

APPLICATION NOTE

SOLID AT' SENSORS APPLICATION GUIDANCE

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1. SCOPE

This document provides application guidance for use of Solid AT sensors in various applications. The document will refer to different types of application material and Solid AT' sensors' compatibility to these applications in terms of temperature, corrosion, state, etc. With this information customers will be able to operate Solid AT' measurement equipment adequately and achieve better measurement results.

2. OBJECTIVES

- Familiarize the user with Solid AT sensors, transducers and housing specifications.
- Familiarize the user with Solid AT sensors ranges and accuracy.
- Familiarize the user with Solid AT sensors temperature compatibility.
- Familiarize the user with Solid AT sensors corrosion compatibility.

3. TRANSDUCERS AND HOUSING SPECIFICATIONS

3.1 TRANSDUCERS TYPES

The following table summarizes the type of transducers applicable for each of SolidScan ultrasonic devices:

SolidScan Device	Type of transducer available
MicroScan	Coated aluminum
MonoScan	Coated aluminum
MonoScan Ex	Coated aluminum
SmartScan25	Coated aluminum
SmartScan25 Ex	Coated aluminum

3.2 HOUSING TYPES

The following table summarizes the type of housing applicable for each of SolidScan ultrasonic devices:

SolidScan Device	Type of transducer available
MicroScan	PolyProp. PVDF
MonoScan	PolyProp. PVDF
MonoScan Ex	PolyProp. PVDF
SmartScan25	PolyProp. PVDF
SmartScan25 EX	PolyProp. PVDF

3.3 GENERAL APPLIACTION GUIDANCE

3.3.1 Coated Aluminum (Halar®ECTFE)

The most important advantage of ECTFE is not only the good diffusion resistance or the wide temperature range, but especially its excellent chemical resistance. ECTFE can be used with caustic soda or an aggressive caustic potash. Moreover ECTFE provides a good resistance to oxidation acids (>97%), nitric acid (100%), chlorine dioxide and hypochlorite.

Solid AT' coated aluminum (ECTFE) transducer advantage is its high sensitivity and its ability to obtain the weakest echoes. These virtues enable this type of transducer to operate in complex environments with low echo attenuation such as solid materials.

Refer to Appendix A 'Corrosion Table' to verify material resistance for your application.

3.3.2 Summary

The following table summarizes the advantages and disadvantages of Solid AT transducers:

Type	Energy Efficiency	Resistance in aggressive environment	Accuracy/ Response time	Tolerance to short-range interferences
Coated Aluminum	10	9	7	6

- "1" for lowest performance and "10" for highest performance.
- Tolerance to short-range interferences – up to 1 meter.

4. RANGES AND ACCURACY

The following table summarizes Solid AT' products and transducers and specifies applicable ranges and accuracy.

Device	Transducer	Application	Max. Range	Accuracy [%]	Accuracy [cm]
MicroScan	Coated Aluminum	Solid	3.5m/11.5ft	0.25%	1.25cm/0.49in
		Liquid	5m/16.4ft	0.25%	1.25cm/0.49in
MonoScan - Short range	Coated Aluminum	Solid	5m/16.4ft	0.25%	1.25cm/0.49in
		Liquid	5m/16.4ft	0.25%	1.25cm/0.49in
		OCM	5m/16.4ft	0.25%	1.25cm/0.49in
MonoScan - Standard range	Coated Aluminum	Solid	8.5m/27.8ft	0.25%	2.12cm/0.83in
		Liquid	*15m/49ft	0.25%	3.75cm/1.47in
		OCM	*15m/49ft	0.25%	3.75cm/1.47in
SmartScan25 - Standard range	Coated Aluminum	Solid	20m/64ft	0.25%	5.00cm/1.96in
		Liquid	25m/82ft	0.25%	6.25cm/2.46in
		OCM	25m/82ft	0.25%	6.25cm/2.46in
SmartScan25 - Long range	Coated Aluminum	Solid	40m/131ft	0.25%	10.0cm/3.93in
		Liquid	30/40m/ 98/131ft	0.25%	10.0cm/3.93in
		OCM	30/40m/ 98/131ft	0.25%	10.0cm/3.93in

TEMPERATURE COMPATIBILITY

The following tables, summaries Solid AT' products and transducers and their temperature compatibility.

Transducers Temperature compatibility:

Transducer	Temperature range
Coated Aluminum (MonoScan)	-40° - +70° C (-40° - +158°F)
Coated Aluminum (MicroScan)	-40° - +70° C (-40° - +158°F)
Coated Aluminum (SmartScan)	-40° - +80° C (-40° - +176°F)

SolidScan devices' temperature compatibility.

