Genesis HIGH SPEED

User Manual

English

Sensor Database Option

Perception

A03581_02_E00_01 HBM: public

HBM

Document version 2.1 - September 2018

For Perception 7.30 or higher

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1 Sensor Database Option

1.1 Introduction

Setting up an acquisition channel can be a tedious and error-prone job. Multiple parameters need to be entered into various locations of the software. Settings may include:

- Channel mode
- Excitation
- Sensitivity
- Span and offset
- Technical units definition

This process can be simplified by using the Sensor Database.

The Perception Sensor Database is a collection of information about sensors. This information is arranged in groups which all have their own specific settings.

There are two databases used in Perception:

1. HBM Sensor Database: contains information about sensors that can be viewed but not changed and where sensors and groups **cannot** be added to or deleted from.
   This database is controlled by Perception and can be overridden with a new version of Perception.
2. User Sensor Database: contains information about sensors that can be viewed and changed and where sensors and groups **can** be added to or deleted from.
   This database is controlled by the user.

Terminology (IEEE org)

- Sensor: an electronic device that produces electrical, optical or digital data derived from a physical condition or event. Data produced from sensors is then electronically transformed, by another device, into information (output) that is useful in decision making done by 'intelligent' devices (computers) or individuals (people).
- Actuator: a mechanical device that accepts a data signal and performs an action based on that signal.
- Transducer: an electronic device that transforms energy from one form to another. (Examples: microphone, thermometers, antenna).

For the purpose of this document, a transducer is a sensor and/or actuator, and the term sensor will be used throughout this document.

1.1.1 How to install the Sensor Database option

The Perception software requires a HASP key. HASP (Hardware Against Software Piracy) is a hardware-based (hardware key) software copy protection system that prevents unauthorized use of software applications.
Each HASP key contains a unique ID number used to personalize the application in accordance with the features and options purchased. The key is also used to store licensing parameters, applications and customer-specific data.
If you have purchased the Sensor Database option as a separate item, you will receive a personalized "key file". Use this file to unlock the additional features.

You can find the serial number of your key in **Help** ▸ **About Perception**

To update the key information:

1 Choose **Help** ▸ **Update Key...**
2 In the Open dialog, locate the Key File (*.pKey) and click **Open**.
3 If the key is successfully updated, you will see the following message:

Figure 1.1: Software copy protection dialog

4 Click **OK**.
After the installation, you can go to **Help** ▸ **About Perception** ▸ **More...** to see all of the options installed.

You will need to restart the program before the changes take effect. The Sensor Database option will then be available.

2 Setting up the Sensor Database

2.1 Sensor Database Work Area

The Sensor Database work area is laid out as follows:

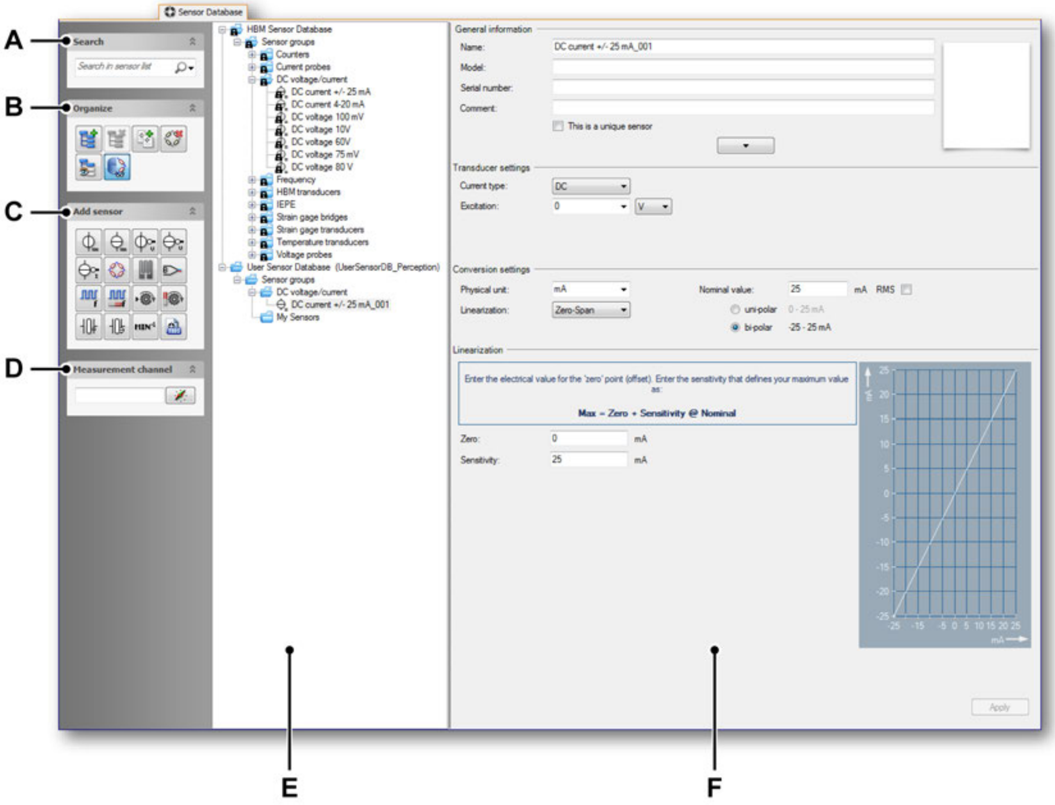


Figure 2.1: Sensor Database work area

A Search sensors

B Organize database

C Add sensor

D Measurement channel

E Sensor tree with HBM and User sensors

F Sensor information

A Search sensors

Panel to perform a search in the sensors.

B Organize database

Panel with tools used for organizing sensors, groups and databases.

C **Add sensor**
Panel to add new sensors.

D **Measurement channel**
Panel to select the channel to use for measurement.

E **Sensor tree**
All the sensors are arranged with their corresponding information in the middle of the panel. The sensors are arranged in groups by electrical similarities or the physical quantity that is measured.

F **Sensor information**
The area shows detailed information about sensors, such as their calibration and linearization information. This panel can also be used to setup or to update the information about sensors defined by the user. For more information about the HBM Sensor Database, please refer to "Groups and sensors within the Sensor Database" on page 21.

In addition to all options provided in the Sensor Database work area, there is also a related menu in the menu bar when the reporter sheet is active, called “Sensor Database”, as well as an additional toolbar in the top toolbar area as shown Figure 2.2.

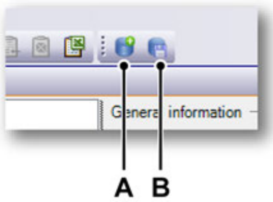


Figure 2.2: Sensor Database toolbar

A Open User Database

B Save User Database as

2.1.1 Panels

Search panel
There are two ways to search for sensors:

- Enter text to use as search query.
- Use the dropdown button and select the sensor per type.

To search using a query:

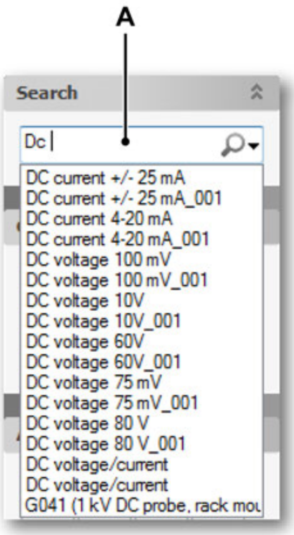


Figure 2.3: Search using a query

A Text box

Start typing text which is in the name of the sensor/group in the text box **(A)**. All sensors/groups containing the text anywhere in the name will be listed in a drop down list (see Figure 2.3). You can then select the necessary item by clicking on it or by using the arrow keys.

To search using the drop down button:

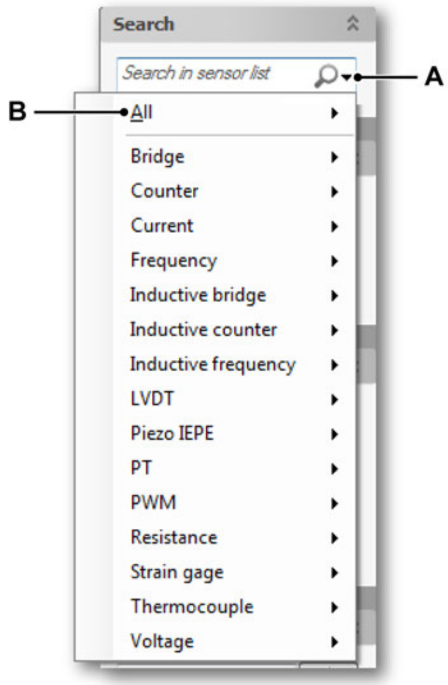


Figure 2.4: Search using the drop down button

A Drop down button

B All sensors

When clicking on the down arrow, a menu with the sensor types will appear (see Figure 2.4). The **All** option contains all sensors sorted in alphabetical order.

Organize panel

The organize panel consists of the tools to organize the sensors, the sensors groups and the Sensor Databases (see Figure 2.5).

Figure 2.5: Organize panel

A Adding new groups 

B Deleting groups 

Sensors are grouped by electrical similarities or the physical quantity that is measured. When a group is deleted, all sensors in that group are deleted from the tree.

C Duplicating sensors 

This feature may be used for adapting read-only sensors in the Master Database when a new sensor's settings are almost the same as those of an existing one or when a sensor needs adaptation (see chapter "The sensor that needs adaptation" on page 25).

D Deleting sensors 

E Showing all sensors 

Supported and not supported sensors. Not supported sensors are sensors that are not currently supported by the hardware compatible with Perception.

F Changing the view of the sensor tree 

The sensors can be viewed in database view, where the sensor information from the HBM Sensor Database is separated from the sensor information from the User Sensor Database. They can also be viewed in merged view, where the sensor information is mixed.

Sensors panel

You can add sensors to the database by using the buttons provided. The sensor is then added to the group currently selected in the sensor tree. If a sensor instead of a group is selected, the sensor is added to the group to which the sensor belongs.

Note *When in database view, you can only add a sensor when the sensor tree node selected is in the User Database (see chapter "The two views of the sensor tree" on page 19).*

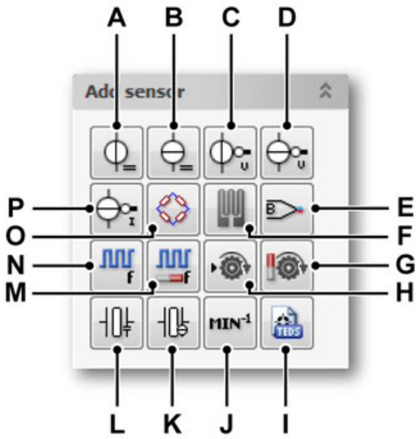


Figure 2.6: Add sensor

A Voltage sensors

B Current sensors

C Voltage Probe

D Current Probe Vout

E Temperature sensors

F Strain gauge sensors

G Inductive counter sensors

H Counter sensors

I Sensors out of a virtual TEDS file

J RPM sensors

K Piezo IEPE sensors

L Piezo charge sensors

M Inductive frequency sensors

N Frequency sensors

O Bridge sensors

P Current Probe Aout

Note *List of sensor types which can be added for Perception V6.30*

Measurement panel

The measurement panel is used to select a channel from the connected hardware. For certain linearization types available for the sensors (e.g. two point, tabular), the channel you select in the panel will automatically be used for the measurement when you click on the measure now button (see an example in Figure 2.45 "Two Point linearization" on page 47).

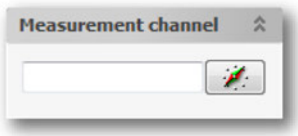


Figure 2.7: Measurement channel

Note *When no measurement channel is selected and the voltage needs to be measured, the user is prompted with a dialog to select a channel. The measurement channel is cleared when another sensor is selected.*

2.2 Sensor Tree

The sensor tree shows the two loaded databases:

- User Sensor Database (User)
- HBM Sensor Database (Master)

All available sensors in these databases are arranged in groups. Two databases are referenced as:

- **Master** Database
- **User** Database

The Master Database is read-only and therefore no sensors/groups can be added, edited or deleted. The fact that these sensors are read-only can also be seen in the sensor tree, as these sensors have a small lock icon, (see Figure 2.8 for an example of a locked sensor).

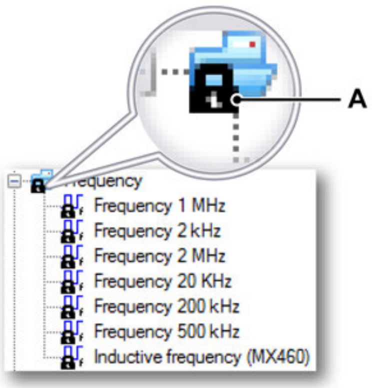


Figure 2.8: Sensor tree (Detail)

A Lock icon

The User Database is editable. Thus sensors can be added, edited and deleted within this database. When modifying an existing sensor in the Master Database, the sensor should first be duplicated and then edited.

2.2.1 The two views of the sensor tree

The sensor tree provides two different views:

- The merged view, in which the HBM Sensor Database and the User Sensor Database are merged in the same main group called Sensors (see Figure 2.9).

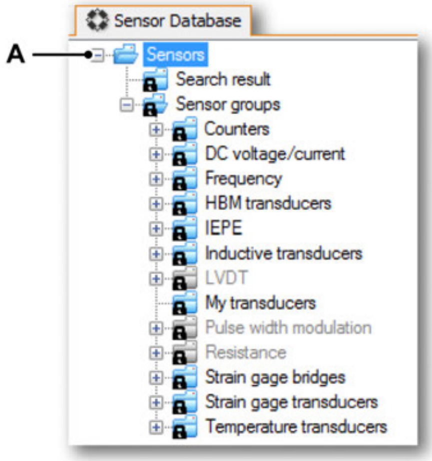


Figure 2.9: Sensor Database (Merged view)

A Sensors main group

- The database view, in which the Master Database and User Database are separated into different groups (see Figure 2.10).

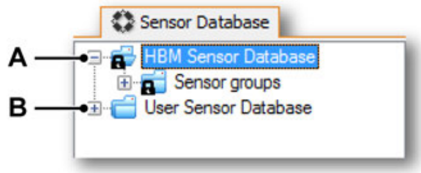


Figure 2.10: Sensor Database (Separated view)

A HBM Sensor Database

B User Sensor Database

You can switch between the different views by:

- Clicking the **Database View** button in the **Organize** panel.

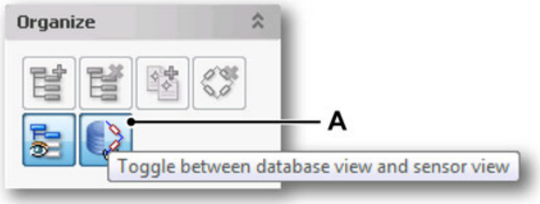


Figure 2.11: Organize panel with Database View button

A Database View button (Organize panel)

- Right-clicking the mouse on the sensor tree and selecting **Database View**.

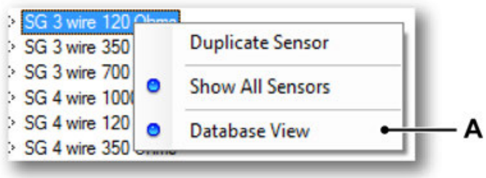


Figure 2.12: Sensor tree with sub-menu

A Database View option (Sensor tree context menu)

- Clicking on the **Database View** menu item in the Sensor Database sheet main menu.

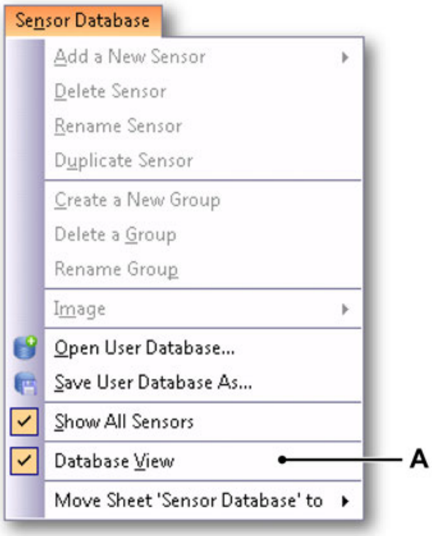


Figure 2.13: Sensor Database menu

A Database View option (Main menu)

Note *When both databases contain a sub-group with the same name at the same level, these groups will also be merged in the tree.*

2.2.2 Groups and sensors within the Sensor Database

The Sensor Database consists of groups and sensors which can be created, edited or deleted. A group is a sub-directory which can contain both other sub-directories and sensors. Groups can be used to bundle certain sensors, e.g. sensors that are all used in the same way such as for torque. A group does not have any properties and only the name can be changed, in addition to creating, editing and deleting the group.

A sensor in the Sensor Database is a representation of a real sensor that can be used in the system. It has all the necessary settings and information to correctly configure the channel to be able to use the sensor properly. Besides that, it is possible to create new sensors of a certain type (e.g. voltage) and all the information stored for the sensor can be edited as long as the sensor is not read-only.
When a sensor is being created, it will be created in the group currently selected in the sensor tree. That means that you can create new sensors at different group levels within the sensor tree.

2.2.3 Creating new groups and sensors

The Sensor panel and the Sensor Database menu can be used to create new sensors. When creating a sensor similar to an existing one, the right-click menu in the sensor tree can also be used to duplicate the existing sensor and to adapt the duplicated sensor (see Figure 2.14). Newly added sensors are added to the group currently selected in the sensor tree or, if a sensor is selected, to the parent group of the sensor selected. The new sensors are always added to the User Database.

Note *Only supported sensors can be added to the User Sensor Database.*

The organize panel and the Sensor Database menu can be used to create new groups. It is also possible to add a new group by using the right-click menu in the sensor tree (see Figure 2.14). A new group is also added to the group currently selected in the sensor tree or, if a sensor is selected, to the parent group of the sensor selected. The new groups are always added to the User Database.

Note *New sensors or groups are always added to the User Sensor Database.*

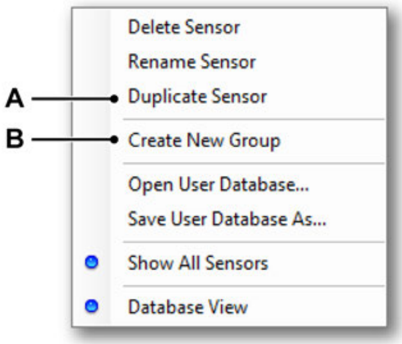


Figure 2.14: Context menu of the sensor tree (User Sensor Database)

A Duplicate Sensor

B Create New Group

2.2.4 Duplicating sensors

The Organize panel and the Sensor Database menu sensors can be duplicated from the right-click menu. Duplicating means that an exact copy of the sensor is made. The duplicated sensor is always added to the User Database, even when a sensor is being duplicated in the Master Database.

This feature is useful when a sensor needs to be modified in the HBM Sensor Database, when a new sensor's settings are almost the same as that of an existing one or when a sensor needs to be adapted (see chapter "The sensor that needs adaptation" on page 25).

2.2.5 Renaming groups or sensors

If a sensor or group needs to be renamed, start by selecting it in the sensor tree. A group or sensor can then be renamed by using the right-click menu or the Sensor Database main menu.

Each sensor needs to have a unique name. When an already existing name is assigned to a sensor, the sensor will automatically be renamed by adding a suffix _xxx to the sensor name.

Groups only need to have a unique name within the same parent. If an existing name is assigned to a group, the group will automatically be renamed by adding a suffix _xxx to the name.

Note *When a sensor is duplicated, the same renaming mechanism is used.*

Example

When a voltage sensor with the name **Voltage_sensor** is duplicated, the duplicated sensor is renamed **Voltage_sensor_001**.
When the duplicated sensor **Voltage_sensor_001** is duplicated, a sensor is added with the name **Voltage_sensor_001_001**.

2.2.6 Deleting groups or sensors

If a sensor or group needs to be deleted, start by selecting it in the sensor tree. The option to delete a sensor or group can be accessed by using the right-click menu, the organize panel or the Sensor Database main menu. Only sensors and groups from the User Database can be deleted; these options are unavailable for sensors and groups within the Master Database.

2.2.7 Moving groups and sensors

The sensor tree provides an overview of the sensors available in the Sensor Databases, using the groups to point out the level on which the sensor is present. However, a sensor might be created in the wrong group or some sensors might need to be bundled at another level. For these cases, the sensor tree provides a moving mechanism for both groups and sensors.

Moving items between groups is as simple as selecting the group or sensor to be moved, holding the left mouse button, dragging the item to the position where it should be moved to and releasing the button.

Note *Moving groups and sensors is only possible if the group or sensor is not read-only.*

Read-only groups and sensors can be identified by the small, black lock icon which is located on top of the sensor or group icon (see Figure 2.8 for an example).

If a group is moved to another group that already contains a sub-group with the same name, a message box will appear and indicate whether or not the groups should be merged. When merging, the content of the group to be moved is relocated. Otherwise the group to be moved receives a unique name and will then be moved.

2.2.8 Opening and saving User Databases

When Perception is started, two databases are opened: the HBM Sensor Database and the most recently opened User Sensor Database.

It is possible to load another User Database or to save the current one. This functionality can be accessed by using the right-click menu, the Sensor Database main menu or the toolbar.

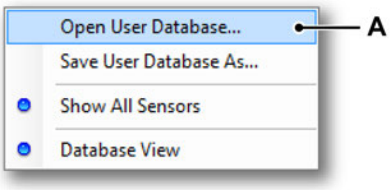


Figure 2.15: Database/Sensors options

A Open User Database

When a new User Database is opened, the current User Database is automatically closed. Perception only supports one User Database. Thus it is not possible to use multiple User Databases at the same time.
When Perception is restarted, the most recently opened User Database is automatically reopened. When a new User Database is loaded, modifications can be made to the sensors available in this database.

The interface of the sensor management sheet can also save a copy of the current User Database in a new location. Saving the current User Database means that a copy of the current database is made; Perception still uses the database as is.

2.2.9 Supported and not supported sensors

The sensor tree can contain both supported and not supported sensors.

- Not supported sensors are sensors that are not currently supported by the hardware Perception can connect to.
- Not supported sensors are shown as disabled in the sensor tree (see Figure 2.16).

Note *Not supported sensors cannot be duplicated and no changes can be made to these sensors.*

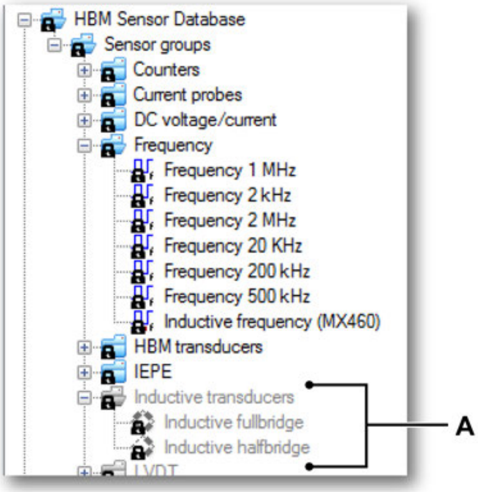


Figure 2.16: Not supported sensors

The right-click menu in the sensor tree, the Organize panel and the Sensor Database main-menu have an option to **Show All Sensors** (see Figure 2.15). When this option has checked all sensors, both supported and not supported sensors are shown. When this option is not checked, only the supported sensors are shown.

2.2.10 The sensor that needs adaptation

There are HBM sensors which need to be individually adapted. These sensors should not be used without specifying the exact calibration data and entering the custom linearization information present in the sensor's datasheet.

These sensors also exist in the Sensor Database with a basic set of information. You need to be informed about this setting (only if set for the selected sensor). A message box will appear if such a sensor is being applied to a channel either by drag and drop or by selecting the sensor in the settings sheet. This message box remembers the fact that the selected sensor should be edited and configured correctly before use. See Figure 2.17 for an example of what this message box looks like.

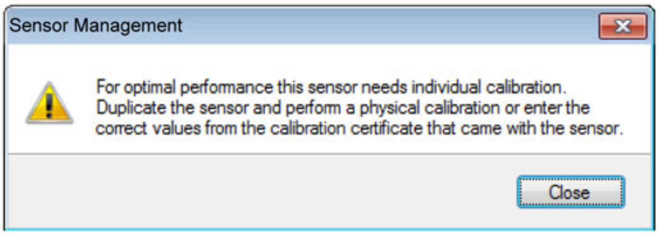


Figure 2.17: Sensor Management message

Note *If the sensor is used anyway, it might not operate within the specified accuracy.*

Besides the message box, the sensors that require the adaptation also receive a red border within the sensor tree. See Figure 2.18 for an example of what this red border looks like. The sensor with the name **Voltage_Sensor_004** is the sensor with the needs adaptation flag set.

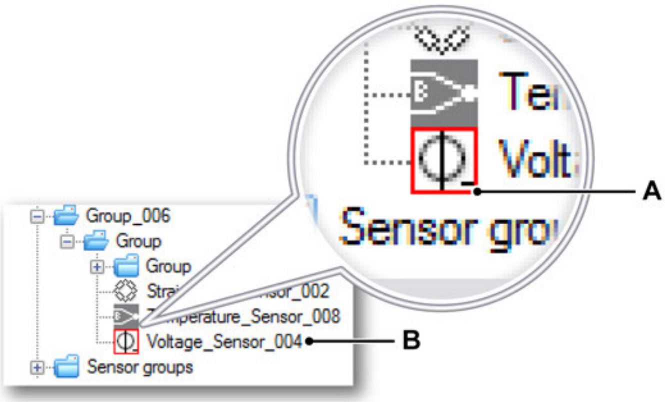


Figure 2.18: HBM sensor tree with adaptation flag set (detail)

A Adaptation flag set

B Voltage_Sensor_004

2.3 Detailed Sensor Information

When a sensor is selected in the sensor tree, the detailed information is displayed on the right-hand side of the sensors sheet.

The detailed information is grouped into four parts:

- General sensor information
- Transducer information
- Conversion information
- Linearization information

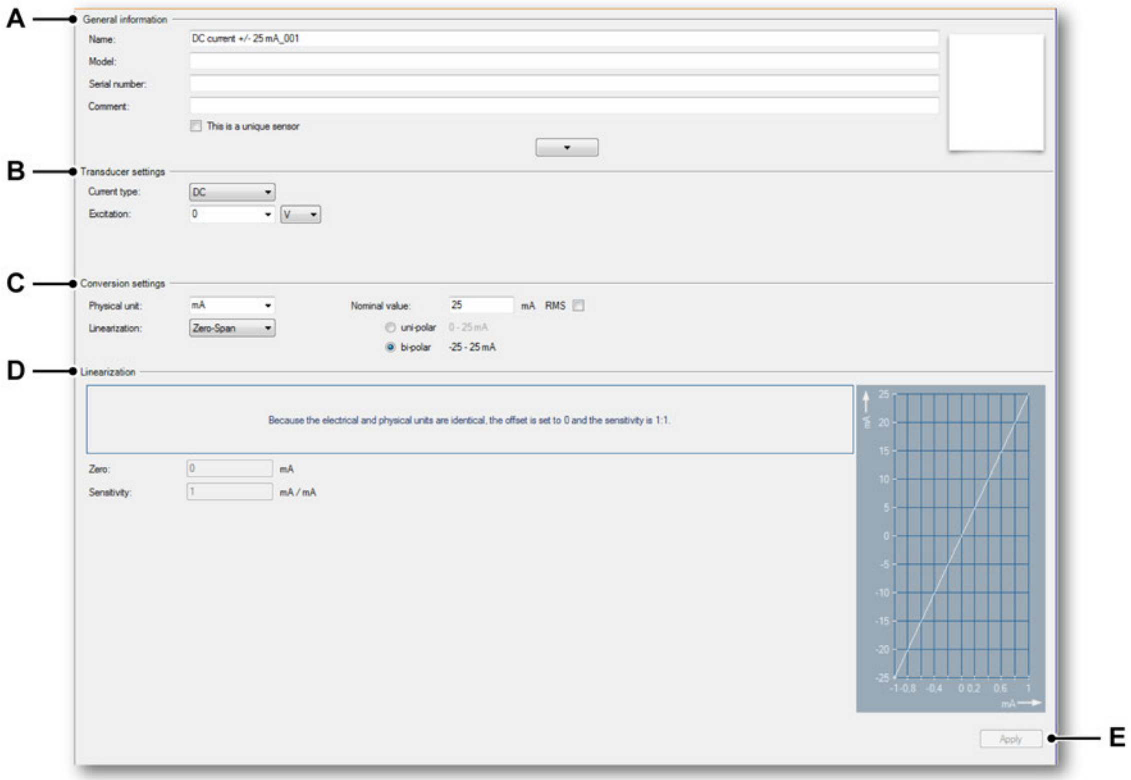


Figure 2.19: Sensor Database work area (right-hand side)

A General settings

B Transducer settings

C Conversion settings

D Linearization settings

E Apply button

When settings are changed, the **Apply** button in the bottom right-hand corner of the screen is enabled so that the settings can be saved. When no settings are changed, the **Apply** button is disabled. If settings from the selected sensor are changed but not applied and then another sensor is selected, you will be prompted with a message box (see Figure 2.20) that asks if the settings should be saved.

