Temperature switch
Model 720, 770, 780, 730

Applications

- Power generation
- Waste water management
- Oil and gas
- Petrochemical industrial

Special features

- Internal switch point adjustment for critical applications
- Stainless steel case option for corrosive environment
- Switch point repeatability ±0.5% of FSR for reliable switching
- Two set-point option for controlling at different process levels



Fig.Left: Model 720 / 770, GM weatherproof enclosure
Right: Model 730, GK flameproof enclosure

Description

The model 700 temperature Switch has been designed for control and monitoring applications. The stainless steel case option enables the temperature switch to perform in harsh operating conditions of the process industry.

The switch point repeatability of ±0.5 or 1% enables reliable switching in critical operating conditions. Model 721, 723, 781, 771, 773 & 774 comes with capillary systems for remote sensing and Model 731, 733, 734 with rigid-stem thermal systems for limited space measurements enable to meet a variety of applications in oil, gas, power, steel and petrochemical industries.

Adjustable switch differential combinations are available to realize flexible on/off controls. This wide setting range is often needed for the on/off control mode of cyclic applications.

The switch point can be specified on site, with internal adjustment options. Depending on the application, the appropriate variant for the contact version and the electrical connection can be selected. For example, hermetically sealed micro switches are suitable for hazardous ambient conditions.

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Specifications

Basic information	
Switch enclosure	■ GM style aluminium pressure die cast weatherproof to IP66 ■ GA style 304 SS casting, weatherproof to IP66 ■ GA6 style 316 SS casting, weatherproof to IP66 ■ GK style (Type-1) aluminium pressure die cast, weatherproof and flameproof to group IIC as per IS/IEC 60079-1
Sensing membrane	316 SS bulb
Bulb dimension	Refer bulb dimension table
Measuring element	Vapour Pressure / Gas filled thermal system actuating a 316L SS Bellows

Output signal	
Ranges	Several standard ranges between (-)50°C ... 300°C
Switching differential	■ Fixed ■ Wideband adjustable (Refer table 2 & 3)
Repeatability of the setpoint (note 3)	■ ± 1% of FSR (standard) ■ ± 0.5% of FSR
Scale accuracy (note 3)	±5% of FSR
Switching contacts with microswitch	■ 1 x SPDT (single pole double throw) ■ 2 x SPDT (single pole double throw)
Switching function (note 8)	Instrument quality snap acting microswitch

Operating condition	
Permissible ambient and storage temperature	–10°C ... +60°C
Maximum working pressure	Temperature sensing bulb are designed to withstand 100 bar without thermowell
Ingress protection	IP66
Connection of thermowell	Through sliding gland – 3/8" NPT(M) per ASME B1.20.1 Adaptors for other sizes optional
Connection to thermowell	■ 3/8" NPT(M) per ASME B1.20.1 ■ 1/2" NPT(M) per ASME B1.20.1 Other connections through adaptor
Electrical connection	1/2" NPT(F) per ASME B1.20.1 single entry standard Dual entry on request
Mounting	Back panel / wall / Field Vertical position only

Ordering matrix

Switch enclosure
GM style aluminium pressure die cast, weatherproof to IP66 — **GM**
GA style 304 SS casting, weatherproof to IP66 — **GA**
GA6 style 316 SS casting, weatherproof to IP66 — **GA6**
GK style (Type-1) aluminium pressure die cast, weatherproof and flameproof to group IIC as per IS/IEC 60079-1 — **GK**

Models
Remote mount types
Models 721, 723 & 781 — Vapour Pressure,
Models 771, 773 & 774 — Gas filled
Temperature switch with flexible thermal system comprising of bulb, semi-rigid stem extension, capillary and armour, having close fixed non-adjustable switching differential — **721** / **771**
Same as 721/771, but with auxiliary mechanism permitting wide adjustable band of switching differential without disturbing the setpoint (falling temperature) — **723** / **773**
A variant of 721/771, employs twin levers each operating a SPDT microswitch actuated by a single thermal system through an unique linkage thereby providing two independent adjustable set points, each with its own setting scale, spring & switch — **781** / **774**

