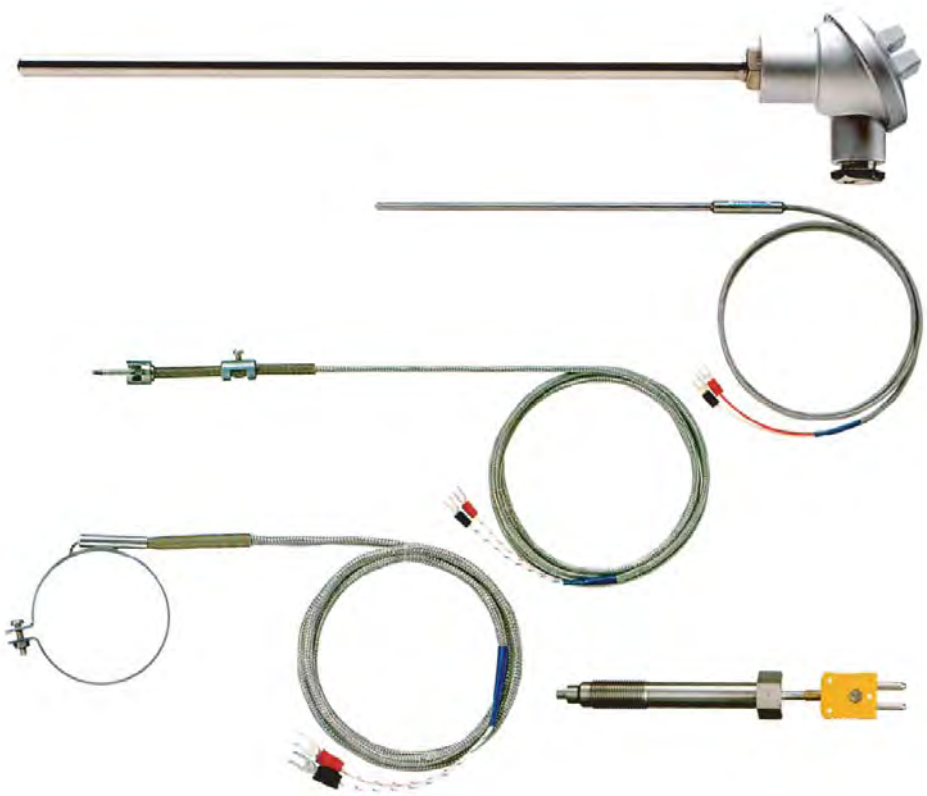
TEMPERATURE SENSOR

Temperature Sensors

- **Thermocouples**
- **Resistance Temperature Detectors**



RKC INSTRUMENT INC.

Precautions for Temperature Sensor

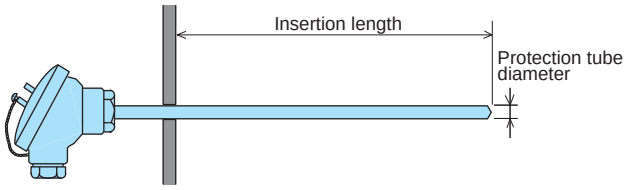
Insertion length

To measure the temperature accurately, the temperature sensor should be thermally balanced against the measuring object. If the actual insertion length of the protection tube is short, the temperature sensor will be thermally affected from the surrounding area and cause an error. The required insertion length will differ depending on the measuring object, protection tube, etc. Install the temperature sensor so that the insertion length will be longer than the values shown in Table 1.

Table 1 : Insertion of thermocouple (Melt protection tube) · Reference value

Measuring object	Insertion length
Liquid	More than 5 times of protection tube diameter
Gas	More than 10 times of protection tube diameter

· Resistance temperature detector should be inserted more deeply. (Approx 2 times of thermocouple)



WIRING

- Check polarity when wiring for the following. Wrong polarity causes measurement error.
  · Connect temperature sensors to element wires, compensation cables, connectors or terminal blocks.
- Use appropriate compensation cables to joint between terminal boxes and instruments when thermocouple is used. Use copper wire cables when resistance temperature detector used.
- When connecting the sensor to a terminal block or a connector, make sure all connections are properly made. If screws are not tightened firmly enough, it may cause a loose contact. A burr on the cable may cause short circuit.
- Consider heat resistance of cable. Contacting cable to heat source or putting it closer causes insulation failure, short-circuit or cable break.
- Double-element type thermocouple
  When thermocouple is double-element type, measurement point is bonded together regardless of grounded junction or ungrounded junction. No need to divide into plus polar and minus polar in each element. Specify when ordering if measurement points need to be bonded individually.

HANDLING

- Connect to specified terminals of sensor inputs when connecting temperature sensors to instruments. Connecting to power supply cause burn, fire or explosion.
- Do not install sensors:
  Near a high-voltage power supply.
  At places where high-voltage could be applied to them due to electric leakage or other causes.
- Avoid quick heating and cooling. It causes failure or damage due to heating shock.
  (Especially pay attention to it in case of using Ceramic Thermocouple Protection Tube .)
- Do not touch temperature sensors till those temperature return to ambient temperature when temperature sensors are used at high or low temperature. It causes burn injury or cold injury.
- Confirm that temperature sensors work well after installment.

- **MgO sheathed temperature sensor**
  Do not bend repeatedly though it is able to bend in the range of 5 times radius of sensor's diameter. It causes failure or damage.
  · Bending work can be specified in the range of three-times radius when ordering.
  Do not bend at the point within 100mm from the tip of measuring points since resistance element is mounted at the tip.
  If the ordered protection tube is long, it may be shipped coiled. To uncoil the tube, carefully restore it by uncoiling it into the reverse direction of coiling. (Don't pull the tube with force while it is still in coil form)

- **Temperature sensor with sleeve**
  Don't bend the cable sharply near the sleeve fixed with resin. Do not use the sensor where the temperature of the sleeve parts exceeds its high limit of operating temperature. It causes disconnection, connection failure, or short-circuit.
  Sheath thermocouples can be ordered with a minimum protection tube length of 50mm.
  However, with a short protection tube, the temperature on the sleeve may be affected by the heat source and need longer time to get stabilized. Temperature error may be also larger. It is recommended to order the protection tube with a longer length considering the operating temperature.

- **Temperature sensor with lead wire**
  Do not forcibly pull the lead wire, it may cause connection failure or short-circuit. When installing or removing sensors using stainless steel shield wire, handle with care to prevent a break of the thin shield wire. Do not bend the lead wire or slide spring excessively or repeatedly.
  Protect your hands with gloves to avoid hurting by shielded cable.

- **Fluorine resin coated temperature sensor**
  Fluorine resin coated temperature is sexcels in chemical resistance. However some chemicals penetrate into the internal of the sensor.
  Use it within the range of the specifications.

- **Temperature sensor with porcelain protection pipe**
  Porcelain protection pipe is easy to be broken. Do not apply an excessive force to the part of protection pipe.

INSPECTION IN USING

Inspect regularly as follows.
· Inspect damaged condition of protection pipe.
· Remove extraneous matter such as soot, dust or sludge.
· Tighten screw at junction part.
· Remove water drops or dew condensation
· Inspect insulation resistance. (except grounded junction sensor)
· Other usage environment.
· Inspect accuracy regularly.

DISPOSAL

Dispose of sensors in compliance with the law, regulation, and any other applicable rules at the place where the sensor is used.

NOTICE

- RKC is not responsible for any damage or injury that is caused as a result of using this sensor, sensor failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of sensors made by imitating this instrument.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.

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Temperature Sensor List

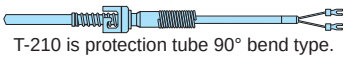
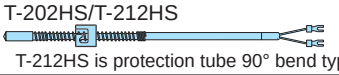
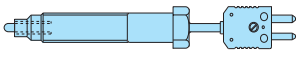
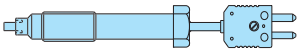
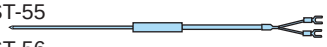
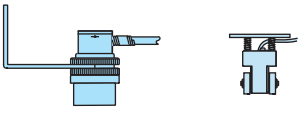
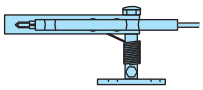
● General Purpose Temperature Sensors

Measuring range differ to protection tube diameter, etc.

Measuring Range (-200 0 200 400 600 800 1000 1200 1400 1600)	Type	Appearance	Features	Reference page
T Type 200°C(250°C) K,J Type 300°C(400°C)	Thermocouples	T-100/T-110 T-110 is protection tube 90° bend type.	Standard type. The diameter of protection tube is either ϕ5 or ϕ6.	12
T Type 250°C(300°C) J Type 450°C(550°C) E Type 500°C(550°C) K Type 750°C(950°C)	Thermocouples	T-101/T-111 T-111 is protection tube 90° bend type. T-102 T-30/35 T-80/T-85 T-90	Standard type. A variety of kinds are available.	13 to 17
R,S Type 1400°C(1600°C) B Type 1500°C(1700°C)	Noble Metal Thermocouples	T-30/T-35 T-80	Temperature sensor which is suitable for high temperature measurement. Platinum is used for element.	18 to 19
T Type 350°C J Type 750°C E Type 800°C K Type 900°C	Sheathed Thermocouples	T-101S/T-111S T-101S is protection tube 90° bend type. T-30S/T-35S T-70S/T-75S T-80S/T-85S T-90S	Thin protection pipe is available. Faster responsiveness. Excellent Vibration and shock resistance.	20 to 24
K,N Type 1200°C	NICROBELL Sheathed Thermocouples	T-101N/T-111N T-111N is protection tube 90° bend type. T-30N/T-35N	High stability, and excellent heat and environmental resistance. Capable of high temperature measurement. Excellent Vibration and shock resistance.	25 to 27
Pt100 Type 650°C JPt100 Type 500°C	Resistance Temperature Detectors	R-101/R-111 R-111 is protection tube 90° bend type. R-102 R-30/35 R-90	High accuracy and stability. Inexpensive compared with the MgO sheathed RTDs.	45 to 49
Pt100/Jpt100 Type 500°C	Sheathed Resistance Temperature Detectors	R-101/R-111S R-30S/35S R-90S	Excellent vibration proof and shock resistance compared with the other standard types of thermocouples.	50 to 52
Pt100/Jpt100 Type 200°C	Sanitary type Sheathed Resistance Temperature Detectors	R-31S/36S R-31RS/36RS	Sanitary designed sensor protected from foreign materials and microbiological contamination. Suitable for usage in food, beverage, chemical processes without concern of contamination.	53 to 54
Pt100 Type 200°C	PFA (Fluororesin) coated temperature sensors (Thermocouple, Resistance Temperature Detectors)	FT-100 FR-100	Chemical and humid resistant PFA coated sensor. PFA coated from the sensing point to the lead wire.	55 to 56

• For thermocouple, value is normal operating temperature limit while that of in ( ) is maximum operating temperature limit. For RTDs, it is operating temperature.

● Temperature sensors for various applications

Measuring Range (-200 0 200 400 600 800 1000)	Type • Usages	Appearance	Features	Reference page
T Type 200°C(250°C) K,J Type 300°C(400°C)	Bayonet type thermocouples [Applications] Plastic molding Cylinder Molding die Hot runner	T-200/T-210  T-210 is protection tube 90° bend type. T-201/T-211 T-201S/T-211S(Sheathed Thermocouple)  T-211(S) is protection tube 90° bend type.	The tip is going to be pressure welded to the measured object by mounting bracket. Suitable for measurement of hot runners, dies and moulds.	29 to 31
K Type 550°C		Sheathed Thermocouple for High Temperature T-202HS/T-212HS  T-212HS is protection tube 90° bend type.	Thermocouple with bayonet. Length can be easily adjusted. Easy mounting is possible by moving the bayonet cap dependent upon the insertion length.	32
T Type 200°C(250°C)		T-220 	Thermocouple with bayonet. Length can be easily adjusted. Decide the position of the mounting bracket dependent upon insertion length and fix the spring by fixed screw.	33
K,J Type 300°C(400°C)		T-221 	Thermocouple with bayonet. Length can be easily adjusted. Easy mounting is possible by moving the bayonet cap dependent upon the insertion length.	33
T Type 200°C(250°C) K,J Type 300°C(400°C)	Screwed Tip Thermocouples [Applications] Plastic molding Cylinder Molding die Hot runner	T-230 	The tip is M6 size (M8 size is also available) rotary screw. Internal screws will be threaded in the fitting point. *M6, M8 is based on JIS Standard.	34
T Type 200°C(250°C) K,J Type 300°C(400°C)	Fixing screw type thermocouples for surface temperature measurement	T-240 	Fix the sensor at a ϕ4.5 fixed screw hole of the tip with a screw. Suitable for temperature measurement for the tiny spaces.	34
T Type 200°C(250°C) K,J Type 300°C(400°C)	Ring type thermocouples for surface temperature measurement [Applications] Plastic molding Cylinder Nozzle Pipe shaped objects	T-250 	Suitable for temperature measurement for the pipe shaped objects and the surface of the nozzles.	35
K,J Type 400°C	Thermocouples for Resin Temperature [Applications] Melting resin temperature of Extruder	T-260 	Capable of measurement of the molten resin temperature, such as the inside of the extruder. M16 screw is cut and its tip directly touches to the melting resin. *M16 is based JIS Standard.	36
K,J Type 400°C	Thermocouples for Resin Temperature [Applications] Melting resin temperature of Extruder	T-270Z 	By utilizing ZHF (zero-heat-flow) method, it eliminates thermal disturbances and temperature errors between the tip and the outside case and realizes more precise temperature measurement of the melting resin.	36
K Type 300°C	Adhesive and exposed tip type temperature sensors [Applications] Surface of electronic parts	ST-50/ST-51 	An adhesive surface at the tip allows easy attachment and measurement of the surface temperature. Exposed type is also available.	37 to 38
K Type 300°C Fluorine resin coating type K Type 500°C Ceramic coating type	Temperature Sensors for Extremely Small Surface [Applications] Surface of electronic parts	ST-55  ST-56 	A fine thermocouple enables measurement of a fine surface or a surface with small thermal capacity such as SMT parts.	39 to 41
ST-100 K Type 300°C ST-100K/K1 K Type 200°C(260°C)	Thermocouple Type Non-Contacting Temperature Sensors [Applications] Surface temperature of Roller and Rotationary objects	ST-100 ST-100K/ST-100K1 	Capable of surface temperature measurement of the rotating objects such as rollers and sheets without direct contact.	42 to 43
K Type 300°C	Rotationary Roll Surface Temperature Measuring Sensors [Applications] Rotationary Roll Surface	JBS-3898 	Capable of surface temperature measurement of the rotating objects such as rollers and sheets with direct contact.	44

• Temperature value : Normal operating temperature limits, ( ) : Maximum operating temperature limits

● Normal operating temperature limits and maximum operating temperature limits

Normal operating temperature limit is a temperature limit of sensors' continuous use in the air. It is a reference temperature that ±0.75% of thermo electromotive force might not change with 10,000 hours of its successive use.

• For R, B, and S type, it is a reference temperature that ±0.5% of thermo electromotive force might not change with 2,000 hours of its successive use.

Maximum operating temperature limit is a limit of allowable temperature for short-term used in unavoidable situations. It is a reference temperature that ±0.75% of thermo electromotive force might not change with 250 hours of successive use.

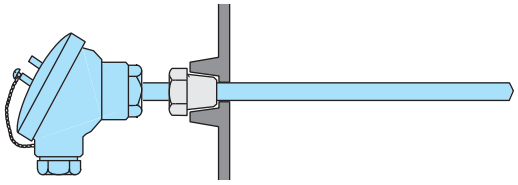
• For R, B, and S type, it is a reference temperature that ±0.5% of thermo electromotive force might not change with 50 hours of its continuous use.

(JIS C1602-1995)

Installation example

● Fixed nipple (nut), Code : A

The insertion length is fixed (specify when you order) as for the nipple is fixed on the protection tube.
Screw will be fit by welding at the fitting side or threading. Screw types will be either tapered or parallel one.

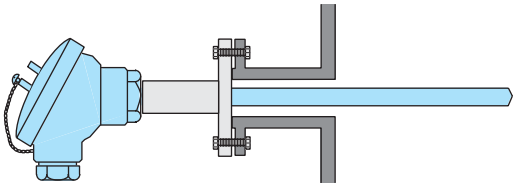


● Rotary nipple (nut), Code : B

The insertion length is fixed (specify when you order) as for the stopper of nipple which is fixed on the protection tube.
Screw will be fit by welding or threading at the fitting side. Easy fitting is realized because only the screw rotates.
There is no air tightness.
Available screw types are taper and parallel.

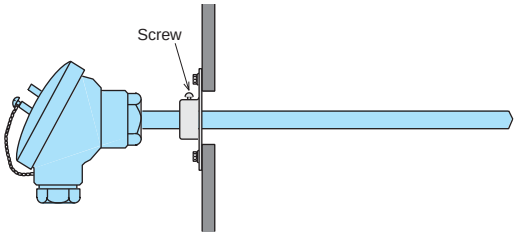
● Fixed flange (Code : C)

The insertion length is fixed (specify when you order) as for the flange is welded to the protection tube.
The flange will be welded to the fitting side in advance, and fixing it with a bolt.



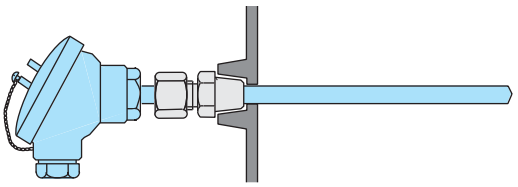
● Sliding flange

The insertion length will be decided arbitrarily. The flange will be fixed at the fitting part with a bolt, and fastened with screws. There is no air proof.



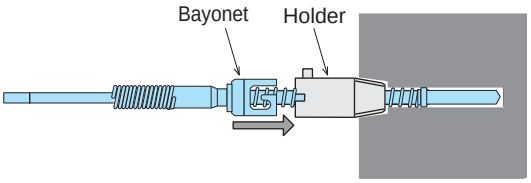
● Compression fitting (Code : E)

The insertion length is freely adjustable. Weld a screw to the mounting side or thread a hole for it. Screw the mounting bracket into the hole. Determine the length and tighten the nut to fix



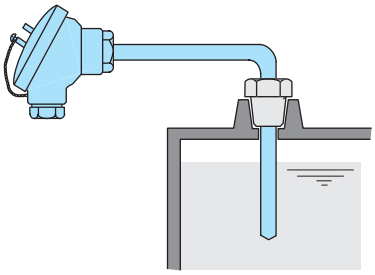
● Bayonet type thermocouple

Thread a hole in advance on the mounting side and screw the holder into the hole.
Hang the bayonet cap on the holder and fix it.
Temperature measuring junction is constantly pressed to the measuring point with the spring force.



● L shape type

Use an L-shaped type where a straight type is hard to install or where lead wire/terminal box may be corroded or thermally affected.

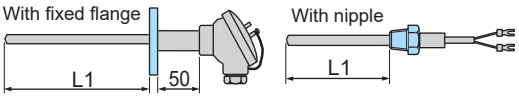


Mounting Brackets

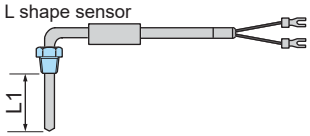
● How to specify the length (L) of the protection tube with the mounting bracket.

With fixed flange / With nipple

For the sensor with fixed flange or fixed nipple, specify length (L) by referring length of under the screw or under the flange.
If a space is required between the mounting bracket and the sleeve or between the mounting bracket and the terminal box, please specify it as well.

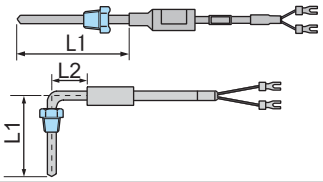


For L shape sensors, mounting bracket will be installed as the below picture.
* Please contact with our distributors in case mounting bracket is needed to install to other places.



With compression fitting

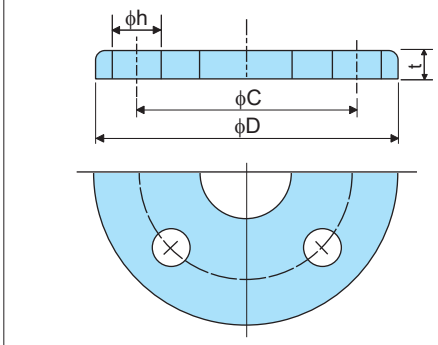
For the sensor with compression fitting, specify length (L) by referring the terminal box and the sleeve as the same order way without mounting bracket.



● Flange

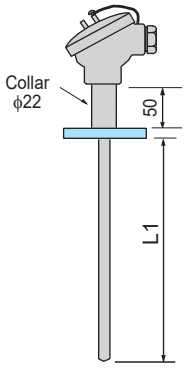
● JIS • FF flange (Fixed type) <Material : SUS304>

Unit:mm



	Name of Size		Dimension of Flange		Bolt Hole		
	A	B	ϕD	t	ϕC	ϕh	Number of Hole
JIS 5K Flange	10	3/8	75	9	55	12	4
	15	1/2	80	9	60	12	4
	20	3/4	85	10	65	12	4
	25	1	95	10	75	12	4
	40	1 1/2	120	12	95	15	4
	50	2	130	14	105	15	4
	65	2 1/2	155	14	130	15	4
	80	3	180	14	145	19	4
JIS 10K Flange	10	3/8	90	12	65	15	4
	15	1/2	95	12	70	15	4
	20	3/4	100	14	75	15	4
	25	1	125	14	90	19	4
	40	1 1/2	140	16	105	19	4
	50	2	155	16	120	19	4
	65	2 1/2	175	18	140	19	4
	80	3	185	18	150	19	8
JIS 20K Flange	25	1	125	16	90	19	4
	40	1 1/2	140	18	105	19	4
	50	2	155	18	120	19	8
	65	2 1/2	175	20	140	23	8
	80	3	200	22	160	23	8

* A collar will be equipped between the fixed flange and the terminal box if diameter of the protection pipe is under φ10,

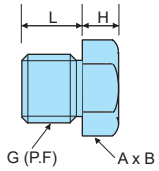


How to Specify For JIS 5K flange, pleasse specify as JIS5K (fixed) flange 10A or specify as 3/8B.

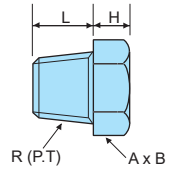
• RF flange is also available. Please specify when you order.

● Nipple (nut) <Material : SUS304>

Parallel Screw



Taper Screw



Unit:mm

G(PF)/R(PT)	Diameter of protection tube	L	H	A x B
1/8	ϕ6 or less	10	6	14×16.2
1/4	ϕ8 or less	12	6	17×19.6
3/8	ϕ10 or less	15	7	21×24.2
1/2	ϕ12 or less	18	10	26×30
3/4	ϕ16 or less	22	16	32×37
1	ϕ22 or less	22	16	41×47.3

How to Specify

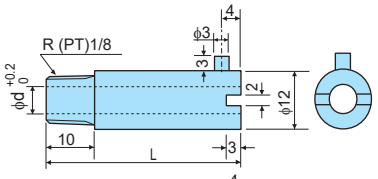
Please specify as G or PF (parallel nipple) 1/8 • R or PT(taper nipple) 1/8.

• Parallel nipple • taper nipple are both applied to the fixed and rotary nipples.

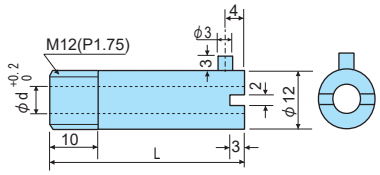
● Holder

T-220 Holder Available model (Inner diameter ϕd=5.2mm) : T-220,221,202SH,212SH

T-200 Holder Available model (Inner diameter ϕd=7.2mm) : T-200,201,210,211



Screw : R(PT)1/8
L=32,40,62
(Please specify when you order)

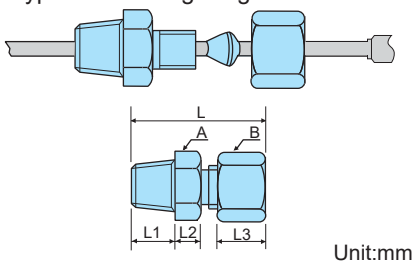


Screw : M12(P1.75)
L=32,62
(Please specify when you order)

• Different types of screws are also available.

● Compression Fitting

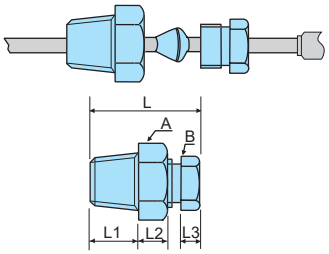
Cap nut type <Fastening Ring Material : SUS304>



Unit:mm

R(PT)	Diameter of protection tube	L	L1	L2	L3	A	B
1/8	1.6	33	10	6	12	12×13.7	12×13.7
	3.2	33	10	6	12	12×13.7	12×13.7
	4.8	35	10	6	14	12×13.7	14×16.2
1/4	3.2	37	14	6	12	14×16.2	12×13.7
	4.8	38	14	6	14	14×16.2	14×16.2
	6.4	38	14	6	14	14×16.2	14×16.2
	8.0	41	14	6	16	17×19.6	17×19.6

Push screw type <Fastening Ring Material : Brass or copper>



Unit:mm

R(PT)	Diameter of protection tube	L	L1	L2	L3	A	B
3/8	3.2	39	16	15	5	22×25.4	14×16.2
	4.8	40	16	15	5	22×25.4	14×16.2
	6.4	45	16	19	5	22×25.4	17×19.6
	8.0	44	16	19	5	22×25.4	17×19.6
1/2	3.2	43	20	15	5	24×27.7	14×16.2
	4.8	44	20	15	5	24×27.7	14×16.2
	6.4	49	20	19	5	24×27.7	17×19.6
	8.0	48	20	19	5	24×27.7	17×19.6

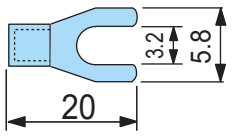
Lead wire termination

● Lead wire termination

For lead wire termination (compensation wire and copper wire), Spade lugs, Ring lugs, connector, and TC type connector are available. We also can provide requested termination type.

Spade lugs

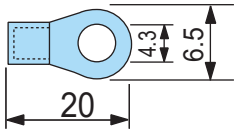
JIS standard "M3" size screw



V1.25-B3A
(Manufactured by J.S.T MFG CO., LTD.)

Ring lugs

JIS standard "M4" size screw

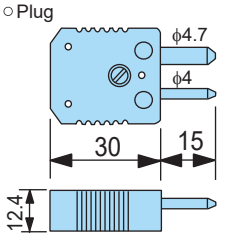


V1.25-M4
(Manufactured by J.S.T MFG CO., LTD.)

Thermocouple connectors

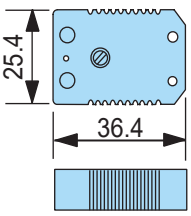
Composition of the leadwire will be as follows [(plug) + (clamp) + (jack)] when TC connector [code : TE] is specified. For other types and combinations, please refer to p.10.

○ Plug



Model Code : CSP01-□

○ Jack



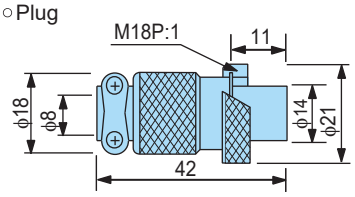
Model Code : CSP02-□

Metal connectors

Connector is manufactured by Sanwa Connector laboratory Co., Ltd..
Metal connector manufactured by Nanaboshi Electric Mfg. Co., Ltd. is also available.

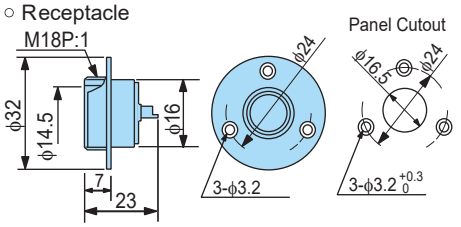
Manufactured by Sanwa Connector Laboratory Co., Ltd. (Standard)

○ Plug



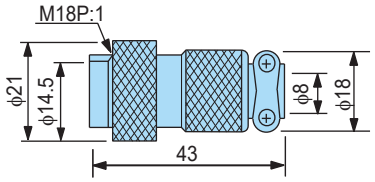
Specification	Model Code
Thermocouple (Single element)	SCK-1602-P
Thermocouple (Double element)	SCK-1604-P
Resistance Temperature Detector (Single element)	SCK-1603-P
Resistance Temperature Detector (Double element)	SCK-1606-P

○ Receptacle



Specification	Model Code
Thermocouple (Single element)	SCK-1602-R
Thermocouple (Double element)	SCK-1604-R
Resistance Temperature Detector (Single element)	SCK-1603-R
Resistance Temperature Detector (Double element)	SCK-1606-R

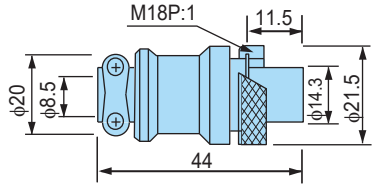
○ Adaptor



Specification	Model Code
Thermocouple (Single element)	SCK-1602-A
Thermocouple (Double element)	SCK-1604-A
Resistance Temperature Detector (Single element)	SCK-1603-A
Resistance Temperature Detector (Double element)	SCK-1606-A

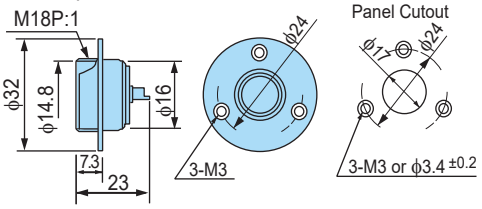
Manufactured by Nanaboshi Electric Mfg. Co., Ltd.

○ Plug



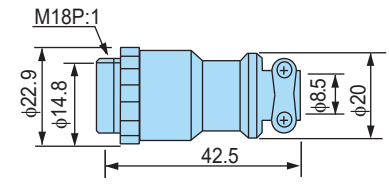
Specification	Model Code
Thermocouple (Single element)	NCS-162-P-CH
Resistance Temperature Detector (Single element)	NCS-163-P-CH

○ Receptacle



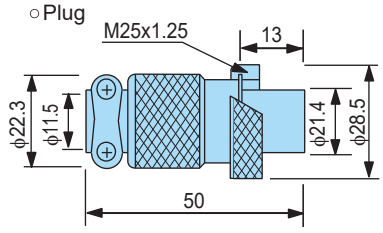
Specification	Model Code
Thermocouple (Single element)	NCS-162-R-CH
Resistance Temperature Detector (Single element)	NCS-163-R-CH

○ Adaptor



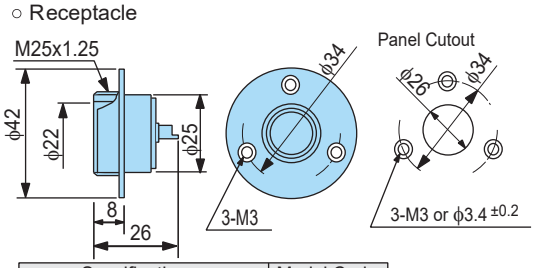
Specification	Model Code
Thermocouple (Single element)	NCS-162-Ad-CH
Resistance Temperature Detector (Single element)	NCS-163-Ad-CH

○ Plug



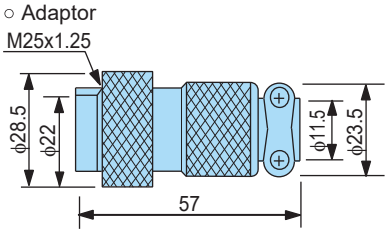
Specification	Model Code
Thermocouple (Double element)	NCS-254-P
Resistance Temperature Detector (Double element)	NCS-256-P

○ Receptacle



Specification	Model Code
Thermocouple (Double element)	NCS-254-R
Resistance Temperature Detector (Double element)	NCS-256-R

○ Adaptor



Specification	Model Code
Thermocouple (Double element)	NCS-254-Ad
Resistance Temperature Detector (Double element)	NCS-256-Ad

Connector has 2 types. One is "Female connector type (standard), the other one is "Male connector type".

Female connector type (standard)

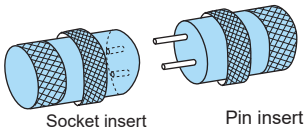
Specification
Socket insert plug
Pin insert receptacle
Pin insert adaptor

Male connector type

Specification
Pin insert plug
Socket insert receptacle
Pin insert adaptor

(There are some changes in codes dependent upon production companies. For Sanwa Connector Laboratory Co., Ltd., NCF will be SCH. For Nanaboshi Electric Mfg. Co., Ltd., plugged end connector will be P to PM, receptacle will be R to RF, and adaptor will be Ad to AdF.

