



TOUGHSONIC®

Ultrasonic Sensors



ToughSonic® ultrasonic level and distance sensors use non-contact technology to measure through the air using ultrasonic sound waves. They provide fast, reliable non-contact measurements at distances up to 50 feet (15.2 meters). ToughSonic® sensors are used to measure the level of liquids in open or closed tanks and in outdoor environments. They are also used to detect the presence/absence or distance to objects and in material handling applications.

Applications include inventory management, batch control, high or low alerts, and scheduling the ordering, delivery, pick up, or disposal of liquid products. They are suitable for distance ranging, harmless liquid, and compatible chemical level applications, including agricultural irrigation, flood monitoring, object detection, roll diameter, and general industrial automation.

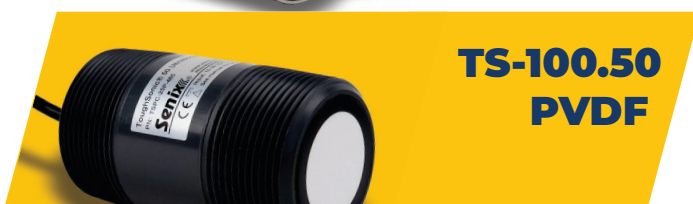
Since 1990, Senix® ultrasonic sensors have served the global market for reliable measurement. Now, Senix is a part of the Garner Industries family, including the BinMaster and HerdStar brands, with products and expertise to meet the toughest inventory challenges.

TOUGHSONIC® 100 SERIES

These rugged, compact ultrasonic sensors live up to the “ToughSonic” name. Made in the USA, the TS-100 features durable construction with heavy-duty electronics epoxy potted into type 316 stainless steel housings. TS-100 series sensors feature permanently attached cables and ruggedized piezoelectric transducers.

They are used for non-contact level measurement in tanks and mixers in liquid processing operations and excel in harsh factory environments. In environmental applications, they are used to monitor and control water and non-volatile liquid levels in storage tanks and open-air conditions.

The TS-100 can protect expensive assets and enhance safety when used for distance monitoring in heavy mining, aggregate, and farm equipment applications. They can measure distances and detect objects on conveyor belts and production lines.



Free Setup Software

TS-100 sensors come with free SensorView™ software to simply set up, manage, and maintain your network of ultrasonics. You can quickly adjust, optimize, save, and clone sensor parameters to each application without time-consuming calibration!

Features of TS-100 Sensors

Distance Measurements

- Up to 3, 14, 30, or 50 ft range
- Unaffected by visual factors like color and transparency
- SensorView™ PC software setup
- Adjustable transmit power to optimize performance
- Temperature compensated accuracy

Performance Enhancements

- For indoor and outdoor applications
- Versatile mounting options
- Durable sealed housing for wet or dirty applications
- Input/output short & overload protection
- Multi-sensor measurement synchronization
- Adjustable sensitivity via SensorView™ software
- Rear status indicators visualize current sync status

