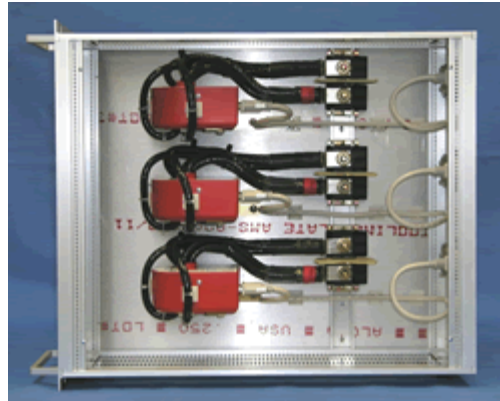GMW offer a "wrap around" Primary Cable with three returns for a 600A Transducer.

Primary current cable
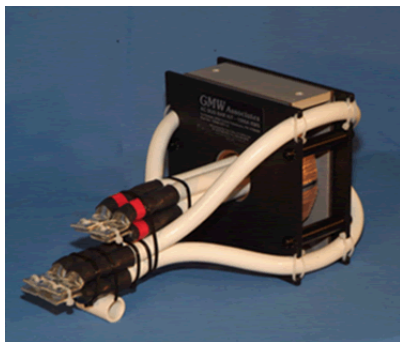

866-600 with primary current cable

Three 866-600 with primary current cables

A similar wrap around Primary Cable for a 2000A Transducer with four returns.

STH-2000 with 199080011 Cable Kit

The advantages of this wrap around arrangement for high accuracy, broad frequency range measurements are:

1. The area of the loop formed by the primary current cables can be minimized. Compare figure 1.1 with figure 1.2. The primary cables can be run together from source to load and the cable to be measured is cut to insert the transducer/primary cable assembly. Alternatively the transducer insertion can take place at the source end avoiding cutting the primary cable. If the primary circuit has high currents switched between levels and the current forms a large loop there will be radiated high frequency magnetic fields from the loop. These can interfere with other equipment and are potentially hazardous to personnel.

