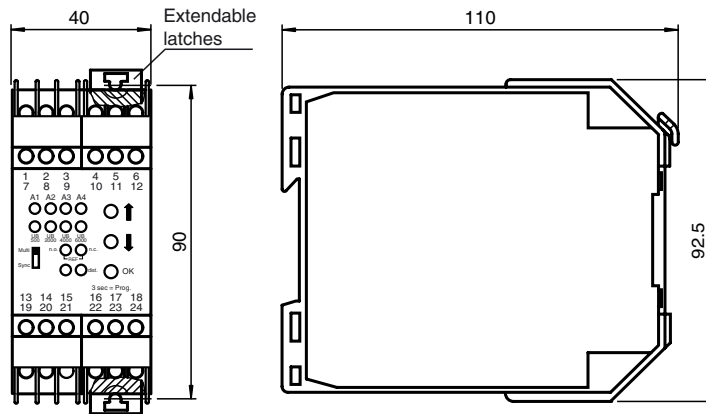


**Evaluation unit
UH3-KHD2-4E5**



Dimensions

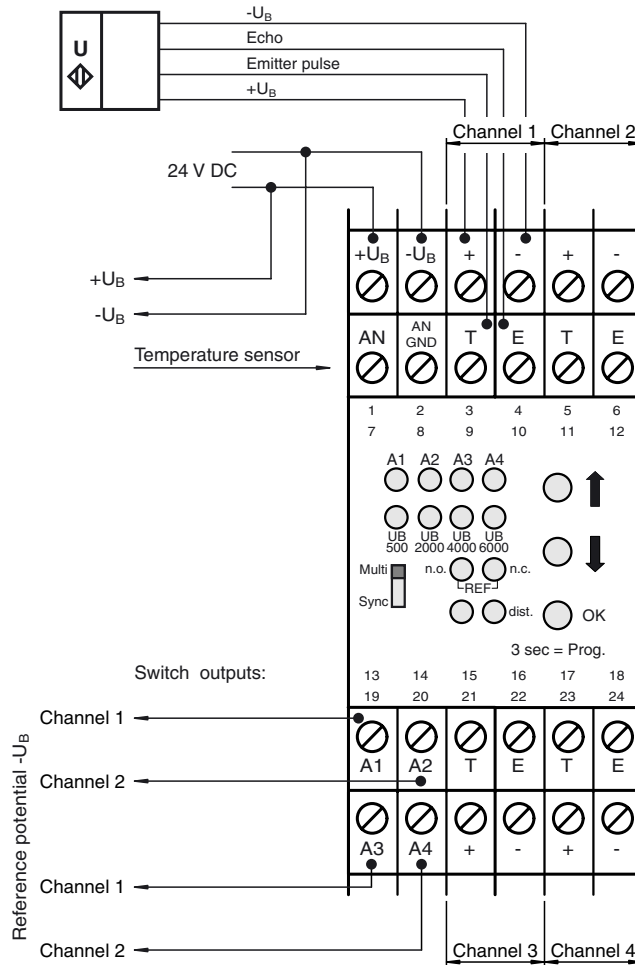


Features

- External evaluation for ultrasonic sensors UB...-H1, -H2 and -H3
- Modular concept: Installation of sensor on-site and evaluation in the control cabinet
- Simultaneous operation of 1 to 4 ultrasonic sensors with ranges from 60 mm to 6 m
- Freely selectable evaluation range
- Multiplex operation - no mutual interaction, operation is possible in a very confined space
- Synchronous operation
- Temperature compensation
- Reference measurement for highest accuracy
- 4 switch outputs



Electrical connection



Technical Data

General specifications

Operating modes with switch-over:
multiplex operation - consecutive activation of the channels
synchronous operation - activation of the channels simultaneously
Measuring frequency dependent on the operating mode, number and longest range of the active sensors (see page multiplex/synchronous operation)

Indicators/operating means

LED green sensor type / channel active (4 items)
NO/NC/REF (2 items)
switch point (1 item)
LED yellow channel number A1 ... A4 / object in operating range (4 items)

Electrical specifications

Operating voltage U_B 20 ... 30 V DC, ripple 10 %_{SS}
No-load supply current I_0 ≤ 50 mA (without sensors)

