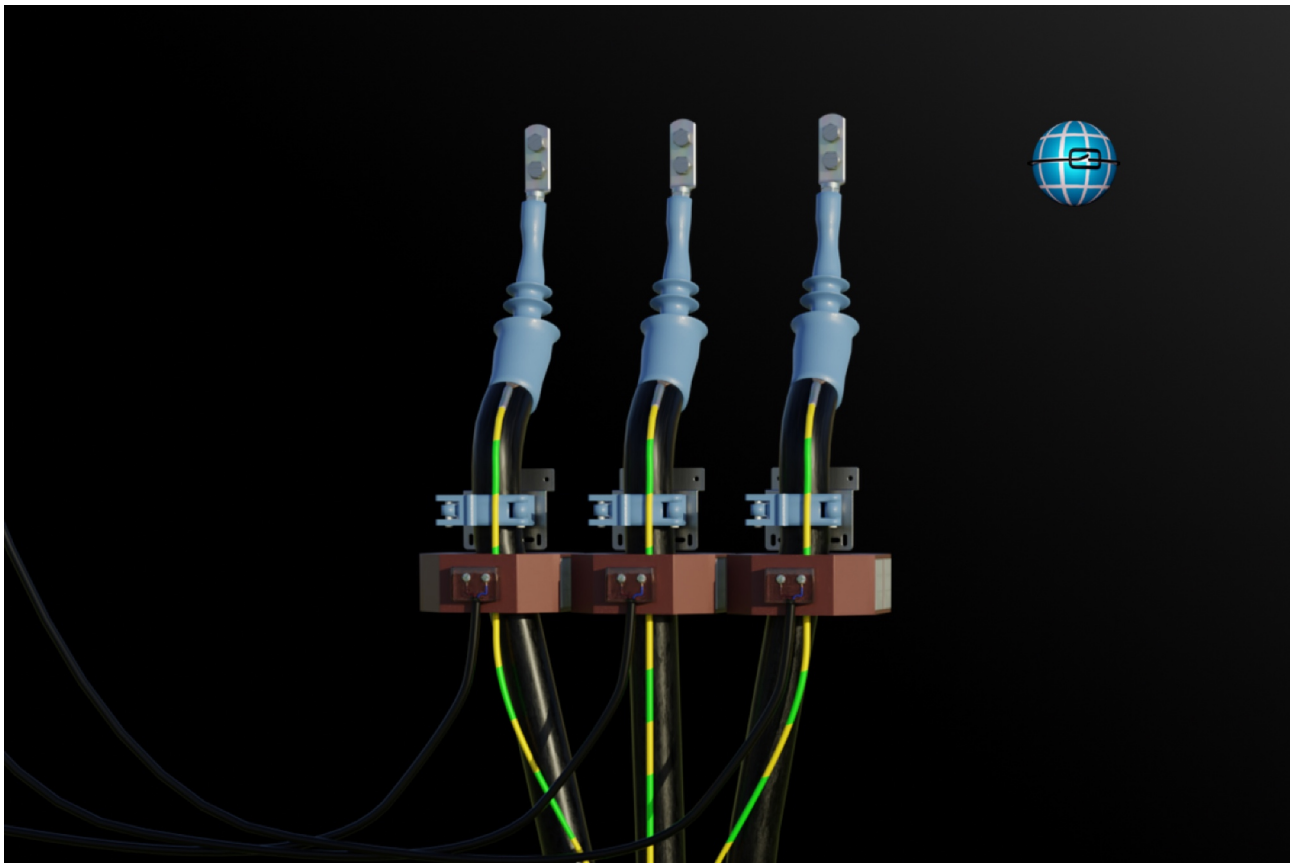
ELECTRICAL-ENGINEERING.ACADEMY

Cable Type Current Transformers - What really matters!



Welcome dear friends of electrical engineering. This week we will again devote ourselves in detail to the technically correct grounding of cable shields. In the last few months we have again accompanied several projects where this has led to problems. Even if the basic procedure is already known to most, there are always discussions in practice on how to do it correctly. Especially when cable type current transformers are used in combination for conductor and zero sequence current transformers. In addition, people often ask about the sense of the measure, which we will also go into in this article, let's go!

