

Installation guide - ET410 WiHART sensors

This guide details the installation process for ET410 WiHART sensors. It assumes the user is familiar with the operation of the IK220 installation kit.



Refer to *User guide – IK220 installation kit* for more detailed usage instructions.



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

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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 in the relevant datasheet for restrictions on safe installation.

Only fit approved Permasense or Rosemount 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.

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

Cut strap may have sharp edges, wear appropriate PPE.

Do not put fingers in the gap between the tensioner bolts and the strap.

Do not cut the strap while it is under tension as this may result in damage or injury.

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 with an antenna separation distance of at least 20cm (8") from all persons.

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

Compatibility

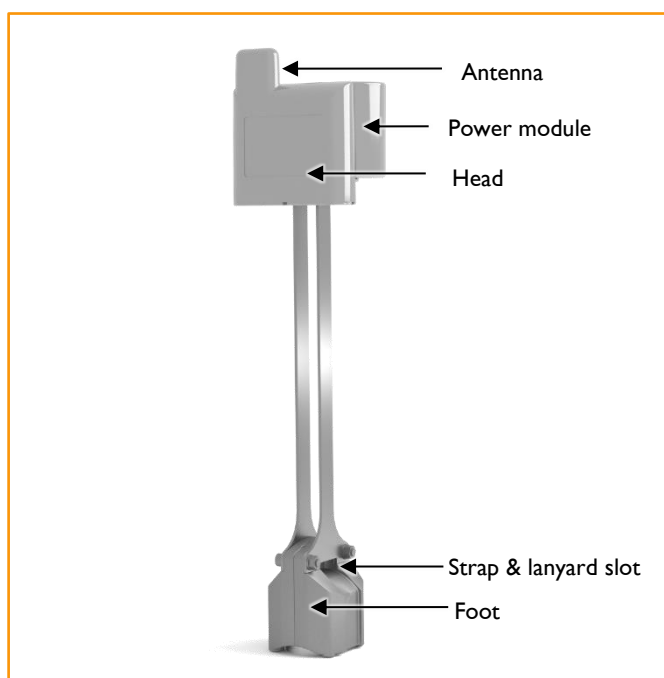
ET410 WiHART sensors can be used in networks with other WirelessHART devices, including Permasense and Rosemount ET210, ET310 and WT210 sensors. Compatible with Emerson Wireless I410 and I420 Gateways. For compatibility with other gateways, contact Permasense.

Technical background

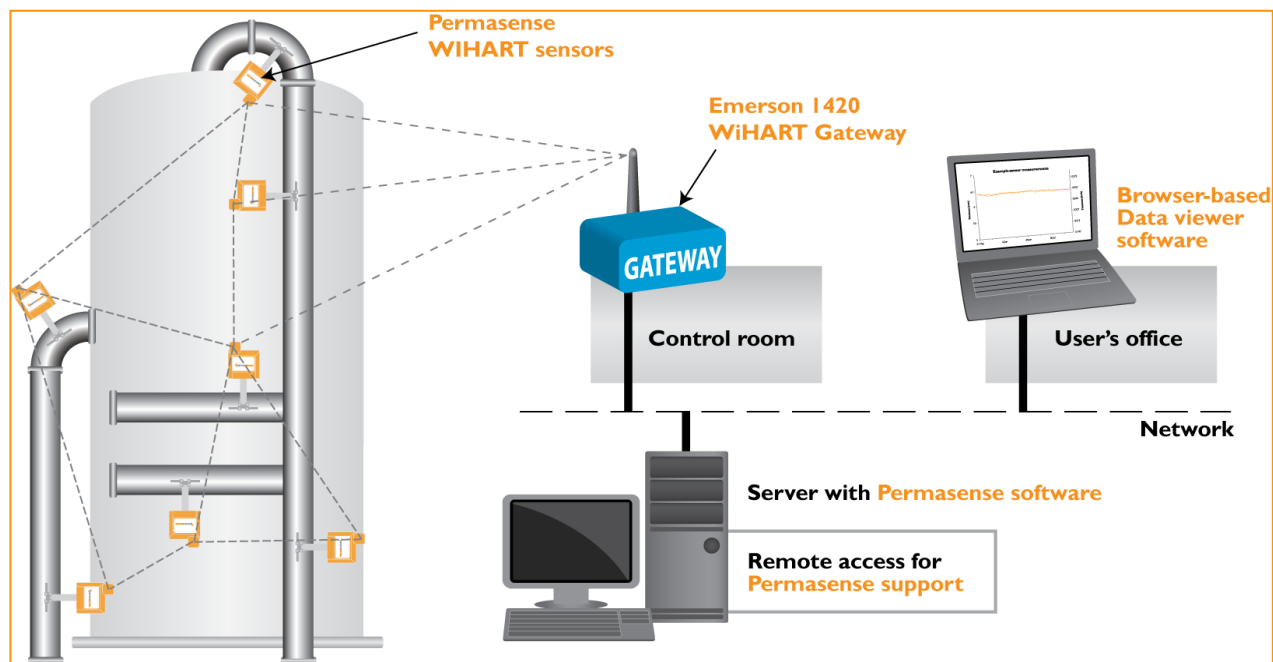
Permasense systems are corrosion monitoring solutions for use in oil and gas and other industrial facilities using permanently installed ultrasonic wall thickness measurement sensors.

