Application Note RTD Nickel Sensor



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1. General Information

In many sectors, temperature measurement is one of the most important physically defined parameter to determine product quality, security and reliability. Temperature sensors are produced with different technologies to fit specific application requirements. To this end, IST AG has concentrated the development, manufacturing processes and materials to produce high-end thin-film temperature sensors. This know-how, partially derived from the semiconductor industry, allows IST AG to manufacture sensors in very small dimensions. Thin-film temperature sensors exhibit a very short response time due to their low thermal mass. The technologies and processes of IST AG thin-film sensors combines the positive attributes of traditional wire-wound nickel sensors - accuracy, long-term stability, repeatability and interchangeability within a wide temperature range. The advantages of thin-film mass-production create an optimal price/performance-ratio.

2. Construction

The temperature sensor consists of a photolithographically structured nickel meander on a ceramic substrate. The resistivity is laser-trimmed and precisely adjusted to the final value. The resistive structure is covered with a polymer or glass passivation layer protecting the sensor against mechanical and chemical damages. The welded wires are covered with an additional fixation layer.

3. Nominal Value and Temperature Coefficient

The nominal value of the sensor is the defined value of the sensor resistance at 0 °C. The temperature coefficient α (TCR) is defined as:

 $\alpha = \frac{R_{100} - R_0}{100 \times R_0}$ [K⁻¹] according to the DIN 43760 (formerly) numerical value of 0.00618 K⁻¹.

Generally, the value is defined in ppm/K.

 R_0 = resistance value in Ω at 0 °C R_{100} = resistance value in Ω at +100 °C

4. Long-term Stability

The change in ohmic value after 1,000 h at maximum operating temperature amounts to less than 0.1 %.

5. Temperature Characteristic Curve¹⁾

The characteristic curve is defined with a polynomial:

$R(T) = R_0 (1 + A * T + B * T^2 + C * T^3 + D * T^4 + E * T^5 + F * T^6)$

	Nickel ND (6180 ppm/K)	Nickel NL (5000 ppm/K)	Nickel NJ (6370 ppm/K)	Nickel NA (6720 ppm/K)
А	5.485 * 10 ⁻³ [°C ⁻¹]	4.427 * 10 ⁻³ [°C ⁻¹]	5.64742 * 10 ⁻³ [°C ⁻¹]	5.88025 * 10 ⁻³ [°C ⁻¹]
В	6.65 * 10 ⁻⁶ [°C ⁻²]	5.172 * 10 ⁻⁶ [°C ⁻²]	6.69504 * 10 ⁻⁶ [°C ⁻²]	8.28385 * 10 ⁻⁶ [°C ⁻²]
С	0	5.585 * 10 ⁻⁹ [°C ⁻³]	5.68816 * 10 ⁻⁹ [°C ⁻³]	0
D	2.805 * 10 ⁻¹¹ [°C ⁻⁴]	0	0	7.67175 * 10 ⁻¹² [°C ⁻⁴]
Е	0	0	0	0
F	-2 * 10 ⁻¹⁷ [°C ⁻⁶]	0	0	-1.5 * 10 ⁻¹⁶ [°C ⁻⁶]

 R_0 = resistance value in Ω at 0°C

T = temperature at ITS 90

1) custom-specific characteristic curve (e.g. Balco) available

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6. Tolerance classes formerly DIN 43760

Class	± limit deviati	IST AG reference			
	T < 0 °C	T > 0 °C			
1/2 DIN 43760	0.2 + 0.014 x T	0.2 + 0.0035 x T	A		
DIN 43760	0.4 + 0.028 x T	0.4 + 0.007 x T	В		

|T| is the numerical value of the temperature in °C without taking leading signs into account. The tolerances are only guaranteed up to +260 °C.



Temperature in [°C]

7. Applied Current

The current applied is highly dependent on the application and leads to self-heating effects and temperature measuring errors is $\Delta T = P/E$ (see self-heating). Depending on the thermal transfer from the sensor into the application, the current can be increased. There is no bottom current limit for nickel thin-film sensors.

Recommended current supplies:

100 Ω	500 Ω	1000 Ω	2000 Ω	10000 Ω
1 mA	0.5 mA	0.3 mA	0.2 mA	0.1 mA

8. Self-heating

To measure the resistance, electric current must run through the element. The current generates heat energy, resulting in errors of measurement. To minimize the error, caused by self-heating, the current should be kept as low as possible. Temperature error $\Delta T = P/E = R \times I^2/E$.

E = the self-heating coefficient in mW/K, R = resistance in k Ω , I = measured current in mA, P = Power in mW

9. Response Time

The response time is defined as the time in seconds the sensor needs to detect the change in temperature. $t_{0.63}$ describes the time in seconds the sensor needs to measure 63 % of the temperature change. The response time is depending on the sensor dimensions, the thermal contact resistance and the surrounding medium.