The question of WHY

Why should we return the cable shield back through the current transformer before grounding? The answer is very practical: Because it gives us a much easier life. There are fewer false trippings (overfunction), the measured values are available in the best possible way (avoidance of underfunction) and we show the cable shield what the current transformer thinks of it:

„Nothing“

Let us also answer the question professionally. First of all, it should be clear: Since the cable shield is "married" to the cable, it is passed through the converter together with it. If it is not returned, any current that flows through the cable shield is also captured by the current transformer. Several undesirable effects come into play here.

Cable shields are grounded at the beginning and at the end of the cable. If these are grounding points that are far apart and have different potentials, compensating currents will flow. The one-sided potential increase in the event of a ground fault alone can drive undesirably high currents here. In addition, atmospheric coupling can generate unwanted compensating currents. In addition, we must also take into account: The cable shield is loaded with zero sequence currents parallel to the earth branch in the event of single-pole faults. These are also measurable and have a negative impact on the protective decision. In practice, this leads to over- and under-functioning of our protective systems.

The topic becomes understandable when we ask ourselves the "actual" task of a cable type current transformer.

What is the primary task of a cable type current transfomer?

A current transformer has the job of measuring the current of the primary conductor. This applies both to phase current measurement and to zero sequence current measurement. Because even if we measure the 3-fold zero sequence current with a cable type current transformer, we want to capture the vector sum of all three conductor currents, but not any stray currents across the cable shield. Cable shields falsify our measurement results, often lead to overfunction (e.g. with differential protection) and must be safely excluded from the measurement. For this purpose, the return of the cable shield is mandatory before grounding.

Since problems occur again and again in practice, we will look at all the important configurations below.

Simple single conductor cable

In the first figure we see the technically clean return of the cable shield through the CT. As a result, the current via the screen can be safely excluded from the measured value acquisition.

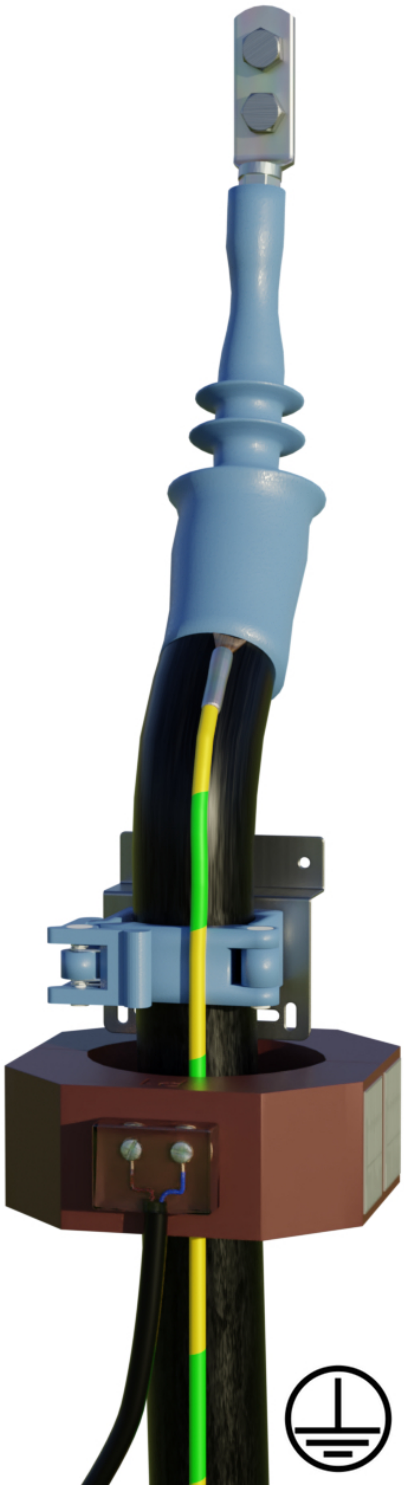


Figure 1: Professional shield grounding of single core cables- That's the proper way!

In the second figure we see a failed attempt. Instead of excluding the screen from the measurement, it was passed through the CT one more time. This doubles the problem and we can definitely expect undesirable effects. We baptize this version with the name "Fool-Grounding".

