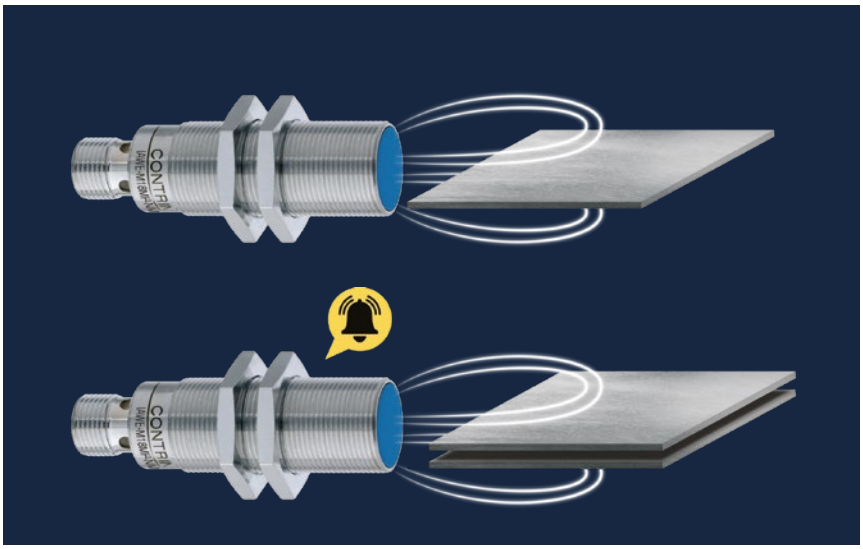
CONTRINEX
SENSORS SAFETY RFID

LATERAL DOUBLE SHEET DETECTION

1. APPLICATION DESCRIPTION

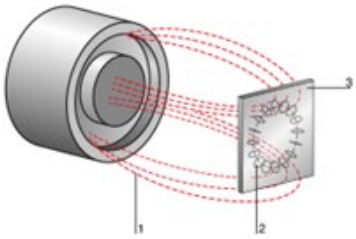
In industrial processes, detecting double sheets or multiple layers is crucial to prevent equipment malfunctions and ensure reliable operations. An inductive smart sensor is a highly effective technology for this purpose. It utilizes electromagnetic principles to sense changes induced by conductive materials. By analysing the electromagnetic field interaction, the sensor can differentiate between single and multiple sheets. Its intelligent features enable adaptability, high speed, and precise detection, making it suitable for integration into various material handling systems. Overall, the inductive smart sensor enhances operational efficiency and product quality in manufacturing applications.

Contrinex IDWx-Mxx-Mx Smart sensors provide a cost-effective and freely configurable solution for double sheet detection applications by detecting the presence of one or more sheets with a measurement on the side of the sheets.



Contrinex smart sensors can utilize the distance measurement principle to determine the presence of one or more sheets in front of the sensor. The configurable detection thresholds of Contrinex smart sensors allow for the detection of various sheet materials and thicknesses using a single sensor.

As this method is sensible to the distance and angle of the sheets it is recommended to install multiple sensors (at least two) to avoid faulty detections on the application.



2. CONFIGURATIONS

2.1. IDWX-MXXMP-NMS-A0 LATERAL DOUBLE SHEET CONFIGURATION

https://app.pocketcodr.com/follow-config/b661e8f6-04be-4a65-9cf9-8f6b73d018a2/

2.2. IDWX-MXXMM-NMS-A0 LATERAL DOUBLE SHEET CONFIGURATION

https://app.pocketcodr.com/follow-config/74ab9d2e-9881-4a6b-974d-1ffebe704fd9/

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3. CONTRINEX SMART SENSOR TYPE

Contrinex does recommend using inducitve DMS smart sensors from the 500 family with a nonmetallic sensing face.

IDWE-MxxMP or **IDWN-MxxMP**

The DMS sensors from the 700 Family (**IDWE-MxxMM**) with a stainless-steel housing, employ a measurement principle that is more responsive to the material's depth rather than its surface. As a result, the measurement saturation increases, leading to a smaller difference in measurement between one and two sheets. Therefore, careful evaluation of the switch points and hysteresis configuration is necessary to ensure accurate detection in such cases.

