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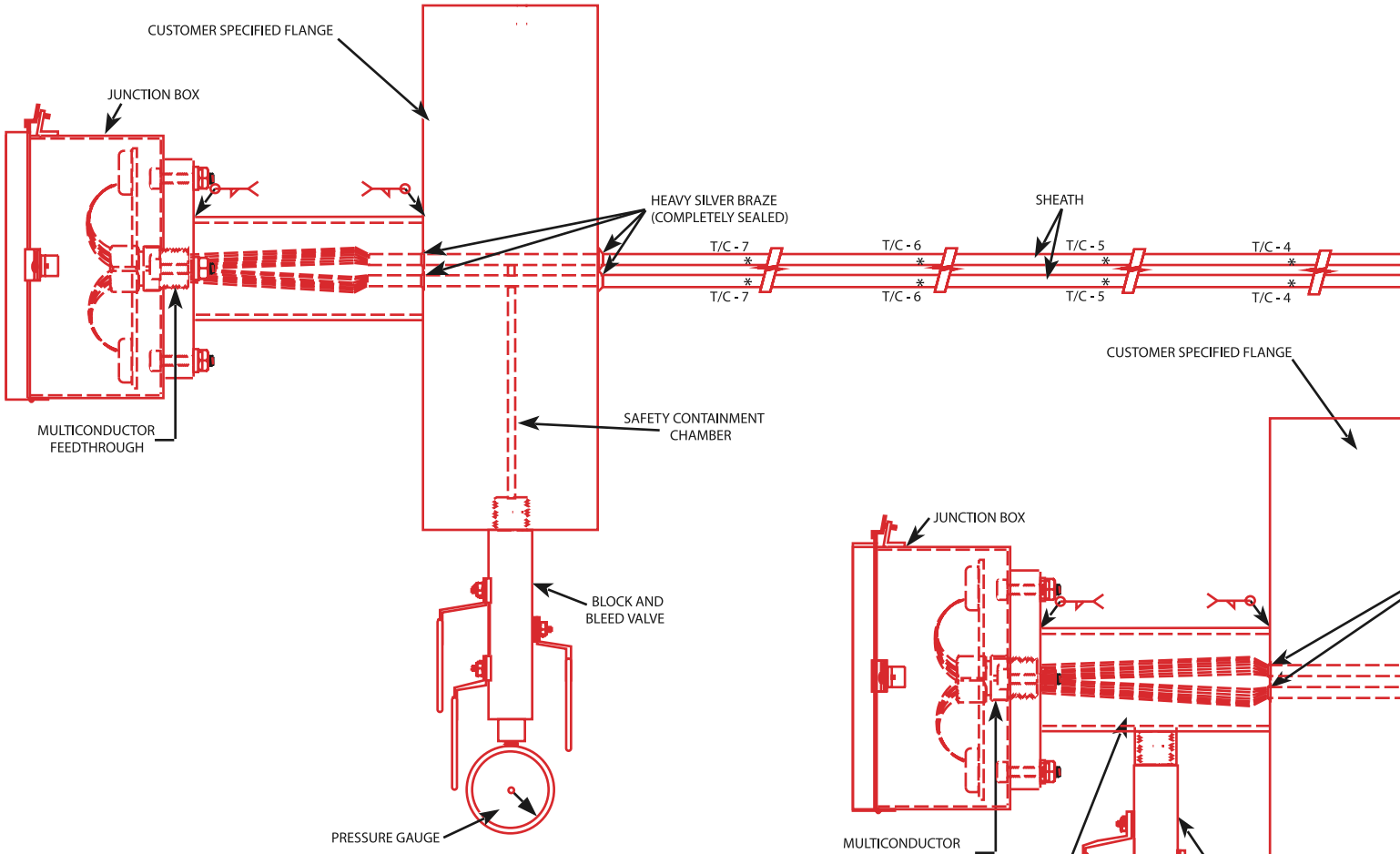
MS Centerpoint

Flexible multipoint thermocouples for process reactors



MI Cable Design and Construction

DESIGN

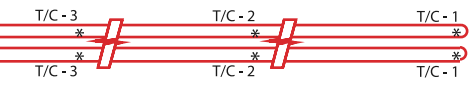
- ***CenterPoint MI cables are 0.070" thick, double-wall design***
- ***First wall is 0.035" overlapping second wall of 0.035"***
- ***Second wall acts as a flexible protective Thermowell wrapped around a flexible heavy walled thermocouple***
- ***Single CenterPoint MI cable can house 16 points of temperature indication, greatest in the industry***
- ***CenterPoint sheath materials are available in all standard thermocouple materials***
- ***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

