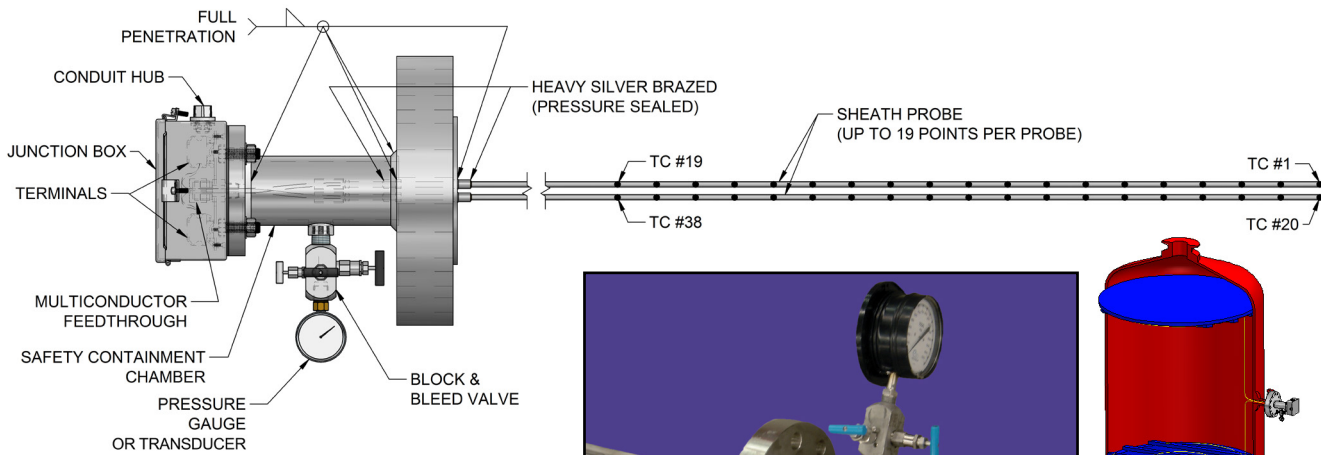


CENTERPOINT



MI CABLE DESIGN AND CONSTRUCTION

DESIGN

- CenterPoint MI cables are 0.070" thick, double-wall design with a 5/16" sheath O.D.
- First wall is 0.035" overlapping second wall of 0.035"
- Second wall acts as a flexible protective thermowell wrapped around a flexible, heavy-walled thermocouple
- Single CenterPoint MI cable can house 19 points of temperature indication, greatest in the industry
- CenterPoint sheath materials are available in any metallurgy
- Thermocouples are available in any calibration
- A single CenterPoint assembly can be designed for complete coverage of a single catalyst bed

Each CenterPoint assembly is custom designed to meet the specification of the Process Licensor, Engineering Company and End User

CONSTRUCTION

- Double wall construction allows the MI cable to be welded to the flange face without damage to the cable caused by localized heat buildup during the welding procedure
- Drawing and Annealing sheath material provides a flexible housing for the thermocouples
- Restricting process flow (should the sheath integrity become breached) is tightly packed Magnesium Oxide insulation
- No special tools necessary for making long bends
- Tubing benders required for tight radius bends

COLD END DESIGN

- Pressure gauge directly tied to flange penetration creating secondary safety system
- Eliminates the need for additional welded or flanged safety chamber
- Reduced flange face penetrations maintains flange integrity
- Double block and bleed valve designed to bleed off trapped hydrogen or process fluids
- Each junction is equipped with a 10,000 psi pressure fitting,
- All welds are full penetration welds
- Bare wire feedthrough seal ensures no tunnel through safety containment chamber

CenterPoint provides optional secondary containment chambers available to meet the design needs and specifications of the customer

SAFETY BENEFITS

- Rapid speed of response time: Real time temperature measurements
- 96% of a 100 degree step change in 3 to 8 seconds
- Eliminate temperature excursions on high temperature, high pressure
- Radial spread determines "hotspot" locations near reactor walls
- Reduce/replace many reactor skin thermocouples
- Can be tied into the EMS system

