QE2008-W SET

SYSTEM FOR STRAIN MEASUREMENT WITH BLUETOOTH TRANSMISSION, IDEAL FOR TIE BAR ANALYSIS

User Manual

C-0123_v1.0_ENG

TABLE OF CONTENTS

PREFACE

Device unique data

Note the device serial number, order code and type, which are listed on the label, here:

- applied to the housing for the sensor
- applied on the case for the set

Should you need technical assistance, they must be communicated to Gefran Customer Service.

QE2008-W	
Serial No.	
Order code	

Warnings and safety

Always make sure you have the latest manual version, that can be freely downloaded from the Gefran website (www.gefran.com).

The devices illustrated in the manual must be installed by qualified technicians, following the laws and regulations in effect and according to the instructions contained in this manual.

Installation and/or maintenance technicians must read this manual and strictly follow the instructions herein and found in the annexes since Gefran cannot be held liable for personal, property and/or product damages should the following conditions not be met.

Disposal

The QE2008-W must be disposed of in accordance with applicable regulations.

Some of the components used in the devices can cause damage to the environment if incorrectly disposed.

Disclaimer

Although all information contained within this document has been carefully checked, Gefran S.p.A. cannot be held liable for the possible presence of errors, or damage to persons or property due to improper use of this manual.

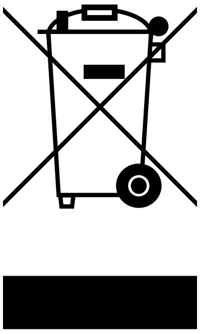
Gefran S.p.A. also reserves the right to make changes to the content and form of this document as well as the characteristics of the illustrated devices at any time without prior notice.

The technical and performance data indicated in this manual are to be considered as a guide for the user to determine the suitability for a certain use, and are not guarantees. They may be the result of Gefran S.p.A. test conditions and the user must compare them to his/her real application requirements.

Gefran S.p.A. cannot be held in any way liable for any damage to persons or property resulting from QE2008-W Sensor tampering, incorrect and improper use or otherwise non compliant with instructions in this manual.

Copyright

WEEE INFORMATION



DE

„Umsetzung der Richtlinie 2012/19/EU über Elektro- und Elektronik-Altgeräte (EEA)“
Das Symbol der durchgekreuzten Mülltonne auf dem Gerät oder der Geräteverpackung weist darauf hin, dass Sie das Produkt am Ende seines Lebenszyklus separat entsorgen müssen.
Die Getrenntsammlung dieses Geräts an seinem Lebenszyklusende wird vom Hersteller organisiert und besorgt.
Der Nutzer, der das Gerät entsorgen möchte, muss sich daher an den Hersteller wenden, um Auskunft über seine Vorgehensweise zur Getrenntsammlung des Geräts an dessen Lebenszyklusende zu erhalten.
Die entsprechende Getrenntsammlung für die anschließende Zuführung des Altgeräts zum Recycling, zur Wiederaufbereitung und zur umweltverträglichen Entsorgung trägt dazu bei, negative Auswirkungen auf die Umwelt und die Gesundheit zu unterbinden und begünstigt die Wiederverwendung und/oder das Recycling von Werkstoffen, aus denen das Gerät besteht.

EN

“Implementation of Directive 2012/19/EU on waste electrical and electronic equipment (WEEE)”
The symbol showing a crossed-out wheeled bin on equipment or its packaging indicates that the product must be collected separately from other waste at the end of its useful life.
The manufacturer is responsible for organising and managing the separate collection of this piece of equipment at the end of its useful life.
Users wishing to dispose of the equipment must therefore contact the manufacturer to obtain instructions from the same on how to have the equipment collected separately at the end of its useful life.
By collecting the disused equipment separately, it can be recycled, treated or disposed of in an environmentally friendly manner, thus helping to prevent the environment and public health from being affected negatively and enabling reuse and/or recycling of the materials forming the same equipment.

FR

“Transposition de la Directive 2012/19/UE relative aux déchets d’équipements électriques et électroniques (RAEE)”
Le pictogramme de la poubelle barrée, figurant sur l’équipement ou sur son emballage, indique que le produit en fin de vie doit être traité séparément des autres déchets.
Le ramassage sélectif de cet équipement en fin de vie est organisé et géré par le constructeur.
Tout utilisateur qui souhaiterait se débarrasser de l’équipement devra donc contacter le constructeur pour obtenir des informations concernant la méthode adoptée pour permettre le ramassage sélectif de l’équipement en fin de vie.
Un ramassage sélectif correct, en vue de l’acheminement de l’équipement vers des opérations de recyclage, de traitement et de mise au rebut respectueuses de l’environne-ment, contribue à réduire les impacts poten-tiellement néfastes sur l’environnement et la santé, outre à favoriser la réutilisation des matériaux/composants dont l’équipement est constitué.

IT

“Attuazione della direttiva 2012/19/UE sui rifiuti di apparecchiature elettriche ed elettroniche (RAEE)”
Il simbolo del cassonetto barrato riportato sull’apparecchiatura o sulla sua confezione indica che il prodotto alla fine della propria vita utile deve essere raccolto separatamente dagli altri rifiuti.
La raccolta differenziata della presente ap-parecchiatura giunta a fine vita è organizzata e gestita dal produttore.
L’utente che desideri disfarsi dell’apparec-chiatura dovrà quindi contattare il produttore per ricevere indicazioni sul sistema da quest’ultimo adottato per consentire la raccolta separata dell’apparecchiatura giunta a fine vita.
L’adeguata raccolta differenziata per l’avvio successivo dell’apparecchiatura dismessa al riciclaggio, al trattamento e allo smaltimento ambientalmente compatibile contribuisce ad evitare possibili effetti negativi sull’ambiente e sulla salute e favorisce il reimpiego e/o riciclo dei materiali di cui è composta l’apparecchiatura.

1. GENERAL DESCRIPTION

1.1. Profile

The double magnet wireless strain sensors QE2008-W are used for **accurate force and strain measurements** on ferromagnetic surfaces. The compact design, quick installation and simple usage, along with the capability of working colaboratively with more sensors of its kind, offer a wide variety of applications.

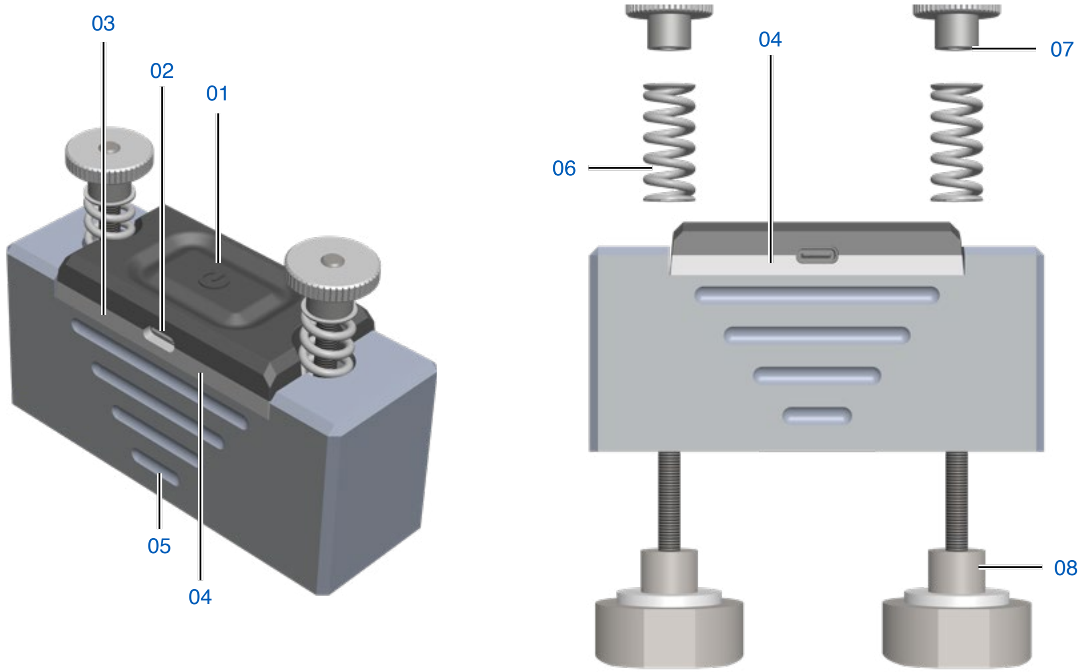
The heart of the QE2008-W is a foil strain gauge, which signal is enhanced by an integrated state of the art amplifier. The digitalized signal is then transmitted through the Bluetooth Low Energy protocol to a mobile device running the “Sensormate” mobile app. The app processes and displays the received measurements in real-time. The data can be stored for tracking purposes or further analysis and opened using any *.csv* parser.

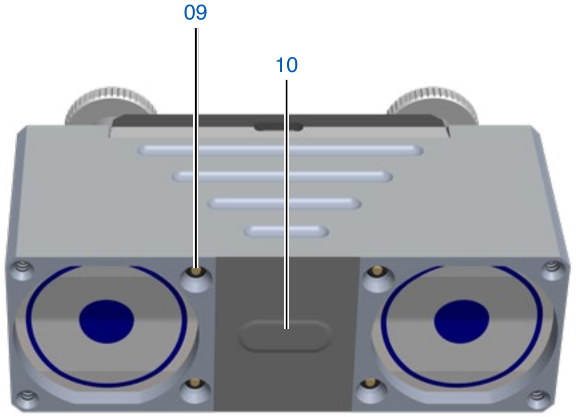
1.2. Main features

- Wireless set for strain measurements with Bluetooth 5.0 Low Energy.
- Press-on strain gauge technology (quick and non-destructive mounting).
- Easy mounting via magnetic holding on flat and round surfaces (diameter ≥45mm).
- Visualization of the measurements via the “Sensormate App”.
- High performance amplifier with high resolution and fast sampling rate.
- Integrated LiPo battery with long operating time.
- Integrated accelerometer for mounting assistance.

1.3. Part Description

1.3.1. QE2008-W Sensor





01	Power button
02	USB-C connector
03	Charging LED
04	Function LEDs
05	Mounting guides
06	Spring
07	Knurled nut
08	Magnet + screw
09	Charging contact
10	Sensing element

1.3.2. QE2008-W Set

Example with 8 sensors.

01	QE2008-W Set case
02	QE2008-W
03	Repair Kit
04	USB power adapter + USB-C cable
05	Protective foam
06	Charging station
07	USB-C connector

1.4. Turn QE2008-W on or off

Turn on

- Press and hold the power button until the function LEDs turn blue. Now the device is ready for connection.

  If QE2008-W doesn't turn on, you might need to charge its battery. Refer to **“1.6. Charging the sensors”** on page 8.

Turn off

- Press and hold the power button until the function LEDs turn off.

1.5. LEDs status

QE2008-W sensors have two set of LEDs to inform both about the charging status and the operation status of the sensor.

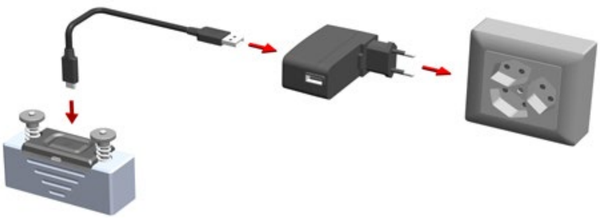
<table>
<tr><td></td><td>Charging LED</td><td>Description</td></tr>
<tr><td></td><td>Orange</td><td>Charging</td></tr>
<tr><td></td><td>Green</td><td>Fully charged</td></tr>
<tr><td>Connected to the App</td><td>Function LEDs</td><td>Description</td></tr>
<tr><td rowspan="5">No</td><td>Steady blue</td><td>Ready for connection</td></tr>
<tr><td>Steady red</td><td>Defective</td></tr>
<tr><td>Steady orange</td><td>Battery charge low</td></tr>
<tr><td>Steady yellow</td><td>Unassigned and ready for connection</td></tr>
<tr><td>Fast blinking blue</td><td>Establishing a connection with the Sensormate app</td></tr>
<tr><td rowspan="2">Yes</td><td>Slow blinking blue</td><td>Connected to the Sensormate app and running</td></tr>
<tr><td>Other</td><td>A special mode was set by the Sensormate app</td></tr>
</table>

1.6. Charging the sensors

The QE2008-W sensors have an internal lithium-ion polymer rechargable battery, which assures a long operating time of the device. Compared with traditional battery technology, lithium-ion polymer batteries are lighter, charge faster, last longer, and have a higher power density for more battery life.

To charge the QE2008-W sensor, do any of the following:

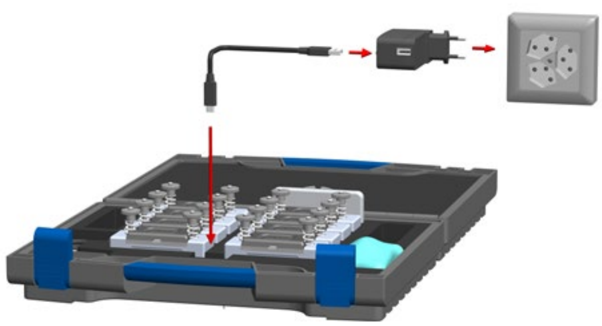
- Connect the sensor to a power outlet using the charging USB-C cable and the USB power adapter.



The battery is charged via the sensor's USB-C port.

- Put the sensor in the QE2008-W Set case. Plug the charging station to a power outlet using the charging USB-C cable and the USB power adapter.

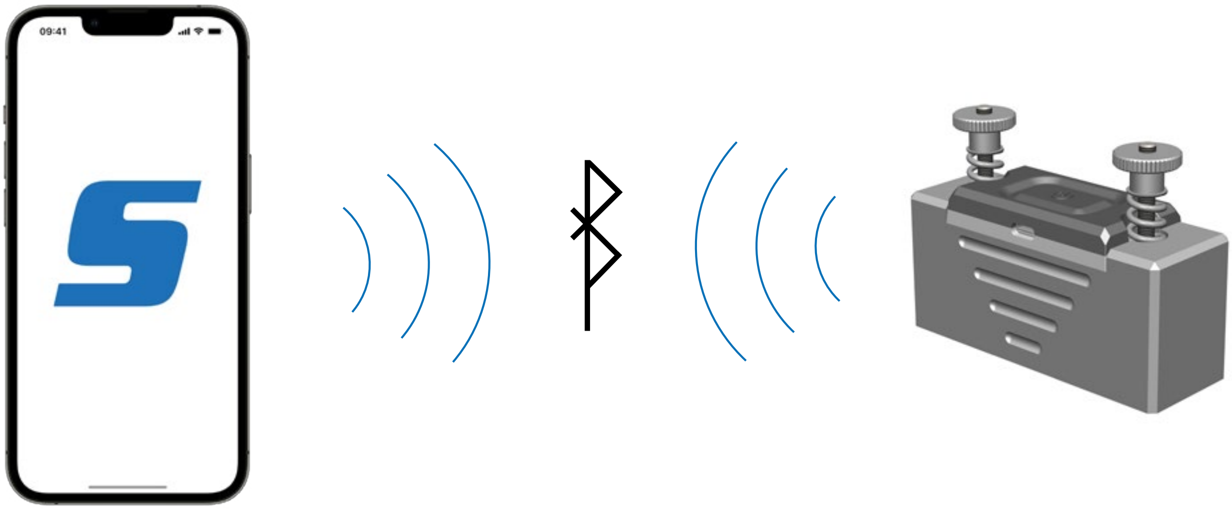
  Up to 8 sensors can be charged simultaneously via the charging station.



The battery is charged via the sensor's charging contacts.

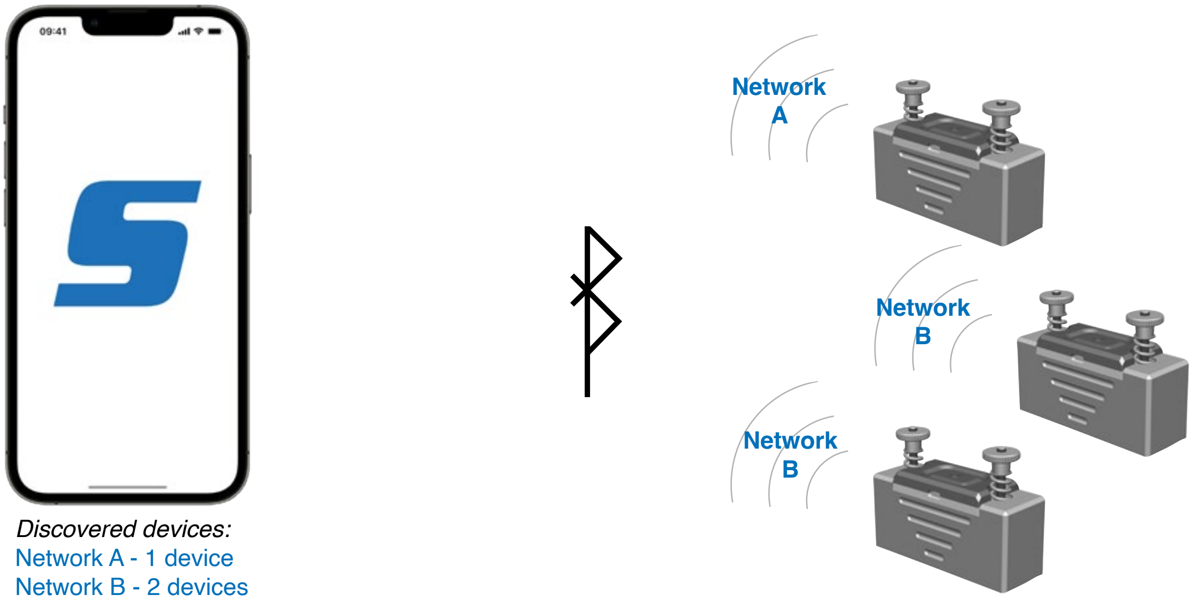
1.7. Sensor Operation Principles

The QE2008-W sensors communicate via **Bluetooth 5.0 Low Energy** directly with the "Sensormate" App, installed on a mobile device or a Desktop computer. The "Sensormate" app is designed to read the sensor's strain measurements and other parameters (e.g., the battery level, sensor orientation, firmware version, etc.) as well as to control the sensor's operation (e.g., sampling rate, signal reset, LED colors, firmware upgrade, etc.).



