

Calibration

The TasAlyser measurement application includes a semi-automatic **calibration function**.

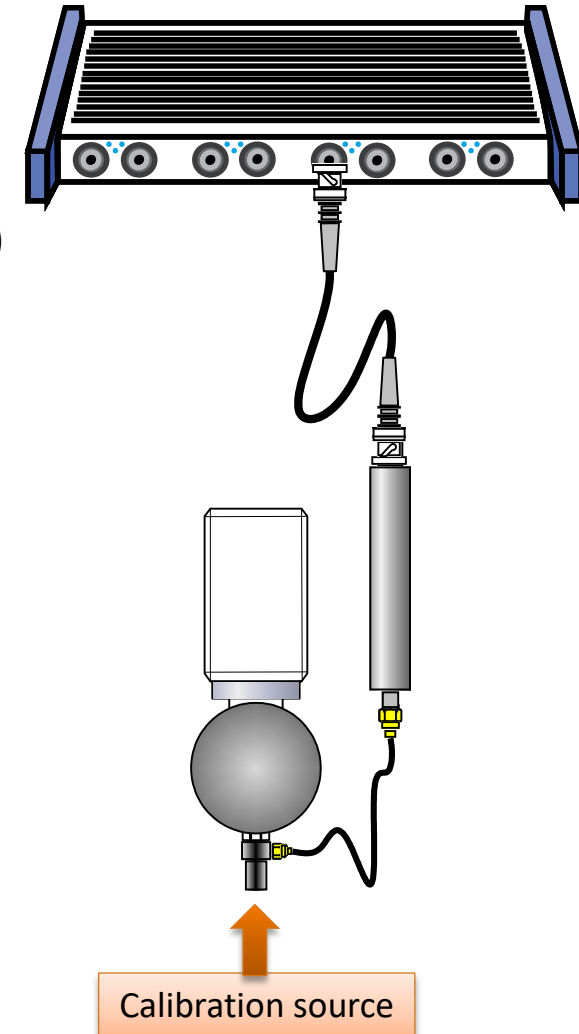
Calibration applies to the complete measurement chain including sensor, amplifier and A/D converter.

The result is the **calibration factor**, which converts a voltage detected by the A/D converter into a physical value (e.g. in m/s^2 or g) which is measured by the attached sensor.

To calculate the calibration factor, a calibration signal of known quantity is necessary. This signal is generated by a **calibration source**, for example a handheld shaker which produces a vibration with exactly 9.81 m/s^2 peak.

The properties of the calibration source have to be entered into the measurement system, so the calibration function knows the reference value and can calculate the factor.

To perform the actual calibration, the calibration control function is started and then the calibration source applied to the sensor. The measurement system will detect automatically the presence of a valid signal and calculate the calibration factor.



Source Definitions



Calibrator

To perform the calibration, the A/D converters must be active. Therefore, manually initiate a test run using the command center window or by pressing F5 on the keyboard. (TasAlyser has to load the parameter data base information to know the signal names and properties.) Then, open the calibration control from the *Favorites* window.

To perform calibration, you first need the external source of your calibration signal. In the **calibration control** window you can create an according **source definition** and then assign it to the appropriate **sensor channels**:

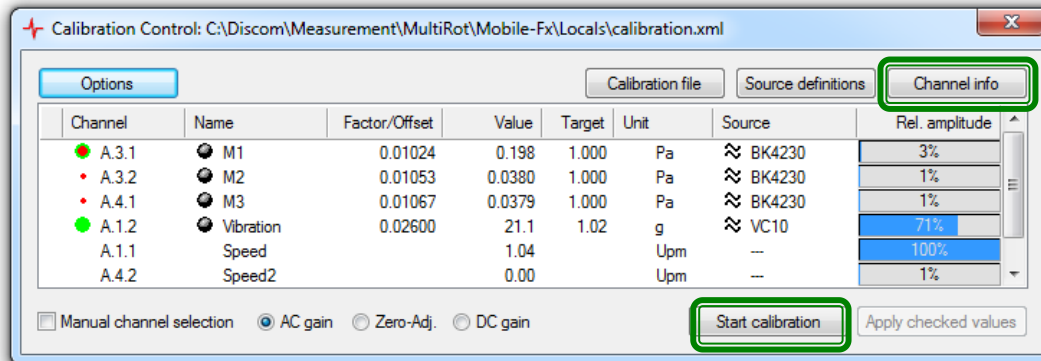
Calibration control shows the labels of the TAS box input channels, the assigned signal names and the current calibration factors.

