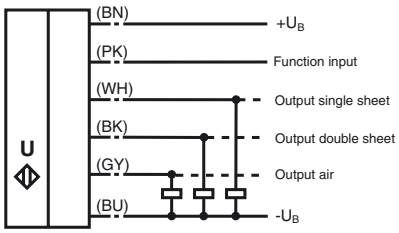
Ultrasonic double sheet monitor
UDC-18GM-400-3E3

Features

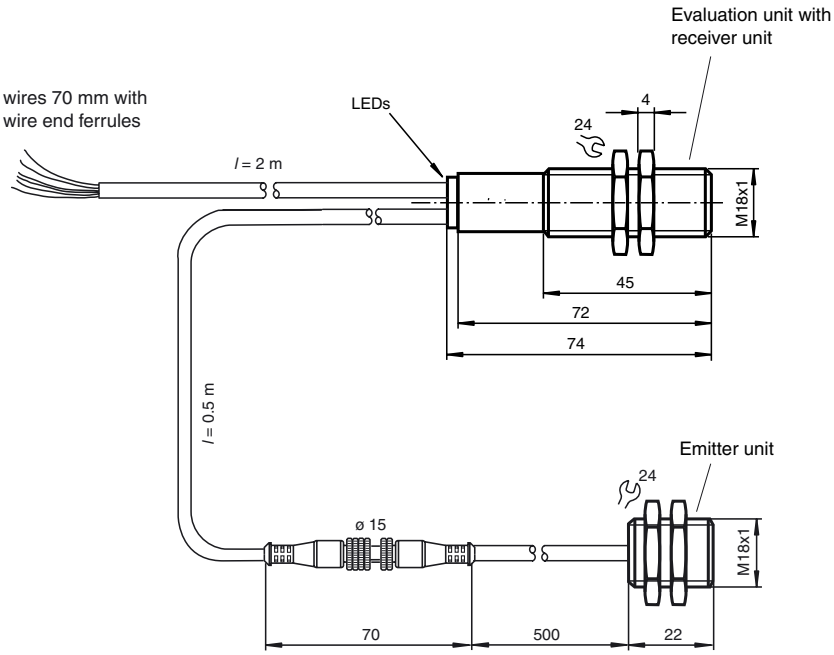
- Ultrasonic system for reliable detection of no, one, or two overlapping sheet materials, preferably papers
- No TEACH-IN required
- Function indicators visible from all directions
- Insensitive to printing, colours and shining surfaces
- Material weight from 10 g/m^2 up to over 2000 g/m^2
- Very wide material spectrum, finest papers up to thin sheet metals as well as plastic- and metal foils
- Perpendicular or inclined sensor mounting relative to the sheet plane possible

Electrical connection

Standard symbol/Connection:
Double sheet control



Dimensions



Technical data

General specifications	
Sensing range	20 ... 60 mm , optimal distance: 45 mm
Transducer frequency	395 kHz
Indicators/operating means	
LED green	indication: single sheet detected
LED yellow	Display: No sheet detected (Air)
LED red	indication: double sheet detected
Electrical specifications	
Operating voltage	18 ... 30 V DC , ripple 10 $\%_{SS}$
No-load supply current I_0	< 80 mA
Input	
Input type	Function input 0-level: $-U_B$ ... $-U_B$ + 1V 1-level: $+U_B$ - 1 V ... $+U_B$
Pulse length	≥ 100 ms
Impedance	≥ 4 kΩ
Output	
Output type	3 Switch outputs pnp, normally-closed
Rated operational current I_e	3 x 100 mA , short-circuit/overload protected
Voltage drop U_d	≤ 2 V
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)
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 ... 70 °C (233 ... 343 K)
Mechanical specifications	
Protection degree	IP67
Connection	2 m, PVC cable 0.14 mm²
Material	
Housing	brass, nickel-plated, plastic components PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	150 g

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Notes

Model number

UDC-18GM-400-3E3

Description of sensor functions

The ultrasonic double sheet monitor is used for double sheet detection in all situations in which the automatic distinction between double and single sheets is required in order to protect machines or avoid waste production. The double-sheet monitor is based on the ultrasonic through-beam principle. The following can be detected:

- No sheet, i.e. air,
- Individual sheet
- Double sheet

A microprocessor system evaluates the signals. The appropriate switch outputs are set as a result of the evaluation. Changes in ambient conditions such as temperature and humidity are compensated for automatically. The interface electronics is integrated into a compact M18 metal housing together with a sensor head.

