Lithium iron ferrous phosphate batteries

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Charge and discharge profiles

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The battery module can be decomposed into cells and used components according to UL 1974. The used components of the battery systems, such as the battery enclosure, battery management system (BMS), thermal management systems, and other auxiliary systems, should not be considered for repurposing if they have already been used longer than the calendar expiration date specified by the original manufacturer. The cells preparing for repurposing will undergo the performance test for sorting. UL 1974 suggests that the following test procedures shall be conducted by the repurposed manufacturer as part of the routine analysis of the incoming battery assembly:

Incoming open circuit voltage (OCV) measurements (Sec. 19.2 of UL 1974)

Incoming high voltage isolation check (Sec. 19.3 of UL 1974)

Capacity check (Sec. 19.4 of UL 1974)

Internal resistance check (Sec. 19.5 of UL 1974)

Discharge/charge cycle test (Sec. 19.7 of UL 1974)

Self-discharge (Sec. 19.8 of UL 1974)

The charge and discharge profile measurement according to Sec. 19 of UL 1974 is divided into two primary procedures. The first procedure with detailed steps containing Secs. 19.2 and 19.4 of UL 1974 are listed in Table 1. The second procedure with detailed steps containing Secs. 19.5, 19.7, and 19.8 of UL 1974 are listed in Table 2. The key parameters in the procedures are described as follows.

In this work, the voltage ranging from 2.5 to 3.5 V is adopted for safe working of the repurposed LFP battery cells (i.e., Vcut = 2.5 V and Vthres = 3.5 V), which is narrower than the safe working voltage range of new LFP battery cells (2-3.65 V). The voltage range can be adjusted according to the manufacturer"s design. In

addition, the designed test procedures based on UL 1974 can be used for other types of Li-ion repurposed batteries.

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