

4 Temperature Sensor

TEMPERATURE SENSOR

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4-1. RTD Sensor

Outline of Platinum Resistance Bulb

The temperature resistance characteristic of platinum wire is internationally utilized for measuring temperatures in the range of -200°C to 600°C.

Platinum thermal resistance bulbs are known to be most suitable when used as temperature sensors which require extreme accuracy and stability.

High Temperature Platinum Thermal Resistance Bulb

The platinum thermal resistance bulb is used to measure and monitor the exhaust and steam temperature of the main engine and the boiler.

This resistance element provided as a unit by depositing platinum wires and internal conductors to an aluminum oxide bobbin, matches a thermocouple in mechanical strength.

The platinum thermal resistance bulb allows accuracy and stability even under such a strict environment as a continuous high working temperature of 700°C.

Low Temperature Platinum Thermal Resistance Bulb

The platinum thermal resistance bulb is used to measure and monitor the temperatures of lubricating oil, cooling water and bearing of various engines as well as the air temperature. Since the delay characteristic(response speed) is most important factor for low temperature use this thermal resistance bulb is so designed that its resistor element keeps excellent heat which may otherwise develop in it.

The adoption of double protection tube does not affect the characteristic, maintaining the same characteristics as those of protection tube types.

| MODEL | Operating Range(°C) | Material of Protection Tube | Remark |
|--------|---------------------|---|--|
| TTR-LN | 0 ~ 200°C | SUS 304 (SUS316 For Cooling Sea Water) | 1. Nominal Resistance Pt 100Ω(at 0°C) 2. Wire connecting terminal |
| TTR-LD | 0 ~ 350°C | | |
| TTR-SD | 0 ~ 600°C | | |
| TTR-M | 0 ~ 200°C | | |
| TTR-MN | | | |

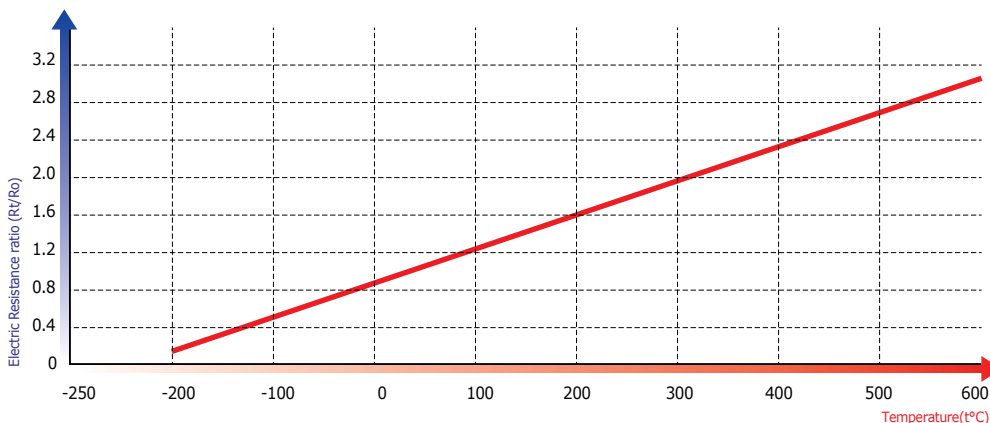
Note We can make and supply dual element type RB sensor according to your order.

Standard Type of Platinum Resistance Bulb

| Operating Temperature(°C) | Class | Tolerance(°C) |
|---------------------------|-------|---------------------------|
| -200 ~ 600°C | A | $\pm(0.15 + 0.002 t)$ |
| | B | $\pm(0.30 + 0.005 t)$ |

Note According to DIN RULE
 $R_{100}/R_0 = 1.3851$
 R_0 : Resistance Value at 0 °C
 R_{100} : Resistance Value at 100 °C
 t : measuring temperature

Temperature Characteristic Curve of Platinum Resistance Bulb



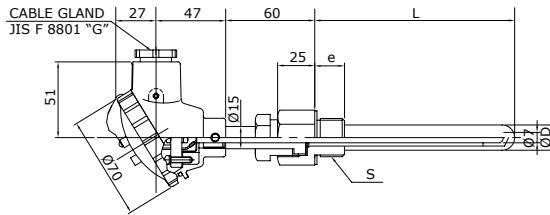
Note R_0 : Resistance at 0 °C
 R_t : Resistance at t °C

TTR-LN

0 ~ 200 °C



Dimension



Application

For cooling fresh water, lubricating oil, fuel oil, cooling sea water temperature and low temperature flow object.

