



Operating Manual
mic+ Ultrasonic Sensors
with one analogue output

mic+25/IU/TC
mic+35/IU/TC
mic+130/IU/TC
mic+340/IU/TC
mic+600/IU/TC

Product description

- The mic+ sensor with one analogue output measures the distance to an object within the detection zone contactless. A signal proportional to distance is created according to the adjusted window limits of the analogue characteristic curve.
- The sensor automatically detects the load put to the analogue output and switches to current output or voltage output respectively.
- All settings are done with two push-buttons and a three-digit LED display (TouchControl).
- Three-colour LEDs indicate all operation conditions.
- Choosing between rising and falling output characteristic is possible.
- The sensors are adjustable manually via TouchControl or via Teach-in procedure.

- Useful additional functions are set in the Add-on menu.
- Using the LinkControl adapter (optional accessory) and the LinkControl software for Windows®, all Teach-in and additional sensor parameter settings can be optionally undertaken.

The mic+ sensors have a blind zone in which distance measurement is not possible. The operating range indicates the distance of the sensor that can be applied with normal reflectors with sufficient function reserve. When using good reflectors, such as a calm water surface, the sensor can also be used up to its maximum range. Objects that strongly absorb (e.g. plastic foam) or diffusely reflect sound (e.g. pebble stones) can also reduce the defined operating range.

Safety Notes

- Read the operating instructions prior to start-up.
- Connection, installation and adjustment works may only be carried out by expert personnel.
- No safety component in accordance with the EU Machine Directive, use in the area of personal and machine protection not permitted

Proper Use

mic+ ultrasonic sensors are used for non-contact detection of objects.

Synchronisation

If the assembly distance of multiple sensors falls below the values shown in Fig. 1 the integrated synchronisation should be used. Connect Sync/Com-channels (pin 5 at the units receptable) of all sensors (10 maximum).

mic+25...	≥0.35 m	≥2.50 m
mic+35...	≥0.40 m	≥2.50 m
mic+130...	≥1.10 m	≥8.00 m
mic+340...	≥2.00 m	≥18.00 m
mic+600...	≥4.00 m	≥30.00 m

Fig. 1: Assembly distances, indicating synchronisation/multiplex

Multiplex mode

The Add-on-menu allows to assign an individual address »01« to »10« to each sensor connected via the Sync/Com-channel (Pin5). The sensors perform the ultrasonic measurement sequentially from low to high address. Therefore any influence between the sensors is rejected. The address »00« is reserved to synchronisation mode and deactivates the multiplex mode. To use synchronised mode all sensors must be set to address »00«.

Installation

- ➔ Assemble the sensor at the installation location.
- ➔ Plug in the connector cable to the M12 connector, see Fig. 2.

		colour
1	+U _B	brown
3	-U _B	blue
4	-	black
2	I/U	white
5	Sync/Com	grey

Fig. 2: Pin assignment with view onto sensor plug and colour coding of the microsonic connection cable

Start-up

- ➔ Connect the power supply.
- ➔ Set the parameters of the sensor manually via TouchControl (see Fig. 3 and Diagram 1)
- ➔ or use the Teach-in procedure to adjust the detect points (see Diagram 2).

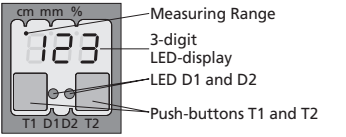


Fig. 3: TouchControl/LED display

Factory setting

- mic+ sensors are delivered factory made with the following settings:
- Rising analogue characteristic
- Window limits for the analogue output set to blind zone and operating range
- Measurement range set to maximum range

Maintenance

mic+ sensors work maintenance free. Small amounts of dirt on the surface do not influence function. Thick layers of dirt and caked-on dirt affect sensor function and therefore must be removed.

Notes

- mic+ sensors have automatic temperature compensation. Because the sensors heat up on their own, the temperature compensation reaches its optimum working point after approx. 30 minutes of operation.
- If an object is within the set window limits of the analogue output, then LED D1 lights up green, if the object is outside the window limits, then LED D1 lights up red.
- The load put to the analogue output is detected automatically when turning supply voltage on.
- During normal operating mode, the measured distance value is displayed on the LED-indicator in mm (up to 999 mm) or cm (from 100 cm). Scale switches automatically and is indicated by a point on top of the digits. Alternatively a percentage scale may be set in the add-on menu. In this connection 0 % and 100 % correspond to the set window limits of the analogue output.
- If no objects are placed within the detection zone the LED-indicator shows »- - -«.
- The sensor can be set to its factory setting, see Diagram 3.
- If no push-buttons are pressed for 20 seconds during parameter setting mode the made changes are stored and the sensor returns to normal operating mode.

