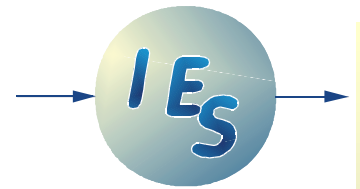


IES 3120 Tilt Calibration Setup



SYSTEM DESCRIPTION (Rev. RC08)

Hardware setup and software for calibration and adjustment of tilt sensors.

Kalibrierauf

Start Abbruch

Set Angle	True Angle	Sensor	Deviation
-45,00	-44,98	23.659,50	
-30,00	-29,97	26.296,00	
-15,00	-15,01	29.335,50	
0,00	0,00	32.571,88	
15,00			
30,00			
45,00			

Sensor-TEDS

Model 1402
Serial MK33
CalDate 2013-01-08
Location ***Nowhere***
MountStr +-L Cal Headover
MountOfsA 0
MountOfsB 0

Axis A

CalOfs 32261
CalScI 12449
CalAlg -14

Axis B

CalOfs 31709
CalScI 12391
CalAlg 2

Kalibrierdatum 2013-01-08

Justierung abschließen

Completed
Chi=0,02120
Completed

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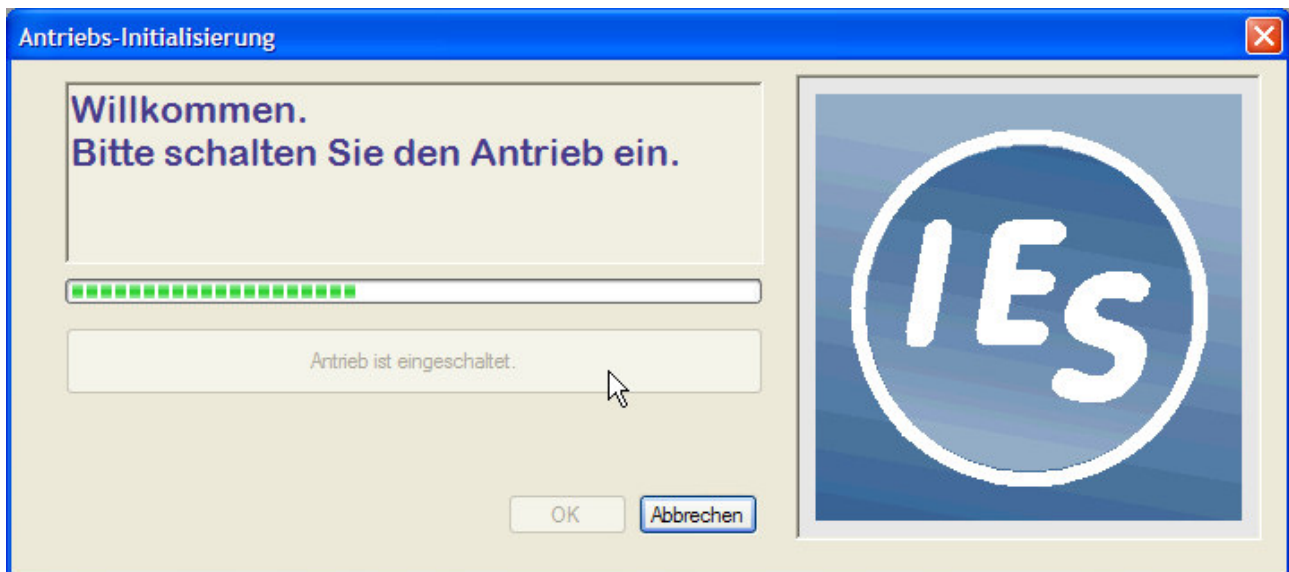
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1 Switching on the calibration hardware

