

Cable Selection and Wiring with PICO STRAIN

Introduction:

The PICO STRAIN measuring principle for strain gages is based on measuring the discharge time of an R-C network. The R-C network is made of the strain gage resistor and a reference capacitor. The discharge time is in typically 50 μ s and so we have a AC measuring principle with an excitation frequency in the lower kHz range.

In consequence the measurement is influenced by parasitic capacities as it is with other AC measuring methods. If the strain gage is connected to a PICO STRAIN device through cables it is necessary to take into account the cable capacity.

Crosstalk and dynamic variations of the cable capacity will disturb. A wrong choice will end up in an unacceptable temperature offset drift. With the correct choice of the cable and the correct wiring it is possible to use cable with several meters of length without additional errors. In particular it is possible to build 3000e and 6000e calibratable scales.

1. How does the measurement result depend on the cable?

A wrong cable or a wrong wiring effects only the **offset drift** over temperature. There is no influence on the resolution or the gain drift.

Note: In applications where the offset drift is not relevant it is possible to use any cable.

2. Correct choice of cable insulation

The cable insulation should be made of a material with low drift of ϵ_r over the temperature. PTFE (teflon) is very well suited. PVC is less suited. Nonetheless it is possible to work with the very well established PVC insulated cables when the following aspects are taken into account.

3. Allignment of the single leads

3.1 Shielded round cables

This kind of cable might be the most popular one. We recommend:

- Use drilled cables
- Best are pairwise drilled cables

3.2 Ribbon cables

For ribbon cables we recommend

- Use only pairwise drilled cables

Note: It is practically possible to eliminate the offset temperature drift caused by the cable. Besides the aspect of

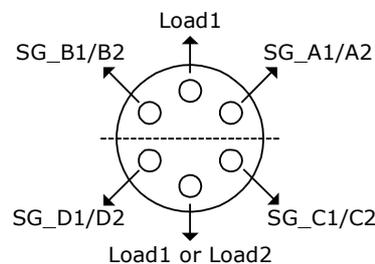
pairwise drilled cables it is very important to connect the strain gage in the correct way. The quality of the results can be compared to the one's of PTFE.

4. Wiring the Strain Gage

A correct connection between the strain gage and the leads of the wire is essential for a low offset drift over temperature.

4.1 Cables with leads not drilled in pairs

The wiring should be very symmetrical. It is shown for a fullbridge separated in two halfbridges as it is typical for PICO STRAIN. This is the best way to connect the strain gage that should be followed.



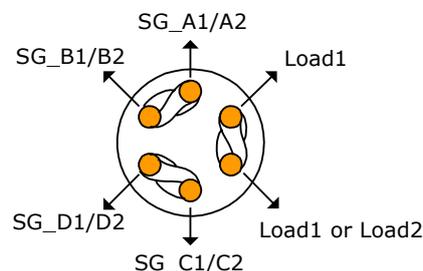
Do not use cables with more wires than necessary. This will introduce an unsymmetry in the cable capacity and cause an increased offset drift over the temperature.

4.2 Pairwise drilled cables

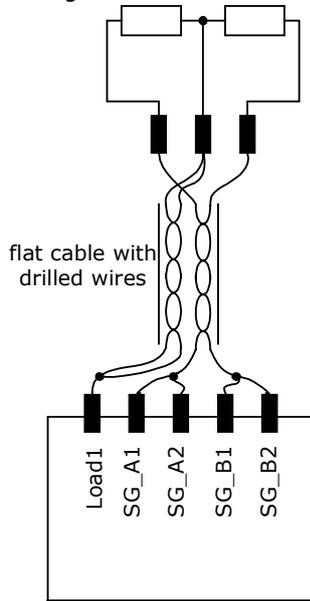
Here it is important to set the correct pairs of wires. In general strain gage terminals with the same function should be used in pairs.

Terminals with the same function are:

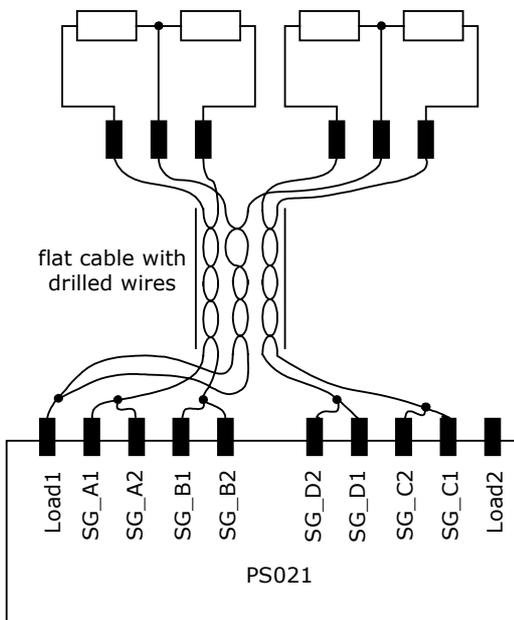
- Terminals to be connected to the port pins SG_A, SG_B etc.
- Terminals to be connected to LOAD



Halfbridge:



Fullbridge:



When using Wheatstone bridges similar terminals are:

- Terminals to be connected to the port pins SG_A, SG_B etc.
- Terminals to be connected to the analog multiplexer