4. APPLICATION RECOMMENDATIONS

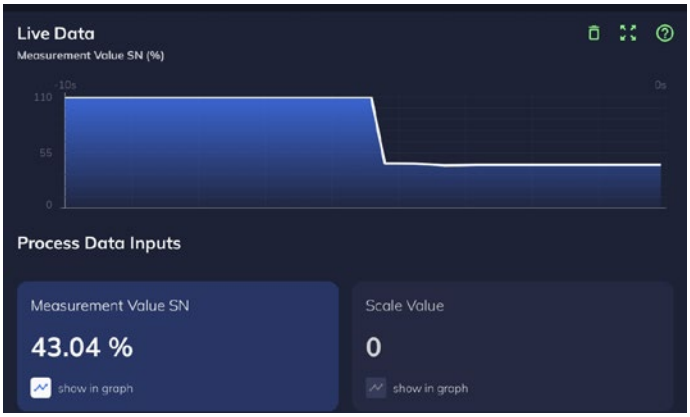
Any metallic sheets can be detected with the inductive smart sensors. Although to ensure a correct detection the following requirements are recommended.

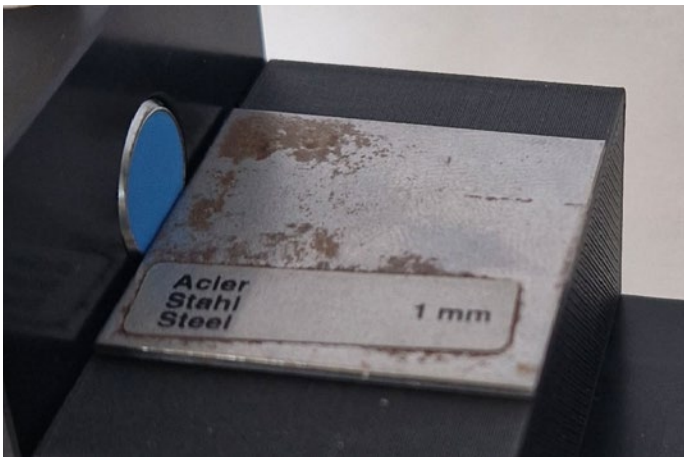
REQUIREMENT	RECOMENDATION	COMMENT
Distance measurement value of first sheet (Constant distance and angle to the target)	≥ 20 %	Increase distance between sensor and first sheet if the measurement is lower.
Measurement drop when adding second sheet	≥ 5 %	Because of the minimum hysteresis width
Hysteresis configuration for SSC2	≥ 5 %	Can be configured bigger depending on the application

4.1. POSITIONING OF THE FIRST SHEET

To ensure a stable reference point and repeatability for the first sheet measurement, the position and angle of the sheet relative to the sensor must be the same at each measurement.

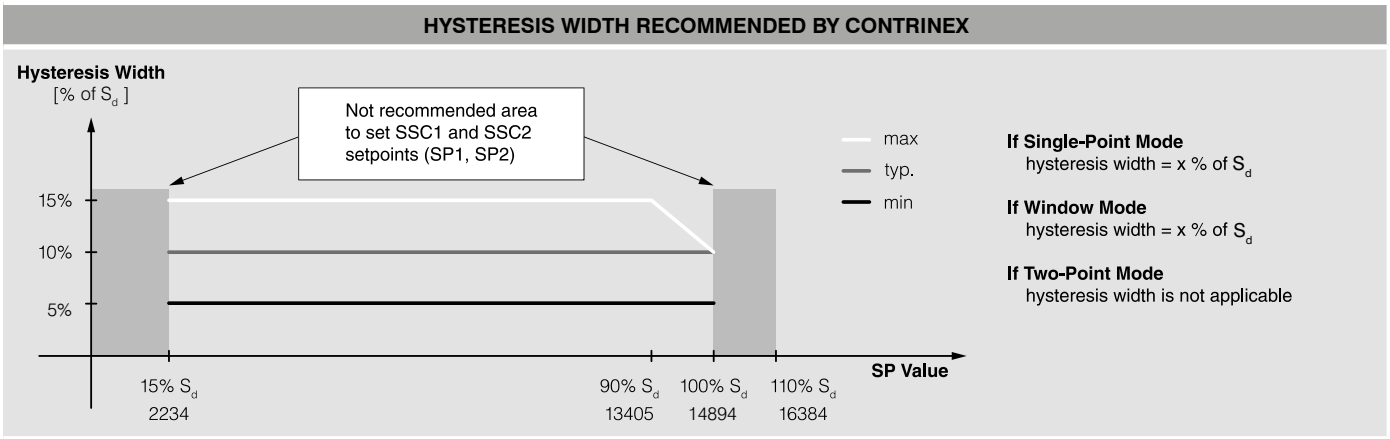
In an example the sheet is placed touching the sensor face. This ensures a stable and repeatable measurement.





