

New Multi-Range Force Sensor



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- ⌘ In many applications contact forces are generated and they need to be controlled.
- ⌘ Sensors can be used to accomplish these tasks.
- ⌘ Today's sensors have limitations.
- ⌘ They can measure force in only one range.
- ⌘ To measure two different force ranges two sensors must be used.

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- ⌘ Could it be possible to design a sensor capable of measuring force in two different ranges?

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- ⌘ A transducer was design.
- ⌘ A transducer is a device which transforms one type of energy into another.
- ⌘ An example is a battery, chemical energy converted to electrical energy.
- ⌘ Some of the components used to make the transducer are: the spring element, strain gages, thermoelectric heaters, electrical wires, insulation, and thermocouples.

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- ⌘ Strain Gages: thin metal-foil grids that can be adhesively bonded to the surface of a component.
- ⌘ When the component is loaded, strains develop and are transmitted to the foil grid.
- ⌘ The resistance of the foil grid changes in proportion to the load-induced strain.

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- ⌘ The spring element is the most critical mechanical component of the transducer.
- ⌘ The spring element was made with the material NiTi, which is a shape memory alloy.
- ⌘ Shape Memory Alloys: materials that exhibit a phase and mechanical transformation when their temperature changes.
- ⌘ The material possesses a low temperature, low strength martensitic phase and a high temperature, high strength austenitic phase.

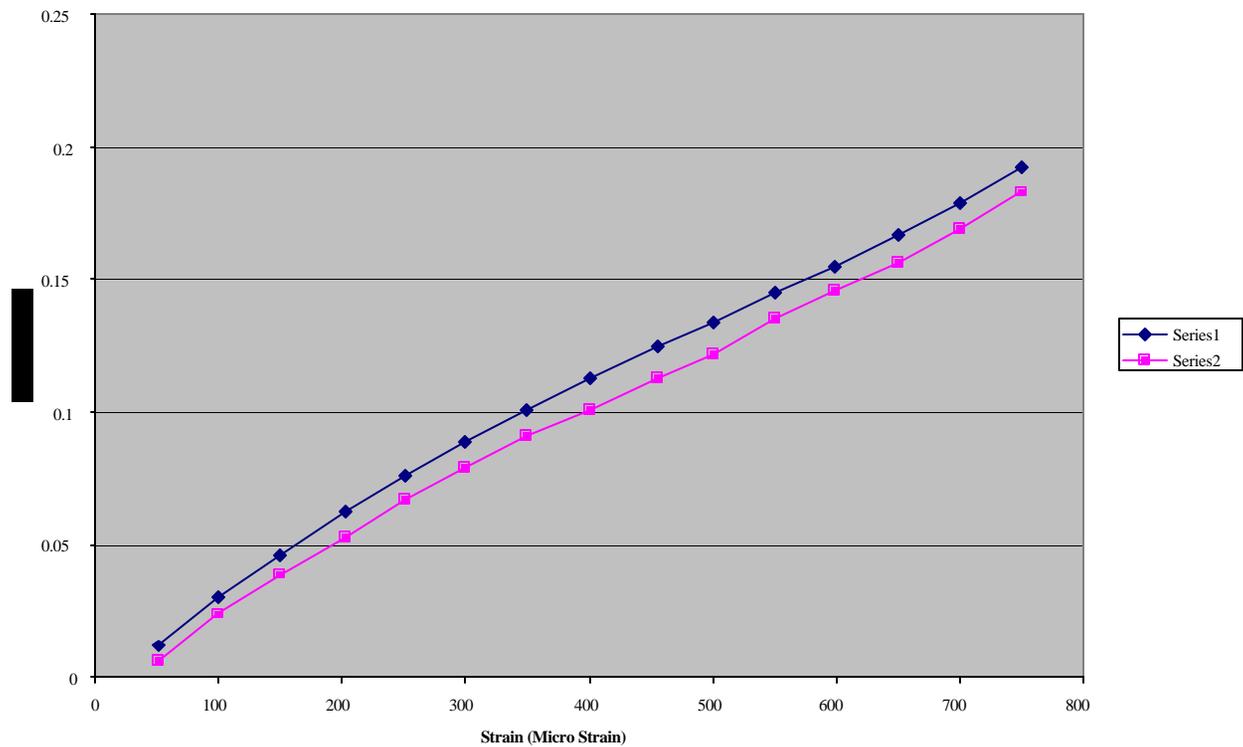
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- ⌘ At the beginning of the experiments we have problems with the electric wires and the thermocouples.
- ⌘ The problems were solve.
- ⌘ Results for the martensitic phase were obtained.