An ET410 sensor requires no couplant and is held against the surface of the pipe using a low force produced by its internal magnet and the securing strap. Multiple sensors can be attached to a pipe using a single strap. The ET410 sensor is not intended for use on painted pipes.

Once correctly installed the sensor creates ultrasonic waves in the surface of the pipe which travel through and reverberate in the pipe wall. One or more echoes are seen in the received signal. The thickness is calculated from this signal.



Once a sensor is installed, it will communicate with the gateway specified during installation and any other sensors already installed that are assigned to the same gateway. These sensors form a wireless mesh network. The gateway manages this mesh, selecting the best path to transmit data from each sensor to the gateway. The gateway then delivers this data to the Permasense Data Manager software, which the end user can use to view the data in a browser.



Installation requirements

Before sensor installation:

- Emerson Smart Wireless gateway must be installed.
- Network ID and provisioning information (join keys) for the gateway must be known.
- Access to the sensor locations must be in place.
- If lines are insulated, all insulation must be removed at sensor locations to allow suitable access for sensor installation.

Hardware supplied with the sensor

- ☐ Permasense ET410 sensor, complete with protective cap
- ☐ Stainless steel circular heat shield, one per sensor
- ☐ Lanyard kit, comprising 2m of 316 stainless steel lanyard with looped end and cable lock
- ☐ Strap (3.5m / 138 inches) and strap tensioner
- ☐ Permasense BP20E power module, one per sensor

Tooling supplied in IK220 installation kit

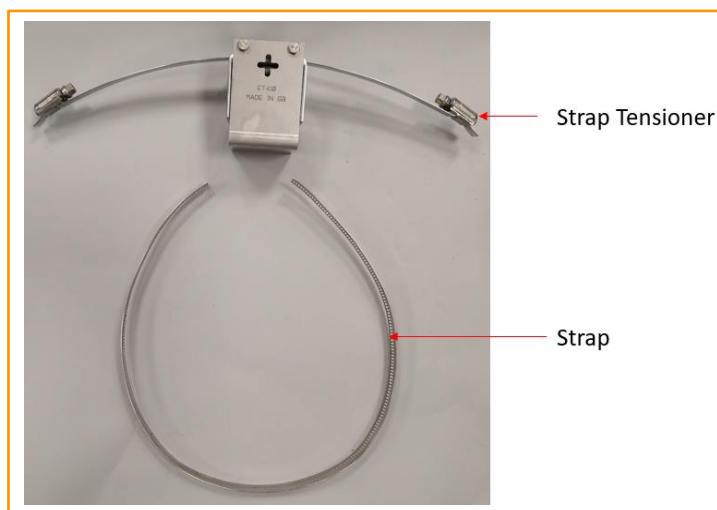
- ☐ Rugged tablet PC, preloaded with Permasense installation software
- ☐ CC21 USB powered commissioning communicator
- ☐ Ratcheting wrench with 8mm socket
- ☐ Tin snips
- ☐ Hex key, 2.5mm, for power module retaining bolts

Task 1. Mounting the sensor

Note: Two people are required for this operation.

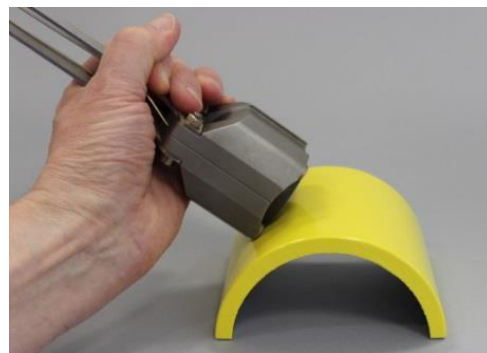
PPE of gloves and safety glasses or full face visor are recommended.