100 SERIES SPECIFICATIONS

	ToughSonic TS-100.3	ToughSonic TS-100.14	ToughSonic TS-100.30	ToughSonic TS-100.50
Maximum/ Optimum Range	3 feet (91 cm)/1.75 to 24 inches	14 ft (4.3 m) / 10 ft (3 m)	30 ft (9.1 m) / 20 ft (6.1 m)	50 ft (15.2 m) / 33 ft (10 m)
Deadband	0-1.75 in (0-4.5 cm)	0-4 in (0-102 mm)	0-10 in (0-254 mm)	0-12 in (0-303 mm)
Mounting Options	US: 1 in NPT Metric: 30 x 1.5 mm	US: 1 in NPT Metric: 30 x 1.5 mm	US: 1.5 in NPT Threaded both ends	Clamp, or 1.5 in NPT rear, or PVC 2.5 in NPT front & rear
Transducer	Ruggedized piezoelectric	Standard, beam width 12 +/-2 degrees	Standard, beam width 15 +/-2 degrees	Standard, beam width 12 +/-2 degrees
Dimensions	Length: 4.062 in (103.2 mm) Diameter: 1.32 in (33.3 mm) max	Length: 4.062 in (103.2 mm) Diameter: 1.32 in (33.3 mm) max	Length: 4.30 in (109 mm) Diameter: 1.88 in (48 mm)	Refer to data sheets
Selectable Outputs	<ul style="list-style-type: none"> ▪ Serial data ▪ Voltage/switch ▪ Current/switch *Switch Selectable 	<ul style="list-style-type: none"> ▪ Serial data ▪ Voltage/switch ▪ Current/switch *Switch Selectable 	<ul style="list-style-type: none"> ▪ Serial data ▪ Voltage ▪ (2) Current ▪ (2) Switches 	<ul style="list-style-type: none"> ▪ Serial data ▪ Voltage ▪ (2) Current ▪ (2) Switches
Adjustments	SensorView & push-button "teachable"	SensorView™ & push-button "teachable"	SensorView™ & push-button "teachable"	SensorView™ adjustable only, no push-button
Cable	6.5 ft (2 m) pigtail standard (other lengths available) 6-wire + drain	6.5 ft (2 m) pigtail standard (other lengths available) 6-wire + drain	6.5 ft (2 m) pigtail standard (other lengths available) 9-wire + drain	6.5 ft (2 m) pigtail standard (other lengths available) 9-wire + drain
Serial Data- Only Models	Cable: 4-wire + drain	Cable: 4-wire + drain	Cable: 4-wire + drain	Cable: 4-wire + drain
Power Requirements	10-30 VDC	10-30 VDC	10-30 VDC	10-30 VDC
Current Draw	60 mA max	60 mA max	70 mA max	70 mA max

TOUGHSONIC® 200 SERIES

Tough applications call for even tougher ultrasonic sensors. The TS-200 series ultrasonic sensors are resistant to deterioration from chemical exposure. These rugged, compact ultrasonic level sensors measure a wide variety of liquids including tanks in the plastics, wood products, paper, agriculture, pharmaceutical, and food processing industries.

Heavy duty electronics are epoxy potted into a chemical-resistant PVDF housing that physically isolates the transducer and electronics from the target material. TS-200 series sensors are used both indoors and out, and in some of the harshest environments. They are ideal for a wide variety of chemicals and can withstand exposure to both acids and bases. They are suitable for liquids in the locomotive industry and for diesel fuel.

TS-200 series sensor housings are made of chemical-resistant polyvinylidene fluoride (PVDF), which is commercially known as Kynar®. This is an excellent housing material for ultrasonic sensors since it is highly resistant to a wide range of chemicals including most inorganic acids, bases, organic acids, alcohols, solvents, and strong oxidizing agents. PVDF is suitable for applications where exposure to harsh chemicals is expected, such as in many processing industries.

3 Range Options

The TS-200 comes in maximum ranges of 14', 20', and 35'.



