A Wiring Assembly

Technical Field

The present disclosure relates to a wiring assembly to enable the in-situ individual testing of a battery in an array of batteries that provides back-up or emergency power. A test system, a battery array, a method of in-situ testing of each battery in a battery array, a method of installing at least one wiring assembly, and a method of assembling an array of batteries are also disclosed.

Background

Locations in which a constant supply of power is required, such as hospitals, offices, data centres, etc, are typically powered by the mains electricity of the building. If an issue arises with the power supply from the mains, an array of batteries provides back-up or emergency power in order to maintain the supply of power. The array of batteries must be routinely checked to ensure there are no faults in the system.

Summary

According to an aspect of the present disclosure, there is provided a wiring assembly to enable the in-situ individual testing of a battery in an array of batteries that provides back-up or emergency power. The wiring assembly comprising a first end permanently couplable to terminals of a battery of the array, and a second end comprising a connector. The connector being configured to enable a test meter to be temporarily coupled to said battery via the wiring assembly during testing.

The wiring assembly may comprise an extension assembly. The extension assembly may have a distal end couplable to the connector of the wiring assembly and a proximal end couplable to the test meter.

The wiring assembly may comprise at least one wire permanently couplable to a positive terminal of the battery and at least one wire permanently couplable to a negative terminal of the battery.

The wiring assembly may comprise two wires permanently couplable to a positive terminal of the battery and two wires permanently couplable to a negative terminal of the battery.

The extension assembly may comprise at least two wires.

The extension assembly may comprise four wires.

The wiring assembly may comprise an adhesive pad configured to secure the wiring assembly to the battery.

The adhesive pad may be heat resistant.

According to another aspect of the present disclosure, there is provided a test system for the in-situ individual testing of a battery in an array of batteries that provides back-up or emergency power. The test system comprising: a wiring assembly according to the present disclosure; and a test meter.

The test meter may comprise a wire having a corresponding connector for connection to the connector of the wiring assembly.

The test meter may comprise a display configured to display test results of the test system.

According to another aspect of the present disclosure, there is provided a battery array configured to provide back-up or emergency power, the battery array comprising: a plurality of batteries; and a plurality of wiring assemblies according to the present disclosure, each wiring assembly being attached to a corresponding battery in the array.

According to another aspect of the present disclosure, there is provided a method of in-situ testing of each battery in a battery array according to the present disclosure, the method comprising temporarily coupling a test meter to each battery of the battery array in turn via the plurality of wiring assemblies.

According to another aspect of the present disclosure, there is provided a method of installing at least one wiring assembly according to the present disclosure, the method comprising: permanently coupling the first end of the wiring assembly to the terminals of a battery of the array of batteries.

The method may further comprise providing a plurality of wiring assemblies; and may further comprise permanently coupling the first end of each wiring assembly to the corresponding terminals of each battery in the array of batteries.

The method may further comprise securing the at least one wiring assembly to the battery via an adhesive pad.

According to another aspect of the present disclosure, there is provided a method of in-situ testing of at least one battery in an array of batteries that provides back-up or emergency power, the method comprising: temporarily coupling a test meter to a wiring assembly according to the present disclosure.

The method may comprise testing each of the batteries in the array of batteries by temporarily coupling the test meter to each of the batteries in the array via a wiring assembly according to the present disclosure.

According to another aspect of the present disclosure, there is provided a method of assembling an array of batteries to provide back-up or emergency power, the method comprising: arranging the batteries into an array to provide back-up or emergency power; and connecting a wiring assembly according to the present disclosure to each of the batteries in the array.

Brief Description of the Drawings

Figure 1 shows a test system according to an embodiment of the invention;
Figure 2 shows a wiring assembly according to an embodiment of the invention;
Figure 3 shows an extension assembly according to an embodiment of the invention; and
Figure 4 shows a battery array according to any embodiment of the invention.

