# PENKO Engineering B.V.

Your Partner for Fully Engineered Factory Solutions


## Manual:
## SIGMA4 Smart Junction Box

PENKO
an ETC Company

## IMPORTANT SAFETY INFORMATION

**READ THIS PAGE FIRST!**

PENKO Engineering B.V. manufactures and tests its products to meet all applicable national and international standards. It is vital that this instrument is correctly installed, used, and maintained to ensure it continues to operate to its optimum specification.

The following instructions must be adhered to and incorporated into your safety program when installing, using, and maintaining PENKO products. Failure to follow the recommended instructions can affect the system's safety and may increase the risk of serious personal injury, property damage, damage to this instrument and may invalidate the product's warranty.

• Read the instructions fully prior to installing, operating, or servicing the product. If this Instruction Manual is not the correct manual for the PENKO product you are using, call 0031(0)318-525630 for a replacement copy. Keep this Instruction Manual in a safe place for future reference.

• If you do not fully understand these instructions, contact your PENKO representative for clarification.

• Pay careful attention to all warnings, cautions, and instructions marked on and supplied with the product.

• Inform and educate your personnel about the correct installation, operation, and maintenance procedures for this product.

• Install your equipment as specified in the installation instructions of the appropriate Instruction Manual and as per applicable local and national codes. Connect all products to the proper electrical sources.

• To ensure correct performance, use qualified personnel to install, operate, update, program, and maintain the product.

• When replacement parts are required, ensure that qualified technicians use replacement parts specified by PENKO. Unauthorized components and procedures can affect the product's performance and may affect the continued safe operation of your processes. The use of non-specified 'look-alike' substitution parts may result in the risk of fire, electrical hazards, or improper operation.

• Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

## WARNING

**ELECTRICAL SHOCK HAZARD**

Installing cable connections and servicing this instrument require access to shock hazard level voltages which can cause death or serious injury.

Disconnect separate or external power sources to relay contacts before commencing any maintenance.

The electrical installation must be carried out in accordance with CE directions and/or any other applicable national or local codes.

Unused cable conduit entries must be securely sealed by non-flammable blanking plates or blind grommets to ensure complete enclosure integrity in compliance with personal safety and environmental protection requirements.

To ensure safety and correct performance this instrument must be connected to a properly grounded, three-wire power source.

Proper relay use and configuration is the responsibility of the user.

Do not operate this instrument without the front cover being secured. Refer any installation, operation or servicing issues to qualified personnel.

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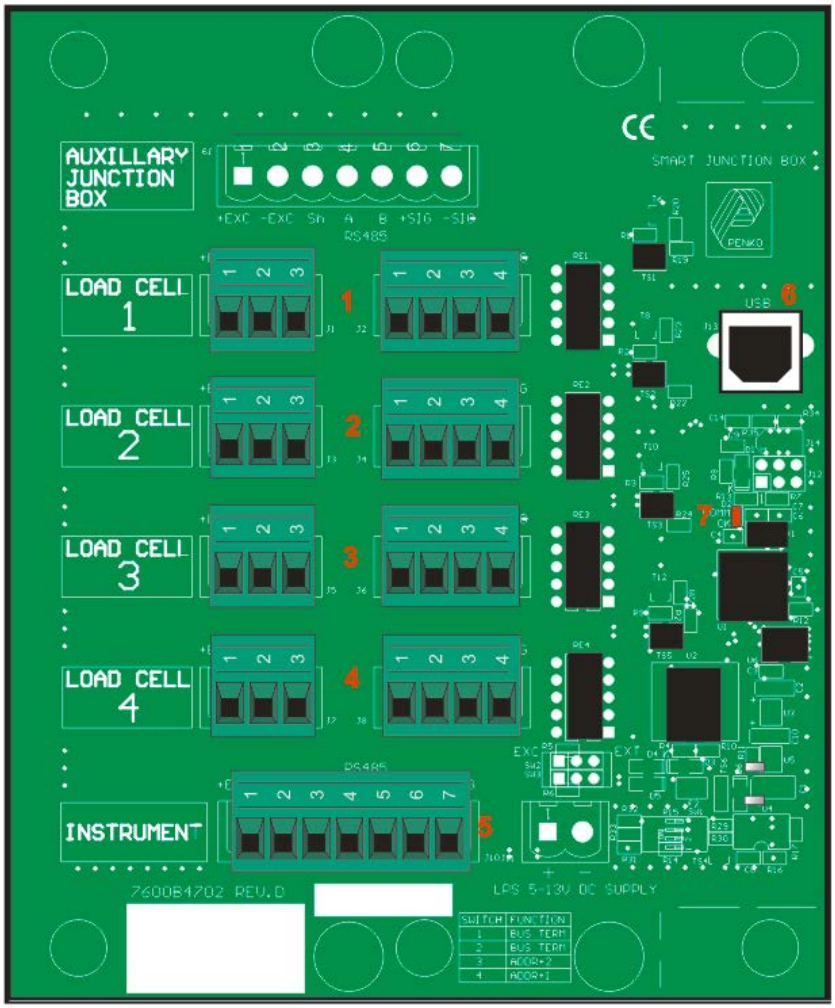
## Table of Contents

## Introduction

The PENKO SIGMA4 Junction Box is a connection box for up to four load cells. The box supports regular and TEDS (Transducer Electronic Data Sheet) load cells. The box can be added to a PENKO 1020 device through the RS422 interface. Adding the box to a PENKO indicator adds the following functionality:

- Calibration by means of TEDS (Transducer Electronic Data Sheet)
- Connecting multiple load cells
- Measuring each individual load cell to determine defects
- Disconnecting defective load cells
- Load cell test measurements can be logged to determine deterioration over time.
- Backup storage of all instrument settings in the Junction box
- On installing a new instrument of the same type, the backup from the Junction Box can be programmed into the instrument.

# 1 Overview




| Number | Description |
|---|---|
| 1 | Load cell + TEDS interface 1 |
| 2 | Load cell + TEDS interface 2 |
| 3 | Load cell + TEDS interface 3 |
| 4 | Load cell + TEDS interface 4 |
| 5 | Instrument connection to connect the PENKO indicator |
| 6 | USB A for direct PC communication |
| 7 | Power and Communication indicator |

# 2 Connections and options

This chapter describes the connections of the SIGMA4 Smart Junction Box.

## 2.1 Instrument connection

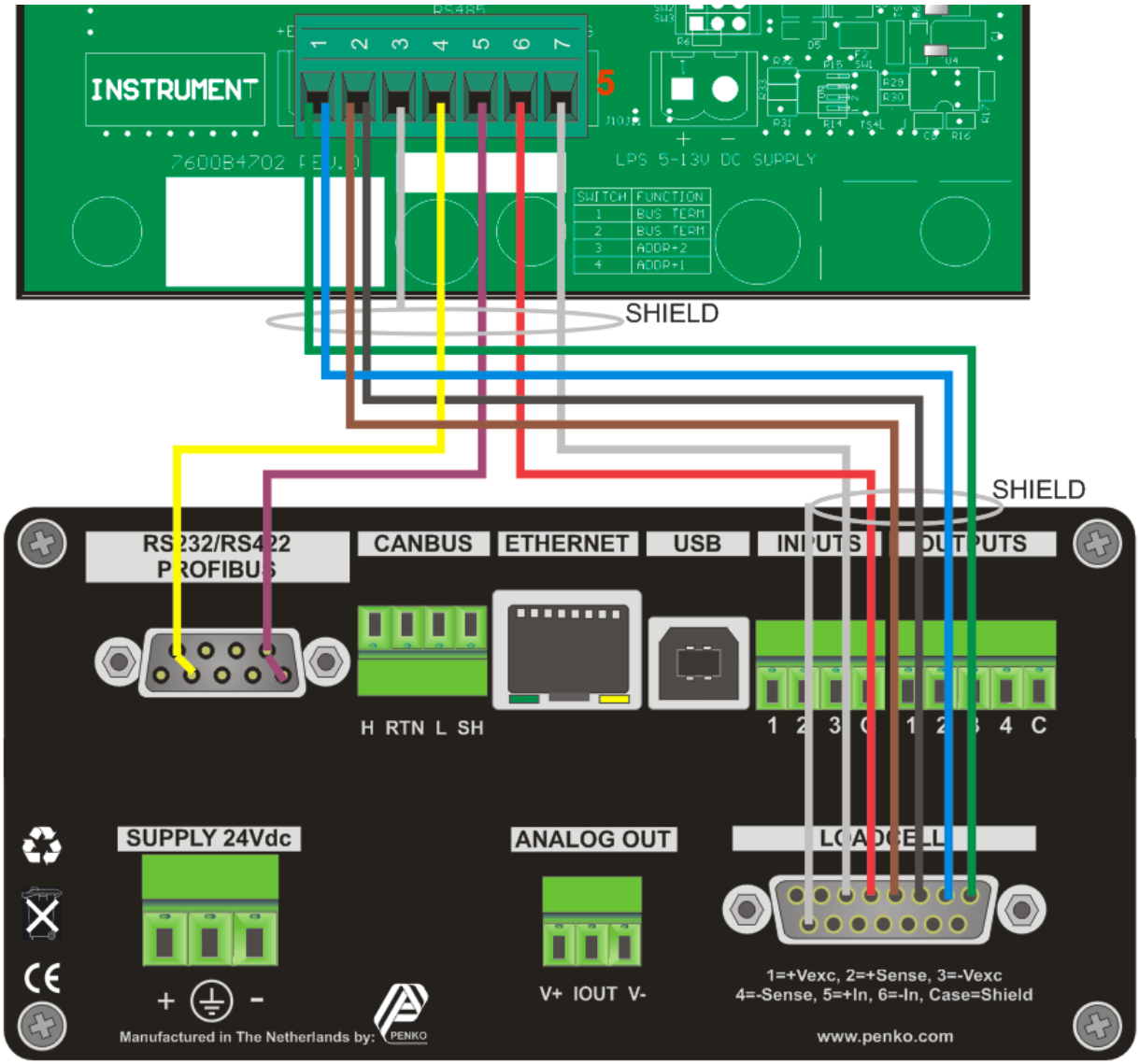
Connect the SIGMA4 Smart Junction Box to a PENKO indicator using the junction box instrument connection and the PENKO device load cell connection + RS422 connection.


| Number | Description |
|---|---|
| 1 | +Excitation |
| 2 | -Excitation |
| 3 | Shield |
| 4 | A |
| 5 | B |
| 6 | +Signal |
| 7 | -Signal |

Connections:

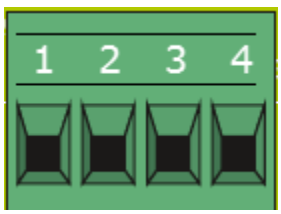
| SIGMA4 | PENKO indicator |
|---|---|
| 1 | Load cell +excitation |
| | Load cell +sense |
| 2 | Load cell -excitation |
| | Load cell -sense |
| 3 | Load cell shield (any pin from 9 - 15 or case) |
| 4 | RS422 pin 1 + 6 |
| 5 | RS422 pin 4 + 9 |
| 6 | Load cell +signal |
| 7 | Load cell -signal |

Connection example PENKO 1020 indicator:




## 2.2 Load cell and TEDS connection

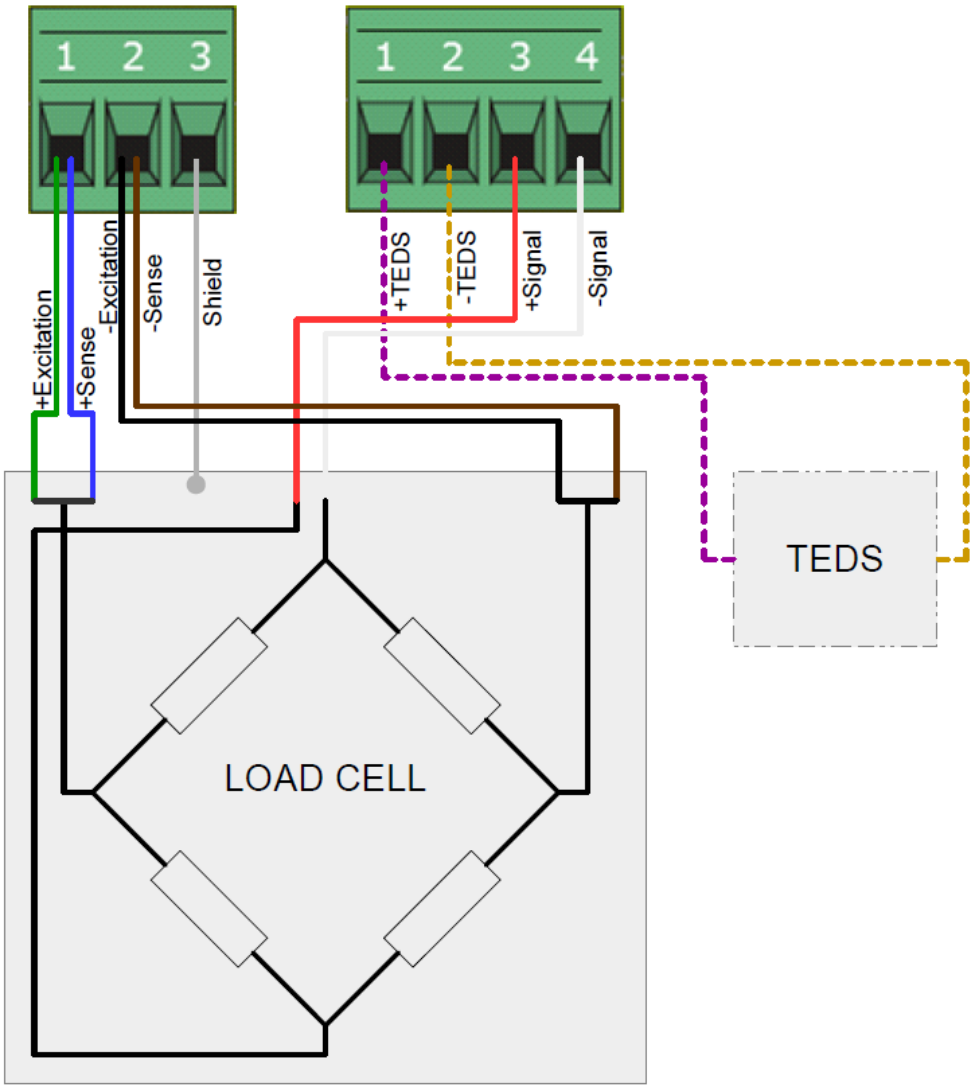
Up to four load cells can be connected.

| Number | Description |
|---|---|
| 1 | +Excitation |
| 2 | -Excitation |
| 3 | Shield |
| | |
| 1 | T+ (TEDS) |
| 2 | T- (TEDS) |
| 3 | +Signal |
| 4 | -Signal |

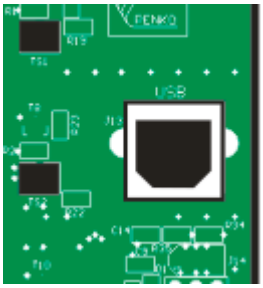
All four load cells can be a regular load cell or a TEDS load cell. If a TEDS interface is connected, the PENKO indicator detects this automatically.

Load cell connection. The TEDS interface is optional.



## 2.3 SIGMA4 USB connection

The USB interface is used for communication with PENKO configuration software. This socket accepts a USB-B type connector.




Before connecting the device to a computer using USB, make sure the USB driver is installed. The driver is included in the PENKO configuration PC applications, see chapter PC applications.