Plug



Socket insert (Female connector)

Pin insert (Male connector)

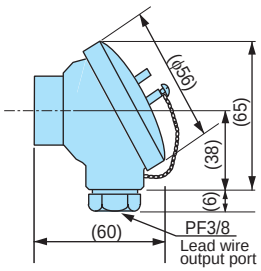
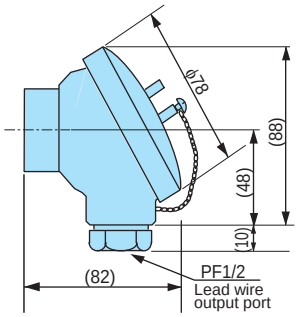
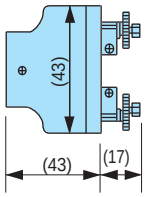
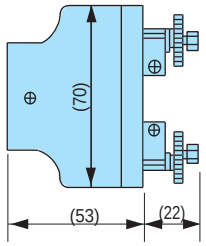
☐ Pin numbers and polarity (standard)

(Single element)

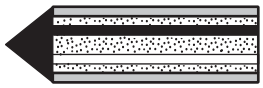
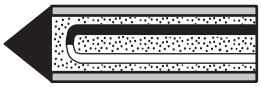
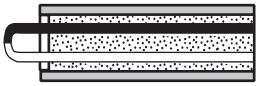
(Double element)

Terminal head • Measuring junction • Tip processing • Lead wire termination

● Terminal head

Name		Enclosed-terminal 30 type Terminal Head	Enclosed-terminal 35 type Terminal Head	Exposed terminal 80 type Terminal Head	Exposed terminal 85 type Terminal Head
Appearance Unit:mm					
Specifications	Material	Aluminum die cast	Aluminum die cast	Phenol resin	Phenol resin
	Lead wire output port	PF3/8	PF1/2	Exposed terminal	Exposed terminal
	Number of Terminals	• Thermocouple : 2 • Resistance temperature detector : 3	• Thermocouple : 2, 4 • Resistance temperature detector : 3, 6	Thermocouple : 2	Thermocouple : 2
	Terminal board Material	Steatite porcelain	Steatite porcelain	Phenol resin	Phenol resin
	Available diameter of protection tube — Metal	φ3 to φ10	φ4.8 to φ22	φ3 to φ10	φ4.8 to φ22
	Available diameter of protection tube — Non-metal	φ6 to φ10	φ6 to φ17	φ6 to φ10	φ6 to φ17
	Coating Color	Silver	Silver	Black	Black

● Measuring junction

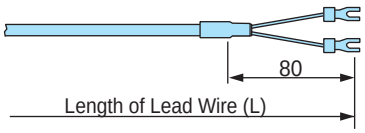
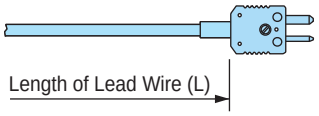
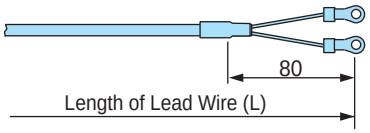
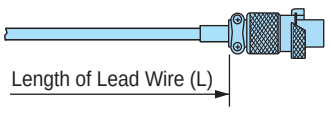
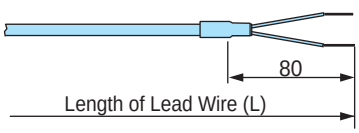
Grounded (Example of Thermocouple)	Ungrounded (Example of Thermocouple)	Exposed (Example of Thermocouple)
		
Thermocouple wires are directly welded to the sheath end. As response is faster, it is suitable for measurement under high temperature and high pressure condition. It is not recommended in the presence of hazard and noise voltages because wires are directly welded to the sheath end.	Completely insulated between the thermocouple element/resistance element and the sheath. The Hot junction is also insulated. Response is slower than the grounded type. Less EMF change by time. Can be used for a comparatively long period of time. Not affected by noise voltage.	Thermocouple wires are exposed from the sheath. As response is fastest, it can follow even a little temperature change. Avoid being used over a long period of time under corrosive atmosphere or high temperature and high pressure conditions due to no air tightness and mechanical strength.

Type		Grounded	Ungrounded	Exposed
Thermocouple	General type	Available	Available	Available
	Sheathed type	Available	Available	Available
Resistance temperature detector	General type	Not available	Available	Available
	Sheathed type	Not available	Available	Not available

● Tip processing

Type	Features
Silver soldering	Maximum heat resistance degree for welding is 500ºC. Not suitable for food and plating applications since it is largely affected by corrosive.
Argon welding	Non-MgO sheathed sensors for high temperature use are welded by argon. All of MgO sheathed sensors are welded by argon.

● Lead wire termination

Spade lugs for JIS standard "M3" size screw	Thermocouple connector
	
Ring lugs for JIS standard "M4" size screw	**Metal connector**
	
No terminal lugs *terminal soldered	
	

Thermocouple Connectors

If standard connector is used for connecting compensating cables for thermocouple, it will cause indication error because the materials of connection terminals differ from those of leadwires and compensation cables.
By using connectors for thermocouple, accuracy of thermocouple can be maintained because connection terminals of the connector are the same materials with thermocouple. There is no concern of intervention of different types of metals.

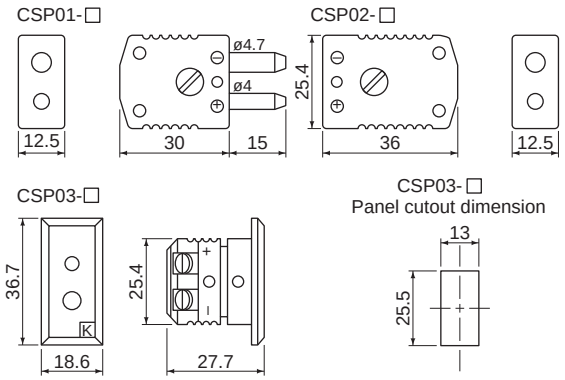
● Standard Size (Polyamide) CSP☐☐−☐

Recommended tightening torque : 1.5kgf•cm
Applicable Sheathed diameter : 2.8 to 6mm


(Plug) CSP01-☐


(Jack) CSP02-☐


(Panel Jack) CSP03-☐

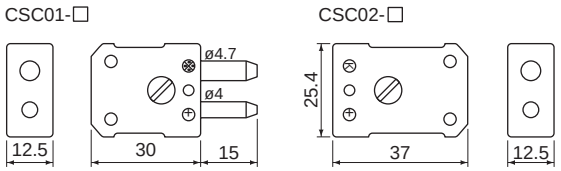


● Standard Size : For High temperature (Ceramic) CSC☐☐−☐

Recommended tightening torque : 1.5kgf•cm
Applicable Sheathed diameter : 2.8 to 6mm


(Plug) CSC01-☐


(Jack) CSC02-☐



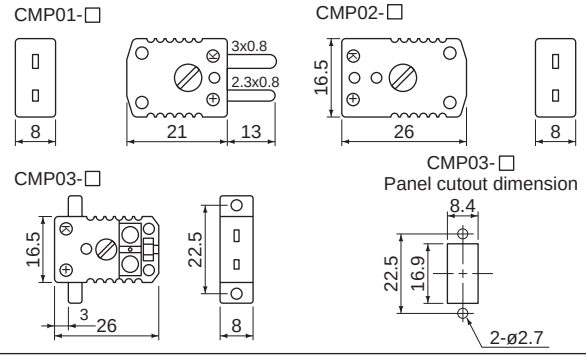
● Miniature Size (Polyamide) CMP☐☐−☐

Recommended tightening torque : 1.5kgf•cm
Applicable Sheathed diameter : 0.5 to 4mm


(Plug) CMP01-☐


(Jack) CMP02-☐


(Panel Jack) CMP03-☐

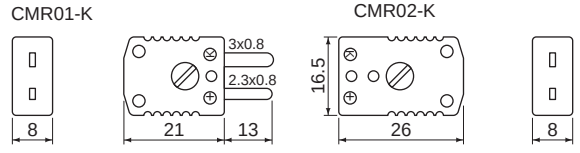


● Miniature Size : For High temperature (Ryton) CMR☐☐−K

Recommended tightening torque : 1.5kgf•cm
Applicable Sheathed diameter : 0.5 to 4mm


(Plug) CMR01-K


(Jack) CMR02-K



• Standard type for high temperature applications (Ryton) : CSR ☐☐- K is available.
Please contact with our distributors.

- 3 thermocouple types are available : K, J, and T. (R type is available for polymaide miniature.)
- Color of K type connector is yellow, J type is black, and T type is blue.
  (If ryton is a material for the connector, its color is brown. This is only for K type)
  Please note that color of each lead wire is different.
- The attached rubber packing and metal adaptor
  Please use rubber seal or metal adapter to stabilize in case the hole size of connector is too bigger against the size of compensation cable or MgO sheathed tube. To stabilize connection, slide rubber seal or metal adapter into the groove of thermocouple connector.
  Either of seal rubber or metal adapter is standard accessory.

Thermocouple Connectors

● Model Code

Specifications	Model and Suffix Code				
	C		□□	□□−□	
Connector Material	Standard Size (Polyamide)	Max.120ºC	SP		
	Standard Size (Ceramic)	Max.900ºC	SC		
	Miniature Size (Polyamide) *2	Max.120ºC	MP		
	Miniature Size (Ryton) *1, *3	Max.220ºC	MR		
Type	Plug			01	
	Jack			02	
	Panel Jack			03	
	Plug + Jack			12	
	Plug + Panel Jack			13	
Thermocouple Type	K : Yellow				K
	J : Black				J
	T : Blue				T

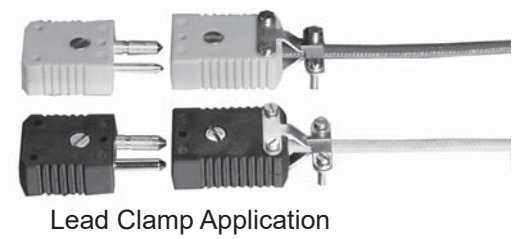
*1 : For the miniature size (ryton), only K is available. Its color is brown.
*2 : For the miniature type (polyamide), R is also available. Its color is green. Please select "R" at thermocouple material code.
*3 : Standard type (ryton) K is also available. Please contact with our distributors.

Material	Type	Model Code
Polyamide	Standard Size (Plug + Jack)	CSP12- □
	Standard Size (Plug + Panel Jack)	CSP13- □
	Standard Size (Plug)	CSP01- □
	Standard Size (Jack)	CSP02- □
	Standard Size (Panel Jack)	CSP03- □
Ceramic	Standard Size (Plug + Jack)	CSC12- □
	Standard Size (Plug)	CSC01- □
	Standard Size (Jack)	CSC02- □
Polyamide	Miniature Size (Plug + Jack)	CMP12- □
	Miniature Size (Plug + Panel Jack)	CMP13- □
	Miniature Size (Plug)	CMP01- □
	Miniature Size (Jack)	CMP02- □
	Miniature Size (Panel Jack)	CMP03- □
Ryton	Miniature Size (Plug + Jack)	CMR12-K
	Miniature Size (Plug)	CMR01-K
	Miniature Size (Jack)	CMR02-K

● Lead Clamp

CLP-A
(For standard size)

CLP-B
(For miniature size)



Lead Clamp Application

● Accessories

Metal adaptor

Specifications	Model Code	Order
For standard size	ADP−AM	10 pieces per set
For miniature size	ADP−BM	

Rubber packing

Specifications	Model Code	Order
For standard size	ADP−AG	10 pieces per set
For miniature size	ADP−BG	

● Model and suffix code for thermocouple connector with lead wire

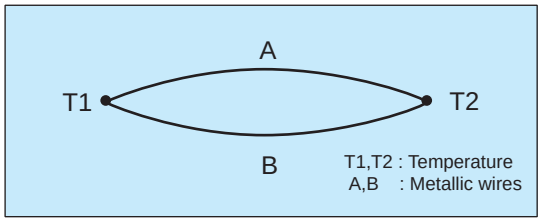
Model Code	Type	
TE	CSP01 + CLP-A + CSP02	Standard Size (Plug + Clamp + Jack)
TS1	CSP01 + CLP-A	Standard Size (Plug + Clamp)
TS2	CSP01	Standard Size (Plug)
TS3	CSP01 + CLP-A + CSP03	Standard Size (Plug + Clamp + Panel Jack)
TS4	CSP01 + CSP02	Standard Size (Plug + Jack)
TSA	CSP02 + CLP-A	Standard Size (Jack + Clamp)
TSB	CSP02	Standard Size (Jack)
TM1	CMP01 + CLP-B	Miniature Size (Plug + Clamp)
TM2	CMP01	Miniature Size (Plug)
TM3	CMP01 + CLP-B + CMP03	Miniature Size (Plug + Clamp + Panel Jack)
TM4	CMP01 + CLP-B + CMP02	Miniature Size (Plug + Clamp + Jack)
TM5	CMP01 + CMP02	Miniature Size (Plug + Jack)
TMA	CMP02 + CLP-B	Miniature Size (Jack + Clamp)
TMB	CMP02	Miniature Size (Jack)

• For the other types, please contact with our distributors.

General purpose type • Sheathed Thermocouples

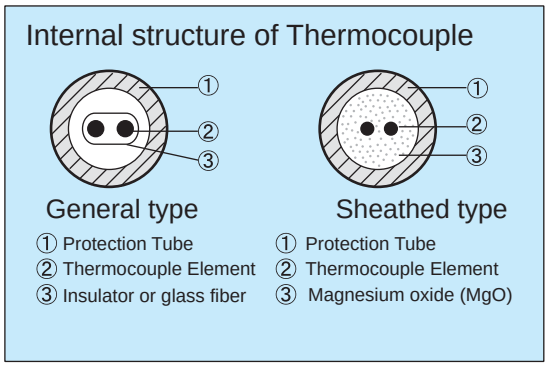
■ Thermocouple

A thermocouple consists of two dissimilar metallic wires, edge of its each wire is jointed, and measures a voltage produced according to a difference of the temperatures through each metallic wire.
This effect is called Seebeck effect and has been known from long time ago.
If a combination of two dissimilar metallic wires are correct, their thickness or shapes do not effect on temperature measurement.
This type of sensor excels in processability for this reason, thus it is widely used in industrial plants.



■ Sheathed Thermocouple

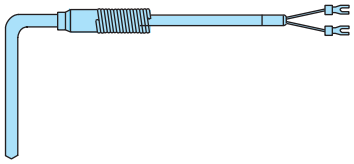
Insulator(Magnesium oxide) is mounted between the protection tube and the measuring element.
This type of sensor features in excellent responsiveness and vibration resistances.



Spring loaded type (Only for General type)

T-100

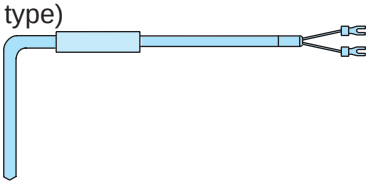
T-110



Sleeve type

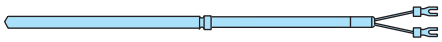
T-101(General type)
T-101S(Sheathed type)

T-111(General type)
T-111S(Sheathed type)



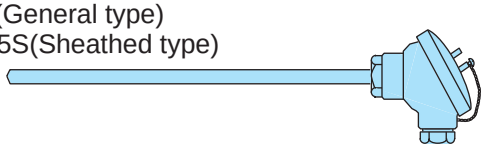
No-sleeve type (Only for General type)

T-102



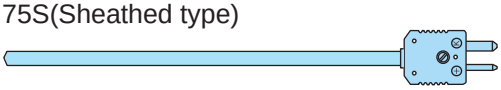
Terminal head type

T-30,35(General type)
T-30S,35S(Sheathed type)



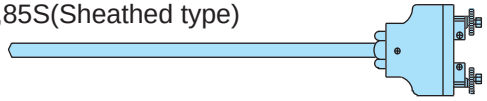
Thermocouple connector type

T-70S,75S(Sheathed type)



Exposed terminal head type

T-80,85(General type)
T-80S,85S(Sheathed type)



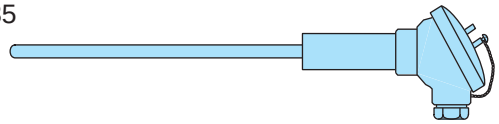
Metal connector type

T-90(General type)
T-90S(Sheathed type)

Noble Metal type (For High Temperature)

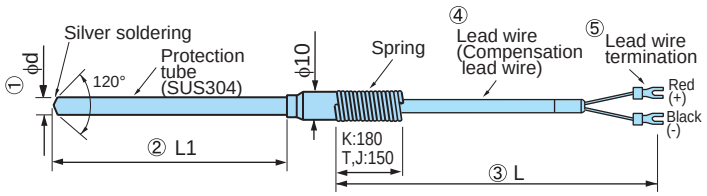
Protection tube is porcelain

T-30,35



T-80

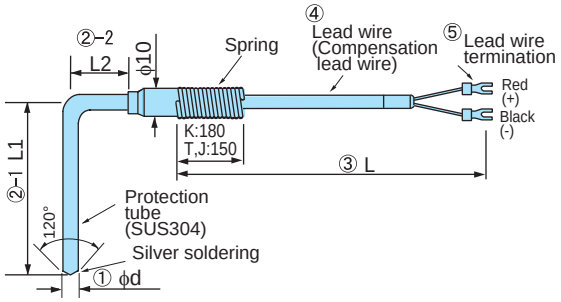
Thermocouples : T-100/T-110



T - 100 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-100-5-100-2000-EXA-Y-K-G-N



T - 110 - ϕd - L1 - L2 - L - □□□ - □ - □ - □ - □
① ②–1 ②–2 ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
②–1, 2 Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-110-5-100-30-2000-EXA-Y-K-G-N

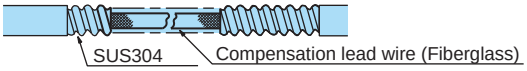
①	Diameter of protection tube	ϕ5.0, ϕ6.0
②	Length of protection tube	Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length. ②– 1 Specify length by “mm” (100mm or more, L1+L2=1,000mm or less) ②– 2 Specify length by “mm” (25mm or more, L1+L2=1,000mm or less) • Length is 25mm without specification. • Please contact distributors regarding other length.
③	Lead wire length	Specify length by “mm” (100mm or more)
④	Lead protection	Code: EXA — Details: Fiberglass with stainless steel — Operating temperature: 0 to 150ºC Code: EXB — Details: Fiberglass — Operating temperature: 0 to 150ºC
⑤	Lead wire termination	Code: Y — Details: Spade lugs for JIS standard "M3" size screw Code: R — Details: Ring lugs for JIS standard "M4" size screw Code: M — Details: Metal connector (SCK-1602-P) Code: TE*1 — Details: Thermocouple connector (CSP01+CLP-A+CSP02) Code: N — Details: No terminal lugs *terminal soldered •See Page7 *1 : Other thermocouple connector : See Page 10
⑥	Thermocouple type	Code: K — Details: Type K (Chromel-Alumel) Code: J — Details: Type J (Iron-Constantan) Code: T — Details: Type T (Copper-Constantan)
⑦	Measuring junction	Code: G — Details: Grounded Code: NG — Details: Ungrounded
⑧	Mounting bracket	Code: E — Details: Compression fitting Code: N — Details: No bracket • Specify size of mounting braket when code is "E".
	Specifications	Class : class 2 * Class 1 is available (Please specify when you order) Element : Single element * Double element is available (Please specify when you order) Maximum temperature for use

Thermocouple type	Operating temperature for regular use	Maximum temperature
K	300ºC	400ºC
J	300ºC	400ºC
T	200ºC	250ºC

Reference

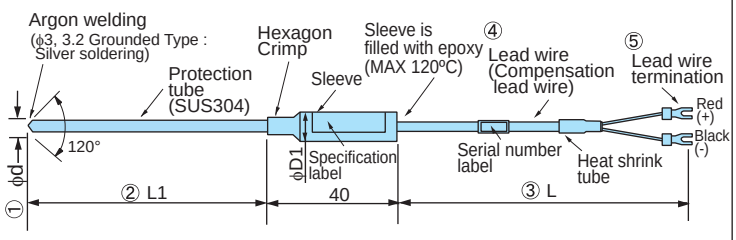
• Stainless flexible lead wire is available

Model Code : T-100F/T-110F



• No waterproof

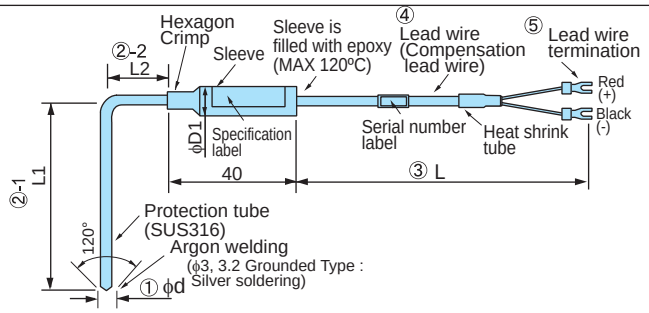
Thermocouples : T-101/T-111



T - 101 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-101-5-100-2000-EXA-Y-K-G-N



T - 111 - ϕd - L1 - L2 - L - □□□ - □ - □ - □ - □
① ②–1 ②–2 ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
②–1, 2 Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-111-5-100-30-2000-EXA-Y-K-G-N

① Diameter of protection tube

ϕ3.0, ϕ3.2, ϕ4.8, ϕ5.0, ϕ6.0, ϕ6.4, ϕ8.0

② Length of protection tube

Specify length by “mm” (100mm to 1,000mm)
• Please contact distributors regarding other length.

②– 1 Specify length by “mm”
(100mm or more, L1+L2=1,000mm or less)
②– 2 Specify length by “mm”
(25mm or more, L1+L2=1,000mm or less)
• Length is 25mm if not specified.
• Please contact distributors regarding other length.

③ Lead wire length

Specify length by “mm” (100mm or more)

④ Lead protection

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC	EXF	Fluorocarbon polymers (FEP)	0 to 200ºC

⑤ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)	E	Type E (Chromel-Constantan)

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded
O	Exposed *

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

Specify size of mounting braket when code is "A", "B", or "E". (See Page 6)
Specify size of flange when code is "C". (See Page 6)
• Please contact distributors regarding other mounting bracket.

Specifications

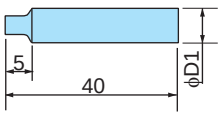
Class : class 2
Element : Single element
* Class 1 is available (Please specify when you order)
* Double element is available. (Diameter of protection tube : ϕ4.8 or more) (Please specify when you order)

Maximum temperature for use

Thermocouple type	Diameter of protection tube	T-101 Operating temperature for regular use	T-101 Maximum temperature	T-111 Operating temperature for regular use	T-111 Maximum temperature
K	ϕ3.0 to ϕ3.2	300ºC	400ºC	300ºC	400ºC
	ϕ4.8 to ϕ6.4	650ºC	850ºC	300ºC	400ºC
	ϕ8.0	750ºC	950ºC	300ºC	400ºC
J	ϕ3.0 to ϕ3.2	200ºC	300ºC	200ºC	300ºC
	ϕ4.8 to ϕ6.4	400ºC	500ºC	300ºC	400ºC
	ϕ8.0	450ºC	550ºC	350ºC	400ºC
T	ϕ4.8 to ϕ6.4	200ºC	250ºC	200ºC	250ºC
	ϕ8.0	250ºC	300ºC	250ºC	300ºC
E	ϕ3.0 to ϕ3.2	200ºC	300ºC	200ºC	300ºC
	ϕ4.8 to ϕ6.4	450ºC	500ºC	300ºC	400ºC
	ϕ8.0	500ºC	550ºC	300ºC	400ºC

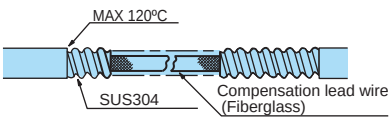
Sleeve Dimension (ϕD1)

Lead wire type \ Diameter of protection tube	ϕ3.0 to ϕ5.0	ϕ6.0 to ϕ8.0
EXA,EXB,EXC EXD,EXF	ϕ8×40	ϕ10×40
EXE	ϕ10×40	



Reference

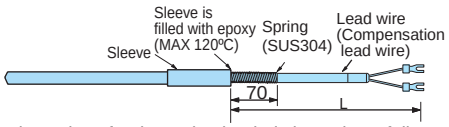
• Stainless flexible lead wire is available
Model Code : T-101F/T-111F



For flexible lead wire, the dimension of the sleeve is ϕ10 x 40mm.(Lead protection EXB type is same to standard specification.)

• No waterproof

• Spring loaded type is available
(Please specify when you order)

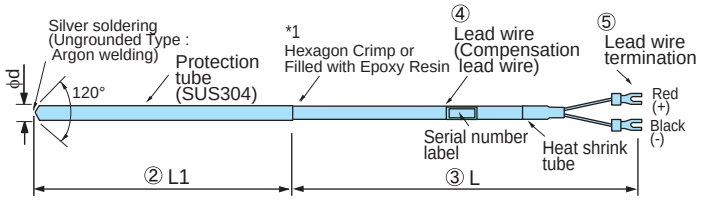


Dimensions for the spring loaded sleeve is as follows.
• Protection tube ϕ8 with extension lead wire EXA, EXB, EXD : ϕ10 x 40mm
• Protection tube ϕ3.0 to ϕ8.0 with extension lead wire EXC : ϕ10 x 40mm
• Except trom the above: : ϕ8 x 40mm

• Material of protection tube
SUS316 is available.
(Please specify when you order)

Thermocouples : T-102

Diameter of protection tube (ϕd) : 3.0, 3.2



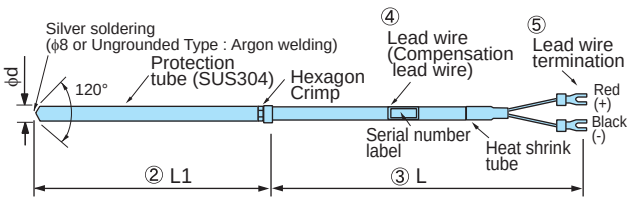
*1:Fiber glass lead protection (EXB) : Hexagon Crimp
Fluorocarbon polymers lead protection (EXF) : Filled with Epoxy Resin

T - 102 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-102-3.2-300-2000-EXA-Y-K-G-N

Diameter of protection tube (ϕd) : 4.0 or more



T - 102 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-102-5.0-300-2000-EXA-Y-K-G-N

①	Diameter of protection tube	ϕ3.0, ϕ3.2	ϕ4.0, ϕ4.8, ϕ5.0, ϕ6.0, ϕ8.0
②	Length of protection tube	Specify length by “mm” (30mm to 500mm)	• Please contact distributors regarding other length.
③	Lead wire length	Specify length by “mm” (100mm to 10,000mm)	• Please contact distributors regarding other length.

④ Lead protection

Code	Details	Operating temperature
EXB	Fiberglass	0 to 150ºC
EXF	Fluorocarbon polymers (FEP)	0 to 200ºC

Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC
EXB	Fiberglass	0 to 150ºC
EXE	Silicone rubber (Only for ϕ4.8, ϕ5.0, Type K)	-20 to +90ºC

⑤ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE *1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)		

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded
O	Exposed *

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

Specify size of mounting braket when code is "A", "B", or "E". (See Page 6)
Specify size of flange when code is "C". (See Page 6)

• Please contact distributors regarding other mounting bracket.

Specifications

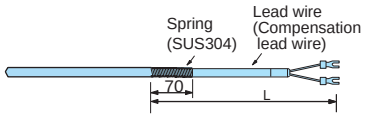
Class : class 2 * Class 1 is available (Please specify when you order)
Element : Single element * Double element is available. (Diameter of protection tube : ϕ4.8 or more) (Please specify when you order)

Maximum temperature for use

Thermocouple type	Operating temperature for regular use				Maximum temperature			
	Lead protection (Code)				Lead protection (Code)			
	EXA	EXB	EXE	EXF	EXA	EXB	EXE	EXF
K	300ºC	300ºC	180ºC	200ºC	400ºC	400ºC		
J	300ºC	300ºC	180ºC	200ºC	400ºC	400ºC		
T	200ºC	200ºC	180ºC	200ºC	250ºC	250ºC		

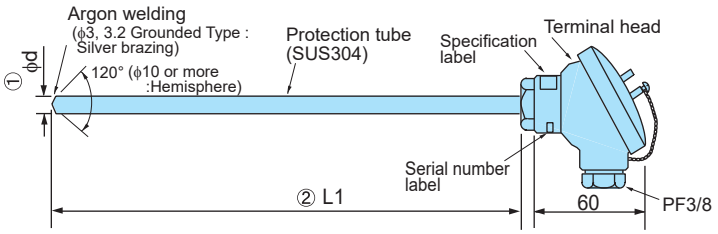
Reference

• Spring loaded type is available
(Please specify when you order)



• Material of protection tube
SUS316 is available.
(Please specify when you order)

Thermocouples : T-30/T-35



No lead wire

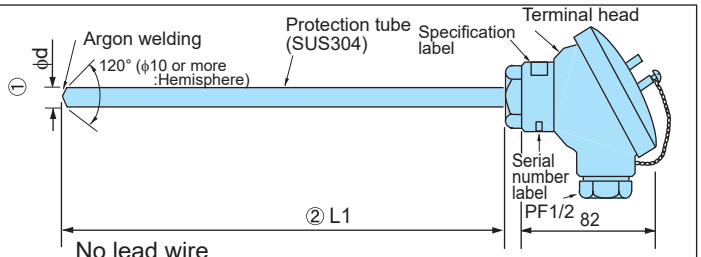
T - 30 - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

T - 30 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-30-5-100-K-G-N (No lead wire)
:T-30-5-100-2000-EXA-Y-K-G-N (With lead wire)



No lead wire

T - 35 - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

T - 35 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-35-5-100-K-G-N (No lead wire)
:T-35-5-100-2000-EXA-Y-K-G-N (With lead wire)

①	Diameter of protection tube	ϕ3.0, ϕ3.2, ϕ4.8, ϕ5.0, ϕ6.0, ϕ8.0, ϕ10.0	ϕ4.8, ϕ5.0, ϕ6.0, ϕ8.0, ϕ10.0, ϕ12.0, ϕ15.0 • Please contact distributors regarding ϕ21.7.
②	Length of protection tube	Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length.	Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length.
③	Lead wire length	Specify length by “mm” (100mm or more)	

④ Lead protection (No need to specify in case of without lead wire)

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC			

⑤ Lead wire termination (No need to specify in case of without lead wire)

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)	E	Type E (Chromel-Constantan)

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded
O	Exposed *

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

• Please contact distributors regarding other mounting bracket.

Specify size of mounting bracket when code is "A", "B", or "E".
Specify size of flange when code is "C".

Specifications

Class : class 2
Element : Single element

* Class 1 is available (Please specify when you order)
* Double element is available. (Only for T-35) (Please specify when you order)

Maximum temperature for use

Protection tube : SUS304

Thermocouple type	Diameter of protection tube	Operating temperature for regular use	Maximum temperature
K	ϕ3.0 to ϕ3.2	300ºC	400ºC
	ϕ4.8 to ϕ6.0	650ºC	850ºC
	ϕ8.0 or more	750ºC	950ºC
J	ϕ3.0 to ϕ3.2	200ºC	300ºC
	ϕ4.8 to ϕ6.0	400ºC	500ºC
	ϕ8.0 or more	450ºC	550ºC
T	ϕ3.0 to ϕ6.0	200ºC	250ºC
	ϕ8.0 or more	250ºC	300ºC
E	ϕ3.0 to ϕ3.2	200ºC	300ºC
	ϕ4.8 to ϕ6.0	450ºC	500ºC
	ϕ8.0 or more	500ºC	550ºC

Reference

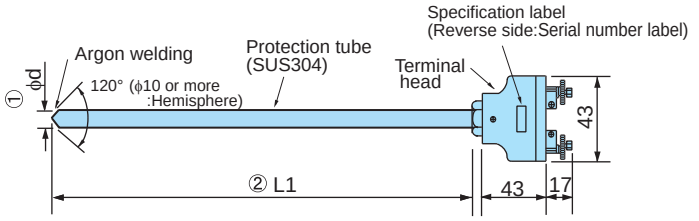
• Material of protection tube

SUS316 is available.
(Please specify when you order)

• High temperature type

Thermocouple type R, S, B for high temperature type :
See page 18.

Thermocouples : T-80/T-85



No lead wire

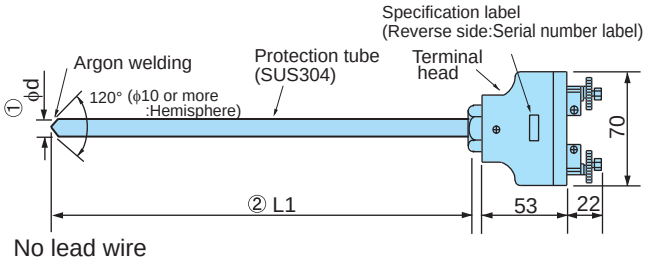
T - 80 - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

T - 80 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-80-5-100-K-G-N (No lead wire)
:T-80-5-100-2000-EXA-Y-K-G-N (With lead wire)



No lead wire

T - 85 - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

T - 85 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-85-5-100-K-G-N (No lead wire)
:T-85-5-100-2000-EXA-Y-K-G-N (With lead wire)

① Diameter of protection tube

ϕ3.0, ϕ3.2, ϕ4.8, ϕ5.0, ϕ6.0, ϕ8.0, ϕ10.0

ϕ4.8, ϕ5.0, ϕ6.0, ϕ8.0, ϕ10.0, ϕ12.0, ϕ15.0
• Please contact distributors regarding ϕ21.7.

② Length of protection tube

Specify length by “mm” (100mm to 1,000mm)
• Please contact distributors regarding other length.