Bluetooth 5.0 Low Energy connection established to one sensor

The fundamental communication concept that regulates the behavior of the sensor is the **Network**.
A Network is an abstract concept that defines a group of devices which has to operate together. QE2008-W networks are configurable, and can be composed by one or serveral devices.
Every sensor must be part of a network in order to be able to send measurements to the Sensormate App, and it is important that, inside a specific network, sensor names are uniquely identified: two sensors with the same name will lead to a conflict.



Sensors belonging to different networks are recognized by the app

Sensors that are sold as part of a QE2008-W Set belong to the same network by default.

2. GENERAL HANDLING REQUIREMENT

These sensors are precision instruments with a resolution of 0.1$\mu\varepsilon$.
The devices must therefore be handled with great care. This instruction manual must be read and observed by every user.

Warning! The installation of the devices described in the manual must be carried out by qualified personnel, following the laws and regulations and in accordance with the instructions contained in this manual.

Warning! Do not ever open the device.

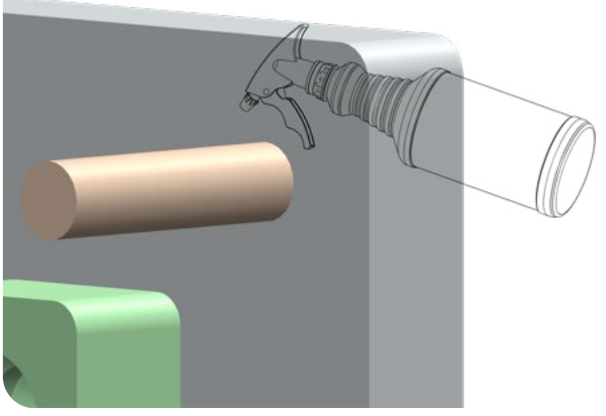
Warning! Use extreme caution when installing and fixing the sensor unit.
If the sensor unit is installed at a height of more than 1.8 meters, all persons near the sensors location must wear the protective helmet.

Before proceeding with the installation, check that the sensors are intact and have not been damaged during transport. Also make sure that the package contains all accessories listed in the documentation.

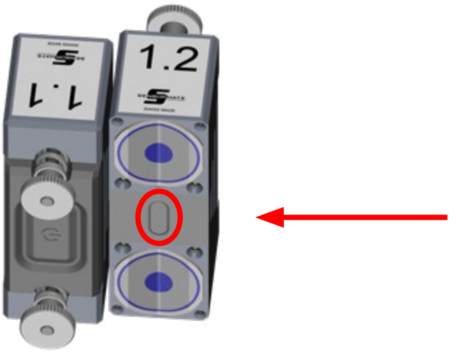
Warning! If even one of the above-mentioned requirements is not met, suspend installation and contact your Gefran dealer or Gefran Customer Service.

2.1. Sensor Handling and Installation

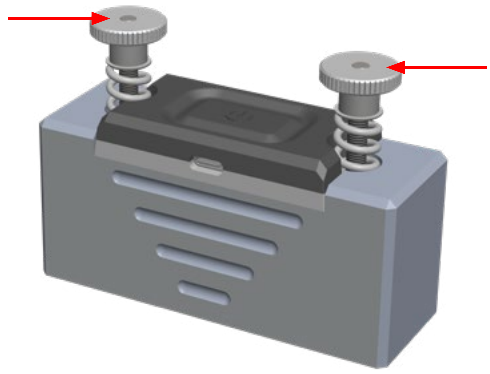
1. Careful surface cleaning - Oil and other surface contamination, or paint which has been applied, must be removed at the site of installation.



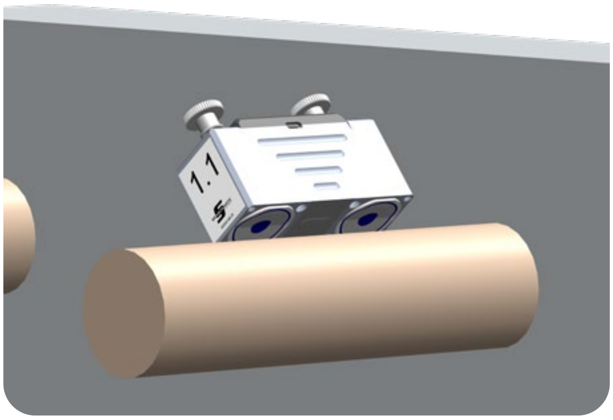
2. Check the foil on the sensor for signs of damage. In case of damage, please refer to the Foil replacement section or contact your Gefran dealer or Gefran Customer Service

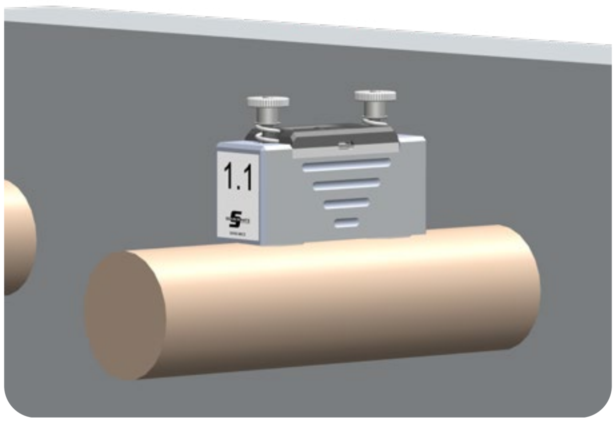


3. Knurled nuts alignement - Turn both knurled nuts so that they are flush with the end of the threaded rod.

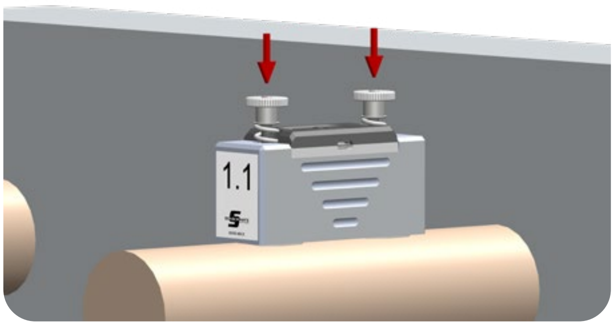


4. Careful placement - The long edge of the sensor must be placed onto the surface to be measured and then tilted. The magnets pull the sensor onto the surface.





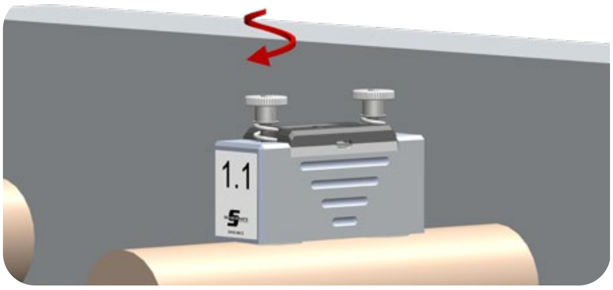
5. Placement validation - If the magnets do not automatically jump onto the measuring surface, press down the knurled nuts one after the other. The magnets should now jump onto the surface. The attraction force of the magnets is now optimal.



- **The sensor shall not be moved onces placed on the surface.**
- **The magnets have ground guides. Make sure that both sides of the guide rest on the surface!**

6. Placement optimization - The contact force can be increased by tightening the knurled nut (usually not necessary).

If a magnet jumps back, the knurled nut has been tightened too much, thereby making the spring tension too big. Loosen the knurled nut to relieve the tension of the spring.



- **The sensor must make proper contact and be stable.**
- **The sensor must not move when shaken slightly.**

3. SENSORMATE APP

Sensormate is a simple, user-friendly front end to the QE2008-W and other GEFRAN products.

Its frequent updates enable constant improvement in measurement efficiency and speed, making it the best companion for sensors.

3.1. App Installation

- The Sensormate app is available free of charge for Android, iOS and Windows devices. Scan the QR code or follow the link related to your device of choice to download it from the official store.
- This version of the manual refers to the Sensormate app version 2.0.0. New releases of the app might differ from what is stated in this manual.

--> For Android 6.0 or newer: https://play.google.com/store/apps/details?id=ch.Sensormate.Inspectmate&hl=en_US

GET IT ON Google Play

--> For iOS 8 or newer: https://apps.apple.com/de/app/sensormate/id1509011013

Download on the App Store

--> For Windows 10 or newer: https://www.microsoft.com/de-de/p/sensormate/9nj60q0cmbzl

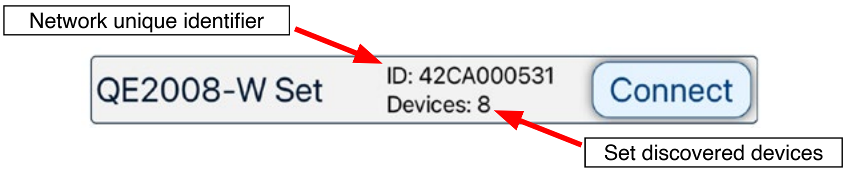
Get it from Microsoft

3.2. Scan for QE2008-W Networks

- When the Sensormate app is started, the device list page is presented.
- A "scan for devices" is automatically launched for approximately 15s. If during this interval no QE2008-W networks/devices were found, please make sure they are turned on and launch manually the "scan for devices". When a device has been found, it is added to the device list and becomes available for connection.
- When connecting to a device, the navigation menu opens.
  Tapping the ≡ icon also opens the navigation menu. To close it, tap anywhere outside the menu.
- The navigation menu shows the pages available for the connected device. From these pages the user can configure and control the device, as well as process, analyse and store measurements.

3.3. QE2008-W connection

- After having scanned (refer to previous paragraph) and found the desired QE2008-W sensors, the connection between the sensors and the app can be established. The discovered QE2008-W sensors will be added under the "QE2008-W Set" item in device list page.



- Tap connect in order to establish a connection with the QE2008-W Set.
- Wait until the status of the network is “online”. The set is now ready to be used.

- **Bluetooth must be enabled for the Sensormate app to discover nearby devices**

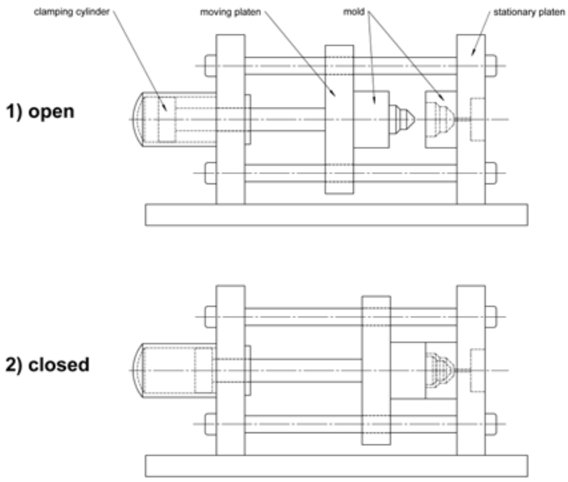
4. TYPICAL APPLICATIONS

These sensors are precision instruments with a resolution of 0.1$\mu\varepsilon$.
The devices must therefore be handled with great care. This instruction manual must be read and observed by every user.

4.1. Strain Measurement on tie bars and round surfaces

4.1.1. Parallelism and Clamping Force analysis

4-Tie bar (4-Column) Press machines are used in a wide variety of applications. The goal of these presses is, as the name suggests, to press an object, applying to it a certain force often called **Closing Force** or **Clamping Force**. The most common models of presses consist of two stationary platens anchored to the ends of four parallel tie bars. One additional platen is placed between the stationary ones and is free to move by means of a closing unit. This closing unit serves the purpose of applying the force to the compressed object.



When the press is closed (the moving platen is compressing the object), the applied force causes the two stationary platens to slightly translate away from each other, making the tie bars elongate.
In an ideal working condition, the amount of this elongation is exactly the same on each of the four tie bars. This is technically known as "even distribution of the closing force".

In real life, it is common that this distribution is not even. Several factors, such as incorrect installation and non-flatness of the pressed object, can be the cause of this issue. It is fundamental to monitor this phenomenon as it can induce important damages to the press itself and to the involved parts.
Moreover, in certain applications such as Injection Molding or Die Casting machines, where the compressed object is a mold, an uneven distribution can result in a produced part with poor quality, not reaching customers specifications.

Not only is the even distribution of the closing force essential, but the total value is also of crucial interest, since it is applied directly to the compressed object.

With the QE2008-W sensors, measuring and analysing the above mentioned closing force parameters is made available in a quick and easy way, and check of each tie bar is immediate. Along with the Sensormate App, the measurements are processed and the overall inspection is presentend via user friendly indicators

4.1.1.1. Mounting - 2 Sensors on the Tie Bar

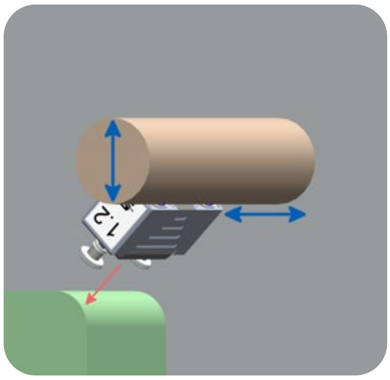
Please refer to **"2.1. Sensor Handling and Installation"** on page 10 for instructions on how to install the QE2008-W sensors on any ferromagnetic surface.

For this measurement, each of the 4 tie bars of the machine must have 2 QE2008-W sensors placed 180° apart from each other, at the same longitudinal position of the tie bar.

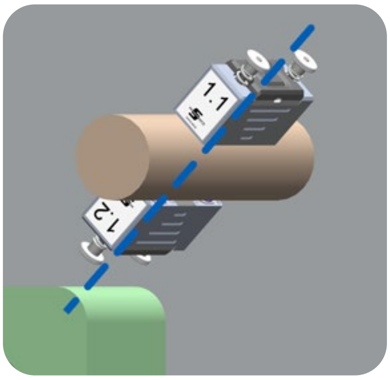
Procedure

- Choose one pair of QE2008-W sensors.

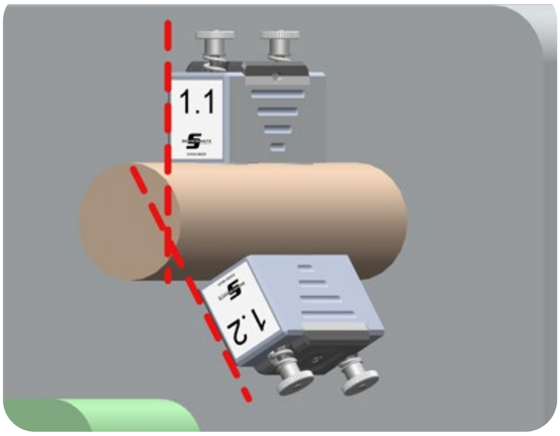
- Select one of the 4 tie bars of the machine to mount the chosen sensors on.
- Mount one sensor on the tie bar, placing it away from the clamping platen at least at a distance equal to the tie bar diameter. For an optimal measurement, it is reccomended to position the sensor with the power button facing the center of the mold, if the space allows it.



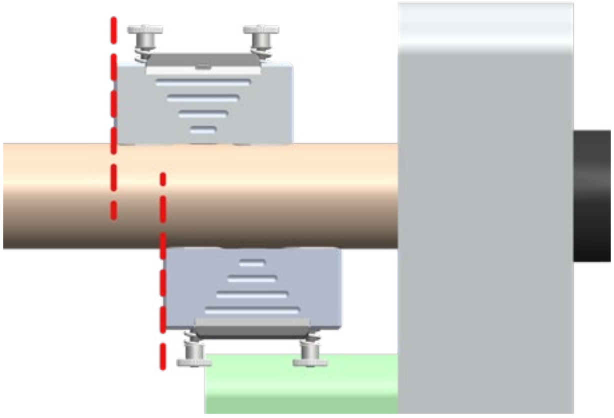
- Mount the second sensor at 180° from the first.
  Make sure that the external edges of the sensors are aligned. This type of mounting allows compensation of bendings.



