Short instructions for the operation of sensors of SPECTRO-1 series with the software SPECTRO-1-Scope V1.1

These instructions describe how to perform quick teaching of the sensors of SPECTRO-1 series with the **SPECTRO1-Scope V1.1** software interface.

Basically there are 3 methods of switching threshold monitoring. The desired method can be set with the **THRESHOLD MODE** software parameter.

Threshold mode THRESHOLD MODE LOW:
In this mode the **switching threshold** lies below the current reference value. The distance of the switching threshold from the reference value **REF** is defined by the specified **TOLERANCE** value. In this mode the **HYSTERESIS THRESHOLD** lies above the switching threshold. If automatic threshold tracing is activated **(THRESHOLD TRACING=ON)**, appropriate time constants must be selected for threshold tracing.

Threshold mode THRESHOLD MODE HI:
In this mode the **switching threshold** lies above the current reference value. The distance of the switching threshold from the reference value **REF** is defined by the specified **TOLERANCE** value. In this mode the **HYSTERESIS THRESHOLD** lies below the switching threshold. If automatic threshold tracing is activated **(THRESHOLD TRACING=ON)**, appropriate time constants must be selected for threshold tracing

Threshold mode THRESHOLD MODE WIN:
This mode operates with two **switching thresholds** that lie symmetrically around the current reference value **REF**. The distance of the switching thresholds from the reference value **REF** is defined by the specified **TOLERANCE** value. In this mode the two **HYSTERESIS THRESHOLDS** lie within the tolerance band. If automatic threshold tracing is activated **(THRESHOLD TRACING=ON)**, appropriate time constants must be selected for threshold tracing.

In the following example parameterisation of the sensor system is performed with these settings: **POWER MODE = STATIC, LED MODE = AC, OUTMODE = DIRECT, THRESHOLD MODE = LOW, THRESHOLD TRACING = OFF, EXTERN TEACH = OFF** and **THRESHOLD CALC = RELATIVE(%)**.

Step 1:
Prior to the use of the software aids (graphic display of sensor signals) the sensor must be manually adjusted as accurately as possible. For this procedure please refer to the data sheet of the respective sensor type.
Make sure that the sensor is properly connected and supplied with power.