1. Identify the location where the sensor is to be fixed. The securing strap can be installed around pipes up to 1m (40 inches) in diameter. Ensure all cladding and insulation is removed around the circumference of the pipe at the desired sensor location.
2. Unbox the strap tensioner and strap from the packaging.
3. Cut a length of strap by wrapping it around the pipe and cut where the strap overlaps. Feed the strap into one end of the strap tensioner and using the wrench and socket provided, turn the screw on the tensioner until the end of the strap emerges from under the worm drive (at least 5 turns of the worm screw are required).



4. Clean the area of the pipe where the sensor will make contact, mainly to remove any particles which might keep the transducer away from the pipe surface or damage the face of the transducer. A permanent marker may be used to show exactly where each sensor is to be placed on the pipe.
5. Remove the protective cap from the sensor.
Note: Ensure tools and fastenings are kept away from the sensor when the cap is removed as there is a strong magnetic field at the end of the sensor, and this can be damaged upon impact.

6. Carefully place the sensor in the required location on the pipe. Note that the magnets used in the sensors have a high pull force. To avoid damage, and to get the precise location for each sensor, initially place the sensor at an angle to the pipe...

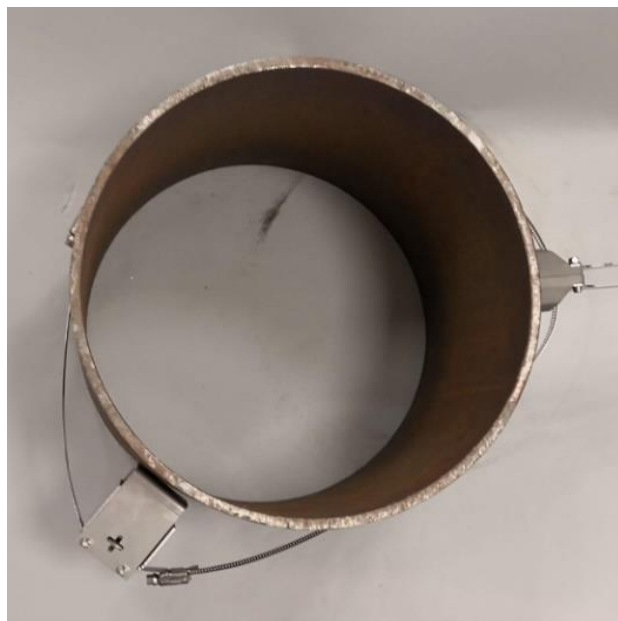


... and then gently lower onto the pipe.

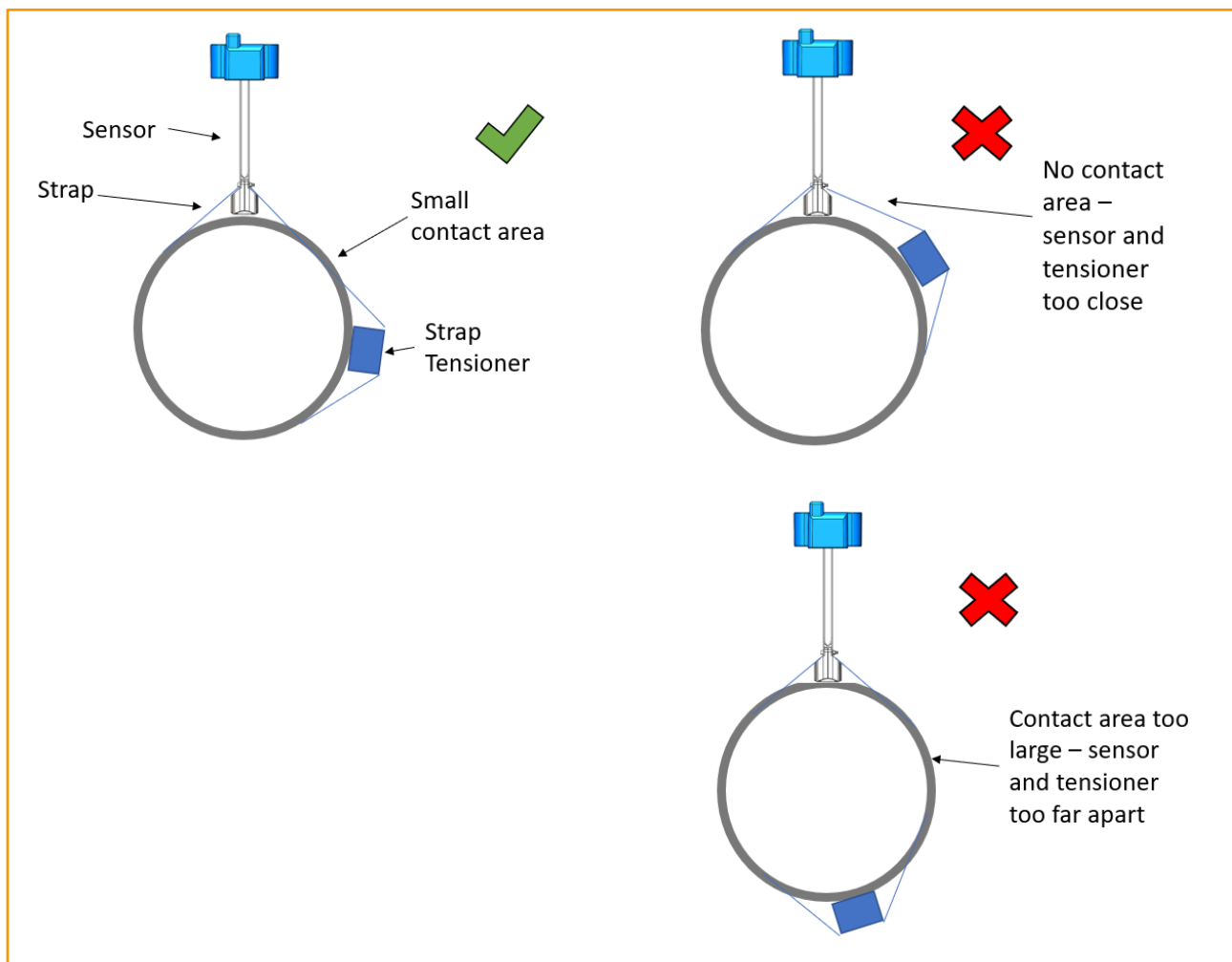
Note: One person should hold the sensor until the strap is installed.