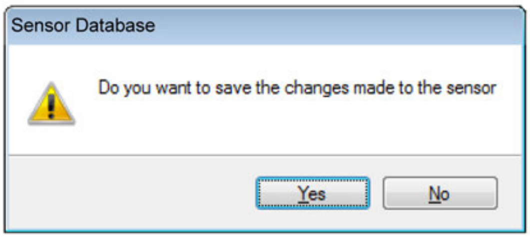


Figure 2.20: Sensor Database save message

2.3.1 General sensor information

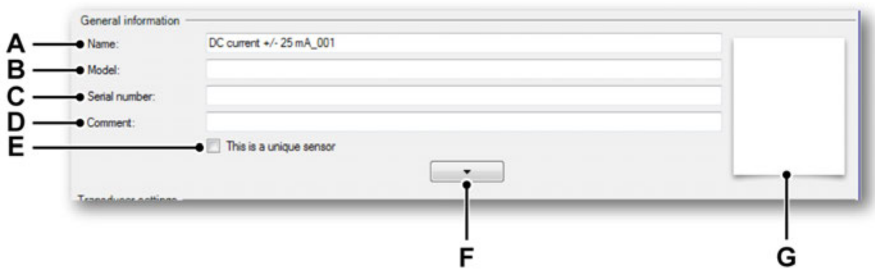


Figure 2.21: General information area

A Name of the sensor

B Model of the sensor

C Serial number of the sensor

D Comment about the sensor

E Whether or not the sensor is unique: when a sensor is unique, it can only be applied to one channel at a time

F Show Advanced settings

G Image preview (see Figure 2.23)

When you click the show **Advanced settings** button (see Figure 2.21), the General information area is extended and shows the following advanced settings (see Figure 2.22).

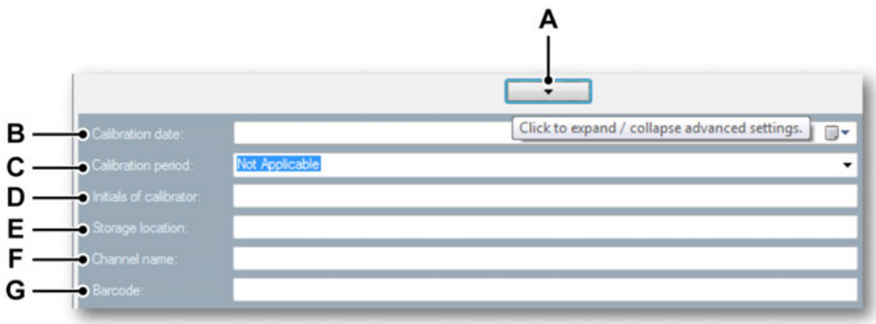


Figure 2.22: General information area - Advanced settings

A Show/Hide Advanced settings

B Calibration date

C Calibration period

D Initials of calibrator

E Storage location

F Channel name

G Barcode

A **Show/Hide** Click to expand/collapse advanced settings.

B **Calibration date** The date when the sensor was last calibrated.

Note *Calibration might be required because the sensor output and accuracy may drift outside of its specifications after a period of time.*

C **Calibration period** Defines the new calibration expiration date. This can be a predefined period, but you can also enter the number of days.

Note *When the expiration date is exceeded, an exclamation sign is shown next to the calibration date field and there is also a warning in the tool tip of the **Show Advanced settings** button.*

D **Initials of calibrator** The name of the person who last calibrated the sensor.

E **Storage location** The physical location where the sensor is stored.

F **Channel name** When you enter a channel name and apply the sensor to a channel, the current channel receives the name entered.
For example, when a channel is named after a sensor, you can immediately see which sensor is applied to a certain channel in the display sheet.

G **Barcode** The barcode related to the sensor.

Adding an image to a sensor

It is possible to add an image to the sensor selected in the Sensor Database sheet.

Note *You can only add an image to editable sensors; read-only sensors are locked and cannot be edited.*

Multiple image formats are supported, e.g.: *.bmp, *.jpg, *.jpeg, *.gif, *.tif, *.tiff and *.png.
The image of the sensor will be automatically resized if the image is too large to fit in the database. When resizing the image, its aspect ratio will stay the same. Small images will not be resized.

To load or clear an image, use one of the following options:

- Load or clear an image by right-clicking the mouse or by double-clicking on the photo-frame situated in the Sensor Database sheet.

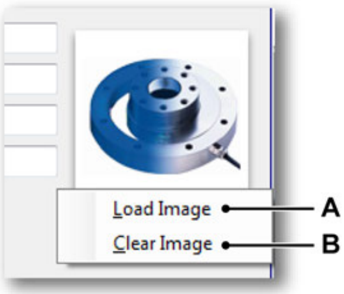


Figure 2.23: Sensor Database sheet image loading and clearing

A Load Image

B Clear Image

- In the **Sensor Database** menu select **Image ▸ Load image/Clear image**

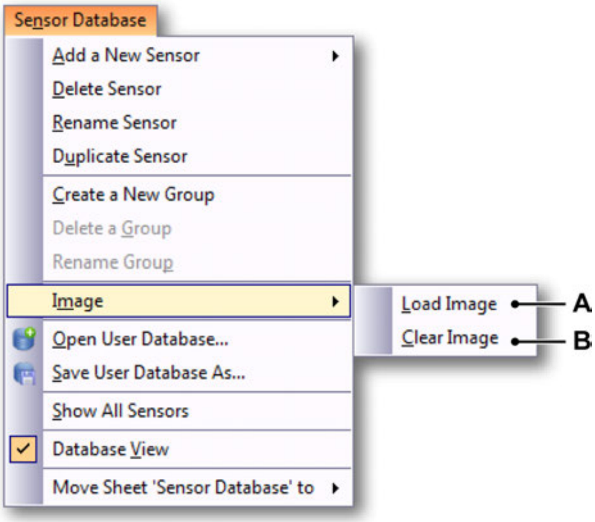


Figure 2.24: Main menu image loading and clearing

A Load Image

B Clear Image

2.3.2 Transducer and conversion information

The **transducer information** that is shown for the sensor depends on the type of sensor that is selected.

The **transducer settings** provide information about the electrical settings of the sensor.

For each new added sensor of a certain type, the following descriptions explain the the settings in more detail:

- Voltage sensor (on page 32)
- Current sensor (on page 32)
- Probes (on page 33)
- Piezo sensors (on page 36)
- Bridge sensor (on page 37)
- Strain gauge sensor (on page 37)
- Temperature sensor (on page 39)
- Frequency sensors (on page 39)
- Counter sensor (on page 40)
- RPM sensor (on page 42)

The **conversion settings** provides information about what is measured by the sensor. The transducer settings are specific for each type of sensor, but the conversion settings all consist of the same information.

Voltage sensor
A voltage type sensor in Perception is a sensor that outputs a voltage (V). Figure 2.25 shows the settings for the voltage sensor in Perception.

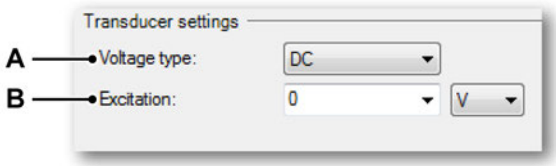


Figure 2.25: Transducer settings/Voltage sensor

A Voltage type

B Excitation

A **Voltage type**
The type of the directional flow which exits the sensor. You can choose between **DC** and **AC**.

B **Excitation**
The external input (power supply) for the sensor needed to function. You can choose between the excitation units **V** (voltage) or **mA** (milliampere).

Current sensor
A current type sensor is a sensor that outputs a current (A). Figure 2.26 shows the settings for the current sensor in Perception.

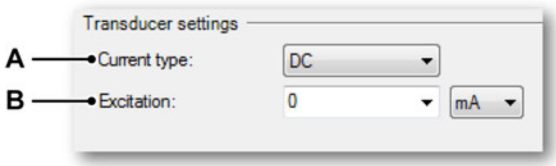


Figure 2.26: Transducer settings/Current sensor

A Current type

B Excitation

A Current type
The type of the directional flow which exits the sensor. You can choose between **DC** and **AC**.

B Excitation
The external input (power supply) which the sensor requires in order to operate correctly.
You can choose between the excitation units **V** (voltage) or **mA** (milliampere).

Probes
Perception supports three types of probes:

- Voltage Probe (see Figure 2.27)
- Current Probe (Vout) (see Figure 2.28)
- Current Probe (Aout) (see Figure 2.29)

Voltage Probe
Voltage Probes are intended to measure voltages. When a Voltage Probe is selected, the following settings are shown (see Figure 2.27).

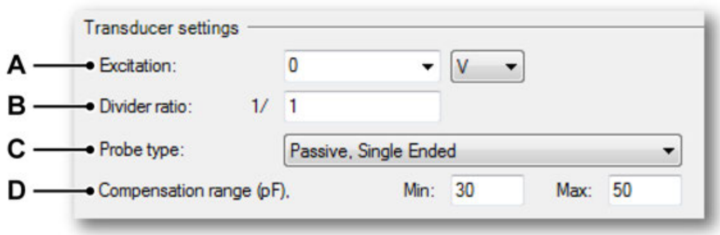


Figure 2.27: Transducer settings/Voltage Probe

A Excitation

B Divider ratio

C Probe type

D Compensation range (pf)

A Excitation
The external input (power supply) that the sensor needs to function. You can choose between the excitation units **V** (voltage) or **mA** (milliampere).

B Divider ratio
The ratio between the input and the output voltage of the probe.

C Type of voltage probe supported by Perception

- **Passive, Single-Ended**
  These probes increase the input range of a single-ended amplifier, but they typically decrease the overall accuracy of the amplifier.
- **Passive, Single-Ended, Isolated version**
  These probes increase the input range of a single-ended isolated amplifier, but they typically decrease the overall accuracy of the amplifier.

Note *The probes increase only the range, not the isolation voltage.*

- **Passive, Single-Ended, Isolated version, GHS-XT**
  These probes increase the input range of a single-ended isolated amplifier while they maintain the overall accuracy of the amplifier.

Note *The probes increase only the range, not the isolation voltage.*

- **Passive, Differential**
  These probes increase the input range of a differential amplifier, but they typically decrease the overall accuracy and the CMRR of the amplifier.
  They work with isolated as well as with non-isolated variants of differential amplifiers. If used with isolated amplifiers, they increase only the range, not the isolation voltage.
- **Active, Differential**
  These probes are self-contained, differential amplifiers in front of the instrument.
  The input range and accuracy depend on the type of active differential probe used.
  Active differential probes can be used in front of virtually any amplifier, but their performance is typically limited. Active differential probes usually operate from batteries, which can cause inconvenience.

D The compensation range (pF)
The probe type is compatible with amplifiers that have a capacity in this range.

Current Probe (Vout)
Current Probes (Vout) are intended to measure current, but they also output voltage.
When a Current Probe (Vout) is selected, the following settings are shown (see Figure 2.28).

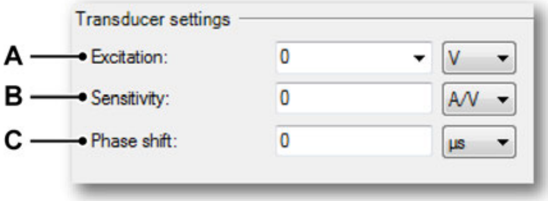


Figure 2.28: Transducer settings/Current Probe (Vout)

A Excitation

B Sensitivity

C Phase shift

A Excitation
The external input (power supply) that the sensor needs to function. You can choose between the excitation units **V** (voltage) or **mA** (milliampere).

B Sensitivity
The ratio between the input and the output of the probe.

C Phase shift
Measurements made using a Current Probe may introduce a phase shift to the measured signal; the time shift entered here will be used to compensate for that.

Current Probe (Aout)
Current Probes (Aout) are intended to measure currents, but they also output a current.
When a Current Probe (Aout) is selected, the following settings are shown (see Figure 2.29).

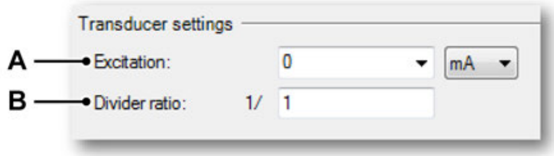


Figure 2.29: Transducer settings/Current Probe (Aout)

A Excitation

B Divider ratio

A **Excitation**
The external input (power supply) that the sensor needs to function. You can choose between the excitation units **V** (voltage) or **mA** (milliampere).

B **Divider ratio**
The ratio between the input and the output currents of the probe.

Piezo sensors
Perception supports two types of Piezo sensors:

- Piezo Charge (see Figure 2.30)
- Piezo IEPE (see Figure 2.31)

Piezo Charge
A piezoelectric sensor is a device that uses the piezoelectric effect to measure pressure, acceleration, strain or force by converting them to an electrical charge.
When a Piezo Charge is selected, the following settings are shown (see Figure 2.30).

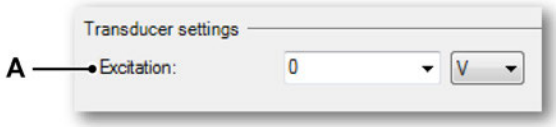


Figure 2.30: Transducer settings/Piezo Charge

A Excitation
The external input (power supply) that the sensor needs to function. You can choose between the excitation units **V** (voltage) or **mA** (milliampere).

Piezo IEPE
Integrated electronic piezoelectric (IEPE) accelerometers are accelerometers that incorporate an electronic amplifier.
When a Piezo IEPE is selected, the following settings are shown (see Figure 2.31).

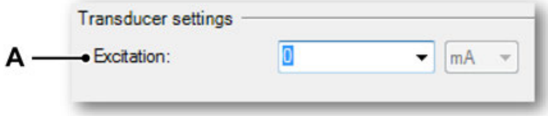


Figure 2.31: Transducer settings/Piezo IEPE

A Excitation
The external input (power supply) that the sensor needs to function. The excitation unit is **mA** (milliampere).

Bridge sensor
Bridge sensors are commonly used to measure pressure. Bridge sensors have integrated bridge circuits which are constructed on a silicon die. When a force is exerted on the die, the resistance changes.
When a Bridge sensor is selected, the following settings are shown (see Figure 2.32).

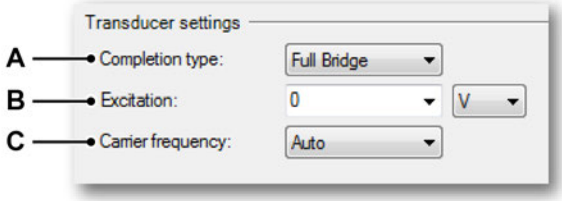


Figure 2.32: Transducer settings/Bridge sensor

A Completion type

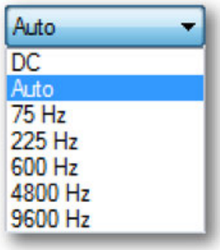
B Excitation

C Carrier frequency

A Completion type
You can choose between three types of bridges:
- **Full Bridge**
- **Half Bridge**
- **Quarter Bridge**

B **Excitation** The external input (power supply) that the sensor needs to function. You can choose between the excitation units **V** (voltage) or **mA** (milliampere).

C **Carrier frequency** A frequency which is required for the sensor to operate.



Note *Perception can only handle **DC** or **Auto**.*

Strain gauge sensor
Strain gauge sensors are commonly used for both force and pressure measurements. Typically, the strain gauge is bonded to a rigid structure and when a force acts upon the structure, the strain gauge changes resistance. When a strain gauge sensor is selected, the following settings are shown (see Figure 2.33).

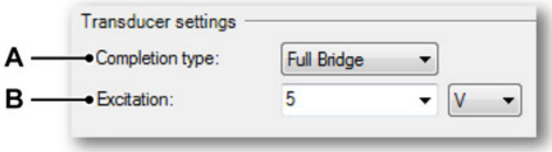


Figure 2.33: Transducer settings/Strain gauge sensor

A Completion type

B Excitation

A **Completion type**
You can choose between three types of bridges:
- **Full Bridge**
- **Half Bridge**
- **Quarter Bridge**

B **Excitation**
The external input (power supply) that the sensor needs to function. You can choose between the excitation units **V** (voltage) or **mA** (milliampere).

Temperature sensor
A Temperature sensor is a device that produces voltage which is proportional to a temperature value.
When a Temperature sensor is selected, the following settings are shown (see Figure 2.34).

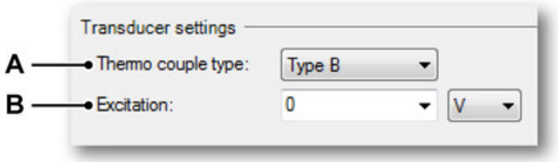


Figure 2.34: Transducer settings/Temperature sensor

A Thermo couple type

B Excitation

A Thermocouple type
The type of thermocouple to use.

B Excitation
The external input (power supply) that the sensor needs to function. You can choose between the excitation units **V** (voltage or **mA** (milliampere).

Frequency sensors
Perception supports two types of Frequency sensors:

- Normal Frequency sensors
- Inductive Frequency sensors

Frequency sensors
A Frequency sensor is a sensor that outputs a frequency.
When a Frequency sensor is selected, the following settings are shown (see Figure 2.36).

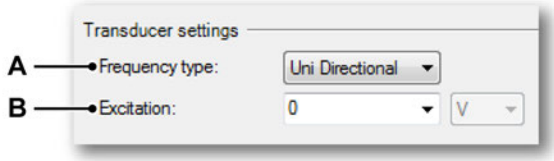


Figure 2.35: Transducer settings/Frequency sensor

A Frequency type

B Excitation

A **Frequency type**
Count high speed input signals:
- **Unidirectional**
- **Bidirectional**
- **Quadrature**

B **Excitation**
The external input (power supply) that the sensor needs to function. The excitation unit is **V** (voltage).

Inductive Frequency sensors
An inductive frequency sensor measures frequency by using induction. When an Inductive Frequency sensor is selected, the following settings are shown (see Figure 2.36).

Figure 2.36: Transducer settings/Inductive Frequency sensor

A Excitation
The external input (power supply) that the sensor needs to function. The excitation unit is **V** (voltage).

Note *Inductive Frequency sensors always use unidirectional input signals.*

Counter sensors
Perception supports two types of Counter sensors:

- Counter sensors
- Inductive Counter sensors

Counter sensors
Counter sensors are used for counting.
When a Counter sensor is selected, the following settings are shown (see Figure 2.37).

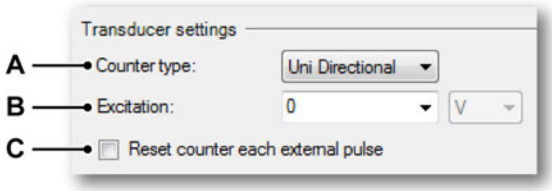


Figure 2.37: Transducer settings/Counter sensor

A Counter type

B Excitation

C Reset counter each external pulse

A Counter type
Count high speed input signals:
- **Unidirectional**
- **Bidirectional**
- **Quadrature**

B Excitation
The external input (power supply) that the sensor needs to function. The excitation unit is **V** (Volts).

C Reset counter each external pulse
When this option is checked, the count is reset on an external pulse.

Inductive Counter sensors
Inductive Counter sensors count by using induction measurement.
When an Inductive Counter sensor is selected, the following settings are shown (see Figure 2.38).

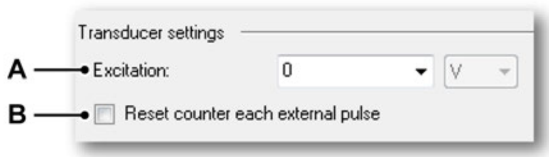


Figure 2.38: Transducer settings/Inductive Counter sensor

A Excitation
The external input (power supply) that the sensor needs to function. The excitation unit is **V** (voltage)

B Reset counter each external pulse
When this option is checked, the count is reset on an external pulse.

Note *Inductive Counter sensors always use unidirectional input signals.*

RPM sensors
RPM sensors are used to measure pulses which are converted to rotations. When a RPM Sensor is selected, the following settings are shown (see Figure 2.39).

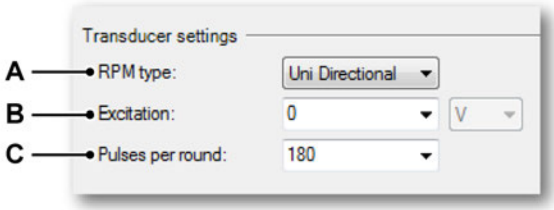


Figure 2.39: Transducer settings/RPM sensor

A RPM type

B Excitation

C Pulse per round

A RPM type
Count high speed input signals:
- **Unidirectional**
- **Bidirectional**
- **Quadrature**

B Excitation
The external input (power supply) that the sensor needs to function. The excitation unit is **V** (voltage).

C Pulses per round
How many counted pulses are treated as one rotation.

2.3.3 Conversion information

The conversion information pane, which is available for all sensor types, contains:

- **Physical unit**
- **Linearization**
- **Nominal value**

Note *Certain sensor types may not support all or any of the linearization options. Only the linearization options that are supported can be selected.*

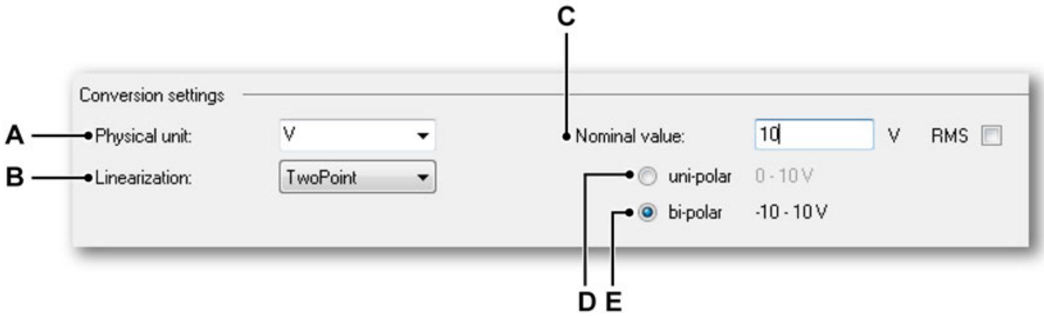


Figure 2.40: Conversion settings

A Physical unit

B Linearization

C Nominal value

D Uni-polar

E Bi-polar

A Physical unit
The physical unit provides information about what the sensor measures. The default unit may differ per sensor type. Manually entered units are added to the list.

B Linearization
Some sensors have a fixed linearization type and others have a selectable type.
There are a total of six linearization types: Zero-Span, Two Point, Tabular, Polynomial, Strain gauge (Fixed for strain gauge sensors), and Standard (Fixed for probes).

The linearization type selected provides information about how the output voltage of the sensor relates to the value that the sensor measures. For more information about linearization types, please refer to "Linearization types" on page 44.

C Nominal value
The maximum value of the physical quantity that is measured.
If the **Physical unit** is **mV**, **V**, **kV**, **mA**, **A** or **kA**, the **RMS** checkbox is shown. You can indicate that the nominal value entered is in RMS with this checkbox. This means the actual nominal value is the entered nominal value multiplied by the square root of two.

D **Uni-polar**
If the **uni-polar** setting is selected, the sensor only measures positive values.

E **Bi-polar**
If the **bi-polar** setting is selected, the sensor measures both positive and negative value of the nominal value.

2.3.4 Linearization types

There are six types of linearization that can be selected to define the relationship between the output voltage and the measured quantity:

- Zero-Span (on page 44)
- Two Point (on page 47)
- Tabular (on page 50)
- Polynomial (on page 55)
- Strain gauge (Fixed for strain gauge sensors; on page 57)
- Standard (Fixed for probes)

Note *The available linearization types can differ per sensor type.*

Zero-Span linearization

Zero-Span linearization settings are shown (see Figure 2.41) when the zero-span linearization option is selected in the conversion settings.

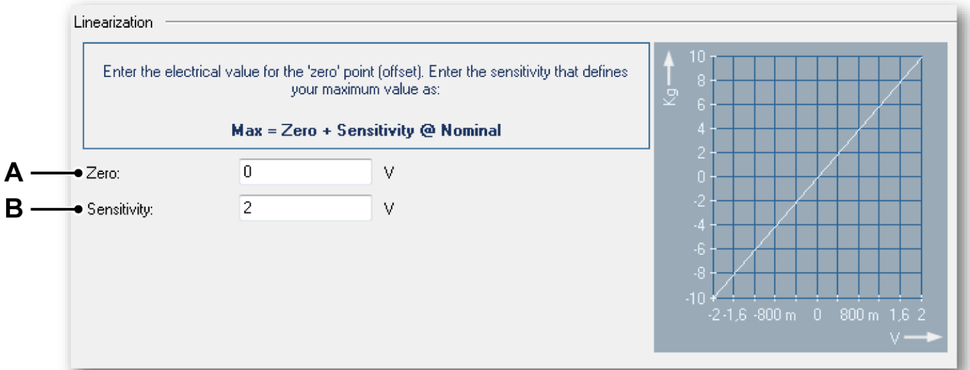


Figure 2.41: Linearization

A Zero

B Sensitivity

A **Zero**
Defines the amount of output voltage where the measured quantity should be zero.

B **Sensitivity**
Defines the output voltage growth (from the offset) where the measured quantity reaches its maximum value (nominal value).

When a setting that results in conflicting data points is selected, a warning sign appears in the diagram and the settings cannot be applied (see Figure 2.42).

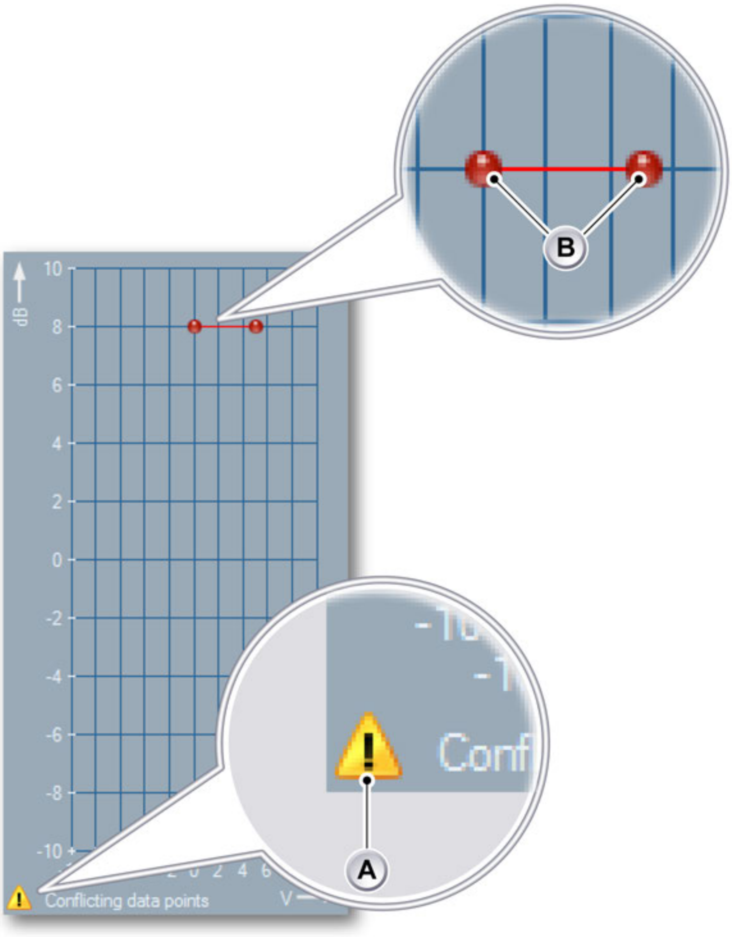


Figure 2.42: Zero-Span linearization/Conflict data points

A Warning sign

B Conflict data points

For Bridges, Strain gauges and Inductive bridges, the following **additional** settings are shown in figure Figure 2.43 below.

