



VAPOUR AND GAS FILLED TEMPERATURE SWITCHES

SERIES 700

FOR PNEUMATIC CONTROL APPLICATIONS



**DIRECT MOUNTING VERSION SHOWN –
ALSO AVAILABLE WITH CAPILLARY**

MANUFACTURED IN THE U.K.

Designed to complement the extensive Series 700 Pressure and DP switches, Series 700 Temperature Switches offer accurate, reliable switching in a robust cast enclosure. Featuring:

■ **RANGES FROM -50°C TO $+400^{\circ}\text{C}$**

Both vapour filled and gas filled systems are available. Vapour filled systems have the advantage of negligible ambient temperature effects on the switching point. Gas filled temperature systems provide larger ranges and are more suited to applications where switching points are close to ambient temperature.

■ **WIDE RANGE OF OUTPUT SWITCHES**

Series 700 pneumatic output switches make extensive use of the HNL precision pilot valve (PPV). This valve provides a final switching differential equal to that obtained by the use of a sensitive electrical microswitch.

Versions are also available for electrical switching in hazardous areas and non-hazardous areas (see data sheets TD700 THAZ and TD700 TELC).

■ **DIRECT AND REMOTE MOUNTING VERSIONS AVAILABLE**

Direct mounting (as shown opposite) allows the switch to be screwed directly into a thermowell (pocket). With remote mounting versions the temperature bulb is secured in the thermowell and connected to the switch housing via a capillary tube.

Both types are available with aluminium housings for general industrial use or stainless steel housings for ultimate protection from the environment.

The temperature system in all versions is fully welded in 316 Stainless Steel.

■ **FIELD ADJUSTABLE**

The setpoint of the switch is adjusted by means of a capstan head screw, located within the lower section of the enclosure.

■ **ACCURACY AND REPEATABILITY**

These switches provide excellent repeatability and long in-service life. In addition switching differentials are typically below 2% of range.

QUALITY ASSURANCE

Designed and manufactured by HNL in accordance with BS EN ISO 9001:2000.



Range Selection

SETPOINT RANGES			MIN TEMP. (°C)	MAX TEMP. (°C)	SYSTEM TYPE	MOUNTING	
RANGE CODE	MIN (°C)	MAX (°C)				DIRECT	REMOTE
78A T	-15	30	-30	90	Vapour	✓	✓
78B T	0	70	-30	90	Vapour	✓	✓
78C T	40	100	-30	170	Vapour	●	✓
78D T	60	150	-30	170	Vapour	●	✓
78E T	110	170	0	230	Vapour	●	✓
78F T	130	215	0	230	Vapour	●	✓
78G T	80	160	-30	230	Vapour	●	✓
78H T	110	210	-30	230	Vapour	●	✓
78J T	110	190	-30	290	Vapour	✗	✓
78K T	130	260	-30	290	Vapour	✗	✓
78L T	-35	10	-40	60	Vapour	✓	✓
78M T	-20	45	-30	60	Vapour	✓	✓
78N T	-50	150	-50	175	Gas	●	✓
78P T	-50	350	-50	400	Gas	✗	✓
78Q T	0	200	-50	225	Gas	●	✓
78R T	0	400	-50	400	Gas	✗	✓

✓ = available ✗ = not available ● = available if housing temperature does not exceed maximum (see note on page 4)

Vapour Filled Systems

For correct operation of vapour filled temperature switches a quantity of the filling liquid must be maintained in the bulb at all times. This cannot be assured if the bulb volume is small, relative to the total volume of the temperature system.

Consequently if a long capillary is required either the bulb length and/or the bulb diameter must be increased. The availability of various combinations of bulb length and capillary length is shown in the table below:

BULB LENGTH x DIAMETER (mm)	DIRECT MOUNTED	CAPILLARY LENGTH (m)		
		1.5	2.5	4.0
50 x 12	✓	✗	✗	✗
75 x 12	✓	✓	✗	✗
100 x 12	✓	✓	✓	✗
150 x 12	✓	✓	✓	✓

Temperature Coefficient:

For vapour filled systems the typical error due to changes in ambient temperature is 0.2% per 10°C.

