

SONIC-PRO[®] Hybrid Ultrasonic Flowmeter



Model S3C1A1



- Selectable Doppler or Transit Time
- Non-Invasive clamp on transducers
- High quality QVGA display
- NEMA 4X (IP 66) washdown enclosure
- Full function front panel interface
- “Smart” external communications
- Process control features
- 2 Year warranty
- Includes portable carrying case

💧 Liquid applications

NEMA 4X



Applications:

- Sewage
- Wastewater
- Pulp & Paper Slurries
- DI water
- Discharge water
- Caustics
- Chemical Slurries
- Ground water
- Food and Beverage
- Petrochemical
- Any sound conducting liquid

Features:

- Selectable Doppler or Transit Time operating mode.
- Custom quality metric algorithms and DSP technology ensures reliable, high accuracy measurements.
- Quick and easy clamp-on transducer installation. Proprietary AGC (Automatic Gain Control) algorithm eliminates manual gain adjustment.
- Three display options: user programmable via 5-button menu driven interface (S3 option), display without menu access (S2 option) and no display (S1 option).
- Factory configured for easy installation. Includes five user programmable, password protected configurations for multiple user and portable applications.
- High quality 320 x 240 pixel QVGA backlit LCD.
- Data logging to standard SD Card format. User configurable to time interval, flow rate and total set-point triggers. 500,000 events with included 32MB SD Card.
- Isolated 4-20 mA output - fully configurable.
- 0 - 1000Hz Pulse output - fully configurable.
- Optional computer connection via RS-232, RS-485, USB, Ethernet. Permits remote access and control of all functions including real-time display, system configuration, data logging, remote data capture and process control functions. Software permits remote internet access through local network set-up.
- Optional process control via three independently configurable 10 amp, form C relays. Configure to flow rate for high/low/range rate alarm or to flow total for either manual triggered batch operations or flow triggered batch operations.

Specifications:

General Operation

Measuring Principle

Hybrid. User-selectable Doppler or Transit Time operating modes.

Fluid Types

Virtually any acoustically conductive fluid.

Transit time mode from 0% to 10% (0 to 100,000 ppm) particulate.

Doppler from 0.02% to 15% (200 to 150,000 ppm) 50 micron particles.

Fluid Velocity Range

0.25 to 30 feet per second (0.07 to 9 meters per second)

Flow Sensitivity

0.001 feet per second (0.0003 meters per second)

Nominal Pipe Sizes

2.0 inch - 100 inch (63mm to 2500mm)

Pipe Liner Materials

Most plastic liners

Pipe Materials

Most metal and plastic pipes

Pipe Material	Pipe Size Ranges	Max Pipe Wall
Brass (Naval)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Copper	2" to 100" (63mm to 2500mm)	.500" (13mm)
FRP (fiberglass Reinforced Plastic)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Iron (cast)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Iron (ductile)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Nylon	2" to 100" (63mm to 2500mm)	2.00" (50mm)
Polyethylene (HDPE)	1" to 100" (25mm to 2500mm)	2.00" (50mm)
Polyethylene (LDPE)	1" to 100" (25mm to 2500mm)	1.00" (25mm)
Polypropylene	1" to 100" (25mm to 2500mm)	.500" (13mm)
PVC / CPVC	1" to 100" (25mm to 2500mm)	2.00" (50mm)
304 Stainless Steel	2" to 100" (63mm to 2500mm)	.500" (13mm)
304L Stainless Steel	2" to 100" (63mm to 2500mm)	.500" (13mm)
316 Stainless Steel	2" to 100" (63mm to 2500mm)	.500" (13mm)
Steel (1% carbon hard)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Steel (carbon)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Titanium	2" to 100" (63mm to 2500mm)	.500" (13mm)

Note: Consult the factory for an updated list of pipe materials.