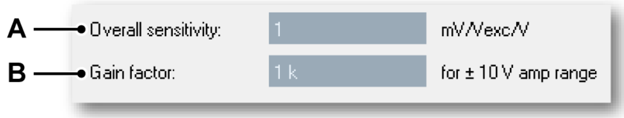


Figure 2.43: Linearization - Additional settings

A Overall sensitivity

B Gain factor

A Overall sensitivity
The overall sensitivity setting provides the ratio between the output voltage and the excitation voltage per measured quantity.

B Gain factor
The Gain factor setting defines the amount of increase in voltage expressed as the ratio of output to input.

Note *Only contains a valid value when the excitation voltage higher than 0 (zero) is entered.*

Select the **Include excitation voltage** check box (see Figure 2.44) to show:

- Physical value against the sensitivity.
  OR
- Physical value against the measured voltage.

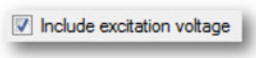


Figure 2.44: Include excitation voltage

Two Point linearization

Two point linearization settings are shown (see Figure 2.45) when the two point linearization option is selected the conversion settings. Two points, **P1** and **P2**, can be selected to define the relationship between the electrical output and the measured quantity. That relationship can be seen on the right-hand side of the screen in the diagram.

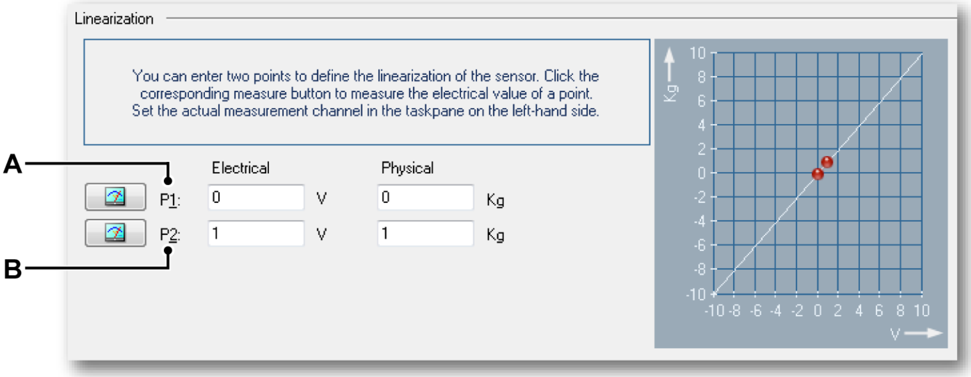


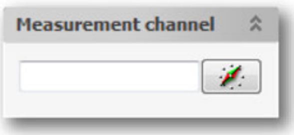
Figure 2.45: Two Point linearization

A P1 (Point 1)

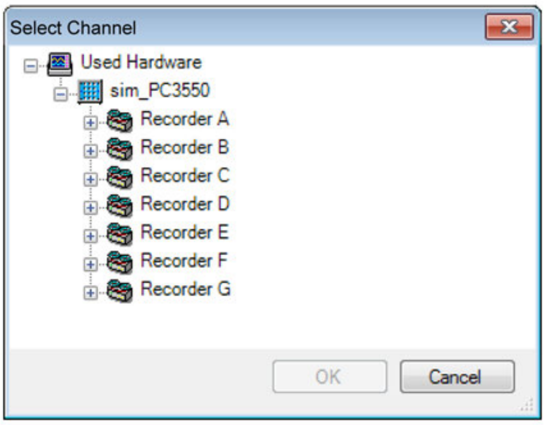
B P2 (Point 2)

The two point linearization option makes it possible to measure the electrical value on a channel. When the measure now button is clicked  the voltage on the channel is measured and shown in the corresponding column of the row selected.

If no channel is selected in the **Measurement channel**,



you will be asked to select a channel in the **Select Channel** dialog as shown in the figure below.



When a setting that results in conflicting data points is selected, a warning sign appears in the diagram and the settings cannot be applied (see Figure 2.46).

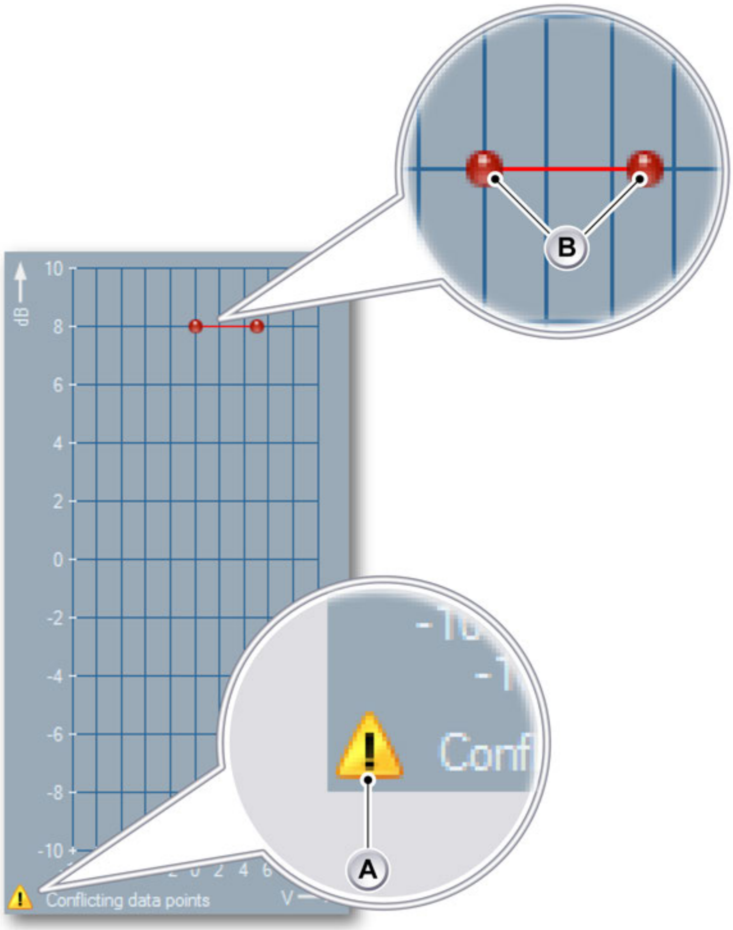


Figure 2.46: Two Point linearization/Conflict data points

A Warning sign

B Conflict data points

For Bridges, Strain gauges and Inductive bridges, the **following** additional settings are shown in the figure below.

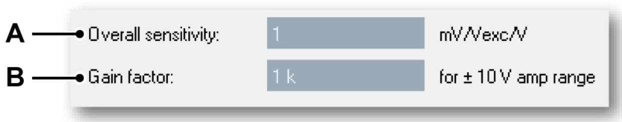


Figure 2.47: Linearization - Additional settings

A Overall sensitivity

B Gain factor

A Overall sensitivity
The overall sensitivity setting provides the ratio between the output voltage referred to the excitation voltage per measured quantity.

B Gain factor
The Gain factor setting defines the amount of increase in voltage expressed as the ratio of output to input.

Note *Only contains a valid value when the excitation voltage higher than 0 (zero) is entered.*

Select the **Include excitation voltage** check box (see Figure 2.48) to show:

- Physical value against the sensitivity.
  OR
- Physical value against the measured voltage.

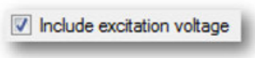


Figure 2.48: Include excitation voltage

Tabular linearization
Tabular linearization settings are shown (see Figure 2.49) if tabular linearization is selected in the conversion settings. This option ishould be selected when the relationship between the output voltage and the measured quantity is best described by multiple functions with different slopes.

The tabular linearization option makes it possible to measure the electrical value on a channel.

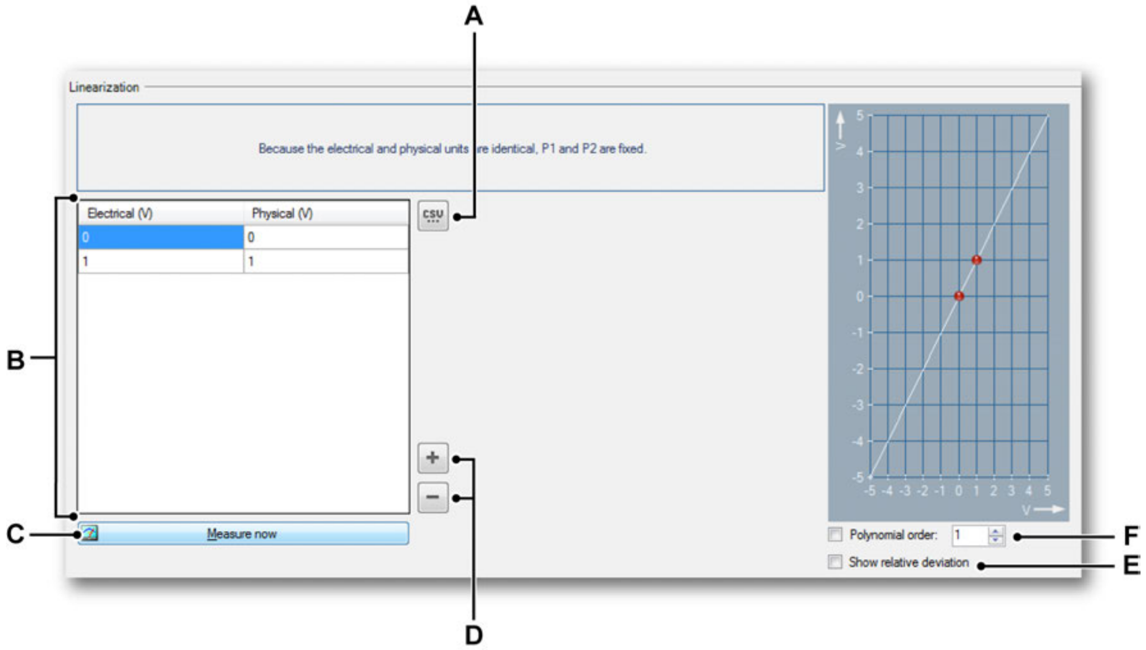


Figure 2.49: Tabular linearization

A Fill table with CSV file format

B Linearization table

C Measure now

D Increase/Decrease numbers of table rows

E Show relative deviation

F Polynomial order

A Fill table with CSV file format

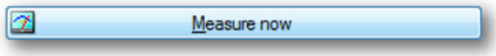
The table can be filled from a text file by clicking the button.

B Linearization table

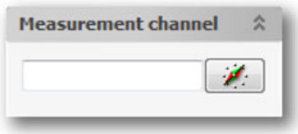
Different points can be added in the table.

C Measure now

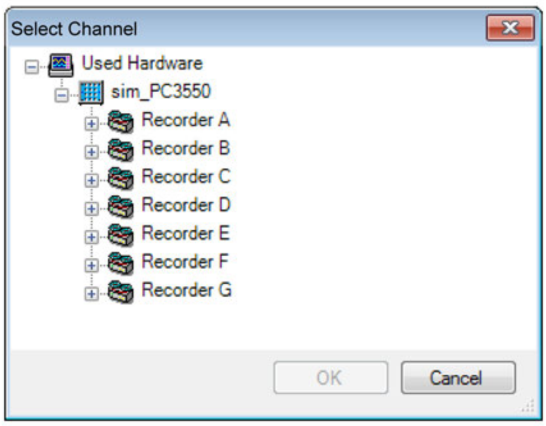
When you click the **Measure now** button, the voltage on the channel is measured and shown in the corresponding column of the selected row.



If no channel is selected in the **Measurement channel**,



you will be asked to select a channel in the **Select Channel** dialog as shown in the figure below.



D Increase/Decrease

The amount of rows available in the table can be increased by clicking the button or decreased by clicking the button.

E Show relative deviation

Figure 2.50: Show relative deviation

Shows the deviation of the tabular data from a linear relationship between the actual voltage and the measured quantity.

F Polynomial order

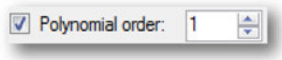


Figure 2.51: Polynomial order

When the **Polynomial order** (see Figure 2.51) option is selected, the system tries to find the best fitting polynomial function for the given points. The number of terms for the polynomial function can be chosen by the numeric text box and is restricted by the number of points available to describe the relationship between the output voltage and the measured quantity.

When the points selected result in conflicting data points (e.g. when two different output voltages relate to the same measured quantity), a warning sign appears in the diagram and the settings cannot be applied (see Figure 2.52).

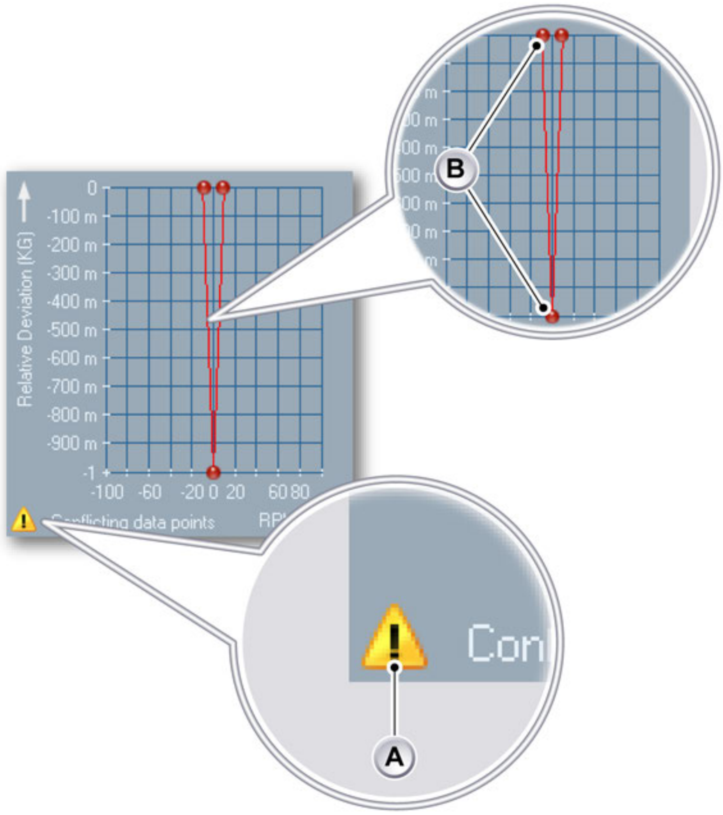


Figure 2.52: Polynomial order/Conflict data points

A Warning sign

B Conflict data points

Polynomial linearization
Polynomial linearization settings are shown (see Figure 2.53) if polynomial linearization is selected in the conversion settings. This option should be selected when the relationship between the output voltage and the measured quantity is best described by a polynomial function.

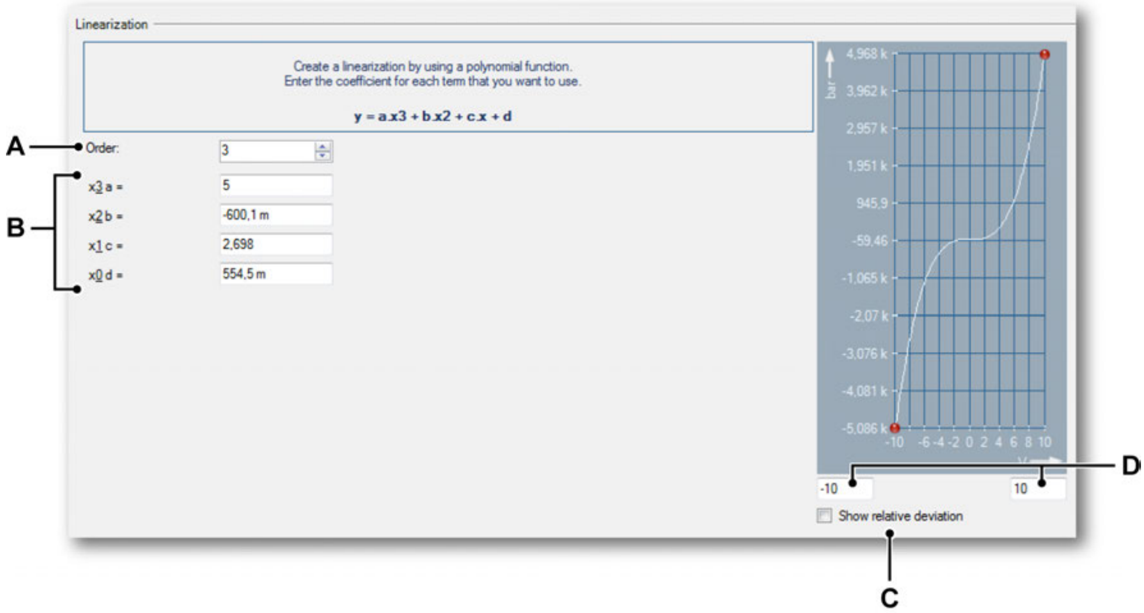


Figure 2.53: Polynomial linearization

A Order the number of terms

B Coefficients

C Show relative deviation

D Minimum/Maximum output voltage

A Order the number of terms
The number of terms for the polynomial function can selected in the **Order** box.

B Coefficients
The coefficients of the corresponding terms can be filled into the textboxes.

C Show relative deviation

Click the check box to show the deviation of the polynomial data from a linear relationship between the actual voltage and the measured quantity.

D Minimum/Maximum output voltage
Directly under the diagram, the scope of the drawing can be selected by setting the minimum and maximum value of the output voltage.

When a function or points that result in conflicting data points are selected (when two different output voltages relate to the same measured quantity), a warning sign appears in the diagram and the settings cannot be applied (see Figure 2.54).

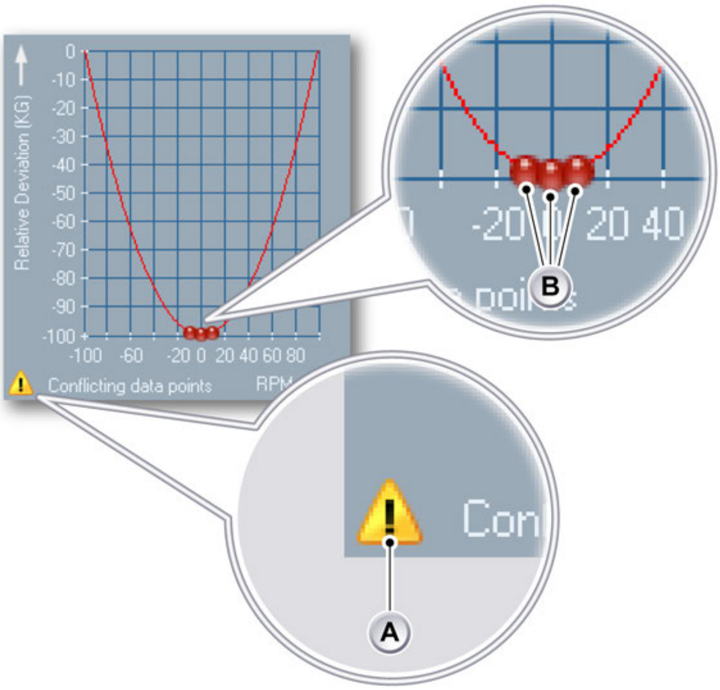


Figure 2.54: Polynomial linearization/Conflict data points

A Warning sign

B Conflict data points

Strain gauge linearization
Strain gauge linearization settings are shown (see Figure 2.55) when a strain gauge sensor is selected in the tree. For the sensor, the linearization types that can be selected are restricted to strain gauge only.

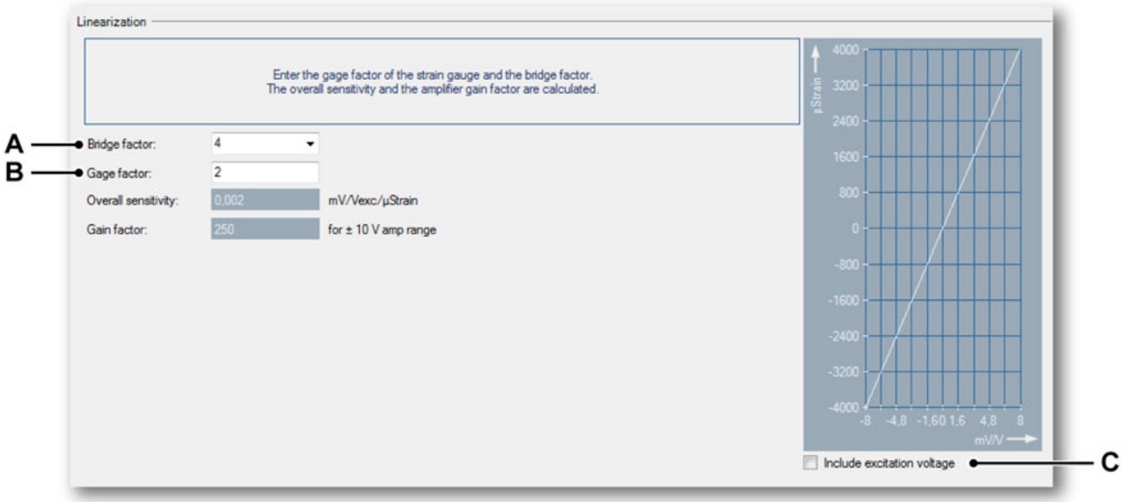


Figure 2.55: Strain gauge linearization

A Bridge factor

B Gauge factor

C Include excitation voltage

A Bridge factor
The Bridge factor setting indicates the number of active gauges for the sensor.

B Gauge factor
The Gauge factor setting describes the gauge factor, which is the ratio between the relative change in electrical resistance and the mechanical strain.

C Include excitation voltage
Select the **Include excitation voltage** check box to show (see Figure 2.56):

- Physical value against the sensitivity.

  OR

- Physical value against the measured voltage.

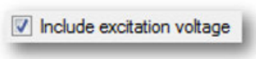


Figure 2.56: Include excitation voltage

When a function or points that result in conflicting data points are selected (when two different output voltages relate to the same measured quantity), warning sign appears in the diagram and the settings cannot be applied (see Figure 2.57).

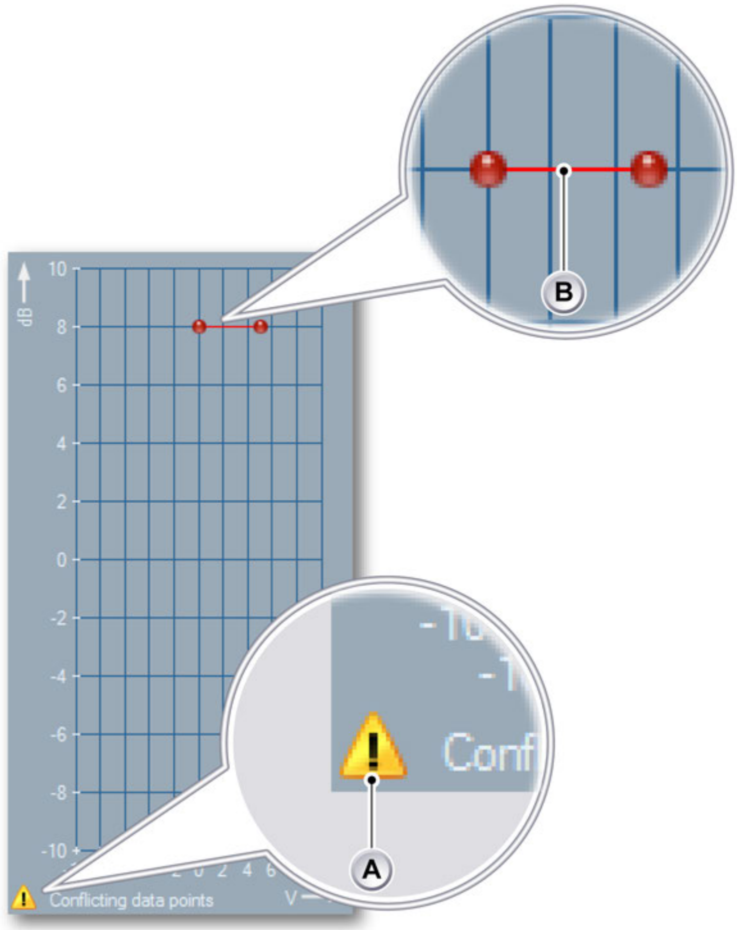


Figure 2.57: Strain gauge linearization/Conflict data points

A Warning sign

B Conflict data points

2.4 The Sensor Tree and the Settings Grid

2.4.1 Apply sensors to a channel

Sensors can be applied to channels displayed in the settings grid in Perception. It is possible to select a sensor for only one channel, but if a sensor is selected on the recorder, this sensor will then be applied to all channels of the recorder.

There are three ways to apply a sensor to a recorder or a channel.

1 Drag the sensor from the Sensor tree. If the tree is not visible, select **Sensors** in the **Window** menu (see Figure 2.58).

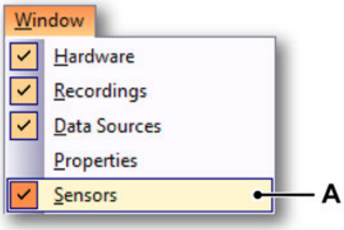


Figure 2.58: Windows menu

A Sensors option

If the wrong type of sensor is dragged to drop, a red cursor mark is displayed with the reason why the sensor is not allowed to be dropped. If the sensor is allowed to be dropped, a green mark is displayed.

2 Select a sensor from the **Sensor** column on a channel.

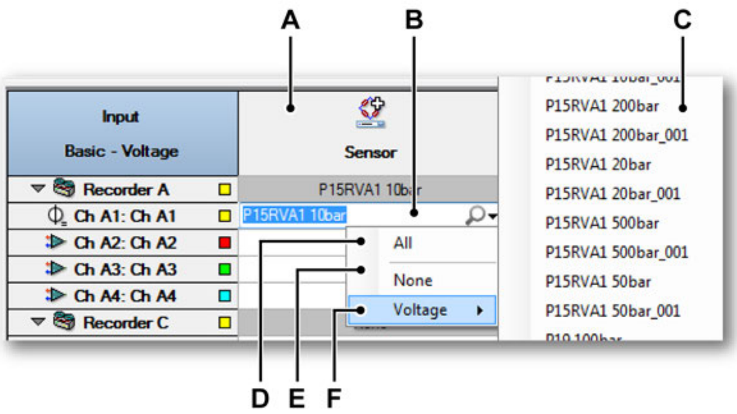


Figure 2.59: Sensor column/list

A Sensor column

B Sensor text box

C Sensor list

D All option

E None option

F Voltage option

Note *Only sensors that are allowed on the channel are available in the list.*

3 The sensor name can be typed in the **Sensor (B)** text box.

Note *If the wrong sensor name entered, the Sensor columns background column turns red.*

It is also possible to unselect the sensor used for a certain channel. For this, the **None (E)** sensor used has been added to the list of sensors. This option is displayed in the first position of the sensor list, where all sensors are sorted by sensor name.

Selecting or dragging & dropping sensors to channels is not the same in all available settings sheets. For example, if the system is equipped with a bridge board, a voltage sensor can also be applied to the bridge channels displayed in the “Analog Channel” settings sheet. These channels then automatically change into basic voltage.
However, this application is not possible in the bridge setting sheet (displayed in the input pane). Here, you can only apply sensors which have a matching amplifier.

When a sensor is applied to a channel that allows it, all settings used by that sensor are set correctly on the channel. That means that settings such as signal coupling, ranges, span and technical unit multiplier are all set to the values required by the sensor. After applying a sensor, no additional modifications are necessary and measuring can start instantly.

If a sensor is applied to a channel that does not allow the sensor to be applied, the mouse cursor explains why it is not allowed in the message below. For example, when trying to drop a thermocouple sensor on a bridge channel the message is shown as in Figure 2.60.

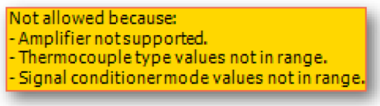


Figure 2.60: Example of an error message/Sensor is applied to a channel

2.4.2 Sensor capability restrictions

When using sensors, they may limit the capabilities available for protection. That means that if a selected sensor has a nominal value of 10 V, it is not possible to set a higher range than 10 V on the sensor to prevent damage. To be able to clip the capabilities, a new capability restriction enumeration which lists the settings that can be clipped is available.

