permasense
Experts in remote monitoring solutions

Datasheet – ET410 WiHART sensor

The *ET410* is a permanently mounted wall thickness monitoring sensor which forms part of the Permasense WirelessHART corrosion monitoring system. The ET410 sensor provides measurements on pipes and vessels with a continuous service temperature of up to 270°C.

Features

- May be used on metal with a continuous service temperature up to 270 °C (518 °F) with a maximum short-term temperature excursion up to 300 °C (572 °F)
- WirelessHART data transmission
- Intrinsically safe

Refer to *Overview – ET410 WiHART system deployment* for the full list of system documentation.

Table of contents

Safety notices

Installation of this sensor in an explosive environment must be in accordance with the standards and practices appropriate to the site.

Review the *Regulatory compliance* section for restrictions for safe installation.

Only fit approved Permasense BP10, BP10E, BP20 or BP20E power modules.

Use supplied lanyard to prevent sensor falling from heights, potentially causing injury.

The sensor contains magnets which can be harmful to pacemaker wearers and can be suddenly attracted to other objects such as tools. This can cause injury as well as damage to the sensor and to other objects. Only remove the protective cap when necessary and then take great care.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Ensure the device is installed to provide a separation distance of at least 20cm (8") from all persons.

Potential electrostatic charging hazard - do not rub or clean with a dry cloth.

Introduction

Permasense systems use ultrasonic wall thickness measurement sensors such as the ET410 (see Figure 1) for corrosion and erosion monitoring and are proven to provide robust measurements in oil and gas environments. The sensors are easy to install and intrinsically safe so they can be deployed anywhere, including inaccessible locations and hazardous environments.

The sensors communicate using the WirelessHART protocol, creating a self-forming and self-managing wireless mesh, which delivers continuous wall thickness measurements of the highest integrity and accuracy directly to the end user.

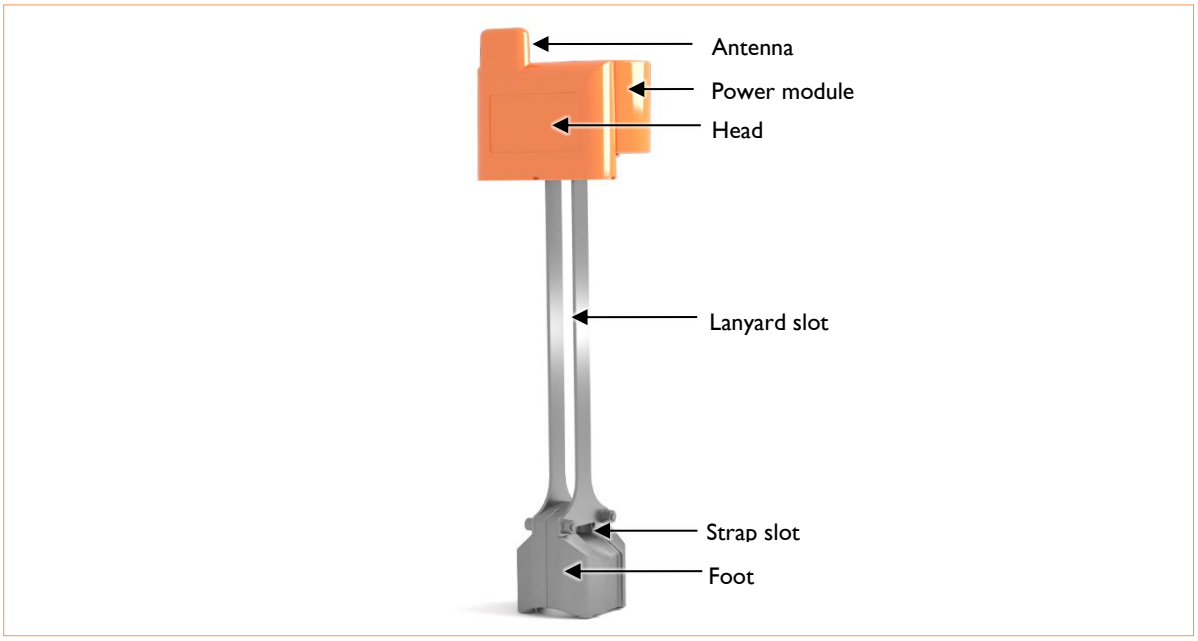

Figure 1. ET410 sensor

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A built-in thermocouple probe is used to monitor the pipe surface temperature. This allows the wall thickness measurement to be temperature-compensated.

