

**RESISTANCE BULB**  
*MICA TYPE RTD*

**RESIMIC**  
*SHEATHED TYPE RTD*

**RESISLIM**  
*STEM TYPE RTD*

**THERMOWELL**  
*THERMOWELL*

Agent in Indonesia : PT. Instrumentation Engineering and Services ( +62811371371 )



**YAMARI INDUSTRIES, LIMITED**

# LINE OF BUSINESS

## Temperature Sensors:

Metal Sheathed Thermocouple, THERMIC  
 Beaded Type Thermocouple with  
 Protection Tube  
 Metal Sheathed Resistance Temperature  
 Detector, RESIMIC  
 Resistance Temperature Detector with  
 Protection Tube  
 Fine Diameter Resistance Temperature  
 Element, RESICERAM  
 Tubular Stem Type Resistance  
 Temperature Detector, RESISLIM  
 Special Thermocouple for Ultra-High  
 Temperature, HT-THERMIC  
 Special Thermocouple for Temperature  
 Measurement of Tube Skin  
 Multi-Point Thermocouple

## Other products and Imported Equipment:

Metal Sheathed Heat Tracing Cable and  
 Micro Heater Assembly  
 Dissolved Oxygen Sensor for Molten  
 Copper Bath, METAL-OX  
 AM•FM Turbine Blade Tip Clearance  
 Measuring System  
 ISOTECH Precision Temperature  
 Calibration Apparatus and Standard  
 Thermometers  
 Turbine Blade and Aircraft Wing Models  
 for Wind-Tunnel Experiment  
 Computerized Two & Three Dimensional  
 Fine Traverser  
 Total, Static and YAW Probes for high  
 temperatures  
 Temperature Transmitters

## Test and Calibration Services for Temperature Sensors by JCSS Laboratory:

Precision calibration using Triple Point of  
 Water and Mercury, Fixed Point  
 Standards of pure metals and Standard  
 Platinum Thermometer traceable to  
 National Standard.  
 Comparison Calibration with Standard  
 Platinum Thermometer and Standard  
 Thermocouple using Ice and Liquid  
 Baths, Fluidized Bed Alumina powder  
 Bath, Spherical Electric Furnace, and  
 Dry-Block Baths. A Certified Calibration  
 Report shall be issued.

## ACCREDITATIONS OF QUALITY ASSURANCE, SAFETY AND P.L. WARRANTY



ISO 9001 : 2000 / JIS Q 9001 : 2000



symbolizes the traceability system in accordance  
 with the law of metrology.



CENELEC(KEMA)

## ISO 9001

Since 1995, we maintain leading position  
 as one of the reliable manufacturers of  
 various temperature sensors under rigid  
 quality assurance system to ISO 9001  
 which has compatibility with the  
 qualification marks and logos (left).

## JCSS:

In order to certify accuracy and reliability  
 of the temperature sensors, we obtained  
 an accreditation by AIST (National  
 Institute of Advanced Industrial Science  
 and Technology) in 1994 as a qualified  
 temperature calibration service laboratory  
 through an established traceability with  
 the National Standard. JCSS (Japan  
 Calibration Service System) is in  
 conformity with ISO/IEC 17025 to  
 provide measurement standards and  
 measured quantities, i.e., an authorized  
 certification of the temperature figures.

## P.L.

Our products are fully inspected to  
 assure quality and proper functions, but  
 for warranty to the customers, sufficient  
 amount of P.L. Insurance is being  
 covered.

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# RESISTANCE TEMPERATURE DETECTORS

## What is Resistance Temperature Detector (RTD)?

Generally, electrical resistance of any metallic conductor varies according to temperature changes. The sensor for measurement of temperature by utilizing this phenomenon is called "Resistance Thermometer" or "RTD" and can measure temperatures more precisely than other temperature sensors.

## Its Features

Resistance temperature detectors for industrial applications have the following features.

1. Good sensitivity.
2. Excellent stability and reproducibility.
3. High accuracy.



## Structure and Measuring Methods

### Structure:

Metal wire that changes its electric resistance to changes in temperature are utilized is called "Resistance Wire". This resistance wire, normally of platinum, is used to manufacture a temperature sensor called "Resistance Temperature Detector(RTD)Element". Generally speaking, RTD is composed of RTD element, lead wires, protection tube and terminals.

### Measuring Methods:

#### 2-Wires Connection: Type W

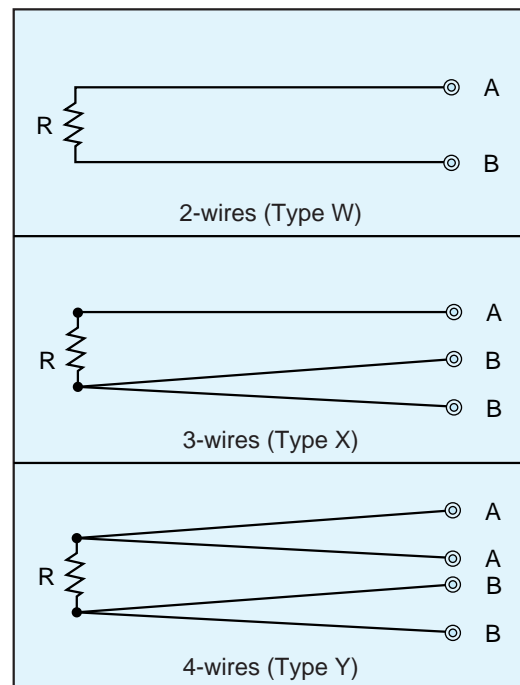
RTD element is connected to respective two wire leads. Although it is less expensive than other types, it is not recommendable for high precision measurement of temperature because it is susceptible to lead resistance and produces error.

#### 3-Wires Connection: Type X

One end of RTD element is connected to two wire leads and the other end connected to single lead to eliminate the effect from lead resistance. This type is most widely used as a reliable method in industrial applications.

#### 4-Wires Connection: Type Y

RTD element is connected to respective two wire leads to remove the effect from lead resistance. This connection cancels lead resistance effect and is especially recommendable for high precision measurement of temperature but somewhat expensive than other types.



R = RTD element. ⊙ = Terminal.  
 - = lead wire.  
 A or B = Code for terminal

## Precautions in Practical Applications

Selection of proper RTD suitable for the application is the most important factor. For precision measurement of temperature, consideration should be given to selection of RTD element, protection tube, structure and fitting (location) according to the respective resistance to heat, corrosion, mechanical shock and other environmental conditions.

## Characteristics and Standards

JIS C 1604-1997  
 JIS C 1604-1989 (JPt 100)  
 IEC 751-1986 (Amd. '95)

BS EN60751-1996  
 DIN EN60751-1996

### Nominal Resistance

Code	Resistance Value (Ω at 0°C)	Resistance Ratio R <sub>100</sub> /R <sub>0</sub>
Pt 100	100	1.3851
(JPt 100)	100	1.3916

R<sub>100</sub> is resistance value at 100°C.  
 R<sub>0</sub> is resistance value at 0°C.

### Operating Temperature Range

Code	Application	Operating Temperature
L	low temperature	-200~+100
M	medium temperature	0~350
H	high temperature	0~650*
S**	extra-high temperature	0~850

★ This shall be 500°C for sheathed type RTD  
 ★★ Not applicable for sheathed type RTD

### Temperature Tolerance

Measuring Temp.(°C)		-200	-100	0	100	200	300	400	500	600	650
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

### Class and Rated Current

Code	Class	Tolerance(°C)	Rated Current(mA)
Pt 100	A	±(0.15+0.002   t   )	0.5, 1, 2
(JPt 100)	B	±(0.3 +0.005   t   )	0.5, 1, 2, (5)

| t | means the measurement temperature expressed by a temperature (°C) unrelated to signs +, -.

### Temperature/Resistance Table

Std. °C	Pt100	JPt100	Std. °C	Pt100	JPt100	Std. °C	Pt100	JPt100	Std. °C	Pt100	JPt100	Std. °C	Pt100
-200	18.52	17.14	0	100.00	100.00	200	175.86	177.13	400	247.09	249.56	600	313.71
-190	22.83	21.46	10	103.90	103.97	210	179.53	180.86	410	250.53	253.06	610	316.92
-180	27.10	25.80	20	107.79	107.93	220	183.19	184.58	420	253.96	256.55	620	320.12
-170	31.34	30.12	30	111.67	111.88	230	186.84	188.29	430	257.38	260.02	630	323.30
-160	35.54	34.42	40	115.54	115.81	240	190.47	191.99	440	260.78	263.49	640	326.48
-150	39.72	38.68	50	119.40	119.73	250	194.10	195.67	450	264.18	266.94	650	329.64
-140	43.88	42.91	60	123.24	123.64	260	197.71	199.35	460	267.56	270.38	660	332.79
-130	48.00	47.11	70	127.08	127.54	270	201.31	203.01	470	270.93	273.80		
-120	52.11	51.29	80	130.90	131.42	280	204.90	206.66	480	274.29	277.22		
-110	56.19	55.44	90	134.71	135.30	290	208.48	210.30	490	277.64	280.63		
-100	60.26	59.57	100	138.51	139.16	300	212.05	213.93	500	280.98	284.02		
-90	64.30	63.68	110	142.29	143.01	310	215.61	217.54	510	284.30	287.40		
-80	68.33	67.77	120	146.07	146.85	320	219.15	221.15	520	287.62			
-70	72.33	71.85	130	149.83	150.67	330	222.68	224.74	530	290.92			
-60	76.33	75.91	140	153.58	154.49	340	226.21	228.32	540	294.21			
-50	80.31	79.96	150	157.33	158.29	350	229.72	231.89	550	297.49			
-40	84.27	83.99	160	161.05	162.08	360	233.21	235.45	560	300.75			
-30	88.22	88.01	170	164.77	165.86	370	236.70	238.99	570	304.01			
-20	92.16	92.02	180	168.48	169.63	380	240.18	242.53	580	307.25			
-10	96.09	96.02	190	172.17	173.38	390	243.64	246.05	590	310.49			

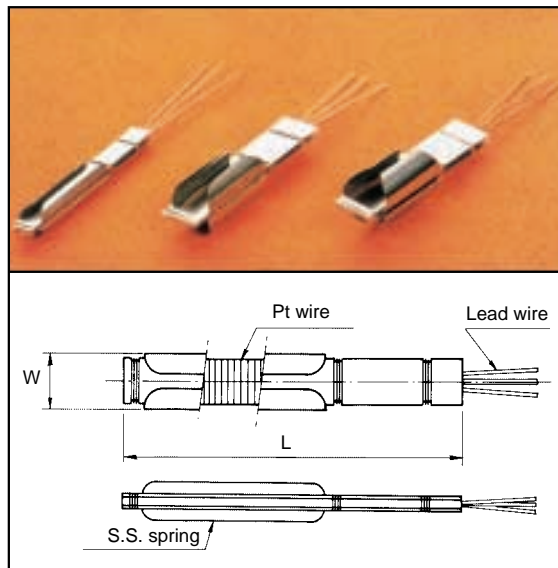
## Types of RTD Element

# RESIMICA

### Mica Type Platinum RTD Element

Mica type Platinum RTD element is composed of a mica plate wound with a high purity platinum wire and sandwiched in between two mica plates for insulation and, again, sandwiched in between two stainless steel plate springs and, then, fixed tightly by stainless steel wires.

Because of ease in handling and rigid structure, it is being used widely in industrial applications.