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Dimensions number	Sensor size	Response time in seconds				Self-heating						
	L x W x H / H2 in mm	Water ((v = 0.4 m	ı/s)	Air (v	/ = 1 m/	s)	Water (v = 0	Water (v = 0 m/s)		Air (v = 0 m/s)	
		t _{0.5}	t _{0.63}	t _{0.9}	t _{0.5}	t _{0.63}	t _{0.9}	E in mW/K	ΔT in $[mK]^{\mbox{\tiny 1)}}$	E in mW/K	ΔT in $[mK]^{1)}$	
232	2.3 x 2.0 x 0.25/0.8	0.09	0.12	0.33	2.7	3.6	7.5	40	2.3	4	22.5	
232	2.3 x 2.0 x 0.65/1.3	0.15	0.2	0.55	4.5	6	12	40	2.3	4	22.5	
325	3.0 x 2.5 x 0.65/1.3	0.25	0.3	0.7	5.5	7.5	16	90	1	8	11.3	
516	5.0 x 1.6 x 0.65/1.3	0.25	0.3	0.7	5.5	7.5	16	80	1.1	7	12.9	
520	5.0 x 2.0 x 0.65/1.3	0.25	0.3	0.75	6	8.5	18	80	1.1	7	12.9	
525	5.0 x 2.5 x 0.65/1.3	0.33	0.4	0.85	6.5	9	19	90	1	8	11.3	
102	10.0 x 2.0 x 0.65/1.3	0.33	0.4	0.85	7.5	10.5	20	140	0.6	10	9	
538	5.0 x 3.8 x 0.65/1.3	0.35	0.5	0.9	7.5	10	20	140	0.6	10	9	
505	5.0 x 5.0 x 0.65/1.3	0.4	0.5	1.1	8	11	21	150	0.6	11	0.6	
SMD 1206	3.2 x 1.6 x 0.4	0.15	0.25	0.45	3.5	4.2	10	55	1.8	7	14.3	
SMD 0805	2.0 x 1.2 x 0.4	0.1	0.12	0.33	2.5	3	8	38	2.6	4	25	

L: Sensor length (without connections) W: Sensor width H: Sensor height (without connections)H2: Sensor height (incl. connections and strain relief)

The values in the table are for informative purposes only. Based on the assembly method and the different measurement conditions, self-heating and response time can variate.

10. Dimensions Tolerances

Sensor width (W) ± 0.2 mm Sensor length (L) ± 0.2 mm Sensor height (H2) ± 0.2 mm Sensor height (H) \pm 0.1 mm Wire length \pm 1.0 mm (5 mm to 30 mm) Wire length > 30 mm, tolerances on request

11. Additional documents

	Document name:		
	English:	German:	
Data sheets:	DTN150_E	DTN150_D	
	DTN200_E	DTN200_D	
	DTN200_E	DTN200_D	
	DTNSMD_E	DTNSMD_D	



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Benefits & Characteristics

- Excellent long-term stability
- Insulated wires
- Easy interchangeability
- Small dimensions

- Simple linearization
- Vibration and temperature shock resistant
- Customer-specific sensor available upon request

Illustration¹⁾



1) For actual size, see dimensions

Technical Data

Operating temperature range:	-60 °C to +150 °C					
Nominal resistance:*	100 Ω at 0 °C					
	500 Ω at 0 °C					
	1000 Ω at 0 °C					
Characteristics curve:*	6180 ppm/K (Nickel ND)					
	5000 ppm/K (Nickel NL)					
	6370 ppm/K (Nickel NJ)**					
	6720 ppm/K (Nickel NA)***					
Long-term stability:	< 0.1 % at 1000 h at maximal operating temperature					
Tolerance class (dependent on temperature) ¹⁾ :*	IST AG reference $T > 0 °C$					
1) For tolerances <0°C please check application note	A 0.2 + 0.0035 x t					
	B 0.4 + 0.007 × t					
	C 0.8 + 0.014 x t					
Connection:*	Enameled Cu-wire, Ø 0.2 mm, (solderable, weldable)					
	Enameled Cu-wire, Ø 0.15 mm, (solderable, weldable)					
	Enameled Cu-wire, Ø 0.25 mm, metallized back side, (solderable, weldable)					
Alternative wire construction:*	Inverted welding					
Recommended applied current: ²⁾	1 mA at 100 Ω					
2) Self-heating must be considered	0.5 mA at 500 Ω					
	0.3 mA at 1000 Ω					
Other alternatives:*	Metallized backside					

	150 °C s Nickel sens For low ten	eries or with wires nperatures		INNOVATIVE SENSOR TECHNOLOGY						
		c I								
	* Customer-specific alte ** 6370 ppm/K (Nickel *** 6720 ppm/K (Nicke	Sub ernatives available NJ) 891 Ω at 0 °C only el NA) 120 Ω at 0 °C only	ostrate thickness							
	Order Informatior	n - 1E (Enameled Cu-wire, Ø C).2 mm)							
Л	Size	Dimensions (L x W x H / H2 in mm)	Class A	Class B						
	6180 ppm/K (Nickel ND)								
	Nominal resistance: 100	Ω at 0 °C								
	232 Order code	2.3 x 2.0 x 0.65 / 1.3	Upon request	ND0K1.232.1E.B.025 Upon request						
	Nominal resistance: 1000 O at 0 °C									
	Nominal resistance: Tu		Lipop request							
	Order code	2.3 % 2.0 % 0.03 / 1.3	opon request	Upon request						
	520	5.0 x 2.0 x 0.65 / 1.3	Upon request	ND1K0.520.1E.B.025						
	Order code			Upon request						
	5000 ppm/K (Nickel NL)								
	Nominal resistance: 100	00 Q at 0 °C								
	520	5.0 x 2.0 x 0.65 / 1.3	Upon request	NL1K0.520.1E.B.025						
	Order code			Upon request						
	Order Information	n - 1K (Enameled Cu-wire, Ø (0.15 mm)							
	Size	Dimensions (L x W x H / H2 in mm)	Class A	Class B						
	6180 ppm/K (Nickel ND)								
	Nominal resistance [,] 100) Q at 0 °C								
	232	2.3 x 2.0 x 0.65 / 1.3	Upon request	ND0K1.232.1K.B.007						
	Order code			Upon request						
	Nominal resistance: 100	00 Ω at 0 °C								
	232	2.3 x 2.0 x 0.65 / 1.3	Upon request	ND1K0.232.1K.B.007						
	Order code			Upon request						
	520	5.0 x 2.0 x 0.65 / 1.3	Upon request	ND1K0.520.1K.B.007						
	Order code			Upon request						



