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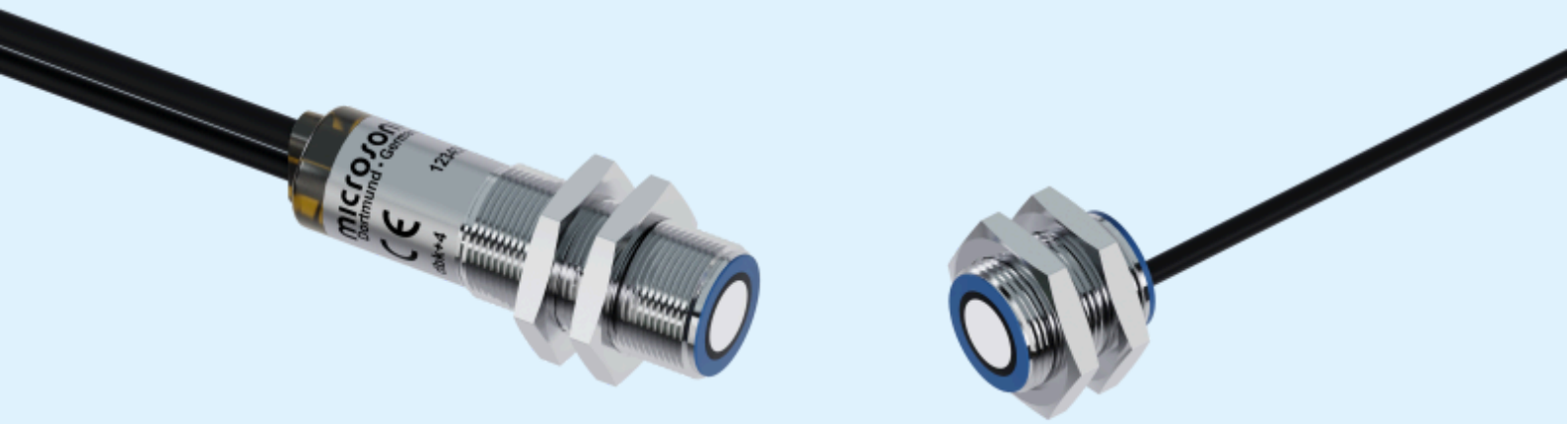

extract from our online catalogue:

# *dbk+4/3BEE/M18 E+S*

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# dbk+4

The latest type of ultrasonic double sheet control. Three variants: for all imaginable fitting positions.

## Highlights

- 3 control inputs › for trigger, Teach-in and external sensitivity settings for the material
- IO-Link interface › for support of the new industry standard
- Teach-in option › e.g. for probing wafers stuck together by a water film
- Variant with 90° angled head › for individual installation situations
- Variant with external M18 receiving transducer
- Variants with very compact transmitters and receivers in the M12 threaded sleeve
- UL Listed › to Canadian and US safety standards

## Basics

- Reliable detection of single and double sheets
- No Teach-in needed (plug and play)
- Double sheet and missing sheet output
- Working distance between the transmitter and the receiver selectable from 20 to 60 mm
- Trigger option › for applications in warehouse flow
- LinkControl › for configuration of sensors from a PC