The source definition has to be set up and selected only at the first time calibration (or when the source is changed).

Performing calibration



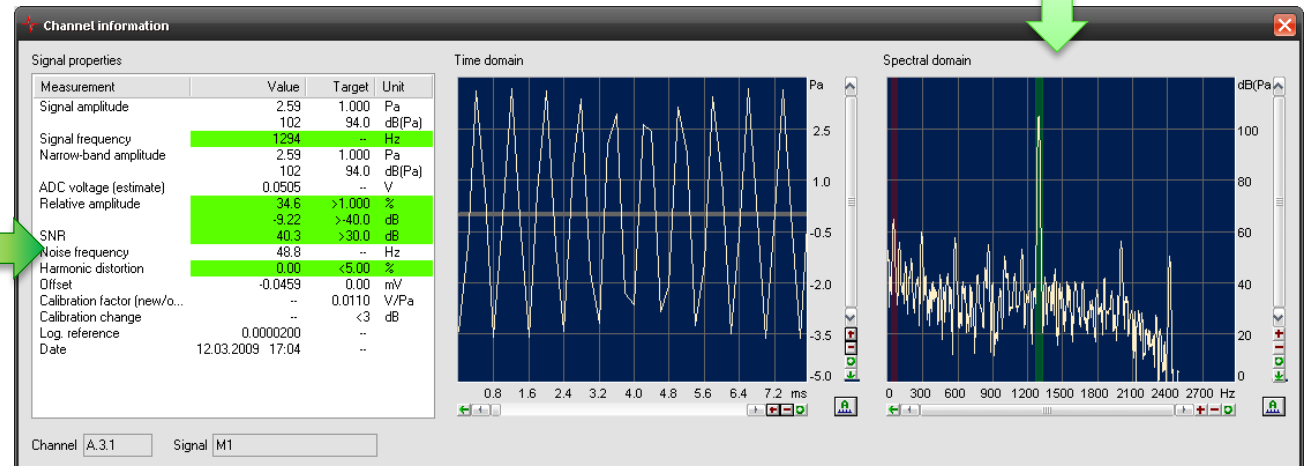
Open the **calibration control** window and press **Start calibration**. From now on, calibration control “listens” on all sensor channels for a calibration signal.



You can press **Channel info** to see the signal and spectrum. Calibration control automatically selects the strongest signal source.

In the spectrum the detected calibration signal and the strongest noise source are marked.

Press the calibrator source (e.g. shaker) to the sensor. When calibration control detects a “clear” signal, all lines in the channel information will change to green. If the signal is stable long enough, a new calibration factor is calculated and then shown in the list of calibration control (see above).



In the Channel Info display you can check whether you have a proper calibration signal. If not, check the sensor and cable connections!

Calibration: Input settings

The Calibration function will only accept a proper and clear calibration signal.

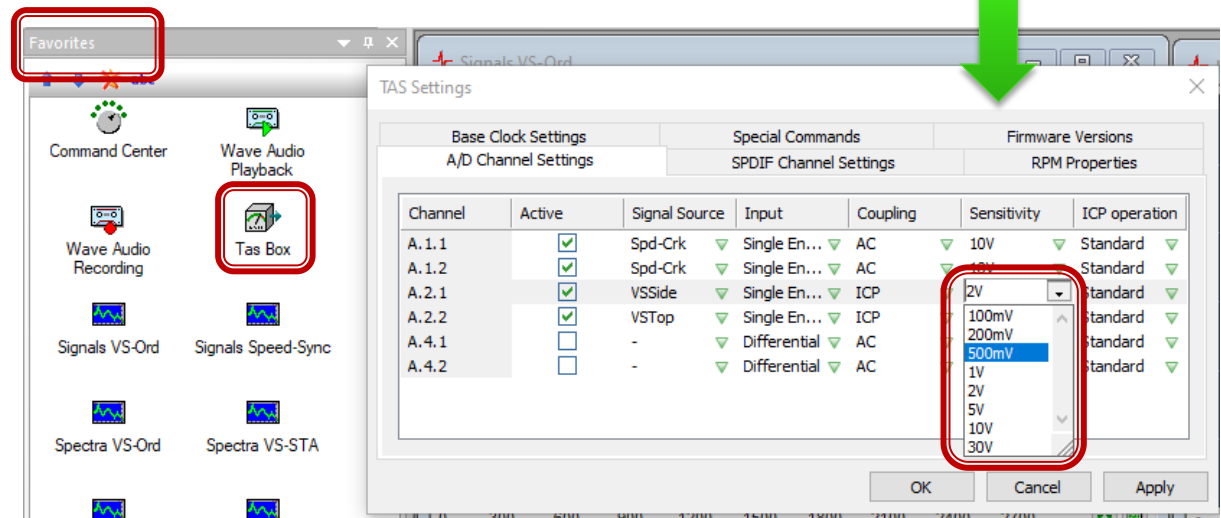
Several signal properties are checked, e.g. signal-to-noise ratio, harmonic distortion and relative amplitude.

