MULTIPOINT TEMPERATURE SENSORS

REACTOR & FURNACE MULTIPOINT TEMPERATURE SENSORS

FLEXIBLE, BENDABLE FREE HANGING STYLES

&

RIGID PROTECTION TUBE DESIGNS

ML7000

thermo-electra

temperature sensor solutions

Thermo-Electra Thermocouple and RTD Multipoint Temperature Sensors

Thermo-Electra multipoint sensors are designed for single entry process connection and measure temperature at different points along its length within Catalytic Crackers, Pressurized Reactors, Distillation Columns, Tanks and many other applications. Available in a wide variety of process connections, fixed or remote junction boxes with optional built-in Transmitters, Explosion proof enclosures and other safety items. Flexible versions for coiled shipping or versions with a sturdy protection tube design, using contact leaf springs , bimetal springs or a design with guiding tubes allowing individual sensor replacement during operation. Direct spring loaded sensor to wall contact at the measuring points, or through internal welded heat transfer blocks which ensure the best thermal conductive contact with the inner wall of the protection tube or thermowell.

The different systems offer a large number of possibilities to measure the temperatures in the harshest environments and conditions, having a high pressure single or double sensor feedthrough sealing and designs with safety chamber, bleed valve and pressure gauge options.

ML7038 series design options

- multiple measuring points along the length
- thermocouple or RTD Pt100 sensors
- fixed or replaceable with guiding tubes
- radial spring design
- laminated leaf spring design
- bimetallic spring design
- wide selection of junction boxes & materials
- integrated loop powered transmitters
- fixed or remote junction box
- up to 60 measuring points
- protection tube and thermowells
- secondary pressure containment
- mineral insulated cables
- stainless steel, hasteloy, inconel etc.
- explosion proof designs

Thermo-Electra can engineer a custom design for any application

Contents

Thermo-Electra ML7038 Series

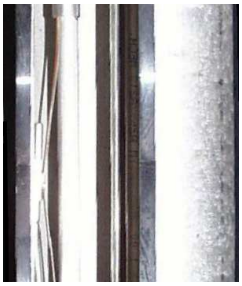
Multipoint thermocouples and Pt100 RTD's are mainly used in chemical reactors, distillation columns, fractionators and storage tanks & vessels for profiling temperature measurements and hot-spot detection. Pt100 RTD versions are mainly used in LNG storage applications. Custom Designed to fit the application and can be of any length, and are constructed to withstand extreme working temperatures and pressures. A junction box suitable for the ambient conditional and area classification is provided with terminal connections or transmitters, an extension tube to place the junction box away from the radiated vessel heat. The process connection flange which mates the vessel instrumentation nozzle flange is welded to welded closed-end pipe well, protecting the internal thermocouples or RTD's sensors from the extreme process conditions. Hazardous area options: Atex and IECEx Explosion proof certification: Ex d Flameproof, Ex e Increased Safety, Ex i Intrinsically Safety and for Dust ta/tb.
Below some system details showing proper heat conduction from inner thermowell wall to the measuring sensor tip.