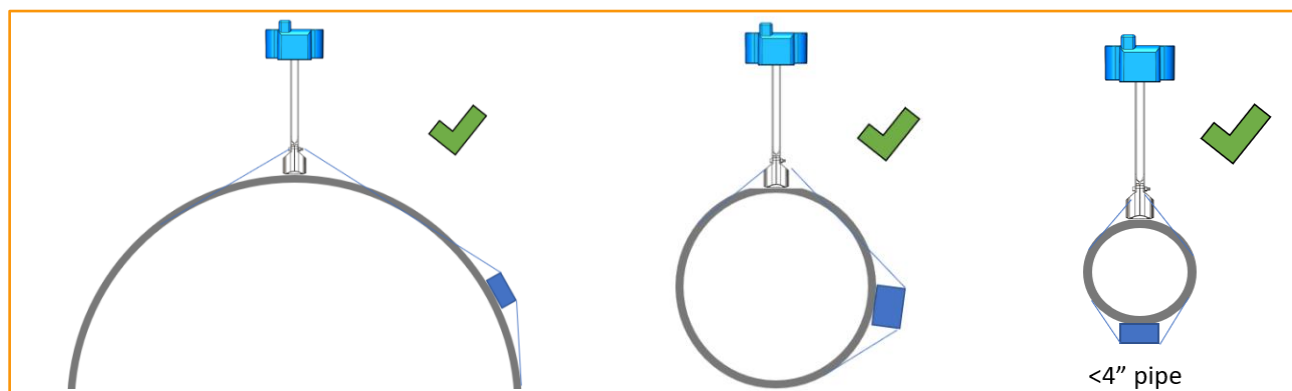
7. Feed the previously cut strap through the strap slot hole of the sensor and around the pipe
8. Feed the free end of the strap into the other end of the strap tensioner and using the wrench and socket provided, turn the screw on the tensioner until the end of the strap emerges from under the worm drive (at least 5 turns of the worm-screw is required)



9. Position the strap tensioner such that the strap just touches the pipe between the sensor and the strap tensioner as per images below.

