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| Prepared Date | 2013-09-24 |
| Approved Date | |
| Part No. | IFM12-75E3 |
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Lithium iron Phosphate Battery Specification

MODEL: IFM12-75E3 (12.8V 7.5Ah)

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| Prepared By/Date | Checked By/Date | Approved By/Date |
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|----------------------|-----------------------|
| Customer Approval | Signature/Date |
| | |
| | Company Name |
| | |
| | Company Stamp |
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Amendment Records

| Edition | Description | Prepared by | Approved by | Date |
|---------|-----------------------|-------------|-------------|------------|
| A | First Edition | Johnson | | 2012-10-22 |
| B | Current Changed | Che youbao | | 2013-1-10 |
| C | Add PCM specification | Yu xiaochen | | 2013-9-24 |
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1. Scope

This specification is applied to the LiFePO4 battery pack with SMBus communication port that distributed by Master Instruments Pty Ltd.

2. Specification

| No. | Item | General Parameter | Remark |
|-----|---------------------------|---|---|
| 1 | Rated Capacity | 7.5Ah | Standard discharge(0.2C) after standard charge(0.2C) |
| 2 | Minimal Capacity | 7.0Ah | |
| 3 | Nominal Voltage | 12.8V | |
| 4 | Life Expectation | Residual capacity is more than 60% of the rated capacity | 1) Charge: <u>CC@0.2C</u> to 14.6V, then CV till current to 0.05C 2) Rest: 30min. 3) Discharge: 0.2C to 10.0V Temperature:20±5°C Carry out 1200 cycles |
| 5 | Discharge cut-off voltage | 2.4V/cell (≥ 9.6V) | 10.0V recommended |
| 6 | Charging cut-off voltage | 3.9V/cell (≤ 15.6V) | 14.6V recommended |
| 7 | Assembly method | IFR18650EC-1.5AH | 4S5P |
| 8 | Housing material | ABS+PC | Flame Retardant Plastic |
| 9 | Standard charge | 0.2C constant current (CC) charge to 14.6V, then constant voltage (CV) 14.6V charge till charge current decline to ≤ 0.05C | Charge time : Approx 7.0h |

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|----|--------------------------------------|---|--|
| 10 | Standard discharge | Constant current 0.2C Cut-off voltage 10.0V | |
| 11 | Maximum Continuous Charge Current | 7.5A@20°C | |
| 12 | Maximum Continuous Discharge Current | 15A@20°C | Over current: 20A (<2S) |
| 13 | Operation Temperature Range | Charge: 0~50°C | 60±25%R.H. |
| | | Discharge: -10~50°C | |
| 14 | Storage Temperature Range | Less than 1 year: 10~25°C | 60±25%R.H. at the shipment state |
| | | Less than 3 months:10~40°C | |
| 15 | Approx. Weight | 1.0Kg | Specific energy: 93.5Wh/Kg |
| 16 | Dimension | L151*W65*H97 mm | Housing color is optional; F2 Terminal; |
| 17 | Fuel Gauge | 4 LEDs indicator | |
| 18 | Over-temperature protection | 70±5°C (Discharge) 60±5°C (Charge) | |
| 19 | Short circuit protection | Will recover after removal of short | Replaceable 30A fuse as 2 nd protection |
| 20 | Pre-charge function | <u>Start@ <2.0V/cell</u> & <u>finish@>2.3V/cell;</u> | Depend on charger |
| 21 | Communication protocol | SMbus | |

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3. Performance And Test Conditions

3.1 Standard Test Conditions

Test should be conducted with new batteries within one week after shipment from our factory and the batteries shall not be cycled more than five times before the test. Unless otherwise specified, test and measurement shall be done under temperature of $20 \pm 5^{\circ}\text{C}$ and relative humidity of 45~85%. If it is judged that the test results are not affected by such conditions, the tests may be conducted at temperature 15~30 $^{\circ}\text{C}$ and humidity 25~85%RH.

3.2 Measuring Instrument or Apparatus

3.2.1 Dimension Measuring Instrument

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

3.2.2 Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance more than 10k Ω /V

3.2.3 Ammeter

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01 Ω .