③ Lead wire length

No need to specify in case of without lead wire

Specify length by “mm” (100mm or more)

④ Lead protection

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC			

⑤ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)	E	Type E (Chromel-Constantan)

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded
O	Exposed *

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

• Please contact distributors regarding other mounting bracket.

Specify size of mounting bracket when code is "A", "B", or "E".
Specify size of flange when code is "C".

Specifications

Class : class 2
* Class 1 is available (Please specify when you order)
Element : Single element

Maximum temperature for use Protection tube : SUS304

Thermocouple type	Diameter of protection tube	Operating temperature for regular use	Maximum temperature
K	ϕ3.0 to ϕ3.2	300ºC	400ºC
	ϕ4.8 to ϕ6.0	650ºC	850ºC
	ϕ8.0 or more	750ºC	950ºC
J	ϕ3.0 to ϕ3.2	200ºC	300ºC
	ϕ4.8 to ϕ6.0	400ºC	500ºC
	ϕ8.0 or more	450ºC	550ºC
T	ϕ3.0 to ϕ6.0	200ºC	250ºC
	ϕ8.0 or more	250ºC	300ºC
E	ϕ3.0 to ϕ3.2	200ºC	300ºC
	ϕ4.8 to ϕ6.0	450ºC	500ºC
	ϕ8.0 or more	500ºC	550ºC

Class : class 2
* Class 1 is available (Please specify when you order)
Element : Single element

Maximum temperature for use Protection tube : SUS304

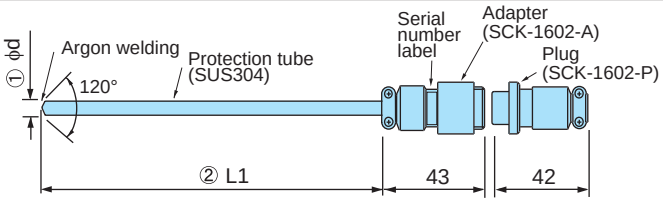
Thermocouple type	Diameter of protection tube	Operating temperature for regular use	Maximum temperature
K	ϕ4.8 to ϕ6.0	650ºC	850ºC
	ϕ8.0 or more	750ºC	950ºC
J	ϕ4.8 to ϕ6.0	400ºC	500ºC
	ϕ8.0 or more	450ºC	550ºC
T	ϕ4.8 to ϕ6.0	200ºC	250ºC
	ϕ8.0 or more	250ºC	300ºC
E	ϕ4.8 to ϕ6.0	450ºC	500ºC
	ϕ8.0 or more	500ºC	550ºC

Reference

• Material of protection tube
SUS316 is available.
(Please specify when you order)

• High temperature type
Thermocouple type R, S, B for high temperature type :
See page 19.

Thermocouples : T-90



No lead wire

T - 90 - ϕd - L1 - □ - □ - □

① ② ⑥ ⑦ ⑧

With lead wire

T - 90 - ϕd - L1 - L - □□□ - □ - □ - □ - □

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-90-5-100-K-G-N (No lead wire)
:T-90-5-100-2000-EXA-Y-K-G-N (With lead wire)

① Diameter of protection tube

ϕ3.0, ϕ3.2, ϕ4.8, ϕ5.0, ϕ6.0, ϕ8.0

② Length of protection tube

Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length.

③ Lead wire length

Specify length by “mm” (100mm or more)

④ Lead protection (No need to specify in case of without lead wire)

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC			

⑤ Lead wire termination (No need to specify in case of without lead wire)

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)	E	Type E (Chromel-Constantan)

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded
O	Exposed *

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

• Please contact distributors regarding other mounting bracket.

Specify size of mounting bracket when code is "A", "B", or "E".
Specify size of flange when code is "C".

Specifications

Class : class 2 * Class 1 is available (Please specify when you order)
Element : Single element * Double element is available. (Diameter of protection tube : ϕ4.8 or more) (Please specify when you order)

Maximum temperature for use Protection tube : SUS304

Thermocouple type	Diameter of protection tube	Operating temperature for regular use	Maximum temperature
K	ϕ3.0 to ϕ3.2	300ºC	400ºC
	ϕ4.8 to ϕ6.0	650ºC	850ºC
	ϕ8.0	750ºC	950ºC
J	ϕ3.0 to ϕ3.2	200ºC	300ºC
	ϕ4.8 to ϕ6.0	400ºC	500ºC
	ϕ8.0	450ºC	550ºC
T	ϕ3.0 to ϕ6.0	200ºC	250ºC
	ϕ8.0	250ºC	300ºC
E	ϕ3.0 to ϕ3.2	200ºC	300ºC
	ϕ4.8 to ϕ6.0	450ºC	500ºC
	ϕ8.0	500ºC	550ºC

Reference

Connector

Pin No. Single Element

SCK-1602-□

Pin No.	Details
1	+
2	−

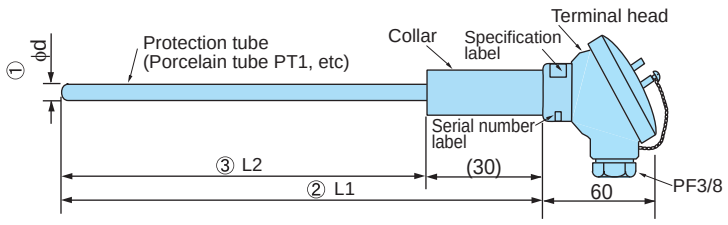
Double Element

SCK-1604-□

Pin No.	Details
1	+
2	−
3	+
4	−

For connector for T-90, Connector manufactured by Sanwa Connector Laboratory Co., Ltd. is used as standard.
Nanaboshi Electric Mfg brand is also available (Please specify when you order).
Please specify in case of no need of the plug.

Noble Metal Thermocouples : T-30/T-35 (For High Temperature)

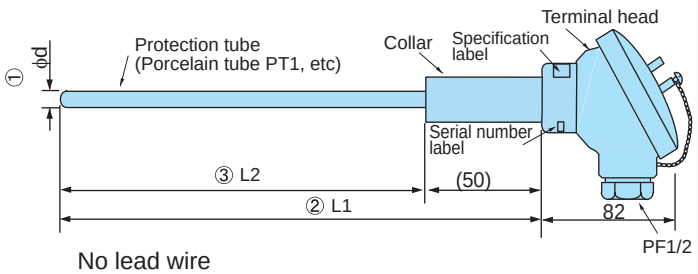


No lead wire
T - 30 - ϕd - L1 - L2 - □-□-□
① ② ③ ⑦ ⑧ ⑨

With lead wire
T - 30 - ϕd - L1 - L2 - L - □□□-□-□-□-□
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Diameter of protection tube
② Length of protection tube (L1)
③ Length of protection tube (L2)
④ Lead wire length
⑤ Lead protection
⑥ Lead wire termination
⑦ Thermocouple type
⑧ Sensing junction
⑨ Mounting bracket

Example :T-30-10-200-170-R-NG-N (No lead wire)
:T-30-10-200-170-2000-EXA-Y-R-G-N (With lead wire)



No lead wire
T - 35 - ϕd - L1 - L2 - □-□-□
① ② ③ ⑦ ⑧ ⑨

With lead wire
T - 35 - ϕd - L1 - L2 - L - □□□-□-□-□-□
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Diameter of protection tube
② Length of protection tube (L1)
③ Length of protection tube (L2)
④ Lead wire length
⑤ Lead protection
⑥ Lead wire termination
⑦ Thermocouple type
⑧ Sensing junction
⑨ Mounting bracket

Example :T-35-10-200-150-R-NG-N (No lead wire)
:T-35-10-200-150-2000-EXA-Y-R-G-N (With lead wire)

①	Diameter of protection tube	ϕ6.0, ϕ8.0, ϕ10.0	ϕ6.0, ϕ8.0, ϕ10.0, ϕ13.0, ϕ15.0, ϕ17.0
②	Length of protection tube (L1)	Specify length by “mm” (130mm to 1,030mm) • Please contact distributors regarding other length.	Specify length by “mm” (150mm to 1,050mm) • Please contact distributors regarding other length.
③	Length of protection tube (L2)	Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length.	Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length.
④	Lead wire length	Specify length by “mm” (100mm or more)	
⑤	Lead protection	No need to specify in case of without lead wire	
⑥	Lead wire termination	No need to specify in case of without lead wire	

⑤ Lead protection

Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC
EXB	Fiberglass	0 to 150ºC
EXD	PVC (polyvinyl chloride)	-20 to +90ºC

⑥ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw		Only for Type R
M	Metal connector (SCK-1602-P)	N	No terminal lugs *terminal soldered •See Page7

*1 : Other thermocouple connector : See Page 10

⑦ Thermocouple type

Code	Details	Code	Details
R	Type R (Platinum - Platinum Rhodium13%)	B	Type B(Platinum - Platinum Rhodium6%)
S	Type S (Platinum - Platinum Rhodium10%)		

⑧ Measuring junction

Code	Details
NG	Ungrounded

⑨ Mounting bracket

Code	Details
C	Fixed flange
N	No bracket

Specify size of flange when code is "C".
• Please contact distributors regarding other mounting bracket.

Specifications

Class : class 2 * Class 1 is available. (Thermocouple type : R,S) (Please specify when you order)

Element : Single element * Double element is available. (Only for T-35) (Please specify when you order)

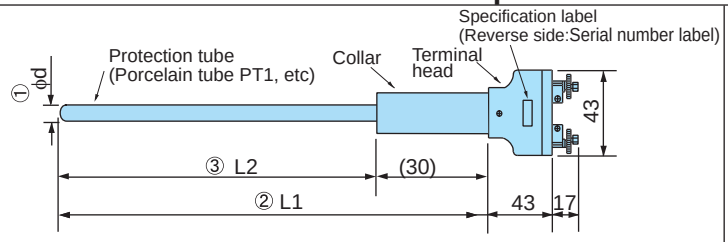
Maximum temperature for use

Thermocouple type	Operating temperature for regular use	Maximum temperature
R	1400ºC	1600ºC
S	1400ºC	1600ºC
B	1500ºC	1700ºC

*The lists above are operating temperature limits for the element wire. For the protection tube, please refer to page.58 about reference data of protection tube.

Reference

Noble Metal Thermocouples : T-80/T-85 (For High Temperature)

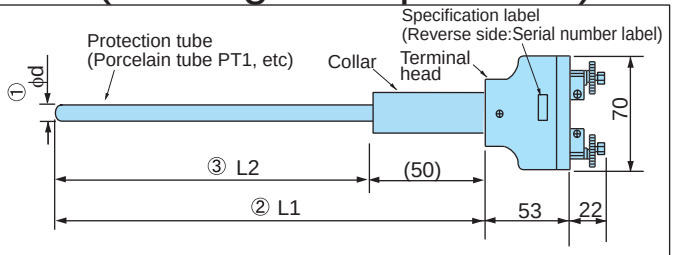


No lead wire
T - 80 - φd - L1 - L2 - □ - □ - □
① ② ③ ⑦ ⑧ ⑨

With lead wire
T - 80 - φd - L1 - L2 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Diameter of protection tube
② Length of protection tube (L1)
③ Length of protection tube (L2)
④ Lead wire length
⑤ Lead protection
⑥ Lead wire termination
⑦ Thermocouple type
⑧ Sensing junction
⑨ Mounting bracket

Example :T-80-10-200-170-R-NG-N (No lead wire)
:T-80-10-200-170-2000-EXA-Y-R-G-N (With lead wire)



No lead wire
T - 85 - φd - L1 - L2 - □ - □ - □
① ② ③ ⑦ ⑧ ⑨

With lead wire
T - 85 - φd - L1 - L2 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Diameter of protection tube
② Length of protection tube (L1)
③ Length of protection tube (L2)
④ Lead wire length
⑤ Lead protection
⑥ Lead wire termination
⑦ Thermocouple type
⑧ Sensing junction
⑨ Mounting bracket

Example :T-85-10-200-150-R-NG-N (No lead wire)
:T-85-10-200-150-2000-EXA-Y-R-G-N (With lead wire)

①	Diameter of protection tube	φ6.0, φ8.0, φ10.0	φ6.0, φ8.0, φ10.0, φ13.0, φ15.0, φ17.0
②	Length of protection tube (L1)	Specify length by “mm” (130mm to 1,030mm) • Please contact distributors regarding other length.	Specify length by “mm” (150mm to 1,050mm) • Please contact distributors regarding other length.
③	Length of protection tube (L2)	Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length.	Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length.
④	Lead wire length	Specify length by “mm” (100mm or more)	

⑤ Lead protection (No need to specify in case of without lead wire)

Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC
EXB	Fiberglass	0 to 150ºC
EXD	PVC (polyvinyl chloride)	-20 to +90ºC

⑥ Lead wire termination (No need to specify in case of without lead wire)

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑦ Thermocouple type

Code	Details	Code	Details
R	Type R (Platinum - Platinum Rhodium13%)	B	Type B(Platinum - Platinum Rhodium6%)
S	Type S (Platinum - Platinum Rhodium10%)		

⑧ Measuring junction

Code	Details
NG	Ungrounded

⑨ Mounting bracket

Code	Details
C	Fixed flange
N	No bracket

Specify size of flange when code is "C".
• Please contact distributors regarding other mounting bracket.

Specifications

Class : class 2 * Class 1 is available. (Thermocouple type : R,S) (Please specify when you order)
Element : Single element

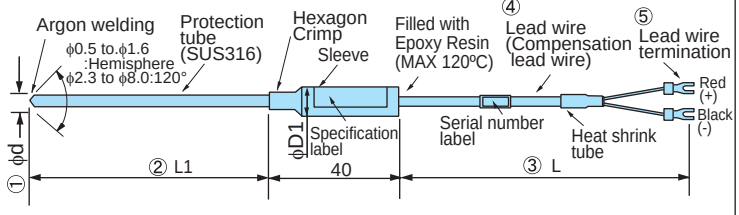
Maximum temperature for use

Thermocouple type	Operating temperature for regular use	Maximum temperature
R	1400ºC	1600ºC
S	1400ºC	1600ºC
B	1500ºC	1700ºC

*The lists above are operating temperature limits for the element wire. For the protection tube, please refer to page.58 about reference data of protection tube.

Reference

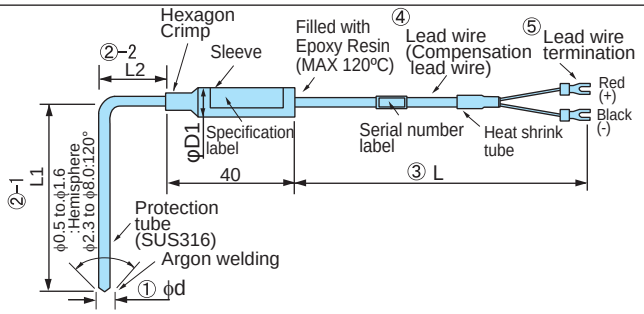
Sheathed Thermocouples : T-101S/T-111S



T - 101S - φd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-101S-4.8-100-2000-EXA-Y-K-G-N



T - 111S - φd - L1 - L2 - L - □□□ - □ - □ - □ - □
① ②−1 ②−2 ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
②−1, 2 Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-111S-4.8-100-30-2000-EXA-Y-K-G-N

①	Diameter of protection tube	φ0.5 (Only for K,T type), φ1.0, φ1.6, φ2.3, φ3.2, φ4.8, φ6.4, φ8.0
②	Length of protection tube	Specify length by “mm” (100mm to 10,000mm) ②− 1 Specify length by “mm” (100mm or more, L1+L2=10,000mm or less) ②− 2 Specify length by “mm” (25mm or more, L1+L2=10,000mm or less) • Length is 25mm without specification.
③	Lead wire length	Specify length by “mm” (100mm or more)

④ Lead protection

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC	EXF	Fluorocarbon polymers (FEP)	0 to 200ºC

⑤ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)	E	Type E (Chromel-Constantan)

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded
O	Exposed *

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

Specify size of mounting bracket when code is "A", "B", or "E". (See Page 6)
Specify size of flange when code is "C". (See Page 6)

• Please contact distributors regarding other mounting bracket.

Specifications

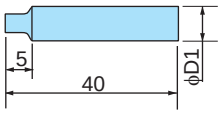
Class : class 2
Element : Single element
* Class 1 is available (Please specify when you order)
* Double element is available. (Diameter of protection tube : φ3.2 or more) (Please specify when you order)

Operating temperature for regular use

Thermocouple type	Diameter of protection tube	Operating temperature for regular use
K	φ0.5	600ºC
	φ1.0 to φ2.3	650ºC
	φ3.2	750ºC
	φ4.8 to φ6.4	800ºC
	φ8.0	900ºC
J	φ1.0 to φ2.3	450ºC
	φ3.2	650ºC
	φ4.8 or more	750ºC
T	φ0.5	300ºC
	φ1.0 to φ2.3	300ºC
	φ3.0 or more	350ºC
E	φ1.0 to φ2.3	650ºC
	φ3.2	750ºC
	φ4.8 or more	800ºC

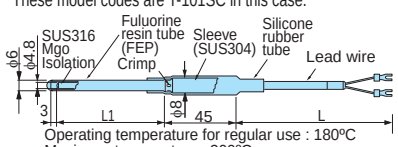
Sleeve Dimension (φD1)

Lead wire type \ Diameter of protection tube	φ0.5, φ1.0, φ1.6, φ2.3, φ3.2, φ4.8	φ6.4, φ8.0
EXA,EXB,EXC EXD,EXF	φ8×40	φ10×40
EXE	φ10×40	



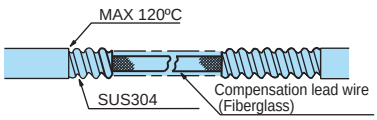
Reference

• Fluor resin coating is available
It is avaiable to cover Fuluorine resin tube with φ4.8 protection tube (SUS316). Total Diameter becomes φ6.0. It is also available to do coating with T-101 whose tube is more than φ3.2.
These model codes are T-101SC in this case.



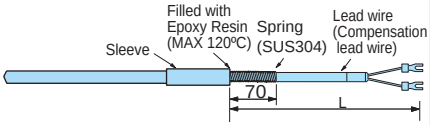
Operating temperature for regular use : 180ºC
Maximum temperature : 200ºC
• Please contact distributors regarding Fuluorine resin tube.

• Stainless flexible lead wire is available
Model Code : T-101FS/T-111FS



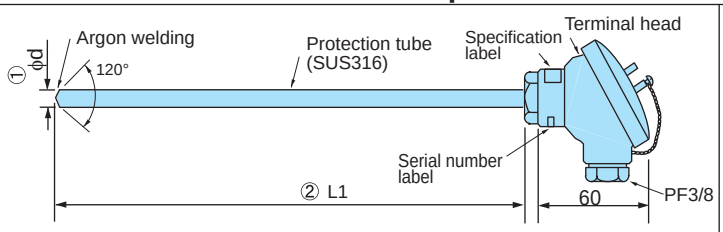
For flexible lead wire, the dimension of the sleeve is φ10 x 40mm.
When φ1.0 to φ4.8 of the protection tube with EXB is selected as the extention lead wire, its dimension is φ8 x 40mm.
• No waterproof

• Spring loaded type is available
(Please specify when you order)



Dimensions for the spring loaded sleeve is as follows.
• Protection tube φ1.0 to φ4.8 with extension lead wire
EXA, EXB, EXC, EXD : φ8 x 40mm
• Except the above: : φ10 x 40mm

Sheathed Thermocouples : T-30S/T-35S



No lead wire

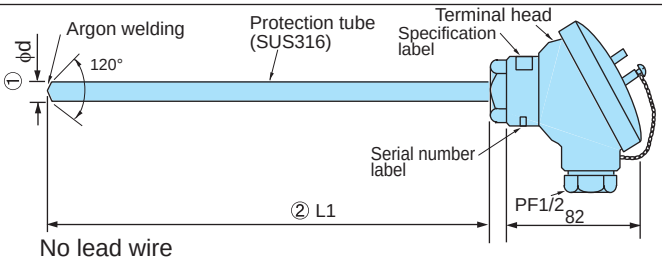
T - 30S - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

T - 30S - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-30S-4.8-100-K-G-N (No lead wire)
:T-30S-4.8-100-2000-EXA-Y-K-G-N (With lead wire)



No lead wire

T - 35S - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

T - 35S - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-35S-4.8-100-K-G-N (No lead wire)
:T-35S-4.8-100-2000-EXA-Y-K-G-N (With lead wire)

①	Diameter of protection tube	ϕ3.2, ϕ4.8, ϕ6.4, ϕ8.0	ϕ4.8, ϕ6.4, ϕ8.0
②	Length of protection tube	Specify length by “mm” (100mm to 10,000mm) • Please contact distributors regarding other length.	Specify length by “mm” (100mm to 10,000mm) • Please contact distributors regarding other length.
③	Lead wire length	Specify length by “mm” (100mm or more)	

④ Lead protection (No need to specify in case of without lead wire)

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC			

⑤ Lead wire termination (No need to specify in case of without lead wire)

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)	E	Type E (Chromel-Constantan)

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded
O	Exposed *

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

• Please contact distributors regarding other mounting bracket.

Specify size of mounting braket when code is "A", "B", or "E".
Specify size of flange when code is "C".

Specifications

Class : class 2 * Class 1 is available (Please specify when you order)
Element : Single element * Double element is available. (Only for T-35S) (Please specify when you order)

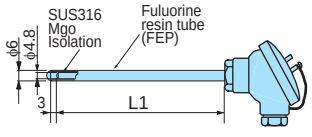
Operating temperature for regular use

Thermocouple type	Diameter of protection tube	Operating temperature for regular use
K	ϕ3.0 to ϕ3.2	750ºC
	ϕ4.8 to ϕ6.4	800ºC
	ϕ8.0	900ºC
J	ϕ3.2	750ºC
	ϕ4.8 or more	800ºC
T	ϕ3.2 or more	350ºC
E	ϕ3.0 to ϕ3.2	650ºC
	ϕ4.8 or more	750ºC

Reference

• Fluor resin coating is available

It is avaiable to cover Fuluorine resin tube with ϕ4.8 protection tube (SUS316). Total Diameter becomes ϕ6.0.
It is also available to do coating with T-30S/T-35S whose tube is more than ϕ3.2.
These model codes are T-30SC/T-35SC in this case.



Operating temperature for regular use : 180ºC
Maximum temperature : 200ºC

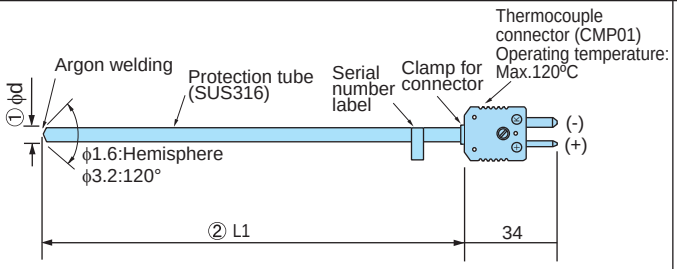
Example of Model Code

T-30SC-6.0-100-PDM-NG-N (No lead wire)
① ② ⑥ ⑦ ⑧

• Please contact distributors regarding Fuluorine resin coating

• Please contact distributors regarding Fuluorine resin tube.

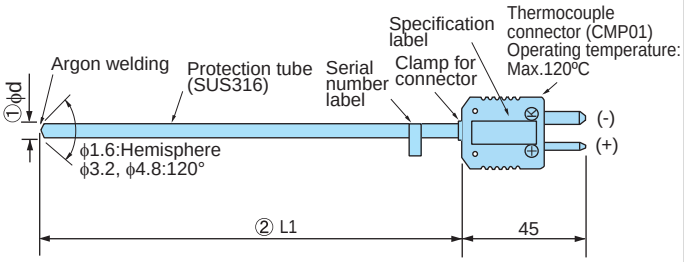
Sheathed Thermocouples : T-70S/T-75S



T - 70S - ϕd - L1 - □ - □ - □
① ② ③ ④ ⑤

① Diameter of protection tube ④ Sensing junction
② Length of protection tube ⑤ Mounting bracket
③ Thermocouple type

Example :T-70S-1.6-100-K2-G-N



T - 75S - ϕd - L1 - □ - □ - □
① ② ③ ④ ⑤

① Diameter of protection tube ④ Sensing junction
② Length of protection tube ⑤ Mounting bracket
③ Thermocouple type

Example : T-75S-3.2-100-K1-G-N

①	Diameter of protection tube	ϕ1.0, ϕ1.6, ϕ3.2	ϕ1.6, ϕ3.2, ϕ4.8
②	Length of protection tube	Specify length by “mm” (100mm to 2000mm)	

③ Thermocouple type

Code	Details	Code	Details	Code	Details
K1	Type K (Chromel-Alumel) class 1	J1	Type J (Iron-Constantan) class 1	T1	Type T (Copper-Constantan) class 1
K2	Type K (Chromel-Alumel) class 2	J2	Type J (Iron-Constantan) class 2	T2	Type T (Copper-Constantan) class 2

④ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded
O	Exposed

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑤ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

Specify size of mounting braket when code is "A", "B", or "E".
Specify size of flange when code is "C".

Specifications

Class : class 1 or class 2
Element : Single element
Operating temperature for regular use

Thermocouple type	Diameter of protection tube	Operating temperature for regular use
K	ϕ1.0, ϕ1.6	650ºC
	ϕ3.2	750ºC
	ϕ4.8	800ºC
J	ϕ1.0, ϕ1.6	450ºC
	ϕ3.2	650ºC
	ϕ4.8	750ºC

Thermocouple type	Diameter of protection tube	Operating temperature for regular use
T	ϕ1.0, ϕ1.6	300ºC
	ϕ3.2	350ºC
	ϕ4.8	350ºC

Regarding thermocouple connectors for high-temperature use, please contact distributors

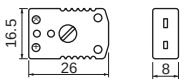
Miniature connector: (Material: Ryton): CMR-01 operating temperature limit 220ºC

Standard connector: (Material: Ceramic): CSC-01 operating temperature limit 900ºC

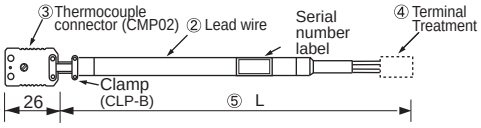
Reference

Thermocoule connector (jack) *Sold separately

CMP02-□

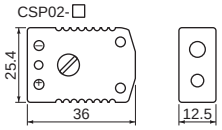


Thermocoule connector (jack) with lead wire *Sold separately

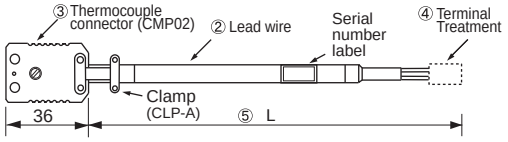


Thermocoule connector (jack) *Sold separately

CSP02-□



Thermocoule connector (jack) with lead wire *Sold separately

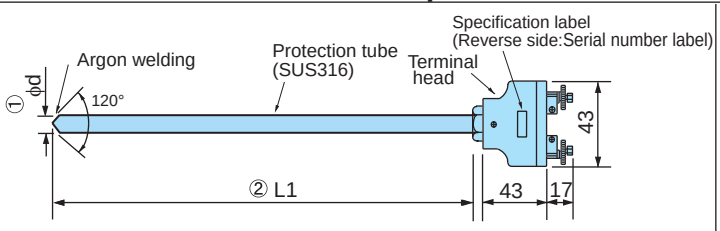


Model and suffix code for thermocoule connector (jack) with lead wire

Specifications		Model and Suffix Code					
		W-BL-	−□□	□□□−□□□−	□	−□□□□□	
①	Thermocouple type	Type K (class 2)	K2				
		Type J (class 2)	J2				
②	Lead protection	Fiberglass with stainless steel		EXA			
		Fiberglass		EXB			
		PVC (polyvinyl chloride)		EXD			
		Silicone rubber		EXE			
③	Thermocouple connector	Thermocouple connector CMP02 jack (with clamp)			TMA		
		Thermocouple connector CSP02 jack (with clamp)			TSA		
④	Lead wire termination	Spade lugs for JIS standard "M3" size screw				Y3	
		Spade lugs for JIS standard "M4" size screw				Y4	
		Ring lugs for JIS standard "M3" size screw				R3	
		Ring lugs for JIS standard "M4" size screw				R4	
		No terminal lugs				C	
		No terminal lugs *terminal soldered				N	
⑤	Lead wire length (unit: mm)	Specify length by "mm" (100mm each)					□□□□□□

Please contact distributors regarding T type thermocouple.

Sheathed Thermocouples : T-80S/T-85S



No lead wire

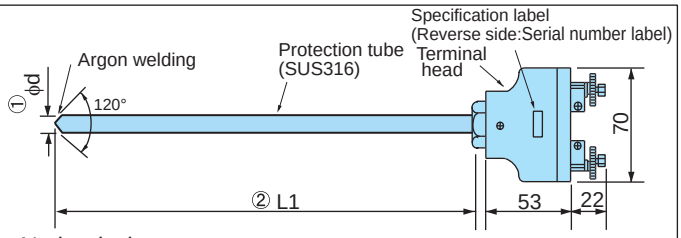
T - 80S - ϕd - L1 - □-□-□
① ② ⑥⑦⑧

With lead wire

T - 80S - ϕd - L1 - L - □□□- □- □- □- □
① ② ③ ④ ⑤⑥⑦⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-80S-4.8-100-K-G-N (No lead wire)
:T-80S-4.8-100-2000-EXA-Y-K-G-N (With lead wire)



No lead wire

T - 85S - ϕd - L1 - □-□-□
① ② ⑥⑦⑧

With lead wire

T - 85S - ϕd - L1 - L - □□□- □- □- □- □
① ② ③ ④ ⑤⑥⑦⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-85S-4.8-100-K-G-N (No lead wire)
:T-85S-4.8-100-2000-EXA-Y-K-G-N (With lead wire)

① Diameter of protection tube

ϕ3.2, ϕ4.8, ϕ6.4, ϕ8.0

ϕ4.8, ϕ6.4, ϕ8.0

② Length of protection tube

Specify length by “mm” (100mm to 10,000mm)
• Please contact distributors regarding other length.

③ Lead wire length

Specify length by “mm” (100mm or more)

④ Lead protection

No need to specify in case of without lead wire

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC			

⑤ Lead wire termination

No need to specify in case of without lead wire

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)	E	Type E (Chromel-Constantan)

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded
O	Exposed *

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

• Please contact distributors regarding other mounting bracket.

Specify size of mounting braket when code is "A", "B", or "E".
Specify size of flange when code is "C".

Specifications

Class : class 2
* Class 1 is available (Please specify when you order)
Element : Single element
Operating temperature for regular use

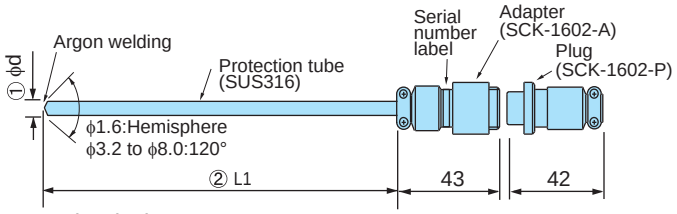
Thermocouple type	Diameter of protection tube	Operating temperature for regular use
K	ϕ3.2	750ºC
	ϕ4.8 to ϕ6.4	800ºC
	ϕ8.0	900ºC
J	ϕ3.2	650ºC
	ϕ4.8 or more	750ºC
T	ϕ3.2 or more	350ºC
E	ϕ3.0 to ϕ3.2	750ºC
	ϕ4.8 or more	800ºC

Class : class 2
* Class 1 is available (Please specify when you order)
Element : Single element
Operating temperature for regular use

Thermocouple type	Diameter of protection tube	Operating temperature for regular use
K	ϕ4.8, ϕ6.4	800ºC
	ϕ8.0	900ºC
J	ϕ4.8 to ϕ8.0	750ºC
T	ϕ4.8 to ϕ8.0	350ºC
E	ϕ4.8 to ϕ8.0	800ºC

Reference

Sheathed Thermocouples : T-90S



No lead wire

T - 90S - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

T - 90S - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-90S-4.8-100-K-G-N (No lead wire)
:T-90S-4.8-100-2000-EXA-Y-K-G-N (With lead wire)

① Diameter of protection tube

ϕ1.6, ϕ3.2, ϕ4.8, ϕ6.4, ϕ8.0

② Length of protection tube

Specify length by “mm” (100mm to 10,000mm)

③ Lead wire length

Specify length by “mm” (100mm or more)

④ Lead protection (No need to specify in case of without lead wire)

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC			

⑤ Lead wire termination (No need to specify in case of without lead wire)

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		

•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)	E	Type E (Chromel-Constantan)

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded
O	Exposed *

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

• Please contact distributors regarding other mounting bracket.

Specify size of mounting braket when code is "A", "B", or "E".
Specify size of flange when code is "C".

