Leaflet No. INS.4
Issue 3

GENERAL SPECIFICATION AND INSTALLATION AND MAINTENANCE INSTRUCTIONS

SERIES 2009 TEMPERATURE SWITCHES

SIRCO CONTROLS LTD.
SWEYNES INDUSTRIAL ESTATE,
ASHINGDON ROAD, ROCHFORD, ESSEX, SS4 1RQ

Tel: +44 (0)1702 545125
Email: info@sirco-controls.co.uk

A455

A better response time will be achieved when the calibration bath is constantly agitated.

The apparent error of a switch calibrated as described in the previous paragraph, with the bulb and switch housing on the same level, will be considerably magnified if, when taken to site, the bulb is mounted above or below the switch housing.

RESPONSE TIMES

Response times of Vapour Pressure Temperature Switches with a 12.5mm dia. Bulb and 3m of capillary.

	Still Air Seconds	Agitated Air Seconds	Still Liquid Seconds	Agitated Liquid Seconds
Bare Bulb	100-300	10-25	10-15	2-5
In Thermowell	300-500	30-75	20-50	6-50

CHARACTERISTIC BEHAVIOUR OF VAPOUR PRESSURE TEMPERATURE SWITCHES WHEN RELATED TO AMBIENT TEMPERATURE

Vapour pressure temperature switches do not generally need ambient compensation, as when properly installed, the temperature sensitive bulb is the only component in which the vapour pressure producing volatile liquid is present, although in IIC systems, when the bulb could be either hotter or colder than the ambient temperature, due to the migrating nature of the volatile liquid under these circumstances, there will be erratic behaviour and a variance of 10^{o}C to 15^{o}C as the ambient crosses the set point in either direction. (Handbook of Instrumentation and control, Howard P. Kallen).

NOTE: In liquid filled systems compensation is only possible when the set point is known and then only between known ambient variations.

TECHNICAL DETAILS OF THE SERIES 2009 VAPOUR PRESSURE TEMPERATURE SWITCHES

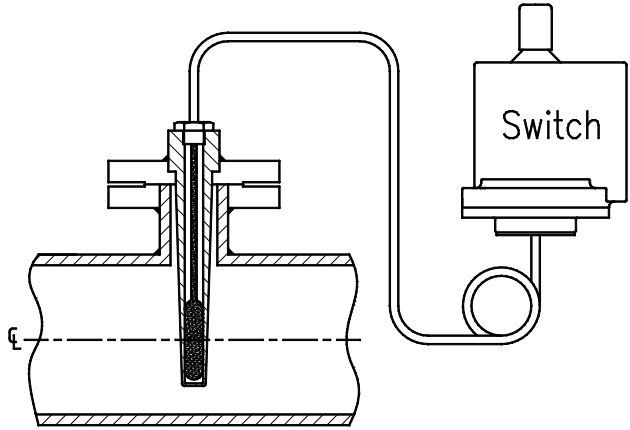
CLASS II VAPOUR SWITCHES

The SIRCO Vapour-Pressure thermal system is based on the physical characteristic that all enclosed liquids at a given temperature will create a definite vapour pressure if the liquid only partially occupies the enclosed space. The vapour pressure will increase with temperature.

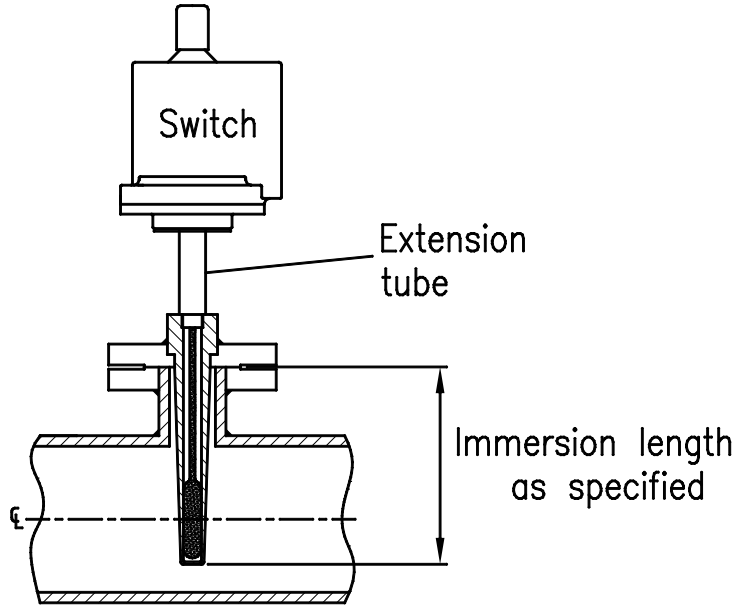
Four types of vapour-pressure systems are used in industry. The type selected depends mainly on the processed application. The first type (Class IIA) is designed to operate with the measured temperature at the bulb always above the temperature of the rest of the system. The system is filled with the precise amount of actuating liquid so that the dividing surface between the liquid and the vapour is within the bulb.