ML7038B

Guiding tube design

ML7038C

Positive contact design

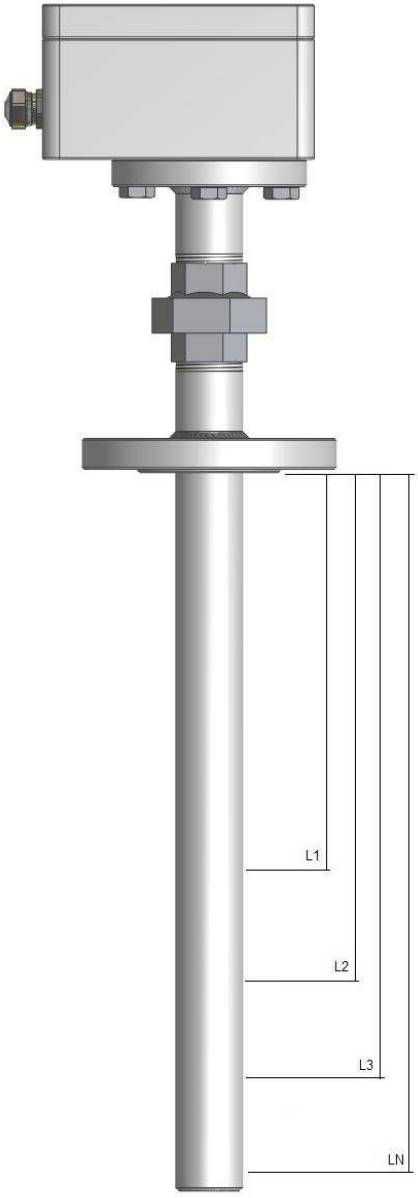


ML7038D/7038E

Leaf and Bimetal spring design

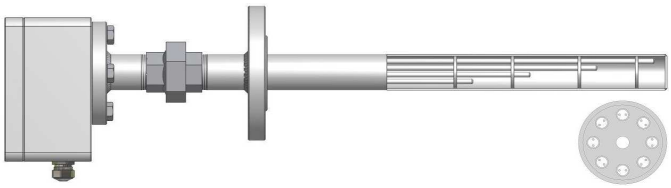
ML7060

Balloon spring design



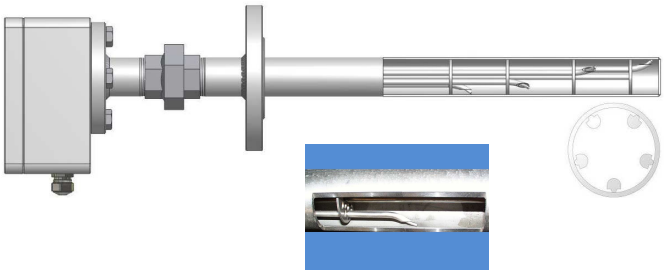
Thermo-Electra ML7038A

Mineral insulated Thermocouples or Pt100's with measuring points at desired length, bundled or mounted with spacers. Suitable for direct medium contact with open or perforated thermowells or where the bundle diameter tightly fills up the inner area of the thermowell to reduce thermal lag.



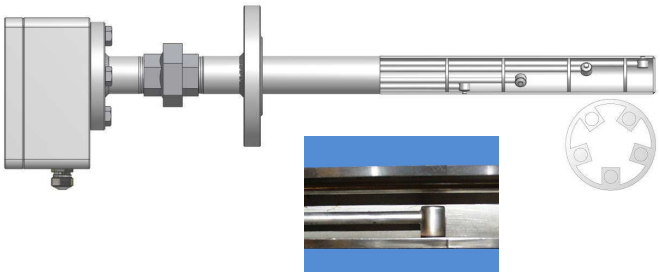
Thermo-Electra ML7038B Multipoint with guiding tube system

Individual guiding tubes, centered with spacers, each tube having independent springloaded thermocouples or Pt100 inside, individually replaceable sensors. Spacer discs prevent rotation of the guiding tubes and centre the multipoint into the thermowell.



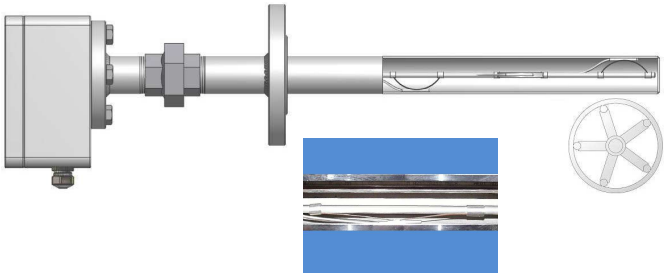
Thermo-Electra ML7038C Multipoint with heat transfer blocks

Multipoint where each individual single guiding tube is attached by a welded contact block into the thermowell becoming an integral part of this thermowell. This is the most common and reliable multipoint design. Easy maintenance due to individually replaceable springloaded thermocouples or Pt100 elements.