When you get a lot of red lines in the Channel Info window, one possible reason is that with the current Tas Box input settings, the signal from the calibrator unit is too weak. The Tas Box is typically configured for much stronger input signals than the calibrator unit provides, therefore the relative amplitude is too low for calibration.

Channel information: Source: A.2.2, VSTop

| Measurement | Value | Target | Unit |
|---------------------|----------------|---------|-------|
| Signal amplitude | 1.20 | 1.02 | g |
| | 102 | 100 | dB... |
| Signal frequency | 186 | 159 | Hz |
| Narrow-band a... | 1.06 | 1.02 | g |
| | 100 | 100 | dB... |
| ADC voltage (s... | 0.0197 | | V |
| Relative amplit... | 0.884 | > 1.00 | % |
| | -41.1 | > -40.0 | dB |
| SNR | 36.2 | > 30.0 | dB |
| Noise frequency | 103 | | Hz |
| Harmonic disto... | 46.7 | < 5.00 | % |
| Offset | -0.00860 | 0.0 | mV |
| Calibration fact... | | 0.0111 | V/g |
| Calibration cha... | | < 3 | dB |
| Log. reference | 1.00e-005 | | |
| Date | 14.09.2019 ... | | |

The solution is to temporarily change the input sensitivity of the Tas Box channel(s) to a lower value like 500mV.



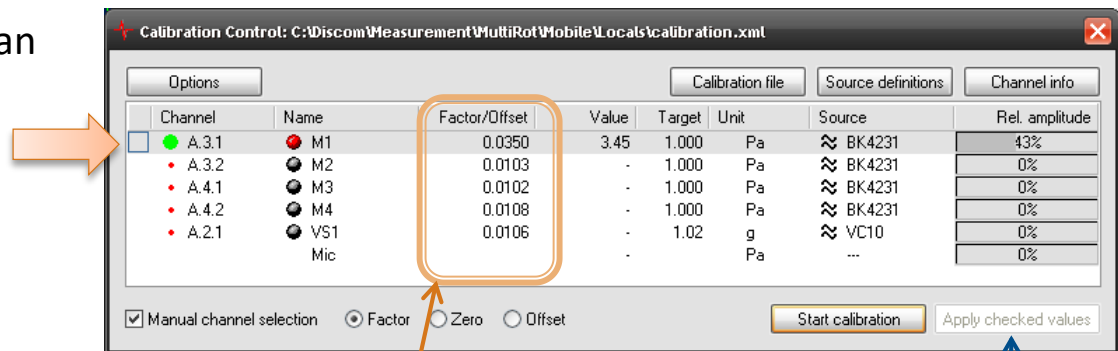
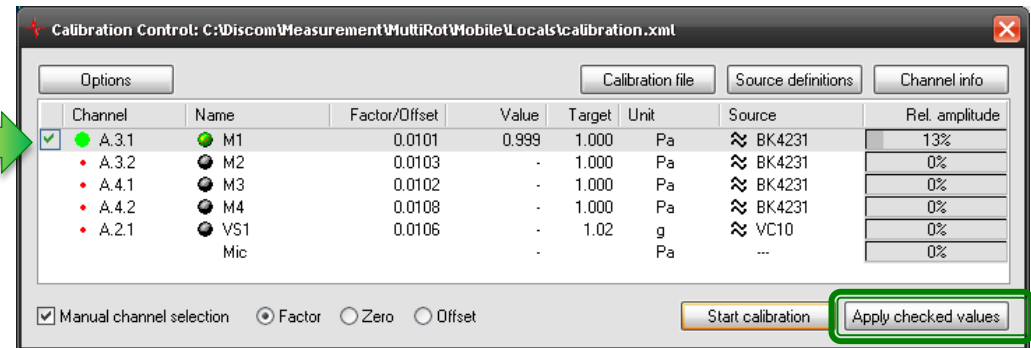
Do not forget to set the Sensitivity back to it's original value after calibration.