Accuracy

Flow Rate Averaging Time	Transit Time Accuracy at at Nominal Pipe Sizes
5.0 Seconds (default setting)	+/-1% of rate > 1 ft/sec +/-0.01 ft/sec < 1 ft/sec
1.0 Seconds	+/-1% of rate > 5 ft/sec +/-0.05 ft/sec < 5 ft/sec
0.5 Seconds	+/-2% of rate > 12 ft/sec +/-0.25 ft/sec < 12 ft/sec

Flow Rate Averaging Time	Doppler Accuracy at Nominal Pipe Sizes
5.0 Seconds (default setting)	+/-2% of rate > 5 ft/sec +/-0.10 ft/sec < 5 ft/sec
1.0 Seconds	+/-2% of rate > 8 ft/sec +/-0.20 ft/sec < 8 ft/sec
0.5 Seconds	+/-2% of rate > 12 ft/sec +/-0.25 ft/sec < 12 ft/sec

Shipping Specifications

Carton Dimensions: 21" x 17" x 9-1/2"

Carton Weight: 24 lbs. (10.9 Kg.)

SPU (Signal Processing Unit)

Enclosure

NEMA 4X (IP66), Powder coated aluminum, SS clamps and hardware. Dimensions: 11.00H x 8.60W x 5.00D inches (279H x 218W x 127D mm) Weight 9.5 lb. (4.3 Kg.)

Mounting

Wall, pipe (vertical or horizontal) or panel mounting. Hardware included. Panel opening: 10.63H x 8.10W inches (270H x 206W mm) Panel Depth. Rear: 2.78 inches (71 mm), Front : 2.18 inches (55 mm)

Power Requirements

95-264 VAC 50/60Hz or 15-30 VDC; 30 watts maximum

Operating Temperature

14°F to 140°F (-10°C to 60°C) **Storage:** -40°F to 158°F (-40°C to 70°C)

Display

320 x 240 pixel QVGA backlit LCD, UV resistant. Simultaneous Rate and Total: 10 digit maximum + exponent to E+32 Decimal location configurable to 10 places.

Display Languages

English, Spanish, French or German selectable.

Keypad

Five-button positive action tactile switch keypad.

Security

Programmable master password and individual configuration passwords.

Display Volume Units

Independently configurable Rate and Total display units in: U.S. Gallons, ounces, barrels (US liquid), barrels (US oil), cubic ft, acre ft, Imperial (British) gallons, liter, cubic meter, or user defined "custom" units. Rate display in feet or meters per second.

Display Time Units

Seconds, minutes, hours, days.

Display/Output Response Time

Selectable: 0.25, 0.50, 1.0 (default), 2.5, 5.0 seconds.

Flow Rate Display Averaging

Selectable: 0.50, 1.0, 2.5, 5.0 (default), 10.0 seconds.

Data Outputs

- Isolated 4-20 mA output - fully configurable, invertible
- 0-1000 Hz Pulse output - fully configurable, invertible

Data Logging

Date/time stamped flow rate and flow total data in FAT32 file format, easily imported into Excel. Configurable to trigger on time interval (1-999,999 sec), rate and/or total set-point values. Over 500,000 log events possible with included 32MB SD Card.

Process Control

- Three independently configurable 10 amp Form C, NO/NC relays.
- Configure to flow rate for high/low/range rate alarm. Programmable release values enable auto release or manual latching operation.
- Configure to flow total for manual trigger batch operations or automatically triggered, timed batch operations.

External Communications

- Computer connection via RS-232, RS485, USB, Ethernet.
- Includes user communication and configuration software
- Permits remote internet access through local network set-up
- Remotely access and upload data logging files.

Clamp-On Transducers

Housing

NEMA 6P (IP67), Nickel plated aluminum, SS clamps & hardware. Dimensions: 3.12H x 2.95W x 1.60D in. (79H x 75W x 41D mm) Weight (excluding cable): 0.8 lb. (0.4 kg.) each

Cable

Shielded coaxial RG/U Type:59. PVC jacket, black. RoHS Compliant Standard length: 10 ft. (3m) Optional lengths available: 25 ft. (7m), 50 ft. (15m), 100 ft. (30m)

Pipe Surface Temperature

-20°F to 250°F (-34°C to 121°C)

Installation:

Fluid Requirements

The **Sonic-Pro** series **Hybrid Ultrasonic Flow Meters** can measure fluid flow in virtually any fluid in which sound waves can travel. The **Sonic-Pro** meters are considered “hybrid” because they can measure fluid flow using either the Doppler or Transit Time methods. The **Sonic-Pro** ultrasonic sound transducers are clamped to the outside of the pipe wall and include no moving parts. This method of flow measurement is safe, non-intrusive and very easy to service.