Detailed Description

Currently, an array of batteries configured to provide back-up or emergency power to locations which require a constant supply of power is tested by a test engineer exposing the terminals of a battery in the array and actively placing contact points of a test system directly onto the terminals of each battery in the array in turn. This is not only a slow and tedious process, but also means that a number of detailed health and safety rules must be followed.

Figure 1 illustrates a test system according to an embodiment of the invention. The test system 1 is for the in-situ individual testing of a battery in an array of batteries that provides back-up or emergency power. The test system 1 comprises a wiring assembly 2 and a test meter 3. The wiring assembly 2 is configured to connect the test meter 3 to each individual battery in the array of batteries.

Figure 2 illustrates the wiring assembly 2 according to an embodiment of the invention. The wiring assembly 2 is configured to enable the in-situ individual testing of a battery in an array of batteries that provides back-up or emergency power whilst avoiding the issues presented by current testing methods.

The wiring assembly 2 comprises a first end 4 permanently couplable to terminals of a battery of the array. As shown, the first end 4 comprises a plurality of ring terminals 5 which are configured to be permanently attached to the terminals of a battery. A "permanent" connection is one which is established on installation of the battery array or as a retro-fit operation to an existing battery array and refers to the wiring assembly as being left in place once attached to enable future testing operations to be carried out. The ring terminals 5 may be crimped and soldered to the terminals of the battery to provide the permanent connection. It is to be appreciated that other means for permanently attaching the first end 4 of the wiring assembly 2 to the terminals of a battery are envisaged. The wiring assembly 2 also comprises a second end 6 comprising a connector 7. The connector 7 is configured to enable the test meter 3 to be temporarily coupled to the battery via the wiring assembly 2 during testing. It can be seen that the wiring assembly 2 has no moving parts nor any electronics which may fail or malfunction.

The wiring assembly 2 comprises at least one wire permanently couplable to a positive terminal of the battery and at least one wire permanently couplable to a negative terminal of the battery. Therefore, when the test meter 3 is connected to the connector 7 of the wiring assembly 2, the voltage across the battery can be tested. In the depicted embodiment, the wiring assembly 2 comprises two wires 8 permanently couplable to a positive terminal of the battery and two wires 8 permanently couplable to a negative terminal of the battery. The pairs of wires 8 are secured together by a cable tie 9 which prevents twisting of the wires 8 and provides a more simple arrangement of the wires 8. Since the wiring assembly 2 comprises a total of four wires 8, a Kelvin connection is obtained thereby reducing inaccuracies of any readings made by the test meter 3.

The testing of a battery using four wires (a Kelvin connection) is beneficial as it removes any error in the reading caused by the inherent resistance of the wires themselves. The wiring assembly 2 of the present disclosure ensures minimal, if any, chance of human error due to an incorrect or partial Kelvin connection. If such an error were to occur, it is immediately detected by the test meter 3 which reports the

error. Additionally, human intervention has been reduced by 95% regarding the integrity of the Kelvin connection therefore ensuring consistent and correct results which allow for proactive preventive measures, if required, to protect the array of batteries. Moreover, this also ensures accurate battery trending between quarterly or biannual test intervals.

In some embodiments, the wiring assembly 2 comprises an adhesive pad 10. The adhesive pad 10 is configured to secure the wires 8 in position relative to the battery. In particular, the adhesive pad 10 ensures that a venting valve of the battery is not compromised as well as ensuring safe access by the test engineer. Optionally, the adhesive pad 10 is heat resistant to avoid being damaged by heat produced from the battery.

Furthermore, in some embodiments, the wiring assembly 2 comprises an extension assembly 11 as shown in Figure 3. The extension assembly 11 is configured to extend the length of the wiring assembly 2. This is beneficial when the batteries are located in areas which are difficult for a test engineer to reach. The extension assembly 11 comprises a distal end 12 which is couplable to the connector 7 of the wiring assembly 2. Additionally, the extension assembly 11 comprises a proximal end connector 13 couplable to the test meter 3. The extension assembly 11 further comprises at least two wires 14. As shown, the extension assembly 11 comprises four wires 14 to maintain the Kelvin connection discussed above.