Gas Filled Systems

The pressure in a gas filled system is dependent upon both the temperature of the bulb and the temperature of the fill outside of the bulb (in the capillary and pressure chamber). Consequently changes in ambient temperature will affect the switching point of the switch.

This effect can be minimised by selecting the largest bulb and the shortest capillary.

Temperature Coefficient:

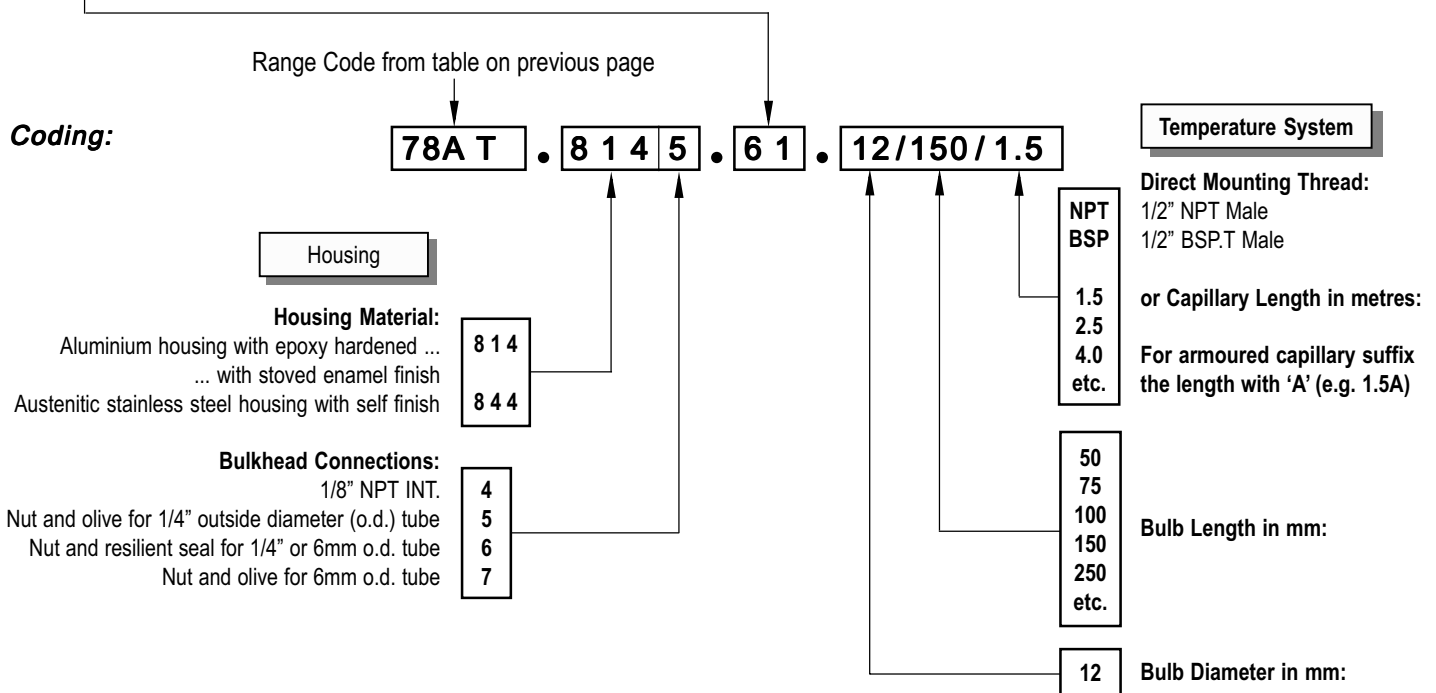
For a 150 x 12mm dia. bulb with a 1.5m capillary gas filled system the switching point will typically change by 1°C for each 10°C change in ambient temperature. An increase in ambient temperature will reduce the switching point.

