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SIAYQ controller control parameter adjustment instructions

Due to the wide variety of motors on the market, different motors have different working parameters.

1. Basic parameters:

1.1. Maximum phase current

the maximum phase current of the working motor.Determines the maximum motor output from stand still to rated speed Torque.

The maximum phase current has a maximum limit on the controller hardware, and the set value is not allowed to exceed the factory setting. Otherwise it will lead to The probability of the controller being burnt out is greatly increased.

Different types of motors will have different output torque performance under the same maximum phase current setting value. Torque version The motor output torque of the version is large, the output of the balance version is slightly smaller, and the output of the speed version is the smallest. The motor with a low fixed speed has a large output torque, The output torque of the motor with high fixed speed is small.

1.2. Maximum line current

the maximum bus current of the controller's working battery. Determines the maximum power value of the motor output. control The maximum input power of the device = battery voltage * maximum line current.

This value determines the maximum output power and thus the maximum speed.

1.3. Rated voltage:

The maximum number of strings of SIAYQ controllers with different voltages is as follows:

Voltage	Lead-acid batteries	Ternary lithium battery	Lithium iron phosphate battery
48V	4 Cells	13-14 Cells	16 Cells
60V	5 Cells	17 Cells	20 Cells
72V	6 Cells	21 Cells	24 Cells
75V	6 Cells	22 Cells	25 Cells
84V	7 Cells	24 Cells	28 Cells
96V	8 Cells	28 Cells	32 Cells
108V	9 Cells	32 Cells	35-36 Cells

1.4. Throttle Threshold

The handlebars on the market are uneven, and the voltage value of different handles or accelerator pedals will be different

	Idle voltage	Full voltage
Electric motorcycle handlebar	0.8V-0.9V	4.1-4.3V
Central control transfer	0.8V-0.9V	4.5-4.95V
12V accelerator pedal	0.0V-0.2V	4.6-4.8V

1.4.1. We set the low throttle threshold according to the idle voltage. Considering the voltage fluctuation of the switch, set the low throttle threshold Generally, it is 0.2-0.3V higher than the idle voltage to ensure that the motor works in an idle state when stopped.

For example, the low-throttle threshold of the electric friction handle will be set to 1.1V, and the low-throttle threshold of the 12V accelerator pedal will be set to 0.5V.

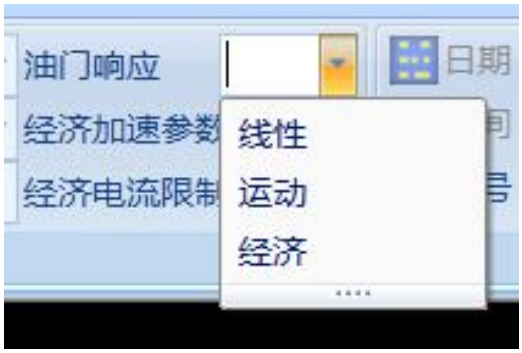
1.4.2. We set the high throttle threshold according to the full-hand voltage. In order to enable the controller to output in the full state.For full power, we need to make the set value lower than the full voltage. But here you have to pay attention not to set too low. For automatic To detect whether the electronic throttle is damaged, we set a value 0.6V higher than the high throttle threshold as the alarm limit,If the limit is exceeded, it is considered that the handlebar is damaged, and the controller immediately stops the power output to prevent the vehicle from speeding and avoiding Causing a speed safety accident.

So when we set a high throttle threshold, for example, when the steering wheel of an electric motorcycle is full of 4.1-4.3V, we will set 3.9V is used as the high throttle threshold. For the high throttle threshold of the 12V accelerator pedal, we will set it at 4.3V.

The 742 version adds the function of self-learning throttle. When turning to the end during self-learning, the controller will automatically recognize the handle/pedal The maximum voltage of the throttle signal, and generate the throttle high threshold according to this voltage.