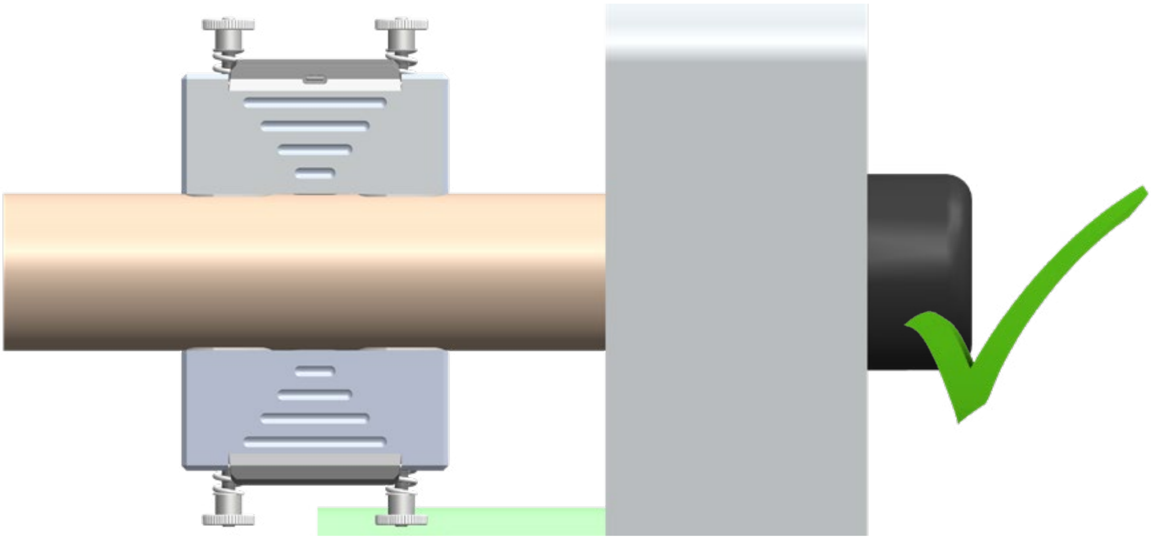
- **The sensors must be positioned parallel to the tie bar!**
- **The 2nd sensor must be placed exactly opposite (180°) and parallel to the 1st sensor!**
- **Mount the sensors when there is no load applied (e.g. no force applied on the object / mold open)**



Incorrect! Distance not 180°



Incorrect! External edges not aligned



Correct!

- Repeat the mounting process for the rest of the tie bars (one couple of sensors per tie bar).

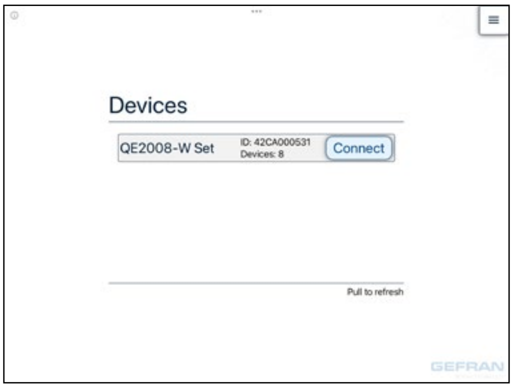
Before the start of your measurements, operate slowly the machine and ensure that

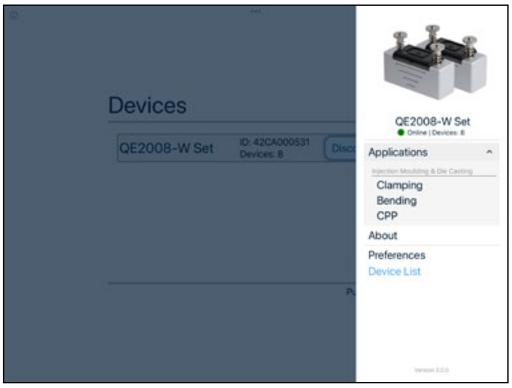
- **the sensors do not obstruct the normal operation of the machine.**
- **the integrity of the sensors is not compromised.**

Mounting check via the Sensormate app - 2 Sensors on the Tie Bar

Once the placement of the sensors is complete on all of the desired tie bars, check if the mounting was correctly done using the Sensormate app.

1. Open the app and scan for nearby devices. Once the QE2008-W Set is detected, connect to it and wait for the status of the network to be **"online"**



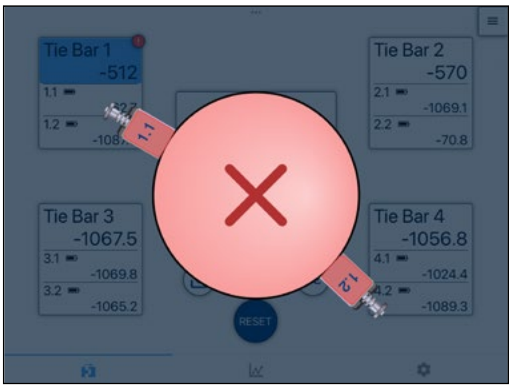


2. Navigate to the **Clamping Measurement** page under **Applications** > **Clamping** and tap the **Mounting check** button.
   The app will analyse the mounting of all the sensors. This process takes a few seconds.

3. Once the mounting check has finished, the incorrect mountings will be indicated with an exclamation mark

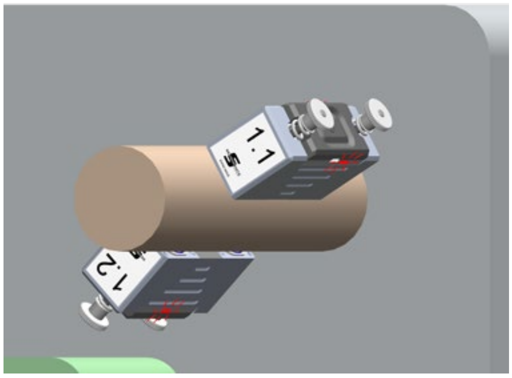
4. By tapping on the tie bar name, a submenu will open. Tap the **Mounting viewer** button to open the mounting viewer for the chosen tie bar.

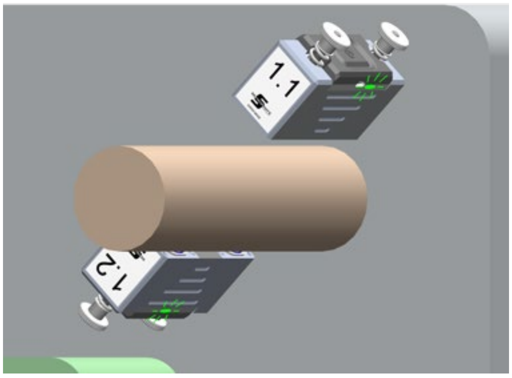
5. The mounting viewer will show how the sensors are positioned and will indicate the status of the mounting by setting the filling color. RED stands for incorrect and GREEN for correct.



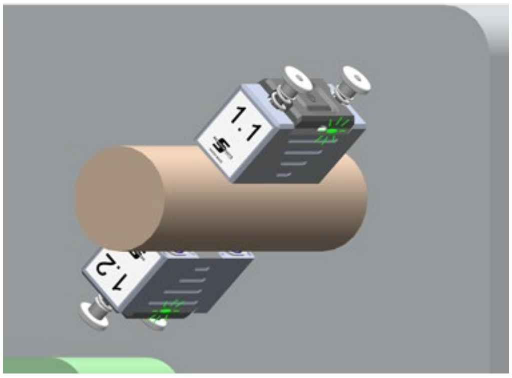
6. While the mounting viewer is open, the function LEDs of the selected sensors will indicate their relative alignment status. LEDs are RED when the sensors are not correctly aligned and they are GREEN when they are correctly aligned.

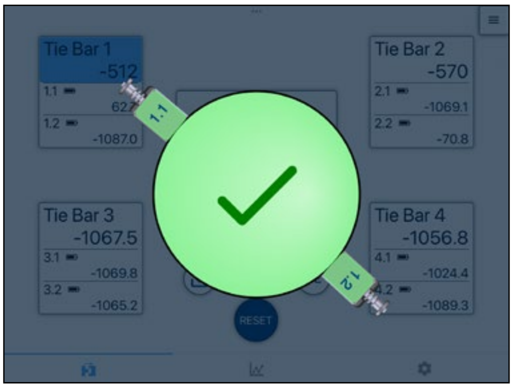
   In case of incorrect alignment, unmount the most accessible sensor and, hovering it around the tie bar, find the position where the LEDs become GREEN. This indicates the correct angular position (180°) where to mount the sensor.





7. Mount the sensor at the previously found position. Check that the LEDs are GREEN after the mounting. If they are not, repeat this step until you find the correct spot.





7. Repeat for all the Tie Bars that show an exclamation mark 

Always tilt the sensors and place them from the long edge when mounting

Never drag the sensors through the surface when the magnets are pulling. This can cause damage to the sensing element.

4.1.1.2. Measurement procedure

During the tie-bar strain measurement, the machine must not be operated or closed at high speeds as vibrations can affect the measurement. Drive the machine slowly.

1. After the sensors have been mounted and their mounting position has been checked with the Sensormate app, perform 3 **dry cycles** (without injection), only closing and opening the press. This procedure allows the sensors to stabilize and adapt to the surface where they are mounted.

   Dry cycle: *consists of closing the press completely and opening it afterwards, without any intermediate step. The term "dry" derives from Injection molding, where this step is performed without injecting plastics in the mold.*

2. Open the press.

3. Navigate to the **Settings** page under **Applications** > **Clamping** and set the operator name, the machine name, the diameter of the tie bar, the accepted **tolerance** and finally the **Young's modulus** of the tie bar material.

   Tolerance: *maximum allowed deviation between a tie bar value and the average of all the tie bars.*

   Young's modulus: *depends on the material the tie bar is made of. It is used to convert a measurement from strain units to force units.*

4. Go to the **Clamping Measurement** page and press the **RESET** button. This will remove the residual values the sensors may have.

For a detailed explanation on the Clamping Measurement page, please refer to the section "4.1.1.3. Pages details" on page 22.

5. Close the press. The sensors will continue sending the measured strain to the app durign the whole process.

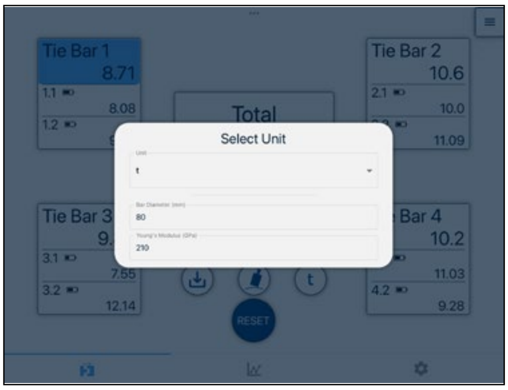
6. Check if the **Unbalance** indicator and one tie bar are highlighted in blue.

   A highlighted tie bar indicates that the tie bar strain value is out of the set tolerance. This means that the highlited tie bar is subject to a lower or higher force compared to the other tie bars.

   If no tie bar is highlighted, the machine is working within the configured tolerance and the closing force is said to be evenly distributed.

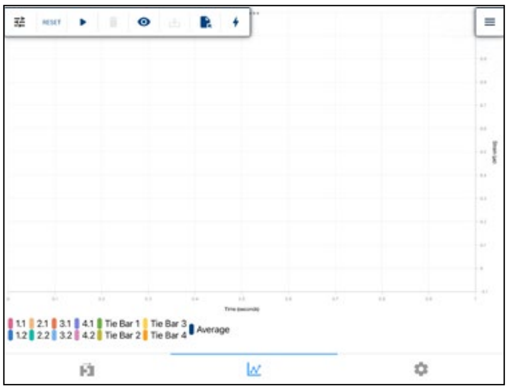
7. If desired, press the με button to change the units to a force unit (kN, t, tUS, tUK). If not yet done, set the tie bar diameter, required for the force calculations.

   The **Total** force applied on the tie bars is shown. If working on an Injection Molding machine, this is the **Clamping force**.



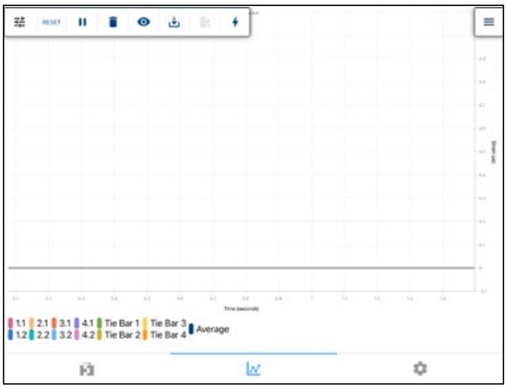
8. Press the **Save** button to store the measured data in a CSV file.

9. To measure the dynamic distribution of the forces over time, navigate to the **Clamping Chart** page.



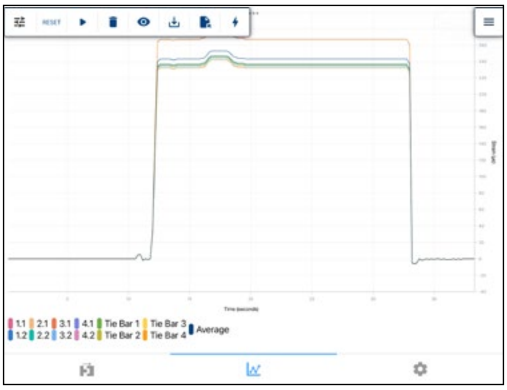
10. Open the press.

11. Hit the **Play ▶** button to start logging the data in the graph.



12. Close the press. The curve of measurements can be seen on the chart.

13. Stop the logging of data with the **Pause ⏸** button.



14. Analyse the measurement using the available features of the Sensormate graphing tool.

15. Press the **Save** button to share the recorded data to other apps in a CSV file format.

For a detailed explanation on the Clamping Chart page, please refer to the section “4.1.1.3. Pages details” on page 22.

4.1.1.3. Pages details

Clamping Measurement Page

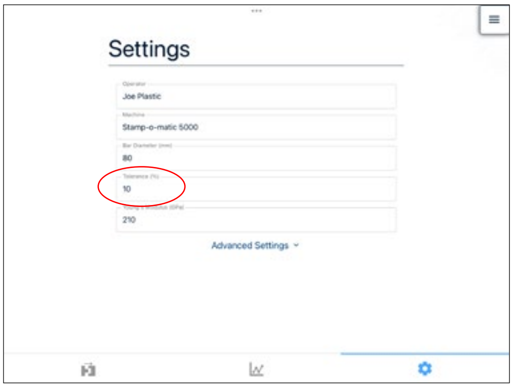
- Each of the active senors is always sending the measurements to the app, which is diplaying them in relative fields.
- Measurements can be displayed in the strain unit “$\mu\varepsilon$” (micro strain) as well as in the force units “kN“ (kilo Newton), “t” (tons), “tUS” (US tons), “tUK” (UK tons)*.
- The Tie Bar value is also calculated and presented on the go. This value corresponds to the average of the two sensor values that belong to the tie bar.

* to calculate force units, the diameter of the Tie Bars must be set in the **Settings** page.

- When strain is selected as "unit", the average of all the Tie Bar strain values is shown below the “Average” title.
- When instead one of the available forces is selected as "unit", the sum of all the Tie Bar force values is shown under the “Total” title.

- The unbalance indicator shows the maximum difference between the tie bars values and the average of the tie bars values, and it's represented as percentage.
This value shows how load distributes among the tie bars, signalizing the one with the highest deviation.

- A Tolerance value can be configured through the **Settings** ⚙ page. When the unbalance is measured and found to be bigger than the configured tolerance, the flawed tie bar and the unbalance value are highlighted in blue. This communicates the user which tie bar needs attention.



- A symbol next to the sensor name shows the status of the sensor.

 → *The sensor is disconnected*

 → *The sensor is connected and discharging*

 → *The sensor is connected and charging*

 → *The sensor is defective*

- Different commands can be executed through the displayed buttons.

 → *A snapshot of the measured data is saved in a CSV file*

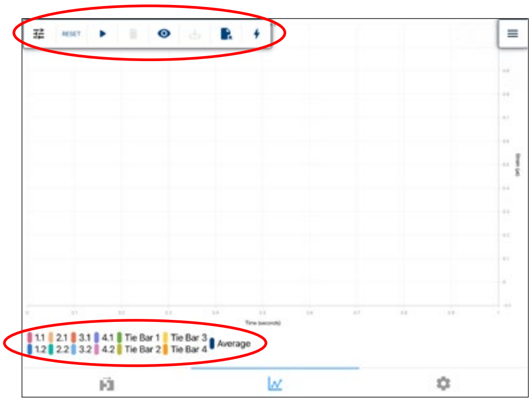
 → *Checks the proper mounting of the sensors*

με kN t tUK tUS → *Opens the unit selection popup*

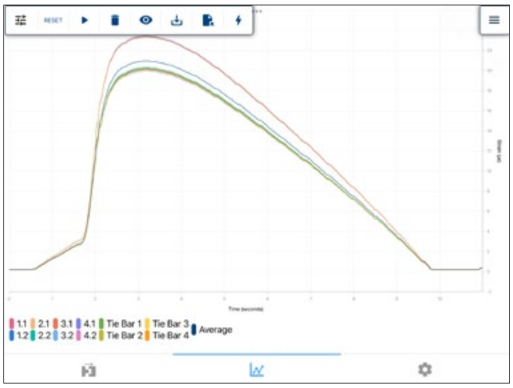
RESET → *Resets the sensors signal to zero (Tare)*

Clamping Chart Page

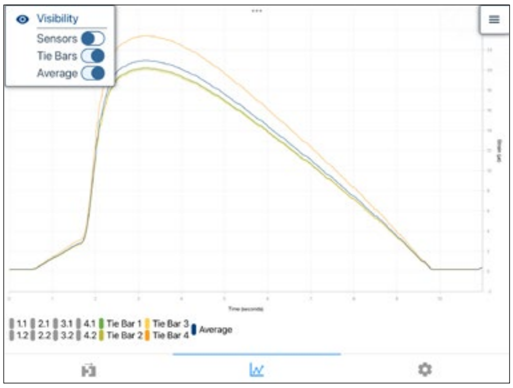
- To log measurements in real time, select the page **Clamping Chart**.
  → Sensormate graphing and analysis tool is shown.
- In the upper left corner the control panel is shown.
- In the lower left corner the legends are shown.