Direct mount types
Models 731, 733 & 734 — Vapour pressure
Similar to 721, but with a rigid stem thermal system comprising of bulb and rigid stem — **731**
Similar to 731, but has a wide adjustable band of switching differential — **733**
A variant of 731, provides two independent adjustable setpoints actuated by a single rigid stem thermal system similar to 781 — **734**

Thermal system data
For series 720 / 770 (Capillary shall be supplied only in multiples of 3 meters)
3 metre capillary without semi rigid stem — **EZZ**
6 metre capillary without semi rigid stem — **GZZ**
3 metre capillary 100 mm semi rigid stem — **Q**
3 metre capillary 250 mm semi rigid stem — **E**
3 metre capillary 500 mm semi rigid stem — **F**
6 metre capillary 250 mm semi rigid stem — **G**
6 metre capillary 500 mm semi rigid stem — **H**
9 metre capillary 250 mm semi rigid stem — **J**
9 metre capillary 500 mm semi rigid stem — **K**
12 metre capillary 250 mm semi rigid stem — **L**
12 metre capillary 500 mm semi rigid stem — **M**
15 metre capillary 250 mm semi rigid stem — **N**
15 metre capillary 500 mm semi rigid stem — **P**

For 730 series
For all ranges 250 mm Rigid stem except range 'C11'; For range C11 400 mm Rigid stem.
Regid stem bulb length — **T**
335 mm Rigid stem (for C08 and C07 only) including bulb length — **Z**
400 mm Rigid stem including bulb length (for C11) [Not applicable for direct mounting] — **X**

Range Code
Refer Table–1 — □

Switch Code and Rating
Refer Table–5 — □

Electrical Entry
Refer Table–6 — □

Bulb dimensions
Refer Table–7 — □

Mounting
On-line — **Z**
Wall — **W**
2" pipe — **2**
Univeral — **U**

Mounting material
Not applicable — **0**
Mild steel — **C**
316 SS — **2**

Thermowell
With thermowell — **WT**
Without thermowell — **WO**

For available other options refer "page 6"

Table 1: Range code and availability

Range code	Range	Maximum working temperature	Model					
			721 & 723	731 & 733	781	734	771 & 773	774
C007	-25 ... 35°C	45°C	-	-	-	-	✓	-
C008	20 ... 100°C	110°C	-	-	-	-	✓	-
C011	90 ... 200°C	210°C	✓	✓	✓	✓	-	-
C012	180 ... 300°C	310°C	✓	-	-	-	-	-
C003	-50 ... 150°C	250°C	-	-	-	-	✓	✓
C016	50 ... 120°C	130°C	-	-	-	✓	✓	✓

Table 2: Switching differential – GM / GA enclosures

Model	Range Code	Range	On-off Fixed differential					
			1 × SPDT			2 × SPDT (DPDT action)		
			D / 3 / 4	5	9 / G	DD / 33 / 44	55	99 / GG
721 / 731	C007	-25 ... 35°C	4	9	12	5	12	18
	C008	20 ... 100°C	3	6	6	4	8	9
721 / 731 / 781	C011	90 ... 200°C	4	7	9	5	9	13
721	C012	180 ... 300°C	5	9	12	6	12	18
771	C007	-25 ... 35°C	6	9	10	8	12	12
	C008	20 ... 100°C	6	9	10	8	12	12
771 / 734 / 774	C003	-50 ... 150°C	6.5	14	14	10	18	18
	C016	50 ... 120°C	10	-	-	14	-	-

1. Fixed on-off differentials for style GM/GA –721/731/771 with 1 SPDT contact switching differentials will be less than or equal to the published values. For style GK multiply the listed differential by 1.5 times.

2 Fixed on-off differentials for style GM/GA –721/731/771 with 2 SPDT contacts (for DPDT action). Switching differentials will be less than or equal to the published values. For style GK multiply the following differentials by 1.2 times.