It is also important that the first sheet does not saturate the measurement value beneath 20% to be able to latter on detect an additional sheet.

15% (not recommend area to set SSC's) + 5 % (min recommended hysteresis width) = 20%



If the first sheet does bring down the measurement value beneath 20% increasing the distance between the sensor and the first sheet will resolve the issue

4.2. MEASUREMENT DROP FROM ADDITIONAL SHEET

As it is not recommended to configure the hysteresis of a smart sensor beneath 5 %, it is suggested that the addition of a sheet above the first one makes the measurement value drop by at least 5%.

The user can configure the hysteresis with a bigger value than 5 % depending on the needs of the specific application.

Moreover, since the second sheet can be positioned differently from the first sheet due to factors such as air bubbles or mechanical variations, it is advisable to employ multiple sensors measuring different positions on the sheets. This approach helps prevent erroneous detections caused by mechanical limitations.

5. CONFIGURATION EXAMPLES

All configurations in the examples have been done with the PocketCodr app and the widgets available in the app.

The links can be used to load the configurations into the account.

The Switchpoints (SSC1 and SSC2) will need to be redefined for the respective application.

Recalibration to do on this configuration.

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- Teach SSC1 (Single point) with one sheet infront of the sensor adapt the hysteresis to the needs of the application (any teach procedure can be used and fine tuning can be done manually in the ssc configuration).

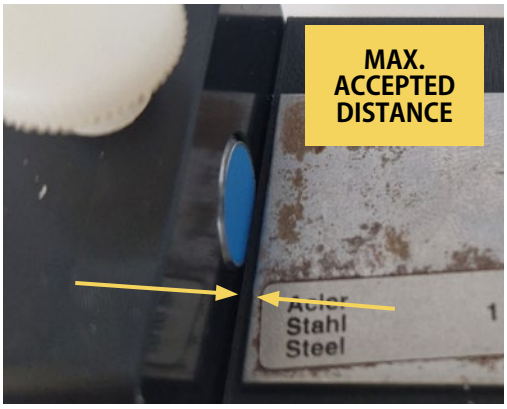
- It is recommended to teach the position of the first sheet at the furthest possible distance to the sensor. This ensures a reliable first sheet detection.

