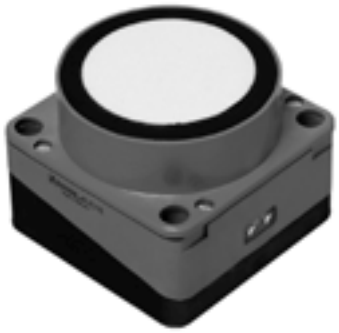
## Ultrasonic sensor
# UC6000-FP-E6-R2-P5

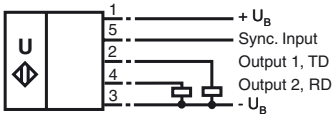


## Features

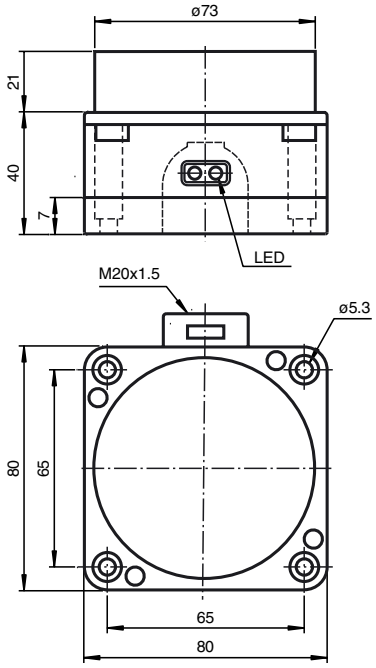
- 2 independent switch outputs
- Serial interface
- Switch point setting via DIP-switches or RS 232 interface
- Synchronisation options
- Temperature compensation
- Absolute polarity reversal protection
- Parameterisable with ULTRA 2001

## Electrical connection

**Standard symbol/Connection:**
(Version E6, pnp)




## Dimensions




## Technical data

CE

| | |
|---|---|
| **General specifications** | |
| Sensing range | 800 ... 6000 mm |
| Unusable area | 0 ... 800 mm |
| Standard target plate | 100 mm x 100 mm |
| Transducer frequency | approx. 65 kHz |
| Response delay | for factory setting<br>minimal (EM; NONE): ≤180 ms (2 measuring cycles)<br>default (EM, MXN, 5, 2): ≤360 ms (4 measuring cycles)<br>dynamic (EM, DYN): ≤270 ms (3 measuring cycles) |
| **Indicators/operating means** | |
| LED yellow | switching state switch output 1<br>switching state switch output 2 |
| LED red/green | permanently green : "Power on", flashes during standby operation<br>red flashing : "Error", (e. g. background noise level too high) |
| **Electrical specifications** | |
| Operating voltage | 15 ... 30 V DC , ripple 10 $\%_{SS}$ |
| No-load supply current $I_0$ | ≤ 60 mA |
| **Interface** | |
| Interface type | RS 232, 9600 bit/s, no parity, 8 data bits, 1 stop bit |
| **Input/Output** | |
| Synchronisation | 1 synchronous connection, bidirectional<br>0-level: $-U_B$ ... ($-U_B$ + 1 V), 1-level: ($-U_B$ + 5 V) ... $+U_B$ |
| Pulse length | ≥ 100 µs |
| Pause length | ≥ 2 ms |
| Synchronisation frequency | ≤ 10 Hz , with external synchronisation |
| **Output** | |
| Output type | 2 switch outputs pnp, NO/NC |
| Resolution | < 1 mm |
| Repeat accuracy | ≤ 0,1 % of full-scale value |
| Rated operational current $I_e$ | 200 mA , short-circuit/overload protected |
| Voltage drop $U_d$ | ≤ 3 V DC |
| Range hysteresis H | ≤ 1 % of the set operating distance |
| Temperature influence | ≤ 2 % |
| **Standard conformity** | |
| Standards | EN 60947-5-2 |
| **Ambient conditions** | |
| Ambient temperature | -25 ... 70 °C (248 ... 343 K) |
| Storage temperature | -40 ... 85 °C (233 ... 358 K) |
| **Mechanical specifications** | |
| Protection degree | IP65 |
| Connection | terminal compartment, ≤ 2.5 $mm^2$ conductor csa |
| Material | |
| Housing | PBT |
| Transducer | epoxy resin/hollow glass sphere mixture; polyurethane foam |
| Mass | 320 g |

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## Notes

### Description of the sensor functions

The outputs of the sensor can be used in two different operating modes: Switching mode with 2 adjustable switching points, or RS 232 mode (RS 232, 9600, n, 8, 1). Select the operating mode with DIP switch 10. The switching points are set with the DIP switches 1-4 and 5-8 (see table). Switch 9 is used to set the close or open function of the switch outputs.
For further information on the sensor's command set, please see the publication "Command Set for Ultrasonic Sensors with RS 232 Interface".
**Caution:** Ensure that DIP switch S10 is correctly set before connecting the RS 232 interface.

