. Note that the peak current. Eg machine with the characteristic "C" for the rated current 63A-CPA was treated with a peak current of about 200A.
- The controller is designed for moisture protection degree IP54. This means that con-
This means that the controller is not afraid of splashing water. Nevertheless desired but bear in mind that when driving in the rain at high speed possible ingress of water jets (e.g., from the wheels), and also dripping water at high speed that is equal fledged water streams. Therefore, when driving in the rain or puddles without proper protection can not be operated controller.
- Controller power supply must not exceed 98 volts. Operation with voltage bOlshim prohibited. If you want more power (more than 70 ampere-phase of current), or use the battery voltage which more 90 volts. Recommended voltage to achieve maxi-

mal power - 85 volts.

1.1 Overview

1.1.1 Capabilities

Key capabilities of the controller

- Three fully customizable cardinality profile include
tea braking;
- Built-in power meter with a variety of parameters
- Integration with BMS, a second controller, DC-DC conversion
THE USER digital pen and gas
- Tuning linearity and throttle progression for the most-
Sheha comfort
- The ability to connect virtually any source in
dc charging
- The ability to use the controller as a powerful source
nick DC
- Password lock controller
- Ability to specify the required mileage. The controller will
automatically set the limit dynamics and maxi-
minimum speed for covering a given distance
- Information about the voltage of each battery yaeyke, when under-
Turning BMS
- Ability to continue driving with faulty sensor-
E Hall in motor

1.1.2 Supplied

Package Includes:

Controller	1 Pieces
Dislpey	1 Pieces
Instruction manual	1 Pieces
Installation kit	1 Pieces

Composition installation set:

Contact connector XT150 "mom"	2 Pieces
Contact connector XT150 "dad"	3 Pieces
Insulator connector XT150 "mom" black	1 Pieces
Insulator connector XT150 "mom" red	1 Pieces
Insulator connector XT150 "Dad" blue	3 Pieces
Miniature connector for connection to a display-brook acid gas-brake	1 Pieces
Temperature sensor	
Connector for the hall sensors	1 Pieces
Yokes fastening display	1 Pieces
Display long mounting screws	2 Pieces
Display mounting screws short	2 Pieces
Mounting nuts display	2 Pieces
Allen wrench 1 pc	4 Pieces

1.1.3 Connection

Display connection Connect the long wire to the display connector controller according to the color-coded connectors, ems. Connector for display 4-pole with blue meth-Coy cable.

Connect the throttle and brake For correct work you need to solder the controller throttle stick to the corresponding schim wire mating connector in accordance with the color marking conductors (see table below). For use regenerative braking function connects handle braking for. In the case of using the brake handle button instead dachtika Hall, one touch button is sealed brake sensor input, second to +5 V.

Color conduction function of contact number

yes		
Brown +5 V1		
Belyyvhod sensor (button) 2 brakes		
ChernyyGND3		
Siniyvhod sensor akseleratora4		

Motor connection



Fig. 1.2: Wiring handles



Fig. 1.3: Wiring the hall sensors

Connect the phase conductors Solder the three blue-connector EMA XT150 to phase conductors of the motor. Pair them with blue pro-Controller waters. Match the wires does not matter.

Connecting the Power Solder the black connector XT150 to the negative battery power, red - to plus. We natoyatelno rekomenduem in the power supply circuit in the fuse. This can be a fuse or circuit breaker. For mini-e-rec etsya machine with the characteristic "C" 63A. For the max-e-rec etsya establish two parallel machine 63A with characteristic "C".

Connect the charger to the controller Connected Chita tee break any phase conductor, as shown in Figure 1.1

Connect the black connector of the charging coil to the black wire controller.

Connect the red plug of the charging coil to a tee.

Connect the correct polarity, battery charger to charge- tion coil via the supplied connector XT90.

Connect the charger to the mains.

Configure the controller when charging is in paragraph [3.3.6](#)

Attention! When a charger is connected, do not press throttle and (or) the brakes. This may result in damage to equipment.

1.1.4 Quick Setup

After connecting the power supply, and you will see the main screen.

In order to get to the main menu you have to press the button

Down. If you had activated desired quick menu

but press down again. Now you have the main menu

(Screen [1.4](#))



Fig. 1.4: Main menu

First, make sure that the correct settings are exposed cutoff upper and lower voltage for your battery.

They are in the BMS Setup [3.5](#) Dolistayte BMS Setup before using button down and press the Right button to enter the menu.

Set the lower threshold voltage Dischg cutoff and top threshold HV cutoff in accordance with the minimum and maximum voltage of your battery. Upper threshold recommend mounting twist slightly higher in order to function regenerative braking work including on a fully charged battery.

Controller Setup menu [3.3.1](#) you must configure the following

Options:

Set speed Koeffitsient <Speed ratio> in accordance with your motor. This value is given in millimeters on the electric turnover. To calculate the required value must be circumference of the wheel motor divided by the number of pairs in

poles. For most Direct-drive motors in the number of pairs power poles will be 23, but if possible verify the data for your motor. For example, for motor 9 Continent in 24 "wheel tire with 2.5 "value will be $1965\text{mm}/23 = 85.4\text{mm}$.

The next step in setting Autodetect item [3.3.2 Attention!](#) The wheel must be posted and freely rotate during auto-toopredeleniya!

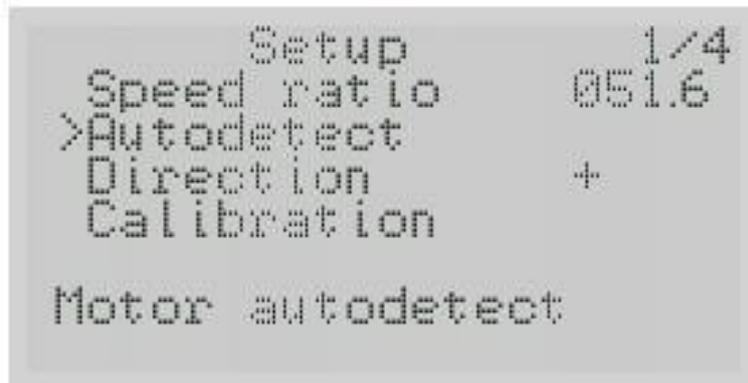


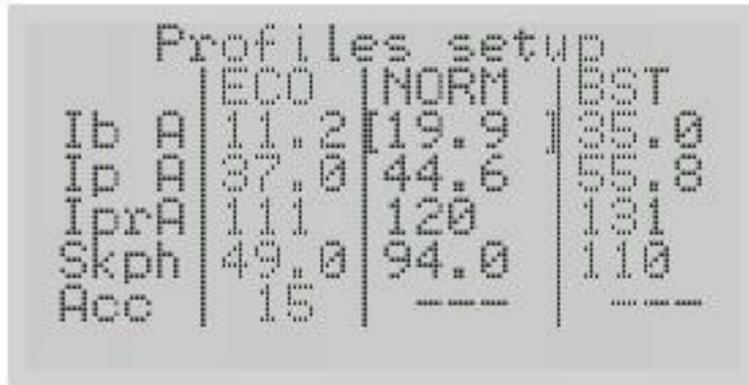
Fig. 1.5: The Setup Menu

Select <Autodetect> (autodetect) menu by pressing the "Right then press and hold the throttle control in Annex maximum gas. Be careful on the wheel can- chat to rotate in the opposite direction, causing rotation of the pedal- Leu. If you notice that the wheel began to spin in the opposite side immediately release the throttle control, change direction rotation option <Direction> (direction) and repeat the procedure <Autodetect>. Full cycle avtoopredelleniya takes 2-3 minutes- you, the wheel will rotate slowly at first (about 2/3 times- no), and then quickly the rest of the time. Please memorize Nita, to correctly auto-detect timing angles during all procedures necessary to ensure free rotation of the wheel.