Features

1. High accuracy
2. Rapid response time
3. High durability against vibration.
4. Easy maintenance
5. Replaceable internal element at fitting status

| Unit : mm | | | |
|--------------------------|------|--|----|
| L | ØD | S | e |
| 80, 100, 120, 150 | 12 | • Standard : PF 3/4 • Option : PF 1/2, M33, NPT 3/4 etc | 15 |
| 200, 250, 300, above 300 | 13.8 | | |

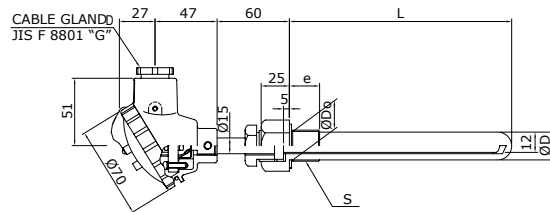
- Operating Range : 0 ~ 200°C

TTR-LD

0 ~ 300 °C



Dimension



Application

For fuel oil, feed water, cooling water temperature and medium temperature flow object.

Features

1. High accuracy
2. Rapid response time
3. High durability against vibration.
4. Easy maintenance
5. Replaceable internal element at fitting status

| Unit : mm | | | |
|-------------------|-------|--|----|
| L | ØD | S | e |
| 80, 100, 120, 150 | 17 | • Standard : PF 3/4 • Option : PF 1/2, M33, NPT 3/4 etc | 20 |
| 200, 250 | 23/17 | | |
| above 300 | 22 | | |

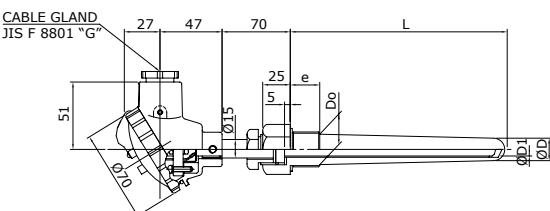
- Operating Range : 0 ~ 300°C
- TTR-L : without protecting well

TTR-SD

0 ~ 600 °C



Dimension



Application

Use for exhaust gas system and high temperature steam system. Vibration-resistant and shock-resistant at high temperature place.

Features

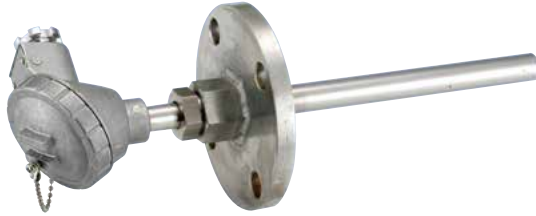
1. Excellent measurement accuracy
2. Rapid response speed
3. High durability against vibrations and shocks at high temperature place
4. Maintenance and checks are easy

| Unit : mm | | | | | |
|--------------------|-----|-------|--|----|----|
| L | ØD1 | ØDo/D | S | e | f |
| 80, 100, 120, 150 | 12 | 23/17 | • Standard : PF 3/4 • Option : PF 1/2, M33, NPT 3/4 etc | 25 | 25 |
| 180, 200, 250, 300 | 15 | 23/20 | | | |
| 350, 400, 450, 600 | | 22 | | 35 | |

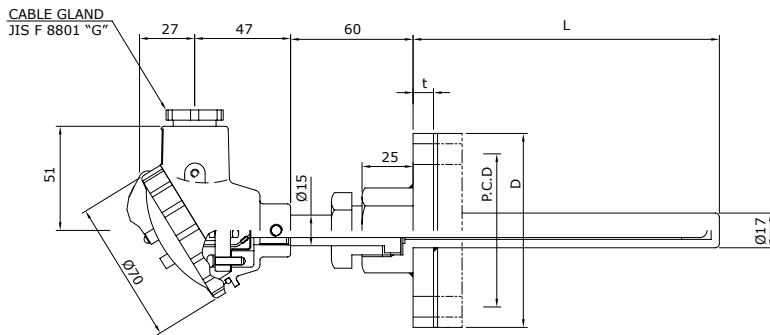
- Operating Range : 0 ~ 600°C
- TTR-S : without protecting well

