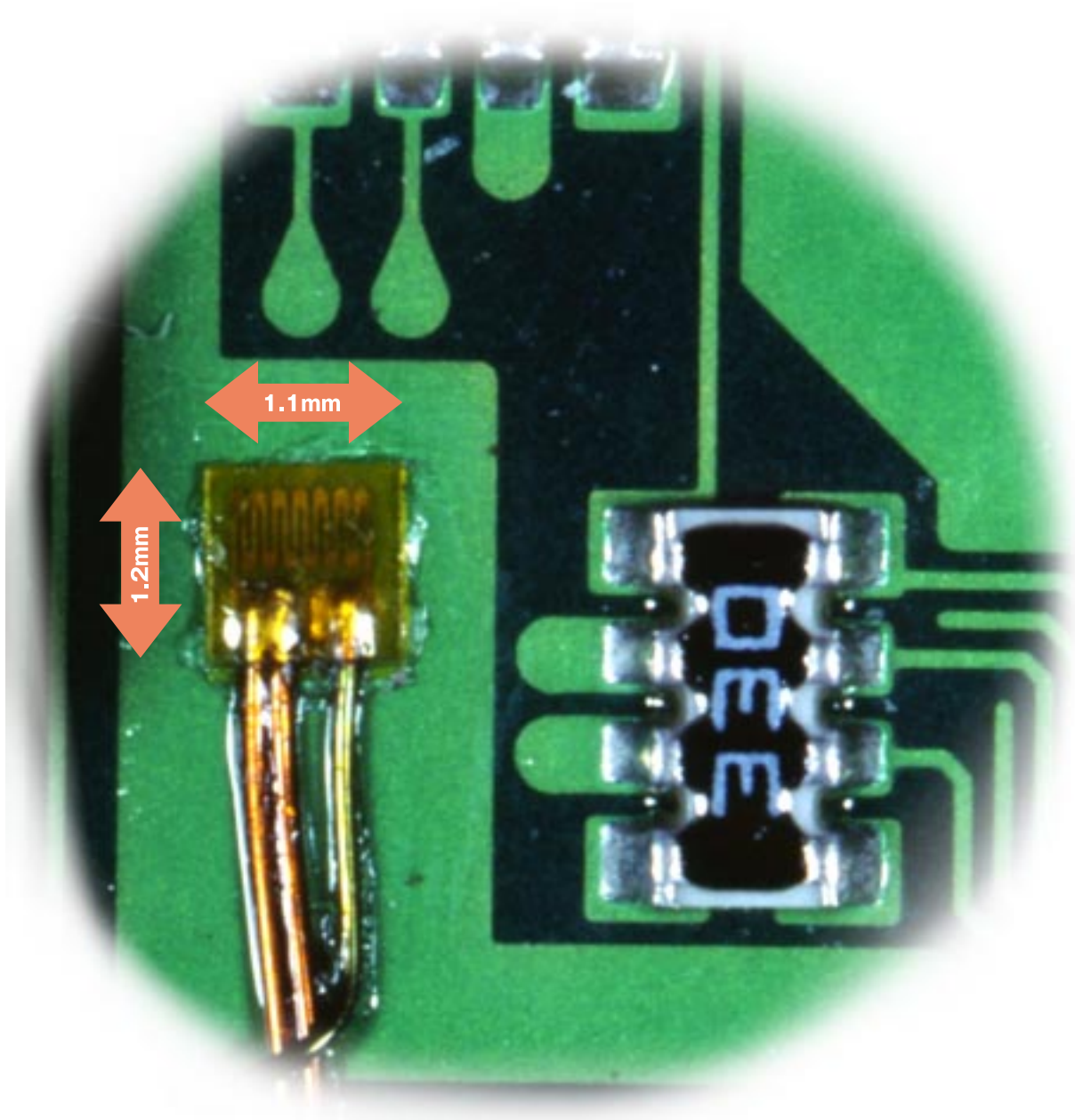


**Small** by any measurement !

# Strain Gages for PCBs

Bondable Anywhere

**KFRS**  
SERIES





## Wanted: Evaluation Test for PCBs

A wide variety of PCBs are incorporated into personal computers, cellular phones, digital cameras, electronic measuring instruments, car navigation equipment, automobile drive control parts....

As the number of mounting components is increasing, PCBs are given ever higher packaging density and at the same time they are designed to dimensional and structural limits ever smaller in size and lighter in weight.

To cope with the need for evaluating mechanical and thermal properties of PCBs, KYOWA developed the KFRS series gages by harmonizing the advantages of general-purpose KFG and KFR gages. The KFRS series gages enable PCB users and manufacturers to check whether the PCBs they use or manufacture conform with relevant standards or not. The strain gages can also be used to verify the reliability of PCBs by checking against company standards. They attract attention because they:

- (1) are easy to handle**
- (2) are highly accurate**
- (3) require less testing expense**
- (4) are small-sized**
- (5) yield test results immediately**
- (6) endure severe testing environments.**

In combination with KYOWA measuring instruments such as the PCD-300A, EDX-1500A or CDV-700A, the KFRS gages will surely satisfy all needs for evaluation tests of PCBs.

