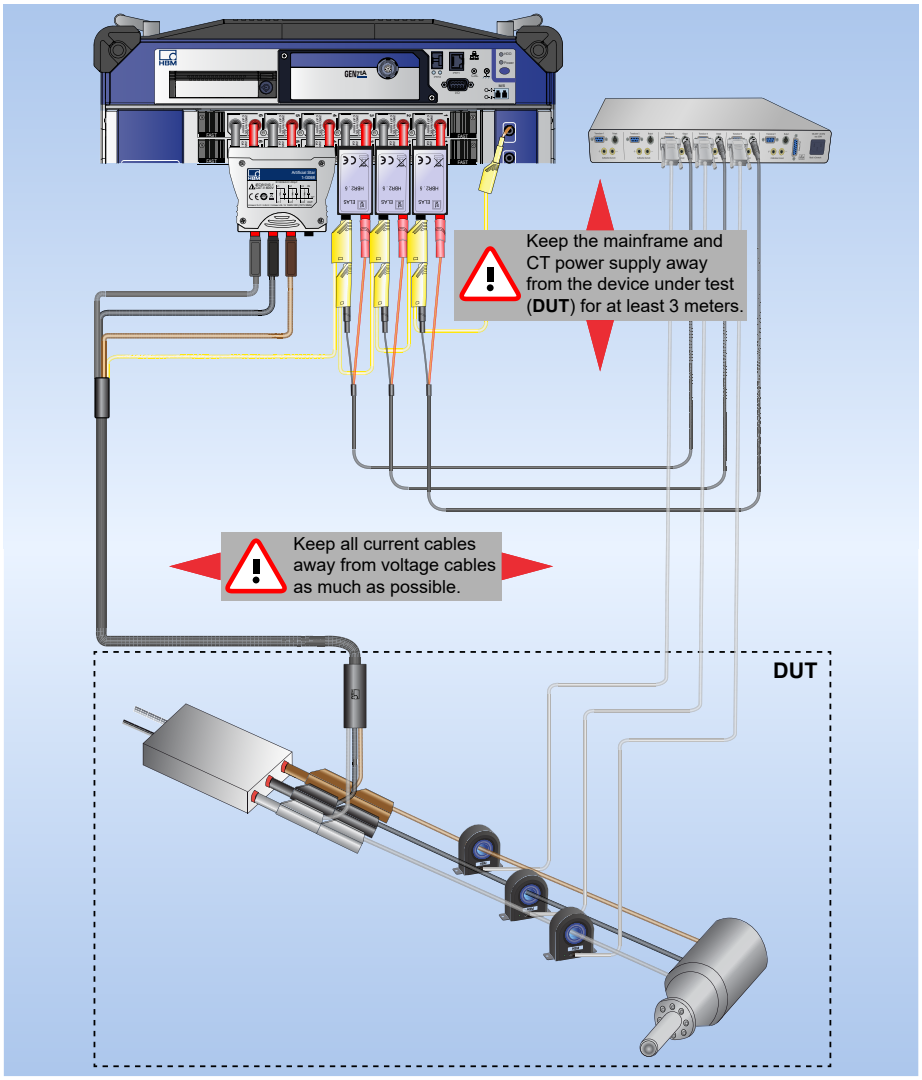
Genesis HIGH SPEED

Using Current Transducers

English



GN61xB Cabling Details

GEN series

HBM

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1 Introduction

1.1 Overview

The GN610B (and GN611B) has isolated balanced differential input to minimize common mode signals.

HINT/TIP

As with any input, using external proper cabling is required to make the best use of this amplifier.

2 Using the Correct Cable

2.1 Overview

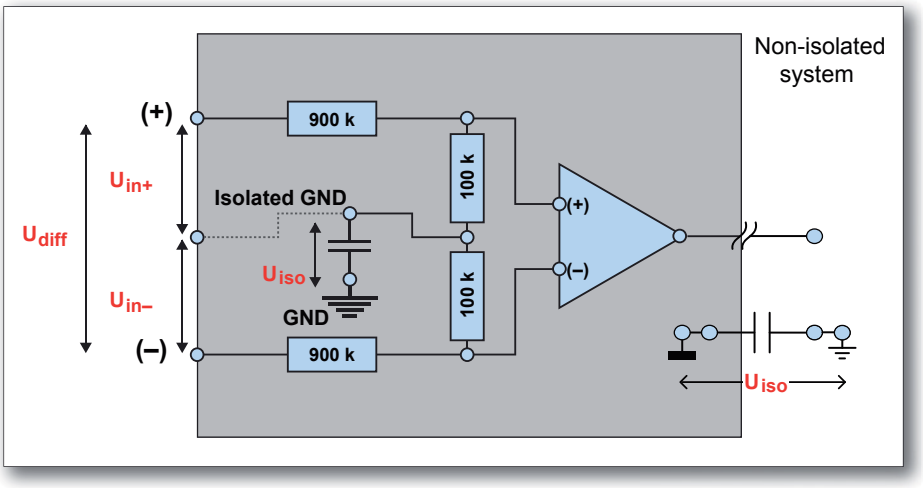

Figure 2.1: Isolated balanced differential amplifier

The input stage of this amplifier is symmetrical on positive and negative input side. The intent is to make sure both sides behave 100% identical allowing reversal of signal as well as good common mode reduction on both inputs. For best measurement results the external cables must be identical on the positive and negative input. For this reason HBM supplies the KAB290 cable. This cable is constructed using two identical wires with a common shield.

