ToughSonic® Distance Sensors

Waterproof, Two Outputs and Push-Button "Teachable"

TS-21S Series

Non-Contact Ultrasonic Air Distance Measurement

TS-21S ultrasonic distance sensors contain a rugged transducer in a stainless steel case for long service life in tough environments. Typical applications include roll diameter, liquid level, motion control, positioning and dimensioning. They are excellent in tanks, drums and level applications.

Two outputs are available in many combinations, including analog 0-10/0-5 VDC, 4-20 ma. current loop, PNP (sourcing) switches, NPN (sinking) switches and RS-232/485 serial data. All outputs are relative to measured distance and adjustable anywhere in the sensor's range.

Features

- Sealed for ingress protection rating IP68 for washdown or outdoor applications like food processing or car washes
- Long 50-ft (15.2 m) measurement range
- Short 12-in (30.5 cm) deadband
- Simple pushbutton “teachable” setup of many features, and calibration using actual targets
- Analog outputs are distance-proportional and reversable, anywhere in sensor's range
- Switch outputs have adjustable distance and polarity
- Output response filter for stability with poor targets
- Sync connection for several sensors in close proximity
- Security “Lock” prevents accidental mis-adjustment
- Status indicator for each output

Reliable Operation

- Unaffected by optical factors like color and transparency
- Stable output if target is lost
- Overload and short circuit protected switch & analog outputs
- Heavy duty 303 stainless case, potted, waterproof IP68 rating

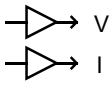
Easy Installation

- Temperature compensated
- Body clamp or optional Senix UA-MB-SS bracket
- Permanently attached cable
- 3 rear LED's display target, fault and output status
- Simple push-button setup - no potentiometers!

Output Options

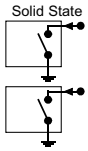
Here are 3 common TS-21S output configurations. Eight other output combinations are available (see next page).

DUAL ANALOG



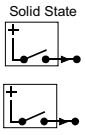
Both voltage and 4-20 ma. current loop (sourcing) outputs with teachable endpoints

DUAL SINKING SWITCH



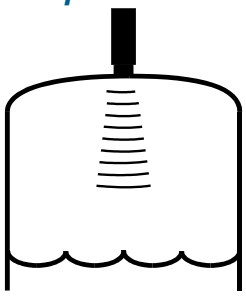
Two solid state "NPN" type outputs with independent teachable switch distances and ON/OFF polarities

DUAL SOURCING SWITCH

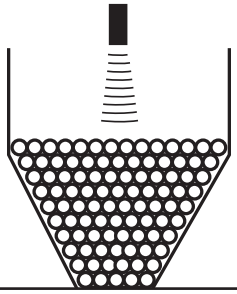


Two solid state "PNP" type outputs with independent teachable switch distances and ON/OFF polarities

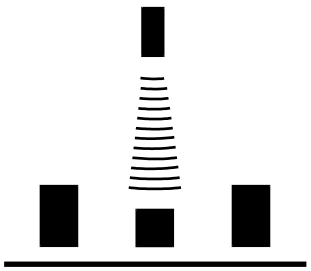
Liquid Levels



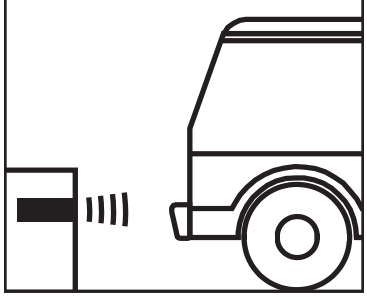
Solid Levels



Dimension/Sort



Object / Security



800-677-3649 802-453-5522 FAX: 802-453-2549 52 Maple St., Bristol, VT 05443
web: www.senix.com e-mail: sales@senix.com

Senix® Distance Measurement

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TS-21S Two Output Teachable Distance Sensors

Target Performance

Color/Transparency
Unaffected by target's color, transparency or optical characteristics.

Orientation
Detects flat or curved objects. Surface must reflect back to sensor. Flat surfaces are best when perpendicular to beam axis, and may not be detected at high angles of incidence.