Specifications

Class : class 2 * Class 1 is available (Please specify when you order)
Element : Single element * Double element is available. (Diameter of protection tube : ϕ3.2 or more) (Please specify when you order)

Operating temperature for regular use

Thermocouple type	Diameter of protection tube	Operating temperature for regular use
K	ϕ1.6	650ºC
	ϕ3.2	750ºC
	ϕ4.8, ϕ6.4	800ºC
	ϕ8.0	900ºC
J	ϕ1.6	450ºC
	ϕ3.2	650ºC
	ϕ4.8 or more	750ºC
T	ϕ1.6	300ºC
	ϕ3.2 or more	350ºC
E	ϕ1.6	650ºC
	ϕ3.2	750ºC
	ϕ4.8 or more	800ºC

Reference

Connector

Pin No. Single Element

SCK-1602-□

Pin No.	Details
1	+
2	−

Double Element

SCK-1604-□

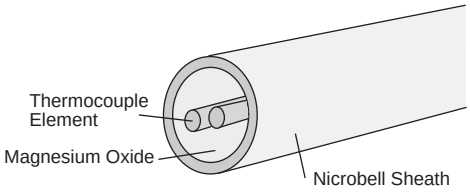
Pin No.	Details
1	+
2	−
3	+
4	−

For connector for T-90S, Connector manufactured by Sanwa Connector Laboratory Co., Ltd. is used as standard.
Nanaboshi Electric Mfg brand is also available (Please specify when you order).
Please specify in case of no need of the plug.

Nicrobell Sheathed Thermocouples

■ Nicrobell Sheathed Thermocouple

Wires of traditional metallic sheath (stainless steel, inconel, etc) is likely to receive chemical erosion or metallic fatigue under high temperature circumstance, and these give negative effects on their stability and longevity. Nicrobell Sheath is an epoch making heat resistant alloy and has chemical composition very close to that of the type N (Nicrosil) element, minimizing chemical erosion and metal fatigue.



■ Nicrobell Sheathed N Thermocouple

High Stability

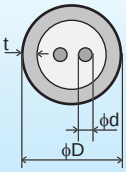
Nicrobell sheath has chemical composition very close to that of the type N element and does not generate any metal gas in high temperature range different from conventional alloys such as stainless steel (SUS316, SUS310) and Inconel, thus prevents the element of type N thermocouple from contamination.

High Accuracy

Our Nicrobell sheath (N) thermocouple is class 1. It is capable of high temperature measurement with high accuracy compared with traditional sheath types.
Moreover, its high stability shows the same or higher realization with PL II (platinum II) and R around 1200°C.

Environmental Resistance

Nicrobell sheath (N) thermocouple has chemical composition very close to that of the type N element and does not generate any metal gas in high temperature range different from conventional alloys such as stainless steel (316SS, 310SS) and Inconel, thus prevents the element of type N thermocouple from contamination.



t : More than 10% of ϕD
ϕd : More than 18% of ϕD

Long Life

Nicrobell sheath (N) thermocouple, which has high stability and environmental resistance, has a longer cycle of periodic replacement and economical for it will less change over the time and has a long life span compared with traditional sheathes.

■ Nicrobell Sheathed K Thermocouple

Because Nicrobell sheath is a nickel based alloy as K type, it minimizes corrosion by metallic gas expansion to its wires under high temperature range, and improves stability, environmental resistance, and thermal resistance of its thermoelectromotive force.

Low Cost

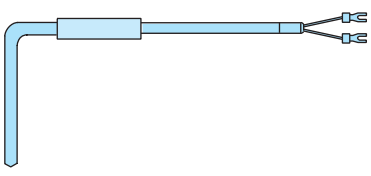
Nicrobell K thermocouple realizes high stability and environmental resistance with almost same price with traditional Inconel sheath. Progress of basic function results in low cost due to long-term use by stabilizing accuracy of thermoelectromotive force in long-term and by extending periodic replacement by reinforcing K type strength (thermal resistance) in high temperature range.

Improved Reliability

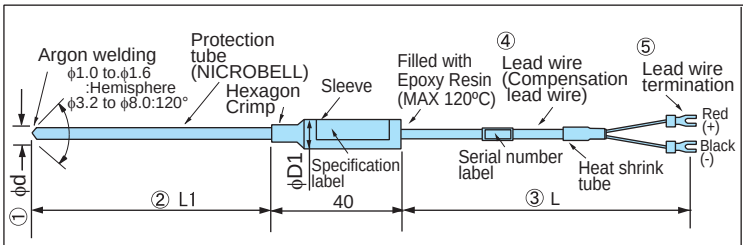
Traditionally, when talking about environmental resistance for selection of thermocouple metallic sheath, people were likely to more focus on its materials and did not pay much attention on relationship between its materials and wire.
Nicrobell sheath is a new created metallic sheath balancing its traditional matter, thus its accountability will be highly progressed

Long Life

Nicrobell sheath K type thermocouple can be used for long duration of time in a high temperature range by the difference of performance and traditional thick wire.

Sleeve type	Terminal head type
T-101N 	T-30N 
T-111N 	Terminal head type T-35N 

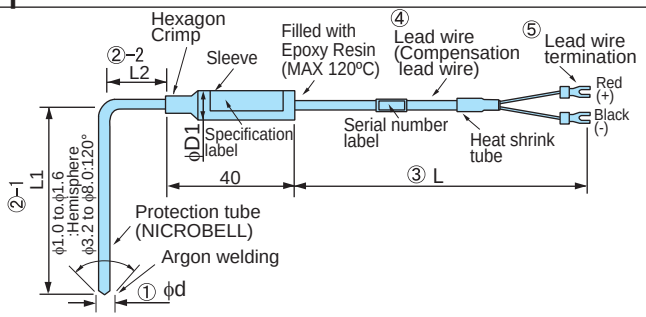
NICROBELL Sheathed Thermocouples : T-101N/T-111N



T - 101N - φd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-101N-4.8-100-2000-EXA-Y-K-G-N



T - 111N - φd - L1 - L2 - L - □□□ - □ - □ - □ - □
① ②–1 ②–2 ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
②–1, 2 Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-111N-4.8-100-30-2000-EXA-Y-K-G-N

①	Diameter of protection tube	φ1.0, φ1.6, φ2.3, φ3.2, φ4.8, φ6.4, φ8.0
②	Length of protection tube	Specify length by “mm” (100mm to 10,000mm) ②– 1 Specify length by “mm” (100mm or more, L1+L2=10,000mm or less) ②– 2 Specify length by “mm” (25mm or more, L1+L2=10,000mm or less) • Length is 25mm without specification.
③	Lead wire length	Specify length by “mm” (100mm or more)

④ Lead protection

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber (Only for Type K)	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC	EXF	Fluorocarbon polymers (FEP) (Only for Type K)	0 to 200ºC

⑤ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE *1	Thermocouple connector (CSP01+CLP-A+CSP02) (Only for Type K)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details
K	Type K (Chromel-Alumel)
N	Type N (Nicrosil-Nisil)

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket

Specify size of mounting braket when code is "A", "B", or "E". (See Page 6)

• Fixed nipple/Rotary nipple is Silver brazing. (Maximum temperature : 500ºC.)
• Please contact distributors regarding other mounting bracket.

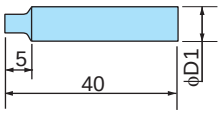
Specifications

Class : class 1
Element : Single element
Operating temperature for regular use

Thermocouple type	Diameter of protection tube	Operating temperature for regular use
K	φ1.0	900ºC
	φ1.6, φ2.3	1000ºC
	φ3.2, φ4.8	1100ºC
	φ6.4	1150ºC
	φ8.0	1200ºC
N	φ1.6, φ2.3	1000ºC
	φ3.2, φ4.8	1100ºC
	φ6.4	1150ºC
	φ8.0	1200ºC

Sleeve Dimension (φD1)

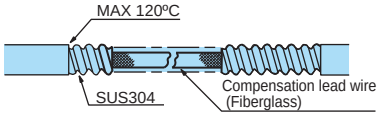
Lead wire type \ Diameter of protection tube	φ1.0, φ1.6, φ2.3 φ3.2, φ4.8	φ6.4, φ8.0
EXA,EXB,EXC EXD,EXF	φ8×40	φ10×40
EXE	φ10×40	



Reference

• Stainless flexible lead wire is available

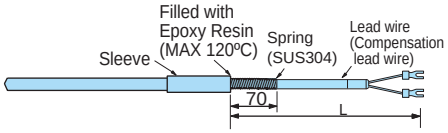
Model Code : T-101FS/T-111FS



For flexible lead wire, the dimension of the sleeve is φ10 x 40mm.
When φ1.0 to φ4.8 of the protection tube with EXB is selected as the extention lead wire, its dimension is φ8 x 40mm.

• No waterproof

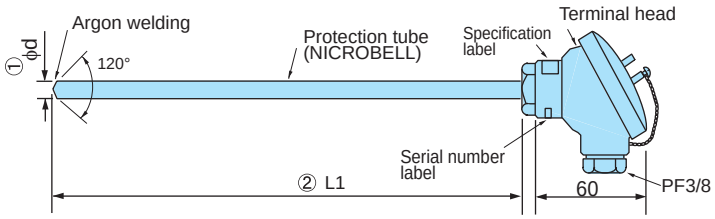
• Spring loaded type is available
(Please specify when you order)



Dimensions for the spring loaded sleeve is as follows.

• Protection tube φ1.0 to φ4.8 with extension lead wire
EXA, EXB, EXC, EXD : φ8 x 40mm
• Except the above: : φ10 x 40mm

NICROBELL Sheathed Thermocouples : T-30N/T-35N



No lead wire

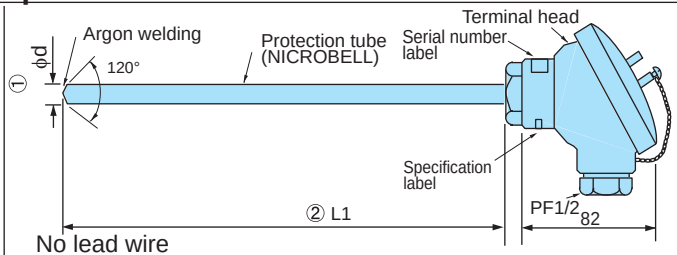
T - 30N - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

T - 30N - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-30N-4.8-100-K-G-N (No lead wire)
:T-30N-4.8-100-2000-EXA-Y-K-G-N (With lead wire)



No lead wire

T - 35N - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

T - 35N - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-30N-4.8-100-K-G-N (No lead wire)
:T-30N-4.8-100-2000-EXA-Y-K-G-N (With lead wire)

①	Diameter of protection tube	ϕ3.2, ϕ4.8, ϕ6.4, ϕ8.0	ϕ4.8, ϕ6.4, ϕ8.0
②	Length of protection tube	Specify length by “mm” (100mm to 10,000mm)	Specify length by “mm” (100mm to 10,000mm)
③	Lead wire length	Specify length by “mm” (100mm or more)	

④ Lead protection (No need to specify in case of without lead wire)

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber (Only for Type K)	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC			

⑤ Lead wire termination (No need to specify in case of without lead wire)

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details
K	Type K (Chromel-Alumel)
N	Type N (Nicrosil-Nisil)

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket

Specify size of mounting bracket when code is "A", "B", or "E". (See Page 6)

• Fixed nipple/Rotary nipple is Silver soldering. (Maximum temperature : 500ºC.)
• Please contact distributors regarding other mounting bracket.

Specifications

Class : class 1
Element : Single element
Operating temperature for regular use

Thermocouple type	Diameter of protection tube	Operating temperature for regular use
K	ϕ3.2 to ϕ4.8	1100ºC
	ϕ6.4	1150ºC
	ϕ8.0	1200ºC
N	ϕ3.2 to ϕ4.8	1100ºC
	ϕ6.4	1150ºC
	ϕ8.0	1200ºC

Reference

Temperature sensors for various applications

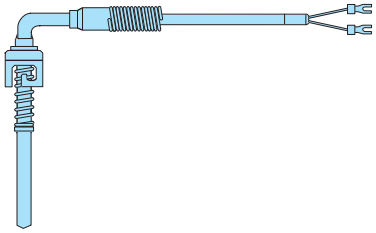
Bayonet Type

The tip is going to be pressure welded to the measured object by mounting bracket.
Suitable for measurement of hot runners, dies and moulds.

● Spring loaded type

T-200

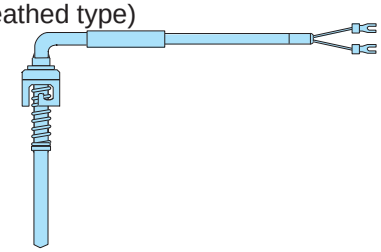
T-210



● Sleeve type

T-201
T-201S (Sheathed type)

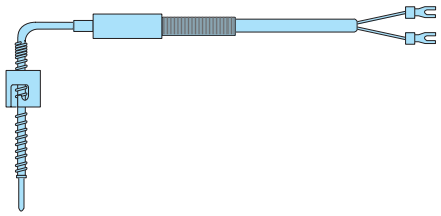
T-211
T-211S (Sheathed type)



● Sheathed Thermocouple for High Temperature (550°C)

T-202SH

T-212SH



Bayonet Type (Variable insertion length type)

Thermocouple with bayonet. Length can be easily adjusted.
Decide the position of the mounting bracket dependent upon insertion length and fix the spring by fixed screw.

T-220

Bayonet Type (Variable insertion length type)

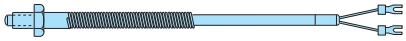
Thermocouple with bayonet. Length can be easily adjusted.
Easy mounting is possible by moving the bayonet cap dependent upon the insertion length.

T-221

Screwed Tip Type

The tip is M6 size (M8 size is also available) rotary screw. Internal screws will be threaded in the fitting point.
*M6, M8 is based on JIS Standard.

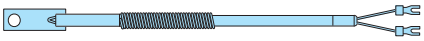
T-230



Fixing Screw Type for Surface Temperature

Fix the sensor at a ϕ4.5 fixed screw hole of the tip with a screw.
Suitable for temperature measurement for the tiny spaces.

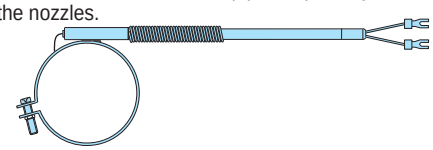
T-240



Ring Type for Surface Temperature

Suitable for temperature measurement for the pipe shaped objects and the surface of the nozzles.

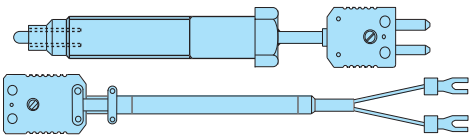
T-250



For Resin Temperature

Capable of measurement of the molten resin temperature, such as the inside of the extruder. M16 screw is cut and its tip directly touches to the melting resin.

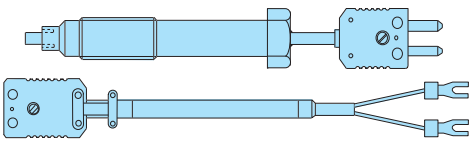
T-260
Withstand pressure : 70MPa (at 250ºC)



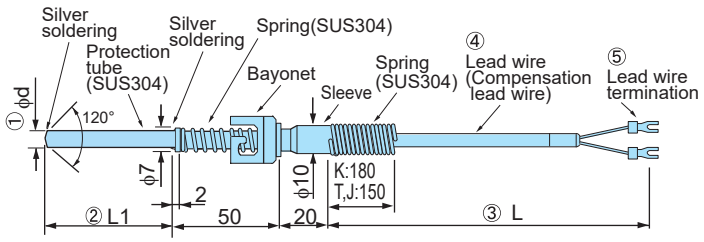
For Resin Temperature

By utilizing ZHF (zero-heat-flow) method, it eliminates thermal disturbances and temperature errors between the tip and the outside case and realizes more precise temperature measurement of the melting resin.

T-270Z
Withstand pressure : 100MPa (at 250ºC)



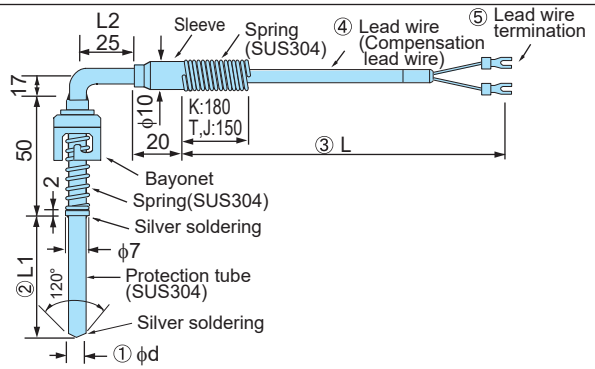
Bayonet Type Thermocouples : T-200/T-210



T - 200 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-200-5-100-2000-EXA-Y-K-G-N



T - 210 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-210-5-100-2000-EXA-Y-K-G-N

①	Diameter of protection tube	ϕ5.0	
②	Length of protection tube	Specify length by “mm” (50mm to 1,000mm) • Please contact distributors regarding other length.	Specify length by “mm” (50mm to 1,000mm) • Please contact distributors regarding other length. • L2 is 25mm. Other length is available. (Please specify when you order)
③	Lead wire length	Specify length by “mm” (100mm or more)	

④ Lead protection

Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC
EXB	Fiberglass	0 to 150ºC

⑤ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE *1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)		

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded

⑧ Mounting bracket

Code	Details
G	Holder (Specify screw type and length. See Reference.)
N	No bracket

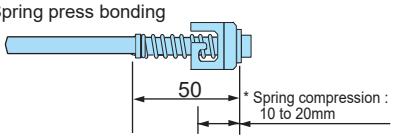
Specifications

Class : class 2
Element : Single element
* Class 1 is available (Please specify when you order)
* Double element is available (Please specify when you order)

Maximum temperature for use

Thermocouple type	Operating temperature for regular use	Maximum temperature
K	300ºC	400ºC
J	300ºC	400ºC
T	200ºC	250ºC

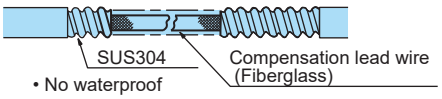
Spring press bonding



• Install bayonet so that its amount of spring compression should be 10mm to 20mm.

Reference

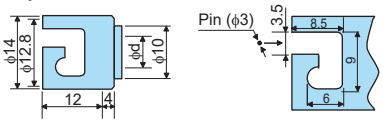
• Stainless flexible lead wire is available
Model Code : T-200F/T-210F



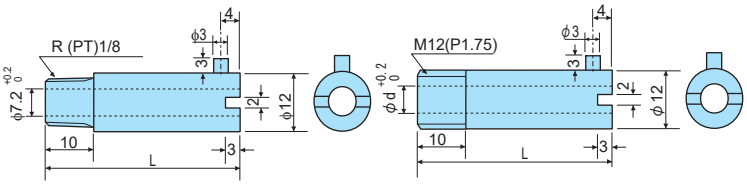
• No waterproof

• Diameter ϕ6 protection tube is available.
For diameter ϕ6 protection tube, thermocouple holder is a special type.
Please contact distributors.

Bayonet SUS304



Holder

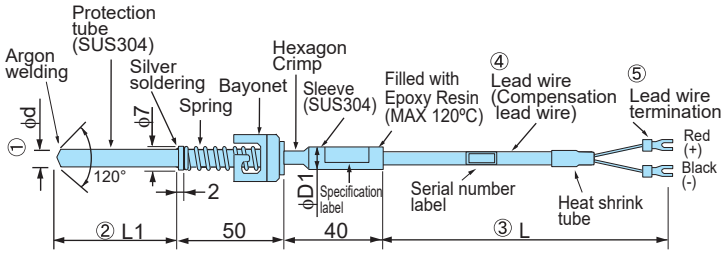


Screw:R(PT)1/8
L=32,40,62
(Specify by ordering)

Screw : M12(P1.75)
L=32,62
(Please specify when you order)

• Different types of screws are also available.

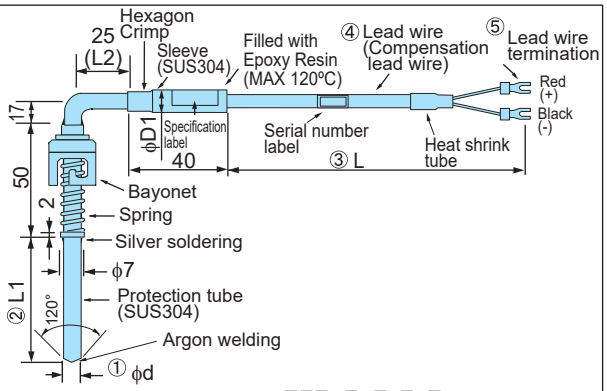
Bayonet Type Thermocouples : T-201/T-211



T - 201 - φd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-201-5-100-2000-EXA-Y-K-G-G



T - 211 - φd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-211-5-100-2000-EXA-Y-K-G-G

①	Diameter of protection tube	φ5.0	
②	Length of protection tube	Specify length by “mm” (50mm to 1,000mm) • Please contact distributors regarding other length.	Specify length by “mm” (50mm to 1,000mm) • Please contact distributors regarding other length. • L2 is 25mm. Other length is available. (Please specify when you order)
③	Lead wire length	Specify length by “mm” (100mm or more)	

④ Lead protection

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC	EXF	Fluorocarbon polymers (FEP)	0 to 200ºC

⑤ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)		

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded

⑧ Mounting bracket

Code	Details
G	Holder (Specify screw type and length. See Reference.)
N	No bracket

Specifications

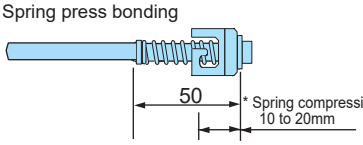
Class : class 2
* Class 1 is available (Please specify when you order)

Element : Single element
* Double element is available (Please specify when you order)

Maximum temperature for use

Thermocouple type	Operating temperature for regular use	Maximum temperature
K	300ºC	400ºC
J	300ºC	400ºC
T	200ºC	250ºC

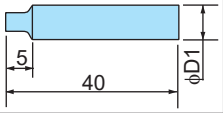
Spring press bonding



• Install bayonet so that its amount of spring compression should be 10mm to 20mm.

Sleeve Dimension (φD1)

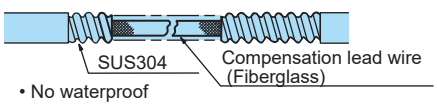
Lead wire type	φD1
EXA,EXB,EXC EXD,EXF	φ8
EXE	φ10



Reference

• Stainless flexible lead wire is available

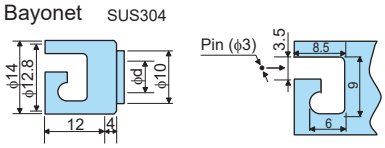
Model Code : T-201F/T-211F



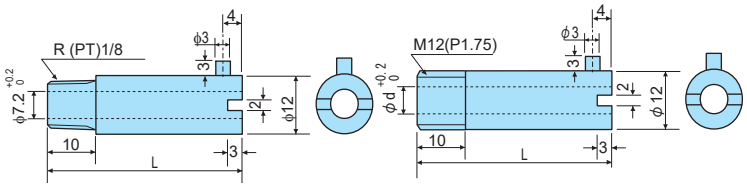
• No waterproof

• Diameter φ6 protection tube is available.
For diameter φ6 protection tube, thermocouple holder is a special type.
Please contact distributors.

Bayonet SUS304



Holder

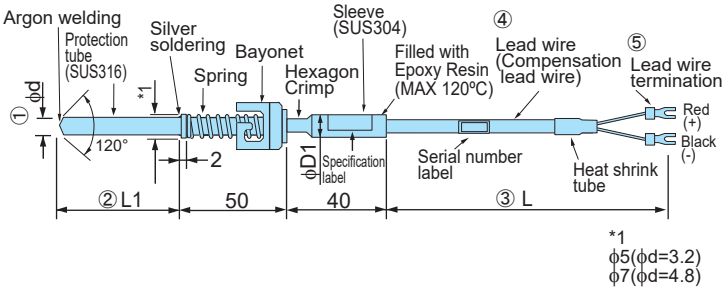


Screw:R(PT)1/8
L=32,40,62
(Specify by ordering)

Screw : M12(P1.75)
L=32,62
(Please specify when you order)

• Different types of screws are also available.

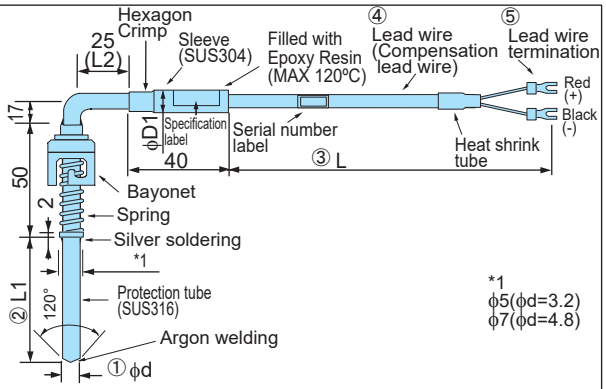
Bayonet Type Sheathed Thermocouples : T-201S/T-211S



T - 201S - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-201S-4.8-100-2000-EXA-Y-K-G-G



T - 211S - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ Mounting bracket

Example :T-211S-4.8-100-2000-EXA-Y-K-G-G

①	Diameter of protection tube	ϕ3.2, ϕ4.8	
②	Length of protection tube	Specify length by “mm” (50mm to 1,000mm) • Please contact distributors regarding other length.	Specify length by “mm” (50mm to 1,000mm) • Please contact distributors regarding other length. • L2 is 25mm. Other length is available. (Please specify when you order)
③	Lead wire length	Specify length by “mm” (100mm or more)	

④ Lead protection

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC	EXF	Fluorocarbon polymers (FEP)	0 to 200ºC

⑤ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

⑥ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)		

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded

⑧ Mounting bracket

Code	Details
G	Holder (Specify screw type and length. See Reference.)
N	No bracket

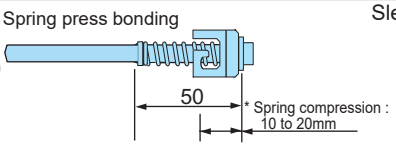
Specifications

Class : class 2
* Class 1 is available (Please specify when you order)
Element : Single element
* Double element is available (Please specify when you order)
Maximum temperature for use

Thermocouple type	Operating temperature for regular use
K	400ºC
J	400ºC
T	250ºC

In case of selecting silicon cover (code:EXE), temperature range for usage changes to 180ºC.

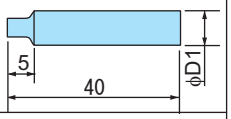
Spring press bonding



• Install bayonet so that its amount of spring compression should be 10mm to 20mm.

Sleeve Dimension (ϕD1)

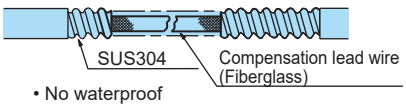
Lead wire type	ϕD1
EXA,EXB,EXC EXD,EXF	ϕ8
EXE	ϕ10



Reference

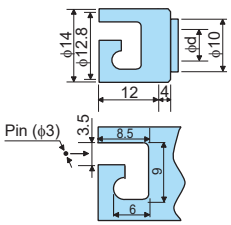
• Stainless flexible lead wire is available

Model Code : T-201FS/T-211FS

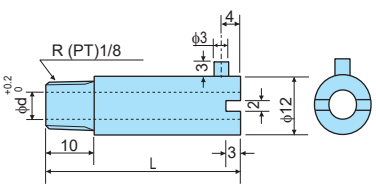


• No waterproof

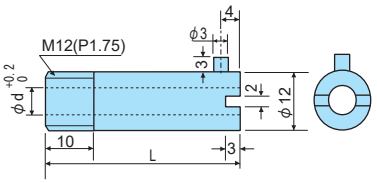
Bayonet SUS304



Holder



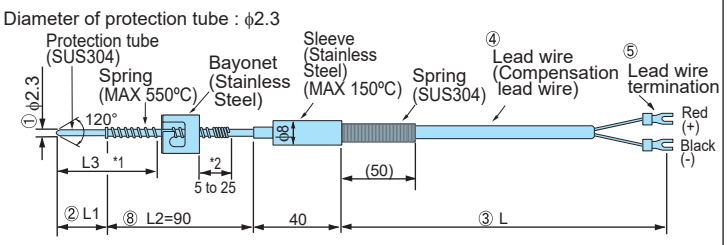
Diameter of protection tube : ϕ3.2, ϕd=5.2mm
Diameter of protection tube : ϕ4.8, ϕd=7.2mm
Screw:R(PT)1/8
L=32,40,62
(Specify by ordering)

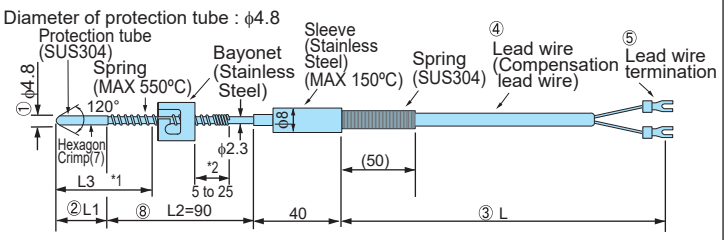


Screw : M12(P1.75)
L=32,62
(Please specify when you order)

• Different types of screws are also available.

Bayonet Type Sheathed Thermocouples : T-202SH/T-212SH (For High Temperature)

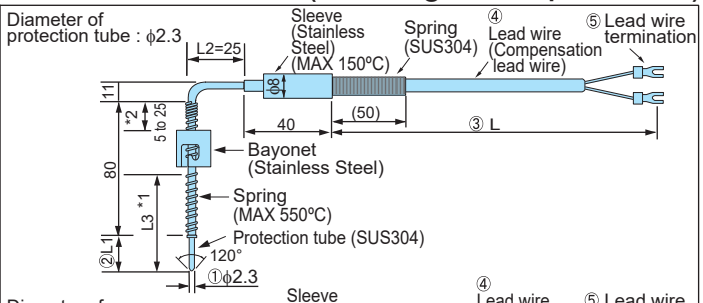


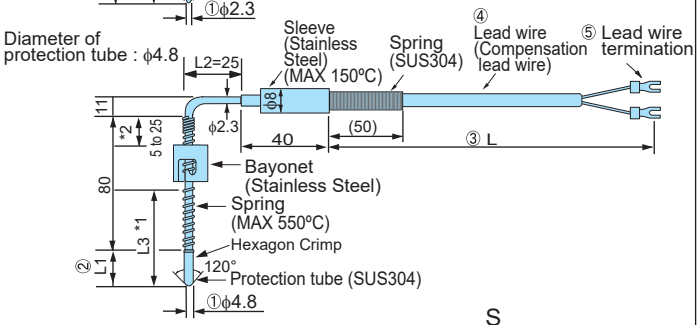


T - 202SH - ϕd - L1 - L - □□□ - □ - □□ - □ - S L2
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ S : 90mm
L2 : More than 90mm (Specify length by "mm")

Example :T-202SH-4.8-25-EXA-Y3-K2-G-S





T - 212SH - ϕd - L1 - L - □□□ - □ - □□ - □ - S L2
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Thermocouple type
⑦ Sensing junction
⑧ S : 25mm
L2 : More than 25mm (Specify length by "mm")

Example :T-212SH-4.8-25-EXA-Y3-K2-G-30

①	Diameter of protection tube	ϕ2.3, ϕ4.8
②	Length of protection tube	Specify length by "mm" (25mm to 500mm)
③	Lead wire length	Specify length by "mm" (1000mm to 8000mm)

④ Lead protection

Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC
EXB	Fiberglass	0 to 150ºC

⑤ Lead wire termination

Code	Details	Code	Details
Y3	Spade lugs for JIS standard "M3" size screw	TS1	Thermocouple connector (CSP01+CLP-A)
R3	Ring lugs for JIS standard "M3" size screw	TS2	Thermocouple connector (CSP01)
MS1	Metal connector (SCK-1602-P)	TS3	Thermocouple connector (CSP01+CLP-A+CSP03)
MN1	Metal connector (NCS-162-P-CH)	TM1	Thermocouple connector (CMP01+CLP-B)
MN2	Metal connector (NCS-162-AdF-CH)	TM2	Thermocouple connector (CMP01)
MN3	Metal connector (NCS-162-PM-CH)	TM3	Thermocouple connector (CMP01+CLP-B+CMP03)
		N	No terminal lugs *terminal soldered

⑥ Thermocouple type

Code	Details
K1	Type K (Chromel-Alumel) Class 1
K2	Type K (Chromel-Alumel) Class 2

⑦ Measuring junction

Code	Details
G	Grounded
NG	Ungrounded

⑧ Length of L2

T-202SH

Code	Details
S	90mm
91 to □□□	More than 90mm (Specify length by "mm")

• L2 should be within L1+L2=500mm. (Maximum)

T-212SH

Code	Details
S	25mm
26 to □□□	More than 26mm (Specify length by "mm")

• L2 should be within L1+L2+80=500mm. (Maximum)

⚠ If temperature of the sleeve may exceed 150ºC, make the L2 longer and insulate the sleeve.

Specifications

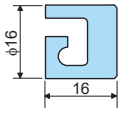
Class : class 2 * Class 1 is available (Please specify when you order)
Element : Single element
Operating temperature for regular use : 550ºC

Reference

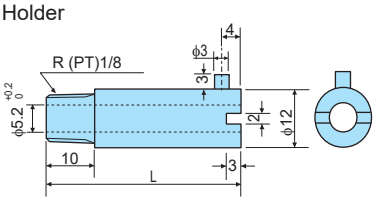
*1:
L3= holder length (excluding screw) + mounting hole length.
More than 60 mm is recommended.

*2:
Bayonet cap should be fit to the holder in the range of 5 to 25 mm.
6~8mm is recommended as the amount of spring compression.
(The gap between the pin holder and the bayonet should be 0 to 2 mm for setting.)