### Types

Type	Nominal Resistance( $\Omega$ )	Resistance Ratio $R_{100}/R_0$	Nom. Dimensions(mm)		I.D. of Protection Tube (mm)	Operating Temp. ( $^{\circ}\text{C}$ )	Rated Current (mA)	Class	
			Length(L)	Width(W)					
M100/ 40S	100	1.3851	50	4.0	5.0	-200~250	Below 2	A B	
M100/ 50S	100		50	5.0	6.0				
M100/ 50D	100×2		50	6.0	7.0				
M100/ 60S	100		50 (75)	7.0	8.0				
M100/ 60D	100×2		50 (75)	8.0	9.0				
M100/ 70S	100		50 (75)	9.0	10.0				
M100/ 70D	100×2		50 (75)	10.0~	11.0~16.0				
M100/ 80S	100		JIS IEC DIN BS	50	4.0				5.0
M100/ 80D	100×2			50	5.0				6.0
M100/ 90S	100			50	6.0				7.0
M100/ 90D	100×2			50 (75)	7.0				8.0
M100/100S	100			50	8.0				9.0
M100/100D	100×2	50 (75)		9.0	10.0				
MJ100/40S	100	1.3916		50	4.0	5.0			
MJ100/50S	100			50	5.0	6.0			
MJ100/50D	100×2		50	6.0	7.0				
MJ100/60S	100		50 (75)	7.0	8.0				
MJ100/60D	100×2		50 (75)	8.0	9.0				
MJ100/70S	100		50	9.0	10.0				
MJ100/70D	100×2		50 (75)	10.0~	11.0~16.0				
MJ100/80S	100		Old JIS	50	4.0	5.0			
MJ100/80D	100×2			50	5.0	6.0			
MJ100/90S	100			50	6.0	7.0			
MJ100/90D	100×2	50 (75)		7.0	8.0				
MJ100/100S	100	Old JIS	50	8.0	9.0				
MJ100/100D	100×2		50 (75)	9.0	10.0				

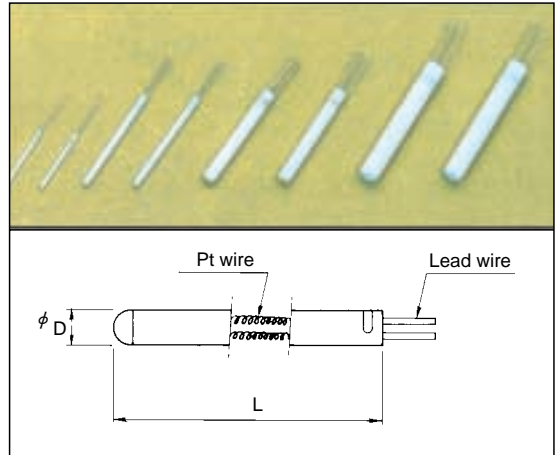
In the Nominal Resistance column, × 2 means dual elements.

Other sizes and nominal resistance values (500  $\Omega$ , 1000  $\Omega$ ) are also available upon request.

# RESICERAM<sup>®</sup>

## Ceramic Type Platinum RTD Element

**RESICERAM<sup>®</sup>** is composed of a coil-formed high purity platinum wire inserted into bores of a fine polished recrystallized Alumina ceramic body and fixed on its bottom by special heat resistant frit. As approximately 80% of the resistance wire is free of heat strain from temperature change, drift in resistivity is minimized and its reproducibility and long term stability are superior to any of conventional core-wound elements.



## Types

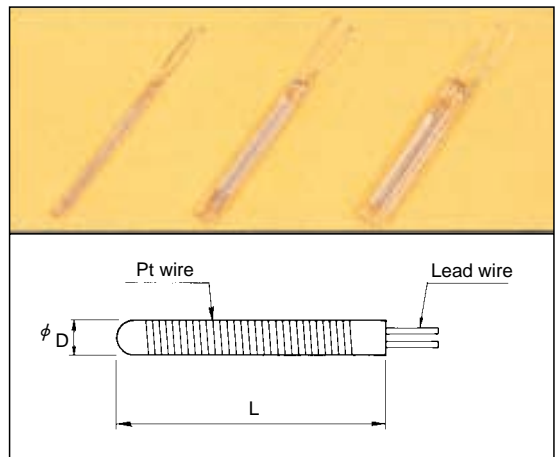
Type	Nominal Resistance(Ω)	Resistance Ratio R <sub>100</sub> /R <sub>0</sub>	Nom. Dimensions(mm)		Operating Temp. (°C)	Rated Current (mA)	Class
			Length(L)	O. D. (D)			
C100 / 0715S	100	1.3851	15	0.75	-200~500	Below 1	A
C100 / 0915S	100		15	0.9			
C100 / 1210S	100		10	1.2			
C100 / 1615S	100		JIS	15		1.6	
C100 / 2815S	100		IEC	15		2.8	
C100 / 3025S	100		DIN	25		3.0	
C100 / 4530S	100		BS	30		4.5	
CJ100/0715S	100	1.3916	15	0.75		Below 2	B
CJ100/0915S	100		15	0.9			
CJ100/1210S	100		10	1.2			
CJ100/1615S	100		15	1.6			
CJ100/2815S	100		15	2.8			
CJ100/3025S	100	Old JIS	25	3.0		Below 5	
CJ100/4530S	100		30	4.5			

On order for dual element, put suffix D instead of S. Other special sizes are also available.  
For high temperature use (0-650°C) put suffix-H after S or D on element Types. Example — “C100/2815S-H”.

# RESIGLASS

## Glass-sealed Platinum RTD Element

It is composed of a high purity platinum wire wound non-inductively around a special glass body, of which resistivity at 0°C is adjusted to fall within the respective standard ranges, inserted into another special glass tube and heat sealed overall. Quick response and excellent in insulation, withstand voltage, vibration, and high resistance to liquid, chemicals and gases.



## Types

Type	Nominal Resistance(Ω)	Resistance Ratio R <sub>100</sub> /R <sub>0</sub>	Nom. Dimensions(mm)		Operating Temp. (°C)	Rated Current (mA)	Class
			Length(L)	O. D. (D)			
G100 / 2025S	100	1.3851	25	2.0	-200~350	Below 1	A
G100 / 3025S	100			JIS, IEC.			
G100 / 4025S	100			DIN, BS		4.0	
GJ100/2025S	100	1.3916	25	2.0		Below 2	B
GJ100/3025S	100			3.0			
GJ100/4025S	100			4.0			
		Old JIS			Below 5		

Other sizes are also available.

# RESISTANCE BULB (MODEL:RE)

## Mica Type RTD

### What is Mica Type RTD?

This is the most typical resistance temperature detector using RESIMICA (Mica type RTD element) as shown in the right picture.

### Features

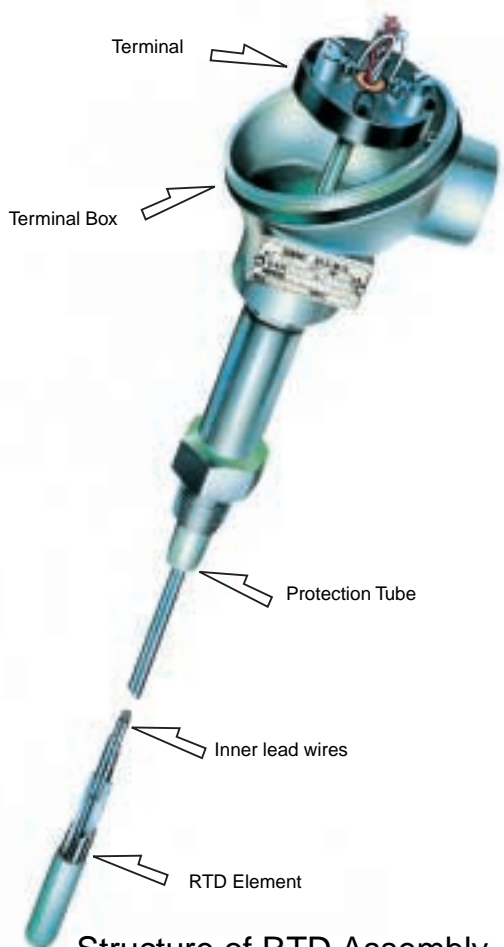
- 1) The use of high purity platinum resistance wire ensures precision measurement.
- 2) Excellent in stability and reproducibility.

### Vibration & Shock Resistance

For the use under high flow-velocity, vibration or mechanical shock, RTD element and inner lead wires are protected by shock-resistant stainless steel inner tube support.

### Low Temperature Treatment

Low temperatures often cause dew condensation in a protection tube that results in deterioration of insulation resistance. For use at sub-zero temperature, please specify "Low Temperature Treatment" that makes the sensing tip of RTD element covered with silicon or paraffin coating to protect from dewing.



Structure of RTD Assembly

### Standard Specifications

Nominal Resistance (at 0°C)	Code
Pt 100Ω	100
JPt 100Ω	J100

No. of Element	Code
1 (Single)	S
2 (Double)	D

Lead Connection	Code
2-wires	W
3-wires	X
4-wires	Y

Rated Current	Code
0.5 mA	005
1 mA	01
2 mA	02
5 mA※	05

※: 5 mA for JPt100

### Lead Wires to Applications

Application	Code	Operating Temperature	Inner Lead Wires
Low Temperature	L	-200~100°C	Silver
Mid. Temperature	M	0~250°C	Silver
High Temperature	H	0~400°C	Nickel



## Properties of Insulating Tubes

Material	Code	Operating Temp.	Maximum Temp.	Properties
Ceramic 1	PS1	1400°C	1600°C	Highest insulation among insulation materials. Solid.
Teflon	FEP	180°C	200°C	Excellent resistance to heat, chemicals, etc. Flexible.
Polyimide	PM	220°C	—	Characteristics similar to FEP but tougher and thin-wall thickness.

## Properties of Metal Protection Tubes

Material	Code	Operating Temp.	Properties
Copper	CU	250°C	Good heat conductivity and excellent corrosion-resistance.
Brass	BS	Oxidizing 400°C Reducing 150°C	Similar to Copper and good workability.
304S. S.	304	980°C	High resistance to heat and corrosion.
316S. S.	316	980°C	Excellent resistance to heat, acids and alkalis.
316L.S. S.	316L	980°C	Excellent resistance to grain boundary corrosion.
Titanium	TI	Oxidizing 250°C Reducing 1000°C	Excellent resistance to corrosion at low temp. but easily oxidized and embrittled at high temperature.
Monel	MN	Oxidizing 500°C Reducing 600°C	Excellent resistance to heat, high pressure and corrosion.

Other special tubes are also available. Operating and maximum temperatures vary depending on atmospheres.

## Standard Dimensions of Protection Tubes

(○=Available)

material Size(mm)	Regular Type single			Regular Type double			Shock Proof Type single			Shock Proof Type double			Remarks
	304	316	316L	304	316	316L	304	316	316L	304	316	316L	
7 × 5	○												
8 × 6	○	○											
9 × 7	○			○									
10 × 8	○	○	○	○	○	○	○	○	○				
11 × 9	○			○			○			○			
12 × 9	○	○	○	○	○	○	○	○	○	○	○	○	
13 × 9	○			○			○			○			
13.8 × 9.4	○	○	○	○	○	○	○	○	○	○	○	○	8A SCH.40
15 × 11	○	○	○	○	○	○	○	○	○	○	○	○	
16 × 12	○			○			○			○			
17.3 × 12.7	○	○	○	○	○	○	○	○	○	○	○	○	10A SCH.40
20 × 16	○			○			○			○			
21.7 × 16.1	○	○	○	○	○	○	○	○	○	○	○	○	15A SCH.40

## SURFACE COATINGS

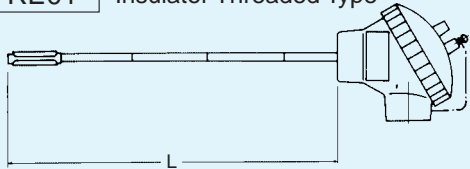

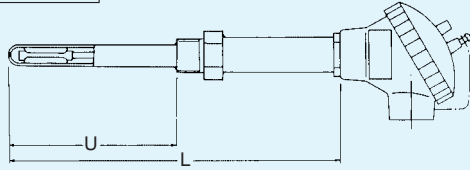
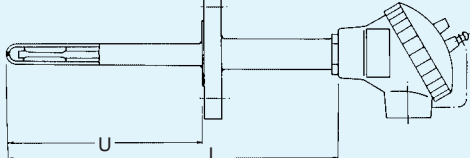
### Corrosion Resistant Lining & Coating

Coating Material	Thickness (mm)	Structure	Max Oper. Temp.	Characteristics
Glass-lining	1~1.2	Steel+Glass	450°C	Good protection against oxidation and gas penetration but poor thermal shock resistance.
Teflon(FEP)coating	0.3	Metal+FEP	120°C	Suitable in concentrated 2HCl, H <sub>2</sub> SO <sub>4</sub> and HNO <sub>3</sub> and most of chemicals but depending on temperature conditions.

