Reducing the cost of
hazardous area temperature measurement

Temperature is perhaps the most common process variable to be measured and displayed. Techniques are legion, and depend upon the range, accuracy required and the environment in which the measurement is to be made. From the first mention of a thermometer in the early 1600s, to modern electrical techniques, development has been continuous.

BA474D indicating temperature transmitter

Process temperature measurement initially relied on an artisan's skill which was gradually augmented with mercury in metal gauges and ingenious electromechanical indicators and chart recorders.

While mechanical techniques could safely be used for temperature measurement in explosive atmospheres, electrical measurement systems required protection. In 1938 George Kent Ltd obtained Home Office approval to install meters fitted with flame-proof terminals and intrinsically safe electric clocks in mines and oil refineries. By the early 1960s Kent instruments were having difficulty obtaining similar approval from the Factory Inspectorate for their new transistorised equipment.

It was at about this time that Bob Redding at Evershed and Vignoles published his first proposal for a separate collection of Zener diodes and resistors to limit the current and voltage entering the explosive atmosphere. This shunt Zener barrier could be approved as a stand alone device and removed the need for the safe area instrumentation to be approved. Gradually certified shunt Zener diode safety barriers became universally adopted until the widespread introduction of galvanic isolators in the late 1970s.

However, there are still occasions when the use of a separate certified shunt Zener barrier or galvanic isolator may not be the most economic solution for temperature measurement within a flammable atmosphere and displaying the result in a safe area. By reverting to the original concept of certifying the thermocouple or resistance thermometer input terminals of the safe area temperature measuring instrument, the need for a Zener barrier or galvanic isolator may be eliminated.

The BEKA BA474D field mounting loop powered indicating temperature transmitter employs this concept. The input terminals, which can be safely connected to a thermocouple or resistant thermometer in the hazardous area, are galvanically isolated from the rest of the instrument and include multiple voltage and current limiting components. This ensures that even with two countable component faults, the input remains incapable of igniting a flammable gas or igniting a combustible dust.

The BA474D loop powered indicating temperature transmitter has IECEx, ATEX, FM and cFM associated apparatus certification, allowing it to be installed without the need for a Zener barrier or galvanic isolator as shown in Fig 1.

In addition to displaying the measured temperature, the BA474D transmits a 4/20mA analogue current representing the temperature, plus a HART™ digital temperature together with the status of the thermocouple or resistance thermometer.

Elimination of the requirement for a galvanic isolator or Zener barrier not only reduces hardware cost, but the need to install and maintain it.

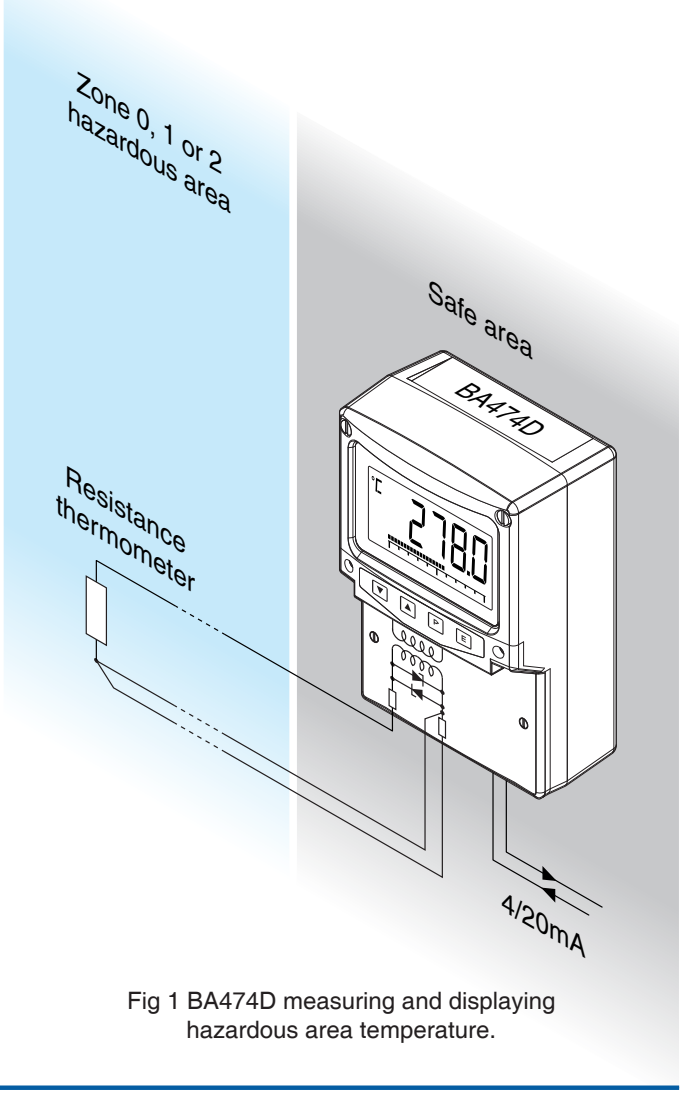

Fig 1 BA474D measuring and displaying hazardous area temperature.