Input

Input type for 4 sensors for each of 4 connections + U_B / $-U_B$ /clock (T)/echo (E) short-circuit proof with reverse-polarity protection
attachable sensors: UB500/2000/4000/6000-...-H3 or -H1/-H2

Output

Output type 4 switch outputs A1 ... A4 $I_{max} = 500$ mA, pnp,
reverse-polarity protected, NO/NC operation
Repeat accuracy multiplex operation: ± 1 mm
synchronous operation: ± 3 mm

Ambient conditions

Ambient temperature -20 ... 70 °C (253 ... 343 K)
Storage temperature -40 ... 85 °C (233 ... 358 K)

Mechanical specifications

Protection degree IP20
Connection terminal housing, suitable for 35 mm standard rail
plug-in screw terminal 1.5 mm²
Mass 230 g

Ordering code

UH3-KHD2-4E5

Description

The UH3-KHD2-4E5 is an evaluation device for ultrasonic sensors with external interface electronics. Up to four sensors of type UB...-H3 or sensor pairs UB...-H1/-H2 can be connected to the device.

The evaluation unit issues the transmission pulses (cycle) for each sensor channel, then records the echo signal and forms the sensing range according to the echo time. A switch output is associated with each channel.

If the detected distance is less than the set switching point, the output of the associated channel is actuated according to the selected open/close action. This is indicated by the yellow LED assigned to the channel.

Sensors with a variety of detection ranges can be deployed on the four evaluation channels. One of the channels can be programmed as a reference measurement for a temperature compensation.

Note:

The maximum cable-length between evaluation unit and sensor must not exceed 20 m!

Notes

Initial operation/connection of the sensors

The sensors are connected to the channels in accordance with the terminal diagram (electrical connections).

Caution:

Please refer also to the electrical connection on the sensors data sheet.

Connect the lower connections (operating power + and -) first, then the upper ones (T and E).

The number of connected sensors is limited by the performance of the external 24 V DC power supply of the evaluation unit.

Channels equipped with sensors may also be disabled via programming (program step 2)

Selecting the operating mode

The slide switch Multi/Sync toggles the multiplex and synchronous operating modes.

Multiplex mode: The connected sensors are controlled consecutively, briefly and in a cyclic manner. The evaluation unit always processes the signals of a single sensor.

This operating mode should be selected if the sensors are installed in a restricted space or are arranged opposite each other. Multiplex mode prevents mutual interference.

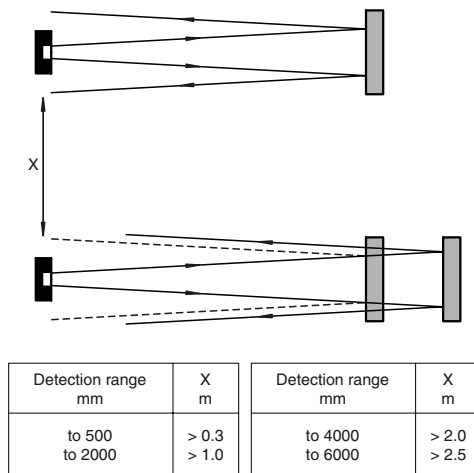
The measuring repeat rate is based on the number of activated sensors multiplied by the repeat time of the sensor with the longest range. The repeat times are:

UB 500:	approx. 30 ms
UB 2000:	approx. 40 ms
UB 4000:	approx. 50 ms
UB 6000:	approx. 65 ms

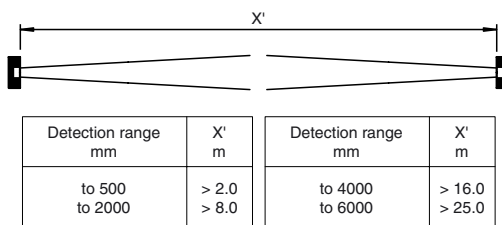
Synchronous mode: This operating mode guarantees a shorter response time than multiplex mode. All activated channels receive transmit pulses simultaneously. Each channel evaluates the time between the transmit pulse and the first echo. Later echoes could be signals from a neighbouring sensor in the case of sensors with similar switching points (longer distance). They are not evaluated.