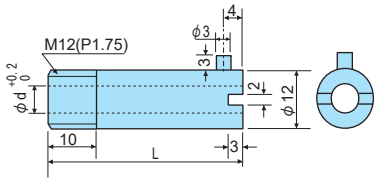
Bayonet



Holder



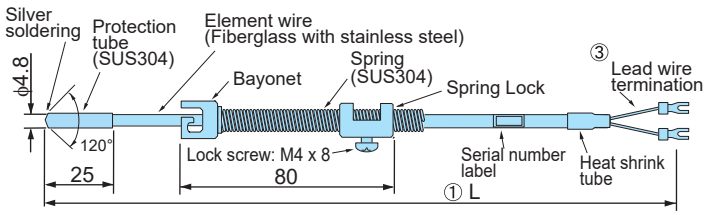
Screw:R(PT)1/8
L=32,40,62
(Specify by ordering)

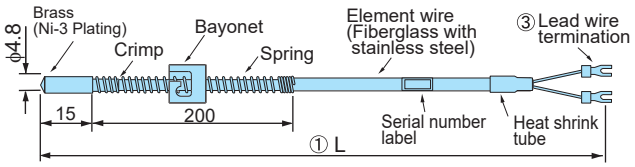


Screw : M12(P1.75)
L=32,62
(Please specify when you order)

• Different types of screws are also available.

Bayonet Type Thermocouples : T-220/T-221





T - 220 - L - EXA -□-□
① ② ③④

① Lead wire length
② Lead protection : EXA, Element wire (Fiberglass with stainless steel)
③ Lead wire termination
④ Thermocouple type

Example :T-220-2000-EXA-Y-K

T - 221 - L - EXA -□-□
① ② ③④

① Lead wire length
② Lead protection : EXA, Element wire (Fiberglass with stainless steel)
③ Lead wire termination
④ Thermocouple type

Example :T-221-2000-EXA-Y-K

① Lead wire length

Specify length by “mm” (500mm to 10,000mm)

② Lead protection

Code	Details
EXA	Element wire (Fiberglass with stainless steel) (1.0/1X2)

Code	Details
EXA	Element wire (Fiberglass with stainless steel) (0.65/1X2)

③ Lead wire termination

Code	Details
Y	Spade lugs for JIS standard "M3" size screw
R	Ring lugs for JIS standard "M4" size screw
M	Metal connector (SCK-1602-P)
TE *1	Thermocouple connector (CSP01+CLP-A+CSP02)
N	No terminal lugs *terminal soldered

• See Page 7.

*1 : Other thermocouple connector : See Page 10

Code	Details
Y	Spade lugs for JIS standard "M3" size screw
R	Ring lugs for JIS standard "M4" size screw
N	No terminal lugs *terminal soldered

• See Page 7.

④ Thermocouple type

Code	Details
K	Type K (Chromel-Alumel)
J	Type J (Iron-Constantan)
T	Type T (Copper-Constantan)

Code	Details
K	Type K (Chromel-Alumel)
J	Type J (Iron-Constantan)

Specifications

Class : class 2
* Class 1 is available (Please specify when you order)
Element : Single element
* Double element is available (Please specify when you order)
Measuring junction : Grounded
* Grounded type is available (Please specify when you order)
Maximum temperature for use

Thermocouple type	Operating temperature for regular use	Maximum temperature
K	300ºC	400ºC
J	300ºC	400ºC
T	200ºC	250ºC

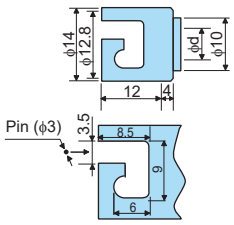
Class : class 2
Element : Single element
* Double element is available (Please specify when you order)
Measuring junction : Grounded

Maximum temperature for use

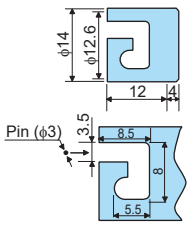
Thermocouple type	Operating temperature for regular use	Maximum temperature
K	300ºC	400ºC
J	300ºC	400ºC

Reference

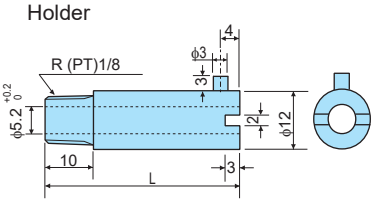
Bayonet SUS304



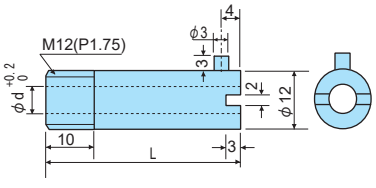
Bayonet SUS303



Holder



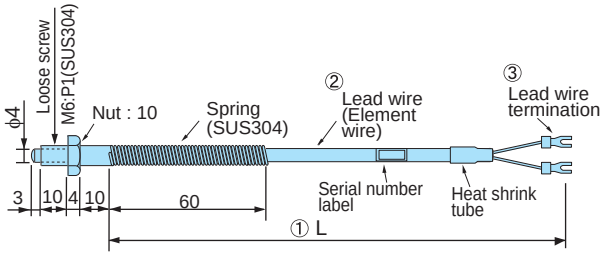
Screw:R(PT)1/8
L=32,40,62
(Specify by ordering)



Screw : M12(P1.75)
L=32,62
(Please specify when you order)

• Different types of screws are also available.

Screwed Tip Thermocouples : T-230

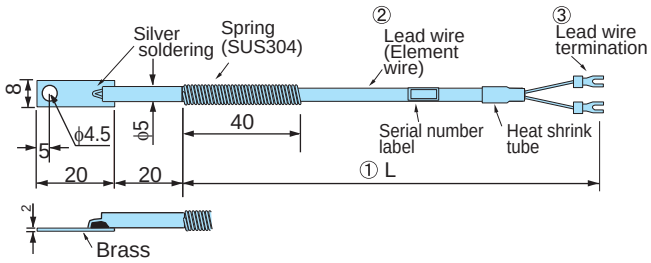


T - 230 - L - □□□ - □ - □
① ② ③ ④

① Lead wire length
② Lead protection
③ Lead wire termination
④ Thermocouple type

Example :T-230-2000-EXA-Y-K

Fixing Screw Type Thermocouples for Surface Temperature Measurement : T-240



T - 240 - L - □□□ - □ - □
① ② ③ ④

① Lead wire length
② Lead protection
③ Lead wire termination
④ Thermocouple type

Example :T-240-2000-EXA-Y-K

① Lead wire length

Specify length by “mm” (500mm to 10,000mm)

② Lead protection

Code	Details
EXA	Element wire (Fiberglass with stainless steel) (0.3/7X2)
EXB	Element wire (Fiberglass) (0.3/7X2)
EXE	Element wire [PVC (polyvinyl chloride) with copper wire braided] (0.1/30X2)

* EXE type is Thermocouple K only.(Protection : Black, Flat type)

③ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	TE*1	Thermocouple connector (CSP01+CLP-A+CSP02)
R	Ring lugs for JIS standard "M4" size screw	N	No terminal lugs *terminal soldered
M	Metal connector (SCK-1602-P)		•See Page7

*1 : Other thermocouple connector : See Page 10

④ Thermocouple type

Code	Details	Code	Details
K	Type K (Chromel-Alumel)	T	Type T (Copper-Constantan)
J	Type J (Iron-Constantan)		

Specifications

Class : class 2 * Class 1 is available (Please specify when you order)
Element : Single element
Measuring junction : Grounded
Maximum temperature for use

Thermocouple type	Operating temperature for regular use	Maximum temperature
K	300ºC	400ºC
J	300ºC	400ºC
T	200ºC	250ºC

In case of selecting silicon cover (code:EXE), temperature range for usage change to 180ºC.

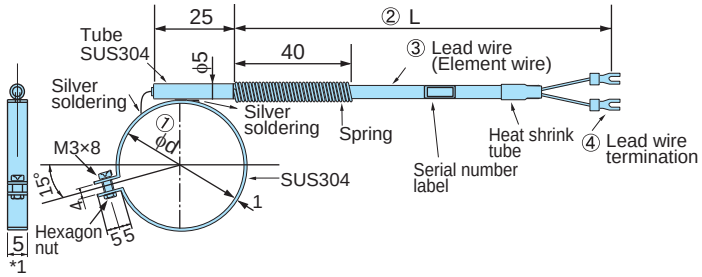
Reference

Screw Type

Standard	M6:P1
Optional	M8:P1.25
	W1/4

(Please specify when you order)

Ring Type Thermocouples for Surface Temperature Measurement : T-250



T - 250 - ϕd - L - □□□ - □ - □
① ② ③ ④ ⑤

① Diameter of ring
② Lead wire length
③ Lead protection
④ Lead wire termination
⑤ Thermocouple type

Example :T-250-50-2000-EXA-Y-K

①	Diameter of ring	Specify length by “mm” (25mm to 150mm) (Standard : ϕ30, ϕ35, ϕ40, ϕ45, ϕ50, ϕ55, ϕ60, ϕ65)
②	Lead wire length	Specify length by “mm” (500mm to 10,000mm)
③	Lead protection	Code: EXA — Element wire (Fiberglass with stainless steel) (0.3/7X2); EXB — Element wire (Fiberglass) (0.3/7X2)
④	Lead wire termination	Y — Spade lugs for JIS standard "M3" size screw; R — Ring lugs for JIS standard "M4" size screw; M — Metal connector (SCK-1602-P); TE*1 — Thermocouple connector (CSP01+CLP-A+CSP02); N — No terminal lugs *terminal soldered •See Page7
⑤	Thermocouple type	K — Type K (Chromel-Alumel); J — Type J (Iron-Constantan); T — Type T (Copper-Constantan)

*1 : Other thermocouple connector : See Page 10

Specifications

Class : class 2 * Class 1 is available (Please specify when you order)
Element : Single element
Measuring junction : Grounded
Maximum temperature for use

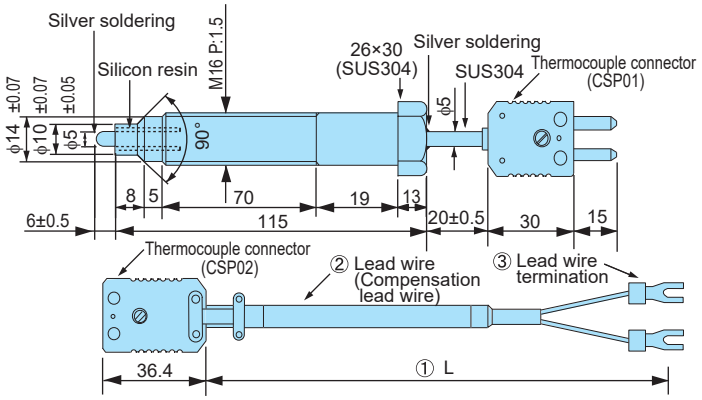
Thermocouple type	Operating temperature for regular use	Maximum temperature
K	300ºC	400ºC
J	300ºC	400ºC
T	200ºC	250ºC

Reference

*1 : Ring width 7mm or 10mm are also available

*1	Width of Ring	Lock screw size
Standard	5mm	M3X8
Optional	7mm	M4X8
	10mm	M4X8

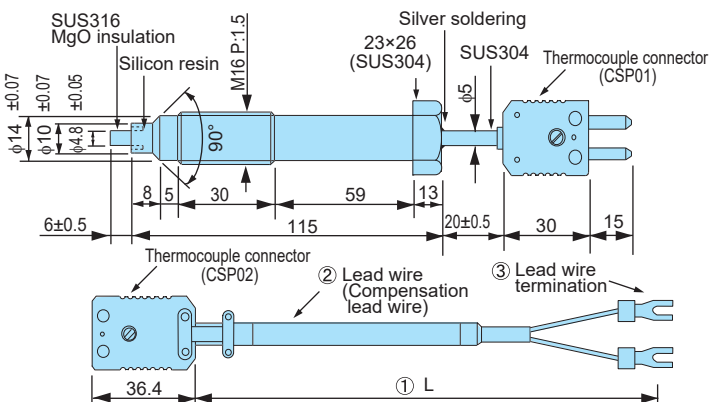
Thermocouples for Resin Temperature : T-260/T-270Z



T - 260 - L - □□□ - □ - □□
① ② ③ ④

① Lead wire length ③ Lead wire termination
② Lead protection ④ Thermocouple type

Example :T-260-2000-EXA-Y-K2



T - 270Z - L - □□□ - □ - □□
① ② ③ ④

① Lead wire length ③ Lead wire termination
② Lead protection ④ Thermocouple type

Example :T-270Z-2000-EXA-Y-K2

①	Lead wire length	Specify length by “mm”

② Lead protection

Code	Details
EXA	Element wire (Fiberglass with stainless steel)
EXB	Element wire (Fiberglass)
EXE	Element wire [PVC (polyvinyl chloride) with copper wire braided] (Only for Type K)

③ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	N	No terminal lugs *terminal soldered
R	Ring lugs for JIS standard "M4" size screw		
M	Metal connector (SCK-1602-P)		

④ Thermocouple type

T-260

Code	Details
K2	Type K (Chromel-Alumel)
J2	Type J (Iron-Constantan)

T-270Z

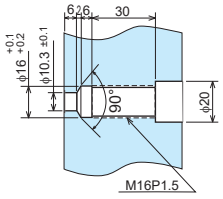
Code	Details
K	Type K (Chromel-Alumel)
J	Type J (Iron-Constantan)

Specifications

Class : class 2
Measuring junction : Grounded (T-260 is available for ungrounded type. Please specify when you order)
Maximum temperature for use : 400ºC
Material of protection tube : SUS304(T-260), SUS316(T-270Z)
Material body : SUS304
withstand pressure : 70MPa (T-260, at 250ºC), 100MPa (T-270Z, at 250ºC)

Reference

Mounting hole (Unit:mm)



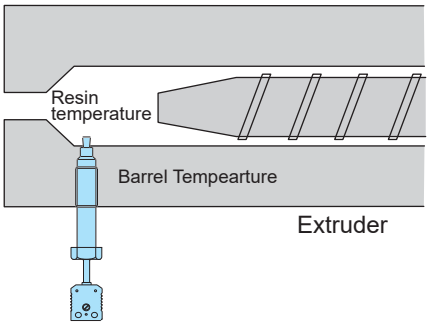
Select codes from the below when order lead wires only.

Specifications		Model and Suffix Code					
		W-BL-	−□□	□□□	−□□□	−□	−□□□□□□
①	Thermocouple type	Type K (class 2) Type J (class 2)	K2 J2				
②	Lead protection	Fiberglass with stainless steel Fiberglass PVC (polyvinyl chloride) Silicone rubber		EXA EXB EXD EXE			
③	Thermocouple connector	Thermocouple connector CSP02 jack (with clamp)		TSA			
④	Lead wire termination	Spade lugs for JIS standard "M3" size screw Spade lugs for JIS standard "M4" size screw Ring lugs for JIS standard "M3" size screw Ring lugs for JIS standard "M4" size screw No terminal lugs No terminal lugs *terminal soldered			Y3 Y4 R3 R4 C N		
⑤	Lead wire length (unit: mm)	Specify length by "mm" (100mm each)					□□□□□□

Thermocouple for Resin Temperature

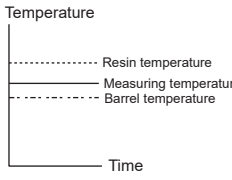
Accurate measurement of resin temperature was difficult in general as there are many thermal disturbances as well as high temperature and high pressure.
T-260/T-270Z has an excellent resistance against high temperature and high pressure. Moreover, T-270Z can measure resin temperature change even there are thermal disturbances because of its Zero-Heat-Flow structure. That leads to be stable resin temperature control.

Because the barrel temperature will be transferred to the protection tube, traditional sensors negatively effects on their measurements. T-270Z realizes its accurate measurement of the resin temperature by compensating the barrel temperature.

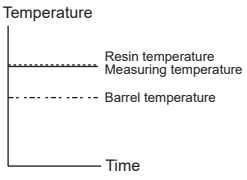


Condition where resin temperature is higher than barrel temperature

Conventional sensor

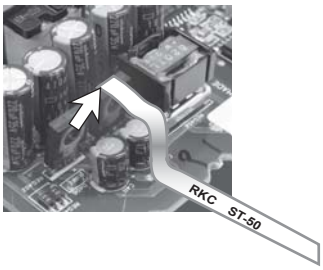


T-270Z



When the resin temperature is lower than the barrel temperature, traditional sensors detects a slightly higher degree than the actual resin temperature.

Adhesive and exposed tip type temperature sensor ST-50/51



Adhesive type temperature sensor : Max. 300°C

■ Glass cloth base type **ST-50**

■ Polyimide sheet type **ST-51**

■ Polyimide sheet type (Fine type) **ST-51S**

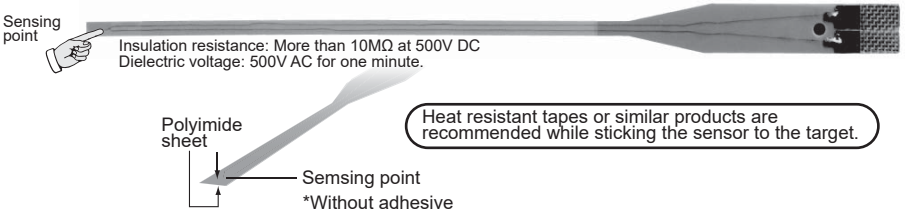
Exposed tip type temperature sensor : Max. 300°C

■ Glass cloth base type **ST-50B**

■ Polyimide sheet type **ST-51B**

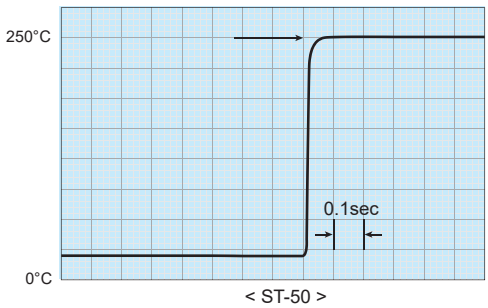
Insulated type temperature sensor : Max.300°C

■ Polyimide sheet type (Fine type) **ST-51SC**



Fast response

As the heat capacity of the sensor is very small temperature can be measured instantly.



< ST-50 >

Measuring up to 300°C (572°F)

Up to 300°C(572°F) can be measured by the tip with an adhesive tape.

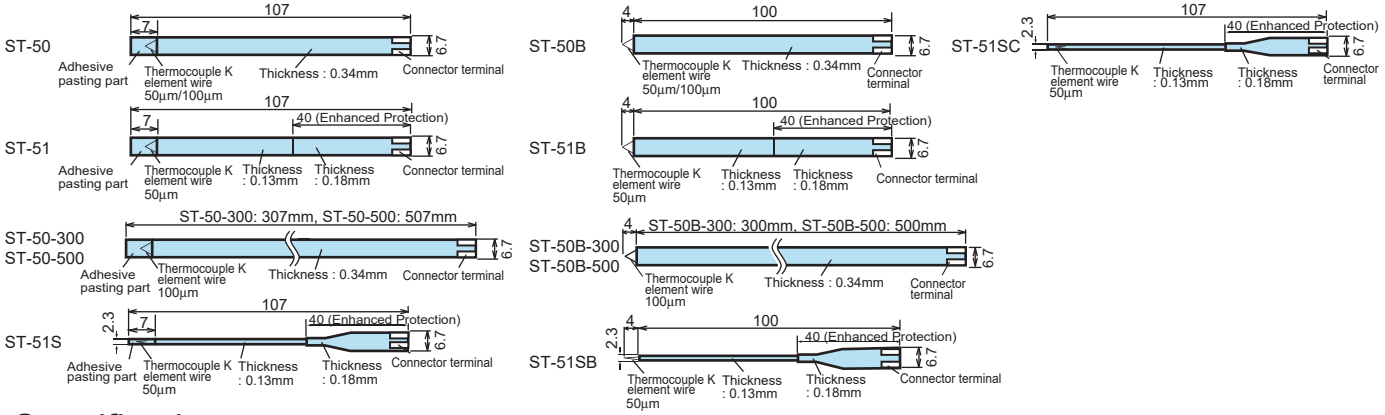
Durable adhesive tape

The adhesive tape can be repeatedly applied to and detached from various types of surfaces.

<Durability of adhesive tape>

- Up to 150°C (302°F) : Repeated use and detachment is available.
- Up to 200°C (393°F)
  When temperature stays above 150°C (302°F), repeated use and detachment is available.
- Up to 250°C (482°F)
  When temperature stays above 200°C (392°F), repeated use and detachment is available.
- Higher than 250°C (482°F)
  Adhesive part will be burnt. Repeated use is not available.

External Dimensions



Specifications

<ST-50/ST-51/ST-51S>

Sheet Material	ST-50/50B : Glass cloth base sheet ST-51/51S/51B/SC : Polyimide sheet
Operating Temperature	ST-51S/51SC : -40 to 300°C (-40 to 577°F) ST-50/50B/51S/51B : 0 to 300°C (32 to 577°F)
Thermocouple	Type K
Sensor Length	ST-50/50B : 100/300/500mm Type ST-51/51S/51B/51SC : 100mm Type
Sensor Thickness	ST-50/50B : 0.34mm ST-51/51S/51B/SC : 0.13mm
Element wire diameter	ST-50/50B : 50µm/100µm (100mm Type) 100µm (300/500mm Type) ST-51/51S/51B/SC: 50µm

	Response of *1 95.0%	Resistance value (With cable 1m)	*2 Accuracy
ST-50	0. 08秒	51Ω	±1.3°C
ST-50-100-D	0. 08秒	17Ω	±1.5°C
ST-50-300	0. 08秒	41Ω	±1.5°C
ST-50-500	0. 08秒	66Ω	±1.5°C
ST-50B	0. 03秒	51Ω	±1.3°C
ST-50B-100-D	0. 03秒	17Ω	±1.5°C
ST-50B-300	0. 03秒	41Ω	±1.5°C
ST-50B-500	0. 03秒	66Ω	±1.5°C
ST-51	0. 08秒	51Ω	±1.3°C
ST-51B	0. 03秒	51Ω	±1.3°C
ST-51S	0. 08秒	51Ω	±1.2°C
ST-51SB	0. 03秒	51Ω	±1.2°C
ST-51SC	0. 32秒	51Ω	±1.2°C

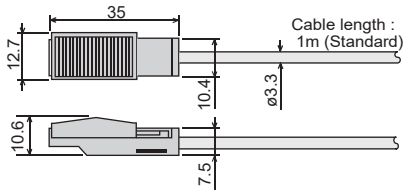
Response of Metal Surface (Adhesive type)

50µm element wire type : 0.4sec
100µm element wire type : 0.9sec

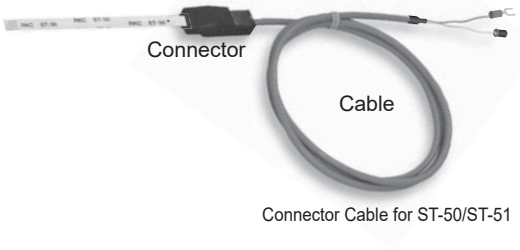
*1 : Response when temperature of paraffin is 250°C (482°F).
*2 : Accuracy when temperature on metal surface is 100°C (212°F).

<W-ST50A> Connector Cable for ST-50/ST-51

Sensor-side connector allowable ambient temperature	0 to 230°C
Connector material	PPS resin
Connector Max. temperature	230°C
Cable	ø3.3 Extended cable, Standard 1m
Cable material	Silicon rubber coated (Green)
Resistance value	8.5Ω or less (1m)
Cable Max. temperature	180°C
Weight	Approx 20g (Cable 1m, Y-sharped terminal lug type)

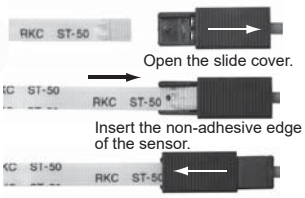


Slide cover type connector

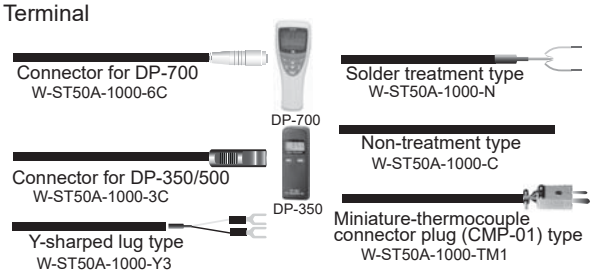


Connector Cable for ST-50/ST-51

How to connect ST-50/ST-51 sensor



Terminal



Model and Suffix Code

<ST-50> Glass cloth base type

ST-50 (Adhesive type)

Model Code	Contents
ST-50	Length : 107mm, Element Wire Diameter 50µm, 5 pieces per set
ST-50-100-D	Length : 107mm, Element Wire Diameter 100µm, 5 pieces per set
ST-50-300	Length : 307mm, Element Wire Diameter 100µm, 1 piece
ST-50-500	Length : 507mm, Element Wire Diameter 100µm, 1 piece

ST-50B (Exposed tip type)

Model Code	Contents
ST-50B-100-04	Length : 104mm, Element Wire Diameter 50µm, 5 pieces per set
ST-50B-100-04-D	Length : 104mm, Element Wire Diameter 100µm, 5 pieces per set
ST-50B-300-04	Length : 304mm, Element Wire Diameter 100µm, 1 piece
ST-50B-500-04	Length : 504mm, Element Wire Diameter 100µm, 1 piece

<ST-51> Polyimide sheet type

ST-51 (Adhesive type)

Model Code	Contents
ST-51-100-C	Length : 107mm, Element Wire Diameter 50µm, 5 pieces per set

ST-51B (Exposed tip type)

Model Code	Contents
ST-51B-100-C	Length : 104mm, Element Wire Diameter 50µm, 5 pieces per set

<ST-51S> Polyimide sheet type

ST-51S (Adhesive type)

Model Code	Contents
ST-51S-100-C	Length : 107mm, Element Wire Diameter 50µm, 5 pieces per set

ST-51SB (Exposed tip type)

Model Code	Contents
ST-51SB-100-C	Length : 104mm, Element Wire Diameter 50µm, 5 pieces per set

<ST-51SC> Polyimide sheet type

ST-51S (Insulated Type)

Model Code	Contents
ST-51SC-100-C	Length : 107mm, Element Wire Diameter 50µm, 5 pieces per set

<ST-50 Connector>

Model Code	Contents
W-ST50A-1000-3C	ST-50/51 Connector cable for DP-350/500 connection (1m)
W-ST50A-1000-6C	ST-50/51 Connector cable for DP-700 connection (1m)
W-ST50A-1000-Y3	Y-sharped terminal lug type ST-50/51 Connector cable (1m)
W-ST50A-1000-N	Solder treatment type ST-50/51 Connector cable (1m)
W-ST50A-1000-C	Non-treatment type ST-50/51 Connector cable (1m)
W-ST50A-1000-TM1	Miniature-thermocouple connector plug (CMP-01) type ST-50/51 Connector cable

Temperature Sensors for Extremely Small Surface ST-55/56

■ Features

Measuring temperature in a small surface area

A fine thermocouple enables measurement of a fine surface or a surface with small thermal capacity such as SMT parts.

Measuring up to 500 °C (932°F) (Ceramic coating type)

Ceramic coating type can measure up to 500°C (932°F) and fluorine resin coating type up to 260°C (500°F).

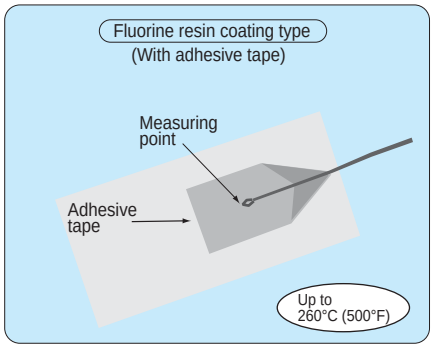
Optional adhesive tape on the tip (Fluorine resin coating type)

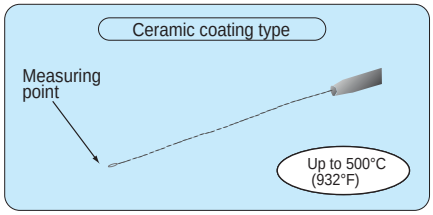
Optional adhesive tape on the fluorine resin coating type allows the tip to stick to an exact spot for measurement.

Fast response with fine thermocouple

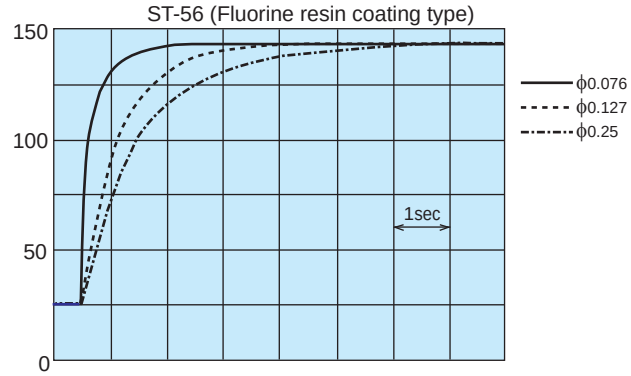
As the heat capacity of the sensor is very small temperature can be measured instantly.

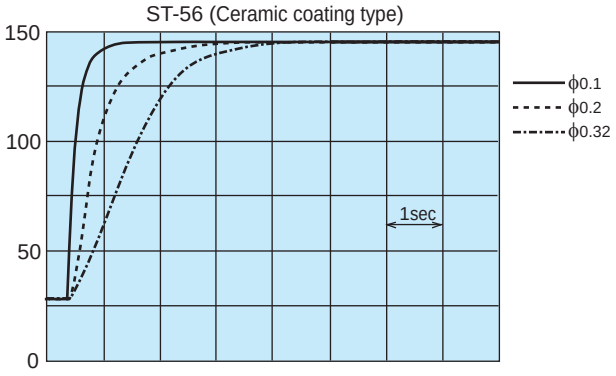
Measuring point on the tip



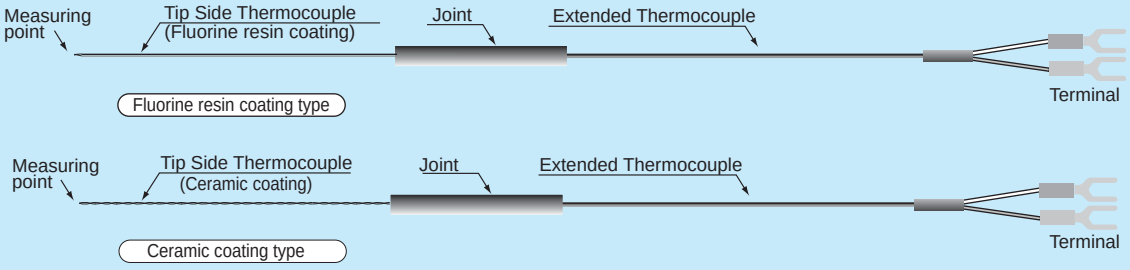


Response of Metal Surface

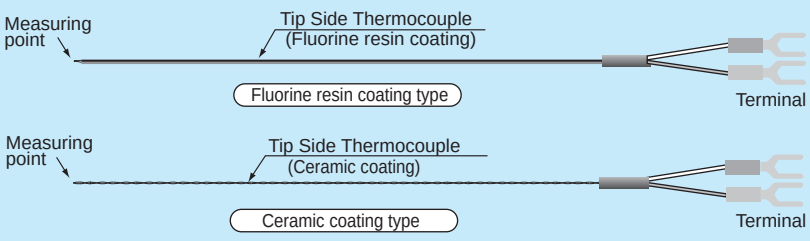




ST-55 ST-55 has a joint which enables a longer length

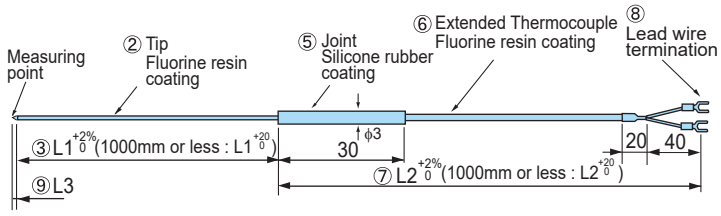


ST-56 ST-56 is a seamless thermocouple



Temperature Sensors for Extremely Small Surface ST-55

Fluorine resin coating type : ST-55K-T □

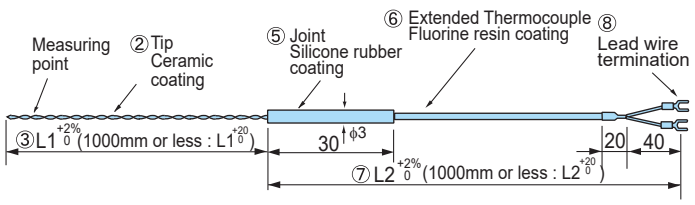


ST - 55K - ① □□ ② ③ L1 ④ □ - ⑤ G - ⑥ ⑦ □□ L2 - ⑧ □ - ⑨ L3

① Thermocouple type
② Shape of Thermocouple (Element wire diameter/Coating)
③ Length of thermocouple element wire
④ Adhesive tape for tip
⑤ Joint specifications
⑥ Shape of extended thermocouple (Element wire diameter/Coating)
⑦ Length of extended thermocouple element wire
⑧ Lead wire termination
⑨ Length of exposed tip

Example :ST-55K-TA0300P-G-TD1000-Y-05

Ceramic coating type : ST-55K-C □



ST - 55K - ① □□ ② ③ L1 N ④ - ⑤ G - ⑥ ⑦ □□ L2 - ⑧ □

① Thermocouple type
② Shape of Thermocouple (Element wire diameter/Coating)
③ Length of thermocouple element wire
④ Adhesive tape for tip
⑤ Joint specifications
⑥ Shape of Extended Thermocouple (Element wire diameter/Coating)
⑦ Length of extended thermocouple element wire
⑧ Lead wire termination

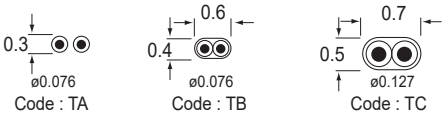
Example :ST-55K-CA0300N-G-TD1000-Y

① Thermocouple type

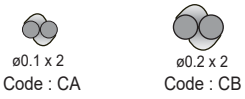
Type K

② Shape of Thermocouple (Element wire diameter/Coating)

Code	Details
TA	ø0.076 Fluorine resin coating (Single thermocouple type)
TB	ø0.076 Fluorine resin coating (Paired thermocouple type)
TC	ø0.127 Fluorine resin coating (Paired thermocouple type)



Code	Details
CA	ø0.1 Ceramic coating (Single thermocouple type)
CB	ø0.2 Ceramic coating (Single thermocouple type)



③ Length of thermocouple element wire

Specify every 50mm unit

④ Adhesive tape for tip

Code	Details
P	Polymide tape
G	Glass cloth base tape
N	None

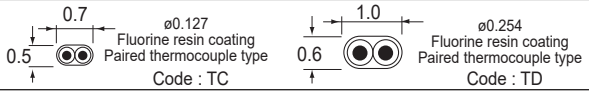
N: None

⑤ Joint specifications

Silicone rubber coating (Max. temperature : 170°C)

⑥ Shape of extended thermocouple (Element wire diameter/Coating)

Code	Details
TC	ø0.127 Fluorine resin coating (Paired thermocouple type)
TD	ø0.254 Fluorine resin coating (Paired thermocouple type)



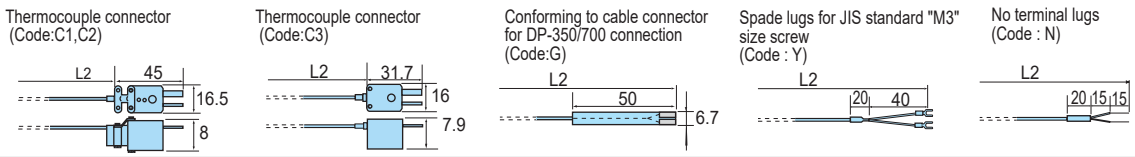
⑦ Length of extended thermocouple element wire

Unit : mm (Min.200mm) Specify every 50mm unit • Please select length so that a total resistance of thermocouple become 100Ω or less.