TTR-LN

0 ~ 200 °C



Dimension



Application

Use for H.F.O Tank

Features

- 1. Excellent measurement accuracy
- 2. Rapid response speed.
- 3. High durability against vibrations.
- 4. Maintenance and checks are easy
- 5. The element is replaceable

Flange Selection

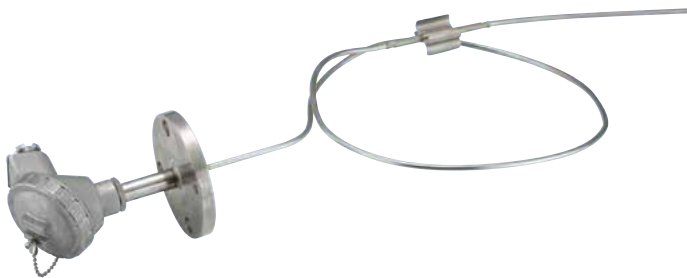
Flange (JIS TYPE)

| Class | PCD | D | DIA of Holes | t |
|--------|-----|------|--------------|----|
| 5K25A | 75 | Ø95 | 4 - Ø12 | 10 |
| 10K25A | 90 | Ø125 | 4 - Ø19 | 14 |
| 5K40A | 95 | Ø120 | 4 - Ø15 | 12 |
| 10K40A | 105 | Ø140 | 4 - Ø19 | 16 |

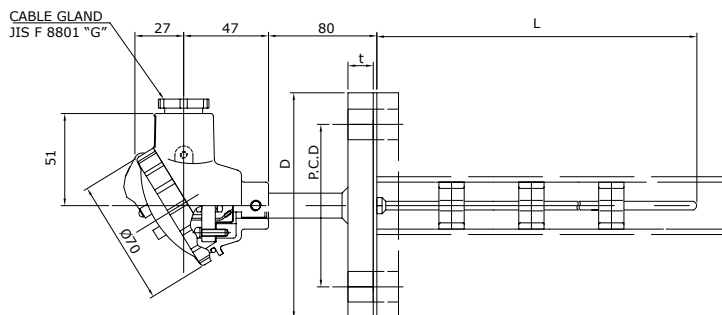
- Operating Range : 0 ~ 200 °C
- CLASS : B

TTR-M

0 ~ 100 °C



Dimension



Application

Use for H.F.O Tank

Features

- 1. Excellent measurement accuracy
- 2. Rapid response speed.
- 3. High durability against vibrations.
- 4. Maintenance and checks are easy

Flange Selection

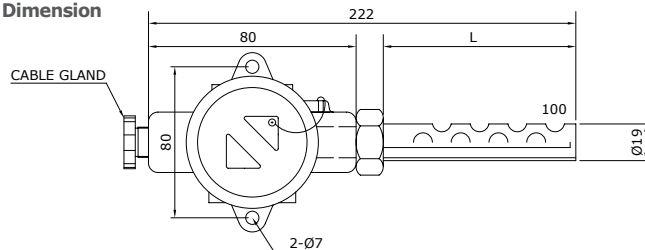
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| 5K40A | 95 | Ø120 | 4 - Ø15 | 12 |
| 10K40A | 105 | Ø140 | 4 - Ø19 | 16 |

- Operating Range : 0 ~ 100 °C
- CLASS : B

TTR-A11

-50 ~ 100 °C

**Dimension****Application**

For indoor, freezing chamber and ambient temperature.

