

**Environment responsive type****TS40 · TS50 · TD50  
Temperature Switches****Outline**

Temperature switches consist of a temperature element and a switch.

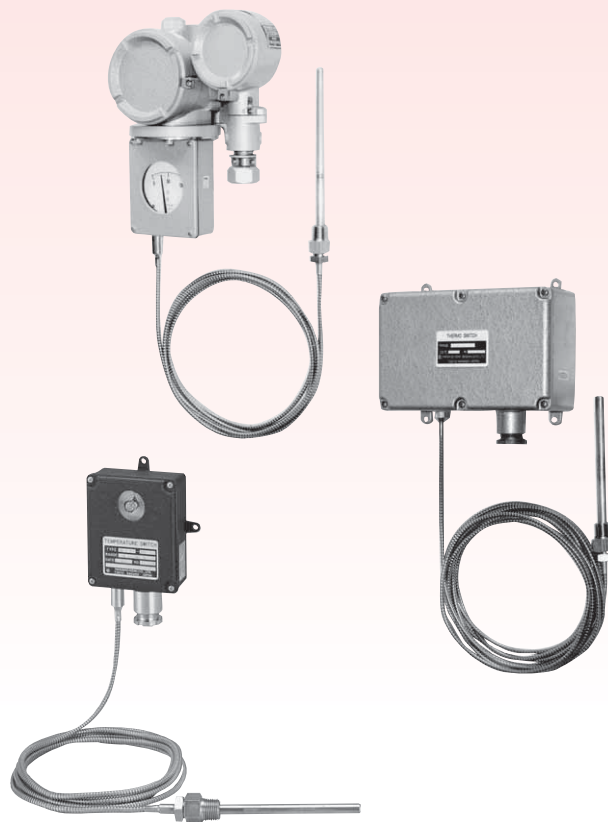
The temperature element with enclosed liquid adopts a pressure system which applies the expansion and contraction of the liquid by temperature changes.

By using a low-pollution organic liquid, it is an environmentally friendly temperature switch.

The switch uses an industrial micro switch and is classified by case construction into drip-proof type and explosion-proof type.

\* To maximize performance, please select the temperature range with your common operating temperature should be 30 to 65% of the temperature range.

Furthermore, please ensure that the wetted parts materials listed are suitable for the use against measuring gas or liquid.

**Specifications****Manufacturing temperature range:**

-70 to 50°C → 0 to 300°C

**Switch:**

Micro switch

**Construction:**

Drip-proof type

Explosion-proof type (d 2 G 4) (TD50)

**Mounting:**

Remote type, surface mounting

(2B pipe mounting is available for explosion-proof type)

**Bulb / Connection mounting:**

SUS304

**Lead parts material:**

Capillary: SUS304, SUS316

Armored tube: SUS430

**Connection:**

R $\frac{1}{2}$ , R $\frac{3}{4}$ ,  $\frac{1}{2}$ NPT, G  $\frac{1}{2}$  B, G  $\frac{3}{4}$  B

JIS10K20ARF, JIS10K25ARF,

ANSI1B150RF, NS11B300RF

\* For other connections, please contact us.

**Number of contacts:**

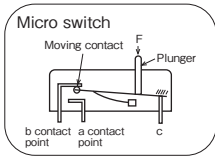
One contact, two contacts

**Accuracy:**

Reproducibility Within  $\pm 2\%$ F.S.

### Selection of the specifications of temperature switches

#### 1. Features of switch



A micro switch is able to handle a high electric rating and is safe from vibrations. It is available for various control applications, in addition to transmitting an alarm.

#### Electrical performance:

Electric rating				Dielectric strength	Insulation resistance
TS50 · TD50		TS40			
Resistance load	Inductive load	Resistance load	Inductive load	1500V AC 1 minute	100MΩ or more by 500V DC megger
125V AC 15A	(Power factor 0.4 or more or time-contact 7ms or less)	125V AC 5A	125V AC 3A		
250V AC 15A		250V AC 5A	250V AC 3A		
30V DC 2A		30V DC 5A	30V DC 3A		
125V DC 0.5A		125V DC 0.4A	125V DC 0.05A		

#### 2. Explosion-proof temperature switch

Electric equipment used in hazardous areas when inflammable gas or explosive liquids exist must be explosion-proof products which have received national approval.

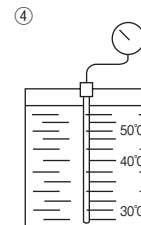
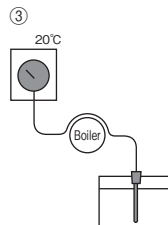
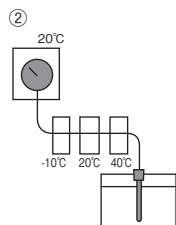
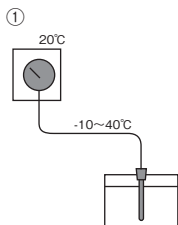
Select explosion-proof thermometers with electric contact for use in factories, indoor storage sites, outdoor tank storage, indoor tank storage, general handling sites, and transport handling sites which handle dangerous materials.

#### 3. Compensation system by installation site

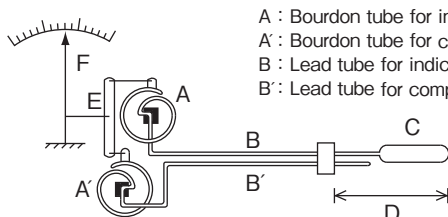
When the ambient temperature of a temperature gauges changed, the liquid sealed in the indicator and capillary tube of filled system thermometer expands or contracts and causes an indication error. To compensate for this error, the following compensation systems are available.

The lead compensation system is superior to the case compensation system and is especially effective in the following cases.

- ① When the temperature change around the indicator is small and the temperature change around the capillary tubes is large and vice versa.
- ② When the capillary tubes are used under various ambient temperatures.
- ③ When a part of the capillary tubes is heated.
- ④ When measuring the liquid temperature in the tank with different temperature distribution. Or when the height of the liquid level changes.



When in the position of 30°C is Bulb, it to indicate the 30°C.