Step 2:
Start the SPECTRO1-Scope V1.1 software. Please check whether the status line at the right bottom displays the „SPECTRO1 V1.1   RT:KW*xx/xx* " message.
Info: Moving the mouse cursor to a control element and clicking with the right mouse button displays a short info on the respective individual control element
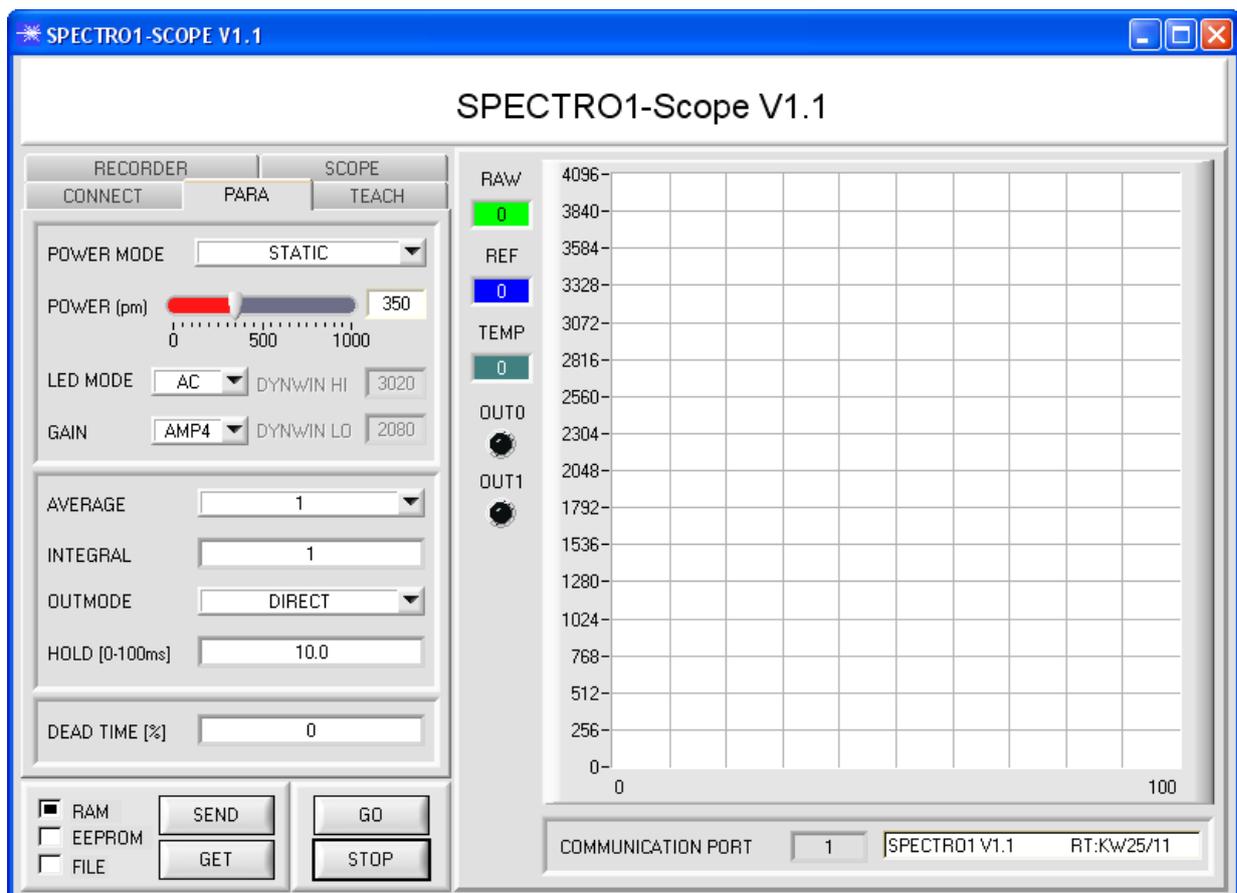
Step 3:
Please make sure that for the time being **RAM** and not **EEPROM** is selected for the data exchange with the sensor (RAM is a volatile memory in the sensor, i.e. the data will be lost when power is turned off. EEPROM is a non-volatile memory in the sensor, i.e. the data will not be lost when power is turned off.)
Click on the **TEACH** tab to display the teach parameters.
Now press the **GO** button. Data exchange between sensor and PC will then start. The software shows the measurement value **RAW** in a numeric display element and as a green line in the graph. Adjust the **POWER** value such that **RAW** lies in the upper third of its dynamic range.

ATTENTION: The sensor must be informed when you have changed the **POWER** value. Press the **SEND** button to send this information to the sensor. Check **RAW** by pressing **GO** again. Repeat this process until you have a suitable **POWER** value.