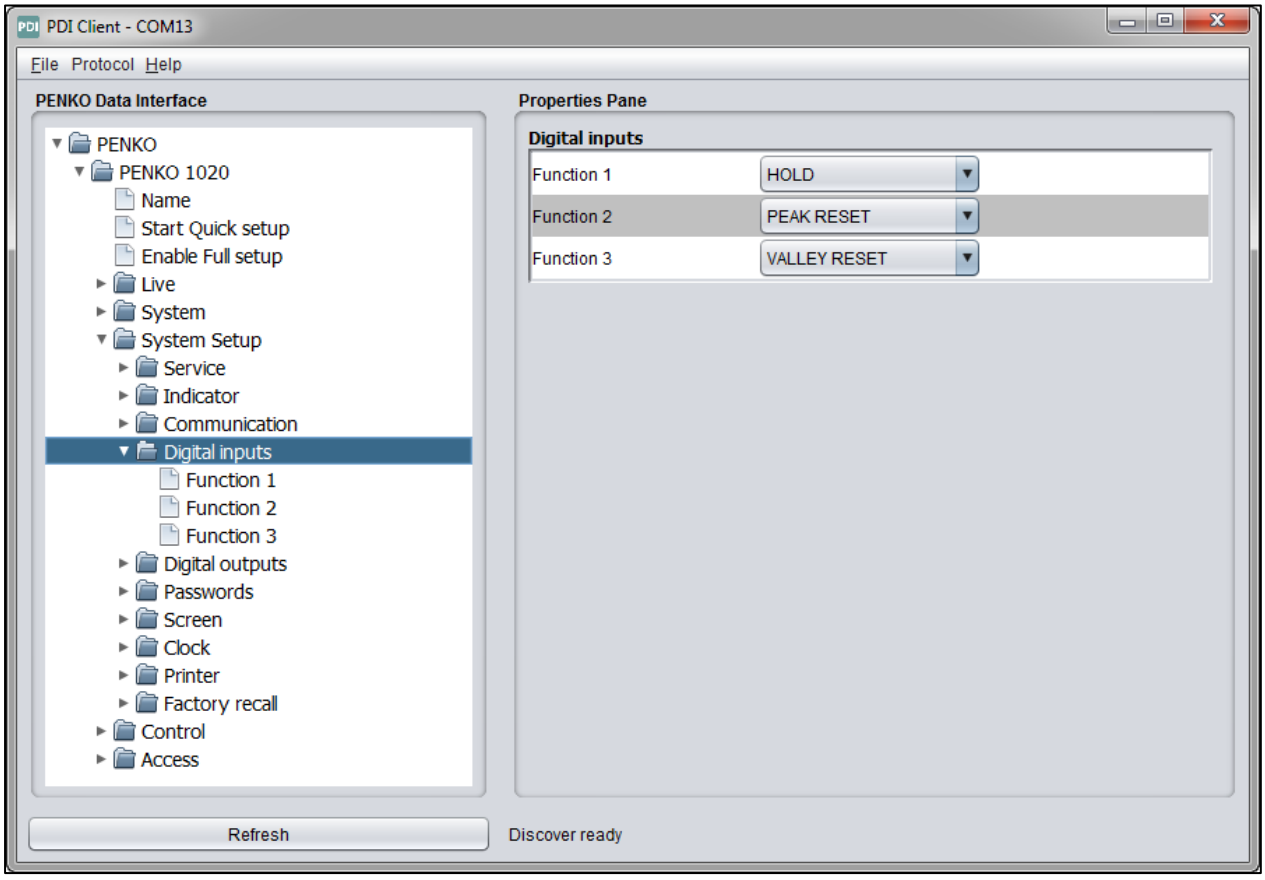
# 3 PC applications

For easy configuration and monitoring, two PC applications are available as download. PDI Client and Pi Mach II. In the following chapters, Pi Mach II is used to demonstrate the SIGMA4 Smart Junction Box functionality.

www.penko.com/software

## 3.1 PDI Client

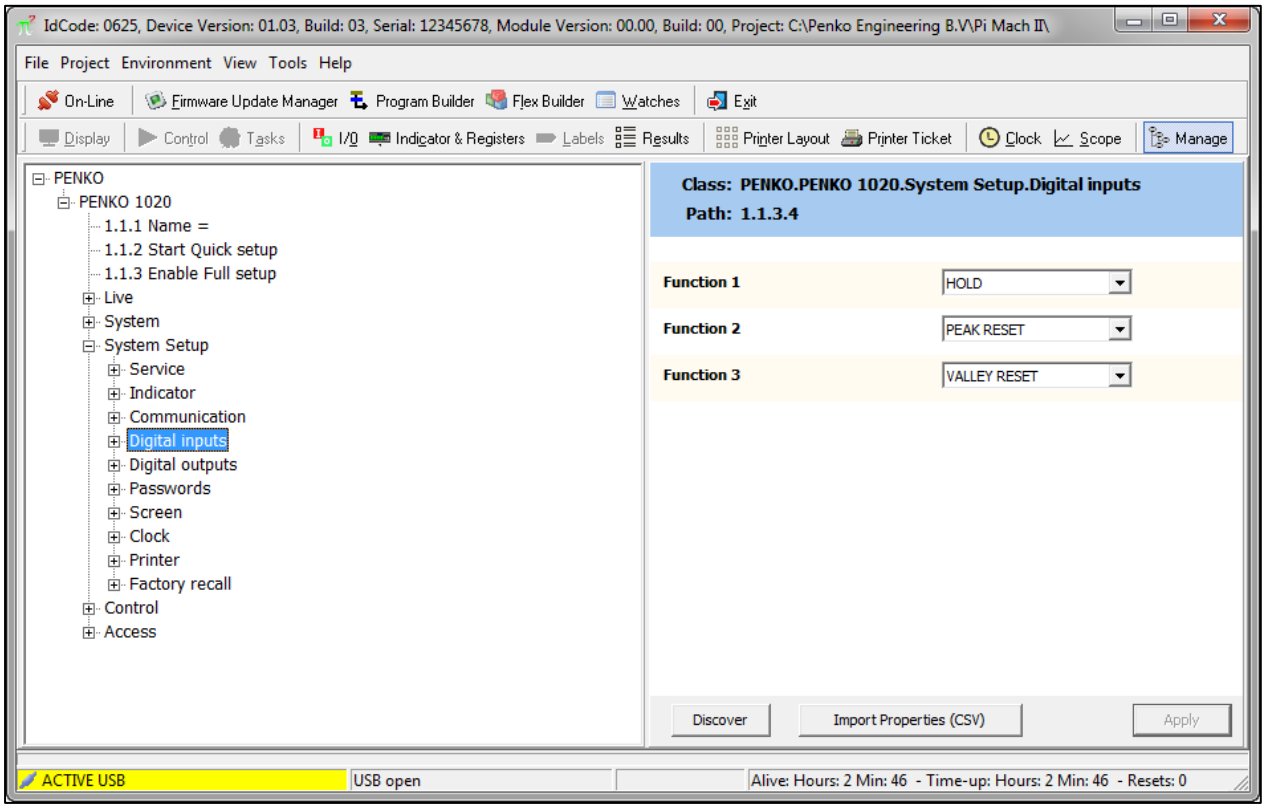
PDI client is a small cross-platform application that only works with USB communication. It can run on any operating system that runs Java Runtime Environment (JRE). All device properties are shown in a tree structure and can easily be edited.




USB driver and user manual are included in the download

## 3.2 Pi Mach II

Pi Mach II is a comprehensive Windows application that works with USB and Ethernet communication and has more functionality compared to PDI Client. The tree structure configuration of PDI Client is available in this program. Other features are backup and restore, firmware updates and a build in oscilloscope to analyze signals for different filter settings.



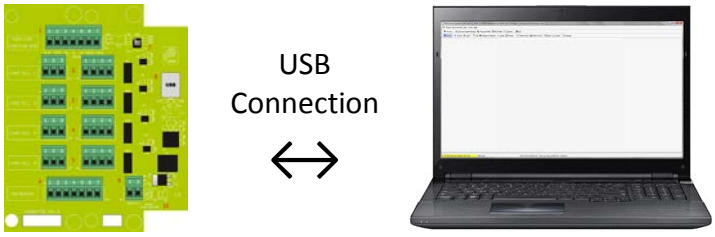

USB driver and user manual are included in the download

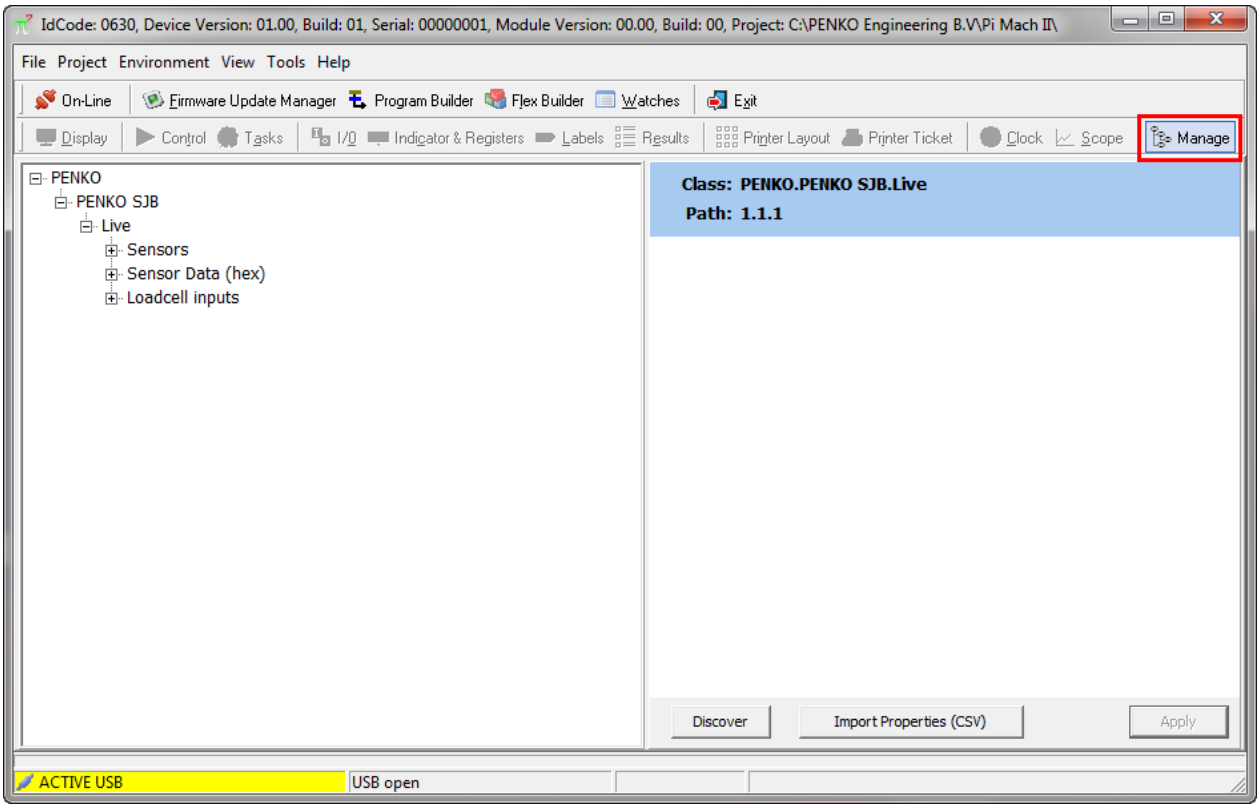
# 4 Configuration

This chapter describes all configuration settings. All examples are made with the PENKO 1020 indicator and PENKO Pi Mach II software.

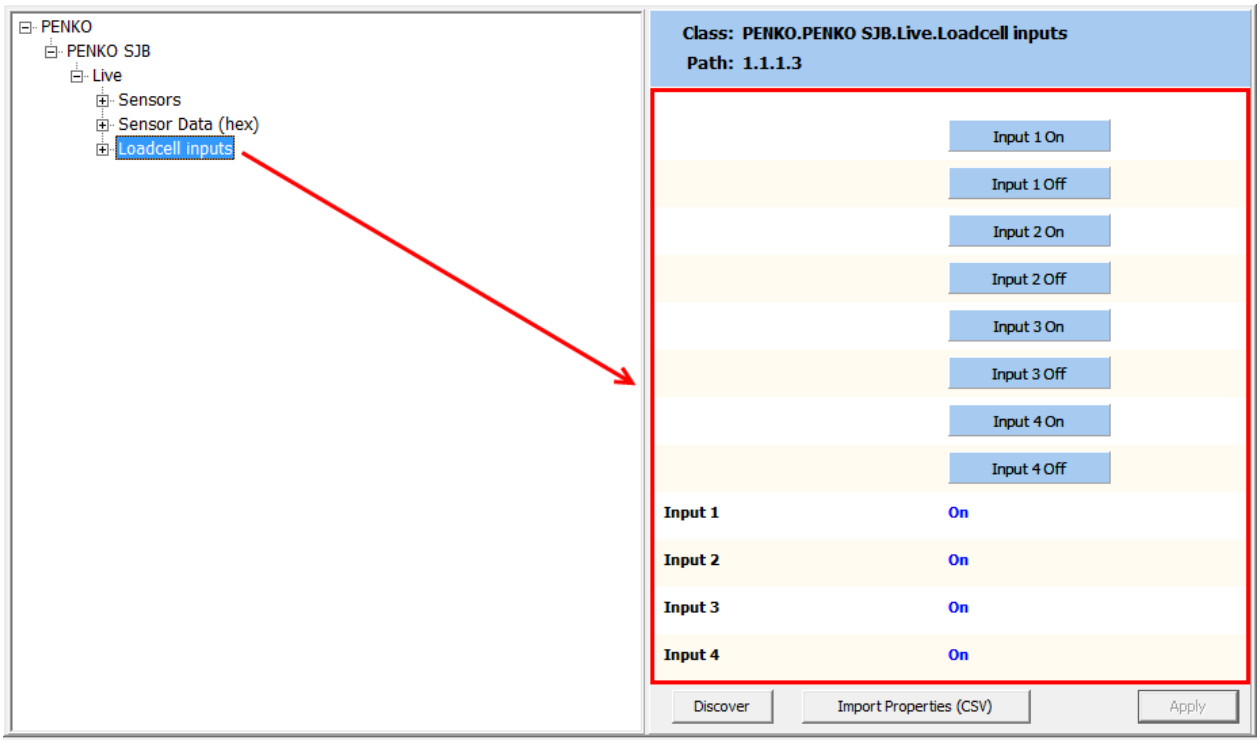
## 4.1 SIGMA4 Live data

Although the configuration of the SIGMA4 Junction Box is done via the connected indicator, the box itself provides some basic live data. Make sure Pi Mach II and the USB driver are installed properly as described in the Pi Mach II user manual. Open Pi Mach II and open Manage. If a USB device is connected, this device will automatically be connected.



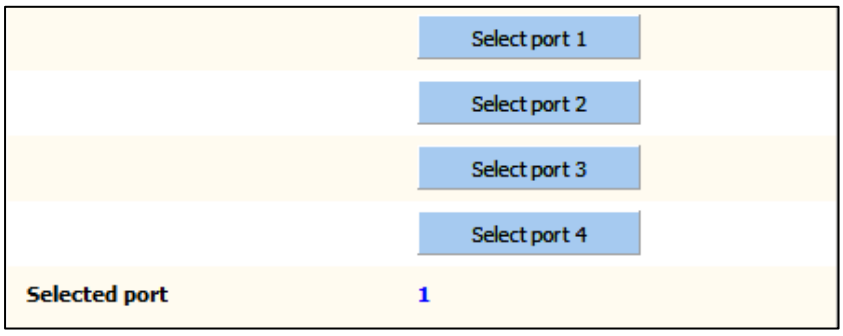
The left screen shows the device configuration in a tree structure. The right screen shows the properties of the selected item in the left screen. For example the live load cell information:




### 4.1.1 Sensors

The Sensors node provides various sensor data.

Select one of the four ports:



Read the TEDS information of the selected port:

| | |
|---|---|
| | Read TEDS 1 |
| | Read TEDS 2 |
| | Read TEDS 3 |
| | Read TEDS 4 |
| | Read TEDS 5 |
| | Read TEDS 6 |
| **Number of TEDS** | 001 |
| **TEDS 1** | 23e1aba0010000f7 |
| **TEDS 2** | - |
| **TEDS 3** | - |
| **TEDS 4** | - |
| **TEDS 5** | - |
| **TEDS 5** | - |
| **TEDS 6** | - |

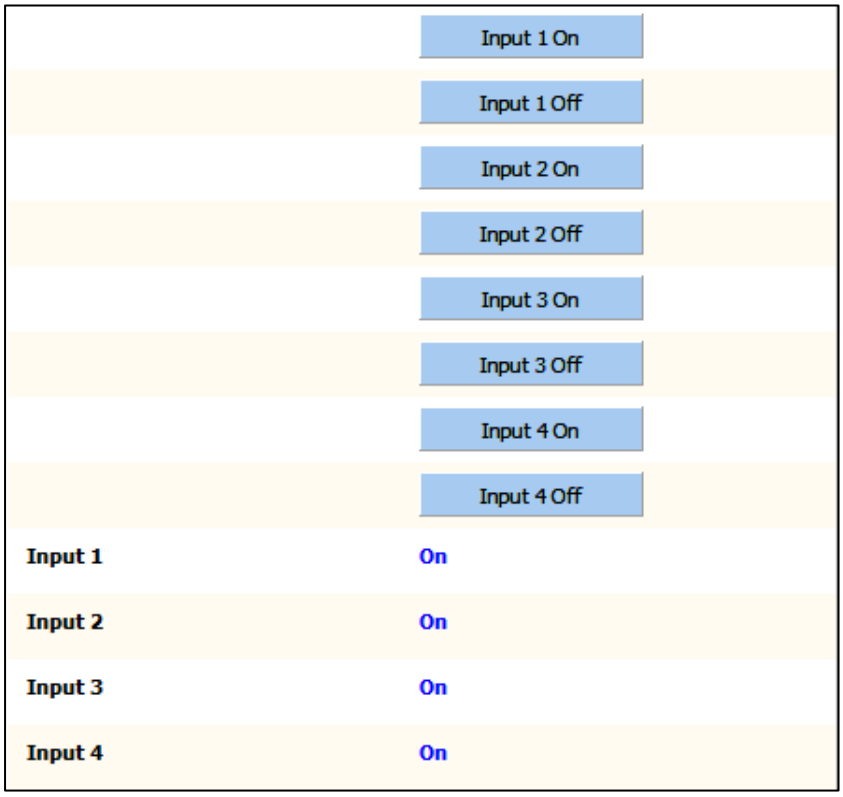
### 4.1.2 Sensor Data (hex)

The Sensor Data node provides the raw hexadecimal TEDS sensor data:

| | |
|---|---|
| **000** | c3 1f 00 81 00 00 00 00 |
| **008** | 00 00 00 00 00 84 38 00 |
| **010** | 00 84 38 00 00 00 00 00 |
| **018** | 00 00 00 00 00 48 42 02 |
| **020** | 00 48 42 02 00 00 00 bc |

### 4.1.3 Load cell inputs

The Load cell inputs node provides the input status of the four inputs and the possibility to enable or disable the inputs:



## 4.2 1020 configuration

The configuration of the junction box is done with the connected indicator. This can be done on the device or with the computer.