If successful, you will see a message hotplug <Successful>. This means that auto-negotiation is completed and we can- but let go of the throttle control.

If an error message appears:

- <Interrupted By thr> (interrupted gas) when you release the handle ac- tor pedal before you finish the auto-detection;
- <Halls Error> Error halls motor;
- <Interrupted By key> if you press any button;
- <Unknown Error> other errors.



		ECO	NORM	BST
Ib	A	11.2	19.9	35.0
Ip	A	37.0	44.6	55.8
Ipr	A	111	120	131
Skph		49.0	94.0	110
Acc		15	---	---

Fig. 1.6 Profiler

Set the current limit for profiles through the menu <POWER MODE PROFILES> 3.2 (Located in the main menu):

- Ib A = battery current limit in amperes
- Ip A = limit the phase current in amperes
- Ipr A = phase current limit regenerative braking in amperes
- Skph = maximum speed limit in km / h or miles- / Hr Speed Unit is set in the section 3.4 <INTERFACE>
- Acc = acceleration limiting. This dimension adstrakt- tion value with increasing dimension acceleration increases.

Setting BMS 3.5 (Battery Monitoring System)

If the module E-BMS is not connected (not used), it is necessary specify the capacity of the battery and the cutoff for the lower and upper voltage NIJ.

Need to specify the capacity in watt-hour Amperchasah and Correction- rectly work wattmeter. These values can vary during full discharge cycle.

Setting regenerative braking 3.3.5

When using the brake lever with the Hall sensor is enough specify the maximum battery voltage and maximum battery- total current recovery.

Brake handle signal can be inverted option <Inversion> if required. When using a reed switch button, it is recommended also enable the soft-start recovery <Smooth>.

This will avoid additional burden on the dropouts.

Calibration handles gas / brake.

Calibration knobs on the menu: Controller setup-> Calibration-> <Thr Limits> 3.3.4

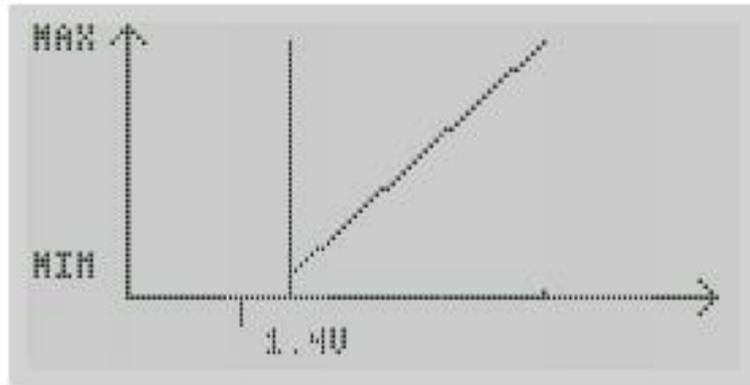


Fig. 1.7: Calibration

After setting limits recommended that you configure as if-linearity of the throttle (optional <Thr linear>), especially if you used use the throttle control sensor hall.

When you select this option, press 4 times the throttle control as uniformly as possible for 2-3 seconds each time. After every correct click you will see the curve of the output signal la your throttle.

After the 4th time calibration is complete and the throttle stick is operate linearly. If the need for progress in the management of gas change <thr progr.> digit from 0 to 1-3.

After calibration, use the throttle point <Brk limits> and adjust the brake lever is similar.

Congratulations, your controller is ready to use!

Chapter 2

Guide Users

2.1 Display

2.1.1 User Interface

The controller is implemented by 5 KNO pok. 4 of them are located crosswise in a joystick and one just above and to the left.

Denoted as a button "Up" "Down", "Left", "Right" "Exit"

From the main screen buttons "VlevoVpravo" can perklyuchat-smiling between the following: Main screen \Leftrightarrow Wattmeter \Leftrightarrow BMS \Leftrightarrow Health Monitor

Use the "Up" standby switch profiles Power Eco-Normal-Boost.

The "Down" lets get to the main menu setting controller. Accordingly, menu navigation is vnop-kami "Up" Down "to scroll the menu, click" position to right- in "you can go inside of an item, change the value of being in the right column can be "RIGHT" button Vle- in exit this option, you can click "Exit"

When the output from the main menu, if the settings are of the- meneny, confirmation save. In the case- case if you want to save the setting is per click Save settings,

if you want to leave the SETUP unchanged, select Discard setting.

2.1.2 The main screen

The main screen consists of the following elements:

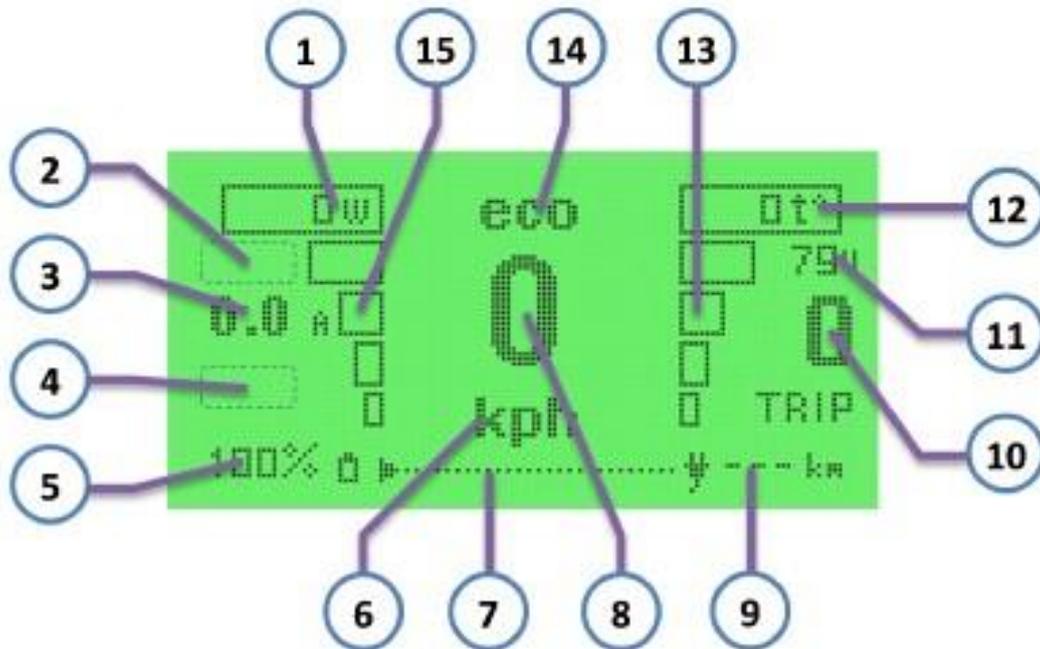


Fig. 2.1: Main screen

1. Current consumption in watts
2. TSC (traction control system) is visible when function traction control
3. Actual current in amperes
4. Data Smart-Range, if the function is a smart path calculation Included
5. Battery Level in%
6. Units rate (khp, mph)
7. Graphical the remaining battery
8. Actual speed
9. Estimated mileage at the current battery
10. Distance traveled per trip (since last Throw-sa)
11. The current battery voltage
12. Motor temperature (if connected and configured termodatchk)

- 13. Graphic display temperature / current limit at overheating.
- 14. The current profile / information messages (Eco / normal / boost / cruise / brake / charge etc.)
- 15. Graphic display of power.