Tip! There is a trick for finding a suitable **POWER** value in no time at all. Set **POWER MODE = DYNAMIC**. The sensor then tries to find a suitable **POWER** value such that **RAW** lies between **DYN WIN LO** and **DYN WIN HI**. Check this by pressing **GO**. Press **STOP** when **RAW** has "levelled out". Then press **GET**. The **POWER** value that was found now is shown in the **POWER** function field. Now set **POWER MODE = STATIC**, and press **SEND**.
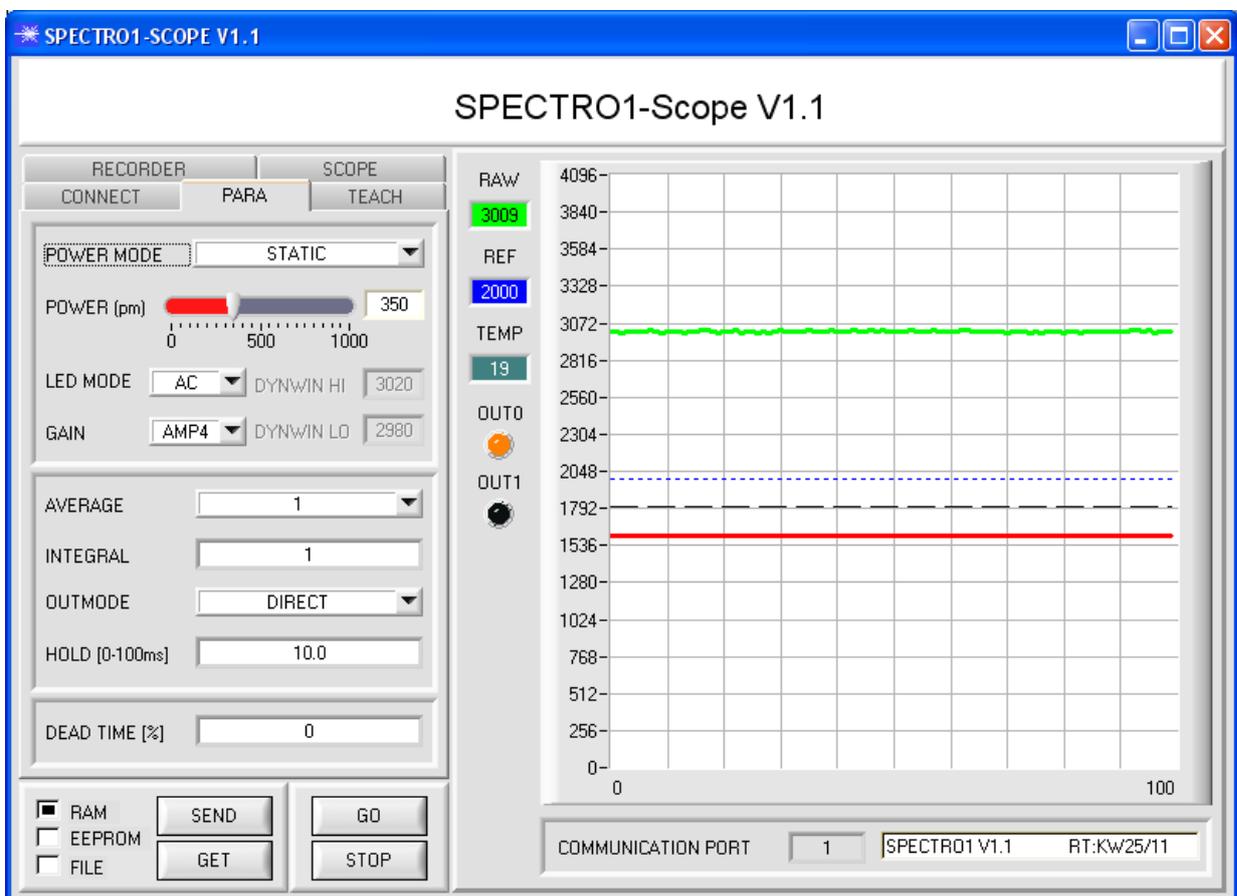
Step 4:
Press the **GO** button.

Now press the **TEACH** button. The current **RAW** value is written to the **TEACH VALUE** edit box.
With a click on **SEND** the **TEACH VALUE** is updated as reference value **REF** in the sensor.

Info: If **THRESHOLD TRACING** or **EXTERN TEACH** is not **OFF**, the electronic control unit calculates the reference value **REF** automatically or adopts this value from "teaching" after a corresponding event at IN0. In this case **TEACH VALUE** and **TEACH** are not active on the software interface.

The reference value **REF** (blue line) is used for the calculation of the switching threshold (red line) and hysteresis threshold (black line).
Switching threshold = **REF - (TOLERANCE * REF) / 100** = red line
Hysteresis threshold = **REF- (HYSTERESIS * REF) / 100** = black line

The **TOLERANCE** value must be chosen such that when a faulty object is measured the switching threshold is reliably overshot (or undershot).