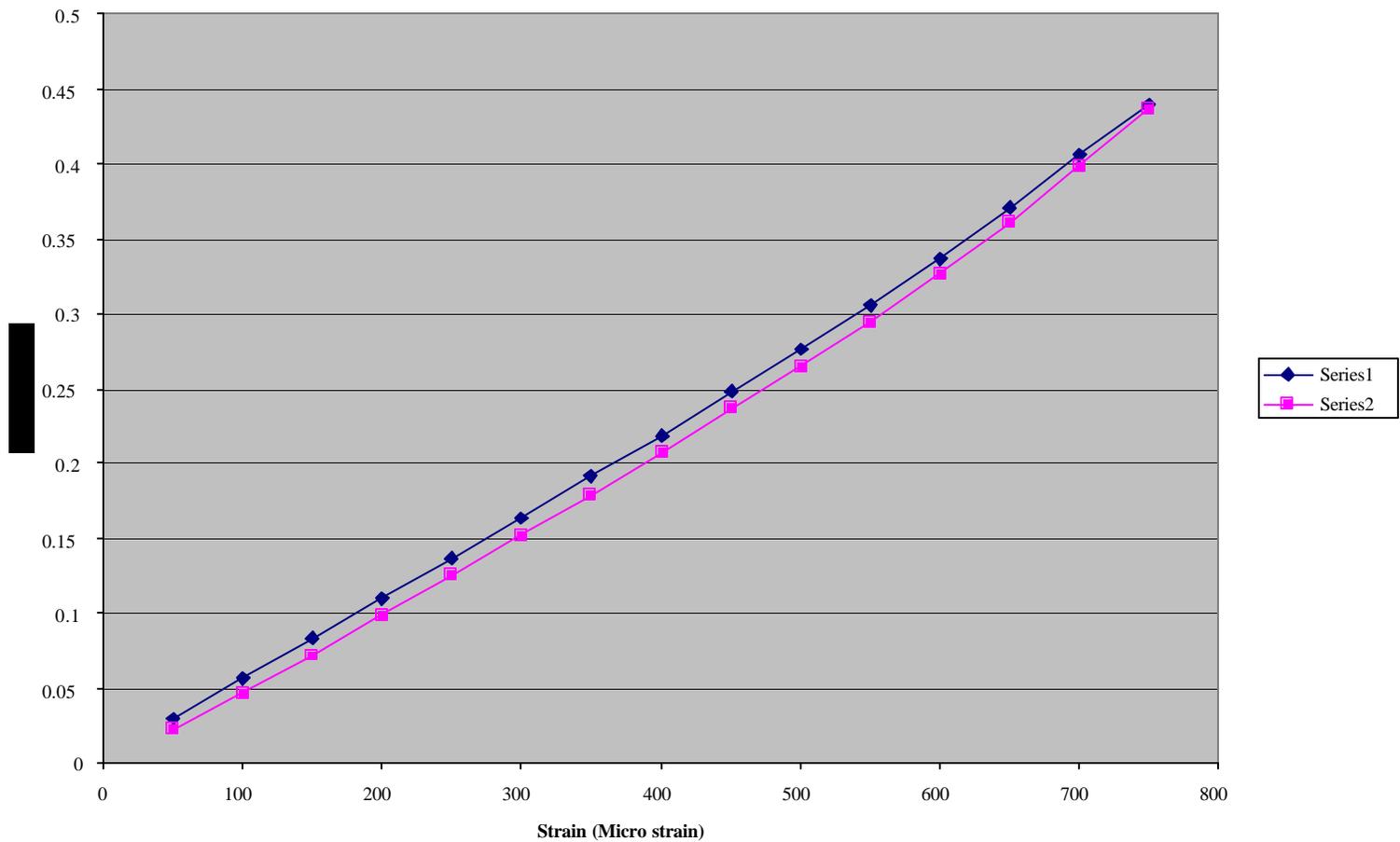
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Strain Vs Voltage Matensitic Phase



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Strain Vs Voltage Martensitic 2



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- ⌘ Experiments in the austenitic phase are been conducted.
- ⌘ Several design problems had been noticed.
- ⌘ Thermoelectric heaters were replaced.
- ⌘ The thermocouple was also replaced.

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⌘ Questions?