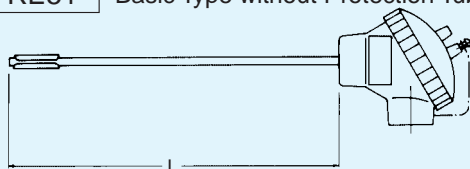
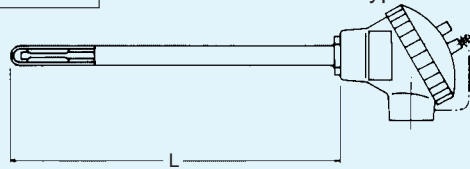
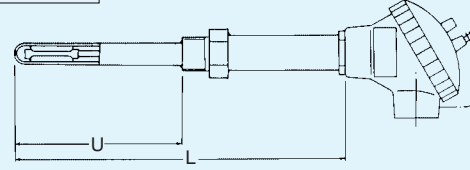
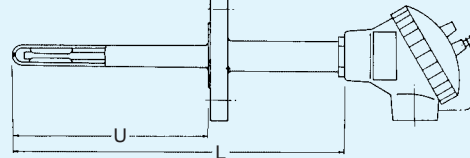
**For Abrasion Resistance**..... Stellite, Colmonoy, Tungsten and other materials can be processed to improve abrasion resistance of metal protection tubes. For further details, please consult factory.

# Standard Assemblies of Mica Type RTD

(MODEL:RE)

<p><b>RE01</b> Insulator Threaded Type</p> 	<p>Order Code : <b>RE01</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> - <b>L</b> -</p> <p>Ref Page : <b>11</b> + <b>KN</b></p> <p>Applicable tube I.D. P6 Term. Box P11</p>
<p><b>RE12</b> Metal Protection Tube Type</p> 	<p>Order Code : <b>RE12</b> - <b>M</b> <b>J100</b> <b>S</b> <b>X</b> <b>02</b> - <b>L</b> - <b>KN</b> -</p> <p>Ref Page : <b>15</b> / <b>316</b></p> <p>Dimensions of Prot. Tube P9 Material P9</p>
<p><b>RE13</b> Metal Protection Tube Type (Screwed)</p> 	<p>Order Code : <b>RE13</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> - <b>L</b> / <b>U</b> -</p> <p>Ref Page : <b>KN</b> - <b>15</b> / <b>316</b> + <b>PT<math>\frac{1}{2}</math></b> / <b>316</b></p> <p>Term. Box P11 Dimensions of Prot. Tube P9 Material P9 Thread Std P9</p>
<p><b>RE14</b> Metal Protection Tube Type (Flanged)</p> 	<p>Order Code : <b>RE14</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> - <b>L</b> / <b>U</b> - <b>KN</b> -</p> <p>Ref Page : <b>15</b> / <b>316</b> + <b>JIS10K25ARF</b> / <b>316</b></p> <p>Dimensions of Prot. Tube P9 Material P9 Flange Rating P21 Material P11</p>

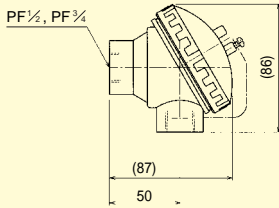
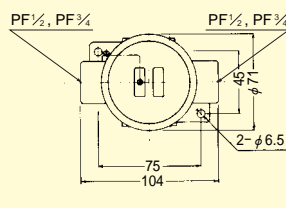
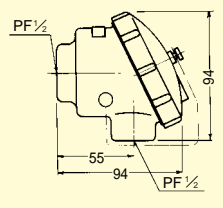
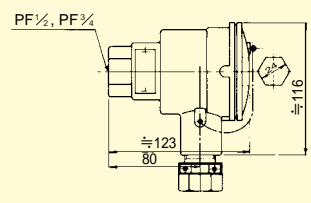
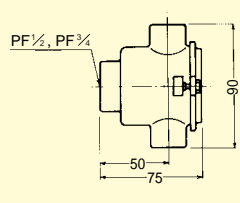
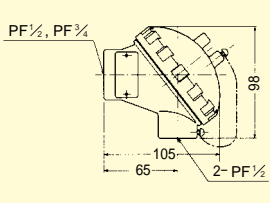
## Shock Proof Models

<p><b>RE51</b> Basic Type without Protection Tube</p> 	<p>Order Code : <b>RE51</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> - <b>L</b> -</p> <p>Ref Page : <b>11</b> + <b>KN</b></p> <p>Applicable tube I.D. P6 Term. Box P11</p>
<p><b>RE52</b> Metal Protection Tube Type</p> 	<p>Order Code : <b>RE52</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> - <b>L</b> -</p> <p>Ref Page : <b>KN</b> - <b>15</b> / <b>316</b></p> <p>Term. Box P11 Dimensions of Prot. Tube P9 Material P9</p>
<p><b>RE53</b> Metal Protection Tube Type (Screwed)</p> 	<p>Order Code : <b>RE53</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> - <b>L</b> / <b>U</b> -</p> <p>Ref Page : <b>KN</b> - <b>15</b> / <b>316</b> + <b>PT<math>\frac{1}{2}</math></b> / <b>316</b></p> <p>Term. Box P11 Dimensions of Prot. Tube P9 Material P9 Thread Std P9</p>
<p><b>RE54</b> Metal Protection Tube Type (Flanged)</p> 	<p>Order Code : <b>RE54</b> - <b>M</b> <b>J100</b> <b>S</b> <b>X</b> <b>02</b> - <b>L</b> / <b>U</b> - <b>KN</b> -</p> <p>Ref Page : <b>15</b> / <b>316</b> + <b>JIS10K25ARF</b> / <b>316</b></p> <p>Dimensions of Prot. Tube P9 Material P9 Flange Rating P21 Material P11</p>

In case of JPt ( $R_{100}/R_0=1.3916$ ), put a suffix-J, Example see code RE 12 and RE 54.

# Terminal Boxes

Other entry threads of PT, NPT or Metrics can be specified.

Type	Weather Proof K N	Wall Mount KW	Plastics Molded KP
Material: Conduit Dia: No. of Terminals: Terminal Block: Surface Finish: Surface Color:	Al-alloy diecast PF $\frac{1}{2}$ · PF $\frac{3}{4}$ 2, 3, 4, 6 Ceramic Melamin baked Metallic Silver	Al-alloy diecast PF $\frac{1}{2}$ · PF $\frac{3}{4}$ 2, 3, 4, 6 Ceramic Melamin baked Metallic Silver	Phenolic Resin PF $\frac{1}{2}$ 2, 3, 4 Ceramic — Black
Dimensions			
Type	Flame Proof * KG (d2G4, Exd IIC T6)	Two Way Cable Entry KR	Dual Cable Entry KF
Material: Conduit Dia: No. of Terminals: Terminal Block: Surface Finish: Surface Color:	Al-alloy diecast, Stainless Steel M16, 20, 25 2, 3, 4, 6 Bakelite Melamin baked Metallic Silver	Al-alloy diecast PF $\frac{1}{2}$ × 2 4, 6 Ceramic Melamin baked Metallic Silver	Al-alloy diecast PF $\frac{1}{2}$ × 2 4, 6 Ceramic Melamin baked Metallic Silver
Dimensions			

\* Approved by CENELEC for "Exd IIC T6" to EN50018.  
Two way entry model also available.



# RESIMIC® (MODEL:RM)

## Sheathed Type RTD

### RESIMIC® What is RESIMIC?

RESIMIC® is a registered trade name of YAMARI's metal sheathed RTD that has a monolithic structure comprising of RESICERAM® element and MI cable (MgO compacted, metal sheathed lead wires). This newly developed RTD has very quick response, longer service life and high accuracy under critical conditions.

### RESIMIC® Its Features

- 1) Quick Response:  
Since RESIMIC® sensing part is filled with high purity alumina powder and protected by a metal sheath, it has much faster response than those of ordinary RTD's and can follow any slight change in temperature.
- 2) High Flexibility:  
Except for the sensing part of up to 60mm from the tip, it can be bent to the radius equal to 2 times of the sheath O.D.
- 3) High Accuracy:  
Since high purity platinum resistance wire is used, it has high accuracy falling within the class of A or B stipulated by JIS C1604-1997, or other internationally known Standards.
- 4) Wide Variety of Specifications:  
Outer diameters from 3.2mm to 8.0mm and total length up to 150 meters are available.
- 5) Wide Range of Measuring Temperatures:  
From cryogenic ( $-200^{\circ}\text{C}$ ) to high temperature ( $+500^{\circ}\text{C}$ ) can be measured although it may vary depending on surrounding atmospheres.



