

## DMU330

## Ultrasonic sensors with analog and switching output

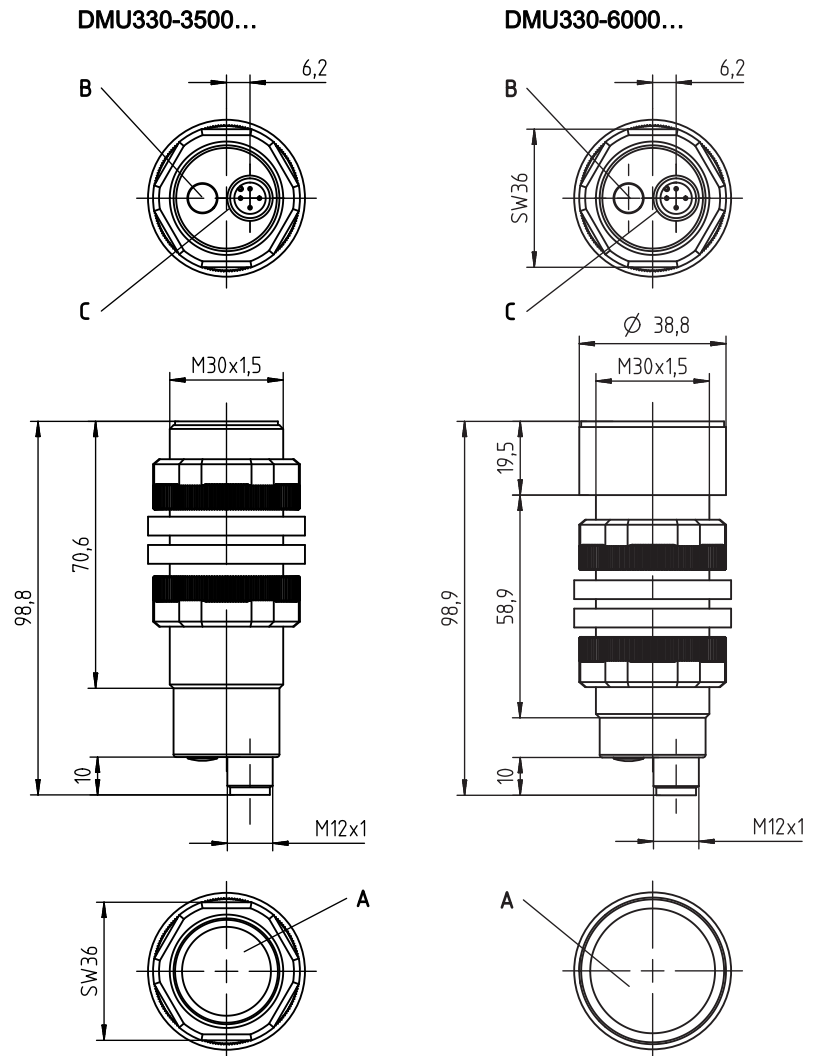
en 2022/02/11 50135826



250 ... 3500mm  
350 ... 6000mm

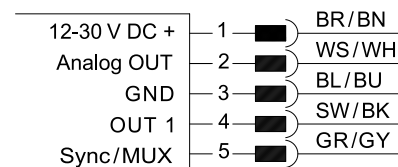
- Function largely independent of surface properties, ideal for detection of liquids, bulk materials, transparent media, ...
- Small dead zone at long range
- 1 analog output 0 ... 10V or 4 ... 20mA
- 1 switching output (PNP or NPN)
- NO/NC function reversible
- **NEW** – Both outputs can easily be taught using a button
- **NEW** – Stable plastic design
- **NEW** – Temperature-compensated range

## Dimensioned drawing



- A** Active sensor surface  
**B** Teach-in button  
**C** Indicator diodes

## Electrical connection

Accessories:  
(available separately)

- Mounting systems
- Cables with M12 connector (KD ...)

We reserve the right to make changes ? PAL\_DMU330\_3500\_6000\_en\_50135826.fm

### Technical data

#### Ultrasonic specifications

Operating range <sup>1)</sup>  
Adjustment range  
Ultrasonic frequency  
Typ. opening angle  
Resolution  
Direction of beam  
Reproducibility  
Switching hysteresis  
Analog output accuracy  
Temperature drift <sup>5)</sup>

#### DMU330-3500.3/...-M12

250 ... 3500 mm <sup>2)</sup>  
250 ... 3500 mm  
112 kHz  
 $\pm 7^\circ$   
5 mm  
Axial  
 $\pm 0.5\%$  <sup>1) 4)</sup>  
1% <sup>4)</sup>  
1% <sup>4)</sup>  
Analog output:  $\leq 5\%$   
Switching output:  $\leq 8\%$

