Data sheet DS/TSM800–EN

TSM800
Multipoint temperature sensor

For continuous production process vessels in the Oil & Gas, Petrochemicals and chemicals industries

Measurement made easy



Designed to suit the application
— Solutions individually tailored to the application
— A range of options to suit every application
— Data capture form to gather all the relevant information

Manufactured to the highest standards
— ASME welding procedures
— Full material traceability
— ISO29001 certified quality system
— A full suite of NDT available on request

Documented to prove it
— Oil & Gas industry level of documentation

Safe Tough and Reliable

EUROTEC
TECNOLOGIE IMPIANTISTICHE - AUTOMAZIONE - TELECONTROLLO

Power and productivity
for a better world™

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Multipoint temperature

What is multipoint?

— Any instrument that measures more than one temperature point utilizing a single access point into the vessel can be considered as a multipoint. This is distinct from a temperature sensor with two sensors measuring the same point. Normally a multipoint is mounted into a vessel rather than a pipeline.
— The design and dimensions of a multipoint vary depending on the service required, position of the sensors, size and shape of the vessel, corrosion, erosion, pressure and temperature environment within the vessel and the plant communication output required.
— Multipoints are engineered solutions, the quality of which depends on the chosen supplier.

What measurement methods are there?

— Most multipoints use thermocouple sensors. These sensors are physically flexible, have a wide temperature operating range and are extremely robust.
— There are a wide range of thermocouple types available for different temperature ranges and signal accuracy.
— Typical types of thermocouples are:
  — Type K –270 to 1370 °C (–454 to 2498 °F) with better than 1.5 °C (34.7 °F) accuracy
  — Type N –270 to 1300 °C (–454 to 2372 °F) with better than 1.5°C (34.7 °F) accuracy
  — Type J –270 to 760 °C (–454 to 1400 °F) with better than 1.5 °C (34.7 °F) accuracy
  — Others available on request
— Some designs can use resistance elements as the primary sensor. These are more accurate over a much reduced temperature range and are not as robust when compared to thermocouple sensors.
— All ABB multipoint sensors use fully metal sheathed cable with ceramic insulation.

What designs are available?

— Almost limitless; multipoints can be designed to include process piping, reducing even further the number of pressure vessel connections. ABB engineers are available to assist with the design of a system that matches your needs.
— To illustrate the design principles available, ABB offers five basic designs of multipoint covering distinct and typical needs. If your need is not described, don't worry – this is just a starting point.
— The compact thermocouple; designed where space is at a premium. This design uses a single multicore cable to produce a multipoint sensor that can be as thin as 3.18 mm (0.12 in.) in diameter.
— The flexible multipoint; designed primarily for retrofitting into an existing thermowell, with the ability to cater for curvature or deformation in an existing plant.
— The guided tube multipoint; where thermocouple cables are guided within a thermowell. Each individual sensor can be replaced in service without the need to shut the operating plant down.
— The Medusa Thermocouple multipoint; multiple free-hanging sensors from a single process connection can be routed to exactly where they are needed within the vessel.
— The Medusa RTD multipoint; is the same principle as the thermocouple design but using the industry-standard PT100 platinum resistance sensor.

Compact Thermocouple multipoint

— Thermocouple type K, N, J or E.
— Minimum distance between points 26 mm (1 in.).
— Tolerance on point position ±25 mm (1 in.).
— Minimum bend radius 10 times sheath diameter.
— Maximum pressure 69 bar (1,000 psi).
— 3.18 mm (0.125 in.) cable up to 7 measuring points maximum length 487 m (1600 ft.).
— 4.78 mm (0.188 in.) cable up to 10 measuring points maximum length 213 m (700 ft.).
— 6.35 mm (0.250 in.) cable up to 16 measuring points maximum length 121 m (400 ft.).