Applying a new calibration

When for a sensor channel the calibration was completed successfully, a green check mark appears in front of that line and the new factor is displayed.

If the new factor deviates from the previous one so much that a difference in the measurement results of more than 3 dB has to be expected, no check mark will appear. You still can set the check manually.

When you are done, press the **Apply selected values** button to activate the new values.



You can enter calibration factors manually. Just click into the according field in the **Factor/Offset** column and enter the desired value. Set the check mark and press the **Apply checked values** button.

DC Calibration

Noise sensors like accelerometers, microphones or laser vibrometers generate oscillating voltage (AC signals). Other sensors, for example for torque or force, generate DC voltage signals. For this type of sensors, a **DC Calibration** must be done.

Switch to DC Gain below the list in the calibration control window. Now you can enter the calibration factors for DC signal sources:

Calibration Control:

Options Export Source definitions Channel info

| Channel | Name | Factor/Offset | Value | Target | Unit | Source | Rel. amplitude |
|---------|--------------|---------------|-----------|--------|------|-----------------|----------------|
| A.2.1 | VS | 0.02604 | 0.00371 | 1.00 | g | ≈ VC10 | |
| A.2.2 | Mic | 0.1000 | 3.89e-004 | 1.000 | Pa | ≈ Mic | |
| A.4.1 | Shift Force | 0.02135 | 1.28 | 500 | N | = Force | |
| A.4.2 | Shift Positn | 0.2131 | -24.0 | 50.0 | mm | = Position (mm) | |
| A.3.1 | Torque | 0.02000 | -2.71 | 1.00 | Nm | = Torque | |

☐ Manual channel selection ☐ AC gain ☐ Zero-Adj ☒ DC gain

Start calibration Apply checked values

The symbol in the "Source" column shows whether this is an AC or a DC signal.

For editing the value, click into the field

In this example, according to the data sheet the torque sensor produces 10 Volts at 500 Nm. The calibration factor calculates as $10V \div 500 \text{ Nm} = 0.02 \text{ V/Nm}$.

Although you may be copying the calibration factor directly from the data sheet of your sensor and entering it into the list, you still have to define and assign a valid calibration source.

After entering the values, press the button [**Apply checked values**] in the same way as you do after normal (AC) calibration.

Calibration Reports

Use the “Export” function to create a report about the current calibration factors:

The screenshot shows the 'Calibration Control' software interface. The main window displays a table of calibration factors for channels A.4.1 and A.3.2. The 'Options' dialog is open, showing settings for the main dialog, channel info, and general options. The 'Export' button is highlighted, and an arrow points to the 'Calibration Report' window, which displays the report in XML format.

Options Dialog:

- Main dialog: ☒ Show all channels, ☒ Hold levels after calibration, ☐ dB scale, Threshold for value display (%): 1
- Channel info dialog: Spectral view: logarithmical
- Processing: Sampling freq. (Hz): 5000
- General: ☒ Warn on uncalibrated signals, ☒ Automatic Insert/Remove
- Calibration file: C:\Discom\Measurement\MultiRot\PrjF\Locals\calib
- Export XSLT: C:\Discom\Measurement\MultiRot\PrjF\Locals\Calib

Calibration Table:

| Channel | Name | Factor/Offset | Value | Target | Unit | Source | Rel. amplitude |
|---------|--------|---------------|-------|--------|------|--------|----------------|
| A.4.1 | Torque | 0.05000 | - | 100 | Nm | Torque | |
| A.3.2 | VS1 | 0.02331 | - | 1.02 | g | VC10 | |
| | | 0.01009 | - | 1.02 | g | VC10 | |
| | | 0.01024 | - | 1.02 | g | VC10 | |
| | | | - | 1.02 | g | VC10 | |

Calibration Report:

Calibration
EOL3 DX ALG33
2017-09-21.13:56:37

| Sensor | Calibration Date | Factor | Offset [V] |
|--------|------------------|---------------|------------|
| Torque | 27/06/2016 10:49 | 0.05 V/Nm | -0.020723 |
| VS1 | 07/03/2017 13:28 | 0.0233059 V/g | 0 |
| CM_1 | 27/06/2016 11:26 | 0.0100949 V/g | 0 |
| CM_2 | 27/06/2016 11:34 | 0.0101524 V/g | 0 |
| CM_I | 27/06/2016 11:31 | 0.0102844 V/g | 0 |

In the Options, among other settings the location of the calibration file can be specified.

Calibration reports are in XML and can be viewed in web browsers.
An according style sheet for generating a formatted output is created automatically.