Typical Distance

Object	Max Range (ft.)
Liquid surface	50

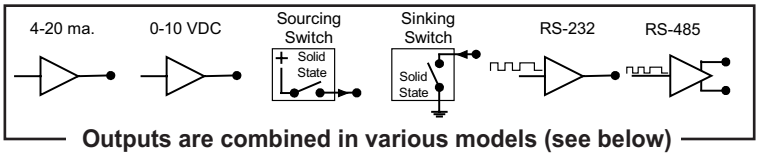
(Performance may be reduced at input voltages less than 18 VDC)

Specifications

Range	12 inches - 50 feet 305 mm - 15.2 meters	**Input Power**	10-30 VDC @ 50-70 ma. nominal 15-30 VDC if using analog output
Case Material	303 stainless steel	**Transducer**	Ruggedized piezoelectric
Temperature	-40 to 70 C (-40 to 158 F)	**Adjustments**	Push-button, permanently stored
Protection	NEMA-4X, NEMA-6P, IP68	**Humidity**	0 to 100% operating
Resolution	0.014 in. (.34 mm) max.; Analog 12 bits (4095 steps) over spanned distance		
Repeatability	Nominal 0.1% of range @ constant temp. Affected by target, distance, environment		
Compensation	Temperature compensated, internal temperature sensor		
Update Rate*	5 (default), 8, 12.5 or 50 per second, selectable* output response time filter		
Voltage Output*	0-10 and 0-5 VDC (user selectable), 10 ma. max., reversable teachable endpoints		
Current Loop*	4-20 ma. (sourcing), 500Ω max. @ >15 VDC, reversable teachable endpoints		
Switch Outputs	150 ma. max, sinking 40 VDC max., teachable setpoint and polarity, fault indication		
RS-232, RS-485	6 bytes, 9600 baud, 8 data bits, 1 stop bit, no parity, transmitted at update rate		
SYNC feature	Permits up to 32 sensors to be wired together for operation in the same area		

Asterisk (*) indicates user teachable using pushbutton.

Models & Outputs



Outputs are combined in various models (see below)

Wiring (6-wire cable)

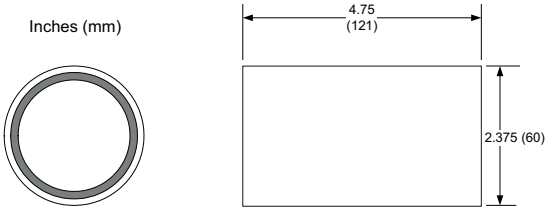
Brown	DC+ IN
Blue	GND
Gray	SYNC out or below
Yellow	SYNC in or below
Black	see below
White	see below

MODEL NUMBER	Output #1 (BLACK wire)	Output #2 (WHITE wire)
TS-21S-IV	4-20 ma. current loop	0-10 / 0-5 VDC
TS-21S-ISK	4-20 ma current loop	Sinking Switch
TS-21S-ISR	4-20 ma. current loop	Sourcing Switch
TS-21S-SKV	Sinking Switch	0-10 / 0-5 VDC *
TS-21S-SRV	Sourcing Switch	0-10 / 0-5 VDC *
TS-21S-SKSK	Sinking Switch	Sinking Switch
TS-21S-SRSR	Sourcing Switch	Sourcing Switch
TS-21S-SKSR	Sinking Switch	Sourcing Switch
TS-21S-SK232	Sinking Switch	RS-232 Output (Gray wire)
TS-21S-SR232	Sourcing Switch	RS-232 Output (Gray wire)
TS-21S-485	RS-485+ Output (Yellow wire)	RS-485- Output (Gray wire)

Asterisk (*) indicates user teachable using pushbutton.

Each sensor ships with installation instructions and a plastic Clik bracket. Options available.

Dimensions



Mechanical

Mounting: Senix UA-MB-SS bracket or other body clamp

Attached Cable: 6-ft (2 m)
Total Weight: 25.9 oz (0.73 kg)

1 Jan 07

ToughSonic® Distance Sensors

Waterproof, Dual Outputs and Push-Button "Teachable"

TS-30S Series

Non-Contact Ultrasonic Air Distance Measurement

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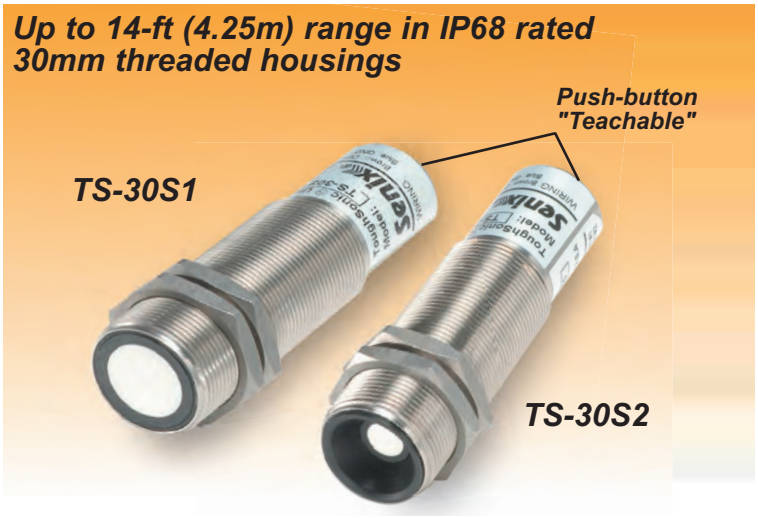
Two outputs are available in many combinations, including analog 0-10/0-5 VDC, 4-20 ma. current loop, PNP (sourcing) switches, NPN (sinking) switches and RS-232/485 serial data. All outputs are relative to measured distance and adjustable anywhere in the sensor's range.



