

Overview: The TF01N is a new type of the high precision current collection (commonly known as: coulometer) capacity indicating parameter instrument, which is compatible with lithium batteries, lithium iron phosphate batteries, lead-acid, nickel-metal hydride batteries, referred to as the electricity meter. It can reach a detailed use condition of the battery at anytime; it has various features, such as a wide range of operating voltage, low power consumption, high accuracy in indicating. It can be set cell payload capacity and other parameters arbitrarily, with automatic memory function when powered down.

Display contents:

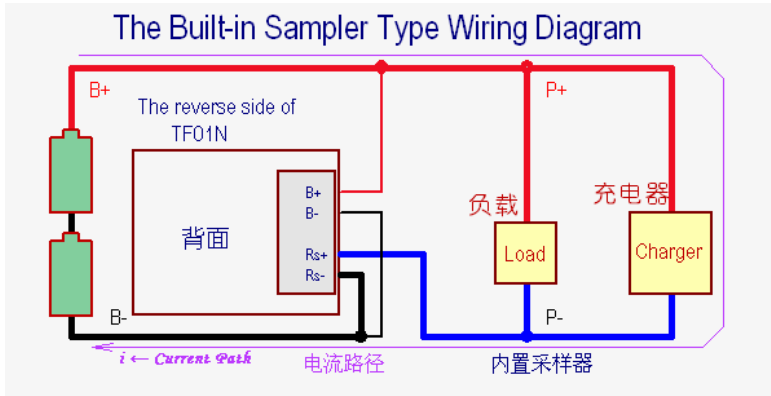
1. Residual capacity of battery (Ah or mAh);
2. Capacity percentage and totem pole display;
3. Battery voltage;
4. Battery current;
5. Power output;
6. The remaining time of charging and discharging.

Features:

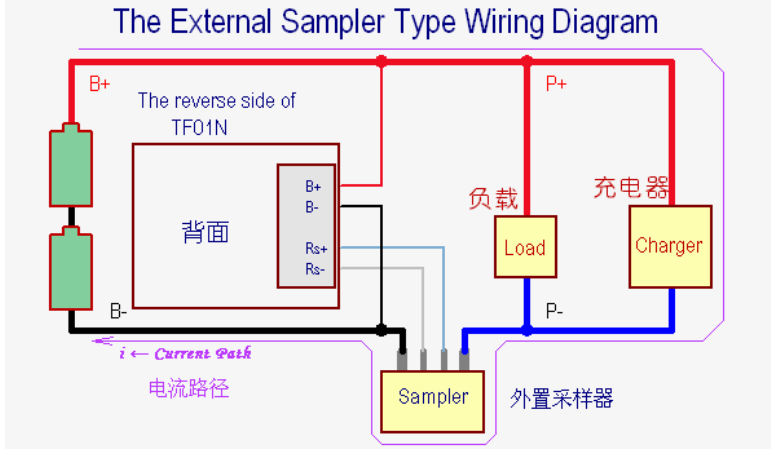
1. Display the remaining electricity of real capacity, indicate the high precision capacity;
2. The backlight automatically open when using;
3. automatic memory function when powered down;
4. Adapt to the super power load;
5. High sensitivity;
6. Low power consumption.

Connection mode: The maximum charging or discharging current is less than 10A, the built-in sampler type can be used; as the following diagram:

Note: In the application when more than 3A, the RS+/RS- in the diagram must be directly lead soldered to the circuit board, do not use the socket.



The maximum charging or discharging current is more than 10A, the external sampler type should be used;



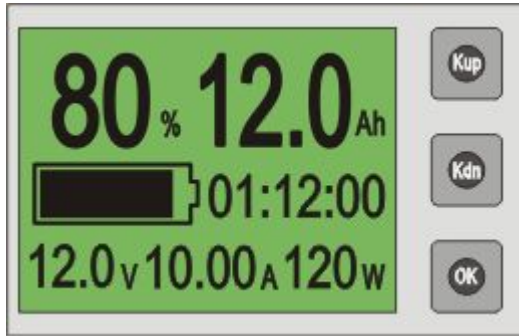
Basic parameters:

parameter	Min	Typ	Max	Unit
Working voltage range of 1 (conventional)	8.0	12.0	50.0	VDC
Working voltage range of 2 (high voltage)	30.0	50.0	80.0	VDC
Working power consumption		8.0	10.0	mA
Standby power consumption		3.0	4.0	mA
Sleep power consumption		10	20	uA
Voltage acquisition accuracy		±1.0		%
Current acquisition accuracy		±1.0		%
Using ambient temperature range	0	20	+50	°C
Backlight on current		40	50	mA
Backlight off current		30	40	mA
Battery capacity setting value	0.1		590	Ah
Built-in sampler working current		3.0	10.0 (instant)	A
External normal sampler working current		20.0	50	A
External big sampler working current		50.0	100	A
Overall Size	58(length) × 36(width) × 15(height)			mm
Display area size (Panel hole size)	32(length) × 23(width)			mm
External normal Sampler Size	23(length) × 18(width) × 5mm(height)			mm