#### DMU330-6000.3/...-M12

350 ... 6000 mm <sup>3)</sup>  
350 ... 6000 mm  
75 kHz  
 $\pm 9^\circ$   
6 mm  
Axial  
 $\pm 0.5\%$  <sup>1) 4)</sup>  
1% <sup>4)</sup>  
1% <sup>4)</sup>  
Analog output:  $\leq 5\%$   
Switching output:  $\leq 8\%$

#### Time behavior

Switching frequency  
Response time  
Readiness delay

2 Hz  
250 ms  
 $\leq 900$  ms (analog output),  
 $\leq 500$  ms (switching output)

1 Hz  
500 ms  
 $\leq 900$  ms (analog output),  
 $\leq 500$  ms (switching output)

#### Electrical data

Operating voltage  $U_B$  <sup>6)</sup>  
Residual ripple  
Open-circuit current

12 ... 30 V DC (incl.  $\pm 5\%$  residual ripple)  
 $\pm 5\%$  of  $U_B$   
 $\leq 50$  mA

#### Analog output

Analog output .../...C...  
.../...V...

1 analog output 4 ... 20 mA  
1 analog output 0 ... 10 V  
Current output:  $R_L \leq 500 \Omega$ ,  
Voltage output:  $R_L \geq 2 k\Omega$

Load resistance

Characteristic curve adjustment

1-point teach: teach in button 2 ... 7 s,  
2-point teach: teach in button 7 ... 12 s,  
Characteristic curve inversion: teach in button > 12 s  
Distance too small: approx. 3.8 mA,  
Distance too large: approx. 11 V / approx. 21 mA

Analog output error signal

#### Switching output

Switching output / Function .../4...  
.../2...

1 PNP transistor switching output  
OUT 1 (pin 4): NO contact preset  
1 NPN transistor switching output  
OUT 1 (pin 4): NO contact preset  
Max. 100 mA

Output current

Switching range adjustment

1-point teach: teach-in button 2 ... 7 s,  
2-point teach: teach-in button 7 ... 12 s  
Teach-in button > 12 s

Changeover of normally open contact  
(NO)/normally closed contact (NC)

#### Indicators

Yellow LED  
Blue LED  
Yellow/green or blue/green LED flashing  
Green LED

OUT1: object detected  
Analog OUT: object detected  
Teach-in / teach error  
Object within the operating range

#### Mechanical data

Housing  
Active surface  
Weight  
Ultrasonic transducer  
Connection type  
Installation position

Plastic (PBT)  
Epoxy resin, glass fiber reinforced  
140 g / 170 g  
Piezoceramic <sup>7)</sup>  
M12 connector, 5-pin  
Any

#### Environmental data

Ambient temp. (operation/storage)  
Protective circuit <sup>8)</sup>  
VDE protection class  
Degree of protection  
Standards applied  
Certifications

$-20^\circ \dots +70^\circ \text{C} / -20^\circ \dots +70^\circ \text{C}$   
1, 2, 3  
III  
IP 67  
EN 60947-5-2  
UL 508, CSA C22.2 No.14-13 <sup>6) 9)</sup>

1) At  $20^\circ \text{C}$

2) Target: 200 mm x 200 mm plate

3) Target: 400 mm x 400 mm plate

4) From end value

5) Over the temperature range  $-20^\circ \text{C} \dots +70^\circ \text{C}$

6) For UL applications: use is permitted exclusively in Class 2 circuits according to NEC

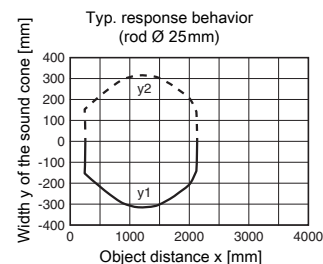
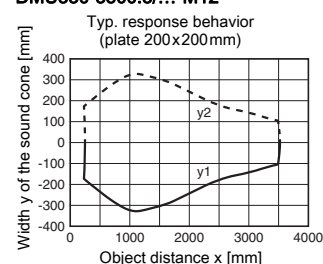
7) The ceramic material of the ultrasonic transducer contains lead zirconium titanate (PZT)

8) 1=short-circuit and overload protection, 2=polarity reversal protection, 3=wire break and inductive protection