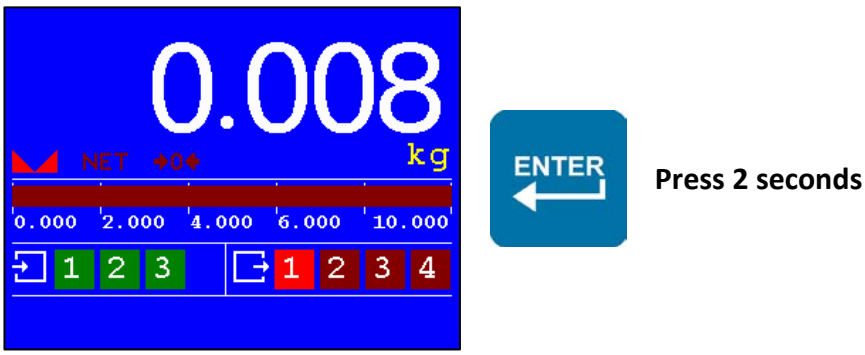

### 4.2.1 Communication settings

The indicator and junction box communicate using the RS-422/RS-485 port and the TP-Master protocol. This protocol is enabled by default in the indicator. By changing this protocol, the communication with the junction box is disabled.

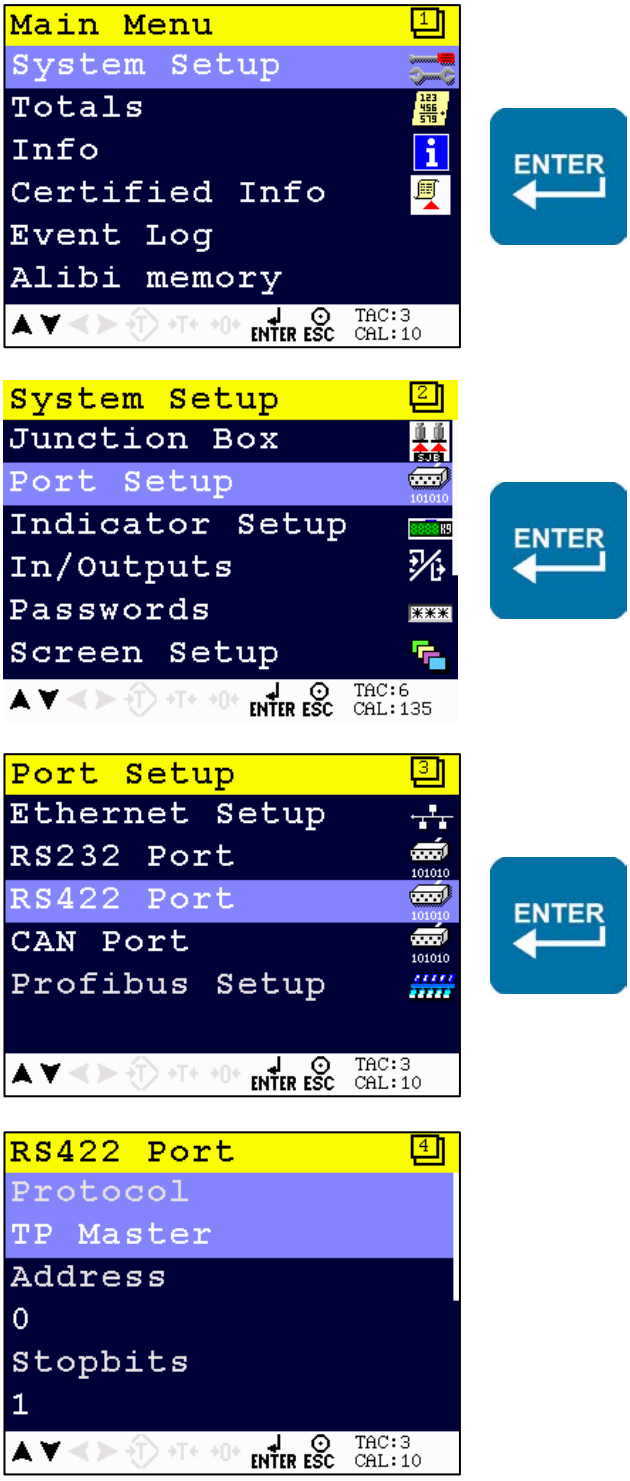
Setting:

| Parameter | Value |
|---|---|
| Protocol | TP Master |
| Address | 0 |
| Stopbits | 1 |
| Parity | None |
| Baudrate | 38400 |
| Indicator | 0 |

#### *4.2.1.1 Settings on the 1020 instrument:*



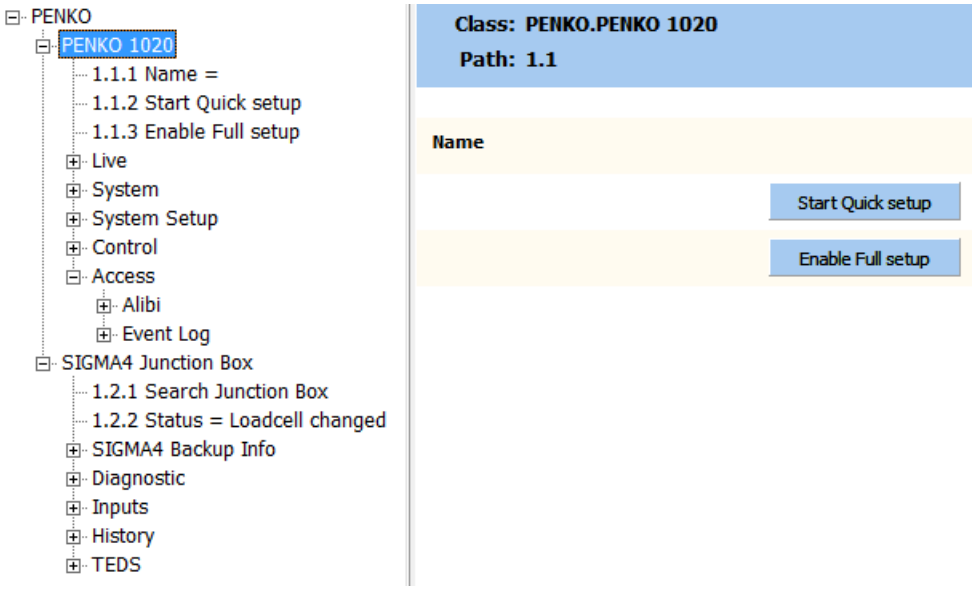

**Press 2 seconds**



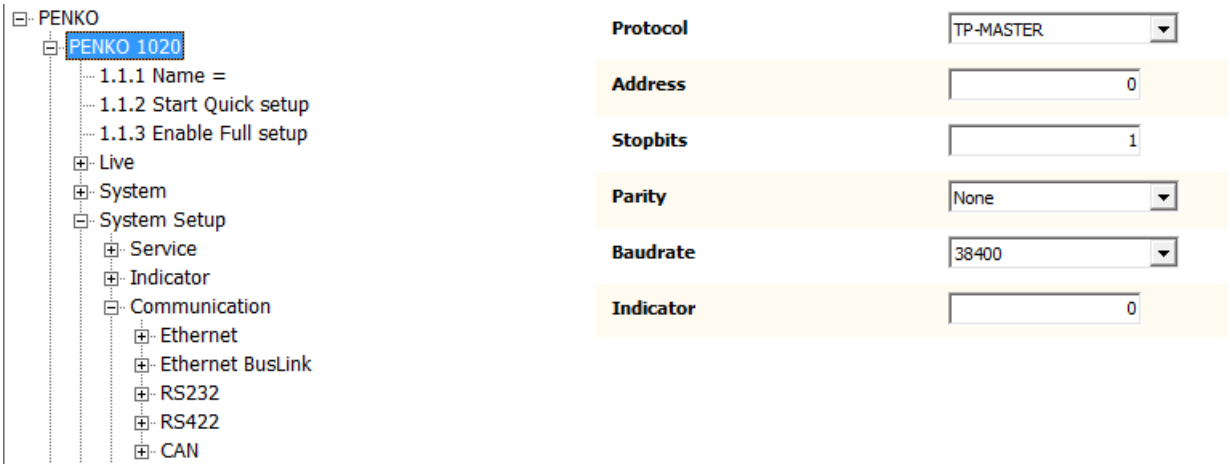

When TP-MASTER is selected, only the protocol setting is actually used. The other settings are not used.

### *4.2.1.2 Settings on PC using 1020 with Pi Mach II:*

Select the PENKO 1020 node and click Enable Full Setup:




Go to System Setup - Communication - RS422:

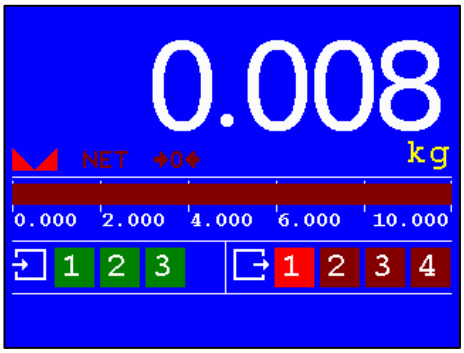



When TP-MASTER is selected, only the protocol setting is actually used. The other settings are not used.

### 4.2.2 Load cell selection

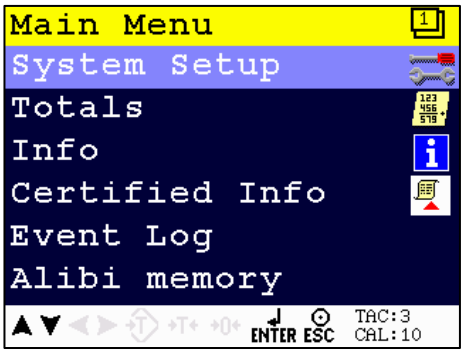
All four load cells can be enabled or disabled manually.

#### *4.2.2.1 Selection on the 1020 instrument:*

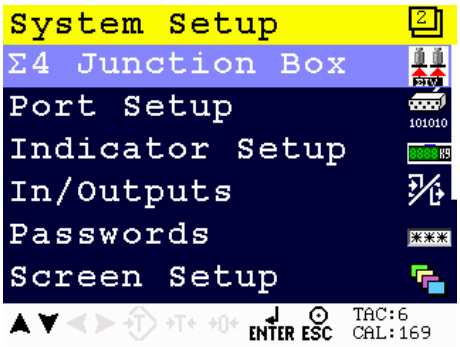




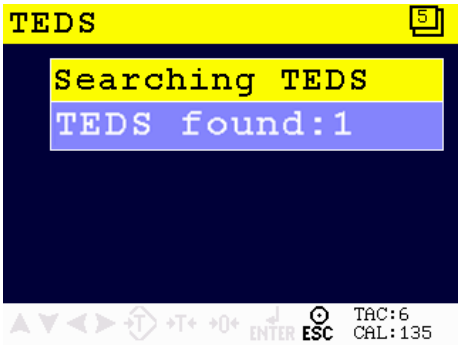
**Press 2 seconds**



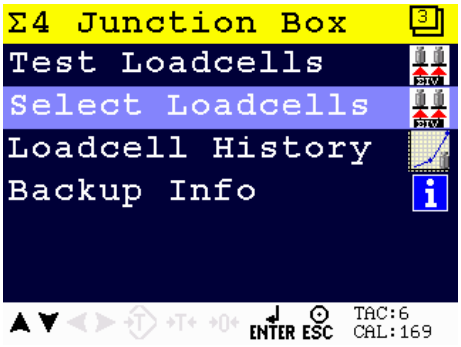




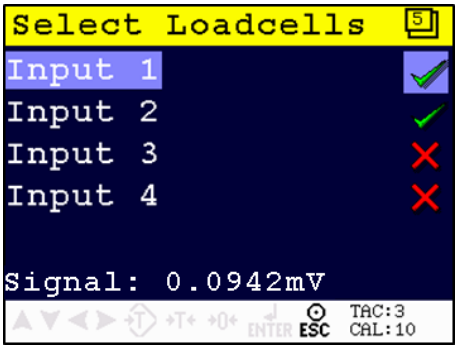





Before entering the menu, the TEDS data is read

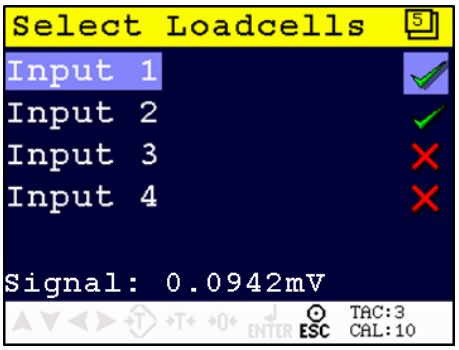






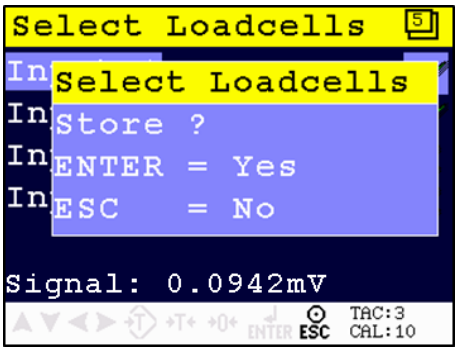

**Use the**  **and**  **key to select the input.** 

**toggles the input ON or OFF**





**Press ESC to leave the selection screen**

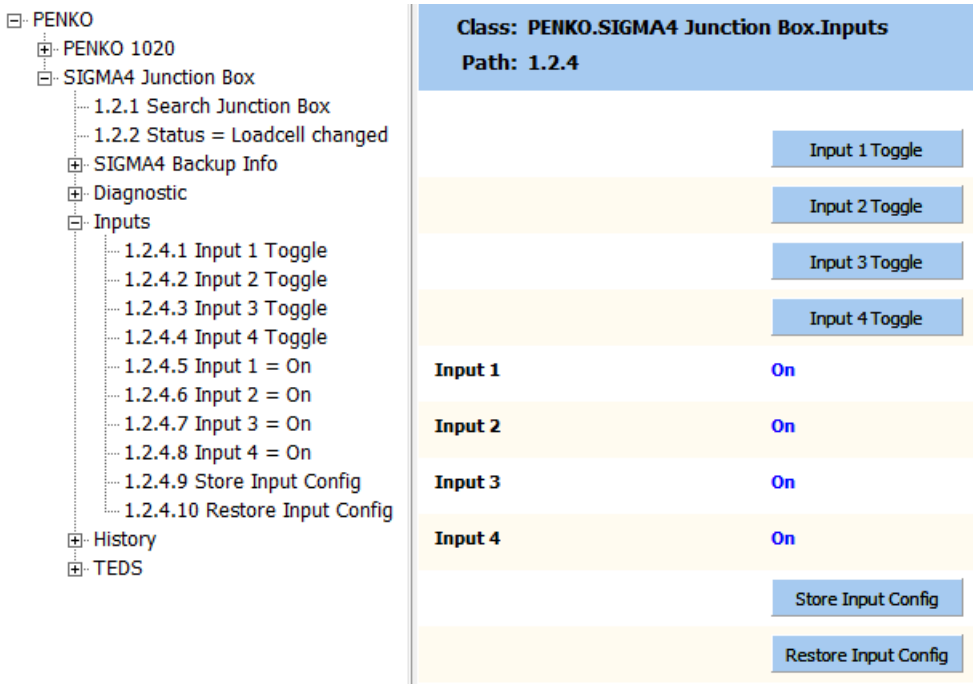




Or


**ENTER saves the input selection as default**
**ESC restores the last saved setting**

#### *4.2.2.2 Selection on PC using 1020 with Pi Mach II:*




'Store Input Config' stores the currently selected load cells as default. This way, after power on only the selected load cells are connected.

'Restore Input Config' selects the previously stored setting and switches the inputs accordingly.

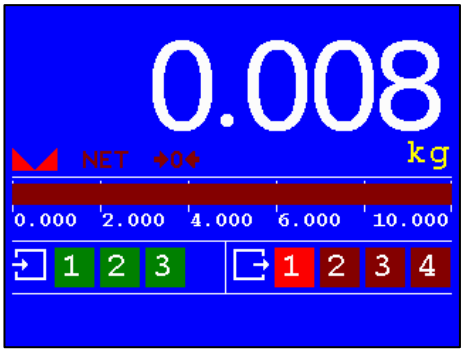
### 4.2.3 Load cell test

The connected load cells can be automatically tested one by one. If a load cell has a significant deviation, it is marked as suspicious. If more load cells have a significant deviation, all will be marked as suspicious.

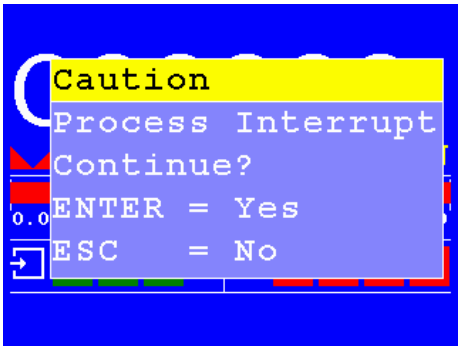
#### *4.2.3.1 Quick test*

The load cell test can be started directly from the main screen.