2.1.3 Displays statistics

Statistics screen (Parameters	since last reset)
trpProbeg per trip	Used Wh
tmeVremya Driving	Used Ah
remOstavshysya mileage	Remaining Wh
avgSrednyaya speed	Average consumption
maxMaksimalnaya speed	Max. Power
Ah regRekuperatsiya	Recovery Wh
batSrednee voltage	Int. Resistance

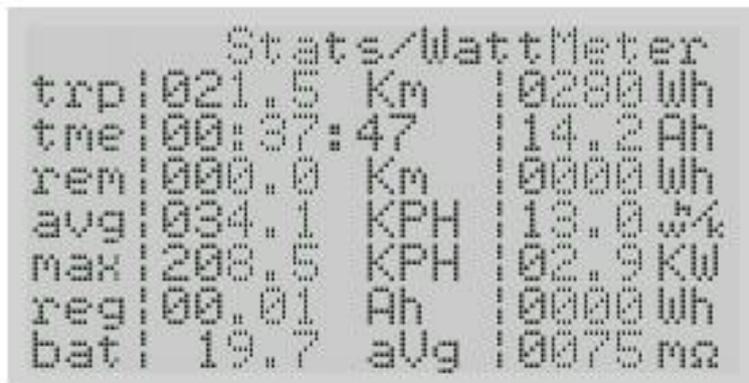


Fig. 2.2: Statistics

Statistics screen displays current information about the trial- n since the last reset. Statistics are not reset after reboot the controller. Pressing the "Up" from the screen statistics on the menu you will see the statistics were reset. There are several reset options, namely:

No - Exit the screen reset statistics unchanged.

Yes - Means to drop the statistics without resetting the current value battery. Used to reset the odometer, dis- flowmeter and inofrmatsii for a last minute trip.

Set Full Charge - Reset the current battery level on 100 percent. Applied after a full charge, if

you do not use the module E-BMS or balancing option on BMS disabled.

Reset and Set full charge - Reset statistics with simultaneous installing the battery to 100 percent.

Pressing the "Down" displays general statistics:

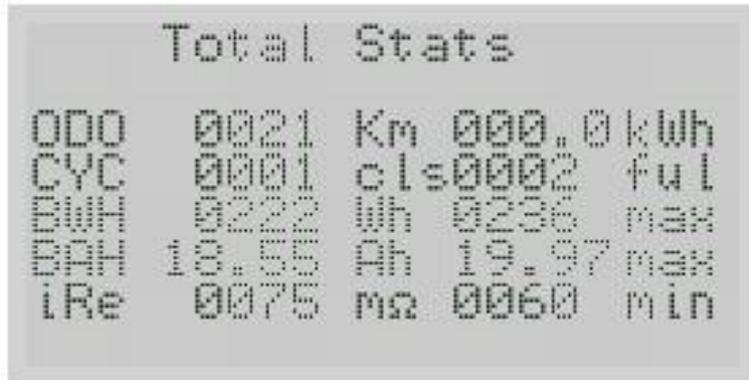


Fig. 2.3: General Statistics

ODO	Odometr	Km	Total spent kWh
CYC	tsiklovc	cls	Number of full cycles
BWH	current capacity	Wh	Wh Max. Wh capacity
BAH	Ach	Ah	Maks current capacity. Ah capacity
lRe	Tekuschee ext. Sopr.	mΩ	Minimum ext. Conjugated.

Overall statistics are not reset and is used to display data in capacity and mileage for all the operation of the controller.

2.1.4 Status BMS

Only available when the module BMS Adapto.



Fig. 2.4: BMS

1. Upper band of the displayed voltage (defined automatically)
2. Difference between the maximum and minimum voltage battery cells
3. Lower range displayed voltage (defined automatically)
4. Battery status (BMS fail, Battery empty, Balancing, Charged, Battery OK)
 - BMS fail - error BMS (refusal or incorrect setting)
 - Battery empty - the battery is low
 - Balancing - Active balancing mode battery
 - Battery OK - Battery OK, the above modes inactive

BMS page shows the graph of voltage cells, once the difference between the maximum and minimum voltage of yacheeks all left, and the status of BMS on the bottom line. At Pressing "Down" with BMS screen brings you directly to the menu SETUP BMS <BMS Setup> See chapter 3.5 for detailed SETUP menu descriptions BMS Setup.

2.1.5 System information

Health monitor - This screen appears when you press the button ki "Left" from the main screen. It displays the options Controller needed for troubleshooting. Pre-assigned to Controller Diagnostics service personnel prices-tra.

Device information - This screen appears when you press "Up" button of the screen <Health monitor>. Displayed here information about the firmware version and the serial number of the controller. Serial number is specified when produces and can not be changed nen user. The firmware version can be changed by the updated

```

Health monitor
U: 12.6V/13.4V/3.27V
Vhall: 4.66V/002mA
Motor t°:000°C 00 00 00
HALLS: 111,H2 CFF
P0000M0028 Protect:N
Mosfet T°:026°C
-4.0°+9.9°-0.0°-2.3°+3.4°

```

Fig. 2.5: Health Monitor

```

Device information
Serial #: 10300275
Product ID: #CI002
Firmware Ver.: #001
UNLOCKED:F001
Compiled
F/W Rev.: v1-RC8f

```

Fig. 2.6: Device information

lenii user. Also in case of firmware unlocked firmware version, the screen would display <UNLOCKED>. It means that the lifting of restrictions on the maximum currents SETUP profiles and the maximum current in excess voltage pi-Tania threshold of 90 volts. However, it also means that the guarantee for this controller is not available, because unlocking bathroom firmware version assumes that the user-taking is the responsibility for exceeding manufacturer threshold voltage and maximum current. Change type firmware is only possible in one direction. In other words if you once flashed <UNLOCKED> version, then return to the standard version of the impossible.

Debug This screen displays the service information and necessary only for service personnel.

```

Debug
SS=ECA0t0000a0002
#=0000 0000 0000 0000
I:0000 0000 0038 0000
Ia= FFFFn0828p0000f00
OA:F280 DA=0000 A82AF
U01E=242E 06ACcFFC6
PHV:0005 000A 0005

```

Fig. 2.7: Debug

2.2 Controller Setup

2.2.1 Configuring the Interface

Setting the interface is made in the main menu Interface menu. Select the desired unit of kilometers or miles per hour, while also changing the display mode temperature in Fahrenheit or Celsius, respectively. Here adjust brightness Brightness HI or LOW, speed update of information on the screen, set the Quick Menu mode and Enables and configures the transition in power efficient mode. For a detailed description of each menu item: View Interface chapter [3.4](#).

2.2.2 Modes with motor

There are several modes in which the controller FPICbin to control the motor, namely sine management, Bloch-tion control and sensorless mode. Mode-selection produces smiling in the menu Controller setup -> Advanced Settings -> Control MODE. See Chapter [3.3.8](#) Sensorless mode can be used van in case of damage to wiring the hall sensors in the motor or Hall sensors themselves and redundant. Avoid using polzovat sensorless working mode when there is sensor Hall, as it is not optimal.