The following settings might cause restrictions in applying a sensor to a channel:

- Range from
- Range to
- Span

2.5 TEDS Sensors

Sensors that are equipped with **T**ransducer **E**lectronic **D**ata **S**heets (TEDS) can be used. This makes it possible for the data acquisition system to automatically detect and to configure the connected sensors. This approach has some advantages over the manual setup of the sensor:

- Reduced configuration time, as no manual configuration is required.
- Possibility to use more detailed calibration information.
- No specifications on paper necessary to be able to use the sensor.
- The sensor is automatically detected; no location mismatches.
- No transcription errors, as the configuration is done automatically.

All the items mentioned above would normally apply only to sensors with TEDS stored directly in a sensor. With Virtual TEDS, you can take advantage of both the items and of sensors without integrated TEDS. Virtual TEDS sensors can be loaded from a (*.ted) file. Click the button to load a virtual TEDS file in the Add Sensor panel.

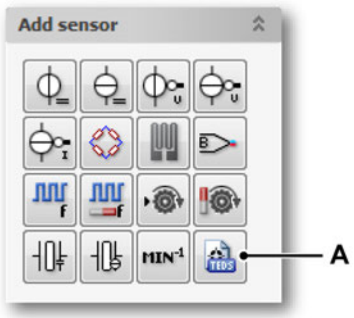


Figure 2.61: Add sensor/Load a virtual TEDS button

A Load a virtual TEDS file

These sensors are configured automatically by using a binary file which can be imported in the Sensor Database. The Sensor Database reads the file, parses the all information and automatically creates the sensor with the settings specified in the file.

The virtual TEDS files (if available) can be gathered from the sensor supplier and are provided.

Note *It is still possible to modify the sensor information after importing the Virtual TEDS, so changes can still be made (if necessary).*

After creating the sensor, you can apply the sensor to the desired channel by using selection or drag & drop.

3 Perception Sensor Importer

3.1 Introduction

By selecting **Import Sensors**... in the **Sensor Database** main menu, you can import your own sensor data into the Perception Sensor Database.

A special user interface allows you to import your own sensor data into the Perception Sensor Database. This chapter explains how to import this sensor data into the Perception Sensor Database in detail.

3.2 Scope

The Perception Import Sensor dialog enables custom sensor data to be imported into or synchronized in the Perception Sensor Database.
This dialog allows you to:

- Load custom sensor data from an Excel field or a CSV (Comma Separated Values) file.
- Link custom sensor definition fields to corresponding Perception Sensor definition fields.
- Save the new custom sensor data in the Perception Sensor Database.

3.3 Application Functionality

3.3.1 General

Select **Import Sensors...** in the Sensor Database main menu to open the Import Sensors dialog.. You can use this new dialog to import your own sensors into the Perception Sensor Database.

After opening your own sensor file, link your sensor fields to corresponding Perception fields. These links can be saved in a configuration file and can be reused later. Lastly, import the data into the Perception Sensor Database. The Import Sensors dialog can also be used to keep the customer database and the Perception Sensor Database synchronized with just a few clicks.

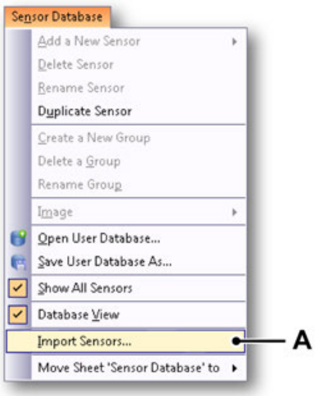


Figure 3.1: Import Sensors dialog

A **Import Sensors...** in the main menu

The following paragraphs describe the application in more detail.

3.3.2 Custom sensor database file

The data file should preferably be in an Excel or a CSV (Comma Separated Values) file format to import it. Other file formats may also be imported, but you will need a customized plugin. For more information, see **Programming customized sensor importers**.

The first line or the header line of the Excel or CSV file defines the fields used to describe the sensor data. The other lines define the individual sensor data per line.

See Figure 3.2 for an example of how an Excel file looks.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Equipt Type	Father Equipt Type	Assembly Date	PN	SN	Comacola	Maintenance	Validity	Fournisseur	Multiplie	Gamme	Unité	Comment
2	BOUCLE DE ROGOWSKI	ELEC METRO	15 November 2012 15:22:35	i3000S FLEX-24	16490023	3.932.223.0261-1	Maintened	29-1-2012	FLUKE	10	60	A	Rogowski coil
3	BOUCLE DE ROGOWSKI	ELEC METRO	15 November 2012 15:22:35	i3000S FLEX-24	16490023	3.932.223.0261-2	Maintened	29-1-2012	FLUKE	100	600	A	Rogowski coil
4	BOUCLE DE ROGOWSKI	ELEC METRO	15 November 2012 15:22:35	i3000S FLEX-24	16490023	3.932.223.0261-3	Maintened	29-1-2012	FLUKE	1000	6000	A	Rogowski coil
5	SONDE DIFFERENTIELLE DE TENSION	ELEC METRO	12 June 2012 09:28:11	SI9000	PG 01	3.932.221.0019-1	Maintened	1-7-2013	WAVETEK	20	280	V	Differential Voltage sensor
6	SONDE DIFFERENTIELLE DE TENSION	ELEC METRO	12 June 2012 09:28:11	SI9000	PG 01	3.932.221.0019-2	Maintened	1-7-2013	WAVETEK	200	2800	V	Differential Voltage sensor

Figure 3.2: Example of an Excel file

The fields of your own sensor database have to be linked to the correct sensor fields of the Perception Sensor Database. The linking procedure is simple and is described later. The biggest challenge is to match your field to the Perception sensor field. To help you with this task, you can find a description of all available Perception Sensor fields in this manual. There are also some examples that show how to import various sensor types.

3.3.3 Sensor Importer Sheet

This chapter explains the functions of the new sheet.

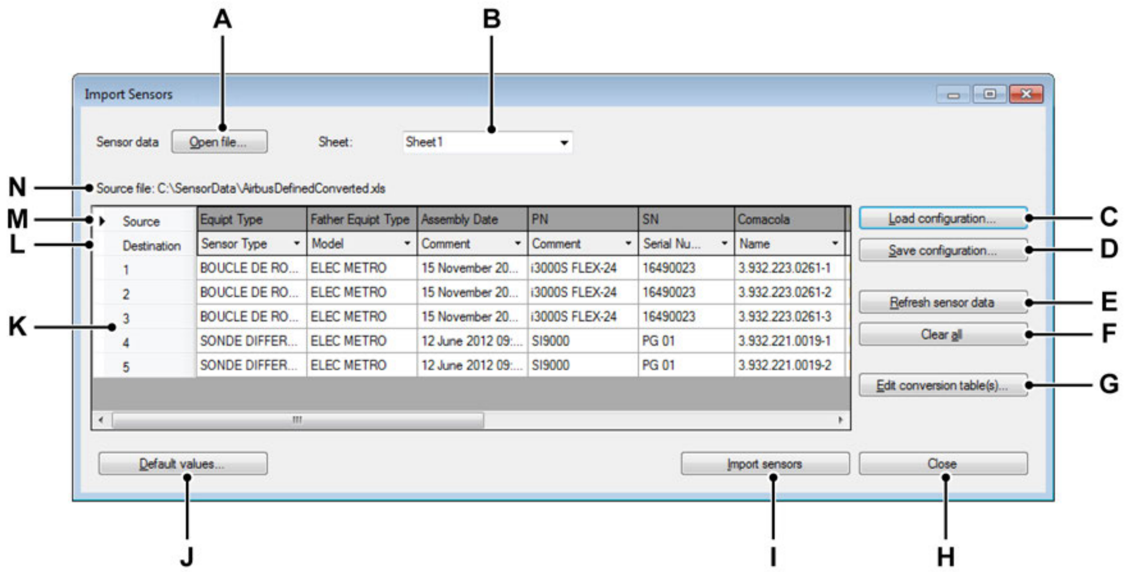


Figure 3.3: Sensor importer sheet

The following items can be found:

A Open file
You can open your Excel or CSV file by clicking on this button.

B Sheet or data sets selection
When you open an Excel file, you can select the correct sheet. However, when you open a CSV file, you do not need to select a sheet because the CSV file has no sheets or data sets.

C Load configuration
The Load configuration button is used to load your **Import Sensor** configuration settings.

D Save configuration
The Save configuration button is used to save your **Import Sensor** configuration settings in an XML file.

E Refresh sensor data
The Refresh sensor data button is used to reread sensor source data from the source data file.

F Clear all
The Clear all button is used to clear all data in the table and to remove all defined **Source – Destination** pairs. The **Import Sensors** dialog is then ready to restart.

G Edit conversion table(s)

For some fields, a conversion table is needed to map the source field value to the destination field value. The Edit conversion table(s) button is used to access one of the conversion table dialogs available.

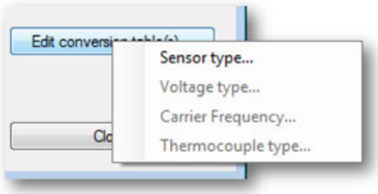


Figure 3.4: Edit conversion table

When you click on this button, a menu with all the conversion table dialogs appears. When the conversion table is not used, the selection is disabled. A table is used when one of the source fields is linked to a destination field with a conversion table. **Sensor Type**, **Voltage Type** and **Carrier Frequency** are examples of such fields.

The **Conversion Table Sensor Type** dialog is one of these conversion table dialogs. You can define the relation between your sensor types and the sensor types supported by Perception in this dialog. For more information, see "Conversion Table for Sensor Type" on page 69.

H Close

The Close button is used to close the Import Sensors dialog.

I Import sensors

If everything is setup correctly, you can click on this button to start saving your sensor data in the Perception sensor database. A dialog shows how much of the data has been saved while the data is being imported.

J Default Values
Click on this button to see the **Default Values** dialog.
You can set the default **Excitation**, **Units**, **Range polarity**, **Bridge Factor**, **Voltage/Current type** and **Thermocouple type** values in this dialog.

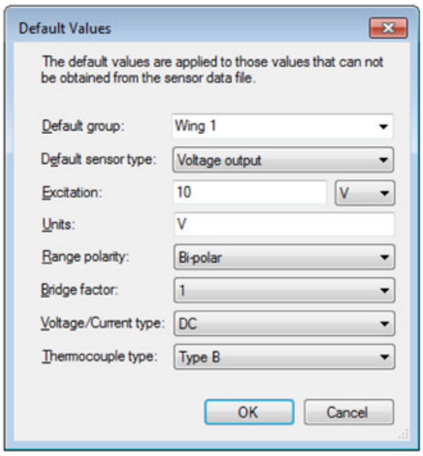


Figure 3.5: Default Values dialog

K Custom Sensor data table
The table shows the sensor data which will be imported into Perception.

L Destination fields
This second header line of the table shows the corresponding Perception sensor field names.
These fields are initially empty. You need to select the correct fields before you can save the sensor data in the Perception Sensor Database.

M Source fields
This header line of the table shows all your sensor field names.

N Source file
The source file is the name of the file which contains your custom sensor data. The programm currently supports Excel and CSV file formats. Depending on market demand, the program may support more file fomats in the future.

3.3.4 Conversion Table for Sensor Type

Select a Perception **sensor type** to add your custom senor to the Perception Sensor Database. Ensure that each of your sensors is mapped to a sensor type which Perception supports. The Sensor Database sheet shows the different sensor types supported by Perception (see position A in Figure 3.6).

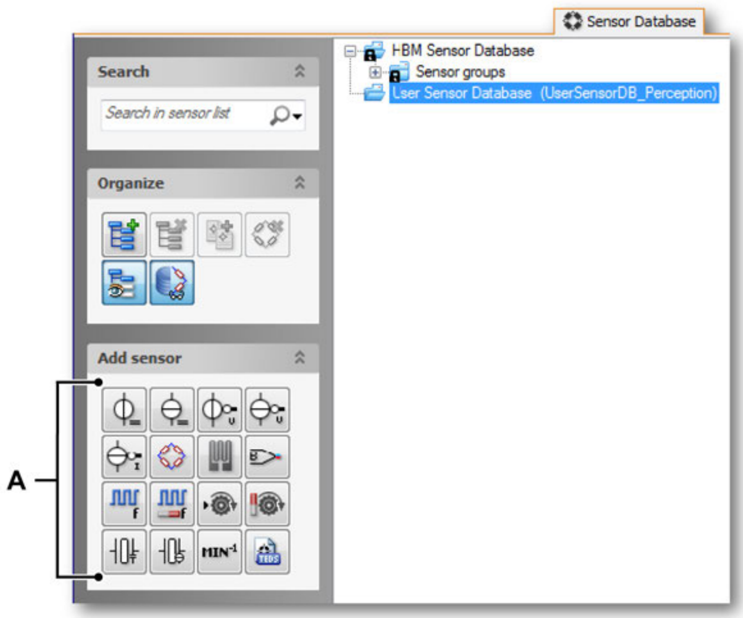


Figure 3.6: Sensor Database menu

A Sensor types

Since you will have a custom sensor type in most cases, you need to name a conversion table to map your custom sensor type to a sensor type which Perception supports. You can perform this step with the **Conversion Table Sensor Type** dialog (see Figure 3.7).

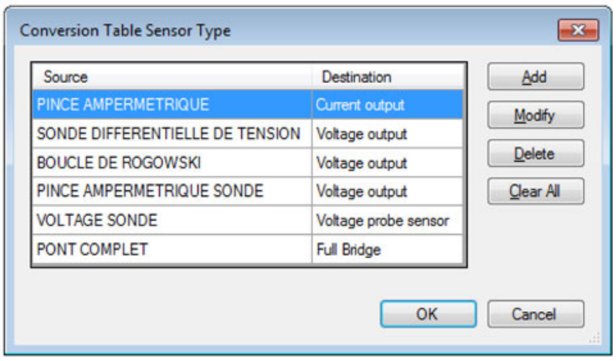


Figure 3.7: Conversion Table Sensor Type dialog

In the table shown in Figure 3.7, the “Voltage output” sensor type is created when the source sensor type is “BOUCLE DE ROGOWSKI”.
You define which column is used as the Perception **Sensor Type** column in the custom sensor table. Map all the possible values of this column to a specific Perception Sensor Type. To do this, you can add new links in the **Conversion Table Sensor Type** dialog. For more detailed information about Perception Sensor types, see "Detailed Sensor Information" on page 27.

Adding a new sensor type conversion pair:

1 Open the **Conversion Table Sensor Type** dialog.
You can open the **Conversion Table Sensor Type** by using the **Edit conversion table(s)** button (see position **B** in Figure 3.8 and position **G** in Figure 3.3 on page 67) or by using the context menu of the destination cell defined as **Sensor Type** (see position **A** in Figure 3.8).

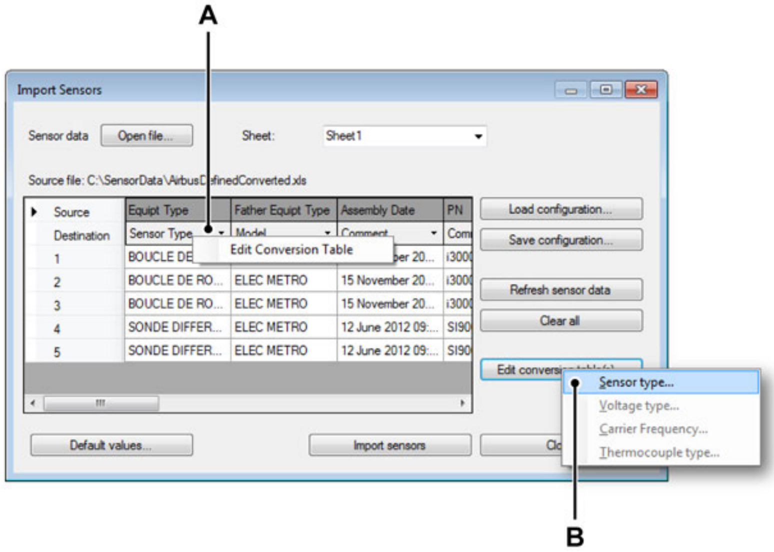


Figure 3.8: Sensor Type context menu

A Destination cell

B **Edit conversion table(s)** button

2 Click the **Add** button in the **Conversion Table Sensor Type** dialog (see Figure 3.7).

3 The following dialog appears (see Figure 3.9):

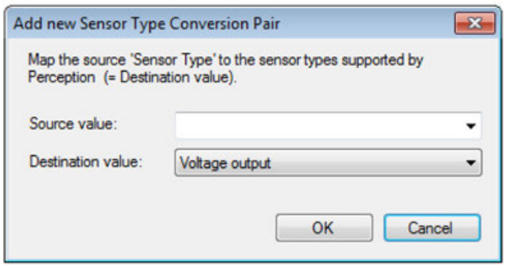


Figure 3.9: Add new Sensor Type Conversion Pair dialog

4 Enter a source value. This value is most likely a name from your customer database used in the column marked with the **Sensor Type** source field. The **Source value** combo box list shows all the names it found in the customer column (Figure 3.10).

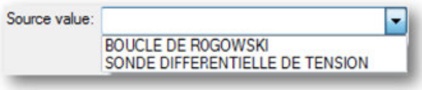


Figure 3.10: Search using the Source value

5 Select a sensor type destination value supported by Perception (see Figure 3.11).

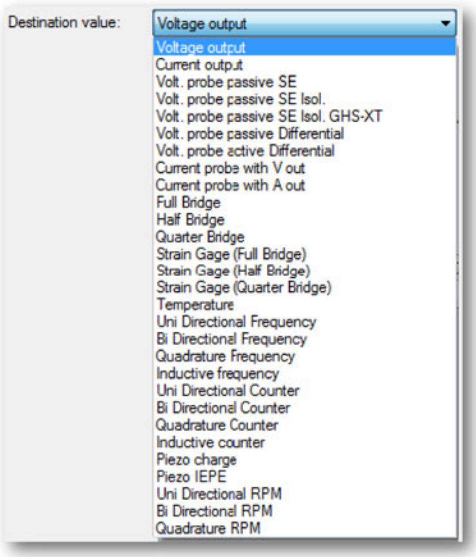


Figure 3.11: Destination value

6 See Figure 3.12 for an example of how the dialog looks after you select the destination value.

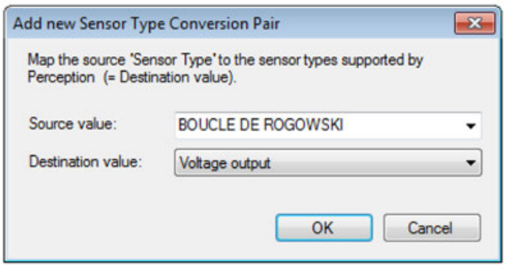


Figure 3.12: Add new Sensor Type Conversion Pair example

7 If the conversion pair is supported by Perception, press **OK** to add this pair to the conversion list.

3.3.5 The Conversion Table Voltage Type section

The voltage type is the type of the directional flow which exits the sensor. You can choose between **DC** and **AC**. A conversion table is used to define the AC and DC values.
The destination column shows a readable description of the voltage types used by the Perception Sensor Database.

Ensure that all your possible source voltage type values are in the conversion table. See Figure 3.13 for an example of a setup.

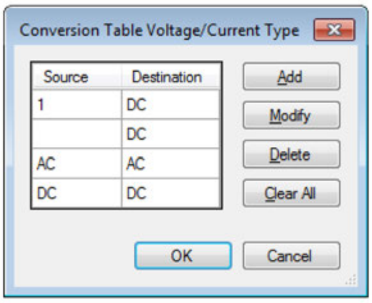


Figure 3.13: Conversion Table Voltage/Current Type example

3.3.6 The Conversion Table Carrier Frequency

The Carrier Frequency is sometimes refered to as Excitation Frequency.
This field is applicable only for a Bridge sensor. It names the frequency which is required for the sensor to operate.

The destination column shows a readable description of the carrier frequencies used by the Perception Sensor Database.

See Figure 3.14 for an example of a setup.
Strictly speaking, the definitions between 75 kHz and 9600 kHz in the table below can be omitted because the source value is the same as the real Perception destination value, but it is advisable to define the complete table for readability.

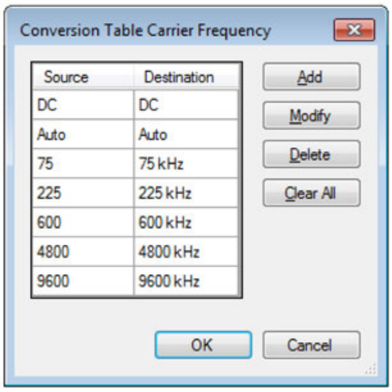


Figure 3.14: Conversion Table Carrier Frequency example

3.3.7 Input Formats

The entry fields can have various input formats. Some notes about the various input formats can be found below.

String

A string value is read as is. For some fields, you can use a conversion table to convert the string to a format which matches one of the Perception Sensor fields.

Integer

This field allows you to work with *Engineering* format, e.g. 1k means 1000

Double

This field allows you to work with *Engineering* format, e.g. 100m means 0.1

Boolean

The Boolean field can have various entries which are translated to the logical **True** value.
The following strings are converted to the logical true value:

- Yes
- Checked
- OK
- True
- 1
- X
- +
- *

These strings always work independently from the language used. However, when working with a language other than English, the translations also work. All other values are translated to the logical **False** value.

Date/Time
Use your local date time format for this field.

3.3.8 Destination Fields

This field is part of the setup is to match your customer (**Source**) sensor fields to the Perception (**Destination**) sensor fields.
You can see all the available destination fields by clicking on the arrow of the selection boxes on the **Destination** row in the table (see Figure 3.15).

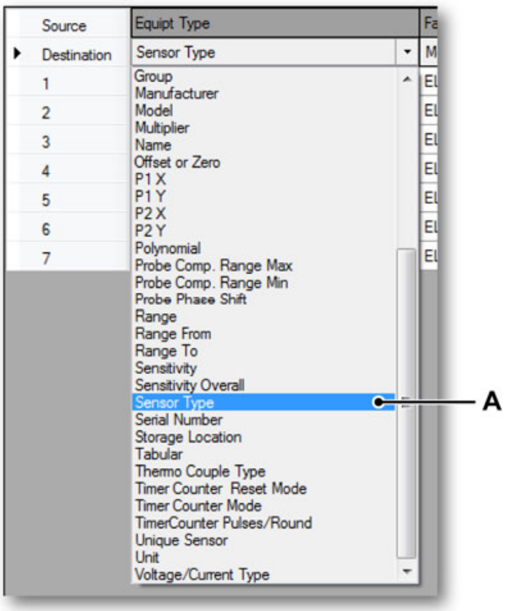


Figure 3.15: Destination fields

A Destination field example

When you leave the destination field empty, the column is skipped during the import. Therefore, the data in this column will not be imported into the Perception Sensor Database.

This chapter describes the destination fields available.

Barcode
This field is used to save a barcode.
The current Perception application only saves this information.
No other functionality is related to this barcode field. Further functions may be added to connect a sensor to a channel in the future.

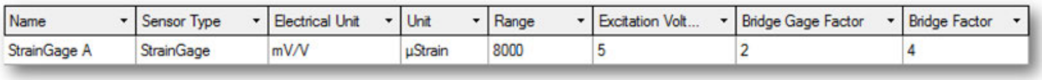
Bridge Compl. Type
You can choose between three types of bridges in this field:

- Full Bridge
- Half Bridge
- Quarter Bridge

The bridge completion type can also be set by the sensor type field (see "Sensor Type" on page 85).

Bridge Factor

Relevant for strain gauge circuits. The Bridge factor setting indicates the number of active gauges for the sensor (see Figure 3.16 and Figure 3.17).



Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Volt...	Bridge Gage Factor	Bridge Factor
StrainGage A	StrainGage	mV/V	µStrain	8000	5	2	4

Figure 3.16: Bridge Factor

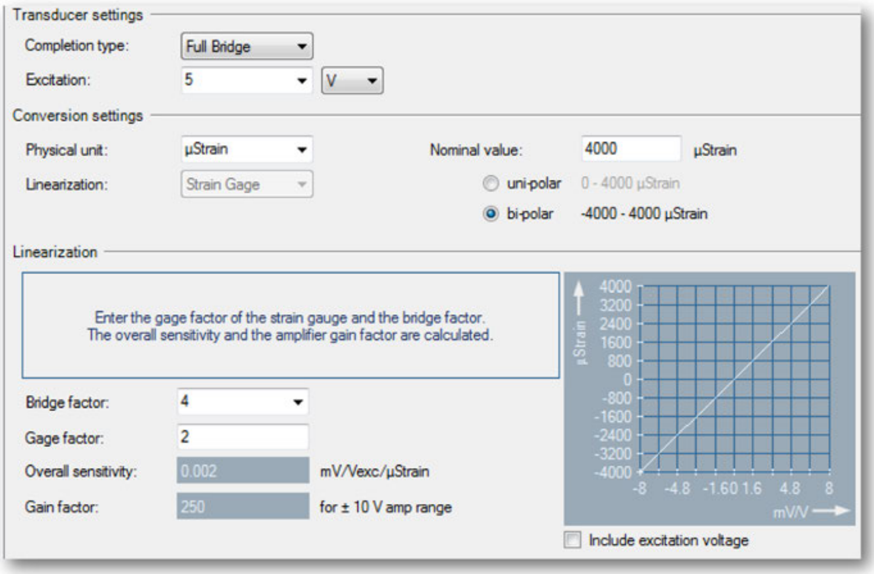


Figure 3.17: Transducer settings

For more information on how to import a strain gauge, see "Importing Strain Gauge Sensors" on page 88.

Bridge Gauge Factor

Relevant only for strain gauge circuits. The Bridge factor defines the strain sensitivity of the strain, which is the ratio of the relative change in resistance to the stretch or the ratio between the relative change in electrical resistance and the mechanical strain. For more information, see "Bridge Factor" on page 77.

For more information on how to import a strain gauge, see chapter "Importing Strain Gauge Sensors" on page 88.

Calibration Date

This field is used for the calibration date.

Calibration Exp. Date
Date when the calibration validity of the sensor expires.

Calibrator Name
Name of the person or organization responsible for the calibration.

Carrier Frequency
The Carrier Frequency is sometimes refered to as Excitation Frequency. This field is applicable only for a Bridge sensor. It names the frequency which is required for the sensor to operate.
For more information, see chapter "The Conversion Table Carrier Frequency" on page 73.

Comment
This field is used for comments about the sensor.

Description
This field is used to describe the sensor.

Divider Ratio

For a **Voltage probe**, the Divider Ratio is defined as:

The ratio between the input and the output voltage of the probe.

For a **Current Probe with A_{out}**, the Divider Ratio is defined as:

The ratio between the input currents and the output currents of the probe.

The relation between the **Divider ratio** (or **Multiplier**) and the Sensitivity is:

Divider Ratio = Range / Sensitivity

For more information, see "Sensitivity" on page 84.

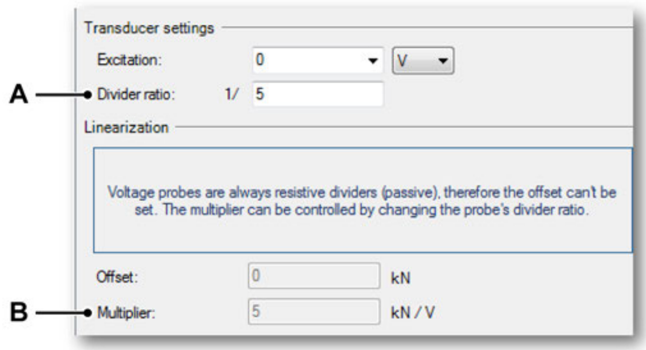


Figure 3.18: Divider Ratio

A Divider Ratio

B Multiplier

Electrical Unit
The electrical unit which is derived from the sensor type.
Examples: V, mA, mV/V, °C

Excitation Frequency
Carrier frequency (e.g. at the strain gauge bridge sensor).

Excitation Current
The external current input (power supply) needed for the sensor to function.
Excitation current is shown in A.

Excitation Voltage
The external voltage input (power supply) needed for the sensor to function.
Excitation voltage is shown in V.

Group
Group to which the sensor will belong.

Manufacturer
Name of the sensor manufacturer. This field is not visible in the Perception Sensor Database sheet.

Model
This field is used for the model of the sensor.

Multiplier
This is the same as the "Divider Ratio" on page 78.

Name
This field is used for the sensor name.

Offset or Zero
Defines the amount of output voltage where the measured quantity should be zero.
When working with a **Zero-Span** linearization type, this field and the **Sensitivity** field are used to define the linearization.