- A : Bourdon tube for indication (or bellows)
- A' : Bourdon tube for compensation (or bellows)
- B : Lead tube for indication
- B' : Lead tube for compensation
- C : Sensor tube
- D : Sensor part
- E : Link
- F : Pointer

The lead compensation system has the symmetrical element which is same as the one for indication and its piping is extended to the inlet of the temperature sensing portion. Therefore, the displacement in accordance with the ambient temperatures of the case and the piping can be compensated. According to this construction, on the contrary to the bimetal compensation system, this thermometer is appropriately applied to the case where the ambient temperatures of the indicating portion and the piping are not the same and the lengths of the lead tube and the temperature sensing portion are long.

### Selection of the specifications of temperature switches

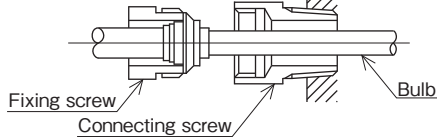
#### 4. Temperature range (Scale range)

- The upper limit of the normal temperature should be selected temperature range to be 75% or less of the temperature span.
- The instrument itself is active even though the thermometer is not used, including temperature measurement from the time of manufacture.
- When the temperature exceeds the temperature range, it may cause the temperature gauge to break.  
If the gauges will cross the equator or pass through cold regions during shipment, or will be stored in a cold region, careful attention is required.

#### 5. Mounting type of bulb

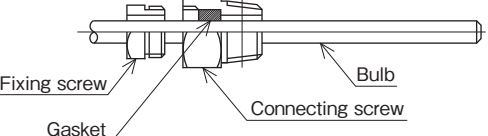
##### Union type

- Standard spec.

 <p>Fixing screw Connecting screw Bulb</p>	<p>By tightening the fixing screw, the bulb is fixed to the connecting screws so that its position does not change.</p>	<p>Maximum allowable working pressure of union type is Less than 200g → 2MPa Over 200g → 1MPa (If the pressure is higher than the above, a thermowell should be provided.)</p>
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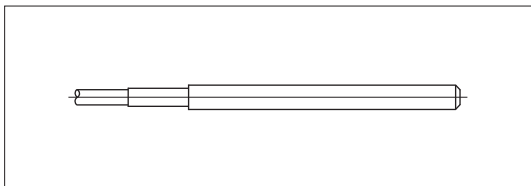
##### Slide type

- When the bulb position must be adjusted due to changing of the position of the fluid to be measured in a tank or other vessel.
- When thermowell is provided or the bulb must be inserted all the way to the bottom.

 <p>Fixing screw Gasket Connecting screw Bulb</p>	<p>By tightening the gasket with fixing screw, bulb can be fixed at any position.</p>	<p>Maximum allowable working pressure of slide type is 0.3MPa (If the pressure is higher than the above, a thermowell should be provided.)</p>
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##### Plain type

- When a long bulb is inserted into the thermowell, it does not have to be fixed.
- Only remote type is manufactured.

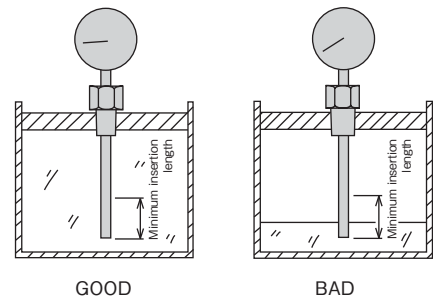


#### 6. Bulb minimum insertion length

- The minimum bulb insertion length is decided according to the type, temperature range and bulb diameter. Decide the bulb length within the range between the minimum insertion length and the maximum insertion length. Make sure that the bulb is inserted into the liquid under measurement up to the screws, flange, or other connecting parts.

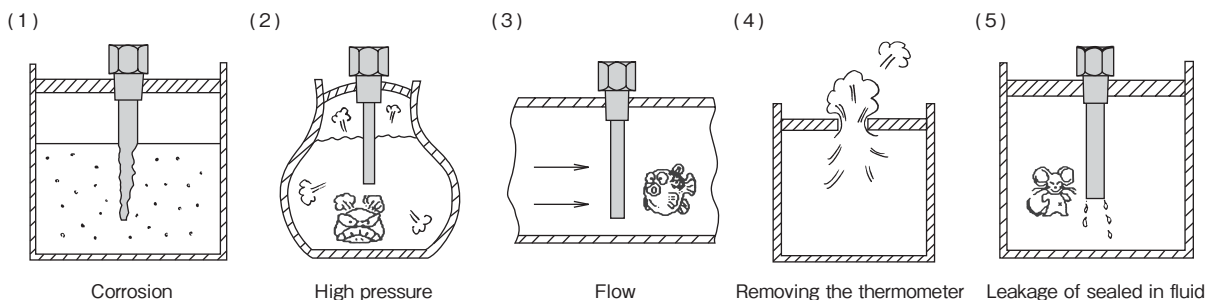
##### [Caution]

If the bulb is not inserted into the liquid under measurement up to the screws or flange, an indication error may occur.






#### 7. Thermowell necessary conditions

- (1) For corrosive fluids, a thermowell made of a suitable material is necessary.
- (2) For high pressure, a thermowell suited to the operating pressure must be used.
- (3) When the fluid flows, a thermowell suitable for the flow speed must be used.
- (4) When the fluid leaks when the thermometer is removed, a thermowell is convenient for maintenance.
- (5) When the liquid in the thermometer leaks from the bulb and is harmful, a thermowell must be used.



### Temperature switches

	Mounting	Sensing method	Manufacturing range	Number of contacts	Compensation	Max. lead length	Model	Page
Drip-proof type		Liquid filled type	-70°C to 50°C ↓ 0°C to 300°C	One contact	Lead compensation	10m	TS40	7
Drip-proof type				One contact or two contacts		20m	TS50	9
Explosion-proof type				TD50		11		

### Connection / Bulb specifications

#### 1. Without thermowell

	Connection		Bulb outer dia.	Note
	Screw type	Flange type		
Union type	<p>Max. operating pressure: 2MPa for less than 200°C, 1MPa for 200°C or over</p>		8	
			10	
Slide type	<p>Max. operating pressure: 0.3MPa</p>		12	
			13	
Plain type			16	T = 1/2 not available. Slide type not available.