2.2.3 Working with planetary engines

The controller supports the work of the planetary motors and IME - is some additional SETUP allowing optimized Vat work with planetary engines. Also possibly connected chenie reed datchtka speed instead of the brake lever when using transformations motor with freewheel for correct determination speed. Parameter responsible for the calibration of this sensor the menu Controller setup -> Ext SPD ratio. Full description of special settings to work with the planetary engines Refer to the Advanced Settings section of Chapter [3.3.8](#)

2.2.4 Manual tuning motor

Manual adjustment of the motor may be required in the case of special-cific configuration engine as well as if the sensors Hall installed in the engine with significant displacement (about 30gradusov). If auto-detection does not work the first time, in the case of phase-shifted by 30 degrees sensors can help small-Choe resistance motor rotation at the beginning of the process of auto-toopredeleniya example uderzhivaenie motor brakes with sufficient precise effort to slow down the rotation but insufficient just great to motor locked. If and Such a method fails, you can customize or adjust after automatic motor parameters manually.

Manual adjustment of the motor:

1. Connect the hall sensor and the phase conductors of arbitrary-time.
2. Verify that the hall sensors are working for this:
 - a) Navigate to the health monitor (from the main screen to the left)
 - b) slowly roll the wheel forward and watch the figure in following inscription "Halls: xxx, Hy". Digital "y" must be changed, either from According to the scheme 1-2-3-4-5-6-1-2-3-4-5-6 - ... or 6-5-4-3-2-1-6-5-4-3 - 2-1 - ... and three figures "x" denote the logic levels of each of the three Hall sensor.

If, during the rotation of the motor numbers "y" sometimes takes knowledge chenie "0" or other sequence of digits, the hall sensors do not work properly or the motor sensors have an angle of 60 gra-grees. (If 60 degrees - then you need to flip one of the sensors Hall in the motor, not any, and a specific sensor)

3. Choose the direction of rotation of the motor.

If you rotate the motor forward, the menu "health monitor" figures after saying "Halls:" should increase. If the numbers decrease shayutsya, then change the setting "Hall reverse" or "Direction".

4. Setting phase combination.

Setting consists of setting the direction of the control signal Ia and a phase shift control signal. Direction of Governors outgoing signal set using "wire reverse".

To determine the correct direction, try a little give gas. If the wheel does not rotate in two ways behavior of the motor:

- a) during the motor current supply is positioned in a certain expansion (or the motor starts to twitch, trying to stay in prezh-position it) and if you try to wiggle the motor rotor from ustoyavshegosya position, then the effect will be felt in the spring attempt to move it in one or the other side. If effort and rotate the motor, it will be felt YaV-but expressed intervals where the rotor tend to return. If engine behaves, you need to change the wire reverse.
- b) at the time the motor current or rotates, or inhibited, but in an attempt to shake the motor is not felt salient intervals, trying to get back to the rotor and the effect of the spring. Knowledge cheat setting "wire reverse" faithful and need to change the parameter "hall offset".

After selecting wire reverse pick hall offset (a total of 6 combinations), in which the motor rotates forward best.

At the selection of combinations is completed.

The next step is to configure the timing angles.

This three parameters: "angle corr" ind timing "and" pwr timing".

To adjust the angle corr set to a value close to zero, "Ind timing" in a value close to 400-500, "pwr timing" in the meaning of 0.3-0.5, "OVS" to 0.

First you need to choose the angle corr.

To do this, unscrew the motor slightly (about 10-15 speed km / h), and changing the setting angle corr as a minus and a plus, oversees the work of the motor. You will see that this shear-on

construction strongly in minus and plus strong in the motor starts slower rotate and louder. You need to find a value of about silvered dyne interval where the motor rotates best.

Next you need to configure ind timing.

To do this, unscrew the motor up to cruising speed. If you not sure what the cruising speed of the motor, then look at zhkran "debug papast which can be pressed from the main screen, Thieme combination of "left-up-up." In the line "OA: xxxx DA = xxxx Axxxx "see" Axxxx ". Look at the first digit after the book-you "A" and gradually unroll motor. She will begin to change in following manner: 8,9, A, B, C, D, E, F. Accordingly, F corresponds exists a maximum turnover, and 8 - to a minimum. Need speed corresponding to the letter "D". After promotion to the motor cruising speed start changing parameter "ind timing". Please select at-Rita is a matter where the cruise speed at dstigaetsya minimal consumption (ie, the minimum turning the handle the accelerator torus). If the wheel does not spin or vice versa unwinds very quickly, revving is not worth much. Keep current consumption at no greater than 7.5 amps. Above a certain value-tion settings and gently pressing the throttle motor starts heavily and noisily to unwind. This should be avoided by reducing gas. The value will generally be slightly less than the threshold at wherein the motor begins to unwind and noisy.

Next you need to configure the PWR timing and OVS.

PWR timing affects cravings (and efficiency) of the motor under load. Of-changing PWR timing (usually missing one of the values: 0.17 for speed motors, 0.3-0.5 and 0.7-1.2 for normal to slow motors), achieve maximum thrust when you sneakers on the floor at cruising speed.

OVS can raise the maximum speed by reducing Motor efficiency. Optimal values are usually 2-4. Chosen experimentalnym way.

Keep in mind that if you strongly vykruchennyh settings "OVS" and "Ind timing of large operating currents and no speed limit ec-Is strongly gazanut, motor starts uncontrollably strong disclosure ivatsya and can even burn the controller. Therefore Avoid indexer

similar situations recommend that you install in the profile settings maximum speed limit around 20 percent more than the actual maximum speed of your machine on the road.

2.2.5 Setting the minimum path

(SET RANGE)

This function is used to automatically correct necessary power for passing a given distance.

You need to specify the amount of energy which is planned to spend <Power amount> and how far you have to drive <Range>, Then run the automatic control. A power option (Go).

```
SmartRange setup 1/1
Range           037.7KM
Power amount    15.2Ah
>Power range    00.5Ah
Go

Power range
for adjust torque
```

Fig. 2.8: Set Range

Additional settings <Power range> need for pre-overcoming ups and compensate for uneven loads. Its should install the more, the more hilly terrain will be on your way. In other words, this option sets the reserve capacity, which can be used without a significant decrease in power.

The controller will automatically limit the power of motion to overcome a given distance.

It should be remembered that the power consumption in the first depends on the speed of movement and the option to automatically correct power can not indefinitely increase the maximum running on a single charge.

When activated, the mode is displayed on <Set Range> display on the main screen in the lower left corner of the letter R and two

values are displayed percentage distance traveled relative-respect to a specified percentage of remaining and reserve capacity. In the case of premature flow reserve bike continued INH movement in eco mode, but given capacity battery may not be enough to achieve the route.