If you have the following input field (see Figure 3.19):

Electrical Unit	Unit	Offset or Zero	Sensitivity	Range	Range Min
V	N	5	20	200	-100

Figure 3.19: Input field (N)

The Perception Sensor Database sheet will have the following sensor properties (see Figure 3.20):

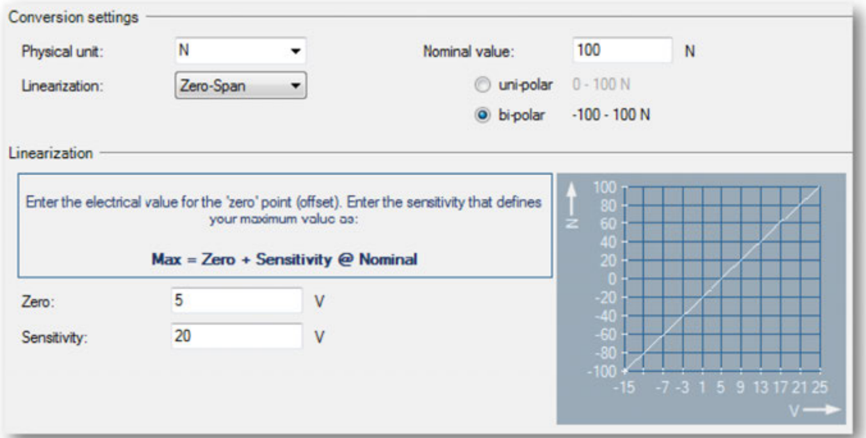


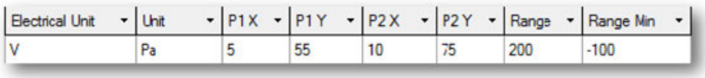
Figure 3.20: Conversion settings (N)

P1 X, P1 Y, P2 X and P2 Y
These are scaling points in accordance with the scale type.
These fields are used for two point linearization.

When working with a **two point linearization**, these fields are defined as:

- P1 X = Electrical value of first calibration point
- P1 Y = Physical value of first calibration point
- P2 X = Electrical value of second calibration point
- P2 Y = Physical value of second calibration point

If you have the following input field (see Figure 3.21):



Electrical Unit	Unit	P1 X	P1 Y	P2 X	P2 Y	Range	Range Min
V	Pa	5	55	10	75	200	-100

Figure 3.21: Input field (Pa)

The Perception Sensor Database sheet will have the following sensor properties (see Figure 3.22):

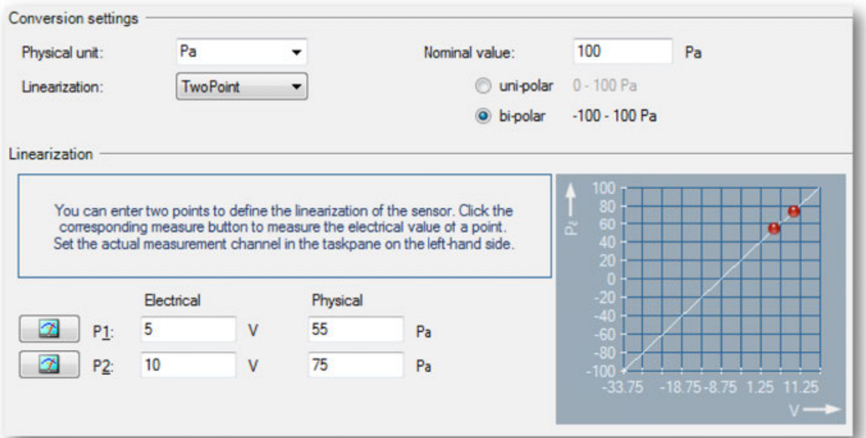


Figure 3.22: Conversion settings (Pa)

Polynomial

Use this field when you perform the linearization via a polynomial.

A polynomial is defined as:

$$Y = aX^3 + bX^2 + cX + \text{offset}$$

The input field should then look like:

"Order~offset~c~b~a"

A numerical example:

$$Y = \mathbf{3.3}\,X^3 + \mathbf{2.2}\,X^2 + \mathbf{1.1}\,X + \mathbf{1}$$

The polynomial input field then should look like:

"4~1~1.1~2.2~3.3"

See Figure 3.23) for an example of how the field looks in Perception:

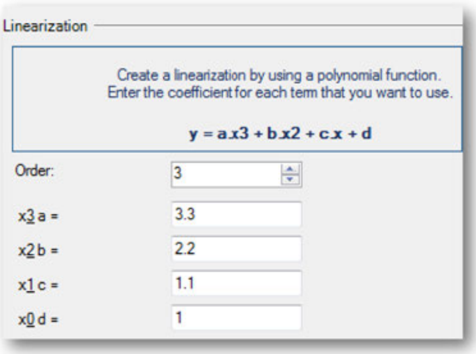


Figure 3.23: Polynomial input

Probe Comp. Range Max

The maximum compensation range in pF for Voltage probes with V_{out}.

Probe Comp. Range Min

The minimum compensation range in pF for Voltage probes with V_{out}.

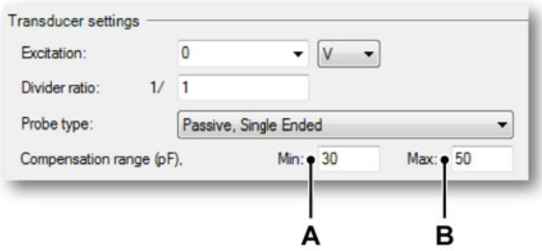


Figure 3.24: Compensation range

A Compensation range Min

B Compensation range Max

The probe type is compatible with amplifiers that have a capacity within this range.

Probe Phase Shift
Measurements made with a Current Probe may introduce a phase shift to the measured signal. The time shift entered here is used to compensate for this phase shift.

Note *Applicable only for Current Probes with V_{out}*

Range
Physical range of the measured value. Always use the maximum value of the measured physical quantity.

Note *If you work with RMS values in your own database, you need to multiply this value with the square root of two before you can import the value into the Perception Sensor Database.*

The range can be defined in several ways. You can define the range using the **Range From**, **Range To** and the **Range polarity**.
In the table below, you can see the relation between the various range values and the values as shown by the Perception Sensor Database sheet.

Range from	Range to	Range	Default range polarity	Nominal value	Polarity	From	To
		100	bi-polar	50	bi-polar	-50	50
		100	uni-polar	100	uni-polar	0	100

Range from	Range to	Range	Default range polarity	Nominal value	Polarity	From	To
-50	50			50	bi-polar	-50	50
-50		100		50	bi-polar	-50	50
	50		bi-polar	50	bi-polar	-50	50
	50		uni-polar	50	uni-polar	0	50
-50	0			50	uni-polar	0	50
-150	-50			100	uni-polar	0	100
50	150			100	uni-polar	0	100
50	-50			50	bi-polar	-50	50

Range From
Physical range from of the measured value.
For more information, see "Range" on page 83.

Range To
Physical range of the measured value.
For more information, see "Range" on page 83.

Sensitivity
The sensitivity of the sensor depends on the sensor type.

Probes, Sensitivity, Divider Ratio
For probes, this field is used for the ratio between the input and the output of the probe.

For a **Voltage Probe** or **Current Probe with A_{out}**, the *sensitivity* is used to enter the “**Divider Ratio**”.

For a **Voltage probe**, the Divider Ratio is defined as:

The ratio between the input voltage and the output voltage of the probe.

For a **Current Probe with A_{out}**, the Divider Ratio is defined as:

The ratio between the input currents and the output currents of the probe.

The relation between the Divider Ratio (or Multiplier) and the Sensitivity is:

Divider Ratio = Range / Sensitivity

For example, if the Range is 200 V and the Divider ratio is 50, the Sensitivity is 4 V.

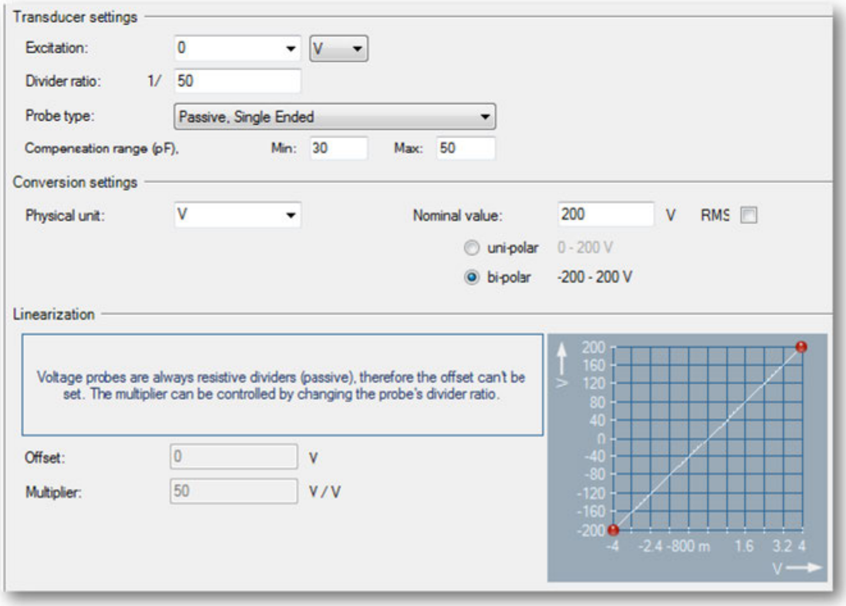


Figure 3.25: Transducer settings (zero)

When using a Zero-Span linearization, sensitivity is defined as the output voltage growth (from the offset) where the measured quantity reaches its maximum value (nominal value).
For more information, see "Offset or Zero" on page 80.

Sensitivity can also be used to define a strain gauge sensor (see "Importing Strain Gauge Sensors" on page 88).

Overall Sensitivity
The overall sensitivity setting provides the ratio between the output voltage and the excitation voltage per measured quantity.
This field can also be used to import strain gauges.
For more information, see "Importing Strain Gauge Sensors" on page 88.

Sensor Type
This field is for the sensor type. For more information, see "Detailed Sensor Information" on page 27 and "Conversion Table for Sensor Type" on page 69.

Serial Number
This field is for the serial number of the sensor.

Storage Location
This field is used for the sensor storage location.

Tabular
Use this field to perform the linearization via a table.
The field contains all the table values separated by the symbol **~**.
The first number defines the number of values used in the table.

See Figure 3.26 for an example of how a linearization table looks.

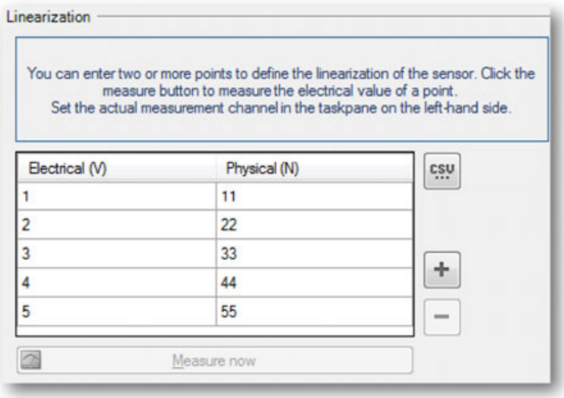


Figure 3.26: Example - Linearization table

The Tabular input field in this case is:

“10~1~11~2~22~3~33~4~44~5~55”

Thermocouple Type
The type of thermocouple that needs to be used.
For more information, see "Importing Thermocouple Sensors" on page 114.

Timer Counter Reset Mode
Reset counter for each external pulse (see Figure 3.27).

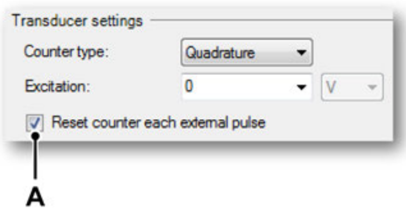


Figure 3.27: Reset Counter

A Reset counter each external pulse

Timer Counter Pulses/Round
Pulses for one rotation (property of a counter-sensor).

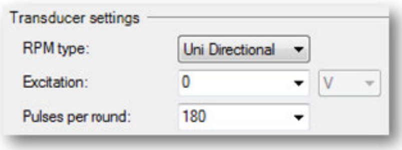


Figure 3.28: Counter Pulses

Unique Sensor
When a sensor is unique, it can be applied to only one channel at a time.

Note *If this field is not available in the import data then the Unique Sensor flag of the sensor will be set to true.*

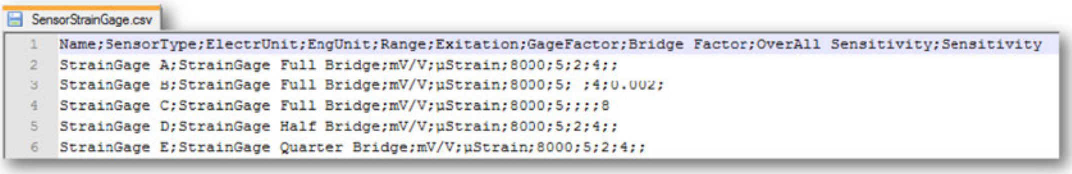
Unit
Engineering unit of the measured value provided by the sensor.

Voltage/Current type or Signal Coupling
The voltage type is the type of the directional flow which exits the sensor. You can choose between **DC** and **AC**. A conversion table is used to define the AC and DC values.
For more information, see "The Conversion Table Voltage Type section" on page 73.

3.4 Importing Strain Gauge Sensors

This chapter explains to import strain gauge sensors.

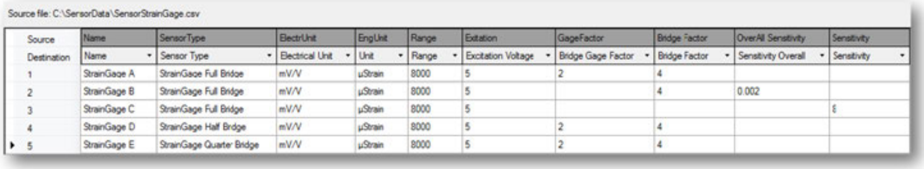
The following **CSV** file with five strain gauge sensors is used as an example in this chapter (see Figure 3.29):


SensorStrainGage.csv

```
Name;SensorType;ElectrUnit;EngUnit;Range;Exitation;GageFactor;Bridge Factor;OverAll Sensitivity;Sensitivity
StrainGage A;StrainGage Full Bridge;mV/V;µStrain;8000;5;2;4;;
StrainGage B;StrainGage Full Bridge;mV/V;µStrain;8000;5; ;4;0.002;
StrainGage C;StrainGage Full Bridge;mV/V;µStrain;8000;5;;;;8
StrainGage D;StrainGage Half Bridge;mV/V;µStrain;8000;5;2;4;;
StrainGage E;StrainGage Quarter Bridge;mV/V;µStrain;8000;5;2;4;;
```

Figure 3.29: Example - CSV file with strain gauge sensors

If you open this file in the **Perception Sensor Importer** sheet and select the correct **Destination** fields, you will see the following table (see Figure 3.30):


Source file: C:\SensorData\SensorStrainGage.csv

Source	Name	SensorType	ElectrUnit	EngUnit	Range	Exitation	GageFactor	Bridge Factor	OverAll Sensitivity	Sensitivity
Destination	Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Voltage	Bridge Gage Factor	Bridge Factor	Sensitivity Overall	Sensitivity
1	StrainGage A	StrainGage Full Bridge	mV/V	µStrain	8000	5	2	4		
2	StrainGage B	StrainGage Full Bridge	mV/V	µStrain	8000	5		4	0.002	
3	StrainGage C	StrainGage Full Bridge	mV/V	µStrain	8000	5				8
4	StrainGage D	StrainGage Half Bridge	mV/V	µStrain	8000	5	2	4		
5	StrainGage E	StrainGage Quarter Bridge	mV/V	µStrain	8000	5	2	4		

Figure 3.30: Example - CSV file with strain gauge sensors opened

First, define the sensor type to import the strain gauges. The following figure shows the conversion table used to define the sensor type (see Figure 3.31).

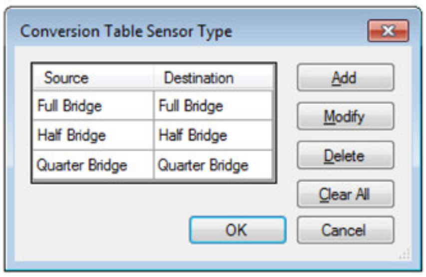


Figure 3.31: Example - Conversion Table Sensor Type

If you do not have a sensor type field in your import file and all the sensors are the same type, set the default sensor type to that type. In Figure 3.32 (position **A**), the default sensor type is set to **Strain Gauge (Full Bridge)**.

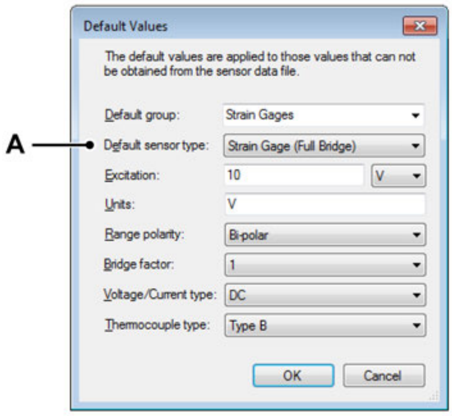


Figure 3.32: Example of setting the default sensor type

A Default sensor type

The same concept applies to the Group field. If not defined, the default group is used. In the example above (see Figure 3.32), the default group name is **Strain Gauges**.

The default settings are used to save the Perception Sensor Database when one of those fields is not defined in the import data.

In the example used, you can see several different ways to import the same strain gauge sensor. Sensor A, B and C are the same full bridge strain gauge sensors. After importing the various sensors, the following values can be found in the Perception Sensor Database sheet (see Figure 3.33):

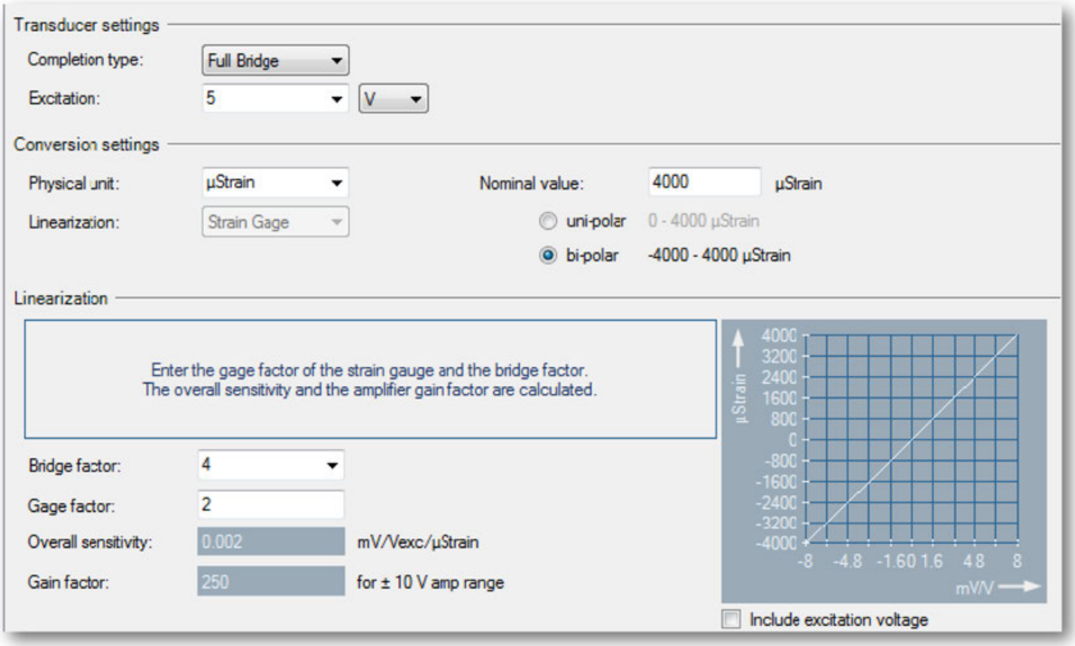


Figure 3.33: Values in the Perception Sensor Database sheet

Sensor A

The parameters of Sensor A are defined in the following fields (see Figure 3.34):

Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Voltage	Bridge Gage Factor	Bridge Factor
StrainGage A	StrainGage Full Bridge	mV/V	µStrain	8000	5	2	4

Figure 3.34: Definition of Sensor A

These fields are almost the same fields as the fields that are used by the Perception Sensor Database sheet, except for the **Nominal value** field. The importer for this field works with the range value. Since the range polarity is defined by default as bi-polar, the range value is twice that of the nominal value.

The **Bridge factor** setting indicates the number of active gauges for the sensor. It is a nondimensional ratio.

The **Gauge factor** setting describes the gauge factor, which is the ratio between the relative change in electrical resistance and the mechanical strain. The **Gauge factor** measures the sensitivity of the material or its resistance change of the applied strain per unit.

Sensor B
In this case, the **Sensitivity Overall** (mV/V_{exc}/µStrain) is used instead of the **Gauge factor** (mV/V_{exc}/Units) (see Figure 3.35).

Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Voltage	Bridge Factor	Sensitivity Overall
StrainGage B	StrainGage Full Bridge	mV/V	µStrain	8000	5	4	0.002

Figure 3.35: Definition of Sensor B

Internally, the following formula is used to get the Bridge factor from the Sensitivity Overall:

Bridge Gauge Factor = 4000 x Sensitivity OverAll / Bridge Factor

Sensor C
This case works with **Sensitivity** (mV/V_{exc}) and a default **Bridge Factor** of four is used (see Figure 3.36).

Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Voltage	Sensitivity
StrainGage C	StrainGage Full Bridge	mV/V	µStrain	8000	5	8

Figure 3.36: Definition of Sensor C

Internally, the following formula is used to get the Bridge factor from the Sensitivity:

When the range setting is **uni-polar**:

Bridge Gauge Factor = 4000 x Sensitivity / (Bridge Factor x Range)

When the range setting is **bi-polar**:

Bridge Gauge Factor = 4000 x Sensitivity / (Bridge Factor x 0.5 x Range)

Sensor D
Sensor D is a Half Bridge strain gauge (see Figure 3.37).

Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Voltage	Bridge Gage Factor	Bridge Factor
StrainGage D	StrainGage Half Bridge	mV/V	µStrain	8000	5	2	4

Figure 3.37: Definition of Sensor D

Sensor E

Sensor E is a Quarter Bridge strain gauge (see Figure 3.38).

Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Voltage	Bridge Gage Factor	Bridge Factor
StrainGage E	StrainGage Quarter Bridge	mV/V	µStrain	8000	5	2	4

Figure 3.38: Definition of Sensor E

3.5 Importing Bridge Sensors

This chapter explains how to import Bridge sensors.

The following **CSV** file with five Bridge sensors is used as an example in this chapter (see Figure 3.39).

SensorDataSetBridge.csv

```
Name;SensorType;Range;Electrical Units;Units;P1X;P1Y;P2X;P2Y;Zero;OverAll Sensitivity;Sensitivity;Exitation;Carrier Frequency
Bridge A;Full Bridge;200;mV/V;kN; ; ; ; ;;0.02;;5;-1
Bridge B;Full Bridge;200;mV/V;kN; ; ; ; ;; ;2;5;-1
Bridge C;Full Bridge;200;mV/V;kN;0;0;2;100;; ;;5;-1
Bridge D;Half Bridge;200;mV/V;kN; ; ; ; ;;0.02; ;5;-1
Bridge E;Quarter Bridge;200;mV/V;kN; ; ; ; ;;0.02; ;5;600
```

Figure 3.39: Example - CSV file with Bridge sensors

If you open this file in the **Perception Sensor Importer** sheet and select the correct **Destination** fields, you will see the following table (see Figure 3.40):

Source file: C:\SensorData\SensorDataSetBridge.csv

Source	Name	SensorType	Range	Electrical Units	Units	P1X	P1Y	P2X	P2Y	Zero	OverAll Sensitivity	Sensitivity	Exitation	Carrier Frequency
Destination	Name	Sensor Type	Range	Electrical Unit	Unit	P1 X	P1 Y	P2 X	P2 Y	Offset or Zero	Sensitivity Overall	Sensitivity	Excitation Voltage	Carrier Frequency
1	Bridge A	Full Bridge	200	mV/V	kN						0.02		5	-1
2	Bridge B	Full Bridge	200	mV/V	kN							2	5	-1
3	Bridge C	Full Bridge	200	mV/V	kN	0	0	2	100				5	-1
4	Bridge D	Half Bridge	200	mV/V	kN						0.02		5	-1
5	Bridge E	Quarter Bridge	200	mV/V	kN						0.02		5	600

Figure 3.40: Example - CSV file with Bridge sensors opened

First, define the sensor type to import the Bridge sensors. The following figure shows the conversion table used to define the sensor type (see Figure 3.41).

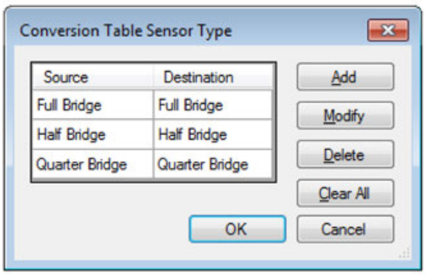


Figure 3.41: Example - Conversion Table Sensor Type

If you do not have a sensor type field in your import file and all the sensors are the same type, set the default sensor type to that type. In Figure 3.42, the default sensor type is set to **Full Bridge**.

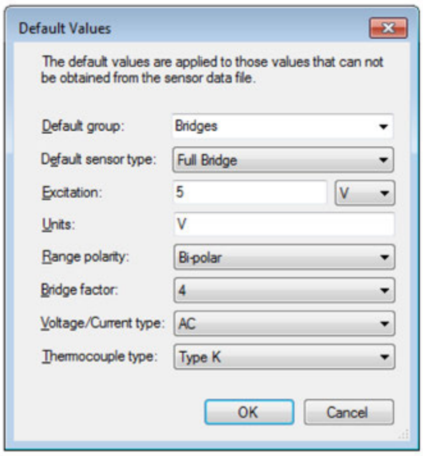


Figure 3.42: Setting the default sensor type

A Default sensor type

The same concept applies to the **Group** field. If not defined, the default group is used. In the example above (see Figure 3.42), the default group name is **Bridges**.
These settings are to save the Perception Sensor Database when one of those fields is not defined in the import data.

The bridge sensor import data contains another field which needs a conversion table to set the correct **Carrier Frequency**. An example of the conversion table is shown in Figure 3.43.

