



# NSAI

Legal Metrology

## Temperature Compensation of Liquid Fuel Dispensers

Ever wondered why the number of miles you got out of your last tank of petrol or diesel varied slightly from what you got the time before? Perhaps the answer lies in the temperature of the fuel you filled up with. When we buy fuel, we are buying energy. As temperature of the fuel rises, the amount of energy contained in the same volume of fuel decreases. On a cold day (below 15°C), fuel contracts and becomes denser. In these conditions, you will receive fuel which contains more energy per litre (gallon, etc.) Conversely, on a hot day (above 15°C), fuel expands and you will receive less dense fuel. Less dense fuel contains less energy by volume, resulting in higher fuel consumption. This is why the temperature limits of fuel dispensed into Formula 1 race cars are controlled – the cooler the fuel, the more energy you can put into the race cars fuel tank.

As a rule of thumb, the volume of a litre of petrol changes by approximately 1.2ml per 1°C and diesel changes by approximately 0.8ml per 1°C. Temperature compensation on a liquid fuel dispenser using Standard Temperature accounting (STA) ensures that extremes of temperature of the fuel do not result in significant changes in the energy of that fuel. With Standard Temperature Accounting (STA) the volume of the fuel delivered is automatically corrected, so that it is equivalent to the amount that would be delivered at 15°C. This assures that, although the physical volume of fuel changes as its temperature changes, the energy value per litre remains constant. Metrology law permits the use of equipment that corrects physically dispensed volume to a set temperature volume reading.

On a retail forecourt, there is no legal metrological requirement that would prevent STA from being enabled on one dispenser and not on another, providing that the correct markings are shown on the dispenser. Buyers of liquid fuel at a retail forecourt can recognise an STA fuel dispenser by the legend on the faceplate, "Litres at 15°C", or something similar.

Liquid fuel dispensers that are verified with the STA function enabled should remain STA enabled throughout the whole year to avoid consistently favouring the seller or the buyer. Alternatively, if the STA function is disabled then it should remain disabled for the same reason. Switching the STA function "on and off" throughout the year to gain a commercial advantage from seasonal changes in fuel temperature is an offence under the Metrology Act, 1996.

Regardless if STA is installed or not, the dispensed volume must meet the legal tolerances. It is not the intention to introduce regulations to prescribe for STA at this time.

Legal Metrology are currently seeing an increase in the number of retailers using STA and of those liquid fuel dispensers inspected last year.

See [www.nsai.ie](http://www.nsai.ie) for more information on the inspection and verification of liquid fuel dispensers.