### Major Properties of KFRS Gages

Major properties of KFRS gages are shown in Table 1.  
Applicable adhesive: CC-33A (instantaneous adhesion)

Item	Model	KFRS-02-120-C1-13	Remarks
1. Resistive element	Material Thickness	NiCr alloy 2.5μm	Same as KFR gage
2. Gage base	Material Thickness	Polyimide 13μm	Same as KFG gage
3. Laminate	Material Thickness	Polyester 9μm	Same as KFR gage
4. Resistance		120Ω	
5. Gage length		0.2mm	
6. Base size		1.2 x 1.1mm	
7. Operating temp. range		-196 to 150°C*	
8. Compensated temp. range		-30 to 120°C	
9. Gage factor		2.0	
10. Mechanical hysteresis (0 to ±3000με)		7με	
11. Fatigue life at room temp. (±1500με)		2 × 10 <sup>6</sup> times	
12. Strain limit at room temp.		1.6%	
13. Thermally-induced apparent strain		Within ±1.8 × 10 <sup>-6</sup> strain	-30 to 120°C
14. Creep at room temp.		-7με	Load strain +1000με
15. Temperature effect on gage factor		-0.02%/°C +0.02%/°C	20 to 120°C 20 to -30°C

\*When bonded with EP-34B adhesive

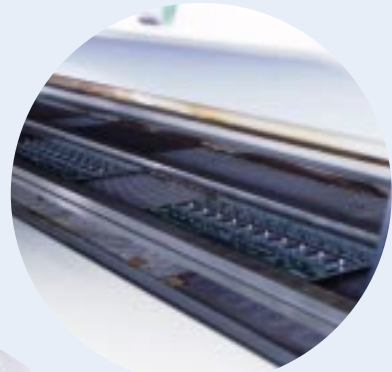
## Typical Measurement Purposes and Timings

Typical measurements for evaluation tests now performed by users are as shown below.

### Measurement on Production Line



Measuring mechanical stress in the mounting process

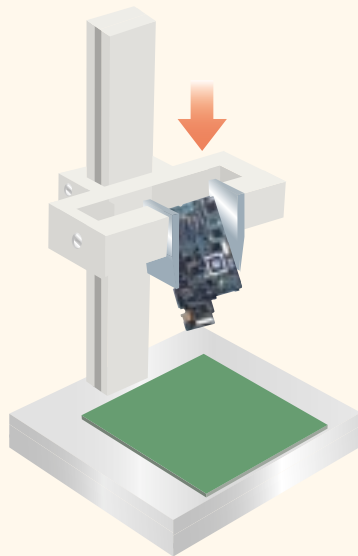


Measuring bending stress of the PCB at the time of reflow soldering



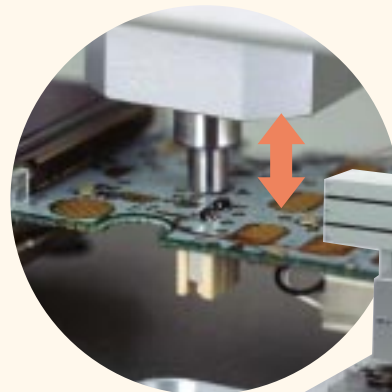
Measuring the stress of the PCB being cut