⑧ Lead wire termination

Code	Details
C1	CMP01-K (RKC product) Material : Polyamide (Max. temperature : 140°C (284°F))
C2	CMR01-K (RKC product) Material : PPS resin (Max. temperature : 220°C (428°F))
C3	1260-K (MARINE product) (Max. temperature : 205°C (401°F))
Y	Spade lugs for JIS standard "M3" size screw *1
G	Conforming to cable connector for DP-350/700 connection
N	No terminal lugs *terminal soldered

*1 Spade lugs for JIS standard "M3" size screw is not available if extended thermocouple was specified ø0.127 (Code : TC).



⑨ Length of exposed tip (Only for ST-55K-T□)

Code	Details
No symbol	Length of exposed tip : 2mm (Standard)
03 to 30	Length of exposed tip : 3 to 30mm (Specify every 1mm unit)

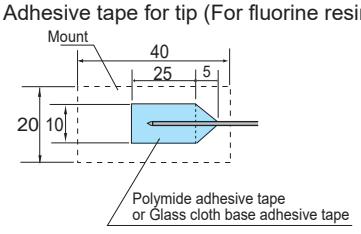
Specifications

Class : Equal to JIS class 2 (Only for fluorine resin coating type)
Accuracy : ±0.5%±1°C
• Accuracy when temperature 100°C on metal surface (copper) is measured. (Prior to to factory)
Response time : ø0.076 Fluorine resin coating
0.2 sec (Response of 63.2%)
0.8 sec (Response of 95.0%)
ø0.1 x 2 Ceramic coating
0.2 sec (Response of 63.2%)
0.5 sec (Response of 95.0%)
• Accuracy when temperature on metal surface is measured.

Maximum operating temperature
1) Measuring point : Fluorine resin coating : 300°C
(Coating section 260°C)
Ceramic coating : 500°C
2) Adhesive tape : 300°C
3) Joint section : 170°C
4) Extended section : 260°C
Thermocouple resistance per 100mm
ø0.076mm : 20Ω, ø0.127mm : 8Ω, ø0.254mm : 2Ω,
ø0.10mm : 13Ω, ø0.20mm : 3.1Ω

Reference

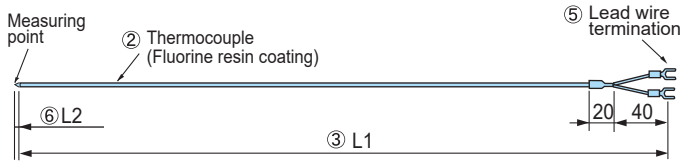
Adhesive tape for tip (For fluorine resin coating type)



The adhesive tape permits the tip to stick to various types of surfaces.
Repeated peeling and sticking is possible.
<Durability of adhesive tape>
• Up to 150°C (302°F) : Repeated use.
• Up to 200°C (392°F) : Repeated use, as long as temperature stays above 150°C (302°F).
• Up to 250°C (482°F) : Repeated use, as long as temperature stays above 200°C (392°F).
• More than 250°C (482°F) : Adhesive will burn and no longer be used.
However, the number of sticking times differs depending on the environment where the adhesive is used.

Temperature Sensors for Extremely Small Surface ST-56

Fluorine resin coating type : ST-56K-T□

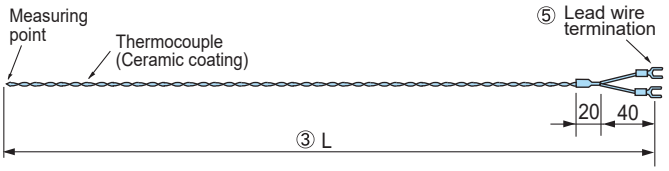


ST - 56K - □□ L1 □ - □ - L2
① ② ③ ④ ⑤ ⑥

① Thermocouple type
② Shape of Thermocouple (Element wire diameter/Coating)
③ Length of thermocouple element wire
④ Adhesive tape for tip
⑤ Lead wire termination
⑥ Length of exposed tip

Example : ST-56K-TA0500P-Y-05

Ceramic coating type : ST-56K-C□



ST - 56K - □□ L N - □
① ②③④⑤

① Thermocouple type
② Shape of Thermocouple (Element wire diameter/Coating)
③ Length of thermocouple element wire
④ Adhesive tape for tip
⑤ Lead wire termination
⑥ Length of exposed tip

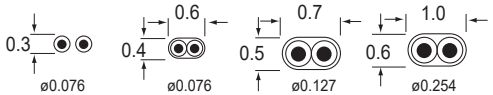
Example : ST-56K-CA0500N-Y

① Thermocouple type

Type K

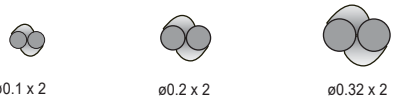
② Shape of Thermocouple (Element wire diameter/Coating)

Code	Details
TA	ø0.076 Fluorine resin coating (Single thermocouple type)
TB	ø0.076 Fluorine resin coating (Paired thermocouple type)
TC	ø0.127 Fluorine resin coating (Paired thermocouple type)
TD	ø0.254 Fluorine resin coating (Paired thermocouple type)



ø0.076 Code : TA | ø0.076 Code : TB | ø0.127 Code : TC | ø0.254 Code : TD

Code	Details
CA	ø0.1 Ceramic coating (Single thermocouple type)
CB	ø0.2 Ceramic coating (Single thermocouple type)
CC	ø0.32 Ceramic coating (Single thermocouple type)



ø0.1 x 2 Code : CA | ø0.2 x 2 Code : CB | ø0.32 x 2 Code : CC

③ Length of thermocouple element wire

Specify every 200mm unit • Please select length so that a resistance of thermocouple become 100Ω or less.

④ Adhesive tape for tip

Code	Details
P	Polymide tape
G	Glass cloth base tape
N	None

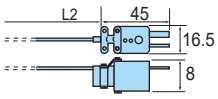
N: None

⑤ Lead wire termination

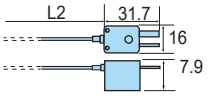
Code	Details
C1	CMP01-K (RKC product) Material : Polyamide (Max. temperature : 140°C (284°F))
C2	CMR01-K (RKC product) Material : PPS resin (Max. temperature : 220°C (428°F))
C3	1260-K (MARINE product) (Max. temperature : 205°C (401°F))
Y	Spade lugs for JIS standard "M3" size screw *1
G	Conforming to cable connector for DP-350/700 connection
N	No terminal lugs *terminal soldered

*1 Spade lugs for JIS standard "M3" size screw is not available if extended thermocouple was specified ø0.076, ø0.127,ø0.10 (Code : TA/TB/TC/CA).

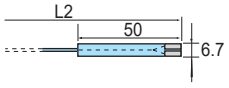
Thermocouple connector (Code:C1,C2)



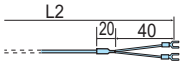
Thermocouple connector (Code:C3)



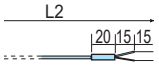
Conforming to cable connector for DP-350/700 connection (Code:G)



Spade lugs for JIS standard "M3" size screw (Code : Y)



No terminal lugs (Code : N)



⑥ Length of exposed tip (Only for ST-56K-T□)

Code	Details
No symbol	Length of exposed tip : 2mm (Standard)
03 to 30	Length of exposed tip : 3 to 30mm (Specify every 1mm unit)

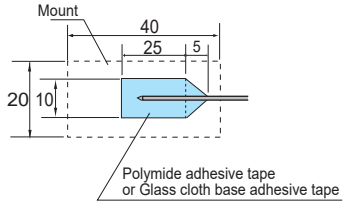
Specifications

Class : Equal to JIS class 2 (Only for fluorine resin coating type)
Accuracy : ±0.5%±1°C
• Accuracy when temperature 100°C on metal surface (copper) is measured. (Prior to to factory)
Response time : ø0.076 Fluorine resin coating
0.2 sec (Response of 63.2%)
0.8 sec (Response of 95.0%)
ø0.1 x 2 Ceramic coating
0.2 sec (Response of 63.2%)
0.5 sec (Response of 95.0%)
• Accuracy when temperature on metal surface is measured.

Maximum operating temperature
1) Measuring point : Fluorine resin coating : 300°C
(Coating section 260°C)
Ceramic coating : 500°C
2) Adhesive tape : 300°C
3) Joint section : 170°C
4) Extended section : 260°C
Thermocouple resistance per 100mm
ø0.076mm : 20Ω, ø0.127mm : 8Ω, ø0.254mm : 2Ω,
ø0.10mm : 13Ω, ø0.20mm : 3.1Ω, ø0.32mm : 1.2Ω

Reference

Adhesive tape for tip (For fluorine resin coating type)



The adhesive tape permits the tip to stick to various types of surfaces.
Repeated peeling and sticking is possible.
<Durability of adhesive tape>
• Up to 150°C (302°F) : Repeated use.
• Up to 200°C (392°F) : Repeated use, as long as temperature stays above 150°C (302°F).
• Up to 250°C (482°F) : Repeated use, as long as temperature stays above 200°C (392°F).
• More than 250°C (482°F) : Adhesive will burn and no longer be used.
However, the number of sticking times differs depending on the environment where the adhesive is used.

Thermocouple Type Non Contact Temperature Sensors : ST-100

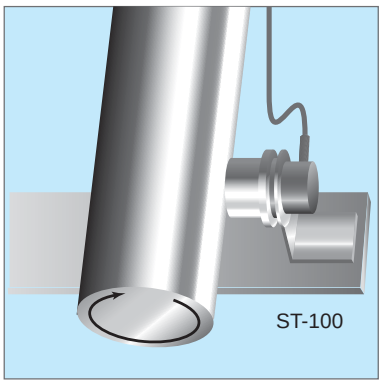
Features

When contact thermocouple was used for measuring a surface temperature of moving objects such as roller and rotationary objects, it causes tremendous consumption to the sensor or damages to the surface of the measured object, this caused error in measurement due to friction heat.
This problem can be solved by putting a distance between a sensor and a measured object, however, there still causes influence of disturbance by thermal connection failure, slower response of temperature for measuring object, poor linearlization or slower response
ST-100 uses uniquely designed triple measuring elements (thermocouples).
Change of connection method and use of movable structure have solved these problems.
Moreover, it can be used with connecting indicator and controller for K type thermocouple since output characteristics is similar to traditional contact-type thermocouple

Specifications

Application : Roller and Moving objects (Sheets)
Measuring method : Non-contact
Measuring element : Thermocouple K (Daiameter of element : ϕ0.08)
Measuring range : Ambient temperature to 300°C
Response time : Approx.30 sec (Response of 98%)
Approx. 6 sec (Response of 63%)
* At metal surface measuring
Measuring accuracy : Within ±3°C (at 200°C)
* When output is adjusted at the middle of the measuring range.
Measuring distance : Distance between sensor surface of ST-100 and measured object should be kept 0.5 to 1.5mm
Keep a cetrain distance when measuring.
(1mm when it is with distancer)
Output signal : Thermocouple K output
Lead wire : ϕ6 Silicone rubber protection lead (KX type, 3m)
Output impedance : 50Ω

Example of Application



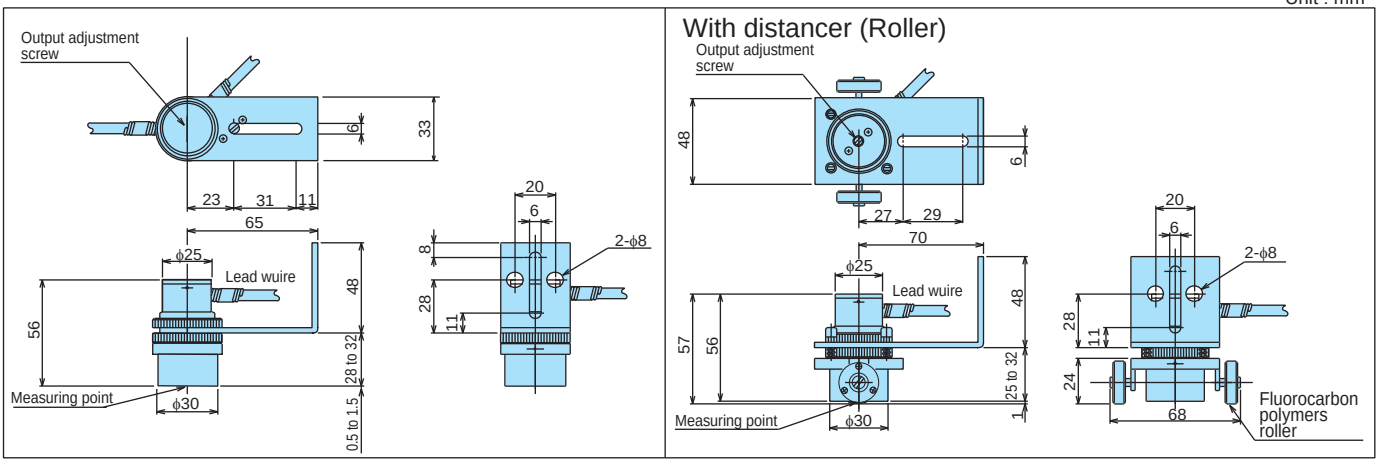
Example of non-contact temperature measurement for rotating heat roller

Model Code

Specifications	Model and Suffix Code	
	ST-100 -	K-□□□□□-□ / □*□
Thermocouple type	Type K	K
Lead wire length (unit: mm)	1000 to 20000mm (Standard :3000mm) *1000 to 5000mm (Specify 500mm each) 6000 to 20000mm (Specify 1000mm each)	□□□□□
Lead wire termination	Spade lugs for JIS standard "M3" size screw Spade lugs for JIS standard "M4" size screw No terminal lugs No terminal lugs *terminal soldered	Y3 Y4 C N
Lead protection	Silicone rubber (Blue)	D
Distancer (Roller)	None With distancer (Roller)	No symbol D

External Dimension

Unit : mm



Thermocouple Type Non-Contact Temperature Sensors : ST-100K

Features

ST-100K, a compacted type of ST-100, is a non-contact thermocouple sensor for surface measurement of moving objects such as roller, rotating objects, and sheet.

Specifications

Application : Insulator surface (Roller and Moving objects (Sheets))
Measuring method : Non-contact
Measuring element : Thermocouple K, Class 2 (Daiameter of element : ϕ0.076)
Measuring range : Ambient temperature to 260°C
(Maximum continuous operating temperature : 200°C)
Measuring accuracy : Within ±2°C (Ambient temperature to 150°C)
Within ±5°C (150 to 260°C)
* Measuring distance : 0.5mm
If a measuring distance will become within 0.5mm, indicated value is higher than actual temperature.
Measuring distance : 0.5mm (Fixed)
Spring stroke : 0.5 to 2mm (ST-100K)
0.2 to 1mm (ST-100K1)
Output signal : Thermocouple K output
Lead wire : Fiberglass
* Response time (reference values) : Approx.3.5 sec (90%) Typ.

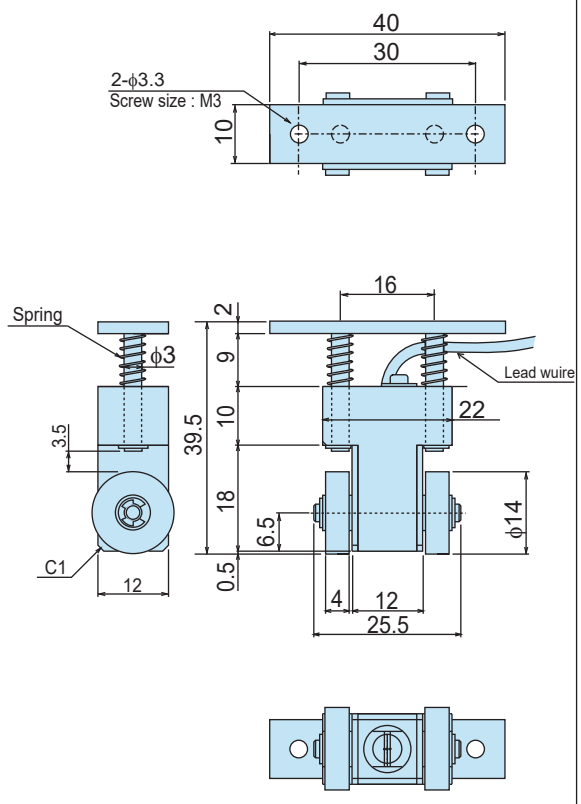
Model Code

Specifications	Model and Suffix Code			
	ST-100K- ST-100K1-	-□□□□□-□□-		
Lead wire length (unit: mm)	500 to 5000mm * 500 to 990mm (Specify 100mm each) 1000 to 5000mm (Specify 500mm each)	□□□□□		
Lead protection	Fiberglass		EXF	
Lead wire termination	Spade lugs for JIS standard "M3" size screw			Y3
	Ring lugs for JIS standard "M4" size screw			R4
	Thermocouple connector (CSP01-K + CLP-A)			TE1
	Thermocouple connector (CMP01-K + CLP-B)			TE3
	No terminal lugs *terminal soldered			N

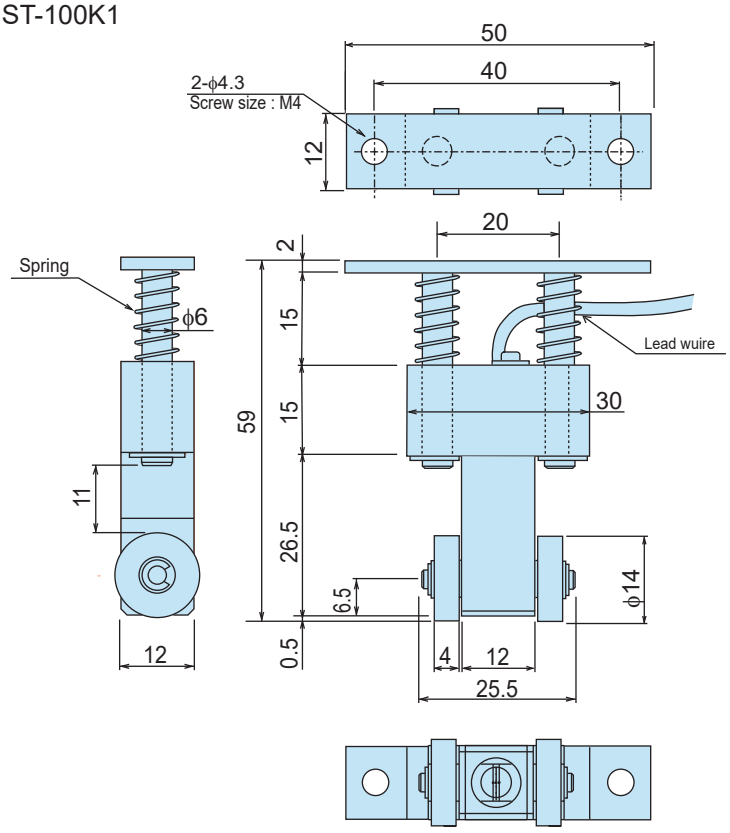
External Dimension

Unit : mm

ST-100K



ST-100K1



Rotating Roll Surface Temperature Measuring Sensors JBS-3898

Features

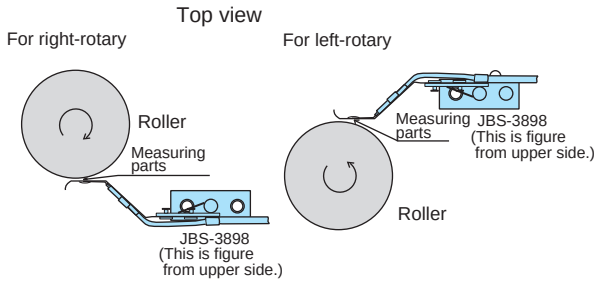
JBS-3898 is a sensor for surface temperature measurement, and it is small and easily connectable. Pressed by the spring, a sensor touches to a measuring part and realizes a stable temperature measurement. Non contact type is capable of easy and accurate measurement for rotary roll and belt with shiny surface which is difficult to be measured.

Specifications

Thermocouple Type	: Type K, Class 2 (JIS) Type T, Class 1 (JIS)
Measuring accuracy	: Type K ±2.5°C [0 to 50°C] ±(1.0°C + 0.03|t|) or ±0.045|t|, whichever is larger. [50 to 300°C] t: measuring temperature Type T ±2°C [0 to 50°C] ±(1.0°C + 0.03|t|) [50 to 100°C] t: measuring temperature
Response time	: Type K, Fiberglass lead wire 1.0 sec (Response of 63.2%). 3.6 sec (Response of 95.0%) Type K, Fluorocarbon polymers lead wire 1.2 sec (Response of 63.2%). 6.3 sec (Respose of 95.0%) Type T, Fluorocarbon polymers lead wire 2.0 sec (Response of 63.2%). 6.0 sec (Response of 95.0%)
Operating temperature	: Type K,0 to 300°C (Fiberglass lead wire) Type K,0 to 200°C (Fluorocarbon polymers lead wire) Type T,0 to 100°C (Fluorocarbon polymers lead wire)
Contact plate	: SUS304, Width 7mm,Thickness:0.15mm
Lead wire	: Fiberglass lead wire, Element diameter (ϕ0.32) Fluorocarbon polymers lead wire, Element diameter (ϕ0.2)
Weight	: 23g (Fiberglass lead wire, Lead length : 3m, Lead wire termination : Spade lugs for JIS standard "M3" size screw)

2 types are available (Right-rotary and left-rotary types)

For directions of rotation and mounting of roller, we have right-rotary and left-rotary types.



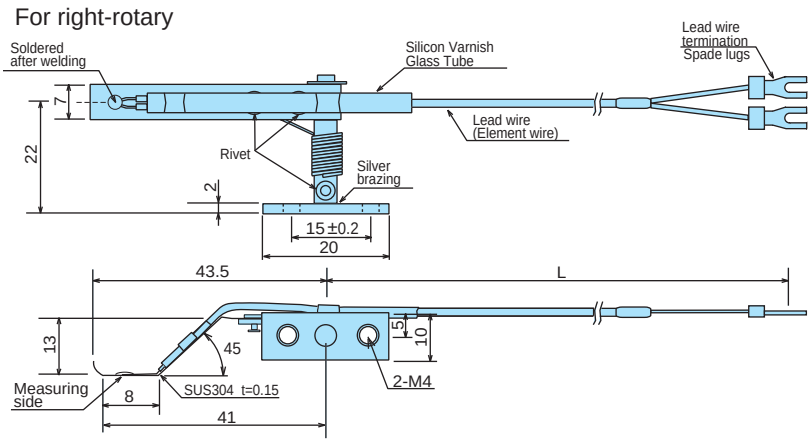
Model Code

Specifications	Model and Suffix Code					
	JBS-3898	−□□□□−□□□−□	−□	−□		
Lead wire length (unit: mm)	100 to 8000mm * 100 to 990mm (Specify 10mm each) 1000 to 8000mm (Specify 500mm each)	□□□□				
Lead protection	Fiberglass lead wire (Type K only) Fluorocarbon polymers lead wire		EXB EXF			
Lead wire termination	Spade lugs for JIS standard "M3" size screw Spade lugs for JIS standard "M4" size screw No terminal lugs *terminal soldered			Y3 R4 N		
Thermocouple type	Type K Type T				K T	
Directions of rotaion	For right-rotary For left-rotary					R L

External Dimension

Unit : mm

For right-rotary

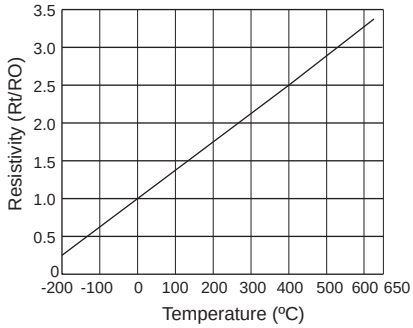


General type • Sheathed Resistance Temperature Detectors

■ Resistance Temperature Detector

The value of metal resistance changes according to temperature change. This measuring element which utilizes a relationship between temperature and resistance is called Resistance Temperature Detectors (RTDs). Platinum, nickel, and copper are used as metals of RTDs, and utilizes a characteristic that the resistance increases as the temperature rises.
Platinum is the most excellent element in accuracy and stability and is defined in "JIS" standard.
Platinum is fragile compared with the other elements, be cautious about its usage at a place where vibrations and shocks will occur.
All of our RTDs are platinum ones of the type Pt100.

Platinum Resistance Temperature Detector (Pt100)
Temperature Characteristic

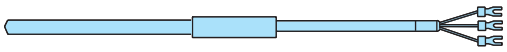


■ Sheathed Resistance Temperature Detector

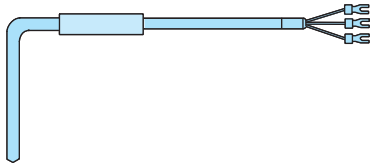
Inside the thin stainless steel pipe, element is located, and then Stainless pipe is filled with a MgO.
This type of sensor features in excellent responsiveness and vibration resistances.

Sleeve type

R-101(General type)/R-101S(Sheathed type)



R-111(General type)/R-111S(Sheathed type)

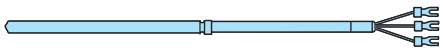


Terminal head type

R-30,35(General type)/R-30S,35S(Sheathed type)

No-sleeve type (Only for General type)

R-102



Metal connector type

R-90(General type)/R-90S(Sheathed type)

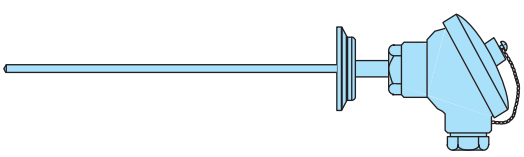
■ Sanitary type Resistance Temperature Detector

Sanitary Sensors are able to keep cleanness of foreign matters and bacteria, users can relief to apply them in food, beverage, and chemical processing applications.

- Protection tube is #400 polish finishing.
- Ferrule cap and hexagon nut and linear cap are available.
- Protection tube material is SUS316.
- Electropolishing is available (Specify from "option" code).

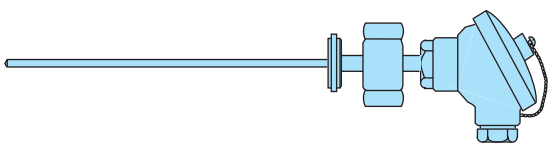
Ferrule cap
(Sheathed Resistance Temperature Detector)

R-31S, R-36S

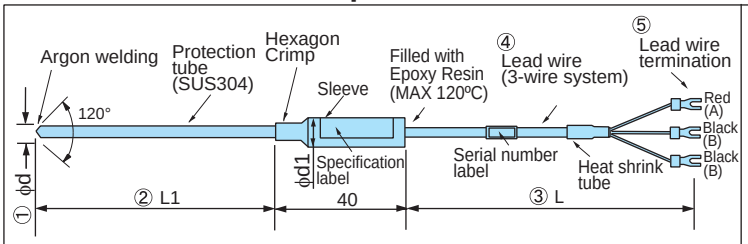


Hexagon nut and Linear cap
(Sheathed Resistance Temperature Detector)

R-31RS, R-36RS



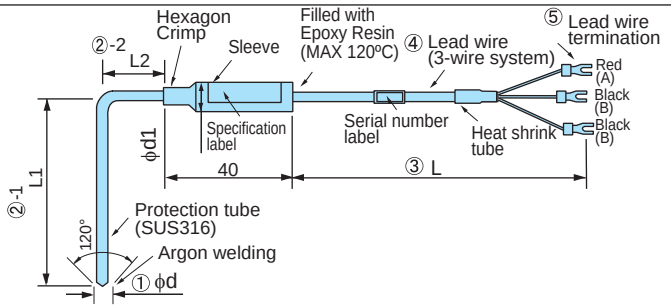
Resistance Temperature Detectors : R-101/R-111



R - 101 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Resistance temperature detector type
⑦ Sensing junction
⑧ Mounting bracket

Example :R-101-5-100-2000-EXA-Y-PDM-NG-N



R - 111 - ϕd - L1 - L2 - L - □□□ - □ - □ - □ - □
① ②-1 ②-2 ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
②-1, 2 Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Resistance temperature detector type
⑦ Sensing junction
⑧ Mounting bracket

Example :R-111-5-100-30-2000-EXA-Y-PDM-NG-N

① Diameter of protection tube

ϕ3.0, ϕ3.2, ϕ4.0, ϕ4.8, ϕ5.0, ϕ6.0, ϕ8.0

② Length of protection tube

Specify length by "mm" (100mm to 1,000mm)
• Please contact distributors regarding other length.

②-1: Specify length by "mm" (100mm or more, L1+L2=1,000mm or less)
②-2: Specify length by "mm" (25mm or more, L1+L2=1,000mm or less)
• Length is 25mm without specification.
• Please contact distributors regarding other length.

③ Lead wire length

Specify length by "mm" (100mm or more)

④ Lead protection

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC	EXF	Fluorocarbon polymers (FEP)	0 to 200ºC

⑤ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	N	No terminal lugs * terminal soldered
R	Ring lugs for JIS standard "M4" size screw		
M	Metal connector (SCK-1603-P)		

•See Page7

⑥ Resistance temperature detector type

Code	Details	Operating temperature	Code	Details	Operating temperature
PDP	Pt100 Middle Temperature Type (ϕ3.0 to ϕ4.0)	0 to 220ºC	PAP	JPt100 Middle Temperature Type (ϕ3.0 to ϕ4.0)	0 to 220ºC
PDM	Pt100 Middle Temperature Type (ϕ4.8 or more)	0 to 350ºC	PAM	JPt100 Middle Temperature Type (ϕ4.8 or more)	0 to 350ºC
PDH	Pt100 High Temperature Type (ϕ4.8 or more)	0 to 500ºC	PAH	JPt100 High Temperature Type (ϕ4.8 or more)	0 to 500ºC

⑦ Measuring junction

Code	Details
NG	Ungrounded
O	Exposed

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

Specify size of mounting bracket when code is "A", "B", or "E". (See Page 6)
Specify size of flange when code is "C". (See Page 6)

• Please contact distributors regarding other mounting bracket.

