
Rigid vs MI RTDs

Construction

- **SS316 Rigid, Hand-Filled MgO**

This is a straight SS316 tube/pipe. The RTD element and lead wires are placed inside and high purity MgO powder is filled manually by hand and compacted by vibration. The bottom end is welded with a disc and top is sealed with epoxy / ceramic seal. It is a conventional, workshop-made construction. Suitable for stem lengths less than 1 Meter.

- **SS316 Mineral Insulated, Machine-Filled MgO, Flexible**

This is made from Mineral Insulated [MI] cable. It is factory made. A SS316 sheath contains the internal conductors embedded in highly compacted MgO powder, which is filled and then swaged / drawn through precision dies under very high pressure by machine. The entire length is a single, hermetically sealed, highly dense unit. The RTD element is welded to this MI cable.

Rigid, Hand-Filled



**MI, Machine-Filled,
Flexible**



Comparison Table

Parameter	Rigid, Hand-Filled	MI, Machine-Filled, Flexible
Flexibility	Completely rigid. Cannot be bent at site. Straightness must be maintained.	Flexible / Bendable. Can be bent to a radius of ~5x diameter at site for routing, alignment with thermowell, or to avoid obstruction.
Durability & Vibration Resistance	Good for short lengths. MgO compaction density is lower. Approx. 15 to 20% less. Under severe vibration, powder can shift and cause element breakage / insulation drop.	Excellent. Machine swaging gives >95% compaction density. MgO becomes rock-hard. Highly resistant to shock and vibration. Preferred for compressors, pumps, long overhangs.
Temperature Performance & Insulation	Suitable up to 400 to 450°C continuous. Due to lower compaction, insulation resistance [IR] drops faster at high temperatures. Slightly more prone to moisture ingress if seal fails.	Superior. High compaction gives IR >1000 MΩ even at 600°C. Moisture proof due to fully swaged construction. More stable and accurate at high temperatures and long lengths.
Installation / Application	Ideal for short, straight insertions <1 meter where support is available. For length >1 meter, a rigid stem will bend under its own weight, sag, vibrate and can fail. Difficult to handle and transport.	Ideal for lengths >1meter, bent / angled installations, and locations where sensor must be routed through clamps. Does not sag. Easy to install, transport and can be coiled.
Response & Accuracy	Slightly slower response due to loose contact between powder and element.	Faster and more uniform response due to intimate, high-pressure contact of MgO around conductors.
Cost	Lower cost for short lengths. Economical and easy to manufacture.	Higher cost per meter due to cost of MI cable and machine processing. But for >1meter, it is the only reliable and technically correct option. Rigid long stems would cost more due to heavy supports and high rejection rate.

Summary

For shorter lengths, Rigid Hand-Filled is technically adequate, robust and most cost-effective.

For lengths above 1 meter, a rigid stem is not recommended - it will sag, vibrate and is prone to failure. It is an industry standard for long RTDs. It guarantees long life, maintains high insulation resistance, allows bending at site during installation, and withstands vibration.

