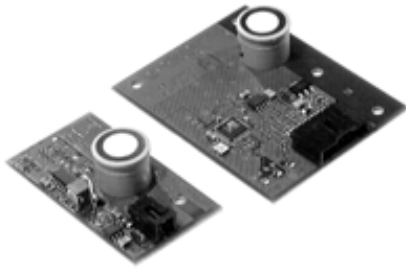
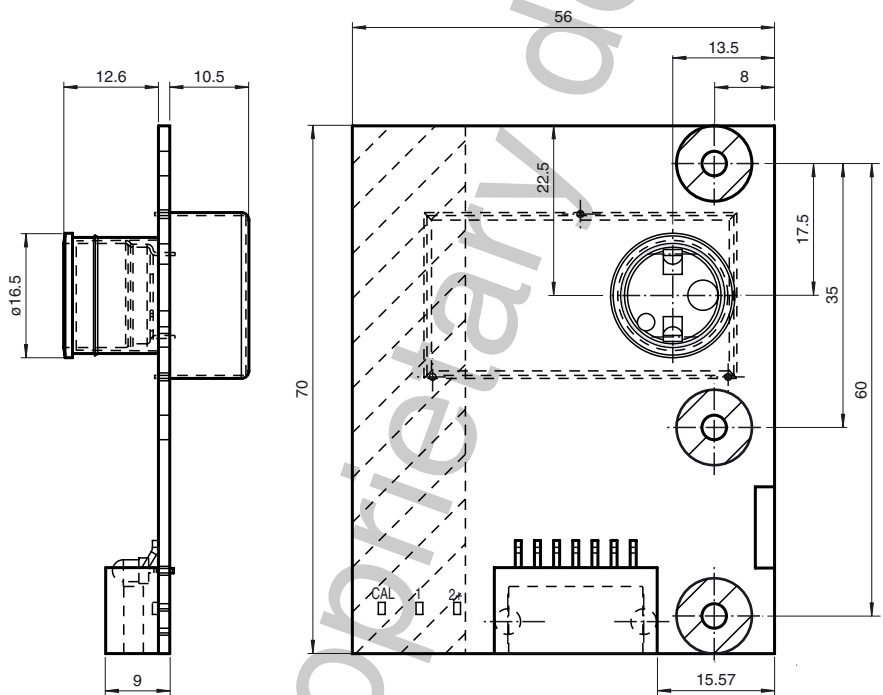
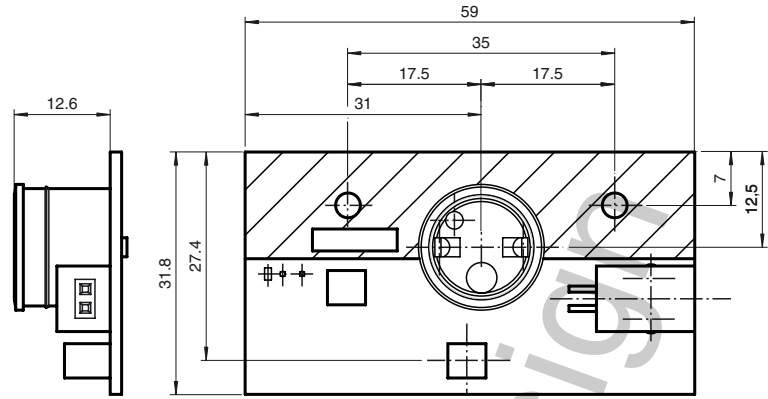


**Double sheet sensor**  
**UDB-400-SU-Y131215**



**Dimensions**



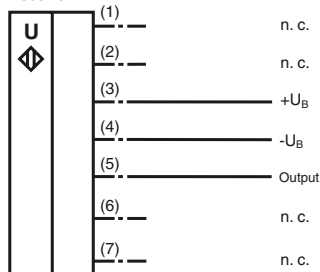
**Features**

- Ultrasonic system for reliable detection of no, one, or two overlapping sheet materials, preferably papers
- No TEACH-IN required
- Insensitive to printing, colours, and shining surfaces
- Material weight from 20 g/m<sup>2</sup> up to over 1200 g/m<sup>2</sup>

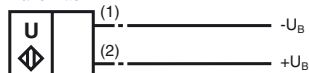
**Electrical connection**

Standard symbol/Connection:  
Double sheet control

Receiver



Transmitter



## Technical data

### General specifications

Sensing range 40 ... 50 mm , optimal distance: 45 mm  
Transducer frequency 395 kHz

### Indicators/operating means

LED green 1 indication: CAL  
LED green 2 indication: 1  
LED red indication: 2+

### Electrical specifications

Operating voltage 24 V  $\pm$  5 %  
No-load supply current  $I_0$  < 80 mA  
Time delay before availability  $t_v$  < 500 ms

### Output

Rated operational current  $I_e$  10 mA  
Switch-on delay  $t_{on}$  approx. 15 ms (shorter response time on request)  
Switch-off delay  $t_{off}$  approx. 15 ms (shorter response time on request)  
Analog voltage output 0 V: no power/error  
0.5 V: air/single sheet  
4 V: double sheet

### Standard conformity

Standards IEC / EN 60947-5-2:2004 C-UL listed: 57M3, IND CONT. EQ., "Powered by Class 2 Power Source"

### Ambient conditions

Ambient temperature 0 ... 60 °C (273 ... 333 K)  
Storage temperature -40 ... 85 °C (233 ... 358 K)

### Mechanical specifications

Connection Receiver: connector 7 pin, MOLEX type SL  
Transmitter: connector 2 pin, MOLEX type SL

### Material

Transducer epoxy resin/hollow glass sphere mixture; polyurethane foam  
Mass 85 g

### Sensor Functions:

Ultrasonic Double sheet detection systems are used in applications where the automatic distinction between single and double sheets is necessary. This is typically done for the purpose of machine protection and process improvements. Double Sheet detection is based on thru-beam Ultrasonic transmission. The following cases are easily distinguishable:

- No sheet i.e. Air
- Single Sheet
- Double Sheet

Signal processing is performed by a microprocessor system, resulting in the activation of the appropriate electronic output. Small changes in the detected signals due to slowly varying environmental conditions are automatically taken into consideration. The entire double sheet detection system consists of fully tested, unboxed electronic circuit boards.