Current transducer with wrap around primary cable

Figure 1.1

Small loop area generates low external magnetic field

Figure 1.2

Large loop area generates large external magnetic field which can interfere with other equipment, cause cross-coupling and may be hazardous to personnel.
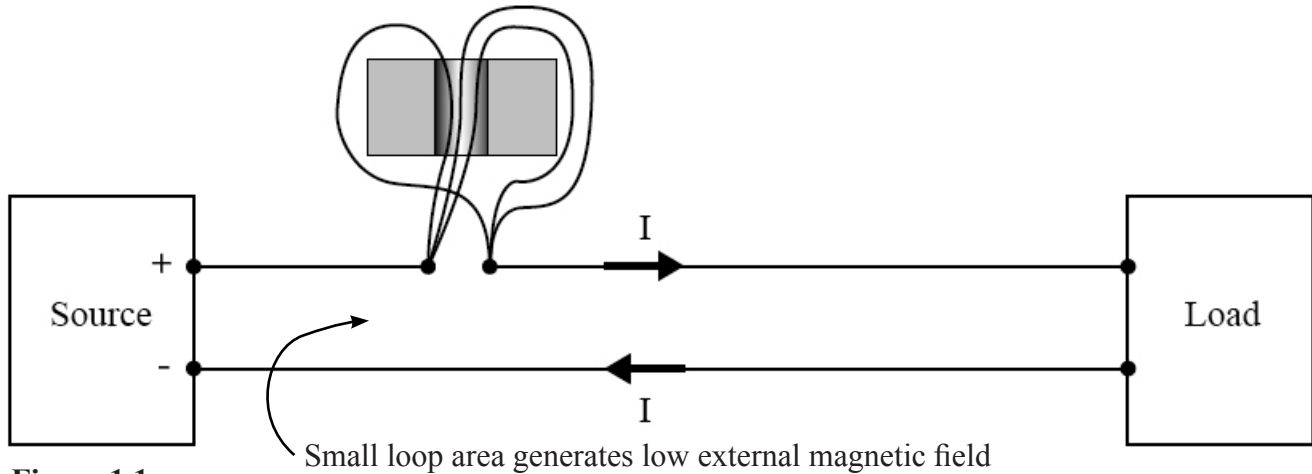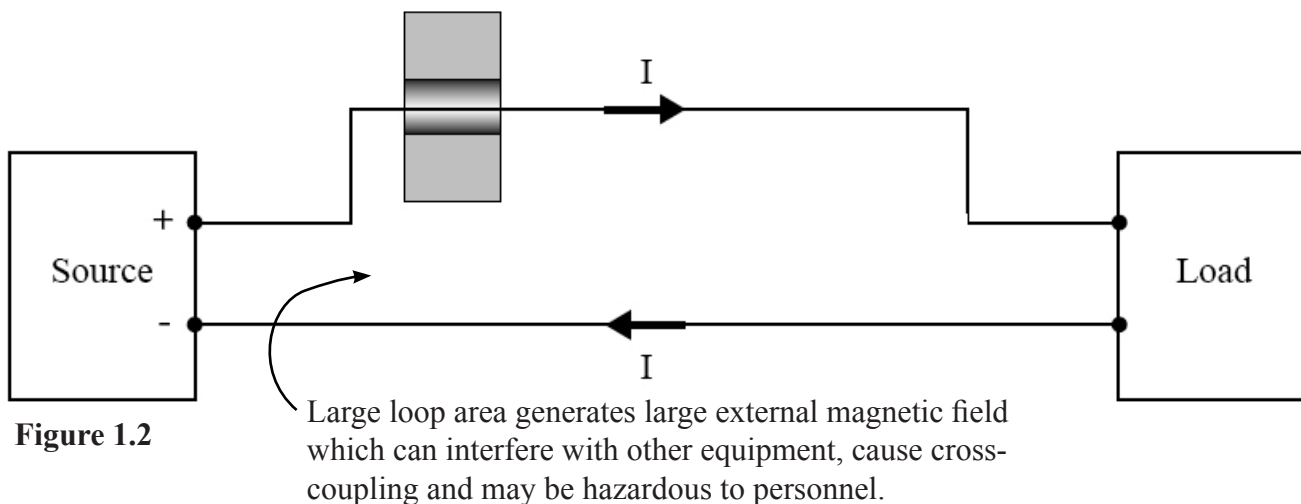
2. The peak currents in each of the outer returns are reduced by 3 or 4 times from the total primary current depending on the number of returns. In a multiphase system this enable the transducers to be placed closer together (generally side-by-side) since the magnetic fields from any one return conductor is lowered by the factor of 3 or 4. If single return conductors are used they have to be separated by some distance (the bus bar clear zone) from the transducer. Refer to figures 2.1, 2.2 and 2.3 modeled for the dimensions of an 867-200IHF transducer with a nominal maximum primary current of 200A. For the 867-200IHF the specifications require that with a single return conductor, it be located at least 75mm from the transducer center. Refer to figure 2.1. The magnetic flux density B at a point in the toroid magnetic core approximately 50mm from the return current is approximately given by $B \sim \mu_0 I/2\pi R$, the field at distance R from a long straight wire carrying current I. In MKS units $\mu_0 = 4\pi \times 10^{-7}$. Note when the transducer is
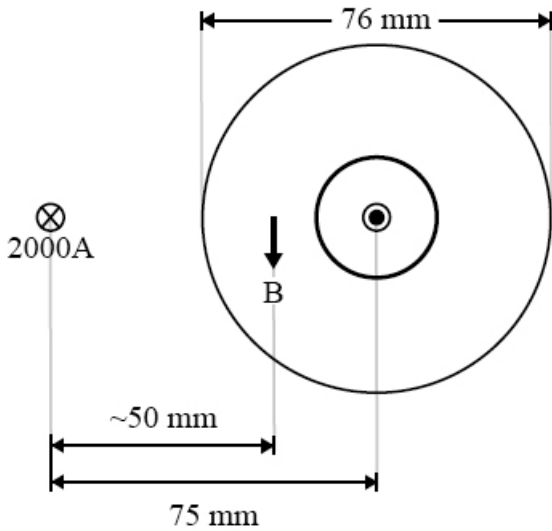
Figure 2.1