Specifications

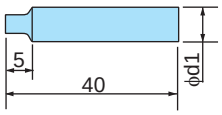
Class : class B * Class A is available (Please specify when you order)
Element : Single element * Double element is available.
(Diameter of protection tube : ϕ4.8 or more)
(Please specify when you order)

Maximum temperature for use

Diameter of protection tube	Operating temperature
ϕ3.0 to ϕ4.0 (Middle temperature type : Code PDP/PAP)	0 to 220ºC
ϕ4.8 or more (Middle temperature type : Code PDM/PAM)	0 to 350ºC
ϕ4.8 or more (High temperature type : Code PDH/PAH)	0 to 500ºC

Sleeve Dimension (ϕd1)

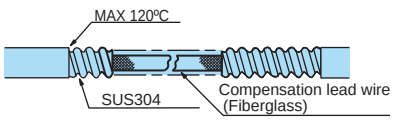
Lead wire type \ Diameter of protection tube	ϕ3.0 to ϕ5.0	ϕ6.0 to ϕ8.0
EXA,EXB,EXC EXD,EXE,EXF	ϕ8×40	ϕ10×40



Reference

• Stainless flexible lead wire is available

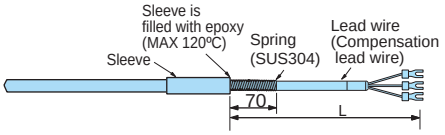
Model Code : R-101F/R-111F



For flexible lead wire, the dimension of the sleeve is ϕ10 x 40mm.

• No waterproof

• Spring loaded type is available
(Please specify when you order)

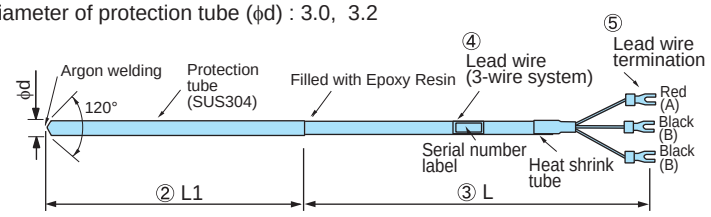


Dimensions for the spring loaded sleeve is as follows.
• Protection tube ϕ1.0 to ϕ4.8 with extension lead wire
EXC, EXD : ϕ10 x 40mm
• Protection tube ϕ6.0 to ϕ8.0 : ϕ10 x 40mm
• Except from the above: : ϕ8 x 40mm

• Material of protection tube
SUS316 is available.
(Please specify when you order)

Resistance Temperature Detectors : R-102

Diameter of protection tube (ϕd) : 3.0, 3.2

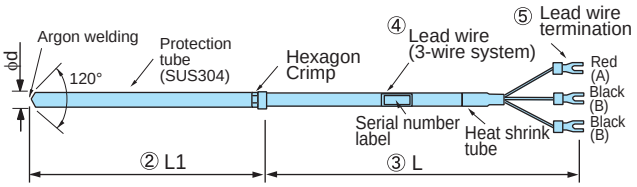


R - 102 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Resistance temperature detector type
⑦ Sensing junction
⑧ Mounting bracket

Example :R-102-3.2-100-2000-EXF-Y-PDM-NG-N

Diameter of protection tube (ϕd) : 4.0 or more



R - 102 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Resistance temperature detector type
⑦ Sensing junction
⑧ Mounting bracket

Example :R-102-5-100-2000-EXA-Y-PDM-NG-N

① Diameter of protection tube

ϕ3.0, ϕ3.2

ϕ4.0, ϕ4.8, ϕ5.0, ϕ6.0, ϕ8.0

② Length of protection tube

Specify length by “mm” (50mm to 500mm) • Please contact distributors regarding other length.

③ Lead wire length

Specify length by “mm” (100mm or more)

④ Lead protection

Code	Details	Operating temperature
EXF	Fluorocarbon polymers (FEP)	0 to 200ºC

Code	Details	Operating temperature
EXA	Fiberglass with stainless steel (Diameter of protection tube : ϕ4.8 or more)	0 to 150ºC
EXB	Fiberglass (Diameter of protection tube : ϕ4.8 or more)	0 to 150ºC
EXC	PVC (polyvinyl chloride) with copper wire braided (Diameter of protection tube : ϕ5.0 or more)	-20 to +90ºC
EXD	PVC (polyvinyl chloride) (Diameter of protection tube : ϕ5.0 or more)	-20 to +90ºC
EXE	Silicone rubber (Diameter of protection tube : ϕ5.0 or more)	-55 to +180ºC
EXF	Fluorocarbon polymers (FEP) (Diameter of protection tube : ϕ4.0 or more)	0 to 200ºC

⑤ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	N	No terminal lugs * terminal soldered
R	Ring lugs for JIS standard "M4" size screw		
M	Metal connector (SCK-1603-P)		

•See Page7

⑥ Resistance temperature detector type

Code	Details	Operating temperature
PDP	Pt100 Middle Temperature Type	0 to 220ºC
PAP	JPt100 Middle Temoerature Type	0 to 220ºC

Code	Details	Operating temperature
PDP	Pt100 Middle Temperature Type (ϕ4.0)	0 to 220ºC
PDM	Pt100 Middle Temperature Type (ϕ4.8 or more)	0 to 300ºC
PAP	JPt100 Middle Temoerature Type (ϕ4.0)	0 to 220ºC
PAM	JPt100 Middle Temperature Type (ϕ4.8 or more)	0 to 300ºC

⑦ Measuring junction

Code	Details
NG	Ungrounded
O	Exposed

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

Specify size of mounting bracket when code is "A", "B", or "E". (See Page 6)
Specify size of flange when code is "C". (See Page 6)

• Please contact distributors regarding other mounting bracket.

Specifications

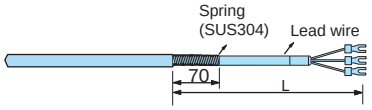
Class : class B * Class A is available (Please specify when you order)
Element : Single element
Maximum temperature for use : 0 to 220ºC

Class : class B * Class A is available (Please specify when you order)
Element : Single element * Double element is available. (Diameter of protection tube : ϕ8.0 or more) (Please specify when you order)
Maximum temperature for use

Diameter of protection tube	Operating temperature
ϕ4.0 (Middle temperature type : Code PDP/PAP)	0 to 220ºC
ϕ4.8 or more (Middle temperature type : Code PDM/PAM)	0 to 300ºC

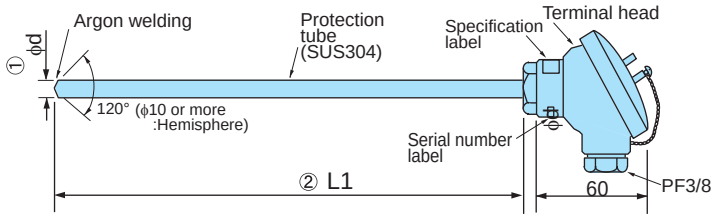
Reference

• Spring loaded type is available
(Please specify when you order)



• Material of protection tube
SUS316 of protection tube is available.
(Please specify when you order)

Resistance Temperature Detectors : R-30/R-35



No lead wire

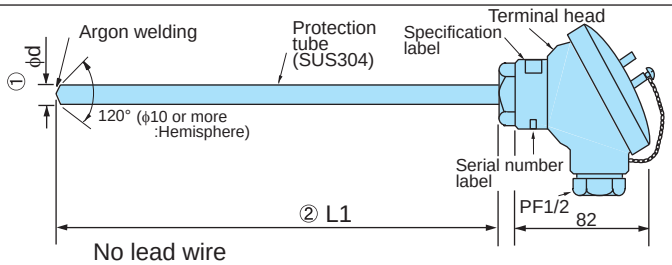
R - 30 - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

R - 30 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Resistance temperature detector type
⑦ Sensing junction
⑧ Mounting bracket

Example :R-30-5-100-PDM-NG-N (No lead wire)
:R-30-5-100-2000-EXA-Y-PDM-NG-N (With lead wire)



No lead wire

R - 35 - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

R - 35 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Resistance temperature detector type
⑦ Sensing junction
⑧ Mounting bracket

Example :R-35-5-100-PDM-NG-N (No lead wire)
:R-35-5-100-2000-EXA-Y-PDM-NG-N (With lead wire)

①	Diameter of protection tube	ϕ3.0, ϕ3.2, ϕ4.8, ϕ5.0, ϕ6.0 ϕ6.4, ϕ8.0, ϕ10.0, ϕ12.0
		ϕ4.8, ϕ5.0, ϕ6.0, ϕ6.4, ϕ8.0, ϕ10.0, ϕ12.0, ϕ15.0 • Please contact distributors regarding ϕ21.7.
②	Length of protection tube	Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length.
		Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length.
③	Lead wire length	Specify length by “mm” (100mm or more)

④ Lead protection (No need to specify in case of without lead wire)

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC			

⑤ Lead wire termination (No need to specify in case of without lead wire)

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	N	No terminal lugs * terminal soldered
R	Ring lugs for JIS standard "M4" size screw		
M	Metal connector (SCK-1603-P)		•See Page7

⑥ Resistance temperature detector type

Code	Details	Operating temperature	Code	Details	Operating temperature
PDP	Pt100 Middle Temperature Type (ϕ3.0 to ϕ4.0)	0 to 220ºC	PAP	JPt100 Middle Temperature Type (ϕ3.0 to ϕ4.0)	0 to 220ºC
PDM	Pt100 Middle Temperature Type (ϕ4.8 or more)	0 to 300ºC	PAM	JPt100 Middle Temperature Type (ϕ4.8 or more)	0 to 300ºC
PDH	Pt100 High Temperature Type (ϕ4.8 or more)	0 to 500ºC	PAH	JPt100 High Temperature Type (ϕ4.8 or more)	0 to 500ºC

⑦ Measuring junction

Code	Details
NG	Ungrounded
O	Exposed

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

Specify size of mounting bracket when code is "A", "B", or "E". (See Page 6)
Specify size of flange when code is "C". (See Page 6)

• Please contact distributors regarding other mounting bracket.

Specifications

Class : class B * Class A is available (Please specify when you order)
Element : Single element * Double element is available. (Only R-35)
(Please specify when you order)

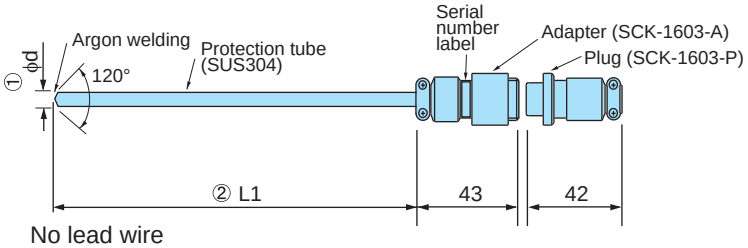
Maximum temperature for use

Diameter of protection tube	Operating temperature
ϕ3.0 to ϕ4.0 (Middle temperature type : Code PDP/PAP)	0 to 220ºC
ϕ4.8 or more (Middle temperature type : Code PDM/PAM)	0 to 300ºC
ϕ4.8 or more (High temperature type : Code PDH/PAH)	0 to 500ºC

Reference

• Material of protection tube
SUS316 is available.
(Please specify when you order)

Resistance Temperature Detectors : R-90



No lead wire

R - 90 - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

R - 90 - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Resistance temperature detector type
⑦ Sensing junction
⑧ Mounting bracket

Example :R-90-5-100-PDM-NG-N (No lead wire)
:R-90-5-100-2000-EXA-Y-PDM-NG-N (With lead wire)

① Diameter of protection tube

ϕ3.0, ϕ3.2, ϕ4.8, ϕ5.0, ϕ6.0, ϕ8.0

② Length of protection tube

Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length.

③ Lead wire length

Specify length by “mm” (100mm or more)

④ Lead protection (No need to specify in case of without lead wire)

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC			

⑤ Lead wire termination (No need to specify in case of without lead wire)

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	N	No terminal lugs * terminal soldered
R	Ring lugs for JIS standard "M4" size screw		
M	Metal connector (SCK-1603-P)		

•See Page7

⑥ Resistance temperature detector type

Code	Details	Operating temperature	Code	Details	Operating temperature
PDP	Pt100 Middle Temperature Type (ϕ3.0 to ϕ4.0)	0 to 220ºC	PAP	JPt100 Middle Temperature Type (ϕ3.0 to ϕ4.0)	0 to 220ºC
PDM	Pt100 Middle Temperature Type (ϕ4.8 or more)	0 to 350ºC	PAM	JPt100 Middle Temperature Type (ϕ4.8 or more)	0 to 350ºC

⑦ Measuring junction

Code	Details
NG	Ungrounded
O	Exposed

* Exposed-junction type is available depending on specification such as shapes, environment of usage, etc. Please contact with our distributors.

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

Specify size of mounting bracket when code is "A", "B", or "E". (See Page 6)
Specify size of flange when code is "C". (See Page 6)

• Please contact distributors regarding other mounting bracket.

Specifications

Class : class B * Class A is available (Please specify when you order)
Element : Single element * Double element is available.
(Diameter of protection tube : ϕ4.8 or more)
(Please specify when you order)

Maximum temperature for use

Diameter of protection tube	Operating temperature
ϕ3.0 to ϕ4.0 (Middle temperature type : Code PDP/PAP)	0 to 220ºC
ϕ4.8 or more (Middle temperature type : Code PDM/PAM)	0 to 350ºC

Reference

• Material of protection tube
SUS316 is available.
(Please specify when you order)

Connector
Pin No.

Single Element

Pin No.	Details
1	A
2	B
3	b

SCK-1603-□

Double Element

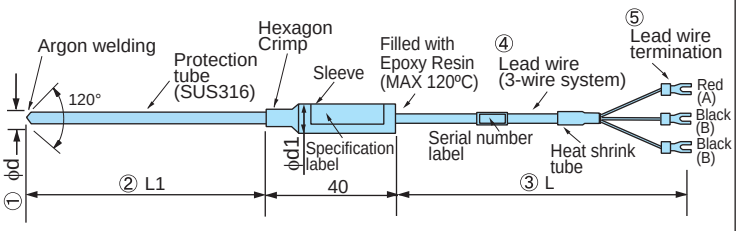
Pin No.	Details
1	A
2	B
3	b

Pin No.	Details
1	A
2	B
3	b

SCK-1606-□

For connector for R-90, Connector manufactured by Sanwa Connector Laboratory Co., Ltd. is used as standard.
Nanaboshi Electric Mfg brand is also available
(Please specify when you order).
Please specify in case of no need of the plug.

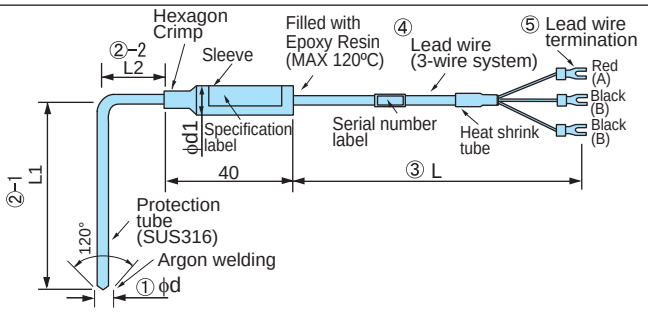
Sheathed Resistance Temperature Detectors : R-101S/R-111S



R - 101S - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Resistance temperature detector type
⑦ Sensing junction
⑧ Mounting bracket

Example :R-101S-4.8-100-2000-EXA-Y-PDM-NG-N



R - 111S - ϕd - L1 - L2 - L - □□□ - □ - □ - □ - □
① ②–1 ②–2 ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
②–1, 2 Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Resistance temperature detector type
⑦ Sensing junction
⑧ Mounting bracket

Example :R-111S-4.8-100-30-2000-EXA-Y-PDM-NG-N

① Diameter of protection tube

ϕ3.2, ϕ4.8, ϕ6.4, ϕ8.0

② Length of protection tube

Specify length by “mm” (100mm to 1,000mm)
• Please contact distributors regarding other length.

②-1: Specify length by “mm”
(100mm or more, L1+L2=1,000mm or less)
②-2: Specify length by “mm”
(25mm or more, L1+L2=1,000mm or less)
• Length is 25mm without specification.
• Please contact distributors regarding other length.

③ Lead wire length

Specify length by “mm” (100mm or more)

④ Lead protection

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC	EXF	Fluorocarbon polymers (FEP)	0 to 200ºC

⑤ Lead wire termination

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	N	No terminal lugs * terminal soldered
R	Ring lugs for JIS standard "M4" size screw		
M	Metal connector (SCK-1603-P)		

•See Page7

⑥ Resistance temperature detector type

Code	Details	Operating temperature	Code	Details	Operating temperature
PDL	Pt100 Low Temperature Type	-200 to +100ºC	PAL	JPt100 Low Temperature Type	-200 to 100ºC
PDM	Pt100 Middle Temperature Type	0 to 350ºC	PAM	JPt100 Middle Temperature Type	0 to 350ºC
PDH	Pt100 High Temperature Type	0 to 500ºC	PAH	JPt100 High Temperature Type	0 to 500ºC

⑦ Measuring junction

Code	Details
NG	Ungrounded

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

Specify size of mounting bracket when code is "A", "B", or "E". (See Page 6)
Specify size of flange when code is "C". (See Page 6)

• Please contact distributors regarding other mounting bracket.

Specifications

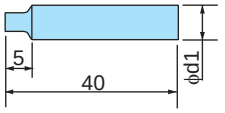
Class : class B * Class A is available (Please specify when you order)
Element : Single element * Double element is available.
(Diameter of protection tube : ϕ4.8 or more)
(Please specify when you order)

Maximum temperature for use

Diameter of protection tube	Operating temperature
ϕ3.0 to ϕ4.0 (Low temperature type : Code PDL/PAL)	-200 to +100ºC
ϕ4.8 or more (Middle temperature type : Code PDM/PAM)	0 to 350ºC
ϕ4.8 or more (High temperature type : Code PDH/PAH)	0 to 500ºC

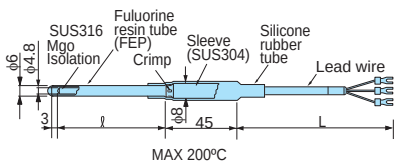
Sleeve Dimension (ϕd1)

Lead wire type \ Diameter of protection tube	ϕ3.2, ϕ4.8	ϕ6.4, ϕ8.0
EXA,EXB,EXC EXD,EXE,EXF	ϕ8×40	ϕ10×40



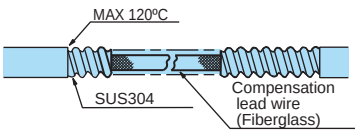
Reference

• Fluor resin coating is available
It is available to cover Fuluorine resin tube with φ4.8 protection tube (SUS316). Total Diameter becomes φ6.0. It is also available to do coating with R-101S whose tube is more than φ3.2.
These model codes are R-101SC in this case.



• Stainless flexible lead wire is available

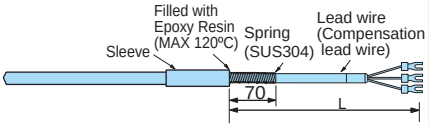
Model Code : R-101S/R-111S



For flexible lead wire, the dimension of the sleeve is ϕ10 x 45mm.

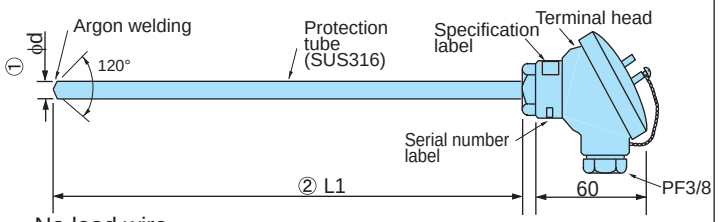
• No waterproof

• Spring loaded type is available
(Please specify when you order)



Dimensions for the spring loaded sleeve is as follows.
• Protection tube ϕ3.2 with extension lead wire EXE : ϕ8 x 40mm
• Protection tube ϕ4.8 to ϕ8.0 with extension lead wire : ϕ8 x 45mm
• Except from the above: : ϕ10 x 45mm

Sheathed Resistance Temperature Detectors : R-30S/R-35S

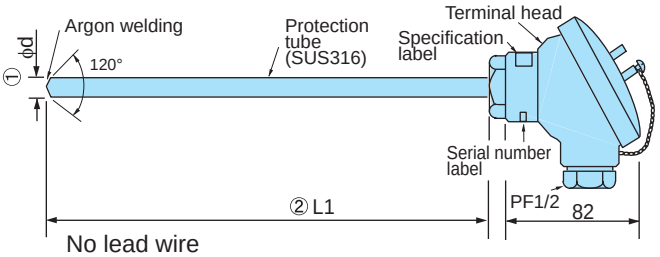


No lead wire
R - 30S - φd - L1 - □-□-□
① ② ⑥⑦ ⑧

With lead wire
R - 30S - φd - L1 - L - □□□-□-□-□-□
① ② ③ ④ ⑤⑥⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Resistance temperature detector type
⑦ Sensing junction
⑧ Mounting bracket

Example :R-30S-4.8-100-PDM-NG-N (No lead wire)
:R-30S-4.8-100-2000-EXA-Y-PDM-NG-N (With lead wire)



No lead wire
R - 35S - φd - L1 - □-□-□
① ② ⑥⑦ ⑧

With lead wire
R - 35S - φd - L1 - L - □□□-□-□-□-□
① ② ③ ④ ⑤⑥⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Resistance temperature detector type
⑦ Sensing junction
⑧ Mounting bracket

Example :R-35S-5-100-PDM-NG-N (No lead wire)
:R-35S-5-100-2000-EXA-Y-PDM-NG-N (With lead wire)

①	Diameter of protection tube	φ3.2, φ4.8, φ6.4, φ8.0 / φ4.8, φ6.4, φ8.0
②	Length of protection tube	Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length. / Specify length by “mm” (100mm to 1,000mm) • Please contact distributors regarding other length.
③	Lead wire length	Specify length by “mm” (100mm or more)

④ Lead protection (No need to specify in case of without lead wire)

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC			

⑤ Lead wire termination (No need to specify in case of without lead wire)

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	N	No terminal lugs * terminal soldered
R	Ring lugs for JIS standard "M4" size screw		
M	Metal connector (SCK-1603-P)		•See Page7

⑥ Resistance temperature detector type

Code	Details	Operating temperature	Code	Details	Operating temperature
PDL	Pt100 Low Temperature Type	-200 to +100ºC	PAL	JPt100 Low Temperature Type	-200 to 100ºC
PDM	Pt100 Middle Temperature Type	0 to 350ºC	PAM	JPt100 Middle Temperature Type	0 to 350ºC
PDH	Pt100 High Temperature Type	0 to 500ºC	PAH	JPt100 High Temperature Type	0 to 500ºC

⑦ Measuring junction

Code	Details
NG	Ungrounded

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

Specify size of mounting bracket when code is "A", "B", or "E". (See Page 6)
Specify size of flange when code is "C". (See Page 6)

• Please contact distributors regarding other mounting bracket.

Specifications

Class : class B * Class A is available (Please specify when you order)
Element : Single element * Double element is available. (Only for R-35S)
(Please specify when you order)

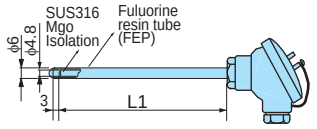
Maximum temperature for use

Diameter of protection tube	Operating temperature
Low temperature type : Code PDL/PAL	-200 to +100ºC
Middle temperature type : Code PDM/PAM	0 to 350ºC
High temperature type : Code PDH/PAH	0 to 500ºC

Reference

• Fluor resin coating is available

It is available to cover Fuluorine resin tube with φ4.8 protection tube (SUS316). Total Diameter becomes φ6.0. It is also available to do coating with R-101S whose tube is more than φ3.2. These model codes are R-30SC/R-35SC in this case.

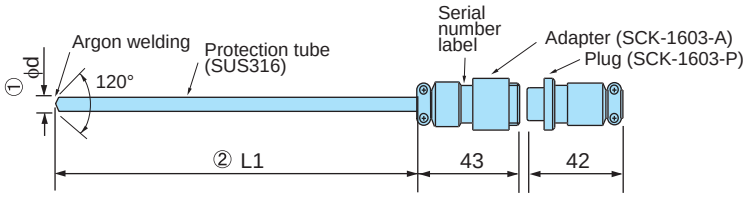


Operating temperature for regular use : 180ºC
Maximum temperature : 200ºC

Example :
R-30SC-6.0-100-PDM-NG-N (No lead wire)
① ② ⑥ ⑦ ⑧

• Please contact distributors regarding Fuluorine coating type.

Sheathed Resistance Temperature Detectors : R-90S



No lead wire

R - 90S - ϕd - L1 - □ - □ - □
① ② ⑥ ⑦ ⑧

With lead wire

R - 90S - ϕd - L1 - L - □□□ - □ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Diameter of protection tube
② Length of protection tube
③ Lead wire length
④ Lead protection
⑤ Lead wire termination
⑥ Resistance temperature detector type
⑦ Sensing junction
⑧ Mounting bracket

Example :R-90S-4.8-100-PDM-NG-N (No lead wire)
:R-90S-4.8-100-2000-EXA-Y-PDM-NG-N (With lead wire)

① Diameter of protection tube

ϕ3.2, ϕ4.8, ϕ6.4, ϕ8.0

② Length of protection tube

Specify length by “mm” (100mm to 1,000mm)
• Please contact distributors regarding other length.

③ Lead wire length

Specify length by “mm” (100mm or more)

④ Lead protection (No need to specify in case of without lead wire)

Code	Details	Operating temperature	Code	Details	Operating temperature
EXA	Fiberglass with stainless steel	0 to 150ºC	EXD	PVC (polyvinyl chloride)	-20 to +90ºC
EXB	Fiberglass	0 to 150ºC	EXE	Silicone rubber	-55 to +180ºC
EXC	PVC (polyvinyl chloride) with copper wire braided	-20 to +90ºC			

⑤ Lead wire termination (No need to specify in case of without lead wire)

Code	Details	Code	Details
Y	Spade lugs for JIS standard "M3" size screw	N	No terminal lugs * terminal soldered
R	Ring lugs for JIS standard "M4" size screw		
M	Metal connector (SCK-1603-P)		

•See Page7

⑥ Resistance temperature detector type

Code	Details	Operating temperature	Code	Details	Operating temperature
PDL	Pt100 Low Temperature Type	-200 to +100ºC	PAL	JPt100 Low Temperature Type	-200 to 100ºC
PDM	Pt100 Middle Temperature Type	0 to 350ºC	PAM	JPt100 Middle Temperature Type	0 to 350ºC
PDH	Pt100 High Temperature Type	0 to 500ºC	PAH	JPt100 High Temperature Type	0 to 500ºC

⑦ Measuring junction

Code	Details
NG	Ungrounded

⑧ Mounting bracket

Code	Details	Code	Details
A	Fixed nipple (nut)	E	Compression fitting
B	Rotary nipple (nut)	N	No bracket
C	Fixed flange		

Specify size of mounting bracket when code is "A", "B", or "E". (See Page 6)
Specify size of flange when code is "C". (See Page 6)

• Please contact distributors regarding other mounting bracket.

Specifications

Class : class B * Class A is available (Please specify when you order)
Element : Single element * Double element is available.
(Diameter of protection tube : ϕ4.8 or more)
(Please specify when you order)

Maximum temperature for use

Diameter of protection tube	Operating temperature
Low temperature type : Code PDL/PAL	-200 to +100ºC
Middle temperature type : Code PDM/PAM	0 to 350ºC
High temperature type : Code PDH/PAH	0 to 500ºC

Reference

Connector
Pin No.

Single Element

Pin No.	Details
1	A
2	B
3	b

SCK-1603-□

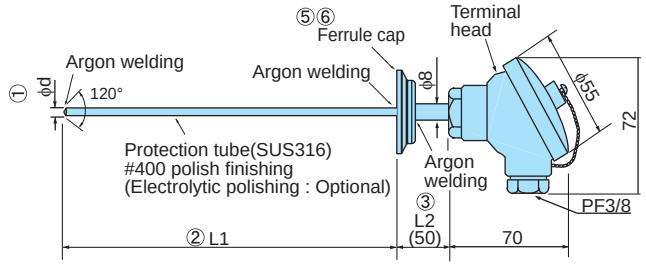
Double Element

Pin No.	Details	Pin No.	Details
1	A	1	A
2	B	2	B
3	b	3	b

SCK-1606-□

For connector for R-90S, Connector manufactured by Sanwa Connector Laboratory Co., Ltd. is used as standard.
Nanaboshi Electric Mfg brand is also available
(Please specify when you order).
Please specify in case of no need of the plug.

