

## Special Use Sensors - Crack Propagation Sensors

Crack Propagation Gages provide a convenient method for indicating rate of crack propagation in a test part or structure. The CPA, CPB, and CPC patterns consist of a number of resistor strands connected in parallel. When bonded to a structure, progression of a surface crack through the gage pattern causes successive open-circuiting of the strands, resulting in an increase in total resistance. The CPA pattern incorporates 20 resistor strands; the CPB, with the same basic configuration, incorporates ten. Both series produce stepped increases in resistance with successive open-circuiting as indicated in the charts below. In applications where space permits, the CPC pattern may be preferred because of greater uniformity of increases in total resistance with successive strand fractures.

The resistor strands of the CPD pattern operate independently, each producing an open circuit when fractured. This type of gage allows the user to electrically predetermine a specific point in the fracturing process at which the instrumentation will perform some type of altering function.

### GAGE CHARACTERISTICS

Crack Propagation Gages have a nominal gage thickness of only 0.0017 in [0.043 mm]. The high-endurance K-alloy foil

grid has a single cycle strain range of up to  $\pm 1.5\%$  with a fatigue life of greater than  $10^7$  cycles at  $\pm 2000$  microstrain. The standard backing is a glass-fiber-reinforced epoxy matrix. These gages are useful through the temperature range of  $-452^\circ\text{F}$  [ $-269^\circ\text{C}$ ] to over  $+450^\circ\text{F}$  [ $+230^\circ\text{C}$ ].

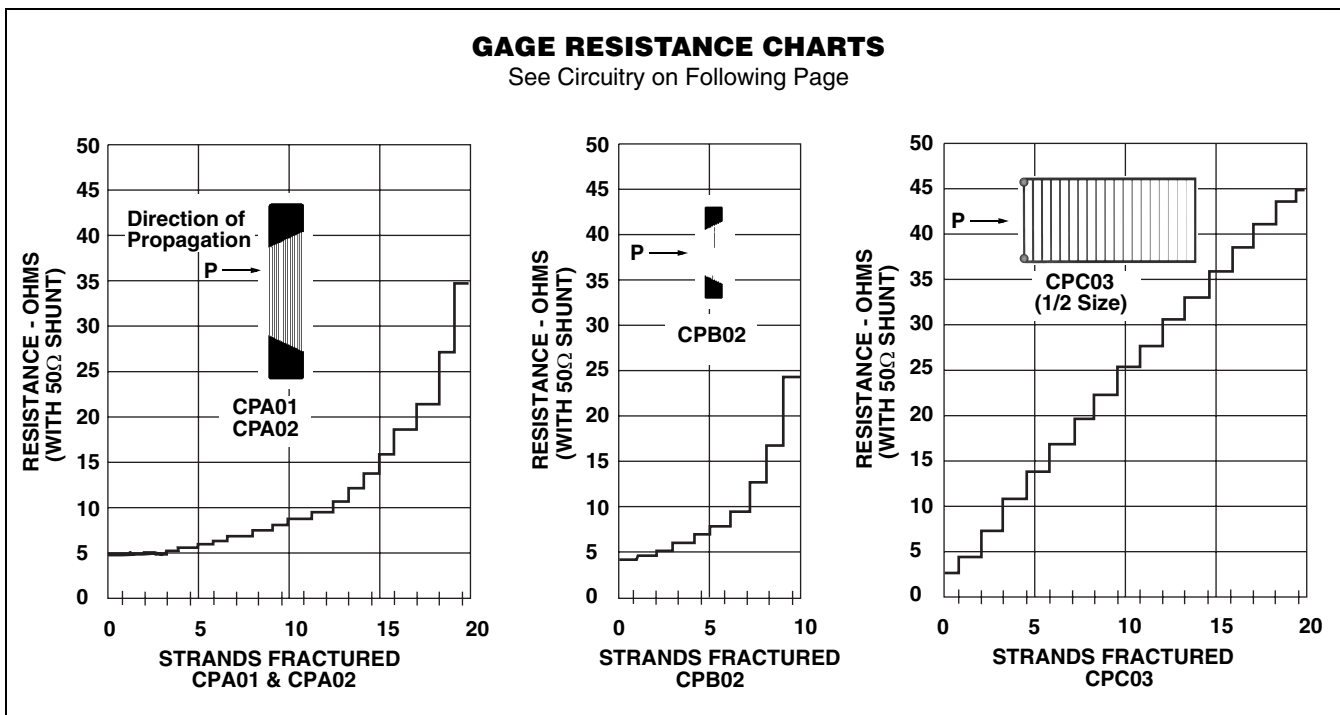
Since exact self-temperature compensation is unnecessary in crack propagation studies, all of these gages are supplied in 09 S-T-C.

