



TRANSCELL

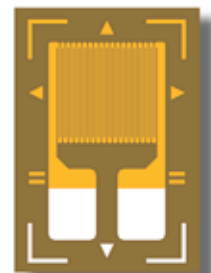
Resistance Strain Gauge

Compensation Resistor

Zero Adjustment Resistor

Terminal

Adhesive CL-639



Resistance Strain Gauge

Transcell Group founded in 1981 in Chicago, USA, is a world famous enterprise group that specializes in the production of resistance strain gauges, load cells, weighing indicators and various electronic scales and its products are sold to whole America, Europe, Southeast Asia and Australia, etc.

Based on the global business strategy, Transcell has established many branch companies all over the world. In Asian regions, its main branch companies include Taipei Transcell, Nanjing Transcell and Shanghai Transcell, etc.

Transcell Electronic Scale (Nanjing) Co., Ltd., founded at the end of 1997, is a production base of Transcell in China, which mainly produces various types of resistance strain gauges, load cells, weighing indicators, electronic scales and automatic control and testing equipment, including dozens of series and hundreds of varieties and covering various precisions and measuring ranges. Transcell possesses perfect scientific research and development institutions, advanced manufacturing equipment and perfect inspection and testing means. We always attach great importance to product quality and management quality and have passed such international certifications as OIML, NTEP, UL and CE as well as ISO 9001 and ISO 14001. We also possess multiple patent technologies, and the production technology and product quality take the lead on the international and domestic markets and are highly favored by global users.

Chicago Headquarter



RoHS PA FC ISO 9001 ISO 14001



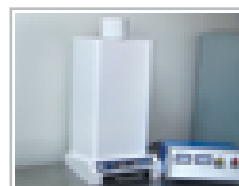
Strain Gauge Production Workshop



Specialized testing procedure

Strict quality management

Advanced production equipments



Overview

Transcell Electronic Scale (Nanjing) Co., Ltd. is one of the factories of American Transcell in China. Its headquarters is located in Chicago, USA. Founded in 1981, it is a famous enterprise that specializes in the production of electronic scales, weighing indicators, load cells and resistance strain gauges. Through decades of research, development and production practice, Transcell has realized that the core issue is to increase the quality of resistance strain gauge in order to increase the long-term stability and reliability of load cells. So we adopt the high technology by which the semiconductor integrated circuit is manufactured to design and manufacture the resistance strain gauge, make use of the technological and administrative concept in which the aerospace IC with high reliability is manufactured to increase the long-term stability and reliability of strain gauge. Later with the joint efforts of domestic and foreign experienced specialists, the high-performance (slight hysteresis) strain gauge series of Transcell have been developed, which are especially applicable for the stainless steel fully sealed sensors. The L/C hysteresis increases after the close cover is welded by laser so the strain gauge with slight hysteresis is required. When the load cell suppliers are confronted with significant hysteresis and have difficulty in overcoming it during the production, research and development of high precision products, the high performance strain gauge with slight hysteresis that is manufactured by Transcell can be put into trial use.

Transcell not only has excellent specialists in the world, but also possesses top-class factory building and hardware equipment. The standard purification plant of Transcell reaches the class of 1,000 to 10,000 and some working procedures actually reach the class of 10 to 100. The equipment for photoengraving, etching and cleaning are program-controlled. Transcell always attaches great importance to product quality and management quality and strictly implements ISO9001:2000 quality control system and ISO14001:2004 Environmental Management System. The indexes such as long-term stability of strain gauge are difficult to detect specifically in the production process so we have implemented stricter supervision measures for the production process so as to ensure the product quality. Resistance strain gauge is a kind of sensitive element that transforms shape change (strain) on the elastic body into resistance variation, the adhesive and the base material of strain gauge play a key role in the transmission process of shape change from elastic body to sensitive grid of strain gauge. Transcell has specially researched the performance of epoxy resin, and uses special epoxy resin as the base layer of strain gauge and the adhesive. In combination with the CL-639 adhesive researched by us, the strain gauge manufactured by us can reduce hysteresis and increase the precision and moisture-proof stability of load cell.