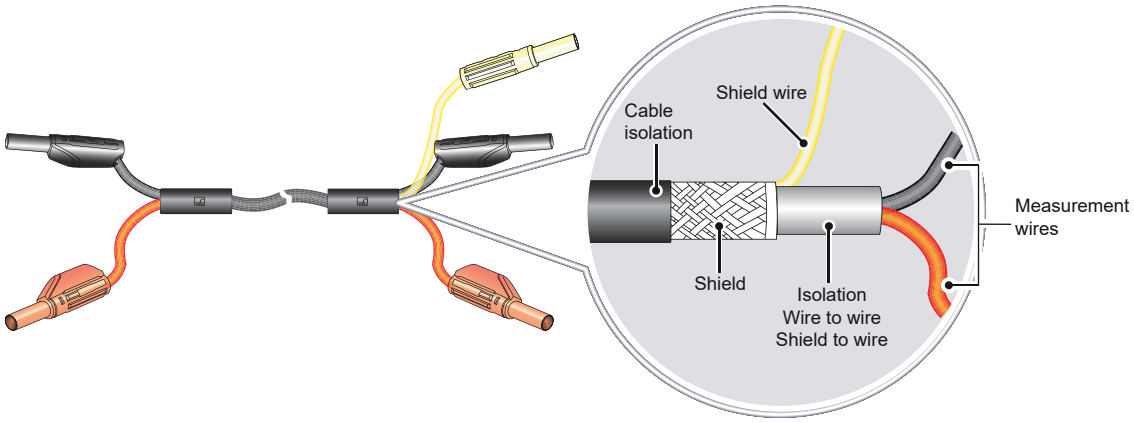

Figure 2.2: HBM shielded high voltage cable KAB290

IMPORTANT

Connect the shield to earth on one side only. The shield can only effectively reduce the external noise when the shield is connected to earth. Connecting the shield on both sides creates potential ground currents creating extra measurement errors.

IMPORTANT

Do not use coaxial cables for voltage or current measurements with GN610B/GN611B amplifiers!
When using a coax cable the negative wire picks up the external noise. The inner positive wire cannot to pick up the same noise due to the coaxial shield function of the negative wire. The disturbance on the positive signal wire is different from that on the negative wire. The full differential input of the GN610B/GN611B detects different voltages on both inputs and therefore cannot eliminate this as common mode signals. Instead it will amplify the difference, that is, increase the noise.

3 Connecting HBM Current Transducers

3.1 Using the GEN DAQ ground terminal

Following the recommendation in chapter “Using the Correct Cable” on page 5, the connection between the Current Transducer power supply and the GN610B/GN611B must always use the KAB290 cables.

HINT/TIP

Best results are achieved grounding the shield directly on the GEN DAQ mainframe ground terminal(s).

As the ground terminal does not accept the shrouded banana plugs, every KAB290 cable comes with an adapter (LD-024-1001712) that can be mounted directly underneath the ground terminal of the GEN DAQ mainframe (see Figure 3.1).

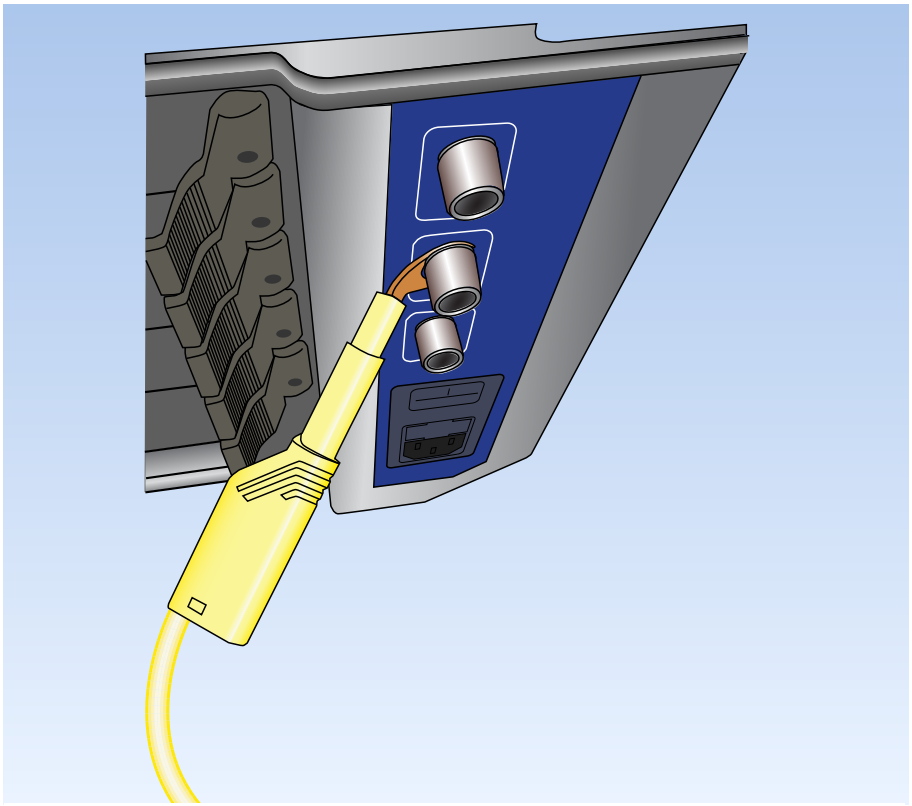

Figure 3.1: LD-024-1001712 connector attached top ground terminal and shrouded banana plug

3.2 Burden resistors and cabling

The Current Transducer is isolated from any voltage within the measurement chain. However, the magnetic coupling of the transducer with the current cable creates an indirect coupling to the voltage of the current cable. As a result a Current Transducer picks up common mode voltages from the device under test.

Table 3.1: GN610B(GN611B common voltage specifications

Common mode (referred to system ground)		
Ranges	Less than ± 10 V	Larger than or equal to ± 10 V
Rejection (CMR)	> 80 dB @ 80 Hz (100 dB typical)	> 60 dB @ 80 Hz (80 dB typical)
Maximum common mode voltage	7 V RMS	1000 V RMS

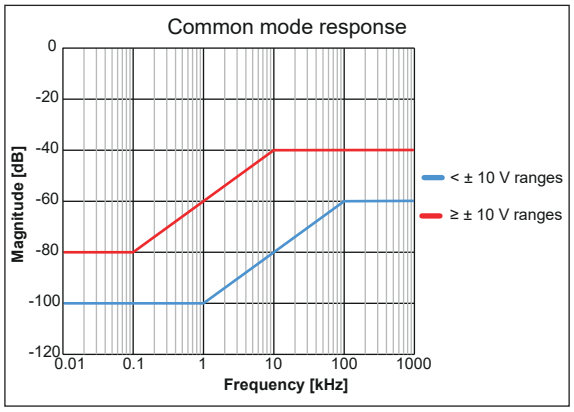

Figure 3.2: Representative common mode response

Using the burden resistors, the measurement range typically will be less than ±10 V, therefore resulting in a maximum common mode voltage of 7 V RMS. The Current Transducer common mode voltage pick up in many cases will exceed this 7 V RMS. As a result the input will create wrong measurement results. Typically this can be recognized as spikes on the current traces (most often negative spikes).

