

No. 1 Deflectometer (Messuhr) Huggenberger Zürich, Jointmeter JM 3D



Principle: Dial indicator with a fine spring, "Feinzeiger-Messgerät", measures deflections (relative distances)

Application: Crack observation used at dams and bridges

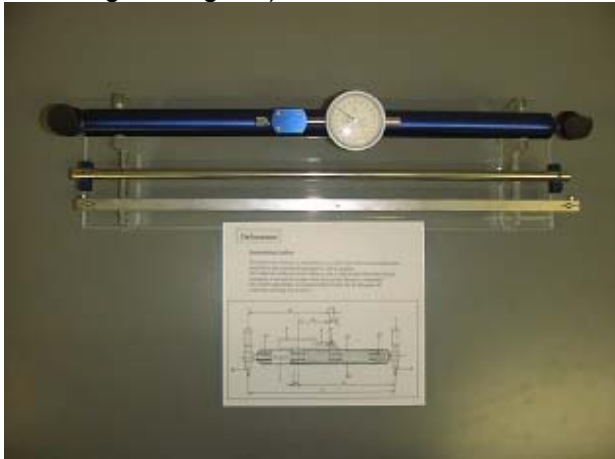
No. 2 Micrometer (Huggenberger Rissmikrometer)



Principle: Mechanical micrometer that can be turned until a slipping clutch has grip. Reading 0.02 mm intervals at nonius, 0.5 mm is equal to one turn of the outer ring.

Application: crack observations at dams, quality control

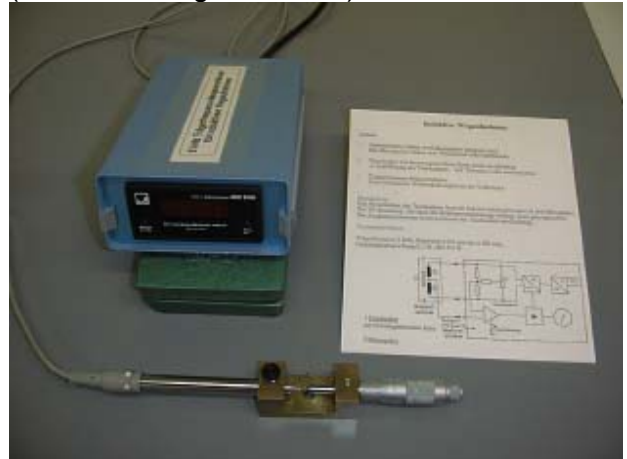
No. 3 [Deformeter](#) (Extensometer, Präzisions-Dehnungsmessgerät)



Principle: mechanical transformation of small shifts between two probes to a sensitive dial. Mechanical compensation of expansion by temperature. A bar with a same length is used for marking the points at the wall. Another bar is used for reference. Cracks with larger changes require other observation or action.

Application: Cracks in walls, joint observation, deformation measurements

No. 4 Inductive Displacement Transducer (Induktiver Wegaufnehmer)



Principle: If the length changes, the spring releases or contracts. An anchor is moved between two coils, which causes a change in the inductance.

Application: precision scales, displacements, fast movements of mechanical parts, permanent monitoring

No. 5 Resistance Strain Gauge Exhibition

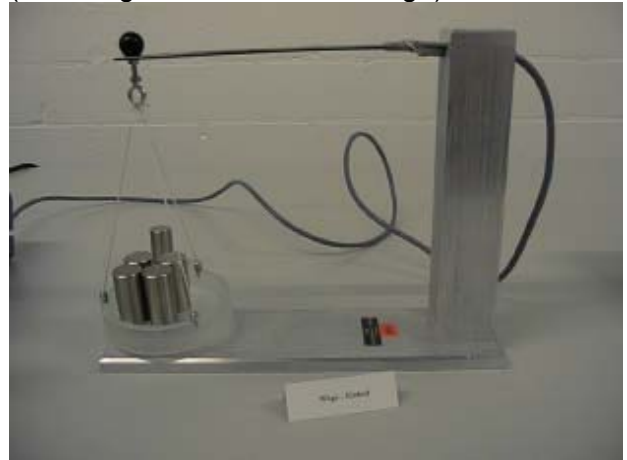


Principle: permanent monitoring of  $p_r$

The smaller, the more precise. Multiple loops inside the gauge extend the length of the wire. This factors the sensitivity for detection of changes in strain respective the lengths.

Application: permanent monitoring of distortions at bridges, structures, buildings, frequency (swinging) measurements of up to 5-8 Hz

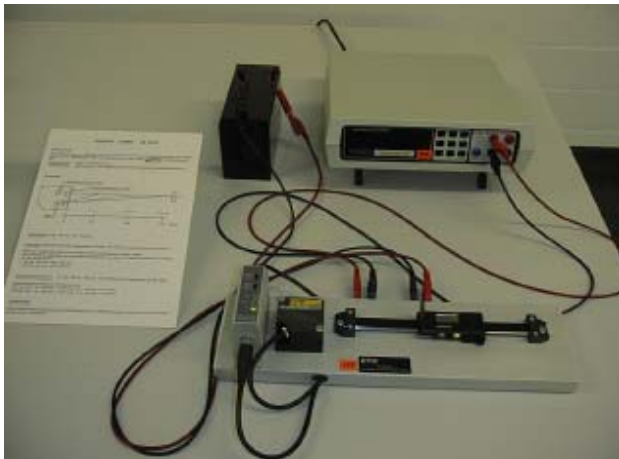
No. 6 Resistance Strain Gauge and Scale (Dehnungsmessstreifen + Waage)



Principle: By the following physical units is the measured signal transferred: mass [kg]  $\rightarrow$  weight [N]  $\rightarrow$  stain ( $\Delta l/l$ )  $\rightarrow$  deflection [m]  $\rightarrow$  resistance [ $\Omega$ ]  $\rightarrow$  current [A]. Four Strain Gauges are mounted at the metal bar.

Application: Scales, vibration analysis, deformation measurements

No. 7 Analogue Laser, Tectron AG, Keyence



Principle: A change in length [m] at the calliper  $\rightarrow$  angle of laser spot [ $^\circ$ ]  $\rightarrow$  position change at CCD sensor [m]  $\rightarrow$  change of electrical current [A]

Application: deformation measurements, permanent monitoring of displacements

No. 8 [Distometer](#) ETH



Principle: measures distance by an invar wire up two distances of 50 m. The upper scale is used to measure the weight and calibrate the instrument to a certain force. The actual length is measured at the smaller scale.

Application: Tunnels, caverns, construction and excavation pits.