Accept parts should lie in the range between the reference value **REF** and the switching threshold. The value of **TOLERANCE** is determined by a for example production-related variance of accept parts.
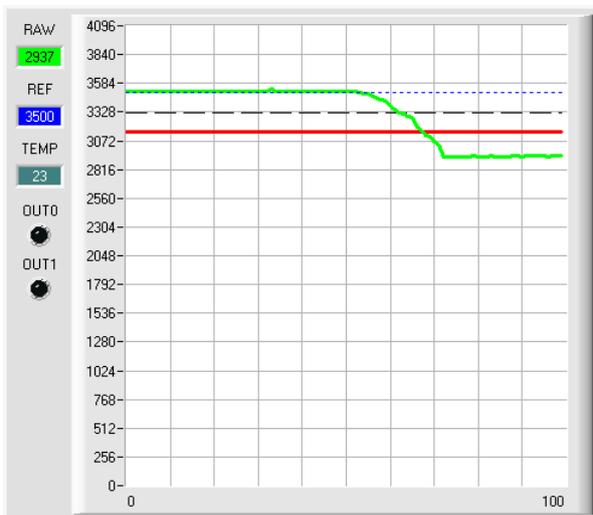
The hysteresis threshold prevents a switching of the digital output in case of short-time undershooting of the switching threshold.

Press the **GO** button once again.
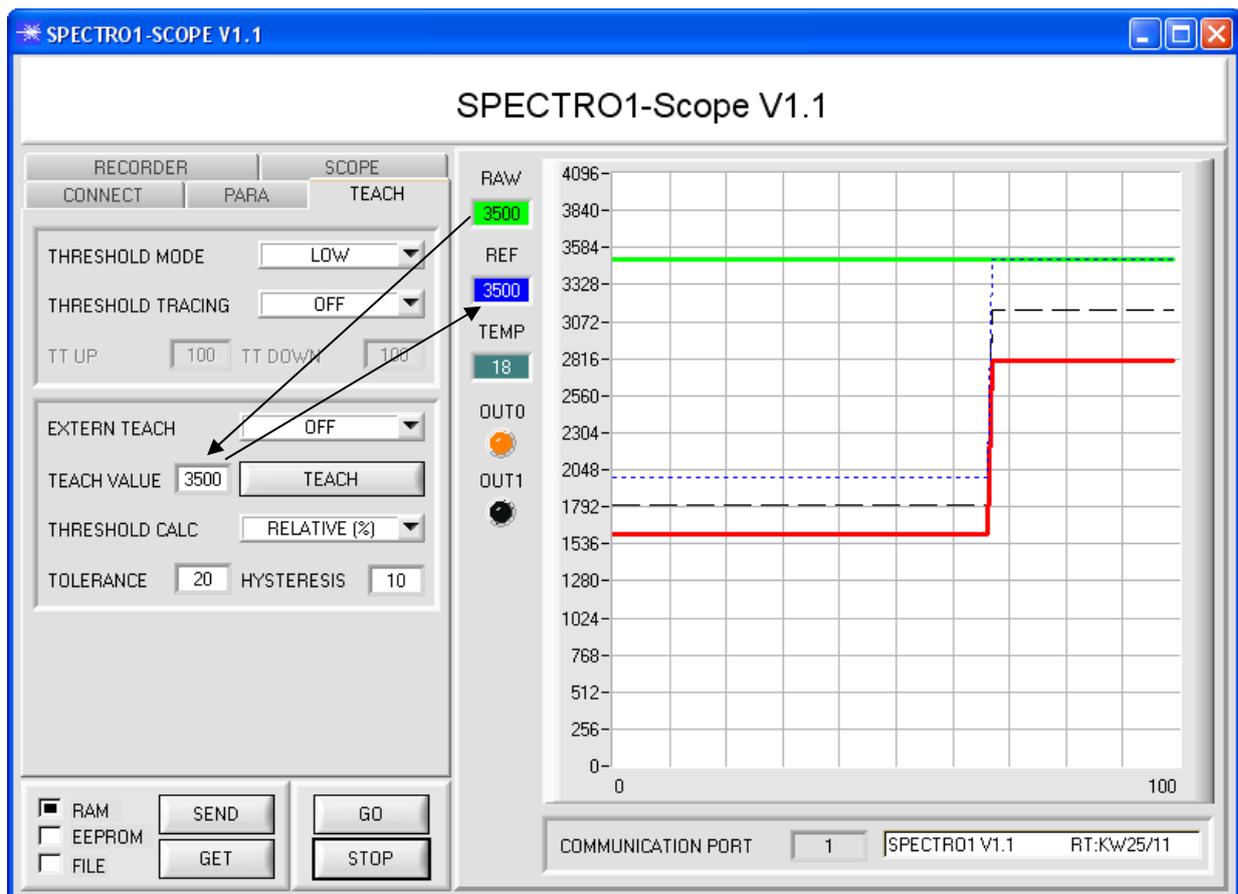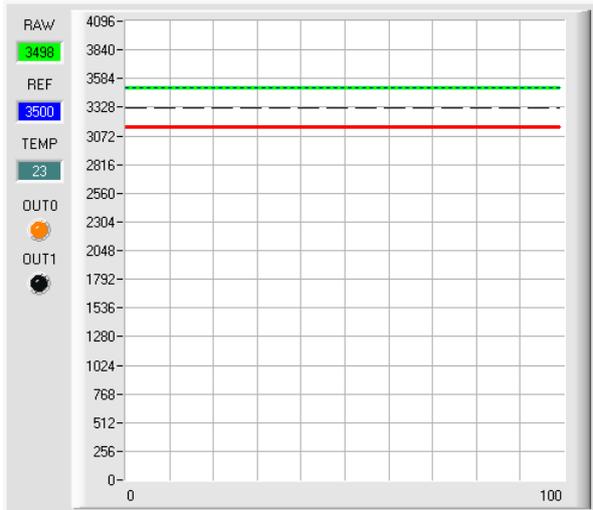
As long as the current measurement value **RAW** (green line) lies above the switching threshold (red line), the output **OUT0** has +24V (signal is OK). This is visualised by the **OUT0** LED.