Specification

Method of mounting

The *ET410* sensor is mounted on pipes using a strap fitted tightly around the pipe and through the sensor. Multiple sensors can be attached in a ring around the pipe using a single strap. On vessels, a magnetic mounting fixture may be used instead of a strap. A lanyard provides additional security against the sensor falling.

Suitable magnetic fixtures, straps, lanyards, buckles and fixing tools are supplied by Permasense.

Note: If securing sensors with the magnetic mounting fixture, sensors must be ordered with the pre-fitted magnetic fixture attachment option.

The sensor installation procedure can be found in *Installation guide – ET410 WiHART sensor*. For magnetic mounting also use *Installation guide - Magnetic fixture for ET410 sensor*

Dimensions

ET410 sensor dimensions are shown in Figure 2.

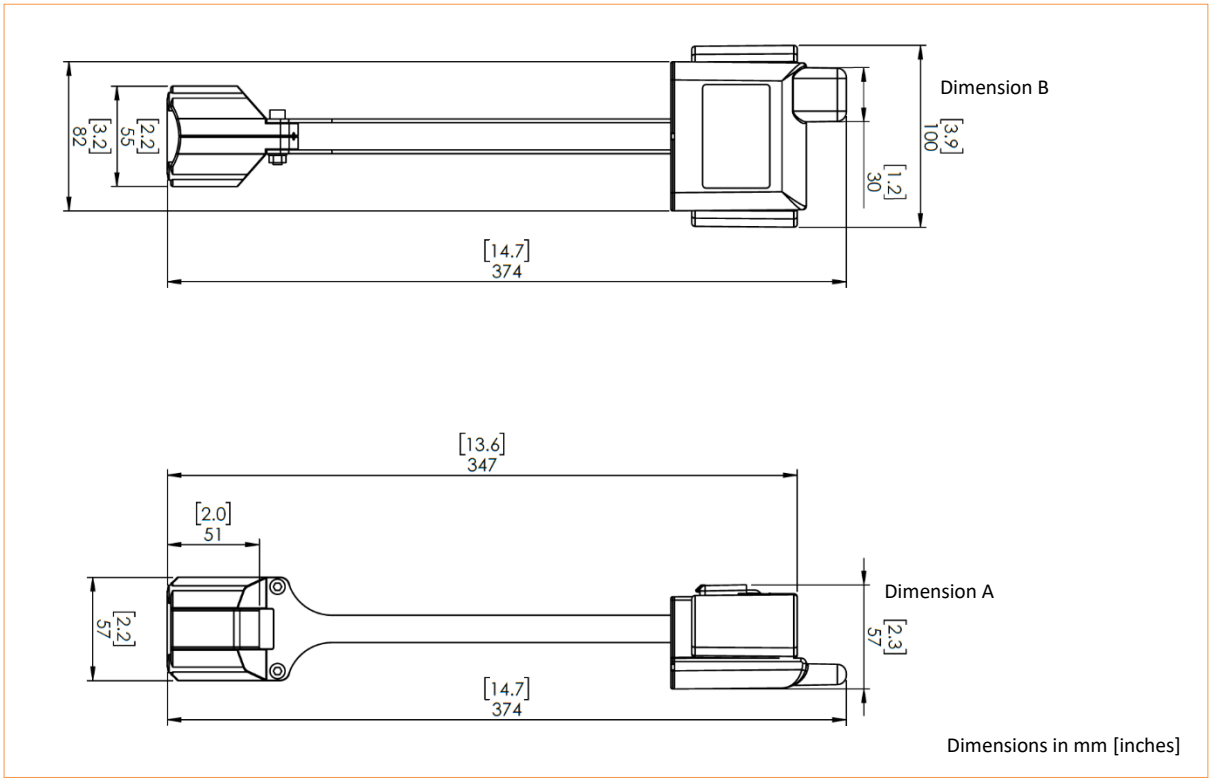

Figure 2. Dimensions of the ET410 sensor, shown with a BP10E power module

Note: for a BP20E power module, dimension A is 58mm (2.3") and dimension B is 140mm (5.51")

Weight

Sensor excluding power module	960g (2.1 lbs)

Measurement location

Pipe diameter	Minimum 100mm (4 inches). Where the diameter is too large to secure the sensor with a strap, an alternative mounting system will be required. Please contact Permasense.
Pipe material	Carbon steels, martensitic steels which have not been hardened. For austenitic stainless steels use WT210 marine sensors.