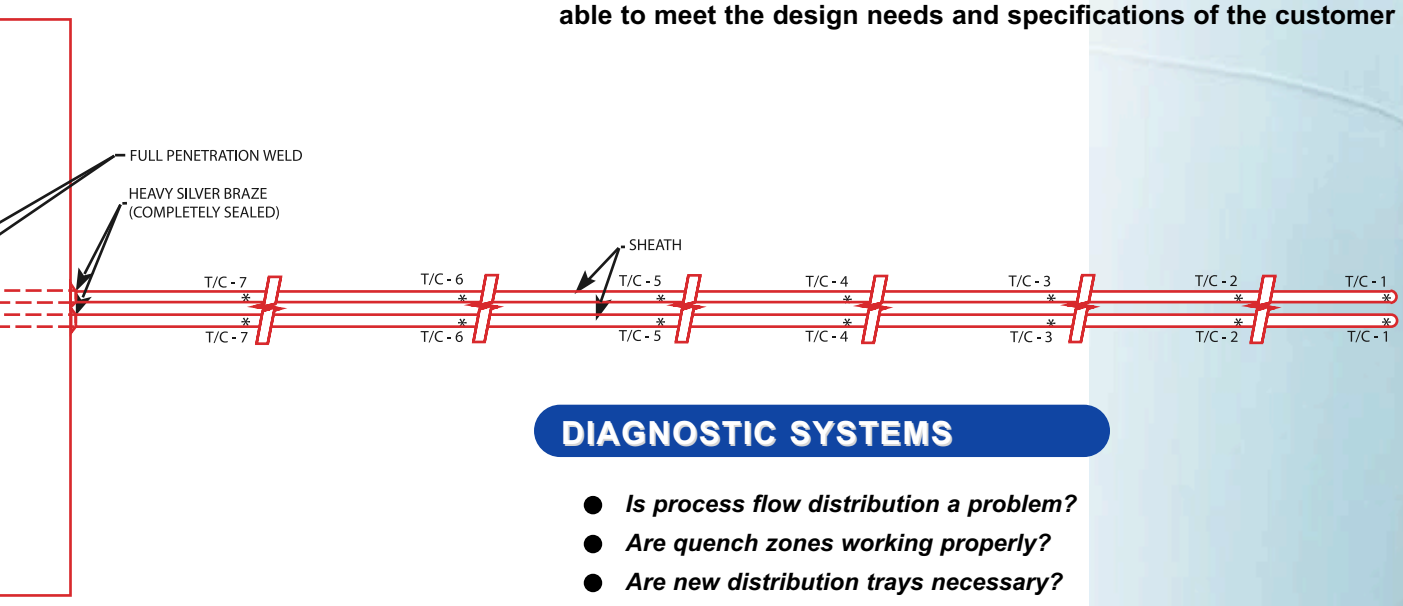
- ***Double wall construction allows the MI cable to be welded to the flange face without damage to the cable caused by localized heat buildup during the welding procedure***
- ***Drawing and Annealing sheath material provides a flexible housing for the thermocouples***
- ***Restricting process flow (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 a flange penetration, safety containment chamber (or both) creating primary (and secondary) safety systems*
- *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 8,000 psi pressure fitting,*
- *All welds are full penetration welds*

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



DIAGNOSTIC SYSTEMS

- *Is process flow distribution a problem?*
- *Are quench zones working properly?*
- *Are new distribution trays necessary?*
- *Is process channeling occurring?*
- *Does the reactor exhibit areas of localized catalyst coking?*
- *Are heat related problems causing out-of-specification products?*

SAFETY BENEFITS

- *Rapid Speed of Response time: Real time temperature measurements*
- *Eliminates temperature excursions*
- *Radial spread determines "hotspot" locations near reactor walls*
- *Reduce/ replace many reactor skin thermocouples*
- *Can be tied into the EMS system*
- *Redundancy – A duplicate sheath can be installed alongside the original at time of installation*

Can put as many temperature sensors into the reactor bed at any discreet point location in the catalyst bed where you want "real-time" temperature indication.