TS-200.14



TS-200.20

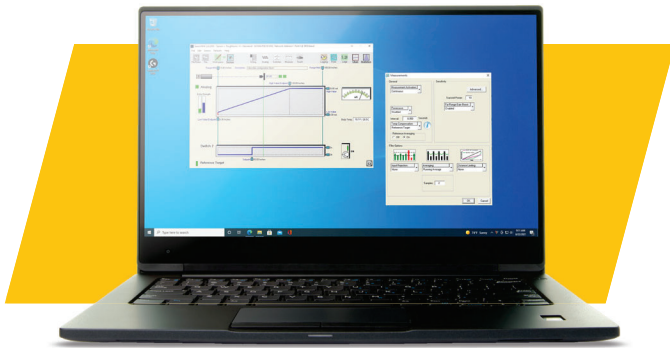


TS-200.35

200 SERIES SPECIFICATIONS

	ToughSonic TS-200.14	ToughSonic TS-200.20	ToughSonic TS-200.35
Maximum / Optimum Range	14 ft (4.3 m) / 10 ft (3 m)	20 ft (6.1 m) / 13 ft (4 m)	35 ft (10.7 m) / 25 ft (7.6 m)
Deadband	0-3.5 in. (0-8.9 cm)	0-8 in (0-20.3cm)	0-12 in (0-30.5cm)
Top Threads	1 in NPT, tapered	1 in NPT, tapered	1 in NPT, tapered
Bottom Threads	1.5 in NPT (tapered threads)	1.5 in, fits NPT or BSP (threads not tapered)	2 in, fits NPT or BSP (threads not tapered)
Body & Transducer	PVDF (Kynar®), Beam Width 12 +/-2 degrees	PVDF (Kynar®), Beam Width 14 +/-2 degrees	PVDF (Kynar®), Beam Width 10 +/-2 degrees
Dimensions (D x L)	3.05 x 4.99 in (77 x 126 mm)	3.05 x 5.62 in (77 x 143 mm)	3.05 x 5.59 in (77 x 143 mm)
Simultaneous Outputs	5 plus serial data Voltage, 2 current, 2 switches	5 plus serial data Voltage, 2 current, 2 switches	5 plus serial data Voltage, 2 current, 2 switches
Adjustment	SensorView™ PC software	SensorView™ PC software	SensorView™ PC software
Cable	6.5 ft (2 m) pigtail 9-wire + drain	6.5 ft (2 m) pigtail 9-wire + drain	6.5 ft (2 m) pigtail 9-wire + drain
Cable, Serial Data-Only Models	6.5 ft (2 m) pigtail 4-wire + drain	6.5 ft (2 m) pigtail 4-wire + drain	6.5 ft (2 m) pigtail 4-wire + drain
Power Requirements	10-30 VDC	10-30 VDC	10-30 VDC
Current Draw	50 mA max, Typical: 45 mA @ 24 VDC	50 mA max, Typical: 45 mA @ 24 VDC	50 mA max, Typical: 45 mA @ 24 VDC

SIMPLE SENSORVIEW™ SETUP



SensorView™ Setup Software is a Windows® compatible application that makes it easy to configure, test, and clone any ToughSonic® ultrasonic sensor. Use your PC to adjust, validate, and duplicate sensor setup parameters. Measurements can be displayed in metric or English units. Update one sensor or a group of sensors using Group Control.

Easy to Use

Real-time graphics for each sensor parameter. Simply open a parameter to revise it, and then send it to a sensor to update it.

Help tips pop up when you mouse over any screen element or parameter. Tips can be time delayed or turned off.

Plug & play with no calibration required. Configuration is only needed if additional customization is desired.

Repositionable Views

Measurement history graphs show distance over time. Adjust scales manually or automatically. See filtered/unfiltered data simultaneously in real-time.

Large character display option to view PC screen measurements when working on equipment up to 100 feet away.

Sensor setup can be saved, retrieved, and then recalled and copied to new sensors or shared by email in just seconds.

Powerful Setup

Easily adjust **functionally organized parameters**. Calibrate and set measurement rates, ranges, filters, and timeouts for unusual conditions.

Multi-sensor management lets you change sensor parameters using Group Control.

Sensor parameter duplication reduces setup and downtime for OEM and MRO maintenance and installation.

Reference targets can be used improve the accuracy of distance measurements, especially in environments with changing conditions like temperature fluctuations.

Performance Analysis

Statistical displays of minimum, maximum, and average, with a standard and maximum deviation are available. View continuously or over a selected number of samples.

Time logging stores measurements to a disk file. Historical measurement files can be replayed, displayed, or exported to Microsoft Excel.

ToughSonic Outputs

ToughSonic sensors require a wired interface for setup and to transmit data to SensorView or BinCloud. The sensors offer RS-485 or RS-232 serial data communications with high noise immunity to send data reliably over long cable lengths. RS-485 supports up to 32 addressable sensors connected to a single data bus. Sensors come standard with RS-485, Analog outputs standard, with all outputs active simultaneously.

