# LCD3 additional manual

## TSDZ2 open source firmware 20beta1.C
## modified version of 20 beta 1 (C) for KT- LCD3 display

Before using the software, please read the following instructions and the display wiki carefully:

0.20.0 (DEVELOPMENT) | KT LCD3 | TSDZ2 | Manual · OpenSourceEBike/TSDZ2_wiki Wiki · GitHub

This manual is a supplement only.

## Menu items changed or added:

0.3 removed “Experimental high cadence mode”, choice of motor only 0=48V or 1=36V
0.11 added "Number of assist levels"

2.0 removed “Enable Power Assist”, replaced with -> "Startup Boost" enable/disable
2.1 removed "Number of assist levels", moved in 0.11

3.0 removed “Enable Torque Assist”, replaced with -> "Torque sensor calibration" enable/disable
3.1 removed "Number of assist levels", moved in 0.11

4.0 removed “Enable Cadence Assist”, replaced with -> "Assist with error enabled"
4.1 removed "Number of assist levels", moved in 0.11

5.1 removed “Sensitivity” eMTB”, replaced with -> “eMTB assist level 1”
5.x added “eMTB assist level x” until 9 + 1

10.4 removed "Cadence sensor mode", replaced with -> "Coaster brake torque threshold"
10.9 added " Pedal torque ADC offset”
10.10 added " Pedal torque ADC max"
10.11 added "Startup Boost torque factor"
10.12 added "Startup Boost cadence step"

11.7 removed "Cadence sensor magnet pulse percentage", replaced with -> “Pedal torque delta”

The choice of assistance mode is in the main screen.
At level 0, ON/OFF button to view the current mode, UP/DOWN button to change, ON/OFF button to confirm.

Assistance values for all modes from 1 to 254, for eMTB from 1 to 20.

## Description of the modified or added parameters:

### 0.3 - Motor voltage type

Choice of 48V or 36V motor type, read motor plate data.
Caution. It is not the battery voltage.
High-cadence experimental modes are no longer available.

### 0.11 - Number of assist levels

Choice of the number of levels to use, from 1 to 9.
It has the same function as the deleted items in the assist mode menus.

## 2.0 - Startup Boost

Enabled / Disabled.
The BOOST function increases assistance when starting and at low cadence in "Power assist" mode.
Attention, by enabling BOOST and "Start-up assistance without pedaling" at the same time, the effect increases! This can cause greater transmission stress.

## 3.0 - Torque sensor calibration

Enabled / Disabled.
Enable only after having entered the actual values of “Pedal torque ADC offset” and “Pedal torque ADC max”, obtained from the calibration.
Enabling without having entered the correct values can lead to unpredictable operations.
Calibration procedure: display in the "Technical Data" menu, the item (11.2) - "Torque sensor ADC value", enter the ADC value of the torque sensor without any push on the pedals in "Pedal torque ADC offset" (10.9). Enter the ADC value of the torque sensor with the maximum thrust applied to the pedal (cyclist standing on the right pedal in horizontal position) in "Pedal torque ADC max" (10.10).
Torque sensor calibration is required if the working range is limited, “Pedal torque ADC max” - “Pedal torque ADC offset” < 140.
Caution. The ADC values of the torque sensor over time may change, check periodically.

## 4.0 - Assist with error enabled

Enabled / Disabled. The presence of an error disables assistance in all modes.
It is however possible to force assistance even with an error if this is caused by a problem with a sensor. Torque, cadence or speed sensor.
You will have to choose the assistance mode that does not involve the use of the faulty sensor.
Use only in case of need, with this function enabled there are limitations in assistance.
The error codes have changed, see the new codes below.

## 5.1 - eMTB assist level 1

Also for eMTB assist, the same number of levels of assistance is provided as for the other modes.
The values are those of the available eMTB sensitivities, from 1 to 20.

## 5.x - eMTB assist level x

EMTB sensitivity up to level 9.
There is an additional level 10 (0 on the display), it is used in the other modes after the last level of assistance when "E" is displayed, only if "Enable eMTB assist" is enabled.
Attention, if you have chosen 5 levels of assistance, the value used after the last level will not be 10, but 6.

## 10.0 - Motor acceleration

Acceleration of the motor.
As a first setting, use low values, then gradually increase if necessary.
Consider the values in the table as maximum values.
Set carefully, aware that setting a higher value than necessary can cause greater stress on the transmission.

Consider the values in the table as maximum values.