Resistance Strain Gauge

● Introduction of main characteristics

1. Strain gauge factor

The ratio of relative resistance variation which is caused when the strain gauge installed on the tested sample is subject to unidirectional stress in axial direction to the axial length change (strain) on the sample surface caused by such unidirectional stress is expressed by K.

$K = (\Delta R/R) / (\Delta L/L)$ In the formula: $\Delta L/L$ — axial strain on the surface of the tested sample,

$\Delta R/R$ — Relevant resistance variation of strain gauge caused by $\Delta L/L$,

The value of K mainly depends on the metal material of sensitive grid, and the gauge factor of constantan can be approximately thought as $K \approx 2$ at a normal temperature when the strain is very small, and K will increase with the rise of temperature, approximately being $90 \times 10^{-6}/^{\circ}\text{C}$.

2. Thermal output

The strain gauge is stuck onto the test sample with certain linear expansion coefficient, and the indicated strain caused by ambient temperature without external force is called the thermal output of strain gauge, expressed by ϵ_t .

The thermal output of strain gauge mainly includes two parts: the first part is caused by the resistance temperature coefficient

of the sensitive grid material, while the second part is caused by the difference between the linear expansion coefficient β_s of elastic body and the linear expansion coefficient β of sensitive grid.

$\varepsilon_t = 1/K \cdot \alpha \Delta T + (\beta_s - \beta) \Delta T$ In the formula, K is the gauge factor of strain gauge and ΔT is the variable of ambient temperature.

α and β of sensitive grid material can be changed only in the heat treatment method. Only when $\alpha = K(\beta - \beta_s)$ is met, the thermal output $\varepsilon_t = 0$ of strain gauge can be realized, which is the principle of self-temperature compensation of strain gauge. Currently, we have classified the elastic body material by the linear expansion coefficient. The material of $\beta_s = 11 \times 10^{-6}/^\circ\text{C}$ belongs to steel material series, including alloy steel 40CrNiMoA and stainless steel 17-4ph, 2Cr13; the material of $\beta_s = 23 \times 10^{-6}/^\circ\text{C}$ belongs to aluminum material series, including alloy aluminum Ly12.

3. Creep

When the strain gauge which has been stuck bears the constant mechanical strain at a constant temperature, the variation of indicated strain along with the time is called creep.

When the metal material of the load cell's elastic body is subject to deformation under fixed external force, due to anelastic effect, the shape change will increase with the increase of time, manifested as positive creep; the base and adhesive of strain gauge that are stuck onto the elastic body have certain visco-elasticity to make the deformation of sensitive grid decrease with the increase of time, manifested as negative creep. Through integrated action of them, the result is that the load cell is manifested as positive or negative creep. The change in size of top of grid can adjust the value and positive or negative direction of the strain gauge's creep, so such strain gauge is called creep self-compensation strain gauge. In actual application, different creep code of strain gauge should be chosen for different types of load cells to offset the positive creep and negative creep, being close to zero.

As for steel elastic body made of heat-treated 40CrNiMoA with Rockwell hardness of 43-45°, its anelasticity is relatively positive, so we should choose some relatively negative creep code of the strain gauge. As for the elastic body with hardness of 37-39° which is made of heat-treated 40Cr material, the anelasticity is relatively small, so some relatively positive creep code of the strain gauge need to be chosen.

