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SMD Operations Procedures Manual

8.1.1.4 OPERATION OF THE TWIN 15 kA POWER SUPPLIES FOR SHORT SAMPLE TESTING

Text Pages 1 through 6
Attachment 1

Hand Processed Changes

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Prepares(s) P. Ribaldo

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8.1.1.4 Operation of the Twin 15 kA Power Supplies for Short Sample Testing

1.0 Purpose and Scope

- 1.1 The purpose of this Procedure is to provide step by step instruction in the start-up, operation, and shut-down of the Twin 15kA Short Sample Power Supply (Supplies) during short sample testing.
- 1.2 This information is provided for any person who will operate the controls of the Supplies during short sample testing

2.0 Responsibilities

- 2.1 Authorized operators (Operators) of the Short Sample Control Room (SSCR) will perform the procedure described here.
- 2.2 The Operator shall maintain a log book for short sample testing. Entries shall include notes of link box configuration, any irregularities encountered during start-up, operation, and shut-down of the Supplies.

3.0 Prerequisites

- 3.1 Operators shall be instructed by the Cognizant Engineer responsible for operation of the supplies, or his designee, before using this procedure.
- 3.2 Operators shall be instructed by the CE/CS responsible for short sample testing, or his designee, before using this Procedure.
- 3.3 Operators shall be a "Authorized employee" as defined by SBMS Subject Area, "Lockout/Tagout (LOTO)".
- 3.4 Operator must be trained in NFPA 70E Personal Protective Equipment Requirements and Arc Flash Hazards
- 3.5 Operator LOTO OJT Training on Power Supply System must be current.
- 3.6 Operator must follow SMD-OPM 8.1.1.44 Generic LOTO Procedure

4.0 Precautions

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- 4.1 The output power of the 15kA Supply is routed through the Short Sample Power Supplies Link Box (Link Box). For any changes of the link configuration within the link box, both 15kA power supplies must be locked out (see para. 5.2.1). If in doubt as to the proper lock out procedure, consult with your supervisor before proceeding.
- 4.2 Place protective covers over the power connections on the top hat of the short sample test dewars.
- 4.3 Verify that the safety interlock system for the Supplies has been tested within the past six months. A form indicating the date of the last safety test is posted on both Supplies, on the Link Box, and in the Short Sample Control Room.
- 4.4 Contact the CE responsible for operation of the Supplies, or his designee, if it is necessary to operate the Supplies in a non-standard manner, which is defined as a manner that deviates from the procedure described below.
- 4.5 Personal Protective Equipment must be worn as defined in NFPA 70E for verifying LOTO, 480V is a category 2 hazard. Only when LED Meter UPA-100 and AC Panel Meters monitoring each AC Phase to ground are installed on the 480V Disconnect is the Hazard Category is reduced to (-1), operator can then follow PPE requirements for the lower classification.

5.0 Procedure

- 5.1 Pre-operational checks:

CAUTION: FAILURE TO PERFORM THE PRE-OPERATIONAL CHECKS COULD RESULT IN EQUIPMENT DAMAGE.

- 5.1.1 Check magnet temperature--DO NOT operate above 4.8 degrees K.
- 5.1.2 Adjust gas-cooled lead flow at 50 S.C.F.H.
- 5.1.3 Verify that cooling water is flowing to the power supplies.
- 5.1.4 Check that all doors are locked and covers are in place on both power supplies.

5.2 Configure Link Box

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- 5.2.1 Operator must follow SMD-OPM 8.1.1.44 generic LOTO Procedure. Place the 480V input disconnect switches for the Twin 15kA supplies, located on the wall behind the supplies and labeled "15 kA POWER SUPPLY MAIN POWER" (PS1) and "15kA POWER SUPPLY MAIN POWER" (PS2) in the OFF position. Remove the Kirk Lock key.
 - 5.2.2 Open the Link Box, which is labeled SHORT SAMPLE POWER SUPPLY LINK BOX, by unlocking the Kirk Lock (key #98-(17262)).
 - 5.2.3 Make sure that the system is de-energized by using a Fluke T-3 meter or other passive, low impedance voltage detector (per Lockout/Tagout training).
 - 5.2.4 Connect the load via the links of the Link Box, securing all nuts.
 - 5.2.5 Close the Link Box. Lock the kirk locks. Install and secure all cover panels.
- 5.3 Kirk Key Safety Interlock Overview.

OVERVIEW

The safety Kirk lock system of the Short Sample Test Facility was designed to accommodate multitasking within in the various stages of setup and testing of Superconducting magnet cable. Below is explanation of each integrated part.

Within each test dewar their are three set of safety enclosures that protect the power leads used to energize superconducting test cable and a magnet coil. Each positive and negative power lead and magnet coil has an independent cover with the following designation. S4+, S4-, M4, S5+, S5-, M5, S6+, S6-, M6.

Each dewar test cage entry door has a Kirk lock installed on them designated as G4, G5, and G6. Dewars cage entry doors G4 and G5 have two doors that share the same Kirk key.

In the Short Sample control room there is three banks of four Kirk key locks. These are designated as the Magnet Cover Safety Kirk key Interlock Logic Panel. Next to that panel is four banks of five Kirk Key locks. This is called the Power Supply Safety Kirk Key Interlock Logic Panel.

On each power supply main disconnect switch is a Kirk Key lock labeled PS, PSS, PM and PSM. Kirk Keys PS and PM are the final results after all the correct Kirk Key logic has been satisfied in the Short Sample control room. Then each main power switch can be activated to each Short Sample power supply to conduct cable testing. The PSS and PSM Kirk keys are used to gain entry to the

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power supply doors for periodic maintenance. These Kirk keys in conjunction with the PS and PM Kirk key can gain entry to the Short Sample Link Box.