Size	Dimensions (L x W x H / H2 in mm)	Class A	Class B
5000 ppm/K (Nickel NL)			
Nominal resistance: 1000	Ω at 0 °C		
520	5.0 x 2.0 x 0.65 / 1.3	Upon request	NL1K0.520.1K.B.007
Order code			Upon request
6370 ppm/K (Nickel NJ) Nominal resistance: 891 Ω	2 at 0 °C		
538	5.0 x 3.8 x 0.65 / 1.3		NJ891.538.1K.K.076
Order code			020.00514

Order Information - 1K (Enameled Cu-wire, Ø 0.25 mm, metallized back side)

Size	Dimensions (L x W x H / H2 in mm)	Class A	Class B
5000 ppm/K (Nickel NL)			
Nominal resistance: 1000	Ω at 0 °C		
520	5.0 x 2.0 x 0.65 / 1.3		NL1K0.520.1K.B.300.M
Order code			020.00604
Additional Docume	nts		
		Document name:	
Application Note:		ATN_E	



Order Information Nickel sensors Secondary reference



Ma	ater	ial															
Ν	=	Ni	ckel														
S	=	sp	ecial														
		TC	R		700 ///			6070									
		A	=	ANSI 67	/20 ppm/K	J	=	63/0) ppm/K								
		B	=	Balco	117	M	=	5696	ppm/K	(COST O	605						
		D	=	6180 pj	pm/K	C	=	4280	ppm/K	(GOST 8	.625	-2006)					
		L	=	5000 pj	pm/K	2	=	speci	ai								
			Re	sistance i	in Q at 0 °C												
				Size ir	n mm												
					Operating	temp	eratu	ire rar	ige								
					1 = -60	0 °C t	:0 +1	50 °C									
					2 = -60	0 °C t	:0 +2	00 °C									
					3 = -60	0 °C t	:0 +3	00 °C									
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							А	= 0	.2 + 0.0	035 x t							
							В	= C	.4 + 0.0	07 x t							
							С	= C	.8 + 0.0	14 x t							
							Κ	= C	ustomer	-specific							
								Wir	e length	in mm							
									Creatial								
									зресіаі т	aubetrat	ta th	ickpace (Ν.4		matallized b	a clusida
										substra	te th	ICKNESS U	0.25 mm	IVI	=	metallized b	ackside
									VV =	sintered	i pov	wder		U	=	inverted we	laing
									5 =	special							
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							ININ		SENSOR TEC								
							INP	OVAIIVE	JENJUK IEU	INVLUGI							



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Benefits & Characteristics

- Excellent long-term stability
- Connections remain in shape
- Easy interchangeability
- Small dimensions

- Simple linearization
- Vibration and temperature shock resistant
- Customer-specific sensor available upon request

Illustration¹⁾



1) For actual size, see dimensions

Technical Data

Operating temperature range:	-60 °C to +200 °C	
Nominal resistance:*	100 Ω at 0 °C	
	500 Ω at 0 °C	
	1000 Ω at 0 °C	
Characteristics curve:*	6180 ppm/K (Nickel NE	0)
	5000 ppm/K (Nickel NL	_)
	6370 ppm/K (Nickel NJ)**
	6720 ppm/K (Nickel NA	۹)***
Long-term stability:	< 0.1 % at 1000 h at r	maximal operating temperature
Tolerance class (dependent on temperature) ¹⁾ :*	IST AG reference T	> 0 °C
1) For tolerances <0°C please check application note	A 0	.2 + 0.0035 x t
	В 0	.4 + 0.007 × t
	C 0	.8 + 0.014 x [t]
Connection:*	Ag-wire, Ø 0.25 mm (s	solderable, weldable)
	Cu/Ag-wire, PTFE AWG	530 (solderable, weldable)
	Cu/Ag-wire, PTFE AWG	526 (solderable, weldable)
	Cu/Ag-wire, Ø 0.4 mm	n (solderable, weldable)
	Ni/Au-flat wire, 0.2 x 0.4	4 mm (solderable, weldable, crimpable)
	CuP-SIL wire post-plate	ed with Sn (solderable, crimpable)
Alternative wire construction:*	Inverted welding	
Recommended applied current: ²⁾	1 mA at 100 Ω	
2) Self-heating must be considered	0.5 mA at 500 Ω	
	0.3 mA at 1000 Ω	





Other alternatives	:* Met Sub Sint	Metallized backside Substrate thickness Sintered powder						
* Customer-specif ** 6370 ppm/K (I *** 6720 ppm/K	ic alternatives available Nickel NJ) 891 Ω at 0 °C only (Nickel NA) 120 Ω at 0 °C only							
Order Inform	ation - 2W (Ag-wire, Ø 0.25 m Dimensions (L x W x H / H2 in mn	m) n) Class A	Class B					
6180 ppm/K (Nick	cel ND)							
NI 1 1 1								
232 Order code	2.3 x 2.0 x 0.65 / 1.3	ND0K1.232.2W.A.010 020.00004	ND0K1.232.2W.B.010 020.00002					
232 Order code	2.3 x 2.0 x 0.65 / 1.3	ND0K1.232.2W.A.015 020.00003	ND0K1.232.2W.B.015 020.00001					
325 Order code	3.0 x 2.5 x 0.65 / 1.3	ND0K1.325.2W.A.010 ND0K1.325.2W 020.00011 020.00009						
505 Order code	5.0 x 5.0 x 0.65 / 1.3	Upon request ND0K1.505.2W.B.010 020.00529						
Nominal resistanc	e: 200 Ω at 0 °C							
520 Order code	5.0 x 2.0 x 0.65 / 1.3	Upon request	ND0K2.520.2W.B.015 020.00031					
Nominal resistanc 520 Order code	e: 300 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3	Upon request	ND0K3.520.2W.B.015					
			020.00557					
Nominal resistanc 520 Order code	e: 500 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3	Upon request	ND0K5.520.2W.B.010					
520 Order code	5.0 x 2.0 x 0.65 / 1.3	ND0K5.520.2W.A.015 ND0K5.520.2W.B.015 020.00683 020.00682						
Nominal resistance	e: 1000 Ω at 0 °C							
232 Order code	2.3 x 2.0 x 0.65 / 1.3	ND1K0.232.2W.A.015 020.00050	ND1K0.232.2W.B.010 020.00049					
520 Order code	5.0 x 2.0 x 0.65 / 1.3	ND1K0.520.2W.A.010 ND1K0.520.2W.B.010						