#### 2. With thermowell

	Connection		Thermowell outer dia.	Bulb outer dia.	Note
	Screw type	Flange type			
Standard type		<p>JIS, ANSI, JPI</p>	12	8	
			15	10	
Double socket type			19	13	T = 1/2 not available.
			23	16	T = 1/2 not available. Welding type well not available
Taper				13	T = 1/2 not available. Welding type well not available

#### 3. Connection standard

	Screw type	Flange type
Standard connection	R 1/2, R 3/4, 1/2NPT, G 1/2B, G 3/4B (Fixing screw only = W22 thread 14)	JIS 10K 20ARF JIS 10K 25ARF ANSI 1B 150RF ANSI 1B 300RF

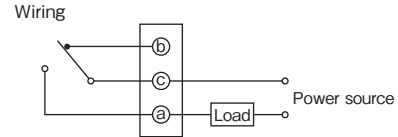
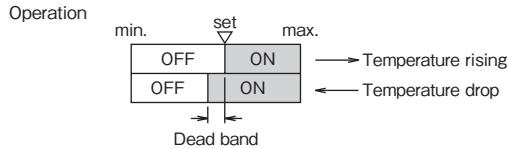
Other screws and flanges in addition to those shown at above are available.  
Contact NKS for details.

### Type of contact and wiring system

#### TS40 (Liquid filled type)

##### 1. Upper limit type with one contact · H (ⓐ—ⓒ wired)

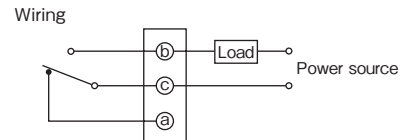
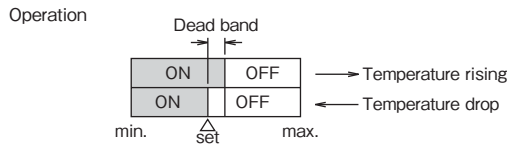
When the temperature rises to the set point or upper, the contact points operate to turn the circuit ON.  
The OFF point when the temperature drops is only the amount of the dead band inherent to the micro switch.



This type can also be used as a lower limit type (ⓓ—ⓒ wired), but the setting must be corrected by the amount of the dead band.

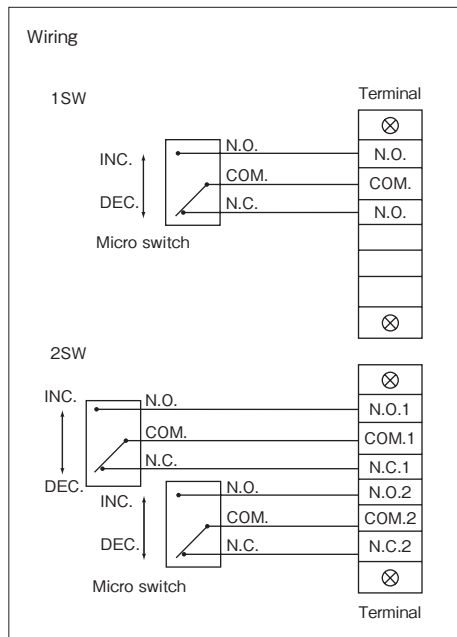
##### 2. Lower limit type with one contact · L (ⓓ—ⓒ wired)

When the temperature decreases to the set point or lower, the contact points operate to turn the circuit ON.  
The OFF point when the temperature rises is only the amount of the dead band inherent to the micro switch.

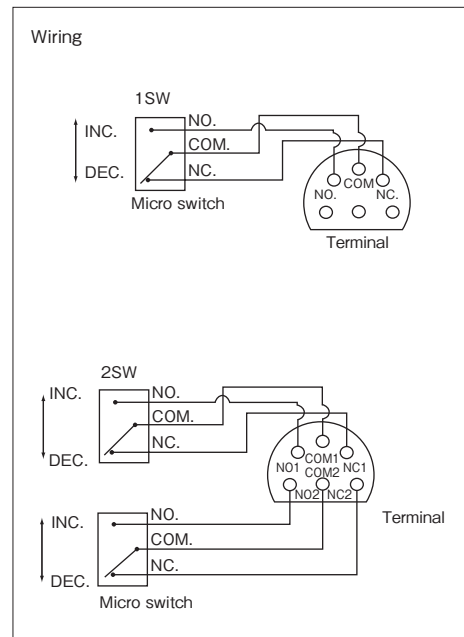


This type can also be used as an upper limit type (ⓐ—ⓒ wired), but the setting must be corrected by the amount of the dead band.

#### TS50 (Liquid filled type)



#### TD50 (Liquid filled type)



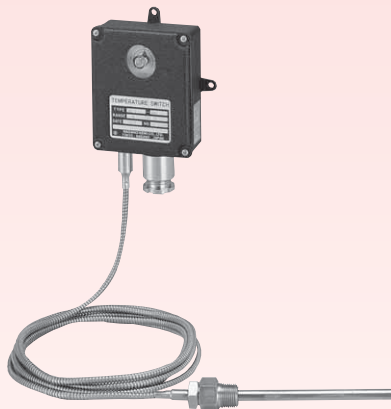
N.O. (Normally open)	Terminal of micro switch circuit is normally open at minimum temperature→Normally Open
N.C. (Normally closed)	Terminal of micro switch circuit is normally closed at minimum temperature→Normally Closed
Upper limit type with one contact H (Reverse lower limit type with one contact L R)	System by which the contacts close (open) when the temperature increases (decreases) to the set point. (Reverse lower limit wiring is the same as upper limit.)
Lower limit type with one contact L (Reverse upper limit type with one contact H R)	System by which the contacts close (open) when the temperature decreases (increases) to the set point. (Reverse upper limit wiring is the same as lower limit.)
Upper & lower limit type two contacts H L (Reverse lower and upper limits type with two contacts HR, LR)	Combination of upper limit system and lower limit system. There are types whose contacts operate independently (dual setting, dual circuits) and types whose contacts operate simultaneously (single setting, dual circuits)
Upper limit type with two contacts 2H (Reverse lower limit type with two contacts 2LR)	Combination of two upper limit systems. There are types whose contacts operate independently (dual setting, dual circuits) and types whose contacts operate simultaneously (single setting, dual circuits)
Lower limit type with two contacts 2L (Reverse upper limit type with two contacts 2HR)	Combination of two lower limit systems. There are types whose contacts operate independently(dual setting, dual circuits) and types whose contacts operate simultaneously (single setting, dual circuits)