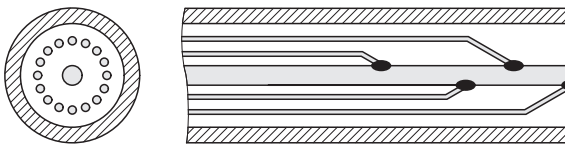


Fig. 1: Cross-sections of cable and junctions

Flexible thermocouple multipoint

— Thermocouple type K, N or J others on request.
— 3 mm (0.11 in.) cable sensors arranged along a flexible band and pushed to the outer wall of the thermowell by a spring arrangement.
— Minimum distance between points 100 mm (4 in.).
— Tolerance of point position 25 mm (1 in.).
— Maximum pressure dependant on external thermowell.
— Minimum bend radius 600 mm (2 ft.).
— Maximum sensor length 20 m (65 ft.).
— Maximum number of measurement points 5 for thermowell diameter less than 50 mm (2 in.) Schedule 80 and 6 points for larger sizes (may depend on connection flange or coupling size).

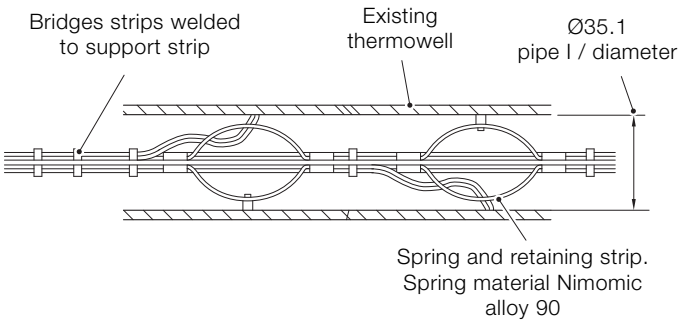


Fig. 2: Flexible thermocouple multipoint

Guided tube thermocouple multipoint

— Thermocouple type K, N or J others on request.
— 3 mm (0.12 in.) cable sensors guided to the thermowell wall by 6 mm (0.23 in.) tubes, to allow for removal while the process is still running.
— Minimum distance between points 50 mm (2 in.).
— Tolerance of point position 25 mm (1 in.).
— Maximum pressure dependent upon external thermowell, supplied by ABB. Thermowell design pressure is dependent upon process temperature, material chosen and thickness of material. Please specify design pressure and temperature upon request for quotation.
— Minimum bend radius not applicable as normally this unit is straight to enable sensor exchange.
— Maximum sensor length 22 m (72 ft.).
— Maximum number of measuring points – see Table 1:

Min. flange size (ANSI)	Max. flange size (ANSI)	Max. number of points	Max. length	Thermowell pipe size (ANSI)	Max. Pipe Schedule (ANSI)
1 ½ in.	3 in.	4	22 m (72 ft.)	1 in.	10
2 in.	3 in.	6	22 m (72 ft.)	1 ½ in.	80
3 in.	–	10	22 m (72 ft.)	2 in.	80
4 in.	–	12	22 m (72 ft.)	2 ½ in.	80
4 in.	–	16	22 m (72 ft.)	3 in.	80
6 in.	–	16	22 m (72 ft.)	4 in.	80

Table 1: Maximum number of measuring points

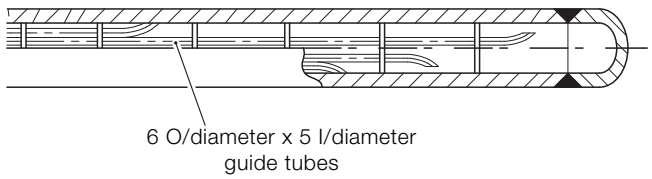


Fig. 3: Guided tube thermocouple multipoint

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Medusa thermocouple multipoint

— Thermocouple type K, N or J others on request.
— 3 mm (0.12 in.) or 6 mm (0.23 in.) cable sensors, free-hanging for routing to the desired position within the vessel.
— Tolerance of point position 5 mm (0.2 in.).
— Maximum pressure 69 bar (1,000 psi).
— Minimum bend radius 30 mm (1.18 in.) for 3 mm (0.012 in.) cable or 60 mm (2.36 in.) for 6 mm (0.23 in.) cable.
— Maximum sensor length 40 m (130 ft.).
— Maximum number of sensor points 3 mm (0.12 in.) cable – see Table 2:
— Maximum number of sensor points 6 mm (0.23 in.) cable – see Table 3:

Min. flange size (ANSI)	Max. flange size (ANSI)	Max. number of points	Max. length
3/4 in.	1 1/2 in. NPT	5	40 m (130 ft.)
1 in.	–	5	40 m (130 ft.)
1 1/2 in.	–	8	40 m (130 ft.)
2 in.	–	12	40 m (130 ft.)
3 in.	–	16	40 m (130 ft.)
4 in.	–	16	40 m (130 ft.)
6 in.	–	16	40 m (130 ft.)

Table 2: Maximum number of sensor points 3 mm (0.12 in.) cable

Min. flange size (ANSI)	Max. flange size (ANSI)	Max. number of points	Max. length
1 in.	–	3	40 m (130 ft.)
1 1/2 in.	–	4	40 m (130 ft.)
2 in.	–	6	40 m (130 ft.)
3 in.	–	10	40 m (130 ft.)
4 in.	–	15	40 m (130 ft.)
6 in.	–	15	40 m (130 ft.)

Table 3: Maximum number of sensor points 6 mm (0.23 in.) cable

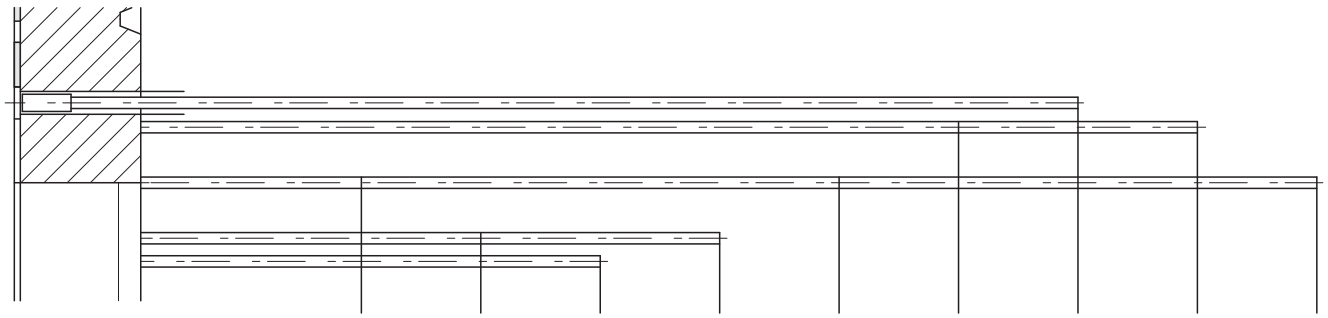


Fig. 4: Medusa thermocouple multipoint

Medusa RTD multipoint

— PT100 class A as standard other RTD available on request.
— 6 mm (0.23 in.) cable sensors free hanging for routing to the required position within the vessel.
— Tolerance of point position 5 mm (0.2 in.).
— Maximum pressure 69 bar (1,000 psi).
— Minimum bend radius 60 mm (2.36 in.) for 6 mm (0.23 in.) cable.
— Maximum sensor length 40 m (130 ft.).
— Maximum number of sensor points 6 mm (0.23 in.) cable – see Table 4:

Min. flange size (ANSI)	Max. flange size (ANSI)	Max. number of points	Max. length
1 in.	–	3	40 m (130 ft.)
1 1/2 in.	–	4	40 m (130 ft.)
2 in.	–	6	40 m (130 ft.)
3 in.	–	10	40 m (130 ft.)
4 in.	–	15	40 m (130 ft.)
6 in.	–	15	40 m (130 ft.)

Table 4: Maximum number of sensor points 6 mm (0.23 in.) cable

Special design multipoint

— Where none of the designs above meet the needs of your application ABB can work with you to provide a solution.
— Please give as much information as you can to our local representative to be passed to the Engineering team.
— A hand-drawn sketch is of great assistance to our team, together with as much information on the vessel, process and measurement required as possible.
— Truly innovative solutions are possible and, given time, our Engineers can provide a suggestion that, working with you, can be refined to a solution.

