

vibro-meter
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**EW 140
DIC 413**

Ice Detection Sensor Type EW 140

CHARACTERISTICS

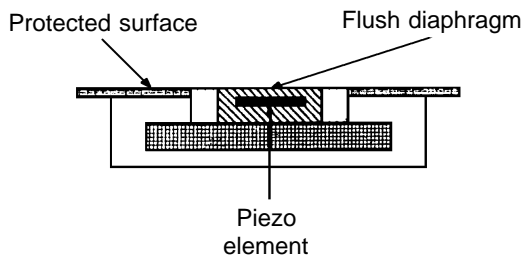
- Ice detection
- Discrimination between ice and water or other liquid contaminants
- No moving parts, high reliability
- CENELEC approved

FEATURES

- **Measurement range:**
0.2 to 2 mm, accuracy $\pm 12\%$
- **Temperature range:**
-55°C to +120°C (-67° to +250°F)
- **Vibration:**
10 grms (20 to 2000 Hz)
- **Humidity:**
The sensor housing is hermetically sealed
100% RH at 43°C (110°F)
- **Shock:**
Saw tooth pulse 20 gpeak, 11 ms duration,
6 shocks/axis
- **Weight:**
330 g (max)



SENSOR OPERATING PRINCIPLE



The natural frequency of the vibration diaphragm is raised by a layer of ice (due to increased stiffness) and lowered by water or contaminants (due to increased mass).

THEORY OF OPERATION

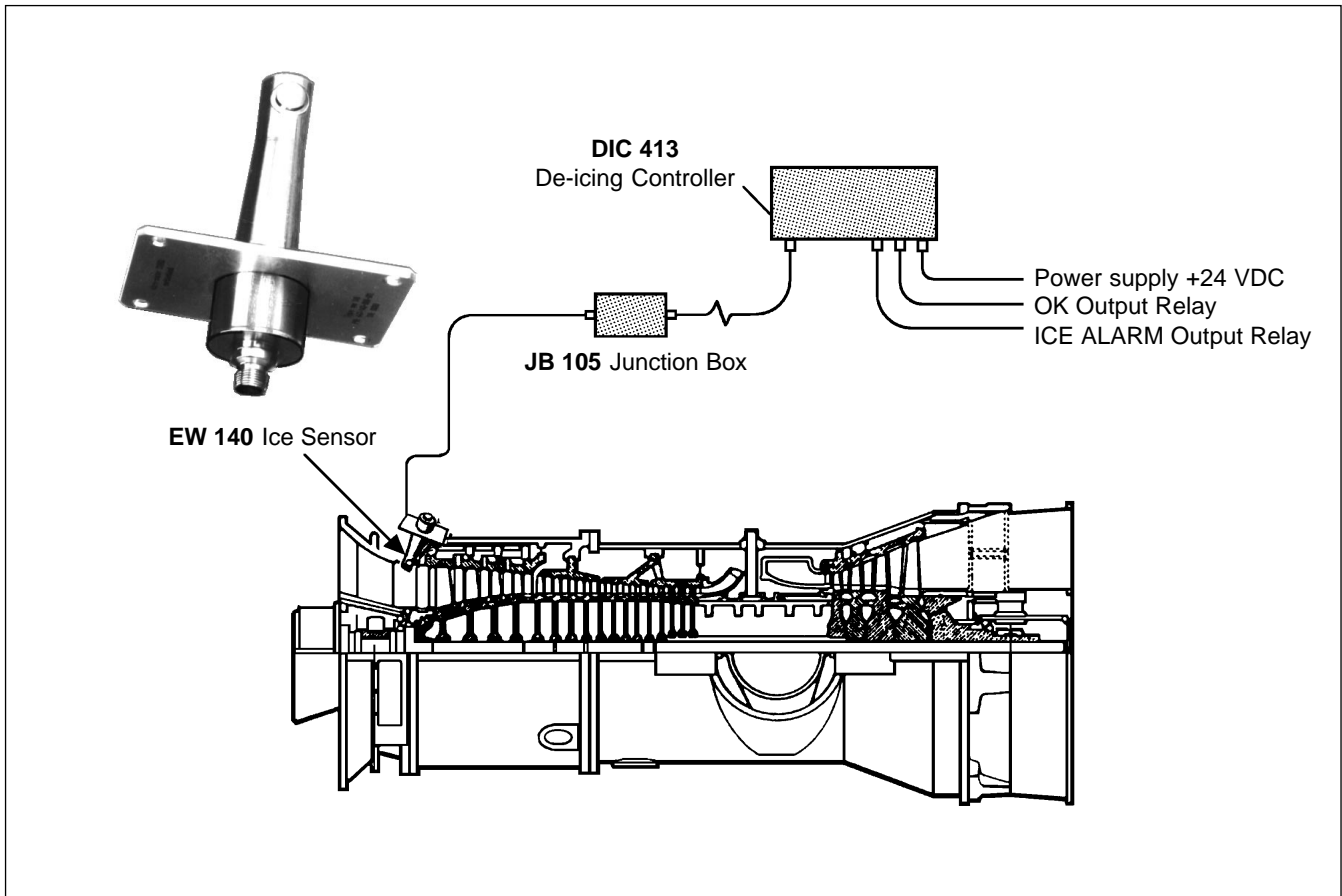
Vibro-Meter has patented the simple and reliable method of measuring ice that is used by the EW 140 flush mount ice detector. The method is based upon the principle that the resonant (or natural) frequency of a solid body will change with a change in mass or stiffness.

