



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).

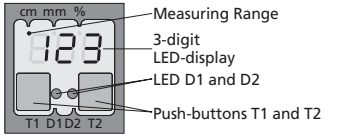


Fig. 3: TouchControl/LED display

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.

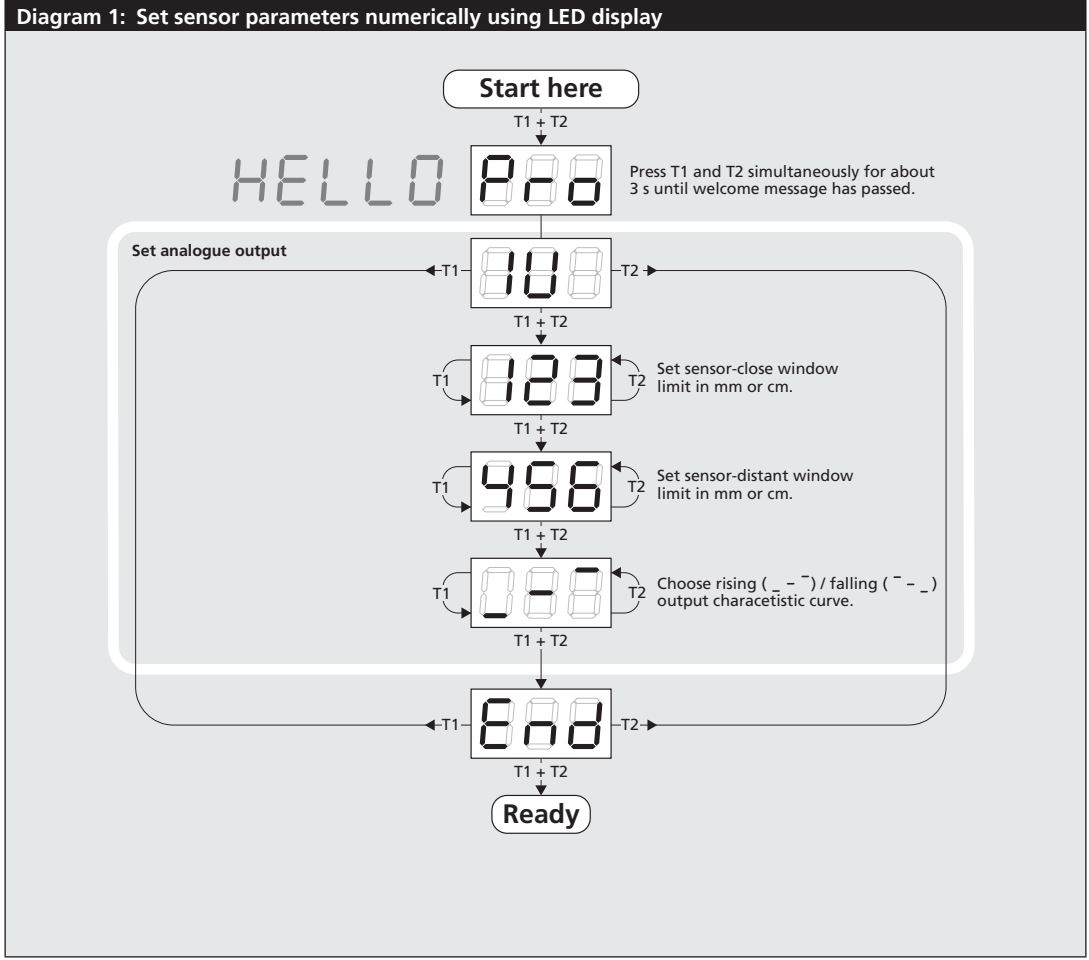


Diagram 2: Set sensor parameters via Teach-in procedure

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.**
- 123** Current measuring value
- Place object at position ②.**
- 456** Current measuring value
- 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.**
- rising/falling characteristics**
- 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 [ ]
        direction TB
        L1[Activate/deactivate TouchControl] --> L2[Turn supply voltage OFF.]
        L2 --> L3[While pressing T1 turn supply voltage ON.]
        L3 --> L4[Keep T1 pressed for about 3 s until »on« or »off« is displayed.]
        L4 --> L5[»on« or »off«]
        L5 --> L6[»off« or »on«]
        L6 --> L7[To activate or deactivate press T1.]
        L7 --> L8[Don't press any push-button for 20 s.]
        L8 --> L9[Normal operating mode]
    end