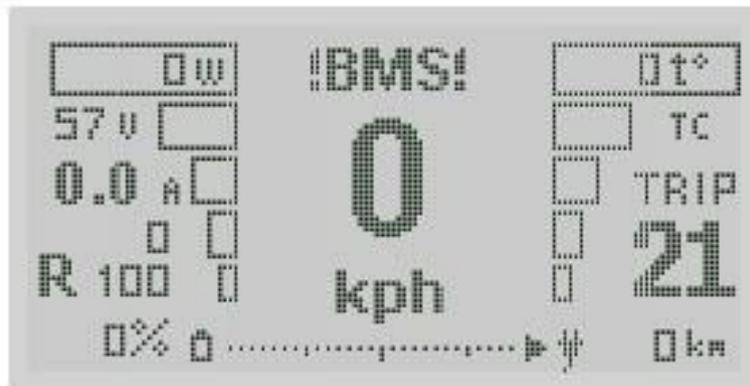


Fig. 2.9: Set Range

2.2.6 Regeneration

(Regen settings) menu Preset the braking reregenerativnogo you must configure the maximum battery voltage, maximum mum short charging current, which is capable of at-adopt the battery as well as enable and configure active mode torus the engine being able, if necessary. Full description of each settings, refer to paragraph Controller Setup -> Regen Settings chapter you [3.3.5](#)

2.2.7 Password lock

You can set a password to enter the main menu or to enable the controller. Password is set in the Master password and Menu Password respectively. Password is entered using the Up Down Left Right proizolnoy in sequence. Closing-it serves as a password Back button. The default password for the-key and the first password change be careful and well remember the sequence that you entered as Throw-Sit yourself without knowing the password combination is not possible. See Chapter [3.4](#)

2.2.8 Protection regime

This mode is designed to resist the motor-wheel without overrunning clutch mobility Lock-vannogo password bicycle moped. If the mode is activated, the controller will prevent the motor from turning Wheel until not entered the correct password. function avtiviruetsya menu Controller Setup -> Traction settings -> Anti Theft. For this function to work recommended set phase current protection regime (Anti th. PHC) in accordance with your motor. Detailed descriptions of the options in Chapter [3.3.8](#)

2.2.9 Setting Battery

For correct operation of the controller you need to correctly specify the parameters of your battery, namely:

- Maximum doputimoe voltage HV cutoff
- The minimum allowable voltage Discharge cutoff
- Battery capacity in ampere-hours Battery AH
- Battery capacity in watt-hours Battery WH

These parameters are defined through BMS setup and required to install before using the controller.

Also in the presence of BMS Adapto in this menu you can skonfigure the BMS to work with battery, point to Settings View bmc [3.5](#).

2.2.10 DC-DC converter

Function DC-DC converter [3.3.9](#) allows the use of controller as a power source with a given voltage, which Roe may be lower than the voltage of the connected battery.

To use this option, you have to

be connected to the capacitor charge coil output.

Runs the function of demand switching point DC-DC enable in on-position ON. However, if you come in from the menu on the main screen and sohranyate settings when prompted save the settings, the function of demand automatically turned off for safety reasons. Therefore, mu is recommended that you set the necessary parameters DC-DC voltage and DC-DC Current, exit, saving options, and only then include the mode to ON. After that you can exit to the main screen, the controller at the same time should not be over-

it requests saving settings if no other options were not changed.

The main screen will display the current battery and power consumption from the controller.

To deactivate, go to the menu mode and switch mode DC-DC Enable switch to OFF. Or, if you have changed or what settings when you exit to the main screen, click save settings, in this case, the mode DC-DC switched off auto-ski.

2.2.11 Charging

Charge mode can only be used with coil inductance efficiency, connected in accordance with Figure ??.

To work correctly, you must configure the charge mode maximum charge voltage (Max voltage), then the restriction-Straight plug power supply (Supply Current), charging battery current (Battery current) and voltage drop allowed of the power supply (Supply Vdrop).

Since the charging current is directly dependent on it-Single power supply, the current limit will be minimum of two values. In other words putting too large a Scheu battery charging current, it can not be achieved in the case of set low current power supply and lack of incidence the voltage drop on the power supply. Description of the parameters, see Chapter [3.3.6](#)

2.2.12 Calibration gas and brake handles

Calibration handles (Controller Settings -> Calibtarion - Throttle | Brake) is an obligatory stage settings, as without it is impossible can be reasonably certain job options, including avtoopre-Motor division. Calibration consists of configuring the voltage limit handles of the gas and brake, throttle linearity calibration, and for-denmark progression by clicking pens. Note that when significant change of borders and replacing the sensor Hall / handles entirely obazatelno produce recalibration linearity.

Detailed description of each item, refer to the menu description Calibration chapter [3.3.4](#).

2.2.13 Calibration of current and voltage

Value of the shunt and voltage readings are given in the menu Controller Setup -> Calibration ShuntR and Voltage adj.

These values are calibrated by the manufacturer and do not need to be calibrated by the user. However, in the case of you accurate voltmeter and ammeter, you can manually recalibrate the data values.

To calibrate the voltage controller connection for more accurate voltmeter voltage directly supply terminal controller and change the value of Voltage adj until the value does not coincide with the value of voltmeter.

To calibrate the output, you need accurate ampermetr/vattmeter connected to the supply gap controller. At constant load and the exposed stall prevention 10-15 amperes comparison Nita accurate readings of the ammeter and ammeter readings on the main screen of the controller. Adjust the value to ShuntR As long as these values will not match.

We remind you that the manufacturer is not responsible for the WHO-ble damage to the battery / engine incorrectly exhibi- lennyh user calibration parameters!

Detailed description of each menu item, see Calibration the description in Chapter [3.3.4](#)

2.2.14 Traction

This mode is intended to prevent failure of the wheel skid with a deterioration of traction such as hololith- de. TRK option activated in the menu Controller Setup -> Traction control. Options TRK dV, TRK dA, PWR rise configured experimentally. Detailed description of each item, see Chapter [3.3.7](#)

2.2.15 External DC-DC converter

The controller can control an external DC-DC converters

2.2.16 Four-wheel drive mode of operation

zhenii at low speeds such as uphill, ie in those regimes max, in which the main direct-drive motor neobladaet sufficient tion effektivostyu. Slave controller must have additional tion connector. Additional connector is not included standard and must be ordered separately.

2.3 Common problems

2.3.1 Controller by pressing the throttle no attempt rotate the motor melts

The controller disables the operation of the engine in the following cases:

- if the supply voltage is higher than the maximum
- Set parameter HV cutoff in BMS setup or no-
same than the minimum allowable - set parameter
Dischg cutoff menu BMS Setup.
- if connected and activated and exhibited BMS
incorrect thresholds, or the battery is empty or broken
communication with BMS, as the engine will not rotate.
- tripped over current protection (Protect = "Y") data
ing option can try to lose in "N" in the Advanced menu
Settings, or reboot the controller.

2.3.2 It is impossible to perform an unattended setting motor

Autoconfiguration may not work in several cases, namely:

- hall sensors are connected incorrectly or defective
- poor contact or not connected all the phase conductors
- hall sensors installed offset about 30graduov
- Sensors in the engine originally designed to 60gradus-tion controller.

In this case, you must make sure that all connectors decay Yana and correctly connected and the motor has the correct location Hall sensor and is designed for use 120gradusnogo controller Teller.

2.3.3 Felt a stab at razhatii (released) throttle or brake

This problem usually occurs in the case of incorrectly installed lennyh settings active engine braking and Wire R PHC. To resolve this problem, you must perform Autodetect full cycle and make sure that all the settings related with active braking set correctly

2.3.4 Motor cuts out intermittently, goes gap-Kami

This problem occurs usually when incorrect mouth-Novka upper or lower limit battery voltage. Come-those in the BMS setup menu and set the correct value LVC and HV cutoff for your battery. Keep in mind that the battery with high internal resistance may need to install data values with a small margin, since the load voltage of such a battery may be very different from the strain without load.