Show parameters

- ➔ In normal operating mode shortly push T1. The LED display shows »PAr.«
- Each time you tap push-button T1 the actual settings of the analogue output are shown.

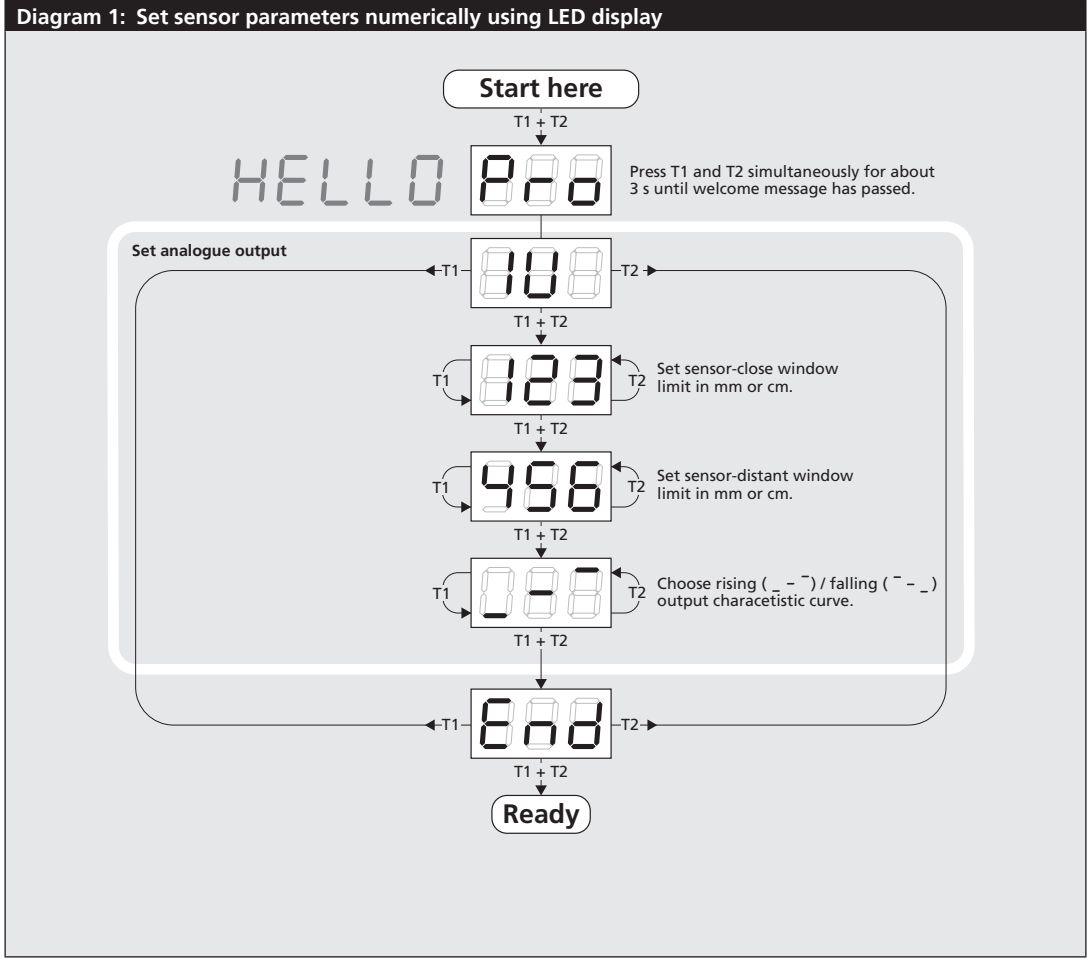


Diagram 2: Set sensor parameters via Teach-in procedure

The diagram illustrates the Teach-in procedure for setting sensor parameters via analogue output. It begins with a sensor icon and two numbered positions, ① and ②. The procedure follows these steps:

- Set window limits**
- Place object at position ①.
- Press T1 until »IU« is shown.
- Current measuring value: 123
- Place object at position ②.
- Current measuring value: 456
- Press T1 until »End« is shown.
- Set rising/falling output characteristic curve**
- Press T1 until countdown passed from »8« to »0« and symbol for rising/falling characteristics displayed.
- Options: rising/falling characteristics or falling/rising characteristics.
- To change output characteristic press T1.
- Press T1 and T2 simultaneously until »End« is displayed.
- Normal operating mode**

Diagram 3: Key lock and factory setting

```
graph TD
    subgraph Left_Path [Activate/deactivate TouchControl]
        L1[Turn supply voltage OFF.] --> L2[While pressing T1 turn supply voltage ON.]
        L2 --> L3[Keep T1 pressed for about 3 s until »on« or »off« is displayed.]
        L3 --> L4[»on« or »off«]
        L4 --> L5[»off« or »on«]
        L5 --> L6[To activate or deactivate press T1.]
        L6 --> L7[Don't press any push-button for 20 s.]
        L7 --> L8[Normal operating mode]
    end
    subgraph Right_Path [Reset to factory setting]
        R1[Turn supply voltage OFF.] --> R2[While pressing T1 turn supply voltage ON.]
        R2 --> R3[Keep T1 pressed for about 13 s until »rESEt« has passed through the display.]
        R3 --> L4
    end
```

The flowchart illustrates the procedures for activating/deactivating TouchControl and resetting the device to factory settings. Both processes begin with turning the supply voltage OFF. For activation/deactivation, the user presses T1 to turn the supply voltage ON and keeps it pressed for 3 seconds until the display shows »on« or »off«. For a factory reset, the user presses T1 to turn the supply voltage ON and keeps it pressed for 13 seconds until »rESEt« is displayed. Both paths then lead to a state where the user can press T1 to activate or deactivate TouchControl, followed by a 20-second wait period before returning to normal operating mode.

Diagram 4: Useful additional functions in Add-on menu (for experienced users only, settings not required for standard applications)

Start here

HELLO Pro Add-on

Press T1 and T2 simultaneously for about 13 s until »Add« is shown in the LED-display.

Ready

Lower power mode

- »C01«: Display bright
- »C02«: Display dimmed
- »C03«: Display off

Display mode

- »- - «: Display in mm or cm
- »- % «: Display in %, 100 % at minimum measured value
- »- 100% «: Display in %, 100% at maximum measured value

Choose current/voltage output

- »Aut«: automatic detection of the load
- »U«: voltage output
- »I«: current output

Measurement filter

- »F00«: no filter
- »F01«: standard filter
- »F02«: averaging filter
- »F03«: foreground filter
- »F04«: background filter

Filter strength

Defines the strength of the chosen filter.

- »P00«: weak filter up to
- »P09«: strong filter

Response time

Delay in seconds between the detection of an object and the output of the measured distance in case of object approach (behaves as on-delay).

00: 0 s (no delay) up to *20*: 20 s response time

Foreground suppression

Minimum value: blind zone

Maximum value: nearwindow limit - 1

Multiplex mode device addressing

- *00*: synchronisation
- *01* to *10*: sensor address for multiplex mode
- *0F*: synchronisation deactivated

Multiplex mode highest address

To optimize multiplex speed the highest sensor address may be set.

Setting range »01« to »10«

Measurement range

Minimum value: sensor-distant window limit

Maximum value: 999 mm for mic+25/..., mic+35/..., 999 cm for mic+130/..., mic+340/..., mic+600/...

Calibration display

Put plane reflector vertically disposed in front of sensor; in an exact distance of 250 mm for mic+ 25... and mic+35... and 900 mm for all other types.

Adjust display to 250 mm or 900 mm. Confirm calibration with T1+T2.

Detection zone sensitivity

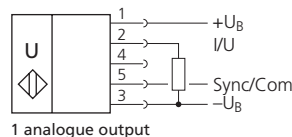
Affects the size of the detection zone.

- »E01«: high
- »E02«: standard
- »E03«: slight

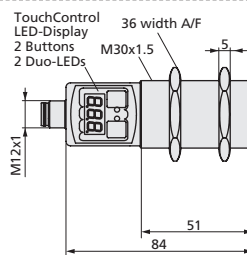
Note

Changes in the Add-on menu may impair the sensor function.