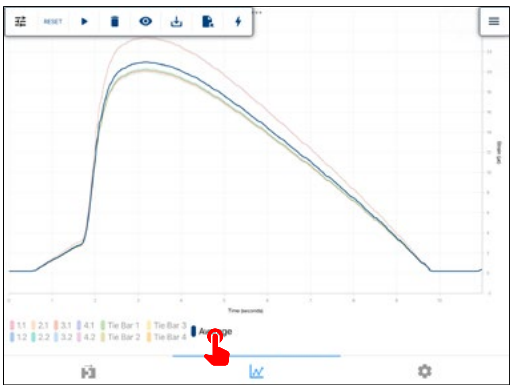
- Tapping folds or expands the control panel.
- The **RESET** button will reset the sensors signal to zero (Tare).
- With **Play** ▶ the sensors measurements start to be logged in the graph. With **Pause** ❚❚ the logging stops.
- **Clear** deletes the logged data.
- The **Save** button exports the logged measurements to a CSV file, which can then be saved in local storage as well as shared to other devices.



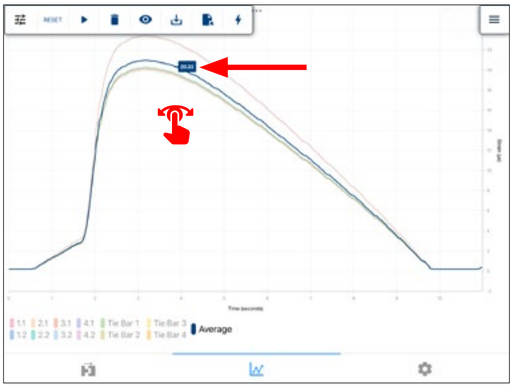
- From the **Visibility** control panel, the visibility of the curves can be toggled by groups.
- With the **Load** button, previously exported measurements can be imported in the graph. This allows off-site analysis of measurements done in the field directly from the Sensormate app.



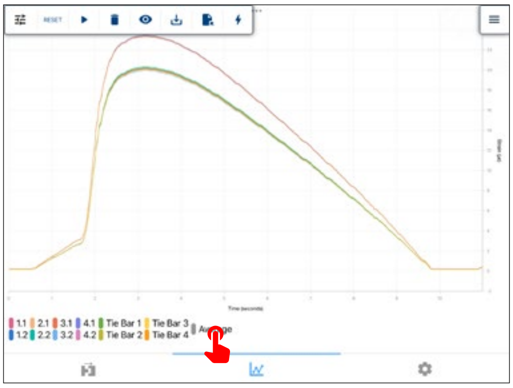
- The graph features pinch-to-zoom and pan gestures.
- Tapping (left-clicking on Desktops) one of the legends will highlight the corresponding curve in the graph. Tapping it again will put it back to its normal state.



- When a curve is highlighted, the individual values of the curve can be displayed by simply tapping, holding and swiping across the graph while keeping holded (hovering the cursor over the graph on Desktops).

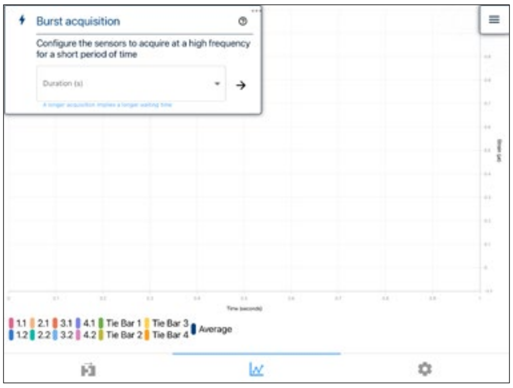


- Curves can be hidden individually by long-pressing their legend (right-click on Desktops). Tap the hidden legend to make it visible again (left-click on Desktops).

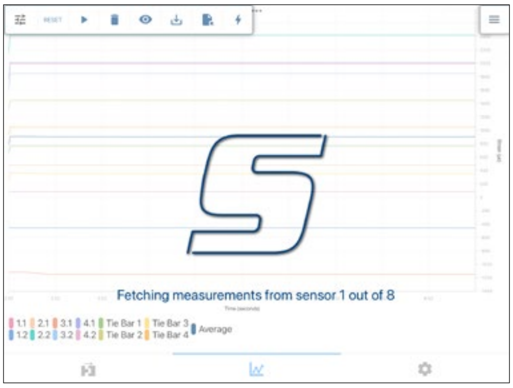


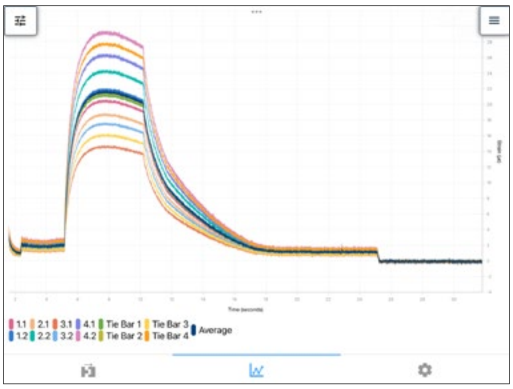
- With the **Burst** ϟ button, the **Burst acquisition** control panel opens. From here a burst acquisition can be configured and triggered.

  When a burst acquisition is triggered, the sensors begin acquiring measurements at high rate for a short period of time. These measurements are stored in the sensor's internal memory. Once the burst acquisition is completed, the measurements acquired at high rate will be transfered to the Sensormate App one sensor at a time.



A longer burst acquisition implies a longer waiting time

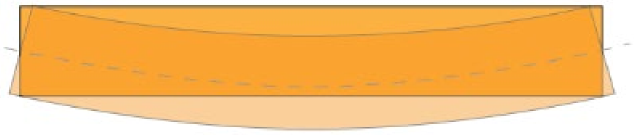




4.1.2. Bending analysis

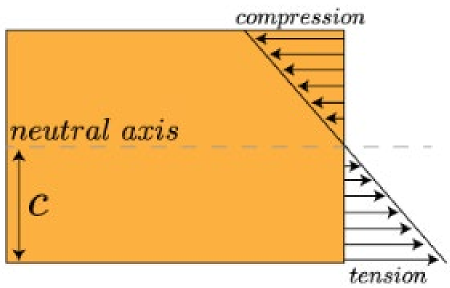
When a circular beam bends, tension and compression are produced inside the beam. Some parts of the beam are pushed together, while some others are stretched.

The following image shows an overlay of a bent beam on top of the original, straight beam.



The bottom surface of the beam gets longer in length, while the top surface of the beam gets shorter in length. Also, along the center of the beam – also known as the neutral axis –, the length doesn't change. The bottom surface is under tension, while the top surface is under compression. Furthermore, the displacement of the beam varies linearly from the top to the bottom – passing through zero at the neutral axis.

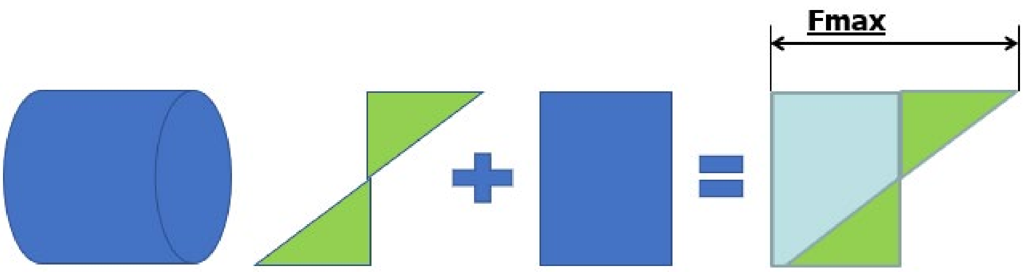
The stress distribution through a cross section of the beam shows that, when bending, a peak in tension appears on the surface of the beam.



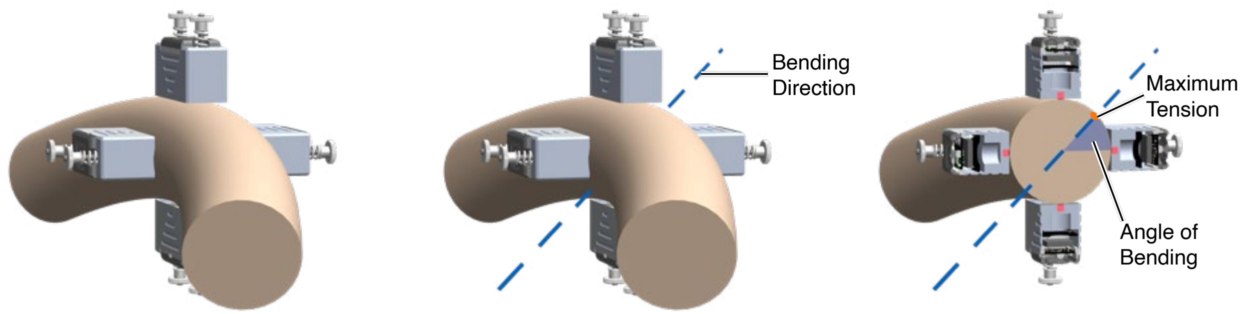
Measuring this peak tension is of interest to understand if the beam is overloaded. Any overloaded object is likely to crack where it suffers the maximum tension.

Bending is in many cases not visible to the naked eye, therefore measuring the maximum tension suffered by the beam becomes a tedious, time wasting and complicated task without knowing the direction in which the beam is bending.

In scenarios where bending is present along with extension, such as in the tie bars of an injection molding machine, die casting machine or any 4-Column press, even the invisible bending is a concern. This is because the beam's tension due to bending is summed with the tension due to extension, resulting in a total maximum tension that could be above the recommended safe values for the material.



With 4 QE2008-W sensors mounted around the circular beam, it is immediate to measure the total maximum tension on the beam. In addition, this mounting configuration allows to extrapolate the direction in which the bending occurs.



4.1.2.1. Mounting - 4 Sensors on the Tie Bar

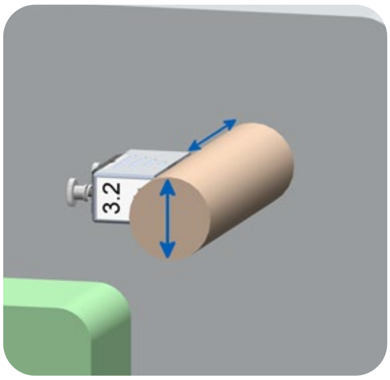
Please refer to **“2.1. Sensor Handling and Installation”** on page 10 for instructions on how to install the QE2008-W sensors on any ferromagnetic surface.

For this measurement, 4 sensors must be placed on a single tie bar. The sensors must be evenly distributed around the tie bar, 90° apart from each other, and their external edges should be aligned.

Procedure

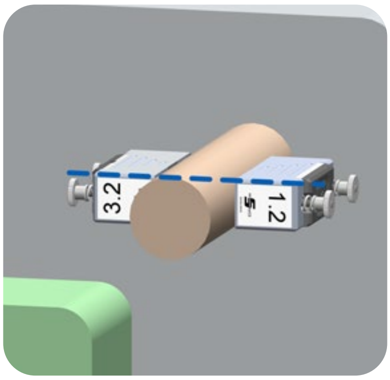
- Choose 4 QE2008-W sensors

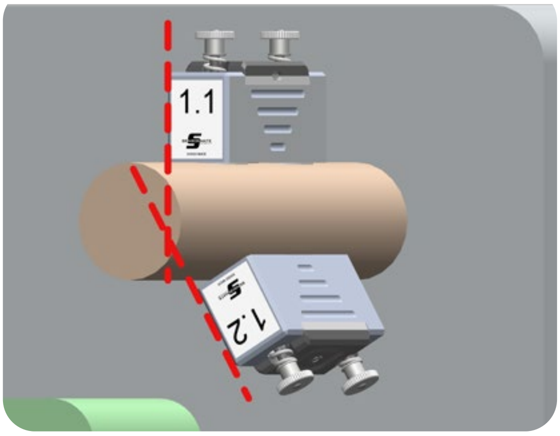
- Select one of the 4 tie bars of the machine to mount the chosen sensors on.
- Mount one sensor on the tie bar, placing it away from the clamping platen at least at a distance equal to the tie bar diameter. This placement assures an even and correct measurement of the deformation of the tie bar.



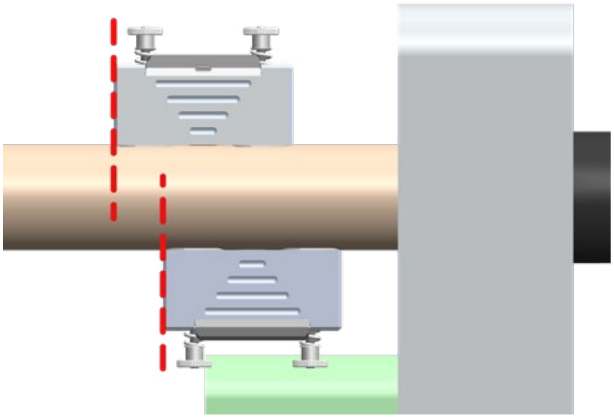
Given that 4 sensors will be mounted on the same tie bar, it is strongly advised to mount the first sensor on the least accessible position of the tie bar. The rest of the sensors positions will be referenced to this sensor.

- Take the second sensor and mount it on the same tie bar at 180° from the first, keeping it on the same axis (external edges aligned).

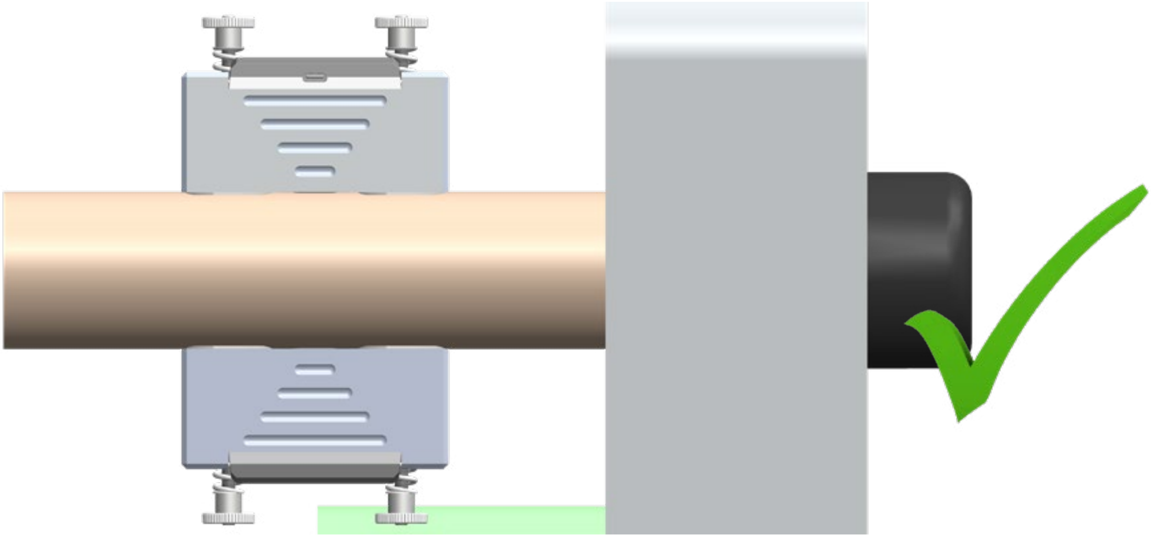




Incorrect! Distance not 180°

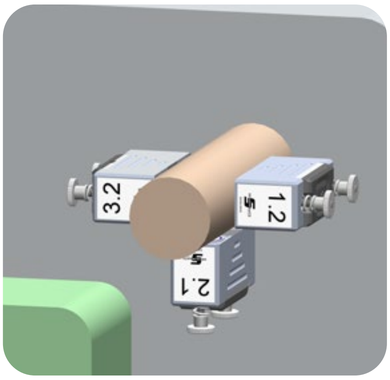


Incorrect! External edges not aligned

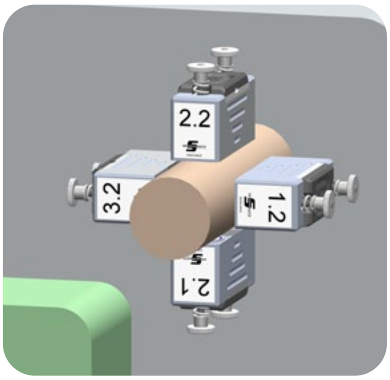


Correct!

- Grab a third sensor and mount it on the same tie bar at 90° from the other two already mounted sensors, aligning the external edges with the other sensors.



- Finally, mount the last sensor at 180° from the third mounted sensor and 90° from the first two. Now all of the sensors should be distributed around the tie bar with 90° between them.