Table 3: Switching differential – GM / GA enclosures

Model	Range Code	Range	Wideband adjustable swtitching differential in Deg C	
			1 × SPDT	2 × SPDT (DPDT action)
			W	WW
723 / 733	C007	-25 ... 35°C	10 ... 30	12 ... 30
	C008	20 ... 100°C	10 ... 30	13 ... 30
	C011	90 ... 200°C	10 ... 30	13 ... 30
723	C012	180 ... 300°C	10 ... 30	12 ... 30
773	C003	-50 ... 150°C	30 ... 100	40 ... 100
	C007	-25 ... 35°C	20 ... 30	23 ... 30
	C008	20 ... 100°C	22 ... 30	25 ... 35

1 Wide band adjustable on-off differentials for style GM/GA –723 / 733 / 773 with SPDT/2SPDT (for DPDT action) contacts. For style GK multiply the lower limit of the listed wide band adjustable differential values by 1.2 times.

2. For Switching Differential of models 781, 734, 774 please consult factory.

Table 4: Response time

Series	Response time		
	Capillary length & Temperature range	Without Thermowell	With Thermowell ✶
720 / 770	Up to 6 mtrs. & 100°C	15 sec.	45 sec.
	Up to 6 mtrs. & 300°C	25 sec.	75 sec.
	> 9 mtrs. to 15 mtrs. & 100°C	25 sec.	75 sec.
	> 9 mtrs. to 15 mtrs. & 300°C	40 sec.	90 sec.
730	All ranges	15 sec.	40 sec.

✶ Will vary depending on the design of the thermowell and flling media

Table 5: Switch code, rating and availability (note 11)

Switch code		Contact version	AC rating	DC rating in Ampere						Availability in models	
				Resistive			Inductive				
SPDT	DPDT			250V	125V	30V	250V	125V	30V	SPDT	DPDT
D	DD	General purpose	15A 250 / 125V	0.2	0.4	2.0	0.02	0.03	1.0	721, 731, 771 781, 734 & 774	721, 731 & 771
3	33	General purpose	15A 250 / 125V	-	-	-	-	-	-	721, 731, 771 781, 734 & 774	301 & 304
W	WW	General purpose	15A 250 / 125V	-	-	-	-	-	-	723, 733 & 773	723, 733 & 773
4	44	With Gold alloy contact.	1A 125V	-	0.5	0.5	-	0.25	0.25	721, 731, 771 781, 734 & 774	721, 731 & 771
5	55	General purpose with good DC rating.	5A 250 / 125V	0.2	0.4	4.0	0.2	0.4	3.0	721, 731, 771 781, 734 & 774	721, 731 & 771
9	99	Hermetically sealed, inert gas filled with Silver alloy contact.	1A 115V 400 Hz.	-	-	3.0 ✶	-	-	1.0 ✶	721, 731 & 771	721, 731 & 771
G	GG	Hermetically sealed, inert gas filled with Gold plated contact.	-	-	-	1.0 ✶	-	-	0.25 ✶	721, 731 & 771	721, 731 & 771

✶ For Codes 9, 99, G, GG, DC Rating of Resitive and Inductive is 28V

Table 6: Electrical entry

Size ✶	Single entry		Dual entry	
	GM / GA	GK/GR	GM / GA	GK/GR
1/2" NPT(F) per ASME B1.20.1	A	A	N	N
3/4" NPTF per ASME B1.20.1 through adaptor	L	-	O	-
M20 × 1.5 per ISO724 ✶✶	E	E	EB	EB
7 pin plug through connector	C	-	-	-
9 pin plug through connector	D	-	-	-

✶ Cable gland available on request

✶✶ Possible in GK enclosure as direct. Others through adaptor.