3.2.4 Impedance Meter

Impedance shall be measured by a sinusoidal alternating current method (1kHz LCR meter).

3.3 Standard Charge/Discharge

3.3.1 Standard Charge : 0.2C

Charging at 0.2C constant current until the battery reaches 14.6V. The battery shall then be charged at constant voltage of 14.6V while tapering the charge current. Charging shall be terminated when the current has tapered to 0.05C. Charge time is approx 7.0 hours, The battery shall demonstrate no permanent degradation when charged between 0 $^{\circ}\text{C}$ and 50 $^{\circ}\text{C}$.

3.3.2 Standard Discharge : 0.2C

Battery shall be discharged at a constant current of 0.2C to 10.0V @ $20 \pm 5^{\circ}\text{C}$

3.3.3 If no otherwise specified, the rest time between charging and discharging is 30min.

3.4 Appearance

There shall be no such defect as crack, rust, leakage, which may adversely affect commercial value of battery.

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4. Handling of battery

4.1 Prohibition short circuit

Never short circuit battery. It generates very high current which causes heating of the battery and may cause electrolyte leakage, gassing or explosion that is very dangerous. The terminals may be easily short-circuited by putting them on conductive surface. Such outer short circuit may lead to heat generation and damage of the battery.

4.2. Mechanical shock

Falling, hitting, bending, etc. may cause degradation of battery characteristics.

5. Period of Warranty

The period of warranty is 12 months from the date of INVOICE. Master Instruments guarantees to give a replacement in case of battery with defects proven due to manufacturing process instead of the customer abuse and misuse.

6. Storing the Batteries

The batteries should be stored at room temperature, charged to about 30% to 50% of capacity. We recommend that battery to be charged once each three months to prevent over-discharge.

7. Photo



1 PIN:N/A 2 PIN:SMBC 3 PIN:SMBD 4 PIN:GND

8. Any other item which is not covered in this specification shall be agreed by both parties.

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Specification of PCM

| No. | Item | Parameter | |
|-----|-----------------------------|--|---------------------------------|
| 1 | Voltage | Charging voltage | DC:3.65V/cell |
| | | Balancing voltage | 3.60±0.025V/cell |
| 2 | Current | Balancing current | 110±5mA |
| | | Self-consume current | ≤600μA |
| | | Max. continuous charging current | 7.5A |
| | | Max. continuous discharging current | 15A |
| 3 | Over-charging protection | Over-charging voltage | 3.90±0.025V/cell |
| | | Over-charging delay time | ≤2S |
| | | Over-charging release voltage | 3.8±0.05V/cell |
| 4 | Over-discharging protection | Over-discharging voltage | 2.40±0.05V/cell |
| | | Over-discharging delay time | ≤2S |
| | | Over-discharging release voltage | 2.60±0.05V/cell |
| 5 | Over-current protection | Software Over-current charge and discharge | 20±1A |
| | | Software Over-current delay time | ≤2S |
| | | Hardware Over-current discharge | ≥30A |
| | | Hardware Over-current delay time | ≤11ms |
| | | Release condition | Remove load |
| 6 | Short circuit protection | Function condition | External short circuit |
| | | Short Over-current | ≥75A |
| | | Delay time | ≤61μs |
| | | Release condition | Remove load |
| 7 | Fuel Gauge display | 1 st LED | 0%≤RSOC≤10% |
| | | 2 nd LED | 10%<RSOC≤30% |
| | | 3 rd LED | 60%<RSOC≤90% |
| | | 4 th LED | 90%<RSOC≤100% |
| 8 | RSOC for 0%/3%/8% | EVD0/EVD1/EVD2 | 2.5V/2.7V/2.9V |
| 9 | RSOC for 100% | Taper voltage or taper current | 14.6V/0.05C |
| 10 | Impedance | PCBA | ≤10mΩ |
| 11 | Temperature | Operation temperature | -40~+85℃ |
| | | Storage temperature | -40~+125℃ |
| | | Over-temperature protection | 60±5℃(charge), 70±5℃(discharge) |