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## RESIMIC® Types and Codes

Nominal Resistance (at 0°C)	Code
Pt 100Ω	100
JPt 100Ω	J100

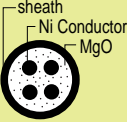

Number of Element	Code
1 (single)	S
2 (double)	D

Lead Connection	Code
3 wires	X
4 wires	Y

Rated Current	Code
0.5 mA	005
1 mA	01
2 mA	02
5 mA*	05

\*: 5 mA for JPt100

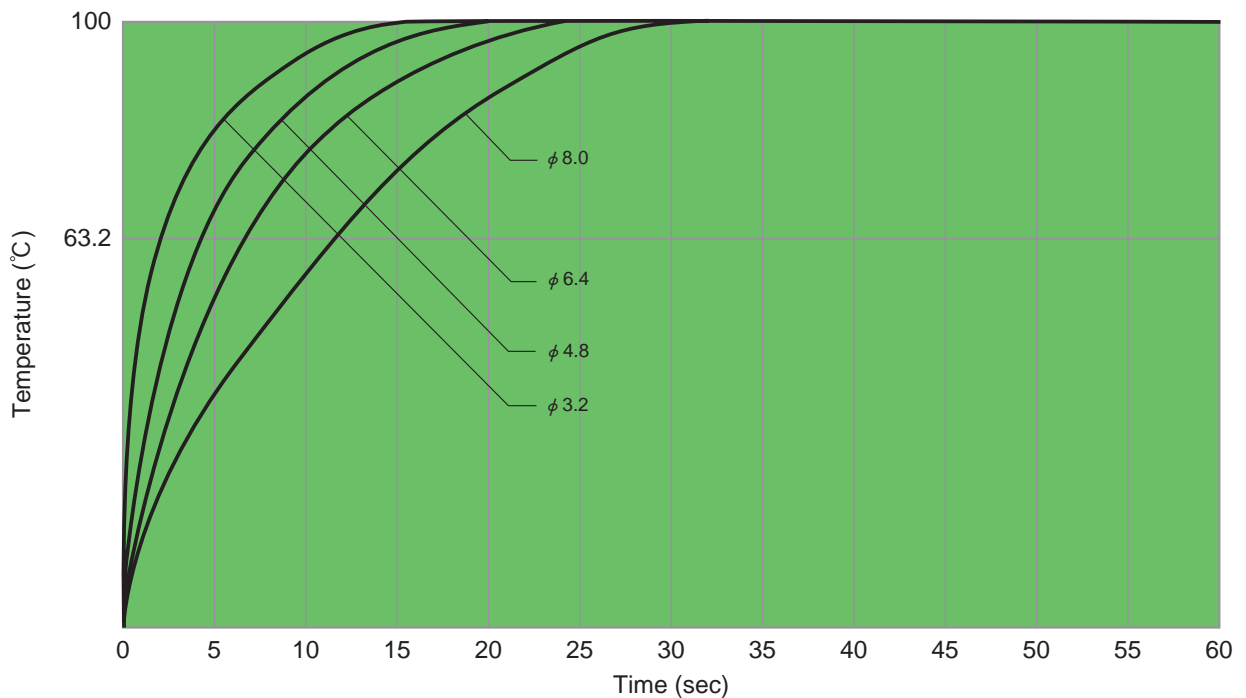
## RESIMIC® Sheathed Leads

	Sheath O. D. (mm)	Conductor Dia. (mm)	Lead Resistance (Ω/m at 20°C)	Sheath Wall (mm)	Sheath Material	Max Length (m)
	3.2	0.33	1.106	0.30	316 SS	150
	4.8	0.51	0.467	0.43	316 SS	60
	6.4	0.66	0.276	0.58	316 SS	30
	8.0	0.81	0.177	0.74	316 SS	15
	4.8	0.51	0.467	0.43	316 SS	60
	6.4	0.66	0.276	0.58	316 SS	30
	8.0	0.81	0.177	0.74	316 SS	15

## RESIMIC® Response Time

The “ $\tau$ ” Constants (63.2%) when RESIMIC® is immersed into 100°C (boiling water) from 0°C (ice bath).

- $\phi$  3.2 less than 2 sec.
- $\phi$  4.8 less than 4 sec.
- $\phi$  6.4 less than 6 sec.
- $\phi$  8.0 less than 11 sec.



# RESISLIM (MODEL:RS)

## Stem Type RTD

### RESISLIM What is RESISLIM?

RESISLIM is a newly developed RTD assembly that is composed of a fine diameter metal protection tube in which high purity  $Al_2O_3$  powder is tightly compacted and sealed around RESICERAM<sup>®</sup> element.

### RESISLIM Its Features

- 1) Due to small mass of heat and finer diameter, it is possible to measure temperatures in such places where conventional types are not accessible.
- 2) It has quicker response than Mica type RTD or RESIMIC<sup>®</sup>.
- 3) It has accuracies of class A or B stipulated by JIS C1604-1997, or other internationally known standards due to use of RESICERAM<sup>®</sup> elements.
- 4) It has wide range of operating temperatures from  $-200^{\circ}C$  to  $+650^{\circ}C$  depending on surrounding atmospheres as in the case of RESIMIC<sup>®</sup>.

### RESISLIM Types and Codes

Nominal Resistance (at 0°C)	Code
Pt 100Ω	100
JPt 100Ω	J100

Number. of Element	Code
1 (single)	S
2 (double)	D

Lead Connection	Code
3-wires	X
4-wires	Y

Rated Current	Code
0.5 mA	005
1 mA	01
2 mA	02
5 mA <sup>※</sup>	05

※: 5 mA for JPt100

### Inner Lead Material to Operating Temperature

Application	Code	Operating Temperature	Lead Material
Mid. Temperature	M	$-200\sim 250^{\circ}C$	Silver
High Temperature	H	$0\sim 650^{\circ}C$ <sup>※</sup>	Nickel

※: Operating temperature of Old JIS JPt is up to  $500^{\circ}C$ .

## RESISLIM Types

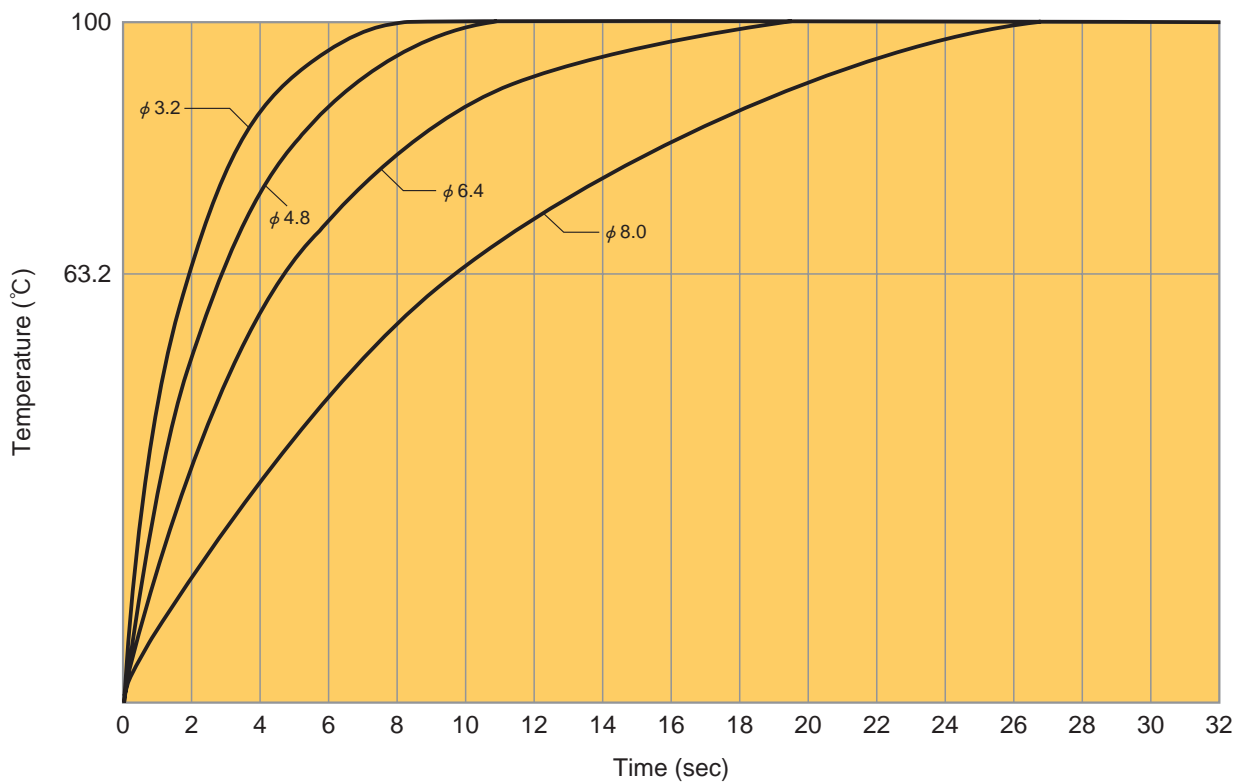
Nominal Resistance (at 0°C)	Nom. O.D. (mm)	Manufacturable Range to Operating Temp.		Maximum Length (mm)
		-200~250°C	250~650°C*	
Pt 100Ω JPt 100Ω	1.0	○		200
	1.2	○		∕
	1.6	○		1,000
	2.0	○		∕
	2.5	○		∕
	3.2	○	○	2,000
	4.0	○	○	∕
	4.8	○	○*	∕
	6.4	○	○*	∕
	8.0	○	○*	∕
Pt 100Ω × 2 JPt 100Ω × 2	3.2	○		2,000
	4.0	○		∕
	4.8	○	○	∕
	6.4	○	○*	∕
	8.0	○	○*	∕

\*High temperature models of up to 650°C are available upon request.

## RESISLIM Response Time

The “ $\tau$ ” Constants (63.2%) when RESISLIM is immersed into 100°C (boiling water) from 0°C (ice bath).

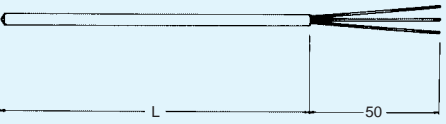
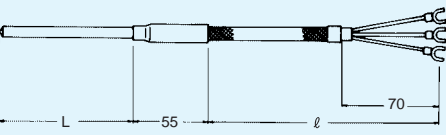
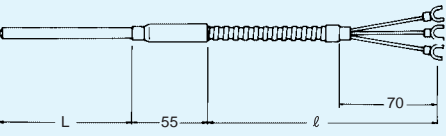
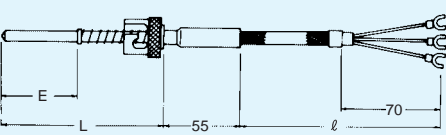
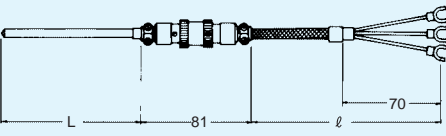
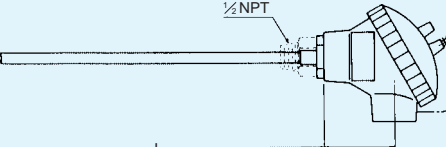
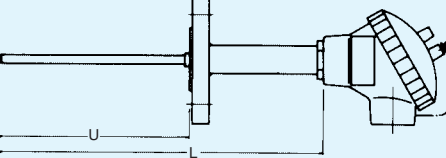
- φ 3.2 less than 2 sec.
- φ 4.8 less than 3 sec.
- φ 6.4 less than 5 sec.
- φ 8.0 less than 10 sec.



# Standard Assemblies of

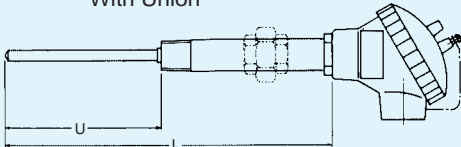
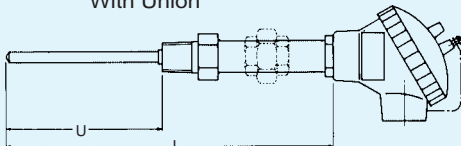
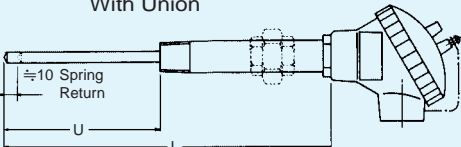
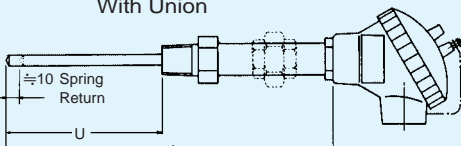
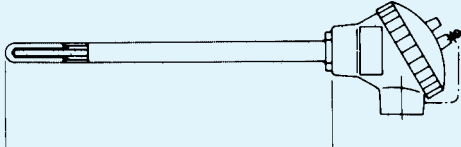
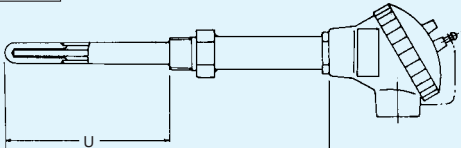
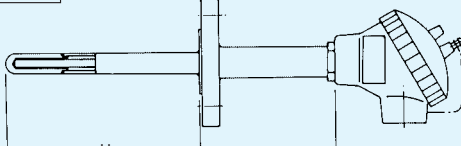
**RESIMIC**® (MODEL:RM)