- **The sensors must be positioned parallel to the tie bar!**
- **All the sensors must be evenly distributed around the tie bar 90° apart from each other and at the same position!**
- **Mount the sensors when there is no load applied (e.g. no force applied on the object / mold open)**

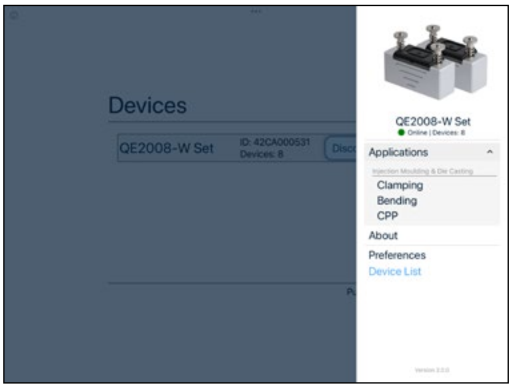
By operating the machine in a slow and controlled manner, ensure that

- **the sensors do not obstruct the normal operation of the machine.**
- **the integrity of the sensors is not compromised.**

Mounting check via the Sensormate app - 4 Sensors on the Tie Bar

Once the installation of the sensors is complete, check if the mounting was correctly done using the Sensormate app.

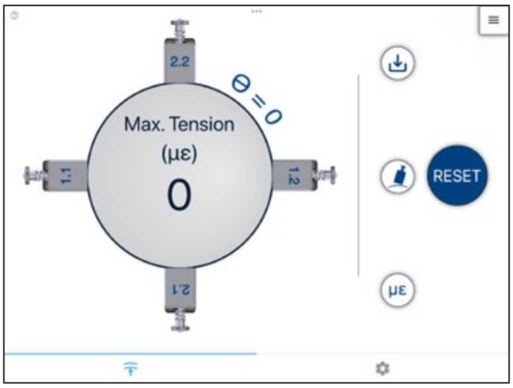
1. Open the app and scan for nearby devices. Once the QE2008-W Set is detected, connect to it and wait for the status of the network to be **“online”**.

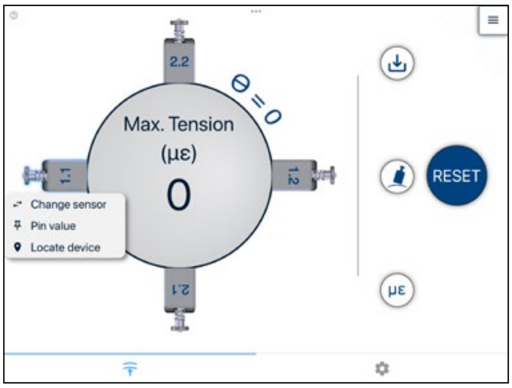


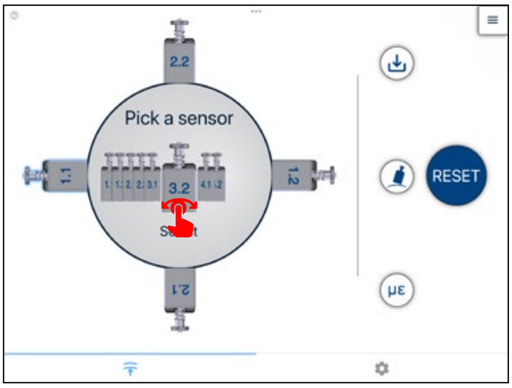
2. Navigate to the **Bending Measurement** page under **Applications** > **Bending**. A cross-section of a tie bar with 4 sensors mounted is presented.

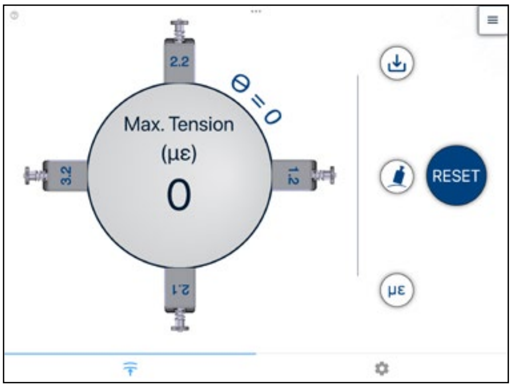
   By default, sensors 1.1, 1.2, 2.1 and 2.2 are selected. Configure the page to match the real placement of the chosen sensors.

   By tapping a sensor, a context menu opens. To change the sensor, select the **Change sensor** button, swipe through the available sensors, and select the desired one.





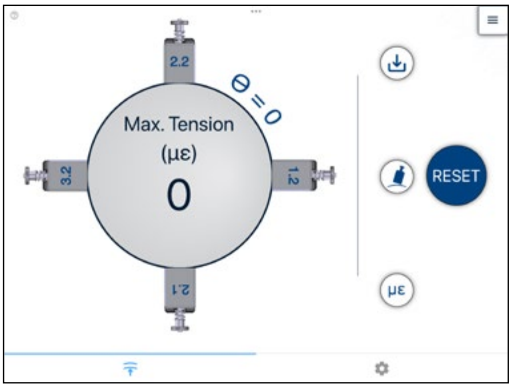


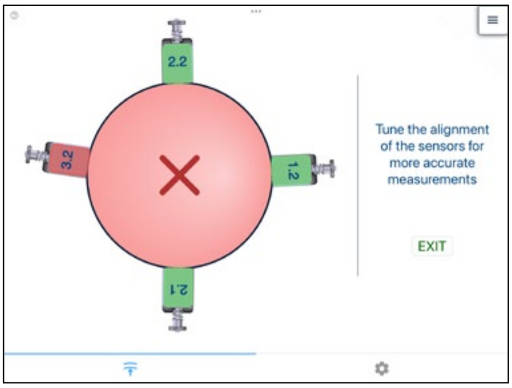


The relative position of the sensors in the bending page must be identical to the physical layout of the sensors mounted on the tie bar.

3. Once the desired sensors are selected, tap the **Mounting check** button.

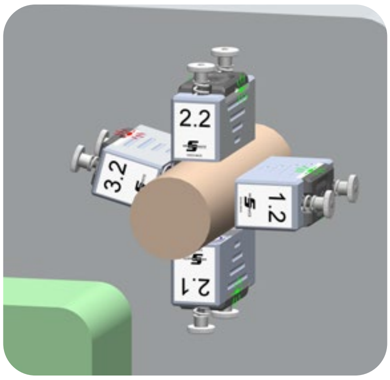
   The mounting tool appears: the sensors highlighted in GREEN are correctly placed on the tie bar, while the ones highlighted in RED are incorrectly placed.

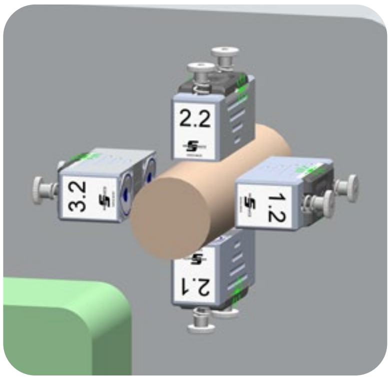




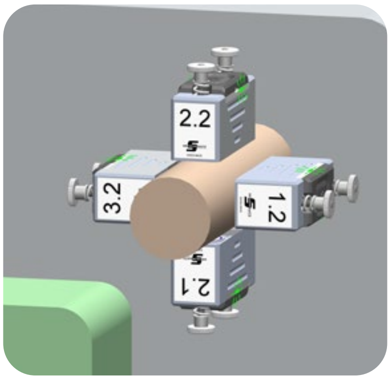
4. While the mounting viewer is open, the function LEDs of the selected sensors will indicate their relative alignment status. LEDs are RED when the sensors are not correctly aligned and they are GREEN when they are correctly aligned.

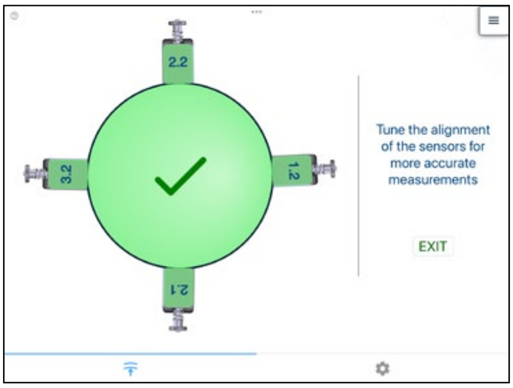
   In case of incorrect alignment, unmount the non-correctly aligned sensor and, hovering it around the tie bar, find the position where the LEDs become GREEN. This indicates the correct angular position (90°) where to mount the sensor.





5. Mount the sensor at the previosly found position. Check that the LEDs are GREEN after the mounting. If they are not, repeat this step until you find the correct spot.





Always tilt the sensors and place them from the long edge when mounting

Never drag the sensors through the surface when the magnets are pulling. This can cause damage to the sensing element.

6. Tap "Exit" to return to the Bending page.

4.1.2.2. Measurement procedure

During the tie-bar strain measurement, the machine must not be operated or closed at high speeds as vibrations can affect the measurement. Drive the machine slowly.

1. After the sensors have been mounted and their mounting position has been checked with the Sensormate app, perform 3 **dry cycles** (without injection), only closing and opening the press. This procedure allows the sensors to stabilize and adapt to the surface where they are mounted.

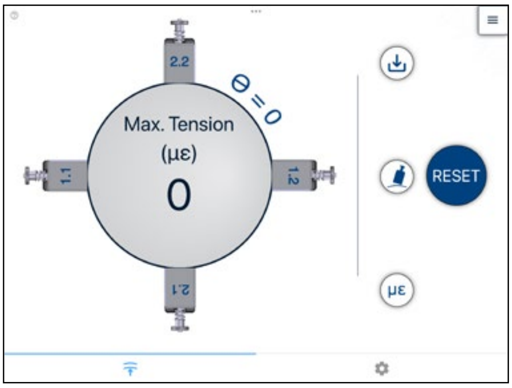
   Dry cycle: *consists of closing the press completely and opening it afterwards, without any intermediate step. The term "dry" derives from Injection molding, where this step is performed without injecting plastics in the mold.*

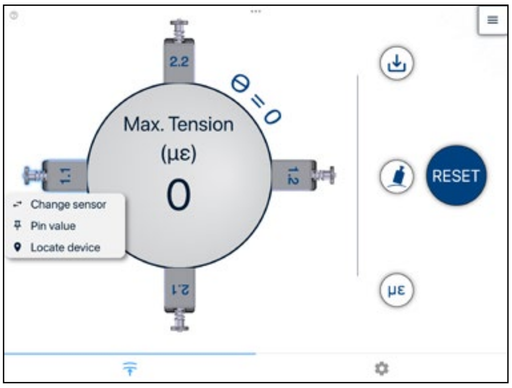
2. Open the press

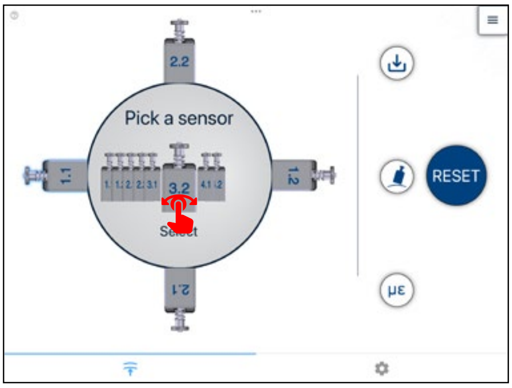
3. Navigate to the **Bending Measurement** page under **Applications** > **Bending**.

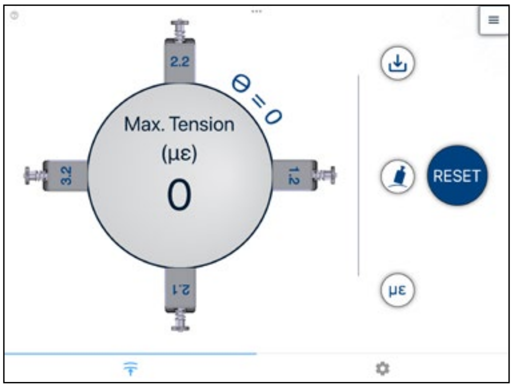
   By default, sensors 1.1, 1.2, 2.1 and 2.2 are selected. Configure the page to match the real placement of the chosen sensors.

   By tapping a sensor, a context menu opens. To change the sensor, select the **Change sensor** button, swipe through the available sensors, and select the desired one.



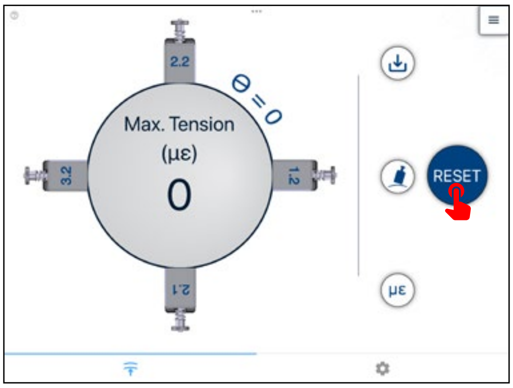






For a detailed explanation on the Bending Measurement  page, please refer to the sections “4.1.2.3. Pages details” on page 34.

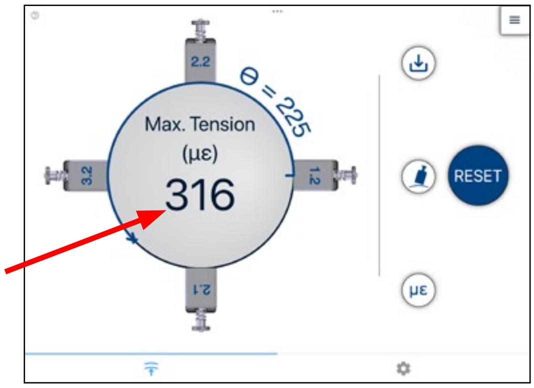
4. Press the **RESET** button. This will remove the residual values the sensors may have (Tare).

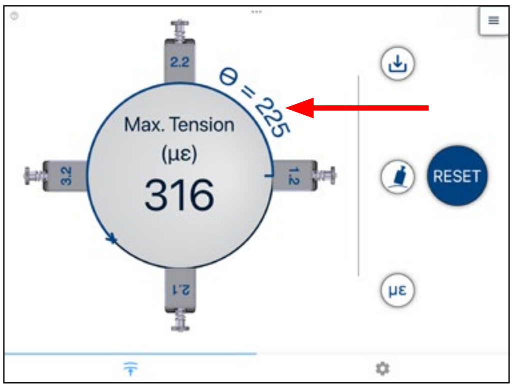


5. Close the press.

   The **Maximum Tension** applied on the tie bar as well as the **Bending Direction** are measured and presented.

   The Bending Direction is given as the angle *Θ*, measured anticlockwise starting from the right-most sensor.



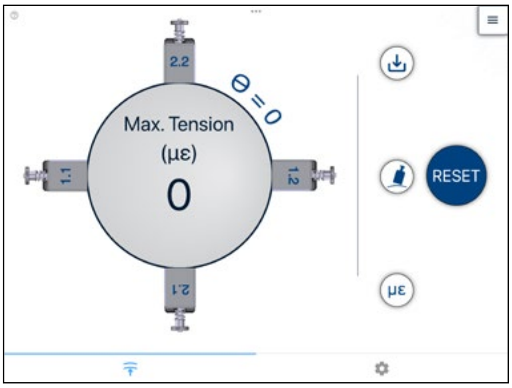


6. Press the **Save** button to store the measured data in a CSV file.

4.1.2.3. Pages details

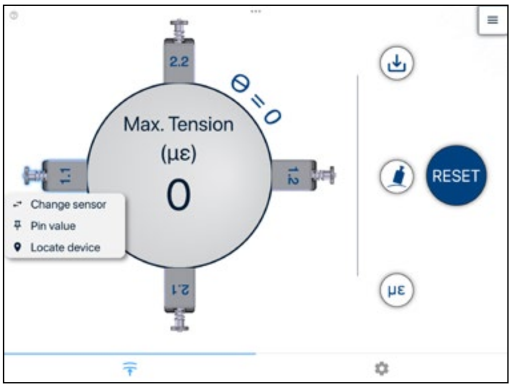
Bending Measurement Page

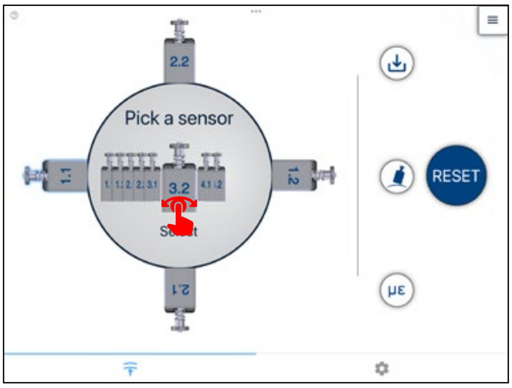
- A cross-section of a tie bar with 4 QE2008-W sensors is presented. The sensors are located around the tie bar in steps of 90°, in accordance with the physical mounting of the sensors.

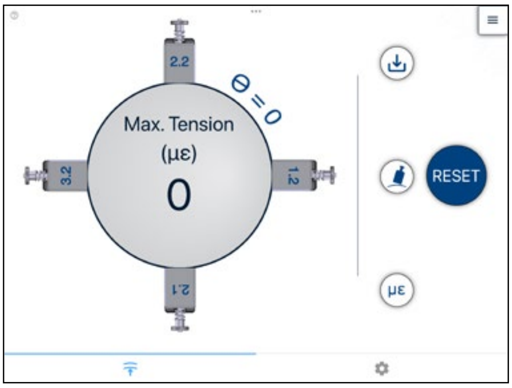


- By default, sensors 1.1, 1.2, 2.1 and 2.2 are selected for the bending measurement.