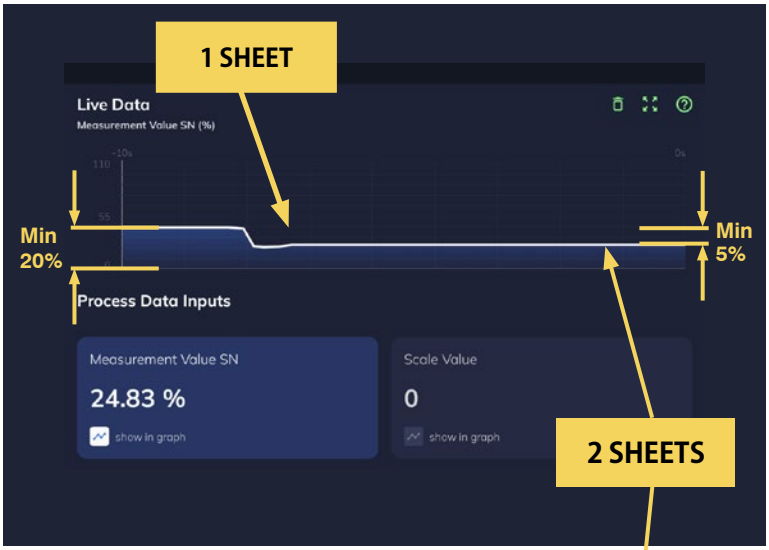
- Teach SSC2 (Single point) to detect when a second sheet is placed in front of the sensor. Place the additional sheet in front of the sensor and see when a measurement drop is visible. A drop of at least 5 % is recommended. The minimum hysteresis of 5% is also recommended

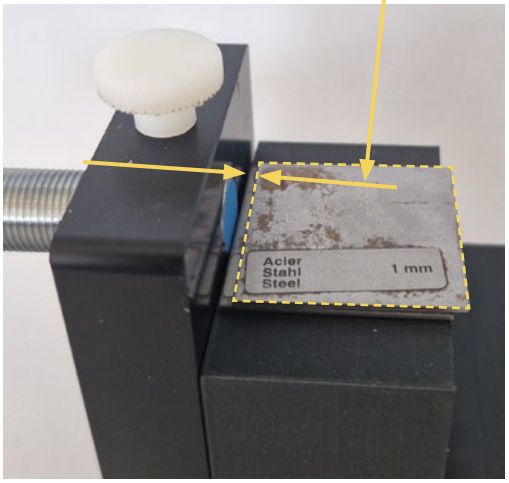
- Adapt the timer delayed signal TSSP to the time needed on the specific applications

- The output OSS1 is configured to signal a single sheet detection (No changes needed)

- The output OSS2 is configured to be the double sheet detection after the timer delay has passed. (No changes needed)







5.1. CONFIGURATION DESCRIPTION

In this configurations example the sensor is configured to detect with the first switchpoint a single sheet and with the second one a double sheet case. The second switchpoint (SSC2) is delayed by the timer by 1 second do avoid double sheet detection while placing the first sheet.

The first output (OSS1) is configured to switch only when a single sheet is detected.

The secondary output (OSS2) does switch when a double sheet is detected and the time of 1 second has passed in this state.

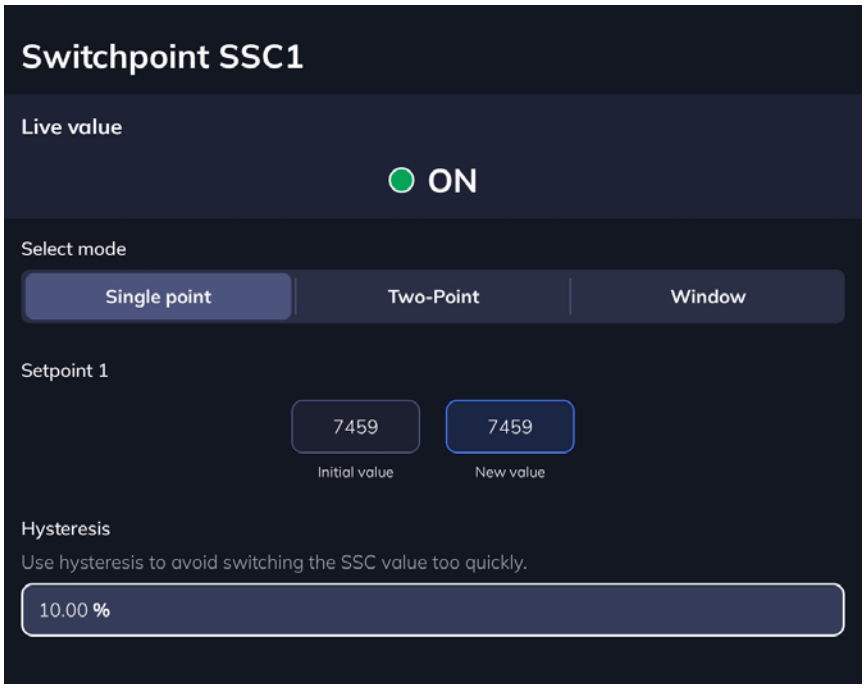
Additionally, the internal counter does count the amount of double sheet detections the sensor encountered.