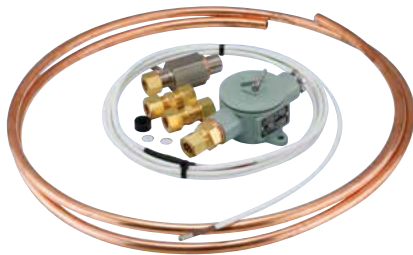
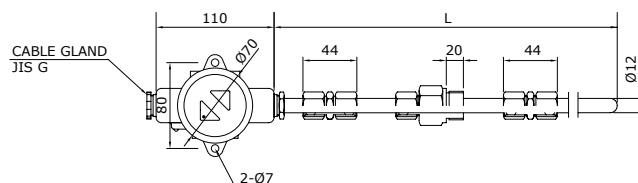
Features

1. High accuracy
2. Rapid response time
3. High durability against vibration.

- Operating Range : -50 ~ 100°C

TTR-MN

0 ~ 200 °C

**Dimension****Application**

For stern tube bearing oil temperature.

Features

1. High accuracy
2. Rapid response time
3. High durability against vibration.
4. Replaceable internal element at fitting status
5. Minimum bending radius is 80mm.

Remark

Standard length of protecting tube -3, 5, 7, 9, 11m

Mounting parts are specially designed and should be specified by the user.

- Operating Range : 0 ~ 200°C

TTR-LN-DX / TTR-LD-DX

0 ~ 200 °C / -200 ~ 100 °C

**Application**

Use for LNGC - FWD H.F.O Tank
Use for LNG Fueled Vessel
- B/S LNG Main / Filling / Return Line,
Deck Drip Tray

Features

1. High accuracy
2. Rapid response time
3. High durability against vibration.
4. Excellent flexibility.

Remark

- Operating Range : 0 ~ 200°C (TTR-LN-DX)
- Operating Range : -100 ~ 200°C (TTR-LD-DX)
- Approval : IECEx Explosion Proof Ex d II C T6

TTR-LD

-200 ~ 100 °C



Application

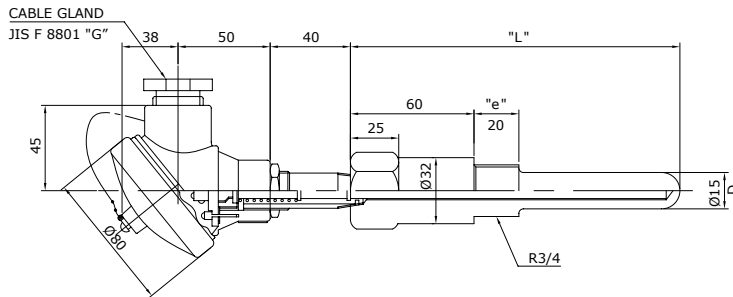
Use for LNG Cargo Tank Spray ,
Liquid , Vapor Line

Features

1. Excellent measurement accuracy
2. Rapid response speed.
3. High durability against vibrations.
4. Maintenance and checks are easy

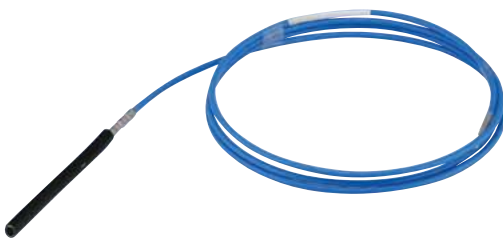
- Operating Range : -200~100 °C
- CLASS : A

Dimension



TTR-M

-200 ~ 100 °C



Application

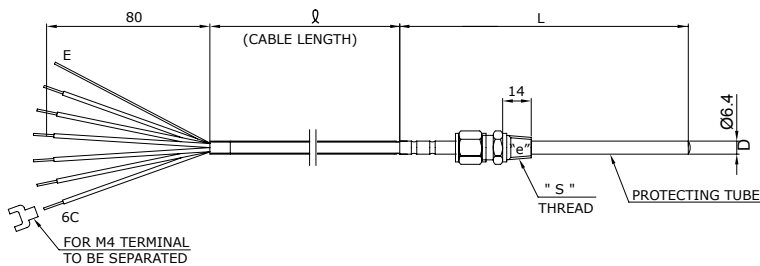
Use for LNG Cargo Tank Barrier

Features

1. Excellent measurement accuracy
2. Rapid response speed.
3. High durability against vibrations.
4. Maintenance and checks are easy