When the current measurement value **RAW** (green line) falls below the switching threshold (red line), the output **OUT0** changes to 0V (error). This is visualised by the **OUT0** LED.
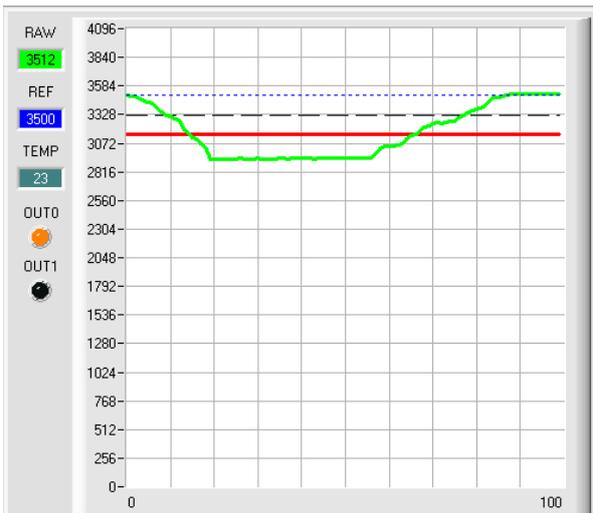
When the current measurement value **RAW** (green line) rises above the hysteresis threshold (black line) again, the output **OUT0** also changes to +24V again (signal is OK). This is visualised by the **OUT0** LED.

Step 5:
When you have finished parameterisation, please select **EEPROM** and press **SEND** to save the data to the non-volatile memory of the sensor.