Ice is detected using a continuously vibrating sensor diaphragm which is forced into oscillation at its resonant or natural frequency by a piezoelectric material. The piezoelectric material is driven by an ultrasonic frequency (above 70 kHz) and the maximum oscillation amplitude is very small (under 1 micrometer), so that effectively there are no moving parts.

Ice accretion on the sensor diaphragm increases its stiffness and mass and hence increases the natural frequency. Water or liquid contaminants increase the sensor diaphragm mass without increasing the stiffness, thus decreasing the natural frequency. A clear discrimination between ice and liquid is therefore ensured.

MOUNTING LOCATION

The Ice Detector System is used in turbomachinery, operating in an environment where intake air is moisture-laden and the ambient temperature is below 5°C (+41°F). The sensor is typically mounted at the turbine inlet, where the air velocity is at its highest. The figure on the next page shows the mounting position for a typical modern gas turbine.



MECHANICAL SPECIFICATIONS

- **Material and finish**
The sensor housing is made of Inconel 600 Alloy.
The sensor diaphragm is manufactured from a corrosion resistant BzAl 75 Alloy.
- **Connector**
A two-pin hermetic, threaded coupling connector exceeding the performance and environmental requirements of MIL-C-83723 is provided.

ELECTRICAL SPECIFICATIONS

- **Power requirements**
10 mA at 24 VDC nominal voltage
- **Type of supply**
Voltage power supply with output signal current modulation, enabling the same two-wire connection for the supply and the output.
- **Electrical isolation**
Case grounded

- **Output signal**
Current modulated output signal. The typical current modulation amplitude is 3 mA peak to peak.

SENSOR INTERFACE

A standard Deicing Sensor Processor (DIC 413 family) interface is available.

The DIC 413 can be located up to 200 m from the sensor. It can be configured to provide:

- Conversion of current modulated sensor output to analog voltage
- Discrete outputs:
ICE ALARM - at preset levels
SYSTEM OK - continuous built-in-test
- Power supply interface

Refer to the DIC 413 data sheet for further information

Alternatively a digital interface to international standards can be provided.

- CENELEC approved
- Protection class IP 65 (NEMA class 12)
- Aluminium die-casting

DESCRIPTION

The DIC 413 is a controller designed to match the EW 140 ice sensor. Together, these elements form an ICE DETECTION SYSTEM.

The DIC 413 provides power to and reads the current-modulated signal from the EW 140. The DIC 413 allows intrinsically safe operation of the EW 140 in an explosive atmosphere and meets CENELEC requirements for class EEx ib IIB equipment.