**RESISLIM** (MODEL:RS)

<p><b>RM RS A</b> Basic Type</p> 	<p>Order Code : <b>RMA</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> / <b>32</b> -</p> <p style="font-size: small;">Type Inner Leads Resistance No. of Element Lead Connection Rated Current O.D. P13,P14 P13,P15</p> <p><b>L</b> Length</p>
<p><b>RM RS B</b> Flexible Lead Type</p> 	<p>Order Code : <b>RMB</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> / <b>32</b> -</p> <p style="font-size: small;">Type Inner Leads Resistance No. of Element Lead Connection Rated Current O.D. P13,P14 P13,P15</p> <p><b>L</b> - <b>WR13</b> ( <b>l</b> ) Length Lead Length P19</p>
<p><b>RM RS BF</b> Armoured Lead Type</p> 	<p>Order Code : <b>RMBF</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> /</p> <p style="font-size: small;">Type Inner Leads Resistance No. of Element Lead Connection Rated Current P13,P14</p> <p><b>48</b> - <b>L</b> - <b>WR13</b> - <b>l</b> O.D. Length Lead Insert P13,P15 P19 Length</p>
<p><b>RM RS BYS</b> Bayonet Mount Type</p> 	<p>Order Code : <b>RMBYS</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> /</p> <p style="font-size: small;">Type Inner Leads Resistance No. of Element Lead Connection Rated Current P13,P14</p> <p><b>48</b> - <b>L</b> - <b>WR13</b> - <b>l</b> O.D. Length Lead Insert P13,P15 P19 Length</p>
<p><b>RM RS ES</b> Metal Connector Type</p> 	<p>Order Code : <b>RMES</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> /</p> <p style="font-size: small;">Type Inner Leads Resistance No. of Element Lead Connection Rated Current P13,P14</p> <p><b>48</b> - <b>L</b> - <b>WR13</b> - <b>l</b> O.D. Length Lead Insert P13,P15 P19 Length</p>
<p><b>RM RS H</b> Basic Type with Terminal Box</p> 	<p>Order Code : <b>RMH</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> / <b>48</b> -</p> <p style="font-size: small;">Type Inner Leads Resistance No. of Element Lead Connection Rated Current O.D. P13,P14 P13,P15</p> <p><b>L</b> - <b>KN</b> <b>+ NPT 1/2 BU</b> Length Term. Box Bushing P11</p>
<p><b>RM RS NF</b> Flanged Type</p> 	<p>Order Code : <b>RMNF</b> - <b>M</b> <b>100</b> <b>S</b> <b>X</b> <b>02</b> / <b>48</b> -</p> <p style="font-size: small;">Type Inner Leads Resistance No. of Element Lead Connection Rated Current O.D. P13,P14 P13,P15</p> <p><b>L</b> / <b>U</b> - <b>KN</b> - <b>JIS10K25ARF</b> / <b>304</b> Length Insert Length Term. Box Flange Rating Material P11 P21</p>

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<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px;">RM RS N</div> <div style="border: 1px dashed black; padding: 2px;">RM RS UN</div> </div> <p style="text-align: center;">Screwed Type With Union</p> 	<p>Order Code : <span style="border: 1px solid black; padding: 2px;">RMN</span> - <span style="border: 1px solid black; padding: 2px;">M</span> <span style="border: 1px solid black; padding: 2px;">100</span> <span style="border: 1px solid black; padding: 2px;">S</span> <span style="border: 1px solid black; padding: 2px;">X</span> <span style="border: 1px solid black; padding: 2px;">02</span> / <span style="border: 1px solid black; padding: 2px;">48</span> -</p> <p style="text-align: center; font-size: small;">Inner Resist- No. of Lead Rated Leads ance Element Connection Current P13,P14 O.D. P13,P15</p> <p><span style="border: 1px solid black; padding: 2px;">L</span> / <span style="border: 1px solid black; padding: 2px;">U</span> - <span style="border: 1px solid black; padding: 2px;">KN</span> - <span style="border: 1px solid black; padding: 2px;">PT 1/2</span> / <span style="border: 1px solid black; padding: 2px;">304</span></p> <p style="text-align: center; font-size: x-small;">Length Insert Term. Thread Material Length Box P11 Std</p>
<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px;">RM RS NB</div> <div style="border: 1px dashed black; padding: 2px;">RM RS UNB</div> </div> <p style="text-align: center;">Screwed Type With Union</p> 	<p>Order Code : <span style="border: 1px solid black; padding: 2px;">RMNB</span> - <span style="border: 1px solid black; padding: 2px;">M</span> <span style="border: 1px solid black; padding: 2px;">100</span> <span style="border: 1px solid black; padding: 2px;">S</span> <span style="border: 1px solid black; padding: 2px;">X</span> <span style="border: 1px solid black; padding: 2px;">02</span> / <span style="border: 1px solid black; padding: 2px;">48</span> -</p> <p style="text-align: center; font-size: small;">Inner Resist- No. of Lead Rated Leads ance Element Connection Current P13,P14 O.D. P13,P15</p> <p><span style="border: 1px solid black; padding: 2px;">L</span> / <span style="border: 1px solid black; padding: 2px;">U</span> - <span style="border: 1px solid black; padding: 2px;">KN</span> - <span style="border: 1px solid black; padding: 2px;">PT 1/2</span> / <span style="border: 1px solid black; padding: 2px;">304</span></p> <p style="text-align: center; font-size: x-small;">Length Insert Term. Thread Material Length Box P11 Std</p>
<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px;">RM RS NS</div> <div style="border: 1px dashed black; padding: 2px;">RM RS UNS</div> </div> <p style="text-align: center;">Spring-Loaded Type With Union</p>  <p style="font-size: x-small;">≈10 Spring Return</p>	<p>Order Code : <span style="border: 1px solid black; padding: 2px;">RMNS</span> - <span style="border: 1px solid black; padding: 2px;">M</span> <span style="border: 1px solid black; padding: 2px;">J100</span> <span style="border: 1px solid black; padding: 2px;">S</span> <span style="border: 1px solid black; padding: 2px;">X</span> <span style="border: 1px solid black; padding: 2px;">02</span> / <span style="border: 1px solid black; padding: 2px;">48</span> -</p> <p style="text-align: center; font-size: small;">Inner Resist- No. of Lead Rated Leads ance Element Connection Current P13,P14 O.D. P13,P15</p> <p><span style="border: 1px solid black; padding: 2px;">L</span> / <span style="border: 1px solid black; padding: 2px;">U</span> - <span style="border: 1px solid black; padding: 2px;">KN</span> - <span style="border: 1px solid black; padding: 2px;">PT 1/2</span> / <span style="border: 1px solid black; padding: 2px;">304</span></p> <p style="text-align: center; font-size: x-small;">Length Insert Term. Thread Material Length Box P11 Std</p>
<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px;">RM RS NBS</div> <div style="border: 1px dashed black; padding: 2px;">RM RS UNBS</div> </div> <p style="text-align: center;">Spring-Loaded Type With Union</p>  <p style="font-size: x-small;">≈10 Spring Return</p>	<p>Order Code : <span style="border: 1px solid black; padding: 2px;">RMNBS</span> - <span style="border: 1px solid black; padding: 2px;">M</span> <span style="border: 1px solid black; padding: 2px;">J100</span> <span style="border: 1px solid black; padding: 2px;">S</span> <span style="border: 1px solid black; padding: 2px;">X</span> <span style="border: 1px solid black; padding: 2px;">02</span> / <span style="border: 1px solid black; padding: 2px;">48</span> -</p> <p style="text-align: center; font-size: small;">Inner Resist- No. of Lead Rated Leads ance Element Connection Current P13,P14 O.D. P13,P15</p> <p><span style="border: 1px solid black; padding: 2px;">L</span> / <span style="border: 1px solid black; padding: 2px;">U</span> - <span style="border: 1px solid black; padding: 2px;">KN</span> - <span style="border: 1px solid black; padding: 2px;">PT 1/2</span> / <span style="border: 1px solid black; padding: 2px;">304</span></p> <p style="text-align: center; font-size: x-small;">Length Insert Term. Thread Material Length Box P11 Std</p>
<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px;">RM RS P</div> </div> <p style="text-align: center;">Metal Protection Tube Type</p> 	<p>Order Code : <span style="border: 1px solid black; padding: 2px;">RMP</span> - <span style="border: 1px solid black; padding: 2px;">M</span> <span style="border: 1px solid black; padding: 2px;">100</span> <span style="border: 1px solid black; padding: 2px;">S</span> <span style="border: 1px solid black; padding: 2px;">X</span> <span style="border: 1px solid black; padding: 2px;">02</span> / <span style="border: 1px solid black; padding: 2px;">48</span> -</p> <p style="text-align: center; font-size: small;">Inner Resist- No. of Lead Rated Leads ance Element Connection Current P13,P14 O.D. P13,P15</p> <p><span style="border: 1px solid black; padding: 2px;">L</span> - <span style="border: 1px solid black; padding: 2px;">KN</span> - <span style="border: 1px solid black; padding: 2px;">15</span> / <span style="border: 1px solid black; padding: 2px;">304</span></p> <p style="text-align: center; font-size: x-small;">Length Term. Dimensions of Material Box P11 Prot. Tube P9</p>
<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px;">RM RS PB</div> </div> <p style="text-align: center;">Metal Protection Tube Type (Screwed)</p> 	<p>Order Code : <span style="border: 1px solid black; padding: 2px;">RMPB</span> - <span style="border: 1px solid black; padding: 2px;">M</span> <span style="border: 1px solid black; padding: 2px;">100</span> <span style="border: 1px solid black; padding: 2px;">S</span> <span style="border: 1px solid black; padding: 2px;">X</span> <span style="border: 1px solid black; padding: 2px;">02</span> / <span style="border: 1px solid black; padding: 2px;">48</span> -</p> <p style="text-align: center; font-size: small;">Inner Resist- No. of Lead Rated Leads ance Element Connection Current P13,P14 O.D. P13,P15</p> <p><span style="border: 1px solid black; padding: 2px;">L</span> / <span style="border: 1px solid black; padding: 2px;">U</span> - <span style="border: 1px solid black; padding: 2px;">KN</span> - <span style="border: 1px solid black; padding: 2px;">15</span> / <span style="border: 1px solid black; padding: 2px;">304</span> +</p> <p style="text-align: center; font-size: x-small;">Length Insert Term. Dimensions of Material Length Box P11 Prot. Tube P9</p> <p><span style="border: 1px solid black; padding: 2px;">PT 1/2</span> / <span style="border: 1px solid black; padding: 2px;">304</span></p> <p style="text-align: center; font-size: x-small;">Thread Std Material</p>
<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px;">RM RS PF</div> </div> <p style="text-align: center;">Metal Protection Tube Type (Flanged)</p> 	<p>Order Code : <span style="border: 1px solid black; padding: 2px;">RMPF</span> - <span style="border: 1px solid black; padding: 2px;">M</span> <span style="border: 1px solid black; padding: 2px;">100</span> <span style="border: 1px solid black; padding: 2px;">S</span> <span style="border: 1px solid black; padding: 2px;">X</span> <span style="border: 1px solid black; padding: 2px;">02</span> / <span style="border: 1px solid black; padding: 2px;">48</span> -</p> <p style="text-align: center; font-size: small;">Inner Resist- No. of Lead Rated Leads ance Element Connection Current P13,P14 O.D. P13,P15</p> <p><span style="border: 1px solid black; padding: 2px;">L</span> / <span style="border: 1px solid black; padding: 2px;">U</span> - <span style="border: 1px solid black; padding: 2px;">KN</span> - <span style="border: 1px solid black; padding: 2px;">15</span> / <span style="border: 1px solid black; padding: 2px;">303</span> +</p> <p style="text-align: center; font-size: x-small;">Length Insert Term. Dimensions of Material Length Box P11 Prot. Tube P9</p> <p><span style="border: 1px solid black; padding: 2px;">JIS10K25ARF</span> / <span style="border: 1px solid black; padding: 2px;">304</span></p> <p style="text-align: center; font-size: x-small;">Flange Rating Material P21</p>

In case of JPt ( $R_{100}/R_0=1.3916$ ), put suffix-J. Example see code RMNF and RMNS.