A controller already has to be in STOP mode (by pressing arrow down). An indicator can always access the load cell test:

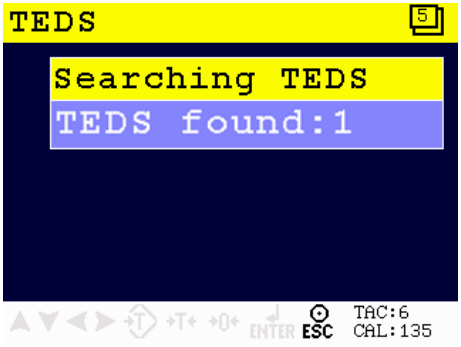



**Press 2 seconds**

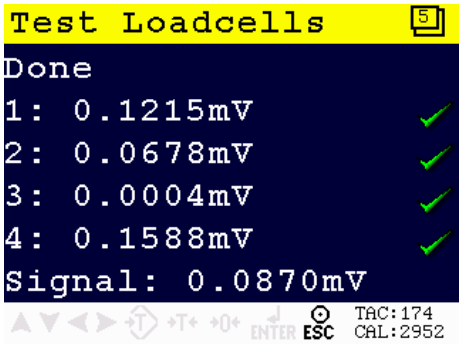




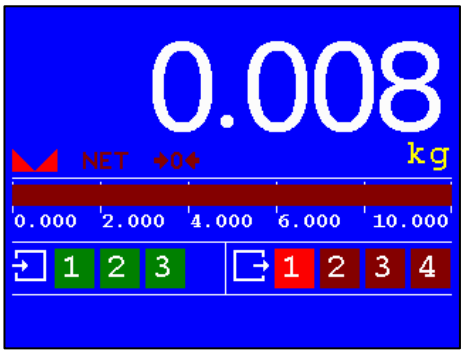
**Press ENTER to continue**




Before testing,the TEDS data is read

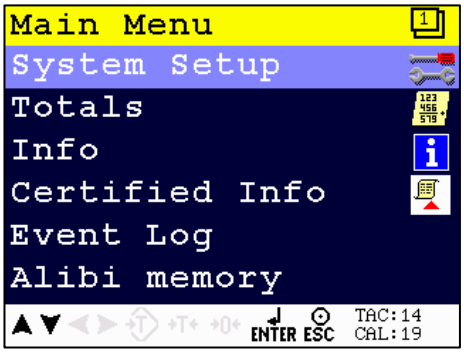


### *4.2.3.2 Load cell test on the 1020 instrument:*

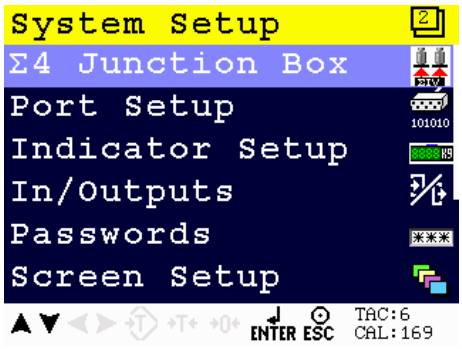




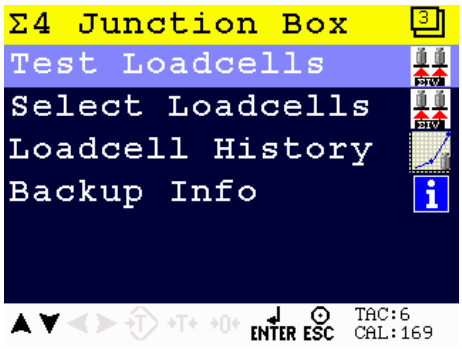
**Press 2 seconds**













**The load cell test starts**

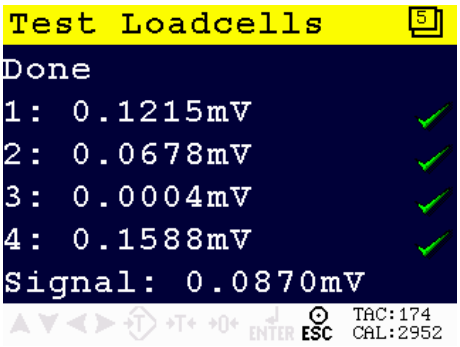
This test takes about 12 seconds for each load cell. There are 3 stages to each load cell test.

1. During the first 2 seconds of the test, the instrument is checking for an open connection which could indicate defects in the load cell wiring.
2. Then there is a 5 second wait to get a stable reading. This also accounts for the filter settings of the instrument.
3. During the last 5 seconds, the load cell average and variation are measured. During measurement, the current measured value is shown. After this stage the average value remains on screen as other load cells are tested.

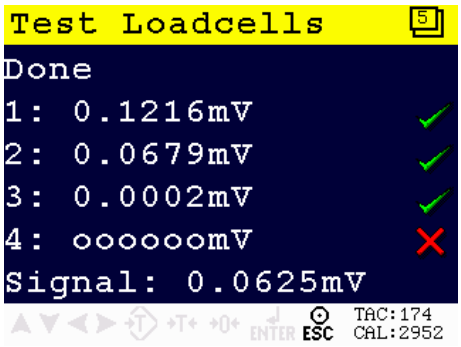
During testing, the current mV value is shown by default. After completion of the test cycle the load cell test evaluation is also shown.

**Examples:**

**Result - all load cells OK:**




**Result - Load cell 4 disconnected or defective:**



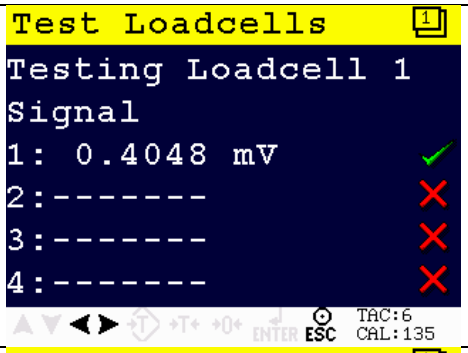
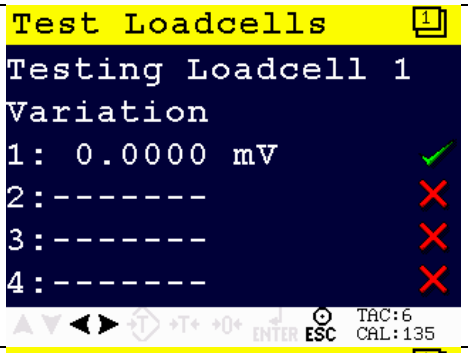
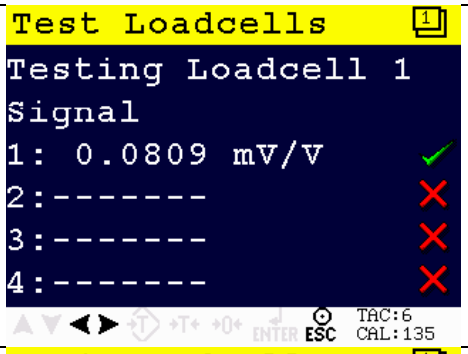
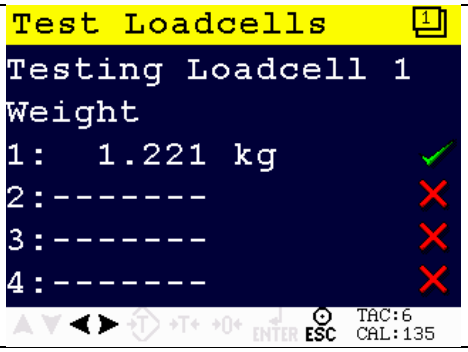

The test can be interrupted by pressing 

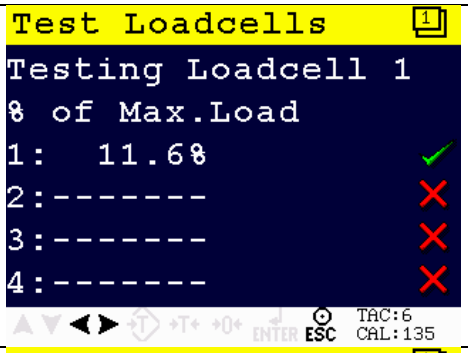
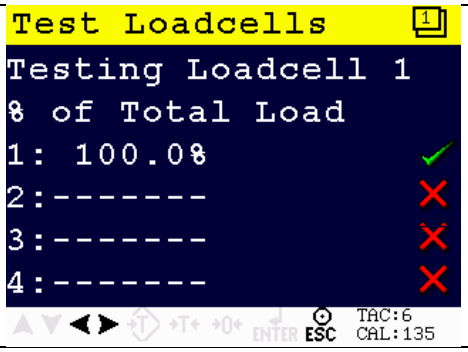
.

When the test is completed, the 

key is used to exit the test menu.

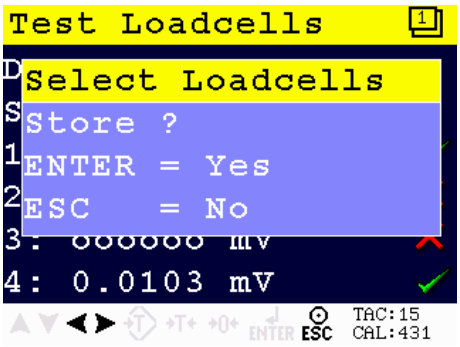
By pressing  or  the display value can be switched to show as:

| | | |
|---|---|---|
| Signal in mV |  | This shows the in the load cell output signal in mV. The 1020 uses a 5V excitation voltage |
| Variation in mV |  | This shows the variation in the load cell output signal during the last 5 seconds of the load cell test. This number should be close to 0. Large numbers can indicate electrical interference, bad cables or a load cell defect. |
| Signal in mV/V |  | This shows the in the load cell output signal in mV/V. This is the basic measurement unit of the instrument. |
| Weight |  | This shows the measured weight on the loadcell. When multiple loadcells are connected in parallel, the resulting weight is the average of all 4 loadcells. |

| | | |
|---|---|---|
| % of maxload |  | This shows load on the load cell as a percentage of its rated maximum load |
| % of total load |  | This shows load on the load cell as a percentage of the total load on the functioning load cells |

Measured values can also show the following errors:

| | | |
|---|---|---|
| oooooo | Overload | The load cell input measures a signal that is above its maximum measuring range. |
| uuuuuu | Underload | The load cell input measures a signal that is below its minimum measuring range. |
| cccccc | Calibration Error | This is only shown during weight display when the instrument is not calibrated correctly. |
| ------ | Invalid | Open circuit detect failed. The load cell input measures an open circuit or a signal that is above its maximum measuring range. |
| | No readout | This input has not been tested yet. |



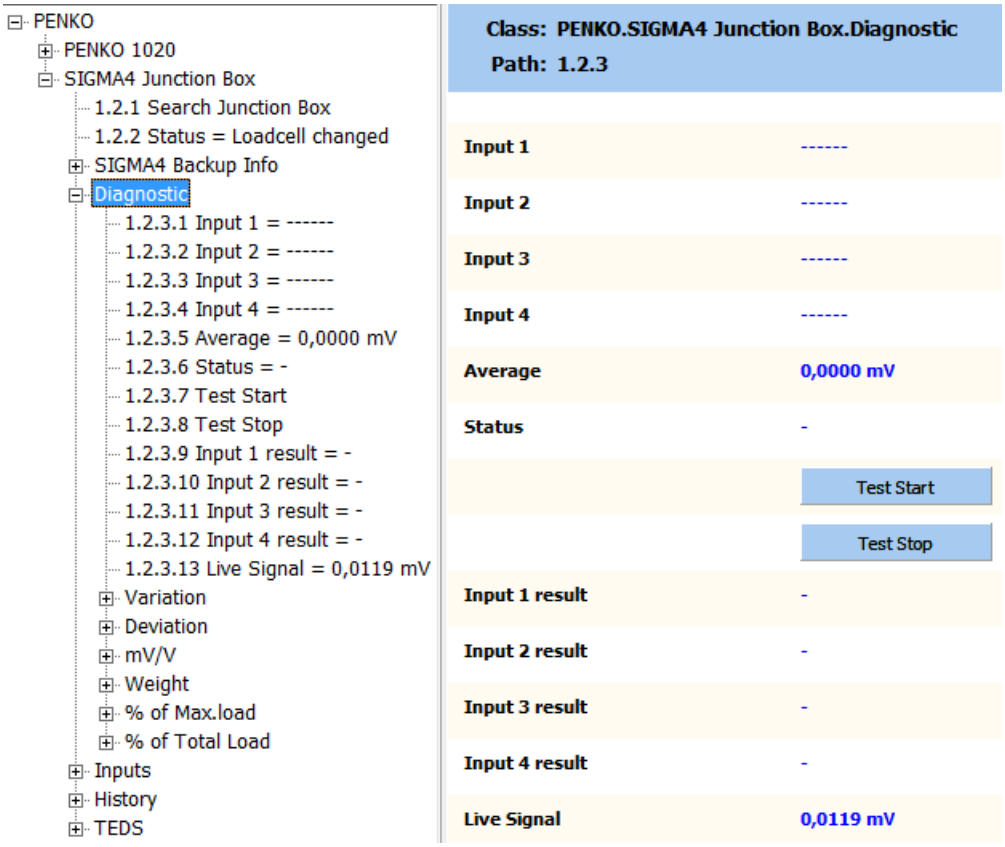
When 

is pressed, only the load cells marked with  are enabled and this setting is stored as the new default.

When 

is pressed the inputs are restored to their last saved settings.

### *4.2.3.3 Loadcell test on PC using 1020 with Pi Mach II:*

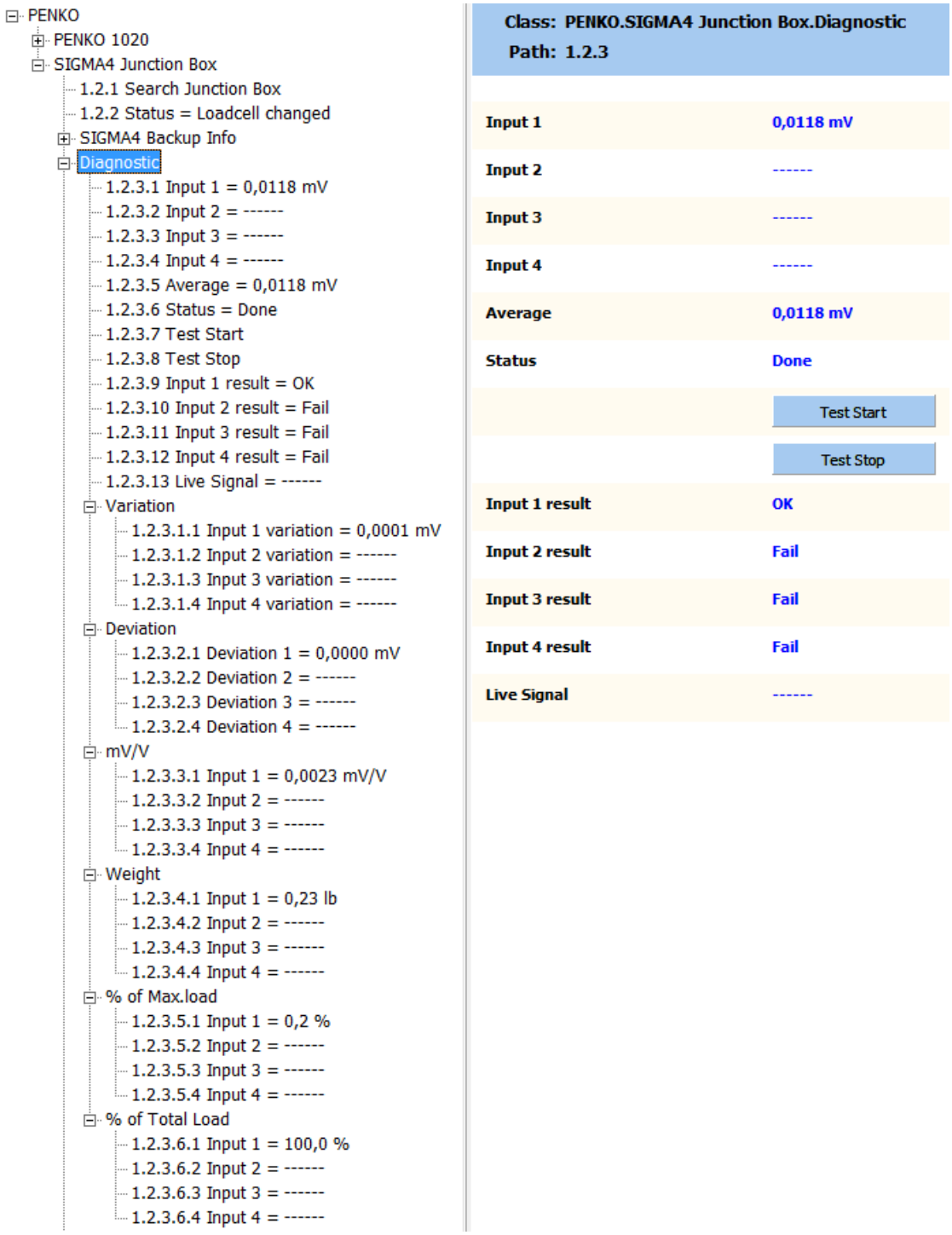



- *Input 1* to *Input 4* show signal in mv from each load cell. When the signal is out of range, no load cell is connected or a test has not yet been performed, '------' is shown.
- *Average* shows the average of all load cells that are generating a valid signal
- *Status* shows which loadcell is currently being tested
- *Test Start* and *Test Stop* are used to start and stop the load cell test
- *Input 1 result* to *Input 4 result* show the test results after evaluation. This information is updated after all 4 inputs have been tested

- *Live signal* shows the current input signal to the 1020. During the first phase of the test this value jumps up due to the open circuit test.

The submenus under Diagnostic can also be opened to show the Variation, Deviation from average, mV/V signal, weight, % of maxload and  % of total load of each load cell.