Table 7: Bulb dimension

Standard

Bulb size	code	Length	Series			
			720	730	770 'C03'	770 'C16'
12Ø × 80	F80	Up to 6 Meters	✓	✓	×	✓
12Ø × 140	F140	9 ... 15 Meters	✓	×	✓	✓

Optional

Bulb size	code	Up to 6 Meters		9 .. 15 Meters
		720 series	730 series	720 series
16Ø × 45 mm	J45	✓	✓	×
15Ø × 50 mm	I50	✓	✓	×
14Ø × 50 mm	H50	✓	✓	×
14Ø × 60 mm	H60	✓	✓	×
14Ø × 100 mm	H100	✓	✓	✓
14Ø × 150 mm	H150	✓	✓	✓
12.7Ø × 70 mm	K70	✓	✓	×
10Ø × 125 mm	E125	✓	✓	×
10Ø × 225 mm	E225	✓	✓	✓
9.5Ø × 140 mm	D140	✓	✓	×
9Ø × 160 mm	C160	✓	✓	×
8Ø × 200 mm	B200	✓	✓	×

Options

- Special repeatability (±0.5% FSR or 0.5 deg C which ever is higher)
- Sliding gland 1/2" NPT(M) per ASME B1.20.1, 304 SS
- Optional MWT (125 Deg C for C008 only)
- 316 SS, semi rigid stem (721 / 771 / 774 / 781)
- 316 SS, armour (721 / 771 / 774 / 781)
- 3 meter capillary 100 mm semi rigid stem (bulb dimension 14 mm dia × 50 mm long & 14 mm dia × 60 mm long)
- SS tag plate (Maximum allowed three three lines)
- PVC cover for armor

NOTES

1. Style GM/GA is weatherproof only if all entries and joint faces are properly sealed. Style GK is weatherproof only if cover 'O' ring is retained in position and proper flameproof cable gland is used. It is recommended to procure cable glands along with GK instruments to avoid neglect of it while installation.

2. Intrinsic Safety (Exi) — Temperature Switches are classified as simple electrical apparatus as per BS 5345–6.3.3. Hence Temperature Switches with GM/GA enclosures may be used in intrinsically safe systems without certification if energy levels are limited to 1.2V, 0.1A or 25 mW.

3. Accuracy & Repeatability are one and the same for all blind temperature switches.

4. The instrument is calibrated in the mounting position depicted in the drawing. Hence mounting in any other direction will cause a minor range shift.

5. A Temperature switch is a switching device and not a measuring instrument — eventhough it has a scale to assist setting. For this reason, Test Certificates will not contain individual ON-OFF switching values at different scale readings. Maximum differential obtained alone will be declared, besides other specifications.

6. Select working range of the instrument such that the set value lies in the mid 35% of the range i.e., between 35% and 70% of range span.

7. For switching differential values please refer respective Range Table. Switching differentials furnished are nominal values under test conditions at mid-scale and will vary with range settings and operating conditions.

8. On and off settings should not exceed the upper or lower range span.

9. DPDT action is achieved by two SPDT switches synchronised to practical limits i.e., ±2% of FSR. (Synchronisation is applicable at Setpoint only. Not applicable at Reset points.) Differential for DPDT contacts are higher than that of SPDT as force required to actuate the contacts are more. Please refer respective range table for exact values.

10. Contact life of microswitches are 5×10^5 switching cycles for nominal load. To quench DC sparks, use diode in parallel with inductance, ensuring polarity. A 'R–C' network is also recommended with 'R' value in Ohms equal to coil resistance and 'C' value in micro Farads equal to holding current in Amps.

11. All models are suitable for operating within a range of ambient temperature from (–) 10°C to (+) 60°C. Below 0°C, precautions should be taken in humid atmospheres to prevent frost formation inside the instrument from jamming the mechanism.

12. In models 721, 723 & 781 it is advisable to avoid the condition where the ambient temperature is within ±5°C of the setpoint. Under this condition the liquid / vapour phase becomes less well defined and the switching differential increases.