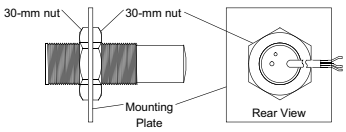
Features

- Sealed for ingress protection rating IP68 for washdown or outdoor applications like food processing or car washes
- Narrow ultrasonic beam to avoid unwanted obstacles
- Simple pushbutton "teachable" setup of many features, and calibration using actual targets
- Analog outputs are distance-proportional and adjustable anywhere in sensor's range
- Several standard analog output ranges, reversable slope
- Switch outputs have adjustable distance and polarity
- Output response filter for stability with poor targets
- Sync connection for several sensors in close proximity
- Security "Lock" prevents accidental mis-adjustment
- All in one small package!

Reliable Operation

- Detects solid or liquids
- Unaffected by optical factors like color, transparency, reflectivity or opaqueness
- Stable output if target is lost
- Industrially rated interfaces
- Heavy duty 303 stainless case, 30x1.5 mm threaded, waterproof with IP68 rating

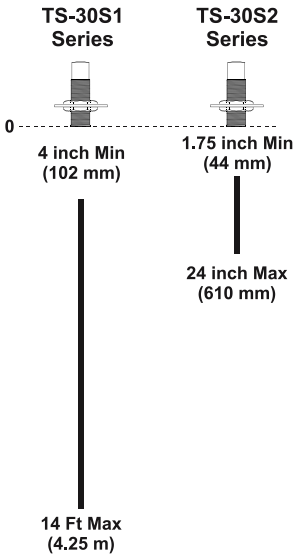
Easy Installation



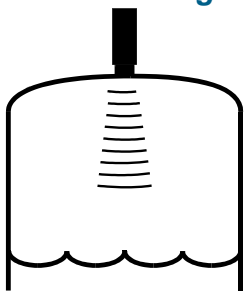
- Quick bolt-in mounting
- Permanently attached cable
- Rear indicator displays output status and fault conditions
- Simple push-button setup - no potentiometers!

Two Ranges

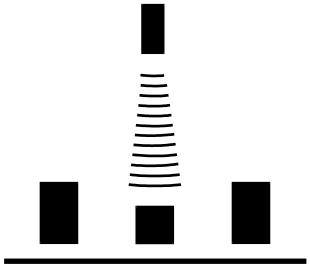
The TS-30S series is available in two ranges. The shorter range model is useful when a small deadband is required due to space limitations.



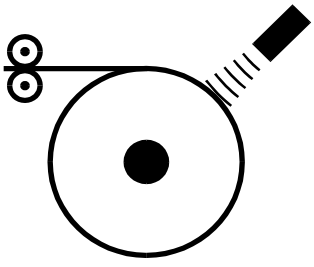
Level or Height



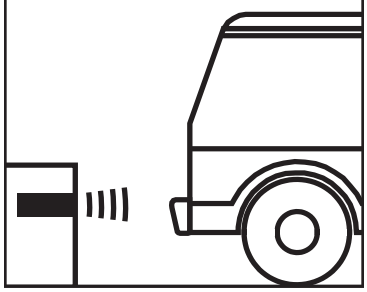
Dimension/Sort



Roll Diameter



Object Detection



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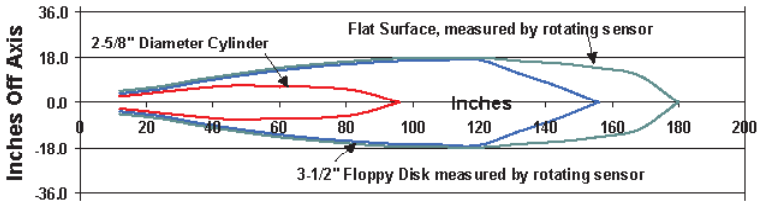
TS-30S Dual Output Teachable Distance Sensors

Target Performance of TS-30S1 Long Distance Model

Target Area Coverage for Typical Targets



Color/Transparency
Unaffected by color, transparency or optical characteristics.

Orientation
Detects flat or curved objects. Surface must reflect back to sensor. Flat surfaces are best when perpendicular to beam axis, and may not be detected at high angles of incidence.

