62 GDS Helpsheet

GDS INSTRUMENTS LIMITED

World Leaders in Computer Controlled Testing Systems for Geotechnical Engineers and Geologists

Hardware

Hall Effect Transducers

Use of Hall Effect Transducers

1. Introduction

The Hall Effect local strain transducers are used to make measurements without the well known errors of bedding, end effects and machine compliance. The Hall Effect readings should therefore be expected to be lower than the readings from the axial actuator.

When using the reading from the local axial strain devices you must calculate the axial strain as (local axial strain reading) / (gauge length). The gauge length is the distance apart of the pads which fix the local strain device to the test specimen. For example: you may have a 72 mm diameter test specimen with height 144 mm. The local strain gauge pads are positioned say 65 mm apart. The deformation measured from the actuator is 5 mm and the deformation measured by the local strain transducers is 2 mm. In this case strain measured from the actuator is 5*100/144 = 3.472%, whereas the strain measured by the local strain device is 2*100/65 = 3.077%. You should do the calculations for each local strain device separately and then average the two to allow for bending of the test specimen.

You should also note that at very small strains and low loads the non-linear nature of the machine compliance is important. This is mainly due to the behaviour of the belt on reversal and looks like a backlash of about six micro metres.

The Hall Effect local strain transducers are designed for local strain measurement at small strains. They have a range of +/- 3 mm to give the best possible resolution.

For the local radial strain transducer the reading from the calliper is actually approximately twice the diameter change. This is due to the geometry of the calliper - the pads are fixed across the centre of the test specimen but the measurement is made at the end of the calliper.

Fluctuations of 10 microns are not unusual for the Hall effect devices. Normally this is not a problem but for tests with very small displacements you need to look at a complete cycle of data in graphical form and use some curve fitting (probably manual) to visually remove the effects of the fluctuations and thereby determine the actual strains more accurately.

To recap. You must take into account the gauge length when calculating local axial strain. You must take into account that the radial calliper gives a measurement that is twice the change in diameter.