# Temperature Switches

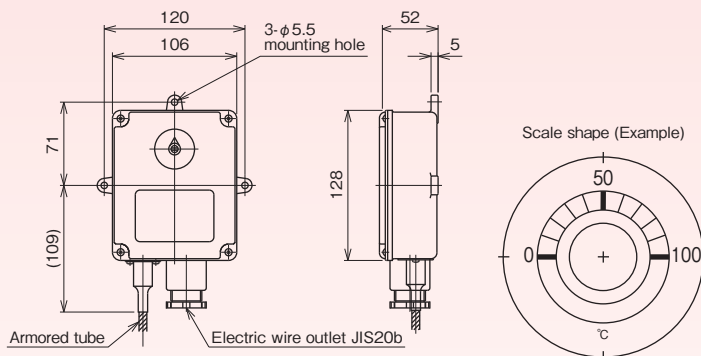
# TS40

## <Drip-proof • Surface mounting type>

Liquid filled dial thermometer



### Dimensions



### Specifications

Item	Description	
Manufacturing range	-70 to 50°C → 0 to 300°C	
Case	Construction: Drip-proof / Equivalent to IP33, Material: ADC12, Finish: Black	
Wetted parts material	Bulb: SUS304, Connection / Flange: SUS304	
Accuracy	Reproducibility	± 2 %F.S.
	Setting	Within ± 4 %F.S.
Dead band	Within 8 %F.S.	
Ambient temperature error	Within ± 2 %F.S. / 15°C	
Number of contacts	One contact	
Setting	External adjustment	
Lead length	Standard 3m, Max. 10m	
Compensation	Lead compensation	
Connection	R 1/2, R 3/4, 1/2 NPT, G 1/2 B, G 3/4 B 1/2 is not available with φ 16 bulb and φ 19, φ 23 thermowell.	
Flange	JIS10K20ARF, JIS10K25ARF, ANSI1B150RF, ANSI1B300RF	
Connection	Without thermowell	Union type, Slide type
	With thermowell	Double socket union type: R 1/2, 1/2 NPT (Connection) Double socket slide type: R 1/2, 1/2 NPT (Connection)

Slide type is not available with φ 16 bulb.

● Other screws and flanges are manufactured. Please contact NKS for details.

### Range / Bulb DIA. / Bulb length

Range °C	Bulb length (L) mm					Maximum
	Minimum insertion length					
	d = φ 8	d = φ 10	d = φ 12	d = φ 13	d = φ 16	
-70~ 50	160	110	90	75	65	500
-70~100	125	90	75	65	60	
-50~ 50	180	120	95	85	70	
-30~ 50	215	140	110	95	80	
-20~100	160	110	90	75	65	
-10~100	170	115	95	80	70	
-10~ 50	265	170	130	110	90	
0~ 50	305	190	145	125	100	
~ 60	265	170	130	110	90	
~ 80	245	155	120	105	85	
~100	205	135	105	90	75	
~120	180	120	95	85	70	
~150	155	105	85	75	65	
~200	110	80	70	60	55	
~250	100	75	65	60	55	
~300	90	70	60	55	50	

● The above lengths are the minimum necessary of the bulb to be inserted into the fluid to be measured.

● Bulb length should be over the above length and specified in 5mm steps.

● For plain type, make the sum of 40mm added to the bulb minimum insertion dimension given in the table the minimum length.

The above minimum insertion length is the length without thermowell.  
With thermowell, 25mm is added to the above length.





# Temperature Switches

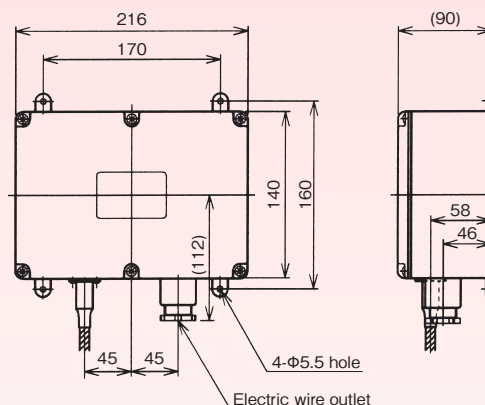
# TS50

## <Drip-proof • Surface mounting type>

Liquid filled dial thermometer



### Dimensions



Weight: Approx. 2kg (Indicator)

### Specifications

Item	Description	
Manufacturing range	-70 to 50°C → 0 to 300°C	
Case	Construction: Drip-proof / Equivalent to IP33 (IP65 available), Material: AC7A, Finish: Gray crystal	
Wetted parts material	Bulb: SUS304, Connection / Flange: SUS304	
Accuracy	± 2 %F.S.	
Reproducibility		
Dead band	Within 3 %F.S.	
Ambient temperature error	Within ± 2 %F.S. / 15°C	
Number of contacts	One contact / Two contacts	
Setting	Internal adjustment	
Lead length	Standard 3m, Max. 20m	
Compensation	Lead compensation	
Connection	R 1/2, R 3/4, 1/2 NPT, G 1/2 B, G 3/4 B 1/2 is not available with φ 16 bulb and φ 19, φ 23 thermowell.	
Flange	JIS10K20ARF, JIS10K25ARF, ANSI1B150RF, ANSI1B300RF	
Connection	Without thermowell	Union type, Slide type
	With thermowell	Double socket union type: R 1/2, 1/2 NPT (Connection) Double socket slide type: R 1/2, 1/2 NPT (Connection)

Slide type is not available with φ 16 bulb.

● Other screws and flanges are manufactured. Please contact NKS for details.