Installation of the wiring assemblies 2 to an array of batteries can be done on installation of the array, or retroactively to an already installed array of batteries. As the wiring assemblies 2 are directly connected to each battery, once correctly installed, the wiring assemblies 2 cannot be accidentally disconnected due to their structure and manufacturing design. To install a wiring assembly 2, an engineer permanently couples the first end 4 of the wiring assembly 2 to the terminals of a battery of the array of batteries. This process is then repeated for each battery in the array. In some embodiments, the wiring assemblies 2 are secured to the batteries via the adhesive pads 10.

The wiring assemblies 2 ensure that during testing, human interaction with the battery or its terminals and connector straps is not necessary. There is no need to remove safety links, battery terminal shrouds/covers nor battery breaker fuses which can be dangerous and can also lead to issues when reinstating these components. As there are no exposed terminals, uninsulated battery straps or cables, the test engineer is

not exposed to any live parts when conducting a test. The wiring assemblies 2 are flexible to ensure easy access and handling for test purposes. There is no danger of a compromised hand position when connecting to or conducting a test. Furthermore, an ad hoc or complete string test can be conducted on a live system with the necessary personal protective equipment. Additionally, the wiring assemblies 2 are easily handled with cumbersome insulated gauntlets.

Referring back to Figure 1, the test meter 3 comprises a corresponding connector 15 which connects to the connector 7 of the wiring assembly 2. Additionally, the test meter 3 comprises a display 16 configured to display test results of the test system 1.

Figure 4 illustrates a battery array according to an embodiment of the invention. The battery array 17 is configured to provide back-up or emergency power. As shown, the battery array 17 comprises a plurality of batteries 18. Typically, the batteries 18 are arranged in rows and stacked on a frame. The battery array 17 further comprises a plurality of the wiring assemblies 2 described above. Each wiring assembly 2 is attached to a corresponding battery 18 in the battery array 17. In order to test in-situ each battery 18 of the battery array 17, a test engineer can simply temporarily couple the test meter 3 to each battery 18 of the battery array 17 in turn via the plurality of wiring assemblies 2.

The connector 7 of the wiring assembly and the connector 15 of the test meter may be of the push-fit type to enable easy and quick connection and disconnection. The connector 7 of the wiring assembly may be a male push-fit connector and the connector 15 of the test meter may be female push-fit connector to cooperate with the male push-fit connector 7 of the wiring assembly. The proximal end connector 13 of the extension assembly 11 may also comprise a push-fit connector, i.e. a male push-fit connector to cooperate with the female push-fit connector 15 of the test meter. The connector at the distal end 12 of the extension assembly 11 may comprise a female push fit connector for connection to the male push-fit connector 7 of the wiring assembly 2.

During testing, there is no need for a test engineer to reach over battery terminals in battery cabinets nor racks as the connectors 7 of the wiring assemblies 2 can be accessed from the front. Additionally, working at height when testing installed wiring assemblies 2 is safer due to ease of accessibility and handling.

Furthermore, the using the wiring assemblies 2 no longer requires the power to be reduced to a safe working voltage (120 V DC) thus there is no need to remove safety links or battery terminal shrouds/covers which ensures that the integrity of the installation is maintained.

Assembly of the battery array 17 includes arranging the batteries 18 into an array 17 to provide back-up or emergency power and connecting a wiring assembly 2 to each of the batteries 18 in the array 17.

Another advantage of the present disclosure is that the down time of the uninterruptible power supply (UPS) of the location is reduced. The down time is reduced to a minimum as testing with the wiring assemblies reduces the overall test time by 50% thus allowing double the amount of systems to be tested than would normally be possible. This down time only occurs if it is required to open the battery breaker for testing purposes. Also, there is no need to isolate the UPS nor remove string fuses.