- Operating Range : -200~100 °C
- CLASS : A

Dimension



| L | ØDO/D | S | e |
|-----|-------|--------|----|
| 135 | Ø6.4 | NPT1/4 | 14 |
| 145 | | | |

TTR-M

-200 ~ 100 °C

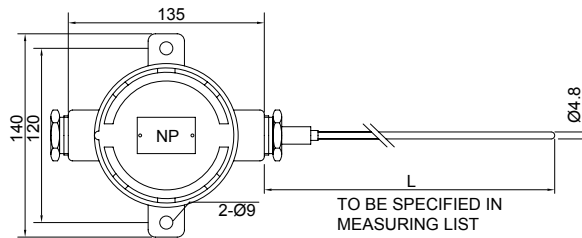
**Application**

Use for LNG Cargo Tank Bulk Head

Features

1. Excellent measurement accuracy
2. Rapid response speed.
3. High durability against vibrations.
4. Maintenance and checks are easy

- Operating Range: -200 ~ 100 °C
- CLASS : A

Dimension**TTR-M**

-200 ~ 100 °C

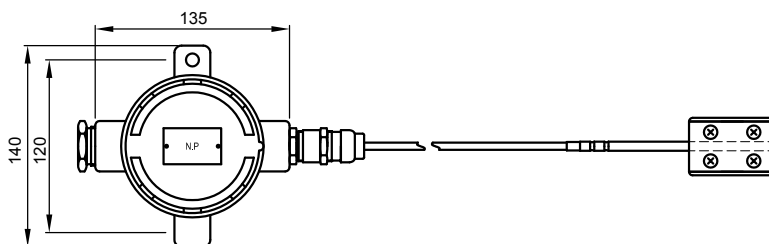
**Application**

Use for LNG Liquid Header

Features

1. Excellent measurement accuracy
2. Rapid response speed.
3. High durability against vibrations.
4. Maintenance and checks are easy

- Operating Range: -200 ~ 100 °C
- CLASS : B

Dimension

4-2. Thermocouple Sensor

TCA-D

0 ~ 600 °C



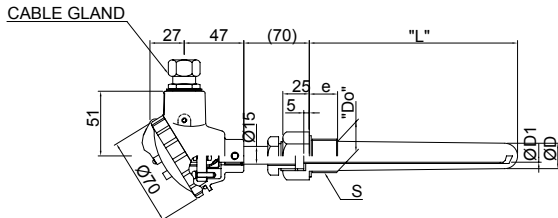
Application

For exhaust gas of engine & boiler, steam and high temperature flow object.
Vibration-resistant and shock-resistant position at high temperature.

Features

1. High accuracy
2. Rapid response time
3. High durability against vibration.
4. Easy maintenance.
5. Replaceable internal element at fitting status

Dimension



Standard Model of Thermocouple

| MODEL | Operating Range(°C) | Material of Protecting well | Remark |
|-------|---------------------|-----------------------------|--|
| TCA-D | 0 ~ 600 °C | SUS 304 | With Amplifier & Compensation or Extension Cable |

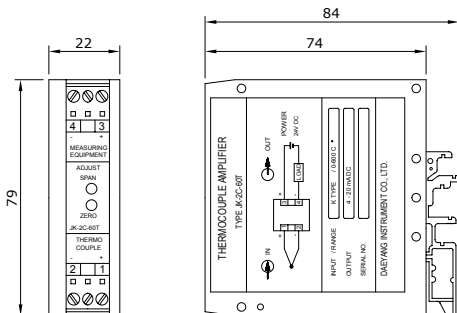
• MCA-D must be used with amplifier and compensation or extension cable.