MULTIPOINT

PERMANENT & REPLACEABLE MULTIPOINT SENSOR DESIGNS AVAILABLE

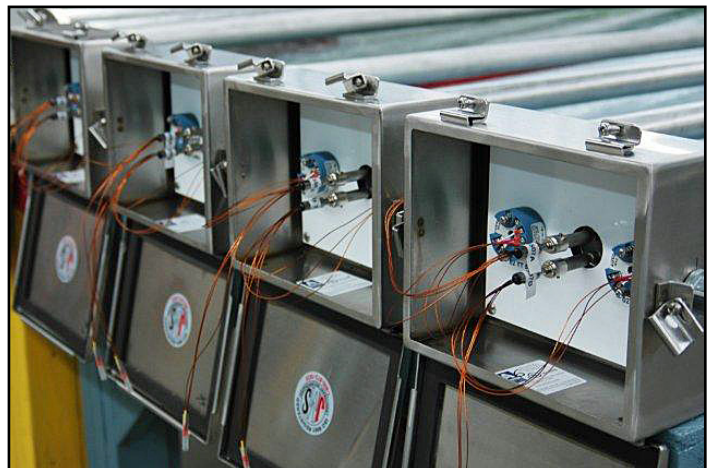
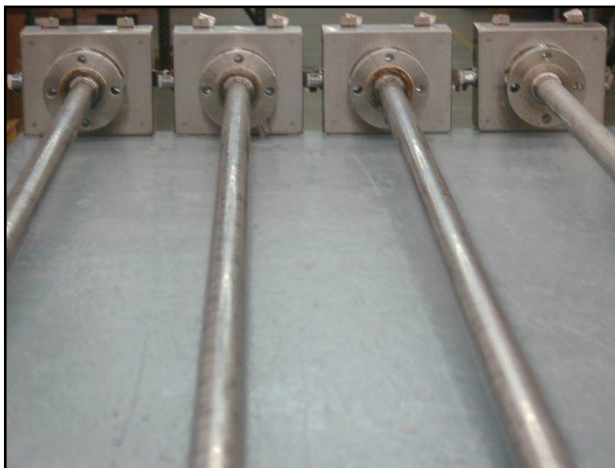
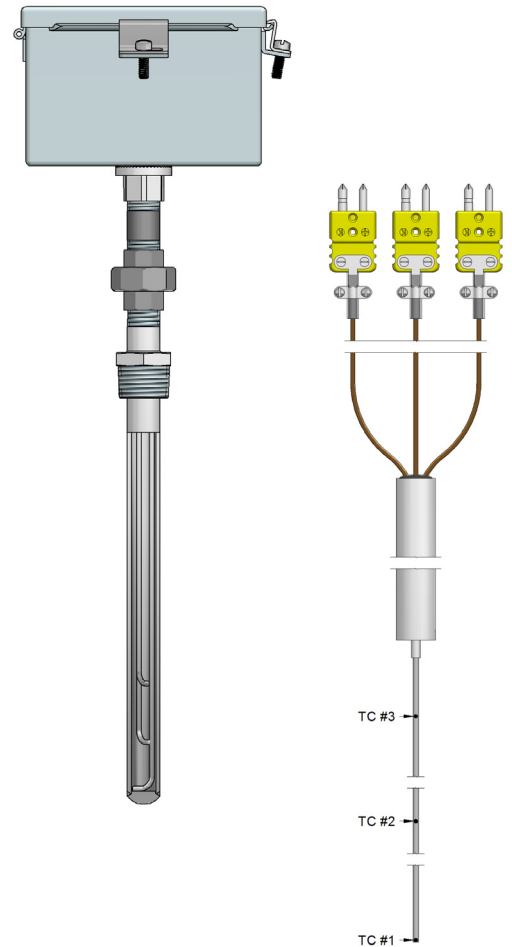
Note: For flexible high temperature reactor design, see next two pages.

A multipoint sensor allows the measurement of a temperature profile across a large area. Thermocouples or RTDs are arranged with measuring junctions at various points along a pipe, allowing the measurement of various points from a complete assembly. Many elements can be spaced along a probe.

This opens up possibilities for improved profiling in reactors, for example, where flow interference prevents inserting large numbers of individual probes. Multipoint probes can also be used to give a temperature profile where stratification of a tanks contents may be of concern. JMS will custom design your assembly to give you the most accurate temperature measurement for your process.

The following information and/or drawing is needed to properly design your assembly:

- Thermocouple calibration or RTD element type
- Outside diameter of pipe and pipe material
- Junction style of thermocouple
- Sensor material (bare wire, 316 SS tubing, or sheath material)
- Overall length of the entire assembly
- Process connection
- Accuracy required
- Cold-end termination
- Maximum operating temperature



Averaging or discrete point measurement available upon request.

JMS will generate a drawing for your assembly.