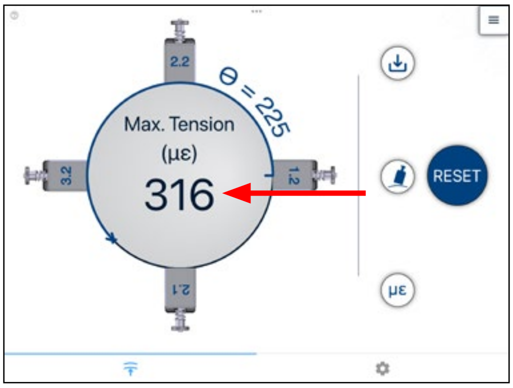
  By tapping a sensor, its context menu opens. To change the sensor, select the **Change sensor** ⇄ button, swipe through the available sensors, and select the desired one.



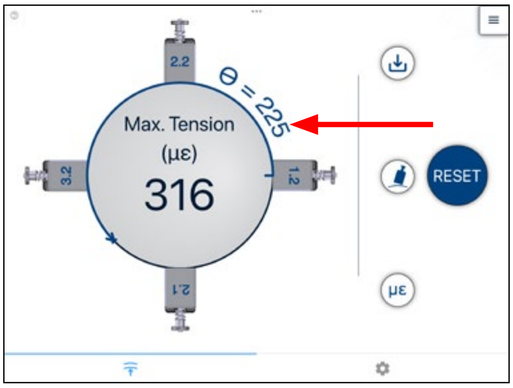


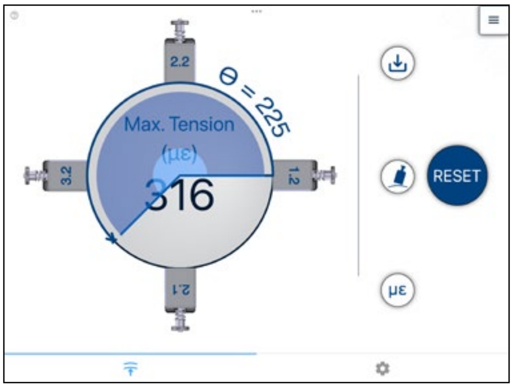


- The maximum tension applied on the tie bar's surface is located below the **Max. Tension** title. This value can be displayed in the strain unit "*με*" (micro strain) as well as in the force units "kN" (kilo Newton), “t” (tons), "tUS" (US tons), "tUK" (UK tons)*.



- The bending direction is given as an angle measured from the most-right sensor.This angle is called *Θ*, and is indicated with a blue arrow.





The maximum tension and the direction of the bending are only valid at the longitudinal position of the tie bar in which the 4 sensors are placed.

- Different commands can be executed through the displayed buttons.

 → *A snapshot of the measured data is saved in a CSV file*

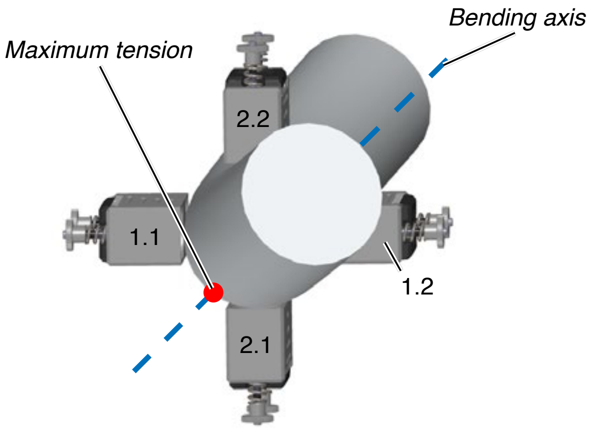
 → *Checks the proper mount-ing of the sensors*

με kN
t tUK
tUS → *Opens the unit selection popup*

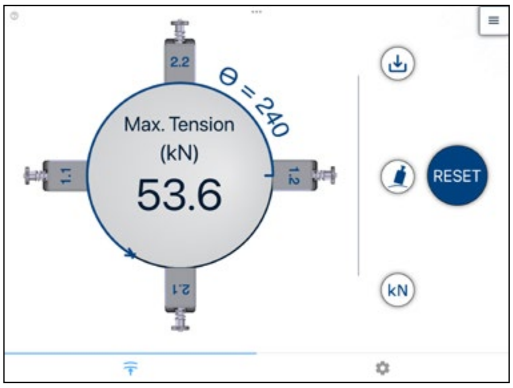
RESET → *Resets the sensors signal to zero (Tare)*

* to calculate force units, the diameter of the Tie Bars must be set in the **Settings** ⚙ page.

Example



Exaggerated bending representation

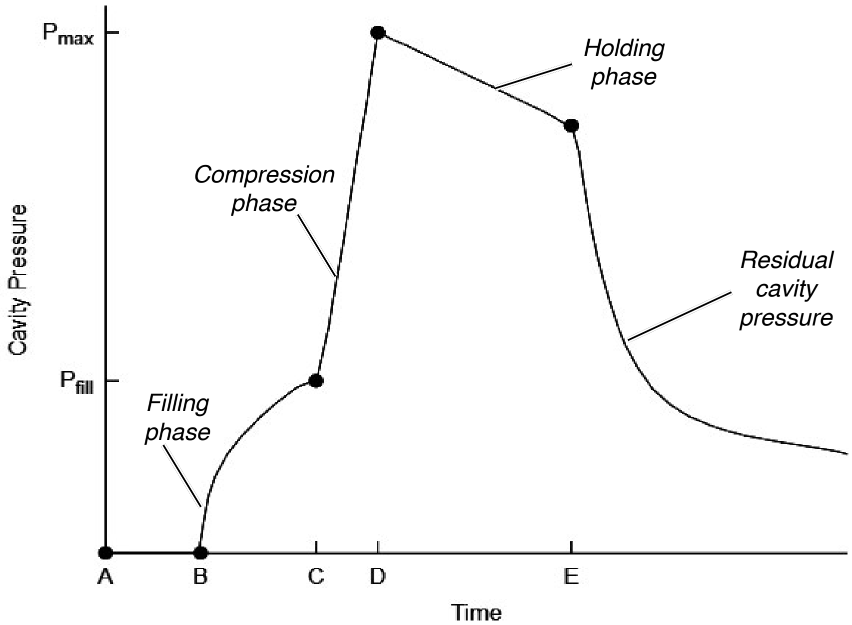


4.1.3. Cavity Pressure Profile - Fast acquisition measurement

In the plastic injection molding process, molten plastic at high temperatures is injected under pressure into a mold cavity, where it fills the mold and solidifies to create the final product. This is a cyclic process that consists of four phases: filling, melt compressing (or packing), holding, and cooling, each with a series of adjustable parameters that determine the efficiency of the process and the quality of the final product.

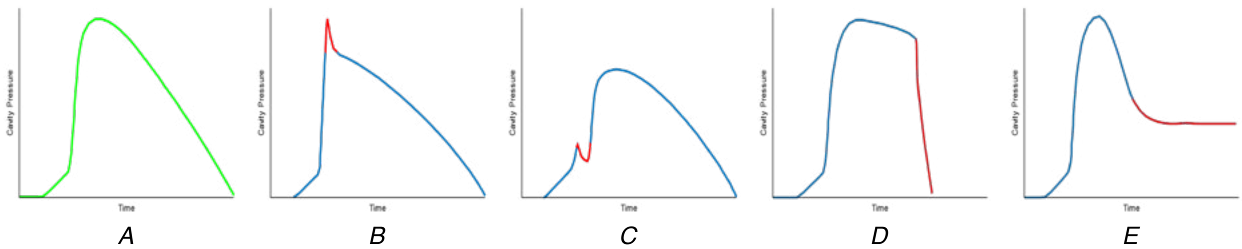
A given configuration that produces a high quality final part will most likely not have the same result when producing a different part with different characteristics. The optimal parameters for achieving a high quality product with high efficiency depend directly on the mold used, the type of plastic, the machine, and many other aspects. Discovering all these ideal parameters often involves a series of time-consuming trial-and-error iterations that do not guarantee to find the perfect combination.

However, this can be considerably accelerated if the pressure profile inside the cavity of the mold during an injection cycle is known: the cavity pressure profile is strongly linked to the final quality of the produced part and the production efficiency.



A correctly shaped pressure transition between phases implies a high quality part produced. Moreover, a correct se-tup will allow the machine run with lower energy consumption and faster cycle times. On the other side, a bad setup can cause serious damages on the involved machine parts.

When adjusting the injection parameters, the goal is to achieve a Cavity Pressure Profile curve with a shape similar to that of Figure A. Figures B to E show different scenarios where the pressure profile is not ideal, which will most probably induce a production of a part with low quality.



A peak in the pressure profile, like the one shown in Figure B, denotes a late switch to the holding phase and/or a high injection speed. Figure C implies an early switch to the holding phase. A short duration of the holding phase reflects on the cavity pressure profile like shown in Figure D. Lastly, in Figure E a residual pressure is shown.

The high sampling rate and the high resolution of the QE2008-W sensors makes it possible to extract the shape of the cavity pressure curve. In a nutshell, the high pressure inside the cavity of the mold generates a back-force on the clamping unit, which is transfered as an elongation of the tie bars. This elongation during the injection cycle can be measured via the sensors, obtaining the shape of the cavity pressure curve.

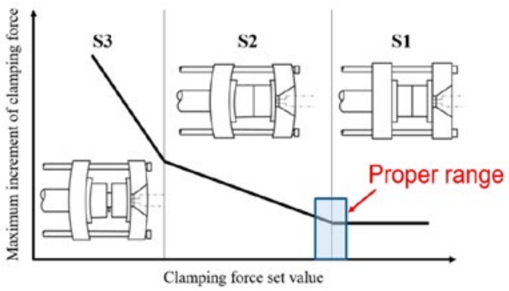
This method of analysis of the cavity pressure profile is often preferred among others because, as the sensors are mounted non-invasively (magnetically), there is no need to modify the mold. The great advantage of the QE2008-W sensors is that hey can be reused on several machines and many different molds.

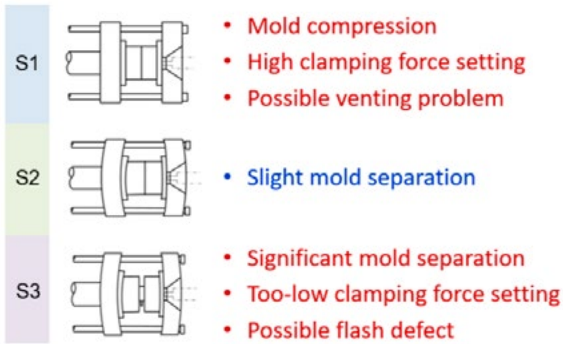
4.1.3.1. Measurement prerequisites

The **Cavity Pressure Profile** measurement using the QE2008-W is an indirect measurement of the pressure on the press' Tie Bars. The basic physics concept that lies behind the measurement is that a pressure (P), when applied to a surface (A), generates a force (F). In case of injection molding machines, these parameters are the holding pressure and the cavity area projected on the mold.

$$F = P \cdot A$$

It is immediate to see that, the bigger is the holding pressure and the bigger is the produced part, the higher is the force being generated.
For an indirect measurement of the cavity pressure profile, it is mandatory that this force is high enough to generate a sensible elongation of the tie bars.
Directly related to the tie bars elongation is the **clamping force** set value, which has to be chosen carefully: it is important that the clamping force is not too high (S1) in order to avoid over stressing the mold and the tie bars as well as to prevent venting problems and energy consumption excesses. On the other side, it is also important that the clamping force is not too low (S3), so mold separation and consequent part flashing can be avoided during the injection phase. **The proper range stands between S1 and S2, therefore with slight mold separation (ref [1]).**





The following equation can help understand if the machine setup is correct, and if the cavity pressure profile will be measurable on the tie bars using the QE2008-W. Obtaing a value **bigger then 10 mictrostrains** will lead to a probable successful set of measurements.

$$\mu\varepsilon = 10^4 \cdot \frac{(P_H \cdot A) - (100 \cdot F_C)}{\pi \cdot D^2 \cdot E}$$

where:

- P_H: holding pressure in "bar"
- A: projected surface of the produced part in "cm^2"
- F_C: clamping force in "kN"
- D: diameter of the Tie Bar in "mm"
- E: Young's modulus in "GPa"

4.1.3.2. Sensor mounting

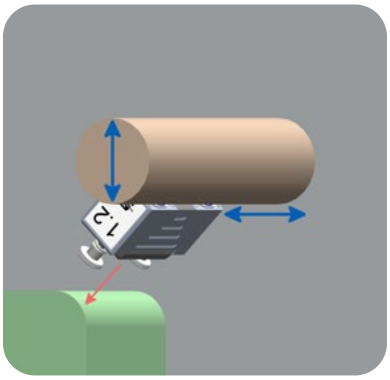
Please refer to **“2.1. Sensor Handling and Installation”** on page 10 for instructions on how to mount the QE2008-W sensors on any ferromagnetic surface.

For this measurement, it is enough that **only one** sensor is mounted on only one tie bar, and it's **not mandatory** that each of the 4 tie bars of the machine have 2 QE2008-W sensors mounted. However, we reccomend to mount the sensors as follows and run an injection cycle, in order to understand which one is giving the **"best signal"**, and later focus only on the chosen sensor, turning off the uneccessary ones.

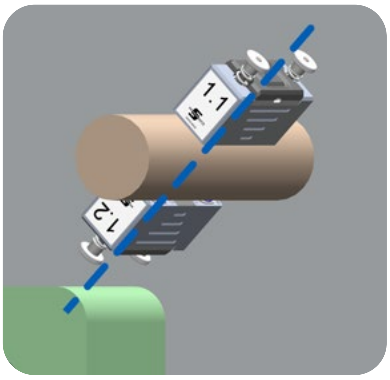
Procedure

- Choose one pair of QE2008-W sensors.

- Select one of the 4 tie bars of the machine to mount the chosen sensors on.
- Mount one sensor on the tie bar, placing it away from the clamping platen at least at a distance equal to the tie bar diameter. This placement assures an even and correct measurement of the deformation of the tie bar.



- Mount the second sensor at approximately 180° from the first.



- Repeat the mounting process for the rest of the tie bars (one couple of sensors per tie bar).

- **The sensors must be positioned parallel to the tie bar!**
- **Mount the sensors when there is no load applied (e.g. no force applied on the object / mold open)**

By operating the machine in a slow and controlled manner, ensure that
- **the sensors do not obstruct the normal operation of the machine.**
- **the integrity of the sensors is not compromised.**

4.1.3.3. Measurement procedure

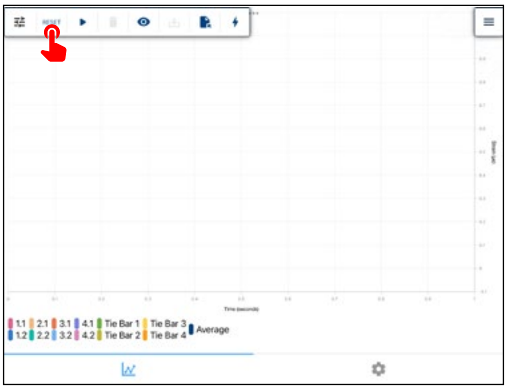
During the tie-bar strain measurement, the machine must not be operated or closed at high speeds as vibrations can affect the measurement. Drive the machine slowly.

1. After the sensors have been mounted, perform 3 **dry cycles** (without injection), only closing and opening the press. This procedure allows the sensors to stabilize adapt and to the surface where they are mounted.

   Dry cycle: *consists of closing the press completely and opening it afterwards, without any intermediate step. The term "dry" derives from Injection molding, where this step is performed without injecting plastics in the mold.*

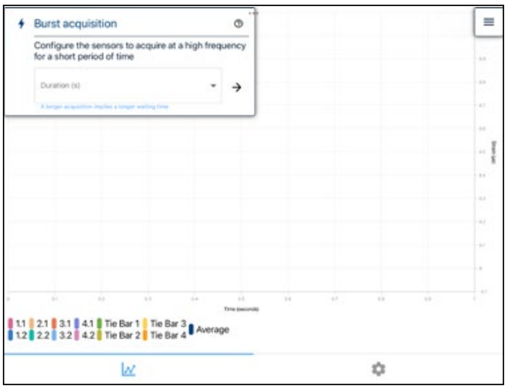
2. Close the press, but do not inject yet.

3. Navigate to the **CPP Chart** page under **Applications** > **CPP** and hit the **RESET** button.
   This will remove the residual values the sensors may have. Also, since the reset is done when the mold is closed, the measurements will be relative only to the injection phase.



For a detailed explanation on the CPP Chart page, please refer to the sections “4.1.3.4. Pages details” on page 43.

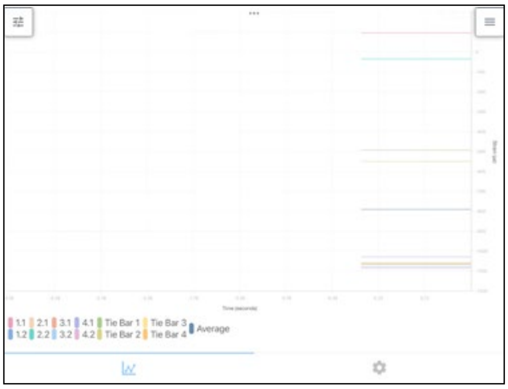
4. Press the **Burst** button to open the **Burst acquisition** control panel.
   Set the desired burst aquisition time based on the injection time configured on the Injection Molding or Die Casting machine.