Tolerance of Thermocouple(Type K)

| Operating Temperature(°C) | Class | Tolerance(°C) |
|---------------------------|-------|---------------|
| -40 ~ 375 | 1 | ±1.5 |
| 375 ~ 1000 | | ±0.004 t |
| -40 ~ 333 | 2 | ±2.5 |
| 333 ~ 1200 | | ±0.075 t |

JK-2C-60T

Dimension



THERMOCOUPLE AMPLIFIER

Application

Use for Thermocouple

Specification

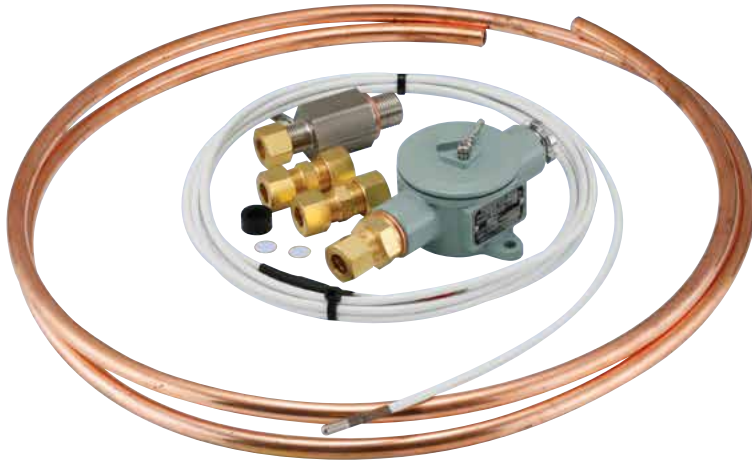
1. Ambient temperature : 0 ~ 70° C
2. Input signal : Electromotive force of K type
3. Output signal : DC 4~20mA
4. Max. load impedance : 250Ω
5. Accuracy : ±1.0%
6. Power source : DC 24V (+10%, -15%)
7. Color of case : RAL 6018
8. Measuring range : 0 ~ 600 °C

4-3. Application

Stern Tube Bearing (AFT/FWD)

TTR-MN

RTD / 0 ~ 100°C



STERN TUBE BEARING (AFT)
STERN TUBE BEARING (FWD)

Tank

TTR-LN

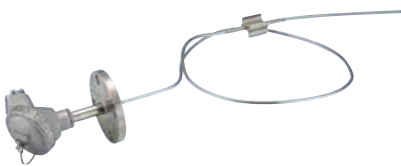
RTD / 0 ~ 100°C



F.O TANK TOP MOUNTING

TTR-LN

RTD / 0 ~ 100°C



F.O TANK TOP MOUNTING

TTR-LN

RTD / 0 ~ 200°C



F.O TANK SIDE MOUNTING
SLUDGE / BILGE TANK
UREA / NaOH TANK

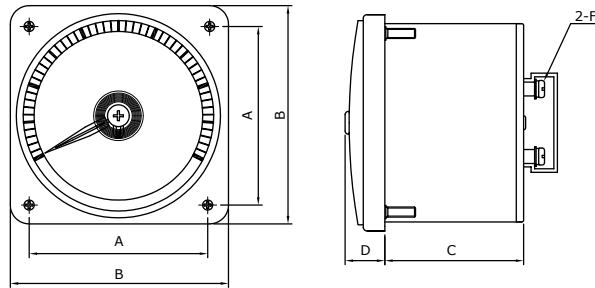
4-4. Option

Temperature Indicator

KAE-11/KAJ-11E5A



Dimension



| SYM | MODEL | KAE-11 | | KAJ-11E5A | |
|-----|-------|--------|--|-----------|--|
| | | | | | |
| | A | 90 | | 90 | |
| | B | 110 | | 110 | |
| | C | 70 | | 70 | |
| | D | 20 | | 20 | |
| | E | 20 | | 15 | |
| | F | Ø102 | | Ø102 | |
| | G | M5 | | M5 | |

- KAE-11 : Input Signal : 4~20mA
- KAJ-11E5A : Input Signal : 4~20mA, with Illumination

Temperature Calibrator



TP17650M

Power Source : AC110/220V
 Type : Dry Block
 Range : 30 ~ 650°C
 Accuracy : ±1 °C
 Stability : ±0.1 °C
 Power Consumption : 1000VA
 Approval : DNV GL
 Maker : SIKA



TC-65

Power Source : AC110/220V
 Type : Dry Block
 Range : 30 ~ 650°C
 Accuracy : ±0.5 °C
 Stability : ±0.1 °C
 Power Consumption : 1600W
 Approval : DNV GL
 Maker : SCANSENSE