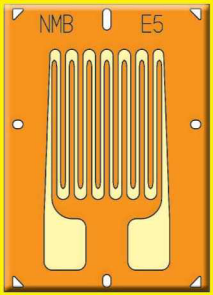
NMB

Transducer Gages



MINEBEA Co., Ltd.
Measuring Components Div.

Minebea – Leading strain gage technologies

For over 50 years, Measuring Components Division of Minebea Company has fulfilled needs of numerous customers for high quality measurement components and electronic instrumentation. NMB strain gages possess the highest pedigree, tracing their roots to the original invention and commercial development of bonded resistance strain gages. With its dedication to continuous development of products and improved manufacturing technologies, Minebea introduces its J, K and Y series strain gages for superior transducer performance. Enhanced performance combined with significantly improved long term stability make these strain gages the ideal choice for transducer applications.
The J, K and Y series strain gages are designed for a broad range of transducer applications for improved performance, lower costs and ease of application.

Description of strain gage types

J-series Strain Gage

J gages are a series of Constantan alloy patterns on a highly flexible modified Polyimide backing. This strain gage series is most suitable for general-purpose sensor production and experimental stress analysis. It is available with fully encapsulated grid (Option A) and Silver-plated copper leads (Option B).

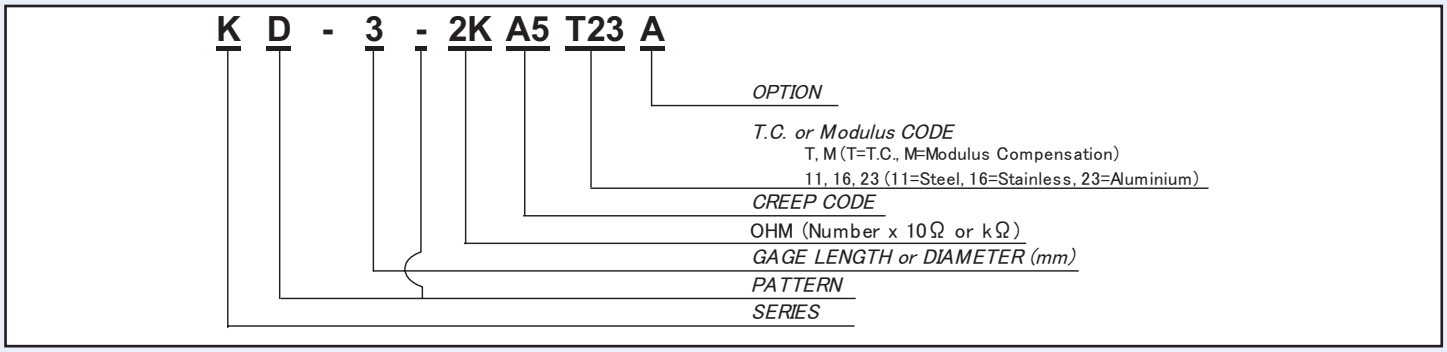
K-series Strain Gage

K gages are a series of selected-foil Constantan patterns on a highly flexible modified Polyimide for very low creep variation with temperature. This strain gage series is especially suited for precision transducer production. It is available with fully encapsulated grid (Option A) and Silver-plated copper leads (Option B).

Y-series Strain Gage

Y gages are a series of Evanohm® alloy patterns on a highly flexible modified Polyimide backing. This strain gage series is suitable where higher resistance and long fatigue life are important for transducer manufacturing. Since Evanohm® is a hard alloy, sharp bending during installation may lead to early fatigue failure. Option D, encapsulated grid with pre-tinned tabs is recommended for ease of lead attachment. Use appropriate solder to attach nickel-clad copper leads to the gage solder-tabs.

Strain Gage Coding System



Strain Gage Options

Option A (with encapsulation)

J Series gages

A flexible Polyimide cover is laminated over the entire grid to fully encapsulate it against moisture and other elements.