The Doppler measurement method requires particles be present in the flow stream to “reflect” the sound waves. The meter may be operated in the Doppler mode when the fluid contains 0.02% to 15% (200 to 150,000 ppm) of particles .

The Transit Time measuring method requires relatively “clean” fluid to enable the sound waves to complete their circuit. The meter may be operated in the Transit-Time mode when the fluid contains 0% to 10% (0 to 100,000 ppm) of particles. To allow for changes in the fluid’s particle count, the **Sonic-Pro** monitors the signal gain and employs an Automatic Gain Control (AGC) algorithm that periodically adjusts the gain maintain the optimum power level.

The speed at which sound travels in the fluid must be known. The factory will configure the meter for a known fluid during the initial configuration. The **Sonic-Pro** model **S3c** includes a 5-button user interface and remote PC software that can be used to configure the meter. Many common fluids are listed in the software and can be selected directly from the menu. Provided the speed of sound in the fluid is known, custom “unknown” fluids can be input manually by the user. A list of various fluids and their sound speeds are provided in the user manual.

Flow Stream Requirements

The Sonic-Pro’s sound wave beam is only affected by fluid that actually passes through the beam and therefore, the meter will not measure accurately if the fluid velocity is not consistent across the entire pipe diameter. Flow disturbances such as pumps, elbows, tees, and valves in the flow stream can cause swirl patterns and vortices that will affect the measurement. Install the transducers on a straight run of pipe **as far as possible** from any disturbances. The distance required for accuracy will depend on the type of disturbance.

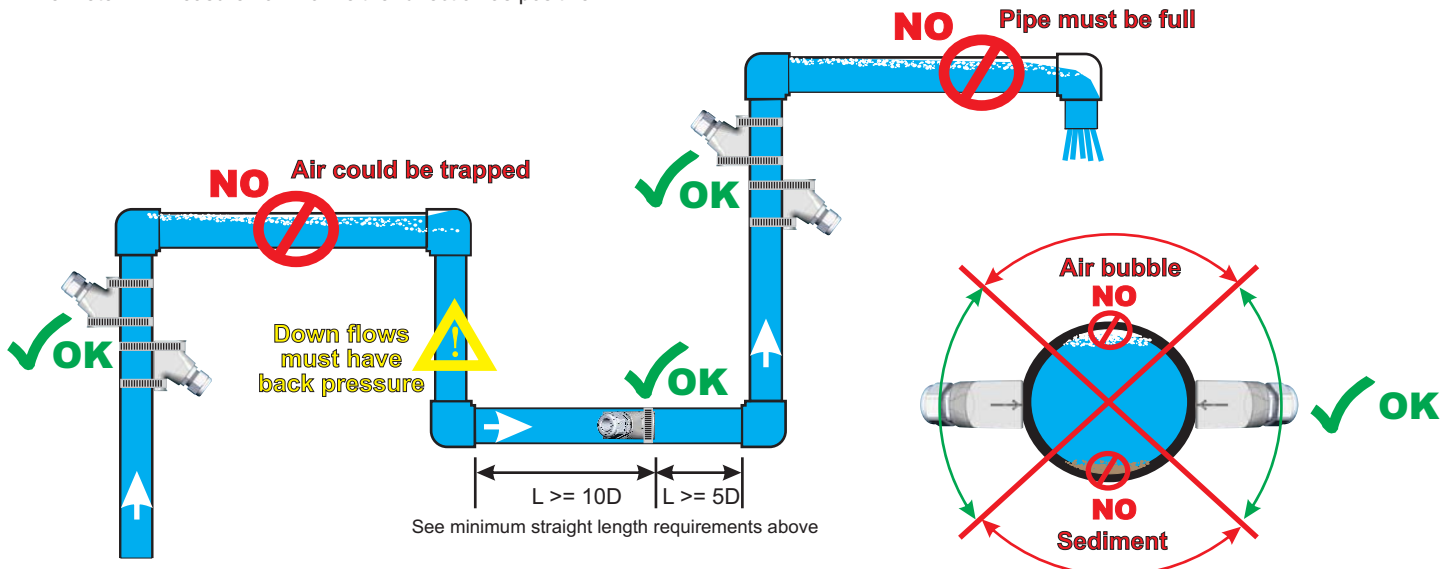
Minimum Straight Pipe Length Requirements

The meter’s accuracy is affected by disturbances such as pumps, elbows, tees, valves, etc., in the flow stream. Install the meter in a straight run of pipe **as far as possible** from any disturbances. The distance required for accuracy will depend on the type of disturbance.