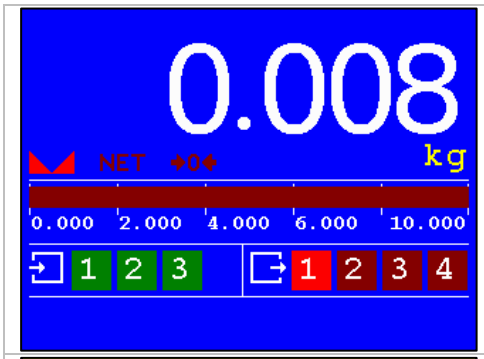
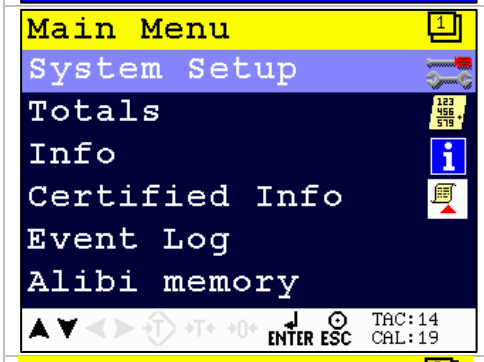
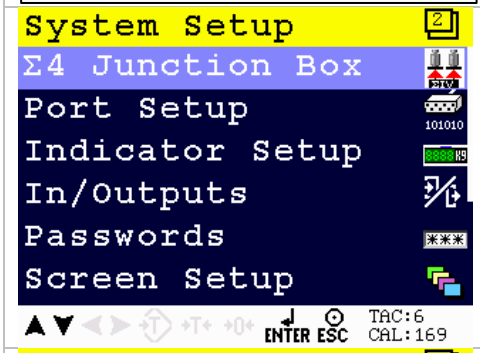
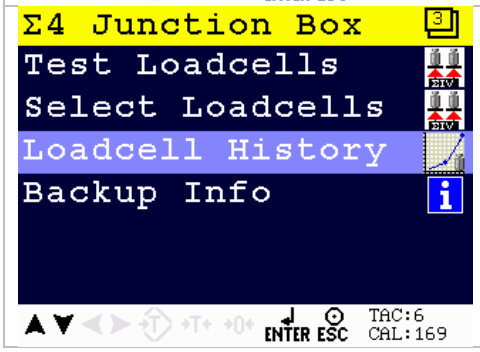
A large variation can indicate unstable construction, vibration, bad cabling or moisture ingress into the load cell electronics.

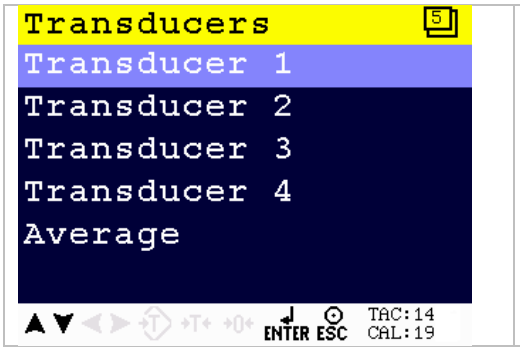



### 4.2.4 Load cell history overview

The result of the load cell tests performed on the instrument can be stored in the event log of the indicator. For an overview of a load cells performance, the last 10 test can be retrieved. When testing should always be done when the scale is empty or at the same load. This way changes in the signal over time can be observed.

#### *4.2.4.1 History on the 1020 instrument:*

| | | |
|---|---|---|
|  |  | **Press 2 seconds** |
|  |  | |
|  |  | |
|  |  | |





**Transducer 1**

| | Date: | Average | Variation | U |
|---|---|---|---|---|
| 01: | 24-09-15 | 0.1205 | ± 0.0000 | m |
| 02: | 24-09-15 | oooooo | ± 0.0000 | m |
| 03: | 24-09-15 | 0.1208 | ± 0.0000 | m |
| 04: | 22-09-15 | 10.0384 | ± 0.0000 | m |
| 05: | 22-09-15 | 10.0388 | ± 0.0000 | m |
| 06: | 22-09-15 | 10.0387 | ± 0.0000 | m |
| 07: | 22-09-15 | 10.0388 | ± 0.0000 | m |
| 08: | 14-09-15 | 0.1199 | ± 0.0000 | m |
| 09: | 14-09-15 | 0.1279 | ± 0.0000 | m |
| 10: | 14-09-15 | 0.1199 | ± 0.0000 | m |
| Avg: | | 4.5293 | ± 0.0000 | m |

**Transducer 2**

| | Date: | Average | Variation | U |
|---|---|---|---|---|
| 01: | 24-09-15 | 0.0673 | ± 0.0000 | m |
| 02: | 24-09-15 | 0.0677 | ± 0.0001 | m |
| 03: | 24-09-15 | 0.0677 | ± 0.0000 | m |
| 04: | 22-09-15 | 0.0814 | ± 0.0001 | m |
| 05: | 22-09-15 | 0.0814 | ± 0.0000 | m |
| 06: | 22-09-15 | 0.0815 | ± 0.0000 | m |
| 07: | 22-09-15 | 0.0814 | ± 0.0000 | m |
| 08: | 14-09-15 | 0.0672 | ± 0.0000 | m |
| 09: | 14-09-15 | 0.0672 | ± 0.0000 | m |
| 10: | 14-09-15 | 0.0672 | ± 0.0000 | m |
| Avg: | | 0.0730 | ± 0.0000 | m |

**Transducer 3**

| | Date: | Average | Variation | U |
|---|---|---|---|---|
| 01: | 24-09-15 | -0.0045 | ± 0.0000 | m |
| 02: | 24-09-15 | oooooo | ± 0.0000 | m |
| 03: | 24-09-15 | oooooo | ± 0.0000 | m |
| 04: | 22-09-15 | oooooo | ± 0.0000 | m |
| 05: | 22-09-15 | -0.0045 | ± 0.0000 | m |
| 06: | 22-09-15 | -0.0045 | ± 0.0000 | m |
| 07: | 22-09-15 | -0.0045 | ± 0.0000 | m |
| 08: | 14-09-15 | -0.0031 | ± 0.0001 | m |
| 09: | 14-09-15 | -0.0032 | ± 0.0000 | m |
| 10: | 14-09-15 | -0.0032 | ± 0.0000 | m |
| Avg: | | -0.0039 | ± 0.0000 | m |

**Transducer 4**

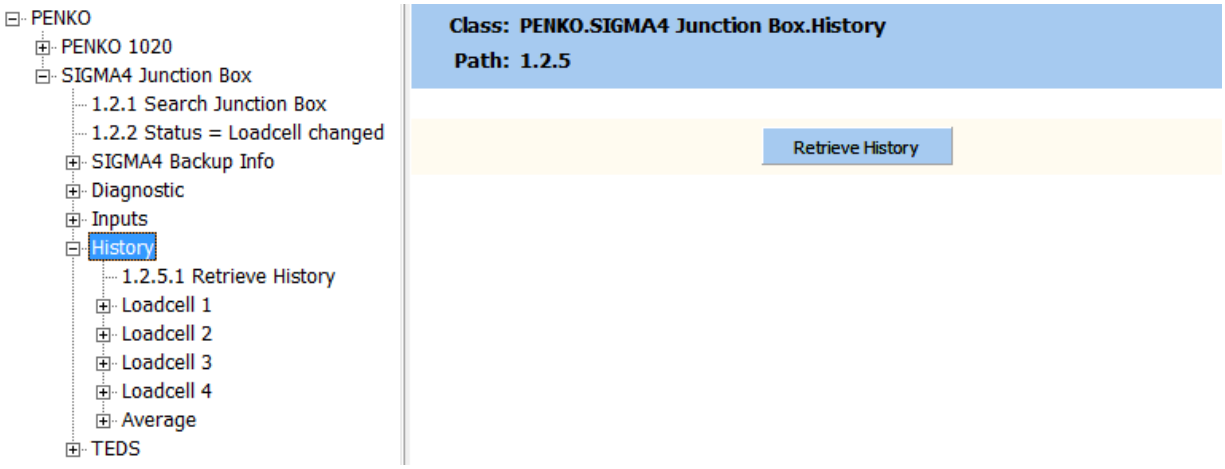
| | Date: | Average | Variation | U |
|---|---|---|---|---|
| 01: | 24-09-15 | 0.1572 | ± 0.0000 | m |
| 02: | 24-09-15 | 0.1577 | ± 0.0000 | m |
| 03: | 24-09-15 | 0.1576 | ± 0.0001 | m |
| 04: | 22-09-15 | 0.1574 | ± 0.0000 | m |
| 05: | 22-09-15 | 0.1573 | ± 0.0000 | m |
| 06: | 22-09-15 | 0.1574 | ± 0.0000 | m |
| 07: | 22-09-15 | 0.1574 | ± 0.0000 | m |
| 08: | 14-09-15 | 0.1581 | ± 0.0000 | m |
| 09: | 14-09-15 | 0.1580 | ± 0.0000 | m |
| 10: | 14-09-15 | 0.1580 | ± 0.0000 | m |
| Avg: | | 0.1576 | ± 0.0000 | m |

**Average**

| | Date: | Average | Variation | U |
|---|---|---|---|---|
| 01: | 24-09-15 | 0.0851 | ± 0.0000 | m |
| 02: | 24-09-15 | 0.1127 | ± 0.0000 | m |
| 03: | 24-09-15 | 0.1153 | ± 0.0000 | m |
| 04: | 22-09-15 | 3.4257 | ± 0.0000 | m |
| 05: | 22-09-15 | 2.5682 | ± 0.0000 | m |
| 06: | 22-09-15 | 2.5682 | ± 0.0000 | m |
| 07: | 22-09-15 | 2.5682 | ± 0.0000 | m |
| 08: | 14-09-15 | 0.0855 | ± 0.0000 | m |
| 09: | 14-09-15 | 0.0874 | ± 0.0000 | m |
| 10: | 14-09-15 | 0.0854 | ± 0.0000 | m |

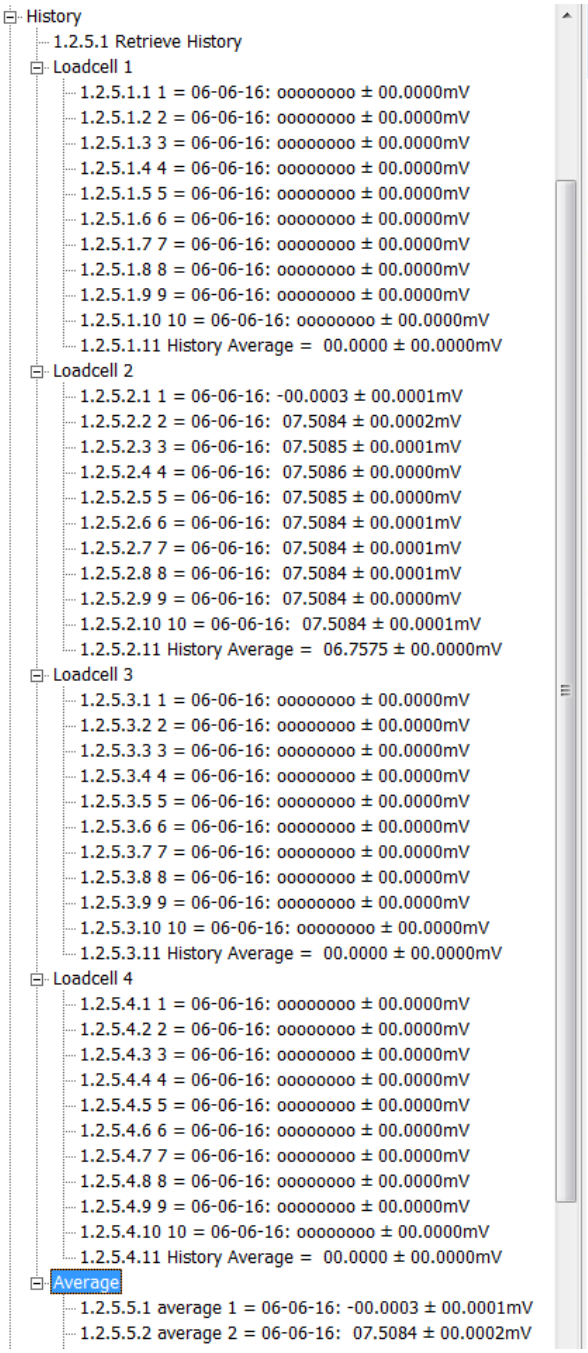
#### *4.2.4.2 History on PC using 1020 with Pi Mach II:*

Searching the log for loadcell data can take a few seconds. It is only retrieved when pressing the 'Retrieve History'button.




After the history retrieval is done, the history overview consists of:

- The date of the last 10 measurements.
- The last 10 measurements for each load cell.
- The variation during the last 10 measurements for each load cell.
- The average of all 4 load cells of the last 10 measurements.
- The variation of the average of all 4 load cells during the last 10 measurements.
- The average value of each load cell over the last 10 measurements.



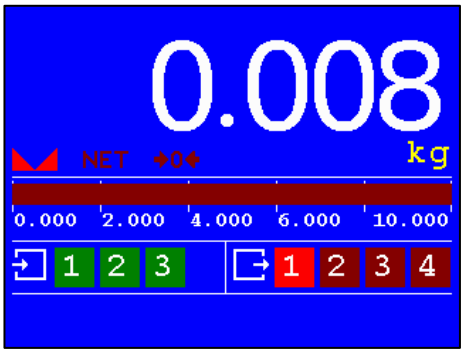

**Class: PENKO.SIGMA4 Junction Box.History.Average**
**Path: 1.2.5.5**

| | |
|---|---|
| **average 1** | **06-06-16: -00.0003 ± 00.0001mV** |
| **average 2** | **06-06-16: 07.5084 ± 00.0002mV** |
| **average 3** | **06-06-16: 07.5085 ± 00.0001mV** |
| **average 4** | **06-06-16: 07.5086 ± 00.0000mV** |
| **average 5** | **06-06-16: 07.5085 ± 00.0000mV** |
| **average 6** | **06-06-16: 07.5084 ± 00.0001mV** |
| **average 7** | **06-06-16: 07.5084 ± 00.0001mV** |
| **average 8** | **06-06-16: 07.5084 ± 00.0001mV** |
| **average 9** | **06-06-16: 07.5084 ± 00.0000mV** |
| **average 10** | **06-06-16: 07.5084 ± 00.0001mV** |

### 4.2.5 Test results in event log

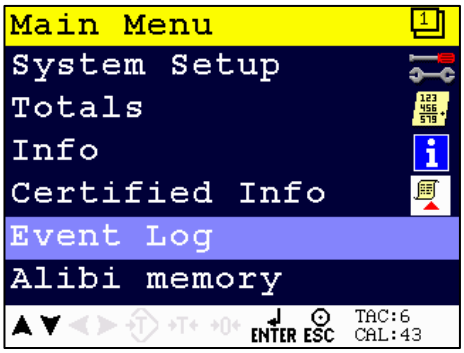
The result of the load cell tests are stored in the event log of the indicator.