Outputs: Modbus RS-485 or RS-232, 0-10 VDC, two current loops (4/20 mA sinking & sourcing) & two switches (PNP or NPN)

BinCloud® for ToughSonic

These ultrasonic sensors can also be integrated into BinCloud inventory management software. All BinMaster continuous level sensors – including ultrasonics – as well as any sensor with a 4-20 mA output can be used with BinCloud for:

- **Alerts & Notifications:** Timely status updates to address critical inventory situations promptly
- **Multiple-Site Management:** See and sort every bin, tank, or silo at every site
- **Historical Data:** Data-driven decision-making to optimize purchasing
- **Reporting Tools:** Track inventory of liquid or solid bulk materials by site, identify trends, automate reports
- **Custom Roles:** Tailor BinCloud for a personalized, secure user experience
- **Effortless Ordering:** Integrate your supply chain with Vendor Managed Inventory

Mounting a ToughSonic

There are multiple mounting options to make installing a ToughSonic sensor simple. For a TS-100 series 30mm threaded sensor use a swivel-style sensor mount, stainless steel mount, block clamp mount, or an adjustable multi-axis sensor clamp. There are also standard and elevated 2" NPT to 30mm thread adapters. For TS-200 series sensors, use the appropriate 1.5", 2" or 2.5" NPT female thread adapter. Accessories such as 90° adapters and 90° stainless steel sensor mounts allow for installation in tight spaces or on vessel walls.



TOUGHSONIC® ACCESSORIES

Configuration Accessories

USB Setup Kit: USB-to-serial converter with attached connection board, setup cable, universal DC modular power supply for bench setup of sensors.

Universal Junction Box: Used to network up to 32 sensor addresses for ToughSonic RS-485 sensors. NEMA 4X, IP68 rated.

Universal Termination Board: Consolidates all power and interface wiring in color-coded sensor wire terminals.

Termination Board with Two Relays: Includes two Form-C dry contact relays rated 5A@250 VAC or 5A@24VDC with LED status indicators.

USB Setup



Digital Displays

DPM-200: One-line display for 4-20 mA sensors, 4-button keypad, large 4-digit LED display.

DPM-300: Large format Modbus sensor display, functions as master, slave, or snooter, 2-line, 6-digit LED display.

DPM-500: Two-line display for 4-20 mA sensors, 4-button keypad, can power loop if needed.



Wiring Accessories

RS-485 Serial Connection Cable: Used to connect terminal boards to the serial port. Six feet.

Isolated Serial to USB Converter: For panel or DIN rail installation, includes 3 feet USB cable.

Serial Cable and Terminal Board: Used for bench testing ToughSonic sensors. Six feet.

Sensor Cable: Sold per foot. 4-wire, 6-wire, and 9-wire PUR cable and shielded.

Serial Cable & Terminal Board



Senix ToughSonic® ultrasonic sensors are a reliable and cost-effective solution for indoor and outdoor water monitoring. From harsh, salty ocean environments to freshwater applications, ToughSonic® deliver smart and reliable level and distance measurements. ToughSonic® perform best in open-air applications or within “stilling” tubes that focus the ultrasonic sound waves to avoid obstacles and improve performance. Use them in tank-level monitoring, irrigation, stream monitoring, sea-level monitoring, and flood and tsunami warning systems.

Water Applications

- Irrigation
- Flood monitoring
- Open channel flow
- Sea, pond, lake & river level data
- Manure pit monitoring
- Wastewater levels
- Tide & wave measurements
- Towing tanks
- Marine vessel operations: hydrofoil, vessel pitch & roll



TANK LEVELS



ToughSonic® ultrasonic sensors offer cost-effective, continuous level monitoring and measurements for small, mid-size, and large tanks. They are installed at the top of the tank to provide non-contact liquid level measurement. Senix ultrasonics are easy to install into standard fittings, adapt to most liquids and liquid environments, and can be used both indoors and out. Send tank level measurements to SensorView™ or BinCloud® for convenient on-site or remote monitoring.