Type of Disturbance	Straight Lengths of Pipe Required	
	Upstream from Transducers	Downstream from Transducers
Flange	5 x Nominal Pipe Size	5 x Nominal Pipe Size
Reducer	7 x Nominal Pipe Size	5 x Nominal Pipe Size
90° Elbow	10 x Nominal Pipe Size	5 x Nominal Pipe Size
Two 90° Elbows - 1 Direction	15 x Nominal Pipe Size	5 x Nominal Pipe Size
Two 90° Elbows - 2 Directions	20 x Nominal Pipe Size	5 x Nominal Pipe Size
Gate valve or Pump	25 x Nominal Pipe Size	5 x Nominal Pipe Size

Transducer Mounting Location

- The meter can be mounted on horizontal or vertical runs of pipe.
- Mounting on the sides (3 o'clock and 9 o'clock) position on horizontal pipe is recommended.
- Mounting anywhere around the diameter of vertical pipe is acceptable, however, the pipe must be completely full of fluid at all times.
- Back pressure is required on downward flows to ensure a full pipe.
- See the minimum straight length of pipe requirement chart above.
- The meter will measure flow from either direction as positive.



Application Qualifier:

Fluid Requirements

Doppler Operation	Transit Time Operation
<ul style="list-style-type: none"> • Must conduct sound • Must contain sound reflecting particles such as air bubbles, sand, etc. <p>Doppler measurement requires 0.02% to 15% (200 to 150,000 ppm) particles be present in the flow stream to “reflect” the sound waves.</p>	<ul style="list-style-type: none"> • Must conduct sound • Must be relatively clean fluid <p>Transit Time measurement requires relatively “clean” fluid. Fluids containing from 0% to 10% (0 to 100,000 ppm) of particles are acceptable.</p>

Note: Do not attempt to measure very low flow velocities in the Doppler mode, the particles can fall out of suspension resulting in error or failure.

Pipe Requirements:

Pipe Material	Pipe Size Ranges and Maximum Wall Thickness		
	Doppler Mode Pipe Size Range	Transit Time Mode Pipe Size Range	Max Pipe Wall
Brass (Naval)	2" to 100" (63mm to 2500mm)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Copper	2" to 100" (63mm to 2500mm)	2" to 100" (63mm to 2500mm)	.500" (13mm)
FRP (fiberglass Reinforced Plastic)	2" to 100" (63mm to 2500mm)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Iron (cast)	2" to 100" (63mm to 2500mm)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Iron (ductile)	2" to 100" (63mm to 2500mm)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Nylon	1" to 100" (25mm to 2500mm)	1-1/2" to 100" (40mm to 2500mm)	2.00" (50mm)
Polyethylene (HDPE)	1" to 100" (25mm to 2500mm)	1-1/2" to 100" (40mm to 2500mm)	2.00" (50mm)
Polyethylene (LDPE)	1" to 100" (25mm to 2500mm)	1-1/2" to 100" (40mm to 2500mm)	1.00" (25mm)
Polypropylene	1" to 100" (25mm to 2500mm)	1-1/2" to 100" (40mm to 2500mm)	.500" (13mm)
PVC / CPVC	1" to 100" (25mm to 2500mm)	1-1/2" to 100" (40mm to 2500mm)	2.00" (50mm)
304 Stainless Steel	2" to 100" (63mm to 2500mm)	2" to 100" (63mm to 2500mm)	.500" (13mm)
304L Stainless Steel	2" to 100" (63mm to 2500mm)	2" to 100" (63mm to 2500mm)	.500" (13mm)
316 Stainless Steel	2" to 100" (63mm to 2500mm)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Steel (1% carbon hard)	2" to 100" (63mm to 2500mm)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Steel (carbon)	2" to 100" (63mm to 2500mm)	2" to 100" (63mm to 2500mm)	.500" (13mm)
Titanium	2" to 100" (63mm to 2500mm)	2" to 100" (63mm to 2500mm)	.500" (13mm)




Note: The outside surface of the pipe must be clean and smooth. Insulation, coatings, rust and other surface imperfections should be removed before installing the transducers. The inside surface of the pipe must be smooth to properly reflect the sound wave.