    subgraph Right_Path [ ]
        direction TB
        R1[Reset to factory setting] --> R2[Turn supply voltage OFF.]
        R2 --> R3[While pressing T1 turn supply voltage ON.]
        R3 --> R4[Keep T1 pressed for about 13 s until »rESEt« has passed through the display.]
        R4 --> R5[Normal operating mode]
    end
```

The diagram illustrates two procedures for returning the device to normal operating mode:

- Activate/deactivate TouchControl:**
 - Turn supply voltage OFF.
 - While pressing T1 turn supply voltage ON.
 - Keep T1 pressed for about 3 s until »on« or »off« is displayed.
 - »on« or »off«
 - »off« or »on«
 - To activate or deactivate press T1.
 - Don't press any push-button for 20 s.
 - Normal operating mode
- Reset to factory setting:**
 - Turn supply voltage OFF.
 - While pressing T1 turn supply voltage ON.
 - Keep T1 pressed for about 13 s until »rESEt« has passed through the display.
 - 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
- »_ - «: 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

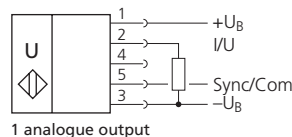
Put plane reflector vertically disposed in front of sensor; in an exact distance of 250 mm for mic+ 25... and mic+35... and 900 mm for all other types.
Adjust display to 250 mm or 900 mm. Confirm calibration with T1+T2.

Detection zone sensitivity

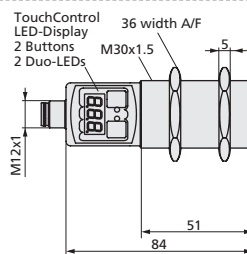
Affects the size of the detection zone.

- »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.



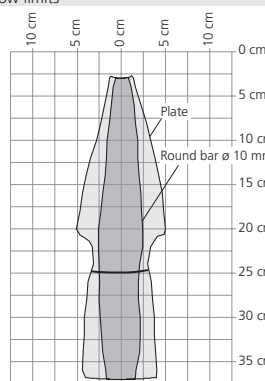
mic+25...



blind zone 0 to 30 mm
operating range 250 mm
maximum range 350 mm
angle of beam spread see detection zone
transducer frequency 320 kHz
resolution 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.

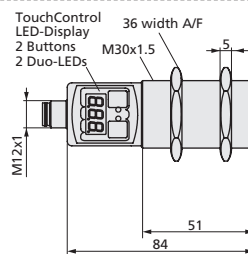


reproducibility $\pm 0.15\%$
accuracy $\pm 1\%$ (Temperature drift internal compensated, may be deactivated²⁾, 0.17%/K without compensation)
operating voltage U_B 9 to 30 V DC, short-circuit-proof, Class 2
voltage ripple $\pm 10\%$
no-load supply current ≤ 80 mA
housing Brass sleeve, nickel-plated, plastic parts: PBT, TPU; Ultrasonic transducer: polyurethane foam, epoxy resin with glass content

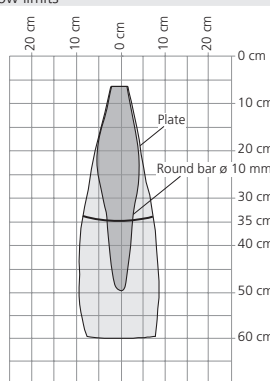
class of protection to EN 60529 IP 67
norm conformity EN 60947-5-2
type of connection 5-pin initiator plug, PBT
controls 2 push-buttons (TouchControl)
indicators 3-digit LED display, 2 three-colour LEDs with TouchControl and LinkControl
programmable with TouchControl and LinkControl
operating temperature -25 to +70 °C
storage temperature -40 to +85 °C
weight 150 g
response time¹⁾ 32 ms
time delay before availability <300 ms

order No. mic+25/IU/TC
current output 4 to 20 mA $R_L \leq 100 \Omega$ at $9 V \leq U_B \leq 20 V$
 $R_L \leq 500 \Omega$ at $U_B \geq 20 V$
 Rising/falling output characteristic
voltage output 0 to 10 V $R_L \geq 100 k\Omega$ at $U_B \geq 15 V$, short-circuit-proof