TS-30S1 Typical Distances

Object	Max Range (ft.)
2-5/8-in. diam. cylinder	7
3.5-in. floppy disk	10
Liquid surface	14

Angle off perpendicular (+/-) vs. distance (ft.), large flat surface

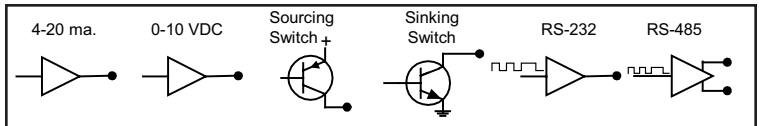
Ft:	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Deg:	17	13	13	12	12	11	10	10	9	8	6	5	5	4

Specifications

Range	*Two ranges (see page 1)*	***Adjustments***	*Push-button, permanently stored*
Case Material	*303 stainless steel*	***Transducer***	*Ruggedized piezoelectric*
Temperature	*-40 to 70 degrees C* *-40 to 158 degrees F*	***Input Power***	*10-30 VDC @ 50-70 ma. nominal* *15-30 VDC if using analog output*
Protection	*NEMA-4X, NEMA-6P, IP68*	***Humidity***	*0 to 100% operating*
Resolution	*0.003384 in. (.086 mm) max.; Analog 12 bits over spanned distance*		
Repeatability	*Nominal 0.1% of range @ constant temp. Affected by target, distance, environment*		
Update Rate*	*20 (default), 33, 50 or 200 per second, selectable* output response time filter*		
Voltage Output	*0-10 and 0-5 VDC (user selectable), 10 ma. max., reversable teachable endpoints*		
Current Loop	*4-20 ma. (sourcing), 500Ω max. @ >15 VDC, reversable teachable endpoints*		
Switch Outputs	*150 ma. max, sinking 40 VDC max., teachable switching points and polarity*		
RS-232, RS-485	*6 bytes, 9600 baud, 8 data bits, 1 stop bit, no parity, transmitted at update rate*		
SYNC feature	*Permits up to 32 sensors to be wired together for operation in the same area*		

Asterisk (*) indicates user configurable using pushbutton.

Models & Outputs



Outputs are combined in various models (see below)

Wiring (6-wire cable)

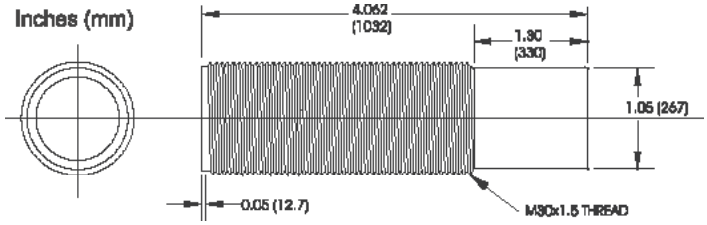
Brown	DC+ IN
Blue	GND
Gray	SYNC out or below
Yellow	SYNC in or below
Black	see below
White	see below

MODEL NUMBER	*Output #1 (BLACK wire)*	*Output #2 (WHITE wire)*
TS-30S#-IV	*4-20 ma. current loop*	*0-10 / 0-5 VDC*
TS-30S#-ISK	*4-20 ma current loop*	*Sinking Switch*
TS-30S#-ISR	*4-20 ma. current loop*	*Sourcing Switch*
TS-30S#-SKV	*Sinking Switch*	*0-10 / 0-5 VDC **|
TS-30S#-SRV	*Sourcing Switch*	*0-10 / 0-5 VDC **|
TS-30S#-SKSK	*Sinking Switch*	*Sinking Switch*
TS-30S#-SRSR	*Sourcing Switch*	*Sourcing Switch*
TS-30S#-SKSR	*Sinking Switch*	*Sourcing Switch*
TS-30S#-SK232	*Sinking Switch*	*RS-232 Output (Gray wire)*
TS-30S#-SR232	*Sourcing Switch*	*RS-232 Output (Gray wire)*
TS-30S#-485	*RS-485+ Output (Yellow wire)*	*RS-485- Output (Gray wire)*

Asterisk (*) indicates user configurable using pushbutton.

** Replace symbol (#) with 1 or 2 depending on the desired range*

Dimensions



Dimensions are in inches (mm)

Mounting Hole: 1.2 in. (30.5 mm) diameter

Attached Cable: 6-ft (2 m)
Total Weight: 12.7 oz (0.36 kg)

Ships with instructions and two 30mm SS mounting nuts. Mounting options available.