Operating instructions:

1. When connection is completed according to the diagram, connect the battery B+ to the entire circuit, the LCD screen should display the voltage of the battery and the capacity of the original factory chip memory, not the actual capacity of battery. To obtain the actual capacity of the battery, you should charge the battery after a complete discharge, the capacity displayed is the real capacity of the battery; if the screen does display, you should check whether the circuit is connected correctly and re-power.
2. Connect to the load, the loop current is greater than 50mA, the current of the middle of the bottom should be numerically displayed, the backlight should be powered up (if the backlight is flashing, the positive and negative of the RS+ and RS- are connected in opposite), thus the load is discharging, and the time displayed on the right side of the center of the screen is the load-working time remaining under the current at present.
3. Disconnect the load, connect to the charger, the backlight flashes in interval (if the backlight keeps on, the positive and negative of the RS+ and RS- are connected in opposite), thus the load is charging, and the time displayed on the right side of the center of the screen is the charging time remaining under the current at present. Note that if the load current changes much, the time will also change, which is normal.
4. When charging or discharging, the electricity meter must be powered on and in the working state, or the capacity of the battery will not be accurately calculated;
5. When charging or discharging, the electricity meter should not be powered off; when the current is less than the light-on value, after the backlight off, the electricity meter will memory capacity without loss.
6. If the battery payload capacity is unknown, discharge the battery pack fully, set the payload capacity as large as possible in the electricity meter project mode. Charging the battery pack, record the capacity value after charging fully, then enter the electricity meter project mode and set the payload capacity to the recorded capacity, so as to correctly display the electricity meter percentage.
7. Note that if the real payload capacity battery capacity is set with error, then the capacity percentage displayed may be error, please set correctly;
8. Because of high sensitivity, under the standby state (the battery pack has no input or output current), if it is near electrical radiation interference (open or close inductive loads, such as the motor), the backlight can be briefly lit on, which is normal.
9. The RS+ and RS- must be connected to the battery cathode circuit, they are forbidden to be connected to the anode circuit!
10. For anti-interference filtering delay of the sampling circuit, the acquisition in occasions where the current changes frequently may produce error, thereby affecting capacity accuracy.

Parameter display and setting:



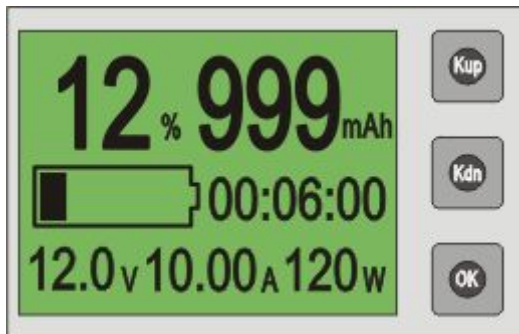
Main interface description:

1. The percentage of the residual capacity is displayed on the left corner;
2. The current actual residual capacity (Ah/mAh) is displayed on the upper right corner;
3. The battery symbol is on the middle left, the residual capacity of battery ratio is displayed as a visualized totem;
4. The charging or discharging time remaining is on the middle right, the maximum display value is 99:00:00;
5. The bottom respectively displays the voltage, current, power and other battery parameters.



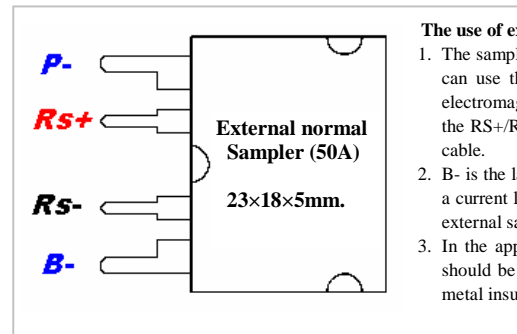
Battery capacity (payload capacity) setting 2:

1. Press the "Kup" or "Kdn" buttons to select the accurate battery capacity;
2. Press the "OK" button to select the current setting;
3. Verify that the value is correct, press "OK" button for 3 seconds, save and exit the setting interface, engineering mode menu interface;
4. Re-power and work normally after powering off.