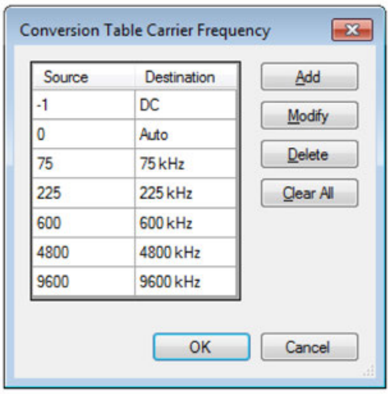


Figure 3.43: Example - Conversion Table Carrier Frequency

In the example used, you can see several different ways to import the same Bridge sensor.
Sensor A, B and C are the same Full Bridge sensors. After importing the various sensors, the following values can be found in the Perception Sensor Database sheet (see Figure 3.44):

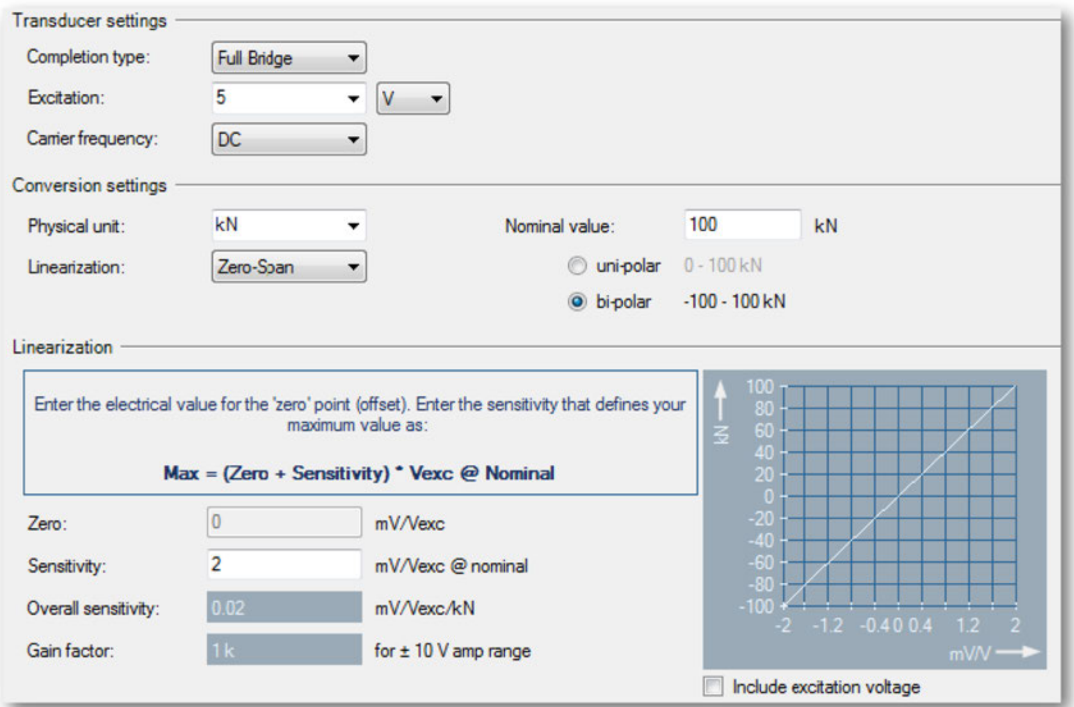


Figure 3.44: Values in the Perception Sensor Database sheet

Bridge Sensor A

The parameters of Sensor A are defined in the following fields (see Figure 3.45):

Name	Sensor Type	Range	Electrical Unit	Unit	Sensitivity Overall	Excitation Voltage	Carrier Frequency
Bridge A	Full Bridge	200	mV/V	kN	0.02	5	-1

Figure 3.45: Definition of Sensor A

This sensor uses the overall sensitivity in its definition parameters. The overall sensitivity setting provides the ratio between the output voltage and the excitation voltage per measured quantity. The Carrier Frequency value of **-1** is converted via the conversion table to **DC**.
Because the default **Range polarity** is set to **Bi-Polar**, the **Range** value of **200 kN** results in a **Nominal** value of **100 kN**, a minimum range value of **-100 kV** and a maximum range value of **100 kV**.

Bridge Sensor B

The parameters of Sensor B are defined in the following fields (see Figure 3.46):

Name	Sensor Type	Range	Electrical Unit	Unit	Sensitivity	Excitation Voltage	Carrier Frequency
Bridge A	Full Bridge	200	mV/V	kN	2	5	-1

Figure 3.46: Definition of Sensor B

This sensor uses the sensitivity in its definition parameters. The sensitivity defines the output voltage growth (from the offset) where the measured quantity reaches its maximum value (nominal value).

The relation between the Sensitivity and the Overall Sensitivity is:

When the range setting is **uni-polar**:

Sensitivity = Overall *Sensitivity x Range*

When the range setting is **bi-polar**:

Sensitivity = Overall *Sensitivity x 0.5 x Range)*

Bridge Sensor C

The parameters of Sensor C are defined in the following fields (see Figure 3.47):

Name	Sensor Type	Range	Electrical Unit	Unit	P1 X	P1 Y	P2 X	P2 Y	Excitation Voltage	Carrier Frequency
Bridge C	Full Bridge	200	mV/V	kN	0	0	2	100	5	-1

Figure 3.47: Definition of Sensor C

There are two points to define the linearization of the bridge sensor. These two points are defined in the following fields:

- P1 X = Electrical value of first calibration point
- P1 Y = Physical value of first calibration point
- P2 X = Electrical value of second calibration point
- P2 Y = Physical value of second calibration point

Bridge Sensor D
Sensor D is a Half Bridge (see Figure 3.48).

Name	Sensor Type	Range	Electrical Unit	Unit	Sensitivity Overall	Excitation Voltage	Carrier Frequency
Bridge D	Half Bridge	200	mV/V	kN	0.02	5	-1

Figure 3.48: Definition of Sensor D

Bridge Sensor E
Sensor E is a Quarter Bridge (see Figure 3.49).

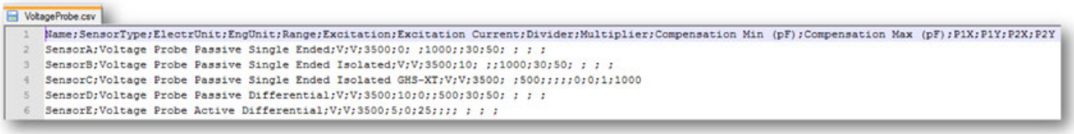
Name	Sensor Type	Range	Electrical Unit	Unit	Sensitivity Overall	Excitation Voltage	Carrier Frequency
Bridge E	Quarter Bridge	200	mV/V	kN	0.02	5	600

Figure 3.49: Definition of Sensor E

3.6 Importing Voltage Probe Sensors

This chapter explains how to import Voltage probe sensors.

The following **CSV** file with five Voltage Probe sensors is used as an example in this chapter (see Figure 3.50).

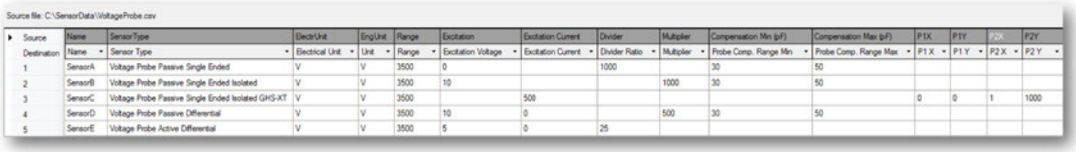


VoltageProbe.csv

```
Name;SensorType;ElectrUnit;EngUnit;Range;Excitation;Excitation Current;Divider;Multiplier;Compensation Min (pF);Compensation Max (pF);P1X;P1Y;P2X;P2Y
SensorA;Voltage Probe Passive Single Ended;V;V;3500;0; ;1000;;30;50; ; ; ;
SensorB;Voltage Probe Passive Single Ended Isolated;V;V;3500;10; ;;1000;30;50; ; ; ;
SensorC;Voltage Probe Passive Single Ended Isolated GHS-XT;V;V;3500; ;500;;;;;0;0;1;1000
SensorD;Voltage Probe Passive Differential;V;V;3500;10;0;;500;30;50; ; ; ;
SensorE;Voltage Probe Active Differential;V;V;3500;5;0;25;;;; ; ; ;
```

Figure 3.50: Example - CSV file with Voltage Probe sensors

If you open this file in the **Perception Sensor Importer** sheet and select the correct **Destination** fields, you will see the following table (see Figure 3.51):



Source file: C:\SensorData\VoltageProbe.csv

Source	Name	SensorType	ElectrUnit	EngUnit	Range	Excitation	Excitation Current	Divider	Multiplier	Compensation Min (pF)	Compensation Max (pF)	P1X	P1Y	P2X	P2Y
Destination	Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Voltage	Excitation Current	Divider Ratio	Multiplier	Probe Comp. Range Min	Probe Comp. Range Max	P1 X	P1 Y	P2 X	P2 Y
1	SensorA	Voltage Probe Passive Single Ended	V	V	3500	0		1000		30	50				
2	SensorB	Voltage Probe Passive Single Ended Isolated	V	V	3500	10			1000	30	50				
3	SensorC	Voltage Probe Passive Single Ended Isolated GHS-XT	V	V	3500		500					0	0	1	1000
4	SensorD	Voltage Probe Passive Differential	V	V	3500	10	0		500	30	50				
5	SensorE	Voltage Probe Active Differential	V	V	3500	5	0	25							

Figure 3.51: Example - CSV file with Voltage Probe sensors opened

First, define the sensor type to import the Voltage probe sensors. The following figure shows the conversion table used to define the sensor type (see Figure 3.52).

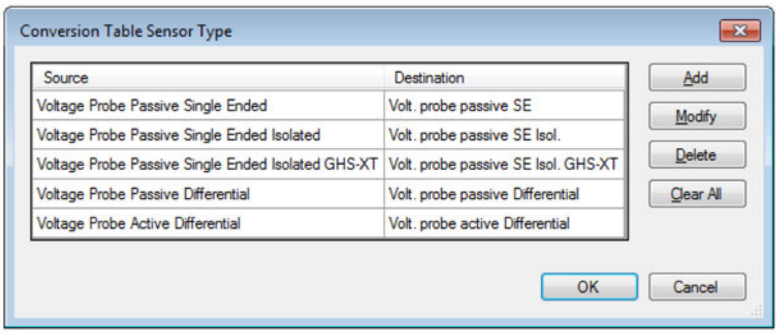


Figure 3.52: Example - Conversion Table Sensor Type

If you do not have a sensor type field in your import file and all the sensors are the same type, set the default sensor type to that type. In Figure 3.53, the default sensor type is set to **Voltage probe active Differential**.

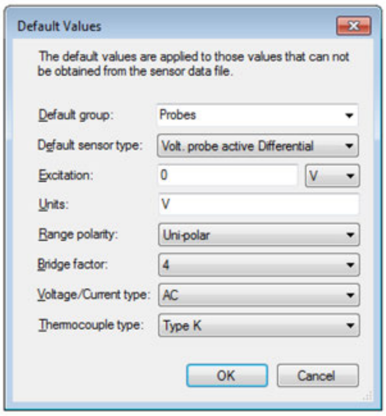


Figure 3.53: Setting the default sensor type

The same concept applies to the **Group** field. If not defined, the default group is used. In the example above (see Figure 3.53), the default group name is **Probes**.
These settings are used during to save the Perception Sensor Database when one of those fields is not defined in the import data.

In the example used, you can see several different ways to import a voltage probe are shown.

Voltage probe Sensor A
The parameters of Sensor A are defined in the following fields (see Figure 3.54):

Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Voltage	Divider Ratio	Probe Comp. Range Min	Probe Comp. Range Max
SensorA	Voltage Probe Passive Single Ended	V	V	3500	0	1000	30	50

Figure 3.54: Definition of Sensor A

Importing Voltage proble Sensor A will result in the following information appearing in the Perception Sensor Database sheet (see Figure 3.55):

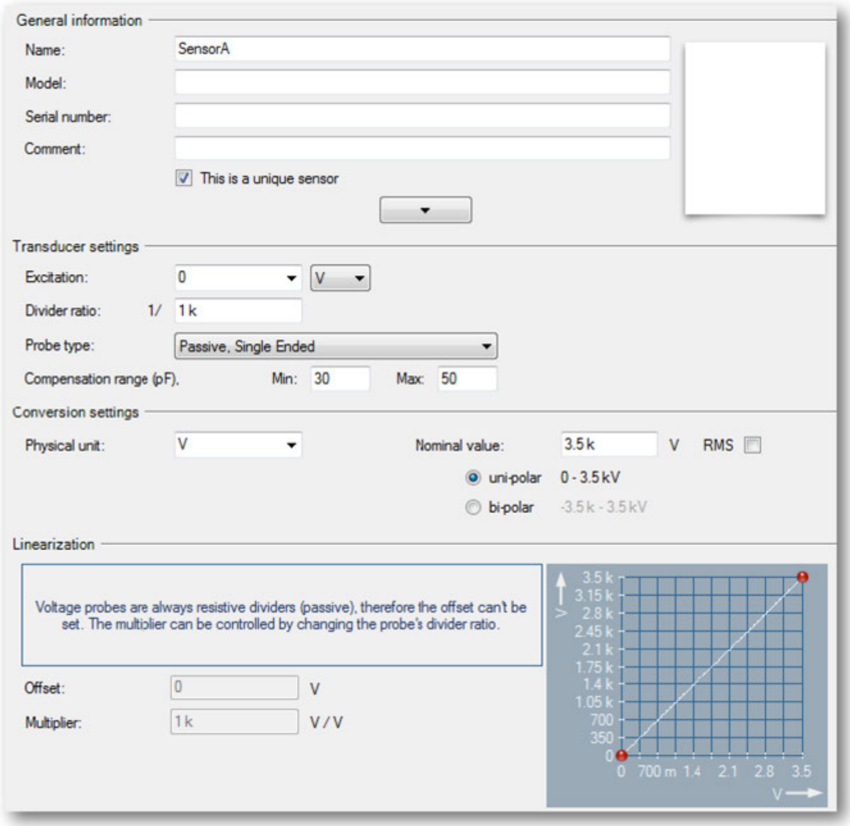


Figure 3.55: General Information for Voltage Sensor A

This sensor uses the **Divider** to define the linearization settings. The field's **Divider** and **Multiplier** have the same linearization results and no differences. The field **Multiplier** is used for Sensor B.

Voltage probe Sensor B

The parameters of Sensor B are defined in the following fields (see Figure 3.56):

Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Voltage	Multiplier	Probe Comp. Range Min	Probe Comp. Range Max
SensorB	Voltage Probe Passive Single Ended Isolated	V	V	3500	10	1000	30	50

Figure 3.56: Definition of Sensor B

Importing Voltage probe Sensor B will result in almost the same information appearing in the Perception Sensor Database sheet as for Sensor A, except for the **Excitation** voltage and the **Probe Type** (see Figure 3.57):

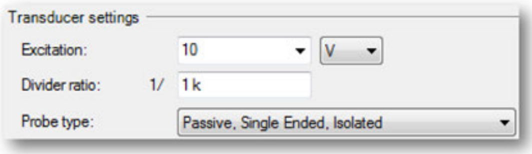


Figure 3.57: Transducer settings Voltage Sensor B

Voltage probe Sensor C
The parameters of Sensor C are defined in the following fields (see Figure 3.58):

Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Current	P1 X	P1 Y	P2 X	P2 Y
SensorC	Voltage Probe Passive Single Ended Isolated GHS-XT	V	V	3500	500	0	0	1	1000

Figure 3.58: Definition of Sensor C

Two points are now used to define the linearization of the bridge sensor. These two points are defined in the following fields:

- P1 X = Electrical value of first calibration point
- P1 Y = Physical value of first calibration point
- P2 X = Electrical value of second calibration point
- P2 Y = Physical value of second calibration point

This sensor uses a current for **Excitation** (see Figure 3.59).

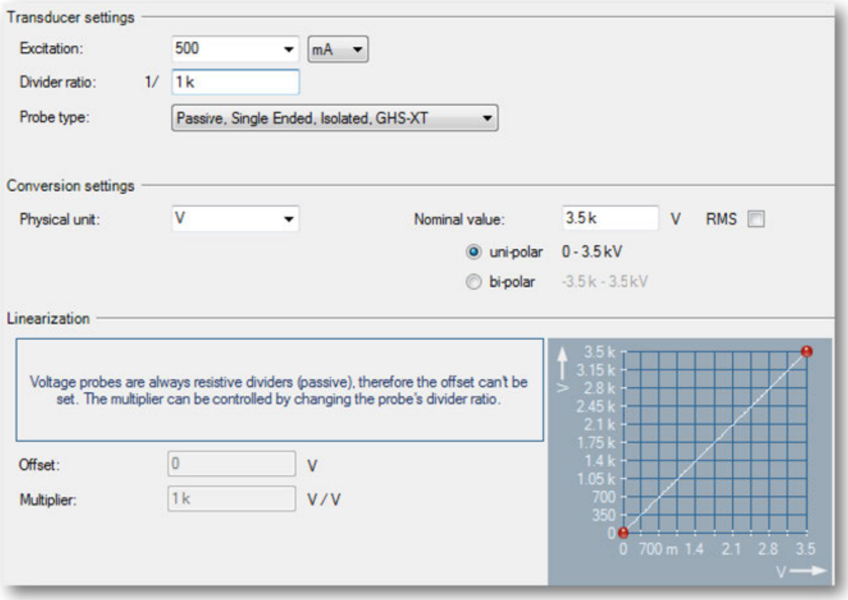


Figure 3.59: Transducer settings Voltage Sensor C

Voltage probe Sensor D
Sensor D is a passive Differential voltage probe with compensation (see Figure 3.60 and Figure 3.61).

Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Voltage	Excitation Current	Multiplier	Probe Comp. Range Min	Probe Comp. Range Max
SensorD	Voltage Probe Passive Differential	V	V	3500	10	0	500	30	50

Figure 3.60: Definition of Sensor D

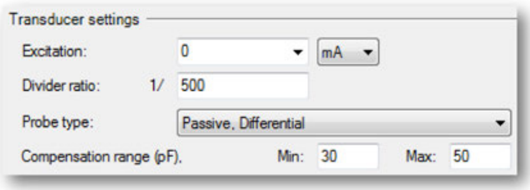


Figure 3.61: Transducer settings Voltage Sensor D

Voltage probe Sensor E
Sensor E is an active Differential voltage probe (see Figure 3.62 and Figure 3.63).

Name	Sensor Type	Electrical Unit	Unit	Range	Excitation Voltage	Excitation Current	Divider Ratio
SensorE	Voltage Probe Active Differential	V	V	3500	5	0	25

Figure 3.62: Definition of Sensor E

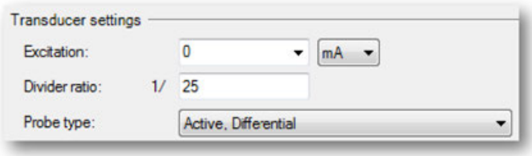
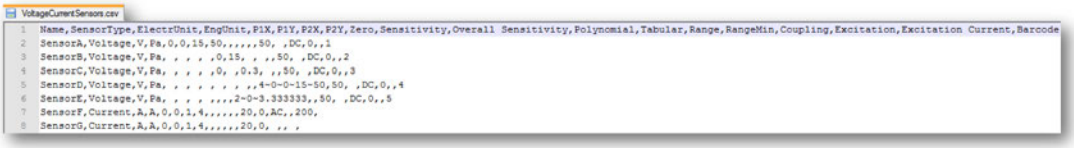


Figure 3.63: Transducer settings Voltage Sensor E

3.7 Importing Voltage or Current Sensors

This chapter explains how to import **Voltage** or **Current** sensors.

The following **CSV** file with seven sensors is used in this chapter (see Figure 3.64).

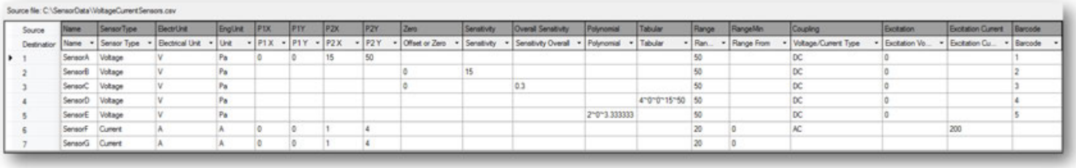


VoltageCurrentSensors.csv

```
1 Name,SensorType,ElectrUnit,EngUnit,P1X,P1Y,P2X,P2Y,Zero,Sensitivity,Overall Sensitivity,Polynomial,Tabular,Range,RangeMin,Coupling,Excitation,Excitation Current,Barcode
2 SensorA,Voltage,V,Pa,0,0,15,50,,,,,,50, ,DC,0,,1
3 SensorB,Voltage,V,Pa, , , , ,0,15, , ,,50, ,DC,0,,2
4 SensorC,Voltage,V,Pa, , , , ,0, ,0.3, ,,50, ,DC,0,,3
5 SensorD,Voltage,V,Pa, , , , , , , ,,4~0~0~15~50,50, ,DC,0,,4
6 SensorE,Voltage,V,Pa, , , , ,,,,2~0~3.333333,,50, ,DC,0,,5
7 SensorF,Current,A,A,0,0,1,4,,,,,,20,0,AC,,200,
8 SensorG,Current,A,A,0,0,1,4,,,,,,20,0, ,, ,
```

Figure 3.64: Example - CSV file with Voltage or Current sensors

If you open this file in the **Perception Sensor Importer** sheet and select the correct **Destination** fields, you will see the following table (see Figure 3.65):



Source file: C:\SensorData\VoltageCurrentSensors.csv

Source	Name	SensorType	ElectrUnit	EngUnit	P1X	P1Y	P2X	P2Y	Zero	Sensitivity	Overall Sensitivity	Polynomial	Tabular	Range	RangeMin	Coupling	Excitation	Excitation Current	Barcode
Destination	Name	Sensor Type	Electrical Unit	Unit	P1 X	P1 Y	P2 X	P2 Y	Offset or Zero	Sensitivity	Sensitivity Overall	Polynomial	Tabular	Ran...	Range From	Voltage/Current Type	Excitation Vo...	Excitation Cu...	Barcode
1	SensorA	Voltage	V	Pa	0	0	15	50						50		DC	0		1
2	SensorB	Voltage	V	Pa					0	15				50		DC	0		2
3	SensorC	Voltage	V	Pa					0		0.3			50		DC	0		3
4	SensorD	Voltage	V	Pa									4~0~0~15~50	50		DC	0		4
5	SensorE	Voltage	V	Pa								2~0~3.333333		50		DC	0		5
6	SensorF	Current	A	A	0	0	1	4						20	0	AC		200	
7	SensorG	Current	A	A	0	0	1	4						20	0				

Figure 3.65: Example - CSV file with Voltage or Current sensors opened

First, define the sensor type to import the sensors. The following figure shows the conversion table used to define the sensor type (see Figure 3.66).

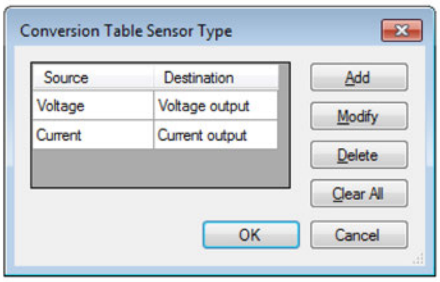


Figure 3.66: Example - Conversion Table Sensor Type

If you do not have a sensor type field in your import file and all the sensors are the same type, set the default sensor type to that specific type. In Figure 3.67, the default sensor type is set to **Voltage output**.

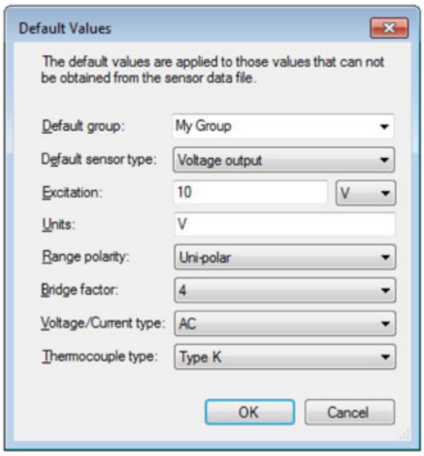


Figure 3.67: Setting the default sensor type

The same concept applies to the **Group** field. If not defined, the default group is used. In the example above (see Figure 3.67), the default group name is **My Group**.

These settings are used during to save the Perception Sensor Database when one of those fields is not defined in the import data. Only the relevant default settings are used, e.g. the default of the Thermocouple type is not used to import voltage sensors.

The Voltage or Current sensor import data dialog contains another field called **Coupling** This field needs a conversion table to set the correct **Signal Coupling** or **Voltage/Current Type**. See Figure 3.68 for an example of the conversion table.

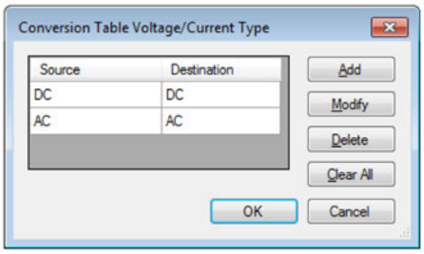


Figure 3.68: Example - Conversion Table Voltage/Current Type

In the example used, you can see several different ways to import the same voltage sensor. Sensor A, B, C, D and E are the same voltage sensors. After importing the various sensors, the following values can be found in the Perception Sensor Database sheet (see Figure 3.69):

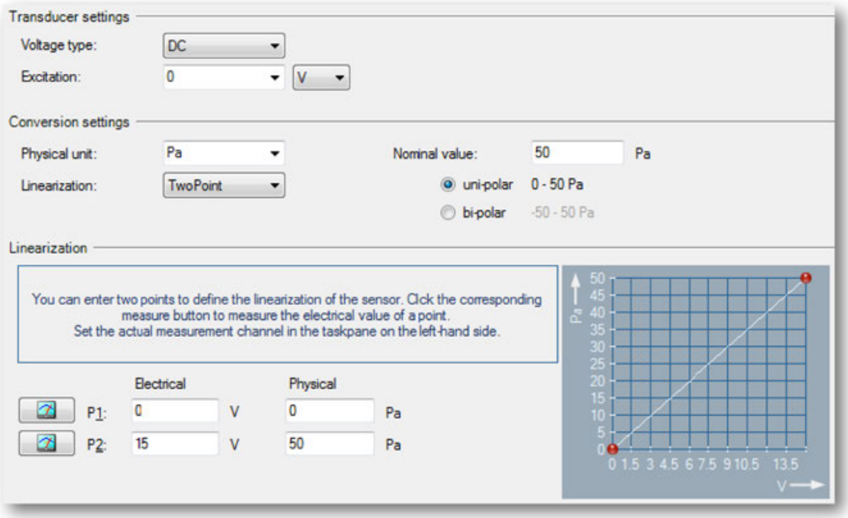


Figure 3.69: Values in the Perception Sensor Database sheet

Voltage Sensor A
The parameters of Sensor A are defined in the following fields (see Figure 3.70):

Name	Sensor Type	Electrical Unit	Unit	P1 X	P1 Y	P2 X	P2 Y	Range	Voltage/Current Type	Excitation Voltage
SensorA	Voltage	V	Pa	0	0	15	50	50	DC	0

Figure 3.70: Definition of Sensor A

Two points are used to define the linearization. This type of linearization is called **TwoPoint** in the Sensor database sheet.
When working with a **two point linearization**, these fields are defined as:

- P1 X = Electrical value of first calibration point (= 0 V)
- P1 Y = Physical value of first calibration point (= 0 Pa)
- P2 X = Electrical value of second calibration point (= 15 V)
- P2 Y = Physical value of second calibration point (= 50 Pa)

The **Range** is 50 Pa because no minimum range is defined. The default range polarity is used and set to **uni-polar**. Therefore, the Nominal value is 50 Pa and the range is between 0 Pa and 50 Pa.

Voltage Sensor B
The parameters of Sensor B are defined in the following fields (see Figure 3.71):

Name	Sensor Type	Electrical Unit	Unit	Offset or Zero	Sensitivity	Range	Voltage/Current Type	Excitation Voltage
SensorB	Voltage	V	Pa	0	15	50	DC	0

Figure 3.71: Definition of Sensor B

To import the voltage or current, the linearization is defined by **Zero** and **Sensitivity**.
Zero defines the amount of output voltage where the measured quantity should be zero.
Sensitivity defines the output voltage growth (from the offset) where the measured quantity reaches its maximum value (nominal value).
Voltage sensor B has a zero of 0 V and a sensitivity of 15 V (see Figure 3.72).

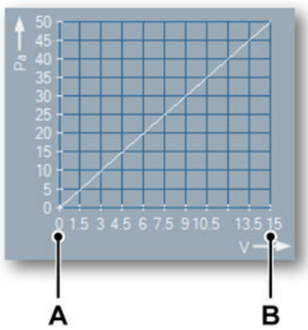


Figure 3.72: Example - Linearization Voltage Sensor

A 0 V

B 15 V

Voltage Sensor C
The parameters of Sensor C are defined in the following fields (Figure 3.73):

Name	Sensor Type	Electrical Unit	Unit	Offset or Zero	Sensitivity Overall	Range	Voltage/Curren...	Excitation Voltage
SensorC	Voltage	V	Pa	0	0.3	50	DC	0

Figure 3.73: Definition of Sensor C

This linearization is defined by **Zero** and **Overall Sensitivity**.

The overall sensitivity setting provides the ratio between the sensor input and output values.

Overall Sensitivity = ΔIn / ΔOut

For sensor C, the overall sensitivity is 15 V / 50 Pa = 0.3 V/Pa (see Figure 3.74).