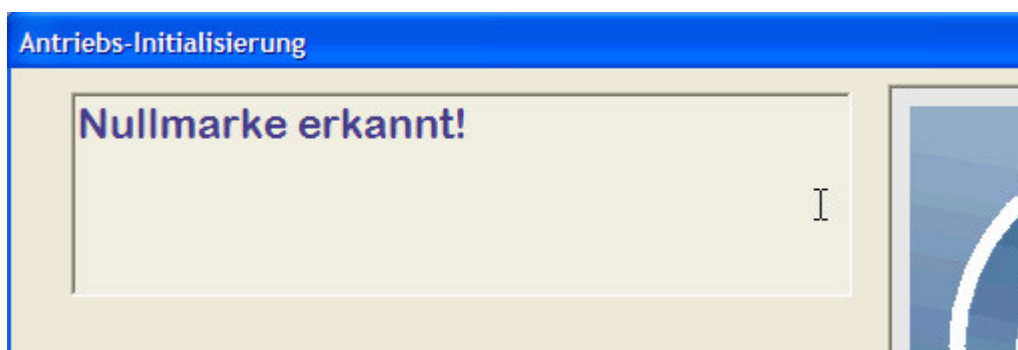
The calibration hardware (tilt drive and electronic device in 19" housing) is switched on at the rear side of the 19" housing. **Attention!** The turn table can do smaller but quick movements at power on and short after.

Software on PC can be started *before* or *after* switching on the hardware. To ensure proper initialisation a dialog comes up as shown below. Please acknowledge now, that the hardware was switched on.



For the next step the turn table must manually be turned across the zero position. This is better done manually than automatically, because the hardware has no knowledge about mounted sensors or eventually (too) short cables.

When the zero position was crossed, a message is shown in the dialog box. Now the OK button is enabled and the dialog can be finished by pressing it.



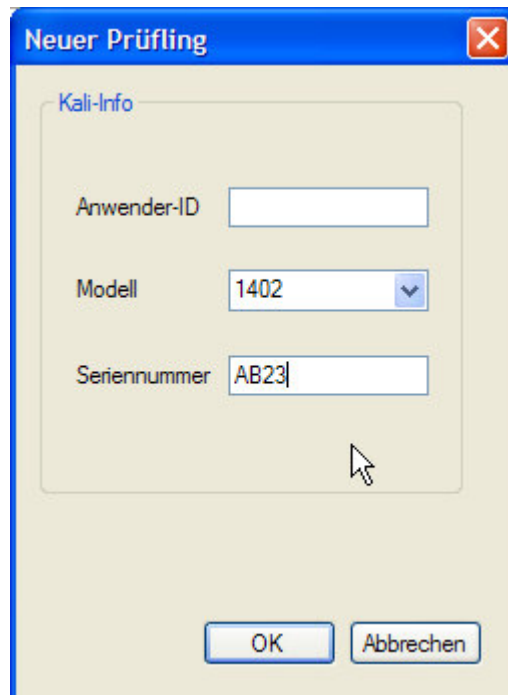
The switching on procedure and initialisation is now finished. This needs not to be done before every calibration, only once a day is normally sufficient.

2 Preparing a calibration or adjustment run

A complete calibration or adjustment for a multi axis sensor (DUT device under test) typically involves a couple of turning runs with data acquisition for every run. The DUT needs to be mounted in different axis orientations as needed. Also, some end customers want to have calibration data from *before* an adjustment and *after* the adjustment (if an adjustment is made). From this, obviously a minimum of two and a maximum of six turning runs are required to make a complete calibration.

The first step to start a fresh calibration (or adjustment) is to log in a DUT into the TiltCal software, so it can know the sensor and it can know this is the starting point of the calibration job.

To log in a **new DUT**, select this in the main menu. A dialog comes up, where some information about the DUT needs to be given, such as model, serial number and an optional user's ID. When finished, close the dialog with OK. At this point, a fresh **result file** is created, which will be filled with data during subsequent turning runs.