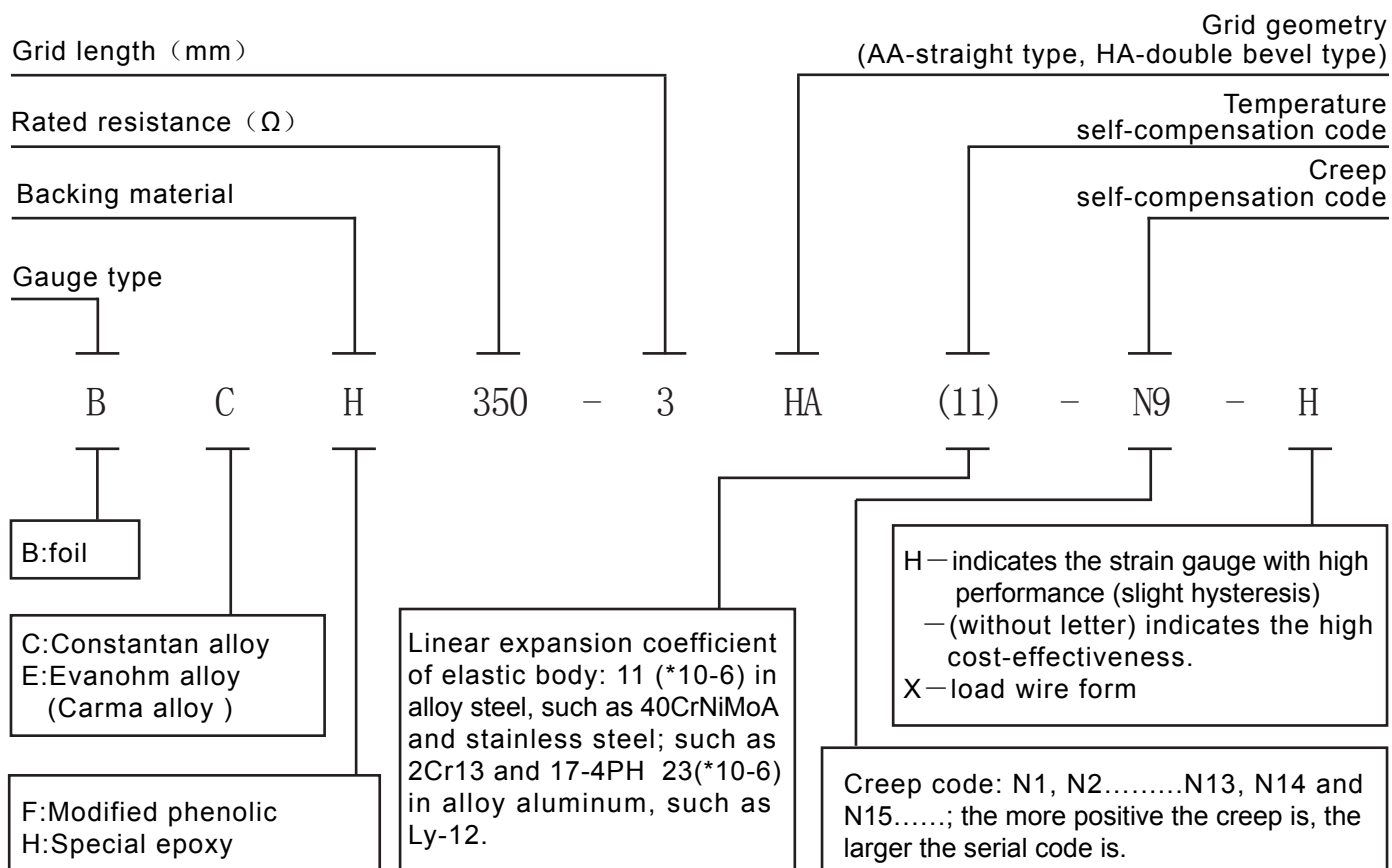
As for aluminum elastic body, when the T thickness of the load cells with a smaller measuring range is smaller, some relatively negative creep code of the strain gauge need to be chosen. On the contrary, the load cells with a larger measuring range need to choose some relatively positive creep code of the strain gauge; the selection of reasonable creep code should be determined by test. The customers can test the relatively intermediate creep code. If the creep of load cell is relatively negative, it should be replaced with a positive creep code. Conversely, if the creep of load cell is relatively positive, it should be replaced with a negative creep code. You can contact our company's technical service department, and we are pleased to help customers find the suitable creep code of strain gauge.

4. Hysteresis

The metal elastic body of load cell is usually manifested as the positive hysteresis, while the substrate of strain gauge is manifested as negative hysteresis, but the metal sensitive grid is manifested as positive hysteresis. So the result is that the strain gauge is always manifested as positive hysteresis under integrated action. In the synthetic error of load cell, hysteresis occupies a certain share, including the hysteresis of elastic body and the hysteresis of strain gauge and adhesive. In order to increase the precision of load cell, the strain gauge and adhesive with slight hysteresis should be chosen. Our company adopts the special epoxy resin as base and adhesive, as epoxy resin has good moisture-proof performance but also has slight hysteresis. Especially as for the fully sealed stainless steel load cells with a smaller measuring range, the hysteresis will increase after the close cover is welded by laser. The high-performance (slight hysteresis) strain gauge manufactured by our company as well as our CL-639 adhesive will be better to reduce the synthetic error of load cell.