Thickness measurement

Transduction	Single electro-magnetic acoustic transducer
Couplant	No couplant required
Minimum measurable wall thickness	6mm (1/4 inch)
Maximum measurable wall thickness	50mm (2 inches). Thicker metals can be accommodated – contact Permasense.

Temperature measurement

Temperature at pipe surface	Absolute accuracy: within 10°C (18°F) Repeatability: within 2°C (4°F)

Environmental

Maximum continuous service temperature		up to +270°C (+518°F)
Maximum short-term temperature excursion		up to +300°C (+572°F)
Sensor head temperature range	For safety compliance	-50°C to +75°C (-58°F to +167°F)
	For operation	-40°C to +75°C (-40°F to +167°F)
IP rating (when mated to power module)		IP67

WirelessHART

Standard	Based on IEEE 802.15.4, WirelessHART
Network type	Self-forming, self-managing, self-healing mesh
Operating band	2.4 GHz worldwide unlicensed band
Channel use / frequency	Channels 11-25, 2.405 GHz to 2.475 GHz
RF power output (maximum)	<10dBm EIRP
Range	Up to 50m (160ft) line of sight between devices
Maximum ET410 series sensors per gateway	Gateway dependant - typically 100
Maximum data hops from gateway to furthest sensor	Gateway dependant - typically 8 hops
Compatible gateways	Emerson Smart WirelessHART gateways

When sensors are installed, they form a robust, self-managing mesh network over which data will flow from the sensor via the most reliable route, as shown in Figure 3. Permasense recommends a minimum network size of 25 sensors to ensure adequate redundancy in the network.

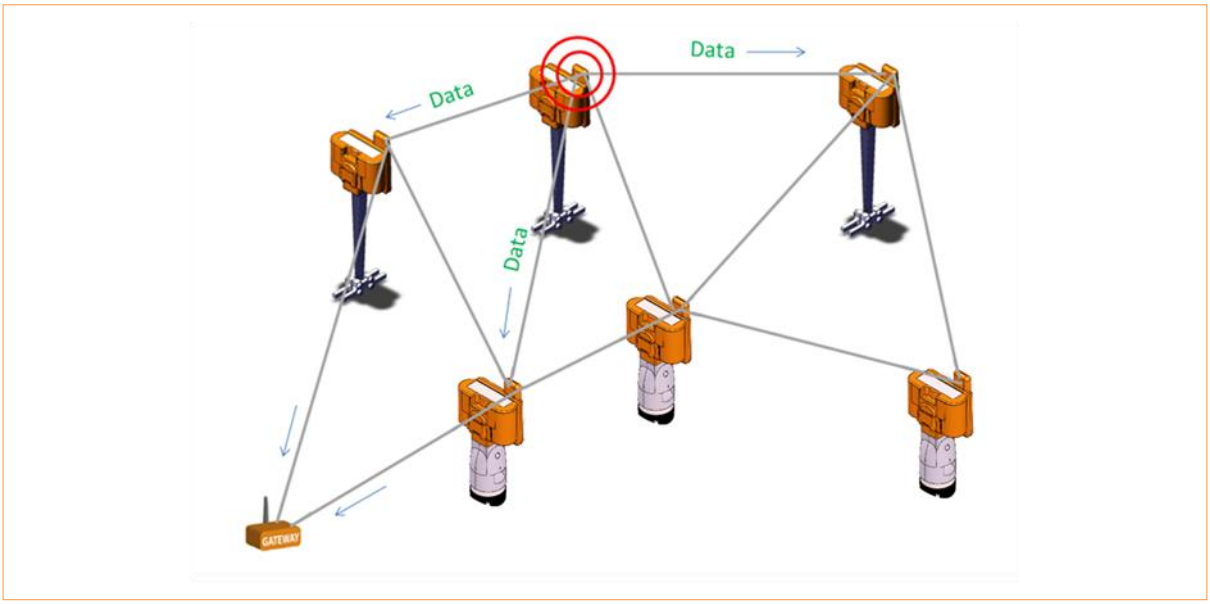

Figure 3. Mesh networking in Permasense WiHART sensors

Handling, storage and transit

Sensors must be stored within the operating ambient temperature range in a dry place.

ET410 sensor shipping box information

Maximum number in box	15
Full box weight	19.4 kg (42.8 lbs)
Dimensions (w x d x h) approx	67cm x 55cm x 45cm (26" x 21" x 18")

CAUTION: take care when lifting full boxes of sensors. Handles are provided to allow lifting by two persons.