operating correctly in the zero flux mode, the core has a relative permeability, μ_r of approximately 1. (This does not apply if the transducer is not operating.) For I ~200 and R~75mm, B~0.8mT. For three conductors distributed around the 867-200IHF the field, B_1, from the conductor 1 carrying 67A at a distance of about 20mm is 0.54mT. Refer to figure 2.2. The fields from conductors 2 and 3 carrying 67A at a distance of about 58mm are 0.23mT. The vector sum of these two fields is about 0.42mT in the opposite direction to B_1. Hence the total field is about 0.12mT compared with 0.8mT from a single conductor much further away. For the effect of the cabling of transducer 2 on transducer 1, see figure 2.3. We can vectorially add the fields from conductors 1, 2, 3 and 4. For conductor 1, at a distance of about 20mm the field is about 0.54mT. For conductors 2 and 3 the distance is about 96mm and the resultant field of B_2 and B_3 is 0.27mT. For conductor 4 with current of 200A at about 65mm the field is 0.62mT. The vector sum of the four fields is about 0.19mT in the B_1 direction. Thus the total field of about 0.19mT from an adjacent transducer with the wrap around primary is much less than the approximately 0.8mT from a single return conductor located at about 75mm from the center.
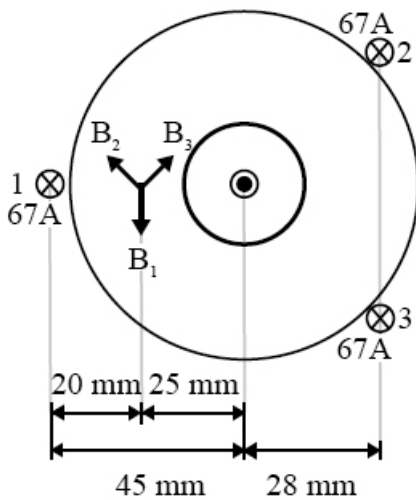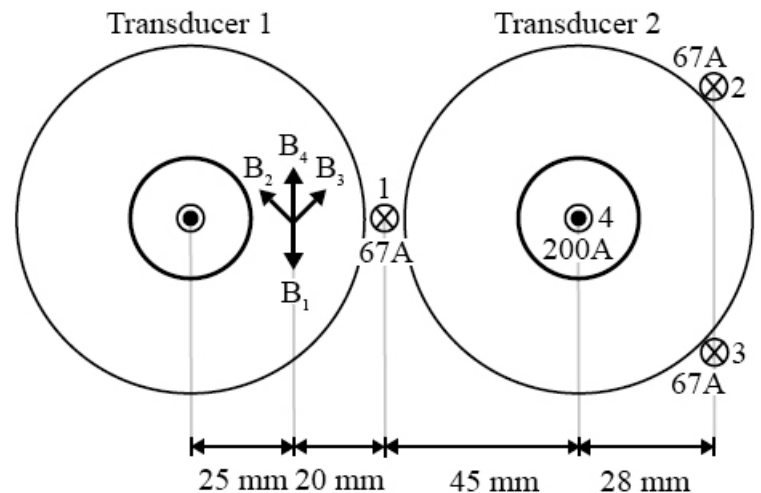

Figure 2.2

Figure 2.3

3. The frequency response of the transducer is also typically improved because of the improved coupling to the primary circuit.

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