Our company adopts the epoxy base with good parameter performance and it is very crisp, so it is necessary to carefully use it and the lead wire had better be welded by temperature controlled pointed soldering iron so as to prevent the cracking or shedding at solder joints.



Strain Gauge Type Naming Rules










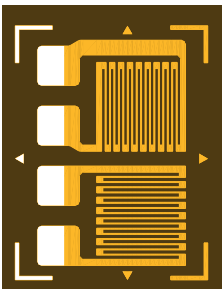
Description:

For example, BCH350-3HA(11)-N9-H indicates the normal temperature resistance strain gauge, which is made of constantan foil and has the special epoxy base, resistance value of 350 Ω , grid length of 3mm and double level of 45°. It is applicable for the alloy steel elastic body with linear expansion coefficient of 11 ($\times 10^{-6}$), its creep self-compensation code is N9 and it is high-performance (slight hysteresis) resistance strain gauge.


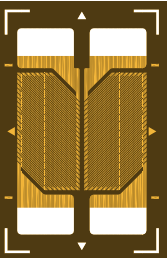

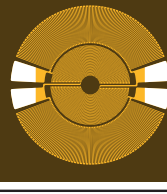


Pattern, size and parameter of strain gauge

Gauge pattern	Gauge model	Grid size (LxW)(mm)	Base size (LxW)(mm)	Creep code
	BCH350-1AA (11) N** BCH350-1AA (11) N**-H	1.6*2.5	5.1*4.1	N16、N20、N24、N30
	BCH350-2AA (11) N** BCH350-2AA (11) N**-H	2.3*3.0	6.5*4.3	N06、N09、N13、N18、 N22、N26、N30、N34、 N38

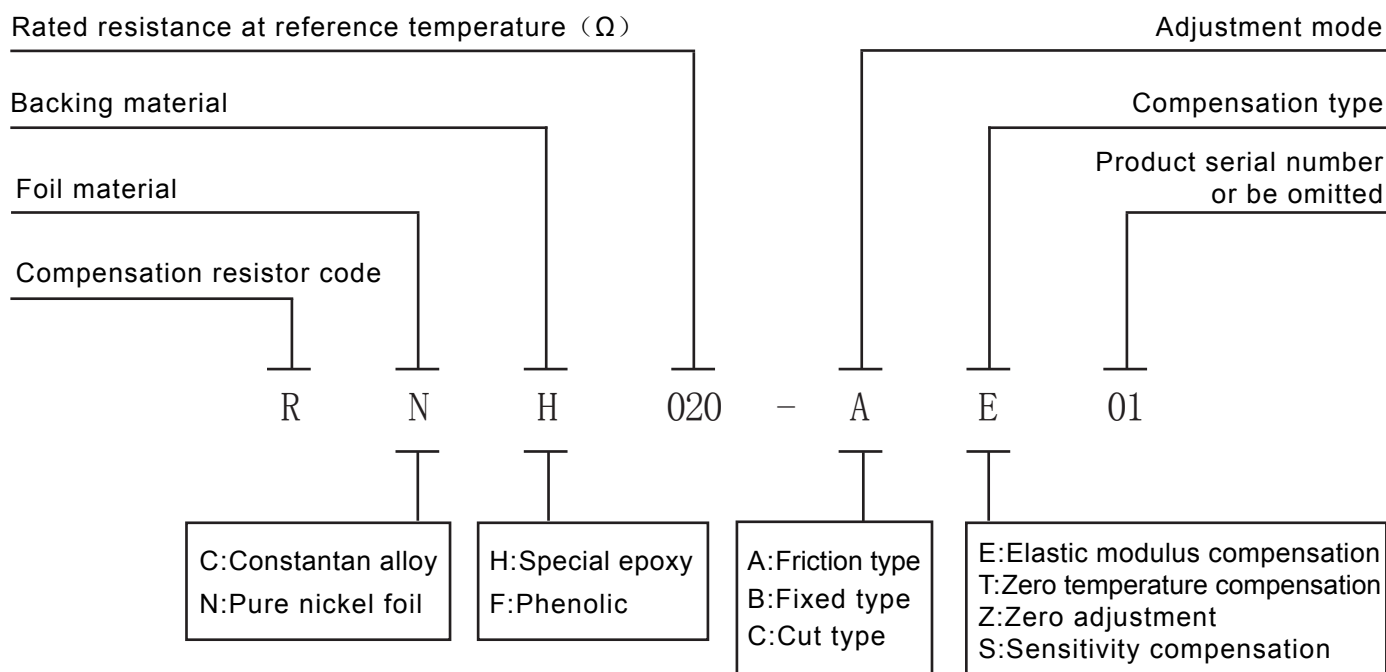
Pattern, size and parameter of strain gauge