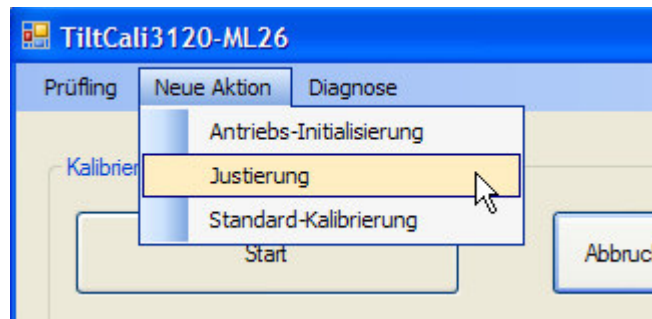
The image shows a software dialog box titled "Neuer Prüfling" (New Test Piece) with a blue header and a close button. The main area is titled "Kali-Info" and contains three input fields: "Anwender-ID" (empty), "Modell" (a dropdown menu currently showing "1402"), and "Seriennummer" (a text box containing "AB23"). A mouse cursor is visible over the "Seriennummer" field. At the bottom of the dialog are two buttons: "OK" and "Abbrechen" (Cancel).

It is possible to log in many DUT's and do the tilt table runs at a later point in time.

The log in of a DUT creates a sensor status of being "**not adjusted**".

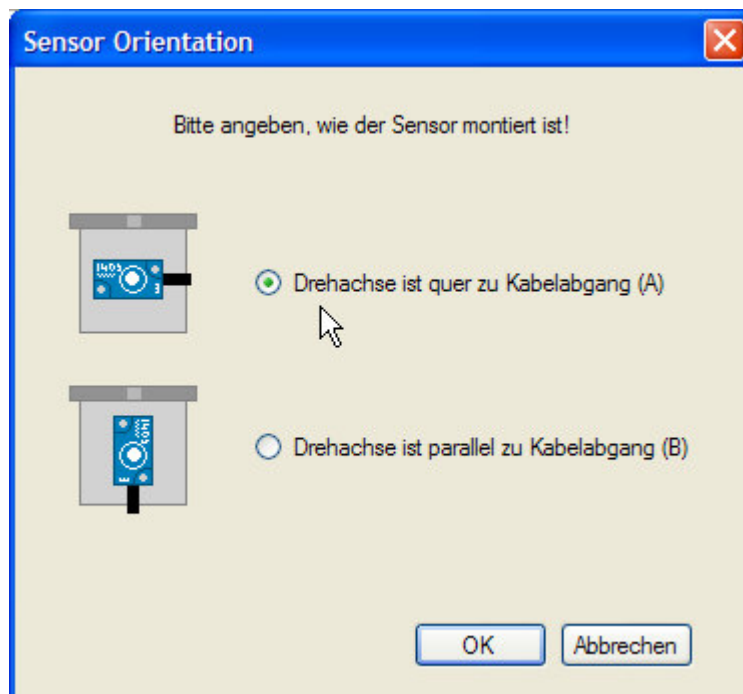
3 Performing a calibration run

After being logged in a sensor (DUT) can be worked with. Choose the desired action in the main menu "New action". For the following choose "Standard calibration".



At this point the sensors electronic data sheet TEDS is read and its serial number is cross checked with the logged in DUTs. All data from this sensor lands in the already created result file named after the sensors serial number. It is a good practice to remove the result files to another directory, after the calibration job is done.

Next, the mounting orientation for this tilt calibration run needs to be selected. The sensor should be mounted at latest NOW, corresponding to the selection made. Only these two different mounting orientations shown are allowed.



After this selection is done and OK was given, the dialog is closed, and in the main window the START button is enabled. Before starting, it is now possible to check or uncheck the box "Cal headover". The software proposes this from the data of the sensor TEDS, but it can be changed at this time. If user uses a headover mounting in her/his application, the calibration should also be performed headover, so normally the suggestion should not be touched.