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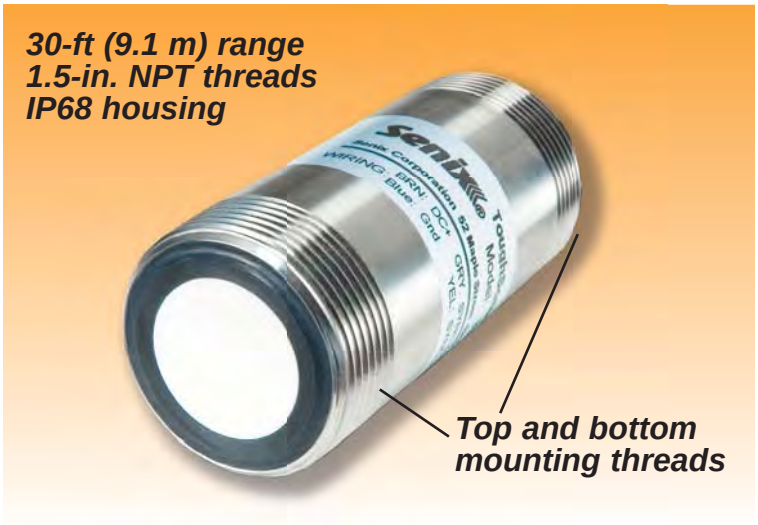


Features

- Sealed for ingress protection rating IP68 for washdown or outdoor applications like food processing or car washes
- Narrow ultrasonic beam to avoid unwanted obstacles
- Long 30-ft (9 m) measurement range
- Short 10-in (25 cm) deadband
- Simple pushbutton “teachable” setup of many features, and calibration using actual targets
- Analog outputs are distance-proportional and reversible, anywhere in sensor's range
- Switch outputs have adjustable distance and polarity
- Output response filter for stability with poor targets
- Sync connection for several sensors in close proximity
- Security “Lock” prevents accidental mis-adjustment
- Status indicator for each output

Reliable Operation

- Unaffected by optical factors like color and transparency
- Stable output if target is lost
- Overload and short circuit protected switch & analog outputs
- Heavy duty 303 stainless case, 1.5 in. NPT threaded, potted, waterproof with IP68 rating
- Temperature compensated

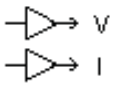
Easy Installation

- Standard 1.5 inch NPT threads
- Dual threaded for top or bottom mounting
- Thread into flange or nipple, or use external clamp bracket
- Permanently attached cable
- 3 rear LED's display target, fault and output status
- Simple push-button setup - no potentiometers!

Output Options

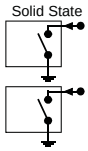
Here are 3 common TS-15S output configurations. Eight other output combinations are available (see next page).

ANALOG V and I



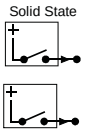
Voltage & two 4-20 ma. current loop (source and sink) outputs with teachable endpoints

DUAL SINKING SWITCH



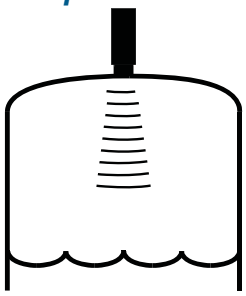
Two solid state "NPN" type outputs with independent teachable switch distances and ON/OFF polarities

DUAL SOURCING SWITCH

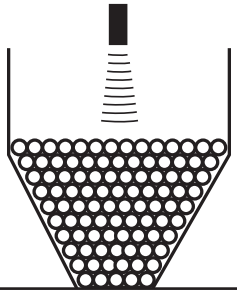


Two solid state "PNP" type outputs with independent teachable switch distances and ON/OFF polarities

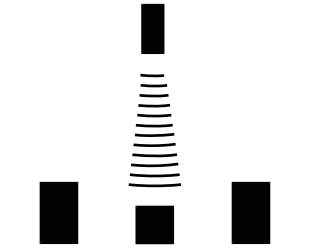
Liquid Levels



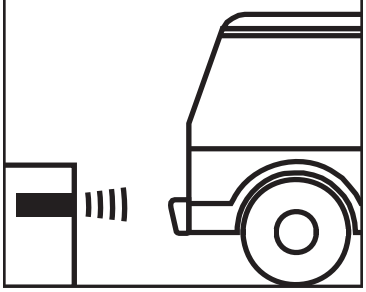
Solid Levels



Dimension/Sort



Object / Security



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TS-15S Two Output Teachable Distance Sensors

Target Performance

Color/Transparency
Unaffected by target's color, transparency or optical characteristics.

Orientation
Detects flat or curved objects. Surface must reflect back to sensor. Flat surfaces are best when perpendicular to beam axis, and may not be detected at high angles of incidence.