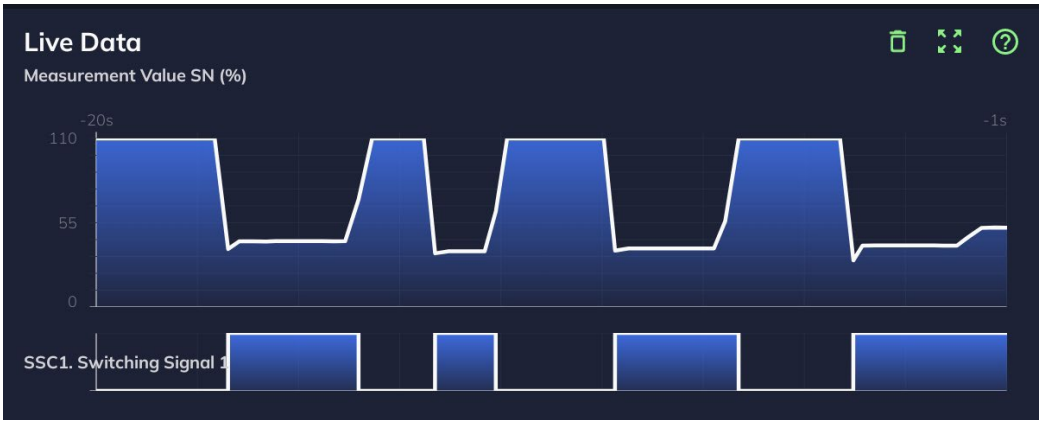
The counter is also analyzed by an internal alarm of the sensor. The alarm will rise as soon as the counter of the double sheet detection rises to 20 as it might signal a constant mechanical issue on the application or a faulty detection which requires a recalibration of the sensors.

5.2. SSC1

SSC1 is configured in single point mode so it does switch on as soon as a single sheet is detected.

To cater to the requirements of the application, it is necessary to adjust the setpoints of the system. This adjustment can be accomplished either by manually inputting the setpoint values or by utilizing a teaching procedure. By doing so, the SSC1 is configured only to detect when an actual sheet is present in front of the sensor. The user can change the setpoint and the hysteresis to adjust the sensibility of the single sheet detection.