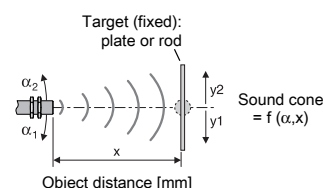
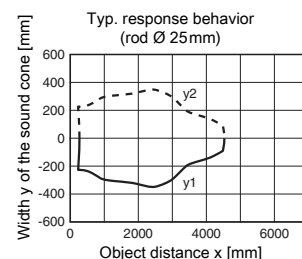
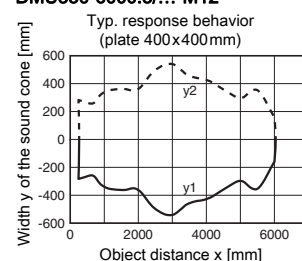
9) These proximity switches shall be used with UL Listed Cable assemblies rated 30V, 0.5A min,  
in the field installation, or equivalent (categories: CYJV/CYJV7 or PVVA/PVVA7)

### Diagrams

#### DMU330-3500.3/...-M12



#### DMU330-6000.3/...-M12



### Notes

#### Observe intended use!

- ⚠ This product is not a safety sensor and is not intended as personnel protection.
- ⚠ The product may only be put into operation by competent persons.
- ⚠ Only use the product in accordance with its intended use.

## DMU330

## Ultrasonic sensors with analog and switching output

## Part number code

D M U 3 3 0 - 3 5 0 0 . 3 / 4 V K - M 1 2

## Operating principle

- HTU** Ultrasonic sensor, scanning principle, with background suppression
- DMU** Ultrasonic sensor, distance measurement
- RKU** Ultrasonic sensor, retro-reflective ultrasonic sensor

## Series

- 330** 330 series, cylindrical short M30 design

## Operating range in mm

- 3500** 250 ... 3500

- 6000** 350 ... 6000

## Equipment

- .3** Teach button on the sensor

## Pin assignment of connector pin 4 / black cable wire (OUT1)

- 4** PNP output, NO contact preset
- P** PNP output, NC contact preset
- 2** NPN output, NO contact preset
- N** NPN output, NC contact preset

## Pin assignment of connector pin 2 / white cable wire (Analog OUT/ OUT2)

- 4** PNP output, NO contact preset
- P** PNP output, NC contact preset
- 2** NPN output, NO contact preset
- N** NPN output, NC contact preset
- C** Analog output 4 ... 20mA
- V** Analog output 0 ... 10V

## Pin assignment of connector pin 5 / gray cable wire (Sync / MUX)

- K** Synchronization/multiplex input

## Connection technology

- M12** M12 connector, 5-pin

## Order guide

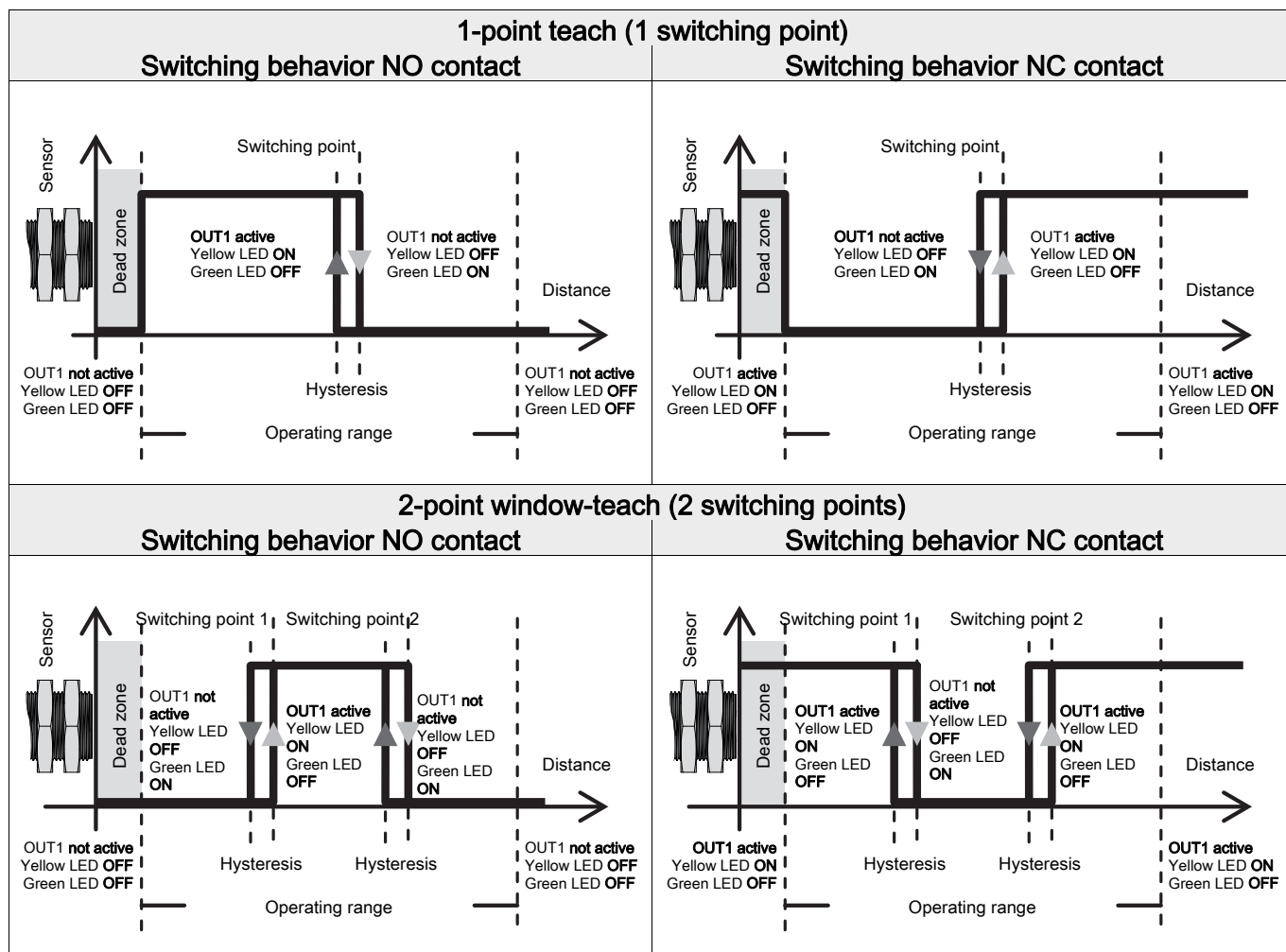
The sensors listed here are preferred types; current information at [www.leuze.com](http://www.leuze.com).