Gauge pattern	Gauge model	Grid size (LxW)(mm)	Base size (LxW)(mm)	Creep code
	BCH350-3AA (11) N** BCH350-3AA (11) N**-H	3.1*3.0	7.4*4.6	N09、N12、N16、N20、 N24、N31、N40、N44、 N50
	BCF1000-6AA (11) N20 BCF1000-6AA (11) N20-X	6.0*4.0	10.0*5.4	N20
	BCH350-1AA (23) N**	1.6*2.5	5.1*4.1	N16、N20、N24、N30
	BCH350-2AA (23) N**	2.3*3.0	6.5*4.3	N06、N09、N13、N18、 N22、N26、N30、N34、 N38
	BCH350-3AA (23) N**	3.1*3.0	7.4*4.6	N09、N12、N16、N20、 N24、N31、N40、N44、 N50
	BCH1000-6AA (23) N20	6.0*4.0	10.0*5.4	N20
	BCH-350-3GB (11) N22	3.1*4.0	18.2*5.3	N22
	BCH-350-3GB (11) N22-H	3.1*4.0	18.2*5.3	N22
	BCH-350-3GB (23) N22	3.1*4.0	18.2*5.3	N22
	BCH-175-3BB (11) N18	3.1*8.5	6.9*9.7	N18
	BCH-175-3BB (11) N18-H	3.1*8.5	6.9*9.7	N18
	BCH-175-3BB (23) N18	3.1*8.5	6.9*9.7	N18

Pattern, size and parameter of strain gauge

Gauge pattern	Gauge model	Grid size (LxW)(mm)	Base size (LxW)(mm)	Creep code
	BCH350-3HA (11) -N** BCH350-3HA (11) -N**-H	3.0*5.0	10.0*6.1	N07、N13、N16、N21
	BCH350-3HA (23) -N**	3.0*5.0	10.0*6.1	N07、N13、N16、N21
	BCH1000-3HA (11) -N** BCH1000-3HA (11) -N**-H	3.0*5.1	9.9*6.3	N06、N09、N11、N13
	BCH1000-3HA (23) -N**	3.0*5.1	9.9*6.3	N06、N09、N11、N13
	BEF1000-9KA (11) N20	Φ9	Φ13.2	N20
	BCF350-14KA (11) N10	Φ14.2	Φ15	N10
	BEF2500-11KA (11) N10	Φ11.9	Φ12.4	N10
	BCF1000-12KA (11) N10	Φ12.1	Φ12.8	N10
	BEF2000-6KA (11) N10	Φ6.1	Φ7.1	N10
	BCH350-2FG (11) N26	2.0*7.0	16.2*8.2	N26
	BCH350-2FG (11) N26-H	2.0*7.0	16.2*8.2	N26
	BCH350-2FG (23) N26	2.0*7.0	16.2*8.2	N26

Compensation/adjustment resistor naming rules



Description:

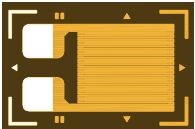
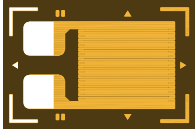
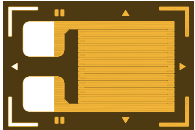
1.For example: RNH020-BE-01

It is the elastic modulus compensation resistor, which is made of pure nickel foil and has the epoxy base, its resistance value is 20 Ω at a normal temperature (23 $^{\circ}$ C) and it is a fixed resistance volume. The serial number is 01.

