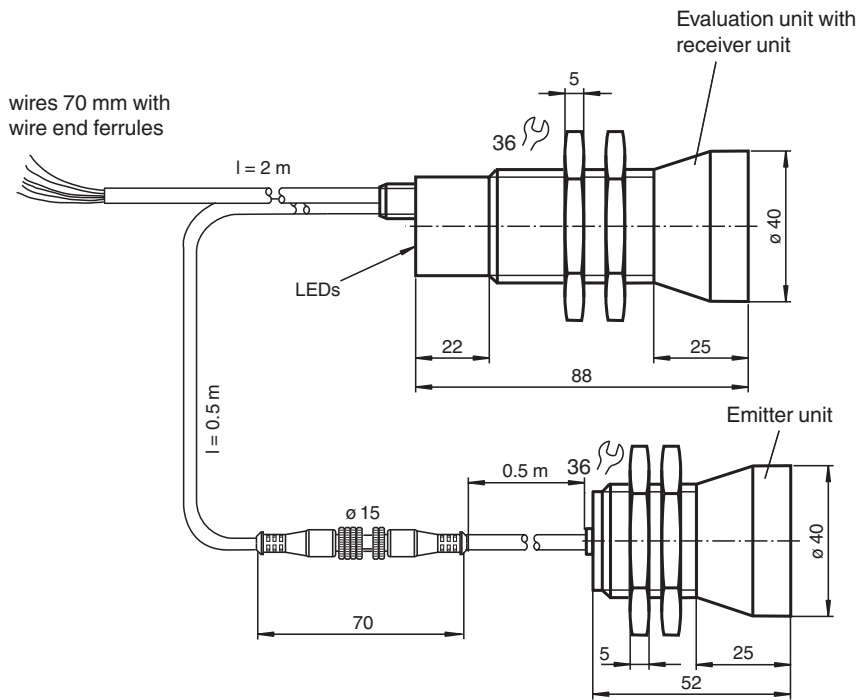# Double material sensor

# UDC-30GM-085-3E3

- Ultrasonic system for reliable detection of no, one, or two overlapping sheet materials
- No TEACH-IN required
- Insensitive to printing, colors, and shining surfaces
- Programmable

CE   c(UL)us   UKCA

## Dimensions



Evaluation unit with receiver unit

wires 70 mm with wire end ferrules

l = 2 m

LEDs

5

36

ø 40

22

88

25

l = 0.5 m

Emitter unit

0.5 m   36

ø 15

ø 40

70

5

25

52

## Technical Data

### General specifications

| | |
|---|---|
| Sensing range | 50 ... 150 mm , optimal distance: 80 mm |
| Transducer frequency | 85 kHz |

### Indicators/operating means

| | |
|---|---|
| LED green | Display: single-layer material detected |
| LED yellow | Display: no material (air) |
| LED red | Display: 2-layer or multi-layer material detected |

### Electrical specifications

| | | |
|---|---|---|
| Operating voltage | $U_B$ | 18 ... 30 V DC , ripple 10 %$_{SS}$ |
| No-load supply current | $I_0$ | < 200 mA |

Refer to "General Notes Relating to Pepperl+Fuchs Product Information".

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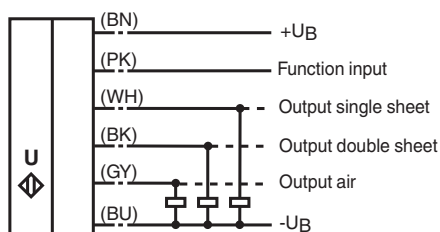
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## Technical Data

| Time delay before availability | $t_v$ | < 500 ms |
|---|---|---|
| **Input** | | |
| Input type | | Function input<br>0-level: $-U_B$ ... $-U_B + 1V$<br>1-level: $+U_B - 1 V$ ... $+U_B$ |
| Pulse length | | ≥ 100 ms |
| Function | | in normal operation mode, the function input has to be connected with UB+ or UB- |
| Impedance | | ≥ 4 kΩ |
| **Output** | | |
| Output type | | 3 switch outputs PNP, NC |
| Rated operating current | $I_e$ | 3 x 100 mA , short-circuit/overload protected |
| Voltage drop | $U_d$ | ≤ 3 V |
| Switch-on delay | $t_{on}$ | approx. 30 ms |
| Switch-off delay | $t_{off}$ | approx. 30 ms |
| Pulse extension | | min. 120 ms programmable |
| **Compliance with standards and directives** | | |
| Standard conformity | | |
| Standards | | EN IEC 60947-5-2:2020<br>IEC 60947-5-2:2019 |
| **Approvals and certificates** | | |
| UL approval | | cULus Listed, General Purpose, Class 2 Power Source |
| CCC approval | | CCC approval / marking not required for products rated ≤36 V |
| **Ambient conditions** | | |
| Ambient temperature | | 0 ... 50 °C (32 ... 122 °F) |
| Storage temperature | | -40 ... 70 °C (-40 ... 158 °F) |
| **Mechanical specifications** | | |
| Connection type | | cable PVC , 2 m |
| Core cross section | | 0.14 mm² |
| Housing diameter | | 40 mm |
| Degree of protection | | IP65 |
| Material | | |
| Housing | | nickel plated brass; plastic components: PBT |
| Transducer | | epoxy resin/hollow glass sphere mixture; polyurethane foam |
| Mass | | 300 g |
| **General information** | | |
| Supplementary information | | Switch settings of the external programming adapter:<br>"output load": pull-down<br>"output logic": inv |