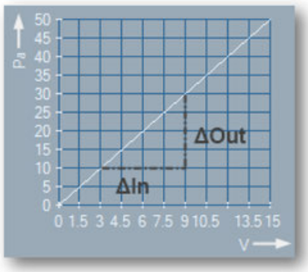


Figure 3.74: Example of Overall Sensitivity

The relation between the **Sensitivity**, **Range** and **Overall Sensitivity** is:

When the range setting is **uni-polar**:

Sensitivity = Overall *Sensitivity x Range*

When the range setting is **bi-polar**:

Sensitivity = Overall *Sensitivity x 0.5 x Range*

Voltage Sensor D

The parameters of Sensor D are defined in the following fields (see Figure 3.75):

Name	Sensor Type	Electrical Unit	Unit	Tabular	Range	Voltage/Curren...	Excitation Voltage
SensorD	Voltage	V	Pa	4~0~0~15~50	50	DC	0

Figure 3.75: Definition of Sensor D

In this case, the linearization is defined by a table. In this example, the table contains only two points (see Figure 3.76). Normally, a table contains a lot more points and is used in cases where the relation between the output voltage and the measured quantity is best described by multiple functions with different slopes.

Electrical (V)	Physical (Pa)
0	0
15	50

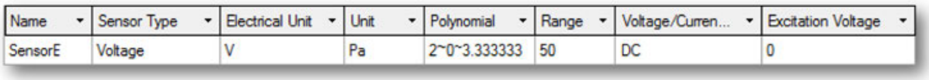
Figure 3.76: Example - Linearization Table

The Tabular field contains all the table values separated by the symbol **~**. The first number defines the number of values used in the table.

In this example, the tabular string is: *4~0~0~15~50*

Voltage Sensor E

The parameters of Sensor E are defined in the following fields (see Figure 3.77):



Name	Sensor Type	Electrical Unit	Unit	Polynomial	Range	Voltage/Curren...	Excitation Voltage
SensorE	Voltage	V	Pa	2~0~3.333333	50	DC	0

Figure 3.77: Definition of Sensor E

In this case, the linearization is defined by a second order polynomial function. Normally, you do not use a polynomial entry for second order functions, but you will use it for higher order polynomials.

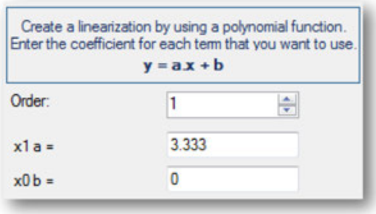
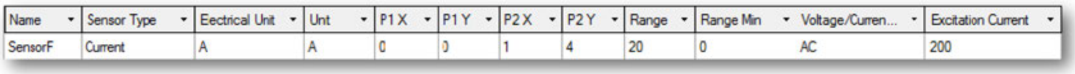


Figure 3.78: Example for creating linearization

A polynomial is defined as:	$Y = aX^3 + bX^2 + cX + \text{offset}$
The input field should then look like:	“Order~offset~c~b~a”
A numerical example:	$Y = \mathbf{3.3}\, X^3 + \mathbf{2.2}\, X^2 + \mathbf{1.1}\, X + 1$
The polynomial input field should then look like:	“4~1~1.1~2.2~3.3”
In our example above (see Figure 3.78), the polynomial is defined as:	“2~0~3.333333”
This results in the following function:	$Y = 3.333333\, X$

Current Sensor F

The parameters of Sensor F are defined in the following fields (see Figure 3.79):



Name	Sensor Type	Electrical Unit	Unit	P1 X	P1 Y	P2 X	P2 Y	Range	Range Min	Voltage/Curren...	Excitation Current
SensorF	Current	A	A	0	0	1	4	20	0	AC	200

Figure 3.79: Definition of Sensor F

This is a current sensor. The signal coupling or Current type is set to **AC** (see Figure 3.80).
The excitation is defined as a 200 mA current.
The range is defined using the **Range From** value. Therefore, the importer does not use the default **Range polarity** value.

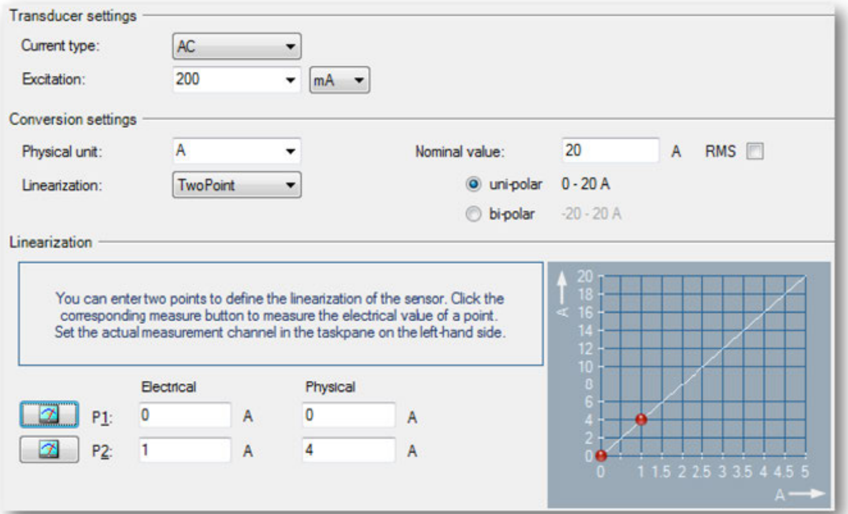


Figure 3.80: Values in the Perception Sensor Database sheet

Current Sensor G

The parameters of Sensor G are defined in the following fields (see Figure 3.81):

Name	Sensor Type	Electrical Unit	Unit	P1 X	P1 Y	P2 X	P2 Y	Range	Range Mn
SensorG	Current	A	A	0	0	1	4	20	0

Figure 3.81: Definition of Sensor G

No signal coupling (Voltage/Current type) and no Excitation Voltage or current is defined. Therefore, the sensor is imported with the default values (see Figure 3.82).

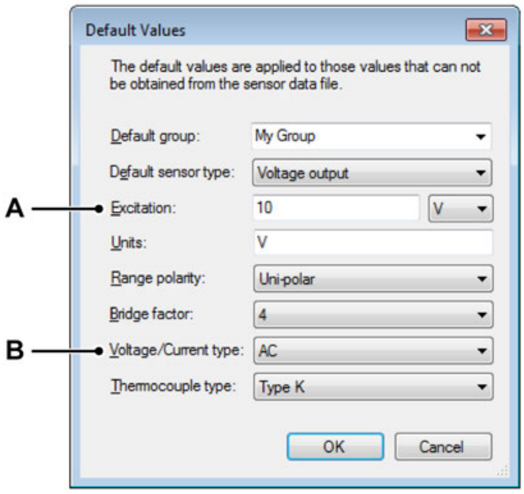


Figure 3.82: Example of more Default Values

A Default Excitation

B Default Voltage/Current type

This results in the following transducer settings (see Figure 3.83):

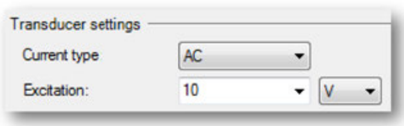
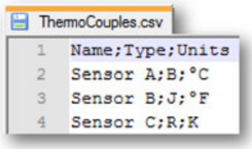


Figure 3.83: Example - Transducer settings

3.8 Importing Thermocouple Sensors

This chapter will explain how to import **Thermocouple** sensors.

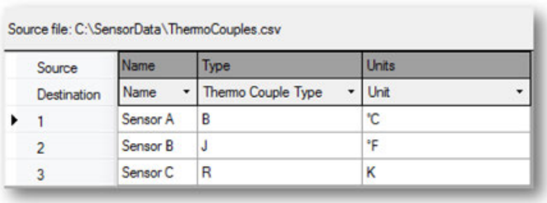
The following **CSV** file with three sensors is used as an example in this chapter (see Figure 3.84).


ThermoCouples.csv

```
1 Name;Type;Units
2 Sensor A;B;°C
3 Sensor B;J;°F
4 Sensor C;R;K
```

Figure 3.84: Example - CSV file with Thermocouple sensors

If you open this file in the **Perception Sensor Importer** sheet and select the correct **Destination** fields, you will see the following table (see Figure 3.85):


Source file: C:\SensorData\ThermoCouples.csv

	Name	Type	Units
Source	Name	Type	Units
Destination	Name	Thermo Couple Type	Unit
1	Sensor A	B	°C
2	Sensor B	J	°F
3	Sensor C	R	K

Figure 3.85: Example - CSV file with Thermocouple sensors opened

First, define the sensor type to import the sensors. The following figure shows the conversion table used to define the sensor type (see Figure 3.86).

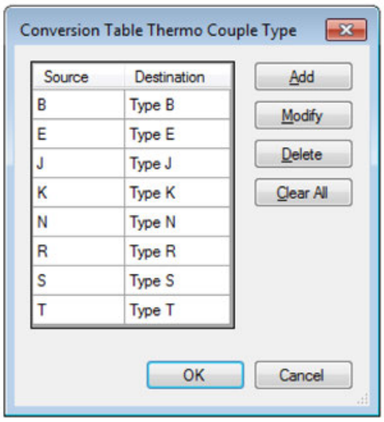


Figure 3.86: Example - Conversion Table Thermcouple Type

The units are **°C**, **°F** or **K**.

If the unit name starts with an **F**, it is assumed that the selected unit is **°F**.
If the unit name starts with a **K**, it is assumed that the selected unit is **K**.
If the unit name is empty, the default unit is used. However, **°C** is used if this is not a temperature unit.
In all other cases, the program assumes that the unit is **°C**.

When you click on the **Import sensors** button, the following dialog appears (Figure 3.87):

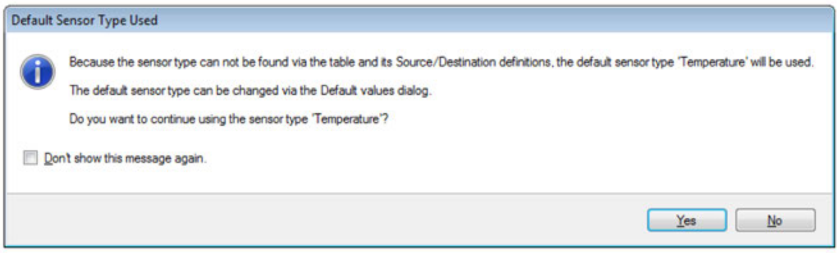


Figure 3.87: Default Sensor Type Used

This dialog appears when the sensor type cannot be found from the data in the table and the Source/Destination definitions. Although the message may seem as if it refers to defining the **sensor type**, it refers to defining the **thermo couple type**. The system does not know that the sensor type needs to be set to “Temperature”. Therefore, the dialog above appears and the default sensor type is used. This default sensor type is set via the **Default Values** dialog (see Figure 3.88):

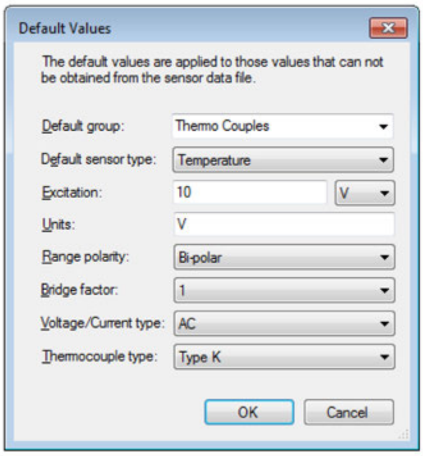


Figure 3.88: Default Values dialog

After importing these sensors, the following information can be found in the Perception Sensor Database sheet (see Figure 3.89):

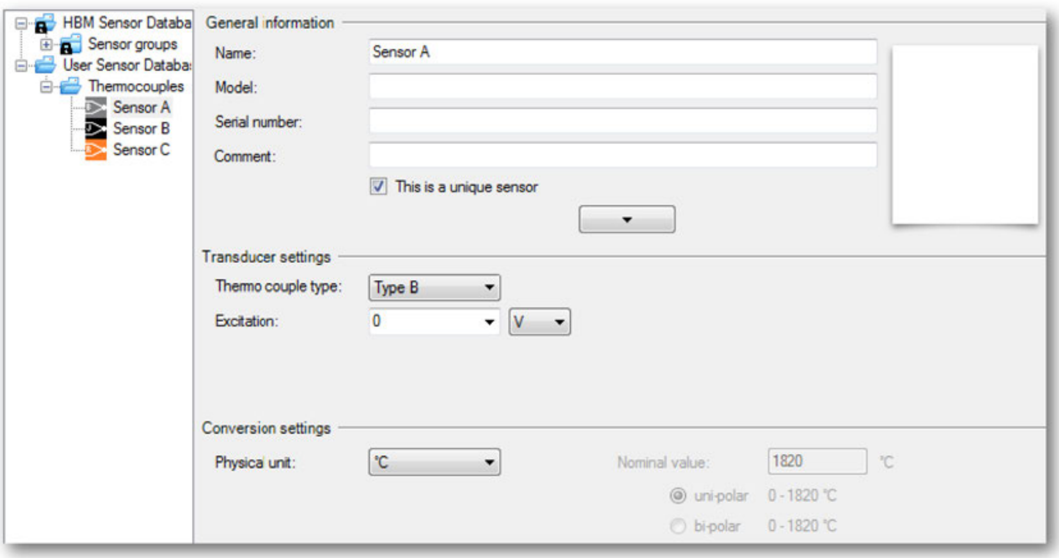
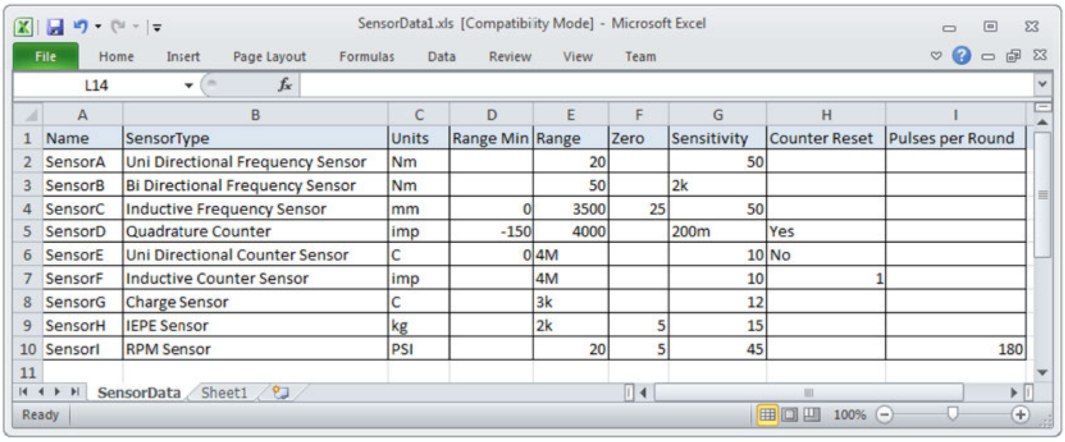


Figure 3.89: Values in the Perception Sensor Database sheet

3.9 Importing various Frequency, Counter, Charge and RPM Sensors

This chapter explains how to import various Frequency, Counter, Charge and RPM sensors.

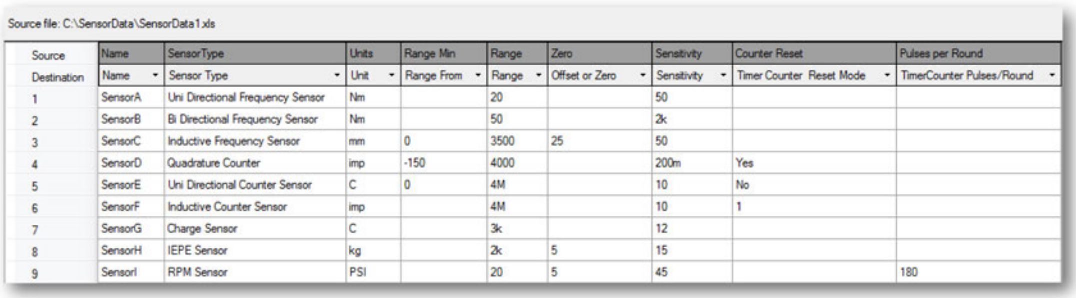
The sensor data used during this chapter is from the following Microsoft® Excel file (see Figure 3.90):



	A	B	C	D	E	F	G	H	I
1	Name	SensorType	Units	Range Min	Range	Zero	Sensitivity	Counter Reset	Pulses per Round
2	SensorA	Uni Directional Frequency Sensor	Nm		20		50		
3	SensorB	Bi Directional Frequency Sensor	Nm		50		2k		
4	SensorC	Inductive Frequency Sensor	mm	0	3500	25	50		
5	SensorD	Quadrature Counter	imp	-150	4000		200m	Yes	
6	SensorE	Uni Directional Counter Sensor	C	0	4M		10	No	
7	SensorF	Inductive Counter Sensor	imp		4M		10	1	
8	SensorG	Charge Sensor	C		3k		12		
9	SensorH	IEPE Sensor	kg		2k	5	15		
10	SensorI	RPM Sensor	PSI		20	5	45		180
11									

Figure 3.90: Example - CSV with file various sensors

If you open this file in the **Perception Sensor Importer** sheet and select the correct **Destination** fields, you will see the following table (see Figure 3.91):



Source file: C:\SensorData\SensorData1.xls

Source	Name	SensorType	Units	Range Min	Range	Zero	Sensitivity	Counter Reset	Pulses per Round
Destination	Name	Sensor Type	Unit	Range From	Range	Offset or Zero	Sensitivity	Timer Counter Reset Mode	TimerCounter Pulses/Round
1	SensorA	Uni Directional Frequency Sensor	Nm		20		50		
2	SensorB	Bi Directional Frequency Sensor	Nm		50		2k		
3	SensorC	Inductive Frequency Sensor	mm	0	3500	25	50		
4	SensorD	Quadrature Counter	imp	-150	4000		200m	Yes	
5	SensorE	Uni Directional Counter Sensor	C	0	4M		10	No	
6	SensorF	Inductive Counter Sensor	imp		4M		10	1	
7	SensorG	Charge Sensor	C		3k		12		
8	SensorH	IEPE Sensor	kg		2k	5	15		
9	SensorI	RPM Sensor	PSI		20	5	45		180

Figure 3.91: Example - CSV with file various sensors opened

Do not forget to select the correct sheet in case you open a multi-sheet Excel file (Figure 3.92):

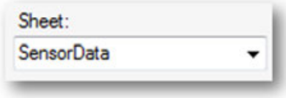


Figure 3.92: Correct Excel sheet

Before you save this data in the Perception Sensor Database, ensure that the default values are correct.
The following defaults values are used to import these sensors (see Figure 3.93):

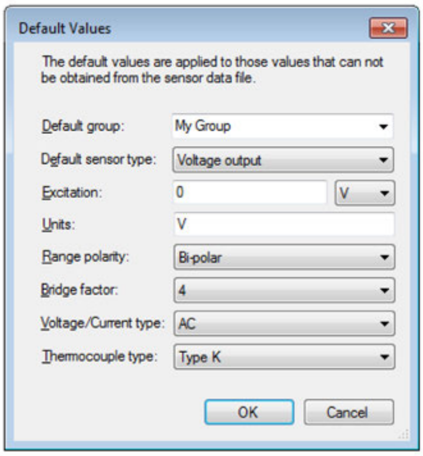


Figure 3.93: Example of more Default Values

First, define the sensor type to import those sensors. The following figure shows the conversion table used to define the sensor type (see Figure 3.94).

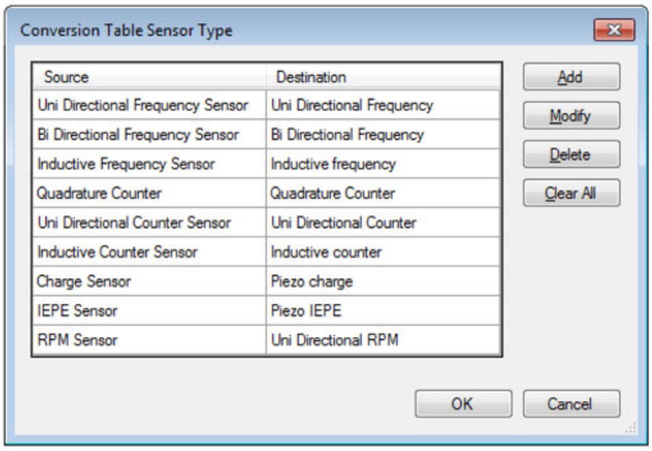


Figure 3.94: Example - Conversion table of various sensor types

After saving all the sensors, the Perception Sensor Database sheet shows the following new sensors (Figure 3.95):

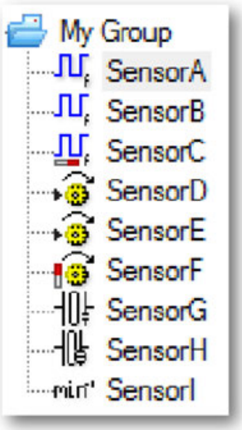


Figure 3.95: List of various sensors

Sensor A
The parameters of Sensor A are defined in the following fields (see Figure 3.96):

Name	Sensor Type	Unit	Range	Sensitivity
SensorA	Uni Directional Frequency Sensor	Nm	20	50

Figure 3.96: Definition of Sensor A

Sensor A is a uni-directional frequency sensor with a **Nominal** value of 10 Nm and a **Sensitivity** of 50 kHz.
See Figure 3.97 for an example of how the imported data looks in the Perception Sensor Database.

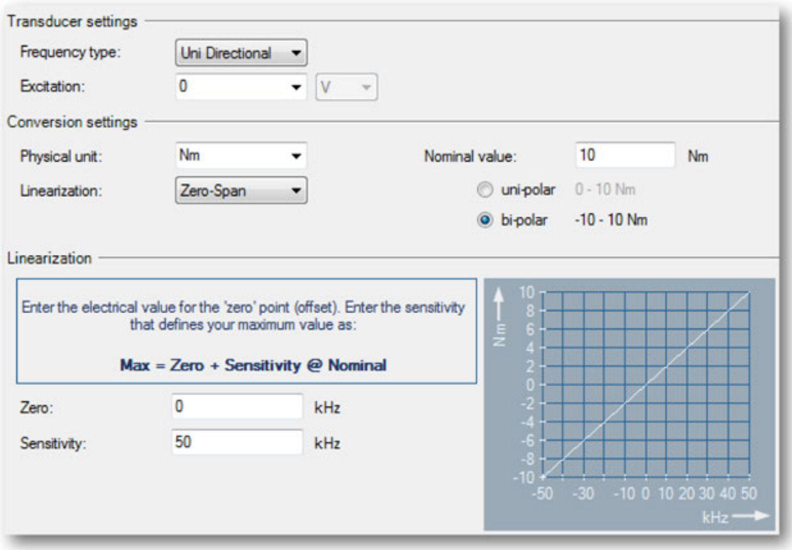


Figure 3.97: Values in the Perception Sensor Database sheet

Sensor B

The parameters of Sensor B are defined in the following fields (see Figure 3.98):

Name	Sensor Type	Unit	Range	Sensitivity
SensorB	Bi Directonal Frequency Sensor	Nm	50	2k

Figure 3.98: Definition of Sensor B

Sensor B is a bi-directional frequency sensor with a **Nominal** value of 25 Nm and a **Sensitivity** value of 2000 kHz.
As shown in Figure 3.98, **Engineering** formatted numerical values may be used, e.g **2 k**.

Sensor C

The parameters of Sensor C are defined in the following fields (see Figure 3.99):

Name	Sensor Type	Unit	Range From	Range	Offset or Zero	Sensitivity
SensorC	Inductive Frequency Sensor	mm	0	3500	25	50

Figure 3.99: Definition of Sensor C

Sensor C is an inductive frequency sensor with a **Nominal** value of 3500 mm and a **Sensitivity** value of 50 kHz.
The Range From field is used. Therefore, the range is uni-polar from 0 to 3500 mm.
For this reason, the default bi-polar range polarity is overruled.

Sensor D

The parameters of Sensor D are defined in the following fields (see Figure 3.100):

Name	Sensor Type	Unit	Range From	Range	Sensitivity	Timer Counter Reset Mode
SensorD	Quadrature Counter	imp	-150	4000	200m	Yes

Figure 3.100: Definition of Sensor D

Sensor D is a quadrature counter sensor.
The timer counter reset mode is enabled (see Figure 3.101). Boolean fields can be filled in various ways.
For more information, see "Input Formats" on page 74.

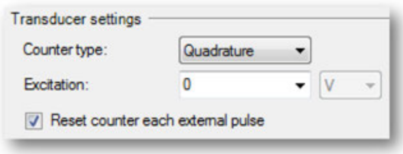


Figure 3.101: Example - Transducer settings

Although the sensor definition defines a range between -150 imp and 3850 imp, the imported sensor range is between -2000 imp and 2000 imp. This is because the Perception Sensor Database works either with uni-polar ranges or symmetrical bi-polar ranges.

Sensor E

The parameters of Sensor E are defined in the following fields (see Figure 3.102):

Name	Sensor Type	Unit	Range From	Range	Sensitivity	Timer Counter Reset Mode
SensorE	Uni Directional Counter Sensor	C	0	4M	10	No

Figure 3.102: Definition of Sensor E

Sensor E is a uni-directional counter sensor. The timer counter reset mode is disabled.

Sensor F
The parameters of Sensor F are defined in the following fields (see Figure 3.103):

Name	Sensor Type	Unit	Range From	Range	Sensitivity	Timer Counter Reset Mode
SensorE	Uni Directional Counter Sensor	C	0	4M	10	No

Figure 3.103: Definition of Sensor F

Sensor F is an inductive counter sensor. The timer counter reset mode is enabled.

Sensor G
The parameters of Sensor G are defined in the following fields (see Figure 3.104):

Name	Sensor Type	Unit	Range	Sensitivity
SensorG	Charge Sensor	C	3k	12

Figure 3.104: Definition of Sensor G

Sensor G is a piezo charge sensor.

Sensor H
The parameters of Sensor H are defined in the following fields (see Figure 3.105):

Name	Sensor Type	Unit	Range	Offset or Zero	Sensitivity
SensorH	IEPE Sensor	kg	2k	5	15

Figure 3.105: Definition of Sensor H

Sensor H is a piezo IEPE sensor.

Sensor I
The parameters of Sensor I are defined in the following fields (see Figure 3.106):

Name	Sensor Type	Unit	Range	Offset or Zero	Sensitivity	TimerCounter Pulses/Round
SensorI	RPM Sensor	PSI	20	5	45	180

Figure 3.106: Definition of Sensor I

Sensor I is an RPM sensor with 180 pulses per round.

3.10 Programming customized Sensor Importers

3.10.1 Introduction

There are situations where you are not able to import your sensor data with the current Sensor Importer.

There can be various reasons for this:

- The file format is not supported (e.g. XML file or Access database).
- The fields in your sensor file cannot be mapped to the Perception Sensor fields.
  - The field is a combination of Range and Units, e.g. 50 kg.
  - One line in your sensor file refers to several lines in the Perception Sensor database:
    Range = "30 A/3 V; 300 A/3 V; 3000 A/3 V". This line needs to be split into three different sensor entries in Perception, so that there is an entry for each range.
  - You need to use a formula to convert a numerical setting from your sensor file to an equivalent value which is supported by Perception.

In the cases listed above, a new software plugin can be programmed so that the sensor can be imported. You can program the software plugin yourself or you can ask HBM to do this for you.

This chapter is useful **only** for programmers, as it explains how to write an importer plugin.

If you are not a programmer, ask HBM if it is possible to import your sensor data. HBM will provide you with a quote. When requesting a quote, it is very important to have detailed information about the format you are using and that you already have a good idea how to map your sensor data to the Perception Sensor Database fields. Try to add some of your sensors manually and provide this information to HBM when you are request a quote, as this can speed things up.

3.10.2 Plugin DLL

The plugin you write is a dll which will dynamically be loaded by the Perception Importer sheet during startup. The dll needs to be located in a folder called **SensorImporters**. This folder needs to be a sub-folder of the Perception.exe file location.

For example:

C:\Program Files\HBM\Perception\SensorImporters

You may need to write several different dlls. It is not very likely that you will have different dlls, but it may be necessary if you are work with different kinds of sensor files.

3.10.3 ISensorImport interface

The plugin needs to implement the interface ISensorImport. The sensor import sheet will use this interface to communicate with your new plugin.