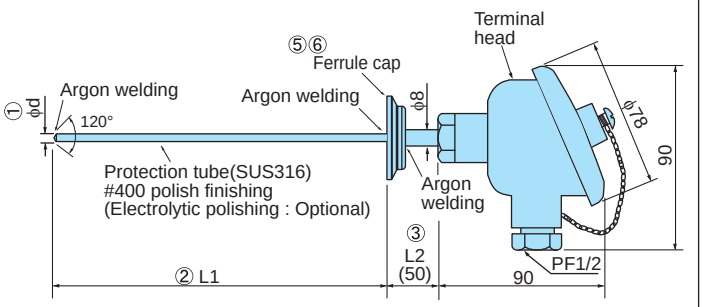
Sanitary type Sheathed Resistance Temperature Detectors : R-31S/R-36S



R - 31S - φd - L1 - L2 - □□□ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦

① Diameter of protection tube
② Length of protection tube (L1)
③ Length of Terminal head - ferule cap (L2)
④ Resistance temperature detector type
⑤ Ferrule cap type
⑥ Ferrule cap material
⑦ Optional (Electrolytic polishing)

Example : R-31S-4.8-500-50-DMA-10S-1-E

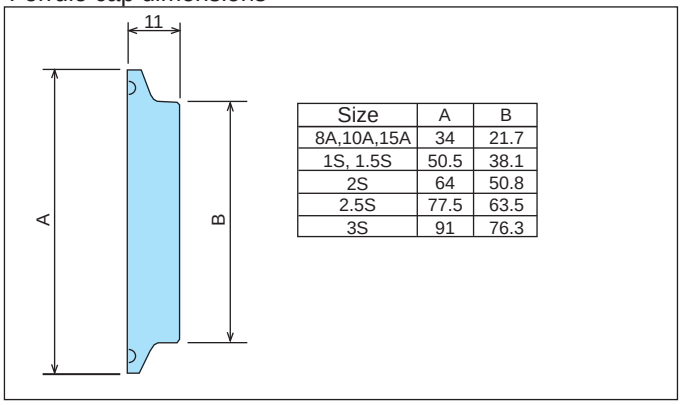


R - 36S - φd - L1 - L2 - □□□ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦

① Diameter of protection tube
② Length of protection tube (L1)
③ Length of Terminal head - ferule cap (L2)
④ Resistance temperature detector type
⑤ Ferrule cap type
⑥ Ferrule cap material
⑦ Optional (Electrolytic polishing)

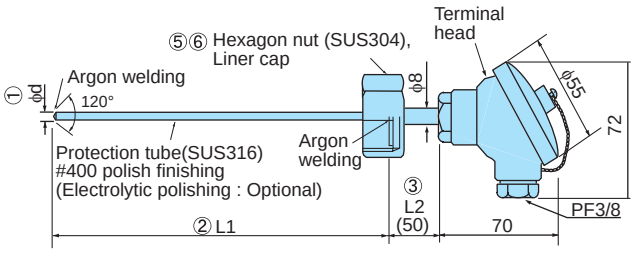
Example : R-36S-4.8-500-50-DMA-10A-2-E

①	Diameter of protection tube	φ3.2, φ4.8, φ6.4, φ8.0
②	Length of protection tube (L1)	Specify length by “mm” (100mm to 500mm)
③	Length of Terminal head - ferule cap (L2)	50mm (Standard)
④	Resistance temperature detector type	Code: DMA, Pt100 (Class A); DMB, Pt100 (Class B); AMA, JPt100 (Class A); AMB, JPt100 (Class B)
⑤	Ferrule cap type	Code: 8A, 8A *1; 10A, 10A *1; 15A, 15A *1; 10S, 1.0S; 15S, 1.5S; 20S, 2.0S; 25S, 2.5S; 30S, 3.0S
⑥	Ferrule cap material	Code: 1, SUS304; 2, SUS316L *1. *1 : 8A,10A,15A : Only SUS316 (Code :2)
⑦	Optional (Electrolytic polishing)	Code: E, Electrolytic polishing; N, No electrolytic polishing
	Specifications	Class : class A or B Element : Single element * Double element is available. (Only R-36S) (Please specify when you order) Specified current : 2mA Operating temperature: -40 to +200ºC
	Reference	Ferrule cap dimensions



Size	A	B
8A,10A,15A	34	21.7
1S, 1.5S	50.5	38.1
2S	64	50.8
2.5S	77.5	63.5
3S	91	76.3

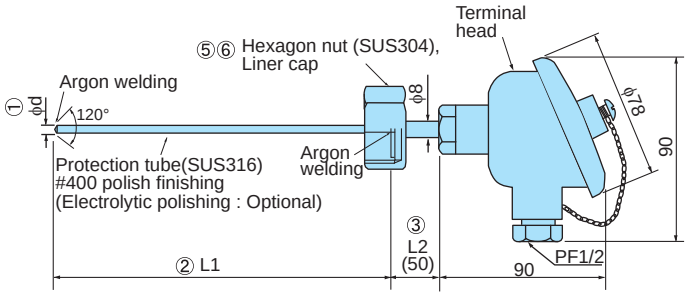
Sanitary type Sheathed Resistance Temperature Detectors : R-31RS/R-36RS



R - 31RS - ϕd - L1 - L2 - □□□ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦

① Diameter of protection tube
② Length of protection tube (L1)
③ Length of Terminal head - Linear cap (L2)
④ Resistance temperature detector type
⑤ Hexagon nut type
⑥ Liner cap material
⑦ Optional (Electrolytic polishing)

Example : R-31RS-4.8-500-50-DMA-15S-1-E

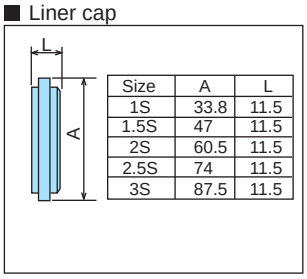


R - 36RS - ϕd - L1 - L2 - □□□ - □ - □ - □
① ② ③ ④ ⑤ ⑥ ⑦

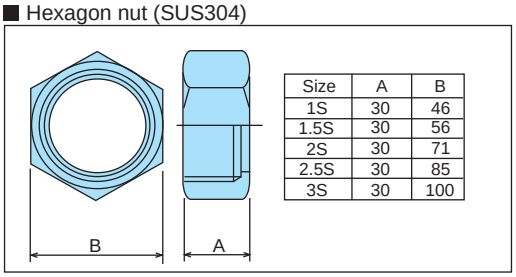
① Diameter of protection tube
② Length of protection tube (L1)
③ Length of Terminal head - Linear cap (L2)
④ Resistance temperature detector type
⑤ Hexagon nut type
⑥ Liner cap material
⑦ Optional (Electrolytic polishing)

Example : R-36RS-4.8-500-50-DMA-15S-1-E

①	Diameter of protection tube	ϕ3.2, ϕ4.8, ϕ6.4, ϕ8.0
②	Length of protection tube (L1)	Specify length by “mm” (100mm to 500mm)
③	Length of Terminal head - Liner cap (L2)	50mm (Standard)
④	Resistance temperature detector type	Code: DMA, DMB, AMA, AMB Details: Pt100 (Class A), Pt100 (Class B), JPt100 (Class A), JPt100 (Class B)
⑤	Hexagon nut type	Code: 10S, 15S, 20S, 25S, 30S Details: 1.0S, 1.5S, 2.0S, 2.5S, 3.0S
⑥	Liner cap material	Code: 1, 2 Details: SUS304, SUS316L
⑦	Optional (Electrolytic polishing)	Code: E, N Details: Electrolytic polishing, No electrolytic polishing
	Specifications	Class : class A or B Element : Single element * Double element is available. (Only R-36RS) (Please specify when you order) Specified current : 2mA Operating temperature: -40 to +200ºC
	Reference	■ Liner cap / ■ Hexagon nut (SUS304)

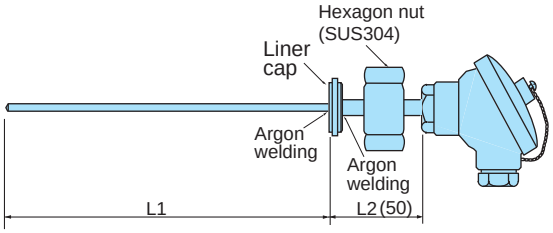


Size	A	L
1S	33.8	11.5
1.5S	47	11.5
2S	60.5	11.5
2.5S	74	11.5
3S	87.5	11.5



Size	A	B
1S	30	46
1.5S	30	56
2S	30	71
2.5S	30	85
3S	30	100

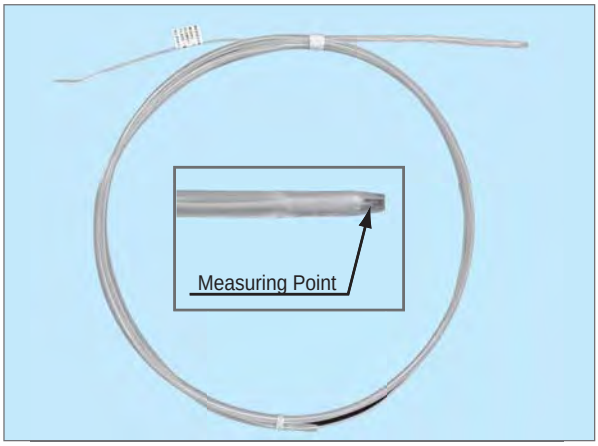
Hexagon nut (SUS304) and Liner cap



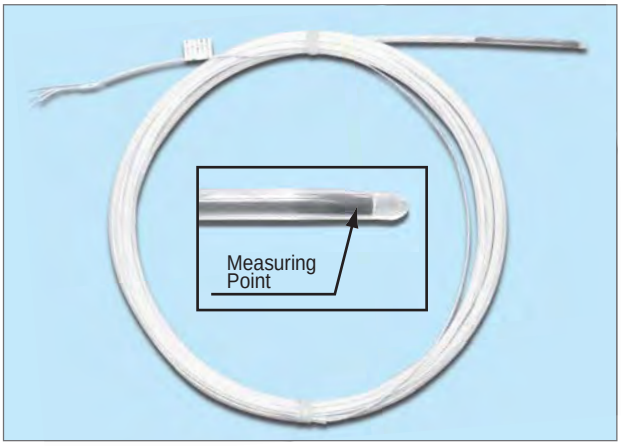
PFA (Fluororesin) coated temperature sensors

FT-100 (Thermocouple)
FR-100 (Resistance Temperature Detector)

Temperature sensor with perfluoroalkoxy polymer resin coating (PFA) excels in chemical and moisture resistance.



Thermocouple : FT-100



Resistance Temperature Detector : FR-100

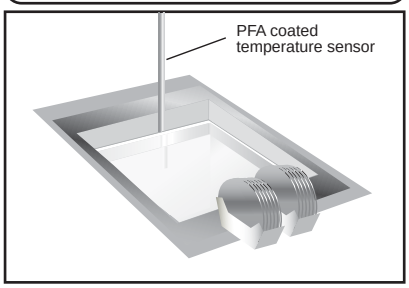
Specifications

FT-100 (Thermocouple)	
Type	Thermocouple K, Class 1
Measuring range	0 to 200ºC Do not condensate except for the protection tube
Measuring accuracy	±2.5°C (Immersion length : 100mm or more)
Protection tube material	PFA (fluororesin)
Acceptable radius for protection tube bending	15mm (Except 90mm from tip)
Lead wire diameter	1.0×1.6mm
Lead wire configure	ϕ3.2mm X 1
Lead coating material	PFA (fluororesin), Green

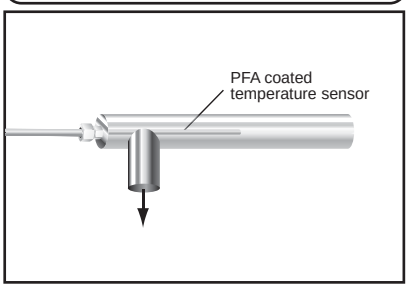
FR-100 (Resistance Temperature Detector)	
Type	Pt100, 3-wire system, Class A
Measuring range	0 to 200ºC Do not condensate except for the protection tube
Measuring accuracy	±(0.15 + 0.002 | t |)°C (t:Measuring temperature) Specified current : 2mA (Immersion length : 100mm or more)
Protection tube material	PFA (fluororesin)
Lead wire diameter	ϕ1.7mm
Lead wire configure	ϕ0.1mm X 7
Lead coating material	PFA (fluororesin), Gray

Application

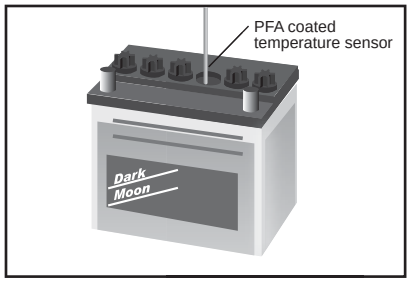
Cleaning Chemicals



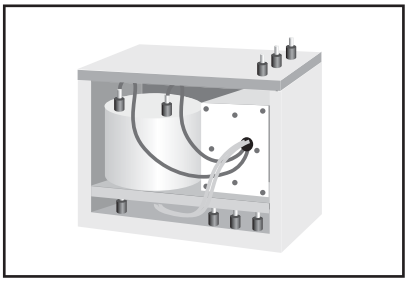
Gas Exhaust Pipe



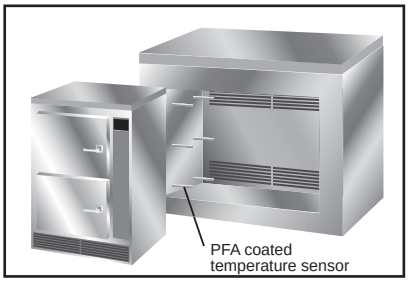
Battery electrolyte



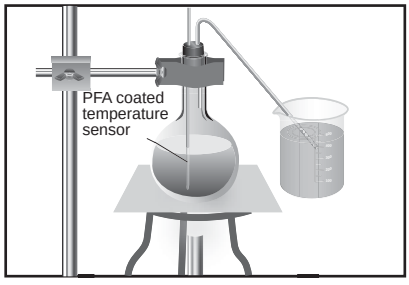
Chemical liquid supplying device



Environmental test chambers



Thermal reaction



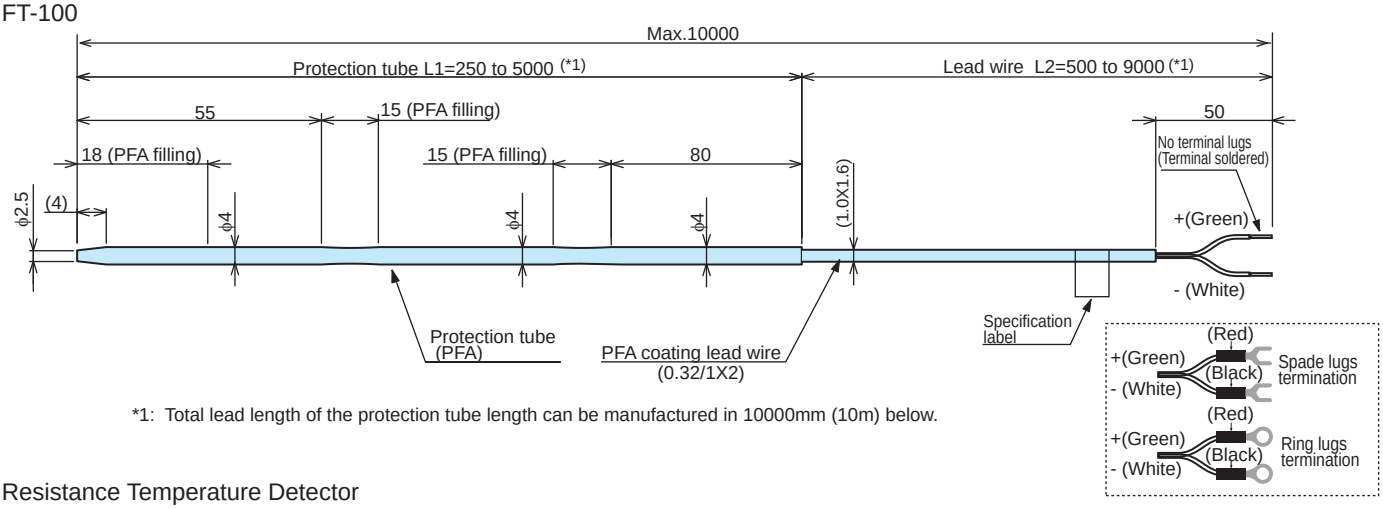
PFA (Fluororesin) coated temperature sensors

FT-100 (Thermocouple)
FR-100 (Resistance Temperature Detector)

External Dimensions

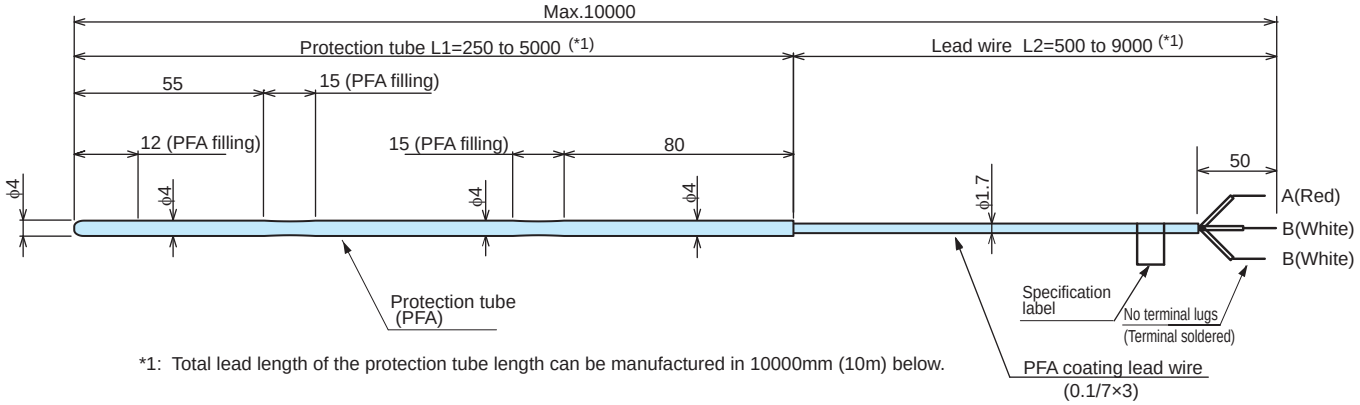
Unit : mm

Thermocouple
FT-100



*1: Total lead length of the protection tube length can be manufactured in 10000mm (10m) below.

Resistance Temperature Detector
FR-100



*1: Total lead length of the protection tube length can be manufactured in 10000mm (10m) below.

Model Code

Thermocouple
FT-100

Specifications	Model and Suffix Code FT-100 - K- 42- A-□□□□-□□□□- □-AW							
Thermocouple type	Thermocouple K, Class 1	K						
Diameter of protection tube	ϕ4		42					
Protection tube	PFA (Fluororesin)			A				
Length of protection tube (L1) *2	250mm 500mm to (Each 500mm) 5000mm				250 500 to 5000			
Lead wire length (L2) *2	500mm to (Each 500mm) 5000mm					500 to 5000		
	5000mm to (Each 1000mm) 9000mm					5000 to 9000		
Lead wire termination	No terminal lugs *terminal soldered						W	
	Spade lugs for JIS standard "M3" size screw						Y3	
	Spade lugs for JIS standard "M4" size screw						Y4	
	Ring lugs for JIS standard "M3" size screw						R3	
	Ring lugs for JIS standard "M4" size screw						R4	
Pure water cleaning	Pure water cleaning & Clean packing							AW

*2 : Total length of Protection tube and lead wire can be up to 10000mm (10m).

Resistance Temperature Detector
FR-100

Specifications	Model and Suffix Code FR-100 - DPA - 42- A-□□□□-□□□□ - □-AW							
Resistance temperature detector type	Pt100, Class A, Middle temperature type	DPA						
Diameter of protection tube	ϕ4		42					
Protection tube	PFA (Fluororesin)			A				
Length of protection tube (L1) *3	250mm 500mm to (Each 500mm) 5000mm				250 500 to 5000			
Lead wire length (L2) *3	500mm to (Each 500mm) 5000mm					500 to 5000		
	5000mm to (Each 1000mm) 9000mm					5000 to 9000		
Lead wire termination	No terminal lugs * terminal soldered						N	
Pure water cleaning	Pure water cleaning & Clean packing							AW

*3 : Total length of Protection tube and lead wire can be up to 10000mm (10m).

Reference information

● Thermocouple

(1) Thermocouple element type

Thermocouple elements K(CA), J(IC), T(CC), E(CRC), N, R, S, B are available. Please find the below chart and choose them according to applications.
Thermocouple classes are standard as class 2 and an accurate type as class 1. (see the differences of temperature allowance section)
All standard types are class 2. (Only standard type for B is class 3)

JIS C1602-1995

Symbol	(+) side wire	(-) side wire	Element wire diameter (mm)	Operating temperature range (°C)
K (CA)	Chromel	Alumel	0.65	-200 to 650°C
			1.00	-200 to 750°C
			1.60	-200 to 850°C
			2.30	-200 to 900°C
			3.20	-200 to 1000°C
J (IC)	Iron	Constantan	0.65	-40 to 400°C
			1.00	-40 to 450°C
			1.60	-40 to 500°C
			2.30	-40 to 550°C
			3.20	-40 to 600°C
T (CC)	Copper	Constantan	0.32	-200 to 200°C
			0.65	-200 to 200°C
			1.00	-200 to 250°C
			1.60	-200 to 300°C
E (CRC)	Chromel	Constantan	0.65	-200 to 450°C
			1.00	-200 to 500°C
			1.60	-200 to 550°C
			2.30	-200 to 600°C
			3.20	-200 to 700°C
N	Nicrosil	Nisil	0.65	-200 to 850°C
			1.00	-200 to 950°C
			1.60	-200 to 1050°C
			2.30	-200 to 1100°C
			3.20	-200 to 1200°C
R	Platinum Rhodium13%	Platinum	0.50	0 to 1400°C
S	Platinum Rhodium10%	Platinum	0.50	0 to 1400°C
B *1	Platinum Rhodium30%	Platinum Rhodium6%	0.50	0 to 1500°C

°C

*1 Maximum operating temperature is normal operating temperature limit (temperature limit for continuous operation). For overheating use limitation (temperature limitation for a short time use for an unavoidable situation), please find JIS standards (JIS C1602).
Consider the above chart only as a guide. Operating temperature limit is subject to change dependent upon the types of the protection tube.
For B type, measurement below 600°C is out of the tolerance range.

(2) Tolerance to temperature

JIS C1602-1995

Type		Class 1	Class 2	Class 3
K	Temperature range	-40°C to +375°C	-40°C to +333°C	-167°C to +40°C
	Tolerance	±1.5°C	±2.5°C	±2.5°C
	Temperature range	+375°C to +1000°C	+333°C to +1200°C	-200°C to -167°C
	Tolerance	±0.004•|t|	±0.0075•|t|	±0.015•|t|
J	Temperature range	-40°C to +375°C	-40°C to +333°C	———
	Tolerance	±1.5°C	±2.5°C	
	Temperature range	+375°C to +750°C	+333°C to +750°C	———
	Tolerance	±0.004•|t|	±0.0075•|t|	
T	Temperature range	-40°C to +125°C	-40°C to +133°C	-67°C to +40°C
	Tolerance	±0.5°C	±1°C	±1°C
	Temperature range	+125°C to +350°C	+133°C to +350°C	-200°C to -67°C
	Tolerance	±0.004•|t|	±0.0075•|t|	±0.015•|t|
E	Temperature range	-40°C to +375°C	-40°C to +333°C	-167°C to +40°C
	Tolerance	±1.5°C	±2.5°C	±2.5°C
	Temperature range	+375°C to +800°C	+333°C to +900°C	-200°C to -167°C
	Tolerance	±0.004•|t|	±0.0075•|t|	±0.015•|t|
N	Temperature range	-40°C to +375°C	-40°C to +333°C	-167°C to +40°C
	Tolerance	±1.5°C	±2.5°C	±2.5°C
	Temperature range	+375°C to +1100°C	+333°C to +1200°C	-200°C to -167°C
	Tolerance	±0.004•|t|	±0.0075•|t|	±0.015•|t|
R,S	Temperature range	0°C to +1100°C	0°C to +600°C	———
	Tolerance	±1°C	±1.5°C	
	Temperature range	———	+600°C to +1600°C	———
	Tolerance		±0.0025•|t|	
B	Temperature range	———	———	+600°C to +800°C
	Tolerance			±4°C
	Temperature range	———	+600°C to +1700°C	+800°C to +1700°C
	Tolerance		±0.0025•|t|	±0.005•|t|

• |t| is a value which represents regardless of + or - symbols of temperature (°C).

Reference information

● Resistance Temperature Detector

(1) Resistance Temperature Detector Type

Platinum RTD (resistance temperature detector) can be divided into either Pt100 or JPt100 (former). It is more often used for low temperature applications than thermocouples, and has a high accuracy.
On the other hand, it is not suitable in a situation where the responsiveness and measurement of surface or tiny spaces are required.
Pt100 classes are either B as standard or A as accurate. For standard type, its class is B and its specified current is 2mA.

Elements L, M, and H meet JIS C1604-1997 whereas "P" doesn't.

Type		Specifications	Operating temperature range (°C)
Pt100 JPt100	L (Low Temperature Type)	Sheathed type	100°C
	P (Middle Temperature Type)	General type (ϕ3 to ϕ4)	220°C
	M (Middle Temperature Type)	Sheathed type General type(ϕ4.8 to ϕ8)	350°C
	H (High Temperature Type)	Sheathed type General type (ϕ5 to ϕ8)	650°C (Sheathed type or JPt100 : Up to 500°C)

-200 0 200 400 600 800

Consider the above chart only as a guide.

(2) Tolerance to temperature JIS C 604-1997

Class	Tolerance (°C)
Class A	±(0.15+0.002|t|)
Class B	±(0.3+0.005|t|)

• |t| is a value which represents regardless of + or - symbols of temperature (°C).

Measuring temperature (°C)		-200	-100	0	100	200	300	400	500	600	650	700	800	850
Tolerance (°C)	Class A	±0.55	±0.35	±0.15	±0.35	±0.55	±0.75	±0.95	±1.15	±1.35	±1.45			
	Class B	±1.3	±0.8	±0.3	±0.8	±1.3	±1.8	±2.3	±2.8	±3.3	±3.6	±3.8	±4.3	±4.6

● Protection Tube

SUS304, SUS316(for sheath), and Nicrobell are available as materials for the protection tube for standard type. It is available to select its material based on measured objects and measurement conditions.

<Normal operating temperature limits> <Sheathed type> JIS C 1605,(Nicrobell is out of JIS standard)

Thermocouple	Protection tube \ Diameter	ϕ1.0	ϕ1.6	ϕ3.2	ϕ4.8	ϕ6.4	ϕ8.0
K	SUS316	650°C	650°C	750°C	800°C	800°C	900°C
	SUS310S	650°C	650°C	750°C	800°C	800°C	900°C
	Inconel				900°C	1000°C	1050°C
	Nicrobell	900°C	1000°C	1100°C	1100°C	1150°C	1200°C
J	SUS316	450°C	450°C	650°C	750°C	750°C	750°C
T	SUS316	300°C	300°C	350°C	350°C	350°C	350°C
N	Nicrobell		1000°C	1100°C	1100°C	1150°C	1200°C

(1) Special Protection Tube

Metal protection tube

Material	Operating temperature for regular use (°C)	Maximum temperature (°C)	Features
Sandvik P4 (SUH446)	1000°C	1200°C	Excellent heat resistance and contained 27% chromium steel. Excellent salt-bath, melted metal, and acid resistance under high temperature. It can be used for sulfate containing reducing flame.
Titanium	250°C	500°C	Extremely excellent corrosion resistance, however this feature will be fragile under high temperature by oxidization.
Cast Iron	700°C	800°C	Extreme mechanical resistance.
Fluor resin coating	180°C	200°C	Fluor resin (FEP) coating with SUS316 sheath. Incredible chemical resistance under low temperature.

Non-metal protection tube

Material	Operating temperature for regular use (°C)	Maximum temperature (°C)	Features
Hard glass	500°C	600°C	Heatproof temperature limit is low. Fragile to thermal and mechanical shock and has a resistance to alkaline and acid.
Silica glass	1000°C		Has a resistance to sudden cooling and heating, Meanwhile, its strength is small. Vulnerable to alkaline, and resistant to acidity. Airtightness is deteriorated in hydrogen and reducing atmosphere.
High alumina Ceramic tube	1400°C 1500°C	1450°C 1550°C	Incredible air proof. Melted metal and combustion gas resistance. Vulnerable to metallic oxide and alkaline.
Pure sintering alumina	1700°C	1900°C	Incredible air proof. It is a neutral refractory. Melted metal, glass, and leady slag resistant. Vulnerable to thermal shock.
Zirconia	1900°C	2100°C	It is thermal resistant and air proof. Excellent resistance to corrosion from glass and metallic slag.
Silicon carbide	1500°C	1700°C	Good electrical and thermal conductivity. Withstand sudden heating, cooling, and oxidizing for its massive thermal strengthens.
Silicon nitride	1200°C	1600°C	Excellent corrosion resistance to non-ferrous metals. Its thermal shock resistance is also excellent.
Ceramic JIS Special	1600°C		Available to be stable measurement in a oxidized, reducing atmosphere, and high vacuum ambient environment.
Ceramic JIS Type 1	1500°C		Excellent thermal and corrosion resistance. Good thermal characteristics.
Ceramic JIS Type 2	1400°C		Less thermal softening and good thermal shock resistant.

• Temperature for regular use and maximum temperature vary dependent upon the diameter of the protection tube.

Reference information

● Lead Wire : Compensation cable (Thermocouple), Copper wire (Resistance temperature detector)

Compensation cable is used for thermocouple. Copper wire is used for RTD. There are other types of the lead wire such as glass fiber (EXB), vinyl coating(EXD) and so on. Please specify its type.
To use the copper lead wire for thermocouple result in inaccurate temperature measurement. Characteristics of lead wire should be same as the element of thermocouple.
Copper lead wire is used for RTD. Pay attention for wiring due to three-wires. Make sure that a resistance value of each wire is balanced.
Below chart is the plain specification for each compensation lead wire.

JIS C 1610-1995

Type	Applications	Code (JIS)	Composition of core *1		Shearh		Contact point compensation temperature (°C)	Error (μV) *3
			(+) Side	(-) Side	Material *2	Color		
K	Standard	KCC-G	Copper 0.3 × 7	Alloy of Copper and Nichel 0.3 × 7	Vinyl	Blue	0 to 100	±100
	For heat-resistive	KCB-H	Iron 0.3 × 7	Alloy of Copper and Nichel 0.3 × 7	Fiberglass		0 to 150	
J	Standard	JX-G	Iron 0.3 × 7	Alloy of Copper and Nichel 0.3 × 7	Vinyl	Yellow	-25 to 200	±140
	For heat-resistive	JX-H			Fiberglass			
T	Standard	TX-G	Copper 0.3 × 7	Alloy of Copper and Nichel 0.3 × 7	Vinyl	Brown	-25 to 100	±60
	For heat-resistive	TX-H			Fiberglass			
E	Standard	EX-G	Alloy of Nichel and Chrome 0.3 × 7	Alloy of Copper and Nichel 0.3 × 7	Vinyl	Purple	-25 to 200	±200
	For heat-resistive	EX-H			Fiberglass			
N	Standard	NX-G	Alloy of Nichel and Chrome 0.3 × 7	Alloy of Nichel and Silicon 0.3 × 7	Vinyl	Pink	-25 to 200	±100
	For heat-resistive	NX-H			Fiberglass			
R	Standard	RCM-G	Copper 0.3 × 7	Alloy of Copper and Nichel 0.3 × 7	Vinyl	Black	0 to 100	±30
	For heat-resistive	RCM-H			Fiberglass			
S	Standard	SCA-G			Vinyl			
	For heat-resistive	SCA-H			Fiberglass			
B	Standard	BC-G	Copper 0.3 × 7	Copper 0.3 × 7	Vinyl	Gray	0 to 100	——— *4

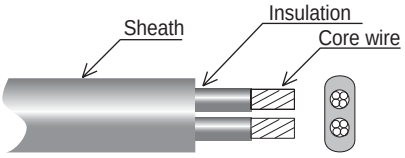
*1:0.65 ×4 wires is available for both (+) and (-).
*2:Codes and types for external material (Coating) is based on JIS. Please refer to the below chart for the other types.
*3:It is concerinig temperature of the junction with element and compensation cable.
*4:Tolerance value is not specified since a material for + core wire and - core wire is identical.

● Compensation cable

JIS C 1610-1995 (EXE, EXF is out of JIS standard)

Code	Details	Operating temperature
EXA	For heat-resistive, Fiberglass with stainless steel	0 to 150°C
EXB	For heat-resistive, Fiberglass	
EXC	For standard, PVC (polyvinyl chloride) with copper wire braided	-20 to +90°C (KCB,RCA,SCA,BC : 0 to 90°C)
EXD	For standard, PVC (polyvinyl chloride)	
EXE	For heat-resistive, Silicone rubber	-55 to +180°C
EXF	For heat-resistive, Fluorocarbon polymers (FEP)	0 to 200°C

Composition of Compensation cable



● Responsiveness of sensors

It takes a certain time for measuring junction of thermocouple or element of RTD to reach the same temperature with measuring object. The shorter the pipe is, the faster the response is. Meanwhile mechanical resistance becomes weaken. It is important to select a sensor according to purpose and condition. Please refer to following chart as a guide.

Response time (Atmospheric temperature to boiling water)

Reference values

Type		63.2%	95.0%
Thermocouple (General type)	ϕ3.2	0.3 sec	0.9 sec
	ϕ5.0	0.8 sec	2.6 sec
Sheathed Thermocouple	ϕ1.0	0.05 sec	0.2 sec
	ϕ1.6	0.15 sec	0.6 sec
	ϕ3.2	0.5 sec	1.8 sec
	ϕ4.8	1.0 sec	2.6 sec
	ϕ8.0	2.7 sec	10.7 sec

Reference values

Type		63.2%	95.0%
Resistance temperature detector (General type)	ϕ3.0	3.6 sec	9.2 sec
	ϕ5.0	5.5 sec	15 sec
	ϕ6.0	7.1 sec	19 sec
	ϕ8.0	11.8 sec	33 sec
Sheathed resistance temperature detector (General type)	ϕ3.2	3.2 sec	8.7 sec
	ϕ4.8	4.2 sec	11.5 sec
	ϕ8.0	8.7 sec	21 sec

Temperature sensor specification check sheet (For General type and Sheathed type)

● Please make a copy of this specification check sheet and send it to our distributors.

Check Item	Reference page	Check Specifications
Protection tube type		☐ General type ☐ Sheathed type ☐ NICROBELL sheathed type
Type	Page 3 to Page 4 Page 11 to Page 27 (Thermo-couple) Page 45 to Page 54 (Resistance temperature detector)	☐ Thermocouple ☐ K ☐ J ☐ T ☐ E ☐ N ☐ R ☐ B ☐ S ☐ PLII ☐ W5Re/W26Re ☐ Grounded (Standard) ☐ Ungrounded ☐ Exposed ☐ Single element (Standard) ☐ Double element ☐ Class 2 (Standard) ☐ Class 1 ☐ Class 3 (Type B) ☐ Resistance Temperature Detector (RTD) ☐ Single element (Standard) ☐ Double element ☐ Class B (Standard) ☐ Class A ☐ ☐ Grounded (Standard) ☐ Ungrounded
Operating temperature		Normal : _____ °C Maximum : _____ °C
Shape	Page 11 to Page 27 (Thermo-couple) Page 45 to Page 54 (Resistance temperature detector)	☐ Straight type (Please check one out of 6 from the following pictures) Length of protection tube (L1) _____ mm Diameter of protection tube (ϕd) ϕ_____ ☐ 90° bend type (Please check one out of 2 from the following pictures) Length of protection tube (L1) _____ mm (L2) _____ mm Diameter of protection tube (ϕd) ϕ_____ ☐ ϕd L1 ☐ ϕd L1 ☐ L2 L1 ϕd ☐ ϕd L1 With spring loaded ☐ ϕd L1 ☐ L2 L1 ϕd With spring loaded ☐ ϕd L1 With spring loaded ☐ ϕd L1 ☐ Other: please draw external view Optional ☐ With stainless flexible lead wire ☐ Fluor resin coating ☐ Other
Mounting Bracket	Page 6	☐ No bracket ☐ Fixed flange JIS __K __A or __B  ☐ Fixed nipple (nut) (Check either parallel or taper screw) ☐ Rotary nipple (nut) (Check either parallel or taper screw) Parallel screw __G (PF) Taper screw __R (PT)  G (P.F)  R (P.T) ☐ Compression fitting Taper screw ___ R(PT)  Other
Lead protection	Page 59	☐ Fiberglass with stainless steel ☐ Fiberglass ☐ PVC (polyvinyl chloride) with copper wire braided ☐ PVC (polyvinyl chloride) ☐ Silicone rubber ☐ Fluorocarbon polymers (FEP)
Lead wire length	Page 11 to Page 54	_____ mm
Lead wire termination	Page 7 to Page 8	☐ No terminal lugs *terminal soldered ☐ Spade lugs (M3 size)  ☐ Ring lugs (M4 size)  ☐ Metal connector Plug  Receptacle  ☐ Thermocouple connector Plug  Jack  ☐ Other
Other requests or environments of usage		
Measuring object or application (for reference)		

Company Name

Name

Country

Address

E-mail Address

Phone Number

Safety Warning	• This product is intended for use with industrial machines, test and measuring equipment. It is not designed for use with medical equipment. • If it is possible that an accident may occur as a result of the failure of the product or some other abnormality, an appropriate independent protection device must be installed.	Caution for the export trade All transactions must comply with laws, regulations, and treaties. Caution for imitated products As products imitating our product now appear on the market, be careful that you don't purchase these imitated products. We will not warrant such products nor bear the responsibility for any damage and/or accident caused by their use.

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CSEN13-E