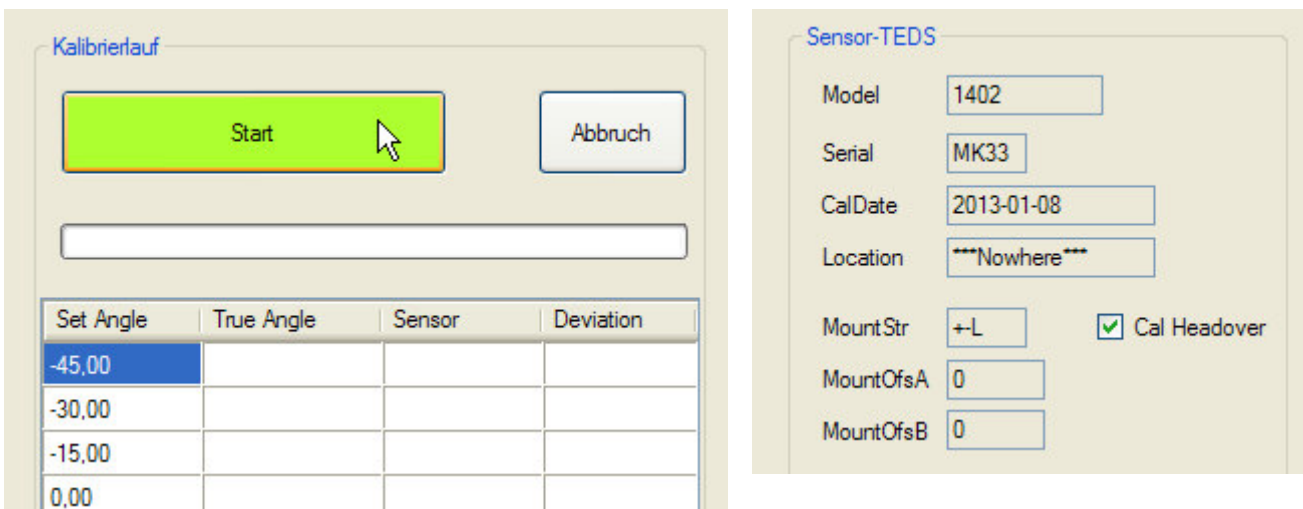
Another check is done on the "MountOfs", that might be set in the TEDS. If it is nonzero, another dialog comes up to ask how to deal with it.

Additional information about "Headover" and "MountOfs" is given below for in depth reading. As a summary:

We recommend **not to change the CalHeadover checkmark**, unless there is a good reason.

We recommend to **calibrate sensors without angle changing mount adapters** and set the **MountOfs to 0**.

It is -of course- possible to configure the sensor for a different mount situation before the calibration process begins (i.e. before log in of sensor to the software). It can be done with TiltView software. But it should always be done in agreement with end user.



By pressing START now the tilt turning run begins. The process can be monitored with the progress bar and by the values populating the list. The button is disabled during the run, but enabled again after the run. If anything went wrong, e.g. a noise spike was measured, the run can be repeated.

In the file "CalControl.ini" two entries influence the run:

```
...  
  
[TILT]  
SETPOINTS=-45,-30,-15,0,15,30,45  
NUMAVG=8  
  
[CONTROL]  
RESULTPROC=
```

The setpoints are the listed values to be used for calibration.

The value NUMAVG determines the number of single measurements taken from the sensor for building a mean value for the angle.

After completion of the tilt turning run the measured data is stored into the result file by pressing button "Finish adjustment". The result file also contains the information, whether the sensor was adjusted before this calibration run. This enables to automatically write the data into the proper section of the file (before adjustment / after adjustment).

The **Calibration Date** is taken from the text field in the main window at this moment. It should be set properly and is written to the result file and into the sensor TEDS.

If required for whatever reason, the calibration run can be repeated, just press START button..

Additional information

MountOfs

The TEDS value MountOfs specifies (if non zero) that the sensor is in use with an angle offset mount adapter. For calibration, two possibilities or choices exist. Either the sensor is calibrated without this adapter. Then dismount it and set value MountOfs to zero for the calibration procedure. Or the sensor is calibrated together with the adapter (but not recommended).