# Optional Accessories

Unit : mm

1. Fixed Type Bushing 304SS		$\phi D$	TYPE	S <sub>1</sub>	S <sub>2</sub>	A	B
	1.0	BN 101	PT 1/8	—	10	16	
	1.6	BN 161	PT 1/8	—	10	16	
	2.2	BN 221	PT 1/8	—	10	16	
	3.2	BN 321	PT 1/8	—	10	16	
		BN 322	PT 1/4	—	12	20	
	4.8	BN 324	PT 1/2	—	20	35	
		BN 481	PT 1/8	—	10	16	
		BN 482	PT 1/4	—	12	20	
	6.4	BN 484	PT 1/2	—	20	35	
		BN 486	PT 3/4	—	20	35	
		BN 642	PT 1/4	—	12	20	
	8.0	BN 644	PT 1/2	—	20	35	
		BN 646	PT 3/4	—	20	35	
		BN 802	PT 1/4	—	12	20	
		BN 804	PT 1/2	—	20	35	
	BN 806	PT 3/4	—	20	35		
2. Compression Fitting 304SS							
	1.0	CF 101	PT 1/8	—	10	33	
	1.5	CF 151	PT 1/8	—	10	33	
		CF 152	PT 1/4	—	12	35	
	1.6	CF 161	PT 1/8	—	10	33	
		CF 162	PT 1/4	—	12	35	
	2.0	CF 201	PT 1/8	—	10	33	
		CF 202	PT 1/4	—	12	35	
	2.2	CF 221	PT 1/8	—	10	33	
		CF 222	PT 1/4	—	12	35	
	3.0	CF 301	PT 1/8	—	10	33	
		CF 302	PT 1/4	—	12	35	
	3.2	CF 321	PT 1/8	—	10	33	
		CF 322	PT 1/4	—	12	35	
	4.5	CF 451	PT 1/8	—	10	33	
		CF 452	PT 1/4	—	12	35	
	4.8	CF 481	PT 1/8	—	10	33	
		CF 482	PT 1/4	—	12	35	
	6.0	CF 602	PT 1/4	—	12	35	
6.4	CF 642	PT 1/4	—	12	35		
8.0	CF 802	PT 1/4	—	12	35		
3. Compression Fitting with Bushing 304SS							
	3.2	CF 323	PT 3/8	PT 1/8	15	54	
		CF 324	PT 1/2	PT 1/8	20	59	
		CF 326	PT 3/4	PT 1/8	20	59	
	4.8	CF 483	PT 3/8	PT 1/8	15	54	
		CF 484	PT 1/2	PT 1/8	20	59	
		CF 486	PT 3/4	PT 1/8	20	59	
	6.4	CF 643	PT 3/8	PT 1/4	15	54	
		CF 644	PT 1/2	PT 1/4	20	59	
		CF 646	PT 3/4	PT 1/4	20	59	
	8.0	CF 803	PT 3/8	PT 1/4	15	54	
		CF 804	PT 1/2	PT 1/4	20	59	
		CF 806	PT 3/4	PT 1/4	20	59	

Note: The standard cotter is Stainless Steel but Teflon cotter (Type TCF) is also available.

## Types of Lead Wires

Appearance	Type	Color Coding	Dimensions	Covering	Application
	WR12	Black (Red, White, Blue)	Conductor 0.4/7 Nom. O.D. φ 9.0mm	Outer: PVC insulating sheath. Inner: Copper shield	General
	WR13	Grey (Red, White, White)	Conductor 0.18/20 Nom. O.D. φ 5.0mm	Outer: Stainless Steel shield. Inner: Glass braided insulating sheath.	High Temp.
	WR13D	Grey (R,W,W) (R,W,W)	Conductor 0.18/20 Nom. O.D. φ 6.6mm	∕	∕
	WR15A	Grey (R,W,W)	Conductor 0.18/20 Nom. O.D. φ 5.0mm	Outer: Heat-resistant PVC insulating sheath. Inner: Copper shield.	General
	WR15D	Grey (R,W,W) (R,W,W)	Conductor 0.18/20 Nom. O.D. φ 6.8mm	∕	∕
	WR16	Grey (R,W,W)	Conductor 0.18/20 Nom. O.D. φ 5.8mm	Outer: Silicon insula- ting sheath. Inner: Copper shield.	High Temp.
	WR17	White (R,W,W)	Conductor 0.18/12 Nom. O.D. φ 4.0mm	Outer: Stainless Steel shield. Inner: Glass insulating sheath.	∕
	WR17D	White (R,W,W) (R,W,W)	Conductor 0.18/12 Nom. O.D. φ 5.0mm	∕	∕
	WR18	Grey (R,W,W)	Conductor 0.18/7 Nom. O.D. φ 3.5mm	Heat-resistant PVC insulating sheath.	General

Other special types are also available. (R=Red, W=White)

# THERMOWELL (MODEL:WL)

THERMOWELL (Drilled Bar Stock Type Protection Tube) is usually being used to ensure longer service life under critical conditions such as very corrosive gases or liquids, high temperature, high pressure, vibration, shock or high flow velocity.

At YAMARI, various THERMOWELLS durable under these conditions are manufactured.

## THERMOWELL Bores & Depths

Bore (mm)	Max.Depth (mm)
4.0	500
5.5	700
7.0	800
8.5	1,000
10.0	1,200
11.0	1,200
12.0	1,200
16.0	1,200



## THERMOWELL Raw Material Sizes

### Round Bar (O.D.): mm

25, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 55

### Hexagonal Bar: mm

26, 29, 32, 35, 38, 41

## THERMOWELL Standard Materials

304 SS, 316 SS, 316L SS, 310S SS, 321 SS, Inconel, Hastelloy B, Hastelloy C, Hastelloy X, Monel, Nickel and its alloys, 50Co-30Cr, Titanium and its alloys. Other special materials are also available upon request.

## Tests and Inspection

### ○ Pressure Test

N<sub>2</sub> gass pressure test up to 10MPa is conducted upon request.

### ○ Hydrostatic Pressure Test

Internal pressure test up to 40MPa is conducted upon request.

### ○ X-Ray Inspection

X-ray inspection to insure uniform wall thickness or complete finish is also performed upon request.

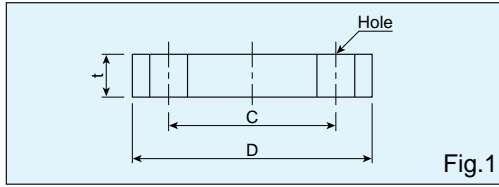


Agent in Indonesia : PT. Instrumentation Engineering and Services ( +62811371371 )

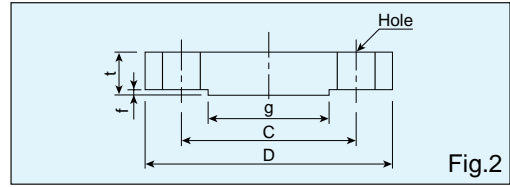
# Flanges

## JIS Flange

Flat Face (FF)



Raised Face (RF)



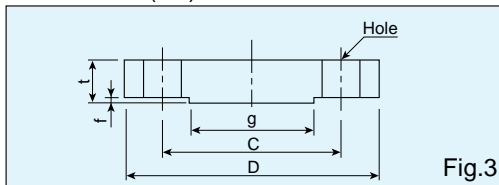
### Dimensional Specifications

Unit : mm

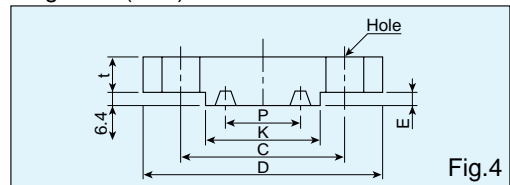
Flange Rating	Size A	Size B	D	t	f	g	C	f	No. of Bolt Holes	Hole Dia.	Bolt Size	Nom. Weight(kg)
JIS 5K	15	1/2	80	9	1	44	60	1	4	12	M10	0.32
	20	3/4	85	10	1	49	65	1	4	12	M10	0.41
	25	1	95	10	1	59	75	1	4	12	M10	0.52
	32	1 1/4	115	12	2	70	90	2	4	15	M12	0.91
	40	1 1/2	120	12	2	75	95	2	4	15	M12	0.99
JIS 10K	15	1/2	95	12	1	51	70	1	4	15	M12	0.63
	20	3/4	100	14	1	56	75	1	4	15	M12	0.78
	25	1	125	14	1	67	90	1	4	19	M16	1.22
	32	1 1/4	135	16	2	76	100	2	4	19	M16	1.66
	40	1 1/2	140	16	2	81	105	2	4	19	M16	1.80

## ANSI Flange

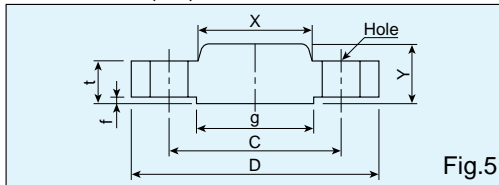
Raised Face (RF)



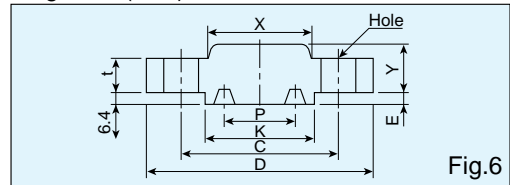
Ring Joint (RTJ)



Raised Face (RF)



Ring Joint (RTJ)



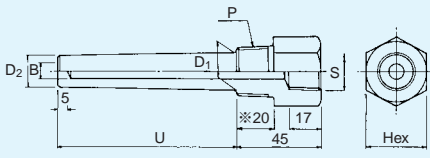
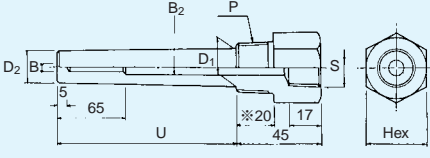
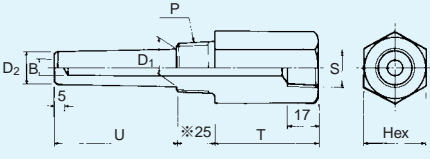
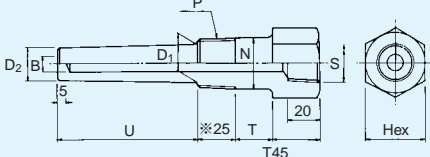
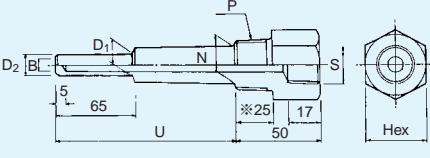
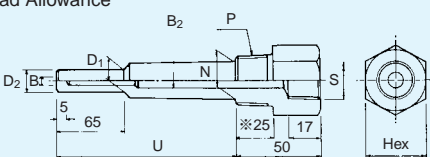
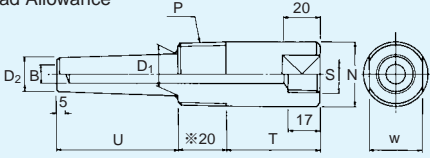
### Dimensional Specifications