### Synchronisation

The sensor features a synchronisation input for the suppression of mutual interference. If this input is not used, the sensor will operate using an internally generated clock rate. It can be synchronised by applying a square wave voltage. A falling edge leads to the transmission of a single ultrasonic pulse. A low level > 1 s or an open synchronisation input will result in the normal operation of the sensor. A high level > 1 s will result in the standby operation of the sensor (green LED).

Several functions are available:

- Two to five sensors can be synchronised by interconnecting their synchronisation inputs. In this case, the sensors alternately transmit ultrasonic pulses.
- Multiple sensors can be controlled by the same synchronisation signal. The sensors are synchronised.
- The synchronisation pulses are sent cyclically to individual sensors. The sensors operate in multiplex mode.

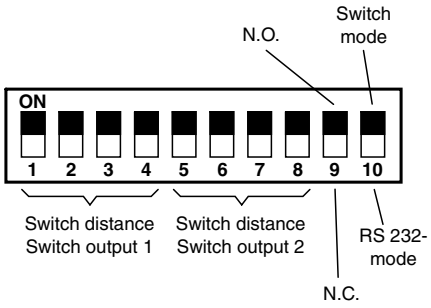
The response time increases when sensors are synchronised as the measuring cycle time is increased by the synchronisation.

### Adjustment of the evaluation window via coding switch in terminal compartment

| Switch 1 2 3 4 | NDE [mm] | Switch 5 6 7 8 | FDE [mm] |
|---|---|---|---|
| 0 0 0 0 | 800 | 0 0 0 0 | 950 |
| 0 0 0 1 | 1100 | 0 0 0 1 | 1250 |
| 0 0 1 0 | 1400 | 0 0 1 0 | 1550 |
| 0 0 1 1 | 1700 | 0 0 1 1 | 1850 |
| 0 1 0 0 | 2000 | 0 1 0 0 | 2150 |
| 0 1 0 1 | 2300 | 0 1 0 1 | 2450 |
| 0 1 1 0 | 2600 | 0 1 1 0 | 2750 |
| 0 1 1 1 | 2900 | 0 1 1 1 | 3050 |
| 1 0 0 0 | 3200 | 1 0 0 0 | 3350 |
| 1 0 0 1 | 3500 | 1 0 0 1 | 3650 |
| 1 0 1 0 | 3800 | 1 0 1 0 | 4000 |
| 1 0 1 1 | 4200 | 1 0 1 1 | 4400 |
| 1 1 0 0 | 4600 | 1 1 0 0 | 4800 |
| 1 1 0 1 | 5000 | 1 1 0 1 | 5200 |
| 1 1 1 0 | 5400 | 1 1 1 0 | 5600 |
| 1 1 1 1 | 5800 | 1 1 1 1 | 6000 |

1 ^ ON, 0 ^ OFF

**DIP Switches in Terminal Compartment**

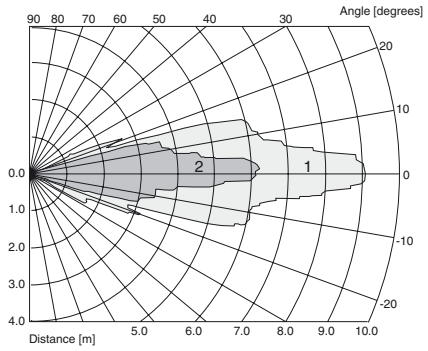



## Model number

**UC6000-FP-E6-R2-P5**

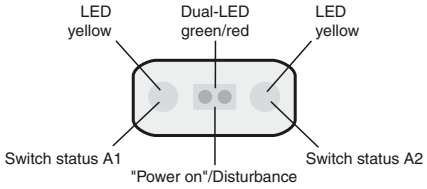
## Characteristic curves/additional information

### Characteristic response curves




Curve 1: flat surface 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

### LED-Window




## Accessories

**Mounting aid**
MH 04-3505

**Mounting flange**
PA02

**Interface-cable**
UC-FP/U9-R2

**Service program**
ULTRA 2001

Thanks to its extensive command set, the sensor can be configured to suit the application via the RS 232 interface.