|                                                                      | Designation           | Part no. |
|----------------------------------------------------------------------|-----------------------|----------|
| <b>Operating range / switching output / analog output / teach-in</b> |                       |          |
| 250 ... 3500mm / PNP / current output 4 ... 20mA / teach button      | DMU330-3500.3/4CK-M12 | 50136114 |
| 250 ... 3500mm / PNP / voltage output 0 ... 10V / teach button       | DMU330-3500.3/4VK-M12 | 50136112 |
| 250 ... 3500mm / NPN / current output 4 ... 20mA / teach button      | DMU330-3500.3/2CK-M12 | 50136115 |
| 250 ... 3500mm / NPN / voltage output 0 ... 10V / teach button       | DMU330-3500.3/2VK-M12 | 50136113 |
| 350 ... 6000mm / PNP / current output 4 ... 20mA / teach button      | DMU330-6000.3/4CK-M12 | 50136117 |

## Device functions and indicators – switching output

The sensor has a button for setting switching output **OUT1** and analog output **Analog OUT**. Use the **teach button** to perform the 1-point teach, the 2-point window-teach and to change over the switching function (normally open contact/normally closed contact). Device status and switching states for **OUT1** are indicated as follows by means of a **yellow LED**:

### Switching output OUT1



#### NOTE



The switching behavior is not defined in the dead zone.

### Switching behavior with 2-point window-teach as a function of the switching function

| Switching function configured as | First taught object distance | Second taught object distance | Output switching behavior |
|----------------------------------|------------------------------|-------------------------------|---------------------------|
| NO contact                       | Close                        | Far                           |                           |
|                                  | Far                          | Close                         |                           |
| NC (normally closed)             | Close                        | Far                           |                           |
|                                  | Far                          | Close                         |                           |

## DMU330

## Ultrasonic sensors with analog and switching output

## Adjusting the switching points via the teach button

The switching point of the sensor is set to 3500mm or 6000mm (static 1-point teach) on delivery.

By means of a simple operating procedure, the switching point for the output OUT1 can be individually taught to an arbitrary distance within the operating range with 1-point teach (static) or 2-point window-teach (static).

Moreover, the output function can be switched from NO contact (NO - normally open) to NC contact (NC - normally closed).

## Selecting the output that is to be taught: OUT 1 or Analog OUT

1. Press the **teach button** for **≥ 2s** to **activate teach mode**. The **yellow LED (OUT 1)** **flashes** at 1Hz.  
While in this state, **output OUT 1** can be taught.
2. To teach **output Analog OUT**, **briefly** press the **teach button** again. The **blue LED (Analog OUT)** now flashes at 1Hz.  
While in this state, **output Analog OUT** can be taught.
3. Briefly press the teach button again to toggle between outputs **OUT 1** and **Analog OUT** in this state. The flashing LED indicates which output is ready for teaching:  
**yellow LED flashing = OUT 1 ready for teaching,**  
**blue LED flashing = Analog OUT ready for teaching.**

## Teaching output OUT 1

First activate the previously described teach mode for output OUT 1.