IMPORTANT

Connecting the burden resistor on one side to ground eliminates the magnetic coupled common mode voltage.

The required connections then look like this:

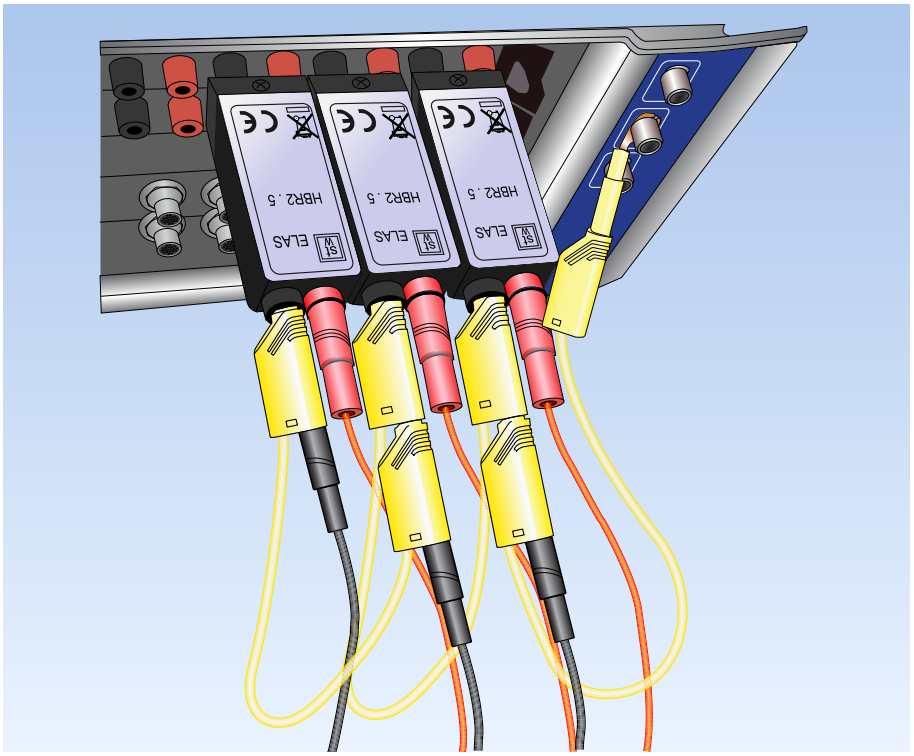

Figure 3.3: Detailed view on burden resistor connections

Connection to be made for each shunt resistor used (see Figure 3.3).

1 Connect a short yellow banana cable from each black input of burden resistor to the next black input of burden resistor.
2 Connect a short yellow banana cable from the black input of the last burden resistor to the system ground using adapter LD-024-1001712.
3 Connect the red wire from each KAB2135 cable to the red input of each burden resistor.
4 Connect the black wire from each KAB2135 cable to the yellow wire on the black input of each burden resistor.

IMPORTANT

Connecting the burden resistor on one side to ground eliminates the magnetic coupled common mode voltage.

3.2.1 Burden resitors connected with the GEN7tA grounding adapter

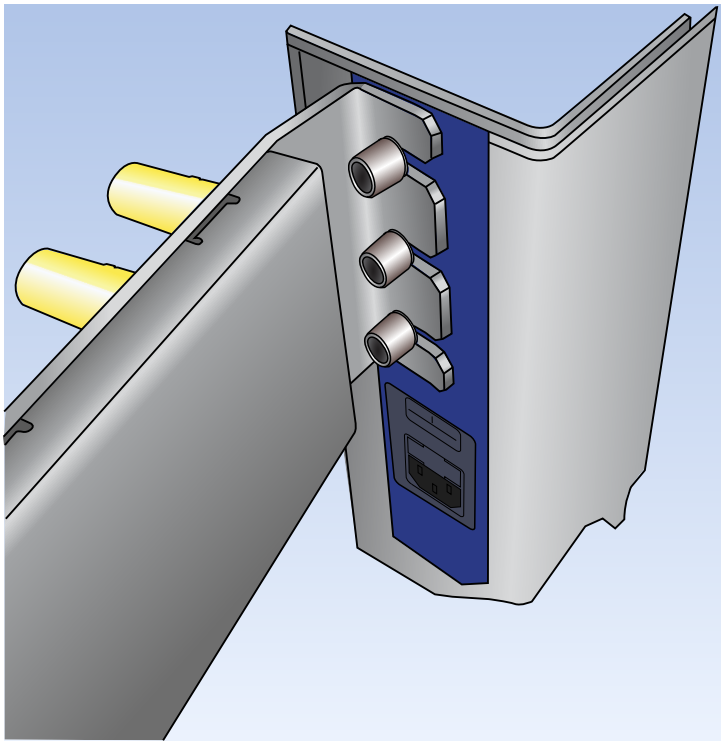

Figure 3.4: Detailed view on mounting bracket

Steps to mount the grounding adapter (see Figure 3.4).

1. Release all three grounding terminal screws.
2. Carefully place the grounding adapter in between the screws and mainframe housing.
3. Tighten the grounding screws to secure the adapter and electric ground connection.

