

# SENTRY GB-300

## WIRELESS TEMPERATURE MEASURING SYSTEM

KONGSBERG SENTRY GB-300 is a unique product developed for temperature monitoring of crank pin/crosshead bearings in engines and compressors and other rotating machinery.

### Features

- Fast and reliable temperature response.
- By providing an early warning the consequence of a bearing seizure is reduced to a minimum.
- The sensor is passive, has no battery and does not need an external power source.
- Flexible mounting, compact and simple installation.
- Approved by classification societies as an alternative to traditional oil mist detectors.
- Signal Processing Unit approved for Ex Zone 1 and 2 classified hazardous areas.
- Wireless Temperature Sensor and Stationary Antenna are simple apparatus, may be used in Ex Zone 0,1,2

### Functional description

Figure 1 shows the arrangement of the SENTRY Wireless Temperature Measuring System installed on an engine or compressor

- A wireless temperature sensor is fitted to the moving part (e.g the connecting rod of an engine/compressor
- A stationary antenna is fitted to a bracket inside each cylinder compartment in a position so that the sensor will pass nearby as the engine/compressor runs
- Coaxial cables connect the stationary antennas with the signal processing unit fitted outside the engine. The bulkhead penetration is made by use of a special, high IP-grade cable gland in which the coaxial cable shield is terminated to ground.
- The signal processing unit calculates the temperature and transmits the result to engine/compressor control system

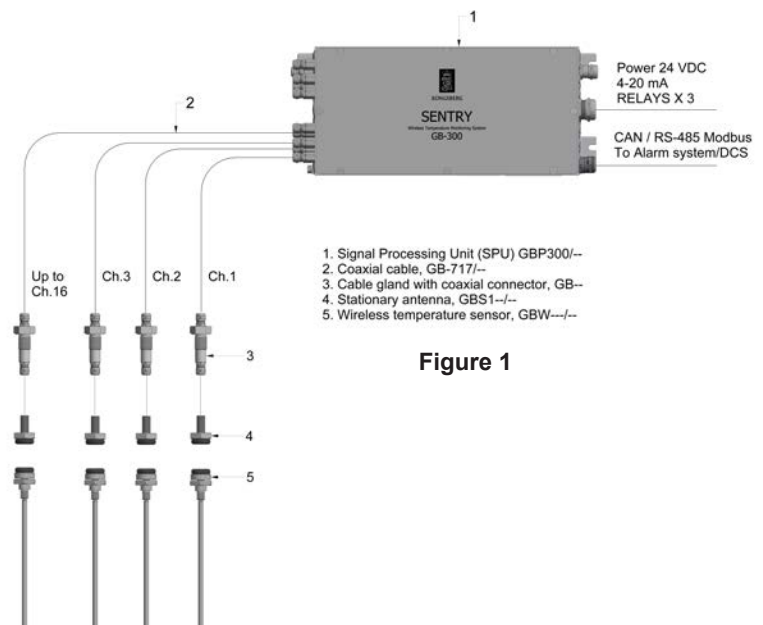


Figure 1

The SENTRY GB-300 system is based on Surface Accoustic Wave (SAW) -and radar technology. The sensors are passive, have no battery and are in no need of an external power source.

**Technical description**

Low energy, high frequency radar pulses are generated by the Signal Processing Unit (SPU) and transmitted via coaxial cables to the Stationary Antennas installed inside each cylinder compartment.

The antenna transmits the signal further into the open space of the crankcase. When the sensor passes the antenna, the radar pulse is picked up. The SAW element at the tip of the sensor then reflects the signal which is picked up by the stationary antenna and sent back to the processing unit for interrogation.

The shape and characteristics of the reflected pulse determine the temperature of the sensor, i.e. the bearing temperature. The processing unit software calculates the temperature and transmits this to the engine control and monitoring system.

Figure 2 shows the working principle of the SENTRY GB-300 system.

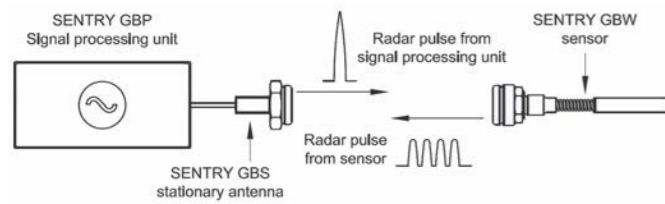


Figure 2

The SPU can monitor up to 16 channels in sequence. Calculation time for each channel is appr. 25 ms. Installed on a 10 cylinder engine running at 600 rpm all 10 channels are updated in less than one second.

