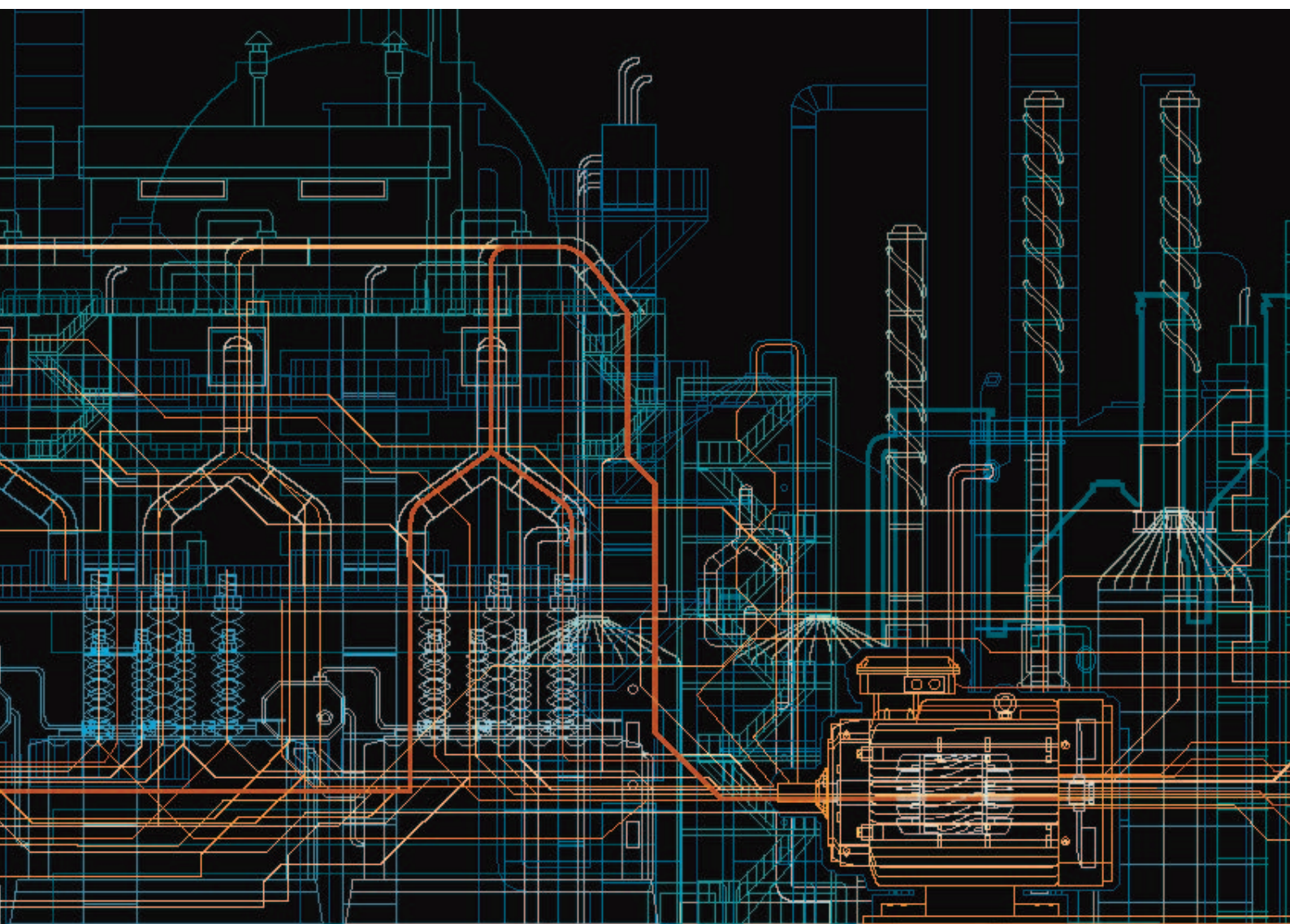

APPLICATION NOTE AN001

Protection for Resistance Temperature Detectors (RTDs)

ESP AN001 for ESP 06D, ESP SL06,
ESP 06Q, ESP RTD, ESP SL RTD,
ESP RTDQ



Protection for Resistance Temperature Detectors (RTDs)

The Resistance Temperature Detector is a widely used device for measuring temperature. In basic terms, the electrical resistance of a sensing resistor, R_t , varies with temperature.

