**UFA-1500 Series**

**Key features:**

- Measurement range 120 to 1500 mm
- Distance sensor or 1-point proximity switch
- Teachable measurement range
- Linearity <1% of full scale
- Resolution approx. 0.5 mm
- Working temperature 0 to +60 °C
- Measurement regardless of material, surface, colour and transparency of the target
- Protection class IP67
- Waterproof, oil-resistant
- Configurable size of sound cone
- Configurable as scanner or reflection barrier
- Chemical-resistant version available
- ATEX version zone 2, zone 22 available on request
## TECHNICAL DATA

<table>
<thead>
<tr>
<th>Parameter</th>
<th>UFA1500-M18-A / AR Distance sensor</th>
<th>UFA1500-M18-1P / 1PR Proximity sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range MR</td>
<td>120...1500</td>
<td>120...1500</td>
</tr>
<tr>
<td>Switching point hysteresis, axial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity over full temperature range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating frequency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status indicator</td>
<td>LED yellow / red</td>
<td>PNP closer / opener</td>
</tr>
<tr>
<td>Switching output, short circuit proof</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching speed, max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog output frequency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage supply (reverse polarity protection)</td>
<td>11...30</td>
<td></td>
</tr>
<tr>
<td>Ripple of supply voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean current consumption</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing material</td>
<td>Nickel-plated brass (V4A version available on request)</td>
<td></td>
</tr>
<tr>
<td>Explosion protection</td>
<td>ATEX version, zone 2, zone 22 available on request</td>
<td></td>
</tr>
<tr>
<td>Electrical connection</td>
<td>M12 connector, 4-pole</td>
<td></td>
</tr>
</tbody>
</table>

* linearity can be further improved by only teaching the sensor in a heat-resisting state (e.g. 30 minutes after switching on).

** The analog sensor automatically recognises the load connected and emits the corresponding signal 4...20 mA or 0...10 V. On request with synchronisation.

## TECHNICAL DRAWING

**UFA-1500-M18-A / UFA-1500-M18-1P: axial measuring direction**

**UFA-1500-M18-AR / UFA-1500-M18-1PR: radial measuring direction**

## SOUND CONE

The detection beam of an ultrasonic sensor has the shape of a cone. The size depends on the target and its sound reflecting characteristics. Small and poorly reflecting objects result in a smaller cone (narrower and shorter). Bigger objects and those with surfaces which are not perpendicular to the central axis can expand the cone. The exact cone shape and size can be determined only at the object itself. No disturbing objects must be between the sensor and the target within the cone. Otherwise the sensor would detect the disturbing object instead of the desired target. The diagram shows the three typical cone shapes of the UFA-1500 sensors (small, medium and large cone). Furthermore the size of the detection beam is influenced by air temperature and humidity. The colder and dryer the air, the larger is the beam. On UFA-1500 sensors three different cones can be programmed by the user. This is e.g. helpful when sensing into small containers or between narrow gaps.

The cone size is set by connecting the teach input for >5 s with the power supply ~UB (0V). See also the teach table at page 5:

- Small cone: Teach 5...10s with ~UB (yellow LED blinks fast)
- Medium cone: Teach 10...15s with ~UB (yellow/red LED blinks fast)
- Large cone: Teach 15...20s with ~UB (red LED blinks fast)
SETTING THE SWITCHING POINTS IN SCANNING MODE

In scanning mode the target reflects a portion of the ultrasound, which in turn is detected by the sensor. The switching points are set by attaching the voltage supply -U_B (0 V) or +U_B (+24 VDC) during 1...5 s to the Teach input.

During the learn-in process a flashing LED indicates whether the sensor detects the target.

- Yellow flashing LED:  detected
- Red flashing LED:  not detected

### Window operation closer NO:
- Set target to near switching point
- Teach switching point 1...5 s with -U_B
- Set target to far switching point
- Teach switching point 1...5 s with +U_B

### Window operation opener NC:
- Set target to near switching point
- Teach switching target at 1...5 s with +U_B
- Set target to far switching point
- Teach switching point 1...5 s with -U_B

### Switching point closer NO:
- Set target to switching point
- Teach switching point 1...5 s with +U_B
- Point sensor at space (>1.5 m)
- Teach 1...5 s with -U_B

### Switching point opener NC:
- Set target to switching point
- Teach switching point 1...5 s with -U_B
- Point sensor at space (>1.5 m)
- Teach 1...5 s with +U_B

SETTING SWITCHING POINT IN RETROFLECTIVE MODE

Retroflective mode uses a reflector in the background (max. 1.5 m from the sensor). Unlike optical sensors the reflector can be any material which is somewhat sound-reflecting. Retroreflective mode is used in place of scanning mode if the target is at a very sharp angle to the sensor beam (see drawing), or is extremely sound-absorbing (no evaluable signal would be reflected from the target to the sensor). In this mode the sensor permanently checks whether it sees the reflector or if it is covered by the target. Likewise, the sensor has no blind range in this operating mode.