Furthermore, testing using the wiring assemblies allows for proactive maintenance programming in that any battery issues identified during testing can then be scheduled for resolution to coincide with the routine annual UPS preventive maintenance inspection which requires the system to be shut down. This ensures minimum downtime of the UPS.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

Claims

1. A wiring assembly to enable the in-situ individual testing of a battery in an array of batteries that provides back-up or emergency power, the wiring assembly comprising a first end permanently couplable to terminals of a battery of the array, and a second end comprising a connector, the connector being configured to enable a test meter to be temporarily coupled to said battery via the wiring assembly during testing.

2. A wiring assembly according to claim 1, wherein the wiring assembly comprises an extension assembly, the extension assembly having a distal end couplable to the connector of the wiring assembly and a proximal end couplable to the test meter.

3. A wiring assembly according to claims 1 or 2, wherein the wiring assembly comprises at least one wire permanently couplable to a positive terminal of the battery and at least one wire permanently couplable to a negative terminal of the battery.

4. A wiring assembly according to claim 3, wherein the wiring assembly comprises two wires permanently couplable to a positive terminal of the battery and two wires permanently couplable to a negative terminal of the battery.

5. A wiring assembly according to claims 2 or 3, wherein the extension assembly comprises at least two wires.

6. A wiring assembly according to claim 5, wherein the extension assembly comprises four wires.

7. A wiring assembly according to any preceding claim, wherein the wiring assembly comprises an adhesive pad configured to secure the wiring assembly to the battery.

8. A wiring assembly according to claim 7, wherein the adhesive pad is heat resistant.

9. A test system for the in-situ individual testing of a battery in an array of batteries that provides back-up or emergency power, the test system comprising:

a wiring assembly according to any of claims 1 to 8; and

a test meter.

10. A test system according to claim 9, wherein the test meter comprises a wire having a corresponding connector for connection to the connector of the wiring assembly.

11. A test system according to claims 9 or 10, wherein the test meter comprises a display configured to display test results of the test system.

12. A battery array configured to provide back-up or emergency power, the battery array comprising:

a plurality of batteries; and

a plurality of wiring assemblies according to any of claims 1 to 8, each wiring assembly being attached to a corresponding battery in the array.

13. A method of in-situ testing of each battery in a battery array according to claim 12, the method comprising temporarily coupling a test meter to each battery of the battery array in turn via the plurality of wiring assemblies.

14. A method of installing at least one wiring assembly according to any of claims 1 to 8, the method comprising:

permanently coupling the first end of the wiring assembly to the terminals of a battery of the array of batteries.

15. A method according to claim 14, comprising providing a plurality of wiring assemblies; and permanently coupling the first end of each wiring assembly to the corresponding terminals of each battery in the array of batteries.

16. A method according to claims 14 or 15, comprising securing the at least one wiring assembly to the battery via an adhesive pad.

17. A method of in-situ testing of at least one battery in an array of batteries that provides back-up or emergency power, the method comprising:

temporarily coupling a test meter to a wiring assembly according to any of claims 1 to 8.

18. A method according to claim 17, comprising testing each of the batteries in the array of batteries by temporarily coupling the test meter to each of the batteries in the array via a wiring assembly according to any of claims 1 to 8.

19. A method of assembling an array of batteries to provide back-up or emergency power, the method comprising:

arranging the batteries into an array to provide back-up or emergency power; and

connecting a wiring assembly according to any of claims 1 to 8 to each of the batteries in the array.

Abstract

Wiring Assembly

The present disclosure relates to a wiring assembly to enable the in-situ individual testing of a battery in an array of batteries that provides back-up or emergency power. The wiring assembly comprising a first end permanently couplable to terminals of a battery of the array, and a second end comprising a connector. The connector being configured to enable a test meter to be temporarily coupled to said battery via the wiring assembly during testing. A test system, a battery array, a method of in-situ testing of each battery in a battery array, a method of installing at least one wiring assembly, and a method of assembling an array of batteries are also disclosed.