Straight Lengths of Pipe Requirements

Type of Disturbance	Straight Lengths of Pipe Required	
	Upstream from Transducers	Downstream from Transducers
Flange	5 x Nominal Pipe Size	5 x Nominal Pipe Size
Reducer	7 x Nominal Pipe Size	5 x Nominal Pipe Size
90° Elbow	10 x Nominal Pipe Size	5 x Nominal Pipe Size
Two 90° Elbows - 1 Direction	15 x Nominal Pipe Size	5 x Nominal Pipe Size
Two 90° Elbows - 2 Directions	20 x Nominal Pipe Size	5 x Nominal Pipe Size
Gate valve	25 x Nominal Pipe Size	5 x Nominal Pipe Size
Pump	25 x Nominal Pipe Size	5 x Nominal Pipe Size

Note: The Sonic-Pro’s sound wave beam is only affected by fluid that actually passes through the beam and therefore, the meter will not measure with high accuracy if the fluid velocity is not consistent across the entire pipe diameter. Flow disturbances such as pumps, elbows, tees, and valves in the flow stream can cause swirl patterns and vortices that will affect the measurement. Install the transducers on a straight run of pipe **as far as possible** from any disturbances. The distance required for high accuracy will depend on the type of disturbance.

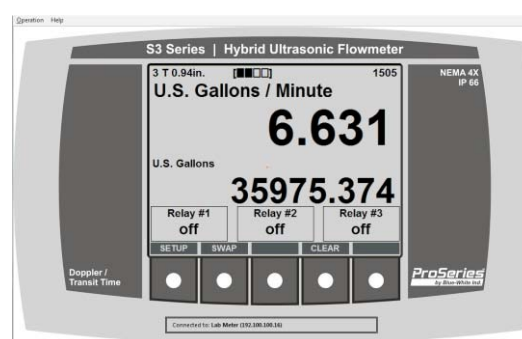
Display Options:

		
<p>Model S3 Display</p> <p>The S3 display option allows full access to the configuration menus directly from the front panel Keypad.</p> <p>Display 320 x 240 pixel QVGA backlit LCD</p> <p>Display Languages English, Spanish, French or German.</p> <p>Keypad Five-button tactile switch keypad.</p> <p>Security Master and configuration passwords.</p> <p>Display Volume Units Configurable Rate and Total units. Rate display in feet or meters per second.</p> <p>Display Time Units Seconds, minutes, hours, days.</p>	<p>Model S2 Display</p> <p>The S2 display option allows the user to clear the accumulated total to zero (if allowed by configuration) and to swap the rate and total display fonts. Access to the configuration menu is not available from the keypad.</p> <p>The meter is factory set for one pipe application only. Pipe material and dimensional changes, fluid selections, output signal scaling, and other features of the meter are not accessible.</p> <p>The communications option is required to access to the configuration menus.</p> <p>Display 320 x 240 pixel QVGA backlit LCD</p>	<p>Model S1 Display</p> <p>The S1 display option does not include a local display.</p> <p>The meter is factory set for one pipe application only. Pipe material and dimensional changes, fluid selections, output signal scaling, and other features of the meter are not accessible.</p> <p>The communications option is required to access to the configuration menus.</p> <p>Display None.</p>

Communications Options:

Any Sonic-Pro model can be equipped with a **Communications Package** that includes Ethernet, USB, RS-232, and RS-485 connections, and proprietary Sonic-Pro User PC Software. When connected to a PC computer running the Sonic-Pro software, the user can access the configuration menu for program editing and data logging downloads directly into a PC.