Temperature is simply measured indirectly by reading the voltage drop across the sensing resistor in the presence of a constant current flowing through it using Ohm's Law.

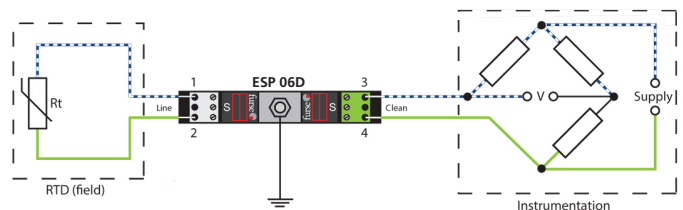
Fundamentally, every sensing resistor is a 2 wire device. It is essential that the resistance values of any external lead wires are taken into account.

2 Wire systems

2 Wire systems offer poor accuracy due to lead resistance but are adequate for some industrial applications.

This type of system can be protected using a single 2-channel ESP 06D or space saving Slim Line ESP SL06 surge protective device (SPD) (ESP 06D illustrated opposite).

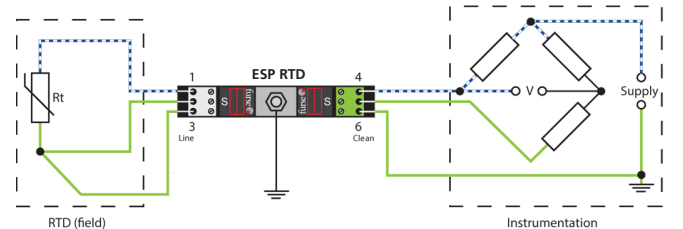
Depending on the accuracy required and application, the sensing resistor is terminated with either 2, 3 or 4 wires. Each type of lead wire arrangement is connected to a suitable bridge circuit in the measuring instrumentation.



3 Wire systems - earthed bridge

3 Wire systems allow for a good deal of lead resistance compensation and therefore offer better accuracy than a 2 wire system.

In a typical 3 wire system, the bridge circuit is earthed as shown in the diagram opposite. It is therefore necessary to protect all three wires.



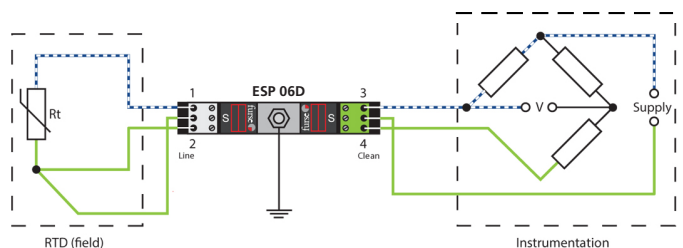
This could be accomplished using two ESP 06D or ESP SL06 SPDs where only 1 channel of the second SPD is utilised. However, this would be bulky and not cost effective due to the unused channel.

The ESP SL RTD and ESP RTD are 3-channel SPDs specifically designed to protect this type of system. All 3 channels are housed in an enclosure identical in size to their respective 2-channel SPD.

3 Wire systems - floating bridge

There are also 3 wire systems where the bridge circuit is not earthed and is said to be "floating".

In this system, a single ESP SL06 or ESP 06D SPD can be used to protect the 2 leads from the bridge arms whilst the third (supply) lead is connected to the SPD's earth via the screen connection (ESP 06D illustrated opposite).



4 Wire systems

4 Wire systems provide the highest accuracy as the lead resistances and connection contact resistances have a negligible effect if the measuring circuit has high input impedance.

The leads are often connected to a constant current circuit.

All 4 channels can be protected using two ESP 06D or OVR SL06 SPDs (ESP SL06 illustrated opposite).