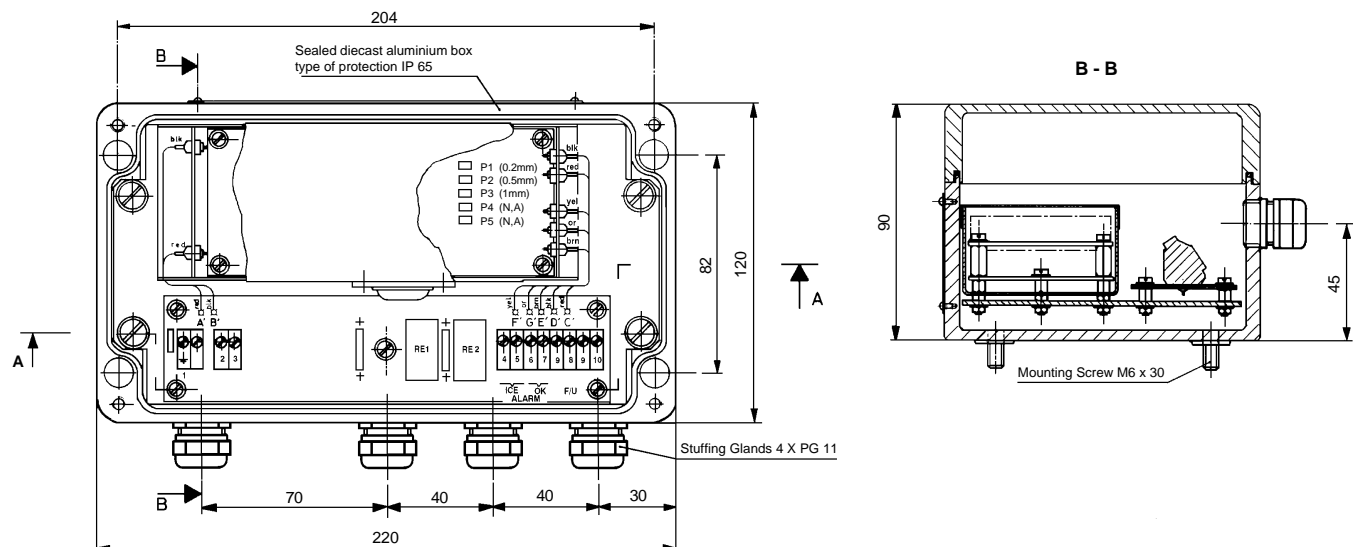
The DIC 413 is composed of the following elements:

- DC/DC converter
- Low-pass filter

- Frequency-voltage converter
- Buffer to adapt the outgoing voltage
- Circuit that transforms the incoming signal from the sensor

The DIC 413 can be used as an actuator for a visible/audible alarm system and/or an automatic controller of the engine de-icing system (this could supply bleed air to the system to de-ice the inlet). An alarm (Ice Alarm) is activated if the ice thickness exceeds a preselected value. Jumper connections inside the controller box allow five different alarm levels to be set (ice thickness 0.2 mm to 2.0 mm).

The ice detection system contains a simple but extensive self-test feature. This continuously checks the complete measurement chain up to (but not including) the output relays of the controller. An internal or external power supply failure is considered as a failure and will deactivate the OK output relay.



Function

- Minimum ice thickness detected : 0.2 mm
- Measurement accuracy (from 0 to 1.5 mm of ice) : ± 0.2 mm
- Pass band : 60 kHz to 100 kHz
- Current consumption : 100 mA (max.)