In reflection barrier mode the reflector is taught as follows:

### Closer NO:
Teach 5...10 s with +U_B  
(Rapid flashing yellow LED)

### Opener NC:
Teach 10...15 s with +U_B  
(Rapid flashing red LED)

SETTING THE ANALOG OUTPUT MEASURING LIMITS

The two measuring limits are set by attaching the voltage supply -U_B (0 V), or +U_B (+24 VDC) to the Teach input for 1...5 s. During the teaching process the flashing LED indicates if the sensor detected the target.

- Yellow flashing LED:  detected
- Red flashing LED:  not detected

- U_B teaches the lower evaluation limit (0 V or 4 mA) and the upper evaluation limit with +U_B (10 V or 20 mA). It can be used to program a rising or falling ramp

- Position the target at the lower measuring limit (i.e. where 0 V or 4 mA is desired)
- Teach lower limit 1...5 s with -U_B

- Position the target at the upper measuring limit (i.e. where 10 V or 20 mA is desired)
- Teach upper limit 1...5 s with +U_B

Upper and lower measuring limits can also later be programmed individually.

**Attention:**

The Teach wire/input must be disconnected after the Teaching process is completed. The sensor can therefore also be operated with a 3-wire cable after teaching.
CHEMICAL-RESISTANT VERSION UFA-1500-M30-A-CH / -1P-CH

- Based on the UFA-1500-M18 series
- Resistant to most chemicals, e.g. acids and alkalis
- Front of housing made from PVDF
- Membrane protected with PTFE foil
- For level measurement or monitoring aggressive mediums

Description:
UFA-CH sensors are designed specifically for use in chemically harsh environments. The high resistance corresponds to that of PVDF, or of PTFE. One possible application is level metering of acids and alkalis in small containers. The front exposed to the medium consists of PVDF. What makes these chemical-resistant sensors special is that the ultrasonic converter is fully encased in a special PTFE film which allows ultrasound waves to pass through.

Technical data correspond to those of UFA-1500-M18 sensors. (See page 2)

INSTALLATION

Mount to the flange with 6 M4 screws, or
Mount to the G1 thread. Sealing with the included Viton O-rings.

Ultrasonic sensors should be „mounted” as flexibly as possible to keep acoustic interference away from the installation site. The included rubber rings for a Ø 21 mm installation hole should be used at any rate.

Inclination Angle:
Smooth surfaces can be detected up to an inclination angle of approx. 10 degrees. Rough and heavily textured surfaces can be detected at significantly higher angles. In retroreflective mode the angle does not matter at all.

TECHNICAL DRAWING

UFA-1500-M30-A-CH / UFA-1500-M30-1P-CH
ELECTRICAL CONNECTION

The sensors feature a 4-pole M12 connector. The cables should never be mounted parallel or close to high current cables. Please order the necessary cables separately (see accessories).

PIN assignment: UFA-1500-M18-A / AR

The analog sensor automatically recognises the load connected and emits the corresponding signal 4…20 mA or 0…10 V.

<table>
<thead>
<tr>
<th>PIN No.</th>
<th>cable colour</th>
<th>PIN No.</th>
<th>cable colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>brown</td>
<td>3</td>
<td>blue</td>
</tr>
<tr>
<td>2</td>
<td>white</td>
<td>4</td>
<td>black</td>
</tr>
</tbody>
</table>

Connection cable (accessory)

- K4P2M-S-M12 2 m, connector straight
- K4P5M-S-M12 5 m, connector straight
- K4P10M-S-M12 10 m, connector straight
- K4P2M-SW-M12 2 m, connector angular
- K4P5M-SW-M12 5 m, connector angular
- K4P10M-SW-M12 10 m, connector angular

PIN assignment: UFA-1500-M18-1P / 1PR

<table>
<thead>
<tr>
<th>PIN No.</th>
<th>cable colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24 VDC (brown)</td>
</tr>
<tr>
<td>2</td>
<td>Teach (white)</td>
</tr>
<tr>
<td>3</td>
<td>0V (blue)</td>
</tr>
<tr>
<td>4</td>
<td>OUT 0…10 V or 4…20 mA (black)</td>
</tr>
</tbody>
</table>

Mating connector (accessory)

- D4-G-M12-S straight, M12 for self assembly
- D4-W-M12-S angular, M12 for self assembly