1.5. Throttle response

For different user preferences, there are three configurations for the handlebar characteristics: linear, sporty, and economic.



1.6. Phase shift:

the key feature of the angular position of the motor, the general motor factory will indicate the angular position, most of the hub motors on the market There are three types of 30°, 210° and 90° in the market, but some motors are also special. If this angle is not clear, self-learning can be used Find this value.

1.6.1. Start self-learning method:

1) The controller is defaulted.

2) The controller is fixed, and the self-learning is started through the upper computer.

3) New controller Fixed, start self-learning through operation method.

1.6.2. The method of starting self-learning or changing the motor direction without using the host computer:

Note that this method is not suitable for the 485 communication controller, because the 485 communication controller comes with Bluetooth, this function is shielded up.

Conditions: electric motorcycles, tricycles and four-wheelers without neutral gear (forward by default) need to be connected to the brake cable.

For electric four-wheeled vehicles with neutral gear, there is no need to connect the brake cable.

1: Keep the motor in the no-load state (the wheel is suspended) and the controller keeps shutting down.

2: Pinch the brake or put in neutral, turn the throttle to the end.

3: Turn on, keep the throttle stick turning to the end for 10 seconds.

4: Return the throttle and turn the throttle three times: (Return the throttle for 0.5 seconds, then turn for 0.5 seconds, then return to the throttle for 0.5 seconds, turn again, and then turn again.Go back, turn again, go back again).

5: The controller will make one long and two short calls, which is a prompt to enter the self-learning state.

At this time, follow the self-learning operation steps to complete self-learning.

Note that step 4 turns the throttle for three times to start self-learning, and step 4 turns the throttle for 5 times to change the motor direction.

2. Constant speed and weak magnetic field:

2.1. Constant speed

the speed of the motor under the rated voltage, referred to as the rated speed, which is often called constant speed in the electric motorcycle industry.

This constant speed determines the highest motor speed. Normal controller can be driven under rated voltage.The maximum speed of the motor is near the constant speed.

The controller will recognize the rated speed under the current voltage during self-learning.

2.2. Speed expansion

The motor speed is pushed to a higher speed than the fixed speed, which is called speed expansion.

Speed expansion method 1: increase the working voltage, the higher the voltage, the higher the motor speed.

Speed expansion method 2: Do not increase the working voltage, and increase the motor speed through field weakening.

2.3. SIAYQ controller adopts weak magnetic field to expand speed

Without changing the battery voltage, it directly increases the battery voltage by controlling the current limiting parameters. Machine speed.

2.4. Maximum speed, backward speed

The maximum speed of the motor is limited.

In the electric vehicle market, the maximum speed is generally not limited, but the maximum speed is limited by the following current limiting parameters.After the speed exceeds the fixed speed, it will automatically enter the field weakening state. The more the speed exceeds the fixed speed, the greater the depth of field weakening.

2.5. Depth of field weakening

Depth of field weakening: (maximum speed-fixed speed) / fixed speed *100%.

Generally, the field weakening depth of in-wheel motors can reach 50%.

Some in-wheel motors have a field weakening depth of more than 100%. Therefore, we stipulate that the field weakening depth of surface mount motors should not exceed 50%.The depth of field weakening of the built-in motor does not exceed 150%.

2.6. Current limit parameter:

Adjust the maximum speed by adjusting this parameter.

Let me talk about the conversion of 500RPM, 1000RPM,. 8500RPM, 9000RPM in the current limit.

These speeds are those of the mid-mounted motor. The corresponding parameter is also the parameter of the central motor. For in-wheel motors, a conversion is needed.

Usually the pole pairs of the in-wheel motor are 16, 20, 24, 28, 30 pole pairs. Usually the central motor has 4 pairs of poles.

Pole pair ratio of hub motor and mid-mounted motor

Hub motor pole Pairs	16	20	24	28	30
The Ratio value for					

Compare with mid drive motor Pole pair	4	5	6	7	7.5

After we obtain the pole pair value of a hub motor, we can set the current limiting parameters according to the speed requirements. For example, the pole pair number of the in-wheel motor is 16, divided by 4 to get the pole pair ratio=16/4=4.