Hazardous area classifications

— Intrinsic safety can be provided by using transmitters designed and manufactured by ABB. Each individual sensor can be connected to a transmitter to provide a 4 to 20 mA output with HART. The transmitters are mounted in an enclosure rated to a minimum of IP65.
— Increased safety can be provided by terminating thermocouple or RTD cables using suitable certified connectors. The connectors are mounted in an enclosure rated to a minimum of IP65.
— Explosion-proof safety can be supplied by using an enclosure certified for the appropriate certification body.
— All ABB multipoints are constructed in such a way that a gas-tight seal is maintained between the process and the instrument enclosure. The guided tube design benefits from this and the thermowell provided by ABB.
— Sensor elements are considered as simple apparatus in that they are incapable within themselves of producing or storing enough energy to produce a spark.
— All temperature multipoint systems should be grounded to the plant via the connection provided to prevent any build-up of static electrical energy that could cause a spark.
— Different zones and different certification bodies require different approaches. ABB engineers, while trained in hazardous area approvals, are not qualified to offer assistance with the design of safety related systems or recommend specific approaches to solving safety issues. They can advise on what is available and at what cost. More detailed discussion of these issues must be through a certified safety engineer.

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Thermowell materials

— Thermowell materials need to be considered in the context of the plant installation. Physical strength to resist the pressure of the process. Corrosion considerations and erosion need to be taken into account.
— Working in cooperation with client engineers ABB engineers can advise on the consequences of material selection on product price. Plant engineers have the ultimate responsibility for material suitability ABB engineers can assist with this process and discuss the implications of various choices available.
— ABB has a policy of total integrity in business dealings, including technical integrity. ABB engineers will point out decisions that conflict with design codes and offer a compliant solution. However, we will accommodate local expertise and adhere to local decisions where these decisions are given to ABB in writing. We strongly recommend that the advice of ABB engineers is taken into serious consideration and that the safety implications of deviations from codes are considered very carefully.
— Almost any material can be used to make a thermowell; ABB thermowells are exclusively manufactured from metals. ABB has welding procedures for stainless steels and high nickel alloys in various forms and thicknesses. Coating of base materials with hard erosion resisting materials is not uncommon. Painting of atmospheric exposed parts is also not uncommon.
— Whatever the needs of your process ask our engineers to assist.

Head mounted transmitters

— Where required, head-mounted transmitters can be included in the scope of a multipoint measurement system.
— Converting week sensor signals into robust plant communications signals at the first opportunity is advantageous.
— ABB head-mounted transmitters are designed and manufactured for the needs of process industries with a minimum of HART communications.
— The TTH200 is a single sensor input device with 4 to 20 mA output and HART. A digital display can be connected to the device without loading the current output – refer to DS/TTH200-EN for further details.
— The TTH300 transmitter can accommodate two sensor inputs and provide automatic redundancy if it detects a failure with one of the sensors. A digital display with local programming functions is available that will not load the current output. Full bus technology is also available with a fieldbus version of the TTH300 in either Foundation Fieldbus or Profibus – refer to DS/TTH300-EN for further details.

Ordering guide

		Main code				
Sensor	**TSM800**	**X X**	**XX**	**X X X X X X**	**X X**	**X X X**
Hazardous area						
Safe Area		0 0				
IECEX ia		1 1				
IECEX d		1 2				
ATEX ia		2 1				
ATEX d		2 2				
FM intrinsically safe		3 1				
FM flame-proof		3 2				
FMc intrinsically safe		4 1				
FMc flame-proof		4 2				
Design style						
Compact thermocouple			C T			
Flexible thermocouple			F T			
Guided tube replaceable thermocouple			G T			
Medusa Thermocouple			M T			
Medusa RTD			M R			
Customer specific			Z 9			
Total length						
Concentric longest length in mm				L n n n n n		
Material source restrictions						
None					Y 0	
Only European Union or US materials					E 1	
Other					Z 9	
Measuring points						
Number of measuring points						N n n
Quotation number						
Quotation number provided by PMU						

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