| 1-point teach (static)                                                                                                                                                                                                                                                                                                                                                  | 2-point window-teach (static) <sup>1)</sup>                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. <b>Place</b> object at desired switching distance.                                                                                                                                                                                                                                                                                                                   | 1. First, <b>place</b> object at desired switching distance for <b>switching point 1</b> .                                                                                                                                                                                                     |
| 2. To adjust the output <b>OUT1</b> , <b>press</b> the <b>teach button</b> for <b>2 ... 7s</b> until the <b>yellow LED flashes at 3Hz</b> .                                                                                                                                                                                                                             | 2. To adjust the output <b>OUT1</b> , <b>press</b> the <b>teach button</b> for <b>7 ... 12s</b> until the <b>yellow and green LEDs flash alternately at 3Hz</b> .                                                                                                                              |
| 3. <b>Release</b> the <b>teach button</b> to complete the teach event.<br>The current object distance has been taught as the new switching point.                                                                                                                                                                                                                       | 3. <b>Release the button</b> . The sensor remains in teach mode and the LEDs continue to flash.                                                                                                                                                                                                |
| 4. Error-free teach: <b>LED states</b> and switching behavior according to the diagram shown above.<br><b>Faulty teach</b> (object may be too close or too far away – please note operating range):<br><b>green and yellow LEDs flash at 8Hz</b> until an error-free teach event is performed.<br>The affected output is inactive as long as there is a teaching error. | 4. Then, <b>place</b> the object at the desired switching distance for <b>switching point 2</b> .<br><b>Note:</b> The minimum distance between the switching points is as follows:<br>range of 3500mm: <b>350mm</b><br>range of 6000mm: <b>600mm</b>                                           |
|                                                                                                                                                                                                                                                                                                                                                                         | 5. <b>Briefly press</b> the <b>teach button</b> again to complete the teach event.<br>The switching window was taught in.                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                         | 6. Error-free teach: <b>LED states</b> and switching behavior according to the diagram shown above.<br><b>Faulty teach</b> (object may be too close or too far away – please note operating range):<br><b>green and yellow LEDs flash at 8Hz</b> until an error-free teach event is performed. |

1) See table "Switching behavior with 2-point window-teach as a function of the switching function"

## Adjusting the switching function (NC/NO) via the teach button

The switching function of the sensor is preset as follows on delivery:

- **OUT 1: NO contact**

The output function can be switched from NO contact (NO - normally open) to NC contact (NC - normally closed) and vice versa. If the switching function is changed, the switching output is changed to the opposite state (toggled).

**First activate the previously described teach mode for output OUT 1.**

| Changeover of the switching function |                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                                   | To change the switching function of output <b>OUT 1</b> , <b>press the teach button for longer than 12s.</b><br>The current state of output <b>OUT 1</b> is frozen during the adjustment process.                                                                                                                     |
| 2.                                   | The <b>green and yellow LEDs flash alternately at 3Hz.</b><br>If the <b>yellow LED</b> is <b>ON</b> afterwards, output <b>OUT 1</b> functions as a <b>normally open contact (NO)</b> .<br>If the <b>yellow LED</b> is <b>OFF</b> afterwards, output <b>OUT 1</b> functions as a <b>normally closed contact (NC)</b> . |