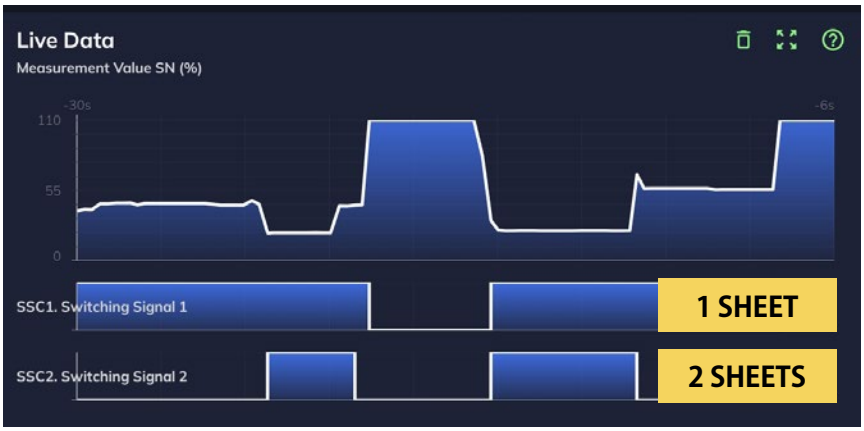




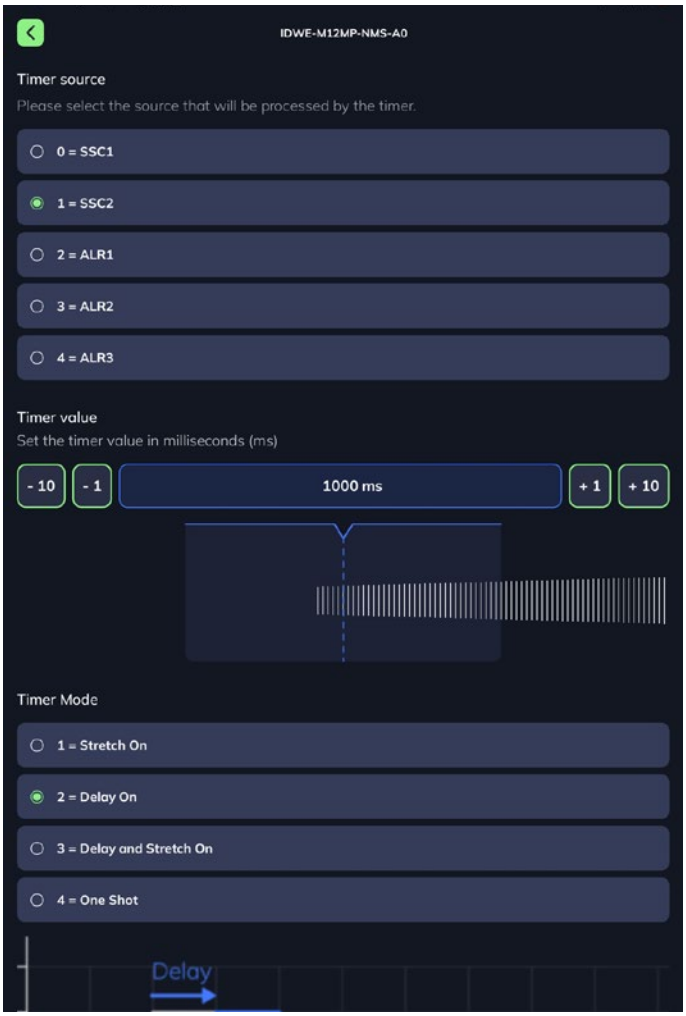
It is shown that the SSC1 switches on only when the predefined level is reached. This indicates that at least on sheet is in position infront of the sensor.

5.3. SSC2

Switch point SSC2 is configured to detect only when there are two sheets present. To do this SSC2 is configured as single point detection configured with a lower threshold than SSC1.



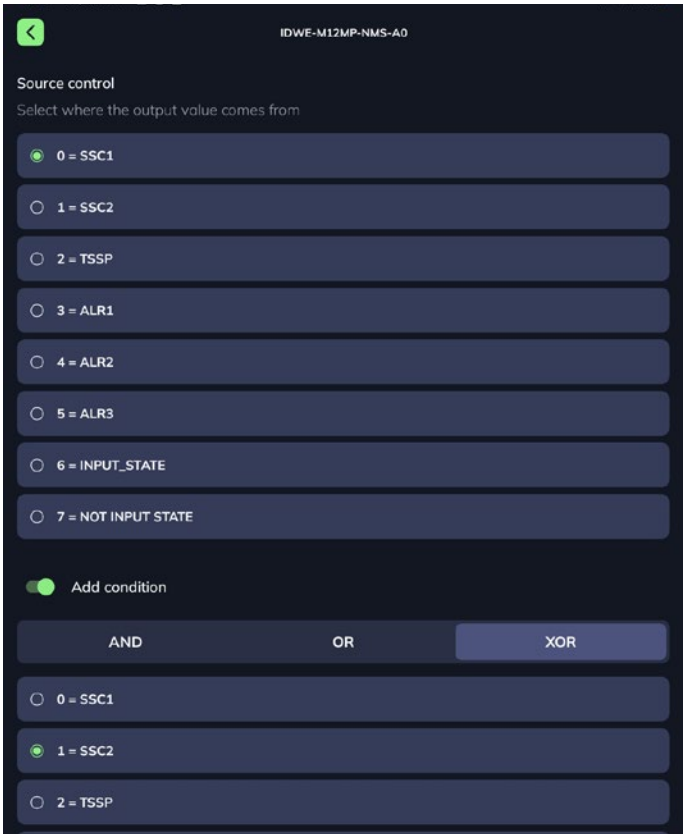
SSC2 will identify excessive target material in front of the sensor, indicating the presence of an extra sheet. The desired threshold can be programmed using any method, causing SSC2 to activate when additional material is detected.