K and Y Series gages

A proprietary coating is applied to fully encapsulate the grid against moisture and other corrosive elements while maintaining superior creep performance over temperature.

Option B (with leads)

J and K Series gages

Silver-plated copper leads, 1.25 inch in length are soldered to the gage tabs with 425 °F solder

Y Series gages

Check with factory. Specify maximum operating temperature for application.

Option C (encapsulated with leads)

Options A and B are combined appropriately for each gage series. The encapsulation completely covers the grid as well as the solder joint and the whole solder tab to provide protection for the entire strain gage.

Option D (with pre-tinned solder tabs)

Encapsulated grid with pre-tinned tabs is recommended for ease of lead attachment. Use 425 °F solder to attach leads to the gage solder-tabs.

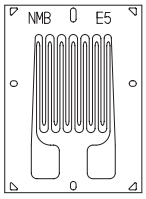
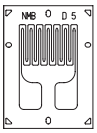
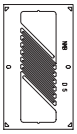
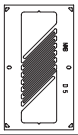
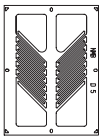
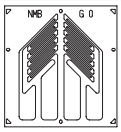
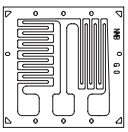
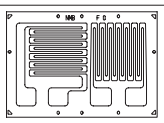
Creep Compensation

It is sometimes necessary to match the strain gage creep characteristics to the spring element to achieve a suitable creep specification for commercial transducers. Creep characteristic of a strain gage pattern is usually achieved by varying the length of end-loops for a fixed strand width. This is specified as an End-Tab-Ratio (ETR) of the strain gage. This is specified by a two-character code, such as A5.
Larger the ETR for a strain gage, more positive its creep characteristic. Most spring elements exhibit a positive creep. Select a strain gage with a negative creep characteristic to compensate for the positive creep of the spring element. Transducer creep depends upon several variables such as the spring element material, its heat treatment, type of adhesive used, designed strain field and operating temperature. Select the standard recommended creep code for general transducer application. For precision transducer applications, testing may be necessary to select the most suitable creep code for a strain gage.

ETR = X . X　　Example : E5 = 5.5

0～9
A=1, B=2, C=3, D=4, E=5, ・・・

Strain Gage Specification

Gage Type	Actual Matrix Size mm (inch)	Grid Length mm (inch)	Grid Width mm (inch)	Overall Length mm (inch)	Overall Width mm (inch)	Resistance Ω	Gage Designation	E .T. R.
	6.9 × 4.7 (0.27 × 0.18)	3.00 (0.12)	2.53 (0.10)	4.83 (0.19)	3.00 (0.12)	350 350 350 350 350 350 350 120 175 700 1 000	K-3-35C0Txx K-3-35C5Txx K-3-35D0Txx K-3-35D5Txx K-3-35E0Txx K-3-35E5Txx K-3-35F0Txx K-3-12D5Txx K-3-17D5Txx K-3-70D5Txx K-3-100D5Txx	3.0 : 1 3.5 : 1 4.0 : 1 4.5 : 1 5.0 : 1 5.5 : 1 6.0 : 1 4.5 : 1 4.5 : 1 4.5 : 1 4.5 : 1
	5.5 × 4.0 (0.22 × 0.16)	1.50 (0.06)	2.35 (0.09)	3.80 (0.15)	2.60 (0.10)	350 1 000	K-2-35D5Txx Y-2-100D5Txx	4.5 : 1 4.5 : 1
	9.0 × 5.0 (0.35 × 0.20)	3.20 (0.13)	2.05 (0.09)	8.00 (0.31)	2.55 (0.10)	350 1 000	KG-3L-35D5Txx YG-3L-100F0Txx	4.5 : 1 6.0 : 1
	9.0 × 5.0 (0.35 × 0.20)	3.20 (0.13)	2.35 (0.09)	8.00 (0.31)	2.55 (0.10)	350 1 000	KG-3R-35D5Txx YG-3R-100F0Txx	4.5 : 1 6.0 : 1
	11.0 × 8.0 (0.43 × 0.31)	3.20 (0.13)	2.80 (0.11)	9.50 (0.37)	6.00 (0.24)	350 350 1 000 2 500	KD-3-35D5Txx KD-3-35E5Txx KD-3-100D5Txx YD-3-250F0Txx	4.5 : 1 5.5 : 1 4.5 : 1 6.0 : 1
	7.0 × 6.5 (0.28 × 0.26)	2.00 (0.08)	1.53 (0.06)	6.20 (0.24)	4.83 (0.19)	350	KD-2-35G0Txx	7.0 : 1
	5.6 × 5.6 (0.22 × 0.22)	1.20L (0.05L) 2.80R (0.11R)	2.98L (0.12L) 1.22R (0.05R)	4.50 (0.18)	4.26 (0.17)	350	KT-1-35G0Txx	7.0 : 1
	7.0 × 10.0 (0.28 × 0.39)	3.20 (0.13)	3.21 (0.13)	5.50 (0.22)	8.64 (0.34)	350 1 000	KT-3-35F0Txx YT-3-100F0Txx	6.0 : 1 6.0 : 1