Unit : mm

Flange	Size A	Size B	D	Min.t	f	g	C	No. of Bolt Holes	Hole Dia.	Bolt Size (inch)	Nom. Weight(kg)	Hub		RTJ		
												X	Y	Min.K	P	E
ANSI 150lbs	15	1/2	89	11.5	1.6	35.1	60.5	4	15.8	1/2	0.43	30.2	16.0	--	--	--
	20	3/4	99	13.0	1.6	42.9	69.9	4	15.8	1/2	0.62	38.1	16.0	--	--	--
	25	1	108	14.5	1.6	50.8	79.2	4	15.8	1/2	0.87	49.5	18.0	63.5	74.62	6.4
	32	1 1/4	117	16.0	1.6	63.5	88.9	4	15.8	1/2	1.16	58.7	21.0	73.5	57.15	6.4
	40	1 1/2	127	18.0	1.6	73.2	98.6	4	15.8	1/2	1.54	65.1	22.4	83.0	65.07	6.4
ANSI 300lbs	15	1/2	95	14.5	1.6	35.1	66.5	4	15.8	1/2	0.65	38.1	22.4	51.0	34.14	6.4
	20	3/4	117	16.0	1.6	42.9	82.5	4	19.0	5/8	1.09	48.0	25.4	63.5	42.88	6.4
	25	1	124	18.0	1.6	50.8	88.9	4	19.0	5/8	1.38	54.0	27.0	70.0	50.80	6.4
	32	1 1/4	133	19.5	1.6	63.5	98.6	4	19.0	5/8	1.82	63.5	27.0	63.5	60.32	6.4
ANSI 400lbs & 600lbs	15	1/2	95	14.5	6.4	35.1	66.5	4	15.8	1/2	0.76	38.1	22.4	51.0	34.14	6.4
	20	3/4	117	16.0	6.4	42.9	82.6	4	19.0	5/8	1.27	48.0	25.4	63.5	42.88	6.4
	25	1	124	18.0	6.4	50.8	88.9	4	19.0	5/8	1.59	54.0	27.0	70.0	50.80	6.4
	32	1 1/4	133	21.0	6.4	63.5	98.5	4	19.0	5/8	2.24	63.5	28.5	79.5	60.32	6.4
ANSI 900lbs & 1,500lbs	15	1/2	121	22.5	6.4	35.1	82.5	4	22.4	3/4	1.79	38.1	32.0	60.5	39.67	6.4
	20	3/4	130	25.5	6.4	42.9	88.9	4	22.4	3/4	2.40	44.5	35.1	67.0	44.45	6.4
	25	1	149	28.5	6.4	50.8	101.6	4	25.4	7/8	3.44	52.5	41.2	71.5	50.80	6.4
	32	1 1/4	159	28.5	6.4	63.5	111.3	4	25.4	7/8	3.95	63.5	41.2	81.5	60.32	6.4
40	1 1/2	178	32.0	6.4	73.2	124.0	4	28.5	1	5.41	70.0	44.5	92.0	68.28	6.4	

# Standard Thermowells

(MODEL:WL)

<p><b>WL-01</b> Hexagonal Screwed-in Type</p> <p>※ Thread Allowance</p> 	<p>Order Code : <b>WL-01</b> / <b>316</b> - <b>250</b> / <b>PT 1/2</b> - <b>9</b> / <b>15</b></p> <p>Model No. Material "U" Length "P" Thread Std. "B" Bore "D2" Dia</p> <p>× <b>18</b> - <b>45/20/29×33.5Hex</b> - <b>NPT 1/2</b></p> <p>"D2" Dia For Tapered Well Only Factory Standard Unless Otherwise Specified "S" Thread Std.</p>
<p><b>WL-11</b> Hexagonal Screwed-in Type</p> <p>※ Thread Allowance</p> 	<p>Order Code : <b>WL-11</b> / <b>304</b> - <b>300</b> / <b>PT 3/4</b> - <b>8.5×65</b> /</p> <p>Model No. Material "U" Length "P" Thread Std. "B"×Length Bore Size</p> <p><b>11</b> / <b>17</b> × <b>21</b> - <b>45/20/35×40.4Hex</b> - <b>PT 1/2</b></p> <p>"B2" Dia "D2" Dia "D1" Dia For Tapered Well Only Factory Standard Unless Otherwise Specified "S" Thread Std.</p>
<p><b>WL-12</b> Hexagonal Lagging Extension Type</p> <p>※ Thread Allowance</p> 	<p>Order Code : <b>WL-12</b> / <b>310</b> - <b>450</b> / <b>PT1</b> - <b>11</b> / <b>17</b></p> <p>Model No. Material "U" Length Std. "P" Thread Std. "B" Bore "D2" Dia</p> <p>× <b>26</b> - <b>75</b> - <b>25/38×43.9Hex</b> - <b>PT 1/2</b></p> <p>"D2" Dia For Tapered Well Only "T" Length Factory Standard Unless Otherwise Specified "S" Thread Std.</p>
<p><b>WL-02</b> Hexagonal Lagging Extension Type</p> <p>※ Thread Allowance</p> 	<p>Order Code : <b>WL-02</b> / <b>321</b> - <b>300</b> / <b>NPT1</b> - <b>11</b> /</p> <p>Model No. Material "U" Length Std. "P" Thread Std. "B" Bore</p> <p><b>17</b> × <b>26</b> - <b>75</b> × <b>34</b> - <b>25/34/41×47.3Hex</b> - <b>NPT 3/4</b></p> <p>"D2" Dia "D1" Dia For Tapered Well Only "T" Length "N" Factory Standard Unless Otherwise Specified "S" Thread Std.</p>
<p><b>WL-21</b> Hexagonal Heavy Duty Type</p> <p>※ Thread Allowance</p> 	<p>Order Code : <b>WL-21</b> / <b>321</b> - <b>350×65</b> / <b>PT 1/2</b> - <b>11</b> /</p> <p>Model No. Material "U" Length Std. "P" Thread Std. "B" Bore</p> <p><b>17</b> × <b>26</b> - <b>34</b> - <b>50/25/50×57.7Hex</b> - <b>PT 3/4</b></p> <p>"D2" Dia "D1" Dia For Tapered Well Only "N" Factory Standard Unless Otherwise Specified "S" Thread Std.</p>
<p><b>WL-22</b> Hexagonal Heavy Duty Type</p> <p>※ Thread Allowance</p> 	<p>Order Code : <b>WL-22</b> / <b>316</b> - <b>400×65</b> / <b>PT1</b> - <b>7×65</b> / <b>11</b></p> <p>Model No. Material "U" Length Std. "P" Thread Std. "B"×Length Bore Size "B" Dia</p> <p><b>17</b> × <b>26</b> - <b>34</b> - <b>50/25/35×40.4Hex</b> - <b>PT 1/2</b></p> <p>"D2" Dia "D1" Dia For Tapered Well Only "N" Factory Standard Unless Otherwise Specified "S" Thread Std.</p>
<p><b>WL-04</b> Screwed-in Weld Type</p> <p>※ Thread Allowance</p> 	<p>Order Code : <b>WL-04</b> / <b>304</b> - <b>300</b> / <b>PT 3/4</b> - <b>11</b> / <b>17</b></p> <p>Model No. Material "U" Length Std. "P" Thread Std. "B" Bore "D2" Dia</p> <p>× <b>21</b> - <b>75</b> - <b>28-20</b> - <b>PT 1/2</b></p> <p>"D2" Dia For Tapered Well Only "T" Length "N" Factory Standard Unless Otherwise Specified "S" Thread Std.</p>

Other special types are also available upon request.

<p><b>WL·05</b> Flanged (Screwed-in) Type</p>	<p>Order Code : <b>WL·05</b> / <b>304</b> - <b>500</b> / <b>PT<sup>3</sup>/<sub>4</sub></b> / <b>JIS10K20ARF</b> / <b>304</b>  <small>Model No. Material 304SS "U" Length "P" Thread Flange Rating Material 304SS</small></p> <p>- <b>11</b> / <b>17</b> × <b>21</b> - <b>50×28</b> - <b>PT<sup>1</sup>/<sub>2</sub></b>  <small>"B" Bore "D2" Dia "D1" Dia For Tapered Well Only Neck Dimension Length×"N" "S" Thread Std.</small></p>
<p><b>WL·06</b> Flanged (Weld) Type</p>	<p>Order Code : <b>WL·06</b> / <b>316</b> - <b>1250</b> / <b>JIS10K20ARF</b> / <b>316</b>  <small>Model No. Material 316SS "U" Length Flange Rating Material 316SS</small></p> <p>- <b>9</b> / <b>15</b> × <b>18</b> - <b>50×28</b> - <b>PF<sup>1</sup>/<sub>2</sub></b>  <small>"B" Bore "D2" Dia "D1" Dia For Tapered Well Only Neck Dimension Length×"N" "S" Thread Std.</small></p>
<p><b>WL·61</b> Flanged (Weld) Type</p>	<p>Order Code : <b>WL·61</b> / <b>310</b> - <b>600</b> / <b>ANSI1"600LBRF</b> / <b>310</b>  <small>Model No. Material 310SS "U" Length Flange Rating Material 310SS</small></p> <p><b>8.5×65</b> / <b>11</b> / <b>17</b> × <b>26</b> - <b>50×34</b> / <b>NPT<sup>3</sup>/<sub>4</sub></b>  <small>"B"×Length Bore Size "B2" Dia "D2" Dia "D1" Dia For Tapered Well Only Neck Dimension Length×"N" "S" Thread Std.</small></p>
<p><b>WL·07</b> Plain Weld Type</p>	<p>Order Code : <b>WL·07</b> / <b>446</b> - <b>300</b> - <b>9</b> / <b>17</b> -  <small>Model No. Material 446SS "U" Length "B" Bore "D2" Dia</small></p> <p><b>75×38</b> - <b>PT<sup>1</sup>/<sub>2</sub></b>  <small>Neck Dimension Length×"N" "S" Thread Std.</small></p>
<p><b>WL·08</b> Weld Type</p>	<p>Order Code : <b>WL·08</b> / <b>321</b> - <b>500</b> - <b>11</b> / <b>22</b> × <b>25</b> -  <small>Model No. Material 321SS "U" Length "B" Bore "D2" Dia "D1" Dia For Tapered Well Only</small></p> <p><b>50×41</b> - <b>PT<sup>1</sup>/<sub>2</sub></b>  <small>Neck Dimension Length×"N" "S" Thread Std.</small></p>
<p><b>WL·09</b> Ball Joint Type</p>	<p>Order Code : <b>WL·09</b> / <b>316</b> - <b>1300</b> / <b>25.4R×34.9D×3.2T</b>  <small>Model No. Material 316SS "U" Length Ball Joint Dimension "R"×"D"×"T"</small></p> <p>- <b>10</b> / <b>14.3</b> / <b>19</b> - <b>75×26.6</b> - <b>NPT<sup>1</sup>/<sub>2</sub></b>  <small>"B" Bore "D2" Dia "D1" Dia For Tapered Well Only Neck Dimension Length×"N" "S" Thread Std.</small></p>
<p><b>WL·10</b> Van Stone Type</p>	<p>Order Code : <b>WL·10</b> / <b>304</b> - <b>250</b> / <b>50×6.5</b> - <b>11</b> /  <small>Model No. Material 304SS "U" Length Raised Face "D"×"Q" "B" Bore</small></p> <p><b>17</b> × <b>26</b> - <b>65×34</b> - <b>PT<sup>3</sup>/<sub>4</sub></b>  <small>"D2" Dia "D1" Dia For Tapered Well Only Neck Dimension Length×"N" "S" Thread Std.</small></p>

Other special types are also available upon request.

# Inspections and Tests

At YAMARI, all products (Mica Type, RESIMIC®, RESISLIM and Thermowell) are inspected and tested before delivery in accordance with the following inspection procedures.