Switching on

The sensor is equipped with 6 connections. The functionality of the connections is described in the following table. The function input (PK) is used to assign parameters to the sensor. (See Output pulse extension, Alignment aid and Program selection). During normal operation, the function input must always be securely connected with $+U_B$ or $-U_B$, to avoid possible interference or improper functionality.

Colour	Switching on	Comments
BN	$+U_B$	
WH	Switch output for single sheets	Pulse width corresponds to the event
BK	Switch output for double sheets	Pulse width corresponds to the event
GY	Switch output for air	Pulse width corresponds to the event
PK	$-U_B/+U_B$	Function input for parameter assignment/pulse prolongation
BU	-UB	

Normal mode

The sensor is working in normal mode if the function input (PK) is applied to $-U_B$ or $+U_B$ when the power source (Power-On) is supplied, as shown in the output pulse extension table (see below).

Displays:

LED yellow: Detection of air
LED green: Detection of single sheets
LED red: Detection of double sheets

Switch outputs:

The switch outputs are only active in normal operation!

White: WH Single sheet output
Black: BK Double sheet output
Gray: GY Air output

Output pulse extension

Switching the function input (PK) on to $-U_B$ or $+U_B$ makes it possible to select a minimum pulse width of 120 ms for all output pulses of the three switch outputs.

Switching on (PK)	Operating behaviour (after Power-On)
$-U_B$	No output pulse extension for switch outputs
$+U_B$	Output pulse extension of all switch outputs to at least 120 ms

Please note:

This can result in a condition in which more than one switch output is switched through!

Display Mode

The selected parameter assignment of the sensor can be displayed by switching the function input (PK) to voltage-free during normal operation. The green LED displays the program number (the number of flashing pulses (1 ... 4) = the program number).
The outputs are inactive during this time.

If the function input (PK) is switched to voltage-free when power is supplied (Power-On), the sensor will also work in display mode.

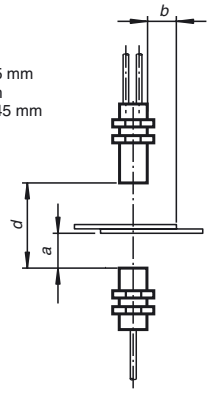
If the unit is switched to voltage-free while the function input (PK) is in operation due to an error (broken cable, coming loose because of vibration), display mode acts as a fault display.

Characteristic curves/additional information

Mounting/Adjustment

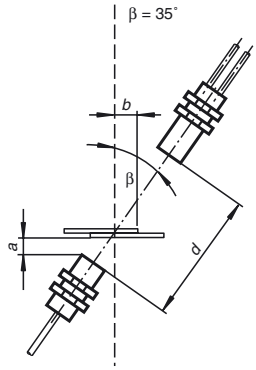
Recommended distances

a = 5 ... 15 mm
b ≥ 10 mm
d = 40 ... 45 mm



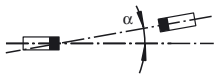
Mounting/Adjustment

(for very thick papers)

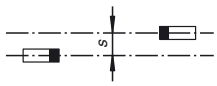


Thin foil detection

α < +/- 1°



s < +/- 1 mm



Accessories

Mounting aids

MH-UDB01

Extention cables

UDB-Cable-1m (length 1 m)
UDB-Cable-2m (length 2 m)

Parameter assignment

The sensor is equipped with 4 programs for different ranges of application. This makes it possible to work with a wide range of material. The user can select the program best suited for a specific application.

