

# Gages for Composite Materials & Plastics KFRP

Patterns, Gage Resistance, Gage Factor	Models	Dimensions (mm)				Remarks
		Grid		Base		
		Length	Width	Length	Width	

## ●KFRP Series Foil Strain Gages for Composite Materials

When ordering, suffix the lead wire cable code (See table at the right) to the model number with a space in between.

E.g.

**KFRP-5-120-C1-1 N15C2**

for the gage with polyester-coated 2-wire copper cable 15 cm long

**KFRP-5-120-D22-3 L5M3S**

for the gage with a vinyl-coated flat 3-wire cable 5 m long pre-attached  
If no lead wire cable code is suffixed, the gage is delivered with gage leads only (Silver-clad copper wires 25 mm long)

The KFRP series foil strain gages are self-temperature-compensation gages (SELCOM® gages) suitable for strain measurement of composite materials such as CFRP and GFRP. The special gage pattern minimizes the effect of self-heating due to gage current and the effect of reinforcement of low-elasticity materials.

To ensure accurate measurement by avoiding the self-heating effect of gage current, consider the following:

1. Select a lower bridge excitation voltage if the amplifier allows bridge voltage selection.
2. Active-dummy system
3. 350Ω strain gages

### Applicable Adhesives and Operating Temperature Range after Curing

CC-33A: -196 to 120°C    CC-35: -30 to 120°C  
CC-36: -30 to 100°C    EP-34B: -55 to 200°C

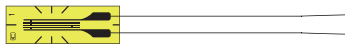
### ■Types, lengths and codes of lead wire cables pre-attached to KFRP gages

Types	2polyester-coated copper wires		3polyester-coated copper wires		Vinyl-coated flat 2-wire cable		Vinyl-coated flat 3-wire cable		Middle-temperature 2-wire cable	Middle-temperature 3-wire cable	Fluoroplastic coated high/low-temp. 3-wire cable
	C1, D22		C1, D22		C1	D22	C1	D22	C1, D22		
Length	C1, D22		C1, D22		C1	D22	C1	D22	C1, D22		
15 cm	N15C2	N15C3	L15C2R	L15C2S	L15C3R	L15C3S	R15C2	R15C3	F15C3		
30 cm	N30C2	N30C3	L30C2R	L30C2S	L30C3R	L30C3S	R30C2	R30C3	F30C3		
1 m	N1M2	N1M3	L1M2R	L1M2S	L1M3R	L1M3S	R1M2	R1M3	F1M3		
3 m			L3M2R	L3M2S	L3M3R	L3M3S	R3M2	R3M3	F3M3		
5 m			L5M2R	L5M2S	L5M3R	L5M3S	R5M2	R5M3	F5M3		
Oprg. temp. range	-196 to 150°C				-10 to 80°C				-100 to 150°C		-196 to 200°C
Remarks	Twisted for 50 cm or longer		L-6, L-9 for 6 m or longer		L-7, L-10 for 6 m or longer		L-11	L-12	L-3		

\* For other lead wire cable lengths, contact us.

### Uniaxial

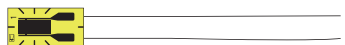
Resistance: 120 Ω  
Gage factor: Approx. 2.1



KFRP-5-120-C1-1					
KFRP-5-120-C1-3	5	1.4	15	5	
KFRP-5-120-C1-6					
KFRP-5-120-C1-9					
KFRP-2-120-C1-1					
KFRP-2-120-C1-3	2	1.2	10	5	
KFRP-2-120-C1-6					
KFRP-2-120-C1-9					

### Uniaxial

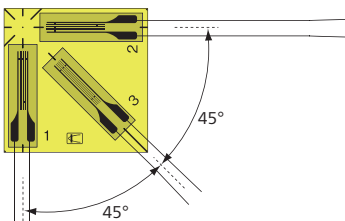
Resistance: 350 Ω  
Gage factor: Approx. 2.1



KFRP-5-350-C1-1					
KFRP-5-350-C1-3	5	1.5	15	5	
KFRP-5-350-C1-6					
KFRP-5-350-C1-9					
KFRP-2-350-C1-1					
KFRP-2-350-C1-3	2	2.2	10	5	
KFRP-2-350-C1-6					
KFRP-2-350-C1-9					

### Triaxial, 0°/90°/45°

Resistance: 120 Ω  
Gage factor: Approx. 2.1

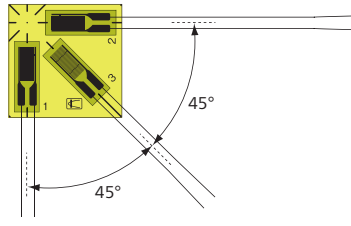


Each of 3 axis may be given a different linear expansion coefficient if requested.

