

INSTRUCTION

Temperature Rise Test Procedure

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1. Test Objectives

Determine the temperature rise warning and alarm limits of a secondary switchgear:

- Measure the steady-state temperature rise value of cable bushings by using intelligent temperature sensor STE202 under rated current
- Measure the steady-state temperature rise value of cable bushings by using thermocouple under rated current

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2. Test Equipment

Name	Abbreviation	Quantity
MDC4-M	MDC4-M	1
Ambient air T&H sensor	THS01	1
Intelligent temperature sensor	STE202	3
Lab temperature rise test system (thermocouple)		1

The data concentrator MDC4-M and ambient temp. & humidity sensor THS01 need to be installed inside LV, as where it should be on customer site.

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3. Measuring Points

3.1. Inside Gas Tank

To determine the temperature steady state of a RMU, several temperature test points are required inside the gas tank using thermocouples.

The recommended measuring points are illustrated in Figure 1:

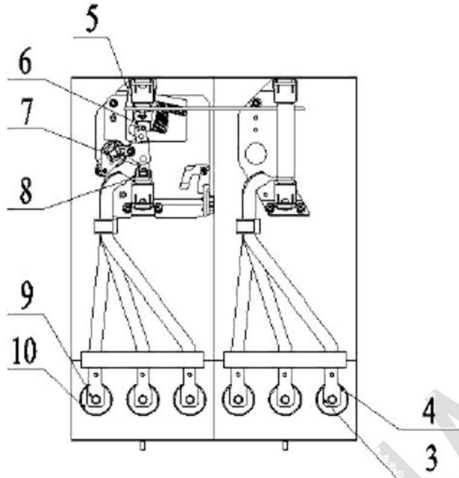


Figure 1 Temperature test points in C module

Thermocouple	Test point in Figure 1	Description
1	6	Connecting point between phase A upper static knife and moving knife
2	6	Connecting point between phase B upper static knife and moving knife
3	6	Connecting point between phase C upper static knife and moving knife
4	7	Phase A moving knife rotating shaft
5	7	Phase B moving knife rotating shaft
6	7	Phase C moving knife rotating shaft
7	8	Connecting point between phase A moving knife fixed end and branch busbar
8	8	Connecting point between phase B moving knife fixed end and branch busbar
9	8	Connecting point between phase C moving knife fixed end and branch busbar

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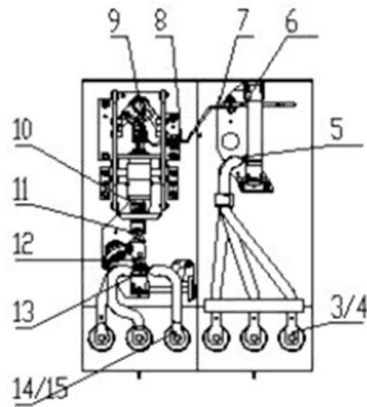


Figure 2 Temperature test points in V module

Thermocouple	Test points in Figure 2	Description
10	8	Phase A main busbar soft connector
11	8	Phase B main busbar soft connector
12	8	Phase C main busbar soft connector
13	9	Connecting point between phase A soft connector and vacuum interrupter moving conductive rod
14	9	Connecting point between phase B soft connector and vacuum interrupter moving conductive rod
15	9	Connecting point between phase C soft connector and vacuum interrupter moving conductive rod
16	10	Connecting point between phase A lower static knife and vacuum interrupter lower static end
17	10	Connecting point between phase B lower static knife and vacuum interrupter lower static end
18	10	Connecting point between phase C lower static knife and vacuum interrupter lower static end
19	11	Connecting point between phase A lower static knife and disconnecting knife
20	11	Connecting point between phase B lower static knife and disconnecting knife
21	11	Connecting point between phase C lower static knife and disconnecting knife
22	12	Phase A disconnecting moving knife rotating shaft
23	12	Phase B disconnecting moving knife rotating shaft
24	12	Phase C disconnecting moving knife rotating shaft
25		Measuring point hanging in the middle of the gas tank

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3.2. Inside Cable Compartment

Inside cable compartment, for each unit, the temperature of VPIS test point (as marked in Figure 3 need to be measured by using both thermocouples and STE202.