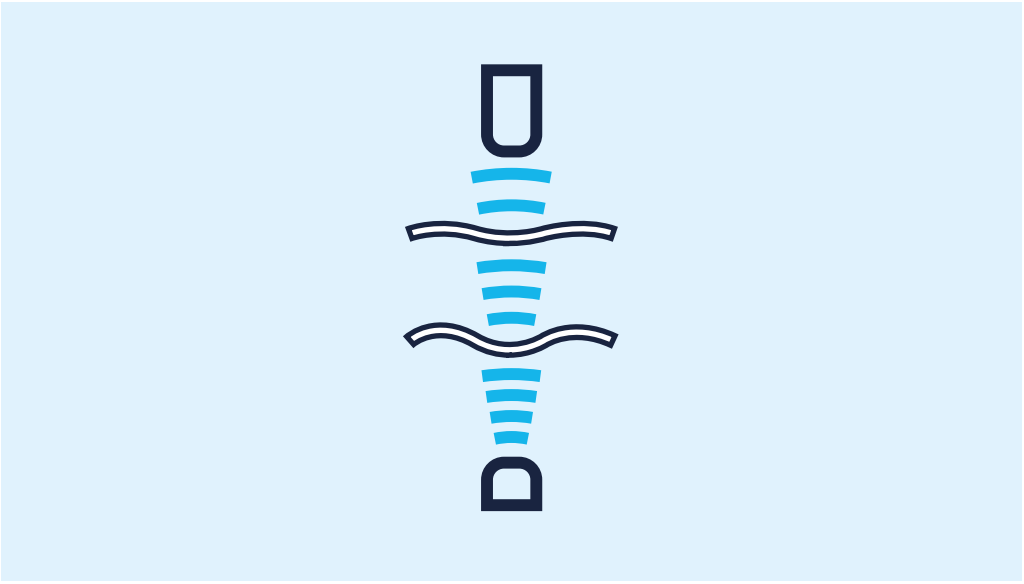
# The task of double-sheet control

is to identify two or more pieces or sheets inadvertently adhering together.

## The functional principle

A high-frequency ultrasonic transmitter beams against the sheet from the underside. The beamed signal induces the material to vibrate. The effect of these vibrations is a very small sonic wave on the other side of the sheet being spread. This wave is evaluated by the ultrasonic receiver on the opposite side. The signal from the stacked sheet ("double sheet") is so weak that it hardly gets to the receiver.

The dbk+4 detects missing, single and double sheet.

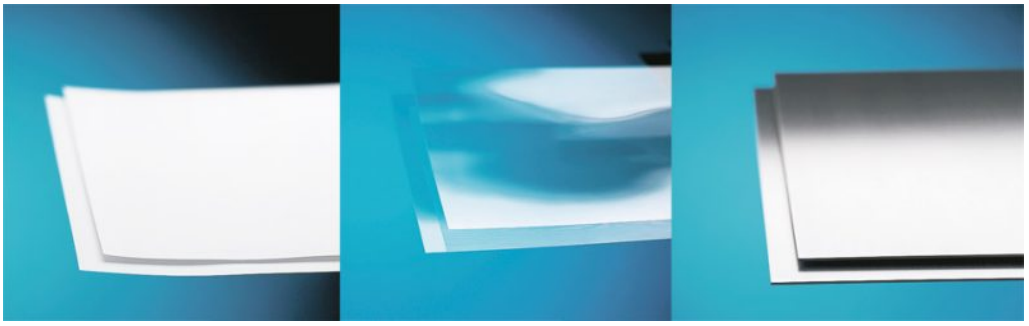


*Functional principle ultrasonic double-sheet control*

## The working ranges

The new dbk+4 has 3 control inputs by means of which 3 working range can be preselected. The standard working ranges covers the sheet material weight range from 20 g/m2 to 1,200 g/m2. Extremely thin materials such as Bible printing paper with a weight per unit area of less than 20 g/m2 are scanned with the use of the "Thin" setting.

The "Thick" setting is available for paperboard containers and fine-corrugated card. Changes between the working ranges can be undertaken under on-going operations. A Teach-in for the material to be scanned is not necessary. If the 3 control inputs stay unconnected, then the dbk+4 operates in the standard working range. As such, a very broad material spectrum can be scanned.



*Paper, Film, Sheet material*

## Teach-in

The Teach-in function is additionally available for materials which cannot be scanned with one of the three working ranges. A material Teach-in is done by inserting a single sheet into the double-sheet control. The C3 control input is then placed to logic 1 level for at least 3 seconds. Materials with non-homogeneous elements must be moved during the Teach-in phase so that the dbk+4 detect them. Success with a Teach-in operation is shown by a green LED. The material can now be scanned. The Teach-in makes it possible to scan material from thin Washi to wafers glued with a water film.

## Range of uses of dbk+4:

- Assembly machines
- Battery cell production
- Folding machines
- Labelling
- Manufacturing of solar cells and silicon wafers
- Paper-processing machines
- PCB manufacturing
- Sheet-printing machines