Chapter 3

Description of menu

3.1 Set range

This function is used for correction avtomaticheskoy necessary power for passing zadannoy distance. Bo-
more detail adjustment described in paragraph [2.2.5](#)

3.2 Power mode profiles

In this menu you can adjust 3 power profile in
according to your needs.

- Ib A = battery current limit in amperes
- Ip A = limit the phase current in amperes
- Ipr A = phase current limit regenerative braking
tion in amperes
- Skph = maximum speed limit in km / h or miles-
/ Hr
- Acc = acceleration limiting

3.3 Controller setup

3.3.1 Speed ratio

Calibration is performed by changing the value of a speedometer Speed
Ratio used in accordance with the motor and the wheel diameter.

This value is given in millimeters per electrical revolution. To calculate the required value must be the circumference Wheel motor divided by the number of pole pairs. For most properties of Direct Drive Motor pole pair number is equal to 23, but if possible verify the data for your motor.

3.3.2 Motor autodetect

Autodetect - The "Auto Detect" is designed to auto-ated SETUP controller mounted under the engine. At run this option, make sure that the motor is free to rotate, smiling and is in a convenient position for 2-3 minute free-of rotation. Strongly recommended this procedure "on weight." Zafiksirute vehicle so that the engine Tel / wheels to rotate freely and you can hold the throttle control pressed. In case of emergency, immediate slowly release the throttle control to interrupt the process.

To start the process you need to click and hold on-zhatoy throttle control. After starting a determination sequence sequence connecting the hall sensors for a few se-will take a few seconds the engine korodkih movements forward. At this point in time on me, you need to make sure that the rotation really proish-DIT in the direction of "forward." If the motor / impeller rotates in the opposite ing side, immediately release the throttle control, leave in the pre-duschee menu and change the following parameter <Direction> on pro-opposites. Then you can return to procedure-avtoopre division.

Making sure that the motor / impeller rotates in the right hand Well, keep the knob of gas until you see on the screen <Successfull> inscription or any custom error messages. Per-vye 1.5-2 minutes the motor will rotate slowly, after some Time will rotate about 75 percent of the maximum speed.

Ubedivshist that auto-negotiation is completed (motor stopped rotate on the screen and written inscription <Successfull>), can of-keep the throttle lever, exit to the main screen and be sure to confirm dite save settings before exiting.

If an error message appears:

- <Interrupted By thr> when you release the throttle;
- <Halls Error> Error halls motor;

- <Interrupted By key> if you press any button;
- <Unknown Error> other errors.

3.3.3 Direction

Direction - Change the direction of rotation of the motor. Change this option if the opposite when trying to run Autodetect wheel rotates in the opposite direction. After the change on-Autodetect board run again.

3.3.4 Calibration

Voltage adj - Calibration of voltmeter. Press the "left" position to right- in "adjusted current voltage that appears sprites va. This option does not require the user SETUP.

ShuntR - Built-in shunt resistance. Adjusted producers, does not require user calibration.

Shunt2 - Korreksiya current profiles. If consumed current, as indicated by a power meter controller differs from the maximum current set in power mode profiles, change this value. Changing this option will change the numbers then-Single profiles (power mode profiles), while the actual needs trolled current does not change. Used to fine-tune for-given by the current proilyah in accordance with real-tokoograni cheniem controller.

Zero Offset - Calibration of zero current. Option uses-smiling for installation of indications "zero" current with no load on the main screen. Serves to correct operation of a power meter.

Thr limits - Calibration of the throttle.

Thr linear - Calibration throttle linearity.

Thr progr. - Set the throttle progression (0 = linear)

Brk limits - Calibration of the brake lever.

Brk progr. - Installation of the brake lever progression (0 = linear)

Weight - Total weight of vehicle with a driver.

Int TSensor - Type of thermal sensors. Fits manufacturer does not require adjustments by the user.

In the calibration mode the throttle / brake buttons <left> and <right> you can adjust the current limit and the <top> and <down> switch between upper and lower limit.

The current position of the throttle / brake indicator is displayed torus under the axis coordinates.

Recommended to set the lower limit just to the right (with per-cross) the minimum position of the handle, as the hall sensors IME- are temperature shift and changing environmental conditions environment can shift the threshold that the incorrect calibration can lead to a sudden movement of the vehicle. In the picture below is an example of proper calibration.

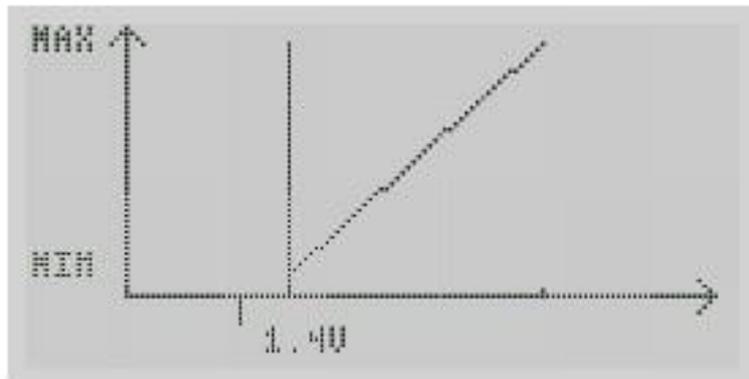


Fig. 3.1: Calibration

3.3.5 Regen settings

Enable - There are three possible settings: on - braking motorm Included; off - Braking the motor is turned off, as well as on-zhatii brake motor will not turn off. m-off - When you press the brake motor is switched off.

ActiveMode - Braking motor switched mode re-Versa thrust possible while braking to zero speed.

Required for operation mode setting KV motor, as well as co-resistance of motor windings. These parameters are set autotune.

ForcedActive - With this option disabled, braking first performed classical regeneration (ie shorting all subsequent phases of the motor and drain accumulated in the current in the windings battery), and when the current begins to decrease this mode, braking automatically switches to reverse thrust. This will sly-shen-clicking switch. If this option is enabled, braking always happens in reverse thrust. At high speeds

reverse thrust requires correct settings complementary angles advance.

Rated Current - Current limit regeneration. Recommended set according to your battery charging current.

Inversion - Inversion sensor brakes. If ka-calibration boundaries when you brake handle signal voltage decreases (ie calibration slider moves to the left), change Nita this option.

Smooth - Useful to include, if the signal regeneration of shoot-Xia with buttons, not the sensor is sensitive to stress. When included chennoy options braking force will gradually increase, and the Releasing - decrease smoothly.

PWM limit - Limitation of the minimum cycle of the PWM at classical work the brakes. The larger the value, the less to necks speed will slow down, but the efficiency will be reduced, and the heating of the motor - to rise. Recommended to set about 95 percent.

SPD sensor - Allows you to connect to the display input pen brakes from a speed sensor bike computer. Useful for motors Freewheel where braking is meaningless, and external sensor snip sorosti needed.

Torque rise - Option for braking thrust reversers. Allow-configure a smooth braking response at low velocity grow. The higher the number, the stronger will slow at low speed. 80-150 is recommended.

Min speed - Minimum braking speed reverse. In tenths of km / h The default value is 2.

3.3.6 Charge settings

Charge Enable - Enable / disable charging through the controller. When set to "YES" charge mode will be active and early-netsya immediately after plugging in the charger with the charging the coil to the controller.

Max voltage - The maximum charging voltage of the battery.