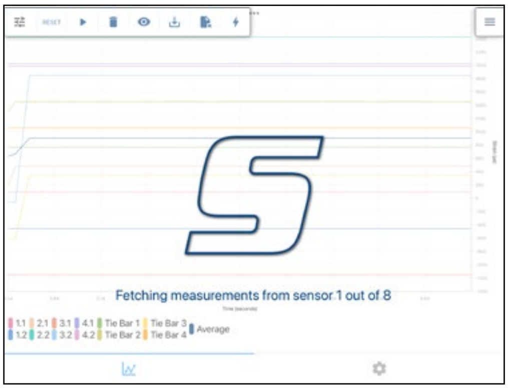
A longer burst acquisition implies a longer waiting time

5. Press the **Start** → button to launch the high rate sampling.
   In the same moment, **start the injection** process on the Injection Molding or Die Casting machine.

   The interaction with the app is blocked until the process is finished. In the meantime, the app will present a preview of the measurements in the graph which was acquired with normal sampling rate.



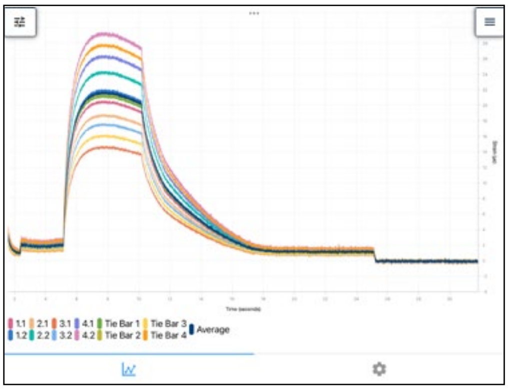
6. After the requested burst acquisition time has elapsed, the sensors will start transmitting the acquired data to the application. This step is autamatically executed one sensor at a time.



7. When the transmission is finished, the measurements are plotted in the graph.

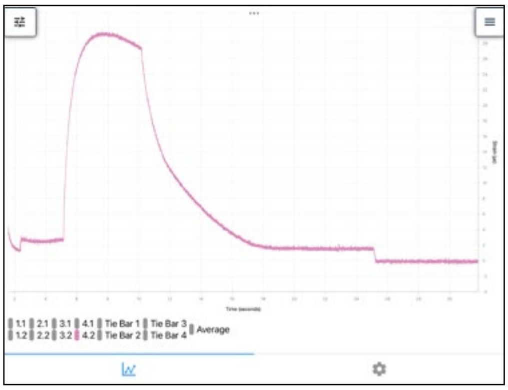
   If no cavity pressure profile curve is visible, please check if the machine is correctly setup with the help of the formula in the section **“4.1.3.1. Measurement prerequisites”** on page 38.

   Also, make sure that the selected duration of the burst acquisition matches the machine's injection cycle duration.



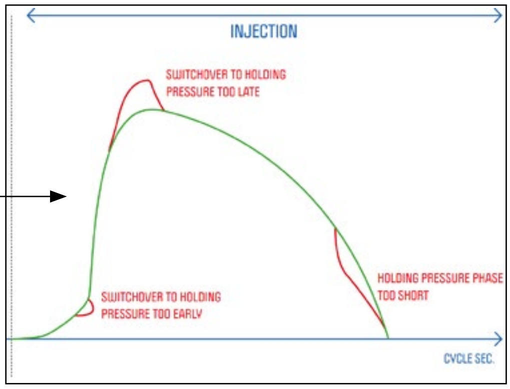
8. At this point, we recommend to find the sensor whose curve shows the highest absolute value, and **continue the analysis with only that sensor ON**. This means, **turn off** all the other sensors, and reconnect only to the chosen one.

   This setup will allow a faster data tranfer from the sensor to the app.

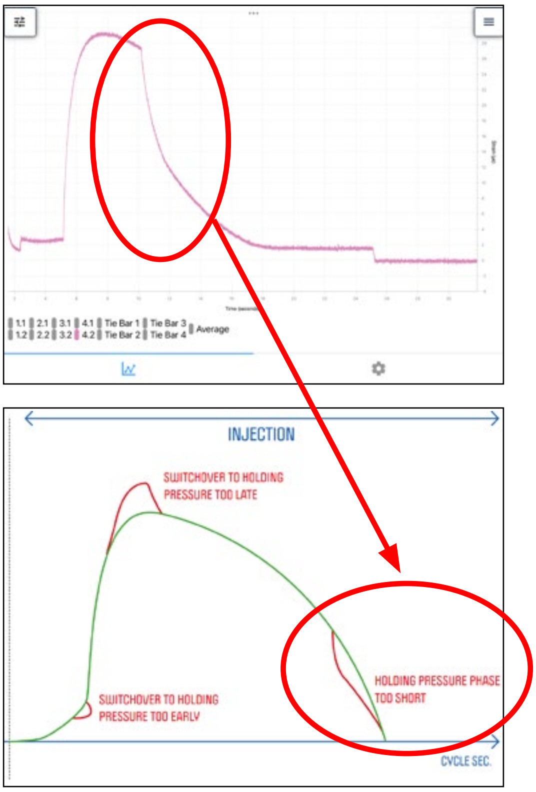


9. Analyse the shape of the curve and compare it to the "ideal" shape of a Cavity Pressure Profile.

   - Ideal cavity pressure curve
   - Deviations and their cause

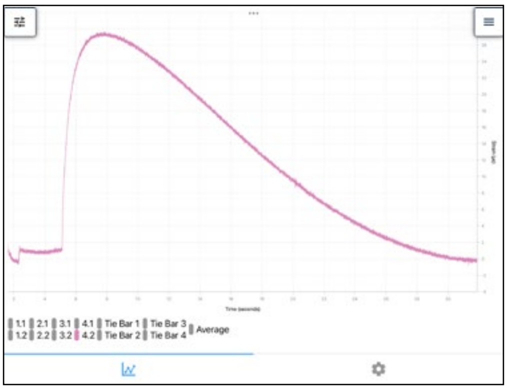


10. Analyse the differences, if any, and consult the relevant literature in order to determine the reason for the poorly achieved curve.



11. If needed, save the measurement for tracking purposes with the **Save** button.
12. Implement the necessary corrections on the machine setup and measure again.

    Confirm an improvement in the shape of the cavity pressure curve.

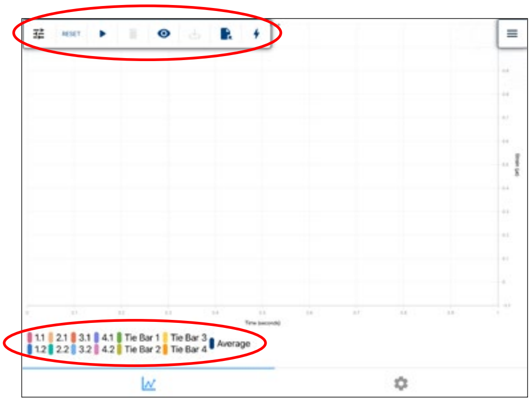


13. Save the measurement for tracking purposes with the **Save** button.

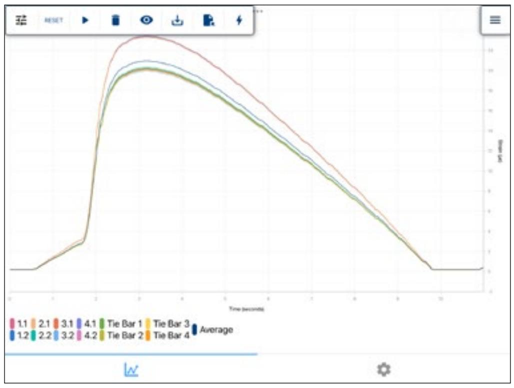
4.1.3.4. Pages details

Cavity Pressure Chart Page

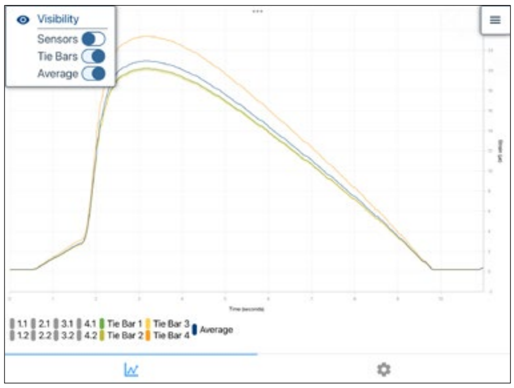
- To log measurements in real time, select the page **Cavity Pressure Chart**.
  → Sensormate graphing and analysis tool is shown.
- In the upper left corner the control panel is shown.
- In the lower left corner the legends are shown.



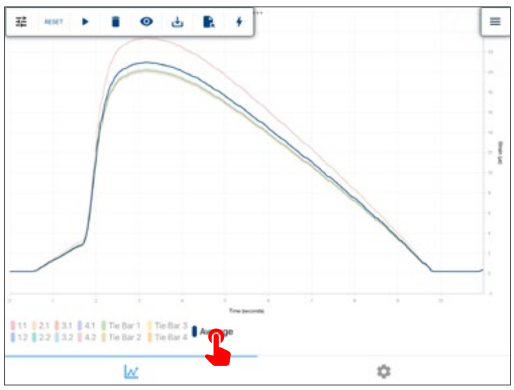
- Tapping folds or expands the control panel.
- The **RESET** button will reset the sensors signal to zero (Tare).
- With **Play** ▶ the sensors measurements start to be logged in the graph. With **Pause** ⏸ the logging stops.
- **Clear** deletes the logged data..
- The **Save** button exports the logged measurements to a CSV file, which can then be saved in local storage as well as shared to other devices.



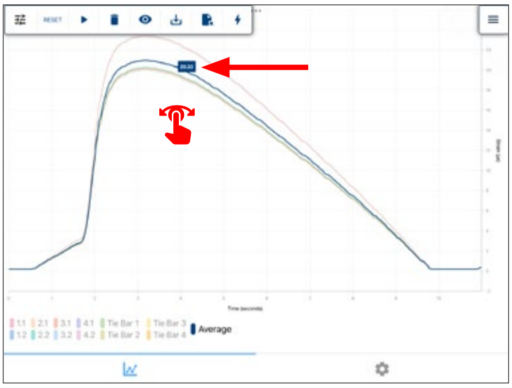
- From the **Visibility** control panel, the visibility of the curves can be toggled by groups.
- With the **Load** button, previously exported measurements can be plotted in the graph. This allows off-site analysis of measurements done in the field directly from the Sensormate app.



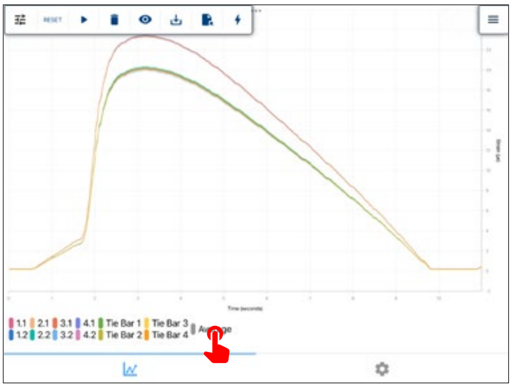
- The graph features pinch-to-zoom and pan gestures.
- Tapping (left-clicking on Desktops) one of the legends will highlight the corresponding curve in the graph. Tapping it again will put it back to its normal state.



- When a curve is highlighted, the individual values of the curve can be displayed by simply tapping, holding and swiping across the graph while keeping holded (hovering the cursor over the graph on Desktops).

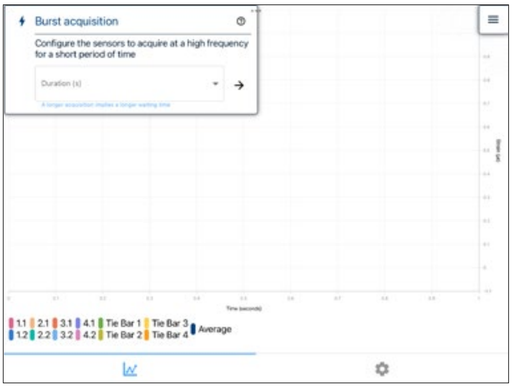


- Curves can be hidden individually by long-pressing their legend (right-click on Desktops). Tap the hidden legend to make it visible again (left-click on Desktops).

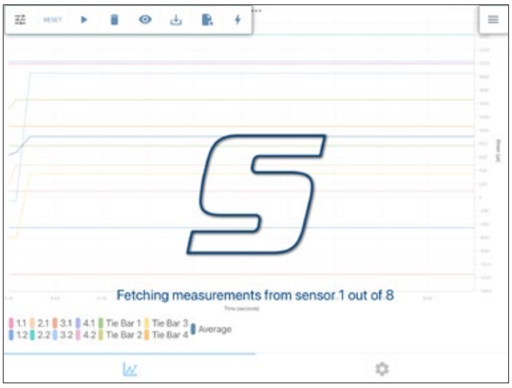


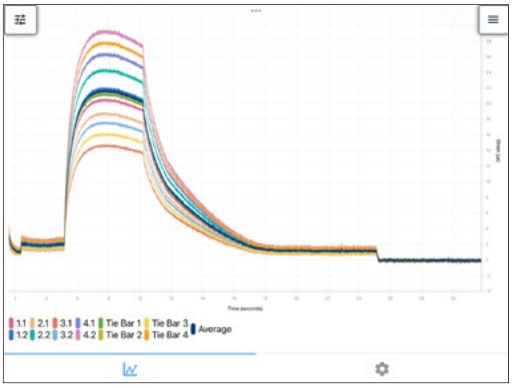
- With the **Burst** ϟ button, the **Burst acquisition** control panel opens. From here a burst acquisition can be configured and triggered.

  When a burst acquisition is triggered, the sensors begin acquiring measurements at high rate for a short period of time. These measurements are stored in the sensor's internal memory. Once the burst acquisition is completed, the measurements acquired at high rate will be transfered to the Sensormate App one sensor at a time.



A longer burst acquisition implies a longer waiting time





 Subject to technical modifications

5. NETWORK CONFIGURATION

As explained in **“1.7. Sensor Operation Principles”** on page 9, the "Sensormate" app can connect to several devices at the same time when they belong to the same network. By default, sensors are already assigned to a network and they are ready to use.

However, in some scenarios could be necessary to add or remove sensors from a network. One example of this is when replacing a damaged one: a new (spare) sensor has to take the place of the damaged one. The user will have to remove the defective sensor from the network and add the new one.
In the case of an inoperable (does not turn on) sensor, the "remove" step is not necessary.

When a sensor is not part of any network, it is called **unassigned sensor**.

5.1. Removing a QE2008-W sensor from a network

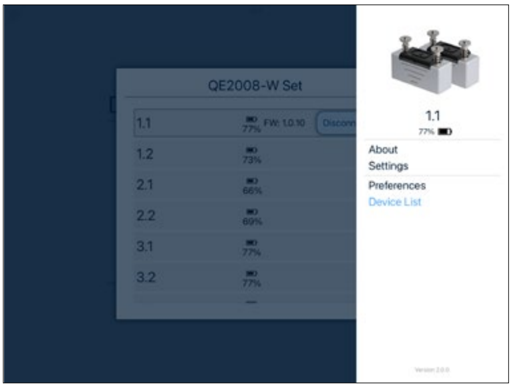
Folow these steps to remove a QE2008-W sensor from the network it currently belongs. The removed sensor will become an unassigned sensor.
In this example, the QE2008-W sensor **1.1** will be removed from the network with ID **42CA000531**.

1. If the Sensormate app has an active connection, disconnect.
2. Turn on the QE2008-W sensor to be removed and, on the **Device List** page, scan for BLE devices. A "QE2008-W Set" item will appear in the device list.

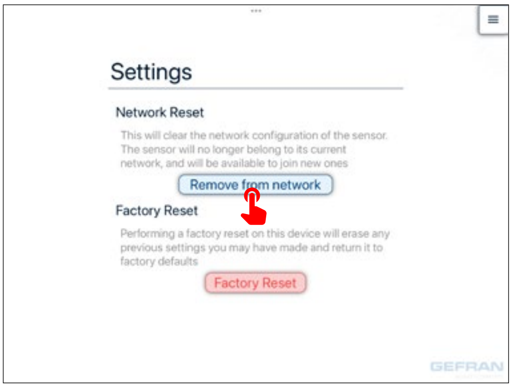
3. Selected a "QE2008-W Set" item in order to show the network details and check that it is the correct network to remove the sensor from.

4. Long-press the item to show the list of devices in the network.

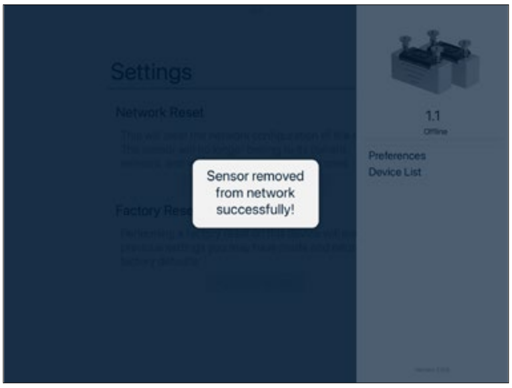
5. Connect to the sensor to be removed from the network.