Input

- Frequency modulated current

Output

- OK signal
- ICE alarm (indicates when pre-selected ice-thickness is exceeded)
- Power supply : +24 VDC (nominal)

Weight : Max. 2.2 kg

Temperature
- Operating range : 0°C to 60°C

Humidity

- Provides protection against splashing water and humidity up to 100%

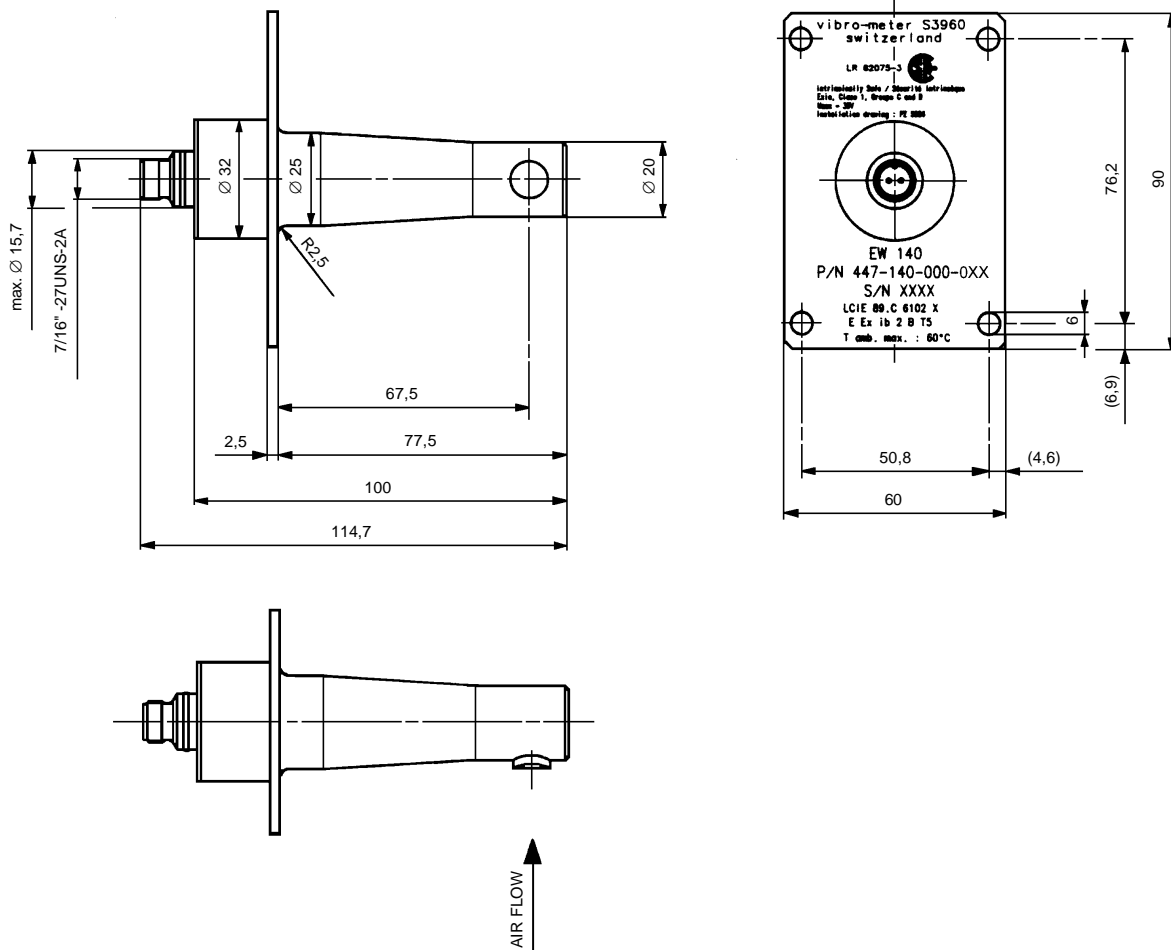
Intrinsic Safety

- Meets CENELEC requirements for class EEx ib IIB equipment

Ordering information:

Description : De-Icing Controller
Ordering Number : 241-413-000-021

EW 140 (Version 01)



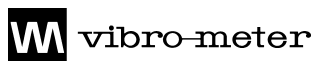
Ordering Information:

Description	: Ice Detection Sensor EW 140	
Ordering No	: 447-140-000-01	Short version for LM2500 and general installation (see drawing above)
	: 447-140-000-11	Longer version ⁽¹⁾
	: 447-140-000-12	Long version for thick walled gas turbines ⁽¹⁾

(1) Drawing available on demand



Due to the continual development of our products we reserve the right to modify the specifications without forewarning.



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