Device (Control Unit)	Temperature range
MonoScan	-40° - +70° C (-40° - +158°F)
MicroScan	-40° - +70° C (-40° - +158°F)
SmartScan25	-40° - +60° C (-40° - +140°F)

APPENDIX A: CORROSION DATA

The information presented in this application note is intended as a guide to the chemical resistance of materials used in the transducers manufactured by Solid AT.

The information presented refers only to basic corrosion resistance and has no relevance acoustic performances and or ultrasonic behavior.

Some factors which influence corrosion rating, such as temperature fluctuations, concentration and aeration of fluids, high velocity or abrasions in the fluid steam have been taken into account.

As Solid AT ultrasonic devices are non-contact level measurement gauges, there is no direct contact between the transducer and the medium so one can consider a good corrosion resistance as "A" or "B"rank.

In the ECTFE column, the rating has been based on working temperature, which can influence to ECTFE resistance.

Rating Explanation

A Excellent

UP TO 80°C
(ECTFE)

B Good

UP TO 65°C
(ECTFE)

C Poor

UP TO 26°C
(ECTFE)

D Do not use

Note:

- Ratings are based on ambient temperatures unless otherwise specified.
- Ratings are given for the corrosion resistance of Solid AT' transducers and have no relevance with the acoustic/ultrasonic performances.
- Ratings are given for direct contact of the medium with the transducer. Although Solid AT' devices are non-contact, it is advised to use a compatible transducer that is ranked with "A" or "B" and fits the application requirements.
- Ratings and guidance are based on chemical studies from sources which are specified at the end of this bulletin.
- It is recommended that in critical applications, testes will be conducted to verify the rating.
- Please consult our customer support to verify proper functionality of Solid AT products in your application.

① Note:

An empty cell where no rating is specified indicates lack of information on certain materials.

A

Material	ECTFE
Acetic Acid	B
Acetic Anhydride	C
Acetone	B
Acetyl Chloride	B
Acetylene	B
Acrylonite	B
Alcohol, Butyl	A
Alcohol, Diacetone	B
Alcohol, Ethyl	A
Alcohol, Fatty	A
Alcohol, Isopropyl	A
Alcohol, Methyl	A
Alcohol, Propyl	A
Alumunia	
Aluminum Acetate	
Aluminum Chloride Dry	
Aluminum Fluoride	A
Aluminum Hydroxide	A
Aluminum Nitrate	A
Aluminum Oxalate	
Alum	A
Amines	
Ammonia Alum	
Ammonia, Anhydrous Liquid	A
Ammonia, Aqueous	
Ammonia Solutions	
Ammonium Acetate	B
Ammonium Bicarbonate	
Ammonium Bromide 5%	
Ammonium Carbonate	A
Ammonium Chloride	A
Ammonium Hydroxide 28%	A
Ammonium Hydroxide Concentrated	A
Ammonium Monosulfate	
Ammonium Nitrate	A
Ammonium Oxalate 5%	
Ammonium Persulfate	B
Ammonium Phosphate	A
Ammonium Sulfate	A
Ammonium Sulfide	
Amyl Acetate	B
Amyl Chloride	A
Aniline	C
Aniline Dyes	

B

Material	ECTFE
Barium Carbonate	A
Barium Chloride	A
Barium Cyanide	
Barium Hydrate	
Barium Hydroxide	A
Barium Nitrate	C
Barium Sulfate	A
Barium Sulfide	A
Benzaldehyde	B
Benzene (Benzol)	B
Benzoic Acid	A
Beryllium Sulfate	
Borax (Sodium Borate)	A
Boric Acid	A
Bromine	B
Butadiene	A
Butyl Acetate	B
Butylene	
Butyric Acid	A

C

Material	ECTFE
Calcium Bisulfite	A
Calcium Carbonate	A
Calcium Chlorate	A
Calcium Chloride	A
Calcium Hydroxide	A
Calcium Nitrate	A
Calcium Phosphate	
Calcium Silicate	
Calcium Sulfate	A
Camphor	
Carbonated Water	
Carbon Bisulfide	C
Carbon Dioxide	A
Carbonic Acid	A
Carbon Monoxide	B
Carbon Tetrachloride	A
Casein	
Caustic Potash	A
Caustic Soda	
Cellulose Acetate	C
Chlorinated Solvents	
Chlorinated Water	A
Chlorobenzene	B
Chloroform	A
Chlorophyll	
Chlorosulfonic Acid	C
Chrome Alum	
Chromic Acid < 50%	A
Chromic Acid > 50%	
Chromium Sulfate	
Citric Acid	A
Copper Acetate	
Cooper Carbonate	B
Cooper Cyanide	A
Cooper Nitrate	A
Cooper Sulfate	A
Cresol	A
Cresylic Acid	B
Cupric Nitrate	A
Cyclohexane	A
Cyclohexanone	A