The ISensorImport interface is defined as follow:

```
public interface ISensorImport
{
    /// <summary>
    /// Sensor Import name
    /// </summary>
    string Name { get; }

    /// <summary>
    /// Sensor Import filename
    /// </summary>
    string Filename { get; }

    /// <summary>
    /// Description of the sensor import
    /// </summary>
    string Description { get; }

    /// <summary>
    /// Returns the supported file extension
    /// </summary>
    string Extension { get; }
```

```
/// <summary>
/// The file filter as used by a file open dialog
/// CSV file (*.csv, *asc, *.txt)|*.csv;*.asc;*.txt
/// </summary>
string FileFilters { get; }

/// <summary>
/// Indicates if there are multiple data sets in the
    input file
/// </summary>
/// <remarks>
/// If we are dealing with e.g. Excel than the Excel
    file can contain multiple sheets, therefor we need
    a sheet selection.
/// HasMultipleDataSets is then true
/// The same happens when we are dealing with an
    Microsoft Access database, we need to select which
    table we want.
/// However when working with a csv file we do not need
    a sheet or table selection and therefore the
    HasMultipleSets will be false
/// </remarks>
bool HasMultipleDataSets { get; }

/// <summary>
/// Returns the names of the available datasets in the
    selected file
/// </summary>
/// <remarks>
/// When working with Excel this will return all the
    sheet names
/// When working with Access this will return all the
    tables in the acess database file.
/// </remarks>
string[] DataSets { get; }
```

```
/// <summary>
/// Get the data set you want to work with
/// </summary>
/// <remarks>
/// When working with Excel this will be the name of
    the sheet you want to use
/// When working with Access this will be the name of
    the table you want to use
/// </remarks>
string DataSet { get; }

/// <summary>
/// The name of a data set
/// </summary>
/// <remarks>
/// When we are dealing with e.g. Excel the name will
    be "Sheet", for Access this will be "Table"
/// </remarks>
string DataSetName { get; }

/// <summary>
/// Opens the sensor file
/// </summary>
/// <param name="Filename">Filename</param>
/// <param name="DataSet">Name of the data set, empty
    for CSV file, Sheet name when working with Excel,
    Table name when working with Access</param>
/// <returns></returns>
bool OpenSensorFile(string Filename, string DataSet);

/// <summary>
/// Reads the header file
/// </summary>
/// <param name="aHeader"></param>
/// <returns></returns>
bool ReadHeader(out string[] aHeader);
```

```
    /// <summary>
    /// Reads the next sensor line
    /// </summary>
    /// <param name="aData"></param>
    /// <returns></returns>
    bool ReadNextLine(out object[] aData);

    /// <summary>
    /// Close the sensor file
    /// </summary>
    void CloseSensorFile();

    /// <summary>
    /// Returns a value between 0 and 100 to indicate if
        this file can be read
    /// </summary>
    /// <param name="Name">Sensor file name</param>
    /// <remarks>
    /// This numerical value is used when the Sensor
        importer finds two loaders for the same file
        extension. In that case the loader returning the
        highest value is used. The two internal Excel and
        CSV loaders return both 50
    /// If you want your own CSV reader than make sure you
        return a higher value then 50
    /// </remarks>
    /// <returns>Numerical value uses as desision number
        </returns>
    int CanLoadRecording(string Name);
}
```

3.10.4 XML sensor loader plugin Code

This chapter uses an example to demonstrate how to create a plugin to load a sensor file in an XML format.

The sensor is defined by the following fields:

- Sensor Name
- Sensor Type
- Units
- Range
- Sensitivity

This example uses **VS2010** to show you how to create your plugin dll step by step.

1 Start VS2010
2 Create a new Class Library and name it **XMLSensorImporter** (see Figure 3.107).

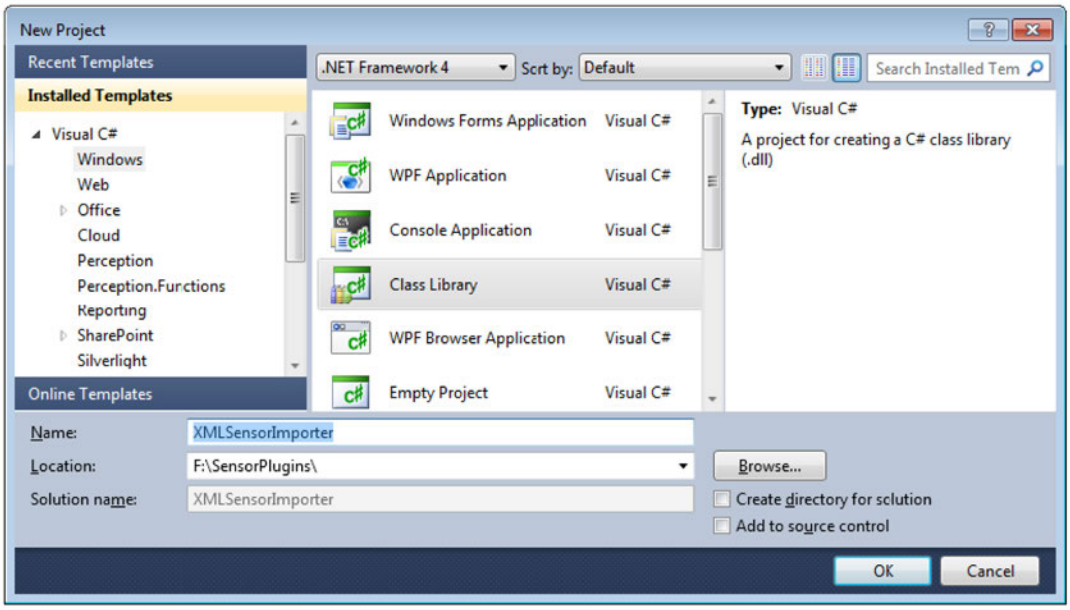


Figure 3.107: Example of how to create a plugin

3 Rename the generated class name to **XMLSensorImporter**.
4 Include a reference to the Perception.Sensor-Importer dll that can be found in the Perception sheets folder.
5 Set the reference property **Copy Local** to **False** (see Figure 3.108).

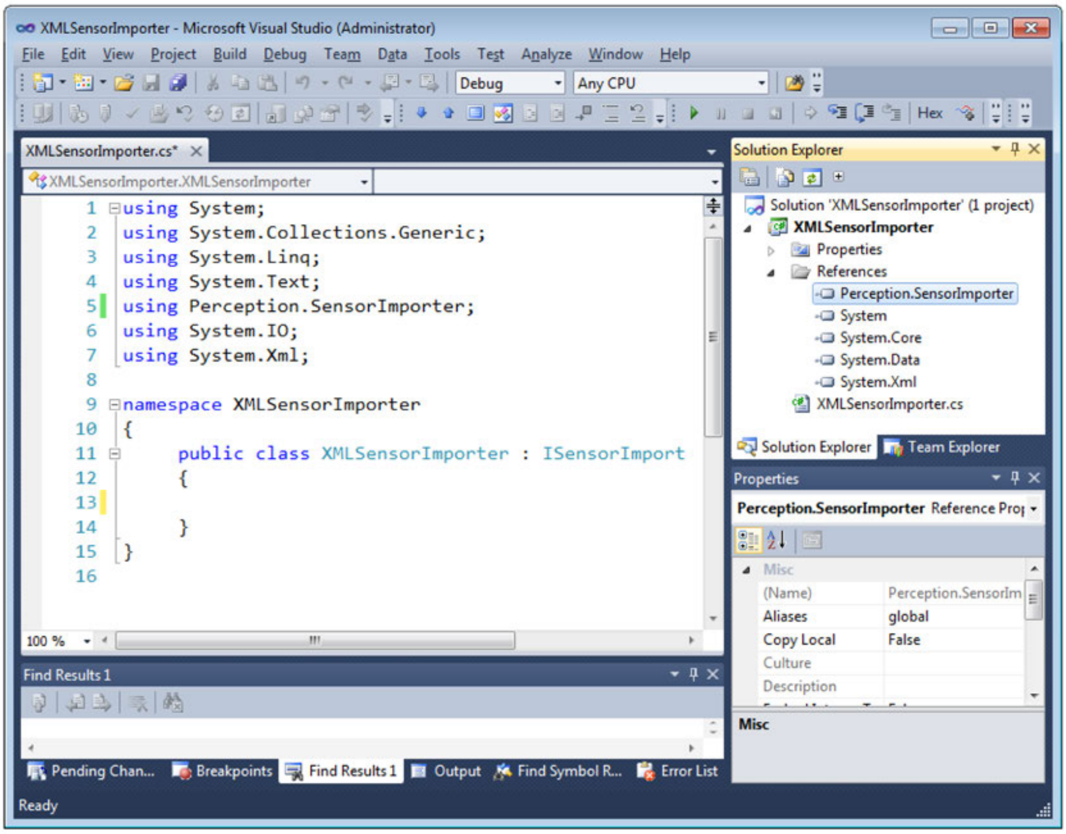


Figure 3.108: Example of XMLSensorImporter

6 Set the **output path** to **C:\Program Files\HBM\Perception\SensorImporters**

Note *The exact location depends on your OS and which version of Perception you are run: 32 or 64 bit. If you work on a 64 bit PC with a 32 bitversion of Perception, use the following build output path:*
C:\Program Files (x86)\HBM\Perception\SensorImporters

7 To be able to perform debugging, select the Perception.exe file as the external program to be started up (see Figure 3.109).

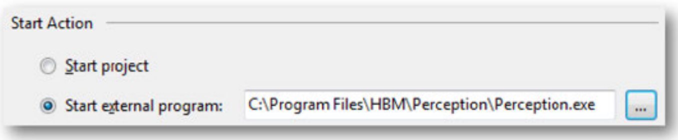


Figure 3.109: Start Action menu

8 Start implementing the **ISensorImport** interface.

9 Implement this interface by writing its name behind the class name (see Figure 3.110).

10 VS2010 will implement the interface stubs for you.

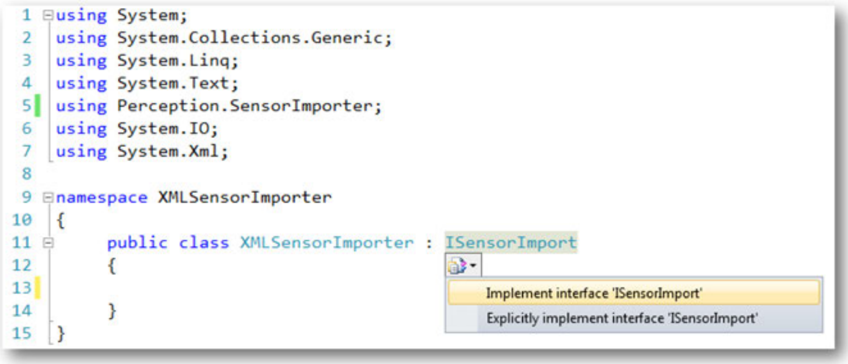


Figure 3.110: Implementing the Interface

See below for an example of how the complete code looks.

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using Perception.Sensor.Importer;
using System.IO;
using System.Xml;

namespace XMLSensorImporter
{
    public class XMLSensorImporter : ISensorImport
    {
        #region private members
        private struct SensorData
        {
            public string Name;
            public string SensorType;
            public string Units;
            public string Range;
            public string Sensitivity;
        }
```

```
private XmlDocument m_XmlDoc;
private List<SensorData> m_Sensors = new
List<SensorData>();
private int nActiveLine = 0;
private string m_strFileName = "";
#endregion

#region ISensorImport Members
public string Name
{
   get { return "xml"; }
}

public string Filename
{
   get { return m_strFileName; }
}

public string Description
{
   get { return "Importing Sensor information from
   an xml file"; }
}

public string[] DataSets
{
   get { return null; }
}

public string DataSet
{
   get { return string.Empty; }
}

public string DataSetName
{
   get { return string.Empty; }
}
```

```
public int CanLoadRecording(string Name)
{
   string strExtension = Path.GetExtension(Name);
   if (string.IsNullOrEmpty(strExtension))
      return 0;
   if (string.Equals(strExtension, ".xml",
      StringComparison.CurrentCultureIgnoreCase))
      return 100;
   return 0;
}

public string Extension
{
   get { return "xml"; }
}

public string FileFilters
{
   get { return "XML file (*.xml)|*.xml"; }
}

public bool HasMultipleDataSets
{
   get { return false; }
}

public bool ReadHeader(out string[] aHeader)
{
   aHeader = new string[5];
   aHeader[0] = "Name";
   aHeader[1] = "SensorType";
   aHeader[2] = "Units";
   aHeader[3] = "Range";
   aHeader[4] = "Sensitivity";
   return true;
}

public bool ReadNextLine(out object[] aData)
```

```
{
   aData = null;
   if (nActiveLine >= m_Sensors.Count) return
   false;
   SensorData mySensorData = m_Sensors[nActiveLine+
   +];
   aData= new object[5];

   aData[0] = mySensorData.Name;
   aData[1] = mySensorData.SensorType;
   aData[2] = mySensorData.Units;
   aData[3] = mySensorData.Range;
   aData[4] = mySensorData.Sensitivity;
   return true;
}

public bool OpenSensorFile(stringFilename, string
aDataSet)
{
   m_strFileName = Filename;
   nActiveLine = 0;
   if (string.IsNullOrEmpty(m_strFileName)) return
   false;
   if (!File.Exists(m_strFileName)) return false;

   try
   {
      m_XmlDoc = new XmlDocument();
      m_XmlDoc.Load(m_strFileName);
      XmlNode SensorsNode =
      m_XmlDoc.SelectSingleNode("Sensors");
      m_Sensors.Clear();
      if (!SensorsNode.HasChildNodes) return false;
      for (int i = 0; i <
      SensorsNode.ChildNodes.Count; i++)
      {
         XmlNode xmlSensorNode =
         SensorsNode.ChildNodes[i];
         SensorData mySensor = new SensorData();
```

```
            LoadSensorFromXml(xmlSensorNode, ref
            mySensor);
            m_Sensors.Add(mySensor);
        }
    }
    catch
    {
        return false;
    }
    return true;
}

public void CloseSensorFile()
{
    if (m_XmlDoc == null) return;
    m_XmlDoc = null;
}
#endregion

#region private methods
public string GetElement(XmlNode xmlNode, string
ElementName, string strElementValue)
{
    XmlNode xmlElement =
    xmlNode.SelectSingleNode(ElementName);
    if (xmlElement == null)
        return strElementValue;
    return xmlElement.InnerText;
}

public double GetElement(XmlNode xmlNode, string
ElementName, double dElementValue)
{
    XmlNode xmlElement =
    xmlNode.SelectSingleNode(ElementName);
    if (xmlElement == null)
        return dElementValue;
    double dOut;
    dOut =
    XmlConvert.ToDouble(xmlElement.InnerText);
```

```
            return dOut;
        }

        private void LoadSensorFromXml(XmlNode xmlNode, ref
        SensorData aSensor)
        {
            aSensor.Name = GetElement(xmlNode, "Name", "");
            aSensor.SensorType = GetElement(xmlNode,
            "SensorType", "");
            aSensor.Units = GetElement(xmlNode, "Units",
            "");
            aSensor.Range = GetElement(xmlNode, "Range",
            10);
            aSensor.Sensitivity = GetElement(xmlNode,
            "Sensitivity", 1);
        }
        #endregion
    }
}
```

3.10.5 Testing the new XML sensor loader plugin

This example uses the following xml file (see Figure 3.111):

SensorData.xml


```xml
<?xml version="1.0" encoding="utf-8"?>
<Sensors>
  <Sensor>
    <Name>SensorA</Name>
    <SensorType>Voltage</SensorType>
    <Units>Nm</Units>
    <Range>20</Range>
    <Sensitivity>50</Sensitivity>
  </Sensor>
  <Sensor>
    <Name>SensorB</Name>
    <SensorType>Voltage</SensorType>
    <Units>kg</Units>
    <Range>1000</Range>
    <Sensitivity>10</Sensitivity>
  </Sensor>
  <Sensor>
    <Name>SensorC</Name>
    <SensorType>Current</SensorType>
    <Units>PSI</Units>
    <Range>100</Range>
    <Sensitivity>30</Sensitivity>
  </Sensor>
  <Sensor>
    <Name>SensorD</Name>
    <SensorType>Current</SensorType>
    <Units>Pa</Units>
    <Range>10</Range>
    <Sensitivity>200</Sensitivity>
  </Sensor>
</Sensors>
```


Figure 3.111: Example - xml file

This file contains four sensors. The name of the sensor file is **SensorData.xml**.

After starting Perception, you can test your new plugin.

1 Start Perception.
2 Open the Import Sensors dialog.
3 Open the SensorData.xml file (see Figure 3.112).

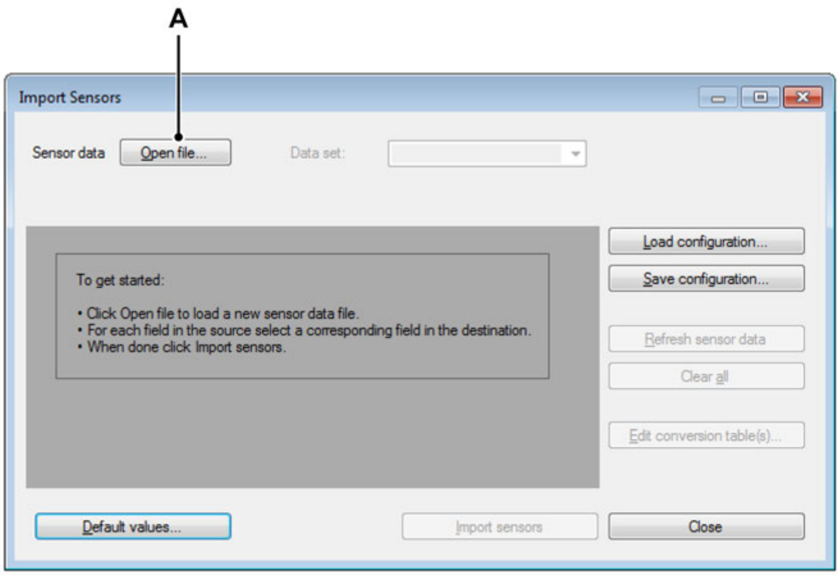


Figure 3.112: Import Sensors

A Open file

4 As shown in Figure 3.113, XML is supported in the file open dialog.

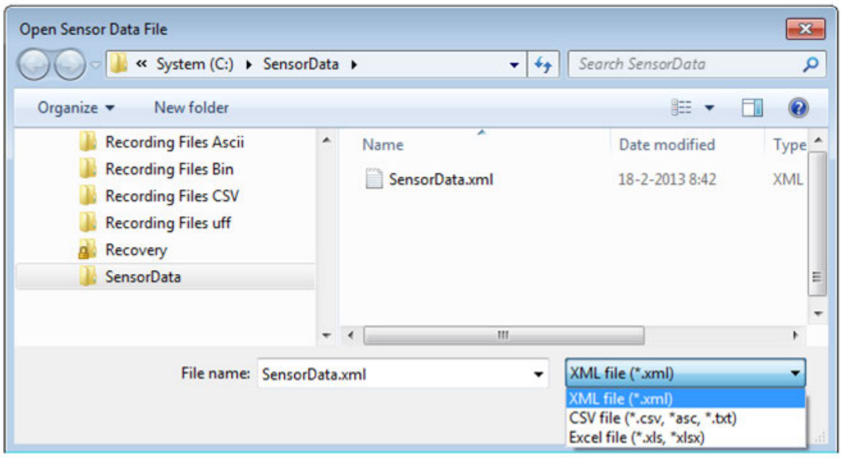
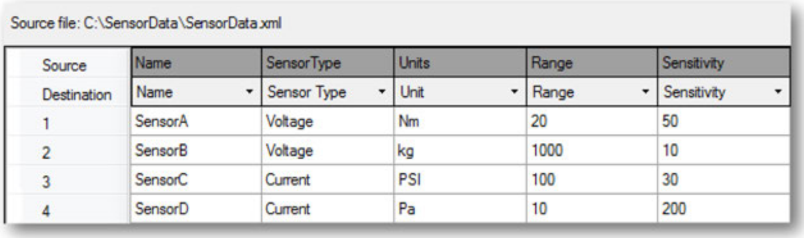


Figure 3.113: File open dialog

5 Open the SensorData.xml file and set the appropriate destination fields (see Figure 3.114).


Source file: C:\SensorData\SensorData.xml

Source	Name	SensorType	Units	Range	Sensitivity
Destination	Name	Sensor Type	Unit	Range	Sensitivity
1	SensorA	Voltage	Nm	20	50
2	SensorB	Voltage	kg	1000	10
3	SensorC	Current	PSI	100	30
4	SensorD	Current	Pa	10	200

Figure 3.114: Setting destination fields

6 Define the following sensortype conversion table (see Figure 3.115):

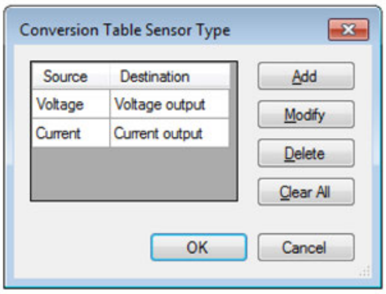


Figure 3.115: Conversion Table Sensor Type menu

7 Now you can import the sensors into the Perception Sensor Database.

A CSV Import

A.1 Introduction

With CSV import, you can import a file which contains the point to be used in the Tabular linearization.

The **Quick CSV Import** dialog is shown when the CSV button is pressed.

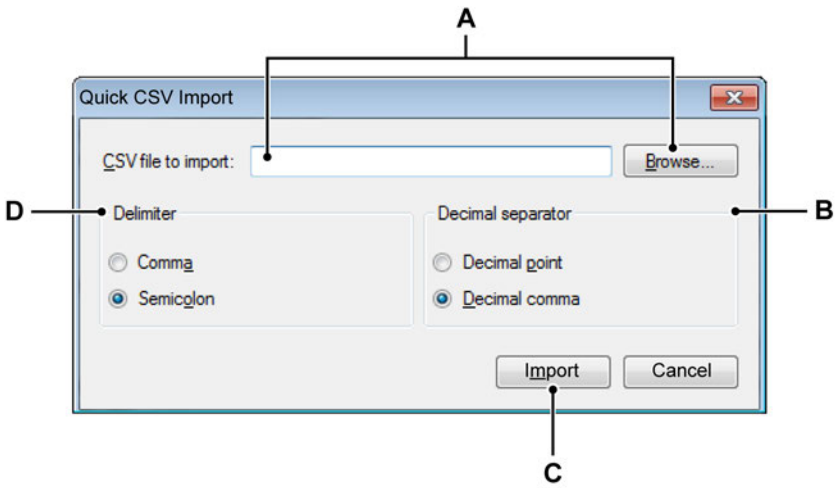


Figure A.1: Quick CSV Import

A Insert filename or browse for CSV file to import

B Decimal separator

C Import

D Delimiter

A.1.1 Import a CSV file

A Select the **CSV file to import**
Select the file to import by entering the full path here.

Note *Values in the CSV file are retrieved by reading all the text in the file and splitting it into the “delimiter” and “carriage return line feeds”.*

OR

Click **Browse...** to navigate to the desired reference document.

B **Decimal separator**
Decimal point or decimal comma as decimal separator.

C Import
Import the selected CSV file with the options selected.

Note *The **Import** button is only enabled when the selected CSV file exists.*

D Delimiter
Decimal point or decimal comma as decimal separator. Select if the values in the CSV file contain a decimal point or decimal comma as decimal separator.

A.1.2 Examples

For example, when you use the following two CSV files:

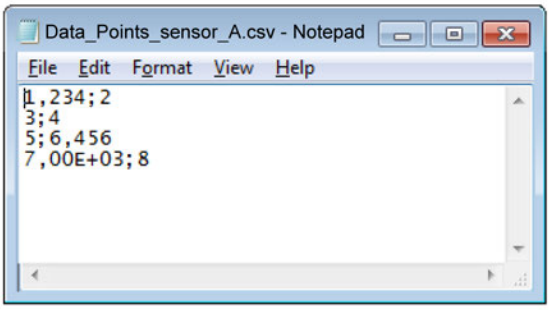


Figure A.2: CSV file (example 1)

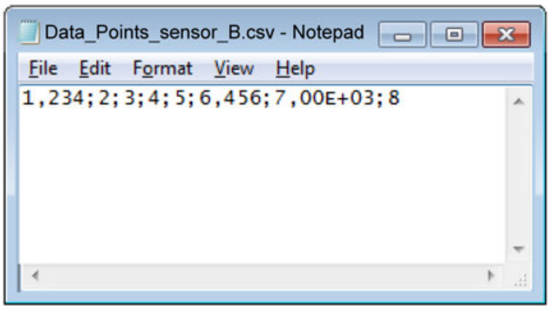


Figure A.3: CSV file (example 2)

The following setup is required (see Figure A.4):

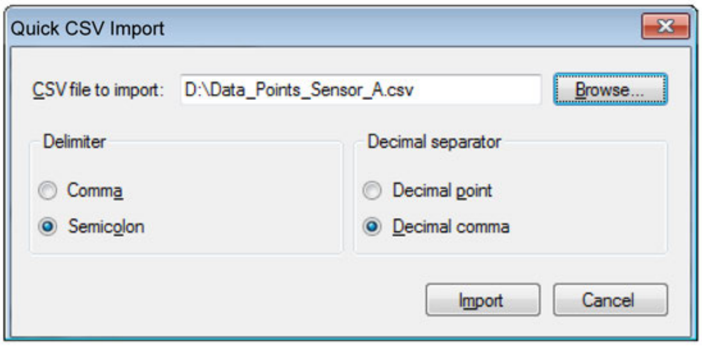


Figure A.4: Quick CSV Import

Which results in the following CSV Import (see Figure A.5):

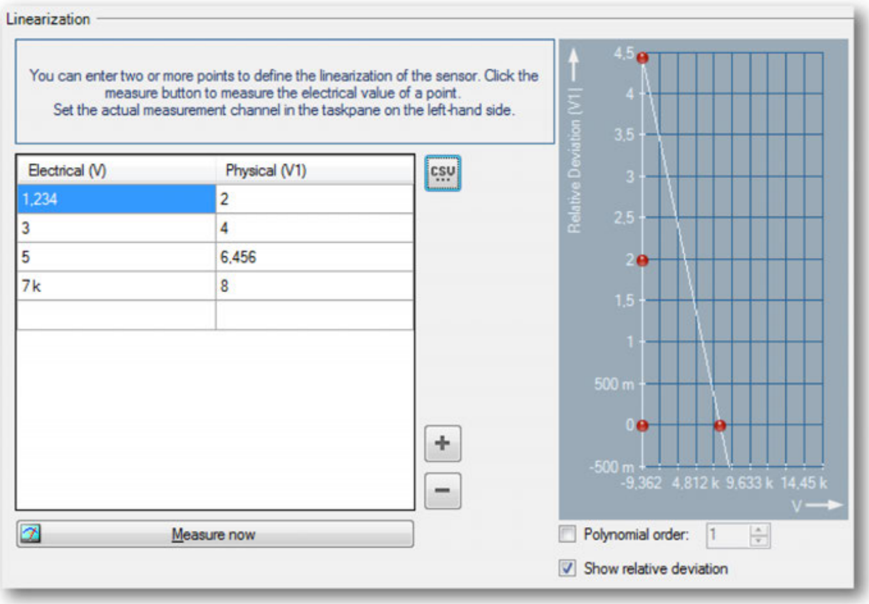


Figure A.5: CSV Import result

If the wrong settings are selected (Comma delimiter instead of Semicolon), as shown in Figure A.6:

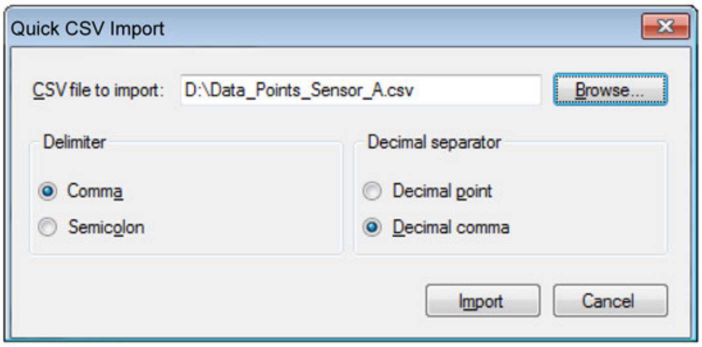


Figure A.6: Quick CSV Import - Wrong settings

The Quick CSV Import will generate an error message (see Figure A.7):

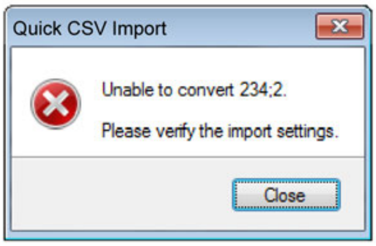


Figure A.7: Quick CSV Import - Error message

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