Crack Propagation Gages feature small copper pads on the tabs for ease of soldering.

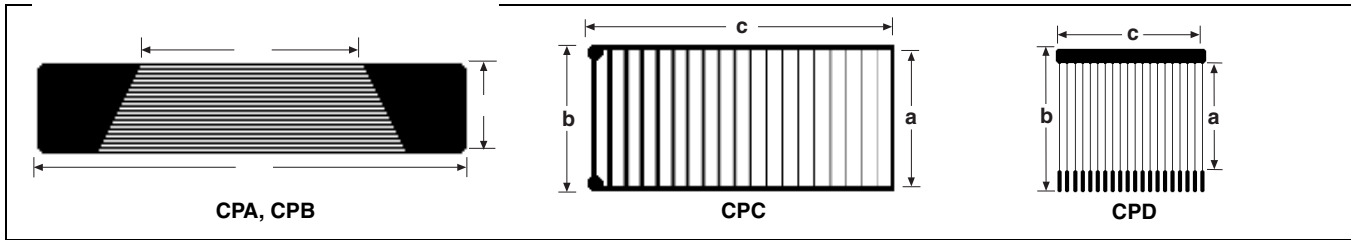
### ADHESIVES AND PROTECTIVE COATINGS




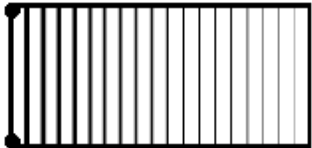
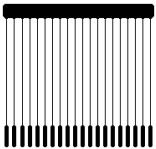
Crack Propagation Gages should be installed with a solvent-thinned adhesive incorporating a cure temperature of at least  $+300^\circ\text{F}$  [ $+150^\circ\text{C}$ ]. M-Bond 600 or 610 adhesives are recommended for use over the widest temperature range. Handling tape should not be applied over the grid or soldering tabs during installation. Room-temperature-curing adhesives are not recommended for use with Crack Propagation Gages.

Protective coating selection considerations are similar to those for CD-Series Crack Detection Gages. Refer to appropriate datasheet for protective coating recommendations.



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GAGE PATTERN AND DESIGNATION	NOMINAL RESISTANCE IN OHMS	DIMENSIONS				
		a	b	c	MATRIX	
					Length	Width
TK-09-CPB02-005/DP 	5	0.25	0.50	0.10	0.56	0.16
		6.4	12.7	2.5	14.2	4.1
		Ten Grid Lines — 0.010 in [0.25 mm] between centerlines.				
TK-09-CPA01-005/DP 	5	0.50	1.00	0.20	1.08	0.28
		12.7	25.4	5.1	27.4	7.1
		Twenty Grid Lines — 0.010 in [0.25 mm] between centerlines.				
TK-09-CPA02-005/DP 	5	1.00	2.00	0.40	2.08	0.48
		25.4	50.8	10.2	52.8	12.2
		Twenty Grid Lines — 0.020 in [0.51 mm] between centerlines.				
TK-09-CPC03-003/DP 	3	0.70	0.75	1.57	0.80	1.62
		17.8	19.1	39.9	20.3	41.1
		Twenty Grid Lines — 0.080 in [2.03 mm] between centerlines.				
TK-09-CPD01-NRA/DP 	110	0.75	1.00	1.00	1.11	1.11
		19.1	25.4	25.4	28.1	28.1
		Twenty Grid Lines — 0.050 in [1.27 mm] between centerlines.				

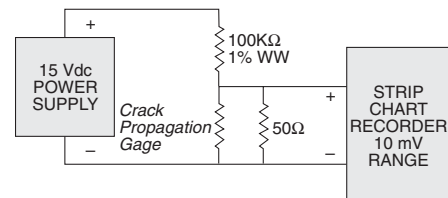
CIRCUITRY

CPA, CPB, AND CPC PATTERNS

An ohmmeter with milliohm sensitivity is a subtle readout instrument. Alternately, a strip chart recorder, connected in the manner shown at right, can be used to obtain a step curve of strands broken versus time.

CPD Pattern

Low voltage instrumentation can be employed to shut off a motor, sound an alarm, or trigger some other type of alerting function.



Conventional strain gage instrumentation is not readily adaptable for use with Crack Propagation Gages.