Thermowells (Pockets)

HNL can supply, with your Series 700 temperature switches, a wide range of thermowells for most applications. Please contact Sales Support with your requirements.

Output Switch

Code	Pilot Pressure	Switched Pressure	Notes
61	3 to 8 Bar	Vacuum to 8 Bar	Pilot operated, spring return, 3 port sliding spool relay valve - fixed differential
64	2 to 8 Bar	Vacuum to 8 Bar	Pilot operated, bistable, 3 port sliding spool relay valve - adjustable differential (12% max.)
67	1 to 4 Bar	As pilot	Non-bleed valve, Supply pressure fed forward above the setpoint (0/1) - fixed differential
68	1 to 4 Bar	As pilot	Non-bleed valve, Supply pressure fed forward below the setpoint (1/0) - fixed differential
71	1.4 to 1.7 Bar	As pilot	Pilot operated valve, switching supply on rising (0/1) or falling (1/0) setpoint - fixed differential
81	1.4 to 1.7 Bar	0 to 2 Bar	Pilot operated, spring return, 3 port diaphragm seal valve - fixed differential



Notes on Output Switch Selection:

- Output codes 61, 64 and 81 are 3 port valves. These have a separate pilot bulkhead in addition to the 3 bulkheads for the valve. Generally the centre bulkhead is the output and the other two bulkheads are the switched supply and the vent. Swapping these two connections determines if the output pressure is present on a falling or rising process pressure.
- Output codes 67 and 68 are two port valves, having a supply and output bulkhead. They are designed not to vent continuously (above or below the setpoint) and are particularly suited to operation using natural gas for the pilot supply. All other output switch codes have a continuous consumption of pilot gas in at least one state (above or below the setpoint). A bulkhead is provided to the switch enclosure that enables gas vented during operation of the valve to be piped away. The use of output switch codes 67 and 68 will increase the basic reset by typically 1%.
- Output code 71 is a two port valve, with two bulkhead connections, the pilot supply and the output.
- All output switches must be supplied with a clean, dry and filtered inert gas at the recommended pilot pressure for correct operation.

Notes:

- The preferred mounting attitude of these switches is with the centreline of the switch vertical. The bulb on the remote mounted switches (with a capillary) can be mounted at any attitude.
- At the preferred mounting attitude dust and weatherproof ratings are IP66 to BS EN 60529 (IEC 60529).
- For direct mounted switches the bulb length dimension is taken from the bottom of the tapered mounting thread to the end of the bulb. This is commonly referred to as the 'U' length.
- On vapour filled systems the switching differential may be higher, and the speed of response lower if the switching point is close to ambient temperature. A gas or liquid filled system is recommended for these applications.

Scale Accuracy & Setpoint Calibration:

A 0-100% scale is fitted to all switches and provides an approximate indication of the setpoint relative to the range of the switch. The scale is not intended for precise calibration purposes. For precise calibration the scale should be used for initial guidance and the final adjustment made against an instrument sufficiently accurate to meet the site requirements.

Combined Switching Errors & Maximum Working Temperature (MWT):

The sum of the average switching errors and the operating value repeatability will typically not exceed 0.3% of range span, at setpoints of 10%, 50% and 90% of span.

The maximum working temperature of the temperature element is detailed in the range table on page 2 of this data sheet.

Reset (Switching Differential):

There may be some variation in the reset throughout the range of the switch. The figure quoted on page 1 of this data sheet is the basic switching differential value expressed as a percentage of the span at a mid range setpoint.

Ambient Temperature Ratings:

Enclosures are rated for continuous use over the ambient temperature range -20°C to $+60^{\circ}\text{C}$, except where restricted by the min. or max. process temperature shown on the range selection table on page 2.

It is essential that the dewpoint of both pilot and switched supplies is at least 10°C below the ambient temperature, otherwise there is the risk of freezing up the valve.