### Range / Bulb DIA. / Bulb length

Range °C	Bulb length (L) mm					Maximum
	Minimum insertion length					
	d = φ 8	d = φ 10	d = φ 12	d = φ 13	d = φ 16	
-70~ 50	160	110	90	75	65	500
-70~100	125	90	75	65	60	
-50~ 50	180	120	95	85	70	
-30~ 50	215	140	110	95	80	
-20~100	160	110	90	75	65	
-10~100	170	115	95	80	70	
-10~ 50	265	170	130	110	90	
0~ 50	305	190	145	125	100	
~ 60	265	170	130	110	90	
~ 80	245	155	120	105	85	
~100	205	135	105	90	75	
~120	180	120	95	85	70	
~150	155	105	85	75	65	
~200	110	80	70	60	55	
~250	100	75	65	60	55	
~300	90	70	60	55	50	

● The above lengths are the minimum necessary of the bulb to be inserted into the fluid to be measured.

● Bulb length should be over the above length and specified in 5mm steps.

● For plain type, make the sum of 40mm added to the bulb minimum insertion dimension given in the table the minimum length.

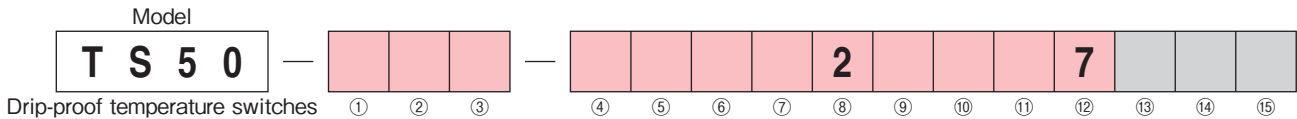
The above minimum insertion length is the length without thermowell.  
With thermowell, 25mm is added to the above length.

# TS50

## Temperature Switches

### Model number configuration

Please specify the model number, each specs and the range for ordering.



Model number Selective spec. Additional spec. (Option)

① Thermowell inside screws For with thermowell, please specify the thermowell type on a separate page.	0	Without thermowell	Welded type	Drilled type		Welded type
		With thermowell		Straight	Taper	
	1	Inside screws: Standard (W22 thread 14)	SW11(SW10)	SW41(SW40)	SW71(SW70)	SW81
	2	Inside screws: Rc1/2 double socket	SW12	SW42	SW72	SW82
	3	Inside screws: 1/2NPT double socket	SW13	SW43	SW73	—
	4	Inside screws: G1/2 double socket	SW14	SW44	SW74	—
	5	Inside screws: Rc3/4 double socket	SW15	SW45	SW75	—

② Connecting part	0	Union type
	1	Slide type (φ 16 bulb are not available.)
	4	Plain type

③ Connecting screws	0	R1/2	H	JIS10K50ARF
	1	R3/4	J	JIS20K20ARF
	2	1/2NPT	K	JIS20K25ARF
	3	G1/2B	L	JIS10K15AFF
	4	G3/4B	M	JIS10K20AFF
	5	JIS10K20ARF	N	JIS10K25AFF
	6	JIS10K25ARF	P	ANSI3/4B150RF
	7	ANSI1B150RF	Q	ANSI3/4B300RF
	8	ANSI1B300RF	R	ANSI1B600RF
	A	Fixing screws (W22 thread 14)	S	ANSI 1 1/2B150RF
	B	R3/8	T	ANSI 1 1/2B300RF
	C	R1	U	ANSI 1 1/2B600RF
	D	3/4NPT	W	JPI 1B150RF
	E	1NPT	X	JPI 1B300RF
	F	JIS10K15ARF	Y	JPI 1B600RF
	G	JIS10K40ARF	Z	Plain type

Please specify the temperature range and units separately besides selection of range code.

④ Range °C	1	0 to 50, 60, 80, 100, 120, 150
	2	0 to 200, 250, 300
	4	-10 to 50, -30 to 50, -50 to 50
	5	-20 to 100
	6	-70 to 50, -70 to 100

⑤ Bulb material	1	SUS304
	2	SUS316
	X	With thermowell

⑥ Bulb DIA.	1	d=φ 8	
	2	d=φ 10	
	3	d=φ 12	
	4	d=φ 13	
	5	d=φ 16	Slide type not available
	X	With thermowell	

⑦ Bulb length	A	Minimum dimension to 500mm
	X	With thermowell

⑧ Compensation	2	Lead compensation
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⑨ Lead type	2	Armored tube B (SUS430) (Standard)
	B	Armored tube B (SUS304)
	E	Armored tube B (SUS316)

⑩ Lead length	ア	Up to 3m
	イ	Up to 4m
	ウ	Up to 5m
	エ	Up to 6m
	オ	Up to 7m
	カ	Up to 8m
	キ	Up to 9m
	ク	Up to 10m
	9	Other specified ( /m)

⑪ Contact	A	H: Upper limit type with 1 contact
	B	L: Lower limit type with 1 contact
	C	HL: Upper & lower limit type with 2 contacts
		Other specified

⑫ Electric wire outlet	7	Gland JIS20b (Standard)
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⑬ Kind of thermowell	1	Welded type
	4	Drilled type straight
	7	Drilled type taper
	8	Welded flange

⑭ Thermowell inside screws	0	For slide type General products: Not available	
	1	W22 thread 14	
	2	Rc1/2	
	3	1/2NPT	General products: Not available
	4	G1/2	
5	Rc3/4		

#### [Manufacturing range]

[Note] φ 16 bulb for the connecting R1/2, 1/2NPT, G1/2B and R3/8 without thermowell and φ 13 bulb for the connecting R3/8 are not available.

• Thermowell inside screws: For slide type, φ 16 bulb is not available.

\* When ordering, please specify the bulb length and lead length.

\* The thermowell model composition is SW ⑬⑭.

\* For with thermowell, please refer to P 116 to thermowell manufacturing specifications and specify the SW model also.

\*Specify "X" if there is no specification item.

⑮ Documents	0	Nii
	1	Required (Please specify the desired documents separately.) Submission drawings, instruction manual, inspection procedure, mill sheet, test report (1 pc 1 copy), traceability / inspection certificate, strength calculation, attended inspection

# Temperature Switches

# TD50

## <Explosion-proof • Surface mounting type>

Liquid filled dial thermometer



Registered model for labor ministry inspection  
and approval number: (CD50)

Registered model for labor ministry inspection: CD50-2  
Approval number for labor ministry inspection: NO. T25230

It is official approval number to represent that explosion-proof construction pressure switch conformed to explosion proof standard.  
It is national official approval which is examined and authorized by technology institution of industrial safety.