## 1. Check on Appearance and Structure:

Visual inspection is made on joints, junctions, welds, name plate and other parts.  
Color penetration check also made on welds.

## 2. Dimensional Check:

Dimensions specified in the drawing are checked by a scale or calipers.  
Unless otherwise specified, dimensional check is made according to the tables below.



**Length of Mica Type RTD** Unit:mm

Nominal Length	Tolerance
Under 1,000	±3.0
1,000~2,000	±5.0
Above 2,000	±7.0

**Length of RESIMIC® and RESISLIM** Unit:mm

Nominal Length	Tolerance
Under 250	±3.0
250~1,000	±5.0
Above 1,000	±1.0%

Note : For those assembled with protection tube or thermowell, the length within the range of giving no functional trouble is regard as passed.

## 3. Insulation Resistance Inspection

Insulation resistance is checked at room temperature by a DC 100V or 500V megohmmeter in accordance with the following table.

Type of RTD	Voltage Applied	Insulation Resistance
Mica Type RTD	500V D.C.	Above 10MΩ
RESIMIC®,RESISLIM (<φ2.0)	100V D.C.	Above 20MΩ
RESIMIC®,RESISLIM	500V D.C.	Above 100MΩ

## 4. Temperature Resistance Calibration

Each product is calibrated on resistance value at ice point (0°C) and/or boiling point of water (100°C). Comparison test in the range of -50°C to +500°C or the fixed point test at respective freezing points of Indium, Tin, Cadmium or Zinc are also conducted upon request.

Metal	Freezing Temp. ITS-90(°C)	Accuracy (°C)
Indium (In)	156.5985	※
Tin (Sn)	231.928	±0.01
Cadmium (Cd)	321.069	※
Zinc (Zn)	419.527	±0.001

※= Accuracy varies depending on respective purities of the metals refined.



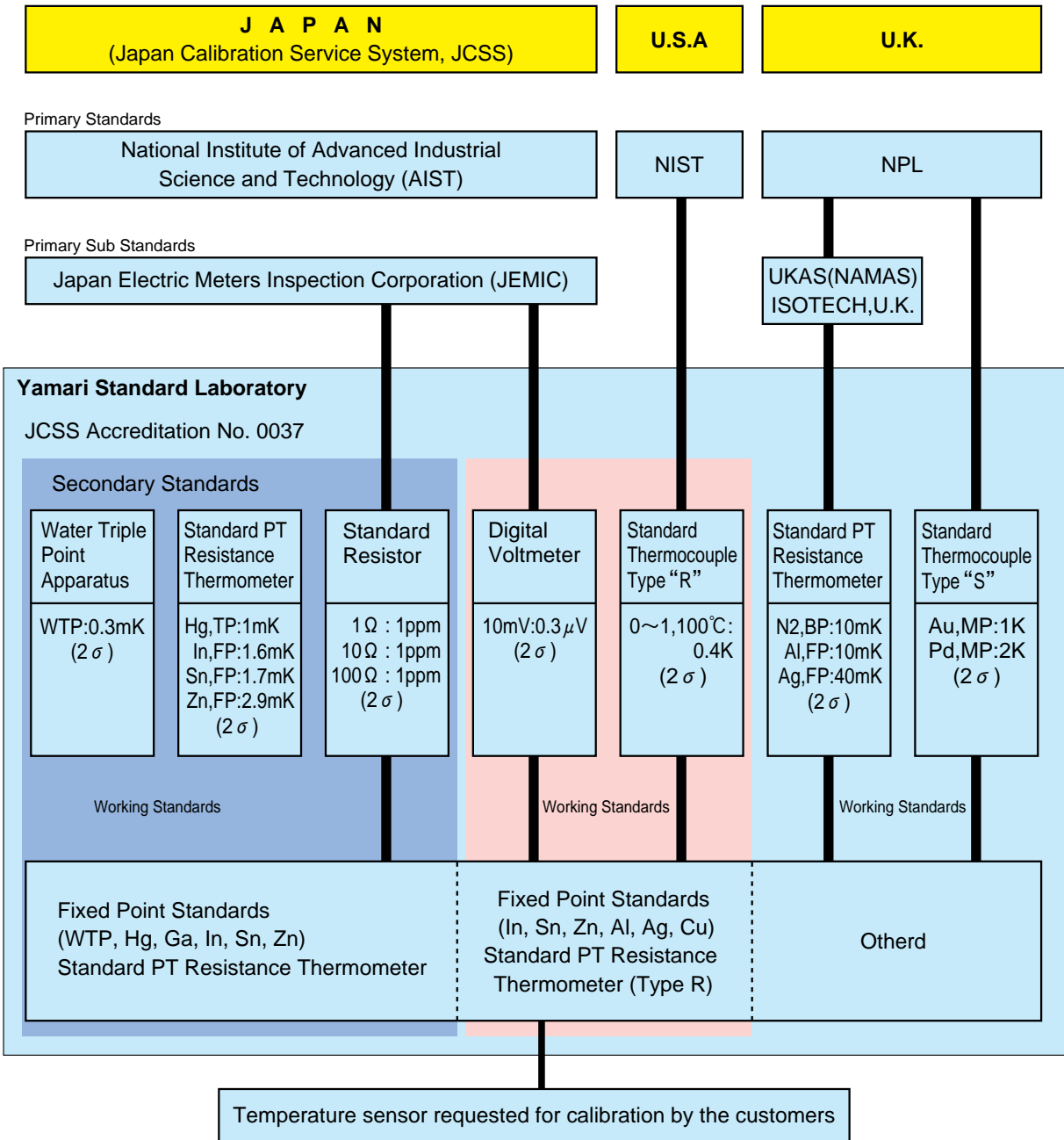
## 5. Others Tests

Voltage Withstand Test, X-Ray Test, Vibration Test, Pressure Test, Helium Leak Test, etc. are also performed upon request.



# Temperature Calibration Services

## Traceability System of Temperature Laboratory



- AIST : National Institute of Advanced Industrial Science and Technology
- NIST : National Institute of Standards and Technology
- NPL : National Physical Laboratory
- UKAS : United Kingdom Accreditation Service
- NAMAS : National Measurement Accreditation Service
- JEMIC : Japan Electric Meters Inspection Corporation
- JCSS : Japan Calibration Service System



# Explosion Protection and Signal Processing

## Explosion Protection

Depending on the Class of hazardous area and the type of explosives, the following explosion protection can be specified with the thermocouple assembly by considering installation space and measurement circuit wiring.

### 1. Flame-Proof Enclosure



Material: ADC, Cast Iron & Cast SS

Approved by KEMA:

KEMA No. Ex-99.E.5324X, EEx de II CT6...T1 (for Temperature Sensors)

KEMA No. Ex-99.E.5325, EEx d II CT6 (for Temperature Transmitters and Terminals)

To: EN 50014:1992, General requirements

EN 50018:1994, Flame proof enclosure "d"

EN 50019:1994, Increased safety "e" (for Temperature Sensors)

Approved by Research Institute of Industrial Safety, Ministry of Labor, Japan (R.I.I.S):

Exd II CT6

No. C13997~C14002 (for Temperature Sensors)

No. C14391~C14396 (for Temperature Sensors with Transmitters)

## Signal Processing

The Two-wire Transmitters shown below are all compatible with YAMARI's Thermocouple Assemblies. Our Weatherproof Terminal Box Model KN, Flame proof Terminal Head Enclosure Model KG (EXdII CT6 or d2G4) and DIN Type Standard Terminal Head are all compatible with no special attachment. After careful evaluation, YAMARI keep stock and accommodate Two-wire Transmitters. Customer may select a suitable model from our various stocks which will be delivered factory-set with the thermocouple as specified.

### 1. Programmable Model

Accepts EMF input of all the standard calibrations to transmit linearized temperature output signal in 4-20 mA. Required Calibration can be selected and programmed, input and output circuit are completely isolated, and can be connected with intrinsically safe Barrier Loop with a simple adapter, or housed in a Flame proof Enclosure

### 2. Smart Intelligent Model

Smart Temperature Transmitter offers competitive performance in a highly compact module with a wide range of smart communication protocols. It supports temperature measurements from either thermocouples (T/C) or resistance temperature detectors (RTD) and scale the measurement into the required 4-20mA analog output signal. Can be connected with digital indicator or surge protector, or housed in Flame proof Enclosure. HART communication model is also available.



YAMARI Smart Sensor carrying a Smart Transmitter

For details, please consult our factory with specifications of your interest.

# Chemical Resistance of Protection Tube Material

Corrosives	Concentration	Temp. (°C)	One of the Hastelloy series and excellent in heat resistance.													Titanium	Monel	Tantalum	Teflon	Copper	Zirconium	Nickel	PVC	Cupro-nickel	Aluminium	Brass	Lead	Common steel	50Co-30Cr	Haynes alloy 25
			304SS	321SS	316SS	316LSS	316J1LSS	310S SS	347SS	Carpenter 20	Inconel 600	Nimonic	Hastelloy B	Hastelloy C-276	Hastelloy X															
H <sub>2</sub> SO <sub>4</sub>	5%	30	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
	10%	30	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
	50%	30	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
	90%	30	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
2HCl	5%	30	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
	10%	30	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
	20%	30	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
HNO <sub>3</sub>	20%	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
	40%	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
	75%	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
		30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
CH <sub>3</sub> CO <sub>2</sub> H	10%	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
	50%	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
	80%	30	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
H <sub>3</sub> PO <sub>4</sub>	5%	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
	50%	30	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
	85%	30	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
H <sub>2</sub> F <sub>2</sub>	30%	30	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
	70%	30	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
		30	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
HCl	200	30	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
	400	30	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
		30	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
NaOH	10%	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
	50%	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
	70%	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
		30	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
KOH	25%	B.P	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
	50%	B.P	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
HCl (dry) / (wet)		30	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
		30	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
HCl vapor			C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
HF			C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
H <sub>2</sub> (SiF <sub>6</sub> )	5%	20	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
F	10%	30	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
NaOH	10%	B.P	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
	75%	100	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
CO <sub>2</sub>	10%	200	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
SO <sub>2</sub>			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
Na <sub>5</sub> P <sub>3</sub> O <sup>10</sup>	10%	30	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
CHCl <sub>3</sub>		30	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
AlF <sub>3</sub>	50%	30	B		B																									
Fatty Acids		100	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
NH <sub>3</sub>			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
NaCl			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
CrO <sub>4</sub>																														
H <sub>2</sub> O <sub>4</sub>			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
S (liquid)			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
CaCl <sub>2</sub>			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		

Note: A = Almost no corrosion in critical conditions. B = Small corrosion but permissible in general use other than specific parts. C = Heavy corrosion and unsuitable.

 **Yamari Industries, Limited**

Head Office : Fujisho Bldg. No.2-1, 2-Chome, Edobori,  
Nishi-ku, Osaka 550-0002, Japan  
Tel :+81-6-6441-4897 Fax:+81-6-6441-3516  
E-mail:intl-div@yamari.co.jp  
Home Page:<http://www.yamari.com>

Takatsuki Factory : No.5-24, 1-Chome, Mishimae, Takatsuki,  
Osaka 569-0835, Japan  
Tel:+81-72-678-1313 Fax:+81-72-679-2006

Subsidiary : Thermosensor Technologies Pte Ltd  
in Singapore Tel:+65-268-0090 Fax:+65-262-0013  
Home Page:<http://www.thermosensor.com>

Indonesia :PT.Instrumentation Engineering & Services  
Telp :~~6221-70993088~~ / Mobile No: ~~62-08161921611~~  
( 08111371371 - 08111371373 )