Basic operating instructions:

1. When the charging and discharging current value < 40mA, it's under the standby low power consumption state, the backlight is off, the remaining capacity and voltage are displayed;
2. When the discharging current value > 50mA, the backlight keeps on automatically, and it starts to calculate the battery capacity consumption, displays the working time remaining;
3. When the charging current value > 50mA, the backlight flashes, and it starts to calculate the battery capacity charged, and displays the time required to a full charge;



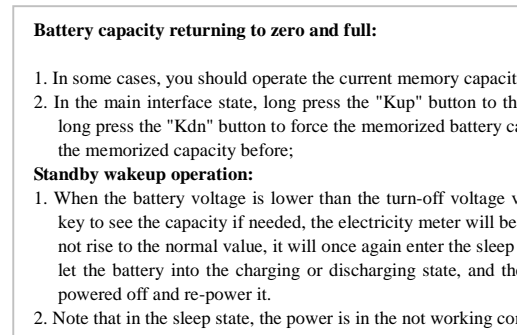
The use of external sampler:

1. The sampler and the electricity meter Rs+/Rs- wires is the signal line, you can use the safety line 22/24#) to lengthen. If more than 50cm or the electromagnetic interference environment is relatively strong, please twist the RS+/RS- to use, you can also use one twisted pair line of the network cable.
2. B- is the large current line, connected to the negative battery B-; P- is also a current line, connected to the load and the charging cathode. Usually the external sampler and the battery are connected nearby.
3. In the application where the current is above 20A, the external sampler should be mounted on a good radiating metal (the back of the sampler is metal insulated).



Turn-off voltage setting:

1. In order to ensure the accurate memory capacity and the low power consumption under the low battery status, the turn-off voltage should be set correctly;
2. Press the "OK" button for 2 seconds in the main interface and enter the "SET OFFVOLT" setting interface;
3. Press the "Kup" and "Kdn" key to select the number, press the "OK" button to select the current setting;
4. If you long press the "OK" button for 3 seconds or there's no operation after 20 seconds, it will automatically saves and exits the setting interface,

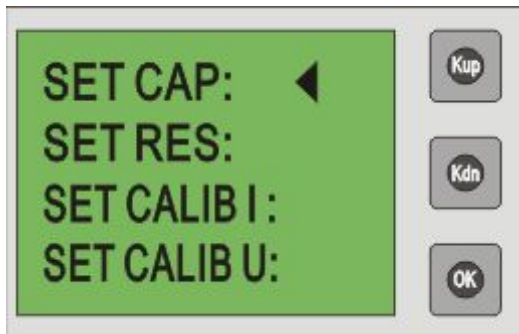


Battery capacity returning to zero and full:

1. In some cases, you should operate the current memory capacity to zero or full power;
2. In the main interface state, long press the "Kup" button to the full power, the capacity should be 100% the maximum value; long press the "Kdn" button to force the memorized battery capacity to zero; note that the above operations will not recover to the memorized capacity before;

Standby wakeup operation:

1. When the battery voltage is lower than the turn-off voltage value, it will enter the extreme low power sleep state. Press any key to see the capacity if needed, the electricity meter will be woken up and displays for 5 seconds, if the battery voltage does not rise to the normal value, it will once again enter the sleep state. If the electricity meter is needed in the sleep state, you can let the battery into the charging or discharging state, and then press any key to wake up the power meter; you can also be powered off and re-power it.
2. Note that in the sleep state, the power is in the not working condition, so the battery charge and discharge will not be recorded.
3. when the battery capacity is large and the turn-off voltage is set correctly, the electricity meter can be connected to the battery pack without an additional switch.



Battery capacity (payload capacity) setting 1:

1. Note: please make sure you know the accurate value of the battery capacity before you set!
2. Press 3 buttons at the same time after powered on, enter the project mode menu selection interface;
3. Press the "Kup" or "Kdn" button and select the setting project; the arrow pointing to the "SET CAP" project; press the "OK" button to enter;
4. Note: other parameters should not be set by yourself.

Version history:

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| 1. 2012-1:V1.0 Draft | BW-TF01N V1.PCB |
| 2. 2012-4:V1.1 | BW-TF01N V2.PCB sample current 30A Max |
| 3. 2013-5:V1.2 | BW-TF01N V3.PCB added the low voltage sleep function, sample current 72A Max |
| 4. 2013-7:V1.3 | BW-TF01N V3.PCB maximum 99h, 100Vmax, modified the calibration function |
| 5. 2014-7:V1.4E | BW-TF01N V3.PCB English version; Wiring diagram updated |