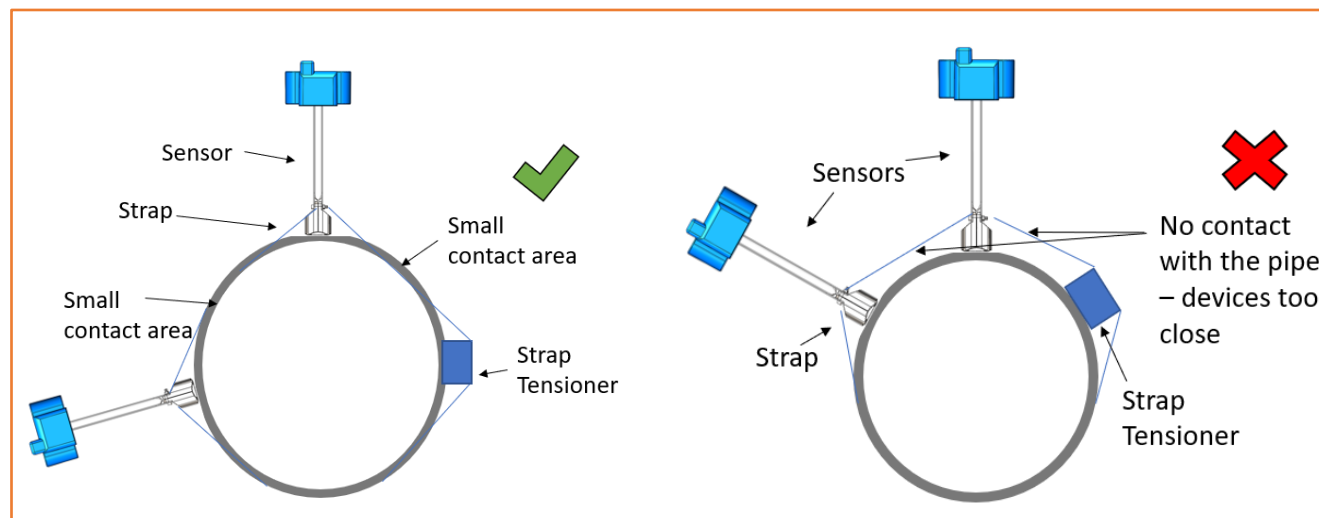


Note: The relative positions of the strap tensioner and the sensor change depending on the pipe diameter. On pipes of less than 4" diameter, position the sensor and tensioner on opposite sides of the pipe.



Note: If there are obstructions which do not allow for the recommended strap tensioner position relative to the sensor, then move the strap tensioner away from the sensor to the closest accessible position.

When installing multiple sensors on one strap it is important to ensure the strap makes contact with the pipe between each of the sensors and the tensioner.



Maintaining this spacing and the length of the strap provided, determine the maximum number of sensors that can share the same strap for a given pipe size.

Pipe size	2" to 7"	8" to 14"	16" to 24"	26" to 34"	36"	40"
Maximum permitted number of sensors	1	2	3	4	5	3

This also restricts the locations you can mount multiple sensors on a pipe using a single strap. If closer spacings are desired, multiple straps must be used.

Note: When mounting multiple sensors on a single strap, only one tensioner is required.

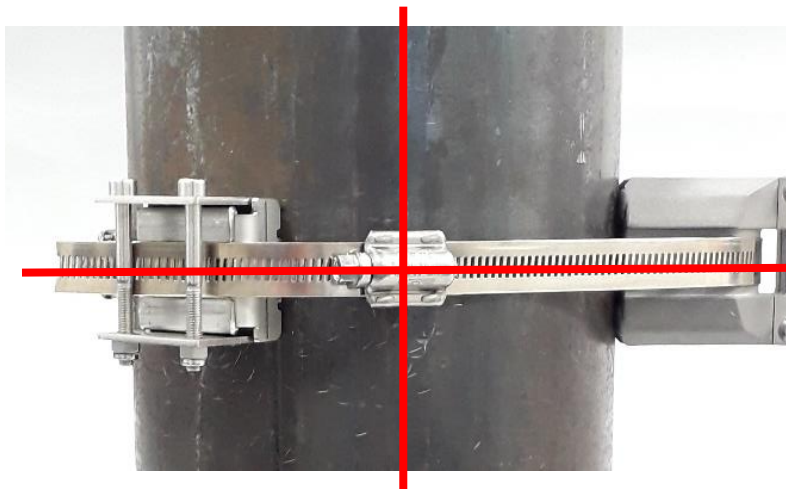
10. Ensure one of the worm-screws of the strap tensioner is in contact with the pipe (or as close to contacting the pipe as possible)

Note: Positioning the worm-screw on the pipe will make it easier to complete the installation.



11. Ensure the strap tensioner, strap and sensor(s) are in-line before tightening the worm-screws on the strap tensioner.