Tank Applications

- Measuring tank ingredient levels
- Agriculture irrigation and fertilizers
- General industrial automation
- Inventory management
- Batch control
- Low- & high-level alarms
- Emptying, filling, or maintaining levels
- Proactive order, delivery, & pickup scheduling
- Waste liquid monitoring
- Pump & valve control

OBJECT DETECTION & RANGING

Object Detection

Get non-contact, unintrusive, long-distance proximity detection in a factory or processing setting. Senix ToughSonic® ultrasonic proximity sensors reliably detect objects or materials through the air and are easy to install and program. Most materials can be detected: hard or soft, of any color or transparency. ToughSonics are unaffected by optical characteristics and remain accurate through ambient light, shine, and reflectivity. Unlike traditional proximity sensors, ultrasonics operate over longer distances and can be set up to limit object detection within a user-specified distance band—or “window.”

Detection Applications

- Web breaks in printing & converting
- Discriminating outliers or errors on conveyors
- Detecting people at work, kiosks or displays
- Proximity warnings for mass transit & vehicles
- Obstacle avoidance in robotics & automation
- Counting & controlling items on conveyors

Distance Ranging

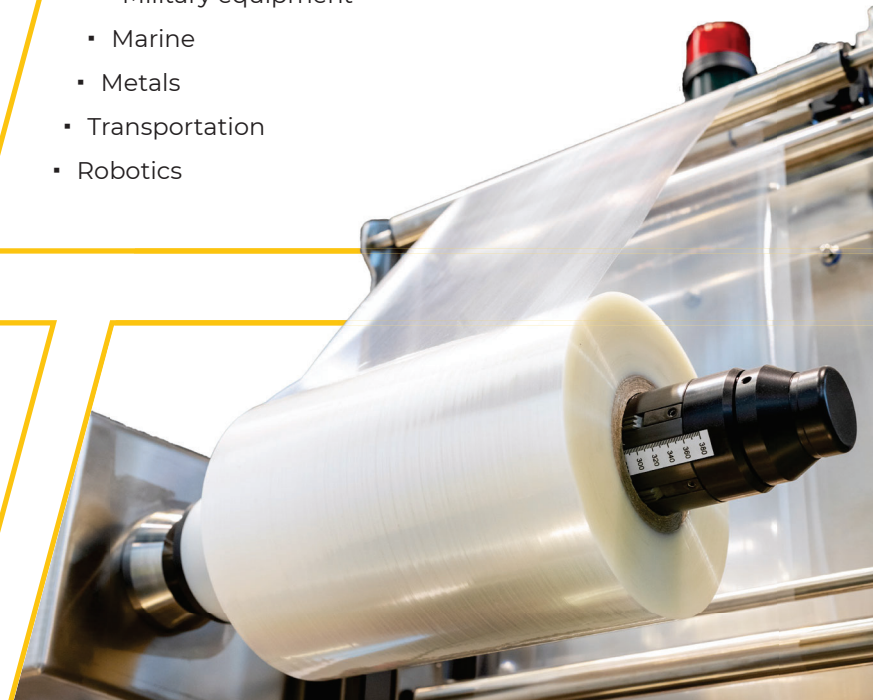
ToughSonic ultrasonic sensors excel at distance ranging, without touching or damaging the target. They are widely used for collision avoidance in vehicles and for obstacle avoidance in robotics and autonomous systems. In industrial processing settings, they're used for liquid level measurement in tanks and bins. They can detect objects for security and inventory purposes. Use them to monitor fill levels in containers, detect objects in confined spaces, and measure the diameter of products on rolls.

Distance Applications

- Web loop positioning
- Converting
- Factory automation
- Military equipment
- Marine
- Metals
- Transportation
- Robotics
- Material handling
- Web tension control
- Turret unwind diameter

Web Loop Positioning

The TS-100 series provides precise non-contact web loop positioning with continuous measurement of roll diameter in winding and unwinding operations. From roll full/empty detection to excessive slack warnings, TS-100 sensors effectively alert operations and systems to ideal tension and material handling.



AGRICULTURE & FARMING

Senix ultrasonic sensors play a vital role in modern agriculture and farming, enabling precision and automation. They measure water storage in reservoirs, ponds, or tanks for optimizing irrigation. In crop management, they monitor plant height and growth and aid in harvesting and fertilizer application. They also control boom height on sprayers, ensuring efficient and even application of fertilizers and pesticides. Furthermore, they can detect obstacles and aid in navigation for autonomous agricultural vehicles.