The thermocouples should be mounted on the head of STE202 firmly, as shown in Figure 4.

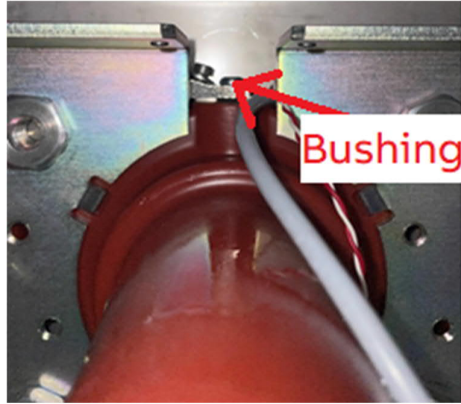


Figure 3 Bushing test point



Figure 4 Mounting of thermocouple on STE202

Thermocouple	STE202 #	Description
26	1	Phase A cable bushing measuring marked in Figure 3
27	2	Phase B cable bushing measuring marked in Figure 3
28	3	Phase C cable bushing measuring marked in Figure 3

3.3. Ambient Temperature

Multiple points of ambient temperature need to be measured for the analysis of the optimal selection of ambient temperature measuring point.

Description	Description	Description
29	oil_bottle_1	Measuring point inside the first bottle of oil hanged and placed per general standard of temperature rise test
30	oil_bottle_2	Measuring point inside the second bottle of oil hanged and placed per general standard of temperature rise test

31	oil_bottle_3	Measuring point inside the third bottle of oil hanged and placed per general standard of temperature rise test
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4. Test Procedures

4.1. Equipment Setup

1. Setup switchgear (SafeRing/SafePlus 12kV CCV) as per temperature rise type test requirements
2. At least 3 environment test (oil_bottle_1, oil_bottle_2, oil_bottle_3) points must be placed one meter away from the switchgear
3. MDC4-M and Ambient air T&H sensor (THS01) must be installed in Low-voltage box per User Manual_Safe Digital Step A_Installation and Configuration_EN_Rev1.1_20211028.pdf
4. STE202 for each bushing of all three phases must be installed per User Manual_Safe Digital Step A_Installation and Configuration_EN_Rev1.1_20211028.pdf
5. Take pictures of the test site and configuration details

4.2. Starting the Test

6. Switch on the current generator based on the following table

Test Round	Phase A Current	Phase B Current	Phase C Current
1	630A	630A	630A

7. Record the temperature data by using "TR_Data_Logger_V1.0", its main interface is shown in Figure 5 below:

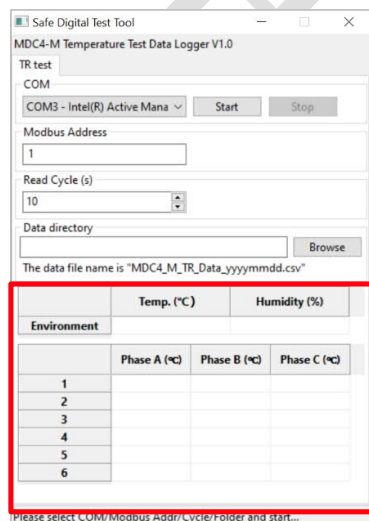


Figure 5 Main interface of TR_Data_Logger_V1.0

- a) Execute TR_Data_Logger_V1.0.exe to open this tool
 - b) Connect USB to RS485 adapter between configuration computer and MDC4-M
 - c) Set "Read Cycle(s)" to 10; "Modbus Address" to 1, "Data directory" to the full path of the ".csv" file for data recoding.
 - d) Select "COM" port used in step b), click the "Start" button
 - e) If communication is built successfully, humidity and temperature data will be displayed in the bottom area marked with red rectangular in Figure 5
8. When the maximum increment of temperature rise value (of all 31 test points) is smaller than 1K per hour, the test is completed.
 9. Stop the data recording by clicking "Stop" button on the TR_Data_Logger_V1.0

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5. Revision

Rev	Page	Description	Date
1.0	All	Initial draft	2022.01.06
1.1	8	Add one step for MDC4-M and THS01 installation Add data recording table as a reference Reduce two rounds of test to one round	2022.01.07
1.2	8,9	Update one test step of data recording	2022.01.13

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