KFRP-5-120-D22-1					
KFRP-5-120-D22-3	5	1.4	19	19	
KFRP-5-120-D22-6					
KFRP-5-120-D22-9					
KFRP-2-120-D22-1					
KFRP-2-120-D22-3	2	1.2	15	15	
KFRP-2-120-D22-6					
KFRP-2-120-D22-9					

# Gages for Composite Materials & Plastic KFRP & KFRS



Patterns, Gage Resistance, Gage Factor	Models	Dimensions (mm)				Remarks
		Grid		Base		
		Length	Width	Length	Width	
<b>Triaxial, 0°/90°/45°</b> Resistance: 350 Ω Gage factor: Approx. 2.1 	Each of 3 axis may be given a different linear expansion coefficient if requested. KFRP-5-350-D22-1 KFRP-5-350-D22-3 KFRP-5-350-D22-6 KFRP-5-350-D22-9 KFRP-2-350-D22-1 KFRP-2-350-D22-3 KFRP-2-350-D22-6 KFRP-2-350-D22-9	5	1.5	19	19	
	2	2.2	15	15		

Patterns, Gage Resistance, Gage Factor	Models	Dimensions (mm)				Remarks
		Grid		Base		
		Length	Width	Length	Width	

## ●KFRS Series Foil Strain Gages for Printed Boards

When ordering, suffix the lead wire cable code (See table at the right) to the model number with a space in between.

Printed boards are used for varieties of products including cellular phones, car navigation systems and digital cameras. To evaluate the mechanical and thermal characteristics of these printed boards, the KFRS gages were developed by integrating the advantageous features of KFG and KFR gages.

E.g.

KFRP-02-120-C1-13 N10C3

for the gage with a polyester-coated 3-wire copper cable 10-cm long pre-attached

- Dimensions of gage base (bondable space to mounted components and narrow parts) 1.2 mm long by 1.1 mm wide (uniaxial), 2.5 mm long by 2.5 mm wide (biaxial or triaxial)
- Linear expansion coefficient of  $13 \times 10^{-6}/^{\circ}\text{C}$ , suitable for component-mounted board
- Self-temperature-compensation range is made as wide as  $-30$  to  $120^{\circ}\text{C}$  to satisfy thermal cyclic tests of printed boards




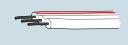
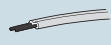

KFRP-5-120-D35-13 L5M3S

for the gage with a vinyl-coated flat 3-wire cable 5 m long pre-attached

### Applicable Adhesives and Operating Temperature Range after Curing

CC-33A:  $-196$  to  $120^{\circ}\text{C}$     CC-36:  $-30$  to  $100^{\circ}\text{C}$     PC-600:  $-196$  to  $150^{\circ}\text{C}$

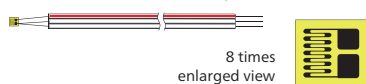
### ■Types, lengths and codes of lead wire cables pre-attached to KFRS gages

Types	Polyester-coated 2-wire copper cable	Polyester-coated 3-wire copper cable	Vinyl-coated flat 2-wire cable		Vinyl-coated flat 3-wire cable		Middle-temperature 2-wire cable	Middle-temperature 3-wire cable
								
Length	C1, D34, and D35		C1	D34, D35	C1	D34, D35	C1, D34, and D35	
10 cm	N10C2	N10C3						
30 cm	N30C2	N30C3						
1 m			L1M2R	L1M2S	L1M3R	L1M3S	R1M2	R1M3
3 m			L3M2R	L3M2S	L3M3R	L3M3S	R3M2	R3M3
5 m			L5M2R	L5M2S	L5M3R	L5M3S	R5M2	R5M3
使用温度範囲	$-196$ to $150^{\circ}\text{C}$		$-10$ to $80^{\circ}\text{C}$				$-100$ to $150^{\circ}\text{C}$	
備考			L-6		L-7		L-11	L-12

\* For other lead wire cable lengths, contact us.

### Uniaxial

Resistance: 120 Ω  
Gage factor: Approx. 2.0.

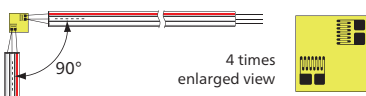


The following models with the lead wire cable code L1M3R are delivered with a vinyl-coated flat 3-wire cable 1 m long pre-attached.

KFRS-1-120-C1-13 L1M3R	1	0.65	4	1.4
KFRS-02-120-C1-13 L1M3R	0.2	0.8	1.2	1.1

### Biaxial, 0°/90°

Resistance: 120 Ω  
Gage factor: Approx. 2.0

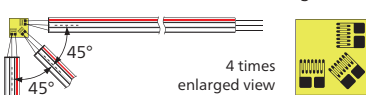


The following models with the lead wire cable code L1M3R are delivered with a vinyl-coated flat 3-wire cable 1 m long pre-attached.

KFRS-02-120-D34-13 L1M3S	0.2	0.8	2.5	2.5	A min. qty 5 PC.
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### Triaxial, 0°/90°/45°

Resistance: 120 Ω  
Gage factor: Approx. 2.0



The following models with the lead wire cable code L1M3R are delivered with a vinyl-coated flat 3-wire cable 1 m long pre-attached.

KFRS-02-120-D35-13 L1M3S	0.2	0.8	2.5	2.5	A min. qty 5 PC.
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A min. qty 10 PC.