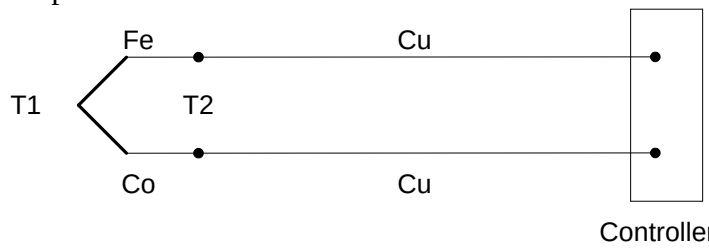
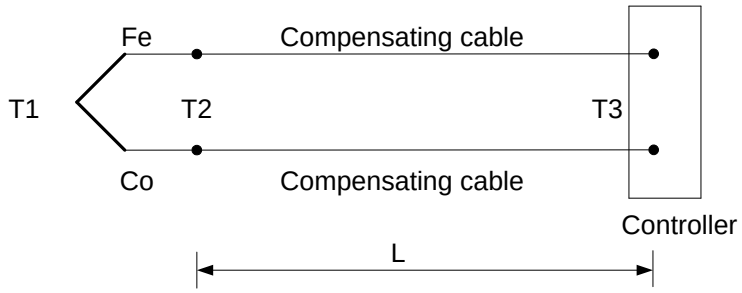
Hello people,
I need your help by checking my knowleadge about thermocouple. Principle of operation is simple, thermocouple consists of two different metals connected on one end (hot junction) that has property to provide voltage on its other end (cold junction) that is proportional to difference of temperatures between hot end and cold end. I know that one must be careful when using thermocouple because inaccurate readings are possible when copper leads are connected on cold junction. That is why, usually, compensating cables are used.
For example, if we look picture 1.



Here, compensation cables are not used and thus mV signal at controller end is proportional to (T1-T2). Since controller itself has temperature sensor and that information is used to compensate cold junction temperature, inaccurate readings by controller are possible if copper wire length is significant in such way that there is difference between T2 and temperature T3 which is temperature which controller's sensor reads.
Solution is usually this:



Since compensation cable is built with similar material like thermocouple, voltage that is read by controller is proprtional to (T1-T3) and not to (T1-T2) as in previous case. Since controller's internal sensor now measure T3, controller will produce correct cold junction compensation, and thus real temperature T1 can be accurately measured.
Am I right here?
Also, if L is relatively small (example, < 1 m) so that there is small difference between T2 and T3, controller can obtain correct T1 measurement without use of compensating cable, because T1-T2 is very close to T1-T3.
Canyou comment this „first part“?

Second part
My question is: did I forget something here? I assume in first case, there will be two additional thermocouples Fe-Cu and Co-Cu. Now, I know that in first case, error will exist because there is difference between T2 and T3 if L is rather long, but is this only source of inaccuracy or additional thermocouples makes things worse? Since, same material is used from point T2 to controller, there will be no additional mV because there are no thermocouples between points T2 and T3 (controller). I think that two additional thermocouples have influence included in mV = K(T1-T2) and that is all.

Can you comment this?
Thanks