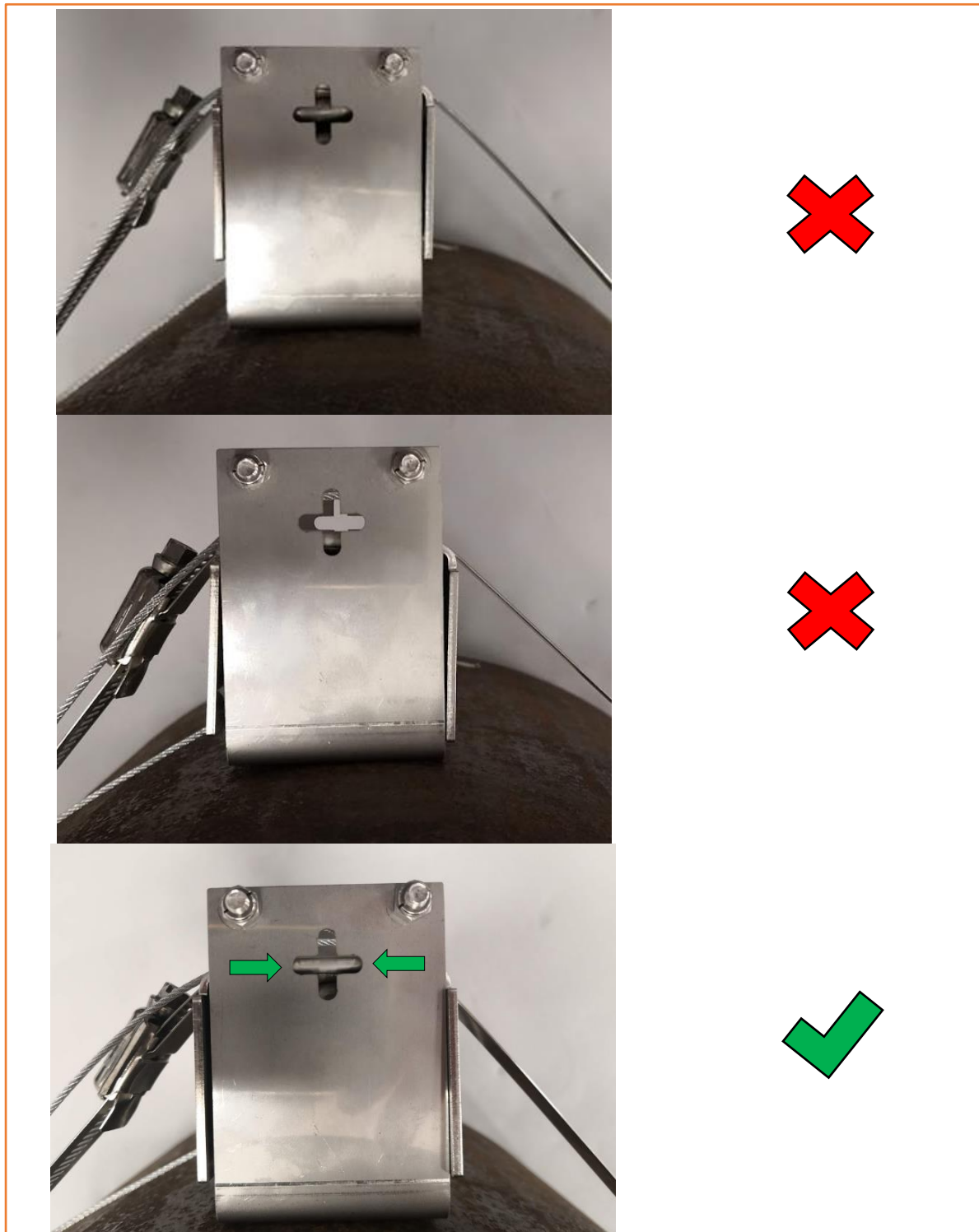
Note: One person should hold the sensor and strap in-line while the other person tightens the strap tensioner.



12. Tighten the worm-screw that is in contact with the pipe (step 10) with the wrench and socket provided, ensuring the tensioner does not slide relative to the pipe. As the worm-screws are tightened, observe the position of the metal plate on top of the spring through the + shaped cut-out on the side of the tensioner. The correct tension is set when the plate is aligned with wide part of the middle of the cut-out as shown in the images below.

Note: When the worm-screws are tightened, the springs in the tensioner are compressed. To avoid the strap becoming loose or over-tightened when the pipe temperature changes, it is important that the spring is set to the correct tension. Do not over-tighten the worm-screws as this could damage the strap or strap tensioner.

Note: As the tensioner is tightened ensure the sensor(s), strap and strap tensioner remain in-line.



13. Ensure that the parts on both sides of the strap tensioner assembly have aligned. If not loosen/adjust the worm-screws on either side until they do. Ensure the sensor is firmly fixed and sitting perpendicular to the pipe as shown in step 11.

Task 2. Fitting the lanyard

1. Wrap the lanyard around the circumference of the pipe, on top of any cladding. The 2m (7ft) length is sufficient for a maximum pipe diameter of up to 20". When it is not possible to wrap the lanyard around a pipe, find an alternative attachment point for the lanyard.
 - For pipes exceeding 20" in diameter, lanyards may be linked together.
 - For sensors in close proximity to each other, a single lanyard may be used.
2. Thread the bare end of the wire through the loop in the lanyard to secure it to the pipe.
3. Feed the end of the lanyard into the cable lock and push the lock up the lanyard.