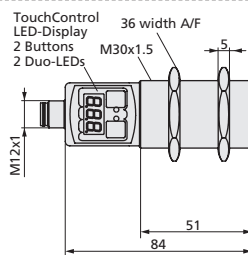
A6, A7, A8, A10, A11, A12 have influence on the response time of the sensor.



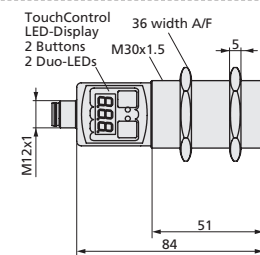
mic+25... D·■■■■■■■■



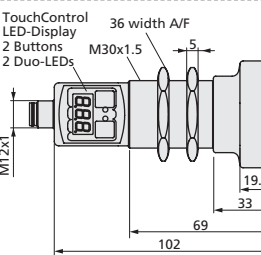
mic+35... D·■■■■■■■■



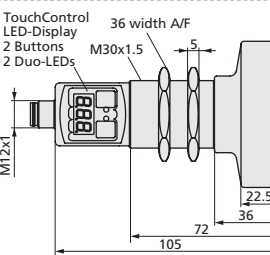
mic+130... D·■■■■■■■■



mic+340... D·■■■■■■■■



mic+600... D·■■■■■■■■

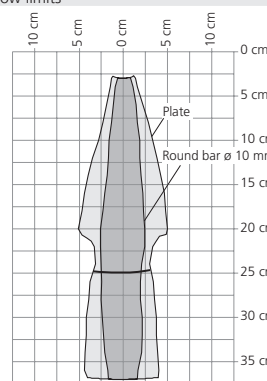


blind zone
operating range
maximum range

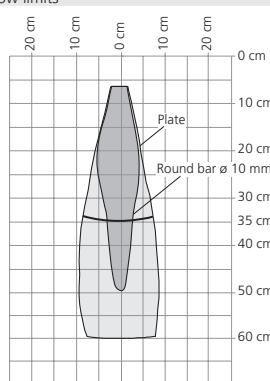
0 to 30 mm
250 mm
350 mm
see detection zone
320 kHz
0.025 to 0.10 mm, depending on the window limits

detection zones

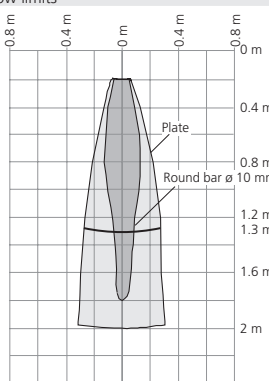
for different objects:
The dark grey areas represent the zone where it is easy to recognise the normal reflector (round bar). This indicates the typical operating range of the sensors. The light grey areas represent the zone where a very large reflector – for instance a plate – can still be recognised. The requirement here is for an optimum alignment to the sensor. It is not possible to evaluate ultrasonic reflections outside this area.



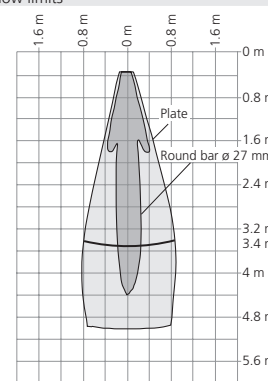
0 bis 65 mm
350 mm
600 mm
see detection zone
400 kHz
0.025 to 0.17 mm, depending on the window limits



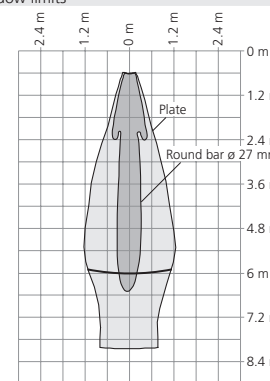
0 to 200 mm
1,300 mm
2,000 mm
see detection zone
200 kHz
0.18 to 0.57 mm, depending on the window limits



0 to 350 mm
3,400 mm
5,000 mm
see detection zone
120 kHz
0.18 to 1.5 mm, depending on the window limits