#### *4.2.5.1 Event log on the 1020 instrument*

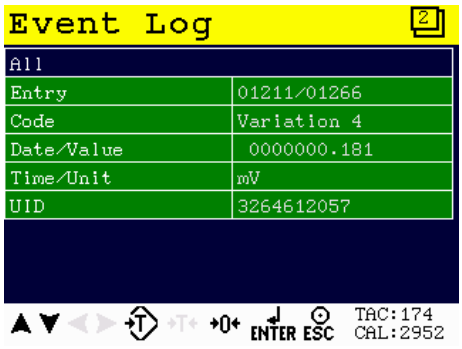




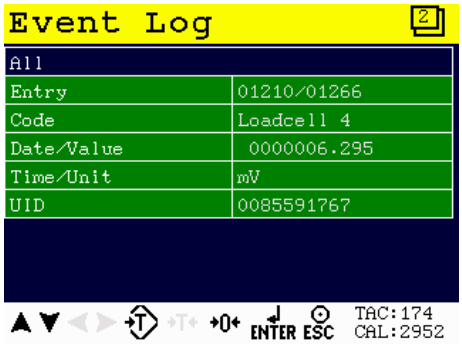
**Press 2 seconds**



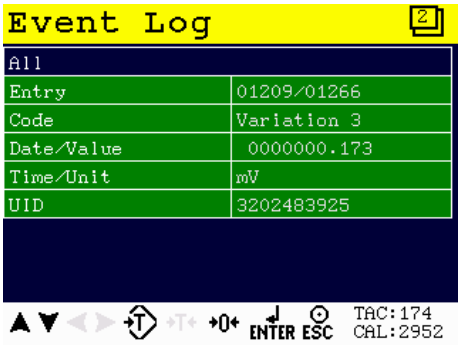




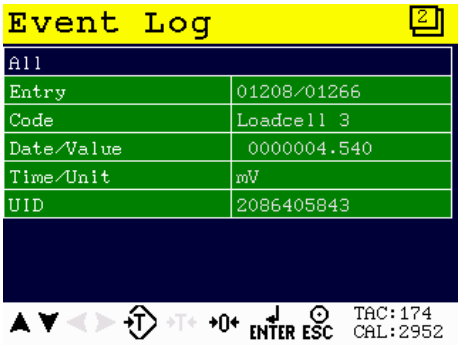

*The Event log display starts at the last registered event.*
*By pressing arrow up, the log steps one entry back to the past. The last entry is Load cell 4 variation*



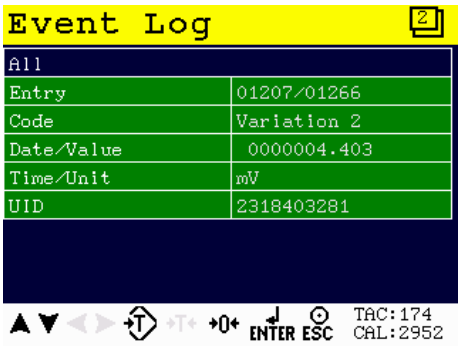

*Load cell 4 result*



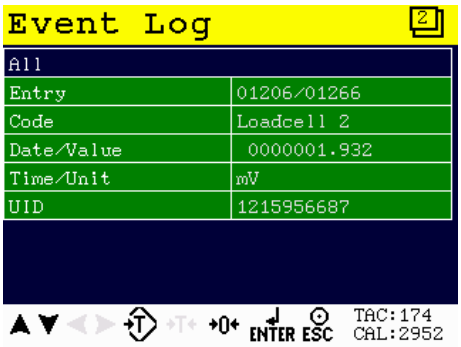

*Load cell 3 variation*



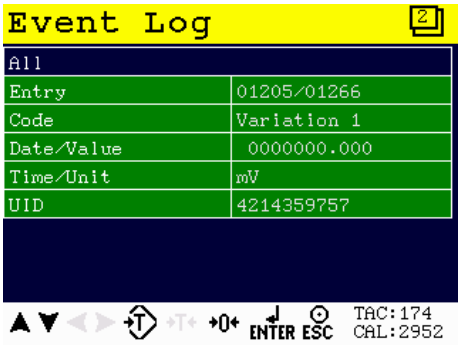

*Load cell 3 result*



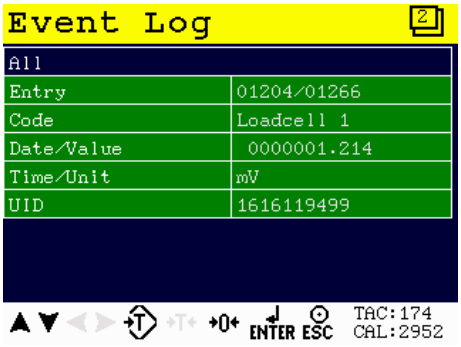

*Load cell 2 variation*



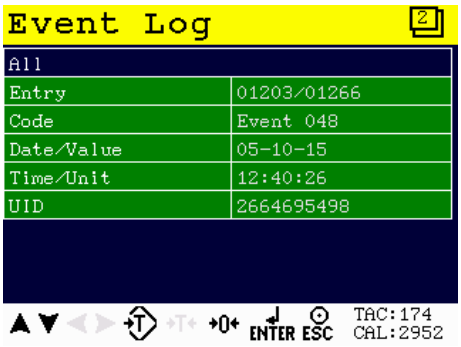

*Load cell 2 result*




*Load cell 1 variation*

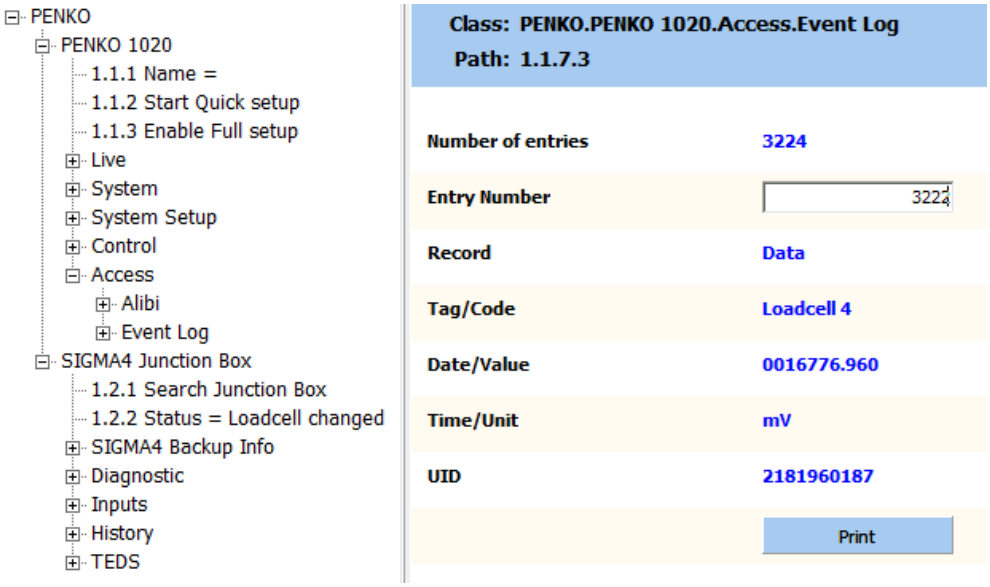



*Load cell 1 result*




*Header with date/time*

#### *4.2.5.2 Event log on PC using 1020 with Pi Mach II:*

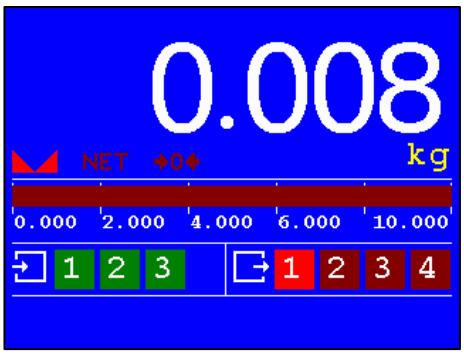



### 4.2.6 TEDS calibration

The junction box can read out Transducer Electronic Data Sheets (TEDS) information from IEEE1451.4 compliant load cells. The following actions are performed when a TEDS load cell is detected:

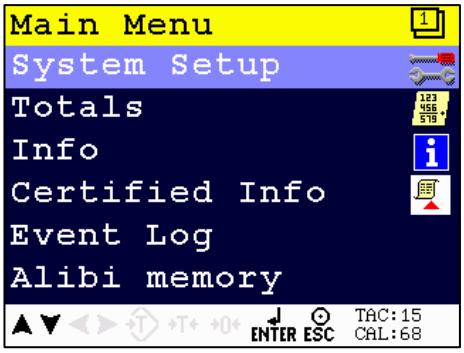
- The input number and TEDS ID code are stored as a transducer type
- The Transducer measurement unit is selected as the instrument unit.
- The minimum and maximum electrical value are used to set the zero balance and range
- The maximum force/weight is used to calculate the maximum load
- From the total maximum load, a decimal point position and step size are selected so the readout is 10.000 parts or less

#### *4.2.6.1 TEDS calibration on 1020 device:*

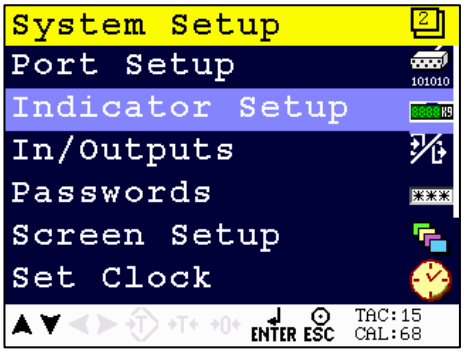




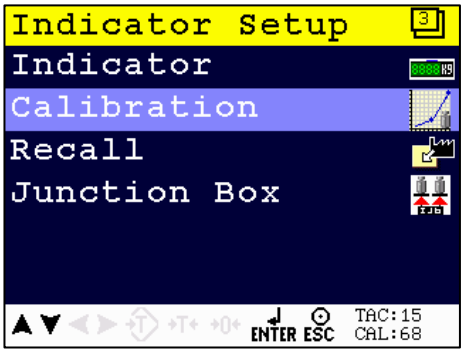
**Press 2 seconds**



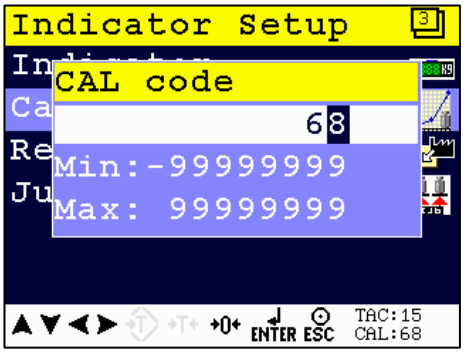








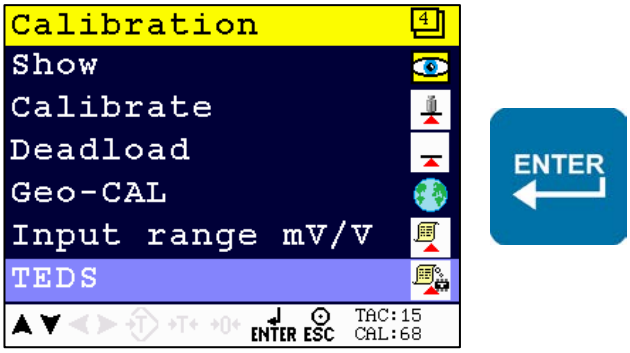




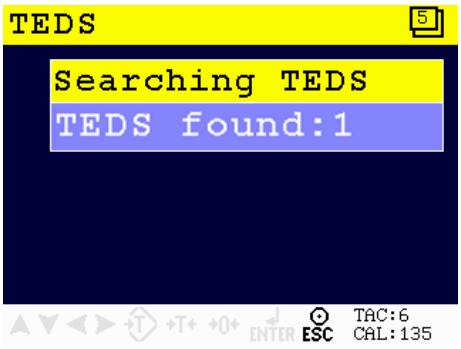


*The CAL code is found at the right bottom*

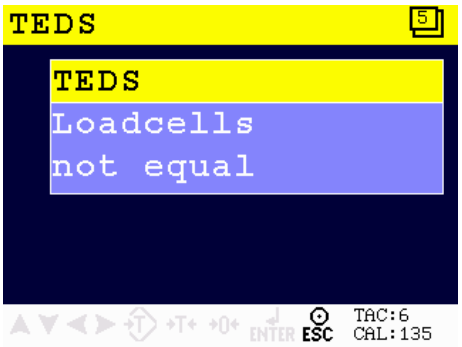
*Use the arrow keys to enter the CAL code*



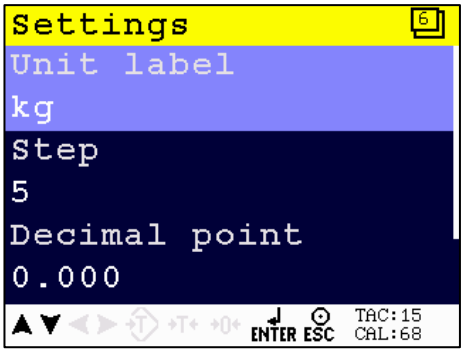

After entering the TEDS menu, the indicator requests the TEDS data from the junction box and its connected TEDS chips. When all datasheets are read, the indicator totalizes the data and calculates the calibration data.




When TEDS load cells of different units, ranges or manufacturers are found, the instrument cannot simply add the load cell information and an error is shown. The electronic datasheets of all TEDS load cells can be displayed on a PC using PI.

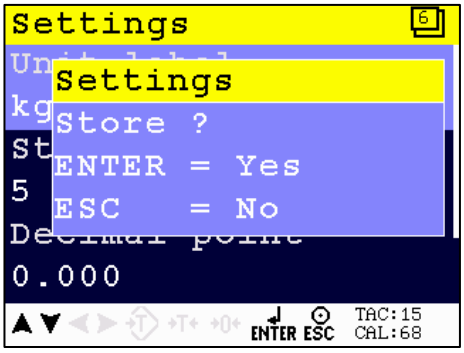



When one or more compatible TEDS load cells have been found, the suggested indicator settings are shown:




These settings can be changed manually. The suggested Max Load is the addition of the maximum weight from each of the TEDS datasheets plus a small margin.


**closes this menu**

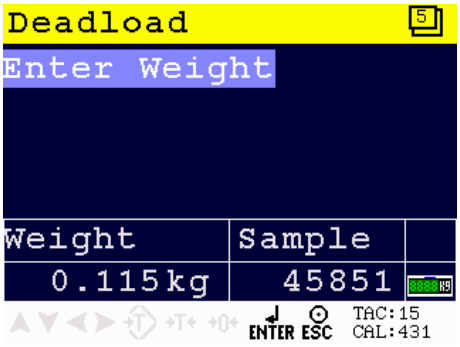




**stores the settings -**

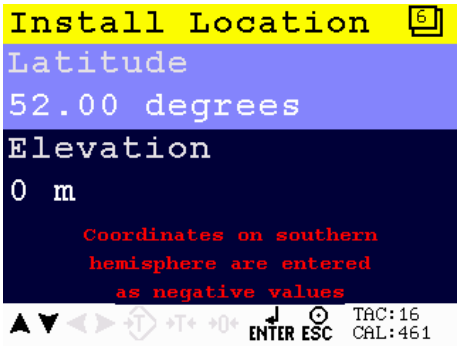

**discards the settings**

**After storing the settings, the deadload calibration is started.**



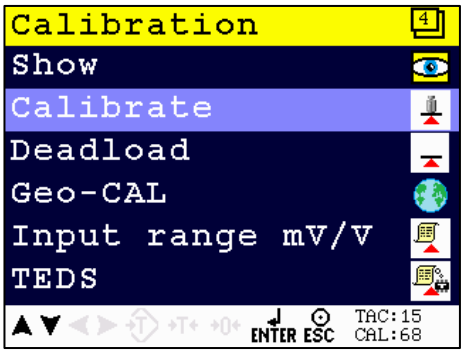

**Enter the weight that is currently on the scale.**

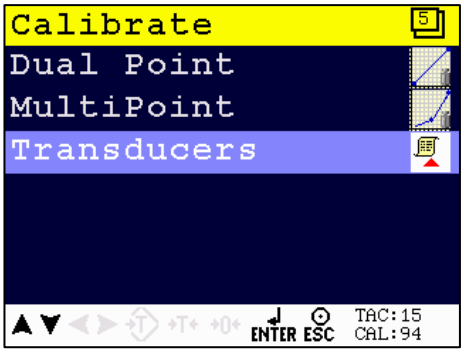
**When TECSIS TEDS loadcells are connected, the 1020 Sets the factory location. To ensure correct gravity settings the installation location must now be entered.**



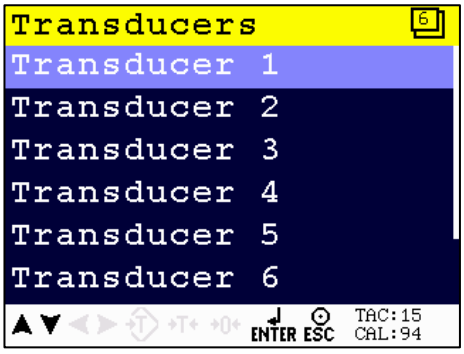

**Enter the Latitude and Elevation of the install location.**

The TEDS data is stored as a transducer type and is found in the calibration menu.



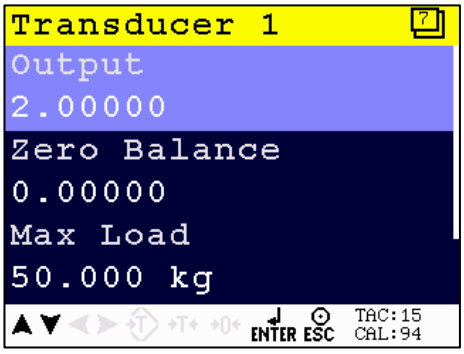




ENTER

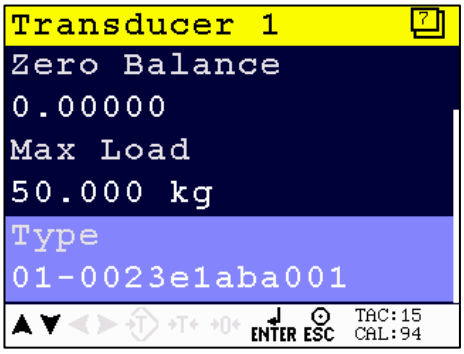



ENTER

*Each transducer is stored in order of the input number*



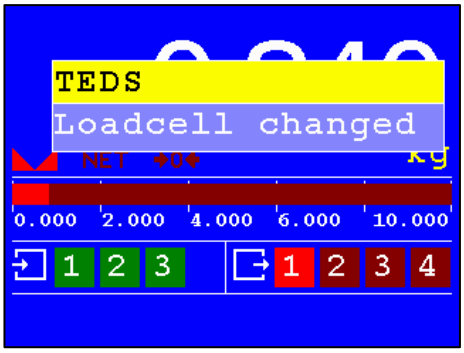

*Output, zero balance and max load are calculated from TEDS information*



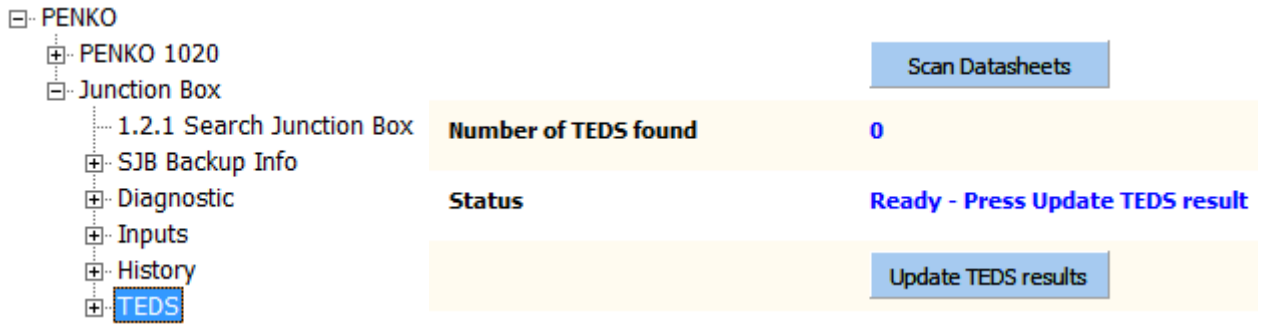

*01 indicates this TEDS load cell is connected to input 1*

*0023e1aba001 is the TEDS ID Code*

The TEDS datasheets are checked on startup, on entering the 'Σ4 Junction Box' menu or before a load cell test. If the number of TEDS or TEDS ID codes differ from the stored configuration, a warning is displayed:


TEDS
Loadcell changed
NET
kg
0.000
2.000
4.000
6.000
10.000
1 2 3
1 2 3 4

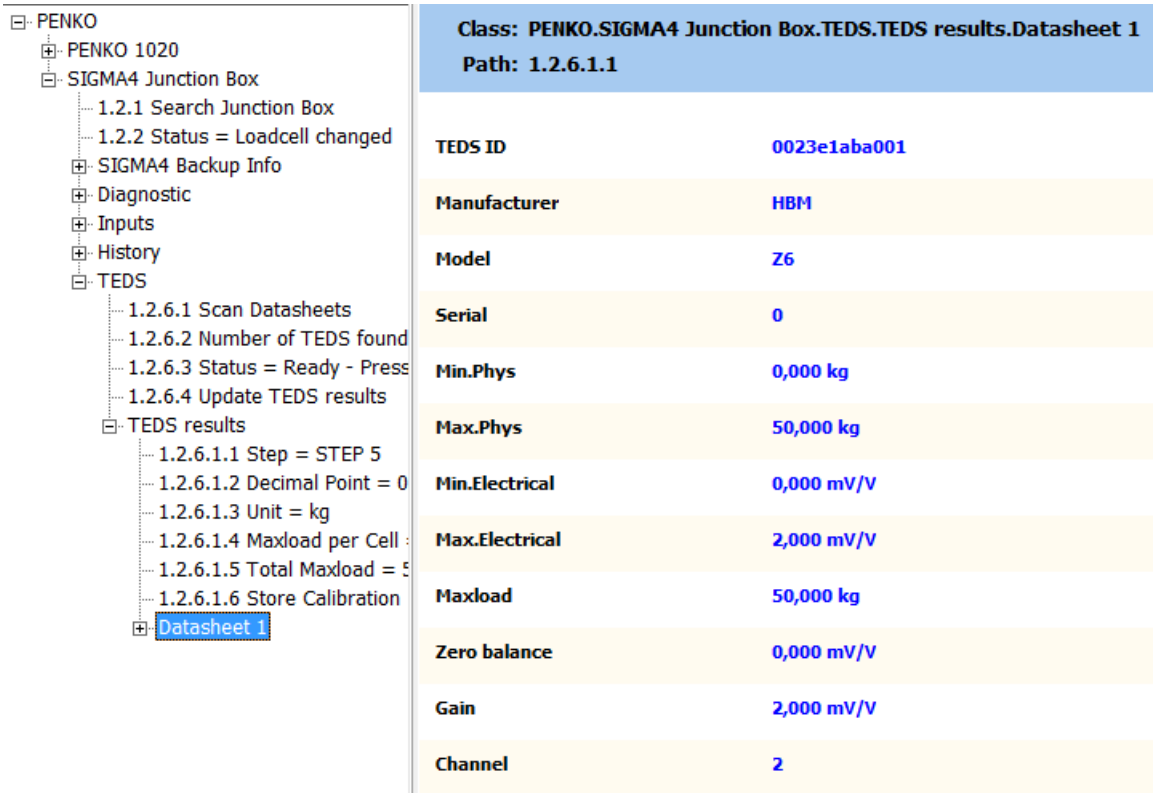
### *4.2.6.2 TEDS calibration on PC using 1020 with Pi Mach II:*




The buttons have the following functions:

- 'Scan datasheets' checks the currently connected TEDS information and shows the suggested settings.
- 'Store Calibration' stores the TEDS information as a Max Load and Load cell calibration. It also stores the suggested step size, decimal position and unit as weigher settings.
- Update TEDS results can be used to view the retrieved TEDS information.

All found TEDS datasheets can be viewed:

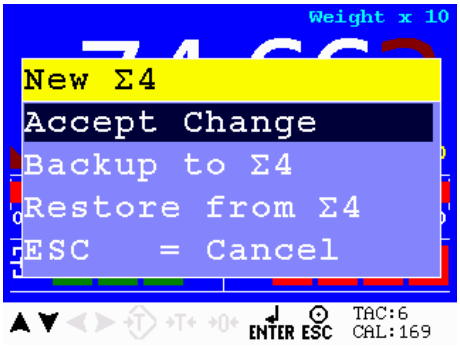


# 5 Startup messages

When the 1020 is powered up, the connected junction box and load cell TEDS data are checked.

## 5.1 New Junction box

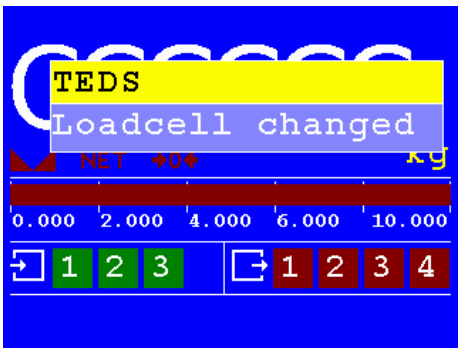
When a new SIGMA4 junction box is connected to the 1020, the following message appears.




The options are:

- Accept Change. This registers the SIGMA4 junction box in the instrument. The message will not be shown again.
- Backup to Σ4. This copies all settings from the instrument to the SIGMA4 junction box. After a successful backup the junction box will be registered in the instrument. The message will not be shown again.
- Restore from Σ4. This option is only available when the SIGMA4 Junction box already contains a valid backup. After a successful restore the junction box will be registered in the instrument. The message will not be shown again.
- ESC = Cancel. By just pressing the ESC key, the message is dismissed. It will be shown again when the instrument is restarted.

## 5.2 Loadcell changed




This message is shown when

- The instrument does not contain a TEDS calibration, but TEDS load cells are found

- The instrument contains a TEDS calibration, but no TEDS load cells are found
- The instrument contains a TEDS calibration, but TEDS Load cells are swapped or disconnected
- The instrument contains a TEDS calibration, but load cell's TEDS circuitry or the connection to the TEDS load cell has failed.

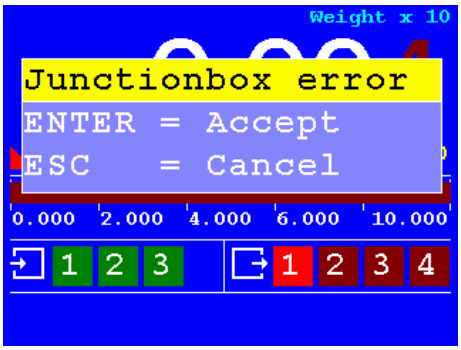
This indicates that the weight shown on the instrument might not be correct since the installation has been changed.

Pressing 

dismisses this message but it will be shown again when the instrument is restarted. To end this message

- Restore the installation to its original configuration.
- Check all loadcells and cables
- Do a new TEDS calibration. After this the CAL code will be incremented to show a change in calibration but the new TEDS data is then stored in the instrument.

## 5.3 Junctionbox error




This message is shown when

- The load cell or communication cables or connectors are disconnected.
- The connection between the instrument and the junction box is broken or shorted. Check the connection cables for both the communication connection and the instrument load cell connection
- A short circuit in the excitation voltage. The load cell excitation voltage is used as power supply for the junction box. The excitation voltage output of the instrument is protected against a short circuit. When the junction box is powered, the LED on the SIGMA4 will flash once per second.

Pressing 

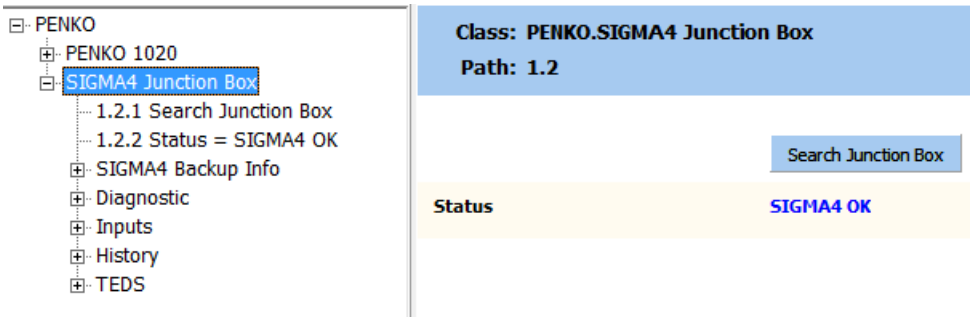
will dismiss the warning until the next power up. Pressing 

stores a configuration without SIGMA4 as default so the warning will not return unless the 1020 was already calibrated using TEDS information.

When the communication with the junction box is restored, this message clears automatically.

## 5.4 Messages on PC

Using PI, the startup messages are shown in the Junction Box status screen.




The following messages can be shown

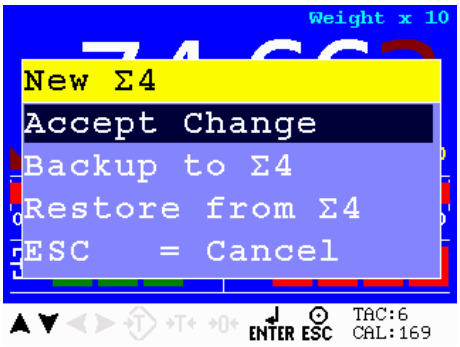
| | |
|---|---|
| SIGMA4 OK | Communication with SIGMA4 and TEDS load cells is working. |
| TPMaster not enabled | The TPMaster protocol is disabled. This stops communication with the SIGMA4. |
| SIGMA4 not found | Communication with SIGMA4 fails. |
| SIGMA4 changed | The connected SIGMA4 has a different serial number from the stored configuration. |
| Loadcell changed | The number of TEDS chips or the TEDS ID codes have changed from the stored configuration. |

# 6 Backup and Restore

The junction box can store a backup of the connected indicator. All indicator settings and calibrations are stored. In case the indicator fails, it can easily be replaced with a new one and restored from the backup.

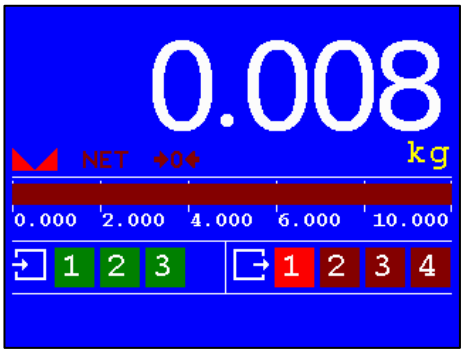
## 6.1 Backup

When a SIGMA4 is connected to the 1020 for the first time, a popup is shown. This menu offers the option to make a backup to the SIGMA4.



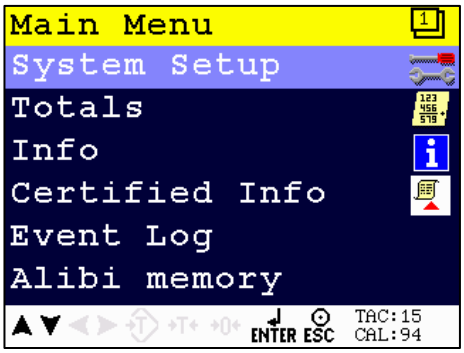

### *6.1.1.1 Making a backup on the 1020*

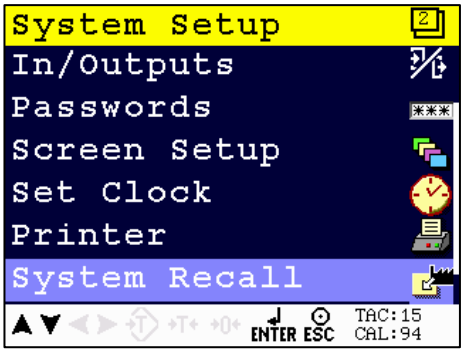
A backup of the 1020 device can be made at any moment from the menu:



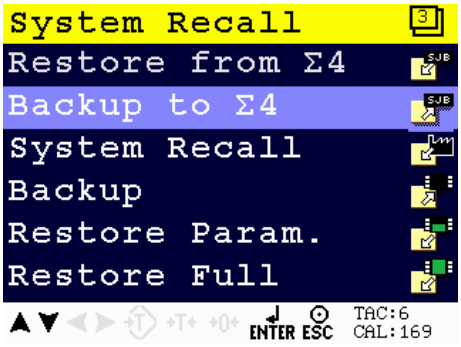


**Press 2 seconds**

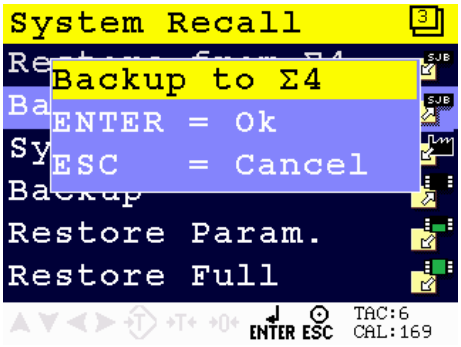




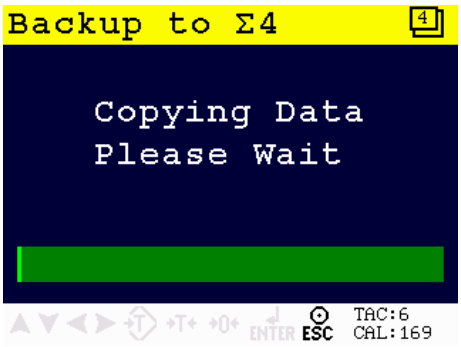






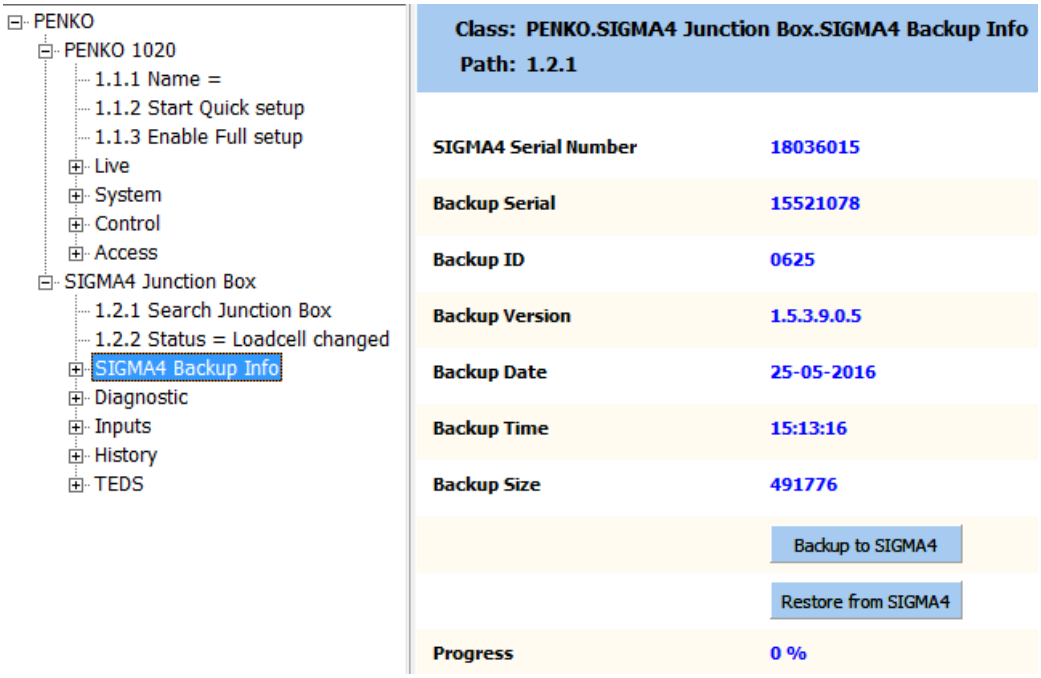


Press ENTER to start the backup




During backup a progress bar is shown. A complete backup can take up to 6 minutes

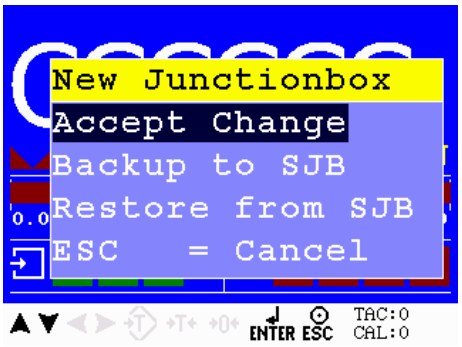
#### *6.1.1.2 Making a backup on PC using 1020 with Pi Mach II:*




Press *Backup to SIGMA4* to start copying data from the 1020 Instrument to the SIGMA4 junction box. This can take up to 6 minutes. The Progress indication will increment from 0% to 100%. When the backup is complete.