### Specifications

Item	Description	
Manufacturing range	-70 to 50°C → 0 to 300°C	
Case	Construction: Explosion-proof / Equivalent to IP54, Material: ADC12, Finish: Grey crystal	
Wetted parts material	Bulb: SUS304, Connection / Flange: SUS304	
Accuracy	Reproducibility	± 2 %F.S.
	Indication	Within ± 1 dial at 20°C
Dead band	Within 3 %F.S.	
Ambient temperature error	Within ± 2 %F.S. / 15°C	
Number of contacts	One contact / Two contacts	
Setting	Internal adjustment	
Lead length	Standard 3m, Max. 20m	
Compensation	Lead compensation	
Connection	R 1/2, R 3/4, 1/2 NPT, G 1/2 B, G 3/4 B 1/2 is not available with φ 16 bulb and φ 19, φ 23 thermowell.	
Flange	JIS10K20ARF, JIS10K25ARF, ANSI1B150RF, ANSI1B300RF	
Connection	Without thermowell	Union type, Slide type
	With thermowell	Double socket union type: R 1/2, 1/2 NPT (Connection) Double socket slide type: R 1/2, 1/2 NPT (Connection)

Slide type is not available with φ 16 bulb.

● Other screws and flanges are manufactured. Please contact NKS for details.

### Range / Bulb DIA. / Bulb length

Range °C	Bulb length (L) mm					Maximum
	Minimum insertion length					
	d = φ 8	d = φ 10	d = φ 12	d = φ 13	d = φ 16	
-70~ 50	160	110	90	75	65	500
-70~100	125	90	75	65	60	
-50~ 50	180	120	95	85	70	
-30~ 50	215	140	110	95	80	
-20~100	160	110	90	75	65	
-10~100	170	115	95	80	70	
-10~ 50	265	170	130	110	90	
0~ 50	305	190	145	125	100	
~ 60	265	170	130	110	90	
~ 80	245	155	120	105	85	
~100	205	135	105	90	75	
~120	180	120	95	85	70	
~150	155	105	85	75	65	
~200	110	80	70	60	55	
~250	100	75	65	60	55	
~300	90	70	60	55	50	

● The above lengths are the minimum necessary of the bulb to be inserted into the fluid to be measured.

● Bulb length should be over the above length and specified in 5mm steps.

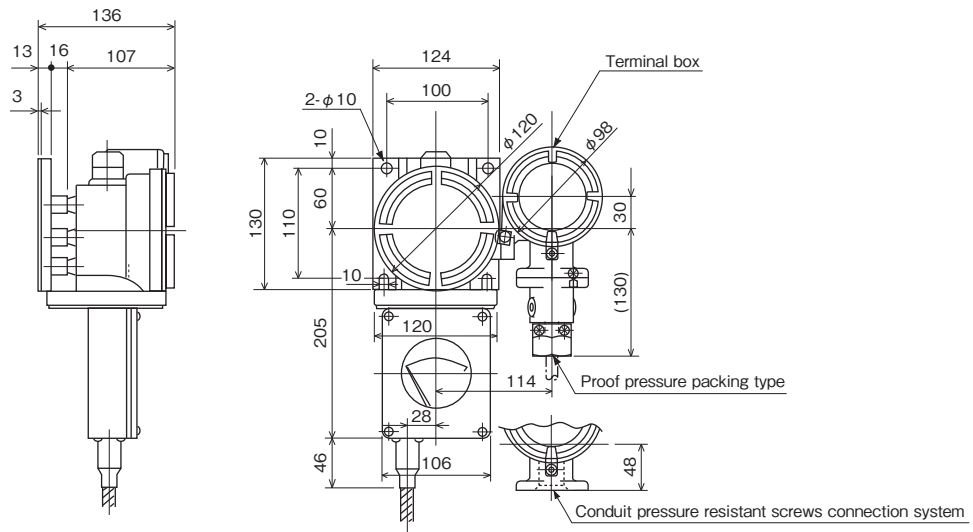
● For plain type, make the sum of 40mm added to the bulb minimum insertion dimension given in the table the minimum length.

The above minimum insertion length is the length without thermowell.  
With thermowell, 25mm is added to the above length.

# TD50

## Temperature Switches

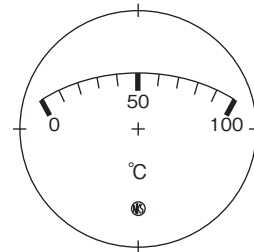
### Dimensions



Weight: Approx. 11.5kg (Indicator part)

### Scale shape

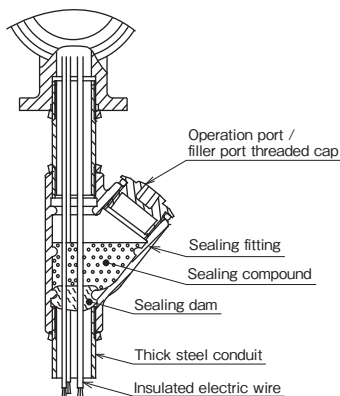
Range °C	Scale division and number entry posit	Range °C	Scale division and number entry posit
0~ 50		-10~ 50	
0~ 60		-30~ 50	
0~ 80		-50~ 50	
0~100		-10~100	
0~120		-20~100	
0~150		-70~ 50	
0~300		-70~100	
0~200			
0~250			



Ground: White  
Entry: Black, red for minus graduation lines and figures.