Technical Data

Specifications		K-Series	J-Series	Y-Series
Resistance tolerance (open face)		±0.15 %		
Resistance tolerance with other options		±0.2 %		
Gage factor, nominal (actual gage factor is given on package label)		2.0	2.0	2.0 to 2.5
Gage factor tolerance		±0.5 %		
Gage factor slope		In Package		
Transverse sensitivity		In Package		
Temperature range:	Without any options	−70 °C to 200 °C (−158 °F to 392 °F)		−70 °C to 300 °C (−158 °F to 572 °F)
	With Options A, B, C, −	ditto		−70 °C to 200 °C (−158 °F to 392 °F)
Long Term Stability (40 °C [104 °F], 95 %R.H. 1 000 hr) with Option C, Bonded.		＜100 ppm		
Fatigue life (NAS942 ±1 500 μST)		＞10^7 cycles		
Safe bending radius		1.6 mm		3.0 mm
Recommended Adhesive to use		SP-4 or #8112		SP-4

Custom Strain Gages and Accessories

Custom Strain Gages

We welcome your requirements at times when your design may require a strain gage configuration or creep code not listed in our catalog. We have established facilities to expeditiously turn your concept into a production strain gage to fit your requirements.

Self Modulus Compensation

Y-series strain gages are also available with Self Modulus Compensation. Temperature effects on Young's Modulus of transducer material as well as on gage factor of strain gage change transducer sensitivity. Self-Modulus-Compensation provides correction for these temperature-induced effects by a controlled negative gage factor of the strain gage.

M-Series

Modulus Gages (12.3Ω, 13.6Ω, 20.0Ω, 26.5Ω, 33.6Ω, 63.7Ω)

Terminals

For connecting Strain gages to instrumentation lead.

Adhesives and Coatings

Adhesive Selection

Parts No.	Type	Base	Operating Temperature Range	Capacity
309	SP-4	Heat-curing epoxy-phenolic	−30 °C to 200 °C (−86 °F to 392 °F)	20 g bottle
306-3	#8112	Heat-curing 2-components	−195 °C to 300 °C (−383 °F to 572 °F)	3 g×5 pcs

Coating Selection

Parts No.	Type	Base	Operating Temperature Range	Capacity
315-1	SE9186	Silicone Resin	−50 °C to 200 °C (−122 °F to 392 °F)	100 g tube
317-3	Buthyl rubber Sheet L	Buthyl rubber	−50 °C to 80 °C (−122 °F to 176 °F)	100 cm×5 pcs

Information to contact NMB sales

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