

# Gages for Composite Materials/Plastics



Pattern, Gage Resistance, Gage Factor	Model	Dimensions (mm)				Remarks
		Grid		Base		
		Length	Width	Length	Width	

## ●KFRP Series Foil Strain Gages for Composite Materials

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

Example :

**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 leadwire 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 method
3. 350Ω strain gages

### Applicable Adhesives and Operating Temperature Range after Curing

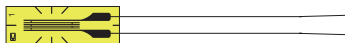
CC-33A : -196 to 120°C    CC-35 : -30 to 120°C  
CC-36 : -30 to 100°C    EP-34B : -55 to 200°C

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

Type	2 polyester-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			
2 cm	N2C2	N2C3								
3	N3C2	N3C3								
4	N4C2	N4C3								
5	N5C2	N5C3								
10	N10C2	N10C3								
15	N15C2	N15C3	L15C2R	L15C2S	L15C3R	L15C3S	R15C2	R15C3	F15C3	
30	N30C2	N30C3	L30C2R	L30C2S	L30C3R	L30C3S	R30C2	R30C3	F30C3	
50	N50C2	N50C3	L50C2R	L50C2S	L50C3R	L50C3S	R50C2	R50C3	F50C3	
1 m	N1M2	N1M3	L1M2R	L1M2S	L1M3R	L1M3S	R1M2	R1M3	F1M3	
2			L2M2R	L2M2S	L2M3R	L2M3S	R2M2	R2M3	F2M3	
3			L3M2R	L3M2S	L3M3R	L3M3S	R3M2	R3M3	F3M3	
4			L4M2R	L4M2S	L4M3R	L4M3S	R4M2	R4M3	F4M3	
5			L5M2R	L5M2S	L5M3R	L5M3S	R5M2	R5M3	F5M3	
6			L6M2R	L6M2S	L6M3R	L6M3S	R6M2	R6M3	F6M3	
7			L7M2R	L7M2S	L7M3R	L7M3S	R7M2	R7M3	F7M3	
8			L8M2R	L8M2S	L8M3R	L8M3S	R8M2	R8M3	F8M3	
9			L9M2R	L9M2S	L9M3R	L9M3S	R9M2	R9M3	F9M3	
10			L10M2R	L10M2S	L10M3R	L10M3S	R10M2	R10M3	F10M3	
15			L15M2R	L15M2S	L15M3R	L15M3S	R15M2	R15M3	F15M3	
20			L20M2R	L20M2S	L20M3R	L20M3S	R20M2	R20M3	F20M3	
25			L25M2R	L25M2S	L25M3R	L25M3S	R25M2	R25M3	F25M3	
30 m			L30M2R	L30M2S	L30M3R	L30M3S	R30M2	R30M3	F30M3	
Oprg. temp. range	-196~150°C		-10 to 80°C				-100 to 150°C		-196 to 200°C	
Remarks	Twisted for 50 cm and 1 m long		L-6, L-9 for 6 m or longer		L-7, L-10 for 6 m or longer		L-11	L-12	L-3	

### Uniaxial

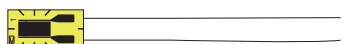
Resistance : 120Ω, Gage factor : Approx. 2.1



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

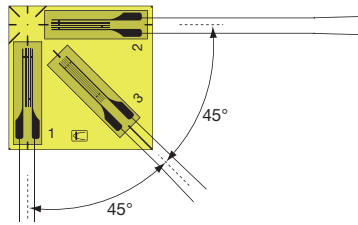
### Uniaxial

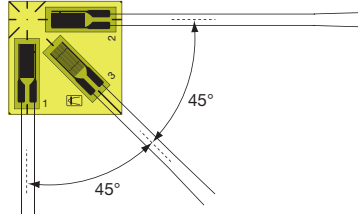
Resistance : 350Ω, Gage factor : Approx. 2.1



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



Pattern, Gage Resistance, Gage Factor	Model	Dimensions (mm)				Remarks
		Grid		Base		
		Length	Width	Length	Width	
<b>Triaxial, 0°/90°/45°</b> Resistance : 120Ω, Gage factor : Approx. 2.1 	Each of 3 axis may be given a different linear expansion coefficient if requested.					
	KFRP-5-120-D22-1	5	1.4	19	19	
	KFRP-5-120-D22-3					
	KFRP-5-120-D22-6					
	KFRP-5-120-D22-9					
	KFRP-2-120-D22-1	2	1.2	15	15	
	KFRP-2-120-D22-3					
	KFRP-2-120-D22-6					
KFRP-2-120-D22-9						

<b>Triaxial, 0°/90°/45°</b> Resistance : 350Ω, Gage factor : Approx. 2.1 	Each of 3 axis may be given a different linear expansion coefficient if requested.					
	KFRP-5-350-D22-1	5	1.5	19	19	
	KFRP-5-350-D22-3					
	KFRP-5-350-D22-6					
	KFRP-5-350-D22-9					
	KFRP-2-350-D22-1	2	2.2	15	15	
	KFRP-2-350-D22-3					
	KFRP-2-350-D22-6					
KFRP-2-350-D22-9						

●KFRS Series Foil Strain Gages for Printed Boards

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

Example :

KFRP-02-120-C1-13 N10C3

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

KFRP-5-120-D35-13 L5M3S

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

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.

- 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

Applicable Adhesives and Operating Temperature Range after Curing

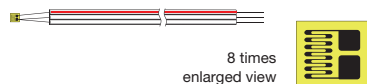
CC-33A :  $-196$  to  $120^{\circ}\text{C}$     CC-36 :  $-30$  to  $100^{\circ}\text{C}$     PC-600 :  $-196$  to  $150^{\circ}\text{C}$

■Types, lengths and codes of leadwire cables pre-attached to KFRS gages

Type	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
	C1,D34,D35		C1	D34,D35	C1	D34,D35	C1,D34,D35	
Length	C1,D34,D35		C1	D34,D35	C1	D34,D35	C1,D34,D35	
10 cm	N10C2	N10C3						
30	N30C2	N30C3						
1 m			L1M2R	L1M2S	L1M3R	L1M3S	R1M2	R1M3
3			L3M2R	L3M2S	L3M3R	L3M3S	R3M2	R3M3
5			L5M2R	L5M2S	L5M3R	L5M3S	R5M2	R5M3
Oprg. temp. range	$-196$ to $150^{\circ}\text{C}$		$-10$ to $80^{\circ}\text{C}$				$-100$ to $150^{\circ}\text{C}$	
Remarks			L-6		L-7		L-11	L-12

Uniaxial

Resistance : 120Ω, Gage factor : Approx. 2.0

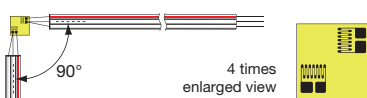


The following models with the leadwire cable code L1M3R are delivered with a vinyl-coated flat 3-wire cable 1 m long pre-attached.

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 : 120Ω, Gage factor : Approx. 2.0

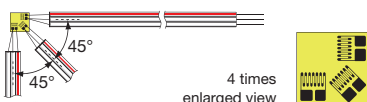


The following models with the leadwire cable code L1M3R are delivered with a vinyl-coated flat 3-wire cable 1 m long pre-attached.

KFRS-02-120-D34-13 L1M3S	0.2	0.8	2.5	2.5	A minimum quantity 5 piece
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Triaxial, 0°/90°/45°

Resistance : 120Ω, Gage factor : Approx. 2.0



The following models with the leadwire 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 minimum quantity 5 piece
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For further information please contact:

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0418 369 505  
sales@testmachines.com.au  
www.testmachines.com.au

A minimum quantity 10 piece