0 to 600 mm
6,000 mm
8,000 mm
see detection zone
80 kHz
0.18 to 2.4 mm, depending on the window limits



reproducibility
accuracy

±0.15 %
±1 % (Temperature drift internal compensated, may be deactivated²⁾, 0.17%/K without compensation)
9 to 30 V DC, short-circuit-proof, Class 2

operating voltage U_B
voltage ripple
no-load supply current

±10 %
≤ 80 mA
Brass sleeve, nickel-plated, plastic parts: PBT, TPU;
Ultrasonic transducer: polyurethane foam,
epoxy resin with glass content

class of protection to EN 60529
norm conformity
type of connection

IP 67
EN 60947-5-2
5-pin initiator plug, PBT
2 push-buttons (TouchControl)

indicators

3-digit LED display, 2 three-colour LEDs

programmable

with TouchControl and LinkControl

operating temperature

–25 to +70 °C

storage temperature

–40 to +85 °C

weight

150 g

response time¹⁾

32 ms

time delay before availability

<300 ms

±0.15 %

±1 % (Temperature drift internal compensated, may be deactivated²⁾, 0.17%/K without compensation)
9 to 30 V DC, short-circuit-proof, Class 2

±10 %

≤ 80 mA
Brass sleeve, nickel-plated, plastic parts: PBT, TPU;
Ultrasonic transducer: polyurethane foam,
epoxy resin with glass content

IP 67

EN 60947-5-2

5-pin initiator plug, PBT

2 push-buttons (TouchControl)

3-digit LED display, 2 three-colour LEDs

with TouchControl and LinkControl

–25 to +70 °C

–40 to +85 °C

150 g

64 ms

<300 ms

±0.15 %

±1 % (Temperature drift internal compensated, may be deactivated²⁾, 0.17%/K without compensation)
9 to 30 V DC, short-circuit-proof, Class 2

±10 %

≤ 80 mA
Brass sleeve, nickel-plated, plastic parts: PBT, TPU;
Ultrasonic transducer: polyurethane foam,
epoxy resin with glass content

IP 67

EN 60947-5-2

5-pin initiator plug, PBT

2 push-buttons (TouchControl)

3-digit LED display, 2 three-colour LEDs

with TouchControl and LinkControl

–25 to +70 °C

–40 to +85 °C

150 g

92 ms

<300 ms

±0.15 %

±1 % (Temperature drift internal compensated, may be deactivated²⁾, 0.17%/K without compensation)
9 to 30 V DC, short-circuit-proof, Class 2

±10 %

≤ 80 mA
Brass sleeve, nickel-plated, plastic parts: PBT, TPU;
Ultrasonic transducer: polyurethane foam,
epoxy resin with glass content

IP 67

EN 60947-5-2

5-pin initiator plug, PBT

2 push-buttons (TouchControl)

3-digit LED display, 2 three-colour LEDs

with TouchControl and LinkControl

–25 to +70 °C

–40 to +85 °C

210 g

172 ms

<380 ms

±0.15 %

±1 % (Temperature drift internal compensated, may be deactivated²⁾, 0.17%/K without compensation)
9 to 30 V DC, short-circuit-proof, Class 2

±10 %

≤ 80 mA
Brass sleeve, nickel-plated, plastic parts: PBT, TPU;
Ultrasonic transducer: polyurethane foam,
epoxy resin with glass content

IP 67

EN 60947-5-2

5-pin initiator plug, PBT

2 push-buttons (TouchControl)

3-digit LED display, 2 three-colour LEDs

with TouchControl and LinkControl

–25 to +70 °C

–40 to +85 °C

270 g

240 ms

<450 ms

order No.

mic+25/IU/TC

current output 4 to 20 mA

R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V

R_L ≤ 500 Ω at U_B ≥ 20 V

Rising/falling output characteristic

R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof

Rising/falling output characteristic

mic+35/IU/TC

R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V

R_L ≤ 500 Ω at U_B ≥ 20 V

Rising/falling output characteristic

R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof

Rising/falling output characteristic

mic+130/IU/TC

R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V

R_L ≤ 500 Ω at U_B ≥ 20 V

Rising/falling output characteristic

R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof

Rising/falling output characteristic

mic+340/IU/TC

R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V

R_L ≤ 500 Ω at U_B ≥ 20 V

Rising/falling output characteristic

R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof

Rising/falling output characteristic

mic+600/IU/TC

R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V

R_L ≤ 500 Ω at U_B ≥ 20 V

Rising/falling output characteristic

R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof

Rising/falling output characteristic

¹⁾ Can be programmed via TouchControl and LinkControl.

²⁾ Can be deactivated via LinkControl.