Supply Current - Limitation of the power supply current. Establishes White is not a permissible current unit used pitaniya/zarow unit.

Charge current - Limit the battery charge current. Mouth-navlivayte no more acceptable for your current charge the accumulator

tor.

Supply Vdrop - Maximum voltage drop block pi supply. Sets the maximum voltage drop power supply under load. In the case of high-quality pulse the power supply is sufficient value of about 3V.

3.3.7 Traction settings

Throttle mode - TORQ (default) or SPD. Mode TORQ is regulated by turning the accelerator rod motor. In SPD mode the velocity and thrust in a small range (le setting close to the Chinese controllers).

Thr Cruise - Vklischenie or disabling the ability to go in cruise mode. Cruise control mode allows you to maintain constant speed without keeping the accelerator. If this attitude-Straight off, the cruise control can not be activated. If this option is included Chen, the cruise control can be activated in two ways: a) rapid Roe triple pressing the accelerator b) while keeping the accelerator torus in a nonzero status display press "up then let go of the accelerator. Turns off the cruise control or depression-eat the brake lever or pressing on the throttle. For activate cruise control you need to dial the speed of not less than 8-10 km / h With active cruise control can reduce and increase-increment a supported speed by pressing the display up and down.

PWM rise lim - Regulates the maximum speed of the motor (Or the maximum rate of increase of the PWM filling) and some extent, the rate of increase traction under hard pressed on the accelerator. The larger the number, the faster. For extreme tion drive recommended 80 (maximum).

SPD smooth - Adjusts the smoothness of response limitations speed. When approaching the maximum speed, controller begins to limit power. Size of the window soon-STAY governed by this setting. The higher the number, the sharper activated speed limit. Less - the less accurate completely maintain a constant speed, but the rate maintenance going smoother and softer.

TRK - Enabling Traction. When the mode, the controller controls the acceleration of the motor. Usually if wheel ran over a piece of ice, it starts to sharply accelerate. In

Traction triggered this moment and for some time reset traction motor.

TRK dV - Set the acceleration at which the CPA-Traction was treated.

TRK dA - Sharpness (term for acceleration of acceleration). Allows you to fine-tune the time-tripping and at the same time allows to achieve high thrust (acceleration) without positives. That is, if the wheel has broken, the acceleration increases sharply, leading to fire. And if the melting but to press the accelerator, the acceleration will increase smoothly without positives.

PWR rise - How quickly after firing antiprobukscoops restored thrust motor.

LS enable - Current limitation at low speeds. Helps using motors BMC / MAC, which starts with a sharp may twitch in view of the freewheel.

LS current - Limiting the starting current.

LS start - The rate at which the current begins to achieving increased-increment a.

HS start - The rate at which the current reaches achieving maximum (which are shown in profile) values. That is, current gradually increases, from the speed LS start and ending speed HS start.

2WD enable - Enable / disable all-wheel drive mode ma. In the fieldbus controller can be a primary sub-Keys an additional controller. Additional controller controlled by the main controller if this setting include Chen.

Slave SL - When this speed is reached additional controller is disabled. It is recommended to establish if a second motor with planetary gear and overrunning clutch and helps only low speeds and at high speeds it spins uselessly.

BMC halls fix - Option to help overcome the problem of old-in motors that BMC / MAC by shifting the timing advance at the start of ago. At the start slightly reduced efficiency, but the start-ray occurs above.

ACC off on BRK - When this option if keeping actor pedal to release the brake, the engine will not start spinning. For consideration Torsional motor need to press the accelerator when released-tion brake handle.

Backwd SPD - Maximum reverse speed.

Anti thief - If enabled, the wheel will be locked when controller is locked with a password.

Anti th. PHC - Maximum motor phase current mode protivougonki. Allows you to set the maximum force of the motor.

3.3.8 Advanced settings

Angle corr. - This setting compensates inaccuracy installed ki hall sensors. That is, the difference between the applied magnetic netic field of the stator and the testimony angle hall sensors. Since Hall sensor - three, the setting - the average deviation of all three sensors from scratch. Deviation of each sensor individually determined and automatically compensated during rotation can-torus. Determined automatically during the auto-tuning motor.

Ind timing - Set between the signal delay compensation Hall sensor and the control signal of the controller. When rotation SRI at high speeds, the signal from the sensor is delayed, so adjustment is required this time. Accordingly, the time is the sum of the delay hall sensors, filters scheme ME controller and data processor time controller Teller. Determined automatically during the auto-tuning motor.

PWR timing - Setting for the shift angle ahead-tion depending on the phase current. The more inductance on-hank motor, the stronger the current in phases behind the manager signal. Compensation current backlog given this setting.

angle corr2 and PWR timing2 (In the firmware since v1RC8b)
- Analogues of the above settings for reverse thrust mode (ie active inhibition)

OVS timing - Setting responsible for unwinding motorcycle pa, in the case when the battery voltage is not enough to achieve of maximum speed. Works as follows: the pre-achieving almost maximum cycle of the PWM controller, increased increment a lead angle, which enables more increase to the speed (and reduce motor efficiency) if the rate-limited stricted the maximum motor speed, not the draft.

HallOffset, HallReverse, WireReverse - Three settings corresponding connection setup for the hall sensors relative

phase conductors, as well as reverse the motor and sensors. These on-construction projects chosen the right combination and direction of rotation phases and connecting halls "on ujad." Determined automatically during the auto-tuning the motor.

Wire R - Stator resistance at normal temperature (24 degrees). Determined automatically during auto-tuning the motor.

Motor KV - KV motor. Measured in arbitrary units. Determined automatically determined by the motor during auto-tuning.

Wire R and Motor KV Need for a new calculation algorithm phase current (based on the current speed, control voltage supply and winding resistance, and not from the control voltage and current, as in the standard version). This algorithm requires Reversible motor for braking and improves smoothness and clarity of the phase current restrictions. It included the following setting:

Wire R PHC - The inclusion of an alternative algorithm for calculating phase current. Allows you to calculate the current even at zero filled nenii PWM that is required for proper zero crossing Reversible inhibition at work. Important: When this option is you-key, the motor KV will be automatically installed if

At

controller.

legend). In the YES / P included adjustment of inert STI temperature sensor.

Motor Tsens - Selection of the temperature sensor in the motor.

T.limit - Peak temperature of the engine. Upon reaching the temperature below this limit by 20 degrees, the controller starts limit the power dalneynem with increasing temperature.

As temperatures rise, the power decreases linearly to zero at reaching this limit.

Control method - Method of motor control. Sine - Sinus (D- is recommended). SQWAV - The same sine, but with a trip third phase. Emulation control block. Not recommended for use Call. SLESS - Sensorless mode. Recommended only in Single-honors in the event of an emergency hall sensors because low speed and high power is unstable, bug it is not.

3.3.9 DCDC setup

Current limit - Output current limitation.

Voltage out - Setting the output voltage.

DC-DC enable - Enabling DC-DC preorazovatelya.

3.3.10 Master passwd

System password-protect switch on controller. When you enable this password, you will need to whenever you turn on the controller to enter this password. That is, there is no password is entered the controller will not boot and the motion is impossible.

3.3.11 Menu passwd

Password menu allows you to set a password only to enter the main menu, ie when it is activated, you can include a controller go, switch profiles, and view statistical sbarsyvat nosis, but to change the settings at the entrance to the main menu will need to enter the password that you specified.