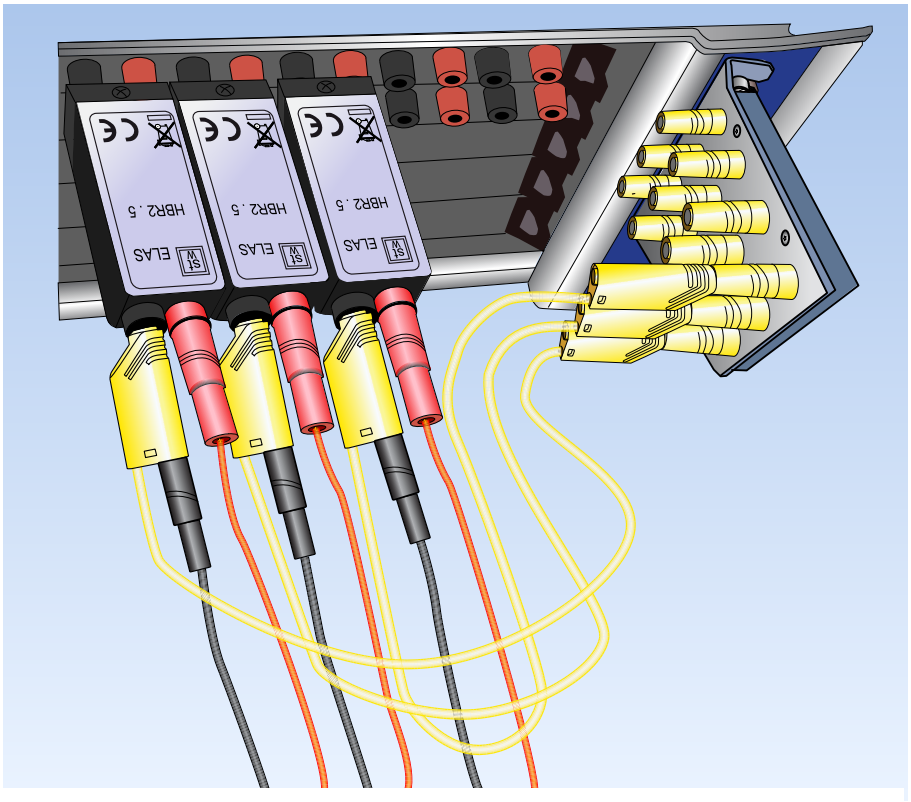

Figure 3.5: Detailed view on burden resistor with three connections

Connection to be made for mounting the bracket to three connection points (see Figure 3.5).

1 Connect a short yellow banana cable from each black input of burden resistor to the grounding adapter.
2 Connect the red wire from each KAB2135 cable to the red input of each burden resistor.
3 Connect the black wire from each KAB2135 cable to the yellow wire on the black input of each burden resistor.

3.3 HBM Current Transducer power supply cabling

The HBM Current Transducer power supply comes with XLR output connectors.

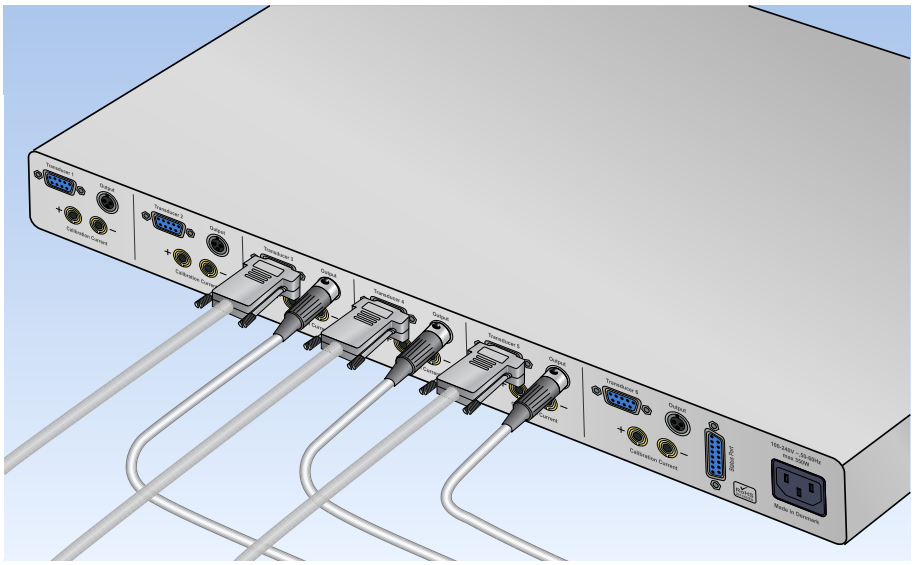

Figure 3.6: HBM Current Transducer power supply connections

Connection to be made for each HBM Current Transducer used (see Figure 3.6).

1. Connect KAB2133 to Transducer input of the HBM Current Transducer power supply.
2. Connect KAB2135 to Output connector of HBM Current Transducer power supply.

3.4 Overview of HBM Current Transducer cabling

When all cables are connected the connection looks like this:

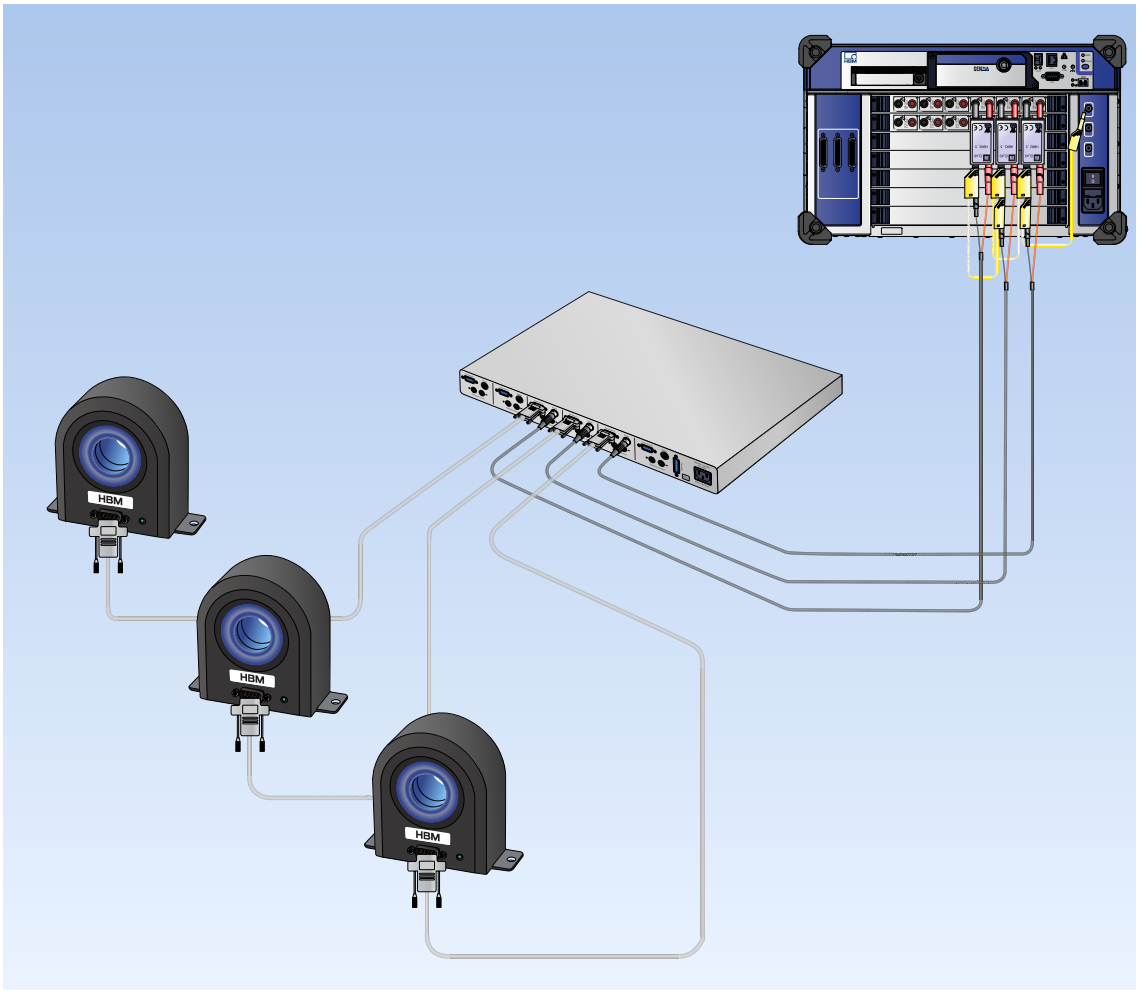

Figure 3.7: Overview of shunt connection cabling

Note *Choose the right Current Transducer range to increase the measurement accuracy.*

4 Connecting HBM voltages cables

4.1 Overview

The voltages typically measured are in the range of several hundred volts. Thus the input amplifier is used with an input range where the common mode limits are no longer a potential issue (as described before with burden resistors, see "Burden resistors and cabling" on page 19).

Also for voltage measurements, the usage of a KAB290/KAB2129 is strongly advised as it will positively impact your measurement results.

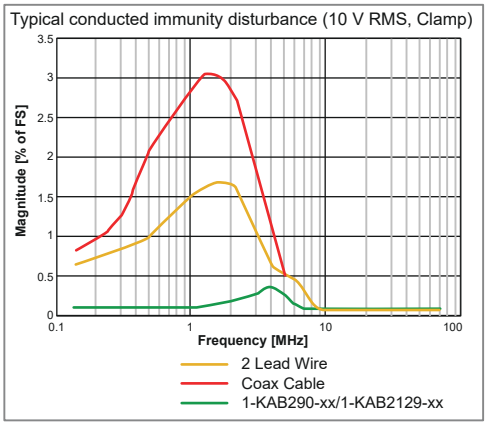

Figure 4.1: Overview of cable effects on immunity

Depending on your setup some or more of the following effects will be present:

1 **Minimize intrinsic noise**
Independent from the connection or measurement type (phase to phase or phase to ground or whatever) using KAB290/KAB2129 both positive and negative voltages runs inside a shielded cable.
Both signal wires pick up the same external disturbance signal and put this on the full differential input of the GN610B/GN611B amplifier allowing the common mode rejection to eliminate this noise.

2 **Preventing noise emission**
The measured high frequency signals from the switching inverter will be shielded inside the KAB290/KAB2129 cable not radiating to the current cables that are typically using 100 times lower voltage levels.

Note *Using individual banana cables (unshielded) will not shield the cables therefore higher frequency EMC signals will transferred to the measurement cable as well as higher intrinsic noise might be visible.*

4.2 Three phase to artificial star voltage measurement

In the three phase system, **phase** to **artificial** star voltage measurement method is commonly used, this chapter describes how to do the connections.

The required connections then look like this:

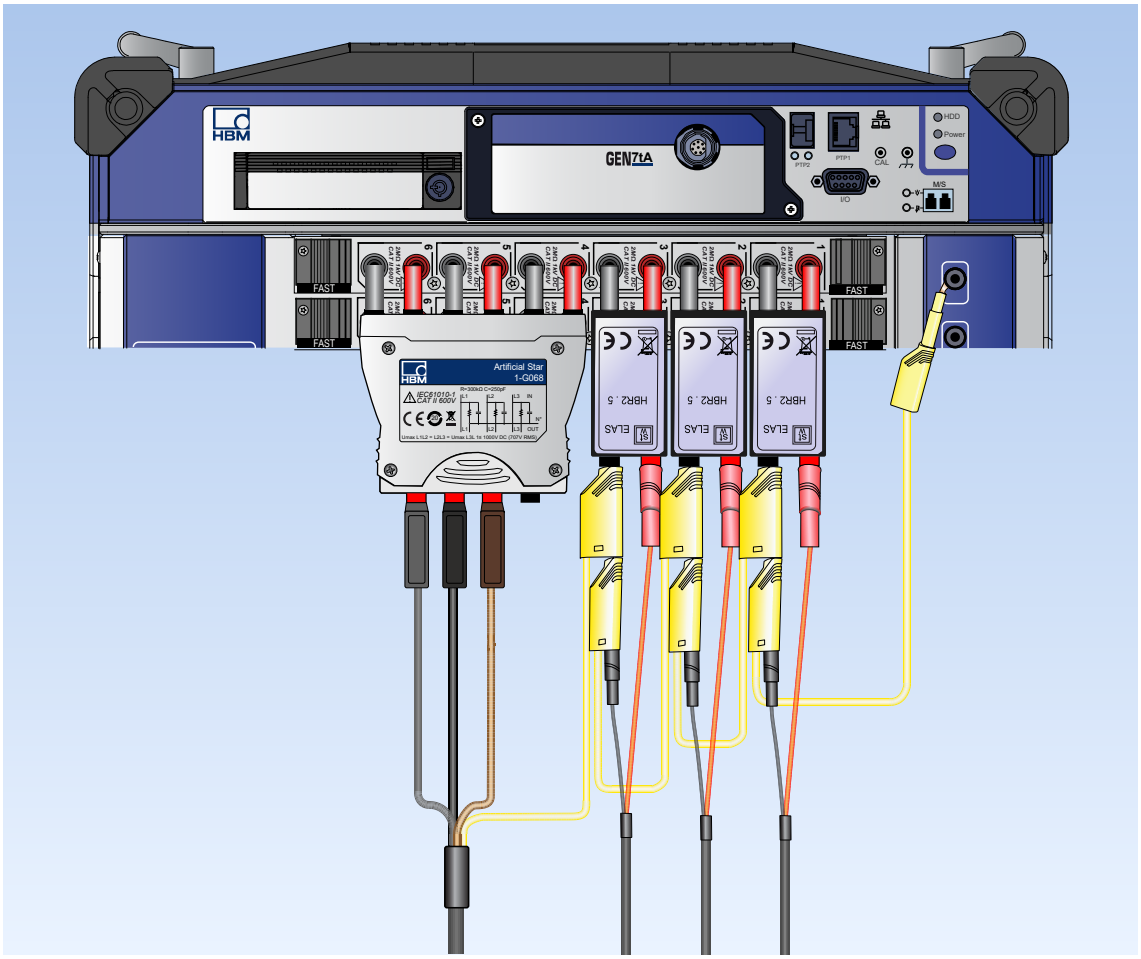

Figure 4.2: 2 Three phase to artificial connections diagram

1. Connect brown, grey and black shrouded banana plugs of KAB2128 to the artificial star adapter G068.
2. Connect KAB2128 yellow shrouded banana plug (using adapter LD-024-1001712) to the system ground terminal.

IMPORTANT

Connecting the burden resistor on one side to ground eliminates the magnetic coupled common mode voltage.

4.3 Recommended test cell cable routing

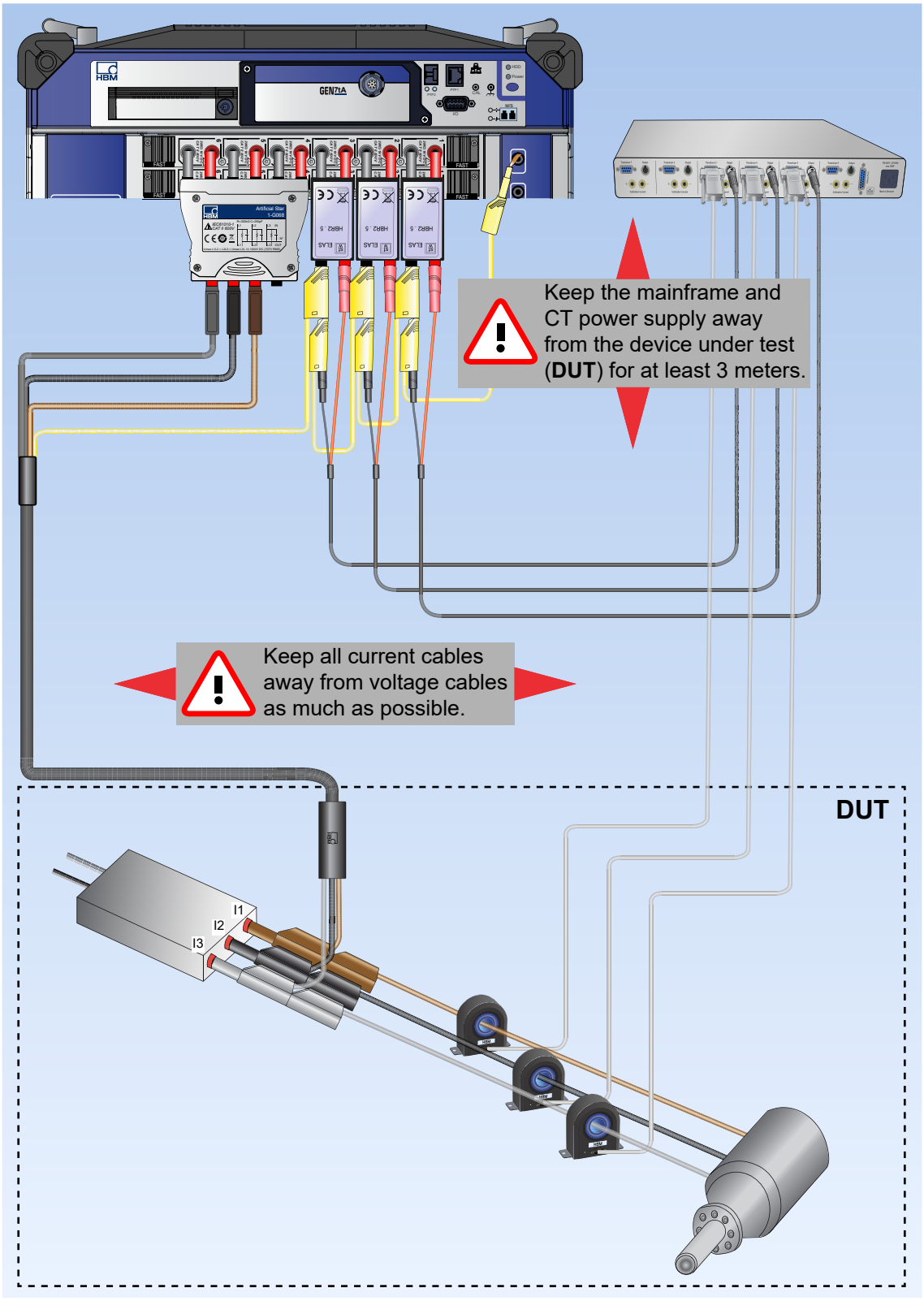

Figure 4.3: Recommended voltage and current cable routing

5 Electromagnetic interference

5.1 Overview

Note *In real life electric motor testing, inverter, variable-frequency drive and other electronic equipment generate a lot of high frequency electromagnetic interference in the environment. Sometimes, the interference is so strong which makes the measurement data distorted or unusable.*

Here are a few tips which help you to reduce the electromagnetic interference and thus ensure accurate measurement:

- For the best signal fidelity, keep all current cables always away from voltage cables as much as possible (suggested 3 meters).
- It is suggested to keep the mainframe away from the DUT (Device under test) for at least 3 meters.
- Choose the right length of voltage and current cable and avoid rolling up cables as shown in Figure 5.1 **(A)** and **(B)**.