D-E

Material	ECTFE
Detergents, Synthetic	A
Dextrin	A
Dichloromethane	
Diesel Oil Fuels	A
Diethylamine	D
Diethyl Benzene	
Diethylene Glycol	C
Diethyl Sulfate	
Dimethyl Formamide	C
Dioxane	B
Dipentane (Pinene)	
Disodium Phosphate	A
Epsom Salts (MgSo4)	
Ethane	
Ethers	A
Ethyl Acetate	B
Ethyl Acrylate	B
Ethyl Chloride	
Ethylene Chloride	
Ethylene Dichloride	D
Ethylene Glycol	A
Ethylene Oxide	A
Ethyl Ether	B
Ethyl Silicate	
Ethyl Sulfate	

F-G

Material	ECTFE
Fatty Acids	A
Ferric Hydroxide	
Ferric Nitrate	A
Ferric Sulfate	A
Ferrous Ammonium Citrate	
Ferrous Chloride	A
Ferrous Sulfate	A
Fertilizer solutions	
Fluoboric Acid	C
Fluosilicic Acid	A
Formaldehyde	C
Formic Acid	A
Fuel Oil	
Furfural	
Gallic Acid 5%	B
Gasoline, Aviation	
Gasoline, Leaded	A
Gasoline, Motor	
Gasoline, Refined	
Gasoline, sour	A
Gasoline, Unleaded	A
Gelatine	A
Glucose	A
Glue	
Glycerine (Glycerol)	A
Glycol Amine	
Glycol	A
Graphite	
Grease	

H-I-J-K-L

Material	ECTFE
Hydraulic Oilm Petroleum Base	
Hydrazine	
Hydrocyanic Acid	A
Hydrochloric Acid	A
Hydrofluoric Acid	A
Hydrofluosilicic Acid	A
Hydrogen Peroxide	B
Hydrogen Sulfide	A
Hypo (Sodium Thiosulfate)	A
Ink	
Iodoform	
Iso-Octane	C
Isopropyl Acetate	
Isopropyl Ether	C
JP-4 Fuel	A
JP-5 Fuel	A
JP-6 Fuel	
Kerosene	A
Ketones	
Lactic Acid Concentrated	B
Lactic Acid Dilute	
Lead Acetate	A
Lead Sulfate	A
Lecithin	
Linoleic Acid	A
Lithium Chloride	
Lubricating Oil Petroleum Base	A

M

Material	ECTFE
Magnesium Bisulfate	
Magnesium Bisulfate	
Magnesium Carbonate	A
Magnesium Chloride	A
Magnesium Hydroxide	A
Magnesium Nitrate	A
Magnesium Sulfate	A
Maleic Acid	A
Maleic Anhydride	
Malic Acid	A
Managanese Carbonate	
Managanese Sulfate	
Melamine Resins	
Methanol	
Mercuric Chloride	A
Mercuric Cyanide	A
Mercurous Nitrate	A
Mercury	A
Methane	A
Methyl Acetate	
Methyl Acetone	
Methylamine	D
Methyl Bromide 100%	A
Methyl Cellosolve	A
Methyl Chloride	A
Methyl Ethyl Ketone	B
Methylene Chloride	D
Methyl Formate	
Methyl Isobutyle Ketone	B
Molybdcic Acid	
Monochloro Benzene	B
Morphine	

N-O

Material	ECTFE
Naptha	A
Napthalene	B
Nickel Ammonium Sulfate	
Nickel Chloride	A
Nickel Nitrate	A
Nickel Sulfate	A
Nicotinic Acid	A
Nitric Acid < 30%	A
Nitric Acid < 80%	B
Nitric Acid 100%	B
Nitrobenzene	B
Nitrogen	A
Nitrus Acid 10%	A
Nitrous Oxide	C
Olaic Acid	
Oleic Acid	A
Oleum	D
Oxalic Acid	B
Oxygen	
Ozone	A