SEQUENCE OF OPERATION OF THE KIRK KEY SAFETY INTERLOCK SYSTEM

To perform a superconducting cable test, the Short Sample control room operator must insure that all safety covers on both test dewars that are not in used be secured and have Kirk key inserted in the proper designated Kirk locks (Magnet Cover Safety Kirk Key Interlock Logic Panel). Once this condition is satisfied, the Magnet Supply key (MS#) can be removed and inserted into the “Power Supply Safety Kirk Key Interlock Logic Panel” along with the gate key from the dewar facility be used for the cable test.

When all these conditions have been satisfied in the “Power Supply Safety Kirk Key Interlock Logic Panel,” both the Power Supply Short Sample Key (PS#) and Power Supply Magnet (PM#) can be removed. These Kirk Keys can now be inserted into their respective Kirk locks to activate the main power supply to conduct superconducting cable testing.

5.4 Start the Control Software

5.4.1 In the SSCR, on the interface panel, first place the computer manual switch in the manual position. Second, turn the current-setting control potentiometer of both 15kA P.S. to zero.

CAUTION: DO NOT TURN ON SUPPLIES BEFORE CONTROL SOFTWARE IS STARTED.

5.4.2 Start the control software on the power supply control computer.

5.4.3 Make sure that communications has been established between the computer and the control bucket. No bus error messages should be displayed on the computer monitor.

5.4.4 Set the REMOTE/LOCAL toggle switches on the two control cards located in the power supply control bucket to REMOTE.

Note: Setting these switches to LOCAL enables the ON, OFF, and RESET push buttons. Setting the switches to REMOTE enables computer control of these functions. The output current of the Supplies is controlled by the current-control potentiometers in both cases.

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5.4.5 Verify that the LOOP GAIN ADJUST and PARKING GAIN ADJUST potentiometers are set correctly. The settings are written on each regulator card.

5.5 Activate Power to the Supplies Locally

5.5.1 Turn the LOCAL/REMOTE selector switch, located on the control panel on the outside of the Supplies, to LOCAL.

5.5.2 Verify that the POWER SUPPLY CONTROL POWER disconnect switches and the DCCT POWER disconnect switches, located on the outside of the Supplies, are in the ON position.

5.5.3 Unlock the Kirk Lock on both switches (key #98-(17262)). Place the disconnect switches in the ON position.

5.5.4 Depress the RESET button on both Supplies. On the control panel, verify that: 1) no fault lights are lit; 2) D.C. voltmeters and D.C. current output meters read zero; 3) A.C input meters read 240VAC on three phases.

5.5.5 Turn the LOCAL/REMOTE selector switches on both Supply control panels to REMOTE.

5.6 Before Leaving the Supply Area and Dewar Area

5.6.1 Verify that protective covers are in place on all dewar power connections and that a protective barrier surrounds the dewar.

5.6.2 Notify cryogenic personnel and other affected personnel that the Supplies are about to be operated.

5.7 Operate Supplies Remotely from the SSCR

CAUTION: SET THE CURRENT-CONTROL POTENTIOMETERS FOR BOTH SUPPLIES TO ZERO BEFORE TURNING ON THE SUPPLIES REMOTELY.

5.7.1 Verify that the computer manual switch is in the manual position and the current potentiometer is set to zero.

5.7.2 Verify that the software is running and that no error messages are displayed.

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- 5.7.3 From the computer keyboard, clear faults using the RESET function key.
- 5.7.4 Verify that the dewar area is free of all personnel. Observe closed circuit monitors.
- 5.7.5 Turn the Supplies ON using the ON function key. Verify proper operation of the Supplies by observing the information displayed on the computer monitor and on the voltage and current meters in the control rack.
- 5.7.6 Verify that warning lights over the dewar and the Link Box are flashing.
- 5.7.7 Use the current-control potentiometer to adjust the current to the required level.
- 5.8 After Completion of Sample Testing, Shut Down Supplies
 - 5.8.1 Turn current-control potentiometer to zero.
 - 5.8.2 Issue a Power Supply OFF command via the computer. All D.C. indicators should show zero voltage and zero current. DO NOT turn off the computer.
 - 5.8.3 Put the input disconnect switches labeled "15kA POWER SUPPLY" (PS1) and "15kA POWER SUPPLY" (PS2) in the OFF position. Lock the Kirk Lock on the disconnect switches.
 - 5.8.4 Turn off the computer.
- 5.9 Fill out the Short Sample Testing Log Book. Note any irregularities regarding operation of the Supplies. Contact the Cognizant Engineer for operation of the Supplies, if an irregularity has occurred.

6.0 Documentation

- 6.1 Short Sample Testing Log Book.

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7.0 References

- 7.1 SBMS Subject Area, "Lockout/Tagout (LOTO)".
- 7.2 OPM 8.1.1.7, "Test of Safety Interlocks of Twin 15 KA Power Supply"
- 7.3 OPM 8.1.1.44, Generic LOTO Procedure Incorporating UPA-100 LED Meter and AC Panel Meters.
- 7.4 NFPA 70E, Standard for Electrical Safety in the Workplace.
- 7.5 System Specific SMD LOTO OJT Training.
- 7.6 Interpretation by the Laboratory Electrical Safety Committee – June 2005, “Engineered Voltage Monitoring Solutions for Lockout/Tagout”.