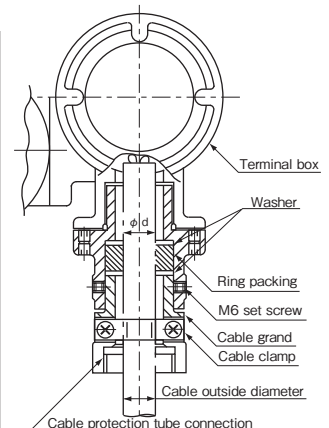
### Terminal box external lead drawing method

〈1〉 Conduit proofpressure threads connection type



〈2〉 Proof pressure packing type

Gasket inside diameter (d) φ	Applicable cable outside diameter φ	Protection tube connection
10.5	9.4	G 1/2 G 3/4
	9.9	
	10.1	
12	10.5	G 3/4 G 1
	11.0	
	11.5	
14	11.9	G 3/4 G 1
	12.0	
	12.5	
15.5	12.6	G 3/4 G 1
	13.1	
	13.5	
16.5	13.6	G 3/4 G 1
	14.5	
	15.6	



### Explosion-proof

#### Explosion-proof construction

Explosion-proof construction is a totally enclosed construction such that even if the explosive gas explodes inside the container, the container withstands the force of the explosion and there is no danger of ignition of external explosive gases.

#### Application range: d2G4

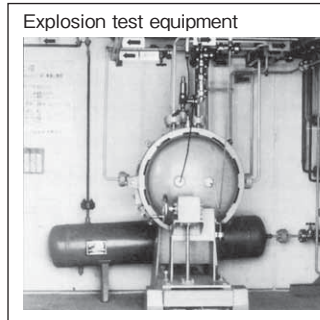
- 1) Explosion-proof construction: d
- 2) Explosion class : 2
- 3) Ignitability : G 4
- 4) Hazardous areas : Zone 1 or zone 2
- 5) Objective industries : Petrochemical, chemical fiber, synthetic resin, ethylene, methanol, dielectric products manufacturing, liquefied gas, electric furnace, pharmaceuticals, paints, ammonium sulfate, soda, other measurement medium or industries in which there is the danger of ignition and explosion.

#### Classification of hazardous areas:

Hazardous area	Contents
Zone 0	A place where hazardous atmosphere is continuously present or present for a long period under ordinary circumstances.
Zone 1	A place where hazardous atmosphere is likely to occur under ordinary circumstances.
Zone 2	A place where hazardous atmosphere is likely to occur under abnormal circumstances.

#### Classification of explosion:

Explosion class	Minimum gap with a 25mm length of path which permits the flame propagation
1	Over 0.6mm
2	0.4mm to 0.6mm
3	Up to 0.4mm



#### Classification of ignition groups:

Ignition class	Ignition point	Limits of temperature rise (deg)
G 1	Over 450°C	320
G 2	300°C to 450°C	200
G 3	200°C to 300°C	120
G 4	135°C to 200°C	70
G 5	100°C to 135°C	40
G 6	85°C to 100°C	30

The standard ambient temperature range of an electric instrument in the normal usage state shall be 40°C.

#### Example of classification of typical explosive gases:

Explosion class	Ignition class	G 1	G 2	G 3	G 4	G 5	G 6
		Acetone	Ethanol	Gasoline	Acetaldehyde		
1	Ammonia	Isopentyl acetat	Hexane	Ethyl ether			
	Carbon monoxide	1-Butanol					
	Ethane	Butane					
	Acetic acid	Acetic anhydride					
	Ethyl acetate						
	Toluene						
	Propane						
	Benzene						
	Methanol						
	Methane						
2	Carbon gas	Ethylene					
		Ethylene oxide					
3	Water gas	Acetylene				Carbon dioxide	
	Hydrogen						



## For Temperature Gauges

# SW Thermo-well

When measuring temperature object flows, and the speed is fast, and the pressure is high, Temperature gauges are necessary to equip the thermo-well for their sensing part. And, in general application, Thermo-well is used for easy-maintenance.

The necessary conditions for thermo-well

- 1) Ability to withstand temperature, the pressure that is going to be measured (it contains a flow) fully.
- 2) Not raising corrosion, other chemical reaction by measuring temperature object.
- 3) With air tightness.
- 4) It isn't damaged even if receives sudden temperature change.
- 5) Ability to withstand mechanical power such as vibration, a shock enough.
- 6) Thermo-well oneself doesn't generate harmful gas to temperature gauges.
- 7) It can transmit the temperature changes to the sensing part rapidly.

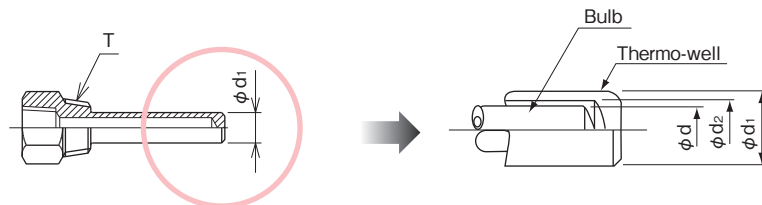
Thermo-well has digging type and welding type (welding type is standard).  
In addition, screw type and flange type are available by method of mounting.

### Specifications

#### ■Relation of thermo-well DIA. and bulb DIA., and manufacturing range of screws and flange

Outer DIA. ( $d_1$ )	Type	Inner DIA. ( $d_2$ )	Bulb outer DIA. (d)	Screw (T)			Flange JIS, ANSI, JPI
				$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	
$\phi 12$	Drilled type	$\phi 8.5$	$\phi 8$	○	○	○	○
	Welded type			—	○	○	○
$\phi 15$	Drilled type	$\phi 10.5$	$\phi 10$	—	○	○	○
	Welded type	$\phi 11$		—	○	○	○
$\phi 19$	Drilled type	$\phi 13.5$	$\phi 13$	—	—	○	○
	Welded type			—	—	○	○
$\phi 23$	Drilled type	$\phi 16.5$	$\phi 16$	—	—	○	○
$\phi 19/\phi 23$ (Taper)	Drilled type	$\phi 13.5$	$\phi 13$	—	—	○	○

Inside screws (Connecting screws with thermometer): W22 thread 14 or Rc $\frac{1}{2}$



#### ■Thermo-well material

SUS304, SUS316, SUS316L, Titanium, Hastelloy-B<sup>®</sup>, and Monel-metal<sup>®</sup> are available.

Teflon<sup>®</sup>, or Glass etc. coating is available.

Coated thermo-well is available with flange type only.

