

Both the ambient and process temperatures can markedly affect the operation, and therefore the accuracy, of a diaphragm seal system.

Ambient temperature affects the instrument itself while process temperature affects the seal system.

PCi diaphragm seal systems are calibrated at 20°C. We have produced figures on the data sheets for each individual seal to demonstrate the effects of ambient or process temperature on the accuracy of the reading.

When specifying a diaphragm seal you will therefore need to calculate the level of potential effect depending on temperatures within your process context and decide whether it is acceptable or whether another seal system would be more appropriate for your situation.

When seal systems are not direct-mounted and capillary transmission is involved in achieving a reading, ambient temperature variations can cause even more effects and these must also be added into the calculation.

Below we have given an example of how the complete calculation should be carried out based on the kind of tables you will find on the data sheets for individual seals.

Effects of temperature on pressure readings per ±10 °C (in mbar) ~ measured from 20°C

Process Connection		TRANSMITTERS				GAUGES				
Flange Size	Diaphragm Diameter (mm)	Transmitter Type	Transmitter Effect	Seal	Capillary per metre	Diam (ø)	Gauge Effect (<60)	Gauge Effect (>60)	Seal	Capillary per metre
2" / DN50	44	DP	0.05	1.2	2.3	63	13	6	7.2	15
2" / DN50	44	AP	5	5	10.4	100	52	29	7.2	15
2" / DN50	44	GP	5	5	10.4	150	90	35	7.2	15

DP = differential pressure GP = gauge pressure AP = absolute pressure

Example 1:

Using the tables above, the effect on a differential pressure diaphragm seal system with 2" base and 2 x 2 meter capillary at 30 °C ambient temperature and 50 °C process temperature will be:

DP transmitter effect:	1 x 0.05 mbar (ambient temperature) =	0.05
Chemical seal effect:	3 x 1.2 mbar (process temperature) =	3.60
2 x 2 meter capillary effect:	2 x 2.3 mbar (ambient temperature) =	9.20
	TOTAL =	12.85 mbar

Example 2:

The temperature effect of a pressure gauge seal system with a 63 mm diameter and a working pressure of 20 bar using 2 meters of capillary at 40 °C ambient and process temperatures will be:

Gauge effect:	2 x 13 mbar (ambient temperature) =	26.0
Chemical seal effect:	2 x 7.2 mbar (process temperature) =	14.4
2 meter capillary effect:	4 x 15 mbar (ambient temperature) =	60.0
	TOTAL =	100.4 mbar