### Measurement after Mounting



Drop impact test of mounted PCB

Sample measuring system



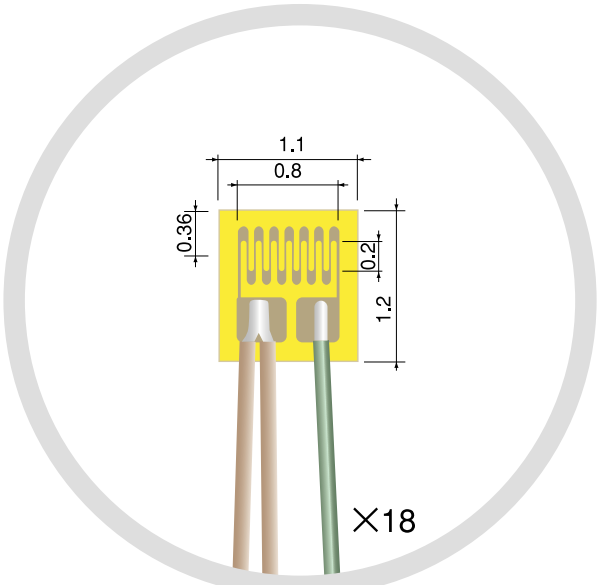
Cycling fatigue test of mounted PCB

Sample measuring system

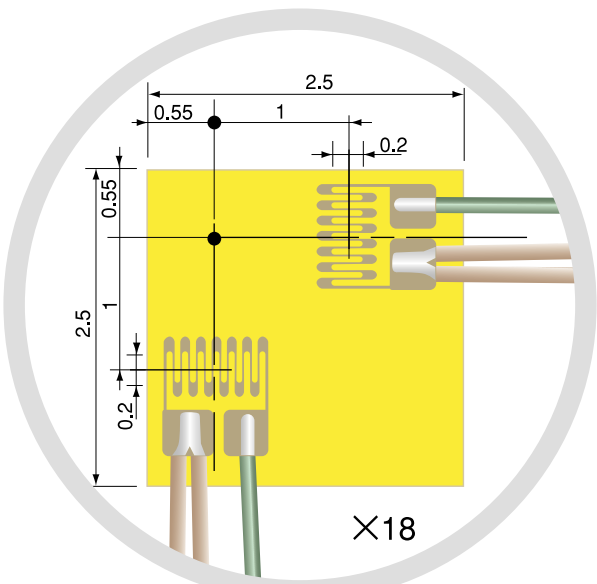
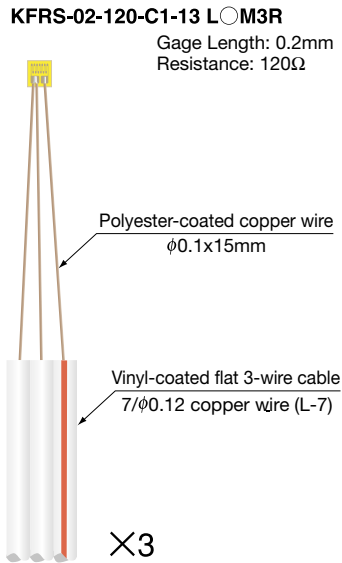
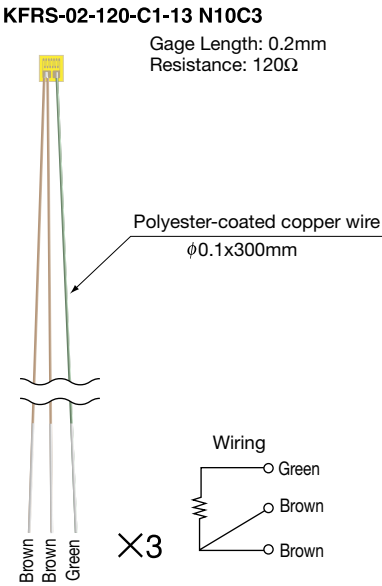


Confirmation of deformation behavior of mounted PCB under thermal cycling test

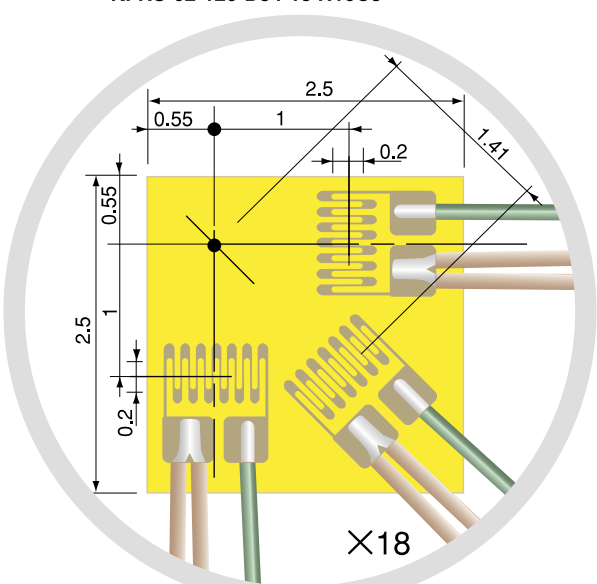
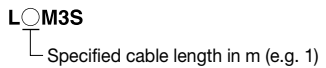
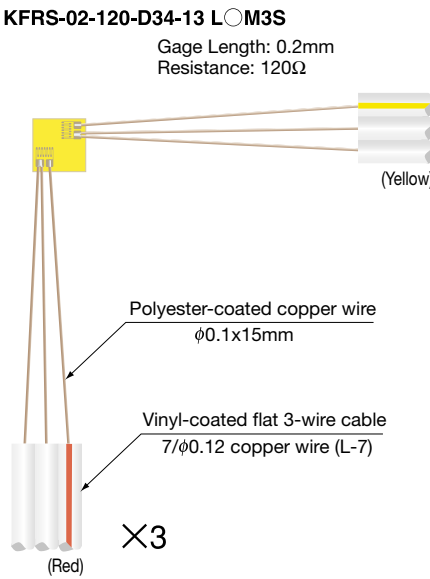
# Strain Gages for Printed Boards    KFRS Series



KFRS-02-120-C1-13 N10C3



KFRS-02-120-D34-13 N10C3



KFRS-02-120-D35-13 N10C3