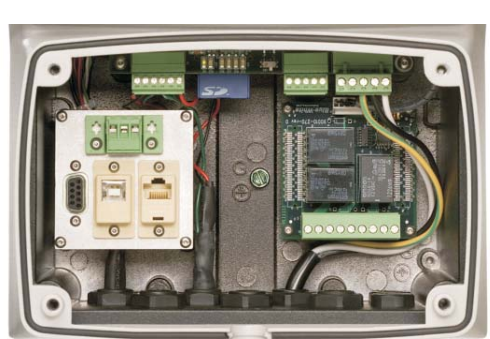
The Sonic-Pro Software user interface mimics the S3 model 5-button touch pad so learning to use the software application is simple. Simply clicking on the buttons is the same as pressing the buttons on the Sonic-Pro SPU touch pad. Pressing and holding shift while clicking on a button simulates pressing and holding a button on the touch pad.



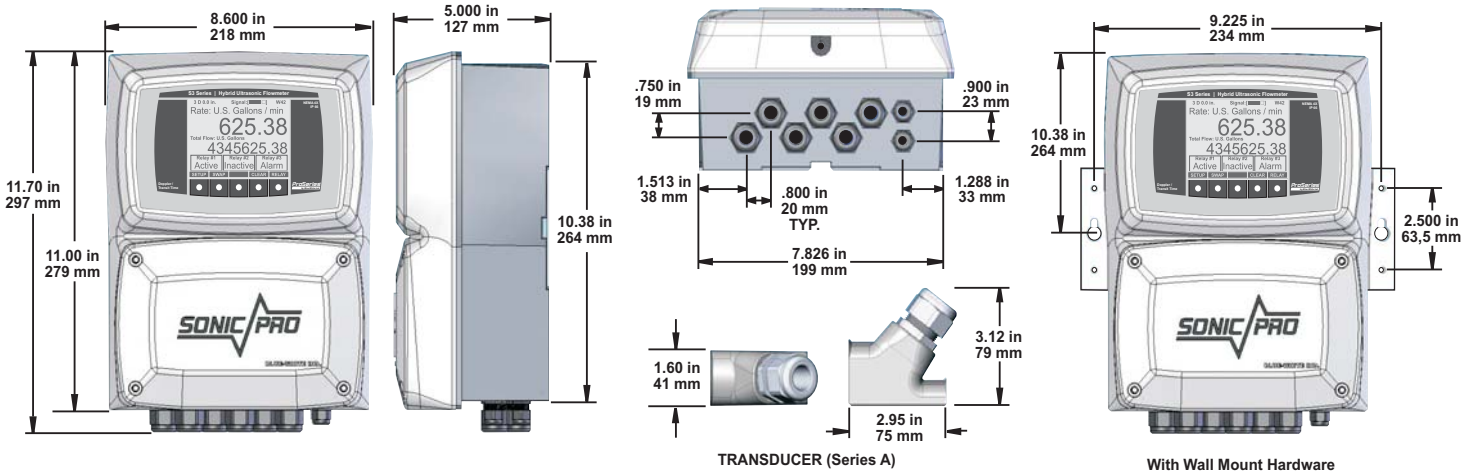
Process Control Options:

Any Sonic-Pro model can be equipped with a **Process Control Relay Package** that includes three independently programmable 10 amp relays. However, relay programming requires the Model S3 programming features or the Communications package to function. Models S1 and S2 cannot access the relay functions unless connected to the communications Software.

Each relay can be configured to respond to changes in either the measured *rate* of flow or the accumulated *total* flow value. When assigned to monitor flow rate, high/low/range rate alarms are possible. When assigned to monitor accumulated total, manual trigger batch operations or automatically triggered, timed batch (proportional feed) operations are possible.