Agriculture Applications

- Levels of tanks, streams, flumes & weirs
- Liquid levels in planters, fertilizers, and sprayers
- Storing or dispensing agricultural chemicals
- Monitor crop height & growth
- Obstacle detection while driving farm equipment
- Monitoring levels in silos & fuel tank storage
- Fish farming & aquaculture
- Pit monitoring for animal waste
- Flood monitoring
- Wastewater storage or disposal





Monitor tanks of diesel fuel, the water level under a bridge, or the inventory of chicken feed until the next delivery. View inventory data on a PC or mobile device quickly, safely, and inexpensively in real time. Wireless monitoring enables remote data collection and analysis and wirelessly transmits data to a central control system or cloud-based software for real-time monitoring. Eliminate the hassle and expense of manual checks and extensive wiring. Particularly useful in remote or harsh environments, wireless connectivity enhances operational efficiency and safety and allows data-driven decisions to be made quickly.

Wireless Applications

Level & Flow

- Open channel flow
- Flumes & weirs
- Historical data logging

Tank Level

- Inventory management
- Shipping & delivery scheduling
- Low and high alerts
- Open or closed tanks
- Low-dust solids
- Benign liquids and chemicals

Bodies of Water

- Flood alarms & warnings
- Data collection & history
- Pond, stream, & river levels
- Tidal & tsunami warnings

TOUGHSONIC® APPLICATIONS

INVENTORY SYSTEMS

Ultrasonic sensors enhance inventory management by measuring levels within containers, distances to items or equipment, or the height, presence, or absence of items or material on a conveyor belt. This data is used in inventory systems to maintain product integrity, track stock levels, automate processes, and trigger alerts. Real-time data reduces manual checks and ensures more precise bulk material inventory, helping to prevent overstocking or stockouts at plants or worksites.

