SONARANGE

UPX 04.04 e

SNT SENSORTECHNIK AG

Ultrasonic proximity sensors
UPX Series

- Detection range up to 500mm
- Small size in popular ‚R-Shape'
- Versions with synchronisation input
- Measurement independent of material, surface, color and size of target
- Work under dust, dirt, fog, light
- Detect transparent and bright objects
- Protection class IP 67, fully watertight, robust
- Cable is scope of delivery!
- Customized versions available!

Technical specifications		UPX 150	UPX 500
Detection range	mm	0...170	0...500
Adjustment range of binary output (with potentiometer)	mm	60...170	120...500
Hysteresis of binary output, axial	%	~10...40	~10
		adjustable with potentiometer	
Reproducability	%FS	<1	
Operating frequency	kHz	~350	~175
Status indicator	-	LED red	
Binary output, short circuit proof, max. 0.1A	-	by choice PNP, NPN, NO, NC	
Switching frequency	Hz	~15	~2
t_{on} binary output	ms	<5	<10
t_{off} binary output	ms	<40	~400...8000
		adjustable with potentiometer	
Power supply voltage (reversal polarity protection)	VDC	12...28	
Ripple of supply voltage	%	<10	
Mean consumption, switched wo. load	mA	~45	~55
Peak current, switched wo. load	mA	100	250
Temperature coefficient of sensor	%/°K	typ. –0.1	
Temperature coefficient of air path	%/°K	-0.17	
Ambient temperature during operation	°C	-20...+50	
Sensor temperature during operation	°C	-20...+70	
Pressure range	$mbar_{abs}$	~900...1100	
Mass wo. cable	g	~50	
Protection class	-	IP67	
Housing material	-	Polyamide and stainless steel	
Electrical connection	-	M8 connector with cable resp. integrated cable	

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Model selection

The main difference between the two UPX models is their different detection range (reach and shape). Also switching speed is different.

UPX 150 ...
Very narrow detection zone. Useful for looking into small orifices. Fast reaction time t_{on}. For fast counting/detecting up to 170mm distance and for level control as well. Binary output only. Axial hysteresis can be adjusted with potentiometer from approx. 5...50mm, depending on switching distance. This enables e.g. also a min./max. level control.

UPX 500 ...
General purpose proximity switch with fast reaction time t_{on} and slower t_{off} delay. The delay can be adjusted with potentiometer between 0.4...8s. Detection zone with Ø ~90mm. Binary output only.

Blind range

The lower detection range is called blind range. It is typical for ultrasonic sensors. In the blind range no distance measurement is possible! However the pure function as proximity switch (binary output), as used on the UPX series, is possible in the blind range with certain restrictions (only bigger objects).

Binary output

The binary output becomes active, i.e. it switches on or off, when a scanned object falls below the set distance or if it exceeds it. Each switch point has a hysteresis (see technical specifications). This is the difference between switch on and switch off point during approach or departure. Hysteresis is necessary for an appropriate switching behaviour.
The switching distance is set with the potentiometer. An object with reasonable size and perpendicularly to the sensor axis is placed at the desired distance from the sensor. The potentiometer is now turned from left slowly clockwise until the LED illuminates (NO) or expires (NO). Thus the switching distance for the binary output is set.

Synchronisation input (Y versions)

The ultrasonic signals can disturb each other when several sensors are focused on he same target or when sensors are mounted close together. This can be avoided by synchronizing the sending pulses. The synchronisation leads of all sensors are connected to each other by shielded cables as short as possible. Since all sensors send then simultaneously, the current consumption increases heavily. Not used synchronisation leads shall be isolated.

Inclination angle of object

Smooth surfaces can be detected up to an inclination angle of 7° (UPX 150) and 10° (UPX 500). However rough and structured (granular) surfaces can be detected up to much higher angles.

