

**A note on  
larger GSU transformer LV winding DC resistance measurement –AMC – (Assisted  
Magnetizing Circuit 助磁法) method**

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The larger GSU transformer's low voltage windings DC resistance are in a range of 1-10 mOhm. When measuring it automatically with typical DC resistance instrument setup, you might get a “stable” reading in a couple minute, but you can tell that you can NOT trust the readings because they do not match the factory's result and when switched testing DC polarity, or changed an order of the 3 tests on the 3 LV windings with same setup, you will get different readings. Refer to (1)(2).

Two main reasons behind this frustration:

1. The testing instrument cannot correctly tell if the reading is “stable” and will stop measuring in automatic mode around a minute.
2. larger GSU transformer core , particularly 5 limb core design, its magnetization does take much, much longer time to stabilize, one hour is not uncommon.

Here two solutions are recommended.

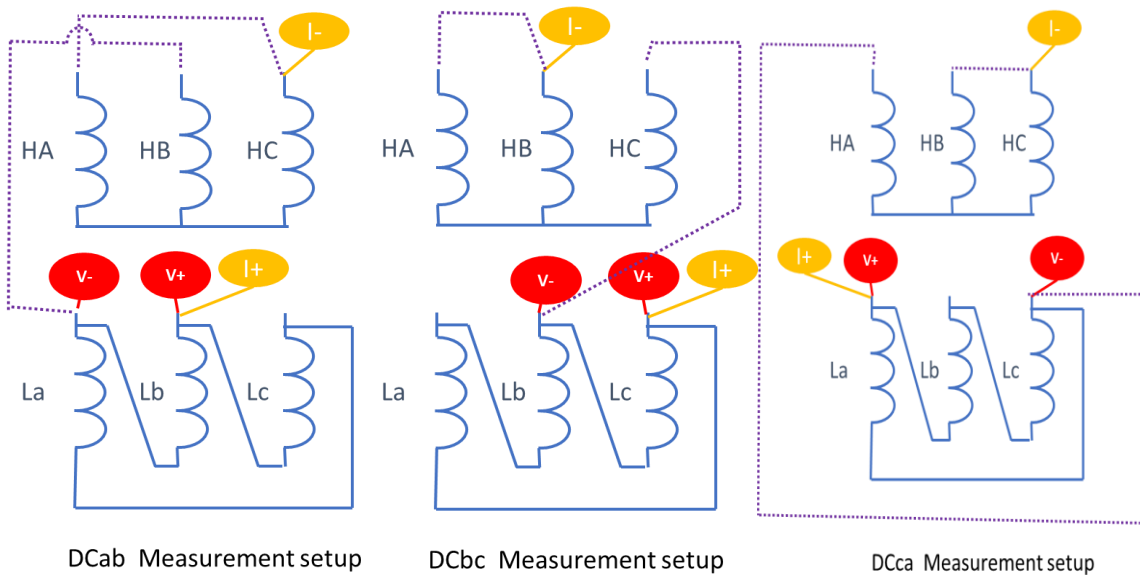
1. With typical measurement setup and disable the automatic measurement, just wait for a long time so you can tell if the readings is stable. JSHP's experience with 200MVA , up to 600MVA GSUs, you may have wait around an hour. The reported worst case took about 5 hours. Theoretically , the time can be derived from the core structure and core silicon steel characteristics , but no manufacture will spend effort on modelling.
2. AMC - (Assisted Magnetizing Circuit 助磁法) method with one channel instrument.

AMC method has been used since 2000 in China. It is default method to measure the low voltage winding DC resistance of large GSUs. No special requirement on the testing instrument and each test takes about 10 minutes to have a satisfactory reading.

Principle behind this AMC method is that by using hysteresis, you can expedite the magnetizing process to have the core saturable much quicker. This is also why the method is called in Chinese by “Assisted Magnetizing Circuit method – AMC(1). But the other translation has it as “Saturable Magnetic Circuit” method as in (1).

In practice, using one typical test instrument, you connect the DC source to low voltage terminal, and you also inject same DC to the high voltage windings in a way to make full use of the hysteresis.

Here are one sample of using AMC method to setup the test on a 500MVA GSU with YD connection. The 40A is used and the time is about 10 minute to have a stable reading.



### References

1. “Application of saturable magnetic circuit method to measure the DC resistance of low voltage winding of large-size transformer” [published April 2003 “High Voltage Apparatus” magazine](#) by Mr Wang of Chongqing university, China.
2. [A guide to transformer winding resistance](#) by Meggar 2010

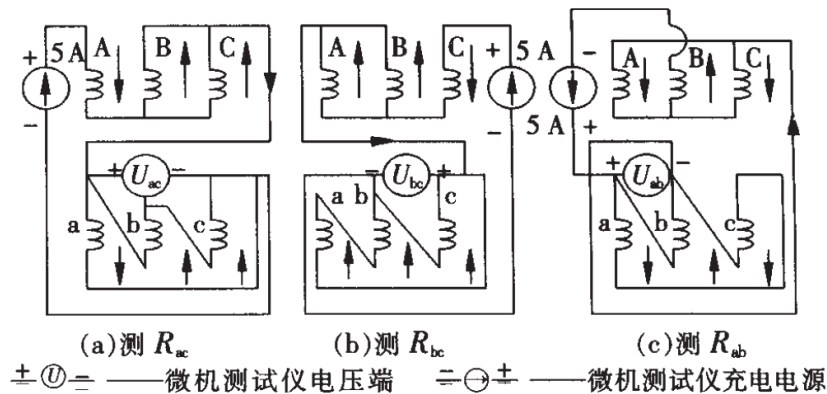


图 1 助磁法原理接线图

This diagram from reference 1 and the arrows show the magnetic field/flux directions are.