P

Material	ECTFE
Palmitic Acid	A
Paraffin	B
Paraformaldehyde	
Paraldehyde	
Pentane	
Perchlorethylene	B
Petrolatum	
Phenol	B
Phosphate Ester 10%	
Phosphate Acid 10%	
Phosphoric Acid 10%	A
Phosphoric Acid 50%	A
Phosphoric Acid 85%	A
Phosphoric Anhydride	
Phosphorous Trichloride	A
Phthalic Acid	A
Phthalic Anhydride	
Picric Acid	C
Polysulfide	
Polyvinyl Acetate	A
Polyvinyl Chloride	
Potassium Bicharbonate	
Potassium Bichromate	A
Potassium Bisulfate	A
Potassium Bromide	A
Potassium Carbonate	A
Potassium Chlorate	A
Potassium Chloride	A
Potassium Chromate	A
Potassium Cyanide	A
Potassium Dichromate	A
Potassium Ferricyanide	A
Potassium Hydroxide	B
Potassium Iodide	A
Potassium Nitrate	A
Potassium Oxalate	
Potassium Permanganate	A
Potassium Phosphate	
Potassium Sulfate	A
Potassium Sulfide	A
Propyl Bromide	
Propylene Glycol	
Pyridine	D
Pyrolgalic Acid	B

S

Material	ECTFE
Salicylic Acid	A
Salt (NaCl)	
Salt Brine	
Sauerkraut Brine	
Sea Water	
Sewage	
Shellac	
Silicone Fluids	
Silver Bromide	
Silver Cyanide	A
Silver Nitrate	A
Silver Plating	
Soap Solutions	B
Sodium Acetate	A
Sodium Aluminate	
Sodium Benzoate	A
Sodium Bicarbonate	A
Sodium Bichromate	B
Sodium Bisulfate	A
Sodium Borate	
Sodium Bromide	A
Sodium Carbonate (Soda Ash)	A
Sodium Chlorate	A
Sodium Chloride	A
Sodium Chromate	
Sodium Citrate	
Sodium Cyanide	A
Sodium Fluoride	A
Sodium Hydroxide 20%	A
Sodium Hydroxide 50%	A
Sodium Hydroxide 70%	B
Sodium Hypochloride	A
Sodium Lactate	
Sodium Metaphosphate	A
Sodium Metasilicate	
Sodium Nitrate	A
Sodium Nitrite	A
Sodium Perborate	
Sodium Peroxide	A
Sodium Phosphate	A
Sodium Polyphosphate	
Sodium Salicylate	
Sodium Silicate	A
Sodium Sulfate	A
Sodium Sulfide	A
Sodium Sulfite	A
Sodium Tetraborate	A
Starch	
Stearic Acid	A
Styrene	

Sulfur	A
Sulfur Chlorides	C
Sulfur Dioxide	A
Sulfur Hexafluoride	
Sulfur, Molten	
Sulfur Trioxide	
Sulfur Acid 0 to 77%	A
Sulfur Acid 100%	B
Sulfurous Acid	A

T-U-V-W-X-Z

Material	ECTFE
Tannic Acid	A
Tartaric Acid	A
Tetraethyl Lead	A
Toluol (Toluene)	B
Tributyl Phosphate	D
Trichlorethylene	
Trichloroacetic Acid	B
Triethanolamine	D
Triethylamine	B
Trisodium Phosphate	A
Turpentine	A
Uric Acid	
Varnish	
Vinyl Acetate	A
Water, Distilled	A
Water, Fresh	
Water, Acid Mine	A
Waxes	
Xylene (Xylol)	B
Zinc Bromide	
Zinc Hydrosulfite	
Zinc Sulfate	A

Oils

Material	ECTFE
Bunker Oils (Fuel)	
Caster Oil	A
China Wood Oil (Tung)	
Coconut Oil	A
Cooking Oil	
Corn Oil	A
Cottonseed Oil	A
Creosote Oil	C
Crude Oil, Sour	
Crude Oil, Sweet	A
Cutting Oils, Water Emulsions	
Diesel Oil Fuels	A
Drying Oil	
Fish Oil	
Fuel Oil	
Lard Oil	A
Linseed Oil	A
Mineral Oils	A
Oils & Fats	
Oils, Animal	
Oils, Petroleum	
Oils, Petroleum Sour	
Oils, Water Mixture	
Olive Oil	
Palm Oil	
Pine Oil	
Quench Oil	
Salad Oil	
Soybean Oil	
Tall Oil	A
Tar Oils	A
Transformer Oil	B
Vegetable Oils	A

Food & Beverage

Material	ECTFE
Apple Juice	
Beer	B
Blood (meat juices)	
Beet Sugar liquors	B
Butter	
Buttermilk	
Caned Sugar liquors	B
Cider	
Coca Cola Syrup	
Coffee	
Fruit Juice	B
Ketchup	
Lactose	
Lard	A
Malt Beverage	
Mayonnaise	
Milk and Milk Products	A
Molasses, Crude	B
Molasses, Edible	B
Mustard	
Pineapple Juice	
Sugar, Liquids	
Sugar, Syrups & Jam	
Tomato Juice	A
Vinegar	A
Whiskey & Wines	A