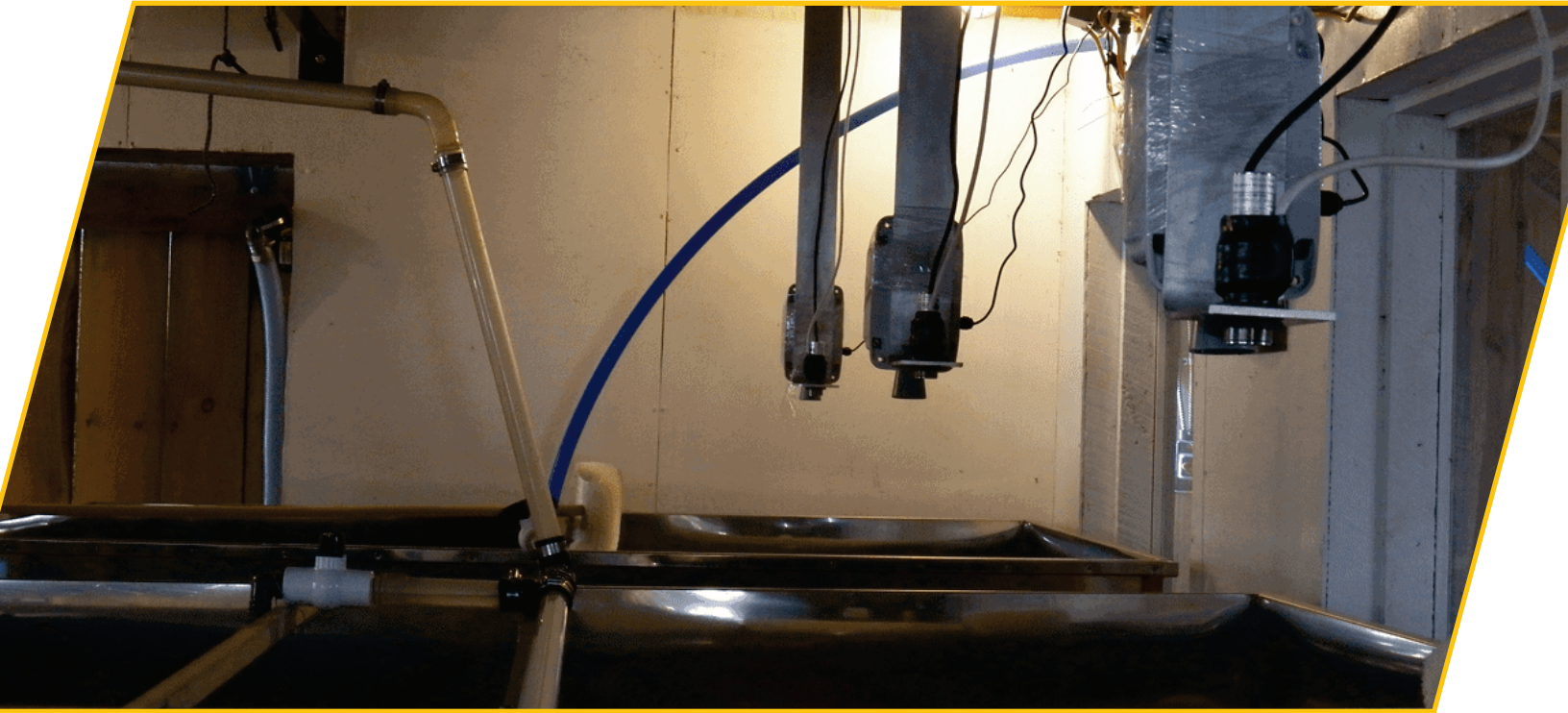
Inventory Applications

- Benign liquids in tanks or IBCs
- Kynar-compatible chemical storage

Communication Platforms

- SensorView™ software
- BinCloud® software
- HMI or PLC automation systems
- API calls between services





Ultrasonic sensors are vital in material handling, process control, and object positioning systems by providing non-contact detection and distance measurement. They are used to detect object presence, position, and level for various applications like conveyor systems, robotic arms, and forklifts. Their ability to operate regardless of color, transparency, or material properties enhances automation to prevent collisions, and ensures efficient and safe material flow. ToughSonic® sensors can be configured to react in **as quickly as 5 milliseconds** in case of an incident or critical error.

Positioning & Material Handling Applications

- Conveyor loading
- Diameter monitoring
- Height control
- Detection of presence or absence
- Dimensioning
- Sorting processes
- Roll diameter
- Position control
- Industrial equipment alignment

HYDROFOIL & NAUTICAL

Ultrasonic sensors provide real-time, non-contact distance measurements, crucial for maintaining optimal ride height and stability in hydrofoils. Mounted on the hull, these sensors measure the distance to the water's surface, helping control the foiling process and enhance handling. Additionally, they are used for tank level monitoring, enabling safer navigation and efficient operation.

Boat, Barge, & Ship Applications

- Fuel level readings
- Wastewater holding tanks
- Ballast tanks
- Measure liquid cargo
- Hull-to-water distance
- Freeboard deck to waterline
- Obstacle detection & avoidance
- Tide observation
- Environment monitoring
- Offshore engineering



Ultrasonic sensors play a vital role in civil engineering, for water level monitoring and for non-destructive testing and monitoring of structures. In non-destructive testing (NDT), they can monitor movement or flaws without causing any damage or disrupting operations. They're used for tasks like measuring liquid levels in tanks or monitoring the stability of excavation pits by detecting changes in distance and position which could indicate ground movement.



Civil Engineering Applications

- Levels in reservoirs, rivers, channels
- Flood prediction and water management
- Monitor sludge levels in water treatment plants
- Concrete production levels in mixers and storage
- Detect flaws & measure thickness in NDT



BRIDGES & ROADS

Bridges

Ultrasonic sensors are used during construction and for monitoring long-term structural integrity. Sensors monitor the stability of foundation pits by measuring distances between support struts and pit walls, ensuring structures remain stable. Additionally, they can be mounted on bridge structures to monitor distance changes that could be due to load or age-related structural health.