Typical Distance

Object	*Max Range (ft.)*
Liquid surface	*30*

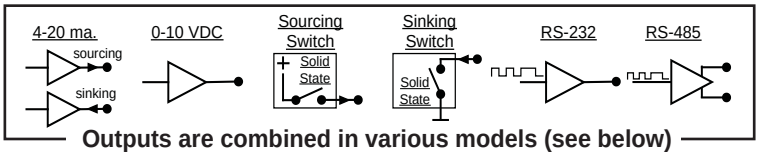
(Performance may be reduced at input voltages less than 18 VDC)

Specifications

Range*	*10 inches - 30 feet* *254 mm - 9.1 meters*	***Input Power***	*10-30 VDC @ 50-70 ma. nominal* *15-30 VDC if using analog output*
Case Material	*303 or 304 stainless steel*	***Transducer***	*Ruggedized piezoelectric*
Temperature	*-40 to 70 C (-40 to 158 F)*	***Adjustments***	*Push-button, permanently stored*
Protection	*NEMA-4X, NEMA-6P, IP68*	***Humidity***	*0 to 100% operating*
Resolution	*0.0068 in. (.172 mm) max.; Analog 12 bits (4095 steps) over spanned distance*		
Repeatability	*Nominal 0.1% of range @ constant temp. Affected by target, distance, environment*		
Compensation	*Temperature compensated*		
Update Rate*	*+10 (default), 16, 25 or 100 per second, selectable* output response time filter*		
***Voltage Output **	*0-10 and 0-5 VDC (user selectable), 10 ma. max., reversable teachable endpoints*		
Current Loop*	*4-20 ma. (sourcing), 500Ω max. @ >15 VDC, reversable teachable endpoints*		
Switch Outputs	*150 ma. max, sinking 40 VDC max., teachable setpoint and polarity, fault indication*		
RS-232, RS-485	*6 bytes, 9600 baud, 8 data bits, 1 stop bit, no parity, transmitted at update rate*		
SYNC feature	*Permits up to 32 sensors to be wired together for operation in the same area*		

Asterisk (*) indicates user teachable using pushbutton.

Models & Outputs



Outputs are combined in various models (see below)

Wiring (9-wire cable)

Brown	DC+ IN
Blue	GND
Gray	SYNC(-) or below
Yellow	SYNC(+) or below
Black, White, Violet, Green, Orange wires - see below	

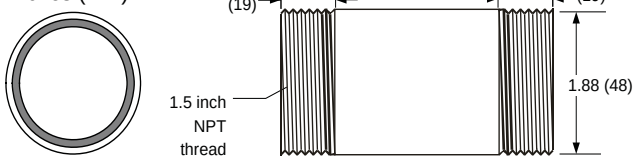
MODEL NUMBER	*Output #1 (wire color)*	*Output #2 (wire color)*
TS-15S-IV	*4-20 ma. current loop (green, org)*	*0-10 / 0-5 VDC (Violet)*
TS-15S-ISK	*4-20 ma current loop (green, org)*	*Sinking Switch (White)*
TS-15S-ISR	*4-20 ma. current loop (green, org)*	*Sourcing Switch (White)*
TS-15S-SKV	*Sinking Switch (Black)*	*0-10 / 0-5 VDC * (Violet)*
TS-15S-SRV	*Sourcing Switch (Black)*	*0-10 / 0-5 VDC * (Violet)*
TS-15S-SKSK	*Sinking Switch (Black)*	*Sinking Switch (White)*
TS-15S-SRSR	*Sourcing Switch (Black)*	*Sourcing Switch (White)*
TS-15S-SKSR	*Sinking Switch (Black)*	*Sourcing Switch (White)*
TS-15S-SK232	*Sinking Switch (Black)*	*RS-232 Output (Gray wire)*
TS-15S-SR232	*Sourcing Switch (Black)*	*RS-232 Output (Gray wire)*
TS-15S-485	*RS-485+ Output (Yellow)*	*RS-485- Output (Gray)*

Asterisk (*) indicates user teachable using pushbutton.

Each sensor ships with installation instructions and one UA-CLIC-15 plastic bracket.

Dimensions

Dimensions in Inches (mm)



Mechanical

Mount: 1.5 in. NPT thread into flange or nipple, top or bottom, or external clamp style bracket

Attached Cable: 6-ft (2 m)
Total Weight: 19.8 oz (0.56 kg)