The second type of vapour-pressure system (Class IIB) is used when the bulb temperature is always lower than the remaining parts of the filled system. The amount of filling liquid is the main difference between this and Class IIA.

In many cases it is necessary to read temperature below as well as above ambient. This system is designed to take care of this need by the use of a larger volume bulb, so that when the bulb is cooler than the capillary and switch, the liquid and vapour dividing line is still in the bulb and when the bulb is hotter than the rest of the system, there will remain in the bulb, sufficient liquid to produce an interface within the bulb between the liquid and the vapour. This type is called Class IIC. With this system there will be a region of about 3 to 6^{o}C around the ambient temperature where switching is not definite.



Filled system temperature switch with flexible capillary



Direct-mounted temperature switch with flanged thermowell pocket

CALIBRATION

VAPOUR PRESSURE OF LIQUID FILLED TEMPERATURE SWITCHES

To calibrate and establish the set point of a Vapour Pressure or liquid expansion temperature switch that has a bulb in a thermowell or pocket and a length of capillary tube leading up to the switch; it is essential to use (as a calibration standard) a vapour pressure or liquid expansion temperature gauge with approximately the same length of capillary tube as the switch to be calibrated, as well as a calibration bath that has the facility for stopping the calibration medium, be it a fluid, sand bath or air at the precise temperature set point required. The reason for this is the varying response times encountered with different capillary tube lengths and bores.

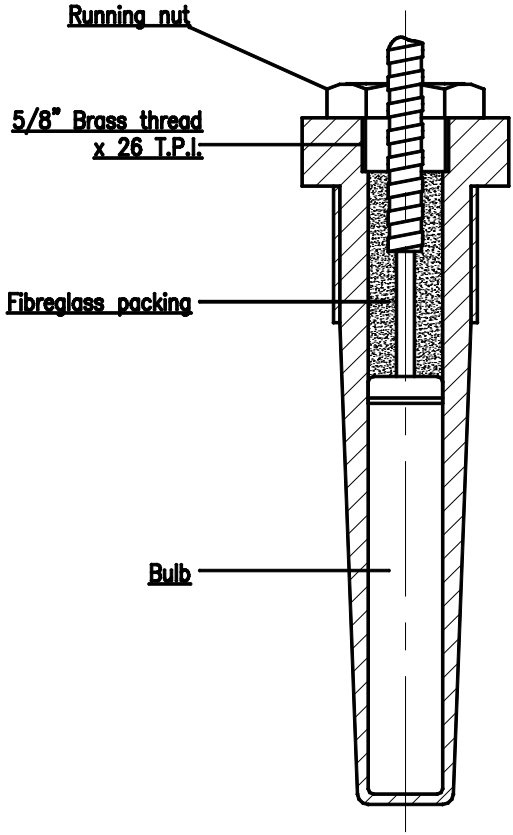
It is for this reason that electronic digital of mercury in glass thermometers are unsuitable and must not be used for calibration.

EXAMPLE:- If a temperature switch bulb with 3 metres of capillary and a thermocouple or thermistor are suspended in a liquid of a calibration bath that is still and the temperature of the bath is then raised slowly to the set point required, say 50^{o}C the digital thermometer will respond instantaneously to the temperature change in the bath, as will a mercury in glass thermometer, but the temperature switch with the bulb and 3m of capillary will take 15 seconds to respond at the switch end to the temperature at the bulb end in the bath. Therefore, when the electronic digital thermometer is registering 50^{o}C the actuator end of the switch is responding to the temperature the bath was 15 seconds earlier; which could 5 to 10^{o}C less (depending on the rate of temperature rise). The same response time rule applies to falling temperature and the whole result will seem as if the switch is malfunctioning with a large differential.