Then

The actual speed of the 16-pole hub motor corresponding to 500RPM is 125RPM.

The actual speed of the 16-pole hub motor corresponding to 1000RPM is 250RPM.

The actual speed of the 16-pole hub motor corresponding to 4000RPM is 1000RPM.

The actual speed of the 16-pole hub motor corresponding to 5000RPM is 1250RPM.

The actual speed of the 16-pole hub motor corresponding to 5500RPM is 1375RPM.

The actual speed of the 16-pole hub motor corresponding to 6000RPM is 1500RPM.

The actual speed of the 16-pole hub motor corresponding to 6500RPM is 1625RPM. The actual speed of the 16-pole hub motor corresponding to 8000RPM is 2000RPM.

2.7. Magnetic field weakening limit

gradually increase current limit parameters

The current limit value we set should be considered according to actual needs. For a motor with a fixed speed of 1000RPM, consider weak The magnetic depth is 50%. The maximum speed is also considered at 1500RPM, and it is hoped that the motor will not work above 1625RPM. Therefore, the current limit value is set to 30% at 6000RPM, and the speed at 6500RPM and above is set to below 5%.

This ensures that the motor will weaken the field by 50% when idling. It will not cause the motor to shake or even burn control due to the excessively deep field

weakening.

For many motors, the field weakening depth can reach 100%, and a 1000RPM motor can work at a high speed of 2000RPM. Correct

For this kind of motor, in order to exert higher performance, the current limiting coefficient can be continuously expanded, and the current limiting parameters within 8000RPM can be Set the normal value above 70, 8500 is set to 30, and 9000RPM is set to below 5.

The setting of the current limit value starts from a safe value and gradually increases the speed. It is necessary to ensure that the field weakening cannot be excessive. Once found If the idling speed is unstable or even out of MOE or OVER protection, it indicates that the speed is too high and the field weakening is excessive. Want to change it back.

3. Control parameters:

3.1. Acceleration sensitivity:

Electric vehicles and electric motorcycles have very different requirements for accelerator acceleration.

An electric car is generally an accelerator pedal, while an electric motorcycle is an accelerator or central control.

The response of electric vehicles to the throttle should be moderate, while the requirements of electric motorcycles are different. Some customers require light, slow and stable.Some customers require responsiveness, which can be triggered immediately.

Acceleration sensitivity refers to the speed of throttle response. This parameter is between 16~224. The higher the number, the higher the throttle The faster the more sensitive.

16 is already very slow. Generally, it is appropriate to set around 32 on electric vehicles, and rarely exceed 64. For electric motorcycles, in addition to setting it at 32, many users prefer fast response, so set it at 64,128. The track race is even set at 224.

3.2. AN: The characteristic AN value of the motor itself, the parameter range is 0~16.

Standard surface mount motor AN=0.

Standard IPM motor AN=16.

This parameter setting must conform to the characteristics of the motor.

Hub motor, surface mount mid-mounted motor, AN is less than 8.

The AN value of the embedded central motor is not less than 8.

The encoder center-mounted motor that cooperates with SIAYQ and the automobile permanent magnet synchronous motor all adopt AN=16.

All hub motors on the market are surface mount motors, and the AN value is generally set to 0 and not more than 4.

If the AN value is set incorrectly, the starting efficiency will become low, and even MOE/OVER protection will appear.

3.3. LM: Vehicle motor acceleration matching parameter, this value is used to adjust the smoothness of the motor on the vehicle.

The default setting is 22. The value used by most motors and vehicles on the market.

However, there are individual motor types that are poorly matched to the whole vehicle, and you will feel obvious resonance and shaking at low speed and medium speed.Adjusting the LM value will improve.

