Technical data

General specifications	
Sensing range	40 ... 100 mm optimal distance 75 mm
Transducer frequency	255 kHz
Indicators/operating means	
LED green	Indicator: single material detected
LED yellow	Indicator: no material detected (air)
LED red	Indicator: double material detected
Electrical specifications	
Operating voltage U_B	18 ... 30 V DC , ripple 10 %$_{SS}$
No-load supply current I_0	< 65 mA
Time delay before availability t_v	< 500 ms
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, 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. 35 ms
Switch-off delay t_{off}	approx. 35 ms
Pulse extension	min. 120 ms programmable
Ambient conditions	
Ambient temperature	0 ... 60 °C (32 ... 140 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications	
Connection type	cable PVC , 2 m
Core cross-section	0.14 mm^2
Degree of protection	IP67
Material	
Housing	nickel plated brass; plastic components: PBT
Transducer	epoxy resin/hollow glass sphere mixture; polyurethane foam
Mass	150 g
Factory settings	
Program	1
General information	
Supplementary information	Switch settings of the external programming adapter: "output load": pull-down "output logic": inv
Compliance with standards and directives	
Standard conformity	
Standards	EN 60947-5-2:2007+A1:2012 IEC 60947-5-2:2007 + A1:2012
Approvals and certificates	
UL approval	cULus Listed, General Purpose, Class 2 Power Source
CSA approval	cCSAus Listed, General Purpose, Class 2 Power Source
CCC approval	CCC approval / marking not required for products rated ≤36 V

Model Number

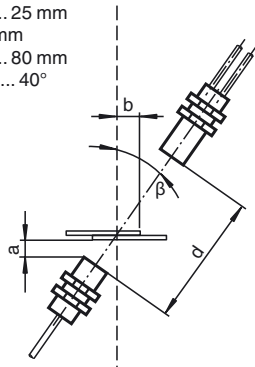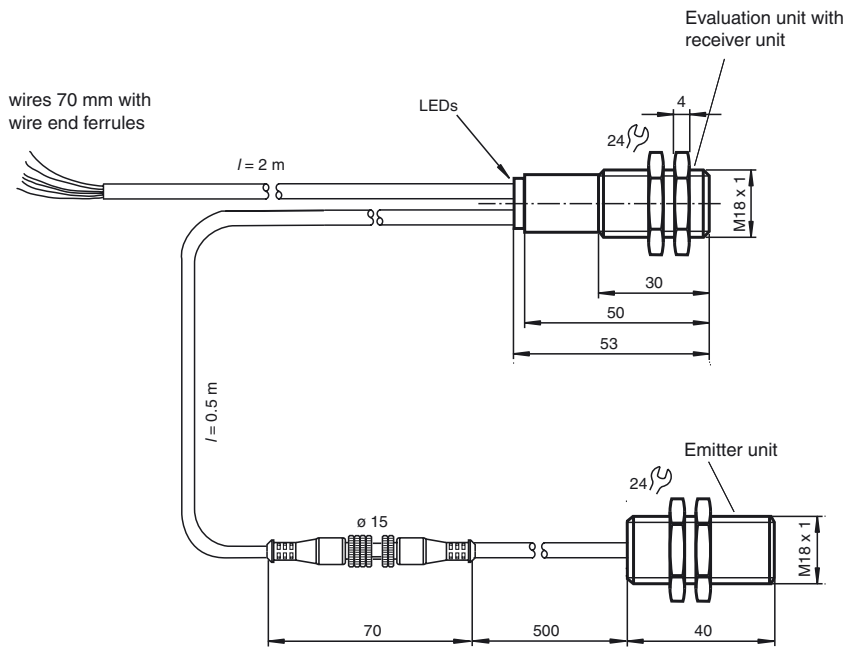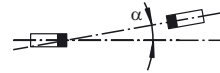**UDC-18GM50-255S-3E3**

Features

- **Ultrasonic system for reliable detection of no, one, or two overlapping sheet materials**