Size	Dimensions (L x W x H / H2 in mm)	Class A	Class B							
538	5.0 x 3.8 x 0.65 / 1.3	Upon request	ND1K0.538.2W.B.015							
Order code			020.00083							
102	10.0 x 2.0 x 0.65 / 1.3	Upon request	ND1K0.102.2W.B.015							
Order code			020.00090							
Nominal resistance: 50	00 Ω at 0 °C									
525	5.0 x 2.5 x 0.65 / 1.3	Upon request	ND5K0.525.2W.B.010							
Order code			020.00098							
5000 ppm/K (Nickel NL)										
Nominal resistance: 10	000 Ω at 0 °C									
Nominal resistance: 10	000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3	NL1K0.520.2W.A.010	NL1K0.520.2W.B.010							
Nominal resistance: 10 520 Order code	000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3	NL1K0.520.2W.A.010 020.00110	NL1K0.520.2W.B.010 020.00108							
Nominal resistance: 10 520 Order code 525	000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 2.5 x 0.65 / 1.3	NL1K0.520.2W.A.010 020.00110 Upon request	NL1K0.520.2W.B.010 020.00108 NL1K0.525.2W.B.010							
Nominal resistance: 10 520 Order code 525 Order code	000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 2.5 x 0.65 / 1.3	NL1K0.520.2W.A.010 020.00110 Upon request	NL1K0.520.2W.B.010 020.00108 NL1K0.525.2W.B.010 020.00117							
Nominal resistance: 10 520 Order code 525 Order code Nominal resistance: 10	000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 2.5 x 0.65 / 1.3 0000 Ω at 0 °C	NL1K0.520.2W.A.010 020.00110 Upon request	NL1K0.520.2W.B.010 020.00108 NL1K0.525.2W.B.010 020.00117							
Nominal resistance: 10 520 Order code 525 Order code Nominal resistance: 10 525	2000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 2.5 x 0.65 / 1.3 2000 Ω at 0 °C 5.0 x 2.5 x 0.65 / 1.3	NL1K0.520.2W.A.010 020.00110 Upon request	NL1K0.520.2W.B.010 020.00108 NL1K0.525.2W.B.010 020.00117 NL10K.525.2W.B.010							
Nominal resistance: 10 520 Order code 525 Order code Nominal resistance: 10 525 Order code	2000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 2.5 x 0.65 / 1.3 2000 Ω at 0 °C 5.0 x 2.5 x 0.65 / 1.3	NL1K0.520.2W.A.010 020.00110 Upon request Upon request	NL1K0.520.2W.B.010 020.00108 NL1K0.525.2W.B.010 020.00117 NL10K.525.2W.B.010 020.00128							
Nominal resistance: 10 520 Order code 525 Order code Nominal resistance: 10 525 Order code	000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 2.5 x 0.65 / 1.3 0000 Ω at 0 °C 5.0 x 2.5 x 0.65 / 1.3	NL1K0.520.2W.A.010 020.00110 Upon request	NL1K0.520.2W.B.010 020.00108 NL1K0.525.2W.B.010 020.00117 NL10K.525.2W.B.010 020.00128							

Order Information - 2I (Cu/Ag-wire, AWG 30, PTFE-insulated)

Size	Dimensions (L x W x H / H2 in mm)	Class A	Class B							
6180 ppm/K (Nickel ND)										
Nominal resistance: 100	0Ω at 0°C									
325	3.0 x 2.5 x 0.65 / 1.3	Upon request	ND0K1.325.2I.B.030							
Order code			020.00014							
Nickel NL (5000ppm/K)	Nickel NL (5000ppm/K)									
Nominal resistance: 100	00 Ω at 0 °C									
520	5.0 x 2.0 x 0.65 / 1.3	Upon request	NL1K0.520.2I.B.050							
Order code			020.00629							
520	5.0 x 2.0 x 0.65 / 1.3	Upon request	NL1K0.520.2I.B.100							
Order code			020.00627							