Start at 22. If the jitter is accelerated in the low-speed section, reduce the LM. Start the test from 16, 14, 12, 11, 8, and 5.As a result, the numbers in the middle will also work. Generally, it is better to be larger and try not to be too small. Too small will not control the current, causing With MOE/OVER protection, even burn control. Therefore, the LM value after the jitter disappears is the best parameter, so do not adjust it down.

Some motors and the whole vehicle are very smooth when LM=22, but after changing the size, it will bring jitter, so pay attention to When LM=22, there is no problem, do not adjust this parameter.

Or, after the occurrence of jitter resonance, the LM value is changed from 22 to 16,14. . . Even 5 doesn’t have much effect, it means It has nothing to do with this parameter. At this time, it must be changed back to the maximum value, such as 22,

instead of leaving a random number in the controller inside.

3.4. PID parameters

StartKI, MidKI, MaxKI / StartKP, MidKP, MaxKP.

The default parameters StartKI=4, MidKI=8, MaxKI=12 / StartKP=40, MidKP=80, MaxKP=120.

The greater the motor power and the higher the voltage, the smaller the PID. PID parameters cannot be filled in casually, otherwise it will cause abnormal operation Even burn control. The following are the commonly used PID setting parameter values. A total of 9 sets, select one set of parameters to match the motor The car is modified under the guidance of professionals.

	StartKI	MidKI	MaxKI	StartKP	MidKP	MaxKP	
1	1	1	1	10	10	10	Surfboard default
2	2	2	3	20	20	30	Super power motor
3	3	3	4	30	30	40	
4	4	4	6	40	40	60	High power default
5	4	5	8	40	50	80	
6	6	6	9	60	60	90	Medium power motor
7	6	7	10	60	70	100	
8	8	8	12	80	80	120	Small and medium power default
9	8	9	13	80	90	130	
10	8	10	15	80	100	150	
11	8	11	16	80	110	160	
12	10	12	18	100	120	180	
13	10	13	19	100	130	190	
14	10	14	21	100	140	210	
15	10	15	22	100	150	220	
16	16	16	24	160	160	240	Small power motor

Note that improper PID parameter setting will cause the system to work abnormally, and even MOE/OVER/PHASE failures If the difference is too large, it will cause burning control, so pay special attention.

Three-speed, electronic brake, power display, undervoltage protection parameters:

3.4.1. Three-speed control: high gear, middle gear, and low gear. The current ratio is adjusted by 4 parameters.

High speed: D is displayed on the mobile phone APP/computer. The power is fully open, working at the maximum line current and maximum phase current.

Medium speed gear: DM is displayed on the mobile APP/computer. Part of the power is turned on, the phase current affects the starting acceleration, the line current Affect the maximum vehicle speed, generally set as, the proportion of the medium-speed phase current is 75% of the maximum phase current, and the proportion of the medium-speed line current is 50% of the maximum line current.

Low speed gear: DL is displayed on the mobile APP/computer. When the power is turned on, the phase current affects the acceleration of the start and the line current.It affects the maximum vehicle speed. Generally, the low-speed phase current ratio is 50% of the maximum phase current, and the low-speed line current ratio is the maximum 25% of the large line current.

3.4.2. The electronic brake is controlled by two parameters: stop reflux, and maximum reflux: charging current limit during reverse charging.

For the electronic brake function, when braking, the vehicle gives a braking electronic brake will be used to stop the return current, and the brake current does not exceed the maximum return value.

Note that when you want to use the electronic brake function, you must select the electronic brake in the follow item to enable this function. And set Reflux current. Note that when setting parameters, the maximum reflux is generally 25% to 50% larger than the stop reflux.

3.4.3. Power factor: 0 power factor, full power factor: calibration power display parameters.

The controller itself can estimate the battery power, and it can be more accurate by adjusting the 0 power factor and the full power factor.The correct battery level is displayed.

When the battery is full, adjust the full power factor so that the display capacity is exactly 100%.