For power module handling and storage, consult the relevant power module datasheet.

Disposal of equipment

The European Union Directive 2012/19/EU on waste electrical and electronic equipment mandates recycling of electrical and electronic equipment throughout the EU. Unless otherwise noted, all products manufactured by Permasense are compliant with this directive and any subsequent revisions or amendments. This product carries the WEEE symbol to demonstrate compliance. Dispose of this product in accordance with local regulations.

Accessories

Power modules

ET410 sensors may be powered from Permasense, intrinsically safe, approved BP20E power modules.

Power module service life	BP20E	9 years*

* Figures assume an acquisition is taken every 12 hours at an average sensor head and power module temperature of 20°C (68°F). Acquisitions taken more frequently or at higher ambient temperatures will reduce the service life of the power module.

Alternatively, an appropriately certified intrinsically safe power source may be used.

Sensor input parameters

U_i = 7.9V	C_i = 0	C_o = 8.8µF
I_i = 850mA	L_i = 0	L_o = 40µH

Regulatory compliance

Note: Certifications are frequently updated. For current information please contact permasense.support@emerson.com

Generic certifications

IECEx Intrinsic Safety

Certificate number: IECEx BAS 17.0048X
Applicable standards: IEC 60079-0: 2017 Edition 7.0, IEC 60079-11: 2011 Edition 6.0
Markings: Ex ia IIC T4...T1 Ga, T_{amb} = -50°C to +75°C, IP67

WARNING:
POTENTIAL ELECTROSTATIC CHARGING HAZARD
USE ONLY WITH APPROVED POWER SOURCE
CONTAINS MAGNETS
SEE INSTRUCTIONS

Specific conditions of use:

1. Parts of the mounting foot contain titanium or a titanium alloy. Care must be taken to ensure that the equipment is suitable for the intended mounting location and must be protected against the risk of impact or frictional ignition.
2. The capacitance of the mounting foot will exceed 3pF if the foot is not bonded to earth; this must be taken into account during installation.
3. Plastic on the base of the mounting foot may present a potential electrostatic ignition risk and must not be rubbed or cleaned with a dry cloth.
4. The equipment may be attached to process pipework at a temperature of up to 300°C as follows:
    a) up to +120 °C (+248 °F), for T4
    b) up to +190 °C (+374 °F), for T3
    c) up to +290 °C (+554 °F), for T2
    d) up to +300 °C (+572 °F), for T1

ATEX Intrinsic Safety

Certificate number: Baseefa17ATEX0063X
Applicable standards: EN 60079-0: 2018, EN 60079-11: 2012
Markings: Ⓔx II 1 G, Ex ia IIC T4…T1 Ga, T_{amb} = -50°C to +75°C, IP67

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Radio

IEEE 802.15.4 compliant, operating in the 2.4GHz worldwide ISM band
Compliant with EN 300 328 v2.1.1

EMC

Compliance to the following standards:
EN 301 489-1 v1.9.2: 2011 in accordance with EN 301 489-17 v2.2.1: 2012
EN 61326-1: 2013

Dangerous goods regulations

The magnets in the sensor are shielded for transportation and meet the IATA Dangerous Goods Regulations for magnetic fields. The sensors are therefore safe for air transportation.

Regional/country specific certifications

Australia & New Zealand

Radio – ACMA
Declaration of conformity number: 1402-01
Marking: 

Canada

SGS North America - Intrinsically Safe

Certificate number: SGSNA/17/SUW/00281
Applicable standards: CSA C22.2 No. 157-92 (R2012) +Upd1 +Upd2
Marking: CLASS I, DIV 1, GP ABCD, T4…T1, Tamb = -50°C to +75°C, IP67

Ordinary Location Certification

Certificate number: SGSNA/17/SUW/00259
Applicable standards: CAN/CSA C22.2 No. 61010-1-12, 3rd Edition

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SEE INSTRUCTIONS

RISQUES POTENTIEL DE CHARGEMENT ÉLECTROSTATIQUE
UTILISER UNIQUEMENT AVEC SOURCE D'ALIMENTATION APPROUVÉ
VOIR LES INSTRUCTIONS

Radio

Important notes:

- The antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons.
- This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Notes importantes:

- L'antenne utilisée pour ce transmetteur doit être installée en considérant une distance de séparation à toute personne d'au moins 20 cm.
- Cet appareil est conforme à la norme RSS Industrie Canada exempt de licence. Son fonctionnement est soumis aux deux conditions suivantes : (1) cet appareil ne peut pas provoquer d'interférences ; et, (2) Cet appareil doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositif.

