

91 Cold Junction Compensator Calibration

application note AN108 for 9000 / 9010 / 9010+ / M160



1. Verification of complete measurement chain

Complete measuring chain verification of cold end measurement includes a built-in calibrator meter and an external temperature sensor inside OPTION 91(Pt100) with terminals for connecting a thermocouple.

For measurement accuracy of 0.1 °C with specific constants of option 91 or 0.3 °C using default constants, a temperature measurement uncertainty of <0.05 °C is required. This can only be achieved by using a medium that transfers heat well. We recommend using an ethanol, or methanol bath for calibration. Calibration in a water or oil bath is not recommended due to possible damage of option 91 and internal contacts of thermocouple.

Due to shortness of Option 91 main cable, "Option 91 Calibration Set DMM Extender" is an optional accessory. It is a 50 cm extension cable that can be inserted between calibrator and Option 91, which can then be inserted into ethanol or methanol calibration bath.



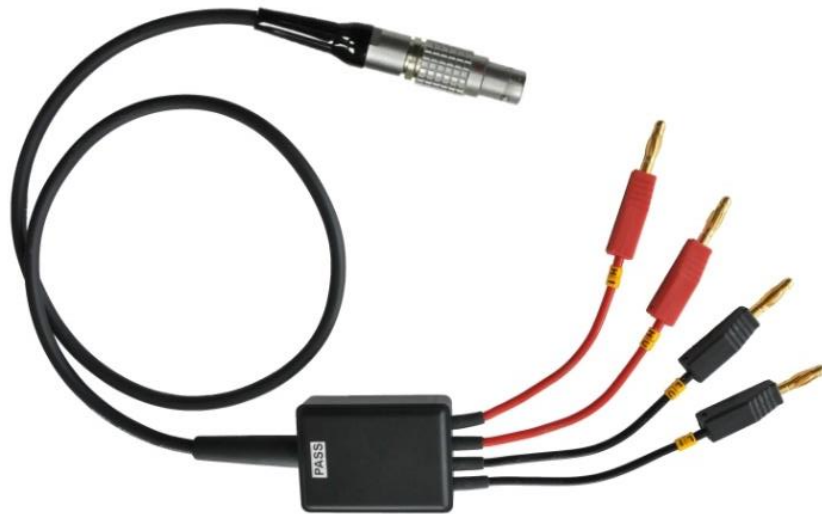
Recommended calibration points are: 15 °C, 20 °C, 25 °C, 30 °C, 35 °C.

2. Calibration principle

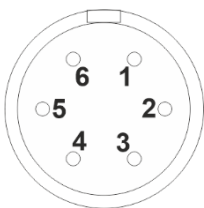
Calibration is based on separation of measuring chain into calibration of electronics and resistance sensor stored in option 91 and subsequent verification of measuring chain as a whole.

3. Calibration of meter resistance function

Calibrators contain unified calibration points for available 2 k Ω and 20 k Ω ranges. Individual ranges are calibrated in 0 Ω and in 50% range (1 k Ω and 10 k Ω), where it is possible to set exact value of resistance standard. Option 9000-60 is used to convert from Lemo connector to 4 mm banana plugs, which is supplied as a standard accessory for MER option and is an optional accessory for other variants.



Front view of female RTD connector



PIN 1	HU
PIN 2	HI
PIN 3	LI
PIN 4	
PIN 5	Shield
PIN 6	LU

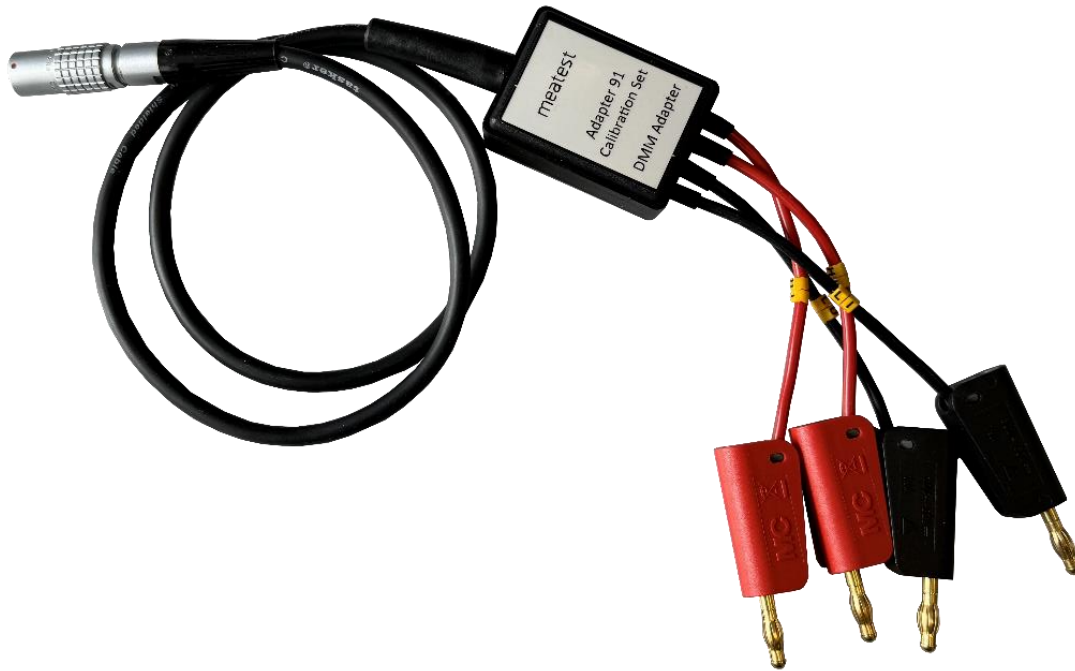
Suitable counterpart for cable: LEMO FGG.1B.306.CLAD62Z + LEMO GMA.1B.054.DN

4. Option 91 calibration

To calibrate Option 91, it is necessary to use DMM that measures resistance with accuracy of <100 ppm.

Most 6 ½ DMMs or better are suitable.

For conversion of Lemo connector to 4 mm banana plugs suitable for DMM is Adapter 91 Calibration Set DMM Adapter with cable length: 500 mm + 180 mm.



Recommended calibration points are: 15 °C, 25 °C, 35 °C.

It is possible to obtain R_0 , A and B values of specific Option 91 from calibration points. These values must be entered into calibrator in appropriate menu.