 Rising/falling output characteristic

mic+35...



blind zone 0 bis 65 mm
operating range 350 mm
maximum range 600 mm
angle of beam spread see detection zone
transducer frequency 400 kHz
resolution 0.025 to 0.17 mm, depending on the window limits

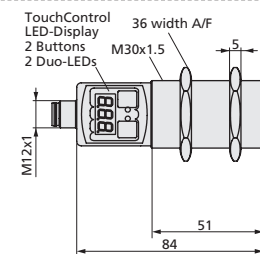


reproducibility $\pm 0.15\%$
accuracy $\pm 1\%$ (Temperature drift internal compensated, may be deactivated²⁾, 0.17%/K without compensation)
operating voltage U_B 9 to 30 V DC, short-circuit-proof, Class 2
voltage ripple $\pm 10\%$
no-load supply current ≤ 80 mA
housing Brass sleeve, nickel-plated, plastic parts: PBT, TPU; Ultrasonic transducer: polyurethane foam, epoxy resin with glass content

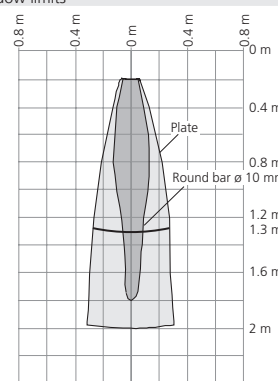
class of protection to EN 60529 IP 67
norm conformity EN 60947-5-2
type of connection 5-pin initiator plug, PBT
controls 2 push-buttons (TouchControl)
indicators 3-digit LED display, 2 three-colour LEDs with TouchControl and LinkControl
programmable with TouchControl and LinkControl
operating temperature -25 to +70 °C
storage temperature -40 to +85 °C
weight 150 g
response time¹⁾ 64 ms
time delay before availability <300 ms

order No. mic+35/IU/TC
current output 4 to 20 mA $R_L \leq 100 \Omega$ at $9 V \leq U_B \leq 20 V$
 $R_L \leq 500 \Omega$ at $U_B \geq 20 V$
 Rising/falling output characteristic
voltage output 0 to 10 V $R_L \geq 100 k\Omega$ at $U_B \geq 15 V$, short-circuit-proof
 Rising/falling output characteristic

mic+130...



blind zone 0 to 200 mm
operating range 1,300 mm
maximum range 2,000 mm
angle of beam spread see detection zone
transducer frequency 200 kHz
resolution 0.18 to 0.57 mm, depending on the window limits

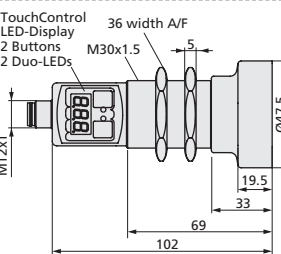


reproducibility $\pm 0.15\%$
accuracy $\pm 1\%$ (Temperature drift internal compensated, may be deactivated²⁾, 0.17%/K without compensation)
operating voltage U_B 9 to 30 V DC, short-circuit-proof, Class 2
voltage ripple $\pm 10\%$
no-load supply current ≤ 80 mA
housing Brass sleeve, nickel-plated, plastic parts: PBT, TPU; Ultrasonic transducer: polyurethane foam, epoxy resin with glass content

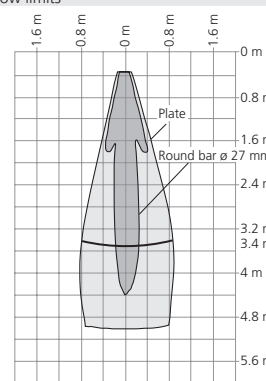
class of protection to EN 60529 IP 67
norm conformity EN 60947-5-2
type of connection 5-pin initiator plug, PBT
controls 2 push-buttons (TouchControl)
indicators 3-digit LED display, 2 three-colour LEDs with TouchControl and LinkControl
programmable with TouchControl and LinkControl
operating temperature -25 to +70 °C
storage temperature -40 to +85 °C
weight 150 g
response time¹⁾ 92 ms
time delay before availability <300 ms

order No. mic+130/IU/TC
current output 4 to 20 mA $R_L \leq 100 \Omega$ at $9 V \leq U_B \leq 20 V$
 $R_L \leq 500 \Omega$ at $U_B \geq 20 V$
 Rising/falling output characteristic
voltage output 0 to 10 V $R_L \geq 100 k\Omega$ at $U_B \geq 15 V$, short-circuit-proof