The lateral safety distance required to avoid mutual interference in neighbouring sensors can be determined with the following table, provided smooth objects at a right angle to the axis of the ultrasonic bursts are to be detected. The indicated values are intended as a guideline. The values increase in the event of unfavourable alignment of the objects and should then be determined experimentally.

The repeat time of the sensor with the greatest range determines the measuring repeat rate of the evaluation unit.



The distance "X" must be observed if two sensors of the same range are installed opposite one another.



Programming mode

Programming is performed with three keys: ▲ (up), ▼ (down) and OK. Starting the programming mode: Press OK key for 3 seconds.

Step 1: Select channel

One of the yellow LEDs in the upper row will be flashing to indicate the channel to be programmed, A1 to A4. Use ▲ (up) or ▼ (down) to select a different channel if required and confirm your choice with OK (yellow LED lit).

Step 2: Select UB range/(disable channel)

After the first OK, one of the green LEDs in the second row will be flashing. It indicates the range. Use ▲ (up) or ▼ (down) to make a selection (500/2000/4000/6000) so that the display corresponds to the range of the connected sensor. Confirm this setting with OK.

Disable channel: In step 2, ▲ (up) or ▼ (down) can also be used to start the "disable" function (all four green LEDs flashing). If this is confirmed with OK, the selected channel will be removed from the measuring cycle. The programming mode will be aborted and normal operation started.

Step 3: Select switching behaviour/(REF)

After confirming the range, the program switches to the third LED row. The switching behaviour is checked and programmed here. Use ▲ (up) or ▼ (down) to choose between the normally-open (n.o.) and normally-closed (n.c.) function. Confirm your choice with the OK key.

REF: The third option is REF (both LEDs). If this is confirmed with the OK key, the sensor on the selected channel must be aligned with a reference object. Normal operation will start immediately.

If the start does not take place, the sensor will not detect a reference object.

Step 4: Set/teach switching point

The switching point is adjustable within the detection range of the UB sensor if the lower LED "dist" is flashing (the left LED has no function). Use ▲ (up) to adjust toward the maximum, and ▼ (down) to adjust toward the minimum switching point. The minimum switching point begins above the unusable area which is indicated on the data sheets of the sensors that can be connected:

UB 500: 60 mm
 UB 2000: 200 mm

UB 4000: 500 mm
UB 6000: 800 mm

Press OK for the evaluation to accept the selected switching point and start normal operation.

TEACH-IN: Press \blacktriangle (up) and \blacktriangledown (down) simultaneously to store a distance determined by a target positioned in the sound cone. If no reflector is present, the largest switching point will apply. The evaluation unit will then change over to normal operation.

General information on programming mode

The channels must be programmed individually and consecutively.

The selected options will not be permanently stored for the given channel until the fourth programming step has been completed.

Correction option: In the event of an incorrectly chosen option, the programming mode can be aborted by not pressing any keys for 20 s. The previous settings for the selected channel (range, switching function, switching point) will be restored.

Display mode

To check the selected settings, use \blacktriangle (up) or \blacktriangledown (down) during normal operation to start the display. The settings will remain unchanged.

Yellow LEDs:	Channel number A1 to A4: Object in switching range
Upper row green LEDs:	Type of connected sensor
Green LEDs n.o./n.c./REF:	Normally-open/normally-closed behavior of the switch output/refer- ence measurement

Back to normal operation: Press \blacktriangle (up) and \blacktriangledown (down) keys simultaneously or do not press any key for 20 seconds.

Temperature compensation/reference measurement (REF)

The properties of the air as a transmission medium affect the velocity of sound. Especially fluctuations of the air temperature have a noticeable effect on the evaluation. Two types of compensation are possible to ensure the highest measuring accuracy:

Connection of an external temperature probe: The

evaluation unit calculates using the following basic data: 4 mA = -20 °C and 20 mA = +70 °C. The Pepperl+Fuchs KFD2-UT-Ex1 universal temperature measuring transducer fulfills these requirements. It is simple to parameterise via an RS 232 interface, or can be supplied preconfigured if desired. A Pt100 is preferable as a temperature probe; a thermocouple (Type B, E, J, K, L, N, R, S, T) can also be connected. The transformer must be externally supplied with 24 V DC and connected to contacts 7 and 8 (GND).