- **Short version**

- **No TEACH-IN required**

- **Function indicators visible from all directions**

- **Insensitive to printing, colors, and shining surfaces**

- **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**

- **Programmable**

Diagrams

Mounting/Adjustment

Recommended distances

a = 15 ... 25 mm
b ≥ 10 mm
d = 60 ... 80 mm
β = 20° ... 40°

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Dimensions

wires 70 mm with
wire end ferrules

LEDs

Evaluation unit with
receiver unit

$l = 2$ m

4

24

M18 x 1

30

50

53

$l = 0.5$ m

Emitter unit

24

ø 15

M18 x 1

70

500

40

Additional Information

Angular misalignment

$\alpha < +/- 1°$

Sensor offset

$s < +/- 1$ mm

Electrical Connection

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

(BN)	+U$_B$
(PK)	Function input
(WH)	Output single sheet
(BK)	Output double sheet
(GY)	Output air
(BU)	-U$_B$

U $\diamondsuit$
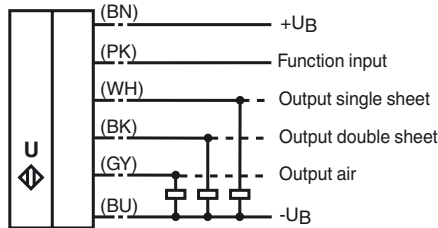
Accessories

UC-PROG1-USB
Programming adapter

UDB-Cable-2M

MH-UDB01
Mounting bracket for double sheet monitor

UDB-Cable-1M

V15S-G-0,3M-PUR-WAGO
Male cordset, M12, 5-pin, PUR cable with WAGO terminals

Ultraschall-Sensoren DTM
DTM devices for communication with cube style and UMC... sensors

PACTware 4.1
FDT Framework

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Description of the sensor functions

Ultrasonic double material sensors are used in any situation where it is necessary to make an automatic distinction between a single sheet of material and a double sheet of material in order to provide protection for a machine and/or to avoid wastage. The double material sensor is based on the ultrasonic single-pass principle. The following situations can be detected:
- No material, i.e. air
- Single layer of material
- 2 or more layers of material

The evaluation of the signals is carried out with a microprocessor system. As a consequence of the evaluation the corresponding switch outputs are set. Changing ambient conditions, such as temperature and humidity, are automatically compensated. The evaluation electronics system is built into an evaluation unit, together with a sensor head, and contained in a compact M18 metal housing.

Interface

The sensor has 6 connections. The function of the connections is shown in the following table. The function input (PK) is used to configure the sensor parameters. (see Output pulse expansion, alignment aids and program select). During operation, the function input must always be permanently connected to $+U_B$ or $-U_B$ to prevent possible faults or malfunctions.

Color	Interface	Note
BN	$+U_B$	
WH	Switch output, single material	Pulse width corresponding to the event
BK	Switch output, double material	Pulse width corresponding to the event
GY	Switching output air	Pulse width that corresponds to the event
PK	$-U_B/+U_B$	Function input for parameterization/pulse extension.
BU	$-U_B$	

Normal operation

The sensor operates in normal mode if the function input (PK) is set to $-U_B$ or $+U_B$ when the supply voltage is applied (power on) as specified in the output pulse expansion table (see below).

Display:
Yellow LED: Air detection
Green LED: Detection of single material
Red LED: Detection of double material

Switching outputs:
The switching outputs are only active in normal mode!
White: WH   Single material output
Black: BK   Double material output
Gray: GY   Air output

Output pulse expansion

A minimum pulse width of 120 ms can be selected for all the output pulses of the three switching outputs by connecting the function input (PK) to $+U_B$.

Interface (PK)	Switching behavior (after power on)
$-U_B$	No output pulse expansion of switching outputs
$+U_B$	Output pulse expansion of all switching outputs to a minimum of 120 ms

Caution!

This can lead to a situation where more than one switch output is switched through!

Programs

The sensor has 4 programs for different application areas. This enables a wide range of materials to be detected. The user can select the program most suited to the relevant application.

The default setting program 1 is selected so that the settings of the majority of applications do not need modifying.
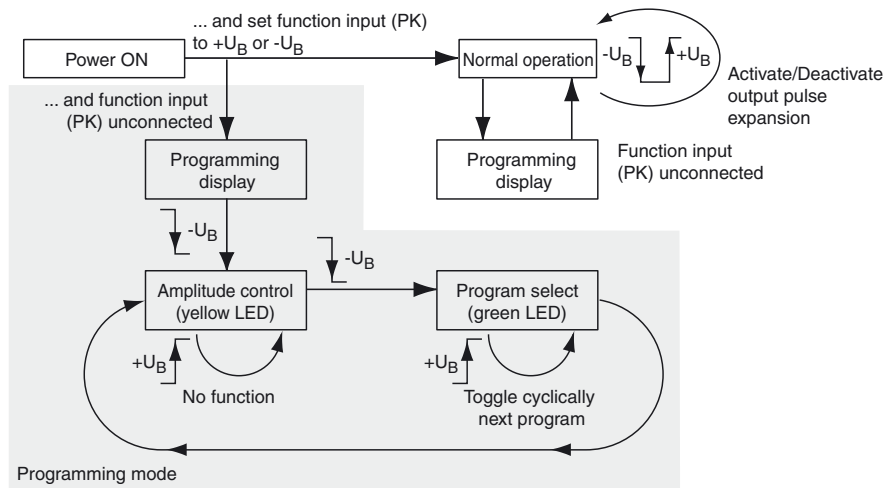
Program numbers	Notes*
1	Standard setting. Covers a wide range of materials
2	Thick, heavy materials
3	Thin materials
4	The thinnest of materials, films