Summary

For 2 wire systems

use 1 x ESP 06D or ESP SL06 SPD

For 3 wire systems (earthed bridge)

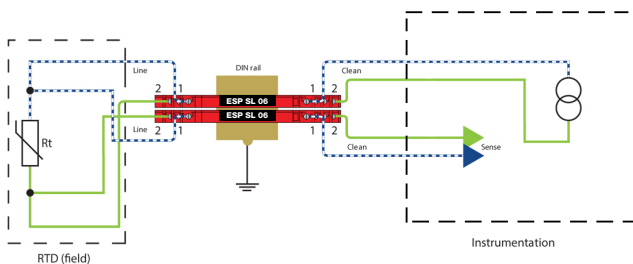
use 1 x ESP RTD or ESP SL RTD SPD

For 3 wire systems (floating bridge)

use 1 x ESP 06D or ESP SL06 SPD

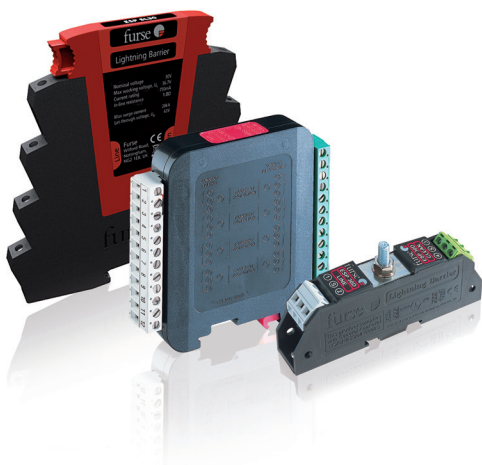
For 4 wire systems

use 2 x ESP 06D or ESP SL06 SPDs



Please note:

Information about safe and correct installation of ABB OVR SPDs can be found in the ESP SPD installation Instructions, supplied with all products.

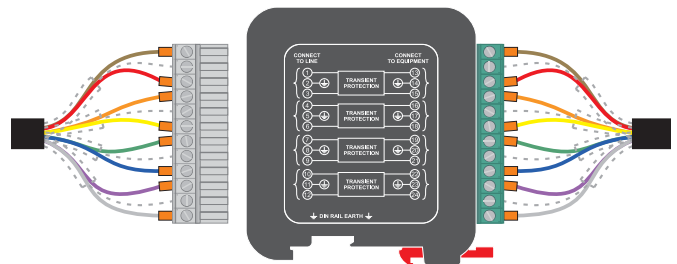


Protecting multiple RTDs

Where there are multiple RTD systems requiring protection, the ESP Q series variants, ESP 06Q and ESP RTDQ, can be utilised.

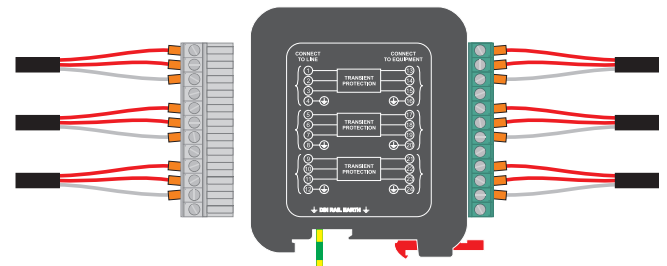
The ESP 06Q provides protection for 4 pairs (8 channels) of wires whilst the ESP RTDQ will protect three sets of 3 wires (9 channels). Diagrams for each type are shown opposite.

Thus space saving potential and cost effectiveness can be realised over the equivalent number of SPDs.



An ESP 06Q unit is capable of protecting:

- Four 2 wire systems
- Four 3 wire systems (floating bridge)
- Two 4 wire systems



An ESP RTDQ unit is designed to protect up to three 3 wire systems with an earthed bridge.

Part No.	ABB order code
ESP 06D	7TCA085400R0079
ESP SL06	7TCA085400R0058
ESP 06Q	7TCA085400R0087
ESP RTD	7TCA085460R0157
ESP SLRTD	7TCA085400R0232
ESP RTDQ	7TCA085400R0158

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