Reference measurement (REF): In program section 3, the option REF can be specified for the selected channel. The connected UB sensor must be working against a fixed target. All deviations of the echo time resulting from changes in the ambient conditions of the reference measurement distance will be applied to the other channels and their measured values adjusted accordingly.

The reference channel does not provide switch output.

If another channel has already been selected as the reference channel, the REF function will be disabled for that channel and the normal mode activated.

The start of the reference function of a channel must take place at the same temperature at which the switching points were programmed for the other channels. If this was done at other temperatures, they should be readjusted.

Interesting deployment options

Increased coverage: Multiple UB sensors of the same range can work together if a larger area is to be monitored. Connect the transmission pulse inputs (BK/2) of all sensors to one another externally and connect them to the transmission pulse output (T) of a channel. The echo outputs (WH/4) of all sensors must also be connected to one another externally and then connected to the same evaluation channel of the echo input (E, see terminal diagram A).

All interconnected sensors thus simultaneously transmit ultrasonic pulses. Due to the inclusive OR circuit, the evaluation unit does not distinguish which sensor delivered the first echo. The time between the transmission pulse for all sensors on a channel and this first echo is used by the electronics to determine the distance to the detected object.

The number of connected sensors is limited by the performance of the external 24 V DC power supply of the evaluation unit.

The current consumption of an evaluation system is the sum of the following values:

1. The no-load current consumption of the unit (max. 50 mA) and current consumption of the temperature probe (if connected):

max. 20 mA)

2. The total no-load current consumption of all connected US sensors; (for the sake of simplicity, calculate 30 mA max. for each sensor),

3. The maximum output current of the evaluation unit: 2 A (4 channels x 500 mA)

Example: In terminal diagram A, three UB sensors are connected to a single evaluation channel. If one sensor is working on each of the three other channels, the total no-load current (for 6 sensors) is 180 mA. The power supply must have a capacity of around 2.3 A (50 mA + 6 x 30 mA + 2 A), not including a temperature probe.

Through-beam: Through-beam ultrasonic barriers can be realised with two type H3 sensors or a combination of an H1 emitter and H2 receiver.

Type H3: The resulting usable barrier width amounts to about 2.5 times the detection range of the deployed sensors. The sensors used as receivers may not transmit sound.

The transmission pulse output (T) of an evaluation channel should be applied only to the emitter sensor (BK/2); apply only the echo signal of the receiver sensor (WH/4) to the input (E) of the channel (see terminal diagram B).

Program the detection range appropriate to the sensor at the evaluation channel in programming step 2. In step 4, teach the maximum switching point.

To perform the TEACH-IN, press the ▲ (up) and ▼ (down) keys simultaneously. The sound cone must not pick up any objects during TEACH-IN.

H1/H2 combination: Refer to the data sheet for the usable barrier width.

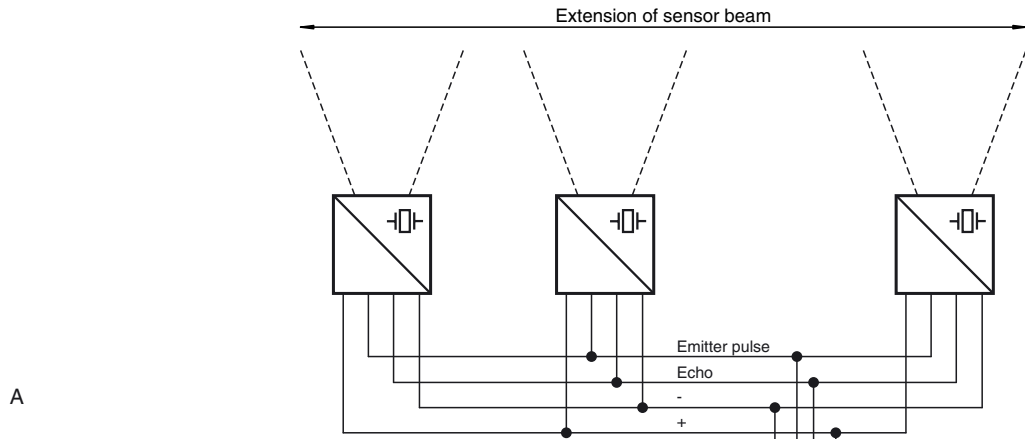
The transmission pulse output (T) of an evaluation channel should be applied to the emitter H1 (BK) and receiver H2 (BK); the echo signal is provided by the receiver sensor (WH) to the input (E) of the channel (see terminal diagram C).