- Protection class: IP67
- Temperature: -25...+90 °C
- Cable passage: ø 4…8 mm
- Wire cross-section: 0.14…0.34 mm²
- Mode of connection: spring cage

TEACH TABLE

<table>
<thead>
<tr>
<th>TIME</th>
<th>Connect Teach input to</th>
<th>LED flashes</th>
<th>Switching output version</th>
<th>Analog output version</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 5 s</td>
<td>+Ug (typ. +24 VDC)</td>
<td>slow yellow</td>
<td>Closer NO: far window point, or switching point</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Opener NC: close window point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Ug (0 VDC)</td>
<td>slow yellow</td>
<td>Closer NO: near window point</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Opener NC: far window point, or switching point</td>
<td></td>
</tr>
<tr>
<td>5 to 10 s</td>
<td>+Ug (typ. +24 VDC)</td>
<td>fast yellow</td>
<td>Retroreflective barrier closer NO</td>
<td></td>
</tr>
<tr>
<td>10 to 15 s</td>
<td>+Ug (typ. +24 VDC)</td>
<td>fast red</td>
<td>Retroreflective barrier opener NC</td>
<td></td>
</tr>
<tr>
<td>5 to 10 s</td>
<td>-Ug (0 VDC)</td>
<td>yellow</td>
<td>Small detection cone</td>
<td></td>
</tr>
<tr>
<td>10 to 15 s</td>
<td>-Ug (0 VDC)</td>
<td>yellow/ red</td>
<td>Medium detection cone</td>
<td></td>
</tr>
<tr>
<td>15 to 20 s</td>
<td>-Ug (0 VDC)</td>
<td>red</td>
<td>Large detection cone</td>
<td></td>
</tr>
<tr>
<td>&gt;20 s</td>
<td>-Ug (0 VDC)</td>
<td>No LED</td>
<td>Factory reset</td>
<td></td>
</tr>
</tbody>
</table>

Connection cable (accessory)

- K4P2M-S-M12 2 m, connector straight
- K4P5M-S-M12 5 m, connector straight
- K4P10M-S-M12 10 m, connector straight
- K4P2M-SW-M12 2 m, connector angular
- K4P5M-SW-M12 5 m, connector angular
- K4P10M-SW-M12 10 m, connector angular

Mating Connector M12, 4 poles, shielded

- D4-G-M12-S straight, M12 for self assembly
- D4-W-M12-S angular, M12 for self assembly

- Protection class: IP67
- Temperature: -25...+90 °C
- Cable passage: ø 4…8 mm
- Wire cross-section: 0.14…0.34 mm²
- Mode of connection: spring cage
UFA-1500-M18

OUTPUT

A*
Analog output 0...10 V and 4...20 mA, axial measuring direction

A-R*
Analog output 0...10 V and 4...20 mA, radial measuring direction

1P
Switching output, 1 x PNP, axial measuring direction

1P-R
Switching output, 1 x PNP, radial measuring direction

UFA-1500-M30

CH

OUTPUT

A*
Analog output 0...10 V and 4...20 mA, axial measuring direction

1P
Switching output, 1 x PNP, axial measuring direction

* The analog sensor automatically recognises the load connected and emits the corresponding signal 4...20 mA or 0...10 V.

OVERVIEW

UFA-1500-M18-A
UFA-1500-M18-AR
UFA-1500-M18-1P
UFA-1500-M18-1P-R

UFA-1500-M30-A-CH
UFA-1500-M30-1P-CH

ACCESSORIES

Cable with mating connector M12, 4 poles, shielded
K4P2M-S-M12 2 m, straight connector
K4P9M-S-M12 5 m, straight connector
K4P10M-S-M12 10 m, straight connector
K4P2M-SW-M12 2 m, angular connector
K4P9M-SW-M12 5 m, angular connector
K4P10M-SW-M12 10 m, angular connector

Mating Connector M12, 4 poles, shielded
D4-G-M12-S straight, M12 for self assembly
D4-W-M12-S angular, M12 for self assembly

Digital display 1 channel, 0...10V/4...20 mA
PA0D00B 1 channel, supply: 85 to 250 VAC
PA0D01B 1 channel, supply: 11...36 VDC/24 VAC

Digital display 2 channels, 0...10V/4...20 mA
PA0D00B 2 channels, supply: 85 to 250 VAC
PA0D01B 2 channels, supply: 11...36 VDC/24 VAC

For further information please see the data sheet of the PAXD display series

!! WARNING – PERSONAL INJURY !!

Never use these products as safety- or emergency shut-off devices, nor in other applications where a malfunction of this product may result in personal injury. Failure to follow this notice may result in serious or fatal injury.

Subject to change without prior notice.

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