## The mounting

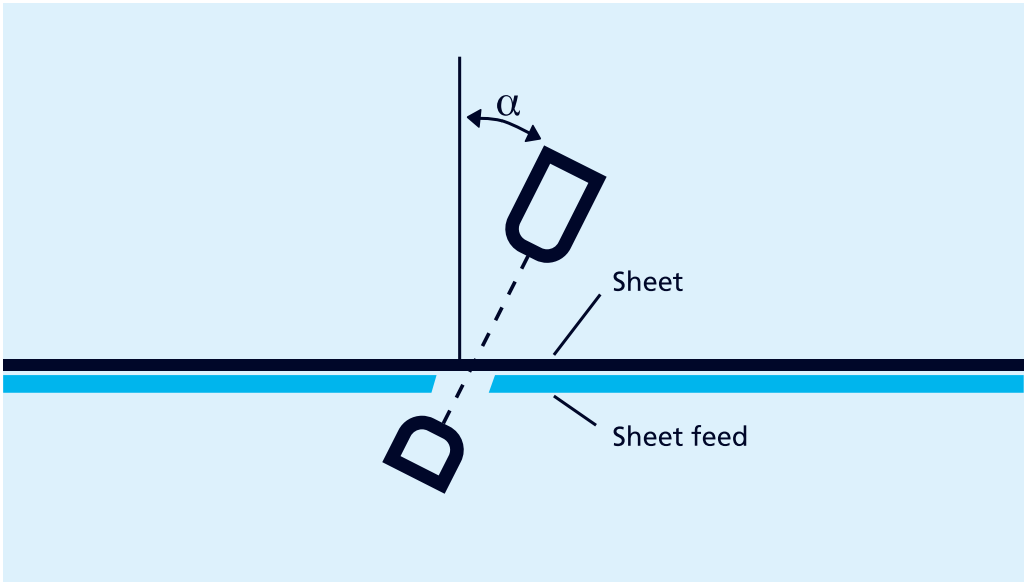
The recommended spacing between transmitter and receiver is 40 mm (or 20 mm with dbk+4/M12/CD/M18 ER+S). If needed, this spacing can be adapted to the local conditions in the 20 to 60 mm range. For the matter of commissioning, this can be done by means of a simple Teach-in or with the LinkControl parameterisation software.



*Double-sheet control*

## Material-conditioned fitting position

With papers and thin films, the double-sheet control is effected perpendicularly to the material; flapping does not impair the function. In the case of fine-corrugated card, thin sheet metal, wafers or thicker plastic films (e. g. credit cards), the dbk+4 should to be mounted at a specific angle of inclination α to the material running through.




*Fine-corrugated card can be optimally dimensioned at an inclination of α ≥ 35°, thin sheet metal or thicker plastic films at 27° and wafers at an angle of 11°*

## The free-run mode

The dbk+4 operates as standard in the free-run mode. This means that the dbk+4 cyclically carries out measurements at a high measuring rate. Under ongoing operations, the working range can be changed and a teach-in carried out by means of the C1 to C3 control inputs.

### Free-run mode – selection of the working range

| | C1 | C2 | C3 |
|---|---|---|---|
| **Standard** | 0 | 0 | 0 |
| **Thick** | 0 | 1 | 0 |
| **Thin** | 1 | 0 | 0 |
| **Teach-in-Mode** | 1 | 1 | 0 |
| **Teach-in** | 1 | 1 | 1 |

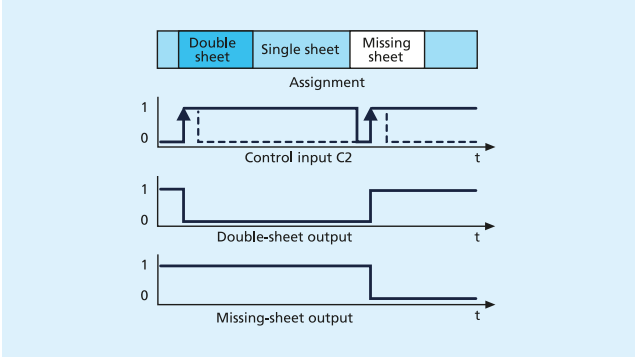
## The trigger mode

Should, on the other hand, measurements be undertaken in applications with continous feed, then an external trigger signal can trigger a measurement. This function is parameterised with the aid of the LinkControl- Software. A choice can be made between edge trigger and level trigger. The C2 control input then assumes the function of the trigger input (tr).

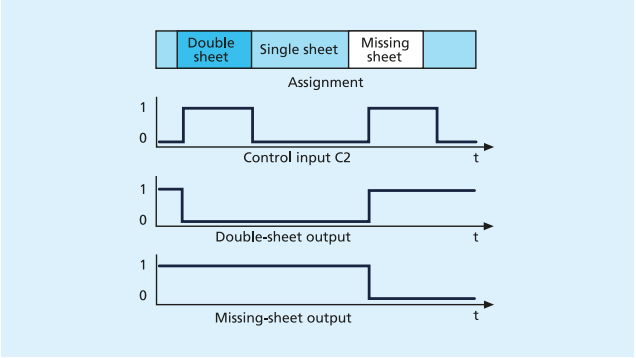
### Trigger mode – selection of the working range

| | C1 | C2 | C3 |
|---|---|---|---|
| **Standard** | 0 | tr | 0 |
| **Thin** | 0 | tr | 1 |
| **Teach-in-Mode** | 1 | tr | 0 |
| **Teach-in** | 1 | tr | 1 |

Under ongoing operations, the working range can be changed by means of the C3 control input.