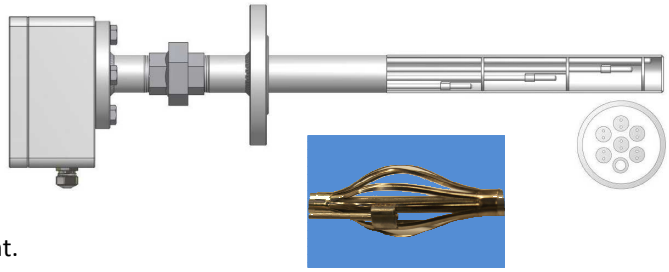
Thermo-Electra ML7038D Multipoint with contact block system

High temperature leaf shaped spring design guarantees a good and stable spring function within a large temperature range up to 500°C. A leaf shaped spring presses and holds the hot junction to the inner wall of the protection tube. Spring loaded multipoints respond quickly to temperature changes.
strip allowing the sensor to follow the contour of the protection tube

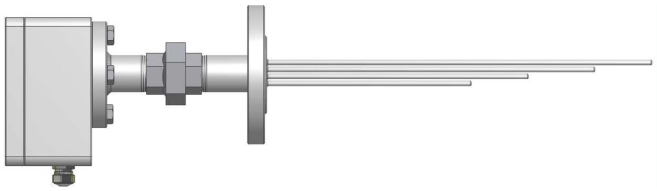


Thermo-Electra ML7038E

The bimetal laminated springs are welded onto a strip allowing removal and replacement of the complete thermocouple bundle during operation. At process temperature the bimetal springs shall bend outwards and produce an internal pressure of 40kPa between sensor and the internal thermowell wall, creating sufficient pressure for reliable and accurate temperature measurement.

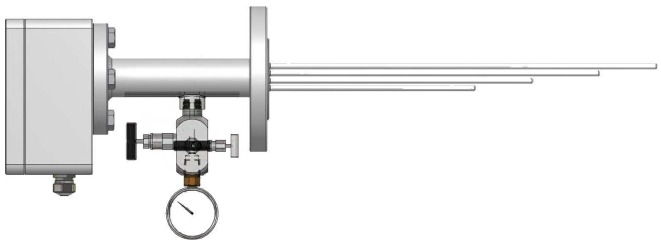


Thermo-Electra ML7038F



Free hanging reactor multipoints are designed to be routed freely around the internal circumference of a reactor and guided inwards to the required measuring point. Advantages are: a flexible mineral insulated bendable cable, offering a greater area coverage. A redundant system by a multiple independent system which measures cross sectional and radial temperatures. The sensors are having a metallic sheath, such as Stainless Steel. Hasteloy, Inconel etc, and can have a standard, heavy or double wall. Accessories for these assemblies such as metallic supports, wall brackets and welding clips are available in a wide material selection range.

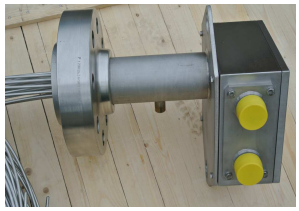
Double Seal Safety chamber



Free hanging reactor sensors normally have a single primary pressure boundary. For safety we have designs with a secondary pressure sealing & containment. In case of a failure of the primary sealing, such as leakage, the safety chamber prevents the escape of process fluids or gases. Optional a bleeding valve and indicator, can be added. Many types of seals are available.

High pressure brazed feed through

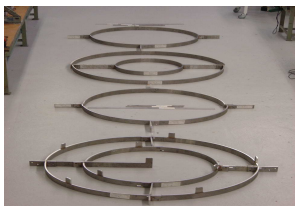
Each Thermocouple or RTD sensor is independently routed through the process flange, and can have a seal welding or a high temperature/pressure seal brazing to obtain maximum safety, and serve both Hydrocracker and Hydrotreater vessels



Thermo-Electra ML7038F

Individual Free hanging multipoints assembies are supplied without an outer protection tube and can be coiled for shipment.