Mounting

Ultrasonic sensors should be mounted softly in order to keep external acoustic noise away from the sensor. The UPX sensors can be mounted in two ways, with two M4 screws through the two holes in the housing or on the M18 thread of the transducer as well. Anyway a rubber gasket should be used between the sensor and the mounting spot. Thus scope of delivery are a M18 nut, a washer and a rubber sleeve for mounting on the M18 transducer. The rubber sleeve fits for a mounting hole of Ø21mm.
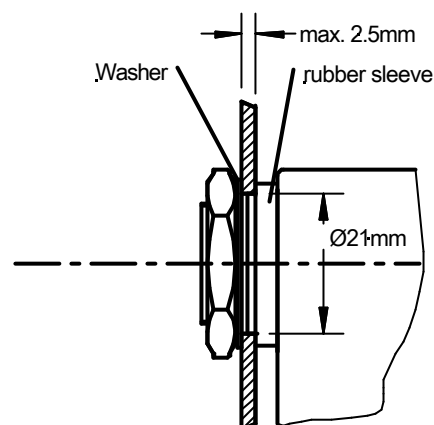
Cable

With all M8 connector versions a PVC cable l=1.5m with push type connector is scope of delivery. However any standard M8 push or screw type connector cable can be used with the sensors. Special cable lengths available on demand. The cable should be kept as short as possible. Maximum cable length is approx. 100m, if cross section area is appropriate (peak current of 100 or 250mA!, use 470µF/35V backup capacitor close to sensor). The cable should not be mounted parallel or close to high current cables.

Power supply

Ideally a regulated, not switched power supply is used exclusively for the sensor. But this is not compulsory. The power supply must be able supply the short peak current of approx. 100mA (UPX 150) or 250mA (UPX 500).

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Detection beam

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 more badly 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. Below the typical cone shapes for the UPX sensors are shown. The bold line shows the range, where the sensor detects objects which are perpendicular to the sensor axis. In the dotted range the sensor detects round objects (Ø10mm).

No other ultrasonic sensor working at the same frequency shall be within the cone or close to it or opposite to it. This is only allowed when using the synchronisation option (Y-version).
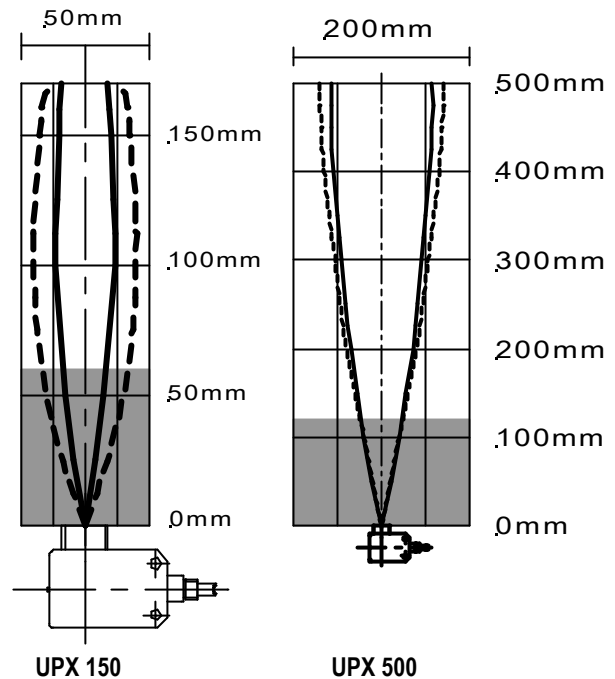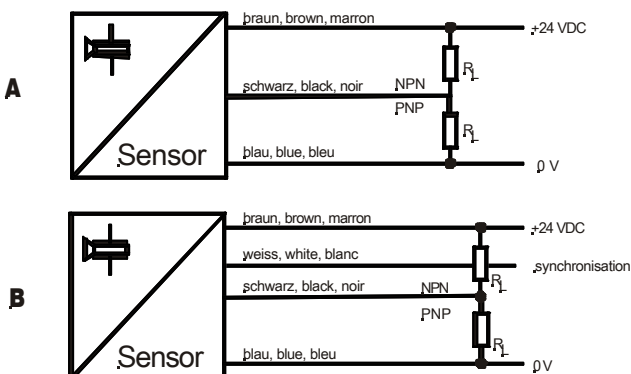
UPX 150 — 50mm; 150mm, 100mm, 50mm, 0mm

UPX 500 — 200mm; 500mm, 400mm, 300mm, 200mm, 100mm, 0mm

Diagram of connections

A
- Sensor
- braun, brown, marron — +24 VDC
- schwarz, black, noir — NPN / PNP — R_L
- blau, blue, bleu — 0 V