Order Informa						
Size	Dimensions (L x W x H / H2 in mm)	Class A	Class B			
6180 ppm/K (Nick	cel ND)					
Nominal resistance	e: 1000 Ω at 0 °C					
520	5.0 x 2.0 x 0.65 / 1.3	Upon request	ND1K0.520.2K.B.058			
Order code			020.00071			
538	5.0 x 3.8 x 0.65 / 1.3	Upon request	ND1K0.538.2K.B.026			
Order code			020.00619			
5000 ppm/K (Nick	cel NL)					
Nominal resistance	e: 1000 Ω at 0 °C					
520	5.0 x 2.0 x 0.65 / 1.3	Upon request	NL1K0.520.2K.B.165			
Order code			020.00605			
520		Upon request NL1K0.520.2K.B				
	5.0 X 2.0 X 0.057 1.5	Upon request	NLIKU.520.2K.B.215			
Order code	5.0 x 2.0 x 0.057 1.5	Upon request	NETKU.520.2K.B.2T5 020.00606			
Order code Order Informa Size	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm)	Upon request n) Class A	NETKU.520.2K.B.2T5 020.00606 Class B			
Order code <u>Order Informa</u> Size 6180 ppm/K (Nick	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm) cel ND)	Upon request n) Class A	NETKU.520.2K.B.2T5 020.00606 Class B			
Order code Order Informa Size 6180 ppm/K (Nick	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm) cel ND)	Dpon request	NLTKU.520.2K.B.215 020.00606 Class B			
Order code Order Informa Size 6180 ppm/K (Nick Nominal resistance	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm) cel ND) e: 1000 Ω at 0 °C	n) Class A	Class B			
Order code <u>Order Informa</u> Size 6180 ppm/K (Nick Nominal resistance 520 Order code	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm) cel ND) e: 1000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3	Upon request n) Class A Upon request	NLTK0.520.2K.B.215 020.00606 Class B ND1K0.520.2K.B.007			
Order code Order Informa Size 6180 ppm/K (Nick Nominal resistance 520 Order code	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm) (cel ND) e: 1000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3	Upon request Class A Upon request	NETK0.520.2K.B.215 020.00606 Class B ND1K0.520.2K.B.007 020.00322			
Order code Order Informa Size 6180 ppm/K (Nick Nominal resistance 520 Order code 538	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm) cel ND) e: 1000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3	n) Class A Upon request ND1K0.538.2K.A.010	NL1K0.520.2K.B.215 020.00606 Class B ND1K0.520.2K.B.007 020.00322 ND1K0.538.2K.B.010			
Order code Order Informa Size 6180 ppm/K (Nick Nominal resistance 520 Order code 538 Order code	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm) e: 1000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3	Dpon request Dpon request Upon request Upon request Upon request ND1K0.538.2K.A.010 020.00639	NLTK0.520.2K.B.215 020.00606 Class B ND1K0.520.2K.B.007 020.00322 ND1K0.538.2K.B.010 020.00635			
Order code Order Informa Size 6180 ppm/K (Nick Nominal resistance 520 Order code 538 Order code 5000 ppm/K (Nick	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm) cel ND) e: 1000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3	Dpon request The second	NLTK0.520.2K.B.215 020.00606 Class B ND1K0.520.2K.B.007 020.00322 ND1K0.538.2K.B.010 020.00635			
Order code Order Informa Size 6180 ppm/K (Nick Nominal resistance 520 Order code 538 Order code 5000 ppm/K (Nick Nominal resistance	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm) cel ND) e: 1000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 cel NL) e: 1000 Ω at 0 °C	Dpon request The second	NLTK0.520.2K.B.215 020.00606 Class B ND1K0.520.2K.B.007 020.00322 ND1K0.538.2K.B.010 020.00635			
Order code Order Informa Size 6180 ppm/K (Nick Nominal resistance 520 Order code 538 Order code 5000 ppm/K (Nick Nominal resistance 520	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm) cel ND) e: 1000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 cel NL) e: 1000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3	Upon request n) Class A Upon request ND1K0.538.2K.A.010 020.00639 Upon request	NL1K0.520.2K.B.215 020.00606 Class B ND1K0.520.2K.B.007 020.00322 ND1K0.538.2K.B.010 020.00635 NL1K0.520.2K.B.007			
Order code Order Informa Size 6180 ppm/K (Nick Nominal resistance 520 Order code 538 Order code 5000 ppm/K (Nick Nominal resistance 520 Order code	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm) (cel ND) e: 1000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 (cel NL) e: 1000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3	Upon request n) Class A Upon request	NL1K0.520.2K.B.215 020.00606 Class B ND1K0.520.2K.B.007 020.00322 ND1K0.538.2K.B.010 020.00635 NL1K0.520.2K.B.007 020.00635			
Order code Order Informa Size 6180 ppm/K (Nick Nominal resistance 520 Order code 538 Order code 5000 ppm/K (Nick Nominal resistance 520 Order code 520 Order code 520	ation - 2K (Cu/Ag-wire, Ø 0.4 mr Dimensions (L x W x H / H2 in mm) eel ND) e: 1000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 eel NL) e: 1000 Ω at 0 °C 5.0 x 2.0 x 0.65 / 1.3 5.0 x 2.0 x 0.65 / 1.3	Upon request	NL1K0.520.2K.B.215 020.00606 Class B ND1K0.520.2K.B.007 020.00322 ND1K0.538.2K.B.010 020.00635 NL1K0.520.2K.B.007 020.00201 NL1K0.520.2K.B.020			