Complementary mounting support brackets and rings to suit the Vessel

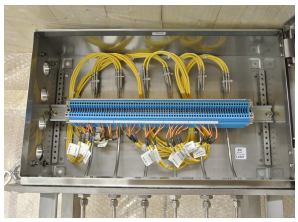


Brackets and mounting accessories from Stainless Steel or other materials are custom made to suit the vessel interior, and optimal sensor routing to obtain the best temperature location for a 3D temperature profile.

Metallic supports
Welding clips
Technical design support

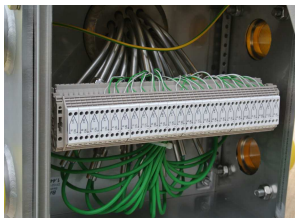
Side wall brackets
Stainless Steel Bolts & Nuts
Additional hardware

Junction Box with DIN-rail Terminals



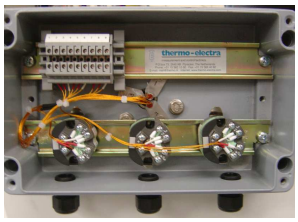
Thermocouples and RTD's are terminated with DIN rail terminals. All terminals are numbered and a connection diagram is attached on the inside of the lit of the junction box.
The terminal configuration can be either for connecting the sensors only, or optional a number of spare terminals or wired terminals for transmitter connections. A Pt100 RTD temperature sensor can be added within the junction box to measure the temperature of the terminals.

Junction Box with Thermocouple Terminals



Thermocouples are terminated with dedicated thermocouple DIN rail terminals. The calibration is exactly the same as the thermocouple type used in the assembly. When using these kind of terminals, the sensor signals are free of errors introduced due to the ambient temperatures of the junction box. The connected compensating or thermocouple extention cables ensure proper thermocouple signals without cold junction effects.

Single Input Temperature Transmitters



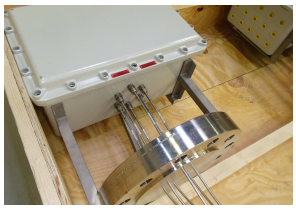
Temperature converters, single channel loop powered can be placed into the junction box, having an analog process signal of 4-20 mA, or a digital transmitter with Hart, Profibus or Fieldbus protocol.
These "Hockey puck" style transmitters are mounted on a Din rail, and are easily to service or replace. All transmitters can have Hazardous area certification to suit the zone 0, 1 or 2 application.

Multi-Input Temperature Transmitters

Multi-Input Temperature Transmitters from established brands can be mounted, at clients choice such as the 8 input Yokogawa YTMX580 , Rosemount 848T, SMAR TT383 etc.

Thermo-Electra Multipoint Sensors can be manufactured with built-in transmitters for the several platforms such as Fieldbus, Profibus, Hart and can be hard wired or Wireless.

Junction Box Selection

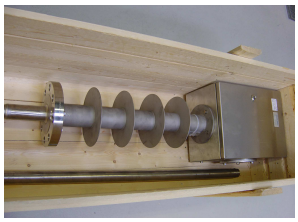


The Junction box is available in a wide choice of materials and Ingress Protection (IP) ratings, to suit the environment. The Junction box materials most used are Stainless Steel, Aluminium, Polycarbonate and Cast Iron. Threaded conduit connections and cable glands can be placed at the sides or bottom of the junction box. The junction boxes and sensors can be Explosion proof Certified to suit the hazardous area. The junction box dimensions are determined by the number of sensors, transmitters and terminal strips.

Remote Junction Box

In many cases a remote mounted junction box offers solutions for having easy access to the junction box with built-in transmitters and terminals. The flexible extension cable can be a multipair screened and armoured cable or a stainless steel gas and watertight hose. In case of elevated temperatures, high temperature resistant versions are possible.

Heat radiation shielding



To prevent high temperatures in the junction box, where terminals and electronic transmitters are placed, radiation shields on the head extention piece are welded, serving as free to air cooling fins protecting the junction box from vessel radiation heat.
The extention piece at the same time minimize conducted heat from the elevated vessel temperatures.
Cooling fins are in standard made from Stainless Steel, and are made in the form of a disk.