6. Hit the **Remove from Network** button under the **Settings** page.



7. A pop-up message will confirm that the removal was successful, and the app will disconnect from the sensor. Now the sensor doesn't belong to any network, and it has become an **unassigned sensor**.

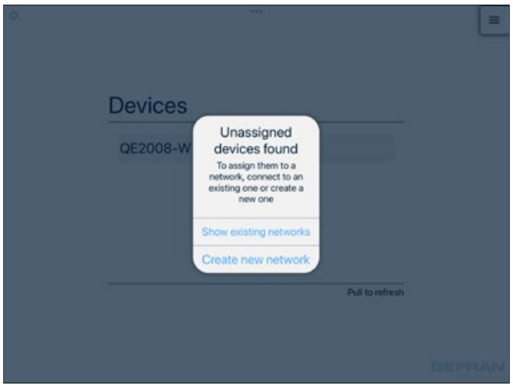


5.2. Adding a QE2008-W sensor to a network

Folow these steps to add an unassigned QE2008-W sensor to an existing QE2008-W network.
In the following example, an unassigned sensor is added to the network with ID **42CA000531** at position **1.1**.

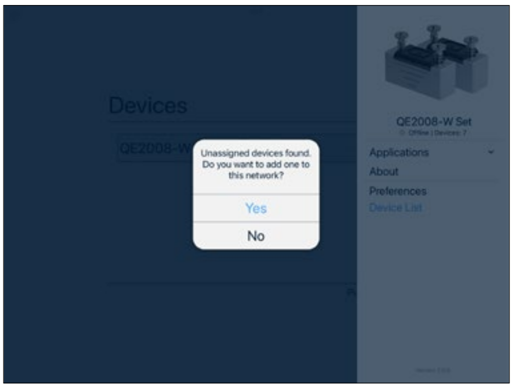
1. If the Sensormate app has an active connection, disconnect.
2. Turn on the unassigned sensor to be added to a network.
3. Turn on at least one of the QE2008-W sensors that belongs to the target network.
4. On the **Device List** page, scan for BLE devices. A "QE2008-W Set" item corresponding to the target network will appear in the device list.

5. Once the scan is over, a pop-up message will notify that an unassigned device was found. Select the option **"Show existing networks"**.



6. In the Devices list, locate the destination network item and press **Connect**.

7. A prompt will ask if it is wanted to add an unassigned device to the current network. Select **Yes**.

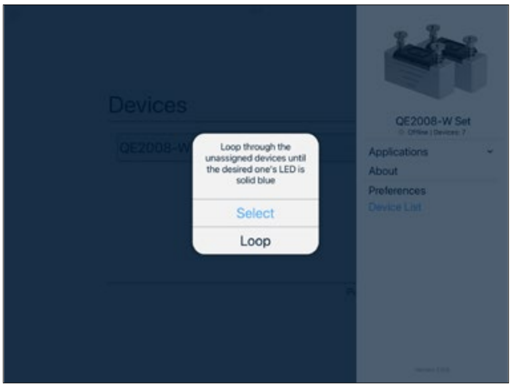


8. The app will now establish a connection with an unassigned device.

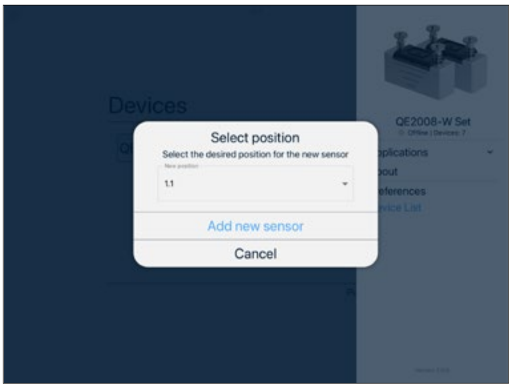
9. If the Sensormate application discovered more than one unassigned device, a pop-up message will ask the user to select the unassigned sensor they wish to add to the network.

   If wanted, press the **Loop** button to search for another sensor, then press **Select**.

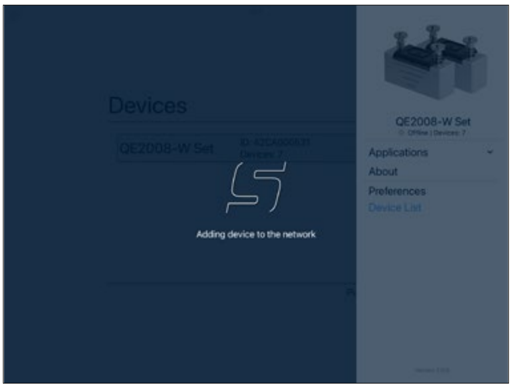
   The currently selected sensor will indicate it via the function LEDs, setting them to *Fast blinking yellow.*

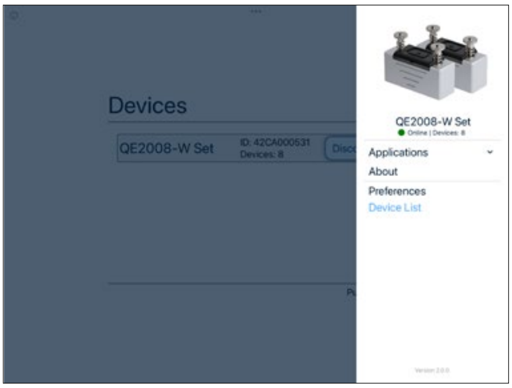


9. When a sensor has been selected, a list of available positions in the network is presented. Choose the desired position for the new sensor and press **Add new sensor**.



10. The sensor will be added to the network at the desired position and the app will connect to the network of QE2008-W sensors.

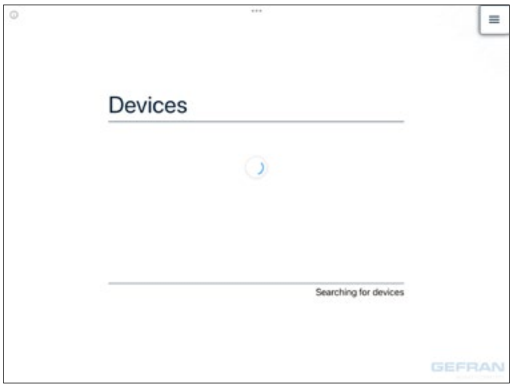




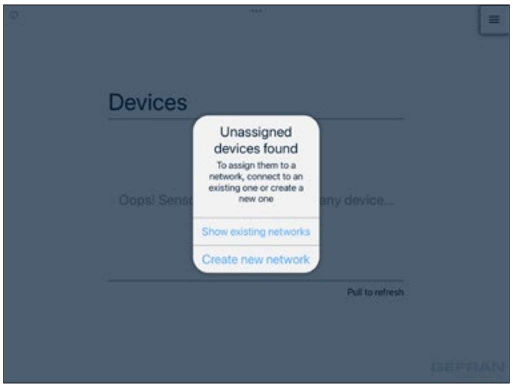
5.3. Creating a new network

Folow these steps to create a new QE2008-W network.
In the following example, a new network with the ID "**NewNetwork**" will be created. Note that an unassigned sensor is required to create new networks. If needed, follow the section **“5.1. Removing a QE2008-W sensor from a network” on page 45** to create an unassigned sensor.

1. If the Sensormate app has an active connection, disconnect.
2. Turn on an unassigned sensor that will be part of the new network.
3. On the **Device List** page, scan for BLE devices.

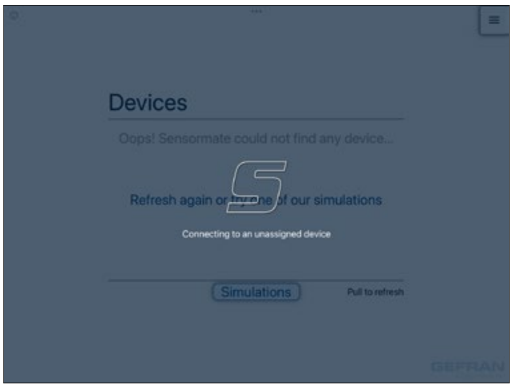


4. Once the scan is over, a pop-up message will notify of a discovered unassigned device. Select the option **"Create new network"**.



5. Insert the desired **Network ID** for the new network in the relative field and press **Next**.

6. The app will now establish a connection with an unassigned device.

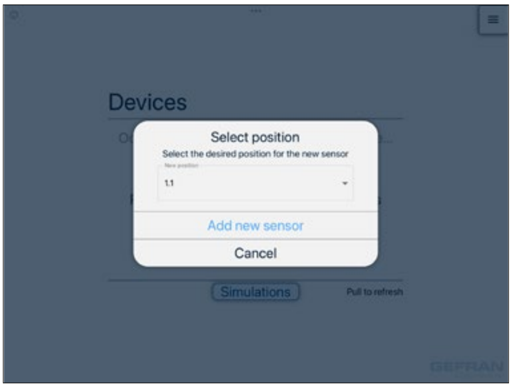


7. f the Sensormate application discovered more than one unassigned device, a pop-up message will ask the user to select the unassigned sensor they wish to add to the new network.

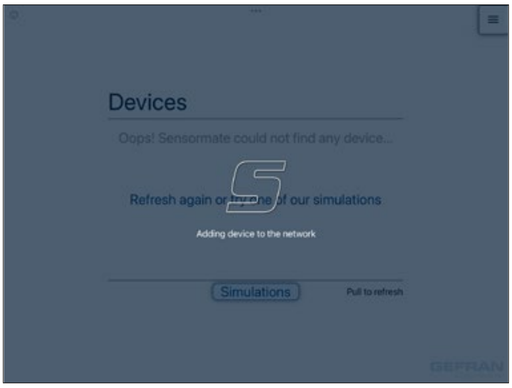
   If wanted, press the **Loop** button to search for another sensor, then press **Select**.

   The currently selected sensor will indicate it via the function LEDs, setting them to *Fast blinking yellow.*

8. When a sensor has been selected, a list of available positions in the network is presented. Choose the desired position for the new sensor and press **Add new sensor**.



9. The new network has now been created and the unassigned sensor has been added to it.



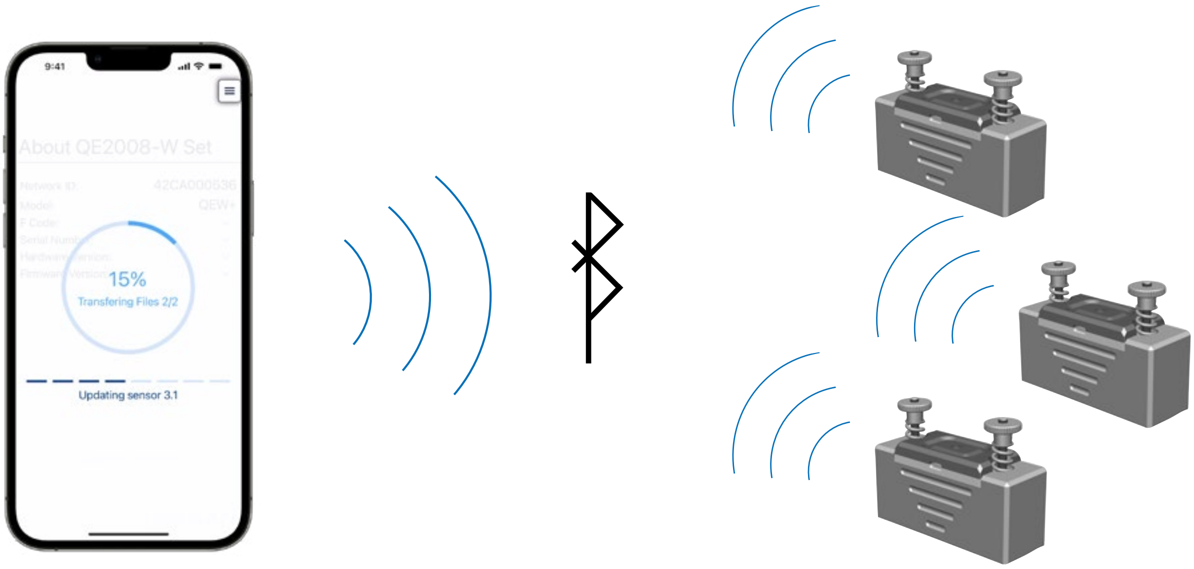
6. FIRMWARE UPGRADE

The firmware of the QE2008-W sensors can be updated using the Sensormate App.

Every time a connection with the QE2008-W sensor has been established, its firmware version is checked and, if a later version is available, the **Update Firmware** button on the **About** page will become enabled.
Once pressed, all the outdated sensors within the network will be automatically updated.
Note that an active internet connection is necessary in order to check the availability of new firmware versions on the Gefran database.

The update of the firmware of a single sensor can take up to 1.5 minutes. Updating a set of 8 sensors can last up to 10 minutes.

We recommend to perform this step while the sensors are sitting in the charging case and charging is ongoing.



7. TECHNICAL SPECIFICATIONS

7.1. QE2008-W SET

TECHNICAL DATA SENSOR

On board power supply	Integrated LiPo battery 3.7V 330mAh
Charging specification	5V, 175mA

TECHNICAL DATA WIRELESS PROTOCOL

Frequency	2.4000-2.4835 GHz (ISM-Band)
Protocol transceiver to end device	Bluetooth 5 (Low Energy)
End device compatibility	Sensormate App: - Windows 10 or newer - Android 6.0 or newer - IOS 8.0 or newer
TX-power	8dBm
Range	Bluetooth 5, theoretical up to 300m (Typ. 30 m) "
The contained bluetooth module is approved for the use in the following countries/regions:	Europe USA Canada Japan Taiwan South Korea Brazil Australia New Zealand South Africa

7.2. Country approvals

Europe

USA and Canada – FCC/IC

Industry Canada

This device contains
FCC ID: XPYNINAB30
IC: 8595A-NINAB30

“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, and2.This device must accept any interference received, including interference that may cause undesired operation.”

JAPAN - MIC

The used module comply with the Japanese Technical Regulation Conformity Certification of Specified Radio Equipment (ordinance of MPT N°. 37, 1981), Article 2, Paragraph 1:

- Item 19 „2.4 GHz band wide band low power data communication system

R 204-810006

TAIWAN – NCC

- Without permission granted by the NCC, any company, enterprise, or user is not allowed to change frequency, enhance transmitting power or alter original characteristic as well as performance to an approved low power radio-frequency devices.
- The low power radio-frequency devices shall not influence aircraft security and interfere legal communications; If found, the user shall cease operating immediately until no interference is achieved. The said legal communications means radio communications is operated in compliance with the Telecommunications Act.
  The low power radio-frequency devices must be susceptible with the interference from legal communications or ISM radio wave radiated devices

Contains Transmitter Module

內含發射器模組: CCAI19LP1670T0

SOUTH KOREA – KCC

R-C-ULX-NINA-B30

BRAZIL – ANATEL

This equipment operates on a secondary basis and, consequently, must accept harmful interference, including from stations of the same kind, and may not cause harmful interference to systems operating on a primary basis

ANATEL
03851-19-05903

> “Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.”

AUSTRALIA and NEW ZEALAND

The contained module compliant with AS/NZS 4268:2012/AMDT 1:2013 standard

– Radio equipment and systems
– Short range devices
– Limits and methods of standard measurement made by the Australian Communications and Media Authority (ACMA)

SOUTH AFRICA - ICASA

ICASA

TA-2019/1202

APPROVED

8. TROUBLESHOOTING

Mounting

- The sensor is positioned too loosely
  - The sides of the magnets are not all seated evenly.
  - Tighten the knurled nut ½ turn.
  - The spiral spring may be too tight. --> Loosen the knurled nut.

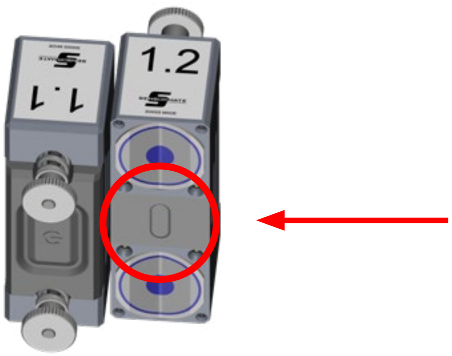
Strain measurement

- The measurement does not produce a useful result
  - Has the correct unit been set in the display software?
  - Are the sensors stable and do not wobble?
  - Is the surface to be measured clean?
  - Is the surface to be measured ferromagnetic?
  - Is the surface to be measured free of paint?
  - Are the magnets clean?
  - Is the foil or strain gauge damaged?

9. MAINTENANCE

Foil

- To avoid damage on the foil, it should be checked always before using the sensor.
- Immediately remove any impurities.



Magnet

The surfaces of the magnets are ground and can suffer rusting. They must therefore be protected using an anti-corrosive substance. We recommend to remove any impurities and lubricate the magnetic surfaces after use with a paper towel soaked in anti-corrosive substance.

Servicing

The QE2008-W sensors should be calibrated every 12 months to assure the measurement metrical parameters and stability. This process can be executed only by professionally trained staff in Sensormate AG. Contact your Gefran dealer or Gefran Customer Service to organize this task.

Notes and citations:

[1] Tie-Bar Elongation Based Filling-To-Packing Switchover Control and Prediction of Injection Molding Quality - Jian-Yu Chen, Chun-Ying Liu and Ming-Shyan Huang [2019]

10. SHIPMENT

Product containing lithium ion batteries in compliance with section II of PI 967 or PI 966. Shipment shall follow ADR/IMDG/ICAO rules.

SENSORMATE
A GEFRAN COMPANY

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