SIZE	Dimensions (L x W x H / H2 in mm)	Class A	Class B		
6180 ppm/K (Nic	kel ND)				
Nominal resistant	ce: 1000 Ω at 0 °C				
520 Order code	5.0 x 2.0 x 0.65 / 1.3	ND1K0.520.2FW.A.007 020.00349	ND1K0.520.2FW.B.007		
325 Order code	3.0 x 2.5 x 0.65 / 1.3	Upon request	ND0K1.325.2I.B.030 020.00014		
5000 ppm/K (Nic	kel NL)				
Nominal resistance	ce: 1000 Ω at 0 °C				
520 Order code	5.0 x 2.0 x 0.65 / 1.3	NL1K0.520.2FW.A.007 020.00351	NL1K0.520.2FW.B.007 020.00350		
Order Inform	nation 25 (CuP SII wire past plat	ad with Sp. 10 mm)			
	lation - 23 (Cur-sic wire post-plat				
Size	Dimensions (L x W x H / H2 in mm)	Class A	Class B		
6180 ppm/K (Nic	kel ND)				
	- /				
Nominal resistant	ce: 100 Ω at 0 °C				
505					
Order code	5.0 x 5.0 x 0.65 / 1.3	Upon request	ND0K1.505.2S.B 020.00027		
Order code 538	5.0 x 5.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3	Upon request Upon request	ND0K1.505.2S.B 020.00027 ND0K1.538.2S.B		
Order code 538 Order code	5.0 x 5.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3	Upon request Upon request	ND0K1.505.2S.B 020.00027 ND0K1.538.2S.B 020.00024		
Order code 538 Order code Nominal resistance	5.0 x 5.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 ce: 200 Ω at 0 °C	Upon request	ND0K1.505.2S.B 020.00027 ND0K1.538.2S.B 020.00024		
Order code 538 Order code Nominal resistant	5.0 x 5.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 ce: 200 Ω at 0 °C 5.0 x 3.8 x 0.65 / 1.3	Upon request Upon request Upon request	ND0K1.505.2S.B 020.00027 ND0K1.538.2S.B 020.00024 ND0K2.538.2S.B		
Order code 538 Order code Nominal resistant 538 Order code	5.0 x 5.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 ce: 200 Ω at 0 °C 5.0 x 3.8 x 0.65 / 1.3	Upon request Upon request Upon request	ND0K1.505.2S.B 020.00027 ND0K1.538.2S.B 020.00024 ND0K2.538.2S.B 020.00034		
Order code 538 Order code Nominal resistant 538 Order code	5.0 x 5.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 ce: 200 Ω at 0 °C 5.0 x 3.8 x 0.65 / 1.3	Upon request Upon request Upon request	ND0K1.505.2S.B 020.00027 ND0K1.538.2S.B 020.00024 ND0K2.538.2S.B 020.00034		
Order code 538 Order code Nominal resistand 538 Order code Nominal resistand	5.0 x 5.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 ce: 200 Ω at 0 °C 5.0 x 3.8 x 0.65 / 1.3 ce: 1000 Ω at 0 °C 5.0 x 2.5 x 0.65 / 1.3	Upon request Upon request Upon request	ND0K1.505.2S.B 020.00027 ND0K1.538.2S.B 020.00024 ND0K2.538.2S.B 020.00034		
Order code 538 Order code Nominal resistand 538 Order code Nominal resistand 525 Order code	5.0 x 5.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 ce: 200 Ω at 0 °C 5.0 x 3.8 x 0.65 / 1.3 ce: 1000 Ω at 0 °C 5.0 x 2.5 x 0.65 / 1.3	Upon request Upon request Upon request ND1K0.525.25.A 020.00078	ND0K1.505.2S.B 020.00027 ND0K1.538.2S.B 020.00024 ND0K2.538.2S.B 020.00034 ND1K0.525.2S.B 020.00077		
Order code 538 Order code Nominal resistand 538 Order code 525 Order code 538	5.0 x 5.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 ce: 200 Ω at 0 °C 5.0 x 3.8 x 0.65 / 1.3 ce: 1000 Ω at 0 °C 5.0 x 2.5 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3	Upon request Upon request Upon request Upon request ND1K0.525.2S.A 020.00078 ND1K0.538.2S.A	ND0K1.505.2S.B 020.00027 ND0K1.538.2S.B 020.00024 ND0K2.538.2S.B 020.00034 ND0K2.538.2S.B 020.00034		
Order code 538 Order code Nominal resistand 538 Order code 525 Order code 538 Order code	5.0 x 5.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 ce: 200 Ω at 0 °C 5.0 x 3.8 x 0.65 / 1.3 ce: 1000 Ω at 0 °C 5.0 x 2.5 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3	Upon request Upon request Upon request Upon request ND1K0.525.2S.A 020.00078 ND1K0.538.2S.A 020.00085	ND0K1.505.2S.B 020.00027 ND0K1.538.2S.B 020.00024 ND0K2.538.2S.B 020.00034 ND1K0.525.2S.B 020.00077 ND1K0.538.2S.B 020.00084		
Order code 538 Order code Nominal resistant 538 Order code 525 Order code 538 Order code	5.0 x 5.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 te: 200 Ω at 0 °C 5.0 x 3.8 x 0.65 / 1.3 te: 1000 Ω at 0 °C 5.0 x 2.5 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3	Upon request Upon request Upon request Upon request ND1K0.525.25.A 020.00078 ND1K0.538.25.A 020.00085	ND0K1.505.2S.B 020.00027 ND0K1.538.2S.B 020.00024 ND0K2.538.2S.B 020.00034 ND1K0.525.2S.B 020.00077 ND1K0.538.2S.B 020.00084		
Order code 538 Order code Nominal resistand 538 Order code 525 Order code 538 Order code 538 Order code	5.0 x 5.0 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 ce: 200 Ω at 0 °C 5.0 x 3.8 x 0.65 / 1.3 ce: 1000 Ω at 0 °C 5.0 x 2.5 x 0.65 / 1.3 5.0 x 3.8 x 0.65 / 1.3 ce: 5000 Ω at 0 °C 5.0 x 2.5 x 0.65 / 1.3	Upon request Upon request Upon request Upon request ND1K0.525.2S.A 020.00078 ND1K0.538.2S.A 020.00085	ND0K1.505.2S.B 020.00027 ND0K1.538.2S.B 020.00024 ND0K2.538.2S.B 020.00034 ND1K0.525.2S.B 020.00077 ND1K0.538.2S.B 020.00084 ND5K0.525.2S.B		



Size	Dimensions (L x W x H / H2 in mm)	Class A	Class B								
5000 ppm/K (Nickel NL)											
Nominal resistance: 50	0Ωat0°C										
538 Order code	5.0 x 3.8 x 0.65 / 1.3	Upon request	NL0K5.538.2S.B 020.00203								
Nominal resistance: 10	00 Ω at 0 °C										
425 Order code	4.0 x 2.5 x 0.65 / 1.3	NL1K0.425.2S.A 020.00157	NL1K0.425.2S.B 020.00106								
525 Order code	5.0 x 2.5 x 0.65 / 1.3	Upon request	NL1K0.525.2S.B 020.00118								
538 Order code	5.0 x 3.8 x 0.65 / 1.3	Upon request	NL1K0.538.2S.B 020.00122								
Nominal resistance: 50	00 Ω at 0 °C										
525 Order code	5.0 x 2.5 x 0.65 / 1.3	Upon request	NL5K0.525.2S.B 020.00166								