When the battery power is empty, adjust the 0 power factor to make the displayed capacity and power basically match. For example, the remaining 10% When charging the battery, adjust the 0 battery factor so that the battery display is just 10%.

3.4.4. Under-voltage protection: a protective measure to extend battery life when power is lacking.

When the battery voltage is close to the undervoltage protection point, the controller reduces the power output so that the battery will not be damaged due to excessive discharge. One The general battery undervoltage setting is as follows:

Rated voltage	48V	60V	72V	84V	96V	108V
Undervoltage protection port	42V	52.5V	63V	73.5V	84V	94.5V

4. Auxiliary parameters

4.1. Three-speed control:

high gear, middle gear, and low gear. The current ratio is adjusted by 4 parameters.

High speed: D is displayed on the mobile phone APP/computer. The power is fully open, working at the maximum line current and the maximum phase current to And the maximum speed.

Medium speed gear: DM is displayed on the mobile APP/computer. Part of the power is turned on, the phase current affects the starting acceleration, the line current Affects the maximum speed, and there is also a speed limit. Generally, the ratio of the medium-speed phase current is 75% of the maximum phase current.The proportion of medium-speed line current is 50% of the maximum line current.

Low speed gear: DL is displayed on the mobile APP/computer. When the power is turned on, the phase current affects the acceleration of the start and the line current The maximum vehicle speed is affected, and there is also a speed limit. Generally, the low-speed phase current ratio is 50% of the maximum phase current.The proportion of low-speed line current is 25% of the maximum line current.

4.2. Stop reflux, maximum reflux:

charging current limit during reverse charging.

For the electronic brake function, when braking, the vehicle gives a braking signal to the controller, and the controller detects the brake After the signal, the electronic brake will be used to stop the return current, and the brake current does not exceed the maximum return value.

Note that when you want to use the electronic brake function, you must select the electronic brake in the follow item to enable this function. And set Reflux current. Note that when setting parameters, the maximum reflux is generally 25% to 50% larger than the stop reflux.

4.3. 0 power factor, full power factor

The default setting is 22. The value used by most motors and vehicles on the market.

However, there are individual motor types that are poorly matched to the whole vehicle, and you will feel obvious resonance and shaking at low speed and medium speed. Adjusting the LM value will improve.

Start at 22. If the low-speed section accelerates the jitter, reduce LM, from 16, 14, 12, 11,8,5 Start to test the effect, the numbers in the middle will also work, generally consider a larger one, try not to be too small. Too young The current cannot be controlled, causing MOE/OVER protection and even burning control. So the LM value after the jitter disappears is the best parameter Count, don't decrease it.

Note that a MOE of 1 means that the MOE protection is valid, and a MOE of 0 means that the protection is invalid.

4.4. Undervoltage protection

Some motors and the whole vehicle are very smooth when LM=22, but after changing the size, it will bring jitter, so pay attention to When LM=22, there is no problem, do not adjust this parameter.

Or, after the occurrence of jitter resonance, the LM value is changed from 22 to 16,14. . . Even 5 doesn't have much effect, it means

It has nothing to do with this parameter. At this time, it must be changed back to the maximum value, such as 22, instead of leaving a random number in the controller inside.

4.5. Speedometer calibration

Hall pulse meter: The number of Hall pulses is 1~16. The 485 meter can calibrate the speed display through this pulse number.

Analog instrument: 60V corresponds to 10000RPM

4.6. Speedometer mode: pulse/analog/isolated pulse

4.7. Cruise

There are grounding cruises and floating cruises for cruise. Generally, grounding cruises are selected, that is, the cruise line touches the ground.Turn on the cruise function and drive automatically at the current speed. Press again or add the

accelerator or brake again to exit the cruise and enter Manual driving mode.

Note that the maximum cruising speed is limited by the maximum speed of the low gear. If it exceeds the maximum speed at low speed, press cruise, automatic

When driving, it will automatically reduce the speed to the highest speed in the low gear.