FITTING BULB INTO THERMOWELLS

1. Push bulb down into the thermowell pocket.

2. Pack well with fibreglass or other thermowell packing material and tighten the running nut, ensuring that the armour is below the bottom face of it.



SETTING THE SWITCH

Remove the weatherhead located on the top of the switch and insert socket key into the top of the range screw. Turning this key clockwise draws the actuator away from the microswitch, thereby raising the temperature set point at which the switch will actuate. Turning the key anti-clockwise the actuator closes to the microswitch, lowering the temperature set point at witch the switch will operate.

To calibrate the switch place the bulb into a calibrating bath, with a test thermometer and connect a meter or other signal device to the normally open contacts of the microswitch. Now by slowly raising or lowering the temperature of the calibration bath and rotating the range adjusting socket key in the desired direction, the actuator can be accurately set to operate the microswitch or other signal device at the precise set point required. Do not use the “kettle and bucket” method of calibration.

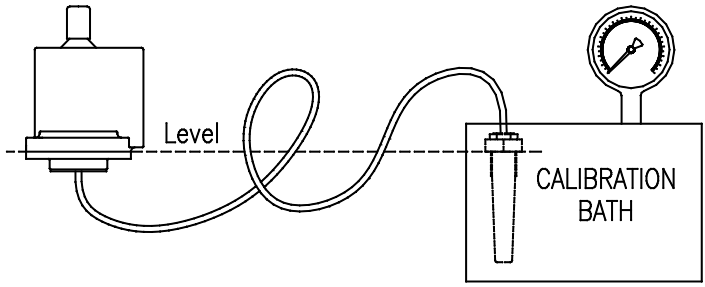
A reliable calibration bath with a very slow temperature rise or drop must be used.

CALIBRATION OF TEMPERATURE CONTROLS

SERIES 2009

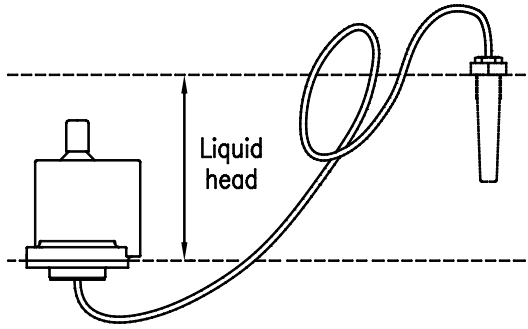
THE POSITION OF THE BULB IN RELATION TO THE SWITCH IS A VITAL FACTOR IN CALIBRATION

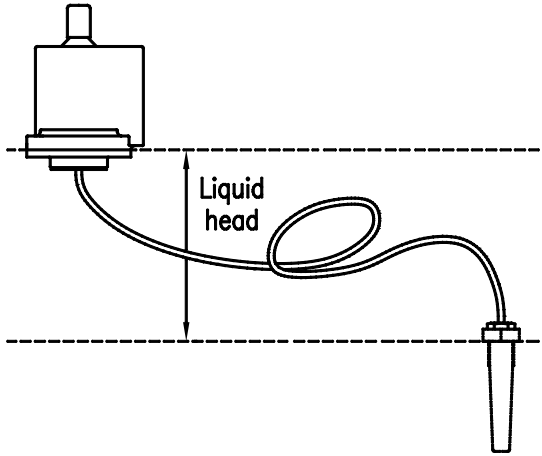
Switches are calibrated with the bulb and housing at the same level.



Do not run the capillary along hot spots or through ambients subject to extreme changes of temperature.

If the bulb is to be positioned above the housing, then calibration should be done in this position (see below).





Similarly, if the bulb is below the switch housing, then calibration should take place in this position; preferably at the ambient temperature of the environment in which it will operate.

Important: keep the switch away from engine of other excessive vibrations sources unless anti-vibration brackets are fitted.