4. Feed the bare end of the lanyard through the strap tensioner...



Do not put fingers under bolts of the tensioner. Take special care when the bare end of the lanyard is fed through the tensioner.



5. ... then through the strap slot of each sensor, the lanyard hole in the sensor head and then into the return hole of the cable lock.

Feed the lanyard wire through the cable lock to minimize the slack in the wire.



Note: The lanyard wire can be released from the 'lock' using the release key.



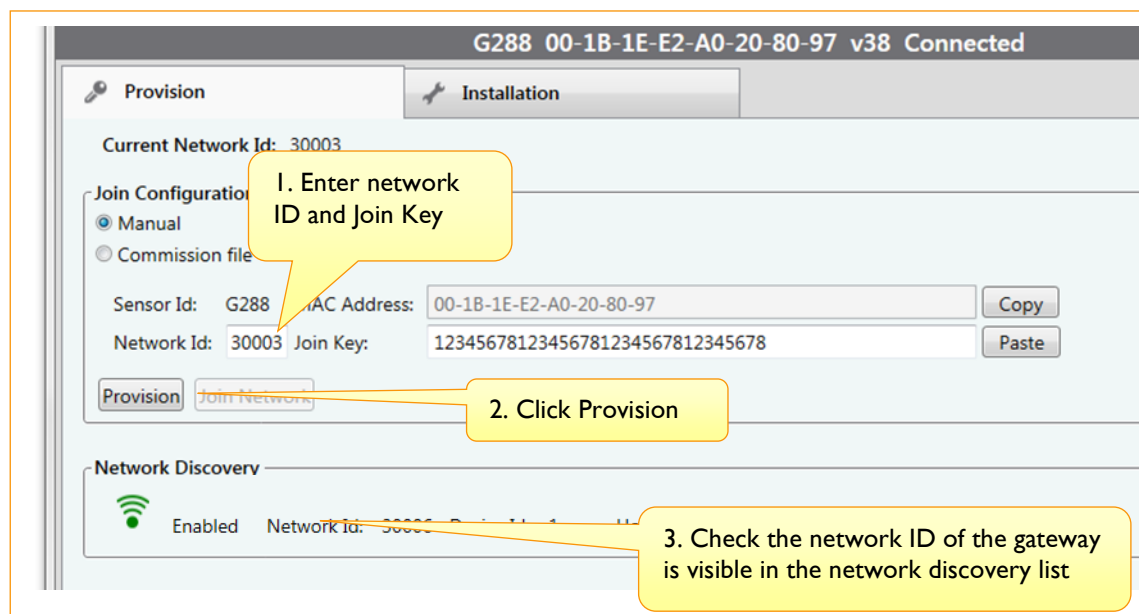
6. If the heatshield is to be installed later, secure it to the lanyard or sensor strap with a Nylon cable tie.

Task 3. Provisioning the sensor on the radio network

1. Provision the sensor to join the gateway using the 200 series installation app



Refer to *User guide – IK220 installation kit* for detailed instructions. A summary of the steps is given below.