## Connection

**Standard symbol/Connection:**
**Double sheet control**

## Mounting/Adjustment

Recommended distances

a = 20 ... 30 mm
b ≥ 75 mm
d = 50 ... 150 mm
β = 20 ... 30°
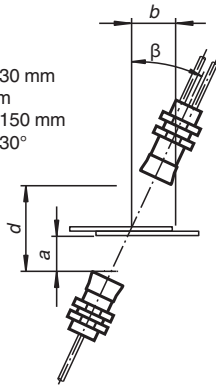
### Angular misalignment
$\alpha$ < +/- 1°

### Sensor offset
s < +/- 1 mm
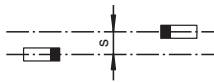
## Accessories
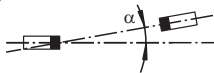
| | | |
|---|---|---|
| | UC-PROG1-USB | Programming adapter |
| | MH-UDB02 | Mounting bracket for double sheet metal monitor |
| | UDB-Cable-2M | Extension cable |
| | UDB-Cable-1M | Extension cable |
| | V15S-G-0,3M-PUR-WAGO | Male cordset, M12, 5-pin, PUR cable with WAGO terminals |
| | UVW90-M30 | Ultrasonic -deflector |
| | UVW90-K30 | Ultrasonic -deflector |
| | M30K-VE | Plastic nuts with centering ring for the vibration-free mounting of cylindrical sensors |

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## Additional Information

### Description of sensor functions

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

- No material, i.e. air,
- single-layer material
- Double or multi-layer material

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 M30 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-layer material | Pulse width corresponds to the event |
| BK | Switch output for double-layer material | 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-layer material
LED red:        Detection of double-layer material
Switch outputs:
The switch outputs are only active in normal operation!
White:          WH          Single-layer material output
Black:          BK          Double-layer material 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.

### 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.

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### Programs

| Program number | Notes: |
|---|---|
| 1 | Standard setting. Covers a wide spectrum of material |
| 2 | Thick, heavy materials |
| 3 | Thin materials |
| 4 | Extremely thin materials or foils |

The usage of the programs 1 ... 4, mentioned above, shall give only a rough benchmark to the user. For each particular application the best suitable program has to be found out empirically, beginning with the standard program 1.

### 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!
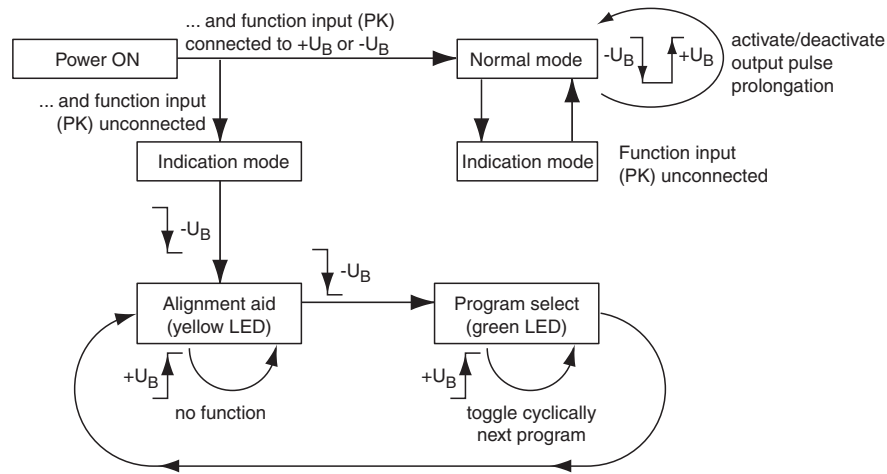


### Modes

#### Amplitude control

During installation, the amplitude control can be used to check whether the ultrasonic amplitude at the receiver is sufficient. If the transmitter is not aligned properly in relation to the receiver, maximum sound energy is not transmitted to the receiver, which may result in the incorrect detection of materials.

When the sensor detects an area of air (yellow LED lights up), the UDC begins to display the strength of the measured amplitude signal:

- if the signal is weak, the yellow LED flashes at low frequency
- the flashing frequency increases in line with the signal strength
- the yellow LED lights up continuously when the signal strength is sufficient.

The single sheet function (green LED) and double sheet function (red LED) are now active. This can be used to check the correct function of the sensor.

#### 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.

If two or more double material monitors UDC 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.

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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.

## Parameterization

Parameterization using *PACTware* DTM

The double sheet sensor can be connected using a V15S-G-0.3M-PUR-WAGO terminal adapter.

M12 socket for the UC-PROG1 ← ... → Connection cable for the double sheet sensor

V15S-G-0.3M-PUR-WAGO

Connect the sensor to the terminal adapter according to the table below.

| Terminal adapter wire color | Sensor cable wire color |
|---|---|
| Brown | Brown |
| Blue | Blue |
| Black | Black |
| Gray | Pink |

The sensor features a time lock. If no communication request occurs, the time lock blocks parameterization of the sensor 30 seconds after the supply voltage is connected. Start PACTware before switching on the sensor so that the communication request can be made in time.