 Rising/falling output characteristic

mic+340...



blind zone 0 to 350 mm
operating range 3,400 mm
maximum range 5,000 mm
angle of beam spread see detection zone
transducer frequency 120 kHz
resolution 0.18 to 1.5 mm, depending on the window limits

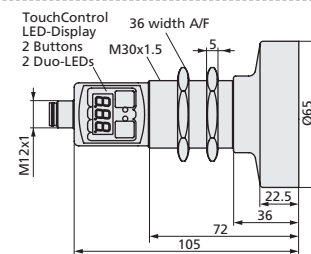


reproducibility $\pm 0.15\%$
accuracy $\pm 1\%$ (Temperature drift internal compensated, may be deactivated²⁾, 0.17%/K without compensation)
operating voltage U_B 9 to 30 V DC, short-circuit-proof, Class 2
voltage ripple $\pm 10\%$
no-load supply current ≤ 80 mA
housing Brass sleeve, nickel-plated, plastic parts: PBT, TPU; Ultrasonic transducer: polyurethane foam, epoxy resin with glass content

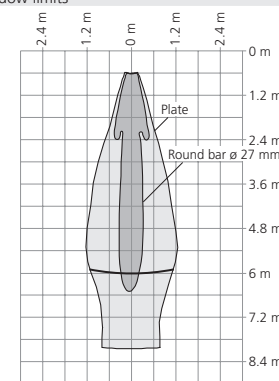
class of protection to EN 60529 IP 67
norm conformity EN 60947-5-2
type of connection 5-pin initiator plug, PBT
controls 2 push-buttons (TouchControl)
indicators 3-digit LED display, 2 three-colour LEDs with TouchControl and LinkControl
programmable with TouchControl and LinkControl
operating temperature -25 to +70 °C
storage temperature -40 to +85 °C
weight 210 g
response time¹⁾ 172 ms
time delay before availability <380 ms

order No. mic+340/IU/TC
current output 4 to 20 mA $R_L \leq 100 \Omega$ at $9 V \leq U_B \leq 20 V$
 $R_L \leq 500 \Omega$ at $U_B \geq 20 V$
 Rising/falling output characteristic
voltage output 0 to 10 V $R_L \geq 100 k\Omega$ at $U_B \geq 15 V$, short-circuit-proof
 Rising/falling output characteristic

mic+600...



blind zone 0 to 600 mm
operating range 6,000 mm
maximum range 8,000 mm
angle of beam spread see detection zone
transducer frequency 80 kHz
resolution 0.18 to 2.4 mm, depending on the window limits



reproducibility $\pm 0.15\%$
accuracy $\pm 1\%$ (Temperature drift internal compensated, may be deactivated²⁾, 0.17%/K without compensation)
operating voltage U_B 9 to 30 V DC, short-circuit-proof, Class 2
voltage ripple $\pm 10\%$
no-load supply current ≤ 80 mA
housing Brass sleeve, nickel-plated, plastic parts: PBT, TPU; Ultrasonic transducer: polyurethane foam, epoxy resin with glass content

class of protection to EN 60529 IP 67
norm conformity EN 60947-5-2
type of connection 5-pin initiator plug, PBT
controls 2 push-buttons (TouchControl)
indicators 3-digit LED display, 2 three-colour LEDs with TouchControl and LinkControl
programmable with TouchControl and LinkControl
operating temperature -25 to +70 °C
storage temperature -40 to +85 °C
weight 270 g
response time¹⁾ 240 ms
time delay before availability <450 ms

order No. mic+600/IU/TC
current output 4 to 20 mA $R_L \leq 100 \Omega$ at $9 V \leq U_B \leq 20 V$
 $R_L \leq 500 \Omega$ at $U_B \geq 20 V$
 Rising/falling output characteristic
voltage output 0 to 10 V $R_L \geq 100 k\Omega$ at $U_B \geq 15 V$, short-circuit-proof
 Rising/falling output characteristic

¹⁾ Can be programmed via TouchControl and LinkControl.
²⁾ Can be deactivated via LinkControl.