2. Record the installation location, sensor ID, MAC address of the sensor, and power module serial number.

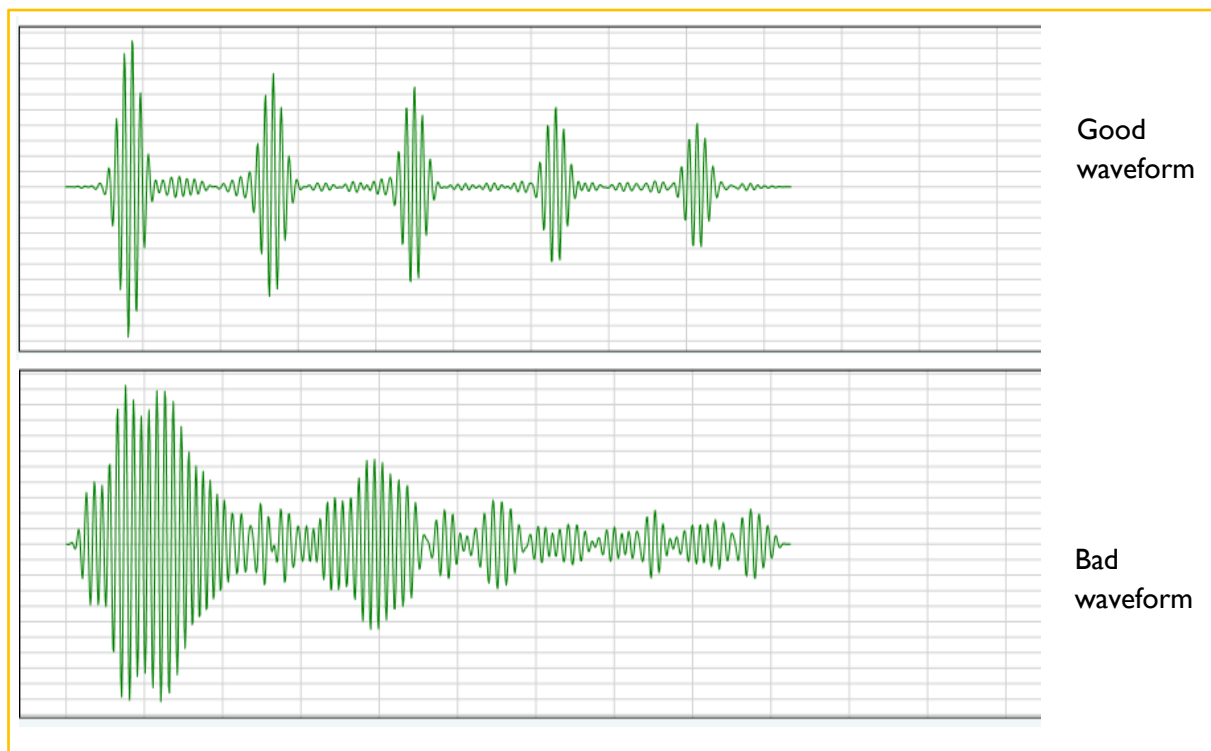
Task 4. Completing sensor installation

In the installation app software on the Installation tab

1. Press the Start button. Wait for an Ultrasonic waveform to download from the sensor.

Note. Waveforms are automatically downloaded every 10 seconds. When a new waveform arrives, the lines briefly become thicker.


2. Check the quality of the waveform. The first one or two reflections must be well defined above the noise. Only one reflection is needed to calculate a thickness. If the signal is poor, loosen the strap by unscrewing one of the worm-screws. Move the sensor and strap to a slightly different position then follow steps 10 to 13 from Task 1 to reinstall sensor in the new position. Once the sensor is safely reinstalled on the pipe, wait 20 seconds before assessing the waveform quality for the new location.



3. Check the measured thickness displayed is inline with expectations.
4. Press the *Complete* button. Verify that the Install State is Off and Installed is ticked in the footer of the application.



5. Remove the CC21 and fit the power module, tightening the two power module retaining bolts. When the power module is fitted, the sensor will restart and try to join the WiHART gateway. In a large network of 100 sensors this can often take 2 hours, and sometimes up to 6 hours.

 Refer to *Installation guide – BP series power module*.

Sensor installation is now complete.

Task 5. Sealing the cladding

1. Re-pack the cavity around the sensor with insulation.
2. Take the heatshield and slide it around the sensor legs. Bend the heatshield to form it as closely as possible to the curvature of the cladding.
3. Drill through the holes in the heatshield and through the cladding.
4. Put a generous bead of sealant around the rim of the circular hole in the cladding push the heatshield down onto it.
5. Fix the heatshield in place with suitable pop rivets or screws.
6. Apply further sealant where necessary to ensure the sensor and cladding are well sealed.

Re-installing a sensor (if required)

If the sensor is producing a poor-quality ultrasonic signal, it can be reinstalled:

1. Attach the CC2I to the tablet PC and the sensor and run the installation app.
2. On the Installation tab, press the Reset button and then follow the instructions described in Task 4.

Note. The sensor will no longer join the network until the Complete button is pressed again.

3. If the sensor has to be moved, loosen the strap by undoing the worm-screw in contact with the pipe until the strap is released from the worm-drive, then follow the instructions described in Task 1 as for a new installation. Where possible, leave the lanyard in place to prevent a hazard should the sensor fall.



Do not cut the strap while it is under tension. Doing so will result in the sudden release of energy from the tensioner which could cause damage or injury.



Re-provisioning a sensor (if required)

A sensor can be re-provisioned, if required to assign the sensor to a different gateway, without needing to physically reinstall the sensor:

1. Remove the power module and attach the CC2I to the tablet PC and the sensor and run the installation app.
2. On the Provision tab, enter the new provisioning information.
3. Click the Provision button.

The Join Network button can be pressed to start the sensor join process and receive on-screen feedback about the join state of the sensor.

Note. Although the join process often takes just a few minutes, it can take several hours depending on the size and activity of the network.



See *User guide – IK220 installation kit* for more details about using the status bar to identify the join state.

Maintenance

The ET410 sensor is a sealed unit with no user serviceable parts.



See *Installation guide - BP series power module* if the power module requires changing.