13. In Models 771, 773 & 774 a 10°C rise in ambient temperature will on average result in 1°C fall in setpoint.

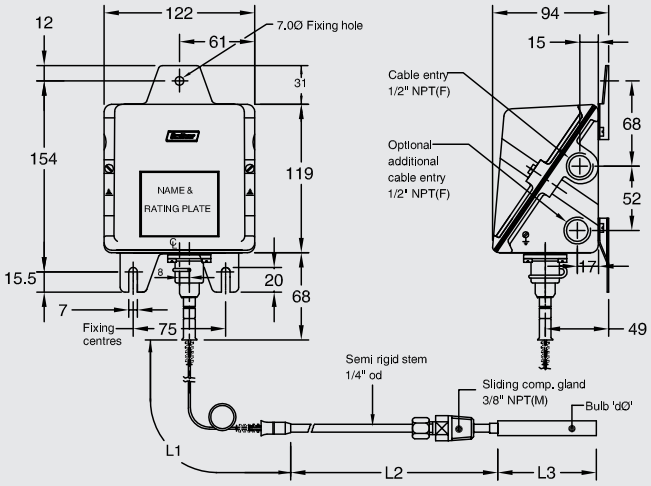
14. Accuracy figures are exclusive of test equipment tolerance on the claimed values.

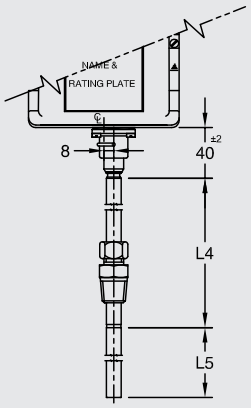
Dimensions in mm

Models 721, 723, 781, 771, 773 & 774

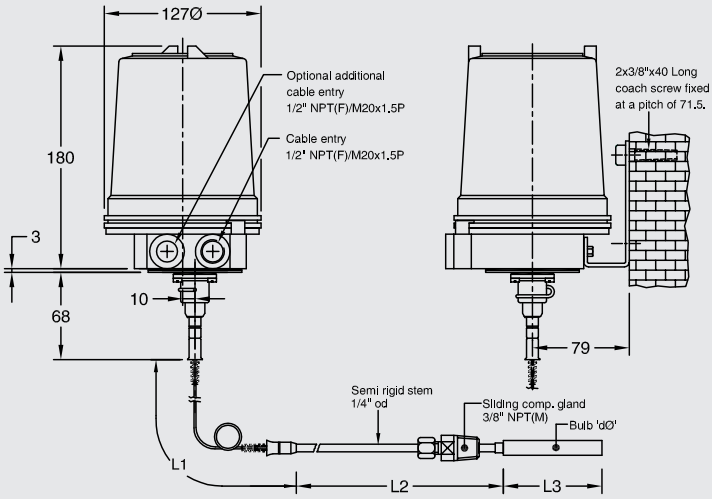
Models 731, 733 & 734

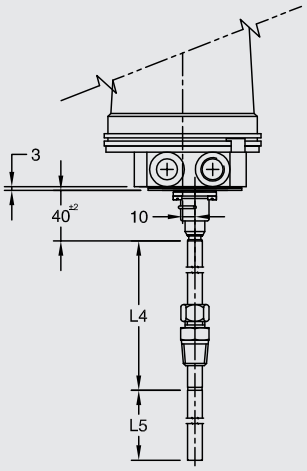
Weatherproof enclosure – Style GM





Weatherproof enclosure – Style GK





Notes:

- Dim L1, L2 varies depending on armoured capillary length
- Use certified weatherproof cable gland for GM enclosure
- It is mandatory to use certified flameproof cum weatherproof cable gland for flameproof enclosures.

L1 – Length of armoured SS capillary
3 / 6 / 9 / 12 / 15 Mtrs.

L2 – Length of semi rigid stem 100, 250, 500 mm
(excludes compression gland length)

L3 – Length of rigid stem including
bulb 250, 335, 400 mm

Ordering information

Switch Enclosure / Model / Thermal system / Range / Switch code and rating / Electrical entry / Bulb dimensions / Mounting / Mounting Material / Thermowell

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