*Trigger mode – edge-controlled*




*Trigger mode – level-controlled*

### *The following parameters can be individually adapted:*

- Spacing between transmitter and receiver
- Double sheet - NOC/NCC
- Single sheet or missing sheet NOC/NCC
- Trigger mode on/off
- Edge-controlled trigger: falling/ rising edge
- Level-controlled trigger: high/low active
- Switch-on delay for detecting double sheet
- Switch-off delay for detecting double sheet
- Threshold values for the working ranges

### *IO-Link integrated*

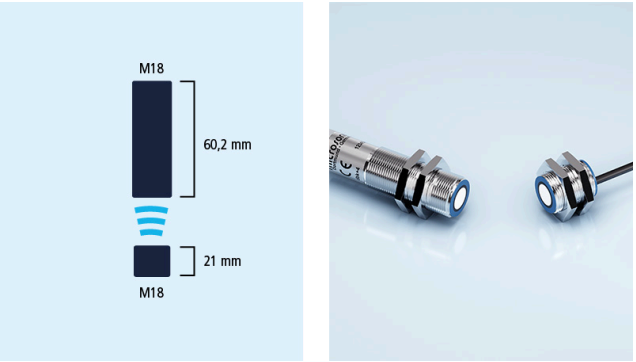
in version 1.1.5. The double-sheet control dbk+4 ultrasonic sensors are equipped with Smart Sensor Profile, which creates more transparency between IO-Link devices.

## *The housing variants*

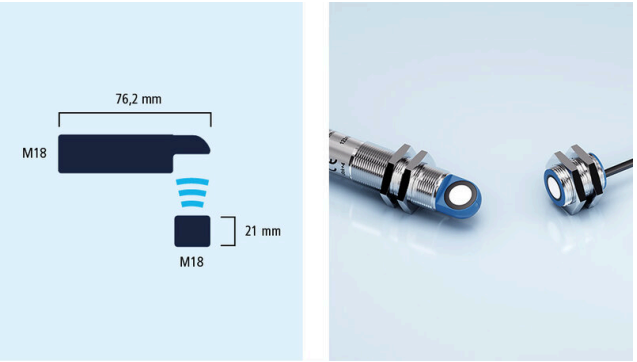
cover all imaginable fitting positions.

### a) Standard: dbk+4/3CDD/M18 E+S and dbk+4/3CFF/M18 E+S

The standard: receiver and all the evaluation electronics are housed in an M18 threaded sleeve, which is only 60.2 mm long. The transmitter is housed in an M18×21 mm threaded sleeve and a 2-pin plug connects it to the receiver.




*a) dbk+4/3CDD/M18 E+S*



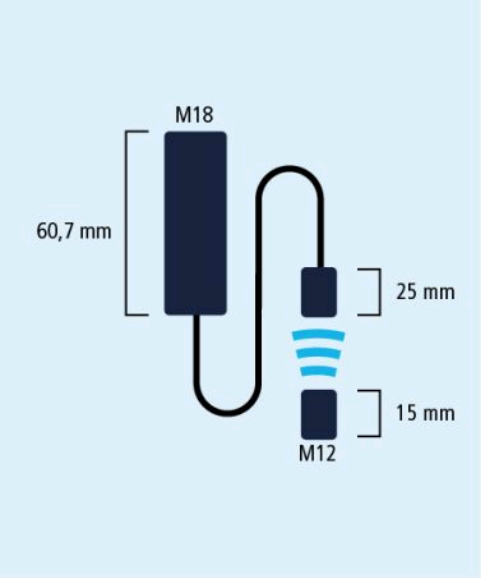

*b) dbk+4/WK/3CDD/M18 E+S*

### b) Receiver with 90° angular head: dbk+4/WK/3CDD/M18 E+S and dbk+4/WK/3CFF/M18 E+S

As with the standard, but here the receiver is arranged at right angles to the M18 threaded sleeve.

### c)dbk+4/M12/3CDD/M18 E+S and dbk+4/M12/3CFF/M18 E+S

The M12-heads variant has an optimum spacing of 20 mm between transmitter and receiver.