Additional Documents

	Document name:
Application Note:	ATN_E



Order Information Nickel Sensor Secondary reference



Má	ater	ial													
Ν	=	Ni	ckel												
S	=	sp	ecial												
		TC	R		Z 1		C270	- 117							
		A	=	ANSI 6720 ppm/i		=	6370 ppn	n/K							
		B	=	Balco	IVI C	=	5696 ppn	n/K		625					
		D	=	6180 ppm/K	C	=	4280 ppn	n/K (G(721.8	.625	o-2006)				
		L	=	5000 ppm/K	2	=	special								
			Re	sistance in Ω at 0°	°C										
					0										
				Size in mm											
				Operatin	g temp	perat	ure range								
				1 = -	60 °C	to + '	150 °C								
				2 = -	60 °C	to +2	200 °C								
				3 = -	60 °C	to +3	300 °C								
					Conn	iectic	n 		FIZ		CL .			· C·	
					S	= :			FK	=	flat w	ire custom	ier-sp	ecitio	
						=	nsulated wi	re	K	=	custor	ner-specif	IC		
					VV	= \	wire		F	=	enam	eled Cu-w	ire		
					FVV	= 1	flat wire								
						То	erance class	s (T > () °C)						
						A	= 0.2 +	0 003	5 x ltl						
						B	= 0.2 +	0.007	x Itl						
						C	= 0.8 +	0.014	x Itl						
						К	= custor	mer-sp	ecific						
							0.500	ner op	cente						
							Wire len	gth in	mm						
							Spe	cial							
							Т	= su	bstrat	te th	ickness	0.25 mm	Μ	=	metallized backside
							W	= sir	itered	l pov	wder		U	=	inverted welding
							S	= sp	ecial						
V		JOI	<1.	520. 3 F\	N.	Β.	015. W								
						IN	INOVATIVE SENSO	R TECHNOL	_OGY						

Phone: 0523 - 88155558 | Mobile: 13701245182 | E-mail:micsensor@yeah.net | Web: www.mic-sensor.com

LISC 9001 ***** KOHS All mechanical dimensions are valid at 25 °C ambient temperature, if not differently indicated • All data except the mechanical dimensions only have information purposes and are not to be understood as assured characteristics • Technical changes without previous announcement as well as mistakes reserved • The information on this data sheet was examined carefully and will be accepted as correct; No liability in case of mistakes • Load with extreme values during a longer period can affect the reliability • The material contained herein may not be reproduced, adapted, merged, translated, stored, or used without the prior written consent of the copyright owner • Typing errors and mistakes reserved • Product specifications are subject to change without notice • All rights reserved





Benefits & Characteristics

- Very robust connections
- Easy interchangeability
- Small dimensions
- Simple linearization

- Vibration and temperature shock resistant
- Wide temperature range
- Inorganic glass passivation
- Customer-specific sensor available upon request

Illustration¹⁾



1) For actual size, see dimensions

Technical Data

Operating temperature range:	-60 °C to +300 °C
Nominal resistance:*	100 Ω at 0 °C
	500 Ω at 0 °C
	1000 Ω at 0 °C
Characteristics curve:*	6180 ppm/K (Nickel ND)
	5000 ppm/K (Nickel NL)
	6370 ppm/K (Nickel NJ)**
	6720 ppm/K (Nickel NA)***
Long-term stability:	< 0.1 % at 1000 h at maximal operating temperature
Tolerance class (dependent on temperature) ¹⁾ :*	IST AG reference $T > 0 °C$
1) For tolerances <0°C please check application note	A 0.2 + 0.0035 x t
	B 0.4 + 0.007 x t
	C 0.8 + 0.014 x t
Connection:*	Ni-wire, \emptyset 0.2 mm (solderable, weldable, crimpable)
	Pt/Ni-wire, Ø 0.2 mm (solderable, weldable, crimpable, brazeable)
Alternative wire construction:*	Inverted welding
Recommended applied current: ²⁾	1 mA at 100 Ω
2) Self-heating must be considered	0.5 mA at 500 Ω
	0.3 mA at 1000 Ω
Other alternatives:*	Metallized backside
	Substrate thickness
* Customer-specific alternatives available	

** 6370 ppm/K (Nickel NJ) 891 Ω at 0 °C only

*** 6720 ppm/K (Nickel NA) 120 Ω at 0 °C only





Size	Dimensions (L x W x H / H2 in mm)	Class A or class K - customer- specific	Class B or class K - customer specific
6720 ppm/K	(Nickel NA)		
Nominal resi	stance: 120 Ω at 0 °C		
232 Order code	2.3 x 2.0 x 0.65 / 1.3	NA120.232.3W.K.007 020.00346	
420 Order code	4.0 x 2.0 x 0.65 / 1.3	NA120.420.3W.K.007 020.00588	
6180 ppm/K	(Nickel ND)		
Nominal resi	stance: 100 Ω at 0 °C		
232 Order code	2.3 x 2.0 x 0.65 / 1.3	ND0K1.232.3W.A.010 020.00658	ND0K1.232.3W.B.010 020.00007
520 Order code	5.0 x 2.0 x 0.65 / 1.3	Upon request	ND1K0.520.3W.B.010 020.00186
5000 ppm/K	(Nickel NL)		
Nominal resi	stance: 100 Ω at 0 °C		
520 Order code	5.0 x 2.0 x 0.65 / 1.3	Upon request	NL0K1.520.3W.B.010 020.00665
Nominal resi	stance: 1000 Q at 0 °C		
520 Order code	5.0 x 2.0 x 0.65 / 1.3	Upon request	NL1K0.520.3W.B.010 020.00324
Order Info	ormation - 3K (Pt/Ni-wire, Ø	0.2 mm)	
Size	Dimensions (L x W x H / H2 in mm)	Class A or class K - customer- specific	Class B or class K - customer specific
6720 ppm/K	(Nickel NA)		
Newsia - Luc 1			
232		NIA 120 232 3K K 007	NIA 120 232 2K K 010
Order code	2.5 A 2.0 A 0.05 / 1.5	020 00179	020 00355