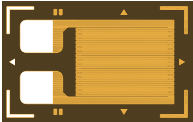
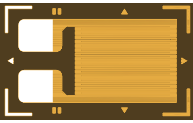
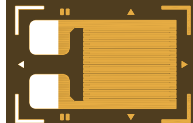

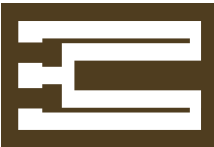
2.For example: RCH003-AZ

It is the zero adjustment resistor, which is made of constantan foil. Its initial resistance value is about 2.5 Ω and the resistance value can be increased by the way of friction.







Pattern and size of compensating/adjustment resistor

Name	Resistor pattern	Resistor model	Base size (LxW)(mm)	Remarks
Elastic modulus compensation resistor		RNH020-BE	4.5*2.9	20 Ω
		RNH021.5-BE	4.5*2.9	21.5 Ω
		RNH026-BE	6.5*4.3	26 Ω

Pattern and size of compensating/adjustment resistor

Name	Resistor pattern	Resistor model	Base size (LxW)(mm)	Remarks
Elastic modulus compensation resistor		RNH030-BE	6.55*4.0	30 Ω
		RNH040-BE	6.9*4.12	40 Ω
		RNH052-BE	6.9*4.6	52 Ω
		RNH080-BE	8.1*5.7	80 Ω
Zero adjustment resistor		RCH002-AZ	8.0*5.3	Be used by steel L/C
		RCH002-AZ-01	8.0*5.3	Be used by aluminium L/C

Pattern and size of terminal

Name	Terminal pattern	Terminal model	Pattern size (LxW)(mm)	Remarks
Terminal		YDZ-57*32	5.75*3.2	We can made terminals according to the drawings or requirements offered by the customer.
		YDZ-50*26	5.0*2.6	
		YDZ-40*26	4.0*2.6	
		IDZ-50*20	5.0*2.0	
		IDZ-30*12	3.0*1.2	
		IDZ-25*12	2.5*1.2	

Adhesive**1. Performance introduction CL-639**

The adhesive actually exerts a great influence on the performance of load cell. The creep and hysteresis are required small in the transmission process of shape change from elastic body to strain gauge, which requires a good rigidity, so the selected material should have a good adhesive property; meanwhile, it is also required to prevent the external moisture from permeating through adhesive into the interior of strain gauge which can affect the strain gauge and the performance of load cell. Therefore, our company has researched and developed the adhesive made from two-component epoxy resin. The two kinds of epoxy resin with good adhesive property and moisture-proof performance can realize the complementation of advantages. As a result, both the rigidity and moisture-proof performance of such CL-639 adhesive are enhanced, so as to reduce the hysteresis of load cell and enhance the moisture-proof performance. The good matching of adhesive with strain gauge base made of special epoxy resin can give full play to the advantages of our strain gauge and increase the quality of load cell.

2. Package

The CL-639 adhesive offered by us is divided into two components of A and B, 402g for each CL-639, in which component A is 268g and component B is 134g; and the single component can be stored for more than 6 months at the normal temperature.

3. Mixing

In use, the weight ratio of part A to part B is A: B=2:1. The adhesive can be used after being mixed and shaken up in the purification room. If the adhesive has small particles, it can be used after being filtered by filter paper for once to twice. The mixed adhesive should be stored in the refrigerator at about 5°C for less than 10 days. It shouldn't be uncapped for use unless it get the room temperature (about 1-2h), after it is taken out of the refrigerator.

4. Chip mounting

Adhesive is brushed onto the backside of strain gauge and the surface of elastic body and the gauge will be fixed within several seconds.

5. Curing

Use clamps for curing for the first time (pressure of 12-20kg/cm²) 135-140°C *2h.

Release the pressure for the second time, 175-180°C*6h.

After the pressure is released for the second time, the curing can not only guarantee and increase the performance of adhesive but also can help eliminate the interior stress of load cell.

Therefore, this time can be prolonged but should not be shortened.

Postscript

We can make Resistance strain gauges, Compensation resistors, Adjustment resistors and Terminals according to the drawings or requirements offered by customers.

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