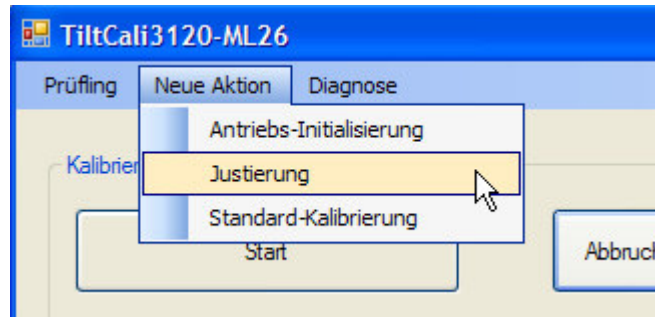
Cal Headover

If the sensors TEDS indicates, that it is in use headover, then the calibration should be performed headover also. In the software this is controlled by the CalHeadover checkmark. It is possible to override this selection, resulting in (wrong) calibration of a headover used sensor in normal orientation, or (wrong) calibrating a normal oriented sensor in headover. These calibrations are then against the sensor TEDS usage information and result in "mirror correction values", making the sensor performing bad. Overriding the checkmark thus is only good for very special purposes.

After the calibration run, a performed or not performed headover calibration is stated in the result file, CalHeadOver=YES/NO.

4 Performing an adjustment run

An adjustment is more or less the same procedure as a calibration. It is started from the main menu:



Then the mount orientation for the sensor is queried.

In contrast to a calibration the setpoints for adjustment are fixed and not selectable. And the adjustment is always done in the normal mount position, not headover.

It should be assured, that the sensor is mounted precisely in its axes. It's even more important for an adjustment than for a calibration, because all errors would result in correction values that are later stored into the sensors TEDS.

If there is a **MountOfs** set in the TEDS, this will not be used during the adjustment run. So it can remain unchanged.

After the run, the evaluation of correction parameters is automatically started. Resulting values are displayed in text boxes. At this point, it is possible to override values **manually**. But it should only be done in rare cases and with care.

If measurement values are not plausible, an error message is shown.



Possible sources of errors are, that the sensor was not mounted to the tilt table, or was mounted with incorrect axis orientation.

Finally, the button "finish adjustment" must be pressed.

Axis B

CalOfs	<input type="text" value="32414"/>	<input type="text" value="32396"/>
CalScl	<input type="text" value="8475"/>	<input type="text" value="8474"/>
CalAlg	<input type="text" value="5"/>	<input type="text" value="4"/>

Adjustment parameters are now stored in TEDS and a summary about the adjustment procedure is shown.

Justierergebnis

Bei der Justierung der Achse traten folgende Probleme auf:

- Qualität Parametersuche:
OK.
- Abweichung Sensormeßwerte:
OK.
- Plausibilität Kalibrierwerte:
Mindestens ein Justierparameter hat einen ungewöhnlichen Wert.
- TEDS Schreibvorgang:
OK.
- Manuelle Korrekturen:
Keine.