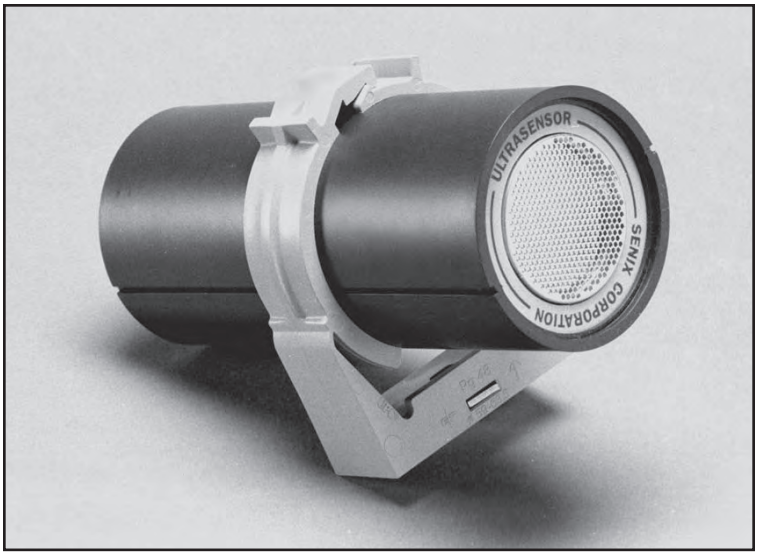
18 May 08 Rev F

Ultrasensor™
Configurable Material Sensor

ULTRA-U Series
Senix "Universal" Compact Sensors

Non-Contact Ultrasonic Air Distance Measurement

Ultrasensor's™ intelligent design makes it ideal for material sensing needs. One sensor gives you precise distance measurement and a variety of outputs. Connect with alarms, PLC's, motor drives, proportional air valves, computers, etc.



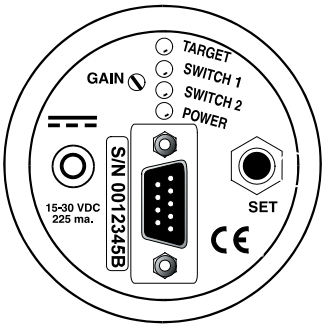
Multiple Outputs

All common outputs are included–proportional voltage 0-10 VDC and two 4-20 ma. current loops, two transistor switches and serial data. Use what you need. All outputs are affected by the sensor's measured distance, and you can adjust the outputs either by push-button or computer.

Button Configured

Install the sensor, attach your equipment via the rear connector and adjust the analog scaling and/or switch distances using only the rear SET push-button and simulated or actual targets. View material detection and setpoints on the rear indicators (see drawing below).

Ultrasensor automatically spans and polarizes the outputs without potentiometers, screwdrivers or test equipment!



PC Configured

For ultimate flexibility, connect Ultrasensor to any IBM-PC or compatible with our powerful SoftSpan™ program and gain control over sensor operational parameters. Using a menu, set output values and conditions, setpoints, security options and much more. Adjust distance characteristics in metric or English units. You can do this with or without the sensor installed. The sensor permanently retains the new configuration!

Instant Duplication

Setups can also be stored to the PC's disk for future use. Quickly recall a setup from a previous application and create a duplicate in seconds. Now you can stock one part for many applications and configure it quickly!

Models

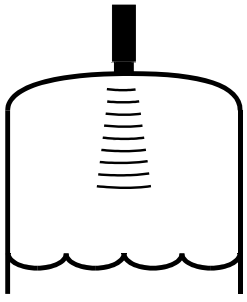
ULTRA-U
HIPS plastic
wt: 6 oz.
(shown with UA-CLIC bracket)

ULTRA-U-SS
Stainless steel
wt: 24 oz.
(shown with UA-MB-SS bracket)

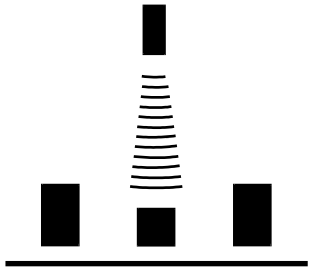
ULTRA-U-SS2
SS w/2" NPT male thread
wt: 26 oz.
(shown with UA-FM-SS)

All sensors ship with a snap bracket (UA-CLIC) and field cable. Other options are available for mounting, configuration and displays.

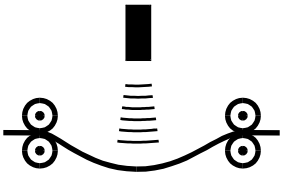
Level



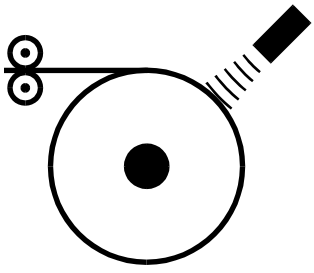
Dimension/Sort



Web/Loop Control



Roll Diameter



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web: www.senix.com e-mail: sales@senix.com

Senix®
Setting New Dimensions

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Phone: 800-677-3649 or 802-453-5522 FAX: 802-453-2549
Web Site: http://www.senix.com e-mail: sales@senix.com

Ultrasensor™ Configurable Material Sensor

Target Performance

Color/Transparency
Unaffected by object color, transparency or optical characteristics.

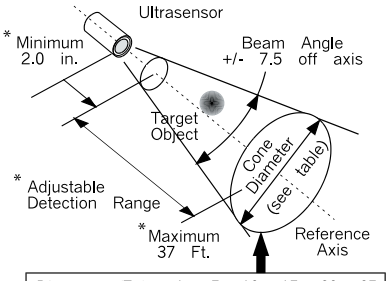
Orientation
Detects flat or curved objects. Surface should reflect back to sensor. Flat surfaces are best when perpendicular to reference axis, and may not be detected at higher angles of incidence.