Note *When cables are rolled up, high frequency electromagnetic interference induces currents and adding noise to the signal.*

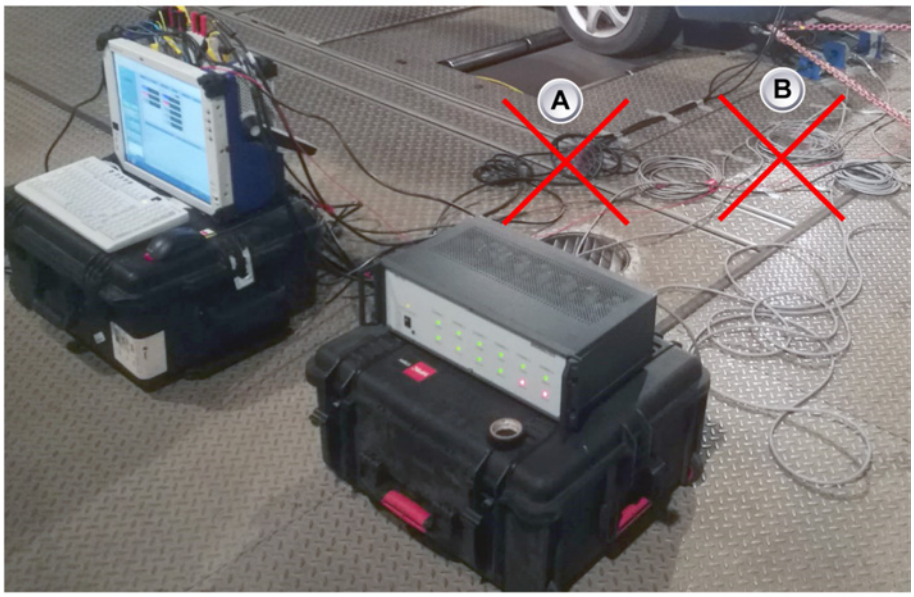

Figure 5.1: Cable loops induce *electromagnetic interference*

A Connecting LEM Current Transducers

A.1 Using the GEN DAQ ground terminal

Following the recommendation in chapter “Using the Correct Cable” on page 5, the connection between the Current Transducer power supply and the GN610B/GN611B must always use the KAB290 cables.

HINT/TIP

Best results are achieved grounding the shield directly on the GEN DAQ mainframe ground terminal(s).

As the ground terminal does not accept the shrouded banana plugs, every KAB290 cable comes with an adapter (LD-024-1001712) that can be mounted directly underneath the ground terminal of the GEN DAQ mainframe (see Figure A.1).

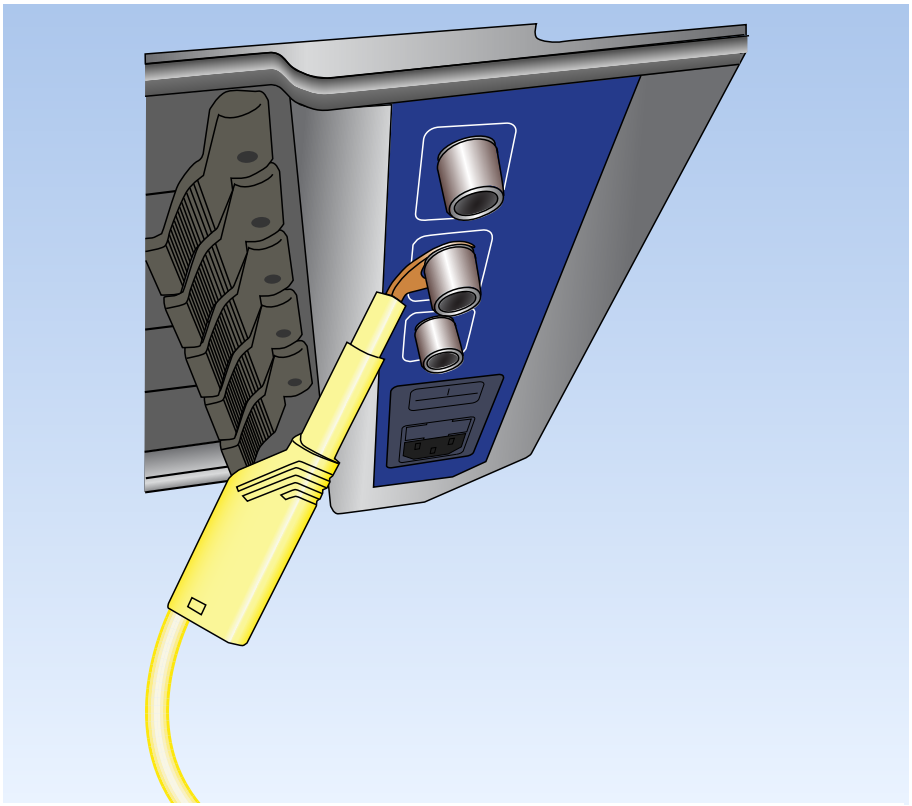

Figure A.1: LD-024-1001712 connector attached top ground terminal and shrouded banana plug

A.2 Burden resistors and cabling

The Current Transducer is isolated from any voltage within the measurement chain. However, the magnetic coupling of the transducer with the current cable creates an indirect coupling to the voltage of the current cable. As a result a Current Transducer picks up common mode voltages from the device under test.

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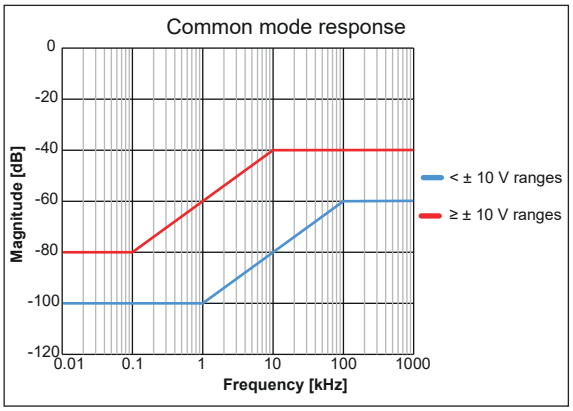

Figure A.2: Representative common mode response

Using the burden resistors, the measurement range typically will be less than ±10 V, therefore resulting in a maximum common mode voltage of 7 V RMS. The Current Transducer common mode voltage pick up in many cases will exceed this 7 V RMS. As a result the input will create wrong measurement results. Typically this can be recognized as spikes on the current traces (most often negative spikes).