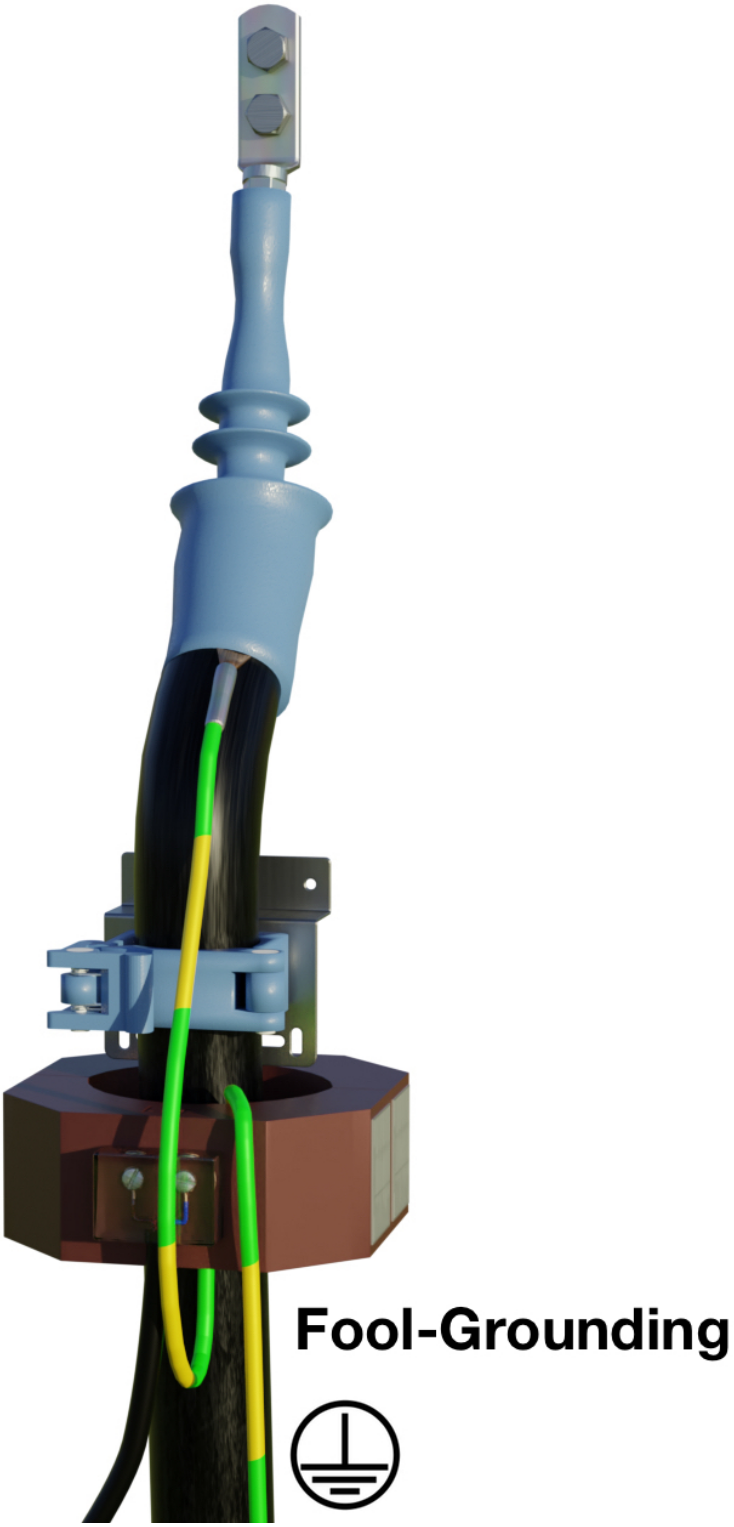


Figure 2: The Fool-Grounding-Methode | Please not in this way!

Measuring of the 3-fold zero sequence current

With the wattmetric earth fault protection, the measurement of the threefold zero sequence current is used. Here three single-core cables or a three-core cable are fed through the CT. In any case, all existing screens are to be led back through the CT (see Figure 3).

Figure 3: Professionell Grounding of 3-fold zero sequence measuring

Combination of conductor and 3-fold zero sequence measuring

If conductor and 3-fold zero sequence current measurement are used in combination, the shields of the three conductors are first fed back through the phase-CT's and then fed together through the common current transformer (Figure 4). This also gives us accurate secondary measurement currents here. (The black secondary connection cables are not used for grounding)

Figure 4: Professional Ground in Combination of conductor and 3-fold zero sequence measuring

What else is important?

Correct handling of cable end plugs is also very important. These must always be applied in isolation and must not come into contact with ground potential. If cable currents are measured using a Rogowski coil, the statements made here also apply.

Kind Regards

Your EEA-Team

PS.: Cable Type Current Transformers of **MBS** are available at our **Store**!