B
- Sensor
- braun, brown, marron — +24 VDC
- weiss, white, blanc — synchronisation
- schwarz, black, noir — NPN / PNP — R_L
- blau, blue, bleu — 0 V

Scope of delivery

- Sensor
- Cable KAB 1.5K4GPVC (4 pin) or KAB 2K3GPVC (3 pin)
- M18 nut, washer and rubber sleeve for mounting

Dimensions

18, 46, 14

30, 42, 20, M18x1, Ø4.1, Ø10

40
- Distance
- LED
- UPX 150: Hysteresis
  UPX 500: toff
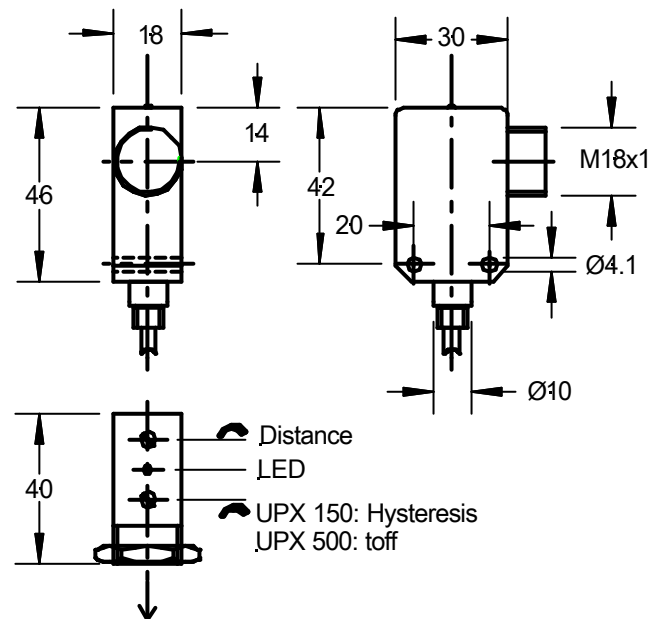
Use appropriate miniature screw driver max. size 2.5mm for adjustment of the two potentiometers!

Standard versions

Type	Detection range	Description	Scheme
UPX 150 PVPS 24	150mm	PNP NO, 2m integrated cable	A
UPX 150 PVPS 24 C	150mm	PNP NO, 3-Pin connector	A
UPX 500 PVPS 24	500mm	PNP NO, 2m integrated cable	A
UPX 500 PVPS 24 Y	500mm	PNP NO, synchronisation input, 4-Pin connector	B
UPX 500 PVPS 24 C	500mm	PNP NO, 3-Pin connector	A

Option		NPN instead of PNP	
Option		NC instead of NO	

Basically all possible versions are available according to the following key:
Detection range: XXX: 150 = 170mm, XXX: 500 = 500mm

Product key

UPX XXX PV ⌐ ⌐ 24 ⌐ ⌐

synchronisation input (4-pin connector)	Y
connector	C
integr. Cable	-
binary output NO	S
binary output NC	O
binary output PNP	P
binary output NPN	N

Some typical ultrasound applications

Level measurement
- Measuring level in small containers
- Water gauge measurement
- Monitoring liquid levels in bottling plants
- Checking for tailbacks on conveyor belts
- Monitoring contents of granulate hoppers on injection molding machines
- Distance monitoring on combine harvesters, beet lifters etc.
- Monitoring ground clearance and distance on agriculture and construction vehicles

Process control
- Controlling belt tension or sag
- Sensing and signaling valve positions
- Measuring roll diameter on reeling machines
- Monitoring the height of stacks (charges, storehouse, assembling machines)
- Detecting material feed
- Detecting the feed of strip stock to blanking machines and presses
- Detecting on plastic blow-molding machines

Counting / Detection
- Counting onlookers at freestanding sales displays or show cases
- Access supervision at rotating doors, counters etc.
- Door automation
- Detecting transparent objects, foils, flat glass, bottles etc.
- Sensing objects in robot grippers
- Recognizing full or empty pallets
- Count and detect objects with 'difficult' surface
- Detect wrong parts on conveyors
- Collision protection on vehicles

Scanning of dimensions
- Determining the dimensions of packages
- Sensing the height of plants in automated green houses
- Measuring the volume of tree-trunks

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