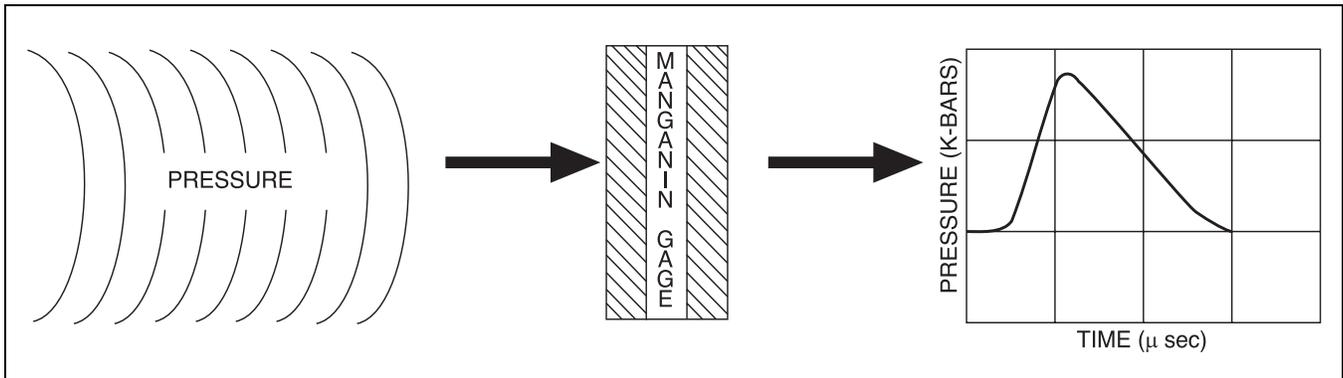


Special Use Sensors - Manganin Pressure Sensor



FOR HIGH-PRESSURE MEASUREMENTS SHOCK WAVE PROPAGATION • BLAST EFFECT • EXPLOSIVE-FORMING STUDIES HIGH HYDROSTATIC PRESSURES

Manganin is a copper-manganese-nickel alloy with a low strain sensitivity, but a relatively high sensitivity to hydrostatic pressure. Resistance change as a function of applied pressure is linear to extremely high pressures. This characteristic has been utilized in the construction of high-range fluid pressure cells using manganin wire for many years.

Manganin gages are used extensively in high-pressure shock wave studies ranging from 1 to over 400 kilobars (1 bar = 14.5 psi = 100 000 N/m²). In conventional applications, the gage is bonded between two flat metallic or polymer plates.

Micro-Measurements offers a large selection of gages for shock wave studies, manufactured from specially treated shunt stock manganin foil. The ultrathin construction offers several advantages over the wire type, including:

- Improved repeatability from gage to gage, due to precisely defined grids manufactured from the same lot of foil.
- Faster response times (nanosecond rise times have been recorded).
- Smaller, high resistance grids.
- Minimal distortion of the pressure wave when mounted in high-modulus materials.

TECHNICAL INFORMATION

Nominal pressure sensitivity of Micro-Measurements manganin foil gages is 0.27% per kilobar [0.0027 ohm/ohm/kb]. Long signal transmission cables, low signal levels, and high electrical noise complicate the measurement. Most of these gages are designed for

impedance matching to 50-ohm coaxial cable. The 210AW pattern illustrated has been used with excitation currents exceeding 6 amperes for periods to 100 microseconds.

The 580SF pattern was designed specifically for investigating the effects of sweeping explosive waves. With the target intentionally tilted at a small angle to the wave front, the pressure wave traverses the grid in the direction toward the leads.