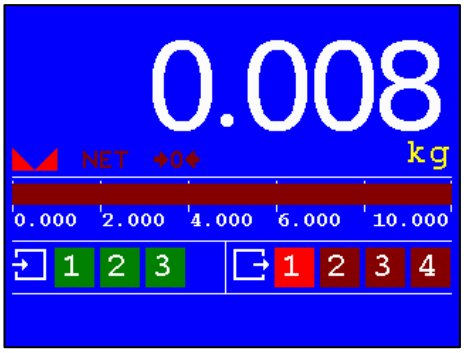
## 6.2 Restore

When an empty 1020 is connected to a SIGMA4 Junction Box containing a valid backup, a popup screen is show during startup:



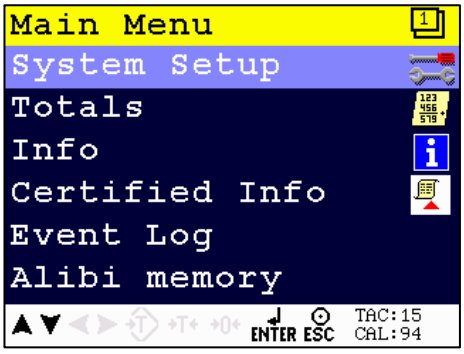

#### *6.2.1.1 Restoring data on the 1020 instrument*

For manually restoring from a backup, the following actions are required:

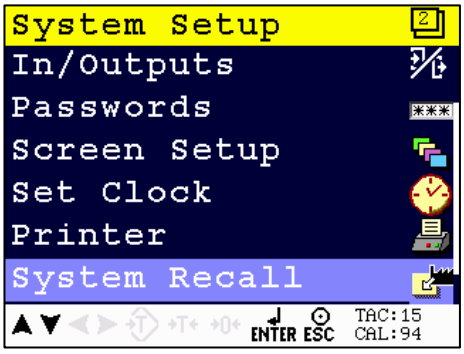



ENTER

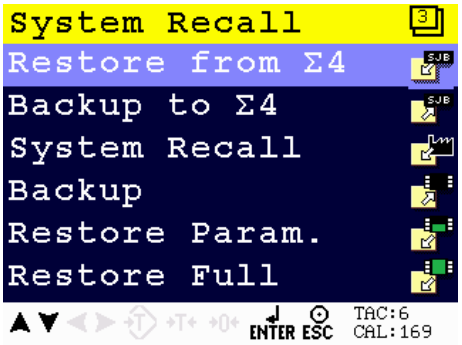
**Press 2 seconds**




ENTER

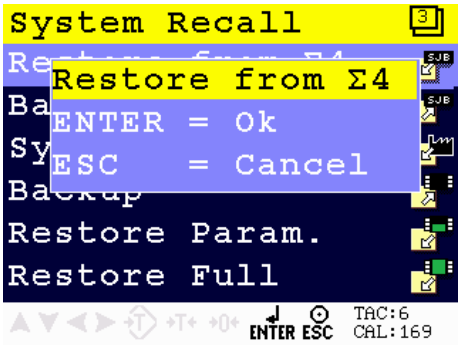



ENTER



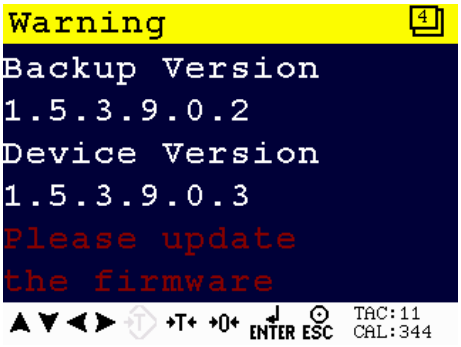

ENTER

*Only shown when a* SIGMA4 *Junction Box is detected. When the* SIGMA4 *Junction Box does not contain a valid backup, the restore option is disabled.*





ENTER restores date from the SIGMA4 Junction BOX into the instrument.
ESC cancels the restore





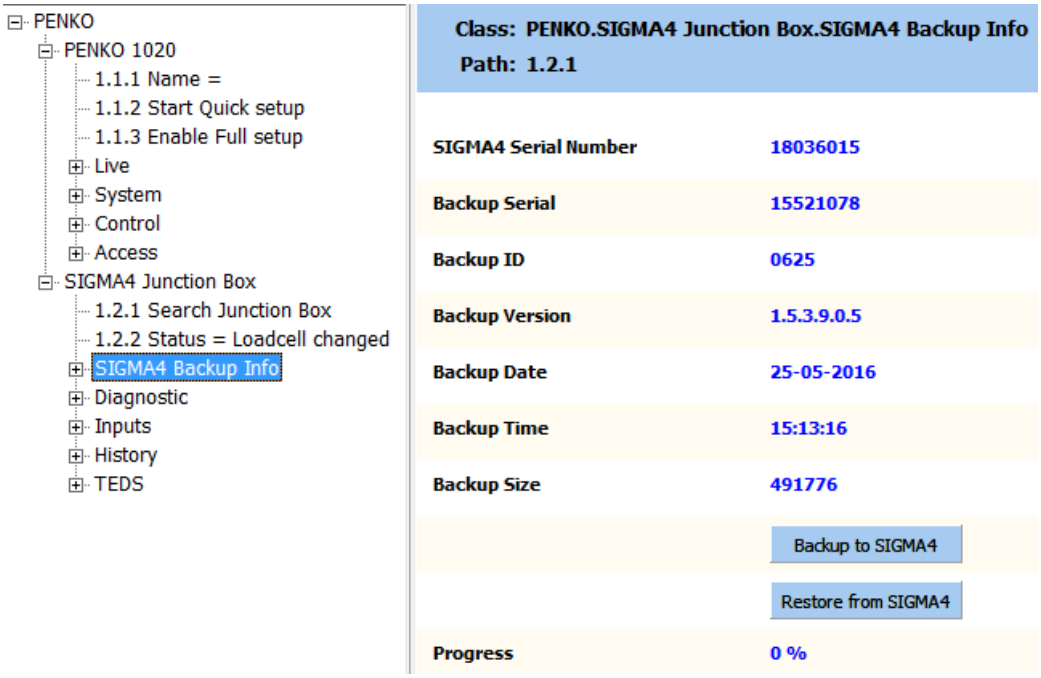
Or


When the firmware version of the new device and the SIGMA4 backup are different, a warning is displayed. It is recommended to keep versions identical since newer firmware can contain different settings. Enter starts the restore. Esc cancels restore

During restore a progress bar is shown. A complete restore can take up to 6 minutes. **After restoring, the indicator is restarted using the new settings**

### *6.2.1.2 Restoring data on PC using 1020 with Pi Mach II:*

When a backup is stored in the SIGMA4, Its information is shown in the SIGMA4 Backup Info menu.

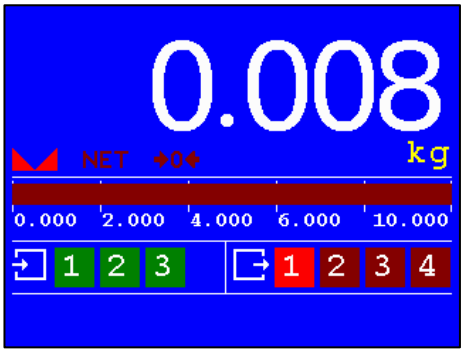



Press *Restore from SIGMA4* to start copying data from the SIGMA4 junction box back to the 1020 Instrument. This can take up to 6 minutes. The Progress indication will increment from 0% to 100%. After restoring, the indicator is restarted using the new settings

## 6.3 Backup Info

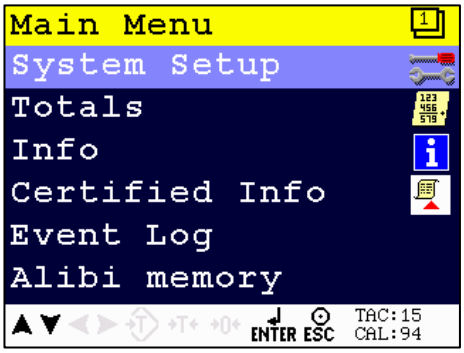
The 1020 can show information about the backup information in the SIGMA4.

### *6.3.1.1 Backup Info on the 1020 instrument*

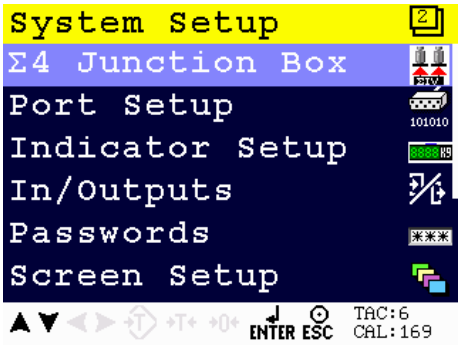




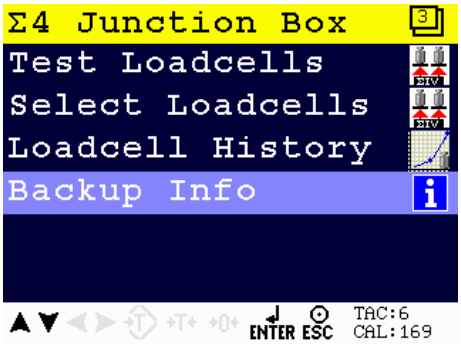
**Press 2 seconds**

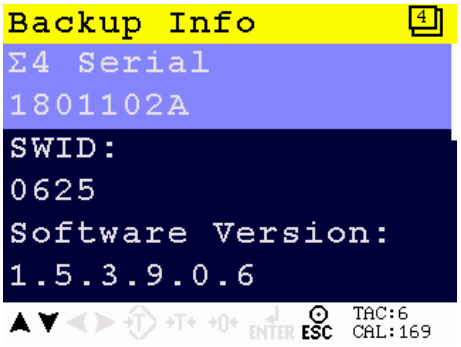


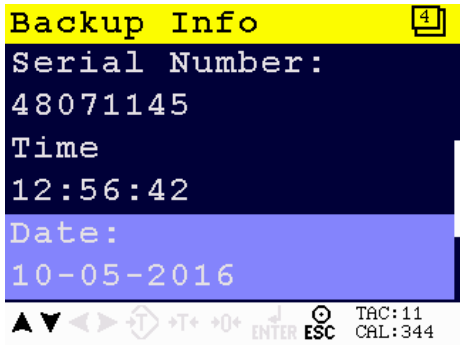


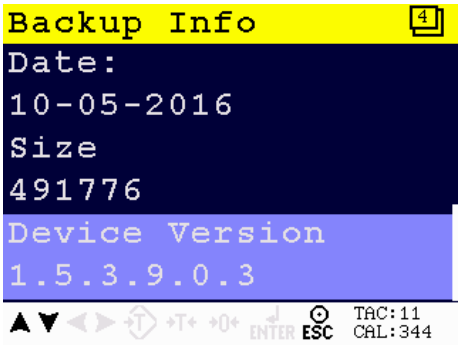






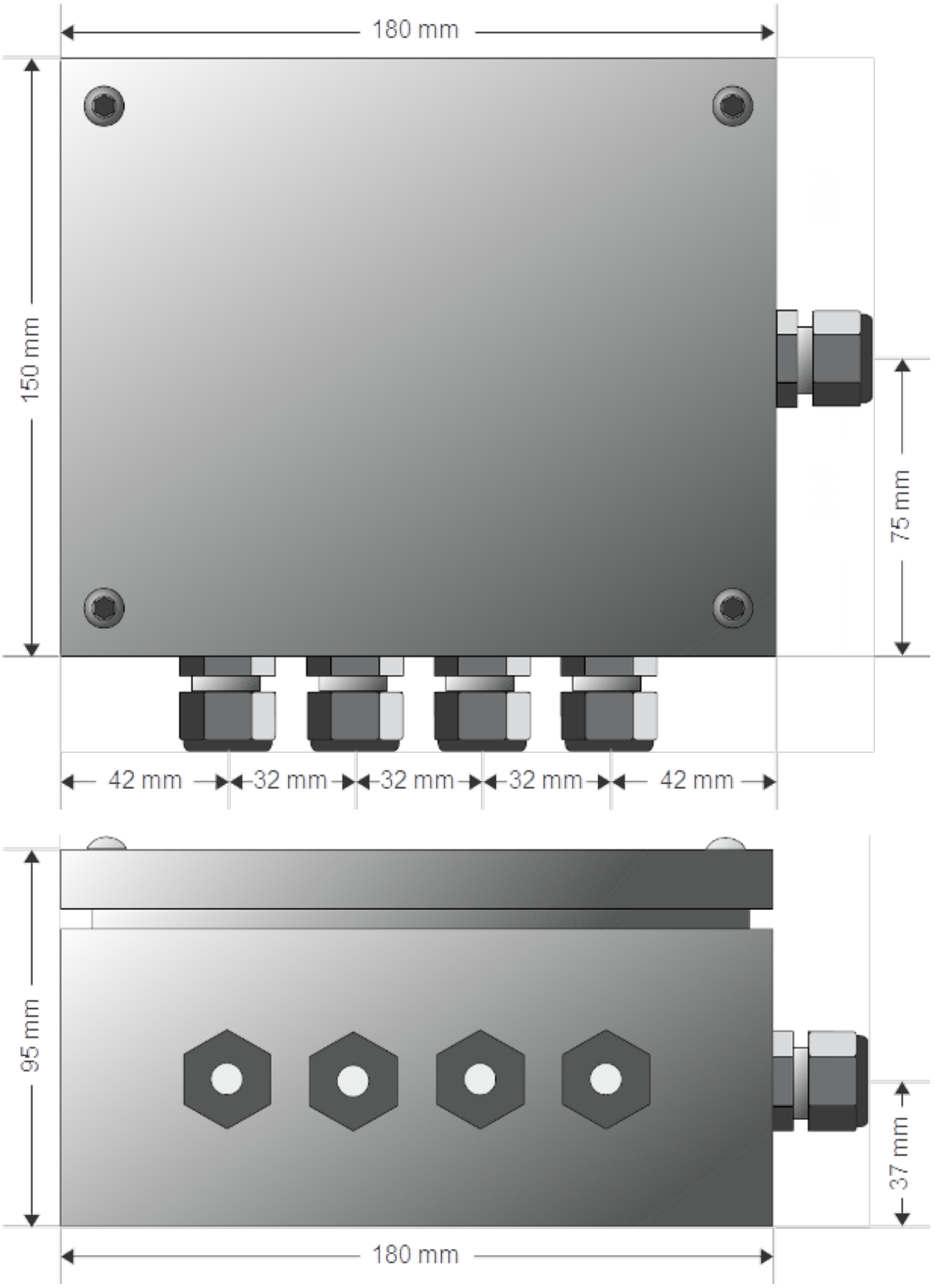




When no backup is stored in the SIGMA4, only 'Σ4 Serial' is displayed.

# 7 Specifications

| Type | Description |
|---|---|
| **Electrical** | |
| - Power supply | Powered by 5 to 12VDC load cell supply voltage<br>Current consumption 30-200mA |
| **User interface** | |
| - LED | 1 x LED alive heartbeat |
| **Interfaces** | |
| - Load cell | 4 x 6 wire load cell input interface + earth, connector MSTB<br>4 x TEDS interface, connector MSTB<br>6 wire load cell output interface + earth, connector MSTB |
| - Communication | Non-isolated RS485 interface<br>Non-isolated USB device interface |
| **Switches** | |
| - Relay | 4x bi-stable Dual pole relay<br>Switching capacity 1A @ 30VDC resistive load |
| **Housing** | |
| - Material | Stainless steel enclosure |
| - Dimensions | 180 x 150 x 95mm (W x H x D) excluding cable glands |
| - Cable glands | 4 x PG9 or M16 for load cells \|\| 1 x PG9 or M16 for indicator |
| - Mounting holes | 157 x 125mm \|\| diameter 6mm |
| - Weight | ±1500g |
| **Environmental** | |
| - Operating temperature | -10°C to +40°C [14°F to 104°F] |
| - Storage temperature | -20°C to +70°C [-4°F to 158°F] |
| - Relative humidity | 40 - 90% non-condensing |
| - Ingress Protection rating | IP65 |
| **Approvals** | |
| - CE | Industrial CE |
| - UL | Pending |

# SIGMA4 Smart Junction Box




## About PENKO

Our design expertise include systems for manufacturing plants, bulk weighing, check weighing, force measuring and process control. For over 35 years, PENKO Engineering B.V. has been at the forefront of development and production of high-accuracy, high-speed weighing systems and our solutions continue to help cut costs, increase ROI and drive profits for some of the largest global brands, such as Cargill, Sara Lee, Heinz, Kraft Foods and Unilever to name but a few.

Whether you are looking for a simple stand-alone weighing system or a high-speed weighing and dosing controller for a complex automated production line, PENKO has a comprehensive range of standard solutions you can rely on.

## Certifications

PENKO sets high standards for its products and product performance which are tested, certified and approved by independent expert and government organizations to ensure they meet – and even – exceed metrology industry guidelines. A library of testing certificates is available for reference on:
**http://penko.com/nl/publications_certificates.html**

## PENKO Professional Services

PENKO is committed to ensuring every system is installed, tested, programmed, commissioned and operational to client specifications. Our engineers, at our weighing center in Ede, Netherlands, as well as our distributors around the world, strive to solve most weighing-system issues within the same day. On a monthly basis PENKO offers free training classes to anyone interested in exploring modern, high-speed weighing instruments and solutions. A schedule of training sessions is found on: **www.penko.com/training**

## PENKO Alliances

PENKO's worldwide network: Australia, Belgium, Brazil, China, Denmark, Germany, Egypt, Finland, France, India, Italy, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Syria, Turkey, United Kingdom, South Africa, Slovakia Sweden and Switzerland, Singapore.
A complete overview you will find on: **www.penko.com/dealers**

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