Marking: Contains IC: 5853A-ETERNA2

EMC - Compliant with RSS-Gen: Issue 4

European Union

Meets the intent of the following directives:

2014/34/EU - ATEX
2014/30/EU - EMC
2014/53/EU - RED

Marking: CE 1180
[See EU Declaration of Conformity below]

Japan

Radio – MIC

Certification number: ACB-MIC000221

Safety – CML

Certificate number: CML 17JPN2140X
Markings: Ex ia IIC T4…T1 Ga

周囲温度 (Ta) -50°C ≤ Ta ≤ +75°C
「警告」 -静電気帯電の危険あり-
電池パックは防爆検定品を使用すること。
磁石が含まれています。
取扱説明書を参照すること。

Specific conditions of use:

1. Parts of the mounting foot contain titanium or a titanium alloy. Care must be taken to ensure that the equipment is suitable for the intended mounting location and must be protected against the risk of impact or frictional ignition.
2. The capacitance of the mounting foot will exceed 3pF if the foot is not bonded to earth; this must be taken into account during installation.
3. Plastic on the base of the mounting foot may present a potential electrostatic ignition risk and must not be rubbed or cleaned with a dry cloth.
4. The equipment may be attached to process pipework at a temperature of up to 300°C.

Malaysia

Radio – SIRIM approval number: RAOS/37A/0418/S(18-0339)

Singapore

Radio – IMDA

Registration number: N2148-17
Marking: Complies with IMDA standards DA105282

South Korea

Complies with KGS safety requirements

Certificate number: KGS 17-KA4BO-0478X
Marking: 17-KA4BO-0478X

Complies with Korea Communication Commission radio requirements

Certificate number: MSIP-RMM-PL4-ET410
Marking: MSIP-RMM-PL4-ET410
MSIP-CRM-LT9-ETERNA2

Trinidad and Tobago

Radio – TATT reference 2/2/1/1948/6

USA certification

SGS North America - Intrinsically Safe

Certificate number: SGSNA/17/SUW/00281
Applicable standards: UL 913 - 8th Edition, Revision Dec 6 2013
Marking: CLASS I, DIV 1, GP ABCD, T4...T1, Tamb = -50°C to +75°C, IP67

Ordinary Location Certification

Certificate number: SGSNA/17/SUW/00259
Applicable standards: UL 61010-1, 3rd Edition

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CONTAINS MAGNETS
SEE INSTRUCTIONS

Radio

- The antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons.
- This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Marking: Contains FCC IC: SJC-ETERNA2

EMC - Compliant with FCC/CFR 47: Part 15: 2016

permasense
Experts in remote monitoring solutions

EU Declaration of Conformity

We,

Permasense Ltd
Alexandra House
Newton Road
Manor Royal
Crawley
RH10 9TT, UK

declare under our sole responsibility that the product,

ET410 WiHART wireless mesh, corrosion monitoring sensor

is in conformity with the relevant Union harmonisation legislation:

Electromagnetic compatibility directive (EMC) 2014/30/EU
Radio equipment directive (RED) 2014/53/EU
Equipment for explosive atmospheres directive (ATEX) 2014/34/EU

The following harmonised standards and reference standards have been applied:

EMC: EN 61326-1:2013, including radiated emissions to CISPR 11:2009 + A1:2010 Class B

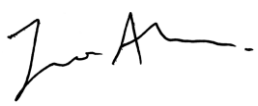
RED: EN 300 328 v2.1.1
EN 301 489-1 v1.9.2: 2011 in accordance with EN 301 489-17 v2.2.1:2012
with reference to:
EN 61000-4-2:2009
EN 61000-4-3:2006 + A1:2008 & 2010
EN 61010-1:2010

ATEX: EN IEC 60079-0: 2018
EN 60079-11: 2012

ATEX notified body:
SGS Baseefa Ltd (notified body number 1180) performed an EU-type examination and issued certificate number Baseefa17ATEX0063X
with coding Ⓔx II 1 G, Ex ia IIC T4…T1 Ga

ATEX notified body for quality assurance:
SGS Baseefa Ltd (notified body number 1180)

Signed for and on behalf of Permasense Ltd.



Dr Jonathan Allin – Chief Technical Officer
Crawley, UK – 1 May 2019