Bridge Applications

- During construction to ensure proper footing & foundation placement
- Monitor water levels under bridges, in rivers and canals
- Early flood warnings & bridge closures
- Monitor movement of bridge components during construction or after completion
- Checking for deformation or sagging due to heavy loads or temperature variations
- Measure levels of concrete and materials during construction

Roads

Ultrasonic sensors are employed for road surface monitoring, detecting irregularities like potholes and speed bumps. They can also be used in construction equipment for obstacle detection, helping prevent collisions and enhancing safety. Ultrasonic sensors aid in concrete pouring processes by measuring distances and levels for optimal dispensing. Asphalt plants use sensors to monitor material levels in tanks and storage structures.

Road Applications

- Surface monitoring for irregularities, roughness, and texture
- Identifying potholes, speed bumps, and uneven surfaces
- Monitoring the level of asphalt or other paving materials
- Traffic monitoring by detecting the presence/absence of vehicles
- Measuring distances to equipment, objects, or obstacles
- Ensuring construction safety and efficiency



Ultrasonic sensors are valuable in disaster management by enabling early detection and monitoring. They measure water levels in flood-prone areas, triggering alerts for rising water. In structural safety, they monitor building stability, detecting subtle shifts that could indicate potential collapses. In the event of an earthquake, they are used to assess structural movement. They also aid in mapping environmental events on buildings, roads, and bridges.

Disaster Applications

Flood Monitoring & Early Warning

- Rising levels of rivers & streams
- Reservoirs & dams for failure or overload
- Urban flooding in storm drains & flash floods
- Coastal areas for storm surge & high tides
- Post-disaster level monitoring for relief effort

Landslide Detection

- Detect subtle or sudden ground movements
- Combine with soil moisture monitors to identify instability

Tsunami Warning & Detection

- Detect abnormalities in coastal water levels
- Data for early warning systems for timely evacuations

Consumer Protection

- Prevent damage and overflows in municipal water systems
- Track levels in chemical & oil tanks after earthquakes or industrial accidents



THE TOUGHER ULTRASONIC



Non-Contact Technology

Liquid level measurement and target material distances are measured without contaminating, contacting, or damaging the tank contents, stored materials, or a target object. Corrosion, scaling, coating and other contact-related wear or damage are avoided, and the integrity of the target material is maintained. ToughSonic sensors are maintenance-free and have a long service life.

With ToughSonic, the target distance is measured rather than just the presence or proximity. This benefits operations by detecting the precise location identification of objects, enabling applications like collision avoidance, inventory management, and quality control by measuring the distance to an object with high accuracy. ToughSonic sensors are particularly valuable in scenarios where visual recognition alone might not be sufficient due to lighting conditions or object complexity.



Precise Target Ranging



Distance Proportional Output

When using a ToughSonic sensor with analog outputs, the output value directly corresponds to the measured distance, meaning that as the distance increases or decreases, the output signal proportionally changes in the same direction. ToughSonic sensors provide a distance proportional output, making it easy to interpret the measured distance directly from the sensor signal.

A ToughSonic's high resolution allows the sensor to detect very small changes in distance, enabling precise measurements and making ToughSonic suitable for applications where minute variations in position or distance need to be accurately identified. This makes it ideal for liquid level sensing or close-range obstacle detection where small discrepancies matter significantly.



High Resolution



Unaffected by Optical Characteristics

ToughSonic sensors are unaffected by a target's optical characteristics like ambient light, color, transparency, shine, or reflectivity because they "see" or detect objects by reflecting sound waves, not light. This means the visual properties of the target have no influence on how well the sound waves bounce back to the sensor.

All ToughSonic sensors are constructed with long-life solid-state electronics, rugged piezoelectric transducers, and full epoxy potting. Housing materials include 316 stainless steel and chemically resistant Kynar® (PVDF) and interface cables are permanently attached. All ToughSonic sensors are sealed to protect against water ingress, operate over a wide range of humidity and temperature ranges, and are NEMA-4X, NEMA-6P, and IP68-rated.



Rugged Construction