The default setting, Program 1, is designed so that no change in the setting is required for most applications.

Programs

Program number	Notes:	Range of materials
1	Default setting, standard paper	20 - 1200 g/m^2
2	Thick paper, cardboard, fine corrugated boards(DIN 55 468--1)and thin sheet metal**	> 100 g/m^2
3	Thin paper	20 – 250 g/m^2
4	Extremely fine paper	< 40 g/m^2

*) The measurements were made under the following conditions: d = 45 mm, a = 10 mm, β = 0°

*) The measurements were made under the following conditions: d = 45 mm, a = 10 mm, β = 35°

Procedure for assigning parameters

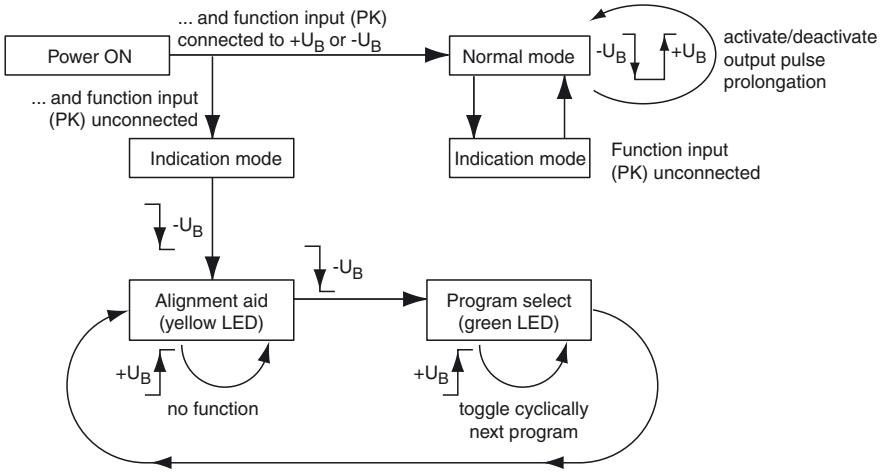
It is possible to switch to additional parameter assignment modes from the display mode:

Alignment mode -->
Program selection mode -->
Alignment aid mode --> (for checking)

When the function input (PK) is applied to -U_B (for > 500 ms), the mode changes. When the "Program selection“ mode is active, switching on function input (PK) on to +U_B (for > 500 ms) selects the next program level.

Disconnecting the power supply causes the system to exit the current mode with the selected program change.

The switch outputs are not active while parameters are being assigned to the sensor!



Modes

Alignment aid

During installation, the DSM can provide an adjustment aid for optimal alignment of the emitter to the receiver.

If the sensor detects an area of air (yellow LED is lit) the DSM will begin to display the intensity of the measured amplitude signal:

- If the signal is weak, the yellow LED will flash at a slow rate
- As the intensity of the signal increases, the rate at which the LED flashes becomes faster
- At optimal alignment (maximum signal intensity), the yellow LED is continuously lit.

The single sheet function (green LED) and double sheet function (red LED) continues to be active. This makes it possible to check for correct functionality of the double sheet control.

Program selection

In the program selection mode, the current program is displayed by the green LED (number of flashing pulses = program number). Applying the adjustment input (PK) to +U_B (for > 500 ms) causes the next program to be selected in cyclic sequence (program 1 follows through to program 4).

Notes:

A complete device consists of an ultrasonic emitter and an evaluation unit with an ultrasonic emitter. The sensor heads are optimally adjusted to each other when they leave the factory. Therefore, they must not be used separately or exchanged with other devices of the same type. The plug connector on the emitter/receiver connection cable is only intended to be used for easier mounting, not to replace units.

Very light papers (for example handkerchiefs) or perforated papers are not always suitable for double sheet detection because of their physical characteristics.

If two or more double sheet controls are used in the immediate vicinity of each other, there may be mutual interference between them, which can result in improper functionality of the devices. Mutual interference can be prevented by introducing suitable countermeasures when planning systems.