- 36 Volt motor, 36 volt battery = 43
- 36 Volt motor, 48 volt battery = 6
- 36 Volt motor, 52 volt battery = 0
- 48 Volt motor, 36 volt battery = 55
- 48 Volt motor, 48 volt battery = 43
- 48 Volt motor, 52 volt battery = 37

## 10.1 - Startup assist without pedal rotation

0 = Disabled, X = Enabled e sensitivity of the torque to be applied for the start.
In addition to the initial assistance with just the push on the pedals, without rotation for an immediate start, now this function is also activated with the bike in motion, when you resume pedaling after a break.
Attention, by enabling the BOOST function at the same time, the effect increases!
This can cause greater transmission stress.

## 10.4 - Coaster brake torque threshold

0 = Disabled, X = Enabled and sensitivity of the torque to be applied for braking. Value from 15 to 40.
Disable if you do not have a coaster brake motor.

## 10.9 - Pedal torque ADC offset (no weight)

ADC value of the torque sensor without any push on the pedals.
It is obtained from the calibration procedure to be carried out on the display.
When you need to increase the sensitivity at the start, for example with a arm-bike, subtract a number from 1 to 10 from the value obtained.
Caution. Decreasing the offset value too much can cause an unwanted start and / or a delayed motor stop.

## 10.10 - Pedal torque ADC max (max weight)

ADC value of the torque sensor with the maximum thrust applied to the pedal (cyclist standing, on the right pedal in horizontal position).
It is obtained from the calibration procedure to be carried out on the display.
This parameter is used to amplify the range of use of the torque sensor when it is too limited.
Check that the assistance is well distributed over all levels and in all modes, if necessary correct the value obtained in plus or minus. Lower value = higher amplification.

## 10.11 - Startup boost torque factor (%)

It is used to increase the starting assistance and at low cadence.
“Startup boost” must be enabled. Available only in "Power assist" mode.
It works both with standing start and with resuming pedaling in motion.
The value of this parameter is the percentage increase in torque applied to the pedals with cadence = 0.
This value gradually decreases as the cadence increases, depending on the next parameter.
Set carefully, aware that setting too high a value can cause greater stress to the transmission.
Recommended value 250, maximum 500.

## 10.12 - Startup boost cadence step

It is used to calculate the decrease in the boost torque factor as the cadence increases, until extinction.
Recommended value 25. Limits from 10 to 50, higher value = shorter effect.

## 11.7 – Pedal torque delta

Display only. ADC value of the torque sensor without offset.
It is possible to observe and analyze the variations resulting from the torque calibration and BOOST.

## - Set assist mode

There are 5 assistance modes available, the choice is in the main screen.

| | |
|---|---|
| P - POWER ASSIST | assistance proportional to the power on the pedals |
| ↵ - TORQUE ASSIST | assistance proportional to the couple on the pedals |
| C - CADENCE ASSIST | assistance subordinated to the movement of the pedals |
| E - EMTB ASSIST | assistance with progressive percentage of the torque on the pedals |
| H - HYBRID ASSIST | combined torque + power assistance |

At level 0, ON/OFF button to view the current mode, UP/DOWN button to change, ON/OFF button to confirm. Assistance values for all modes from 1 to 254, for eMTB from 1 to 20.
In "Power assist" mode, the assistance values of the previous version must be multiplied by 50.

“Hybrid assist” is a combination of the “Torque assist” and “Power assist” modes.
The result is excellent low-cadence assistance typical of Torque mode, and the extension of high-cadence Power mode.
The assistance parameters are the same used in the two modes, combined with the same level.

## - Error codes

The errors and related codes listed in the previous version manual are no longer valid.
Error codes and description:

E01 - ERROR_OVERVOLTAGE

Battery voltage higher than the maximum expected value.
Probable error in setting the battery parameters.

E02 - ERROR_TORQUE_SENSOR

A mechanical problem may have occurred with the torque sensor or the calibration at startup has not been performed correctly. A torque was probably applied to the pedals during power on.
Switch off and on again so that the system can recalibrate, without forcing the pedals.
If the "Torque sensor calibration" function is enabled, check on the display if the value of "Pedal torque ADC offset" with free pedals and "Pedal torque ADC max" with maximum effort, correspond to those entered.

E03 - ERROR_CADENCE_SENSOR

While pedaling, no pulses are generated by the cadence sensor, possibly faulty.

E04 - ERROR_MOTOR_BLOCKED

Motor or wheel blocked, excessive current absorption without motor rotation.
Check the cause.
After 6 seconds the error disappears and the bike can be reused.

E08 - ERROR_SPEED_SENSOR

Faulty speed sensor or magnet too far away.

E09 - ERROR_WRITE_EEPROM

Error writing to eeprom. Switch off and on again to try again.
The writing in eeprom occurs at the first start-up after loading the program and every time the display is turned off.