Density
Low density materials including some foams, cloths and powders may exhibit reduced detection range in some applications. Testing is recommended.

Typical Distances

Object	*Max Range (ft.)*
14 ga. solid wire	*10*
baseball	*16*
1 sq. in. plate	*20*
basketball	*22*
1 sq. ft. plate	*30*
Large surfaces or Liquid in standpipe	*37*

More distant objects should typically be larger. Consult Senix for assistance with special considerations or applications.



Distance (Ft.)	1	5	10	15	20	25
Cone Diam(In.)	4.6	17	33	48	64	79

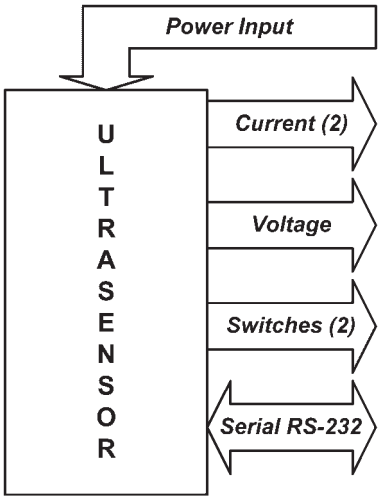
Cone Diameter at nominal sensitivity

* The factory configured minimum range is 6.5 in. (165 mm). This can be reduced to 2 in. (51 mm) using SoftSpan.

Specifications

Range*	*2 in. to 37 feet (5 cm - 11.3 m)*	***Beam Angle***	*15 degrees (nom) @ -3db, conical*
Temperature	*0 to 70 C (32 to 158 F)*	***Transducer***	*High sensitivity electrostatic*
Case Material	*HIPS Plastic or Stainless Steel*	***Humidity***	*5 to 95% operating*
Compliance	*CE Compliant for EU*	***Adjustments***	*Permanently stored*
Sensitivity	*Adjustable 3/4 turn potentiometer (rear accessible using screwdriver)*		
Repeatability	*Nominal 0.1% of range @ constant temp. Affected by target, distance, environment*		
Update Rate	*Adjustable, 120 Hz maximum, 20 Hz (nominal), adjust to distance & application*		
Resolution	*0.003384 in. (.086 mm) max.; Analog 8 bits over spanned distance*		
Dimensions	***ULTRA-U, ULTRA-U-SS2:** 2.375 in. (60.33 mm) diam. X 5.5 in. (139.7 mm) long* ***ULTRA-U-SS:** 2.31 in. (58.7 mm) diameter x 5.5 in. (139.7 mm) long*		

Interfaces



- *10-30 VDC @ 180 ma. (nominal), polarity protected*
- *Powered via rear connector (DB9F) or 3.5 mm rear jack*
- *Min 13.5 v in for 10 VDC out, min 15 v in for current sourcing (#1)*

- *#1: 4-20 ma. current loop, current sourcing*
- *#2: 4-20 ma. current loop, current sinking, externally sourced*
- *Custom output currents (endpoints) in the range of 0 to 20 ma.*
- *Endpoint distances pushbutton or SoftSpan adjustable*

- *Standard output voltages 0-10, 0-5 or 1-5 VDC selectable*
- *Custom output voltages (endpoints) in the range of 0 to 10 VDC*
- *Endpoint distances pushbutton or SoftSpan adjustable*

- *Two (2) switch outputs, each with rear status LED indicator*
- *Open collector NPN transistor, 40 VDC max, 200 ma. continuous*
- *Push-button or SoftSpan adjustable switching distances (setpoints)*
- *Switch polarity can be set for each switch to simplify interface*

- *Serial data communications to any receiving or controlling device*
- *9600 baud, 8 data bits, 2 stop bits, no parity, 3-wire (Tx, Rx, Gnd)*
- *Free running or polled (externally requested) data outputs*

Functional

Target Window	*Targets can be range discriminated to ignore unwanted objects or increase focus*
Output Modes	*All Outputs: Free running or polled (RS-232 request by external controller)*
PC Configuration	*Connects to COM port using SoftSpan™ software kit*
Output Polarity	*Analogs can increase or decrease with distance. Switches on or off @ setpoints*
Output Filtering	*All outputs can be averaged from 2 to 255 measurements*
Status Indicators	*Four (4) rear LED's indicate target echo, switch 1, switch 2 and power status*

Components

- *Each sensor is shipped with a 6-ft. cable with tinned leads, UA-CLIC bracket and instructions*
- *SoftSpan™ kit available for configuration using IBM-PC includes power supply and computer cable*
- *Other options are available. Contact Senix to discuss your specific needs or for application assistance*

10 Dec 04