5.4. TIMER TSSP

To prevent double sheet detection when the first sheet is placed in front of the sensor, it is advised to introduce a delay in the SSC2 signal. This delay ensures that the timer output (TSSP) does not activate when a single sheet is placed in position, as it may temporarily lower the measurement below the threshold for double sheet detection.

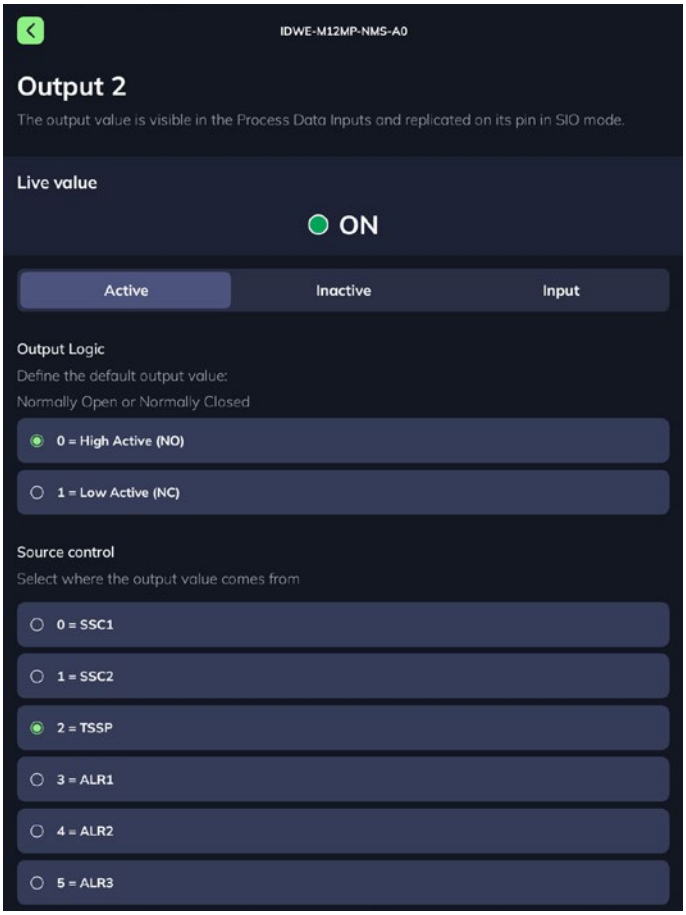
The default timer has been set to a 1 second delay but can be adapted by the user depending on the needs of the application.



5.5. OUTPUT PIN 4 OSS1

The initial output is set up to activate exclusively when a single sheet is detected. This is achieved by utilizing the XOR function in the OSS configuration. This arrangement ensures that the output only activates when SSC1 is detected and deactivates when timer signal TSSP is also triggered.

If IO-Link is used the user can read out the signal OSS1 through the process data.