The multiplexing and low signal strength removes any danger of overhearing from one cylinder to another. All sensors and antennas can therefore be similar. This reduces the number of variants and represents a huge benefit in terms of keeping spares.

**Mechanical design and installation**

Design of engines /compressors and other rotating equipment varies with type and make. KONGSBERG therefore always involve the equipment maker when planning a SENTRY installation. All SENTRY installations are approved by the equipment maker and supported by their specific installation instructions and drawings.

A hole for the SENTRY Wireless Temperature Sensor is drilled in the connecting rod or in the bearing cap. Different designs of this sensor are available; fixed or adjustable length (spring load) and with flat tip or angled tip. Diameters are from 5 to 10mm. The sensors are normally fixed by threads of various types, but can also be fixed by use of glue. Surface mounted sensors are also available. The sensor designs thus vary with the application.

At a suitable place inside the cylinder compartment, the SENTRY Stationary Antenna is installed in such a way that the wireless temperature sensor passes the antenna at recommended maximum distance and angle. See figure 3.

The antenna coaxial cable is connected to a plug inside a gland penetrating the engine wall. An outside coaxial cable connects the gland to the the SENTRY GBP300 Signal Processing Unit which can be fitted on vibration dampers directly onto the monitored equipment. (e.g. engine wall)

A screened cables for power supply (24 VDC) and signal (CAN, RS485, 4 to 20 mA) are connected to the SENTRY GBP300 Signal Processing Unit. The other end of the cables are connected to the monitoring and control system.