## RS 232 command set (overview)

| Command | Meaning | Parameter | Access |
|---|---|---|---|
| VS0 | **V**elocity of **S**ound at **0** °C | VS0 in [cm/s] | read and set |
| TO | **T**emperature **O**ffset | TO in [0.1K] | read and set |
| TEM | **TEM**perature | TEM in [0.1K] | read and adapt to TO |
| REF | **REF**erence measurement | REF distance in [mm] | adaptation of VS0 |
| VS | **V**elocity of **S**ound | VS in [cm/s] | read |
| UDS | **U**se **D**IP **S**witches | UDS binary [0/1] | read and set |
| SD1[1] | **S**witching **D**istance **1 1** | SD11 distance in [mm] | read and set |
| SD12 | **S**witching **D**istance **1 2** | SD12 distance in [mm] | read and set |
| SD2[1] | **S**witching **D**istance **2 1** | SD21 distance in [mm] | read and set |
| SD22 | **S**witching **D**istance **2 2** | SD12 distance in [mm] | read and set |
| SH1 | **S**witching **H**ysteresis **1** | Hysteresis in [%] | read and set |
| SH2 | **S**witching **H**ysteresis **2** | Hysteresis in [%] | read and set |
| BR | Unusable area (**B**lind **R**ange) | Unusable area to [mm] | read and set |
| RR | **R**ange **R**eduction | Unusable area from [mm] | read and set |
| NEF | **N**o **E**cho is **F**ailure | 1: "no echo" is failure; 0: "no echo" is not failure | read and set |
| FSF | **F**ail **S**afe **F**unction | Shutdown function in event of failure | read and set |
| CBT | **C**onstant **B**urst **T**ime | Burst time in [µs] | read and set |
| CCT | **C**onstant **C**ycle **T**ime | Time in [ms] | read and set |
| SSY | **S**tartup **SY**nchronised | SSY binary [0/1] | read and set |
| FTO | **F**ilter **T**ime**O**ut | Number of measurements without echo to be filtered | read and set |
| EM | **E**valuation **M**ethod | Evaluation method { 0 = NONE; PT1[,f,p,c]; MXN[,m,n]; DYN[,p] } | read and set |
| CON | **CON**servative filter | Counter threshold as number | read and set |
| OPM | **O**peration **M**ethod | Switch output operating mode { S,R,W,L,H } analogue output { S,L } | read and set |
| OM | **O**utput **M**ode | OM coded [ close NO = 0, open NC = 1] | read and set |
| MD | **M**aster **D**evice | Function as master {0 = NONE},AD,RD,RT,SS,ATB,RDB,RTB } | read and set |
| DIP | **DIP** switch settings | DIP switch setting as hexadecimal string | read |
| AD | **A**bsolute **D**istance | Distance in [mm] | read |
| RT | **R**un**T**ime | Echo run time in machine cycles [1 machine cycle = 1.085µs] | read |
| SS1 | **S**witching **S**tate **1** | SS1 binary [0: inactive, 1 active] (independent of OM) | read |
| SS2 | **S**witching **S**tate **2** | SS2 binary [0: inactive, 1 active] (independent of OM) | read |
| ADB | **A**bsolute **D**istance **B**inary | Distance in [mm], binary | read |
| RTB | **R**un**T**ime **B**inary | Echo run time in machine cycles [1 machine cycle = 1.085µs], binary | read |
| ER | **E**cho **R**eceived | Echo detected: no, yes [0/1] | read |
| VER | **VER**sion | Version string: xxxx | read |
| ID | **ID**entification | ID string: P&F UC...-..-E6/E7-R2 Eprom: xxxx Version yyyy | read |
| DAT | **DAT**e | Date string: e.g. Date: 06/11/96 Time: 16:14:26 | read |
| ST | **ST**atus | Status as hexadecimal string | read |
| RST | **R**e**S**e**T** | Performs a reset | Command |
| DEF | **DEF**ault settings | Restores defaults | Command |
| SUC | **S**tore **U**ser **C**onfiguration | Stores all settings | Command |
| RUC | **R**ecall **U**ser **C**onfiguration | Restores stored settings | Command |

### Programming instructions

**Caution:** When programming the sensor via the integrated RS 232 interface, ensure that DIP switch 10 is in the OFF (RS 232 mode) position before connecting the interface cable.

Electrical connection of interface cable UC-FP/U9-R2 (see accessories).

| Interface cable<br>Conductor colour | Sensor terminal compartment<br>Terminal no. |
|---|---|
| brown (TD) | 4 (RD) |
| black (RD) | 2 (TD) |
| blue (GND) | 3 ($-U_B$) |

### Structure of the filter functions