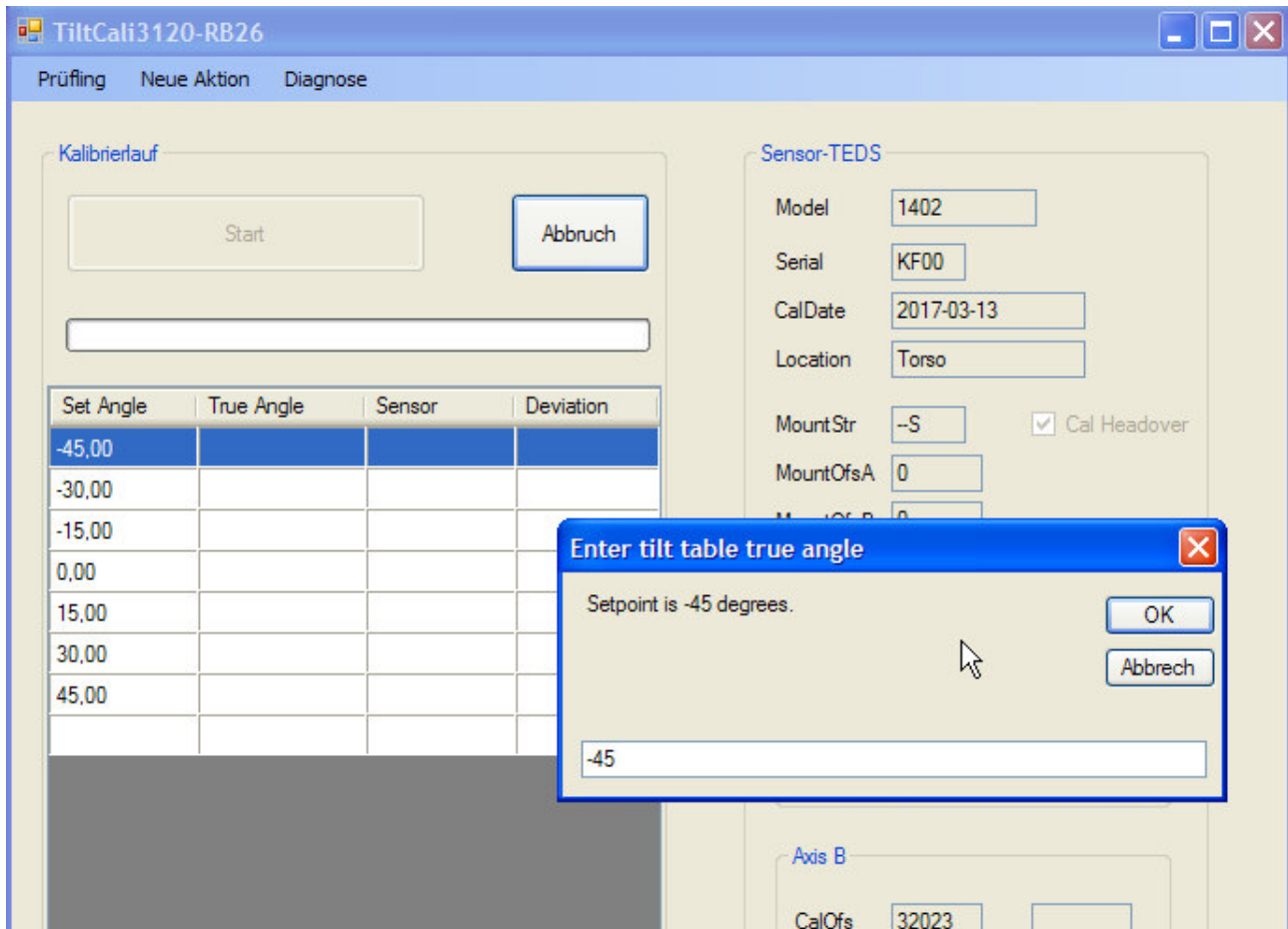
For judgment of the adjustment process these aspects are considered:

- Quality measure CHI from parameter estimation
- Maximum deviation between calculated sensor values from measured values
- Similarity of found adjustment values to nominal values

The "Finish" button is not disabled after this step. Thus it is possible to repeat the step, e.g. in case of a TEDs write error.

5 Usage of an external tilt table

It is possible to use the TiltCal software in combination with an external (non IES) tilt table. In this case, the software cannot control the table. Instead, an input box is shown whenever the true (reference) tilt angle from the external table is needed



The software must be configured for this mode with an entry in the **INI file**. The line `TILTTABLE=IES3120` must be changed into `TILTTABLE=NONE`.

```
[CONTROL]
RESULTPROC=C:\windows\system32\notepad.exe
DRVPORT=COM5
TILTTABLE=IES3120
```

The picture below shows the sign of angle for input and output of the TiltCal software (values of the input box).