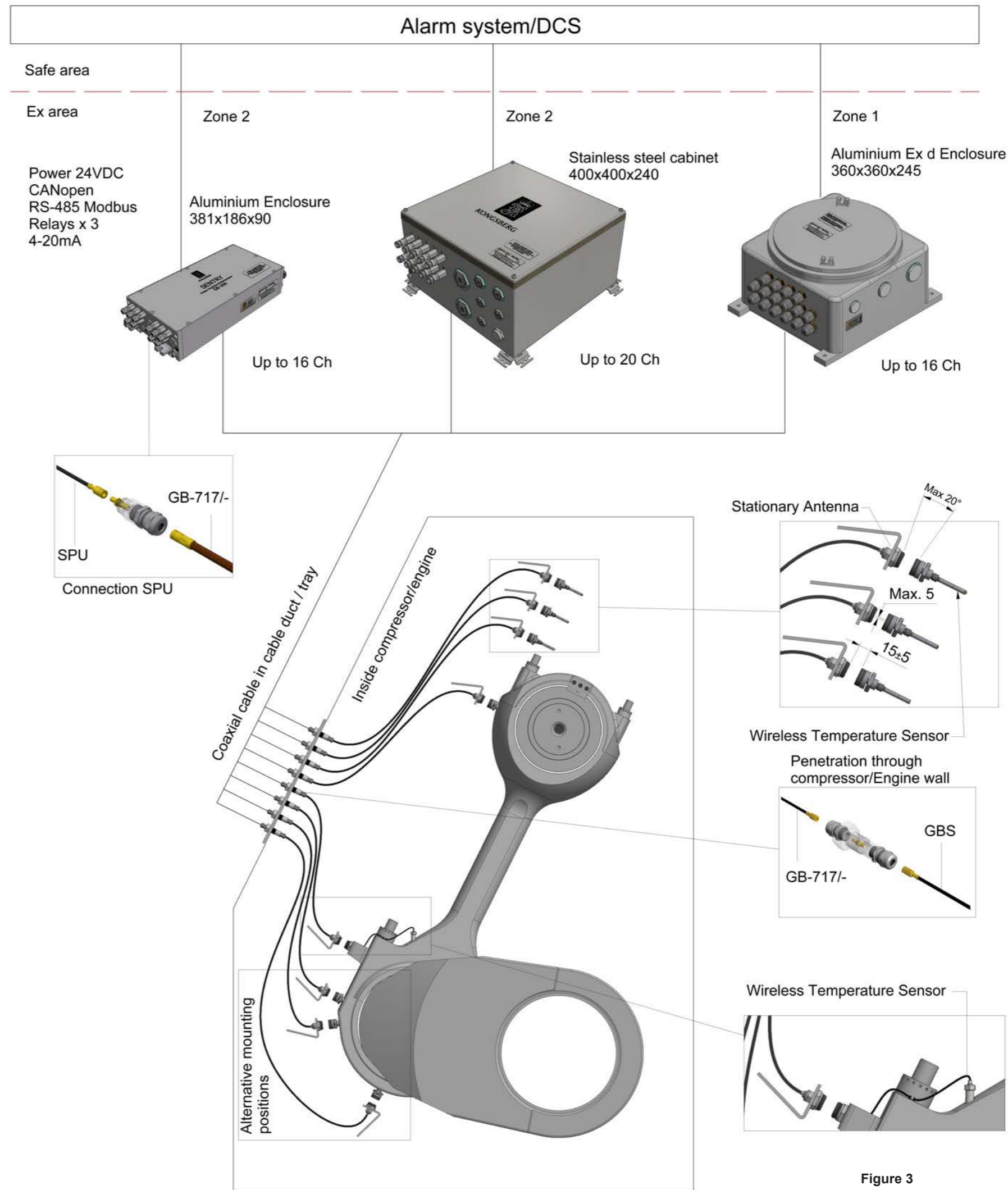


Figure 3

# TECHNICAL SPECIFICATIONS

## Overall system specifications:

Measuring range:	0 to 160 °C	
Ambient operating temperature Ex zone 2:	- 25 to 85 °C (-40 to 85 °C)	
Ambient operating temperature Ex zone 1:	- 20 to 60 °C	
Accuracy *):	±2 °C	
Sensor and antenna relative passage speed:	Maximum 80 m/sec.	
Gap between temperature sensor and antenna:	5 to 35 mm	
Lateral position between sensor and stationary antennas:	Maximum displacement ±5 mm	
Angle between sensor and stationary antennas:	Maximum 20 degrees	
Maximum cable length between SPU and stationary antenna:	5 to 35 m dependent on gap between antennas	
Generic EMC Standard		
Emission:	EN	61000-6-4
Immunity:	EN	61000-6-2
Maximum error during immunity test:	±2 °C	

\*) Accuracy incl. non-linearity, hysteresis and repeatability with ambient temperature from 0 to 85 °C

## The SENTRY GBP300 Signal Processing Unit (Ex):

Power-supply:	24 VDC (18 to 32 VDC)	
Current consumption:	<10W, Maximum 400 mA during normal operation @ 24v	
Number of input channels:	10,16 or 20	
Material housing:	Aluminium alloy	
Communication outputs:	CANOpen, RS485 Modbus and 4 – 20mA	
Size housing zone 2 SPU:	382 x 186 x 90 mm	
Weight SPU zone 2:	4,6 kg	
Size housing zone 1 SPU:	360 x 430 x 245 mm	
Weight SPU zone 1: Relay outputs (normally open):NC by SW config	25 kg 3 Max.150mA/24 VDC, High, High High and Fault	
Protection:	IP66	
Electrical connections:	Cable through EMC glands	

## 4 to 20 mA output module:

Number of output channels:	10, 16 or 20	
Mode:	Passive/ Active set by slide	
Output range:	0 - 160°C default , set by SW	
Output signal when error condition:	3.5 mA default, set by SW	
Maximum load/loop resistance:	300 ohm	

Specifications subject to change without any further notice.

Ex certification zone 2:	Ex nA [ja Ga] IIC T5 Gc -25°C ≤Ta≤85 °C
	Ex nA [ja Ga] IIC T5 Gc -40°C ≤Ta≤85 °C
Ex certification zone 1:	Ex db [ja Ga] IIC T6 Gb -20 °C ≤Ta≤60 °C

## The SENTRY GBW series Wireless Temperature Sensor:

Sensor tip diameter:	Std 5.0/6.0/7.0 and 10.0 mm ±0.2 mm	
Sensor head:	6-edge, 30 mm and 22mm	
Threads type:	M12 x 1, M14x2,1/2 -20UNF	
Sensor length minimum:	50 mm min, dep. on type	
Maximum temp sensor tip:	200 °C	
Maximum temp sensor head:	130 °C (GRIVORY HTV-4H1)	
Protection:	IP67	
Weight:	70 to 100 gram dep. on type	
Material antenna body:	AISI 304/ 316	
Spring load:	Approximately 175 Nm	
Depth of machined hole:	L ±1.0 mm	
Ex version GBW3--/---:	Simple Apparatus	
Temperature Class:	T4, Ta = 130 °C	

## The SENTRY GBS series Stationary Antenna:

Antenna head Diameter:	30 mm	
Overall length:	33 or 53 mm	
Maximum ambient temp:	130 °C (GRIVORY HTV-4H1)	
Threads type:	M12x1,5	
Length of threads:	25 or 45 mm	
Protection:	IP67	
Weight:	Approximately 90 gram	
Material antenna body:	AISI 304	
Material coaxial cable Ø4.8 mm:	Teflon FEP	
Ex version GBS150/:	Simple Apparatus	
Temperature Class:	T4, Ta = 130 °C	