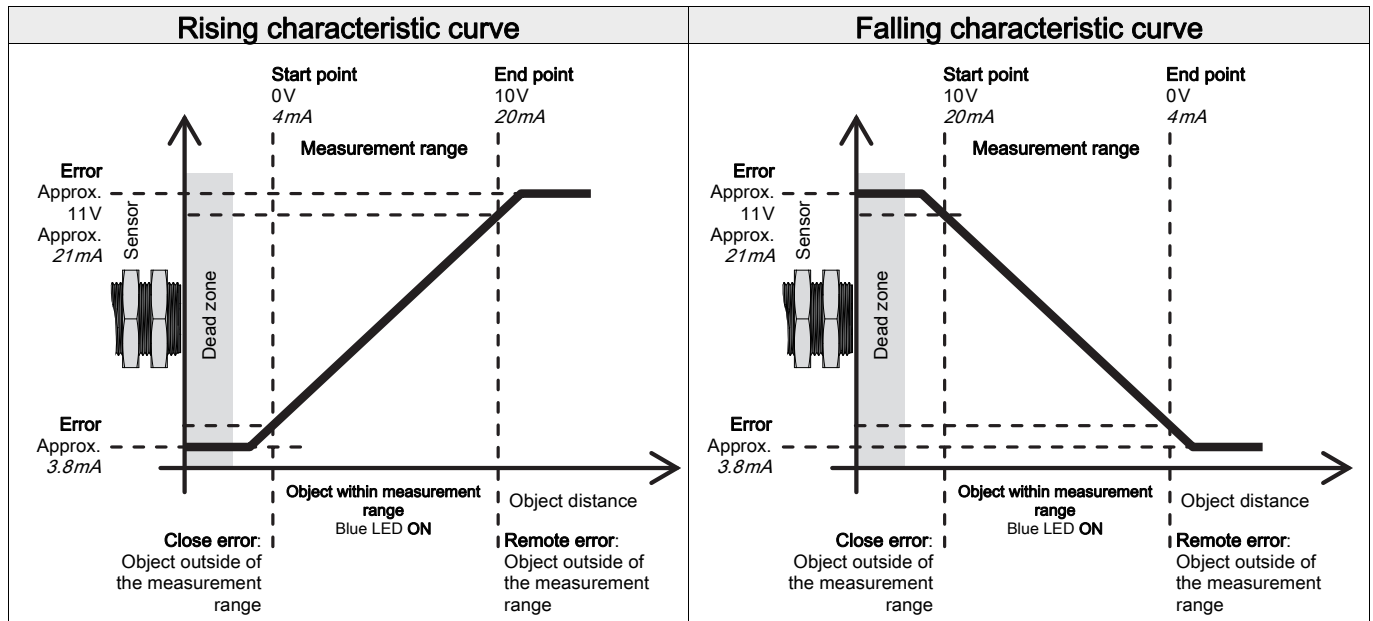
## DMU330

## Ultrasonic sensors with analog and switching output

## Device functions – analog output

In measurement operation, the **blue LED** displays the behavior of analog output **Analog OUT**.

## Analog output Analog OUT



## NOTE



When setting the analog output (teach) via the teach button, one **rising characteristic curve** is always taught; with 2-point teach, independent of the selected object distances near/far. The characteristic output curve can be inverted, however.

## Adjusting the analog output via the teach button

On delivery, the characteristic output curve of the sensor is set as a rising characteristic curve with spread over the entire operating range: 4 ... 20mA or 0 ... 10V corresponds to an object distance of 250 ... 3500mm or 350 ... 6000mm, respectively.

The analog output can be set by means of 1-point teach or 2-point teach.

## NOTE



When setting the analog output (teach) via the teach input, one **rising characteristic curve** is always taught; with 2-point teach, independent of the selected object distances near/far. The characteristic output curve can be inverted, however.

## Selecting the output that is to be taught: OUT 1 or Analog OUT

1. Press the **teach button** for **≥ 2s** to **activate teach mode**. The **yellow LED (OUT 1)** flashes at 1Hz.  
While in this state, **output OUT 1** can be taught.
2. To teach **output Analog OUT**, **briefly** press the **teach button** again. The **blue LED (Analog OUT)** now flashes at 1Hz.  
While in this state, **output Analog OUT** can be taught.
3. Briefly press the teach button again to toggle between outputs **OUT 1** and **Analog OUT** in this state. The flashing LED indicates which output is ready for teaching:  
**yellow LED flashing** = OUT 1 ready for teaching,  
**blue LED flashing** = Analog OUT ready for teaching.

### 1-point teach of the analog output

First activate the previously described teach mode for output Analog OUT.

By selecting an object distance within the operating range, the characteristic curve of the analog output can be adjusted.

If an object is located outside of the taught measurement range, an error signal is output. A different analog signal is output here by the sensor for the errors "distance too close: object outside of the measurement range" and "distance too far: object outside of the measurement range".

| 1-point teach - rising characteristic curve                                                                                                                  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 1. Place object at desired distance for the end point of the measurement range.                                                                              |  |
| <b>Note:</b> The minimum object distance for the end of the measurement range is as follows:<br>range of 3500mm: 600mm<br>range of 6000mm: 950mm             |  |
| 2. To adjust analog output <b>Analog OUT</b> , press the <b>teach button</b> for 2 ... 7s until the <b>blue and green LEDs flash simultaneously at 3Hz</b> . |  |
| 3. Release the button. The characteristic curve with plot rising from the start of the range (50 mm or 150 mm) to the set object distance was taught in.     |  |
| 4. Error-free teach: LED states acc. to "Technical data" -> "Indicators".                                                                                    |  |
| Faulty teach: green and blue LEDs flash at 8Hz until an error-free teach is performed.                                                                       |  |

### 2-point teach of the analog output

First activate the previously described teach mode for output Analog OUT.

By selecting 2 object distances within the operating range, the characteristic curve of the analog output can be adjusted.