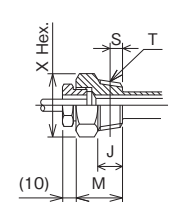
## Specifications

### ■ Connection type and size

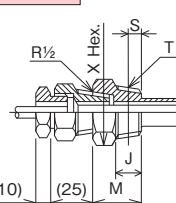
### ■ Thermo-well type and size

**Screw type Union type**

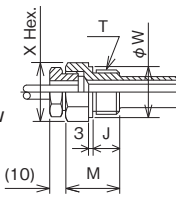
**Taper Screw**



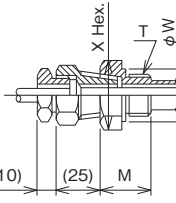
**Double socket type**



**Straight Screw**

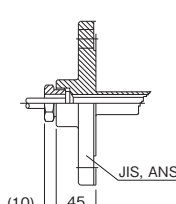


**Double socket type**

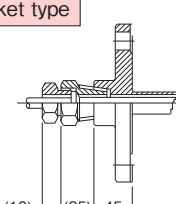


**Flange type Union type**

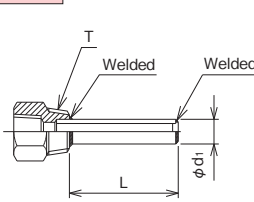
**Standard**



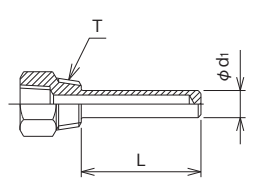
**Double socket type**



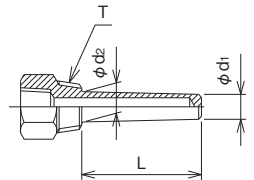
**Welded type** Weld the pipe as shown below.



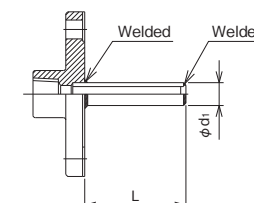
**Drilled type (Straight)**



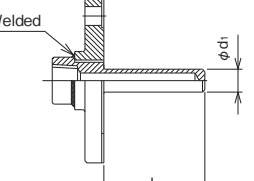
**Drilled type (Taper)**



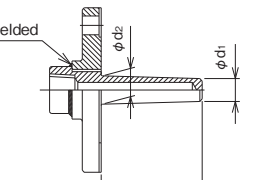
**Welded type** Weld the pipe as shown below.



**Drilled type (Straight)**



**Drilled type (Taper)**



(mm)

T	J	S	W	X	M
R 1/2	18	8	-	27×31.2	43
R 3/4	20	9.5	-	30×34.6	45
G 1/2 B	18	-	32	32×37	43
G 3/4 B	20	-	36	36×41.6	45

Note) Please refer to JIS, ANSI, and JPI standard for flange size.





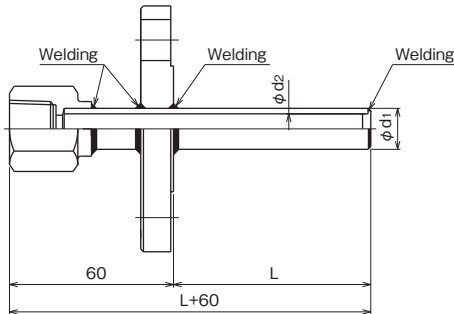


## Welded type, flange general-purpose type

### Flange general-purpose type specifications

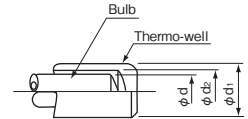
#### Types and dimensions

Please weld the pipe and flange the following figure.



#### Relation of thermo-well DIA. and bulb DIA., manufacturing range flange

Outer DIA. (d <sub>1</sub> )	Type	Inner DIA. (d <sub>2</sub> )	Bulb outer DIA. (d)	Flange
				JIS, ANSI, JPI
φ 12	Welded type	φ 8.5	φ 8	○
φ 15		φ 11	φ 10	○
φ 19		φ 13.5	φ 13	○



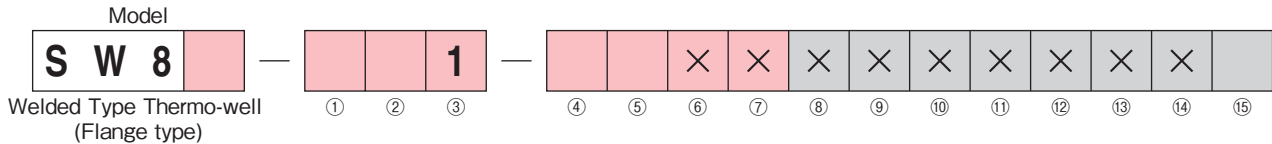
Inside screws (Connecting screws with thermometer): W22 thread 14 or Rc½

#### Thermo-well material

SUS304

### Model number configuration

Please specify the model number and each specs for ordering.



Model number	Selective spec.	Additional spec. (Option)
1	Welding type straight	Inside screws W22 thread 14
2	Welding type straight	Inside screws Rc1/2

①② Connection	③ Material	④ Outer DIA.	⑤ L length (mm)	⑮ Documents
05	1	1	0	0
JIS10K20ARF	SUS304	Outer DIA. φ 12 (Bulb inner DIA. for φ 8)	to 100	Nil
06		2	1	1
JIS10K25ARF		Outer DIA. φ 15 (Bulb inner DIA. for φ 10)	101 to 200	Required
07		3	2	(Please specify the desired documents separately.)
ANSI 1B150RF		Outer DIA. φ 19 (Bulb inner DIA. for φ 13)	201 to 300	Submission drawings, mill sheet
08			3	
ANSI 1B300RF			301 to 400	
0F			4	
JIS10K15ARF			401 to 500	
0G			5	
JIS10K40ARF			501 to 600	
0H			6	
JIS10K50ARF			601 to 700	
0J			7	
JIS20K20ARF			701 to 800	
0K			8	
JIS20K25ARF			801 to 900	
			9	
			901 to 1000	
			1001 to ( /100mm)	

Please specify thermo-well length. →

• No oil & no water treatment are available.

\*Specify "X" if there is no specification item.