3.4 Interface

Speed units - Units display speed and temperature. When selecting "KPH" will be displayed speed in kilometers per hour and the temperature in degrees Celsius, when selecting "MPH" speed bu-children displayed in miles per hour and the temperature in degrees Faren- gate, respectively.

T.Display - Display on the main screen right indicator torus. When "T" strips are as heating zaolnyatsya motor / controller, selecting "OVH" strips will fill-smiling only if already included protection against overheating and began the current limit due to overheating of the controller / motor.

LCD refresh - Change the update rate on the main screen. Specified in tenths of a second.

Brightness - Brightness takes advantage. Has 2 positions: "HIGH" (Bright) and "LOW" (blackout).

BackLight - Activating the rear envelope / stoplight. Function is used only when an external DC-DC converter.

HeadLight - Activation of the front envelope / lights. The function used enjoys only when an external DC-DC converter shipment.

Quick menu - Option enables quick menu that appearance etsya by pressing "Down" from the main screen instead of the commonly-On the menu. Used for quick access to frequently used functions.

QMenu Setup - In this menu, you can program options you need quick menu for operational use if quick menu is activated.

Suspend Mode - Enabling reduced energopotreb-tion when idle. Enable this option if you want the controller to enters a power saving mode in the inactive state. In after activate dislpey and goes again to activate Vat controller, simply press any button on the display.

Suspend time - Time in seconds after which the controller go into power save mode when inactive.

3.5 BMS setup

BMS Enable - Enable module BMS Adaptto. Ec-whether BMS is not in your configuration, select "No"

BMS Setup - In this menu you can configure BMS Adaptto module if it is connected and activated.

Instructions for configuring the module is attached to the BMS Adaptto.

Battery AH - Ask your battery in ampere-hours.

Battery WH - Ask your battery in watt-hours. For

calculation using the midpoint of the battery voltage multiplier
ing on the capacity in ampere-hours.

Discharge cutoff - Trim the lower battery voltage.

Used to protect the battery from overcharge if no-

Corollary module BMS Adapto. Install in accordance with the parameters
ramie your battery.

HV cutoff - Set the maximum voltage of the battery to the co-
Torah it safely charge when using recovery. Used

uses to protect the battery from overcharging during prolonged studies

use regenerative tormozheniya.Vnimanie! When fully

battery regenerative braking does not work.

```

      BMS setup      1/1
BMS enable      YES
>BMS SETUP
Battery AH      30.0Ah
Battery WH      01444Wh
Dischg cutoff   037V
  
```

Fig. 3.2: E-BMS Setup

BMS setup - In the configuration in case of BMS BMS
Adapto you need to choose the type of battery or set minimum
ITATION and maximum voltage thresholds for the cells used
a battery. Detailed instructions for setting contained in document
tation module BMS Adapto.

Chapter 4

Maintenance and service

4.1 Operating conditions

Operating temperature range -20 .. 40 °C

VlagozaschitalP54

In the chain plus adapter should be connected automatically switch. For mini-e recommended 50A with the characteristic "C". For the max-e recommended parallel connection of two automata 63A breakers with characteristic "C".

4.2 Limitation of liability

Manufacturer makes every possible effort to device
tion errors and the safe use of the device.

Nevertheless, all possible situations can not be foreseen.

The manufacturer declines all responsibility for any reason-
enormous damage (including property damage, physical harm,
injury, death, non-pecuniary damage) associated with use
vaniem or non-unit, loss of benefits, action
consequence of third parties, force majeure or any
other actions. These actions include, but are not limited
vayutsya: fire batteries or electronic devices; reason-
of physical harm due to an accident in the operation of the vehicle
means; inadvertent movement of the vehicle (for
example, due to a failure in the throttle or for other reasons

us); motor failure of the braking system (brake-oby mechanical optionally be duplicated); management of trans-Motor vehicles without the necessary skills; use of electronics mode more power than is permissible (overheating capacitor, failure or fire batteries, wires or electricity nicknames, breakdown of the vehicle due to high loads etc.); use of electronics in the other, except the wheel or motor vehicles; other actions PROVIDED-Indigenous applicable law. Remember that transportation means, driven by an electric motor connected in a elevated risk.

4.3 Warranty

We guarantee that the product does not contain any obvious mechanical damage and passed the final inspection is operational-STI before sending distributor or sales. Due to that, second, that the finished product is a compulsory check-serviceability lities (possibly repeated) connectors on the device can be seen slight traces of switching. This is not an defect. The manufacturer is the warranty, pre-considered applicable law. The warranty period with-constitutes 12 months from date of sale. In case of loss or incorrectly filled warranty card warranty period used is calculated from the date of manufacture. The manufacturer also ha-tees the possibility of-warranty (after warranty) repairs-is the product for a period of at least 36 months from date of manufacture izdeniya.

4.4 Warranty Card

Dear customer!

We thank you for what you have chosen and the controller Adapto confident that it will meet all your expectations. Before the start of the exploitation of the controller, please read the attached instruction manual, which sets out the note of attention of the assembly instructions, configuring, and using that must be followed to maintain it in good condition.

The warranty period for the controller you purchased (including display) is 12 months from the date of sale. During this period, we will gratuitously make over the disadvantages of the controller in if they meet the terms of this warranty. Elimination of under-STATCOM and repairs can be carried out only by authorized-E workshops distributor representing the manufacturer in the Russian Federation. On issues related to the guarantee service products Adapto, contact:

Manufacturer "Adapto E-drives lab." Address: 117246, Moscow, Str. Vvedenskogo, 8 Tel.: +7 (495) 228-18-78

Registered address: Address: 117246, Moscow, Scientific passage, , 19, room 64

Name:

Serial number

Date of purchase

Printing company-seller

Name and signature of the seller

Warranty provisions

1. Warranty repairs carried out exclusively in C. for of the warranty period specified in this warranty coupon and only in authorized workshops distributors pa, representing manufacturers in the Russian Federation.
2. This warranty is valid with proper-Making lenii warranty card, namely the right and clear indicating the name of the controller, serial number, date of purchase, as well as the availability of the name, stamp and signature representative of the seller.
3. When troubleshooting controller buyer oby-occupied immediately stop its operation, taking all available measures to be taken to avoid or at the most reduce further damage arising from malfunction STI.

4. Warranty does not cover:

- maintenance controller;
- repair and replacement of parts due to their mechanical damage;
- to repair the controller that operated without Use a circuit breaker or before-custodian that meets the regulations;
- repair of failures resulting from violation sheniya Manuals and improper-ing transportation or any foreign liquid bones inside the body;
- repair of failures controller encountered in re-result of an accident, mechanical damage the electrical vodka, strong mechanical influences or actions third parties or force majeure;
- repair damage caused after the Unauthorized-tion buyer making changes to the design, complektatsiyu model.

5. Warranty void in the following case-teas:

- repair by unauthorized persons, parse it-ki, and other actions not envisaged, Manual manuals;

- use of the product for the purposes for which it is not pre-appointed, including, in the case of not-for value in extreme conditions (excess of admissible-TRIMS power liquid is spilled or objects inside), or in violation of the operating conditions of tation and storage set forth in the Owner's Handbook-atatsii;
- failure buyer responsibilities listed in Section 3 hereof.

With the basic rules of operation aware of (a) with the conditions warranty aware of (a) and agree (on), to appearance, completeness and additional equipment (if the one-kovogo) have not, confirm functionality of the product.

Buyer

(Name)

(Signed)