The applications specified in Programs 1 ... 4 provide orientation values for the user. In a specific individual case the selection of the suitable program for the respective material in use has to be obtained empirically. In this procedure the starting point should be the standard Program 1.

Adjustment options using the function input

The adjustment options are indicated in the following, together with the function input.

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Program display

The preset sensor program can be displayed by disconnecting the function input (PK) from the power supply during normal operation.

The green LED indicates the program number (number of flashing pulses (1...4) = program number).

The outputs are inactive during this time.

If the function input (PK) is disconnected from the power during operation due to a fault (cable break, loosening due to vibration), the program display also serves as a fault display. Changing to programming mode is not possible.

Programming mode

To activate the programming mode,

the function input (PK) must be disconnected from the power when the supply voltage is applied (power on). The flashing green LED linked to the sensor indicates the preset program first (number of flashing pulses (1...4) = program number).

By briefly setting the function input (PK) to -Ub (>500ms), it is now possible to switch cyclically between the amplitude control and the program selection.

By disconnecting the supply voltage, you exit the programming mode and the current selected program setting is applied.

The switching outputs are deactivated while the sensor is parameterized!

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 double material sensor.

Program select

In program select mode, briefly setting the (PK) to +Ub (>500ms) selects the next program cyclically (number of flashing pulses from the green LED = program number). A flashing sequence that has already started is not interrupted by a program change.

Note:

A complete device consists of one ultrasonic sensor and one evaluation unit with the ultrasonic receiver. The sensor heads are optimally matched to each other in the ex-works condition and should therefore not be used separately. The connector disconnection point on the transmitter/receiver connection cable is merely provided to simplify assembly.

Because of their physical condition, materials that are perforated or otherwise contain holes are not always suitable for double sheet material detection.

If a number of UDC double material sensors are installed close together there is the possibility of mutual interference, leading to the occurrence of faults. Mutual interference can be avoided by suitable countermeasures implemented when planning the system.

On installation, care should be taken, that the ultrasonic signal cannot pass around the material to be detected due to multiple reflections. This can happen if, for example, there are large surfaces capable of reflecting the sound at right angles to the direction of propagation of the sound. This can be the case when unsuitable clamping devices are used, or may be due to plant components with large surfaces. In the case of reflecting plant components, these must either be clad with sound-absorbing material, or an alternative mounting location found for the sensor.

Correct functionality of the sensor can only be ensured if the emitter and receiver are adjusted so they are exactly centred on each other.

The sensor heads and the evaluation unit must not be grounded.

To avoid an unintended grounding, please use the plastic nuts for fixation, which are in scope of delivery. These nuts are equipped with a centering ring at one side, which ensures, that there is no electrical contact to the environmental material. The drawing beside shows the 2 possible nut orientations. The drilling hole diameter in the carrier has to be 20 mm.
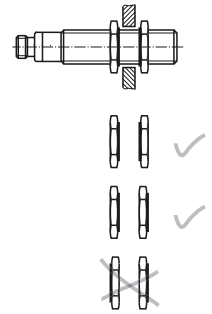
Parameterization using *PACTware* DTM

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

M12 socket for
the UC-PROG1   ←———   V15S-G-0.3M-PUR-WAGO   ———→   Connection cable for
the double sheet sensor
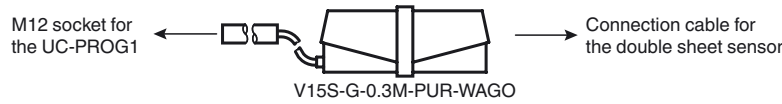
Connect the sensor to the terminal adapter according to the table below.

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.

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