5.6. OUTPUT PIN 2 OSS2

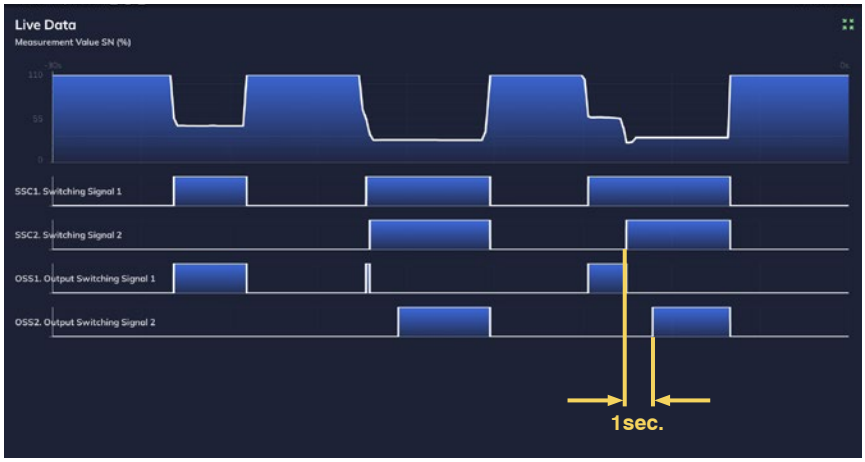
OSS2 is configured to switch when TSSP is triggered.

This allows to give out a signal when a double sheet detection has taken place.

5.7. DISPLAY THE RESULT ON A GRAPH

To display the result on a graph the process data of SSC1, SSC2, OSS1 and OSS2 allow to visualize the right functioning of the double sheet detection.

It is visible that OSS1 is only active when SSC1 detects a single sheet, but TSSP did not get activated. It is also visible that OSS2 switches on with a delay compared to the rising edge of SSC2.



5.8. ADDITIONAL CONFIGURATIONS

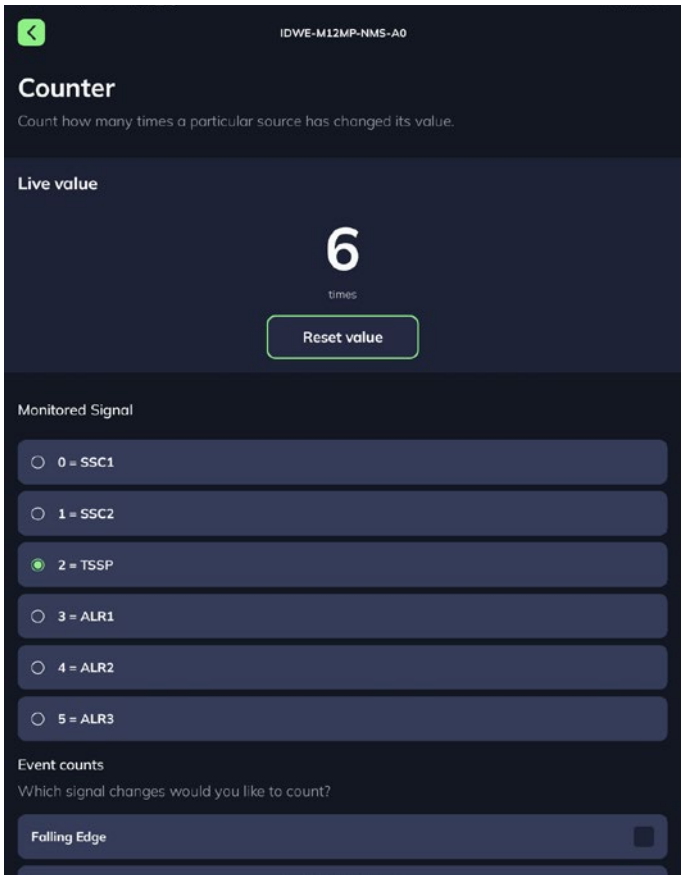
Those additional configurations allow for more indicative data which can be read out of the sensor if needed. They do not alter anyhow the functioning of the double sheet detection and can be deactivated if needed.

5.8.1. COUNTER

In this configuration example the counter is set to count the number of times the sensor detected an additional sheet on the application. For this the rising edge of the timer signal TSSP triggers the incrementation of the counter.

This value can be read out through IO-Link or could be configured as the measurement value of the process data with the Sensor configuration unit (SCU) in the “all value” widget.

The counter can be reset to 0 by either one of the three alarms, by writing the counter index through IO-Link or with the available button in the PocketCodr app.



5.8.2. ALARMS

Alarm 1: Configured to switch on when the counter reaches the value of 20.

The threshold of 20 is not representative of what might be needed on a real application and must therefore be adapted if used.