### Operation

The measurement principle is based on the transmitted amplitude of the ultrasonic signal passing through a sheet. With no sheet between the transmitter and receiver the system detects no sound absorption; the received signal is at a maximum. With two sheets stacked on top of each other, multiple reflections result in a nearly 100% absorption of the emitted sound; the received signal is at a minimum. For thicker or denser materials the amplitude of the transmitted sound is reduced. Consequently, the operation of the system must be limited to a range of materials and material thicknesses. Materials that are too thin will exhibit too little absorption, while materials that are too thick result in too much absorption. In the first case the signal difference between no sheet and one sheet may be undetectable. In the second case the signal difference between one sheet and two sheets may be too small for accurate detection. It is not necessary to perform any Teach-In based on the single sheet.

### Detection System:

A complete double sheet detection system is composed of an ultrasonic transmitter unit and an ultrasonic receiver unit. The components are tuned in pairs and cannot be operated with another transmitter or receiver units. See also device labels, which must have the same identification number.

### Mounting/Orientation

#### Orientation:

**For reliable operation of the system it is important that the transmitter and receiver's centers are aligned axially to each other (see figure).**

Optimal transmitter to receiver separation:  $d = 40 \text{ mm} \dots 50 \text{ mm}$

Angular misalignment tolerance:  $\alpha < \pm 1^\circ$

Maximum lateral offset:  $s < \pm 1 \text{ mm}$

#### Angular sensor adjustment:

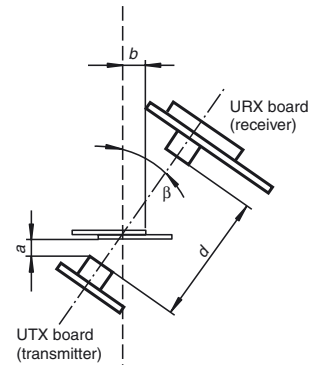
The sensor is emitting the ultrasonic sound signal in continuous wave mode. Due to this, the sensor heads must not be mounted perpendicular to the paper sheets ( $\beta = 0^\circ$ ). For best performance the transmitter and receiver should be mounted at an angle of  $\beta = 25^\circ$  -  $30^\circ$  with respect to the sheet normal. Sheets should be between 5 mm and 15 mm

## Model number

**UDB-400-SU-Y131215**

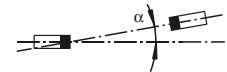
## Mounting/Adjustment

$b \geq 10 \text{ mm}$

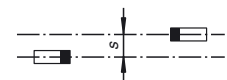


### Thin foil detection

$\alpha < \pm 1^\circ$



$s < \pm 1 \text{ mm}$



above the transmitter (dimension *a*). To limit any influence due to collection of dust the transmitter should be mounted below the sheet, emitting its ultrasonic signals upwards. The continuous emission of the ultrasonic signal results in a self-cleaning action. The emission field must be covered completely by the sheet. This requires the sheets to extend a minimum of 10 mm past the edges of the transmitter and receiver pair (dimension *b*). The direction of motion of the sheet has no influence on the detection process.

**Indicators/Output**

The double sheet detection system boards are equipped with LED indicator lamps. The UTX board (transmitter) has a power on LED. The URX board (receiver) has a voltage signal output and 3 LED lamps for indicating the operation status/ultrasonic signal strength (meaning/description see table).

URX board (receiver):				
LED CAL (green)	LED 1 (green)	LED 2+ (red)	Operation status	Output voltage
●	○	○	<b>Strong ultrasonic signal</b> - Paper path is clear - μP passed self-test & running OK	0.5 V
○	●	○	<b>Low (weak) ultrasonic signal</b> - paper path has one sheet	0.5 V
○	●	●	<b>Very low (weak) ultrasonic signal</b> - paper path has 2-plus sheets	4 V
○	○	○	<b>No power</b>	0.0 V

**Note:**

When several double sheet detection systems are used in close proximity to each other the units may interfere, resulting in incorrect operation. Counter measures should be considered during the project-planning phase.

**Warning!**

During operation the sheets must not touch the transmitter and/or receiver.

**Additional Information**

This Sensor is not suitable for splice control or label detection. For those applications Pepperl+Fuchs offers especially designed products.

Extremely light papers (e. g. handkerchifs) or perforated Papers (e. g. stamp sheets) are possibly unsuitable for double sheet detection by physical reason. Materials must be excluded, which are double sheets by themselves, e. g. composite materials with air cavities. Air cavities in sheet material may occur due to material damage e. g. by bending the sheets.

Due to the large variety of papers, cards and foils we recommend strongly to check out the desired material spectrum before running in application within an approval procedure for an optimal detection reliability.

**Information to the user:**

Class A Statement:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

**Notes:**

When installing, care has to be taken that the ultrasonic signal cannot pass around the material that is to be detected, due to multiple reflections. This can happen if large surfaces are present at right angles to the direction of sound propagation. This can be the case if unsuitable mounting brackets are used, or if assemblies with large surface are part of the machine. In the latter case such machine parts should be covered by sound absorbing material or a different location for the installation should be chosen.

In cases where more than one system is needed per machine, acoustic isolation should be provided to avoid cross-talk. This can be provided, for example, by appropriately positioning isolation panels.