If an object is located outside of the taught measurement range, an error signal is output. A different analog signal is output here by the sensor for the errors "distance too close: object outside of the measurement range" and "distance too far: object outside of the measurement range".

| 2-point teach - rising characteristic curve                                                                                                                             |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 1. Position the object at the first desired distance (near or far).                                                                                                     |  |
| 2. To adjust analog output <b>Analog OUT</b> , press the <b>teach button</b> for 7 ... 12s until the <b>blue and green LEDs flash alternately at 3Hz</b> .              |  |
| 3. Release the button. The sensor remains in teach mode and the LEDs continue to flash.                                                                                 |  |
| 4. Then position the object at the second desired distance (far or near).                                                                                               |  |
| <b>Note:</b> the minimum object distance between the start and end point of the measurement range<br>for a range of 3500mm is: 350mm<br>for a range of 6000mm is: 600mm |  |
| 5. Briefly press the <b>teach button</b> again to complete the teach event.                                                                                             |  |
| The characteristic curve with rising plot from the near to the far object distance was taught in.                                                                       |  |
| 6. Error-free teach: LED states acc. to "Technical data" -> "Indicators".                                                                                               |  |
| Faulty teach: green and blue LEDs flash at 8Hz until an error-free teach is performed.                                                                                  |  |

### Inverting the analog output (falling/rising characteristic curve)

First activate the previously described teach mode for output Analog OUT.

The characteristic curve of the analog output can be inverted, e.g., if a falling characteristic output curve is desired.

| Inverting the characteristic curve                                                                                                                                              |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 1. To invert the characteristic curve of the analog output <b>Analog OUT</b> , press the <b>teach button</b> for > 12s until the <b>blue and green LEDs flash alternately</b> . |  |
| 2. Release the button. The characteristic curve plot was inverted.                                                                                                              |  |
| The blue LED indicates the current setting of the analog output:                                                                                                                |  |
| <b>ON</b> = rising characteristic curve                                                                                                                                         |  |
| <b>OFF</b> = falling characteristic curve                                                                                                                                       |  |

## Synchronization of multiple DMU330 ultrasonic sensors

If adjacent ultrasonic sensors receive the signals of other sensors, so-called crosstalk occurs, which leads to faulty measurement results. Through temporal synchronization of the adjacent sensors, this can be avoided. Via the **Sync/MUX** input, the DMU330 ultrasonic sensors can be synchronized in 2 different ways:

### Synchronous operation

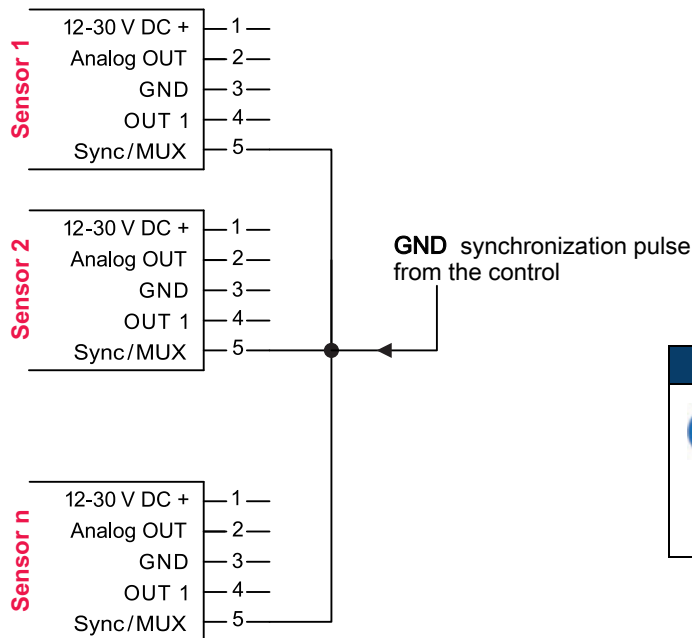
In this operating mode the mutual interference of adjacent sensors can be avoided; a minimum mounting distance between the sensors is to be maintained, however:

| Working distance | Minimum mounting distance |
|------------------|---------------------------|
| < 1,500mm        | 100mm                     |
| ≥ 1500mm         | 50mm                      |

Sensors of the same type are wired together in a network according to the following diagram. A synchronization pulse from the control activates synchronous operation.

The devices work in synchronous operation with a **simultaneous transmission pulse**. The response time of the individual sensors in the network corresponds approximately to that of a single sensor.

#### Synchronous operation wiring schematic

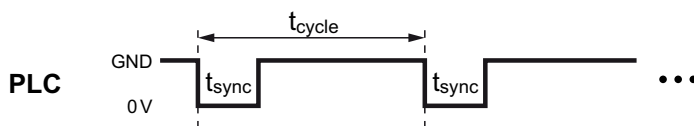


#### NOTE



Please make certain that the wiring is performed according to the connection diagram. The **Sync/MUX** pin 5 on all sensors in the network must be connected to **one** output of the control. Generation of the synchronization signal for all sensors in the network occurs via the control.