Exposure of the enclosure to direct sunlight should be such that the heat gain due to absorption of radiant energy does not cause the enclosure temperature to exceed the recommended maximum.

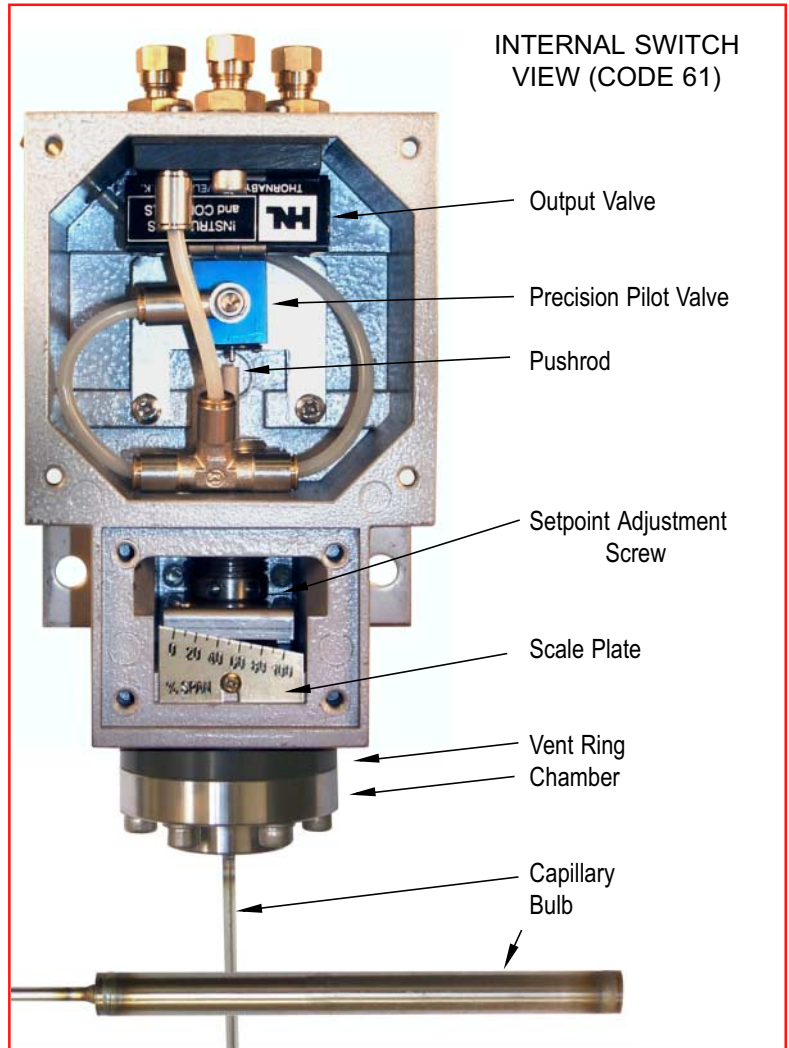
In addition it must be ensured that heat conduction from the process will not cause the switch enclosure to operate outside the stated ambient temperature limits. When using direct mounted switches at high temperatures, they should be fitted into a thermowell with a large 'T' length. Alternatively use a remote mounted switch.

Special Options & Specifications:

Where the standard temperature system options in this data sheet do not meet your application HNL can manufacture a custom system for you. Within certain technical limitations almost any size of bulb and capillary length can be supplied. Please contact Sales Support with your requirements.

Dimensions:

Housing dimensions are 175 x 100 x 81 (H x W x D in mm).



Instruments & Controls

Pressure, DP and Temperature Switches & Transmitters. Rotary and linear positioners. Flow regulators & Bubblers. Control Systems.

Precision Machining

Turning, Milling, Drilling, Tapping, Sawing, Welding, Painting, Anodising. From small to large batch sizes in a wide range of materials.

Manifolds & Valves

Wide range of distribution manifolds in both anodised aluminium and stainless steel. Stainless steel ball valves.

The information contained in this data sheet may be changed without notice.