Bended Thermowell

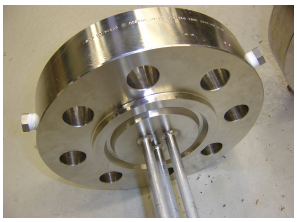
Multipoint protection thermowells can be made to customer demands, including bendings to suit the vessel they shall be used in. The internal thermocouple bundle has been designed in such way that it is retractable and replaceable. The thermowell does not have to be dismounted from the vessel to replace the sensor bundle.

S

Single tube with multiple sensors

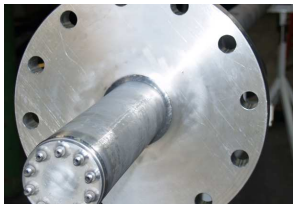
Temperature measurement along the tube length is possible up to 60 independent measuring points into a single protection tube. The internals design is such that the sensor tube may be bended without getting wrinkles, creases or folds on the protection tube. These sensors offer a great advantage, as they can be shipped coiled and allow easy mounting.

Multi-tube with multiple sensors



Temperature measurement allong the tube length is possible up to 60 independent measuring points into each single protection tube. The internal design is such that the sensor tube may be bended without getting wrinkles, creases or folds on the protection tube. The sensors protection tubes can also be made from thick wall tubes, welded to one other, getting a rigid straight insertion.

Compression fittings



The upper part of the safety chamber is standard equipped with double ferulle type stainless steel compression glands, ensuring a high pressure boundery. A welded primary and secondary boundery are possible also, depending of the requirements.

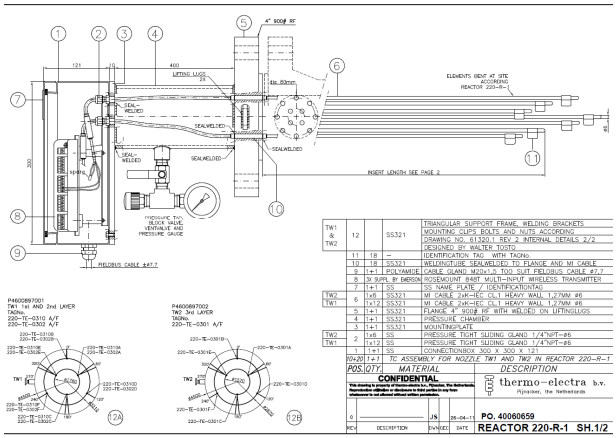
Instrumentation Feedthroughs

Soft sealant compression fittings allows single sensor or bundle replacement / calibration.
Sealant material specifications:

Neoprene	temperature range	-40°C to +93°C	Vacuum to 345 bar
Viton	temperature range	-20°C to +232°C	Vacuum to 690 bar
PTFE	temperature range	-185°C to +232°C	Vacuum to 220 bar
Lava	temperature range	-185°C to +870°C	1 bar to 690 bar
Grafoil	temperature range	-240°C to +495°C	Vacuum to 690 bar

Thermo-Electra

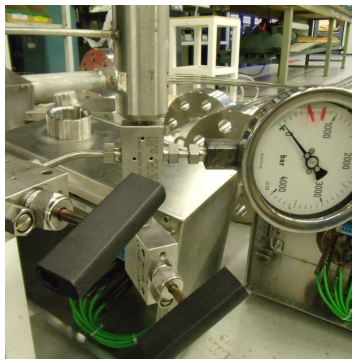
Multipoint thermocouples and Pt100 assemblies made by Thermo-Electra meet the highest quality standards. Testing of the sensors and materials include: Dye Penetrant (DPI/LPI), Helium leakage testing, Hydrostatic pressure test (both internal and external), X-Ray examinations (RT), Ultrasonic testing (UT), Positive material identification (PMI), Thermocouple and RTD sensor calibration to IEC/NIST, Electrical insulation test, Third party inspection.



Detailed drawings by the engineering department for client approval and databook

Internal pressure testing

PMI material identification



External pressure testing

Assemblies ready to go

thermo-electra
temperature sensor solutions

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