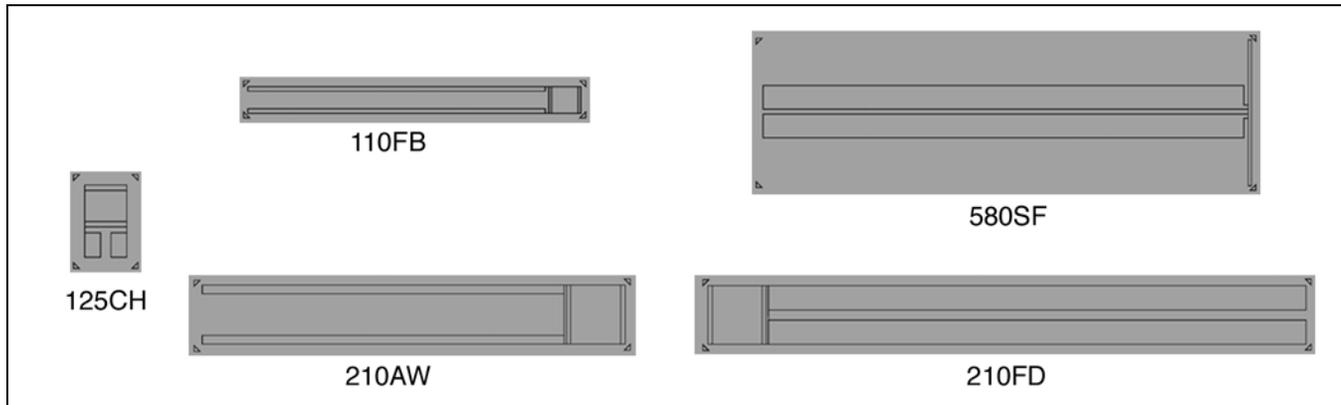
Micro-Measurements manufactures manganin foil gages in several backing materials. The backing material is normally selected to minimize the mechanical impedance mismatch within the target.

L backing is a glass-fiber-reinforced epoxy-phenolic approx. 0.002 in [0.050 mm] thick. Although commonly used in the 1- to 15-kilobar range, its usefulness is not limited to this extent. The backing is ideal for use in quartz-phenolic transducers since it does not present a significant impedance discontinuity. L-backed gages may be used in high-mechanical-impedance materials with the understanding that rise-time limitations may exist due to an impedance mismatch between the sensor and the test material. An encapsulated version (Option SP60), with only the tab ends exposed for soldering, is available.

N2 backing is nominally 0.0008 in [0.020 mm] thick polyimide film. This backing is rugged, highly flexible, and easy to handle. It is suited to very-low-kilobar pressure ranges.

J2 backing is an encapsulated version of the N2, with the ends of the tabs exposed.

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MANGANIN GAGE SELECTION CHART

GAGE DESIGNATION†		FOIL THICKNESS	DIMENSIONS				inch
			OVERALL PATTERN		ACTIVE GRID		millimeter
			Length	Width	Length	Width	TAB LENGTH
LM-SS-110FB-048 LM-SS-110FB-048/SP60 N2M-SS-110FB-048 J2M-SS-110FB-048		0.0002	1.380	0.125	0.110	0.125	1.240
		0.005	35.05	3.18	2.79	3.18	31.49
LM-SS-125CH-048 LM-SS-125CH-048/SP60 N2M-SS-125CH-048 J2M-SS-125CH-048		0.0002	0.290	0.175	0.125	0.175	0.100
		0.005	7.37	4.45	3.18	4.45	2.54
LM-SS-210AW-048 LM-SS-210AW-048/SP60 N2M-SS-210AW-048 J2M-SS-210AW-048		0.0005	1.750	0.250	0.210	0.250	1.500
		0.013	44.45	6.35	5.33	6.35	38.10
LM-SS-210FD-050 LM-SS-210FD-050/SP60 N2M-SS-210FD-050 J2M-SS-210FD-050		0.0005	2.500	0.250	0.210	0.250	2.250
		0.013	63.50	6.35	5.33	6.35	57.15
LM-SS-580SF-025 LM-SS-580SF-025/SP60 N2M-SS-580SF-025 J2M-SS-580SF-025		0.0004	2.018	0.600	0.580	0.008	2.000
		0.010	51.26	15.24	14.73	0.20	50.80

†All resistance values are ±1%, measured on the tab near the grid.

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