Dimensions:



Model Number Matrix:

Sonic-Pro Ordering Information

Sonic-Pro Part Number Matrix		Pipe Size	Pipe Pressure Rating	Fluid
Base Electronics Package		IPS Pipe Size	SK Sch 5 (ASTM D 1785)	AA Alcohol (Ethyl alcohol; Ethanol)
S1	Factory configured without display ¹	020 2"	SA Sch 10 (ASTM D 1785)	AB Benzene
S2	Factory configured with display ¹	025 2-1/2"	SB Sch 20 (ASTM D 1785)	AC Ethylene glycol
S3	Factory configured with user configurable display	030 3"	SC Sch 30 (ASTM D 1785)	AD Ethylene glycol / water (50%)
Smart Communications and Control²		040 4"	SD Sch 40 (ASTM D 1785)	AE Gasoline
A	Communications Includes Ethernet, USB, RS-232, RS-485 connections, and user configuration and monitoring PC software.	050 5"	SE Sch 60 (ASTM D 1785)	AF Isopropyl alcohol
B	Process control Includes three 10 amp, form C relays. Note: Requires S3 configurable display or the communications option	060 6"	SF Sch 80 (ASTM D 1785)	AG Methyl alcohol (Methanol)
C	Both Communication and Process Control options	080 8"	SG Sch 100 (ASTM D 1785)	AH Methyl ethyl Ketone
X	None	100 10"	SH Sch 120 (ASTM D 1785)	AI Milk, homogenized
Power Supply Cord Rating and Plug Type³		120 12"	SI Sch 140 (ASTM D 1785)	AJ Oil, diesel
1	U.S. 125V with NEMA 5/15 plug	141 14"	SJ Sch 160 (ASTM D 1785)	AK Toluene
2	European 250V with CEE 7/IIII plug	161 16"	DA SDR 41 (ASTM D 2241)	AL Water (distilled; waste)
3	U.S. 250V with NEMA 6/15 plug	181 18"	DB SDR 26 (ASTM D 2241)	AN Water, sea
X	Power cord without attachment plug	201 20"	DC SDR 21 (ASTM D 2241)	XX User configured
Transducer Model and Cable Length		220 22"	DD SDR 13.5 (ASTM D 2241)	
A1	Model A with 10 ft cable	240 24"	PA PN 4 Metric (DIN 8062)	
A2	Model A with 25 ft cable	260 26"	PB PN 6 Metric (DIN 8062)	
A3	Model A with 50 ft cable	281 28"	PC PN 10 Metric (DIN 8062)	
A4	Model A with 100 ft cable	300 30"	PD PN 16 Metric (DIN 8062)	
Nominal Pipe Size⁴		320 32"	PE PN 20 Metric (DIN 8062)	
Select from options list		340 34"	BB CLASS B British (BS 3506)	
Pipe Pressure Rating⁴		360 36"	BC CLASS C British (BS 3506)	
Select from options list		420 42"	BD CLASS D British (BS 3506)	
Pipe Material⁴		480 48"	BE CLASS E British (BS 3506)	
Select from options list			B7 CLASS 7 British (BS 3506)	
Display Volume Units³			XX User configured	
G	Gallons	Metric Pipe Size		
L	Liters	063 63mm		
F	Cubic Feet	075 75mm		
A	Acre Feet	090 90mm		
M	Cubic Meters	110 110mm		
Display Time Units		125 125mm		
M	Minutes	140 140mm		
H	Hours	160 160mm		
D	Days	180 180mm		
Fluid⁴		200 200mm		
Select from options list		225 225mm		
Display language		250 250mm		
E	English	280 280mm		
S	Spanish	315 315mm		
G	German	355 355mm		
F	French	400 400mm		
Sample model number		450 450mm		
S3	C	500 500mm		
	1	560 560mm		
	A1	630 630mm		
	060	710 710mm		
	SD	800 800mm		
	J	101 1000mm		
	G	XXX User config.		
	M			
	AL			
	E			

Optional replacement set of transducers	
ST	SonicPro Transducer
Pipe Size	
A	Pipe 1" to 100" (25mm to 2500mm)
Cable Length	
010	10 feet
025	25 feet
050	50 feet
100	100 feet
ST - A - 010	Sample model

Notes:

- 1) Unless equipped with the communications option and user software, models S1 and S2 are factory configurable only.
- 2) Smart Communications Option B (process control relays), requires either the S3 configurable display or the communications option for relay configuration.
- 3) Other display volume units, including custom units are available. Contact the factory for ordering information.
- 4) Not all pipe sizes, pipe pressure ratings and fluids are shown here. Contact the factory for more information.
- 5) The basic Sonic-Pro model number includes one set of transducers. Optional transducer set ordering information is shown to enable ordering replacement or secondary sets.