#### Timing diagram for synchronous operation



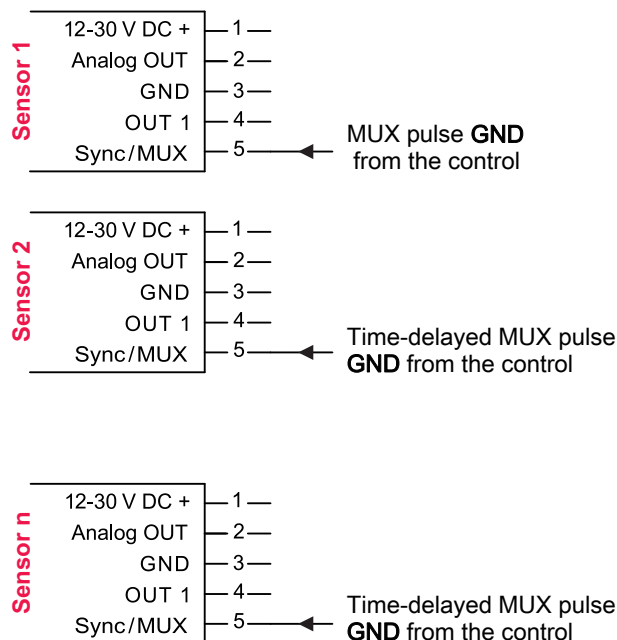
| Operating range | Sync impulse duration $t_{sync}$ | Cycle time $t_{cycle}$ |
|-----------------|----------------------------------|------------------------|
| 250 ... 3500mm  | 0.5 ... 5ms                      | 35ms                   |
| 350 ... 6000mm  | 0.5 ... 1ms                      | 60ms                   |

### Multiplex operation

In this operating mode the mutual interference of adjacent sensors can be reliably avoided. For this purpose, each sensor is wired with a separate output of the control.

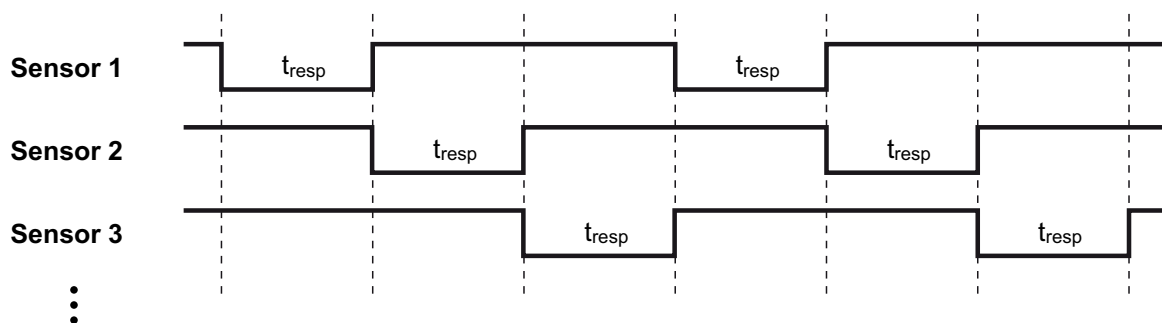
The devices operate in multiplex operation with a **cyclically time-delayed transmission pulse** and are switched to a passive state outside of the active phase.

*Multiplex operation wiring schematic*



| NOTE                                                                              |                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Please make certain that the wiring is performed according to the connection diagram.<br>The <b>Sync/MUX</b> pin 5 of each sensor must be connected with a separate output of the control.<br>The control generates the time-delayed multiplex signals for all sensors. |

*Timing diagram for multiplex operation*



| Operating range | Response time of the switching/analog output $t_{resp}$ |
|-----------------|---------------------------------------------------------|
| 250 ... 3500mm  | 250ms                                                   |
| 350 ... 6000mm  | 500ms                                                   |

### Resetting to factory settings

The sensor can be reset to the factory setting (1 switching point at 3500mm or 6000mm, rising characteristic curve with spread over the entire operating range).

| Resetting to factory settings                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. When switching on the supply voltage (during power-on), press the <b>teach button</b> for > 5s.                                                                                                                                                                                                                                                                                                           |
| 2. Release the button. The <b>green, yellow and blue LEDs</b> flash <b>alternately and very quickly</b> for a brief time.<br>The sensor was reset to the factory setting:<br><b>switching output:</b> 1 switching point at 3500mm or 6000mm (1-point teach, static),<br><b>analog output:</b> 4 ... 20mA or 0 ... 10V corresponds to an object distance of 250 ... 3500 mm or 350 ... 6000 mm, respectively. |