*c) dbk+4/M12/3CDD/M18 E+S or dbk+4/M12/3CFF/M18 E+S*

## *You have special requirements?*

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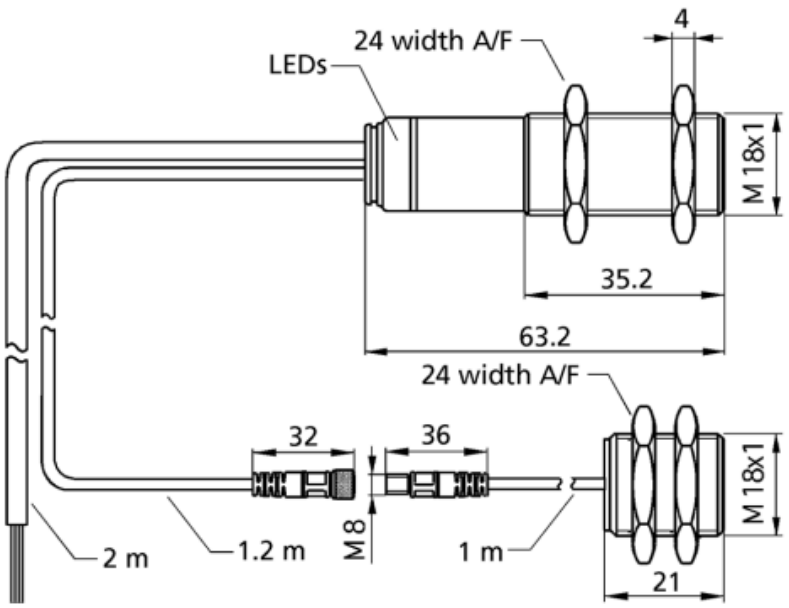
# dbk+4/3BEE/M18 E+S

## scale drawing




2 x npn

| | |
|---|---|
| design | cylindrical M18 |
| operating mode | double sheet control |
| working range | papers with weights of 20 - 2,000 g/m$^2$, Washi, metal-laminated sheets and films up to 0.4 mm thick, self-adhesive films, sheet metals up to 0.3 mm thick, fine corrugated card, wafers, PCBs |
| particularities | distance between transmitter and receiver can be selected<br>cable connection |

## Ultrasonic-Specific

| | |
|---|---|
| means of measurement | pulse operation with amplitude evaluation |
| transducer frequency | 400 kHz |
| blind zone | 7 mm in front of transmitter and receiver |

## Electrical Data

| | |
|---|---|
| operating voltage $U_B$ | 20 - 30 V d.c., reverse polarity protection |
| voltage ripple | ± 10 % |
| no-load current consumption | ≤ 50 mA |
| type of connection | 2 m PUR cable, 7 × 0.14 mm$^2$ |

## Outputs

| | |
|---|---|
| output 1 | double sheet output<br>npn: $I_{max}$ = 200 mA (-$U_B$+2V)<br>NOC/NCC adjustable, short-circuit-proof |
| Ausgang 2 | missing sheet output<br>npn: $I_{max}$ = 200 mA (-$U_B$+2V)<br>NOC/NCC adjustable, short-circuit-proof |
| response delay | < 500 µs in trigger mode, 2.5 ms in free-run mode |
| delay prior to availability | < 750 ms |

## Inputs

| | |
|---|---|
| input 1 | control input |
| Eingang 2 | control input |
| Eingang 3 | control input |

## Housing

| | |
|---|---|
| material | brass sleeve, nickel-plated, plastic parts, PBT, PA |
| ultrasonic transducer | polyurethane foam, epoxy resin with glass contents |
| class of protection to EN 60529 | IP 65 |
| operating temperature | +5°C to +60°C |
| storage temperature | -40°C to +85°C |
| weight | 130 g |
| further versions | dbk+4/WK/3BEE/M18 E+S<br>dbk+4/M18/3BEE/M18 E+S<br>dbk+4/Sender/M18/K1<br>dbk+4/Empf/3BEE/M18 |
| further versions | 90° angular head<br>swapped-out transmitter/receiver<br>single transmitter/receiver |

## Technical Features/Characteristics

| | |
|---|---|
| controls | control input |
| scope for settings | working range selection via control inputs<br>Teach-in via control inputs<br>LCA-2 with LinkControl |
| indicators | 1 x Duo-LED; green: working / red: double sheet / flashing red: missing sheet |

## Accessories

| | |
|---|---|
| deployable accessory | dbk-Testbogen<br>BF-18<br>LCA-2<br>LCA-2 Koffer |

## *pin assignment*