IMPORTANT

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The required connections then look like this:

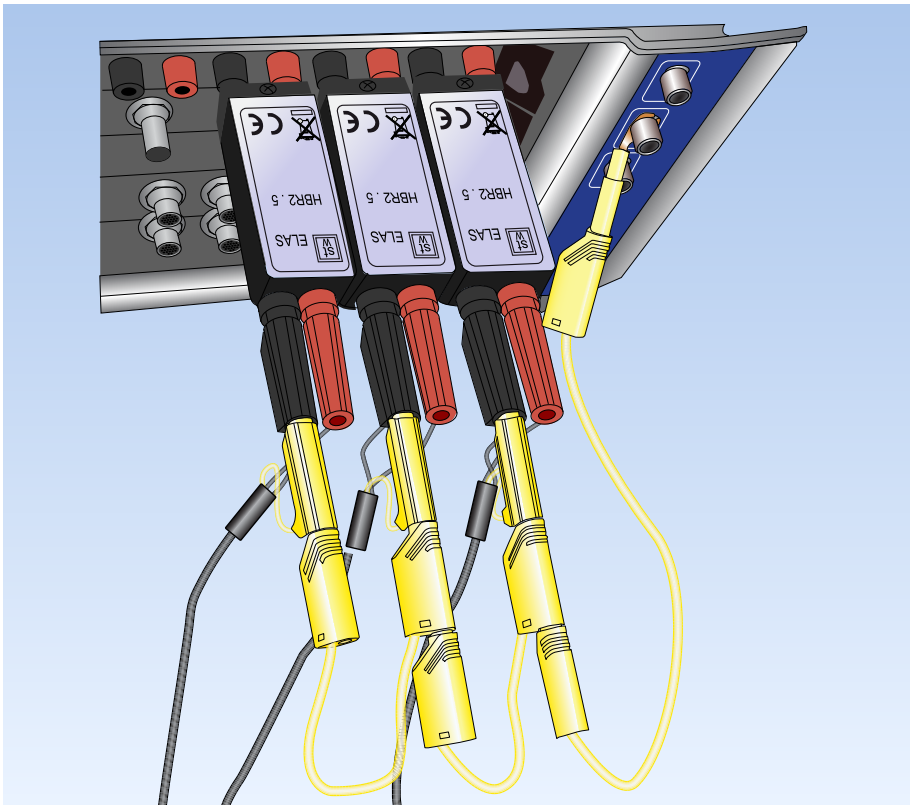

Figure A.3: Detailed view on burden resistor connections

Connection to be made for each shunt resistor used (see Figure A.3).

1. Connect KAB290 red wire to red input of burden resistor.
2. Connect KAB290 black wire to black input of burden resistor.
3. Connect KAB290 yellow wire to black wire of KAB290.
4. Connect a short yellow banana cable from each KAB290 yellow connector to the next yellow cable connector.
5. Connect a short yellow banana cable from the last KAB290 yellow connector to system ground using adapter LD-024-1001712 .

IMPORTANT

Connecting the burden resistor on one side to ground eliminates the magnetic coupled common mode voltage.

A.3 LEM Current Transducer power supply cabling

The LEM Current Transducer power supply comes with banana plugs.

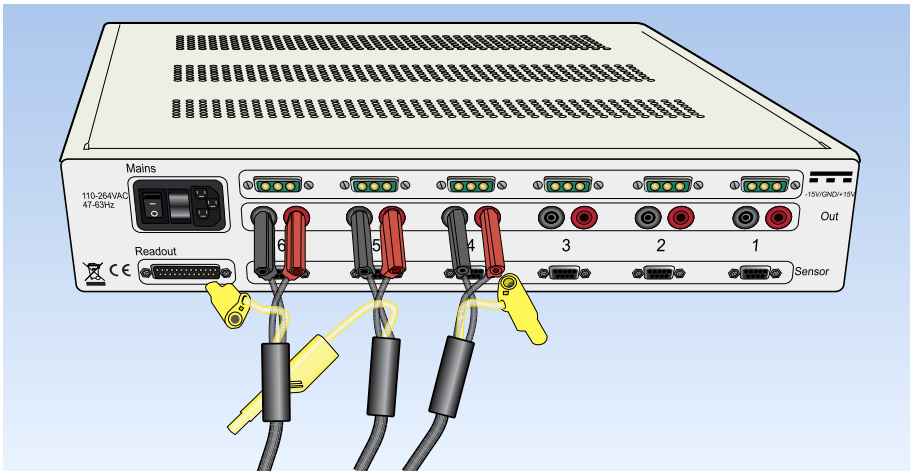

Figure A.4: LEM Current Transducer power supply connections

Connection to be made for each LEM Current Transducer used (see Figure A.4).

1. Connect KAB290 red wire to red input of the LEM Current Transducer power supply.
2. Connect KAB290 black wire to black input of the LEM Current Transducer power supply.
3. Connect KAB290 yellow wire leave open and do not connect them together to avoid ground loops.

A.4 Overview of LEM Current Transducer cabling

When all cables are connected the connection looks like this:

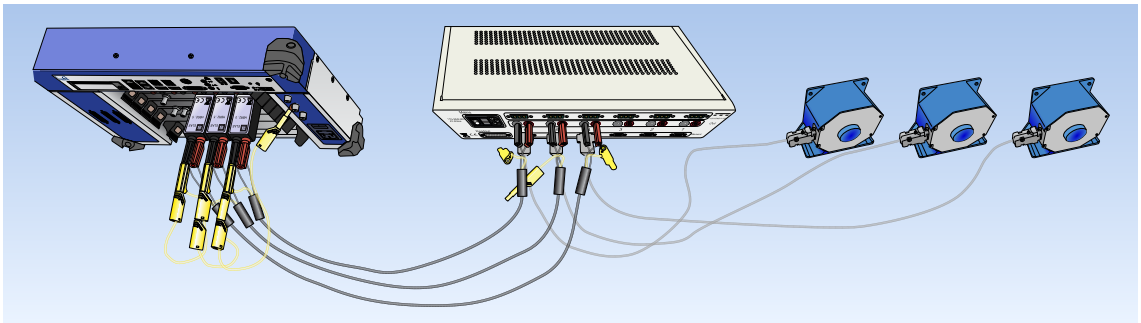

Figure A.5: Overview of shunt connection cabling

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