NA120.420.3K.K.007

020.00526

420

Order code

4.0 x 2.0 x 0.65 / 1.3





Additional Documents

Application note:

Document name: ATN_E



Order Information Nickel Sensor Secondary reference



Ma	ater	ial														
Ν	=	Ni	ckel													
S	=	sp	ecial													
		TC	R				6270									
		A	=	ANSI 6720 ppm/	K J	=	63/U	ppm/K								
		R	=	Balco	IVI	=	4290	ppm/K		625	= 200C)					
			=	6180 ppm/K	Ć	=	: 4280	ppm/K	(GOST 8	.625	5-2006)					
		L	=	5000 μμπ/κ	2	=	speci	dl								
			Re	sistance in Ω at 0	°C											
				Size in mm												
				Operatir	ng tem	pera	ature ran	ge								
				1 = ·	-60 °C	to -	+150 °C									
				2 = -	-60 °C	to -	+200 °C									
				3 = -	-60 °C	το -	F300 °C									
					Conr	hect	ion									
					S	=	SIL		FK	=	flat wi	re custom	er-sp	pecifi	с	
					1	=	insulate	ed wire	K	=	custon	ner-specifi	C			
					W	=	wire		Е	=	ename	eled Cu-w	ire			
					FW	=	flat wire	ē								
						Т	olerance	class (T	> 0 °C)							
						A	· = 0	.2 + 0.0	035 x t							
						В	= 0	.4 + 0.0	07 x t							
						C	. = 0	.8 + 0.0	14 x t							
						K	(= C	ustomer-	specific							
							Mir	o longth	in mm							
							VVII	eiengun								
								Special								
								T =	substrat	te th	nickness	0.25 mm	Μ	=	metallized bad	ckside
								W =	sintered	l pov	wder		U	=	inverted weld	ding
								S =	special							9
Ν		J Oł	<1. !	520. 3 F	W.	Β.	015. V	V								
									-							
							4	D	F							
							INNOVATIVE	SENSOR TECH	HNOLOGY							

Phone: 0523 - 88155558 | Mobile: 13701245182 | E-mail:micsensor@yeah.net | Web: www.mic-sensor.com

ISOMOT EVANCE All mechanical dimensions are valid at 25 °C ambient temperature, if not differently indicated • All data except the mechanical dimensions only have information purposes and are not to be understood as assured characteristics • Technical changes without previous announcement as well as mistakes reserved • The information on this data sheet was examined carefully and will be accepted as correct; No liability in case of mistakes • Load with extreme values during a longer period can affect the reliability • The material contained herein may not be reproduced, adapted, merged, translated, stored, or used without the prior written consent of the copyright owner • Typing errors and mistakes reserved • Product specifications are subject to change without notice • All rights reserved



SMD series SMD nickel sensor

For the automatic assembling on PCBs



Benefits & Characteristics

- Vibration and temperature shock resistant
- Simple linearization
- Excellent long-term stability
- Low self-heating

- Reflow solderable
- Available as Tape&Reel
- Customer specific sensor available upon request

Illustration¹⁾



1) For actual size, see dimensions

Technical Data

Operating temperature range:	-60 °C to +150 °C
Nominal resistance:*	891 Ω at 0 °C
Characteristics curve:*	6370 ppm/K (Nickel NJ)
Long-term stability:	< 0.1 % at 1000 h at maximal operating temperature
Tolerance class (dependent on temperature range):*	IST AG reference
	Customer specific K
Connections:*	2P (Contacts tin-coated (100% Sn) (reflow solderable))
	Bondable contacts without bumps available on request
Solderability:	235 °C \leq 8 s (DIN IEC 68 2-20, Ta Meth. 1)
Resistance to soldering heat:1)	260 °C 10 s (DIN IEC 68 2-20, Ta Meth. 1A)
1) The soldering process can influence accuracy	
Recommended applied current: ²⁾	0.3 mA at 891 Ω
2) Self-heating must be considered	
Other alternatives:*	Substrate thickness
Packaging:	< 100 pcs in bags
	> 100 pcs taped on reel (sensor side up or sensor side down)

* Customer specific alternatives available



SMD series SMD nickel sensor For the automatic assembling on PCBs



Order Inform	nation - 2P (Contacts tin-coated	d (100% Sn), LMP lead	d-free (reflow solderable)
Ciac		л.	Class K. Custamer er sifis
SIZE	Dimensions (L X VV X H in mm	1)	Class K - Customer specific
Packed in bags (<	< 100 pcs)		
6370 ppm/K (Nic	kel NJ)		
Nominal resistance	ce: 891 Ω at 0 °C		
0805	2 x 1.2 x 0.4		NJ891.0805.2P.K
Order code			020.00541
Taped on reel - se	ensor side up or sensor side down (> 10	00 pcs)	
6370 ppm/k (Nic	KEI NJ)		
Nominal resistance	ce: 891 Ω at 0 °C		
0805	2 x 1.2 x 0.4	Sensor side up	NJ891.0805.2P.K.S

0805	2 x 1.2 x 0.4	Sensor side up	NJ891.0805.2P.K.S
Order code			020.00657
0805	2 x 1.2 x 0.4	Sensor side down	NJ891.0805.2P.K.S
Order code			020.00624

Additional Documents

	Document name:		
Application note:	ATN_E		

Order Information SMD nickel sensor Secondary reference



- N	INICIA	CI									
	TCR										
	J	=	6370	ppm/K							
		Res	istance	e in Ω at C) °C						
				Size in m	m						
					Opera	ting ten	peratu	re range			
					2 =	-60 °C	to +15	50 °C			
						Con	nectior				
						(2)P	=	contacts ti	n-coated (100)% Sn) (re	eflow solderab
							То	lerance cla	ass		
							К	= cust	omer specific		
									Special		
									S - sr	pecial	





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