Program the detection range listed in the data sheet at the evaluation channel in programming step 2. In step 4, teach the maximum switching point (see Type H3).

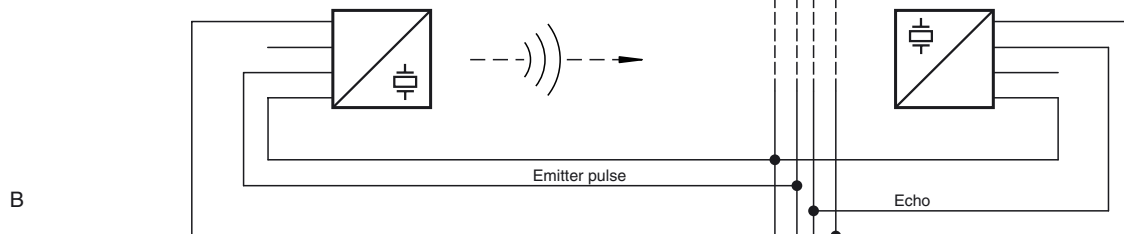
If the barriers set the output of the evaluation channel to the signal state active (high) in the event of a signal interruption, program the output to "n.c." in programming step 3.

The number of connected sensors is limited by the performance of the external 24 V DC power supply of the evaluation unit. The calculation of the required power corresponds to the example above.

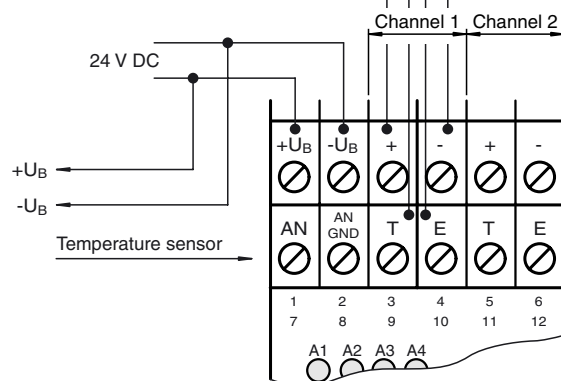
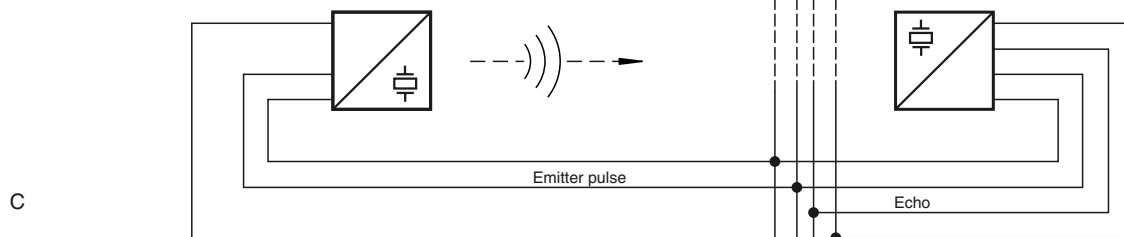
Extension of sensor beam



Through Beam Barrier using Type H3 Sensors



Through Beam Barrier with H1/H2 Combination



UB sensor with multiple switching points:

A UB sensor connected to any evaluation channel can work with up to 4 switching points by making use of the three other channels. Select synchronous mode and connect the echo output (WH/4) of the sensor to the echo signal inputs (E) of the other channels. For four switching points, use the entire evaluation unit.

Program each used channel to the same range (that of the connected sensor) in programming step 2. The switching points can then be set or taught consecutively for the channels.

Perform the TEACH-IN in programming step 4 by placing an object in the sound cone at the desired distance and pressing the **▲** (up) and **▼** (down) keys simultaneously.

