



KONGSBERG

# MN4213 LNG/LPG



## CALIBRATED TEMPERATURE SENSOR

KONGSBERG temperature sensor MN4213 is specially designed for accurate temperature measurements in tanks containing liquefied gas. It is manufactured to meet the requirements set in the governing international standards for Custody Transfer Systems on gas carriers;

- ISO 8310: Refrigerated light hydrocarbon fluids – Measurement of temperature in tanks containing liquefied gases – Resistance thermometers and thermocouples  
ISO 10976: Refrigerated light hydrocarbon fluids – Measurement of cargo on board LNG carriers

Each sensor is delivered with serial number and a calibration certificate.

### Sensor design

A 4-wire Pt100 element is sealed in a tube filled with isolating powder, and extended by a mineral insulated cable made of AISI 316 stainless steel in required length. At the upper end of the mantle cable, a compression fitting is fixed to ensure gas-tight penetration through tank top (see figure 1). In addition the sensor has an extension flexible CU- cable.

### Element and accuracy

Temperature measurement is a crucial parameter for correct calculation of volume of liquid gas in gas carriers.

The MN4213 uses a high quality Pt100 Class B 1/10 DIN element with a tolerance of  $\pm 0.03$  °C at 0 °C. To obtain the optimal accuracy in the cryogenic temperature range, each sensor is calibrated so that the characteristic and precision around 0 °C instead applies in the range around -155 °C (LNG), -95 °C (LEG) or -25 °C (LPG).

### Calibration of sensors

The production process of MN4213 calibrated temperature sensors goes through several steps;

Step 1: All elements are aged and stabilised by varying the temperatures from -196 °C to room temperature several times.

Step 2: Each sensor is connected to a certified meter and readings are recorded several times at different temperatures;

LNG: -196 °C, -70 °C, 0 °C and +70 °C

LEG: -196 °C, -70 °C, 0 °C and +70 °C

LPG: -70 °C, 0 °C and +70 °C

Step 3: Calibration certificate according to ISO/DIS 10976 with nominal values for each 5th °C is printed.

# TECHNICAL SPECIFICATIONS

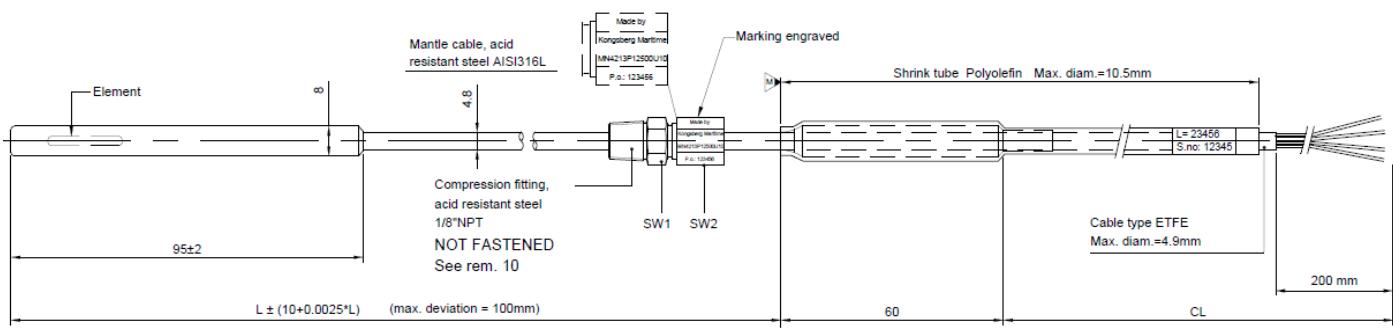


Fig. 1: The MN4213 design

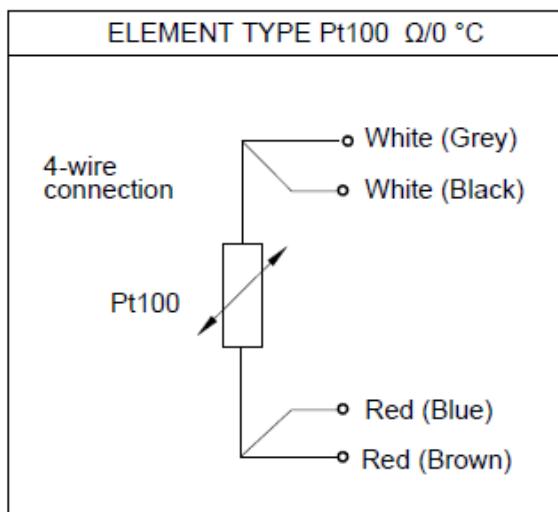
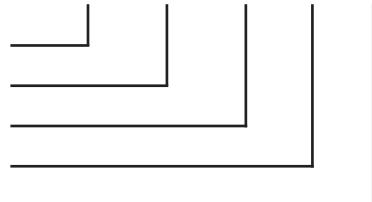


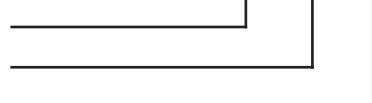
Fig. 2: The MN4213 connections

ORDERING EXAMPLE: MN4213 P 12500 U 10

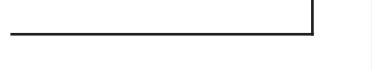
Mechanical design



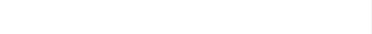
Calibration range



Length in mm



Pt100 element type



CL = 10 decimeter

LETTER 1	EXPLANATION
P	Temp. element 4-wire 1/10 DIN LNG
W	Temp. element 4-wire 1/10 DIN LPG
Y	Temp. element 4-wire 1/10 DIN LEG

LETTER 2	ELEMENT TYPE	RANGE
U	Pt100 100 Ohm/0°C	-196 to 400°C

Type	MN4213X --- X.
Length (mm)	Customized (150 - 50 000 mm)
Tolerance, length	$\pm 10 \text{ mm} + 0.0025 * L$ (max. deviation $\pm 100 \text{ mm}$ )
Material in sensor	AISI 316L acid resistant steel
Material flexible cable	Polyolefin / ETFE
Insulation resistance	>100 M $\Omega$ at 500 V
Protection grade	IP68 (20 bar)
Coupling	1/8" NPT threads
Weight	Approximately 0.1 kg/m

Element	Pt100 Class B 1/10, according to IEC 60751/(ITS90)
Calibration (LNG)	According to ISO/DIS 10976
Calibration accuracy (LNG)	-165 °C to -145 °C $\pm 0.1 \text{ }^\circ\text{C}$ -145 °C to -80 °C $\pm 0.15 \text{ }^\circ\text{C}$ -80 °C to +50 °C $\pm 0.3 \text{ }^\circ\text{C}$
Calibration accuracy (LEG)	-105 °C to -85 °C $\pm 0.15 \text{ }^\circ\text{C}$ -85 °C to +50 °C $\pm 0.3 \text{ }^\circ\text{C}$
Calibration accuracy (LPG)	-50 °C to +50 °C $\pm 0.15 \text{ }^\circ\text{C}$
Connection	4-wire flexible wires

Specifications subject to change without any further notice.

